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### Authors

Wohl, C G

Armstrong, F E

Rittenberg, A

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## CURRENT EXPERIMENTS IN ELEMENTARY PARTICLE PHYSICS

**C.G. Wohl, F.E. Armstrong, A. Rittenberg, T.G. Trippe, G.P. Yost**

*Particle Data Group, Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720 USA*

**Y. Oyanagi**

*University of Tsukuba, Sakura-mura, Niihari-gun, Ibaraki-ken 305, Japan*

**D.C. Dodder**

*Los Alamos National Laboratory, Los Alamos, NM 87545, USA*

**Yu.G. Ryabov, S.R. Slabospitsky**

*Institute for High Energy Physics, Serpukhov, Protvino, Moscow Region 142 284, USSR*

**R. Frosch**

*Swiss Institute for Nuclear Research, CH-5234 Villigen, Switzerland*

**A. Olin**

*TRIUMF, 4004 Wesbrook Mall, Vancouver BC V6T 2A3, Canada*

**F. Lehar**

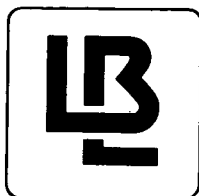
*DPhPE-SEPh, CEN Saclay, F-91190 Gif-sur-Yvette, France*

**A.N. Moskalev**

*Leningrad Nuclear Physics Institute, Gatchina, Leningrad 188 350, USSR*

**B.P. Barkov**

*Institute of Theoretical and Experimental Physics, Moscow 117 259, USSR*



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University of California

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*Particle Data Group, Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720 USA*

**Y. Oyanagi**

*University of Tsukuba, Sakura-mura, Niihari-gun, Ibaraki-ken 305, Japan*

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**R. Frosch**

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**B.P. Barkov**

*Institute of Theoretical and Experimental Physics, Moscow 117 259, USSR*

**Abstract** – This report contains summaries of 720 recent and current experiments in elementary particle physics (experiments that finished taking data before 1980 are excluded). Included are experiments at Brookhaven, CERN, CESR, DESY, Fermilab, Moscow Institute of Theoretical and Experimental Physics, Tokyo Institute of Nuclear Studies, KEK, LAMPF, Leningrad Nuclear Physics Institute, Saclay, Serpukhov, SIN, SLAC, and TRIUMF, and also experiments on proton decay. Instructions are given for searching online the computer database (maintained under the SLAC/SPIRES system) that contains the summaries. Properties of the fixed-target beams at most of the laboratories are summarized.

*\*The Berkeley Particle Data Group is supported by the Director, Office of Energy Research, Office of High Energy and Nuclear Physics, Division of High Energy Physics of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098, and by the U.S. National Science Foundation under Agreement No. PHY86-15529.*

## TABLE OF CONTENTS

<b>Introduction</b>	1
<b>Searching the EXPERIMENTS computer database online</b>	3
<b>Indices to the summaries</b>	
Beam-target momentum	6
Spokesperson	15
<b>Abbreviations used in the summaries</b>	
Journals	21
Kinematic variables	21
Accelerators	22
Detectors	23
Particles	25
<b>Summaries of experiments</b>	
BNL	29
CERN	40
CESR	75
DESY	76
Fermilab (FNAL)	79
Institute for Nuclear Studies, Tokyo (INS)	98
Institute for Theoretical and Experimental Physics, Moscow (ITEP)	100
KEK	102
Los Alamos (LAMPF)	107
Leningrad Nuclear Physics Institute (LENI)	118
Nucleon decay (P-DECAY)	121
Saclay	122
Serpukhov (SERP)	128
SIN	135
SLAC	140
TRIUMF	145
<b>Properties of fixed-target beams</b>	
Brookhaven AGS beams	153
CERN PS beams	154
CERN SPS beams	155
Fermilab beams	157
KEK beams	158
LAMPF beams	159
Serpukhov beams	160
SIN beams	161
SLAC beams	162
TRIUMF beams	163

## INTRODUCTION

This report contains summaries of 720 approved experiments in elementary particle physics. A glance at the summaries in the body of the report will show the kind of information given. Note that a summary includes a list of the any journal papers that have come from the experiment. Experiments at the following laboratories are included:

Brookhaven (BNL)	KEK
CERN	Leningrad Nuclear Physics Institute (LENI)
CESR	Los Alamos (LAMPF)
DESY	Saclay
Fermilab (FNAL)	Serpukhov (SERP)
Institute for Nuclear Studies, Tokyo (INS)	SIN
Institute for Theoretical and Experimental Physics, Moscow (ITEP)	SLAC
	TRIUMF

There are also summaries of proton decay experiments (P-DECAY). Experiments that finished taking data before 1980 are not included here but exist on a computer database (see below).

**Sources of information** — Our first information about an experiment usually comes from the proposal for the experiment. Then we follow the progress of the experiment as best we can in laboratory reports such as “Experiments at CERN in 1986.” Finally, a few months before an edition of this report is to appear, we send copies of the summaries of the experiments to the spokespersons for checking and updating. If a reply is received — as was the case for 403 of the experiments — there is a “✓” next to the spokesperson on the summary. Since current experiments are often in flux, we rely heavily on these replies to be up to date, so if there is no ✓ by the spokesperson the summary is likely to be incomplete.

**Computer database** — This report is produced from a computer database maintained at SLAC under the SPIRES database management system. The database, named EXPERIMENTS, also contains information from earlier editions of this report about many experiments completed before 1980 (going back to about 1975, and including experiments at Argonne and Rutherford). A guide to using the EXPERIMENTS database online begins on p. 3.

**Abbreviations** — To keep the summaries brief, abbreviations are used to indicate journals, kinematic variables, accelerators, and detectors. The abbreviations are usually obvious but are defined near the beginning of the report. They are needed for searching the EXPERIMENTS database online.

**Properties of particle beams** — Tables at the back of the report summarize the properties of beams for fixed-target experiments at Brookhaven, CERN, Fermilab, KEK, LAMPF, Serpukhov, SIN, SLAC, and TRIUMF.

**Supplement on detectors** — This report has a supplement entitled “Major Detectors in Elementary Particle Physics.” The second edition, describing 49 detectors, appeared in May 1985. For each detector, there is a 2-page summary giving properties and performance characteristics and a diagram. A third edition is planned for 1988.

**Acknowledgments** — We thank L. Addis (SLAC) for much help with the SPIRES database system, A. Ogawa (SLAC) for help with the  $\text{T}_{\text{E}}\text{X}$  system, M. Ferro-Luzzi (CERN) for permission to make extensive use of “Experiments at CERN in 1986,” J. Coleman (FNAL) for information about Fermilab experiments, and the hundreds of spokespersons who took the time to reply to our inquiries.

**Comments and requests** — We invite comments pointing out omissions, obscurities, out-of-date information, and errors. Comments should be sent to:

Particle Data Group (50-308)  
Attn: EXPERIMENTS  
Lawrence Berkeley Laboratory  
Berkeley, CA 94720  
USA

Requests for copies from the Americas, Australasia, and the Far East should go to the above address, while those from other areas should go to:

CERN Scientific Information Service  
CH-1211 Geneva 23  
Switzerland

## SEARCHING THE EXPERIMENTS COMPUTER DATABASE ONLINE

As mentioned in the Introduction, the summaries in this report and summaries of many earlier experiments are contained in a computer database named EXPERIMENTS maintained at SLAC under the SPIRES database management system.

Anyone who has an account on the SLAC IBM 3081 computer can access this database online. If you have an account but are unfamiliar with SPIRES, a "Guide to VM SPIRES" is available from the SLAC Library, Bin 196, SLAC, P.O. Box 4349, Stanford, CA 94305, USA (phone: 415/854-3300, ext. 2411). If you do not have an account and cannot find anyone who does (at main laboratories, ask at the library), contact Louise Addis of the SLAC Library. If you just want to try out the system, contact us about using a temporary guest account: Particle Data Group, 50-308, Lawrence Berkeley Laboratory, Berkeley, CA 94720, USA (phone: 415/486-4723, or FTS 451-4723).

The EXPERIMENTS database is also available under a different system in Europe (contact M. Whalley, Dept. of Physics, Univ. of Durham, South Road, Durham DH1 3LE, England) and in the USSR (contact V. V. Ezhela, Inst. for High Energy Physics, Serpukhov, Moscow Region, USSR).

A brief description of how to use the EXPERIMENTS database under SPIRES follows. Words *not* enclosed in angular brackets <> are to be typed as given (only the letters in **BOLDFACE UPPER CASE** are needed, and these may be entered in upper or lower case). Words in angular brackets are "variables" for which the user substitutes an appropriate value, again in either upper or lower case (the brackets are *not* typed).

If you will be communicating with the SLAC computer at 1200 BAUD or less (such as over telephone lines or with a hardcopy terminal), you will probably want to run in line-by-line mode, in which case you need to set your terminal/modem for half-duplex operation. If you will be communicating at a speed greater than 1200 BAUD, you will probably want to run in full-screen mode, in which case you need to use full-duplex, even-parity, 7-data-bit operation. You will usually connect to the computer through the "MICOM switch," which will ask you what "class" you want. If you are set up for line-by-line mode, type:

### **VMLINE**

If you are set up for full-screen mode, type:

### **VM24**

In full-screen mode, you will then be asked to type a carriage return, and for the kind of terminal you are using (e.g., VT100 or ADM3A). Finally, in either mode, type an extra carriage return after you see the message VM/370 ONLINE. [Note that in full-screen mode, whenever the screen fills up (indicated by the word MORE at the bottom), you may clear it by hitting the CLEAR key (which may be ENTER, CONTROL-L, or CONTROL-Z on your terminal); if you don't explicitly clear the screen, it will do so automatically after a minute or so (you can hold the screen indefinitely by hitting a carriage return). Also, if you are listing out information and want to abort the listing, type HT and a carriage return before hitting the CLEAR key. In line-by-line mode, you can abort a listing with the BREAK or ATTN key.]

After going through the above connection procedure, log on to the computer by typing:

Logon <your-account>  
(e.g., Logon **JDOE**)

Then type your password when asked for it (it will not show on your terminal), and finally type an extra carriage return after the system gives its introductory messages.

To enter the SPIRES system, type:

### **SPIRES**

(special SPIRES-only accounts, ending in the letters SPI, don't need to do this)

To get a detailed explanation of how to use a particular SPIRES command, type:

**EXPLAIN** <command-word>  
(e.g., **EXPLAIN FIND, EXPLAIN EXPLAIN, EXPLAIN EVERYTHING**)



To access the database, type:

**SELect EXPERIMENTS**

To find out what indices are available for searching in this database (and the various index names you may use to refer to them), type:

**SHOw INDEx**

To see a random selection of values in an index (and thus determine the form to use for a search value), type:

**BROwse <index-name>**  
(e.g., **BROwse EXPeriment-num**)

To see a selection of values in an index near a particular value (perhaps to see if a value you are interested in is valid, or to see nearby values), type:

**BROwse <index-name> <value>**  
(e.g., **BROwse EXPeriment-num SLAC-PEP**)

To search for experiments satisfying certain criteria, type:

**FIND <index-name> <value> AND(OR) <index-name> <value> . . .**

Some sample searches are:

**FIND EXPeriment-num CERN-UA-001**

**FIND Author RUBBIA**

**FIND DETector OMEGA OR OMEGAPRIME**

**FIND Title J/PSI**

This finds any experiment with J/PSI as part of the title.

**FIND CITation "PRL 46 (1981) 1115"**

Note that the above form, with spaces but no commas between the elements, must be used. Note also the quotes which are required here and in the following two examples; for an explanation, see the discussion below on *Searching Problems*.

**FIND REaction "PI- P --> PI0 N" AND ECM 3 TO 4**

The "arrow" here is composed of two minus signs and a greater-than sign. Specifying the reaction as, e.g., **PI- P#**, would get all reactions with  $\pi^-p$  as the initial state, regardless of the final state. Energies and momenta are in GeV and GeV/c, respectively.

**FIND Particle "UPSI(9460)"**

---

*Searching Problems:* If your search does not find any experiments, there are two common reasons why it may have failed spuriously. (1) You may have used an incorrect form for the value for which you were searching (e.g., an incorrect particle or experiment name). To find out the correct form, use the BROWSE command for the index you are searching (see above), or look in the lists of names and abbreviations beginning on page 21. Note, in particular, that in reaction and particle searches, an antiparticle name is formed by following the corresponding particle name with BAR (thus the antiproton is written as PBAR); in title searches, particle names are somewhat variable in their spelling, and several forms may be used. (2) Any search value containing any of the special characters ( ) < > = must be enclosed in quotes "..."; see the examples for CITATION, REACTION, and PARTICLE above.

---

After entering a FIND command, you will be told the number of experiments satisfying the criteria given. At this point, you have several options:

(1) You may list out the information available for these experiments by typing:

**TYPE** (or **TYPE PAUSE** if you are in line-by-line mode on a CRT terminal)

[Recall that you may abort a long listing by hitting the BREAK or ATTN key if you are in line-by-line mode, or by typing HT followed by a carriage return followed by the CLEAR (ENTER, CONTROL-L, or CONTROL-Z) key if you are in full-screen mode.]

Or (2) you may narrow the list already found (i.e., add more selection criteria) by typing:

**AND** <index-name> <value>

Or (3) you may broaden the list already found (i.e., include more cases) by typing:

**OR** <index-name> <value>

Or (4) you may initiate a new search with a new FIND command, or issue any other command.

To switch to a briefer format (which does not list reactions and certain other information), type:

**SET FORMat QUICKLIST**

To switch back to the complete format, type:

**SET FORMat DEFAULT**

To terminate the session and log off the computer, type:

**CP LOGoff**

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
$\gamma e^-$	0.12-0.40	INS-ES-111	$\nu_\mu n$	2.0-30.0	SERP-E-045
$\gamma p$	0.60-1.10	INS-15-1	$\nu_\mu n$	<230.	FNAL-594
$\gamma p$	0.80-1.00	INS-14-3	$\nu_\mu n$	<260.	CERN-WA-025
$\gamma p$	0.90-1.15	INS-17-1	$\nu_\mu$ deut	<10.0	BNL-737
$\gamma p$	<1.30	INS-15-2	$\nu_\mu$ deut	<260.	CERN-WA-001
$\gamma p$	10.5	SLAC-BC-076	$\nu_\mu$ deut	<260.	CERN-WA-025
$\gamma p$	20.0	SLAC-BC-072/073	$\nu_\mu$ Ne	<200.	FNAL-053A
$\gamma p$	20.0	SLAC-BC-075	$\nu_\mu$ Ne	10.0-200.	FNAL-646
$\gamma p$	65.0-180.	CERN-WA-069	$\nu_\mu$ Al	2.00-30.0	SERP-E-045
$\gamma p$	70.0-140.	FNAL-516	$\nu_\mu$ Fe	<160.	CERN-WA-001-2
$\gamma p$	80.0-140.	FNAL-612	$\nu_\mu$ Fe	<260.	CERN-WA-001
$\gamma p$	<200.	CERN-NA-014	$\nu_\mu$ Fe	2.00-30.0	SERP-E-045
$\gamma p$	<200.	CERN-NA-014-2	$\nu_\mu$ Fe	30.0-230.	FNAL-701
$\gamma p$	100.-260.	FNAL-691	$\nu_\mu$ Pb	<200.	CERN-WA-044
$\gamma p$	200.-600.	FNAL-683	$\nu_\mu$ nucleus	0.50-1.50	CERN-PS-181
$\gamma n$	0.55-0.90	INS-14-4	$\nu_\mu$ nucleus	0.50-3.00	CERN-PS-180
$\gamma$ nucleon	10.0-180.	CERN-NA-001	$\nu_\mu$ nucleus	<6.0	CERN-PS-167
$\gamma$ deut	0.30-0.65	INS-16-1	$\nu_\mu$ nucleus	<6.0	CERN-PS-168
$\gamma$ deut	0.35-0.85	INS-15-3	$\nu_\mu$ nucleus	10.0-20.0	SERP-E-107
$\gamma$ deut	0.40-0.80	INS-ES-112	$\nu_\mu$ nucleus	<70.0	SERP-E-152
$\gamma$ deut	0.50-1.00	INS-18-3	$\nu_\mu$ nucleus	10.0-100.	CERN-WA-059
$\gamma$ deut	0.50-1.00	INS-ES-103	$\nu_\mu$ nucleus	10.0-100.	FNAL-531
$\gamma$ deut	0.50-1.00	INS-19-1	$\nu_\mu$ nucleus	10.0-100.	FNAL-564
$\gamma$ deut	?	INS-ES-113	$\nu_\mu$ nucleus	<160.	CERN-WA-018-2
$\gamma$ He	0.20-0.45	INS-ES-105	$\nu_\mu$ nucleus	10.0-200.	CERN-WA-047
$\gamma$ He	0.20-0.45	INS-19-2	$\nu_\mu$ nucleus	<230.	FNAL-594
$\gamma$ nucleus	0.20-0.45	INS-17-2	$\nu_\mu$ nucleus	10.0-250.	FNAL-636
$\gamma$ nucleus	0.20-0.45	INS-18-1	$\nu_\mu$ nucleus	25.0-250.	FNAL-616
$\gamma$ nucleus	0.20-1.00	INS-16-2	$\nu_\mu$ nucleus	<260.	CERN-WA-018
$\gamma$ nucleus	0.35-0.60	INS-19-3	$\nu_\mu$ nucleus	<400.	FNAL-744
$\gamma$ nucleus	0.35-0.85	INS-15-3	$\nu_\mu$ nucleus	10.0-400.	FNAL-632
$\gamma$ nucleus	0.74-0.98	INS-15-4	$\nu_\mu$ nucleus	<500.	FNAL-733
$\gamma$ nucleus	10.0-180.	CERN-NA-001	$\nu_\mu$ nucleus	<500.	FNAL-745
$\gamma$ nucleus	20.0-80.0	CERN-WA-058	$\nu_\mu$ nucleus	<600.	FNAL-770
$\gamma$ nucleus	70.0-200.	CERN-EMU-006	$\nu_\mu$ nucleus	20.0-600.	FNAL-652
$\gamma$ nucleus	<300.	FNAL-458	$\bar{\nu}_\mu e^-$	<0.05	LAMPF-1015
$\gamma$ nucleus	200.-500.	FNAL-687	$\bar{\nu}_\mu e^-$	<12.0	BNL-734
$\gamma$ nucleus	?	INS-ES-101	$\bar{\nu}_\mu e^-$	5.0-100.	CERN-WA-079
$\gamma$ crystal	0.50	INS-ES-102	$\bar{\nu}_\mu e^-$	<200.	FNAL-180
$\gamma$ crystal	15.0-150.	CERN-WA-081	$\bar{\nu}_\mu e^-$	<230.	FNAL-594
$\gamma$ crystal	20.0-200.	CERN-NA-033	$\bar{\nu}_\mu e^-$	<260.	CERN-WA-018
<i>MOMENTUM RANGES FOR NEUTRINO BEAMS ARE NOT DEFINED VERY SYSTEMATICALLY.</i>			$\bar{\nu}_\mu e^-$	<400.	FNAL-635
$\nu$ Ne	10.0-200.	FNAL-646	$\bar{\nu}_\mu p$	<12.0	BNL-734
$\nu_e e^-$	0.020-0.053	LAMPF-225	$\bar{\nu}_\mu p$	2.0-30.0	SERP-E-045
$\nu_e e^-$	0.030	LAMPF-1015	$\bar{\nu}_\mu p$	<150.	CERN-WA-021
$\nu_e e^-$	<70.0	SERP-E-152	$\bar{\nu}_\mu p$	<200.	FNAL-180
$\nu_e e^-$	10.0-200.	FNAL-646	$\bar{\nu}_\mu p$	<230.	FNAL-594
$\nu_e$ Ne	10.0-200.	FNAL-646	$\bar{\nu}_\mu p$	<260.	CERN-WA-001
$\nu_e$ nucleus	0.50-3.00	CERN-PS-180	$\bar{\nu}_\mu p$	<260.	CERN-WA-025
$\nu_e$ nucleus	<70.0	SERP-E-152	$\bar{\nu}_\mu n$	<12.0	BNL-734
$\nu_e$ nucleus	10.0-250.	FNAL-636	$\bar{\nu}_\mu n$	<260.	CERN-WA-025
$\bar{\nu}_e e^-$	10.0-200.	FNAL-646	$\bar{\nu}_\mu$ nucleon	<200.	FNAL-180
$\bar{\nu}_e e^-$	<230.	FNAL-594	$\bar{\nu}_\mu$ deut	<260.	CERN-WA-001
$\bar{\nu}_e$ Ne	10.0-200.	FNAL-646	$\bar{\nu}_\mu$ deut	<260.	CERN-WA-025
$\bar{\nu}_e$ Al	2.00-30.0	SERP-E-045	$\bar{\nu}_\mu$ Ne	10.0-200.	FNAL-646
$\nu_\mu e^-$	<0.050	LAMPF-1015	$\bar{\nu}_\mu$ Al	2.00-30.0	SERP-E-045
$\nu_\mu e^-$	<12.0	BNL-734	$\bar{\nu}_\mu$ Fe	2.00-30.0	SERP-E-045
$\nu_\mu e^-$	2.00-30.0	SERP-E-045	$\bar{\nu}_\mu$ Fe	<160.	CERN-WA-001-2
$\nu_\mu e^-$	<70.0	SERP-E-152	$\bar{\nu}_\mu$ Fe	30.0-230.	FNAL-701
$\nu_\mu e^-$	5.0-100.	CERN-WA-079	$\bar{\nu}_\mu$ Fe	<260.	CERN-WA-001
$\nu_\mu e^-$	<150.	CERN-WA-021	$\bar{\nu}_\mu$ Fe	<260.	CERN-WA-018
$\nu_\mu e^-$	<200.	FNAL-053A	$\bar{\nu}_\mu$ nucleus	<6.0	CERN-PS-167
$\nu_\mu e^-$	<230.	FNAL-594	$\bar{\nu}_\mu$ nucleus	<6.0	CERN-PS-168
$\nu_\mu e^-$	<260.	CERN-WA-018	$\bar{\nu}_\mu$ nucleus	10.0-20.0	SERP-E-107
$\nu_\mu e^-$	<400.	FNAL-635	$\bar{\nu}_\mu$ nucleus	10.0-100.	CERN-WA-059
$\nu_\mu p$	<10.0	BNL-737	$\bar{\nu}_\mu$ nucleus	10.0-100.	FNAL-531
$\nu_\mu p$	<12.0	BNL-734	$\bar{\nu}_\mu$ nucleus	10.0-100.	FNAL-564
$\nu_\mu p$	<150.	CERN-WA-021	$\bar{\nu}_\mu$ nucleus	<160.	CERN-WA-018-2
$\nu_\mu p$	<200.	FNAL-053A	$\bar{\nu}_\mu$ nucleus	10.0-200.	CERN-WA-047
$\nu_\mu p$	<260.	CERN-WA-001	$\bar{\nu}_\mu$ nucleus	<230.	FNAL-594
$\nu_\mu p$	<260.	CERN-WA-025	$\bar{\nu}_\mu$ nucleus	25.0-250.	FNAL-616
$\nu_\mu n$	<10.0	BNL-737	$\bar{\nu}_\mu$ nucleus	<260.	CERN-WA-018
$\nu_\mu n$	<12.0	BNL-734	$\bar{\nu}_\mu$ nucleus	10.0-400.	FNAL-632
			$\bar{\nu}_\mu$ nucleus	<400.	FNAL-744
			$\bar{\nu}_\mu$ nucleus	<500.	FNAL-733

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
$\bar{\nu}_\mu$ nucleus	<600.	FNAL-770	$\mu^-$ nucleus	0.0	SIN-R-81-02
$\bar{\nu}_\mu$ nucleus	20.0-600.	FNAL-652	$\mu^-$ nucleus	0.0	TRIUMF-104
$\nu_\tau$ Ne	10.0-200.	FNAL-646	$\mu^-$ nucleus	100.-280.	CERN-NA-004
$\nu_\tau$ nucleus	10.0-250.	FNAL-636	$\mu^+ e^-$	0.005	LAMPF-869
$\bar{\nu}_\tau$ Ne	10.0-200.	FNAL-646	$\bar{\mu}^+ e^-$	0.020-0.029	TRIUMF-304
$e^- p$	3.0-21.0	SLAC-E-140	$\mu^+ e^-$	?	TRIUMF-168
$e^- p$	6.40	SLAC-E-130	$\mu^+ \text{Al}$	0.125	BNL-754
$e^- p$	14.0	SLAC-E-136	muon p	120.	CERN-NA-037
$e^- p$	16.2	SLAC-E-130	muon p	280.	CERN-NA-037
$e^- p$	21.0	SLAC-E-136	muon p	<750.	FNAL-665
$e^- p$	22.6	SLAC-E-130	muon deut	120.	CERN-NA-037
$e^- p$	28.5	SLAC-E-136	muon deut	280.	CERN-NA-037
$e^- \text{deut}$	3.0-21.0	SLAC-E-140	muon nucleus	120.	CERN-NA-037
$e^- \text{deut}$	6.40	SLAC-E-130	muon nucleus	160.	CERN-NA-037
$e^- \text{deut}$	16.2	SLAC-E-130	muon nucleus	280.	CERN-NA-037
$e^- \text{deut}$	22.6	SLAC-E-130	muon nucleus	280.	CERN-NA-028
$e^- \text{Fe}$	3.0-21.0	SLAC-E-140	muon nucleus	325.	CERN-NA-028
$e^- \text{Wt}$	2.50	KEK-PF-000	muon nucleus	<750.	FNAL-665
$e^- \text{Au}$	3.0-21.0	SLAC-E-140	pion deut	?	TRIUMF-375
$e^-$ nucleus	20.0	SLAC-E-137	pion $^{12}\text{C}$	<4.00	KEK-132
$e^\pm$ crystal	1.00-10.0	CERN-PS-188	pion nucleus	250.	FNAL-769
$e^\pm$ crystal	20.0-200.	CERN-NA-042	pion nucleus	350.	CERN-NA-019
$e^\pm$ crystal	150.	CERN-NA-033	pion nucleus	?	CERN-NA-018
Beam-target	C.m. energy GeV	Experiment	$\pi^+ p$	0.077-0.150	TRIUMF-394
$e^+ e^-$	0.320-0.423	CERN-NA-007	$\pi^+ p$	0.140	SIN-R-82-17
$e^+ e^-$	3.00-8.40	SLAC-SP-030	$\pi^+ p$	0.150-0.242	LAMPF-567
$e^+ e^-$	3.10-5.0	SLAC-SP-032	$\pi^+ p$	0.247	LAMPF-058/120
$e^+ e^-$	4.40-11.2	DESY-DORIS-CRYSTAL-BALL	$\pi^+ p$	0.300-0.460	CERN-SC-094
$e^+ e^-$	7.40-11.5	DESY-DORIS-LENA	$\pi^+ p$	0.378-0.625	LAMPF-806
$e^+ e^-$	9.00-11.5	DESY-DORIS-ARGUS	$\pi^+ p$	0.471-0.687	LAMPF-849
$e^+ e^-$	9.00-12.0	CESR-CLEO	$\pi^+ p$	0.522	LAMPF-032
$e^+ e^-$	9.40-11.6	CESR-CUSB	$\pi^+ p$	0.687	LAMPF-058/120
$e^+ e^-$	9.40-11.6	CESR-CUSB-II	$\pi^+ p$	1.40-2.10	ITEP-E-801
$e^+ e^-$	10.0-44.0	DESY-PETRA-JADE	$\pi^+ p$	1.50-1.90	CERN-PS-160
$e^+ e^-$	12.0-47.0	DESY-PETRA-MARK-J	$\pi^+ p$	2.50-14.0	CERN-PS-157
$e^+ e^-$	12.0-47.0	DESY-PETRA-TASSO	$\pi^+ p$	5.00-20.0	SERP-E-102
$e^+ e^-$	14.0-47.3	DESY-PETRA-CELLO	$\pi^+ p$	6.0	BNL-838
$e^+ e^-$	29.0	SLAC-PEP-002	$\pi^+ p$	10.0	BNL-755
$e^+ e^-$	29.0	SLAC-PEP-004/009	$\pi^+ p$	20.0	CERN-WA-056
$e^+ e^-$	29.0	SLAC-PEP-005	$\pi^+ p$	40.0	SERP-E-155
$e^+ e^-$	29.0	SLAC-PEP-006	$\pi^+ p$	50.0-200.	CERN-WA-006
$e^+ e^-$	29.0	SLAC-PEP-012	$\pi^+ p$	60.0-70.0	SERP-E-161
$e^+ e^-$	29.0	SLAC-PEP-014	$\pi^+ p$	80.0	CERN-WA-069
$e^+ e^-$	29.0	SLAC-PEP-020	$\pi^+ p$	85.0	CERN-WA-076
$e^+ e^-$	29.0	SLAC-PEP-021	$\pi^+ p$	100.	FNAL-577
$e^+ e^-$	35.0	DESY-PETRA-PLUTO-2	$\pi^+ p$	100.	FNAL-597
$e^+ e^-$	60.0	KEK-TE-004	$\pi^+ p$	140.	CERN-WA-069
$e^+ e^-$	<70.0	KEK-TE-001	$\pi^+ p$	147.	FNAL-570
$e^+ e^-$	<70.0	KEK-TE-002	$\pi^+ p$	200.	FNAL-577
$e^+ e^-$	<70.0	KEK-TE-003	$\pi^+ p$	200.	CERN-WA-070
$e^+ e^-$	100.	SLAC-SLC-SLD	$\pi^+ p$	250.	CERN-NA-022
$e^+ e^-$	100.	SLAC-SLC-6	$\pi^+ p$	280.	CERN-WA-070
$e^+ e^-$	<120.	CERN-LEP-ALEPH	$\pi^+ p$	280.	CERN-WA-083
$e^+ e^-$	<120.	CERN-LEP-DELPHI	$\pi^+ p$	300.	CERN-NA-024
$e^+ e^-$	<120.	CERN-LEP-L3	$\pi^+ p$	400.	FNAL-609
$e^+ e^-$	<120.	CERN-LEP-OPAL	$\pi^+ n$	5.0-20.0	SERP-E-102
Beam-target	Lab momentum GeV/c	Experiment	$\pi^+ n$	20.0	CERN-WA-056
$\mu^- p$	0.0	SIN-R-78-15.1	$\pi^+$ nucleon	70.0	SERP-E-163
$\mu^- p$	120.-280.	CERN-NA-002	$\pi^+ \text{deut}$	0.038	LAMPF-828
$\mu^- p$	120.-280.	CERN-NA-009	$\pi^+ \text{deut}$	0.054	LAMPF-828
$\mu^- p$	?	TRIUMF-249	$\pi^+ \text{deut}$	0.066	LAMPF-828
$\mu^- \text{deut}$	0.0	TRIUMF-297	$\pi^+ \text{deut}$	0.096-0.169	LAMPF-767
$\mu^- \text{He}$	0.0	BNL-745	$\pi^+ \text{deut}$	0.150	LAMPF-567
$\mu^- \text{He}$	0.0	SIN-R-82-03.1	$\pi^+ \text{deut}$	0.160	LAMPF-567
$\mu^- \text{}^6\text{Li}$	0.0	TRIUMF-326	$\pi^+ \text{deut}$	0.169	LAMPF-567
$\mu^-$ nucleus	0.0	LAMPF-421	$\pi^+ \text{deut}$	0.169-0.364	TRIUMF-205
			$\pi^+ \text{deut}$	0.188	LAMPF-567
			$\pi^+ \text{deut}$	0.195-0.410	TRIUMF-337
			$\pi^+ \text{deut}$	0.207	LAMPF-567
			$\pi^+ \text{deut}$	0.209-0.410	SIN-R-79-07

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	C.m. energy GeV	Experiment	Beam-target	Lab momentum GeV/c	Experiment
$\pi^+$ deut	0.215-0.443	SIN-R-78-18	$\pi^- p$	0.247-0.687	LAMPF-804
$\pi^+$ deut	0.220-0.260	SIN-R-73-01.2	$\pi^- p$	0.300-0.460	CERN-SC-094
$\pi^+$ deut	0.225	LAMPF-567	$\pi^- p$	0.350-0.450	SIN-R-86-02
$\pi^+$ deut	0.242	LAMPF-567	$\pi^- p$	0.378-0.625	LAMPF-806
$\pi^+$ deut	0.246	LAMPF-478	$\pi^- p$	0.400-0.600	LENI-SC-063
$\pi^+$ deut	0.246-0.370	TRIUMF-377	$\pi^- p$	0.471-0.687	LAMPF-849
$\pi^+$ deut	0.265	TRIUMF-360	$\pi^- p$	0.687	LAMPF-058/120
$\pi^+$ deut	0.275-0.600	LAMPF-825	$\pi^- p$	1.40-2.10	ITEP-E-801
$\pi^+$ deut	0.310-0.417	LAMPF-605	$\pi^- p$	2.00-14.0	CERN-PS-157
$\pi^+$ deut	0.310-0.417	LAMPF-979	$\pi^- p$	6.00	BNL-838
$\pi^+$ deut	0.340	SIN-R-78-18	$\pi^- p$	<8.00	KEK-064
$\pi^+$ deut	0.370	LAMPF-581	$\pi^- p$	8.00	BNL-771
$\pi^+$ deut	0.370	LAMPF-783	$\pi^- p$	8.00	KEK-121
$\pi^+$ deut	0.396-0.665	LENI-SC-062	$\pi^- p$	8.00-12.0	CERN-WA-074
$\pi^+$ deut	0.478	LAMPF-783	$\pi^- p$	9.00	KEK-135
$\pi^+$ deut	0.480-1.16	KEK-083	$\pi^- p$	10.0	BNL-755
$\pi^+$ deut	0.573	LAMPF-783	$\pi^- p$	10.0	BNL-834
$\pi^+$ deut	0.740	KEK-081	$\pi^- p$	12.0	BNL-818
$\pi^+$ deut	1.00-1.40	CERN-PS-159	$\pi^- p$	12.0	CERN-WA-056
$\pi^+$ deut	1.05	BNL-798	$\pi^- p$	13.0	BNL-726
$\pi^+$ deut	1.50	KEK-081	$\pi^- p$	13.0	BNL-732
$\pi^+$ deut	300.	FNAL-705	$\pi^- p$	13.0	SERP-E-116
$\pi^+$ deut	750.	FNAL-705	$\pi^- p$	13.5	BNL-755
$\pi^+$ deut	?	TRIUMF-303	$\pi^- p$	20.0	BNL-705
$\pi^+$ trit	0.243-0.413	LAMPF-905	$\pi^- p$	20.0	CERN-WA-007
$\pi^+$ trit	0.246	LAMPF-546	$\pi^- p$	20.0	SERP-E-148
$\pi^+$ trit	0.288	LAMPF-546	$\pi^- p$	20.0-40.0	SERP-E-105
$\pi^+$ $^3\text{He}$	0.128-0.331	SIN-R-79-05	$\pi^- p$	21.0	BNL-769
$\pi^+$ $^3\text{He}$	0.243-0.413	LAMPF-905	$\pi^- p$	22.0	BNL-747
$\pi^+$ $^3\text{He}$	0.246	LAMPF-546	$\pi^- p$	25.0	SERP-E-116
$\pi^+$ $^3\text{He}$	0.288	LAMPF-546	$\pi^- p$	30.0	SERP-E-148
$\pi^+$ He	0.242	LAMPF-898	$\pi^- p$	33.0	SERP-E-142
$\pi^+$ He	0.288	LAMPF-998	$\pi^- p$	38.0	SERP-E-140
$\pi^+$ He	0.374	LAMPF-898	$\pi^- p$	40.0	SERP-E-116
$\pi^+$ He	100.-150.	CERN-NA-008	$\pi^- p$	40.0	CERN-WA-007
$\pi^+$ $^{12}\text{C}$	1.05	BNL-758	$\pi^- p$	40.0	SERP-E-148
$\pi^+$ C	2.60	ITEP-E-784	$\pi^- p$	40.0	SERP-E-142
$\pi^+$ Bi	2.60	ITEP-E-784	$\pi^- p$	40.0	SERP-E-112
$\pi^+$ nucleus	0.20-2.00	KEK-094	$\pi^- p$	40.0	SERP-E-147
$\pi^+$ nucleus	0.850	BNL-828	$\pi^- p$	40.0	SERP-E-155
$\pi^+$ nucleus	1.00-5.00	KEK-090	$\pi^- p$	40.0	SERP-E-164
$\pi^+$ nucleus	1.00-9.00	ITEP-E-771	$\pi^- p$	60.0	CERN-WA-007
$\pi^+$ nucleus	1.05	BNL-798	$\pi^- p$	60.0-70.0	SERP-E-161
$\pi^+$ nucleus	1.50	ITEP-E-812	$\pi^- p$	70.0	SERP-E-163
$\pi^+$ nucleus	1.85	ITEP-E-823	$\pi^- p$	80.0	CERN-WA-007
$\pi^+$ nucleus	3.00	ITEP-E-823	$\pi^- p$	80.0	CERN-WA-069
$\pi^+$ nucleus	30.0	CERN-WA-072	$\pi^- p$	85.0	CERN-WA-067
$\pi^+$ nucleus	40.0	SERP-E-155	$\pi^- p$	100.	CERN-NA-012
$\pi^+$ nucleus	100.	FNAL-597	$\pi^- p$	100.	FNAL-577
$\pi^+$ nucleus	140.-300.	CERN-NA-010	$\pi^- p$	100.	FNAL-597
$\pi^+$ nucleus	150.	CERN-NA-003	$\pi^- p$	100.-345.	CERN-NA-008
$\pi^+$ nucleus	200.	FNAL-565	$\pi^- p$	140.	CERN-WA-069
$\pi^+$ nucleus	200.	FNAL-629	$\pi^- p$	140.	CERN-WA-011
$\pi^+$ nucleus	200.	CERN-NA-003	$\pi^- p$	147.	FNAL-570
$\pi^+$ nucleus	250.	CERN-NA-022	$\pi^- p$	150.	CERN-NA-005
$\pi^+$ nucleus	250.	FNAL-615	$\pi^- p$	175.	FNAL-663
$\pi^+$ nucleus	280.	CERN-NA-003	$\pi^- p$	200.	FNAL-577
$\pi^+$ nucleus	360.	CERN-WA-082	$\pi^- p$	200.	CERN-WA-070
$\pi^+$ nucleus	500.	FNAL-672	$\pi^- p$	200.	FNAL-580
$\pi^+$ nucleus	530.	FNAL-706	$\pi^- p$	230.	CERN-NA-012
$\pi^+$ crystal	1.00-10.0	CERN-PS-188	$\pi^- p$	280.	CERN-WA-070
$\pi^+$ crystal	2.00-20.0	CERN-PS-164	$\pi^- p$	280.	CERN-WA-083
$\pi^- e^-$	250.	CERN-NA-007	$\pi^- p$	300.	CERN-NA-005
$\pi^- e^-$	300.	CERN-NA-007	$\pi^- p$	300.	CERN-NA-024
$\pi^- p$	0.0	SIN-R-81-01	$\pi^- p$	300.	CERN-WA-076
$\pi^- p$	0.0	SIN-R-85-10	$\pi^- p$	320.	FNAL-597
$\pi^- p$	0.0	SIN-R-85-14	$\pi^- p$	360.	CERN-NA-016
$\pi^- p$	0.0	TRIUMF-217	$\pi^- p$	360.	CERN-NA-027
$\pi^- p$	0.077-0.220	TRIUMF-009			
$\pi^- p$	0.077-0.150	TRIUMF-394			
$\pi^- p$	0.087-0.128	LAMPF-190			
$\pi^- p$	0.100-0.150	LAMPF-808			
$\pi^- p$	0.140	SIN-R-82-17			
$\pi^- p$	0.190-0.430	SIN-R-75-07.2			
$\pi^- p$	0.247	LAMPF-058/120			

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
$\pi^-$ nucleon	70.0	SERP-E-163	$\pi^-$ nucleus	300.	CERN-NA-012-2
$\pi^-$ deut	0.0	SIN-R-81-01	$\pi^-$ nucleus	300.	CERN-NA-017
$\pi^-$ deut	0.096-0.169	LAMPF-767	$\pi^-$ nucleus	320.	FNAL-597
$\pi^-$ deut	0.096-0.342	LAMPF-295	$\pi^-$ nucleus	350.	CERN-WA-071
$\pi^-$ deut	0.246	LAMPF-478	$\pi^-$ nucleus	350.	CERN-WA-078
$\pi^-$ deut	0.246-0.370	TRIUMF-377	$\pi^-$ nucleus	350.	FNAL-653
$\pi^-$ deut	0.250	LAMPF-689	$\pi^-$ nucleus	360.	CERN-WA-075
$\pi^-$ deut	0.370	LAMPF-581	$\pi^-$ nucleus	500.	FNAL-672
$\pi^-$ deut	0.370	LAMPF-783	$\pi^-$ nucleus	530.	FNAL-706
$\pi^-$ deut	0.408	LAMPF-981	$\pi^-$ crystal	1.00-10.0	CERN-PS-188
$\pi^-$ deut	0.420-1.16	KEK-083	$\pi^-$ crystal	2.00-20.0	CERN-PS-164
$\pi^-$ deut	0.478	LAMPF-783			
$\pi^-$ deut	0.552	LENI-SC-067			
$\pi^-$ deut	0.573	LAMPF-783	kaon nucleus	250.	FNAL-769
$\pi^-$ deut	1.00-1.40	CERN-PS-159	$K^+ p$	6.0	BNL-838
$\pi^-$ deut	300.	FNAL-705	$K^+ p$	10.0	BNL-755
$\pi^-$ deut	750.	FNAL-705	$K^+ p$	11.0	SLAC-E-135
$\pi^-$ trit	0.243-0.413	LAMPF-905	$K^+ p$	32.1	SERP-E-133
$\pi^-$ trit	0.246	LAMPF-546	$K^+ p$	70.0	CERN-WA-027
$\pi^-$ trit	0.288	LAMPF-546	$K^+ p$	80.0	CERN-WA-069
$\pi^-$ $^3\text{He}$	0.	SIN-R-79-05	$K^+ p$	100.	FNAL-577
$\pi^-$ $^3\text{He}$	0.243-0.413	LAMPF-905	$K^+ p$	100.	FNAL-597
$\pi^-$ $^3\text{He}$	0.246	LAMPF-546	$K^+ p$	140.	CERN-WA-069
$\pi^-$ $^3\text{He}$	0.288	LAMPF-546	$K^+ p$	147.	FNAL-570
$\pi^-$ He	0.242	LAMPF-898	$K^+ p$	200.	FNAL-577
$\pi^-$ He	0.288	LAMPF-998	$K^+ p$	250.	CERN-NA-022
$\pi^-$ He	0.374	LAMPF-898	$K^+ n$	1.06	KEK-034
$\pi^-$ He	50.0-300.	CERN-NA-008	$K^+ n$	1.28	KEK-034
$\pi^-$ $^6\text{Li}$	2.60	ITEP-E-784	$K^+ n$	1.39	KEK-034
$\pi^-$ $^7\text{Li}$	2.60	ITEP-E-784	$K^+ n$	1.49	KEK-034
$\pi^-$ Be	100.-200.	CERN-NA-011	$K^+ n$	5.00-20.0	SERP-E-102
$\pi^-$ Be	150.	CERN-WA-077	$K^+ n$	75.0	FNAL-585
$\pi^-$ Be	185.	FNAL-673	$K^+ n$	100.	FNAL-585
$\pi^-$ Be	225.	FNAL-326	$K^+ n$	150.	FNAL-585
$\pi^-$ Be	225.	FNAL-610	$K^+$ nucleus	70.0	SERP-E-163
$\pi^-$ Be	275.	FNAL-650	$K^+$ deut	0.55-0.80	BNL-835
$\pi^-$ Be	300.	CERN-WA-077	$K^+$ deut	1.50	KEK-081
$\pi^-$ C	2.60	ITEP-E-784	$K^+$ deut	1.70	KEK-081
$\pi^-$ Si	40.0	SERP-E-157	$K^+$ Xe	0.790	ITEP-E-802
$\pi^-$ Si	200.	CERN-NA-032	$K^+$ Xe	0.800	ITEP-E-761
$\pi^-$ Fe	278.	FNAL-595	$K^+$ nucleus	0.55-0.80	BNL-835
$\pi^-$ Cu	20.0	SERP-E-148	$K^+$ nucleus	100.	FNAL-597
$\pi^-$ Cu	30.0	SERP-E-148	$K^+$ nucleus	200.	FNAL-565
$\pi^-$ Cu	40.0	SERP-E-148	$K^+$ nucleus	250.	CERN-NA-022
$\pi^-$ Cu	225.	FNAL-326	$K^+$ crystal	2.00-20.0	CERN-PS-164
$\pi^-$ Cu	230.	CERN-NA-032	$K^- e^-$	250.	CERN-NA-007
$\pi^-$ Sn	225.	FNAL-326	$K^- p$	0.0	BNL-811
$\pi^-$ Wt	225.	FNAL-326	$K^- p$	0.0	CERN-PS-165
$\pi^-$ Pb	100.-200.	CERN-NA-029	$K^- p$	0.700	BNL-702
$\pi^-$ Bi	2.60	ITEP-E-784	$K^- p$	1.80	BNL-813
$\pi^-$ nucleus	0.20-2.00	KEK-094	$K^- p$	2.20	BNL-698
$\pi^-$ nucleus	1.00	SERP-E-127	$K^- p$	4.74	CERN-PS-157
$\pi^-$ nucleus	1.00-1.20	KEK-150	$K^- p$	6.00	BNL-771
$\pi^-$ nucleus	1.00-9.00	ITEP-E-771	$K^- p$	6.00	BNL-838
$\pi^-$ nucleus	1.50	ITEP-E-812	$K^- p$	8.00-16.0	CERN-WA-074
$\pi^-$ nucleus	1.85	ITEP-E-823	$K^- p$	10.0	BNL-755
$\pi^-$ nucleus	2.00-4.00	KEK-084	$K^- p$	11.0	SLAC-E-135
$\pi^-$ nucleus	2.50	ITEP-E-813	$K^- p$	13.0	SERP-E-116
$\pi^-$ nucleus	3.00	ITEP-E-823	$K^- p$	20.0	CERN-WA-007
$\pi^-$ nucleus	5.00	ITEP-E-813	$K^- p$	20.0	SERP-E-148
$\pi^-$ nucleus	20.0	SERP-E-148	$K^- p$	22.0	BNL-747
$\pi^-$ nucleus	30.0	SERP-E-148	$K^- p$	25.0	SERP-E-116
$\pi^-$ nucleus	30.0	CERN-WA-072	$K^- p$	30.0	SERP-E-148
$\pi^-$ nucleus	40.0	SERP-E-148	$K^- p$	33.0	SERP-E-142
$\pi^-$ nucleus	40.0	SERP-E-143	$K^- p$	40.0	SERP-E-116
$\pi^-$ nucleus	40.0	SERP-E-155	$K^- p$	40.0	CERN-WA-007
$\pi^-$ nucleus	75.0	FNAL-615	$K^- p$	40.0	SERP-E-148
$\pi^-$ nucleus	100.	FNAL-597	$K^- p$	40.0	SERP-E-112
$\pi^-$ nucleus	125.	FNAL-537	$K^- p$	60.0	CERN-WA-007
$\pi^-$ nucleus	140.-300.	CERN-NA-010	$K^- p$	70.0	SERP-E-163
$\pi^-$ nucleus	150.	CERN-NA-003	$K^- p$	75.0	FNAL-585
$\pi^-$ nucleus	200.	FNAL-490	$K^- p$	80.0	CERN-WA-007
$\pi^-$ nucleus	200.	FNAL-515			
$\pi^-$ nucleus	200.	FNAL-565			
$\pi^-$ nucleus	200.	CERN-NA-003			
$\pi^-$ nucleus	250.	FNAL-615			
$\pi^-$ nucleus	280.	CERN-NA-003			

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
$K^- p$	80.0	CERN-WA-069	$p p$	1.09	LAMPF-392
$K^- p$	100.	FNAL-585	$p p$	1.09	LAMPF-517
$K^- p$	100.	FNAL-577	$p p$	1.09	LAMPF-563
$K^- p$	109.	CERN-WA-028	$p p$	1.09-1.46	LAMPF-518
$K^- p$	140.	CERN-WA-069	$p p$	1.10	LAMPF-492
$K^- p$	150.	FNAL-585	$p p$	1.10	SACLAY-124
$K^- p$	175.	FNAL-663	$p p$	1.10	TRIUMF-300
$K^- p$	200.	FNAL-577	$p p$	1.11	TRIUMF-174
$K^-$ nucleon	70.0	SERP-E-163	$p p$	1.12-3.62	SACLAY-087
$K^-$ deut	0.870	BNL-773	$p p$	1.12	SACLAY-124
$K^-$ deut	1.00-1.40	CERN-PS-159	$p p$	1.17	SACLAY-124
$K^-$ $^3\text{He}$	0.715	BNL-829	$p p$	1.20	SIN-R-78-05.4
$K^-$ $^3\text{He}$	0.870	BNL-820	$p p$	1.20	SIN-R-82-06
$K^-$ $^3\text{He}$	1.80	BNL-836	$p p$	1.20-3.80	SACLAY-104
$K^-$ He	0.72	BNL-774	$p p$	1.22	LAMPF-517
$K^-$ He	0.80	BNL-788	$p p$	1.22	LAMPF-590
$K^-$ $^6\text{Li}$	0.72	BNL-752	$p p$	1.26	LAMPF-973
$K^-$ $^6\text{Li}$	0.80	BNL-788	$p p$	1.28	LAMPF-194
$K^-$ C	0.80	BNL-759	$p p$	1.28	LAMPF-336
$K^-$ O	0.72	BNL-752	$p p$	1.28	LAMPF-517
$K^-$ Si	40.0	SERP-E-157	$p p$	1.28	LAMPF-585
$K^-$ Si	200.	CERN-NA-032	$p p$	1.28	LAMPF-708
$K^-$ Wt	6.00	BNL-751	$p p$	1.28	LAMPF-790
$K^-$ nucleus	0.0	KEK-117	$p p$	1.28	LAMPF-885
$K^-$ nucleus	0.40	CERN-PS-166	$p p$	1.28-1.46	LAMPF-636
$K^-$ nucleus	0.45	CERN-PS-166	$p p$	1.30-3.20	SACLAY-052-2
$K^-$ nucleus	0.80	BNL-746	$p p$	1.33-1.64	LENI-SC-056
$K^-$ nucleus	0.80	BNL-760	$p p$	1.34	LAMPF-517
$K^-$ nucleus	0.80	BNL-781	$p p$	1.38	LAMPF-973
$K^-$ nucleus	1.00	SERP-E-127	$p p$	1.38	LAMPF-517
$K^-$ nucleus	200.	FNAL-565	$p p$	1.38	LAMPF-708
$K^-$ crystal	2.00-20.0	CERN-PS-164	$p p$	1.46	LAMPF-492
$K_L$ Cu	1.00-8.00	ITEP-E-811	$p p$	1.46	LAMPF-385
<i>pp COLLIDING BEAM EXPERIMENTS ARE MERGED IN WITH FIXED-TARGET EXPERIMENTS BY GIVING THE EQUIVALENT LAB MOMENTUM FOR SCATTERING ON A STATIONARY PROTON.</i>			$p p$	1.46	LAMPF-973
$p p$	0.300	SIN-Z-75-02	$p p$	1.46	LAMPF-336
$p p$	0.644	TRIUMF-171	$p p$	1.46	LAMPF-392
$p p$	0.696	TRIUMF-287	$p p$	1.46	LAMPF-392
$p p$	0.775	TRIUMF-208	$p p$	1.46	LAMPF-517
$p p$	0.777	TRIUMF-301	$p p$	1.46	LAMPF-563
$p p$	0.800-1.20	SIN-R-71-07	$p p$	1.46	LAMPF-590
$p p$	0.800-1.20	SIN-R-80-01	$p p$	1.46	LAMPF-194
$p p$	0.808-1.46	LAMPF-498	$p p$	1.46	LAMPF-708
$p p$	0.835-1.46	LAMPF-504	$p p$	1.46	LAMPF-790
$p p$	0.850	SACLAY-118	$p p$	1.46	LAMPF-885
$p p$	0.850	SACLAY-124	$p p$	1.46	LAMPF-015
$p p$	0.862	SACLAY-123	$p p$	1.46	LAMPF-402
$p p$	0.868	SACLAY-118	$p p$	1.46	LAMPF-457
$p p$	0.868	SACLAY-124	$p p$	1.46	LAMPF-462
$p p$	0.874	SACLAY-123	$p p$	1.46	LAMPF-637
$p p$	0.883	SACLAY-123	$p p$	1.46	LAMPF-758
$p p$	0.883-1.09	TRIUMF-132/192	$p p$	1.46	LAMPF-792
$p p$	0.889	SACLAY-118	$p p$	1.46	LAMPF-846
$p p$	0.889	SACLAY-124	$p p$	1.46	SACLAY-132
$p p$	0.894	SACLAY-118	$p p$	1.46-1.70	LENI-SC-086
$p p$	0.900-2.00	KEK-057	$p p$	1.51	SACLAY-088
$p p$	0.909	SACLAY-124	$p p$	1.51	SACLAY-089
$p p$	0.912	LAMPF-973	$p p$	1.56	SACLAY-088
$p p$	0.926	TRIUMF-174	$p p$	1.56	SACLAY-089
$p p$	0.954-1.46	LAMPF-508	$p p$	1.62	SACLAY-088
$p p$	0.989	TRIUMF-174	$p p$	1.62	SACLAY-089
$p p$	1.00-1.20	SIN-R-78-06	$p p$	1.62	SACLAY-089
$p p$	1.00-1.70	SACLAY-070	$p p$	<1.70	SACLAY-060
$p p$	1.00-2.00	SACLAY-017	$p p$	1.70	SACLAY-088
$p p$	1.00-2.00	SACLAY-106	$p p$	1.70	SACLAY-089
$p p$	1.00-2.00	SACLAY-144	$p p$	1.81	SACLAY-088
$p p$	1.00-3.80	SACLAY-052	$p p$	1.81	SACLAY-089
$p p$	1.00-3.80	SACLAY-101	$p p$	2.25	SACLAY-132
$p p$	1.02-1.21	SACLAY-129	$p p$	2.78	SACLAY-132
$p p$	1.05	TRIUMF-174	$p p$	3.31	SACLAY-132
$p p$	1.06	TRIUMF-368	$p p$	5.60	BNL-722
$p p$	1.09	TRIUMF-301	$p p$	6.00	BNL-838
$p p$	1.09	LAMPF-336	$p p$	10.0	BNL-755
			$p p$	13.0-26.0	BNL-782
			$p p$	20.0	CERN-WA-007
			$p p$	24.0	BNL-785
			$p p$	28.0	BNL-748
			$p p$	28.0	BNL-794
			$p p$	32.0	SERP-E-150
			$p p$	40.0	CERN-WA-007

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
p p	50.0-200.	CERN-WA-006	p deut	0.989-1.46	LAMPF-498
p p	60.0	CERN-WA-007	p deut	1.03	SACLAY-068
p p	60.0-70.0	SERP-E-161	p deut	1.08	TRIUMF-332
p p	70.0	SERP-E-100	p deut	1.09	LAMPF-635
p p	70.0	SERP-E-155	p,deut	1.09	LAMPF-664
p p	80.0	CERN-WA-007	p deut	1.09	LAMPF-853
p p	85.0	CERN-WA-076	p deut	1.22-1.56	LENI-SC-108
p p	100.	FNAL-577	p deut	1.22-3.10	SACLAY-095
p p	100.	FNAL-597	p deut	1.22-3.52	SACLAY-051
p p	100.-300.	CERN-NA-008	p deut	1.28	LAMPF-635
p p	147.	FNAL-570	p deut	1.28	LAMPF-664
p p	175.	FNAL-663	p deut	1.28	LAMPF-853
p p	200.	FNAL-577	p deut	1.28	LAMPF-585
p p	200.	CERN-NA-005	p deut	1.34-1.70	LENI-SC-088
p p	200.	CERN-NA-025	p deut	1.46	LAMPF-385
p p	200.	CERN-WA-070	p deut	1.46	LAMPF-635
p p	200.	FNAL-581/704	p deut	1.46	LAMPF-664
p p	212.	CERN-R-420	p deut	1.46	LAMPF-853
p p	250.	CERN-NA-022	p deut	1.46	LAMPF-015
p p	280.	CERN-WA-070	p deut	1.46	LAMPF-360
p p	280.	CERN-WA-083	p deut	1.46	LAMPF-462
p p	281.	CERN-R-211	p deut	1.46	LAMPF-795
p p	293.-2094	CERN-R-210	p deut	1.46	LAMPF-818
p p	300.	CERN-WA-076	p deut	1.46	LAMPF-951
p p	300.	CERN-NA-005	p deut	1.58-2.20	SACLAY-099
p p	300.	CERN-NA-024	p deut	1.60-3.41	SACLAY-095
p p	314.	CERN-UA-006	p deut	32.0	SERP-E-150
p p	360.	CERN-NA-025	p deut	70.0	SERP-E-100
p p	360.	CERN-NA-016	p deut	300.	FNAL-705
p p	360.	CERN-NA-027	p deut	750.	FNAL-705
p p	>360.	CERN-NA-023	p deut	900.	FNAL-772
p p	400.	FNAL-557	p deut	?	SACLAY-037
p p	400.	FNAL-609	p deut	?	SACLAY-113
p p	400.	FNAL-623	p <sup>3</sup> He	0.912	LAMPF-973
p p	479.	CERN-R-211	p <sup>3</sup> He	1.26	LAMPF-973
p p	479.	CERN-R-421	p <sup>3</sup> He	1.34-2.47	SACLAY-051
p p	479.	CERN-R-608	p <sup>3</sup> He	1.38	LAMPF-973
p p	479.-2047	CERN-R-110	p <sup>3</sup> He	1.40	SACLAY-050
p p	479.-2047	CERN-R-501	p <sup>3</sup> He	1.40	SACLAY-126
p p	479.-2047	CERN-R-703	p <sup>3</sup> He	1.46	LAMPF-973
p p	479.-2047	CERN-R-808	p <sup>3</sup> He	1.60	SACLAY-050
p p	479.-2114	CERN-R-806	p He	0.300	SIN-Z-80-01
p p	511.-2047	CERN-R-807	p He	0.912	LAMPF-973
p p	800.	FNAL-557	p He	1.26	LAMPF-973
p p	800.	FNAL-743	p He	1.34-1.70	LENI-SC-088
p p	1031.	CERN-R-421	p He	1.38	LAMPF-973
p p	1031.-2048.	CERN-R-416	p He	1.46	LAMPF-973
p p	1440.	CERN-R-420	p He	1.46	LAMPF-015
p p	1440.	CERN-R-211	p He	1.46	LAMPF-015
p p	1496.	CERN-R-608	p He	72.1-525.	CERN-R-210
p p	2048.	CERN-R-211	p He	100.-300.	CERN-NA-008
p p	2048.	CERN-R-421	p He	119.-514.	CERN-R-110
p p	2048.	CERN-R-608	p He	258.	CERN-R-418
p p	2048.	CERN-R-419	p Li	1.00	LENI-SC-096
p p	2048.	CERN-R-422	p Li	1.70	LENI-SC-104
p p	2114.	CERN-R-420	p Be	1.46	LAMPF-360
p p	?	SACLAY-113	p Be	22.0	BNL-817
p p	?	SACLAY-121	p Be	28.5	BNL-744
p n	1.09	LAMPF-392	p Be	100.-200.	CERN-NA-011
p n	1.22	LAMPF-590	p Be	200.	FNAL-673
p n	1.30	KEK-075	p Be	250.	FNAL-673
p n	1.39	KEK-075	p Be	400.	CERN-NA-020
p n	1.46	LAMPF-385	p Be	400.	FNAL-555
p n	1.46	LAMPF-392	p Be	450.	CERN-NA-034
p n	1.46	LAMPF-590	p Be	800.	FNAL-756
p n	1.46	LAMPF-457	p Be	900.	FNAL-711
p n	1.46	LAMPF-792	p <sup>12</sup> C	1.46	LAMPF-651
p n	1.46	LAMPF-846	p C	1.00	LENI-SC-096
p n	1.59	KEK-075	p <sup>12</sup> C	<4.00	KEK-132
p n	1.82	KEK-075	p C	?	LENI-SC-074
p n	32.0	SERP-E-150	p Si	200.	CERN-NA-032
p n	<70.0	SERP-E-119	p Ar	200.	CERN-NA-005
p nucleon	1.46	LAMPF-634	p Ca	900.	FNAL-772
p nucleon	70.0	SERP-E-163	p Cr	500.	FNAL-524
p deut	0.679	TRIUMF-332	p Cu	0.846-0.933	TRIUMF-298
p deut	0.846	TRIUMF-332	p Cu	0.880	SACLAY-107
p deut	0.989	TRIUMF-332			



## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
p Cu	1.70	LENI-SC-104	p nucleus	800.	FNAL-758
p Cu	400.	CERN-NA-020	p nucleus	800.	FNAL-759
p Fe	350.	FNAL-595	p nucleus	800.	FNAL-761
p Ag	500.	FNAL-524	p nucleus	800.	FNAL-762
p Ag	?	LENI-SC-074	p nucleus	800.	FNAL-763
p Xe	200.	CERN-NA-005	p nucleus	800.	FNAL-764
p Wt	500.	FNAL-524	p nucleus	800.	FNAL-765
p Ir	20.0	CERN-PS-162	p nucleus	1000	FNAL-672
p Pb	1.00	LENI-SC-096	p nucleus	1000	FNAL-729
p Th	28.0	BNL-779	p nucleus	1000	FNAL-747
p U	20.0	CERN-PS-162	p nucleus	1000	FNAL-750
p U	28.0	BNL-779	p nucleus	1000	FNAL-751
p nucleus	0.850-1.00	LENI-SC-097	p nucleus	?	FNAL-766
p nucleus	1.00	LENI-SC-079	p crystal	1.00	LENI-SC-078
p nucleus	1.00	LENI-SC-085	p crystal	1.00-10.0	CERN-PS-188
p nucleus	1.00	LENI-SC-096	p crystal	2.00-20.0	CERN-PS-164
p nucleus	1.00	SERP-E-127	$\bar{p} p$	0.0	CERN-PS-170
p nucleus	1.00-4.00	KEK-113	$\bar{p} p$	0.0	CERN-PS-171
p nucleus	1.00-5.00	KEK-090	$\bar{p} p$	0.0	CERN-PS-174
p nucleus	1.00-9.00	ITEP-E-771	$\bar{p} p$	0.0	CERN-PS-175
p nucleus	1.00-28.0	BNL-778	$\bar{p} p$	0.0	CERN-PS-182
p nucleus	1.20	SIN-R-81-06	$\bar{p} p$	0.0	CERN-PS-183
p nucleus	1.70	LENI-SC-021	$\bar{p} p$	0.0	CERN-PS-195
p nucleus	1.70	LENI-SC-029	$\bar{p} p$	<0.20	CERN-PS-179
p nucleus	1.70	LENI-SC-042	$\bar{p} p$	<0.30	CERN-PS-183
p nucleus	1.70	LENI-SC-052	$\bar{p} p$	<0.50	CERN-PS-161
p nucleus	1.70	LENI-SC-066	$\bar{p} p$	0.10-0.60	CERN-PS-178
p nucleus	1.70	LENI-SC-104	$\bar{p} p$	0.15-0.60	CERN-PS-173
p nucleus	2.50	ITEP-E-813	$\bar{p} p$	<0.650	BNL-708
p nucleus	2.89	SACLAY-133	$\bar{p} p$	0.20-0.80	CERN-PS-172
p nucleus	3.00	KEK-084	$\bar{p} p$	0.30-0.70	CERN-PS-198
p nucleus	3.52	SACLAY-133	$\bar{p} p$	0.30-2.00	CERN-PS-172
p nucleus	3.70	SACLAY-057	$\bar{p} p$	0.301-0.551	BNL-762
p nucleus	3.90	KEK-133	$\bar{p} p$	0.335-0.960	KEK-074
p nucleus	4.54-10.1	ITEP-E-831	$\bar{p} p$	0.387-0.681	BNL-742
p nucleus	5.00	ITEP-E-813	$\bar{p} p$	0.390-0.780	KEK-074A
p nucleus	12.0	KEK-136	$\bar{p} p$	0.40-1.00	CERN-PS-163-2
p nucleus	12.0-70.0	SERP-E-153	$\bar{p} p$	0.50-1.50	CERN-PS-199
p nucleus	12.0	KEK-049	$\bar{p} p$	1.20-1.60	BNL-789
p nucleus	<13.0	KEK-082	$\bar{p} p$	<1.80	CERN-PS-201
p nucleus	16.0	BNL-810	$\bar{p} p$	<2.00	CERN-PS-197
p nucleus	16.0	BNL-814	$\bar{p} p$	<2.00	CERN-PS-170
p nucleus	17.0	BNL-790	$\bar{p} p$	1.20-2.00	CERN-PS-185
p nucleus	20.0-400.	FNAL-591	$\bar{p} p$	3.00	KEK-062
p nucleus	70.0	SERP-E-120	$\bar{p} p$	3.00-7.00	FNAL-760
p nucleus	70.0	SERP-E-121	$\bar{p} p$	3.50	KEK-062
p nucleus	70.0	SERP-E-144	$\bar{p} p$	3.50-7.50	CERN-R-704
p nucleus	70.0	SERP-E-155	$\bar{p} p$	4.00	KEK-062
p nucleus	100.	FNAL-597	$\bar{p} p$	4.50	KEK-062
p nucleus	200.	FNAL-565	$\bar{p} p$	5.00	BNL-771
p nucleus	200.	FNAL-629	$\bar{p} p$	6.00	BNL-838
p nucleus	200.-400.	FNAL-466	$\bar{p} p$	8.00-12.0	CERN-WA-074
p nucleus	202.	CERN-NA-034-2	$\bar{p} p$	13.0	SERP-E-116
p nucleus	203.	CERN-WA-080	$\bar{p} p$	20.0	CERN-WA-007
p nucleus	250.	CERN-NA-022	$\bar{p} p$	20.0	SERP-E-148
p nucleus	400.	FNAL-565	$\bar{p} p$	25.0	SERP-E-116
p nucleus	400.	CERN-NA-003	$\bar{p} p$	30.0	SERP-E-148
p nucleus	400.	CERN-NA-030	$\bar{p} p$	32.0	SERP-E-138
p nucleus	400.	CERN-WA-038	$\bar{p} p$	32.0	SERP-E-150
p nucleus	400.	CERN-WA-065	$\bar{p} p$	40.0	SERP-E-116
p nucleus	400.	CERN-WA-066	$\bar{p} p$	40.0	CERN-WA-007
p nucleus	400.	FNAL-497	$\bar{p} p$	40.0	SERP-E-148
p nucleus	400.	FNAL-549	$\bar{p} p$	60.0	CERN-WA-007
p nucleus	400.	FNAL-557	$\bar{p} p$	70.0	SERP-E-163
p nucleus	400.	FNAL-605	$\bar{p} p$	74.0	CERN-WA-042
p nucleus	400.	FNAL-613	$\bar{p} p$	80.0	CERN-WA-007
p nucleus	400.	FNAL-631	$\bar{p} p$	100.	FNAL-577
p nucleus	400.	FNAL-706	$\bar{p} p$	100.	FNAL-597
p nucleus	400.-450.	FNAL-622	$\bar{p} p$	137.	CERN-WA-042
p nucleus	450.	CERN-NA-030	$\bar{p} p$	147.	FNAL-570
p nucleus	450.	CERN-WA-068	$\bar{p} p$	175.	FNAL-663
p nucleus	500.	FNAL-576	$\bar{p} p$	200.	FNAL-577
p nucleus	500.	FNAL-672	$\bar{p} p$	200.	CERN-NA-005
p nucleus	800.	FNAL-557	$\bar{p} p$	200.	FNAL-581/704
p nucleus	800.	FNAL-605			
p nucleus	800.	FNAL-706			
p nucleus	800.	FNAL-508			

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
<i>HERE, FOR THE REST OF <math>\bar{p}p</math>, WE SWITCH FROM LAB MOMENTUM TO C.M. ENERGY</i>					
$\bar{p}p$	20.0	CERN-R-420	$\bar{p}$ crystal	2.00-20.0	CERN-PS-164
$\bar{p}p$	23.5-62.7	CERN-R-210	$n p$	0.600-1.20	SIN-R-72-02
$\bar{p}p$	24.3	CERN-UA-006	$n p$	0.609-1.09	TRIUMF-190
$\bar{p}p$	30.0	CERN-R-211	$n p$	0.708	TRIUMF-182
$\bar{p}p$	30.0	CERN-R-421	$n p$	0.808-1.46	LAMPF-960
$\bar{p}p$	30.0	CERN-R-608	$n p$	0.873	TRIUMF-182
$\bar{p}p$	30.0-62.0	CERN-R-110	$n p$	0.883	TRIUMF-369
$\bar{p}p$	30.0-62.0	CERN-R-501	$n p$	0.950-2.00	SACLAY-078
$\bar{p}p$	30.0-62.0	CERN-R-703	$n p$	0.990	LAMPF-498
$\bar{p}p$	30.0-62.0	CERN-R-808	$n p$	1.00-2.00	SACLAY-106
$\bar{p}p$	31.0-62.0	CERN-R-807	$n p$	1.00-2.00	SACLAY-144
$\bar{p}p$	44.0	CERN-R-421	$n p$	1.02	TRIUMF-182
$\bar{p}p$	52.0	CERN-R-420	$n p$	1.02	TRIUMF-372
$\bar{p}p$	52.0	CERN-R-211	$n p$	1.06	TRIUMF-368
$\bar{p}p$	53.0	CERN-R-608	$n p$	1.06	TRIUMF-121
$\bar{p}p$	62.0	CERN-R-211	$n p$	1.09	LAMPF-665
$\bar{p}p$	62.0	CERN-R-421	$n p$	1.09-1.46	LAMPF-683
$\bar{p}p$	62.0	CERN-R-608	$n p$	1.09-1.81	LAMPF-770
$\bar{p}p$	63.0	CERN-R-420	$n p$	1.11	SACLAY-136
$\bar{p}p$	100.-540.	CERN-UA-004	$n p$	1.22	TRIUMF-182
$\bar{p}p$	300.-2000	FNAL-710	$n p$	1.28	LAMPF-590
$\bar{p}p$	300.-2000	FNAL-713	$n p$	1.28	LAMPF-876
$\bar{p}p$	500.-2000	FNAL-741	$n p$	1.28	LAMPF-498
$\bar{p}p$	500.-2000	FNAL-775	$n p$	1.28	LAMPF-665
$\bar{p}p$	540.	CERN-UA-001	$n p$	1.28	LAMPF-683
$\bar{p}p$	540.	CERN-UA-003	$n p$	1.28-1.70	SACLAY-140
$\bar{p}p$	540.	CERN-UA-005	$n p$	1.45	LAMPF-366
$\bar{p}p$	630.	CERN-UA-001	$n p$	1.45	LAMPF-403
$\bar{p}p$	630.	CERN-UA-002	$n p$	1.46	LAMPF-498
$\bar{p}p$	630.	CERN-UA-007	$n p$	1.46	LAMPF-498
$\bar{p}p$	630.	CERN-UA-008	$n p$	1.46	LAMPF-665
$\bar{p}p$	800.-900.	CERN-UA-005-2	$n p$	1.46	LAMPF-683
$\bar{p}p$	2000	FNAL-735	$n p$	1.46	LAMPF-590
$\bar{p}p$	2000	FNAL-740	$n p$	1.46	LAMPF-590
$\bar{p}p$	?	KEK-131	$n p$	1.46	LAMPF-876
			$n p$	1.46	LAMPF-589
			$n p$	1.46	LAMPF-861
			$n p$	1.46	LAMPF-961
			$n p$	10.0-28.0	BNL-766
			$n p$	<400.	CERN-NA-006
			$n$ deut	0.60-1.20	SIN-R-72-02
			$n$ C	0.80-1.20	SIN-R-80-10
			$n$ C	45.0	SERP-E-104
			$n$ Si	280.	FNAL-400
			$n$ Si	560.	FNAL-400
			$n$ nucleus	0.0041-70.0	SERP-E-159
			$n$ nucleus	2.00-9.50	ITEP-E-822
			$n$ nucleus	40.0-60.0	SERP-E-146
			$n$ nucleus	300.	FNAL-630
			$\bar{n} p$	0.0043-0.043	BNL-795
			$\bar{n} p$	0.10-0.50	BNL-767
			$\bar{n} p$	<1.80	CERN-PS-201
			$\bar{n}$ deut	<1.80	CERN-PS-201
			$\Lambda p$	30.0-60.0	SERP-E-120
			$\Lambda$ deut	30.0-60.0	SERP-E-120
			$\Lambda$ nucleus	80.0-350.	FNAL-619
			$\Sigma^+ p$	30.0-60.0	SERP-E-120
			$\Sigma^+ deut$	30.0-60.0	SERP-E-120
			$\Sigma^- p$	30.0-60.0	SERP-E-120
			$\Sigma^- p$	74.0	CERN-WA-042
			$\Sigma^- p$	137.	CERN-WA-042
			$\Sigma^- deut$	30.0-60.0	SERP-E-120
			$\Sigma^- deut$	74.0	CERN-WA-042
			$\Sigma^- deut$	137.	CERN-WA-042
			$\Sigma^- Be$	135.	CERN-WA-062
			$\Sigma^- Cu$	300.-800.	FNAL-756
			$\Sigma^- nucleus$	0.0	BNL-723
			$\Sigma^- nucleus$	1.00	SERP-E-127
			$\Sigma^- nucleus$	20.0-350.	FNAL-666
			$\Sigma^- nucleus$	250.	FNAL-730
			$\Xi^- p$	30.0-60.0	SERP-E-120
			$\Xi^- p$	74.0	CERN-WA-042
			$\Xi^- p$	137.	CERN-WA-042
			$\Xi^- deut$	0.0	BNL-813
			$\Xi^- deut$	30.0-60.0	SERP-E-120
			$\Xi^- deut$	74.0	CERN-WA-042
			$\Xi^- deut$	137.	CERN-WA-042

Beam-target	Lab momentum GeV/c	Experiment
$\bar{p} n$	32.0	SERP-E-150
$\bar{p}$ nucleon	70.0	SERP-E-163
$\bar{p}$ deut	0.0	CERN-PS-174
$\bar{p}$ deut	0.0	CERN-PS-175
$\bar{p}$ deut	<0.20	CERN-PS-179
$\bar{p}$ deut	<0.50	CERN-PS-161
$\bar{p}$ deut	<0.65	BNL-772
$\bar{p}$ deut	0.300-0.700	CERN-PS-198
$\bar{p}$ deut	0.335-0.960	KEK-074
$\bar{p}$ deut	<1.80	CERN-PS-201
$\bar{p}$ deut	32.0	SERP-E-150
$\bar{p}$ deut	74.0	CERN-WA-042
$\bar{p}$ deut	137.	CERN-WA-042
$\bar{p}$ deut	300.	FNAL-705
$\bar{p}$ deut	750.	FNAL-705
$\bar{p}$ $^3\text{He}$	<0.20	CERN-PS-179
$\bar{p}$ He	>0.0	CERN-PS-194
$\bar{p}$ He	<0.60	CERN-PS-179
$\bar{p}$ Ne	<0.60	CERN-PS-179
$\bar{p}$ Al	0.40-0.60	BNL-742
$\bar{p}$ Ar	200.	CERN-NA-005
$\bar{p}$ Cu	0.40-0.60	BNL-742
$\bar{p}$ Br	<0.60	CERN-PS-179
$\bar{p}$ Ag	<0.60	CERN-PS-179
$\bar{p}$ Xe	200.	CERN-NA-005
$\bar{p}$ Pb	0.40-0.60	BNL-742
$\bar{p}$ nucleus	0.0	CERN-PS-176
$\bar{p}$ nucleus	0.0	CERN-PS-177
$\bar{p}$ nucleus	0.0	CERN-PS-186
$\bar{p}$ nucleus	<0.50	CERN-PS-161
$\bar{p}$ nucleus	<1.80	CERN-PS-201
$\bar{p}$ nucleus	0.30-0.80	CERN-PS-184
$\bar{p}$ nucleus	0.60	CERN-PS-187
$\bar{p}$ nucleus	3.00	KEK-084
$\bar{p}$ nucleus	100.	FNAL-597
$\bar{p}$ nucleus	125.	FNAL-537

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum GeV/c	Experiment	Beam-target	Lab momentum GeV/c	Experiment
$\Xi^-$ Be	116.	CERN-WA-042	$^{16}\text{O}$ nucleus	3217	CERN-NA-035
$\Xi^0$ p	30.0-60.0	SERP-E-120	$^{16}\text{O}$ nucleus	3217	CERN-WA-080
$\Xi^0$ deut	30.0-60.0	SERP-E-120	$^{16}\text{O}$ nucleus	?	BNL-802
$\Omega^-$ p	30.0-60.0	SERP-E-120	$^{16}\text{O}$ Pb	3202	CERN-EMU-002
$\Omega^-$ deut	30.0-60.0	SERP-E-120	$^{16}\text{O}$ U	3602	CERN-NA-038
deut p	0.621-1.02	SACLAY-137	O Hg	240.	BNL-801
deut p	0.770-1.50	SACLAY-108	Ca Pb	8021	CERN-EMU-002
deut p	1.46	LAMPF-685	$^{32}\text{Su}$ nucleus	509.	BNL-806
deut p	1.60-3.60	SACLAY-115	$^{32}\text{Su}$ nucleus	509.	BNL-808
deut p	1.62	SACLAY-138	$^{32}\text{Su}$ nucleus	509.	BNL-810
deut p	1.77-3.62	SACLAY-117	$^{32}\text{Su}$ nucleus	509.	BNL-814
deut p	2.00-4.00	KEK-080	$^{32}\text{Su}$ nucleus	509.	BNL-825
deut p	2.05	SACLAY-138	$^{32}\text{Su}$ nucleus	509.	BNL-826
deut p	2.31	SACLAY-138	$^{32}\text{Su}$ nucleus	1921	CERN-NA-040
deut p	2.93	SACLAY-038-2	$^{32}\text{Su}$ nucleus	1951	CERN-NA-035
deut p	?	SACLAY-066	$^{32}\text{Su}$ nucleus	<6403	CERN-NA-036
deut deut	1.50-4.00	KEK-125	$^{32}\text{Su}$ nucleus	6403	CERN-NA-040
deut deut	1.91-2.62	SACLAY-105	$^{32}\text{Su}$ nucleus	6433	CERN-NA-035
deut deut	2.98	SACLAY-080	$^{32}\text{Su}$ nucleus	?	BNL-802
deut deut	3.39	SACLAY-080	Su Hg	480.	BNL-801
deut deut	3.72	SACLAY-080	Su Pb	480.	BNL-793
deut deut	254.	CERN-R-418	Su Pb	6415	CERN-EMU-002
deut deut	?	SACLAY-066	Su nucleus	480.	BNL-804
deut $^3\text{He}$	0.22-0.26	SIN-R-73-01.2	$^{197}\text{Au}$ nucleus	3135	BNL-808
deut $^6\text{Li}$	?	SACLAY-010	charged <sup>+</sup> crystal	12.0-180.	FNAL-660
deut Be	?	SACLAY-010	charged <sup>+</sup> crystal	20.0-200.	FNAL-754
deut $^{10}\text{Bor}$	?	SACLAY-010	charged <sup>+</sup> crystal	30.0-200.	FNAL-753
deut nucleus	1.29	SACLAY-135	charged <sup>+</sup> p	40.0	CERN-WA-063
deut nucleus	1.60-3.60	SACLAY-115	charged <sup>-</sup> crystal	12.0-180.	FNAL-660
deut nucleus	3.72	SACLAY-134	charged <sup>-</sup> crystal	20.0-200.	FNAL-754
deut deut	12.0-13.0	SERP-E-139	charged <sup>-</sup> p	40.0	CERN-WA-063
deut p	12.0-13.0	SERP-E-139	hadron p	200.-2000	FNAL-690
trit p	2.50	ITEP-E-782			
trit p	5.00	ITEP-E-782			
$^3\text{He}$ p	1.80-4.30	SACLAY-085			
$^3\text{He}$ p	2.50	ITEP-E-782			
$^3\text{He}$ p	4.74	SACLAY-050			
$^3\text{He}$ p	5.00	ITEP-E-782			
$^3\text{He}$ $^3\text{He}$	?	SACLAY-092			
$^3\text{He}$ nucleus	1.80-4.30	SACLAY-085			
He p	4.30	SACLAY-013			
He p	7.00	SACLAY-013			
He deut	4.30	SACLAY-013			
He deut	7.00	SACLAY-013			
He $^3\text{He}$	4.30	SACLAY-013			
He $^3\text{He}$	7.00	SACLAY-013			
He He	4.30	SACLAY-013			
He He	5.00	SACLAY-013			
He He	70.2-524.	CERN-R-210			
He He	117.-512.	CERN-R-110			
He He	117.-512.	CERN-R-808			
He He	125.	CERN-R-418			
He He	125.-512.	CERN-R-807			
He nucleus	>45.0	CERN-PS-192			
$^{12}\text{C}$ nucleus	191.	BNL-810			
$^{12}\text{C}$ nucleus	191.	BNL-826			
$^{16}\text{O}$ Au	3633	CERN-NA-041			
$^{16}\text{O}$ Hg	3617	CERN-NA-039			
$^{16}\text{O}$ nucleus	208.-3202	CERN-EMU-001			
$^{16}\text{O}$ nucleus	255.	BNL-808			
$^{16}\text{O}$ nucleus	255.	BNL-814			
$^{16}\text{O}$ nucleus	255.	BNL-815			
$^{16}\text{O}$ nucleus	255.	BNL-825			
$^{16}\text{O}$ nucleus	255.	CERN-EMU-005			
$^{16}\text{O}$ nucleus	815.	CERN-EMU-005			
$^{16}\text{O}$ nucleus	960.	CERN-EMU-003			
$^{16}\text{O}$ nucleus	961.	CERN-NA-040			
$^{16}\text{O}$ nucleus	975.	CERN-EMU-004			
$^{16}\text{O}$ nucleus	975.	CERN-NA-035			
$^{16}\text{O}$ nucleus	<3202	CERN-NA-036			
$^{16}\text{O}$ nucleus	3202	CERN-EMU-003			
$^{16}\text{O}$ nucleus	3202	CERN-NA-040			
$^{16}\text{O}$ nucleus	3202	CERN-NA-034-2			
$^{16}\text{O}$ nucleus	3217	CERN-EMU-005			
$^{16}\text{O}$ nucleus	3217	CERN-EMU-004			

## SPOKESPERSON INDEX

**ADAIR, R.K.** (Yale U) BNL-735  
**ADAIR, R.K.** (Yale U) BNL-749  
**AHLEN, S.P.** (Indiana U) BNL-804  
**AMALDI, U.** (CERN) CERN-LEP-DELPHI  
**ANDERSON, H.L.** (Los Alamos) LAMPF-455  
**ANTIPOV, Y.M.** (Serpuukhov) SERP-E-143  
**ANTIPOV, Y.M.** (Serpuukhov) SERP-E-148  
**ANTONUK, L.** (Saclay & Alberta U) SACLAY-137  
**APPEL, J.A.** (Fermilab) FNAL-769  
**ARAI, I.** (Tsukuba U) KEK-132  
**ARNOLD, R.G.** (American U) SLAC-E-136  
**ARTUSO, M.** (Northwestern U) LAMPF-951  
**ASTBURY, A.** (Victoria U) TRIUMF-387  
**ASTON, D.** (SLAC) SLAC-E-135  
**AUER, I.P.** (Argonne) LAMPF-498  
**AVILEZ, C.** (Mexico U) BNL-766  
**AXEN, D.A.** (British Columbia U) TRIUMF-174  
**AZUELOS, G.** (TRIUMF) TRIUMF-249  
**BACKENSTOSS, G.** (Basel U) SIN-R-79-05  
**BADAWY, O.E.** (Cairo U) CERN-EMU-003  
**BADERTSCHER, A.** (Yale U) LAMPF-869  
**BAKER, S.I.** (Fermilab) FNAL-631  
**BALATZ, M.Y.** (Moscow, ITEP) ITEP-E-811  
**BALATZ, M.Y.** (Moscow, ITEP) ITEP-E-821  
**BALDO-CEOLIN, M.** (Padua U) CERN-PS-180  
**BALTAY, C.** (Columbia U) FNAL-053A  
**BALTAY, C.** (Columbia U) SLAC-SLC-SLD  
**BARATE, R.** (CERN) CERN-NA-014-2  
**BARLOUTAUD, R.** (Saclay) CERN-PS-168  
**BARLOUTAUD, R.** (Saclay) P-DECAY-FREJUS  
**BARNES, P.D.** (Carnegie Mellon U) BNL-759  
**BARNES, P.D.** (Carnegie Mellon U) BNL-788  
**BARNES, P.D.** (Carnegie Mellon U) BNL-813  
**BARNES, P.D.** (Carnegie Mellon U) BNL-836  
**BARRELET, E.** (Ecole Polytechnique) CERN-PS-157  
**BARTLETT, D.F.** (Colorado U) FNAL-502  
**BATTY, C.J.** (Rutherford) CERN-PS-165  
**BELLINI, G.** (Milan U & INFN) CERN-NA-029  
**BERGER, J.** (Saclay) SACLAY-138  
**BERTHET, P.** (Orsay, IPN) SACLAY-095  
**BERTINI, R.** (Saclay) CERN-PS-198  
**BERTINI, R.** (Saclay) SACLAY-060  
**BERTINI, R.** (Saclay) SACLAY-125  
**BHATIA, T.S.** (Texas A & M) LAMPF-457  
**BHATIA, T.S.** (Texas A & M) LAMPF-846  
**BIENLEIN, J.K.** (DESY) DESY-DORIS-CRYSTAL-BALL  
**BIENLEIN, J.K.** (DESY) DESY-DORIS-LENA  
**BIMBOT, L.** (Orsay, IPN) SACLAY-092  
**BIRCHALL, J.** (Manitoba U) TRIUMF-287  
**BLESZYNSKI, M.** (UCLA) LAMPF-635  
**BLESZYNSKI, M.** (UCLA) LAMPF-685  
**BLOOM, E.D.** (SLAC) DESY-DORIS-CRYSTAL-BALL  
**BLOOM, E.D.** (SLAC) SLAC-SP-030  
**BODEK, A.** (Rochester U) FNAL-595  
**BODEK, A.** (Rochester U) SLAC-E-140  
**BOGGILD, H.** (Copenhagen U) CERN-R-807  
**BOLOTOV, V.N.** (Moscow, INR) SERP-E-115  
**BONIN, B.** (Saclay) SACLAY-135  
**BONNER, B.E.** (Rice U) BNL-817  
**BONNER, B.E.** (Los Alamos) LAMPF-403  
**BONNER, B.E.** (Los Alamos) LAMPF-635  
**BONNER, B.E.** (Los Alamos) LAMPF-637  
**BORISOV, V.S.** (Moscow, ITEP) ITEP-E-823  
**BOUDARD, A.** (Saclay) SACLAY-108  
**BOUDARD, A.** (Saclay) SACLAY-117  
**BOUDRIE, R.L.** (Los Alamos) LAMPF-581  
**BOVET, E.** (Neuchatel U) SIN-R-81-01  
**BOWMAN, J.D.** (Los Alamos) LAMPF-295  
**BOWMAN, J.D.** (Los Alamos) LAMPF-455  
**BOWMAN, J.D.** (Los Alamos) LAMPF-650  
**BRADAMANTE, F.** (Trieste U & INFN) CERN-PS-199  
**BRAU, J.** (Tennessee U) SLAC-BC-076  
**BRAUN-MUNZINGER, P.** (SUNY, Stony Brook) BNL-814  
**BREIDENBACH, M.** (SLAC) SLAC-SLC-SLD  
**BRESSANI, T.** (Turin U) CERN-PS-178  
**BRISCOE, W.J.** (UCLA) LAMPF-546  
**BRISCOE, W.J.** (George Washington U) LAMPF-806  
**BRISCOE, W.J.** (George Washington U) LAMPF-849  
**BROCK, R.** (Michigan State U) FNAL-733  
**BRUECKNER, W.** (Heidelberg, Max Planck Inst)  
 CERN-PS-166  
**BRYMAN, D.A.** (TRIUMF & Victoria U) TRIUMF-052  
**BRYMAN, D.A.** (TRIUMF & Victoria U) TRIUMF-104  
**BUDAGOV, Y.A.** (Dubna) SERP-E-102  
**BUGG, D.** (Queen Mary Coll) CERN-PS-172  
**BUNCE, G.** (Brookhaven) BNL-755  
**BUNCE, G.** (Brookhaven) BNL-838  
**BUNYATOV, S.A.** (Dubna) SERP-E-136  
**BURKE, D.** (SLAC) SLAC-PEP-021  
**BURLESON, G.R.** (New Mexico State U) LAMPF-665  
**BURLESON, G.R.** (New Mexico U) LAMPF-770  
**BURLESON, G.R.** (New Mexico State U) LAMPF-960  
**BUTLER, J.** (Fermilab) FNAL-687  
**BUTTON-SHAFER, J.** (Massachusetts U, Amherst)  
 BNL-698  
**CAMERON, J.M.** (Alberta U) SACLAY-108  
**CAMERON, J.M.** (Alberta U) SACLAY-137  
**CAMERON, J.M.** (Alberta U) TRIUMF-190  
**CAMILLERI, L.** (CERN) CERN-R-110  
**CARLINI, R.** (Los Alamos) LAMPF-634  
**CARR, J.** (LBL) TRIUMF-247  
**CARROLL, A.S.** (Brookhaven) BNL-834  
**CASON, N.M.** (Notre Dame U) BNL-769  
**CESTER, R.** (Turin U) FNAL-760  
**CHEN, H.H.** (UC, Irvine) LAMPF-225  
**CHIBA, J.** (KEK) KEK-133  
**CHRIEN, R.E.** (Brookhaven) BNL-828  
**CHRIEN, R.E.** (Brookhaven) BNL-835  
**CHRISTENSON, J.H.** (New York U) BNL-726  
**CHUNG, S.U.** (Brookhaven) BNL-771  
**CHUNG, S.U.** (Brookhaven) BNL-818  
**CLINE, D.** (Wisconsin U) P-DECAY-HPW  
**CONTI, A.** (Florence U & INFN) CERN-EMU-006  
**COOPER, J.** (Fermilab) FNAL-673  
**COOPER, M.D.** (Los Alamos) LAMPF-808  
**COOPER, M.D.** (Los Alamos) LAMPF-969  
**COOPER, P.S.** (Yale U) FNAL-715  
**CORCORAN, M.** (Rice U) FNAL-683  
**COUSINS, R.D.** (UCLA) BNL-791  
**COUVERT, P.** (Saclay) SACLAY-068  
**COX, B.** (Fermilab) FNAL-537  
**COX, B.** (Fermilab) FNAL-705  
**CROWE, K.M.** (LBL) TRIUMF-134  
**CUMALAT, J.** (Colorado U) FNAL-687  
**DAKE, S.** (Kobe U) FNAL-762  
**DALPIAZ, P.** (Ferrara U) CERN-PS-170  
**DARRIULAT, P.** (CERN) CERN-UA-002  
**DAUM, M.** (SIN) SIN-R-85-10  
**DAVID, M.** (Saclay) CERN-WA-011  
**DAVIES, J.D.** (Birmingham U) CERN-PS-174  
**DAVIES, J.D.** (Birmingham U) CERN-SC-077  
**DAVIS, C.A.** (Manitoba U & TRIUMF) TRIUMF-332  
**DAVISON, N.E.** (Manitoba U) TRIUMF-372  
**DEHNHARD, D.** (Minnesota U) LAMPF-998  
**DEL PRETE, T.** (Pisa U) CERN-R-210  
**DENISOV, S.P.** (Serpuukhov) SERP-E-152  
**DEUTSCH, M.** (MIT) BNL-760  
**DEUTSCH, M.** (MIT) BNL-781  
**DEVLIN, T.** (Rutgers U) FNAL-555  
**DEVLIN, T.** (Rutgers U) FNAL-619  
**DIAMBRINI-PALAZZI, G.** (Genoa U) CERN-WA-058  
**DIAMBRINI-PALAZZI, G.** (Rome U & INFN)  
 CERN-WA-071  
**DIDELEZ, J.P.** (Orsay, IPN) SACLAY-121  
**DIGIACOMO, N.** (Los Alamos) CERN-PS-187  
**DITZLER, W.R.** (Argonne) LAMPF-683  
**DOMBECK, T.W.** (Los Alamos) LAMPF-764  
**DORFAN, J.** (SLAC) SLAC-SLC-6  
**DOWELL, J.** (Birmingham U) CERN-UA-001  
**DUFLO, J.** (Saclay) SACLAY-013  
**DYDAK, F.** (CERN) CERN-WA-001-2  
**ECKHAUSE, M.** (William & Mary Coll) TRIUMF-137

## SPOKESPERSON INDEX

EGGER, J.-P. (Neuchatel U) SACLAY-129  
 EGLI, S. (Zurich U) SIN-R-85-16  
 ELLIS, R.J. (Los Alamos) LAMPF-647  
 ENDO, I. (Hiroshima U) INS-ES-111  
 ENDO, I. (Hiroshima U) INS-15-3  
 ERMOLOV, P.F. (Serpukhov) FNAL-180  
 ERMOLOV, P.F. (Moscow State U) SERP-E-161  
 EROE, J. (Budapest, CRIP) SIN-R-80-10  
 EXTERMANN, P. (Geneva U) CERN-WA-042  
 FASSNACHT, P. (Strasbourg) SACLAY-113  
 FAVART, D. (Louvain U) CERN-R-211  
 FELDMAN, G. (SLAC) SLAC-SLC-6  
 FELST, R. (DESY) DESY-PETRA-JADE  
 FERRER, A. (CERN) CERN-WA-056  
 FETSCHER, W. (Zurich, ETH) SIN-R-74-05  
 FETSCHER, W. (Zurich, ETH) SIN-R-83-29  
 FIDECARO, G. (CERN) CERN-WA-006  
 FIORINI, E. (Milan U & INFN) CERN-PS-167  
 FIORINI, E. (Milan U) P-DECAY-NUSEX  
 FISHER, C. (Rutherford) CERN-NA-016  
 FITZGERALD, D.H. (UCLA) LAMPF-689  
 FITZGERALD, D.H. (Los Alamos) LAMPF-808  
 FITZGERALD, D.H. (Los Alamos) LAMPF-849  
 FOA, L. (Pisa U) CERN-NA-001  
 FOA, L. (Pisa U & INFN) CERN-NA-029  
 FONTAINE, J.M. (Saclay) SACLAY-104  
 FORSTER, J.S. (Chalk River, AECL) FNAL-753  
 FRANCIS, W. (Michigan State U) FNAL-585  
 FRANK, S.G.F. (Southampton U) CERN-NA-007  
 FRANKEL, S. (Penn U) LAMPF-421  
 FRANKLIN, G. (Carnegie Mellon U) BNL-788  
 FRANKLIN, G. (Carnegie Mellon U) BNL-813  
 FRANKLIN, G. (Carnegie Mellon U) BNL-836  
 FRANZINI, P. (Columbia U) CESR-CUSB  
 FRANZINI, P. (Columbia U) CESR-CUSB-II  
 FRASCARIA, R. (Orsay, IPN) SACLAY-051  
 FRASCARIA, R. (Saclay) SACLAY-080  
 FRASCARIA, R. (Orsay, IPN) SACLAY-095  
 FRASCARIA, R. (Orsay, IPN) SACLAY-121  
 FRASCARIA, R. (Orsay, IPN) SACLAY-129  
 FRIEDLANDER, E.M. (LBL) CERN-PS-192  
 FROSCH, R. (SIN) SIN-R-71-08  
 FROSCH, R. (SIN) SIN-R-82-01  
 FROSCH, R. (SIN) SIN-R-85-10  
 FRYBERGER, D. (SLAC) SLAC-PEP-002  
 FUJII, T. (Kobe U) KEK-131  
 FUKUI, S. (Nagoya U) KEK-084  
 FUNSTEN, H. (William & Mary Coll) BNL-828  
 GAARDE, C. (Copenhagen U) SACLAY-085  
 GAARDE, C. (Copenhagen U) SACLAY-115  
 GABRIELSE, G. (Washington U, Seattle) CERN-PS-196  
 GAGO, J.M. (Lisbon, CFMC) CERN-WA-074  
 GAINES, I. (Fermilab) FNAL-687  
 GARCON, M. (Saclay) SACLAY-017  
 GARRETA, D. (Saclay) CERN-PS-184  
 GASTALDI, U. (CERN) CERN-PS-201  
 GAZZALY, M. (Minnesota U) LAMPF-885  
 GAZZALY, M. (Minnesota U) LAMPF-973  
 GAZZALY, M.M. (Minnesota U) LAMPF-790  
 GEIST, W. (CERN) CERN-R-416  
 GEIST, W. (CERN) CERN-R-419  
 GEIST, W.M. (LBL) CERN-NA-036  
 GIBSON, W. (SUNY, Albany) FNAL-660  
 GILL, D.R. (TRIUMF) TRIUMF-394  
 GIMLETT, J. (Cal Tech) SIN-R-81-01  
 GLADISCH, M.W. (Heidelberg U, Phys Inst) LAMPF-869  
 GLASHAUSSER, C. (Rutgers U) SACLAY-135  
 GLASS, G.C. (Texas A & M) LAMPF-402  
 GLASS, G.C. (Texas A & M) LAMPF-589  
 GLASS, G.C. (Texas A & M) LAMPF-664  
 GLASS, G.C. (Texas A & M) LAMPF-846  
 GOLDBERGER, G. (LBL) SLAC-SLC-6  
 GOLDSCHMIDT-CLERMONT, Y. (CERN)  
     CERN-WA-083  
 GOLDZAHN, L. (Saclay) SACLAY-095  
 GOLDZAHN, L. (Saclay) SACLAY-138  
 GOLLIN, G.D. (Princeton U) FNAL-773  
 GOSSET, J. (Saclay) SACLAY-132  
 GOTOW, K. (Virginia Tech) LAMPF-567  
 GOTOW, K. (Virginia Tech) LAMPF-767  
 GOTOW, K. (Virginia Tech) LAMPF-828  
 GOUDSMIT, P.F.A. (Zurich, ETH) SIN-R-78-09  
 GOULIANOS, K. (Rockefeller U) FNAL-612  
 GRACCO, V. (Genoa U) CERN-WA-007  
 GRAFSTROM, P. (Uppsala U) CERN-NA-008  
 GRAM, P.A.M. (Los Alamos) LAMPF-783  
 GRAMENITSKY, I.M. (Dubna) SERP-E-139  
 GRAMENITSKY, I.M. (Dubna) SERP-E-161  
 GRANNIS, P. (SUNY, Stony Brook) FNAL-740  
 GREEN, D. (Fermilab) FNAL-580  
 GREEN, D. (Fermilab) FNAL-623  
 GREENIAUS, L.G. (TRIUMF) TRIUMF-368  
 GREENIAUS, L.G. (TRIUMF) TRIUMF-369  
 GROOM, D. (LBL) SLAC-PEP-006  
 GRUEEBLER, W. (Zurich, ETH) SIN-R-73-01.2  
 GÜBLER, H.P. (Manitoba U) TRIUMF-182  
 GURTU, A. (Tata Inst) FNAL-729  
 GUSTAFSON, H.R. (Michigan U) FNAL-622  
 GUTAY, L.J. (Purdue U) FNAL-591  
 GUTAY, L.J. (Purdue U) FNAL-735  
 GUTBROD, H.H. (Darmstadt, GSI) CERN-WA-080  
 HAHN, A.A. (UC, Irvine) FNAL-747  
 HAHN, B. (Bern U) SIN-R-82-04  
 HALLIN, A. (Los Alamos) LAMPF-888  
 HANSEN, O. (Brookhaven) BNL-802  
 HASHIMOTO, O. (Tokyo U, INS) KEK-150  
 HAYANO, R. (Tokyo U) KEK-099  
 HAYANO, R. (Tokyo U) KEK-117  
 HEBERT, J. (Ottawa U) FNAL-576  
 HEINRICH, W. (Siegen U) BNL-806  
 HEPPELMANN, S. (Minnesota U) BNL-834  
 HESS, R. (Geneva U) SACLAY-144  
 HESS, R. (Geneva U) SIN-R-71-07  
 HESS, R. (Geneva U) SIN-R-78-06  
 HESS, R. (Geneva U) SIN-R-80-01  
 HESS, R. (Geneva U) SIN-R-82-06  
 HIBOU, F. (Strasbourg) SACLAY-010  
 HIBOU, F. (Strasbourg & Saclay) SACLAY-092  
 HIBOU, F. (Strasbourg) SACLAY-133  
 HIGHLAND, V.L. (Temple U) LAMPF-726  
 HILL, J.C. (Ames Lab) CERN-NA-040  
 HIRSCHMANN, H. (SIN) SIN-R-75-07.2  
 HITLIN, D. (Cal Tech) SLAC-SP-031  
 HODGES, C.L. (San Francisco State U) BNL-801  
 HOFFMAN, C.M. (Los Alamos) LAMPF-400/445  
 HOFFMANN, G.W. (Los Alamos) LAMPF-385  
 HOFFMANN, G.W. (Texas U) LAMPF-392  
 HOFFMANN, G.W. (Texas U) LAMPF-563  
 HOFMANN, A. (Erlangen U) SIN-R-86-02  
 HOGAN, G. (Los Alamos) LAMPF-726  
 HOLLAS, C.L. (Texas U) LAMPF-636  
 HOLLAS, C.L. (Texas U) LAMPF-708  
 HOLLEBEEK, R. (Penn U) SLAC-PEP-021  
 HOMMA, S. (Tokyo U, INS) INS-ES-105  
 HOMMA, S. (Tokyo U, INS) INS-14-3  
 HOMMA, S. (Tokyo U, INS) INS-17-2  
 HOMMA, S. (Tokyo U, INS) INS-18-1  
 HOMMA, S. (Tokyo U, INS) INS-19-2  
 HORIKAWA, N. (Nagoya U) INS-16-1  
 HUGENTOBLER, E. (Bern U) CERN-NA-018  
 HUGHES, V.W. (Yale U) BNL-821  
 HUGHES, V.W. (Yale U) LAMPF-421  
 HUGHES, V.W. (Yale U) LAMPF-869  
 HUGHES, V.W. (Yale U) LAMPF-985  
 HUGHES, V.W. (Yale U) SLAC-E-130  
 HULTH, P.O. (Stockholm U) CERN-WA-066  
 HUNGERFORD, E.V. (Houston U) BNL-752  
 HUNGERFORD, E.V. (Houston U) BNL-774  
 HUTCHEON, D.A. (TRIUMF) TRIUMF-171  
 HUTCHEON, D.A. (Alberta U & TRIUMF)  
     TRIUMF-300  
 HYNES, M.V. (Los Alamos) CERN-PS-200

## SPOKESPERSON INDEX

IGO, G.J. (UCLA) KEK-081  
 IGO, G.J. (UCLA) LAMPF-015  
 IGO, G.J. (UCLA) LAMPF-635  
 IGO, G.J. (UCLA) LAMPF-685  
 IGO, G.J. (UCLA) LAMPF-818  
 IGO, G.J. (UCLA) LAMPF-853  
 IGO, G.J. (UCLA) SACLAY-038-2  
 IMAEDA, K. (Okayama U) FNAL-765  
 INAGAKI, T. (KEK) KEK-121  
 INAGAKI, T. (KEK) KEK-137  
 ISHII, T. (Tokyo U, INS) INS-17-1  
 ITO, H. (Saga U) KEK-094  
 ITOH, H. (Saga U) BNL-826  
 IWASAKI, M. (Kyoto U) KEK-146  
 IWATA, S. (KEK) KEK-TE-002  
 JACKSON, J.N. (Liverpool U) CERN-WA-067  
 JAIN, P.L. (SUNY, Buffalo) FNAL-751  
 JARMER, J.J. (Los Alamos) LAMPF-517  
 JARMER, J.J. (Los Alamos) LAMPF-518  
 JENSEN, D. (Massachusetts U, Amherst) BNL-744  
 JOHNSON, K.F. (Argonne) LAMPF-960  
 JONSON, B. (Chalmers Univ Tech) CERN-IS-010  
 JOSEPH, C. (Lausanne U) CERN-UA-006  
 JULIEN, J. (Saclay) SACLAY-107  
 KAFTANOV, V.S. (Moscow, ITEP) SERP-E-045  
 KAJIKAWA, R. (Nagoya U) INS-14-4  
 KAJIKAWA, R. (Nagoya U) KEK-TE-002  
 KALMUS, G. (Rutherford) SLAC-BC-072/073  
 KALOGEROPOULOS, T.E. (Syracuse U) BNL-708  
 KALOGEROPOULOS, T.E. (Syracuse U) BNL-772  
 KANAVETS, V.P. (Moscow, ITEP) ITEP-E-801  
 KANE, J. (William & Mary Coll) LAMPF-985  
 KATCOFF, S. (Brookhaven) BNL-779  
 KATO, S. (Tokyo U, INS) INS-15-1  
 KATO, S. (Tokyo U, INS) INS-16-1  
 KATO, S. (Tokyo U, INS) INS-18-3  
 KAZARINOV, Y.M. (Dubna) SERP-E-112  
 KERNEL, G. (Ljubljana U) CERN-SC-094  
 KILIAN, K. (Kernforschungsanlage, Julich) CERN-PS-185  
 KIM, C. (Calgary U) TRIUMF-326  
 KINOSHITA, K. (Harvard U) KEK-TE-004  
 KIRK, T.B.W. (Fermilab) FNAL-610  
 KIRK, T.B.W. (Fermilab) FNAL-665  
 KIRKBY, J. (Stanford U) SLAC-PEP-020  
 KISHIMOTO, T. (Houston U) BNL-829  
 KITAGAKI, T. (Tohoku U) FNAL-745  
 KITAGAKI, T. (Tohoku U) KEK-079  
 KITCHING, P. (Alberta U) TRIUMF-208  
 KITTEL, W. (Nijmegen U) CERN-NA-022  
 KLANNER, R. (Munich, Max Planck Inst) CERN-NA-011  
 KLEMPF, E. (Mainz U, Inst Phys) CERN-PS-171  
 KLUBERG, L. (Ecole Polytechnique) CERN-NA-010  
 KLUBERG, L. (Ecole Polytechnique) CERN-NA-038  
 KLUGE, W. (Karlsruhe U) SIN-R-82-17  
 KNAPP, B. (Nevis Labs, Columbia U) BNL-766  
 KNAPP, B. (Nevis Labs, Columbia U) FNAL-690  
 KOBRAK, H. (UC, San Diego) FNAL-663  
 KOCH, H. (Kernforschungszentrum, Karlsruhe & Karlsruhe U) CERN-PS-161  
 KOCH, H. (Kernforschungszentrum, Karlsruhe & Karlsruhe U) CERN-PS-197  
 KOROLEV, G. (Leningrad, INP) SACLAY-078  
 KOSHIBA, M. (Tokyo U) P-DECAY-KAMIOKA  
 KOSHIBA, M. (Tokyo U) P-DECAY-KAMIOKA-II  
 KOSSLER, W.J. (William & Mary Coll) BNL-754  
 KOTTMANN, F. (Zurich, ETH) SIN-R-78-15.1  
 KOTTMANN, F. (Zurich, ETH) SIN-R-82-03.1  
 KOTTMANN, F. (Zurich, ETH) SIN-R-83-20-2  
 KREISLER, M. (Massachusetts U, Amherst) BNL-766  
 KRISCH, A.D. (Michigan U) BNL-748  
 KRISCH, A.D. (Michigan U) BNL-782  
 KRISCH, A.D. (Michigan U) BNL-794  
 KRUSE, H. (Los Alamos) LAMPF-764  
 KUREPIN, A.B. (Moscow, INR) SACLAY-107  
 KUTYIN, V.M. (Serpukhov) SERP-E-102  
 KUZNETSOV, E.P. (Serpukhov) SERP-E-107  
 KYCIA, T.F. (Brookhaven) BNL-722  
 KYCIA, T.F. (Brookhaven) BNL-732  
 KYCIA, T.F. (Brookhaven) BNL-787  
 LACH, J. (Fermilab) FNAL-497  
 LANDE, K. (Penn U) P-DECAY-HOMESTAKE  
 LANDSBERG, L.G. (Serpukhov) SERP-E-120  
 LANDSBERG, L.G. (Serpukhov) SERP-E-142  
 LE BORNEC, Y. (Orsay, IPN & Saclay) SACLAY-092  
 LE BORNEC, Y. (Orsay, IPN) SACLAY-133  
 LEE-FRANZINI, J. (SUNY, Stony Brook) CESR-CUSB-II  
 LEE, W. (Columbia U) BNL-776  
 LEE, W. (Columbia U) FNAL-458  
 LEE, Y.K. (Johns Hopkins U) TRIUMF-297  
 LEGRAND, D. (Saclay) SACLAY-070  
 LEHAR, F. (Saclay) SACLAY-052  
 LEHAR, F. (Saclay) SACLAY-087  
 LEHAR, F. (Saclay) SACLAY-088  
 LEHAR, F. (Saclay) SACLAY-089  
 LEHAR, F. (Saclay) SACLAY-101  
 LEHAR, F. (Saclay) SACLAY-104  
 LEHAR, F. (Saclay) SACLAY-106  
 LEHAR, F. (Saclay) SACLAY-124  
 LEHAR, F. (Saclay) SACLAY-144  
 LEHAR, F. (Saclay) SIN-R-80-01  
 LEISI, H.J. (Zurich, ETH) SIN-R-78-09  
 LEISI, H.J. (Zurich, ETH) SIN-R-82-10  
 LEKSIN, G.A. (Moscow, ITEP) ITEP-E-771  
 LEKSIN, G.A. (Moscow, ITEP) ITEP-E-813  
 LEVINTHAL, D.A. (Florida State U) FNAL-711  
 LICHTENSTADT, J. (Tel Aviv U) LAMPF-783  
 LIKHACHEV, M.F. (Dubna) SERP-E-104  
 LIKHACHEV, M.F. (Dubna) SERP-E-146  
 LINDENBAUM, S.J. (Brookhaven & City Coll N Y) BNL-747  
 LINDENBAUM, S.J. (Brookhaven & City Coll N Y) BNL-810  
 LING, T.Y. (Ohio State U) LAMPF-645  
 LITCHFIELD, P.J. (Rutherford) CERN-PS-160  
 LITKE, A. (Stanford U) SLAC-PEP-014  
 LIU, L.C. (Los Alamos) BNL-828  
 LOCKYER, N. (SLAC) SLAC-PEP-005  
 LOEHR, B. (DESY) DESY-PETRA-TASSO  
 LONGO, M.J. (Michigan U) FNAL-549  
 LOVE, W.A. (Brookhaven) BNL-747  
 LOVELAND, W. (Oregon State U) BNL-825  
 LUK, K.B. (Washington U, Seattle) FNAL-756  
 MACEK, R.J. (Los Alamos) LAMPF-032  
 MACRI, M. (CERN) CERN-R-704  
 MAKDISI, Y.I. (Brookhaven) BNL-785  
 MAKI, A. (KEK) KEK-TE-003  
 MALAMUD, E. (Fermilab) FNAL-557  
 MANDL, F. (Vienna, OAW) CERN-WA-028  
 MARKOV, P.K. (Sofiya, Inst Nucl Res) SERP-E-104  
 MARKYTAN, M. (Vienna, OAW) CERN-NA-023  
 MARSHAK, M. (Minnesota U) BNL-755  
 MARSHAK, M. (Minnesota U) P-DECAY-SOUDAN-II  
 MARTEMIANOV, V.P. (Kurchatov Inst, Moscow) CERN-WA-038  
 MARTIN, M. (Geneva U) CERN-WA-070  
 MASAIKE, A. (KEK) KEK-081  
 MASTERSON, T.G. (Colorado U) LAMPF-478  
 MASTERSON, T.G. (Colorado U) LAMPF-581  
 MATHIE, E.L. (Regina U) TRIUMF-303  
 MATHIE, E.L. (Regina U) TRIUMF-375  
 MATTHIAE, G. (Naples U, IFS & INFN) CERN-UA-004  
 MAY, M. (Brookhaven) BNL-781  
 MAYER, B. (Saclay) SACLAY-060  
 MAYER, B. (Saclay) SACLAY-099  
 MAYER, B. (Saclay) SACLAY-124  
 MAYES, B.W. (Houston U) LAMPF-366  
 MCCASLIN, J. (LBL) FNAL-766  
 MCCUBBIN, N.A. (Rutherford) CERN-NA-034  
 MCDONALD, K.T. (Princeton U) FNAL-615  
 MCFARLANE, W.K. (Temple U) LAMPF-032  
 MCGILL, J.A. (Los Alamos) LAMPF-979  
 MCNAUGHTON, M.W. (Los Alamos) LAMPF-492

## SPOKESPERSON INDEX

**MCNAUGHTON, M.W.** (Los Alamos) LAMPF-876  
**MEASDAY, D.F.** (British Columbia U) TRIUMF-009  
**MEASDAY, D.F.** (British Columbia U) TRIUMF-301  
**MELISSINOS, A.C.** (Rochester U) BNL-805  
**MELISSINOS, A.C.** (Rochester U) FNAL-723  
**MERRITT, F.** (Chicago U) FNAL-744  
**MEYER, W.T.** (Ames Lab) CERN-R-420  
**MIAKE, Y.** (Tokyo U) KEK-113  
**MICHALOWICZ, A.** (Annecy) SACLAY-052-2  
**MICHELINI, A.** (CERN) CERN-LEP-OPAL  
**MICHELINI, A.** (CERN) CERN-NA-003  
**MILLER, D.H.** (Purdue U) SLAC-PEP-012  
**MINEHART, R.C.** (Virginia U) LAMPF-567  
**MINEHART, R.C.** (Virginia U) LAMPF-828  
**MINEHART, R.C.** (Virginia U) SIN-R-80-11  
**MIYACHI, T.** (Tokyo U, INS) INS-ES-103  
**MIYACHI, T.** (Tokyo U, INS) INS-ES-112  
**MIYACHI, T.** (Tokyo U, INS) INS-19-1  
**MIYAKE, K.** (Kyoto U) KEK-092  
**MO, L.W.** (Virginia Tech) FNAL-635  
**MO, L.W.** (Virginia Tech) SLAC-E-137  
**MOFFEIT, K.C.** (SLAC) SLAC-BC-072/073  
**MOFFEIT, K.C.** (SLAC) SLAC-BC-075  
**MOINESTER, M.A.** (Tel Aviv U & Los Alamos) LAMPF-295  
**MOISEEV, A.M.** (Serpukhov) SERP-E-138  
**MOISEEV, A.M.** (Serpukhov) SERP-E-150  
**MOISEEV, A.M.** (Serpukhov) SERP-E-161  
**MOLZON, W.R.** (Penn U) BNL-791  
**MONETI, G.** (Syracuse U) CESR-CLEO  
**MONTANET, L.** (CERN) CERN-NA-027  
**MORI, S.** (Tsukuba U) KEK-082  
**MORRIS, C.L.** (Los Alamos) LAMPF-651  
**MORRIS, C.L.** (Los Alamos) LAMPF-898  
**MORRIS, C.L.** (Los Alamos) LAMPF-979  
**MORRIS, C.L.** (Los Alamos) LAMPF-998  
**MORRISON, D.R.O.** (CERN) FNAL-632  
**MORSE, W.M.** (Brookhaven) BNL-780  
**MOSER, U.** (Bern U) SIN-R-82-04  
**MOSS, J.** (Los Alamos) FNAL-772  
**MUKHIN, A.I.** (Serpukhov) SERP-E-045  
**MULLER, A.** (Saclay) CERN-WA-063  
**MURAKI, Y.** (Tokyo U, Cosmic Ray Lab) CERN-UA-007  
**MURATA, Y.** (Tokyo U, INS) INS-19-3  
**MURTAGH, M.J.** (Brookhaven) BNL-734  
**MURTAGH, M.J.** (Brookhaven) BNL-775  
**MUSSET, P.** (CERN) CERN-NA-019  
**MUSSET, P.** (CERN) CERN-R-501  
**MUSSET, P.** (CERN) CERN-UA-003  
**MUTCHLER, G.S.** (Rice U) LAMPF-336  
**MUTCHLER, G.S.** (Rice U) LAMPF-366  
**MUTCHLER, G.S.** (Rice U) LAMPF-825  
**MYATT, G.** (Oxford U) CERN-WA-021  
**NAGAMIYA, S.** (Tokyo U) BNL-802  
**NAGASHIMA, Y.** (Osaka U) KEK-TE-001  
**NAGASHIMA, Y.** (KEK) KEK-010  
**NAGY, E.** (Budapest, CRIP) SERP-E-104  
**NAKACH, A.** (Saclay) SACLAY-101  
**NAKAI, K.** (Tokyo U) KEK-090  
**NAKAMURA, K.** (Tokyo U) KEK-074  
**NAKAMURA, K.** (Tokyo U) KEK-074A  
**NANJO, H.** (Hirosaki U) FNAL-764  
**NANN, H.** (Northwestern U) LAMPF-462  
**NARASIMHAM, V.S.** (Tata Inst) P-DECAY-KGF  
**NASH, T.** (Fermilab) FNAL-516  
**NEFKENS, B.M.K.** (UCLA) LAMPF-058/120  
**NEFKENS, B.M.K.** (UCLA) LAMPF-546  
**NEFKENS, B.M.K.** (UCLA) LAMPF-689  
**NEFKENS, B.M.K.** (UCLA) LAMPF-804  
**NEFKENS, B.M.K.** (UCLA) LAMPF-806  
**NEFKENS, B.M.K.** (UCLA) LAMPF-905  
**NEFKENS, B.M.K.** (UCLA) SACLAY-037  
**NEFKENS, B.M.K.** (UCLA) SACLAY-066  
**NEFKENS, B.M.K.** (UCLA) SACLAY-068  
**NELSON, C.A.** (Fermilab) FNAL-629  
**NEMENOV, L.L.** (Dubna) SERP-E-119  
**NEWSOM, C.R.** (Saclay) SACLAY-088  
**NGO, C.** (Saclay) CERN-NA-041  
**NIEBUHR, C.** (Zurich, ETH) SIN-R-85-14  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-517  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-518  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-589  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-590  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-861  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-960  
**NORTHCLIFFE, L.C.** (Texas A & M) LAMPF-961  
**NUMAO, T.** (TRIUMF) TRIUMF-248  
**NURUSHEV, S.B.** (Serpukhov) SERP-E-112  
**OBERLACK, H.** (Munich, Max Planck Inst) DESY-PETRA-CELLO  
**ODDONE, P.** (LBL) SLAC-PEP-004/009  
**OGATA, T.** (Tokyo U, Cosmic Ray Lab) FNAL-763  
**OGAWA, K.** (KEK) KEK-075  
**OLIN, A.** (Victoria U) TRIUMF-304  
**OLSEN, S.L.** (Rochester U) KEK-TE-003  
**ORAM, C.** (British Columbia U) TRIUMF-168  
**OREAR, J.** (Cornell U) FNAL-710  
**ORTH, H.** (Yale U) LAMPF-985  
**ORTNER, H.-W.** (Erlangen U) SIN-R-86-02  
**OTTERLUND, I.** (Lund U) BNL-815  
**OTTERLUND, I.** (Lund U) CERN-EMU-001  
**OTTERLUND, I.** (Lund U) CERN-R-418  
**OTTERLUND, I.** (Lund U) FNAL-576  
**PALANO, A.** (Bari U) CERN-WA-076  
**PALEVSKY, H.** (Brookhaven) BNL-746  
**PALMER, R.B.** (Brookhaven) BNL-737  
**PARNELL, T.A.** (NASA, Marshall) CERN-EMU-004  
**PAUL, E.** (Bonn U) CERN-WA-069  
**PAULETTA, G.** (UCLA) LAMPF-585  
**PAULETTA, G.** (UCLA) LAMPF-790  
**PAULETTA, G.** (Texas U) LAMPF-885  
**PAULETTA, G.** (Texas U) LAMPF-973  
**PAULI, E.** (Saclay) CERN-PS-159  
**PAVLOPOULOS, P.** (CERN) CERN-PS-195  
**PEDRONI, E.** (SIN) SIN-R-82-17  
**PENG, J.C.** (Los Alamos) BNL-798  
**PENZO, A.** (INFN, Trieste) SACLAY-089  
**PERDRISAT, C.F.** (William & Mary Coll) SACLAY-134  
**PERROT, F.** (Saclay) SACLAY-144  
**PERROUD, J.-P.** (Lausanne U) SIN-R-78-13.1  
**PETERS, M.** (Hawaii U) FNAL-646  
**PETRUKHIN, V.I.** (Dubna) SERP-E-105  
**PHILLIPS, G.C.** (Rice U) LAMPF-504  
**PIASETZKY, E.** (Tel Aviv U) BNL-835  
**PIASETZKY, E.** (Los Alamos) LAMPF-783  
**PIEKARZ, H.** (Brandeis U) BNL-773  
**PIEKARZ, H.** (Brandeis U) BNL-820  
**PILE, P.H.** (Brookhaven) BNL-798  
**PINSKY, L.S.** (Houston U) LAMPF-336  
**PIRAGINO, G.** (Turin U) CERN-PS-179  
**PISTILLI, P.** (CERN) CERN-WA-078  
**PLATNER, E.D.** (Brookhaven) BNL-810  
**PLESS, I.A.** (MIT) FNAL-565  
**PLESS, I.A.** (MIT) FNAL-570  
**PLESS, I.A.** (MIT) FNAL-636  
**PLOUIN, F.** (Saclay) SACLAY-105  
**POLIKANOV, S.** (Darmstadt, GSI) CERN-PS-177  
**PONDROM, L.** (Wisconsin U) FNAL-620  
**PORILE, N.T.** (Purdue U) FNAL-466  
**POSTER, R.** (Brandeis U) BNL-751  
**POTH, H.** (Kernforschungszentrum, Karlsruhe & Karlsruhe U) CERN-PS-176  
**POUTISSOU, J.-M.** (TRIUMF) TRIUMF-217  
**PREEDOM, B.** (Southern California U) SACLAY-121  
**PRETZL, K.P.** (Munich, Max Planck Inst) CERN-NA-024  
**PRICE, P.B.** (UC, Berkeley) BNL-793  
**PRICE, P.B.** (UC, Berkeley) CERN-EMU-002  
**PRICE, P.B.** (UC, Berkeley) FNAL-713  
**PRICE, P.B.** (UC, Berkeley) SLAC-PEP-002  
**PRIEELS, R.** (Louvain U) SIN-R-81-09  
**PROKOSHKIN, YU.D.** (Serpukhov) CERN-NA-012  
**PROKOSHKIN, YU.D.** (Serpukhov) CERN-NA-012-2

## SPOKESPERSON INDEX

**PROKOSHKIN, YU.D.** (Serpukhov) SERP-E-116  
**PROKOSHKIN, YU.D.** (Serpukhov) SERP-E-140  
**PROKOSHKIN, YU.D.** (Serpukhov) SERP-E-163  
**QUERCIGH, E.** (CERN) CERN-WA-077  
**RADKEVICH, I.A.** (Moscow, ITEP) ITEP-E-784  
**RADVANYI, P.** (Lyon, IPN & Orsay, IPN & Saclay)  
 SACLAY-057  
**RATCLIFF, B.** (SLAC) SLAC-E-135  
**REAY, N.W.** (Ohio State U) FNAL-531  
**REAY, N.W.** (Ohio State U) FNAL-653  
**REBKA, G.A., JR.** (Wyoming U) LAMPF-783  
**REINES, F.** (UC, Irvine) P-DECAY-IMB  
**REMILLIEUX, J.** (Lyon, IPN) CERN-NA-033  
**REMILLIEUX, J.** (Lyon, IPN) CERN-NA-042  
**REMSBERG, L.P.** (Brookhaven) BNL-790  
**REUCROFT, S.** (CERN) FNAL-743  
**RILEY, P.J.** (Texas U) LAMPF-360  
**RISTINEN, R.A.** (Colorado U) TRIUMF-394  
**RITCHIE, B.G.** (South Carolina U) LAMPF-567  
**RITCHIE, B.G.** (Maryland U) LAMPF-828  
**ROBERTS, B.L.** (Boston U) BNL-723  
**ROBERTS, B.L.** (Boston U) BNL-811  
**ROBERTS, J.B.** (Rice U) BNL-817  
**ROCK, S.** (American U) SLAC-E-140  
**ROE, B.P.** (Michigan U) FNAL-613  
**ROESSLE, E.** (Freiburg U) SIN-R-72-02  
**ROMANO, G.** (Rome U) CERN-WA-075  
**ROMANOWSKI, T.A.** (Ohio State U) LAMPF-645  
**ROSEN, J.** (Northwestern U) FNAL-515  
**ROSEN, J.** (Northwestern U) FNAL-721  
**ROSSI, L.** (CERN) CERN-WA-082  
**ROY-STEPHAN, M.** (Lyon, IPN & Orsay, IPN & Saclay)  
 SACLAY-057  
**ROY, G.** (Alberta U) TRIUMF-287  
**RUBBIA, C.** (CERN) CERN-UA-001  
**RUBBIA, C.** (Harvard U) P-DECAY-HPW  
**RUBINSTEIN, R.** (Fermilab) FNAL-577  
**RUBINSTEIN, R.** (Fermilab) FNAL-710  
**RUNGE, K.** (Freiburg U) CERN-NA-006  
**RUSHBROOKE, J.G.** (Cambridge U) CERN-R-703  
**RUSHBROOKE, J.G.** (Cambridge U) CERN-UA-005  
**RUSHBROOKE, J.G.** (Cambridge U) CERN-UA-005-2  
**RUSSELL, J.J.** (Southeastern Mass U) BNL-838  
**RUTHERFOORD, J.** (Washington U, Seattle) FNAL-605  
**RYKALIN, V.I.** (Serpukhov) SERP-E-144  
**RYSECK, H.E.** (Berlin, DAW) SERP-E-104  
**SACHS, A.M.** (Columbia U) BNL-745  
**SADLER, M.E.** (Abilene Christian U) LAMPF-806  
**SADLER, M.E.** (Abilene Christian U) LAMPF-849  
**SAGHAI, B.** (Saclay) SACLAY-132  
**SAI, F.** (Tokyo U) KEK-080  
**SAKITT, M.** (Brookhaven) BNL-742  
**SANDWEISS, J.** (Yale U) FNAL-490  
**SANDWEISS, J.** (Yale U) FNAL-630  
**SASAKI, A.** (Akita U) INS-15-2  
**SASAO, N.** (Kyoto U) KEK-PF-000  
**SASAO, N.** (Kyoto U) KEK-136  
**SATO, K.** (Nihon U, Tokyo) INS-16-2  
**SAUDINOS, J.** (Saclay) SACLAY-118  
**SAUDINOS, J.** (Saclay) SACLAY-123  
**SCHARENBERG, R.P.** (Purdue U) BNL-778  
**SCHIFFER, J.P.** (Argonne) FNAL-720  
**SCHINDLER, R.** (SLAC) SLAC-SP-032  
**SCHLEIN, P.** (UCLA) CERN-R-608  
**SCHLEIN, P.** (UCLA) CERN-UA-008  
**SCHMIDT-PARZEFALL, W.** (DESY)  
 DESY-DORIS-ARGUS  
**SCHMIDT, M.P.** (Yale U) BNL-780  
**SCHMITT, H.** (Freiburg U) SIN-R-72-02  
**SCHWITTERS, R.** (Harvard U) FNAL-741  
**SCHWITTERS, R.** (Harvard U) FNAL-775  
**SCIULLI, F.** (Cal Tech) FNAL-616  
**SCIULLI, F.** (Columbia U) FNAL-652  
**SCIULLI, F.** (Columbia U) FNAL-744  
**SCULLI, J.** (New York U) BNL-789  
**SELEKTOR, Y.M.** (Moscow, ITEP) ITEP-E-782  
**SELOVE, W.** (Penn U) FNAL-609  
**SETH, K.K.** (Northwestern U) LAMPF-462  
**SETH, K.K.** (Northwestern U) LAMPF-508  
**SETH, K.K.** (Northwestern U) LAMPF-605  
**SETH, K.K.** (Northwestern U) LAMPF-758  
**SETH, K.K.** (Northwestern U) LAMPF-795  
**SETH, K.K.** (Northwestern U) LAMPF-951  
**SETH, K.K.** (Northwestern U) LAMPF-981  
**SEYBOTH, P.** (Munich, Max Planck Inst) CERN-NA-005  
**SHAEVITZ, M.** (Columbia U) FNAL-701  
**SHAW, G.** (UC, Irvine) CERN-NA-039  
**SHEBANOV, V.A.** (Moscow, ITEP) ITEP-E-761  
**SHEBANOV, V.A.** (Moscow, ITEP) ITEP-E-802  
**SHEPHARD, W.D.** (Notre Dame U) FNAL-597  
**SHIBATA, S.** (Tokyo U, INS) INS-ES-101  
**SHIBATA, S.** (Tokyo U, INS) INS-ES-110  
**SHIBATA, T.** (Osaka U) KEK-150  
**SHIN, Y.M.** (Saskatchewan U) TRIUMF-205  
**SHIN, Y.M.** (Saskatchewan U) TRIUMF-360  
**SHIVPURI, R.K.** (Delhi U) FNAL-750  
**SHLYAPNIKOV, P.V.** (Serpukhov) SERP-E-133  
**SHOCHET, M.J.** (Chicago U) FNAL-326  
**SHUPE, M.** (Minnesota U) BNL-785  
**SHUVALOV, R.S.** (Serpukhov) SERP-E-130  
**SILVERMAN, B.** (Saclay) SACLAY-136  
**SIMMONS, J.E.** (Los Alamos) LAMPF-360  
**SIMMONS, J.E.** (Los Alamos) LAMPF-402  
**SIMMONS, J.E.** (Los Alamos) LAMPF-457  
**SIMMONS, J.E.** (Los Alamos) LAMPF-517  
**SIMMONS, J.E.** (Los Alamos) LAMPF-518  
**SIMMONS, J.E.** (Los Alamos) LAMPF-590  
**SIMMONS, J.E.** (Los Alamos) LAMPF-683  
**SIMONIUS, M.** (Zurich, ETH) SIN-Z-75-02  
**SIMONIUS, M.** (Zurich, ETH) SIN-Z-80-01  
**SIMONS, L.M.** (Kernforschungszentrum, Karlsruhe &  
 Karlsruhe U) CERN-PS-175  
**SIMONS, L.M.** (Kernforschungszentrum, Karlsruhe &  
 Karlsruhe U) SIN-R-81-02  
**SLATTERY, P.** (Rochester U) FNAL-706  
**SLOAN, T.** (Lancaster U) CERN-NA-002  
**SLOAN, T.** (CERN) CERN-NA-009  
**SLOAN, T.** (CERN) CERN-NA-028  
**SMIRNOV, V.M.** (Leningrad, INP) SERP-E-127  
**SMITH, A.J.S.** (Princeton U) BNL-787  
**SMITH, G.A.** (Penn State U) BNL-762  
**SMITH, G.A.** (Penn State U) BNL-767  
**SMITH, G.A.** (Penn State U) BNL-795  
**SMITH, G.A.** (Penn State U) CERN-PS-183  
**SMITH, G.R.** (Karlsruhe U) SIN-R-78-18  
**SMITH, G.R.** (Karlsruhe U) SIN-R-79-07  
**SMITH, G.R.** (TRIUMF) TRIUMF-337  
**SMITH, G.R.** (TRIUMF) TRIUMF-377  
**SMITH, W.** (Columbia U) FNAL-770  
**SMOLYANKIN, V.T.** (Moscow, ITEP) SERP-E-120  
**SOBER, D.I.** (Catholic U) LAMPF-058/120  
**SOKOLOVSKY, V.V.** (Moscow, ITEP) SERP-E-147  
**SOUDER, P.A.** (Yale U) LAMPF-421  
**SPECHT, H.J.** (Heidelberg U, Phys Inst) CERN-NA-034-2  
**SPINKA, H.** (Argonne) LAMPF-770  
**STANEK, R.** (Argonne) LAMPF-664  
**STEINBERGER, J.** (CERN) CERN-LEP-ALEPH  
**STEINBERGER, J.** (CERN) CERN-WA-001  
**STEINBERGER, J.** (CERN) CERN-WA-068  
**STOCK, R.** (Frankfurt U) CERN-NA-035  
**STREIT, K.P.** (Heidelberg U, Phys Inst) CERN-WA-062  
**STROOT, J.P.** (Brussels U, IISN) CERN-NA-012-2  
**STROVINK, M.** (UC, Berkeley & LBL) TRIUMF-185  
**SULYAEV, R.M.** (Serpukhov) SERP-E-100  
**SULYAEV, R.M.** (Serpukhov) SERP-E-155  
**SUMI, Y.** (Hiroshima U) INS-ES-113  
**SUMI, Y.** (Hiroshima U) KEK-083  
**SUN, C.R.** (SUNY, Albany) FNAL-754  
**SZEPTYCKA, M.** (Warsaw U, IEP) CERN-WA-072  
**TAKAHASHI, Y.** (NASA, Marshall) CERN-EMU-005  
**TAKASAKI, F.** (KEK) KEK-TE-001  
**TAKASAKI, F.** (KEK) KEK-034



## SPOKESPERSON INDEX

**TAKIKAWA, K.** (Tsukuba U) KEK-049  
**TALAGA, R.L.** (Los Alamos) LAMPF-634  
**TALLINI, B.** (Saclay) CERN-WA-047  
**TANAKA, N.** (Los Alamos) LAMPF-015  
**TANAKA, N.** (Los Alamos) LAMPF-790  
**TANAKA, N.** (Los Alamos) LAMPF-885  
**TANAKA, N.** (Los Alamos) LAMPF-973  
**TARLE, G.** (Michigan U) BNL-804  
**TATISCHEFF, B.** (Orsay, IPN) SACLAY-050  
**TATISCHEFF, B.** (Saclay) SACLAY-080  
**TATISCHEFF, B.** (Orsay, IPN) SACLAY-126  
**TAUSCHER, L.** (Basel U) CERN-PS-182  
**TAVERNIER, S.** (Brussels U, IHE) CERN-NA-025  
**TENNER, A.** (NIKHEF, Amsterdam) CERN-WA-025  
**TERAZAWA, H.** (Tokyo U, INS) INS-15-4  
**TEREKHOV, Y.V.** (Moscow, ITEP) ITEP-E-812  
**TERRIEN, Y.** (Saclay) SACLAY-078  
**TERRIEN, Y.** (Saclay) SACLAY-140  
**THIBAUT, C.** (Orsay, Rene Bernas) CERN-PS-162  
**THIBAUT, C.** (Orsay, CSNSM) CERN-PS-189  
**THIESSEN, H.A.** (Los Alamos) BNL-758  
**THOMPSON, G.** (Rutgers U) FNAL-621  
**THOMSON, G.** (Wisconsin U) FNAL-584  
**TIMM, U.** (DESY) DESY-PETRA-PLUTO-2  
**TING, S.C.C.** (MIT) CERN-LEP-L3  
**TING, S.C.C.** (MIT) DESY-PETRA-MARK-J  
**TKACHUK, R.** (Alberta U) TRIUMF-369  
**TOKI, W.** (SLAC) SLAC-SP-032  
**TOLLESTRUP, A.** (Fermilab) FNAL-741  
**TOLLESTRUP, A.** (Fermilab) FNAL-775  
**TRAN, M.T.** (Lausanne U) SIN-R-75-07.2  
**TREBUKHOVSKY, Y.V.** (Moscow, ITEP) ITEP-E-831  
**TREILLE, D.** (CERN) CERN-NA-014  
**TRETYAKOV, E.F.** (Moscow, ITEP) ITEP-E-783  
**TSURU, T.** (KEK) KEK-064  
**TSURU, T.** (KEK) KEK-135  
**TSUZUKI, Y.** (Kobe U) FNAL-759  
**TSYGANOV, E.N.** (Dubna) SERP-E-132  
**TYAPKIN, A.A.** (Dubna) SERP-E-157  
**UGGERHOJ, E.** (CERN) CERN-PS-164  
**UGGERHOJ, E.** (Aarhus U) CERN-PS-188  
**UGGERHOJ, E.** (Aarhus U) CERN-PS-194  
**UGGERHOJ, E.** (Aarhus U) CERN-WA-064  
**UGGERHOJ, E.** (Aarhus U) CERN-WA-081  
**ULLRICH, H.** (Kernforschungszentrum, Karlsruhe & Karlsruhe U) SIN-R-79-05  
**VAN DE WALLE, R.T.** (Nijmegen U) CERN-WA-027  
**VAN DER VELDE, J.C.** (Michigan U) P-DECAY-IMB  
**VAN DER SCHAAF, A.** (Zurich U) SIN-R-85-14  
**VANNUCCI, F.** (Paris, Curie Univ VI) BNL-816  
**VANNUCCI, F.** (Paris, Curie Univ VI) CERN-PS-191  
**VAN OERS, W.T.H.** (Manitoba U) TRIUMF-121  
**VAN OERS, W.T.H.** (Manitoba U) TRIUMF-182  
**VAN OERS, W.T.H.** (Manitoba U) TRIUMF-369  
**VAN ROSSUM, L.** (Saclay) SACLAY-101  
**VENUS, W.** (Rutherford) CERN-WA-059  
**VILLAR, E.** (Santander U) CERN-NA-017  
**VISHNEVSKY, M.E.** (Moscow, ITEP) ITEP-E-811  
**VISHNEVSKY, M.E.** (Moscow, ITEP) ITEP-E-822  
**VISHNEVSKY, M.E.** (Moscow, ITEP) ITEP-E-824  
**VON DARDEL, G.** (Lund U) CERN-NA-030  
**VON EGIDY, T.** (Munich, Tech U) CERN-PS-186  
**VON HARRACH, D.** (Heidelberg, Max Planck Inst) CERN-NA-037  
**VOROBYEV, A.A.** (Leningrad, INP) FNAL-761  
**VOROBYEV, A.A.** (Leningrad, INP) LENI-SC-074  
**VOROBYEV, A.A.** (Leningrad, INP) LENI-SC-079  
**VOROBYEV, A.A.** (Leningrad, INP) LENI-SC-088  
**VOROBYEV, A.A.** (Leningrad, INP) LENI-SC-096  
**VOSS, R.** (CERN) CERN-NA-004  
**VOVENKO, A.S.** (Serpukhov) SERP-E-136  
**VOYVODIC, L.** (Fermilab) FNAL-564  
**WACHSMUTH, H.** (CERN) CERN-NA-020  
**WADDINGTON, C.J.** (Minnesota U) BNL-808  
**WAGNER, R.** (Argonne) LAMPF-665  
**WAHL, H.** (CERN) CERN-NA-031  
**WAHL, H.** (CERN) CERN-NA-031-2  
**WALCHER, TH.** (Heidelberg, Max Planck Inst) CERN-PS-163-2  
**WALCHER, TH.** (Mainz U, Inst Kernphys) CERN-PS-173  
**WALDEN, P.** (TRIUMF) TRIUMF-132/192  
**WALKER, J.K.** (Fermilab) FNAL-594  
**WALTER, H.K.** (Zurich, ETH) SIN-R-80-06  
**WALTHAM, C.E.** (TRIUMF & British Columbia U) TRIUMF-277  
**WEBB, R.** (Princeton U) FNAL-650  
**WEBSTER, M.S.** (Vanderbilt U) BNL-705  
**WEDDIGEN, CH.** (Kernforschungszentrum, Karlsruhe & Karlsruhe U) SIN-R-78-05.4  
**WEILHAMMER, P.** (CERN) CERN-NA-032  
**WELSH, R.E.** (William & Mary Coll) BNL-723  
**WHISNANT, C.S.** (South Carolina U) LAMPF-767  
**WHITE, D.H.** (Brookhaven) LAMPF-1015  
**WHITMORE, J.** (Penn State U) FNAL-597  
**WILKES, R.J.** (Washington U, Seattle) BNL-815  
**WILKES, R.J.** (Washington U, Seattle) FNAL-524  
**WILKES, R.J.** (Washington U, Seattle) FNAL-666  
**WILKES, R.J.** (Washington U, Seattle) FNAL-730  
**WILLARD, H.B.** (Case Western Reserve U) LAMPF-194  
**WILLARD, H.B.** (Case Western Reserve U) LAMPF-492  
**WILLIS, N.** (Orsay, IPN) SACLAY-010  
**WILLIS, N.** (Saclay) SACLAY-080  
**WILLIS, N.** (Orsay, IPN) SACLAY-113  
**WILLIS, W.J.** (CERN) CERN-R-806  
**WILLIS, W.J.** (CERN) CERN-R-808  
**WINSTEIN, B.** (Chicago U) FNAL-617  
**WINSTEIN, B.** (Chicago U) FNAL-731  
**WINTER, K.** (CERN) CERN-PS-181  
**WINTER, K.** (CERN) CERN-WA-018  
**WINTER, K.** (CERN) CERN-WA-018-2  
**WINTER, K.** (CERN) CERN-WA-065  
**WINTER, K.** (CERN) CERN-WA-079  
**WISS, J.** (Illinois U, Urbana) FNAL-400  
**WITHERELL, M.S.** (UC, Santa Barbara) FNAL-691  
**WOLTER, W.** (Cracow) FNAL-508  
**WOTSCHACK, J.** (CERN) CERN-PS-169  
**YAMAMOTO, S.S.** (Tokyo U) KEK-057  
**YAMAMOTO, S.S.** (Tokyo U) KEK-125  
**YAMAZAKI, T.** (Tokyo U) KEK-089  
**YAMAZAKI, T.** (Tokyo U) KEK-104  
**YEN, S.** (TRIUMF) TRIUMF-298  
**YOKOSAWA, A.** (Argonne) FNAL-581/704  
**YONNET, J.** (Saclay) SACLAY-134  
**YOSHIMURA, Y.** (KEK) KEK-062  
**YUAN, V.** (Illinois U, Urbana) LAMPF-634  
**YUAN, V.** (Illinois U, Urbana) LAMPF-792  
**ZAITSEV, A.M.** (Serpukhov) SERP-E-164  
**ZEHNDER, A.** (Zurich, ETH) SIN-R-77-01  
**ZEHNDER, A.** (SIN) SIN-R-81-06  
**ZELLER, M.E.** (Yale U) BNL-702  
**ZELLER, M.E.** (Yale U) BNL-777  
**ZICHICHI, A.** (CERN) CERN-R-421  
**ZICHICHI, A.** (CERN) CERN-R-422  
**ZICHICHI, A.** (CERN) CERN-WA-044  
**ZIEMINSKI, A.** (Indiana U) FNAL-672  
**ZIOCK, K.O.H.** (Virginia U) LAMPF-190  
**ZIOCK, K.O.H.** (Virginia U) SIN-R-80-11  
**ZOLIN, L.S.** (Dubna) SERP-E-121  
**ZOLIN, L.S.** (Dubna) SERP-E-153

## ABBREVIATIONS USED IN THE SUMMARIES

### JOURNALS

Following are abbreviations for journals listed in the summaries:

<b>AJP</b>	American Journal of Physics
<b>ANNP</b>	Annals of Physics
<b>APP</b>	Acta Physica Polonica
<b>ARNPS</b>	Annual Review of Nuclear and Particle Science
<b>CJP</b>	Canadian Journal of Physics
<b>CNPP</b>	Comments on Nuclear and Particle Physics
<b>EL</b>	Europhysics Letters
<b>HPA</b>	Helvetica Physica Acta
<b>IEEE MAG</b>	Institute of Electrical and Electronics Engineers Transactions on Magnetics
<b>IEEE TNS</b>	Institute of Electrical and Electronics Engineers Transactions on Nuclear Science
<b>JASA</b>	Journal of the Acoustical Society of America
<b>JETP</b>	Journal of Experimental and Theoretical Physics (translation of ZETP)
<b>JETPL</b>	Journal of Experimental and Theoretical Physics Letters (translation of ZETFP)
<b>JJAP</b>	Japanese Journal of Applied Physics
<b>JP</b>	Journale de Physique
<b>JPHY</b>	Journal of Physics
<b>JPL</b>	Journale de Physique Lettres
<b>JPSJ</b>	Journal of the Physical Society of Japan
<b>LNC</b>	Lettere al Nuovo Cimento
<b>NC</b>	Nuovo Cimento
<b>NIM</b>	Nuclear Instruments and Methods
<b>NP</b>	Nuclear Physics
<b>PL</b>	Physics Letters
<b>PR</b>	Physical Review
<b>PRPL</b>	Physics Reports (Physics Letters C)
<b>PRL</b>	Physical Review Letters
<b>PS</b>	Physica Scripta
<b>RMP</b>	Reviews of Modern Physics
<b>RNC</b>	Rivista del Nuovo Cimento
<b>RSI</b>	Review of Scientific Instruments
<b>SHEP</b>	Surveys in High Energy Physics
<b>SJNP</b>	Soviet Journal of Nuclear Physics (translation of YF)
<b>YF</b>	Yadernaya Fizika (translated as SJNP)
<b>ZETP</b>	Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (translated as JETP)
<b>ZETFP</b>	Pis'ma v Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (translated as JETPL)
<b>ZPHY</b>	Zeitschrift für Physik

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### KINEMATIC VARIABLES

The following abbreviations are used with reactions to indicate the momenta or energies at which they are studied:

<b>PLAB</b>	beam momentum in the lab frame
<b>TLAB</b>	beam kinetic energy in the lab frame
<b>ELAB</b>	beam total energy in the lab frame
<b>PLAB/N</b>	beam momentum per nucleon in the lab frame
<b>TLAB/N</b>	beam kinetic energy per nucleon in the lab frame
<b>ELAB/N</b>	beam total energy per nucleon in the lab frame
<b>ECM</b>	total energy in the c.m. frame

## ACCELERATORS

<b>ANL</b>	Argonne ZGS proton synchrotron (12.7 GeV/c Plab)
<b>BNL</b>	Brookhaven AGS proton synchrotron (31 GeV/c Plab)
<b>CERN-ISR</b>	CERN proton-proton Intersecting Storage Rings (62 GeV Ecm)
<b>CERN-LEAR</b>	CERN Low-Energy Antiproton Ring
<b>CERN-LEP</b>	CERN Large Electron-Positron collider (100 GeV Ecm)
<b>CERN-PBAR/P</b>	CERN $\bar{p}p$ collider (900 GeV Ecm)
<b>CERN-PS</b>	CERN Proton Synchrotron (28 GeV/c Plab)
<b>CERN-SC</b>	CERN cyclotron (600 MeV/c Plab)
<b>CERN-SPS</b>	CERN Super Proton Synchrotron (450 GeV/c Plab)
<b>CESR</b>	Cornell Electron-positron Storage Ring (16 GeV Ecm)
<b>COSM</b>	cosmic rays
<b>DESY</b>	Hamburg Deutches Electron SYnchrotron (7.5 GeV/c Plab)
<b>DESY-DORIS</b>	DESY DORIS electron-positron ring (11.6 GeV Ecm)
<b>DESY-DORIS-II</b>	DESY DORIS upgraded
<b>DESY-PETRA</b>	DESY PETRA electron-positron storage ring (40 GeV Ecm)
<b>FNAL</b>	FNAL proton synchrotron (500 GeV/c Plab)
<b>FNAL-COLLIDER</b>	FNAL $\bar{p}p$ collider (2000 GeV Ecm)
<b>FNAL-TEV</b>	FNAL TEVatron
<b>ITEP</b>	ITEP (Moscow) proton synchrotron (7 GeV/c Plab)
<b>KEK-PF-LINAC</b>	KEK electron linac (2.5 GeV) for photon factory and TRISTAN
<b>KEK-PS</b>	KEK Proton Synchrotron (12 GeV/c Plab)
<b>KEK-TRISTAN</b>	KEK electron-positron storage ring (60 GeV Ecm)
<b>LAMPF</b>	Los Alamos Meson/Proton Factory (1460 MeV/c Plab)
<b>LENI</b>	Leningrad Inst. of Nucl. Phys. synchrocyclotron (1 GeV Tlab)
<b>NONE</b>	no accelerator used
<b>RHEL</b>	Rutherford (NIMROD) proton synchrotron (8 GeV/c Plab)
<b>SATURNE-II</b>	Saclay Saturne-II $p$ , $d$ , and He synchrotron
<b>SERP</b>	Serpukhov proton synchrotron (76 GeV/c Plab)
<b>SIN</b>	Schweizerische Inst. für Nuklearforschung (590 MeV Tlab)
<b>SLAC</b>	Stanford electron linear accelerator (40 GeV/c Plab)
<b>SLAC-PEP</b>	SLAC Positron-Electron Project (36 GeV Ecm)
<b>SLAC-SLC</b>	SLAC Linear $e^+e^-$ Collider (100 GeV Ecm)
<b>SLAC-SPEAR</b>	SLAC SPEAR electron-positron ring (8.4 GeV Ecm)
<b>TOKYO</b>	Inst. for Nucl. Studies (Tokyo) electron synchrotron (1.3 GeV/c Plab)
<b>TRIUMF</b>	Canadian TRIangle University Meson Facility (520 MeV Tlab)

## DETECTORS

For bubble chambers, we use a construction such as:

**DBC-2M**, or **HBC-15FT-HYB**, or **HLBC-BEBC-TST**.

The first element, one of

**HBC**, **DBC**, **HEBC**, or **HLBC**,

tells whether the chamber fill is hydrogen, deuterium, helium, or heavy liquid. The second element gives the size or name of the chamber. Where appropriate, a third element, one of

**HYB**, **RAP**, or **TST**,

indicates that the chamber is part of a hybrid system, or that it is rapid cycling, or that it contains a track-sensitive target.

