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Current Experiments in Elementary Particle Physics

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## CURRENT EXPERIMENTS IN ELEMENTARY PARTICLE PHYSICS

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**Abstract** – This report contains summaries of 584 current and recent experiments in elementary particle physics. Experiments that finished taking data before 1986 are excluded. Included are experiments at Brookhaven, CERN, CESR, DESY, Fermilab, Tokyo Institute of Nuclear Studies, Moscow Institute of Theoretical and Experimental Physics, KEK, LAMPF, Novosibirsk, Paul Scherrer Institut (PSI), Saclay, Serpukhov, SLAC, SSCL, and TRIUMF, and also several underground and underwater experiments. Instructions are given for remote searching of the computer database (maintained under the SLAC/SPIRES system) that contains the summaries.

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## INTRODUCTION

This report contains summaries of 584 approved current and recent experiments in elementary particle physics. A glance at the summaries in the body of the report will show the kind of information given. Experiments at the following laboratories are included:

Brookhaven (BNL)	Novosibirsk
CERN	Paul Scherrer Institute (PSI) – formerly SIN
CESR	Saclay
DESY	Serpukhov
Fermilab (FNAL)	SLAC
Institute for Nuclear Studies, Tokyo (INS)	SSCL
Institute for Theoretical and Experimental Physics, Moscow (ITEP)	TRIUMF
KEK	Underground experiments
Los Alamos (LAMPF)	Underwater experiments

We exclude experiments for which the data collection was finished before 1986. The rationale for thus *including* many rather old experiments is that many of them are still producing papers; note that a summary includes a list of journal papers resulting from the experiment.

We also exclude experiments mostly of interest to nuclear physicists, dealing with nuclear levels or other nuclear-structure measurements. There are of course experiments at the fuzzy borderline between particle and nuclear physics, and we have tried to make sensible choices about what experiments to include here.

**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.” 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 almost 80% 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: no √ by the spokesperson means the summary may be inaccurate or incomplete. (For a handful of experiments, we verified our information with a local member of the experiment, not the spokesperson, but for simplicity put a √ by the spokesperson. For experiments with more than one spokesperson, all the spokespersons are checked even if only one of them replied.)

**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 1986 (going back to about 1975, and including experiments at Argonne and Rutherford). See page 3 for a guide to using the EXPERIMENTS database via the remote server QSPIRES.

**Summaries** — Each summary lists several dates related to the experiment: the date of the proposal (in parentheses), the approval date, and when the data-taking began and was completed. The title of the proposal and the most recent list of participants are given. The detector used in the experiment is identified either by a generic name (*e.g.*, counter) or by a widely known acronym (*e.g.*, SLD). The most important reactions and particles studied and the beam energy or momentum are listed where known. A brief comment describing the apparatus and the main goals of the experiment may follow. At the end is a list of any journal articles on results or instrumentation of the experiment.

**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. The abbreviated forms are needed for searching the EXPERIMENTS database online.

**Acknowledgments** — G. Harigel and M. Varela Diaz (CERN), A. Stevens (BNL), and J. Parker (Fermilab) kindly provided computer files with data on experiments from their respective institutions, and L. Addis (SLAC) helped with the SPIRES database system. We also thank 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. We also encourage spokespersons to send us proposals and letters of intent of their future experiments. Comments and other material should be sent to:

EXPERIMENTS  
SLAC Library, Mail-Stop 82  
SLAC, P.O. Box 4349  
Stanford, CA 94309, USA  
e-mail: EXPBASE@SLACVM.BITNET

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Requests for additional copies of this report from the Americas, Australasia, and the Far East should go to:

EXPERIMENTS  
Particle Data Group  
MS 50-308  
Lawrence Berkeley Laboratory  
Berkeley, CA 94720, USA

Requests from other areas should go to:

CERN  
Scientific Information Service  
CH-1211 Geneva 23  
Switzerland

## SEARCHING THE "EXPERIMENTS" COMPUTER DATABASE VIA QSPIRES SERVER

**General information** — 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 with an account on the SLAC's SLACVM computer may access this database by typing **SPIRES**, and then **SELECT EXPERIMENTS**. If you have a SLACVM account but are unfamiliar with SPIRES, a *Guide to VM SPIRES* is available from the SLAC Library, Mail-Stop 82, SLAC, P.O. Box 4349, Stanford, CA 94309, USA (phone: 415/926-2411). The SPIRES search procedure in the EXPERIMENTS database is thoroughly described in the previous (1989) edition of this report.

The EXPERIMENTS database is also available under different systems in Europe. The Rutherford Appleton Laboratory, and CERN, have EXPERIMENTS implemented under the HEPDATA system on their central IBM/VM and VAX/VMS computers. A guest VAX/VMS account which enables the access to HEPDATA is available on the INTERNET node 129.234.8.100 (which is also a DECNET host 19788, or DURPDG): username PDG, password HEPDATA. Contact M. Whalley, Dept. of Physics, Univ. of Durham, South Road, Durham DH1 3LE, United Kingdom, (MRW@UKACRL.BITNET) for more information. In Russia, the EXPERIMENTS is available at IHEP, Serpukhov, and JINR, Dubna. This and other IHEP high energy physics databases are managed by the BDMS/4 system and maintained by the Serpukhov COMPAS group. IHEP databases are also available on the CERN's VXCERN computer. Contact V.V. Ezhela, Inst. for High Energy Physics, 142284 Serpukhov, Moscow Region, Russia, (EZHELA@M9.IHEP.SU) for more information.

This section describes searching in the EXPERIMENTS database via the remote server QSPIRES at SLACVM. You do not need to have a SLACVM computer account to use QSPIRES. The server can be reached through e-mail from almost every international computer network, and also interactively from many BITNET sites. QSPIRES searching is free, and the only requirement is that your computer node is registered with SLAC. For more information on the registration, please contact QSPI@SLACVM.BITNET or QSPI@SLACVM.SLAC.STANFORD.EDU. Many SPIRES databases, including EXPERIMENTS, are accessible via QSPIRES. The QSPIRES search commands are similar to those used in a direct SPIRES search. An extensive *Guide to QSPIRES* is available from the SLAC Library (see the address above).

**QSPIRES search commands** — In the following text the **BOLDFACE UPPER CASE** letters denote the minimum part of a command. Note, however, that SPIRES and QSPIRES are case insensitive, and in an actual search you may use both lower and upper case characters and may enter either the minimum or full commands.

- Note that whenever a search value contains special characters, ')', '>', '<', or '(', the entire search value must be enclosed in double quotes.

The three most useful command verbs are **SHOW**, **BROWSE** and **FIND**. You can formulate a variety of search commands by using these three verbs. Some examples are:

**SHOW INDEXES**

*(Shows available search terms. Use these terms with **BROWSE** and **FIND**.)*

**BROWSE** Author **TRILLING**

*(Displays values in the author-name index surrounding the stated value.)*

**BROWSE** **EXPERIMENT**-num

*(Gives several random values of experiment code-names.)*

**BROWSE** **EXPERIMENT**-num **DESY**

*(Displays values in the code-name index alphabetically surrounding the specified value. Useful if you do not know the exact form or spelling of a search value.)*

**FIND** Author **RUBBIA**, **C** or

**FIND** Author **C RUBBIA**

*(Finds experiments in which the stated author has participated.)*

**FIND** **EXPERIMENT**-num **DESY-HERA-H1**

*(Finds the record corresponding to the specified value.)*



**FINd PAPER "PR D37 (1988) 1131"**

*(Finds the experiment reported in the stated reference. Note that the reference has spaces but no commas between the elements.)*

**FINd REaction "E+ E- --> MU+ MU- X"**

*(The "arrow" is composed of two minus signs and a 'greater-than' sign.)*

**FINd ACcelerator KEK-TRISTAN**

*(Finds experiments using the stated accelerator.)*

**FINd DEtector MARK-II**

*(Finds experiments using the stated detector.)*

**FINd Title CP PHASE DIFFERENCE**

*(Finds experiments with the words CP, PHASE, and DIFFERENCE in the title. The order of words in the search command is unimportant.)*

**FINd AFfiliation RUTGERS U or**

**FINd AFfiliation RUTGERS#**

*(Finds experiments with the stated affiliation. '#' represents any remaining characters.)*

**FINd Particle HIGGS**

*(Finds experiments studying the specified particle.)*

The following search commands are also allowed:

**FINd Author PREFIX PATTERS or**

**FINd Author PATTERS#**

*(Finds authors whose last names begin with the string PATTERS, e.g., Patterson.)*

**FINd EXPERiment-num PREFIX SLAC-SLC**

**FINd AFfiliation PREFIX NORTHWEST**

Compound searching is also possible:

**FINd Author PERROT AND EXPERiment-num PREFIX SACLAY**

**FINd AFfiliation BOLOGNA U AND NOT ACcelerator CERN-SPS**

**FINd Particle J/PSI OR "PSI(2S)"**

Search commands are not the only elements in a QSPIRES search request. Often a search command has to be supplemented with additional instructions. For example, '(IN EXPERIMENTS', following a search command, is required to direct QSPIRES to the EXPERIMENTS database rather than the default HEP database. Such additional instructions are discussed below.

**Interactive QSPIRES searching** — From many BITNET nodes QSPIRES may be reached interactively. (Interactive communication is **not** possible from non-BITNET nodes!) A typical interactive search request contains one-line text beginning with the address of QSPIRES. The address is followed by a search command, and a field indicating the desired database and other instructions:

**TELL QSPIRES AT SLACVM <search-command> (IN EXPERIMENTS RESULT**

'TELL' is an executive command for sending interactive messages from an IBM machine running the VM operative system. The corresponding phrase on a VAX system may be 'SEND QSPIRES@SLACVM'. For other systems, ask your local system manager for instructions. The phrase '(IN EXPERIMENTS', following your search command, is a mandatory part of any search request in the EXPERIMENTS database. The optional 'RESULT' tells QSPIRES what to do with the found data: if the RESULT is used with SHOW or BROWSE, QSPIRES will interactively send you the complete result; if the RESULT is used in a search command beginning with FINd, QSPIRES will interactively notify you on the number of retrieved experiments, but the actual data will not be sent:

**TELL QSPIRES AT SLACVM FIN AC CESR# (IN EXPERIMENTS RES  
FROM SLACVM(QSPIRES): \* Result 3 Experiments**

If you now want to get the retrieved records, your next message should be

**TELL QSPIRES AT SLACVM OUTput**

No database selection is needed with the **OUT**put command. If the search result contains too many records, try to formulate a compound search request with more criteria. An example of a possible interactive session follows:

```
TELL QSPIRES AT SLACVM  SHO IND (IN EXPERIMENTS RES
(QSPIRES responds)
TELL QSPIRES AT SLACVM  BRO DE CRYSTAL (IN EXPERIMENTS RES
(QSPIRES responds)
TELL QSPIRES AT SLACVM  FIN DE CRYSTAL-BALL & AC PRE SLAC
(IN EXPERIMENTS RES
(QSPIRES responds)
TELL QSPIRES AT SLACVM  OUT
(QSPIRES sends the result of the search)
```

**E-mail QSPIRES searching** — People who cannot or do not want to use the interactive procedure, may reach QSPIRES through e-mail. Send your search commands to QSPIRES@SLACVM.BITNET, or QSPIRES@SLACVM.SLAC.STANFORD.EDU . Leave the *subject* line in the header of your letter empty, and send only one search command per letter, *e.g.*,

```
BRO PARTICLE XI (IN EXPERIMENTS RESULT
```

or

```
FIN TITLE LARGE DETECTOR (IN EXPERIMENTS RES
```

QSPIRES will answer through e-mail, and if you are satisfied with the number of retrieved documents, react immediately by sending the command '**OUT**put'. If the search result contains too many records, try to reformulate your request by adding more criteria.

QSPIRES waits about 30 to 40 minutes for your follow-up command (*e.g.*, '**OUT**put'). If it takes more than 20 minutes for a message to reach QSPIRES from your node, you cannot rely on follow-up search requests, and you should merge the search and output commands in a single request. You can do that by replacing '**RES**ult' in the option field with the '**FILE**' option. For example, send the command

```
FIN TITLE LARGE DETECTOR AND DATE > 1984 (IN EXPERIMENTS FILE
```

The intermediate step in which QSPIRES reports the number of records found will be bypassed, and the retrieved records are sent immediately. Warning: if you are using this method, be sure that your search request is as restrictive as possible, by using several search criteria. Otherwise, you might be sent a file with a large number of records, and such long files travel very slowly or may even be deleted by some gateways.

---

**Searching Problems:** *There are several common reasons why a search may fail:*

(1) Any search value containing any of the special characters ) > < ( must be enclosed in double quotes; see the examples above for PAPER, REACTION, and PARTICLE searches.

(2) You may have used an incorrect form of the value for which you were searching, *e.g.*, an incorrect particle or experiment code-name. To find 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.

(3) You may have forgotten to select the EXPERIMENTS database. Always append the selection '(IN EXPERIMENTS' to your QSPIRES search request.

(4) To be able to search via QSPIRES, you must be a registered user. If you are not, please contact QSPI@SLACVM.BITNET or QSPI@SLACVM.SLAC.STANFORD.EDU .

(5) Try using 'SEND' or 'BSEND' instead of 'TELL' in interactive QSPIRES commands. Be sure BITNET is licensed on your computer.

---

## OTHER DATABASES ACCESSIBLE WITH QSPIRES

Other SLAC public databases are available via QSPIRES. Besides EXPERIMENTS, they are HEP, PARTICLES, CONF, HEPNAMES, INST, DATAGUIDE, and REACTION. (Refer to the *Review of Particle Properties*, Phys. Rev. **D45**, S1 (June 1992) for details on databases at other institutions.) Following is a list and brief description of these SLAC public databases:

- (1) PARTICLES contains the Full Listings from this *Review of Particle Properties*, indexed by particle and particle property.
- (2) HEP is a guide to particle physics preprints, journal articles, reports, theses, conference papers, etc., indexed by standard bibliographic entities as well as by citations and topics. HEP is a joint project of the SLAC and DESY libraries and, as of June 1992, contained almost 250,000 records dating from late 1974. It is updated daily with nearly 20,000 new records added each year.
- (3) CONF lists past and future conferences of interest to particle physicists.
- (4) HEPNAMES lists e-mail addresses of many people working in high-energy physics. As of June 1992, more than 20,000 e-mail addresses were available. Additions and corrections may be sent to:  
HEPNAMES@SLACVM.BITNET.
- (5) INST lists nearly 3,000 addresses (often with phone and fax numbers) of high-energy physics related institutions.
- (6) DATAGUIDE, an adjunct to HEP, indexes papers containing experimental data by accelerator, detector, beam momentum, reactions, and particles studied. (Not current; see DOCUMENT under the Serpukhov databases below.)
- (7) REACTIONS gives numerical data (*e.g.*, cross sections, polarizations, etc.) on reactions.
- (8) EXPERIMENTS is a guide to current and past particle physics experiments, indexed similarly to HEP and DATAGUIDE.

## 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	$\nu_\mu$ nucleon	5-30	SERPUKHOV-136
$\gamma p$	<1500	SERPUKHOV-UNK-003	$\nu_\mu C$	<0.2	LAMPF-1173
$\gamma p$	50-200	CERN-NA-014-2	$\nu_\mu$ nucleus	<500	FNAL-733
$\gamma p$	65-180	CERN-WA-069	$\nu_\mu$ nucleus	<400	FNAL-744
$\gamma p$	100-260	FNAL-691	$\nu_\mu$ nucleus	<500	FNAL-745
$\gamma p$	200-400	FNAL-683	$\nu_\mu$ nucleus	<600	FNAL-770
$\gamma$ deut	0.35-1.1	INS-ES-113	$\nu_\mu$ nucleus	3-30	SERPUKHOV-107
$\gamma$ deut	0.4-0.8	INS-ES-112	$\nu_\mu$ nucleus	10-400	FNAL-632
$\gamma$ deut	0.8-1.8	SLAC-NE-08	$\bar{\nu}_\mu e^-$	<12	BNL-734
$\gamma$ deut	1-3	SLAC-NE-17	$\bar{\nu}_\mu e^-$	5-100	CERN-WA-079
$\gamma$ He	0.13-0.45	INS-ES-120	$\bar{\nu}_\mu p$	<12	BNL-734
$\gamma$ He	0.17-0.27	INS-ES-116	$\bar{\nu}_\mu p$	3-30	SERPUKHOV-107
$\gamma$ $^3\text{He}$	0.13-0.45	INS-ES-123	$\bar{\nu}_\mu n$	<12	BNL-734
$\gamma$ $^3\text{He}$	0.38-0.70	INS-ES-124	$\bar{\nu}_\mu$ nucleon	5-30	SERPUKHOV-136
$\gamma$ $^6\text{Li}$	0.15-0.45	INS-ES-127	$\bar{\nu}_\mu$ nucleus	<500	FNAL-733
$\gamma$ $^{12}\text{C}$	0.78-1.1	INS-ES-125	$\bar{\nu}_\mu$ nucleus	<400	FNAL-744
$\gamma$ nucleus	<1	INS-ES-121	$\bar{\nu}_\mu$ nucleus	<600	FNAL-770
$\gamma$ nucleus	<1	INS-ES-126	$\bar{\nu}_\mu$ nucleus	3-30	SERPUKHOV-107
$\gamma$ nucleus	0.25-1.05	INS-ES-118	$\bar{\nu}_\mu$ nucleus	10-400	FNAL-632
$\gamma$ nucleus	5-25	SERPUKHOV-170	$\nu_\tau$ nucleon	?	CERN-WA-095
$\gamma$ nucleus	70-200	CERN-EMU-006	$e^+$ crystal	>30	CERN-NA-043
$\gamma$ nucleus	200-500	FNAL-687	$e^+$ crystal	50-300	CERN-NA-043-2
$\gamma$ crystal	15-150	CERN-WA-081	$e^- p$	0.73-1.28	SLAC-NE-04
$\gamma$ crystal	?	CERN-NA-046	$e^- p$	1.5-10	SLAC-NE-11
<i>MOMENTUM RANGES FOR NEUTRINO BEAMS ARE NOT DEFINED VERY SYSTEMATICALLY</i>			$e^- p$	3-10	SLAC-E-140X
$\nu e^-$	?	UNDERGROUND-KAMIOKANDE-II/III	$e^- p$	3-21	SLAC-E-140
$\nu e^-$	?	UNDERGROUND-LVD	$e^- p$	22.7	SLAC-E-143
$\nu e^-$	?	UNDERGROUND-SUDBURY	$e^-$ nucleon	1.90-5.10	SLAC-NE-18
$\nu C$	<0.2	LAMPF-1173	$e^-$ deut	0.575	SLAC-NE-01
$\nu_e e^-$	<70	SERPUKHOV-152	$e^-$ deut	0.65	SLAC-NE-01
$\nu_e e^-$	0.020-0.053	LAMPF-225	$e^-$ deut	0.73-1.28	SLAC-NE-04
$\nu_e$ nucleon	<70	SERPUKHOV-152	$e^-$ deut	1	SLAC-NE-01
$\nu_e$ nucleon	5-30	SERPUKHOV-136	$e^-$ deut	1.5-10	SLAC-NE-11
$\nu_e$ deut	?	UNDERGROUND-SUDBURY	$e^-$ deut	2	SLAC-NE-01
$\nu_e C$	<0.2	LAMPF-1173	$e^-$ deut	3-10	SLAC-E-140X
$\nu_e C$	?	UNDERGROUND-LVD	$e^-$ deut	3-21	SLAC-E-140
$\nu_e$ $^{12}\text{C}$	0.020-0.053	LAMPF-225	$e^-$ deut	22.7	SLAC-E-143
$\nu_e$ $^{37}\text{Cl}$	?	LAMPF-1213	$e^-$ deut	?	PSI-Z-89-02
$\nu_e$ $^{37}\text{Cl}$	?	UNDERGROUND-HOMESTAKE	$e^-$ He	0.9-4.3	SLAC-NE-09
$\nu_e$ $^{71}\text{Ga}$	?	UNDERGROUND-GALLEX	$e^-$ He	1	SLAC-NE-05
$\nu_e$ $^{71}\text{Ga}$	?	UNDERGROUND-SAGE	$e^-$ He	1.5	SLAC-NE-05
$\nu_e$ $^{127}\text{I}$	?	LAMPF-1213	$e^-$ He	3.6	SLAC-NE-03
$\nu_e$ nucleon	3-30	SERPUKHOV-107	$e^-$ He	9	SLAC-NE-03
$\bar{\nu}_e p$	?	UNDERGROUND-KAMIOKANDE-II/III	$e^-$ $^3\text{He}$	0.9-4.3	SLAC-NE-09
$\bar{\nu}_e p$	?	UNDERGROUND-LVD	$e^-$ $^3\text{He}$	22.7	SLAC-E-142
$\bar{\nu}_e p$	?	UNDERGROUND-SUDBURY	$e^-$ $^{12}\text{C}$	0.575	SLAC-NE-01
$\bar{\nu}_e$ nucleon	5-30	SERPUKHOV-136	$e^-$ $^{12}\text{C}$	0.65	SLAC-NE-01
$\bar{\nu}_e$ deut	?	UNDERGROUND-SUDBURY	$e^-$ $^{12}\text{C}$	1	SLAC-NE-01
$\bar{\nu}_e C$	?	UNDERGROUND-LVD	$e^-$ $^{12}\text{C}$	1	SLAC-NE-05
$\nu_\mu e^-$	<12	BNL-734	$e^-$ $^{12}\text{C}$	1.5	SLAC-NE-05
$\nu_\mu e^-$	<70	SERPUKHOV-152	$e^-$ $^{12}\text{C}$	2	SLAC-NE-01
$\nu_\mu e^-$	5-100	CERN-WA-079	$e^-$ $^{12}\text{C}$	3.6	SLAC-NE-03
$\nu_\mu p$	<0.2	LAMPF-1173	$e^-$ $^{12}\text{C}$	9	SLAC-NE-03
$\nu_\mu p$	<12	BNL-734	$e^-$ Al	1.5-10	SLAC-NE-11
$\nu_\mu p$	3-30	SERPUKHOV-107	$e^-$ $^{27}\text{Al}$	0.9-4.3	SLAC-NE-09
$\nu_\mu p$	5-20	SERPUKHOV-145	$e^-$ $^{27}\text{Al}$	1	SLAC-NE-05
$\nu_\mu n$	<12	BNL-734	$e^-$ $^{27}\text{Al}$	1.5	SLAC-NE-05
$\nu_\mu n$	3-30	SERPUKHOV-107	$e^-$ $^{27}\text{Al}$	3.6	SLAC-NE-03
$\nu_\mu n$	5-20	SERPUKHOV-145	$e^-$ $^{27}\text{Al}$	9	SLAC-NE-03
$\nu_\mu$ nucleon	<70	SERPUKHOV-152	$e^-$ Si	1.2	INS-ES-122
$\nu_\mu$ nucleon	3-30	SERPUKHOV-128	$e^-$ Si	1.2	INS-ES-128
			$e^-$ Fe	3-21	SLAC-E-140
			$e^-$ $^{56}\text{Fe}$	0.575	SLAC-NE-01
			$e^-$ $^{56}\text{Fe}$	0.65	SLAC-NE-01
			$e^-$ $^{56}\text{Fe}$	0.9-4.3	SLAC-NE-09
			$e^-$ $^{56}\text{Fe}$	1	SLAC-NE-01
			$e^-$ $^{56}\text{Fe}$	1	SLAC-NE-05
			$e^-$ $^{56}\text{Fe}$	1.5	SLAC-NE-05
			$e^-$ $^{56}\text{Fe}$	2	SLAC-NE-01



## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum (GeV/c)	Experiment	Beam-target	Lab momentum (GeV/c)	Experiment
$\pi^+$ nucleon	530	FNAL-706	$\pi^- p$	0.321	TRIUMF-441
$\pi^+$ deut	0.032	LAMPF-1085	$\pi^- p$	0.342-0.469	TRIUMF-624
$\pi^+$ deut	0.038	LAMPF-828	$\pi^- p$	0.35-0.45	SIN-R-86-02
$\pi^+$ deut	0.038	LAMPF-1085	$\pi^- p$	0.353	TRIUMF-441
$\pi^+$ deut	0.053	LAMPF-1085	$\pi^- p$	0.385	TRIUMF-441
$\pi^+$ deut	0.054	LAMPF-828	$\pi^- p$	0.471-0.625	LAMPF-806
$\pi^+$ deut	0.066	LAMPF-828	$\pi^- p$	0.471-0.687	LAMPF-849
$\pi^+$ deut	0.067	LAMPF-1085	$\pi^- p$	0.9-2	ITEP-864
$\pi^+$ deut	0.078	LAMPF-1085	$\pi^- p$	4.35	ITEP-829
$\pi^+$ deut	0.087	TRIUMF-506	$\pi^- p$	4.5	ITEP-827
$\pi^+$ deut	0.096	TRIUMF-399	$\pi^- p$	4.5	ITEP-828
$\pi^+$ deut	0.096-0.169	LAMPF-767	$\pi^- p$	4.85	ITEP-829
$\pi^+$ deut	0.121	TRIUMF-506	$\pi^- p$	6	BNL-838
$\pi^+$ deut	0.128	TRIUMF-399	$\pi^- p$	6	KEK-179
$\pi^+$ deut	0.128	TRIUMF-502	$\pi^- p$	8	BNL-771
$\pi^+$ deut	0.150	TRIUMF-506	$\pi^- p$	8	BNL-881
$\pi^+$ deut	0.150	TRIUMF-399	$\pi^- p$	8.95	KEK-135
$\pi^+$ deut	0.195-0.410	TRIUMF-337	$\pi^- p$	12	BNL-818
$\pi^+$ deut	0.246-0.370	TRIUMF-377	$\pi^- p$	18	BNL-852
$\pi^+$ deut	0.265	TRIUMF-360	$\pi^- p$	22	BNL-747
$\pi^+$ deut	0.310-0.417	LAMPF-979	$\pi^- p$	32	SERPUKHOV-169
$\pi^+$ deut	0.331-0.417	LAMPF-1096	$\pi^- p$	32	SERPUKHOV-172
$\pi^+$ deut	0.353	TRIUMF-508	$\pi^- p$	37	SERPUKHOV-164
$\pi^+$ deut	0.364	TRIUMF-443	$\pi^- p$	38	SERPUKHOV-140
$\pi^+$ deut	0.370	TRIUMF-503	$\pi^- p$	40	SERPUKHOV-112
$\pi^+$ deut	0.396	TRIUMF-443	$\pi^- p$	40	SERPUKHOV-147
$\pi^+$ trit	0.128-0.331	SIN-R-85-11	$\pi^- p$	40	SERPUKHOV-149
$\pi^+$ He	0.128-0.331	SIN-R-85-11	$\pi^- p$	40	SERPUKHOV-155
$\pi^+$ He	0.242	LAMPF-898	$\pi^- p$	40	SERPUKHOV-173
$\pi^+$ He	0.288	LAMPF-998	$\pi^- p$	40-50	SERPUKHOV-148
$\pi^+$ He	0.374	LAMPF-898	$\pi^- p$	60-70	SERPUKHOV-161
$\pi^+$ He	0.396	TRIUMF-556	$\pi^- p$	80	CERN-WA-069
$\pi^+$ He	1	KEK-217	$\pi^- p$	140	CERN-WA-069
$\pi^+$ $^3\text{He}$	0.195	TRIUMF-557	$\pi^- p$	200-2400	SERPUKHOV-UNK-002
$\pi^+$ $^7\text{Li}$	300	FNAL-705	$\pi^- p$	280	CERN-WA-070
$\pi^+$ C	3	ITEP-841	$\pi^- p$	280	CERN-WA-083
$\pi^+$ $^{12}\text{C}$	1	KEK-217	$\pi^- p$	300	CERN-NA-012-2
$\pi^+$ $^{12}\text{C}$	1.05	KEK-160	$\pi^- n$	300	CERN-NA-012-2
$\pi^+$ $^{12}\text{C}$	4	KEK-132	$\pi^-$ nucleon	40	SERPUKHOV-163
$\pi^+$ Ti	1.4	ITEP-853	$\pi^-$ nucleon	500-2500	SERPUKHOV-UNK-002
$\pi^+$ Fe	1.4	ITEP-853	$\pi^-$ nucleon	530	FNAL-706
$\pi^+$ Pb	3	ITEP-841	$\pi^-$ deut	0	PSI-R-86-05
$\pi^+$ nucleus	0.5-1.5	KEK-157	$\pi^-$ deut	0.096	TRIUMF-399
$\pi^+$ nucleus	0.8	BNL-828	$\pi^-$ deut	0.096-0.169	LAMPF-767
$\pi^+$ nucleus	1-1.2	KEK-150	$\pi^-$ deut	>0.075	LAMPF-1182
$\pi^+$ nucleus	1-9	ITEP-771	$\pi^-$ deut	0.128	TRIUMF-399
$\pi^+$ nucleus	1.05	BNL-798	$\pi^-$ deut	0.128	TRIUMF-502
$\pi^- p$	0	PSI-R-86-05	$\pi^-$ deut	0.150	TRIUMF-399
$\pi^- p$	0	SIN-R-85-10	$\pi^-$ deut	0.246-0.370	TRIUMF-377
$\pi^- p$	0	SIN-R-85-14	$\pi^-$ deut	0.331-0.417	LAMPF-1096
$\pi^- p$	0.054-0.077	TRIUMF-643	$\pi^-$ deut	0.370	TRIUMF-503
$\pi^- p$	0.077-0.150	TRIUMF-394	$\pi^-$ deut	0.408	LAMPF-981
$\pi^- p$	0.096-0.195	PSI-R-85-13-3	$\pi^-$ deut	0.9-2	ITEP-863
$\pi^- p$	0.100-0.150	LAMPF-808	$\pi^-$ deut	0.9-3	ITEP-762
$\pi^- p$	0.121	LAMPF-1256	$\pi^-$ deut	40	SERPUKHOV-149
$\pi^- p$	0.121-0.195	LAMPF-1178	$\pi^-$ deut	0	PSI-R-86-05
$\pi^- p$	0.130	TRIUMF-560	$\pi^-$ trit	0.128-0.331	SIN-R-85-11
$\pi^- p$	0.152	LAMPF-1256	$\pi^-$ He	0.128-0.331	SIN-R-85-11
$\pi^- p$	0.182	TRIUMF-441	$\pi^-$ He	0.242	LAMPF-898
$\pi^- p$	0.195-0.364	TRIUMF-537	$\pi^-$ He	0.288	LAMPF-998
$\pi^- p$	0.219	TRIUMF-441	$\pi^-$ He	0.374	LAMPF-898
$\pi^- p$	0.225-0.310	TRIUMF-598	$\pi^-$ $^6\text{Li}$	4	KEK-187
$\pi^- p$	0.247-0.378	TRIUMF-645	$\pi^-$ $^7\text{Li}$	300	FNAL-705
$\pi^- p$	0.254	TRIUMF-441	$\pi^-$ Be	150	CERN-WA-077
$\pi^- p$	0.279	TRIUMF-561	$\pi^-$ Be	300	CERN-WA-077
$\pi^- p$	0.288	TRIUMF-441	$\pi^-$ C	1.2	ITEP-841
$\pi^- p$	0.292	TRIUMF-561	$\pi^-$ C	1.5-3	ITEP-826
$\pi^- p$	0.299	TRIUMF-561	$\pi^-$ C	3	ITEP-841
$\pi^- p$	0.3-0.5	BNL-857	$\pi^-$ C	5	ITEP-841
$\pi^- p$	0.313	TRIUMF-561			



## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum (GeV/c)	Experiment	Beam-target	Lab momentum (GeV/c)	Experiment
<i>p p</i>	2.25	SACLAY-212	<i>p trit</i>	1.41	LAMPF-1135
<i>p p</i>	2.31	SACLAY-174	<i>p trit</i>	1.44	LAMPF-1135
<i>p p</i>	2.57	SACLAY-212	<i>p trit</i>	1.46	LAMPF-1135
<i>p p</i>	2.89	SACLAY-212	<i>p He</i>	0.912	LAMPF-973
<i>p p</i>	3.23	SACLAY-174	<i>p He</i>	1.26	LAMPF-973
<i>p p</i>	3.31	SACLAY-132	<i>p He</i>	1.38	LAMPF-973
<i>p p</i>	3.52	SACLAY-244	<i>p He</i>	1.46	LAMPF-973
<i>p p</i>	3.8	SACLAY-213	<i>p He</i>	1.46	LAMPF-973
<i>p p</i>	6	BNL-834	<i>p <sup>3</sup>He</i>	0.793	TRIUMF-541
<i>p p</i>	6	BNL-838	<i>p <sup>3</sup>He</i>	0.912	LAMPF-973
<i>p p</i>	6-20	BNL-850	<i>p <sup>3</sup>He</i>	1.26	LAMPF-973
<i>p p</i>	10	BNL-834	<i>p <sup>3</sup>He</i>	1.38	LAMPF-973
<i>p p</i>	12	KEK-248	<i>p <sup>3</sup>He</i>	1.46	LAMPF-973
<i>p p</i>	12	BNL-834	<i>p <sup>6</sup>Li</i>	2	ITEP-874
<i>p p</i>	13-26	BNL-782	<i>p <sup>7</sup>Li</i>	2	ITEP-874
<i>p p</i>	13.5	BNL-785	<i>p <sup>7</sup>Li</i>	300	FNAL-705
<i>p p</i>	18.5	BNL-785	<i>p Be</i>	2	ITEP-874
<i>p p</i>	24	BNL-794	<i>p Be</i>	22	BNL-817
<i>p p</i>	28	BNL-794	<i>p Be</i>	450	CERN-NA-034
<i>p p</i>	60-70	SERPUKHOV-161	<i>p Be</i>	451	CERN-NA-044
<i>p p</i>	70	SERPUKHOV-149	<i>p Be</i>	800	FNAL-756
<i>p p</i>	70	SERPUKHOV-155	<i>p Be</i>	800	FNAL-800
<i>p p</i>	85	CERN-WA-076	<i>p Be</i>	900	FNAL-711
<i>p p</i>	200	FNAL-581/704	<i>p C</i>	3	ITEP-841
<i>p p</i>	280	CERN-WA-070	<i>p C</i>	3.37	KEK-159
<i>p p</i>	300	CERN-WA-076	<i>p C</i>	4.5	ITEP-826
<i>p p</i>	314	CERN-UA-006	<i>p C</i>	7.5	ITEP-841
<i>p p</i>	400-3000	SERPUKHOV-UNK-001	<i>p C</i>	7.5	ITEP-826
<i>p p</i>	450	CERN-NA-012-2	<i>p C</i>	70	SERPUKHOV-168
<i>p p</i>	450	CERN-WA-091	<i>p <sup>12</sup>C</i>	0.07	PSI-Z-90-07
<i>p p</i>	800	FNAL-743	<i>p <sup>12</sup>C</i>	1.99	SACLAY-174
<i>p p</i>	2190	SERPUKHOV-UNK-008	<i>p <sup>12</sup>C</i>	2.2	SACLAY-174
<i>p p</i>	3000	SERPUKHOV-UNK-003	<i>p <sup>12</sup>C</i>	2.31	SACLAY-174
<i>p p</i>	6000	SERPUKHOV-UNK-004	<i>p <sup>12</sup>C</i>	4	KEK-132
<i>p p</i>	6000	SERPUKHOV-UNK-005	<i>p Mg</i>	70	SERPUKHOV-168
<i>p p</i>	?	SACLAY-113	<i>p Al</i>	7.5	ITEP-895
<i>p p</i>	?	SACLAY-121	<i>p Si</i>	200	CERN-NA-032
<i>p p</i>	?	SACLAY-237	<i>p Si</i>	800-925	FNAL-771
<i>p n</i>	<70	SERPUKHOV-119	<i>p Su</i>	451	CERN-NA-044
<i>p n</i>	<70	SERPUKHOV-174	<i>p Cu</i>	0.87-0.92	TRIUMF-298
<i>p n</i>	0.346-3.37	KEK-174	<i>p Cu</i>	3.37	KEK-159
<i>p n</i>	0.375	PSI-Z-91-02	<i>p Cu</i>	30	FNAL-776
<i>p n</i>	0.876-1.08	TRIUMF-460	<i>p Cu</i>	70	SERPUKHOV-168
<i>p n</i>	1.6	ITEP-893	<i>p Cu</i>	150	FNAL-776
<i>p n</i>	1.81-3.52	SACLAY-225	<i>p Cu</i>	400	FNAL-776
<i>p nucleon</i>	70	SERPUKHOV-169	<i>p Cu</i>	800	FNAL-776
<i>p nucleon</i>	70	SERPUKHOV-136	<i>p Wt</i>	1000	FNAL-793
<i>p nucleon</i>	500-3000	SERPUKHOV-UNK-002	<i>p Pb</i>	3	ITEP-841
<i>p nucleon</i>	530	FNAL-706	<i>p Pb</i>	4.5	ITEP-826
<i>p nucleon</i>	800	FNAL-706	<i>p Pb</i>	7.5	ITEP-841
<i>p nucleon</i>	1000-3000	SERPUKHOV-UNK-002	<i>p Pb</i>	7.5	ITEP-826
<i>p deut</i>	0.3	PSI-Z-85-06	<i>p Pb</i>	7.5	ITEP-895
<i>p deut</i>	>0.414	SACLAY-198	<i>p Pb</i>	451	CERN-NA-044
<i>p deut</i>	0.644	TRIUMF-482	<i>p <sup>197</sup>Au</i>	800	FNAL-792
<i>p deut</i>	0.679	TRIUMF-332	<i>p <sup>238</sup>U</i>	202	CERN-NA-038
<i>p deut</i>	0.793	TRIUMF-482	<i>p nucleus</i>	0.808-0.982	SACLAY-155
<i>p deut</i>	0.846	TRIUMF-332	<i>p nucleus</i>	1-9	ITEP-771
<i>p deut</i>	0.954	TRIUMF-482	<i>p nucleus</i>	1-10	ITEP-873
<i>p deut</i>	0.989	TRIUMF-332	<i>p nucleus</i>	1.46	SACLAY-192
<i>p deut</i>	1.08	TRIUMF-332	<i>p nucleus</i>	1.46-1.92	SERPUKHOV-171
<i>p deut</i>	1.09	LAMPF-853	<i>p nucleus</i>	1.5	KEK-173
<i>p deut</i>	1.28	LAMPF-853	<i>p nucleus</i>	2.2	ITEP-894
<i>p deut</i>	1.28	LAMPF-1119	<i>p nucleus</i>	2.36	SACLAY-192
<i>p deut</i>	1.46	LAMPF-853	<i>p nucleus</i>	2.89	SACLAY-133
<i>p deut</i>	1.46	LAMPF-1119	<i>p nucleus</i>	3	ITEP-813
<i>p deut</i>	1.46	LAMPF-795	<i>p nucleus</i>	3.50-5	KEK-257
<i>p deut</i>	1.46	LAMPF-818	<i>p nucleus</i>	3.52	SACLAY-133
<i>p deut</i>	1.59	SACLAY-174	<i>p nucleus</i>	4.54-10.1	ITEP-831
<i>p deut</i>	1.59	SACLAY-174	<i>p nucleus</i>	5	ITEP-813
<i>p deut</i>	3.37	KEK-159	<i>p nucleus</i>	6	BNL-834
<i>p deut</i>	70	SERPUKHOV-149	<i>p nucleus</i>	6-20	BNL-850
<i>p deut</i>	800	FNAL-772			
<i>p deut</i>	?	SACLAY-113			
<i>p deut</i>	?	SACLAY-197			
<i>p deut</i>	?	SACLAY-222			
<i>p deut</i>	?	SACLAY-237			



## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum (GeV/c)	Experiment
$p$ nucleus	7.5	ITEP-894
$p$ nucleus	7.5	ITEP-813
$p$ nucleus	9.96	ITEP-842
$p$ nucleus	10	BNL-834
$p$ nucleus	10	BNL-855
$p$ nucleus	10.9	ITEP-831
$p$ nucleus	12	KEK-136
$p$ nucleus	12	BNL-834
$p$ nucleus	14.6	BNL-802
$p$ nucleus	15-65	SERPUKHOV-153
$p$ nucleus	15.5	BNL-878
$p$ nucleus	16	BNL-810
$p$ nucleus	16	BNL-814
$p$ nucleus	18	BNL-855
$p$ nucleus	60.5	CERN-NA-045
$p$ nucleus	60.9	CERN-NA-035
$p$ nucleus	70	SERPUKHOV-120
$p$ nucleus	70	SERPUKHOV-155
$p$ nucleus	201	CERN-NA-035
$p$ nucleus	202	CERN-NA-045
$p$ nucleus	203	CERN-WA-080
$p$ nucleus	250	FNAL-769
$p$ nucleus	370	CERN-WA-082
$p$ nucleus	400	FNAL-605
$p$ nucleus	400-3000	SERPUKHOV-UNK-001
$p$ nucleus	450	CERN-NA-034-2
$p$ nucleus	500	FNAL-672A
$p$ nucleus	800	FNAL-605
$p$ nucleus	800	FNAL-672A
$p$ nucleus	800	FNAL-653
$p$ nucleus	800	FNAL-761
$p$ nucleus	800	FNAL-772
$p$ nucleus	?	BNL-888
$p$ nucleus	?	FNAL-766
$p$ nucleus	?	SACLAY-237
$\bar{p} p$	0	CERN-PS-170
$\bar{p} p$	0	CERN-PS-171
$\bar{p} p$	0	CERN-PS-174
$\bar{p} p$	0	CERN-PS-175
$\bar{p} p$	0	CERN-PS-182
$\bar{p} p$	0	CERN-PS-183
$\bar{p} p$	0	CERN-PS-195
$\bar{p} p$	<0.2	CERN-PS-179
$\bar{p} p$	<0.3	CERN-PS-183
$\bar{p} p$	<1.8	CERN-PS-201
$\bar{p} p$	<2	CERN-PS-197
$\bar{p} p$	<2	CERN-PS-170
$\bar{p} p$	0.1-0.6	CERN-PS-178
$\bar{p} p$	0.15-0.60	CERN-PS-173
$\bar{p} p$	0.22-0.80	CERN-PS-172
$\bar{p} p$	0.3-0.7	CERN-PS-198
$\bar{p} p$	0.30-1.55	CERN-PS-172
$\bar{p} p$	0.36-0.76	KEK-131
$\bar{p} p$	0.5-1.3	CERN-PS-199
$\bar{p} p$	0.6-1.9	CERN-PS-202
$\bar{p} p$	1.2-2	CERN-PS-185
$\bar{p} p$	3-7	FNAL-760
$\bar{p} p$	5	BNL-771
$\bar{p} p$	6	BNL-838
$\bar{p} p$	8	BNL-881
$\bar{p} p$	40-50	SERPUKHOV-148
$\bar{p} p$	200	FNAL-581/704
$\bar{p} p$	200-2400	SERPUKHOV-UNK-002

HERE, FOR THE REST OF  $\bar{p}p$ , WE SWITCH FROM LAB MOMENTUM TO C.M. ENERGY

Beam-target	C.m. energy (GeV)	Experiment
$\bar{p} p$	24.3	CERN-UA-006
$\bar{p} p$	300	FNAL-710
$\bar{p} p$	300-2000	FNAL-713
$\bar{p} p$	500-2000	FNAL-741
$\bar{p} p$	500-2000	FNAL-775
$\bar{p} p$	540	CERN-UA-001
$\bar{p} p$	546	FNAL-710

Beam-target	Lab momentum (GeV/c)	Experiment
$\bar{p} p$	630	CERN-UA-001
$\bar{p} p$	630	CERN-UA-002
$\bar{p} p$	630	CERN-UA-004-2
$\bar{p} p$	630	CERN-UA-007
$\bar{p} p$	630	CERN-UA-008
$\bar{p} p$	1000	FNAL-710
$\bar{p} p$	1800	FNAL-710
$\bar{p} p$	2000	FNAL-735
$\bar{p} p$	2000	FNAL-740
$\bar{p} p$	6000	SERPUKHOV-UNK-004
$\bar{p} p$	6000	SERPUKHOV-UNK-005

Beam-target	Lab momentum (GeV/c)	Experiment
$\bar{p}$ deut	0	CERN-PS-174
$\bar{p}$ deut	0	CERN-PS-175
$\bar{p}$ deut	<0.2	CERN-PS-179
$\bar{p}$ deut	<1.8	CERN-PS-201
$\bar{p}$ deut	0.3-0.7	CERN-PS-198
$\bar{p}$ He	0	CERN-PS-175
$\bar{p}$ He	<0.6	CERN-PS-179
$\bar{p}$ He	0.10E-04-0.0001	CERN-PS-194-3
$\bar{p}$ He	0.01	CERN-PS-194-2
$\bar{p}$ He	0.031-0.087	CERN-PS-194
$\bar{p}$ He	0.2	CERN-PS-194-2
$\bar{p}$ He	0.519	KEK-215
$\bar{p}$ He	?	CERN-PS-205
$\bar{p}$ $^3\text{He}$	0	CERN-PS-175
$\bar{p}$ $^3\text{He}$	<0.2	CERN-PS-179
$\bar{p}$ $^7\text{Li}$	300	FNAL-705
$\bar{p}$ Be	1.26	ITEP-865
$\bar{p}$ Be	1.53	ITEP-865
$\bar{p}$ Be	1.76	ITEP-865
$\bar{p}$ C	0.1	CERN-PS-204
$\bar{p}$ C	1.26	ITEP-865
$\bar{p}$ C	1.53	ITEP-865
$\bar{p}$ C	1.76	ITEP-865
$\bar{p}$ Ne	<0.6	CERN-PS-179
$\bar{p}$ Al	1.26	ITEP-865
$\bar{p}$ Al	1.53	ITEP-865
$\bar{p}$ Al	1.76	ITEP-865
$\bar{p}$ Fe	1.26	ITEP-865
$\bar{p}$ Fe	1.53	ITEP-865
$\bar{p}$ Fe	1.76	ITEP-865
$\bar{p}$ Cu	1.26	ITEP-865
$\bar{p}$ Cu	1.53	ITEP-865
$\bar{p}$ Cu	1.76	ITEP-865
$\bar{p}$ Pb	1.26	ITEP-865
$\bar{p}$ Pb	1.53	ITEP-865
$\bar{p}$ Pb	1.76	ITEP-865
$\bar{p}$ nucleus	0	CERN-PS-177
$\bar{p}$ nucleus	0	CERN-PS-186
$\bar{p}$ nucleus	0	CERN-PS-203
$\bar{p}$ nucleus	<1.8	CERN-PS-201
$\bar{p}$ nucleus	0.0002-0.004	CERN-PS-194-3
$\bar{p}$ nucleus	5	BNL-854
$\bar{p}$ nucleus	7	BNL-854
$\bar{p}$ nucleus	9	BNL-854
$\bar{p}$ nucleus	40	SERPUKHOV-148
$\bar{p}$ nucleus	40-50	SERPUKHOV-148
$\bar{p}$ crystal	0.03	CERN-PS-194-2
$\bar{p}$ crystal	0.2	CERN-PS-194-2
$n p$	0.311-0.955	LAMPF-1208
$n p$	0.341	PSI-Z-89-06
$n p$	0.342-2.85	KEK-235
$n p$	0.364	SIN-R-89-07
$n p$	0.50-1.20	PSI-R-87-12
$n p$	0.55-1.20	PSI-R-86-14
$n p$	0.60-1.20	SIN-R-72-02
$n p$	0.609	TRIUMF-498