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In searching the SLAC/SPIRES database from which this report is taken, use the following abbreviations for general kinds of detectors (in this report, the words are spelled out):

<b>CALO</b>	calorimeter
<b>CNTR</b>	counter(s)
<b>COMB</b>	combination of various elements
<b>DAS</b>	double-arm spectrometer
<b>EMUL</b>	emulsion
<b>OSPK</b>	optical spark chamber
<b>OTHER</b>	rare, nonelectronic detector (e.g., moon, ocean floor)
<b>PHOTON</b>	photon spectrometer such as NaI or Ge detectors
<b>PLASTIC</b>	Lexan, etc., used like emulsion
<b>SAS</b>	single-arm spectrometer
<b>SPEC</b>	spectrometer system
<b>STRC</b>	streamer chamber
<b>TRAD</b>	transition radiation detector
<b>WAS</b>	wide-angle spectrometer
<b>WIRE</b>	wire chamber

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Acronyms for specific detectors. Those with an asterisk are described in "Major Detectors in Elementary Particle Physics" (LBL-91 supplement, May 1985).

<b>AFS</b>	CERN-ISR Axial-Field Spectrometer
<b>ALPH*</b>	CERN-LEP detector
<b>AMY*</b>	KEK-TRISTAN high-resolution lepton detector
<b>ARGUS*</b>	DESY-DORIS-II detector
<b>BIS-2</b>	Serpukhov upgrade of BIS
<b>BIS-2M</b>	Serpukhov upgrade of BIS-2
<b>CCM</b>	FNAL, FNAL-TEV Chicago Cyclotron Magnet spectrometer
<b>CDF*</b>	FNAL-COLLIDER detector
<b>CDHS</b>	CERN-PS, CERN-SPS CERN-Dortmund-Heidelberg-Saclay neutrino detector
<b>CELLO*</b>	DESY-PETRA spectrometer system
<b>CHARM</b>	CERN-PS, CERN-SPS CERN-Hamburg-Amsterdam-Rome-Moscow neutrino detector
<b>CHARM-II*</b>	CERN-SPS upgrade of CHARM detector
<b>CLEO*</b>	CESR spectrometer system
<b>CRYS-BALL*</b>	SLAC-SPEAR, SLAC-PEP, DESY-DORIS, DESY-DORIS-II Crystal Ball large-solid-angle neutral detector
<b>CRYS-BARREL</b>	CERN-LEAR Crystal Barrel large-solid-angle detector
<b>CRYS-BOX</b>	LAMPF Crystal Box crystal array detector
<b>CUSB</b>	CESR Columbia-Stony Brook high-resolution calorimeter
<b>CUSB-II*</b>	CESR upgrade of CUSB
<b>DASP</b>	DESY-DORIS Double-Arm Spectrometer system
<b>DELCO</b>	SLAC-SPEAR, SLAC-PEP detector
<b>DELPHI*</b>	CERN-LEP detector
<b>DIogene</b>	Saclay SATURNE-II pictorial drift chamber
<b>DO*</b>	FNAL-COLLIDER detector

## DETECTORS

EHS	CERN-SPS European Hybrid Spectrometer
EMC*	CERN-SPS European Muon Collaboration apparatus
EMS	ANL Effective-Mass Spectrometer
EPICS	LAMPF Energetic Pion Channel and Spectrometer
FANCY	KEK-PS, KEK-TRISTAN Forward ANd CYlindrical detector system
FMPS*	FNAL, FNAL-TEV Multiparticle Spectrometer
FODS	Serpukhov double-arm spectrometer
GAMS-2000	Serpukhov hodoscope gamma spectrometer
GAMS-4000	CERN-SPS 64x64 cell Pb-glass array
HPW*	BNL, Harvard-Penn-Wisconsin neutrino detector
HRS*	SLAC-PEP High-Resolution Spectrometer
HYPERSPEC	BNL hypernuclear spectrometer
JADE*	DESY-PETRA detector
JANUS	LAMPF proton polarimeter
LAB-E*	FNAL, FNAL-TEV target-calorimeter muon-spectrometer detector for neutrino physics
LAHRS	LAMPF Los Alamos High-Resolution proton Spectrometer
LASS	SLAC Large-Aperture Superconducting Solenoid spectrometer
LENA	DESY-DORIS nonmagnetic lead-glass NaI detector
LEPTON	Serpukhov magnetic wide-aperture spectrometer with automatic spark chambers
L3*	CERN-LEP detector
MAC*	SLAC-PEP MAGnetic Calorimeter
MARK-II*	SLAC-SPEAR, SLAC-PEP, SLAC-SLC detector
MARK-III*	SLAC-SPEAR detector
MARK-J*	DESY-PETRA detector
MEGA	LAMPF array of electron and photon spectrometers
MIS	Serpukhov multiparticle spectrometer
MPS	BNL MultiParticle Spectrometer
MPS-II*	BNL upgrade of BNL MPS
NICE	Serpukhov nonmagnetic precision spectrometer
OMEGA*	CERN-PS, CERN-SPS spectrometer system
OMEGAPRIME*	CERN-SPS spectrometer system
OMICRON	CERN-SC spectrometer system
OPAL*	CERN-LEP detector
PLASTIC-BALL	LBL-BEVALAC, CERN-SPS plastic ball detector
PLUTO	DESY-DORIS, DESY-PETRA superconducting solenoid spectrometer
RMS	CERN-PS, RHEL Rutherford Magnetic Spectrometer
SASF	FNAL Single-Arm Spectrometer Facility
SFM	CERN-ISR Split-Field Magnet
SHIP	KEK-TRISTAN detector for Search for Highly Ionizing Particles
SIGMA	Serpukhov CERN-IHEP magnetic spectrometer
SINDRUM	SIN large-solid-angle magnetic detector
SLD*	SLAC-SLC detector
SPEC-6M	Serpukhov 6 meter spectrometer
SPES-I	Saclay, SATURNE-II high-resolution spectrometer
SPES-III	Saclay, SATURNE-II high-resolution spectrometer
SPES-IV	Saclay, SATURNE-II high-resolution spectrometer
SPES-0	SATURNE-II modular lead-glass Cerenkov detector
SSF	SLAC Spectrometer Facility -- 1.6, 8, and/or 20 GeV spectrometers
SUPERBENKEI	KEK-PS window-frame type superconducting magneto-spectrometer
TAGX	TOKYO large-aperture spectrometer system
TASSO*	DESY-PETRA
TELAS	KEK-PS Target-Embodied Large-Aperture Spectrometer
TISS	ITEP spark chamber and 2.5 m spectrometer
TOKIWA	KEK-PS spectrometer
TOPAZ*	KEK-TRISTAN solenoidal spectrometer with TPC
TPC*	SLAC-PEP Time Projection Chamber
TPS*	FNAL Tagged Photon Spectrometer
UA1*	CERN-PBAR/P UA1 experiment detector
UA2*	CERN-PBAR/P UA2 experiment detector
VENUS*	KEK-TRISTAN Versatile Economical and Novel Universal Spectrometer
2-GAMMA*	SLAC-PEP forward detectors for studying mainly the 2-gamma process

## PARTICLES

The first column gives the name as printed in this report, the second gives the name to use in searching the SLAC/SPIRES database from which this report is taken (see p. 3). Charges of particles are omitted here ( $\pi^+$ ,  $\pi^-$ ,  $\pi^0$ ), as are such obvious constructions as ( $\gamma$ ),  $\gamma(s)$ ,  $\gamma$ 's, etc.

Ag	AG	silver nucleus
Al	AL	aluminum nucleus
annihil	ANNIHIL	annihilation final state in nucleon-antinucleon scattering
anomalon	ANOMALON	nuclear fragment with anomalous cross section
Ar	AR	argon nucleus
<sup>37</sup> Ar	AR37	argon-37 nucleus
Au	AU	gold nucleus
<sup>197</sup> Au	AU197	gold-197 nucleus
axion	AXION	hypothesized light Higgs scalar boson
$a_0(980)$	A0(980)	meson [was $\delta(980)$ ]
$a_1(1270)$	A1(1270)	meson
$a_2(1320)$	A2(1320)	meson
$B(5270)$	B(5270)	bottom meson
$B^*(5325)$	B*(5325)	excited bottom meson
baryon	BARYON	unspecified baryon
baryon	BARYONBAR	unspecified antibaryon
baryonium	BARYONIUM	meson coupling mainly to baryon-antibaryon
Be	BE	beryllium nucleus
Bi	BI	bismuth nucleus
<sup>10</sup> Bor	BOR10	boron-10 nucleus - note name not same as chemical symbol
<sup>12</sup> Bor	BOR12	boron-12 nucleus - note name not same as chemical symbol
<sup>8</sup> Bor	BOR8	boron-8 nucleus - note name not same as chemical symbol
bottom	BOTTOM	unspecified particle with naked bottom
bottomonium	BOTTOMONIUM	unspecified $b\bar{b}$ meson
Br	BR	bromine nucleus
$b_1(1235)$	B1(1235)	the "Buddha" meson
C	C	carbon nucleus
$C^*(4.44)$	C*(4.44)	4.44 keV excited state of carbon nucleus
Ca	CA	calcium nucleus
Cd	CD	cadmium nucleus
centauro	CENTAURO	final state with 50 or more charged particles, no $\pi^0$ 's
charged	CHARGED	unspecified charged particle
charm	CHARM	unspecified charmed particle
charm	CHARMBAR	unspecified anticharmed particle
charmed-baryon	CHARMED-BARYON	unspecified charmed baryon
charmed-meson	CHARMED-MESON	unspecified charmed meson
charmonium	CHARMONIUM	unspecified $c\bar{c}$ meson
$\chi(\text{unspec})$	CHI(UNSPEC)	unspecified radiative decay product of $\psi(3685)$
$\chi_b(\text{unspec})$	CHI/B(UNSPEC)	unspecified radiative decay product of higher mass $\Upsilon$ 's
$\chi_{b0}(10235)$	CHI/B0(10235)	$b\bar{b}$ meson
$\chi_{b0}(9860)$	CHI/B0(9860)	$b\bar{b}$ meson
$\chi_{b1}(10255)$	CHI/B1(10255)	$b\bar{b}$ meson
$\chi_{b1}(9895)$	CHI/B1(9895)	$b\bar{b}$ meson
$\chi_{b2}(10270)$	CHI/B2(10270)	$b\bar{b}$ meson
$\chi_{b2}(9915)$	CHI/B2(9915)	$b\bar{b}$ meson
$\chi_1(3510)$	CHI1(3510)	$c\bar{c}$ meson
$\chi_2(3555)$	CHI2(3555)	$c\bar{c}$ meson
Cl	CL	chlorine nucleus
<sup>37</sup> Cl	CL37	chlorine-37 nucleus
Cr	CR	chromium nucleus
crystal	CRYSTAL	crystal, general target for channeling experiments
Cu	CU	copper nucleus
<sup>12</sup> C	C12	carbon-12 nucleus
$D(\text{unspec})$	D(UNSPEC)	unspecified charmed nonstrange meson
$D$	D	charmed nonstrange meson
$D^*(2010)$	D*(2010)	excited charmed nonstrange meson
$D_s$	D/S	$D_s(1971)$ charmed strange meson [was $F$ ]
$\bar{D}$	DBAR	anticharmed nonstrange meson
$\Delta(\text{unspec})$	DELTA(UNSPEC)	unspecified $I = 3/2, S = 0$ baryon
$\Delta(1232 P_{33})$	DELTA(1232P33)	nucleon resonance
$\Delta(1950 B)$	DELTA(1950B)	bump in production experiment
$\bar{\Delta}(1232 P_{33})$	DELTABAR(1232P33)	antinucleon resonance
demon	DEMON	exotic 6-quark deuteron-like state
deut	DEUT	deuteron
deut	DEUTBAR	antideuteron

## PARTICLES

dibaryon	DIBARYON	unspecified nonstrange dibaryon resonance
dibaryon( $S = -1$ )	DIBARYON( $S=-1$ )	unspecified $S = -1$ dibaryon resonance
dibaryon( $S = -2$ )	DIBARYON( $S=-2$ )	unspecified $S = -2$ dibaryon resonance
$e^+$	E+	positron
$e^\pm$	E+-	electron or positron
$e^-$	E-	electron
$\eta$	ETA	$\eta(549)$ meson
$\eta(1080)$	ETA(1080)	meson
$\eta(1440)$	ETA(1440)	glueball candidate [was $\iota(1440)$ ]
$\eta_b$	ETA/B	lowest mass $J^P = 0^- b\bar{b}$ meson
$\eta_c(2980)$	ETA/C(2980)	lowest mass $J^P = 0^- c\bar{c}$ meson
$\eta_c(3590)$	ETA/C(3590)	charmonium meson
$\eta'$	ETAPRIME	$\eta'(958)$ meson
exotic-meson	EXOTIC-MESON	cannot be formed of $q\bar{q}$
exotic-nucleon	EXOTIC-NUCLEON	cannot be formed of $qqq$
Fe	FE	iron nucleus
frag	FRAG	nuclear fragment
$f_0(1300)$	F0(1300)	$\pi\pi$ S-wave (near 1300 MeV) [was $\epsilon(1300)$ ]
$f_0(1590)$	F0(1590)	meson
$f_0(700)$	F0(700)	$\pi\pi$ S-wave (near 700 MeV) [was $\epsilon(700)$ ]
$f_0(975)$	F0(975)	meson [was $S(975)$ ]
$f_1(1285)$	F1(1285)	meson [was $D(1285)$ ]
$f_1(1420)$	F1(1420)	meson [was $E(1420)$ ]
$f_2(1270)$	F2(1270)	meson
$f_2(1720)$	F2(1720)	glueball candidate [was $\theta(1690)$ ]
$f_2'(1525)$	F2PRIME(1525)	meson
$f_4(2030)$	F4(2030)	$I = 0, J^P = 4^+$ meson resonance [was $h(2030)$ ]
Ga	GA	gallium nucleus
$\gamma$	GAMMA	photon
glueball	GLUEBALL	unspecified glueball
gluon	GLUON	
$h(990)$	H(990)	meson
hadron	HADRON	unspecified hadron
He	HE	helium nucleus
$^2\text{He}$	HE2	helium-2 nucleus
$^3\text{He}$	HE3	helium-3 nucleus
Hg	HG	mercury nucleus
higgs	HIGGS	Higgs boson
hvy-flavor	HVY-FLAVOR	unspecified particle carrying a flavor heavier than strange
hvy-lepton	HVY-LEPTON	unspecified heavy lepton
hvy- $\nu$	HVY-NU	unspecified heavy neutrino
hvy- $\nu_e$	HVY-NUE	unspecified heavy electron neutrino
hvy- $\nu_\mu$	HVY-NUMU	unspecified heavy muon neutrino
hypernuc	HYPERNUC	unspecified hypernucleus, generally containing more than two baryons
inelastic	INELASTIC	same as X, except elastic excluded
Ir	IR	iridium nucleus
$J/\psi$	J/PSI	$J/\psi(3097)$
jet	JET	jet of particles
K	K	K meson
$K^*(\text{unspec})$	$K^*(\text{UNSPEC})$	unspecified $K^*$
$K^*(892)$	$K^*(892)$	meson
$\bar{K}^*(\text{unspec})$	$K^*\text{BAR}(\text{UNSPEC})$	unspecified $\bar{K}^*$
$\bar{K}^*(892)$	$K^*\text{BAR}(892)$	meson
kaon	KAON	kaon or antikaon of unspecified charge
$\bar{K}$	KBAR	$\bar{K}$ meson
$K_L$	KL	$K_{\text{long}}$ , neutral K meson
$KN(1760)$	KN(1760)	meson
$K_S$	KS	$K_{\text{short}}$ , neutral K meson
$K_1(1240-1400)$	K1(1240-1400)	meson [was $Q(1240-1400)$ ]
$K_2(1770)$	K2(1770)	meson [was $L(1770)$ ]
$K_2^*(1430)$	K2*(1430)	meson
$\Lambda$	LAMBDA	$\Lambda$ hyperon
$\Lambda(\text{unspec})$	LAMBDA(UNSPEC)	unspecified $I = 0, S = -1$ baryon
$\Lambda(1330\text{B})$	LAMBDA(1330B)	bump in production experiment
$\Lambda(1520\text{D}03)$	LAMBDA(1520D03)	hyperon resonance
$\Lambda N(2130)$	LAMBDA-N(2130)	$S = -1$ dibaryon resonance
$\Lambda_c$	LAMBDA/C	$\Lambda_c(2281)$ $I = 0$ charmed baryon
$\bar{\Lambda}$	LAMBDA BAR	antilambda
lepton	LEPTON	unspecified lepton
Li	LI	lithium nucleus

## PARTICLES

${}^6\text{Li}$	LI6	lithium-6 nucleus
${}^7\text{Li}$	LI7	lithium-7 nucleus
longlived	LONGLIVED	unspecified particle stable under strong and electromagnetic decay
meson	MESON	unspecified meson
meson(2950)	MESON(2950)	bump seen in $p\bar{p}\pi$
monopole	MONOPOLE	magnetic monopole
$\mu$	MU	muon
mult[charged]	MULT(CHARGED)	multiplicity distribution for unspecified charged particle
muon	MUON	muon of unspecified charge
muonium	MUONIUM	$\mu^+e^-$ atom
$n$	N	neutron
$n(\text{spect})$	N(SPECT)	spectator neutron
$N(\text{unspec})$	N(UNSPEC)	unspecified $I = 1/2, S = 0$ baryon
$N(1440\text{B})$	N(1440B)	bump in production experiment
$N(1440\text{P}_{11})$	N(1440P11)	nucleon resonance
$N(1520\text{B})$	N(1520B)	bump in production experiment
$N(1520\text{D}_{13})$	N(1520D13)	nucleon resonance
$N(1675\text{D}_{15})$	N(1675D15)	nucleon resonance
$N(1680\text{F}_{15})$	N(1680F15)	nucleon resonance
$N(1700\text{B})$	N(1700B)	bump in production experiment
$N^*(\text{unspec})$	$N^*(\text{UNSPEC})$	$S = 0$ baryon of unspecified mass and isospin
$N_{5/2}^*(\text{unspec})$	$N_{5/2}^*(\text{UNSPEC})$	unspecified $I = 5/2, S = 0$ baryon
$\bar{n}$	NBAR	antineutron
Ne	NE	neon nucleus
neutral	NEUTRAL	unspecified neutral particle
${}^{12}\text{Nit}$	NIT12	nitrogen-12 nucleus - note name not same as chemical symbol
$N\bar{N}(2020)$	NNBAR(2020)	meson
$N\bar{N}(2200)$	NNBAR(2200)	meson
$\nu$	NU	unspecified neutrino
$\bar{\nu}$	NUBAR	unspecified antineutrino
nucleon	NUCLEON	unspecified nucleon
nucleon	NUCLEONBAR	unspecified antinucleon
nucleus	NUCLEUS	unspecified nucleus
$\nu_e$	NUE	electron neutrino
$\bar{\nu}_e$	NUEBAR	electron antineutrino
nuino	NUINO	any light supersymmetric particle
nuino	NUINOBAR	antineuino
$\nu_\mu$	NUMU	muon neutrino
$\bar{\nu}_\mu$	NUMUBAR	muon antineutrino
$\nu_\tau$	NUTAU	$\tau$ neutrino
$\bar{\nu}_\tau$	NUTAUBAR	$\tau$ antineutrino
O	O	oxygen nucleus
$\omega$	OMEGA	$\omega(783)$ meson
$\Omega^*(\text{unspec})$	OMEGA*(UNSPEC)	$S = -3$ baryon of unspecified mass and isospin
$\Omega$	OMEGA	$\Omega$ hyperon
$\Omega_c$	OMEGA/C	$\Omega_c(2740)$ $I = 0$ charmed doubly strange baryon
${}^{16}\text{O}$	O16	oxygen-16 nucleus
p	P	proton
$p(\text{spect})$	P(SPECT)	spectator proton
Pb	PB	lead nucleus
$\bar{p}$	PBAR	antiproton
$\phi$	PHI	$\phi(1020)$ meson
$\phi(1680)$	PHI(1680)	meson
photino	PHOTINO	spin-1/2 SUSY partner of the photon
$\pi$	PI	pion
pion	PION	pion of unspecified charge
$\pi_2(1680)$	PI2(1680)	meson [was $A(1680)$ ]
pomeron	POMERON	
$\psi(\text{unspec})$	PSI(UNSPEC)	unspecified $\psi$ meson
$\psi(3685)$	PSI(3685)	$c\bar{c}$ meson
$\psi(3770)$	PSI(3770)	$c\bar{c}$ meson
$\psi(4415)$	PSI(4415)	$c\bar{c}$ meson
Pt	PT	platinum nucleus
quark	QUARK	quark of unspecified charge
quark(1/3)	QUARK(1/3)	quark of charge $-1/3$
quark(2/3)	QUARK(2/3)	quark of charge $2/3$
quark(1/3)	QUARKBAR(1/3)	antiquark of charge $1/3$
quark(2/3)	QUARKBAR(2/3)	antiquark of charge $-2/3$
$\rho$	RHO	$\rho(770)$ meson
$\rho(1250)$	RHO(1250)	meson



## PARTICLES

$\rho(1600)$	RHO(1600)	meson
$\rho_3(1690)$	RHO3(1690)	meson [was $g(1690)$ ]
S	S	intermediate scalar boson
s-electron	SELECTRON	spin-0 SUSY partner of the electron or positron
Si	SI	silicon nucleus
$\Sigma$	SIGMA	$\Sigma$ hyperon
$\Sigma(\text{unspec})$	SIGMA(UNSPEC)	unspecified $I = 1, S = -1$ baryon
$\Sigma(1385 P_{13})$	SIGMA(1385P13)	hyperon resonance
$\Sigma(1670 B)$	SIGMA(1670B)	bump in production experiment
$\Sigma(1915 B)$	SIGMA(1915B)	bump in production experiment
$\Sigma(2250 B)$	SIGMA(2250B)	bump in production experiment
$\Sigma_c(2450)$	SIGMA/C(2450)	$I = 1$ charmed baryon
$\bar{\Sigma}$	SIGMABAR	ordinary $\bar{\Sigma}$ antihyperon
Sn	SN	tin nucleus
s-particle	SPARTICLE	supersymmetric partner of any ordinary particle
s-quark	SQUARK	spin-0 SUSY quark partner
strange	STRANGE	unspecified strange particle
strange	STRANGEBAR	unspecified strangeness +1 particle
strangeonium	STRANGEONIUM	unspecified meson whose quark content is dominantly $s\bar{s}$ , such as the $\phi$
Su	SU	sulfur nucleus - note name not same as chemical symbol
$^{32}\text{Su}$	SU32	sulfur-32 nucleus - note name not same as chemical symbol
Ta	TA	tantalum nucleus
tachyon	TACHYON	
$\tau$	TAU	$\tau$ lepton
Th	TH	thorium nucleus
Tl	TL	thallium nucleus
top	TOP	unspecified particle with naked top
trit	TRIT	tritium nucleus
U	U	uranium nucleus
unspec	UNSPEC	unspecified particle
$\Upsilon(\text{unspec})$	UPSI(UNSPEC)	unspecified $\Upsilon$ particle
$\Upsilon(10023)$	UPSI(10023)	$b\bar{b}$ meson
$\Upsilon(10355)$	UPSI(10355)	$b\bar{b}$ meson
$\Upsilon(10575)$	UPSI(10575)	$b\bar{b}$ meson
$\Upsilon(10860)$	UPSI(10860)	$b\bar{b}$ meson
$\Upsilon(11020)$	UPSI(11020)	$b\bar{b}$ meson
$\Upsilon(9460)$	UPSI(9460)	$b\bar{b}$ meson
vee	VEE	unspecified neutral-strange-particle decay
vmeson	VMESON	vector meson of unspecified mass
W	W	weak gauge boson
water	WATER	
Wt	WT	tungsten nucleus - note name not same as chemical symbol
X	X	anything, as is $pp \rightarrow \pi^+ X$ or $K^- p \rightarrow X$
$X(1700)$	X(1700)	meson
$X(1935)$	X(1935)	meson [was $S(1935)$ ]
$X(2220)$	X(2220)	meson seen in $J/\psi$ decays [was $\xi(2220)$ ]
Xe	XE	xenon nucleus
$\Xi$	XI	$\Xi$ hyperon
$\Xi(\text{unspec})$	XI(UNSPEC)	unspecified $I = 1/2, S = -2$ baryon
$\Xi(1530 P_{13})$	XI(1530P13)	$\Xi$ resonance
$\Xi(1630)$	XI(1630)	$\Xi$ resonance
$\Xi(1820)$	XI(1820)	$\Xi$ resonance
$\Xi(1940)$	XI(1940)	$\Xi$ resonance
$\Xi(2030)$	XI(2030)	$\Xi$ resonance
$\Xi(2250)$	XI(2250)	$\Xi$ resonance
$\Xi(2500)$	XI(2500)	$\Xi$ resonance
$\Xi^*(\text{unspec})$	XI*(UNSPEC)	unspecified $\Xi$ resonance
$\Xi_c$	XI/C	$\Xi_c(2460)$ $I = 1/2$ charmed strange baryon
$\bar{\Xi}$	XIBAR	$\bar{\Xi}$ antihyperon
Y	Y	$\Lambda$ or $\Sigma$ or low-mass $Y^*$
$Y^*(\text{unspec})$	Y*(UNSPEC)	$S = -1$ baryon of unspecified mass and isospin
Z	Z	neutral weak gauge boson
$Z^*(\text{unspec})$	Z*(UNSPEC)	$S = +1$ exotic baryon of unspecified mass and isospin
$\zeta(8300)$	ZETA(8300)	reported $\zeta(8300)$ meson

## SUMMARIES OF EXPERIMENTS

**BNL-698** (Jul 1976, Aug 1978) Approved Sep 1978; Completed Dec 1980.

### POLARIZED-TARGET PHYSICS WITH THE MPS FOR STUDY OF STRANGE-PARTICLE REACTIONS

MASSACHUSETTS U, AMHERST - J Button-Shafer (✓ Spokesperson), S Dhar, S Gottesman, R L Lichti

Accelerator BNL Detector MPS

<u>Reactions</u>	Polarized target	
$K^- p \rightarrow \Lambda \pi^0$		2.2 GeV/c
$K^- p \rightarrow \Lambda \pi^+ \pi^-$		"
$K^- p \rightarrow \Lambda \omega$		"
$K^- p \rightarrow \bar{K}^0 n$		"
$K^- p \rightarrow \bar{K}^0 p \pi^-$		"

Particles studied  $Y^*$  (unspec)

Comments The final states with a  $\Lambda$  are of most interest. Tests SU(6) predictions for  $K^- p \rightarrow \Sigma(1385)\pi$ . (Primarily a feasibility study.) Ran for 400 hours.

Papers NIM (submitted).

**BNL-702** (Dec 1976) Approved Jan 1977; Started Feb 1980; Completed Mar 1983.

### RADIATIVE DECAY $\Sigma^+ \rightarrow p\gamma$ FROM POLARIZED $\Sigma^+$ HYPERONS

YALE U - S Axelrod, R Morrison, J Snow, M E Zeller (Spokesperson)

BROOKHAVEN - D M Lazarus  
MOUNT HOLYOKE COLL - H Nicholson  
PITTSBURGH U - J A Thompson

Accelerator BNL Detector Combination

<u>Reactions</u>	Polarized target	
$K^- p \rightarrow \Sigma^+ \pi^-$		0.7 GeV/c
$K^- p \rightarrow \Sigma^- \pi^+$		"

Particles studied  $\Sigma^+$ ,  $\Sigma^-$

Comments Also studies nonleptonic decays of the  $\Sigma^+$  and  $\Sigma^-$ . Ran for 1640 hours.

Papers PR D32 (1985) 11.

**BNL-705** (Jan 1977) Approved May 1977; Started Feb 1980; Completed May 1980.

### A SEARCH FOR NARROW AND BROAD RESONANCES DECAYING INTO $K_S K_S$ , $\Lambda\bar{\Lambda}$ , $\Delta K_S$ , AND $\bar{\Lambda} K_S$ FROM $\pi^- p$ INTERACTIONS AT 20 GeV/c USING THE BNL MPS

BROOKHAVEN - A Etkin, K J Foley, J H Goldman, K W Lai, W A Love, T W Morris, S Ozaki, E D Platner, A C Saulys, C D Wheeler, E H Willen  
BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum  
CITY COLL, N Y - M A Kramer  
VANDERBILT U - J Marraffino, S Reucroft, C Roos, M S Webster (Spokesperson)  
TUFTS U - F T Dao, A Mann, J Schneps  
MICHIGAN STATE U - J Hylen, Z Ming Ma

Accelerator BNL Detector MPS

<u>Reactions</u>		
$\pi^- p \rightarrow \Lambda \bar{\Lambda}$ neutral(s)		20 GeV/c
$\pi^- p \rightarrow K_S K_S$ neutral(s)		"
$\pi^- p \rightarrow \Lambda K_S$ (neutrals)		"
$\pi^- p \rightarrow \bar{\Lambda} K_S$ neutrals		"

Particles studied meson<sup>0</sup>,  $N$ (unspec)<sup>0</sup>,  $\Xi^*$ (unspec)<sup>0</sup>

Comments Ran for 1018 hours.

**BNL-708** (Mar 1977) Approved May 1977, Feb 1980; Started Nov 1978; Completed Apr 1981.

### SEARCH FOR $\gamma$ TRANSITIONS IN $\bar{p}p$ ANNIHILATIONS AT REST AND LOW ENERGIES

BROOKHAVEN - D I Lowenstein

BROWN U - D C Peaslee

MICHIGAN STATE U - R A Lewis, B Y Oh, M Pratap, G Sionakides, G A Smith, J Whitmore

SYRACUSE U - T Brando, T E Kalogeropoulos (✓ Spokesperson), G S Tzanakos

Accelerator BNL Detector Combination

<u>Reactions</u>		
$\bar{p} p \rightarrow \gamma$ (s) hadrons		0-650 MeV/c
$\bar{p} p \rightarrow \pi^+ X$		"
$\bar{p} p \rightarrow \pi^- X$		"
$\bar{p} p \rightarrow K^+ X$		"
$\bar{p} p \rightarrow K^- X$		"

Comments Ran for 1850 hours.

Papers PR D23 (1981) 2788, PR D26 (1982) 543, and PL 139B (1984) 133.

**BNL-722** (Mar 1978) Approved May 1978; Started Apr 1982; Completed Apr 1983.

### FURTHER SEARCH FOR EXOTIC SIX-QUARK STATES

BROOKHAVEN - I-H Chiang, R A Johnson, T F Kycia (Spokesperson), K K Li, L S Littenberg

Accelerator BNL Detector Double-arm spectrometer

<u>Reactions</u>		
$p p \rightarrow K^+ K^+ X$		5.6 GeV/c

Particles studied dibaryon( $S = -2$ )

Comments A repeat of BNL-703 with an improvement in sensitivity by a factor 100. Ran for 1255 hours.

**BNL-723** (Mar 1978) Approved May 1979, Oct 1983; Started Mar 1982; Completed Jul 1984.

### A PRECISION MEASUREMENT OF THE MAGNETIC MOMENT OF THE $\Sigma^-$ BY THE EXOTIC ATOMS TECHNIQUE

WILLIAM AND MARY COLL - M Eckhause, D W Hertzog, J R Kane, W Phillips, W F Vulcan, R E Welsh (Spokesperson), R J Whyley, R G Winter

BOSTON U - G Dodson, J Miller, F O'Brien, B L Roberts (Spokesperson), D Tieger

CARNEGIE MELLON U - R B Sutton

CAL TECH - R J Powers

WYOMING U - A R Kunselman

Accelerator BNL Detector Spectrometer

<u>Reactions</u>		
$\Sigma^-$ nucleus $\rightarrow \Sigma^-$ nucleus $\gamma$		0 GeV/c

Particles studied  $\Sigma^-$

Comments Uses Ge(Li) detectors to measure fine-structure splitting in  $\Sigma^-$  atoms. Measures, in addition to the  $\Sigma^-$  magnetic moment, the masses of the  $\Sigma^-$  and  $K^-$  and the effects of their strong interaction with heavy nuclei. Ran for 1504 hours.

Papers PRL 51 (1983) 1131.

**BNL-726** (Apr 1978) Approved May 1978; Started Jul 1980; Completed Jun 1982.

### SEARCH FOR CHARM IN HADRONIC INTERACTIONS NEAR THRESHOLD

NEW YORK U - J H Christenson (Spokesperson), E Hummel, G A Kreiter, J Sculli

BROOKHAVEN - P Yamin

Accelerator BNL Detector Spectrometer

<u>Reactions</u>		
$\pi^- p \rightarrow$ charm X		13 GeV/c
$\pi^- p \rightarrow K^+ \pi^- \pi^- X$		"

## SUMMARIES OF EXPERIMENTS

Particles studied  $D^*(2010)^-, \bar{D}^0$ , charmed-baryon

Comments Looks for  $D^{*-} \rightarrow \bar{D}^0 \pi^-$  decay followed by  $\bar{D}^0 \rightarrow K^+ \pi^-$  decay, and for charmed baryons in the missing mass against the  $D^{*-}$ . Ran for 1795 hours.

Papers PRL 55 (1985) 154.

**BNL-732** (Aug 1978) Approved Sep 1978, Feb 1980; Started Jan 1979; Completed Aug 1980.

### SEARCH FOR THE $\eta_c$

BROOKHAVEN - I-H Chiang, R A Johnson, B P Kwan, T F Kycia (Spokesperson), K K Li, L S Littenberg, A Wijangco

PRINCETON U - A M Halling, G E Hogan, J C Licini, C G Lu, K McDonald, S Smith, M H Ye

ILLINOIS U, URBANA - L Garren, J Thaler

Accelerator BNL Detector Calorimeter

#### Reactions

$\pi^- p \rightarrow \gamma \gamma n$	13 GeV/c
$\pi^- p \rightarrow \eta_c(2980) n$	"
$\pi^- p \rightarrow \gamma's n$	"

Particles studied  $\eta_c(2980)$

Comments Ran for 2327 hours.

Papers PL 140B (1984) 145, and PR D34 (1986) 1619.

**BNL-734** (Aug 1978) Approved Feb 1979, Feb 1984; Started Jan 1981; Completed May 1986.

### A MEASUREMENT OF THE ELASTIC SCATTERING OF NEUTRINOS FROM ELECTRONS AND PROTONS

BROOKHAVEN - L A Ahrens, S H Aronson, B G Gibbard, M J Murtagh ( $\checkmark$  Spokesperson), S J Murtagh, P J Wanderer, D H White

BROWN U - J Callas, D Cutts, J Hoftun, R E Lanou

KEK - K Abe, K Amako, S Kabe, T Shinkawa, A Sterad

OSAKA U - Y Nagashima, Y Suzuki

PENN U - E W Beier, L S Durkin, S M Heagy, M Hurley,

A K Mann, H H Williams, T York

SUNY, STONY BROOK - D Hedin, M D Marx, E Stern

Accelerator BNL Detector Calorimeter

#### Reactions

$\nu_\mu e^- \rightarrow \nu_\mu e^-$	0-12 GeV/c
$\nu_\mu p \rightarrow \nu_\mu p$	"
$\nu_\mu p \rightarrow \nu_\mu p \pi^0$	"
$\nu_\mu p \rightarrow \nu_\mu n \pi^+$	"
$\nu_\mu n \rightarrow \mu^- p$	"
$\nu_\mu n \rightarrow \nu_\mu p \pi^-$	"
$\nu_\mu n \rightarrow \nu_\mu n \pi^0$	"
$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu p$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu p \pi^0$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu n \pi^+$	"
$\bar{\nu}_\mu n \rightarrow \bar{\nu}_\mu p \pi^-$	"
$\bar{\nu}_\mu n \rightarrow \bar{\nu}_\mu n \pi^0$	"

Comments Ran for 4630 hours. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 51 (1983) 1514, IEEE TNS 30 (1983) 3782, PRL 54 (1985) 18, PR D31 (1985) 2732, PRL 56 (1986) 1107, PR D34 (1986) 75, PRL 58 (1987) 636, and PR D35 (1987) 785.

**BNL-735** (Oct 1978) Approved Feb 1979; Started Jun 1980; Completed Jun 1981.

### TRANSVERSE MUON POLARIZATION IN $K^+ \rightarrow \mu^+ \pi^0 \nu$ DECAYS: AN EXPERIMENTAL TEST OF TIME REVERSAL INVARIANCE

BROOKHAVEN - R C Larsen, L B Leipuner, W M Morse  
YALE U - R K Adair (Spokesperson), H Kasha, M Schmidt

Accelerator BNL Detector Counter

#### Reactions

$K^+ \rightarrow \mu^+ \pi^0 \nu_\mu$  4 GeV/c

Comments Ran for 2061 hours.

**BNL-737** (Jan 1979) Approved Feb 1979; Started Nov 1979; Completed Jan 1980.

### STUDY OF NEUTRINO INTERACTIONS IN DEUTERIUM

BROOKHAVEN - P L Connolly, S A Kahn, M J Murtagh, R B Palmer ( $\checkmark$  Spokesperson), N P Samios, M Tanaka  
TOHOKU U - K Abe, K Hasegawa, T Hayashino, T Kitagaki, S Kunori, Y Ohtani, K Tamai, S Tanaka, A Yamaguchi, H Yuta

TOHOKU GAKUIN U - M Higuchi, M Sato

Accelerator BNL Detector DBC-7FT

#### Reactions

$\nu_\mu$ deut $\rightarrow \mu^-$ pion(s) X	0-10 GeV/c
$\nu_\mu$ deut $\rightarrow \mu^-$ charmed-baryon X	"
$\nu_\mu$ deut $\rightarrow \mu^-$ strange(s) X	"
$\nu_\mu n \rightarrow \nu_\mu p \pi^-$	"
$\nu_\mu n \rightarrow \mu^- p$	"
$\nu_\mu p \rightarrow \mu^- p \pi^+$	"
$\nu_\mu p \rightarrow \mu^- \Delta(1232 P_{33})^{++}$	"

Particles studied charmed-baryon

Comments An extension of BNL-427. Took 802 KPX.

Papers PR D28 (1983) 2900, and PR D34 (1986) 2554.

**BNL-742** (Apr 1979) Approved May 1979; Started Feb 1981; Completed Jun 1981.

### SEARCH FOR THE S MESON IN THE TOTAL, ELASTIC, AND ANNIHILATION $\bar{p}p$ CROSS SECTIONS

BROOKHAVEN - V Ashford, M Sakitt ( $\checkmark$  Spokesperson), J Skelly

CASE WESTERN RESERVE U - W Fickinger, R Marino, D K Robinson

Accelerator BNL Detector Wire chamber

#### Reactions

$\bar{p} p \rightarrow X$	387-681 MeV/c
$\bar{p} p \rightarrow \bar{p} p$	"
$\bar{p} p \rightarrow$ pions	"
$\bar{p} \text{Cu}$	400-600 MeV/c
$\bar{p} \text{Al}$	"
$\bar{p} \text{Pb}$	"

Particles studied  $X(1935)^0$

Comments Measures both the elastic and the absorption cross sections for the nuclear targets. Ran for 674 hours.

Papers PR C30 (1984) 1080, PR C31 (1985) 663, PRL 54 (1985) 518, and PR D34 (1986) 3332.

**BNL-744** (Apr 1979) Approved May 1979; Started Feb 1980; Completed Aug 1980.

### MEASUREMENT OF INCLUSIVE $\Sigma^0$ PRODUCTION RATE AND POLARIZATION IN THE REACTION $p \text{Be} \rightarrow \Sigma^0 X$

MASSACHUSETTS U, AMHERST - D Jensen (Spokesperson), M Kreisler, M Marcin, K Raychaudhuri, M Sullivan

BROOKHAVEN - G Bunce, Y Makdesi, P Yamin

MINNESOTA U - K Heller

MICHIGAN U - E C Dukes, O E Overseth

Accelerator BNL Detector Combination

#### Reactions

$p \text{Be} \rightarrow \Sigma^0 X$	28.5 GeV/c
$p \text{Be} \rightarrow \Lambda X$	"

## SUMMARIES OF EXPERIMENTS

Comments The  $\Sigma^0$  production rate is measured relative to the  $\Lambda$  rate. Ran for 872 hours.

Papers PL 142B (1984) 451.

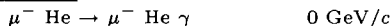
**BNL-745** (Apr 1979) Approved Sep 1979, Feb 1984; Started Feb 1983; Completed May 1986.

**AN IMPROVED TEST OF QED — AN EXPERIMENT TO MEASURE VACUUM POLARIZATION IN THE 3D-3P TRANSITIONS IN MUONIC HELIUM**

CERN - E Zavattini  
BROOKHAVEN & COLUMBIA U - M May  
COLUMBIA U - A Blaer, J Derderian, J French, A M Sachs (Spokesperson)

Accelerator BNL Detector Counter

Reactions



Comments The transitions are stimulated by infrared radiation from an isotopic-gas CO<sub>2</sub> laser. Ran for 2142 hours.

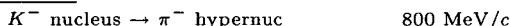
**BNL-746** (Apr 1979) Approved May 1979; Started Mar 1980; Completed Aug 1980.

**SPIN AND ISOSPIN EFFECTS IN LIGHT HYPERNUCLEI**

BROOKHAVEN - R E Chrien, M May, H Palevsky (✓ Spokesperson), R Sutter  
TURIN U - R Cester  
MIT - M Deutsch  
HOUSTON U - S Bart, E V Hungerford, B Mayes, L Pinsky  
VASSAR COLL - R L Stearns  
CARNEGIE MELLON U - P Barnes, S Dytman, R Eisenstein, D Marlow, F Takeutchi, R Wharton

Accelerator BNL Detector Spectrometer

Reactions



Particles studied hypernuc

Comments Measures hypernucleus states of <sup>10</sup>B, <sup>13</sup>C, <sup>14</sup>N, and <sup>18</sup>O. Ran for 1359 hours.

Papers PRL 47 (1981) 1106.

**BNL-747** (Aug 1979) Approved Oct 1980, Feb 1984; Started Jun 1982.

**A HIGH STATISTICS STUDY OF  $\phi$  AND  $\phi\phi$  PRODUCTION FROM  $\pi^-p$  AND  $K^-p$  INTERACTIONS AT 22 GeV/c — A SEARCH FOR GLUEBALLS**

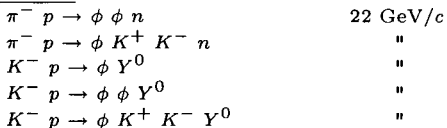
BROOKHAVEN - A Etkin, K J Foley, R S Longacre, W A Love (✓ Spokesperson), T W Morris, E D Platner, A C Saulys

BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum (✓ Spokesperson)

CITY COLL, N Y - C S Chan, M A Kramer, J Piekarz

Accelerator BNL Detector MPS-II

Reactions



Particles studied glueball

Comments Of particular interest is the role of glueballs in the breaking of the OZI rule in  $\pi^-p \rightarrow \phi\phi n$ . Three new meson states at 2050, 2300, and 2350 MeV fit the glueball resonance hypothesis and no other one proposed. For a description of the apparatus, see the LBL-91 supplement on detectors. Approved for 2300 hours, with 1807 hours run as of November 86.

Papers PRL 49 (1982) 1620, SHEP 4 (1983) 69, PL 131B (1983) 221, CNPP 13 (1984) 285, PL 165B (1985) 202, and PL 165B (1985) 217.

**BNL-748** (Aug 1979) Approved Feb 1980, Oct 1982, Oct 1983; Started Mar 1982; Completed May 1984.

**POLARIZATION IN  $pp$  ELASTIC SCATTERING AT MEDIUM AND HIGH  $p_{\perp}^2$  FROM 15 TO 28.5 GeV/c**

MICHIGAN U - K A Brown, R J Bruni, P R Cameron, D G Crabb, R L Cummings, M Fujisaki, M Hejazifar, F Z Khiari, A D Krisch (✓ Spokesperson), A M T Lin, S L Linn, R S Raymond, T Shima, K M Terwilliger

NOTRE DAME U - J R O'Fallon  
BROOKHAVEN - G T Danby, Y Y Lee, L G Ratner  
COPENHAGEN U - P H Hansen  
MIAMI U, FLA - A Perlmutter

MARYLAND U & MICHIGAN U - D C Peaslee  
TEXAS A AND M - T S Bhatia, G Glass, L C Northcliffe  
ZURICH, ETH - M Simonius

Accelerator BNL Detector Double-arm spectrometer

Reactions Polarized target



Comments Found very large polarization at  $p_{\perp}^2 = 6.6 \text{ GeV}^2$ . Ran for 2550 hours.

Papers PRL 50 (1983) 802, and PRL 51 (1983) 2359.

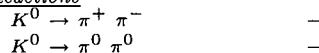
**BNL-749** (Aug 1979) Approved Sep 1979, Oct 1983; Started Mar 1982; Completed Apr 1984.

**A MEASUREMENT OF MILLIWEAK CP VIOLATION IN  $K_L-K_S$  DECAYS THROUGH THE DETERMINATION OF  $\epsilon'$**

BROOKHAVEN - R C Larsen, L B Leipuner, W M Morse  
YALE U - R K Adair (Spokesperson), K Black, S R Blatt, M K Campbell, H Kasha

Accelerator BNL Detector Spectrometer

Reactions



Particles studied  $K^0$

Comments Ran for 2037 hours.

Papers PRL 54 (1985) 1628.

**BNL-751** (Apr 1980) Approved Oct 1980; Started May 1983; Completed Apr 1984.

**MEASUREMENT OF HYPERON RADIATIVE DECAY**

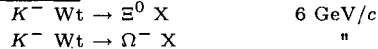
BRANDEIS U - J Bensinger, M Fortner, L Kirsch, H Piekarz, R Poster (Spokesperson), L Spencer, P Zogrofov

SOUTHEASTERN MASS U - Z Bar-Yam, J Dowd, W Kern  
NOTRE DAME U - J M Bishop, N N Biswas, N M Cason, V P Kenney, M Rath, R Ruchti, W D Shephard

DUKE U - L Fortney, A Goshaw, E McGrory, W Robertson

Accelerator BNL Detector MPS-II

Reactions



Particles studied  $\Xi^0, \Omega^-$

Comments Measures the radiative decays  $\Xi^0 \rightarrow p\gamma$ ,  $\Xi^0 \rightarrow \Lambda\gamma$ ,  $\Xi^0 \rightarrow \Sigma^0\gamma$ , and  $\Omega^- \rightarrow \Xi^-\gamma$ . For a description of the apparatus, see the LBL-91 supplement on detectors. Ran for 850 hours.

**BNL-752** (Dec 1979) Approved Feb 1980; Started Nov 1980; Completed Jun 1981.

**A SEARCH FOR  $\Sigma$  HYPERNUCLEAR LEVELS IN <sup>16</sup>O IN THE ( $K^-, \pi^+$ ) REACTION**

## SUMMARIES OF EXPERIMENTS

HOUSTON U - S Bart, R Hackenburg, D Hancock,  
 E V Hungerford (✓ Spokesperson), B Mayes, L Pinsky,  
 T Williams  
 BROOKHAVEN - R Chrien, M May, H Palevsky, R Sutter  
 CARNEGIE MELLON U - P Barnes, R Eisenstein,  
 F Takeuchi, W Wharton  
 VASSAR COLL - R Sterns  
Accelerator BNL Detector Spectrometer  
Reactions  
 $K^- \text{ } ^6\text{Li} \rightarrow \pi^- \text{ hypernuc}$  720 MeV/c  
 $K^- \text{ O} \rightarrow \pi^- \text{ hypernuc}$  "  
Particles studied hypernuc  
Comments Ran for 690 hours.  
Papers PL 110B (1982) 428.

**BNL-754** (Dec 1979) Approved Feb 1980; Started May 1983;  
 Completed Jun 1985.

### DETERMINATION OF THE DYNAMICS OF $\mu^+$ MOTION IN ALUMINUM

BTL, MURRAY HILL - A T Fiory, R P Minnich  
 BROOKHAVEN - A N Goland, Y C Jean, K G Lynn  
 WILLIAM AND MARY COLL - W J Kossler (Spokesperson)  
 GEORGE MASON U - W F Lankford  
 VIRGINIA STATE COLL - C E Stronach  
Accelerator BNL Detector Counter  
Reactions Polarized beam  
 $\mu^+ \text{ Al}$  125 MeV/c  
Comments Studies depolarization effects in aluminum under  
 various conditions. Ran for 1127 hours.

**BNL-755** (Jan 1980) Approved Apr 1980, Oct 1983; Started  
 Feb 1983; Completed Apr 1984.

### $\pi^- p$ TWO-BODY EXCLUSIVE REACTIONS AT 90° FROM 8 GeV/c TO 18 GeV/c, AND (PHASE II) LARGE ANGLE EXCLUSIVES — POSITIVES AND POLARIZATION

BROOKHAVEN - D S Barton, G Bunce (✓ Spokesperson),  
 A S Carroll, Y Makdisi  
 MINNESOTA U - B Baller, G Blazey, H Courant, K Heller,  
 S Heppelmann, M Marshak (✓ Spokesperson), E Peterson,  
 M Shupe, D S Wahl  
 SOUTHEASTERN MASS U - S Gushue, J Russell  
Accelerator BNL Detector Double-arm spectrometer

Reactions  
 $\pi^- p \rightarrow \pi^- p$  10, 13.5 GeV/c  
 $\pi^- p \rightarrow \rho^- p$  "  
 $\pi^- p \rightarrow a_2(1320)^- p$  "  
 $\pi^- p \rightarrow \pi^+ \Delta(1232 P_{33})^-$  "  
 $\pi^- p \rightarrow K^+ \Sigma^-$  "  
 $\pi^- p \rightarrow K^+ \Sigma(1385 P_{13})^-$  "  
 $\pi^- p \rightarrow \Lambda K^0$  "  
 $\pi^+ p \rightarrow \pi^+ p$  10 GeV/c  
 $\pi^+ p \rightarrow K^+ \Sigma^+$  "  
 $K^+ p \rightarrow K^+ p$  "  
 $p p \rightarrow p p$  "  
 $p p \rightarrow p \Delta(1232 P_{33})^+$  "  
 $K^- p \rightarrow K^- p$  "

Comments The apparatus is a single-arm spectrometer and a  
 nonmagnetic arm. Ran for 2579 hours.  
Papers PRL 55 (1985) 1820, and PRL 55 (1985) 1824.

**BNL-758** (Apr 1980) Approved May 1980; Started Feb 1983;  
 Completed Apr 1983.

### THE ( $\pi^+, K^+$ ) REACTION — A NEW TOOL FOR THE STUDY OF HYPERNUCLEAR STRUCTURE

LOS ALAMOS - J Amann, T S Bhatia, T Kozlowski,  
 J C Peng, R Silbar, H A Thiessen (✓ Spokesperson)  
 BROOKHAVEN - R Chrien, P Pile, R Sutter  
 FLORIDA STATE U - H Plendl  
 HOUSTON U - S Bart, R Hackenburg, E Hungerford  
 RUTGERS U - C Glashauser, J McGill  
 VASSAR COLL - R L Stearns  
 CARNEGIE MELLON U - P D Barnes, G B Franklin,  
 R Grace  
 TEXAS U - M Barlett, G W Hoffmann, E C Milner  
Accelerator BNL Detector Spectrometer

Reactions  
 $\pi^+ \text{ } ^{12}\text{C} \rightarrow K^+ \text{ hypernuc}$  1050 MeV/c  
Particles studied hypernuc

Comments The first experiment using this reaction with  
 sufficient resolution to study hypernuclear states. Ran for  
 696 hours.  
Papers PRL 54 (1985) 1237. No other papers expected.

**BNL-759** (Jan 1981) Approved Mar 1981; Started May 1983;  
 Completed May 1983.

### THE WEAK DECAY MODES OF HYPERNUCLEI

CARNEGIE MELLON U - P D Barnes (✓ Spokesperson),  
 R A Eisenstein, G Franklin, R Grace, C Maher, R Rieder,  
 J Seydoux, J Szymanski, W R Wharton  
 BROOKHAVEN - R Chrien, P Pile  
 HOUSTON U - R Hackenburg, E Hungerford  
 NEW MEXICO U - B Bassalleck  
 TEXAS U - M Barlett, E Milner  
Accelerator BNL Detector Spectrometer

Reactions  
 $K^- \text{ C} \rightarrow \pi^- \text{ hypernuc}$  800 MeV/c  
Particles studied hypernuc

Comments Studies (1) the 4-fermion weak interactions  $\Lambda N \rightarrow$   
 $NN$ , and (2)  $\Lambda \rightarrow N\pi$  decays in nuclear matter. Measures  
 the ground-state lifetime of  $\Lambda^{12}\text{C}$  and the partial decay rates  
 for these processes. Ran for 489 hours.

Papers PRL 55 (1985) 1055.

**BNL-760** (Apr 1980) Approved May 1980; Started May  
 1982; Completed Jun 1982.

### SPIN DEPENDENCE OF THE $\Lambda$ NUCLEUS INTER- ACTION DETERMINED BY OBSERVATION OF HY- PERNUCLEAR $\gamma$ RAYS

MIT - M Deutsch (Spokesperson), J Piekarz  
 BROOKHAVEN - R Chrien, M May, H Palevsky, H Piekarz,  
 R Sutter  
 TURIN U - R Cester  
 HOUSTON U - S Bart, E V Hungerford, B Mayes, L Pinsky  
 NEW YORK U - B Budick  
 VASSAR COLL - R L Stearns  
 BEIJING, IHEP - Y Xu  
Accelerator BNL Detector Spectrometer

Reactions  
 $K^- \text{ nucleus} \rightarrow \pi^- \text{ hypernuc } \gamma(s)$  800 MeV/c  
Particles studied hypernuc

Comments Targets are  ${}^7\text{Li}$ ,  ${}^9\text{Be}$ , and  ${}^{16}\text{O}$ . Both the  $\pi^-$   
 and  $\gamma$ 's from de-excitation of the hypernuclear states are  
 detected. Ran for 624 hours.

**BNL-762** (Aug 1980) Approved Oct 1980; Started Mar 1982;  
 Completed Apr 1982.

### SEARCH FOR NARROW STRUCTURES IN THE $\bar{p}p$ ANNIHILATION CROSS SECTION FROM 1900 TO 1950 MeV

BROOKHAVEN - D I Lowenstein  
 MARYLAND U - D C Peaslee  
 MICHIGAN STATE U - R J Miller

## SUMMARIES OF EXPERIMENTS

PENN STATE U - R A Lewis, B Y Oh, G A Smith  
(√ Spokesperson), J Whitmore  
SYRACUSE U - T Brando, I Daftari, A de Guzman,  
T E Kalogeropoulos, C Petridou, M Singer, G S Tzanakos,  
R Venugopal

TEMPLE U - R D von Lintig

Accelerator BNL Detector Spectrometer

Reactions

$\bar{p} p \rightarrow$  annihil 1900-1950 MeV ( $E_{cm}$ )

Particles studied  $X(1935)^0$

Comments Ran for 532 hours.

Papers PL 158B (1985) 505. No other papers expected.

**BNL-766** (Sep 1980, Dec 1980) Approved Feb 1981; Started Jun 1982; Completed Jul 1986.

**STUDY OF  $\Omega^-$  PRODUCTION AND DEVELOPMENT OF ON-LINE HARDWARE PROCESSING**

NEVIS LABS, COLUMBIA U - M Church, E Gottschalk,  
R Hylton, B Knapp (√ Spokesperson), B Stern, L Wienck  
MASSACHUSETTS U, AMHERST - E Hartouni, D Jensen,  
M Kreisler (√ Spokesperson), M Rabin  
MEXICO U - C Avilez (√ Spokesperson)  
FERMILAB - D Christian, G Guitierrez, S Holmes, J Strait,  
A Wehman

TEXAS ACCELERATOR CENTER - R Huson, J White

Accelerator BNL Detector Spectrometer

Reactions

$n p \rightarrow \Omega^- X$	10-28 GeV/c
$n p \rightarrow p \Omega^- 3K^+ 2\pi^-$	"
$n p \rightarrow p \Omega^- K^0 2K^+ \pi^-$	"
$n p \rightarrow \Lambda X$	"
$n p \rightarrow \Lambda K^0 p$	"
$n p \rightarrow \Lambda K^+ p \pi^+ 2\pi^-$	"
$n p \rightarrow \Xi^- X$	"
$n p \rightarrow 2\Lambda X$	"
$n p \rightarrow \phi \pi^+ \pi^- X$	"

Particles studied  $\Omega^-$

Comments Only a sampling of the reactions to be studied is listed above. The spectrometer is designed to measure exclusive topologies with high sensitivity. Ran for 1194 hours.

**BNL-767** (Jan 1981) Approved Mar 1981; Started May 1983; Completed Jun 1985.

**DEVELOPMENT OF A LOW ENERGY ANTINEUTRON SOURCE AND MEASUREMENT OF  $\bar{n}p$  ANNIHILATION CROSS SECTIONS NEAR  $\bar{N}N$  THRESHOLD**

BROOKHAVEN - D I Lowenstein  
HOUSTON U - C Chu, M Furic, E V Hungerford,  
T Kishimoto, B W Mayes, L S Pinsky, L Tang, A Xue  
PENN STATE U - T Armstrong, C Elinon, K Hartman,  
A Hicks, R A Lewis, W Lochstet, G A Smith  
(√ Spokesperson)

RICE U - J Clement, J Kruk, B Moss, G S Mutchler,  
W von Witsch

Accelerator BNL Detector Wire chamber

Reactions

$\bar{n} p \rightarrow$  annihil 100-500 MeV/c  
 $\bar{n} p \rightarrow X$  "

Particles studied baryonium

Comments Ran for 1748 hours.

Papers PL 175B (1986) 383.

**BNL-769** (Jan 1981) Approved Mar 1981; Started Apr 1984; Completed Jul 1984.

**SEARCH FOR GLUEBALLS AND OTHER MESON STATES**

NOTRE DAME U - J M Bishop, N N Biswas, N M Cason  
(√ Spokesperson), V P Kenney, R C Ruchti, W D Shepherd  
BRANDEIS U - J Bensing, L Kirsch, F Lomanno, W Morris,  
R Poster

BROOKHAVEN - A Etkin, K J Foley, R Longacre, W A Love,  
T W Morris, E D Platner, V A Polychronakos, A C Saulys,  
C D Wheeler

BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum  
CITY COLL, N Y - M Kramer, Y Terramoto

DUKE U - L R Fortney, A T Goshaw, W D Walker

Accelerator BNL Detector MPS-II

Reactions

$\pi^- p \rightarrow n K_S K_S \pi^0$	21 GeV/c
$\pi^- p \rightarrow n K_S K_S \eta$	"
$\pi^- p \rightarrow n K_S K_S$	",

Particles studied glueball,  $f_1(1420)$ , meson<sup>0</sup>

Comments A search for new mesons with the goal of determining whether they are ordinary quark states, exotic quark states, or glueballs. Ran for 901 hours. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 177B (1986) 223.

**BNL-771** (Jan 1981) Approved Mar 1981, Oct 1983; Started Apr 1983.

**STUDY OF E-MESON CHARACTERISTICS IN  $\pi^- p$ ,  $K^- p$ , AND  $\bar{p}p$  INTERACTIONS**

BROOKHAVEN - S U Chung (Spokesperson), R C Fernow,  
H Kirk, S D Protopopescu, D Weygand

FLORIDA STATE U - D Boehnlein, J H Goldman,  
V Hagopian, D Reeves

SOUTHEASTERN MASS U - Z Bar-Yam, J Dowd, W Kern,  
H Rudnicka

INDIANA U - R Crittenden, A Dzierba, T Marshall,  
S Teague, D Zieminska

Accelerator BNL Detector MPS-II

Reactions

$\pi^- p \rightarrow K^+ K_S \pi^- X$	8 GeV/c
$\pi^- p \rightarrow f_1(1420) n$	"
$\pi^- p \rightarrow \Xi^- \pi^+ \pi^- X$	"
$\pi^- p \rightarrow \Xi^*(\text{unspec})^- X$	"
$K^- p \rightarrow K^+ K_S \pi^- X$	6 GeV/c
$K^- p \rightarrow f_1(1420) \Lambda$	"
$K^- p \rightarrow \Lambda K^- \pi^+ K^0$	"
$K^- p \rightarrow \Xi^*(\text{unspec})^0 K^0$	"
$K^- p \rightarrow \Lambda K_S \pi^- K^+$	"
$K^- p \rightarrow \Xi^*(\text{unspec})^- K^+$	"
$\bar{p} p \rightarrow K^+ K_S \pi^- X$	5 GeV/c
$\bar{p} p \rightarrow f_1(1420) \pi^0$	"
$\bar{p} p \rightarrow f_1(1420) \rho^0$	"
$\bar{p} p \rightarrow \bar{p} p \pi^0$	"

Particles studied  $f_1(1420)$ , glueball,  $\Xi^*(\text{unspec})$ , baryonium, strangeonium

Comments An attempt to see if the  $f_1(1420)$  is a glueball. For a description of the apparatus, see the LBL-91 supplement on detectors. Approved for 2425 hours, with 1625 hours run as of November 86.

Papers PR D30 (1984) 1409, PRL 55 (1985) 779, and PR D34 (1986) 1960.

**BNL-772** (Aug 1981) Approved Feb 1982; Started Apr 1983; Completed May 1983.

**SEARCH FOR  $\bar{p}n$  BOUND AND RESONANT STATES**

SYRACUSE U - I Daftari, A de Guzman, T E Kalogeropoulos  
(√ Spokesperson), C Petridou, R Venugopal  
BROOKHAVEN - H Brown, M Sakitt

## SUMMARIES OF EXPERIMENTS

CASE WESTERN RESERVE U - R Debbe, W Fickinger,  
R Marino, K Robinson  
BLOOMSBURG U - L Gray  
COLUMBIA U - G Tzanakos  
LE MOYNE COLL - D Bridges  
MARYLAND U - D C Peaslee

Accelerator BNL Detector Spectrometer

Reactions

$\bar{p}$  deut  $\rightarrow$   $p$  X 0-650 MeV/c  
 $\bar{p}$  deut  $\rightarrow$   $\pi^+$  X "  
 $\bar{p}$  deut  $\rightarrow$   $\pi^-$  X "

Particles studied baryonium

Comments Ran for 644 hours.

Papers PRL 56 (1986) 211, PRL 56 (1986) 215, and PL 180B (1986) 313.

**BNL-773** (Aug 1981) Approved Feb 1983; Started Apr 1984; Completed Jul 1986.

**SEARCH FOR  $S = -1$  DIBARYON STATES IN THE  $\Lambda p$  MISSING MASS SPECTRUM NEAR THE  $\Sigma N$  THRESHOLD IN THE REACTION  $d(K^-, \pi^-)\Lambda p$**

BRANDEIS U - J R Bensinger, L Kirsch, H Piekarz  
(Spokesperson), R Poster  
HOUSTON U - R Hackenburg, E V Hungerford, B W Mayes,  
L S Pinsky

BROOKHAVEN - R Chrien, P Pile, R Sutter  
NEW MEXICO U - B Bassalleck  
VASSAR COLL - R Stearns  
MIT - M Deutsch, J Piekarz  
CARNEGIE MELLON U - P Barnes, W Wharton

Accelerator BNL Detector Spectrometer

Reactions

$K^-$  deut  $\rightarrow$   $\pi^- \Lambda p$  870 MeV/c

Particles studied dibaryon ( $S = -1$ )

Comments Ran for 1550 hours.

**BNL-774** (Aug 1981, Apr 1982) Approved May 1982; Started Apr 1985.

**SEARCH FOR  $\Sigma$  HYPERNUCLEAR LEVELS IN  $^4\text{He}$**

HOUSTON U - E V Hungerford ( $\checkmark$  Spokesperson),  
B W Mayes, H Piekarz, L S Pinsky  
BROOKHAVEN - S Bart, R Chrien, P Pile  
NEW MEXICO U - B Bassalleck  
VASSAR COLL - R Stearns

Accelerator BNL Detector Spectrometer

Reactions

$K^- \text{He} \rightarrow \pi^+$  hypernuc 720 MeV/c

Particles studied hypernuc

Comments A continuation of BNL-752. Approved for 500 hours with 432 hours run as of November 86.

**BNL-775** (Aug 1981) Approved Feb 1982; Started Nov 1982; Completed Jan 1983.

**NEUTRINO OSCILLATION EXPERIMENTS AT THE AGS TO COVER THE INTERVAL  $0.1 < \Delta^2 \sin(2\alpha) < 100 \text{ eV}^2$**

BROOKHAVEN - L A Ahrens, S H Aronson, P L Connolly,  
B G Gibbard, M J Murtagh ( $\checkmark$  Spokesperson), S J Murtagh,  
S Terada, D H White

BROWN U - J Callas, D C Cutts, B Hughlock, R E Lanou  
KEK - K Amako, S Kabe  
OSAKA U - Y Nagashima, Y Suzuki  
PENN U - K Abe, E W Beier, D C Doughty, S M Heagy,  
M Hurley, A K Mann, H H Williams, T York  
SUNY, STONY BROOK - D Hedin, M D Marx, E Stern  
UC, IRVINE - R C Allen, H H Chen, A Hahn, K C Weng

Accelerator BNL Detector Calorimeter

Reactions

$\nu_\mu \rightarrow \nu_e$  0-4 GeV/c

Particles studied  $\nu_\mu$

Comments For a description of the apparatus, see the LBL-91 supplement on detectors. A  $\nu_\mu \rightarrow \nu_e$  oscillation search using a narrow band beam. Ran for 658 hours.

**BNL-776** (Sep 1981) Approved Feb 1982; Started Dec 1983; Completed May 1986.

**NEUTRINO OSCILLATION EXPERIMENT**

BROOKHAVEN - G Bozoki, A Fainberg  
COLUMBIA U - M Atiya, C Y Chi, W Lee (Spokesperson),  
Y Qian, G Tzanakos  
ILLINOIS U, URBANA - M Diesburg, E O'Brien,  
T O'Halloran, K Reardon, J Wiss  
JOHNS HOPKINS U - B Barnett, B Blumenfeld, C Chien,  
L Madansky, J Matthews, A Pevsner  
NAVAL RESEARCH LAB, WASH, D C - B Sa'enz, N Seeman

Accelerator BNL Detector Combination

Reactions

$\nu_\mu \rightarrow X$  0-7 GeV/c  
 $\nu_\mu \rightarrow \nu_e$  "

Particles studied  $\nu_\mu$

Comments Studies  $\nu_\mu$  disappearance and  $\nu_\mu \rightarrow \nu_e$  oscillations. Ran for 2715 hours.

**BNL-777** (Jan 1982) Approved May 1982; Started Feb 1985.

**SEARCH FOR THE RARE DECAY MODE  $K^+ \rightarrow \pi^+ \mu^+ e^-$**

BROOKHAVEN - N J Baker, T Erickson, H A Gordon,  
D M Lazarus, T W Ludlam, V A Polychronakos, P Rehak,  
M J Tannenbaum  
YALE U - P S Cooper, N Hadley, W D Herold, M E Zeller  
(Spokesperson)  
WASHINGTON U, SEATTLE - V Chaloupka, H J Lubatti,  
J E Rothberg, K K Young  
SIN - J Egger, H Kasper

Accelerator BNL Detector Spectrometer

Reactions

$K^+ \rightarrow \pi^+ \mu^+ e^-$  6 GeV/c  
 $K^+ \rightarrow \pi^+ e^+ e^-$  "

Particles studied  $K^+$

Comments Approved for 1300 hours, with 409 hours run as of November 86.

**BNL-778** (Apr 1982) Approved Oct 1982; Started Nov 1984; Completed Jun 1985.

**STUDY OF NUCLEAR FRAGMENTS PRODUCED FROM  $p$  NUCLEUS COLLISIONS IN THE THRESHOLD REGION  $1 < P < 28 \text{ GeV}/c$  USING A WARM GAS JET INTERNAL TARGET**

PURDUE U - A Bujak, D D Carmony, L J Gutay, A S Hirsch,  
G Paderewski, N T Porile, C Sangster, R P Scharenberg  
( $\checkmark$  Spokesperson), B C Stringfellow

Accelerator BNL Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow$  frag X 1-28 GeV/c

Comments The gas targets are hydrogen and noble gas mixtures. Ran for 1332 hours

Papers NIM A251 (1986) 242.

**BNL-779** (Aug 1982) Approved Oct 1982; Started Nov 1982; Completed Sep 1983.

**USE OF 28-GeV PROTON EXTERNAL BEAM FOR NUCLEAR SPECTROSCOPY AND NUCLEAR REACTION STUDIES**

## SUMMARIES OF EXPERIMENTS

BROOKHAVEN - Y-Y Chu, S Katcoff (✓ Spokesperson)

Accelerator BNL Detector Spectrometer

Reactions

$p$  Th 28 GeV/c  
 $p$  U "

Comments Studies neutron-rich nuclides below thorium, measuring their  $\gamma$ -ray spectra and determining their level schemes. Ran for 10 hours.

Papers PR C28 (1983) 1379. No other papers expected.

**BNL-780** (Sep 1982) Approved Feb 1983; Started May 1985.

**A SEARCH FOR THE FLAVOR CHANGING NEUTRAL CURRENTS  $K_L \rightarrow \mu e$  AND  $K_L \rightarrow e^+ e^-$**

BROOKHAVEN - R C Larsen, L B Leipuner, W M Morse (Spokesperson)

YALE U - R K Adair, J K Black, H Kasha, M P Schmidt (Spokesperson), C B Schwarz

Accelerator BNL Detector ?

Reactions

$K_L \rightarrow \mu\text{on } e^\pm$  4-12 GeV/c  
 $K_L \rightarrow e^+ e^-$  "  
 $K_L \rightarrow \mu^+ \mu^-$  "

Particles studied  $K_L$

Comments A sensitivity to branching fractions as small as about  $10^{-10}$  is expected. Approved for 1000 hours, with 497 hours run as of November 86.

**BNL-781** (Sep 1982) Approved Feb 1983; Started Jan 1984.

**SPIN DEPENDENCE OF THE  $\Lambda$  NUCLEUS INTERACTION DETERMINED BY OBSERVATION OF HYPERNUCLEAR  $\gamma$  RAYS**

BROOKHAVEN - S Bart, R E Chrien, M May (Spokesperson), P Pile

MIT - M Deutsch (Spokesperson)

HOUSTON U - E V Hungerford, B Mayes, L Pinsky

CARNEGIE MELLON U - P Barnes

VASSAR COLL - R L Stearns

NEW YORK U - B Budick

Accelerator BNL Detector Spectrometer

Reactions

$K^-$  nucleus  $\rightarrow \pi^-$  hypernuc  $\gamma(s)$  800 MeV/c

Particles studied hypernuc

Comments A continuation of BNL-760. Approved for 1028 hours, with 878 hours run as of November 86.

**BNL-782** (Sep 1982) Approved Feb 1983; Started Jul 1984.

**SPIN-SPIN EFFECTS IN MEDIUM AND HIGH MOMENTUM TRANSFER ELASTIC  $pp$  SCATTERING**

MICHIGAN U - R J Bruni, P R Cameron, G R Court,

D G Crabb, R L Cummings, I Gialas, F Z Khiari,

A D Krisch (✓ Spokesperson), A M T Lin, R R Raylman,

R S Raymond, T Roser, K M Terwilliger

BROOKHAVEN - K A Brown, G T Danby, Y Y Lee,

L G Ratner

MARYLAND U & MICHIGAN U - D C Peaslee

NOTRE DAME U - J R O'Fallon

RICE U - J B Roberts

TEXAS A AND M - T S Bhatia, G Glass, L C Northcliffe

ZURICH, ETH - M Simonius

Accelerator BNL Detector Counter

Reactions Polarized beam and target

$p p \rightarrow p p$  13-26 GeV/c

Comments Continues to higher energies studies at Argonne of spin-spin effects. Approved for 700 hours, with 283 hours run as of November 86.

Papers PR D31 (1985) 3017, and PRL 57 (1986) 507.

**BNL-785** (Jan 1983) Approved Feb 1983; Started Jul 1984; Completed Feb 1986.

**SINGLE SPIN ASYMMETRY MEASUREMENT IN INCLUSIVE  $\bar{p}p$  REACTIONS AT BEAM MOMENTA UP TO 24 GeV/c AND HIGH TRANSVERSE MOMENTUM**

BROOKHAVEN - D S Barton, G Bunce, A S Carroll, Y I Makdisi (✓ Spokesperson)

MINNESOTA U - H Courant, K Heller, S Heppelman,

M Marshak, M Shupe (✓ Spokesperson)

SOUTHEASTERN MASS U - J J Russell

Accelerator BNL Detector Single-arm spectrometer

Reactions Polarized beam

$p p \rightarrow \pi^+ X$  24 GeV/c  
 $p p \rightarrow \pi^- X$  "  
 $p p \rightarrow K^+ X$  "  
 $p p \rightarrow K^- X$  "  
 $p p \rightarrow p X$  "

Comments Ran for 624 hours.

**BNL-787** (Sep 1983) Approved Oct 1983; Started Jun 1984.

**A STUDY OF THE DECAY  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$**

BROOKHAVEN - I-H Chiang, R A Johnson, T F Kycia

(Spokesperson), K K Li, L S Littenberg, R C Strand

CARNEGIE MELLON U - D Marlow

COLUMBIA U - M S Atiya, R Seto

PRINCETON U - W C Louis, A J S Smith (Spokesperson)

TRIUMF - E Blackmore, D A Bryman, P Kitching, J A Mc-

Donald, J-M Poutissou

Accelerator BNL Detector Counter

Reactions

$K^+ \rightarrow \pi^+ \nu \bar{\nu}$  0 MeV/c  
 $K^+ \rightarrow \pi^+$  axion "  
 $K^+ \rightarrow \pi^+$  nuino nuino "

Particles studied  $K^+$ , axion, nuino

Comments A sensitivity down to a level of about  $2 \times 10^{-10}$  is expected. Approved for 2500 hours, with 172 hours run as of November 86.

**BNL-788** (Sep 1983) Approved Oct 1983; Started May 1985.

**THE FOUR-FERMION WEAK INTERACTION AND THE DECAY OF  ${}^4_\Lambda\text{He}$  AND  ${}^5_\Lambda\text{He}$**

CARNEGIE MELLON U - P D Barnes (✓ Spokesperson),

G Diebold, G Franklin (✓ Spokesperson), R Grace,

D Hertzog, C Maher, B Quinn, J Seydoux, J Szymanski

BROOKHAVEN - S Bart, R Chrien, P Pile, R Sutter

HOUSTON U - E V Hungerford, T Kishimoto, L G Tang

NEW MEXICO U - B Bassalleck

VASSAR COLL - R Stearns

Accelerator BNL Detector Spectrometer

Reactions

$K^- \text{He} \rightarrow \pi^-$  hypernuc 800 MeV/c  
 $K^- {}^6\text{Li} \rightarrow \pi^-$  hypernuc "

Particles studied hypernuc

Comments The  ${}^5\text{He}$  hypernucleus comes from decay of the  ${}^6\text{Li}$  hypernucleus. Measures the lifetimes and branching fractions for the weak processes  $\Lambda \rightarrow p\pi^-$ ,  $\Lambda p \rightarrow np$ , and  $\Lambda n \rightarrow nn$  in the  ${}^4\text{He}$  and  ${}^5\text{He}$  hypernuclei. Approved for 650 hours, with 156 hours run as of November 86.

**BNL-789** (Feb 1984) Approved Feb 1984; Started May 1984; Completed Jun 1985.

**SEARCH FOR  $\xi(2.22)$  FORMATION IN  $\bar{p}p$  INTERACTIONS**



## SUMMARIES OF EXPERIMENTS

NEW YORK U - J H Christenson, E Hummel, G Kreiter,  
P Nemethy, J Sculli (Spokesperson), M Zuo  
BROOKHAVEN - P Yamin

Accelerator BNL Detector Wire chamber

Reactions

$\bar{p} p \rightarrow K^+ K^-$  1.2-1.6 GeV/c  
 $\bar{p} p \rightarrow \pi^+ \pi^-$  "

Particles studied X(2220)

Comments Ran for 1829 hours.

**BNL-790** (Feb 1984) Approved Feb 1984; Started Apr 1984;  
Completed May 1984.

**NUCLEAR STOPPING POWER MEASUREMENTS  
WITH 18-GeV/c PROTONS**

BROOKHAVEN - D S Barton, G Bunce, A S Carroll,  
Y Y Chu, J B Cumming, P E Haustein, S Katcoff,  
T W Ludlam, Y Makdisi, L P Remsberg (Spokesperson)  
MINNESOTA U - B Baller, J Blazey, B Collick, H Courant,  
K Heller, M Marshak, E Peterson, M Shupe, D S Wahl  
SOUTHEASTERN MASS U - S Gushue, J Russell

Accelerator BNL Detector Single-arm spectrometer

Reactions

$p$  nucleus  $\rightarrow p X$  17 GeV/c

Comments Measures inclusive proton spectra to determine  
the rate of energy loss of high energy protons traversing  
nuclear matter. Ran for 144 hours.

**BNL-791** (1984) Approved Jun 1984; Started Apr 1985.

**STUDY OF VERY RARE  $K_L$  DECAYS**

UCLA - R D Cousins (Spokesperson), P Melese  
LOS ALAMOS - J F Frank, W Kinneson, J W Lillberg,  
R McKee, Jr, G Sanders  
PENN U - W R Molzon (Spokesperson), W D Wales  
PRINCETON U - J F Greenhalgh  
STANFORD U - G M Irwin, J L Ritchie, S G Wojcicki  
TEMPLE U - L B Auerbach, V L Highland, W K McFarlane

Accelerator BNL Detector Spectrometer

Reactions

$K_L \rightarrow \mu\text{on } e^\pm$  4-20 GeV/c  
 $K_L \rightarrow \mu^+ \mu^-$  "  
 $K_L \rightarrow e^+ e^-$  "  
 $K_L \rightarrow \pi^0 e^+ e^-$  "  
 $K_L \rightarrow \pi^0 \mu\text{on } e^\pm$  "

Particles studied  $K_L$

Comments The first priority is a search for  $K_L \rightarrow \mu e$  with  
a branching-ratio sensitivity of  $10^{-12}$ . Approved for 2500  
hours, with 233 hours run as of November 86.

**BNL-793** (Aug 1984) Approved Oct 1984.

**SEARCH FOR FRACTIONALLY CHARGED NUCLEI  
IN 15 A GeV SULFUR-OXYGEN COLLISIONS**

UC, BERKELEY - P B Price ( $\checkmark$  Spokesperson), M H Salamon

Accelerator BNL Detector Plastic

Reactions

Su Pb 15 GeV ( $E_{\text{lab}}/N$ )

Particles studied quark

Comments Looks for quarks bound to nuclear fragments.  
Approved for 8 hours, with 2 hours run as of November 86.

**BNL-794** (Aug 1984) Approved Oct 1984; Started Mar 1985.

**ONE-SPIN EFFECTS IN  $pp \rightarrow pp$  AT HIGH  $p_\perp^2$**

MICHIGAN U - P R Cameron, G R Court, D G Crabb,  
I Giasal, F Z Khiari, A D Krisch (Spokesperson),  
A M T Lin, G de Muth, R S Raymond, T Roser,  
K M Terwilliger

BROOKHAVEN - K A Brown, G T Danby, L G Ratner  
MARYLAND U & MICHIGAN U - D C Peaslee  
NOTRE DAME U - J R O'Fallon

RICE U - J B Roberts

TEXAS A AND M - T S Bhatia, G Glass, L C Northcliffe  
ZURICH, ETH - M Simonius

Accelerator BNL Detector Double-arm spectrometer

Reactions Polarized target

$p p \rightarrow p p$  28 GeV/c

Comments Measures elastic differential cross sections in  
different initial spin states in the large  $p_\perp^2$  region from 6.6  
to 8 (GeV/c)<sup>2</sup>. Continues studies of BNL-748. Approved for  
1200 hours, with 483 hours run as of November 86.

Papers PR D32 (1985) 3070.

**BNL-795** (Sep 1984) Approved Oct 1984; Started Feb 1985;  
Completed May 1985.

**MEASUREMENT OF THE IMAGINARY PART OF  
THE  $I = 1 \bar{N} N$  S-WAVE SCATTERING LENGTH AT  
THRESHOLD**

BROOKHAVEN - D I Lowenstein  
HOUSTON U - M Furic, E Hungerford, T Kishimoto, B Mays,  
L Pinsky, L Tang, Y Xue  
KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
KARLSRUHE U - S Cierjacks, H Poth  
NEW MEXICO U - B Bassalleck  
PENN STATE U - T A Armstrong, R A Lewis, W Lochstet,  
B Y Oh, S M Playfer, G A Smith ( $\checkmark$  Spokesperson),  
J Whitmore  
RICE U - J Buchanan, J Clement, J Kruk, B Moss, G Mutch-  
ler, W von Witsch

Accelerator BNL Detector Wire chamber

Reactions

$\bar{n} p \rightarrow \text{annihil}$  < 1 MeV ( $T_{\text{lab}}$ )

Particles studied baryonium

Comments Measures the product ( $\bar{n}$  velocity)<sup>\*</sup>(annihilation  
cross section) at energies very close to the  $\bar{n} p$  threshold.  
Complimentary to BNL-767. Ran for 1104 hours.

**BNL-798** (Sep 1984) Approved Oct 1984.

**STUDY OF STRANGENESS IN NUCLEI BY USE OF  
THE ( $\pi^+$ ,  $K^+$ ) REACTION**

BROOKHAVEN - S Bart, R E Chrien, P H Pile  
( $\checkmark$  Spokesperson), R J Sutter  
CARNEGIE MELLON U - P D Barnes, G Diebold,  
G B Franklin, D Herzog, J Seydoux, J Symanski  
FLORIDA STATE U - H Plendl  
HOUSTON U - E V Hungerford, T Kishimoto  
LOS ALAMOS - J F Amann, T S Bhatia, J A McGill,  
E C Milner, J C Peng ( $\checkmark$  Spokesperson), R Silbar,  
H A Thiessen

RUTGERS U - C Glashauser  
TEXAS U - M Barlett, G W Hoffman  
TRIUMF - D Gill  
VASSAR COLL - R L Stearns

Accelerator BNL Detector Spectrometer

Reactions

$\pi^+$  nucleus  $\rightarrow K^+$  hypernuc 1.05 GeV/c  
 $\pi^+$  deut  $\rightarrow K^+$  dibaryon ( $S = -1$ ) "

Particles studied hypernuc, dibaryon ( $S = -1$ )

Comments Extends measurements of BNL-758. Approved for  
600 hours.

**BNL-801** (Sep 1984) Approved Oct 1984.

**A SEARCH FOR QUARKS PRODUCED IN HEAVY-  
ION MERCURY INTERACTIONS**

SAN FRANCISCO STATE U - R W Bland, S Dickson,  
C L Hodges ( $\checkmark$  Spokesperson), R Johnson, M Lindgren,  
M Savage

## SUMMARIES OF EXPERIMENTS

Accelerator BNL Detector Other

Reactions

Su Hg 15 GeV ( $E_{lab}/N$ )  
O Hg "

Particles studied quark

Comments Quarks produced in collisions of oxygen and sulfur with a mercury target are stopped in the target, which then is distilled and run through an automated Millikan-type device. Quarks are also stopped in a liquid argon tank and collected electrostatically, then dissolved in mercury for the Millikan apparatus. Approved for 72 hours. Runs in late 1986.

**BNL-802** (Sep 1984) Approved Oct 1984.

**STUDIES OF PARTICLE PRODUCTION AT EXTREME BARYON DENSITIES IN NUCLEAR COLLISIONS AT THE AGS**

BROOKHAVEN - D Alburger, P D Bond, C Chasman, Y Y Chu, J B Cumming, J M van Dijk, E Duek, O Hansen (Spokesperson), P Haustein, S Katcoff, M J LeVine, T Ludlam, J Olness, A Pfoh, L P Remsburg, A Shor, A Sunyar, M Tanaka, M J Tannenbaum, P Thieberger, P Vincent, H Wegner

HIROSHIMA U - T Sugikate

LBL - D Greiner, T Mulera, V Perez-Mendez

MIT - H A Enge, L Grodzins, R J Ledoux, S G Steadman, D Woodruff

TOKYO U - Y Akiba, H Hamagaki, O Hashimoto, S Homma, Y Miake, S Nagamiya (Spokesperson)

Accelerator BNL Detector Single-arm spectrometer

Reactions

$^{32}\text{Su}$  nucleus  $\rightarrow$  charged X ---  
 $^{16}\text{O}$  nucleus  $\rightarrow$  charged X ---

Comments Aims to establish effective temperatures in hard nucleus-nucleus conditions and to measure particle production cross sections. Measures inclusive spectra of  $\pi^\pm$ ,  $K^\pm$ ,  $p^\pm$  under well-defined, variable trigger conditions. Approved for 1000 hours, with 322 hours run as of November 86.

**BNL-804** (Aug 1984) Approved Oct 1984.

**SEARCH FOR FRACTIONAL CHARGE WITH HEAVY ION BEAMS AT THE BROOKHAVEN AGS**

INDIANA U - S P Ahlen (Spokesperson)

MICHIGAN U - G Tarle (Spokesperson)

Accelerator BNL Detector Plastic

Reactions

Su nucleus 15 GeV ( $E_{lab}/N$ )

Particles studied quark

Comments Approved for 8 hours, with 2 hours run as of November 86.

**BNL-805** (Dec 1984) Approved Mar 1985.

**A SEARCH FOR GALACTIC AXIONS**

ROCHESTER U - A C Melissinos (Spokesperson), J Rogers, W Wuensch

BROOKHAVEN - H Halama, A Prodell, P Thompson

FERMILAB - W-B Fowler

Accelerator COSM Detector Other

Particles studied axion

Comments A search for a light-mass axion through its electromagnetic conversion to a photon in the presence of a strong static field. Uses a high-field large-aperture solenoid and microwave detection apparatus.

**BNL-806** (Dec 1984) Approved Mar 1985.

**NUCLEAR FRAGMENTATION IN HEAVY ION COLLISIONS AT 15 GeV/amu**

SIEGEN U - C Brechtmann, J Dreute, W Heinrich (✓ Spokesperson)

Accelerator BNL Detector Plastic

Reactions

$^{32}\text{Su}$  nucleus 15 GeV ( $T_{lab}/N$ )

Particles studied frag

Comments Measures the cross sections for the production of beam fragments with charges greater than six and the emission angles of fragments, and searches for anomalously short mean free paths. Approved for 10 hours, with 1 hour run as of November 86.

**BNL-808** (Feb 1985) Approved Mar 1985.

**INTERACTIONS OF 14.1 GeV/amu NUCLEI FOR  $^{16}\text{O}$  TO  $^{197}\text{Au}$  IN LIGHT AND HEAVY TARGETS**

CRACOW - R Holynski, A Jurak, B Wilczynska, H Wilczynski, W Wolter, B Wosiek, K Wozniak  
LOUISIANA STATE U - W V Jones, A Olsszewski  
MINNESOTA U - P S Freier, C J Waddington (✓ Spokesperson)

Accelerator BNL Detector Emulsion

Reactions

$^{16}\text{O}$  nucleus 15 GeV ( $T_{lab}/N$ )  
 $^{32}\text{Su}$  nucleus "  
 $^{197}\text{Au}$  nucleus "

Comments A search for evidence for a quark-gluon plasma. Uses chambers. Approved for 40 hours. The  $^{16}\text{O}$  exposure was completed November 86.

**BNL-810** (Jan 1985) Approved Mar 1985.

**A SEARCH FOR QUARK MATTER (QGP) AND OTHER NEW PHENOMENA UTILIZING HEAVY ION COLLISIONS AT THE AGS**

BROOKHAVEN - A Etkin, K J Foley, R W Hackenburg, R S Longacre, W A Love, T W Morris, E D Platner (✓ Spokesperson), A C Saulys

BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum (✓ Spokesperson)

CITY COLL, N Y - C Chan, M A Kramer  
JOHNS HOPKINS U - P Halman, L Madansky

Accelerator BNL Detector MPS

Reactions

p nucleus 15 GeV ( $T_{lab}/N$ )  
 $^{32}\text{Su}$  nucleus "  
 $^{12}\text{C}$  nucleus "

Comments Searches for anomalous behavior in rapidities, multiplicities, strangeness enhancements, transverse momenta, energy flows, etc. Targets are carbon, sulfur, and gold. The tracking and momentum analysis of most of the charged particles emitted in individual events permit a very sensitive search for anomalous phenomena such as a quark-gluon plasma. Approved for 1650 hours, with 9 hours run as of November 86.

**BNL-811** (Jan 1985) Approved Mar 1985, Jun 1986.

**RADIATIVE KAON CAPTURE AND HYPERON WEAK RADIATIVE DECAY**

BIRMINGHAM U - N Hessey, J Lowe

BOSTON U - K P Gall, C Heisey, E K McIntyre, J P Miller, B L Roberts (Spokesperson), W VanRiper, D W Warner, D A Whitehouse

BRITISH COLUMBIA U - M D Hasinoff, D F Measday, A J Noble, C Waltham

BROOKHAVEN - M Sakitt, J Skelly

CASE WESTERN RESERVE U - W Fickinger, K Robinson

BUDAPEST, CRIP & TRIUMF - D Horvath

TRIUMF - M Salomon

Accelerator BNL Detector Counter

## SUMMARIES OF EXPERIMENTS

### Reactions



Particles studied  $\Lambda, \Sigma^+$

Comments Measures the above reactions for stopping  $K^-$  and the weak radiative decays of the  $\Lambda$  and  $\Sigma^+$ . Approved for 1550 hours, with 356 hours run as of November 86.

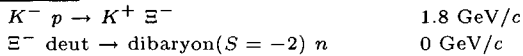
**BNL-813** (Jan 1985) Approved Mar 1985.

### SEARCH FOR A STRANGENESS -2 DIBARYON

CARNEGIE MELLON U - P D Barnes ( $\checkmark$  Spokesperson),  
G Diebold, G Franklin ( $\checkmark$  Spokesperson), D Hertzog,  
B Quinn, J Seydoux, J Szymanski, C Yi  
BROOKHAVEN - S Bart, R Chrien, P Pile, R Sutter  
ERLANGEN U - W Eyrich, A Hofmann  
FREIBURG U - J Franz, N Hamann, E Roessle, H Schmitt  
HOUSTON U - E V Hungerford  
NEW MEXICO U - B Bassalleck  
PITTSBURGH U - S Dytman  
SACLAY - P Birien  
VASSAR COLL - R L Stearns

Accelerator BNL Detector Spectrometer, Counter

### Reactions



Particles studied dibaryon( $S = -2$ )

Comments Covers from about 100 MeV below to 20 MeV above the  $\Lambda\Lambda$  mass. Approved for 1000 hours, but the experiment is conditional on the building of a new beam line. See also BNL-836 for a search in the reaction  $K^- \text{ } ^3\text{He} \rightarrow K^+ \text{ dihyperon } N$ .

**BNL-814** (Feb 1985) Approved Nov 1985.

### STUDY OF EXTREME PERIPHERAL COLLISIONS AND OF THE TRANSITION FROM PERIPHERAL TO CENTRAL COLLISIONS IN REACTIONS INDUCED BY RELATIVISTIC HEAVY IONS

BROOKHAVEN - M Fatyga, R Hogue, D Lissauer, T Ludlam,  
L Olsen, V Polychronakos, I Stumer  
CEBAF - V Burkert  
CERN - W J Willis  
LOS ALAMOS - J Boissevain, N J DiGiacomo, A Gavron,  
H Van Hecke, B V Jacak, P L McGaughey, W E Sondheim,  
J W Sunier  
MICHIGAN STATE U - M Maier  
NEW MEXICO U - B Bassalleck, J Hall, N Kominos, D Wolfe  
PITTSBURGH U - W Cleland, J Saladin, J Thompson  
SUNY, STONY BROOK - P Braun-Munzinger  
( $\checkmark$  Spokesperson), P Paul, J Stachel, T Throwe, L Waters  
TEL AVIV U - O Benary, S Dagan, Y Oren  
YALE U - B Shivakumar

Accelerator BNL Detector Spectrometer, Calorimeter

### Reactions



Comments Combines  $4\pi$  calorimetry with a high-resolution forward spectrometer, allowing a completely exclusive study of the projectile fragmentation region and a detailed study of more central collisions. Approved for 1200 hours. Scheduled to take test data in Spring 87 and to complete setting up in Summer 88.

**BNL-815** (1985) Approved Mar 1986.

### PARTICLE PRODUCTION AND NUCLEAR FRAGMENTATION IN COLLISIONS OF HEAVY IONS IN EMULSION AT AGS ENERGIES

RAJASTHAN U - K B Bhalla, V Kumar, S Lokanathan

WASHINGTON U, SEATTLE - T H Burnett, J J Lord,  
R J Wilkes ( $\checkmark$  Spokesperson)  
MARBURG U - E Ganssaue  
LUND U - S Garpman, B Jakobsson, L Karlsson, B Noren,  
I Otterlund ( $\checkmark$  Spokesperson), S Persson, K Soederstroem,  
E Stenlund  
OTTAWA U - C J D Hebert  
NATIONAL RESEARCH COUNCIL, OTTAWA - B Judek  
JAMMU U - L Mangotra, N K Rao  
BEIJING, IHEP - P Y Zheng  
SHANXI NORMAL U - J F Sun  
TASHKENT, FTI - S A Asimov, G M Chernov,  
K G Gulamov, G Guliamov, W S Nawotny  
HUA-ZHONG NORMAL U - X Cai, L S Lian  
LEBEDEV INST - M I Tretyakova  
GRENOBLE, CEN - F Schussler

Accelerator BNL Detector Emulsion

### Reactions



Comments Uses emulsion chambers with lead calorimeters as well as emulsion stacks. Studies pseudo-rapidity density distributions, density fluctuations, multiplicity and angular distributions, production cross sections, etc. Approved for 26 hours.

**BNL-816** (May 1985) Approved Jun 1985; Completed 1986.

### SEARCH FOR NEUTRINO OSCILLATIONS

BROOKHAVEN - M J Murtagh, D H White  
CERN - C Detraz, M Ferro-Luzzi, J M Perreau  
PARIS, CURIE UNIV VI - P Astier, J Chauveau,  
J Dumarchez, F Kovacs, A Letessier, J M Levy, Y Pons,  
A M Touchard, F Vannucci ( $\checkmark$  Spokesperson)  
BOSTON U - G Bernardi, T Chrysiopoulou, J Stone

Accelerator BNL Detector Calorimeter

### Reactions



Comments A repeat of CERN-PS-191 with 20 times more statistics. Uses a fine-grained calorimeter.

**BNL-817** (Jun 1985)

### POLARIZATION TRANSFER IN HYPERON PRODUCTION

RICE U - B E Bonner ( $\checkmark$  Spokesperson), J A Buchanan,  
J M Clement, M D Corcoran, J W Kruk, H E Miettinen,  
R M Moss, G S Mutchler, F Nessi-Tedaldi, M Nessi,  
G C Phillips, J B Roberts ( $\checkmark$  Spokesperson), P M Stevenson,  
S R Tonse  
BROOKHAVEN - A Birman, S U Chung, R C Fernow,  
H Kirk, S D Protopopescu  
JOHNS HOPKINS U - T Hallman, L Madansky  
HOUSTON U - B W Mayes, L S Pinsky  
SOUTHEASTERN MASS U - Z Bar-Yam, J Dowd, W Kern,  
E King

Accelerator BNL Detector MPS

Reactions Polarized beam



Comments Has run for 404 hours as of November 86, with a request for 400 more hours deferred.

Papers PRL (submitted).

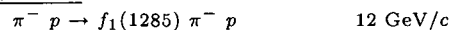
**BNL-818** (1985) Approved Mar 1986.

### SEARCH FOR A $J^{PC}$ -EXOTIC HYBRID MESON

BROOKHAVEN - S U Chung (Spokesperson)  
INDIANA U & SOUTHERN MISSISSIPPI U & RICE U - et al.

Accelerator BNL Detector MPS

### Reactions



Particles studied exotic-meson

## SUMMARIES OF EXPERIMENTS

Comments Looks for a resonance in the  $f_1(1285)\pi^-$  system.  
Approved for 1000 hours.

**BNL-820** (1985) Approved Nov 1985.

**SEARCH FOR  $S = -1$  DIBARYON RESONANCE ( $D_S$ ) IN THE MASS REGION 2050-2130 MeV USING THE REACTION  ${}^3\text{He}(K^-, \pi^+)nD_S$**

BRANDEIS U - L Bensinger, L Krisch, H Piekarz  
(Spokesperson)  
BROOKHAVEN - S Bart, R E Chrien, P H Pile, R J Sutter  
INDIANA U - T Ward  
MIT - M Deutsch  
OSAKA U - T Fukuda, T Shibata  
HOUSTON U - E V Hungerford, T Kishimoto, B Mayes,  
L Pinsky  
TEXAS U - M Barlett, G W Hoffman  
VASSAR COLL - R L Stearns

Accelerator BNL Detector Spectrometer

Reactions

$K^- {}^3\text{He} \rightarrow \pi^+ n$  dibaryon ( $S = -1$ ) 870 MeV/c

Particles studied dibaryon ( $S = -1$ )

Comments Approved for 600 hours.

**BNL-821** (Sep 1985, Sep 1986) Approved Nov 1986.

**A NEW PRECISION MEASUREMENT OF THE MUON G-2 VALUE AT THE LEVEL OF 0.35 PPM**

BOSTON U - E Hazen, C Heisey, B Kerosky, F Krienen,  
D Magaud, E K McIntyre, J P Miller, B L Roberts,  
D Stassinopoulos, L R Sulak, W Worstell  
BROOKHAVEN - H N Brown, E D Courant, G T Danby,  
C R Gardner, J W Jackson, M May, A Prodell, R Shutt,  
P A Thompson  
CITY COLL, N Y - M S Lubell  
COLUMBIA U - A M Sachs  
CORNELL U - T Kinoshita  
HEIDELBERG U, PHYS INST - G zu Putlitz  
LOS ALAMOS - W P Lysenko  
MICHIGAN U - W Williams  
MISSISSIPPI U - J T Reidy  
SHEFFIELD U - F Combley  
TOKYO U - K Nagamine  
YALE U - S K Dhawan, A A Disco, F J M Farley,  
V W Hughes (Spokesperson), Y Kuang, H Venkateramanian

Accelerator BNL Detector Calorimeter

Reactions Polarized beam

$\mu\text{on} \rightarrow e^\pm \nu \bar{\nu}$  3.09 GeV/c

Particles studied muon

Comments Uses a 7-m-radius muon storage ring with a 1.47-tesla vertical field. Approved, with the number of hours still to be decided (December 86).

**BNL-825** (Oct 1985) Approved Nov 1985.

**RADIOCHEMICAL STUDIES OF ULTRARELATIVISTIC NUCLEAR COLLISIONS**

OREGON STATE U - C Casey, W Loveland ( $\checkmark$  Spokesperson)  
LBL - G T Seaborg  
BROOKHAVEN - Y Y Chu, J B Cumming, P E Haustein,  
S Katcoff  
PURDUE U - M Bronikowski, Y H Chung, N T Porile  
STUDSVIK SCI RES LAB, NYKOPING - K Aleklett,  
L Sihver

Accelerator BNL Detector Photon spectrometer

Reactions

${}^{16}\text{O}$  nucleus 15 GeV ( $T_{\text{lab}}/N$ )

${}^{32}\text{S}$  nucleus "

Particles studied frag

Comments Targets are copper, silver, and gold. Induced radioactivities are determined by off-line  $\gamma$  spectroscopy.

Investigates evidence for a quark-gluon plasma. Approved for 48 hours, with 37 hours run as of November 86.

**BNL-826** (Dec 1985) Approved Mar 1986.

**EXCLUSIVE EXPERIMENT OF HIGH ENERGY NUCLEAR REACTIONS INDUCED BY  ${}^{32}\text{S}$  IONS WITH 15 GeV/N AT THE BNL AGS**

SAGA UNIV, JAPAN - H Itoh ( $\checkmark$  Spokesperson)  
TOHOKU U - M Chida, T Hayashino, Y Yamamoto  
NAGOYA U - K Nakazawa  
OSAKA U - R Ihara, T Nakai  
SAGAMI INST TECH - H Sugimoto, K Taira  
GIFU U - S Tasaka  
UTSUNOMIYA U - Y Sato  
KANAGAWA U - N Tateyama

Accelerator BNL Detector Emulsion

Reactions

${}^{32}\text{S}$  nucleus 15 GeV ( $T_{\text{lab}}/N$ )

${}^{12}\text{C}$  nucleus "

Comments Uses emulsion chambers in a 2-tesla magnetic field. A search for evidence for a quark-gluon plasma, etc. Approved for 10 hours. Scheduled to run May 87.

**BNL-828** (Jan 1985) Approved Mar 1986.

**SEARCH FOR  $\eta$ -MESIC NUCLEUS WITH THE  $(\pi^+, p)$  REACTION AT 0.85 GeV/c**

LOS ALAMOS - B J Dropesky, R J Estep, G C Giesler,  
L C Liu ( $\checkmark$  Spokesperson)  
WILLIAM AND MARY COLL - M Finn, H Funsten  
( $\checkmark$  Spokesperson), C F Perdrisat  
BROOKHAVEN - S Bart, R E Chrien ( $\checkmark$  Spokesperson),  
P H Pile, R J Sutter, T E Ward  
GEORGE MASON U - B J Lieb  
RUTGERS U - R D Ransome  
HOUSTON U - T Kishimoto  
VASSAR COLL - R L Stearns  
VIRGINIA TECH - C E Stronach

Accelerator BNL Detector Spectrometer

Reactions

$\pi^+$  nucleus  $\rightarrow p X$  0.85 GeV/c

Comments The targets are lithium, carbon, oxygen, and magnesium. Investigates a prediction of strongly bound systems of the  $\eta$  meson and nuclei. Approved for 120 hours.

**BNL-829** (Jan 1986) Approved 1986.

**SEARCH FOR  $S = -1$  THREE BODY BOUND SYSTEM**

HOUSTON U - E V Hungerford, T Kishimoto  
( $\checkmark$  Spokesperson), B Mayes, L Pinsky  
BRANDEIS U - H Piekarz  
BROOKHAVEN - S Bart, R E Chrien, P H Pile, R J Sutter,  
T E Ward  
MIT - M Deutsch  
OSAKA U - T Fukuda, T Shibata  
TEXAS U - M Barlett, G W Hoffman  
VASSAR COLL - R L Stearns

Accelerator BNL Detector HYPERSPEC

Reactions

$K^- {}^3\text{He} \rightarrow \pi^- X$  715 MeV/c

Particles studied hypernuc

Comments Searches for a  $\Lambda_{pp}$  bound state. Later may search for a  $\Lambda_{nn}$  state in  $K^- {}^3\text{He} \rightarrow \pi^+ X$ . Approved for 16 hours.

**BNL-834** (Jan 1986) Approved Mar 1986.

**STUDY OF HADRONIC HARD SCATTERING WAVE FUNCTIONS USING ELASTIC SCATTERING INSIDE NUCLEI**

## SUMMARIES OF EXPERIMENTS

BROOKHAVEN - D S Barton, G M Bunce, A S Carroll

( $\checkmark$  Spokesperson), S Gushue, Y I Makdisi  
MINNESOTA U - H Courant, G Y Fang, K J Heller,  
S Heppelmann ( $\checkmark$  Spokesperson), M L Marshak,  
E A Peterson, K Ruddick, M A Shupe  
SOUTHEASTERN MASS U - J J Russell

Accelerator BNL Detector Spectrometer

Reactions

$\pi^- p \rightarrow \pi^- p$  10 GeV/c

Comments Studies elastic  $\pi^- p$  scattering from protons in nuclei as a function of A. Approved for 800 hours. Scheduled to run December 86.

**BNL-835** (Apr 1986) Approved Jun 1986.

**KAON-NUCLEUS TOTAL CROSS SECTION MEASUREMENTS AND PARTIAL DECONFINEMENT IN NUCLEI**

TEL AVIV U - J Alster, D Ashery, J Lichtenstadt,  
M A Moinester, I Navon, E Piasetzky ( $\checkmark$  Spokesperson),  
A Rahav, I Yavin

BROOKHAVEN - S Bart, R E Chrien ( $\checkmark$  Spokesperson),  
M May, P H File, R J Sutter

Accelerator BNL Detector Counter

Reactions

$K^+$  deut 550-800 MeV/c  
 $K^+$  nucleus "

Comments Measures the ratio of  $K^+$  nucleus to  $K^+ d$  total cross sections to search for evidence for nucleon swelling in nuclei. Targets are light nuclei with  $N = Z$ . Approved for 330 hours.

**BNL-836** (May 1986) Approved Jun 1986.

**SEARCH FOR A STRANGENESS -2 DIBARYON USING A  $^3\text{He}$  TARGET**

CARNEGIE MELLON U - P D Barnes (Spokesperson),  
G Diebold, G Franklin (Spokesperson), D Hertzog, B Quinn,  
J Seydoux, J Szymanski, C Yi

BROOKHAVEN - S Bart, R Chrien, P Pile, R Sutter

ERLANGEN U - W Eyrich, A Hofmann

FREIBURG U - J Franz, N Hamann, E Roessle, H Schmitt

HOUSTON U - E V Hungerford

NEW MEXICO U - B Bassalleck

PITTSBURGH U - S Dytman

SACLAY - P Birien

VASSAR COLL - R L Stearns

Accelerator BNL Detector Spectrometer

Reactions

$K^- ^3\text{He} \rightarrow K^+ n$  dibaryon( $S = -2$ ) 1.8 GeV/c

Particles studied dibaryon( $S = -2$ )

Comments See also BNL-813 for a search in the reaction  $\Xi^- d \rightarrow$  dihyperon  $n$ . Approved for 700 hours.

**BNL-838** (Oct 1986) Approved Nov 1986.

**90° EXCLUSIVES AT 6 GeV**

BROOKHAVEN - D S Barton, G Bunce (Spokesperson),  
A S Carroll, Y I Makdisi

MINNESOTA U - H Courant, K J Heller, S Heppelmann,

M L Marshak, M A Shupe

SOUTHEASTERN MASS U - J J Russell (Spokesperson)

Accelerator BNL Detector Double-arm spectrometer

Reactions

$\pi^- p \rightarrow \pi^- p$  6 GeV/c  
 $\pi^- p \rightarrow \rho^- p$  "  
 $\pi^- p \rightarrow \pi^+ \Delta(1232 P_{33})^-$  "  
 $\pi^- p \rightarrow K^+ \Sigma^-$  "  
 $\pi^- p \rightarrow K^0 \Lambda$  "

$\pi^+ p \rightarrow \pi^+ p$  "  
 $\pi^+ p \rightarrow \rho^+ p$  "  
 $\pi^+ p \rightarrow \pi^+ \Delta(1232 P_{33})^+$  "  
 $\pi^+ p \rightarrow K^+ \Sigma^+$  "  
 $K^+ p \rightarrow K^+ p$  "  
 $K^- p \rightarrow K^- p$  "  
 $p p \rightarrow p p$  "  
 $\bar{p} p \rightarrow \bar{p} p$  "

Comments Continues studies of BNL-755 to a lower momentum, where the cross sections are larger. The apparatus is a single-arm spectrometer and a nonmagnetic arm. Approved for 500 hours.

**CERN-EMU-001** (Apr 1984) Approved Nov 1984.

**STUDY OF PARTICLE PRODUCTION AND NUCLEAR FRAGMENTATION IN COLLISIONS OF  $^{16}\text{O}$  BEAMS WITH EMULSION NUCLEI AT 13-200 A GeV**

BEIJING, IHEP - P Y Zheng

RAJASTHAN U - K B Bhalla, V Kumar, S Lokanathan

WASHINGTON U, SEATTLE - T H Burnett, J J Lord,  
R J Wilkes

LBL - E Friedlander, H H Heckman, Y J Karant,  
P J Lindstrom

LUND U - S Garpman, B Jakobsson, L Karlsson, B Noren,  
I Otterlund ( $\checkmark$  Spokesperson), S Persson, K Soderstrom,  
E Stenlund

OTTAWA U - C J D Hebert, J Hebert

NATIONAL RESEARCH COUNCIL, OTTAWA - B Judek

JAMMU U - L Mangotra, N K Rao

SHANXI NORMAL U - J F Sun

TASHKENT, FTI - S A Asimov, G M Chernov,

K G Gulamov, G Guliamov, W S Nawotny

HUA-ZHONG NORMAL U - X Cai, L S Lian

LEBEDEV INST - M I Tretyakova

GRENOBLE, CEN - F Schussler

MARBURG U - E Ganssaue

Accelerator CERN-SPS Detector Emulsion

Reactions

$^{16}\text{O}$  nucleus 13-200 GeV ( $E_{\text{lab}}/N$ )

Comments In preparation (November 86).

**CERN-EMU-002** (May 1984) Approved Nov 1984.

**SEARCH FOR FRACTIONALLY CHARGED NUCLEI IN HIGH-ENERGY OXYGEN-LEAD COLLISIONS**

UC, BERKELEY - P B Price ( $\checkmark$  Spokesperson)

CERN - G Vanderhaeghe

Accelerator CERN-SPS Detector Plastic

Reactions

$^{16}\text{O}$  Pb 200 GeV ( $E_{\text{lab}}/N$ )

Su Pb "

Ca Pb "

Particles studied quark

Comments A 1-cm thick lead sheet followed by 10 sheets of CR-39, the whole pattern being repeated then nine more times. In preparation (November 86).

**CERN-EMU-003** (Oct 1984) Approved Nov 1984.

**INTERACTIONS OF  $^{16}\text{O}$  PROJECTILE AND ITS FRAGMENTS IN NUCLEAR EMULSION AT ABOUT 60 AND 200 GeV/NUCLEON**

CAIRO U - O E Badawy (Spokesperson), A El-Hamalawy,

M El-Nadi, M El-Nagdy, A El-Shawarby, A El-Souroy,

M T Ghoneim, Z Moharram, M Mossaad, A Moussa,

N Moussa, Z A Moussa, O Osman, N Rashid, M Riad,

N M Sadek

Accelerator CERN-SPS Detector Emulsion

## SUMMARIES OF EXPERIMENTS

### Reactions

$^{16}\text{O}$  nucleus 60, 200 GeV ( $E_{\text{lab}}/N$ )

Particles studied anomalon

Comments In preparation (November 86).

**CERN-EMU-004** (Oct 1985) Approved Feb 1986.  
**MEASUREMENT OF COULOMB CROSS SECTION FOR PRODUCTION OF DIRECT ELECTRON PAIRS BY HIGH ENERGY IONS AT THE CERN SPS**

ALABAMA U, HUNTSVILLE - J C Gregory, T Hayashi

BOSTON U - S P Ahlen, A Marin

MICHIGAN U - J A Musser, G Tarle

NASA, MARSHALL - J H Derrickson, P B Eby,

W F Fountain, T A Parnell (Spokesperson), F E Roberts, Y Takahashi, J W Watts

TOKYO U - S Dake, T Ogata, T Tabuki, T Tominaga

Accelerator CERN-SPS Detector Emulsion

### Reactions

$^{16}\text{O}$  nucleus  $\rightarrow e^+ e^- X$  60, 200 GeV ( $T_{\text{lab}}/N$ )

Comments Aims to establish cross sections for use in measuring energies of very high energy cosmic rays. In preparation (November 1986).

**CERN-EMU-005** (Oct 1985) Approved Feb 1986.

**STUDY OF EXTREMELY SHORT-RANGE PARTICLE CORRELATIONS IN HIGH-ENERGY ION COLLISIONS**

ALABAMA U, HUNTSVILLE - J C Gregory, T Hayashi

NASA, MARSHALL - J H Derrickson, P B Eby,

W F Fountain, T A Parnell, F E Roberts, Y Takahashi (Spokesperson), J W Watts

TOKYO U - S Dake, M Fuki, O Miyamura, S Nagamiya, T Ogata, T Tabuki

Accelerator CERN-SPS Detector Emulsion

### Reactions

$^{16}\text{O}$  nucleus 15, 50, 200 GeV ( $T_{\text{lab}}/N$ )

Comments Uses an emulsion chamber with air gaps between plates in a 2-tesla magnetic field. Measures two-particle angular correlations for both like-charge and unlike-charge pairs. In preparation (November 1986).

**CERN-EMU-006** (Mar 1986) Approved Jun 1986; Completed Oct 1986.

**STUDY OF THE PRODUCTION MECHANISMS AND DECAY PROPERTIES OF CHARMED PARTICLES OBSERVED IN NUCLEAR EMULSION COUPLED TO THE NA14 SPECTROMETER**

BOLOGNA U & INFN, BOLOGNA - A Forino, R Gessaroli, A Quareni-Vignudelli, F Viaggi

CERN - G Vanderhaeghe

FLORENCE U & INFN, FLORENCE - M Bocciolini, A Conti

( $\checkmark$  Spokesperson), M G Dagliana, M Meschini, G Parrini

GENOA U & INFN, GENOA - G Tomasini

LEBEDEV INST - M I Adamovich, Y A Alexandrov,

N M Chernyavsky, S G Gerassimov, S P Kharlamov,

V G Larionova, G I Orlova, N G Peresadko, N A Salmanova,

M I Tretyakova

Accelerator CERN-SPS Detector Emulsion, Spectrometer

### Reactions

$\gamma$  nucleus  $\rightarrow$  charm X 70-200 GeV/c

Particles studied  $\Lambda_c^+$ , charm

Comments A hybrid experiment, using the particle identification power and microstrip vertex detector of the NA-14 spectrometer to speed and enrich the detection of charmed particles.

**CERN-IS-010** (1982) Approved Apr 1982.

**DETERMINATION OF THE  $\nu_e$  MASS FROM EXPERIMENTS ON ELECTRON-CAPTURE BETA DECAY (EC)**

AARHUS U - J U Andersen, P G Hansen, E Laegsgaard, K Riisager

CERN - D F Anderson, G Charpak, H L Ravn, A De Rujula

CHALMERS UNIV TECH - B Jonson ( $\checkmark$  Spokesperson)

RISO NATIONAL LAB. DENMARK - B Elbek, P Knudsen,

J Pedersen

LUND U - H A Gustafsson

ZFK, ROSSENDORF - G J Beyer

MADRID, CONSEJO SUPERIOR - M J G Borge

Accelerator CERN-SC Detector ?

Particles studied  $\nu_e$

Comments Measures the shape of the internal bremsstrahlung spectrum in electron capture near its upper end point. Uses  $^{193}\text{Pt}$ ,  $^{163}\text{Ho}$ , and  $^{81}\text{Kr}$ . Taking data (November 86).

**CERN-LEP-ALEPH** (1982) Approved Nov 1982.

**THE ALEPH DETECTOR**

ALEPH COLLABORATION

ATHENS U - E Simopoulou, A Vayaki

BARCELONA, AUTONOMA U - J M Crespo, E Fernandez,

X Furio, L Garrido, M Martinez, P Mato, R Miquel,

S Orteu, J Perlas

BARI U - M G Catanesi, G Iaselli, G Maggi, S Natali,

S Nuzzo, M De Palma, T Ranieri, F Romano, F Ruggieri,

G Selvaggi, G Zito

BEIJING, IHEP - Y B Chen, S H Gu, Y Guo, D Huang,

Y Huang, J F Lin, Z Qian, D R Wang, S G Wang, T Wang,

X L Wang, W M Wu, Y G Xie, Y L Xu, W G Yan,

J Q Zhang, H Q Zhao, W R Zhao

CERN - C Arnault, A Ball, P Battaiotto, A Blondel,

J Boucrot, J Bourotte, R Budde, T Charity, D C Cundy,

H Drevermann, F Dydak, A Farilla, M Ferro-Luzzi,

A Ghiselli, J C Gouache, R Hagelberg, F James,

B Jost, G Kellner, A Lacourt, P Lazeyras, I Lehraus,

T Lohse, G P Mannonchi, A Marchioro, P S Marrocchesi,

J M Maugain, J May, R McClatchey, A Minten, P Palazzi,

G Petrucci, I Pizer, M Poppe, A Putzer, F Ranjard,

M Reyrolle, W Richter, W Von Rueden, W D Schlatter,

G Stefanini, J Steinberger (Spokesperson), H Taureg,

W Tejessy, J Thomas, H W Wachsmuth, H Wahl,

W Witzeling, J Wotschack

CLERMONT-FERRAND U - M Bardadin-Otwinowska,

M Brossard, A Falvard, J Jousset, B Michel, J C Montret,

D Pallin, M Querrou

BOHR INST - H Bertelsen, J Dines-Hansen, J R Hansen,

P Hansen, A Lindahl, B Madsen, R Mollerud, B S Nilsson,

G Petersen

EDINBURGH U - D J Candlin, J Muir, P Osborne, K J Peach

FLORIDA STATE U - C Georgiopoulos, J Lannuti,

D Levinthal

FRASCATI - R Baldini, G Bencivenni, G Bologna,

P Campana, G Capon, F Celani, V Chiarella, G Felici,

P Laurelli, G P Murtas, B D'Ettore Piazzoli, P Picchi

GLASGOW U - A Conway, R Edgecock, A J Flavell,

J Hearn, I S Hughes, K W Ledingham, J G Lynch,

D J Martin, P J Negus, R O'Neill, C Raine, J M Scarr,

K M Smith, D T Stewart, A S Thompson, R M Turnbull

HEIDELBERG U, IHEP - O Braun, R Brazioli, C Geweniger,

P Hanke, V Hepp, E E Kluge, M Panter, H Plothow-Besch,

B Rensch, K Tittel

INNSBRUCK U - P Girtler, D Kuhn, G Rudolph

LANCASTER U - C Bowdery, A Finch, F Foster, G Hughes,

T Sloan

IMPERIAL COLL - R Beuselinck, D M Binnie, W Cameron,

R J Campbell, P J Dornan, D A Garbutt, G Hall, J Hassard,

A Heinson, W G Jones, M MacDermott, J G McEwen,

J K Sedgbeer, D M Websdale

MAINZ U, INST PHYS - L Bauerdick, G Hubricht,

K Kleinnecht, J Knobloch, E Mueller, D Pollmann, B Renk,

J Richstein, K Schmitz

## SUMMARIES OF EXPERIMENTS

- MARSEILLE U, LUMINY - J P Albanese, J J Aubert, R Bazzoli, M Belliard, C Benchouk, A Bonissent, G D'Agostini, A Ealet, F Etienne, Y Gally, V Mallet, R Nacasch, P Payre, B Pietrzyk
- MUNICH, MAX PLANCK INST - W Blum, M Bosman, H Brettel, M Comin, H Dieltl, P Holl, G Lutjens, G Lutz, W Maenner, R Richter, R Settles, U Stiegler, U Stierlin, G Stimpf, W Tribanek, P K Weissbach
- ORSAY, LAL - G De Bouard, O Callot, A Cordier, M Davier, S Dugeay, D Fournier, J F Grivaz, P Heusse, J Lefrancois, A M Lutz, G Rahal-Callot, G Raso, J J Veillet
- ECOLE POLYTECHNIQUE - J Badier, F Boillot, G Bonneaud, M Haguenaouer, F Jacquet, A Rouge, H Videau, I M Videau, M Zentilin
- PISA U - S R Amendolia, G Bagliesi, G Batignani, A Bigi, L Bosisio, U Bottigli, P L Braccini, C Bradaschia, F Fidecaro, L Foa, E Focardi, F Forti, M Giorgi, A Lusiani, I Mannelli, G Pierazzini, G Sanguinetti, S Scapellato, R Tenchini, G Tonelli, G Triggioni
- ROYAL HOLLOWAY COLL - E H Bellamy, M G Green, M Landon, P V March, A McKemey, T Medcalf, M Saich, J R Strong
- RUTHERFORD - D R Botterill, R Clift, M Edwards, S M Fisher, J Harvey, P Norton, J C Thompson, B J Whittaker
- SACLAY - P Bloch, H Desportes, D Lloyd-Owen, S Loucatos, P Perez, F Perrier, B Peyaud, B Pignard, J Rander, J F Renardy, J P Schuller, B Vallage
- SHEFFIELD U - F Combley, C Wells, S Wheeler
- SIEGEN U - D Arnold, S Brandt, H Burkhardt, C Grupen, M Holder, H Meinhard, H J Meyer, E Neugebauer, M Rost, R Stuecher, K H Stupperich
- TRIESTE U - M Budinich, F Liello, E Milotti, L Rolandi
- WISCONSIN U - G Baranko, J Boudreau, M Bykhovsky, A Caldwell, D Cinabro, R Cormack, D Cowen, D Delaiman, R Dolin, M Hildebrandt, H Hilgart, R Jared, R Johnson, P Maas, M Mermikides, J Messersmith, D Mueller, Y Pan, S Price, S Ritz, D Strom, M Takashima, J Wear, D Weber, S L Wu, G Zobernig
- Accelerator CERN-LEP Detector ALEPH
- Reactions  
 $e^+ e^- < 120 \text{ GeV (Ecm)}$
- Particles studied  $W^+, W^-, Z^0$ , hvy-lepton, higgs, hvy-flavor
- Comments A  $4\pi$  detector designed to give as much detailed information as possible about complex events. For a description of the apparatus, see the LBL-91 supplement on detectors. In preparation.
- Papers NIM 225 (1984) 481, and NIM 226 (1984) 82.
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- CERN-LEP-DELPHI** (1982) Approved Nov 1982.
- DELPHI**
- AMES LAB - H B Crawley, A Firestone, J M Hauptman, J W Lamsa, W T Meyer, E I Rosenberg
- NIKHEF, AMSTERDAM - G Van Apeldoorn, P Van Dam, A N Diddens, H Jansen, B Koene, D Langerveld, R de Miranda, J Timmermans, D Toet, F Udo
- DEMOCRITOS NUCLEAR RESEARCH CENTER - M Dris, P Kokkinias, P Kostarakis, A Markou, G Theodosiou, E Zevgolatakos
- ATHENS U - E Anassontzis, P Ioannou, G Kalkanis, S Katsanevas, C Kourkoumelis, J Koutentakis, A Manousakis, P Pramantiotis, L K Resvanis, S Tzamarias, M Vassiliou, G Voulgaris
- ATHENS, TECH UNIV - T Filippas, E Fokitis, E Gazis, Y Giomataris, E C Katsoufis, A Maltezos, S Maltezos, S D P Vlassopoulos
- BRUSSELS U, IIHE - D Bertrand, M Breusers, C De Clercq, E Daubie, W Van Doninck, F Grard, P Herquet, J Kesteman, J Lemonne, C Poiret, J Sacton, S Tavernier, C Van Der Velde-Wilquet, F Verbeure, J H Wickens
- BERGEN U - A G Frodesen, P S Iversen, A Klovning, E Lillestol, E Lillethun, J M Olsen, A K Topphol
- INFN, BOLOGNA - D Bollini, G Bruni, F R Cavallo, A Cavana, C Chiccoli, P Giusti, F Navarra, P Pasini, G Valenti
- BOHR INST - H Boggild, E Dahl-Jensen, I Dahl-Jensen, G Damgaard, K Hansen, J Hooper, R Moeller
- CERN - J V Allaby, U Amaldi ( $\checkmark$  Spokesperson), G Anzivino, P Baillon, M Barranco-Luque, W Bell, C Brand, R C A Brown, H Burmeister, S Cairanti, F Carena, A Cattai, R Cirio, G Darbo, F Etienne, H G Fischer, H Foeth, D Fraissard, P Frandsen, B R French, P Gavillet, Y Goldschmidt-Clermont, B Goret, A Grant, J P Grillet, E Gygi, B Heck, H J Hilke, R Horisberger, B D Hyams, G Kantardjian, H Klein, W Klempt, Y Kornelis, G Kuhn, G Lecoeur, J C Legrand, J C Marin, M Metcalf, G Mornacchi, H Muller, L Pape, J B Pattison, J Perez, G Petrucci, E Quercigh, P Queru, L Rossi, E Rosso, F Saldana, F Schneider, D Treille, T Tuuva, O Ullaland, P Weilhammer, A M Wetherell
- COLLEGE DE FRANCE - P Billoir, J M Brunet, M Crozon, D Delikaris, P Delpierre, P Frenkiel, E Herniou, P Lutz, J Maillard, A Tilquin, G Tristram
- CRACOW - Z Hajduck, B Muryn, G Polok, K Rybicki, M Turala, A Zalewska
- DUBNA - G D Alekseev, P N Bogolubov, Yu N Denisov, V N Golovatyuk, R B Kadyrov, V V Kruglov, G V Mitselmakher, J Rydki, A N Sissakian, L G Tkachov, E N Tsyganov, A A Tyapkin, I A Tyapkin, A S Vodopyanov, V Vrba
- GENOA U & INFN, GENOA - G Barbiellini, M Bozzo, C Caso, R Contri, G Crosetti, S Ferroni, F Fontanelli, V Gracco, M Macri, M Sannino, G Sette, S Squarcia, U Trevisan
- HELSINKI U - P Aarnio, M Ellila, R Lauhakangas, P Laurikainen, R Orava, H Saarikko, M Voutilainen
- KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - G Flugge, D Fries, G Hopp, H Muller, M Panter
- LIVERPOOL U - S Biagi, P S L Booth, L J Carroll, D N Edwards, M A Houlden, J N Jackson, B King, W H Range
- LUND U - S Almehed, G Gustafsson, R Haglund, G Jarlskog, L Joensson, S Johansson, B Lorestad
- MILAN U & INFN, MILAN - M Calvi, P Folegati, P Guazzoni, P Manfredi, C Matteuzzi, C Meroni, P Negri, A Pullia, S Ragazzi, M Rollier, M Tamborini, G Vegni, L Zetta
- ORSAY, LAL - J E Augustin, B Bouquet, G Cosme, F Couchot, B D'Almagne, A Ferrer, F Fulda, J Haissinski, B Jean-Marie, P Petroff, F Richard, P Roudeau, G Wormser
- OSLO U - L Bugge, T Buran, T Fearnley, K Kirsebom, B Skaali, S Stapnes, B Stugu
- OXFORD U - J Loken, L Lyons, G Myatt, K J Powell, D Radojicic, P Ratoff, P B Renton, A M Segar, W S C Williams, J Yelton
- PADUA U - A de Angelis, P Checchia, M Cresti, U Gasparini, M Mazzucato, M Nigro, M Pegoraro, L Ventura, G Zumerle
- PARIS, CURIE UNIV VI - M Baubillier, M Boratav, L Cerrito, B Grossetete, M C Touboul, C de la Vaissiere, R Zitoun
- ROME, ISS & INFN, ROME - A Baroncelli, C Bosio, G Matthiae, D Sacco, C Santoni, C Stanescu, L Tortora
- RUTHERFORD - J Barlow, B Franek, G Gopal, J G Guy, G Kalmus, R Lucock, R Sekulin, M Tyndel, W Venus
- SACLAY - R Barate, T Bolognese, P Borgeaud, P Charpentier, G Marel, Y Sacquin, P Siegrist, G Smadja, M L Turlur, D Villanova, M Virchaux
- SANTANDER U - J Cuevas, M A Lopez, J Marco, A Ruiz
- SERPUKHOV - A A Borovikov, V V Bryzgalov, P Chliapnikov, R I Dzhelyadin, A Fenjuk, L N Gerdyukov, S A Gumenyuk, V V Lapin, V F Obraztsov, Yu L Petrovykh, N E Tyurin, E V Vlasov, A P Vorobiev, A M Zajtsev
- STOCKHOLM U - M Berggren, P Carlson, G Ekspong, S O Holmgren, P O Hulth, K Hultqvist, E Johansson, T Moa, Ch Walck, N Yamdagni
- STRASBOURG - R Arnold, D Bloch, M Croissiaux, M Dracos, W Dulinski, J P Engel, J P Gerber, J L Guyonnet, D Husson, P Juillot, M Schaeffer, R Strub
- TURIN U & INFN, TURIN - F Bianchi, R Cester, D Gamba, F Marchetto, E Menichetti, G Rinaudo, A Romero
- TRIESTE U - E Castelli, L Lanceri, P Poropat, M Sessa, C Troncon-Ragusa, D Zangrando
- UPPSALA U - O Botner, L O Eek, T Ekelof, K Fransson, A Hallgren, S Kullander, B Lund-Jensen

## SUMMARIES OF EXPERIMENTS

VALENCIA U - J M Bolta, M V Castillo, J J Gomez-Cadenas, E Higon, J Martinez, M A Sanchis, J Velasco  
 VIENNA, OAW - W Adam, W Bartl, R Fruehwirt, J Hrubec, G Leder, F Mandl, W Mitaroff, M Pernicka, M Regler, C Wutte  
 WARSAW, INR - K Doroba, R Gokieli, M Gorski, T Hofmoki, J Krolkowski, R Sosnowski, M Szczekowski, M Szeptycka  
 WUPPERTAL U - K H Becks, H Braun, J Drees, H Forsbach, K W Glitza, G Lenzen, P Lorenz, D Schmidt, H Wahlen

Accelerator CERN-LEP Detector DELPHI

### Reactions

$$e^+ e^- < 120 \text{ GeV (Ecm)}$$

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , hvy-lepton, higgs, hvy-flavor

Comments For a description of the apparatus, see the LBL-91 supplement on detectors. In preparation.

Papers NIM 225 (1984) 606.

**CERN-LEP-L3** (1982) Approved Nov 1982.

### L3 EXPERIMENT

#### L3 COLLABORATION

AACHEN, TECH HOCHSCH, I PHYS INST - D Braun, Y Degen, A Schultz von Dratzig, H Genzel, T Haeck, W Kaprinski, C Kukulies, F Lurken, U Martyn, U Micke, L Niessen, D Pandoulas, G Peise, T Ponomareff, H G Sander, G Schild, D Schmitz, R Siedling, K Sudhakar, W Wallraff, J F Zhou  
 AACHEN, TECH HOCHSCH, III PHYS INST - A Bohm, C Camps, V Commichau, M Deutschmann, H Fesefeldt, P Fritze, H Graessler, K Hangarter, P Hawelka, W Krenz, D Linnhofer, K Schultze, W Struczinski, M Tonutti, S X Wu  
 NIKHEF, AMSTERDAM - R Blokzijl, R Buis, J Buskens, M A Van Driel, P Duinker, J A Dykema, F Erne, G Faber, W Gobink, D Gosman, H Van der Graaf, H Groenstege, H De Groot, D Harting, J Homma, B Hooghoudt, P Hunck, P F Klok, H Kok, G Konijn, N De Koning, M Kroezen, G G G Massaro, P Pohm, C Pols, Y Pong, H Postma, M Raaymakers, P Rewiersma, D J Schotanus, H Schuylenburg, H Sens, G De Vries, R Van der Walle, E Wassenaar, T Wynen  
 ANNECY - A Bazan, M Bermond, Y Bertsch, J F Bottollier, X De Bouard, M Caillat, B Camberlin, J Chauveau, G Coignet, A Degre, J P Denis, C Girard, C Guillon, J C Lacotte, M Lebeau, J Lecoq, M Maire, J C Le Marec, L Massonnet, R Morand, P Mugnier, A Oribini, A Pellier, D Perret-Gallix, P Petitpas, M Schneegans, J Sheng-Lu, J Toth, H Vey, M Vivargent  
 BEIJING, IHEP - C Chen, Ho-Sen Chen, Mei-Li Chen, G F Fong, Y F Gu, J T He, B N Jin, Y S Lu, Hsiao-Wei Tang, K L Tung, J H Wang, Y J Wu, K S Yang, Chang-Chen Zhang, S Y Zhang  
 TATA INST - S Banerjee, S S Chendvankar, S N Ganguli, A Gurtu, R Mahalingam, P Malhotra, R Raghavan, K Sudhakar, S Tonwar  
 BUDAPEST, CRIP - G Eszes, G Jancso, E Nagy, P Ribarics, L Urban  
 CAL TECH - R Gomez, J Hanson, T L Kwok, S Lally, T Lawrence, H Ma, R Mount, H Newmann, T Pal, M Pedram, H Stone, R Y Zhu  
 CARNEGIE MELLON U - G Bobbink, A Engler, R Kraemer, C Rippich, J Smith, R B Sutton, H Vogel, T Q Zhou  
 CERN - H Anders, U Becker, F Bruyant, M Feldmann, K Freudenreich, D Gusewell, M Harris, J T He, G Herten, A Herve, P Lecoq, L Leistam, Y S Lu, K Lubelsmeyer, L Montanet, S Reucroft, K L Tung, F Wittgenstein, J Zoll  
 WURENLINGEN, INST REAKTORFORSCHUNG - W Boehlen, M Koller, A Kuhn, R Waespe  
 FLORENCE U - M Bocciolini, A M Cartacci, F Celletti, G Ciancaglini, G Conforti, G Conforto, A Conti, G Landi, A Marchionni, B Monteleoni, G Parrini, P G Pelfer, C Ricci  
 FRASCATI - P Spillantini  
 GENEVA U - H Alcoreza, P Bene, S Bergamaschi, M Bourquin, A Cristinet, P Extermann, R Hausammann, D La Marra, F Masciocchi, R Mermod, M Nusbaumer, J Ossman, E Perrin, N Produit, J P Richeau, W Ruckstuhl, S Tentindo, M Zofka

HARVARD U - D Antreasyan, J Irion, P McBride, K Strauch, D Williams

HAWAII U - R Cence

HEFEI, CUST - He-Qian Bian, Hong-Fang Chen, Zhong-Ping Chou, Yang-Mei Fan, Cu-Fang Gong, Yong-Dian Han, Cheng Li, Zi-Yong Lin, X L Wang, Zhong-Min Wang, Zi-Zong Xu, Bao-Zhong Yang, Tie-Jian Yu

JOHNS HOPKINS U - B Blumenfeld, C Y Chien, A Pevsner, J Spangler

LAUSANNE U - T Boehringer, C Dore, M Gailloud, J Lebroussard, J P Moyard, M Rochat, P Rosselet, C Roth, R Weill

LUND U - G Von Dardel

LYON, IPN - J P Burq, M Chemarin, M Chevallier, J Fay, M Goyot, B Ille, M Lambert, P Lebrun, N Madjar, H El Mamouni, J P Martin, B Veyron

MADRID, JEN - A Adeva, M Aguilar-Benitez, M C Albajar, J Alvarez-Taviel, J Berdugo, M Cerrada, I Duran, E Gonzalez, J M Legoff, C Mana, M A Marquina, L Martinez, P Olmos, S Rodriguez, J A Rubio, J Salicio, C Willmott

MICHIGAN U - T Azemoon, R C Ball, M Capell, L W Jones, I D Leedom, J Pluta, B P Roe, H Schick

MIT - P Berges, P Bowditch, J Branson, J Burger, H Chang, H S Chen, Min Chen, M Dhina, J Donahue, F Eppling, D Fong, M Fukushima, E Henestroza, R Hoffman, D Luckey, S Marks, P Marsden, M Milbocker, Ren-Da Ning, D Osborne, J Qian, H Rykaczewski, J Tarrh, S C C Ting (✓ Spokesperson), W Toth, T Wenaus, M White, B Wyslouch, Xi Fu Yun, B Zhou, Ping Zhang Zi

MOSCOW, ITEP - A Arefiev, V Bocharov, O Fedorov, Yu Galaktionov, A Gordeev, B Gordeev, Yu Gorodkov, Yu Kamyshev, M Kosov, V Koutsenko, A Kunin, V Lulevich, N N Luzgetski, V Morgunov, A Nikitin, V Plyaskin, V Pojidaev, V Shevchenko, E Shumilov, E Tarkovsky, V Tchudakov, I Vetlitski, I Vorobyev

NAPLES U, IFS & INFN, NAPLES - F Carbonara, G Chiefari, E Drago, S Lanzano, L Merola, M Napolitano, G Paternoster, S Patricelli, C Sciacca, F Visco

NORTHEASTERN U - G Alverson, W Faissler, D Garelick, M Gettner, M Glaubman, R Polvado, D Shambroom

OHIO STATE U - J Dunlea, E Gothier, J Kalen, G Oleynik, N Reay, K Reibel, R Sidwell, K Stanton

OKLAHOMA U - G Kalbfleisch

PRINCETON U - J A Bakken, C Blino, C Bopp, P Denes, G Grazer, M Isaila, P Piroue, R Rabberman, A J S Smith, D Stickland, R Sumner

ROME U - P Bagnaia, L Barone, G Bellomi, R Bizzarri, B Borgia, F Cesaroni, M Diemoz, C Dionisi, s Falciano, F Ferroni, S Gentile, G Gratta, E Longo, P F Loverre, L Luminari, G Lunadei, F Marzano, P Monacelli, F De Notaristefani, E Petrolo, A Tusi, E Valente

SIEGEN U - U Biermann, D Mattern, E Roderburg, H Walenta

YALE U - M Zeller

BERLIN, DAW - K Deiters, M Klein, R Leiste, W D Nowak, J Schreiber, H Vogt

ZURICH, ETH - H Anderhub, P Le Coultre, J Fehlmann, H Hofer, M G Jongmanns, P Lecomte, L Li, X Lue, M Pohl, D Ren, P G Seiler, H Suter, V L Telegdi, J Ulbricht, G Viertel

Accelerator CERN-LEP Detector L3

### Reactions

$$e^+ e^- < 120 \text{ GeV (Ecm)}$$

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , hvy-lepton, higgs, hvy-flavor

Comments For a description of the apparatus, see the LBL-91 supplement on detectors. In preparation.

Papers NIM 225 (1984) 493.

**CERN-LEP-OPAL** (1982) Approved Nov 1982.

### OPAL COLLABORATION LEP

#### OPAL COLLABORATION

BIRMINGHAM U - P Hattersley, R J Homer, T McMahon, S W O'Neale, P Watkins, J Wilson



## SUMMARIES OF EXPERIMENTS

BOLOGNA U - P Capiluppi, M Dallavalle, M M Deninno, F Fabbri, G Giacomelli, G Mandrioli, S Marcellini, F Rimondi, A M Rossi

BONN U - V Borelli-Alles, H Breuker, H M Fischer, M Hauschild, R Hospes, G Knop, T P K Kokott, H Kreuzmann, B Nellen, B Wuensch

CAMBRIDGE U - J R Carter, P A Elcombe, M J Goodrick, J C Hill, W W Neale, C P Ward, D R Ward

CARLETON U - J C Armitage, R K Carnegie, P E Estabrooks, G Giles, R J Hemingway, P Mattig, A McPherson, J Pinfold, J Waterhouse

CERN - C Beard, F Beck, R Brun, H Burckhart, M Dittmar, M Hansroul, R Heuer, L Levinson, L Mazzone, A Michelini (Spokesperson), D Pjane, O Runolfsson, A D Schaile, V Sergo, A M Smith, S Weisz, N Wermes

CHICAGO U - K J Anderson, J D Hobbs, A Jigang, F S Merritt, M J Oreglia, J E Pilcher, A Possoz, W Schappert

FREIBURG U - J Ludwig, H J Mayer, W Mohr, T Poser, F Roehner, K Runge, O Schaile, J Schwarz, H E Stier, A Weltin

HEIDELBERG U, IHEP - P Bock, J W Gary, J Heintze, P Igo-Kemenes, P Lennert, H Rieseberg, B Schmidt, H von der Schmitt, A Wagner

TECHNION - S Dado

QUEEN MARY COLL - A A Carter, W R Gibson, P Kyberd, S L Lloyd, T R Wyatt

UNIVERSITY COLL, LONDON - B Anderson, A Charalambous, M Coupland, R Cranfield, F F Heymann, P Hobson, D C Imrie, D J Miller, J Wells

MANCHESTER U - J Allison, R J Barlow, I P Duerdoth, R E Hughes-Jones, G D Lafferty, F K Loebinger, P G Murphy

MARYLAND U - A Ball, C Y Chang, R G Glasser, P Hill, R Kellogg, P Rapp, G P Siroti, J A Skard, A Skuja, G A Snow, P H Steinberg, G T Zorn

MONTREAL U - G Bavaria, H Jeremie, L Lessard, B Lorazo, J P Martin

NATIONAL RESEARCH COUNCIL, OTTAWA - M S Dixit, L Godfrey, C K Hargrove, D Klem, M J Losty, H Mes, F G Oakham, C Virtue

WEIZMANN INST - D Hochman, L Levinson, G Mikenberg, D Revel, A Shapira, G Yekutieli

UC, RIVERSIDE - G Van Dalen, W Gorn, W Langeveld, J G Layter, B C Shen

RUTHERFORD - K W Bell, R M Brown, N I Geddes, C N P Gee, P W Jeffreys, C N Patrick

SACLAY - P Le Du, B Gandois, F X Gentit, B Lesquoy, J Mallet, A Muller, P Rougevin, S Zylberajch

TEL AVIV U - G Alexander, G Bella, J Grunhaus, A Levy

TOKYO U - C Fukunaga, M Imori, T Kawamoto, T Kobayashi, M Koshihira, T Mashimo, M Minowa, M Nozaki, S Orito, H Takeda, T Takeshita

Accelerator CERN-LEP Detector OPAL

Reactions

$$e^+ e^- < 120 \text{ GeV (Ecm)}$$

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , hvy-lepton, higgs, hvy-flavor

Comments A general-purpose detector. For a description of the apparatus, see the LBL-91 supplement on detectors. In preparation.

**CERN-NA-001** Approved Mar 1975, Oct 1976, Jun 1982; Completed Jun 1984.

**MEASUREMENT OF THE PHOTOPRODUCTION OF VECTOR AND SCALAR BOSONS**

FRASCATI - F Celani, M Enorini, F L Fabbri, P Laurelli, L Satta, P Spillantini, A Zallo

MILAN U - G Bellini, S Bonetti, P F Manfredi, D Menasce, E Meroni, L Moroni, L Perasso, S Sala

PISA U - S R Amendolia, E Bertolucci, D Bettoni, L Bosio, C Bradaschia, M Dell'Orso, L Foa (Spokesperson), E Focardi, A Giazotto, M Giorgi, P S Marrocchesi, A Menzione, L Ristori, A Scribano, R Tenchini

TURIN U - G A Beck, H Bilokon, G Bologna, G Mannonchi, B D'Ettore, Piazzoli, P Picchi

TRIESTE U - G Batignani, M Budinich, F Liello, F Ragusa, L Rolandi, A Stefanini

WESTFIELD COLL - E H Bellamy, F Fidecaro, G Heath, M J Landon, P V March, J R Strong

Accelerator CERN-SPS Detector Spectrometer

Reactions

$$\begin{aligned} \gamma \text{ nucleon} &\rightarrow \text{meson hadrons} && 10-180 \text{ GeV}/c \\ \gamma \text{ nucleus} &\rightarrow \text{meson nucleus} && \text{"} \end{aligned}$$

Particles studied  $\eta'$ ,  $\eta_c(2980)$ ,  $D^+$ ,  $D^-$

Comments Measurement of coherent photoproduction on nuclei to study (1) photoproduction of charmed particle pairs and determine the lifetimes of charmed particles, and (2) the spectroscopy of charmed particles in hadronic and radiative decay channels.

Papers PL 110B (1982) 339, NIM 196 (1982) 351, NIM 204 (1983) 299, NIM 226 (1984) 78, and NIM 226 (1984) 117.

**CERN-NA-002** (Jul 1974) Approved Mar 1975, Oct 1976, Feb 1979; Completed Aug 1985.

**ELECTROMAGNETIC INTERACTIONS OF MUONS**

THE EUROPEAN MUON COLLABORATION

AACHEN, TECH HOCHSCH, III PHYS INST - G Berghoff, M Dueren, F J Hasert, D Lanske, K Schultze, L Urban

ANNECY - Y Bertsch, G Coignet, J Favier

CERN - J W Beaufays, P Grafstrom, T Niinikoski, A M Osborne, J M Rieubland, E J Watson, S Wimpenny

FREIBURG U - T Dreyer, T Ernst, J Haas, H Hartenthaler, H Jung, E M Kabuss, G Kroesen, U Landgraf, W Mohr, K Rith, A Schlagboehmer, T Schroeder, H E Stier, E Tieck, W Wallucks

HAMBURG U - J Figiel, C Hoppe, F Janata, H Schiemann, M Studt, A De La Torre

HEIDELBERG, MAX PLANCK INST - D von Harrach, H Kniess, B Povh, T A Shibata, T Walcher

LANCASTER U - I Bird, J Coughlan, N Dyce, T Sloan ( $\checkmark$  Spokesperson)

LIVERPOOL U - S Brown, G R Court, D Frances, E Gabathuler, R Gamet, P Hayman, J R Holt, T Jones, M Matthews

MARSEILLE U, LUMINY - J J Aubert, C Benchouk, G D'Agostini, F Montanet, P Payre, B Pietrzyk

MONS U - R Windmolders

OXFORD U - N Geddes, V Gibson, J Gillies, J Loken, P Renton, G Taylor, W S C Williams, J Womersley

RUTHERFORD - J Alner, C P Bee, D Botterill, S Chima, R Clift, M Edwards, R Gray, P R Norton, G Oakham, J C Thompson

SHEFFIELD U - F Combley, J Foster, D Salmon, S Wheeler

TURIN U - M Arneodo, M I Ferrero, P Guibellino, S Maselli, C Peroni, A Staiano

UPPSALA U - A Arnidson, H Calen, S Dahlgren, E Hagberg, S Kullander, F Lettenstrom, T Lindquist

WARSAW U, IEP - B Badelek, J Ciboroski, J Gajewski, J Nassalski, E Rondio, A Sandacz

WUPPERTAL U - K H Becks, J Drees, A Edwards, H Forsbach, K Hamacher, B Korzen, N Pavel, H Peschel, U Pietrzyk, A Schneider, W Stockhausen, H Wahlen

YALE U - G Baum, S Dhawan, V Hughes, R Oppenheim, V Papavassiliou, M C Caputo di Piegai, R Piegai, P Schueler

BONN U - M Leenen

BUDAPEST, CRIP - G Eszes, G Jancso, E Nagy, P Ribarics, J Toth, L Urban

Accelerator CERN-SPS Detector EMC

Reactions

$$\mu^- p \rightarrow \mu^- \text{ hadrons} \quad 120-280 \text{ GeV}/c$$

Comments See also NA-009 and NA-028. Studies deep-inelastic muon scattering. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers See NA-028 for papers.

## SUMMARIES OF EXPERIMENTS

**CERN-NA-003** (Oct 1974, Sep 1980) Approved Mar 1975, Feb 1979, May 1979, Dec 1979, Nov 1980, Mar 1984; Completed Sep 1984.

### DIRECT PHOTON PRODUCTION IN HADRON-HADRON COLLISIONS AT THE SPS.

CERN - M Hansroul, A Michelini (Spokesperson), G Rahal-Callot, O Runolfsson  
 COLLEGE DE FRANCE - M Crozon, P Delpierre, P Espigat, J Maillard, A Tilquin  
 ORSAY, LAL - M Bardadin-Otwinowska, J Boucrot, O Callot, M Cohen, D Decamp, M Moniez  
 ECOLE POLYTECHNIQUE - J Badier, H Bienvenue, J Bourotte, Y Karyotakis, E Pare, S Weisz  
 PISA U & INFN, PISA - C Bemporad, A M Cnops, F Costantini, G R Giannini, P Lariccia  
 SACLAY - P Charpentier, J F Detoeuf, P Le Du, B Gandois

Accelerator CERN-SPS Detector Spectrometer

#### Reactions

$\pi^+$ nucleus $\rightarrow \gamma X$	150, 200, 280 GeV/c
$\pi^+$ nucleus $\rightarrow \mu^+ \mu^- X$	"
$\pi^-$ nucleus $\rightarrow \gamma X$	"
$\pi^-$ nucleus $\rightarrow \mu^+ \mu^- X$	"
$p$ nucleus $\rightarrow \mu^+ \mu^- X$	400 GeV/c

Comments Aims are (1) a measurement of the direct  $\gamma$  cross section and a search for the annihilation process  $q\bar{q} \rightarrow \gamma g$  from the charge asymmetry, (2) a determination of the gluon structure function of the pion and nucleon, and (3) use of the  $\pi^-/\pi^+$  difference on carbon to get the gluon fragmentation from the  $\gamma$ -hadron correlations.

Papers PL 86B (1979) 98, PL 114B (1982) 457, ZPHY C18 (1983) 281, PL 122B (1983) 441, PL 124B (1983) 535, NIM 225 (1984) 463, PL 142B (1984) 446, PL 158B (1985) 85, PL 164B (1985) 184, ZPHY C26 (1985) 489, ZPHY C30 (1986) 45, ZPHY C31 (1986) 21, and ZPHY C31 (1986) 341.

**CERN-NA-004** Approved May 1975, May 1977, Feb 1979; Completed Aug 1985.

### INCLUSIVE DEEP INELASTIC MUON SCATTERING

BOLOGNA U - G Bari, A Benvenuti, D Bollini, G Bruni, G Laurenti, L Monari, F Navarra  
 CERN - A Argento, Y Sacquin, R Voss ( $\checkmark$  Spokesperson)  
 DUBNA - D Yu Bardin, J Cvach, N G Fadeev, I A Golutvin, V Karzhavin, Yu T Kiryushin, V G Krivokhizhin, V V Kukhtin, W Lohmann, J Nemecek, P Reimer, I A Savin, G I Smirnov, D A Smolin, J Strachota, G Sultanov, P Todorov, I Veress, A G Volodko  
 MUNICH U, EXP PHYS - D Jamnik, R Kopp, U Meyer-Berkhout, A Staude, K M Teichert, R Tirlor, C Zupancic  
 SACLAY - M Cribier, J Feltesse, A Milstajn, A Ouraou, P Rich-Hennion, G Smadja, M Virchaux

Accelerator CERN-SPS Detector Spectrometer

#### Reactions

$\mu^-$ nucleus $\rightarrow \mu^-$ hadrons	100-280 GeV/c
$\mu^-$ nucleus $\rightarrow \mu^-$ muon(s) hadrons	"

Comments Aims include the study of nuclear structure functions and their dependence on atomic number, and of weak-electromagnetic interference phenomena.

Papers PL 104B (1981) 403, NIM 204 (1982) 333, NP B199 (1982) 27, NIM 212 (1983) 125, PL 120B (1983) 245, NIM 226 (1984) 330, PL 140B (1984) 142, ZPHY C28 (1985) 171, PL 158B (1985) 531, and PL 163B (1985) 282.

**CERN-NA-005** Approved Jun 1976; Completed May 1980.

### A STUDY OF HARD HADRON-HADRON COLLISIONS WITH A STREAMER CHAMBER VERTEX SPECTROMETER AND A CALORIMETER TRIGGER

BARI U - A Distante, C Favuzzi, G Germinario, L Guerriero, P Lavopa, G Maggi, C de Marzo, M de Palma, F Posa, A Raniieri, G Selvaggi, P Spinelli, F Waldner

CRACOW - A Bialas, T Coghren, W Czyz, A Eskreys, K Eskreys, K Fialkowski, D Kisielewska, B Madeyski, P Malecki, K Olkiewicz, B Pawlik, K Sliwa  
 LIVERPOOL U - W H Evans, J R Fry, C Grant, M A Houlden, A Morton, H Muirhead, J Shiers, S L Wong  
 MUNICH, MAX PLANCK INST - M Antic, W Baker, H Bechteler, T Coghren, F Dengler, I Derado, V Eckardt, J Fent, P Freund, H J Gebauer, T Kahl, R Kalbach, A Manz, P Polakos, K P Pretzl, N Schmitz, T Schouten, P Seyboth ( $\checkmark$  Spokesperson), J Seyerlein, P Stopa, D Vranic, G Wolf

NIJMEGEN U - F Crijns, W Metzger, C Pols, T Spuijbroek

Accelerator CERN-SPS Detector Streamer chamber, Calorimeter

#### Reactions

$\pi^- p$	150, 300 GeV/c
$p p$	300 GeV/c
$p p$	200 GeV/c
$p$ Ar	"
$p$ Xe	"
$\bar{p} p$	"
$\bar{p}$ Ar	"
$\bar{p}$ Xe	"

Comments The first two reactions are to study high transverse energies, the others are to study multiparticle production.

Papers PL 112B (1982) 173, PR D26 (1982) 1019, NP B211 (1983) 375, NP B227 (1983) 189, NIM 217 (1983) 405, NP B234 (1984) 1, PR D29 (1984) 263, PR D29 (1984) 2476, and ZPHY C33 (1986) 187.

**CERN-NA-006** (1976) Approved Jan 1977; Completed Apr 1980.

### NEUTRON ELASTIC SCATTERING AT VERY SMALL ANGLES

FREIBURG U - A Bamberger, U Fischer, D Friedrich, W Grosshans, W Heck, R Maier, K Runge (Spokesperson), O Schaile, H Skodzek, B Thomauske, G Volk, H C Weber  
 MOSCOW, ITEP - A Arefiev, A Babaev, G Eliseev, Yu Galaktionov, Y Gorodkov, Yu Kamyshev, V Lubimov, W Pliaskine, V E Pogidaev, V Shevchenko, M Vlasov

Accelerator CERN-SPS Detector Combination

#### Reactions

$n p \rightarrow n p$	0-400 GeV/c
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Comments The range of  $-t$  covered is  $10^{-5}$  to  $10^{-2}$  GeV<sup>2</sup>.

**CERN-NA-007** (1977) Approved Sep 1977; Completed Jun 1982.

### MEASUREMENT OF THE ELECTROMAGNETIC FORM FACTORS OF $\pi$ AND $K$ MESONS AT THE SPS

CERN - P Laurelli  
 WESTFIELD COLL - E H Bellamy, M G Green, G Heath, E van Herwizzen, M Landon, P V March, C G Saltmarch, W Von Schlippe, A Soucha, J R Strong, R Tenchini  
 SOUTHAMPTON U - S G F Frank ( $\checkmark$  Spokesperson), J Harvey, D Storey  
 FRASCATI - A Codino, F L Fabbri, P Laurelli, L Satta, P Spillantini, A Zallo

MILAN U - D Menasce, E Meroni, L Moroni  
 PISA U - S R Amendolia, B Badelek, G Batignani, F Bedeschi, E Bertolucci, D Bettoni, L Bosisio, C Bradaschia, M Dell'Orso, F Fidecarro, L Foa, E Focardi, A Giazotto, M Giorgi, P S Marrochiesi, A Menzione, L Ristori, A Scribano, G Tonelli  
 TURIN U - G A Beck, H Bilokon, G Bologna, G Mannocchi, B D'Ettorre Piazzoli, P Picchi  
 TRIESTE U - M Budinich, F Liello, E Milotti, F Ragusa, L Rolandi, A Stefanini

Accelerator CERN-SPS Detector Spectrometer

## SUMMARIES OF EXPERIMENTS

### Reactions

$\pi^- e^- \rightarrow \pi^- \pi^0 e^-$	300 GeV/c
$\pi^- e^- \rightarrow \pi^- e^-$	250, 300 GeV/c
$K^- e^- \rightarrow K^- e^-$	250 GeV/c
$e^+ e^- \rightarrow \pi^+ \pi^-$	100, 125, 150, 175 GeV/c

Particles studied pion, kaon

Comments Uses the forward spectrometer of CERN-NA-001.

Papers PL 138B (1984) 454, PL 146B (1984) 116, PL 155B (1985) 457, PL 178B (1986) 435, and NP B277 (1986) 168. No other papers expected.

**CERN-NA-008** (Sep 1977) Approved Dec 1977; Completed May 1980.

### HADRON ELASTIC SCATTERING AT SMALL ANGLES

CLERMONT-FERRAND U - S Maury, J L Paumier, M Querrou, M Verbeke  
 LENINGRAD, INP - A S Denisov, A P Kashchuk, A V Kulikov, V A Schegelsky, I I Tkach, A A Vorobyov  
 LYON, IPN - J P Burq, M Chemarin, M Chevallier, J Fay, B Ille, M Lambert, J P Martin  
 UPPSALA U - T Ekelof, P Grafstrom (✓ Spokesperson), L Gustafsson, E Hagberg, S Kullander

Accelerator CERN-SPS Detector Double-arm spectrometer

### Reactions

$\pi^- p \rightarrow \pi^- p$	100-345 GeV/c
$\pi^- He \rightarrow \pi^- He$	50-300 GeV/c
$\pi^+ He \rightarrow \pi^+ He$	100-150 GeV/c
$p p \rightarrow p p$	100-300 GeV/c
$p He \rightarrow p He$	"

Comments An extension of experiment WA-009 to higher energies.

Papers NIM 177 (1980) 353, NIM 187 (1981) 407, NP B187 (1981) 205, PL 109B (1982) 111, PL 109B (1982) 124, and NP B217 (1983) 285. No other papers expected.

**CERN-NA-009** (Nov 1977) Approved Feb 1978, Mar 1979; Completed Dec 1983.

### STUDY OF FINAL STATES IN DEEP INELASTIC MUON SCATTERING

THE EUROPEAN MUON COLLABORATION

AACHEN, TECH HOCHSCH, III PHYS INST - G Berghoff, M Duren, F Hasert, D Lanske, K Schultze, L Urban  
 ANNECY - Y Bertsch, X de Bouard, G Coignet, J Favier, G Jancso, M Maire, H Minssieux, M Moynot, H Pessard, M Schneegans, J M Thenard, M Vivargent  
 CERN - R Dobinson, C Goessling, L Gustafsson, G von Holtey, G Kellner, H Muller, A M Osborne, L Osborne, T Sloan (✓ Spokesperson), E Watson  
 FREIBURG U - T Dreyer, T Ernst, J Haas, H Hartenthaler, H Jung, E M Kabuss, G Kroesen, U Landgraf, W Mohr, K Rith, A Schlagbohmer, T Schroeder, R Smith, H E Stier, E Tieck, W Walluchs  
 DESY - F W Brasse, W Flauger, J Gayler, V Korbelt, J Nassalski, B Poensgen  
 HAMBURG U - G Bucholtz, J Figiel, B Hoppe, F Janata, E Rondio, M Studt, A de la Torre  
 KIEL U - O C Altkofer, E Bohm, W Dau  
 LANCASTER U - C Bee, I Bird, J Coughlan  
 LIVERPOOL U - S Brown, G R Court, E Gabathuler, R Gamet, P Hayman, J R Holt, J Pettingale, S Wimpenny  
 MARSEILLE U, LUMINY - G d'Agostini, J P Albanese, J J Aubert, C Benchouk, M Mermet-Guyennet, F Montanet, P Payre, B Pietrzyk  
 MONS U - J Beaufays, D Callebaut, F Grard, J Hanton, R Windmolders  
 MUNICH, MAX PLANCK INST - F Dengler, I Derado, V Eckardt, A Manz, B Pawlik, N Schmitz, M Schouten, J Shiers, G Wolf  
 ORSAY, LAL - D Blum, P Heusse, A Jacholkowska, M Jaffre, C Pascaud

OXFORD U - N Geddes, A S Johnson, J Loken, K Long, P Renton, G Taylor, W S C Williams  
 RUTHERFORD - D Botterill, J Chima, R Clift, M Edwards, P R Norton, G Oakham, M Sproston, J C Thompson  
 SHEFFIELD U - F Combley, J Foster, S Wheeler  
 TURIN U - M Arneodo, F Costa, U Dosselli, M I Ferrero, P Giubellino, S Maselli, C Peroni, A Staiano  
 UPPSALA U - A Arvidson, B Badelek, H Calen, S Dahlgren, P Grafstrom, E Hagberg, S Kullander  
 WUPPERTAL U - K Becks, H Braun, H Bruck, J Drees, A Edwards, H Forsbach, K Hamacher, B Korzen, J Kruger, L Paul, N Pavel, H Peschel, U Pietrzyk, M Poetsch, H Preissner, A Schneider, W Stockhausen, H Wahlen  
 BUDAPEST, CRIP - G Eszes, E Nagy, P Ribarics, J Toth  
Accelerator CERN-SPS Detector EMC

### Reactions

$\mu^- p \rightarrow \mu^- X$	120-280 GeV/c
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Particles studied charm

Comments An extension of experiment NA-002, with addition of a vertex detector to see what accompanies the  $\mu^-$ . Studies charm production, jets, and inclusive hadron distributions. See also NA-028. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers See NA-028 for papers.

**CERN-NA-010** (Nov 1977) Approved Mar 1978, Jan 1980; Started Sep 1981; Completed Aug 1985.

### HIGH RESOLUTION STUDY OF THE INCLUSIVE PRODUCTION OF MASSIVE MUON PAIRS BY INTENSE PION BEAMS

ANNECY - J J Blaising, A Degre, R Morand  
 CERN - K Freudenreich  
 NAPLES U, IFS & INFN, NAPLES - L Carotenuto, A Ereditato, E Gorini, P Strolin  
 ECOLE POLYTECHNIQUE - P Bordalo, S Borenstein, Ph Bussion, L Kluberg (Spokesperson), A Romana, R Salmeron, C Vallee  
 STRASBOURG - P Juillot, M Winter  
 ZURICH, ETH - P Le Coultre, M Grossmann, M Guanzioli, H Hofer, P Lecomte, H Suter, V L Telegdi  
 SOFIYA U - B Betev

Accelerator CERN-SPS Detector Spectrometer

### Reactions

$\pi^- \text{nucleus} \rightarrow \mu^+ \mu^- X$	140-300 GeV/c
$\pi^+ \text{nucleus} \rightarrow \mu^+ \mu^- X$	"

Particles studied  $\Upsilon$ (unspec)

Comments Studies the differential cross section and angular and transverse-momentum distributions of muon pairs in the mass range 4-to-15 GeV.

Papers PL 104B (1981) 416, NIM 223 (1984) 26, ZPHY C28 (1985) 9, ZPHY C28 (1985) 15, PL 157B (1985) 463, PL 158B (1985) 92, ZPHY C31 (1986) 513, and PL 179B (1986) 170.

**CERN-NA-011** (Feb 1978) Approved May 1978; Completed Dec 1982.

### MEASUREMENT OF CHARMED PARTICLE PRODUCTION IN HADRONIC REACTIONS

NIKHEF, AMSTERDAM - C Daum, H Dijkstra, J Hardwick, W Hoogland, G De Rijk, W Spierenburg, H Tiecke, L Wiggers  
 BRISTOL U - R Gilmore, J Malos, R Tapper  
 CERN - R Bailey, T Boehringer, M Bosman, V Chabaud, B D Hyams, P Weilhammer  
 CRACOW - L Gorlich, J Michalowski, H Palka, G Polok, M Rozanska, K Rybicki, M Turala  
 MUNICH, MAX PLANCK INST - E Belau, Z Hajduk, R Klanner (✓ Spokesperson), G Lutjens, G Lutz, W Manner, E Neugebauer, H Seebrunner, U Stierlin, A Wylie, T Zeludziewicz  
 RUTHERFORD - C Damerell, S Gill, A Gillman, F J Wickens

## SUMMARIES OF EXPERIMENTS

Accelerator CERN-SPS Detector Spectrometer

Reactions

$\pi^-$  Be  $\rightarrow$  charm X                    100-200 GeV/c  
 $p$  Be  $\rightarrow$  charm X                         "

Particles studied  $D^+$ ,  $D^0$ ,  $D^-$ ,  $D_s^+$ ,  $D_s^-$ , charmed-baryon

Comments Uses a silicon microstrip vertex detector.

Papers PL 132B (1983) 230, PL 132B (1983) 237, NP B223 (1983) 1, ZPHY C18 (1983) 1, NIM 205 (1983) 99, NIM 205 (1983) 141, NIM 214 (1983) 253, NIM 217 (1983) 224, NIM 217 (1983) 261, ZPHY C22 (1984) 125, NP B239 (1984) 15, PL 139B (1984) 320, ZPHY C24 (1984) 111, NIM 226 (1984) 56, ZPHY C28 (1985) 357, ZPHY C29 (1985) 1, ZPHY C30 (1986) 51, ZPHY C31 (1986) 375, ZPHY C31 (1986) 391, ZPHY C32 (1986) 349, and ZPHY C32 (1986) 353.

**CERN-NA-012** (Aug 1978) Approved Nov 1978; Completed Jun 1984.

**STUDY OF  $\pi^-p$  INTERACTIONS WITH NEUTRAL FINAL STATES**

ANNECY - J Dufournaud, M Gouanere, D Lac, J P Peigneux, D Sillou, M Spighel  
 BRUSSELS U, IISN - F G Binon, C Bricman, J P Lagnaux, T Mouthuy, J P Stroot  
 LOS ALAMOS - D Alde, E A Knapp, R Martin, J Potter  
 SERPUKHOV - S V Donskov, A V Inyakin, D B Kakauridze, V A Katchanov, G V Khaustov, A V Kulik, A A Lednev, Yu V Mikhailov, V F Obraztsov, Yu D Prokoshkin ( $\checkmark$  Spokesperson), Y V Rodnov, S A Sadovsky, P M Shagin, A V Singovsky, V P Sugonyaev  
 LOUVAIN U - A Possoz

Accelerator CERN-SPS Detector GAMS-4000

Reactions

$\pi^- p \rightarrow n \gamma$ 's                            100, 230 GeV/c  
 $\pi^- p \rightarrow n$  meson<sup>0</sup>                         "  
 $\pi^- p \rightarrow n \pi^0$                                  "  
 $\pi^- p \rightarrow n \eta$                                  "  
 $\pi^- p \rightarrow n \omega$                                  "  
 $\pi^- p \rightarrow n \eta'$                                  "  
 $\pi^- p \rightarrow n f_2(1270)$                          "  
 $\pi^- p \rightarrow n a_2(1320)^0$                          "  
 $\pi^- p \rightarrow n f_4(2030)$                          "  
 $\pi^- p \rightarrow n \eta_c(2980)$                          "  
 $\pi^- p \rightarrow n f_0(1590)$                          "

Particles studied meson<sup>0</sup>, glueball

Comments Only some of the many reactions to be studied in detail are listed above.

Papers NC 71A (1982) 497, NIM 206 (1983) 373, NC 78A (1983) 313, NIM 214 (1983) 269, NP B269 (1986) 485, and PL 177B (1986) 120.

**CERN-NA-012-2** (Aug 1985) Approved Feb 1986.

**SEARCH FOR MESONS AND GLUEBALLS DECAYING INTO MULTIPHOTON FINAL STATES PRODUCED IN CENTRAL HADRON COLLISIONS AND STUDY OF INCLUSIVE PRODUCTION OF HEAVY QUARK MESONS**

ANNECY - M Boutemour, M Gouanere, J P Peigneux, M Spighel  
 BRUSSELS U, IISN - F Binon, C Bricman, J P Lagnaux, J P Stroot ( $\checkmark$  Spokesperson)  
 LOS ALAMOS - D Alde, E A Knapp  
 PISA U & INFN, PISA - R Bellazzini, A Brez, M M Massai, M R Torquati  
 SERPUKHOV - S V Donskov, A V Inyakin, V A Kachanov, D B Kakauridze, G V Khaustov, A V Kulik, A A Lednev, Yu D Prokoshkin ( $\checkmark$  Spokesperson), V I Rykalin, S A Sadovsky, P M Shagin, A V Singovsky

Accelerator CERN-SPS Detector GAMS-4000

Reactions

$\pi^-$  nucleus  $\rightarrow \gamma$ 's X                    300 GeV/c

Particles studied glueball, meson<sup>0</sup>,  $\eta_c(2980)$ ,  $\chi(\text{unspec})$

Comments Scheduled to run in 1987.

**CERN-NA-014** (Jun 1978, Oct 1982) Approved Dec 1978, Dec 1979; Completed Sep 1984.

**PHOTOPRODUCTION AT HIGH ENERGY AND HIGH INTENSITY**

ATHENS, TECH UNIV - A Filippas, E Fokitis, E Karpathopoulos, Th Papadapoulou, Ch Trakkas  
 CERN - L Andersson, R Barate, H Burmeister, J Engelen, S Hancock, F James, E C Katsoufis, J C Lassalle, K Maeshima, J B Pattison, D Treille ( $\checkmark$  Spokesperson)  
 IMPERIAL COLL - P Astbury, A Duane, P Gregory, P Kyberd, D Miller, J W Morris, R Namjoshi, I Siotis, T S Virdee, D M Websdale  
 ORSAY, LAL - B Bouquet, B D'Almagne, A Ferrer, P Petroff, F Richard, P Roudeau, J Six, W Wojcik, G Wormser  
 ECOLE POLYTECHNIQUE - P Benkheiri, S Costa Ramos, A Rouge, J P Wuthrick  
 COLLEGE DE FRANCE - A de Bellefon, J M Brunet, B Lefevre, S Orenstein, D Poutot, G Tristram  
 SACLAY - P Bareyre, P Bonamy, M David, Y Lemoigne, J Mouchet, G Villet, Y Zolnierowski  
 SOUTHAMPTON U - G McEwen, H Shooshtari  
 STRASBOURG - D Bloch, J P Engel, J L Guyonnet, M Schaeffer  
 WARSAW U, IEP & WARSAW, INR - M Gorski, T Hofmokl, A Jacholkowska, C Sobczynski  
 INFN, MILAN - P G Rancoita

Accelerator CERN-SPS Detector Spectrometer

Reactions

$\gamma p$     < 200 GeV/c

Comments Studies the point-like behavior of the photon. Deep-inelastic Compton scattering is observed at the level expected from fractionally charged quarks. QCD expectations are accurately verified.

Papers PL 152B (1985) 419, PL 168B (1986) 163, PL 174B (1986) 458, PL 182B (1986) 409, and ZPHY C (accepted).

**CERN-NA-014-2** Approved Apr 1983.

**A PROGRAM OF HEAVY FLAVOR PHOTOPRODUCTION**

ATHENS, TECH UNIV - A Filippas, E Fokitis, E N Gazis, E C Katsoufis, A Maltezos, Th Papadapoulou, H Rahmani  
 BARCELONA, AUTONOMA U - M P Alvarez, F Calvino, J M Crespo  
 CERN - R Barate ( $\checkmark$  Spokesperson), H Burmeister, L di Ciaccio, Y Giomataris, B Pattison, D Treille, Y Zolnierowski  
 IMPERIAL COLL - M Cattaneo, A Duane, R Forty, M Koratzinos, D M Websdale  
 ORSAY, LAL - B D'Almagne, P Druet, C Krafft, P Roudeau, J Six, M Wayne, G Wormser  
 COLLEGE DE FRANCE - J M Brunet, B Lefevre, D Poutot, P Triscos, G Tristram, A Volte  
 SACLAY - P Bonamy, P Borgeaud, M David, Y Lemoigne, C Magneville, M Primout, G Villet  
 SOUTHAMPTON U - J G McEwen  
 STRASBOURG - D Bloch, J P Engel, P Foucault, M Schaeffer, R Strub  
 WARSAW U, IEP - T Hofmokl

Accelerator CERN-SPS Detector Spectrometer

Reactions

$\gamma p$     < 200 GeV/c

Particles studied  $D_s^+$ ,  $\Lambda_c^+$ , charm, bottom

Comments Running with a silicon active target and microstrip hodoscopes. Taking data (November 86).

## SUMMARIES OF EXPERIMENTS

**CERN-NA-016** (Aug 1979) Approved Sep 1970; Completed Jun 1980.

**STUDY OF THE HADRONIC PRODUCTION AND PROPERTIES OF NEW PARTICLES WITH A LIFETIME  $10^{-13} < \tau < 10^{-10}$  s USING LEBC-EHS**

AMSTERDAM U - R Blokzijl, F G Hartjes, D J Holthuizen, T E Schouten, D Toet  
 BRUSSELS U, IIHE - M Van Immerseel, J Lemonne, R Roosen, S Tavernier  
 CERN - F Bruyant, P Gavillet, Y Goldschmidt-Clermont, P Gusewell, A Herve, D Jacobs, P Lecoq, H Leutz, L Montanet, A Poppleton, B Powell, S Reucroft  
 MADRID, JEN - M Aguilar-Benitez, A Ferrando, P Ladron de Guevara, R Llosa, J A Rubio, C Willmott  
 MONS U - F Grard, Ph Herquet, J Kesteman, J M Lesceux, P Pilette  
 NIJMEGEN U - F I G H Crijns, W Kittel, M C Th Raaymakers, A Stergiou, R T Van de Walle  
 OXFORD U - W W M Allison, P Hughes, L Lyons, J H Mulvey  
 PADUA U - A Bettini, S Centro, M Cresti, M De Giorgi, M Mazzucato, D Pascoli, L Peruzzo, P Rossi, G Sartori, L Ventura, G Zumerle  
 PARIS, CURIE UNIV VI - M Boratav, D Burlaud, J Duboc, M C Touboul  
 ROME U - P Bagnaia, B Baldo, L Barone, R Bizzarri, E Di Capua, G Ciapetti, C Dionisi, F Marzano, G Piredda, D Zanello, L Zanello  
 RUTHERFORD - D Crennell, C Fisher (Spokesperson), K Paler  
 SERPUKHOV - V V Boseeva, P V Chliapnikov, A G Kholodenko, E P Kistenev, B F Poljakov, V A Yarba  
 STOCKHOLM U - S O Holmgren, K E Johansson, S Nilsson  
 STRASBOURG - F Etienne, N Kurtz, A Michalon, C Voltolini  
 TURIN U - G Borreani, F Marchetto, E Menichetti, G Rinaudo  
 TRIESTE U - E Castelli, P Checchia, P Poropat, M Sessa, C Troncon  
 VIENNA, OAW - W Bartl, H Dibon, R Fruhwirth, J Hrubec, M Marqytan, G Neuhofer, P Porth, M Regler  
 MUNICH, MAX PLANCK INST - R Settles

Accelerator CERN-SPS Detector HBC-LEBC, EHS

Reactions

$\pi^- p$  360 GeV/c  
 $p p$  "

Particles studied  $D^+$ ,  $D^-$ ,  $\bar{D}^0$

Papers PL 102B (1981) 285, NIM 198 (1982) 217, NIM 205 (1983) 79, PL 122B (1983) 312, PL 123B (1983) 98, PL 123B (1983) 103, NIM 215 (1983) 377, ZPHY C19 (1983) 83, PL 135B (1984) 237, and PL 160B (1985) 217.

**CERN-NA-017** (Sep 1979) Approved Sep 1979; Completed Sep 1982.

**MOMENTUM AND ANGULAR CORRELATIONS STUDY IN  $\pi^-$  NUCLEI JETS AT HIGH ENERGIES USING AN EMULSION TELESCOPE TECHNIQUE WITH MAGNETIC FIELD**

LYON, IPN - R Schmitt  
 JADAVPUR U - M Basu, D Ghosh, S Naha, J Roy, K Sengupta  
 SANTANDER U - M Lopez-Quelle, R Niembro, A Ruiz, E Villar (Spokesperson)  
 STRASBOURG - C Jacquot, J N Suren

Accelerator CERN-SPS Detector Emulsion

Reactions

$\pi^-$  nucleus  $\rightarrow$  jet(s) X 300 GeV/c

**CERN-NA-018** Approved Nov 1979; Completed Feb 1980.  
**SEARCH FOR SHORT-LIVED PARTICLES PRODUCED ON NUCLEI WITH A HEAVY LIQUID MINI BUBBLE CHAMBER**

BERN U - A Badertscher, B Hahn, E Hugentobler (Spokesperson), T Marti, U Moser, L Muller, E Ramseyer

MUNICH, MAX PLANCK INST - I Derado, V Eckardt, P Freund, H J Gebauer, T Kahl, K Pretzl, P Seyboth, J Seyerlein

Accelerator CERN-SPS Detector Heavy-liquid b.c.

Reactions

pion nucleus  $\rightarrow$  charm X

Particles studied  $D^+$ ,  $D^-$ ,  $D^0$

Papers PL 123B (1983) 471. No other papers expected.

**CERN-NA-019** Approved Nov 1979; Completed Apr 1980.  
**DIRECT OBSERVATION OF BEAUTY PARTICLES SELECTED BY MUONIC DECAY IN EMULSION**

BARI U - N Armenise, M Calicchio, O Erriquez, M T Muciaccia, S Natali, S Nuzzo, F Romano, F Ruggieri  
 BRUSSELS U, IIHE - M Barth, G Bertrand-Coremans, D Bertrand, R Roosen, J Sacton, J H Wickens  
 CERN - J P Albanese, C Matteuzzi, P Musset (Spokesperson), F Piuz, G Poulard, H Sletten  
 UNIVERSITY COLL, DUBLIN - A Breslin, A Montwill  
 BIRKBECK COLL - M Coupland, I Roberts, P Trent  
 UNIVERSITY COLL, LONDON - J H Bartley, D G Davis, D H Davis, B G Duff, M J Esten, F F Heymann, D C Imrie, G J Lush, D N Tovee  
 OPEN U, ENGLAND - F R Stannard  
 ROME U - G Baroni, M Conversi, S Di Liberto, A Manfredini, S Petreara, G Romano, G Rosa, R Santonico, F Sebastiani  
 TURIN U - D Allasia, D Gamba, A Marzari-Chiesa, L Riccati, A Romero

Accelerator CERN-SPS Detector Emulsion

Reactions

pion nucleus  $\rightarrow$  bottom X 350 GeV/c

Particles studied bottom, charm

Comments Search for beauty identified by cascade decay through charm. Events scanned are associated with three muons in final state.

Papers PL 122B (1983) 197.

**CERN-NA-020** Approved Nov 1979; Completed Dec 1983.

**MEASUREMENTS OF  $\pi^+$ ,  $\pi^-$ ,  $K^+$ ,  $K^-$ ,  $p$ , AND  $\bar{p}$  YIELDS IN 400 GeV PROTON BERYLLIUM AND COPPER COLLISIONS**

CERN - H W Atherton, H Wachsmuth (Spokesperson)  
 RUTHERFORD - W Venus

Accelerator CERN-SPS Detector Counter

Reactions

$p$  Be  $\rightarrow$   $\pi^+$  X 400 GeV/c  
 $p$  Be  $\rightarrow$   $\pi^-$  X "  
 $p$  Be  $\rightarrow$   $K^+$  X "  
 $p$  Be  $\rightarrow$   $K^-$  X "  
 $p$  Be  $\rightarrow$   $p$  X "  
 $p$  Be  $\rightarrow$   $\bar{p}$  X "  
 $p$  Cu  $\rightarrow$   $\pi^+$  X "  
 $p$  Cu  $\rightarrow$   $\pi^-$  X "  
 $p$  Cu  $\rightarrow$   $K^+$  X "  
 $p$  Cu  $\rightarrow$   $K^-$  X "  
 $p$  Cu  $\rightarrow$   $p$  X "  
 $p$  Cu  $\rightarrow$   $\bar{p}$  X "

**CERN-NA-022** (Jun 1980) Approved Oct 1980; Completed Aug 1983.

**THE INFLUENCE OF PARTON STRUCTURE ON HADRONIC INTERACTIONS IN EHS WITH A  $K^+/\pi^+/p$  BEAM AT 250 GeV/c**

AACHEN, TECH HOCHSCH, III PHYS INST - H Graessler, P Schmitz, W Schmitz  
 ANTWERP U & BRUSSELS U, IIHE - B Michalowska, A De Roeck, F Verbeure, E A De Wolf

## SUMMARIES OF EXPERIMENTS

BERLIN, DAW - H Boettcher, C Dreher, W Friebel, H Roloff, R Wischnewski  
 HELSINKI U - R Poellaenen, E Riipinen, H Saarikko  
 CRACOW - K Dziunikowska, A Eskreys, T Haupt, D Kis, D Kisielewska, M Kowalski, K Olkiewicz, P Stopa, L Suszycki, W Zielinski  
 MOSCOW STATE U - P Ermolov, V G Gavrjusev, I V Gorelov, B B Levcheno, N A Sotnikova, L Tikhonova, S A Zotkin  
 NIJMEGEN U - F G H Crijs, P van Hal, W Kittel (✓ Spokesperson), F Meijers, L Scholten  
 RIO DE JANEIRO, CBPF - A M Freire-Endler, F M L DeAlmeida Jr, L C S Oliveira  
 SERPUKHOV - I Ajinenko, V Belokopytov, V A Berezhnoy, P V Chliapnikov, S A Gumenyuk, E P Kistenev, V Kniasev, A I Kurnosenko, A G Minaev, V I Nikolaenko, L P Petrovich, V H Ronjin, A M Rybin, V A Stopchneko, O G Tchikilev, B A Utochkin, V Uvarov, A P Vorobiev  
 WARSAW U, IEP & WARSAW, INR - M Adamus, H Bialkowska, J Stepaniak, A K Wroblewski  
 YEREVAN PHYS INST - N M Agababyan, M R Atayan, G V Gevorkyan, J K Karamyan, N S Khalatian, S S Megrebian

Accelerator CERN-SPS Detector EHS

Reactions

$K^+ p$	250 GeV/c
$\pi^+ p$	"
$p p$	"
$K^+$ nucleus	"
$\pi^+$ nucleus	"
$p$ nucleus	"

Comments The aims are a good particle identification study of (1) the influence of parton structure on low  $p_t$  hadron-hadron collisions, (2) strangeness flow and correlations in fragmentation, and (3) hadron-nucleus collisions.

Papers PL 177B (1986) 239, and ZPHY C32 (1986) 475.

**CERN-NA-023** (Jun 1980) Approved Oct 1980; Completed Aug 1982.

**STUDY OF DIFFRACTIVE DISSOCIATION ESPECIALLY INTO STRANGE AND CHARMED PARTICLES WITH EHS**

TATA INST - S Banerjee, S Ganguli, A Gurtu, P Malhotra, R Raghavan, K Shankar, A Subramanian, K Sudhakar  
 CERN - M Benot, F Bruyant, M Dykes, D Gusewell, A Herve, J Hrubec, E Johansson, P Lecoq, J C Marin, L Montanet, B Pijlgroms, A Poppleton, S Reucroft, S Squarcia  
 GENOA U & INFN, GENOA - C Caso, R Contri, F Fontanelli, R Monge, U Trevisan  
 INNSBRUCK U - B Epp, P Girtler, D Kuhn, J Weiss  
 JAPAN U GROUP COLLAB - Y Chiba, T Emura, R Hamatsu, T Hirose, S Kaneko, I Kita, S Kitamura, H Kohno, S Matsumoto, K Takahashi, T Yamagata  
 MADRID, JEN - A Ferrando, P Ladron de Guevara, M T Rodrigo, J A Rubio  
 MONS U - J Beaufays, F Grard, P Herquet  
 RUTGERS U - E B Brucker, P Jacques, E L Koller, P Miller, R Plano, P Stamer, S Taylor, T L Watts  
 SERPUKHOV - Yu Fisjak, G Iolobov, A G Kholodenko, E Kistenev, N G Minaev, B S Poliakov, V Stopchenko, V A Yarba  
 TENNESSEE U - W M Bugg, H O Cohn, G T Condo, T Handler, E I Hart, A H Rogers  
 VIENNA, OAW - W Bartl, H Dibon, J MacNaughton, M Marqytan (Spokesperson), G Neuhofer, P Porth, M Regler  
 COLLEGE DE FRANCE - M Aguilar-Benitez  
 STOCKHOLM U - H Rohringer

Accelerator CERN-SPS Detector EHS

Reactions

$p p \rightarrow p$ strange	strange	> 360 GeV/c
$p p \rightarrow p$ charm	charm	"

Comments Uses a rapid-cycling bubble chamber. Compares diffractive associated production of strange and charmed pairs.

Papers NIM 219 (1984) 66, ZPHY C22 (1984) 119, ZPHY C23 (1984) 205, ZPHY C27 (1985) 11, ZPHY C28 (1985) 339, ZPHY C30 (1986) 381, and ZPHY C31 (1986) 367.

**CERN-NA-024** (Aug 1980) Approved Nov 1980; Completed Aug 1985.

**DEEP INELASTIC SCATTERING PROCESSES INVOLVING LARGE- $p_t$  DIRECT PHOTONS IN THE FINAL STATE**

BARI U - C Favuzzi, G Maggi, C De Marzo, E Nappi, M De Palma, F Posa, A Ranieri, G Selvaggi, P Spinelli  
 FREIBURG U - A Bamberger, M Fuchs, W Heck, R Marx, K Runge, E Skodzeck, H Ch Weber, M Wulker  
 MOSCOW, ITEP - V Artemiev, Y Galaktionov, A Gordeev, Y Gorodkov, Y Kamyshkov, M Kossov, V Lubimov, V Plyaskin, V Pojidaev, V Shevchenko, E Shoumilov, V Tchudakov  
 MUNICH, MAX PLANCK INST - J Bunn, J Fent, P Freund, H J Gebauer, M Glas, P Polakos, K P Pretzl (✓ Spokesperson), T E Schouten, P Seyboth, J Seyerlein, G Vesztergombi

Accelerator CERN-SPS Detector Calorimeter

Reactions

$\pi^+ p \rightarrow \gamma(s) X$	300 GeV/c
$\pi^+ p \rightarrow \gamma \text{ jet } X$	"
$\pi^- p \rightarrow \gamma(s) X$	"
$\pi^- p \rightarrow \gamma \text{ jet } X$	"
$p p \rightarrow \gamma(s) X$	"
$p p \rightarrow \gamma \text{ jet } X$	"

**CERN-NA-025** (Nov 1980) Approved Apr 1981; Completed Sep 1982.

**STUDY OF CHARM AND BOTTOM PARTICLE PRODUCTION USING A HOLOGRAPHIC BUBBLE CHAMBER**

BARI U - N Armenise, M Calicchio, O Erriquez, M Muciaccia-Fogli, S Natali, S Nuzzo, F Romano, F Ruggieri  
 BRUSSELS U, IIHE - M Barth, R Roosen, S Tavernier (✓ Spokesperson)  
 CERN - H Drevermann, I Gjerpe, A Herve, K E Johansson, P Lecoq, P Olivier  
 UNIVERSITY COLL, LONDON - F W Bullock, M Coupland, R Cranfield, D H Davis, B G Duff, M J Esten, F F Heymann, P Hobson, D C Imrie, G Lush, D N Tovee, R Williams  
 MONS U - J F Baland, F Grard, V Henri, J Kesteman  
 PARIS, CURIE UNIV VI - M Boratav, M C Touboul, A M Touchard  
 STRASBOURG - R Arnold, G Maurer  
 VIENNA, OAW - J Hrubec, G Neuhofer, A Taurok

Accelerator CERN-SPS Detector HLBC-HOBC-HYB

Reactions

$p p \rightarrow \text{charm } X$	200, 360 GeV/c
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Particles studied charm

Comments A first attempt to study production and decay of charmed particles (and later on particles with beauty) using a small rapid-cycling holographic heavy-liquid bubble chamber. Also uses the muon filter from NA-019.

Papers NIM 202 (1982) 417, NIM 214 (1983) 245, and PS 33 (1986) 202.

**CERN-NA-027** (Nov 1981) Approved Dec 1981; Started Apr 1982; Completed Jun 1984.

**AN EXPERIMENT TO MEASURE ACCURATELY THE LIFETIMES OF THE  $D^0, D^+, D^-, F^+, F^-, \Lambda_c$  CHARM PARTICLES AND TO STUDY THEIR HADRONIC PRODUCTION AND DECAY PROPERTIES**

AACHEN, TECH HOCHSCH, III PHYS INST - M Deutschmann, G Otter, H Schluetter, R Schulte, W Struczinski

## SUMMARIES OF EXPERIMENTS

BERLIN, DAW - W Friedel, U Gensch, D Knauss, T Naumann, H Nowak, R Wischniewski  
 BRUSSELS U, IIHE - G Bertrand-Coremans, J Lemonne, P Vilain, B Vonck, J H Wickens  
 TATA INST - S Ganguli, A Gurtu, P K Malhotra, R Raghavan, A Schrankar, K Shankar, A Subramanian, K Sudhakar  
 COLLEGE DE FRANCE - P Beilliere, J Dolbeau, M Laloum  
 CERN - J A Hernandez, H Leutz, L Montanet (✓ Spokesperson), A Poppleton  
 DUKE U - A T Goshaw, W Kowald, W J Robertson, W D Walker, C Wild  
 GENOA U - C Caso, R Contri, F Fontanelli, R Monge, S Squarcia, U Trevisan  
 JAPAN U GROUP COLLAB - Y Chiba, T Emura, R Hamatsu, S Hirose, S Kaneko, I Kita, S Kitamura, H Kono, S Matsumoto, N Oshima, K Takahashi, T Tsugurai, K Yamagata, F Yuasa  
 LIVERPOOL U - J R Fry, M A Houlden, G P Patel, K Roberts, B Whyman  
 MADRID U - M Aguilar-Benitez, B Castano, N Colino, F Diez, P Ladron de Guevara  
 MONS U - J Baily, J F Baland, F Grard, P Herquet, P Pilette  
 OXFORD U - W W M Allison, D Gibaut, L Lyons, P Wright  
 PADUA U - A De Angelis, A Bettini, P Checchia, M Cresti, U Gasparini, M Mazzucato, L Peruzzo, C Pinori, P Rossi, G Sartori, L Ventura, P Zotto, G Zumerle  
 PARIS, CURIE UNIV VI - L De Billy, H Briand, J Duboc, J Dumarchez, J Laberrigue, H K Nguyen, T P Yiou  
 ROME U - R Bizzarri, E Di Capua, S Falciano, A Forni, S Gentile, M Iori, G Marel, F Marzano, G Piredda, L Zanello  
 RUTGERS U - M Kalekar, R Di Marco, R J Plano, P Stamer  
 RUTHERFORD - D Crennell, C Fisher, P Hughes, M MacDermott  
 SERPUKHOV - Y Fisjak, E P Kistenev, V Knyazev, Y Petrovich, V Stopchenko, E Vlasov  
 STOCKHOLM U - L Haupt, S Hellman, S O Holmgren, T Moa, S Nilsson, B Sellén  
 STRASBOURG - D Huss, E Jegham, A Michalon, M Michalon, C Voltolini  
 TENNESSEE U - W M Bugg  
 TURIN U - G Borreani, F Marchetto, G Rinaudo  
 TRIESTE U - E Castellani, D Cauz, P Poropat, M Sessa, C Troncon  
 VIENNA, OAW - W Bartl, B Epp, J Hrubec, G Neuhofer, M Pernika, P Porth, M Regler, H Rohringer, J Schmidmayer

Accelerator CERN-SPS Detector HBC-LEBC-HYB

### Reactions

$\pi^- p \rightarrow \text{charm X}$  360 GeV/c  
 $p p \rightarrow \text{charm X}$  "

Particles studied  $D^0, D^+, D^-, D_s^+, D_s^-, A_c^+$

Comments Uses the EHS. The sensitivity is 16 events/ $\mu\text{b}$  for  $\pi^-$ , 40 events/ $\mu\text{b}$  for  $p$ .

Papers PL 146B (1984) 266, PL 156B (1985) 444, PL 161B (1985) 400, PL 164B (1985) 404, PL 168B (1986) 170, PL 169B (1986) 106, and ZPHY C31 (1986) 491.

**CERN-NA-028** (Jan 1982) Approved Feb 1982; Completed Dec 1983.

### STUDY OF SHADOWING AND HADRON PRODUCTION IN HIGH ENERGY MUON SCATTERING USING NUCLEAR TARGETS

THE EUROPEAN MUON COLLABORATION

AACHEN, TECH HOCHSCH, III PHYS INST - G Berghoff, M Duren, F J Hasert, D Lanske, K Schultze, L Urban  
 ANNECY - Y Bertsch, X de Bouard, G Coignet, J Favier, G Jancso, M Maire, H Minssieux, M Moynot, H Pessard, M Schneegans, J M Thenard, M Vivargent  
 CERN - R W Dobinson, C Goessling, L Gustafsson, G Kellner, H R Muller, A M Osborne, L Osborne, T Sloan (✓ Spokesperson), E Watson  
 FREIBURG U - T Dreyer, T Ernst, J Haas, H Hartenthaler, H Jung, E M Kabuss, G Kroesen, U Landgraf, W Mohr, K Rith, A Schlagbohrer, T Schroeder, R Smith, H E Stier, E Tieck, W Wallucks

DESY - F W Brasse, W Flauger, J Gayler, V Korbel, J Nassalski, B Poengen  
 HAMBURG U - G Bucholtz, J Figiel, B Hoppe, F Janata, E Rondio, M Studt, A De la Torre  
 KIEL U - O C Allkofer, E Bohm, W Dau  
 LANCASTER U - C Bee, I Bird, J Coughlan  
 LIVERPOOL U - S Brown, G R Court, E Gabathuler, R Gamet, P Hayman, J R Holt, J Pettingale, S Wimpenny  
 MARSEILLE U, LUMINY - J P Albanese, J J Aubert, C Benchouk, G D'Agostini, M Mermet-Guyennet, F Montanet, P Payre, B Pietrzyk  
 MONS U - J Beaufays, D Callebaut, F Grard, J Hanton, R Windmolders  
 MUNICH, MAX PLANCK INST - F Dengler, I Derado, V Eckardt, A Manz, N Schmitz, J Shiers, G Wolf  
 ORSAY, LAL - D Blum, P Heusse, A Jacholkowska, M Jaffre, C Pascaud  
 OXFORD U - N Geddes, A S Johnson, J Loken, K Long, R Mount, P B Renton, G Taylor, M Villers, W S C Williams  
 RUTHERFORD - C Best, D Botterill, J Chima, R Clift, M Edwards, P R Norton, G Oakham, M Sproston, J C Thompson  
 SHEFFIELD U - F Combley, J Foster, S Wheeler  
 TURIN U - M Arneodo, F Costa, M I Ferrero, P Giubellino, S Maselli, C Peroni, A Staiano  
 UPPSALA U - A Arvidson, B Badelek, H Calen, S Dahlgren, P Grafstrom, E Hagberg, S Kullander  
 WUPPERTAL U - K H Becks, H Braun, H Bruck, J Drees, A Edwards, H Forsbach, K Hamacher, B Korzen, J Kruger, L Paul, N Pavel, H Peschel, U Pietrzyk, M Poetsch, H Preissner, A Schneider, W Stockhausen, H Wahlen  
 BUDAPEST, CRIP - G Eszes, E Nagy, P Ribarics, J Toth  
Accelerator CERN-SPS Detector EMC

### Reactions

muon nucleus  $\rightarrow$  muon X 280, 325 GeV/c

Comments See also the earlier EMC experiments NA-002 and -009. Studies the point- and hadron-like components of the photon shadowing, and the evolution of the elementary quark system into hadrons using the distribution of hadrons. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers This includes papers from the earlier EMC experiments NA-002 and NA-009. NIM 160 (1979) 23, NIM 165 (1979) 113, NIM 166 (1979) 541, PL 89B (1980) 267, NIM 177 (1980) 337, PL 94B (1980) 96, PL 94B (1980) 101, PL 95B (1980) 306, PS 23 (1981) 710, NIM 179 (1981) 445, PL 100B (1981) 433, NIM 187 (1981) 401, ZPHY C10 (1981) 101, PL 103B (1981) 388, PL 105B (1981) 315, PL 105B (1981) 322, PL 106B (1981) 419, PL 110B (1982) 73, PL 114B (1982) 291, PL 114B (1982) 373, PL 119B (1982) 233, NIM 193 (1982) 445, PL 121B (1983) 87, NP B213 (1983) 1, NP B213 (1983) 31, NIM 212 (1983) 111, PL 123B (1983) 123, PL 123B (1983) 275, ZPHY C18 (1983) 189, PL 130B (1983) 118, PL 133B (1983) 370, PL 133B (1983) 461, PL 135B (1984) 225, ZPHY C22 (1984) 341, PL 144B (1984) 302, PL 145B (1984) 156, PL 149B (1984) 415, NP B246 (1984) 381, PL 150B (1985) 458, PL 152B (1985) 433, PL 155B (1985) 461, NP B258 (1985) 249, NP B259 (1985) 189, PL 160B (1985) 417, PL 161B (1985) 203, PL 165B (1985) 222, ZPHY C30 (1986) 23, PL 167B (1986) 127, NP B264 (1986) 739, NP B272 (1986) 158, ZPHY C31 (1986) 1, ZPHY C31 (1986) 175, ZPHY C31 (1986) 275, ZPHY C31 (1986) 333, ZPHY C32 (1986) 1, and ZPHY C33 (1986) 167.

**CERN-NA-029** (Oct 1981) Approved Feb 1982; Completed May 1982.

### STUDY OF $\pi^- \pi^0$ PRODUCTION VIA THE PRIMAKOFF EFFECT ON NUCLEI

CLERMONT-FERRAND U - L Capraro, P Levy, M Querrou, C Verbeck, M Verbeke  
 FRASCATI - F Celani, M Enorini, F L Fabbri, P Laurelli, G Rivellini, L Satta, P Spillantini, A Zallo  
 MILAN U & INFN, MILAN - G Bellini (Spokesperson), S Bonetti, M Di Corato, P F Manfredi, E Meroni, L Moroni, C Palazzi-Cerrina, F Palombo, F Ragusa, S Sala

## SUMMARIES OF EXPERIMENTS

PISA U & INFN, PISA - S R Amendolia, E Bertolucci, D Bettoni, L Bosisio, C Bradaschia, M Dell'Orso, F Fidecaro, L Foa (Spokesperson), E Focardi, A Giazotto, M Giorgi, A Menzione, L Ristori, A Scribano, R Tenchini  
 TURIN U - G A Beck, H Bilokon, G Bologna, G Mannocchi, B D'Ettoire Piazzoli, P Picchi  
 TRIESTE U - G Batignani, M Budinich, F Liello, N Paver, M L Piazzoli, L Rolandi, A Stefanini  
 WESTFIELD COLL - E H Bellamy, G Heath, M Landon, P V March, P S Marrocchesi, J R Strong

Accelerator CERN-SPS Detector Spectrometer

Reactions

$\pi^- \text{Pb} \rightarrow \pi^- \pi^0 \text{Pb}$  100-200 GeV/c

Particles studied  $\rho^-$

Comments Measures the radiative decay width of the  $\rho^-$  and  $\pi^- \pi^0$  production near threshold to test the number of quark colors. Uses the spectrometer of experiments NA-001 and NA-007, with modifications.

**CERN-NA-030** (Apr 1982) Approved Jun 1982; Completed Jun 1984.

**PRECISION DETERMINATION OF THE LIFETIME OF THE NEUTRAL PION**

AMES LAB - E W Anderson  
 CERN - H Atherton, C Bovet, P Coet, R Desalvo, N Doble, R Malleyran

CHICAGO U - J W Cronin, B Milliken  
 LUND U - G von Dardel ( $\checkmark$  Spokesperson), K Kulka  
 PARIS, CURIE UNIV VI - M Boratav

Accelerator CERN-SPS Detector Counter

Reactions

$p \text{ nucleus} \rightarrow \pi^0 \text{s X}$  400, 450 GeV/c

Particles studied  $\pi^0$

Comments Measures positron flux (1) from a double-foil tungsten target as a function of foil separation, and (2) from three sets of from 1 to 30 gold foils of the same total thickness.

Papers PL 158B (1985) 81.

**CERN-NA-031** (Dec 1981) Approved Sep 1982.

**MEASUREMENT OF  $|\eta_{00}|^2/|\eta_{+-}|^2$**

CERN - H Burkhardt, P Clarke, D Cundy, N Doble, L Gatignon, R Hagelberg, G Kessler, T Miczaika, H G Sander, A C Schaffer, P Steffen, J Steinberger, H Taureg, H Wahl (Spokesperson), C Youngman  
 DORTMUND U - G Dietrich, F Eisele, W Heinen  
 EDINBURGH U - D J Candlin, J Muir, K J Peach, B Pijlgroms, I P Shipsey, B Stephenson  
 MAINZ U, INST PHYS - H Bluemer, M Kasemann, K Kleinknecht, P Panzer, B Renk  
 ORSAY, LAL - E Auge, M Corti, D Fournier, P Heusse, A M Lutz, C Pascaud  
 PISA U & INFN, PISA - G Antonelli, L Bertanza, A Bigi, M Calvetti, R Carosi, R Casali, C Cerri, R Fantechi, I Mannelli, A Nappi, G Pierazzini  
 SIEGEN U - C Becker, D Heyland, M Holder, G Quast, M Rost, W Weihs, G Zech

Accelerator CERN-SPS Detector Calorimeter, Wire chamber

Reactions

$K_L \rightarrow \pi^+ \pi^-$  50-150 GeV/c  
 $K_L \rightarrow \pi^0 \pi^0$  "  
 $K_S \rightarrow \pi^+ \pi^-$  "  
 $K_S \rightarrow \pi^0 \pi^0$  "

Particles studied  $K_L, K_S$

Comments Taking data (November 86).

**CERN-NA-031-2** (Mar 1986) Approved Jun 1986.  
**A MEASUREMENT OF THE PHASE DIFFERENCE OF  $\eta_{00}$  AND  $\eta_{+-}$  IN CP VIOLATING  $K^0 \rightarrow 2\pi$  DECAYS**

CERN - P Clarke, D Coward, D C Cundy, N Doble, L Gatignon, R Hagelberg, T Miczaika, A C Schaffer, J Steinberger, H Taureg, H Wahl (Spokesperson), C Youngman  
 EDINBURGH U - R Black, D J Candlin, J Muir, K J Peach, B J Pijlgroms, I P Shipsey, B Stephenson  
 MAINZ U, INST PHYS - H Bluemer, M Kasemann, K Kleinknecht, B Panzer, B Renk  
 ORSAY, LAL - E Auge, D Fournier, P Heusse, A M Lutz, H G Sander  
 INFN, PISA - G Antonelli, L Bertanza, A Bigi, M Calvetti, R Carosi, R Casali, C Cerri, I Mannelli, E Massa, A Nappi, G M Pierazzini  
 SIEGEN U - C Becker, H Burkhardt, D Heyland, M Holder, G Quast, M Rost, W Weihs, G Zech

Accelerator CERN-SPS Detector Calorimeter, Wire chamber

Reactions

$K_L \rightarrow \pi^+ \pi^-$  50-150 GeV/c  
 $K_L \rightarrow \pi^0 \pi^0$  "  
 $K_S \rightarrow \pi^+ \pi^-$  "  
 $K_S \rightarrow \pi^0 \pi^0$  "

Particles studied  $K_L, K_S$

Comments In preparation (November 86).

**CERN-NA-032** (Jul 1982) Approved Nov 1982; Completed Aug 1986.

**INVESTIGATION OF CHARM PRODUCTION IN HADRONIC INTERACTIONS USING HIGH-RESOLUTION SILICON DETECTORS**

NIKHEF, AMSTERDAM - C Daum, H Tiecke, L Wiggers  
 BRISTOL U - R Gilmore, T Gooch, W Kwan, J Malos  
 CERN - V Castillo, V Chabaud, G D Kelsey, P Weilhammer ( $\checkmark$  Spokesperson)  
 CRACOW - Z Hajduk, H Palka, K Rybicki, M Turala, T Zeludziejewicz  
 MUNICH, MAX PLANCK INST - S Barlag, M Bosman, H Dietl, G Luetjens, G Lutz, W Maenner, H Seebrunner, U Stierlin  
 RUTHERFORD - C Damerell, A Gillman, M Pepe, J Richardson, S Watts, F Wickens  
 VALENCIA U - P Gras, E Higon  
 DESY - R Klanner  
 LAUSANNE U - T Boehringer

Accelerator CERN-SPS Detector Spectrometer

Reactions

$\pi^- \text{Si} \rightarrow \text{charm X}$  200 GeV/c  
 $K^- \text{Si} \rightarrow \text{charm X}$  "  
 $p \text{Si} \rightarrow \text{charm X}$  "  
 $\pi^- \text{Cu} \rightarrow \text{charm X}$  230 GeV/c

Particles studied  $D^0, D^+, D^-, D_s^+, D_s^-, \Lambda_c^+$

Comments Uses an active target made from segmented silicon detectors, CCD's, and the spectrometer from CERN-NA-011.

Papers NIM 226 (1984) 56.

**CERN-NA-033** (Oct 1983) Approved Feb 1984; Completed Jul 1985.

**AN EXPERIMENTAL STUDY OF SINGLE-VERTEX ( $e^-e^+$ ) PAIR CREATION IN A CRYSTAL**

SUNY, ALBANY - N Cue, J Kimball, B Marsh, C R Sun  
 ANNECY - G Bologna, J P Peigneux, D Sillou, M Spighel  
 LYON, IPN - A Belkacem, M Chevallier, M J Gailard, R Genre, R Kirsch, J C Poizat, J Remillieux ( $\checkmark$  Spokesperson)

Accelerator CERN-SPS Detector Spectrometer

Reactions

$e^\pm \text{ crystal} \rightarrow \gamma(s) e^\pm \text{ crystal}$  150 GeV/c



## SUMMARIES OF EXPERIMENTS

$\gamma$  crystal  $\rightarrow e^+ e^-$  crystal                      20-200 GeV/c

Comments Investigates a predicted enhancement in pair production and radiation by high-energy photons and electrons directed along an axis of a crystal. See also CERN-NA-042 for a continuation.

Papers PRL 53 (1984) 2371, PRL 54 (1985) 2667, NIM B13 (1986) 9, and PL 177B (1986) 211.

**CERN-NA-034** (Aug 1983) Approved Mar 1984.

### LEPTON PRODUCTION

#### HELIOS COLLABORATION

BARI U - S Simone  
 BROOKHAVEN - H Gordon, T Ludlam, L Olsen,  
 V A Polychronakos, D C Rahm, I Stumer  
 CERN - T Akesson, H Atherton, D Bettoni, E Chesi,  
 C Dederichs, M Esten, C W Fabjan, G Poulard, F Puiz,  
 A Rudge, P Schotton, J Schukraft, M Seman, H Sletten,  
 J P Vanuxem, R Wigmans, W J Willis  
 HEIDELBERG U, PHYS INST - P Glaessel, U Goerlach,  
 V Kroh, A Pfeiffer, J Soltani, H J Specht  
 LEBEDEV INST - I Gavrilencov, S Mayburov, A Shmeleva,  
 V Tikhomirov  
 NOVOSIBIRSK, IYF - V Sidorov, Y Tikhonov  
 LUND U - S Almehed, R Haglund, V Hedberg, G Jarlskog,  
 S Johansson, B Lorstad, U Mjornmark  
 MOSCOW PHYS ENG INST - V Cherniatin, B Dolgoshein,  
 Yu Golubkov, A Kalinovsky, V Kantserov, P Nevsky,  
 A Sumarakov  
 RUTHERFORD - N A McCubbin ( $\checkmark$  Spokesperson)  
 TEL AVIV U - O Benary, S Dagan, D Lissauer, Y Oren  
 BIRKBECK COLL - P Trent  
 UNIVERSITY COLL, LONDON - A L S Angelis, J H Bartley,  
 J Dodd, F F Heymann, M McCubbin  
 LOS ALAMOS - N J Di Giacomo, H van Hecke, B Jacak,  
 P L McGaughey, W E Sondheim, J W Sunier  
 MCGILL U - F Corriveau, L A Hamel, F Lamarche, C Leroy,  
 Y Sirois  
 MONTREAL U - P Aubry, G Beaudoin, J M Beaulieu,  
 P Depommier, H Jeremie, L Lessard, A Lounis  
 PITTSBURGH U - W E Cleland, M Clemen, B Collick,  
 M Murray, Y M Park, J Thompson  
 SACLAY - A Gaidot, F Gibrat, G W London, J P Pansart  
 STOCKHOLM U - B Erlandsson, S Nilsson, B Sellden  
 BRUSSELS U, IIHE - R Roosen  
 KEK - H En'yo  
 ROME U - S Dell'uomo, S DiLiberto, M Mazzoni, F Meddi,  
 G Romano, G Rosa  
 TURIN U - V Bisi, P Giubellino, A Marzari-Chiesa,  
 L Ramello, L Riccati

Accelerator CERN-SPS    Detector Combination

#### Reactions

$p$ Be $\rightarrow e^\pm(s)$ X	450 GeV/c
$p$ Be $\rightarrow$ muon(s) X	"
$p$ Be $\rightarrow \nu(s)$ X	"
$p$ Be $\rightarrow e^\pm$ muon X	"
$p$ Be $\rightarrow e^\pm \nu$ X	"
$p$ Be $\rightarrow$ muon $\nu$ X	"

Particles studied charm

Comments Investigates open questions in lepton production by hadrons, such as  $e/\mu$  universality, anomalies in single-lepton production, the contribution of charm decay to lepton pair production, and 'anomalous' low-mass pair production. For a description of the apparatus, see the LBL-91 supplement on detectors. Taking data (November 86).

**CERN-NA-034-2** (May 1984) Approved Nov 1984.

### STUDY OF HIGH ENERGY DENSITIES OVER EXTENDED NUCLEAR VOLUMES VIA NUCLEUS-NUCLEUS COLLISIONS AT THE SPS

#### HELIOS COLLABORATION

BROOKHAVEN - H Gordon, T Ludlam, L H Olsen,  
 V Polychronakos, D C Rahm, I Stumer, C Woody

CERN - T Akesson, H Atherton, E Chesi, K Dederichs,  
 M J Esten, C Fabjan, U Mjornmark, F Puiz, A Rudge,  
 J Schukraft, M Seman, J P Vanuxem, R Wigmans,  
 W J Willis  
 HEIDELBERG U, PHYS INST - P Glaessel, U Goerlach,  
 V Koch, A Pfeiffer, J Soltani, H J Specht ( $\checkmark$  Spokesperson)  
 LOS ALAMOS - N J DiGiacomo, H van Hecke,  
 P L McGaughey, W E Sondheim, J W Sunier  
 LUND U - S Almehed, R Haglund, V Hedberg, G Jarlskog,  
 S Johansson, B Lorstad  
 MCGILL U - F Corriveau, L A Hamel, C Leroy, Y Sirois  
 MONTREAL U - G Beaudoin, J M Beaulieu, P Depommier,  
 H Jeremie, L Lessard, A Lounis  
 LEBEDEV INST - I Gavrilencov, S Mayburov, A Shmeleva  
 MOSCOW PHYS ENG INST - V Cherniatin, B Dolgoshein,  
 Yu Golubkov, A Kalinovsky, V Kantserov, P Nevsky,  
 A Sumarakov  
 NOVOSIBIRSK, IYF - V Sidorov, Yu Tikhonov  
 PITTSBURGH U - W Cleland, M Clemen, B Collick,  
 M Murray, J Thompson  
 SACLAY - A Gaidot, F Gibrat, G W London, J P Pansart  
 STOCKHOLM U - B Erlandsson, S Hellman, S Nilsson,  
 B Sellden  
 TEL AVIV U - O Benary, S Dagan, D Lissauer, Y Oren  
 BRUSSELS U, IIHE - R Roosen  
 SYRACUSE U - D Bettoni

Accelerator CERN-SPS    Detector Calorimeter, Spectrometer

#### Reactions

$^{16}\text{O}$ nucleus	200 GeV/c ( $P_{\text{lab}}/N$ )
$p$ nucleus	"

Comments Uses a multiwire active target and combines 4 $\pi$  calorimeter coverage with measurements of inclusive spectra, 2-particle correlations, low- and high-mass muon pairs, and photons. The target wires are aluminum, silver, and tungsten. Taking data (November 86).

**CERN-NA-035** (1982) Approved Feb 1983, Nov 1984.

### STUDY OF RELATIVISTIC NUCLEUS-NUCLEUS COLLISIONS

ATHENS U - S Margetis, A Panagiotou, A Petridis  
 BARI U - C Favuzzi, P Lapova, G Maggi, C De Marzo,  
 E Nappi, M De Palma, F Posa, A Ranieri, G Slevaggi,  
 P Spinelli  
 CERN - D Bangert, K Geissler  
 CRACOW - J Bartke, M Kowalski  
 DARMSTADT, GSI - R Bock, R Brockmann, C Guerra,  
 T Humanic, A Sandoval, H Stroebel, D Vranic  
 FRANKFURT U - W Heck, J Pfennig, R Renfordt, R Stock  
 (Spokesperson), S Wenig  
 FREIBURG U - A Bamberger, K Runge  
 HEIDELBERG U, IHEP - M Gazdzichi, D Schall  
 LBL - J Harris, G Odyniec, H G Pugh, L Teitelbaum,  
 M Ticknell  
 MARBURG U - R Keider, F Puelhofer, D Roehricht  
 MUNICH, MAX PLANCK INST - I Derado, V Eckardt,  
 J Fendt, P Freund, H J Gebauer, K P Pretzl, N Schmitz,  
 T Schouten, P Seyboth, J Seyerlein, G Vesztergombi  
 WARSAW U, IEP - H Bialkowska, E Skrzypczak  
 BOSKOVIC INST, ZAGREB - D Ference, K Kadija, G Paic

Accelerator CERN-SPS    Detector Streamer chamber,  
 Calorimeter

#### Reactions

$^{16}\text{O}$ nucleus	60, 200 GeV ( $T_{\text{lab}}/N$ )
$^{32}\text{Su}$ nucleus	"

Comments Determines for each event the charged-particle multiplicity, the proton and pion rapidity distributions, the  $\pi^0$  multiplicity around mid-rapidity, the charge-pion mean transverse momentum, the energy flow, and strange-particle production. Studies the stopping power of nuclear matter with different nuclear targets, and searches for evidence of formation of quark matter or quark-gluon plasma. Taking data (November 86).

## SUMMARIES OF EXPERIMENTS

**CERN-NA-036** (Feb 1984) Approved Nov 1984.

**THE PRODUCTION OF STRANGE BARYONS AND ANTIBARYONS WITH RELATIVISTIC ION COLLISIONS**

LBL - M Cherney, W M Geist (✓ Spokesperson), D Greiner, C R Gruhn, M Heiden, H G Pugh  
 BERGEN U - G Lovhoiden, T F Thorsteinsen  
 BIRMINGHAM U - M Cohler, G C Morrison, J M Nelson, R Zybert  
 CARNEGIE MELLON U - P D Barnes, G Franklin, B Quinn, Xia Yi  
 CERN - B Powell  
 PANJAB U - V S Bhatia, J M Kohli, I Mittra, J Singh  
 CRACOW - Z Natkaniec, M Rozanska, K Rybicki, I Sakrejda, J Turnau  
 STRASBOURG - R Blaes, H Braun, M Huss, A Michalon, M E Michalon, J L Riestler, C Voltolini  
 VIENNA, OAW - J Hrubec, J McNaughton, G Neuhofer, P Porth, H Rohringer  
 MADRID, JEN - P Ladron de Guevara  
 SANTIAGO DE COMPOSTELA U - B Castano, C Fernandez, C Garabatos, J Garzon

Accelerator CERN-SPS Detector TPC, Wire chamber, Calorimeter

Reactions

$^{16}\text{O}$ nucleus $\rightarrow \Lambda$ X	< 200 GeV/c ( $P_{\text{lab}}/N$ )
$^{16}\text{O}$ nucleus $\rightarrow \Xi$ X	"
$^{16}\text{O}$ nucleus $\rightarrow \Omega^-$ X	"
$^{16}\text{O}$ nucleus $\rightarrow K_S$ X	"
$^{32}\text{Su}$ nucleus $\rightarrow \Lambda$ X	"
$^{32}\text{Su}$ nucleus $\rightarrow \Xi$ X	"
$^{32}\text{Su}$ nucleus $\rightarrow \Omega^-$ X	"
$^{32}\text{Su}$ nucleus $\rightarrow K_S$ X	"

Comments Also studies production of the antibaryons. Uses an active target. Targets are Al, Cu, and Au. Studies among other things, the quark-gluon plasma. Scheduled to run October 87.

**CERN-NA-037** (Feb 1985) Approved Jun 1985.

**DETAILED MEASUREMENTS OF STRUCTURE FUNCTIONS FROM NUCLEONS AND NUCLEI**

BIELEFELD U - G Baum, F Sever  
 FREIBURG U - H Engelin, U Landgraf  
 HEIDELBERG, MAX PLANCK INST - I G Bird, W Brueckner, D von Harrach (Spokesperson), E Kabuss, Y Mizuno, D Nowotry, B Povh, K Rith, N A Simon, A Staiano  
 INDIANA U - R Crittenden, A Dzierba, A Jacholkowska  
 MAINZ U, INST PHYS - F Klein, G Mallot, K Roehrich, T Walcher  
 MONS U - R Windmolders  
 NEUCHATEL U - C Broggin, L D Fluri, P Gretillat, J L Vuilleumier  
 NIKHEF, AMSTERDAM - J Beaufays, R von Dantzig, M v d Heijden, M de Jong, K Ketel  
 UC, SANTA CRUZ - C Huesch  
 SIN - M Botje, W Burger, J Domingo, Q Ingram, R Schumacher, U Sennhauser  
 TURIN U & INFN, TURIN - D Allasia, M Arneodo, M I Ferrero, C Peroni, F Truc  
 UPPSALA U - A Arvidsson, P Grafstrom, E Hagberg, K Janson, S Kullander, F Lettenstrom, T Lindqvist  
 WARSAW U, IEP - B Badelek, J Ciborowski, J Nassalski, E Rondio, L Ropelewski, A Sandacz  
 WUPPERTAL U - B Korzen, N Pavel, H Peschel, U Pietrzyk

Accelerator CERN-SPS Detector EMC

Reactions

muon p	120, 280 GeV/c
muon deut	"
muon nucleus	120, 160, 280 GeV/c

Comments Deep inelastic muon scattering for  $Q^2$  from 1 to 200 GeV<sup>2</sup> and  $x$  from 0.005 to 0.75. Investigates the

structure function  $F_2^A$  on hydrogen, deuterium, and heavier nuclei, the ratio  $R = \sigma_L/\sigma_T$ , the cross section for  $J/\psi$  production, the EMC effect, etc. For a description of the apparatus, see the LBL-91 supplement on detectors. Taking data (November 86).

**CERN-NA-038** (Mar 1985) Approved Sep 1985.

**STUDY OF HIGH-ENERGY NUCLEUS-NUCLEUS INTERACTIONS WITH THE ENLARGED NA10 DIMUON SPECTROMETER**

ANNECY - C Baglin, A Bussiere, J P Guillaud  
 CERN - P Sonderegger  
 CLERMONT-FERRAND U - J Arnold, A Baldit, J Castor, F Daudon, A Devaux, J Fargeix, X Felgerolles, P Force, R Hutin, G Landaud  
 LISBON, CFMC - M C Abreu, G P Barreira, P Bordalo, A Casaca, J M Gago, P Gomes, A Maio, M Pimenta, S Ramos, J Valera  
 LYON, IPN - M Bedjidian, D Contardo, E Descroix, J Y Grossiord, A Guichard, R Haroutunian, J R Pizzi  
 ORSAY, IPN - C Gerschel, A Sinquin  
 ECOLE POLYTECHNIQUE - S Borenstein, P Busson, C Charlot, B Chaurand, L Kluberg (Spokesperson), A Romana, R Salmeron  
 STRASBOURG - J Britz, P Gorodetzky, L Kraus, I Linck  
 VALENCIA U - R Cases, J Velasco

Accelerator CERN-SPS Detector Spectrometer

Reactions

$^{16}\text{O}$ U $\rightarrow \mu^+ \mu^-$ X	225 GeV/c ( $P_{\text{lab}}/N$ )
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Comments If a quark-gluon plasma is produced, resulting thermal dimuons should differ from ordinary dimuons in transverse-momentum and rapidity distributions. In preparation (November 86).

**CERN-NA-039** (Feb 1986) Approved Apr 1986.

**A SEARCH FOR QUARKS PRODUCED IN HEAVY-ION INTERACTIONS**

UC, IRVINE - G Shaw (Spokesperson)  
 LBL - H Matis, H Pugh  
 SAN FRANCISCO STATE U - R Bland, C Hodges, J Huntington, M Savage, A Steiner

Accelerator CERN-SPS Detector Other

Reactions

$^{16}\text{O}$ Hg $\rightarrow$ quark X	225 GeV ( $T_{\text{lab}}/N$ )
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Particles studied quark

Comments Free quarks produced in a mercury target (part of the beam stop for NA-038) are concentrated by distillation of the mercury and searched for using an automated Millikan-like apparatus. In preparation (November 86).

**CERN-NA-040** (Feb 1986) Approved Apr 1986.

**ELECTROMAGNETIC DISSOCIATION OF TARGET NUCLEI BY  $^{16}\text{O}$  AND  $^{32}\text{S}$  PROJECTILES**

AMES LAB - J C Hill (✓ Spokesperson), J A Winger, F K Wohn

Accelerator CERN-SPS Detector Photon spectrometer

Reactions

$^{16}\text{O}$ nucleus	60, 200 GeV/c ( $P_{\text{lab}}/N$ )
$^{32}\text{Su}$ nucleus	"

Comments The target nucleus is  $^{197}\text{Au}$ . Measures in particular one-neutron-removal cross sections. A test of the energy dependence of the electromagnetic dissociation process. The oxygen run was completed in December 86. The sulfur run is scheduled for September 87.

**CERN-NA-041** (Feb 1986) Approved Jun 1986.

**SEARCH FOR NUCLEI IN HEAVY ION COLLISIONS AT ULTRARELATIVISTIC ENERGIES**

## SUMMARIES OF EXPERIMENTS

SACLAY - B Berthier, J Julien, S Leray, R Lucas, C Mazur, C Ngo (✓ Spokesperson), M Ribrag

Accelerator CERN-SPS Detector Counter

Reactions

$^{16}\text{O Au} \rightarrow \text{nucleus X} \quad 226 \text{ GeV } (T_{\text{lab}}/N)$

Comments Studies whether nuclei survive the collision of heavy ions at ultrarelativistic energies. This is relevant for a better understanding of possible critical phenomena in nuclear matter. In preparation (October 1986).

**CERN-NA-042** (Jul 1986) Approved Oct 1986.

**STUDY OF UNEXPLAINED HARD PHOTON PRODUCTION BY ELECTRONS CHANNЕLED IN A CRYSTAL**

LYON, IPN - X Artru, A Belkacem, M Chevallier, M J Gaillard, R Genre, R Kirsch, J-C Poizat, J Remillieux (Spokesperson)

ANNECY - G Bologna, M Gouanere, J-P Peigneux, D Sillou, M Spighel

SUNY, ALBANY - N Cue, J C Kimball, B Marsh

Accelerator CERN-SPS Detector Counter, Calorimeter

Reactions

$e^{\pm} \text{ crystal} \rightarrow \gamma(s) e^{\pm} \text{ crystal} \quad 20-200 \text{ GeV}/c$

Comments Continues studies of CERN-NA-033.

**CERN-PS-157** (Feb 1977) Approved Mar 1977; Completed Aug 1980.

**HIGH PRECISION MEASUREMENT OF  $\pi^- p$  TOTAL CROSS SECTION**

CERN - P Baillon, J Chauveau, M Ferro-Luzzi, J M Perreau, J Sequinot

ECOLE POLYTECHNIQUE - E Barrelet (Spokesperson),

D Lellouch, P Liaud, F Moreau, M Urban

COLLEGE DE FRANCE - M Benayoun, J Kahane, P Leruste, R Sene, J Tocqueville

LBL - D Mettel-Chew

Accelerator CERN-PS Detector Wire chamber

Reactions

$\pi^- p \rightarrow X \quad 2-14 \text{ GeV}/c$   
 $\pi^+ p \rightarrow X \quad 2.5-14 \text{ GeV}/c$   
 $K^- p \rightarrow X \quad 4.74 \text{ GeV}/c$

Particles studied  $N(\text{unspec})^0, \Delta(\text{unspec})^0$

Comments An addition to CERN experiment PS-153. A search for narrow resonances. A high-statistics experiment ( $2 \times 10^{11}$  events).

Papers PL 94B (1980) 541.

**CERN-PS-159** Approved Oct 1977, Nov 1978, Jun 1979, Nov 1979, Jan 1980, Jul 1980, Nov 1980; Completed Sep 1981.

**STRANGE DIBARYON SYSTEMS**

ROME U - G Marini, G Martellotti, F Massa, A Rambaldi  
 SACLAY - J P De-Brion, J B Cheze, J Derre, G Marel,

E Pauli (✓ Spokesperson), C Pigot

VANDERBILT U - J Marraffino, C Roos, M Webster

MADRID U - A Ferrando, R Llosa

CERN - S Reucroft, K Schulze

COLLEGE DE FRANCE - J Vrana

Accelerator CERN-PS Detector Spectrometer

Reactions

$K^- \text{ deut} \rightarrow K^+ X \quad 1.0-1.4 \text{ GeV}/c$   
 $K^- \text{ deut} \rightarrow \pi^+ X \quad "$   
 $K^- \text{ deut} \rightarrow \pi^- X \quad "$   
 $\pi^+ \text{ deut} \rightarrow K^+ X \quad "$   
 $\pi^- \text{ deut} \rightarrow K^+ X \quad "$

Particles studied dibaryon( $S = -2$ ), dibaryon( $S = -1$ )

Comments Measures missing mass against the  $K^+$  and  $\pi^{\pm}$  to search for  $S = -2$  and  $S = -1$  dibaryons.

Papers NIM 158 (1979) 303, NIM 179 (1981) 61, NIM 185 (1981) 49, NIM 188 (1981) 29, PL 104B (1981) 330, NP B209 (1982) 1, and NP B249 (1985) 172.

**CERN-PS-160** (1977) Approved Dec 1977; Completed Aug 1980.

**MEASUREMENT OF A AND R PARAMETERS IN THE REACTION  $\pi^+ p \rightarrow K^+ \Sigma^+$**

EDINBURGH U - D Candlin, D Lowe, J Muir, K Peach, L Scotland

RUTHERFORD - G J Alner, C Brankin, I F Corbett, S Fisher, M Gibson, G Ioannidis, E W Kendall,

P J Litchfield (✓ Spokesperson), L Mapelli, M Morrissey, R Nickson, J Wright

WESTFIELD COLL - E Arik, M Green, G Hallewell, B Pollock, A Shirany

Accelerator CERN-PS Detector RMS

Reactions Polarized target

$\pi^+ p \rightarrow K^+ \Sigma^+ \quad 1.5-1.9 \text{ GeV}/c$

Particles studied exotic-nucleon,  $\Delta(\text{unspec})^{++}$

Comments The first stage of the experiment, measurement of the differential cross section and polarization, was RHEL-193.

**CERN-PS-161** (1977) Approved Jan 1978; Completed Aug 1980.

**SEARCH FOR STRONGLY BOUND STATES OF THE  $\bar{p}p, \bar{p}d,$  and  $\bar{p}$ -FEW-NUCLEON STATES**

BASEL U - G Backenstoss, P Pavlopoulos, J Repond, L Tauscher, D Troester

KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - P Blum, R Guigas, H Koch

(✓ Spokesperson), M Meyer, U Raich, B Richter

STOCKHOLM U - L Adiels, I Bergstrom, K Fransson, A Kerek

STRASBOURG - M Suffert

THESSALONIKI U - K Zioutas

Accelerator CERN-PS Detector Combination

Reactions

$\bar{p} p \rightarrow \gamma \text{ mesons} \quad 0-500 \text{ MeV}/c$   
 $\bar{p} \text{ deut} \rightarrow \gamma \text{ mesons nucleon} \quad "$   
 $\bar{p} \text{ nucleus} \rightarrow \gamma \text{ mesons nucleus} \quad "$

Particles studied baryonium

Comments A search for high-energy  $\gamma$  transitions between 'atomic' and below-threshold antinucleon-nucleus bound states.

Papers NP B228 (1983) 424, PL 126B (1983) 284, NIM 213 (1983) 251, ZPHY C21 (1984) 315, PL 137B (1984) 323, and PL 138B (1984) 235.

**CERN-PS-162** (Feb 1978) Approved May 1978, May 1979, Nov 1979, Jan 1980, Mar 1980, Nov 1980; Completed Jul 1982.

**STUDY OF THE STRUCTURE OF EXOTIC LIGHT NUCLEI PRODUCED AT THE PS**

ORSAY, RENE BERNAS - G Audi, A Coc, M Epherre, P Guimbal, S K T Mark, A C Mueller, M de Saint-Simon,

J M Serre, C Thibault (✓ Spokesperson), F Touchard

ORSAY, AIME COTTON - H T Duong, P Jacquinet, P Juncar, S Liberman, J Pinard, J L Vialle

ORSAY, IPN - C Detraz, M C Goffri, D Guillemaud, M Langevin, F Naulin, C Zaidins

BONN U - S Buttgenbach

CERN - R Klapisch

Accelerator CERN-PS Detector Combination

Reactions

$p U \rightarrow \text{nucleus X} \quad 20 \text{ GeV}/c$

## SUMMARIES OF EXPERIMENTS

$p$  Ir  $\rightarrow$  nucleus X " "

Comments A further study of an 'island of deformation' around  $N = 20$  for  $Z = 11$  and  $12$  (Na and Mg).

Papers PL 94B (1980) 307, JPL 41 (1980) L459, NIM 186 (1981) 87, NIM 186 (1981) 193, NIM 186 (1981) 329, NP A366 (1981) 449, PL 108B (1982) 169, JP 43 (1982) 509, PR C25 (1982) 2756, NP A394 (1983) 378, NP A402 (1983) 301, PL 125B (1983) 116, PL 130B (1983) 251, NP A414 (1984) 151, and NP A426 (1984) 37.

**CERN-PS-163-2** (1979) Approved Nov 1979; Completed Jul 1980.

### MEASUREMENT OF THE $\bar{p}p$ EXCITATION FUNCTION

CERN - C Amsler  
HEIDELBERG, MAX PLANCK INST - K Braune, W Bruckner, H Dobbeling, T J Ketel, K Kilian, B Povh, M Uhrmacher, Th Walcher ( $\checkmark$  Spokesperson)  
HEIDELBERG U, PHYS INST - R W Frey, R Walczak  
SACLAY - P Birien, D Garreta

Accelerator CERN-PS Detector Spectrometer

#### Reactions

$\bar{p} p \rightarrow X$  400-1000 MeV/c  
 $\bar{p} p \rightarrow \bar{p} p$  "  
 $\bar{p} p \rightarrow$  annihil " "

Particles studied baryonium

Comments Measures the elastic differential cross section and extracts the total cross section, the slope parameter, and the real-to-imaginary part at  $0^\circ$

Papers Workshop on Physics at LEAR (Erice, 1982). No other papers expected.

**CERN-PS-164** (Sep 1978) Approved Oct 1978; Completed Apr 1980.

### THE INFLUENCE OF CHANNELLING ON ATOMIC AND NUCLEAR REACTION YIELDS

AARHUS U - J S Forster, P R Jensen, H Madsboll, S P Moller, H Nielsen, G Petersen, H Schiott  
CERN - J Bak, G Melchart, E Uggerhoj ( $\checkmark$  Spokesperson)  
STRASBOURG - J J Grob, P Siffert

Accelerator CERN-PS Detector Wire chamber

#### Reactions

$p$  crystal 2-20 GeV/c  
 $\bar{p}$  crystal " "  
 $\pi^+$  crystal " "  
 $\pi^-$  crystal " "  
 $K^+$  crystal " "  
 $K^-$  crystal " "

Comments Continues studies of channelling in Ge and Si crystals of PS-150.

**CERN-PS-165** (Sep 1978) Approved Nov 1978; Completed Apr 1980.

### MEASUREMENT OF THE $K^-p$ SCATTERING LENGTH AT THRESHOLD BY OBSERVATION OF KAONIC HYDROGEN X-RAYS FROM A CONDENSED TARGET

BIRMINGHAM U - S D Hoath, J Lowe, G J Pyle, G T A Squier  
RUTHERFORD - S Baird, C J Batty ( $\checkmark$  Spokesperson), P Sharman  
SURREY U - P Bird, A S Clough, K Parker

Accelerator CERN-PS Detector Counter

#### Reactions

$K^- p \rightarrow K^- p \gamma$  0 GeV/c

Comments Continues measurements and uses apparatus of RHEL-181.

Papers NP B209 (1982) 16, NP A392 (1983) 297, and NP A404 (1983) 482. No other papers expected.

### CERN-PS-166 Approved Nov 1979; Completed Nov 1982. SEARCH FOR $\Sigma$ HYPERNUCLEAR STATES USING THE STRANGENESS EXCHANGE REACTIONS ( $K^-, \pi^-$ ) AND ( $K^-, \pi^+$ )

HEIDELBERG, MAX PLANCK INST - K Braune, W Brueckner (Spokesperson), H Doebbeling, T J Ketel, H Kneis, B Povh, R Ransome, R Szwed, A Thiessen, M Treichel, M Uhrmacher, T Walcher  
HEIDELBERG U, PHYS INST - J Ciborowski, R W Frey, A Majewski, T A Shibata  
SACLAY - R Bertini, P Birien, G Bruge, H Catz, A Chaumeaux, J M Durand, D Garreta, S Janouin, B Mayer, J C Peng, J Saudin  
CERN - K Kilian

Accelerator CERN-PS Detector Spectrometer

#### Reactions

$K^-$  nucleus  $\rightarrow \pi^- X$  400, 450 MeV/c  
 $K^-$  nucleus  $\rightarrow \pi^+ X$  "

Particles studied hypernuc

Papers PL 136B (1984) 29, and PL (to be published).

**CERN-PS-167** (Jan 1980) Approved May 1980; Completed May 1981.

### BACKGROUND CALIBRATION FOR A PROTON LIFETIME DETECTOR

CERN - D C Cundy, M Price  
FRASCATI - G Battistoni, V Chiarella, E Iarocci, G P Murtas, L Trasatti  
MILAN U & INFN, MILAN - E Bellotti, E Fiorini ( $\checkmark$  Spokesperson), P Negri, A Pullia, S Ragazzi, M Rollier, L Zanotti  
TURIN U - G Bologna, C Castagnoli, G Mannocchi, L Periale, B D'Ettorre Piazzoli, P Picchi, O Saavedra

Accelerator CERN-PS Detector Calorimeter

#### Reactions

$\nu_\mu$  nucleus 0-6 GeV/c  
 $\bar{\nu}_\mu$  nucleus " "

Comments Calibrates a module of a nucleon lifetime detector (to be used in a deep underground experiment) with a neutrino flux similar to the atmospheric neutrino flux.

Papers NIM 219 (1984) 300.

**CERN-PS-168** (May 1980) Approved May 1980; Completed Jun 1981.

### TO TEST A PROTOTYPE OF A PROTON LIFETIME DETECTOR IN A NEUTRINO BEAM AT THE PS

ORSAY, LAL - B Grelaud, S Jullian, C Longuemare, C Poulot, G Szklarz  
ECOLE POLYTECHNIQUE - B Degrange, U Nguyen-Khac  
SACLAY - R Barloutaud ( $\checkmark$  Spokesperson), G Chardin, J Mallet, J C Michau, S Palanque, J Rich, M Spiro, J C Thevenin

Accelerator CERN-PS Detector Calorimeter

#### Reactions

$\nu_\mu$  nucleus 0-6 GeV/c  
 $\bar{\nu}_\mu$  nucleus " "

Comments Tests a prototype calorimeter for a proton lifetime experiment. Didn't get enough statistics to be used as background for nucleon decay.

**CERN-PS-169** (Aug 1980) Approved Oct 1980; Completed Mar 1983.

### SEARCH FOR NEUTRINO OSCILLATIONS

## SUMMARIES OF EXPERIMENTS

CERN - F Dydak, G Feldman, C Guyot, R Hagelberg, H J Meyer, F Ranjard, J R Rothberg, W von Rueden, J Steinberger, H Taureg, H Wachsammuth, H Wahl, J Wotschack (✓ Spokesperson)  
 DORTMUND U - H Bluemer, P Buchholz, J Duda, F Eisele, K Kleinknecht, J Knobloch, D Pollmann, B Pzola, B Renk  
 HEIDELBERG U, IHEP - R Belusevic, B Falkenburg, T Flottmann, C Geweniger, J G H de Groot, H Keilwerth, K Tittel  
 SACLAY - P Debu, J P Merlo, A Para, P Perez, B Peyaud, J Rander, J P Schuller, R Turlay  
 WARSAW, INR - H Abramowicz, J Krolikowski

Accelerator CERN-PS Detector CDHS

Reactions

$\nu_\mu \rightarrow \nu_\mu$  0.5-3.0 GeV/c

Particles studied  $\nu_\mu$

Comments Measures the disappearance rate of  $\nu_\mu$ 's between two points at 130 and 885 m from the target, using charged current events as the signature. Two detectors with identical structure are used simultaneously. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 134B (1984) 281. No other papers expected.

**CERN-PS-170** (Aug 1980) Approved Nov 1980.

**PRECISION MEASUREMENTS OF THE PROTON ELECTROMAGNETIC FORM FACTORS IN THE TIME-LIKE REGION AND VECTOR MESON SPECTROSCOPY**

FERRARA U - R Calabrese, P Dalpiaz (Spokesperson), P F Dalpiaz, F Petrucci, M Savrie  
 PADUA U - R Carlin, U Dosselli, F Gasparini, S Limentani, M Posocco, R Stroeli, C Voci  
 SACLAY - G Bardin, G Burgun, J Derre, J Duclos, M Huet, C Kochowsky, G Marel, N Zekri  
 FRASCATI - G Capon  
 TURIN U - L Tecchio  
 CERN - E Mazzucato

Accelerator CERN-PS Detector Wire chamber

Reactions

$\bar{p} p \rightarrow e^+ e^-$  0-2 GeV/c  
 $\bar{p} p \rightarrow e^+ e^-$  neutrals 0 GeV/c

Particles studied  $v_{\text{meson}}^0$

Comments Pending (November 86).

**CERN-PS-171** (Aug 1980) Approved Nov 1980; Completed Jul 1986.

**A STUDY OF  $\bar{p}p$  INTERACTIONS AT REST IN A H<sub>2</sub> GAS TARGET AT LEAR**

ASTERIX COLLABORATION

CERN - R Armenteros, D Bailey, U Gastaldi  
 MAINZ U, INST PHYS - K D Duch, M Heel, H Kalinowsky, F Kayser, E Klempt (✓ Spokesperson), R Landua, B May, O Schreiber, M Ziegler  
 MUNICH U, EXP PHYS - W Dahme, F Feld-Dahme, U Schaefer, R W Wodrich  
 ORSAY, LAL - J C Bizot, B Delcourt, J Jeanjean, H Nguyen, N Prevot  
 BRITISH COLUMBIA U - E G Auld, D A Axen, M Comyn, K L Erdman, B Howard, R Howard, G Marshall, B L White  
 VICTORIA U - G A Beer, L P Robertson  
 VIENNA, INST RADIUMFORSCH, KERNPHYS - M Botlo, C Laa, H Vonach  
 ZURICH U - C Amsler, M Doser, J Riedelberger, U Straumann, P Truoeil  
 GENEVA U - C Sabev

Accelerator CERN-LEAR Detector Combination

Reactions

$\bar{p} p \rightarrow \bar{p} p \gamma$  0 GeV/c  
 $\bar{p} p \rightarrow \text{annihil}$  "  
 $\bar{p} p \rightarrow \pi^+ \pi^-$  "  
 $\bar{p} p \rightarrow K^+ K^-$  "  
 $\bar{p} p \rightarrow \text{pions } (\gamma)$  "  
 $\bar{p} p \rightarrow \text{kaons pion(s)}$  "

Particles studied baryonium, exotic-meson, glueball,  $f_1(1420)$

Papers PL 152B (1985) 135, and PL 157B (1985) 333.

**CERN-PS-172** (Jul 1980) Approved Nov 1980; Completed Aug 1986.

**$\bar{p}p$  TOTAL CROSS SECTIONS AND SPIN EFFECTS IN  $\bar{p}p \rightarrow K^+ K^-, \pi^+ \pi^-, \bar{p}p$  ABOVE 200 MeV/c**

NIKHEF, AMSTERDAM - R Blokzijl, K Bos, J Kluyver, R A Kunne, L Linssen  
 GENEVA U - E Heer, R Hess, C Lechanoine-Leluc, Y Onel, D Rapin  
 QUEEN MARY COLL - D Bugg (✓ Spokesperson), J Hall  
 SURREY U - A S Clough, R Shypit  
 TRIESTE U & INFN, TRIESTE - R Birsa, F Bradamante, A Martin, A Penzo, P Schiavon, F Tessarotto, S Dalla Torre, A Villari

Accelerator CERN-LEAR Detector Wire chamber

Reactions Polarized target

$\bar{p} p \rightarrow \pi^+ \pi^-$  300-2000 MeV/c  
 $\bar{p} p \rightarrow K^+ K^-$  "  
 $\bar{p} p \rightarrow \bar{p} p$  "  
 $\bar{p} p \rightarrow X$  200-800 MeV/c  
 $\bar{p} p \rightarrow \text{neutrals}$  "

Particles studied baryonium

Comments The main aim is the study of narrow states (if they exist). Also to study the analyzing power of carbon in small-angle  $\bar{p}p$  scattering, and  $\bar{p}p$  elastic scattering in the coulomb-nuclear interference region.

Papers PL 155B (1985) 437.

**CERN-PS-173** (Aug 1980) Approved Nov 1980; Completed May 1986.

**MEASUREMENT OF  $\bar{p}p$  CROSS SECTIONS AT LOW  $\bar{p}$  MOMENTA**

HEIDELBERG, MAX PLANCK INST - W Bruckner, H Doebbeling, K Dworschak, D von Harrach, S Paul, B Povh, M Treichel  
 HEIDELBERG U, PHYS INST - M Nomachi, T A Shibata  
 LAVAL U - B Cujec  
 MAINZ U, INST KERNPHYS - Th Walcher (✓ Spokesperson)  
 RUTGERS U - R Ransome

Accelerator CERN-LEAR Detector Combination

Reactions

$\bar{p} p \rightarrow \bar{p} p$  150-600 MeV/c  
 $\bar{p} p \rightarrow \bar{n} n$  "  
 $\bar{p} p \rightarrow \text{annihil}$  "  
 $\bar{p} p \rightarrow X$  "

Particles studied baryonium

Comments A search for baryonium and a measurement of differential cross sections.

Papers PL 158B (1985) 180, PL 166B (1986) 113, and PL 169B (1986) 302.

**CERN-PS-174** (Aug 1980) Approved Dec 1980; Completed Jul 1986.

**PRECISION SURVEY OF X-RAYS FROM  $\bar{p}p$  ( $\bar{p}d$ ) ATOMS USING THE INITIAL LEAR BEAM**

NIKHEF, AMSTERDAM - E W A Lingeman  
 BIRMINGHAM U - J D Davies (Spokesperson), J Lowe, J M Nelson, G J Pyle, A Selvarajah, G T A SQUIER

## SUMMARIES OF EXPERIMENTS

DELFT UNIV TECH - C Van Eijk, R Hollander,  
D Langerveld, W J C Okx, A Zoutendijk  
RUTHERFORD - C A Baker, C J Batty, S Sakamoto  
WILLIAM AND MARY COLL - R E Welsh, R Winter  
Accelerator CERN-LEAR Detector Photon spectrometer  
Reactions  
 $\bar{p} p \rightarrow \bar{p} p \gamma$  0 MeV/c  
 $\bar{p} \text{ deut} \rightarrow \bar{p} \text{ deut} \gamma$  "  
Comments The detector is a Si(Li) crystal.  
Papers PL 162B (1985) 71.

**CERN-PS-175** (1980) Approved Dec 1980; Completed Jul 1986.  
**MEASUREMENT OF THE ANTIPROTONIC LYMAN AND BALMER X-RAYS OF  $\bar{p}$  H AND  $\bar{p}$  d ATOMS AT VERY LOW TARGET PRESSURES**  
KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - R Bacher, P Bluem, D Gotta, H Koch, W Kunold, D Rohmann, M Schneider, L M Simons (✓ Spokesperson)

Accelerator CERN-LEAR Detector Photon spectrometer  
Reactions  
 $\bar{p} p \rightarrow \bar{p} p \gamma$  0 GeV/c  
 $\bar{p} \text{ deut} \rightarrow \bar{p} \text{ deut} \gamma$  "  
Comments The detectors are Si(Li) crystals.

**CERN-PS-176** (Aug 1980) Approved Dec 1980; Completed Jun 1986.  
**STUDY OF X-RAY AND  $\gamma$ -RAY SPECTRA FROM ANTIPROTONIC ATOMS AT THE SLOWLY EXTENDED  $\bar{p}$  BEAM OF LEAR**

BASEL U - G Backenstoss, C Findeisen, L Tauscher  
KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - P Bluem, G Bueche, D Gotta, D Hancock, J Hauth, H Koch, T Koehler, H Poth (✓ Spokesperson), D Rohmann  
STOCKHOLM, RES INST ATOMIC PHYS - L Adiels  
STOCKHOLM U - I Bergstrom, S Carius, A Nilsson  
STRASBOURG - M Suffert  
THESSALONIKI U - S Charalambous, M Chardalas, G Dedoussis, K Zioutas  
CERN - A Kreissl, P Pavlopoulos, D Troester, A Wolf  
Accelerator CERN-LEAR Detector Photon spectrometer  
Reactions  
 $\bar{p} \text{ nucleus} \rightarrow \bar{p} \text{ nucleus} \gamma$  0 MeV/c  
Comments The detectors are Ge and Si(Li) crystals.  
Papers PL 176B (1986) 327.

**CERN-PS-177** (Jul 1980) Approved Dec 1980; Completed Jul 1986.

**A SEARCH FOR HEAVY HYPERNUCLEI AT LEAR**  
NIKHEF, AMSTERDAM - J Konijn  
DARMSTADT, GSI - S Polikanov (Spokesperson)  
GRENOBLE, CEN - J P Bocquet, M Maurel, E Monnard, H Nifenecker, P Perrin, C Ristori  
SACLAY - J Mougey  
WARSAW U, IEP - T Krogulski  
UPPSALA U - G Eriksson, T Johansson, G Tibell  
ORSAY, CSNSM - M Epherre  
Accelerator CERN-LEAR Detector Wire chamber  
Reactions  
 $\bar{p} \text{ nucleus}$  0 GeV/c  
Particles studied hypernuc

Comments Searches for heavy hypernuclei and measures their yields and lifetimes by using the fission mode as a decay signature. The reaction chain is as follows:  $\bar{p}$ 's stopping in heavy-element targets annihilate and occasionally produce

kaons. A  $K^-$  then occasionally interacts to produce a  $\Lambda$ , which forms a hypernucleus.

**CERN-PS-178** (Aug 1980) Approved Dec 1980; Completed Jul 1986.

### $\bar{n}$ PRODUCTION AT LEAR

CAGLIARI U - L Cugusi, M P Macciotta, S Marcello, A Masoni, G Puddu, S Serci  
PADUA U - M Morandini, R A Ricci, C Voci  
TURIN U - T Bressani (✓ Spokesperson), G Della Casa, E Chiavassa, S Costa, M Gallio, F Iazzi, B Minetti, A Musso  
Accelerator CERN-LEAR Detector Calorimeter

Reactions  
 $\bar{p} p \rightarrow \bar{n} n$  0.1-0.6 GeV/c  
Comments Studies  $\bar{n}$  production near  $0^\circ$ , with an eye toward future experiments on  $\bar{n}p$ ,  $\bar{n}n$ , and  $\bar{n}d$  reactions.

**CERN-PS-179** (Aug 1980) Approved Dec 1980; Completed Jul 1986.

### STUDY OF THE INTERACTION OF LOW-ENERGY ANTIPROTONS WITH $^2\text{H}$ , $^3\text{He}$ , $^4\text{He}$ , AND Ne NUCLEI USING A STREAMER CHAMBER IN A MAGNETIC FIELD

BERGEN U - A Haatuft, A Halsteinslid, K Myklebost, J M Olsen  
BRESCIA U - E Lodi Rizzini  
DUBNA - Y A Batusov, S A Bunyatov, I V Falomkin, G B Pontecorvo, M G Sapozhnikov  
FRASCATI - C Guaraldo, A Maggiora  
OSLO U - F O Breivik, T Jacobsen, S O Sorensen  
PADUA U - L Peruzzo, G Sartori, M Vascon  
PAVIA U - G Bendiscioli, G Fumagalli, C Marciano, A Rotondi, A Zenoni  
TURIN U - F Balestra, S Bossolasco, M P Bussa, L Busso, L Ferrero, R Garfagnini, A Grasso, D Panziereni, G Piragino (✓ Spokesperson)

Accelerator CERN-LEAR Detector Streamer chamber  
Reactions  
 $\bar{p} p$  0-200 MeV/c  
 $\bar{p} \text{ deut}$  "  
 $\bar{p} ^3\text{He}$  "  
 $\bar{p} \text{ He}$  0-600 MeV/c  
 $\bar{p} \text{ Ne}$  "  
 $\bar{p} \text{ Ag}$  "  
 $\bar{p} \text{ Br}$  "

Papers NIM 188 (1981) 69, RNC 5 (1982) NO. 10, LNC 38 (1983) 83, LNC 38 (1983) 211, NC 79A (1984) 193, NIM 222 (1984) 524, LNC 41 (1984) 223, PL 149B (1984) 69, NIM 234A (1985) 30, PL 165B (1985) 265, NP A452 (1986) 573, and EL 2 (1986) 115.

**CERN-PS-180** (Oct 1980) Approved Mar 1981; Completed Aug 1984.

### SEARCH FOR NEUTRINO OSCILLATIONS AT CERN PS USING BEBC

ATHENS U - A Apostolakis, P Ioannou, P Kostarakis, C Kourkoumelis, P Pramatiotis, L K Resvanis  
PADUA U - M Baldo-Ceolin (Spokesperson), F Bobisut, E Calimani, S Ciampolillo, H Huzita, M Loreti, G Miari, G Puglierin, A Sconza  
PISA U & INFN, PISA - C Angelini, A Baldini, L Bertanza, A Bigi, R Fantechi, E Flaminio, R Pazzi, C Petri, G Saitta  
WISCONSIN U - U Camerini, W Fry, R Loveless, R March, M Procaro, D D Reeder  
CERN - S Katsanevas

Accelerator CERN-PS Detector HLBC-BEBC  
Reactions  
 $\nu_\mu \text{ nucleus} \rightarrow \mu^- X$  0.5-3.0 GeV/c

## SUMMARIES OF EXPERIMENTS

$\nu_e$  nucleus  $\rightarrow e^- X$  " "  
Particles studied  $\nu_e, \nu_\mu, \nu_\tau$   
Papers PL 179B (1986) 307.

**CERN-PS-181** (Feb 1981) Approved Mar 1981; Completed Mar 1983.

**CONTRIBUTION OF THE CHARM COLLABORATION TO THE CERN NEUTRINO OSCILLATION PROGRAM**

CHARM COLLABORATION

NIKHEF, AMSTERDAM - J Dorenbosch, C Nieuwenhuis  
 CERN - J V Allaby, U Amaldi, F Bergsma, A Capone,  
 W Flegel, L Lancieri, M Metcalf, J Panman, C Santoni,  
 K Winter ( $\checkmark$  Spokesperson)  
 HAMBURG U - I Abt, J Aspiazu, F W Busser, H Daumann,  
 P D Gall, F Niebergall, P Schutt, P Stahelin  
 MOSCOW, ITEP - E Grigoriev, V Kaftanov, V Khovansky,  
 A Rosanov  
 INFN, ROME - G Barbiellini, A Baroncelli, L Barone,  
 B Borgia, C Bosio, M Diemoz, U Dore, F Ferroni, E Longo,  
 L Luminari, P Monacelli, F de Notaristefani, L Tortora,  
 V Valente

Accelerator CERN-PS Detector CHARM

Reactions

$\nu_\mu$  nucleus  $\rightarrow \mu^- X$  0.5-1.5 GeV/c

Particles studied  $\nu_\mu$

Comments Consists of two detectors, one at 150 m, the other at 880 m, from the target. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 142B (1984) 103.

**CERN-PS-182** (Jan 1981) Approved May 1981; Completed Jul 1986.

**INVESTIGATIONS ON BARYONIUM AND OTHER RARE  $\bar{p}p$  ANNIHILATION MODES USING HIGH-RESOLUTION  $\pi^0$  SPECTROMETERS**

BASEL U - G Backenstoss, M Hugi, U Mall, H O Meyer,  
 R Rickenbach, A Schopper, L Tauscher ( $\checkmark$  Spokesperson)  
 CERN - P Pavlopoulos, D Troester  
 STOCKHOLM, RES INST ATOMIC PHYS - L Adiels,  
 I Bergstrom, S Carius, A Kerek  
 THESSALONIKI U - S Charalambous, D Hadjifotiadou,  
 K Papastefanou, K Zioutas

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p} p \rightarrow \pi^0 X$  0 GeV/c

$\bar{p} p \rightarrow \eta X$  "

$\bar{p} p \rightarrow \gamma X$  "

Particles studied baryonium

Comments Uses high-resolution  $\gamma$  detectors, as well as scintillators for charged particles.

Papers NIM A244 (1986) 380, and PL 182B (1986) 405.

**CERN-PS-183** (Aug 1980) Approved May 1981; Completed Aug 1986.

**SEARCH FOR BOUND  $N\bar{N}$  STATES USING A PRECISION  $\gamma$  AND CHARGED-PION SPECTROMETER AT LEAR**

ATHENS U - A Angelopoulos, A Apostolakis, P Papailias,  
 H Rozaki, L Sakelliou, M Spyropoulou-Stassinaki  
 UC, IRVINE - M Fero, M Y Gee, M A Mandelkern, R Ray,  
 D Schultz, J Schultz, T Usher  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
 KARLSRUHE U - G Bueche, H Koch, W Rohrback,  
 D Walther  
 PENN STATE U - T A Armstrong, J Biard, R A Lewis,  
 B Y Oh, S M Playfer, G A Smith ( $\checkmark$  Spokesperson),  
 M Soulliere, J Whitmore

NEW MEXICO U - B Bassalleck, P Denes, N Graf, N Komminos, M Suffert, D M Wolfe

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p} p \rightarrow \gamma X$  0 GeV/c

$\bar{p} p \rightarrow \pi^+ X$  "

$\bar{p} p \rightarrow \pi^- X$  "

$\bar{p} p \rightarrow K^+ X$  "

$\bar{p} p \rightarrow K^- X$  "

$\bar{p} p \rightarrow \text{annihil}$  0-300 MeV/c

Particles studied baryonium, meson

Comments Continues studies of BNL-708.

Papers PL 159B (1985) 210, and PL 178B (1986) 441.

**CERN-PS-184** (Dec 1980) Approved May 1981; Completed Aug 1985.

**STUDY OF  $\bar{p}$ -NUCLEUS INTERACTION WITH A HIGH RESOLUTION MAGNETIC SPECTROMETER**

SACLAY - P Birien, G Bruge, H Catz, A Chaumeaux,  
 D Drake, D Garreta ( $\checkmark$  Spokesperson), S Janouin,  
 D Legrand, M C Mallet-Lemaire, B Mayer, J Pain, J C Peng,  
 F Perrot

STRASBOURG - E Aslanides, O Bing

TEL AVIV U - J Lichtenstadt, A I Yavin

GRENOBLE, CEN - M Berrada, J P Bocquet, E Monnard,  
 J Mougey, P Perrin

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p}$  nucleus  $\rightarrow \bar{p}$  nucleus 300-800 MeV/c

$\bar{p}$  nucleus  $\rightarrow p X$  "

Comments The nuclear targets range from deuterium to Pb and Bi.

Papers PL 135B (1984) 266, PL 149B (1984) 64, PL 150B (1985) 95, PR C32 (1985) 1096, NP A451 (1986) 541, PL 169B (1986) 14, and NP A456 (1986) 557.

**CERN-PS-185** (Aug 1981) Approved Oct 1981.

**STUDY OF THRESHOLD PRODUCTION OF  $\bar{p}p \rightarrow \bar{Y}Y$  AT LEAR**

CARNEGIE MELLON U - P D Barnes, G Franklin, B Quinn,  
 J Seydoux, J Szymanski

KERNFORSCHUNGSANLAGE, JULICH - K Kilian  
 ( $\checkmark$  Spokesperson), W Oelert, G Sehl, T Zeludziewicz

ERLANGEN U - W Eylich, M Frankenberg, A Hofmann,  
 M Meyerhofer, F Stinzing

FREIBURG U - P Birien, W Dutty, J Franz, N Hamann,  
 E Roessle, H Schledermann, H Schmitt

ILLINOIS U, URBANA - R A Eisenstein, D Hertzog

RICE U - B Bonner

UPPSALA U - G Ericsson, T Johansson, S Ohlsson

VIENNA, INST RADIUMFORSCH, KERNPHYS - W Breunlich, N Naegele, P Pawlek

Accelerator CERN-LEAR Detector Wire chamber

Reactions

$\bar{p} p \rightarrow \bar{\Lambda} \Lambda$  1.2-2.0 GeV/c

$\bar{p} p \rightarrow \bar{\Lambda} \Sigma^0$  "

$\bar{p} p \rightarrow \bar{\Sigma}^- \Sigma^+$  "

$\bar{p} p \rightarrow \bar{\Sigma}^+ \Sigma^-$  "

$\bar{p} p \rightarrow K_S K_S$  "

Particles studied baryonium, X(2220)

Comments Measures cross sections, polarizations, and spin correlations. Emphasis is on the  $\bar{\Lambda}\Lambda$  channel. Investigates the  $Y\bar{Y}$  final-state interaction and decays and compares  $\Lambda$  and  $\bar{\Lambda}$  decay asymmetries and lifetimes. Taking data (December 86).

## SUMMARIES OF EXPERIMENTS

**CERN-PS-186** (Aug 1980) Approved Oct 1981; Completed Jul 1986.

**NUCLEAR EXCITATIONS BY ANTIPROTONS AND ANTIPROTONIC ATOMS**

MUNICH, TECH U - H Daniel, T von Egidy  
( $\checkmark$  Spokesperson), H Hagn, F J Hartmann, W Kanert,  
H Plendl

MISSISSIPPI U - J J Reidy  
KERNFORSCHUNGSANLAGE, JULICH - H Machner,  
G Riepe

Accelerator CERN-LEAR Detector Photon spectrometer,  
Spectrometer

Reactions

$\bar{p}$  nucleus  $\rightarrow \gamma$  charged X 0 GeV/c

Papers PRL 56 (1986) 2368, and PL 179B (1986) 25.

**CERN-PS-187** (May 1981, Sep 1981) Approved Oct 1981; Completed Jun 1984.

**A GOOD STATISTICS STUDY OF  $\bar{p}$  INTERACTIONS WITH NUCLEI**

LOS ALAMOS - M Clover, R DeVries, N DiGiacomo  
( $\checkmark$  Spokesperson), J Kapustinsky, P McGaughey,  
W Sondheim, J Sunier

GRENOBLE U - M Buenerd, J Chauvin, D Lebrun, P Martin,  
P De Saintigon

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p}$  nucleus  $\rightarrow$  annihil 600 MeV/c

$\bar{p}$  nucleus  $\rightarrow p$  nucleus "

Comments Measures the overall characteristics of  $\bar{p}$  annihilations in nuclei. Studies inclusive and multiparticle correlations yields for  $\pi$ ,  $K$ ,  $p$ ,  $d$ , ... ejectiles. Also searches for  $\bar{p}$ -nucleus bound or resonant states using the  $A(\bar{p}, p)A^*$  reaction.

Papers NIM A249 (1986) 361, and PRL 56 (1986) 2156.

**CERN-PS-188** (Oct 1981) Approved Dec 1981; Completed Aug 1985.

**MEASUREMENTS OF CHANNELLING RADIATION AND ITS POLARIZATION, X-RAY EXCITATION, TOGETHER WITH DEVIATIONS FROM LANDAU DISTRIBUTIONS**

AARHUS U - J Bak, J A Ellison, F Meyer, S P Moller,  
K Ostergaard, J Pedersen, R Stensgaard, E Uggerhøj  
(Spokesperson)

CERN - A Sorensen  
STRASBOURG - R Regall, P Siffert, M Suffert

Accelerator CERN-PS Detector Wire chamber

Reactions

$e^+$  crystal 1-10 GeV/c

$e^-$  crystal "

$p$  crystal "

$\pi^+$  crystal "

$\pi^-$  crystal "

Comments Continues studies of experiments PS-164 and WA-064.

Papers PL 110B (1982) 162, and PL 112B (1982) 83.

**CERN-PS-189** (Nov 1981) Approved Feb 1983.

**HIGH PRECISION MASS MEASUREMENTS WITH A RADIOFREQUENCY MASS SPECTROMETER - APPLICATION TO THE MEASUREMENT OF THE  $p\bar{p}$  MASS DIFFERENCE**

ORSAY, CSNSM - A Coc, R Fergeau, R Le Gac, M de Saint-Simon, C Thibault ( $\checkmark$  Spokesperson), F Touchard

CERN - E Haebel, H Herr, R Klapisch, G Lebee, G Petrucci,  
G Stefanini

Accelerator CERN-PS Detector Spectrometer

Reactions

$\bar{p}$  20 MeV/c

Particles studied  $\bar{p}$

Comments The  $\bar{p}$  mass is compared with that of the  $H^-$  ion. In preparation (October 86).

**CERN-PS-191** (Feb 1983) Approved Mar 1983; Completed Aug 1984.

**SEARCH FOR DECAYS OF HEAVY NEUTRINOS WITH THE PS BEAM**

DEMOCRITOS NUCLEAR RESEARCH CENTER - M Dris,  
D Lukas

CERN - M Ferro-Luzzi, J M Perreau, Ch Peyrou  
PARIS, CURIE UNIV VI - G Bernardi, J M Levy, Y Pons,  
M Rivoal, F Vannucci ( $\checkmark$  Spokesperson)

ROME U - F Di Carlo, G Carugno  
COLLEGE DE FRANCE - J Chauveau

Accelerator CERN-PS Detector Calorimeter

Reactions

$\nu$  0-5 GeV/c

$\bar{\nu}$  "

Particles studied  $\nu, \bar{\nu}$

Comments Aims to detect an  $e^+e^-$  or  $\gamma\gamma$  pair originating from a point in an empty volume exposed to a flux of neutrinos.

Papers PL 166B (1986) 479, and PL 181B (1986) 173.

**CERN-PS-192** (Mar 1983) Approved Mar 1983; Completed Aug 1983.

**STUDY OF THE ENERGY DEPENDENCE OF THE ANOMALOUS MEAN FREE PATH EFFECT BY MEANS OF HIGH-ENERGY ( $> 12$  GeV/NUCLEON) HELIUM NUCLEI**

LBL - E M Friedlander (Spokesperson), H H Heckman,  
Y J Karant

FRANKFURT U - B Baican, H G Baumgardt, E Schopper  
MARBURG U - R Beckmann, R Brandt, G Dersch, H Molzahn, R M Weiner

Accelerator CERN-PS Detector Combination

Reactions

He nucleus  $> 45$  GeV/c

Particles studied anomalon

Comments Effects detected in emulsion, in AgCl crystals, and by radiochemical methods.

**CERN-PS-194** (Nov 1982) Approved Nov 1984; Completed Jul 1986.

**MEASUREMENTS OF THE RATIO BETWEEN DOUBLE AND SINGLE IONIZATION OF HELIUM FOR ANTIPROTONS**

AARHUS U - J Bak, P Hvelplund, H Knudsen, E Uggerhøj  
(Spokesperson)

CERN - S P Moller, A H Sorensen  
STOCKHOLM, RES INST ATOMIC PHYS - G Astner,  
I Bergstrom, L Liljebj

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p}$  He  $> 3$  MeV ( $T_{lab}$ )

**CERN-PS-195** (Jan 1985) Approved Sep 1985.

**TEST OF CP VIOLATION WITH  $\bar{K}^0$  AND  $K^0$  AT LEAR**

DEMOCRITOS NUCLEAR RESEARCH CENTER - M Dris,  
P Kokkinias, P Kostarakis, L Papadopoulos, S Zevgolatakos  
BASEL U - G Backenstoss, M Hugi, U Mall, R Rickenbach,  
C Santoni, A Schopper, L Tauscher



## SUMMARIES OF EXPERIMENTS

CERN - P Bloch, M Fidencaro, D Garreta, G Kessler,  
 P Pavlopoulos (Spokesperson), D A Troester, E Watson  
 FRIBOURG U - J C Dousse, J Kern, L Schaller  
 LIVERPOOL U - C Bee, M Dodgson, J R Fry, E Gabathuler,  
 W G Hayes, P Hayman, L Sachs  
 SACLAY - G Burgun, J Derre, J L Faure, C Guyot,  
 C Kochowski, G Marel, A Milstajn, E Pauli  
 SIN - P Kettle, T Nakada  
 STOCKHOLM, RES INST ATOMIC PHYS - L Adiels,  
 I Bergstrom, S Carius, A Kerek, T Lindblad, A Nilsson  
 THESSALONIKI U - M Chaldaras, S Charalambous,  
 S Dedousis, D Hatzifotiadou  
 ZURICH, ETH - R Von Dincklage, W Fetscher, H J Gerber,  
 P Grumplinger, M Troege, C Witzig

Accelerator CERN-LEAR Detector Spectrometer,  
 Calorimeter

Reactions

$\bar{p} p \rightarrow K^0 X$  0 GeV/c  
 $\bar{p} p \rightarrow \bar{K}^0 X$  "

Particles studied  $K^0, \bar{K}^0$

Comments In preparation (November 86).

**CERN-PS-196** (Mar 1985) Approved Nov 1985.

**PRECISION COMPARISON OF  $\bar{p}$  AND  $p$  MASSES IN A PENNING TRAP**

FERMILAB - W Kells  
 MAINZ U, INST PHYS - H Kalinowsky  
 WASHINGTON U, SEATTLE - G Gabrielse  
 (✓ Spokesperson), T A Trainor

Accelerator CERN-LEAR Detector ?

Reactions

$\bar{p}$  0.0005 eV ( $T_{lab}$ )

Particles studied  $\bar{p}, p$

Comments Aims to compare  $p$  and  $\bar{p}$  masses to an accuracy of one part in  $10^9$ . Antiprotons have been trapped below 3 keV.

Papers PRL (accepted).

**CERN-PS-197** (Oct 1985) Approved Apr 1986.

**THE CRYSTAL BARREL: MESON SPECTROSCOPY AT LEAR WITH A  $4\pi$  NEUTRAL AND CHARGED DETECTOR**

CERN - K Braune  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
 KARLSRUHE U - E Aker, G Bueche, S Cierjacks,  
 D Engelhardt, T Henkes, H Koch (✓ Spokesperson),  
 A Kreissl, F Kroener, M Kunze, H Matthaey, D Rohmann,  
 W Rohrbach, W Schott, D Walther, C Weddigen  
 ZURICH U - C Amsler, B Schmid, P Truoel  
 LBL - J Bistirlich, K M Crowe, C A Meyer  
 QUEEN MARY COLL - D V Bugg, G Hall, P Wells  
 SURREY U - A S Clough, R L Shypit  
 MAINZ U, INST PHYS - M Guckes, H Kalinowsky, E Klempt,  
 R Rieger, U Straumann, W Weidenauer  
 STRASBOURG - M Suffert  
 VIENNA, INST RADIUMFORSCH, KERNPHYS & VIENNA  
 U - H Vonach  
 MUNICH U, EXP PHYS - M Faessler, C Zupancic

Accelerator CERN-LEAR Detector CRY-S-BARREL

Reactions

$\bar{p} p \rightarrow \text{annihil}$  0-2000 MeV/c

Particles studied glueball, meson

Comments High detection efficiency for both neutral and charged particles at nearly all angles means nearly all annihilation channels are accessible. In preparation (October 86).

**CERN-PS-198** (Oct 1985) Approved Apr 1986.

**MEASUREMENT OF SPIN-DEPENDENT OBSERVABLES IN  $\bar{p}N$  ELASTIC SCATTERING FROM 300 TO 700 MeV/c**

SACLAY - J Arvieux, R Bertini (✓ Spokesperson), H Catz,  
 C Cerruti, A Chaumeaux, J M Durand, D Legrand,  
 F Perrot, J Yonnet  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
 KARLSRUHE U - E Boschitz, W Gyles, C R Ottermann,  
 T Tacik  
 LYON, IPN - E Descroix, J Y Grossiord, A Guichard,  
 R Harountunian  
 SIN - B Van den Brandt, J Konter, S Mango

Accelerator CERN-LEAR Detector Spectrometer

Reactions Polarized target

$\bar{p} p \rightarrow \bar{p} p$  300-700 MeV/c  
 $\bar{p} \text{ deut} \rightarrow \bar{p} \text{ deut}$  "

Comments Scheduled to run in September 87.

**CERN-PS-199** (Nov 1985) Approved Apr 1986.

**STUDY OF THE SPIN STRUCTURE OF THE  $\bar{p}p \rightarrow \bar{n}n$  CHANNEL AT LEAR**

CAGLIARI U - M P Macciotta, A Masoni, G Puddu, S Serci  
 GENEVA U - E Heer, R Hess, C Lechanoine-Leluc, D Rapin  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
 KARLSRUHE U - E Boschitz, W Gyles, C R Otterman,  
 T Tacik  
 TRIESTE U & INFN, TRIESTE - R Birsá, F Bradamante  
 (✓ Spokesperson), M Giorgi, A Martin, A Penzo, P Schiavon,  
 F Tessarotto, S Dalla Torre, A Villari, A M Zanetti  
 TURIN POLYTECHNIC & INFN, TURIN - F Iazzi, B Minetti  
 TURIN U & INFN, TURIN - T Bressani, G Della Casa,  
 E Chiavassa, M Gallio, N De Marco, A Musso

Accelerator CERN-LEAR Detector Counter

Reactions Polarized target

$\bar{p} p \rightarrow \bar{n} n$  500-1500 MeV/c

Particles studied meson

Comments Measures over the whole angular range the polarization parameter  $P$  and the polarization transfer parameter  $D$  in 100 MeV/c steps. Searches for resonances in the s channel. Uses a frozen-spin polarized target. In preparation (October 86).

**CERN-PS-200** (Jan 1986) Approved Apr 1986.

**A MEASUREMENT OF THE GRAVITATIONAL ACCELERATION OF THE ANTIPROTON**

PISA U - N Beverini, L Bracci, G Torelli  
 LOS ALAMOS - J H Billen, R E Brown, L J Campbell,  
 K R Crandall, T Goldman, D B Holtkamp,  
 M H Holzscheiter, S D Howe, R J Hughes, M V Hynes  
 (✓ Spokesperson), N Jarmie, N S King, M M Nieto,  
 A Picklesimer, W Saylor, E R Siciliano, J E Stovall,  
 T P Wangler  
 RICE U - B E Bonner  
 TEXAS A AND M - D A Church, D J Ernst, A L Ford,  
 R A Kenefick, J Reading  
 GENOA U - V Lagomarsino, G Manuzio  
 KENT STATE U - P C Tandy  
 CASE WESTERN RESERVE U - R M Thaler  
 CERN - M Weiss  
 NASA, AMES - F C Witteborn

Accelerator CERN-LEAR Detector Other

Reactions

$\bar{p}$

Comments Measures time of flight of ultra-low-velocity  $\bar{p}$ 's up a vertical drift tube. In preparation (October 86).

## SUMMARIES OF EXPERIMENTS

**CERN-PS-201** (Jan 1986) Approved Sep 1986.  
**STUDY OF ANTINUCLEON ANNIHILATIONS AT LEAR WITH OBELIX, A LARGE-ACCEPTANCE AND HIGH-RESOLUTION DETECTOR, BASED ON THE OPEN AXIAL FIELD SPECTROMETER**

OBELIX COLLABORATION

BRESCIA U - D Marioli, E Lodi Rizzini  
 CAGLIARI U - L Cugusi, M P Macciotta, S Marcello, A Masoni, G Puddu, S Serci  
 CERN - R Armenteros, J Butler, U Gastaldi ( $\sqrt$  Spokesperson), R Landua, F Muller  
 FRASCATI - B Dulak, C Guaraldo, A Maggiora, F Sgamma  
 GENEVA U - C Sabev  
 DUBNA - Yu Batusov, S A Bunyatov, I V Falomkin, F Nichitiu, G B Pontecorvo, M G Sapozhnikov  
 LEGNARO - P Boccaccio, R Cherubini, F Gramegna, G Maron, G Moschini, R A Ricci, L Vannucci  
 ORSAY, AIME COTTON - H T Duong, S Liberman, J Pinard  
 ORSAY, RENE BERNAS - A Coc, R Le Gac, M Rey-Campagnolle, M de Saint-Simon, C Thibault, F Touchard  
 PADUA U - M Morando, G Sartori  
 PAVIA U - G Bendiscioli, C Marciano, A Rotondi, A Zenoni  
 TRIESTE U - G Pauli  
 TURIN U - F Balestra, G C Bonazzola, S Bossolasco, T Bressani, M P Bussa, L Busso, S Costa, A Feliciello, L Ferrero, R Garfagnini, A Grasso, D Panzieri, G Piragino, F Tosello, B Zosi  
 TURIN POLYTECHNIC - F Iazzi, B Minetti  
 UDINE U - D Cauz, L Santi, E Toppano  
 BRITISH COLUMBIA U - K L Erdman

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p} p \rightarrow$ annihil	0-1.8 GeV/c
$\bar{p}$ deut $\rightarrow$ annihil	"
$\bar{p}$ nucleus $\rightarrow$ annihil	"
$\bar{n} p \rightarrow$ annihil	"
$\bar{n}$ deut $\rightarrow$ annihil	"

Comments Studies (1) spectroscopy of  $q\bar{q}$ , exotic, glueball, and hybrid mesons, (2) dynamics of  $NN$  interactions, (3) strong-interaction effects on  $p\bar{p}$  atoms, (4) quark-gluon aspects of nuclear matter, (5) possible highly excited states of nuclear matter, and (6)  $\bar{p}$  annihilations with two nucleons. In preparation (October 1986).

**CERN-R-110** (1979) Approved Mar 1979; Completed Dec 1983.

**STUDY OF HIGH MASS ELECTRON PAIRS AND HIGH  $p_t$  PHENOMENA**

BROOKHAVEN - C Chasman, P Haustein, J Olness, M Tanaka, M J Tannenbaum, P Thieberger  
 CERN - H J Besch, L Camilleri (Spokesperson), P T Cox, Ch von Gagern, C Grosso-Pilcher, C Newman-Holmes  
 OXFORD U - A L S Angelis, R Nickerson, N Phinney, K J Powell, A M Segar, J M Yelton  
 ROCKEFELLER U - R Breedon, T J Chapin, R L Cool, D S Hanna, J T Linnemann, S H Pordes, R W Rusack  
 MICHIGAN STATE U - B M Humphries, B G Pope, C W Salgado, S Stampke  
 FRASCATI - G Basini

Accelerator CERN-ISR Detector Spectrometer

Reactions

$p p \rightarrow$ neutrals X	30-62 GeV (E <sub>cm</sub> )
$p p \rightarrow e^+ e^- X$	"
$p p \rightarrow \pi^0 X$	"
$p p \rightarrow e^+ e^- \gamma X$	"
$p p \rightarrow \gamma(s) X$	"
$\bar{p} p$	"
$p$ He	"
He He	"

Particles studied  $\Upsilon$ (unspec),  $\chi_b$ (unspec),  $\eta_c$ (2980)

Comments Uses modified apparatus of and extends studies of CERN-R-108. The listed final states are also studied in the  $p\bar{p}$ ,  $p$ -He, and He-He reactions.

Papers PL 116B (1982) 379, PL 118B (1982) 217, PL 126B (1983) 132, PL 141B (1984) 140, NP B244 (1984) 1, PL 147B (1984) 472, PL 147B (1984) 477, and PL 168B (1986) 158.

**CERN-R-210** (Apr 1979) Approved Jul 1979; Completed Dec 1983.

**PRECISE MEASUREMENT OF THE  $\bar{p}p$  TOTAL CROSS SECTION AT THE CERN-ISR**

CERN - G Carboni, D Lloyd Owen  
 NAPLES U, IFS - M Ambrosio, G Barbarino, M Paternoster, S Patricelli  
 PISA U - V Cavasinni, M Morganti, T Del Prete (Spokesperson), F Schiavo, M Valdata-Nappi  
 SUNY, STONY BROOK - G Anzivino, P Grannis

Accelerator CERN-ISR Detector Combination

Reactions

$\bar{p} p \rightarrow X$	23.5-62.7 GeV (E <sub>cm</sub> )
$\bar{p} p \rightarrow \bar{p} p$	"
$p p \rightarrow X$	"
$p p \rightarrow p p$	"
$p$ He $\rightarrow X$	"
$p$ He $\rightarrow p$ He	"
He He $\rightarrow X$	"
He He $\rightarrow$ He He	"

Comments The apparatus consists of scintillation counter hodoscopes and a drift chamber central detector. Measures total and small- $t$  elastic cross sections, and for the  $pp$  and  $\bar{p}p$  reactions the topological cross sections and pseudo-rapidity distributions and correlations.

Papers PL 108B (1982) 145, PL 113B (1982) 87, PL 113B (1982) 347, PL 115B (1982) 495, ZPHY C21 (1984) 299, and ZPHY C28 (1985) 487.

**CERN-R-211** (Apr 1979) Approved Jul 1979; Completed Jun 1982.

**MEASUREMENT OF THE  $\bar{p}p$  TOTAL CROSS SECTION AT THE CERN-ISR**

LOUVAIN U - D Favart ( $\sqrt$  Spokesperson), C Leroy, P Lipnik, J P Matheys  
 NORTHWESTERN U - N Amos, M M Block, D Miller, S Zucchelli  
 CERN - G J Bobbink, K Potter, C Van der Velde-Wilquet  
 UTRECHT U - M Botje

Accelerator CERN-ISR Detector Counter

Reactions

$\bar{p} p \rightarrow \bar{p} p$	30, 52, 62 GeV (E <sub>cm</sub> )
$p p \rightarrow p p$	23, 30, 52, 62 GeV (E <sub>cm</sub> )

Comments Measures the elastic scattering differential cross sections at small  $t$  and determines the total cross sections, the slopes of the elastic cross sections, and the ratios of the real and imaginary parts of the elastic amplitudes at  $t = 0$ .

Papers PRL 47 (1981) 1191, PL 120B (1983) 460, PL 128B (1983) 343, and NP B262 (1985) 689. No other papers expected.