## BEAM/TARGET/MOMENTUM INDEX

Beam-target	Lab momentum (GeV/c)	Experiment	Beam-target	Lab momentum (GeV/c)	Experiment
$n p$	0.680	TRIUMF-182	$deut p$	0.65	SACLAY-157
$n p$	0.771	TRIUMF-466	$deut p$	0.889	SACLAY-166
$n p$	0.773	TRIUMF-466	$deut p$	0.889-1.29	SACLAY-235
$n p$	0.776	TRIUMF-466	$deut p$	1.20	SACLAY-166
$n p$	0.782	TRIUMF-466	$deut p$	1.29	SACLAY-246
$n p$	0.795	TRIUMF-466	$deut p$	1.30	SACLAY-157
$n p$	0.808-1.46	LAMPF-960	$deut p$	1.46	LAMPF-685
$n p$	0.827-1.81	SACLAY-144	$deut p$	1.46-3.62	SACLAY-117
$n p$	0.846	TRIUMF-182	$deut p$	1.6	SACLAY-157
$n p$	0.883	TRIUMF-369	$deut p$	1.6-3.6	SACLAY-115
$n p$	0.99	TRIUMF-182	$deut p$	1.62	SACLAY-138
$n p$	1-2	SACLAY-106	$deut p$	2.05	SACLAY-138
$n p$	1.02	TRIUMF-372	$deut p$	2.10	SACLAY-157
$n p$	1.09	LAMPF-1234	$deut p$	2.31	SACLAY-138
$n p$	1.09	LAMPF-665	$deut p$	2.40	SACLAY-157
$n p$	1.09-1.28	LAMPF-770	$deut p$	2.93	SACLAY-038-2
$n p$	1.09-1.46	LAMPF-770	$deut p$	2.93	SACLAY-216
$n p$	1.19	LAMPF-1234	$deut p$	2.93	SACLAY-217
$n p$	1.28	LAMPF-876	$deut p$	3.20	SACLAY-157
$n p$	1.28	LAMPF-1234	$deut p$	3.39	SACLAY-145
$n p$	1.28	LAMPF-665	$deut p$	?	SACLAY-190
$n p$	1.28-1.70	SACLAY-140	$deut deut$	1.5-4.0	KEK-125
$n p$	1.38	LAMPF-1234	$deut deut$	1.91-2.62	SACLAY-105
$n p$	1.45	LAMPF-961	$deut C$	1.5-4.0	KEK-125
$n p$	1.46	LAMPF-665	$deut Al$	1.5-4.0	KEK-125
$n p$	1.46	LAMPF-876	$deut nucleus$	1.6-3.6	SACLAY-115
$n p$	1.46	LAMPF-589	$deut nucleus$	3.5-5.0	KEK-257
$n p$	10-28	BNL-766	$deut nucleus$	3.51	SACLAY-202
$n p$	231	TRIUMF-498	$deut nucleus$	3.72	SACLAY-134
$n Pb$	2-10	ITEP-862	$deut nucleus$	?	BNL-859
$\bar{n} p$	<0.3	CERN-PS-201	$He p$	3	ITEP-892
$\bar{n} C$	0.1-0.6	CERN-PS-178	$He p$	5	ITEP-892
$\bar{n} Al$	0.1-0.6	CERN-PS-178	${}^6Li p$	7.73-8.40	SACLAY-206
$\bar{n} Fe$	0.1-0.6	CERN-PS-178	${}^{12}C p$	3.38	TRIUMF-478
$\bar{n} Cu$	0.1-0.6	CERN-PS-178	${}^{12}C nucleus$	191	BNL-826
$\bar{n} Pb$	0.1-0.6	CERN-PS-178	${}^{13}C p$	3.52	TRIUMF-478
$\bar{n} nucleus$	<0.3	CERN-PS-201	$Ne Br$	80.6	ITEP-852
$\Lambda p$	30-60	SERPUKHOV-120	$Ne Ag$	80.6	ITEP-852
$\Lambda deut$	30-60	SERPUKHOV-120	$Mg Ar$	97.1	ITEP-852
$\Lambda Cu$	300-500	FNAL-800	$Mg Br$	97.1	ITEP-852
$\Lambda Cu$	300-800	FNAL-756	$O Hg$	232	BNL-801
$\Sigma^+ p$	0.2-0.6	KEK-251	${}^{16}O C$	96.1	BNL-831
$\Sigma^+ p$	30-60	SERPUKHOV-120	${}^{16}O C$	224	BNL-831
$\Sigma^+ deut$	30-60	SERPUKHOV-120	${}^{16}O Au$	232	BNL-844
$\Sigma^- p$	30-60	SERPUKHOV-120	${}^{16}O {}^{197}Au$	975	CERN-NA-041
$\Sigma^- deut$	30-60	SERPUKHOV-120	${}^{16}O {}^{197}Au$	3633	CERN-NA-041
$\Sigma^- Be$	360	CERN-WA-089	${}^{16}O Hg$	975	CERN-NA-039
$\Sigma^- Cu$	360	CERN-WA-089	${}^{16}O Hg$	3217	CERN-NA-039
$\Xi^- p$	30-60	SERPUKHOV-120	${}^{16}O Pb$	3217	CERN-EMU-002
$\Xi^- deut$	0	BNL-813	${}^{16}O {}^{238}U$	3202	CERN-NA-038
$\Xi^- deut$	30-60	SERPUKHOV-120	${}^{16}O nucleus$	96.1	BNL-831
$\Xi^- {}^6Li$	0	BNL-885	${}^{16}O nucleus$	223-3217	CERN-EMU-001
$\Xi^- Be$	270	CERN-WA-089	${}^{16}O nucleus$	224	BNL-831
$\Xi^- Cu$	270	CERN-WA-089	${}^{16}O nucleus$	232	BNL-802
$\Xi^0 p$	30-60	SERPUKHOV-120	${}^{16}O nucleus$	239	BNL-847
$\Xi^0 deut$	30-60	SERPUKHOV-120	${}^{16}O nucleus$	247	BNL-806
$\Xi^0 Cu$	300-500	FNAL-800	${}^{16}O nucleus$	255	BNL-808
$\Xi^0 Cu$	300-800	FNAL-756	${}^{16}O nucleus$	255	BNL-810
$\Omega^- p$	30-60	SERPUKHOV-120	${}^{16}O nucleus$	255	BNL-814
$\Omega^- deut$	30-60	SERPUKHOV-120	${}^{16}O nucleus$	255	BNL-815
$\Omega^- Be$	270	CERN-WA-089	${}^{16}O nucleus$	255	BNL-825
$\Omega^- Cu$	270	CERN-WA-089	${}^{16}O nucleus$	255	CERN-EMU-005
$deut p$	0.621-1.02	SACLAY-137	${}^{16}O nucleus$	815	CERN-EMU-005
			${}^{16}O nucleus$	815	CERN-WA-086
			${}^{16}O nucleus$	961	CERN-NA-040
			${}^{16}O nucleus$	975	CERN-EMU-003

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Beam-target	Lab momentum (GeV/c)	Experiment	Beam-target	Lab momentum (GeV/c)	Experiment
$^{16}\text{O}$ nucleus	975	CERN-EMU-004	$^{32}\text{S}$ nucleus	6433	CERN-EMU-008
$^{16}\text{O}$ nucleus	975	CERN-EMU-007	$^{32}\text{S}$ nucleus	6433	CERN-EMU-009
$^{16}\text{O}$ nucleus	975	CERN-EMU-008	$^{32}\text{S}$ nucleus	6433	CERN-EMU-010
$^{16}\text{O}$ nucleus	975	CERN-NA-035	$^{32}\text{S}$ nucleus	6433	CERN-WA-080
$^{16}\text{O}$ nucleus	975	CERN-WA-080	$^{32}\text{S}$ nucleus	6433	CERN-WA-087
$^{16}\text{O}$ nucleus	975	CERN-WA-087	$^{32}\text{S}$ nucleus	6433	CERN-WA-090
$^{16}\text{O}$ nucleus	3202	CERN-NA-040	Au nucleus	3035	BNL-875
$^{16}\text{O}$ nucleus	3202	CERN-NA-034-2	Au nucleus	?	BNL-888
$^{16}\text{O}$ nucleus	3202	CERN-NA-036	$^{197}\text{Au}$ Pb	3056	BNL-882
$^{16}\text{O}$ nucleus	3217	CERN-EMU-005	$^{197}\text{Au}$ nucleus	2286	BNL-866
$^{16}\text{O}$ nucleus	3217	CERN-WA-086	$^{197}\text{Au}$ nucleus	2308	BNL-864
$^{16}\text{O}$ nucleus	3217	CERN-EMU-003	$^{197}\text{Au}$ nucleus	3036	BNL-878
$^{16}\text{O}$ nucleus	3217	CERN-EMU-004	$^{197}\text{Au}$ nucleus	3135	BNL-808
$^{16}\text{O}$ nucleus	3217	CERN-EMU-007	$^{197}\text{Au}$ nucleus	3135	BNL-886
$^{16}\text{O}$ nucleus	3217	CERN-EMU-008	$^{197}\text{Au}$ nucleus	0.396E5	CERN-EMU-011
$^{16}\text{O}$ nucleus	3217	CERN-NA-035	Pb Pb	0.416E5	CERN-NA-044
$^{16}\text{O}$ nucleus	3217	CERN-WA-080	Pb Pb	0.540E5	CERN-WA-097
$^{16}\text{O}$ nucleus	3217	CERN-WA-087	Pb nucleus	?	CERN-NA-049
Si Cu	421	BNL-793	Pb nucleus	?	CERN-NA-050
Si Pb	421	BNL-793	$^{207}\text{Pb}$ nucleus	0.126E5	CERN-EMU-011
$^{28}\text{Si}$ Pb	434	BNL-882	$^{207}\text{Pb}$ nucleus	0.126E5-0.333E5	CERN-EMU-012
$^{28}\text{Si}$ nucleus	406	BNL-802	$^{207}\text{Pb}$ nucleus	0.374E5	CERN-EMU-013
$^{28}\text{Si}$ nucleus	418	BNL-847	$^{207}\text{Pb}$ nucleus	0.416E5	CERN-EMU-011
$^{28}\text{Si}$ nucleus	432	BNL-806	hadron p	200-2000	FNAL-690
$^{28}\text{Si}$ nucleus	432	BNL-878			
$^{28}\text{Si}$ nucleus	446	BNL-810			
$^{28}\text{Si}$ nucleus	446	BNL-815			
$^{28}\text{Si}$ nucleus	446	BNL-825			
$^{28}\text{Si}$ nucleus	446	BNL-858			
$^{28}\text{Si}$ nucleus	446	BNL-886			
$^{28}\text{Si}$ nucleus	?	BNL-859			
Su Su	6445	CERN-NA-044			
Su Su	6445	CERN-WA-094			
Su Wt	6415	CERN-NA-034-3			
Su Ag	6445	CERN-NA-044			
Su Hg	464	BNL-801			
Su Hg	6445	CERN-NA-039			
Su Pb	6445	CERN-NA-044			
Su nucleus	494	BNL-875			
Su nucleus	6445	CERN-WA-093			
$^{32}\text{S}$ C	192	BNL-831			
$^{32}\text{S}$ C	448	BNL-831			
$^{32}\text{S}$ Al	6433	CERN-EMU-002			
$^{32}\text{S}$ Cu	6433	CERN-EMU-002			
$^{32}\text{S}$ Wt	6433	CERN-WA-085			
$^{32}\text{S}$ Au	7266	CERN-NA-041			
$^{32}\text{S}$ Pb	6433	CERN-EMU-002			
$^{32}\text{S}$ $^{238}\text{U}$	6403	CERN-NA-038			
$^{32}\text{S}$ nucleus	192	BNL-831			
$^{32}\text{S}$ nucleus	448	BNL-831			
$^{32}\text{S}$ nucleus	477	BNL-847			
$^{32}\text{S}$ nucleus	509	BNL-808			
$^{32}\text{S}$ nucleus	509	BNL-814			
$^{32}\text{S}$ nucleus	509	BNL-826			
$^{32}\text{S}$ nucleus	1630	CERN-WA-086			
$^{32}\text{S}$ nucleus	1921	CERN-NA-045			
$^{32}\text{S}$ nucleus	1951	CERN-EMU-003			
$^{32}\text{S}$ nucleus	1951	CERN-EMU-004			
$^{32}\text{S}$ nucleus	1951	CERN-EMU-007			
$^{32}\text{S}$ nucleus	1951	CERN-NA-035			
$^{32}\text{S}$ nucleus	6403	CERN-NA-045			
$^{32}\text{S}$ nucleus	6403	CERN-NA-034-2			
$^{32}\text{S}$ nucleus	6403	CERN-NA-036			
$^{32}\text{S}$ nucleus	6403	CERN-NA-040			
$^{32}\text{S}$ nucleus	6433	CERN-WA-086			
$^{32}\text{S}$ nucleus	6433	CERN-EMU-003			
$^{32}\text{S}$ nucleus	6433	CERN-EMU-004			
$^{32}\text{S}$ nucleus	6433	CERN-EMU-007			
$^{32}\text{S}$ nucleus	6433	CERN-NA-035			
$^{32}\text{S}$ nucleus	6433	CERN-EMU-001			

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## ABBREVIATIONS USED IN THE SUMMARIES

### JOURNALS

Following are abbreviations for journals listed in the summaries:

<b>AIPCP</b>	American Institute of Physics Conference Proceedings
<b>APL</b>	Applied Physics Letters
<b>APP</b>	Acta Physica Polonica
<b>AOPT</b>	Applied Optics
<b>ASTJ</b>	Astrophysical Journal
<b>BJP</b>	Bulgarian Journal of Physics
<b>CAMP</b>	Comments on Atomic and Molecular Physics
<b>CJP</b>	Canadian Journal of Physics
<b>CNPP</b>	Comments on Nuclear and Particle Physics
<b>CPC</b>	Computer Physics Communications
<b>CZJP</b>	Czechoslovakian Journal of Physics
<b>DANS</b>	Doklady Akademii Nauk SSSR (in Russian)
<b>ECHAYA</b>	Fizika Elementarnykh Chastits i Atomnogo Yadra (in Russian)
<b>EPL</b>	Europhysics Letters
<b>FORT</b>	Fortschritte der Physik
<b>HEPNP</b>	High Energy Physics and Nuclear Physics (in Chinese)
<b>HFI</b>	Hyperfine Interactions
<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>IJMP</b>	International Journal of Modern Physics
<b>JETP</b>	Journal of Experimental and Theoretical Physics (translation of ZETF)
<b>JETPL</b>	Journal of Experimental and Theoretical Physics Letters (translation of ZETFP)
<b>JJAP</b>	Japanese Journal of Applied Physics
<b>JdeP</b>	Journale de Physique
<b>JOSA</b>	Journal of the Optical Society of America
<b>JPHY</b>	Journal of Physics
<b>JPSJ</b>	Journal of the Physical Society of Japan
<b>LNC</b>	Lettere al Nuovo Cimento
<b>MPL</b>	Modern Physics Letters
<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>PTE</b>	Pribory i Tekhnika Eksperimenta (in Russian)
<b>PTP</b>	Progress of Theoretical Physics
<b>PW</b>	Particle World
<b>RCHA</b>	Radiochimica Acta
<b>RMP</b>	Reviews of Modern Physics
<b>RNC</b>	Rivista del Nuovo Cimento
<b>RPP</b>	Reports on Progress in Physics
<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>ZETF</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

## KINEMATIC VARIABLES

Following are abbreviations 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

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## ACCELERATORS

<b>BNL</b>	Brookhaven AGS proton synchrotron (31 GeV/c Plab)
<b>BNL-ION</b>	Brookhaven heavy ion accelerator
<b>BNL-RHIC</b>	Brookhaven relativistic heavy ion collider (100 GeV/n per beam)
<b>CERN</b>	CERN proton synchrotron (28 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-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>DESY</b>	Hamburg Deutches Electron SYNchrotron (7.5 GeV/c Plab)
<b>DESY-DORIS</b>	DESY DORIS electron-positron double ring (11.6 GeV Ecm)
<b>DESY-DORIS-II</b>	DESY DORIS single-ring 1982 upgrade
<b>DESY-DORIS-III</b>	DESY DORIS 1991 upgrade
<b>DESY-HERA</b>	DESY HERA electron (26 GeV) - proton (820 GeV) collider
<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 fix target Tevatron (1000 GeV)
<b>ITEP</b>	ITEP Moscow proton synchrotron (7 GeV/c Plab)
<b>JINR</b>	JINR (Dubna) proton synchrotron (10 GeV/c Plab)
<b>KEK-PS</b>	KEK proton synchrotron (12 GeV/c Plab)
<b>KEK-PF-LINAC</b>	KEK electron linac (2.5 GeV) for photon factory and TRISTAN
<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>NONE</b>	no accelerator used
<b>NOVO-VEPP-2M</b>	Novosibirsk VEPP-2M electron-positron storage ring (1.4 GeV Ecm)
<b>NOVO-VEPP-4</b>	Novosibirsk VEPP-4 electron-positron storage ring (10.4 GeV Ecm)
<b>PSI</b>	Paul Scherrer Institute, formerly SIN (590 MeV Tlab)
<b>SATURNE-II</b>	Saclay Saturne-II $p$ , $d$ , and He synchrotron
<b>SERPUKHOV</b>	Serpukhov proton synchrotron (76 GeV/c Plab)
<b>SERPUKHOV-UNK</b>	Serpukhov multi-TeV proton machine
<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>SSC</b>	Texas $pp$ Superconducting Super Collider (40 TeV 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>DRIFT</b>	drift chamber
<b>EMUL</b>	emulsion
<b>IONIZATION</b>	detector looking for ionization
<b>MICROSTRIP</b>	microstrip detector
<b>NEUTRONSPEC</b>	neutron spectrometer
<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>SCINT</b>	scintillator
<b>SPEC</b>	spectrometer system
<b>STRC</b>	streamer chamber
<b>TPC</b>	time projection chamber
<b>TRAD</b>	transition radiation detector
<b>WAS</b>	wide-angle spectrometer
<b>WIRE</b>	wire chamber
<b>X-RAY</b>	detector x-ray spectrometer

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Acronyms for specific detectors:

<b>ALEPH</b>	CERN-LEP detector
<b>AMY</b>	KEK-TRISTAN high-resolution lepton detector
<b>ARGUS</b>	DESY-DORIS-II detector
<b>BCD</b>	FNAL Bottom Collider Detector
<b>BENKEI</b>	KEK-PS detector
<b>BIS-2</b>	Serpukhov upgrade of BIS spectrometer
<b>CCM</b>	FNAL, FNAL-TEV Chicago Cyclotron Magnet spectrometer
<b>CDF</b>	Collider Detector at Fermilab
<b>CELLO</b>	DESY-PETRA spectrometer system
<b>CHAOS</b>	TRIUMF detector
<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>CMD</b>	Novosibirsk detector
<b>CMD-2</b>	Novosibirsk upgrade of CMD
<b>CRYSTAL-BALL</b>	SLAC-PEP, DESY-DORIS, DESY-DORIS-II Crystal Ball large-solid-angle neutral detector
<b>CRYSTAL-BARREL</b>	CERN-LEAR Crystal Barrel large-solid-angle detector
<b>CRYSTAL-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>DELPHI</b>	CERN-LEP detector
<b>DIogene</b>	Saclay SATURNE-II pictorial drift chamber

## DETECTORS

<b>D0</b>	FNAL-COLLIDER detector
<b>EMC</b>	CERN-SPS European Muon Collaboration detector
<b>EMRIC</b>	Saclay detector
<b>EPICS</b>	LAMPF Energetic Pion Channel and Spectrometer
<b>EVA</b>	BNL Exclusive Variable Apparatus
<b>EXCHARM</b>	Serpukhov detector, upgrade of BIS-2M
<b>FANCY</b>	KEK-PS, KEK-TRISTAN Forward ANd CYlindrical detector system
<b>FHS-1</b>	ITEP Focusing Hadron Spectrometer
<b>FHS-2</b>	ITEP upgrade of FHS-1
<b>FMPS</b>	FNAL, FNAL-TEV Fermilab Multiparticle Spectrometer
<b>FODS</b>	Serpukhov double-arm spectrometer
<b>FOCUS</b>	ITEP modified NHS spectrometer
<b>GAMS-2000</b>	Serpukhov hodoscope gamma spectrometer
<b>GAMS-4PI</b>	Serpukhov gamma spectrometer
<b>GAMS-4000</b>	CERN-SPS 64×64 cell Pb-glass array
<b>GEM</b>	SSCL Gamma, Electron and Muon detector
<b>GGNT</b>	Baksan Gallium-Germanium Neutrino Telescope
<b>GLUON</b>	Serpukhov-UNK detector
<b>HELIOS</b>	CERN-SPS detector
<b>HRS</b>	SLAC-PEP High-Resolution Spectrometer
<b>HYPERON-II</b>	Serpukhov single arm magnetic spectrometer
<b>HYPERSPEC</b>	BNL hypernuclear spectrometer
<b>H1</b>	DESY-HERA detector
<b>ISTRA-M</b>	Serpukhov detector
<b>JADE</b>	DESY-PETRA detector
<b>JANUS</b>	LAMPF proton polarimeter
<b>JETSET</b>	CERN-LEAR compact general purpose detector
<b>KASKAD</b>	Serpukhov cascade magnetic spectrometer
<b>KURAMA</b>	KEK wide angle spectrometer
<b>LAB-E</b>	FNAL, FNAL-TEV target-calorimeter muon-spectrometer detector for neutrino physics
<b>LAHRS</b>	LAMPF Los Alamos High-Resolution proton Spectrometer
<b>LAMBDA METER</b>	ITEP detector
<b>L3</b>	CERN-LEP detector
<b>MAC</b>	SLAC-PEP Magnetic Calorimeter
<b>MARK-II</b>	SLAC-SPEAR, SLAC-PEP, SLAC-SLC detector
<b>MARK-III</b>	SLAC-SPEAR detector
<b>MARK-J</b>	DESY-PETRA detector
<b>MEGA</b>	LAMPF array of electron and photon spectrometers
<b>MIS</b>	Serpukhov multiparticle spectrometer
<b>MIS-2</b>	Serpukhov upgrade of MIS
<b>MMS-UNK</b>	Serpukhov-UNK multimMuon spectrometer
<b>MPS</b>	BNL MultiParticle Spectrometer
<b>MPS-II</b>	BNL upgrade of MPS
<b>MTS</b>	ITEP detector
<b>NEPTUN</b>	Serpukhov-UNK jet target detector
<b>NEUTRONSPEC</b>	FNAL detector
<b>NEUTSPEC</b>	Novosibirsk neutral-particle energy and angle measuring detector
<b>NHS</b>	ITEP non-magnetic hadron spectrometer
<b>OMEGA</b>	CERN, CERN-SPS spectrometer system
<b>OMEGAPRIME</b>	CERN-SPS spectrometer system
<b>OPAL</b>	CERN-LEP detector
<b>PHENIX</b>	BNL-RHIC photon, electron, and hadron detector
<b>PINOT</b>	Saclay high resolution pi0 and eta detector
<b>PLASTIC-BALL</b>	CERN-SPS plastic ball detector
<b>POLDER</b>	Saclay polarimeter
<b>POMME</b>	Saclay medium energy deuteron polarimeter
<b>PROZA</b>	Serpukhov polarized proton target with frozen polarization, gamma spectrometer, neutron detector
<b>PROZA-M</b>	Serpukhov polarized target detector
<b>QUARTZ</b>	Serpukhov crystal-diffraction spectrometer
<b>SDC</b>	SSCL solenoidal detector
<b>SFINKS</b>	Serpukhov detector
<b>SHIP</b>	KEK-TRISTAN detector for Search for Highly Ionizing Particles
<b>SIGMA</b>	Serpukhov CERN-IHEP magnetic spectrometer
<b>SIGMA-AYAKS</b>	Serpukhov upgrade of SIGMA

## DETECTORS

<b>SINDRUM</b>	SIN large-solid-angle magnetic detector
<b>SINDRUM-II</b>	SIN upgraded large-angle solenoid detector
<b>SLD</b>	SLAC-SLC detector
<b>SND</b>	Novosibirsk Spherical Neutral Detector
<b>SPES-I</b>	Saclay high-resolution spectrometer
<b>SPES-II</b>	CERN, CERN-LEAR high-resolution spectrometer
<b>SPES-III</b>	Saclay high-resolution spectrometer
<b>SPES-IV</b>	Saclay high-resolution spectrometer
<b>SPES-0</b>	Saclay modular lead-glass Cerenkov detector
<b>STAR</b>	BNL-RHIC solenoidal detector
<b>SUPERBENKEI</b>	KEK window-frame type superconducting magnetic spectrometer
<b>TAGX</b>	TOKYO large-aperture spectrometer system
<b>TASSO</b>	DESY-PETRA detector
<b>TOKIWA</b>	KEK-PS spectrometer
<b>TOPAZ</b>	KEK-TRISTAN solenoidal spectrometer with TPC
<b>TPS</b>	FNAL Tagged Photon Spectrometer
<b>TSD</b>	Serpukhov-UNK streamer detector
<b>2-GAMMA</b>	SLAC-PEP system of forward detectors for 2-gamma process
<b>UA1</b>	CERN-PBAR/P UA1 experiment detector
<b>UA2</b>	CERN-PBAR/P UA2 experiment detector
<b>UKD</b>	Serpukhov-UNK Universal Calorimetric Detector
<b>VENUS</b>	KEK-TRISTAN Versatile Economical and Novel Universal Spectrometer
<b>ZEUS</b>	DESY-HERA detector

## PARTICLES

The first column gives the name as printed in this report, the second gives the name to use in searching the SLAC/SPIRES EXPERIMENTS database from which this report is taken (see p. 3).

As printed herein	For searching EXPERIMENTS database	Definition or comment
(charged)s	(CHARGEDS)	zero or more charged particles plus possible neutrals
( $\gamma$ )	(GAMMA)	zero or one $\gamma$
( $\gamma$ 's)	(GAMMAS)	zero or more $\gamma$ 's
(hadrons)	(HADRONS)	zero or more hadrons
(jets)	(JETS)	zero or more jets
(neutrals)	(NEUTRALS)	zero or more neutral particles
(pions)	(PIONS)	zero or more pions
( $\pi^0$ )	(PI0)	zero or one $\pi^0$
( $\pi^0$ 's)	(PI0S)	zero or more $\pi^0$ 's
(vees)	(VEES)	zero or more unspecified neutral strange particle decays
Ag	AG	silver nucleus
Al	AL	aluminum nucleus
<sup>27</sup> Al	AL27	aluminum-27 nucleus
<u>muonium</u>	AMUONIUM	anti-muonium
annihil	ANNIHIL	pure annihilation final state in nucleon-antinucleon scattering
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)+	was $\delta(980)$
$a_0(980)^-$	A0(980)-	was $\delta(980)$
$a_0(980)^0$	A0(980)0	was $\delta(980)$
$a_1(1260)^+$	A1(1260)+	
$a_1(1260)^-$	A1(1260)-	
$a_1(1260)^0$	A1(1260)0	
$a_2(1320)$	A2(1320)	
$a_2(1320)^+$	A2(1320)+	
$a_2(1320)^-$	A2(1320)-	
$a_2(1320)^0$	A2(1320)0	
$B$	B	$B(5270)$ bottom meson
$B^+$	B+	$B(5270)^+$ bottom meson
$B^*$	B*	excited bottom meson
$B^-$	B-	$B(5270)^-$ bottom meson
$B_s$	B/S	$B_s$ bottom-antistrange meson
$\bar{B}_s$	B/SBAR	antibottom-strange meson
<u>baryon</u>	BARYON	unspecified baryon
baryon	BARYONBAR	unspecified antibaryon
baryonium	BARYONIUM	meson that couples predominantly to baryon-antibaryon
<sup>134</sup> Ba	BA134	barium-134 nucleus
<sup>136</sup> Ba	BA136	barium-136 nucleus
$\bar{B}$	BBAR	$\bar{B}(5270)$ antibottom meson
$\bar{B}^0$	BBAR0	$\bar{B}(5270)^0$ antibottom meson
Be	BE	beryllium nucleus
<sup>7</sup> Be	BE7	beryllium-7 nucleus
Bi	BI	bismuth nucleus
Bor	BOR	boron nucleus - note name is not same as chemical symbol
<sup>8</sup> Bor	BOR8	boron-8 nucleus - note name is not same as chemical symbol
<sup>10</sup> Bor	BOR10	boron-10 nucleus - note name is not same as chemical symbol
<sup>11</sup> B	BOR11	boron-11 nucleus - note name is not same as chemical symbol
<sup>12</sup> Bor	BOR12	boron-12 nucleus - note name is not same as chemical symbol
bottom	BOTTOM	unspecified particle with naked bottom

## PARTICLES

<u>bottom</u>	BOTTOMBAR	unspecified particle with naked antibottom
Br	BR	bromine nucleus
<sup>81</sup> Br	BR81	bromine-81 nucleus
$B^0$	B0	$B(5270)^0$ bottom meson
$b_1(1235)^+$	B1(1235)+	
$b_1(1235)^-$	B1(1235)-	
$b_1(1235)^0$	B1(1235)0	
<u>C</u>	C	carbon nucleus
<sup>12</sup> C	C12	carbon-12 nucleus
<sup>13</sup> C	C13	carbon-13 nucleus
$C(1480)$	C(1480)	meson decaying into $\phi\pi$
$C(1480)^+$	C(1480)+	meson decaying into $\phi\pi^+$
$C(1480)^-$	C(1480)-	meson decaying into $\phi\pi^-$
$C(1480)^0$	C(1480)0	meson decaying into $\phi\pi^0$
$C^*$	$C^*$	excited state of carbon nucleus
$C^*(4.44)$	$C^*(4.44)$	4.44 keV excited state of carbon nucleus
Cd	CD	cadmium nucleus
<sup>116</sup> Cd	CD116	cadmium-116 nucleus
centauro	CENTAURO	new type of final state with 50 or more charged particles; no $\pi^0$ 's
charged	CHARGED	unspecified charged particle
charged(s)	CHARGED(S)	one or more unspecified charged particles
charged <sup>+</sup>	CHARGED+	unspecified positive particle
charged <sup>-</sup>	CHARGED-	unspecified negative particle
charged(s)	CHARGEDS	two or more unspecified charged particles
<u>charm</u>	CHARM	unspecified charmed particle
<u>charm</u>	CHARMBAR	unspecified anticharmed particle
charmed-baryon	CHARMED-BARYON	unspecified charmed baryon
charmed-meson	CHARMED-MESON	unspecified charmed meson
charmonium	CHARMONIUM	unspecified charm-anticharm state
chgd-hadron(s)	CHGD-HADRON(S)	one or more unspecified charged hadrons
$\chi_b$ (unspec)	CHI/B(UNSPEC)	unspecified radiative decay product of higher mass $\Upsilon$ 's
$\chi_{b0}(1P)$	CHI/B0(1P)	bottomonium meson
$\chi_{b0}(2P)$	CHI/B0(2P)	bottomonium meson
$\chi_{b1}(1P)$	CHI/B1(1P)	bottomonium meson
$\chi_{b1}(2P)$	CHI/B1(2P)	bottomonium meson
$\chi_{b2}(1P)$	CHI/B2(1P)	bottomonium meson
$\chi_{b2}(2P)$	CHI/B2(2P)	bottomonium meson
$\chi_c$ (unspec)	CHI/C(UNSPEC)	unspecified radiative decay product of any $\psi$ meson
$\chi_{c1}(1P)$	CHI/C1(1P)	charmonium meson
$\chi_{c2}(1P)$	CHI/C2(1P)	charmonium meson
Cl	CL	chlorine nucleus
<sup>35</sup> Cl	CL35	chlorine-35 nucleus
<sup>37</sup> Cl	CL37	chlorine-37 nucleus
Cr	CR	chromium nucleus
crystal	CRYSTAL	general target for channeling expts - target is not individual particles
Cu	CU	copper nucleus
$D$ (unspec)	D(UNSPEC)	unspecified charmed nonstrange meson
$D^+$	$D^+$	$D(1869)^+$ charmed nonstrange meson
$D^*(2010)$	$D^*(2010)$	excited charmed nonstrange meson
$D^*(2010)^+$	$D^*(2010)^+$	excited charmed nonstrange meson
$D^*(2010)^-$	$D^*(2010)^-$	excited charmed nonstrange meson
$D^-$	$D^-$	$D(1869)^-$ charmed nonstrange meson
$D_s^+$	D/S+	$D_s(1971)^+$ charmed strange meson, was $F$
$D_s^\pm$	D/S+-	$D_s(1971)^+$ or $D_s(1971)^-$ charmed strange meson, was $F$
$D_s^-$	D/S-	$D_s(1971)^-$ charmed strange meson, was $F$
$\bar{D}^0$	DBAR	$D^-$ or $\bar{D}^0$ charmed meson
$\bar{D}^0$	DBAR0	$\bar{D}(1865)^0$ anticharmed nonstrange meson
$\Delta$ (unspec)	DELTA(UNSPEC)	unspecified $I = 3/2, S = 0$ baryon



## PARTICLES

$\Delta(\text{unspec})^{++}$	DELTA(UNSPEC)++	unspecified $I = 3/2, S = 0$ baryon
$\Delta(\text{unspec})^0$	DELTA(UNSPEC)0	unspecified $I = 3/2, S = 0$ baryon
$\Delta(1232 P_{33})$	DELTA(1232P33)	
$\Delta(1232 P_{33})^+$	DELTA(1232P33)+	
$\Delta(1232 P_{33})^{++}$	DELTA(1232P33)++	
$\Delta(1232 P_{33})^-$	DELTA(1232P33)-	
$\Delta(1232 P_{33})^0$	DELTA(1232P33)0	
$\bar{\Delta}(1232 P_{33})^0$	DELTABAR(1232P33)0	
deut	DEUT	deuteron
$\bar{\text{deut}}$	DEUTBAR	antideuteron
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
$D^0$	D0	$D(1865)^0$ charmed nonstrange meson
$e^+$	E+	positron
$e^+(s)$	E+(S)	one or more positrons
$e^\pm$	E+-	electron or positron
$e^\pm(s)$	E+-(S)	one or more electrons or positrons
$e^{*\pm}$	E*+-	excited positron or electron
$e^-$	E-	electron
$e^-(s)$	E-(S)	one or more electrons
$\eta$	ETA	$\eta(549)$ meson
$\eta(s)$	ETA(S)	one or more $\eta(549)$ mesons
$\eta(1080)$	ETA(1080)	
$\eta(1440)$	ETA(1440)	was $\iota(1440)$ - glueball candidate
$\eta_b$	ETA/B	lowest mass $J^P = 0^- b\bar{b}$ state
$\eta_c(1S)$	ETA/C(1S)	charmonium meson
$\eta_c(2S)$	ETA/C(2S)	charmonium meson
$\eta'$	ETAPRIME	$\eta'(958)$ meson
exotic	EXOTIC	unspecified particle which cannot be fit into $q\bar{q}$ or $qqq$ model
exotic-meson	EXOTIC-MESON	cannot be formed of $q\bar{q}$
exotic-nucleon	EXOTIC-NUCLEON	cannot be formed of $qqq$
Fe	FE	iron nucleus
$^{56}\text{Fe}$	FE56	iron-56 nucleus
frag	FRAG	nuclear fragment
$f_0(700)$	F0(700)	was $\epsilon(700) - \pi\pi$ S-wave (near 700 MeV)
$f_0(975)$	F0(975)	was $S(975)$
$f_0(1300)$	F0(1300)	was $\epsilon(1300) - \pi\pi$ S-wave (near 1300 MeV)
$f_0(1590)$	F0(1590)	
$f_1(1285)$	F1(1285)	was $D(1285)$
$f_1(1420)$	F1(1420)	was $E(1420)$
$f_2(1270)$	F2(1270)	
$f_2(1720)$	F2(1720)	was $\theta(1690)$ - glueball candidate
$f_2(1810)$	F2(1810)	
$f_2(2010)$	F2(2010)	glueball candidate
$f_2'(1525)$	F2PRIME(1525)	
$f_4(2050)$	F4(2050)	was $h(2030) - I = 0, J^P = 4^+$ meson resonance
$f_4(2220)$	F4(2220)	was $\xi(2220)$ - meson seen in $J/\psi$ decays
Ga	GA	gallium nucleus
$^{71}\text{Ga}$	GA71	gallium-71 nucleus
$\gamma$	GAMMA	photon
$\gamma(s)$	GAMMA(S)	one or more $\gamma$ 's
$\gamma$ 's	GAMMAS	two or more $\gamma$ 's
$^{71}\text{Ge}$	GE71	germanium-71 nucleus
$^{76}\text{Ge}$	GE76	germanium-76 nucleus
glueball	GLUEBALL	unspecified glueball
gluino	GLUINO	spin 1/2 SUSY partner of the gluon
gluon	GLUON	

## PARTICLES

$h(990)$	H(990)	unspecified hadron
hadron	HADRON	unspecified hadron
hadron(s)	HADRON(S)	one or more unspecified hadrons
hadron <sup>+</sup>	HADRON+	unspecified positive hadron
hadron <sup>-</sup>	HADRON-	unspecified negative hadron
hadrons	HADRONS	two or more unspecified hadrons
He	HE	helium nucleus
<sup>2</sup> He	HE2	helium-2 nucleus
<sup>3</sup> He	HE3	helium-3 nucleus
<sup>6</sup> He	HE6	helium-6 nucleus
Hg	HG	mercury nucleus
higgs	HIGGS	Higgs boson
higgs <sup>±</sup>	HIGGS+-	charged Higgs of unspecified sign
higgsino	HIGGSINO	spin 1/2 SUSY partner of any Higgs boson
hvy-flavor	HVY-FLAVOR	any unspecified particle carrying a flavor heavier than strange
hvy-lepton	HVY-LEPTON	unspecified heavy lepton
hvy-lepton <sup>0</sup>	HVY-LEPTON0	unspecified neutral 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
hyperon	HYPERON	unspecified hyperon
In	IN	indium nucleus
inelastic	INELASTIC	same as anything, except elastic excluded
Ir	IR	iridium nucleus
<sup>124</sup> I	I124	iodine-124 nucleus
<sup>127</sup> I	I127	iodine-127 nucleus
$J/\psi(1S)$	J/PSI(1S)	$J/\psi(3097)$
jet	JET	
jet(s)	JET(S)	one or more jets
jets	JETS	two or more jets
$K^+$	K+	ordinary $K^+$ meson
$K^\pm$	K+-	ordinary $K^+$ or $K^-$ meson
$K^*(\text{unspec})$	K*(UNSPEC)	unspecified $K^*$
$K^*(\text{unspec})^+$	K*(UNSPEC)+	unspecified $K^{*+}$
$K^*(\text{unspec})^-$	K*(UNSPEC)-	unspecified $K^{*-}$
$K^*(\text{unspec})^0$	K*(UNSPEC)0	unspecified $K^{*0}$
$K^*(892)$	K*(892)	
$K^*(892)^+$	K*(892)+	
$K^*(892)^-$	K*(892)-	
$K^*(892)^0$	K*(892)0	
$\bar{K}^*(\text{unspec})$	K*BAR(UNSPEC)	unspecified $\bar{K}^*$
$\bar{K}^*(\text{unspec})^0$	K*BAR(UNSPEC)0	unspecified $\bar{K}^{*0}$
$\bar{K}^*(892)^0$	K*BAR(892)0	
$K^-$	K-	ordinary $K^-$ meson
kaon	KAON	kaon or antikaon of unspecified charge
$\bar{K}^0$	KBAR0	ordinary $\bar{K}^0$ meson
$K_L$	KL	$K_{\text{long}}$ , neutral $K$ meson
$K_S$	KS	$K_{\text{short}}$ , neutral $K$ meson
$K^0$	K0	ordinary $K^0$ meson
$\Lambda$	LAMBDA	ordinary $\Lambda$ hyperon
$\Lambda(s)$	LAMBDA(S)	one or more $\Lambda$ 's
$\Lambda(\text{unspec})$	LAMBDA(UNSPEC)	unspecified $I = 0, S = -1$ baryon
$\Lambda(1520 D_{03})$	LAMBDA(1520D03)	
$\Lambda N(2130)^+$	LAMBDA-N(2130)+	$S = -1$ dibaryon resonance
$\Lambda_c^+$	LAMBDA/C+	$\Lambda_c(2281)^+ I = 0$ charmed baryon
$\bar{\Lambda}$	LAMBDA BAR	ordinary $\bar{\Lambda}$ antihyperon
<sup>139</sup> La	LA139	lanthanum-139 nucleus

## PARTICLES

lepton – quark	LEPTO-QUARK	lepton-quark
lepton	LEPTON	unspecified lepton
lepton <sup>+</sup>	LEPTON+	unspecified positive lepton
lepton <sup>-</sup>	LEPTON-	unspecified negative lepton
leptons	LEPTONS	two or more unspecified leptons
Li	LI	lithium nucleus
<sup>6</sup> Li	LI6	lithium-6 nucleus
<sup>7</sup> Li	LI7	lithium-7 nucleus
longlived	LONGLIVED	unspecified particle stable under strong and electromagnetic decay
majoron	MAJORON	neutral, spinless hypothetical light or massless particle
meson	MESON	unspecified meson
meson(2950)	MESON(2950)	bump seen in $p\bar{p}\pi$
meson <sup>+</sup>	MESON+	unspecified positive meson
meson <sup>-</sup>	MESON-	unspecified negative meson
mesons	MESONS	two or more unspecified mesons
meson <sup>0</sup>	MESON0	unspecified neutral meson
Mg	MG	magnesium nucleus
<sup>27</sup> Mg	MG27	magnesium-27 nucleus
monopole	MONOPOLE	magnetic monopole
<sup>94</sup> Mo	MO94	molybdenum-94 nucleus
<sup>96</sup> Mo	MO96	molybdenum-96 nucleus
<sup>100</sup> Mo	MO100	molybdenum-100 nucleus
$\mu^+$	MU+	ordinary $\mu^+$ lepton
$\mu^-$	MU-	ordinary $\mu^-$ lepton
mult[charged]	MULT(CHARGED)	multiplicity distribution for unspecified charged particle
muon	MUON	ordinary muon of unspecified charge
muon(s)	MUON(S)	one or more muons
<u>muonium</u>	MUONIUM	$\mu^+e^-$ atom
muonium	MUONIUMBAR	$\mu^-e^+$ atom
muons	MUONS	two or more muons
<i>n</i>	N	neutron
<i>N</i> (unspec) <sup>+</sup>	N(UNSPEC)+	unspecified $I = 1/2, S = 0$ baryon
<i>N</i> (unspec) <sup>0</sup>	N(UNSPEC)0	unspecified $I = 1/2, S = 0$ baryon
<i>N</i> (1440 <i>P</i> <sub>11</sub> ) <sup>+</sup>	N(1440P11)+	
<i>N</i> (1520 <i>D</i> <sub>13</sub> ) <sup>+</sup>	N(1520D13)+	
<i>N</i> (1520 <i>D</i> <sub>13</sub> ) <sup>0</sup>	N(1520D13)0	
<i>N</i> (1675 <i>D</i> <sub>15</sub> ) <sup>+</sup>	N(1675D15)+	
<i>N</i> (1680 <i>F</i> <sub>15</sub> ) <sup>0</sup>	N(1680F15)0	
<i>N</i> * (unspec)	N*(UNSPEC)	$I = \text{unspecified}, S = 0$ baryon of unspecified mass
<i>N</i> * (unspec) <sup>+</sup>	N*(UNSPEC)+	$I = \text{unspecified}, S = 0$ baryon of unspecified mass
<i>N</i> * (unspec) <sup>0</sup>	N*(UNSPEC)0	$I = \text{unspecified}, S = 0$ baryon of unspecified mass
<i>N</i> * <sub>5/2</sub> (unspec)	N*5/2(UNSPEC)	unspecified $I = 5/2, S = 0$ baryon
<i>N</i> * <sub>5/2</sub> (unspec) <sup>+++</sup>	N*5/2(UNSPEC)+++	unspecified $I = 5/2, S = 0$ baryon
<sup>23</sup> Na	NA23	sodium-23 nucleus
<sup>24</sup> Na	NA24	sodium-24 nucleus
$\bar{n}$	NBAR	antineutron
Ne	NE	neon nucleus
neutral	NEUTRAL	unspecified neutral particle
neutral(s)	NEUTRAL(S)	one or more unspecified neutral particles
neutrals	NEUTRALS	two or more unspecified neutral particles
<sup>23</sup> Ne	NE23	neon-23 nucleus
<sup>12</sup> N	NIT12	nitrogen-12 nucleus – note name is not same as chemical symbol
Nit	NIT	nitrogen-14 nucleus – note name is not same as chemical symbol
<i>N</i> $\phi$ (1950)	NPHI(1950)0	reported baryon with $s\bar{s}$ plus 3 other quarks
$\nu$	NU	unspecified neutrino
$\nu$ (s)	NU(S)	one or more unspecified neutrinos
$\bar{\nu}$	NUBAR	unspecified antineutrino
nucleon	NUCLEON	unspecified nucleon

## PARTICLES

<u>nucleon</u>	NUCLEONBAR	unspecified antinucleon
nucleus	NUCLEUS	unspecified nucleus
$\nu_e$	NUE	electron neutrino
$\bar{\nu}_e$	NUEBAR	anti-electron neutrino
nuino	NUINO	any light supersymmetric particle
$\nu_\mu$	NUMU	muon neutrino
$\bar{\nu}_\mu$	NUMUBAR	anti-muon neutrino
$\nu_\tau$	NUTAU	$\tau$ neutrino
$\bar{\nu}_\tau$	NUTAUBAR	anti- $\tau$ neutrino
O	O	oxygen nucleus
$^{16}\text{O}$	O16	oxygen-16 nucleus
$\omega$	OMEGA	$\omega(783)$ meson
$\Omega^*(\text{unspec})$	OMEGA*(UNSPEC)	$S = -3$ baryon of unspecified mass
$\Omega^*(\text{unspec})^-$	OMEGA*(UNSPEC)-	$S = -3$ baryon of unspecified mass
$\Omega^-$	OMEGA-	ordinary $\Omega^-$ hyperon
$\Omega_b^-$	OMEGA/B-	$\Omega_b^-$ doubly strange baryon with bottom quark
$\Omega_{bb}^-$	OMEGA/BB-	$\Omega_{bb}^-$ strange baryon with two bottom quarks
$\Omega_{cb}^0$	OMEGA/CB0	$\Omega_{cb}^0$ strange baryon with bottom and charm quarks
$\Omega_c^0$	OMEGA/C0	$\Omega_c(2740)^0$ $I = 0$ charmed doubly strange baryon
$\bar{\Omega}^+$	OMEGABAR+	ordinary $\bar{\Omega}^+$ antihyperon
p	P	proton
Pb	PB	lead nucleus
$^{207}\text{Pb}$	PB207	lead-207 nucleus
$\bar{p}$	PBAR	antiproton
$\phi$	PHI	$\phi(1020)$ meson
$\phi(1680)$	PHI(1680)	
$\phi_3(1850)$	PHI3(1850)	bump in $K^+K^-$ mass
photon	PHOTINO	spin 1/2 SUSY partner of the photon
$\pi^+$	PI+	ordinary $\pi^+$ meson
$\pi^\pm$	PI+-	ordinary $\pi^+$ or $\pi^-$ meson
$\pi^-$	PI-	ordinary $\pi^-$ meson
pion	PION	pion of unspecified charge
pion(s)	PION(S)	one or more pions
pions	PIONS	two or more pions
$\pi^0$	PI0	ordinary $\pi^0$ meson
$\pi^0(\text{s})$	PI0(S)	one or more $\pi^0$ 's
$\pi^0$ 's	PI0S	two or more $\pi^0$ 's
$\pi_2(1670)^-$	PI2(1670)-	was A(1680)
pomeron	POMERON	
positronium	POSITRONIUM	
$\psi(\text{unspec})$	PSI(UNSPEC)	unspecified $\psi$ meson
$\psi(2S)$	PSI(2S)	
$\psi(3770)$	PSI(3770)	
$\psi(4415)$	PSI(4415)	
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
$q^*$	QUARK*	excited quark
$\bar{q}^*$	QUARK*BAR	excited antiquark
<u>quark</u>	QUARKBAR	antiquark of unspecified charge
<u>quark(1/3)</u>	QUARKBAR(1/3)	antiquark of charge 1/3
<u>quark(2/3)</u>	QUARKBAR(2/3)	antiquark of charge 2/3
$\rho$	RHO	$\rho(770)$ meson
$\rho(1250)^0$	RHO(1250)0	
$\rho(1700)^0$	RHO(1700)0	
$\rho^+$	RHO+	$\rho(770)^+$ meson
$\rho^-$	RHO-	$\rho(770)^-$ meson

## PARTICLES

$\rho^0$	RHO0	$\rho(770)^0$ meson
$\rho_3(1690)^+$	RHO3(1690)+	was $g(1690)$
$\rho_3(1690)^-$	RHO3(1690)-	was $g(1690)$
$\rho_3(1690)^0$	RHO3(1690)0	was $g(1690)$
$^{100}\text{Ru}$	RU100	ruthenium-100 nucleus
s-electron	SELECTRON	spin-0 SUSY partner of the electron or positron
$^{76}\text{Se}$	SE76	selenium-76 nucleus
shower	SHOWER	shower track
Si	SI	silicon nucleus
$^{28}\text{Si}$	SI28	silicon-28 nucleus
$\Sigma$	SIGMA	ordinary $\Sigma$ hyperon
$\Sigma(\text{unspec})^+$	SIGMA(UNSPEC)+	unspecified $I = 1, S = -1$ baryon
$\Sigma(\text{unspec})^-$	SIGMA(UNSPEC)-	unspecified $I = 1, S = -1$ baryon
$\Sigma(\text{unspec})^0$	SIGMA(UNSPEC)0	unspecified $I = 1, S = -1$ baryon
$\Sigma(1385 P_{13})^+$	SIGMA(1385P13)+	
$\Sigma(1385 P_{13})^-$	SIGMA(1385P13)-	
$\Sigma^+$	SIGMA+	ordinary $\Sigma^+$ hyperon
$\Sigma^-$	SIGMA-	ordinary $\Sigma^-$ hyperon
$\Sigma_c(2455)$	SIGMA/C(2455)	$I = 1$ charmed baryon
$\Sigma_c(2455)^+$	SIGMA/C(2455)+	$I = 1$ charmed baryon
$\Sigma_c(2455)^{++}$	SIGMA/C(2455)++	$I = 1$ charmed baryon
$\Sigma_c(2455)^0$	SIGMA/C(2455)0	$I = 1$ charmed baryon
$\bar{\Sigma}^+$	SIGMABAR+	ordinary $\bar{\Sigma}^+$ antihyperon
$\bar{\Sigma}^-$	SIGMABAR-	ordinary $\bar{\Sigma}^-$ antihyperon
$\bar{\Sigma}^0$	SIGMABAR0	ordinary $\bar{\Sigma}^0$ antihyperon
$\Sigma^0$	SIGMA0	ordinary $\Sigma^0$ hyperon
s-lepton	SLEPTON	spin 0 SUSY lepton partner
Sn	SN	tin nucleus
$^{116}\text{Sn}$	SN116	tin-116 nucleus
$^{120}\text{Sn}$	SN120	tin-120 nucleus
s-particle	SPARTICLE	supersymmetric partner of any ordinary particle
s-quark	SQUARK	spin 0 SUSY quark partner
strange	STRANGE	unspecified strange particle
strange(s)	STRANGE(S)	one or more unspecified strange particles
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 is not same as chemical symbol
$^{32}\text{S}$	SU32	sulfur-32 nucleus – note name is not same as chemical symbol
$^{35}\text{S}$	SU35	sulfur-35 nucleus – note name is not same as chemical symbol
Ta	TA	tantalum nucleus
tachyon	TACHYON	
$\tau$	TAU	ordinary $\tau$ lepton of unspecified charge
$\tau^+$	TAU+	ordinary $\tau^+$ lepton
$\tau^-$	TAU-	ordinary $\tau^-$ lepton
$^{124}\text{Te}$	TE124	tellurium-124 nucleus
Th	TH	thorium nucleus
Ti	TI	titanium nucleus
Tl	TL	thallium nucleus
top	TOP	unspecified particle with naked top
$\bar{\text{top}}$	TOPBAR	unspecified particle with naked antitop
trit	TRIT	tritium nucleus
U	U	uranium nucleus
$^{238}\text{U}$	U238	uranium-238 nucleus
$U(3100)$	U(3100)	exotic meson possibly seen in lambda-pbar plus pions
unspec	UNSPEC	particle of unspecified type
$\Upsilon(\text{unspec})$	UPSI(UNSPEC)	unspecified $\Upsilon$ particle
$\Upsilon(1S)$	UPSI(1S)	
$\Upsilon(10860)$	UPSI(10860)	

## PARTICLES

$\Upsilon(11020)$	UPSI(11020)	
$\Upsilon(2S)$	UPSI(2S)	
$\Upsilon(3S)$	UPSI(3S)	
$\Upsilon(4S)$	UPSI(4S)	
vee	VEE	unspecified neutral-strange-particle decay
vee(s)	VEE(S)	one or more unspecified neutral-strange-particle decays
vmeson	VMESON	vector meson of unspecified mass
vmeson <sup>0</sup>	VMESON0	neutral vector meson of unspecified mass
W	W	weak gauge boson
W <sup>+</sup>	W <sup>+</sup>	positive weak gauge boson
W <sup>±</sup>	W <sup>+−</sup>	positive or negative weak gauge boson
W <sup>−</sup>	W <sup>−</sup>	negative weak gauge boson
W' <sup>±</sup>	WPRIME <sup>+−</sup>	additional charged W boson
Wt	WT	tungsten nucleus – note name is not same as chemical symbol
W <sup>0</sup>	W0	neutral weak gauge boson
X	X	for use in inclusive reactions, also for total cross-section data, as in $K^-p \rightarrow X$
X(1700)	X(1700)	
X(1935)	X(1935)	was S(1935)
X(1935) <sup>−</sup>	X(1935) <sup>−</sup>	was S(1935)
X(1935) <sup>0</sup>	X(1935)0	was S(1935)
X(3100)	X(3100)	
X(3100) <sup>+</sup>	X(3100) <sup>+</sup>	exotic meson possibly seen in lambda pbar plus pions
X(3100) <sup>−</sup>	X(3100) <sup>−</sup>	exotic meson possibly seen in lambda pbar plus pions
X(3100) <sup>0</sup>	X(3100)0	exotic meson possibly seen in lambda pbar plus pions
X(3250)	X(3250)	
X-ray	X-RAY	x-ray frequency gamma ray
Xe	XE	xenon nucleus
<sup>124</sup> Xe	XE124	xenon-124 nucleus
<sup>127</sup> Xe	XE127	xenon-127 nucleus
<sup>134</sup> Xe	XE134	xenon-134 nucleus
<sup>136</sup> Xe	XE136	xenon-136 nucleus
$\Xi$	XI	ordinary $\Xi$ hyperon
$\Xi(\text{unspec})$	XI(UNSPEC)	unspecified $I = 1/2, S = -2$ baryon
$\Xi(\text{unspec})−$	XI(UNSPEC) <sup>−</sup>	unspecified $I = 1/2, S = -2$ baryon
$\Xi(\text{unspec})0$	XI(UNSPEC)0	unspecified $I = 1/2, S = -2$ baryon
$\Xi(1530 P_{13})−$	XI(1530P13) <sup>−</sup>	
$\Xi(1530 P_{13})0$	XI(1530P13)0	
$\Xi(1620)−$	XI(1620) <sup>−</sup>	
$\Xi(1620)0$	XI(1620)0	
$\Xi(1820 D_{13})−$	XI(1820D13) <sup>−</sup>	
$\Xi(1820 D_{13})0$	XI(1820D13)0	
$\Xi(1950)−$	XI(1950) <sup>−</sup>	
$\Xi(1950)0$	XI(1950)0	
$\Xi(2030)−$	XI(2030) <sup>−</sup>	
$\Xi(2030)0$	XI(2030)0	
$\Xi(2250)−$	XI(2250) <sup>−</sup>	
$\Xi(2250)0$	XI(2250)0	
$\Xi(2500)−$	XI(2500) <sup>−</sup>	
$\Xi(2500)0$	XI(2500)0	
$\Xi^*(\text{unspec})$	XI*(UNSPEC)	$I = \text{unspecified}, S = -2$ baryon of unspecified mass
$\Xi^*(\text{unspec})−$	XI*(UNSPEC) <sup>−</sup>	$I = \text{unspecified}, S = -2$ baryon of unspecified mass
$\Xi^*(\text{unspec})0$	XI*(UNSPEC)0	$I = \text{unspecified}, S = -2$ baryon of unspecified mass
$\Xi−$	XI <sup>−</sup>	ordinary $\Xi−$ hyperon
$\Xib−$	XI/B <sup>−</sup>	$\Xib−$ strange baryon with bottom quark
$\Xib0$	XI/B0	$\Xib0$ strange baryon with bottom quark
$\Xic+$	XI/C <sup>+</sup>	$\Xic(2460)+ I = 1/2 charmed strange baryon$
$\Xic−$	XI/CBAR <sup>−</sup>	$\Xic(2460)− I = 1/2 charmed strange antibaryon$
$\Xic0$	XI/CBAR0	$\Xic(2460)0 I = 1/2 charmed strange antibaryon$

## PARTICLES

$\Xi_c^0$	XI/C0	$\Xi_c(2460)^0$ $I = 1/2$ charmed strange baryon
$\Xi_c^+$	XIBAR+	ordinary $\Xi_c^+$ antihyperon
$\Xi_c^0$	XIBAR0	ordinary $\Xi_c^0$ antihyperon
$\Xi^0$	XI0	ordinary $\Xi^0$ hyperon
$Y^*(\text{unspec})$	$Y^*(\text{UNSPEC})$	$I = \text{unspecified}, S = -1$ baryon of unspecified mass
$Y^*(\text{unspec})^+$	$Y^*(\text{UNSPEC})^+$	$I = \text{unspecified}, S = -1$ baryon of unspecified mass
$Y^*(\text{unspec})^-$	$Y^*(\text{UNSPEC})^-$	$I = \text{unspecified}, S = -1$ baryon of unspecified mass
$Y^*(\text{unspec})^0$	$Y^*(\text{UNSPEC})0$	$I = \text{unspecified}, S = -1$ baryon of unspecified mass
$Y^0$	Y0	represents a $\Lambda$ or $\Sigma^0$ or low-mass neutral $Y^*$
$Z$	Z	neutral weak gauge boson
$Z^*(\text{unspec})^0$	$Z^*(\text{UNSPEC})0$	exotic $I = \text{unspecified}, S = +1$ baryon of unspecified mass
$\zeta(8300)$	ZETA(8300)	reported $\zeta(8300)$
Zn	ZN	zinc nucleus
$Z'$	ZPRIME	additional Z boson
$^{94}\text{Zr}$	ZR94	zirconium-94 nucleus
$^{96}\text{Zr}$	ZR96	zirconium-96 nucleus
$Z^0$	Z0	neutral weak gauge boson

SUMMARIES OF BROOKHAVEN EXPERIMENTS

BNL Experiments

**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 (✓ 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
$\nu_\mu p \rightarrow \nu_\mu p$	"
$\nu_\mu p \rightarrow \nu_\mu p \pi^0$	"
$\nu_\mu p \rightarrow \nu_\mu n \pi^+$	"
$\nu_\mu n \rightarrow \nu_\mu p$	"
$\nu_\mu n \rightarrow \nu_\mu p \pi^-$	"
$\nu_\mu n \rightarrow \nu_\mu n \pi^0$	"
$\bar{\nu}_\mu e^- \rightarrow \bar{\nu}_\mu e^-$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu p$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu p \pi^0$	"
$\bar{\nu}_\mu p \rightarrow \bar{\nu}_\mu n \pi^+$	"
$\bar{\nu}_\mu n \rightarrow \bar{\nu}_\mu p \pi^-$	"
$\bar{\nu}_\mu n \rightarrow \bar{\nu}_\mu n \pi^0$	"

Comments Ran for 4630 hours.

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, NIM A254 (1987) 515, PR D35 (1987) 785, PL B194 (1987) 420, PL B194 (1987) 586, PL B202 (1988) 284, PRL 62 (1989) 1709, and PR D41 (1990) 3297.

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

Accelerator BNL Detector Counter

Reactions

$\mu^- \text{He} \rightarrow \mu^- \text{He } \gamma$	0 GeV/c
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Comments The transitions are stimulated by infrared radiation from an isotopic-gas CO<sub>2</sub> laser. Ran for 2142 hours.

Papers PR A40 (1989) 158.

**BNL-747** (Aug 1979) Approved Oct 1980, Feb 1984; Started Jun 1982; Completed 1988.

**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 W Hackenburg,  
 R S Longacre, W A Love, 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

Accelerator BNL Detector MPS-II

Reactions

$\pi^- p \rightarrow \phi \phi n$	22 GeV/c
$\pi^- p \rightarrow \phi K^+ K^- n$	"

$K^- p \rightarrow \phi Y^0$	"
$K^- p \rightarrow \phi \phi Y^0$	"
$K^- p \rightarrow \phi K^+ K^- Y^0$	"

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  $I^G J^{PC} = 0^+ 2^{++}$  meson states, the  $f_2(2010)$ ,  $f_2(2300)$ , and  $f_2(2340)$ , fit the glueball resonance hypothesis and no other one proposed. A second-phase experiment is planned to search for exotic- $J^{PC}$  glueballs in  $\pi^-p \rightarrow \phi\phi n$  and other reactions.

Papers PRL 49 (1982) 1620, SHEP 4 (1983) 69, PL B131 (1983) 221, CNPP 13 (1984) 285, PL B149 (1984) 407, PL B165 (1985) 202, PL B165 (1985) 217, and PL B201 (1988) 568.

**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 Wiencke  
 MASSACHUSETTS U, AMHERST - E Hartouni, D Jensen,  
 M Kreisler (✓ Spokesperson), M Rabin, J Uribe  
 MEXICO U - C Avilez (✓ Spokesperson), W Correa, J Escalona  
 FERMLAB - D Christian, G Guitierrez, S Holmes, J Strait,  
 A Wehman

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. Also studied  $pp$  interactions. The spectrometer is designed to measure exclusive topologies with high sensitivity. Ran for 1194 hours.

Papers AIPCP 132 (1985) 425, AIPCP 185 (1988) 408, and IEEE TNS 36 (1989) 1480.

**BNL-771** (Jan 1981) Approved Mar 1981, Oct 1983; Started Apr 1983; Completed 1987.

**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, H J Willutzki  
 FLORIDA STATE U - A Boehnlein, D Boehnlein, J H Goldman,  
 V Hagopian, D Reeves  
 SOUTHEASTERN MASS U - Z Bar-Yam, J Dowd, W Kern,  
 E King, 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
$\pi^- p \rightarrow f_1(1420) n$	"
$\pi^- p \rightarrow \eta(1440) n$	"
$\pi^- p \rightarrow \Xi^- \pi^+ \pi^- X$	"
$\pi^- p \rightarrow \Xi^*(\text{unspec})^- X$	"



## SUMMARIES OF BROOKHAVEN EXPERIMENTS

$K^- p \rightarrow K^+ K_S \pi^- X$	6 GeV/c
$K^- p \rightarrow f_1(1420) \Lambda$	"
$K^- p \rightarrow \eta(1440) \Lambda$	"
$K^- p \rightarrow \Lambda K^- \pi^+ K^0$	"
$K^- p \rightarrow \Xi^*(\text{unspec})^0 K^0$	"
$K^- p \rightarrow \Lambda K_S \pi^- K^+$	"
$K^- p \rightarrow \Xi^*(\text{unspec})^- K^+$	"
$\bar{p} p \rightarrow K^+ K_S \pi^- X$	5 GeV/c
$\bar{p} p \rightarrow f_1(1420) \pi^0$	"
$\bar{p} p \rightarrow f_1(1420) \rho^0$	"
$\bar{p} p \rightarrow \eta(1440) \pi^0$	"
$\bar{p} p \rightarrow \eta(1440) \rho^0$	"
$\bar{p} p \rightarrow \bar{p} p \pi^0$	"

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

Comments An attempt to study  $f_1(1420)$  and  $\eta(1440)$ .

Papers PR D30 (1984) 1409, PRL 55 (1985) 779, PR D34 (1986) 1960, and PRL 61 (1988) 1557.

**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  $d(K^-, \pi^-)X$  AT 870 MeV/c**

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

Accelerator BNL Detector Spectrometer

Reactions

$K^- \text{ deut} \rightarrow \pi^- X$  870 MeV/c

Particles studied dibaryon( $S = -1$ )

Comments The reaction was studied using a double-arm magnetic spectrometer. The scattering angles were 6, 10, 14, 18, 22, and 26°, allowing for both  $s$ -wave and  $p$ -wave resonance production. The 3-layer scintillation range hodoscope closely surrounding a liquid deuterium target and arranged into 12 polar angles was used to detect charged particles from  $\Lambda p$  final-state resonance decays as well as to suppress the quasi-elastic  $\Lambda p$  and  $\Sigma^0 p$  backgrounds.  $X$  denotes a dibaryon state with  $S = -1$  and  $Q = +1$ .

Papers NP A463 (1987) 205c.

**BNL-774** (Aug 1981, Apr 1982) Approved May 1982; Started Apr 1985; Completed 1991.

**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

$K^- \text{ He} \rightarrow \pi^+ \text{ hypernuc}$  600 MeV/c

Particles studied hypernuc

Comments A continuation of BNL-752. Ran for 650 hours. Data under analysis.

Papers PR C35 (1987) 1589.

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

**NEUTRINO OSCILLATION EXPERIMENT**

COLUMBIA U - L Borodovsky, C Y Chi, Y Ho, N Kondakis, W Lee ( $\checkmark$  Spokesperson), J Mechalakos, B Rubin, R Seto, C Stoughton, G Tzanakos  
 ILLINOIS U, URBANA - W P Hogan, E O'Brien, T O'Halloran, K Reardon, S Salman, P D Sheldon, G W Sullivan  
 JOHNS HOPKINS U - B Blumenfeld, L Chichura, C Chien, J Krizmanic, E Lincke, L Lueking, W Lyle, L Madansky, A Pevsner

Accelerator BNL Detector Combination

Reactions

$\nu_\mu \rightarrow X$  0-10 GeV/c

$\nu_\mu \rightarrow \nu_e$  "

$\bar{\nu}_\mu \rightarrow X$  "

$\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  "

Particles studied  $\nu_\mu, \nu_e, \bar{\nu}_\mu, \bar{\nu}_e$

Comments Studies (1)  $\nu_\mu$  disappearance and  $\nu_\mu \rightarrow \nu_e$  oscillations using a *narrow band* beam, and (2)  $\nu_\mu$  ( $\bar{\nu}_\mu$ ) disappearance and  $\nu_\mu \rightarrow \nu_e$ ,  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  oscillations using a *wide band* beam. Ran for 2715 hours.

Papers PRL 62 (1989) 2237, NIM A281 (1989) 448, and PRL 68 (1992) 274.

**BNL-777** (Jan 1982) Approved May 1982; Started Feb 1985; Completed May 1988.

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

BROOKHAVEN - H A Gordon, D M Lazarus, P Rehak  
 YALE U - C Alliegro, C Campagnari, P S Cooper, N Hadley, A Lee, M E Zeller ( $\checkmark$  Spokesperson)  
 WASHINGTON U, SEATTLE - V Chaloupka, E Jagel, H J Lubatti  
 PSI, VILLIGEN - J Egger, W D Herold, H Kasper

Accelerator BNL Detector Spectrometer

Reactions

$K^+ \rightarrow \pi^+ \mu^+ e^-$  5.8 GeV/c

$K^+ \rightarrow \pi^+ e^+ e^-$  "

Particles studied  $K^+$

Papers PRL 59 (1987) 2832, PRL 61 (1988) 2062, and PRL 64 (1990) 165.

**BNL-780** (Sep 1982) Approved Feb 1983; Started May 1985; Completed 1988.

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

BROOKHAVEN - E Jastrzembski, R C Larsen, L B Leipuner, W M Morse ( $\checkmark$  Spokesperson)  
 YALE U - R K Adair, H B Greenlee, H Kasha, E B Mannelli, M Mannelli, K E Ohl, S F Schaffner, M P Schmidt ( $\checkmark$  Spokesperson), C B Schwarz

Accelerator BNL Detector Spectrometer

Reactions

$K_L \rightarrow \mu^+ e^-$  4-12 GeV/c

$K_L \rightarrow \mu^- e^+$  "

$K_L \rightarrow e^+ e^-$  "

$K_L \rightarrow \mu^+ \mu^-$  "

$K_L \rightarrow \pi^0 e^+ e^-$  "

Particles studied  $K_L$

Comments A sensitivity to branching fractions of  $10^{-9}$  was achieved.

Papers PRL 60 (1988) 893, PRL 61 (1988) 2300, and PR D39 (1989) 990. No other papers expected.

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

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

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

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.

**BNL-782** (Sep 1982) Approved Feb 1983; Started Jul 1984; Completed 1988.

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

MICHIGAN U – R J Bruni, G R Court, D G Crabb,  
R L Cummings, I Gialas, F Z Khiari, A D Krisch  
(✓ Spokesperson), A M T Lin, R A Phelps, R R Raylman,  
R S Raymond, T Roser, J A Stewart, K M Terwilliger  
BROOKHAVEN – K A Brown, G T Danby, Y Y Lee, L G Ratner  
MARYLAND U & MICHIGAN U – D C Peaslee  
MIT – P R Cameron  
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.

Papers PR D31 (1985) 3017, PRL 57 (1986) 507, PRL 60 (1988) 2351, and PR D39 (1989) 45.

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

**SINGLE SPIN ASYMMETRY MEASUREMENT IN INCLUSIVE  $\bar{p}p$  REACTIONS AT 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, S Z Saroff, M Shupe (✓ Spokesperson)  
SOUTHEASTERN MASS U – J J Russell

Accelerator BNL Detector Single-arm spectrometer

Reactions Polarized beam

$p p \rightarrow \pi^+ X$  13.5, 18.5 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.

Papers PRL 64 (1990) 995. No other papers expected.

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

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

BROOKHAVEN – S Adler, M S Atiya, I Chiang, J S Frank,  
J S Haggerty, T F Kycia, K K Li, L S Littenberg  
(✓ Spokesperson), A K Sambamurti, A J Stevens, R C Strand,  
C Witzig  
PRINCETON U – M Ardibili, M Convery, M M Ito, D R Marlow,  
R McPherson, P D Meyers, F C Shoemaker, A J S Smith  
(✓ Spokesperson)

TRIUMF – E W Blackmore, D A Bryman (✓ Spokesperson),  
L Felawka, P Kitching, A Konaka, V Kujala, Y Kuno, J A Macdonald,  
T Nakano, T Numao, P Padley, J Poutissou, R Poutissou,  
J Roy, R Soluk, A S Turcot

Accelerator BNL Detector Spectrometer

Reactions

$K^+ \rightarrow \pi^+ \nu \bar{\nu}$  0 MeV/c  
 $K^+ \rightarrow \pi^+ \mu^+ \mu^-$  "  
 $K^+ \rightarrow \mu^+ \mu^+ \mu^- \nu$  "  
 $K^+ \rightarrow \pi^+ \text{higgs}$  "  
 $K^+ \rightarrow \pi^+ \gamma \gamma$  "  
 $K^+ \rightarrow \pi^+ X$  "  
 $\pi^0 \rightarrow \nu \bar{\nu}$  205 MeV/c  
 $\pi^0 \rightarrow \gamma X$  "  
 $\pi^0 \rightarrow \gamma \nu \bar{\nu}$  "

Particles studied  $K^+$ , higgs, nuino,  $\pi^0$

Comments A sensitivity down to a level of about  $2 \times 10^{-10}$  is expected for  $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ . A measurement at this level would determine  $|V_{td}|$  if  $m_t$  were known. An observation significantly above this level would indicate a fourth generation of quarks and leptons, the presence of nuinos, or other new phenomena. A simultaneous measurement of  $K^+ \rightarrow \pi^+ X$  to a sensitivity of about  $5 \times 10^{-11}$  is also expected. This probes the existence of axions, familons, hyperphotons, or other new particles. Other processes probe the existence of higgs, majorons, massive neutrinos, and other hypothetical particles. Approved for 3000 additional hours with an upgraded beam and detector. In progress (February 92).

Papers PRL 63 (1989) 2177, PRL 64 (1990) 21, PRL 65 (1990) 1188, and PRL 66 (1991) 2189.

**BNL-788** (Sep 1983) Approved Oct 1983; Started May 1985; Completed May 1990.

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

CARNEGIE MELLON U – M Athanas, G Franklin  
(✓ Spokesperson), C Maher, B Quinn, R A Schumacher,  
I R Sukaton, V Zeps  
ALBERTA U – F M Rozon  
BROOKHAVEN – S Bart, R Chrien, K Johnson, P Pile,  
R Sawafta, R Sutter  
HOUSTON U – E V Hungerford, T Kishimoto, L G Tang  
INDIANA U – J J Szymanski  
LOS ALAMOS – P D Barnes (✓ Spokesperson)  
NEW MEXICO U – B Bassalleck  
VASSAR COLL – R L Stearns  
YALE U – G Diebold

Accelerator BNL Detector Spectrometer

Reactions

$K^- \text{He} \rightarrow \pi^- \text{hypernuc}$  750 MeV/c  
 $K^- {}^6\text{Li} \rightarrow \pi^- \text{hypernuc}$  "

Particles studied hypernuc

Comments Tests the  $\Delta I = 1/2$  rule through measurements of hypernuclear decay rates  $\Gamma(\Lambda \rightarrow p\pi^-)$ ,  $\Gamma(\Lambda \rightarrow n\pi^0)$ ,  $\Gamma(\Lambda n \rightarrow nn)$ , and  $\Gamma(\Lambda p \rightarrow np)$ . The hypernuclear state is isolated by momentum analysis of the ( $K^-, \pi^-$ ) target reaction. Out-of-beam large volume scintillation detectors and tracking chambers are used to identify the hypernuclear decay products by time-of-flight,  $dE/dx$ , and range.

Papers PR C43 (1991) 849.

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

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

UC, IRVINE – A Heinson, J Horvath, P Knibbe, C Mathiazhagan,  
W R Molzon (✓ Spokesperson), J Urheim  
UCLA – K Arisaka, R D Cousins (✓ Spokesperson), T Kaarsberg,  
J Konigsberg, J Kubic, P Melese, P Rubin, W E Slater,  
D Wagner



## SUMMARIES OF BROOKHAVEN EXPERIMENTS

### Reactions

$^{28}\text{Si}$ nucleus $\rightarrow$ charged X	14.5 GeV/c ( $P_{\text{lab}}/N$ )
$^{16}\text{O}$ nucleus $\rightarrow$ charged X	"
p nucleus $\rightarrow$ charged X	"

**Comments** Aims to establish effective temperatures in 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. Ran for 2300 hours.

**Papers** NIM A254 (1987) 88, RSI 58 (1987) 143, RSI 58 (1987) 1761, PL B197 (1987) 285, ZPHY C38 (1988) 35, ZPHY C38 (1988) 135, NP A498 (1989) 67c, NP A498 (1989) 415c, NIM A281 (1989) 367, NIM A283 (1989) 772, PRL 64 (1990) 847, NP A525 (1991) 231c, NP A525 (1991) 455c, NP A525 (1991) 531c, NP A525 (1991) 681c, PRL 66 (1991) 1567, PR C44 (1991) 1611, and NP A527 (1991) 595c.

**BNL-805** (Dec 1984) Approved Mar 1985; Started Aug 1986; Completed Jun 1989.

### A SEARCH FOR GALACTIC AXIONS

ROCHESTER U - S DePanfilis, A C Melissinos ( $\checkmark$  Spokesperson), B Moskowitz, J Rogers, Y Semertzidis, W Wuensch  
 BROOKHAVEN - H Halama, A Prodell  
 FERMILAB - W B Fowler, F Nezzick

**Accelerator** NONE **Detector** Other

**Particles studied** axion

**Comments** A search for a light-mass galactic 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. Data from 1 to 6 GHz are complete.

**Papers** PRL 59 (1987) 839, APL 52 (1988) 2266, IEEE MTT 36 (1988) 607, NIM A264 (1988) 98, NIM A264 (1988) 445, and PR D40 (1989) 3153.

**BNL-806** (Dec 1984) Approved Mar 1985; Started Nov 1986; Completed Jun 1988.

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

SIEGEN U - C Brechtmann, W Heinrich ( $\checkmark$  Spokesperson)

**Accelerator** BNL-ION **Detector** Plastic

### Reactions

$^{28}\text{Si}$ nucleus	14.5 GeV ( $T_{\text{lab}}/N$ )
$^{16}\text{O}$ nucleus	"

**Particles studied** frag

**Comments** Measures the cross sections for production of beam fragments with charges greater than five. Studies nuclear fragmentation and coulomb dissociation for various targets. Searches for projectile fragments with fractional charge.

**Papers** PL B200 (1988) 583, PR C39 (1989) 2222, and MPL A4 (1989) 1879.

**BNL-808** (Feb 1985) Approved Mar 1985; Completed 1988.

### 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, A Olszewski, B Wilczynska, H Wilczynski, W Wolter  
 LOUISIANA STATE U - L Barbier, W V Jones, E Pruet, J P Wefel, B Wosiek  
 MINNESOTA U - P S Freier, C J Waddington ( $\checkmark$  Spokesperson)

**Accelerator** BNL-ION **Detector** Emulsion

### Reactions

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

**Comments** A search for evidence for a quark-gluon plasma. Uses emulsion chambers.

**Papers** PRL 60 (1988) 405, PRL 62 (1989) 733, NP A498 (1989) 535c, PR C39 (1989) 1385, PR C40 (1989) 2449, and PR C41 (1990) 1292.

**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 ( $\checkmark$  Spokesperson), A C Saulys  
 BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum ( $\checkmark$  Spokesperson)

CITY COLL, N Y - C Chan, M A Kramer

JOHNS HOPKINS U - T J Halman, L Madansky

RICE U - S Ahmad, B E Bonner, J A Buchanan, C N Chiou, J M Clement, G S Mutchler

**Accelerator** BNL-ION **Detector** MPS

### Reactions

p nucleus	15 GeV ( $T_{\text{lab}}/N$ )
$^{28}\text{Si}$ nucleus	"
$^{16}\text{O}$ nucleus	"

**Comments** Searches for anomalous behavior in rapidities, multiplicities, strangeness enhancements, transverse momenta, energy flows, etc. Targets are carbon, silicon, tin, copper, tungsten, lead, 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. Data were taken in December 88, June 89, June 90, and February 91.

**Papers** NP A498 (1989) 523c, IEEE TNS 36 (1989) 58, NIM A283 (1989) 557, PL B248 (1990) 254, NP (Proc. Suppl.) B16 (1990) 405, NP A525 (1991) 601c, and PL B (accepted).

**BNL-811** (Jan 1985) Approved Mar 1985, Jun 1986; Completed Apr 1989.

### RADIATIVE KAON CAPTURE AND HYPERON WEAK RADIATIVE DECAY

BIRMINGHAM U - N Hessey, J Lowe

BOSTON U - E C Booth, K P Gall, C Heisey, E K McIntyre,

J P Miller, B L Roberts ( $\checkmark$  Spokesperson), D A Whitehouse

BRITISH COLUMBIA U - M D Hasinoff, D F Measday,

A J Noble

BROOKHAVEN - M Sakitt

CASE WESTERN RESERVE U - W Fickinger, K Robinson

BUDAPEST, CRIP & TRIUMF - D Horvath

TRIUMF - M Salomon

**Accelerator** BNL **Detector** Counter

### Reactions

$K^- p \rightarrow \Lambda \gamma$	0 MeV/c
$K^- p \rightarrow \Lambda \pi^0$	"
$K^- p \rightarrow \Sigma^0 \gamma$	"
$K^- p \rightarrow \Sigma^+ \pi^-$	"
$K^- \text{deut} \rightarrow \Lambda n \gamma$	"

**Particles studied**  $\Lambda$ ,  $\Sigma^+$

**Comments** Studies weak radiative decays of the  $\Lambda$  and  $\Sigma^+$  in the  $K^- p$  reactions, and measures the  $\Lambda - n$  scattering length in  $K^- d$  capture. Approved for 3750 hours.

**Papers** NP A479 (1988) 75c, ZPHY C42 (1989) 175, NC 102A (1989) 145, PRL 63 (1989) 1352, NP (Proc. Suppl.) B13 (1990) 449, and PR C42 (1990) 475.

**BNL-813** (Jan 1985) Approved Mar 1985; Started 1991.

### SEARCH FOR A STRANGENESS -2 DIBARYON

CARNEGIE MELLON U - M Athanas, G Franklin

( $\checkmark$  Spokesperson), R Magahiz, C Maher, F Merrill, B Quinn,

R A Schumacher, I R Sukaton, V Zeps

ALBERTA U - F M Rozon

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

BIRMINGHAM U - J Lowe, J Nelson, R Zybert  
 BROOKHAVEN - R Chrien, P Pile, R Sawafta, R Sutter  
 CERN - N Hamann  
 FREIBURG U - P Birien, T Buerger, M Burger, H Fischer,  
 J Franz, E Roessle, H Schmitt  
 INDIANA U - J J Szymanski  
 KYOTO U - T Iijima, K Imai, A Masaike, K Miyake  
 KYOTO SANGYO U - K Okada, F Takeuchi  
 LOS ALAMOS - P D Barnes (✓ Spokesperson)  
 MANITOBA U - A Berdoz, C Davis, N E Davison,  
 W T H van Oers, S Page, W D Ramsay, V Sum  
 NEW MEXICO U - B Bassalleck, A Rusek, D Wolfe  
 TRIUMF - D Gill  
 VASSAR COLL - R L Stearns  
 YALE U - G Diebold

Accelerator BNL Detector Spectrometer, Counter

Reactions

$K^- p \rightarrow K^+ \Xi^-$  1.8 GeV/c  
 $\Xi^- \text{ deut} \rightarrow \text{dibaryon}(S = -2) n$  0 GeV/c

Particles studied dibaryon( $S = -2$ )

Comments Covers from about 100 MeV below to 20 MeV above the  $\Lambda\Lambda$  mass in a triple-coincidence mode. See also BNL-836 for a search in the reaction  $K^- {}^3\text{He} \rightarrow K^+$  dihyperon  $N$ . Approved for 1000 hours, began taking data in 1991.

**BNL-814** (Feb 1985) Approved Nov 1985; Started Dec 1988.  
**STUDY OF EXTREME PERIPHERAL COLLISIONS AND OF THE TRANSITION FROM PERIPHERAL TO CENTRAL COLLISIONS IN REACTIONS INDUCED BY RELATIVISTIC HEAVY IONS**

BROOKHAVEN - E Duek, M Fatyga, R Hogue, D Lissauer,  
 T Ludlam, D Makowiecki, E O'Brien, V Polychronakos, H Takai,  
 T Throwe, C Woody  
 CERN - W J Willis  
 LOS ALAMOS - J Boissevain, D Fox, H Van Hecke,  
 W E Sondheim, J W Sunier  
 MCGILL U - J Barrette, S K Mark, C Pruneau  
 NEW MEXICO U - B Bassalleck, J Hall, D Wolfe  
 PITTSBURGH U - W Cleland, K Jayananda, D Kraus,  
 U Sonnadara, M Takagui  
 SUNY, STONY BROOK - R Bellwied, P Braun-Munzinger  
 (✓ Spokesperson), G David, N Herrmann, G Ingold, W Llope,  
 M Muthuswami, J Stachel, L Waters  
 TEL AVIV U - R Heifetz  
 TEXAS A AND M - E Barasch, M Rawool, J A Shoemaker,  
 J Simon, J Sullivan, K Wolf  
 YALE U - V Greene, T Hemmick, R Majka, J Mitchell, F Rondo,  
 J Sandweiss, B Shivakumar

Accelerator BNL-ION Detector Spectrometer, Calorimeter

Reactions

$p$  nucleus 15 GeV ( $T_{\text{lab}}/N$ )  
 ${}^{16}\text{O}$  nucleus "  
 ${}^{32}\text{S}$  nucleus "

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. Topics include a search for strange matter, and a study of rapidity distributions for baryons and mesons. Ran for 2700 hours. Final run scheduled for Spring 92.

Papers ZPHY C38 (1988) 45, NIM A284 (1989) 323, IEEE TNS 37 (1990) 82, IEEE TNS 37 (1990) 88, PR C41 (1990) 1512, PR C41 (1990) 2644, PRL 64 (1990) 1219, PL B252 (1990) 550, NP (Proc. Suppl.) B24 (1991) 265, and PR C45 (1992) 421.

**BNL-815** (1985) Approved Mar 1986; Completed 1988.  
**PARTICLE PRODUCTION AND NUCLEAR FRAGMENTATION IN COLLISIONS OF HEAVY IONS IN EMULSION AT AGS ENERGIES**

ALMA ATA, PHYS INST - N P Andreeva, Z V Anson,  
 V I Bubnov, Y I Chasnikov, G Z Eligbaeva, L E Eremenko,

A S Gaitanov, G S Kalyachkina, E K Kanygina, V N Lepetan,  
 C I Shakova  
 BEIJING, IHEP - G F Xu, P Y Zheng  
 PANJAB U - M M Aggarwal, R Arora, V S Bhatia, I S Mitra  
 HUNAN EDUCATION INST - Y X Li, L Liang, Z G Liu,  
 Z Q Weng, Y L Xia  
 DUBNA - S A Krasnov, S Kulikova, T N Maksimkina,  
 J J Musulmanbekov, G S Shabratova, K D Tolstov  
 RAJASTHAN U - K B Bhalla, S K Gupta, V Kumar, P Lal,  
 S Lokanathan, S Mookerjee, H S Palsania, R Raniwala,  
 S Raniwala  
 JAMMU U - S K Badyal, A Bhasin, V K Gupta, S Kachroo,  
 S Kitroo, L Mangotra, N K Rao  
 KOSICE U - L Just, M Karabova, M Tothova, S Vokal, J Vrlakova  
 SHANXI NORMAL U - S B Lou, Y M Qin, D H Zhang  
 LUND U - S Garpman, B Jakobsson, J Nystrand, I Otterlund  
 (✓ Spokesperson), K Soderstrom, E Stenlund  
 MARBURG U - E Ganssaue, J T Rhee  
 LEBEDEV INST - M I Adamovich, Y A Alexandrov,  
 M M Chernyavsky, S G Gerassimov, S P Kharlamov,  
 V G Larionova, N V Maslennikova, G I Orlova, N G Peresadko,  
 V M Rappoport, N A Salmanova, M I Tretyakova  
 WASHINGTON U, SEATTLE - T H Burnett, J Grote, J J Lord,  
 D Skelding, R J Wilkes  
 KHLOPIN RADIUM INST - V G Bogdanov, V A Plyushchev,  
 Z I Solovieva  
 TASHKENT, IFY - E S Basova, H Nasrullaeva, S Z Nasyrov,  
 N V Petrov, D A Qarshiev, T P Trofimova, U I Tuleeva  
 TASHKENT, FTI - L P Chernova, K G Gulamov, F G Kadyrov,  
 N S Lukicheva, V S Navotny, N Saidkhanov, L N Svechnikova,  
 S I Zhokhova  
 HUA-ZHONG NORMAL U - X Cai, H Huang, L S Liu,  
 W Y Qian, H Q Wang, D C Zhou  
 YEREVAN PHYS INST - F A Avetyan, N A Marutyan,  
 L G Sarkisova, V R Sarkisyan

Accelerator BNL Detector Emulsion

Reactions

${}^{16}\text{O}$  nucleus 15 GeV ( $T_{\text{lab}}/N$ )  
 ${}^{28}\text{Si}$  nucleus "

Comments Uses emulsion chambers and emulsion stacks. Studies pseudo-rapidity density distributions, density fluctuations, multiplicity and angular distributions, production cross sections, etc. See also CERN-EMU-001.

Papers PR C40 (1989) 66, PL B223 (1989) 262, PRL 62 (1989) 2801, HEPNP 13 (1989) 865, PL B230 (1989) 175, PL B242 (1990) 512, MPL A5 (1990) 169, PS T32 (1990) 168, NP A525 (1991) 551c, ZPHY C49 (1991) 395, MPL A6 (1991) 469, HEPNP 15 (1991) 131, PL B262 (1991) 369, PL B263 (1991) 539, and PRL 67 (1991) 1201.

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

**SEARCH FOR NEUTRINO OSCILLATIONS**

BROOKHAVEN - M J Murtagh, H White  
 CERN - C Detraz, M Ferro-Luzzi, J M Perreau  
 PARIS, CURIE UNIV VI & PARIS, UNIV VII, LPNHE -  
 P Astier, J Chauveau, A Diaczek, J Dumarchez, F Kovacs,  
 A Letessier, J M Levy, Y Pons, A M Touchard, F Vannucci  
 (✓ Spokesperson)  
 BOSTON U - G Bernardi, T Chrysicopoulou, J Stone

Accelerator BNL Detector Calorimeter

Reactions

$\nu_\mu \rightarrow \nu_e$  < 4 GeV/c

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

Papers PL B220 (1989) 646, and NP B335 (1990) 517. No other papers expected.

**BNL-817** (Jun 1985)

**POLARIZATION TRANSFER IN HYPERON PRODUCTION**

RICE U - D L Adams, B E Bonner (✓ Spokesperson),  
 J A Buchanan, J M Clement, M D Corcoran, N Krishna,

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

J W Kruk, H E Miettinen, G S Mutchler, F Nessi, M Nessi,  
 J B Roberts (✓ Spokesperson), P M Stevenson  
 BROOKHAVEN - S U Chung, R C Fernow, H Willutski  
 JOHNS HOPKINS U - T Hallman, L Madansky  
 HOUSTON U - L S Pinsky  
 MINNESOTA U - K Johns  
 SOUTHEASTERN MASS U - Z Bar-Yam, J Dowd, W Kern,  
 E King

Accelerator BNL Detector MPS

Reactions Polarized beam  
 $p \text{ Be} \rightarrow \Lambda X$  22 GeV/c  
 $p \text{ Be} \rightarrow \Sigma^0 X$  "

Comments Approved for 1300 hours. In progress (Dec 91).

Papers PRL 58 (1987) 447, PR D38 (1988) 729, PRL 62 (1989) 1591, and PR D41 (1990) 13.

**BNL-818** (1985) Approved Mar 1986; Started 1990.

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

BROOKHAVEN - A Birman, S U Chung (✓ Spokesperson),  
 R C Fernow, H Kirk, S D Protopopescu  
 INDIANA U - R Crittenden, A Dzierba, T Marshall, D Zieminska  
 SOUTHEASTERN MASS U - N Bar-Yam, J Dowd, W Kern,  
 E King  
 RICE U - B E Bonner, G C Phillips, J B Roberts

Accelerator BNL Detector MPS

Reactions  
 $\pi^- p \rightarrow f_1(1285) \pi^- p$  12 GeV/c

Particles studied exotic-meson

Comments Looks for a resonance in the  $J^{PC} = 1^{-+}$   
 $f_1(1285)\pi^-$  system. Approved for 1000 hours. In progress  
 (December 91).

**BNL-820** (1985) Approved Nov 1985; Started Dec 1988;  
 Completed May 1989.

**SEARCH FOR  $S = -1$  DIBARYON RESONANCES IN  
 THE MASS REGION 2050-2130 MeV/c USING THE  
 REACTIONS  ${}^3\text{He}(K^-, \pi^+)nX$  AND  ${}^3\text{He}(K^-, \pi^+)pX^-$  AT  
 870 MeV/c**

BROOKHAVEN - S Bart, R E Chrien, P H Pile, R J Sutter,  
 N Tsoupas, T Ward  
 FLORIDA STATE U - H Piekarczyk (✓ Spokesperson)  
 HOUSTON U - E V Hungerford, K Johnstone, B Mayes,  
 L Pinsky, L Tang  
 OHIO STATE U - K Hicks  
 OSAKA U - T Kishimoto  
 TEXAS U - R Krauss  
 TOKYO U - T Fukuda  
 TRIUMF - D Gill  
 VASSAR COLL - R L Stearns

Accelerator BNL Detector Spectrometer

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

Particles studied dibaryon( $S = -1$ )

Comments A double-arm magnetic spectrometer was used to  
 measure the missing mass spectrum from the studied reactions.  
 The scattering angle was  $20^\circ$ , in order to enhance the  $p$ -wave  
 resonance production. A two-layer scintillation hodoscope  
 closely surrounding a liquid  ${}^3\text{He}$  target and arranged into twelve  
 azimuthal and polar angles was used to detect charged particles  
 from the  $\Lambda n$  and  $\Sigma^- n$  final state resonance decays. It was also  
 used to suppress the  $K_S^0$  and quasi-elastic  $\Sigma^- p$  backgrounds.  
 The neutral ( $Q = 0$ ) and charged ( $Q = -1$ ) two-baryon states  
 were studied in the first and second reactions, respectively.

**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 - D H Brown, R M Carey, M Chertok, E Hazen,  
 F Krienen, Z Liu, J P Miller, B L Roberts (✓ Spokesperson),  
 L R Sulak, W Worstell, T Zwart  
 BROOKHAVEN - H N Brown, J R Cullen, G T Danby,  
 C R Gardner, J W Jackson, Y Y Lee, S Mane, W Meng,  
 W M Morse (✓ Spokesperson), K Woodlee  
 CORNELL U - T Kinoshita, Y Orlov  
 HEIDELBERG U, PHYS INST - K Jungmann, G zu Putlitz  
 HEIDELBERG, MAX PLANCK INST - U Haeberlen  
 KEK - K Endo, H Hirabayashi, S Kurokawa, Y Mizumachi,  
 T Sato, A Yamamoto  
 LOS ALAMOS - W P Lysenko  
 NOVOSIBIRSK, IYF - L M Barkov, D N Grigorev, B I Khazin,  
 E A Kuraev, Y M Shatunov, E Solodov  
 WAKO, RIKEN - K Ishida  
 TOKYO U - K Nagamine, K Nishiyama  
 YALE U - P Cushman, S K Dhawan, A A Disco, F J M Farley,  
 X Fei, S Hou, V W Hughes (✓ Spokesperson)

Accelerator BNL Detector Other

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 for 2100 hours. Expected to run in  
 1992.

**BNL-825** (Oct 1985) Approved Nov 1985; Completed 1988.

**RADIOCHEMICAL STUDIES OF ULTRARELATIVIS-  
 TIC NUCLEAR COLLISIONS**

OREGON STATE U - C Casey, W Loveland (✓ Spokesperson),  
 Z Xu  
 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 ( $T_{\text{lab}}/N$ )  
 ${}^{28}\text{Si}$  nucleus "

Particles studied frag

Comments Targets are copper, silver, and gold. Induced  
 radioactivities are determined by off-line  $\gamma$  spectroscopy.  
 Investigates evidence for a limiting fragmentation.

Papers PR C37 (1988) 1311, PR C42 (1990) 1753, and PR C44  
 (1991) 1661.

**BNL-826** (Dec 1985) Approved Mar 1986; Completed 1988.

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

SAGA U, JAPAN - H Itoh (Spokesperson)  
 TOHOKU U - M Chida, T Hayashino, Y Yamato  
 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-ION 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.

**BNL-828** (Jan 1985) Approved Mar 1986; Completed 1987.

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

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

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  $\rightarrow p X$  0.80 GeV/c

Comments The targets are lithium, carbon, oxygen, and aluminum. Investigates a prediction of strongly bound systems of the  $\eta$  meson and nuclei. Sets an upper limit on the production cross section.

Papers PRL 60 (1988) 2595. No other papers expected.

**BNL-829** (Jan 1986) Approved 1986; Completed 1989.

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

HOUSTON U - E V Hungerford, T Kishimoto ( $\checkmark$  Spokesperson),

B Mayes, L Pinsky

BRANDEIS U - H Piekarcz

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 A search for a  $pp$  bound state in  $K^-$   $^3\text{He} \rightarrow \pi^- X$ .

**BNL-831** (1986) Approved 1986; Completed 1987.

**SEARCH FOR HYPERNUCLEAR PROJECTILE FRAGMENTATIONS IN THE RELATIVISTIC HEAVY-ION COLLISION USING AN EMULSION CHAMBER**

TOKYO U, INS - C Nagoshi, K Omata, Y Shida (Spokesperson)

KOBE U - H Fukushima, T Hara, M Miyagaki, K Taruima,

C Yokoyama

BROOKHAVEN - D Beavis

Accelerator BNL-ION Detector Emulsion, Counter

Reactions

$^{16}\text{O}$  C 6, 14 GeV/c ( $P_{\text{lab}}/N$ )

$^{16}\text{O}$  nucleus "

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

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

Comments Ran for 6 hours.

**BNL-834** (Jan 1986) Approved Mar 1986; Completed 1987.

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

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,

M L Marshak, M A Shupe

PENN STATE U - S Heppelmann ( $\checkmark$  Spokesperson)

SOUTHEASTERN MASS U - J J Russell

Accelerator BNL Detector Spectrometer

Reactions

$p p \rightarrow p p$  6, 10, 12 GeV/c

$p$  nucleus "

Comments Studies elastic scattering from protons in nuclei as a function of A and energy. This provides information on the color transparency of the interacting particles. Spectral functions of nuclei at large momentum transfer are also measured.

Papers PRL 61 (1988) 1698, and PL B232 (1989) 167.

**BNL-835** (Apr 1986) Approved Jun 1986, Mar 1989; Completed 1990.

**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 Pile, R J Sutter

Accelerator BNL Detector Counter

Reactions

$K^+$  deut 450-800 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  $N = Z$  ( $^6\text{Li}$ ,  $^{12}\text{C}$ ,  $^{28}\text{Si}$ , and  $^{40}\text{Ca}$ ).

The first run was completed in 1988, the last in 1990. Analysis of data is in progress.

Papers PRL 65 (1990) 2110, and PR C (to be published).

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

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

CARNEGIE MELLON U - M Athanas, G Franklin

( $\checkmark$  Spokesperson), R Magahiz, C Maher, F Merrill, B Quinn,

R A Schumacher, I R Sukaton, V Zeps

ALBERTA U - F M Rozon

BIRMINGHAM U - J Lowe, J Nelson, R Zybert

BROOKHAVEN - R Chrien, P Pile, R Sawafta, R Sutter

CERN - N Hamann

FREIBURG U - P Birien, T Buerger, M Burger, H Fischer,

J Franz, E Roessle, H Schmitt

INDIANA U - J J Szymanski

KYOTO U - T Iijima, K Imai, A Masaie, K Miyake

KYOTO SANGYO U - K Okada, F Takeuchi

LOS ALAMOS - P D Barnes ( $\checkmark$  Spokesperson)

MANITOBA U - A Berdoz, C Davis, N E Davison,

W T H van Oers, S Page, W D Ramsay, V Sum

NEW MEXICO U - B Bassalleck, A Rusek, D Wolfe

TRIUMF - D Gill

VASSAR COLL - R L Stearns

YALE U - G Diebold

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. Expected to run in 1993.

**BNL-838** (Oct 1986) Approved Nov 1986; Started 1988; Completed 1988.

**90° EXCLUSIVES AT 6 GeV**

BROOKHAVEN - D S Barton, G Bunce ( $\checkmark$  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 ( $\checkmark$  Spokesperson)

Accelerator BNL Detector Double-arm spectrometer

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

### 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. Ran for 902 hours.

**BNL-839** (1988) Completed 1989.

### A SEARCH FOR MAGNETIC MONOPOLES

IBM WATSON RES CTR - S Bermon (✓ Spokesperson),  
P Chaudhari, C C Chi, C C Tsuei  
BROOKHAVEN - A Prodel (✓ Spokesperson)

**Accelerator** NONE **Detector** Other

**Particles studied** monopole

**Comments** A study involving the design, construction, and operation of a prototype superconducting induction monopole detection system. The goal is to develop a large-area prototype detector which can be replicated to achieve monopole flux limits approaching the Parker limit.

**BNL-840** (Jul 1987) Approved Oct 1987; Started Jul 1989; Completed Dec 1991.

### SEARCH FOR THE COHERENT PRODUCTION OF LIGHT SCALAR AND PSEUDOSCALAR PARTICLES

ROCHESTER U - R Cameron, G Cantatore, A C Melissinos (✓ Spokesperson), J T Rogers, G Ruoso, Y K Semertzidis  
BROOKHAVEN - H Halama, D Lazarus, A G Prodel  
FERMILAB - F A Neznick  
CERN & TRIESTE U - P Micossi, C Rizzo, E Zavattini

**Accelerator** NONE **Detector** Other

**Particles studied** axion

**Comments** The detector used two CBA superconducting dipoles. Searched for light scalar or pseudoscalar particles that couple to the electromagnetic field. Looked for optical rotation of a polarized laser beam traversing in vacuum the 3.5-T magnetic field. The sensitivity of  $10^{-10}$  rad corresponds to a limit on the coupling  $g_{a\gamma\gamma}$  of  $4 \times 10^{-7}$  GeV $^{-1}$ . Did not reach Delbruck scattering (real photons from virtual photons) below the  $e^+e^-$  threshold. Analysis of data is in progress.

**Papers** PRL 64 (1990) 2988, JOSA B8 (1991) 520, and PL A157 (1991) 125.

**BNL-841** (1987) Approved Aug 1987.

### PHYSICS CALIBRATION OF THE SOUDAN-II NUCLEON DECAY EXPERIMENT USING NEUTRINOS AT BROOKHAVEN

ARGONNE - I Ambats, D Ayres, L Balka, L Barrett, J Biggs, J Dawson, T Fields, M C Goodman, N Hill, D Jankowski, F Lopez, E May, L E Price, J Schlereth, J Thron  
MINNESOTA U - H Courant, U DasGupta, K Heller, K Johns, M Marshak, E Peterson, D Rosen, K Ruddick, M Shupe, S Werkema

OXFORD U - W W M Allison, G D Barr, C B Brooks, J H Cobb, L Kirby-Gallagher, D H Perkins, P Shield, N West

RUTHERFORD - J Alner, D Cockerill, C Garcia, R Giles, P J Litchfield, G F Pearce

TUFTS U - T Kafka, W A Mann (✓ Spokesperson), R Milburn, A Napier, W Oliver, B Saitta, J Schneps, N Sundaralingam

**Accelerator** BNL **Detector** Calorimeter

### Reactions

$\nu_\mu$  <5 GeV/c

**Comments** A test of modules for the Soudan-II proton decay detector, to run parasitically during neutrino runs. For neutrino energies near the nucleon mass, the flux from the AGS wide-band beam has a shape similar to the spectrum of atmospheric neutrinos. The test measures the extent to which neutrino events can mimic decaying nucleons in the detector. Approved for 350 hours.

**BNL-844** (1988) Approved Mar 1988.

### MEASUREMENT OF ANGULAR DISTRIBUTIONS FOR FRAGMENTS IN THE TARGET RAPIDITY REGION

BROOKHAVEN - Y Y Chu, J B Cumming (✓ Spokesperson),

P E Hausteine, S Katcoff, R W Stoenner  
OREGON STATE U - W Loveland

**Accelerator** BNL-ION **Detector** Other

### Reactions

$^{16}\text{O Au} \rightarrow ^{37}\text{Ar X}$  13.6 GeV ( $T_{\text{lab}}/N$ )  
 $^{16}\text{O Au} \rightarrow ^{127}\text{Xe X}$  "

**Comments** Investigates enhanced backward yields of fragments in the mass range  $A = 24-48$  observed in BNL-825. Fragments are stopped in catcher foils and yields are determined off-line. Approved for 100 hours. Awaiting the availability of a high intensity  $^{16}\text{O}$  beam.