**CERN-R-416** (Oct 1975) Approved Apr 1976, Nov 1979; Completed Mar 1981.

**STUDY OF RARE EVENTS AT THE SPLIT FIELD MAGNET**

ANNECY - D Linglin, M Della Negra  
 CERN - D Drijard, H G Fischer, H Frehse, W Geist ( $\sqrt$  Spokesperson), M Heiden, R Messerli, A Norton, O Ullaland, H Wahl  
 COLLEGE DE FRANCE - G Fontaine, P Frenkiel, C Ghesquiere, G Sajot  
 DORTMUND U - W Hofmann, M Panter, K Rauschnabel, J Spengler, D Wegener

## SUMMARIES OF EXPERIMENTS

HEIDELBERG U, IHEP - P Hanke, W Herr, E E Kluge,  
T Nakada, A Putzer  
WARSAW U, IEP & WARSAW, INR - R Gokieli, R Sosnowski

Accelerator CERN-ISR Detector SFM

Reactions

$p p \rightarrow e^+ X$	44-62 GeV (E <sub>cm</sub> )
$p p \rightarrow e^- X$	"
$p p \rightarrow \pi^+ X$	"
$p p \rightarrow \pi^- X$	"
$p p \rightarrow K^+ X$	"
$p p \rightarrow K^- X$	"
$p p \rightarrow p X$	"
$p p \rightarrow \bar{p} X$	"

Particles studied charm

Comments Triggers on (1) an electron produced near 90° with a transverse momentum  $p_t$  greater than 0.3 GeV/c, or (2) an identified hadron produced near 45° with  $p_t$  greater than 4 GeV/c. Generally the full event associated with these triggers is identified. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 85B (1979) 452, ZPHY C11 (1981) 203, ZPHY C12 (1982) 217, PL 108B (1982) 361, NP B208 (1982) 1, PL 121B (1983) 433, PL 123B (1983) 467, ZPHY C21 (1984) 321, ZPHY C23 (1984) 1, PL 135B (1984) 505, PL 135B (1984) 510, ZPHY C23 (1984) 9, ZPHY C24 (1984) 31, ZPHY C25 (1984) 21, PR D30 (1984) 528, and ZPHY C27 (1985) 205.

**CERN-R-418** (Apr 1979) Approved Mar 1980; Completed Dec 1983.

**STUDY OF LIGHT ION COLLISIONS**

AMES LAB - A Breakstone, H B Crawley, A Firestone, M Gorbics, J W Lamsa, W T Meyer  
BOLOGNA U - G M Dallavalle, F Fabbri, G Giacomelli, F Rimondi  
CERN - W Bell, D Drijard, M A Faessler, H G Fischer, W Geist, M Heiden, G Mornacchi, M Panter, M Szczecowski, O Ullaland  
DORTMUND U - T Lohse, R Mankel, K Rauschnabel, M Schmelling, D Wegener  
LUND U - G Claesson, S Garpman, I Lund, I Otterlund (✓ Spokesperson), E Stenlund  
HEIDELBERG U, IHEP - P Hanke, W Herr, E E Kluge, T Nakada, A Putzer, B Rensch, M Wunsch  
LBL - C R Gruhn, H Pugh, L Schroeder, T J M Symons  
WARSAW U, IEP & WARSAW, INR - K Doroba, R Gokieli, R Sosnowski, R Szwed, R Walzack  
UC, RIVERSIDE - S Y Fung  
AMSTERDAM U - T J Ketel

Accelerator CERN-ISR Detector SFM

Reactions

$deut deut \rightarrow X$	31 GeV (E <sub>cm</sub> )
$p He \rightarrow p He$	44 GeV (E <sub>cm</sub> )
$p He \rightarrow X$	"
$He He \rightarrow He He$	31 GeV (E <sub>cm</sub> )
$He He \rightarrow X$	"

Comments Several different triggers are used. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 112B (1982) 271, PL 117B (1982) 131, PL 123B (1983) 467, PL 128B (1983) 349, NP A400 (1983) 525C, ZPHY C22 (1984) 109, NP B254 (1985) 475, ZPHY C27 (1985) 191, NP A324 (1986) 67, ZPHY C30 (1986) 507, ZPHY C30 (1986) 513, ZPHY C32 (1986) 335, PL 183B (1987) 227, and ZPHY C33 (1987) 333.

**CERN-R-419** (Jan 1980) Approved Mar 1980; Completed May 1983.

**STUDY OF EVENTS WITH IDENTIFIED FORWARD PARTICLES AT THE SPLIT FIELD MAGNET**

CERN - D Drijard, F Fabbri, H G Fischer, H Frehse, W Geist (✓ Spokesperson), M Heiden, P G Innocenti, G Mornacchi, M Panter, M Szczecowski, O Ullaland

BOLOGNA U - R Campanini, G M Dallavalle, M M Deninno, G Giacomelli, F Rimondi

HEIDELBERG U, IHEP - P Hanke, W Herr, E E Kluge, T Nakada, A Putzer

WARSAW U, IEP & WARSAW, INR - K Doroba, R Gokieli, R Sosnowski

AMES LAB - A Breakstone, H B Crawley, A Firestone, M Gorbics, J W Lamsa, W T Meyer

DORTMUND U - T Lohse, R Mankel, K Rauschnabel, M Schmelling, D Wegener

Accelerator CERN-ISR Detector SFM

Reactions

$p p \rightarrow K^- X$	62 GeV (E <sub>cm</sub> )
$p p \rightarrow \pi^+ X$	"
$p p \rightarrow \pi^- X$	"
$p p \rightarrow p X$	"
$p p \rightarrow \bar{p} X$	"

Particles studied charm, bottom

Comments Studies heavy hadron production with a medium  $p_t$   $K^-$  trigger, and hard scattering dynamics with a high  $p_t$  trigger away from 90°. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 132B (1983) 463, PL 147B (1984) 237, ZPHY C28 (1985) 335, PL 162B (1985) 400, ZPHY C30 (1986) 507, ZPHY C31 (1986) 185, and PL 183B (1987) 227.

**CERN-R-420** (Apr 1980) Approved May 1980; Completed Dec 1983.

**STUDY OF  $\ln(s)$  PHYSICS IN  $\bar{p}p$  INTERACTIONS AT THE SPLIT FIELD MAGNET**

AMES LAB - A Breakstone, H B Crawley, A Firestone, M Gorbics, J W Lamsa, W T Meyer (✓ Spokesperson)  
BOLOGNA U - R Campanini, M M Deninno, G Giacomelli, F Rimondi  
CERN - D Drijard, F Fabbri, H G Fischer, H Frehse, W Geist, M Heiden, P G Innocenti, G Mornacchi, M Panter, M Szczecowski, O Ullaland  
DORTMUND U - T Lohse, K Rauschnabel, D Wegener  
HEIDELBERG U, IHEP - G M Dallavalle, P Hanke, W Herr, E E Kluge, T Nakada, A Putzer, B Rensch, M Wunsch  
WARSAW U, IEP & WARSAW, INR - K Doroba, R Gokieli, R Sosnowski

Accelerator CERN-ISR Detector SFM

Reactions

$\bar{p} p \rightarrow \bar{p} p$	20, 52, 63 GeV (E <sub>cm</sub> )
$\bar{p} p \rightarrow X$	"
$p p \rightarrow p p$	"
$p p \rightarrow X$	"

Comments Studies elastic, total, and topological cross sections, inclusive spectra, and 2-body correlations. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NP B248 (1984) 253, PRL 54 (1985) 2180, and PL 162B (1985) 400.

**CERN-R-421** (Jun 1980) Approved Jul 1980, Dec 1980; Completed Dec 1983.

**STUDY OF  $pp$  AND  $\bar{p}p$  COLLISIONS AT THE SFM FACILITY OF THE CERN ISR**

BOLOGNA U - M Basile, L Cifarelli, G D'Ali, G Sartorelli  
INFN, BOLOGNA - G Bonvicini, P Giusti, T Massam, F Palmonari, G Cara Romeo  
CERN - A Contin, R Nania, G Susinno, A Zichichi (✓ Spokesperson)

FRASCATI - M Curatolo, B Esposito, M Spinetti, L Votano

Accelerator CERN-ISR Detector SFM

## SUMMARIES OF EXPERIMENTS

### Reactions

$p p$  30, 44, 62 GeV (Ecm)  
 $\bar{p} p$  "

**Comments** A comparison of  $pp$  and  $\bar{p}p$  multiparticle events, suitably adjusted, with  $e^+e^-$  inelastic events. For a description of the apparatus, see the LBL-91 supplement on detectors.

**Papers** LNC 32 (1981) 210, NC 65A (1981) 414, NC 65A (1981) 421, NC 67A (1982) 53, NC 67A (1982) 244, LNC 36 (1983) 303, LNC 36 (1983) 555, LNC 36 (1983) 563, NC 73A (1983) 329, LNC 37 (1983) 246, LNC 37 (1983) 289, LNC 38 (1983) 289, LNC 38 (1983) 359, LNC 38 (1983) 367, NC 79A (1984) 1, LNC 41 (1984) 293, and LNC 41 (1984) 298.

**CERN-R-422** (Oct 1981) Approved Feb 1982; Completed Dec 1983.

### STUDY OF HEAVY FLAVORS PRODUCTION IN $pp$ INTERACTIONS AT $E_{cm} = 62$ GeV

CERN - A Contin, R Nania, G Susinno, A Zichichi (✓ Spokesperson)  
 BOLOGNA U - M Basile, L Cifarelli, G D'Ali, F Palmonari, G Sartorelli  
 INFN, BOLOGNA - G Bonvicini, P Giusti, T Massam, C Del Papa, G Cara Romeo  
 FRASCATI - M Curatolo, B Esposito, M Spinetti, L Votano

**Accelerator** CERN-ISR **Detector** SFM

### Reactions

$p p \rightarrow e^- X$  62 GeV (Ecm)  
 $p p \rightarrow e^+ X$  "

**Particles studied** charm, bottom

**Comments** Continues studies of experiment R-415. For a description of the apparatus, see the LBL-91 supplement on detectors.

**CERN-R-501** Approved Jan 1978; Started Sep 1978; Completed Dec 1983.

### SEARCH FOR MAGNETIC MONOPOLES

ANNECY - B Aubert  
 CERN - P Musset (Spokesperson), M Price  
 ORSAY, LAL - J P Vialle

**Accelerator** CERN-ISR **Detector** Emulsion

### Reactions

$p p \rightarrow$  monopole X 30-62 GeV (Ecm)  
 $\bar{p} p \rightarrow$  monopole X "

**Particles studied** monopole

**Comments** The detectors are inside the vacuum pipe.

**CERN-R-608** (Jun 1978) Approved Nov 1978, Mar 1979, Oct 1980; Completed Dec 1983.

### LARGE- $x$ HADRON PHYSICS AND CORRELATIONS WITH CENTRAL REGION PHENOMENA

CERN - S Erhan, A Smith  
 CLERMONT-FERRAND U - L Meritet, M Reyrolle, F Vazeille  
 SACLAY - J Alitti, B Bloch-Devaux, J B Cheze, J Mallet, A Montag, J Zsembery  
 UCLA - R Bonino, A Castellina, M Medinnis, P Schlein (✓ Spokesperson), P Sherwood, S Vernetto, J Zweizig

**Accelerator** CERN-ISR **Detector** Spectrometer

### Reactions

$p p$  30, 53, 62 GeV (Ecm)  
 $\bar{p} p$  "

**Particles studied**  $\Lambda_c^+$ ,  $f_1(1285)$ ,  $f_1(1420)$ ,  $f_2(1270)$

**Comments** Extends the program of CERN-R-603, to study Cerenkov-identified multiparticle systems in the forward direction and at  $90^\circ$ . The main studies are of (1) diffractive excitation of glueballs, (2) inclusive excitation of charmed particles, (3) differences in leading-baryon production in

$pp$  and  $\bar{p}p$  interactions, (4) C-invariance in  $\bar{p}p$  interactions (at  $90^\circ$ ), (5)  $\Lambda$  and  $\bar{\Lambda}$  polarization, both inclusively and diffractively, and (6) evidence for pomeron-single quark scattering and the longitudinal structure of diffraction.

**Papers** PL 127B (1983) 384, PL 148B (1984) 382, PL 152B (1985) 131, PL 163B (1985) 267, PL 163B (1985) 273, and PL 167B (1986) 248.

**CERN-R-703** (Feb 1979) Approved May 1979; Completed Apr 1981.

### EVALUATION OF A LARGE STREAMER CHAMBER DETECTION SYSTEM AND A STUDY OF $\bar{p}p$ - $pp$ DIFFERENCES AT ISR ENERGIES

BONN U - K Bockmann, L Burow, B Eckart, K v Holt, R Hospes, T P K Kokott, R Meinke, Th Muller, M Rosenberg, H Saarikko, T Saarikko  
 BRUSSELS U, IHE - D Bertrand, J Gaudaen, M Gijzen, D Johnson, H Mulkens, G Wilquet  
 CAMBRIDGE U - R E Ansorge, C N Booth, J R Carter, K French, M N Maggs, D J Munday, J G Rushbrooke (Spokesperson), C P Ward, D R Ward, A R Weidberg, T O White  
 CERN - A Odian, F A Triantis, G Weber  
 STOCKHOLM U - K Alpgard, B Asman, S Berglund, P Carlson, G Ekspong, K Jon-And, C Walck, N Yamdagni

**Accelerator** CERN-ISR **Detector** Streamer chamber

### Reactions

$p p$  30-62 GeV (Ecm)  
 $\bar{p} p$  "

**Comments** The main aim is to test and evaluate the equipment to be used in experiment UA-005.

**Papers** PL 112B (1982) 183. No other papers expected.

**CERN-R-704** (Apr 1980) Approved Oct 1980; Completed Jun 1984.

### CHARMONIUM SPECTROSCOPY AT THE ISR USING A $\bar{p}$ BEAM AND A HYDROGEN JET TARGET

ANNECY - C Baglin, G Bassompierre, J C Brient, C Broll, C Girard, J P Guillaud, M Poulet  
 CERN - R Oester, L Leistam, A Lundby, M Macri (✓ Spokesperson), B Mouellic  
 GENOA U - A Buzzo, S Ferroni, V Gracco, L Mattera, M G Pia, A Pozzo, A Santroni, F Tomasini, U Valbusa  
 LYON, IPN - J P Burq, M Chemarin, M Chevallier, J Fay, B Ille, M Lambert, J P Martin  
 OSLO U - L Bugge, T Buran, T Fearnley, K Kirsebom, G Skjevling, S O Sorensen  
 ROME U - L Petrillo, M Severi  
 TURIN U - G Borreani, F Marchetto, E Menichetti, N Pastrone, G Rinaudo  
 STRASBOURG - J M Brom, B Escoubes

**Accelerator** CERN-ISR **Detector** Combination

### Reactions

$\bar{p} p \rightarrow \gamma \gamma$  3.5-7.5 GeV/c  
 $\bar{p} p \rightarrow e^+ e^-$  "  
 $\bar{p} p \rightarrow e^+ e^- \gamma$  "  
 $\bar{p} p \rightarrow \bar{p} p$  "  
 $\bar{p} p \rightarrow \pi^+ \pi^-$  "  
 $\bar{p} p \rightarrow K^+ K^-$  "

**Particles studied**  $\eta_c(2980)$ ,  $\chi_1(3510)$ ,  $\chi_2(3555)$

**Comments** Studies formation of charmonium states not accessible in the s channel of  $e^+e^-$ , and measures 2-body hadron channels at  $90^\circ$  in the c.m.

**Papers** PL 163B (1985) 400, PL 171B (1986) 135, and PL 172B (1986) 455.

**CERN-R-806** Approved Jul 1974, Nov 1975, May 1976; Completed Aug 1980.

### STUDY OF LARGE TRANSVERSE MOMENTUM PHENOMENA

## SUMMARIES OF EXPERIMENTS

ATHENS U - T Filippas, E Fokitis, C Kourkoumelis, L Resvanis  
 BROOKHAVEN - R Palmer, D Rahm, P Rehak, I Stumer  
 CERN - C Fabjan, T Fields, D Lissauer, I Mannelli, P Mouzourakis, A Nappi, W J Willis (Spokesperson)  
 SYRACUSE U - M Goldberg

Accelerator CERN-ISR Detector Combination

<u>Reactions</u>	30-63 GeV (E <sub>cm</sub> )
$p p \rightarrow \gamma(s) X$	"
$p p \rightarrow e^+ X$	"
$p p \rightarrow e^- X$	"
$p p \rightarrow e^+ e^- X$	"
$p p \rightarrow \gamma \gamma X$	"
$p p \rightarrow \pi^0 X$	"
$p p \rightarrow \eta X$	"
$p p \rightarrow \omega X$	"
$p p \rightarrow J/\psi X$	"

Papers ZPHY C13 (1982) 277, ZPHY C16 (1982) 101, and PL 127B (1983) 384.

**CERN-R-807** (Jan 1977) Approved Apr 1977, Jun 1977, Jul 1979, Nov 1979, Oct 1981; Completed Dec 1983.

### A STUDY OF LARGE TRANSVERSE MOMENTUM PHENOMENA

AXIAL FIELD SPECTROMETER COLLABORATION

BROOKHAVEN - H Gordon, T Ludlam, I Stumer, M Winik, C Woody  
 CERN - T Akesson, R Batley, H Breuker, V Burkert, Ch Fabjan, U Goerlach, S Katsanevas, G Kessler, J van der Lans, B S Nielsen, L H Olsen, E Rosso, A Rudge, J Schukraft, H Specht, W J Willis, W Witzeling  
 COPENHAGEN U - H Boggild (✓ Spokesperson), O Botner, E Dahl-Jensen, I Dahl-Jensen, P Dam, G Damgaard, K H Hansen, J E Hooper, R Moller, H H Thodberg  
 LUND U - S Almehed, G von Dardel, V Hedberg, G Jarlskog, K Kulka, B Lorstad, U Mjornmark, A Nilsson, G Thorstenson  
 PENN U - H Brody, B Callen, S Frankel, W Frati, W Molzon, E Vella, W Zajc  
 RUTHERFORD - M G Albrow, W M Evans, N A McCubbin, J Williamson  
 TEL AVIV U - O Benary, S Dagan, D Lissauer, Y Oren  
 QUEEN MARY COLL - A A Carter  
 CAMBRIDGE U - J R Carter, P Cecil  
 PITTSBURGH U - Y Choi, W Cleland, R Kroeger, M Sullivan, J Thompson

Accelerator CERN-ISR Detector AFS

<u>Reactions</u>	31-62 GeV (E <sub>cm</sub> )
$p p$	"
$\bar{p} p$	"
He He	"

Particles studied charm, quark, glueball, gluon

Comments For a description of the apparatus, see the LBL-91 supplement on detectors. A study of the structure of  $pp$  and  $\bar{p}p$  collisions having a very high transverse momentum flow ( $> 30$  GeV/c) in the central region. Studies high  $p_t$  jets, and direct photons and leptons. Searches for glueballs and other new states.

Papers PL 91B (1980) 301, NIM 196 (1982) 303, NIM 196 (1982) 315, IEEE TNS 29 (1982) 373, PL 108B (1982) 58, NP B203 (1982) 27, PL 110B (1982) 344, NP B209 (1982) 309, NP B209 (1982) 321, PL 118B (1982) 178, PL 118B (1982) 185, PL 118B (1982) 193, PL 119B (1982) 464, PL 121B (1983) 439, PL 123B (1983) 133, ZPHY C18 (1983) 5, PL 123B (1983) 367, PR D28 (1983) 2736, PL 128B (1983) 354, PL 129B (1983) 269, NP B228 (1983) 409, PL 133B (1983) 268, NP B246 (1984) 1, NP B246 (1984) 408, ZPHY C25 (1984) 13, PR D31 (1985) 976, PL 152B (1985) 140, PL 152B (1985) 411, PL 155B (1985) 128, PL 158B (1985) 282, PRL 55 (1985) 2535, NIM A241 (1985) 17, NIM A242 (1985) 75, ZPHY C30 (1986) 27, NP B264 (1986) 154, PS 34 (1986)

106, PL 178B (1986) 447, ZPHY C32 (1986) 317, and ZPHY C32 (1986) 491.

**CERN-R-808** (Jun 1981) Approved Jul 1981; Completed Dec 1983.

### A STUDY OF DIRECT PHOTON PRODUCTION

ATHENS U - P Ioannou, A Karabarounis, C Kourkoumelis, T Markou, L Resvanis, S Tzamarias  
 BONN U - V Burkert  
 BROOKHAVEN - R Palmer, D Rahm, I Stumer  
 CERN - R Batley, Ch Fabjan, U Goerlach, I Mannelli, W J Willis (Spokesperson)  
 LEBEDEV INST - I Gavrilenko, A Shmeleva, P Vasiljev  
 MOSCOW PHYS ENG INST - V Chernyatin, B Dolgoshein, V Kantserov  
 NOVOSIBIRSK, IYF - S Eidelman, M Minakov, G Piskounov, V Sidorov  
 PISA U & INFN, PISA - R Carosi, G M Pierazzini  
 PITTSBURGH U - W Cleland, M Sullivan, J Thompson

Accelerator CERN-ISR Detector Calorimeter

<u>Reactions</u>	30-62 GeV (E <sub>cm</sub> )
$p p \rightarrow \gamma(s) X$	"
$p p \rightarrow e^+ e^- X$	"
$\bar{p} p \rightarrow \gamma(s) X$	"
$\bar{p} p \rightarrow e^+ e^- X$	"
He He $\rightarrow \gamma(s) X$	"
He He $\rightarrow e^+ e^- X$	"

Comments Uses two arrays of NaI blocks together with the CERN-R-807 calorimeter. Studies both single and double direct photon production, and electron pair production.

**CERN-SC-077** (1977) Approved Dec 1977, Mar 1980; Completed Aug 1981.

### DETERMINATION OF THE BRANCHING RATIO FOR THE DECAY $\pi^0 \rightarrow e^+ e^-$

AMSTERDAM, VRIJE U - W Van Doesburg, H Verheul, A G Zephat  
 BIRMINGHAM U - J D Davies (Spokesperson), J Lowe, S M Playfer  
 CAGLIARI U - T Bressani, M Caria  
 CERN - E G Michaelis  
 DELFT UNIV TECH - C W E van Eijk, W Lourens  
 LJUBLJANA U - G Kernel, F Sever, A Stanovnik  
 MANITOBA U - J V Jovanovich  
 OXFORD U - F Siohan, N W Tanner  
 TURIN U - G Della Casa, E Chiavassa, S Costa, M Gallio, A Musso  
 GLASGOW U - D Frame  
 RUTHERFORD - J Harvey

Accelerator CERN-SC Detector OMICRON

<u>Reactions</u>	$\pi^0 \rightarrow e^+ e^-$	$< 300$ MeV/c

Particles studied  $\pi^0$

Papers NIM 196 (1982) 393.

**CERN-SC-094** (Sep 1980) Approved Oct 1981; Completed Nov 1982.

### STUDY OF THE PRODUCTION OF SINGLE PIONS IN $\pi p$ COLLISIONS NEAR THRESHOLD

AMSTERDAM, VRIJE U - H Verheul  
 BIRMINGHAM U - J D Davies, J Lowe, S M Playfer  
 CERN - E G Michaelis  
 DELFT UNIV TECH - C W E van Eijk, R Hollander, W Lourens  
 LJUBLJANA U - G Kernel (✓ Spokesperson), D Korbar, P Krizan, M Mikuz, F Sever, A Stanovnik, M Staric, D Zavrtnik  
 OXFORD U - N W Tanner  
 MANITOBA U - J V Jovanovich  
 RUTHERFORD - A S Clark

Accelerator CERN-SC Detector OMICRON

## SUMMARIES OF EXPERIMENTS

### Reactions

$\pi^- p \rightarrow \pi^- \pi^+ n$	300-460 MeV/c
$\pi^- p \rightarrow p \pi^0 \pi^-$	"
$\pi^+ p \rightarrow \pi^+ \pi^+ n$	"
$\pi^+ p \rightarrow p \pi^0 \pi^+$	"

**Comments** A full-kinematics experiment. The transformation properties of the chiral-symmetry-breaking part of the  $\pi\pi$  Lagrangian are obtained from the data at threshold.

**Papers** NIM 214 (1983) 273, NIM 216 (1983) 67, NIM 227 (1984) 237, NIM A239 (1985) 202, NIM A244 (1986) 367, and NIM A248 (1986) 451.

**CERN-UA-001** (Jan 1978) Approved Jun 1978, Jun 1983, Sep 1983, Feb 1984, Nov 1984.

### A $4\pi$ SOLID ANGLE DETECTOR FOR THE SPS USED AS A $\bar{p}p$ COLLIDER AT A C.M. ENERGY OF 630 GeV

AACHEN, TECH HOCHSCH, III PHYS INST - K Eggert, P Erhard, H Faissner, A Geiser, H Grassmann, E Iskals, H Moser, A Moulin, T Redelberger, H Reithler, E Tscheslog, K Wacker

NIKHEF, AMSTERDAM - K Bos, J Dorenbosch, B van Eijk, D Holthuisen, I Ten-Have, I Zacharov

ANNECY - B Aubert, Ph Catz, J Colas, P Ghez, C Ghiglini, J-P Lees, D Linglin, M N Minard, B Mours, C Perrault, J P Vialle, I Wingerter, M Yvert

BIRMINGHAM U - N Bains, R Bonino, D G Charlton, M Corden, G Cox, J Dowell (Spokesperson), R Edgecock, N Ellis, J Garvey, D Grant, S J Haywood, M Jimack, I Kenyon, J Streets, P Watkins, J Wilson

CERN - C Albajar, L Bassi, A Bezagueta, P Cennini, S Cittolin, M Demoulin, E Duchovni, J Feyt, A Gonidec, W Jank, G Jorat, W KiENZLE, E Locci, K Long, G Maurin, T Meyer, T Muller, L Naumann, M Della Negra, A Norton, F Pauss, E Petrolo, A Piacci, J P Porte, E Radermacher, J Richman, C Rubbia (Spokesperson), W Ruhm, D Samyn, J Sass, D Schinzel, V Vuillemin, S Winpenny, C Wulz

HARVARD U - G Bauer, E Buckley, S Geer, J Kroll, J Rohlf, A Schwartz, K C T O Sumorok

HELSINKI U - V Karimaki, R Kinnunen, E Pietarinen, M Pimia, J Tuominiemi

KIEL U - O C Altkofer, D Dau, R Leuchs, S Levergrun, D Ohlendorf, M Preischel, M Schroeder

IMPERIAL COLL - T Bacon, A Khan, C Markou, D Robinson, C Seez, I Siotis, T S Virdee, A Wildish  
 QUEEN MARY COLL - R Batley, D Clarke, E Eisenhandler, I Fensome, W R Gibson, P Kalmus, P Kyberg, M Landon, W Von Schlippe, G Thompson

MADRID, JEN - F Diez-Hedo, A Ferrando, M Marquina, T Rodrigo

MIT - J Hunt, J P Revol, P Sphicas, S Tether, X Wu  
 PADUA U - A Bettini, G Busetto, S Centro, R Conte, M De Giorgi, A Meneguzzo, R Pavanello, P Rossi, P L Zotto

COLLEGE DE FRANCE - L Dobrzynski, G Fontaine, C Ghesquiere, Y Giraud-Heraud, D Kryn, D Marchand, J-P Mendiburu, P Nedelec, A Orkin-Lecourtois, G Sajot, D Salin, C Tao, J Vrana

UC, RIVERSIDE - L Gately, D Gee, M Ikeda, D Joyce, A Kernan, M Lindgren, J P Merlo, K Morgan, J Ransdell, I Sheer, D Smith

ROME U - C Bacci, F Ceradini, A Di Ciaccio, G Ciapetti, F Ghio, F Lacava, M Moricca, G Piano-Mortari, G Salvini, A Tusi, C Zaccardelli, L Zanella

RUTHERFORD - M Albrow, R Apsimon, G Arnison, J Coughlan, B Denby, P Flynn, W J Haynes, D Hill, W Scott, T Shah

SACLAY - J P De Brion, C Cochet, P Colas, D Denegri, A Givernaud, J P Laugier, C Pigot, A Savoy-Navarro, C Stubenrauch, N Zaganidis

VICTORIA U - A Astbury, S Beingessner, M Keeler, R Keeler, S Li, R Sobie

VIENNA, OAW - P Liba, M Markytan, J Strauss, F Szoncsco, A Taurok, J Traxler, G Walzel, E Warmuth

WISCONSIN U - J Bellinger, D Cline, T Markiewicz, M Mohammad, J Rhoades, T Smart, D Summers, L Villasenor

**Accelerator** CERN-PBAR/P **Detector** UA1

### Reactions

$\bar{p} p$	540, 630 GeV (Ecm)
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**Particles studied**  $W^+$ ,  $W^-$ ,  $Z^0$ , higgs, s-particle

**Comments** Has discovered the  $W$  and  $Z$  bosons and also found a few events compatible with the existence of the top quark. The present program includes a search for various high-mass particles such as new quarks and supersymmetric particles, and an investigation of quark and gluon interactions, etc. For a description of the apparatus, see the LBL-91 supplement on detectors. Taking data (November 86).

**Papers** NIM 176 (1980) 217, NIM 176 (1980) 225, NIM 176 (1980) 233, PL 118B (1982) 167, PL 118B (1982) 173, PL 121B (1983) 77, PL 122B (1983) 103, PL 122B (1983) 189, PL 123B (1983) 108, PL 123B (1983) 115, PL 126B (1983) 398, PL 128B (1983) 336, PL 129B (1983) 273, PL 132B (1983) 214, PL 132B (1983) 223, NP B224 (1983) 523, IEEE TNS 30 (1983) 71, PL 134B (1984) 469, PL 135B (1984) 250, PL 136B (1984) 294, PL 139B (1984) 115, PL 147B (1984) 222, PL 147B (1984) 241, PL 147B (1984) 493, NIM 224 (1984) 153, PL 155B (1985) 442, PL 158B (1985) 494, LNC 44 (1985) 1, PL 166B (1986) 484, PL 172B (1986) 461, PL 177B (1986) 244, EL 1 (1986) 327, and NIM A243 (1986) 4557.

**CERN-UA-002** (Jan 1978) Approved Dec 1978, Sep 1984, Feb 1985; Started Nov 1981.

### STUDY OF $\bar{p}p$ INTERACTIONS AT 630-GeV C.M. ENERGY

BERN U - K Borer, B Hahn, E Hugentobler, R Moning, L Mueller, J Schacher

CAMBRIDGE U - R Ansorge, S Katvars, M Lefebvre, B McCluskey, D J Munday, M Pentney, J Rushbrooke, W Tsang, T White, S Wotton

CERN - P Bagnaia, G Blaylock, C Booth, M Borghini, P Cenci, A G Clark, P Darriulat (✓ Spokesperson), K Einsweiler, O Gildemeister, C Goessling, S Hellman, K Hultqvist, P Jenni, L Di Lella, L Linssen, L Mapelli, K H Meier, C Onions, T Pal, A Parker, C Petridou, A Poppleton, L Rasmussen, S Stapnes, H H Thodberg, A Weidberg

HEIDELBERG U, IHEP - K Bernlohr, S Gruenendal, K Jacobs, E E Kluge, N Kurz, H Plothow-Besch, K Tittel, M Wunsch

BOHR INST - J Dines-Hansen, J R Hansen, P Hansen, O Kofoed-Hansen, B Madsen, R Mollerud

MILAN U & INFN, MILAN - M Bonesini, D Cavalli, G Costa, F Gianotti, L Mandelli, M Mazzanti, M S Pepe, L Perini, G Polesello

ORSAY, LAL - R Ansari, J C Chollet, L Fayard, D Froidevaux, J M Gaillard, B Merkel, M Moniez, G Parour, J P Repellin

PAVIA U - C Conta, R Ferrari, M Fraternali, G Fumagalli, V G Goggi, M Livan, B De Lotta, F Pastore, A Rimoldi, V Vercesi

PERUGIA U - R Battiston, G C Mantovani

PISA U - G Carboni, V Cavasinni, C Corona, F Costantini, E Iacopini, S Lami, P Lariccia, M Morganti, T Del Prete, M Valdata-Nappi

SACLAY - M Banner, P Bareyre, P Bonamy, J Crittenden, E Lancon, S Loucatos, B Mansoulie, J P Meyer, M Polverel, A Roussarie, V Ruhlmann, J Teiger, H Zaccone

**Accelerator** CERN-PBAR/P **Detector** UA2

### Reactions

$\bar{p} p \rightarrow e^\pm X$	630 GeV (Ecm)
$\bar{p} p \rightarrow \text{jet}(s) X$	"

**Particles studied**  $W^+$ ,  $W^-$ ,  $Z^0$

**Comments** The main aim is an investigation of the  $W$  and  $Z$  bosons. For a description of the apparatus, see the LBL-91 supplement on detectors. Presently being upgraded for better hermiticity and electron identification. Scheduled to run again Autumn 87.

**Papers** PL 115B (1982) 59, PL 118B (1982) 203, PL 121B (1983) 187, PL 122B (1983) 322, PL 122B (1983) 476, ZPHY

## SUMMARIES OF EXPERIMENTS

C20 (1983) 117, PL 129B (1983) 130, PL 138B (1984) 430, PL 139B (1984) 105, NIM 224 (1984) 65, NIM 224 (1984) 360, ZPHY C24 (1984) 1, PL 144B (1984) 283, NIM 227 (1984) 29, PL 144B (1984) 291, PL 154B (1985) 338, PL 156B (1985) 129, PL 160B (1985) 349, PL 165B (1985) 441, ZPHY C25 (1985) 329, ZPHY C27 (1985) 329, PL 176B (1986) 239, ZPHY C30 (1986) 1, and ZPHY C30 (1986) 341.

**CERN-UA-003** (Feb 1978) Approved Dec 1978; Completed Dec 1983.

**SEARCH FOR MAGNETIC MONOPOLES AT THE  $\bar{p}p$  COLLIDING RING**

ANNECY - B Aubert, J P Vialle  
CERN - P Musset (Spokesperson), M Price

Accelerator CERN-PBAR/P Detector Emulsion

Reactions

$\bar{p} p \rightarrow \text{monopole } X$  540 GeV ( $E_{cm}$ )

Particles studied monopole

Papers PL 120B (1983) 465.

**CERN-UA-004** (Oct 1978) Approved Jan 1979, Mar 1984; Completed Jun 1985.

**MEASUREMENT OF ELASTIC SCATTERING IN THE COULOMB INTERFERENCE REGION AT THE CERN  $\bar{p}p$  COLLIDER**

NIKHEF, AMSTERDAM - B Koene, R Van Swol, J Timmermans

CERN - D Bernard  
INFN, GENOA & GENOA U - M Bozzo, G Sette  
NAPLES U, IFS & INFN, NAPLES - F Carbonara, G Chiefari, E Drago, S Lanzano, G Matthiae (Spokesperson), L Merola, M Napolitano, V Palladino, C Sciacca, F Visco

ECOLE POLYTECHNIQUE - J Badier, M Haguenaer, V Innocente

PISA U & INFN, PISA - P L Braccini, R Castaldi, F Cervelli, G Sanguinetti, S Scapellato, C Vannini, P G Verdini  
VALENCIA U - J Velasco

Accelerator CERN-PBAR/P Detector Wire chamber

Reactions

$\bar{p} p \rightarrow X$  100-540 GeV ( $E_{cm}$ )

$\bar{p} p \rightarrow \bar{p} p$  "

Papers PL 115B (1982) 333, PL 117B (1982) 126, PL 127B (1983) 472, NIM 207 (1983) 365, PL 136B (1984) 217, PL 147B (1984) 385, PL 147B (1984) 392, NC 81A (1984) 737, PL 155B (1985) 197, and PL 166B (1986) 459.

**CERN-UA-005** (May 1978, Oct 1982) Approved Feb 1979, Feb 1983; Completed Sep 1982.

**INVESTIGATION OF  $\bar{p}p$  EVENTS AT 540-GeV C.M. ENERGY WITH A STREAMER CHAMBER DETECTION SYSTEM**

BONN U - P Anderer, K Boeckmann, L Burow, B Eckart, A Eyring, M Fischer, C Geich-Gimbel, K von Holt, R Hospes, T P K Kokott, M Langer, R Meinke, Th Mueller, H Schmickler

BRUSSELS U - C De Clercq, J Gaudaen, M Gijsen, D Johnson, G Wilquet

CAMBRIDGE U - R E Ansorge, C N Booth, K French, V P Kenney, D J Munday, J Ovens, J G Rushbrooke (Spokesperson), C P Ward, D R Ward, T O White, R S De Wolf

CERN - G J Alner, J L Chevalley, I Evangelou, J P Fabre, J Gareyte, G von Holtey, R Mackenzie, F Triantis, L Vos, G Weber

STOCKHOLM U - K Alpgard, B Asman, P Carlson, G Ek-spong, K Jonand, F Lotse, C Walck, N Yamdagni

Accelerator CERN-PBAR/P Detector Streamer chamber

Reactions

$\bar{p} p$  540 GeV ( $E_{cm}$ )

$\bar{p} p \rightarrow \text{centauro}$  "

Comments A brief visual survey, with emphasis on a search for centauro events. See UA-005/2 for the second phase.

Papers PS 23 (1981) 642, PL 107B (1981) 310, PL 107B (1981) 315, PL 115B (1982) 65, PL 115B (1982) 71, PL 121B (1983) 209, PL 123B (1983) 361, PL 138B (1984) 304, PL 151B (1985) 309, PL 160B (1985) 193, PL 160B (1985) 199, ZPHY C33 (1986) 1, and ZPHY C33 (1986) 175.

**CERN-UA-005-2** Approved Feb 1983; Completed Apr 1985.

**AN EXPLORATORY INVESTIGATION OF  $\bar{p}p$  INTERACTIONS AT 800-900 C.M. ENERGY AT THE SPS COLLIDER**

BONN U - K Boeckmann, L Burow, A Drees, B Eckart, A Eyring, L Froebel, C Geich-Gimbel, B Hall, R Hospes, T P K Kokott, M Langer, R Meinke, W Pelzer, H Schmickler  
BRUSSELS U - C De Clercq, J Gaudaen, L van Hamme, G Wilquet

CAMBRIDGE U - R E Ansorge, D J Munday, J Ovens, J G Rushbrooke (Spokesperson), C P Ward, D R Ward, C J S Webber, T O White, R S De Wolf

CERN - G J Alner, J L Chevalley, I Evangelou, J P Fabre, J Gareyte, G von Holtey, R Mackenzie, F Triantis, L Vos, G Weber

STOCKHOLM U - K Alpgard, K Jon And, B Asman, P Carlson, G Ekspong, C Fuglesang, F Lotse, C Walck, N Yamdagni

Accelerator CERN-PBAR/P Detector Streamer chamber

Reactions

$\bar{p} p$  800-900 GeV ( $E_{cm}$ )

Comments A second phase at higher energies of UA-005.

Papers ZPHY C32 (1986) 153, PL 157B (1986) 476, and PL 180B (1986) 415.

**CERN-UA-006** (Aug 1980) Approved Apr 1981.

**AN INTERNAL HYDROGEN JET TARGET IN THE SPS TO STUDY INCLUSIVE ELECTROMAGNETIC FINAL STATES AT LARGE TRANSVERSE MOMENTA AND  $\Lambda$  PRODUCTION IN  $\bar{p}p$  AND  $pp$  INTERACTIONS AT  $E_{cm} = 24.3$  GeV**

CERN - L Camilleri, L Dick, E C Dukes, W Kubischta, A Vacchi

LAUSANNE U - A Bernasconi, F Gaille, C Joseph (Spokesperson), J F Loude, E Malamud, C Morel, J Pages, J P Perroud, D Ruegger, G Sozzi, M T Tran

MICHIGAN U - O E Overseth, G Valenti

ROCKEFELLER U - R E Breedon, R L Cool, P T Cox, P Giacomelli, P Petersen, R Rusack, G A Snow

LUND U - G Von Dardel

Accelerator CERN-PBAR/P Detector Double-arm spectrometer

Reactions

$\bar{p} p \rightarrow e^+ e^- X$  24.3 GeV ( $E_{cm}$ )

$\bar{p} p \rightarrow \pi^0 X$  "

$\bar{p} p \rightarrow \gamma X$  "

$\bar{p} p \rightarrow \Lambda X$  "

$\bar{p} p \rightarrow \bar{\Lambda} X$  "

$\bar{p} p \rightarrow \bar{p} p$  "

$\bar{p} p \rightarrow X$  "

$pp \rightarrow e^+ e^- X$  "

$pp \rightarrow \pi^0 X$  "

$pp \rightarrow \gamma X$  "

$pp \rightarrow \Lambda X$  "

$pp \rightarrow \bar{\Lambda} X$  "

$pp \rightarrow pp$  "

$pp \rightarrow X$  "

Particles studied  $J/\psi$

Comments The  $\bar{p}$  and  $p$  beams in the collider are in turn incident upon a gas jet target. In the reactions above, the

## SUMMARIES OF EXPERIMENTS

emphasis is on high  $e^+e^-$  masses, the  $\pi^0$  and  $\gamma$  inclusive cross sections at high  $p_t$ , the  $\Lambda$  and  $\bar{\Lambda}$  polarizations at high  $p_t$ , and the elastic and inelastic cross sections at low  $t$ . Taking data (November 86).

**CERN-UA-007** (Jan 1985) Approved Apr 1985; Completed Apr 1986.

**MEASUREMENT BY SILICON SHOWER DETECTORS OF THE INVARIANT CROSS SECTION OF  $\pi^0$ 's EMITTED CLOSE TO  $0^\circ$**

NAPLES U, IFS & INFN, NAPLES - V Innocente, S Lanzano  
 TOKYO U, COSMIC RAY LAB - K Kasahara, Y Muraki  
 (✓ Spokesperson), T Nakada, T Yuda  
 RIKKYO U - H Murakami, A Nakamoto  
 WASEDA U - T Doke, T Kashiwagi, J Kikuchi, K Masuda  
 ECOLE POLYTECHNIQUE - M Haguenaue, E Pare

Accelerator CERN-PBAR/P Detector Calorimeter

Reactions

$\bar{p} p \rightarrow \pi^0 X$	630 GeV (Ecm).
$\bar{p} p \rightarrow K_S X$	"
$\bar{p} p \rightarrow \eta X$	"

Comments Measures the invariant cross section and the transverse momentum distribution of  $\pi^0$ 's produced at large Feynman  $x$ . Uses finely segmented silicon shower calorimeters placed inside the Roman pots of CERN-UA-004.

**CERN-UA-008** (Oct 1984) Approved Apr 1985.

**STUDY OF JET STRUCTURE IN HIGH MASS DIFFRACTION AT THE SPS COLLIDER**

UCLA - J B Cheze, S Erhan, R Jackson, M Medinnis,  
 P Schlein (✓ Spokesperson), J Zsembery, J Zweizig

Accelerator CERN-PBAR/P Detector UA2, Wire chamber

Reactions

$\bar{p} p \rightarrow \text{jet}(s) X$	630 GeV (Ecm)
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Particles studied pomeron

Comments Studies jet structure in high-mass diffraction to investigate the pomeron and its possible parton structure. Uses a fast trigger processor. Works in collaboration with CERN-UA-002. First run scheduled to begin November 87.

**CERN-WA-001** (Jul 1973) Approved Apr 1974, Dec 1975, Feb 1979, May 1979; Completed Dec 1983.

**HIGH-ENERGY NEUTRINO INTERACTIONS**

CERN - F Dydak, R Hagelberg, M Krasny, J May, A Para,  
 F Ranjard, W von Rueden, J Steinberger (Spokesperson),  
 H Taureg, H Wachsmuth, H Wahl, J Wotschack  
 DORTMUND U - H Bluemer, H Brummel, P Buchholz,  
 J Duda, F Eisele, B Kampschulte, K Kleinknecht,  
 J Knobloch, D Pollmann, B Pszola, B Renk  
 HEIDELBERG U, IHEP - R Belusevic, B Falkenburg,  
 M Fiedler, R Geiges, C Geweniger, V Hepp, H Keilwerth,  
 K Tittel

SACLAY - P Debu, C Guyot, J P Merlo, P Perez, F Perrier,  
 J Rander, J P Schuller, R Turlay, B Vallage  
 WARSAW, INR - H Abramowicz, J Krolkowski, A Lipniacka

Accelerator CERN-SPS Detector CDHS

Reactions

$\nu_\mu \text{ Fe} \rightarrow \mu^- X$	0-260 GeV/c
$\nu_\mu \text{ Fe} \rightarrow \nu_\mu X$	"
$\bar{\nu}_\mu \text{ Fe} \rightarrow \mu^+ X$	"
$\bar{\nu}_\mu \text{ Fe} \rightarrow \bar{\nu}_\mu X$	"
$\nu_\mu p \rightarrow \mu^- X$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ X$	"
$\nu_\mu \text{ deut} \rightarrow \mu^- X$	"
$\bar{\nu}_\mu \text{ deut} \rightarrow \mu^+ X$	"

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , hvy-lepton

Comments Studies inclusive neutrino reactions in iron, including rare processes such as multilepton production, and compares neutrino interactions in hydrogen and iron. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers ZPHY C12 (1982) 225, ZPHY C12 (1982) 289, PL 109B (1982) 115, ZPHY C13 (1982) 179, ZPHY C13 (1982) 199, ZPHY C15 (1982) 19, IEEE TNS 29 (1982) 360, ZPHY C17 (1983) 283, AND ZPHY C25 (1984) 29.

**CERN-WA-001-2** (1983) Approved Sep 1983; Completed Aug 1984.

**MEASUREMENT OF  $\sin^2(\theta_W)$  IN SEMILEPTONIC  $\nu$ -Fe INTERACTIONS WITH HIGH PRECISION CDHSW COLLABORATION**

CERN - A Blondel, P Boeckmann, H Burkhardt, F Dydak  
 (✓ Spokesperson), A Grant, R Hagelberg, E Hughes,  
 M Krasny, A Para, F Ranjard, H Taureg, H Wachsmuth,  
 J Wotschack

DORTMUND U - H Bluemer, H Brummel, P Buchholz,  
 J Duda, B Kampschulte, K Kleinknecht, J Knobloch,  
 E Mueller, D Pollmann, B Renk

HEIDELBERG U, IHEP - R Belusevic, B Falkenburg,  
 M Fiedler, R Geiges, C Geweniger, V Hepp, H Keilwerth,  
 N Kurz, K Tittel

SACLAY - P Debu, C Guyot, J P Merlo, P Perez, F Perrier,  
 J P Schuller, R Turlay, B Vallage

WARSAW, INR - H Abramowicz, J Krolkowski, A Lipniacka

Accelerator CERN-SPS Detector CDHS

Reactions

$\nu_\mu \text{ Fe}$	0-160 GeV/c
$\bar{\nu}_\mu \text{ Fe}$	"

Papers PRL 57 (1986) 298, ZPHY C28 (1985) 51, and ZPHY C31 (1986) 39.

**CERN-WA-006** (Feb 1974) Approved Sep 1974; Completed Apr 1980.

**POLARIZATION IN  $pp$  AND  $\pi p$  ELASTIC SCATTERING**

CERN - G Fidecaro (✓ Spokesperson), M Fidecaro, L Lanceri,  
 L Piemontese, C Poyer, A Vascotto

PADUA U - F Gasparini, S Limentani, M Nigro, L Pescara,  
 M Posocco, P Sartori, C Voci

TRIESTE U & INFN, TRIESTE - R Birsa, F Bradamante,  
 M Giorgi, A Penzo, P Schiavon, A Villari

VIENNA, OAW - W Bartl, R Fruhwirth, Ch Gottfried,  
 G Leder, W Majerotto, G Neuhofer, M Pernicka, M Regler,  
 M Steuer, H Stradner

SERPUKHOV - S Nurusev, V Solovyanov

Accelerator CERN-SPS Detector Spectrometer

Reactions Polarized target

$p p \rightarrow p p$	50-200 GeV/c
$\pi^+ p \rightarrow p \pi^+$	"

Papers NP B173 (1980) 513, and PL 105B (1981) 309.

**CERN-WA-007** (Mar 1974) Approved Sep 1974, Oct 1976, Jan 1979; Completed May 1982.

**TWO-BODY REACTIONS AT LARGE TRANSVERSE MOMENTUM**

ANNECY - C Baglin, J P Guillaud, M Poulet

CERN - R Bock, L Bugge, T Buran, A Lundby, B Mouellic  
 COPENHAGEN U - J Myrheim

GENOA U - A Buzzo, S Ferroni, V Gracco (Spokesperson),  
 M Macri, A Santroni

UNIVERSITY COLL, LONDON - Z Asa'd, M Coupland,  
 D Davis, B G Duff, F F Heymann, D C Imrie, G J Lush,  
 M H Phillips

OSLO U - K Brobakken, A Eide, T Fearnley, I Gjerpe,  
 J Haldorsen, T Jacobsen, K Kirsebom, G Skjevling,  
 S O Sorensen



## SUMMARIES OF EXPERIMENTS

Accelerator CERN-SPS Detector Double-arm spectrometer

Reactions

$\pi^- p \rightarrow \pi^- p$	20, 40, 60, 80 GeV/c
$p p \rightarrow p p$	"
$K^- p \rightarrow K^- p$	"
$\bar{p} p \rightarrow \bar{p} p$	"
$\bar{p} p \rightarrow \pi^- \pi^+$	"
$\bar{p} p \rightarrow K^- K^+$	"

Papers PL 108B (1982) 51, PL 118B (1982) 442, PL 123B (1983) 265, PL 128B (1983) 124, PL 130B (1983) 335, and NP B216 (1983) 1.

**CERN-WA-011** (Jan 1976) Approved Feb 1976, Oct 1976; Completed Jun 1980.

**SEARCH FOR HIGH MASS STATES PRODUCED WITH THE  $\psi(3.1)$**

INDIANA U - B Brabson, R Crittenden, R Heinz, J Krider, T Marshall, T R Palfrey

IMPERIAL COLL - P Astbury, A Duane, G King, R Namjoshi, B Nandi, D M Websdale, J S Wiejak  
SACLAY - R Barate, P Bareyre, P Bonamy, P Borgeaud, J C Brisson, M David ( $\checkmark$  Spokesperson), J Ernwein, F X Gentit, G Laurens, Y Lemoigne, J Pascual,

J Poinignon, A Roussarie, G Villet, S Zaninotti  
SOUTHAMPTON U - J G McEwen

Accelerator CERN-SPS Detector Wide-angle spectrometer

Reactions

$\pi^- p \rightarrow \mu^+ \mu^- X$	140 GeV/c
$\pi^- p \rightarrow e^+ e^- X$	"

Particles studied  $J/\psi$ ,  $\psi(3685)$ ,  $\chi(\text{unspec})$

Comments Reaction given is trigger only. Muons are from  $J/\psi$  decay, and accompanying particles are also detected.

Papers PL 82B (1979) 145, PRL 43 (1979) 1541, PR D24 (1981) 2994, PL 113B (1982) 105, PL 113B (1982) 509, PL 121B (1983) 198, and PL 121B (1983) 449.

**CERN-WA-018** (Oct 1975) Approved Jul 1976; Completed Dec 1983.

**STUDY OF SEMILEPTONIC AND LEPTONIC NEUTRAL-CURRENT PROCESSES AND OF MUON POLARIZATION PRODUCED IN  $\nu$  AND  $\bar{\nu}$  INTERACTIONS USING COUNTER TECHNIQUES**

CHARM COLLABORATION

CERN - J V Allaby, U Amaldi, L Barone, A Capone, W Flegel, L Lanceri, M Metcalf, J Panman, K Winter ( $\checkmark$  Spokesperson)

HAMBURG U - I Abt, J Aspiazu, F W Busser, H Daumann, P D Gall, F Niebergall, P Schutt, P Stahelin

NIKHEF, AMSTERDAM - F Bergsma, J P Dorenbosch, C Nieuwenhuis

ROME U - G Barbiellini, A Baroncelli, B Borgia, C Bosio, M Diemoz, U Dore, F Ferroni, E Longo, L Luminari, P Monacelli, F de Notaristefani, C Santoni, L Tortora, V Valente

MOSCOW, ITEP - P Gorbunov, E A Grigoriev, V S Katanov, V D Khovansky, A Rosanov

Accelerator CERN-SPS Detector CHARM

Reactions

$\nu_\mu$ nucleus $\rightarrow \nu_\mu$ hadrons	0-260 GeV/c
$\nu_\mu$ nucleus $\rightarrow \mu^-$ hadrons	"
$\nu_\mu$ nucleus $\rightarrow \mu^- \mu^- X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \bar{\nu}_\mu$ hadrons	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+$ hadrons	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+ \mu^+ X$	"
$\nu_\mu e^- \rightarrow \nu_\mu e^-$	"
$\nu_\mu e^- \rightarrow \mu^- \nu_e$	"
$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$	"
$\bar{\nu}_\mu \text{Fe} \rightarrow \mu^+$ hadrons	"

Particles studied charm, hvy-lepton

Comments Both narrow and wide band beams are used.

Measures total cross sections and  $x$  and  $y$  distributions of neutral and charged current interactions. Several rare processes have been seen. This apparatus follows behind that of experiment WA-001, and part of this experiment is to measure the polarization of  $\mu^+$ 's produced in that one (these latter reactions have Fe as target). The upgraded detector incorporating 78 planes of streamer tubes will be used for future measurements. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 86B (1979) 229, PL 93B (1980) 203, NIM 176

(1980) 189, NIM 178 (1980) 27, PL 96B (1980) 435, PL 99B (1981) 265, PL 102B (1981) 67, PL 105B (1981) 242, PL 107B (1981) 241, PL 109B (1982) 133, NIM 200 (1982) 183, PL 117B (1982) 272, PL 121B (1983) 429, PL 122B (1983) 185, PL 122B (1983) 465, PL 123B (1983) 269, ZPHY C17 (1983) 211, PL 128B (1983) 117, PL 128B (1983) 361, NIM 215 (1983) 361, NIM 217 (1983) 291, IEEE TNS 30 (1983) 122, IEEE TNS 30 (1983) 138, PL 141B (1984) 129, PL 147B (1984) 481, ZPHY C24 (1984) 217, PL 153B (1985) 111, PL 157B (1985) 469, and PL 180B (1986) 303.

**CERN-WA-018-2** (1983) Approved Feb 1984; Completed Sep 1984.

**HIGH-PRECISION MEASUREMENT OF THE RATIO  $\sigma_\nu(\text{n.c.})/\sigma_\nu(\text{c.c.})$**

CHARM COLLABORATION

CERN - J V Allaby, U Amaldi, M Baubillier, W Flegel, F Grancagnolo, L Lanceri, M Metcalf, C Nieuwenhuis, J Panman, R Plunkett, C Santoni, K Winter ( $\checkmark$  Spokesperson)

HAMBURG U - I Abt, J Aspiazu, F W Buesser, H Daumann, P D Gall, T Hebbeker, F Niebergall, P Schuett, P Stahelin

NIKHEF, AMSTERDAM - F Bergsma

MOSCOW, ITEP - P Gorbunov, E Grigoriev, V Khovansky, A Rosanov

INFN, ROME - G Barbiellini, A Baroncelli, L Barone, B Borgia, C Bosio, A Capone, M Diemoz, C Dionisi, U Dore, F Ferroni, E Longo, P Loverre, L Luminari, P Monacelli, S Morganti, F de Notaristefani, L Tortora, V Valente

Accelerator CERN-SPS Detector CHARM

Reactions

$\nu_\mu$ nucleus	0-160 GeV/c
$\bar{\nu}_\mu$ nucleus	"

Comments A high-precision measurement of the neutral-to-charged-current ratio on an isoscalar target to determine the electroweak mixing  $\sin^2 \theta$ .

Papers PL 177B (1986) 446, and PL 179B (1986) 301.

**CERN-WA-021** (Nov 1974) Approved Aug 1976; Completed Dec 1983.

**HIGH-ENERGY  $\nu$  AND  $\bar{\nu}$  INTERACTIONS IN BEBC FILLED WITH  $\text{H}_2$**

BIRMINGHAM U - D C Colley, G T Jones, S W O'Neale, F Votruba

BONN U - C Geich-Gimbel, T P K Kokott, B Nellen

CERN - A Grant, D R O Morrison, L Pape, C Peyrou, P Schmid, H W Wachsmuth

IMPERIAL COLL - E F Clayton, D B Miller, M Mobayyen

UNIVERSITY COLL, LONDON - J Bartley, F W Bullock, M Esten, D J Miller

MUNICH, MAX PLANCK INST - M Aderholz, N Schmitz, W Wittek

OXFORD U - G Corrigan, G Myatt ( $\checkmark$  Spokesperson), D Radojicic

Accelerator CERN-SPS Detector HBC-BEBC-HYB

## SUMMARIES OF EXPERIMENTS

### Reactions

$\nu_\mu p \rightarrow \mu^- X$	0-150 GeV/c
$\nu_\mu p \rightarrow \mu^- \Delta(1232 P_{33})^{++}$	"
$\nu_\mu p \rightarrow \mu^- \pi^+ p$	"
$\nu_\mu p \rightarrow \mu^- \Delta(\text{unspec})^{++}$	"
$\nu_\mu p \rightarrow \mu^- \pi^+ \pi^0 p$	"
$\nu_\mu p \rightarrow \mu^- \pi^+ \pi^+ n$	"
$\nu_\mu p \rightarrow \mu^- \pi^+ \pi^+ \pi^- p$	"
$\nu_\mu p \rightarrow \mu^- \rho^+ p$	"
$\nu_\mu p \rightarrow \nu_\mu p$	"
$\nu_\mu p \rightarrow \nu_\mu \pi^+ n$	"
$\nu_\mu p \rightarrow \text{charm } X$	"
$\nu_\mu e^- \rightarrow \mu^- \nu_e$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ X$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \pi^- p$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \Delta(1232 P_{33})^0$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ N^*(\text{unspec})^0$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \pi^- \pi^0 p$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \pi^+ \pi^- n$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \pi^+ \pi^- \pi^- p$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \rho^- p$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu p$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu \pi^+ n$	"
$\bar{\nu}_\mu p \rightarrow \text{charm } X$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ n$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \Lambda$	"

### Particles studied charm

**Comments** Most of the flux is below 50 GeV/c. Uses the EMI and the IPF. The principal aims are (1) the study of charmed particle production in fully constrained events, (2) the study of neutral current interactions on free protons, (3) the measurement of  $N^*$  and  $\Delta$  production cross sections, (4) studies of hadronic final states in charged and neutral current reactions, and (5) the measurement of inclusive charged-current cross sections and structure functions.

**Papers** PL 86B (1979) 108, PL 87B (1979) 281, PL 88B (1979) 381, PL 96B (1980) 209, NP B176 (1980) 269, NP B176 (1980) 333, PL 99B (1981) 159, PL 103B (1981) 71, NP B181 (1981) 385, NP B188 (1981) 1, PL 112B (1982) 88, NP B194 (1982) 1, NP B194 (1982) 373, PL 109B (1982) 234, NP B214 (1983) 369, NP B223 (1983) 269, ZPHY C25 (1984) 121, ZPHY C27 (1985) 43, ZPHY C28 (1985) 23, PL 173B (1986) 211, PL 178B (1986) 329, and NP B264 (1986) 221.

**CERN-WA-025** (Jun 1974) Approved Aug 1976; Completed Dec 1983.

### NEUTRINO AND ANTINEUTRINO INTERACTIONS IN DEUTERIUM

NIKHEF, AMSTERDAM - G van Apeldoorn, S Barlag, P van Dam, B Jongejans, A Tenner (Spokesperson), C Visser, M Wigmans  
 BERGEN U - A G Frodesen, B Grung, A Haatuft, A Halsteinslid, K Myklebost, A Rognebakke, O Skjeggestad, R Time  
 BOLOGNA U - P Capiluppi, G Giacomelli, G Graziani, P Serra Lugaresi, G Mandrioli, A Rossi  
 PADUA U - M Baldo-Ceolin, P Bobisut, E Calimani, S Ciampolillo, J Derkaoui, H Huzita, M Loreti, G Puglierin, A Sconza  
 PISA U & INFN, PISA - C Angelini, L Bertanza, A Bigi, R Casali, R Fantechi, E Flaminio, A Nappi, R Pazzi, C Petri, G Pierazzini  
 SACLAY - T Bolognese, A Borg, M L Faccini-Turluer, C Louedec, D Vignaud  
 TURIN U - D Allasia, F Bianchi, V Bisi, D Gamba, A Marzari-Chiesa, L Riccati, A Romero

**Accelerator** CERN-SPS **Detector** DBC-BEBC

### Reactions

$\nu_\mu p \rightarrow \mu^- \text{hadrons}$	0-260 GeV/c
$\nu_\mu p \rightarrow \nu_\mu \text{hadron(s)}$	"

$\nu_\mu n \rightarrow \mu^- p$	"
$\nu_\mu n \rightarrow \mu^- \text{hadrons}$	"
$\nu_\mu n \rightarrow \nu_\mu \text{hadrons}$	"
$\nu_\mu \text{deut}$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ n$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ \text{hadrons}$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu \text{hadron(s)}$	"
$\bar{\nu}_\mu n \rightarrow \mu^+ \text{hadrons}$	"
$\bar{\nu}_\mu n \rightarrow \bar{\nu}_\mu \text{hadrons}$	"
$\bar{\nu}_\mu \text{deut}$	"

### Particles studied charm

**Comments** The main aim is a comparison of cross sections and structure functions on protons and neutrons.

**Papers** PL 117B (1982) 262, ZPHY C24 (1984) 119, ZPHY C27 (1985) 239, PR D31 (1985) 2996, ZPHY C28 (1985) 321, PL 154B (1985) 231, and PL 174B (1986) 450.

**CERN-WA-027** (Feb 1976) Approved Aug 1976; Completed Apr 1980.

### $K^+ p$ INTERACTIONS IN BEBC AT 70 GeV/c

BRUSSELS U - C de Clercq, M Csejthey-Barth, J J Dumont, D Johnson, J Lemonne, E de Wolf  
 CERN - R Contri, M Drevermann, Y Goldschmidt-Clermont, G Harigel, J P Porte, R T Ross, P Theocharopoulos  
 GENOA U - C Caso, F Fontanelli, R Monge, S Squarcia, U Trevisan  
 MONS U - J F Balland, J Beaufays, F Grard, J Hanton  
 NIJMEGEN U - F Crijns, W Kittel, W Metzger, P Van der Poel, C Pols, M Raaymakers, J Schotanus, A Stergiou, R T Van de Walle ( $\checkmark$  Spokesperson)  
 SERPUKHOV - Y Belokopytov, P V Chliapnikov, A B Fenjuk, L N Gerdyukov, I Gritsaenko, V M Kubic, V Lugovsky, V I Nikolaenko, Y Petrovich, V Ronjin, O G Tchikilev, A P Vorobjev, V A Yarba

**Accelerator** CERN-SPS **Detector** HBC-BEBC

### Reactions

$K^+ p \rightarrow X$	70 GeV/c
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**Comments** A general survey experiment. Studies low- $p_t$  inclusive production of low-mass particles and resonances.

**Papers** ZPHY C2 (1979) 285, ZPHY C7 (1981) 89, ZPHY C7 (1981) 187, NP B191 (1981) 39, ZPHY C10 (1981) 205, NP B192 (1981) 289, PL 115B (1982) 329, PL 117B (1982) 267, ZPHY C16 (1982) 111, PL 121B (1983) 183, ZPHY C16 (1983) 291, NP B223 (1983) 296, NIM 207 (1983) 399, PL 141B (1984) 276, ZPHY C22 (1984) 1, ZPHY C22 (1984) 23, NP B246 (1984) 431, and ZPHY C31 (1986) 13.

**CERN-WA-028** (Dec 1975) Approved Aug 1976; Completed Apr 1980.

### $K^- p$ INTERACTIONS IN BEBC AT 110 GeV/c

TATA INST - S Banerjee, S N Ganguli  
 CERN - Y Goldschmidt-Clermont, D R O Morrison  
 CRACOW - T Coghen, K Dziunikowska, A Eskreys, T Haupt, M W Krasny  
 IMPERIAL COLL - K W J Barnham, P Wright  
 VIENNA, OAW - F Mandl ( $\checkmark$  Spokesperson), M Markytan, E Shaaban  
 WARSAW U, IEP & WARSAW, INR - M Bardadin-Otwinowska, A Jacholkowska, M Szczekowski  
 JAMMU U - G L Kaul, Y Prakash  
 INNSBRUCK U - P Girtler, D Kuhn

**Accelerator** CERN-SPS **Detector** HBC-BEBC

### Reactions

$K^- p \rightarrow X$	108.6 GeV/c
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**Comments** A general survey experiment.

**Papers** NP B155 (1979) 307, ZPHY C3 (1979) 89, NP B167 (1980) 285, ZPHY C9 (1981) 17, ZPHY C9 (1981) 21, ZPHY C11 (1981) 189, NP B178 (1981) 392, NP B189 (1981) 421, ZPHY C12 (1982) 323, NP B206 (1982) 349, ZPHY C19

## SUMMARIES OF EXPERIMENTS

(1983) 283, ZPHY C22 (1984) 205, ZPHY C28 (1985) 57, ZPHY C31 (1986) 401, and ZPHY C31 (1986) 409.

**CERN-WA-038** (Apr 1977) Approved Jun 1977; Completed Dec 1983.

### MAGNETIC MONOPOLE SEARCH AT THE SPS

CERN - P Lazeyras  
 KURCHATOV INST, MOSCOW - I I Gurevich,  
 S Kh Khakimov, V P Martemianov (Spokesperson),  
 A P Mishakora, V V Ogurtzov, V G Tarasenkov  
 NOVOSIBIRSK, IYF - J Barkov  
 SERPUKHOV - A P Bugorsky  
 BOLOGNA U - G Giacomelli

Accelerator CERN-SPS Detector Other

#### Reactions

$p$  nucleus  $\rightarrow$  monopole X 400 GeV/c

Particles studied monopole

Comments Targets are bombarded and the monopoles (if produced) are to be pulled out by a pulsed magnetic field and detected in emulsion and plastic.

**CERN-WA-042** (Mar 1977) Approved Nov 1977; Completed Jun 1982.

### AN EXPERIMENT ON THE STRONG INTERACTIONS AND RADIATIVE DECAYS OF HYPERONS

BRISTOL U - W M Gibson, R Owen, V J Smith, A Wood  
 GENEVA U - M Bourquin, P Extermann ( $\checkmark$  Spokesperson),  
 T Modis, P Muhlemann, J Perrier, K Ragan, P Schirato  
 HEIDELBERG U, PHYS INST - H Burckhart, H W Siebert,  
 K P Streit  
 LAUSANNE U - C Dore, M Gailloud, P Jacot, P Rosselet,  
 R Weill  
 QUEEN MARY COLL - S Biagi  
 RUTHERFORD - R M Brown, C N P Gee, R Gray, P W Jeffreys,  
 B Saunders, J J Thresher, C Yanagisawa

Accelerator CERN-SPS Detector Spectrometer

#### Reactions

$\Sigma^- p \rightarrow X$	74, 137 GeV/c
$\Sigma^- p \rightarrow \Lambda \pi^- p$	"
$\Sigma^- p \rightarrow \Sigma^0 \pi^- p$	"
$\Sigma^- p \rightarrow \Sigma^+ \pi^- \pi^- p$	"
$\Sigma^- p \rightarrow \Sigma^- \pi^+ \pi^- p$	"
$\Sigma^- \text{deut} \rightarrow X$	"
$\Xi^- p \rightarrow X$	"
$\Xi^- p \rightarrow \Xi^- p$	"
$\Xi^- p \rightarrow \Lambda K^- p$	"
$\Xi^- p \rightarrow \Sigma^0 K^- p$	"
$\Xi^- p \rightarrow \Xi^- \pi^+ \pi^- p$	"
$\Xi^- \text{deut} \rightarrow X$	"
$\bar{p} p \rightarrow X$	"
$\bar{p} \text{deut} \rightarrow X$	"
$\Xi^- \text{Be} \rightarrow \Xi^- X$	116 GeV/c
$\Xi^- \text{Be} \rightarrow \Omega^- X$	"
$\Xi^- \text{Be} \rightarrow Y^*(\text{unspec}) X$	"
$\Xi^- \text{Be} \rightarrow \Xi^*(\text{unspec}) X$	"
$\Xi^- \text{Be} \rightarrow \Omega^*(\text{unspec}) X$	"

Particles studied  $\Lambda$ ,  $\Sigma^+$ ,  $\Sigma(\text{unspec})^-$ ,  $\Xi(\text{unspec})^-$

Comments The main aim is to study  $\Sigma^*$ ,  $\Xi^*$ , and  $\Omega^*$  production in  $\Xi^- N$  collisions. Hyperon radiative decays, mainly  $\Lambda \rightarrow n\gamma$  and  $\Sigma^+ \rightarrow p\gamma$ , are also studied.

Papers NP B186 (1981) 1, ZPHY C9 (1981) 305, PL 112B (1982) 265, PL 112B (1982) 277, ZPHY C17 (1983) 113, PRPL 114 (1984) 100, ZPHY C28 (1985) 495, ZPHY C30 (1986) 201, ZPHY C31 (1986) 33, and ZPHY C (submitted).

**CERN-WA-044** (Feb 1977, Aug 1977) Approved Dec 1977; Completed Dec 1983.

### SEARCH FOR QUARKS IN HIGH-ENERGY NEUTRINO INTERACTIONS

INFN, BOLOGNA - G Bonvicini, P Giusti, T Massam,  
 C Del Papa, G Cara Romeo  
 BOLOGNA U - M Basile, G D'Alì, F Palmonari, G Sartorelli  
 CERN - L Cifarelli, A Contin, R Nania, F Rohrback,  
 A Zichichi ( $\checkmark$  Spokesperson)  
 FRASCATI - M Curatolo, B Esposito, M Spinetti, G Susinno,  
 L Votano  
 INFN, ROME & ROME U - I Laakso

Accelerator CERN-SPS Detector Combination

#### Reactions

$\nu_\mu \text{Pb} \rightarrow \text{quark X}$  0-200 GeV/c

Particles studied quark

Papers LNC 29 (1980) 251.

**CERN-WA-047** (Feb 1978) Approved Jun 1978; Completed Feb 1980.

### CONTINUATION OF THE STUDY OF NEUTRINO INTERACTIONS WITH DICHROMATIC BEAMS AT THE SPS, USING BEBC FILLED WITH NEON

AACHEN, TECH HOCHSCH, III PHYS INST - H Deden,  
 M Deutschmann, P Fritze, H Grassler, F J Hasert, J Morfin,  
 R Schulte, K Schultze, H H Seyfert  
 DEMOCRITOS NUCLEAR RESEARCH CENTER -  
 M Mermikidis, E Simopoulou, A Vayaki  
 BONN U - K Bockmann, C Geich-Gimbel, H G Heilmann,  
 T P K Kokott, B Nellen, R Pech  
 CERN - P Bosetti, V T Cocconi, D C Cundy, P O Hulth,  
 D R O Morrison, E Pagiola, L Pape, C Peyrou, P Schmid,  
 W G Scott, H W Wachsmuth  
 IMPERIAL COLL - K W J Barnham, R Beuselinck,  
 I Butterworth, J Chima, E F Clayton, D B Miller, K Powell  
 OXFORD U - R Giles, P Grossmann, J Lloyd, R McGow,  
 G Myatt, D H Perkins, D Radojicic, P Renton, B Saitta  
 SACLAY - M Bloch, T Bolognese, B Tallini (Spokesperson),  
 D Vignaud

Accelerator CERN-SPS Detector HLBC-BEBC

#### Reactions

$\nu_\mu \text{nucleus} \rightarrow \mu^- X$	10-200 GeV/c
$\nu_\mu \text{nucleus} \rightarrow \nu_\mu X$	"
$\bar{\nu}_\mu \text{nucleus} \rightarrow \mu^+ X$	"
$\bar{\nu}_\mu \text{nucleus} \rightarrow \bar{\nu}_\mu X$	"

Comments A continuation of CERN-WA-019.

Papers NP B198 (1982) 365, PL 110B (1982) 167, NP B203 (1982) 362, PRL 50 (1983) 224, and NP B217 (1983) 1.

**CERN-WA-056** (Oct 1978) Approved Dec 1978; Completed Apr 1980.

### STUDY OF $N\bar{N}$ STATES PRODUCED VIA BARYON EXCHANGE IN $\pi^+ p$ INTERACTIONS USING THE OMEGAPRIME SPECTROMETER

CERN - A Ferrer ( $\checkmark$  Spokesperson), P Sonderegger  
 NEUCHÂTEL U - L Bachman, M Bogdanski, L Dorsaz,  
 L Fluri, E Jeannet, D Perrin, R Schwarz  
 ECOLE POLYTECHNIQUE - Z Ajaltouni, P Benkheiri,  
 B Chaurand, A Rouge, J P Wuthrick  
 COLLEGE DE FRANCE - A de Bellefon, P Billoir,  
 J M Brunet, P Frenkiel, B Lefevre, D Poutot, G Tristram,  
 A Volte  
 LISBON U - J M Gago

Accelerator CERN-SPS Detector OMEGAPRIME

#### Reactions

$\pi^+ p \rightarrow \Delta(1232 P_{33})^{++} p \bar{p}$	20 GeV/c
$\pi^+ p \rightarrow p p \bar{n}$	"
$\pi^+ p \rightarrow p p \bar{p} \pi^+$	"
$\pi^+ p \rightarrow \Delta(1232 P_{33})^0 p \bar{n} \pi^+$	"
$\pi^+ p \rightarrow \Delta(1232 P_{33})^0 p \bar{p} \pi^+ \pi^+$	"

## SUMMARIES OF EXPERIMENTS

$\pi^+ n \rightarrow p p \bar{p}$  " "  
 $\pi^- p \rightarrow p p \bar{p} \pi^-$  12 GeV/c  
Particles studied baryonium,  $N\bar{N}(2020)^0$ ,  $N\bar{N}(2200)^0$   
Comments Searches in the recoil from a fast proton or  $\Delta$  for narrow mesons (neutral or singly or doubly charged). For a description of the apparatus, see the LBL-91 supplement on detectors.  
Papers NP B209 (1982) 301.

**CERN-WA-058** (Nov 1978) Approved Mar 1979; Completed Jan 1980.

### MEASUREMENT OF THE LIFETIME OF CHARMED PARTICLES IN NUCLEAR EMULSION EXPOSED TO AN 80 GeV BREMSSTRAHLUNG BEAM IN CONJUNCTION WITH THE OMEGAPRIME SPECTROMETER

BOLOGNA U - A Forino, R Gessaroli, A Quareni  
 CERN - G Vanderhaeghe  
 FLORENCE U - G Di Caporiacco, A M Cartacci, B Conforto, A Conti, M G Dagliana, G Parrini  
 GENOA U - M Dameri, G Diambri-Palazzi (Spokesperson), B Osculati, M Sannino, G Tomasini  
 LEBEDEV INST - M I Adamovich, Y A Alexandrov, M M Chernyavsky, S P Kharlamov, V G Larionova, G I Orlova, N G Peresadko, M I Tretyakova  
 PARIS, CURIE UNIV VI - J Lory, C Meton, D Schune, Tsai-Chu, B Willot  
 SANTANDER U - L Bravo, A Ruiz, E Villar  
 VALENCIA U - J M Bolta, E Higon  
 MADRID, JEN - R Llosa  
 MOSCOW, STATE RES INST FOR PHOTOCHEM PROJ - K M Romanovskaya

Accelerator CERN-SPS Detector OMEGAPRIME

#### Reactions

$\gamma$  nucleus  $\rightarrow$  charm X 20-80 GeV/c

Particles studied charm

Comments A continuation of experiment WA-045. Candidate events photoproduced in emulsion are tagged by Omegaprime. Single emulsion pellicles with an effective thickness of 6.9 mm were exposed one at a time. Some emulsion remains to be scanned (October 84). For a description of Omegaprime, see the LBL-91 supplement on detectors.

Papers PL 89B (1980) 424, PL 99B (1981) 271, LNC 30 (1981) 166, PL 140B (1984) 119, and PL 140B (1984) 123.

**CERN-WA-059** (Nov 1978, Dec 1978) Approved Apr 1979; Completed May 1980.

### MEASUREMENT OF NUCLEON STRUCTURE FUNCTIONS IN HORN-FOCUSED $\nu$ AND $\bar{\nu}$ BEAMS IN BEBC FILLED WITH NEON

DEMOCRITOS NUCLEAR RESEARCH CENTER - E Simopoulou, A Vayaki, E Zevgolatakos  
 BARI U - N Armenise, M Calicchio, O Enriquez, M T Fogli-Muciaccia, G Iaselli, S Natali, S Nuzzo, F Romano, F Ruggieri  
 BIRMINGHAM U - G T Jones, R P Middleton, S O'Neale  
 BRUSSELS U - G Bertrand-Coremans, D Bertrand, W Van Doninck, P Marage, J Sacton  
 CERN - A M Cooper, H Klein, D R O Morrison, M A Parker, H W Wachsmuth  
 IMPERIAL COLL - K Barnham, E F Clayton, D B Miller, M Mobbayen, A Petridis, M Talebzadeh  
 UNIVERSITY COLL, LONDON - T Azemoon, J H Bartley, F W Bullock, P J Fitch, S Robertson, R A Sansum  
 MUNICH, MAX PLANCK INST - M Aderholz, L Deck, N Schmitz, K L Wernhard, W Wittek  
 OXFORD U - P Allport, D Radojicic, K Varvell, J Wells  
 ECOLE POLYTECHNIQUE - V Brisson, P Petiau, C Vallee  
 RUTHERFORD - J G Guy, P Kasper, W Venus ( $\checkmark$  Spokesperson)  
 SACLAY - J P Baton, G Gerbier, C Kochowski, M Neveu  
 CRACOW - J Chwastowski, T Coghén

STOCKHOLM U - M Berggren, P-O Hulth  
Accelerator CERN-SPS Detector HLBC-BEBC

#### Reactions

$\nu_\mu$  nucleus 10-100 GeV/c  
 $\bar{\nu}_\mu$  nucleus "

Comments Approximately 15000  $\bar{\nu}_\mu$  and 10000  $\nu_\mu$  charged current events fully measured.

Papers ZPHY C21 (1984) 307, PL 140B (1984) 137, PL 141B (1984) 133, ZPHY C29 (1985) 15, ZPHY C31 (1986) 51, PL 173B (1986) 211, and ZPHY C31 (1986) 191.

**CERN-WA-062** Approved Dec 1979; Completed Jun 1980.

### SEARCH FOR CHARMED STRANGE BARYONS

BRISTOL U - W M Gibson, V J Smith  
 GENEVA U - M Bourquin, P Extermann, T Modis, P Muhlemann, P Schirato  
 HEIDELBERG U, PHYS INST - H J Burckhart, P Igo-Kemenes, H W Siebert, K P Streit ( $\checkmark$  Spokesperson)  
 LAUSANNE U - C Dore, M Gailloud, P Jacot-Guillarmod, P Rosselet, R Weill  
 MELBOURNE U - S N Tovey  
 QUEEN MARY COLL - S F Biagi, A J Britten, A A Carter  
 RUTHERFORD - R M Brown, C N P Gee, J C Gordon, R J Gray, W C Louis, B J Saunders, J J Thresher

Accelerator CERN-SPS Detector Spectrometer

#### Reactions

$\Sigma^- \text{Be} \rightarrow \Lambda K^- \pi^+$  pions 135 GeV/c  
 $\Sigma^- \text{Be} \rightarrow \Xi_c^0 X$  "  
 $\Sigma^- \text{Be} \rightarrow \Xi_c^+ X$  "  
 $\Sigma^- \text{Be} \rightarrow \Omega_c^0 X$  "  
 $\Sigma^- \text{Be} \rightarrow \Xi^- K^- \pi^+ \pi^+$  "  
 $\Sigma^- \text{Be} \rightarrow \Lambda \bar{p} \pi^+$  pions "

Particles studied  $\Xi_c^+$ ,  $J/\psi$ ,  $\Omega_c^0$

Comments Uses modified apparatus of CERN-WA-042. Search for final states with strangeness -2 and -3 and positive or zero charge.

Papers PL 122B (1983) 455, PL 150B (1985) 230, ZPHY C28 (1985) 175, and PL 172B (1986) 113.

**CERN-WA-063** (Nov 1979) Approved Jan 1980; Completed Jun 1980.

### INCLUSIVE BARYON-ANTIBARYON PRODUCTION IN THE CENTRAL REGION USING THE OMEGA SPECTROMETER

CERN - W Beusch  
 SACLAY - E Lesquoy, L Moscoso, A Muller ( $\checkmark$  Spokesperson), S Zylberajch  
 ANNECY - A Bussiere  
 COLLEGE DE FRANCE - A de Bellefon  
 NEUCHATEL U - D Perrin  
 ECOLE POLYTECHNIQUE - J P Wuthrick

Accelerator CERN-SPS Detector OMEGAPRIME

#### Reactions

charged<sup>+</sup>  $p \rightarrow \bar{p} p X$  40 GeV/c  
 charged<sup>-</sup>  $p \rightarrow \bar{p} p X$  "

Particles studied baryonium

Comments A search for centrally produced baryon-antibaryon resonances. For a description of the apparatus, see the LBL-91 supplement on detectors.

**CERN-WA-064** (Apr 1980) Approved May 1980; Completed Jun 1981.

### CHANNELLING RADIATION IN A SILICON CRYSTAL

AARHUS U - P Christensen, B Marsh, P Meyer, R Stensgaard, E Uggerhoj (Spokesperson)  
 BASEL U - P Pavlopoulos

## SUMMARIES OF EXPERIMENTS

CERN - J Bak, S Pape-Moller  
 GLASGOW U - P J Bussey  
 LANCASTER U - D Newton  
 MANCHESTER U - R J Ellison, R E Hughes-Jones, D Mercer  
 RUTHERFORD - M Atkinson, D I Giddings, P H Sharp  
 STRASBOURG - M Suffert

Accelerator CERN-SPS Detector Spectrometer

Reactions

$e^+$  5-20 GeV/c  
 $e^-$  "

**CERN-WA-065** (Apr 1980) Approved May 1980; Completed Sep 1982.

**FURTHER STUDIES OF PROMPT NEUTRINO PRODUCTION IN 400 GeV PROTON NUCLEUS COLLISIONS**

CHARM COLLABORATION

CERN - J V Allaby, U Amaldi, L Barone, A Capone, W Flegel, L Lanceri, M Metcalf, J Panman, K Winter (✓ Spokesperson)  
 HAMBURG U - J Aspiazu, F W Busser, H Daumann, P D Gall, F Niebergall, P Schutt, P Stahelin  
 NIKHEF, AMSTERDAM - F Bergsma, J P Dorenbosch, M Jonker, C Nieuwenhuis, F Udo  
 ROME U - G Barbiellini, A Baroncelli, B Borgia, C Bosio, M Diemoz, U Dore, F Ferroni, E Longo, L Luminari, P Monacelli, F de Notaristefani, C Santoni, L Tortora, V Valente  
 MOSCOW, ITEP - P Gorbunov, E A Grigoriev, V S Kaf-tanov, V D Khovansky, A Rosanov

Accelerator CERN-SPS Detector CHARM

Reactions

$p$  nucleus  $\rightarrow \nu$  X 400 GeV/c

Particles studied longlived

Comments Continues studies of CERN-WA-018 on properties of prompt neutrino production. A first run with Cu beam dumps of densities 1 and 1/3 and  $2.5 \times 10^{18}$  protons finished in September 82. The dump-to-detector distance is 480 m in a new facility. Also made in parallel a search for penetrating neutral particles in a second detector at 10 mrad to the incident proton beam viewing a 40-m-long decay length. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 128B (1983) 361, PL 157B (1985) 458, and PL 166B (1986) 473.

**CERN-WA-066** (Apr 1980) Approved May 1980; Completed Sep 1982.

**FURTHER STUDY OF PROMPT NEUTRINO PRODUCTION IN PROTON-NUCLEUS COLLISIONS USING BEBC**

AACHEN, TECH HOCHSCH, III PHYS INST - H Grassler  
 DEMOCRITOS NUCLEAR RESEARCH CENTER - M Dris, E Simopoulou, A Vayaki  
 BONN U - W Droge, U Idschok, H Kreutzman, B Nellen, B Wuensch  
 CERN - A M Cooper-Sarkar, D C Cundy, H Foeth, A Grant, G G Harigel, H Klein, D R O Morrison, M Nikolic, L Pape, A Parker, P Schmid, H W Wachsmuth  
 IMPERIAL COLL - K W J Barnham, D B Miller, M M Mobayyen, M Talebzadeh  
 MUNICH, MAX PLANCK INST - M Aderholz, L Deck, N Schmitz, W Wittek  
 OXFORD U - P Bostock, J Kristic, G Myatt, D Radojicic  
 SACLAY - T Bolognese, M L Faccini-Turlur, D Vignaud  
 STOCKHOLM U - K Hultquist, P O Hulth (✓ Spokesperson), C Walck  
 RUTHERFORD - J Guy, W Venus

Accelerator CERN-SPS Detector HLBC-BEBC-HYB

Reactions

$p$  nucleus  $\rightarrow \nu$  X 400 GeV/c

Comments Continues studies of CERN-WA-052. A beam dump experiment.

Papers PL 160B (1985) 207, PL 160B (1985) 212, and NP B273 (1986) 253.

**CERN-WA-067** (Nov 1979) Approved Dec 1980; Completed Nov 1981.

**STUDY OF  $\pi^-p$  INTERACTIONS AT 85 GeV/c LEADING TO  $K^+K^+K^-K^-$  IN THE FINAL STATE - SEARCH FOR NEW STATES**

CERN - B R French, J C Lassalle, J A Richardson  
 GLASGOW U - D Frame, I S Hughes, J G Lynch, A S Thompson, I R M Thompson, R M Turnbull  
 LIVERPOOL U - P S L Booth, L J Carroll, R A Donald, D N Edwards, M A Houlden, J N Jackson (✓ Spokesperson), P A Kilcoyne, J M Myerscough, W H Range, I Rumford

Accelerator CERN-SPS Detector OMEGAPRIME

Reactions

$\pi^- p \rightarrow K^+ K^- X$  85 GeV/c  
 $\pi^- p \rightarrow K^+ K^+ K^- K^- X$  "  
 $\pi^- p \rightarrow \phi K^+ K^- X$  "  
 $\pi^- p \rightarrow \phi \phi X$  "

Particles studied  $\phi$ ,  $\eta_c(2980)$ ,  $\phi(1680)$ , exotic-meson, glueball

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NP B242 (1984) 51, NP B273 (1986) 677, and NP B273 (1986) 689. No other papers expected.

**CERN-WA-068** (Aug 1980) Approved Mar 1981; Completed Sep 1982.

**FURTHER STUDY OF PROMPT NEUTRINO PRODUCTION IN A PROTON BEAM DUMP EXPERIMENT**

CERN - F Dydak, R Hagelberg, J Knobloch, J Krolkowski, J May, F Ranjard, W von Rueden, J Steinberger (Spokesperson), H Taureg, H Wahl, J Wotschack  
 DORTMUND U - P Buchholz, J Duda, F Eisele, K Kleinknecht, D Pollmann, B Pzola, B Renk  
 HEIDELBERG U, IHEP - T Flottmann, C Geweniger, J G H de Groot, R Herden, H Keilwerth, N Magnussen, K Tittel  
 SACLAY - P Debu, C Guyot, J P Merlo, P Perez, J Rander, J P Schuller, R Turlay  
 WARSAW, INR - H Abramowicz, A Para, M Szczekowski, M Szeptycka  
 FERMILAB - J P Berge

Accelerator CERN-SPS Detector CDHS

Reactions

$p$  nucleus  $\rightarrow \nu$  X 450 GeV/c

Particles studied charm

Comments An extension of CERN-WA-054 to investigate with much better accuracy the equality of prompt  $\nu_e$  and  $\nu_\mu$  fluxes. For a description of the apparatus, see the LBL-91 supplement on detectors.

**CERN-WA-069** (Mar 1980) Approved Apr 1981, Jun 1982, Jun 1985; Completed Jul 1986.

**PHOTOPRODUCTION IN THE ENERGY RANGE 70-200 GeV**

BONN U - B Diekmann, C Gapp, K Heinloth, C Hoeger, S Holtzkamp, H-P Jakob, M Jung, G Koersgen, E Paul (✓ Spokesperson), H Rotscheidt, S Soeldner-Rembold, A Tetzner-Voightlaender, A S Weigend  
 CERN - D Barberis, M Davenport, J Eades, R H McClatchey  
 YEREVAN PHYS INST - L S Bagdassaryan, S Danagulian, P I Galumyan, A G Oganessyan  
 LANCASTER U - T J Brodbeck, T Charity, A B Clegg, R C W Henderson, N Keemer, D Newton, A O'Conner, G W Wilson

## SUMMARIES OF EXPERIMENTS

MANCHESTER U - N Brook, P Coyle, B Dickinson, A Donnachie, A T Doyle, R J Ellison, R E Hughes-Jones, M Ibbotson, S D Kolya, G D Lafferty, H McCann, C McManus, D Mercer, P J Ottewell, D Reid, R J Thompson, J Waterhouse, M F Worsell  
 RUTHERFORD - R Apsimon, P S Flower, G Halliwell, J S Hutton, J A G Morris, J V Morris, C N Patterson, P H Sharp, C Uden  
 SHEFFIELD U - S Danaher, W Galbraith, N A Thacker, L Thompson

Accelerator CERN-SPS Detector OMEGA

Reactions

$\gamma p \rightarrow$ hadrons	65-180 GeV/c
$\pi^+ p \rightarrow$ hadrons	80, 140 GeV/c
$\pi^- p \rightarrow$ hadrons	"
$K^+ p \rightarrow$ hadrons	"
$K^- p \rightarrow$ hadrons	"

Particles studied  $D^0, D^+, D_s^+, \Lambda_c^+, \nu$ meson

Comments Continues photoproduction studies of WA-004 and WA-057 to higher energies, with comparison to hadronic beam data. Topics include photoproduction of charmed particles, vector mesons, and high-mass multiparticle states, and a search for events due to lowest order QCD processes giving evidence of point-like interactions of the photon. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers IEEE TNS 30 (1983) 35.

**CERN-WA-070** (Aug 1980) Approved Oct 1981.  
**STUDY OF DIRECT PHOTON EVENTS IN HADRONIC COLLISIONS**

GENEVA U - R Bopp, S U Chung, M Donnat, P A Dorsaz, J Fischer, M N Kienzle, M Martin (Spokesperson), L Mathys, L Rosselet, M Werlen  
 GLASGOW U - S Jack, J G Lynch, A Maxwell, P J Negus, A S Thompson, R M Turnbull, J Wells  
 LIVERPOOL U - P S L Booth, L J Carroll, A J Cass, D N Edwards, J N Jackson, R Poultney, W H Range, S Snow  
 MILAN U - M Bonesini, D Cavalli, G Costa, E Galluzzi, F Gianotti, L Mandelli, M Mazzanti, L Perini, G Polesello  
 NEUCHATEL U - E Bonvin, L Fluri, A Jornod

Accelerator CERN-SPS Detector OMEGA

Reactions

$\pi^+ p \rightarrow \gamma X$	200, 280 GeV/c
$\pi^- p \rightarrow \gamma X$	"
$p p \rightarrow \gamma X$	"

Comments Uses a fine-grained  $\gamma$  detecting calorimeter together with the Omega spectrometer. For a description of the apparatus, see the LBL-91 supplement on detectors. Taking data (November 86).

**CERN-WA-071** (Feb 1981) Approved Oct 1981; Completed Sep 1984.

**AN EXPERIMENT TO STUDY BEAUTY PRODUCTION AND LIFETIME IN THE UPGRADED OMEGAPRIME SPECTROMETER**

CERN - G Darbo, J Garcia, E Higon, L Rossi, G Vanderhaeghe  
 GENOA U - M Dameri, B Osculati, M Sannino, G Tomasini, S Vitale  
 MILAN U & INFN, MILAN - P F Manfredi, D Marioli, C Meroni, S Micheletti, G Vegni  
 LEBEDEV INST - M I Adamovich, Y A Alexandrov, M M Chernyavsky, S G Gerasimov, V G Larionova, N G Menjelai-Peresadko, G I Orlova, N A Salmanova, L N Shtarkov, M I Tretyakova, M V Vnukova  
 PARIS, CURIE UNIV VI & PARIS, UNIV VII, LPNHE - M M Cloarec, F Levy, J Lory, D Schune, Tsai-Chu, B Willot  
 INFN, ROME & ROME U - G Baroni, G Diambri-Palazzi (Spokesperson), P Ginobbi, E Lamanna, M A Mazzoni, F Meddi, S Petrerà

SANTANDER U - R Niembro, A Ruiz, E Villar  
 VALENCIA U - J M Bolta, J Cabrera, R Llosa, M A Sanchis, F Senent  
 GENEVA U - S Tentindo

Accelerator CERN-SPS Detector OMEGAPRIME

Reactions

$\pi^-$  nucleus 350 GeV/c

Particles studied bottom, charm

Comments Detects beauty particles produced in emulsion targets using a charm decay detector or a high- $p_t$  electron trigger. For a description of the apparatus, of the apparatus, see the LBL-91 supplement on detectors. A total of 50 liters of emulsion exposed.

Papers NIM 217 (1983) 194, NIM 225 (1984) 661, and NIM 226 (1984) 63.

**CERN-WA-072** (Jun 1981) Approved Oct 1981; Completed Mar 1982.

**A STUDY OF FAST PROTON PRODUCTION IN  $\pi^\pm$  NUCLEUS INTERACTIONS USING THE OMEGA SPECTROMETER**

CERN - W Beusch, A Burns, K Knudson, A Palano, E Quercigh, R Zitoun  
 PARIS, CURIE UNIV VI - T A Armstrong, M Baubillier, N Er Schaidat

NEUCHATEL U - D Perrin

WARSAW U, IEP - A Jacholkowski, S Otwinowski, M Szeptycka (Spokesperson), S Tkaczyk, R Walczak  
 LISBON, CFMC - M C Abrell, J Gago, M Pimenta

Accelerator CERN-SPS Detector OMEGA

Reactions

$\pi^+$ nucleus $\rightarrow p X$	30 GeV/c
$\pi^-$ nucleus $\rightarrow p X$	"

Comments Measures the inclusive cross sections of fast ( $> 11$  GeV/c) protons produced by  $\pi^+$  and  $\pi^-$  on H, C, Al, Cu, Sn, and Pb. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers ZPHY C25 (1984) 115.

**CERN-WA-074** (Dec 1981) Approved Feb 1982; Completed May 1982.

**$\bar{p}p$  GLORY SCATTERING**

CERN - P Sonderegger, R Zitoun  
 LISBON, CFMC - J Dias de Deus, J M Gago

( $\sqrt$  Spokesperson), M Pimenta

NEUCHATEL U - D Perrin  
 PARIS, CURIE UNIV VI - T Armstrong, M Baubillier, J C Brient, M Sene, Z Strachman  
 COLLEGE DE FRANCE - J Kahane, R Sene  
 MOSCOW, ITEP - Yu Galaktionov

Accelerator CERN-SPS Detector OMEGA

Reactions

$\bar{p} p \rightarrow \bar{p} p$	8-12 GeV/c
$\pi^- p \rightarrow \pi^- p$	"
$K^- p \rightarrow K^- p$	8-16 GeV/c

Comments Studies backward elastic scattering, and  $\Lambda$  polarization in the  $K^-$  fragmentation region. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NP B262 (1985) 356, and NP B (accepted).

**CERN-WA-075** (Sep 1981) Approved Apr 1982; Completed Jun 1984.

**AN EXPERIMENT TO OBSERVE DIRECTLY BEAUTY PARTICLES SELECTED BY MUONIC DECAY IN EMULSION AND TO ESTIMATE THEIR LIFETIMES**

## SUMMARIES OF EXPERIMENTS

BARI U - N Armenise, O Enriquez, M T Muciaccia, S Natali, S Nuzzo, F Romano, F Ruggieri

BRUSSELS U, IIHE - M Barth, G Bertrand-Coremans, R Roosen

CERN - E Chesi, P Musset, F Piuz, G Poulard, G Rosa, H Sletten

UNIVERSITY COLL, DUBLIN - A Breslin, A Montwill

JAPAN U GROUP COLLAB - M Hazama, K Hoshino, Y Isogane, Y Maeda, M Miyanishi, M Nakamura, K Niu, K Niwa, M Ohashi, Y Sato, H Shibuya, Y Tsuneoka, N Ushida, O Yamakawa, Y Yanagisawa

UNIVERSITY COLL, LONDON - J H Bartley, D H Davis, B G Duff, M J Esten, F F Heymann, D C Imrie, G J Lush, D N Tovee

ROME U - G Baroni, S Dell'Uomo, A Frenkel, S Di Liberto, A Manfredini, G Marini, G Martellotti, A Nigro, G Penso, E Petrolo, P Pistilli, G Romano (Spokesperson), A Sciubba, G Sgarbi, M De Vincenzi

TURIN U - D Allasia, V Bisi, D Gamba, A Marzari-Chiesa, L Ramello, L Ricatti, A Romero

MARSEILLE U, LUMINY - J P Albanese

STRASBOURG - R Arnold

BIRKBECK COLL - M Coupland, P Trent

Accelerator CERN-SPS Detector Emulsion

### Reactions

$\pi^-$  nucleus  $\rightarrow$  bottom X 360 GeV/c

Particles studied bottom, charm

Comments Identification involves direct observation in emulsion of beauty and charm decays. Selection uses high- $p_t$  muons. Sixty liters of emulsion are exposed.

Papers PL 158B (1985) 186.

**CERN-WA-076** (Jan 1982) Approved Apr 1982, Nov 1984; Completed Sep 1986.

**STUDY OF THE MESONS PRODUCED CENTRALLY IN THE REACTION  $pp \rightarrow ppX^0$  AND  $\pi^- p \rightarrow \pi^- pX^0$  AT 300 GeV/c**

ATHENS U - A Apostolakis, M Stassinaki, G Vassiliadis

BARI U - C Evangelista, B Ghidini, V Lenti, F Navach, A Palano ( $\checkmark$  Spokesperson), G Zito

BIRMINGHAM U - O Baillie-Villalobos, I J Bloodworth, J N Carney, R Childs, J B Kinson, H R Shaylor, M T Trainor, M F Votruba

CERN - W Beusch, B R French, Y Goldschmidt-Clermont, A Jacholkowski, K Knudson, J C Lassalle, E Quercigh, N Redaelli, L Rossi, R Zitoun

COLLEGE DE FRANCE - M Benayoun, J Kahane, P Leruste, A Malamant, J L Narjoux, M Sene, R Sene

Accelerator CERN-SPS Detector OMEGA

### Reactions

$p p \rightarrow p p X$  85, 300 GeV/c

$\pi^+ p \rightarrow \pi^+ p X$  85 GeV/c

$\pi^- p \rightarrow \pi^- p X$  300 GeV/c

Particles studied  $f_1(1420)$ , meson<sup>0</sup>, glueball

Comments Many specific exclusive channels are examined. For a description of the Omega spectrometer, see the LBL-91 supplement on detectors.

Papers PL 146B (1984) 273, PL 166B (1986) 245, and PL 167B (1986) 133.

**CERN-WA-077** (Sep 1982) Approved Nov 1982.

**SEARCH FOR DIRECT PRODUCTION OF GLUONIUM STATES IN HIGH  $p_t$   $\pi^- N$  COLLISIONS AT 350 GeV/c**

ATHENS U - A Angelopoulos, A Apostolakis, H Rozaki, M Stassinaki, G Vassiliadis

BARI U - C Evangelista, B Ghidini, V Lenti, F Navach, A Palano, G Zito

BIRMINGHAM U - I J Bloodworth, J N Carney, J B Kinson, H R Shaylor, M F Votruba

CERN - W Beusch, A J Burns, B R French, Y Goldschmidt-Clermont, K Knudson, J C Lassalle, R Petronzio, E Quercigh ( $\checkmark$  Spokesperson)

COLLEGE DE FRANCE - M Benayoun, J Kahane, P Leruste, A Malamant, J L Narjoux, R Sene

PARIS, CURIE UNIV VI - M Baubillier, R Parrie, M Sene, Z Strachman, R Zitoun

Accelerator CERN-SPS Detector OMEGAPRIME

### Reactions

$\pi^-$  Be  $\rightarrow$  hadrons 150, 300 GeV/c

Particles studied glueball

Comments For a description of the Omega spectrometer, see the LBL-91 supplement on detectors. Took some data in 1984, and scheduled to run again in 1987.

**CERN-WA-078** (Feb 1983) Approved Jun 1983; Completed Aug 1985.

**SEARCH FOR THE HADROPRODUCTION OF  $b\bar{b}$  PAIRS**

BARI U - G Catanese, M T Muciaccia, S Natali, S Nuzzo, F Ruggieri

BRUSSELS U, IIHE - M Van Homwegen, R Roosen

CERN - G Carboni, M J Esten, G Fidecaro, M Fidecaro, P Musset, P Pistilli (Spokesperson), F Piuz, G Poulard, H Sletten

UNIVERSITY COLL, LONDON - J H Bartley, M Coupland, D H Davis, B G Duff, F F Heymann, D C Imrie, G J Lush, D N Tovee, P Trent

ROME U & INFN, ROME - A Frenkel, E Lamanna, S Di Liberto, G Marini, G Martellotti, A Nigro, G Penso, S Petrer, E Petrolo, G Romano, G Rosa, A Sciubba, M De Vincenzi

TURIN U & INFN, TURIN - V Bisi, D Gamba, L Riccati

TURIN U - L Ramello

GENOA U & INFN, GENOA - G Crosetti

DESY - C Gerke

Accelerator CERN-SPS Detector Spectrometer

### Reactions

$\pi^-$  nucleus  $\rightarrow \mu^+ \mu^+ X$  350 GeV/c

$\pi^-$  nucleus  $\rightarrow \mu^- \mu^- X$  "

$\pi^-$  nucleus  $\rightarrow 3\mu\text{on} X$  "

$\pi^-$  nucleus  $\rightarrow 4\mu\text{on} X$  "

Particles studied bottom,  $D^0$

Comments In addition to the search for the associated production of beauty particles, the experiment also looks for evidence of  $D^0\bar{D}^0$  mixing and measures the A dependence of the  $D\bar{D}$  cross section.

**CERN-WA-079** (Apr 1983) Approved Jun 1983; Started Aug 1986.

**STUDY OF NEUTRINO-ELECTRON SCATTERING AT THE SPS**

CHARM-II COLLABORATION

BRUSSELS U, IIHE - G Bertrand-Coremans, D Geiregat, P Villian, G Wilquet, C De Winter

CERN - F Bergsma, C Busi, A Capone, T Delbar, A Ereditato, W Flegel, H Grote, C Nieuwenhuis, J Panman, D De Pedis, A Seiden, K Winter ( $\checkmark$  Spokesperson), V Zacek

HAMBURG U - T Bauche, V Blöbel, F W Busser, A Eckel,

P D Gall, L Gerland, F Niebergall, P Stahelin

LOUVAIN U - D Favart, G Gregoire, T Mouthuy

MOSCOW, ITEP - P Gorbunov, E A Grigoriev,

V D Khovansky, M Kubantsev, A Rosanov

MUNICH U, EXP PHYS - D Braun, E Gorini, W Lippich,

U Meyer-Berkhout, A Staude, C Zupancic

NAPLES U, IFS & INFN, NAPLES - M Caria,

F Grancagnolo, R Iasevali, G Miele, V Palladino, P Strolin

INFN, ROME - E Di Capua, U Dore, P Loverre, G Piredda,

A Rambaldi-Frenkel, R Santacesaria, D Zanella

Accelerator CERN-SPS Detector CHARM-II

## SUMMARIES OF EXPERIMENTS

### Reactions

$\nu_\mu e^-$  5-100 GeV/c  
 $\bar{\nu}_\mu e^-$  "

**Comments** The main aim is to measure the ratio of cross sections for  $\nu_\mu e^-$  and  $\bar{\nu}_\mu e^-$  scattering. This gives the electroweak mixing angle. For a description of the apparatus, see the LBL-91 supplement on detectors. Taking data (November 86).

**CERN-WA-080** (1982) Approved Feb 1983, Nov 1984.

### STUDY OF RELATIVISTIC NUCLEUS-NUCLEUS COLLISIONS AT THE CERNS SPS

DARMSTADT, GSI - R Albrecht, R Bock, G Claesson, H H Gutbrod ( $\sqrt{\text{Spokesperson}}$ ), B Kolb, I Lund, R Schmidt, R Schulze, T Siemiarczuk

LBL - A Franz, P Kristiansson, A M Poskanzer, H G Ritter  
 LUND U - S Garpman, H A Gustafsson, A Oskarsson, I Otterlund, S Persson, K Soderstrom, E Stenlund  
 MUNSTER U - P Beckmann, F Berger, L Dragon, R Glasow, K H Kampert, H Loehner, T Peitzmann, M Purschke, R Santo, R Weinke

OAK RIDGE - T Awes, C Baktash, J Beene, R Ferguson, E Gross, J Johnson, I Y Lee, F Obenshain, F Plasil, S Sorensen, G Young

**Accelerator** CERN-SPS **Detector** PLASTIC-BALL, Wire chamber, Calorimeter

### Reactions

$^{16}\text{O}$  nucleus 200 GeV ( $T_{\text{lab}}/N$ )  
 $p$  nucleus "

**Comments** Determines the energy flux and transverse energy distribution, the high  $E_t \pi^0$  and  $\gamma$  spectra near mid-rapidity, the target spectator decay pattern and entropy (from relative yields of  $p$ ,  $d$ , pions, etc.), and the multiplicity distribution and multiplicity fluctuations. Taking data (November 86).

**CERN-WA-081** (1983) Approved Nov 1984; Completed Jun 1986.

### MEASUREMENTS OF PAIR PRODUCTION UNDER CHANNELLING CONDITIONS BY 70-180 GeV PHOTONS INCIDENT ON SINGLE CRYSTALS

AARHUS U - J Bak, S P Moller, G Oades, K Ostergaard, J B B Petersen, E Uggerhøj ( $\sqrt{\text{Spokesperson}}$ )

CERN - A Sorensen  
 STRASBOURG - P Siffert, M Suffert

**Accelerator** CERN-SPS **Detector** OMEGA

### Reactions

$\gamma$  crystal  $\rightarrow e^+ e^- X$  15-150 GeV/c

**Comments** Uses the set-up of CERN-WA-069.

**CERN-WA-082** (Oct 1985) Approved Feb 1986.

### A TEST OF AN IMPACT PARAMETER TRIGGER AIMED AT HIGH STATISTICS HEAVY-QUARK STUDY

CERN - W Beusch, J P Dufey, B R French, A Jacholkowski, K Knudson, J C Lassalle, F Muller, N Redaelli, L Rossi ( $\sqrt{\text{Spokesperson}}$ )

INFN, GENOA & GENOA U - M Dameri, G Darbo, B Osculati, G Tomasini  
 INFN, MILAN & MILAN U - D Marioli, C Meroni, G Vegni  
 MONS U - J F Balland, F Grad, P Legros  
 SANTANDER U - J J Garcia

**Accelerator** CERN-SPS **Detector** OMEGA

### Reactions

$\pi^+$  nucleus  $\rightarrow$  charm X 360 GeV/c

**Particles studied** charm,  $D^+$ ,  $D^0$ ,  $D_s^+$ ,  $\Lambda_c^+$

**Comments** Triggers on charm decays by measuring the impact parameter silicon-strip counters as a microvertex detector. Test run data taking completed August 86.

**CERN-WA-083** (Oct 1985) Approved Feb 1986.

### INVESTIGATION OF SOFT PHOTON PRODUCTION IN HADRONIC COLLISIONS USING THE OMEGA SPECTROMETER

ATHENS U - M Spyropoulou-Stassinaki, G Vassiliadis, I Vichou

TATA INST - S Bannersee, A Subramanian  
 CERN - W Beusch, Y Goldschmidt-Clermont ( $\sqrt{\text{Spokesperson}}$ ), K Knudson, E Quercigh, P Sonderegger

**Accelerator** CERN-SPS **Detector** OMEGA

### Reactions

$\pi^+ p \rightarrow \gamma(s) X$  280 GeV/c  
 $p p \rightarrow \gamma(s) X$  "  
 $\pi^- p \rightarrow \gamma(s) X$  "

**Comments** Investigates an observation made in BEBC that the yield of soft  $\gamma$ 's exceeds the QED prediction of hadronic bremsstrahlung. Taking data (November 86).

**CESR-CLEO** Started Oct 1979.

### THE CLEO EXPERIMENT AT CESR

CORNELL U - C Bebek, K Berkelman, E Blucher, D G Cassel, T Copie, R DeSalvo, J W DeWire, R Ehrlich, R Galik, M G D Gilchriese, B Gittelman, S W Gray, M Halling, D L Hartill, B K Heltsley, S Holzner, M Ito, J Kandaswamy, R Kowalewski, D L Kreinick, Y Kubota, N B Mistry, J Mueller, R Namjoshi, E Nordberg, M Ogg, D Perticone, D Peterson, M Pisharody, K Read, D Riley, A Silverman, P C Stein, S Stone, Xia Yi

HARVARD U - T Bowcock, R Giles, J Hassard, K Kinoshita, F Morrow, F M Pipkin, R Wilson

ROCHESTER U - S Behrends, J A Guida, J M Guida, F Morrow, R Poling, C Rosenfeld, E H Thorndike, P Tipton  
 RUTGERS U - J Green, F Sannes, R Stone

SYRACUSE U - D Bortoletto, A Chen, L Garren, M Goldberg, N Horwitz, A Jawahery, P Lubrano, G Moneti ( $\sqrt{\text{Spokesperson}}$ )

VANDERBILT U - S Csorna, M Mestayer, R S Panvini, G B Word

OHIO STATE U - T Gentile, P Haas, M Hempstead, T Jensen, H Kagan, R Kass

ITHACA COLL - A J Sadoff

SUNY, ALBANY - M S Alam, N Katayama, I J Kim, C R Sun, V Tanikella

CARNEGIE MELLON U - A Bean, G J Bobbink, I Brock, A Engler, T Ferguson, R Kraemer, C Rippich, R Sutton, H Vogel

FLORIDA U - P Avery, D Besson

**Accelerator** CESR **Detector** CLEO

### Reactions

$e^+ e^- \rightarrow$  hadrons 9.0-12.0 GeV ( $E_{\text{cm}}$ )  
 $e^+ e^- \rightarrow e^+ e^-$  "  
 $e^+ e^- \rightarrow \mu^+ \mu^-$  "

**Particles studied**  $\Upsilon(9460)$ ,  $\Upsilon(10023)$ ,  $\Upsilon(10355)$ ,  $\Upsilon(10575)$ ,  $B(5270)$ ,  $\tau$ ,  $D^+$ ,  $D^0$ ,  $D_s^+$

**Comments** Studies  $e^+ e^-$  interactions in the energy range of the  $\Upsilon$  resonances. Topics include  $b\bar{b}$  spectroscopy,  $b$ -quark decays, and decays of the  $\Upsilon$ 's. For a description of the apparatus, see the LBL-91 supplement on detectors.

**Papers** PRL 44 (1980) 1108, PRL 45 (1980) 219, PRL 46 (1981) 84, PRL 46 (1981) 88, PRL 46 (1981) 1181, PRL 48 (1982) 1070, PRL 49 (1982) 357, PRL 49 (1982) 610, PRL 49 (1982) 617, PR D27 (1983) 475, PR D27 (1983) 1665, NIM 211 (1983) 47, PL 122B (1983) 317, PRL 50 (1983) 807, PRL 50 (1983) 877, PRL 50 (1983) 881, PRL 51 (1983) 347, PRL 51 (1983) 634, PRL 51 (1983) 1139, PRL 51 (1983) 1143, PR D29 (1984) 1285, PRL 52 (1984) 799, PL 137B (1984) 277, PRL 52 (1984) 1084, PRL 53 (1984) 24, PRL 53 (1984) 1309, PR D30 (1984) 1433, PR D30 (1984) 1996, PR D30 (1984) 2279, PRL 54 (1985) 381, PRL 54 (1985) 1894, PRL 55 (1985) 923, PRL 55 (1985) 1248, PR D31 (1985) 2161,



## SUMMARIES OF EXPERIMENTS

PR D31 (1985) 2386, PR D32 (1985) 2294, PR D32 (1985) 2468, PRL 56 (1986) 800, PRL 56 (1986) 1222, PRL 56 (1986) 1893, PRL 56 (1986) 2676, PR D33 (1986) 300, PR D34 (1986) 905, PRL 56 (1986) 2781, PR D34 (1986) 3279, PRL 58 (1987) 183, PR D35 (1987) 19, PRL 58 (1987) 307, and PR D35 (1987) 1081.

**CESR-CUSB** (1978) Approved Feb 1978, Nov 1979.

**CUSB — HIGH RESOLUTION CALORIMETER TO STUDY THE  $\Upsilon$  SPECTROSCOPY AND B PHYSICS**

SUNY, STONY BROOK - J E Horstkotte, C Klopfenstein, J Lee-Franzini, R D Schamberger, Jr, M Sivertz, L J Spencer

COLUMBIA U - P Franzini ( $\checkmark$  Spokesperson), D Son, P M Tuts, S Youssef, T Zhao

CORNELL U - S W Herb

LOUISIANA STATE U - K Han, R Imlay, G Levman, W Metcalf, V Sreedhar

MUNICH, MAX PLANCK INST - H Dietl, G Eigen, E Lorenz, G Mageras, F Pauss, H Vogel

Accelerator CESR Detector CUSB

Reactions

$e^+ e^- \rightarrow$ hadrons	9.4-11.6 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow e^+ e^-$	"
$e^+ e^- \rightarrow \mu^+ \mu^-$	"
$e^+ e^- \rightarrow \gamma X$	"

Particles studied  $\Upsilon(9460)$ ,  $\Upsilon(10023)$ ,  $\Upsilon(10355)$ ,  $\Upsilon(10575)$ ,  $\Upsilon(10860)$ ,  $\Upsilon(11020)$ ,  $\chi_{b0}(9860)$ ,  $\chi_{b1}(9895)$ ,  $\chi_{b2}(9915)$ ,  $\chi_{b0}(10235)$ ,  $\chi_{b1}(10255)$ ,  $\chi_{b2}(10270)$ ,  $B(5270)$ ,  $B^*(5325)$ , higgs, axion,  $\zeta(8300)$ ,  $X(2220)$

Comments See also CESR-CUSB-II. For a description of the apparatus, see the first edition of the LBL-91 supplement on detectors.

Papers PRL 44 (1980) 1111, PRL 45 (1980) 222, PRL 46 (1981) 1115, PRL 47 (1981) 771, PRL 48 (1982) 906, PR D26 (1982) 717, PR D26 (1982) 720, PL 114B (1982) 277, NP B206 (1982) 1, PRL 49 (1982) 1612, PRL 49 (1982) 1616, PL 118B (1982) 453, PRL 51 (1983) 160, PL 130B (1983) 439, PL 130B (1983) 444, PR D29 (1984) 2483, NP B242 (1984) 31, PL 138B (1984) 225, PL 139B (1984) 332, PL 141B (1984) 271, PR D30 (1984) 1985, PRL 54 (1985) 377, PRL 55 (1985) 36, and PRL 56 (1986) 2672.

**CESR-CUSB-II** (1978) Approved Jun 1984.

**CUSB-II — HIGH RESOLUTION BGO CALORIMETER TO STUDY THE  $\Upsilon$  SPECTROSCOPY AND B PHYSICS**

COLUMBIA U - M Artuso, P Franzini ( $\checkmark$  Spokesperson), P M Tuts

SUNY, STONY BROOK - U Heintz, T M Kaarsberg, J Lee-Franzini ( $\checkmark$  Spokesperson), D M J Lovelock, M Narain, R D Schamberger, Jr, J Willins, C Yanagisawa

Accelerator CESR Detector CUSB-II

Reactions

$e^+ e^- \rightarrow$ hadrons	9.4-11.6 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow e^+ e^-$	"
$e^+ e^- \rightarrow \mu^+ \mu^-$	"
$e^+ e^- \rightarrow \gamma X$	"

Particles studied  $\Upsilon(9460)$ ,  $\Upsilon(10023)$ ,  $\Upsilon(10355)$ ,  $\Upsilon(10575)$ ,  $\Upsilon(10860)$ ,  $\Upsilon(11020)$ ,  $\chi_{b0}(9860)$ ,  $\chi_{b1}(9895)$ ,  $\chi_{b2}(9915)$ ,  $\chi_{b0}(10235)$ ,  $\chi_{b1}(10255)$ ,  $\chi_{b2}(10270)$ ,  $B(5270)$ ,  $B^*(5325)$ , higgs, axion,  $\zeta(8300)$ ,  $\eta_b$ , s-quark

Comments An upgraded detector. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers See also CESR-CUSB. NIM (to be published), PR D37 (to be published), PL 184B (to be published).

**DESY-DORIS-ARGUS** Approved 1979; Started Sep 1982.

**ARGUS — A NEW DETECTOR FOR DORIS**

DESY - H Albrecht, U Binder, P Boeckmann, R Glaeser, G Harder, I Lembke-Koppitz, W Schmidt-Parzefall ( $\checkmark$  Spokesperson), H Schroeder, H D Schulz, R Wurth, A Yagil

DORTMUND U - J P Donker, A Drescher, D Kamp, U Matthiesen, H Scheck, B Spaan, J Spengler, D Wegener  
HEIDELBERG U, IHEP - J C Gabriel, K R Schubert, J Stiewe, K Strahl, R Waldi, S Weseler

IPP, CANADA - K W Edward, W R Frisken, D J Gilkinson, D M Gingrich, H Kapitza, P Kim, R Kutschke, D B MacFarlane, J A McKenna, K W McLean, A W Nilsson, R S Orr, P Padley, J A Parsons, P M Patel, J D Prentice, H Seywerd, J D Swain, G Tsipolitis, T S Yoon, J C Yun  
KANSAS U - R Ammar, D Coppage, R Davis, S Kanekal, N Kwak

LUND U - L Joensson

MOSCOW, ITEP - A Babaev, M Danilov, A Golutvin, I Gorelov, V Lubimov, V Matveev, V Nagovitsin, V Ryltsov, A Semenov, V Shevchenko, V Soloshenko, V Tchistilin, I Tichomirov, Y Zaitsev

SOUTH CAROLINA U - R L Childers, C W Darden, Y Oku

LJUBLJANA U - B Bostjancic, G Kernel, M Plesko

STOCKHOLM U - H Gennow

Accelerator DESY-DORIS Detector ARGUS

Reactions

$e^+ e^- \rightarrow$ hadrons	9-11.5 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow$ charm X	"
$e^+ e^- \rightarrow$ bottom X	"
$e^+ e^- \rightarrow \Upsilon(\text{unspec})$	"
$e^+ e^- \rightarrow$ hvy-lepton X	"

Particles studied charm, bottom,  $\Upsilon(\text{unspec})$ , hvy-lepton

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM 163 (1979) 77, NIM 195 (1982) 475, NIM 205 (1983) 125, NIM 216 (1983) 35, NIM 217 (1983) 153, PL 134B (1984) 137, PL 135B (1984) 498, PL 146B (1984) 111, NIM A235 (1985) 26, NIM A237 (1985) 464, PL 150B (1985) 235, PL 153B (1985) 343, PL 154B (1985) 452, PL 156B (1985) 134, ZPHY C28 (1985) 45, PL 157B (1985) 326, PL 158B (1985) 525, PL 160B (1985) 331, PL 162B (1985) 395, PL 163B (1985) 404, ZPHY C29 (1985) 167, NIM A249 (1986) 277, PRL 56 (1986) 549, PL 167B (1986) 360, ZPHY C31 (1986) 181, PL 179B (1986) 398, PL 179B (1986) 403, PL 182B (1986) 95, ZPHY C33 (1986) 7, and ZPHY C33 (1987) 359.

**DESY-DORIS-CRYSTAL-BALL** (Jun 1981) Started Jul 1982; Completed 1986.

**A LARGE SOLID ANGLE NEUTRAL DETECTOR (THE CRYSTAL BALL)**

CAL TECH - C Peck, F C Porter, P Ratoff  
CARNEGIE MELLON U - I Brock, A Engler, R W Kraemer, D Marlow, F Messing, D Prindle, B Renger, C Rippich, H Vogel

CRACOW - Z Jakubowski, G Nowak

DESY - J K Bienlein ( $\checkmark$  Spokesperson), T Kloiber, W Koch, T Skwarnicki, H-J Trost, P Zschorsch

HARVARD U - D Antreasyan, J Irion, K Strauch, D Williams  
PRINCETON U - D Besset, R Carbenda, M Cavalli-Sforza, R Cowan, D Coyne

SLAC - E D Bloom ( $\checkmark$  Spokesperson), R Clare, S Cooper, J Gaiser, G Godfrey, W Lockman, S Lowe, B Niczyporuk, A Schwarz, K Wacker

STANFORD U - D Gelpman, R Hofstadter, I Kirkbride, R Lee, A Litke, B Pollock, J Tompkins

ERLANGEN U - G Folger, B Lurz, U Volland, H Wegener

FLORENCE U & INFN, FLORENCE - A Cartacci,

G Conforto, B Monteleoni, P Pelfer

HAMBURG U - A Fridman, F H Heimlich, R Lekebusch,

W Maschmann, R Nernst, D Sievers, U Strohbush

NIJMEGEN U & NIKHEF, NIJMEGEN - A C Koenig,

W Metzger, D J Schotanus, W Walk, R T Van de Walle

WURZBURG U - S Keh, H Kilian, K Koenigsmann, M Scheer,

P Schmitt

Accelerator DESY-DORIS-II Detector CRYST-BALL

## SUMMARIES OF EXPERIMENTS

### Reactions

$e^+ e^- \rightarrow \gamma X$	4.4-11.2 GeV (Ecm)
$e^+ e^- \rightarrow \pi^0 X$	"
$e^+ e^- \rightarrow \eta X$	"
$e^+ e^- \rightarrow e^\pm X$	"

Particles studied  $\Upsilon(9460)$ ;  $\Upsilon(10023)$ ,  $\chi_b(\text{unspec})$

Comments An extension of studies of quarkonium and gluonium (see SLAC-SP-024 and -030) to the  $\Upsilon$  system, with special emphasis on  $\gamma$  transitions. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 135B (1984) 498, PRL 54 (1985) 2195, PR D32 (1985) 2893, PR D33 (1986) 1847, and PR D34 (1986) 2611.

**DESY-DORIS-LENA** Approved 1979; Started 1979; Completed 1980.

### MEASUREMENTS IN CONTINUATION OF DESY-147

CRACOW-DESY-ERLANGEN-HAMBURG-MICHIGAN STATE-CARNEGIE MELLON-SACLAY-TEL AVIV-WURZBURG COLLABORATION

CRACOW - B Niczyporuk, T Zeludziewicz  
 DESY - J K Bienlein (✓ Spokesperson), R Graumann, J Krueger, M Leissner, M Schmitz, H-J Trost  
 ERLANGEN U - G Folger, B Lurz, H Vogel, U Volland, H Wegener  
 HAMBURG U - F H Heimlich, R Nernst, A Schwarz, U Strobusch, P Zschorsch  
 MICHIGAN STATE U - K W Chen, R Hartung  
 CARNEGIE MELLON U - M Coles, R W Kraemer, D Marlow, F Messing, T Ridge, C Rippich, B Stacey, S Youssef  
 SACLAY - A Fridman  
 TEL AVIV U - G Alexander, A Av-Shalom, G Bella, Y Gnat, J Grunhaus  
 WURZBURG U - E Hoerber, W Langguth, M Scheer

Accelerator DESY-DORIS Detector LENA

### Reactions

$e^+ e^-$	7.4-11.5 GeV (Ecm)
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Particles studied  $\Upsilon(9460)$ ,  $\Upsilon(10023)$

Comments Nonmagnetic lead glass-Nal  $\gamma$  and  $e^\pm$  detector and inner drift chambers.

Papers PRL 46 (1981) 92, PL 99B (1981) 169, PL 100B (1981) 95, ZPHY C9 (1981) 1, ZPHY C15 (1982) 299, and ZPHY C17 (1983) 197.

**DESY-PETRA-CELLO** (Jul 1976) Approved Oct 1976; Started Mar 1980; Completed Nov 1986.

### A $4\pi$ MAGNETIC DETECTOR FOR PETRA — CELLO

DESY-KARLSRUHE-MUNCHEN-ORSAY-PARIS-SACLAY COLLABORATION

DESY - H J Behrend, J H Field, V Schroeder, H Sindt  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - D Apel, J Bodenkamp, D Crobaczek, J Engler, G Fluegge, D Fries, F Moennig, H Mueller, H Randoll, G Schmidt, H Schneider  
 MUNICH, MAX PLANCK INST - W de Boer, G Buschhorn, G Grindhammer, P Grosse-Wiesmann, B Gunderson, C Kiesling, R Kotthaus, H Lierl, D Luers, T Meyer, L Moss, H Oberlack (Spokesperson), P Schacht, M J Schachter, A Snyder, H Steiner  
 ORSAY, LAL - G Carnesecchi, A Cordier, M Davier, F Le Diberder, D Fournier, J F Grivaz, J Haissinski, V Journe, F Laplanche, J J Veillet, A Weitsch  
 PARIS, CURIE UNIV VI - R George, M Goldberg, B Grossetete, F Kapusta, F Kovacs, G London, L Poggioli, M Rivoal  
 SACLAY - R Aleksan, J Bouchez, G Cozzika, Y Ducros, A Gaidot, J Pamela, J P Pansart, F Pierre

Accelerator DESY-PETRA Detector CELLO

### Reactions

$e^+ e^-$	14-47.3 GeV (Ecm)
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Comments The first experiment surveys cross sections, etc.

CELLO is optimized for  $e^\pm$  and  $\gamma$  detection, at the expense of extensive particle identification. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PS 23 (1981) 610, PL 103B (1981) 148, PL 110B (1982) 329, PL 113B (1982) 427, PL 114B (1982) 282, PL 114B (1982) 287, PL 114B (1982) 378, ZPHY C14 (1982) 95, ZPHY C14 (1982) 189, ZPHY C14 (1982) 283, PL 118B (1982) 211, NP B211 (1983) 369, NP B218 (1983) 269, ZPHY C16 (1983) 301, PL 123B (1983) 127, PL 126B (1983) 384, PL 126B (1983) 391, PL 127B (1983) 270, ZPHY C19 (1983) 291, ZPHY C20 (1983) 207, ZPHY C21 (1984) 205, PL 138B (1984) 311, ZPHY C23 (1984) 103, ZPHY C23 (1984) 223, PL 140B (1984) 130, PL 141B (1984) 145, PL 144B (1984) 297, PL 158B (1985) 536, PL 161B (1985) 182, PL 168B (1986) 420, PL 176B (1986) 274, PL 178B (1986) 452, and PL 181B (1986) 178.

**DESY-PETRA-JADE** Approved Oct 1976; Started Sep 1978; Completed Nov 1986.

### A COMPACT MAGNETIC DETECTOR AT PETRA — JADE

DESY - W Bartel, L Becker, C Bowdery, D Cords, R Felst (✓ Spokesperson), D Haidt, H Junge, G Knies, H Krehbiel, P Laurikainen, R Meinke, B Naroska, J Olsson, E Pietarinen, D Schmidt, P Steffen

HAMBURG U - G Dietrich, J Hagemann, G Heinzemann, H Kado, C Kleinwort, M Kuhlen, T Mashimo, K Meier, A Petersen, R Ramcke, U Schneekloth, G Weber  
 HEIDELBERG U, IHEP - K Ambrus, S Bethke, A Dieckmann, J Heintze, K H Hellenbrand, R D Heuer, S Komamiya, J von Krogh, P Lennert, H Matsumura, H Rieseberg, J Spitzer, A Wagner

LANCASTER U - A Finch, F Foster, G Hughes, T Nozaki, J Nye

MANCHESTER U - J Allison, J Baines, A H Ball, R Barlow, J Chrin, I P Duerdoth, T Greenshaw, P Hill, F K Loebinger, A A Macbeth, H McCann, H E Mills, P G Murphy, K Stephens, P Warming

MARYLAND U - R G Glasser, B Sechi-Zorn, J A J Skard, S Wagner, G T Zorn

RUTHERFORD - S L Cartwright, D Clarke, R Marshall, R P Middleton, J B Whittaker

TOKYO U - T Kawamoto, T Kobayashi, M Minowa, M Nozaki, H Takeda, T Takeshita, S Yamada

Accelerator DESY-PETRA Detector JADE

### Reactions

$e^+ e^- \rightarrow \text{hadrons}$	10-44 GeV (Ecm)
$e^+ e^- \rightarrow e^+ e^-$	"
$e^+ e^- \rightarrow \mu^+ \mu^-$	"
$e^+ e^- \rightarrow \tau^+ \tau^-$	"
$e^+ e^- \rightarrow \gamma \gamma$	"
$e^+ e^- \rightarrow e^+ e^- \text{ hadrons}$	"
$e^+ e^- \rightarrow e^+ X$	"
$e^+ e^- \rightarrow e^- X$	"
$e^+ e^- \rightarrow \mu^+ X$	"
$e^+ e^- \rightarrow \mu^- X$	"
$e^+ e^- \rightarrow e^+ \mu^- X$	"
$e^+ e^- \rightarrow e^- \mu^+ X$	"

Particles studied  $\tau$ , quark, hvy-lepton,  $D^*(2010)$ , s-particle

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 88B (1979) 171, PL 89B (1979) 136, PL 91B (1980) 142, PL 91B (1980) 152, PL 92B (1980) 206, ZPHY C6 (1980) 295, PL 99B (1981) 277, PL 99B (1981) 281, PL 100B (1981) 364, PL 101B (1981) 129, PL 101B (1981) 361, ZPHY C9 (1981) 315, PL 104B (1981) 325, PL 107B (1981) 163, PL 108B (1982) 140, PL 113B (1982) 190, PL 114B (1982) 71, PL 114B (1982) 211, PL 115B (1982) 338, PL 119B (1982) 239, PL 121B (1983) 203, PL 123B (1983) 353, PL 123B (1983) 460, ZPHY C19 (1983) 197, ZPHY C20 (1983) 187, PL 129B (1983) 145, PL 130B (1983) 454,

## SUMMARIES OF EXPERIMENTS

PL 132B (1983) 241, ZPHY C21 (1983) 37, PL 134B (1984) 275, PL 139B (1984) 327, ZPHY C24 (1984) 223, ZPHY C24 (1984) 231, ZPHY C25 (1984) 231, PL 145B (1984) 441, PL 146B (1984) 121, PL 146B (1984) 126, PL 146B (1984) 437, ZPHY C26 (1985) 507, PL 152B (1985) 385, PL 152B (1985) 392, PL 155B (1985) 288, ZPHY C28 (1985) 343, PL 157B (1985) 340, PL 158B (1985) 511, PL 160B (1985) 337, PL 160B (1985) 421, ZPHY C29 (1985) 505, PL 161B (1985) 188, PL 161B (1985) 197, PL 163B (1985) 277, ZPHY C30 (1986) 371, ZPHY C30 (1986) 545, ZPHY C31 (1986) 349, ZPHY C31 (1986) 359, PL 174B (1986) 350, PL 182B (1986) 216, ZPHY C33 (1986) 23, and ZPHY C33 (1987) 339.

**DESY-PETRA-MARK-J** (Jul 1976) Approved Oct 1976; Completed Nov 1986.

### A SIMPLE DETECTOR TO MEASURE $e^+e^-$ REACTIONS AT HIGH ENERGIES — MARK J

AACHEN, TECH HOCHSCH, III PHYS INST - R Becker-Szendy, A Boehm, E Defur, H S Fesefeldt, D Hueser, W Krenz, D Linnhofer, J Mnich, F P Poschmann, U Schroeder, J Schug, D Teuchert, S X Wu  
 BROOKHAVEN - R R Rau  
 CAL TECH - H Ma, H Newman, H Stone, R Y Zhu  
 DESY - S Ansari, M Hussain, K Nadeem, M Rohde, M F Wyne  
 MIT - U Becker, J G Branson, J D Burger, M Capell, M Chen, M Dhina, D Fong, M Fukushima, G Herten, M M Ilyas, D Luckey, H Rykaczewski, S C C Ting (✓ Spokesperson), M White, B Wyslouch, B Zhou  
 MADRID, JEN - B Adeva, J Berdugo, M Cerrada, L Garrido, C Mana, M A Marquina, M Martinez, S Rodriguez, J A Rubio, J Salicio  
 NIKHEF, AMSTERDAM - M Demarteau, P Duinker, D Harting, P Kuijer, E J Luit, G G G Massaro, G M Swider  
 GENEVA U - M Nusbaumer  
 BEIJING, IHEP - C C Chang, Y H Chang, H S Chen, M L Chen, M Y Chen, Y K Chi, B Z Dong, R D Han, M C Ho, D Z Jiang, H W Tang, K L Tung, M Q Wang, H G Wu, B X Yang, X Yu, L S Zhang, Z H Zhang  
 BERLIN, DAW - K Deiters, M Klein, R Leiste, W D Nowak, M Sachwitz, H J Schreiber, H Vogt  
 ZURICH, ETH - Q Z Li, M Pohl

*Accelerator* DESY-PETRA *Detector* MARK-J

#### Reactions

$e^+e^- \rightarrow \mu^+\mu^-$	12-47 GeV ( $E_{cm}$ )
$e^+e^- \rightarrow e^+e^-$	"
$e^+e^- \rightarrow \tau^+\tau^-$	"
$e^+e^- \rightarrow \text{muon X}$	"
$e^+e^- \rightarrow \text{hadrons}$	"

*Particles studied*  $\tau$ ,  $B(5270)$ , gluon

*Comments* Measures asymmetries, looks for structures in the total hadronic cross section, determines properties of  $B$  mesons and gluons, searches for a wide variety of new particles up to  $E_{cm} = 46.78$  GeV, etc. For a description of the apparatus, see the LBL-91 supplement on detectors.

*Papers* PRL 42 (1979) 1110, PRL 42 (1979) 1113, PRL 43 (1979) 830, PL 85B (1979) 463, PRL 43 (1979) 901, PRL 43 (1979) 1915, PRPL 63 (1980) 337, PL 89B (1979) 139, PRL 44 (1980) 1722, PL 95B (1980) 149, PRL 45 (1980) 1904, PRL 46 (1981) 1663, PL 108B (1982) 63, PRL 48 (1982) 721, PRL 48 (1982) 967, PRL 48 (1982) 1701, PL 115B (1982) 345, PRL 50 (1983) 799, PRL 50 (1983) 2051, PRL 51 (1983) 443, PRPL 109 (1984) 131, PRL 53 (1984) 134, PRL 53 (1984) 1806, PL 152B (1985) 439, PRL 54 (1985) 1750, PRL 55 (1985) 665, PL 179B (1986) 177, PL 180B (1986) 181, and PR D34 (1986) 681.

**DESY-PETRA-PLUTO-2** (Jul 1979) Started Aug 1981; Completed Aug 1982.

### STUDY OF $\gamma\gamma$ INTERACTIONS WITH THE DETECTOR PLUTO AT PETRA

AACHEN, TECH HOCHSCH, I PHYS INST - Chr Berger, A Deuter, H Genzel, R Grigull, W Lackas, F Pielorz, F Raupach

BERGEN U - A Klovning, E Lillestol, J M Olsen  
 GLASGOW U - P J Bussey, S Cartwright, J B Dainton, B King, C Raine, J M Scarr, I O Skillicorn, K Smith  
 MARYLAND U - C Y Chang, R Glasser, R G Kellogg, K H Lau, S Maxfield, R O Polvado, B Sechi-Zorn, J A Skard, A Skuja, A Tyka, G Welch, G Zorn  
 SIEGEN U - M Almeida, A Baecker, F Barreiro, S Brand, K Derikum, C Grupen, H J Meyer, B Neumann, M Rost, K H Stupperich, G Zech  
 TEL AVIV U - G Alexander, G Bella, Y Gnat, J Grunhaus  
 WUPPERTAL U - H J Daum, H Meyer, O Meyer, D Schmidt  
 DESY - H Ackermann, U Bartnik, J Buerger, L Criegee, H C Dehne, G Franke, H Funge, M Gaspero, Chr Gerke, U Jacobs, G Knies, K Kraski, E Lehmann, C Maxeiner, H Maxeiner, U Michelsen, H Nakata, K H Pape, F Ritter, B Stella, U Timm (✓ Spokesperson), W Wagner, P Waloschek, G G Winter, M Zachara, W Zimmermann  
 HAMBURG U - O Achterberg, Ch Bieler, V Blobel, L Boesten, D Burkart, K Diehlmann, V Hepp, H Kapitza, B Koppitz, B Lewendel, W Luehrsen, F Meyer, M Poppe, H Spitzer, R V Staa

*Accelerator* DESY-PETRA *Detector* PLUTO

#### Reactions

$e^+e^- \rightarrow e^+e^- \text{ hadrons}$	35 GeV ( $E_{cm}$ )
$e^+e^- \rightarrow e^+e^- \text{ jets}$	"
$e^+e^- \rightarrow e^+e^- \text{ meson}$	"
$e^+e^- \rightarrow e^+e^- \text{ leptons}$	"
$e^+e^- \rightarrow \mu^+\mu^-$	"
$e^+e^- \rightarrow \text{hadrons}$	"
$e^+e^- \rightarrow \gamma\gamma$	"

*Comments* Magnetic forward spectrometers are added to the earlier PLUTO apparatus. Although the emphasis is on  $\gamma\gamma$  physics, single- $\gamma$  events are registered too. For a description of the apparatus, see the LBL-91 supplement on detectors.

*Papers* This is all the papers from all the PLUTO experiments. Most results to 1982 from PLUTO are summarized in PREP 83 (1982) 153. PL 53B (1975) 489, PL 64B (1976) 369, PL 66B (1977) 395, PL 67B (1977) 367, PL 68B (1977) 283, PL 68B (1977) 297, PL 68B (1977) 301, PL 72B (1977) 135, PL 72B (1978) 493, PL 73B (1978) 99, PL 76B (1978) 243, PL 76B (1978) 652, PL 78B (1978) 162, PL 78B (1978) 176, PL 81B (1979) 84, PL 81B (1979) 410, PL 82B (1979) 449, ZPHY C1 (1979) 343, PL 86B (1979) 413, PL 86B (1979) 418, PL 89B (1979) 120, ZPHY C3 (1980) 193, PL 90B (1980) 312, ZPHY C4 (1980) 269, PL 91B (1980) 148, PL 93B (1980) 497, PL 94B (1980) 87, PL 94B (1980) 254, PRL 45 (1980) 1533, PL 95B (1980) 313, PL 97B (1980) 459, PL 99B (1981) 287, PL 99B (1981) 292, PL 99B (1981) 489, PL 100B (1981) 351, ZPHY C7 (1981) 289, ZPHY C8 (1981) 101, ZPHY C8 (1981) 167, PL 104B (1981) 79, PL 107B (1981) 168, ZPHY C12 (1982) 297, NP B202 (1982) 189, NP B214 (1983) 189, ZPHY C19 (1983) 205, ZPHY C21 (1983) 53, ZPHY C22 (1984) 103, PL 137B (1984) 267, PL 142B (1984) 111, PL 142B (1984) 119, PL 142B (1984) 125, ZPHY C26 (1984) 191, ZPHY C26 (1984) 199, PL 149B (1984) 421, PL 149B (1984) 427, ZPHY C26 (1984) 353, ZPHY C27 (1985) 167, ZPHY C27 (1985) 249, ZPHY C27 (1985) 341, ZPHY C28 (1985) 1, ZPHY C28 (1985) 365, ZPHY C29 (1985) 183, ZPHY C29 (1985) 499, PL 167B (1986) 120, NP B281 (1987) 365, and ZPHY C33 (1987) 351.

**DESY-PETRA-TASSO** (Jul 1976) Approved Oct 1976; Completed Nov 1986.

### A LARGE $4\pi$ MAGNETIC DETECTOR FOR PETRA — TASSO

AACHEN, TECH HOCHSCH, I PHYS INST - W Braunschweig, R Gerhards, F J Kirschfink, H-U Martyn, P Roskamp, E Vogel, W Wallraff  
 BONN U - B Bock, J Eisenmann, H M Fischer, H Hartmann, E Hilger, A Jocksch, H Kolanoski, H Kueck, V Mertens, R Wedemeyer  
 BRISTOL U - B Foster, A J Martin  
 DESY - E Bernardi, Y Eisenberg, A Eskreys, K Gather, H Hultschig, P Joos, B Klima, H Kowalski, A Ladage, B Loehr (✓ Spokesperson), D Lueke, P Maettig, A Montag,

## SUMMARIES OF EXPERIMENTS

D Notz, A Shapira, D Trines, T Tymieniecka, G Tysarczyk,  
R Walczak, G Wolf, G Yekutieli, W Zeuner  
HAMBURG U - T Kracht, H L Krasemann, J Krueger,  
E Lohrmann, G Poelz, K U Poesnecker  
IMPERIAL COLL - D M Binnie, P Dornan, D A Garbutt,  
C Jenkins, W G Jones, J Sedgbeer, J Shulman, D Su,  
A P Watson  
MADRID, AUTONOMA U - F Barreiro, E Ros  
OXFORD U - C Balkwill, M G Bowler, P N Burrows,  
R J Cashmore, P Dauncey, R Devenish, G Heath, D Mellor,  
P Ratoff, I Tomalin, J M Yelton  
QUEEN MARY COLL - S L Lloyd  
RUTHERFORD - G E Forden, J C Hart, D K Hasell,  
D H Saxon  
SIEGEN U - S Brandt, M Holder, L Labarga, B Neumann  
WEIZMANN INST - U Karshon, G Mikenberg, R Mir,  
D Revel, E Ronat, N Wainer  
WISCONSIN U - G Baranko, A Caldwell, M Cherney,  
J M Izen, S Ritz, D Strom, M Takashima, E Wicklund,  
S L Wu, G Zobernig

Accelerator DESY-PETRA Detector TASSO

### Reactions

$e^+ e^- \rightarrow \text{hadrons}$	12-47 GeV (E <sub>cm</sub> )
$e^+ e^- \rightarrow \text{lepton}^+ \text{lepton}^-$	"
$e^+ e^- \rightarrow \gamma \gamma$	"
$e^+ e^- \rightarrow e^+ e^- \text{ hadrons}$	"

Particles studied hvy-lepton, unspec

Comments Studies formation of jets, gluon blemsstrahlung, inclusive particle production, QCD tests, lifetimes of the tau, charmed, and bottom particles, QED tests, electroweak asymmetries in muon pair production, new particle searches, and inclusive and exclusive two-photon reactions. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 83B (1979) 261, PL 86B (1979) 243, PL 88B (1979) 199, PL 89B (1980) 418, ZPHY C4 (1980) 87, PL 92B (1980) 199, PL 94B (1980) 91, PL 94B (1980) 259, PL 94B (1980) 437, PL 94B (1980) 444, PL 97B (1980) 448, PL 97B (1980) 453, PL 99B (1981) 163, PL 100B (1981) 357, ZPHY C10 (1981) 117, PL 105B (1981) 75, PL 107B (1981) 290, PL 108B (1982) 67, PL 108B (1982) 71, PL 110B (1982) 173, PL 113B (1982) 98, PL 113B (1982) 499, PL 114B (1982) 65, PL 117B (1982) 135, PL 117B (1982) 365, ZPHY C16 (1982) 13, PL 121B (1983) 216, PL 122B (1983) 95, ZPHY C17 (1983) 5, PL 126B (1983) 493, PL 130B (1983) 340, PL 130B (1983) 449, ZPHY C22 (1984) 13, PL 135B (1984) 243, PL 136B (1984) 130, PL 138B (1984) 219, PL 138B (1984) 317, PL 138B (1984) 441, PL 139B (1984) 126, ZPHY C22 (1984) 219, ZPHY C22 (1984) 307, PL 141B (1984) 264, PL 142B (1984) 135, PL 146B (1984) 443, PL 147B (1984) 487, ZPHY C26 (1984) 157, ZPHY C26 (1984) 181, ZPHY C26 (1984) 337, PL 149B (1984) 524, ZPHY C26 (1985) 521, ZPHY C27 (1985) 27, PL 154B (1985) 236, ZPHY C29 (1985) 29, ZPHY C29 (1985) 189, ZPHY C29 (1985) 347, ZPHY C30 (1986) 355, ZPHY C31 (1986) 527, ZPHY C31 (1986) 537, ZPHY C32 (1986) 11, ZPHY C32 (1986) 343, and ZPHY C33 (1986) 13.