**BNL-845** (Jan 1988) Approved Mar 1988; Started Jan 1989; Completed May 1989.

### A SEARCH FOR THE RARE DECAY $K^0 \rightarrow \pi^0 e^+ e^-$

BROOKHAVEN - E Jastrzembski, R C Larsen, L B Leipuner, W M Morse (✓ Spokesperson)  
YALE U - R K Adair, H B Greenlee, H Kasha, E B Mannelli, K E Ohl, M P Schmidt (✓ Spokesperson), M Vagins  
VASSAR COLL - C B Schwarz

**Accelerator** BNL **Detector** Spectrometer

### Reactions

$K_L \rightarrow \pi^0 e^+ e^-$   
 $K_L \rightarrow e^+ e^- \gamma$   
 $K_L \rightarrow e^+ e^- \gamma \gamma$

**Particles studied**  $K_L$

**Comments** Normalized to  $K_L^0 \rightarrow \pi^+ \pi^- \pi^0$  with and without  $\pi^0$  Dalitz decay. Sensitive to  $K_L^0$  decays with an  $e^+e^-$  pair:  $K_L^0 \rightarrow \pi^0 e^+ e^-$ ,  $e^+ e^- \gamma$ ,  $e^+ e^- e^+ e^-$ ,  $e^+ e^- \gamma \gamma$ , and similar decays. Ran for 1500 hours.

**Papers** PRL 64 (1990) 2755, PRL 65 (1990) 1407, PR D42 (1990) 3724, NP A527 (1991) 717, and PR D45 (1992) 36.

**BNL-847** (1988) Approved Oct 1988; Completed Jun 1989.

### STUDY OF PARTICLE PRODUCTION IN HEAVY-ION COLLISIONS

SUNY, BUFFALO - P L Jain (✓ Spokesperson), K Sengupta, G Singh

**Accelerator** BNL-ION **Detector** Emulsion

### Reactions

$^{16}\text{O nucleus}$  14 GeV ( $T_{\text{lab}}/N$ )  
 $^{32}\text{S nucleus}$  "  
 $^{28}\text{Si nucleus}$  "

**Comments** Emphasis is on central collisions with the aim of finding evidence for a new, collective form of quark matter. Ran for 2 hours.

**Papers** PR C43 (1991) 2027, PR C43 (1991) 2417, PR C44 (1991) 854, ZPHY C52 (1991) 465, MPL A7 (1992) 93, and ZPHY C (accepted).



## SUMMARIES OF BROOKHAVEN EXPERIMENTS

**BNL-849** (Aug 1988)

**SEARCH FOR MUONIUM TO ANTIMUONIUM CONVERSION**

A T AND T BELL LABS, MURRAY HILL - D R Harshman (Spokesperson), A P Mills (Spokesperson)

Accelerator BNL Detector Counter

Reactions

muonium  $\rightarrow$  antimuonium

Comments A search for spontaneous conversion of muonium to antimuonium by looking for the spectator orbital positron remaining after the decay of the  $\mu^-$ . Approved for 500 hours subject to test, with a request for a further 1550 hours deferred.

**BNL-850** (1988) Approved Oct 1988.

**EVA, A SOLENOIDAL DETECTOR FOR LARGE ANGLE EXCLUSIVE REACTIONS: PHASE I - DETERMINING COLOR TRANSPARENCY TO 22 GeV/c**

BROOKHAVEN - D S Barton, G Bunce, A S Carroll ( $\checkmark$  Spokesperson), S Gushue, M Kmit, D I Lowenstein, Y I Makdisi, M Tanaka

MINNESOTA U - H Courant, K J Heller, K Johns, M L Marshak, C White

MOUNT HOLYOKE COLL - H Nicholson

PENN STATE U - S Durand, S Heppelmann ( $\checkmark$  Spokesperson), E D Minor, J Y Wu

SOUTHEASTERN MASS U - S Baker, F J Barbosa, J J Russell

TEL AVIV U - J Aclander, J Alster, I Mardor, Y Mardor, E Piasetzky

Accelerator BNL Detector EVA

Reactions

$p p \rightarrow p p$  6-20 GeV/c  
 $p \text{ nucleus} \rightarrow p p \text{ nucleus}$  "  
 $\pi^- \text{ nucleus} \rightarrow \pi^- p \text{ nucleus}$  6-15 GeV/c

Comments The detector EVA (Exclusive Variable Apparatus) is built around the CLEO I solenoid. This first experiment with EVA measures color transparency, defined as the ratio of  $pp$  elastic scattering for the target proton in a nucleus to elastic scattering on free protons. Continues studies of BNL-834. Approved for 1200 hours.

**BNL-851** (Sep 1988) Approved Oct 1988; Completed 1989.

**A STUDY OF THE DECAY  $K^+ \rightarrow \pi^+ e^+ e^-$**

BROOKHAVEN - H A Gordon, D M Lazarus, P Rehak  
 PSI, VILLIGEN - J Egger, W D Herold, H Kaspar  
 WASHINGTON U, SEATTLE - V Chaloupka, H J Lubatti, A Shukla, T Zhao

YALE U - C Alliegro, A Deshpande, N J Hadley, A M Lee, M E Zeller ( $\checkmark$  Spokesperson)

Accelerator BNL Detector Spectrometer

Reactions

$K^+ \rightarrow \pi^+ e^+ e^-$   
 $K^+ \rightarrow \pi^+ \text{ neutral}$   
 neutral  $\rightarrow e^+ e^-$   
 $\pi^0 \rightarrow e^+ e^-$

Particles studied  $K^+$ ,  $\pi^0$

Comments Measures the  $K^+ \rightarrow \pi^+ e^+ e^-$  and  $\pi^0 \rightarrow e^+ e^-$  branching fractions and searches for an  $e^+ e^-$  state in the mass range 1.02 to 350 MeV. Ran for 2000 hours.

**BNL-852** (Jan 1989) Approved Mar 1989.

**SEARCH FOR GLUEBALLS AND  $J^{PC}$ -EXOTIC HYBRID MESONS**

BROOKHAVEN - S U Chung ( $\checkmark$  Spokesperson), S D Protopopescu, D Weygand, H J Willutzki

INDIANA U - R R Crittenden, A R Dzierba ( $\checkmark$  Spokesperson),

P T Smith, D Zieminska

LOUISVILLE U - C Davis

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

NOTRE DAME U - J M Bishop, N M Cason, R C Ruchti,

W D Shephard

MOSCOW STATE U - L Bravina, A Demianov, A Ostrovidov,

L Sarycheva, N Sinev

SERPUKHOV - V Lipaev, A Soldatov

Accelerator BNL Detector MPS

Reactions

$\pi^- p \rightarrow n \eta \pi^0$  18 GeV/c  
 $\pi^- p \rightarrow p \eta \pi^-$  "  
 $\pi^- p \rightarrow n \eta \pi^0 \pi^0$  "  
 $\pi^- p \rightarrow n \eta \pi^+ \pi^-$  "  
 $\pi^- p \rightarrow n \eta \eta'$  "  
 $\pi^- p \rightarrow n \eta \eta \pi^0$  "  
 $\pi^- p \rightarrow n K^0 \bar{K}^0 \pi^0$  "  
 $\pi^- p \rightarrow n K^0 \bar{K}^0 \pi^0 \pi^0$  "  
 $\pi^- p \rightarrow n K^0 \bar{K}^0 \pi^+ \pi^-$  "

Particles studied exotic-meson, glueball,  $f_0(1590)$

Comments Looks in particular for further evidence for an " $M(1405)$ " observed to decay into  $\eta\pi^0$  in GAMS-spectrometer experiments at Serpukhov and CERN. Expected to take data in 1993.

**BNL-854** (Jan 1989) Approved Mar 1989; Started May 1991.

**ANTIPROTON-NUCLEUS INTERACTIONS AT 5-10 GEV/c**

RICE U - D L Adams, B E Bonner ( $\checkmark$  Spokesperson),

J A Buchanan, C Chiou, J M Clement, M D Corcoran,

H E Miettinen, G S Mutchler, F Nessi-Tedaldi, M Nessi,

J B Roberts

LOS ALAMOS - W R Gibbs

BROOKHAVEN - S E Eiseman, A Etkin, K J Foley,

R W Hackenburg, R S Longacre, W A Love, T W Morris,

E D Platner, A C Saulys

BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum

JOHNS HOPKINS U - T J Hallman, L Madansky

Accelerator BNL Detector MPS

Reactions

$\bar{p} \text{ nucleus} \rightarrow \Lambda X$  5, 7, 9 GeV/c  
 $\bar{p} \text{ nucleus} \rightarrow \bar{\Lambda} X$  "  
 $\bar{p} \text{ nucleus} \rightarrow K_S X$  "

Comments Measured production cross sections and rapidity distributions of  $\Lambda$ 's,  $\bar{\Lambda}$ 's, and  $K_S^0$ 's for five targets from carbon to lead. A probe of the high-temperature, low-density region of the nuclear-matter phase diagram in search of evidence for the quark-gluon plasma. Ran for 400 hours, in May and June 1991. Data are being analyzed.

**BNL-855** (Jan 1989) Approved Mar 1989; Completed Apr 1990.

**LOW ENERGY PHOTON PRODUCTION IN PROTON NUCLEUS COLLISIONS AT THE AGS**

BROOKHAVEN - D Lissauer, C Woody ( $\checkmark$  Spokesperson)

OAK RIDGE - J Gomez del Campo, A Ray, D Shapira

( $\checkmark$  Spokesperson), M Tincknell

CERN - C Erd, J Schukraft, W Willis

VANDERBILT U - R Clark

Accelerator BNL Detector Spectrometer

Reactions

$p \text{ nucleus} \rightarrow \gamma X$  10, 18 GeV/c

Comments Uses the BNL-814 spectrometer and  $\text{BaF}_2$  photon detectors. Studies low-energy photon production in correlation with event topology. A search for new sources of soft photons (in excess of nuclear decays and hadronic bremsstrahlung). Ran for 500 hours.

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

**BNL-857** (Jan 1989) Approved Mar 1989; Completed May 1989.

### $\pi^0$ PAIR PRODUCTION NEAR THRESHOLD AND CHIRAL SYMMETRY BREAKING

BIRMINGHAM U - J Lowe ( $\checkmark$  Spokesperson)  
 OXFORD U - N W Tanner  
 BOSTON U - J P Miller, B L Roberts ( $\checkmark$  Spokesperson)  
 BRITISH COLUMBIA U - M D Hasinoff, A J Noble, M Sevier, C E Waltham  
 BROOKHAVEN - M Sakitt  
 CASE WESTERN RESERVE U - W J Fickinger, D K Robinson  
 BUDAPEST, CRIP & TRIUMF - D Horvath  
 NEW MEXICO U - B Bassalleck, J R Hall, K D Larson, D M Wolfe

Accelerator BNL Detector Counter

#### Reactions

$\pi^- p \rightarrow \pi^0 \pi^0 n$  300 - 500 MeV/c

Comments Measurements made between threshold (265 MeV/c) up to 450 MeV/c, particularly in the region where the cross section varies rapidly, to provide the value of the chiral symmetry breaking parameter  $\xi$ . Also searches for the  $\pi\pi$  resonance reported by the OMICRON collaboration in the neutral two  $\pi^0$  channel. Analysis in progress (January 92).

Papers PR C44 (1991) 956, and PRL 67 (1991) 2622.

**BNL-858** (May 1989) Approved Jun 1989; Completed Jun 1989.

### MEASUREMENT OF NEGATIVE PARTICLE YIELD AT $0^\circ$ FOR 15 A GeV Si + Au COLLISIONS

UC, BERKELEY, SPACE SCI DEPT - H J Crawford ( $\checkmark$  Spokesperson), J Engelage  
 BOSTON U - J Beatty, B Zhou  
 BROOKHAVEN - D Beavis, R Debbe  
 UCLA - J Carroll, G Igo  
 KEK - J Chiba, K Tanaka  
 WASEDA U - T Doke, T Kashiwagi, J Kikuchi  
 TOKYO U - M Aoko, R Hayano, Y Shimazu  
 JOHNS HOPKINS U - T Hallman  
 LOUISIANA STATE U - P Kirk, L Mao, Z Wang  
 LBL - H H Heckman, P J Lindstrom  
 COLUMBIA U - S Nagamiya, P Stankus

Accelerator BNL Detector Counter

#### Reactions

$^{28}\text{Si}$  nucleus  $\rightarrow$  charged X 15 GeV ( $T_{\text{lab}}/N$ )

Particles studied  $\pi^-$ ,  $K^-$ ,  $\bar{p}$ , deut

Comments Studies the yield of antinuclei,  $\pi^-$ , and  $K^-$  at  $0^\circ$ . 100 hours of data taking.

**BNL-859** Approved Jul 1989.

### STUDIES OF HIGH DENSITY BARYON MATTER FROM EXTENDED MEASUREMENTS OF PARTICLE MOMENTUM DISTRIBUTIONS AND FROM HIGH-PRECISION TWO-PARTICLE CORRELATIONS

ARGONNE - S Kaufman  
 BROOKHAVEN - D Beavis, C Chasman, Z Chen, Y Y Chu, J B Cumming, R Debbe, J H van Dijk, S Gushue, O Hansen, S Hayashi, M J LeVine, Y Miake, B E Moskowitz, J Olness, L P Remsberg (Spokesperson), M Tanaka, M Tannenbaum, F Videbaek, H Wegner  
 COLUMBIA U - C Chi, I Juricic, K Kurita, S Nagamiya, P W Stankus, O E Vossnack, Y Wang, F Want, Y Wu, W A Zajc (Spokesperson)  
 HIROSHIMA U - T Sugitate  
 TOKYO U, INS - Y Akiba, H Hamagaki, S Hayashi, S Homma, Y Ikeda  
 KYUSHU U - K Kimura  
 LOS ALAMOS - M Sarabura  
 UC, BERKELEY, SPACE SCI DEPT - H J Crawford, J Engelage, H Z Huang  
 LIVERMORE - H C Britt, M N Namboodiri, T C Sangster, J Thomas  
 MIT - M A Bloomer, V Cianciola, B A Cole, J Costales, L Grodzins, W Kehoe, R J Ledoux (Spokesperson),

D P Morrison, R J Morse, C G Parsons, P J Rothschild, R A Soltz, S G Steadman, G Stephans, T W Sung, V Vutsadakis, D Woodruff, D S Zachary  
 NEW YORK U - B Budick  
 TOKYO U - R S Hayano, H Sakurai  
 UC, RIVERSIDE - T Abbott, J W Chang, S Fung, J H Kang  
Accelerator BNL Detector Calorimeter, Counter, Single-arm spectrometer

#### Reactions

$^{28}\text{Si}$  nucleus  $\rightarrow$  charged X —  
 deut nucleus  $\rightarrow$  charged X —

Particles studied  $K^+$ ,  $\pi^-$ ,  $\pi^+$

Comments Extends the inclusive cross section measurements of BNL-802 over a significantly larger kinematic range and performs high-precision two-particle measurements on particles produced in nucleus-nucleus collisions.

**BNL-864** (May 1990) Approved Nov 1990.

### PRODUCTION OF RARE COMPOSITE OBJECTS IN RELATIVISTIC HEAVY ION COLLISIONS

BROOKHAVEN - C B Dover, T G Throwe  
 MASSACHUSETTS U, AMHERST - M S Z Rabin  
 MCGILL U - C Pruneau  
 NEW MEXICO U - J R Hall  
 PENN STATE U - T A Armstrong, R A Lewis, G A Smith  
 YALE U - K N Barish, G E Diebold, J V Germani, S V Greene, J G Lajoie, R D Majka, J T Mitchell, F S Rotondo, J Sandweiss ( $\checkmark$  Spokesperson), B Shivakumar, A Slaughter, E J Wolin

Accelerator BNL Detector Calorimeter, Counter

#### Reactions

$^{197}\text{Au}$  nucleus 11.71 GeV/c ( $P_{\text{lab}}/N$ )

Particles studied  $\bar{p}$ , dibaryon

Comments Analyzes particles produced in small impact parameter collisions in the central region of rapidity. Studies known objects, such as light nuclei and antinuclei, and those whose existence is uncertain, such as an  $H^0$  dibaryon and quark matter. Approved but not running in FY 1991.

**BNL-865** (May 1990) Approved Jun 1990.

### IMPROVED SEARCH FOR $K^+ \rightarrow \pi^+ \mu^+ e^-$

BASEL U - G Backenstoss, H Weyer  
 BROOKHAVEN - D Lazarus, H Ma, P Pile, P Rehak  
 DUBNA - B Z Zalikhonov  
 MOSCOW, INR - G S Atoyan, S N Gninenko, V V Isakov, A A Poblaguev  
 NEW MEXICO U - B Bassalleck, J Lowe, D Wolfe  
 PSI, VILLIGEN - J Egger, W D Herold, H Kaspar, J Missimer  
 PITTSBURGH U - D E Krauss, J A Thompson  
 TBILISI STATE U - Y S Bagaturia, D Mazavia, T M Sakhelashvili  
 YALE U - R Appel, M E Zeller ( $\checkmark$  Spokesperson)  
 ZURICH U - P Truoel

Accelerator BNL Detector Spectrometer, Calorimeter

Comments Continuation of BNL-777 experiment, with a factor of approximately 70 improved sensitivity. Approved and expected to run in 1994/5.

**BNL-866** (May 1990) Approved Jun 1990.

### STUDIES OF PARTICLE PRODUCTION AT HIGH BARYON DENSITY USING THE Au BEAM

ARGONNE - S Kaufman  
 BROOKHAVEN - D Beavis, C Chasman ( $\checkmark$  Spokesperson), Z Chen, Y Y Chu, J B Cumming, R Debbe, J H van Dijk, M Gonin, S Gushue, O Hansen, S Hayashi, M J LeVine, Y Miake, B E Moskowitz, J Olness, L P Remsberg, D Roehrich, M Tanaka, M J Tannenbaum, F Videbaek, H Wegner  
 COLUMBIA U - K Kurita, S Nagamiya, T K Nayak, P W Stankus, O E Vossnack, Y Wu, W A Zajc  
 HIROSHIMA U - T Sugitate  
 KYUSHU U - K Kimura

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

LIVERMORE - H C Britt, M N Nambodiri, T C Sangster,  
 J H Thomas  
 MIT - L Ahle, V Cianciolo, B A Cole, J B Costales, W L Kehoe,  
 R J Ledoux, D P Morrison, R J Morse, P J Rothschild,  
 R A Soltz, S G Steadman, G S F Stephans, T W Sung,  
 D S Woodruff, D Zachary  
 UC, BERKELEY, SPACE SCI DEPT - H J Crawford, J Engelage  
 UC, RIVERSIDE - P Beery, S Fung, J H Kang, R K Seto  
 TOKYO U - R S Hayano, H Sakurai, K Shigaki, Y Shimizu,  
 H Tamura  
 TOKYO U, INS - Y Akiba, H Hamagaki (✓ Spokesperson),  
 S Homma, Y Tanaka

Accelerator BNL Detector Single-arm spectrometer

Reactions

$^{197}\text{Au}$  nucleus  $\rightarrow$  charged X 11.6 GeV/c ( $P_{\text{lab}}/N$ )

Comments Studies heavy ion reactions at AGS energies for central and peripheral collisions across a wide range of targets. Measures inclusive spectra of  $\pi^\pm$ ,  $K^\pm$ ,  $p^\pm$  under well-defined, variable trigger conditions. Approved for 2600 hours, startup Spring 92.

**BNL-868** (Sep 1990) Approved Nov 1990.

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

CRACOW - R Holynski, A Jurak, A Olszewski, M Szarska,  
 A Trzupiek, B Wilczynska, H Wilczynski, W Wolter, B Wosiek,  
 K Wozniak

LOUISIANA STATE U - M L Cherry, W V Jones, K Sengupta,  
 J P Wefel

MINNESOTA U - P S Freier, J Kapusta, C J Waddington  
 (✓ Spokesperson)

MOSCOW, ITEP - A I Dubinina, O K Egorov, E D Kolganova,  
 E A Pozharova, T Yu Skorotko, V A Smirnitcki

Accelerator BNL Detector Emulsion

Comments Studies the multiple fragmentation of heavy ions into lighter nuclei and searches for evidence of the formation of a quark-gluon plasma. Photographic nuclear emulsions are exposed to high energy AGS beams. Exposure to a gold beam is expected in April 92.

**BNL-871** (Sep 1990) Approved Nov 1990.

**A NEW SEARCH FOR VERY RARE  $K_L$  DECAYS**

UC, IRVINE - R Atmur, D Connor, J Cortese, A Heinson,  
 W R Molzon (✓ Spokesperson)

STANFORD U - M Diwan, K Ecklund, G M Irwin,  
 D A Ouimette, S G Wojcicki (✓ Spokesperson)

TEMPLE U - J Belz, S H Kettell, W K McFarlane

TEXAS U - C C Allen, S Graessle, G W Hoffmann, K Lang,  
 M R Marcin, J McDonough, C T Nguyen, P J Riley, J L Ritchie  
 (✓ Spokesperson), C B Ware, S Worm

WILLIAM AND MARY COLL - M Eckhause, A D Hancock,  
 J R Kane, Y Kuang, R D Martin, R E Welsh, R G Winter,  
 M Witkowski

Accelerator BNL Detector Counter, Drift chamber, Spectrometer

Comments A search for the decays  $K_L \rightarrow \mu e$ ,  $K_L \rightarrow ee$ , and  $K_L \rightarrow \mu\mu$ , building upon the experience and reusing some of the equipment of BNL-791. The detector consists of two dipoles, straw trackers, drift chambers, scintillation and gas Čerenkov counters, lead glass and a muon rangefinder. A novel feature of the experiment is the stopping of the neutral beam inside the spectrometer with a shielded tungsten 'beam plug.' Test data taken in 1991. 2,800 hours approved.

**BNL-874** (Sep 1990) Approved Jan 1991.

**KAON-NUCLEUS QUASIELASTIC AND ELASTIC SCATTERING**

BROOKHAVEN - S Bart, R E Chrien (✓ Spokesperson),  
 R Sawafta, R J Sutter

COLORADO U - C Kormanyos, R J Peterson (✓ Spokesperson),  
 J Wise

HOUSTON U - M Barakat, E V Hungerford (✓ Spokesperson),  
 K Johnston, B W Mayes, L S Pinsky  
 TRIUMF - D R Gill, L Lee, A Rahav, S Yen

Accelerator BNL Detector Spectrometer, Drift chamber

Reactions

$K^+$  nucleus 600 - 720 MeV/c ( $P_{\text{lab}}$ )  
 $K^-$  nucleus "

Particles studied  $K^+$ ,  $K^-$

Comments Studies kaon scattering from light nuclear systems ( $C$ ,  $Li$ , and  $H_2O$ ). Uses the kaon spectrometer, Moby Dick, with its associated detection apparatus. Expected to run May 92.

**BNL-875** (Jan 1991) Approved Mar 1991.

**STUDY OF PARTICLE PRODUCTION AND NUCLEAR FRAGMENTATION IN RELATIVISTIC HEAVY-ION COLLISIONS IN NUCLEAR EMULSIONS**

SUNY, BUFFALO - P L Jain (✓ Spokesperson),

A Mukhopadhyay, G Singh

AMHERST COLL - A Z M Ismail

Accelerator BNL Detector Emulsion

Reactions

Su nucleus 14.5 GeV ( $T_{\text{lab}}/N$ )  
 Au nucleus "

Comments Emphasis is on events produced in central collisions with low-energy fragments emitted from the target excitation. This may provide evidence for a new form of matter-quark matter. In preparation (April 92).

**BNL-876** (Jan 1991) Approved Mar 1991.

**$\mu^+$  SURFACE BEAM CHARACTERIZATION**

COLUMBIA U - G Luke, B Sternlieb, Y J Uemura

GEORGE MASON U - W F Lankford

VIRGINIA STATE COLL - M R Davis, C E Stronach

WILLIAM AND MARY COLL - A Greer, W J Kossler  
 (Spokesperson), H E Schone

Accelerator BNL Detector Counter

Particles studied  $\mu^+$

Comments Studies surface muons produced at the AGS. Surface muons are muons that result from the decay of pions that have come to rest near the surface of the primary production target. Approved but not running in FY 1991.

**BNL-877** (Jan 1991) Approved Mar 1991.

**STUDY OF RELATIVISTIC NUCLEAR COLLISIONS WITH HEAVY BEAMS USING THE BNL-814 4 $\pi$  CALORIMETRY AND MODIFIED FORWARD SPECTROMETER**

BROOKHAVEN - D Lissauer, T Ludlam, S McCorkle, E O'Brien,

V A Polychronakos, H Takai, T G Throwe, C L Woody

DARMSTADT, GSI - N W Herrmann

MCGILL U - J Barrette, S Gilbert, R Lacasse, S Mark,  
 C Pruneau

NEW MEXICO U - B Bassalleck, J Hall, J Lowe, D Wolfe

PITTSBURGH U - W Cleland

SAO PAULO U - O Dietzsch

SUNY, STONY BROOK - P Braun-Munzinger (✓ Spokesperson),

G David, J Dee, T K Hemmick, B Hong, W Llope,

M Muthuswami, J Stachel, N Xu, Y Zhang, Z Zou

WAYNE STATE U - R Bellwied, T M Cormier, Q Li

Accelerator BNL Detector Calorimeter, Spectrometer

Particles studied  $K^-, K^+, \pi^-, \pi^+$ , nucleon

Comments Studies invariant cross sections for identified particles ( $N, K, \pi$ ) with rapidities  $y > 1.5$  and transverse momentum  $p_T > 0.5$  GeV/c. Measures and identifies particles produced at large angles. Analyzes the transverse energy and multiplicity production for very heavy systems. Approved but not running in FY 1991.

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

**BNL-878** (Jan 1991) Approved Mar 1991.

### INVESTIGATION OF ANTINUCLEUS PRODUCTION AND SEARCH FOR NEW PARTICLES IN NUCLEUS-NUCLEUS COLLISIONS AT THE AGS

BROOKHAVEN - D Beavis, R Debbe  
 COLUMBIA U - S Nagamiya, P W Stankus  
 JOHNS HOPKINS U - T J Hallman  
 KEK - J Chiba, K H Tanaka  
 UC, BERKELEY, SPACE SCI DEPT - H J Crawford  
 (✓ Spokesperson), J Engelage, L C Greiner  
 LBL - I Flores, H H Heckman, P J Lindstrom, R Wright  
 TOKYO U - R S Hayano, Y Shimizu  
 UCLA - J B Carroll, G Igo  
 UNIVERSITIES SPACE RESEARCH ASSOC - J Mitchell  
 WASEDA U - T Doke, T Kashiwagi, J H Kikuchi

Accelerator BNL Detector Counter, Spectrometer, Drift chamber

#### Reactions

$p$  nucleus  $\rightarrow$  charged X 14.5 GeV ( $T_{lab}/N$ )  
 $^{28}\text{Si}$  nucleus  $\rightarrow$  charged X "  
 $^{197}\text{Au}$  nucleus  $\rightarrow$  charged X "

Particles studied  $\pi^-$ ,  $K^-$ ,  $\bar{p}$

Comments Investigates the  $\pi^-$ ,  $K^-$ , and  $\bar{p}$  spectrum at  $0^\circ$ . Studies antideuteron and rare particle production in heavy ion collisions. The proton program is designed to provide a check of the spectrometer. Scheduled to run March 92.

**BNL-880** (Jun 1991) Approved Aug 1991.

### THE EFFECTS OF A PARTIAL SIBERIAN SNAKE ON POLARIZATION AT THE AGS

INDIANA U - D Caussyn, T Ellison, B Jones, S Y Lee  
 (✓ Spokesperson), P Schwandt  
 BROOKHAVEN - L Ahrens, J Alessi, W van Asselt, E J Blesser,  
 G Bunce, P Cameron, E D Courant, H W J Foelsche,  
 C J Gardner, J Geller, Y Y Lee, Y I Makdisi, S R Mane,  
L Ratner (✓ Spokesperson), K Reece, T Roser, J F Skelly,  
 A Soukas, S Tepikian, R E Thern  
 ARGONNE - H Spinka, L Teng, D G Underwood, A Yokosawa  
 KEK - S Hiramatsu, Y Mori, H Sato, K Yokoya  
 TRIUMF - U Wienands  
 FERMILAB - V Bharadwaj, S Hsueh

Accelerator BNL Detector Spectrometer

Comments The 5% spin rotator (AGS "partial snake") for overcoming the imperfection-type spin depolarizing resonances is studied, and the impact of the partial snake solenoid on the beam dynamics in the AGS ring is analyzed. A magnetic spectrometer with scintillation counter hodoscopes is used to detect the polarization in  $pp$  elastic scattering at  $-t = 0.15$  ( $\text{GeV}/c$ )<sup>2</sup> from an internal target in the AGS. 320 hours of beam time requested. In preparation (February 92).

**BNL-881** (Jul 1991) Approved Aug 1991.

### UTILIZING $\phi\phi$ SPECTROSCOPY TO SEARCH FOR EXOTIC GLUEBALLS, EXOTIC HYBRID, OR EXOTIC MULTIQUARK STATES

BROOKHAVEN & CITY COLL, N Y - S J Lindenbaum  
 (✓ Spokesperson)  
 BROOKHAVEN - R W Hackenburg, R S Longacre  
 CITY COLL, N Y - C S Chan, M A Kramer, K Zhao, Y Zhu  
 RENSSELAER POLY - G Adams, K Vaziri

Accelerator BNL Detector MPS-II

#### Reactions

$\pi^- p \rightarrow \phi\phi n$  8 GeV/c ( $P_{lab}$ )  
 $\pi^- p \rightarrow \phi K^+ K^- n$  "  
 $\pi^- p \rightarrow K^+ K^- K^+ K^- n$  "

$K^- p \rightarrow \phi\phi\Lambda$  "  
 $K^- p \rightarrow \phi\phi\Sigma$  "  
 $K^- p \rightarrow \phi K^+ K^- \Lambda$  "  
 $K^- p \rightarrow \phi K^+ K^- \Sigma$  "  
 $K^- p \rightarrow K^+ K^- K^+ K^- \Lambda$  "  
 $K^- p \rightarrow K^+ K^- K^+ K^- \Sigma$  "  
 $\bar{p} p \rightarrow \phi\phi\pi^0$  "  
 $\bar{p} p \rightarrow \phi K^+ K^- \pi^0$  "  
 $\bar{p} p \rightarrow K^+ K^- K^+ K^- \pi^0$  "

Particles studied glueball

Comments A search for exotic glueballs and exotic hybrids. Uses the MPS facility and the MESB beam at 8 GeV/c, tuned to contain  $\pi^-$ ,  $K^-$ , and  $\bar{p}$ . Lowering the energy to 8 GeV/c increases the rate of exchanges required to make exotics.

**BNL-882** (Jul 1991) Approved Aug 1991.

### SEARCH FOR PARTICLES WITH $|Z| > 3$ AND NEGATIVE CHARGE OR LARGE $A/Z$ PRODUCED IN CENTRAL NUCLEUS-NUCLEUS COLLISIONS

UC, BERKELEY - Y D He, D M Lowder, P B Price  
 (✓ Spokesperson)

Accelerator BNL Detector Plastic

#### Reactions

$^{28}\text{Si Pb} \rightarrow$  charged X 14.6 GeV ( $T_{lab}/N$ )  
 $^{197}\text{Au Pb} \rightarrow$  charged X "

Comments In a  $^{28}\text{Si}$  run, uses CR-39 plastic track detectors to study production of multiply charged composites in central collisions. In particular, searches for charged, mid-rapidity particles with  $|Z| > 3$  and anomalously large  $A/Z$ , which would be a signature of strange matter. In a  $^{197}\text{Au}$  run, uses PB-1 glass detectors. Studies projectile fragmentation, the nuclear charge pickup process, possible production of fractional charges and  $Z > 79$  exotic composites, and dependence of the detector response on velocity. Scheduled to run March 92.

**BNL-885** (Jan 1992) Approved Feb 1992.

### EXPERIMENT TO DETECT $\Lambda\Lambda$ HYPERNUCLEI

BROOKHAVEN - S Bart, R E Chrien, M May (Spokesperson),  
 P H Pile, R Sawafta, R Sutter  
 CARNEGIE MELLON U - G Franklin (Spokesperson),  
 R Magahiz, F Merrill, B Quinn, R Schumacher, V Zeps  
 KYOTO U - T Iijima  
 KYOTO SANGYO U - F Takeuchi  
 MANITOBA U - C Davis, W van Oers, S Page, D Ramsay  
 NEW MEXICO U - B Bassalleck, J Lowe, A Rusek, D Wolfe  
 TRIUMF - D Gill  
 VASSAR COLL - R Stearns

Accelerator BNL Detector Spectrometer

#### Reactions

$K^- p \rightarrow \Xi^- K^+$  1.8 GeV/c ( $P_{lab}$ )  
 $K^- ^{12}\text{C}$  "  
 $\Xi^- ^6\text{Li}$  0 GeV/c ( $P_{lab}$ )

Comments Studies the properties of  $\Lambda\Lambda$  hypernuclei. The  $K^-$  beam is incident on a polyethylene ( $\text{CH}_2$ ) target where  $\Xi^-$  is produced. The  $\Xi^-$  is then stopped in a  $^6\text{Li}$  target producing  $\Lambda\Lambda$  hypernuclei. The  $K^-$  also interacts with the carbon nuclei in the target, producing other  $\Lambda\Lambda$  hypernuclear final states. Uses the spectrometer of the BNL-813, and a neutron TOF array. In preparation (April 1992).

**BNL-886** (Jan 1992) Approved Feb 1992.

### SEARCH FOR NEW PARTICLES IN NUCLEUS-NUCLEUS COLLISIONS

KYOTO U - H Enyo, T Iijima, K Imai (Spokesperson), A Masaike  
 KYOTO SANGYO U - K Okada, F Takeuchi  
 BIRMINGHAM U - N Nelson, R Zyburt

## SUMMARIES OF BROOKHAVEN EXPERIMENTS

BROOKHAVEN - D Beavis, R E Chrien, P Pile (Spokesperson),  
R Sawafta, R Sutter

CARNEGIE MELLON U - G Franklin, R Magahiz, F Merrill,  
B Quinn, R Schumacher, R Sukaton, V Zeps

YALE U - G Diebold

LOS ALAMOS - P Barnes

NEW MEXICO U - B Bassalleck, J Hall, A Rusek, D M Wolf

NEW MEXICO U & BIRMINGHAM U - J Lowe

FREIBURG U - M Burger, J Franz, E Roessle, H Schmitt

Accelerator BNL Detector Spectrometer, Counter

### Reactions

$^{28}\text{Si}$  nucleus 15 GeV ( $T_{\text{lab}}/N$ )

$^{197}\text{Au}$  nucleus "

$K^- p \rightarrow K^+ \Xi^-$  2 GeV/c ( $P_{\text{lab}}$ )

Comments The goal is to search for new particles, such as strange matter (strangelets), in nucleus-nucleus collisions. Uses the 2 GeV/c  $K^-$ -beam line as a mass spectrometer. By placing two electro-static separators in the beam line spectrometer, specific  $M/Z$  ratios may be selected and background particles deflected out. Uses also a scintillating fiber track detector, TOF and  $dE/dx$  detectors. In preparation (April 1992).

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**BNL-887** (Jan 1992) Approved Feb 1992.

### DO NARROW $\Sigma$ HYPERNUCLEAR STATES EXIST?

BROOKHAVEN - S Bart, R E Chrien, R Sawafta (Spokesperson),  
R Sutter

HAMPTON U & CEBAF - K Baker, L Tang

HOUSTON U - M Barakat, E V Hungerford

INDIANA U - S M Bowyer, S Wells, S W Wissink

TOKYO U, INS - H Outa

OHIO U - K Hicks (Spokesperson), B Larson, R Michael

TOKYO U - R S Hayano, Y Shimizu, H Tamura

Accelerator BNL Detector Spectrometer

### Reactions

$K^-$  nucleus  $\rightarrow \pi^\pm X$  600 MeV/c ( $P_{\text{lab}}$ )

Comments Measures hypernuclear mass spectra for in-flight ( $K^-, \pi^\pm$ ) reactions with  $^7\text{Li}$ ,  $^9\text{Be}$ ,  $^{12}\text{C}$ , and  $^{16}\text{O}$  targets. The aim is to provide data with sufficient energy resolution and statistics, in order to investigate systematically whether narrow  $\Sigma$  hypernuclear states exist below or above threshold in light hypernuclei. Uses the Moby-Dick spectrometer. In preparation (April 1992).

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**BNL-888** (Jan 1992) Approved Feb 1992.

### SEARCH FOR THE $H$ DIBARYON

BROOKHAVEN - M May, S White

UC, IRVINE - D Connor, J Cortese, W R Molzon

UCLA - R D Cousins (Spokesperson)

PRINCETON U - V L Fitch, J Klein, A J Schwartz

(Spokesperson)

STANFORD U - M V Diwan, K Ecklund, G M Irwin,

D A Ouimette, S G Wojcicki

TEMPLE U - J Belz, V L Highland, S H Kettell

TEXAS U - C A Allen, G W Hoffmann, K Lang, M R Marcin,

J McDonough, C T Nguyen, P T Riley, J L Ritchie, B Ware,

S Worm

WILLIAM AND MARY COLL - M Eckhause, A D Hancock,

J R Kane, Y Kuang, W F Vulcan, R E Welsh, R G Winter,

M Witkowski

Accelerator BNL Detector Drift chamber, Counter

### Reactions

$p$  nucleus —

Au nucleus —

Particles studied dibaryon

Comments A proposal to search for the  $H$  dibaryon (six-quark  $uuddss$  state) using the BNL-791 beamline and spectrometer, modified for two  $H$  detection techniques. In the first technique, a search is made for the decay sequence  $H \rightarrow \Lambda X \rightarrow p\pi^- X$  in the decay volume. In the second, a diffractive dissociation of long-lived  $H$ 's is studied:  $H + A \rightarrow \Lambda\Lambda A \rightarrow 2p2\pi^- A$ . Expected to run Spring 92.

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### BNL-RHIC-PHENIX (1989)

#### PHOTON ELECTRON NEW HEAVY ION EXPERIMENT

Accelerator BNL-RHIC Detector PHENIX

Comments Studies thermodynamic conditions and particle states characterizing the high density matter created in ion collisions. Focuses specifically on the measurement of leptons and photons and should be capable of exploiting the highest luminosities envisioned for RHIC. The PHENIX detector system is based on an axial field magnet in which the central rapidity interval is covered by two detector arms, each subtending  $90^\circ$  in azimuth. The aperture is instrumented to detect electrons, photons, and hadrons. The muon arm, covering polar angles forward of  $30^\circ$  has a good acceptance for muon pairs, and allows electron-muon coincidence measurements. In the planning phase (April 92). For further details, please contact the spokesperson, Dr. Shoji Nagamiya, Columbia University.

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**BNL-RHIC-STAR** (1989) Approved Aug 1991.

#### SOLENOIDAL TRACKING AT RHIC

Accelerator BNL-RHIC Detector STAR

Comments Aims to measure thousands of charged particle trajectories per event in collisions of relativistic ions at RHIC. With the capability to reconstruct a large sample of hadrons emitted in each event, the experiment serves as a global survey instrument to guide the early research at the new collider. The core of the STAR detector is a time projection chamber (TPC) covering about three units of central rapidity in a solenoidal magnetic field, with its data acquisition and triggering systems. The cylindrical TPC is four meters in diameter. Ionization charges produced along particle trajectories are drifted to the two end plates, where induced signals and arrival times are read out on 150,000 cathode pads. The central TPC is immersed in a 0.5 T solenoidal magnetic field, and is surrounded by an array of TOF counters and electromagnetic shower detectors. The vertex detector uses position sensitive silicon devices with a drift-time measurement technique. External TPCs extend the particle tracking coverage to very small angles. In preparation (April 92). For further details, please contact the spokesperson, Dr. John Harris, LBL, Berkeley.

## SUMMARIES OF CERN EXPERIMENTS

### CERN Experiments

**CERN-EMU-001** (Apr 1984) Approved Nov 1984; Completed Aug 1990.

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

ALMA ATA, PHYS INST – N P Andreeva, Z V Anson, V I Bubnov, Y I Chasnikov, G Z Eligbaeva, L E Eremenko, A S Gaitanov, G S Kalyachkina, E K Kanygina, V N Lepetan, C I Shakova

BEIJING, IHEP – G F Xu, P Y Zheng

PANJAB U – M M Aggarwal, R Arora, V S Bhatia, I S Mittra

HUNAN EDUCATION INST – Y X Li, L Liang, Z G Liu, Z Q Weng, Y L Xia

DUBNA – S A Krasnov, S Kulikova, T N Maksimkina, J J Musulmanbekov, G S Shabratoeva, K D Tolstov

RAJASTHAN U – K B Bhalla, S K Gupta, V Kumar, P Lal, S Lokanathan, S Mookerjee, H S Palsania, R Raniwala, S Raniwala

JAMMU U – S K Badyal, A Bhasin, V K Gupta, S Kachroo, S Kitroo, L Mangotra, N K Rao

KOSICE U – L Just, M Karabova, M Tothova, S Vokal, J Vrlakova

SHANXI NORMAL U – S B Lou, Y M Qin, D H Zhang

LUND U – S Garpman, B Jakobsson, J Nystrand, I Otterlund

( $\checkmark$  Spokesperson), K Soderstrom, E Stenlund

MARBURG U – E Ganssaug, J T Rhee

LEBEDEV INST – M I Adamovich, Y A Alexandrov, M M Chernyavsky, S G Gerassimov, S P Kharlamov, V G Larionova, N V Maslennikova, G I Orlova, N G Peresadko, V M Rappoport, N A Salmanova, M I Tretyakova

WASHINGTON U, SEATTLE – T H Burnett, J Grote, J J Lord, D Skelding, R J Wilkes

KHLOPIN RADIUM INST – V G Bogdanov, V A Plyushchev, Z I Solovieva

TASHKENT, IFY – E S Basova, H Nasrullaeva, S Z Nasyrov, N V Petrov, D A Qarshiev, T P Trofimova, U I Tuleeva

TASHKENT, FTI – L P Chernova, K G Gulamov, F G Kadyrov, N S Lukicheva, V S Navotny, N Saidkhanov, L N Svechnikova, S I Zhokhova

HUA-ZHONG NORMAL U – X Cai, H Huang, L S Liu, W Y Qian, H Q Wang, D C Zhou

YEREVAN PHYS INST – F A Avetyan, N A Marutyan, L G Sarkisova, V R Sarkisyan

*Accelerator* CERN-SPS *Detector* Emulsion

Reactions

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

$^{32}\text{S}$  nucleus 200 GeV ( $T_{\text{lab}}/N$ )

*Comments* Studies (1) multiplicities of produced charged particles, (2) pseudo-rapidity density distributions globally and in selected regions of pseudo-rapidity, (3) density fluctuations and multiplicity and angular distributions of nuclear fragments and recoiling protons, and (4) cross sections for production and interaction of light and medium projectile fragments. Uses emulsion chambers and emulsion stacks. See also the BNL-815 experiment.

*Papers* PL B201 (1988) 397, NIM A269 (1988) 134, CPC 55 (1989) 103, CPC 55 (1989) 233, HEPNP 13 (1989) 865, PR C40 (1989) 66, NP A498 (1989) 541c, PL B223 (1989) 262, PL B227 (1989) 285, PL B230 (1989) 175, PRL 62 (1989) 2801, PS T32 (1990) 168, MPL A5 (1990) 169, PL B234 (1990) 180, PL B242 (1990) 512, PRL 65 (1990) 412, HEPNP 15 (1991) 131, NP A525 (1991) 551c, MPL A6 (1991) 469 [erratum: MPL A6 (1991) 1629], ZPHY C49 (1991) 395, PRL 67 (1991) 1201, PL B262 (1991) 369, and PL B263 (1991) 539.

**CERN-EMU-002** (May 1984) Approved Nov 1984; Completed Oct 1987.

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

UC, BERKELEY – P B Price (Spokesperson)

*Accelerator* CERN-SPS *Detector* Plastic

Reactions

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

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

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

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

*Particles studied* quark

*Comments* Uses stacks of CR-39 plastic track detectors to look for fractionally charged projectile fragments produced in collisions of high energy nuclei with a lead target.

*Papers* PRL 59 (1987) 2535, and PRL 61 (1988) 2193.

**CERN-EMU-003** (Oct 1984) Approved Nov 1984; Started 1990; Completed Aug 1990.

**INTERACTIONS OF  $^{16}\text{O}$  PROJECTILE AND  $^{32}\text{S}$  AND THEIR FRAGMENTS IN NUCLEAR EMULSIONS AT ABOUT 60 AND 200 GeV/NUCLEON**

CAIRO U – A Abdalla, Z Abou-Moussa, O E Badawy, M El-Nadi ( $\checkmark$  Spokesperson), F Abd El-Wahed, A Fakiha, A A Hamed, A Hussien, S Kamel, N Mettwalli, A Mohamed, W Osman, M Selait, E A Shaat, S Talaat, T Talaat

*Accelerator* CERN-SPS *Detector* Emulsion

Reactions

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

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

*Comments* Studies the  $e^+e^-$  decays of neutral bosons produced in the inelastic collisions of  $^{32}\text{S}$  ions with emulsion nuclei at 200 A GeV. An unbiased sample of 1331 events has been analyzed, 346  $e^+e^-$  pairs observed, and masses and lifetimes of 60 neutral bosons calculated. Studies also the mean free paths, average multiplicities, multiplicity distributions, and correlations of the produced particles, target fragments and projectile fragments, with both  $^{32}\text{S}$  and  $^{16}\text{O}$  beams. Data analysis in progress (May 92).

**CERN-EMU-004** (Oct 1985). Approved Feb 1986, Sep 1987; Completed Oct 1987.

**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, Y Takahashi

BOSTON U – S P Ahlen, A Marin

KOBE U – S Dake

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, T Tabuki, J W Watts

TOKYO U – T Ogata, T Tominaga

*Accelerator* CERN-SPS *Detector* Emulsion

Reactions

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

$^{32}\text{S}$  nucleus  $\rightarrow e^+ e^-$   $^{32}\text{S}$  nucleus "

*Comments* Aims to establish cross sections to compare with recent calculations and for use in measuring energies of very high energy cosmic rays.

**CERN-EMU-005** (Oct 1985) Approved Feb 1986; Completed Aug 1990.

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

ALABAMA U, HUNTSVILLE – C H Chan, B L Dong, J G Duthie, J C Gregory, T Hayashi, T Shiina, Y Takahashi (Spokesperson)

COLUMBIA U – S Nagamiya

NASA, MARSHALL – M J Christl, J H Derrickson, P B Eby, W F Fountain, T A Parnell, F E Roberts, J W Watts

TOKYO U – S Dake, M Fuki, A Iyano, O Miyamura, T Ogata

*Accelerator* CERN-SPS *Detector* Emulsion

## SUMMARIES OF CERN EXPERIMENTS

### 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. Took data in 1987 and 1990.

Papers NP A498 (1989) 529c.

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

### STUDY OF THE PRODUCTION MECHANISMS AND DECAY PROPERTIES OF CHARMED PARTICLES OBSERVED IN NUCLEAR EMULSIONS 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 (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 Lariovova, 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 CERN-NA-014 spectrometer to speed and enrich the detection of charmed particles.

Papers NP (Proc. Suppl.) B1 (1988) 33.

**CERN-EMU-007** (Mar 1987) Approved Jun 1987, Feb 1989; Completed Aug 1990.

### INTERACTIONS OF 60-200 GeV/NUCLEON $^{16}\text{O}$ AND $^{32}\text{S}$ (Pb) NUCLEI IN LIGHT AND HEAVY ABSORBERS

CRACOW - R Holyński, A Jurak, A Olszewski, M Szarska, A Trzupiek, B Wilczyńska, H Wilczyński, W Wolter, B Wosiek, K Wozniak

LOUISIANA STATE U - M L Cherry, W V Jones, K Sengupta, J P Wefel ( $\checkmark$  Spokesperson)

MOSCOW, ITEP - A I Dubinina, O K Egorov, E D Kolganova,

E A Pozharova, T Yu Skorotko, V A Smirnitki

MINNESOTA U - P S Freier, C J Waddington

Accelerator CERN-SPS    Detector Emulsion

### Reactions

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

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

Comments Studies (1) projectile fragmentation modes, including transverse momentum distributions and possible dependencies on topology, (2) pseudo-rapidity distributions, including searches for structure and correlations, (3) the dependence of charged particle multiplicity on the number of interacting nucleons, and (4) possible enhanced production of direct photons or electrons in high density matter. Ran in 1987 and 1990.

Papers PRL 60 (1988) 405, PRL 62 (1989) 733, NP A498 (1989) 535c, PR C39 (1989) 1385, and PR C40 (1989) 2449.

**CERN-EMU-008** (Feb 1987) Approved Sep 1987; Completed Oct 1987.

### STUDY OF PARTICLE PRODUCTION IN RELATIVISTIC HEAVY-ION COLLISIONS

SUNY, BUFFALO - P L Jain ( $\checkmark$  Spokesperson), K Sengupta, G Singh

Accelerator CERN-SPS    Detector Emulsion

### Reactions

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

$^{32}\text{S}$  nucleus                      200 GeV ( $T_{\text{lab}}/N$ )

Comments Searches for evidence for quark matter by analyzing events produced in central collisions.

Papers PRL 59 (1987) 2531, EPL 5 (1988) 135, PRL 61 (1988) 1073, PL B213 (1988) 548, PL B214 (1988) 480, EPL 8 (1989) 15, PL B222 (1989) 301, NP A498 (1989) 547c, PR C39 (1989) 1835, MPL A5 (1990) 285, PL B235 (1990) 351, PL B236 (1990) 219, PL B241 (1990) 273, PR C41 (1990) 999, PR C42 (1990) 1757, MPL A6 (1991) 29, ZPHY C52 (1991) 465, PR C43 (1991) 2027, PR C43 (1991) 2417, PR C44 (1991) 844, PR C44 (1991) 854, IJMP A7 (1992) 1907, and ZPHY C53 (1992) 355.