**FNAL-053A** (Jun 1970, Jul 1971, Jun 1976, Jan 1978, Jun 1978) Approved Dec 1971, Jun 1976, Jun 1978; Completed Mar 1981.

### SEARCH FOR THE INTERMEDIATE BOSON, LEPTON PAIR PRODUCTION, AND A STUDY OF DEEPLY INELASTIC REACTIONS UTILIZING HIGH ENERGY NEUTRINO INTERACTIONS IN LIQUID NEON

COLUMBIA U - C Baltay (✓ Spokesperson), M Bregman, H French, M Hibbs, M Kalelkar, R D Schaffer, J Schmidt  
BROOKHAVEN - N Baker, S Kahn, M Murtagh, R B Palmer, N P Samios

Accelerator FNAL Detector HLBC-15FT

### Reactions

$\nu_\mu \text{ Ne} \rightarrow \text{Ne } \mu^- \mu^+ \nu_\mu$	0-200 GeV/c
$\nu_\mu \text{ Ne} \rightarrow \text{Ne } \mu^- e^+ \nu_e$	"
$\nu_\mu \text{ Ne} \rightarrow \mu^- \text{ hadrons}$	"

$\nu_\mu p \rightarrow \mu^- \Delta(1232 P_{33})^{++}$	"
$\nu_\mu p \rightarrow \mu^- \text{ hadrons}$	"
$\nu_\mu e^- \rightarrow \nu_\mu e^-$	"

Particles studied  $W^+, S^+, D^0, D^*(2010), \Lambda_c^+, \Sigma_c(2450)^{++}$

Comments Studies also include charmed particle production, neutral current interactions, and a search for neutrino oscillations. Took 440 KPX.

Papers PRL 39 (1977) 862, PRL 40 (1978) 144, PRL 41 (1978) 73, PRL 41 (1978) 213, PRL 41 (1978) 357, PRL 42 (1979) 1721, PRL 47 (1981) 1576, PRL 51 (1983) 735, PR D32 (1985) 531, PRL 55 (1985) 2543, PR D34 (1986) 1251, and PR D34 (1986) 2183.

**FNAL-180** (Jun 1972) Approved Jul 1972, Jun 1976; Started 1975.

### A STUDY OF $\bar{\nu}$ INTERACTIONS IN THE FERMI-LAB 15-FT BUBBLE CHAMBER, FILLED WITH HYDROGEN AND NEON

SERPUKHOV - V V Ammosov, A G Denisov, P F Ermolov (✓ Spokesperson), V A Gapienko, V I Klukhin, V I Koreshev, A I Mukhin, P V Pitukhin, V I Sirotenko, E A Slobodyuk

MOSCOW, ITEP - V I Efremenko, A V Fedotov, P A Goritchev, V S Kaftanov, G K Kliger, V Z Kolganov, S P Krutchinen, M A Kubantsev, V I Shekelyan, V G Shevenko

FERMILAB - F R Huson, F A Nezrick

MICHIGAN U - J W Chapman, C T Coffin, B P Roe, D Sinclair, J Vander Velde

Accelerator FNAL Detector HLBC-15FT

### Reactions

$\bar{\nu}_\mu p \rightarrow \mu^+ n$	0-200 GeV/c
$\bar{\nu}_\mu p \rightarrow \mu^+ X$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu X$	"
$\bar{\nu}_\mu \text{ nucleon} \rightarrow \mu^+ X$	"
$\bar{\nu}_\mu \text{ nucleon} \rightarrow \mu^+ \text{ vee } X$	"
$\bar{\nu}_\mu \text{ nucleon} \rightarrow \mu^+ \text{ hadron } X$	"
$\bar{\nu}_\mu \text{ nucleon} \rightarrow \mu^+ e^\pm X$	"
$\bar{\nu}_\mu \text{ nucleon} \rightarrow \bar{\nu}_\mu X$	"
$\bar{\nu}_\mu \text{ nucleon} \rightarrow \bar{\nu}_\mu \text{ vee } X$	"
$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$	"
$\bar{\nu}_\mu \rightarrow \bar{\nu}_\tau$	-

Comments Approved for 500 KPX, of which 273 were taken by July 77. No running since. Analysis combined with the  $\nu$  exposure of FNAL-053.

Papers NIM 129 (1975) 59, PRL 38 (1977) 266, PRL 39 (1977) 382, PR D18 (1978) 3905, PR D18 (1978) 1367, PL 81B (1979) 89, PL 84B (1979) 511, NC 51A (1979) 539, PL 84B (1979) 357, PL 88B (1979) 181, NP B162 (1980) 205, PL 91B (1980) 311, PR D22 (1980) 2581, PL 93B (1980) 210, NP B177 (1981) 365, NP B184 (1981) 13, PL 102B (1981) 213, PL 105B (1981) 301, PL 106B (1981) 151, PR D24 (1981) 1424, PS 25 (1982) 159, NP B199 (1982) 399, NP B203 (1982) 1, PL 132B (1983) 246, NP B203 (1983) 16, ZETFP 36 (1982) 300 = JETPL (1982) 367, ZETFP 38 (1983) 210 = JETPL 38 (1983) 248, YF 39 (1984) 619, YF 39 (1984) 626 = SJNP 39 (1984) 392, ZETFP 39 (1984) 99 = JETPL 39 (1984) 119, ZETFP 39 (1984) 176 = JETPL 39 (1984) 209, ZETFP 39 (1984) 327 = JETPL 39 (1984) 393, ZETFP 39 (1984) 443 = JETPL 39 (1984) 537, PL 137B (1984) 122, PL 140B (1984) 127, ZETFP 40 (1984) 262 = JETPL 40 (1984) 1041, PL 156B (1985) 441, YF 41 (1985) 1193 = SJNP 41 (1985) 763, YF 42 (1985) 374 = SJNP 42 (1985) 236, YF 42 (1985) 664 = SJNP 42 (1985) 421, YF 43 (1986) 598 = SJNP 43 (1986) 380, ZETFP 43 (1986) 502 = JETPL 43 (1986) 649, and ZETFP 43 (1986) 554 = JETPL 43 (1986) 716.

**FNAL-326** (May 1974, Jul 1975, Feb 1977) Approved Mar 1977; Completed Apr 1982.

### A PROPOSAL TO MEASURE MUON PAIRS PRODUCED AT HIGH INVARIANT MASS BY PIONS

## SUMMARIES OF EXPERIMENTS

CHICAGO U - H J Frisch, H B Greenlee, C Grosso-Pilcher, K F Johnson, M D Mestayer, L Schachinger, M J Shochet (✓ Spokesperson), M L Swartz

PRINCETON U - P A Piroué, B G Pope, D P Stickland, R L Sumner

Accelerator FNAL Detector Double-arm spectrometer

Reactions

$\pi^- \text{ Be} \rightarrow \mu^+ \mu^- \text{ X}$	225 GeV/c
$\pi^- \text{ Cu} \rightarrow \mu^+ \mu^- \text{ X}$	"
$\pi^- \text{ Sn} \rightarrow \mu^+ \mu^- \text{ X}$	"
$\pi^- \text{ Wt} \rightarrow \mu^+ \mu^- \text{ X}$	"

Comments Ran for 2000 hours.

Papers PR D25 (1982) 2000, PRL 53 (1984) 32, and PRL 55 (1985) 1555.

**FNAL-400** (May 1975) Approved Jul 1975, Jul 1976, Mar 1977, Apr 1978, Jul 1980; Completed Jul 1984.

**CHARMED PARTICLE PRODUCTION BY NEUTRONS**

FERMILAB - M Binkley, J Butler, I Gaines, P Garbincius,

M Gormley, J Haggerty, D Harding, P Lebrun, J Peoples

ILLINOIS U, URBANA - M Diesburg, J Filaseta, T Kroc,

T O'Halloran, C Shipbough, J Wiss (Spokesperson)

COLORADO U - P Coteus, J Cumalat, J Enagonio,

R Ladbury

INFN, MILAN - A Grabar, S Sala

BOLOGNA U - F Frabetti

MILAN U - M Dicorato

PAVIA U - F Bossi, P Manfredi

Accelerator FNAL Detector Spectrometer

Reactions

$n \text{ Si} \rightarrow \text{charm X}$	280, 560 GeV/c
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Particles studied charm

Comments A charm search using incident neutrons, an active target, and a PWC decay vertex detector. Ran for 2000 hours.

Papers NIM 222 (1984) 474.

**FNAL-458** (Oct 1975, May 1976) Approved Jul 1976, Mar 1977, Apr 1978.

**PHOTOPRODUCTION EXPERIMENT AT FERMI-LAB**

COLUMBIA U - B Knapp, W Lee (Spokesperson), P Leung,

S D Smith, A Wijangco

ILLINOIS U, URBANA - J Bronstein, R Coleman,

G Gladding, M Goodman, R Messner, T O'Halloran,

J Sorracino, A Wattenberg

FERMILAB - M Binkley, I Gaines, J Peoples

HAWAII U - J Knauer

Accelerator FNAL Detector Combination

Reactions

$\gamma \text{ nucleus} \rightarrow \mu^+ \mu^- \text{ X}$	0-300 GeV/c
$\gamma \text{ nucleus} \rightarrow \mu^+ e^- \text{ X}$	"
$\gamma \text{ nucleus} \rightarrow \mu^- e^+ \text{ X}$	"
$\gamma \text{ nucleus} \rightarrow e^+ e^- \text{ X}$	"
$\gamma \text{ nucleus} \rightarrow \mu^+ \text{ charged(s) X}$	"
$\gamma \text{ nucleus} \rightarrow \mu^- \text{ charged(s) X}$	"
$\gamma \text{ nucleus} \rightarrow e^+ \text{ charged(s) X}$	"
$\gamma \text{ nucleus} \rightarrow e^- \text{ charged(s) X}$	"
$\gamma \text{ nucleus} \rightarrow > 3 \text{ charged}$	"
$\gamma \text{ nucleus} \rightarrow 2\pi^+ 2\pi^-$	"
$\gamma \text{ nucleus} \rightarrow 2\pi^+ 2\pi^- \pi^0$	"
$\gamma \text{ nucleus} \rightarrow K^+ K^- \pi^+ \pi^-$	"
$\gamma \text{ nucleus} \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$	"
$\gamma \text{ nucleus} \rightarrow \bar{p} p \pi^+ \pi^-$	"
$\gamma \text{ nucleus} \rightarrow \bar{p} p \pi^+ \pi^- \pi^0$	"

Particles studied  $J/\psi$ ,  $\psi(3685)$ ,  $\eta_c(2980)$ , charm, meson, hvy-lepton

Comments Continues work of FNAL-087A and 401. Previously was approved for 1000 hours, with a total of 2000 hours for FNAL experiments 400, 401 and 458. This time has now, however, been used by experiment 87A. Inactive as of October 81.

Papers This includes papers from FNAL-087A + FNAL-401. PRL 34 (1975) 1040, PRL 34 (1975) 1044, PRL 37 (1976) 571, PRL 37 (1976) 574, PRL 37 (1976) 578, PRL 37 (1976) 882, PRL 43 (1979) 414, PRL 43 (1979) 1691, PRL 44 (1980) 1309, PR D22 (1980) 537, PRL 46 (1981) 799, PRL 48 (1982) 73, PRL 50 (1983) 302, and PRL 54 (1985) 628.

**FNAL-466** (Dec 1975) Approved Mar 1976.

**STUDY OF HIGH-ENERGY REACTION MECHANISMS BY THE MEASUREMENT OF THE ANGULAR AND ENERGY DISTRIBUTIONS OF NUCLEI RECOILING FROM TARGETS BOMBARDED WITH 200-300 GeV PROTONS**

ARGONNE - D Henderson, S B Kaufman, E P Steinberg,

B D Wilkins

PURDUE U - D Fortney, D Klingensmith, N T Porile

(✓ Spokesperson), C F Wang

CHICAGO U - S K Chang, R A Johns, J LaRosa, N Sugar-

man, A Turkevich

Accelerator FNAL Detector Counter

Reactions

$p \text{ nucleus} \rightarrow \text{nucleus X}$	200-400 GeV/c
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Comments An ongoing study, with 102 targets exposed as of September 85.

Papers PRL 43 (1979) 918, PR C21 (1980) 664, PR D21 (1980) 2511, PR C22 (1980) 670, PR C25 (1982) 244, PR C25 (1982) 478, PR C29 (1984) 569, and PR C33 (1986) 2183.

**FNAL-490** (May 1976) Approved Jun 1976; Completed Jun 1980.

**A SEARCH FOR SHORT-LIVED PARTICLES USING A HIGH-RESOLUTION STREAMER CHAMBER**

YALE U - T Cardello, M Dine, D Ljung, T Ludlam, R Majka,

P Nemethy, J Sandweiss (✓ Spokesperson), A Schiz,

J Slaughter, H Taft, L Tzeng

FERMILAB - M Atac, S Ecklund

LBL - et al.

Accelerator FNAL Detector Streamer chamber

Reactions

$\pi^- \text{ nucleus} \rightarrow \text{muon X}$	200 GeV/c
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Particles studied charm

Comments A search for particles with lifetimes as short as  $2.5 \times 10^{-14}$  s in muon-triggered events. Ran for 850 hours.

Papers PRL 44 (1980) 1104.

**FNAL-497** (May 1976) Approved Jun 1976; Completed Mar 1981.

**HYPERON FLUXES AND POLARIZATIONS**

FERMILAB - J Lach (Spokesperson)

FERMILAB & IOWA U & IOWA STATE U & YALE U -

E W Anderson, C Ankenbrandt, J P Berge, A Break-

stone, A E Brenner, J Butler, T R Cardello, P S Cooper,

K Doroba, J Elias, P Lauriakainen, J MacLachlan, J P Mar-

riner, E McCliment, E I Rosenberg, L J Teig, J L Thron,

Y W Wah

Accelerator FNAL Detector Wire chamber

Reactions

$p \text{ nucleus} \rightarrow \Sigma^+ \text{ X}$	400 GeV/c
$p \text{ nucleus} \rightarrow \Sigma^- \text{ X}$	"
$p \text{ nucleus} \rightarrow \Xi^- \text{ X}$	"
$p \text{ nucleus} \rightarrow \Omega^- \text{ X}$	"

## SUMMARIES OF EXPERIMENTS

Particles studied  $\Sigma^+$ ,  $\Sigma^-$

Comments Replaces FNAL-097. Surveys hyperon fluxes and polarizations as functions of  $x$  and  $p_t$ . Also searches for particles with lifetimes around  $10^{-11}$  s. Ran for 2500 hours. See also FNAL-697.

Papers PRL 51 (1983) 863, PR D31 (1985) 451, PR D32 (1985) 1, and PRL 55 (1985) 2551.

**FNAL-502** (Jul 1976) Approved Sep 1976; Completed Jun 1980.

**SEARCH FOR MONOPOLES ABOVE THE 15-FOOT BUBBLE CHAMBER**

COLORADO U - D F Bartlett (✓ Spokesperson), D Soo  
GENERAL ELECTRIC, SCHENECTADY - R L Fleischer,  
H R Hart, Jr, A Mogro-Campero

Accelerator COSM Detector Plastic

Particles studied monopole

Comments Uses the fringe field of the 15-ft bubble chamber as a collector, and lexan as detector.

Papers PR D24 (1981) 612. No other papers expected.

**FNAL-508** (Sep 1976) Approved Sep 1976; Completed Apr 1985.

**STUDY OF MECHANISM FOR MULTIPLE PRODUCTION OF PARTICLES AT HIGH ENERGIES: EMULSION EXPOSURE TO ABOUT 750 GeV PROTONS**

CRACOW - W Wolter (✓ Spokesperson), et al.

Accelerator FNAL Detector Emulsion

Reactions

$p$  nucleus 800 GeV/c

Comments Follows on work of FNAL-90, -249, and -339. Exposed 7 emulsion stacks.

Papers APP B (accepted).

**FNAL-515** (Oct 1976) Approved Mar 1977; Completed Mar 1982.

**STUDY OF CHARM PARTICLES PRODUCED IN HADRONIC INTERACTIONS**

NORTHWESTERN U - D Buchholz, L M Cremaldi,  
S Delchamps, H S Mao, J Rosen (Spokesperson),  
W K Sakumoto, R Schluter, S B Sontz, C Winter  
FERMILAB - D Johnson  
CARNEGIE MELLON U - R Edelstein, G Ginther, R Lipton,  
J M McQuade, J Russ, L Spiegel  
NOTRE DAME U - J Bishop, N Biswas, N Cason, L Dauwe,  
V Kenney, A Kreymer, P Mooney, R Pemper, R Ruchti,  
W Shephard

Accelerator FNAL Detector Spectrometer

Reactions

$\pi^-$  nucleus  $\rightarrow \mu^+$  charged X 200 GeV/c  
 $\pi^-$  nucleus  $\rightarrow \mu^-$  charged X "  
 $\pi^-$  nucleus  $\rightarrow \mu^+$  charm X "  
 $\pi^-$  nucleus  $\rightarrow \mu^-$  charm X "

Particles studied charm

Comments Triggers on prompt muons. An outgrowth of FNAL-397. Ran for 2650 hours.

Papers PRL 53 (1984) 1411.

**FNAL-516** (Oct 1976, Oct 1977) Approved Nov 1977; Completed Jun 1981.

**PHOTOPRODUCTION OF FINAL STATES OF MASS ABOVE 2.5 GeV WITH A MAGNETIC SPECTROMETER IN THE TAGGED PHOTON LAB THE FERMILAB TAGGED PHOTON SPECTROMETER COLLABORATION**

UC, SANTA BARBARA - V Bharadwaj, B Denby, A Eisner,  
R Kennett, A Lu, R Morrison, D Summers, M Witherell  
COLORADO U - D Bartlett, S Bhadra, A Duncan, J Elliott,  
U Nauenberg

CARLETON U & NATIONAL RESEARCH COUNCIL,  
OTTAWA - P Estabrooks, M Losty, J Pinfold  
FERMILAB - J Appel, J Biel, D Bintinger, J Bronstein,  
P Mantsch, T Nash (✓ Spokesperson), W Schmidke, C Sliwa,  
M Sokoloff, K Stanfield, M Streetman, S Willis  
OKLAHOMA U - G Kalbfleisch, M Robertson  
TORONTO U - D Blodgett, S Bracker, G Hartner, R Kumar,  
G Luste, J Martin, K Shahbazian, W J Spalding, C Zorn

Accelerator FNAL Detector TPS

Reactions

$\gamma p \rightarrow \omega p$  70-140 GeV/c  
 $\gamma p \rightarrow J/\psi p$  "  
 $\gamma p \rightarrow \psi(3685) p$  "  
 $\gamma p \rightarrow \text{charm X}$  "

Particles studied charm

Comments Recoils as well as forward-going particles are detected. See also FNAL-691, which is essentially a second run of this. For a description of the apparatus, see the LBL-91 supplement on detectors. Ran for 4500 hours.

Papers IEEE TNS 26 (1979) 686, NIM 216 (1983) 113, PRL 52 (1984) 410, PRL 52 (1984) 795, PRL 55 (1985) 2749, NIM 228 (1985) 283, and PR D32 (1985) 1053.

**FNAL-524** (Jan 1977) Approved Mar 1977; Completed Apr 1985.

**PROTON-NUCLEUS INTERACTIONS IN EMULSION PLATES WITH EMBEDDED METAL POWDER GRANULES AT HIGHEST AVAILABLE ENERGY (> 400 GeV)**

WASHINGTON U, SEATTLE - J R Florian, J J Lord,  
R J Wilkes (✓ Spokesperson)

Accelerator FNAL Detector Emulsion

Reactions

$p$  Cr 500 GeV/c  
 $p$  Ag "  
 $p$  Wt "

Particles studied charm, hvy-lepton

Comments Exposed 6 emulsion stacks. Analysis is in progress.

**FNAL-531** (Jan 1977) Approved Mar 1977, Jul 1979; Completed Jun 1981.

**WEAK DECAY LIFETIMES OF  $\nu$ -PRODUCED PARTICLES IN A TAGGED EMULSION SPECTROMETER**

OHIO STATE U - S M Errede, N W Reay (Spokesperson),

K Reibel, T A Romanowski, N R Stanton  
OTTAWA U - V Areti, G Fortier, J Hebert, J D Hebert  
TORONTO U - P J Davis, M Donnelly, J F Martin,  
J D Prentice, T S Yoon

NAGOYA U - H Fuchi, K Hoshino, S Kuramata, K Niu,  
K Niwa, S Tasaka, Y Yanagisawa  
YOKOHAMA NATIONAL U - H Kimura, Y Maeda  
AICHI U - N Ushida

OSAKA CITY U - T Hara, O Kusumoto, M Teranaka  
OSAKA PREFECTURE U, SCI EDUC INST - H Okabe,  
J Yokota

KOBE U - G Fujioka, H Fukushima, T Hayashino, Y Homma,  
M Igarashi, Y Tsuzuki, H Yamazaki  
FERMILAB & SEOUL NATIONAL U & MCGILL U &  
OKAYAMA U & TOKYO U & VIRGINIA TECH - et al.

Accelerator FNAL Detector Combination

Reactions

$\nu_\mu$  nucleus  $\rightarrow$  charm charged X 10-100 GeV/c  
 $\bar{\nu}_\mu$  nucleus  $\rightarrow$  charm charged X "

Particles studied charm, unspec

## SUMMARIES OF EXPERIMENTS

Comments Search for particles with lifetimes in the range  $2 \times 10^{-15}$  to  $3 \times 10^{-12}$  s. Ran for 3800 hours.

Papers PRL 45 (1980) 1053, JPSJ 47 (1979) 687, PRL 47 (1981) 1694, PRPL 83 (1982) 85, PRL 48 (1982) 844, PL 121B (1983) 287, PL 121B (1983) 292, PRL 51 (1983) 2362, PRL 56 (1986) 1767, PRL 56 (1986) 1771, and PRL 57 (1986) 2897.

**FNAL-537** (Feb 1977, Oct 1977) Approved Mar 1978; Completed Feb 1982.

### STUDY OF $\bar{p}N$ INTERACTIONS IN THE P-WEST HIGH INTENSITY LABORATORY

FERMILAB - M Binkley, B Cox (✓ Spokesperson), J Enagonio, C Hojvat, D Judd, R D Kephart, P K Malhotra, P O Mazur, C T Murphy, F Turkot, R L Wagner, D Wagoner, W Yang

ATHENS U, NUCL PHYS LAB - E Anassontzis, S Katsanevas, P Kostarakis, C Kourkoumelis, A Markou, L K Resvanis, G Voulgaris

MCGILL U - H Areti, S Conetti, P Lebrun, D Ryan, T Ryan, W Schappert, D Stairs

MICHIGAN U - C Akerlof, D Kraushaar, D Nitz, R Thun

SHANDONG U - He Mao, Z Nai-jian

Accelerator FNAL Detector Spectrometer

#### Reactions

$\bar{p}$  nucleus  $\rightarrow \mu^+ \mu^- X$  125 GeV/c  
 $\pi^-$  nucleus  $\rightarrow \mu^+ \mu^- X$  "

Particles studied  $J/\psi$

Comments Studies  $J/\psi$  and high-mass muon pair production. The main result so far is the agreement, except for absolute normalization, of the  $x_F$ ,  $\tau$ , and  $p_t$  spectra with the simple Drell-Yan formalism. Ran for 2700 hours.

Papers NIM 212 (1983) 135, PR D29 (1984) 63, and PRL 54 (1985) 2572.

**FNAL-549** (Apr 1977) Approved May 1977.

### A SEARCH FOR FRACTIONAL CHARGES USING ACCELERATOR AND LOW TEMPERATURE TECHNIQUES

STANFORD U - W M Fairbank, G S LaRue  
 MICHIGAN U - M J Longo (✓ Spokesperson)

Accelerator FNAL Detector Other

#### Reactions

$p$  nucleus  $\rightarrow$  quark X 400 GeV/c

Particles studied quark

Comments Attempts to collect fractional charges on niobium spheres. Approved for parasitic running. Inactive, and very unlikely to be revived.

**FNAL-555** (May 1977) Approved Nov 1978; Completed Feb 1982.

### STUDY OF CROSS SECTIONS AND POLARIZATION IN NEUTRAL STRANGE PARTICLE PRODUCTION AT HIGH TRANSVERSE MOMENTUM

RUTGERS U - A Beretvas, L Deck, T Devlin (✓ Spokesperson), K B Luk, P C Petersen, G B Thomson, R Whitman

WISCONSIN U - R Handler, B Lundberg, L Pondrom, M Sheaff, C Wilkinson

MICHIGAN U - P Border, J Dworkin, O E Overseth, R Rameika, G Valenti

MINNESOTA U - K Heller, C James

Accelerator FNAL Detector Spectrometer

#### Reactions

$p$  Be  $\rightarrow \Lambda X$  400 GeV/c  
 $p$  Be  $\rightarrow \bar{\Lambda} X$  "  
 $p$  Be  $\rightarrow K_S X$  "

Comments Extends measurements and uses apparatus of FNAL-8. Ran for 650 hours. Analysis is in progress. See also FNAL-619.

Papers PRL 46 (1981) 877, PR D25 (1982) 639, PRL 51 (1983) 2025, and PR D34 (1986) 53.

**FNAL-557** (May 1977) Approved Jun 1977; Completed Jul 1984.

### STUDY OF HADRON JETS WITH THE CALORIMETER TRIGGERED MULTIPARTICLE SPECTROMETER

CAL TECH - R Gomez

FERMILAB - B Brown, L Dauwe, P Devensky, H Haggerty, E Malamud (✓ Spokesperson), M Nikolic

ILLINOIS U, CHICAGO - R Abrams, J Ares, H Goldberg, C Halliwell, F Lopez, S Margulies, D McLeod, A Salminen, J Solomon, Gwan Wu

INDIANA U - S Blessing, R Crittenden, P Draper, A Dzierba, J Florian, R Heinz, J Krider, T Marshall, J Martin,

D Petersen, A Sambamurti, P Smith, A Snyder, C Stewart, T Sulanke, S Teige, A Zieminski

MARYLAND U - R G Glasser, J Goodman, S Gupta,

R Holmes, L Myriantopoulos, P Rapp, H Strobele, G Yodh

RUTGERS U - S Ahn, T Watts

GEORGE MASON U - R Ellsworth

FLORIDA STATE U - S Hagopian, J E Lannutti, A Pfffer

SERPUKHOV - A Abramov, Yu Antipov, B Baldin, S Denisov, V Glebov, Y Gorin, V Kryshkin, S Petrukhin, S Polovnikov, V Sulyaev

Accelerator FNAL Detector FMPS

#### Reactions

$p p \rightarrow$  jet(s) X 400, 800 GeV/c  
 $p p \rightarrow \mu^+ \mu^- X$  "  
 $p$  nucleus  $\rightarrow$  jet(s) X "  
 $p$  nucleus  $\rightarrow \mu^+ \mu^- X$  "

Comments An extension and improvement of FNAL-260.

Triggers on jets with high  $p_t$ . Ran 600 hours at 400 GeV/c ending in June 81. Then ran 350 hours at 800 GeV/c on H, Al, Be, Cu, and Pb targets ending in July 84. This run was combined with the start of FNAL-672. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers IEEE TNS 28 (1981) 666, NIM 188 (1981) 285, PRL 49 (1982) 711, PRL 50 (1983) 11, PR D29 (1984) 1895, PR D29 (1984) 2469, NP B232 (1984) 189, PL 177B (1986) 233, PL 183B (1987) 115, and PR D (submitted).

**FNAL-564** (May 1977) Approved Jun 1977, Jul 1979; Completed Mar 1981.

### DIRECT DETECTION OF SHORT-LIVED PARTICLES FROM NEUTRINO INTERACTIONS IN NEUTRAL EMULSIONS INSIDE THE 15-FOOT BUBBLE CHAMBER

FERMILAB - W M Smart, S Velen, L Voyvodic (Spokesperson)

SERPUKHOV - V V Ammosov, V I Baranov, P F Ermolov, V I Sirotenko, E A Slobodyuk, V A Yarba

MOSCOW, ITEP - V I Efremento, P A Gorichev,

V S Kaftanov, G K Kliger, V Z Kolganov, N Kolganova, S P Krutchinin, M A Kubantsev, E Poszarova,

V G Schevchenko, V A Smirnitskiy, A Weissenberg

CRACOW - J Babecki, B Furmanska, R Holyński,

S Kryzwdzinski, W Wolter, B Wosiek

DUBNA - S A Bunyatov, V M Sidorov

KANSAS U - R Ammar, R Davis, C Eklund, N Kwak,

R Stump, D Zacrep

WASHINGTON U, SEATTLE - T H Burnett, J R Florian,

J J Lord, R J Wilkes

ILLINOIS TECH & SYDNEY U & SOFIYA, INST PHYS - et al.

Accelerator FNAL Detector DBC-15FT-HYB

#### Reactions

$\nu_\mu$  nucleus  $\rightarrow$  charm charged(s) 10-100 GeV/c

## SUMMARIES OF EXPERIMENTS

$\bar{\nu}_\mu$  nucleus  $\rightarrow$  charm charged(s) "

Particles studied charm, unspc

Comments Search for particles with lifetimes in the range  $10^{-15}$  to  $10^{-11}$  s. Took 277 KPX.

Papers PL 94B (1980) 118, and PR D29 (1984) 1300.

**FNAL-565** (Jun 1977) Approved Mar 1978; Completed Jun 1982.

**A STUDY OF THE DETAILED CHARACTERISTICS OF HADRON-NUCLEUS COLLISIONS USING THE FERMILAB HYBRID SPECTROMETER**

BROWN U - D Brick, M Heller, A M Shapiro, M Widgoff  
 ILLINOIS TECH - R Burnstein, C Fu, M Nazaretz, H Rubin  
 INDIANA U - E D Alyea, Jr  
 JOHNS HOPKINS U - B Barnett, C-Y Chien, P Lucas, A Pevsner, R Zdanis  
 MIT - F Barreiro, O Benary, G W Brandenburg, J Brau, W Busza, E S Hafen, R I Hulsizer, V Kistiakowsky, I A Pless (Spokesperson), R K Yamamoto  
 OAK RIDGE - H O Cohn  
 RUTGERS U - B Denby, P Jacques, T C Ou, R J Plano, T L Watts  
 STEVENS TECH - E B Brucker, E Koller, P Stamer, S Taylor  
 TENNESSEE U - W M Bugg, G Condo, T Handler, E Hart  
 YALE U - H Kraybill, D Ljung, T Ludlam, H D Taft  
 CERN & TECHNION & NIJMEGEN U & PADUA U & PAVIA U & ROME U & TEL AVIV U & TOHOKU U & TRIESTE U & MONS U & WEIZMANN INST - et al.

Accelerator FNAL Detector HBC-30IN-HYB

Reactions

$p$ nucleus	200, 400 GeV/c
$\pi^+$ nucleus	200 GeV/c
$\pi^-$ nucleus	"
$K^+$ nucleus	"
$K^-$ nucleus	"
$p$ nucleus	"

Comments The targets are magnesium, silver, and gold thin foils in the chamber. Downstream detectors for the hybrid spectrometer include ISIS and a segmented Cerenkov counter. This and FNAL-570 took a total of 1068 KPX.

Papers NP B201 (1982) 189, and RSI 53 (1982) 303. See also FNAL-570.

**FNAL-570** (Sep 1977) Approved Mar 1978; Completed Jun 1982.

**A STUDY OF PARTICLE PRODUCTION AND DYNAMICS FROM  $x = 0$  TO  $x = 1$  AND THE DEPENDENCE ON INCIDENT QUANTUM NUMBERS**

BROWN U - D Brick, A M Shapiro, M Widgoff  
 CERN - F Bruyant, L Montanet  
 ILLINOIS TECH - R A Burnstein, H A Rubin  
 INDIANA U - E D Alyea, Jr  
 JOHNS HOPKINS U - L Bachman, A Pevsner  
 MIT - F Barreiro, O Benary, E S Hafen, R I Hulsizer, V Kistiakowsky, I A Pless (Spokesperson), P Trepagnier, R K Yamamoto  
 MONS U - P Gillis, F Grard, V Henri, P Herquet, J Skura, R Windmolders  
 NIJMEGEN U - F Crijns, W Kittel, W Metzger, C Pols, J Schotanus, R Van de Walle  
 OAK RIDGE - H O Cohn, R D McCulloch  
 PADUA U - A Bettini, M Cresti, M Mazzucato, L Peruzzo, P Rossi, G Sartori, S Sartori, L Ventura, A Zudori, G Zumerle  
 PAVIA U - S Alborghetti, R Attendoli, E Calligarich, G Cecchet, R Dolfini, L Mapelli, S Ratti  
 ROME U - L Barone, R Bizzarri, G Bressi, G Ciapetti, D Dionisi, P F Loverre, D Zanello, L Zanello  
 RUTGERS U - P F Jacques, R J Plano, T L Watts  
 STEVENS TECH - E B Brucker, E L Koller, P E Stamer, S Taylor  
 TECHNION - S Dado, J Goldberg, S Toaff

TEL AVIV U - G Alexander, S Dagan, J Grunhaus, A Levy, D Lissauer, Y Oren  
 TENNESSEE U - W M Bugg, G T Condo, T Handler, E L Hart  
 TRIESTE U - E Castelli, C Omero, P Poropat, M Sessa  
 WEIZMANN INST - Y Eisenberg, B Haber, D Hochman, U Karshon, E E Ronat, A Shapira, R Yaari, G Yekutieli  
 YALE U - H Kraybill, D Ljung, T Ludlam, H D Taft  
 TOHOKU GAKUIN U & TOHOKU U - et al.

Accelerator FNAL Detector HBC-30IN-HYB

Reactions

$p p$	147 GeV/c
$\pi^+ p$	"
$K^+ p$	"
$\bar{p} p$	"
$\pi^- p$	"

Comments Downstream detectors for the hybrid spectrometer system include ISIS and a forward  $\gamma$  detector. The system is to identify and measure  $\gamma$ 's, pions, kaons, protons, antiprotons, and  $\Lambda$ 's, and 4-constraint fits will be possible with perhaps as many as three  $\pi^0$ 's. Physics topics emphasize multiparticle production in the central region. This experiment and FNAL-565 took a total of 1068 KPX.

Papers ZPHY C15 (1982) 1. See also FNAL-565.

**FNAL-576** (Dec 1977) Approved Feb 1978; Completed Jul 1985.

**500 GeV PROTON INTERACTIONS IN NUCLEAR EMULSION**

OTTAWA U - H Areti, C J B Hebert, J Hebert (Spokesperson)  
 LUND U - B Andersson, I Otterlund (Spokesperson)  
 NANCY U - G Baumann, R Devienne  
 PARIS, CURIE UNIV VI - Tsai-Chu  
 STRASBOURG - C J Jacquot  
 LYON, IPN - R Schmitt  
 FERMILAB - A van Ginneken  
 BELGRADE U - O Adamovic, M Juric  
 VALENCIA U - J M Bolta, E Higon  
 SANTANDER U - A Amoroz, E de Felipe, R Niembro, A Ruiz, E Villar

Accelerator FNAL Detector Emulsion

Reactions

$p$ nucleus	500 GeV/c
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Comments Exposed 1 emulsion stack.

**FNAL-577** (Jan 1978) Approved Jun 1978; Completed Mar 1981.

**$\pi p$  ELASTIC SCATTERING AT LARGE ANGLES**

ARIZONA U - R M Kalbach, K W Krueger, A E Pifer  
 CORNELL U - D H Kaplan, P Karchin, J Orear  
 FERMILAB - W F Baker, D P Eartly, J S Klinger, A J Lennox, R Rubinstein ( $\checkmark$  Spokesperson)  
 UC, SAN DIEGO - H G E Kobrak, S F McHugh

Accelerator FNAL Detector Double-arm spectrometer

Reactions

$\pi^+ p \rightarrow \pi^+ p$	100, 200 GeV/c
$\pi^- p \rightarrow \pi^- p$	"
$K^+ p \rightarrow K^+ p$	"
$K^- p \rightarrow K^- p$	"
$\bar{p} p \rightarrow \bar{p} p$	"
$p p \rightarrow p p$	"

Comments Ran for 1550 hours.

Papers PRL 47 (1981) 1683, PR D26 (1982) 723, PR D27 (1983) 2752, and PR D30 (1984) 1413. No other papers expected.



## SUMMARIES OF EXPERIMENTS

**FNAL-580** (Jan 1978) Approved Jun 1978; Completed Jun 1981.

**A SEARCH FOR NARROW AND BROAD RESONANCES DECAYING INTO  $\Lambda\bar{\Lambda}$ ,  $\Lambda\bar{\Lambda}\pi$ ,  $K_S K_S$  AND  $K_S K_S \pi$  FROM  $\pi^- p$  INTERACTIONS AT 200 GeV/c USING THE FERMILAB MPS**

ARIZONA U - E Jenkins, K J Johnson, K W Lai, J LeBritton, Y C Lin, A Pifer

FERMILAB - D Green (✓ Spokesperson)

FLORIDA STATE U - J Albright, R N Diamond, H Fenker, H Goldman, S Hagopian, J Lannutti, J E Piper

NOTRE DAME U - T Davis, J Poirier

TUFTS U - A Napier, J Schneps

VANDERBILT U - J Marraffino, C Roos, J Waters, M S Webster, E Williams

VIRGINIA TECH - G Collins, J Ficenec, P Trower

Accelerator FNAL Detector FMPS

Reactions

$\pi^- p \rightarrow \Lambda \bar{\Lambda} X$	200 GeV/c
$\pi^- p \rightarrow \Lambda \bar{\Lambda} \pi^+ X$	"
$\pi^- p \rightarrow \Lambda \bar{\Lambda} \pi^- X$	"
$\pi^- p \rightarrow K_S K_S X$	"
$\pi^- p \rightarrow K_S K_S \pi^+ X$	"
$\pi^- p \rightarrow K_S K_S \pi^- X$	"

Particles studied meson

Comments For a description of the apparatus, see the LBL-91 supplement on detectors. Ran for 800 hours.

Papers PR D28 (1983) 2304, PR D29 (1984) 1888, PR D30 (1984) 872, PR D30 (1984) 877, PL 149B (1985) 514, PR D34 (1986) 42, and PR D34 (1986) 707.

**FNAL-581-704** (Sep 1981) Approved Dec 1981, Dec 1983, Jul 1984.

**EXPERIMENTS WITH THE POLARIZED BEAM FACILITY**

ARGONNE - D Grosnick, D Hill, D Lopiano, Y Ohashi, T Shima, H Spinka, R Stanek, D Underwood, A Yokosawa (✓ Spokesperson)

FERMILAB - D Carey, D Cossairt, A L Read

KYOTO U - K Imai, R Kikuchi, A Masaike, K Miyake,

T Nagamine, T Nakamura, N Sasao, N Tamura

KYOTO SANGYO U - F Takeuchi

KYOTO U OF EDUCATION - A Okihana, R Takashima

LOS ALAMOS - N Tanaka

ANNECY - K Kuroda, A Michalowicz

NORTHWESTERN U - F Luehring, D H Miller

RICE U - B Bonner, M Corcoran, B Mayes, H E Miettinen,

G S Mutchler, M Nessi, G C Phillips, J B Roberts,

F Tedaldi-Nessi

SACLAY - J Bystricky, J P Debrion, F Lehar, A De Lesquen,

J Movchet, L Van Rossum

SERPUKHOV - V Apokin, A Dereveschikov, Y Matulenko,

A Meschanin, S Nurushev, V Solovyanov, L Solovyev,

A Vasilyev

INFN, TRIESTE - R Birsá, F Bradamante, M Giorgi,

L Lanceri, A Martin, A Penzo, P Schiavon, S Dalla Torre-

Colautti, A Villari, A Zanetti

KEK - S Ishimoto, A Masahito

TEXAS U - Y Onel, G Pauletta

Accelerator FNAL-TEV Detector Spectrometer, Counter

Reactions Polarized beam and target

$p p \rightarrow X$	200 GeV/c
$p p \rightarrow \pi^0 X$	"
$p p \rightarrow \pi^+ X$	"
$p p \rightarrow \pi^- X$	"
$p p \rightarrow \Lambda X$	"
$p p \rightarrow \Sigma^0 X$	"
$\bar{p} p \rightarrow X$	"

Comments The experiments measure (1) the helicity asymmetry in total  $pp$  and  $\bar{p}p$  cross sections, (2) the spin dependence of inclusive  $\pi^0$  production, (3) the production of charged mesons at high  $x$ , and (4) the production of  $\Lambda$ 's and

$\Sigma^0$ 's at large  $x$ . FNAL-581 is approved for 400 hours, and FNAL-704 is approved for 1200 hours. Scheduled for April 87.

**FNAL-584** (Jan 1978) Approved Jun 1978; Completed Jan 1980.

**A SEARCH FOR THE DECAY OF NEW LONG-LIVED NEUTRAL PARTICLES WITH A MASS AND LIFETIME EXCEEDING THAT OF THE  $K_L$**

CHICAGO U - R Bernstein, B Winstein

STANFORD U - R Cousins, J F Greenhalgh, M Schwartz

WISCONSIN U - G Bock, D Hedin, G Thomson (Spokesperson)

Accelerator FNAL Detector Spectrometer

Reactions

neutral —

Particles studied longlived

Comments Uses the spectrometer of FNAL-533. A search for high transverse momentum particles coming from along a neutral beam line. Ran for 400 hours.

**FNAL-585** (Jan 1978) Approved Mar 1978, Dec 1978; Completed Mar 1981.

**EXCLUSIVE  $KN$  CHARGE EXCHANGE**

CARLETON U - K W Edwards

UC, DAVIS - P Yager

UC, SAN DIEGO - H Kobrak, R Pitt, R Swanson

MICHIGAN STATE U - M Abolins, W Francis (Spokesperson), D Owen

Accelerator FNAL Detector Spectrometer

Reactions

$K^- p \rightarrow \bar{K}^0 n$	75, 100, 150 GeV/c
$K^+ n \rightarrow K^0 p$	"

Comments Uses equipment of FNAL-383. Ran for 3150 hours.

**FNAL-591** (Jan 1978) Approved Apr 1978; Completed Feb 1981.

**BROAD SEARCH FOR NEW HADRONIC STATES VIA HIGH RESOLUTION CHARGE AND MASS DETERMINATION OF NUCLEAR FRAGMENTS FROM  $p$ -NUCLEUS COLLISIONS**

FERMILAB - F Turkot

PURDUE U - A Bujak, L J Gutay (Spokesperson), A Hirsch,

N T Porile, R P Scharenberg, B C Stringfellow

Accelerator FNAL Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow$  frag X 20-400 GeV/c

Particles studied longlived

Comments Found evidence for a liquid-gas phase transition and searches for abnormal  $Z/M$  ratios in nuclear fragments as evidence for abnormal nuclear matter, new longlived hadrons bound to fragments, or new neutron-rich isotopes. The fragments studied have  $Z$  from 2 through 13. Uses the gas jet target. Ran for 1950 hours.

Papers PRL 49 (1982) 1321, PL 118B (1982) 458, PR C29 (1984) 508, and PL 156B (1985) 177.

**FNAL-594** (Feb 1978) Approved Mar 1978; Completed Jun 1982.

**A NEW NEUTRINO DETECTOR AT FERMILAB**

FERMILAB - F E Taylor, J K Walker (Spokesperson)

FERMILAB & MIT & MICHIGAN STATE U & NORTHERN ILLINOIS U - et al

Accelerator FNAL Detector Calorimeter

## SUMMARIES OF EXPERIMENTS

### Reactions

$\nu_\mu$ nucleus $\rightarrow \nu_\mu$ hadrons	0-230 GeV/c
$\nu_\mu$ nucleus $\rightarrow \mu^- X$	"
$\nu_\mu$ nucleus $\rightarrow$ muons X	"
$\nu_\mu$ nucleus $\rightarrow$ muons $e^- X$	"
$\nu_\mu$ nucleus $\rightarrow$ muons $e^+ e^- X$	"
$\nu_\mu n \rightarrow \mu^- p$	"
$\nu_\mu e^- \rightarrow \nu_\mu e^-$	"
$\nu_\mu e^- \rightarrow \mu^- \nu_e$	"
$\bar{\nu}_\mu p \rightarrow \mu^+ n$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \bar{\nu}_\mu$ hadrons	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+ X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow$ muons X	"
$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$	"
$\bar{\nu}_\mu e^- \rightarrow \mu^- \bar{\nu}_e$	"
$\bar{\nu}_e e^- \rightarrow \mu^- \bar{\nu}_\mu$	"

**Comments** Exposed to the 400-GeV wide- and narrow-band neutrino beams for about 4400 hours. The analysis emphasizes neutral current interactions. For a description of the apparatus, see the LBL-91 supplement on detectors.

**Papers** IEEE TNS 29 (1982) 363, IEEE TNS 29 (1982) 400, PRL 55 (1985) 574, and PRL 55 (1985) 1969.

**FNAL-595** (Jan 1978) Approved Jun 1978; Completed Jun 1980.

### A STUDY OF CHARM AND PROMPT SINGLE MUON PRODUCTION IN $pN$ AND $\pi N$ COLLISIONS

CAL TECH - B C Barish, R L Messner, M H Shaevitz, E J Siskind  
 ROCHESTER U - A Bodek ( $\checkmark$  Spokesperson), R Breedon, R N Coleman, W Marsh, S Olsen, J Ritchie, I Stockdale  
 STANFORD U - G Donaldson, S Wojcicki  
 CHICAGO U - F S Merritt  
 FERMILAB - H E Fisk, Y Fukushima, P A Rapidis

**Accelerator** FNAL **Detector** Calorimeter, Spectrometer

### Reactions

$\pi^- Fe \rightarrow$ muon(s) hadrons X	278 GeV/c
$p Fe \rightarrow$ muon(s) hadrons X	350 GeV/c

**Particles studied**  $J/\psi$ ,  $D^0$ ,  $\bar{D}^0$ ,  $D^+$ ,  $D^-$

**Comments** Continues work of FNAL-379. Prompt  $\mu$  production for  $x > 0$  is mainly to study charm production. Also puts limits on bottom production. Results published on total charm cross sections,  $x$  distributions, and  $D^0\bar{D}^0$  mixing. Ran for 1450 hours.

**Papers** PRL 44 (1980) 230, PL 113B (1982) 77, PL 113B (1982) 82, PL 126B (1983) 499, and PL 138B (1984) 213.

**FNAL-597** (Jan 1978) Approved Mar 1978; Completed May 1982.

### A HIGH STATISTICS STUDY OF $\bar{p}p$ ANNIHILATIONS AND A COMPARISON OF $\bar{p}$ , $p$ , $\pi^-$ , $\pi^+$ , AND $K^+$ INTERACTIONS ON HYDROGEN, MAGNESIUM, SILVER, AND GOLD AT 100 GeV/c UTILIZING THE FERMILAB 30-INCH HYDROGEN BUBBLE CHAMBER AND DOWNSTREAM PARTICLE IDENTIFIER

CAMBRIDGE U - P A Elcombe, M J Goodrick, J C Hill, W W Neale  
 DUKE U - W Kowald, W D Walker  
 FERMILAB - P Lucas, L Voyvodic  
 PENN STATE U - R A Lewis, B Y Oh, G A Smith, W Toothaker, J Whitmore (Spokesperson)  
 NOTRE DAME U - J M Bishop, N N Biswas, N M Cason, V P Kenney, M C K Mattingly, R C Ruchti, W D Shephard (Spokesperson), S J Y Ting  
 KANSAS U - R Ammar, D Coppage, R Davis, D Day, J Gress, L Herder, S Kanekal, N Kwak

**Accelerator** FNAL **Detector** HBC-30IN-HYB

### Reactions

$\bar{p} p$	100 GeV/c
$p p$	"
$\pi^+ p$	"
$K^+ p$	"
$\bar{p}$ nucleus	"
$p$ nucleus	"
$\pi^+$ nucleus	"
$K^+$ nucleus	"
$\pi^- p$	100, 320 GeV/c
$\pi^-$ nucleus	"

**Comments** The magnesium, silver, and gold targets are thin foils in the chamber. Uses the downstream particle detector (ISIS/OSIRIS) and a neutral calorimeter. This supercedes the previously approved FNAL-304. Took 658 KPX.

**Papers** PR D33 (1986) 3167.

**FNAL-605** (May 1978, Nov 1978) Approved Mar 1979; Completed Aug 1985.

### STUDY OF LEPTONS AND HADRONS NEAR THE KINEMATIC LIMITS

FERMILAB - C N Brown, W Cooper, D Finley, A Ito, A Jonckheere, H Jostlein, L Lederman, G Moreno, R Orava, S Smith, K Sugano  
 SUNY, STONY BROOK - M Adams, H Glass, D Jaffe, J Kirz, R McCarthy, D Sieh  
 WASHINGTON U, SEATTLE - D A Forbush, R Gray, K B Luk, R Plaag, J Rothberg, J Rutherford ( $\checkmark$  Spokesperson), P B Straub, F C Toevs, R W Williams, K Young  
 COLUMBIA U - J A Crittenden, Y B Hsiung, W Sippach  
 SACLAY - J R Hubbard, Ph Mangeot, J Mullie, M Neveu, R Praca, J Tichit, A Zadra  
 KYOTO U - Y Hemmi, K Imai, K Miyake, T Nakamura, Y Sakai, N Sasao, N Tamura, T Yoshida  
 KEK - A Maki  
 CERN - R P Bouclier, G Charpak, G P Million, J-C Santiard, F Sauli  
 FLORIDA STATE U - D Kaplan

**Accelerator** FNAL **Detector** Spectrometer

### Reactions

$p$ nucleus $\rightarrow \mu^+ \mu^- X$	400, 800 GeV/c
$p$ nucleus $\rightarrow e^+ e^- X$	"
$p$ nucleus $\rightarrow$ hadron $^+$ hadron $^- X$	"

**Particles studied** axion

**Comments** Studies single and pair production of leptons and hadrons at very high transverse momenta. The nuclear targets include H<sub>2</sub>, D<sub>2</sub>, Be, Cu, and W. The dilepton invariant mass resolution is exceptionally good. Ran for 3970 hours. For a description of the apparatus, see the LBL-91 supplement on detectors.

**Papers** IEEE TNS 28 (1981) 514, IEEE TNS 28 (1981) 528, IEEE MAG 17 (1981) 1903, IEEE TNS 29 (1982) 323, NIM 205 (1983) 403, NIM 216 (1983) 79, NIM 217 (1983) 237, IEEE TNS 30 (1983) 30, IEEE TNS 31 (1984) 1028, IEEE TNS 32 (1985) 692, PRL 55 (1985) 457, NIM A244 (1986) 440, NIM A245 (1986) 338, PRL 57 (1986) 2101, and PR D34 (1986) 2584.

**FNAL-609** (Sep 1978) Approved Nov 1978, Jan 1980; Completed Feb 1984.

### A STUDY OF THE STRUCTURE OF HIGH $p_t$ HADRONS INTERACTIONS

LEHIGH U - A Kanofsky  
 PENN U - L Cornell, M Dris, J Fleischman, E Gardella, C Hitzman, W Kononenko, B Robinson, W Selove (Spokesperson), G Theodosiou, B Yost  
 WISCONSIN U - H F Chen, A R Erwin, M A Hasan, C E Kuehn, K S Nelson, M Thompson  
 ARGONNE - M W Arenton, W R Ditzler, T H Fields  
 FERMILAB - M Harrison

## SUMMARIES OF EXPERIMENTS

RICE U - M Corcoran, K Johns, H E Miettinen, C Naudet,  
J Rice, J Roberts

MICHIGAN U - R Gustafson

Accelerator FNAL Detector Calorimeter

Reactions

$p p \rightarrow \text{hadrons}$  400 GeV/c  
 $\pi^+ p \rightarrow \text{hadrons}$  "

Comments Continues study of FNAL-395 of high  $p_t$  hadron jets. Ran for 620 hours.

Papers PRL 53 (1984) 1988, PR D31 (1985) 984, PL 150B (1985) 322, and PRL 56 (1986) 808.

**FNAL-610** (Oct 1978) Approved Dec 1978; Completed Jun 1980.

**PION PRODUCTION OF HEAVY QUARK MESON STATES DECAYING INTO  $J/\psi$  (3097)**

FERMILAB - R G Hicks, T B W Kirk ( $\checkmark$  Spokesperson),  
R Raja

ILLINOIS U, URBANA - J Cooper, L Holloway, L Koester,  
U Kruse, R Sard, M Shupe

TUFTS U - R Milburn, W Oliver, R Thornton

HOWARD U & PURDUE U - et al.

Accelerator FNAL Detector CCM

Reactions

$\pi^- \text{Be} \rightarrow \mu^+ \mu^- X$  225 GeV/c  
 $\pi^- \text{Be} \rightarrow J/\psi X$  "  
 $\pi^- \text{Be} \rightarrow J/\psi \pi^+ \pi^- X$  "  
 $\pi^- \text{Be} \rightarrow \psi(3685) X$  "  
 $\pi^- \text{Be} \rightarrow J/\psi \gamma X$  "  
 $\pi^- \text{Be} \rightarrow \chi(\text{unspec}) X$  "

Particles studied  $J/\psi$ ,  $\psi(3685)$ ,  $\chi(\text{unspec})$

Comments Continues work of FNAL-369 with the spectrometer upgraded. Tests a gluon-fusion model for  $\chi$  meson production by pions. Ran for 1250 hours. See also FNAL-673.

Papers PR D28 (1983) 1773, PR D30 (1984) 671, NIM A236 (1985) 307, and PR D31 (1985) 1132. No other papers expected.

**FNAL-612** (Oct 1978) Approved Nov 1978; Completed Apr 1982.

**MEASUREMENT OF THE DIFFRACTIVE PHOTON DISSOCIATION ON HYDROGEN**

ROCKEFELLER U - T Chapin, R Cool, K Goulianos  
( $\checkmark$  Spokesperson), K Jenkins, J Silverman, G Snow,  
H Sticker, S White

BEIJING, IHEP - Y H Chou

Accelerator FNAL Detector TPC

Reactions

$\gamma p \rightarrow p X$  80-140 GeV/c  
 $\gamma p \rightarrow p \text{vmeson}^0$  "

Comments Covers  $0.02 < -t < 0.1 \text{ GeV}^2$  and up to 0.1 in  $M_x^2/s$ . Ran for 1850 hours.

Papers NIM 197 (1982) 305, and PR D31 (1985) 17. No other papers expected.

**FNAL-613** (Sep 1978) Approved Nov 1978; Completed May 1982.

**A PROMPT NEUTRINO EXPERIMENT AT FERMI-LAB**

MICHIGAN U - R C Ball, C T Coffin, H R Gustafson,  
L W Jones, M J Longo, T J Roberts, B P Roe  
( $\checkmark$  Spokesperson), E Wang

WISCONSIN U - M Duffy, G K Fanourakis, R J Loveless,  
D D Reader, D L Schumann, E S Smith

OHIO STATE U - M B Crisler, J S Hoftun, T Y Ling,

T A Romanowski, J T Volk

INFN, FLORENCE - C Castoldi, G Conforto

WASHINGTON U, SEATTLE - S Childress

Accelerator FNAL Detector Calorimeter

Reactions

$p \text{ nucleus}$  400 GeV/c

Particles studied charm

Comments A beam-dump  $\nu$  experiment with several targets, densities, and intensities. Studies production of charmed particles by hadrons, and searches for various exotic phenomena. Ran for 1800 hours with about  $4.3 \times 10^{17}$  protons on target.

Papers NIM 197 (1982) 371, PRL 51 (1983) 743, PRL 52 (1984) 1865, PRL 53 (1984) 1314, NIM 228 (1984) 37, PRL 55 (1985) 1816, and PRL 57 (1986) 1522.

**FNAL-615** (Nov 1978, May 1979) Approved Jul 1979; Completed Jul 1984.

**A STUDY OF THE FORWARD PRODUCTION OF MASSIVE PARTICLES**

CHICAGO U - C Adolphsen, J Alexander, K J Anderson,  
J Conway, J Heinrich, K W Merritt, J E Pilcher

PRINCETON U - C Biind, J F Greenhalgh, W C Louis,

K T McDonald ( $\checkmark$  Spokesperson), S Palestini, F Shoemaker,  
A J S Smith

IOWA STATE U - E I Rosenberg, D T Simpson

Accelerator FNAL Detector Spectrometer

Reactions

$\pi^- \text{ nucleus} \rightarrow \mu^+ \mu^- X$  75, 250 GeV/c  
 $\pi^+ \text{ nucleus} \rightarrow \mu^+ \mu^- X$  250 GeV/c

Particles studied  $J/\psi$ ,  $\psi(3685)$ ,  $\Upsilon(\text{unspec})$

Comments Measures the pion structure function at large  $x$ . Continues work of FNAL-444.

Papers PRL 55 (1985) 2649, PRL 56 (1986) 1027, PR D34 (1986) 315, and NIM A243 (1986) 323.

**FNAL-616** (Jan 1979) Approved Mar 1979; Completed Jan 1980.

**MEASUREMENT OF NEUTRINO STRUCTURE FUNCTIONS**

CAL TECH - R Blair, J Lee, P Linsay, J Ludwig, R Messner,  
F Sciulli (Spokesperson), M Shaevitz

FERMILAB - J F Bartlett, E Fisk, Y Fukushima, Q Kerns,  
T Kondo, S Segler, R Stefanski, D Theriot, D Yovanovitch

ROCHESTER U - A Bodek, R Coleman, W Marsh

ROCKEFELLER U - O Fackler, K Jenkins

COLUMBIA U - et al.

Accelerator FNAL Detector LAB-E

Reactions

$\nu_\mu \text{ nucleus}$  25-250 GeV/c  
 $\bar{\nu}_\mu \text{ nucleus}$  "

Comments Uses the E-lab  $\nu$  detector to continue work of FNAL-356. Special emphasis is on measuring  $F_L$ , or  $R$ , well. For a description of the apparatus, see the LBL-91 supplement on detectors. Ran for 2900 hours.

Papers PR D23 (1981) 1070, PR D24 (1981) 1400, PRL 51 (1983) 343, ZPHY C26 (1984) 1, NIM 226 (1984) 281, and PL 152B (1985) 404.

**FNAL-617** (Jan 1979) Approved Mar 1979; Completed Jun 1982.

**A STUDY OF DIRECT CP VIOLATION IN THE DECAY OF THE  $K^0$  VIA A PRECISION MEASUREMENT OF  $|\eta_{00}/\eta_{+-}|$**

CHICAGO U - R Bernstein, G Bock, D Carlsmith, D Coupal,  
J W Cronin, W Keling, K Nishikawa, H Norton, B Winstein

( $\checkmark$  Spokesperson)

SACLAY - B Peyaud, R Turlay, A Zylberstejn

Accelerator FNAL Detector Spectrometer

## SUMMARIES OF EXPERIMENTS

### Reactions

$K_L \rightarrow \pi^+ \pi^-$	30-200 GeV/c
$K_L \rightarrow \pi^0 \pi^0$	"
$K_L \rightarrow \gamma \gamma$	"
$K^*(892)^0 \rightarrow K^0 \gamma$	"

Particles studied  $K_L$

Comments To reduce bias, measures for each mode ( $\pi^+ \pi^-$  and  $\pi^0 \pi^0$ ) the decay versus regeneration rates in a double-beam arrangement. Ran for 2300 hours.

Papers PRL 54 (1985) 1631, PRL 55 (1985) 566, and PRL 56 (1986) 18. No other papers expected.

**FNAL-619** (May 1979) Approved Jul 1979; Completed Jun 1982.

**MEASUREMENTS OF THE  $\Sigma^0 \rightarrow \Lambda^0$  TRANSITION MAGNETIC MOMENT AND THE WEAK RADIATIVE DECAY  $\Xi^0 \rightarrow \Lambda \gamma$**

RUTGERS U - A Beretvas, T Devlin ( $\checkmark$  Spokesperson),

K B Luk, P C Petersen, G B Thomson, R Whitman

WISCONSIN U - R Handler, B Lundberg, L Pondrom,

M Sheaff, C Wilkinson

MICHIGAN U - P Border, J Dworkin, O E Overseth,

R Rameika, G Valenti

MINNESOTA U - K Heller, C James

Accelerator FNAL Detector Spectrometer

### Reactions

$\Lambda$ nucleus $\rightarrow \Sigma^0$ nucleus	80-350 GeV/c
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Particles studied  $\Sigma^0, \Lambda, \Xi^0$

Comments Uses the Primakoff effect. Follows on work of FNAL-440, -495, and -620. Ran for 675 hours.

Papers PRL 57 (1986) 949.

**FNAL-620** (May 1979) Approved Jul 1979; Completed Jan 1980.

**MEASUREMENT OF THE MAGNETIC MOMENTS OF THE  $\Sigma^+, \Xi^-, \Sigma^-,$  AND  $\Omega^-$  HYPERONS USING THE FERMILAB NEUTRAL HYPERON BEAM**

WISCONSIN U - R Handler, R March, L Pondrom

( $\checkmark$  Spokesperson), M Sheaff

RUTGERS U - A Beretvas, T J Devlin, R Whitman

MICHIGAN U - O E Overseth

MINNESOTA U - K Heller

Accelerator FNAL Detector Spectrometer

### Reactions

$\Sigma^+$	Polarized beam 120-250 GeV/c
$\Xi^-$	"
$\Sigma^-$	"
$\Omega^-$	"

Particles studied  $\Sigma^+, \Xi^-, \Sigma^-, \Omega^-$

Comments Ran for 900 hours.

Papers PRL 46 (1981) 803, PR D28 (1983) 1, PRL 52 (1984) 581, PR D33 (1986) 3172, and PRL (submitted).

**FNAL-621** (May 1979) Approved Jul 1981; Completed Aug 1985.

**A MEASUREMENT OF THE CP VIOLATION PARAMETER  $\eta_{+-0}$**

RUTGERS U - A Beretvas, A J Carracappa, T Devlin,

U P Joshi, K Krueger, A Pal, P Petersen, S Teige,

G Thompson (Spokesperson)

MICHIGAN U - P Border, M Longo, O E Overseth

MINNESOTA U - N Grossman, K Heller, C James, M Shupe,

K Thorne

Accelerator FNAL-TEV Detector Spectrometer

### Reactions

$K_L \rightarrow \pi^+ \pi^- \pi^0$	50-200 GeV/c
$K_S \rightarrow \pi^+ \pi^- \pi^0$	"
$K_L \rightarrow \pi^+ \pi^-$	"
$K_S \rightarrow \pi^+ \pi^-$	"

Particles studied  $K_L, K_S$

Comments Uses the neutral hyperon spectrometer. Ran for 2470 hours.

**FNAL-622** (May 1979) Approved Jul 1979; Completed Jun 1980.

**A SEARCH FOR FRACTIONAL CHARGE PARTICLES FROM A MAGNETIZED BEAM DUMP**

MICHIGAN U - H R Gustafson (Spokesperson)

Accelerator FNAL Detector Counter

### Reactions

$p$ nucleus $\rightarrow$ quark X	400-450 GeV/c
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Particles studied quark

Comments Uses the beam dumps of FNAL-361 and -613.

**FNAL-623** (May 1979) Approved Nov 1980; Completed Jun 1982.

**HIGH-MASS STATES DECAYING INTO  $\phi\pi$  AND  $\phi\phi$  PRODUCED CENTRALLY IN 400 GeV/c  $pp$  INTERACTIONS**

ARIZONA U - E Jenkins, K W Lai, A Pifer

FERMILAB - D Green ( $\checkmark$  Spokesperson)

FLORIDA STATE U - J Albright, H Fenker, H Goldman,

S Hagopian, J Lannutti

NOTRE DAME U - T Davis, J Poirier

TUFTS U - A Napier, J Schneps

VANDERBILT U - C Roos, J Waters, M S Webster

VIRGINIA TECH - G Collins, J Ficenec, P Trower

Accelerator FNAL Detector FMPS

### Reactions

$p p \rightarrow K^+ K^+ K^- K^- X$	400 GeV/c
$p p \rightarrow K^+ K^- p\text{ons} X$	"

Particles studied  $\phi, \phi(1680),$  exotic-meson,  $\eta_c(2980),$  glueball

Comments A study of inclusive  $\phi$  and  $(4K)^0$  production, a search for glueballs and the  $\eta_c$  in  $(4K)^0, \phi(2K)^0,$  and  $\phi\phi,$  and a search for exotics in  $\phi$ -pions. For a description of the apparatus, see the LBL-91 supplement on detectors. Ran for 425 hours.

Papers PL 152B (1985) 428, PRL 56 (1986) 1639, PR D33 (1986) 2519, and PR D34 (1986) 707.

**FNAL-629** (Feb 1980) Approved Jul 1980; Completed Mar 1981.

**MEASUREMENT OF DIRECT PHOTON PRODUCTION IN HADRON-NUCLEUS COLLISIONS**

FERMILAB - J Biel, T Droegge, A Jonckheere, C A Nelson

( $\checkmark$  Spokesperson)

MINNESOTA U - K Heller, M Marshak, E Peterson, J Povlis,

K Ruddick, M Shupe

ROCHESTER U - C Chandlee, S Cihangir, T Ferbel,

J Huston, J LeBritton, F Lobkowicz, M McLaughlin,

P Slattery

MICHIGAN STATE U - C Bromberg, S Cooper, R Lewis,

G A Smith

NORTHEASTERN U - B Brown, D Garelick, G Glass,

M Glaubman, S R Han, S Hossain, E Pothier

Accelerator FNAL Detector Calorimeter

### Reactions

$\pi^+$ nucleus $\rightarrow \gamma(s)$ hadrons	200 GeV/c
$\pi^+$ nucleus $\rightarrow \eta(s)$ hadrons	"
$\pi^+$ nucleus $\rightarrow \pi^0(s)$ hadrons	"

## SUMMARIES OF EXPERIMENTS

$p$  nucleus  $\rightarrow \gamma(s)$  hadrons " "  
 $p$  nucleus  $\rightarrow \eta(s)$  hadrons " "  
 $p$  nucleus  $\rightarrow \pi^0(s)$  hadrons " "  
Comments Uses a liquid-argon  $\gamma$  calorimeter. Measures the  $\gamma$ -to- $\pi^0$  ratio and  $\pi^0$  and  $\eta$  production in nuclei for  $p_t$  up to 5 GeV/c. Ran for 600 hours.  
Papers PRL 51 (1983) 967, PRL 51 (1983) 971, NIM 216 (1983) 381, and PR D33 (1986) 3199.

**FNAL-630** (Jan 1980) Approved Mar 1980; Completed Mar 1982.

**STUDY OF B PARTICLE AND CHARMED PARTICLE PRODUCTION AND DECAY USING A HIGH RESOLUTION STREAMER CHAMBER**

YALE U - T Cardello, M Catalano, P Cooper, S Dhawan,  
 Y Li, R Majka, P McBride, O Murphy, P Nemethy,  
 J Sandweiss ( $\checkmark$  Spokesperson), A J Slaughter, H Taft,  
 L Teig, L Tzeng  
 FERMILAB - M Johnson  
 LBL - et al.

Accelerator FNAL Detector Streamer chamber

Reactions

$n$  nucleus  $\rightarrow$  muon(s) X 300 GeV/c

Particles studied bottom, charm

Comments An extension of FNAL-490. Ran for 1150 hours.

Papers PRL 55 (1985) 1172.

**FNAL-631** (Feb 1980) Approved Dec 1980; Completed Jun 1981.

**A MEASUREMENT OF NUCLEAR CALIBRATION CROSS SECTIONS FOR PROTONS BETWEEN 100 AND 1000 GeV**

FERMILAB - S I Baker ( $\checkmark$  Spokesperson), C R Kerns,  
 S Pordes

BROOKHAVEN - J B Cumming, A Soukas  
 CERN - V Agoritsas, G R Stevenson

Accelerator FNAL Detector Counter

Reactions

$p$  nucleus 400 GeV/c

Comments Took 41 exposures.

Papers NIM 222 (1984) 467. No other papers expected.

**FNAL-632** (May 1980) Approved Jun 1982.

**AN EXPOSURE OF THE 15-FOOT BUBBLE CHAMBER WITH A NEON-HYDROGEN MIXTURE TO A WIDEBAND NEUTRINO BEAM FROM THE TEVA-TRON**

BIRMINGHAM U - G T Jones, R Jones, B Kennedy,  
 S O'Neale

BRUSSELS U, IIHE - P Marage, J Moreels, J Sacton,  
 P Vilain, E A de Wolf

CERN - C Brand, A M Cooper, H Drevermann, H Foeth,  
 K K Geissler, G Harigel, H Klein, J Mittendorfer,  
 D R O Morrison (Spokesperson), A Parker, P Schmid,  
 H Wachsmuth

PANJAB U - J M Kohli, I S Mitra, J Singh, P M Sood  
 FERMILAB - W Smart, L Voyvodic

IMPERIAL COLL - K W J Barnham, J R Campbell,  
 E Clayton, D Miller, M M Mobbayyen, P R Nailor

ILLINOIS TECH - J B Barclay, R A Burnstein, D Cullen,  
 R G Dillenberg, J E Hanlon, D Karatas, C P Mailander,  
 R Naon, H A Rubin

JAMMU U - G L Kaul, J Prakash, N K Rao

MUNICH, MAX PLANCK INST - M Aderholz, L L Deck,  
 N Schmitz, W Wittek

OXFORD U - G Corrigan, J J Lloyd, G Myatt, D Radojicic

RUTGERS U - M S Kalelkar, R J Plano, P E Stamer

RUTHERFORD - B Franck, J Guy, G Kalmus, P Kasper,  
 R L Sekulin, M Tyndal, W A Venus

SACLAY - J P Baton, C Coutures, M Faccini-Turluer,  
 M Jabiol, M Neveu

STEVENS TECH - E B Brucker, E L Koller

TUFTS U - H Akbari, T Kafka, T Mann, R H Milburn,  
 A Napier, J Schneps

UC, BERKELEY - H H Bingham, P Dingus, J E Lys,  
 G P Yost

HAWAII U - R J Cence, F A Harris, V Jain, M D Jones,  
 M W Peters, V Z Peterson

Accelerator FNAL-TEV Detector HLBC-15FT

Reactions

$\nu_\mu$  nucleus  $\rightarrow \mu^- X$  10-400 GeV/c

$\bar{\nu}_\mu$  nucleus  $\rightarrow \mu^+ X$  "

Particles studied charm, bottom, top,  $\tau$

Comments The main aim is an exploratory search for new particles and effects in a new energy range. Also studies (1) production of like-sign dileptons, (2) production of charmed and heavier-quark particles and  $\tau$  leptons, (3) quark and gluon fragmentation functions, the transverse momentum behavior of hadrons, and other aspects of the hadron system, and (4) the inelastic structure functions. Uses high-resolution optics and holography. In progress, with 154 KPIX taken as of September 85. Scheduled to resume March 87.

**FNAL-635** (Apr 1980, Mar 1983) Approved Nov 1983:

**SEARCH FOR AXION-LIKE OBJECTS**

VIRGINIA TECH - C Church, L W Mo ( $\checkmark$  Spokesperson),  
 T Nunamaker

FERMILAB - J Kilmer, R Orr, T Toohig

Accelerator FNAL-TEV Detector Calorimeter

Reactions

$\nu_\mu e^- \rightarrow \nu_\mu e^-$  < 400 GeV/c

$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$  "

Particles studied axion, nuino

Comments A beam-dump experiment to search for axion-like objects, particularly in the  $\mu^+\mu^-$  decay mode. Also studies the elastic-scattering reactions listed. The detector is two calorimeters separated by about 50 feet. Unscheduled (November 86).

**FNAL-636** (Apr 1980) Approved Nov 1980.

**STUDY OF BEAM-DUMP PRODUCED NEUTRINOS**

MIT - B Blatner, E S Hafen, P Haridas, J L Harton,  
 R I Hulsizer, M Mars, S H Oh, I A Pless (Spokesperson),  
 T B Stroughton, B F Wadsworth, R K Yamamoto

BROWN U - D Brick, H Rudnicka, A Shapiro, M Widgoff  
 FERMILAB - S R Childress, N M Gelfand, C T Murphy

BEIJING, IHEP - D Huang, Y Wu, S-W Xu

INDIANA U - E D Alyea

OAK RIDGE - H O Cohn

SETON HALL U - P E Stamer

TECHNION - S Dado, J Goldberg

TEL AVIV U - G Alexander, Y Gnat, R Heifetz, A Levy

TENNESSEE U - W M Bugger, G T Condo, T Handler,  
 E L Hart

TOHOKU GAKUIN U - M Higuchi, M Sato

TOHOKU U - K Abe, K Hasegawa, Y Hayashino, T Kita-  
 gaki, T Nakajima, T Takayama, K Tamai, S Tanaka, A Ya-  
 maguchi, H Yuta

Accelerator FNAL-TEV Detector HLBC-36IN-HYB

Reactions

$\nu_\tau$  nucleus  $\rightarrow \tau X$  10-250 GeV/c

$\nu_e$  nucleus "

$\nu_\mu$  nucleus "

Particles studied  $\tau$ ,  $\nu_\tau$ , charm

Comments The main goal is to establish the existence of the  $\nu_\tau$ . The detector is a new freon rapid-cycling bubble chamber with a holographic camera plus the Fermilab hybrid

## SUMMARIES OF EXPERIMENTS

spectrometer with a  $\mu$  identifier. Size of run unspecified.  
Scheduled to run in 1987-88.

**FNAL-646** (Apr 1980) Approved Jul 1981.

### SEARCH FOR THE $\tau$ NEUTRINO AND STUDY OF PROMPT NEUTRINO PRODUCTION

UC, BERKELEY - H H Bingham, J E Lys, G Yost  
COLUMBIA U - C Baltay, G Harigel, M Hibbs, J Okamitsu  
FERMILAB - J Schmidt, W Smart, L Voyvodic  
HAWAII U - R Cence, F Harris, V Jain, M Jones, M Peters  
(Spokesperson), V Peterson  
RUTGERS U - P Jacques, M Kalelkar, R Plano, P E Stamer

Accelerator FNAL-TEV Detector HLBC-15FT

#### Reactions

$\nu_\tau$ Ne $\rightarrow$ $\tau^-$ X	10-200 GeV/c
$\bar{\nu}_\tau$ Ne $\rightarrow$ $\tau^+$ X	"
$\nu_e$ Ne $\rightarrow$ $e^-$ X	"
$\bar{\nu}_e$ Ne $\rightarrow$ $e^+$ X	"
$\nu_\mu$ Ne $\rightarrow$ $\mu^-$ X	"
$\bar{\nu}_\mu$ Ne $\rightarrow$ $\mu^+$ X	"
$\nu$ Ne $\rightarrow$ $\nu$ X	"
$\nu_e e^- \rightarrow \nu_e e^-$	"
$\bar{\nu}_e e^- \rightarrow \bar{\nu}_e e^-$	"

Particles studied  $\nu_\tau$ ,  $\tau$ , hvy-lepton, charm,  $D_s^+$ ,  $D_s^-$

Comments A beam-dump experiment. Uses a holographic camera system with a resolution of about 100 microns. Unscheduled as of October 86.

**FNAL-650** (Apr 1980) Approved Jul 1980; Completed Dec 1980.

### SEARCH FOR CHARM PRODUCTION IN HADRON INTERACTIONS

PRINCETON U - V L Fitch, A Montag, S Sherman, R Webb  
(Spokesperson), M Witherell  
SACLAY - B Devaux, J Teiger, R Turley, A Zylberstein  
TURIN U - R Cester, D Maurizio, G Rinaudo  
BROOKHAVEN - M May  
TEXAS A AND M - et al.

Accelerator FNAL Detector Spectrometer

#### Reactions

$\pi^-$ Be $\rightarrow$ $D^*(2010)^+$ X	275 GeV/c
$\pi^-$ Be $\rightarrow$ $D^*(2010)^-$ X	"
$\pi^-$ Be $\rightarrow$ $J/\psi$ X	"

Particles studied  $D^0$ ,  $D^*(2010)^+$ ,  $D^*(2010)^-$

Comments A continuation of FNAL-567. Ran for 550 hours.

**FNAL-652** (May 1980) Approved Jul 1980.

### NEUTRINO PHYSICS AT THE TEVATRON

CHICAGO U - F Merritt, M Oreglia, P Reutens, B A Schumm  
COLUMBIA U - P Auchincloss, K T Bachmann,  
R H Bernstein, R Blair, C Foudas, W C Lefmann, S Mishra,  
E Oltman, F Sciulli (Spokesperson), M Shaevitz, W Smith  
FERMILAB - F O Borchering, D A Edwards, E Fisk,  
D Jovanovitch, Q A Kerns, M J Lam, W Marsh,  
K W Merritt, P Rapidis  
ROCHESTER U - A Bodek, H S Budd, K Lang

Accelerator FNAL-TEV Detector LAB-E

#### Reactions

$\nu_\mu$ nucleus $\rightarrow$ muon(s) X	20-600 GeV/c
$\bar{\nu}_\mu$ nucleus $\rightarrow$ muon(s) X	"

Comments A continuation of FNAL-616 to TeV energies.

Extends the useful  $Q^2$  range by a factor of two or three and allows much better tests of asymptotic QCD predictions. Also studies like-sign dimuons. For a description of the apparatus, see the LBL-91 supplement on detectors. Approved for  $2 \times 10^{18}$  protons. Scheduled to run in 1986 and 1987.

**FNAL-653** (May 1980) Approved Jul 1981.

### STUDY OF CHARM AND BEAUTY USING HADRONIC PRODUCTION IN A HYBRID EMULSION SPECTROMETER

AICHI U OF EDUCATION - N Ushida  
UC, DAVIS - W Ko, R L Lander, A Moktarani, V Paolone,  
J T Volk, P M Yager  
CARNEGIE MELLON U - R M Edelman, R Fisher,  
R J Lipton, W R Nichols, D Potter, J S Russ  
CHONNAM NATIONAL U - J-Y Kim, K H Oh  
GIFU U - S Tasaka

GYEONGSANG NATIONAL U - I G Park, J S Song  
JEONBUG NATIONAL U - P W Rho  
KOBE U - G Fujioka, H Fukushima, T Hara, Y Homma,  
T Nakayama, Y Takahashi, Y Tsuzuki, C Yokoyama  
KOREA U - K P Hong, J S Kang, C O Kim, S N Kim,  
K A Moon, K S Sim  
NAGOYA U - S Aoki, K Chiba, H Fuchi, K Hoshino,  
M Miyanishi, M Nakamura, K Niu, K Niwa, M Ohashi,  
H Sasaki, O Yamakawa, Y Yanagisawa  
OHIO STATE U - I Aubrecht, S Chittipeddi, J Dunlea,  
S F Krivatch, S Kuramata, B G Lundberg, G A Oleynik,  
N W Reay (Spokesperson), K Reibel, R A Sidwell,  
N R Stanton

OKAYAMA U - K Moriyama, H Shibata  
OKLAHOMA U - G R Kalbfleisch, P L Skubic, J M Snow,  
J A White, S E Willis  
OSAKA U - O Kusumoto, Y Noguchi, M Teranaka  
OSAKA PREFECTURE U, SCI EDUC INST - H Okabe,  
J Yokota

SOOKMYONG WOMENS U - D Kim, J N Park  
TOHO U - M Kazuno, H Shibuya  
WON KWANG U - S Y Bahk

Accelerator FNAL-TEV Detector Emulsion, Spectrometer

#### Reactions

$\pi^-$ nucleus $\rightarrow$	350 GeV/c
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Particles studied charm, bottom

Comments For a description of the apparatus, see the LBL-91 supplement on detectors. In progress, with 1100 hours run as of September 85. Scheduled to resume Spring 1987.

**FNAL-660** (Jun 1980) Approved Nov 1980; Completed Jun 1982.

### A STUDY OF THE EFFECT OF BENT CRYSTALS ON CHANNELING NEAR THE CRITICAL RADIUS OF BENDING

FERMILAB - S Baker, R Carrigan, T Toohig  
SUNY, ALBANY - W Gibson ( $\checkmark$  Spokesperson), I-J Kim,  
S Salman, C R Sun, K Wang, G O Williams, R Wong  
DUBNA - Z Guzik, T S Nigmanov, E N Tsyganov,  
A S Vodopianov  
CERN & CHALK RIVER, AECL & NEW MEXICO U &  
STRASBOURG - et al.

Accelerator FNAL Detector Wire chamber

#### Reactions

charged <sup>+</sup> crystal	12-180 GeV/c
charged <sup>-</sup> crystal	"

Comments Ran for 425 hours.

Papers NIM 194 (1982) 205, NIM 194 (1982) 239, PRL 48 (1982) 488, NP B203 (1982) 40, NIM B2 (1984) 9, NIM B2 (1984) 54, PL 137B (1984) 129, and NIM A234 (1985) 602.

**FNAL-663** (Sep 1980) Approved Nov 1980; Completed Jun 1981.

### COMPARISON OF POLARIZATIONS OF INCLUSIVELY PRODUCED $\Lambda$ 's AND $\bar{\Lambda}$ 's BY PROTONS, ANTIPROTONS, KAONS, AND PIONS ON HYDROGEN

UC, DAVIS - S Gourlay, P M Yager

## SUMMARIES OF EXPERIMENTS

UC, SAN DIEGO - H Kobrak (Spokesperson), R E Pitt,  
R A Swanson  
CARLETON U - K W Edwards  
MICHIGAN STATE U - M A Abolins, H Melanson, D P Owen  
FERMILAB - W R Francis

Accelerator FNAL Detector Spectrometer

Reactions

$p p \rightarrow \Lambda X$	175 GeV/c
$p p \rightarrow \bar{\Lambda} X$	"
$\bar{p} p \rightarrow \Lambda X$	"
$\bar{p} p \rightarrow \bar{\Lambda} X$	"
$K^- p \rightarrow \Lambda X$	"
$K^- p \rightarrow \bar{\Lambda} X$	"
$\pi^- p \rightarrow \Lambda X$	"
$\pi^- p \rightarrow \bar{\Lambda} X$	"

Comments Ran for 500 hours.

**FNAL-665** (Oct 1980) Approved Jul 1981.

**MUON SCATTERING WITH HADRON DETECTION AT THE TEVATRON**

ARGONNE - D F Geesaman, M C Green, H Jackson,  
S Kaufman  
UC, SAN DIEGO - W R Francis, R Kennedy, H G E Kobrak,  
A Salvarani, R A Swanson  
CRACOW - A Eskreys, P Malecki, K Olkiewicz, B Pawlik  
FERMILAB - F Bartlett, G Coutrakon, J Hanlon,  
T B W Kirk (✓ Spokesperson), H Melanson, H Montgomery,  
J Morfin, R Raja, L Sexton, S Wolbers  
FREIBURG U - T Dreher, M Erdmann, A Haas, W Mohr,  
H E Stier  
HARVARD U - J Conrad, D Michael, R Nickerson,  
F M Pipkin, M Schmitt, R Wilson  
ILLINOIS U, CHICAGO - M Adams, C Halliwell, S Magill,  
D McLeod  
MARYLAND U - S Aid, S Kunori, S O'Day, E J Ramberg,  
A Skuja, G Snow, P Steinberg, R Talaga  
MIT - P Anthony, M Baker, W Busza, T Lyons, L Osborne,  
J J Ryan  
MUNICH, MAX PLANCK INST - I Derado, V Eckardt,  
H J Gebauer, G Jancso, A Manz, N Schmitz, J Seyerlein,  
H J Trost, M Vidal, G Wolf  
WASHINGTON U, SEATTLE - A Bhatti, T H Burnett,  
D Jansen, S Krzywdzinski, J Lord, H J Lubatti, J Wilkes,  
T Zhao  
WUPPERTAL U - H Braun, U Ecker, A Roeser  
YALE U - S Dhawan, V Hughes, P Schuler, H Venkataramania

Accelerator FNAL-TEV Detector CCM

Reactions

muon $p \rightarrow$ muon hadrons	< 750 GeV/c
muon nucleus $\rightarrow$ muon hadrons nucleus	"

Comments Studies (1) the properties of hadron systems recoiling from deep inelastic muon collisions, and (2) the nucleon structure functions. Also uses the superconducting vertex magnet from CERN. For a description of the apparatus, see the LBL-91 supplement on detectors. Approved for 1000 hours. Scheduled to run Spring 87.

**FNAL-666** (Dec 1980) Approved Dec 1980; Completed Mar 1981.

**EMULSION EXPOSURE TO  $\Sigma^-$  BEAM AT FERMI-LAB**

WASHINGTON U, SEATTLE - R J Wilkes (✓ Spokesperson)  
WASHINGTON U, SEATTLE & CRACOW - et al.

Accelerator FNAL Detector Emulsion

Reactions

$\Sigma^-$ nucleus	20-350 GeV/c
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Comments Exposed 6 stacks. Rerun as FNAL-730 due to poor emulsion quality.

**FNAL-672** (Jan 1981) Approved Jul 1981.

**A STUDY OF HADRONIC FINAL STATES PRODUCED IN ASSOCIATION WITH HIGH-MASS DIMUONS**

CAL TECH - R Gomez  
FERMILAB - J Krider  
ILLINOIS U, CHICAGO - H Goldberg, S Margulies,  
J Solomon  
INDIANA U - R Crittenden, A Dzierba, S Kartik,  
T Marshall, J Martin, P Smith, T Sulanke, A Zieminski  
(✓ Spokesperson)  
LOUISVILLE U - C Davis  
MICHIGAN U, FLINT - L Dauwe  
SERPUKHOV - A Abramov, Yu Antipov, B Baldin,  
S Denisov, V Glebov, Y Gorin, V Koreshev, V Kryshkin,  
A Petrukhin, S Polovnikov, V Sirotenko, R Sulyaev

Accelerator FNAL-TEV Detector FMPS

Reactions

$p$ nucleus $\rightarrow \mu^+ \mu^- X$	500, 1000 GeV/c
$\pi^+$ nucleus $\rightarrow \mu^+ \mu^- X$	500 GeV/c
$\pi^-$ nucleus $\rightarrow \mu^+ \mu^- X$	"

Particles studied  $J/\psi, \chi$ (unspec)

Comments Runs with thin-foil targets. For a description of the apparatus, see the LBL-91 supplement on detectors. Ran parasitically with FNAL-557 in 1983. To run simultaneously with FNAL-706 beginning March 1987.

**FNAL-673** (Jan 1981) Approved Jul 1981; Completed Apr 1982.

**$\chi$  MESON PRODUCTION BY HADRONS**

FERMILAB - J Cooper (✓ Spokesperson), T Kirk, S Pordes,  
A Wehmann  
ILLINOIS U, URBANA - G Alverson, G Ascoli, J Bellinger,  
S Cihangir, T Graff, L Holloway, I Karliner, L Koester,  
U Kruse, W-G Li, P Lukens, R Sard  
PURDUE U - V Barnes, C Davis, A Garfinkel, A Laasanen,  
J Simmons, J Wilson  
TUFTS U - W Oliver, R Thornton  
PENN U - D Bauer

Accelerator FNAL Detector CCM

Reactions

$p$ Be $\rightarrow \mu^+ \mu^- X$	200, 250 GeV/c
$p$ Be $\rightarrow J/\psi \gamma X$	"
$p$ Be $\rightarrow \chi$ (unspec) X	"
$\pi^-$ Be $\rightarrow \mu^+ \mu^- X$	185 GeV/c
$\pi^-$ Be $\rightarrow J/\psi \gamma X$	"
$\pi^-$ Be $\rightarrow \chi$ (unspec) X	"

Particles studied  $J/\psi, \chi$ (unspec)

Comments An extension of FNAL-610. Ran for 1100 hours.

Papers PRL 54 (1985) 753, and NIM A236 (1985) 307.

**FNAL-683** (Feb 1981) Approved Dec 1983.

**PHOTOPRODUCTION OF HIGH  $p_t$  JETS**

LEHIGH U - N Akcurin, A Kanofsky  
RICE U - B Bonner, J Buchanan, J Clement, M Corcoran  
(✓ Spokesperson), J Kruk, H Miettinen, G Mutchler,  
F Nessi, M Nessi, G C Phillips, J Roberts  
VANDERBILT U - J Marraffino, C Roos, J Waters,  
M S Webster  
WISCONSIN U - A R Erwin, C Findeisen, B Fletcher,  
K Nelson  
TEXAS U - H McNaughten, B O'Neal, Y Onel, P Riley, S Sen  
MARYLAND U - H Breuer, C C Chang, H D Holmgren,  
D Zhang  
MICHIGAN U - M Longo  
HOUSTON U - B Mays  
BALL STATE U - B Ober, G Thomas

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter

Reactions

$\gamma p \rightarrow$ jets X	200-600 GeV/c
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## SUMMARIES OF EXPERIMENTS

Comments Studies in particular 3- and 4-jet events and the A dependence of jet production. Scheduled to run in 1988.

**FNAL-687** (Jan 1981) Approved Jul 1981, Dec 1983.  
**HIGH ENERGY PHOTOPRODUCTION OF STATES CONTAINING HEAVY QUARKS AND OTHER RARE PHENOMENA**

FERMILAB - M Binkley, J Butler (Spokesperson), I Gaines (Spokesperson), P H Garbincius, M Gormley, D Harding, A E Kreymer, P L G Lebrun, J Peoples  
 COLORADO U - P Coteus, S W Culy, J Cumalat (Spokesperson)

INFN, MILAN - D Pedrini  
 MILAN U - G Bellini, M Dicorato, P Frabetti, P F Manfredi, D Menasce, L Moroni, F Palombo, L Perasso, S Sala, M Szaswowski

NORTHWESTERN U - L Buchholz, B Gobbi, R Yoshida  
 NOTRE DAME U - J Bishop, N Biswas, N Cason, S Grenquist, V Kenney, E J Mannel, R Ruchti, W D Shephard, P Wilkins

FRASCATI - M Dario, M Enorini, F L Fabbri, A Maccari, G Rivellini, A Zallo  
 ILLINOIS U, URBANA - M Diesburg, L Koester, J Wiss

Accelerator FNAL-TEV Detector Spectrometer

Reactions

$\gamma$ nucleus $\rightarrow \mu^+ \mu^- X$	200-500 GeV/c
$\gamma$ nucleus $\rightarrow$ muon X	"
$\gamma$ nucleus $\rightarrow e^+ e^- X$	"
$\gamma$ nucleus $\rightarrow e^\pm X$	"

Particles studied  $\psi$ (unspec), charm,  $\Upsilon$ (unspec), bottom

Comments Continues studies of FNAL-087 and -401. Uses  $\gamma$ 's from a new wideband electron beam, a new large-aperture multiparticle spectrometer, an active silicon target, and a silicon microstrip decay-vertex detector. Scheduled to run Spring 1987.

**FNAL-690** (Jan 1981) Approved Jul 1981, Nov 1983.  
**STUDY OF CHARM AND BOTTOM PRODUCTION**

NEVIS LABS, COLUMBIA U - M Church, E Gottschalk, R Hylton, B Knapp ( $\checkmark$  Spokesperson), B Stern, L Wiencke  
 MASSACHUSETTS U, AMHERST - E Hartouni, D Jensen, M Kreisler, M Rabin  
 MEXICO U - C Avilez

FERMILAB - D Christian, G Gutierrez, S Holmes, A Wehmann  
 TEXAS ACCELERATOR CENTER - R Huson, J White

Accelerator FNAL-TEV Detector Spectrometer

Reactions

hadron p	200-2000 GeV/c
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Particles studied charm, bottom

Comments Initial goals include (1) a systematic study of exclusive reactions, particularly diffraction dissociation, (2) cataloguing the remaining stable charmed particles, with details of production and decay, and (3) determining the scale of bottom production. Uses an innovative spectrometer with a hardware processor. Scheduled to run in 1987 and 1988.

**FNAL-691** (Feb 1981) Approved Nov 1983; Completed Aug 1985.

**CHARM PRODUCTION WITH THE TAGGED PHOTON SPECTROMETER**

FERMILAB - J A Appel, V K Bharadwaj, P M Mantsch, T Nash, M V Purohit, K Sliwa, M D Sokoloff, W J Spalding  
 UC, SANTA BARBARA - T Browder, S F McHugh, R J Morrison, M S Witherell ( $\checkmark$  Spokesperson)

CARLETON U - P Estabrooks, J Pinfold  
 RIO DE JANEIRO, CBPF - J Anjos, A Santoro, M Souza  
 COLORADO U - L M Cremaldi, J R Elliott, M Gibney, U Nauenberg

NATIONAL RESEARCH COUNCIL, OTTAWA - M J Losty  
 TORONTO U - S B Bracker, G F Hartner, B R Kumar, G J Luste, J F Martin, S Menary, A Stundzia  
 SAO PAULO U - C Escobar  
 YALE U - P Karchin

Accelerator FNAL-TEV Detector TPS

Reactions

$\gamma p \rightarrow$ charm X	100-260 GeV/c
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Particles studied  $D^0, D^+, D^*(2010), D_s^+, J/\psi, \Lambda_c^+$

Comments Ran for 1400 hours and collected 100 million events with a silicon microstrip detector. See also FNAL-516. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 57 (1986) 3003, and PRL 58 (1987) 311.

**FNAL-701** (Mar 1981) Approved Jul 1981; Completed Jun 1982.

**A SEARCH FOR NEUTRINO OSCILLATIONS WITH  $(\Delta m)^2 > 10 eV^2$**

COLUMBIA U - P Auchincloss, B Blair, C Haber, F Sciulli, M Shaevitz ( $\checkmark$  Spokesperson), W Smith, R Zhu

CHICAGO U - F Merritt, M Oreglia, P Reutens  
 FERMILAB - R Coleman, E Fisk, B Jin, D Levinthal, W Marsh, P Rapidis, D Yovanovitch

ROCHESTER U - A Bodek, F Borcharding, N Giokaris, K Lang, I Stockdale

Accelerator FNAL Detector LAB-E

Reactions

$\nu_\mu$ Fe $\rightarrow \mu^- X$	30-230 GeV/c
$\bar{\nu}_\mu$ Fe $\rightarrow \mu^+ X$	"

Particles studied  $\nu_\mu, \bar{\nu}_\mu$

Comments Measures the change in  $\nu$  flux with distance by detecting the numbers of charged current events in two detectors at different distances. Ran for 2250 hours.

Papers PRL 52 (1984) 1384, and ZPHY C27 (1985) 53.

**FNAL-705** (Sep 1981) Approved Dec 1981.

**A STUDY OF CHARMONIUM AND DIRECT PHOTON PRODUCTION BY 300 GeV/c  $\bar{p}, p, \pi^+, \text{AND } \pi^-$  BEAMS**

FERMILAB - B Cox ( $\checkmark$  Spokesperson), S Delchamps, C M Jenkins, P Mazur, C T Murphy, R Rakeika, C J Serritella, R Smith, F Turkot, W Yang

ATHENS U, NUCL PHYS LAB - E Anassontzis, P Ioannou, S Katsanevas, P Kostarakis, C Kourkoumelis, A Manousakakis, K Kafitsakakis, P Premantziatis, L Resvanis, M Vassiliou, G Voulgaris

MCGILL U - S Conetti, M Haire, J Kuziminski, A Marchionni, M Rosati, D Ryan, D Stairs, L Turnbull, G Zioukas

SHANDONG U - M He, C-H Shen, C-H Wang, N Zhang, X Zhang

NORTHWESTERN U - J Rosen, L Spiegel, S Tzamarias

ARIZONA U - M Arenton, T Y Chen, K Lai, N Yao

DUKE U - L Fortney, S Oh, Q Shen, R Tesarek, T Turkington  
 FLORIDA A AND M UNIV - K Guffey, D J Judd, W P Tucker, D E Wagoner

Accelerator FNAL-TEV Detector Spectrometer

Reactions

$p$ deut $\rightarrow \mu^+ \mu^- X$	300, 750 GeV/c
$p$ deut $\rightarrow \gamma(s) X$	"
$p$ deut $\rightarrow J/\psi \gamma X$	"
$p$ deut $\rightarrow \chi(\text{unspec}) X$	"
$\bar{p}$ deut $\rightarrow \mu^+ \mu^- X$	"
$\bar{p}$ deut $\rightarrow \gamma(s) X$	"
$\bar{p}$ deut $\rightarrow J/\psi \gamma X$	"
$\bar{p}$ deut $\rightarrow \chi(\text{unspec}) X$	"



## SUMMARIES OF EXPERIMENTS

$\pi^+$ deut $\rightarrow \mu^+ \mu^- X$	"
$\pi^+$ deut $\rightarrow \gamma(s) X$	"
$\pi^+$ deut $\rightarrow J/\psi \gamma X$	"
$\pi^+$ deut $\rightarrow \chi(\text{unspec}) X$	"
$\pi^-$ deut $\rightarrow \mu^- \mu^- X$	"
$\pi^-$ deut $\rightarrow \gamma(s) X$	"
$\pi^-$ deut $\rightarrow J/\psi \gamma X$	"
$\pi^-$ deut $\rightarrow \chi(\text{unspec}) X$	"

Particles studied  $J/\psi$ ,  $\chi(\text{unspec})$ , charm, bottom

Comments Uses the FNAL-537 spectrometer, a large-aperture general-purpose detector. Approved for 1500 hours. In progress, with 1500 hours run as of September 85. Scheduled to resume Spring 1987.

Papers NIM 219 (1984) 487, NIM 219 (1984) 491, NIM A236 (1985) 42, NIM A238 (1985) 315, and NIM A238 (1985) 321.

### FNAL-706 (Oct 1981) Approved Dec 1981, Oct 1983. A COMPREHENSIVE STUDY OF DIRECT PHOTON PRODUCTION IN HADRON INDUCED COLLISIONS

DELHI U - T Chand, B M Rajaram, R K Shivpuri  
FERMILAB - M Afdal, W Baker, D Berg, D Carey, T Droege, H Johnstad, C Johnstone, C A Nelson, Jr  
MICHIGAN STATE U - C Bromberg, D Brown, J Huston, R Miller

MINNESOTA U - R Benson, P Lukens, K Ruddick  
NORTHEASTERN U - G Alverson, W Faissler, D Garelick, G Glass, M Glaubman, I Kourbanis, C Lirakis, E Pothier, A Sinanidis, G H Wu, T Yasuda, C Yosef

PENN STATE U - S Easo, K Hartman, B Oh, T Thwaites, W Toothaker, J Whitmore

PITTSBURGH U - E Engels, Jr, P Koehler, S Manni, P F Shepard, J A Thompson, R Tosh

RAJASTHAN U - K B Bhalla, V Kumar, S Lokanathan  
ROCHESTER U - G Ballocci, W Desoi, G Fanourakis, T Ferbel, G Ginther, P Gutierrez, A Lanaro, F Lobkowicz, J Mansour, G Pedeville, E Prebys, R Roser, D Skow, P Slatery ( $\checkmark$  Spokesperson), M Zielinski

Accelerator FNAL-TEV Detector Spectrometer

#### Reactions

$p$ nucleus $\rightarrow \gamma(s) X$	400, 800 GeV/c
$\pi^+$ nucleus $\rightarrow \gamma(s) X$	530 GeV/c
$\pi^-$ nucleus $\rightarrow \gamma(s) X$	"

Comments Studies the gluon structure functions of hadrons and investigates gluon fragmentation by analyzing the production of direct  $\gamma$ 's and their accompanying hadrons in collisions of pions, kaons, and protons with a variety of nuclear targets. Approved for 1000 hours. Scheduled to run March 87.

Papers NIM A235 (1985) 332, APP B17 (1985) 435, and NIM A253 (1987) 523.

### FNAL-710 (Feb 1982) Approved Jun 1982. MEASUREMENTS OF ELASTIC SCATTERING AND TOTAL CROSS SECTIONS AT THE FERMI-LAB $\bar{p}p$ COLLIDER

BOLOGNA U - G Giacomelli, F Rimondi, S Zucchelli

CORNELL U - R Desalvo, J Orear (Spokesperson)

FERMILAB - W F Baker, D P Eartly, A J Lennox, S M Pruss, R Rubinstein (Spokesperson)

NORTHWESTERN U - N Amos, M M Block

MARYLAND U - R Ellsworth, J Goodman, G Yodh

Accelerator FNAL-COLLIDER Detector Counter, Wire chamber

#### Reactions

$\bar{p} p \rightarrow X$	300-2000 GeV ( $E_{cm}$ )
$\bar{p} p \rightarrow \bar{p} p$	"

Comments The range is  $0 < -t < 1 \text{ GeV}^2$ . Being installed (July 86).

FNAL-711 (Aug 1982) Approved Jul 1983.

### A STUDY OF THE ANGULAR AND ENERGY DEPENDENCE OF CONSTITUENT SCATTERING THROUGH MEASUREMENTS OF THE REACTION $pN \rightarrow \text{HADRON HADRON X}$

FERMILAB - M B Crisler, S H Pordes, H B White

MICHIGAN U - M A Cummings, H R Gustafson

UC, DAVIS - J T Volk

FLORIDA STATE U - C Georgiopoulos, J H Goldman, S L Hagopian, V Hagopian, D M Kaplan, D A Levinthal (Spokesperson), F V Lopez, K R Turner, C J Young

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter

#### Reactions

$p$ Be $\rightarrow$ hadron hadron X	900 GeV/c
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Comments Studies the energy, angular, and flavor dependence of the quark-quark scattering cross section. In progress, with 400 hours run as of September 85. Scheduled to resume Spring 1987.

FNAL-713 (Jan 1982) Approved Jun 1982.

### A SEARCH FOR HIGHLY IONIZING PARTICLES FOR THE D0 AREA AT FERMI-LAB

UC, BERKELEY & UC, BERKELEY, SPACE SCI DEPT - K Kinoshita, P B Price ( $\checkmark$  Spokesperson)

Accelerator FNAL-TEV Detector Plastic

#### Reactions

$\bar{p} p \rightarrow$ monopole X	300-2000 GeV ( $E_{cm}$ )
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Particles studied monopole

Comments Uses Lexan and CR-39 plastic detectors outside and phosphate glass detectors inside the vacuum pipe. Detects any highly ionizing exotic particles, not just monopoles. Setting up in 1986.

FNAL-715 (Feb 1982) Approved Jun 1982; Completed Feb 1984.

### PRECISION MEASUREMENT OF THE DECAY $\Sigma^- \rightarrow n e^- \nu$

ELMHURST COLL - E Swallow

FERMILAB - J P Berge, A Brenner, P Grafstrom,

E Jastrzebski, J Lach, J Marriner, R Raja

LENINGRAD, INP - A Denisov, V Grachev, A Kulikov,

V Schegelsky, D Seliverstov, N Smirnov, N Terentiev,

I Tkach, A Vorobyov

YALE U - P S Cooper ( $\checkmark$  Spokesperson), P Razis, L J Teig

IOWA STATE U - E W Anderson

IOWA U - E McCliment, C Newsom

CHICAGO U - S Y Hsueh, D Mueller, J Tang, R Winston, G Zapalac

Accelerator FNAL Detector Combination

Reactions Polarized beam

$\Sigma^- \rightarrow n e^- \nu_e$	250 GeV/c
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Particles studied  $\Sigma^-$

Comments Uses the apparatus of FNAL-497 augmented by a neutron detector and a double level of electron identification. Expects 100,000 polarized  $\Sigma^-$  beta decays. Ran for 820 hours.

Papers PRL 54 (1985) 2399, and PRL 57 (1986) 1526.

FNAL-720 (Jan 1982) Approved Mar 1982, Jun 1982; Completed Aug 1982.

### A SEARCH FOR $+1/3 e$ STABLE PARTICLES USING CRYOGENIC SOURCES

ARGONNE - D Frekers, W Henning, W Kutschera, M Paul,

J P Schiffer ( $\checkmark$  Spokesperson), K W Shepard

FERMILAB - C D Curtis, C W Schmidt

Accelerator FNAL Detector ?

## SUMMARIES OF EXPERIMENTS

Particles studied quark(1/3), quark(2/3)  
Papers PR D29 (1984) 791. No other papers expected.

**FNAL-721** (Jun 1982) Approved Mar 1984.

### CP VIOLATION

FERMILAB - B Cox, G G Hale, C M Jenkins, D Judd,  
 P Mazur, C T Murphy, R Rakeika, C J Serritella, R Smith,  
 F Turkot, D Wagoner, W Yang  
 ATHENS U, NUCL PHYS LAB - E Anassontzis, P Ioannou,  
 S Katsanevas, P Kostarakis, C Kourkoumelis, A Manousakis-  
 Kaftsikakis, A Markou, P Premantiatas, L Resvanis,  
 S Tzamarias, G Voulgaris  
 MCGILL U - S Conetti, M Haire, A Marchionni, D Ryan,  
 D Stairs, L Turnbull, G Zioukas  
 SHANDONG U - M He, C-H Shen, Q Shen, C-H Wang,  
 N Zhang, X Zhang  
 NORTHWESTERN U - D Buchholtz, C Guss, H Hensley,  
 D H Miller, J Rosen (Spokesperson), L Spiegel  
 ARIZONA U - M Arenton, V Bentley, J Byrd, L Cornell,  
 E J Gallas, K Lai  
 DUKE U - L Fortney, S Oh, T Turkington

Accelerator FNAL Detector Spectrometer

### Reactions

$K_L \rightarrow \pi^+ \pi^-$  5-10 GeV/c

Particles studied  $K_L$

Comments Studies CP violation in the decay of  $K_L$  produced by  $\bar{p}$ 's to see if there is any difference in the decay amplitude from that when the  $K_L$  is produced by  $p$ 's. In test stage (July 86).

**FNAL-723** (Oct 1982) Approved Mar 1984; Completed Aug 1985.

### TEST OF A GRAVITATIONAL DETECTOR AT THE FERMILAB COLLIDER

ROCHESTER U - A C Melissinos (Spokesperson), P Reiner,  
 J Rogers, J Semertzidis, W Wuensch  
 FERMILAB - W B Fowler, M Kuchnir

Accelerator FNAL-COLLIDER Detector Other

Comments Test running completed. The eventual goal is to measure the near-zone gravitational interaction between a bunch of particles stored in the accelerator and a stationary detector. The immediate goal is to detect a signal, due to the passage of the beam, that is not of electromagnetic origin.

Papers NC 62B (1981) 190, PL 104A (1984) 341, and PL 176B (1986) 233.

**FNAL-729** (Nov 1982) Approved Dec 1983; Completed Apr 1985.

### CHARM AND MULTIPARTICLE PRODUCTION IN 1 TeV PROTON-EMULSION COLLISIONS

TATA INST - T Aziz, S N Ganguli, A Gurtu  
 (✓ Spokesperson), P K Malhotra

Accelerator FNAL-TEV Detector Emulsion

### Reactions

$p$  nucleus  $\rightarrow$  charm X 1000 GeV/c

Particles studied charm

Comments Exposed 2 emulsion stacks. The emulsion was defective, and it is hoped that another exposure will be possible in 1987.

**FNAL-730** (Dec 1982) Approved Feb 1984; Completed Feb 1984.

### EMULSION EXPOSURE TO 250 GeV $\Sigma^-$

CRACOW - S Krzywdzinski, H Wilczynski, W Wolter  
 WASHINGTON U, SEATTLE - J J Lord, R J Wilkes  
 (✓ Spokesperson)

Accelerator FNAL Detector Emulsion

### Reactions

$\Sigma^-$  nucleus 250 GeV/c

Comments Ran for 4 hours. Analysis is in progress.

**FNAL-731** (Feb 1983) Approved Jul 1983.

### A PRECISION MEASUREMENT OF THE CP VIOLATION PARAMETER $\epsilon'/\epsilon$ IN THE $K^0$ SYSTEM

CHICAGO U - L Gibbons, K Nishikawa, V Papadimitriou,  
 R Patterson, Y Wah, B Winstein (✓ Spokesperson),  
 R Winston, M Woods, H Yamamoto  
 ELMHURST COLL - E C Swallow  
 FERMILAB - G Bock, R Coleman, B Hsuing, K Stanfield,  
 R Stefanski, T Yamanaka  
 SACLAY - J C Brisson, P Debu, R Douidin, P Jarry,  
 B Peyaud, R Turlay, B Vallage  
 PRINCETON U - G Gollin, G Grazer, M Karlson, J Okamitsu

Accelerator FNAL-TEV Detector Spectrometer

### Reactions

$K_L \rightarrow \pi^+ \pi^-$  50-150 GeV/c  
 $K_L \rightarrow \pi^0 \pi^0$  "

Particles studied  $K_L$

Comments A next-generation experiment following FNAL-617. A new neutral beam gives six times more flux at the same background rate. The apparatus gives five times greater acceptance for  $K_L \rightarrow 2\pi^0$ . The  $K_L$  and  $K_S$  decays are measured simultaneously in a double-beam arrangement. Has test run 1400 hours. Final run to begin April 87.

**FNAL-733** (Feb 1983, Sep 1983) Approved Nov 1983.

### STUDY OF HIGH ENERGY $\nu$ INTERACTIONS WITH THE TEVATRON WIDE BAND TRIPLET BEAM

FERMILAB - L Stutte  
 MIT - J A Boffill, J I Friedman, S Fuess, H W Kendall,  
 V Kistiakowsky, T Lyons, L Osborne, R Pitt, L Rosenson,  
 B Strongin, F E Taylor, R Verdier  
 MICHIGAN STATE U - M Abolins, R Brock (Spokesperson),  
 W G Cobau, R W Hatcher, D Owen, G J Perkins,  
 M Tartaglia, H Weerts  
 FLORIDA STATE U - J K Walker

Accelerator FNAL-TEV Detector Calorimeter

### Reactions

$\nu_\mu$  nucleus 0-500 GeV/c  
 $\bar{\nu}_\mu$  nucleus "

Comments The detector is the Lab-C 200-ton flash-chamber proportional-tube calorimeter. In addition to standard topics such as scaling, studies same-sign dimuon production, weak neutral currents, inverse  $\mu$  decay, and coherent  $\nu$  scattering. For a description of the apparatus, see the LBL-91 supplement on detectors. In progress, with 1900 hours run as of September 85. Scheduled to resume Spring 1987.

**FNAL-735** (Apr 1983, Sep 1983) Approved Dec 1983.

### SEARCH FOR A DECONFINED QUARK-GLUON PHASE OF STRONGLY INTERACTING MATTER IN $\bar{p}p$ INTERACTIONS AT $E_{cm}$ NEAR 2 TeV

DUKE U - L R Fortney, A T Goshaw, S Oh, W J Robertson,  
 W D Walker  
 FERMILAB - C Hojvat, P W Lucas, F Turkot  
 PURDUE U - R J De Bonte, A Bujak, D D Carmony,  
 J E Finn, L J Gutay (Spokesperson), A S Hirsch, N Morgan,  
 N T Porile, F A Rickey, R P Scharenberg, B C Stringfellow  
 WISCONSIN U - A Erwin, A Hasan, K Nelson, M Thompson  
 IOWA STATE U - E W Anderson  
 LIVERMORE - M Duong-Van  
 NOTRE DAME U - J M Bishop, N N Biswas, N Cason,  
 P Kenney, J Piekarczyk

Accelerator FNAL-COLLIDER Detector Spectrometer

### Reactions

$\bar{p} p$  2000 GeV ( $E_{cm}$ )

## SUMMARIES OF EXPERIMENTS

Comments Measures the transverse momentum distributions up to  $p_t = 1.4 \text{ GeV}/c$  and particle ratios for centrally produced  $p, \bar{p}, K^+, K^-, \pi^+, \pi^-$ , and  $\gamma$  as a function of the charged-particle multiplicity. Being installed (July 86).

**FNAL-740** (Sep 1983) Approved Feb 1984.

### A STUDY OF $\bar{p}p$ COLLISION USING A LARGE DETECTOR AT D0

BROOKHAVEN - S Aronson, B Gibbard, H Gordon, W Gurny, S Kahn, S Prototopescu, P Yamin  
 BROWN U - D Cutts, J Hoftun, R Lanou, R Partridge, D Pilipovic, R Zeller  
 RIO DE JANEIRO, CBPF - J Anjos, A Santoro, M Souza  
 COLUMBIA U - P Franzini, P M Tuts, S Youssef  
 FERMILAB - A Bross, C Brown, W Cooper, B Cox, G Dugan, D Eartly, H Fenker, D Finley, H E Fisk, D Green, H Haggerty, S Hansen, A Ito, M Johnson, A Jonckheere, H Jostlein, P Koehler, E Malamud, P Martin, P Mazur, J McCarthy, T Oshima, R Raja, R Smith, R Yamada  
 FLORIDA STATE U - H Goldman, S Hagopian, V Hagopian, D Kaplan, S Linn, H Wahl  
 FLORIDA U - R Belusivic, S Majewski, J Walker, A White, A Wolmelsey  
 INDIANA U - R Crittendon, A Dzierba, T Marshall, J Martin, D Zieminska, A Zieminski  
 LBL - A Clark, O Dahl, W Hofmann, L Kerth, C Klopfenstein, S Loken, R Madaras, P Oddone, A Spadafora, M L Stevenson, M Strovink, T Trippe, W Wenzel  
 MARYLAND U - S Kunori, P Rapp  
 MICHIGAN STATE U - M Abolins, R Brock, D Edmunds, J Linnemann, D Owen, B Pi, B Pope, S Stampke, M Tartaglia, H Weerts  
 NEW YORK U - J Christenson, P Nemethy, D Nestic, J Sculli  
 NORTHWESTERN U - D Buchholz, D Claes, B Gobbi, S Park  
 PENN U - R Van Berg, E Gardella, W Kononenko, R Ruland, W Selove, G Theodosiou  
 ROCHESTER U - G Blazey, P Draper, G Fanourakis, T Ferbel, F Lobkowicz, P Slattery  
 SACLAY - Y Ducros, R Feinstein, J R Hubbard, P Mangeot, B Mansoulie, J Tieger, A Zylberstein  
 SUNY, STONY BROOK - S Ahn, E Barasch, T Behnke, R Engelmann, G Finocchiaro, M L Good, P Grannis (✓ Spokesperson), D Hedin, J Lee-Franzini, M Marx, R McCarthy, K Ng, K Nishikawa, M Rijssenbeek, R D Schamberger, F Stocker  
 YALE U - N Hadley, M Zeller

Accelerator FNAL-COLLIDER Detector D0

#### Reactions

$\bar{p}p$  2000 GeV ( $E_{cm}$ )

Particles studied  $W^+, W^-, Z^0$ , higgs, top, hvy-lepton

Comments Under construction. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM 216 (1983) 45, NIM A244 (1986) 356, and NIM A248 (1986) 379.

**FNAL-741** (Aug 1981) Approved Apr 1982.

### THE COLLIDER DETECTOR AT FERMILAB

ARGONNE - D Ayres, R Diebold, E May, B Musgrave, L Nodulman, J Sauer, R Wagner, A B Wicklund  
 CHICAGO U - H Frisch, C Grosso-Pilcher, M Shochet  
 FERMILAB - M Atac, F Bedeschi, A Brenner, T Collins, T Droege, J Elias, J Freeman, I Gaines, J Grimson, D Gross, D Hanssen, H Jensen, R Kadel, H Kautzky, R Kephart, M Ono, R Thatcher, A Theriot, A Tollestrup (Spokesperson), R Yamada, J Yoh  
 FRASCATI - S Bertolucci, M Cordelli, P Giromini, P Sermoneta  
 HARVARD U - G Brandenburg, R Schwitters (Spokesperson)  
 ILLINOIS U, URBANA - G Ascoli, B Eisenstein, L Holloway, U Kruse  
 KEK - S Inaba, M Mishina, K Ogawa, F Takasaki, Y Watase

LBL - W Carithers, W Chinowsky, K Shinsky  
 PISA U - G Bellettini, R Bertani, L Bosisio, C Bradaschia, R DelFabbro, E Focardi, M A Giorgi, A Menzione, L Ristori, A Scribano, G Tonelli  
 PURDUE U - V Barnes, R S Christian, C Davis, A F Garfinkel, A Laasanen  
 TEXAS A AND M - P McIntyre, T Meyer, R Webb  
 TSUKUBA U - Y Asano, S Kim, K Kondo, S Miyashita, H Miyata, S Mori, I Nakano, Y Takaiwa, K Takikawa, Y Yasu  
 WISCONSIN U - D Cline, R Loveless, R Morse, L Pondrom, D Reeder, J Rhoades, M Sheaff

Accelerator FNAL-COLLIDER Detector CDF

#### Reactions

$\bar{p}p$  500-2000 GeV ( $E_{cm}$ )

Particles studied  $W^+, W^-, Z^0$ , higgs, top

Comments Being installed (October 86). For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM 204 (1983) 351, NIM 204 (1983) 361, NIM 205 (1983) 113, NIM 216 (1983) 127, NIM 219 (1984) 472, JP 45 (1984) 333, and NIM A238 (1985) 18.

**FNAL-743** (Sep 1983) Approved Dec 1983; Completed Aug 1985.

### CHARM PRODUCTION IN $pp$ COLLISIONS WITH LEBC-FMPS AT 1 TeV

AACHEN, TECH HOCHSCH, III PHYS INST - V Commichau, A Roth, W Struczinski  
 BRUSSELS U, IIHE - J Lemonne, B Vonck, J Wickens  
 CERN - J J Hernandez, J Hrubec, M Iori, H Leutz, A Poppleton, S Reucroft (✓ Spokesperson), M C Touboul  
 DUKE U - A Goshaw, W Robertson, W Walker, C F Wild  
 FERMILAB - R Dixon, H C Fenker, J M Marrifino, M Nikolic, L Voyvodic  
 KANSAS U - R Ammar, S Ball, R Davis, J Gress, N Kwak, X Liu  
 MICHIGAN U - R C Ball, C T Coffin, T O Dersham, L W Jones, I D Leedom, B P Roe, M F Weber  
 MICHIGAN STATE U - C Bromberg, R Miller, A Nguyen  
 MONS U - J-F Baland, V P Henri, P Legros, P Pilette  
 NOTRE DAME U - R Brun, G E Canough, N Giokaris, S Mikocki, J Poirier  
 VANDERBILT U - C Roos, M F Senko, J Waters, M Webster  
 TATA INST - T Aziz, S Banerjee, S N Ganguli, A Gurtu, P K Malhotra, R Raghavan, A Subramanian  
 BERLIN, DAW - U Gensch, D Knauss, G E Mendez, T Naumann, H Nowak  
 INNSBRUCK U & VIENNA, OAW - P Girtler, D Kuhn, G Neuhofer, K Rasner

Accelerator FNAL-TeV Detector HBC-LEBC-HYB, FMPS

#### Reactions

$pp \rightarrow \text{charm X}$  800 GeV/c

Particles studied  $D^0, D^+, D_s^+, \Lambda_c^+$

Comments Uses LEBC from CERN-NA-027 (a similar experiment at 400 GeV) as the vertex detector. The main aim is to measure precisely the charm total cross section at 39-GeV c.m. energy to compare with a similar measurement at 27 GeV. Took 1256 KPIX.

Papers PL 178B (1986) 124, and PL 183B (1987) 110.

**FNAL-744** (Sep 1983) Approved Nov 1983; Completed Aug 1985.

### HIGH STATISTICS STUDIES OF CHARGED CURRENT INTERACTIONS USING THE TEVATRON QUAD TRIPLET BEAM

CHICAGO U - F Merritt (Spokesperson), M Oreglia, P Reutens, B Schumm  
 COLUMBIA U - P Auchincloss, K Bachman, R Berstein, R Blair, C Foudas, W C Lefmann, S Mishra, E Oltman, F Sciulli (Spokesperson), M Shaevitz, W Smith

## SUMMARIES OF EXPERIMENTS

FERMILAB - F O Borcharding, D A Edwards, H E Fisk,  
D Jovanovic, Q A Kerns, M Lamm, W Marsh, W Merritt,  
P Rapidis

ROCHESTER U - A Bodek, H Budd, K Lang

Accelerator FNAL-TEV Detector LAB-E

Reactions

$\nu_\mu$  nucleus  $\rightarrow$  muon(s) X < 400 GeV/c  
 $\bar{\nu}_\mu$  nucleus  $\rightarrow$  muon(s) X "

Comments Studies opposite-sign dimuon events, same-sign dimuon events, and structure functions. Continues work of FNAL-616 and -701. Ran for 1900 hours.

**FNAL-745** (Sep 1983) Approved Dec 1983.

**MUON NEUTRINO EXPERIMENT USING THE TOHOKU HIGH RESOLUTION ONE METER BUBBLE CHAMBER**

BROWN U - D Brick, M Widgoff

FERMILAB - N Gelfand, T Murphy

INDIANA U - E D Alyea, Jr

BEIJING, IHEP - C Mao, Y Tai, S Wang, Y Wu, S W Xu,  
C Zhao

MIT - D A Goloskie, E S Hafen, P Haridas, R I Hulsizer,  
M Mars, C Milstene, I A Pless, B F Wadsworth,  
R K Yamamoto

NAGOYA U - S Fukui

OAK RIDGE - H O Cohn

TECHNION - S Dado, J Goldberg

TEL AVIV U - G Alexander, G Bela, Y Gnat, J Grunhaus,  
A Levy

TENNESSEE U - W M Bugg, G T Condo, T Handler,  
J Hargis, E L Hart, J Shimony

TOHOKU U - K Abe, Y Chiba, K Furuno, K Hasegawa,  
J Katayama, N Kato, T Kitagaki (Spokesperson),

H Kurino, S Nakai, T Nakajima, K Numano, H Sagawa,  
M Sasaki, T Takayama, K Tamai, S Tanaka, A Yamaguchi,  
Y Yanokura, H Yuta

TOHOKU GAKUIN U - M Higuchi, Y Hoshi, M Sato

Accelerator FNAL-TEV Detector HLBC-1M

Reactions

$\nu_\mu$  nucleus  $\rightarrow$  charm X < 500 GeV/c  
 $\nu_\mu$  nucleus  $\rightarrow$  muon X "

Particles studied  $D^+$ ,  $D^0$ ,  $D_s^+$ ,  $A_s^+$

Comments Uses the Tohoku high-resolution 1-meter freon bubble chamber. Studies charm production, and neutrino interactions in the high  $Q^2$  region. In progress, with 193 KPIX taken as of September 85. Scheduled to resume Spring 1987.

**FNAL-747** (Feb 1984) Approved Apr 1985; Completed Aug 1985.

**A SEARCH FOR FRACTIONALLY CHARGED PARTICLES AT THE TEVATRON**

UC, IRVINE - A A Hahn (Spokesperson), G L Shaw

FERMILAB - R Tokarek

LBL - H S Matis, H G Pugh

LOS ALAMOS - K Lackner, R Slansky

SAN FRANCISCO STATE U - R Bland, C L Hodges

CAL TECH - R Milner

HEWLETT-PACKARD & LBL - G Hirsch

LIVERMORE - C D Hendricks

ROCHESTER U - D Elmore

TORONTO U - K H Chang

Accelerator FNAL-TEV Detector Other

Reactions

p nucleus  $\rightarrow$  quark X 1000 GeV/c

Particles studied quark

Comments Searches for fractionally charged particles stopped in tanks of freon or in mercury.

**FNAL-750** (1984) Approved Jul 1984; Completed Jul 1985.

**STUDY OF MULTIPARTICLE PRODUCTION IN INTERACTIONS OF 1 TeV PROTONS WITH EMULSION NUCLEI**

DELHI U - T Chand, A Gaur, S K Jha, B Rajaram,  
R K Shivpuri (Spokesperson)

Accelerator FNAL-TEV Detector Emulsion

Reactions

p nucleus 1000 GeV/c

Comments Exposed one emulsion stack.

**FNAL-751** (Jun 1984) Approved Jul 1984; Completed Apr 1985.

**INTERACTIONS OF PROTONS AT 1 TeV IN NUCLEAR EMULSION**

SUNY, BUFFALO - P L Jain ( $\checkmark$  Spokesperson)

Accelerator FNAL-TEV Detector Emulsion

Reactions

p nucleus 1000 GeV/c

Comments Exposed 1 emulsion stack.

Papers PR D34 (1986) 2886, PL B (submitted), and PR D (submitted).

**FNAL-753** (Sep 1984) Approved Nov 1984; Completed Jul 1985.

**IMPROVING THE DEFLECTION OF HIGH ENERGY PARTICLE BEAMS BY CHANNELING IN BENT CRYSTALS OF SI AND Ge**

CHALK RIVER, AECL - J S Forster ( $\checkmark$  Spokesperson),  
H Hatton, I V Mitchell, R J Toone

FERMILAB - S I Baker, R A Carrigan, Jr

BELL NORTHERN RESEARCH, OTTAWA - G Este

NEW MEXICO U - J A Ellison

SUNY, ALBANY - W M Gibson, R Wijayawardana

Accelerator FNAL Detector Wire chamber

Reactions

charged<sup>+</sup> crystal 30-200 GeV/c

Comments Also uses Si and Ge detectors. Continues studies of FNAL-660. See also FNAL-754. Ran for 150 hours.

**FNAL-754** (1984) Approved Nov 1984.

**CRYSTAL CHANNELING TESTS IN M-BOTTOM INCLUDING FOCUSING WITH DEFORMED CRYSTALS AND STUDIES OF HIGH Z CRYSTALS**

SUNY, ALBANY - S Alam, W Gibson, I J Kim, C R Sun  
( $\checkmark$  Spokesperson), F Sun, R Wijayawardana

FERMILAB - S Baker, R Carrigan, J Morfin, T Toohig

GENERAL ELECTRIC, SCHENECTADY - R Wentorf

CASE WESTERN RESERVE U - G E Welsch

SANDIA - W Beezhold

Accelerator FNAL Detector Wire chamber

Reactions

charged<sup>+</sup> crystal 20-200 GeV/c

charged<sup>-</sup> crystal "

Comments Continues studies of FNAL-660. See also FNAL-753. Unscheduled as of November 86.

**FNAL-756** (Oct 1984) Approved Jun 1985.

**MEASUREMENT OF THE MAGNETIC MOMENT OF THE  $\Omega^-$**

WASHINGTON U, SEATTLE - K B Luk (Spokesperson)

FERMILAB - R Rameika

MICHIGAN U - P Border

MINNESOTA U - C James

RUTGERS U - P Petersen

Accelerator FNAL Detector Spectrometer

## SUMMARIES OF EXPERIMENTS

### Reactions

$p \text{ Be} \rightarrow \Omega^- X$                       800 GeV/c  
 $\Sigma^- \text{ Cu} \rightarrow \Omega^- X$                     300-800 GeV/c

### Particles studied $\Omega^-$

Comments Approved for 1000 hours. Scheduled to run Spring 1987.

**FNAL-758** (Mar 1985) Approved Mar 1985; Completed Apr 1985.

### STUDY OF THE MECHANISM OF MULTIPARTICLE PRODUCTION IN EMULSION NUCLEI AT 800 GeV PROTONS

TOHO U - M Kazuno, H Shibuya

Accelerator FNAL-TEV    Detector Emulsion

### Reactions

$p \text{ nucleus}$                       800 GeV/c

Comments Exposed 2 emulsion stacks.

**FNAL-759** (Mar 1985) Approved Mar 1985; Completed Apr 1985.

### A STUDY OF NUCLEAR INTERACTIONS OF 800 GeV PROTONS IN EMULSION

KOBE U - T Abe, G Fujioka, K Fujiwara, H Fukushima,  
 T Hara, H Takahashi, K Taruma, Y Tsuzuki  
 (✓ Spokesperson)

OSAKA CITY U - M Teranaka

OSAKA PREFECTURE U, SCI EDUC INST - H Okabe,  
 J Yokota

Accelerator FNAL-TEV    Detector Emulsion

### Reactions

$p \text{ nucleus}$                       800 GeV/c

Comments Exposed 2 emulsion stacks.

**FNAL-760** (Mar 1985) Approved Jun 1985.

### INVESTIGATION OF THE FORMATION OF CHARMONIUM STATES USING THE $\bar{p}$ ACCUMULATOR RING

FERMILAB - V Bharadwaj, J Griffin, S Holmes, W Kells,  
 J MacCarthy, J MacLachlan, J Peoples, P Rapisdi, D Young  
 FERRARA U - R Calabrese, P Dalpiaz, P Ferretti-Dalpiaz,  
 E Lupi, F Petrucci, M Saurie

GENOA U - M Mainelli, M Mattera, F Tommassini,  
 V Valbusa

TURIN U - G Borreani, R Cester (Spokesperson),

E Menichetti, S Palestini, N Pastrone, G Rinaudo, L Tecchio

Accelerator FNAL    Detector Calorimeter

### Reactions

$\bar{p} p \rightarrow \psi(\text{unspec})$                       3-7 GeV/c

$\bar{p} p \rightarrow 2K^+ 2K^-$                       "

$\bar{p} p \rightarrow \gamma's$                       "

$\bar{p} p \rightarrow e^+ e^- \gamma(s)$                       "

$\bar{p} p \rightarrow e^+ e^- \pi^+ \pi^- \pi^0$                       "

Particles studied charmonium

Comments Uses a gas-jet target. Unscheduled (July 86).

**FNAL-761** (Apr 1985) Approved Jun 1985.

### AN ELECTROWEAK ENIGMA: HYPERON RADIATIVE DECAYS

FERMILAB - E Jastrzembski, J Lach, J Marriner

LENINGRAD, INP - V Golovtsov, A Krivshich, V Schegelsky,  
 N Smirnov, N Terentyev, L Uvarov, A A Vorobyev

(Spokesperson)

IOWA U - E McCliment, C Newsom, E Norbeck

YALE U - P S Cooper

Accelerator FNAL-TEV    Detector Spectrometer, Transition radiation

### Reactions

$p \text{ nucleus} \rightarrow \Sigma^+ X$                       800 GeV/c  
 $p \text{ nucleus} \rightarrow \Xi^- X$                       "

### Particles studied $\Sigma^+, \Xi^-$

Comments Measures branching fractions and asymmetry parameters of  $\Sigma^+ \rightarrow p\gamma$  and  $\Xi^- \rightarrow \Sigma^-\gamma$  decays. Unscheduled (July 86).

**FNAL-762** (Jun 1985) Approved Jun 1985; Completed Jul 1985.

### CASCADE SHOWERS ORIGINATED IN PROTON-NUCLEUS COLLISIONS

KOBE U - S Dake (Spokesperson), K Nakata, H Oda

TOKYO U, COSMIC RAY LAB - T Ogata, T Saito, T Tabuki

OSAKA U - T Tominaga

OKAYAMA U - M Fuki

AOYAMA GAKUIN U - T Shibata

Accelerator FNAL-TEV    Detector Emulsion

### Reactions

$p \text{ nucleus}$                       800 GeV/c

Comments Emulsion and lead plates are interleaved. Exposed 18 such stacks.

**FNAL-763** (Jun 1985) Approved Jun 1985; Completed Jul 1985.

### PROTON-NUCLEUS INTERACTIONS AT TEVATRON ENERGY

TOKYO U, COSMIC RAY LAB - T Ogata (Spokesperson),  
 T Tabuki

KOBE U - S Dake, K Nakata, H Oda

OSAKA U - T Tominaga

OKAYAMA U - M Fuki

Accelerator FNAL-TEV    Detector Emulsion

### Reactions

$p \text{ nucleus}$                       800 GeV/c

Comments Emulsion and metal plates are interleaved. Exposed 2 stacks.

**FNAL-764** (Jun 1985) Approved Jun 1985; Completed Jul 1985.

### THE EXCLUSIVE INVESTIGATION OF MULTIPLE PRODUCTION IN RAPIDITY SPACE

HIROSAKI U - K Ishikawa, H Nanjo (✓ Spokesperson),  
 Y Noto

Accelerator FNAL-TEV    Detector Emulsion

### Reactions

$p \text{ nucleus}$                       800 GeV/c

Comments Emulsion and acryl plates are interleaved. Exposed 1 stack.

**FNAL-765** (Jun 1985) Approved Jun 1985; Completed Jul 1985.

### TRANSVERSE MOMENTUM MEASUREMENT OF SECONDARY PARTICLES IN PROTON-EMULSION COLLISIONS AT 800 GeV

OKAYAMA U - M Fuki, K Imaeda (✓ Spokesperson),  
 H Kobayashi

Accelerator FNAL-TEV    Detector Emulsion

### Reactions

$p \text{ nucleus}$                       800 GeV/c

Comments Exposed 7 emulsion stacks.

**FNAL-766** (Jul 1985) Approved Jul 1985; Completed Oct 1985.

### NEUTRON ENERGY SPECTRUM MEASUREMENTS IN TEVATRON TUNNEL — APPLICATION TO SSC

## SUMMARIES OF EXPERIMENTS

LBL - J McCaslin (Spokesperson), B Swanson

Accelerator FNAL-TEV Detector Counter

Reactions

$p$  nucleus  $\rightarrow n$  X —

Comments A test relevant to radiation damage at the SSC.

**FNAL-769** (Nov 1985) Approved Dec 1985.

**PION AND KAON PRODUCTION OF CHARM AND CHARM-STRANGE STATES**

RIO DE JANEIRO, CBPF - G A Alves, J C C Anjos,

H da Motta, A F S Santoro, M H G Souza

FERMILAB - J A Appel ( $\checkmark$  Spokesperson), R Dixon,

H Fenker, D Green, P M Mantsch, T Nash, K Sliwa,

W J Spalding, M Streetman

NORTHEASTERN U - I D Leedom, S Reucroft

TORONTO U - S B Bracker, C Gay, R Jedicke, G J Luste

TUFTS U - T Kafka, J Metheny, R Milburn, A Napier,

J Schneps

WISCONSIN U - M Sheaff

YALE U - P Karchin

Accelerator FNAL Detector TPS

Reactions

pion nucleus  $\rightarrow$  charm X 250 GeV/c

kaon nucleus  $\rightarrow$  charm X "

Particles studied  $D^0$ ,  $D^+$ ,  $D^-$ ,  $D^*(2010)$ ,  $D_s^+$ ,  $D_s^-$ ,  $\Lambda_c^+$

Comments A sequel to FNAL-691. Scheduled to start March 87.

**FNAL-77C** (Dec 1985) Approved Dec 1985.

**NEUTRINO PHYSICS AT THE TEVATRON**

CHICAGO U - F Merritt, M Oreglia, P Reutens, B Schumm

COLUMBIA U - P Auchincloss, K Bachman, R Berstein,

R Blair, C Foudas, W C Lefmann, S Mishra, E Oltman,

F Sciulli, M Shaevitz, W Smith ( $\checkmark$  Spokesperson)

FERMILAB - F O Borcherding, D A Edwards, H E Fisk,

D Jovanovic, Q A Kerns, M Lamm, W Marsh, W Merritt,

P Rapidis

ROCHESTER U - A Bodek, H Budd, K Lang

Accelerator FNAL-TEV Detector LAB-E

Reactions

$\nu_\mu$  nucleus  $\rightarrow$  muon(s) X < 600 GeV/c

$\bar{\nu}_\mu$  nucleus  $\rightarrow$  muon(s) X "

Comments Uses flash ADC calorimeter drift chamber readout. A continuation of FNAL-744. Scheduled to run in 1987.

**FNAL-772** (Mar 1986) Approved 1986.

**STUDY OF THE NUCLEAR ANTIQUARK SEA VIA  $pN \rightarrow$  DIMUONS**

LOS ALAMOS - G Garvey, J Moss (Spokesperson), J-C Peng

SUNY, STONY BROOK - R L McCarthy

FERMILAB - C N Brown, W E Cooper, A M Jonckheere

ILLINOIS U, CHICAGO - M Adams

Accelerator FNAL-TEV Detector Spectrometer

Reactions

$p$  deut  $\rightarrow \mu^+ \mu^- X$  900 GeV/c

$p$  Ca  $\rightarrow \mu^+ \mu^- X$  "

Comments A precise measurement of the A dependence of the Drell-Yan process with particular emphasis on the kinematic region ( $M > 4$  GeV,  $x > 0.2$ ) most sensitive to beam-valence-quark target-antiquark annihilation. Uses the FNAL-605 spectrometer. Scheduled to run Spring 1987.

**FNAL-773** (Mar 1986) Approved 1986.

**MEASUREMENT OF THE PHASE DIFFERENCE BETWEEN  $\eta_{00}$  AND  $\eta_{+-}$  TO A PRECISION OF  $1^\circ$**

CHICAGO U - Y W Wah, B Winstein, R Winston

ELMHURST COLL & CHICAGO U - E C Swallow

FERMILAB - G J Bock, R N Coleman, Y B Hsiung,

K C Stanfield, R Stefanski, T Yamanaka

PRINCETON U - G D Gollin ( $\checkmark$  Spokesperson),

J K Okamitsu

SACLAY - P Debu, B Peyaud, R Turlay

Accelerator FNAL-TEV Detector Spectrometer

Reactions

$K_L \rightarrow \pi^+ \pi^-$  50-150 GeV/c

$K_L \rightarrow \pi^0 \pi^0$  "

$K_S \rightarrow \pi^+ \pi^-$  "

$K_S \rightarrow \pi^0 \pi^0$  "

Particles studied  $K_L$ ,  $K_S$

Comments CPT conservation requires the phase difference to be  $< 1^\circ$ . The current value is approximately  $10_{-5}^{+10}$ . Adds an additional regenerator to the FNAL-731 spectrometer. A double  $K_L$  beam is incident on the spectrometer, which has 804 lead glass blocks and four drift chambers. Scheduled to run in 1989.

**FNAL-775** (May 1986) Approved 1986.

**THE UPGRADED COLLIDER DETECTOR AT FERMILAB**

ARGONNE - R Diebold, W Li, L Nodulman, J Proudfoot,

R Rezmer, P Schoessow, D Underwood, R Wagner,

A B Wicklund

BRANDEIS U - J Bensinger, C Blocker, M Contreras,

L DeMortier, P Kesten, L Kirsch, H Piekarz, S Tarem

CHICAGO U - D Amidei, M Campbell, H Frisch, C Grosso-

Pilcher, J Hauser, T Liss, G Redlinger, H Sanders,

M Shochet, R Snider, J Ting, Y Tsay

FERMILAB - M Atac, E Barsotti, P Berge, M Binkley,

J Bofill, J T Carroll, J Cooper, C Day, F Dittus, T Droege,

J Elias, G W Foster, J Freeman, I Gaines, J Grimson,

J Huth, C van Ingen, H Jensen, R Kadel, R Kephart,

A Mukherjee, C Nelson, C Newman-Holmes, J O'Meara,

A Para, J Patrick, D Quarrie, S Segler, D Theriot,

A Tollestrup (Spokesperson), K Turner, R Vidal, R Wagner,

T Yamanouchi, G P Yeh, J Yoh

FRASCATI - S Bertolucci, M Cordelli, M Curatolo,

B Esposito, P Giromini, S Miozzi, S Miscetti, A Sansoni

HARVARD U - G Brandenburg, D Brown, R Carey,

R St Denis, M Eaton, A Feldman, E Kearns, J Oliver,

E Sadowski, R Schwitters (Spokesperson), M Shapiro

ILLINOIS U, URBANA - G Ascoli, S Bhadra, R Downing,

S Errede, L Holloway, I Karlinger, H Keutelian, U Kruse,

R Sard, V Simaitis, D Smith, T Westhusing

KEK - Y Arai, Y Fukui, S Mikamo, M Mishina

LBL - W Carithers, W Chinowsky, R Ely, M Franklin,

C Haber, R Harris, B Hubbard, J Siegrist

PENN U - D Connor, L Gladney, S Hahn, N Lockyer,

M Miller, T Rohlay, R VanBerg, J Walsh, H Williams

PISA U - G Appollinari, F Bedeschi, G Bellettini, N Bonavita,

L Bosisio, F Cervelli, M Dell'Orso, R Del Fabbro, E Focardi,

P Giannetti, M A Giorgi, A Menzione, R Paoletti, G Punzi,

L Ristori, A Scribano, P Sestini, A Stefanini, G Tonelli,

F Zetti

PURDUE U - V Barnes, A Byon, K Chadwick, A F Garfinkel,

S Kuhlmann, A Laasanen, M Schub, J Simmons,

A Di Virgilio

ROCKEFELLER U - S Belforte, T Chapin, G Chiarelli,

N Giokaris, K Goulianos, R Plunkett, S White

RUTGERS U - A Beretvas, T Devlin, U Joshi, K Kazlauskis,

N Pearson, T Watts

TEXAS A AND M - J Buchholz, S Cihangir, D DiBitonto,

F Marchetto, P McIntyre, T Meyer, R Webb

TSUKUBA U - F Abe, Y Hayashide, M Ito, T Kamon,

S Kanda, Y Kikuchi, S Kim, K Kondo, M Masuzawa,

T Mimashi, S Miyashita, H Miyata, S Mori, Y Morita,

T Ozaki, M Sekiguchi, M Shibata, Y Takaiwa, K Takikawa,

A Yamashita, K Yasuoka

WISCONSIN U - J Bellinger, D Carlsmith, D Cline, R Hand-

ler, J Jaske, G Ott, L Pondrom, J Rhoades, M Sheaff,

J Skarha, T Winch

## SUMMARIES OF EXPERIMENTS

Accelerator FNAL-COLLIDER Detector CDF

Reactions

$\bar{p} p$  500-2000 GeV (E<sub>cm</sub>)

**INS-ES-101** Completed 1984.

**STUDY OF HIGH ENERGY PHOTONUCLEAR FRAGMENTATION**

TOKYO U, INS - S Shibata (✓ Spokesperson), et al.