**CERN-EMU-009** (Jan 1989) Approved Apr 1989; Started 1990; Completed Aug 1990.

### AN EMULSION HYBRID SETUP FOR THE STUDY OF SULPHUR-NUCLEUS COLLISIONS AT 200 GeV/N

BARI U & INFN, BARI - N Armenise, M T Muciaccia, S Simone  
CERN - G Poulard

UNIVERSITY COLL, DUBLIN - A C Breslin

ALABAMA U, HUNTSVILLE - J C Gregory, T Hayashi, Y Takahashi

NASA, MARSHALL - J H Derrickson, T A Parnell, J Watts  
UNIVERSITY COLL, LONDON - D H Davis, D Tovee

NAGOYA U - S Aoki, K Hoshino, H Kitamura, M Kobayashi, K Kodama, M Miyanishi, K Nakamura, M Nakamura, S Nakanishi, K Niu, K Niwa, H Tajima

ROME U & INFN, ROME - S Dell'Uomo, S Di Liberto, M A Mazzoni, F Meddi, G Rosa, C Sgarbi

SALERNO U & INFN, SALERNO - G Grella, G Romano ( $\checkmark$  Spokesperson)

TURIN U & INFN, TURIN - B Alessandro, V Bisi, P Giubellino, A Marzari-Chiesa, L Ramello, L Riccati

Accelerator CERN-SPS    Detector Emulsion

### Reactions

$^{32}\text{S}$  nucleus                      200 GeV ( $T_{\text{lab}}/N$ )

Particles studied charm

Comments The setup includes silicon detectors and emulsion tapes or chambers. Some of the exposures will be in a 2.5 T field. The main aims are (1) a search for charm particles produced in central interactions on silver and lead targets, (2) a study of charged-particle correlations as a function of charge and momentum differences, and (3) a search for electromagnetic dissociation of sulfur in the field of iron, silver, and lead targets. Data analysis in progress (April 92).

**CERN-EMU-010** (Nov 1989) Approved Feb 1990; Started 1990; Completed Aug 1990.

### STUDY OF EVENT STRUCTURES OF 200 GeV/NUCLEON $^{32}\text{S}$ INTERACTIONS WITH NUCLEI BY THE MAGNETIC EMULSION SPECTROMETER AT THE CERN SPS

GIFU U - K Nakazawa

MIYAZAKI U - T Hasegawa, T Shuin

SAGA U, JAPAN - A Hisatomi, H Itoh (Spokesperson), T Murooka

SAKUYO COLL - R Ihara

TOHOKU U - T Hayashino

Accelerator CERN-SPS    Detector Spectrometer

### Reactions

$^{32}\text{S}$  nucleus                      200 GeV ( $T_{\text{lab}}/N$ )

Comments A search for anomalous event structure, which may be caused by phase transitions. Investigates the space-time structure of nuclear collisions by pion interferometry, through the charged particle exclusive measurement. Uses ten magnetic emulsion spectrometers (ESSPER's).

**CERN-EMU-011** (1991) Approved Nov 1991.

### STUDY OF PARTICLE PRODUCTION AND NUCLEAR FRAGMENTATION IN RELATIVISTIC HEAVY ION COLLISIONS IN NUCLEAR EMULSION

## SUMMARIES OF CERN EXPERIMENTS

SUNY, BUFFALO – A Z M Ismail, P L Jain (✓ Spokesperson),  
A Mukhopadhyay, G Singh

Accelerator CERN-SPS Detector Emulsion

Reactions

$^{197}\text{Au}$  nucleus                    200 GeV ( $T_{\text{lab}}/N$ )  
 $^{207}\text{Pb}$  nucleus                    60, 200 GeV ( $T_{\text{lab}}/N$ )

Comments Measures (1) the shower particle multiplicity, the pseudorapidity density, and density fluctuations of charged particles, (2) the charge multiplicity and angular distributions of projectile fragments, and (3) production and interaction cross sections of heavily ionizing particles emitted from the target fragmentation. Emphasis is placed on the central collisions. Uses stacks of pellicles. In preparation (March 92).

**CERN-EMU-012** (1991) Approved Nov 1991.

**PARTICLE PRODUCTION, DENSITY FLUCTUATIONS, AND BREAK UP OF DENSE NUCLEAR MATTER IN CENTRAL Pb+Ag AND Pb+Pb INTERACTIONS AT 60–160 A GeV**

ALMA ATA, PHYS INST – N P Andreeva, Z V Anson,  
V I Bubnov, I Y Chasnikov, G Z Eligbaeva, L E Eremenko,  
A S Gaitinov, G S Kalyachkina, E K Kanygina, V N Lepetan,  
C I Shakova  
BEIJING, IHEP – G F Xu, P Y Zheng  
PANJAB U – M M Aggarwal, R Arora, V S Bhatia, I S Mittra  
DUBNA – M Karabova, S A Krasnov, S Kulikova,  
T N Maksimkina, J J Musulmanbekov, G S Shabratoeva,  
K D Tolstov, S Vokal  
YEREVAN PHYS INST – F A Avetyan, N A Marutyan,  
L G Sarkisova, V R Sarkisyan  
HUNAN EDUCATION INST – Y X Li, L Liang, Z G Liu,  
Z Q Weng, Y L Xia  
RAJASTHAN U – K B Bhalla, S K Gupta, V Kumar, P Lal,  
S Lokanathan, S Mokerjee, H S Palsania, R Raniwala,  
S Raniwala  
JAMMU U – S K Badyal, A Bhasin, V K Gupta, S Kachroo,  
S Kitroo, L Mangotra, N K Rao  
KOSICE U – L Just, M Karabova, M Tothova, S Vokal, J Vrlakova  
LUND U – S Garpman, B Jakobsson, J Nystrand, I Otterlund  
(Spokesperson), K Soderstrom, E Stenlund  
MARBURG U – E Ganssaue, J T Rhee  
LEBEDEV INST – M I Adamovich, Y A Alexandrov,  
M M Chernyavsky, S G Gerassimov, S P Kharlamov,  
V G Larionova, N V Maslennikova, G I Orlova, N G Peresadko,  
V M Rappoport, N A Salmanova, M I Tretyakova  
KHLOPIN RADIUM INST – V G Bogdanov, V A Plyushchev,  
Z I Solovieva  
SHANXI NORMAL U – S B Lou, Y M Qin, D H Zhang  
TASHKENT, IFY – E S Basova, H Nasrullaeva, S Z NasYROV,  
N V Petrov, D A Qarshiev, T P Trofimova, U I Tuleeva  
TASHKENT, FTI – L P Chernova, K G Gulamov, F G Kadyrov,  
N S Lukicheva, V S Navotny, N Saidkhanov, L N Svechnikova,  
S I Zhokhova  
WASHINGTON U, SEATTLE – T H Burnett, J Grote, J J Lord,  
D Skelding, R J Wilkes  
HUA-ZHONG NORMAL U – X Cai, H Huang, L S Liu,  
W Y Quian, H Q Wang, D C Zhou

Accelerator CERN-SPS Detector Emulsion

Reactions

$^{207}\text{Pb}$  nucleus                    60 – 160 GeV ( $T_{\text{lab}}/N$ )

Comments Studies the multiparticle production globally and locally, fluctuations in particle densities, and the break up of dense nuclear matter in central interactions. Uses emulsion chambers with thin Pb and Ag target foils as well as conventional emulsion pellicle stacks. Scheduled to run in 93/94.

**CERN-EMU-013** (1991) Approved Nov 1991.

**INTERACTIONS OF 180 GeV/NUCLEON  $^{207}\text{Pb}$  NUCLEI IN EMULSION CHAMBERS WITH COPPER AND LEAD TARGETS**

CRACOW – A Dabrowska, R Holynski, A Jurak, A Olszewski,  
M Szarska, A Trzupke, B Wilczynska, H Wilczynski, W Wolter  
(Spokesperson), B Wosiek, K Wozniak

LOUISIANA STATE U – M L Cherry, W V Jones, K Sengupta,  
J P Wefel

MINNESOTA U – P S Freier, C J Waddington

Accelerator CERN-SPS Detector Emulsion

Reactions

$^{207}\text{Pb}$  nucleus                    180 GeV ( $T_{\text{lab}}/N$ )

Comments Measures the pseudorapidity distributions of charged particles, including analysis of particle fluctuations in pseudorapidity and azimuthal angle distributions, and the transverse momentum distribution of  $\alpha$  fragments from the projectile nucleus. In preparation (March 92).

**CERN-IS-010** (1982) Approved Apr 1982; Completed Dec 1987.

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

AARHUS U – P G Hansen, K Riisager  
CERN – H L Ravn, A De Rujula  
CHALMERS UNIV TECH – H Axelsson, M Cronqvist, B Jonson  
(✓ Spokesperson), G Nyman  
MADRID U – M J G Borge  
ZFK, ROSSENDORF – G J Beyer

Accelerator CERN-SC Detector ?

Particles studied  $\nu_e$ , axion

Comments Measures the shape of the internal bremsstrahlung spectrum in electron capture near its upper end point. Uses  $^{163}\text{Ho}$  and  $^{81}\text{Kr}$ .

Papers PS 34 (1986) 591, JPHY G14 (1988) 1301, and PL B210 (1988) 249. No other papers expected.

**CERN-IS-021** Approved Apr 1990; Completed Dec 1990.

**A SEARCH FOR AXIONS BY NUCLEAR RESONANCE SCATTERING**

AARHUS U – P Kringhoj, H L Nielsen, J W Petersen, G Weyer  
(Spokesperson)  
CERN – H L Ravn, A De Rujula

Accelerator CERN-SC Detector ?

Particles studied axion

Comments A search for axions utilizing a strong, high purity source of  $^{125}\text{I}$  produced at ISOLDE.

**CERN-IS-300** Approved Sep 1991.

**A SEARCH FOR AXIONS AND MASSIVE NEUTRINOS**

AARHUS U – P Hornshoj, H Loft Nielsen, J W Petersen,  
K Riisager, G Weyer (Spokesperson)  
CERN – H L Ravn, A De Rujula  
CHALMERS UNIV TECH – B Jonson, G Nyman

Accelerator CERN-SC Detector ?

Particles studied axion,  $\nu$

Comments A search for axions and a heavy neutrino by using a strong, high purity source of  $^{125}\text{I}$ . In preparation (March 92).

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

**THE ALEPH DETECTOR (APPARATUS FOR LEP PHYSICS)**

ALEPH COLLABORATION

ANNECY – D Buskulic, D Decamp, B Deschizeaux, P Ghez,  
C Goy, J P Lees, M N Minard, B Mours  
ATHENS U – I Eftymiopoulos, G Gounaris, A Kyriakys,  
E Matsinos, E Simopoulou, M Spyropoulou-Stassinaki, A Vayaki  
BARCELONA, AUTONOMA U – R Alemany, F Ariztizabal,  
P Comas-Illas, J M Crespo, M Delfino, E Fernandez, V Gaitan,  
L Garrido-Beltram, L M Mir, A Pacheco, A Pascual  
BARI U – D Creanza, A Farilla, A Ghiselli, G Iaselli, G Maggi,  
M Maggi, A Mastrogiacomo, S Natali, S Nuzzo, M De Palma,  
A Quattromini, T Ranieri, G Raso, F Romano, F Ruggieri,  
P Sciacovelli, G Selvaggi, L Silvestris, P Tempesta, G Zito



## SUMMARIES OF CERN EXPERIMENTS

- BEIJING, IHEP - Y Chen, Y Gao, H Hu, D Huang, X Huang, Y Jiang, J Lin, R Liu, J Lou, W Lu, H Pu, C Qiao, T Ruan, X Song, T Wang, X Wang, Z Wang, D Wu, Y Xie, D Xu, R Xu, Y Xu, W Yan, M Ye, J Zhang, H Zhao, W Zhao
- CERN - W Atwood, A Ball, L Bauerdick, E Blucher, G Bonvicini, F Bossi, J Boudreau, T Burnett, P J Dornan, H Drevermann, F Dydak, F Fidicaro, R Forty, M G Green, R Hagelberg, S Haywood, J Hilgart, R Jacobsen, B Jost, J Knobloch, A Lacourt, E Lancon, P Lazeyras, J Lefrancois (Spokesperson), I Lehraus, B Lofstedt, T Lohse, A Lusiani, A Marchioro, M Martinez, P Mato-Vila, T Mattison, J M Maugain, J May, H Meinhard, T Meyer, A Minten, A Miotto, R Miquel, H G Moser, J Nash, P Palazzi, F Ranjard, G Redlinger, W Richter, L Rolandi, A Roth, J Rothberg, M Saich, W D Schlatter, M Schmelling, F Sefkow, W Tejessy, H W Wachsmuth, H Wahl, S Wasserbaech, A Weir, W Wiedenman, W Witzeling, J Wotschack
- CLERMONT-FERRAND U - Z Ajaltouni, F Badaud, M Bardadin-Otwinowska, A Bencheikh, M Brossard, F Daudon, A Falvard, R El Fellous, D Gay, P Henrard, J Jousset, B Michel, J C Montret, D Pallin, P Perret, J Proriol, F Prulhiere, G Stimpfl
- BOHR INST - H Bertelsen, A Engelhardt, J D Hansen, J R Hansen, P Hansen, A Lindahl, R Mollerud, B S Nilsson
- EDINBURGH U - D J Candlin, A Main, M I Parsons, B Richardson, E Veitch
- FLORIDA STATE U - M J Corden, C Georgiopoulos, M Ikeda, K Johnson, J Lannutti, D A Levinthal, M Mermikides, L Sawyer
- FLORENCE U & INFN, FLORENCE - A Conti, G Della Lunga, L Moneta, G Parrini
- FRASCATI - A Antonelli, R Baldini, G Bencivenni, G Bologna, P Campana, G Capon, F Cerutti, V Chiarella, G Felici, M L Ferrer, P Laurelli, L Magro, G Mannocchi, F Murtas, G P Murtas, L Passalacqua, M Pepe-Altarelli, B D'Ettore, P Piazzoli, P Picchi, P Sartori
- GLASGOW U - B Alton, O Boyle, P Colrain, A J Flavell, A Halley, I Ten Have, J G Lynch, W Maitland, D J Martin, W Morton, P J Negus, R O'Neill, C Raine, D Saxon, J M Scarr, K Smith, A S Thompson, R M Turnbull
- HEIDELBERG U, IHEP - B Brandl, O Braun, C Geweniger, G Graefe, P Hanke, V Hepp, W Heyde, C Karger, E E Kluge, J Krause, Y Maumary, A Putzer, B Rensch, A Stahl, K Tittel, M Wunsch
- INNSBRUCK U - P Girtler, E Kneringer, D Kuhn, G Rudolph, R Vogl
- LANCASTER U - C Bowdery, T Brobdeck, A Finch, F Foster, G Hughes, D J Jackson, N Keemer, M Nuttal, A Patel, B Rowlingson, T Sloan, S Snow, E Whelan
- IMPERIAL COLL - A Belk, R Beuselinck, D M Binnie, W Cameron, M Cattaneo, D Colling, S Dugeay, A Greene, J Hassard, N Lieske, S Patton, D Payne, M Phillips, D Price, J E Ratcliffe, J K Sedgbeer, G Taylor, I Tomalin, A C Wright
- MAINZ U, INST PHYS - T Barczewski, K Kleinnecht, R Othegraven, J Raab, B Renk, H Sander, K Schmitz, F Steeg, A Wagner, S Walther, B Wolf
- MARSEILLE U, LUMINY - T Arnouil, J J Aubert, R Bazzoli, C Benchouk, V Bernard, A Bonissent, J Carr, P Coyle, J Drinkard, F Etienne, Y Gally, R Ossa, S Papalexiou, P Payre, B Pietrzyk, Z Qian, J Raguet, D Rousseau, P Schwemling, M Talby
- MUNICH, MAX PLANCK INST - S Adlung, R Assmann, C Bauer, H Becker, W Blum, D Brown, P Cattaneo, G Cowan, B Dehning, R St Dennis, H Dietl, M Fernandez-Bosman, H Fischer, M Frank, T Hansl-Kozanecka, D Hauff, P Klein, W Kozanecki, J Lauber, D Lehner, G Lutjens, G Lutz, W Maenner, Y Pan, V Raab, R Richter, H Rotscheidt, J Schroeder, A Schwarz, R Settles, U Stiegler, U Stierlin, M Takashima, J Thomas, G Wolf
- ORSAY, LAL - G Aioun, C Arnault, G Barrand, V Bertin, J Boucrot, O Callot, R Chase, X H Chen, A Cordier, M Davier, M Dialinas, F Le Diberder, A Ducorps, C Fournie, G Ganis, J F Grivaz, M Gros, P Housse, P Janot, D W Kim, A M Lutz, J J Veillet, I Videau, F Zomer
- ECOLE POLYTECHNIQUE - J Badier, A Blondel, G Bonneaud, J Briant, J R Fanchon, G Fouque, A Gamess, J Harvey, P Matricon, S Orteu, A Rosowski, A Rouge, C Roy, M Rumpf, R Tanaka, H Videau, C Violet
- PISA U - D Abbaneo, S R Amendolia, G Bagliesi, G Batignani, L Bosisio, U Bottigli, P L Braccini, C Bradaschia, F Caravaglios, M Carpinelli, X Chen, M A Ciocci, R Dell'Orso, R Fantechi, I Ferrante, L Foa, E Focardi, F Forti, S Galeotti, C Gatto, A Giassi, M Giorgi, F Ligabue, R Lorenzini, E Mannelli, I Mannelli, P S Marrocchesi, A Messineo, F Palla, G M Pierazzini, R Rattazzi, G Rizzo, G Sanguinetti, J Steinberger, R Tenchini, G Tonelli, G Triggiani, C Vannini, A Venturi, P G Verdini, J Walsh
- ROYAL HOLLOWAY COLL - J Carter, B J Green, P V March, T Medcalf, I Quazi, N Stewart, L R West, T Wildish
- RUTHERFORD - D Botterill, R Clift, R Edgecock, M Edwards, S M Fisher, E Holtom, T Jones, G McPherson, P R Norton, D Salmon, G Tappern, J C Thompson
- SACLAY - R Bernard, B Bloch-Devauux, P Colas, H Desportes, R Gastaud, M Jacquemet, A Joudon, E Locci, S Loucatos, E Monnier, P Perez, J A Perlas, F Perrier, B Peyaud, J Rander, J F Renardy, A Roussarie, J P Schuller, J Schwinding, B Vallage
- UC, SANTA CRUZ - R Johnson, A Litke, M McNeil, J Wear
- SHEFFIELD U - J Ashman, W Babbage, C Booth, C Buttar, R E Carney, S Cartwright, F Combley, M Dogru, F Hatfield, Y Hou, P Reeves, L Thompson
- SIEGEN U - E Barberio, S Brandt, G Gillessen, C Grupen, G Heitner, G Lutters, L Mirabito, U Schaefer, H Seywerd, C Stupperich, H Trier, V Zeuner
- TRIESTE U - G Apollinari, G Giannini, B Gobbo, A Gregorio, R Della Marina, F Ragusa, C Strizzolo
- WISCONSIN U - L Bellantoni, X Chen, D Cinabro, B Le Claire, J Conway, Z Feng, D Ferguson, Y Gao, J Grahl, J Harton, O Hayes, J Jacobsen, R Jared, C Lishka, Y Pan, J Pater, V Sharma, Z Shi, Y Tang, M Walsh, D Weber, M Whitney, 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. The strong points of the detector are the precision of momentum measurements for charged particles, due to a high magnetic field and a TPC, the good identification of electrons and muons, even when they are immersed in jets, and the spatial resolution obtained in  $ec$  calorimetry. Taking data (March 92).

Papers NIM 225 (1984) 481, NIM 226 (1984) 82, NIM A252 (1986) 392, NIM A252 (1986) 399, NIM A252 (1986) 403, IEEE TNS 34 (1987) 133, CPC 45 (1987) 229, CPC 45 (1987) 283, CPC 45 (1987) 433, NIM A257 (1987) 587, IEEE TNS 35 (1988) 316, NIM A263 (1988) 43, NIM A263 (1988) 58, NIM A271 (1988) 449, IEEE TNS 36 (1989) 1459, IEEE TNS 36 (1989) 1464, IEEE TNS 36 (1989) 1514, NIM A277 (1989) 358, NIM A283 (1989) 573, PL B231 (1989) 519, IEEE TNS 37 (1990) 1210, NIM A286 (1990) 61, NIM A289 (1990) 176, NIM A294 (1990) 121 [erratum: NIM A303 (1991) 393], NIM A297 (1990) 153, NIM A297 (1990) 390, HEPNP 14 (1990) 966, PL B234 (1990) 209, PL B234 (1990) 399, PL B235 (1990) 399, PL B236 (1990) 86, PL B236 (1990) 233, PL B236 (1990) 501, PL B236 (1990) 511, PL B237 (1990) 291, PL B241 (1990) 141, PL B241 (1990) 623, PL B241 (1990) 635, PL B244 (1990) 541, PL B244 (1990) 551, PL B245 (1990) 289, PL B246 (1990) 306, PL B250 (1990) 172, ZPHY C48 (1990) 365, NIM A306 (1991) 446, PL B255 (1991) 623, PL B257 (1991) 479, PL B257 (1991) 492, PL B258 (1991) 236, PL B259 (1991) 377, PL B262 (1991) 139, PL B263 (1991) 112, PL B263 (1991) 325, PL B264 (1991) 476, PL B265 (1991) 430, PL B265 (1991) 475, PL B266 (1991) 218, PL B273 (1991) 181, ZPHY C53 (1992) 1, ZPHY C53 (1992) 21, and ZPHY C53 (1992) 375.

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

**THE DELPHI DETECTOR (DETECTOR WITH LEPTON PHOTON AND HADRON IDENTIFICATION)**

NIKHEF, AMSTERDAM - G W Van Apeldoorn, A Augustinus, M Bonapart, N Brummer, P Van Dam, M Donszelmann, N De Groot, S Haider, D Holthuizen, P M Kluit, B Koene, M Los, H Palka, W Ruckstuhl, J Timmermans, D Z Toet

ANTWERP U - H De Boeck, F Verbeure

DEMOCRITOS NUCLEAR RESEARCH CENTER - P Beltran, H Borner, P Kokkinias, C Lambropoulos, D Loukas, A Maltezos, A Markou, G Stavropoulos, G Theodosiou, E Zevgolatakos

## SUMMARIES OF CERN EXPERIMENTS

- ATHENS U - E Anassontzis, P Ioannou, G Kalkanis, S Katsanevas, C Kourkoumelis, L Resvanis, G Voulgaris
- ATHENS, TECH UNIV - M Dris, D Fassouliotis, T A Filippas, E Fokitis, E N Gazis, E C Katsoufis, S Maltezos, T Papadopoulou
- BERGEN U - S J Alvsvaag, A G Frodesen, P S Iversen, A Klovning, E Lillethun
- INFN, BOLOGNA - F R Cavallo, F Navarra, A Perrotta, U Rossi, T Rovelli, G Valenti, S Volponi
- BRUSSELS U, IIHE - D Bertrand, C Bricman, F Cao, C De Clerq, W K Van Doninck, J Lemonne, F Stichelbaut, S Tavernier, C Vander Velde, J H Wickens, S Zhang
- CERN - U Amaldi (✓ Spokesperson), P Baillon, R C A Brown, H Burmeister, J A M A Buytaert, M Caccia, J J Gomez y Cadenas, J E Campagne, T Camporesi, A Cattai, P Charpentier, M Davenport, D Delikaris, S Delorme, H Dijkstra, M Dracos, P Eerola, N Van Eijndhoven, H Foeth, J Fuster, P Gavillet, P Giacomelli, R Gokieli, A Grant, F Hahn, H Herr, H J Hilke, M Jonker, G Kantardjian, N J Kjaer, H Klein, W Klempf, B Korzen, M Lokajick, A N Sissakian, K Moenig, H R Muller, L Pape, M E Pol, J Ridky, E Rosso, P Siegrist, C J Stubenrauch, D Treille, W Trischuk, A Tsiros, S Tzamarias, O Ullaland, P Vaz, P Weilhammer, A M Wetherell, P Yebes
- BOHR INST - E Dahl-Jensen, G Damgaard, J E Hooper, R Moeller, B S Nielsen
- CRACOW - P Jalocha, P Kapusta, K Korcyl, W Krupinski, G Polok, K Rybicki, M Turala, A Zalewska
- DUBNA - G D Alekseev, D Yu Bardine, M S Bilenky, P N Bogolioubov, Y Bonushkin, G A Chelkov, J N Denisov, V Kadyshvsky, B A Khomenko, N N Khovansky, O Kouzietsov, Z Kroumshtein, V Malyshev, G V Mitselmakher, A Olchevski, I Potashnikova, V N Pozdnyakov, A A Sazonov, Y V Sedykh, A N Sissakian, N Skachkov, V G Timofeev, L G Tkatchev, E N Tsyganov, L S Vertogradov, A S Vodopyanov, N I Zimin
- GENOA U & INFN, GENOA - M Begalli, M Bozzo, C Caso, R Contri, G Crosetti, G Darbo, F Fontanelli, V Gracco, G Medla, M R Monge, P Morettini, I Rongagliolo, M Sannino, G Sette, S Simonetti, S Squarcia, U Trevisan
- GRENOBLE U - R Barate, F Ledroit, G Sajot, T Spassov
- HELSINKI U - S Czellar, L Hietanen, R Keranen, K Kurvinen, R Lauhakangas, J Lindgren, R Orava, J Pyyhtia, C Ronqvist, H Saarikko, T Tuuva, M Voutilainen
- IOWA STATE U - H B Crawley, A Firestone, R Holmes, R Mc Kay, J W Lamsa, W T Meyer, E I Rosenberg, M Wayne
- KARLSRUHE U - W D Apel, W De Boer, D C Fries, H Furstenau, M Hahn, J H Koehne, M Kopf, H Mueller, P Privitera, H Schneider, R Seufert
- LISBON, LIFEP - P Abreu, F Barao, M Pimenta, J Varela
- LIVERPOOL U - P S L Booth, A Campion, L Carroll, M Houlden, J N Jackson, D Johnson, B King, M McCubbin, R McNulty, B Nijjhar, D Reid, M Richardson
- LUND U - T Akesson, S Almehed, O Barring, J Bjarne, H Carling, A Hakansson, G Jarlskog, L Jonsson, I J Kronkvist, B Lorstad, U Mjornmark, I A Tyapkin
- LYON, IPN - P Antilogus, G Smadja
- MILAN U & INFN, MILAN - M Bonesini, N Bonivento, M Calvi, T Tabarelli de Fatis, W Kucewicz, C Matteuzzi, C Meroni, A De Min, P Negri, A Pullia, S Ragazzi, N G Redaelli, C Troncon, G Vegni
- MONS U - S Braibant, E Daubie, F Grard, P Herquet, J Kesteman, O Pingot
- ORSAY, LAL - J E Augustin (✓ Spokesperson), P Bambade, M Berggren, B Bouquet, G Cosme, F Couchot, S Dagoret, B Dalmagne, F Fulda-Quenzer, G Grosdidier, B Jean-Marie, V Lepeltier, A Lopez-Fernandez, F Richard, P Roudeau, A Stocchi, T K Tkuong, G Wormser, P Zalewski
- OSLO U - L Bugge, T Buran, M Dam, G Maehlum, A L Read, T B Skaali, G Skjevling, J Wikne
- OXFORD U - M J Bates, C J Beeston, J H Bibby, S Blyth, P Collins, P D Dauncey, F J Harris, S D Hodgson, J G Loken, L Lyons, G Myatt, D Radojicic, P Ratoff, P B Renton, A M Segar, M T Trainor, G R Wilkinson, W S C Williams
- PADUA U & INFN, PADUA - K Brand, P Checchia, A Elliot-Feisert, G Galeazzi, U Gasparini, I Lippi, M Margoni, M Mazzucato, M Michelotto, M Pegoraro, P Ronchese, F Simonetto, L Ventura, G Zumerle
- COLLEGE DE FRANCE - P Beilliere, J M Brunet, M Crozon, C Defoix, P Delpierre, J Dolbeau, Y Y Dufour, P Frenkiel, P F Honore, P Lutz, J Maillard, L Mathis, A Tilquin, G Tristram, R Zukanovich-Funchal
- PARIS, CURIE UNIV VI - P Astier, M Baubillier, P Billoir, V Chorowicz, P David, B Grossetete, F Kapusta, A Letessier-Selvon, F Naraghi, R Pain, C De la Vaissiere, R Zitoun
- ROME, ISS & INFN, ROME - A Baroncelli, C Bosio, P Branchini, E Graziani, A Passeri, E Spiriti, C Stanesco, L Tortora, V Vrba
- ROME U, TORVERGATA & INFN, ROME - V Canale, L Cerrito, L Di Ciaccio, G Matthiae
- RUTHERFORD - T Adye, D Crennell, B Franek, G Gopal, J Guy, G Kalmus, N Murray, R Sekulin, G R Smith, M Tyndel, W Venus
- SACLAY - F Adami, M De Beer, T Bolognese, P Borgeaud, L Chevalier, P Jarry, J P Laugier, G Hamel de Monchenault, A Ouraou, F Pierre, V Ruhlmann, Y Sacquin, M L Turlier, D Vilanova, M Zito
- SANTANDER U - A J Camacho-Rozas, J Cuevas-Maestro, M Fernandez-Alonso, J Garcia, M A Lopez-Aguera, J Marco, F Matorras, A Ruiz
- SERPUKHOV - I Belokopytov, G Borissov, M Chapkin, P Chliapnikov, A Fenyuk, S Gumenyuk, V Kostioukhin, V Lapin, V Nikolaenko, V Obraztsov, A Ostankov, V Perevozchikov, N E Smirnov, O Tchikilev, N E Tyurin, V A Uvarov, E V Vlasov, A Zaitsev
- STOCKHOLM U - B Asman, G Ekspong, A Goobar, S Holmgren, P O Hulth, K Hultqvist, E K Johansson, T Moa, C Walck, N Yamdagni
- STRASBOURG, CRN - D Benedic, D Bloch, F Djama, W Dulinski, J P Engel, J P Gerber, D Husson, P Juillot, A Lounis, M Schaeffer, R Strub, R Turchetta, M Winter
- TRIESTE U - G Barbiellini, E Castelli, P Poropat, M Sessa
- TURIN U & INFN, TURIN - F Bianchi, R Cirio, M P Clara, N Demaria, Y E Derkaoui, D Gamba, M Koratzinos, E Menichetti, G Rinaudo, A Romero, E Vallazza
- UDINE U & INFN, UDINE - A De Angelis, L Lanceri, B De Lotto, F Scuri, F Waldner
- RIO DE JANEIRO U - I Roditi, R C Shellard, Z Thome
- UPPSALA U - O Botner, L O Eek, T Ekelof, J Eriksson, A Hallgren, K Woschnagg
- VALENCIA U - M V Castillo-Gimenez, A Ferrer, C Garcia, F Gonzalez, J J Hernandez, E Higon, C Lacasta, M D M De Fez Laso, J J Lozano, S Marti, Y Salt, E Sanchez, J A Valls-Ferrer, J Zuniga
- VIENNA, OAW - W Adam, W Bartl, R Fruehwirth, J Hrubec, T Kreuzberger, G Leder, N Liko, F Mandl, W A Mitaroff, M Pernicka, M Regler, J Strauss
- WARSAW, INR - K Doroba, M Gorski, T Hofmokl, J Krolikowski, A Lipniacka, R Sosnowski, M Szczekowski, M Szeptycka, P Szymanski
- WUPPERTAL U - K H Becks, J Drees, H Forsbach, K W Glitz, K Hamacher, U Krueener-Marquis, G Lenzen, E Lieb, H Staeck, S Ueberschaer, B Veberschaer, M Vollmer, H Wahlen, J Werner, G Zhang

Accelerator CERN-LEP Detector DELPHI

Reactions

$$e^+ e^- < 200 \text{ GeV (Ecm)}$$

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

Comments A general purpose LEP detector for physics on and above the  $Z^0$ , offering 3-dimensional information on curvature and energy deposition with fine spatial granularity, as well as identification of leptons and hadrons over most of the solid angle. A superconducting coil provides a 1.2 T solenoidal field of high uniformity. Tracking relies on a microvertex detector, an inner detector, a Time Projection Chamber (TPC), an outer detector, and forward drift chambers. The 3-layer silicon microvertex detector allows the precision measurement of the interaction vertex and the decay vertices of short-lived particles such as bottom and charm hadrons and  $\tau$  leptons. Electromagnetic showers are measured in the barrel with high granularity by the High Density Projection Chamber (HPC) and in the endcaps by  $1^\circ \times 1^\circ$  projective towers composed of lead glass as active material and phototriode readout. Hadron identification is provided mainly by liquid and gas Ring Imaging Cherenkov Counters (RICH). The segmented yoke serves for hadron calorimetry and as a filter for muons which are identified in two drift chamber layers. In addition, scintillator systems are

## SUMMARIES OF CERN EXPERIMENTS

implemented in the barrel and forward regions. A Small Angle Tagger (SAT) is used for the luminosity determination. Taking data (April 92).

*Papers* NIM 225 (1984) 477, NIM 225 (1984) 606, NIM A235 (1985) 310, NIM A241 (1985) 429, NIM A243 (1986) 77, NIM A243 (1986) 91, NIM A248 (1986) 317, NIM A252 (1986) 188, NIM A252 (1986) 413, NIM A252 (1986) 418, NIM A252 (1986) 435, NIM A252 (1986) 524, NIM A252 (1986) 573, NIM A254 (1987) 111, NIM A256 (1987) 65, NIM A256 (1987) 267, NIM A257 (1987) 499, NIM A260 (1987) 124, IEEE TNS 34 (1987) 227, NIM A263 (1988) 215, NIM A265 (1988) 218, NIM A269 (1988) 652, NIM A270 (1988) 393, NIM A273 (1988) 553, NIM A273 (1988) 565, NIM A273 (1988) 841, NIM A273 (1988) 847, IEEE TNS 36 (1989) 390, NIM A275 (1989) 49, NIM A277 (1989) 154, NIM A277 (1989) 160, NIM A277 (1989) 338, NIM A277 (1989) 347, NIM A279 (1989) 473, NIM A279 (1989) 518, NIM A283 (1989) 502, NIM A283 (1989) 567, NIM A283 (1989) 792, NIM A289 (1990) 400, NIM A290 (1990) 320, NIM A290 (1990) 327, NIM A292 (1990) 75, NIM A292 (1990) 319, NIM A292 (1990) 551, NIM A294 (1990) 424, PL B231 (1989) 539, PL B240 (1990) 271, PL B241 (1990) 435, PL B241 (1990) 449, PL B242 (1990) 536, PL B245 (1990) 276, PL B247 (1990) 137, PL B247 (1990) 148, PL B247 (1990) 157, PL B247 (1990) 167, PL B252 (1990) 140, PL B252 (1990) 149, NP B342 (1990) 1, NIM A303 (1991) 233, NIM A310 (1991) 596, PL B255 (1991) 466, PL B260 (1991) 240, PL B267 (1991) 422, PL B268 (1991) 296, NP B367 (1991) 511, ZPHY C50 (1991) 185, ZPHY C51 (1991) 25, PL B274 (1992) 230, PL B274 (1992) 498, PL B275 (1992) 222, PL B275 (1992) 231, PL B276 (1992) 247, PL B276 (1992) 254, PL B276 (1992) 536, PL B277 (1992) 371, ZPHY C53 (1992) 555, and ZPHY C53 (1992) 567.

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

### L3 EXPERIMENT

#### L3 COLLABORATION

AACHEN, TECH HOCHSCH, I PHYS INST - P Bloemecke, M Buchholz, H Esser, A Fischer, E Gevlig, H Haan, K Hilgers, W Karpinski, G Kirchhoff, H Kleinmanns, O Kornadt, R Krankenhagen, W Krenz, T Lehmann, B Lindemann, K Lubelsmeyer, H T Meinholz, L Niessen, D Pandoulas, Y Pei, K Reissmann, M Roehner, K Schmiemann, D Schmitz, M Schontag, H Schreiner, J Schwenke, G Schwering, R Siedling, M Vollmar, W Wallraff, A Weber, Y Zeng, J F Zhou  
AACHEN, TECH HOCHSCH, III PHYS INST - S Bachmann, M Bischops, V Commichau, H Fesefeldt, G Fetschenhauer, S Hancke, T Hebbeker, U Herten, C Jakobs, D Lanske, J Mnich, M Moller, A Ricker, S Roehner, J Rose, M Sassowsky, C Schaefer, P Schmitz, S Schulte, T Spickermann, R Starosta, H Szczesny, M Tonutti, U Uwer  
ALABAMA U - L Borksay, J Busenitz, D DiBitonto, R Munoz, P Razis  
NIKHEF, AMSTERDAM - G J Bobbink, B Bouwens, P Duinker, F Erne, T Foreman, H Van der Graaf, H Groenestege, D Hauschildt, M Ijzerman, X Leijtens, G G Massaro, G Raven, J C Sens, D Zhang  
ANNECY - S Beingessner, Y Bertsch, J Blaising, D Boutigny, F Chollet, G Coignet, A Degre, C Girard, S Jezequel, M Lebeau, J Lecoq, S Lees-Rosier, F Marion, R Morand, M Moynot, D Perret-Gallix, G Perrot, X Ricadonna, G Sauvage, M Schneegans, M Vivargent  
BEIJING, IHEP - C Chen, G Chen, H Chen, J L Chen, J T He, B Jin, H Li, X Li, Y Lu, Y F Mao, Z M Qian, X Tang, K Tung, J H Wang, R Wu, Y Wu, C F Xu, J G Xu, C Yang, K S Yang, P Y Zheny, Z C Zhong, G J Zhou, G Y Zhu, H L Zhuong  
BOLOGNA U & INFN, BOLOGNA - D Antreasyan, A Contin, G Sartorelli  
TATA INST - T Aziz, S Banerjee, S N Ganguli, S Katta, P K Malhotra, K Mazumdar, S Saran, S Tonwar  
BOSTON U - S Ahlen, S Otwinowski, J Rohlf  
BUDAPEST, CRIP - K Banicz, G Bencze, E Denes, G Mortory, E Nagy, J Toth, L Urban  
CAL TECH - A E Alder, G Dalgert, G Gratta, M Gruenewald, M Mafeez, R Mount, H B Newman, F Roeber, F Sticozzi, C Tully, C Zaccardelli, R Y Zhu  
CARNEGIE MELLON U - I Brock, A Engler, T Ferguson, R Kraemer, J Rudman, X R Shi, J Shukla, G Tsipolitis, H Vogel, G Wang

CERN - B Adeva, A Boehm, N Colino, G Von Dardel, I Duran, F Ferroni, J M Le Goff, A Herve, V Innocente, M Janssen, J Karyotakis, P Lecoq, L Leistan, F Linde, H Lubbers, C Luci, L L Martinez, E Menant, R Morino, D Peach, M Pieri, L Pigni, M Plasse, J Pothier, J Rodriguez-Lopez, E Saint-Aubert, J Salicio-Diez, H Schopper, R Stampfli, B T'Hart, G Trinquart, F Wittgenstein, A Zichichi  
HEFEI, CUST - H Chen, Z Gong, Z Lin, W Ma, C Wang, X Wang, Z Xu, B Yang, J Ye, X Q Yu  
FLORENCE U - O Adriani, F Becattini, M Bocciolini, F Carminati, A M Cartacci, G Castellini, C Civinini, R D'Alessandro, E Gallo, G Landi, M Lenti, M Meschini, B Monteleoni, S Paoletti, G Passaleva, P Spillantini, Y F Wang  
GENEVA U - A Bay, P Bene, M Bourquin, W Burger, A Christinet, D Duchesneau, P Extermann, J H Field, G Forconi, D Goujon, H Hoorani, M N Kienzle, V Laliou, A Leger, D La Marra, P Martin, G Morand, J Perrier, E Perrin, N Produit, J P Richeux, H Stone, J Weninger, M Zofka  
HARVARD U - K Kumar, P McBride, I Scott, K Strauch, Q F Wang  
IOWA STATE U - W Anderson, J Hauptman  
JOHNS HOPKINS U - H Akbari, J Bao, C Chien, P Fisher, A Gougas, J Krizmanic, A Pevsner, W Spangler, C Spartiotis  
KOREA INST SCI - M Choi, J K Kim, Y Kim, J Lee  
KYUNGPOOK NATIONAL U - Y Keum, S Kim, S Lee, S Oh, Y Oh, Y Park, D Son  
LAUSANNE U - M Gailloud, A Kasser, E Lejeune, J Moser, P Rosselet, C Roth, L Vuilleumier, R Weill  
LIVERMORE - M Capell, O Fackler, W Stoeffl, T Wenaus  
LOS ALAMOS - M Brock, T Coan, W Kinnison, D Lee, G Mills, G Sanders  
LYON, IPN - C Buisson, J P Burq, M Chemarin, J Fay, D Gele, M Goyot, B Ille, M El Kacimi, P Lebrun, N Madjar, M Maire, H El Mamouni, J Martin  
MADRID, CIEMAT - M Aguilar-Benitez, J Alcaraz, P Arce, J Berdugo, C Burgos, M Cerrada, C Fernandez-Figueroa, G Fernandez, P Garcia-Abia, E Gonzalez, C Mana, L Romero, J N Salicio, C Willmott  
MICHIGAN U - T Azemmoon, R C Ball, J W Chapman, M Chen, M Chmeissani, S Göldfarb, R Gustafson, G Hurst, L W Jones, C Leggett, D Mao, J Qian, O Rind, B P Roe  
MILAN U & INFN, MILAN - A Baschirotto, R Castello, C Furetta, S Pensotti, P Rancoita, M Rattaggi, G Terzi  
MIT - A Andersson-Christians, U Becker, P Berges, J D Burger, Y Chang, M Chen, I Clare, R Clare, L Dai, J Donahue, F Epling, C Grinnell, G Herten, T Kramer, D Luckey, H Milent, J Pier-Amory, A Rubbia, M Sarakinos, M Steuer, S C C Ting (✓ Spokesperson), S M Ting, M White, B Wyslouch  
MOSCOW, ITEP - A Alekhine, A Arefiev, M Chumakov, Y Galaktionov, A Gordeev, Y Gorodkov, Y Kamyshkov, A Klimentov, V Koutsenko, V Krylov, A Kunin, A Malinin, I Melnikov, V Morgunov, A Nikitin, V Plyaskine, V Pojidaev, A Savin, S Shevchenko, V Shoutko, E Shumilov, K Smakov, E Tarkovsky, A Tchouzo, I Vetlitski, I Vorobyev  
NAPLES U, IFS & INFN, NAPLES - A Aloisio, M G Alviggi, M Armenante, R De Asmundis, E Brambilla, D Campana, F Carbonara, G Carlino, G Chiefari, P Crisculo, E Drago, S Lanzano, F Manna, G Manto, L Merola, M Napolitano, P Paolucci, G Paternoster, S Patricelli, D Piccole, G Russo, C Sciacca, F Visco  
NIKHEF, AMSTERDAM & NIJMEGEN U - T Driever, F Filthaut, W Kittel, P F Klok, A Konig, H P Kuijten, H M Merk, W Metzger, R Rosmalen, D J Schotanus, C Timmermans, R Van de Walle  
NORTHEASTERN U - G Alverson, G Fairley, M Glaubman, I Leedom, S Reucroft, C Spartiotis, L Taylor  
OAK RIDGE - F Plasil, K Read  
OHIO STATE U - N Reay  
PSI, VILLIGEN - R Fabbretti, P G Seiler  
PERUGIA U & INFN, PERUGIA - B Alpat, G Ambrosi, E Babucci, R Battiston, B Bertucci, M Biasini, G M Bilei, M Caria, B Checucci, E Fiadrini, G Mantovani, M Panluzzi, A Santocchia, S Santos, L Servoli  
ST PETERSBURG, INP - V Andreev, V Andreev, A Atamantchouk, A Chetkovski, G Gavrilov, P Kapinos, A Koulbardi, A Krivshich, P Levchenko, V Maleev, A Nadtochi, S Patritchenov, O Prokofiev, I Riabov, N Saguidova, V Schegelsky, N Smirnov, V Souvorov, I Tkatch, A Tsaregorodtsev, S Volkov, A Vorobyov, A Vorobyov

## SUMMARIES OF CERN EXPERIMENTS

PRINCETON U - W S Anderson, M Convery, P Denes,  
F Osterberg, P Piroue, E Soderstrom, D Stickland, D Wright  
PURDUE U - A Bujak, L Gutay, T McMahon, B C Riemers  
ROME U & INFN, ROME - P Bagnaia, L Barone, R Bizzarri,  
B Borgia, F Camilli, F Cesaroni, S Codino-Falciano, M Consoli,  
S Constantini, C Dionisi, G M De Divitiis, G Finocchiaro,  
S Gentile, S Giagu, E Leonardi, J Locci, E Longo, L Ludovici,  
L Luminari, M Lusignoli, L Maiani, F Marzano, G Mirabelli,  
S Morganti, F De Notaristefani, G Organtini, M Rescigno,  
E Trasatti, E Valente  
SHANGHAI INST CERAMICS - Z Xue  
SOFIYA, AUTOMATION SCI INSTRUM LAB - T Angelov,  
L Antonov, B Betev, S Botev, V Dimitrov, G Sultanov, L Urban  
UC, SAN DIEGO - J Branson, I Sheer, A Sopczak  
TAIWAN, HEP GROUP - C Chang, A Chen, S S Gau, L S Hsu,  
W T Lin, Y P Tong, S C Yeh  
CCAST WORLD LAB, BEIJING - S Aksouh, A Ali, Q An,  
D Antreasyan, P V K S Baba, X D Cai, U K Chaturvedi,  
W Chen, A Contin, X Y Cui, X Cui, M T Dova, M Gourdin,  
C Gu, M Guanziroli, A Hasan, G Hu, M Kaur, R A Khan,  
S Khokhar, V A Kumar, C Li, R Malik, Y Mi, Y Mir, I Mirza,  
N E Moulai, M A Niaz, T Osborne, K Qureshi, Z L Ren,  
H A Rizvi, G Sartorelli, R K Sehgal, L Sun, J Swain, A A Syed,  
P Vikas, U Vikas, M Wadhwa, Z M Wang, S Wu, G Yang, C Ye,  
Q Ye, J You, N Yunus, M Zeng, Z Zhang  
BERLIN-ZEUTHEN ADW - W Friebe, J Groschler, S Kirsch,  
H Kirst, R Leiste, W Lohmann, W Lustermann, H Nowak,  
S Riemann, M Sachwitz, H Schreiber, F Streit, F Tonisch,  
G Trowitzsch, K Truetzschler  
ZURICH, ETH - H Anderhub, T Behner, J Behrens, A Biland,  
P Le Coultre, M Dhina, L Djambazov, G Faber, M Fabre,  
K Freudenreich, J Herrmann, H Hofer, I Horvath, E Isik-  
sal, M G Jongmanns, H Jung, P Lecomte, J Lettry, L Li,  
X Lue, M MacDermott, M Maolinbay, P Marchesini, D Mc-  
Nally, C Neyer, F Pauss, M Pohl, G Rahal-Callot, D Ren,  
H Rykaczewski, B Spiess, H Suter, J Ulbricht, G Viertel,  
S Waldmeier, J Weber, C Yang, J Ye, P Zemp

Accelerator CERN-LEP Detector L3

### Reactions

$e^+ e^- < 100 \text{ GeV (Ecm)}$

Particles studied  $Z^0$ , hvy-lepton, higgs, higgs, s-particle

Comments The detector consists of a high-volume low-field solenoid magnet, a small central tracking chamber with very high resolution, a high resolution electromagnetic calorimeter encapsulating the central detector, a hadron calorimeter acting also as a muon filter, and high precision muon tracking chambers. The detector is designed to measure energy and position of leptons with the highest obtainable precision allowing a mass resolution  $\Delta m/m$  smaller than 2% in dilepton final states. Hadronic energy flux is detected by a fine-grained calorimeter, which also serves as a muon filter and tracking device. Taking data (April 92).

Papers NIM 214 (1983) 525, NIM 225 (1984) 493, NIM 228 (1985) 294, NIM A235 (1985) 464, NIM A251 (1986) 258, NIM A252 (1986) 304, CPC 45 (1987) 391, NIM A253 (1986) 15, NIM A254 (1987) 535, NIM A256 (1987) 261, NIM A257 (1987) 125, NIM A257 (1987) 528, HEPNP 12 (1987) 587, NIM A258 (1987) 58, NIM A263 (1988) 14, NIM A263 (1988) 343, NIM A265 (1988) 50, NIM A265 (1988) 252, NIM A270 (1988) 397, NIM A272 (1988) 713, NIM A273 (1988) 471, NIM A273 (1988) 814, NIM A274 (1989) 113, NIM A275 (1989) 71, NIM A275 (1989) 81, NIM A277 (1989) 187, NIM A278 (1989) 699, NIM A279 (1989) 671, NIM A280 (1989) 25, NIM A283 (1989) 799, NIM A285 (1989) 403, PL B231 (1989) 509, PL B233 (1989) 530, MPL A5 (1990) 1381, NIM A288 (1990) 364, NIM A289 (1990) 35, NIM A289 (1990) 103, NIM A289 (1990) 335, NIM A290 (1990) 115, PL B236 (1990) 109, PL B237 (1990) 136, PL B238 (1990) 122, PL B241 (1990) 416, PL B247 (1990) 177, PL B247 (1990) 473, PL B248 (1990) 203, PL B248 (1990) 227, PL B248 (1990) 464, PL B249 (1990) 341, PL B250 (1990) 183, PL B250 (1990) 199, PL B250 (1990) 205, PL B251 (1990) 311, PL B251 (1990) 321, PL B252 (1990) 511, PL B252 (1990) 518, PL B252 (1990) 525, PL B252 (1990) 703, PL B252 (1990) 713, NIM A302 (1991) 53, NIM A306 (1990) 150, NIM A309 (1991) 318, PL B257 (1991) 450, PL B257 (1991) 469, PL B259 (1991) 199, PL B261 (1991) 169, PL B261 (1991) 177, PL B262 (1991) 155, PL B263 (1991) 551, PL B265 (1991) 451, PL B270 (1991)

111, PL B271 (1991) 453, PL B271 (1991) 461, and ZPHY C51 (1991) 179.