Accelerator TOKYO Detector ?

Reactions

$\gamma$  nucleus

**INS-ES-102** Completed 1984.

**CHANNELLING RADIATION BY AN ELECTRON BEAM AT SEVERAL HUNDRED MeV**

TOKYO U - F Fujimoto, et al.

Accelerator TOKYO Detector ?

Reactions

$\gamma$  crystal 500 MeV/c

**INS-ES-103** Completed Oct 1985.

**MEASUREMENT OF THE BACKWARD DIFFERENTIAL CROSS SECTION FOR  $\gamma d \rightarrow \pi^0 d$**

TOKYO U, INS - A Imanishi, T Miyachi (✓ Spokesperson),  
H Tezuka

TOKYO U OF AGRIC TECH - T Emura, M Nishimura,  
K Takahashi

HIROSHIMA U - M Asai, S Kasai, Y Morita, Y Sumi

HIROSHIMA SHUDO U - K Baba

MEIJI COLL, PHARMACY - Y Wada

KOREA U - Y Kim

Accelerator TOKYO Detector Single-arm spectrometer

Reactions

$\gamma$  deut  $\rightarrow \pi^0$  deut 0.5-1.0 GeV (E<sub>lab</sub>)

Comments Measured over c.m. angles 140 to 156°. Studied the effect of the double scattering term and found no indication for dibaryon resonances.

**INS-ES-105** Completed 1984.

**MEASUREMENT OF  $\gamma^4 \text{He} \rightarrow pN(p)$  ANYTHING**

TOKYO U, INS - S Homma (✓ Spokesperson), M Koike,  
H Okuno, M Sudo, M Torikoshi

AKITA U - A Sasaki

TOHOKU U - Y Fujii

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma \text{He} \rightarrow p n X$  0.2-0.45 GeV (E<sub>lab</sub>)

$\gamma \text{He} \rightarrow p p X$  "

Comments A continuation of INS-19-2.

**INS-ES-107** Completed 1985.

**CUMULATIVE EFFECT IN PHOTONUCLEAR REACTIONS**

TOKYO U, INS - Y Murata, et al.

Accelerator TOKYO Detector ?

**INS-ES-110** Completed 1985.

**PHOTONUCLEAR SPALLATION REACTIONS IN VARIOUS NUCLEI**

TOKYO U, INS - S Shibata (✓ Spokesperson), et al.

Accelerator TOKYO Detector ?

**INS-ES-111** Started Jan 1986; Completed Mar 1986.

**MEASUREMENT OF TRIPLET PHOTOPRODUCTION BY POLARIZED  $\gamma$ 's**

HIROSHIMA U - I Endo (✓ Spokesperson), M Harada,  
S Kasai, K Niki, Y Sumi, M Tobiyama

TOKYO U, INS - M Mutou, H Tsujikawa, K Watanabe,  
K Yoshida

HIROSHIMA SHUDO U - K Baba

Accelerator TOKYO Detector Counter

Reactions Polarized beam

$\gamma e^- \rightarrow e^+ e^- e^-$  120-400 MeV/c

**INS-ES-112** Completed Jul 1986.

**MEASUREMENT OF THE BACKWARD DIFFERENTIAL CROSS SECTION FOR  $\gamma d \rightarrow \pi^0 d$**

TOKYO U, INS - M Koike, T Miyachi (✓ Spokesperson),  
M Mutou, K Yoshida

TOKYO U OF AGRIC TECH - T Emura, M Nishimura,  
O Nitoh, T Takahashi, J Yoshizawa

TOKYO METROPOLITAN U - S Kitamura

HIROSHIMA U - M Asai

HIROSHIMA SHUDO U - K Baba

Accelerator TOKYO Detector Single-arm spectrometer

Reactions

$\gamma$  deut  $\rightarrow \pi^0$  deut 0.4-0.8 GeV (E<sub>lab</sub>)

Comments Uses a tagged  $\gamma$  beam. Measures over the c.m. angles 160 to 170°.

**INS-ES-113** Approved 1985; Started 1986.

**STUDY OF DIBARYON RESONANCES USING  $\gamma d$  INTERACTIONS**

HIROSHIMA U - S Asai, I Endo, M Harada, H Hasai,  
K Iwatani, S Kasai, K Niki, Y Sumi (✓ Spokesperson),  
T Tobiyama

HIROSHIMA SHUDO U - K Baba

KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki

MEIJI COLL, PHARMACY - Y Wada

SAGA UNIV, JAPAN - H Ito

SASKATCHEWAN U - C Rangacharyulu

TOKYO INST TECH - H Shimizu

TOKYO U, INS - T Hasegawa, S Kato, K Maruyama,  
Y Murata, M Mutou, K Yoshida

Accelerator TOKYO Detector TAGX

Reactions

$\gamma$  deut  $\rightarrow$  charged(s)

Comments Uses a tagged  $\gamma$  beam with a large duty factor (> 10%), and a large-aperture magnetic spectrometer (TAGX) which consists of an analyzer magnet with a large gap (60 cm), two sets of scintillation counter hodoscopes, and a central drift chambers. The geometrical acceptance is about  $\pi$  sr.

**INS-14-3** Approved May 1977; Started Jul 1979; Completed 1981.

**MEASUREMENT OF THE DIFFERENTIAL CROSS SECTION FOR THE REACTION  $\gamma p \rightarrow \eta p$  WITH A TAGGED  $\gamma$  BEAM**

TOKYO U, INS - S Homma (✓ Spokesperson), M Kanazawa,  
K Maruyama, Y Murata, H Okuno

AKITA U - A Sasaki

HIROSHIMA U - T Taniguchi

Accelerator TOKYO Detector Wide-angle spectrometer

Reactions

$\gamma p \rightarrow \eta p$  800-1000 MeV (E<sub>lab</sub>)

**INS-14-4** Approved May 1977; Started May 1979; Completed 1981.

**MEASUREMENT OF THE POLARIZED TARGET ASYMMETRY OF THE REACTION  $\gamma n \rightarrow \pi^- p$  IN THE SECOND RESONANCE REGION**

## SUMMARIES OF EXPERIMENTS

NAGOYA U - K Fujii, H Hayashii, S Iwata, R Kajikawa  
(√ Spokesperson), A Miyamoto, T Nakanishi, Y Ohashi,  
S Okumi, H Ozaki, T Tauchi, T Yamaki

OSAKA U - Y Takeuchi

NAGOYA UNIV COLL MEDICAL TECH - K Mori

Accelerator TOKYO Detector Double-arm spectrometer

Reactions Polarized target

$\gamma n \rightarrow \pi^- p$  0.55-0.9 GeV ( $T_{lab}$ )

Comments Measured for c.m. angles between 60 and 120°.

Papers NP B187 (1981) 53.

INS-15-1 Approved Feb 1979; Completed Apr 1981.

**MEASUREMENT OF THE RECOIL PROTON  
POLARIZATION IN THE REACTION  $\gamma p \rightarrow \pi^0 p$**

TOKYO U, INS - A Imanishi, S Kato (√ Spokesperson),

T Miyachi, K Sugano, K Toshioka, K Ukai

TOKYO METROPOLITAN U - M Chiba

KYOTO U - K Egawa, T Ishii

TOHOKU GAKUIN U - Y Yoribayashi

TOKYO U OF AGRIC TECH - K Joh, H Nara, T Noguchi,

T Shinohara, K Takahashi

MEIJI COLL, PHARMACY - Y Wada

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma p \rightarrow \pi^0 p$  600-1100 MeV ( $T_{lab}$ )

$\gamma p \rightarrow \gamma p$  "

Papers NP B168 (1980) 1, NC 63A (1981) 57, and NP B247  
(1984) 313.

INS-15-2 Approved Feb 1979; Completed Dec 1980.

**MEASUREMENT OF  $\gamma p \rightarrow (\pi^\pm \text{ OR } p)X$  WITH A  
TAGGED  $\gamma$  BEAM**

AKITA U - A Sasaki (Spokesperson), et al.

Accelerator TOKYO Detector ?

Reactions

$\gamma p \rightarrow \pi^+ X$  < 1.3 GeV/c

$\gamma p \rightarrow \pi^- X$  "

$\gamma p \rightarrow p X$  "

INS-15-3 Approved Feb 1979; Started Jan 1980; Completed  
Sep 1980.

**MEASUREMENT OF THE BACKWARD DIFFEREN-  
TIAL CROSS SECTION FOR THE  $(\gamma, p)$  REACTION  
OFF DEUTERIUM AND CARBON**

HIROSHIMA U - K Baba, I Endo (√ Spokesperson),

H Fukuma, K Inoue, T Kawamoto, T Ohsugi, Y Sumi,

T Takeshita, S Uehara, Y Yano

INDUSTRIAL MEDICAL COLL, KITAKYUSHU - T Maki

Accelerator TOKYO Detector Single-arm spectrometer

Reactions

$\gamma \text{ deut} \rightarrow p n$  350-850 MeV ( $T_{lab}$ )

$\gamma \text{ deut} \rightarrow p X$  "

$\gamma \text{ deut} \rightarrow \pi^0 \text{ deut}$  "

$\gamma \text{ nucleus} \rightarrow p X$  "

Papers PRL 48 (1982) 729, PL 113B (1982) 459, PR C28  
(1983) 286, and NP A415 (1984) 462.

INS-15-4 Approved Feb 1979; Started Sep 1980; Completed  
Oct 1980.

**PHOTOPRODUCTION OF  $\ell^- \ell^+$  OFF NUCLEI**

TOKYO U, INS - H Terazawa (√ Spokesperson), et al.

Accelerator TOKYO Detector Wide-angle spectrometer

Reactions

$\gamma \text{ nucleus} \rightarrow e^- e^+ X$  740-980 MeV ( $T_{lab}$ )

INS-16-1 (Mar 1980) Approved Mar 1980; Started Apr 1980;  
Completed Jul 1980.

**MEASUREMENT OF POLARIZED TARGET ASYM-  
METRY IN THE REACTION  $\gamma d \rightarrow pn$  IN THE EN-  
ERGY RANGE BETWEEN 300 AND 650 MeV**

TOKYO U, INS - T Ishii, S Kato (√ Spokesperson), H Okuno,  
T Shimomura, K Ukai

NAGOYA U - N Awaji, K Fujii, H Hayashii, N Horikawa

(√ Spokesperson), S Iwata, R Kajikawa, A Miyamoto,

K Mori, T Nakanishi, Y Ohashi, S Okumi, H Ozaki,

T Tauchi, T Yamaki

OSAKA U - Y Takeuchi

Accelerator TOKYO Detector Single-arm spectrometer

Reactions Polarized target

$\gamma \text{ deut} \rightarrow p n$  0.30-0.65 GeV/c

Comments Same apparatus as INS-14-4.

Papers PL 110B (1982) 441.

INS-16-2 (May 1980) Approved Jun 1980; Started Apr 1981;  
Completed Aug 1981.

**MEASUREMENT OF THE  $\pi^-$  PHOTOPRODUC-  
TION RATE ON NUCLEUS TARGET**

NIHON U, TOKYO - T Hayakawa, N Nakamura, T Ozaki,  
M Saito, K Sato (√ Spokesperson)

Accelerator TOKYO Detector Single-arm spectrometer

Reactions

$\gamma \text{ nucleus} \rightarrow \pi^- X$  0.2-1.0 GeV/c

INS-17-1 Approved May 1981; Started Jan 1982; Completed  
Nov 1982.

**MEASUREMENT OF THE DIFFERENTIAL CROSS  
SECTION FOR PROTON COMPTON SCATTERING**

TOKYO U, INS - K Egawa, A Imanishi, T Ishii

(√ Spokesperson), S Kato, K Ukai

TOKYO U OF AGRIC TECH - T Noguchi, T Ohmori,

N Shimura, K Takahashi

MEIJI COLL, PHARMACY - Y Wada

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma p \rightarrow \gamma p$  0.9-1.15 GeV/c

Papers NP B254 (1985) 458.

INS-17-2 Approved May 1981; Started Nov 1982; Completed  
Feb 1983.

**STUDY OF QUASI-FREE DEUTERONS IN LIGHT  
NUCLEI**

TOKYO U, INS - S Homma (√ Spokesperson), M Kanazawa,

M Koike, Y Murata, H Okuno, F Soga, N Yoshikawa

AKITA U - A Sasaki

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma \text{ nucleus} \rightarrow p n X$  200-450 MeV/c

Comments Uses a tagged  $\gamma$  beam.

Papers PRL 45 (1980) 706, PR C27 (1983) 31, PRL 52 (1984)  
2026, and PRL 53 (1984) 2536.

INS-18-1 (Jul 1982) Approved Jul 1982; Started Jun 1983;  
Completed Apr 1984.

**ANGULAR DISTRIBUTION OF PHOTODISIN-  
TEGRATION OF QUASI-FREE DEUTERONS IN  
LIGHT NUCLEI**

TOKYO U, INS - S Homma (√ Spokesperson), M Kanazawa,

M Koike, Y Murata, H Okuno, F Soga, M Yoshikawa

AKITA U - A Sasaki



## SUMMARIES OF EXPERIMENTS

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma$  nucleus  $\rightarrow p n X$  200-450 MeV/c

Comments Uses a tagged  $\gamma$  beam.

**INS-18-3** Approved Jul 1982; Started Jun 1983; Completed Apr 1984.

**MEASUREMENT OF DIFFERENTIAL CROSS SECTIONS OF THE  $\gamma d \rightarrow \pi^0 d$  REACTION**

TOKYO U, INS - A Imanishi, T Ishii, S Kato ( $\checkmark$  Spokesperson), T Miyachi, A Nakamura, Y Takechi, K Ukai

TOKYO U OF AGRIC TECH - T Noguchi, T Ohmori, N Shimura, K Takahashi

HIROSHIMA U - K Baba, Y Morita, Y Sumi

MEIJI COLL, PHARMACY - Y Wada

TOKYO KOGANEI U - K Kurita

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma$  deut  $\rightarrow \pi^0$  deut 500-1000 MeV/c

Papers PRL 54 (1985) 2497.

**INS-19-1** (1984) Approved Mar 1984; Completed Mar 1984.

**MEASUREMENT OF DIFFERENTIAL CROSS SECTIONS FOR THE  $\gamma d \rightarrow \pi^0 d$  REACTION AT BACKWARD ANGLES**

TOKYO U, INS - A Imanishi, T Ishii, S Kato, T Miyachi ( $\checkmark$  Spokesperson), A Nakamura, Y Takeuchi, K Ukai

TOKYO U OF AGRIC TECH - T Noguchi, T Ohmori, N Shimura, K Takahashi

HIROSHIMA U - K Baba, Y Morita, Y Sumi

MEIJI COLL, PHARMACY - Y Wada

TOKYO GAKUGEI U - K Kurita

Accelerator TOKYO Detector Single-arm spectrometer

Reactions

$\gamma$  deut  $\rightarrow \pi^0$  deut 0.5-1.0 GeV ( $E_{lab}$ )

Comments Measures over c.m. angles 80 to 130°.

Papers PRL 54 (1985) 2497.

**INS-19-2** (1984) Approved Mar 1984; Started Apr 1984; Completed Jun 1984.

**STUDY OF THE REACTION  $\gamma {}^4\text{He} \rightarrow pN(p)X$**

TOKYO U, INS - S Homma ( $\checkmark$  Spokesperson), M Koike, H Okuno, M Sudo, M Torikoshi

AKITA U - A Sasaki

TOHOKU U - Y Fujii

Accelerator TOKYO Detector Double-arm spectrometer

Reactions

$\gamma$  He  $\rightarrow p n X$  0.2-0.45 GeV ( $E_{lab}$ )

$\gamma$  He  $\rightarrow 2p X$  "

Comments Uses a tagged  $\gamma$  beam.

**INS-19-3** (1984) Approved Mar 1984.

**STUDY OF CUMULATIVE EFFECTS IN PHOTONUCLEAR REACTIONS**

TOKYO U, INS - Y Murata (Spokesperson)

AKITA U & TOHOKU U & TOKYO U & HIROSHIMA U & SAGA UNIV, JAPAN - et al.

Accelerator TOKYO Detector Single-arm spectrometer

Reactions

$\gamma$  nucleus  $\rightarrow p X$  0.35-0.60 GeV ( $E_{lab}$ )

**ITEP-E-761** (1976) Approved 1976; Started 1978; Completed 1982.

**STUDY OF RARE  $K^0$  DECAYS**

MOSCOW, ITEP - V V Barmin, V G Barylov, T A Chistyakova, I V Chuvilo, G V Davidenko, V S Demidov, A G Dolgolenko, V A Ergakov, V N Golubchikov, V A Matveev, A G Meshkovsky, G S Miroside, V I Moskalev, V A Shebanov (Spokesperson), N N Shishov, M M Sokolov, Y V Trebukhovskiy, B S Volkov, N K Zobkovskaya

PADUA U - M Baldo-Ceolin, E Calimani, S Ciampolillo, F Mattioli, G Miari, A Sconza

Accelerator ITEP Detector HLBC-2M

Reactions

$K^+ \text{Xe} \rightarrow K^0 X$  0.8 GeV/c

$K^0 \rightarrow 3\pi^0$  —

$K^0 \rightarrow \pi^+ \pi^0 \pi^-$  —

$K^0 \rightarrow 2\gamma$  —

$K^0 \rightarrow 2\pi^0 \gamma$  —

$K^0 \rightarrow \pi^+ \pi^- \gamma$  —

Particles studied  $K^0$

Papers PL 128B (1983) 129, ZETFP 38 (1983) 459 = JETPL 38 (1983) 557, YF 39 (1984) 428 = SJNP 39 (1984) 269, and YF 41 (1985) 1187 = JETPL 41 (1985) 759.

**ITEP-E-771** (1977) Approved 1977; Started 1978; Completed 1982.

**STUDY OF THE INCLUSIVE PROPERTIES OF DEEP INELASTIC NUCLEAR REACTIONS**

MOSCOW, ITEP - Y D Bayukov, P V Degtyarenko, B L Druzhinin, V B Fedorov, B A Fominikh, V B Gavrilov, N A Goryainov, Y G Grishchuk, O B Gushchin, M V Kolosov, N L Kornienko, L N Kuleshova, G A Leksin (Spokesperson), S V Shevchenko, S M Shuvalov, B B Shvartsman, D A Suchkov, V P Surin, A V Vlasov

Accelerator ITEP Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow p X$  1-9 GeV/c

$p$  nucleus  $\rightarrow n X$  "

$p$  nucleus  $\rightarrow$  deut X "

$p$  nucleus  $\rightarrow$  trit X "

$p$  nucleus  $\rightarrow {}^3\text{He} X$  "

$p$  nucleus  $\rightarrow \pi^+ X$  "

$p$  nucleus  $\rightarrow \pi^- X$  "

$\pi^+$  nucleus  $\rightarrow p X$  "

$\pi^+$  nucleus  $\rightarrow n X$  "

$\pi^+$  nucleus  $\rightarrow$  deut X "

$\pi^+$  nucleus  $\rightarrow$  trit X "

$\pi^+$  nucleus  $\rightarrow {}^3\text{He} X$  "

$\pi^+$  nucleus  $\rightarrow \pi^+ X$  "

$\pi^+$  nucleus  $\rightarrow \pi^- X$  "

$\pi^-$  nucleus  $\rightarrow p X$  "

$\pi^-$  nucleus  $\rightarrow n X$  "

$\pi^-$  nucleus  $\rightarrow$  deut X "

$\pi^-$  nucleus  $\rightarrow$  trit X "

$\pi^-$  nucleus  $\rightarrow {}^3\text{He} X$  "

$\pi^-$  nucleus  $\rightarrow \pi^+ X$  "

$\pi^-$  nucleus  $\rightarrow \pi^- X$  "

Comments The targets are He,  ${}^6\text{Li}$ ,  ${}^7\text{Li}$ , Be,  ${}^{11}\text{B}$ , C, Al, Ti, Fe,  ${}^{58}\text{Ni}$ ,  ${}^{64}\text{Ni}$ , Ni, Cu, Zn, Nb, Cd, In,  ${}^{112}\text{Sn}$ ,  ${}^{124}\text{Sn}$ , Sn, Ta, Pb, and U.

Papers PTE 3 (1982) 25, YF 33 (1981) 183 = SJNP 33 (1981) 94, YF 34 (1981) 785 = SJNP 34 (1981) 437, YF 35 (1982) 960 = SJNP 35 (1982) 558, YF 37 (1983) 344 = SJNP 37 (1983) 206, YF 41 (1985) 158 = SJNP 41 (1985) 101, YF 41 (1985) 1541 = SJNP 41 (1985) 976, YF 42 (1985) 185 = SJNP 42 (1985) 116, and YF 42 (1985) 377 = SJNP 42 (1985) 238.

## SUMMARIES OF EXPERIMENTS

**ITEP-E-782** (1978) Approved 1978; Started 1978; Completed 1980.

### STUDY OF LIGHT NUCLEUS INTERACTIONS WITH PROTONS IN THE INTERMEDIATE ENERGY REGION

MOSCOW, ITEP - A V Blinov, I V Chuvilo, V V Drobot, V A Ergakov, V E Grechko, L A Kondratyuk, Y V Korablev, Y M Selektor (Spokesperson), V N Shulyachenko, V V Solovyev, Y V Trebuhovskiy, V F Turov, I A Vanyushin, S M Zombkovskiy

Accelerator ITEP Detector HBC-80CM

#### Reactions

trit $p \rightarrow X$	2.5, 5 GeV/c
trit $p \rightarrow$ trit $p$	"
trit $p \rightarrow$ $^3\text{He } n$	"
trit $p \rightarrow$ deut $p n$	"
trit $p \rightarrow$ $2p 2n$	"
$^3\text{He } p \rightarrow X$	"
$^3\text{He } p \rightarrow$ $^3\text{He } p$	"
$^3\text{He } p \rightarrow$ deut $2p$	"
$^3\text{He } p \rightarrow$ $3p n$	"
$^3\text{He } p \rightarrow$ $2p 2n \pi^+$	"

Particles studied  $^3\text{He}$

Comments A study of the non-nucleon admixture in wave functions of  $^3\text{He}$  and  $^3\text{H}$ .

Papers PL 91B (1980) 349, NP A377 (1982) 585, ZETFP 32 (1980) 538 = JETPL 32 (1980) 519, YF 35 (1982) 523 = SJNP 35 (1982) 301, YF 39 (1984) 260 = SJNP 39 (1984) 161, YF 40 (1984) 581 = SJNP 40 (1984) 372, YF 41 (1985) 719 = SJNP 41 (1985) 457, and YF 41 (1985) 1440 = SJNP 41 (1985) 913.

**ITEP-E-783** (1978) Started 1978.

### STUDY OF TRITIUM $\beta$ DECAY TO MEASURE THE $\bar{\nu}$ MASS

MOSCOW, ITEP - S D Boris, A I Golutvin, L P Lapin, V A Lyubimov, V V Nagovitzin, E G Novikov, V Z Nozik, V A Soloshenko, L N Tikhomirov, E F Tretyakov (Spokesperson)

Accelerator NONE Detector Spectrometer

#### Reactions

trit $\rightarrow$ $^3\text{He } e^- \bar{\nu}_e$	0 GeV/c
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Particles studied  $\nu_e$

Comments Valine target.

Papers PL 94B (1980) 266, ZETF 81 (1981) 1158 = JETP 54 (1981) 616, ZETFP 42 (1985) 107 = JETPL 42 (1985) 130, and PL 159B (1985) 217.

**ITEP-E-784** (1978) Approved 1978; Started 1979; Completed 1981.

### STUDY OF DOUBLE CHARGE-EXCHANGE INCLUSIVE REACTIONS INDUCED BY $\pi^+$ AND $\pi^-$ MESONS ON NUCLEI

MOSCOW, ITEP - V M Abramov, I A Dushovskoy, I I Isaev, V V Kishkurno, L A Kondratyuk, A P Krutenkova, V V Kulikov, M A Matsyuk, P A Murat, I A Radkevich (Spokesperson), E N Turdakina

Accelerator ITEP Detector Optical spark chamber

#### Reactions

$\pi^-$ $^6\text{Li} \rightarrow \pi^+ X$	2.6 GeV/c
$\pi^-$ $^7\text{Li} \rightarrow \pi^+ X$	"
$\pi^- C \rightarrow \pi^+ X$	"
$\pi^- \text{Bi} \rightarrow \pi^+ X$	"
$\pi^+ C \rightarrow \pi^+ X$	"
$\pi^+ \text{Bi} \rightarrow \pi^+ X$	"

**ITEP-E-801** (1980) Approved 1980; Started 1982.

### STUDY OF POLARIZATION EFFECTS IN PROCESSES WITH TWO CHARGED PARTICLES IN THE FINAL STATE AT INTERMEDIATE ENERGIES

MOSCOW, ITEP - P E Budkovskii, T S Cherkalina, V M Dobrov, V L Hohlov, Y P Kanavets (Spokesperson), I I Levintov, V L Martynov, B V Morozov, V M Nesterov, V V Ryltsov, A V Soskov, A D Sulimov

Accelerator ITEP Detector Wire chamber

#### Reactions

$\pi^- p \rightarrow p \pi^-$	1.4-2.1 GeV/c
$\pi^- p \rightarrow n \pi^+ \pi^-$	"
$\pi^- p \rightarrow n \rho^0$	"
$\pi^+ p \rightarrow p \pi^+$	"

Comments The target polarization is  $75 \pm 5\%$ .

**ITEP-E-802** (1981) Approved 1980; Started 1981.

### STUDY OF $K^+$ INTERACTIONS WITH XENON

MOSCOW, ITEP - V V Barmin, V G Barylov, T A Chistyakova, G V Davidenko, V S Demidov, A G Dolgolenko, V Luchmanov, A G Meshkovskiy, G S Miroside, A N Nikitenko, V A Shebanov (Spokesperson), N N Shishov, N K Zombkovskaya

Accelerator ITEP Detector HLBC-2M

#### Reactions

$K^+ \text{Xe} \rightarrow K^+ X$	0.79 GeV/c
$K^+ \text{Xe} \rightarrow K^0 X$	"

Comments Study of the cumulative effects in xenon. The detector (DIANA) is a 700-liter xenon bubble chamber.

**ITEP-E-811** (1981) Approved 1981; Started Dec 1981; Completed Jun 1982.

### STUDY OF $K_L \rightarrow 2\gamma$ AND SEARCH FOR $K_S \rightarrow 2\gamma$ DECAYS

MOSCOW, ITEP - M Y Balatz (Spokesperson), V M Berezin, E T Bogdanova, V I Chistilin, N P Dobrovolskaya, G B Dzyubenko, N D Galanina, E T Gedvillo, A D Kamenskiy, N A Khaldeeva, V S Lanaev, A M Lipkin, V N Markisov, V V Metelov, V A Murysov, A A Nedosekin, A Y Ostapchuk, V A Sadykov, S F Semin, A I Sitnikov, E I Tarkovsky, M E Vishnevskiy (Spokesperson), V E Vishnyakov, M O Vlasova, S V Zhelmin

Accelerator ITEP Detector Spectrometer

#### Reactions

$K_L \text{Cu} \rightarrow \text{Cu } K_S$	1-8 GeV/c
$K_L \rightarrow 2\gamma$	"
$K_S \rightarrow 2\gamma$	"

Particles studied  $K_L, K_S$

**ITEP-E-812** (1981) Approved 1981; Started 1981; Completed 1984.

### STUDY OF CUMULATIVE PARTICLE PRODUCTION IN PION NUCLEUS INTERACTIONS

MOSCOW, ITEP - A E Buklej, N A Burgov, M M Chumakov, N A Fedyushkina, S A Gerzon, Y T Kiselev, G A Leksin, A N Martemjanov, N A Pivnyuk, S V Semenov, V L Stolin, Y V Terekhov (Spokesperson), V I Ushakov, M K Vlasov, L S Vorobyev

Accelerator ITEP Detector Spectrometer

#### Reactions

$\pi^+$ nucleus $\rightarrow \pi^+ X$	1.5 GeV/c
$\pi^+$ nucleus $\rightarrow p X$	"
$\pi^+$ nucleus $\rightarrow$ deut $X$	"
$\pi^-$ nucleus $\rightarrow \pi^+ X$	"
$\pi^-$ nucleus $\rightarrow p X$	"
$\pi^-$ nucleus $\rightarrow$ deut $X$	"

Comments The targets are Li, C, O, Cu, and Pb.

## SUMMARIES OF EXPERIMENTS

Papers YF 32 (1980) 423 = SJNP 32 (1980) 219, YF 36 (1983) 1313 = SJNP 36 (1983) ?, and YF 39 (1984) 801 = SJNP 39 (1984) 506.

**ITEP-E-813** (1981) Approved 1981; Started 1982; Completed 1983.

### STUDY OF CUMULATIVE PARTICLE CORRELATIONS

MOSCOW, ITEP - Y D Bayukov, P V Degtyarenko, Y V Efremenko, V B Fedorov, V B Gavrilov, N A Goryainov, Y G Grishuk, M V Kosov, L N Kuleshova, G A Leksin (Spokesperson), S M Shuvalov, B B Shvartsman, A V Stavinsky, D A Suchkov, A V Vlasov, L S Vorobyev

Accelerator ITEP Detector Spectrometer

Reactions  
 $p$  nucleus  $\rightarrow$  2nucleon X                    2.5, 5.0 GeV/c  
 $p$  nucleus  $\rightarrow$  deut  $p$  X                    "  
 $\pi^-$  nucleus  $\rightarrow$  2nucleon X                    "  
 $\pi^-$  nucleus  $\rightarrow$  deut  $p$  X                    "

Comments The spectrometer (BAS) is a large hadron spectrometer. The targets are Be, C, Al, Ti, Cu, Nb, Cd, Ta, Pb, and U.

Papers YF 39 (1984) 1482 = SJNP 39 (1984) 938.

**ITEP-E-821** (1982) Approved 1980; Started 1981; Completed 1983.

### SEARCH FOR $K_L \rightarrow 2$ CHARGED $e^+e^-$ DECAY

MOSCOW, ITEP - M Y Balatz (Spokesperson), V M Berezin, E T Bogdanova, V I Chistilin, N P Dobrovolskaya, G B Dzyubenko, N D Galanina, E T Gedvillo, A D Kamensky, N A Khaldeeva, V S Lanaev, A M Lipkin, V N Markisov, V V Metelov, V A Murysov, A A Nedosekin, A Y Ostapchuk, V A Sadykov, S F Semin, A I Sitnikov, E I Tarkovsky, M E Vishnevsky, V E Vishnyakov, M O Vlasova, S V Zhelnin

Accelerator ITEP Detector Spectrometer

Reactions  
 $K_L \rightarrow \pi^+ \pi^- e^- e^+$                     1-8 GeV/c  
 $K_L \rightarrow \mu^- \mu^+ e^- e^+$                     "  
 $K_L \rightarrow 2e^- 2e^+$                     "

Particles studied  $K_L$

Papers YF 38 (1983) 927 = SJNP 38 (1983) 556.

**ITEP-E-822** (1982) Approved 1982; Started 1983.

### SEARCH FOR BOUND AND RESONANT STATES IN THE $\Lambda\Lambda$ SYSTEM

MOSCOW, ITEP - V M Berezin, E T Bogdanova, V I Chistilin, N P Dobrovolskaya, N D Galanina, E T Gedvillo, N A Khaldeeva, A M Lipkin, V N Markisov, V V Metelov, V A Murysov, A A Nedosekin, A Y Ostapchuk, V A Sadykov, E I Tarkovsky, M E Vishnevsky (Spokesperson), M O Vlasova

Accelerator ITEP Detector Spectrometer

Reactions  
 $n$  nucleus  $\rightarrow$  2 $\Lambda$  X                    2.0-9.5 GeV/c  
 $n$  nucleus  $\rightarrow$  dibaryon( $S = -2$ ) X                    "

Particles studied dibaryon( $S = -2$ )

**ITEP-E-823** (1982) Approved 1982; Started Jan 1983.

### MEASUREMENT OF COULOMB-NUCLEAR INTERFERENCE IN $\pi^\pm$ NUCLEUS SCATTERING

MOSCOW, ITEP - V N Afonasyev, V S Borisov (Spokesperson), I N Borodina, G K Bysheva, L L Goldin, L N Gusev, A V Semenov, V P Tchernyshev, G K Tumanov, A O Vaisenberg, Y V Zubkov

Accelerator ITEP Detector Counter

### Reactions

$\pi^+$  nucleus  $\rightarrow \pi^+$  X                    1.85, 3.0 GeV/c  
 $\pi^-$  nucleus  $\rightarrow \pi^-$  X                    "

Comments The targets are  $^6\text{Li}$ ,  $^7\text{Li}$ , C, and Be. The detector (IRA) consists of proportional chambers and scintillation counters.

Papers YF 40 (1984) 34 = SJNP 40 (1984) 22.

**ITEP-E-824** (1982) Approved 1982; Started 1984.

### STUDY OF $K_L \rightarrow \pi e \nu \gamma$ AND $K_L \rightarrow 2\pi e \nu$ DECAYS

MOSCOW, ITEP - M Y Balatz, V M Berezin, E T Bogdanova, V I Chistilin, N P Dobrovolskaya, G B Dzyubenko, N D Galanina, E T Gedvillo, A D Kamensky, N A Khaldeeva, V S Lakaev, A M Lipkin, V N Markisov, V V Memelov, V A Murysov, A A Nedosekin, A Y Ostapchuk, V A Sadykov, S F Semin, A I Sitnikov, E I Tarkovsky, M E Vishnevsky (Spokesperson), V E Vishnyakov, M O Vlasova, S V Zhelnin

Accelerator ITEP Detector Wire chamber

Reactions  
 $K_L \rightarrow \pi^+ e^- \bar{\nu}_e \gamma$                     1-8 GeV/c  
 $K_L \rightarrow \pi^- e^+ \nu_e \gamma$                     "  
 $K_L \rightarrow \pi^+ \pi^0 e^- \bar{\nu}_e$                     "  
 $K_L \rightarrow \pi^0 \pi^- e^+ \nu_e$                     "

Particles studied  $K_L$

**ITEP-E-831** (1983) Approved 1983; Started 1984.

### MEASUREMENT OF $\pi^-, \pi^+, p, ^2\text{H}, ^3\text{H}$ , AND $^3\text{He}$ INCLUSIVE CROSS SECTIONS IN PROTON INTERACTIONS WITH Be, Al, Cu, AND Ta NUCLEI IN THE ENERGY RANGE 3.7 TO 9.2 GeV

MOSCOW, ITEP - V A Ergakov, G A Safronov, A A Sibirzev, N Smirnov, N V Stepanov, Y V Trebukhovsky (Spokesperson), I A Voronzov

Accelerator ITEP Detector Spectrometer

Reactions  
 $p$  nucleus  $\rightarrow \pi^+$  X                    3.7-9.2 GeV ( $T_{\text{lab}}$ )  
 $p$  nucleus  $\rightarrow \pi^-$  X                    "  
 $p$  nucleus  $\rightarrow p$  X                    "  
 $p$  nucleus  $\rightarrow$  deut X                    "  
 $p$  nucleus  $\rightarrow$  trit X                    "  
 $p$  nucleus  $\rightarrow ^3\text{He}$  X                    "

**KEK-PF-000** (1986) Approved Feb 1986; Started Jan 1986; Completed Jul 1986.

### SEARCH FOR AXION-LIKE PARTICLES

KYOTO U - K Imai, H Kobayashi, A Konaka, A Masaike, K Miyake, N Nagamine, T Nakamura, N Sasao ( $\checkmark$  Spokesperson)

KEK - A Enomoto, Y Fukushima, E Kikutani, H Koiso, H Matsumoto, K Nakahara, S Ohsawa, I Sato, T Taniguchi, J Urakawa

Accelerator KEK-PF-LINAC Detector Wide-angle spectrometer

Reactions  
 $e^- W_t \rightarrow$  axion X                    2.5 GeV ( $E_{\text{lab}}$ )

Particles studied axion

Comments Looks for  $e^+e^-$  and  $\gamma\gamma$  decay modes of the axion.

Papers PRL 57 (1986) 659.

**KEK-TE-001** Approved Mar 1983.

### TRISTAN $e^+e^-$ EXPERIMENTS BY THE VENUS COLLABORATION

## SUMMARIES OF EXPERIMENTS

OSAKA U - J Haba, T Kamitani, H Kaneko, Y Nagashima  
( $\checkmark$  Spokesperson), H Osabe, S Sugimoto, S Tatsumi,  
T Yamashita  
KYOTO U - Y Hemmi, R Kikuchi, K Kubo, H Kurashige,  
K Miyake, T Nakamura, N Sasao, N Tamura, Z Yamada  
HIROSHIMA U - M Asai, I Endo, I Hayashibara, S Kajiyama,  
Y Kurihara, K Morita, T Osugi, Y Sumi, R Tanaka,  
J Uehara, S Yasuishi  
TSUKUBA U - Y Asano, S Mori, I Nakano, M Nishiyama,  
M Shioten, Y Takada, K Takikawa  
TOHOKU GAKUIN U - M Higuchi, Y Hoshi, M Sato  
KOBE U - Y Homma, Y Noguchi, A Ono, H Sakae  
FUKUI U - J Iwahori, H Yoshida  
TOKYO U OF AGRIC TECH - T Emura  
RIKKYO U - H Murakami  
KYUSHU U - K Ishibashi  
TOKYO METROPOLITAN U - M Chiba, I Hirata, T Hirose,  
M Murashita, Y Nakagawa, J Saito, T Watanabe  
KEK - K Amako, R Arai, Y Arai, M Fukawa, Y Fukushima,  
K Hayashi, N Ishihara, J Kanzaki, T Kondo, T Koriki,  
S Kurokawa, T Matsui, S Nakamura, T Obama, S Odaka,  
K Ogawa, H Sakamoto, H Sakuda, J Shirai, F Suekane,  
T Sumiyoshi, F Takasaki ( $\checkmark$  Spokesperson), Y Teramoto,  
K Tobimatsu, T Tsuboyama, S Uehara, Y Unno, M Wake,  
Y Watase

Accelerator KEK-TRISTAN Detector VENUS

Reactions

$e^+ e^-$  < 70 GeV (Ecm)

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

**KEK-TE-002** Approved Mar 1983.

**STUDY OF  $e^+e^-$  ANNIHILATION PHENOMENA BY A DETECTOR WITH PARTICLE IDENTIFICATION**

TOPAZ COLLABORATION

TOKYO U - H Aihara, H Fujii, K Ishikawa, R Itoh, T Kamae,  
T Kishida, N Kusuki, M Kuze, F Sai, A Shirahashi,  
J Toyoura, S S Yamamoto  
TOKYO U, INS - A Imanishi, T Ishii, S Katoh, K Maruyama,  
T Ohshima, H Okuno, K Ukai, M Yoshioka  
NAGOYA U - I Adachi, J Fujimoto, R Kajikawa  
( $\checkmark$  Spokesperson), S Kuroda, H Masuda, H Ozaki,  
A Sugiyama, S Suzuki, T Takahashi, H Takamure,  
T Tsukamoto, S Uno  
NARA WOMENS U - N Fujiwara, H Hayashii, N Iida,  
N Nishiwaki, S Noguchi, S Yamashita  
OSAKA CITY U - S Azuma, C Chou, A Maruyama,  
T Okusawa, T Satoh, T Takahashi, T Tanaka  
KOBE U - T Fujii  
TOKYO U OF AGRIC TECH - K Takahashi, T Ueda  
OKAYAMA U - T Suwada  
KEK - H B Dijkstra, R Enomoto, K Fujii, H Ikeda, H Iwasaki,  
S Iwata ( $\checkmark$  Spokesperson), S Kawabata, H Kichimi,  
M Kobayashi, T Matsuda, A Miyamoto, K Nakamura,  
F Ochiai, T Satoh, R Sugahara, T Tauchi, Y Watanabe,  
O Yamakawa, A Yamamoto, M Yamauchi, Y Yoshimura

Accelerator KEK-TRISTAN Detector TOPAZ

Reactions

$e^+ e^-$  < 70 GeV (Ecm)

Comments Searches for new particles such as heavy quarks, heavy leptons, and various scalar particles, and studies in detail electroweak as well as QCD phenomena. The detector has large solid angle coverage with very good particle identification and 3-dimensional tracking capabilities. For a description of the apparatus, see the LBL-91 supplement on detectors.

**KEK-TE-003** (1983) Approved Nov 1983.

**AMY - A HIGH RESOLUTION LEPTON DETECTOR FOR TRISTAN**

AMY COLLABORATION

ROCHESTER U - A Bodek, H Budd, T Gentile, F Lobkowicz,  
S L Olsen (Spokesperson), R Poling, C Rosenfeld,  
W Sakamoto, E H Thorndike, K Ueno  
OHIO STATE U - H A Kagan, R D Kass  
VIRGINIA TECH - A Abashian, K Gotow, F Kajino,  
S Schnetzer  
UC, DAVIS - W Ko, R Lander  
BEIJING, IHEP - C P Chen, Y C Zhu  
TOKYO INST TECH - R Chiba, K Hara, K Ichimaru,  
S Igarashi, J Kato, Y Mihara, T Mori, K Nakayama,  
H Yokota  
NIIGATA U - K Miyano  
SAITAMA U - T Ishizuka  
SAGA UNIV, JAPAN - H Choji, H Itoh, S Kobayashi,  
S Masumoto, A Murakami, K Toyoshima  
KOREA U - J S Kang, K S Sim  
CHUNGNAN U, DEAJEON - H Y Lee  
CHUO U, TOKYO - S Matsumoto, R Tanaka  
KEK - A Abe, M Ando, A Maki (Spokesperson), T Nozaki,  
Y Sakai, S Terada, K Tsuchiya, H Yoshiki

Accelerator KEK-TRISTAN Detector AMY

Reactions

$e^+ e^-$  < 70 GeV (Ecm)

**KEK-TE-004** (Nov 1984) Approved Apr 1985.

**NIKKO-MARU EXPERIMENT, A SEARCH FOR HIGHLY IONIZING PARTICLES**

SHIP COLLABORATION

HARVARD U - K Kinoshita (Spokesperson)  
TOKYO, INST FOR SPACE AND ASTRONAUTICAL  
SCIENCE - M Fujii  
UC, BERKELEY - P B Price  
GIFU U - S Tasaka  
KEK - K Nakajima

Accelerator KEK-TRISTAN Detector SHIP

Reactions

$e^+ e^-$  60 GeV (Ecm)

Particles studied monopole

**KEK-010** (Mar 1975) Approved Feb 1976; Started Jan 1979; Completed Dec 1980.

**SEARCH FOR RARE DECAY MODES  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ ,  $K^+ \rightarrow \pi^+ 2\gamma$ , AND  $K^+ \rightarrow \pi^+$  AXION**

KEK - Y Asano, S Kurokawa, M Miyajima, Y Nagashima  
( $\checkmark$  Spokesperson), S Sugimoto, Y Yoshimura  
TOKYO U - E Kikutani, T Shinkawa  
TOKYO U, INS - T Miyachi

Accelerator KEK-PS Detector Wire chamber

Reactions

$K^+ \rightarrow \pi^+ \nu \bar{\nu}$  500-700 MeV/c  
 $K^+ \rightarrow \pi^+ \gamma \gamma$  "  
 $K^+ \rightarrow \pi^+$  axion "  
 $K^+ \rightarrow \mu^+$  hvy- $\nu$  "

Particles studied  $K^+$

Papers PL 104B (1981) 84, PL 107B (1981) 159, and PL 113B (1982) 195.

**KEK-034** (Jan 1976) Approved Feb 1976; Started Jan 1979; Completed Dec 1980.

**MEASUREMENT OF THE POLARIZATION FOR THE REACTIONS  $K^+ n \rightarrow K^+ n$ ,  $\rightarrow K^0 p$  AT 1.06, 1.28, 1.39, AND 1.49 GeV/c**

KEK - H Hirabayashi, N Hiramatsu, H Isagawa, S Kabe,  
A Masaike, M Morimoto, F Takasaki (Spokesperson),  
Y Watase  
SAGA UNIV, JAPAN - H Ito, S Kobayashi, A Murakami  
TOKYO U, INS - K Toshioka, K Watanabe, N Yamashita  
TOKYO U OF AGRIC TECH - I Kita  
TSUKUBA U - S Miyashita

## SUMMARIES OF EXPERIMENTS

HIROSHIMA U - S Suetake  
TOKYO U - N Kim

Accelerator KEK-PS Detector TELAS

Reactions Polarized target

$K^+ n \rightarrow K^+ n$  1.06, 1.28, 1.39, 1.49 GeV/c  
 $K^+ n \rightarrow K^0 p$  "

Papers NIM 189 (1981) 369, PL 112B (1982) 75, PL 112B (1982) 80, and NIM 192 (1982) 175.

**KEK-049** (Aug 1976) Approved Mar 1978; Started Nov 1981; Completed Nov 1983.

**PRODUCTION OF  $\Lambda^0$  AND  $K_S^0$  BY 12-GeV PROTONS ON NUCLEAR TARGETS**

TSUKUBA U - F Abe, Y Asano, K Hara, Y Iguchi, S Kim, K Kondo, S Miyashita, H Miyata, S Mori, I Nakano, T Sugaya, K Takikawa ( $\checkmark$  Spokesperson), R Tanaka, Y Yamamoto, T Yasuda, K Yasuoka  
KEK - Y Fukui, S Kurokawa, A Maki

Accelerator KEK-PS Detector Double-arm spectrometer

Reactions

$p$  nucleus  $\rightarrow \Lambda X$  12 GeV/c  
 $p$  nucleus  $\rightarrow K_S X$  "

Particles studied  $\Lambda, K_S$

Papers PRL 50 (1983) 1102, JPSJ 52 (1983) 4107, NIM 220 (1984) 293, JJAP 23 (1984) 492, PR D30 (1984) 1861, and PR D34 (1986) 1950.

**KEK-057** (Nov 1977) Approved Jun 1978; Started Jun 1979; Completed Jun 1981.

**STUDIES OF  $pp$  INTERACTIONS IN THE MOMENTUM RANGE 0.9-2.0 GeV/c**

TOKYO U - H Koiso, Y Kubota, F Sai, S Sakamoto, F Shimizu, S S Yamamoto ( $\checkmark$  Spokesperson)

Accelerator KEK-PS Detector HBC-1M

Reactions

$p p$  0.9-2.0 GeV/c

Papers NP A386 (1982) 571, and NP A389 (1982) 445.

**KEK-062** (Mar 1979) Approved Mar 1979, Feb 1980; Started Jun 1979; Completed Jul 1981.

**STUDY OF  $\bar{p}p$  REACTIONS IN THE 3 TO 5 GeV/c REGION**

KEK - M Fukawa, F Ochiai, A Ono, T Sato, R Sugahara, K Takahashi, Y Yoshimura ( $\checkmark$  Spokesperson)  
NARA WOMENS U - N Fujiwara, S Noguchi, S Yamashita  
NIIGATA U - K Miyano

Accelerator KEK-PS Detector HBC-1M

Reactions

$\bar{p} p$  3.0, 3.5, 4.0, 4.5 GeV/c

Papers ZPHY C23 (1984) 369, ZPHY C24 (1984) 297, and PRL 53 (1984) 1725.

**KEK-064** (May 1978) Approved Jun 1979; Started Dec 1981; Completed Feb 1984.

**STUDY OF  $2\pi$  AND  $3\pi$  STATES IN  $\pi^- p$  INELASTIC FORWARD SCATTERING**

KEK - A Ando, S Inaba, T Inagaki, T Satoh, K Takamatsu, T Tsuru ( $\checkmark$  Spokesperson), Y Yasu  
KYOTO U - K Imai, Y Inagaki, T Nakamura, J Shirai, R Takashima, N Tamura  
TOKYO U, INS - K Maruyama, H Okuno  
TOKYO U - A Itano

SAGA UNIV, JAPAN - S Kobayashi, A Murakami  
AKITA U - A Sasaki  
TSUKUBA U - K Ohmi

Accelerator KEK-PS Detector SUPERBENKEI

Reactions

$\pi^- p \rightarrow n \pi^+ \pi^-$  < 8 GeV/c  
 $\pi^- p \rightarrow n \pi^+ \pi^- \pi^0$  "  
 $\pi^- p \rightarrow n \pi^+ \pi^- \eta$  "

Papers Cryogenics (Feb. 1984) 83, NIM 225 (1984) 347, and PRL 57 (1986) 1296.

**KEK-074** (Dec 1979) Approved Feb 1980; Started Jan 1981; Completed Jul 1981.

**SEARCH FOR BARYONIUM STATES IN  $\bar{p}N$  INTERACTIONS**

TOKYO U - J Chiba, T Fujii, H Iwasaki, T Kageyama, S Kuribayashi, K Nakamura ( $\checkmark$  Spokesperson), T Sumiyoshi, T Takeda

KEK - H Ikeda

TSUKUBA U - Y Takada

Accelerator KEK-PS Detector Single-arm spectrometer

Reactions

$\bar{p} p \rightarrow X$  335-960 MeV/c  
 $\bar{p} p \rightarrow \bar{p} p$  "  
 $\bar{p}$  deut  $\rightarrow X$  "  
 $\bar{p}$  deut  $\rightarrow \bar{p} X$  "

Comments See also KEK-074A for the continuation.

Papers PRL 49 (1982) 628, NIM 206 (1983) 451, JJAP 22 (1983) 1606, and PRL 52 (1984) 731.

**KEK-074A** (Jul 1981) Started Oct 1982; Completed Feb 1983.

**SEARCH FOR BARYONIUM STATES IN  $\bar{p}N$  INTERACTIONS**

TOKYO U - T Fujii, T Kageyama, K Nakamura ( $\checkmark$  Spokesperson), F Sai, S Sakamoto, S Sato, T Takahashi, T Tanimori, S S Yamamoto

TSUKUBA U - Y Takada

Accelerator KEK-PS Detector Wide-angle spectrometer

Reactions

$\bar{p} p \rightarrow \bar{p} p$  390-780 MeV/c  
 $\bar{p} p \rightarrow \bar{n} n$  "  
 $\bar{p} p \rightarrow \pi^+ \pi^-$  "  
 $\bar{p} p \rightarrow K^+ K^-$  "

Comments Phase II of KEK-074.

Papers NIM 215 (1983) 357, NIM 216 (1983) 57, PRL 53 (1984) 885, PR C31 (1985) 1853, PRL 55 (1985) 1835, and JJAP 24 (1985) 1522.

**KEK-075** (Dec 1979) Approved Feb 1980; Started Jan 1980; Completed May 1980.

**MEASUREMENTS OF POLARIZATION PARAMETERS IN ELASTIC  $pn$  SCATTERING**

KEK - S Isagawa, S Ishimoto, A Masaike, K Morimoto, K Ogawa ( $\checkmark$  Spokesperson), F Takasaki, Y Watase  
SAGA UNIV, JAPAN - S Kobayashi, A Murakami  
KYOTO U - N Hoshizaki, M Sakuda  
TOKYO U - N Kim, K Nakajima

Accelerator KEK-PS Detector TELAS

Reactions Polarized target

$p n \rightarrow p n$  1.3, 1.39, 1.59, 1.82 GeV/c

Papers PR D25 (1982) 2004.

**KEK-079** (Feb 1980) Approved Feb 1980; Started Apr 1980; Completed Jun 1980.

**CALIBRATION OF ELECTRON/PION IDENTIFICATION EFFICIENCY IN THE BUBBLE CHAMBER**

TOHOKU U - K Abe, K Hasegawa, T Hayashino, T Kitagaki ( $\checkmark$  Spokesperson), M Kiyono, S Kunori, Y Ohtani,

## SUMMARIES OF EXPERIMENTS

H Takanashi, K Tamai, S Tanaka, Y Unno, A Yamaguchi, H Yuta  
 TOHOKU GAKUIN U - M Chikawa, M Higuchi, Y Kawada, M Sato  
 NARA WOMENS U - N Fujiwara, E Muraoka, K Noda, S Noguchi, S Yamashita  
 KEK - K Takahashi

Accelerator KEK-PS Detector HBC-1M

Comments Ta and Pb plates in the chamber.

**KEK-080** (Apr 1980) Approved May 1980; Started May 1981; Completed Jul 1981.

**STUDY OF  $dp$  REACTIONS FROM 2.0 TO 4.0 GeV/c**

TOKYO U - M Kajita, N Katayama, H Koiso, Y Kubota, F Sai ( $\checkmark$  Spokesperson), S Sakamoto, F Shimizu, T Tsuboyama, S Yamamoto

Accelerator KEK-PS Detector HBC-1M

Reactions

deut  $p$  2-4 GeV/c

Papers NP A423 (1984) 410, NP A438 (1985) 685, and PRL 55 (1985) 2668.

**KEK-081** (May 1980) Approved May 1980; Started Nov 1981; Completed Jul 1982.

**ASYMMETRY IN THE ELASTIC SCATTERING OF  $K^+$  AND  $\pi^+$  FROM DEUTERIUM NEAR 1.5 GeV/c**

UCLA - M Gazzaly, M Hajisaeid, G J Igo (Spokesperson), F Irom, T Kobayashi, G Pauletta, A T H Wang  
 KEK - M Fukawa, S Isagawa, S Ishimoto, A Masaike (Spokesperson), K Morimoto

TOKYO U - T Hasegawa, K Nisimura, F Soga

NIHON U, TOKYO - I Yamauchi

KYOTO U OF EDUCATION - A Okihana

HIROSHIMA U - H Hasai, K Iwatani, F Nishiyama

NAGOYA U - N Horikawa, T Nakanishi, Y Ohashi

Accelerator KEK-PS Detector TELAS

Reactions Polarized target

$K^+$  deut  $\rightarrow K^+$  deut 1.5, 1.7 GeV/c

$\pi^+$  deut  $\rightarrow \pi^+$  deut 0.74, 1.5 GeV/c

**KEK-082** (Jun 1980) Approved Oct 1980; Completed 1985.

**NUCLEAR REACTIONS WITH HIGH ENERGY PARTICLE BEAMS**

TSUKUBA U - Y Asano, S Mori ( $\checkmark$  Spokesperson), M Noguchi, M Sakano

KEK - H Hirabayashi, H Ikeda, K Kato, K Kondo, M Takasaki, A Yamamoto

Accelerator KEK-PS Detector Counter

Reactions

$p$  nucleus < 13 GeV/c

Papers PR C28 (1983) 1718, PR C28 (1983) 1840, and JPSJ 54 (1985) 3734.

**KEK-083** (Aug 1980) Approved Oct 1980; Started Jan 1982; Completed Jul 1982.

**MEASUREMENT OF  $\pi d$  ELASTIC SCATTERING**

HIROSHIMA U - M Akemoto, K Baba, I Endo, H Himemiya, K Inoue, T Kawamoto, Y Maeda, T Ohsugi, R Ohtani, Y Sumi ( $\checkmark$  Spokesperson), T Takeshita, T Uehara, T Umeda  
 KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki, M Nakano

Accelerator KEK-PS Detector Double-arm spectrometer

Reactions

$\pi^-$  deut  $\rightarrow \pi^-$  deut 0.42-1.16 GeV/c

$\pi^+$  deut  $\rightarrow p p$  0.48-1.16 GeV/c

Particles studied dibaryon

Papers NIM 188 (1981) 51, PRL 50 (1983) 400, PRL 51 (1983) 1838, PL 149B (1984) 321, and PTP 75 (1986) 646.

**KEK-084** (Sep 1980) Approved Oct 1980; Started Feb 1981; Completed Jul 1981.

**STUDY OF HADRON-NUCLEUS INTERACTIONS WITH EMULSION CHAMBERS**

NAGOYA U - H Fuchi, S Fukui ( $\checkmark$  Spokesperson), K Hoshino, K Niu, K Niwa, T Yamaki, Y Yanagisawa  
 TOKYO U, INS - T Hasagawa, M Koike

Accelerator KEK-PS Detector Emulsion

Reactions

$p$  nucleus 3 GeV/c

$\bar{p}$  nucleus "

$\pi^-$  nucleus 2-4 GeV/c

**KEK-089** (Oct 1980) Approved Oct 1980; Started Oct 1981; Completed Feb 1982.

**SEARCH FOR A HEAVY NEUTRINO EMITTED IN  $K^+ \rightarrow \mu^+ \nu$  DECAY**

TOKYO U - R Enomoto, T Fujii, R S Hayano, S Sato, T Taniguchi, T Tanimori, T Yamanaka, T Yamazaki ( $\checkmark$  Spokesperson)

KEK - Y Asano, S Kurokawa, S Schnetzer

Accelerator KEK-PS Detector Wire chamber

Reactions

$K^+ \rightarrow \mu^+ \nu$  < 0.5 GeV/c

$K^+ \rightarrow \pi^+ X$  "

Papers PL 104B (1981) 84, PRL 49 (1982) 1305, and PRL 52 (1984) 1089.

**KEK-090** (Jan 1981) Approved Oct 1981; Completed Feb 1984.

**STUDY OF HIGH ENERGY NUCLEAR REACTIONS WITH LARGE APERTURE MULTIPARTICLE DETECTOR**

TOKYO U - I Arai, K Nakai (Spokesperson), H Nobuyo, S Sasaki, T Shibata

TOKYO INST TECH - R Chiba, K Ichimaru, Y Mihara, K Nakayama, H Yokota

Accelerator KEK-PS Detector FANCY

Reactions

$p$  nucleus 1-5 GeV/c

$\pi^+$  nucleus "

Papers NP A418 (1984) 163C.

**KEK-092** (Jan 1981) Approved Feb 1981; Started Apr 1982; Completed Feb 1984.

**MEASUREMENTS OF ASYMMETRY PARAMETER IN  $\Sigma^+ \rightarrow p \gamma$  DECAY**

KYOTO U - J Baba, Y Hemmi, H Kawai, R Kikuchi, M Kobayashi, K Miyake (Spokesperson), S Nakamura,

T Nakamura, K Nishimura, N Sasao, A Tamura, S Yoshioka

Accelerator KEK-PS Detector TELAS

Reactions

$\Sigma^+$  -

Comments Approved for 960 hours.

**KEK-094** (Feb 1981) Approved Jun 1981; Completed Nov 1983.

**REACTION MECHANISMS IN  $\pi$ -NUCLEUS INTERACTIONS**

SAGA UNIV, JAPAN - H Ito (Spokesperson), S Kobayashi, A Murakami

TOKYO METROPOLITAN U - T Hirose, T Wada

## SUMMARIES OF EXPERIMENTS

KEK - S Kishiro  
 TOKYO U OF AGRIC TECH - K Takahashi  
 TOKYO U, INS - C Nagoshi  
 INDUSTRIAL MEDICAL COLL, KITAKYUSHU - T Maki  
 KYUSHU U - A Yoshimura

Accelerator KEK-PS Detector Streamer chamber

Reactions

$\pi^+$  nucleus  $\rightarrow n X$                       0.2-2.0 GeV/c  
 $\pi^-$  nucleus  $\rightarrow n X$                       "

**KEK-099** (Jan 1982) Approved Mar 1982; Started May 1982; Completed Jul 1982.

**STUDY OF  $\mu^+$  POLARIZATION IN  $K_{\mu 2}$  DECAY**

TOKYO U - R Hayano ( $\checkmark$  Spokesperson), T Ishikawa,  
 T Taniguchi, T Yamanaka, T Yamazaki  
 KEK - S R Schnetzer

Accelerator KEK-PS Detector Single-arm spectrometer

Reactions

$K^+ \rightarrow \mu^+ \nu$                       0 GeV/c

Comments Same setup as KEK-089.

Papers PRL 52 (1984) 329, and PR D34 (1986) 85.

**KEK-104** (May 1982) Completed Oct 1982.

**SEARCH FOR HEAVY NEUTRINOS IN  $K^+ \rightarrow \mu^+ \nu$ ,  
 $\rightarrow e^+ \nu$**

TOKYO U - Y Akiba, R Hayano, T Ishikawa, M Iwasaki,  
 A Otake, T Taniguchi, T Yamanaka, T Yamazaki  
 ( $\checkmark$  Spokesperson)

KEK - S R Schnetzer

Accelerator KEK-PS Detector Single-arm spectrometer

Reactions

$K^+ \rightarrow \mu^+ \nu$                       —  
 $K^+ \rightarrow e^+ \nu$                       —

Papers PRL 52 (1984) 1089, PR D32 (1985) 2911, and PRL 54 (1985) 102.

**KEK-113** (Mar 1983) Approved Apr 1983; Started Dec 1983; Completed Feb 1984.

**DEUTERON FROM  $p$  NUCLEUS REACTIONS**

TOKYO U - H Enyo, Y MIAKE (Spokesperson), T Nagae,  
 S Nagamiya, K Nakai, H Sano, S Sasaki, K Tokujuku  
 TOKYO INST TECH - K Ichimaru  
 TOKYO U, INS - Y Murata, I Tanihata, M Yoshikawa

Accelerator KEK-PS Detector TOKIWA

Reactions

$p$  nucleus  $\rightarrow$  deut  $X$                       1-4 GeV/c

Comments Approved for 480 hours.

**KEK-117** (Mar 1983) Approved Feb 1984.

**STUDIES OF  $\Lambda$  AND  $\Sigma$  HYPERNUCLEI BY STOPPED  $K^-$**

TOKYO U - R Hayano ( $\checkmark$  Spokesperson), T Ishikawa,  
 M Iwasaki, H Outa, H Tamura, T Yamazaki  
 KEK - K Tanaka

HEIDELBERG, MAX PLANCK INST - W Brueckner,  
 H Doebbling, S Paul, B Povh, A Sakaguchi, R Schuessler

Accelerator KEK-PS Detector Double-arm spectrometer

Reactions

$K^-$  nucleus  $\rightarrow \pi^- p X$                       0 MeV/c

Particles studied hypernuc

**KEK-121** (Mar 1983) Approved Apr 1983; Started Nov 1983; Completed Feb 1984.

**STUDY OF FEW PION STATES IN THE  $\pi^- p$  EXCHANGE REACTION**

KEK - A Ando, S Inabe, T Inagaki ( $\checkmark$  Spokesperson),  
 T Satoh, K Takamatsu, T Tsuru, Y Yasu  
 KYOTO U - K Imai, Y Inagaki, T Nakamura, J Shirai,  
 R Takashima, N Tamura  
 TSUKUBA U - K Ohmi  
 SAGA UNIV, JAPAN - S Kobayashi, A Murakami  
 AKITA U - A Sasaki

Accelerator KEK-PS Detector SUPERBENKEI

Reactions

$\pi^- p \rightarrow n \eta K^0 \bar{K}^0 \pi^0$                       8 GeV/c

Comments An extension of KEK-064.

**KEK-125** (Sep 1983) Approved Feb 1984; Started Jan 1986; Completed Mar 1986.

**STUDIES OF  $dd$  INTERACTIONS IN THE RANGE OF 2-4 GeV/c**

TOKYO U - F Sai, S S Yamamoto ( $\checkmark$  Spokesperson)  
 KYOTO U - K Imai  
 HIROSHIMA U - K Baba, I Endo, Y Sumi  
 KEK - A Masaike

TOKYO U, INS - K Nishimura

Accelerator KEK-PS Detector Counter

Reactions

deut deut  $\rightarrow X$                       1.5-4 GeV/c

Comments Measures the total cross section.

**KEK-131** Approved Oct 1984; Completed Mar 1986.

**CONFIRMATION OF THE NARROW STATE  $X(1935)$  IN THE REACTION  $\bar{p}p \rightarrow K^+ K^-$  AND  $\pi^+ \pi^-$**

KOBE U - T Fujii ( $\checkmark$  Spokesperson)  
 TOKYO U, INS - S Homma, M Sudo  
 KEK - Y Fujii, S Ishimoto, B Tanaka, T Tanimori  
 KYOTO U - Y Sugimoto  
 TOHOKU U - T Kono  
 HIROSHIMA U - K Morita, K Nakamura, Y Sumi

Accelerator KEK-PS Detector ?

Reactions

$\bar{p} p \rightarrow K^+ K^- \pi^+ \pi^-$                       —  
 $\bar{p} p \rightarrow \pi^+ \pi^-$                       —

Particles studied  $X(1935)$

**KEK-132** (Oct 1984) Approved Apr 1985.

**A STUDY OF CUMULATIVE  $\Lambda$  PRODUCTION IN HIGH ENERGY HADRON-NUCLEUS REACTIONS**

TSUKUBA U - I Arai ( $\checkmark$  Spokesperson), A Manabe,  
 M Ninomiya, H Nunokawa, M Tanaka, K Tomizawa, K Yagi  
 TOKYO U - T Nagae, H Sano, S Sasaki, K Tokushuku  
 KEK - J Chiba, T Kobayashi, K Nakai

Accelerator KEK-PS Detector FANCY

Reactions

pion  $^{12}\text{C} \rightarrow \Lambda X$                       < 4 GeV/c  
 $p \ ^{12}\text{C} \rightarrow \Lambda X$                       "

Comments Approved for 50 shifts. Measures inclusive cross sections and polarizations, and studies multi-nucleon correlations in nuclei.

**KEK-133** Approved Oct 1984; Started Jul 1985; Completed Dec 1985.

**STUDY OF EXCITED NUCLEONS IN NUCLEI**

KEK - J Chiba ( $\checkmark$  Spokesperson), K Nakai  
 TOKYO U - T Nagae, H Sano, S Sasaki, M Sekimoto,  
 K Tokushuku

## SUMMARIES OF EXPERIMENTS

TSUKUBA U - K Aoki, I Arai, A Manabe, H Nunokawa,  
H Sakamoto

Accelerator KEK-PS Detector FANCY

Reactions

$p$  nucleus  $\rightarrow \Delta(1232 P_{33})^0 X$  3.9 GeV/c

Comments Quasi-free production of  $\Delta^0$  isobars in proton nucleus reactions. The nuclear targets are C, Al, Cu, Li, and  $CD_2$ .

Papers NIM A237 (1985) 559.

**KEK-135** (Sep 1984) Approved Feb 1985; Started Jan 1986; Completed Jul 1986.

**MESON SPECTROSCOPY BY CHARGE-EXCHANGE REACTIONS**

KEK - S Inaba, T Inagaki, T Satoh, K Takamatsu, T Tsuru  
( $\checkmark$  Spokesperson), Y Yasu

KYOTO U - Y Inagaki, T Nakamura

KYOTO U OF EDUCATION - R Takashima

TSUKUBA U - K Ohmi

NAGOYA U - S Fukui, N Horikawa, T Iwata, T Kinashi,  
M Kurashina, I Maeda, T Matsuda, K Mori, T Nakanishi

MIYAZAKI U - Y Ishizaki

Accelerator KEK-PS Detector SUPERBENKEI

Reactions

$\pi^- p \rightarrow \eta \pi^+ \pi^- n$  9 GeV/c

$\pi^- p \rightarrow \pi^+ \pi^- 4\gamma n$  "

Particles studied  $f_0(1590)$ ,  $X(1700)$ ,  $f_2(1720)$

**KEK-136** (Jan 1985) Approved Feb 1985; Completed 1986.

**SEARCH FOR LONG-LIVED HADRONS WITH CHARGE TWO**

KYOTO U - K Imai, H Kobayashi, A Konaka, A Masaike,  
K Miyake, T Nakamura, N Sasao ( $\checkmark$  Spokesperson),  
Y Yamada

Accelerator KEK-PS Detector Wire chamber

Reactions

$p$  nucleus  $\rightarrow$  hadron X 12 GeV ( $E_{lab}$ )

Particles studied longlived

**KEK-137** Approved Oct 1985.

**STUDY OF THE RARE DECAY  $K_L \rightarrow \mu e$**

KEK - T Inagaki (Spokesperson), M Kobayashi, T Satoh,  
T Shinkawa, K Takamatsu, Y Yoshimura

TOKYO U - F Sai, S S Yamamoto

KYOTO U - Y Hemmi

Accelerator KEK-PS Detector Wire chamber

Reactions

$K_L \rightarrow \mu^+ e^-$  2-8 GeV/c

$K_L \rightarrow \mu^- e^+$  "

Particles studied  $K_L$

**KEK-146** Approved Feb 1986.

**CHEMISTRY OF  $\pi^-$  MESONIC ATOMS — STUDIES OF ELECTRONIC CHARGE DISTRIBUTION AROUND HYDROGEN IN MATTER**

KYOTO U - I Fujiwara, N Imanishi, M Iwasaki  
( $\checkmark$  Spokesperson), S Iwata, T Mukoyama, Y Takeuchi,  
K Toyada

TOHOKU U - K Hashimoto, H Kaji, T Sekini, K Yoshihara

OSAKA U - H Baba, T Saito, A Shinohara, S Yakamatsu,  
A Yokohama

KEK - Y Yoshimura

Accelerator KEK-PS Detector ?

Reactions

$\pi^-$  140 MeV/c

Comments Approved for 30 shifts.

**KEK-150** (Feb 1986) Approved Feb 1986.

**STUDY OF HYPERNUCLEI VIA ( $\pi^-$ ,  $K^-$ ) REACTIONS**

TOKYO U - J Imazato, T Ishikawa, M Iwasaki, K Nagamine,  
O Sasaki, E Takada, H Tamura

OSAKA U - H Ejiri, T Fukuda, M Fukufa, T Irie, H Noumi,  
H Osumi, T Shibata ( $\checkmark$  Spokesperson)

TOKYO U, INS - H Hamagaki, O Hashimoto  
( $\checkmark$  Spokesperson), S Homma, M Koike, Y Matsuyama,  
K Omata, Y Shida, F Soga, N Yoshikawa

KEK - R Hayano, K H Tanaka

YAMAGATA U - S Kato

KYOTO INDUSTRIAL U - F Takeuchi

TOHOKU U - K Maeda

Accelerator KEK-PS Detector Spectrometer

Reactions

$\pi^-$  nucleus  $\rightarrow K^- X$  1.0-1.2 GeV/c

Comments Approved for 100 shifts.

**LAMPF-015** (Jun 1977) Started Aug 1978; Completed Jan 1980.

**ELASTIC SCATTERING AND TOTAL CROSS SECTION MEASUREMENTS OF PROTONS ON HYDROGEN, DEUTERIUM, AND HELIUM**

LOS ALAMOS - N Tanaka (Spokesperson)

BROOKHAVEN - R E Chrien, T Kozlowski, H Palevsky,  
R J Sutter

MINNESOTA U - N M Hintz, M Oothoudt

UCLA - J C Fong, G J Igo (Spokesperson), R J Ridge,  
C A Whitten

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p p \rightarrow p p$  800 MeV ( $T_{lab}$ )

$p$  deut  $\rightarrow p$  deut "

$p$  He  $\rightarrow p$  He "

Comments Lab angles 1-15° span from dominant coulomb to nuclear scattering. Ran 324 hours.

Papers PL 97B (1980) 33.

**LAMPF-032** (Mar 1971) Started Feb 1974; Completed Nov 1980.

**PRECISION MEASUREMENT OF THE PROCESSES  $\pi^\pm \rightarrow \pi^0 e^\pm \nu$**

TEMPLE U - L B Auerbach, F G Gaille, V L Highland,  
E Jastrzembski, W K McFarlane ( $\checkmark$  Spokesperson)

LOS ALAMOS - F H Cverna, C M Hoffman, G E Hogan,  
R J Macek ( $\checkmark$  Spokesperson), R E Morgado, J Pratt,  
R D Werbeck

Accelerator LAMPF Detector Counter

Reactions

$\pi^+ \rightarrow \pi^0 e^+ \bar{\nu}$  520 MeV/c

$\pi^+ p \rightarrow \pi^0 n$  522 MeV/c

Particles studied  $\pi^+$

Comments The detector is a lead glass hodoscope. A decay-in-flight technique was used to obtain the most precise measurement to date for this decay rate. The result is  $(0.394 \pm 0.015)/s$ , in good agreement with the prediction of  $(0.4027 \pm 0.018)/s$  based on the conserved-vector-current hypothesis and measured nuclear beta-decay rates.

Papers PRL 51 (1983) 249, PR D30 (1984) 2408, and PR D32 (1985) 547. No other papers expected.



## SUMMARIES OF EXPERIMENTS

**LAMPF-058-120** (Aug 1972) Started Sep 1980; Completed Jul 1982.

**MEASUREMENT OF  $\pi^- p \rightarrow \gamma n$ , AND MEASUREMENT OF THE POLARIZATION ASYMMETRY AND THE DIFFERENTIAL CROSS SECTION OF  $\pi N$  CHARGE EXCHANGE FROM 160 TO 500 MeV**

UCLA - P Glodis, R P Haddock, K C Leung, B M K Neffkens (✓ Spokesperson)

CATHOLIC U - D I Sober (✓ Spokesperson)

LOS ALAMOS - C F Hwang

Accelerator LAMPF Detector Counter

Reactions Polarized target  
 $\pi^- p \rightarrow \gamma n$  247, 687 MeV/c  
 $\pi^- p \rightarrow \pi^0 n$  "  
 $\pi^- p \rightarrow \pi^- p$  "  
 $\pi^+ p \rightarrow \pi^+ p$  "

Comments Ran 1580 hours. The analysis is continuing.

Papers NP A416 (1984) 193, NP A416 (1984) 217, and NP A416 (1984) 513.

**LAMPF-190** Started Oct 1981.

**A PRECISION MEASUREMENT OF THE  $\pi^- - \pi^0$  MASS DIFFERENCE**

VIRGINIA U - J Comiso, R C Minehart, K O H Ziock (Spokesperson)

Accelerator LAMPF Detector Counter

Reactions  
 $\pi^- p \rightarrow \pi^0 n$  25-50 MeV ( $T_{lab}$ )

Particles studied  $\pi^-, \pi^0$

Comments An attempt to measure the  $\pi^- - \pi^0$  mass difference to an accuracy of 500 eV by measuring the neutron energy. Approved for 200 hours.

**LAMPF-194** (Aug 1974) Started Nov 1979; Completed Apr 1981.

**PROTON-PROTON D, R, AND A MEASUREMENTS**

CASE WESTERN RESERVE U - H W Baer, P R Bevington, F H Cverna, M W McNaughton, H B Willard (Spokesperson), E Winkelman

VIRGINIA TECH - R A Arndt, L D Roper

TEXAS A AND M - R A Bryan

SUNY COLLEGE, GENESEO - J R Chen

LOS ALAMOS - E P Chamberlin, R R Stevens, Jr

FERMILAB - P A Thompson

IDAHO U - H Willmes

UC, DAVIS - N King

Accelerator LAMPF Detector Counter

Reactions Polarized beam  
 $p p \rightarrow p p$  647, 800 MeV ( $T_{lab}$ )

Comments Measures  $D_{NN}$ ,  $D_{LS}$ ,  $K_{NN}$ ,  $K_{SS}$ , and  $K_{SL}$  from 46 to 90° c.m. Ran 499 hours.

**LAMPF-225** (Feb 1975) Started Sep 1983; Completed Dec 1986.

**A STUDY OF NEUTRINO-ELECTRON SCATTERING**

UC, IRVINE - R C Allen, H H Chen (✓ Spokesperson), P J Doe, W P Lee, X Q Lu, M Potter

LOS ALAMOS - T J Bowles, R L Burman, R D Carlini,

D R F Cochran, J S Frank, E Piasetzky, V D Sandberg

MARYLAND U - D A Krakauer, R L Talaga

Accelerator LAMPF Detector Counter

Reactions  
 $\nu_e e^- \rightarrow \nu_e e^-$  20-53 MeV ( $T_{lab}$ )

Comments A 15-ton detector system giving 120 elastic events in two years. Measures cross sections. Subsidiary results would be a test of multiplicative lepton-number

conservation in  $\mu^+$  decay, a search for  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  oscillations, a measurement of the inverse beta cross section in  $^{12}\text{C}$ , and a search for anomalous neutrino events.

Papers PRL 55 (1985) 2401.

**LAMPF-295** (Jul 1976) Completed.

**STUDY OF THE  $\pi d$  SINGLE CHARGE-EXCHANGE REACTION  $d(\pi^-, \pi^0)2n$**

LOS ALAMOS - J D Bowman (✓ Spokesperson), M D Cooper, W R Gibbs, R H Heffner, C M Hoffman, J Potter, G J Stephenson, M Zaider

TEL AVIV U & LOS ALAMOS - M A Moinester (✓ Spokesperson)

TEL AVIV U - J Alster, S Gilad

CASE WESTERN RESERVE U - H W Baer, P R Bevington, F H Cverna, M W McNaughton

Accelerator LAMPF Detector Spectrometer

Reactions  
 $\pi^- \text{ deut} \rightarrow \pi^0 n n$  30-230 MeV ( $T_{lab}$ )

Comments Measures the double differential cross section at 6 energies and 8 angles.

**LAMPF-336** (Jun 1977) Completed Jul 1982.

**STUDY OF THE SPIN DEPENDENCE OF  $pp$  PION PRODUCTION REACTIONS**

RICE U - S D Baker, J M Clement, I M Duck, G S Mutchler (✓ Spokesperson), G P Pepin, G C Phillips, E A Umland

HOUSTON U - A D Hancock, E V Hungerford, B W Mayes,

L S Pinsky (✓ Spokesperson), T M Williams

LOS ALAMOS - C F Hwang, M W McNaughton

BOSKOVIC INST, ZAGREB - M Furic

Accelerator LAMPF Detector Spectrometer

Reactions Polarized beam  
 $p p \rightarrow p \pi^+ n$  500, 650, 800 MeV ( $T_{lab}$ )  
 $p p \rightarrow p \pi^0 p$  "

Comments The first kinematically complete measurements using a polarized proton beam. Analyzing powers and cross sections were measured for 12 angle pairs.

Papers PR C27 (1983) 2742.

**LAMPF-360** (Nov 1977) Started Mar 1979; Completed Jan 1980.

**THE MEASUREMENT OF THE POLARIZATION TRANSFER COEFFICIENTS  $D_T$  AND  $A_T'$  AT 800 MeV FOR THE REACTIONS  $d(p, n)2p$ ,  ${}^6\text{Li}(p, n){}^6\text{Be}$ , AND  ${}^9\text{Be}(p, n){}^9\text{B}$**

LOS ALAMOS - B E Bonner, J E Simmons (Spokesperson)

TEXAS U - C L Hollas, C R Newson, R D Ransome,

P J Riley (Spokesperson)

TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert, L C Northcliffe, W B Tippens

Accelerator LAMPF Detector Single-arm spectrometer

Reactions Polarized beam  
 $p \text{ deut} \rightarrow n X$  800 MeV ( $T_{lab}$ )  
 $p \text{ Be} \rightarrow n X$  "

Comments Measures the spin transfer coefficients  $K_{LL}$  and  $K_{NN}$  at 0°.

Papers PL 103B (1981) 313.

**LAMPF-366** (Nov 1977) Started Jan 1980; Completed Mar 1980.

**NONRESONANT PION PRODUCTION IN THE REACTION  $np \rightarrow \pi^- pp$**

RICE U - J M Clement, W H Dragoset, I M Duck,

G S Mutchler (✓ Spokesperson), G P Pepin, G C Phillips

HOUSTON U - J C Allred, E V Hungerford, B W Mayes

(✓ Spokesperson), L Pinsky, T M Williams

## SUMMARIES OF EXPERIMENTS

LOS ALAMOS - B E Bonner  
 TEXAS A AND M - G Glass  
 BOSKOVIC INST, ZAGREB - M Furic  
 TEXAS U - C L Hollas, P J Riley

Accelerator LAMPF Detector Double-arm spectrometer

Reactions

$n p \rightarrow \pi^- p p$  790 MeV ( $T_{lab}$ )

Comments Makes kinematically complete measurements at 11 angle pairs. Comparison with  $pp \rightarrow pp\pi^0$  data gives information on isospin-0 amplitudes.

**LAMPF-385** (May 1978) Started May 1979; Completed Mar 1980.

**MEASUREMENT OF THE POLARIZED  $pn$  ANALYZING POWER  $A_Y(\theta)$  FROM 10-70° C.M.**

LOS ALAMOS - J F Amann, B E Bonner, G W Hoffmann (Spokesperson), J B McClelland  
 TEXAS U - M Barlett, R Ferguson, B Hoistad, J Marshall, J A McGill, E C Milner, L Ray  
 SOUTH CAROLINA U - G S Blaupied

Accelerator LAMPF Detector ?

Reactions Polarized beam

$p$  deut 1.46 GeV/c  
 $p n \rightarrow p n$  "  
 $p p \rightarrow p p$  "

Papers PR C27 (1983) 682.

**LAMPF-392** (May 1978) Started 1980; Completed 1983.

**A MEASUREMENT OF THE TRIPLE-SCATTERING PARAMETERS  $D$ ,  $R$ ,  $A$ ,  $R'$ , AND  $A'$  FOR  $pp$  AND  $pn$  SCATTERING AT 800 MeV**

LOS ALAMOS - J F Amann, B E Bonner, J B McClelland  
 TEXAS U - M L Barlett, R W Ferguson, G W Hoffmann (Spokesperson), J A Marshall, J A McGill, E C Milner

Accelerator LAMPF Detector Counter

Reactions Polarized beam

$p n \rightarrow p n$  500, 800 MeV ( $T_{lab}$ )  
 $p p \rightarrow p p$  "

Papers PR C30 (1984) 279.

**LAMPF-400-445** (Jun 1979) Started Dec 1983; Completed 1985.

**STUDY OF  $\pi^0 \rightarrow 3\gamma$  AND  $\pi^+ \rightarrow e^+ \gamma \nu$  DECAYS, AND SEARCH FOR LEPTON FLAVOR-VIOLATING DECAYS  $\mu^+ \rightarrow e^+ e^+ e^-$ ,  $\mu^+ \rightarrow e^+ 2\gamma$ , AND  $\mu^+ \rightarrow e^+ \gamma$**

LOS ALAMOS - R D Bolton, J D Bowman, R Carlini, M D Cooper, M Duong-Van, J S Frank, A L Hallin, P Heusi, C M Hoffman (✓ Spokesperson), G E Hogan, F G Mariam, H S Matis, R E Mischke, D E Nagle, V D Sandberg, G H Sanders, U Sennhauser, R L Talaga, R Werbeck, R A Williams

STANFORD U - R Hofstadter, E B Hughes, M Ritter, S Wilson

CHICAGO U - D Grosnick, S C Wright

TEMPLE U - V Highland, J McDonough

Accelerator LAMPF Detector CRY-BOX

Reactions

$\pi^0 \rightarrow 3\gamma$  0 MeV/c  
 $\pi^+ \rightarrow e^+ \gamma \nu_e$  "  
 $\mu^+ \rightarrow e^+ e^+ e^-$  "  
 $\mu^+ \rightarrow e^+ \gamma \gamma$  "  
 $\mu^+ \rightarrow e^+ \gamma$  "

Particles studied  $\mu^+$ ,  $\pi^0$ ,  $\pi^+$

Comments Measures branching ratios for the rare muon decays of  $10^{-11}$ , two orders better than before.

Papers PRL 53 (1984) 1415, PRL 56 (1986) 2461, and PRL 57 (1986) 1402.

**LAMPF-402** (May 1978) Started Mar 1979; Completed Mar 1980.

**A MEASUREMENT OF THE POLARIZATION TRANSFER COEFFICIENTS  $D_T(0^\circ)$  AND  $A'_T(0^\circ)$  IN THE REACTION  $pp \rightarrow nX$  AT 800 MeV**

TEXAS A AND M - T S Bhatia, G C Glass (Spokesperson), J C Hiebert, L C Northcliffe, B Ver West  
 LOS ALAMOS - B E Bonner, J E Simmons (Spokesperson)  
 TEXAS U - C L Hollas, C R Newsom, R D Ransome, P J Riley

Accelerator LAMPF Detector Single-arm spectrometer

Reactions Polarized beam

$p p \rightarrow n X$  800 MeV ( $T_{lab}$ )

Comments Measures the spin transfer coefficients  $K_{LL}$  and  $K_{NN}$  in the forward direction.

Papers AIP Conf. Proc. 69 (1981) 166.

**LAMPF-403** (May 1978) Started Nov 1979; Completed Jan 1980.

**A MEASUREMENT OF THE TRIPLE-SCATTERING PARAMETER  $D_T$  FOR THE CHARGE-EXCHANGE REGION IN  $np$  SCATTERING**

LOS ALAMOS - B E Bonner (✓ Spokesperson), W R Gibbs, M W McNaughton, J E Simmons  
 TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert, L C Northcliffe, W B Tippens  
 TEXAS U - C L Hollas, R D Ransome, P J Riley

Accelerator LAMPF Detector Single-arm spectrometer

Reactions Polarized beam

$n p \rightarrow p n$  790 MeV ( $T_{lab}$ )

Comments Measures the analyzing power  $A$  and the spin-transfer parameters  $K_{NN}$ ,  $K_{SS}$ ,  $K_{SL}$ , and  $K_{LL}$  for charge exchange.

Papers PRL 48 (1982) 781.

**LAMPF-421** (Jun 1978) Started Sep 1980.

**SENSITIVE SEARCH FOR  $\mu^- \rightarrow e^-$  CONVERSION**

YALE U - V W Hughes (Spokesperson), P A Souder

(Spokesperson)

PENN U - S Frankel (Spokesperson)

Accelerator LAMPF Detector Wire chamber

Reactions

$\mu^-$  nucleus  $\rightarrow e^-$  nucleus 0 MeV/c

Particles studied  $\mu^-$

Comments The branching ratio relative to ordinary muon capture is predicted to be greater than  $10^{-12}$ . The present upper limit is  $10^{-10}$ . This experiment should test to  $10^{-11}$  or better. Approved for 850 hours.

**LAMPF-455** (Nov 1978) Started Jul 1981; Completed.

**HIGH-PRECISION STUDY OF THE  $\mu^+$  DECAY SPECTRUM**

LOS ALAMOS - H L Anderson (✓ Spokesperson), J D Bowman (✓ Spokesperson), C M Hoffman, H S Matis, R J McKee, D E Nagle

CHICAGO U - W W Kinnison

NATIONAL RESEARCH COUNCIL, OTTAWA -

C K Hargrove, H Mes

CARLETON U - A L Carter, D Kessler

Accelerator LAMPF Detector Spectrometer

Reactions Polarized beam

$\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$  0 MeV/c

## SUMMARIES OF EXPERIMENTS

Particles studied  $\mu^+$

Comments By measuring the asymmetry of the  $e^+$  over the energy range, the decay parameters  $\rho$ ,  $\eta$ ,  $\xi$ , and  $\delta$  are determined better than before. Tests  $V-A$  theory accuracy.

**LAMPF-457** (Nov 1978) Started Feb 1981; Completed Apr 1981.

**MEASUREMENT OF THE QUASI-FREE  $pn$  AND  $pp$  AND FREE  $pp$  ANALYZING POWERS, 500-800 MeV**

LOS ALAMOS - J E Simmons (Spokesperson)  
TEXAS A AND M - T S Bhatia (Spokesperson), G Glass,  
J C Hiebert, L C Northcliffe, W B Tippens  
CASE WESTERN RESERVE U - H B Willard

Accelerator LAMPF Detector Single-arm spectrometer

Reactions Polarized beam

$p n \rightarrow p n$  800 MeV ( $T_{lab}$ )  
 $p p \rightarrow p p$  "

Comments Quasi-elastic, uses deuteron target. Measures for  $20 < \theta_{cm} < 75^\circ$ .

**LAMPF-462** (Nov 1978) Started Feb 1981; Completed Apr 1981.

**ANALYZING POWER AND DIFFERENTIAL CROSS SECTIONS FOR THE REACTIONS  $pp \rightarrow d\pi^+$  AND  $pd \rightarrow t\pi^+$  AT ABOUT 600 MeV AND 400 MeV**

NORTHWESTERN U - S G Iversen, M O Kaletka, H Nann  
(Spokesperson), K K Seth (Spokesperson)  
LOS ALAMOS - R L Burman

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p p \rightarrow \text{deut } \pi^+$  800 MeV ( $T_{lab}$ )  
 $p \text{ deut} \rightarrow \text{trit } \pi^+$  "

Comments Differential cross section and asymmetry measured for c.m. angles  $16$  to  $92^\circ$ .

Papers PL 88B (1979) 257.

**LAMPF-478** (Jun 1979) Started Jan 1980; Completed Mar 1980.

**$\pi^+$  AND  $\pi^-$  ELASTIC SCATTERING FROM DEUTERIUM**

COLORADO U - E F Gibson, J J Kraushaar, T G Masterson  
( $\checkmark$  Spokesperson), R J Peterson, R S Raymond,  
R A Ristinen

LOS ALAMOS - R L Boudrie

Accelerator LAMPF Detector EPICS

Reactions

$\pi^+ \text{ deut} \rightarrow \pi^+ \text{ deut}$  143 MeV ( $T_{lab}$ )  
 $\pi^- \text{ deut} \rightarrow \pi^- \text{ deut}$  "

Comments Tests charge symmetry.

Papers PRL 47 (1981) 220, and PR C26 (1982) 2091.

**LAMPF-492** (Jun 1979) Started Jun 1980; Completed Nov 1980.

**POLARIMETER CALIBRATIONS AND SEARCH FOR ENERGY-DEPENDENT STRUCTURE IN  $pp$  ELASTIC SCATTERING VIA CROSS SECTION, ANALYZING POWER, AND WOLFENSTEIN PARAMETER MEASUREMENTS**

LOS ALAMOS - R E Anderson, B E Bonner, E P Chamberlin,  
F H Cverna, O B van Dyck, E W Hoffman, N S P King,  
M W McNaughton ( $\checkmark$  Spokesperson), R E Morgado,  
G G Ohlsen, R R Stevens, Jr, R L York  
CASE WESTERN RESERVE U - P R Bevington, H B Willard  
( $\checkmark$  Spokesperson)  
NEW MEXICO STATE U - G Burleson  
TEXAS U - C L Hollas, P J Riley

Accelerator LAMPF Detector Combination

Reactions Polarized beam and target

$p p \rightarrow p p$  1.10, 1.46 GeV/c

Comments Measures the Wolfenstein parameters for  $pp$  elastic scattering for  $5 < \theta_{cm} < 90^\circ$ .

Papers PR C24 (1981) 1778, NIM 201 (1982) 315, PL 143B (1984) 343, and NIM A241 (1985) 435.

**LAMPF-498** (Jun 1979) Started Jun 1980.

**MEASUREMENTS OF LONGITUDINAL CROSS SECTION DIFFERENCE FOR LONGITUDINAL POLARIZED BEAM AND TARGET:  $\Delta\sigma_L$  FOR (1)  $pp$ , (2)  $pd$ , AND (3)  $np$ .**

ARGONNE - I P Auer (Spokesperson), D Hill, H Spinka,  
K Toshioka, A Yokosawa  
LOS ALAMOS - R E Anderson, E W Hoffman,  
M W McNaughton  
NEW MEXICO STATE U - G R Burleson  
CASE WESTERN RESERVE U - H B Willard

Accelerator LAMPF Detector Combination

Reactions Polarized beam and target

$p p \rightarrow p p$  300-800 MeV ( $T_{lab}$ )  
 $p \text{ deut} \rightarrow p \text{ deut}$  425-800 MeV ( $T_{lab}$ )  
 $n p \rightarrow n p$  425, 650, 800 MeV ( $T_{lab}$ )

Comments Approved for 650 hours.

Papers PR D29 (1984) 2435.

**LAMPF-504** (Jun 1979) Started Jun 1980; Completed Nov 1980.

**MEASUREMENT OF THE TOTAL CROSS SECTION DIFFERENCE FOR  $pp$  SCATTERING IN PURE TRANSVERSE INITIAL SPIN STATES IN THE 400-800 MeV REGION**

RICE U - S D Baker, M Furic, W Madigan, H E Miettinen,  
G S Mutchler, G C Phillips ( $\checkmark$  Spokesperson), J B Roberts,  
W V Witsch  
HOUSTON U - J C Allred, E V Hungerford, B W Mayes,  
L S Pinsky, T M Williams  
LOS ALAMOS - B E Bonner

Accelerator LAMPF Detector Wire chamber

Reactions Polarized beam and target

$p p \rightarrow p p$  318-800 MeV ( $T_{lab}$ )

Comments The total-cross-section difference for the protons in pure transverse spin states was measured using precision ion chambers. Data were taken at 12 energies.

Papers PR D31 (1985) 966. No other papers expected.

**LAMPF-508** (Jun 1979) Started Jun 1980.

**DIBARYON RESONANCES IN PION PRODUCTION**

NORTHWESTERN U - S G Iversen, M O Kaletka, H Nann,  
K K Seth (Spokesperson)  
LOS ALAMOS - F H Cverna

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p p \rightarrow \text{deut } \pi^+$  400-800 MeV ( $T_{lab}$ )

Particles studied dibaryon

Comments Measures the polarization asymmetry to determine  $^1D_2$  and  $^3F_3$  partial waves to investigate possible dibaryon resonances. Approved for 428 hours, with 349 hours run as of October 81.

**LAMPF-517** (Jun 1979) Started Jul 1981; Completed Nov 1981.

**POLARIZED BEAM AND TARGET EXPERIMENTS IN THE  $pp$  SYSTEM. PHASE I.  $A_Y$  AND  $A_{YY}$  FOR THE  $d\pi^+$  CHANNEL AND  $A_{YY}$  FOR THE ELASTIC CHANNEL FROM 500 TO 800 MeV**

## SUMMARIES OF EXPERIMENTS

LOS ALAMOS - J G J Boissevain, J J Jarmer (Spokesperson),  
 J E Simmons (Spokesperson)  
 TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert,  
 R A Kenefick, L C Northcliffe (Spokesperson), W B Tippens  
 WASHINGTON STATE U - G E Tripard  
 UCLA - D Fitzgerald, J Holt, A Mokhtari  
Accelerator LAMPF Detector Combination  
Reactions Polarized beam and target  
 $pp \rightarrow pp$  500, 600, 650, 700, 733, 800 MeV  
 $pp \rightarrow \text{deut } \pi^+$  (T<sub>lab</sub>)  
 $pp \rightarrow np \pi^+$  "  
Particles studied dibaryon  
Comments Measures A<sub>NN</sub>.  
Papers PRL 49 (1982) 1135, and PRL 53 (1984) 1984.

**LAMPF-518** (Jun 1979) Started May 1982.  
**POLARIZED BEAM AND TARGET EXPERIMENTS  
 IN THE  $pp$  SYSTEM: PHASE II. MEASUREMENTS  
 OF  $A_{ZZ}$  AND  $A_{XZ}$  FOR THE  $d\pi^+$  CHANNEL AND  
 FOR THE ELASTIC CHANNEL FROM 500 TO 800  
 MeV**  
 LOS ALAMOS - E P Chamberlin, J J Jarmer (Spokesperson),  
 J E Simmons (Spokesperson), R L York  
 TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert,  
 L C Northcliffe (Spokesperson), W B Tippens  
Accelerator LAMPF Detector Counter  
Reactions Polarized beam and target  
 $pp \rightarrow \text{deut } \pi^+$  500-800 MeV (T<sub>lab</sub>)  
 $pp \rightarrow pp$  "  
Comments Approved for 150 hours.  
Papers PR C31 (1985) 288.

**LAMPF-546** (Nov 1979) Started Jan 1980; Completed Oct  
 1981.  
**INVESTIGATION OF THE SPIN FORM FACTOR OF  
 $^3\text{H}$  AND  $^3\text{He}$**   
 UCLA - W J Briscoe (√ Spokesperson), D H Fitzgerald,  
 P F Glodis, B M K Nefkens (√ Spokesperson), M E Sadler,  
 B H Silverman  
 LOS ALAMOS - R L Boudrie, C L Morris, H A Thiessen  
Accelerator LAMPF Detector EPICS  
Reactions  
 $\pi^+$  trit  $\rightarrow \pi^+$  trit 143, 180 MeV (T<sub>lab</sub>)  
 $\pi^+$   $^3\text{He} \rightarrow \pi^+$   $^3\text{He}$  "  
 $\pi^-$  trit  $\rightarrow \pi^-$  trit "  
 $\pi^-$   $^3\text{He} \rightarrow \pi^-$   $^3\text{He}$  "  
Comments Tests charge symmetry. The analysis is continu-  
 ing.  
Papers PRL 52 (1984) 735.

**LAMPF-563** (Jun 1980) Started Jul 1981; Completed Nov  
 1982.  
 **$pp$  ELASTIC SCATTERING AT 800 AND 500 MeV**  
 TEXAS U - M Barlett, R Ferguson, G W Hoffmann  
 (Spokesperson), B Hoistad, J Marshall, J McGill,  
 E C Milner, L Ray  
 LOS ALAMOS - J F Amann, B E Bonner, J B McClelland  
 SOUTH CAROLINA U - G S Blanpied  
 VIRGINIA TECH - R Arndt  
Accelerator LAMPF Detector LAHRS  
Reactions  
 $pp \rightarrow pp$  500, 800 MeV (T<sub>lab</sub>)  
Comments Measures the absolute elastic angular distribution  
 and analyzing power to investigate disagreements between  
 data and phase shift analyses and between sets of data.  
 Measures for  $8 < \theta_{\text{cm}} < 90^\circ$ .

Papers PR C27 (1983) 682.

**LAMPF-567** (Jun 1980)  
**A STUDY OF THE  $\pi^+d \rightarrow pp$  REACTION AT PION  
 ENERGIES 5-200 MeV**  
 SOUTH CAROLINA U - G S Blanpied, R D Edge,  
 B M Freedom, B G Ritchie (Spokesperson)  
 VIRGINIA TECH - M Blecher, K Gotow (Spokesperson),  
 R Ng  
 VIRGINIA U - J Boswell, J F Davis, R C Minehart  
 (Spokesperson)  
 MARYLAND U - N S Chant, P G Roos  
 LOS ALAMOS - R L Burman, M Hynes, M J Leitch  
 OAK RIDGE - F E Bertrand, E E Gross, F Obenshain  
 MIT - R P Redwine  
Accelerator LAMPF Detector Counter  
Reactions  
 $\pi^+$  deut  $\rightarrow pp$  65, 72.5, 80, 95, 110, 125, 140  
 MeV (T<sub>lab</sub>)  
 $\pi^+ p \rightarrow \pi^+ p$  "  
Comments Differential cross section measured for c.m. angles  
 100 to 168°.  
Papers PR C27 (1983) 1685, and PL 125B (1983) 128.

**LAMPF-581** Started Feb 1981; Completed Dec 1982.  
 **$\pi^\pm$  ELASTIC SCATTERING FROM DEUTERIUM AT  
 256 MeV**  
 COLORADO U - J J Kraushaar, D A Lind, T G Masterson  
 (√ Spokesperson), R J Peterson, R S Raymond,  
 R A Ristinen  
 LOS ALAMOS - R L Boudrie (√ Spokesperson)  
 CAL STATE, SACRAMENTO - E F Gibson  
 TRIUMF - D Gill  
Accelerator LAMPF Detector EPICS  
Reactions  
 $\pi^+$  deut  $\rightarrow \pi^+$  deut 256 MeV (T<sub>lab</sub>)  
 $\pi^-$  deut  $\rightarrow \pi^-$  deut "  
Comments Tests charge symmetry to an accuracy of a few  
 percent.  
Papers PR C30 (1984) 2010.

**LAMPF-585** (Jun 1980) Started Sep 1982; Completed Oct  
 1981.  
**MEASUREMENT OF  $pp$  AND  $pd$  ELASTIC SCAT-  
 TERING IN THE COULOMB INTERFERENCE RE-  
 GION BETWEEN 500 AND 800 MeV**  
 UCLA - B Aas, M Bleszynski, G J Igo, J B McClelland,  
 G Pauletta (Spokesperson), C A Whitten, Jr  
 MINNESOTA U - M Gazzaly  
Accelerator LAMPF Detector LAHRS  
Reactions Polarized beam  
 $pp \rightarrow pp$  650 MeV (T<sub>lab</sub>)  
 $p$  deut  $\rightarrow p$  deut "  
Comments Ran for 106 hours.

**LAMPF-589** (Jun 1980) Completed Nov 1985.  
**FREE-FORWARD  $np$  ELASTIC-SCATTERING  
 ANALYZING POWER MEASUREMENTS AT 800  
 MeV**  
 TEXAS A AND M - T S Bhatia, G C Glass (√ Spokesperson),  
 J C Hiebert, R A Kenefick, L C Northcliffe  
 (√ Spokesperson), R W Tippens  
 LOS ALAMOS - B E Bonner, J E Simmons  
 TEXAS U - G W Hoffmann, C L Hollas, R D Ransome,  
 P J Riley  
Accelerator LAMPF Detector Counter

## SUMMARIES OF EXPERIMENTS

Reactions Polarized beam  
 $n p \rightarrow n p$  800 MeV ( $T_{lab}$ )  
Comments Measures the forward-angle neutron analyzing power. Analysis is in progress.

**LAMPF-590** (Jun 1980) Completed 1985.  
**MEASUREMENT OF  $D(\theta)$  IN  $pn$  AND  $np$  SCATTERING AT 800, 650 MeV AND OTHER ENERGIES WITH ASSOCIATED  $pp$  MEASUREMENTS**

TEXAS A AND M - T S Bhatia, G C Glass, J C Hiebert, R A Kenefick, L C Northcliffe ( $\checkmark$  Spokesperson), W B Tippens  
 LOS ALAMOS - J J Jarmer, J E Simmons ( $\checkmark$  Spokesperson)

Accelerator LAMPF Detector Counter

Reactions Polarized beam and target  
 $p n \rightarrow p n$  600, 800 MeV ( $T_{lab}$ )  
 $n p \rightarrow n p$  "  
 $p p \rightarrow p p$  "

Comments Measures the Wolfenstein depolarization parameter  $D(\theta)$  over a large angular range for the  $np$  ( $I = 0$ ) system using the two reactions for forward and backward angles.  $D(\theta)$  for  $pp$  scattering is measured to calibrate the polarimeter and verify previous results. Analysis is in progress.

**LAMPF-605** (Jun 1980)  
**A DIBARYON SEARCH AT EPICS**  
 NORTHWESTERN U - D Barlow, M Bosco, S G Iversen, M O Kaletka, A Saha, K K Seth (Spokesperson), D Smith

Accelerator LAMPF Detector EPICS

Reactions  
 $\pi^+$  deut  $\rightarrow p p$  200-300 MeV ( $T_{lab}$ )

Particles studied dibaryon

Comments A search for dibaryons by the inverse of the usual reaction facilitates an examination of fine structure. Approved for 100 hours.

**LAMPF-634** (Nov 1980) Started Feb 1981.  
**MEASUREMENT OF PARITY VIOLATION IN THE  $pN$  TOTAL CROSS SECTIONS AT 800 MeV**

LOS ALAMOS - J D Bowman, R Carlini (Spokesperson), R E Mischke, D E Nagle, R L Talaga (Spokesperson)  
 ILLINOIS U, URBANA - H Frauenfelder, R Harper, V Yuan (Spokesperson)

Accelerator LAMPF Detector Counter

Reactions Polarized beam  
 $p$  nucleon  $\rightarrow p$  nucleon 800 MeV ( $T_{lab}$ )

Comments Measures the difference in total cross sections for positive and negative helicities of polarized protons on unpolarized target. The goal is  $10^{-7}$  in the cross section asymmetry. As of July 82, 515 hours run.

Papers PR D31 (1985) 1151.

**LAMPF-635** (Nov 1980) Started Feb 1981; Completed Dec 1982.  
**SPIN MEASUREMENTS IN  $pd$  ELASTIC SCATTERING**

LOS ALAMOS - B E Bonner (Spokesperson), O B van Dyck, M W McNaughton, H Ohnuma, S Tsu-hsun  
 UCLA - B Aas, E Bleszynski, M Bleszynski (Spokesperson), G J Igo (Spokesperson), G S Weston

TEXAS U - D J Cremans, C L Hollas, K H McNaughton, P J Riley, R F Rodebaugh, Shen-Wu Xu  
 RICE U - S F Turpin

Accelerator LAMPF Detector JANUS

Reactions Polarized beam  
 $p$  deut  $\rightarrow p$  deut 496, 647, 800 MeV ( $T_{lab}$ )

Comments An attempt to obtain double spin-flip parts of the  $I = 0$   $NN$  interaction by using Glauber theory on the  $pd$  results.

Papers PR C31 (1985) 515.

**LAMPF-636** (Nov 1980) Completed Dec 1982.  
**A MEASUREMENT OF THE WOLFENSTEIN POLARIZATION PARAMETERS  $D_{LL}$ ,  $D_{SL}$ ,  $K_{LL}$ , AND  $K_{SL}$  FOR  $pp$  ELASTIC SCATTERING**

TEXAS U - C L Hollas (Spokesperson), R D Ransome, P J Riley  
 LOS ALAMOS - B E Bonner, W D Cornelius, O B van Dyck, E W Hoffman, M W McNaughton, R L York  
 ARGONNE - K Imai, K Toshioka

Accelerator LAMPF Detector JANUS

Reactions Polarized beam  
 $p p \rightarrow p p$  650-800 MeV ( $T_{lab}$ )

Papers PR C30 (1984) 1251.

**LAMPF-637** (Nov 1980) Completed Dec 1982.  
**A MEASUREMENT OF THE VECTOR POLARIZATION OF THE DEUTERON IN THE REACTION  $pp \rightarrow d\pi^+$**

LOS ALAMOS - B E Bonner ( $\checkmark$  Spokesperson), W D Cornelius, O B van Dyck, E W Hoffman, M W McNaughton

RICE U & LOS ALAMOS - J B Roberts  
 TEXAS U - C L Hollas, R D Ransome, P J Riley  
 RICE U - S Turpin  
 TRIUMF - J A Niskanen

Accelerator LAMPF Detector JANUS

Reactions Polarized beam  
 $p p \rightarrow$  deut  $\pi^+$  800 MeV ( $T_{lab}$ )

Comments Measures the vector polarization and the vector-polarization transfer for the  $d$  by measuring the  $d$  polarization with unpolarized and polarized proton beams. The  $d$  polarization is measured by dissociating it and measuring the polarization of the resultant proton.

**LAMPF-645** (Nov 1980)  
**A SEARCH FOR NEUTRINO OSCILLATIONS AT LAMPF**

OHIO STATE U - R Harper, T Y Ling ( $\checkmark$  Spokesperson), J Mitchell, T A Romanowski ( $\checkmark$  Spokesperson), E Smith, M Timko

ARGONNE - S Freedman, J Garvey, J Napolitano  
 LOUISIANA STATE U - C Choi, A Fazely, R Imlay, W J Metcalf

CAL TECH - B Fujikawa, R B McKeown  
 LOS ALAMOS - J Donahue  
 LBL - K Lesko, E Norman

Accelerator LAMPF Detector Combination

Reactions  
 $\nu_e \rightarrow \nu_e$  0-53 MeV ( $T_{lab}$ )  
 $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  "  
 $\nu_\mu \rightarrow \nu_\mu$  "  
 $\bar{\nu}_e p \rightarrow e^+ n$  "

Comments A search for neutrino oscillations in the first three reactions. The fourth reaction is measured to permit background suppression. Taking data (November 86).

**LAMPF-647** (Jul 1981)  
**A NEUTRON OSCILLATION EXPERIMENT AT LAMPF**

LOS ALAMOS - R J Ellis (Spokesperson), J D Moses, A Taylor

Accelerator LAMPF Detector Combination

## SUMMARIES OF EXPERIMENTS

### Reactions

$n \rightarrow \bar{n}$  < 1 MeV ( $T_{lab}$ )

Comments It should be possible to put a limit of  $6 \times 10^7$  s on the  $\bar{n}n$  mixing time.

**LAMPF-650** (Apr 1981) Started Feb 1981; Completed Apr 1981.

### A SEARCH FOR NEUTRINO MIXING VIA NONEXPONENTIAL $\pi \rightarrow \mu\nu$ DECAY

LOS ALAMOS - J D Bowman ( $\checkmark$  Spokesperson)  
TEL AVIV U & LOS ALAMOS - M A Moinester

Accelerator LAMPF Detector Counter

### Reactions

$\pi^+ \rightarrow \mu^+ \nu$  0 MeV/c

**LAMPF-651** (Apr 1981)

### MEASUREMENT OF A LOWER LIMIT FOR THE SUBTHRESHOLD PRODUCTION OF KAONS WITH 800-MeV PROTONS

LOS ALAMOS - J F Amann, R L Boudrie, T A Carey,  
N J DiGiacomo, J B McClelland, C L Morris (Spokesperson),  
J M Moss, S J Seestrom-Morris  
TEXAS U - B Hoistad

Accelerator LAMPF Detector EPICS

### Reactions

$p \text{ } ^{12}\text{C} \rightarrow \text{kaon X}$  800 MeV ( $T_{lab}$ )

Comments To place limits on subthreshold  $K$  production. The experiment detects delayed  $\mu$ 's from stopped  $K$ 's. The process will be used in future to study hypernuclear levels, etc. Approved for 72 hours.

**LAMPF-664** (Jun 1981) Completed.

### THE MEASUREMENT OF THE POLARIZATION TRANSFER COEFFICIENTS $A'_T$ AND $D_T$ AT 500, 650, AND 800 MeV FOR THE REACTION $d(p, n)2p$

TEXAS A AND M - T S Bhatia, G C Glass ( $\checkmark$  Spokesperson),  
L C Northcliffe

ARGONNE - V S Chalmers, W R Ditzler, T Shima,  
H Shimizu, H Spinka, R Stanek ( $\checkmark$  Spokesperson),  
D Underwood, R Wagner, A Yokosawa

LOS ALAMOS - J E Simmons  
NEW MEXICO STATE U - G R Bureson, C Fontenla

Accelerator LAMPF Detector Combination

Reactions Polarized beam

$p \text{ deut} \rightarrow n p p$  500, 650, 800 MeV ( $T_{lab}$ )

Comments To permit calculation of the neutron polarization produced in  $d(p, n)2p$  with polarized protons for future polarized  $np$  scattering experiments.

Papers PL 153B (1985) 235.

**LAMPF-665** (Jun 1981) Completed Jan 1984.

### THE MEASUREMENT OF THE INITIAL-STATE SPIN CORRELATION PARAMETERS $C_{LL}$ AND $C_{SL}$ IN $np$ ELASTIC SCATTERING AT 500, 650, AND 800 MeV

NEW MEXICO STATE U - G R Bureson ( $\checkmark$  Spokesperson),  
C Fontenla, R Garnett

ARGONNE - R Ditzler, D Hill, T Shima, H Shimizu,  
H Spinka, R Stanek, R Wagner ( $\checkmark$  Spokesperson),  
A Yokosawa

LOS ALAMOS - R Damjanovich, J J Jarmer, J E Simmons  
TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert,  
R A Kenefick, L C Northcliffe

MONTANA U - R Jeppesen

WASHINGTON STATE U - G Trippard

Accelerator LAMPF Detector Wide-angle spectrometer

Reactions Polarized beam and target

$n p \rightarrow n p$  500, 650, 800 MeV ( $T_{lab}$ )

**LAMPF-683** (Jun 1981)

### MEASUREMENT OF $\Delta\sigma_L$ IN FREE $np$ SCATTERING AT 500, 650, AND 800 MeV

ARGONNE - W R Ditzler (Spokesperson), D Hill, K Imai,  
H Spinka, R Stanek, K Toshioka, R Wagner, A Yokosawa  
LOS ALAMOS - J J Jarmer, J E Simmons (Spokesperson)  
NEW MEXICO STATE U - G R Bureson, W B Cottingham,  
S J Greene  
TEXAS A AND M - T S Bhatia, G C Glass, J C Hiebert,  
R A Kenefick, L C Northcliffe

Accelerator LAMPF Detector ?

Reactions Polarized beam and target

$n p \rightarrow n p$  500, 650, 800 MeV ( $T_{lab}$ )

Comments Approved for 24 hours.

**LAMPF-685** (Jun 1981) Started Jan 1983; Completed Aug 1984.

### SPIN CORRELATIONS IN THE REACTION $d(p, p)d$ AT 500 MeV

UCLA - B Aas, A Azizi, E Bleszynski, M Bleszynski  
( $\checkmark$  Spokesperson), J Geaga, M Hajisaicid, G J Igo  
( $\checkmark$  Spokesperson), F Irom, G Pauletta, A Rahbar, J Wagner,  
A T M Wang, G Weston  
MINNESOTA U - M M Gazzaly

Accelerator LAMPF Detector Counter

Reactions Polarized beam and target

$\text{deut } p \rightarrow p \text{ deut}$  500 MeV ( $T_{lab}$ )

**LAMPF-689** (Jun 1981) Completed 1983.

### (A) NEUTRON COUNTER CALIBRATION USING TAGGED NEUTRONS FROM THE REACTION $\pi^- d \rightarrow nn$ , AND (B). FEASIBILITY STUDY: MEASUREMENTS OF THE DIFFERENTIAL CROSS SECTION FOR $\pi^- d \rightarrow nn$ TO TEST CHARGE SYMMETRY AND ISOSPIN INVARIANCE

UCLA - W J Briscoe, A Eichon, D H Fitzgerald  
( $\checkmark$  Spokesperson), J Holt, A Mokhtari, B M K Nefkens  
( $\checkmark$  Spokesperson)

ABILENE CHRISTIAN U - M E Sadler

Accelerator LAMPF Detector Counter

Reactions

$\pi^- \text{ deut} \rightarrow n n$  250 MeV/c

**LAMPF-708** (Nov 1981) Approved Jan 1982; Completed Sep 1984.

### A MEASUREMENT OF THE DEPOLARIZATION, THE POLARIZATION, AND THE POLARIZATION ROTATION PARAMETERS AND THE ANALYZING POWER FOR THE REACTION $pp \rightarrow p\pi^+n$

TEXAS U - D C Cremans, C L Hollas (Spokesperson),  
P J Riley

LOS ALAMOS - B E Bonner, O van Dyck, E W Hoffman,  
M W McNaughton  
RUTGERS U - J A McGill

Accelerator LAMPF Detector Combination

Reactions Polarized beam

$p p \rightarrow p \pi^+ n$  650, 733, 800 MeV ( $T_{lab}$ )

**LAMPF-726** (Nov 1981) Completed Sep 1985.

### SEARCH FOR THE C-NONINVARIANT DECAY $\pi^0 \rightarrow 3\gamma$

TEMPLE U - L B Auerbach, V L Highland ( $\checkmark$  Spokesperson),  
W K McFarlane

LOS ALAMOS - L S Bayliss, R D Bolton, J D Bowman,  
R D Carlini, M D Cooper, J S Frank, T A Gordon,

## SUMMARIES OF EXPERIMENTS

C M Hoffman, G Hogan ( $\checkmark$  Spokesperson), W W Kinnison, R J Macek, H S Matis, R E Mischke, D E Nagle, V D Sandberg, G H Sanders, R D Werbeck, R A Williams

Accelerator LAMPF Detector CRYX-BOX

Reactions

$\pi^0 \rightarrow \gamma \gamma \gamma$  0 MeV/c

Particles studied  $\pi^0$

Comments To detect the C-noninvariant process at a branching ratio of  $10^{-9}$ , two orders of magnitude better than before. Analysis is in progress.

**LAMPF-758** (Nov 1982) Approved Aug 1982.

**TO CATCH A DEMON**

NORTHWESTERN U - D Barlow, L Casey, D Kielczewska, A Saha, K K Seth ( $\checkmark$  Spokesperson), J Stuart

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p p \rightarrow \text{demon } \pi^+$  800 MeV ( $T_{\text{lab}}$ )

Particles studied demon

Comments A search for a 'demon deuteron', an exotic 6-quark state. Relevant to anomalous. Approved for 100 hours.

**LAMPF-764** (Nov 1982) Approved Jan 1983; Started Aug 1984; Completed Jul 1986.

**SEARCH FOR NEUTRINO OSCILLATIONS AND MEASUREMENTS OF NUCLEAR CROSS SECTIONS USING A LIQUID SCINTILLATOR DETECTOR IN A  $\nu_\mu$  BEAM AT LAMPF**

LOS ALAMOS - T J Bowles, R L Burman, D Clark, S Clearwater, D R F Cochran, T W Dombeck ( $\checkmark$  Spokesperson), H Kruse ( $\checkmark$  Spokesperson), D Lee, V D Sandberg

NEW MEXICO U - B Bassalleck, B D Dieterle, J Kang, K Leavitt

UCLA - B Aas, G Igo

UC, RIVERSIDE - G Van Dalen, S Y Fung, B Gorn  
TEMPLE U - L B Auerbach, S Datta, V L Highland, D Huang  
VALPARAISO U - R Fisk, D Koetke, R Manweiler

Accelerator LAMPF Detector Counter

Reactions

$\nu_\mu \rightarrow \nu_e$  0-300 MeV/c

$\nu_\mu \text{ }^{12}\text{C} \rightarrow \mu^- \text{X}$  "

$\nu_\mu \text{Al} \rightarrow \mu^- \text{X}$  "

$\nu_\mu \text{ }^{12}\text{C} \rightarrow \mu^- \text{ }^{12}\text{N}it$  "

Particles studied  $\nu_\mu$

Comments Neutrino oscillations are first looked for in the appearance mode ( $\nu_\mu \rightarrow \nu_e$ ) and later in the disappearance mode. Expected sensitivity for 80 running days is  $\delta m^2 < 0.1 \text{ eV}^2$  and  $\sin^2(2\theta) < 0.001$ . The neutrino source is decay of  $< 400 \text{ MeV/c } \pi^+$  in flight.

**LAMPF-767** (Oct 1982) Approved Jan 1983.

**$\pi^\pm d$  ELASTIC SCATTERING AT THREE ENERGIES BETWEEN 30 AND 80 MeV**

VIRGINIA TECH - M Blecher, K Gotow ( $\checkmark$  Spokesperson)  
OAK RIDGE - F E Bertrand, E E Gross, F E Obenshain, T P Sjoreen

SOUTH CAROLINA U - G S Blanpied, B M Freedom, B G Ritchie, C S Whisnant ( $\checkmark$  Spokesperson)

LOS ALAMOS - R L Burman, M V Hynes, E Piasetzky  
MARYLAND U - N S Chant, P G Roos

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^+ \text{deut} \rightarrow \pi^+ \text{deut}$  30-80 MeV ( $T_{\text{lab}}$ )

$\pi^- \text{deut} \rightarrow \pi^- \text{deut}$  "

Comments Angular dependence at  $< 40^\circ$  and  $> 120^\circ$  covers the coulomb interference region. The aim is a critical comparison of experimental results with 3-body calculations of the  $\pi d$  system. Approved for 375 hours. In preparation as of September 84.

**LAMPF-770** (Nov 1982) Approved Jan 1983; Completed Dec 1985.

**THE MEASUREMENT OF  $n_p$  ELASTIC-SCATTERING SPIN-CORRELATION PARAMETERS WITH L- AND S-TYPE POLARIZED BEAM AND TARGET BETWEEN 500 AND 800 MeV**

ARGONNE - W R Ditzler, D Hill, K Johnson, D Lopiano, T Shima, H Shimizu, H Spinka ( $\checkmark$  Spokesperson), R Stanek, D Underwood, R Wagner, A Yokosawa

NEW MEXICO STATE U - M Beddo, G R Burleson ( $\checkmark$  Spokesperson), J Faucett, R Garnett, G Kyle, M Rawool

LOS ALAMOS - J J Jarmer

TEXAS A AND M - T S Bhatia, G C Glass, J C Hiebert, L C Northcliffe

MONTANA U - R H Jeppesen

WASHINGTON STATE U - G Trippard

Accelerator LAMPF Detector Wide-angle spectrometer

Reactions Polarized beam and target

$n p \rightarrow n p$  500-800 MeV ( $T_{\text{lab}}$ )

Comments Measures the initial-spin correlation parameters  $C_{SS}$ ,  $C_{LS}$ , and  $C_{LL}$  from 35 to  $172^\circ$  c.m. Complementary to LAMPF-665.

**LAMPF-783** (Nov 1982) Approved Jan 1983; Completed Oct 1983.

**PION-INDUCED PION PRODUCTION ON DEUTERONS**

LOS ALAMOS - R L Burman, P A M Gram ( $\checkmark$  Spokesperson), E Piasetzky ( $\checkmark$  Spokesperson), H J Ziock

WYOMING U - G A Rebka, Jr ( $\checkmark$  Spokesperson), D Roberts

TEL AVIV U - J Alster, D Ashery, J Lichtenstadt

( $\checkmark$  Spokesperson), M A Moenster

COLORADO COLL - C Bordner

NEW MEXICO U - D A Clark

MIT - S Hoibraten, E R Kinney, J L Matthews, S A Wood

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^- \text{deut} \rightarrow \pi^+ \text{X}$  256, 358, 450 MeV ( $T_{\text{lab}}$ )

$\pi^+ \text{deut} \rightarrow \pi^- \text{X}$  "

Comments Measures the double differential cross sections to about 5%. Among anticipated results is evidence concerning  $\Delta\Delta$  or quasi-bound  $nn\pi^-$  states.

Papers PRL 53 (1984) 540.

**LAMPF-790** (Nov 1982) Approved Jan 1983.

**$I = 1$  NN INELASTIC CROSS SECTIONS AND FIRST MEASUREMENTS OF  $T_{20}$  FOR THE  $pp \rightarrow d\pi^+$  REACTION AT 800 AND 650 MeV**

UCLA - B Aas, G J Igo, K Jones, G Pauletta ( $\checkmark$  Spokesperson), F Sperisen, C A Whitten, Jr

MINNESOTA U - M M Gazzaly ( $\checkmark$  Spokesperson), N M Hintz

LOS ALAMOS - J F Amann, B E Bonner, J J Jarmer,

J B McClelland, N Tanaka ( $\checkmark$  Spokesperson)

TEXAS A AND M - G C Glass

NEW MEXICO STATE U - S J Greene

TEXAS U - B Hostad

ARGONNE - H Spinka

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam and target

$p p \rightarrow \text{deut } \pi^+$  650, 800 MeV ( $T_{\text{lab}}$ )

Comments Measures  $A_{LL}$ ,  $A_{SL}$ ,  $A_{SS}$ , and  $A_{NN}$  at forward and backward angles, and  $A_{SS}$  at  $13^\circ$  lab. The tensor polarization  $T_{20}$  of the deuteron will be deduced. Uses same

## SUMMARIES OF EXPERIMENTS

polarized target as LAMPF-583 and -709. Approved for 80 hours.

**LAMPF-792** (Nov 1982) Approved Jan 1983; Started Aug 1983; Completed Jul 1984.

### MEASUREMENT OF PARITY VIOLATION IN THE $pp$ AND $pN$ TOTAL CROSS SECTIONS AT 800 MeV

ILLINOIS U, URBANA - H Frauenfelder, R W Harper, V Yuan (Spokesperson)  
 LOS ALAMOS - J D Bowman, R D Carlini, D MacArthur, R E Mischke, D E Nagle  
 MARYLAND U - R L Talaga  
 PRINCETON U - A B McDonald

Accelerator LAMPF Detector Counter

Reactions Polarized beam

$pp \rightarrow X$  800 MeV ( $T_{lab}$ )  
 $pn \rightarrow X$  "

Comments Uses  $LH_2$  and  $LD_2$  targets. A continuation of LAMPF-634. Parity violation in the scattering of polarized protons by an unpolarized target is used to study the weak contribution to the  $\Delta S = 0$  hadronic interaction. The experiment is sensitive to a parity-violating signal at about the  $10^{-7}$  level.

**LAMPF-795** (Nov 1983) Approved Jan 1983.

### A PRECISION TEST OF CHARGE INDEPENDENCE

NORTHWESTERN U - M Artuso, D Barlow, L Casey, C Magno, A Saha, K K Seth (Spokesperson)

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p \text{ deut} \rightarrow \text{trit } \pi^+$  800 MeV ( $T_{lab}$ )  
 $p \text{ deut} \rightarrow {}^3\text{He } \pi^0$  "

Comments Measures the difference in analyzing powers  $A_{Y0}(\theta)$  for the two reactions to a precision of  $\leq 0.002$  or 0.4%. Probes a possible charge-dependent  $np$  spin-orbit force. Approved for 200 hours.

**LAMPF-804** (Nov 1982) Approved Jan 1983; Started Dec 1983; Completed Aug 1984.

### MEASUREMENT OF THE ASYMMETRY PARAMETER IN $\pi^-p \rightarrow \gamma n$ USING A TRANSVERSE POLARIZED TARGET

UCLA - A Eichon, G Kim, A Mokhtari, B M K Nefkens (Spokesperson), J A Wightman  
 GEORGE WASHINGTON U - W J Briscoe  
 ABILENE CHRISTIAN U - M E Sadler  
 CATHOLIC U - D I Sober  
 LOS ALAMOS - D H Fitzgerald

Accelerator LAMPF Detector Combination

Reactions Polarized target

$\pi^-p \rightarrow \gamma n$  247-687 MeV/c  
 $\pi^-p \rightarrow \pi^0 n$  "

Particles studied  $\Delta(1232 P_{33})^0$ ,  $N^*(\text{unspec})^0$

Comments Adds new information on photoproduction amplitudes. Also tests time-reversal invariance comparing  $P$  with  $A_N$ . The analysis is continuing.

Papers PRL 56 (1986) 1779.

**LAMPF-806** (Nov 1982) Approved Jan 1983.

### MEASUREMENT OF SPIN-ROTATION PARAMETERS 'A AND R' IN $\pi^+p \rightarrow \pi^+p$ AND $\pi^-p \rightarrow \pi^-p$

UCLA - A Eichon, G Kim, A Mokhtari, B M K Nefkens (Spokesperson), J A Wightman  
 GEORGE WASHINGTON U - W J Briscoe (Spokesperson)  
 VIRGINIA TECH - L D Roper  
 ABILENE CHRISTIAN U - M E Sadler (Spokesperson)

Accelerator LAMPF Detector Wide-angle spectrometer

Reactions Polarized target

$\pi^+p \rightarrow \pi^+p$  378-625 MeV/c  
 $\pi^-p \rightarrow \pi^-p$  "

Comments Completes a set of five  $\pi N$  experiments at identical energies designed to provide a complete set of scattering amplitudes. Approved for 1400 hours. Taking data (November 86).

**LAMPF-808** (Jan 1983) Approved Jan 1983; Started Nov 1983; Completed Mar 1986.

### $0^\circ$ EXCITATION FUNCTION FOR $\pi^-p \rightarrow \pi^0 n$

LOS ALAMOS - H W Baer, J D Bowman, M D Cooper (Spokesperson), D H Fitzgerald (Spokesperson), F Irom, N S P King, M J Leitsch, E Piasetzky  
 GEORGE WASHINGTON U - W J Briscoe  
 ABILENE CHRISTIAN U - M E Sadler, K J Smith  
 ARIZONA STATE U - J N Knudson

Accelerator LAMPF Detector Photon spectrometer

Reactions

$\pi^-p \rightarrow \pi^0 n$  100-150 MeV/c

Comments Established the depth of the  $\pi N$  destructive interference minimum between the S and P waves.

Papers PR C34 (1986) 619.

**LAMPF-818** (Nov 1983) Approved Jan 1984; Started Dec 1986.

### $pd$ ELASTIC SCATTERING AT 800 MeV: TWO- AND THREE-SPIN OBSERVABLES

UCLA - D Adams, E Gulmoz, G J Igo (Spokesperson), A Ling, M Moshe, C A Whitten, Jr  
 MINNESOTA U - M M Gazzaly  
 LOS ALAMOS - M McNaughton  
 TEXAS U - K H McNaughton, P Riley, S Sen

Accelerator LAMPF Detector JANUS

Reactions Polarized beam and target

$p \text{ deut} \rightarrow p \text{ deut}$  800 MeV ( $T_{lab}$ )

Comments Extends results of LAMPF-685 to larger momentum transfers.

**LAMPF-825** (Nov 1983) Approved Jan 1984; Started Aug 1984; Completed Sep 1984.

### INVESTIGATION OF THE $N\Delta$ INTERACTION VIA $\pi^+d \rightarrow p\pi^+n$

RICE U - S D Baker, J A Buchanan, J M Clement, M D Corcoran, I M Duck, J W Kruk, G S Mutchler (Spokesperson), P V Pancella, G C Phillips  
 HOUSTON U - B W Mayes, L S Pinsky  
 BONN U - W V Witsch

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^+ \text{ deut} \rightarrow p \pi^+ n$  275-600 MeV/c

Particles studied dibaryon,  $\Delta(1232 P_{33})^{++}$

Comments A kinematically complete experiment. The  $\Delta^{++}$  production excitation is measured for  $\theta_{cm} = 55$  and  $90^\circ$  and the angular distribution for  $30$  to  $150^\circ$  at  $350$  and  $425$  MeV/c. A search for the  ${}^1D_2$ ,  ${}^3F_3$ , and  ${}^1G_4$  dibaryons.

**LAMPF-828** (Nov 1983) Approved Jan 1984.

### TOTAL AND DIFFERENTIAL CROSS SECTIONS FOR $\pi^+d \rightarrow pp$ BELOW 20 MeV

VIRGINIA TECH - M Blecher, B I Fick, K Gotow (Spokesperson), D Wright  
 VIRGINIA U - G Das, R C Minehart (Spokesperson)  
 MARYLAND U - N S Chant, B G Ritchie (Spokesperson), P G Roos  
 SOUTH CAROLINA U - G S Adams, G S Blanpied, B M Freedom, C S Whisnant



## SUMMARIES OF EXPERIMENTS

Accelerator LAMPF Detector Counter

Reactions



Comments The aim is to determine the S-wave  $\pi$  absorption amplitude. The expected errors for the total cross section are about 4%. In preparation as of September 84.

**LAMPF-846** (Nov 1983) Approved Jan 1984.

**$NN \rightarrow NN\pi$ : CROSS SECTIONS AND ANALYZING POWERS FOR THE 800-MeV  $pp \rightarrow \pi^+(np)$  AND  $pn \rightarrow \pi^-(pp)$  INCLUSIVE REACTIONS**

TEXAS A AND M - T S Bhatia ( $\checkmark$  Spokesperson), G C Glass ( $\checkmark$  Spokesperson), J C Hiebert, R A Kenefick, S Nath, L C Northcliffe

LOS ALAMOS - E Colton, S Greene, R R Silbar  
NEW MEXICO STATE U - G Burleson, W Cottingham  
RUTGERS U - J A McGill  
MONTANA U - R H Jeppesen  
WASHINGTON STATE U - G E Tripard  
RICE U - G S Mutchler, P Pancella

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam



Comments Angular range covered is 20 to 50°. Inclusive measurements are over the entire phase space of the outgoing nucleons. Pion momenta range from about 300 MeV/c to maximum. Approved for 96 hours. The experiment has been put on low priority and is very unlikely to run soon.

**LAMPF-849** (Nov 1983) Approved Jan 1984.

**A MEASUREMENT OF THE DIFFERENTIAL CROSS SECTION FOR  $\pi^- p \rightarrow \pi^0 n$  AT 0 AND 180° IN THE MOMENTUM REGION 471-687 MeV/c**

LOS ALAMOS - H W Baer, J D Bowman, M D Cooper, D H Fitzgerald ( $\checkmark$  Spokesperson), N S P King, J C Peng, E Piasetzky, N Stein  
GEORGE WASHINGTON U - W J Briscoe ( $\checkmark$  Spokesperson), M F Taragin  
ABILENE CHRISTIAN U - M E Sadler ( $\checkmark$  Spokesperson)  
CATHOLIC U - D I Sober  
TEL AVIV U - M A Moinester

Accelerator LAMPF Detector Spectrometer

Reactions



Comments The charge-exchange reaction is measured from 0 to 40° and 150-180°, the elastic scattering reactions at 180°. Approved for 700 hours.

**LAMPF-853** (Nov 1983) Approved Jan 1984.

**MEASUREMENT OF WOLFENSTEIN PARAMETERS AT 650 AND  $d\sigma/d\Omega$  AT 500, 650, AND 800 MeV FOR  $pd \rightarrow pd$  ELASTIC SCATTERING**

UCLA - B Aas, D Adams, A Azizi, E Bleszynski, M Bleszynski, G J Igo ( $\checkmark$  Spokesperson), D Lopiano, F Sperisen, A T M Wang, C A Whitten

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam



Comments The angular range is 3-36° in the lab. Measures the differential cross section and  $D_{SS}$ ,  $D_{SL}$ ,  $D_{LL}$ , and  $A_y$ . Approved for 176 hours.

**LAMPF-861** (Nov 1983) Approved Jan 1984.

**MEASUREMENTS OF THE SPIN-CORRELATION PARAMETER  $A_{NN}(\theta)$  FOR  $np$  ELASTIC SCATTERING AT 800 MeV**

TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert, R A Kenefick, S Nath, L C Northcliffe ( $\checkmark$  Spokesperson)  
LOS ALAMOS - D Fitzgerald, J J Jarmer  
NEW MEXICO STATE U - G Burleson  
MONTANA U - R H Jeppesen  
WASHINGTON STATE U - G E Tripard

Accelerator LAMPF Detector Spectrometer

Reactions Polarized beam and target



Comments Covers 80 to 165° in the c.m. The experiment is deferred, pending availability of an intense polarized ion source.

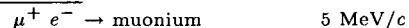
**LAMPF-869** (Nov 1983) Approved Jan 1984.

**HIGHER PRECISION MEASUREMENT OF THE LAMB SHIFT IN MUONIUM**

YALE U - A Badertscher (Spokesperson), S Dhawan, V W Hughes (Spokesperson), D C Lu, M Ritter, K Woodle  
HEIDELBERG U, PHYS INST - M W Gladisch (Spokesperson), H Orth, G zu Putlitz  
WILLIAM AND MARY COLL - M Eckhause, J Kane  
MISSISSIPPI U - J Reidy  
LOS ALAMOS - F G Mariam

Accelerator LAMPF Detector ?

Reactions



Comments An extension of LAMPF-724. Measures the Lamb shift to 0.1% and the hfs interval in the  $2^2 P_{1/2}$  state to 1%. Approved for 350 hours.

Papers PRL 52 (1984) 914.

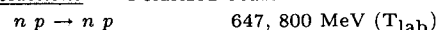
**LAMPF-876** (May 1984) Approved Aug 1984.

**SPIN TRANSFER MEASUREMENTS FOR  $np$  ELASTIC SCATTERING**

LOS ALAMOS - O van Dyck, D Lee, J McGill, M W McNaughton ( $\checkmark$  Spokesperson), R York  
TEXAS U - K H McNaughton, P Riley  
UCLA - G Igo, C Newsome  
RUTGERS U - R D Ransome

Accelerator LAMPF Detector ?

Reactions Polarized beam



Comments Measure the spin-transfer parameters  $K_{NN}$ ,  $K_{SS}$ ,  $K_{LL}$ , and  $K_{LS}$  from 50 to 180° c.m. Requires an intense polarized source not yet available.

**LAMPF-885** (Jul 1984) Approved Aug 1984; Started Apr 1985; Completed Jul 1985.

**MEASUREMENT OF  $K_{SS}$  FOR THE  $\bar{p}p \rightarrow d\pi^-$  REACTION AT 650 AND 800 MeV**

TEXAS U - M Barlett, G W Hoffmann, G Pauletta (Spokesperson)  
MINNESOTA U - M Gazzaly (Spokesperson)  
LOS ALAMOS - B E Bonner, J McClelland, N Tanaka (Spokesperson)  
UCLA - B Aas, G Igo, Y Ohashi, F Sperisen  
UPPSALA U - B Hoistad  
UDINE U - L Santi, E Waldner

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam



Comments Measures  $K_{SS}$  over a wide angular range. Ran for 157 hours.

## SUMMARIES OF EXPERIMENTS

**LAMPF-888** (Jun 1984) Approved Aug 1984; Started Apr 1985; Completed Dec 1985.

**STUDY OF THE DECAYS  $\pi^+ \rightarrow e^+ \nu_e \gamma$  AND  $\pi^+ \rightarrow e^+ e^+ e^- \nu_e$**

LOS ALAMOS - R Bolton, J D Bowman, M D Cooper, J Frank, A Hallin ( $\checkmark$  Spokesperson), P Heusi, C M Hoffman, G Hogan, F Mariam, R E Mischke, D E Nagle, V D Sandberg, G H Sanders, R Werbeck, R A Williams  
 STANFORD U - R Hofstadter, E B Hughes, M Ritter, S L Wilson  
 CHICAGO U - D Grosnick, S C Wright  
 TEMPLE U - V Highland, J McDonough

Accelerator LAMPF Detector CRY5-BOX

Reactions

$\pi^+ \rightarrow e^+ \nu_e \gamma$  140 MeV/c  
 $\pi^+ \rightarrow e^+ e^+ e^- \nu_e$  "

Particles studied  $\pi^+$

Comments Measures the ratio of the axial-vector to vector form factors in  $\pi^+ \rightarrow e^+ \nu_e \gamma$ . Ran for 494 hours.

Papers PRL 57 (1986) 1402. No other papers expected.

**LAMPF-898** (Jul 1984) Approved Aug 1984; Started Apr 1985; Completed Sep 1985.

**PION ELASTIC SCATTERING FROM  $^4\text{He}$  — A TEST OF CHARGE SYMMETRY**

LOS ALAMOS - C L Morris ( $\checkmark$  Spokesperson)  
 MINNESOTA U - C L Blilie, D Dehnhard, S K Nanda, S J Seestrom-Morris  
 TEXAS U - M Bryan, C F Moore

Accelerator LAMPF Detector EPICS

Reactions

$\pi^+ \text{He} \rightarrow \pi^+ \text{He}$  140, 260 MeV ( $T_{\text{lab}}$ )  
 $\pi^- \text{He} \rightarrow \pi^- \text{He}$  "

Comments Tests charge symmetry by estimating the mass splitting between charge states of the  $\Delta(1232)$ . Ran for 102 hours.

**LAMPF-905** (Jul 1984) Approved Aug 1984; Started Apr 1985; Completed Jul 1985.

**ELASTIC AND INELASTIC SCATTERING OF  $\pi^+$  AND  $\pi^-$  ON  $^3\text{H}$  AND  $^3\text{He}$  TO TEST CHARGE SYMMETRY, COMPARE FORM FACTORS, AND INVESTIGATE THE REACTION MECHANISM**

UCLA - S Adrian, A D Eichon, J M Engelage, G J Kim, A A Mokhtari, B M K Nefkens ( $\checkmark$  Spokesperson), J A Wightman, H J Ziock  
 GEORGE WASHINGTON U - W J Briscoe, C J Seftor, M Taragin  
 ABILENE CHRISTIAN U - M E Sadler  
 LOS ALAMOS - R Boudrie, C L Morris

Accelerator LAMPF Detector EPICS

Reactions

$\pi^+ ^3\text{He} \rightarrow \pi^+ ^3\text{He}$  141-296 MeV ( $T_{\text{lab}}$ )  
 $\pi^+ \text{trit} \rightarrow \pi^+ \text{trit}$  "  
 $\pi^- ^3\text{He} \rightarrow \pi^- ^3\text{He}$  "  
 $\pi^- \text{trit} \rightarrow \pi^- \text{trit}$  "

Comments Tests charge symmetry by measuring  $R = [\frac{d\sigma(\pi^+ ^3\text{H})}{d\sigma(\pi^- ^3\text{H})}] / [\frac{d\sigma(\pi^+ ^3\text{He})}{d\sigma(\pi^- ^3\text{He})}]$ . Ran for 329 hours. Analysis is in progress.

**LAMPF-951** (Nov 1984) Approved Feb 1985.

**A SYSTEMATIC SEARCH FOR NARROW DIBARYONS IN THE  $\bar{p}d \rightarrow pX$  REACTION**

NORTHWESTERN U - M Artuso (Spokesperson), G Garino, B Parker, K K Seth (Spokesperson), M Sethi, R Soundra

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p \text{ deut} \rightarrow p X$  800 MeV ( $T_{\text{lab}}$ )

Particles studied dibaryon

Comments Measures  $\sigma(\theta)$  and  $A_{Y0}(\theta)$  as a function of missing mass to search for dibaryons. Approved for 67 hours.

**LAMPF-960** (Jul 1985) Approved Aug 1985.

**MEASUREMENT OF  $\Delta\sigma_L$  AND  $\Delta\sigma_T$  IN FREE  $np$  SCATTERING BETWEEN 300 AND 800 MeV**

ARGONNE - D Hill, K F Johnson ( $\checkmark$  Spokesperson), I Ohashi, T Shima, H Spinka, R Stanek, D Underwood, A Yokosawa  
 LOS ALAMOS - J J Jarmer  
 NEW MEXICO STATE U - M Beddo, G R Burleson ( $\checkmark$  Spokesperson), J Faucett, G Kyke, M Rawool  
 TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert, R A Kenefick, L C Northcliffe ( $\checkmark$  Spokesperson)  
 MONTANA U - R Jeppesen  
 WASHINGTON STATE U - G E Tripard

Accelerator LAMPF Detector Counter

Reactions Polarized beam and target

$n p \rightarrow n p$  300-800 MeV ( $T_{\text{lab}}$ )

Comments Measures at seven energies. A new beam buncher allows time-of-flight neutron energy measurements. Approved for 2440 hours. Development runs are in progress (November 86).

**LAMPF-961** (Jul 1985) Approved Aug 1985; Completed Oct 1986.

**MEASUREMENT OF THE SPIN-CORRELATION PARAMETER  $A_{NN}(\theta)$  FOR  $np$  ELASTIC SCATTERING AT 800 MeV**

TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert, J A Holt, R A Kenefick, S Nath, L C Northcliffe ( $\checkmark$  Spokesperson), W B Tippens  
 LOS ALAMOS - D Fitzgerald, J J Jarmer  
 NEW MEXICO STATE U - G Burleson  
 MONTANA U - R H Jeppesen  
 WASHINGTON STATE U - G E Tripard  
 ARGONNE - K Johnson, I Ohashi, H Spinka

Accelerator LAMPF Detector Wire chamber

Reactions Polarized beam and target

$n p \rightarrow n p$  800 MeV ( $T_{\text{lab}}$ )

Comments Measures  $A_{NN}$  from 40 to 165°. Analysis is in progress.