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

### THE OPAL DETECTOR (AN OMNI PURPOSE APPARATUS FOR LEP)

#### OPAL COLLABORATION

BIRMINGHAM U - I J Bloodworth, P M Hattersley, S J Hillier,  
R J Homer, M Jobs, P Jovanovic, T J Mc Mahon, D L Rees,  
W N Stokes, N J Thackray, J P Walker, P M Watkins,  
A T Watson, M Whalley, J A Wilson  
BOLOGNA U & INFN, BOLOGNA - S Arcelli, P Capiluppi,  
M Cuffiani, G M Dallavalle, M M Deninno, F Fabbri,  
G Giacomelli, C Grandi, M Jimack, S Marcellini, A Montanari,  
F Odorici, B Poli, A M Rossi, G P Siroli  
BONN U - O Biebel, B Boden, A Eyring, H M Fischer, C Geich-  
Gimbel, S Gross, T P K Kokott, S Levegrun, G Maringer,  
P Mattig, E Mauer, U Maur, B Nellen, A Rollnik, S Schreiber,  
J Schwiening, N A Simon, J Thiebes  
CAMBRIDGE U - P P Allport, J R Batley, J R Carter,  
W J Collins, V C Dunwoody, P A Elcombe, V Gibson,  
M J Goodrick, F C Grant, J C Hill, L A Del Pozo, M F Turner,  
C P Ward, D R Ward  
CARLETON U - J C Armitage, R K Carnegie, D Dumas,  
P E Estabrooks, R J Hemingway, L Janissen, D Karlen,  
R Kowalewski, J Mildener, M Ogg, A Pouladdej,  
P Routenburg, S Sanghera, W Schappert, P Weber  
CERN - T Behnke, H Breuer, R Brun, A Buijs, H J Burckhart,  
D G Charlton, M Fillion, W Glessing, J Hagemann,  
R Hammarstrom, M Hansroul, J Hart, M Hauschild,  
C M Hawkes, R D Heuer, J D Hobbs, B Holl, S J De Jong,  
C Kleinwort, L Koepke, R Van Kooten, J F Kral, G Linsler,  
R Lorenzi, M Mannelli, M Mast, F Meijers, A Michelini  
( $\surd$  Spokesperson), S W O'Neale, B Panzer-Steindel, D Plane,  
E J Prebys, G Quast, A Renoux, D Robinson, E Ros,  
O Runolfsson, P Scharff-Hansen, G Schmidlin, D M Sendall,  
A M Smith, T J Smith, M Uldry, P Vande-Vyvre, N Watson,  
S Weisz, P Wells, M Weymann, P Wicht, I Wingerter,  
S Wotton, K Zankel, W Zeuner  
CHICAGO U - K J Anderson, R L Armstrong, H Evans,  
S W Gensler, P Hart, J Kroll, F S Merritt, B Mertens,  
H Nguyen, M J Oreglia, J E Pilcher, E Pod, M W Redmond,  
J M Roney, H Sanders, D M Strom, D Wagner  
FREIBURG U - J Becker, P Berlich, U Binder, H Gao,  
R Humbert, D Joos, R Kolpin, J Ludwig, W Mohr, P Pfister,  
S Rossberg, K Runge, A D Schaile, O Schaile, J Schwarz,  
H E Stier, C Wahl, M Weibel, H C Weber, V Winterer  
HEIDELBERG U, IHEP - S Bethke, P Bock, H M Bosch,  
A Dieckmann, G Duckeck, G Eckerlin, P Igo-Kemenes, H Ihssen,  
J von Krogh, P Lennert, D Menszner, H von der Schmitt,  
R Stroehmer, P Teixeira-Dias, G Tysarczyk, A Wagner,  
P von Walter, M Weber, N Wermes  
INDIANA U - B Brabson, G Hanson, X C Lou, R Mir,  
T Mouthuy, H O Ogren, D R Rust, M Settles,  
E do Couto e Silva, T Sulanke  
KOBE U - M Kuwano, M Nozaki, H Takeda  
BIRKBECK COLL - K Ahmet, M Coupland  
BRUNEL U - P Acton, P Clarke, P Hobson, D C Imrie,  
J McNutt, G Transtromer  
QUEEN MARY - WESTFIELD COLL - G Barker, G A Beck,  
A A Carter, W R Gibson, P F Harrison, R W L Jones,  
P Kyberd, S L Lloyd, A J Martin, T W Pritchard, S A Robins,  
P Singh  
UNIVERSITY COLL, LONDON - B Anderson, A Charalambous,  
J E Conboy, R Cranfield, G J Crone, M N Fray, C J Howarth,  
B W Kennedy, M H Lehto, D J Miller, P Sherwood  
MANCHESTER U - J Allison, P Ashton, G Bahan,  
J T M Baines, J Banks, R J Barlow, J T M Chrin,  
I P Duerdoth, R E Hughes-Jones, G D Lafferty, F K Loebinger,  
R F McGowan, M W Moss, S Pawley, K Stephens, N C Wood,  
T R Wyatt  
MARYLAND U - A Ball, R Bard, C Y Chang, J D Colmer,  
H Deng, D Fong, P R Goldey, S Hou, H Jawahery, R G Kellogg,  
R Lahmann, A Lee, J M Lorah, A Skuja, G A Snow,  
W Springer, G T Zorn  
MONTREAL U - G Azuelos, G Beaudoin, M Beaulieu,  
A Bellerive, P Bentkowski, J Gascon, D Hinshaw, H Jeremie,

## SUMMARIES OF CERN EXPERIMENTS

F Lamarche, P Leblanc, C Leroy, L Lessard, B Lorazo, J Martin, C Moisan, D Van den Plas, H Przysiechniak, P Taras, M Yurko  
**CRPP, OTTAWA** – M S Dixit, C K Hargrove, M J Losty, H Mes, F G Oakham  
**NATIONAL RESEARCH COUNCIL, OTTAWA** – D Klem, C J Virtue  
**UC, RIVERSIDE** – G J Van Dalen, M Dittmar, J W Gary, W Gorn, E Heflin, C Ho, W Larson, J G Layter, J R Letts, B O'Neill, H Oh, K Riles, B C Shen, Y Yang  
**RUTHERFORD** – K W Bell, R M Brown, N I Geddes, J D Gillies, F Jacob, S Jaroslowski, P W Jeffreys, R P Middleton, G N Patrick, W G Scott, M Sproston  
**SACLAY** – P Debu, P Le Du, A Gaidot, F Gentit, J P Pansart, G Vasseur, G W Wilson  
**TECHNION** – M Cooper, S Dado, J Goldberg, N Lupu  
**TEL AVIV U** – G Alexander, A Beck, G Bella, I Cohen, E Etzion, C Milstene  
**TOKYO U** – C Fukunaga, K Kawagoe, T Kawamoto, T Kobayashi, S Komamiya, T Mashimo, M Minowa, T Mori, S Orito, M Sasaki, T Takeshita, T Tsukamoto  
**BRITISH COLUMBIA U** – D A Axen, S Bougerolle, R Howard, R Shypit, R J Sobie  
**VICTORIA U** – A Astbury, G A Beer, M Fincke-Keeler, A Honma, R K Keeler, M Lefebvre, G R Mason, J Mckenna, C J Oram, D Pitman, P Poffenberger, L P Robertson, M Rosvick, P Schenk  
**WEIZMANN INST** – E Duchovni, O Ganel, D Hochman, D Lellouch, L Levinson, G Mikenberg, A Ney, P Paschievici, J L Pinfeld, M Shoa, S Tarem, T Wlodek, R Yaari, G Yekutieli

**Accelerator** CERN-LEP **Detector** OPAL

### Reactions

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

**Particles studied**  $Z^0$ ,  $W^+$ ,  $W^-$ , hvy-lepton, higgs, hvy-flavor, gluon, s-particle

**Comments** OPAL is a general-purpose detector. The apparatus is particularly suitable for a study of (1)  $Z^0$  and  $W^\pm$  bosons, (2) heavy flavors, including the spectroscopy of  $b$ -quarks and mixing of  $B$  states, and (3) Higgs bosons and other new and hypothetical particles. Taking data (April 92).

**Papers** NIM A242 (1986) 247, NIM A244 (1986) 416, NIM A252 (1986) 331, IEEE TNS 34 (1987) 240, CPC 47 (1987) 55, NIM A260 (1987) 132, NIM A260 (1987) 329, NIM A265 (1988) 11, NIM A265 (1988) 445, IEEE TNS 36 (1989) 380, NIM A278 (1989) 725, NIM A279 (1989) 236, NIM A279 (1989) 523, NIM A283 (1989) 492, NIM A283 (1989) 515, NIM A283 (1989) 650, PL B231 (1989) 530, IEEE TNS 37 (1990) 1584, NIM A286 (1990) 99, NIM A286 (1990) 107, NIM A286 (1990) 117, NIM A290 (1990) 76, NIM A293 (1990) 145, NIM A294 (1990) 431, PL B235 (1990) 379, PL B235 (1990) 389, PL B236 (1990) 224, PL B236 (1990) 364, PL B240 (1990) 250, PL B240 (1990) 261, PL B240 (1990) 497, PL B241 (1990) 133, PL B242 (1990) 299, PL B244 (1990) 135, PL B246 (1990) 285, PL B247 (1990) 448, PL B247 (1990) 458, PL B247 (1990) 617, PL B248 (1990) 211, PL B251 (1990) 211, PL B252 (1990) 159, PL B252 (1990) 290, ZPHY C47 (1990) 505, NIM A302 (1991) 434, NIM A305 (1991) 275, PL B253 (1991) 511, PL B254 (1991) 293, PL B257 (1991) 531, PL B261 (1991) 334, PL B262 (1991) 341, PL B262 (1991) 351, PL B263 (1991) 123, PL B263 (1991) 311, PL B264 (1991) 219, PL B264 (1991) 467, PL B265 (1991) 462, PL B266 (1991) 201, PL B266 (1991) 485, PL B267 (1991) 143, PL B268 (1991) 122, PL B273 (1991) 338, PL B273 (1991) 355, ZPHY C49 (1991) 1, ZPHY C49 (1991) 49, ZPHY C49 (1991) 375, ZPHY C50 (1991) 373, ZPHY C52 (1991) 175, and ZPHY C52 (1991) 543.

**CERN-LEP-05** Approved Apr 1989; Completed Oct 1991.  
**A SINGLE BREMSSTRAHLUNG MONITOR TO MEASURE LUMINOSITY AT LEP**

**ROME U & INFN, ROME** – C Bini, G Di Cosimo, G Diambri-Palazzi (✓ Spokesperson), A Di Domenico, P Gauzzi, D De Pedis, D Zanello, G De Zorzi

**Accelerator** CERN-LEP **Detector** Calorimeter

**Comments** Measures the luminosity and the beam divergence by detecting the energy and the angular distribution of single-bremsstrahlung photons emitted at a very forward angle. The

Compton scattering of thermal photons has also been measured for the first time in a particle accelerator. The apparatus consists of a low Z absorber and of an EM calorimeter made of lead and scintillating fibres. Data analysis in progress (April 92).

**Papers** NIM A306 (1991) 467, PL B262 (1991) 135, and NIM A315 (1992) 327.

**CERN-LEP-06** Approved Sep 1989; Completed 1992.

**THE SEARCH FOR HIGHLY IONIZING PARTICLES IN  $e^+e^-$  COLLISIONS AT LEP USING MODAL-MONOPOLE DETECTOR AT LEP**

**ALBERTA U** – J L Pinfeld (✓ Spokesperson)  
**BOLOGNA U & INFN, BOLOGNA** – G Giacomelli, F Patrizii, F Predieri, P Serra  
**HARVARD U** – K Kinoshita

**Accelerator** CERN-LEP **Detector** Plastic

**Particles studied** monopole

**Comments** The MODAL detector is designed to search for monopoles, dyons, and other highly ionizing particles. It is formed from Lexan/CR-39 dielectric track detector modules arranged in a polyhedral configuration around the intersection region.

**Papers** PRL (submitted).

**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 Gouanere, J P Peigneux, M Poulet, M Spighel  
**BRUSSELS U, IISN & BRUSSELS U, IISN** – F Binon, J P Stroot (✓ Spokesperson)

**KEK** – S Inaba, M Kobayashi, K Takamatsu, T Tsuru

**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, G V Khaustov, A V Kulik, A A Lednev, S A Polovnikov, V A Polyakov, Y D Prokoshkin (✓ Spokesperson), V I Rykalin, S A Sadovskiy, V D Samoylenko, P M Shagin, A V Shtannikov, A V Singsovskiy, V P Sugonyaev

**CHIBA U** – H Kawai

**MIYAZAKI U** – T Nakamura

**NAGOYA U** – T Kinashi

**YAMAGATA U** – H Shimizu

**Accelerator** CERN-SPS **Detector** GAMS-4000

### Reactions

$\pi^- p \rightarrow p \pi^- 2\gamma (\gamma's)$	300 GeV/c
$\pi^- p \rightarrow 2\gamma (\gamma's) X$	"
$\pi^- n \rightarrow n \pi^- 2\gamma (\gamma's)$	"
$\pi^- n \rightarrow 2\gamma (\gamma's) X$	"
$p p \rightarrow 2p 2\gamma (\gamma's)$	450 GeV/c

**Particles studied** glueball, exotic, meson<sup>0</sup>,  $\eta_c(1S)$ ,  $\chi_c(\text{unspec})$

**Comments** Searches for neutral mesons, exotics like glueballs, hybrids, and many-quark states produced in central hadron-proton collisions. Studies the inclusive hadronic production of neutral heavy quark mesons. Uses the 4092-cell electromagnetic calorimeter GAMS-4000, supplemented with a forward magnetic spectrometer and microstrip gas chambers. Taking data (April 92).

**Papers** PL B201 (1988) 160, YF 47 (1988) 1273, YF 47 (1988) 1639, YF 49 (1989) 712, ZPHY C43 (1989) 541, and DANS 316 (1991) 900.

**CERN-NA-014-2** Approved Apr 1983; Completed Nov 1986.

**A PROGRAM OF HEAVY FLAVOR PHOTOPRODUCTION**

## SUMMARIES OF CERN EXPERIMENTS

ATHENS, TECH UNIV – A Filippas, E Fokitis, E N Gazis,  
E C Katsoufis, A Maltezos, T Papadapoulou, H Rahmani  
BARCELONA, AUTONOMA U – M P Alvarez, F Calvino,  
J M Crespo  
CERN – L Andersson, R Barate (✓ Spokesperson), H Burmeister,  
L di Caccio, Y Giomataris, A Lopez, B Pattison, D Treille,  
Y Zolnierowski  
IMPERIAL COLL – G Barber, 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 Lefievre, D Poutot,  
P Triscos, G Tristram, A Volte  
SACLAY – P Bonamy, P Borgeaud, M David, Y Lemoigne,  
F Louis, C Magneville, J Poinsignon, M Primout, J F Thomas,  
G Villet  
SOUTHAMPTON U – J G McEwen  
STRASBOURG, CRN – D Bloch, J P Engel, P Foucault,  
J P Gerber, R Strub  
WARSAW U, IEP – T Hofmokl

Accelerator CERN-SPS Detector Spectrometer

Reactions

$\gamma p$  50–200 GeV/c

Particles studied  $D^0, D^+, D_s^+, \Lambda_c^+$ , charm

Comments Measures the photoproduction of charm. Uses a silicon active target and microstrip hodoscopes.

Papers NIM A235 (1985) 235, NIM A253 (1987) 530, ZPHY C47 (1990) 539, PL B246 (1990) 256, PL B246 (1990) 261, ZPHY C50 (1991) 11, PL B255 (1991) 639, and PL B278 (1992) 385.

**CERN-NA-031** (Dec 1981) Approved Sep 1982, Nov 1987; Completed Dec 1989.

**MEASUREMENT OF  $|\eta_{00}|^2/|\eta_{+-}|^2$**

CAMBRIDGE U – V Gibson  
CERN – G Barr, P Buchholz, H Burkhardt, R Carosi, D C Cundy,  
N Doble, D Fournier, L Gatignon, P Grafstrom, R Hagelberg,  
M Holder, G Kessler, J van der Lans, G Quast, J Steinberger,  
H Wahl (Spokesperson)

EDINBURGH U – D J Candlin, K J Peach  
MAINZ U, INST PHYS – H Bluemer, R Heinz, K Kleinknecht,  
P Mayer, P Panzer, B Renk, H Rohrer  
ORSAY, LAL – E Auge, I Harrus, P Heusse, L Iconomidou-  
Fayard, O Perdereau, A C Schaffer, L Serin  
PISA U & INFN, PISA – L Bertanza, A Bigi, P Calafiura,  
N Calvetti, M C Carozza, R Casali, C Cerri, R Fantechi,  
A Giacomucci, I Mannelli, V Marzulli, A Nappi, G M Pierazzini  
UC, SANTA BARBARA – B Keay, H Nelson  
SIEGEN U – A Kreutz, M Rost, H G Sander, W Weihs,  
R Werthenbach, 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 Measures the two decay modes  $K^0 \rightarrow 2\pi^0$  and  $K^0 \rightarrow \pi^+ \pi^-$  simultaneously, and alternately in  $K_L$  and  $K_S$  beams.

Papers PL B199 (1987) 139, NIM A268 (1988) 116, PL B206 (1988) 169, and PL B214 (1988) 303.

**CERN-NA-031-2** (Mar 1986) Approved Jun 1986; Completed Sep 1987.

**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,  
V Gibson, P Grafstrom, R Hagelberg, G Kessler, J Steinberger,  
H Taureg, H Wahl (Spokesperson)  
EDINBURGH U – R Black, D J Candlin, J Muir, K J Peach

MAINZ U, INST PHYS – H Bluemer, M Kasemann,  
K Kleinknecht, P Mayer, B Panzer, B Renk, S Roehn, H Rohrer  
ORSAY, LAL – E Auge, D Fournier, P Heusse, L Iconomidou-  
Fayard, A M Lutz, H G Sander, A C Schaffer  
INFN, PISA – L Bertanza, A Bigi, M Calvetti, R Carosi,  
R Casali, C Cerri, G Gargani, I Mannelli, E Massa, A Nappi,  
G M Pierazzini  
SIEGEN U – C Becker, H Burkhardt, 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 The phase of the ratio of the decay amplitudes  $\eta$  of CP conserving and CP violating decays is determined from the time dependence of the rate of  $K \rightarrow \pi\pi$  decays with the  $K_S$  and  $K_L$  in interference. For papers see CERN-NA-031.

**CERN-NA-032** (Jul 1982) Approved Nov 1982; Completed Aug 1986.

**INVESTIGATION OF CHARM PRODUCTION IN HADRONIC INTERACTIONS USING HIGH-RESOLUTION SILICON DETECTORS**

ACCMOR COLLABORATION

NIKHEF, AMSTERDAM – C Daum, H Tiecke, L Wiggers  
BRISTOL U – R Gilmore, T Gooch, J Malos  
CERN – V Castillo, V Chabaud, D P Kelsey, S Kwan, V Lueth,  
P Weilhammer (✓ Spokesperson)  
CRACOW – L Goerlich, Z Hajduk, H Palka, K Rybicki, M Turala  
MUNICH, MAX PLANCK INST – S Barlag, M Bosman, H Dietl,  
B Luecking, G Lutjens, G Lutz, W Manner, H Seebrunner,  
U Stierlin  
RUTHERFORD – C Damerell, A Gillman, M Pepe,  
J A Richardson, S Watts, F J Wickens  
LAUSANNE U – T Boehringer  
VALENCIA U – P Gras, E Higon  
DESY – R Klanner

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  $D^0, D^+, D^*(2010)^+, D_s^+, \Lambda_c^+, \Xi_c^+, \Xi_c^0$

Comments Uses the spectrometer from CERN-NA-011. In the first stage, a silicon microstrip vertex detector was used together with an active target made from segmented silicon detectors and an interaction trigger. In the second stage, a 2.5 mm thick Cu target followed by two CCD's was added to the microstrip detector and a trigger on  $(K/p)^+$   $(K/p)^-$  pairs was used. Data analysis in progress (April 92).

Papers NIM 213 (1983) 201, NIM 226 (1984) 56, NIM A235 (1985) 481, IEEE TNS 33 (1986) 51, PL B184 (1987) 277, PL B184 (1987) 283, ZPHY C37 (1987) 17, NIM A253 (1987) 460, NIM A253 (1987) 478, ZPHY C39 (1988) 451, PL B218 (1989) 374, PL B232 (1989) 561, PL B233 (1989) 522, PL B236 (1990) 495, PL B247 (1990) 113, ZPHY C46 (1990) 513, ZPHY C46 (1990) 521, ZPHY C46 (1990) 563, ZPHY C48 (1990) 29, PL B257 (1991) 519, and ZPHY C49 (1991) 555.

**CERN-NA-034** (Aug 1983) Approved Mar 1984; Completed Dec 1989.

**LEPTON PRODUCTION**

HELIOS COLLABORATION

BARI U – M T Muciaccia, S Simone  
BROOKHAVEN – V A Polychronakos, D C Rahm, I Stumer,  
C Woody

## SUMMARIES OF CERN EXPERIMENTS

CERN - H W Atherton, H Beker, C W Fabjan, V Hedberg,  
A Mazzoni, F Piu, G Poulard, J Schukraft, H Sletten,  
W J Willis (✓ Spokesperson)

HEIDELBERG U, PHYS INST - L Olsen, A Pfeiffer

KYOTO SANGYO U - H En'yo

UNIVERSITY COLL, LONDON - J Dodd, M J Esten

LUND U - S Johansson

MCGILL U - C Leroy, P Yepes

MONTREAL U - P Aubry, G Beaudoin, P Depommier

LEBEDEV INST - A Chikanian, S Muraviev, A Shmeleva,  
V Tikhomirov

MOSCOW PHYS ENG INST - B Dolgoshein, A Kalinovsky,  
S Smirnov, V Tcherniatin

NOVOSIBIRSK, IYF - S Eidelman, V Sidorov

PITTSBURGH U - M Clemen, Y M Park, P Pomianowski,  
E Stern, J Thompson, L Weber

ROME U & INFN, ROME - F Meddi

RUTHERFORD - N A McCubbin

STOCKHOLM U - B Sellén

TEL AVIV U - O Benary, S Dagan, Y Oren

TURIN U & INFN, TURIN - P Giubellino

NIKHEF, AMSTERDAM - R Veenhof

FERRARA U - E Mazzucato

MUNICH U, EXP PHYS - K Dederichs

VIENNA, OAW - C Erd

Accelerator CERN-SPS Detector HELIOS

### Reactions

$p \text{ Be} \rightarrow e^\pm(s) X$	450 GeV/c
$p \text{ Be} \rightarrow \text{muon}(s) X$	"
$p \text{ Be} \rightarrow \nu(s) X$	"
$p \text{ Be} \rightarrow e^\pm \text{ muon} X$	"
$p \text{ Be} \rightarrow e^\pm \nu X$	"
$p \text{ Be} \rightarrow \text{muon} \nu X$	"
$p \text{ Be} \rightarrow \gamma X$	"
$p \text{ Be} \rightarrow e^+ e^- \gamma X$	"
$p \text{ Be} \rightarrow \mu^+ \mu^- \gamma X$	"

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 and low- $p_T$  photon production.

Papers NIM A252 (1986) 272, NIM A252 (1986) 471, NIM A253 (1987) 500, NIM A262 (1987) 243, NP A461 (1987) 403c, ZPHY C38 (1988) 397, ZPHY C49 (1991) 355, and ZPHY C52 (1991) 219.

**CERN-NA-034-2** (May 1984) Approved Nov 1984; Completed May 1988.

### STUDY OF HIGH ENERGY DENSITIES OVER EXTENDED NUCLEAR VOLUMES VIA NUCLEUS-NUCLEUS COLLISIONS AT THE SPS

HELIOS COLLABORATION

BARI U - N Armenise, M T Muciaccia

CERN - T Akesson, U Goerlach

UNIVERSITY COLL, DUBLIN - A Breslin, A Montwill

HEIDELBERG U, PHYS INST - H W Bartels, A Drees, V Kroh,  
H J Specht

JAPAN U GROUP COLLAB - K Chiba, T Hayashino,  
K Hoshino, M Kazuno, K Kodama, Y Maeda, K Niu, K Niwa,  
M Ohashi, M Okabe, Y Sato, S Tasaka, M Teranaka, I Tezuka,  
M Ushida, J Yokota

LOS ALAMOS - H van Hecke, B Jacak, J W Sunier

LUND U - R Haglund

MCGILL U - A Angelis, F Lamarche, C Leroy

MONTREAL U - G Beaudoin, J M Beaulieu, L A Hamel,

L Lessard, A Lounis, P Taras

LEBEDEV INST - I Gavrilenko, S Mayburov, A Shmeleva

MOSCOW PHYS ENG INST - B Dolgoshein, V Kantserov,  
A Sumarokov

PITTSBURGH U - M Murray

ROME U & INFN, ROME - G Baroni, S Dell'Uomo, S Diliberto,  
G Rosa, C Sgarbi

SACLAY - A Gaidot, G W London (✓ Spokesperson),

J P Pansart, G Vasseur

STOCKHOLM U - B Erlandsson

TURIN U & INFN, TURIN - V Bisi, F Martelli, A Marzari-

Chiesa, M Masera, L Ramello, L Riccati

WEIZMANN INST - I Blevis, Z Fraenkel

SALERNO U - G Romano

Accelerator CERN-SPS Detector HELIOS

### Reactions

$^{16}\text{O}$  nucleus 200 GeV/c ( $P_{\text{lab}}/N$ )

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

$p$  nucleus 450 GeV/c

Comments Uses disk targets or a multiwire active target and combines  $4\pi$  calorimeter coverage with measurements, in restricted rapidity regions, of charged particle multiplicity, inclusive identified particle spectra, 2-particle correlations, low- and high-mass muon pairs, and photons. The disk targets are Al, Ag, W, Pt, Pb, and U. The target wires are aluminum, silver, and tungsten. Data analysis in progress (April 92).

Papers NIM A262 (1987) 243, IEEE TNS 35 (1988) 432, EPL 6 (1988) 131, ZPHY C38 (1988) 15, ZPHY C38 (1988) 59, ZPHY C38 (1988) 73, ZPHY C38 (1988) 85, ZPHY C38 (1988) 383, ZPHY C38 (1988) 397, PL B214 (1988) 295, NIM A283 (1989) 762, PL B252 (1990) 303, ZPHY C46 (1990) 361, ZPHY C46 (1990) 369, NP B333 (1990) 48, NP B342 (1990) 279, ZPHY C49 (1991) 355, ZPHY C52 (1991) 219, NP B353 (1991) 1, and ZPHY C53 (1992) 183.

**CERN-NA-034-3** (1988) Approved Nov 1988; Started Jun 1990; Completed Aug 1990.

### MEASUREMENT OF LOW MASS MUON PAIRS IN SULPHUR-NUCLEUS COLLISIONS WITH AN OPTIMIZED HELIOS MUON SPECTROMETER

HELIOS COLLABORATION

BARI U & INFN, BARI - G Catanesi, M Gallio, M T Muciaccia,  
S Simone

CERN - A L S Angelis, H Beker, S Dagan, M Esten, C W Fabjan,  
U Goerlach, G Poulard

KOSICE, IEF - J Antos, I Kralik, L Sandor, J Urban

MONTREAL U - M Beaulieu, L Hamel, J P Martin, P Taras

MOSCOW PHYS ENG INST - B Dolgoshein, S Smirnov

LEBEDEV INST - S Konovolov, S Muraviev, A Shmeleva

ROME U & INFN, ROME - S Di Liberto, M A Mazzoni,  
F Meddi, G Rosa

SACLAY - J Bystricky, C Guerra, G W London (✓ Spokesperson)

TURIN U & INFN, TURIN - P Cerello, G Dellacasa,

P Giubellino, F Martelli, M Masera, L Ramello, L Riccati,

E Scomparin, E Vercellin

Accelerator CERN-SPS Detector HELIOS

### Reactions

$\text{Su Wt} \rightarrow \mu^+ \mu^- X$  200 GeV/c ( $P_{\text{lab}}/N$ )

$\text{Su Wt} \rightarrow \mu^+ \mu^- X$  "

Comments Measures the low mass dimuon continuum and production of vector resonances in order to test the possible formation of a quark-gluon plasma in heavy ion collisions. Uses the HELIOS muon spectrometer in combination with a light absorber and silicon ring detectors. Data analysis in progress (April 92).

**CERN-NA-035** (1982) Approved Feb 1983, Nov 1984.

### STUDY OF RELATIVISTIC NUCLEUS-NUCLEUS COLLISIONS

ATHENS U - A Panagiotou, A Petridis, G Vasileiadis, M Vassiliou

BARI U - E Nappi, F Posa

CERN - G Paic

CRACOW - J Bartke, E Gladysz

DARMSTADT, GSI - R Bock, R Brockmann, B Fleischmann,

M Fuchs, A Sandoval

FRANKFURT U - H Appelshaeuser, J Eschke, W Heck,

S Kabana, A Kuehnel, M Lahanas, J Y Lee, S Margetis,

R Renfordt, D Roehrich, G Roland, H Rothardt, E Schmidt,

I Schneider, R Sendelbach, R Stock, H Stroebel, S Wenig

## SUMMARIES OF CERN EXPERIMENTS

FREIBURG U - J Baechler, M Hoffmann, K Runge,  
E Schmoetten  
LBL - M Bloomer, S Chase, J Harris, P Jacobs, R Morse,  
G Odyniec, A Poskanzer, G Rai, J Schambach, L Teitelbaum,  
S Tonne

MARBURG U - A Pieper, F Puehlofer  
MUNICH, MAX PLANCK INST - I Derado, V Eckardt,  
H Fessler, M Kowalki, W Rauch, N Schmitz, J Seyboth,  
P Seyboth (✓ Spokesperson), J Seyerlein  
WARSAW, INST NUCL STUDIES - H Bialkowska  
WARSAW U, IEP - M Gazdzicki, J Kosiec, E Skrzypczak  
WASHINGTON U, SEATTLE - W J Braitwaite, J G Cramer,  
T A Trainor, X Zhu  
BOSKOVIC INST, ZAGREB - P Bunčić, D Ferenc, K Kadija,  
A Ljubičić, D Vranić

Accelerator CERN-SPS Detector Streamer chamber, TPC,  
Calorimeter

### Reactions

$p$ nucleus	60, 200 GeV ( $T_{lab}$ )
$^{16}O$ nucleus	60, 200 GeV ( $T_{lab}/N$ )
$^{32}S$ nucleus	"

Comments Determines for each event the charged-particle multiplicity, the proton and pion rapidity distributions, the charged-pion transverse momentum distribution, 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 (April 92).

Papers PL B184 (1987) 271, NP A461 (1987) 465c, PL B203 (1988) 320, PL B205 (1988) 583, ZPHY C38 (1988) 19, ZPHY C38 (1988) 79, ZPHY C38 (1988) 89, ZPHY C38 (1988) 125, ZPHY C43 (1989) 25, ZPHY C48 (1990) 191, NP A525 (1991) 59c, NP A525 (1991) 221c, NP A525 (1991) 327c, NP A525 (1991) 689c, ZPHY C51 (1991) 157, and ZPHY C52 (1991) 239.

**CERN-NA-036** (Feb 1984) Approved Nov 1984; Completed Aug 1990.

### THE PRODUCTION OF STRANGE BARYONS AND ANTIBARYONS IN RELATIVISTIC ION COLLISIONS

BERGEN U - E Andersen, G Lovhoiden, T F Thorsteinsen  
BIRMINGHAM U - E Judd, J M Nelson, R Zybert  
CARNEGIE MELLON U - P D Barnes, G Diebold, G Franklin,  
B Quinn  
CERN - B Powell  
CRACOW - B Dulny, Z Natkaniec, I Sakrejda, K Wozniak  
CREIGHTON U - M Cherny

LBL - D Greiner (✓ Spokesperson), C R Gruhn, P G Jones  
MADRID, CIEMAT - B De la Cruz, P Ladrón de Guevara,  
C Perez de los Heros  
SANTIAGO DE COMPOSTELA U - C Fernandez, C Garabatos,  
J Garzon, S Lopez-Ponte, J Mosquera, M Plo, A Ramil, A Yanez  
STRASBOURG, CRN - H Braun, J M Brom, W M Geist,  
M Hafidouni, E Jegham, M Ladrem, M E Michalon-Mentzer,  
A Michalon, J L Riestner, C Voltolini  
VIENNA, OAW - J McNaughton, G Neuhofer, P Porth,  
H Rohringer, J Traxler  
YORK U, ENGLAND - J P M Kuipers

Accelerator CERN-SPS Detector TPC, Wire chamber,  
Calorimeter

### Reactions

$^{16}O$ nucleus $\rightarrow \Lambda X$	200 GeV/c ( $P_{lab}/N$ )
$^{16}O$ nucleus $\rightarrow \Xi X$	"
$^{16}O$ nucleus $\rightarrow \Omega^- X$	"
$^{16}O$ nucleus $\rightarrow K_S X$	"
$^{32}S$ nucleus $\rightarrow \Lambda X$	"
$^{32}S$ nucleus $\rightarrow \Xi X$	"
$^{32}S$ nucleus $\rightarrow \Omega^- X$	"
$^{32}S$ nucleus $\rightarrow K_S X$	"

Comments Measures differential cross sections of  $K^0$ 's and strange baryons and antibaryons as a possible indicator of the quark-gluon plasma. Targets are Al, Cu, Fe, Ag, and Pb. Data analysis in progress (April 92).

Papers NP A461 (1987) 391c, PL B206 (1988) 146, and PL B220 (1989) 328.

**CERN-NA-037** (Feb 1985) Approved Jun 1985; Completed Dec 1989.

### DETAILED MEASUREMENTS OF STRUCTURE FUNCTIONS FROM NUCLEONS AND NUCLEI

NIKHEF, AMSTERDAM - J Beaufays, R van Dantzig,  
M van der Heijden, M de Jong, T Ketel, G van Middelkoop  
(✓ Spokesperson)

BIELEFELD U - G Baum, F Sever, M Siebler  
FREIBURG U - A Bruell, H Engelin, R Kaiser, U Landgraf,  
A Witzmann  
HEIDELBERG, MAX PLANCK INST - I G Bird, W Brueckner,  
D von Harrach, E Kabuss, Y Mizuno, D Nowotny, B Povh,  
K Rith, C Scholz, T A Shibata, F Zetsche  
MAINZ U, INST PHYS - F Klein, G Mallot, R Rieger, T Walcher  
MONS U - R Windmolders  
NEUCHATEL U - C Broggin, L D Fluri, A Paić, D Schenker,  
J L Vuilleumier  
UC, SANTA CRUZ - C Heusch, F Lettenstrom  
PSI, VILLIGEN - M Botje, W Burger, J Domingo, Q Ingram,  
U Sennhauser  
TURIN U & INFN, TURIN - D Allasia, M Arneodo, M I Ferrero,  
C Mariotti, C Peroni-Predazzi, A Staiano  
UCLA - G Igo, S Trentalange, C Whitten  
UPPSALA U - A Arvidson, B Badelek, K Janson, S Kullander,  
T Lindqvist  
WARSAW U, IEP - J Ciborowski, J Nassalski, E Rondio,  
L Ropelewski, A Sandacz

Accelerator CERN-SPS Detector EMC

### Reactions

muon $p$	90, 120, 280 GeV/c
muon deut	"
muon nucleus	90, 120, 200, 280 GeV/c

Comments Studies the 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. Uses the modified EMC detector.

Papers PL B249 (1990) 366, PL B258 (1991) 493, PRL 66 (1991) 2712, ZPHY C51 (1991) 387, NP B371 (1992) 3, NP B371 (1992) 553, ZPHY C53 (1992) 73, and ZPHY C (accepted).

**CERN-NA-038** (Mar 1985) Approved Sep 1985, Feb 1989.

### STUDY OF HIGH-ENERGY NUCLEUS-NUCLEUS INTERACTIONS WITH THE ENLARGED NA10 DIMUON SPECTROMETER

ANNECY - C Baglin, A Bussiere, J P Guillaud, R Kossakowski,  
P Liaud  
CERN - P Sonderegger  
CLERMONT-FERRAND U - A Baldit, J Castor, T Chambon,  
A Devaux, J Fargeix, P Force, L Fredj, G Landaud, F Vazeille  
LISBON, LIFEP - M C Abreu, P Bordalo, R Ferreira, J M Gago,  
C Lourenco, L Peralta, S Ramos, S Silva, J Varela  
LYON, IPN - M Bedjidian, D Contardo, E Descroix, O Drapier,  
J Y Grossiord, A Guichard, R Haroutunian, J R Pizzi  
ORSAY, IPN - C Gerschel, D Jouan, S Papillon, X Tarrago  
ECOLE POLYTECHNIQUE - P Busson, C Charlot, B Chaurand,  
L Kluber (✓ Spokesperson), A Romana, R Salmeron  
STRASBOURG, CRN - P Gorodetzky, B Grosdidier, R Mazini,  
C Racca

Accelerator CERN-SPS Detector Spectrometer

### Reactions

$p$ $^{238}U \rightarrow \mu^+ \mu^- X$	200 GeV/c ( $P_{lab}/N$ )
$^{16}O$ $^{238}U \rightarrow \mu^+ \mu^- X$	"
$^{32}S$ $^{238}U \rightarrow \mu^+ \mu^- X$	"

Comments Aims to detect evidence for the quark-gluon plasma produced in collisions of ultrarelativistic ions on heavy nuclear targets. Signatures studied are thermal muon pairs in the 1-3



## SUMMARIES OF CERN EXPERIMENTS

GeV mass range, suppressed  $J/\psi$  production, and enhanced  $\phi$  and  $\omega$  production. Taking data (April 92).

Papers ZPHY C38 (1988) 117, ZPHY C38 (1988) 129, PL B220 (1989) 471, PL B251 (1990) 465, PL B251 (1990) 472, PL B255 (1991) 459, PL B262 (1991) 362, PL B268 (1991) 453, PL B270 (1991) 105, and PL B272 (1991) 449.

**CERN-NA-039** (Feb 1986) Approved Apr 1986; Completed Oct 1987.

### A SEARCH FOR QUARKS PRODUCED IN HEAVY-ION INTERACTIONS

UC, IRVINE - G Shaw (✓ Spokesperson)

LBL - H Matis, H Pugh

SAN FRANCISCO STATE U - G Alba, R Bland, D Calloway,

S Dickson, C Hodges, R Johnson, T Palmer, D Stricker

LOS ALAMOS - R Slansky

Accelerator CERN-SPS Detector Other

#### Reactions

$^{16}\text{O}$  Hg  $\rightarrow$  quark X 60, 200 GeV ( $T_{\text{lab}}/N$ )

Su Hg  $\rightarrow$  quark X 200 GeV ( $T_{\text{lab}}/N$ )

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.

Papers PL B232 (1989) 549, and NP A225 (1991) 513c.

**CERN-NA-040** (Feb 1986) Approved Apr 1986; Completed Oct 1987.

### 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 ( $P_{\text{lab}}/N$ )

$^{32}\text{S}$  nucleus 200 GeV/c ( $P_{\text{lab}}/N$ )

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.

Papers PRL 60 (1988) 999.

**CERN-NA-041** (Feb 1986) Approved Jun 1986; Completed Oct 1987.

### SEARCH FOR NUCLEI IN HEAVY ION COLLISIONS AT ULTRARELATIVISTIC ENERGIES

SACLAY - B Berthier, R Boisgard, C Cerruti, J M Hisleur,

J Julien, R Lucas, C Mazur, C Ngo (✓ Spokesperson), M Ribrag

Accelerator CERN-SPS Detector Counter

#### Reactions

$^{16}\text{O}$   $^{197}\text{Au}$   $\rightarrow$  nucleus X 60, 226 GeV ( $T_{\text{lab}}/N$ )

$^{32}\text{S}$  Au  $\rightarrow$  nucleus X 226 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 (multifragmentation of nuclei). Uses silicon telescopes to detect nuclei.

Papers PL B193 (1987) 417.

**CERN-NA-042** (Jul 1986) Approved Oct 1986; Completed May 1988.

### STUDY OF UNEXPLAINED HARD PHOTON PRODUCTION BY ELECTRONS CHANNLED IN A CRYSTAL

ANNÉCY - G Bologna, J Peigneux, D Sillou, M Spighel

LYON, IPN - X Artru, A Belkacem, M Chevallier, N Cue,

M J Gaillard, R Genre, R Kirsch, J C Poizat, J Remillieux

(✓ Spokesperson)

SUNY, ALBANY - N Cue, J C Kimball, B Marsh

Accelerator CERN-SPS Detector Counter, Calorimeter

#### Reactions

$e^\pm$  crystal  $\rightarrow \gamma(s)$   $e^\pm$  crystal 20-200 GeV/c

Comments Continues studies of CERN-NA-033. Devoted to the systematic study of radiation spectra and associated photon multiplicities for axially aligned  $e^-$  and  $e^+$  between 20 and 200 GeV in very thin (75-200  $\mu\text{m}$ ) targets.

Papers PL B206 (1988) 561.

**CERN-NA-043** (Sep 1987) Approved Feb 1988; Completed Sep 1991.

### INVESTIGATIONS OF THE ENERGY AND ANGULAR DEPENDENCE OF ULTRASHORT RADIATION LENGTHS IN Si, Ge, AND W SINGLE CRYSTALS

AARHUS U - K Elsener, R Medenwaldt, S P Moller,

A H Sorensen, S Tang-Petersen, E Uggerhoj (✓ Spokesperson)

STRASBOURG, CRN - P Siffert, J Stoqkurt

STUTTGART, MAX PLANCK INST - K Maier

FLORENCE U - P Sona

Accelerator CERN-SPS Detector Calorimeter

#### Reactions

$e^-$  crystal > 30 GeV/c

$e^+$  crystal "

Comments Following on CERN experiments NA-033 and WA-081, this experiment investigates the shower development in Si, Ge, and W crystals of different thickness for energies 30 GeV and up. The earlier experiments found remarkable enhancements in radiation energy loss for energetic  $e^\pm$  incident along crystal axes.

Papers PL B227 (1989) 483, PRL 63 (1989) 2827, PL B242 (1990) 517, and PL B260 (1991) 235.

**CERN-NA-043-2** (1991) Approved Feb 1991.

### INVESTIGATIONS OF THE COHERENT HARD PHOTON YIELDS FROM 50-300 GeV/c $e^\pm$ IN STRONG CRYSTALLINE FIELDS OF DIAMOND, Si, AND Ge CRYSTALS

AARHUS U - R Medenwaldt, S P Moller, A H Sorensen,

E Uggerhoj (✓ Spokesperson), T Worm

YEREVAN PHYS INST - R O Avakian, H I Avetisyan,

S P Tarorian

FLORENCE U & INFN, FLORENCE - P Sona

WITWATERSRAND U - S H Connell, J P F Sellschop

STRASBOURG, CRN - M Hage-Ali, P Siffert, J Stoquert

Accelerator CERN-SPS Detector Drift chamber, Spectrometer

#### Reactions

$e^-$  crystal 50 - 300 GeV/c

$e^+$  crystal "

Comments The aim is to measure the influence of strong fields on emission of coherent radiation. Multi-GeV electrons and positrons penetrate single crystals near axial/planar directions. Taking data (April 92).

**CERN-NA-044** (Oct 1988) Approved Feb 1989.

### A FOCUSING SPECTROMETER FOR ONE AND TWO PARTICLES

BROOKHAVEN - V Polychronakos, D Rahm

CERN - H W Atherton, K Bussmann, C W Fabjan, A Franz,

F Piuze, G Poulard, J M Rieubland, H Sletten, D Williams

COLUMBIA U - J R Dodd, M Leltchouk, S Nagamiya, H Tam,

W J Willis, T H Zhu

BOHR INST - H Boggild (✓ Spokesperson), J Bondorf, K Hansen

CREIGHTON U - M Cherney, J Downing

HIROSHIMA U - S Esumi, T Ikemoto, N Maeda, S Nishimura,

A Sakaguchi, T Sugitate, Y Sumi

KEK - T Kobayashi, K Shigaki

## SUMMARIES OF CERN EXPERIMENTS

LOS ALAMOS - J Boissevain, H van Hecke, B Jacak, M Murray,  
M Sarabura, J Simon-Gillo, W Sondheim, J Sullivan  
LUND U - B Lorstad, A Miyabayashi  
PITTSBURGH U - T J Humanic, H Kalechofsky, Y Y Lee,  
S Pandey

Accelerator CERN-SPS Detector Spectrometer

### Reactions

$p \text{ Be} \rightarrow \pi^\pm X$	450 GeV ( $T_{\text{lab}}$ )
$p \text{ Be} \rightarrow K^\pm X$	"
$p \text{ Be} \rightarrow p X$	"
$p \text{ Be} \rightarrow \bar{p} X$	"
$p \text{ Su} \rightarrow \pi^\pm X$	"
$p \text{ Su} \rightarrow K^\pm X$	"
$p \text{ Su} \rightarrow p X$	"
$p \text{ Su} \rightarrow \bar{p} X$	"
$p \text{ Pb} \rightarrow \pi^\pm X$	"
$p \text{ Pb} \rightarrow K^\pm X$	"
$p \text{ Pb} \rightarrow p X$	"
$p \text{ Pb} \rightarrow \bar{p} X$	"
$\text{Su Su} \rightarrow \pi^+ \pi^- X$	200 GeV ( $T_{\text{lab}}/N$ )
$\text{Su Su} \rightarrow K^+ K^+ X$	"
$\text{Su Su} \rightarrow K^- K^- X$	"
$\text{Su Su} \rightarrow p p X$	"
$\text{Su Su} \rightarrow \bar{p} \bar{p} X$	"
$\text{Su Ag} \rightarrow \pi^+ \pi^- X$	"
$\text{Su Ag} \rightarrow K^+ K^+ X$	"
$\text{Su Ag} \rightarrow K^- K^- X$	"
$\text{Su Ag} \rightarrow p p X$	"
$\text{Su Ag} \rightarrow \bar{p} \bar{p} X$	"
$\text{Su Pb} \rightarrow \pi^+ \pi^- X$	"
$\text{Su Pb} \rightarrow K^+ K^+ X$	"
$\text{Su Pb} \rightarrow K^- K^- X$	"
$\text{Su Pb} \rightarrow p p X$	"
$\text{Su Pb} \rightarrow \bar{p} \bar{p} X$	"
$\text{Pb Pb} \rightarrow \pi^+ \pi^- X$	"
$\text{Pb Pb} \rightarrow K^+ K^+ X$	"
$\text{Pb Pb} \rightarrow K^- K^- X$	"
$\text{Pb Pb} \rightarrow p p X$	"
$\text{Pb Pb} \rightarrow \bar{p} \bar{p} X$	"

Comments A dedicated spectrometer for high precision measurements of single particle spectra and for intensity interferometry in hadronic systems of high energy density using hadrons and heavy ions. Taking data (April 92).

**CERN-NA-045** (Jun 1988) Approved Feb 1989.

### STUDY OF ELECTRON PAIR PRODUCTION IN HADRON AND NUCLEAR COLLISIONS AT THE CERN SPS

CERES COLLABORATION

BROOKHAVEN - P Holl, J Kemmer, P Rehak

CERN - J Schukraft

HEIDELBERG, MAX PLANCK INST - U Faschingbauer,  
J P Wurm

HEIDELBERG U, PHYS INST - R Baur, A Drees, P Fischer,  
J Frieben, P Glaessel, T Guenzel, D Irmscher, H Klein,  
R Maenner, L H Olsen, A Pfeiffer, A Schoen, H J Specht

( $\checkmark$  Spokesperson), S Tapprogge, T S Ullrich

MILAN POLYTECHNIC - E Gatti, A Longoni, M Sampietro  
WEIZMANN INST - A Breskin, R Chechik, Z Fraenkel, A Shor,  
V Steiner, G Tel-Zur, I Tserruya

Accelerator CERN-SPS Detector Spectrometer

### Reactions

$p \text{ nucleus} \rightarrow e^+ e^- X$	60, 200 GeV/c ( $P_{\text{lab}}/N$ )
$^{32}\text{S} \text{ nucleus} \rightarrow e^+ e^- X$	"

Particles studied  $\rho, \omega, \phi$

Comments Studies the  $e^+e^-$  pair continuum in the mass range 0.1-3 GeV and the vector mesons. Also can study production of

real photons and high- $p_{\perp}$  pions. Uses a magnetic spectrometer based solely on ring-imaging Čerenkov (RICH) techniques. Taking data (April 92).

**CERN-NA-046** (Oct 1988) Approved Apr 1989; Completed Jul 1991.

### DARMSTADTON HUNTING IN THE INTERACTION $\gamma$ -CRYSTAL

ANNECY - G Bassompierre, D Boget, J Dufournaud,  
M Gouanere, M Richard, D Sillou, M Spighel  
LYON, IPN - M A Chevallier ( $\checkmark$  Spokesperson), B Farizon-Mazuy,  
M Farizon, M J Gaillard, R Genre, B Ille, R Kirsch, P Lautesse  
TURIN U & INFN, TURIN - G Bologna, E Botta, S Costa,  
A Feliciello, R Garfagnini, E Rossetta

Accelerator CERN-SPS Detector Calorimeter, Microstrip

### Reactions

$\gamma \text{ crystal} \rightarrow e^+ e^- X$  —

Particles studied axion, neutral

Comments A search for evidence of the "darmstadton" at 1.8 MeV mass in the  $e^+e^-$  spectrum. The  $\gamma$  beam is obtained from a 150 GeV  $e^-$  beam. The angular measurements are performed by a microstrip detector at a large distance ( $\approx 80$  m) from the target. Energy measurements are done by magnetic analysis and independently with lead glass calorimeters.