**LAMPF-969** (Jul 1985) Approved Aug 1985.

**MEGA — SEARCH FOR THE RARE DECAY  $\mu^+ \rightarrow e^+ \gamma$**

UCLA - D Barlow, B M K Nefkens, C Pillai  
 CHICAGO U - S C Wright  
 HOUSTON U - E V Hungerford, B W Mayes, L Pinsky  
 LOS ALAMOS - J F Amann, K Black, R D Bolton, S Carius, M D Cooper ( $\checkmark$  Spokesperson), W Foreman, C M Hoffman, G E Hogan, K F Johnson, T Kozlowski, R E Mischke, F J Naivar, M A Oothoudt, L E Piilonen, R D Werbeck, C Wilkinson  
 STANFORD U - E B Hughes, C Jui, J Otis, M W Ritter  
 TEXAS A AND M - C Gagliardi, R E Tribble  
 VALPARAISO U - R Fisk, D Koetke  
 VIRGINIA U - B Tippens, K O H Ziock  
 WYOMING U - A R Kunselman  
 YALE U - P S Cooper, R Lauer, J Markey

Accelerator LAMPF Detector MEGA

Reactions Polarized beam

$\mu^+ \rightarrow e^+ \gamma$  0 MeV/c  
 $\mu^+ \rightarrow e^+ \gamma \gamma$  "  
 $\mu^+ \rightarrow e^+ \gamma \nu \nu$  "

## SUMMARIES OF EXPERIMENTS

Particles studied  $\mu^+$

Comments Also searches for a  $V+A$  contribution to radiative decay. Approved for 4000 hours. Looks for  $\mu^+ \rightarrow e^+ \gamma$  at a level of  $9 \times 10^{-14}$ , a factor of 500 better than the crystal box. Scheduled to begin taking data in 1988.

**LAMPF-973** (Jul 1985) Approved Aug 1985; Started Oct 1985; Completed Dec 1985.

**SEARCH FOR NARROW RESONANCES IN THE  $B = 2$  MISSING-MASS SPECTRUM FROM  $p$  He REACTIONS AND IN THE EXCITATION FUNCTIONS OF THE  $pp\pi$  PRODUCTION**

TEXAS U - M Barlett, D Coskowsky, G Hoffmann, G Pauletta (Spokesperson), M Purcell

UDINE U - R Garfagnini, L Santi

MINNESOTA U - M Gazzaly (Spokesperson), N Hintz,

S Nanda, S Seestrom-Morris

LOS ALAMOS - K Jones, C Morris, N Tanaka (Spokesperson)

VIRGINIA U - L C Smith, R Whitney

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p \ ^3\text{He} \rightarrow \text{deut } X$	370, 630, 730, 800 MeV ( $T_{\text{lab}}$ )
$p \text{ He} \rightarrow \text{trit } X$	"
$p \text{ He} \rightarrow \ ^3\text{He } X$	"
$pp \rightarrow \text{deut } \pi^+$	"
$pp \rightarrow n p \pi^+$	"

Particles studied dibaryon

Comments Ran for 150 hours.

**LAMPF-979** (Nov 1985) Approved Aug 1985; Completed Sep 1985.

**A SEARCH FOR  $T = 2$  DIBARYON PRODUCTION IN THE  $d(\pi^+, \pi^-)X$  REACTION**

RUTGERS U - C Glashauser

LOS ALAMOS - K W Jones, J A McGill ( $\checkmark$  Spokesperson),  
C L Morris ( $\checkmark$  Spokesperson)

TEXAS U - G W Hoffmann, C F Moore, G Pauletta

MINNESOTA U - M Gazzaly, S J Seestrom-Morris

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^+ \text{ deut} \rightarrow \pi^- X$	200-300 MeV ( $T_{\text{lab}}$ )
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Particles studied dibaryon

Comments Uses the clamshell spectrometer. Ran for 150 hours.

**LAMPF-981** (Jul 1985) Approved Aug 1985.

**DO BOUND STATES OF REAL PIONS EXIST?**

NORTHWESTERN U - M Artuso, G Garino, B Parker,  
K K Seth (Spokesperson), M Sethi, R Soundra

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^- \text{ deut} \rightarrow \pi^+ n n \pi^-$	292 MeV ( $T_{\text{lab}}$ )
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Particles studied dibaryon

Comments Searches for an  $nn\pi^-$  bound state. Approved for 80 hours.

**LAMPF-985** (Nov 1985) Approved Feb 1985.

**SEARCH FOR MUONIUM-TO-ANTIMUONIUM SPONTANEOUS CONVERSION**

HEIDELBERG U, PHYS INST - M Gladisch, G ZuPutnitz

LOS ALAMOS - M Cooper, C Hoffman, G Hogan, F Mariam,  
R Mischke, L Piilonen, V Sandberg

WILLIAM AND MARY COLL - M Eckhause, P Guss, J Kane (Spokesperson)

YALE U - K P Arnold, F Chmely, V W Hughes

(Spokesperson), S Kettell, Y Kuang, J Markey, B Matthias,  
B Ni, H Orth (Spokesperson), R Schaefer, K Woodle  
MISSISSIPPI U - J J Reidy

Accelerator LAMPF Detector CRY-BOX

Reactions

muonium	10 MeV/c
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Comments A search at a level of sensitivity of about  $G_F$  for the conversion coupling constant (compared to a best so far of less than  $42 G_F$ ). Approved for 500 hours.

**LAMPF-998** (Nov 1985) Approved Feb 1986; Completed Aug 1986.

**THE  $^4\text{He}(\pi, \pi p)^3\text{H}$  REACTION — A TEST OF CHARGE SYMMETRY**

MINNESOTA U - D Dehnhard ( $\checkmark$  Spokesperson), S K Nanda,  
S J Seestrom-Morris

LOS ALAMOS - C L Morris ( $\checkmark$  Spokesperson)

TEXAS U - M Bryan, C F Moore

PENN U - J D Zumbro

Accelerator LAMPF Detector EPICS, Counter

Reactions

$\pi^+ \text{ He} \rightarrow \text{trit } p \pi^+$	180 MeV ( $T_{\text{lab}}$ )
$\pi^- \text{ He} \rightarrow \text{trit } p \pi^-$	"

Comments A test of charge symmetry by measuring the ratio of the cross sections. Ran for 180 hours.

**LAMPF-1015** Approved Feb 1986.

**LARGE CHERENKOV DETECTOR**

LOS ALAMOS - R Burman, R Carlini, J Donahue,  
D Fitzgerald, J D He, M Hoehn, D Lee, R Macek, J McGill,  
V Sandberg, G H Sanders

ARGONNE - S Freedman, J Napolitano

BROOKHAVEN - D H White ( $\checkmark$  Spokesperson)

UC, IRVINE - R C Allen, H H Chen, Wen-Piao Lee, X Lee,  
K Roemheld

UCLA - G Igo, C Whitten

COLORADO U - R Ristinen, W R Smythe

NEW MEXICO U - B Bassaleck, B B Dieterle, C P Leavitt

PENN U - E Beier, R Van Berg, A Mann

TEMPLE U - L A Auerbach, V L Highland, W K McFarlane

Accelerator LAMPF Detector Counter

Reactions Polarized beam and target

$\nu_\mu e^- \rightarrow \nu_\mu e^-$	0-50 MeV ( $T_{\text{lab}}$ )
$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$	"
$\nu_e e^- \rightarrow \nu_e e^-$	30 MeV ( $T_{\text{lab}}$ )

Comments Measures  $\sin^2(\theta_W)$  to an accuracy of 1%. Uses the proton storage ring.

**LENI-SC-021** (1982) Completed.

**INELASTIC SCATTERING OF PROTONS WITH ENERGY 1 GeV AND TRANSITION NUCLEAR DENSITIES**

LENINGRAD, INP - G D Alkhazov, S L Belostotskii,  
O A Domchenkov, Yu V Dotsenko, N P Kuropatkin

Accelerator LENI Detector Spectrometer

Reactions

$p \text{ nucleus} \rightarrow \text{nucleus } X$	1 GeV ( $T_{\text{lab}}$ )
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Comments Transition parameters determined for low excited states of Si, S, Ca, Ti, Ni, and  $J^P = 2^+, 3^-, 4^+$ .

Papers YF 41 (1985) 561 = SJNP 41 (1985) 357, and YF 42 (1985) 8 = SJNP 42 (1985) 4.

## SUMMARIES OF EXPERIMENTS

**LENI-SC-029** (1982) Completed 1983.

**MULTIPARAMETER STUDY OF THE KINEMATICS IN 1 GeV PROTON INDUCED FISSION USING A DOUBLE-ARM TIME-OF-FLIGHT MASS SPECTROMETER**

LENINGRAD, INP - Y A Chestnov, V L Gorshkov, A I Ilyin, B Y Sokolovskiy, G E Solyakin

Accelerator LENI Detector Double-arm spectrometer

Reactions

$p$  nucleus  $\rightarrow$  2frag X            1 GeV ( $T_{lab}$ )  
 $p$  nucleus  $\rightarrow$  3frag X            "

Comments The nuclear targets are  $^{184}\text{Wt}$ ,  $^{197}\text{Au}$ ,  $^{232}\text{Th}$ , and  $^{238}\text{U}$ .

Papers ZETFP 37 (1983) 60 = JETPL 37 (1983) 72, NP A400 (1983) 584, and NP A400 (1983) 589.

**LENI-SC-042** (1982)

**STUDY OF NUCLEAR MULTIPARTICLE SPALLATION INDUCED BY FAST HADRONS**

LENINGRAD, INP - L V Bakanov, K N Ermakov, V D Lebedev, V V Miroshkin, V V Paschuk, M V Stabnikov, M G Tverskoj

Accelerator LENI Detector Heavy-liquid b.c.

Reactions

$p$  nucleus  $\rightarrow$  mult[charged] X            1 GeV ( $T_{lab}$ )

Comments Obtained 3500 stereo-photos, 1500 events.

**LENI-SC-052** (1982)

**QUASIFREE PROTON SCATTERING AT ENERGY 1 GeV**

LENINGRAD, INP - S L Belostotsky, Y V Dotsenko, N P Kuropatkin, O V Miklukho, V N Nikulin, O E Prokofjev, S S Volkov, A A Vorobjev

Accelerator LENI Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow$  nucleus nucleon            1 GeV ( $T_{lab}$ )

Comments The targets used are deuterium, Li, Be, B, C, O, and Ca.

**LENI-SC-056** (1982)

**MEASUREMENT OF ENERGY AND ANGULAR DEPENDENCE OF THE POLARIZATION CORRELATION COEFFICIENT  $C_{NN}$  IN ELASTIC  $pp$  SCATTERING AT ENERGIES 690-950 MeV**

LENINGRAD, INP - V A Efimovych, O Y Fedorov, A I Kovalev, V E Popov, A N Prokofjev, A V Shvedchikov, V Y Trautman, V G Vovchenko, A A Zhdanov  
 DUBNA - N S Borisov, M Y Kazarinov, Y M Kazarinov, Y F Kiselev, B S Neganov

Accelerator LENI Detector Spectrometer

Reactions

Polarized beam and target  
 $p p \rightarrow 2p$             690-950 MeV ( $T_{lab}$ )

**LENI-SC-062** (1982)

**STUDY OF DIFFERENTIAL CROSS SECTIONS FOR  $\pi^+ d \rightarrow pp$  IN THE DIBARYON RESONANCES REGION**

LENINGRAD, INP - M Y Borkovskiy, V G Gaditskiy, G E Gavrilov, V A Gordeev, Y S Grigorjev, V P Koptev, A G Krishvich, S P Kruglov, L G Kudin, A Y Majorov, Y A Malov, G V Scherbakov, I I Strakovskiy, L N Uvarov

Accelerator LENI Detector Spectrometer

Reactions

$\pi^+$  deut  $\rightarrow 2p$             280-540 MeV ( $T_{lab}$ )

Particles studied dibaryon

Comments Appreciable contribution of F-wave ( $L = 3$ ).

Papers JPHY G9 (1983) 187.

**LENI-SC-063** (1985)

**MEASUREMENT OF SPIN ROTATION PARAMETERS  $R$  AND  $A$  IN ELASTIC  $\pi p$  SCATTERING**

LENINGRAD, INP - A V Anufriev, V S Bekrenev, Y A Beloglazov, E P Fedorov-Koval, E A Filimonov, V G Gaditskiy, A I Kovalev, I G Kozlenko, S P Kruglov, A A Kulbardin, I V Lopatin, V V Sumachev, I I Tkach, V Y Trautman

Accelerator LENI Detector Counter, Wire chamber

Reactions Polarized target

$\pi^- p \rightarrow \pi^- p$             400-600 MeV/c

**LENI-SC-066** (1982) Completed.

**STUDY OF CUMULATIVE NEUTRON PRODUCTION FROM NUCLEI BY PROTONS WITH ENERGY 1 GeV**

LENINGRAD, INP - V N Baturin, M M Makarov, A A Naberezhnov, V V Nelyubin, V V Sulimov, L N Uvarov, V V Vikhrov

Accelerator LENI Detector Wide-angle spectrometer

Reactions

$p$  nucleus  $\rightarrow$  nucleon X            1 GeV ( $T_{lab}$ )

Comments The targets used are Li, Be, C, Al, Cu, Sn, and Pb. Measured at 94, 114, 120, 140, and 148°.

Papers ZETFP 36 (1982) 370 = JETPL 36 (1982) 448.

**LENI-SC-067** (1983) Completed.

**DEUTERON DISINTEGRATION IN THE REACTION  $\pi^- d \rightarrow \pi^- pn$  AT ENERGY 552 MeV**

LENINGRAD, INP - L G Dakhno, A V Kravtsov, M M Makarov, V I Medvedev, G Z Obrant, V I Poromov, V V Sarantsev, S G Sherman, G L Sokolov

Accelerator LENI Detector DBC-35CM

Reactions

$\pi^-$  deut  $\rightarrow p n \pi^-$             552 MeV/c

**LENI-SC-067-2** (1985) Completed.

**MASSIVE NEUTRINO SEARCH IN THE DECAY  $\pi^+ \rightarrow \mu^+ \nu$**

LENINGRAD, INP - V P Andreev, M M Makarov, V I Medvedev, G Z Obrant, V I Poromov, V V Sarantsev, S G Sherman, G L Sokolov, A B Sokornov

Accelerator LENI Detector Deuterium b.c.

Reactions

$\pi^+ \rightarrow \mu^+ \nu$             —

Particles studied  $\nu$

Comments Obtained 3000 identified  $\pi^+ \rightarrow \mu^+ \nu$  decays.

**LENI-SC-074** (1984)

**MANY-PARTICLE CORRELATION INVESTIGATION IN NUCLEAR DEEP SPALLATION REACTIONS**

LENINGRAD, INP - M N Andronenko, L K Batist, E A Damaskinskij, V T Gratchev, A A Lobodenko, S K Patrichev, O E Prokofjev, D M Selivestrov, N N Smirnov, L N Uvarov, E N Volnin, A A Vorobyev (Spokesperson)

Accelerator LENI Detector Spectrometer

Reactions

$p C \rightarrow$  pion X            —

$p C \rightarrow p X$             —

$p C \rightarrow$  deut X            —

$p C \rightarrow$  trit X            —

## SUMMARIES OF EXPERIMENTS

$p$  Ag  $\rightarrow$  pion X —  
 $p$  Ag  $\rightarrow$   $p$  X —  
 $p$  Ag  $\rightarrow$  deut X —  
 $p$  Ag  $\rightarrow$  trit X —

**LENI-SC-078** (1982) Completed.

**EXPERIMENTAL DISCOVERY OF SPATIAL CAPTURE EFFECT BY A MONOCRYSTAL IN THE CHANNELING REGIME**

LENINGRAD, INP - V A Andreev, V V Baublis, E A Damaskinskiy, A G Krishvich, L G Kudin, V V Marchenkov, V F Morozov, V V Nelyubin, E M Orischin, G E Petrov, G A Ryabov, L E Samsonov, V M Samsonov, V A Schegelskiy, E M Spiridenkov, V V Sulimov, O I Sumbaev

Accelerator LENI Detector ?

Reactions

$p$  crystal 1 GeV/c

Papers ZETFP 36 (1982) 340 = JETPL 36 (1982) 415.

**LENI-SC-079** Completed 1982.

**CUMULATIVE DEUTERON AND TRITON PRODUCTION IN PROTON NUCLEUS INTERACTIONS AT 1 GeV**

LENINGRAD, INP - M N Andronenko, V T Gratchev, A A Lobodenko, N N Smirnov, I I Strakovskij, L N Uvarov, E N Volnin, A A Vorobyev (Spokesperson)

Accelerator LENI Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow$  deut X 1 GeV/c  
 $p$  nucleus  $\rightarrow$  trit X "

Comments The nuclear targets are  ${}^6\text{Li}$ ,  ${}^7\text{Li}$ , Be, C, Al,  ${}^{58}\text{Ni}$ , Ag, and Pb.

**LENI-SC-085** (1982) Completed.

**MEASUREMENT OF CUMULATIVE PROTON POLARIZATION**

LENINGRAD, INP - S L Belostotsky, Y V Dotsenko, L G Kudin, N P Kuropatkin, A A Lobodenko, O V Miklukho, V N Nikulin, O E Prokofyev, E N Volnin, A A Vorobyev

BUDAPEST, CRIP - Y Ere, Z Fodor, Z Sheresh

Accelerator LENI Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow$   $p$  X 1 GeV/c

Comments The targets used are Be, C, Al, Cu, and Pb. Measured at 59, 109, and 145°.

**LENI-SC-086** (1985) Completed.

**MEASUREMENT OF THE POLARIZATION TRANSFER PARAMETER  $K_{NN}$  IN  $pp$  ELASTIC SCATTERING IN THE ENERGY REGION OF 800-1000 MeV**

LENINGRAD, INP - V A Efimovych, O Y Fedorov, A I Kovalev, N G Kozlenko, M Y Myakushin, V V Polyakov, A V Shvedchikov, V Y Trautman, V G Vovchenko, A A Zhdanov

DUBNA - N S Borisov, A N Chernikov, Y M Kazarinov, Y F Kiselev

Accelerator LENI Detector Counter

Reactions Polarized target

$p p \rightarrow p p$  800-1000 MeV ( $T_{\text{lab}}$ )

**LENI-SC-087** (1984) Started 1981; Completed 1983.

**MEASUREMENT OF THE  $\pi^+$  LIFETIME**

LENINGRAD, INP - N K Abrosimov, V A Eliseev, V A Gordeev, E M Ivanov, V P Koptev, S P Kruglov, Y A Malov, S M Mikirtychants, G A Ryabov, G V Shcherbakov, L N Uvarov, V A Volchenkov

Accelerator LENI Detector Spectrometer

Reactions

$\pi^+ \rightarrow \mu^+ \nu_\mu$  0 GeV/c

Particles studied  $\pi^+$

**LENI-SC-088** (1984) Completed 1984.

**$pd$  AND  $p$   ${}^4\text{He}$  SMALL-ANGLE SCATTERING AT PROTON ENERGIES RANGING FROM 700 TO 1000 MeV**

LENINGRAD, INP - A V Dobrovolskij, A V Khanzadeev, G A Korolev, S I Manaenko, N K Terentjev, G N Velichko, A A Vorobyev (Spokesperson)

SACLAY - J Sodinos

Accelerator LENI Detector Spectrometer

Reactions

$p$  deut  $\rightarrow$   $p$  deut 700-1000 MeV ( $T_{\text{lab}}$ )  
 $p$  He  $\rightarrow$   $p$  He "

**LENI-SC-096** (1983) Started 1983.

**STUDY OF CORRELATIONS IN REACTIONS WITH CUMULATIVE PROTON EMISSION**

LENINGRAD, INP - M N Andronenko, V T Gratchev, A A Lobodenko, M M Nesterov, N N Smirnov, N A Tarasov, L N Uvarov, E N Volnin, A A Vorobyev (Spokesperson)

Accelerator LENI Detector Spectrometer

Reactions

$p$  Li  $\rightarrow$   $p$  charged X 1 GeV/c  
 $p$  C  $\rightarrow$   $p$  charged X "  
 $p$  Pb  $\rightarrow$   $p$  charged X "  
 $p$  nucleus  $\rightarrow$   $p$  charged X "

**LENI-SC-097** (1982)

**SUBTHRESHOLD  $K^+$  MESON PRODUCTION IN PROTON NUCLEUS INTERACTIONS**

LENINGRAD, INP - N K Abrosimov, V A Eliseev, A B Gridnev, E M Ivanov, V P Koptev, S P Kruglov, Y A Malov, S M Mikirtychants, G A Ryabov, G V Scherbakov, V A Volchenkov

Accelerator LENI Detector ?

Reactions

$p$  nucleus  $\rightarrow$   $K^+$  X 0.85-1 GeV/c

Comments The targets used are Be, C, Cu, Sn, and Pb.

Papers ZETFP 36 (1982) 211 = JETPL 36 (1982) 261.

**LENI-SC-104** (1984)

**ENERGETIC CORRELATION STUDY IN DEEP INELASTIC PROTON INTERACTIONS WITH NUCLEI**

LENINGRAD, INP - V N Baturin, E N Komarov, M M Mararov, A A Naberezhnov, V V Nelyubin, V V Sulimov, L N Uvarov, V V Vikhrov

Accelerator LENI Detector Spectrometer

Reactions

$p$  Li  $\rightarrow$   $p$  X 1 GeV ( $T_{\text{lab}}$ )  
 $p$  Cu  $\rightarrow$   $p$  X "  
 $p$  nucleus  $\rightarrow$   $p$  X "

## SUMMARIES OF EXPERIMENTS

### LENI-SC-108 (1982)

#### STUDY OF BACKWARD PROTON SPECTRA IN THE REACTION $pd \rightarrow ppn$ IN THE ENERGY REGION 500-1000 MeV

LENINGRAD, INP - V P Andreev, A V Kravtsov,  
M M Makarov, V I Medvedev, G Z Obrant, V I Poromov,  
V V Sarantsev, S G Sherman, G L Sokolov, A B Sokornov

Accelerator LENI Detector Deuterium b.c.

#### Reactions

$p \text{ deut} \rightarrow 2p \ n$  600-880 MeV ( $T_{lab}$ )

Comments Obtained 40000 stereo-photos.

### P-DECAY-FREJUS

#### NUCLEON DECAY EXPERIMENT WITH A MODU- LAR FLASH CHAMBER DETECTOR

FREJUS COLLABORATION

AACHEN, TECH HOCHSCH, I PHYS INST - Ch Berger,  
A Hofmann, F Raupach, P Schleper, G Schmitz, J Tutas,  
B Voigtlaender

ORSAY, LPNHE - C Arpesella, Y Benadjal, G Deuzet,  
B Dudelzak, P Eschtruth, S Jullian, D LaLanne,  
F LaPlanche, C Longuemare, C Paulot, Ph Roy, G Szklarz  
ECOLE POLYTECHNIQUE - L Behr, R W Bland,  
B DeGrange, U Nguyen-Khac, P Serri, S Tisserant, R Tripp

SACLAY - P Bayeyre, R Barloutaud ( $\checkmark$  Spokesperson),  
G Chardin, L Di Ciaccio, D L Edmunds, J Ernwein,  
G Gerbier, M A Jabiol, W Kolton, L Mosca, L Moscoso,  
B Pietrzyk

WUPPERTAL U - K H Becker, H J Daum, S Demski,  
R Hinners, W Kohrs, B Kuznik, R Mayer, H Meyer,  
D Ortmann, J Peters, M Schubnell, J Thierjung, Y Wei,  
P Wintgen

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments A 900-metric-ton array of 3-mm steel plates separated by layers of 5x5-mm polypropylene flash chambers. There are 115 planes of Geiger tubes for triggering. The detector is 4800 meters of water equivalent underground. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 174B (1986) 118.

### P-DECAY-HOMESTAKE

#### THE HOMESTAKE GOLD MINE EXPERIMENT

PENN U - M L Cherry, M Deaknye, K Lande (Spokesperson),  
C K Lee, R I Steinberg  
BROOKHAVEN - B Cleveland

Accelerator NONE Detector Counter

Particles studied  $p, n$

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 47 (1981) 1507.

### P-DECAY-HPW

#### THE HARVARD-PURDUE-WISCONSIN EXPERI- MENT

HARVARD U - J Blandino, W A Huffman, A M Lutz,  
C Rubbia (Spokesperson), D R Winn, W Worstel  
PURDUE U - J A Gaidos, G Kullerud, R McHenry, J Negret,  
T R Palfrey, T Phillips, R B Willmann, C L Wilson  
WISCONSIN U - U Camerini, D Cline (Spokesperson),  
W F Fry, R J Loveless, R March, J Matthews, A More,  
R Morse, D D Reeder

Accelerator NONE Detector Counter

Particles studied  $p, n$

Comments An 800-metric-ton water Cherenkov detector 1500 meters of water equivalent underground. For a description of the apparatus, see the LBL-91 supplement on detectors.

### P-DECAY-IMB

#### THE IRVINE-MICHIGAN-BROOKHAVEN EXPERI- MENT

UC, IRVINE - W Gajewski, K Ganezer, T J Haines,  
W R Kropp, L Price, F Reines (Spokesperson), J Schultz,  
H W Sobel, C Wuest

MICHIGAN U - D Casper, P Chrysicopoulou, R Claus,  
H-S Park, S Seidel, D Sinclair, J L Stone, L R Sulak,  
J C van der Velde (Spokesperson)

MICHIGAN U & UNIVERSITY COLL, LONDON -  
T W Jones

BROOKHAVEN - M Goldhaber

CAL TECH - G Blewitt, J M Losecco

CLEVELAND STATE U - C B Bratton

HAWAII U - J G Learned, R Svoboda

UC, IRVINE & WARSAW U, IEP - D Kielczewska

FERMILAB - G W Foster

ILLINOIS U, URBANA - S Errede

Accelerator NONE Detector Counter

Particles studied  $p, n$

Comments An 8000-metric-ton water Cherenkov detector 1570 meters of water equivalent underground. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 51 (1983) 27, PRL 51 (1983) 245, PRL 52 (1984) 720, PRL 52 (1984) 1092, PRL 54 (1985) 22, PRL 54 (1985) 2299, PRL 55 (1985) 2114, and PRL 57 (1986) 1986.

### P-DECAY-KAMIOKA (Jul 1983) Completed 1985.

#### THE KAMIOKA EXPERIMENT

KEK - K Takahashi

NIIGATA U - K Miyano

TOKYO U - K Arisaka, K Hirata, T Kajita, T Kikune,

M Koshihara ( $\checkmark$  Spokesperson), M Nakahata, Y Oyama,  
A Sato, N Sato, T Suda, A Suzuki, M Takita, Y Totsuka

Accelerator NONE Detector Counter

Particles studied  $p, n$ , monopole

Comments A 3000-metric-ton water Cherenkov detector 2700 m water equivalent underground. Also investigates solar and high-energy neutrinos, high-energy muons, etc. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM 205 (1983) 443, JPSJ 54 (1985) 3213, JPSJ 54 (1985) 4065, JPSJ 55 (1986) 711, JPSJ 55 (1986) 3786, PRL 56 (1986) 991, and PR D34 (1986) 902.

### P-DECAY-KAMIOKA-II Started 1986.

#### THE KAMIOKA-II EXPERIMENT

KEK - K Takahashi

NIIGATA U - K Miyano

TOKYO U - K Arisaka, K Hirata, T Kajita, T Kikune,

M Koshihara ( $\checkmark$  Spokesperson), M Nakahata, Y Oyama,  
A Sato, N Sato, T Suda, A Suzuki, M Takita, Y Totsuka  
CAL TECH - B G Cortez

PENN U - E W Beier, L Ferdsher, S B Kim, A K Mann,

F M Newcommer, R Van Verg, W P Zhang

Accelerator NONE Detector Counter

Particles studied  $p, n$ , monopole

Comments A 3000-metric-ton water Cherenkov detector 2700 m water equivalent underground. The Kamioka detector upgraded with a  $4\pi$  anticounter and TDC added. Also investigates solar and high-energy neutrinos, high-energy muons, etc. For a description of the apparatus, see the LBL-91 supplement on detectors. Taking data (December 86).

### P-DECAY-KGF

#### THE KOLAR GOLD FIELD EXPERIMENT

TATA INST - M R Krishnaswamy, M G K Menon,  
N K Mondal, V S Narasimham (Spokesperson),  
B V Sreekantan

## SUMMARIES OF EXPERIMENTS

OSAKA CITY U - Y Hayashi, N Ito, S Kawakami  
TOKYO U, COSMIC RAY LAB - S Miyake

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments Several candidates for nucleon decay are observed with low background, but no definite conclusion can be reached yet. A 140-ton iron calorimeter with gas proportional tubes 7600 m of water equivalent underground. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PL 106B (1981) 339, and PL 115B (1982) 349.

**P-DECAY-NUSEX** Completed Dec 1986.

### THE MONT BLANC EXPERIMENT

MILAN U - E Fiorini (✓ Spokesperson)  
FRASCATI & MILAN U & TURIN U & CERN - G Battistoni, E Bellotti, G Bologna, P Campana, C Castagnoli, V Chiarella, D Cundy, B D'Ettorre, E Iarocci, G Mannocchi, G P Murtas, P Negri, G Nicoletti, L Periale, P Picchi, M Price, A Pullia, S Ragazzi, M Rollier, O Saavedra, L Trasatti, L Zanotti

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments One event seen consistent with  $p$  decay. A  $3.5 \times 3.5 \times 3.5$ -m cube of 136 layers of 1-cm-thick iron plates separated by layers of  $1 \times 1$ -cm plastic streamer tubes. The mass is 150 tons and is 5000 meters of water equivalent underground. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM 202 (1982) 459, PL 118B (1982) 461, PL 133B (1983) 454, NIM 219 (1984) 300, NC 8C (1985) 76, PL 155B (1985) 465, and NIM A245 (1986) 277.

### P-DECAY-SOUDAN-II

#### THE SOUDAN-II EXPERIMENT

MINNESOTA U - H Courant, K Heller, S Heppelman, T Joyce, M Marshak (Spokesperson), E Peterson, K Ruddick, M Shupe  
ARGONNE - D Ayres, K Coover, J Dawson, T Fields, N Hill, D Jankowski, E May, L Price  
OXFORD U - W Allison, C Brooks, J Cobb, D Perkins, B Saitta, P Shield  
RUTHERFORD - D Cockerill, P Litchfield, R Nicksen, S Yarlar  
TUFTS U - T Kafka, A Mann, R Milburn, A Napier, W Oliver

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments A 1000-ton detector using drift projection tubes arranged in an hexagonal array. The tubes are 16 mm in diameter separated by 1.6 mm of steel. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers Results from Soudan-I: PRL 50 (1983) 651, PRL 54 (1985) 2079, and PRL 55 (1985) 1965.

**SACLAY-010** (Dec 1977) Approved Jan 1979, Mar 1979; Started 1979; Completed Jan 1980.

#### STUDY OF THE COHERENT PRODUCTION OF $\pi^+$ AND $\pi^-$ BY LIGHT IONS IN THE ENERGY REGION 150-300 MeV/NUCLEON

STRASBOURG - E Aslanides, A M Bergdolt, P Fassnacht, F Hibou (✓ Spokesperson)  
SACLAY - K Baba, A Boudard, G Bruge, P Couvert, B Nefkens  
ORSAY, IPN - Y Le Bornec, P Kitching, B Tatischeff, N Willis (✓ Spokesperson)

Accelerator SATURNE-II Detector SPES-I

#### Reactions

deut  ${}^6\text{Li} \rightarrow \pi^- {}^8\text{Bor}$  —  
deut  ${}^6\text{Li} \rightarrow \pi^- X$  —

deut  $\text{Be} \rightarrow \pi^- X$  —  
deut  ${}^{10}\text{Bor} \rightarrow \pi^- X$  —

Papers PL 108B (1982) 91. No other papers expected.

**SACLAY-013** (Sep 1979) Approved Oct 1979; Started 1980; Completed 1982.

#### $\alpha\alpha$ INTERACTIONS

SACLAY - J Banaigs, J Berger, M Boivin, A Codino, J Duflo (Spokesperson), L Goldzahl, D Legrand, J Oostens, F Plouin  
ORSAY, IPN - P Berthet, R Frascaria  
FRASCATI - F L Fabbri, P Picozza, L Satta  
CAEN U - G Bizard, F Lefebures, J C Steckmeyer

Accelerator SATURNE-II Detector ?

#### Reactions

He He  $\rightarrow$  He X 4.3, 5.0 GeV/c  
He  ${}^3\text{He} \rightarrow$  He X 4.3, 7.0 GeV/c  
He deut  $\rightarrow$  He X "  
He  $p \rightarrow$  He X "

Comments Elastic scattering is measured up to momentum transfers of about 4 GeV<sup>2</sup>. The inelastic spectra are described as an incoherent sum of quasi-elastic scattering on substructures of the targets.

Papers NP A356 (1981) 427, NP A374 (1982) 253, and NP A374 (1982) 297.

**SACLAY-017** (Dec 1977) Approved 1980; Started 1980; Completed Nov 1982.

#### CROSSING JETS

SACLAY - M Garcon (✓ Spokesperson), D Legrand, R Lombard, R Maillard, B Mayer, A Nakach, M Rouger, Y Terrien

Accelerator SATURNE-II Detector Counter

#### Reactions

$p p \rightarrow p p$  1.0-2.0 GeV/c

Comments Uses an internal jet target. Measures the energy dependence of the 90° cross section.

Papers NIM 204 (1982) 53, and NP A445 (1985) 669. No other papers expected.

**SACLAY-037** (Dec 1978) Approved Jun 1979; Started 1979; Completed 1982.

#### MEASUREMENT OF $pd \rightarrow \gamma {}^3\text{He}$ TO TEST DE-TAILED BALANCE

SACLAY - A Boudard, G Bruge, J Soudinos  
UCLA - W Briscoe, D Fitzgerald, B M K Nefkens (✓ Spokesperson), M Sadler

Accelerator SATURNE-II Detector SPES-I

#### Reactions

$p \text{ deut} \rightarrow \gamma {}^3\text{He}$  —

Papers PRL 45 (1980) 168, and PR C32 (1985) 1956.

**SACLAY-038-2** (Nov 1984) Approved Mar 1985; Started Jul 1985; Completed Mar 1986.

#### $dp$ ELASTIC SCATTERING AS A SOURCE OF INFORMATION ABOUT THE DEUTERON D-WAVE AND THE SPIN STRUCTURE OF THE $NN$ AMPLITUDES

UCLA - B Aas, D Adams, M Bleszynski, J Bystricky, V Ghazikhanian, G J Igo (✓ Spokesperson), C A Whitten, Jr  
SACLAY - J Ball, P Chaumette, J Deregél, J Fabre, F Lehar, A de Lesquen, F Perrot, L van Rossum

Accelerator SATURNE-II Detector Combination

#### Reactions Polarized beam and target

deut  $p \rightarrow$  deut  $p$  1.6 GeV ( $T_{\text{lab}}$ )

## SUMMARIES OF EXPERIMENTS

Particles studied deut

Comments The original Saclay-038 never ran.

**SACLAY-050** (Jan 1980) Approved Mar 1980; Started 1980; Completed Jun 1983.

**STUDY OF THE DIBARYONIC COMPONENT ( $\Delta^{++}, 2N$ ) AND EVENTUALLY DIBARYONIC ( $T = 1$ ) IN  ${}^3\text{He}$  USING THE TRANSFER REACTIONS  ${}^3\text{He}(p, t)$ ,  ${}^3\text{He}(p, d)$ , AND  $p({}^3\text{He}, d)$ .**

ORSAY, IPN - P Berthet, M P Combes, J P Didelez, R Frascaria, B Tatischeff ( $\checkmark$  Spokesperson)  
 SACLAY - R Beurtey, Y Le Bornec, A Boudard, J M Durand, J L Escudie, L Farvacque, M Garcon, J C Lugol, Y Terrien

Accelerator SATURNE-II Detector SPES-I

Reactions

$p {}^3\text{He} \rightarrow \text{trit X}$  1.4, 1.6 GeV/c  
 $p {}^3\text{He} \rightarrow \text{deut X}$  "  
 ${}^3\text{He} p \rightarrow \text{deut X}$  4.74 GeV/c

Particles studied dibaryon

Comments Narrow isovector structures in 2-baryon invariant masses found.

Papers PRL 52 (1984) 2022, and PL 154B (1985) 107.

**SACLAY-051** (1979) Approved Jun 1979; Started 1979; Completed 1980.

**pd AND  $p {}^3\text{He}$  ELASTIC SCATTERING BETWEEN 140 AND 180° CM**

ORSAY, IPN - I Brissaud, J P Didelez, R Frascaria ( $\checkmark$  Spokesperson), M Morlet, B Tatischeff, A Willis, N Willis  
 SACLAY - J Banaigs, J Berger, A Boudard, J Duffo, M Garcon, L Goldzahl, D Legrand, F Plouin, Y Terrien

Accelerator SATURNE-II Detector SPES-IV

Reactions

$p \text{ deut} \rightarrow p \text{ deut}$  0.6-2.7 GeV ( $T_{\text{lab}}$ )  
 $p {}^3\text{He} \rightarrow p {}^3\text{He}$  0.7-1.7 GeV ( $T_{\text{lab}}$ )

Papers PL 106B (1981) 465, AND JPHY G8 (1982) L111. No other papers expected.

**SACLAY-052** (Dec 1977) Approved Jun 1978; Started Nov 1980; Completed Feb 1982.

**STUDY OF NN SCATTERING AT SATURNE II**

SACLAY - J Ball, J Bystricky, P Chaumette, J Deregel, F M Fontaine, J Gosset, T Hasegawa, F Lehar ( $\checkmark$  Spokesperson), C Newsom, F Perrot, F Petit, T Siemiarczuk, J Simmons, J Vrzal, C A Whitten  
 CAEN U - J Yonnet

MONTREAL U - L Vinet, P Winternitz

ANNECY - H Azaiez, A Michalowicz

TRIESTE U - S Dalla-Torre, A Martin, A Penzo, A Villari

GENEVA U - W R Leo, Y Onel

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target

$p p \rightarrow p p$  1.0-3.8 GeV/c

Comments Measurements of  $\Delta\sigma_{\text{total}}$ , analyzing powers, and spin correlations.

Papers LNC 40 (1984) 466, NC 82A (1984) 385, LNC 41 (1984) 285, NIM A239 (1985) 131, NP B262 (1985) 715, and NP B262 (1985) 727.

**SACLAY-052-2** (Nov 1981) Approved Nov 1981; Started Feb 1982; Completed Feb 1983.

**MEASUREMENT OF  $pp$  ELASTIC SCATTERING IN THE COULOMB-NUCLEAR INTERFERENCE REGION USING THE POLARIZED PROTON BEAM FROM SATURNE II**

ANNECY - H Azaiez, K Kuroda, A Michalowicz ( $\checkmark$  Spokesperson)

TRIESTE U - R Birsa, F Bradamante, S Dallatorre-Colautti, M Giorgi, L Lancieri, A Martin, A Penzo, P Shiavon, A Villari

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam

$p p \rightarrow p p$  1.3-3.2 GeV/c

Comments Uses a scintillating target.

**SACLAY-057** (Sep 1979) Approved Oct 1979; Started 1980; Completed 1983.

**SEARCH FOR BARYONIUM STATES NEAR THE  $N\bar{N}$  THRESHOLD BY THE DETECTION OF RECOIL NUCLEI WITH SPES-IV**

LYON, IPN & ORSAY, IPN & SACLAY - D Bachelier, M Bedjidian, J L Boyard, E Descroix, J Y Grossiord, A Guichard, M Gusakow, T Hennino, J C Jourdain, J R Pizzi, P Radvanyi (Spokesperson), M Roy-Stephan (Spokesperson)

Accelerator SATURNE-II Detector SPES-IV

Reactions

$p \text{ nucleus} \rightarrow \text{nucleus nucleon}$  3.7 GeV/c  
 $\text{nucleon}$

Particles studied baryonium

**SACLAY-060** (Oct 1979) Approved Oct 1979; Started 1981; Completed 1982.

**ANGULAR AND ENERGY DEPENDENCE OF THE CROSS SECTION AND THE ANALYZING POWER OF THE REACTION  $pp \rightarrow d\pi^+$  BETWEEN 725 AND 1000 MeV**

SACLAY - J Arvieux, S D Baker, R Bertini ( $\checkmark$  Spokesperson), P Catillon, H Catz, J M Durand, L Farvacque, G P Gervino, C M Glashauser, D A Hutcheon, J C Lugol, B Mayer ( $\checkmark$  Spokesperson), C A Whitten, A I Yavin

KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - G Smith

Accelerator SATURNE-II Detector SPES-I

Reactions Polarized beam

$p p \rightarrow \text{deut } \pi^+$  < 1.7 GeV/c

Particles studied dibaryon

Papers PL 162B (1985) 77, and NP A437 (1985) 630.

**SACLAY-066** (Feb 1980) Approved Jun 1980; Started Nov 1980; Completed.

**MEASUREMENT OF THE  $dd \rightarrow {}^4\text{He} \gamma$  REACTION FOR A TEST OF THE MICROSCOPIC REVERSIBILITY PRINCIPLE**

SACLAY - A Boudard, G Bruge, P Couvert, L Farvacque, D Legrand

UCLA - W Briscoe, D Fitzgerald, B M K Nefkens ( $\checkmark$  Spokesperson), B Silverman

Accelerator SATURNE-II Detector SPES-I

Reactions

deut deut  $\rightarrow$  He  $\gamma$  —

deut p —

Comments A continuation of SACLAY-037.

Papers PR C29 (1984) 35.

**SACLAY-068** (Feb 1981) Approved Jun 1980; Started Jun 1981; Completed 1982.

**STUDY OF REACTIONS  $pd \rightarrow \pi^0 {}^3\text{He}$ ,  $pd \rightarrow \gamma {}^3\text{He}$ , AND  $pd \rightarrow \pi^+ {}^3\text{H}$**



## SUMMARIES OF EXPERIMENTS

SACLAY - A Boudard, G Bruge, P Couvert (✓ Spokesperson),  
L Farvacque, D Legrand  
UCLA - W J Briscoe, D Fitzgerald, B M K Nefkens  
(✓ Spokesperson), B Silverman

Accelerator SATURNE-II Detector SPES-I

Reactions

$p \text{ deut} \rightarrow \text{trit } \pi^+$  1.03 GeV/c  
 $p \text{ deut} \rightarrow {}^3\text{He } \pi^0$  "  
 $p \text{ deut} \rightarrow {}^3\text{He } \gamma$  "

Papers NP A444 (1985) 621, and PR C32 (1985) 1956.

**SACLAY-070** (Apr 1980) Approved Mar 1982; Started 1982; Completed Feb 1983.

**SEARCH FOR DIBARYONIC RESONANCES IN  $pp$  ELASTIC SCATTERING BETWEEN 600 AND 1000 MeV**

SACLAY - R Beurtey, J C Duchazeaubeneix, J C Faivre,  
M Garcon, B Guillerminet, D Legrand (Spokesperson),  
M Rouger, J Saudinos, Y Terrien

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam

$p p \rightarrow p p$  1.0-1.7 GeV/c

Particles studied dibaryon

**SACLAY-078** (Jan 1981) Approved Jan 1983; Started Feb 1983; Completed.

**$np$  ELASTIC SCATTERING AT SMALL ANGLES**

SACLAY - J C Lugol, J Saudinos, Y Terrien  
(✓ Spokesperson), F Wellers  
LENINGRAD, INP - A V Khazadzev, G Korolev  
(✓ Spokesperson), N Terentiev, A Vorobyov

Accelerator SATURNE-II Detector Wire chamber

Reactions

$n p \rightarrow n p$  0.95-2.0 GeV/c

Comments Detects the recoil proton using an ionization chamber.

Papers PL 165B (1985) 262.

**SACLAY-080** (Apr 1981) Approved Jun 1981; Started Nov 1981; Completed Jun 1982.

**STUDY OF ISOSCALAR DIBARYONIC RESONANCES**

SACLAY - J Banaigs, J Berger, P Berthet, R Beurtey,  
M Boivin, Y Le Bornec, A Codino, M P Combes, J Duflo,  
R Frascaria (✓ Spokesperson), D Hutcheon, C F Perdrisat,  
F Plouin, B Tatischeff (✓ Spokesperson), N Willis  
(✓ Spokesperson)

STRASBOURG - E Aslanides, O Bing, F Hibou

FRASCATI - F Fabbri, G Piccozza, L Satta

CAEN U - J Yonnet

Accelerator SATURNE-II Detector SPES-IV

Reactions

deut deut  $\rightarrow$  deut X 2.98, 3.39, 3.72 GeV/c

Particles studied dibaryon

Comments No resonance found.

Papers NP A431 (1984) 703; and NP A431 (1984) 713.

**SACLAY-085** (Sep-1981) Approved Nov 1981; Started 1982.

**THE ( ${}^3\text{He}, t$ ) REACTION AT INTERMEDIATE ENERGIES**

LUND U - I Bergquist, A Brockstedt, L Carlen, P Ekstrom,  
B Jakobsson

COPENHAGEN U - C Ellegaard, C Gaarde (✓ Spokesperson),  
J Syrak-Larsen

INDIANA U - C Goodman

LYON, IPN - M Bedjidian, D Contardo, J Y Grossiord,  
A Guichard, R Haroutunian, J R Pizzi

ORSAY, IPN - D Bachelier, J L Boyard, T Hennino, M Roy-  
Stephan

SACLAY - M Boivin, P Radvanyi

Accelerator SATURNE-II Detector SPES-IV

Reactions

${}^3\text{He } p \rightarrow \Delta(1232 P_{33})^{++} \text{ trit}$  1.8-4.3 GeV/c  
 ${}^3\text{He nucleus} \rightarrow \text{nucleus trit}$  "

Comments Studies spin-isospin correlations in nuclei — the low-lying collective states of different multiplicities and the  $\Delta$  excitations. The  $p({}^3\text{He}, {}^3\text{H})\Delta^{++}$  reaction is an important test case.

Papers PRL 50 (1983) 17, PL 154B (1985) 110, and PL 168B (1986) 331.

**SACLAY-087** (Feb 1982) Approved Mar 1982; Started Jun 1982; Completed Oct 1983.

**MEASUREMENT OF THE TOTAL CROSS SECTION DIFFERENCE  $\Delta\sigma_L(pp)$  IN THE ENERGY RANGE FROM 0.52 TO 2.8 GeV**

SACLAY - M Arignon, J Ball, J Bystricky, P Chaumette,  
J Deregel, J Fabre, J M Fontaine, J Gosset, T Hasegawa,  
F Lehar (✓ Spokesperson), A de Lesquen, C R Newsom,  
F Perrot, L van Rossum, J Yonnet

GENEVA U - W R Leo, Y Onel

INFN, TRIESTE - A Penzo

ANNECY - H Azaiez, A Michalowicz

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target

$p p \rightarrow p p$  1.12-3.62 GeV/c

Comments Uses a coded transmission detector.

Papers PL 142B (1984) 130, and NIM A235 (1985) 523.

**SACLAY-088** (Feb 1982) Approved Mar 1982; Started Jul 1983; Completed Jul 1983.

**MEASUREMENT OF  $A_{\text{Ookk}}$  FOR  $pp$  ELASTIC SCATTERING FROM 725 TO 1040 MeV**

SACLAY - J Ball, J Bystricky, P Chaumette, J Deregel,  
J Fabre, J M Fontaine, T Hasegawa, F Lehar  
(✓ Spokesperson), A de Lesquen, C R Newsom  
(✓ Spokesperson), F Perrot, L van Rossum

GENEVA U - Y Onel

INFN, TRIESTE - A Penzo

ANNECY - H Azaiez

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target

$p p \rightarrow p p$  1.51, 1.56, 1.62, 1.70, 1.81 GeV/c

Comments Ran simultaneously with SACLAY-089.

Papers NP B258 (1985) 483.

**SACLAY-089** (Feb 1982) Approved Mar 1982; Started Jul 1983; Completed Jul 1983.

**EXPERIMENTAL CONFIRMATION OF THE PHASE-SHIFT ANALYSIS PREDICTIONS IN THE DIBARYON REGION**

SACLAY - J Ball, J Bystricky, P Chaumette, J Deregel,  
J Fabre, J M Fontaine, T Hasegawa, F Lehar  
(✓ Spokesperson), A de Lesquen, C R Newsom, F Perrot,  
L van Rossum

GENEVA U - Y Onel

INFN, TRIESTE - A Penzo (✓ Spokesperson)

ANNECY - H Azaiez

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target

$p p \rightarrow p p$  1.51, 1.56, 1.62, 1.70, 1.81 GeV/c

Particles studied dibaryon

## SUMMARIES OF EXPERIMENTS

Comments Ran simultaneously with SACLAY-088.

Papers NP B258 (1985) 483.

**SACLAY-092** (Feb 1982) Approved Mar 1982; Started Oct 1982; Completed Oct 1982.

**COHERENT PRODUCTION OF PIONS IN THE REACTION  ${}^3\text{He}({}^3\text{He}, \pi^+){}^6\text{Li}$  AS A FUNCTION OF INCIDENT ENERGY**

STRASBOURG - E Aslanides, G Bergdolt, P Fassnacht, C Racca

ORSAY, IPN - L Bimbot (✓ Spokesperson), T Hennino, J C Jourdain, F Reide, B Tatischeff, N Willis

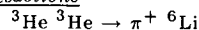
SACLAY - A Boudard, G Bruge, J C Lugol

STRASBOURG & SACLAY - F Hibou (✓ Spokesperson)

ORSAY, IPN & SACLAY - Y Le Bornec (✓ Spokesperson)

Accelerator SATURNE-II Detector SPES-I

Reactions



Papers PL 113B (1983) 149.

**SACLAY-095** (Oct 1982) Approved Dec 1982; Started 1983; Completed.

**COHERENT PRODUCTION OF THE  $\eta$  IN THE BACKWARD DIRECTION IN  $pd$  AND  $dd$  SYSTEMS**

SACLAY - J Banaigs, J Berger, M Boivin, A Codino, J Dufo, L Goldzahl (✓ Spokesperson), F Plouin

ORSAY, IPN - P Berthet (✓ Spokesperson), J P Didelez, R Frascaria (✓ Spokesperson), G Pignault

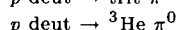
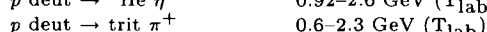
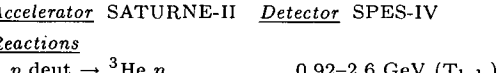
FRASCATI - F Fabbri, G Picozza, L Satta

WILLIAM AND MARY COLL - M Boivin

WILLIAM AND MARY COLL & ORSAY, IPN - C Perdrisat

Accelerator SATURNE-II Detector SPES-IV

Reactions



Papers NP A443 (1985) 4, and PR C32 (1985) 1448.

**SACLAY-099** (Oct 1982) Approved Nov 1983; Completed.

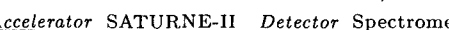
**MEASUREMENT OF THE ANGULAR DISTRIBUTION OF THE DIFFERENTIAL CROSS SECTION AND POLARIZATION  $A_{y0}$  IN THE REACTION  $pd \rightarrow {}^3\text{H} \pi^+$  BETWEEN 900 AND 1450 MeV**

SACLAY - R Bertini, A Boudard, J Cameron, H Catz, J M Durand, G P Gervino, J L Lugol, B Mayer (✓ Spokesperson)

GRENOBLE U & SACLAY - J Arvieux, G Gaillard

Accelerator SATURNE-II Detector Spectrometer

Reactions Polarized beam



**SACLAY-101** (Dec 1982) Approved Jun 1983; Started Oct 1983.

**NOVEL TECHNIQUE FOR THE BEAM POLARIZATION MEASUREMENT AT HIGH ENERGIES**

SACLAY - J Bystricky, J Deregel, J M Fontaine, F Lehar (✓ Spokesperson), G Leleux, A de Lesquen, A Nakach (✓ Spokesperson), F Perrot, L van Rossum (✓ Spokesperson)

INFN, TRIESTE - A Penzo

Accelerator SATURNE-II Detector Counter

Reactions Polarized beam



Comments Uses a nucleon-nucleon polarimeter.

Papers NIM A234 (1985) 412.

**SACLAY-104** (Feb 1983) Approved Jun 1983; Started Dec 1984; Completed Nov 1985.

**MEASUREMENT OF WOLFENSTEIN PARAMETERS IN  $pp$  SCATTERING BETWEEN 600 MeV AND 3 GeV**

SACLAY - J Ball, J Bystricky, P Chaumette, J Deregel, J Fabre, J M Fontaine (✓ Spokesperson), F Lehar (✓ Spokesperson), A de Lesquen, F Perrot, L van Rossum

ANNECY - H Azaiez

INFN, TRIESTE - A Penzo

GENEVA U - Y Onel

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target



Comments A 'complete' experiment. Measures 11 to 13 independent observables over the angular range 20 to 100° at 11 incident kinetic energies from 840 to 2700 MeV.

**SACLAY-105** (Feb 1983) Approved Nov 1983; Started Jan 1984.

**TEST OF CHARGE SYMMETRY IN THE REACTION  $dd \rightarrow {}^4\text{He} \pi^0$**

SACLAY - J Banaigs, J Berger, M Boivin, A Boudard, L Goldzahl, C Kerboul, F Plouin (Spokesperson), B Silverman, J Yonnet

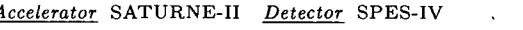
FRASCATI - F L Fabbri, L Satta

UCLA - J Carroll, G Igo

ECOLE POLYTECHNIQUE - P Fleury

Accelerator SATURNE-II Detector SPES-IV

Reactions



Comments Tests charge symmetry violation at the level of 1 pb/sr. Taking data (November 84).

**SACLAY-106** (Feb 1983) Approved Mar 1983; Started Jul 1983.

**SIMULTANEOUS MEASUREMENT OF THE ASYMMETRIES  $\epsilon(pp)$  AND  $\epsilon(np)$**

SACLAY - J Arvieux, J Ball, J Bystricky, J Deregel, J M Fontaine, T Hasegawa, F Lehar (✓ Spokesperson), A de Lesquen, C R Newsom, F Perrot, C Raymond, L van Rossum

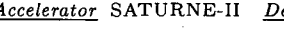
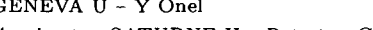
ANNECY - H Azaiez, A Michalowicz

INFN, TRIESTE - A Penzo

GENEVA U - Y Onel

Accelerator SATURNE-II Detector Counter

Reactions Polarized beam



Comments Uses a nucleon-nucleon polarimeter with neutron counters.

Papers NP A444 (1985) 597.

**SACLAY-107** (Feb 1984) Approved Mar 1984; Started Apr 1984.

**ANOMALOUS PION PRODUCTION IN THE PROTON NUCLEUS INTERACTION AT INTERMEDIATE ENERGIES**

SACLAY - M Bolore, J-M Hisleur, J Julien (Spokesperson), J Martino, B Pappalardo, L Roussel, B Saghai

ORSAY, IPN - L Bimbot

GRENOBLE U - O Lebrun

MOSCOW, INR - V K Gorbunov, F F Gruber, V A Krasnov, A B Kurepin (Spokesperson), V S Pantuev, A I Reshetin

CRACOW - H Dabrowski

Accelerator SATURNE-II Detector Combination

Reactions



## SUMMARIES OF EXPERIMENTS

**SACLAY-108** (Jun 1984) Approved Jun 1984; Completed Jun 1984.

**MEASUREMENT OF VECTOR AND TENSOR ANALYZING POWERS FOR THE CONSTRUCTION OF THE DEUTERON POLARIMETER IN THE ENERGY REGION 150-500 MeV**

SACLAY - B Bonin, A Boudard (✓ Spokesperson), G Bruge, J C Duchazeaubeneix, J M Durand, M Garcon, B Mayer, M Rouger, J Saudinos, D Shepard, B Silverman, F Soga  
 GRENOBLE U - J Arvieux, G Gaillard, Nguyen  
 ALBERTA U - J Cameron (✓ Spokesperson), G C Neilson, W C Olsen

Accelerator SATURNE-II Detector Wire chamber

Reactions Polarized beam

deut  $p \rightarrow$  deut  $p$  0.77-1.5 GeV/c

Papers NP A458 (1986) 287.

**SACLAY-113** (Feb 1983) Approved Mar 1984; Completed.

**SEARCH FOR MULTIBARYONIC RESONANCES BY A STUDY OF MISSING MASS SPECTRA IN THE REACTIONS  $pp \rightarrow \pi^- X$  AND  $pd \rightarrow \pi^- X$**

ORSAY, IPN - M P Combes, R Frascaria, B Tatischeff, N Willis (✓ Spokesperson)  
 SACLAY & ORSAY, IPN - Y Le Bornec  
 SACLAY & TOKYO U - F Soga  
 STRASBOURG - E Aslanides, G Bergdolt, O Bing, P Fassnacht (✓ Spokesperson), F Hibou, C Kerboul

Accelerator SATURNE-II Detector SPES-III

Reactions

$p p \rightarrow \pi^- X$  —

$p$  deut  $\rightarrow \pi^- X$  —

Particles studied dibaryon

Comments Analysis is in progress (December 86).

**SACLAY-115** (Jan 1984) Approved Mar 1984; Started Oct 1984.

**THE ( $d, {}^2\text{He}$ ) REACTION**

LUND U - I Bergquist, A Brockstedt, L Carlen, P Ekstrom  
 COPENHAGEN U - C Ellegaard, C Gaarde (✓ Spokesperson), J Syrak-Larsen

INDIANA U - C Goodman

LYON, IPN - M Bedjidian, D Contardo, J Y Grossiord, A Guichard, R Haroutunian, J R Pizzi

ORSAY, IPN - D Bachelier, J L Boyard, T Hennino, M Roy-Stephan

SACLAY - M Boivin, P Radvanyi

Accelerator SATURNE-II Detector SPES-IV

Reactions Polarized beam

deut  $p \rightarrow {}^2\text{He} n$  1.6-3.6 GeV/c

deut  $p \rightarrow {}^2\text{He} \Delta(1232 P_{33})^0$  "

deut nucleus  $\rightarrow {}^2\text{He}$  nucleus "

Comments The ( $d, {}^2\text{He}$ ) reaction is a charge-exchange spin-transfer reaction like the ( $n, p$ ) reaction. Measures the tensor analyzing power. Taking data.

**SACLAY-117** (Nov 1985) Approved Nov 1985; Started 1986.

**MEASUREMENT OF  $T_{20}$  AT 0 AND 180° AND OF DIFFERENTIAL CROSS SECTIONS FOR THE REACTION  $\bar{d}p \rightarrow {}^3\text{He} \pi^0$  FROM 700 TO 2200 MeV**

SACLAY - L Antonuk, J Arvieux, J Berger, R Bertini, M Boivin, A Boudard (✓ Spokesperson), J M Durand, C Kerboul, B Mayer, A Stetz, J Tinsley, J Yonnet  
 GRENOBLE U - Nguyen Van Sen, Y Yanlin  
 ALBERTA U - J Cameron, C Lapointe, D M Sheppard  
 NEUCHATEL U - J F Germond  
 UNIVERSITY COLL, LONDON - C Wilkin

Accelerator SATURNE-II Detector SPES-IV

Reactions Polarized beam

deut  $p \rightarrow {}^3\text{He} \pi^0$  0.7-2.2 GeV ( $T_{\text{lab}}$ )

Papers PL 181B (1986) 28.

**SACLAY-118** (Mar 1984) Approved Mar 1984; Started Apr 1984; Completed.

**RESEARCH ON DIBARYON RESONANCES AROUND 350 MeV**

SACLAY - B Bonin, A Boudard, J C Duchazeaubeneix, M Garcon, D Legrand, M Rouger, J Saudinos (✓ Spokesperson)

GRENOBLE U - J Arvieux, G Gaillard

Accelerator SATURNE-II Detector Combination

Reactions

$p p \rightarrow$  deut  $\pi^+$  328, 340, 354, 358 MeV ( $T_{\text{lab}}$ )

$p p \rightarrow p p$  "

Particles studied dibaryon

**SACLAY-121** (Sep 1984) Approved Nov 1984; Started 1985.

**SEARCH FOR DIBARYONS OF STRANGENESS  $S = -1$  BETWEEN  $\Lambda N$  AND  $\Sigma N$  THRESHOLDS**

ORSAY, IPN - J P Didelez (✓ Spokesperson), R Frascaria (✓ Spokesperson), E Warde

SOUTHERN CALIFORNIA U - G Adams, G Blanpied, G Pignault, B Freedom (✓ Spokesperson)

NEUCHATEL U - E Bovet, J P Egger

GRENOBLE U - C Perrin

CAEN U - J Yonnet

SACLAY - M Boivin, B Saghai

BONN U - J Ernst, T Mayer Kuckuck, R Siebert

Accelerator SATURNE-II Detector SPES-IV, Counter

Reactions

$p p \rightarrow K^+ X$  —

Particles studied dibaryon ( $S = -1$ )

Comments Taking data (November 86).

**SACLAY-123** (Oct 1985) Approved Nov 1985; Started 1986; Completed.

**STUDY OF NARROW STRUCTURES IN THE INVARIANT MASSES OF TWO BARYONS**

SACLAY - J Arvieux, R Beurtey, B Bonin, A Boudard, J C Duchazeaubeneix, J C Faivre, M Garcon, R Rouger, J Saudinos (✓ Spokesperson), Y Terrien

Accelerator SATURNE-II Detector Combination

Reactions

$p p \rightarrow$  deut  $\pi^+$  336, 344, 350 MeV ( $T_{\text{lab}}$ )

Particles studied dibaryon

Comments A continuation of SACLAY-118.

**SACLAY-124** (Nov 1984) Approved Nov 1984; Started Mar 1985.

**SEARCH FOR NARROW DIBARYON RESONANCES IN THE REACTION  $pp \rightarrow d\pi^+$  AT 90° C.M.**

SACLAY - J Arvieux, J Bystricky, J Deregél, F Lehar (✓ Spokesperson), A de Lesquen, B Mayer (✓ Spokesperson), F Perrot, L Van Rossum

INFN, TRIESTE - A Penzo

GENEVA U - Y Onel

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target

$p p \rightarrow$  deut  $\pi^+$  328, 340, 354, 368, 510, 525, 560 MeV ( $T_{\text{lab}}$ )

Particles studied dibaryon

## SUMMARIES OF EXPERIMENTS

Comments Measures spin correlations and analyzing power at 90° c.m.

**SACLAY-125** (Oct 1985)

**COMPARISON OF COHERENT AND INCOHERENT PRODUCTION OF  $\pi^0$  AND  $\eta$  ON NUCLEI**

INFN, TURIN & TURIN U - G B Bonazzola, E Chiavassa, G Dellacasa, N Demarco, F Ferrero, M Gallio, A Musso, A Piccotti, E Vercellin

INFN, CATANIA - V Bellini, A S Figuera, R Fonte  
SACLAY - R Bertini (✓ Spokesperson), M Boivin, A Boudard, P Couvert, J M Durand, F Plouin, B Silverman  
STRASBOURG - F Brochard, P Fassnacht

Accelerator SATURNE-II Detector ?

Comments In preparation and making test runs (December 86).

**SACLAY-126** (Feb 1985) Approved May 1985; Started Nov 1985; Completed Nov 1985.

**STUDY OF NARROW STRUCTURES BY THE TRANSFER REACTION ( $p, d$ ) IN THE INVARIANT MASSES OF TWO BARYONS**

ORSAY, IPN - Y Le Bornec, M P Comets, B Tatischeff (✓ Spokesperson), N Willis  
SACLAY - R Beurtey, B Bonin, A Boudard, J M Durand, M Garcon, J C Lugol, B Mayer, Y Terrien  
STRASBOURG - P Fassnacht, F Hibou

Accelerator SATURNE-II Detector SPES-I

Reactions

$p \ ^3\text{He} \rightarrow \text{deut X} \quad 0.75 \text{ GeV } (T_{\text{lab}})$

Particles studied dibaryon

Comments Finds narrow isovector structures in 2-baryon invariant masses.

**SACLAY-129** (Nov 1985) Started 1985.

**EXCITATION FUNCTION OF THE REACTION  $pp \rightarrow \text{DIBARYON}(2124) \rightarrow \pi^0 pp$  AT  $0^\circ$**

ORSAY, IPN - J-P Didelez, R Frascaria (✓ Spokesperson), R Siebert, E Warde  
SOUTHERN CALIFORNIA U - G Adams, G Blanpied, G Pignault, B Freedom  
NEUCHATEL U - E Bovet, J-P Egger (✓ Spokesperson)  
GRENOBLE U - C Perrin  
SACLAY - H Dabrowski, J Julien, B Saghai  
KERNFORSCHUNGSANLAGE, JULICH - K Killian  
UPPSALA U - J Johanson

Accelerator SATURNE-II Detector SPES-0

Reactions

$pp \rightarrow p p \pi^0 \quad 450\text{-}590 \text{ MeV } (T_{\text{lab}})$

Particles studied dibaryon

Comments Taking data (November 86).

**SACLAY-132** (Nov 1985) Approved Nov 1985; Started May 1986.

**STUDY OF REACTIONS  $pp \rightarrow pn\pi^+$  AND  $pp \rightarrow pp\pi^+\pi^-$  WITH POLARIZED PROTONS FROM 800 MeV TO 2.5 GeV**

SACLAY - G Audit, R Babinet, G Bruge, J M Durand, Z Fodor, G Fournier, J Gosset (✓ Spokesperson), D L'Hote, M C Lemaire, B Mayer, J Poitou, B Saghai (✓ Spokesperson), O Valette, J Yonnet

CLERMONT-FERRAND U - J Augerat, J Berthot, P Y Bertin, H Fonvieille

STRASBOURG - F Brochard

Accelerator SATURNE-II Detector DIOGENE

Reactions Polarized beam

$p p \rightarrow p n \pi^+ \quad 800, 1500, 2000, 2500 \text{ MeV } (T_{\text{lab}})$

$p p \rightarrow p p \pi^+ \pi^-$

**SACLAY-133** (Oct 1985) Approved Nov 1985; Started Jun 1986.

**DEPENDENCE ON A OF PION PRODUCTION IN THE REACTION  $p$  NUCLEUS  $\rightarrow \pi X$**

STRASBOURG - D Benabdellouahed, G Bergdolt, O Bing, P Fassnacht, F Hibou (✓ Spokesperson)  
ORSAY, IPN - Y Le Bornec (✓ Spokesperson), M P Comets, R Frascaria, B Tatischeff  
SACLAY - M Boivin

Accelerator SATURNE-II Detector SPES-III

Reactions

$p \text{ nucleus} \rightarrow \text{pion X} \quad 2.1, 2.7 \text{ GeV } (T_{\text{lab}})$

**SACLAY-134** (Oct 1985) Approved Nov 1985; Started Mar 1986.

**STUDY OF DEUTERON BREAKUP IN THE REACTION  $d$  NUCLEUS  $\rightarrow pX$  AT 3.72 GeV/c**

ORSAY, IPN - J P Didelez, R Frascaria  
SACLAY - R Beurtey, M Boivin, A Boudard, F Plouin, J Yonnet (Spokesperson)  
WILLIAM AND MARY COLL - J M Finn, H Funsten, C F Perdrisat (Spokesperson)  
VIRGINIA U - P C Gugelot

Accelerator SATURNE-II Detector SPES-IV

Reactions Polarized beam

$\text{deut nucleus} \rightarrow p X \quad 3.72 \text{ GeV}/c$

Comments Targets are H, He, and C. Measures the cross section and analyzing power  $T_{20}$  at  $0^\circ$ .

**SACLAY-135** (Oct 1985) Approved Nov 1985; Started 1986.

**MEASUREMENT OF ISOSCALAR SPIN RESPONSE FUNCTIONS IN NUCLEI BY INELASTIC SCATTERING OF POLARIZED DEUTERONS**

RUTGERS U - C Glashauser (✓ Spokesperson)  
SACLAY - B Bonin (✓ Spokesperson)

Accelerator SATURNE-II Detector SPES-I

Reactions Polarized beam

$\text{deut nucleus} \quad 400 \text{ MeV } (T_{\text{lab}})$

Comments Measures the differential cross section, the analyzing power, spin correlations. The apparatus includes a deuteron polarimeter.

**SACLAY-136** (Oct 1985) Approved Nov 1985, May 1986; Started Jul 1986.

**MEASUREMENT OF ANALYZING POWER OF THE REACTION  $np \rightarrow d\gamma$  BETWEEN 500 AND 1100 MeV**

SACLAY - R Beurtey, B Bonin, A Boudard, G Bruge, P Couvert, J C Duchazeaubeneix, J C Faivre, J C Lugol, B Mayer, M Rouger, J Saudinos, B Silverman (Spokesperson), Y Terrien, F Wellers  
GEORGE WASHINGTON U - W Briscoe

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam

$n p \rightarrow \text{deut } \gamma \quad 500\text{-}1100 \text{ MeV } (T_{\text{lab}})$

**SACLAY-137** (Oct 1985) Approved Jun 1986.

**FULL CALIBRATION OF THE "AHEAD" (ALBERTA HIGH EFFICIENCY ANALYZER FOR DEUTERONS) POLARIMETER FOR DEUTERONS BETWEEN 100 AND 260 MeV**

## SUMMARIES OF EXPERIMENTS

SACLAY & ALBERTA U - L Antonuk (✓ Spokesperson),  
G Roy

SACLAY - J Arvieux, B Bonin, A Boudard, J M Durand,  
M Garcon, J Tinsley, Y Yonnet

ORSAY, IPN - D Bachelier

ALBERTA U - E B Cairns, J Cameron (✓ Spokesperson),  
H W Fielding, C Lapointe, W J McDonald, G C Neilson,  
D M Sheppard, J Soukup, K Starko

Accelerator SATURNE-II Detector SPES-I

Reactions Polarized beam  
deut  $p \rightarrow$  deut  $p$  100-260 MeV ( $T_{lab}$ )  
deut  $p \rightarrow$   $p p n$  "

**SACLAY-138** (Oct 1985) Approved Nov 1985; Started Jul 1986.

**TEST OF CHARGE SYMMETRY BY COMPARISON OF ANALYZING POWERS  $T_{20}$  IN REACTIONS  $dp \rightarrow {}^3\text{He } \pi^0$  AND  $dp \rightarrow {}^3\text{H } \pi^+$**

SACLAY - J Banaigs, J Berger (Spokesperson), M Boivin,  
A Boudard, L Goldzahl (Spokesperson), F Plouin, J Yonnet  
ALBERTA U - Roy

FRASCATI - F Fabbri, G Picozza, L Satta  
UCLA - V Ghazikhanian, Gordon

Accelerator SATURNE-II Detector SPES-IV

Reactions  
deut  $p \rightarrow$   ${}^3\text{He } \pi^0$  600, 900, 1100 MeV ( $T_{lab}$ )  
deut  $p \rightarrow$  trit  $\pi^+$  "

**SACLAY-140** (Oct 1985) Approved Nov 1985; Started Jul 1986.

**FIRST MEASUREMENT OF DIFFERENTIAL CROSS SECTIONS AND ANALYZING POWERS FOR THE REACTIONS  $np \rightarrow pp\pi^-$  AND  $np \rightarrow dn^+\pi^-$**

SACLAY - R Beurtey, B Bonin, A Boudard, G Bruge,  
P Couvert, J-C Duchazeaubeneix, J-C Faivre, J-C Lugol,  
B Mayer, M Rouger, J Saudinos, B Silverman, Y Terrien  
(✓ Spokesperson), F Wellers

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam  
 $n p \rightarrow p p \pi^-$  650-1000 MeV ( $T_{lab}$ )  
 $n p \rightarrow$  deut  $\pi^+ \pi^-$  "

**SACLAY-144** (Oct 1985) Approved Nov 1985; Started Dec 1985; Completed Jul 1986.

**NUCLEON-NUCLEON PROGRAM PART II:  $np$  SCATTERING UP TO 1.2 GeV**

SACLAY - J Ball, P Chaumette, J Dregel, J Fabre,  
J M Fontaine, D Legrand, F Lehar (✓ Spokesperson),  
A de Lesquen, F Perrot (✓ Spokesperson), L van Rossum  
GENEVA U - P Bach, R Hess (✓ Spokesperson), P Sormani  
UCLA - V Ghazakhanian  
ANNECY - A Michalowicz

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target  
 $n p \rightarrow n p$  1.0-2.0 GeV/c  
 $p p \rightarrow p p$  "

Comments Measures  $np \rightarrow np$  and  $pp \rightarrow pp$  using a polarized deuteron beam, and also  $np \rightarrow np$  using a free polarized neutron beam. For the latter, measures  $\Delta\sigma_L$ ,  $\Delta\sigma_T$ , and correlation parameter. Compares results for free and quasi-free scattering.

**SERP-E-045** (1970) Approved 1970; Started Dec 1974; Completed Jun 1981.

**STUDY OF MUON CHARACTERISTICS IN NEUTRINO INTERACTIONS**

SERPUKHOV - A P Bugorsky, V N Goryachev,  
L A Klimenko, V I Kochetkov, V A Krendelev, A V Kulikov,

V I Kurbakov, A I Mukhin (Spokesperson), V F Perelygin,  
V G Platonov, V G Rybakov, V N Rychenkov,  
K E Shestermanov, Y G Stroganov, Y M Sviridov,  
V Y Uglekov, A A Volkov, A S Vovenko, V A Yarba,  
V P Zhigunov, Y A Zudin

MOSCOW, ITEP - A E Asratyan, V S Epstein, E A Grigoriev, V S Kaftanov (Spokesperson), N V Kalganov,  
V D Khovansky, Y G Kornelyuk, M A Kubantsev, I P Maksimov, A N Rozanov, M S Ryabinin, V M Serezhin,  
V V Shamanov, V G Shevchenko, V A Smotryaev,  
I S Trostin, A A Zaitsev, A A Zeldovich, V A Zhemanov

Accelerator SERP Detector Optical spark chamber

Reactions  
 $\nu_\mu \text{ Fe} \rightarrow \mu^- X$  2-30 GeV/c  
 $\nu_\mu \text{ Fe} \rightarrow \mu^- \mu^+ X$  "  
 $\bar{\nu}_\mu \text{ Fe} \rightarrow \mu^+ X$  "  
 $\bar{\nu}_\mu \text{ Fe} \rightarrow \mu^- \mu^+ X$  "  
 $\nu_\mu \text{ Al} \rightarrow \mu^- X$  "  
 $\bar{\nu}_\mu \text{ Al} \rightarrow \mu^+ X$  "  
 $\nu_\mu n \rightarrow \mu^- p$  "  
 $\bar{\nu}_\mu p \rightarrow \mu^+ n$  "  
 $\bar{\nu}_e \text{ Al} \rightarrow e^+ X$  "  
 $\nu_\mu e^- \rightarrow \nu_\mu e^-$  "

Comments Ran for 4000 hours. About 40000  $\nu_\mu$  and 10000  $\bar{\nu}_\mu$  interactions obtained as of Jan 1979.

Papers PL 71B (1977) 439, PL 76B (1978) 239, YF 28 (1978) 424 = SJNP 28 (1978) 214, YF 29 (1979) 1506 = SJNP 29 (1979) 773, YF 30 (1979) 1014 = SJNP 30 (1979) 528, NIM 146 (1977) 367, JETP 47 (1977) 991, YF 35 (1982) 59 = SJNP 35 (1982) 35, and ZETFP 38 (1983) 547 = JETPL 38 (1983) 661.

**SERP-E-100** (May 1974) Approved Jun 1975; Started May 1976; Completed Feb 1984.

**STUDY OF LARGE  $p_t$  PARTICLE PRODUCTION IN  $pN$  COLLISIONS AT 70 GeV**

SERPUKHOV - V V Abramov, A V Alekseev, B Y Baldin,  
S I Bityukov, Y P Dmitrevsky, A S Dyshkant, V N Evdokimov,  
V Y Glebov, V I Kotov, A N Krinitsin, V I Kryshkin,  
N Y Kulman, V K Myalitsin, R A Rzaev, R M Sulyaev  
(Spokesperson), L K Turchanovich, Y N Vrazhnov,  
V V Zmushko

Accelerator SERP Detector FODS

Reactions  
 $p p \rightarrow \pi^+ X$  70 GeV ( $E_{lab}$ )  
 $p p \rightarrow \pi^- X$  "  
 $p p \rightarrow K^+ X$  "  
 $p p \rightarrow K^- X$  "  
 $p p \rightarrow p X$  "  
 $p p \rightarrow \bar{p} X$  "  
 $p p \rightarrow \mu^+ X$  "  
 $p p \rightarrow \mu^- X$  "  
 $p p \rightarrow e^+ X$  "  
 $p p \rightarrow e^- X$  "  
 $p p \rightarrow 2\text{hadron } X$  "  
 $p p \rightarrow \mu^+ \text{hadron } X$  "  
 $p p \rightarrow \mu^- \text{hadron } X$  "  
 $p p \rightarrow e^+ \text{hadron } X$  "  
 $p p \rightarrow e^- \text{hadron } X$  "

## SUMMARIES OF EXPERIMENTS

$p$ deut $\rightarrow \pi^+$ X	"	V E Simonov, M I Solov'yev, G G Takhtamyshev, G Vestergombi
$p$ deut $\rightarrow \pi^-$ X	"	BERLIN, DAW - K F Albrecht, K Hiller, R Leiste, H E Ryseck (Spokesperson)
$p$ deut $\rightarrow K^+$ X	"	BUDAPEST, CRIP - E Nagy (Spokesperson), L Sente, L Urban
$p$ deut $\rightarrow K^-$ X	"	LEBEDEV INST - A S Belousov, P A Cherenkov, E I Malinovsky, S V Rusakov, P N Shareyko
$p$ deut $\rightarrow p$ X	"	PRAGUE, INST PHYS - J Hladky, S Nemecek, M Novak, A Prokes, J Schastny, J Votruba
$p$ deut $\rightarrow \bar{p}$ X	"	SOFIYA, INST CHEM TECH - V I Zayachki
$p$ deut $\rightarrow \mu^+$ X	"	SOFIYA, INST NUCL RES - V I Genchev, P K Markov (Spokesperson), G G Sultanov, P T Todorov, P K Trayanov
$p$ deut $\rightarrow \mu^-$ X	"	TBILISI STATE U - V P Djordjadze, V D Kekelidze, G I Nikobadze
$p$ deut $\rightarrow e^+$ X	"	
$p$ deut $\rightarrow e^-$ X	"	
$p$ deut $\rightarrow 2$ hadron X	"	
$p$ deut $\rightarrow \mu^+$ hadron X	"	
$p$ deut $\rightarrow \mu^-$ hadron X	"	
$p$ deut $\rightarrow e^+$ hadron X	"	
$p$ deut $\rightarrow e^-$ hadron X	"	

**Comments** The  $p_t$  range is 0.3 to 4.5 GeV, and the mass-squared range is 1 to 9 GeV<sup>2</sup>.

**Papers** YF 23 (1976) 1195 = SJNP 23 (1976) 636, PTE 4 (1980) 38, NP B173 (1980) 348, YF 31 (1980) 660 = SJNP 31 (1980) 343, YF 31 (1980) 937 = SJNP 31 (1980) 484, YF 31 (1980) 1483 = SJNP 31 (1980) 770, ZETFP 33 (1981) 304 = JETPL 33 (1981) 289, YF 33 (1981) 715 = SJNP 33 (1981) 371, YF 35 (1982) 1199 = SJNP 35 (1982) 702, ZETFP 38 (1983) 206 = JETPL 38 (1983) 243, NP B245 (1984) 1, ZETFP 39 (1984) 92 = JETPL 39 (1984) 111, YF 40 (1984) 1447 = SJNP 40 (1984) 918, YF 41 (1985) 137 = SJNP 41 (1985) 87, YF 41 (1985) 700 = SJNP 41 (1985) 445, and ZPHY C27 (1985) 497.

**SERP-E-102** (1975) Approved Jul 1975; Started May 1978; Completed 1985.

### STUDY OF HYPERCHARGE EXCHANGE SCATTERING PROCESSES

SERPUKHOV - S A Akimenko, V I Belousov, A M Blick, V M Kutyn (Spokesperson), Y D Prokoshkin, A I Ronzhin, V I Rykalin, V I Solyanik  
 DUBNA - Y A Budagov (Spokesperson), V P Dzhelepov, V B Flyagin, Y F Lomakin, V B Vinogradov, A G Volodko  
 TBILISI STATE U - N S Amaglobeli, R G Salukvadze  
 YEREVAN PHYS INST - A T Amatuni, E M Matevosyan  
 KOSICE, IEF - Y Dubinski, L Shandor

**Accelerator** SERP **Detector** Spectrometer

#### Reactions

$\pi^+ p \rightarrow K^+ \Sigma^+$	5-20 GeV/c
$\pi^+ p \rightarrow K^+ Y^*(\text{unspec})^+$	"
$\pi^+ n \rightarrow K^0 \Sigma^+$	"
$\pi^+ n \rightarrow K^0 Y^*(\text{unspec})^+$	"
$\pi^+ n \rightarrow K^+ Y^*(\text{unspec})^0$	"
$\pi^+ n \rightarrow K^+ \Lambda$	"
$K^+ n \rightarrow \pi^+ Z^*(\text{unspec})^0$	"
$\pi^+ n \rightarrow K^+ \Lambda(1330 B)$	"

**Particles studied**  $\Lambda(1330 B)$ ,  $Z^*(\text{unspec})^0$

**Papers** YF 38 (1983) 1212 = SJNP 38 (1983) 732, YF 38 (1983) 1472 = SJNP 38 (1983) 896, and YF 39 (1984) 649 = SJNP 39 (1984) 411.

**SERP-E-104** (1975) Approved Jan 1975; Started Jun 1978; Completed 1980.

### SEARCH FOR CHARM

SERPUKHOV - Y I Salomatin, A S Vovenko  
 DUBNA - A N Aleev, V A Arefiev, V P Balandin, A M Baldin, S G Basiladze, V K Birulev, A S Chvyrov, G G Eichner, I M Geshkov, V M Gorshkov, N N Govorun, T S Grigalashvili, B N Guskov, I M Ivanchenko, N N Karpenko, D A Kirillov, D Kiss, V G Krivokhizhin, V V Kukhtin, M F Likhachev (Spokesperson), A L Lyubimov, A N Maksimov, I Manno, M N Morozov, H Nowak, A V Poze, I A Savin, A E Senner, L V Silvestrov,

V E Simonov, M I Solov'yev, G G Takhtamyshev, G Vestergombi  
 BERLIN, DAW - K F Albrecht, K Hiller, R Leiste, H E Ryseck (Spokesperson)  
 BUDAPEST, CRIP - E Nagy (Spokesperson), L Sente, L Urban  
 LEBEDEV INST - A S Belousov, P A Cherenkov, E I Malinovsky, S V Rusakov, P N Shareyko  
 PRAGUE, INST PHYS - J Hladky, S Nemecek, M Novak, A Prokes, J Schastny, J Votruba  
 SOFIYA, INST CHEM TECH - V I Zayachki  
 SOFIYA, INST NUCL RES - V I Genchev, P K Markov (Spokesperson), G G Sultanov, P T Todorov, P K Trayanov  
 TBILISI STATE U - V P Djordjadze, V D Kekelidze, G I Nikobadze

**Accelerator** SERP **Detector** Wide-angle spectrometer

#### Reactions

$n C \rightarrow \Lambda \pi^+ X$	45 GeV/c
$n C \rightarrow \Lambda \pi^+ \pi^- X$	"
$n C \rightarrow \Lambda \mu^+ X$	"
$n C \rightarrow p K_S X$	"
$n C \rightarrow K_S \pi^+ \pi^- X$	"
$n C \rightarrow K_S \pi^+ X$	"
$n C \rightarrow K_S \pi^- X$	"

**Particles studied** charm,  $\Lambda_c^+$

**Papers** YF 28 (1978) 663 = SJNP 28 (1978) 340, YF 29 (1979) 94 = SJNP 29 (1979) 46, YF 29 (1979) 1516 = SJNP 29 (1979) 778, YF 35 (1982) 1175 = SJNP 35 (1982) 687, YF 37 (1983) 1474 = SJNP 37 (1983) 877, YF 37 (1983) 1479 = SJNP 37 (1983) 880, and ZPHY C26 (1984) 43.

**SERP-E-105** (1975) Approved Jan 1976; Started Jun 1978; Completed 1982.

### STUDY OF HADRON INTERACTIONS IN THE ENERGY RANGE 20-40 GeV

BERLIN, DAW - Y Ber, G Bom, K Dajters, A Donat, K Fogt, V Fribel, I Galm, I Kharder, U Kundt, R Lyajste, Z Novak, G Peter, R Poze, G Roloff, G Shiller, A Shvind, K Tryuchler, K Ventslav  
 BUDAPEST, CRIP - T Gemeshi, D Pinter  
 WARSAW U, IEP - I Gaevski, Z Tsisek, Y Zakzhevski  
 DUBNA - D Albrecht, E M Andreev, P Glasnek, Y V Grishkevich, V G Ivanov, G M Kadykov, G Khemnits, B A Khomenko, N N Khovansky, Z V Krumshtejn, K Lanius, A Majer, Y P Merekov, B A Muravev, G A Ososkov, V I Petrukhin (Spokesperson), D Poze, K Ryuger, G A Shelkov, K Shpiring, J Shyuler, T A Strizh, V M Suvorov, K Tom, L S Vertogradov  
 PRAGUE, INST PHYS - Y Bem, V Cherny, Z Korbel, M Pishut, L Rob, Y Sedlak, M Seman, K Shafarik  
 TBILISI STATE U - D M Kotlyarevsky, T A Lomadze, N N Roinishvili

**Accelerator** SERP **Detector** Wide-angle spectrometer, Streamer chamber

#### Reactions

$\pi^- p$	20-40 GeV/c
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**Comments** Studies multiple hadron production without  $\pi^0$ 's, and processes with production of at least one particle with  $p_t > 1$  GeV/c.

**SERP-E-107** Started Feb 1976.  
**STUDY OF NEUTRINO AND ANTINEUTRINO INTERACTIONS WITH NUCLEI**

SERPUKHOV - D S Baranov, A A Ivanilov, B T Konyushko, V M Korablev, V A Korotkov, E P Kuznetsov (Spokesperson), V V Makeev, C N Parshikura, A Y Polarush, Y G Ryabov, Y I Smirnov, A A Sokolov, G G Volkov, V A Yarba  
 MOSCOW PHYS ENG INST - Y P Nikitin

**Accelerator** SERP **Detector** HLBC-SKAT

## SUMMARIES OF EXPERIMENTS

### Reactions

$\nu_\mu$ nucleus $\rightarrow \nu_\mu$ X	10-20 GeV/c
$\nu_\mu$ nucleus $\rightarrow \mu^-$ hadron X	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \bar{\nu}_\mu$ X	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+$ hadron X	"

Particles studied unspc

Comments Study of neutral current processes, neutrino-electron scattering, and dilepton production. Run 1488 hours through 1981.

Papers YF 16 (1972) 546 = SJNP 16 (1972) 304, YF 17 (1973) 805 = SJNP 17 (1973) 420, YF 26 (1977) 110 = SJNP 26 (1977) 57, YF 27 (1978) 1608 = SJNP 27 (1978) 846, YF 29 (1979) 1203 = SJNP 29 (1979) 620, YF 29 (1979) 1206 = SJNP 29 (1979) 622, YF 30 (1979) 146 = SJNP 30 (1979) 75, PL 70B (1977) 269, PL 76B (1978) 336, ZETFP 30 (1979) 390 = JETPL 30 (1979) 362, ZETFP 31 (1980) 772 = JETPL 31 (1980) 728, ZPHY C21 (1984) 189, ZPHY C21 (1984) 197, YF 40 (1984) 1454 = SJNP 40 (1984) 923, YF 41 (1985) 1520 = SJNP 41 (1985) 963, and YF 43 (1986) 1186 = SJNP 43 (1986).

**SERP-E-112** (Jan 1976) Approved Jun 1976; Started Apr 1979; Completed 1985.

### POLARIZATION MEASUREMENT IN CHARGE-EXCHANGE REACTIONS AT 40 GeV/c

SERPUKHOV - V D Apokin, B N Chuyko, A A Derevschikov, V A Krendélev, Y A Matulenko, A P Meschanin, A I Mismic, E N Monich, S B Nurushhev (Spokesperson), L B Parfenov, D B Prikhodko, A N Prokhorov, V G Rigov, V N Rychenkov, V I Rykalin, A I Saraykin, B N Schelekhov, V K Semenov, V V Siksin, E V Smirnov, V L Solovyanov, L F Solovyev, V Y Uglekov, A N Vasilyev, N I Vishnevsky

DUBNA - M Y Kazarinov, Y M Kazarinov (Spokesperson), B A Khachaturov, V S Kiselev, I K Potashnikova

Accelerator SERP Detector Combination

Reactions Polarized target

$\pi^- p \rightarrow \pi^0 n$	40 GeV/c
$K^- p \rightarrow K_L n$	"

Papers YF 35 (1982) 382 = SJNP 35 (1982) 219, YF 36 (1982) 1191 = SJNP 36 (1982) 694, YF 41 (1985) 116 = SJNP 41 (1985) 74, and NP B255 (1985) 253.

**SERP-E-115** (Nov 1975) Approved Jan 1976; Started 1982; Completed 1986.

### STUDY OF CHARGED PARTICLE RARE DECAYS

SERPUKHOV - B A Arbutov

MOSCOW, INR - V N Bolotov (Spokesperson), R M Dzhilkibaev, S N Gninenko, V M Lobashov, O M Radchenko, A N Toropin

Accelerator SERP Detector Counter

Reactions

$\pi^- \rightarrow e^- \bar{\nu}_e \gamma$	---
$K^- \rightarrow e^- \bar{\nu}_e \gamma$	---
$K^- \rightarrow \pi^- e^- e^+$	---
$K^- \rightarrow \pi^- \mu^- \mu^+$	---

Particles studied  $\pi^-$ ,  $K^-$

Papers ZETFP 42 (1985) 390 = JETPL 42 (1985) 481.

**SERP-E-116** (Feb 1977) Approved Mar 1977; Started Dec 1978; Completed 1980.

### STUDY OF CHARGE-EXCHANGE REACTIONS AT SMALL MOMENTUM TRANSFER

SERPUKHOV - G A Akopdzhanov, V A Davidov, S V Donskov, A V Inyakin, V V Isakov, V A Kachanov, D B Kakauridze, R N Krasnokutsky, A A Lebedev, A A Lednev, Y V Mikhailov, V E Postoev, Yu D Prokoshkin (Spokesperson), E A Rasuvaev, S A Sadovsky, R S Shuvalov, A V Starzev, L M Vasiliev

BRUSSELS U, IISN - F Binon, C Bricman, P Duteil, J P Lagnaux, M Lebrun, J P Stroot  
ANNECY - J Dufournaud, M Gouanere, J P Peigneux, D Sillou, M Spighele

Accelerator SERP Detector GAMS-2000

Reactions

$\pi^- p \rightarrow \pi^0 n$	13; 25, 40 GeV/c
$K^- p \rightarrow \bar{K}^0 n$	"
$\bar{p} p \rightarrow \bar{n} n$	"

Comments Ran for 100 hours.

Papers NIM 174 (1980) 369, NIM 188 (1981) 507, NC 64A (1981) 89, and ZPHY C9 (1981) 109.

**SERP-E-119** (Dec 1976) Approved Jul 1977; Started May 1981.

### RELATIVISTIC POSITRONIUM PHYSICS

DUBNA - G D Alekseev, V I Ganichev, V V Karpukhin, D M Khazins, A V Kuptsov, L L Nemenov (Spokesperson), Y A Plis

SERPUKHOV - D G Baratav, V I Gridasov, S A Knyasev, Y A Lastochkin, V A Maishev, V L Rykov, V P Sakharov, A V Samojlov, V V Vasiliev

MOSCOW STATE U - A T Abrosimov, O E Gorchakov, N A Kalinina, V V Kruglov, A V Kulikov

Accelerator SERP Detector Combination

Reactions

$p n \rightarrow \pi^0 X$	< 70 GeV/c
$\pi^0 \rightarrow 3\gamma$	---
$\pi^0 \rightarrow 4\gamma$	---

Particles studied  $\pi^0$

Comments A test of special relativity. Positronium oscillations. To look for  $\pi^0 \rightarrow \gamma +$  positronium decay. Run 840 hours as of 1982.

Papers YF 40 (1984) 139 = SJNP 40 (1984) 87. For the theory see YF 15 (1972) 1047 = SJNP 15 (1972) 582.

**SERP-E-120** (Apr 1977) Approved Jul 1977; Started 1985.

### EXPERIMENTS WITH HYPERON BEAMS

SERPUKHOV - Y B Bushnin, A F Dunaitsev, R I Dzhelyadin, S V Golovkin, A K Konoplyannikov, V F Konstantinov, V P Kubarovsky, L G Landsberg (Spokesperson),

V M Leontiev, V A Mukhin, T I Petrunina, N S Pokrovsky, V G Rybakov, V A Senko, V A Sergeev, Y N Simonov, A N Sytin, A M Zaitsev

MOSCOW, ITEP - M V Gritsuk, V M Guzhavin, B L Ioffe, G K Kliger, V Z Kolganov, V L Krylov, V F Kuzichev, V L Laponov, A V Lebedev, G S Lomkatsi, A F Nilov, O I Pogorelko, N V Rabin, V T Smolyankin (Spokesperson), D D Tokarev, A V Turbiner, G N Tyapkina, I A Vetlitsky

Accelerator SERP Detector Wide-angle spectrometer

Reactions

$p$ nucleus $\rightarrow \Lambda X$	70 GeV ( $E_{lab}$ )
$p$ nucleus $\rightarrow \Sigma^- X$	"
$p$ nucleus $\rightarrow \Sigma^+ X$	"
$p$ nucleus $\rightarrow \Sigma^0 X$	"
$p$ nucleus $\rightarrow \Xi^0 X$	"
$p$ nucleus $\rightarrow \Xi^- X$	"
$p$ nucleus $\rightarrow \Omega^- X$	"
$\Lambda p \rightarrow X$	30-60 GeV/c
$\Sigma^- p \rightarrow X$	"
$\Sigma^+ p \rightarrow X$	"
$\Xi^0 p \rightarrow X$	"
$\Xi^- p \rightarrow X$	"
$\Omega^- p \rightarrow X$	"
$\Lambda$ deut $\rightarrow X$	"
$\Sigma^-$ deut $\rightarrow X$	"

## SUMMARIES OF EXPERIMENTS

$\Sigma^+$ deut $\rightarrow$ X	"
$\Xi^0$ deut $\rightarrow$ X	"
$\Xi^-$ deut $\rightarrow$ X	"
$\Omega^-$ deut $\rightarrow$ X	"
$\Sigma^- p \rightarrow \Sigma(\text{unspec})^- p$	"
$\Sigma^+ p \rightarrow \Sigma(\text{unspec})^+ p$	"
$\Xi^- p \rightarrow \Xi(\text{unspec})^- p$	"
$\Xi^0 p \rightarrow \Xi(\text{unspec})^0 p$	"
$\Omega^- p \rightarrow \Omega^*(\text{unspec})^- p$	"
$\Lambda p \rightarrow \Lambda(\text{unspec}) p$	"

Particles studied  $\Omega^-, \Sigma^-, \Sigma^+, \Xi^-, \Xi^0, \Lambda, \Sigma(\text{unspec})^+, \Sigma(\text{unspec})^-, \Xi(\text{unspec})^-, \Xi(\text{unspec})^0, \Omega^*(\text{unspec})^-, \Lambda(\text{unspec}), \text{charm}$

Comments Studies weak hyperon decays, with searches for second-class currents and charmed hyperons. Measures  $\Omega^- \rightarrow \Lambda K^-, \Xi^0 \pi^-, \Xi^- \pi^0, \Lambda \pi^-, n \pi^-, \text{ and } \Xi^0 e^- \bar{\nu}$ . Also  $\Xi^- \rightarrow \Lambda e^- \bar{\nu}$  and  $\Sigma^- \gamma$ . Also  $\Sigma^- \rightarrow \Lambda e^- \bar{\nu}$ , and  $ne^- \bar{\nu}$ . Also  $\Sigma^+ \rightarrow \Lambda e^+ \nu$ ,  $ne^+ \nu$ , and  $p \gamma$ . Also  $\Xi^0 \rightarrow \Sigma^+ e^- \bar{\nu}$ ,  $\Sigma^- e^+ \nu$ ,  $\Lambda \gamma$ ,  $\Lambda \pi^-$ , and  $\Lambda \pi^0$ . Also  $\Lambda \rightarrow pe^- \bar{\nu}$ .

**SERP-E-121** (Dec 1976) Approved Jul 1977; Started Feb 1981; Completed 1982.

### SEARCH FOR DECAYS OF PARTICLES WITH MEAN LIFETIMES $10^{-11}$ TO $10^{-12}$ s

SERPUKHOV - V N Chepegin, G G Gurov, V L Ushkov  
DUBNA - L N Strunov, V A Sviridov, Y A Yatsunenko,  
L S Zolin (Spokesperson)

MOSCOW, ITEP - I V Chuvilo, A B Kaidalov

Accelerator SERP Detector Combination

#### Reactions

$p$  nucleus  $\rightarrow$  charm X 70 GeV ( $E_{\text{lab}}$ )

Particles studied charm

Comments A search for charmed particle hadronic and semileptonic decay modes.

**SERP-E-127** (Feb 1978) Approved Feb 1980; Started Jun 1981; Completed 1982.

### STUDY OF HADRON ATOMS AND ELEMENTARY PARTICLE PROPERTIES USING A CRYSTAL-DIFFRACTION SPECTROMETER AT THE SERPUKHOV PROTON SYNCHROTRON

LENINGRAD, INP - A S Denisov, A N Koznov,  
V M Marushenko, A F Mezentsev, N B Mokhov,  
A A Petrunin, S G Skorniyakov, V M Smirnov (Spokesperson),  
V M Suvorov, A V Zhelamkov, V M Zheleznyakov

Accelerator SERP Detector Spectrometer

#### Reactions

$p$  nucleus  $\rightarrow \pi^- X$  1 GeV/c

$p$  nucleus  $\rightarrow K^- X$  "

$p$  nucleus  $\rightarrow \Sigma^- X$  "

$\pi^-$  nucleus  $\rightarrow \gamma X$  "

$K^-$  nucleus  $\rightarrow \gamma X$  "

$\Sigma^-$  nucleus  $\rightarrow \gamma X$  "

Particles studied  $K^-, \Sigma^-$

Comments Studies strong interactions of  $\pi^-, K^-, \text{ and } \Sigma^-$  with nuclei, and transition radiation energies and level widths of  $\pi^- Z, K^- Z, \Sigma^- Z$  atoms.

**SERP-E-130** (Dec 1977) Approved Jan 1978; Started Jun 1981; Completed 1981.

### LIQUID ARGON DETECTOR FOR HADRONS AND $\gamma$ 's

SERPUKHOV - Y M Antipov, V A Bezzubov,  
R N Krasnokutsky, E A Razuvaev, V S Serdyuk,  
R S Shuvalov (Spokesperson)

PISA U - C Cerri, F Manfredi, F Sergiampietri, M Spadoni  
Accelerator SERP Detector Calorimeter

**SERP-E-132** (1978) Approved Apr 1978; Started Apr 1980; Completed 1983.

### INVESTIGATION OF POSSIBILITY OF BENDING AND COOLING OF BEAMS BY SINGLE CRYSTALS. DESIGN OF NEW TYPE DETECTORS FOR CHARGED PARTICLES

DUBNA - V M Golovatyuk, Z Guzik, R B Kadyrov,  
T S Nigmanov, S N Plyashkevich, E N Tsyganov  
(Spokesperson), A S Vodopianov

SUNY, ALBANY - W M Gibson, I J Kim, C R Sun  
FERMILAB - R Carrigan, B Chrisman, T Toohig  
MOSCOW, ITEP - I V Chuvilo, L I Kondratiev,

D G Koshkarev, Y Y Lapitsky

KHARKOV STATE U - I A Grishaev, E V Inopin,  
P V Sorokin

TOMSK POLYTECHNIC INST - A N Didenko, V V Kaplin,  
S A Vorobiev

Accelerator SERP Detector Combination

#### Reactions

charged<sup>+</sup> 10-40 GeV/c

charged<sup>-</sup> "

Comments Ran for 1062 hours.

Papers PL 88B (1979) 387, and ZETFP 30 (1979) 474 = JETPL 30 (1979) 442.

**SERP-E-133** (Jan 1978) Approved Apr 1978; Started Apr 1978; Completed 1984.

### EXTENSION OF THE 32 GeV/c $K^+p$ EXPERIMENT ON THE MIRABELLE BUBBLE CHAMBER UP TO 1 MILLION PICTURES

SERPUKHOV - I V Azhinenko, Yu A Belokopytov,  
O G Chikilev, A B Fenjuk, L N Gerdyukov, P A Gorbunov,  
S V Klimenko, V V Knyazev, S B Lugovsky, B A Manyukov,  
L P Petrovikh, V N Ryadovikov, A M Rybin,  
P V Shlyapnikov (Spokesperson), V A Uvarov, A P Vorobyev

MONS U - C Dujardin, F Grard, R Windmolders

BRUSSELS U - M Csejthey-Barth, J J Dumont, M Gijzen,  
S Tavernier, F Verbeure, E De Wolf

Accelerator SERP Detector HBC-MIRA

#### Reactions

$K^+ p$  32.1 GeV/c

Papers ZPHY C3 (1980) 285, PL 95B (1980) 451, PL 121B

(1983) 183, PL 130B (1983) 432, ZPHY C23 (1984) 307,

ZPHY C25 (1984) 103, YF 39 (1984) 1448 = SJNP 39 (1984)

914, YF 41 (1985) 338 = SJNP 41 (1985) 214, YF 41 (1985)

925 = SJNP 41 (1985) 593, YF 41 (1985) 1535 = SJNP 41

(1985) 972, YF 43 (1986) 95 = SJNP 43 (1986) 61, and YF

43 (1986) 1195 = SJNP 43 (1986).

**SERP-E-136** (1978) Approved Apr 1978; Started 1985.

### NEUTRINO DETECTOR

SERPUKHOV - A A Borisov, A P Bugorsky, Y B Bushnin,  
S K Chernichenko, A F Dunaitsev, R M Fakhruddinov,  
V Y Glebov, V N Goryachev, V I Kochetkov,  
V A Krendelev, A V Kulikov, V I Kurbakov, A I Mukhin,  
V I Poletaev, V N Richenkov, R A Rzaev, Y I Salomatin,  
Y G Stroganov, A A Volkov, A S Vovenko (Spokesperson),  
V A Yarba, V P Zhigunov, Y A Zudin

DUBNA - L S Barabash, S A Bunyatov (Spokesperson),

I A Golutvin, V S Khabarov, Y T Kiryushin, D Kish,

E Kish, A Kondor, V A Kopylov-Sviridov, I Manno,

D Vestergombi, A V Vishnevsky, B Z Zalikhhanov, A V Zaru-  
bin

Accelerator SERP Detector Calorimeter

Comments This includes the design and construction of a new neutrino detector.



## SUMMARIES OF EXPERIMENTS

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**SERP-E-138** (Jan 1979) Approved Feb 1979; Started 1980.  
**STUDY OF MULTIPARTICLE  $\bar{p}p$  INTERACTIONS AT 32 GeV/c WITH STATISTICS OF 10 EVENTS/ $\mu$ b IN MIRABELLE**

SERPUKHOV - G M Aleksandrov, Y I Arestov,  
 V V Babintsev, M Y Bogolyubsky, V A Bumazhnov,  
 E A Kozlovsky, M S Levitsky, V K Malyaev, A A Minaenko,  
 A M Moiseev (Spokesperson), E A Parshin, D I Patalakha,  
 A V Pleskach, G I Selivanov, E A Starchenko, M N Ukhanov,  
 E A Vlasov  
 MOSCOW STATE U - L I Belzer, P F Ermolov,  
 N A Kruglov, V S Murzin, A S Proskuryakov, L I Sarycheva,  
 L N Smirnova, L A Tosunyan  
 ALMA ATA, PHYS INST - E G Boos, E S Lukin,  
 A M Mosienko, G K Zaytsev, B O Zhautykov

Accelerator SERP Detector HBC-MIRA

Reactions

$\bar{p}p$  32 GeV/c

Particles studied exotic-meson, baryonium,  $N_{5/2}^*$  (unspec), charm

Comments To obtain 500000 pictures. Approved for 2000 hours, with 768 hours run as of 1982. Stage I of this experiment was SERP-E-122.

Papers YF 39 (1984) 1189 = SJNP 39 (1984) 750, YF 39 (1984) 1436 = SJNP 39 (1984) 907, YF 40 (1984) 162 = SJNP 40 (1984) 103, and YF 40 (1984) 927 = SJNP 40 (1984) 590.

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**SERP-E-139** (Jan 1979) Approved Feb 1979; Started 1979.  
**STUDY OF  $\bar{d}p$  AND  $\bar{d}d$  INTERACTIONS IN LUD-MILLA**

DUBNA - B V Batyunya, I V Boguslavsky, Y P Bushuev,  
 I M Gramenitsky (Spokesperson), Y V Khrenov, B P Kostin,  
 E V Kozubsky, P Lednitski, E M Leykin, A V Pozharsky,  
 V I Rud, V A Rusakov, Y Sedlak, B Shimak, M I Solovyev,  
 L A Tikhonova, V T Tolmachev, E P Ustenko, A Valkarova,  
 N M Viryasov, S Vyskochil, Y D Zernin

Accelerator SERP Detector HBC-2M

Reactions

deut $p \rightarrow p \bar{n} \bar{p}$ pions	12-13 GeV/c
deut $p \rightarrow \pi^+ X$	"
deut $p \rightarrow p \bar{n} \bar{p} 2\pi^+ 2\pi^-$	"
deut deut $\rightarrow p n \bar{n} \bar{p}$ pions	"
deut deut $\rightarrow$ annihil	"
deut deut $\rightarrow$ nucleon $\bar{2}$ nucleon X	"
deut deut $\rightarrow$ 2nucleon nucleon X	"

Particles studied  $N_{5/2}^*$  (unspec), baryonium

Comments To obtain 250000 pictures in  $\bar{d}p$  and 500000 in  $\bar{d}d$ . Approved for 4200 hours, with 1872 hours run as of 1982.

Papers YF 42 (1985) 903 = SJNP 42 (1985) 573.

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**SERP-E-140** (Dec 1976) Approved Jul 1977; Started Apr 1980.  
**STUDY OF CHARGE-EXCHANGE REACTIONS AND SEARCH FOR NEW PARTICLES**

SERPUKHOV - V A Davidov, S V Donskov, A V Inyakin,  
 V A Kachanov, D B Kakauridze, G V Khaustov,  
 A V Kulik, A A Lednev, Y V Mikhailov, Yu D Prokoshkin  
 (Spokesperson), Y V Rodnov, S A Sadovsky, A V Startsev,  
 V P Sugonyaev  
 BRUSSELS U, IISN - F Binon, C Bricman, T D Jayanti,  
 J P Lagnaux, R Roosen, J P Stroot  
 ANNCEY - J Dufournaud, M Gouanere, J P Peigneux,  
 D Sillou, M Spiegel

Accelerator SERP Detector GAMS-2000

Reactions

$\pi^- p \rightarrow \gamma's n$	38 GeV/c
$\pi^- p \rightarrow \pi^0 n$	"
$\pi^- p \rightarrow \eta n$	"
$\pi^- p \rightarrow b_1(1235)^0 n$	"
$\pi^- p \rightarrow f_2(1270) n$	"
$\pi^- p \rightarrow \phi n$	"
$\pi^- p \rightarrow \omega n$	"
$\pi^- p \rightarrow f_4(2030) n$	"
$\omega \rightarrow \gamma \pi^0$	—
$\phi \rightarrow \gamma \eta$	—
$\phi \rightarrow K_L K_S$	—
$\pi^- p \rightarrow \chi_1(3510) n$	38 GeV/c
$\pi^- p \rightarrow J/\psi n$	"
$\pi^- p \rightarrow \psi(3685) n$	"
$\pi^- p \rightarrow n D^0 \bar{D}^0$	"

Comments Approved for 2500 hours, with 2718 hours run as of 1982.

Papers YF 33 (1981) 1534 = SJNP 33 (1981) 825, LNC 32 (1981) 45, YF 36 (1982) 670 = SJNP 36 (1982) 391, YF 38 (1983) 934 = SJNP 38 (1983) 561, YF 38 (1983) 1199 = SJNP 38 (1983) 723, NC 78A (1983) 313, PL 140B (1984) 264, YF 39 (1984) 640 = SJNP 39 (1984) 405, YF 39 (1984) 831 = SJNP 39 (1984) 526, YF 39 (1984) 1429 = SJNP 39 (1984) 903, LNC 39 (1984) 41, NP B239 (1984) 311, NC 80A (1984) 363, ZPHY C25 (1984) 225, and YF 40 (1984) 1447 = SJNP 40 (1984) 918.

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**SERP-E-142** (Jan 1980) Approved Feb 1980; Started Feb 1981; Completed 1984.

**INVESTIGATIONS OF ELECTROMAGNETIC DECAYS OF MESONS**

SERPUKHOV - R I Dzhelyadin, S V Golovkin,  
 V A Kachanov, D V Kakauridze, A S Konstantinov,  
 V F Konstantinov, V P Kubarovsky, A V Kulik,  
 L G Landsberg (Spokesperson), V M Leontiev, V A Mukhin,  
 V F Obraztsov, T I Petrunina, Y D Prokoshkin,  
 V I Solyanik, V A Viktorov, A M Zaitsev

Accelerator SERP Detector Spectrometer

Reactions

$\pi^- p \rightarrow f_1(1285) n$	33 GeV/c
$\pi^- p \rightarrow f_2'(1525) n$	"
$K^- p \rightarrow f_1(1285) \Lambda$	"
$K^- p \rightarrow f_1(1285) \Sigma^0$	"
$K^- p \rightarrow f_2'(1525) \Lambda$	"
$K^- p \rightarrow f_2'(1525) \Sigma^0$	"
$f_1(1285) \rightarrow \gamma \phi$	—
$f_2'(1525) \rightarrow \gamma \phi$	—

Particles studied  $f_1(1285)$ ,  $f_2'(1525)$

Comments The modified Lepton-F spectrometer is used. Approved for 1800 hours, with 492 hours run as of 1982.

Papers YF 38 (1983) 1205 = SJNP 38 (1983) 727, PL 144B (1984) 133, ZETFP 39 (1984) 96 = JETPL 39 (1984) 115, YF 39 (1984) 1165 = SJNP 39 (1984) 735.

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**SERP-E-143** (Jan 1980) Approved Feb 1980; Started Jan 1980; Completed 1981.

**STUDY OF THE PION STRUCTURE IN THE RADIATIVE SCATTERING REACTION ON NUCLEI**

SERPUKHOV - G A Akopdzhanov, Y M Antipov  
 (Spokesperson), V A Bezzubov, N P Budanov, S P Denisov,  
 Y P Gorin, I V Kotov, A I Petrukhin, S A Polovnikov,  
 D A Stoyanova

TBILISI STATE U - V N Roinishvili

DUBNA - L K Chernenko, L K Litkin, G V Mitselmakher,  
 A G Olshevsky, V I Travkin

Accelerator SERP Detector SIGMA

## SUMMARIES OF EXPERIMENTS

### Reactions

$\pi^-$  nucleus  $\rightarrow$  nucleus  $\pi^- \gamma$  40 GeV/c

**Comments** Ran for 1548 hours.

**Papers** ZETFP 35 (1982) 302 = JETPL 35 (1982) 375, ZPHY C24 (1984) 39, ZPHY C26 (1985) 495, and ZPHY C27 (1985) 21.

**SERP-E-144** (1979) Approved Apr 1978; Started Jan 1979; Completed 1982.

### MEASUREMENTS OF THE SLOW ANTIPROTON YIELD IN 70 GeV PROTON INTERACTIONS

SERPUKHOV - A A Derevschikov, V I Kotov, V G Lapshin, Y A Matulenko, A I Misnik, S B Nurushhev, V I Ronzhin, V I Rykalin (Spokesperson), R A Rzaev, V P Sakharov, V K Semenov, V V Siksin, V I Solyanik, A N Vasiliev, N K Vishnevsky

NOVOSIBIRSK, IYF - L M Barkov, P K Lebedev, V S Okhapkin, V P Smakhtin, M S Zolotarev

**Accelerator** SERP **Detector** Single-arm spectrometer

### Reactions

$p$  nucleus  $\rightarrow \bar{p} X$  70 GeV ( $E_{lab}$ )

**Comments** Approved for 600 hours, with 360 hours run as of 1982.

**Papers** YF 35 (1982) 1186 = SJNP 35 (1982) 694.

**SERP-E-146** (Dec 1980) Approved Feb 1981; Started 1981; Completed 1986.

### SEARCH FOR NARROW BARYON RESONANCES IN HIGH ENERGY NEUTRON DIFFRACTIVE SCATTERING

DUBNA

- A N Aleev, V A Arefiev, V P Balandin, V K Birulev, E A Chudakov, A S Chvyrov, T S Grigalashvili, B N Guskov, I M Ivanchenko, N N Karpenko, D A Kirillov, I G Kosarev, V G Krivokhizhin, V V Kukhtin, B A Kulakov, M F Likhachev (Spokesperson), A L Lubimov, A N Maksimov, A N Morozov, K Novak, V D Novak, A E Senner, L V Silvestrov, V E Simonov, L A Slepets, G G Takhtamyshv, P T Todorov, R K Trayanov

BERLIN, DAW - K Hiller, Z Novak, A V Poze, K E Rizek

LEBEDEV INST - A S Belousov, E D Molodtsov, S V Rusakov, P N Shareiko

SOFIYA, INST CHEM TECH - Y Gladki, S Nemechek, M Novak, A Prokesh, V I Zayachki

SOFIYA, INST NUCL RES - D T Burilkov, V I Genchev, I M Geshkov, P K Markov, G G Sultanov

TBILISI STATE U - V P Dzhordzhadze, V D Kekelidze, G I Nikobadze

**Accelerator** SERP **Detector** BIS-2

### Reactions

$n$  nucleus  $\rightarrow \Lambda K^0 X$  40-60 GeV/c  
 $n$  nucleus  $\rightarrow \Lambda K^+ \pi^- X$  "  
 $n$  nucleus  $\rightarrow \Lambda \pi^+ \pi^0 \pi^- X$  "  
 $n$  nucleus  $\rightarrow \Lambda K^+ K^0 K^- X$  "  
 $n$  nucleus  $\rightarrow p \bar{p} \Lambda K^0 X$  "  
 $n$  nucleus  $\rightarrow n \Lambda \bar{\Lambda} X$  "  
 $n$  nucleus  $\rightarrow p \pi^+ \pi^- X$  "  
 $n$  nucleus  $\rightarrow p K^+ K^- X$  "  
 $n$  nucleus  $\rightarrow 2p \bar{p} X$  "  
 $n$  nucleus  $\rightarrow p K^0 K^- X$  "

**Comments** Approved for 3300 hours.

**Papers** ZPHY C23 (1984) 333, and ZPHY C25 (1984) 205.

**SERP-E-147** (1982) Approved Mar 1982; Started 1984.

### STUDY OF REACTIONS WITH STRANGE PARTICLE PRODUCTION IN THE $\pi^-$ MESON BEAM OF THE IHEP ACCELERATOR

MOSCOW, ITEP - B V Bolonkin, I A Erofeev, O N Erofeeva, V K Grigoryev, A P Grishin, Y V Katinov, I Y Korkov, V N Luzin, V N Nozdrachev, Y P Shkurenko, V V Sokolovsky (Spokesperson), A I Sutormin, G D Tikhomirov, V V Vladimirovsky

**Accelerator** SERP **Detector** MIS

### Reactions

$\pi^- p \rightarrow n \Lambda \bar{\Lambda}$  40 GeV/c  
 $\pi^- p \rightarrow n \Lambda \bar{\Lambda} \pi^0$  "  
 $\pi^- p \rightarrow p \Lambda \bar{\Lambda} \pi^-$  "  
 $\pi^- p \rightarrow n 2K_S$  "  
 $\pi^- p \rightarrow n 2K_S \pi^0$  "  
 $\pi^- p \rightarrow p 2K_S \pi^-$  "  
 $\pi^- p \rightarrow p \bar{p} \Lambda K_S$  "  
 $\pi^- p \rightarrow p \bar{p} \Sigma^0 K_S$  "  
 $\pi^- p \rightarrow n \Sigma^0 \bar{\Sigma}^0$  "  
 $\pi^- p \rightarrow n \Lambda \bar{\Sigma}^0$  "  
 $\pi^- p \rightarrow n \bar{\Lambda} \Sigma^0$  "

**Particles studied** meson,  $f_0(975)$ ,  $a_0(980)^0$

**Comments** Requested 2400-3000 hours.

**SERP-E-148** (Feb 1982) Approved Mar 1982; Started 1984; Completed 1986.

### STUDY OF EXCLUSIVE RESONANCE PRODUCTION IN RARE PROCESSES IN SIGMA-M

SERPUKHOV - Y M Antipov (Spokesperson), V A Batarin, V A Bezzubov, N P Budanov, S P Denisov, Y P Gorin, I V Kotov, A A Lebedev, Y M Melnik, A I Petrukhin, S A Polovnikov, D A Stoyanova

TBILISI STATE U - R B Pirtskhalava, V N Roinishvili  
 DUBNA - I A Golutvin, V S Habarov, D M Hazins, V Y Karzhavin, Y T Kiryushin, P A Kulnich, G V Mitselmakher, A A Nozdrin, A G Olshevsky, V A Sviridov, V I Travkin, A V Vishnevsky

**Accelerator** SERP **Detector** SIGMA

### Reactions

$\pi^- p \rightarrow \pi^- p$  20, 30, 40 GeV/c  
 $K^- p \rightarrow K^- p$  "  
 $\bar{p} p \rightarrow \bar{p} p$  "  
 $\pi^-$  nucleus  $\rightarrow \pi^- \mu^- \mu^+ X$  "  
 $\pi^-$  Cu  $\rightarrow$  Cu  $\rho^0 \pi^-$  "  
 $\rho^0 \rightarrow \mu^+ \mu^-$  —  
 $a_1(1270)^- \rightarrow \pi^- \mu^- \mu^+$  —  
 $\pi_2(1680)^- \rightarrow \pi^- \mu^- \mu^+$  —  
 meson  $\rightarrow \pi^- \mu^- \mu^+$  —  
 $\pi^- p \rightarrow p n \bar{p}$  20, 30, 40 GeV/c

**Particles studied**  $\rho^0$ ,  $f_0(1300)$ ,  $f_2(1270)$ ,  $a_1(1270)^-$ ,  $\pi_2(1680)^-$

**Comments** Requested 1500 hours.

**SERP-E-150** (Feb 1982) Approved Mar 1982; Started 1983; Completed 1984.

### AN ADDITION TO EXPERIMENT E-138 WITH A PROGRAM OF $pp$ AND $pd$ INVESTIGATIONS AT 32 GeV/c

SERPUKHOV - V V Babintsev, T M Bryuhanova, V A Bumazhnov, S V Chekulayev, A M Moiseev (Spokesperson), M N Ukhanov, O S Zaitseva

MOSCOW STATE U - P F Ermolov, N A Kruglov, V S Murzin, A S Proskuryakov, L I Sarycheva, L N Smirnova  
 ALMA ATA, PHYS INST - E G Boos, G K Zaytsev, B O Zhaitykov

**Accelerator** SERP **Detector** HBC-MIRA

### Reactions

$p p$  32 GeV/c  
 $p$  deut "

## SUMMARIES OF EXPERIMENTS

$p n$	"
$\bar{p} p$	"
$\bar{p}$ deut	"
$\bar{p} n$	"

Comments Statistics are  $pp$  — 400000 pictures,  $\bar{p}p$  — 600000,  $\bar{p}d$  — 300000. Uses a track-sensitive deuterium target in Mirabelle.

**SERP-E-152** (1983) Approved Aug 1982.  
**NEUTRINO EXPERIMENT USING A TAGGED NEUTRINO BEAM**

SERPUKHOV — S.P. Denisov (Spokesperson), et al.

Accelerator SERP Detector Combination

Reactions

$\nu_e e^- \rightarrow e^- \nu_e$	< 70 GeV ( $E_{lab}$ )
$\nu_\mu e^- \rightarrow e^- \nu_\mu$	"
$\nu_e$ nucleus $\rightarrow \mu^+ e^- X$	"
$\nu_\mu$ nucleus $\rightarrow \mu^- \mu^+ X$	"
charmed-meson $\rightarrow \mu^- \mu^+$	—
$\tau^- \rightarrow e^- \nu_\tau \bar{\nu}_e$	—

Comments Studies  $\nu_e \nu_\mu$  universality,  $\nu_e \rightarrow \nu_\mu$  oscillations, the ratio of charged to neutral currents, etc.

**SERP-E-153** (1983) Approved Dec 1983; Started 1983; Completed 1986.  
**STUDY OF CUMULATIVE HADRON PRODUCTION IN PROTON-NUCLEUS INTERACTIONS AT ENERGIES FROM 12 TO 70 GeV**

DUBNA — L.S. Zolin (Spokesperson), et al.

Accelerator SERP Detector Spectrometer

Reactions

$p$ nucleus $\rightarrow$ hadrons X	12-70 GeV ( $E_{lab}$ )
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Comments It was Tau detector previously, now Cumulative Hadrons Detector.

**SERP-E-155** (1983) Approved 1985.  
**SINGLE AND PAIR HADRON PRODUCTION WITH LARGE MOMENTUM TRANSFER IN PROTON AND  $\pi^-$  MESON BEAMS**

SERPUKHOV — A.A. Abramov, A.V. Alekseev, B.Y. Baldin, A.F. Buzulukov, A.S. Dyshkant, A.O. Efimov, V.N. Evdokimov, N.A. Galyaev, V.Y. Glebov, Y.P. Korneev, V.I. Kotov, A.N. Krinitsyn, V.I. Kryshkin, N.Y. Kulman, Y.M. Melnik, M.I. Mutafyan, V.K. Myalitsin, V.M. Podstavkov, A.I. Ronjin, V.I. Rykalin, R.M. Sulyaev (Spokesperson), L.K. Turchanovich, Y.N. Vrajnov, V.N. Zapolsky, V.V. Zmushko

Accelerator SERP Detector FODS

Reactions

$p p \rightarrow$ hadron(s) X	70 GeV/c
$p p \rightarrow \mu^- \mu^+ X$	"
$p$ nucleus $\rightarrow$ hadron(s) X	"
$p$ nucleus $\rightarrow \mu^- \mu^+ X$	"
$\pi^- p \rightarrow$ hadron(s) X	40 GeV/c
$\pi^- p \rightarrow \mu^- \mu^+ X$	"
$\pi^-$ nucleus $\rightarrow$ hadron(s) X	"
$\pi^-$ nucleus $\rightarrow \mu^- \mu^+ X$	"
$\pi^+ p \rightarrow$ hadron(s) X	"
$\pi^+ p \rightarrow \mu^- \mu^+ X$	"
$\pi^+$ nucleus $\rightarrow$ hadron(s) X	"
$\pi^+$ nucleus $\rightarrow \mu^- \mu^+ X$	"

**SERP-E-157** (1983) Approved Mar 1983; Started 1986.  
**NEW RESONANCES SEARCH IN DIFFRACTIVE PROCESSES ON NUCLEI WITH THE MIS-2 DETECTOR**

DUBNA — V.V. Antipov, L.P. Chernenko, N.D. Dikumar, A.A. Efendiev, A.G. Galperin, Y.I. Ivanshin, V.I. Komarov, L.K. Lytkin, E.I. Maltsev, V.A. Moiseenko, V.I. Moroz, V.I. Nikanorov, V.A. Petrov, I.L. Pisarev, S.Y. Sychkov, A.A. Tyapkin (Spokesperson), I.M. Vasilevsky, V.V. Vishnyakov, O.A. Zaymidoroga, V.P. Zrelov

MOSCOW STATE U — K.P. Vishnevskaya

CRACOW — M. Sheptitska, R. Sosnovsky

BRATISLAVA, INST PHYS — S. Usachev, R. Yanik

MILAN U — P.L. Frabetti, P.F. Manfredi, F. Palombo

Accelerator SERP Detector MIS

Reactions

$\pi^-$ Si $\rightarrow$ 3pion X	40 GeV/c
$K^-$ Si $\rightarrow$ kaon 2pion X	"

Particles studied meson

Comments Modified spectrometer MIS, with additional spark chamber. Looking for new radial excitations of  $\pi$ ,  $A_1$ ,  $A_2$ ,  $A_3$ ,  $K$  mesons. Requested 4720 hours.

Papers YF 43 (1986) 917 = SJNP 43 (1986) 585.

**SERP-E-159** (1983) Approved May 1986.  
**STUDY OF HADRON PRODUCTION AND PROPERTIES OF CHARMED PARTICLES AND NARROW BARYON RESONANCES WITH THE IHEP ACCELERATOR (CHARM PROJECT)**

DUBNA — N.N. Govorun, T.S. Grigalashvili, B.N. Guskov, I.M. Ivanchenko, I.N. Kakurin, D.A. Kirillov, M.F. Likhachev, A.L. Lyubimov, A.N. Maksimov, E.I. Maltsev, G.G. Takhtamyshv

LEBEDEV INST — A.S. Belousov, P.A. Cherenkov, A.A. Komar, V.V. Pavlovskaya, S.V. Rusakov, L.N. Shtarkov

PRAGUE, INST PHYS — E.D. Molodtsov

TBILISI STATE U — N.S. Amaglobeli, V.D. Kekelidze, G.I. Nikobadze

ALMA ATA, PHYS INST — I.Y. Chasnikov, A.A. Loktionov

SERPUKHOV — S.S. Gershteyn, A.K. Likhoded

MOSCOW, ITEP — A.B. Kaydalov

MOSCOW STATE U — E.I. Chudakov

SOFIYA, INST NUCL RES — P.K. Markov

BERLIN, DAW — E. Novak, H. Novak

KOSICE U — A. Prokesh

BUDAPEST, CRIP — L. Sabo, I. Veresh

Accelerator SERP Detector BIS-2M

Reactions

$n$ nucleus $\rightarrow \Lambda_c^+ X$	< 70 GeV ( $E_{lab}$ )
$n$ nucleus $\rightarrow \Lambda_c^+ \bar{D}^0 X$	"
$n$ nucleus $\rightarrow$ glueball X	"
$n$ nucleus $\rightarrow$ baryon X	"
glueball $\rightarrow 2K_S$	—
baryon $\rightarrow n \phi$	—

Particles studied baryon,  $\Lambda_c^+$

**SERP-E-161** (1983) Approved 1985.  
**STUDY OF CHARMED PARTICLE PRODUCTION AT IHEP ACCELERATOR ENERGIES**

SERPUKHOV — V.V. Babintsev, M.Y. Bogolyubsky, V.A. Bumajnov, S.V. Chekulaev, N.A. Galyaev, A.E. Kiryunin, A.I. Kotova, A.A. Minaenko, G.Y. Mitrofanov, A.M. Moiseev (Spokesperson), E.A. Parshin, A.V. Pleskach, G.I. Selivanov, S.R. Slabospitsky, M.N. Ukhanov, A.A. Volkov, Y.R. Yakubov, V.N. Zapolsky

MOSCOW STATE U — S.G. Basiladze, A.E. Buckley, O.Z. Eloev, P.F. Ermolov (Spokesperson), V.I. Gilev, V.A. Kramarenko, A.N. Larichev, V.E. Ogluzdin, V.P. Rukovichkin, Y.D. Schyukin, V.V. Suvorov, V.Y. Volkov

DUBNA — B.V. Batyunya, I.V. Boguslavsky, I.M. Gramenitsky (Spokesperson), A.I. Grigoryev, Y.V. Khrenov, E.I. Maltsev, V.P. Pugachevich, M.D. Shafranov, V.T. Tolmachev, Y.D. Zernin

Accelerator SERP Detector Combination

## SUMMARIES OF EXPERIMENTS

### Reactions

$\pi^+ p \rightarrow D^+ D^- X$	60-70 GeV/c
$\pi^+ p \rightarrow \text{charmed-baryon } D^- X$	"
$\pi^- p \rightarrow D^+ D^- X$	"
$\pi^- p \rightarrow \text{charmed-baryon } D^- X$	"
$p p \rightarrow D^+ D^- X$	"
$p p \rightarrow \text{charmed-baryon } D^- X$	"

Particles studied  $D^+$ ,  $D^-$ ,  $\Lambda_c^+$ ,  $D^*(2010)$ ,  $\Sigma_c(2450)$

**SERP-E-163** (1985) Approved 1985; Started 1985.

### STUDY OF EXCLUSIVE GLUEBALL PRODUCTION IN THE CENTRAL REGION OF HADRON COLLISIONS

SERPUKHOV - S A Akimenko, V T Belousov, A M Blick, Y B Bushnin, V S Datsko, S V Donskov, S S Gerstein, A V Inyakin, V A Kachanov, D B Kakauridze, V P Kartashev, G V Khaustov, V N Kolosov, V I Kotov, A V Kulik, V M Kut'in, V G Lapshin, A A Lednev, A K Likhoded, Y M Melnik, V F Obratsov, A I Pavlinov, Yu D Prokoshkin (Spokesperson), Y V Rodnov, A I Ronjin, V I Rykalin, S A Sadovskij, V D Samojlenko, A I Sarajkin, P M Shagin, A V Shtannikov, A V Singovskij, A S Solov'ev, V P Sugonyaev

LOS ALAMOS - D Aldi, T Lopez, E A Nap, D Potter

TBILISI STATE U - N S Amaglobeli, B G Chiladze, M D Tabidze

MOSCOW STATE U - L G Afanas'ev, O E Gorchakov, A V Kulikov, V P Kurochkin, S V Trusov

NOVOSIBIRSK, IYF - L M Barkov, B I Khazin, P K Lebedev, E P Solodov

BRUSSELS U, IISN & CERN - F Binon, C Bricman, J P Lagnaux, D Mishot, J P Stroot

KURCHATOV INST, MOSCOW - I I Gurevich, Y A Kozlov, V P Martem'yanov, G S Vidyakin, V N Vyrodov

ANNECY & CERN - J Dufournaud, M Gouanere, J P Peigneux, M Spiegel

DUBNA - V V Karpukhin, D M Khazins, V I Komarov, V V Kruglov, A V Kuptsov, L L Nemenov

TBILISI INST PHYS - V N Rojnishvili

Accelerator SERP Detector GAMS-2000, Calorimeter

### Reactions

$p \text{ nucleon} \rightarrow p \text{ nucleon mesons}$	70 GeV/c
$\bar{p} \text{ nucleon} \rightarrow \bar{p} \text{ nucleon mesons}$	"
$\pi^+ \text{ nucleon} \rightarrow \text{nucleon } \pi^+ \text{ mesons}$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \pi^- \text{ mesons}$	"
$K^+ \text{ nucleon} \rightarrow \text{nucleon } K^+ \text{ mesons}$	"
$K^- \text{ nucleon} \rightarrow \text{nucleon } K^- \text{ mesons}$	"
$p \text{ nucleon} \rightarrow p \text{ nucleon } \psi(\text{unspec})$	"
$p \text{ nucleon} \rightarrow p \text{ nucleon}$	"
bottomonium	"
$\bar{p} \text{ nucleon} \rightarrow \bar{p} \text{ nucleon } \psi(\text{unspec})$	"
$\bar{p} \text{ nucleon} \rightarrow \bar{p} \text{ nucleon}$	"
bottomonium	"
$\pi^+ \text{ nucleon} \rightarrow \text{nucleon } \psi(\text{unspec}),$	"
$\pi^+$	"
$\pi^+ \text{ nucleon} \rightarrow \text{nucleon } \Upsilon(9460) \pi^+$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \psi(\text{unspec})$	"
$\pi^-$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \Upsilon(9460) \pi^-$	"
$K^+ \text{ nucleon} \rightarrow \text{nucleon } \psi(\text{unspec})$	"
$K^+$	"
$K^+ \text{ nucleon} \rightarrow \text{nucleon } \Upsilon(9460) K^+$	"
$K^- \text{ nucleon} \rightarrow \text{nucleon } \psi(\text{unspec})$	"
$K^-$	"
$K^- \text{ nucleon} \rightarrow \text{nucleon } \Upsilon(9460) K^-$	"
$\pi^- p \rightarrow n \pi^0$	"
$K^- p \rightarrow n \eta$	"
$K^- p \rightarrow n \eta'$	"
$K^- p \rightarrow n \omega$	"
$K^- p \rightarrow n K^0$	"

$\bar{p} p \rightarrow n \bar{n}$  "

Particles studied glueball, charmonium,  $\Upsilon(9460)$ ,  $\Upsilon(10023)$ ,  $\Upsilon(10355)$

Comments Looks for glueballs in particular in final states with  $\eta\eta$ ,  $\eta\eta'$ , and  $\eta'\eta'$ .

**SERP-E-164** (1980) Approved May 1986.

### INVESTIGATIONS OF THE $\pi^- p \rightarrow n \pi^+ \pi^- \pi^+ \pi^- (\gamma's)$ REACTION AT 40 GeV/c ON THE BASE OF THE VERTEX SPECTROMETER

SERPUKHOV - S I Bitjukov, G V Borisov, V M Buyanov, R I Dzhelyadin, N A Galyaev, Y P Guz, A N Karyukhin, G A Klyuchnikov, V F Konstantinov, M E Kostrikov, M A Kulagin, V V Lapin, V A Maishev, V D Matveev, V K Myalitsin, V F Obratsov, A P Ostankov, V K Semenov, V A Sergeev, N K Vishnevskij, A P Yablokov, A M Zaitsev (Spokesperson)

TBILISI INST PHYS - T A Lomtadze, E G Tskhadadze

Accelerator SERP Detector Photon spectrometer, Counter

### Reactions

$\pi^- p \rightarrow n 2\pi^+ 2\pi^- (\gamma's)$	40 GeV/c
$\pi^- p \rightarrow n \text{ meson}(s)$	"

Particles studied  $\rho$ ,  $\eta$ ,  $\eta'$ ,  $X(2220)$ ,  $f_2(1270)$ ,  $f_1(1285)$ ,  $f_4(2030)$ ,  $\rho_3(1690)^0$ , glueball

Comments Uses Cerenkov counters together with a  $\gamma$  spectrometer.

**SIN-R-71-07** (Apr 1977) Approved Jun 1977; Started Dec 1977; Completed May 1982.

### pp ELASTIC SCATTERING BETWEEN 400 AND 600 MeV

GENEVA U - E Aprile-Giboni, D Besset, C Cantale, C Eisenegger, R Hausammann, E Heer, R Hess (Spokesperson), C Lechanoine-Leluc, W R Leo, S Morenzoni, Y Onel, D Rapin

SIN - S Jaccard, S Mango

Accelerator SIN Detector Wire chamber

Reactions Polarized beam and target

$p p \rightarrow p p$	0.8-1.2 GeV/c
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Comments Complete experiment for determining the  $pp$  scattering matrix. Ran for 5000 hours.

Papers PRL 46 (1981) 1047, and PRL 47 (1981) 1360.

**SIN-R-71-08** (Mar 1979) Approved Apr 1979; Started Nov 1980; Completed Aug 1983.

### PRECISION MEASUREMENT OF THE MUON MOMENTUM IN PION DECAY AT REST

SIN - R Abela, M Daum, R Frosch ( $\checkmark$  Spokesperson), B Jost, P-R Kettle, E Steiner

Accelerator SIN Detector Spectrometer

### Reactions

$\pi^+ \rightarrow \mu^+ \nu_\mu$	150 MeV/c
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Particles studied  $\nu_\mu$ ,  $\pi^+$

Comments The muon decay momentum is  $(29.79139 \pm 0.00083)$  MeV/c, and the  $\nu_\mu$  mass is less than 0.25 MeV (90% c.l.).

Papers PL 146B (1984) 431. No other papers expected.

**SIN-R-72-02** (Nov 1972) Approved 1973; Started 1976.

### EXPERIMENTS WITH NEUTRON BEAMS

FREIBURG U - J Franz, V Grundies, A Klett, P Koncz, M Krauth, R Peschina, E Roessle ( $\checkmark$  Spokesperson), C Sauerwein, H Schmitt ( $\checkmark$  Spokesperson), L Schmitt

Accelerator SIN Detector Spectrometer

## SUMMARIES OF EXPERIMENTS

### Reactions

$n p \rightarrow n p$	0.6-1.2 GeV/c
$n p \rightarrow X$	"
$n \text{ deut} \rightarrow n \text{ deut}$	"
$n \text{ deut} \rightarrow X$	"

Comments Measures energy spectra and differential cross sections.

Papers PL 90B (1980) 367, PL 91B (1980) 214, PL 93B (1980) 384, NIM 192 (1982) 407, PL 141B (1984) 170, ZPHY A316 (1984) 43, PL 153B (1985) 382, and PL 158B (1985) 15.

**SIN-R-73-01.2** (Mar 1977) Approved May 1980; Started Jul 1980; Completed 1984.

### ENERGY AND ANGLE DEPENDENCE OF THE TENSOR POLARIZATION $T_{20}$ IN $\pi d$ ELASTIC SCATTERING

ZURICH, ETH - M Bittcher, K Elsener, C Forstner, W Grueebler (Spokesperson), V Koenig, P A Schmelzbach, D Singy, J Ulbricht, B Vuaridel  
AUCKLAND U - A Chisholm

Accelerator SIN Detector Counter

### Reactions

$\pi^+ \text{ deut} \rightarrow \pi^+ \text{ deut}$	220-260 MeV/c
$\text{deut } ^3\text{He} \rightarrow p \text{ He}$	"

Particles studied dibaryon

Comments Measures tensor polarization of the recoil deuteron at backward pion scattering angles.

Papers PRL 48 (1982) 311, PRL 49 (1982) 444, and JPHY G9 (1983) L211.

**SIN-R-74-05** (May 1977) Approved Jun 1977; Started 1978; Completed 1981.

### ELECTRON POLARIZATION IN MUON DECAY

ZURICH, ETH - H Burkard, F Corriveau, W Fetscher (Spokesperson), H J Gerber, K Johnson, H J Mahler  
SIN - J Egger, H Kaspar, M Salzmann  
MAINZ U, INST PHYS - F Scheck

Accelerator SIN Detector Counter

Reactions Polarized beam

$\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$	125 MeV/c
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Particles studied  $\mu^+$

Comments The longitudinal polarization of the  $e^+$  is consistent with 1, the transverse polarization components consistent with 0. Ran for 2300 hours.

Papers NP A335 (1980) 91, PR D24 (1981) 2004, PL 150B (1985) 242, and PL 160B (1985) 343.

**SIN-R-75-07.2** (May 1975) Approved Sep 1975; Started 1975; Completed 1980.

### MEASUREMENT OF THE P PARAMETER IN $\pi^- p$ ELASTIC AND CHARGE EXCHANGE SCATTERING

LAUSANNE U - J C Alder, C Joseph, J P Perroud, M T Tran (✓ Spokesperson)  
ZURICH, ETH - P Wiederkehr  
SIN - G H Eaton, R Frosch, H Hirschmann (✓ Spokesperson), S Mango, J McCulloch, P Shrager, P Weymuth  
ZURICH U - G Strassner, P Truoel

Accelerator SIN Detector Counter

Reactions Polarized target

$\pi^- p \rightarrow \pi^- p$	190-430 MeV/c
$\pi^- p \rightarrow \pi^0 n$	"

Comments Measures the Wolfenstein parameter  $P$  in  $\pi^- p$  elastic and charge exchange scattering for c.m. scattering angles 45 to 150°. Ran for 2000 hours.

Papers LNC 23 (1978) 381, and PR D27 (1983) 1040.

**SIN-R-77-01** (Apr 1977) Approved Jun 1977; Started Jul 1977; Completed Feb 1980.

### STUDY OF ANGULAR CORRELATIONS IN THE REACTIONS $^{12}\text{C}(\mu^-, \nu)^{12}\text{B}$ (G.S.)

LOUVAIN U - L Palfy  
LOUVAIN U & ZURICH, ETH - L Grenacs  
ZURICH, ETH - H Braendle, L Roesch, V L Telegdi, P Truttmann, A Zehnder (Spokesperson)

Accelerator SIN Detector Counter

### Reactions

$\mu^- ^{12}\text{C} \rightarrow \nu_\mu ^{12}\text{Bor}$	0 MeV/c
$^{12}\text{Bor} \rightarrow ^{12}\text{C} e^- \bar{\nu}_e$	"

Particles studied  $\nu_\mu$

Comments The  $\nu_\mu$  helicity is  $-1.06 \pm 0.11$ . Induced pseudoscalar coupling  $g_p/g_a = 9.0 \pm 1.7$ . Ran for 1500 hours.

Papers PRL 46 (1981) 1507, HPA 55 (1982) 74, and AJP 50 (1982) 931.

**SIN-R-78-05.4** (Apr 1981) Approved May 1981; Started Aug 1982; Completed Aug 1982.

### MEASUREMENT OF THE $A_{zz}$ PARAMETER IN THE REACTION $pp \rightarrow \pi^+ d$

THE NESIKA COLLABORATION

NEUCHATEL U - A Berdoz, B Favier, F Foroughi  
KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - J Hoftiezter, G Mutchler, Ch Weddigen (Spokesperson)

SIN - J A Konter, S Mango

Accelerator SIN Detector Counter

Reactions Polarized beam and target

$p p \rightarrow \pi^+ \text{ deut}$	1.2 GeV/c
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Comments Ran for 300 hours. Measures the angular distribution of the parameter  $A_{zz}$  at proton lab energies 516, 542, and 582 MeV.

Papers NP A312 (1978) 330, PL 100B (1981) 462, NP A402 (1983) 429, NP A412 (1984) 273, and NP A412 (1984) 286.