**CERN-NA-047** (Dec 1988) Approved Apr 1989; Started Aug 1991.

### MEASUREMENT OF THE SPIN-DEPENDENT STRUCTURE FUNCTIONS OF THE NEUTRON AND PROTON SPIN MUON COLLABORATION (SMC)

NIKHEF, AMSTERDAM - M Ballintijn, R van Dantzig,  
M de Jong, T J Ketel, L Klostermann, G van Middelkoop,  
J E J Oberski, F Sever

BIELEFELD U - G Baum, S Bueltmann, W Thiel  
CERN - P Hautle, T O Niinikoski, J M Rieubland, R Voss  
DELFT UNIV TECH - H Postma

DUBNA - I A Golutvin, M Kadykov, A Karev, I U T Kiryushin,  
Y Kisselev, V Krivokhizhin, V Kukhtin, B Neganov,  
D Peshekhonov, D Pose, A Prokesh, I Savin, S Sergeev,  
G Smirnov, Y Yatsunenko

FREIBURG U - A Bruell, H Engelen, R Kaiser, H J Kessler,  
U Landgraf, A Witzmann

GKSS, GEESTHACHT - W Knopp, H Stuhmann, R Wagner  
HELSINKI U OF TECH - P Berglund, J Kyynaeräinen  
HOUSTON U - K Lau, B Mayes, L Pinsky, J Pyrlík, D Sanders,  
Y Tzamouranis, R Weinstein

UCLA - C Dulya, M Grosse-Perdekamp, G Igo, S Trentalange,  
C Whitten

MAINZ U, INST KERNPHYS - D von Harrach, E M Kabuss,  
G K Mallot, R Seitz

MONS U - R Windmolders

MUNICH U, EXP PHYS - L Betev, C Heusch, U Meyer-  
Berkhout, A Staude

NAGOYA U - T Hasegawa, N Hayashi, N Horikawa, S Ishimoto,  
T Iwata, A Kishi, S Okumi

NORTHEASTERN U - E von Goeler, J Moromisato

RICE U - D L Adams, A Ahmad, B E Bonner, J Buchanan,  
J Clement, M D Corcoran, J Cranshaw, S Eichblatt,

T Gaussiran, M Lowe, H E Miettinen, G S Mutchler,  
J B Roberts

SACLAY - G Bardin, I G Bird, N de Botton, J Bystricky,  
C Cavata, J C Faivre, F Feinstein, B Frois, F Lehar,

A de Lesquen, A Magnon, F Marie, J Martino, F Perrot-Kunne,  
S Platchkov, T Pussieux

SANTIAGO DE COMPOSTELA U - B Adeva, C Fernandez,  
C Garabatos, J A Garzon, A Gomez, S Lopez-Ponte, M Plo,  
M Rodriguez, A Yanez

TEL AVIV U - J Lichtenstadt, I Sabo

TRIESTE U & INFN, TRIESTE - R Birsa, F Bradamante,  
M Giorgi, M Lamanna, A Martin, A Penzo, G Salvato,

P Schiavon, F Tessarotto, S Dalla Torre, A Villari, A M Zanetti

UPPSALA U - A Arvidson, P Bjorkholm, A Dyring, S Kullander,  
T Lindqvist

VIRGINIA U - J P Chen, D Crabb, D Day, J McCarthy,  
J Mitchell, O Rondon

## SUMMARIES OF CERN EXPERIMENTS

WARSAW, INST NUCL STUDIES – J Nassalski, A Sandacz  
 WARSAW U – B Badelek, E Rondio, L Ropelewski  
 YALE U – M Boutemur, S Dhawan, V W Hughes  
 (✓ Spokesperson), R Piegai, P Schueler

Accelerator CERN-SPS Detector EMC

Reactions Polarized beam and target  
 muon  $p \rightarrow$  muon X 100 – 200 GeV ( $E_{lab}$ )  
 muon deut  $\rightarrow$  muon X "

Comments Measures the spin-dependent asymmetries  $A_1$  and  $A_2$  in deep inelastic scattering of longitudinally polarized muons by longitudinally and transversely polarized protons and deuterons. It is similar to the EMC polarization experiment. Tests the nucleus structure models. Next data taking scheduled for May 92.

**CERN-NA-048** Approved Nov 1991.

**A PRECISION MEASUREMENT OF  $\epsilon'/\epsilon$  IN CP-VIOLATING  $K^0 \rightarrow 2\pi$  DECAYS**

CAGLIARI U & INFN, CAGLIARI – A Lai, L Musa, A Nappi, M G Setzu  
 CAMBRIDGE U – R S DeWolf, P A Elcombe, D J Munday, M A Parker, T O White  
 CERN – G D Barr, P Buchholz, D Cundy, N Doble, L Gatignon, A Gonidec, P Grafstroem, G Kessler, A Norton, D Schinzel, H Taureg, H Wahl  
 DUBNA – D Ebert, A M Kalinin, V D Kekelidze, D A Kirilov, Y A Kozhevnikov, N A Kuz'min, A V Pose  
 EDINBURGH U – N McKay, K J Peach, E Veitch, L L J Vick, A Walker  
 FERRARA U & INFN, FERRARA – D Bettoni, R Calabrese, P Dalpiaz, P F Dalpiaz, J Duclos, E Luppi, M Martini, F Petrucci, L Piemontese, M Savvie  
 MAINZ, MAX PLANCK INST – T Beier, H Bluemer, K Kleinknecht, F Leber, P Mayer, B Renk, H Rohrer, J Staeck, A Wagner  
 PERUGIA U & INFN, PERUGIA – M Calvetti, P Cenci, P Lariccia, P Lubrano, F Tondini  
 PISA U & INFN, PISA – L Bertanza, A Bigi, P Calafiura, R Carosi, M C Carozza, C Cerri, R Fantechi, I Mannelli, V Marzulli, G M Pierazzini  
 SACLAY – J Alitti, M De Beer, J Cheze, P Debu, A Migliori, B Peyaud (✓ Spokesperson), B Vallage, J Zsembery  
 SIEGEN U – M Bender, M Holder, A Kreutz, M Rost, W Weish, R Werthenbach  
 TURIN U & INFN, TURIN – C Biino, A Ceccucci, R Cester, F Marchetto, E Menichetti, R Mussa, S Palestini, N Pastrone, L Pesando, M Sozzi  
 VIENNA, OAW – E Griesmayer, M Markytan, G Neuhofer, M Pernicka, A Taurak, C E Wulz

Accelerator CERN-SPS Detector Calorimeter, Spectrometer

Comments The experiment uses two nearly collinear  $K_S$  and  $K_L$  beams produced concurrently which are distinguished by tagging the protons generating the  $K_S$  component. The detector is optimized for the detection of  $\pi^+\pi^-$  and  $\pi^0\pi^0$  final states from neutral kaons with momenta between 70 and 170 GeV/c. Charged decays are measured in a magnetic spectrometer with a central dipole magnet and two sets of large and high-precision drift chambers on each side. Neutral decays are recorded in a homogeneous liquid krypton calorimeter designed for high rate capability, good energy and space resolution, and sub-nanosecond time resolution. This configuration permits collecting simultaneously all four modes with minimal systematic error. In preparation. Scheduled to run in 1994.

**CERN-NA-049** Approved Sep 1991.

**LARGE ACCEPTANCE HADRON DETECTOR FOR AN INVESTIGATION OF Pb-INDUCED REACTIONS AT THE CERN SPS**

ATHENS U – A Panagiotou, A Petridis, G Vasileiadis, M Vassiliou  
 BUDAPEST, CRIP – L Boroczky, S Hegyi, I Szentpetery, J Sziklai, G Vesztergombi, J Zimanyi  
 CERN – H G Fischer, G Paic  
 CRACOW – J Bartke, E Gladysz, M Kowalski, P Stefanski

DARMSTADT, GSI – R Bock, R Brockmann, B Fleischmann, M Fuchs, M Wensveen  
 FRANKFURT U – J Eschke, S Kabana, A Kuehmichel, M Lahanas, J Y Lee, S Margetis, R Renfordt, D Roehrich, G Roland, H Rothard, E Schmidt, I Schneider, R Stock (Spokesperson), H Stroebel, S Wenig  
 FREIBURG U – J Baechler, M Hoffmann, K Runge, E Schmoetten  
 LBL – M Bloomer, S Chase, J Harris, P Jacobs, P Jones, R Morse, G Odyniec, A M Poskanzer, H Ritter, J Schambach, L Teitelbaum  
 MARBURG U – F Eckhardt, V Manske, A Piper, F Puehlhofer  
 MUNICH, MAX PLANCK INST – I Derado, V Eckardt, H Fessler, W Rauch, N Schmitz, J Seyboth, P Seyboth, J Seyerlein  
 WARSAW, INST NUCL STUDIES – H Bialkowska  
 WARSAW U – W Dominik, M Gazdzicki, J Kosiec, E Skrzypczak  
 WASHINGTON U, SEATTLE – W J Braitwaite, J Cramer, T Trainor, X Zhu  
 BOSKOVIC INST, ZAGREB – P Bunčić, D Ferenc, K Kadija, A Ljubičić, D Vranić

Accelerator CERN-SPS Detector TPC

Reactions Pb nucleus —

Comments A study of the production of charged hadrons  $\pi^\pm, K^\pm, p, \bar{p}$ , and neutral strange particles  $K_S^0, \Lambda, \bar{\Lambda}$ , in a search for the deconfinement transition predicted by lattice QCD. Uses a large volume, fine granularity TPC, and two intermediate size TPC's for vertex tracking of neutral strange particle decays. In preparation (March 92).

**CERN-NA-050** Approved Feb 1992.

**STUDY OF MUON PAIRS AND VECTOR MESONS PRODUCED IN HIGH ENERGY Pb-Pb INTERACTIONS**

ANNECY – C Baglin, A Bussiere, J P Guillaud, R Kossakowski, P Liaud  
 CERN – P Sonderegger (✓ Spokesperson)  
 CLERMONT-FERRAND U – A Baldit, C Barriere, J Castor, T Chambon, A Devaux, B Espagnon, J Fargeix, P Force, L Fredj, G Landaud, F Vazeille  
 LISBON, LIFEP – M C Abreu, P Bordalo, R Ferreira, J Gago, C Lourenco, L Peralta, S Ramos, S Silva, J Varela  
 ORSAY, IPN – C Gerschel, D Jouan, X Tarrago  
 ECOLE POLYTECHNIQUE – B Chaurand, L Kluberg (✓ Spokesperson), A Romana  
 STRASBOURG, CRN – P Gorodetzky, B Gorsdidier, D Lazic, R Mazini, C Racca  
 TURIN U & INFN, TURIN – V Bisi, P Cerello, E Chiavassa, W Dabrowski, G Dellacasa, F Ferrero, M Gallio, P Giubellino, P Guaita, N De Marco, F Martelli, A Marzari, M Masera, A Musso, A Piccotti, L Ramello, L Riccati, S Sartori, E Scomparin, E Vercellin

Accelerator CERN-SPS Detector Calorimeter, Spectrometer

Reactions Pb nucleus —

Comments Studies dimuons produced in Pb-Pb and other ion collisions at the nucleon-nucleon c.m. energy of 18 GeV. The setup is optimized for the range which includes both signals probing QGP (Quark and Gluon Plasma), and Drell-Yan dimuons. The detector is an improved version of the NA-038 setup, with the beam traversing the muon spectrometer. In preparation (April 92).

**CERN-PS-170** (Aug 1980) Approved Nov 1980, Feb 1987; Completed Aug 1988.

**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 Savvie  
 PADUA U – R Carlin, U Dosselli, F Gasparini, S Limentani, M Posocco, R Stroili, C Voci

## SUMMARIES OF CERN EXPERIMENTS

SACLAY - G Bardin, G Burgun, J Derre, J Duclos, J L Faure,  
M Huet, C Kochowsky, G Marel, N Zekri  
FRASCATI - G Capon  
TURIN U - L Tecchio  
CERN - E Mazzucato

Accelerator CERN-LEAR 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  $\nu$ meson<sup>0</sup>

Comments The first reaction is for the form factors, the second is for the vector meson ( $\rightarrow e^+ e^-$ ) mass spectrum from 1.0-1.7 GeV.

Papers NIM A259 (1987) 376, PL B192 (1987) 471, PL B195 (1987) 292, NP (Proc. Suppl.) B8 (1989) 203, and PL B257 (1991) 514.

**CERN-PS-171** (Aug 1980) Approved Nov 1980; Completed Jul 1986.

**A STUDY OF  $\bar{p}p$  INTERACTIONS AT REST IN AN H<sub>2</sub> GAS TARGET AT LEAR**

ASTERIX COLLABORATION

CERN - R Armenteros, D Bailey, J Butler, U Gastaldi, R Landua  
MAINZ U, INST PHYS - K D Duch, M Heel, H Kalinowsky,  
F Kayser, E Klempt ( $\checkmark$  Spokesperson), B May, J Reifenroether,  
M Ziegler

MUNICH U, EXP PHYS - W Dahme, F Feld, U Schaefer  
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 Truoel

GENEVA U - C Sabev

Accelerator CERN-LEAR Detector Combination

Reactions

$\bar{p} p \rightarrow \bar{p} p$ X-ray	0 GeV/c
$\bar{p} p \rightarrow$ annihil	"
$\bar{p} p \rightarrow \pi^+ \pi^-$	"
$\bar{p} p \rightarrow K^0 \bar{K}^0$	"
$\bar{p} p \rightarrow K^+ K^-$	"
$\bar{p} p \rightarrow K^+ K^- \pi^0$	"
$\bar{p} p \rightarrow K^+ K^- \eta$	"
$\bar{p} p \rightarrow K^+ K^- \omega$	"
$\bar{p} p \rightarrow$ pions ( $\gamma$ )	"
$\bar{p} p \rightarrow \pi^+ \pi^- \pi^0$	"
$\bar{p} p \rightarrow \pi^+ \pi^- K^+ K^-$	"
$\bar{p} p \rightarrow \pi^+ \pi^- \eta$	"
$\bar{p} p \rightarrow \pi^+ \pi^- \eta'$	"

Particles studied baryonium, exotic-meson, glueball,  $\eta(1440)$ ,  $f_2'(1525)$

Comments A final paper in preparation (April 92).

Papers NIM 217 (1983) 169, PL B152 (1985) 135, PL B157 (1985) 333, PL B206 (1988) 151, PL B214 (1988) 325, PL B215 (1988) 792, NP A486 (1988) 493, PL B225 (1989) 450, ZPHY C45 (1989) 223, PR C40 (1989) 2717, NP A495 (1989) 451, NIM A286 (1990) 76, ZPHY C46 (1990) 191, ZPHY C46 (1990) 203, ZPHY C47 (1990) 353, NP A508 (1990) 317c, and PL B267 (1991) 299.

**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 - K Bos, J Kluyver, R A Kunne,  
L Linssen  
GENEVA U - E Heer, R Hess, C Lechanoine-LeLuc, Y Onel,  
D Rapin

QUEEN MARY - WESTFIELD COLL - D Bugg

( $\checkmark$  Spokesperson), J Hall

SURREY U - A S Clough

TRIESTE U & INFN, TRIESTE - R Birsa, F Bradamante,  
A Martin, A Penzo, P Schiavon, S Dalla Torre, A Villari

Accelerator CERN-LEAR Detector Wire chamber

Reactions Polarized target

$\bar{p} p \rightarrow \pi^+ \pi^-$	300-1550 MeV/c
$\bar{p} p \rightarrow K^+ K^-$	"
$\bar{p} p \rightarrow \bar{p} p$	"
$\bar{p} p \rightarrow X$	220-800 MeV/c
$\bar{p} p \rightarrow$ neutrals	"

Particles studied baryonium

Papers PL B146 (1984) 299, PL B155 (1985) 437, PL B194 (1987) 563, NP A469 (1987) 726, PL B206 (1988) 557, NP A487 (1988) 563, NP A505 (1989) 595, NP B323 (1989) 1, PL B261 (1991) 191, and NP B (accepted). No other papers expected.

**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 Brueckner,  
H Dobbeling, 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 - T Walcher ( $\checkmark$  Spokesperson)

RUTGERS U - R Ransome

Accelerator CERN-LEAR Detector Combination

Reactions

$\bar{p} p \rightarrow \bar{p} p$	150-600 MeV/c
$\bar{p} p \rightarrow \bar{n} n$	"
$\bar{p} p \rightarrow$ annihil	"
$\bar{p} p \rightarrow X$	"

Particles studied baryonium

Comments A search for baryonium and a measurement of differential cross sections.

Papers PL B158 (1985) 180, PL B166 (1986) 113, PL B169 (1986) 302, PL B189 (1987) 232, PL B197 (1987) 463, NIM A269 (1988) 527, NP A478 (1988) 623c, ZPHY A335 (1990) 217, ZPHY A339 (1991) 367, and ZPHY A339 (1991) 379.

**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 ( $\checkmark$  Spokesperson), J Lowe,

J M Nelson, G J Pyle, A Selvarajah, G T A Squier

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

$\bar{p} p \rightarrow \bar{p} p$ X-ray	0 MeV/c
$\bar{p} deut \rightarrow \bar{p} deut$ X-ray	"

Comments The detector is a Si(Li) crystal. Uses gas targets. Measurements are made at several gas pressures.

Papers PL B145 (1984) 319, PL B162 (1985) 71, NP A483 (1988) 631, NP A486 (1988) 604, and NP A494 (1989) 507. No other papers expected.

## SUMMARIES OF CERN EXPERIMENTS

**CERN-PS-175** (1980) Approved Dec 1980, Jun 1987;  
Completed Oct 1988.

### MEASUREMENT OF THE ANTIPROTONIC LYMAN AND BALMER X-RAYS OF $\bar{p}$ H AND $\bar{p}$ d ATOMS AT VERY LOW TARGET PRESSURES

CERN - K Elsener  
KERNFORSCHUNGSANLAGE, JULICH - D Gotta  
KERNFORSCHUNGSZENTRUM, KARLSRUHE &  
KARLSRUHE U - P Bluem, K Heitlinger  
PSI, VILLIGEN - R Bacher, A Badertscher, J Egger, E Moren-  
zoni, L M Simons (✓ Spokesperson)

Accelerator CERN-LEAR Detector Photon spectrometer

#### Reactions

$\bar{p} p \rightarrow \bar{p} p$ X-ray	0 GeV/c
$\bar{p}$ deut $\rightarrow \bar{p}$ deut X-ray	"
$\bar{p}$ $^3\text{He} \rightarrow \bar{p}$ $^3\text{He}$ X-ray	"
$\bar{p}$ He $\rightarrow \bar{p}$ He X-ray	"

Comments The 5 MeV antiprotons from LEAR are stopped in the cyclotron trap. X-rays are detected in Si(Li) crystals.

Papers PS T22 (1988) 90, ZPHY A334 (1989) 93, ZPHY A338 (1991) 217, and ZPHY A (accepted). No other papers expected.

**CERN-PS-177** (Jul 1980) Approved Dec 1980, Jun 1987;  
Completed Nov 1988.

### STUDY OF THE FISSION DECAY OF HEAVY HYPERNUCLEI

CEBAF - J Mougey  
DARMSTADT, GSI - S M Polikanov  
GRENOBLE, CEN - M Maurel, E Monnard, P Perrin, C Ristori  
GRENOBLE U - J P Bocquet, H Nifenecker, M Rey-Campagnolle  
(✓ Spokesperson)  
PENN STATE U - T A Armstrong, R A Lewis, J Passaneau,  
G A Smith  
UPPSALA U - G Ericsson, T Johansson, G Tibell  
WARSAW U, IEP - T Krogulski

Accelerator CERN-LEAR Detector Wire chamber

#### Reactions

$\bar{p}$ nucleus	0 GeV/c
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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, and a  $K^-$  then occasionally interacts to produce a  $\Lambda$  which sticks to the nucleus, forming a hypernucleus. This is an extension of the original PS-177, running to disentangle the two processes quoted above and thus increase the accuracy of the lifetime measurements, and to add a strangeness signature.

Papers PL B182 (1986) 146, PL B192 (1987) 312, NC 102A (1989) 653, NP A531 (1991) 539, and ZPHY A (accepted).

**CERN-PS-178** (Aug 1980) Approved Dec 1980; Completed Aug 1986.

### $\bar{n}$ PRODUCTION AT LEAR

CAGLIARI U - L Cugusi, M P Macciotta, S Marcello, A Masoni,  
G Puddu, S Serci  
PADUA U - M Morandin, R A Ricci, C Voci  
TURIN U - T Bressani (Spokesperson), E Chiavassa, S Costa,  
G Dellacasa, 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
$\bar{n}$ Fe $\rightarrow$ pions X	"
$\bar{n}$ C $\rightarrow \bar{p}$ $^{12}\text{N}$	"
$\bar{n}$ Al $\rightarrow \bar{p}$ Si	"
$\bar{n}$ Cu $\rightarrow \bar{p}$ Zn	"
$\bar{n}$ Pb $\rightarrow \bar{p}$ Bi	"

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. Studies the charge-exchange reaction at  $0^\circ$  in nuclei versus the mass number, measures  $\bar{n}$  annihilation in iron versus the  $\bar{n}$  momentum to compare with the analogous  $\bar{p}$  reaction, and measures the charged-pion multiplicity distribution in the annihilation at low energy.

Papers IEEE TNS 32 (1985) 733, IEEE TNS 33 (1986) 374, EPL 2 (1986) 587, NIM A270 (1988) 354, and EPL 7 (1988) 13.

**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 Panziera, G Piragino  
(Spokesperson), F Tosello

Accelerator CERN-LEAR Detector Streamer chamber

#### Reactions

$\bar{p} p$	0-200 MeV/c
$\bar{p}$ deut	"
$\bar{p}$ $^3\text{He}$	"
$\bar{p}$ He	0-600 MeV/c
$\bar{p}$ Ne	"

Papers NIM 188 (1981) 69, RNC 5 (1982) NO. 10, LNC 38 (1983) 83, LNC 38 (1983) 211, NIM 222 (1984) 524, LNC 41 (1984) 223, PL B149 (1984) 69, NC 79A (1984) 193, NIM A234 (1985) 30, PL B165 (1985) 265, EPL 2 (1986) 115, NP A452 (1986) 573, NIM A257 (1987) 114, PL B194 (1987) 192, PL B194 (1987) 343, NP A465 (1987) 714, NP A469 (1987) 669, NP A474 (1987) 651, NC 100A (1988) 323, PL B217 (1989) 43, PL B230 (1989) 36, NP A491 (1989) 541, NP A491 (1989) 572, PS 42 (1990) 263, and NP A526 (1991) 415.

**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, R Rickenbach,  
A Schopper, L Tauscher (Spokesperson)  
STOCKHOLM, RES INST ATOMIC PHYS - L Adiels,  
I Bergstrom, A Kerek  
THESSALONIKI U - S Charalambous, D Hadjifotiadou,  
K Papastefanou, K Zioutas  
CERN - P Pavlopoulos, D Troester

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, meson<sup>0</sup>

Comments Measures inclusive spectra of  $\pi^0$ 's and  $\eta$ 's to search for new mesons. Uses high-resolution  $\gamma$  detectors, as well as scintillators for charged particles.

Papers NIM A244 (1986) 380, PL B182 (1986) 405, ZPHY C35 (1987) 15, and ZPHY C42 (1989) 49.

## SUMMARIES OF CERN EXPERIMENTS

**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 Papaalias, H Rozaki, L Sakelliou, M Spyropoulou-Stassinaki  
 UC, IRVINE – M Fero, M Y Gee, N Graf, M A Mandelkern, R Ray, J Schultz, T Usher  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U – G Bueche, H Koch, W Rohrbach, D Walther  
 NEW MEXICO U – B Bassalleck, N Komminos, D M Wolfe  
 PENN STATE U – T A Armstrong, R A Lewis, S M Player, G A Smith ( $\checkmark$  Spokesperson), M Soulliere

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 NIM A236 (1985) 354, PL B159 (1985) 210, PL B178 (1986) 441, PL B205 (1988) 590, PL B212 (1988) 129, ZPHY A331 (1988) 519, ZPHY A332 (1989) 467, NP (Proc. Suppl.) B8 (1989) 54, NP (Proc. Suppl.) B8 (1989) 238, ZPHY A336 (1990) 461, PR D44 (1991) 1945, and ZPHY A (accepted).

**CERN-PS-185** (Aug 1981) Approved Oct 1981, Feb 1987.

**STUDY OF THRESHOLD PRODUCTION OF  $\bar{p}p \rightarrow \bar{Y}Y$  AT LEAR**

CARNEGIE MELLON U – P D Barnes, G Franklin, C Maher, B Quinn, M Rozon, R Schumacher, V Zeps  
 CERN – N Hamann, S Ohlsson  
 ERLANGEN U – W Eyrich, M Kirsch, R Kraft, F Stinzing  
 FREIBURG U – P Birien, W Dutty, H Fischer, J Franz, J Kuipers, E Roessle, H Schmitt, R Todenhagen, H Urban  
 ILLINOIS U, URBANA – R A Eisenstein, P Harris, D Hertzog, R Tayloe  
 KERNFORSCHUNGSANLAGE, JULICH – G Decker, K Kilian ( $\checkmark$  Spokesperson), C Lippert, W Oelert, E Roderburg, T Sefzick, M Ziolkowski

UPPSALA U – T Johansson  
 VIENNA, INST RADIUMFORSCH, KERNPHYS – W Breunlich, R Geyer

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,  $f_4(2220)$

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 (April 92).

Papers PL B189 (1987) 249, PL B199 (1987) 147, PL B229 (1989) 432, PL B246 (1990) 273, NP A508 (1990) 311c, and NP A526 (1991) 575.

**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, E Moser, H Plendl, G Schmidt  
 KERNFORSCHUNGSANLAGE, JULICH – H Machner, G Riepe  
 MISSISSIPPI U – J J Reidy

Accelerator CERN-LEAR Detector Photon spectrometer

Reactions

$\bar{p}$  nucleus  $\rightarrow \gamma$  charged X 0 GeV/c

Comments Uses Ge and Si(Li)  $\gamma$  spectrometers, and Ge and Si telescopes for charged particles. Studies antiprotonic atoms, especially the E2 resonance effect. Measures charged-particle emission after  $\bar{p}$  annihilation in nuclei from C to U. Determines the distribution of residual nuclei after  $\bar{p}$  annihilation in  $^{92}\text{Mo}$ ,  $^{95}\text{Mo}$ ,  $^{98}\text{Mo}$ ,  $^{138}\text{Ba}$ ,  $^{165}\text{Ho}$ , and  $^{238}\text{U}$ .

Papers PRL 56 (1986) 2368, PL B176 (1986) 327, PL B179 (1986) 25, ZPHY A325 (1986) 261, Nature 328 (1987) 773, ZPHY A326 (1987) 523, NP A466 (1987) 667, ZPHY A329 (1988) 235, ZPHY C37 (1988) 557, NP A485 (1988) 445, ZPHY A333 (1989) 89, ZPHY A335 (1990) 451, NP A512 (1990) 669, and ZPHY A341 (1991) 79.

**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**

CERN – E Haeberl, H Herr, R Klapisch, G Lebee, G Petrucci, G Stefanini  
 ORSAY, CSNSM – A Coc, R Le Gac, M de Saint-Simon, C Thibault ( $\checkmark$  Spokesperson), F Touchard

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p}$  20 MeV/c

Particles studied  $\bar{p}$

Comments Uses a radiofrequency spectrometer. The resolving power of the spectrometer is around  $5 \times 10^5$ . The  $\bar{p}$  mass is compared with that of the  $\text{H}^-$  ion in order to check the CPT theorem. Scheduled to run June 92.

Papers NIM A271 (1988) 512, NP (Proc. Suppl.) B8 (1989) 454, and NIM A305 (1991) 143.

**CERN-PS-194** (Nov 1982) Approved Nov 1984; Completed Jul 1986.

**MEASUREMENTS OF THE RATIO BETWEEN DOUBLE AND SINGLE IONIZATION OF HELIUM FOR ANTI-PROTONS**

AARHUS U – J Bak, P Hvelplund, H Knudsen, E Uggerhoj ( $\checkmark$  Spokesperson)  
 CERN – S P Moller, A H Sorensen  
 STOCKHOLM, RES INST ATOMIC PHYS – G Astner, I Bergstrom, L Liljeby

Accelerator CERN-LEAR Detector Spectrometer

Reactions

$\bar{p}$  He 0.5–4 MeV ( $T_{\text{lab}}$ )

Comments See also PS-194-2 and PS-194-3.

Papers PRL 57 (1986) 2147, PR A36 (1987) 3612, PRL 62 (1989) 1731, PR A40 (1989) 7366, PR A41 (1990) 6536, JPHY B23 (1990) L395, NIM B58 (1991) 1, and PL A155 (1991) 155.

**CERN-PS-194-2** (1986) Approved Feb 1987; Completed Sep 1990.

**NEW MEASUREMENTS OF  $\bar{p}$ -ATOM COLLISIONS: IONIZATION,  $dE/dx$ , X-RAYS, AND CHANNELLING**

AARHUS U – L H Andersen, P Hvelplund, H Knudsen, S P Moller, J O P Pedersen, E Uggerhoj ( $\checkmark$  Spokesperson)  
 CERN – K Elsener  
 PSI, VILLIGEN – E Morenzoni

## SUMMARIES OF CERN EXPERIMENTS

Accelerator CERN-LEAR Detector Counter

Reactions

$\bar{p}$  He 10, 200 MeV/c  
 $\bar{p}$  crystal 30, 200 MeV/c

Comments Investigates (1) the double ionization of helium by antiprotons, (2) the Barkas effect (different  $dE/dx$  for particle and antiparticle with the same speed), (3) K-shell excitation by antiprotons, (4) channeling of MeV antiprotons by crystals, and (5) single ionization of hydrogen by antiprotons.

Papers For papers see CERN-PS-194.

**CERN-PS-194-3** Approved Jun 1991.

**MEASUREMENT OF STOPPING POWERS AND SINGLE IONIZATION CROSS SECTIONS FOR ANTIPROTONS AT LOW ENERGIES**

AARHUS U - P Hvelplund, H Knudsen, R Medenwaldt, S P Moller, E Uggerhøj (✓ Spokesperson), T Worm  
 PSI, VILLIGEN - E Morenzoni

Accelerator CERN-LEAR Detector ?

Reactions

$\bar{p}$  nucleus 0.2-4 MeV/c  
 $\bar{p}$  He 0.01-0.1 MeV/c

Comments Continues the investigation of new phenomena in collisions of antiprotons with atoms. Taking data (April 92).

Papers For papers see CERN-PS-194.

**CERN-PS-195** (Jan 1985) Approved Sep 1985.

**TEST OF CP VIOLATION WITH  $\bar{K}^0$  AND  $K^0$  AT LEAR**

ATHENS U - A Angelopoulos, A Apostolakis, E Rozaki, L Sakeliou, K Sarigiannis  
 BASEL U - R Adler, G Backenstoss, B Eckard, C Felder, B Pagels, P Pavlopoulos (✓ Spokesperson), G Polivka, R Rickenbach, C Santoni, L Tauscher  
 BOSTON U - A Go, T J Lawry, J P Miller, B L Roberts, G Varner, D Zimmerman  
 CERN - E Aslanides, C P Bee, P Bloch, M Fidecaro, R Gamet, A Schopper  
 COIMBRA U - E Van Beveren, J Carvalho, R Ferreira-Marques, A Onofre, J Pinto-da-Cunha, A Policarpo  
 DELFT UNIV TECH - C W E Van Eijk, R W Hollander, R Kreuger, H Postma  
 FRIBOURG U - J C Dousse, L Faravel, H U Johner, J Kern, L Schaller  
 IOANNINA U - I Evangelou, P Kokkas, N Manthos, F Triantis  
 LIVERPOOL U - J M Bennet, E Cawley, M Dodgson, J R Fry, E Gabathuler, P J Hayman, P D Maley, L E Sacks, P M Sanders, S Vlachos  
 LJUBLJANA U & STEFAN INST, LJUBLJANA - A Filipic, I Mandic, U Seljak, D Zavrtanik  
 MARSEILLE, CPP - T Alhalel, V Bertin, A Ealet, P Fassnacht, T Gerasis, F Montanet, F Pelucchi  
 ORSAY, CSNSM - R Le Gac, C Thibault, F Touchard  
 PSI, VILLIGEN - C Bula, P Kettle, T Nakada, O Wigger  
 SACLAY - G Burgun, G Chardin, M Dejardin, J Derre, J Duclos, D Francis, D Garreta, C Guyot, C Kochowski, G Marel, P Schune, C Yeche  
 STOCKHOLM, RES INST ATOMIC PHYS - P Carlson, C Fuglesang, K Jansson, K Jon-And, A Kerek, S Szilagy  
 THESSALONIKI U - S Charalambous, M Chardalas, S Dedoussis, A Lolios, C Touramanis  
 ZURICH, ETH - H Bienlein, W Fetscher, H J Gerber, T Ruf, M Schaefer, P Weber, M Wolter

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 The aim of the experiment is to carry out precision tests of CP and CPT on the neutral kaon system through

$K^0, \bar{K}^0$  interferometry. All the semileptonic and two and three pion decays are recorded identically under the same operating conditions using tracking chambers and a gaseous electromagnetic calorimeter. Taking data (April 92).

Papers NIM A279 (1989) 285, NIM A279 (1989) 305, NC 102A (1989) 127, NIM A297 (1990) 126, PL B267 (1991) 154, PW 3 (1992) 40, and NIM A311 (1992) 78.

**CERN-PS-196** (Mar 1985) Approved Nov 1985.

**PRECISION COMPARISON OF  $\bar{p}$  AND  $p$  MASSES IN A PENNING TRAP**

HARVARD U - G Gabrielse (✓ Spokesperson), W Jhe, D Phillips, W Quint  
 MAINZ U, INST PHYS - J Grobner, H Kalinowsky

Accelerator CERN-LEAR Detector Other

Particles studied  $\bar{p}, p$

Comments Aims to compare  $p$  and  $\bar{p}$  masses to an accuracy of one part in  $10^9$  within the small volume of an ion trap. Antiprotons have been trapped below 3 keV. Electron cooling from keV to  $< 10^{-3}$  eV has been observed in the trap. Also measures the antiproton storage lifetime. Taking data (April 92).

Papers PRL 57 (1986) 2504, RSI 58 (1987) 2197, PL A129 (1988) 38, and PRL 65 (1990) 1317.

**CERN-PS-197** (Oct 1985) Approved Apr 1986.

**THE CRYSTAL BARREL: MESON SPECTROSCOPY AT LEAR WITH A  $4\pi$  NEUTRAL AND CHARGED DETECTOR**

BUDAPEST, CRIP - T Gemesy, P Hidas, Z Javorfi, G Pinter  
 CERN - M Burchell, M Doser, N Hessey, M Kobel, R Landua, L Montanet, J Zoll  
 HAMBURG U - R Beckmann, F Heinsius, B Kaemmler, T Kiel, U Strobusch, U Wiedner  
 KARLSRUHE U - I Augustin, P Bluem, D Engelhardt, N Winter  
 LBL - P Birien, J Bistirlich, R Bossingham, H Bossy, T Case, K M Crowe  
 QUEEN MARY - WESTFIELD COLL - D V Bugg, A Cooper, A Sanjari  
 MAINZ U, INST PHYS - H Kalinowsky, E Klempt, M Merkel, J Merlo, K Peters, E Schaefer, C Strassburger  
 MUNICH U, EXP PHYS - K Braune, H P Dietz, W Duennweber, M Englert, M A Faessler, C Felix, G Folger, P Illinger, D Jamnik, K Koenigsmann (✓ Spokesperson), U Meyer-Berkhout, C Zupancic  
 RUHR U, BOCHUM - K Beuchert, H Koch, M Kunze, H Matthaey, S Ravndal, D Walther  
 RUTHERFORD - C A Baker, C J Batty  
 STRASBOURG, CRN - M Suffert  
 UCLA - R P Haddock  
 ZURICH U - C Amsler, B Barnett, C A Meyer, T Noble, B Schmid, D Urner

Accelerator CERN-LEAR Detector CRYSTAL-BARREL

Reactions

$\bar{p} p \rightarrow$  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. Taking data (April 92).

Papers NP (Proc. Suppl.) B8 (1989) 65, and PL B260 (1991) 249.

**CERN-PS-198** (Oct 1985) Approved Apr 1986; Completed May 1988.

**MEASUREMENT OF SPIN-DEPENDENT OBSERVABLES IN  $\bar{p}N$  ELASTIC SCATTERING FROM 300 TO 700 MeV/c**

KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - E Boschitz, W Gyles, W List, R Olszewski, C R Ottermann, T Tacik, M Wessler

## SUMMARIES OF CERN EXPERIMENTS

LYON, IPN – E Descroix, J Y Grossiord, A Guichard  
 PSI, VILLIGEN – B Van den Brandt, D R Gill, J Konter,  
 S Mango, G D Wait  
 SACLAY – J Arvieux, H Catz, A Chameaux, J C Faivre,  
 Y Terrien, E Vercellin, J Yonnet  
 CERN – R Bertini (Spokesperson), F Perrot  
Accelerator CERN-LEAR Detector Spectrometer, SPES-II  
Reactions Polarized target  
 $\bar{p} p \rightarrow \bar{p} p$  300–700 MeV/c  
 $\bar{p}$  deut  $\rightarrow \bar{p}$  deut "

Papers NP (Proc. Suppl.) B8 (1989) 149, NP (Proc. Suppl.) B8  
 (1989) 156, PL B228 (1989) 531, and PL B261 (1991) 188.

**CERN-PS-199** (Nov 1985) Approved Apr 1986; Completed  
 1991.

### STUDY OF THE SPIN STRUCTURE OF THE $\bar{p} p \rightarrow \bar{n} n$ CHANNEL AT LEAR

CAGLIARI U & INFN, CAGLIARI – M P Macciotta, A Masoni,  
 G Puddu, S Serci  
 GENEVA U – A Ahmidouch, E Heer, R Hess, C Lechanoine-  
 LeLuc, C Mascarini, D Rapin  
 SACLAY – J Arvieux, R Bertini, H Catz, J C Faivre, R A Kunne,  
 F Perrot  
 TRIESTE U & INFN, TRIESTE – R Birsa, F Bradamante  
 (✓ Spokesperson), S Dalla-Torre, M Giorgi, M Lamanna,  
 A Martin, A Penzo, P Schiavon, F Tessarotto, A Villari  
 TURIN POLYTECHNIC & INFN, TURIN – M Agnello, F Iazzi,  
 B Minetti  
 TURIN U & INFN, TURIN – T Bressani, E Chiavassa,  
 N De Marco, A Musso, A Piccotti

Accelerator CERN-LEAR Detector Counter

Reactions Polarized target  
 $\bar{p} p \rightarrow \bar{n} n$  500–1300 MeV/c

Particles studied meson

Comments Measures over the whole angular range the polar-  
 ization parameter  $P$  in 100 MeV/c steps, and the polarization  
 transfer parameter  $D$ . Searches for resonances in the  $s$  channel.  
 Uses a frozen-spin polarized target, and plastic streamer tubes.

Papers PL B246 (1990) 267, NIM A300 (1991) 43, and PL B273  
 (1991) 533.

**CERN-PS-200** (Jan 1986) Approved Apr 1986.

### A MEASUREMENT OF THE GRAVITATIONAL AC- Celeration OF THE ANTIPROTON

LEWIS AND CLARK COLL, PORTLAND – T Van Dekop,  
 D Oakley  
 LOS ALAMOS – R E Brown, T Darling, P Dyer, T Goldman,  
 M H Holzscheiter (✓ Spokesperson), R J Hughes, N Jarmie,  
 N S P King, M M Nieto, M M Schauer, J A Schecker  
 NASA, AMES – F C Witteborn  
 TEXAS A AND M – S Cornford, K Hosea, R A Kenefick  
 COLORADO U – S Hoibraten, M Midzor, S Parry, R Ristinen

Accelerator CERN-LEAR Detector Other

Comments Measures time of flight of ultra-low-velocity  $\bar{p}$ 's up a  
 vertical drift tube. In preparation (April 92).

**CERN-PS-201** (Jan 1986) Approved Sep 1986; Started Aug  
 1990.

### STUDY OF ANTINUCLEON ANNIHILATIONS AT LEAR WITH OBELIX, A LARGE-ACCEPTANCE AND HIGH RESOLUTION DETECTOR BASED ON THE OPEN AXIAL FIELD SPECTROMETER

OBELIX COLLABORATION

BOLOGNA U & INFN, BOLOGNA – A Bertin, M Bruschi,  
 M Capponi, S De Castro, I D'Antone, D Galli, V Marconi,  
 I Massa, M Piccinini, M Poli, N Semprini-Cesari, M Villa,  
 A Vitale, G Zavattini, A Zoccoli  
 BRESCIA U – G Belli, E Lodi-Rizzini, L Venturelli  
 CAGLIARI U & INFN, CAGLIARI – A Adamo, C Cicalo, A Lai,  
 A Masoni, G Puddu, S Serci, G L Usai

DUBNA – I V Falomkin, F Nichitiu, G B Pontecorvo,  
 A M Rozhdstvensky, M G Sapozhnikov, P Temnikov  
 FRASCATI – C Guaraldo (✓ Spokesperson), A Lanaro,  
 V Lucherini  
 LEGNARO – P Boccaccio, U Gastaldi, L Lombardi, G Maron,  
 R A Ricci, L Vannucci, G Vedovato  
 PADUA U – M Morando  
 PAVIA U – G Bendiscioli, V Filippini, C Marciano, P Montagna,  
 A Rotondi, P Salvini, V Tretyak, A Zenoni  
 TRIESTE U & INFN, TRIESTE – G Margagliotti, G Pauli,  
 S Tessaro, E Zavattini  
 TURIN U & INFN, TURIN – F Balestra, G C Bonazzola,  
 T Bressani (✓ Spokesperson), M P Bussa, L Busso, D Calvo,  
 S Costa, D D'Isep, L Fava, A Feliciello, L Ferrero, R Garfagnini,  
 P Gianotti, A Grasso, A Maggiora, S Marcello, D Panziera,  
 G Piragino, E Rossetto, F Tosello, G Zosi  
 TURIN POLYTECHNIC & INFN, TURIN – M Agnello, F Iazzi,  
 B Minetti  
 UDINE U & INFN, UDINE – L Santi

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 0–0.3 GeV/c  
 $\bar{n}$  nucleus  $\rightarrow$  annihil "

Comments Studies (1) spectroscopy of  $q\bar{q}$ , exotic, glueball, and  
 hybrid mesons, (2) dynamics of  $N\bar{N}$  interactions, (3) atomic  
 physics with  $\bar{p}$ 's, and (4)  $\bar{p}$  annihilations onto more than one  
 nucleon. Taking data (April 92).

Papers IEEE TNS 38 (1991) 331, IEEE TNS 38 (1991) 337,  
 IEEE TNS 38 (1991) 393, NIM A306 (1991) 305, and PL B256  
 (1991) 349.

**CERN-PS-202** (1986) Approved Feb 1987; Started Jul 1991.

### JETSET: PHYSICS AT LEAR WITH AN INTERNAL GAS JET TARGET AND AN ADVANCED GENERAL PURPOSE DETECTOR

CERN – R K Bock, E Chesi, D Drijard, M Ferro-Luzzi,  
 N Hamann, R Jones, B Mouellic, S Ohlsson, J Perreau,  
 M J Price  
 FREIBURG U – P Birien, W Dutty, J Franz, A Klett, J Kuipers,  
 E Roessele, H Schmitt, H Urban  
 GENOA U & INFN, GENOA – D Bassi, A Buzzo, S Easo,  
 K Kirsebom, M Lovetere, M Macri (✓ Spokesperson),  
 M Marinelli, L Mattera, S Passaggio, M Pia, A Pozzo,  
 A Santroni, A Scalisi  
 ILLINOIS U, URBANA – P Debevec, R A Eisenstein  
 (✓ Spokesperson), P Harris, D Hertzog, S Hughes, P Reimer,  
 J Ritter, R Tayloe  
 KERNFORSCHUNGSANLAGE, JULICH – K Kilian, W Oelert,  
 K Roehrich, O Steinkamp, B Stugu  
 OSLO U – H Korsmo  
 UPPSALA U – A Johansson, T Johansson

Accelerator CERN-LEAR Detector JETSET

Reactions  
 $\bar{p} p \rightarrow \phi \phi$  0.6–1.9 GeV/c  
 $\bar{p} p \rightarrow K^+ K^- K^+ K^-$  "  
 $\bar{p} p \rightarrow K_S K_S$  "

Particles studied glueball

Comments Uses an internal gas-jet target surrounded by an  
 advanced, compact non magnetic detector. Initial aim is a  
 search for glueballs ( $gg$  or  $ggg$ ) and hybrids ( $gq\bar{q}$ ) over the mass  
 range 2.04 to 2.4 GeV. Taking data (April 92).

Papers NP (Proc. Suppl.) B8 (1989) 69.

**CERN-PS-203** (Jan 1988) Approved Apr 1988.

### ANTIPROTON INDUCED FISSION AND FRAGMENTATION OF NUCLEI

BONN U – P David  
 FLORIDA STATE U – H S Plendl



## SUMMARIES OF CERN EXPERIMENTS

GEORGE MASON U - B J Lieb  
 HAHN-MEITNER INST - D Hilscher, D Polster, H Rossner  
 KERNFORSCHUNGSANLAGE, JULICH - H Machner, G Riepe  
 MICHIGAN STATE U - D Bowman, W Lynch  
 MUNICH, TECH U - H Daniel, T von Egidy (✓ Spokesperson),

T Haninger, F J Hartmann, P Hofmann, Y S Kim, W Schmid  
 VIRGINIA U - B Wright, K Zioc  
 WARSAW U - J Jastrzebski, W Kurcewicz

Accelerator CERN-LEAR Detector Semiconductor

### Reactions

$\bar{p}$  nucleus 0 GeV/c

Comments Studies fission and fragmentation processes induced by a large, highly localized deposition of energy when an antiproton annihilates with a nucleus. Measures energy, mass, and folding angle of coincident fission fragments from Bi, Th, and U targets. Light fragments ( $K, n, p, d, \dots$ ) are measured for a series of targets with semiconductor detectors and TOF techniques. Taking data (April 92).

**CERN-PS-204** (Nov 1987) Approved Jun 1989; Completed Aug 1990.

### MEASUREMENTS OF WAKE-RIDING ELECTRONS IN ANTIPROTON-CARBON-FOIL COLLISIONS

AARHUS U - L H Andersen, K Elsener, P Hvelplund, H Knudsen, S P Moller, E Uggerhoj

TOKYO U - K Kuroki, Y Yamazaki (✓ Spokesperson)

Accelerator CERN-LEAR Detector Counter

### Reactions

$\bar{p}$  C 100 MeV/c

Comments The target is a carbon foil. A charged particle passing through a dielectric produces an oscillating wake. The experiment searches for electrons riding the moving wake. It also measures the number distribution of multiply emitted secondary electrons.

Papers JPSJ 59 (1990) 2643.

**CERN-PS-205** Approved Apr 1991.

### STUDY OF EXOTIC TRAPPING OF ANTIPROTONS IN LIQUID/GAS HELIUM

CERN - J Eades

MUNICH, TECH U - H Daniel, T von Egidy, F J Hartmann, P Hofmann, W Schmid

TOKYO U - R S Hayano, M Iwasaki, S N Nakamura, H Tamura

TOKYO U, INS - H Outa, E Widmann, T Yamazaki

(✓ Spokesperson)

Accelerator CERN-LEAR Detector Plastic

### Reactions

$\bar{p}$  He

Comments Studies the exotic atom trapping of  $\bar{p}$  by observing the resulting delayed annihilation products. Most models of the cascade process in antiprotonic atoms predict lifetimes of the order of picoseconds or less. However, it has been observed that a few percent of antiprotons stopped in liquid helium have a lifetime of microseconds. The experiment aims to study this effect in great detail using the improved beam intensity and emittance available at LEAR. The program includes investigations of  $^3\text{He}$  and  $^4\text{He}$  in solid, liquid, and gas phases. This may be complemented later with a visible region spectroscopy, and a laser pumping of the metastable exotic atoms. The use of positron and positronium reactions with the metastable atoms is also being contemplated as a route to antihydrogen formation. Four weeks of data taking is scheduled in 1992.

**CERN-UA-001** (Jan 1978) Approved Jun 1978, Jun 1983, Sep 1983, Feb 1984, Nov 1984; Completed Feb 1990.

### 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 - A Bohrer, H Faissner, A Geiser, S Lammel, H Moser, A Moulin, H Reithler, H Teykal, H Tuchscherer, K Wacker, H Wagner

NIKHEF, AMSTERDAM - K Bos, A Van Dijk, J P Dorenbosch, W Van de Guchte, I Ten Have, D Holthuizen, M Schroeder, I Zacharov

ANNECY - B Aubert, F Cavanna, J Colas, D Linglin, J P Vialle, M Yvert

BIRMINGHAM U - G F Cox, J D Dowell, N Ellis, I Fensome, J Garvey, J Gregory, I R Kenyon, M Nikitas

BOSTON U - G Bauer, M Felcini, K Morgan, S Otwinowski, J Rohlf

CERN - T Rodrigo Amoro, A Bezaguet, G Bocquet,

R Bonino, M Botlo, P Cennini, S Cittolin, M Demoulin, D Drijard, K Eggert, A Givernaud, A Gonidec, F Diez Hedo,

W Jank, F Lacava, M Marguina, G Maurin, T Meyer, T Muller, R Munoz, L Naumann, M Della Negra, A Norton

(✓ Spokesperson), F Pauss, A Placci, J P Porte, E Radermacher, J P Revol, C Rubbia, D Samyn, D Schinzel, T P Shah,

P Sphicas, O Ullaland, T S Virdee, V Vuillemin, I Zacharov

HELSINKI U - V Karimaki, R Kinnunen, E Pietarinen, M Pimia,

J Tuominiemi

KIEL U - O C Allkofer, S Bartha, H G Boerst, H Bohn,

D Brockhausen, D Dau, S Levegrun, A Morsch, R Prosi,

M Rauschkolb

IMPERIAL COLL - E Clayton, A Khan, C Markou, S McMahon,

C Seez, I Siotis, L Taylor

QUEEN MARY COLL - P Biddulph, E Eisenhandler,

P Kalmus, M Landon, S Robins, D Robinson, W Von Schlippe,

G Thompson, C Topping

MADRID, JEN - J Salicio Diez, A Ferrando, I Josa, E Torrente

MIT - T Fuess, G Pancheri, S Pavlon, K C T O Sumorok, Q Tan,

S Tether, X Wu

PADUA U - A Bettini, G Busetto, A Caner, P Casoli, S Centro,

R Conte, M De Giorgi, R Martinelli, A Meneguzzo, M Nicoletto,

Y Zolnirowski, P Zotto

COLLEGE DE FRANCE - B Andrieu, L Dobrzynski, D Kryn,

D Marchand, J P Mendiburu, P Nedelec, G Sajot, J Vrana

ROME U - U Aglietti, C Bacci, V Ceconi, F Ceradini,

A Di Ciaccio, G Ciapetti, M Moricca, A Nisati, E Petrolo,

G Piano-Mortari, G Salvini, M Torelli, A Tusi, S Veneziano,

L Zanella

RUTHERFORD - M G Albrow, R Apsimon, J Coughlan,

V O'Dell

SACLAY - D Denegri, Y Lemoigne, J P Merlo

UCLA - K Ankoviak, C Buchanan, D Cline, H Evans, L Fortson,

J Gronberg, T Kubic, M Mohammadi, J Rhoades, D Stork,

M Vargas

VIENNA, OAW - B Buschbeck, H Dibon, M Krammer, P Lipa,

M Markytan, F Szonco, A Taurak, C Wulz

MADRID, AUTONOMA U - C Albajar

Accelerator CERN-PBAR/P Detector UA1

### Reactions

$\bar{p} p$  540, 630 GeV ( $E_{cm}$ )

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , higgs, s-particle

Comments In the first phase of operation has discovered the  $W$  and  $Z$  bosons and found limits on the top quark, heavy lepton, and supersymmetric particles masses. Also studied  $B\bar{B}$  mixing,  $b$  quark production, QCD (via jets), and intermediate bosons and photon production. For the second phase of operation (88/89 collider runs) the following items were upgraded: the muon detection system, the data acquisition system, and the central detector. Data analysis in progress (April 92).