**SIN-R-78-06** (Feb 1978) Approved Mar 1978; Started May 1978; Completed Aug 1981.

### MEASUREMENT OF THE REACTION $\bar{p}\bar{p} \rightarrow \pi^+ d$ AT 580 MeV

GENEVA U - E Aprile-Giboni, D Besset, Q-H Do, B Favier, R Hausammann, E Heer, R Hess (Spokesperson), C Lechanoine-Leluc, W Leo, S Morenzoni, Y Onel, D Rapin  
SIN - J Jaccard, S Mango

ALBERTA U & ORSAY, IPN - J M Cameron

Accelerator SIN Detector Wire chamber

Reactions Polarized beam and target

$p p \rightarrow \pi^+ \text{ deut}$	1.0-1.2 GeV/c
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Comments Measures the spin correlation parameters  $A_{xx}$ ,  $A_{yy}$ ,  $A_{zz}$ , and  $A_{zz}$  at five energies. Ran for 1900 hours.

Papers NP A379 (1982) 369.

**SIN-R-78-09** (Aug 1978) Approved Oct 1978; Started Apr 1979; Completed Nov 1980.

### SEARCH FOR ANOMALOUS $\mu N$ INTERACTIONS: PRECISION MEASUREMENTS OF 2P-1S TRANSITIONS IN MUONIC $^7\text{Li}$ , $^{12}\text{C}$ , AND $^{13}\text{C}$

ZURICH, ETH - B Aas, W Beer, I Beltrami, K Bos, G de Chambrier, P F A Goudsmit (✓ Spokesperson), H J Leisi (✓ Spokesperson), W Ruckstuhl, G Strassner, A Vacchi

FRIBOURG U - F W N De Boer, B Jeckelmann, U Kiebele, R Weber

## SUMMARIES OF EXPERIMENTS

NIKHEF, AMSTERDAM - J M Van der Velden  
WURENLINGEN, INST REAKTORFORSCHUNG -  
P Baertschi

Accelerator SIN Detector Counter

Particles studied  $\mu^-$

Comments Gives an indication of a nonzero effect in  $^{12}\text{C}$ ,  
and an upper limit in  $^7\text{Li}$ .

Papers PRL 49 (1982) 859, NP A430 (1984) 685, NP A433  
(1985) 634, and NP A444 (1985) 589.

**SIN-R-78-13.1** (Sep 1978) Approved Oct 1978; Started Jan  
1981; Completed 1984.

### STUDY OF THE RADIATIVE DECAY OF THE PION

LAUSANNE U - A Bay, C Joseph, J-F Loude, J-P Perroud  
( $\checkmark$  Spokesperson), D Ruegger, O Shoeri, D Steiner,  
M T Tran

ZURICH U - L Van Elmbt, M Lebrun, J M Martoff, P Truoeel

Accelerator SIN Detector Spectrometer, Calorimeter

Reactions



Particles studied  $\pi^+$

Comments Measures the absolute ratio of axial to vector  
weak form factors with an uncertainty better than 10%.

Papers PL 174B (1986) 445.

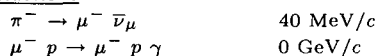
**SIN-R-78-15.1** (Nov 1979) Approved May 1980; Started  
Mar 1981; Completed Dec 1982.

### MEASUREMENT OF THE 2P-2S ENERGY DIFFER- ENCE IN MUONIC HYDROGEN

ZURICH, ETH - H P von Arb, C Brandes, F Dittus,  
H R Heeb, H Hofer, F Kottmann ( $\checkmark$  Spokesperson),  
C Luechinger, R Schaeren, D Taquu, J Unternaeher  
SIN - Ch Tschalaer

Accelerator SIN Detector Counter

Reactions



Comments The lifetime of the 2S state of the  $\mu^- p$  atom is  
less than 100 ns at gas pressures above 6 torr. At 0.25 torr,  
the relative initial population of 2S states is  $(2.2 \pm 0.2)\%$ .

Papers PL 101B (1981) 151, and PL 143B (1984) 65.

**SIN-R-78-18** (Dec 1978) Approved Nov 1979; Started Nov  
1979; Completed 1983.

### DETERMINATION OF THE VECTOR ANALYZING POWER IN $\pi d$ SCATTERING

KARLSRUHE U - J Bolger, E T Boschitz, E L Mathie,  
C R Ottermann, G R Smith (Spokesperson)

SIN - J Arvieux, M Daum, J A Konter, S Mango, G Mutchler

ERLANGEN U - M Meyer, F Vogler

BRITISH COLUMBIA U - R R Johnson

Accelerator SIN Detector Counter, Spectrometer

Reactions Polarized target



Particles studied dibaryon

Comments Measured angular distributions of the vector  
analyzing power at 12 energies.

Papers PRL 46 (1981) 167, PRL 48 (1982) 1667, PR C28  
(1983) 2558, PR C29 (1984) 2206, PL 154B (1985) 28.

**SIN-R-79-05** (Aug 1980) Approved Sep 1980; Started 1980.

### $\pi^+$ AND $\pi^-$ ABSORPTION IN LIGHT NUCLEI

BASEL U - G Backenstoss ( $\checkmark$  Spokesperson), M Izycki,  
M Steinacher, P Weber, H J Weyer  
KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARL-  
SRUHE U - S Cierjacks, H Ullrich ( $\checkmark$  Spokesperson)

Accelerator SIN Detector Counter

Reactions



Papers PL 112B (1982) 129, PL 115B (1982) 445, NP A412  
(1984) 253, PL 137B (1984) 329, PRL 55 (1985) 2782, NP  
A445 (1986) 557, and NP A448 (1986) 567.

**SIN-R-79-07** (Nov 1979) Approved Sep 1980; Started Oct  
1980; Completed May 1984.

### THE STUDY OF THE REACTION $\pi^+ d \rightarrow pp$ WITH A VECTOR POLARIZED $d$ TARGET

KARLSRUHE U - E Boschitz, W Gyles, E L Mathie,  
C R Ottermann, G R Smith (Spokesperson)

SIN - B Van Den Brandt, J A Konter, S Mango

ERLANGEN U - R Olszewski

BRITISH COLUMBIA U - R R Johnson

Accelerator SIN Detector Counter

Reactions Polarized target



Particles studied dibaryon

Comments Measures the angular distribution of the vector  
analyzing power.

Papers PR C25 (1982) 3228, and PR C30 (1984) 980.

**SIN-R-80-01** (Jan 1980) Approved May 1980; Started Jul  
1980; Completed Sep 1980.

### MEASUREMENT OF CROSS SECTIONS WITH A BEAM OF POLARIZED PROTONS AND A POLARIZED TARGET

CAEN U - F Perrot, J Yonnet

SACLAY - J Bystricky, J Deregél, J M Fontaine, F Lehar  
(Spokesperson), J Vrzal

GENEVA U - E Aprile, C Eisenegger, E Heer, R Hess

(Spokesperson), W Leo, S Morenzoni, Y Onel, D Rapin

SIN - S Mango

Accelerator SIN Detector Counter

Reactions Polarized beam and target



Particles studied dibaryon

Comments Measures the difference between total  $pp$  cross  
sections for initial spins parallel and antiparallel, the spins  
being oriented along the beam. Ran for 400 hours.

**SIN-R-80-06** (Nov 1981) Approved Jan 1982; Started 1984.

### SEARCH FOR RARE MUON AND PION DECAYS WITH A LARGE SOLID ANGLE MAGNETIC SPECTROMETER (SINDRUM I)

ZURICH, ETH - R Eichler, C Niebuhr, S Playfer, H K Walter  
( $\checkmark$  Spokesperson)

ZURICH U - S Egli, R Engfer, M Grossmann, E A Hermes,  
F Muheim, H Pruys, A van der Schaaf, D Vermeulen

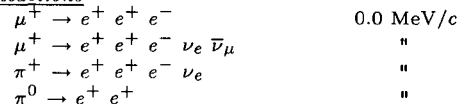
SIN - W Bertl, N Lordong

SACLAY - J Martino

AACHEN, TECH HOCHSCH, III PHYS INST - U Bellgardt,  
G Otter

Accelerator SIN Detector SINDRUM

Reactions



## SUMMARIES OF EXPERIMENTS

Particles studied  $\mu^+$ ,  $\pi^+$

Papers PL 140B (1984) 299, NP A434 (1985) 409, NP B260 (1985) 1, PL 175B (1986) 97, PL 175B (1986) 101, and ARNPS 36 (1986) 327.

**SIN-R-80-10** (Dec 1980) Approved Jan 1981; Started 1981.  
**MEASUREMENT OF INCLUSIVE SPECTRA FROM REACTIONS INDUCED BY PROTONS AND NEUTRONS**

FREIBURG U - J Franz, E Roessle, C Sauerwein, H Schmitt, H L Woolverton

BUDAPEST, CRIP - J Eroo ( $\checkmark$  Spokesperson), Z Fodor, J Kecskemeti, P Koncz, Z Kovacs, Z Seres

Accelerator SIN Detector Counter

Reactions

$n$ C $\rightarrow$ pion X	0.8-1.2 GeV/c
$n$ C $\rightarrow$ p X	"
$n$ C $\rightarrow$ deut X	"
$n$ C $\rightarrow$ trit X	"

Comments Measures energy spectra of p, d, t from 51 to 165°.

Papers PL 153B (1985) 382.

**SIN-R-80-11** (Dec 1980) Approved Jan 1981; Started Feb 1982.

**SEARCH FOR ADMIXTURE OF HEAVY NEUTRINOS IN  $\pi^+ \rightarrow \mu^+ \nu_\mu$  DECAY**

VIRGINIA U - R C Minehart ( $\checkmark$  Spokesperson), K O H Ziock ( $\checkmark$  Spokesperson)

SIN - M Daum, P R Kettle  
 ZURICH, ETH - B Jost

Accelerator SIN Detector Counter

Reactions

$\pi^+ \rightarrow \mu^+ \nu_\mu$	90 MeV/c
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Particles studied hvy- $\nu_\mu$

Comments The muon energy resolution is better than 6 keV FWHM.

Papers PRL 52 (1984) 804.

**SIN-R-81-01** (Apr 1981) Approved May 1981; Started Nov 1982; Completed Oct 1984.

**EXPERIMENTAL DETERMINATION OF THE STRONG INTERACTION SHIFT IN THE 2P-1S TRANSITION OF PIONIC HYDROGEN AND DEUTERIUM ATOMS USING CRYSTAL DIFFRACTION**

NEUCHATEL U - E Bovet ( $\checkmark$  Spokesperson), J P Egger  
 CAL TECH - J Gimlett ( $\checkmark$  Spokesperson), H Kwon  
 SIN - K Gabathuler

Accelerator SIN Detector Photon spectrometer, Counter

Reactions

$\pi^- p \rightarrow \gamma X$	0 MeV/c
$\pi^- deut \rightarrow \gamma X$	"

Papers PL 153B (1985) 231, and NIM A239 (1985) 635.

**SIN-R-81-02** (Aug 1981) Approved Sep 1981.

**STUDY OF THE FORMATION OF MUONIC ATOMS IN LOW Z GASEOUS MATERIALS IN A CYCLOTRON TRAP**

KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
 KARLSRUHE U - P Bluem, E Borie, D Gotta, H Koch,  
 W Kunold, M Schneider, L M Simons ( $\checkmark$  Spokesperson)  
 SIN - R Abela

Accelerator SIN Detector Counter

Reactions

$\mu^-$ nucleus	0 MeV/c
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Comments Approved for 240 hours.

**SIN-R-81-06** (Apr 1983) Approved May 1983; Started Feb 1984; Completed Jan 1985.

**IMPROVED DETECTION OF 2- $\gamma$  EVENTS FROM THE SIN BEAM DUMP AND MEASUREMENT OF THEIR INVARIANT MASS**

AACHEN, TECH HOCHSCH, III PHYS INST - H Faissner,  
 W Heinrigs, A Preussger, J Reitz, D Samm, H Tuchscherer  
 BERLIN, DAW - P Kostka, K Lanius, S Nowak, C Spiering,  
 M Walter

SIN - M Daum, R Dietlicher, A Zehnder ( $\checkmark$  Spokesperson)

Accelerator SIN Detector Optical spark chamber

Reactions

$p$ nucleus $\rightarrow$ axion X	1.2 GeV/c
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Particles studied axion

Comments A search for axions produced in the 600-MeV proton beam dump. No signal observed.

**SIN-R-81-09** (Dec 1981) Approved Jan 1982; Started Mar 1982; Completed Sep 1983.

**SEARCH FOR HEAVY NEUTRINOS IN  $\pi \rightarrow e\nu$  DECAY**

LOUVAIN U - J P Deutsch, M Lebrun, N De Leener-Rosier,  
 O Naviliat-Cuncic, R Prieels ( $\checkmark$  Spokesperson)

ZURICH U - C Amsler, L van Elmbt, M Schaad, P Truoel  
 LAUSANNE U - Cl Joseph, J P Perroud, M T Tran

Accelerator SIN Detector Spectrometer

Reactions

$\pi^+ \rightarrow e^+ \nu_e$	0 MeV/c
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Particles studied hvy- $\nu_e$

Comments Obtains good reduction of the  $\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$  noise. The best background to signal ( $\pi^+ \rightarrow e^+ \nu_e$ ) ratio is 1.3. The resolution is 1.3 MeV/c at 70 MeV/c. Upper limits for  $|UEI|^2$  are  $7 \times 10^{-6}$  for  $m_\nu = 20$  MeV,  $1.5 \times 10^{-6}$  for  $m_\nu = 70$  MeV, etc.

Papers PL 177B (1986) 228.

**SIN-R-82-01** (Apr 1982) Approved Jun 1982; Started Aug 1982; Completed 1982.

**SEARCH FOR AN ADMIXTURE OF HEAVY NEUTRINOS IN THE DECAY OF PIONS AT REST**

SIN - R Abela, M Daum, R Frosch ( $\checkmark$  Spokesperson), B Jost,  
 P-R Kettle, E Steiner

Accelerator SIN Detector Counter

Reactions

$\pi^+ \rightarrow \mu^+ \nu_\mu$	100 MeV/c
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Particles studied hvy- $\nu_\mu$

Comments No evidence for a heavy  $\nu_\mu$  (heavy  $\nu_\mu$  mass range 5 to 30 MeV). Ran for 200 hours, then terminated in favor of experiment R-80-11.

Papers A result from an early test: PL 105B (1981) 263. No other papers expected.

**SIN-R-82-03.1** (Apr 1982) Approved Jun 1982; Started Nov 1982; Completed Aug 1983.

**MEASUREMENT OF THE LIFETIME OF THE 2S STATE OF MUONIC HELIUM AT GAS PRESSURES BELOW 5 ATM**

ZURICH, ETH - H P von Arb, F Dittus, H R Heeb, H Hofer,  
 F Kottmann ( $\checkmark$  Spokesperson), S Niggli, R Schaeren,  
 D Taqqu, J Unternaehrer  
 BASEL U - P Egelhof

Accelerator SIN Detector Counter

Reactions

$\pi^- \rightarrow \mu^- \bar{\nu}_\mu$	40 MeV/c
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## SUMMARIES OF EXPERIMENTS

$\mu^- \text{He} \rightarrow \mu^- \text{He} \gamma$       0 MeV/c  
**Comments** The lifetime of the 2S state of muonic helium ions is  $1116 \pm 96$  ns at 50 torr,  $39 \pm 6$  ns at 600 torr,  $< 150$  ns at 6 atm (90% c.l.). The 2S quenching rate is predominantly a quadratic function of pressure with a 3-body rate coefficient  $k = (6.24 \pm 0.64) \times 10^{-32}$  cm<sup>6</sup>/s.  
**Papers** PL 136B (1984) 232.

**SIN-R-82-04** (Apr 1983) Approved May 1983; Started 1985.  
**PRECISE DETERMINATION OF THE BRANCHING RATIO**  $R = (\pi \rightarrow e\nu + e\nu\gamma) / (\pi \rightarrow \mu\nu + \mu\nu\gamma)$

BERN U - G Czapek, A Fluckiger, D Frei, B Hahn ( $\checkmark$  Spokesperson), M Hess, C Hug, E Hugentobler, W Krebs, J Lauber, U Moser ( $\checkmark$  Spokesperson), E Ramseyer, H Scheidiger, P Schlatter, G Stucki  
 SIN - R Abela, D Renker, E Steiner

**Accelerator** SIN    **Detector** Counter, Calorimeter

**Reactions**  
 $\pi^+ \rightarrow e^+ \nu_e$       85 MeV/c

**Particles studied**  $\pi^+$

**Comments** The detector includes a  $4\pi$  calorimeter with an average thickness of 18 radiation lengths. The resolution for 100 MeV electrons is 4% FWHM. Taking data (November 86).

**SIN-R-82-06** (Jul 1982) Approved Aug 1982; Started Mar 1983; Completed 1984.

**SPIN TRANSFER PARAMETERS IN THE  $pp$  INELASTIC CHANNELS**

GENEVA U - E Aprile, G Cantale, E Heer, R Hess (Spokesperson), C Lechanoine-Leluc, W Leo, Y Onel, D Rapin, P Rascher  
 SIN - S Mango

**Accelerator** SIN    **Detector** Wire chamber

**Reactions** Polarized beam  
 $p p \rightarrow \pi^+$  deut      1.2 GeV/c  
 $p p \rightarrow \pi^0 p p$       "

**Comments** Ran for 2000 hours.

**Papers** From a similar previous experiment: NP A415 (1984) 365.

**SIN-R-82-10** (Dec 1982) Approved Jan 1983; Started Sep 1983.

**PRECISION DETERMINATION OF THE MASS OF THE  $\pi^-$  AND SEARCH FOR STRONG  $\pi n$  VAN DER WAALS FORCES**

ZURICH, ETH - W Beer, G de Chambrier, O Elsenhans, K L Giovanetti, P F A Goudsmit, L Knecht, H J Leisi ( $\checkmark$  Spokesperson), A Ruetschi  
 FRIBOURG U - B Jeckelmann, T Nakada  
 WABERN, EIDG AMT MESSWESEN - O Piller, W Schwitz  
 WILLIAM AND MARY COLL & SIN - M Eckhause

**Accelerator** SIN    **Detector** Counter

**Particles studied**  $\pi^-$

**Comments** The  $\pi^-/e^-$  mass ratio is 273.12677(71), the  $\pi^-$  mass is 139.56871(53) MeV. The measurements concerning the search for strong  $\pi n$  van der Waals forces starts in the second half of 1986.

**Papers** PRL 56 (1986) 1444, and NP A457 (1986) 709.

**SIN-R-82-17** (Jan 1983) Approved Jan 1983; Started Apr 1984; Completed Aug 1984.

**COULOMB-NUCLEAR INTERFERENCE IN  $\pi^+p$  AND  $\pi^-p$  ELASTIC SCATTERING AT 55 MeV**

KARLSRUHE U - K Goering, J Jaki, U Klein, W Kluge ( $\checkmark$  Spokesperson), R Koch, H Matthaey, M Metzler, U Wiedner

SIN - E Pedroni ( $\checkmark$  Spokesperson)  
 ZURICH, ETH - W Fetscher, H-J Gerber  
**Accelerator** SIN    **Detector** Wire chamber

**Reactions**  
 $\pi^+ p \rightarrow \pi^+ p$       140 MeV/c  
 $\pi^- p \rightarrow \pi^- p$       "

**Comments** The measured angular distributions agree with Karlsruhe-Helsinki phase-shift predictions and so reinforce the value of the  $\sigma$  term,  $65 \pm 8$  MeV, calculated by R. Koch. The discrepancy with the value of  $35 \pm 5$  MeV calculated by Gasser and Leutwyler using chiral perturbation theory of QCD persists.

**Papers** PRL 58 (1987) 648.

**SIN-R-83-20-2** (Nov 1983) Approved Jan 1984; Started Jun 1984.

**MEASUREMENT OF THE 2S-2P ENERGY DIFFERENCE IN MUONIC  $^4\text{He}$  AT LOW GAS DENSITY**

ZURICH, ETH - H P von Arb, C Brandes, F Dittus, H R Heeb, H Hofer, F Kottmann ( $\checkmark$  Spokesperson), C Luechinger, R Schaeren, D Taqqu, J Unternaehrer  
 BASEL U - P Egelhof, I Sick

**Accelerator** SIN    **Detector** Counter

**Comments** Measures the 2S-2P energy difference in muonic  $^4\text{He}$  ions by means of laser spectroscopy. The He gas pressure is low enough (0.04 atm) to prevent collisional quenching of the metastable 2S state. Taking data (November 86).

**SIN-R-83-29** (Dec 1983) Approved Jan 1984; Started Dec 1985.

**MEASUREMENT OF THE  $\xi$  PARAMETER IN  $\mu$  DECAY**

ZURICH, ETH - H Burkard, W Fetscher (Spokesperson), H-J Gerber, K F Johnson, E Ungricht  
 SIN - M Salzmann  
 MAINZ U, INST KERNPHYS - F Scheck  
 MUNICH, TECH U - V Zacek

**Accelerator** SIN    **Detector** Wire chamber

**Reactions**  
 $\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$       150 MeV/c  
 $\mu^- \rightarrow e^- \bar{\nu}_e \nu_\mu$       "

**Particles studied**  $\mu^+, \mu^-$

**Comments** Approved for 600 hours.

**SIN-R-85-10** (Jan 1985) Approved Mar 1985; Started Aug 1984; Completed Aug 1985.

**PRECISION MEASUREMENT OF THE  $\pi^- \pi^0$  MASS DIFFERENCE**

SIN - J F Crawford, M Daum ( $\checkmark$  Spokesperson), R Frosch ( $\checkmark$  Spokesperson), B Jost, P-R Kettle  
 VIRGINIA U - R M Marshall, R C Minehart, K O H Ziock

**Accelerator** SIN    **Detector** Counter

**Reactions**  
 $\pi^- p \rightarrow \pi^0 n$       0.0 MeV/c  
 $\pi^- p \rightarrow \gamma n$       "

**Particles studied**  $\pi^0$

**Comments** The  $\pi^- \pi^0$  mass difference is  $4.5930 \pm 0.0013$  MeV. The mean kinetic energy of  $\pi^- p$  atoms at the time of charge exchange in liquid hydrogen is  $< 12$  eV (90% CL).

**Papers** PRL 56 (1986) 1043.

**SIN-R-85-14** (Feb 1985) Approved Mar 1985; Started Oct 1985.

**MEASUREMENT OF THE  $\pi^0 \rightarrow e^+ e^-$  BRANCHING RATIO WITH SINDRUM**



## SUMMARIES OF EXPERIMENTS

ZURICH U - S Egli, R Engfer, M Grossmann-Handschin,  
E A Hermes, F Muheim, H S Pruys, A van der Schaaf

( $\checkmark$  Spokesperson), D Vermeulen  
ZURICH, ETH - W Bertl, R Eichler, C Niebuhr  
( $\checkmark$  Spokesperson), H K Walter

SIN - N Lordong, S M Playfer  
SACLAY - A Godin, J Martino  
AACHEN, TECH HOCHSCH, III PHYS INST - U Bellgard  
BRITISH COLUMBIA U - R Meijerdrees, C E Waltham

Accelerator SIN Detector SINDRUM

Reactions

$\pi^- p \rightarrow \pi^0 n$	0.0 MeV/c
$\pi^- p \rightarrow e^+ e^- n$	"
$\pi^0 \rightarrow e^+ e^-$	—
$\pi^0 \rightarrow e^+ e^- \gamma$	—

Particles studied  $\pi^0$

Comments Approved for 1500 hours, ran 1300 hours for tests.  
Expects to take data in spring 87.

**SIN-R-85-16** (Feb 1985) Approved Mar 1985; Started Aug 1985; Completed Oct 1985.

**STUDY OF THE DECAY  $\pi^+ \rightarrow e^+ \nu e^+ e^-$  WITH SINDRUM**

ZURICH U - S Egli (Spokesperson), R Engfer,  
C Grab, E A Hermes, A Kersch, N Kraus, H S Pruys,  
A van der Schaaf, D Vermeulen  
ZURICH, ETH - W Bertl, R Eichler, C Niebuhr, H K Walter  
SIN - N Lordong  
SACLAY - J Martino  
AACHEN, TECH HOCHSCH, III PHYS INST - U Bellgard,  
G Otter

Accelerator SIN Detector SINDRUM

Reactions

$\pi^+ \rightarrow e^+ e^+ e^- \nu_e$	0.0 MeV/c
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Particles studied  $\pi^+$

Comments First observation of the decay  $\pi^+ \rightarrow e^+ e^+ e^- \nu_e$ .  
No evidence for axions.

Papers PL 175B (1986) 97, and PL 175B (1986) 101.

**SIN-R-86-02** (Dec 1985) Approved Jan 1986; Started Sep 1986.

**STUDY OF THE REACTION  $\pi^- p \rightarrow \pi^+ \pi^- n$  NEAR THRESHOLD**

ERLANGEN U - R Baran, M Dillig, W Eyrich, K Fiedler,  
A Hofmann ( $\checkmark$  Spokesperson), Y Kollert, R Mueller,  
R Olszewski, H-W Ortner ( $\checkmark$  Spokesperson), J Orzechowski  
KERNFORSCHUNGSZENTRUM, KARLSRUHE - W Kluge,  
H Matthay, U Wiedner

Accelerator SIN Detector Spectrometer

Reactions

$\pi^- p \rightarrow \pi^+ \pi^- n$	350-450 MeV/c
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Comments Approved for 1300 hours.

**SIN-Z-75-02** (May 1975) Approved May 1975; Started 1976; Completed 1985.

**PARITY VIOLATION IN  $pp$  SCATTERING**

ZURICH, ETH - J Lang, T Maier, R Mueller, F Nessi-Tedaldi,  
T Roser, M Simonius ( $\checkmark$  Spokesperson)

SIN - S Jaccard  
WISCONSIN U - W Haeberli

Accelerator SIN Detector Wire chamber

Reactions Polarized beam

$p p \rightarrow p p$	300 MeV/c
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Comments The parity-violating longitudinal analyzing power obtained is  $A_z = (-1.50 \pm 0.22) \times 10^{-7}$ .

Papers PRL 44 (1980) 699, and PR C30 (1984) 1409.

**SIN-Z-80-01** (Jul 1980) Approved Sep 1980; Started Jan 1981; Completed 1984.

**PARITY VIOLATION IN  $p\alpha$  SCATTERING**

ZURICH, ETH - J Lang, T Maier, R Mueller, F Nessi-Tedaldi,  
T Roser, M Simonius ( $\checkmark$  Spokesperson)

WISCONSIN U - W Haeberli  
SIN - S Jaccard

Accelerator SIN Detector Wire chamber

Reactions Polarized beam

$p \text{ He} \rightarrow p \text{ He}$	300 MeV/c
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Comments The parity-violating longitudinal analyzing power obtained is  $A_z = -(3.3 \pm 0.9) \times 10^{-7}$ .

Papers PRL 54 (1985) 170, and PR C34 (1986) 1545.

**SLAC-BC-072-073** Approved Nov 1979; Completed Mar 1982.

**MEASUREMENT OF LIFETIME AND OTHER PROPERTIES OF CHARMED PARTICLES**

RUTHERFORD - C Fisher, B Franek, G Gopal, G Kalmus  
( $\checkmark$  Spokesperson), D Kelsey

IMPERIAL COLL - T Bacon, I Butterworth, J Chima,  
P Dornan, G Hall, P Rankin, A White  
UC, BERKELEY - H Bingham, J Kent, J Shank, G Yost  
SLAC - J T Carroll, K C Moffeit ( $\checkmark$  Spokesperson)  
KEK - M Fukawa, F Ochiai, A Ono, T Sato, R Sugahara,  
A Suzuki, K Takahashi, Y Yoshimura  
NARA U - N Fujiwara, S Noguchi, S Yamashita  
TOHOKU U - K Abe, K Hasegawa, T Hayashino, T Kitagaki,  
K Tamai, S Tanaka, A Yamaguchi, H Yuta  
BROWN U & MIT & TUFTS U & DUKE U & FLORIDA  
STATE U & OAK RIDGE & TENNESSEE U & BIRMING-  
HAM U & TECHNION & TEL AVIV U & WEIZMANN  
INST - et al.

Accelerator SLAC Detector HBC-40IN-HYB

Reactions

$\gamma p \rightarrow \text{charm X}$	20 GeV/c
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Particles studied charm

Comments Uses high-resolution optics (about 55  $\mu\text{m}$ ) with the bubble diameter resolved and a high bubble density (about 70 bubbles/cm) to detect the paths of charmed particles.

Papers IEEE TNS 27 (1980) 587, NIM 196 (1982) 403, NIM 203 (1982) 159, NIM 203 (1982) 223, PRL 48 (1982) 1526, PRL 51 (1983) 156, NIM 221 (1984) 330, PR D29 (1984) 1877, PRL 53 (1984) 751, PR D30 (1984) 1, PR D32 (1985) 2288, PR D32 (1985) 2869, and PR D33 (1986) 1. No other papers expected.

**SLAC-BC-075** (1982) Approved Nov 1982; Completed Dec 1983.

**AN IMPROVED CHARM PHOTOPRODUCTION STUDY AT THE SLAC HYBRID FACILITY**

RUTHERFORD - G Kalmus, et al.  
SLAC - K C Moffeit ( $\checkmark$  Spokesperson), et al.  
IMPERIAL COLL & BIRMINGHAM U & UC, BERKELEY &  
TOHOKU U & TECHNION & TEL AVIV U & WEIZMANN  
INST & MIT & BROWN U & OAK RIDGE & TENNESSEE  
U & TUFTS U - et al.

Accelerator SLAC Detector HBC-40IN-HYB

Reactions

$\gamma p \rightarrow \text{charm X}$	20 GeV/c
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Particles studied charm,  $D^0$ ,  $D^-$ ,  $D_s^+$ ,  $D_s^-$ ,  $\Lambda_c^+$

Comments An improvement of SLAC-BC-072/073.

Papers See also SLAC-BC-072/073. PR D33 (1986) 1.

## SUMMARIES OF EXPERIMENTS

**SLAC-BC-076** (Oct 1983) Approved Nov 1983; Completed Nov 1983.

**AN EXPERIMENT TO STUDY  $\Lambda_c^+$  DECAY MODES IN 10.5 GeV PHOTOPRODUCTION, WHERE A THRESHOLD ENHANCEMENT IS PREDICTED**

BIRMINGHAM U - B Franek, et al.  
 TENNESSEE U - J Brau (Spokesperson), et al.  
 IMPERIAL COLL & MIT & RUTHERFORD & SLAC & UC,  
 BERKELEY - et al.

Accelerator SLAC Detector HBC-40IN-HYB

Reactions

$$\gamma p \rightarrow \bar{D}^0 \Lambda_c^+ \quad 10.5 \text{ GeV}/c$$

Particles studied  $\Lambda_c^+$

Comments A test run found no evidence for the hoped-for threshold enhancement for charm production, so the experiment was scrapped.

Papers PR D30 (1984) 694.

**SLAC-E-130** (Dec 1976, May 1977) Approved May 1977; Completed Apr 1980.

**PRECISE MEASUREMENTS OF ASYMMETRIES IN DEEP INELASTIC SCATTERING OF POLARIZED ELECTRONS BY POLARIZED PROTONS AND BY POLARIZED DEUTERONS**

YALE U - M R Bergstrom, J E Clendenin, S Dhawan,  
 R Fong-Tom, V W Hughes (Spokesperson), M S Lubell,  
 U Moser, R F Oppenheim, D A Palmer, L Panda, N Sasao,  
 K P Schuler, P A Souder, H Venkataramania, M E Zeller  
 SLAC - S J St Lorant, R H Miller  
 BIELEFELD U - G Baum, W Raith  
 TSUKUBA U - K Kondo, S Miyashita, I Nakano, K Takikawa  
 KEK - K Morimoto

Accelerator SLAC Detector Single-arm spectrometer

Reactions Polarized beam and target

$$e^- p \rightarrow e^- X \quad 6.4, 16.2, 22.6 \text{ GeV}/c$$

$$e^- \text{deut} \rightarrow e^- X \quad "$$

Comments Increases by an order of magnitude the amount of data taken in SLAC-E-080, and adds data on deuterium.

Papers PRL 51 (1983) 1135.

**SLAC-E-135** Approved Nov 1979; Completed May 1982.

**COMPARISON OF  $K^- p$  AND  $K^+ p$  INTERACTIONS, AND A PROGRAMMATIC STUDY OF STRANGE QUARK SPECTROSCOPY**

SLAC - V Ashford, D Aston (Spokesperson), W Dunwoodie,  
 W Johnson, P Kunz, D W G S Leith, L Levinson,  
 A Miyamoto, B Ratcliff (Spokesperson), S Shapiro,  
 T Shimomura, P K Sinervo, G Tarnopolsky, A Waite,  
 S Williams

NAGOYA U - N Awaji, K Fujii, H Hayashii, S Iwata,  
 R Kajikawa, T Matsui, H Ozaki, C Pak, A Sugiyama,  
 S Suzuki, T Tauchi

TOKYO U - K Ukai

CINCINNATI U - J D'Amore, R Endorf, B Meadows,  
 M Nussbaum

Accelerator SLAC Detector LASS

Reactions

$$K^- p \rightarrow \text{charged } X \quad 11 \text{ GeV}/c$$

$$K^+ p \rightarrow \text{charged } X \quad "$$

Particles studied  $K^*$  (unspec),  $\phi(1680)$ ,  $\Xi^*$  (unspec),  $\Omega^*$  (unspec)

Comments Sensitivities are 4 evts/nb for  $K^-$ , 1 evt/nb for  $K^+$ . For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NP B247 (1984) 261, PL 149B (1984) 258, PR D32 (1985) 2255, PR D32 (1985) 2270, and PL 180B (1986) 308.

**SLAC-E-136** (Jul 1980) Approved May 1981; Completed Apr 1984.

**ELASTIC  $ep$  CROSS SECTIONS AT LARGE MOMENTUM TRANSFER**

AMERICAN U - R G Arnold (Spokesperson), P Bosted,  
 S Rock, Z M Szalata  
 BONN U - B A Mecking  
 SLAC - D J Sherden

Accelerator SLAC Detector SSF

Reactions

$$e^- p \rightarrow e^- p \quad 14.0, 21.0, 28.5 \text{ GeV}/c$$

Comments Measures the scattering cross section for  $Q^2 = 12.1, 23.6, \text{ and } 37.3 \text{ GeV}^2$  using the 8 and 20 GeV spectrometers in coincidence.

**SLAC-E-137** (Jul 1980) Approved Sep 1980, Dec 1980; Completed Dec 1982.

**SEARCH FOR LOW MASS, METASTABLE NEUTRAL PARTICLES AT SLAC**

FERMILAB - J D Bjorken  
 VIRGINIA TECH - A Abashian, L W Mo (Spokesperson)  
 SLAC - S Eklund, W R Nelson, Y S Tsai

Accelerator SLAC Detector Calorimeter

Reactions

$$e^- \text{nucleus} \quad 20 \text{ GeV}/c$$

Particles studied axion

Comments A beam-dump experiment to search for low-mass (< 100 MeV) metastable and neutral particles produced by a highly collimated mechanism. Took 29.9 coulombs of 20 GeV electrons. Analysis is in progress.

**SLAC-E-140** (1984) Approved Dec 1984; Completed Jan 1986.

**MEASUREMENT OF THE  $x$ ,  $Q^2$ , AND NUCLEAR DEPENDENCE OF  $R = \sigma_L/\sigma_T$**

AMERICAN U - R Arnold, D Benton, P Bosted,  
 G de Chambrier, L Clogher, A Lung, S Rock  
 ( $\checkmark$  Spokesperson), Z Szalata  
 CAL TECH - B Filippone, J Jourdan, R McKeown, R Milner,  
 D Potterveld, R Walker  
 FERMILAB - A Para  
 LIVERMORE - K Van Bibber, F Dietrich  
 MASSACHUSETTS U, AMHERST - B Debebe, R Hicks,  
 J Shafer  
 ROCHESTER U - P de Barbaro, A Bodek ( $\checkmark$  Spokesperson),  
 S Dasu, H Harada, M W Krasny, K Lang, E Riordan  
 TEL AVIV U - J Alster  
 SLAC - R Gearhart  
 STANFORD U - L Whitlow

Accelerator SLAC Detector ?

Reactions

$$e^- p \quad 3-21 \text{ GeV}/c$$

$$e^- \text{deut} \quad "$$

$$e^- \text{Fe} \quad "$$

$$e^- \text{Au} \quad "$$

Comments Measures the ratio  $R = \sigma_L/\sigma_T$  in the range  $0.1 < x < 0.5$  and  $1 < Q^2 < 12.5 \text{ (GeV}/c)^2$ . Compares  $R$  with the QCD prediction, and studies the nuclear dependence of the ratio of the  $W_1$  and  $W_2$  structure functions for various nuclear targets (EMC effect).

**SLAC-PEP-002** (Nov 1976) Approved Jan 1978; Completed 1983.

**SEARCH FOR HIGHLY IONIZING PARTICLES AT PEP**

SLAC - D Fryberger ( $\checkmark$  Spokesperson)  
 UC, BERKELEY - P B Price ( $\checkmark$  Spokesperson)

Accelerator SLAC-PEP Detector Plastic

## SUMMARIES OF EXPERIMENTS

### Reactions

$e^+ e^-$  29 GeV (Ecm)

Particles studied monopole

Comments The detector is a C-shaped retractable cylinder of lexan and CR-39. Detects highly charged particles as well as monopoles.

Papers PRL 48 (1982) 77, and PR D29 (1984) 1524. No other papers expected.

**SLAC-PEP-004-009** (Dec 1976) Approved Jan 1977.

### THE TIME PROJECTION CHAMBER AND 2-GAMMA DETECTOR AT PEP

LBL - M Alston-Garnjost, R E Avery, A Barbaro-Galtieri, A Barnes, A Bay, T S Bolognese, A Bross, A R Clark, G D Cowan, O Dahl, K A Derby, J J Eastman, P Eberhard, T K Edberg, J W Gary, W Hofmann, J E Huth, H S Kaye, R W Kenney, L T Kerth, D Lambert, S C Loken, G Lynch, R Madaras, J Marx, L G Mathis, W Moses, D R Nygren, P Oddone (✓ Spokesperson), M Pripstein, M Ronan, R Ross, F R Rouse, G Shapiro, M D Shapiro, M Stevenson, R van Tyen, E M Wang, W Wenzel, Z R Wolf, H Yamamoto  
 UC, BERKELEY - H Bingham, J Lys, G P Yost  
 UC, DAVIS - W Ko, R Lander, K Maeshima, R R McNeil, D Pellett, J R Smith, W Wagner, M C S Williams, C Zeitlin  
 UC, BERKELEY & STANFORD U - A M Eisner, B D Magnuson, M K Sullivan  
 UC, SAN DIEGO - D L Bintinger, K H Kees, G Masek, E Miller, J R Thompson, W Vernon, J T White  
 UC, SANTA BARBARA - A R Barker, D A Bauer, D Caldwell, A Lu, K A Schwitkis, R Stephens, Y X Wang, S Yellin

UCLA - H U Bengtsson, C D Buchanan, R I Koda, D A Park, W E Slater, J S Steinman, D H Stork, M G Strauss, M R Wayne, R F van Daalen Wetters

UC, RIVERSIDE - G J Van Dalen, W Gorn, K K Kwong, W G J Langeveld, J Layter, T T Lin, C S Lindsey, S O Melnikoff, B Shen

CARNEGIE MELLON U - G J Bobbink

AMES LAB - J M Hauptman, S K Park

JOHNS HOPKINS U - B A Barnett, D A Crane, J Hylan, X-Q Lu, J A J Matthews, W-M Zhang

MASSACHUSETTS U, AMHERST - R R Kofler,

S J Maxfield, S Toutouchi

NEW YORK U - P Nemethy

NIKHEF, AMSTERDAM - A Buijs, F Erne, F L Linde,

H Paar, J C Sens, B van Uitert

SLAC - E Bloom, A Fridman, G Godfrey, K Kiess, G Zapalac

TOKYO U - H Aihara, R Enomoto, T Fujii, T Kamata,

T Takahashi, N Toge

Accelerator SLAC-PEP Detector TPC, 2-GAMMA

### Reactions

$e^+ e^-$  29 GeV (Ecm)

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers IEEE TNS 30 (1983) 63, IEEE TNS 30 (1983) 67, IEEE TNS 30 (1983) 76, IEEE TNS 30 (1983) 117, IEEE TNS 30 (1983) 153, IEEE TNS 30 (1983) 162, NIM 217 (1983) 259, PRL 52 (1984) 168, PRL 52 (1984) 577, PRL 52 (1984) 2201, PRL 52 (1984) 2332, PRL 53 (1984) 130, PRL 53 (1984) 2199, PRL 53 (1984) 2378, PRL 53 (1984) 2465, PR D30 (1984) 2436, ZPHY C27 (1985) 39, ZPHY C27 (1985) 187, ZPHY C27 (1985) 495, PRL 54 (1985) 270, PRL 54 (1985) 274, PRL 54 (1985) 763, PR D31 (1985) 996, PRL 54 (1985) 2564, PR D31 (1985) 2719, PRL 55 (1985) 1047, ZPHY C28 (1985) 31, PR D33 (1986) 844, PRL 57 (1986) 51, PRL 57 (1986) 404, PRL 57 (1986) 945, PRL 57 (1986) 1836, PRL 57 (1986) 2500, PRL 57 (1986) 3140, PRL 57 (1986) 3245, PR D34 (1986) 1945, PRL 58 (1987) 97, and PL B (to be published).

**SLAC-PEP-005** (Dec 1976) Approved Jan 1977.

### THE MARK-II DETECTOR AT PEP

SLAC - A Boyarski, P R Burchat, D Burke, J Dorfan, G Feldman, L Gladney, G Hanson, K Hayes, R Hollebeek,

W Innes, J Jaros, D Karlen, A Lankford, R R Larsen, B Leclaire, N Lockyer (Spokesperson), V Luth, C Matteuzzi, R Ong, M Perl, B Richter, K Riles, M Ross, J Yelton, C Zaiser

LBL - G S Abrams, D Amidei, A Baden, J Boyer, F Butler, G Gidal, M Gold, G Goldhaber, L Golding, J Haggerty, D Herrup, I Juricic, J A Kadyk, M Nelson, P Rowson, H Schellman, W B Schmidke, P Sheldon, G H Trilling, C de la Vaissiere, D R Wood

HARVARD U - M Levi, T Schaad

Accelerator SLAC-PEP Detector MARK-II

### Reactions

$e^+ e^-$  29 GeV (Ecm)

Particles studied charm, bottom,  $\tau$

Comments Studies jet properties and evolution, charm and bottom lifetimes and fragmentation, etc. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 48 (1982) 66, PRL 49 (1982) 430, PRL 49 (1982) 517, PRL 49 (1982) 521, PRL 49 (1982) 1232, PRL 49 (1982) 1369, PL 122B (1983) 90, PL 129B (1983) 141, PRL 50 (1983) 1542, PRL 51 (1983) 955, PRL 51 (1983) 1316, PRL 51 (1983) 2253, PRL 52 (1984) 1869, PRL 52 (1984) 2019, PR D30 (1984) 851, PL 160B (1985) 188, PR D31 (1985) 3013, PR D32 (1985) 800, PR D32 (1985) 2859, PRL 54 (1985) 2071, PRL 54 (1985) 2289, PRL 54 (1985) 2580, PRL 54 (1985) 2489, PRL 55 (1985) 1954, PRL 56 (1986) 207, PRL 56 (1986) 812, PRL 57 (1986) 527, PRL 57 (1986) 1398, PR D34 (1986) 2601, PR D34 (1986) 3321, PR D35 (1987) 27, and PRL 58 (1987) 644.

**SLAC-PEP-006** (Dec 1976) Approved Jan 1977; Completed Mar 1986.

### THE MAC DETECTOR AT PEP

COLORADO U - E Fernandez, W Ford, N Qi, A L Read, Jr, J Smith

FRASCATI - T Camporesi, R DeSangro, A Marini, I Peruzzi, M Piccolo, F Ronga

HOUSTON U - H T Blume, R B Hurst, K Lau, J P Venuti, H B Wald, R Weinstein

WISCONSIN U - M C Delfino, B K Heltsley, J R Johnson, T L Lavine, T Maruyama, R Prepost

NORTHEASTERN U - H R Band, M W Gettner, G P Goderre, E Von Goeler, O A Meyer, J Moromisato,

R Polvado, D Sanders, D Shambroom, J C Sleeman

SLAC - W Ash, E D Bloom, G Chadwick, S H Clearwater,

R W Coombes, G Godfrey, H S Kaye, R E Leedy,

H L Lynch, R L Messner, L T Moss, F Muller, D Ritson,

D E Wiser, R W Zdarko

UTAH U - H Lee, P Verdini

CORNELL U - B Heltsley

STANFORD U - H Nelson, L Rosenberg

LBL - D Groom (✓ Spokesperson)

Accelerator SLAC-PEP Detector MAC

### Reactions

$e^+ e^- \rightarrow \mu^+ \mu^-$  29 GeV (Ecm)

$e^+ e^- \rightarrow \tau^+ \tau^-$  "

$e^+ e^- \rightarrow e^+ e^-$  "

$e^+ e^- \rightarrow \mu^+ \mu^- \gamma(s)$  "

$e^+ e^- \rightarrow e^+ e^- \mu^+ \mu^-$  "

$e^+ e^- \rightarrow \gamma \gamma$  "

$e^+ e^- \rightarrow e^+ e^-$  hadrons "

$e^+ e^- \rightarrow$  jets "

Particles studied  $\tau$ , B(5270)

Comments For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 49 (1982) 106, PRL 50 (1983) 1238, PRL 50 (1983) 2054, PRL 51 (1983) 257, PRL 51 (1983) 1022, PR D28 (1983) 2721, PRL 52 (1984) 22, PR D31 (1985) 1537, PR D31 (1985) 2724, PRL 54 (1985) 95, PRL 54 (1985) 1118, PRL 54 (1985) 1620, PRL 54 (1985) 1624, PRL 54 (1985) 2477, PRL 55 (1985) 1831, PRL 55 (1985) 2118, PR

## SUMMARIES OF EXPERIMENTS

D33 (1986) 3472, PR D35 (1987) 1, PR D35 (1987) 10, PR D35 (1987) 374, PR D35 (1987) 408, and PRL 58 (1987) 640.

**SLAC-PEP-012** (Oct 1977) Approved Jan 1978; Completed Mar 1986.

### THE HIGH RESOLUTION SPECTROMETER AT PEP

ARGONNE - M Derrick, P Kooijman, B Musgrave, L Price, J Repond, K Sugano  
 INDIANA U - D Blockus, B Brabson, J-M Brom, H Ogren, H W Paik, D Rust  
 MICHIGAN U - C Akerlof, J Chapman, D Errede, M T Ken, D Meyer, D Nitz, R Thun, R Tschirhart  
 PURDUE U - S Abachi, P Baringer, R De Bonte, B G Bylsma, D Koltick, F Loeffler, E H Low, R McIlwain, D H Miller (✓ Spokesperson), C R Ng, E Shibata  
 LBL - B Cork

Accelerator SLAC-PEP Detector HRS

#### Reactions

$e^+ e^-$  29 GeV (Ecm)

Particles studied  $\tau$ ,  $\nu_\tau$ ,  $D^+$ ,  $D^0$ ,  $D^*(2010)$ ,  $D_s^+$

Comments Obtained a final data sample of 300/pb integrated luminosity. Published on all aspects of lepton and hadron production, such as charmed meson studies, rare  $\tau$  decays and limit on the  $\nu$  mass, electroweak tests, searches for new leptons, and detailed quark fragmentation studies. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM 169 (1980) 413, NIM 186 (1981) 513, NIM 203 (1982) 119, PR D30 (1984) 515, PRL 53 (1984) 1971, PL 146B (1984) 261, PL 149B (1984) 519, PR D31 (1985) 1, PL 153B (1985) 116, PR D31 (1985) 2352, PRL 54 (1985) 1775, PRL 54 (1985) 2568, PRL 55 (1985) 570, PL 156B (1985) 271, PL 158B (1985) 519, PL 161B (1985) 412, PL 164B (1985) 199, PL 165B (1985) 449, PL 166B (1986) 463, PL 166B (1986) 468, PL 168B (1986) 299, NIM A249 (1986) 185, PRL 56 (1986) 1039, PRL 56 (1986) 1346, PRL 56 (1986) 1775, PR D34 (1986) 3286, PR D34 (1986) 3304, PRL 57 (1986) 1990, PL 181B (1986) 403, PL 182B (1986) 101, and PL 183B (1987) 232.

**SLAC-PEP-014** Approved Jan 1978; Completed Jun 1981.

### A SEARCH FOR FREE QUARKS AT PEP

LBL - D Chew, R Ely, T Pun, V Vuillemin  
 NORTHWESTERN U - R Fries, B Gobbi, W Guryn, D H Miller, M Ross  
 STANFORD U - D Besset, S Freedman, A Litke (Spokesperson), J Napolitano, T-C Wang  
 HAWAII U - F Harris, I Karliner, S Parker, D Yount  
 FRASCATI - A Marini, I Peruzzi, M Piccolo, F Ronga

Accelerator SLAC-PEP Detector Combination

#### Reactions

$e^+ e^- \rightarrow$  quark(1/3)  $\overline{\text{quark}}$ (1/3) 29 GeV (Ecm)  
 $e^+ e^- \rightarrow$  quark(1/3) X "  
 $e^+ e^- \rightarrow$  quark(2/3)  $\overline{\text{quark}}$ (2/3) "  
 $e^+ e^- \rightarrow$  quark(2/3) X "

Particles studied quark(1/3), quark(2/3), tachyon

Comments Also looked for fractionally charged particles, tachyons, and massive particles in cosmic rays.

Papers PR D25 (1982) 2837, PRL 48 (1982) 1649, PR D26 (1982) 1777, PL 118B (1982) 199, and PL 139B (1984) 313.

**SLAC-PEP-020** (Jun 1978) Approved Sep 1978.

### DELCO AT PEP

CAL TECH - B Barish, S-C Gao, Y-Z Huang, D Koop, J Ludwig, G Mills, T Pal, L Rivkin, W Ruckstuhl, M Sakuda, S Sherman, E Siskind, R Stroynowski, H Yamamoto

SLAC - W Atwood, P Baillon, A Courau, H DeStaebler, R Dubois, E Elsen, R Johnson, H Kichimi, D Klem, A Ogawa, D Perret-Gallix, R Pitthan, C Prescott, L Rochester, R Taylor, S-Q Wang, C Young  
 STANFORD U - G Bonneaud, G Donaldson, M Duro, G Irwin, J Kirkby (Spokesperson), D Pollard, S Wojcicki, W-G Yan

Accelerator SLAC-PEP Detector DELCO

#### Reactions

$e^+ e^- \rightarrow e^+ X$  29 GeV (Ecm)  
 $e^+ e^- \rightarrow e^- X$  "  
 $e^+ e^- \rightarrow e^+(s) e^-(s) X$  "  
 $e^+ e^- \rightarrow$  hadrons "  
 $e^+ e^- \rightarrow \tau^+ \tau^-$  "

Particles studied charm, bottom,  $\tau$

Comments Studies emphasize inclusive single and multiple electron production, jets using heavy flavor tagging, flavor production in quark and gluon jets, heavy particle lifetimes, and 2- $\gamma$  interactions. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers PRL 52 (1984) 970, PRL 52 (1984) 1944, PRL 53 (1984) 1873, PL 147B (1984) 227, PRL 54 (1985) 522, PRL 54 (1985) 624, PR D32 (1985) 2901, PL 152B (1985) 399, PRL 56 (1986) 2132, PL 177B (1986) 109, and PR D33 (1986) 2708.

**SLAC-PEP-021** (Mar 1983) Approved May 1983; Completed Jan 1986.

### A SEARCH FOR $e^+ e^- \rightarrow$ UNSEEN STATES USING PHOTON TAGGING

CERN - C Matteuzzi  
 BOSTON U - A Johnson, S Whitaker  
 SLAC - G Bartha, D Burke (✓ Spokesperson), C Hawkins, M Jonker, L Keller, N Roe, T Steele, R Wilson  
 WASHINGTON U, SEATTLE - C Hearty, J Rothberg, K Young  
 FERMILAB - P Garbincius  
 PENN U - R Hollebeek (✓ Spokesperson)  
 GENEVA U - P Extermann

Accelerator SLAC-PEP Detector Calorimeter

#### Reactions

$e^+ e^- \rightarrow \gamma X$  29 GeV (Ecm)

Particles studied photino, s-electron, nuino,  $\nu$

Comments A search in particular for light particles predicted by supersymmetric theories. The photon is detected in a calorimeter of lead-glass blocks. No anomalous signal seen. Limit of  $N_\nu < 7.5$  (90% CL) placed on number of neutrino generations with masses less than a few GeV.

Papers PRL 56 (1986) 685, and PRL (submitted).

**SLAC-SLC-SLD** (1983) Approved May 1984.

### THE SLD DETECTOR FOR THE SLC

BRITISH COLUMBIA U - D Axen  
 INFN, BOLOGNA - A Benvenuti  
 BOSTON U - A Johnson, J S Whitaker, R Wilson  
 CAL TECH - F DeJongh, G Eigen, D Hitlin, C Matthews, A Mincer, W Wisniewski  
 UC, SANTA BARBARA - D Bauer, D O Caldwell, A Lu, R Morrison, R Stephens, M Witherell, S Yellin  
 UC, SANTA CRUZ - M Cavalli-Sforza, P Coyle, D Coyne, T Schalk, N Spencer  
 CINCINNATI U - R Endorf, R Johnson, B Meadows, M Nussbaum  
 COLORADO U - G Baranko, C Bogart, J Carr, L Cremaldi, M Gyure, U Nauenberg  
 COLUMBIA U - C Baltay (✓ Spokesperson), L Camilleri, E Hyatt, S Manly, S Rabinowitz, P Rowson, M Shaevitz, S Smith, R Steiner  
 FERRARA U & INFN, BOLOGNA - G Callegari, L Piemontese

## SUMMARIES OF EXPERIMENTS

FRASCATI - A Calcaterra, R DeSangro, I Peruzzi, M Piccolo  
ILLINOIS U, URBANA - J S Brown, G Gladding,  
L Pregernig, J J Thaler

MIT - W Busza, R Cowan, J Friedman, S Fuess, A Johnson,  
H Kendall, L S Osborne, A P T Palounek, L Rosenson,  
F Taylor, R Verdier, R K Yamamoto

MASSACHUSETTS U - S Hertzbach, R Kofler  
PADUA U & INFN, PADUA - D Bisello, M Loreti  
PERUGIA U & INFN, PERUGIA - B Alpat, R Battiston,  
G Bilei, P Cenci, G Mantovani, M Pauluzi, L Servoli  
INFN, PISA - R Castaldi, C Vannini, P Verdini  
RUTHERFORD - C Damerell, A Gillman, F Wickens  
SAN FRANCISCO STATE U - C Hodges

SLAC - I Abt, W W Ash, V Ashford, D Aston, W Atwood,  
T Bienz, F Bird, M Breidenbach (✓ Spokesperson),  
G Chadwick, W M Dunwoodie, S Ecklund, D Fryberger,  
R Gearhart, G Hallewell, T Hansl-Kozanecki, P F Kunz,  
D W G S Leith, H L Lynch, R L Messner, B Nielsen,  
C Y Prescott, B N Ratcliff, P Reutens, L Rochester,  
A Rothenberg, J Russell, R Schindler, D Schultz,  
S L Shapiro, D Sherden, R Stiening, N Toge, J Va'Vra,  
D E Wiser, C Young

TENNESSEE U - J Brau, W Bugg, A Weidemann

TRIUMF - G Ludgate, A Olin, C Oram

VANDERBILT U - A V Barnes, S E Csorna, R S Panvini,  
D Prindle, T Reeves

VICTORIA U - A Astbury, G A Beer, R Dubois, A Honma,  
R Keeler, G R Mason, L P Robertson, A Waite, E Young

WASHINGTON U, SEATTLE - V Cook, R J Davisson,  
P M Mockett, J Rothberg, J Rutherford, E Vella,  
R W Williams, K Young

WISCONSIN U - H Band, J R Johnson, T Maruyama,  
R Prepost

Accelerator SLAC-SLC Detector SLD

### Reactions

$e^+ e^-$  100 GeV ( $E_{cm}$ )

Particles studied  $Z^0$ , higgs, top

Comments Follows the first-run work of the MARK-II at the SLC with a detector of greater capabilities. Studies include (1) measurement of  $Z^0$  mass and width and determination of the number of light neutrinos, (2) tests of standard-model electroweak predictions in dilepton final states, including  $\tau$  polarization, (3) investigation of particles with  $t$  quarks, (4) search for Higgs particles, (5) tests of QCD in multi-jets, and (6) search for new phenomena. For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers NIM A238 (1985) 489, IEEE TNS 33 (1986) 46, IEEE TNS 33 (1986) 51, IEEE TNS 33 (1986) 65, IEEE TNS 33 (1986) 81, IEEE TNS 33 (1986) 113, IEEE TNS 33 (1986) 167, IEEE TNS 33 (1986) 176, IEEE TNS 33 (1986) 194, IEEE TNS 33 (1986) 197, IEEE TNS 33 (1986) 201, and IEEE TNS 33 (1986) 261.

**SLAC-SLC-6** (Apr 1983) Approved May 1983.

### MARK II AT THE SLC

CAL TECH - B Barish, C Hawkes, K Kamemoto, B Millikan,  
C Peck, F Porter, F Soderstrom, R Stroynowski, A Weir,  
E Wicklund, R Wolf, D Wu

COLORADO U - W Ford, D Hinshaw, J Smith, S Wagner,  
P Weber, S White

HAWAII U - A Breakstone, R Cence, F Harris, S Parker  
INDIANA U - D Blockus, B Brabson, J Brom, H Ogren,  
D Rust, A Snyder

JOHNS HOPKINS U - B Barnett, P Dauncey, B Harral,  
J Hlyen, J Matthews, D Stoker

LBL - G Abrams, J Boyer, F Butler, P Drell, G Gidal,  
G Goldhaber (✓ Spokesperson), R Harr, D Herrup, M Jaffe,  
I Juricic, J Kadyk, G Lynch, P Sheldon, G Trilling, D Wood

MICHIGAN U - G Bonvicini, J Chapman, R Frey, E Gero,  
W Koska, D Meyer, D Nitz, M Petradza, R Thun

UC, SANTA CRUZ - C Adolphsen, D Bannon, P Burchat,  
D Dorfman, C Heusch, J Kent, A Litke, H Sadrozinski,  
T Schalk, A Schwarz, A Seiden, S Watson, A Weinstein

SLAC - J Alexander, J Ballam, T Barklow, J Bartelt, A Boyarski, F Bulos, D Burke, D Cords, D Coupal, H DeStaebler,

J Dorfman (✓ Spokesperson), G Feldman (✓ Spokesperson),  
D Fernandes, R Field, C Fordham, D Fujino, K K Gann,  
T Glanzman, P Grosse-Wiesmann, G Hanson, K Hayes,  
T Himel, D Hutchinson, W Innes, J Jaros, C-K Jung,  
D Karlen, S Klein, S Komamiya, R Van Kooten, W Kozanecki,  
A Lankford, R R Larsen, M Levi, V Luth, T Mattison,  
K Moffeit, J Nash, K O'Shaughnessy, T Ohama, R Ong,  
M Perl, F Perrier, A Petersen, R Pitthan, P Rankin, K Riles,  
P Voruganti, A Weigend

Accelerator SLAC-SLC Detector MARK-II

### Reactions

$e^+ e^-$  100 GeV ( $E_{cm}$ )

Particles studied  $Z^0$ , higgs, top,  $\tau$

Comments Studies include (1) measurement of  $Z^0$  mass and width and determination of the number of light neutrinos, (2) tests of standard-model electroweak predictions in dilepton final states, including  $\tau$  polarization, (3) investigation of particles with  $t$  quarks, (4) search for Higgs particles, (5) tests of QCD in multi-jets, and (6) search for new phenomena. Scheduled to start May 87 and end June 89. For a description of the apparatus, see the LBL-91 supplement on detectors.

**SLAC-SP-030** (Jun 1979) Approved Jul 1979; Completed 1981.

### A LARGE SOLID ANGLE NEUTRAL DETECTOR FOR SPEAR II (THE CRYSTAL BALL)

SLAC - E D Bloom (Spokesperson), F Bulos, R Chestnut,  
G Godfrey, W Lockman, M Oreglia, D Scharre  
STANFORD U - R Hofstadter, I Kirkbride, K Koenigsmann,  
J Tompkins

CAL TECH - C Peck, F Porter

HARVARD U - D Antreasyan, Y Gu, K Strauch, K Wacker,  
A Weinstein

PRINCETON U - D Aschman, M Cavalli-Sforza, D Coyne,  
H Sadrozinski

Accelerator SLAC-SPEAR Detector CRYSTAL-BALL

### Reactions

$e^+ e^- \rightarrow \gamma(s) X$  3.0-8.4 GeV ( $E_{cm}$ )

$e^+ e^- \rightarrow \pi^0 X$  "

$e^+ e^- \rightarrow \eta X$  "

Particles studied  $\eta_c(2980)$ ,  $J/\psi$ ,  $\psi(3685)$ ,  $\eta(1440)$ ,  $f_2(1720)$ ,  
 $\eta_c(3590)$ ,  $\chi(\text{unspec})$

Comments This is a continuation of SLAC-SP-024. The detector then went to DESY (see DESY-DORIS-CRYSTAL-BALL). For a description of the apparatus, see the LBL-91 supplement on detectors.

Papers Results from the crystal ball's career at SPEAR are summarized in ARNPS 33 (1983) 143. PRL 44 (1980) 712, PRL 45 (1980) 959, PRL 45 (1980) 1150, PRL 47 (1981) 760, PRL 48 (1982) 70, PRL 48 (1982) 458, PR D25 (1982) 2259, PL 110B (1982) 82, PR D25 (1982) 3065, PRL 48 (1982) 903, PRL 49 (1982) 259, PR D28 (1983) 2896, and PR D34 (1986) 711.

**SLAC-SP-031** (1980) Approved Sep 1980; Completed Mar 1982.

### CHECKOUT OF MARK III DETECTOR AT SPEAR

CAL TECH - R Baltrusaitis, J Hauser, D Hitlin

(✓ Spokesperson), J Richman

SLAC - K Bunnell, D Coward, K Einsweiler, D Hutchinson,  
R Mozley, A Oadian, J Roehrig, W Toki, Y Unno, F Villa

UC, SANTA CRUZ - H Bledsoe, D Dorfman, R Fabrizio,  
F Grancagnolo, C Heusch, T Schalk, A Seiden, D Smith

ILLINOIS U, URBANA - J Becker, R Cassell, H Cui,  
B Eisenstein, G Gladding, J Kohlmeier, S Plaetzer,

A Spadafora, J Thaler, A Wattenberg, W Wisniewski  
WASHINGTON U, SEATTLE - T Burnett, V Cook, H Lu-

batti, H Moriyasu, C del Papa, J Rothberg, J Sleeman,  
H Willutski, D Wisinski

Accelerator SLAC-SPEAR Detector MARK-III

## SUMMARIES OF EXPERIMENTS

### Reactions

$e^+ e^-$

**Comments** The actual experiment is SP-032. For a description of the apparatus, see the LBL-91 supplement on detectors.

**SLAC-SP-032** (May 1981) Approved May 1981; Started Apr 1982.

### MARK-III AT SPEAR

CAL TECH - G Dubois, G Eigen, D G Hitlin, C Matthews, A Mincer, W Wisniewski, Y Zhu  
 SLAC - T Bolton, J C Brient, K Bunnell, R E Cassell, D Coward, C Grab, U Mallik, R Mozley, A Odian, J Parker, D Pitman, R Schindler (✓ Spokesperson), W Stockhausen, W Toki (✓ Spokesperson), F Villa, S Wasserbaech, D E Wisinski  
 UC, SANTA CRUZ - M Burchell, G Corrado, D Dorfman, C Heusch, W Lockman, H Sadrozinski, M Scarlatella, T Schalk, A Seiden, A Weinstein, R C Xu  
 ILLINOIS U, URBANA - B Eisenstein, T Freese, G Gladding, J Izen, C Simopoulos, E Stockdale, B Tripsas, A Wattenberg  
 WASHINGTON U, SEATTLE - T Burnett, V Cook, A D Li, R Mir, P Mockett, B Nemati, L Parrish

**Accelerator** SLAC-SPEAR **Detector** MARK-III

### Reactions

$e^+ e^-$  3.097, 3.686, 3.770, 4-5 GeV ( $E_{cm}$ )

**Particles studied**  $D^0$ ,  $D^+$ ,  $D^-$ ,  $D_s^+$ ,  $\psi(3770)$ ,  $J/\psi$ ,  $\psi(3685)$ ,  $\eta_c(2980)$ ,  $X(2220)$

**Comments** For a description of the apparatus, see the LBL-91 supplement on detectors.

**Papers** PRL 52 (1984) 2126, PRL 54 (1985) 1976, PR D31 (1985) 2192, PR D32 (1985) 566, PR D32 (1985) 2883, PRL 55 (1985) 150, PRL 55 (1985) 1723, PRL 55 (1985) 1842, PR D33 (1986) 629, PR D33 (1986) 1222, PRL 56 (1986) 107, PRL 56 (1986) 2136, and PRL 56 (1986) 2140.

**TRIUMF-009** (Sep 1972) Approved Sep 1972; Completed 1982.

### PION RADIATIVE CAPTURE AND CHARGE EXCHANGE IN FLIGHT

TRIUMF - J-M Poutissou, M Salomon  
 BRITISH COLUMBIA U - K Aniol, A Bagheri, F Entezami, M Hasinoff, D F Measday (✓ Spokesperson), B Robertson, C Virtue

**Accelerator** TRIUMF **Detector** Photon spectrometer

### Reactions

$\pi^- p \rightarrow n \gamma$  77-220 MeV/c  
 $\pi^- p \rightarrow \pi^0 n$  "

**Papers** NP A414 (1984) 493, and CZJP B32 (1982) 138.

**TRIUMF-052** (Nov 1976) Completed 1981.

### A NEW MEASUREMENT OF THE $\pi \rightarrow e\nu$ BRANCHING RATIO — A TEST OF THE STANDARD MODEL

NATIONAL RESEARCH COUNCIL, OTTAWA - M S Dixit  
 TRIUMF & VICTORIA U - D A Bryman (Spokesperson), R Dubois, T Numao, B Olaniyi, A Olin  
 TRIUMF & BRITISH COLUMBIA U - D Berghofer, J-M Poutissou

TRIUMF - J A Macdonald  
 QUEENS U, KINGSTON - B C Robertson

**Accelerator** TRIUMF **Detector** Counter

### Reactions

$\pi^+ \rightarrow e^+ \nu_e$  0 GeV/c  
 $\pi^+ \rightarrow \mu^+ \nu_\mu$  "

**Particles studied**  $\pi^+$

**Comments** The experiment continues as TRIUMF-248.

**Papers** PRL 50 (1983) 7, PRL 50 (1983) 1546, and PR D33 (1986) 1211.

**TRIUMF-104** (Nov 1978) Approved Nov 1978; Completed 1986.

### SEARCH FOR MUON-ELECTRON CONVERSION AT TRIUMF

TRIUMF & VICTORIA U - D A Bryman (Spokesperson), M Leitch, I Navon, T Numao  
 LOS ALAMOS - H L Anderson  
 MONTREAL U - G Azuelos, P Depommier, J P Martin, R Poutissou  
 VIRGINIA TECH - M Blecher, K Gotow  
 NATIONAL RESEARCH COUNCIL, OTTAWA - C K Hargrove, H Mes  
 BRITISH COLUMBIA U - R A Burnham, M Hasinoff, J M Poutissou  
 TRIUMF - J A Macdonald, J Spuller  
 CHICAGO U - C S Wright

**Accelerator** TRIUMF **Detector** TPC

### Reactions

$\mu^- \text{ nucleus} \rightarrow e^- \text{ nucleus}$  0 GeV/c

**Papers** NIM 219 (1984) 461, NIM 234 (1985) 42, and PRL 55 (1985) 445.

**TRIUMF-121** (Jun 1979)

### TEST OF CHARGE SYMMETRY IN $np$ SCATTERING

MANITOBA U - J Birchall, C A Davis, N E Davison, H P Gubler, W P Lee, W T H van Oers (✓ Spokesperson), P R Poffenberger, J P Svenne, Y P Zhang  
 BASEL U - G R Plattner  
 TRIUMF - R Abegg, P P J Delheij, D C Healey, C A Miller, G D Wait  
 ALBERTA U - E B Cairns, G H Coombes, P W Green, L G Greeniaus, W J McDonald, G A Moss, G Roy, J Soukup, R Tkachuk

**Accelerator** TRIUMF **Detector** Wire chamber, Counter

**Reactions** Polarized beam and target

$n p \rightarrow n p$  480 MeV ( $T_{lab}$ )

**Comments** Studies the isospin-mixing, charge-symmetry-breaking component of the  $np$  interaction by measuring the difference between the neutron and proton analyzing powers. Polarized (unpolarized) neutrons are scattered from an unpolarized (polarized) proton target.

**Papers** NIM A234 (1985) 11, NIM A234 (1985) 20, and PRL 56 (1986) 2571.

**TRIUMF-132-192** (Jun 1981) Approved Jun 1981; Completed 1983.

### MEASUREMENT OF THE PION PRODUCTION ASYMMETRIES AND CROSS SECTIONS FROM REACTION $pp \rightarrow d\pi^+$ WITH A POLARIZED PROTON BEAM AT ENERGIES 350-500 MeV

TRIUMF - D Ottewell, P Walden (Spokesperson)  
 MANITOBA U - W Falk  
 BRITISH COLUMBIA U - E G Auld, G Giles, G Jones, G Lolos, B McParland, W Ziegler

**Accelerator** TRIUMF **Detector** Counter, Wire chamber

**Reactions** Polarized beam

$p p \rightarrow \text{deut } \pi^+$  350-500 MeV ( $T_{lab}$ )  
 $p p \rightarrow p p$  "

**Papers** PR C28 (1983) 2551, and NP A412 (1984) 189.

**TRIUMF-134** (1980) Approved Jun 1980.

### MEASUREMENT OF THE PARAMETER $\eta$ IN MUON DECAY

## SUMMARIES OF EXPERIMENTS

LBL - J A Bistirlich, R R Bossingham, A D Chacon,  
 C W Clawson, K M Crowe (Spokesperson), T J Humanic,  
 C J Martoff, C A Meyer, J Miller  
 SIN - J A Jansen  
 BRITISH COLUMBIA U - J H Brewer, R Keitel, M Salomon  
 ZURICH U - U Straumann  
Accelerator TRIUMF Detector Spectrometer  
Reactions Polarized beam  
 $\mu^+ \rightarrow e^+ \nu \bar{\nu}$  0 GeV/c  
Particles studied  $\mu^+$

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**TRIUMF-137** (Nov 1978) Approved Nov 1978.

### LIFETIME OF THE POSITIVE MUON

WILLIAM AND MARY COLL - W Dey, M Eckhause  
 ( $\checkmark$  Spokesperson), K Giovanetti, R D Hart, R Hartmann,  
 D Hertzog, J R Kane, W Orange, W Phillips, R Siegel,  
 W Vulcan, R E Welsh, R G Winter

Accelerator TRIUMF Detector Counter

#### Reactions

$\mu^+ \rightarrow e^+ \nu \bar{\nu}$  0 GeV/c

Particles studied  $\mu^+$

Papers PR D29 (1984) 343.

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**TRIUMF-168** (1980) Approved Nov 1980.

### 2S MUONIUM PRODUCTION FROM THIN FOILS

BRITISH COLUMBIA U - J H Brewer, A Fry, R Kiefl,  
 G Marshall, C Oram (Spokesperson), J B Warren

Accelerator TRIUMF Detector ?

#### Reactions

$\mu^+ e^- \rightarrow \mu^+ e^- \gamma$  —

Comments Measurement of Lamb shift in 2S muonium.

Papers JPHY B14 (1981) L789, and PRL 52 (1984) 910.

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**TRIUMF-171** (Nov 1980) Approved Nov 1980; Completed 1982.

### TEST OF T-INVARIANCE IN $pp$ SCATTERING

TRIUMF - D P Gurd, D A Hutcheon (Spokesperson),  
 C A Miller  
 MANITOBA U - R Abegg  
 ALBERTA U - J M Cameron, G Greeniaus, R Liljestrang,  
 G A Moss, G Roy, H Wilson

Accelerator TRIUMF Detector Counter

Reactions Polarized beam

$p p \rightarrow p p$  200 MeV ( $T_{lab}$ )

Comments Measures P-A.

Papers PR C33 (1986) 1196.

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**TRIUMF-174** (Nov 1980) Approved Nov 1980.

### SPIN DEPENDENCE OF THE $pp \rightarrow pn\pi^+$ REACTION

BRITISH COLUMBIA U - D A Axen (Spokesperson),  
 M Comyn, R Dubois, C Waltham  
 QUEEN MARY COLL - D V Bugg, J A Edgington  
 SURREY U - A S Clough  
 TRIUMF - G Ludgate  
 UCLA - J R Richardson  
 VICTORIA U - L P Robertson  
 BEDFORD COLL - N M Stewart

Accelerator TRIUMF Detector Wire chamber

Reactions Polarized beam and target

$p p \rightarrow p n \pi^+$  380, 425, 470, 515 MeV ( $T_{lab}$ )

Comments Measures cross sections in spin states  $C_{NN}$ ,  $C_{SS}$ ,  
 $C_{LL}$ , and  $C_{LS}$ .

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### TRIUMF-182

#### MEASUREMENT OF THE $np$ SPIN CORRECLA- TION PARAMETER $A_{nn}$

TRIUMF - R Abegg, L G Greeniaus, C A Miller  
 MANITOBA U - J Birchall, N E Davison, H P Gubler  
 (Spokesperson), W P Lee, W T H van Oers (Spokesperson),  
 P R Poffenberger  
 ALBERTA U - P W Green, G A Moss, G Roy, G M Stinson,  
 J Wesick

Accelerator TRIUMF Detector ?

Reactions Polarized beam and target

$n p \rightarrow n p$  237, 343, 445, 515 MeV ( $T_{lab}$ )

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**TRIUMF-185** (Jun 1980) Started 1981.

#### PRECISE MEASUREMENT OF THE POLARIZA- TION PARAMETER $\xi$ : A SEARCH FOR THE EF- FECTS OF A RIGHT-HANDED GAUGE BOSON IN $\mu^+$ DECAY

UC, BERKELEY & LBL - B Balke, J Carr, G Gidal,  
 A Jodidio, K Shinsky, H M Steiner, D P Stoker, M Strovink  
 ( $\checkmark$  Spokesperson), R D Tripp

TRIUMF - C Oram

NORTHWESTERN U - B Gobbi

Accelerator TRIUMF Detector Counter

#### Reactions

$\mu^+ \rightarrow e^+ \nu \bar{\nu}$  30 MeV/c

Particles studied  $\mu^+$

Papers PRL 51 (1983) 627, PRL 54 (1985) 1887, and PR D34  
 (1986) 1967.

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**TRIUMF-190** (Jun 1981) Approved Jun 1981.

#### RADIATIVE POLARIZED NEUTRON CAPTURE ON PROTONS

ALBERTA U - J M Cameron ( $\checkmark$  Spokesperson),  
 I J Van Heerden, P Kitching, W J McDonald, J Soukup,  
 H Wilson

MANITOBA U - R Abegg

TRIUMF - D A Hutcheon, C A Miller

OREGON STATE U - A W Stetz

Accelerator TRIUMF Detector Counter

Reactions Polarized beam

$n p \rightarrow deut \gamma$  180-500 MeV ( $T_{lab}$ )

Comments Measures cross section and analyzing power.

Papers PL 137B (1984) 315.

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**TRIUMF-205** (Nov 1981) Approved Jul 1982; Completed.

#### TENSOR ANALYZING POWER IN $\pi d$ SCATTERING

SASKATCHEWAN U - L Dallin, K Itoh, Y M Shin  
 ( $\checkmark$  Spokesperson)

BRITISH COLUMBIA U - K Aniol, K L Erdman, W Gyles,  
 R R Johnson, G Lolos, R Tacik

TRIUMF - E W Blackmore, D Gill, J S Vincent

TORONTO U - T E Drake

MCGILL U - S K Mark

KERNFORSCHUNGSANLAGE, JULICH - S Martin

Accelerator TRIUMF Detector Counter

#### Reactions

$\pi^+ deut \rightarrow \pi^+ deut$  80-250 MeV ( $T_{lab}$ )

Comments Measures the polarization of the final-state  
 deuteron.

Papers PRL 55 (1985) 2672.

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**TRIUMF-208** (Jul 1982) Approved Dec 1982.

#### PROTON-PROTON BREMSSTRAHLUNG

ALBERTA U - R Abegg, E B Cairns, J M Cameron,  
 H C Coombes, C A Davis, G Gaillard, P W Green,

## SUMMARIES OF EXPERIMENTS

L G Greeniaus, M Hugi, D A Hutcheon, P Kitching  
( $\checkmark$  Spokesperson), K Michaelian, C A Miller, G C Neilson,  
W C Olsen, D M Sheppard, J Soukup, J Uegaki, J Wesick  
TRIUMF - H W Fearing  
BRITISH COLUMBIA U - R Workman

Accelerator TRIUMF Detector Counter

Reactions Polarized beam  
 $p p \rightarrow p p \gamma$  775 MeV/c

Comments Measures differential cross section and analyzing power. Data taking at 775 MeV/c completed July 85. Runs at higher momenta are planned for 1987/88.

Papers PRL 57, (1986) 2363.

**TRIUMF-217** (Jul 1982) Approved Jul 1982.

### LOW ENERGY, ELECTROMAGNETIC PION FORM FACTORS

TRIUMF - J-M Poutissou ( $\checkmark$  Spokesperson)  
OREGON STATE U - P Gumplinger, A W Stetz  
BRITISH COLUMBIA U - M D Hasinoff, C Virtue,  
C Waltham

QUEENS U, KINGSTON - B C Robertson  
LBL - T Mulera, V Perez-Mendez, A F Shor  
OXFORD U - S H Chew  
BIRMINGHAM U - J Lowe

Accelerator TRIUMF Detector Counter

Reactions  
 $\pi^- p \rightarrow \pi^0 n$  0 GeV/c  
 $\pi^0 \rightarrow e^+ e^- \gamma$  —

Particles studied  $\pi^0$

Comments A measurement of the slope parameter of the electromagnetic form factor of the  $\pi^0$  at very low momentum transfers based on the shape and rate of the invariant mass distribution of  $e^+e^-$  pairs. Analysis in progress (October 86).

**TRIUMF-247** (Jul 1983) Approved Jul 1983; Started Jan 1984; Completed Feb 1984.

### PRECISE MEASUREMENT OF MUON DECAY ASYMMETRY PARAMETER $\delta$

LBL - J Carr (Spokesperson), G Gidal  
UC, BERKELEY & LBL - B Balke, A Jodidio, K A Shinsky,  
H M Steiner, D Stoker, M Strovink, R D Tripp  
NORTHWESTERN U - B Gobbi  
TRIUMF - C J Oram

Accelerator TRIUMF Detector ?

Reactions  
 $\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$  0 MeV/c

Particles studied  $\mu^+$

**TRIUMF-248** (Jul 1983) Approved Jul 1983; Started Oct 1983.

### A STUDY OF THE $\pi^+ \rightarrow e^+ \nu_e$ DECAY

VICTORIA U - D Britton, D A Bryman, E T H Clifford,  
A Olin  
NATIONAL RESEARCH COUNCIL, OTTAWA - M S Dixit  
TRIUMF - S Ahmad, Y Kuno, J A Macdonald, T Numao  
(Spokesperson)

BRITISH COLUMBIA U - J M Poutissou  
ALBERTA U - P Kitching  
IFE U - B Olaniyi

Accelerator TRIUMF Detector Photon spectrometer

Reactions  
 $\pi^+ \rightarrow e^+ \nu_e$  70 MeV/c  
 $\pi^+ \rightarrow \mu^+ \nu_\mu$  "  
 $\mu^+ \rightarrow e^+ \bar{\nu}_\nu$  52 MeV/c

Particles studied  $\pi^+$

Comments A measurement of branching ratios to test universality in weak interactions, and a search for secondary peaks.

Papers PRL 56 (1986) 2241.

**TRIUMF-249** (Jul 1983)

### RADIATIVE MUON CAPTURE ON HYDROGEN

TRIUMF - S Ahmad, G Azuelos (Spokesperson),  
J A MacDonald, J M Poutissou  
VIRGINIA TECH - M Blecher, D Wright  
BRITISH COLUMBIA U - D Armstrong, A Burnham,  
T Gorringer, M K Hasinoff, A Larabee, C Waltham  
MONTREAL U - P Depommier, R Poutissou  
QUEENS U, KINGSTON - B Robertson  
VICTORIA U - E T C Clifford  
BEIJING, IHEP - W S Zhang

Accelerator TRIUMF Detector Wire chamber

Reactions  
 $\mu^- p \rightarrow n \nu_\mu \gamma$  —

Comments In preparation (November 86).

**TRIUMF-277** (Jul 1984) Approved Jul 1984.

### THE BRANCHING RATIO OF THE RARE DECAY $\pi^0 \rightarrow e^+e^-$

MONTREAL U - G Azuelos, P Depommier, H Jeremie,  
R Poutissou  
VIRGINIA TECH - M Blecher.  
TRIUMF & VICTORIA U - D A Bryman, E Clifford,  
T Numao  
NATIONAL RESEARCH COUNCIL, OTTAWA -  
C K Hargrove, H Mes  
TRIUMF & BRITISH COLUMBIA U - M D Hasinoff, J-  
M Poutissou, C E Waltham (Spokesperson)  
LBL - T A Mulera, V Perez-Mendez  
QUEENS U, KINGSTON - B Robertson  
OREGON STATE U - A W Stetz

Accelerator TRIUMF Detector TPC

Reactions  
 $\pi^0 \rightarrow e^+ e^-$  —

Particles studied  $\pi^0$

Comments A test of the feasibility of measuring the rare decay mode.

**TRIUMF-287** (Oct 1984) Approved Dec 1984.

### MEASUREMENT OF PARITY VIOLATION IN $\bar{p}p$ SCATTERING

TRIUMF - D A Dohan, D C Healey, C A Miller, P W Schmor  
MANITOBA U - J Birchall ( $\checkmark$  Spokesperson), C A Davis,  
N E Davison, W T H van Oers, S A Page, W D Ramsay  
LOS ALAMOS - J D Bowman  
ALBERTA U - G H Combes, W J McDonald, G Roy  
( $\checkmark$  Spokesperson), J Soukup, G M Stinson  
UC, IRVINE - W P Lee  
WASHINGTON U, SEATTLE - E G Adelberger

Accelerator TRIUMF Detector Wire chamber

Reactions Polarized beam  
 $p p \rightarrow p p$  230 MeV ( $T_{lab}$ )

Comments Measures the analyzing power angular distribution.

**TRIUMF-297**

### ENERGETIC NEUTRON SPECTRA FROM $\mu^-$ CAPTURE IN DEUTERON

JOHNS HOPKINS U - T J Hallman, Y K Lee  
( $\checkmark$  Spokesperson), L Madansky, E K McIntyre, Jr  
VICTORIA U - G R Mason

Accelerator TRIUMF Detector Counter



## SUMMARIES OF EXPERIMENTS

### Reactions

$\mu^-$  deut  $\rightarrow$   $n$   $n$  0 MeV/c

Comments Taking data (November 86).

Papers PL B (submitted).

**TRIUMF-298** (Dec 1984) Approved Dec 1984.

### RESONANT STRUCTURE IN $\text{Cu}(p, \pi^+)X$ : A POSSIBLE DIBARYON SIGNAL

TRIUMF - D Gill, D Ottewell, S Yen ( $\checkmark$  Spokesperson)  
 TRIUMF & SIMON FRASER U - K Hicks, K P Jackson  
 TRIUMF & ALBERTA U - R Abegg, G Gaillard, C A Miller  
 TRIUMF & BRITISH COLUMBIA U - P Walden  
 TORONTO U - R Schubank  
 MELBOURNE U - R Henderson  
 BRITISH COLUMBIA U - E Auld, P Trelle  
 REGINA U - G Huber

Accelerator TRIUMF Detector Spectrometer

### Reactions

$p$  Cu  $\rightarrow$   $\pi^+$  X 325-385 MeV ( $T_{\text{lab}}$ )

Particles studied dibaryon

Comments Last data taken August 85. More to come.

**TRIUMF-300** (Oct 1984)

### SPIN TRANSFER $K_{SS}$ IN THE REACTION $pp \rightarrow d\pi^+$

ALBERTA U & TRIUMF - R Abegg, L G Greeniaus,  
D A Hutcheon (Spokesperson)  
 ALBERTA U - L Antonuk, J M Cameron, J Collot,  
 G Gaillard, G A Moss, W C Olsen, G Roy, R Sawafta,  
 D M Sheppard

BRITISH COLUMBIA U - G R Smith

INDIANA U - B Blankleider

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized beam

$p$   $p \rightarrow$  deut  $\pi^+$  510 MeV ( $T_{\text{lab}}$ )

Comments In progress.

**TRIUMF-301** (Oct 1984) Completed Sep 1986.

### THE REACTION $pp \rightarrow pp\pi^0$ NEAR THRESHOLD

BRITISH COLUMBIA U - D F Measday ( $\checkmark$  Spokesperson),

A J Noble, S Stanislaus

BUDAPEST, CRIP - D Horvath

TRIUMF - M Salomon

Accelerator TRIUMF Detector Photon spectrometer

### Reactions

$p$   $p \rightarrow$   $p$   $p$   $\pi^0$  280, 500 MeV ( $T_{\text{lab}}$ )

Comments Measures the  $\pi^0$  asymmetry and differential and total cross sections.

**TRIUMF-303**

### TENSOR ANALYZING POWERS IN $\pi d$ ABSORPTION

REGINA U - L G Greenberg, G Huber, G J Lolos, E L Mathie  
 (Spokesperson), S I H Naovi, V Pafilis, Z Papandreou

BRITISH COLUMBIA U - R R Johnson, G Jones

TRIUMF - P Delheig, D Healey, D Ottewell, G R Smith,  
 P Trelle, G Wait, P Walden

Accelerator TRIUMF Detector Counter, Wire chamber

Reactions Polarized target

$\pi^+$  deut  $\rightarrow$   $p$   $p$  —

**TRIUMF-304** (Oct 1984) Approved Dec 1984; Started Jul 1985.

### MUONIUM-ANTIMUONIUM CONVERSION

VICTORIA U - G A Beer, G M Marshall, G R Mason, A Olin  
 ( $\checkmark$  Spokesperson)

BRITISH COLUMBIA U - J B Warren  
 ARIZONA U - T Bowen, P Halverson, A E Pifer  
 WYOMING U - T Huber, A R Kunselman  
 TRIUMF - K Kendall

Accelerator TRIUMF Detector Wire chamber, Counter

### Reactions

$\mu^+ e^- \rightarrow \mu^- e^+$  20-29 MeV/c

Papers PRL 57 (1986) 611.

**TRIUMF-326** (Dec 1984) Approved Dec 1984.

### DETERMINATION OF THE $\nu_\mu$ MASS

CALGARY U - C Kim ( $\checkmark$  Spokesperson)

TRIUMF - D Garner, R Keitel

SASKATCHEWAN U - Y M Shin

Accelerator TRIUMF Detector Emulsion

### Reactions

$\mu^-$   ${}^6\text{Li} \rightarrow$  trit trit  $\nu_\mu$  0 MeV/c

Particles studied  $\nu_\mu$

Comments Expected to run in 1987.

**TRIUMF-332** (Oct 1984)

$D_t/R_t$

MANITOBA U - J Birchall, N E Davison, W T H van Oets,  
 P R Poffenberger, D Ramsey

MANITOBA U & TRIUMF - C A Davis (Spokesperson)

ALBERTA U - G Moss, G Roy

ALBERTA U & TRIUMF - G Greeniaus

Accelerator TRIUMF Detector ?

Reactions Polarized beam

$p$  deut  $\rightarrow$   $n$   $p$  220, 325, 425, 495 MeV ( $T_{\text{lab}}$ )

Comments Measures the ratio of the Wolfenstein parameters  $D_t$  and  $R_t$  for the  $np$  system.

**TRIUMF-337** (Dec 1984) Approved Dec 1984; Completed Dec 1986.

### MEASUREMENT OF TENSOR OBSERVABLES IN THE $\pi^+ d$ ELASTIC SCATTERING REACTION

TRIUMF - P Delheij, D Gill, D Healey, D Ottewell,

G R Smith (Spokesperson), G Wait, P Walden

REGINA U - G Lolos, E L Mathie

BRITISH COLUMBIA U - A Altman, R R Johnson, G Jones,  
 F Teruisidis, P Trelle

Accelerator TRIUMF Detector Counter

Reactions Polarized target

$\pi^+$  deut  $\rightarrow$   $\pi^+$  deut 100-294 MeV ( $T_{\text{lab}}$ )

Papers PRL 57 (1986) 803.

**TRIUMF-360** (Nov 1985) Approved Dec 1985.

### POLARIZATION TRANSFER IN $\pi d$ ELASTIC SCATTERING

TRIUMF - P Dehij, D Gill, D Healey, D Ottewell, G Wait

BRITISH COLUMBIA U - A Altman

SASKATCHEWAN U - I Chun, K Itoh, Y M Shin

( $\checkmark$  Spokesperson), N Stevenson

TORONTO U - T Drake, R Schubank

Accelerator TRIUMF Detector ?

Reactions Polarized target

$\pi^+$  deut  $\rightarrow$   $\pi^+$  deut 160 MeV ( $T_{\text{lab}}$ )

**TRIUMF-368** Approved Dec 1985.

### CHARGE SYMMETRY BREAKING IN $p(n, d)\pi^0$ AT 477 MeV

TRIUMF - R Abegg, P W Green, L G Greeniaus

( $\checkmark$  Spokesperson), D A Hutcheon, C A Miller, G M Stinson

## SUMMARIES OF EXPERIMENTS

ALBERTA U - J M Cameron, C Lapointe, G A Moss,  
G C Neilson, W C Olsen, D M Sheppard  
MANITOBA U & TRIUMF - C A Davis  
MANITOBA U - W T H van Oers

Accelerator TRIUMF Detector Spectrometer

Reactions

$n p \rightarrow \text{deut } \pi^0$  477 MeV ( $T_{\text{lab}}$ )  
 $p p \rightarrow \text{deut } \pi^+$  "

Comments Measures the forward-backward asymmetry in  $p(n, d)\pi^0$ . Systematic errors are corrected by comparison with the charge symmetric reaction  $p(p, d)\pi^+$ . The result is sensitive to  $\pi$ - $\eta$  mixing and the  $\eta$ -nucleon coupling constant. In preparation (November 86).

**TRIUMF-369** (Dec 1985) Approved Dec 1985.

**CHARGE SYMMETRY BREAKING IN  $np$  ELASTIC SCATTERING AT 350 MeV**

TRIUMF - R Abegg, P W Green, L G Greeniaus  
( $\checkmark$  Spokesperson), C A Miller  
MANITOBA U - J Birchall, C Davis, W T H van Oers  
( $\checkmark$  Spokesperson), W D Ramsay  
ALBERTA U - C Lapointe, W J McDonald, G A Moss,  
R Tkachuk ( $\checkmark$  Spokesperson)

Accelerator TRIUMF Detector Counter, Wire chamber

Reactions Polarized beam and target

$n p \rightarrow n p$  350 MeV ( $T_{\text{lab}}$ )

Comments Measures analyzing power differences.

**TRIUMF-372** Approved Dec 1985.

**SINGLE PION PRODUCTION IN  $np$  SCATTERING**

MANITOBA U - J Birchall, C A Davis, N E Davison  
( $\checkmark$  Spokesperson), W R Falk, W T H van Oers, S A Page,  
W D Ramsay

TRIUMF - P W Green, D A Hutcheon, C A Miller,  
P L Walden

DAWSON COLLEGE - M Suec

TEXAS U - P J Riley

HOUSTON U - B W Mayes, L Pinsky

RICE U - G W Mutchler, G C Phillips

CAL STATE, L A - D J Margaziotis

Accelerator TRIUMF Detector Wire chamber, Counter

Reactions Polarized beam

$n p \rightarrow p p \pi^-$  450 MeV ( $T_{\text{lab}}$ )

**TRIUMF-375**

**FEW BODY PHYSICS VIA THE PION-DEUTERON BREAKUP REACTION**

REGINA U - G Huber, G J Lolos, E L Mathie (Spokesperson),  
S I H Naqui, V Palitis, Z Papandreou  
BRITISH COLUMBIA U - G Jones, M Sevier, P Trelle  
TRIUMF - P Delheij, D R Gill, D Healey, D Ottewell,  
G R Smith, G Wait

Accelerator TRIUMF Detector Counter

Reactions Polarized target

pion deut  $\rightarrow$  pion  $p n$  —

**TRIUMF-377** Approved Dec 1985; Completed Aug 1986.

**TEST OF CHARGE SYMMETRY IN  $\pi d$  ELASTIC SCATTERING**

TRIUMF - D Gill, D F Ottewell, G R Smith (Spokesperson),  
P L Walden  
BRITISH COLUMBIA U - A Altman, R R Johnson, G Jones,  
F Tervisidis, P Trelle  
COLORADO U - J J Kraushar, R J Peterson, R A Ristinen,  
J L Ullmann

Accelerator TRIUMF Detector Counter

Reactions

$\pi^+$  deut  $\rightarrow \pi^+$  deut 143-256 MeV ( $T_{\text{lab}}$ )  
 $\pi^-$  deut  $\rightarrow \pi^-$  deut "

Comments Measures differential cross sections and  $A_\pi$ .

**TRIUMF-387** (Nov 1985) Approved Dec 1985.

**MEASURE OF BIRKS FACTOR IN TMP**

VICTORIA U - A Astbury (Spokesperson), M Fincke-Keeler,  
R Keeler, G Mason, L Robertson  
CERN - D Schinzel  
ANNECY - A Gonidec  
TRIUMF - C J Oram

Accelerator TRIUMF Detector ?

Reactions

$\pi^+$  50-400 MeV/c  
 $\mu^+$  "  
 $e^+$  "  
 $p$  "  
deut "  
trit "  
 $^3\text{He}$  "

**TRIUMF-394** (Jul 1986) Approved Jul 1986; Completed 1986.

**$\pi^\pm p$  DIFFERENTIAL CROSS SECTIONS FROM 20 TO 65 MeV KINETIC ENERGY**

COLORADO U - J T Brack, J J Kraushaar, R A Loveman,  
R J Peterson, R A Ristinen ( $\checkmark$  Spokesperson), J L Ullmann  
TRIUMF - D R Gill ( $\checkmark$  Spokesperson)  
BRITISH COLUMBIA U - R R Johnson, R Olszewski,  
M Sevier, G R Smith, R P Trelle  
REGINA U - E L Mathie

Accelerator TRIUMF Detector Counter

Reactions

$\pi^+ p \rightarrow \pi^+ p$  20-65 MeV ( $T_{\text{lab}}$ )  
 $\pi^- p \rightarrow \pi^- p$  "

Comments Approval was for a test of the technique, which works. Further beam time will be requested.

**TRIUMF-249** (Jul 1983)

**RADIATIVE MUON CAPTURE ON HYDROGEN**

TRIUMF - S Ahmad, G Azuelos (Spokesperson),  
J A MacDonald, J M Poutissou  
VIRGINIA TECH - M Blecher, D Wright  
BRITISH COLUMBIA U - D Armstrong, A Burnham,  
T Gorringer, M K Hasinoff, A Larabee, C Waltham  
MONTREAL U - P Depommier, R Poutissou  
QUEENS U, KINGSTON - B Robertson  
VICTORIA U - E T C Clifford  
BEIJING, IHEP - W S Zhang

Accelerator TRIUMF Detector Wire chamber

Reactions

$\mu^- p \rightarrow n \nu \mu \gamma$  —

Comments In preparation (November 86).

**TRIUMF-277** (Jul 1984) Approved Jul 1984.

**THE BRANCHING RATIO OF THE RARE DECAY  $\pi^0 \rightarrow e^+e^-$**

MONTREAL U - G Azuelos, P Depommier, H Jeremie,  
R Poutissou  
VIRGINIA TECH - M Blecher  
TRIUMF & VICTORIA U - D A Bryman, E Clifford,  
T Numao  
NATIONAL RESEARCH COUNCIL, OTTAWA -  
C K Hargrove, H Mes  
TRIUMF & BRITISH COLUMBIA U - M D Hasinoff, J-  
M Poutissou, C E Waltham (Spokesperson)

## SUMMARIES OF EXPERIMENTS

LBL - T A Mulera, V Perez-Mendez  
 QUEENS U, KINGSTON - B Robertson  
 OREGON STATE U - A W Stetz

Accelerator TRIUMF Detector TPC

Reactions

$$\pi^0 \rightarrow e^+ e^-$$

Particles studied  $\pi^0$

Comments A test of the feasibility of measuring the rare decay mode.

**TRIUMF-287** (Oct 1984) Approved Dec 1984.

**MEASUREMENT OF PARITY VIOLATION IN  $\bar{p}p$  SCATTERING**

TRIUMF - D A Dohan, D C Healey, C A Miller, P W Schmor  
 MANITOBA U - J Birchall ( $\checkmark$  Spokesperson), C A Davis,  
 N E Davison, W T H van Oers, S A Page, W D Ramsay  
 LOS ALAMOS - J D Bowman  
 ALBERTA U - G H Combes, W J McDonald, G Roy  
 ( $\checkmark$  Spokesperson), J Soukup, G M Stinson

UC, IRVINE - W P Lee

WASHINGTON U, SEATTLE - E G Adelberger

Accelerator TRIUMF Detector Wire chamber

Reactions Polarized beam

$$p p \rightarrow p p \quad 230 \text{ MeV } (T_{\text{lab}})$$

Comments Measures the analyzing power angular distribution.

**TRIUMF-297**

**ENERGETIC NEUTRON SPECTRA FROM  $\mu^-$  CAPTURE IN DEUTERON**

JOHNS HOPKINS U - T J Hallman, Y K Lee  
 ( $\checkmark$  Spokesperson), L Madansky, E K McIntyre, Jr  
 VICTORIA U - G R Mason

Accelerator TRIUMF Detector Counter

Reactions

$$\mu^- \text{ deut} \rightarrow n n \quad 0 \text{ MeV}/c$$

Comments Taking data (November 86).

Papers PL B (submitted).

**TRIUMF-298** (Dec 1984) Approved Dec 1984.

**RESONANT STRUCTURE IN  $\text{Cu}(p, \pi^+)X$ : A POSSIBLE DIBARYON SIGNAL**

TRIUMF - D Gill, D Ottewell, S Yen ( $\checkmark$  Spokesperson)  
 TRIUMF & SIMON FRASER U - K Hicks, K P Jackson  
 TRIUMF & ALBERTA U - R Abegg, G Gaillard, C A Miller  
 TRIUMF & BRITISH COLUMBIA U - P Walden  
 TORONTO U - R Schubank  
 MELBOURNE U - R Henderson  
 BRITISH COLUMBIA U - E Auld, P Trelle  
 REGINA U - G Huber

Accelerator TRIUMF Detector Spectrometer

Reactions

$$p \text{ Cu} \rightarrow \pi^+ X \quad 325\text{-}385 \text{ MeV } (T_{\text{lab}})$$

Particles studied dibaryon

Comments Last data taken August 85. More to come.

**TRIUMF-300** (Oct 1984)

**SPIN TRANSFER  $K_{SS}$  IN THE REACTION  $pp \rightarrow d\pi^+$**

ALBERTA U & TRIUMF - R Abegg, L G Greeniaus,  
 D A Hutcheon (Spokesperson)  
 ALBERTA U - L Antonuk, J M Cameron, J Collot,  
 G Gaillard, G A Moss, W C Olsen, G Roy, R Sawafta,  
 D M Sheppard  
 BRITISH COLUMBIA U - G R Smith  
 INDIANA U - B Blankleider

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized beam

$$p p \rightarrow \text{deut } \pi^+ \quad 510 \text{ MeV } (T_{\text{lab}})$$

Comments In progress.

**TRIUMF-301** (Oct 1984) Completed Sep 1986.

**THE REACTION  $pp \rightarrow pp\pi^0$  NEAR THRESHOLD**

BRITISH COLUMBIA U - D F Measday ( $\checkmark$  Spokesperson),  
 A J Noble, S Stanislaus  
 BUDAPEST, CRIP - D Horvath  
 TRIUMF - M Salomon

Accelerator TRIUMF Detector Photon spectrometer

Reactions

$$p p \rightarrow p p \pi^0 \quad 280, 500 \text{ MeV } (T_{\text{lab}})$$

Comments Measures the  $\pi^0$  asymmetry and differential and total cross sections.

**TRIUMF-303**

**TENSOR ANALYZING POWERS IN  $\pi d$  ABSORPTION**

REGINA U - L G Greenberg, G Huber, G J Lolos, E L Mathie  
 (Spokesperson), S I H Naovi, V Pafilis, Z Papandreou  
 BRITISH COLUMBIA U - R R Johnson, G Jones  
 TRIUMF - P Delheig, D Healey, D Ottewell, G R Smith,  
 P Trelle, G Wait, P Walden

Accelerator TRIUMF Detector Counter, Wire chamber

Reactions Polarized target

$$\pi^+ \text{ deut} \rightarrow p p$$

**TRIUMF-304** (Oct 1984) Approved Dec 1984; Started Jul 1985.

**MUONIUM-ANTI-MUONIUM CONVERSION**

VICTORIA U - G A Beer, G M Marshall, G R Mason, A Olin  
 ( $\checkmark$  Spokesperson)  
 BRITISH COLUMBIA U - J B Warren  
 ARIZONA U - T Bowen, P Halverson, A E Pifer  
 WYOMING U - T Huber, A R Kunselman  
 TRIUMF - K Kendall

Accelerator TRIUMF Detector Wire chamber, Counter

Reactions

$$\mu^+ e^- \rightarrow \mu^- e^+ \quad 20\text{-}29 \text{ MeV}/c$$

Papers PRL 57 (1986) 611.

**TRIUMF-326** (Dec 1984) Approved Dec 1984.

**DETERMINATION OF THE  $\nu_\mu$  MASS**

CALGARY U - C Kim ( $\checkmark$  Spokesperson)  
 TRIUMF - D Garner, R Keitel  
 SASKATCHEWAN U - Y M Shin

Accelerator TRIUMF Detector Emulsion

Reactions

$$\mu^- \text{ } ^6\text{Li} \rightarrow \text{trit trit } \nu_\mu \quad 0 \text{ MeV}/c$$

Particles studied  $\nu_\mu$

Comments Expected to run in 1987.

**TRIUMF-332** (Oct 1984)

$D_t/R_t$

MANITOBA U - J Birchall, N E Davison, W T H van Oers,  
 P R Poffenberger, D Ramsey  
 MANITOBA U & TRIUMF - C A Davis (Spokesperson)  
 ALBERTA U - G Moss, G Roy  
 ALBERTA U & TRIUMF - G Greeniaus

Accelerator TRIUMF Detector ?

## SUMMARIES OF EXPERIMENTS

Reactions Polarized beam

$p \text{ deut} \rightarrow n p p$  220, 325, 425, 495 MeV ( $T_{\text{lab}}$ )

Comments Measures the ratio of the Wolfenstein parameters  $D_L$  and  $R_L$  for the  $np$  system.

**TRIUMF-337** (Dec 1984) Approved Dec 1984; Completed Dec 1986.

**MEASUREMENT OF TENSOR OBSERVABLES IN THE  $\pi^+d$  ELASTIC SCATTERING REACTION**

TRIUMF - P Delheij, D Gill, D Healey, D Ottewell,

G R Smith (Spokesperson), G Wait, P Walden

REGINA U - G Lolos, E L Mathie

BRITISH COLUMBIA U - A Altman, R R Johnson, G Jones, F Teruisidis, P Trelle

Accelerator TRIUMF Detector Counter

Reactions Polarized target

$\pi^+ \text{ deut} \rightarrow \pi^+ \text{ deut}$  100-294 MeV ( $T_{\text{lab}}$ )

Papers PRL 57 (1986) 803.

**TRIUMF-360** (Nov 1985) Approved Dec 1985.

**POLARIZATION TRANSFER IN  $\pi d$  ELASTIC SCATTERING**

TRIUMF - P Dehij, D Gill, D Healey, D Ottewell, G Wait

BRITISH COLUMBIA U - A Altman

SASKATCHEWAN U - I Chun, K Itoh, Y M Shin

( $\checkmark$  Spokesperson), N Stevenson

TORONTO U - T Drake, R Schubank

Accelerator TRIUMF Detector ?

Reactions Polarized target

$\pi^+ \text{ deut} \rightarrow \pi^+ \text{ deut}$  160 MeV ( $T_{\text{lab}}$ )

**TRIUMF-368** Approved Dec 1985.

**CHARGE SYMMETRY BREAKING IN  $p(n, d)\pi^0$  AT 477 MeV**

TRIUMF - R Abegg, P W Green, L G Greeniaus

( $\checkmark$  Spokesperson), D A Hutcheon, C A Miller, G M Stinson

ALBERTA U - J M Cameron, C Lapointe, G A Moss,

G C Neilson, W C Olsen, D M Sheppard

MANITOBA U & TRIUMF - C A Davis

MANITOBA U - W T H van Oers

Accelerator TRIUMF Detector Spectrometer

Reactions

$n p \rightarrow \text{deut } \pi^0$  477 MeV ( $T_{\text{lab}}$ )

$p p \rightarrow \text{deut } \pi^+$  "

Comments Measures the forward-backward asymmetry in  $p(n, d)\pi^0$ . Systematic errors are corrected by comparison with the charge symmetric reaction  $p(p, d)\pi^+$ . The result is sensitive to  $\pi$ - $\eta$  mixing and the  $\eta$ -nucleon coupling constant. In preparation (November 86).

**TRIUMF-369** (Dec 1985) Approved Dec 1985.

**CHARGE SYMMETRY BREAKING IN  $np$  ELASTIC SCATTERING AT 350 MeV**

TRIUMF - R Abegg, P W Green, L G Greeniaus

( $\checkmark$  Spokesperson), C A Miller

MANITOBA U - J Birchall, C Davis, W T H van Oers

( $\checkmark$  Spokesperson), W D Ramsay

ALBERTA U - C Lapointe, W J McDonald, G A Moss,

R Tkachuk ( $\checkmark$  Spokesperson)

Accelerator TRIUMF Detector Counter, Wire chamber

Reactions Polarized beam and target

$n p \rightarrow n p$  350 MeV ( $T_{\text{lab}}$ )

Comments Measures analyzing power differences.

**TRIUMF-372** Approved Dec 1985.

**SINGLE PION PRODUCTION IN  $np$  SCATTERING**

MANITOBA U - J Birchall, C A Davis, N E Davison

( $\checkmark$  Spokesperson), W R Falk, W T H van Oers, S A Page,

W D Ramsay

TRIUMF - P W Green, D A Hutcheon, C A Miller,

P L Walden

DAWSON COLLEGE - M Suec

TEXAS U - P J Riley

HOUSTON U - B W Mayes, L Pinsky

RICE U - G W Mutchler, G C Phillips

CAL STATE, L A - D J Margaziotis

Accelerator TRIUMF Detector Wire chamber, Counter

Reactions Polarized beam

$n p \rightarrow p p \pi^-$  450 MeV ( $T_{\text{lab}}$ )

**TRIUMF-375**

**FEW BODY PHYSICS VIA THE PION-DEUTERON BREAKUP REACTION**

REGINA U - G Huber, G J Lolos, E L Mathie (Spokesperson),

S I H Naqui, V Palitis, Z Papandreou

BRITISH COLUMBIA U - G Jones, M Seviar, P Trelle

TRIUMF - P Delheij, D R Gill, D Healey, D Ottewell,

G R Smith, G Wait

Accelerator TRIUMF Detector Counter

Reactions Polarized target

pion deut  $\rightarrow$  pion  $p n$

**TRIUMF-377** Approved Dec 1985; Completed Aug 1986.

**TEST OF CHARGE SYMMETRY IN  $\pi d$  ELASTIC SCATTERING**

TRIUMF - D Gill, D F Ottewell, G R Smith (Spokesperson),

P L Walden

BRITISH COLUMBIA U - A Altman, R R Johnson, G Jones,

F Tervisidis, P Trelle

COLORADO U - J J Kraushar, R J Peterson, R A Ristinen,

J L Ullmann

Accelerator TRIUMF Detector Counter

Reactions

$\pi^+ \text{ deut} \rightarrow \pi^+ \text{ deut}$  143-256 MeV ( $T_{\text{lab}}$ )

$\pi^- \text{ deut} \rightarrow \pi^- \text{ deut}$  "

Comments Measures differential cross sections and  $A_\pi$ .

**TRIUMF-387** (Nov 1985) Approved Dec 1985.

**MEASURE OF BIRKS FACTOR IN TMP**

VICTORIA U - A Astbury (Spokesperson), M Fincke-Keeler,

R Keeler, G Mason, L Robertson

CERN - D Schinzel

ANNECY - A Gonidec

TRIUMF - C J Oram

Accelerator TRIUMF Detector ?

Reactions

$\pi^+$  50-400 MeV/c

$\mu^+$  "

$e^+$  "

$p$  "

deut "

trit "

$^3\text{He}$  "

**TRIUMF-394** (Jul 1986) Approved Jul 1986; Completed 1986.

**$\pi^\pm p$  DIFFERENTIAL CROSS SECTIONS FROM 20 TO 65 MeV KINETIC ENERGY**

COLORADO U - J T Brack, J J Kraushaar, R A Loveman,

R J Peterson, R A Ristinen ( $\checkmark$  Spokesperson), J L Ullmann

TRIUMF - D R Gill ( $\checkmark$  Spokesperson)

BRITISH COLUMBIA U - R R Johnson, R Olszewski,

M Seviar, G R Smith, R P Trelle

## SUMMARIES OF EXPERIMENTS

REGINA U - E L Mathie

Accelerator TRIUMF Detector Counter

Reactions

$\pi^+ p \rightarrow \pi^+ p$                     20-65 MeV ( $T_{\text{lab}}$ )  
 $\pi^- p \rightarrow \pi^- p$                     "

Comments Approval was for a test of the technique, which works. Further beam time will be requested.

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**BROOKHAVEN AGS BEAMS** (Source: G. Bunce, BNL)

Up to  $10^{13}$  protons per pulse are accelerated typically to 28.5 GeV kinetic energy (31 GeV has been obtained). At 28.5 GeV, the period is 2.4 sec for slow extraction (with a 1-sec flattop), or 1.4 sec for fast extraction (used for neutrino beams). Counting rates may be estimated using the nominal beam spill time of 1 sec. The beam lines with  $0^\circ$  production angles can be used for polarized protons and/or for heavy ion beams.

Beam	Momentum range (GeV/c)	$\pm\Delta p/p$ (%)	Production angle ( $^\circ$ )	Solid angle (msr)	Beam length (m)	Particles	Flux in thousands per $10^{12}$ protons on target	$\rightarrow$ at (GeV/c)	Comments
B2, B4	1.5-6	3	3	0.3	81	$K^+/K^-$	270/120	4	Usually $2 \times 10^{12}$ ppp on target; $\pi/K \sim 3$ in K beam; $\pi/\bar{p} \sim 3/4$
	1.5-9					$\bar{p}$	100		
						$\pi^+/\pi^-$	$4 \times 10^4/3 \times 10^4$		
C2, C4	$\leq 1.1$	2	10.5	2.6	15	$K^+/K^-$	40/12	0.75	Usually $2 \times 10^{12}$ ppp; $\pi/K \sim 10$ in K beam
						$\bar{p}$	2		
						$\pi^+/\pi^-$	$8 \times 10^4$		
C6, C8	$\leq 0.8$	2.5	5	15	15	$K^+/K^-$	200/60	0.75	Usually $2 \times 10^{12}$ ppp; $\pi/K \sim 20$
						$\bar{p}$	14		
						$\pi^+/\pi^-$	$6 \times 10^5$		
A1	5-24	1.5	0	0.2	130	$\pi^-$	1000	22	To multiparticle spectrometer; $10^{12}$ ppp; 25 cm Be target
B1	5-28	3	0	0.3	75	$K^+/K^-$	2000/400	10	Usually $2 \times 10^{12}$ ppp
						$p/\bar{p}$	$5 \times 10^4/130$		
						$\pi^+/\pi^-$	$4 \times 10^4/3 \times 10^4$		
C1	1-24	3	0	0.8	61	$K^+/K^-$	6000/700	13	Usually $2 \times 10^{12}$ ppp; $\mu/\pi \sim 3\%$ in $\pi$ beam
						$p/\bar{p}$	$2 \times 10^5/140$		
						$\pi^+/\pi^-$	$7 \times 10^4/5 \times 10^4$		
D2, D4	0.1-0.3( $\pi$ ) 0.05-0.15( $\mu$ )	9( $\pi$ )	55( $\pi$ )	50( $\pi$ )	9	$\mu^-$	2000	0.10	Muon channel; flux in $100 \text{ cm}^2$ with $\Delta p/p = \pm 2\%$
D6	0-6	8	2	0.5	32	$K^+/K^-$	$2 \times 10^4/7 \times 10^3$	6	
						$p$	$2 \times 10^5$		
						$\pi^+/\pi^-$	$2 \times 10^5/10^5$		
A3	1-28		0	0.045	8	$K_L$	$10^5$	1-28	Typically $10^{12}$ ppp; alternates with A1
						$n$	$3 \times 10^6$		
B5	1-28		1-4.5	0.1	2.6	$n$	$1.5 \times 10^6$	9-28	Typically $10^{10}$ ppp (based on E791 estimate)
						$K_L$	$5 \times 10^4$		
U	$\langle E_\nu \rangle = 1.4$ (wide band)					$\nu/\bar{\nu}$	$2 \times 10^6/1.4 \times 10^6$ per $\text{m}^2$		Typically $1.2 \times 10^{13}$ ppp; flux averaged over 1.5 m radius
	$\langle E_\nu \rangle = 1.3$ (narrow band)					$\nu$	$10^5$ per $\text{m}^2$		

**CERN PS BEAMS** [Source: *Experiments at CERN in 1986* (M. Ferro-Luzzi, editor)]

**East area** — The primary beam.

Beam	Momentum (GeV/c)	Particles	Flux/cycle	Comments
e <sub>17</sub>	8-24	p	2 × 10 <sup>11</sup> (for test beams)	Slow ejection; splits into two branches

**East area** — These are counter beams fed by branches of the e<sub>17</sub> beam above. The fluxes are for  $\Delta p/p = \pm 1\%$  and 10<sup>11</sup> 24-GeV/c protons on the external target; they assume 30% target efficiency (fluxes also depend on the external target used).

Beam	Momentum (GeV/c)	Particles	Flux/cycle	Production angle (°)	Beam height (m)	Comments
t <sub>7</sub>	1-10	p, π <sup>+</sup> , e <sup>+</sup> or π <sup>-</sup> , e <sup>-</sup>		0	1.28	e <sup>+</sup> is 7% of + beam at 5 GeV/c, 50% at 2 GeV/c
t <sub>9</sub>	≤ 10	π <sup>-</sup> e <sup>-</sup> positives	≥ 10 <sup>5</sup> at 10 GeV/c ≈ 1-3% ≈ 4 × 10 <sup>5</sup>	0	2.28	The e <sup>-</sup> percentage in the negative beam depends on the external target used.
t <sub>10</sub>	≤ 5	π <sup>-</sup> e <sup>-</sup> positives	≈ 3 × 10 <sup>5</sup> at 5 GeV/c ≈ 10% ≈ 6 × 10 <sup>5</sup>	3.53	2.5	The e <sup>-</sup> percentage in the negative beam depends on the external target used.
t <sub>11</sub>	≤ 3.5	π <sup>-</sup> e <sup>-</sup> positives	≈ 2 × 10 <sup>5</sup> at 3.5 GeV/c < 10% ≈ 4 × 10 <sup>5</sup>	8.55	2.5	The e <sup>-</sup> percentage in the negative beam depends on the external target used.

**South area (LEAR)** — Design values. The  $\bar{p}$  beam splits into three branches (six experimental areas).

Beam	Momentum range (GeV/c)	Flux (per sec)	Comments
External $\bar{p}$ beam, with ultra-slow ejection (≈ 1 hr)	0.2-1.5 0.1-2.0	≤ 10 <sup>6</sup>	A long spill of ≤ 3 × 10 <sup>9</sup> $\bar{p}$ Under development

North area beams (NA experiments)

Beam	Maximum momentum (GeV/c)	Intensity for $10^{12}$ protons at 450 GeV/c	Beam type
H2	450	$9 \times 10^7 \pi^+$ at 200 GeV/c	High energy hadrons or electrons (also used as a test beam)
		$3 \times 10^7 \pi^-$ " " "	
		$4 \times 10^6 e^\pm$ at 150 "	
		$\approx 10^5$ $^{16}\text{O}$ at 200/60 GeV/A	Heavy ion beam
K4	450	$\approx 10^5 K_L^0/10^{11}$ incident $p$	Alternate $K_L^0/K_S^0$ beam
		$\approx 10^2 K_S^0/10^7$ " "	
H6	250	$1 \times 10^8 \pi^+$ at 150 GeV/c	Medium energy hadrons (also used as a test beam)
		$4 \times 10^7 \pi^-$ " " "	
H8	450	$\sim 10^6 p$ at 450 GeV/c	Attenuated primary protons or high energy hadron ( $e$ ) beam
		$2 \times 10^8 \pi^+$ at 200 "	
		$7 \times 10^7 \pi^-$ " " "	
		$\approx 10^6$ $^{16}\text{O}$ at 200/60 GeV/A	Heavy ion beam
M2	280	$2.5 \times 10^7 \mu^+$ at 200 GeV/c	High intensity muons
		$8 \times 10^6 \mu^-$ " " "	
P0	450	$\sim 10^{13} p$ at 450 GeV/c	High intensity primary protons for production of E12; or transport of hadrons or heavy ions to H10
H10	450	$\approx 1 \times 10^7 \pi^+$ at 200 GeV/c	High energy hadrons or protons (via P0)
		$\approx 3 \times 10^6 \pi^-$ " " "	
		$\approx 10^8$ $^{16}\text{O}$ at 200/60 GeV/A	Heavy ion beam
E12	300	$1.5 \times 10^8 e^-$ total with energy $> 100$ GeV	Broad-band electrons/photons



West area beams (WA experiments)

Beam	Maximum momentum (GeV/c)	Intensity for $10^{12}$ protons at 450 GeV/c	Beam type
H1	450	$4 \times 10^6 \pi^-$ at 350 GeV/c $2 \times 10^8 \pi^+$ at 200 " " $1.5 \times 10^6 e$ " " "	Hadrons, electrons, or attenuated protons
H3	450	$3.6 \times 10^6 \pi^-$ at 350 GeV/c $1.8 \times 10^8 \pi^+$ at 200 " " $1.2 \times 10^6 e$ " " "	Hadrons, electrons, or attenuated protons
		$\sim 10^6 \text{ }^{16}\text{O}$ at 200/60 GeV/A	Heavy ion beam
X1	70	$10^2\text{--}10^4$ tertiaries/ $10^7$ incident particles from H3	Test beam; tertiary electrons and hadrons
X3	50	$10^2\text{--}10^4$ tertiaries/ $10^7$ incident particles from H3	Test beam; tertiary electrons and hadrons
X5'	100	$10^2\text{--}10^4$ tertiaries/ $10^7$ incident particles from H3	Test beam; tertiary electrons and hadrons
X7	100	$10^2\text{--}10^4$ tertiaries/ $10^7$ incident particles from H3	Test beam; tertiary electrons and hadrons

West area neutrino beams (WA experiments)

Beam	Parent momentum (GeV/c)	Particle	Intensity or event rate for $10^{13}$ incident protons*	$\langle E_\nu \rangle$ (GeV)	Beam type
N1	450 protons	$\nu$	$1.3 \times 10^{10}/\text{m}^2$ ( $\sim 0.13$ ev/ton)	$\sim 24$	Wide-band spectrum up to 450 GeV
		$\bar{\nu}$	$0.7 \times 10^{10}/\text{m}^2$ ( $\sim 0.03$ ev/ton)	$\sim 20$	

\*Inside a 1.75 m radius at 870 m from the target.

**FERMILAB BEAMS** (Source: H.B. White, Jr., FNAL, revised by R. Coleman, FNAL)

Currently, protons are accelerated to an operational momentum of 800 GeV/c. The maximum intensity is  $2 \times 10^{13}$  protons per pulse, the current repetition rate is 0.017/sec, and the beam spill time is 20 sec. Maximum design momentum is 1000 GeV/c.

Beam	Momentum range (GeV/c)	$\pm \Delta p/p$ (%)	Production angle (mr)	Solid angle ( $\mu\text{sr}$ )	Particles	**Flux per sec per $10^{12}$ protons on target	$\rightarrow$ at (GeV/c)	Comments
PW	300 (peak)	5	1.5		$\pi^-$	$2 \times 10^6$	300	High intensity pion beam
					$\bar{p}$	$10^4$	300	P-west secondary beam
*PB	600 (peak)	15		4	$e^-$	$10^7$	600	Wide band charged and neutral beam
					$\gamma$	$8 \times 10^6$	> 200	Also capable of $K_L^0$ , $p$ , and $\pi^-$
					$n$	$6 \times 10^8$	$\sim 750$	
PE	300 (peak)	2.3	0-2	1.2	$e^-$	$10^7$	200	Also provides tagged photons
	300 (peak)		0	0.04	$n$	$4 \times 10^6$	> 100	Also tagged photons
	300		0-2		$\pi^-$	$2 \times 10^8$ (peak)	300	
PC	1000		0-3.5		$p$	$2.5 \times 10^9 - 5 \times 10^{10}$	1000	Primary protons
ME	1000 (peak)	1.0			$p$	$\sim 2 \times 10^{11}$	1000	Primary protons
*MP	200	5.0	$0 \pm 1.0$		$p$	$3 \times 10^5$	200	Polarized protons from 1000 GeV primary
					$\bar{p}$	$3 \times 10^4$	200	Antiprotons from 1000 GeV primary
MC	50-150		1-6		$K_L^0$	$2 \times 10^5$	variable	Neutral beam with 1000 GeV primary
					$n$	$7 \times 10^5$	variable	
MB	20-200	5.0	2.5		$\pi, K$	$1.5 \times 10^5$	75-100	Low intensity wide-angle test beam
					$e^\pm$	9	100	
*MT	80-245				hadrons	$\sim 10^4$	245	Test beam (intensity limited)
					$e^\pm$	$\sim 10^2$		Muons also available
*MW	1000 (peak)	10	$0 \pm 0.7$		$p$	$1.5 \times 10^8$	600	Beam transport to new multiparticle spectrometer; assumes 1000 GeV on target
					$\pi^+$	$3 \times 10^7$	600	
					$K^+$	$4 \times 10^6$	600	
					$\pi^-$	$8 \times 10^6$	600	
					$K^-$	$2 \times 10^5$	600	
					$\bar{p}$	$2 \times 10^4$	600	
NW	10-150	2	0-1	4-16	$\mu^-$			Currently a test beam, intensity limited
					$\pi^-$	$4 \times 10^6$	$\sim 100$	
					$e^-$	$6 \times 10^4$	$\sim 100$	
*NC-D	750 (peak)	10	0	0.6	$\nu/\bar{\nu}$	$4.5 \times 10^6 \nu/m^2$ ***	500	Narrow band, sign-selected neutrino beam
*NC-T	1000 (peak)	100	0	6.0	$\nu/\bar{\nu}$	$1.4 \times 10^8 \nu/m^2$ ***	0-800	Broad band, quadrupole focus
NE	900	3.3	0	0.3	$p$	$5 \times 10^7$	900	To hybrid spectrometer system and Lab G and D
	25-700				$\pi^-$	$10^5$	650	
NT	450		3		hadrons	$\sim 10^5$	450	Test beam to Lab E neutrino detector and Lab F
NH	435		3		hadrons	$\sim 10^5$	435	Test beam to Lab C neutrino detector and Lab F Muons and electrons also available at lower intensities
*NM	275-750	20			$\mu^\pm$	$\sim 10^4$	750	Tevatron muon beam
NM	2.5-200	10	0		hadrons	$\sim 10^3$		Test beams to muon spectrometer
(test modes)	5-200	20	0		electrons	$\sim 500$		

\*These beams will be commissioned as part of the Tevatron II project. Design characteristics are shown; detailed characteristics will be determined in operation. These beams will also replace present beams in most cases.

\*\*For 800 GeV protons incident unless otherwise noted.

\*\*\*Flux per  $10^{12}$  protons on target, beam spill times variable ( $\sim 1$  ms to 20 s).

**KEK PS BEAMS** (Source: H. Hirabayashi, KEK)

Protons are accelerated to a maximum momentum of 13 GeV/c. The maximum intensity is  $4.0 \times 10^{12}$  protons per pulse. The repetition rate is 0.4/sec.

Beam	Momentum range (GeV/c)	$\pm \Delta p/p$ (%)	Production angle ( $^\circ$ )	Solid angle (msr)	Beam length (m)	Particles	Typical flux in particles per pulse	→ at (GeV/c)	Comments
EP1	4-13					$p$	$5 \times 10^{10}$		Fast extraction
EP2	4-13					$p$	$2 \times 10^{12}$		Slow extraction; branches feed the K2, K3/K4, $\pi$ - $\mu$ , K0, and P1 beams
$\pi 2$	2-4.3	1	10	0.594	31.3	$p/\bar{p}$ $\pi^+/\pi^-$	$10^5/10^2$ $2 \times 10^5/1 \times 10^5$	3	Internal target beam; fluxes for $10^{11}$ ppp
T1	0.5-2.3	2	23	0.16	18.8	$\pi^+/\pi^-$	$5 \times 10^4/4 \times 10^3$	1	Internal target test beam; fluxes for $10^{11}$ ppp
K2	1-2	3	0	1.02	27.9	$K^+/K^-$ $p/\bar{p}$ $\pi^+/\pi^-$	$1.5 \times 10^5/5.7 \times 10^4$ $2 \times 10^7/1.2 \times 10^4$ $1.7 \times 10^7/1.4 \times 10^7$	2	
K3-S (K3-L)	0.5-1.0 "	2 "	0 "	7.3 (3.0)	14.4 (16.5)	$K^+/K^-$ $p/\bar{p}$ $\pi^+/\pi^-$	$4.2 \times 10^4/1.0 \times 10^4$ $7 \times 10^7/3.5 \times 10^2$ $5 \times 10^7/5 \times 10^7$	0.6 0.8 0.8	Fluxes are for the S (short) mode of operation
K4	0.4-0.8	3	0	7.3	28.5	$\bar{p}$	700	0.6	Branch of K3
$\pi$ - $\mu$	0.1-0.45		87	20		$\pi^\pm$ $\mu^\pm$	$10^6$ $10^4$	0.15	
K0	2-8		0	0.31	10	$K^0$ $n$	$10^7$ $10^9$	2-8 0-8	Neutral beam line
P1	3-13	0.3			57	$\bar{p}$	$2 \times 10^8$	3-13	Polarized beam, under construction

LAMPF PARTICLE PHYSICS BEAMS (Source: D. Dodder, Los Alamos)

The primary 800 MeV  $H^+$  beam normally runs with an average current up to 1 mA, but 1.2 mA has been achieved. The macro duty factor is up to 10.5%, with a macrostructure of 120 pps. Each macropulse consists of a 0.25 ns burst every 5 ns. This beam is used to generate the meson and neutrino beams described below, as well as additional beams for other purposes. Simultaneously with the  $H^+$  beam a low current ( $5 \mu A$  unpolarized; up to 25 nA polarized)  $H^-$  beam is accelerated to a desired energy between 212 and 800 MeV.

Beam	Momentum (MeV/c)	$\pm \Delta p/p$ (%)	Solid angle (msr)	Particle	Flux in particles/sec or current	$\rightarrow$ at (MeV/c)	Comments	
A	1460	0.1		$p$	1 mA	1460	Main beam; 1.2 mA has been achieved	
LEP	77-415	0.05-2.8	0-17	$\pi^+$	$9 \times 10^8$	195	Low energy pion beam; achromatic; flux at $\Delta p/p = 2.8\%$	
				$\pi^-$	$\sim 2 \times 10^8$			
EPICS	156-415	2.0	3.4	$\pi^+$	$1.9 \times 10^8$	300	Energetic pion channel and spectrometer	
				$\pi^-$	$4.2 \times 10^7$			
P <sup>3</sup>	100-750	5.0	7.0	$\pi^+$	$2 \times 10^9$	470	High energy pions; achromatic	
	"			$\pi^-$	$3 \times 10^8$	470		
	28			$\mu^+$	$1.9 \times 10^6$	28		
	100			$\mu^-$	$1.0 \times 10^6$	100		$\mu^-$ flux is without degrader
Stopped muon	25-250			$\mu^+$	$1.8 \times 10^8$	130		
				$\mu^-$	$3.6 \times 10^7$			
	665-1460			$p$	$6 \mu A$	1460	Current reduced to 1/3 for $< 1460$ MeV/c Polarization = 0.8 N, L, S available "Unpolarized" beam has $P = 0.2$ at $20^\circ$ Polarization = 0.5; max $0^\circ$ energy is given; other ports up to $37^\circ$ give lower energies	
	"			$\bar{p}$	25 nA			
	$< 1460$			0.8	$n$			$10^7$
	"			0.8	$\bar{n}$			$10^4$
External proton beam	665-1460	$< 0.1$	$< 6$	$p$	$< 100$ nA	1460	$H^-$ beam stripped to $H^0$ or $H^+$ Polarization = 0.8 N, L, S available Independent of polarization direction of internal beam	
				$H^0$	"			
				$H^-$	"			
				$\bar{p}$	10 nA			
				$\bar{H}^0$	"			
HRS	475-1460	0.26		$p$	100 nA		For high resolution proton spectrometer	
				$\bar{p}$	10 nA			
Neutrino facility	0-53		$\sim 4\pi$ sr	$\nu_e$	$3 \times 10^{14}$	total	Peak momentum is 35 MeV/c for $\nu_\mu$ Flux at 8 m is $4 \times 10^8 \nu/cm^2\text{-sec}$ Source subtends $\pm 1.5^\circ$ for target 8 m away	
				$\nu_\mu$	"			
				$\bar{\nu}_\mu$	"			
Proton storage ring	1460	0.3		$p$	$25 \mu A$	1460	270 ns pulses at 12 Hz; aim is 100 $\mu A$ and eventually 200 $\mu A$ at 24 Hz	
Line D bypass	665-1460	0.1		$p$	200 nA	1460	Chopped 1 $\mu s$ micropulses; available spacing 0.1 to 100 $\mu s$	
PSR neutron source	thermal & EPI thermal			$n$	$\sim 10^{16}$		Optimally moderated spallation source	

**SERPUKHOV BEAMS** (Source: N.A. Galiaev and R.A. Rzaev, Serpukhov)

Protons are accelerated to a maximum momentum of 70 GeV/c. The intensity is about  $3 \times 10^{12}$  protons per pulse. The repetition rate is 0.115/sec, and the beam spill time is about 2 sec.

Beam	Momentum range (GeV/c)	$\pm \Delta p/p$ (%)	Production angle (mr)	Solid angle ( $\mu$ sr)	Beam length (m)	Particles	Typical flux in particles per pulse	$\rightarrow$ at (GeV/c)	Comments
2/14	30-70	1	6-35	10	120	hadrons+	$10^6$	60	Internal target lines 2A, 2B, 14; the $e^-$ 's may be used for polarized $\gamma$ 's
	35-65	1	0-5	30		hadrons-	$1.5 \times 10^6$	60	
	5-45	3	0-7	30		$e^-$	$4 \times 10^5$	30	
4	20-50	1	0-5	40	130	hadrons-	$6 \times 10^6$	40	Internal target lines 4A, 4B, 4V, 4L, 4E
18	3-17	2	0-200	120	50	hadrons+	$10^8$	5	Internal target, injection in ring
	2-14	2	240-400	80	hadrons-	$10^4$	8		
21	70		0		180	$p$	$10^{11}$	70	Slow ejection
	7-70	2.5	0	60	110	hadrons+	$6 \times 10^7$	35	External target
						hadrons-	$2 \times 10^7$	35	Slow ejection
22	70					$p$	$10^{10}$		Slow ejection of diffractively scattered protons
	10-60	2.5				$\pi^+$	$10^9$	35	For $10^{13}$ protons on external target
	10-60	2.5				$\pi^-$	$3 \times 10^8$	35	
23	5-35				500	$\nu_e$	$5.5 \times 10^{-8}/m^2$ per $p$		Tagged from $K \rightarrow \pi e \nu$ decay
	5-35				500	$\nu_\mu$	$1.5 \times 10^{-2}/m^2$ per $p$		Tagged from $K \rightarrow \mu \nu$ decay
4N	$\leq 70$		12	1	40	neutrals	$10^7$	total	Internal target
8	$< 40$ (mean = 6)		0	5000	500	$\nu, \bar{\nu}$	$5 \times 10^9$	total	Wide-band neutrino beam
	70		0			$p$	$10^{12}$	70	Slow ejection

**SIN BEAMS** (Source: R. Frosch, SIN)

The average energy of the primary proton beam is 589 MeV with a FWHM spread of 0.4%. The pulse rate is  $5 \times 10^7$  per sec and the pulse width is 1 nsec. The maximum intensity at extraction is 300  $\mu$ A. Secondary beam rates given below are for  $I_p = 200 \mu$ A

**Pion beams**

Beam	Energy range (MeV)	Minimum $\pm \Delta p/p$ (%)	Maximum flux (per sec)	for maximum flux		
				Energy (MeV)	$\pm \Delta p/p$ (%)	FWHM spot size H×V (cm)
$\pi$ E1	50-350	0.4	$\pi^+$ $9 \times 10^9$	225	2.5	$2 \times 5$
			$\pi^-$ $8 \times 10^8$			
$\pi$ E3	8-105	1.0	$\pi^+$ $8 \times 10^8$	85	5.0	$5.6 \times 2.6$
			$\pi^-$ $1.6 \times 10^8$			
$\pi$ M3	8-350	0.1	$\pi^+$ $3 \times 10^8$	225	3.0	$4 \times 2$
			$\pi^-$ $5 \times 10^7$			
$\pi$ M1	50-350	0.05	$\pi^+$ $6 \times 10^7$	225	1.0	$0.9 \times 0.7$
			$\pi^-$ $6 \times 10^6$			

**Muon beams** ( $\mu^+$  fluxes are 4 or 5 times  $\mu^-$  fluxes)

Beam	Momentum (MeV/c)	$\mu^-$ flux (per sec)	$\Delta$ -range (g/cm <sup>2</sup> )	Stop density $\mu^-$ (stops/g-sec)	Particle ratios	Burst width (nsec)	FWHM spot size H×V (cm)
$\mu$ E1	120-50	$6 \times 10^7 - 8 \times 10^5$	4-0.3	$10^5 - 3 \times 10^4$	0.01-3 ( $e^-/\mu^-$ )	$\sim 4$	$6 \times 4$
$\mu$ E4	stopping			$2 \times 10^5$	0.3 ( $\pi^-/\mu^-$ )		$6 \times 4$
$\pi$ E3	28	$10^7$ ( $\mu^+$ )	0.04	$2 \times 10^7$ ( $\mu^+$ )	0.1 ( $e^+/\mu^+$ )		$5 \times 4$
$\pi$ M3	28	$10^6$ ( $\mu^+$ )	0.04	$6 \times 10^6$ ( $\mu^+$ )	$< 0.01$ ( $e^+/\mu^+$ )		$2 \times 2$

**Neutron beams** (nE1) — Neutron beams with a 20-m flight path and correspondingly higher rates are also possible (the energy resolution at 560 MeV then is 20 MeV)

Energy range (MeV)	Intensity (MeV cm <sup>2</sup> sec) <sup>-1</sup>	Flight path (m)	Polarization (%)	Resolution from TOF at 560 MeV (MeV)	Comments
120-560	$(1-3) \times 10^4$	60	0	7	200 $\mu$ A incident proton beam
200-560	100-300	60	25-45	7	2 $\mu$ A incident polarized protons

SLAC BEAMS (Source: T. Fieguth, SLAC)

Accelerator mode	Particles	Momenta (GeV/c)	Particles per pulse	Pulse length ( $\mu$ s)	Repetition rate (Hz)	Comments
SLC	$e^-$	$\leq 50$	$\leq 2 \times 10^{10}$	$2$ at $5 \times 10^{-6}$	$\leq 120$	The Linac will serve as the source for the SLC (1987). Damped beams.
	$e^+$	$\leq 50$	$\leq 5 \times 10^9$	$5 \times 10^{-6}$	"	
Long pulse	$e^-$	$\leq 28$	$10^{11}$	$\leq 1.6$	"	
NPI -long pulse	$e^-$	5	$6 \times 10^{11}$	1.5	"	Sector 25 off-axis injector, used for SSRL, nuclear physics experiments, and test beams
-short pulse	$e^-$	9	$4 \times 10^{11}$	0.2	"	

Colliding beams	Particles	C.m. energy (GeV)	Peak luminosity ( $\text{cm}^{-2} \text{sec}^{-1}$ )	Average luminosity ( $\text{cm}^{-2} \text{sec}^{-1}$ )	Comments
SPEAR	$e^+e^-$	2-7.4	$2 \times 10^{31}$ at 6.4 GeV	$10^{30}$ at 3.7 GeV	SPEAR has 2 interaction regions, PEP has 6. At PEP, the luminosity scales as $E^{-2}$ ( $E^{-3}$ ) for c.m. energies below (above) that at the peak. Single interaction region; repetition rate $\leq 120$ Hz
PEP	$e^+e^-$	8-36	$3.2 \times 10^{31}$ at 29 GeV	$1.2 \times 10^{31}$	
SLC*	$e^+e^-$	$\approx 100$	$6.4 \times 10^{29}$		

\*The luminosity is the initial design value. See J. Rees, "Progress Report on SLAC Linear Collider," SLAC-Pub-3986 (June 1986) for qualifying factors.

Beam	Momentum range (GeV/c)	$\pm \Delta p/p$ (%)	Production angle ( $^\circ$ )	Solid angle (msr)	Particles	Maximum particles per pulse	$\rightarrow$ at (GeV/c)	Repetition rate (Hz)	Facility	Comments
21	1-16	$\leq 4.0$	1	0.03	$K^+/K^-$	17/8	10	$\leq 120$	Test beams	Separated: $\pi/K \sim 1/30$ $\pi/\bar{p} \sim 1/14$
					$p/\bar{p}$	40/6				
					$\pi^+/\pi^-$	$10^3$				
					$e^-$	$10^4$				
					$e^+$	$10^4$				
	1-8					2.5				
27	20	9.0 FWHM	0	$10^{-7}$	$\gamma$	$10^2$	20	$\leq 20$	Test beam	Backscattered laser beam
3	$\leq 23.5$	0.1-1.0			$e^+$	$5 \times 10^9$	All	$\leq 120$	ESA 1.6, 8, & 20 GeV spectrometers	All fluxes at $\Delta p/p = \pm 0.25\%$
	$\leq 23.5$	0.1-1.0			$e^-$	$5 \times 10^{11}$	All	$\leq 120$		
	$\leq 21.5$	Brems.	0		$\gamma$	$4 \times 10^9$ EQ	20	$\leq 120$		
6	0.1-16	$\leq 2.0$	1.6-6	0.03	$e^-$	10		$\leq 60$	Test beams	
	1-16				$\pi^-$	10				
19	1-25	0.25	0		$e^+$	10	10	$\leq 60$	Test beam	Very pure; $\sigma_x = 1$ mm

**TRIUMF BEAMS** [Source: Status of TRIUMF Plans for Development, G. Dutto, E.W. Blackmore, and M.K. Craddock, TRI-82-PP-37 (October 1982); tables revised by J. Doornbos, TRIUMF.]

The cyclotron energy range is 180–520 MeV with an energy spread of 0.1%/(FWHM). The unpolarized intensity is 150  $\mu\text{A}$ , and the polarized intensity is 300 nA; the polarization is 75–82%. The BL4/BL1A split ratio is  $1/10^4$ . The phase width is variable from 0.5 to 6.0 ns. The pulse separation is 43 or 217 ns. There are plans to upgrade various performance levels.

**Main beam lines**

Beam	Particle	Energy (MeV)	Intensity	Momentum spread FWHM (%)	Polarization (%)	Spot size H×V(cm)
BL1A	$p$	180–520	140 $\mu\text{A}$ (500 MeV)	0.2	0	$0.2 \times 0.5$
BL4/1B	$\bar{p}$	180–520	300 nA	0.2	70–80	$0.2 \times 0.5$
BL4A	$\bar{n}$	160–500	$10^6/\text{sec}$	1.0	40–75	$6 \times 6$
BL2C	$p$	65–100	10 $\mu\text{A}$	0.2	0	$1 \times 2$

**Secondary lines** The M8, M9, and M20 fluxes are for full momentum acceptance with 100  $\mu\text{A}$  of protons on a 10-cm beryllium target. The M11, M13, and M15 fluxes are for full momentum acceptance with 100  $\mu\text{A}$  of protons on a 1-cm carbon target. Beams of  $\pi^-$  and  $\mu^-$  have the same properties as the  $\pi^+$  and  $\mu^+$  beams, except fluxes are about five times lower.

Beam	Particle	Momentum (MeV/c)	Particle flux (per sec)	$\rightarrow$ at (MeV/c)	Momentum spread FWHM (%)	Polarization (%)	Spot size H×V (cm)
M8	$\pi^-$	0–220	$1.3 \times 10^8$	180	13	–	$1 \times 2$
M9	$\mu^-$	30–150	$10^6$	77	14	50	$8 \times 8$
	$\pi^+$	30–250	$2 \times 10^8$	120	14	–	$10 \times 2$
M20	$\mu^+$	30–200	$2.5 \times 10^6$	30	5	> 90	$4 \times 3$
			$2 \times 10^6$	85	8	75	$8 \times 8$
M13	$\pi^+$	30–130	$5 \times 10^7$	130	10	–	$3 \times 2$
	$\mu^+$	30 (surface)	$1.3 \times 10^6$	30	10	> 90	$3 \times 2$
M11	$\pi^+$	90–470	$5 \times 10^6$	200	3	–	$2 \times 3$
M15	$\mu^+$	30 (surface)	$1.4 \times 10^6$	30	10	> 90	$1.2 \times 1.6$



*LAWRENCE BERKELEY LABORATORY  
TECHNICAL INFORMATION DEPARTMENT  
UNIVERSITY OF CALIFORNIA  
BERKELEY, CALIFORNIA 94720*