Papers NIM 176 (1980) 175, NIM 176 (1980) 217, NIM 176

(1980) 223, NIM 176 (1980) 233, NIM 176 (1980) 255, NIM 186 (1980) 533, PL B107 (1981) 320, PL B118 (1982) 167, PL B118 (1982) 173, IEEE TNS 30 (1983) 71, LNC 37 (1983) 255, PL B121 (1983) 77, PL B122 (1983) 103, PL B122 (1983) 189, PL B123 (1983) 108, PL B123 (1983) 115, PL B126 (1983) 398, PL B128 (1983) 336, PL B129 (1983) 273, PL B132 (1983) 214, PL B132 (1983) 223, NP B224 (1983) 523, NIM 224 (1984) 153, PL B134 (1984) 469, PL B135 (1984) 250, PL B136 (1984) 294, PL B139 (1984) 115, PL B147 (1984) 222, PL B147 (1984) 241, PL B147 (1984) 493, ZPHY C25 (1984) 167, IEEE TNS 32 (1985) 1463, RMP 57 (1985) 699, LNC 44 (1985) 1, PL B150 (1985) 223, PL B155 (1985) 442, PL B158 (1985) 494, ZPHY C27 (1985) 155, IEEE TNS 33 (1986) 163, NIM A243 (1986) 45, NIM A252 (1986) 387, EPL 1 (1986) 327, PL B166 (1986) 484, PL B172 (1986) 461, PL B177 (1986) 244, NP B276 (1986) 253, NIM A253 (1987) 179, NIM A253 (1987) 189, NIM A256

## SUMMARIES OF CERN EXPERIMENTS

(1987) 23, NIM A257 (1987) 552, PL B185 (1987) 233, PL B185 (1987) 241, PL B186 (1987) 237, PL B186 (1987) 247, PL B193 (1987) 389, PL B198 (1987) 261, PL B198 (1987) 271, ZPHY C36 (1987) 33, NIM A263 (1988) 26, NIM A263 (1988) 174, NIM A265 (1988) 303, NIM A272 (1988) 669, PL B200 (1988) 380, PL B209 (1988) 127, PL B209 (1988) 385, PL B209 (1988) 397, PL B213 (1988) 405, ZPHY C37 (1988) 489, ZPHY C37 (1988) 505, ZPHY C40 (1988) 527, PR D38 (1988) 1616, NP B309 (1988) 405, IEEE TNS 36 (1989) 364, NIM A279 (1989) 114, NIM A279 (1989) 169, NIM A279 (1989) 297, FORT 37 (1989) 339, PL B226 (1989) 410 [erratum: PL B229 (1989) 439], ZPHY C44 (1989) 15, NIM A289 (1990) 482, NIM A292 (1990) 113, NIM A292 (1990) 401, NIM A291 (1990) 587, APP B21 (1990) 327, PL B241 (1990) 283, PL B244 (1990) 566, ZPHY C48 (1990) 1, NP B335 (1990) 261, NP B345 (1990) 1, NIM A301 (1991) 445, NIM A302 (1991) 331, NIM A305 (1991) 331 [erratum: NIM A311 (1992) 395], PL B253 (1991) 503, PL B256 (1991) 112, PL B256 (1991) 121 [erratum: PL B262 (1991) 497], PL B257 (1991) 459, PL B262 (1991) 163, PL B262 (1991) 171, PL B273 (1991) 540, and PL B275 (1992) 186.

**CERN-UA-002** (Jan 1978) Approved Dec 1978, Sep 1984, Feb 1985, Jun 1987; Started Nov 1981; Completed Dec 1990.

**STUDY OF  $\bar{p}p$  INTERACTIONS AT 630-GeV c.m. ENERGY**

BERN U - K Borer, E Hugentobler, L Mueller, T Pal, K P Pretzl, J Schacher

CALABRIA U - L Malgeri, M Primavera, M Valdata-Nappi

CAMBRIDGE U - R S DeWolf, D J Munday, M A Parker, T O White

CERN - M Borghini, A Dell'Acqua, D Froidevaux, J M Gaillard, O Gildemeister, S Hellman, J Hrivnac, K Jakobs, P Jenni, L Di Lella ( $\checkmark$  Spokesperson), L Linssen, L Mapelli, F Nessi-Tedaldi, M Nessi, C Onions, M Pentney, M S Pepe, H Plotow-Besch, A Poppleton, V Simak, S Stapnes

DORTMUND U - C Goessling, H Hufnagel, D Pollmann, B Schmidt, V Sondermann, R Spiwoks, E Tsesmelis

HEIDELBERG U, IHEP - S Gruenendahl, E E Kluge, N Kurz

MELBOURNE U - I Bertram, S N Tovey

MILAN U & INFN, MILAN - D Cavalli, G Costa, L Cozzi,

F Gianotti, L Mandelli, M Mazzanti, L Perini

ORSAY, LAL - R Ansari, J C Chollet, L Fayard, B Merkel,

M Moniez, G Parrou, P Petroff, J P Repellin, G Unal, D Wood

PAVIA U & INFN, PAVIA - G Ambrosini, C Conta, R Ferrari,

M Fraternali, G Fumagalli, V Goggi, M Livan, F Pastore,

E Pennacchio, G Polesello, A Rimoldi, M Sacchi, V Vercesi

PERUGIA U & INFN, PERUGIA - P Cenci, P Lariccia,

P Lubrano, M Punturo, P Scampoli, C Talamonti, F Tondini

PISA U & INFN, PISA - D Autiero, G Carboni, V Cavalinini,

M Curatolo, B Esposito, E Iacopini, S Lami, M Morganti,

C Petridou, T Del Prete

SACLAY - J Alitti, P Baryre, P Bonamy, M Bourliaud,

Y Ducros, C Magneville, J P Meyer, H Zacccone, A Zylberstein

Accelerator CERN-PBAR/P Detector UA2

Reactions

$\bar{p}p \rightarrow e^\pm X$	630 GeV (Ecm)
$\bar{p}p \rightarrow \text{jet}(s) X$	"
$\bar{p}p \rightarrow \gamma X$	"

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , top,  $\gamma$ , lepton - quark, higgs $^\pm$

Comments The main aims are a study of the  $W$  and  $Z$  bosons and a search for the top quark. Other topics include the production of direct photons at high  $p_T$ , establishing new bounds on leptoquark masses, and a search for the charged Higgs from the top decay. The apparatus has complete calorimetry, both electromagnetic and hadronic, down to about  $5^\circ$  to the beams. Electron identification is achieved by means of calorimetry, preshower, and transition radiation detectors. A total of 6096 independent silicon counters give a precise  $dE/dx$  measurement. Scintillating fibers are used to measure charged particle tracks. The detector includes a lead converter to detect photons.

Papers PL B115 (1982) 59, PL B118 (1982) 203, PL B121 (1983) 187, PL B122 (1983) 322, PL B122 (1983) 476, PL B129 (1983) 130, ZPHY C20 (1983) 117, NIM 224 (1984) 65, NIM 224 (1984) 360, NIM 227 (1984) 29, PL B138 (1984) 430, PL B139 (1984) 105, PL B144 (1984) 283, PL B144 (1984) 291, ZPHY C24

(1984) 1, PL B154 (1985) 338, PL B156 (1985) 129, PL B160 (1985) 349, PL B165 (1985) 441, ZPHY C25 (1985) 329, ZPHY C27 (1985) 329, NIM A252 (1986) 590, PL B176 (1986) 239, ZPHY C30 (1986) 1, ZPHY C30 (1986) 341, NIM A253 (1987) 548, PL B186 (1987) 440, PL B186 (1987) 452, PL B194 (1987) 158, PL B195 (1987) 613, ZPHY C36 (1987) 175, NIM A263 (1988) 31, NIM A265 (1988) 33, NIM A273 (1988) 605, NIM A273 (1988) 826, PL B215 (1988) 175, ZPHY C40 (1988) 527, ZPHY C41 (1988) 395, IEEE TNS 36 (1989) 29, NIM A283 (1989) 646, NIM A286 (1990) 128, NIM A287 (1990) 417, PL B235 (1990) 363, PL B236 (1990) 488, PL B238 (1990) 442, PL B241 (1990) 150, ZPHY C46 (1990) 179, ZPHY C47 (1990) 11, ZPHY C47 (1990) 523, PL B257 (1991) 232, PL B263 (1991) 544, PL B263 (1991) 563, PL B268 (1991) 145, ZPHY C49 (1991) 17, ZPHY C52 (1991) 209, PL B274 (1991) 507, PL B275 (1991) 202, PL B276 (1992) 354, PL B276 (1992) 365, PL B277 (1992) 194, and PL B277 (1992) 203.

**CERN-UA-004-2** Approved Jul 1990.

**A PRECISE MEASUREMENT OF THE REAL PART OF THE ELASTIC SCATTERING AMPLITUDE AT THE  $SppS$**

GENOA U & INFN, GENOA - M Bozzo, G Sette, M Zito  
ECOLE POLYTECHNIQUE - C Augier, D Bernard, J Bourotte,  
M Haguenaer (Spokesperson)

PRAGUE, INST PHYS - V Kundrat, S Nemecek, M Novak,  
M Smizanska

ROME U, TORVERGATA & INFN, ROME - R Cardarelli,

L Cerrito, G Matthiae, F Natali

VALENCIA U - F Alted, R Cases, E Sanchis, J Velasco

Accelerator CERN-PBAR/P Detector Wire chamber

Reactions

$\bar{p}p \rightarrow \bar{p}p$	630 GeV (Ecm)
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Comments Measures the total cross section and the ratio  $\rho$  of the real to the imaginary part of the forward elastic scattering amplitude. The setup is composed of two pairs of Roman Pots placed symmetrically at 45 m from the crossing point. The horizontal scattering angle is measured by drift chambers, and the vertical coordinate is obtained by using an hodoscope. Taking data (March 92).

**CERN-UA-006** (Aug 1980) Approved Apr 1981, Feb 1987; Completed Dec 1990.

**AN INTERNAL HYDROGEN JET TARGET IN THE SPS TO STUDY INCLUSIVE ELECTROMAGNETIC FINAL STATES AT LARGE TRANSVERSE MOMENTUM IN  $\bar{p}p$  AND  $pp$  INTERACTIONS AT  $\sqrt{s} = 24.3$  GeV**

BOLOGNA U & INFN, BOLOGNA - G Valenti

CERN - G Balocchi, L Camilleri ( $\checkmark$  Spokesperson), P Giacomelli,  
W Kubischta

LAUSANNE U - C Comtat, A Ebongue, F Gaille, C Joseph,

J F Loude, C Morel, P Oberson, J Pages, J P Perroud,

D Ruegger, G Sozzi, L Studer, M T Tran, M Werlen

MICHIGAN U - T Dershem, E C Dukes, D B Hubbard,

O E Overseth, G R Snow

ROCKEFELLER U - P T Cox, R W Rusack, A Vacchi

LUND U - G Von Dardel

MILAN U & INFN, MILAN - L Dick

YALE U - P Cushman, V Singh

Accelerator CERN-PBAR/P Detector Double-arm spectromete

Reactions

$\bar{p}p \rightarrow e^+ e^- X$	24.3 GeV (Ecm)
$\bar{p}p \rightarrow \pi^0 X$	"
$\bar{p}p \rightarrow \gamma X$	"
$\bar{p}p \rightarrow \bar{p}p$	"
$\bar{p}p \rightarrow X$	"
$pp \rightarrow e^+ e^- X$	"
$pp \rightarrow \pi^0 X$	"
$pp \rightarrow \gamma X$	"
$pp \rightarrow pp$	"
$pp \rightarrow X$	"

## SUMMARIES OF CERN EXPERIMENTS

### Particles studied $J/\psi(1S)$

Comments The  $\bar{p}$  and  $p$  beams in the collider are in turn incident upon a gas jet target. In the reactions above, the emphasis is on large-mass electron pair production, the  $\pi^0$  and  $\gamma$  inclusive cross sections at high  $p_t$ , and the elastic and inelastic cross sections at low  $t$ .

Papers NIM A252 (1986) 498, HPA 59 (1986) 584, PL B194 (1987) 568, NIM A273 (1988) 865, PL B206 (1988) 163, PL B216 (1989) 459, NIM A286 (1990) 49, and PL B252 (1990) 505.

**CERN-UA-007** (Jan 1985) Approved Apr 1985; Completed May 1986.

### MEASUREMENT BY SILICON SHOWER DETECTORS OF THE INVARIANT CROSS SECTION OF PHOTONS AND $\pi^0$ '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 - J Bourotte, M Haguenaer, E Pare

Accelerator CERN-PBAR/P Detector Calorimeter

#### Reactions

$\bar{p} p \rightarrow \gamma X$	630 GeV ( $E_{cm}$ )
$\bar{p} p \rightarrow \pi^0 X$	"
$\bar{p} p \rightarrow K_S X$	"
$\bar{p} p \rightarrow \eta X$	"

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.

Papers NIM A274 (1989) 129, and PL B242 (1990) 531. No other papers expected.

**CERN-UA-008** (Oct 1984) Approved Apr 1985; Completed Jun 1989.

### STUDY OF JET STRUCTURE IN $\bar{p}p$ EVENTS TAGGED WITH LARGE- $x$ PROTONS

UCLA - A Brandt, J B Cheze, S Erhan, A Kuzucu, D Lynn,  
 M Medinnis, N Ozdes, P Schlein (✓ Spokesperson), M Zeyrek,  
 J Zsembery, J Zweizig

Accelerator CERN-PBAR/P Detector UA2, Spectrometer

#### Reactions

$\bar{p} p \rightarrow \bar{p} p \text{ jet}(s) X$	630 GeV ( $E_{cm}$ )
$\bar{p} p \rightarrow \bar{p} p X$	"
$\bar{p} p \rightarrow p X$	"
$\bar{p} p \rightarrow \bar{\Lambda} X$	"

Particles studied pomeron,  $p$

Comments Studies large- $x$  protons and antiprotons in the UA2 calorimeter system, and the jet structure in high-mass diffraction to investigate the pomeron and its possible parton contents. Uses four Roman Pot spectrometers and a fast (400 ns) data driven trigger processor. Interfaced to the CERN-UA-002 experiment. Several papers in preparation (April 92).

Papers PL B211 (1988) 239.

**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 - M Baake, B Diekmann, F Fiedler, C Gapp,  
 F Gebert, K Heinloth, C Hoeger, R P Hofmann, A Holzkamp,  
 S Holzkamp, H P Jakob, D Joseph, J Kingler, G Koersgen,  
 E Paul (✓ Spokesperson), H Rotscheidt, S Soeldner-Rembold,  
 A S Weigend

CERN - D Barberis, T Charity, M Davenport, J Eades,  
 R McClatchey

YEREVAN PHYS INST - L S Bagdassaryan, S Danagulyan,  
 P I Galumyan, A G Oganessyan

LANCASTER U - T J Brodbeck, T Charity, A B Clegg,  
 R C W Henderson, M T Hickmann, N R Keemer, D Newton,  
 A O'Connor, G W Wilson  
 MANCHESTER U - M Atkinson, N Brook, P Coyle, B Dickinson,  
 A Donnachie, A T Doyle, R J Ellison, J M Foster, 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  
 RUTHERFORD - R Apsimon, P S Flower, G Hallewell,  
 J A G Morris, J V Morris, C N Paterson, P H Sharp  
 SHEFFIELD U - S Danaher, W Galbraith, N A Thacker,  
 L Thompson

Accelerator CERN-SPS Detector OMEGA

#### Reactions

$\gamma p \rightarrow \text{hadrons}$	65-180 GeV/c
$\pi^+ p \rightarrow \text{hadrons}$	80, 140 GeV/c
$\pi^- p \rightarrow \text{hadrons}$	"
$K^+ p \rightarrow \text{hadrons}$	"
$K^- p \rightarrow \text{hadrons}$	"

Comments Continues photoproduction studies of WA-004 and WA-057 to higher energies, with comparison to hadronic beam data. Aim is to study the lowest order QCD processes giving evidence of point-like interactions of photons, and to compare the photon and hadron-induced production of  $\pi^0$ ,  $\pi^\pm$ ,  $\eta$ ,  $\rho^0$ 's,  $f_2$ 's,  $f_0$ 's,  $K^*$  (892), and  $\phi$  in the transition region from soft to hard processes. Data analysis in progress (April 92).

Papers IEEE TNS 30 (1983) 35, IEEE TNS 32 (1985) 674,  
 NIM A241 (1985) 339, IEEE TNS 33 (1986) 122, IEEE TNS 34 (1987) 504, NP (Proc. Suppl.) B7 (1989) 255, ZPHY C42 (1989) 527, ZPHY C43 (1989) 63, ZPHY C44 (1989) 71, NP (Proc. Suppl.) B16 (1990) 236, ZPHY C46 (1990) 35, ZPHY C47 (1990) 397, ZPHY C50 (1991) 179, ZPHY C52 (1992) 397, and ZPHY C (accepted).

**CERN-WA-070** (Aug 1980) Approved Oct 1981; Completed Nov 1986.

### 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 & INFN, MILAN - 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

$\pi^+ p \rightarrow \gamma X$	280 GeV/c
$\pi^+ p \rightarrow \pi^0 X$	"
$\pi^+ p \rightarrow \eta X$	"
$\pi^- p \rightarrow \gamma X$	"
$\pi^- p \rightarrow \gamma \gamma X$	"
$\pi^- p \rightarrow \pi^0 X$	"
$\pi^- p \rightarrow \eta X$	"
$p p \rightarrow \gamma X$	"
$p p \rightarrow \pi^0 X$	"
$p p \rightarrow \eta X$	"

Comments Uses a fine-grained  $\gamma$  detecting calorimeter (lead plates and liquid scintillator in teflon tubes) together with the Omega spectrometer.  $\gamma$ 's,  $\pi^0$ 's, and  $\eta$ 's are measured in all reactions in the  $p_T$  range between 4 and 7 GeV/c.

Papers NIM A261 (1987) 471, ZPHY C37 (1987) 39, ZPHY C37 (1988) 535, NIM A263 (1988) 325, NIM A264 (1988) 205, NIM A270 (1988) 21, NIM A270 (1988) 32, ZPHY C38 (1988) 371, NP (Proc. Suppl.) B7 (1989) 243, ZPHY C41 (1989) 591, ZPHY C42 (1989) 527, ZPHY C44 (1989) 71, PL B236 (1990) 523, and ZPHY C51 (1991) 163. No other papers expected.

## SUMMARIES OF CERN EXPERIMENTS

**CERN-WA-076** (Jan 1982) Approved Apr 1982, Nov 1984; Completed Nov 1986.

**STUDY OF THE MESONS PRODUCED CENTRALLY IN THE REACTION  $pp \rightarrow ppX^0$  AT 300 GeV/c**

ATHENS U - M Spyropoulou-Stassinaki, G D Vassiliadis  
 BARI U - M Caponero, C Evangelista, B Ghidini, M Girone,  
 V Lenti, F Navach, A Palano ( $\checkmark$  Spokesperson), G Zito  
 BIRMINGHAM U - I J Bloodworth, J N Carney, R Childs,  
 J B Kinson, A Kirk, H R Shaylor, O Villalobos-Baillie,  
 M F Votruba  
 CERN - W Beusch, B R French, Y Goldschmidt-Clermont,  
 K Knudson, J C Lassalle, E Quercigh, N Redaelli, L Rossi  
 COLLEGE DE FRANCE - M Benayoun, J Kahane, P Leruste,  
 A Malamant, J L Narjoux, M Sene, R Sene  
 PARIS, CURIE UNIV VI - A Jacholkowski, R Zitoun

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

Particles studied  $f_1(1420)$ , meson<sup>0</sup>,  $f_0(975)$ ,  $f_2(1720)$ , glueball

Comments Examines many specific exclusive channels. The first phase completed in 1982 was at 85 GeV/c, the second phase was at 300 GeV/c. Data analysis in progress (April 92).

Papers PL B146 (1984) 273, IEEE TNS 32 (1985) 674, PL B166 (1986) 245, PL B167 (1986) 133, ZPHY C34 (1987) 23, ZPHY C34 (1987) 33, ZPHY C35 (1987) 167, NIM A274 (1989) 165, PL B221 (1989) 216, PL B221 (1989) 221, PL B227 (1989) 186, PL B228 (1989) 536, ZPHY C43 (1989) 55, NP (Proc. Suppl.) B16 (1990) 304, ZPHY C46 (1990) 405, ZPHY C48 (1990) 213, NP (Proc. Suppl.) B21 (1991) 49, ZPHY C51 (1991) 351, and ZPHY C52 (1991) 389.

**CERN-WA-077** (Sep 1982) Approved Nov 1982; Completed Jul 1987.

**SEARCH FOR DIRECT PRODUCTION OF GLUONIUM STATES IN HIGH  $p_t \pi^- N$  COLLISIONS AT 350 GeV/c**

ATHENS U - A Bellogianni, M Spyropoulou-Stassinaki,  
 G Vassiliadis, I Vichou  
 BARI U - D Di Bari, C Evangelista, R Fini, B Ghidini, V Lenti,  
 F Navach, A Palano, G Zito  
 BIRMINGHAM U - I J Bloodworth, J N Carney, J B Kinson,  
 A Kirk, M T Trainor, O Villalobos-Baillie, M F Votruba  
 CERN - W Beusch, B R French, Y Goldschmidt-Clermont,  
 A Jacholkowski, K Knudson, J C Lassalle, R Petronzio,  
 E Quercigh  
 COLLEGE DE FRANCE - M Benayoun ( $\checkmark$  Spokesperson),  
 J Kahane, P Leruste, A Malamant, J L Narjoux, K Safarik,  
 M Sene, R Sene, A Volte  
 PARIS, CURIE UNIV VI - R Zitoun

Accelerator CERN-SPS Detector OMEGAPRIME

Reactions

$\pi^- Be \rightarrow \text{hadrons}$	150, 300 GeV/c
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Particles studied glueball,  $\rho$ ,  $\eta'$ ,  $f_2(1270)$ ,  $f_0(975)$ ,  $K^*(892)$ ,  $\phi$

Comments The aim is to study the prompt production mechanism expected to give rise to an abnormal rate of  $\rho$  and  $\eta'$  mesons, in contrast to what is predicted by the standard production mechanism of color string fragmentation. Also studies the production of glueball candidates, the e.g., the  $f_0(975)$ . Analyzes correlations in particle pair production at  $p_{\text{lab}} = 300$  GeV/c, and the higher twist production mechanism for  $\rho$  and  $\eta'$ . A study of  $f_0(975)$  production is foreseen. Data analysis in progress (April 92).

Papers NIM A249 (1986) 391, PL B183 (1987) 412, PL B198 (1987) 281, NP (Proc. Suppl.) B7 (1989) 228, and ZPHY C (accepted).

**CERN-WA-079** (Apr 1983) Approved Jun 1983; Started Aug 1986; Completed Aug 1991.

**STUDY OF NEUTRINO-ELECTRON SCATTERING AT THE SPS**

CHARM-II COLLABORATION

MIDDLE EAST TECH U, ANKARA - B Akkus, E Arik, M Serin-Zeyrek, R Sever, P Tolun, M T Zeyrek  
 BRUSSELS U, IIHE - P Vilain, G Wilquet  
 CERN - W Flegel, H Grote, H Overas, J Panman, A Rozanov,  
K Winter ( $\checkmark$  Spokesperson), G Zacek, V Zacek  
 HAMBURG U - R Beyer, F W Buesser, L Gerland, F Niebergall,  
 G Raedel, P Staehelin, T Voss  
 LOUVAIN U - D Favart, G Gregoire, E Knoops, T Mouthuy  
 MOSCOW, ITEP - P Gorbunov, E A Grigoriev, V D Khovansky,  
 A Maslennikov  
 MUNICH U, EXP PHYS - A Nathaniel, A Stauda  
 NAPLES U, IFS & INFN, NAPLES - A Ereditato, V Palladino,  
 P Strolin  
 INFN, ROME - A Capone, E Di Capua, U Dore, P F Loverre,  
 D De Pedis, G Piredda, A Rambaldi-Frenkel, R Santacesaria  
 BERLIN-ZEUTHEN ADW - K Hiller, R Nahnauer, H E Roloff

Accelerator CERN-SPS Detector CHARM-II

Reactions

$\nu_\mu e^-$	5-100 GeV/c
$\bar{\nu}_\mu e^-$	"

Comments The experiment aims at determining the electroweak mixing angle  $\theta_W$  and the ratio  $g_A/g_V$  from the ratio of  $\nu e^-$  and  $\bar{\nu} e^-$  scattering cross sections. The obtained values are to be compared to those determined at LEP for  $Q^2$  values  $10^6$  times larger. The CHARM-II neutrino detector consists of a massive, fine-grained, and low-density electronic calorimeter, followed by a muon spectrometer made of magnetized iron, with scintillators and drift chambers as active elements. The measurements are performed in the horn-focused wide-band neutrino beam.

Papers NIM A252 (1986) 443, NIM A260 (1987) 368, NIM A263 (1988) 109, PL B213 (1988) 554, NIM A277 (1989) 83, NIM A277 (1989) 170, NIM A278 (1989) 670, PL B231 (1989) 317, PL B232 (1989) 539, PL B245 (1990) 271, PL B247 (1990) 131, NP (Proc. Suppl.) B19 (1991) 306, and PL B259 (1991) 499.

**CERN-WA-080** (1982) Approved Feb 1983, Nov 1984; Completed Aug 1991.

**STUDY OF RELATIVISTIC NUCLEUS-NUCLEUS COLLISIONS AT THE CERN SPS**

BROOKHAVEN - C Chasman, R Debbé, O Hansen, B Moskowitz,  
 H Wegner  
 CERN - P Beckmann, A Franz  
 DARMSTADT, GSI - R Albrecht, R Bock, H H Gutbrod, B Kolb,  
 H R Schmidt  
 GRONINGEN U - H Loehner, I Lund  
 LBL - M Bloomer, P Jacobs, A Poskanzer  
 LUND U - G Claesson, A Eklund, S Garpman, H A Gustafsson,  
 J Idh, A Oskarsson, I Otterlund, K Soederstrom, E Stenlund  
 KURCHATOV INST, MOSCOW - V Antonenko, S Fokin,  
 M Ippolitov, K Karadjev, A Lebedev, V Manko, S Nikolaev,  
 A Vinogradov  
 MUNSTER U - F Berger, D Bock, G Clewing, L Dragon,  
 R Glasow, M Hartig, G Hoelker, K H Kampert, T Peitzmann,  
 M Purschke, B Roters, R Santo ( $\checkmark$  Spokesperson), R Schmidt,  
 K Steffens, P Steinhauser, D Stueken, A Twyhues  
 OAK RIDGE - T Awe, F Obenshain, F Plasil, S Saini,  
 M Tincknell, G Young  
 TENNESSEE U - S Sorensen

Accelerator CERN-SPS Detector Calorimeter, Spectrometer, PLASTIC-BALL

Reactions

$^{16}\text{O}$ nucleus	60, 200 GeV ( $T_{\text{lab}}/N$ )
$^{32}\text{S}$ nucleus	200 GeV ( $T_{\text{lab}}/N$ )
$p$ nucleus	"

Comments Forward and transverse energies are determined in calorimeters. Photons,  $\pi^0$ 's, and  $\eta$ 's are measured in the finely granulated lead-glass spectrometer at midrapidity. Multiplicity distributions and fluctuations are studied in streamer tube arrays, and the target rapidity is investigated using the Plastic Ball detector.

Papers PL B199 (1987) 297, NP A461 (1987) 487c, PL B201 (1988) 390, PL B202 (1988) 596, NP A488 (1988) 651c, APP

## SUMMARIES OF CERN EXPERIMENTS

B19 (1988) 399, ZPHY C38 (1988) 3, ZPHY C38 (1988) 51, ZPHY C38 (1988) 97, ZPHY C38 (1988) 109, NIM A276 (1989) 131, NIM A279 (1989) 479, NIM A279 (1989) 503, PL B221 (1989) 427, NP A498 (1989) 53c, NP A498 (1989) 391c, NP A498 (1989) 397c, ZPHY C45 (1989) 31, PS T32 (1990) 118, PS T32 (1990) 147, NP A519 (1990) 449c, NP (Proc. Suppl.) B16 (1990) 420, ZPHY C47 (1990) 367, NP A525 (1991) 305c, NP A525 (1991) 333c, NP A525 (1991) 657c, PR C44 (1991) 2736, ZPHY C51 (1991) 1, and ZPHY C53 (1992) 225.

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**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 Uggerhoj (✓ Spokesperson)

CERN – A Sorensen

STRASBOURG, CRN – P Siffert, M Suffert

Accelerator CERN-SPS Detector OMEGA

Reactions

$\gamma$  crystal  $\rightarrow e^+ e^- X$  15–150 GeV/c

Comments Uses the setup of CERN-WA-069.

Papers PL B202 (1988) 615, PL B212 (1988) 537, and PL B213 (1988) 242.

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**CERN-WA-082** (Oct 1985) Approved Feb 1986; Completed Sep 1989.

**HIGH STATISTICS STUDY OF CHARM HADROPRODUCTION USING AN IMPACT PARAMETER TRIGGER**

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

CERN – D Barberis, W Beusch, M Dameri, M Davenport,

J P Dufey, B R French, A Jacholkowski, K Knudson,

J C Lassalle, F Muller

GENOA U & INFN, GENOA – R Hurst, B Osculati, L Rossi (✓ Spokesperson), G Tomasini

INFN, MILAN & MILAN U – C Meroni, N Redaelli, D Torretta

MONS U – J L Bailly, A Buys, F Grard, P Legros

LEBEDEV INST – M I Adamovich, Y A Alexandrov, S G Gerassimov, S P Kharlamov, L V Malinina, M V Zavertyaev

Accelerator CERN-SPS Detector OMEGA

Reactions

$\pi^-$  nucleus  $\rightarrow$  charm X 340 GeV/c

p nucleus  $\rightarrow$  charm X 370 GeV/c

Particles studied charm,  $D^+$ ,  $D^0$ ,  $D_s^+$ ,  $\Lambda_c^+$

Comments Triggers on charm decays by measuring the impact parameter. Uses silicon-strip counters as a microvertex detector.

Papers NP (Proc. Suppl.) B1 (1988) 303, IEEE TNS 37 (1990) 236, NIM A288 (1990) 82, NP (Proc. Suppl.) B16 (1990) 302, and PL B268 (1991) 142.

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**CERN-WA-083** (Oct 1985) Approved Feb 1986; Completed Nov 1986.

**INVESTIGATION OF SOFT PHOTON PRODUCTION IN HADRONIC COLLISIONS USING THE OMEGA SPECTROMETER**

ATHENS U – S Abatzis, A Belogianni, M Spyropoulou-Stassinaki (✓ Spokesperson), G Vassiliadis, I Vichou

TATA INST – S Banerjee, A Subramanian

CERN – D Barberis, W Beusch, B French, Y Goldschmidt-

Clermont, M Grabowski, U Kerres, K Knudson, J A G Morris, E Quercigh, P Sonderegger

LANCASTER U – T J Brodbeck, G W Wilson

Accelerator CERN-SPS Detector OMEGA

Reactions

$\pi^- p \rightarrow \gamma(s) X$  280 GeV/c

Comments Investigates an observation made in BEBC that the yield of soft  $\gamma$ 's, after the subtraction of gammas from hadronic decays, exceeds the QED prediction of hadronic bremsstrahlung. Data analysis in progress (May 92).

Papers NP A525 (1991) 487c.

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**CERN-WA-084** (Jan 1987) Approved Apr 1987; Completed Sep 1991.

**STUDY OF THE PRODUCTION AND DECAY PROPERTIES OF BEAUTY FLAVORED HADRONS**

BRUSSELS U, IIHE – G Wilquet

CERN – F Antinori, W Beusch, J P Fabre, D R O Morrison

IMPERIAL COLL – A Duane, K Harrison, D M Websdale

PISA U & INFN, PISA – M Adinolfi, C Angelini, A Cardini,

V Flaminio, D Lucchesi, C Roda

ROME U & INFN, ROME – A Frenkel, E Lamanna,

G Martellotti (✓ Spokesperson), G Penso, S Petrera, A Sciubba, M Di Vincenzi

RUTHERFORD – D J Crennell

SOUTHAMPTON U – J G McEwen

Accelerator CERN-SPS Detector OMEGA

Reactions

$\pi^-$  nucleus  $\rightarrow B \bar{B} X$  350 GeV/c

Comments Developing an active target composed of 30- $\mu$ m-diameter scintillating plastic optical fibers. Aims are to measure the  $B^\pm$  and  $B^0$  lifetimes separately, the ratio  $(b \rightarrow u)/(b \rightarrow c)$ , and to search for  $B^0 \bar{B}^0$  mixing. Temporarily inactive (April 92).

Papers NIM A277 (1989) 132, NIM A289 (1990) 342, NIM A289 (1990) 356, NIM A295 (1990) 299, and NIM A311 (1992) 91.

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**CERN-WA-085** (Oct 1984, Mar 1987) Approved Apr 1987; Completed Sep 1991.

**STUDY OF HIGH ENERGY NUCLEUS-NUCLEUS INTERACTIONS USING THE  $\Omega'$  SPECTROMETER EQUIPPED WITH A MULTIPARTICLE HIGH  $p_T$  DETECTOR**

ATHENS U – S Abatzis, G Vassiliadis

BARI U – N Di Bari, C Evangelista, R Falcone, R Fini, B Ghidini, M Gironi, V Lenti, R A Loconsole, V Manzari, F Navach,

A Palano

BERGEN U – N Amelin, L P Csernai, H Helstrup, A K Holme, E F Staubo

BIRMINGHAM U – R Barnes, J N Carney, D Evans, J B Kinson, O Villalobos-Baillie, M F Votruba

CERN – W Beusch, B R French, A Jacholkowski, A Kirk, K Knudson, J C Lassalle, E Quercigh (✓ Spokesperson)

GENOA U & INFN, GENOA – F Antinori

MADRID, CIEMAT – B de la Cruz, P Ladron de Guevara

COLLEGE DE FRANCE – M Benayoun, A Diaczek, J Kahane,

P Leruste, L Lima-Frances, A Malamant, J L Narjoux,

K Safarik, M Sene, R Sene, M Tamazouzt, A Volte

TRIESTE U & INFN, TRIESTE – A Bravar, A Penzo

Accelerator CERN-SPS Detector OMEGAPRIME

Reactions

$^{32}\text{S}$  Wt 200 GeV ( $T_{\text{lab}}/N$ )

Comments An exploratory experiment to look for new physics, and particularly for evidence for a quark-gluon plasma.

Papers NP A498 (1989) 369c, PL B244 (1990) 130, NP (Proc. Suppl.) B16 (1990) 409, PL B259 (1991) 508, PL B270 (1991) 123, NP A525 (1991) 441c, and NP A525 (1991) 445c.

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**CERN-WA-086** (Mar 1987) Approved Jun 1987; Completed Sep 1991.

**EXPOSURE OF CR39 STACKS TO OXYGEN AND/OR SULPHUR BEAMS AT THE CERN-SPS**

BOLOGNA U & INFN, BOLOGNA – G Giacomelli

(✓ Spokesperson), A Margiotta-Neri, L Patrizii, P Serra-Lugaresi, G Sini, M Spurio, G Vanderhaeghe

Accelerator CERN-SPS Detector Plastic

## SUMMARIES OF CERN EXPERIMENTS

### Reactions

$^{16}\text{O}$ nucleus	50, 200 GeV ( $T_{\text{lab}}/N$ )
$^{32}\text{S}$ nucleus	"

**Comments** The main purpose is to calibrate CR-39 sheets to be used in a large-area search for magnetic monopoles (see UNDERGROUND-MACRO) at the Gran Sasso Laboratory. A byproduct is to obtain upper limits on the production of nuclei with attached fractional charge.

**CERN-WA-087** (Mar 1987) Approved Jun 1987; Completed Oct 1987.

### INVESTIGATION OF NUCLEAR FRAGMENTATION IN RELATIVISTIC HEAVY ION COLLISIONS USING PLASTIC NUCLEAR TRACK DETECTORS

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

Accelerator CERN-SPS Detector Plastic

### Reactions

$^{32}\text{S}$ nucleus	200 GeV ( $T_{\text{lab}}/N$ )
$^{16}\text{O}$ nucleus	60, 200 GeV ( $T_{\text{lab}}/N$ )

**Comments** Uses CR-39 track detectors to measure cross sections for production of nuclear fragments. Studies coulomb dissociation for various targets and energies.

Papers PL B200 (1988) 583, ZPHY A330 (1988) 407, ZPHY A331 (1988) 463, and MPL A4 (1989) 1879.

**CERN-WA-088** (May 1987) Approved Jun 1987; Started Oct 1987; Completed Oct 1987.

### TEST OF BUBBLE DAMAGE DETECTORS IN A HEAVY ION BEAM FROM THE SPS

CARLETON U – J L Pinfeld (✓ Spokesperson), J Waterhouse  
CHALK RIVER, AECL – H Ing  
NATIONAL RESEARCH COUNCIL, OTTAWA – F G Oakham,  
C J Virtue

Accelerator CERN-SPS Detector Other

### Reactions

$^{32}\text{S}$	200 GeV ( $T_{\text{lab}}/N$ )
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**Comments** Studies properties of a polymer that holds droplets of a super-heated liquid in suspension. The threshold  $dE/dx$  to cause bubble formation varies with temperature and pressure, and the polymer can be reset with sufficient overpressure. Such a detector could be used to detect ionizing particles from cosmic rays or high energy particle interactions.

**CERN-WA-089** (Aug 1987) Approved Feb 1988.

### NEW HYPERON BEAM EXPERIMENT AT THE CERN-SPS USING THE OMEGA FACILITY

BOLOGNA U & INFN, BOLOGNA – A Forino, R Gessaroli,  
P Mazzanti, A Quareni-Vignudelli, F Viaggi  
CERN – W Beusch, M Dameri, J P Dufey, B R French  
GENOA U & INFN, GENOA – A Brunengo, R B Hurst,  
B Osculati, L Rossi, G Tomasini  
GRENOBLE U – D Barberis, C Berat, M Buenerd, F Charignon,  
J Chauvin, J Y Hostachy, P Martin, M Rey-Campagnolle,  
R Touillon

HEIDELBERG, MAX PLANCK INST – E Albertson,  
K Brenzinger, S Brons, W Brueckner, F Dropmann,  
S G Gerassimov, M Godbersen, M Heydrich, T Kallakowsky,  
R Michaels, S Paul (✓ Spokesperson), B Povh, L Schmitt,  
A Trombini, A Wenzel, R Werding  
HEIDELBERG U – J Engelfried, F Fallner, J Heintze, P Lennert,  
S Ljungfelt, K Martens, H Rieseberg, H W Siebert, A Simon,  
G Waelder

MAINZ U, INST PHYS – E Chudakov, U Mueller, G Rosner,  
H Rudolph, B Volkemer, T Walcher  
LEBEDEV INST – M I Adamovich, Y A Alexandrov, S P Kharlamov,  
L N Malinina, N G Peresadko, M V Zavertyaev

Accelerator CERN-SPS Detector OMEGA

### Reactions

$\Sigma^-$ Cu	360 GeV/c
$\Sigma^-$ Be	"

$\Xi^-$ Cu	270 GeV/c
$\Xi^-$ Be	"
$\Omega^-$ Cu	"
$\Omega^-$ Be	"

Particles studied  $\Lambda_c^+$ ,  $\Sigma_c(2455)$ ,  $\Xi_c^0$ ,  $\Xi_c^+$ ,  $\Omega_c^0$ ,  $\Omega^-$ ,  $\Omega^*$  (unspec),  $\Xi^*$  (unspec), dibaryon ( $S = -2$ ),  $U(3100)$

**Comments** The aims are (1) to study charmed strange baryons, (2) to see if the  $U(3100)$  actually exists, (3) to study  $\Omega$  decays and  $\Xi$  and  $\Omega$  resonances, and (4) to look for the doubly strange dibaryon, the  $H$ . Taking data (April 92).

**CERN-WA-090** Approved Apr 1990.

### MEASUREMENTS OF PAIR PRODUCTION AND ELECTRON CAPTURE FROM THE CONTINUUM IN HEAVY PARTICLE COLLISIONS

SIEGBAHN INST PHYS, STOCKHOLM – H Gao, R H Schuch  
LUND U – R Hutton  
OAK RIDGE – C Bottcher, S Datz (Spokesperson), P F Dittner,  
H F Krause, M Strayer, C R Vane

Accelerator CERN-SPS Detector ?

### Reactions

$^{32}\text{S}$ nucleus	200 GeV ( $T_{\text{lab}}/N$ )
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**Comments** Runs parasitic to WA-093. Studies the electron capture from pair production. This is the only electron capture process which increases with energy, and as such, dominates all others in the ultrarelativistic energy regime. Thin Au, Pd, and Al targets are placed in a beam line dipole magnet:  $e^+e^-$  pairs created in the forward direction are split and bent into the detector planes on either side of the target. Taking data (March 92).

**CERN-WA-091** Approved Apr 1990.

### SEARCH FOR CENTRALLY PRODUCED NON- $q\bar{q}$ MESONS IN PROTON-PROTON INTERACTIONS AT 450 GeV/c BY USING THE CERN $\Omega$ SPECTROMETER

ATHENS U – S Abatzis, G Vassiliadis  
BARI U & INFN, BARI – N Di Bari, C Evangelista, R Fini,  
B Ghidini, M Girone, V Lenti, A Loconsole, V Manzari,  
F Navach  
BIRMINGHAM U – R P Barnes, J N Carney, C J Dodenhoff,  
D Evans, J B Kinson, O Villalobos-Baillie, M F Votruba  
CERN – W Beusch, B R French, A Jacholkowski, A Kirk  
(✓ Spokesperson), K Knudson, J C Lassalle, E Quercigh  
DUBNA – J Budagov, S Maljukov, I Minashvili, N Russakovich,  
A Semenov, A Solovjev, G Tchatchidze  
COLLEGE DE FRANCE – M Sene, R Sene

Accelerator CERN-SPS Detector OMEGA

### Reactions

$p p \rightarrow p p X$	450 GeV/c
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**Comments** A search for new, non- $q\bar{q}$  states in the central region, with at least 10 times the statistics of the CERN-WA-076 experiment. Taking data (April 92).

**CERN-WA-092** Approved Jul 1990.

### MEASUREMENT OF BEAUTY PARTICLE LIFETIMES AND HADROPRODUCTION CROSS SECTIONS

BOLOGNA U & INFN, BOLOGNA – A Forino, R Gessaroli,  
L Malferrari, P Mazzanti, A Quareni  
CERN – F Antinori, W Beusch, J P Dufey, J P Fabre,  
B R French, A Kirk, J C Lassalle, D R O Morrison, G Schuler  
GENOA U & INFN, GENOA – D Barberis, D Casanova,  
M Dameri, G Darbo, R Hurst, P Martinengo, B Osculati,  
L Rossi (✓ Spokesperson), C Salvo  
IMPERIAL COLL – A Duane, D M Websdale  
LEBEDEV INST – M Adamovich, Y Alexandrov, S Gerasimov,  
S Kharlamov, P Nechaeva, M Zaveryaev  
PISA U & INFN, PISA – C Angelini, A Cardini, V Flaminio,  
C Roda  
ROME U & INFN, ROME – C Bacci, F Ceradini, G Ciapetti,  
A Frenkel, K Harrison, F Lacava, G Martellotti, A Nisati,

## SUMMARIES OF CERN EXPERIMENTS

G Penso, E Petrolo, L Pontecorvo, M Torelli, S Veneziano,  
L Zanella

ROME U, TORVERGATA & INFN, ROME – R Cardarelli,  
A Di Ciaccio, R Santonico

SOUTHAMPTON U – J G McEwen

Accelerator CERN-SPS Detector ?

Comments An experimental search for beauty particles produced in fixed target hadronic interactions. Uses a high precision "decay detector" and a fast secondary vertex trigger processor. Taking data (April 92).

**CERN-WA-093** Approved Nov 1990.

### A LIGHT UNIVERSAL DETECTOR FOR THE STUDY OF CORRELATIONS BETWEEN PHOTONS AND CHARGED PARTICLES

CALCUTTA, VECC – S Chattopadhyay, A Das, M R Dutta-Mazumdar, T Ghosh, G N S Murthy, B Sinha, D K Srivastava, M D Trivedi, Y P Vijoyi

DARMSTADT, GSI – R Bock, H H Gutbrod (✓ Spokesperson), B W Kolb, M Purschke, B Roters, H R Schmidt, P Steinhaeuser

GENEVA U – A L S Angelis, P Doenni, E Durieux, M Izycki, M Martin, L Rosselet, N Solomey

GRONINGEN U – H Loehner, I Lund, S Slegt

LUND U – A Eklund, S Garpman, H A Gustafsson, J Idh, A Oskarsson, I Otterlund, K Soederstrom, E Stenlund, H J Whitlow

JAMMU U – S K Badyal, B P V K S Devanand, S Kachroo, N K Rao, S Sambyal

KURCHATOV INST, MOSCOW – V Antonenko, S Fokin, M Ippolitov, K Karadjev, A Lebedev, V Manko, S Nikolaev, A Vinogradov

MUNSTER U – F Berger, D Bock, G Clewing, L Dragon, R Glasow, M Hartig, G Hoelker, K Kampert, T Peitzmann, R Santo, K Steffens, D Stueken, A Twyhues

OAK RIDGE – T C Aves, H Kim, J Kreke, F E Obenshain, F Plasil, S Saini, G R Young

PANJAB U – M M Aggarwal, V S Bhatia, I S Mittra

RAJASTHAN U – K B Bhalla, S K Gupta, V Kumar, S Lokanathan, S Mukherjee, S Raniwala

TENNESSEE U – X He, S P Sorensen

UTRECHT U – N van Eijndhoven, F Geurts, E van Heeringen, R Kamermans, P Kuijer, C Twenhoevel

WARSAW, INST NUCL STUDIES – T Siemiarczuk, G Stefanek

Accelerator CERN-SPS Detector ?

#### Reactions

Su nucleus 200 GeV ( $T_{lab}/N$ )

Comments The experiment combines two essential means of quark matter diagnosis: the measurement of photon production rates relative to charged particles, and the measurement of transverse momenta of charged and neutral particles and their correlations. The setup consists of highly segmented lead glass arrays, a preshower detector that can be operated in a hadron-blind mode, and a set of multistep avalanche chambers read out by CCD cameras downstream of the GOLIATH vertex magnet. Scheduled to run till May 92.

**CERN-WA-094** Approved Apr 1991.

### STUDY OF BARYON AND ANTIBARYON SPECTRA IN SULPHUR-SULPHUR INTERACTIONS AT 200 GeV/c PER NUCLEON

ATHENS U – S Abatzis, G Vassiliadis

BARI U – D Di Bari, R Fini, B Ghidini, M Girone, V Lenti,

R A Loconsole, V Manzari, F Navach

BERGEN U – N S Amelin, L P Csernai, H Helstrup, A K Holme, E F Staubo

BIRMINGHAM U – R P Barnes, J N Carney, C J Dodenhoff,

D Evans, J B Kinson, O Villalobos-Baillie, M F Votruba

CERN – F Antinori, W Beusch, J P Dufey, B R French,

A Jacholkowski, A Kirk, K Knudson, J C Lassalle, F Piuze, E Quercigh (✓ Spokesperson)

KOSICE, IEF – J Ban, J Boehm, L Sandor, J Urban, P Zavada

LEGNARO – R A Ricci

MADRID, CIEMAT – C Burgos, B de la Cruz,

P Ladron de Guevara, C Willmot

PADUA U & INFN, PADUA – M Morando

COLLEGE DE FRANCE – M Benayoun, A Diaczek, J Kahane,  
P Leruste, L Lima-Frances, A Malamant, J L Narjoux,

M Pairat, K Safarik, M Sene, R Sene, A Volte

SERPUKHOV – V A Kachanov, A V Singovsky

STRASBOURG, CRN – R Blaes, J M Brom, B Escoubes,

W Geist, J L Jacquot, M E Michalon-Mentzer, A Michalon,

J L Riestler, C Voltolini

TRIESTE U & INFN, TRIESTE – A Bravar, A Penzo

Accelerator CERN-SPS Detector OMEGA

#### Reactions

Su Su 200 GeV ( $T_{lab}/N$ )

Comments Extends analysis of CERN-WA-085 from S W to S S interactions. For the 1992 run the apparatus has been modified to measure charged particle spectra (in particular  $p$  and  $\bar{p}$ ) with particle identification using an array of Si-microstrip detectors and a newly upgraded Ring Imaging Čerenkov detector. Taking data (April 92).

**CERN-WA-095** Approved Sep 1991.

### A NEW SEARCH FOR $\nu_\mu$ - $\nu_\tau$ OSCILLATIONS

MIDDLE EAST TECH U, ANKARA – E Arik, G Onenguet,

E Pesen, M Serin-Zeyrek, R Sever, P Tolun, M T Zeyrek

BARI U – N Armenise, M G Catanesi, M T Muciaccia, S Simone

HUMBOLDT U, BERLIN – K Hopfner, P Lendermann, T Patzak

BRUSSELS U, IIHE – M Gruwe, C Mommaert, P Vilain,

G Wilquet

CERN – R Beyer, J Fabre, W Flegel, K Hiller, P Lendermann,

H Overas, J Panman, A Rozanov, G Stefanini, K Winter

(✓ Spokesperson), H Wong, G Zacek, V Zacek

FERRARA U – E Di Capua, B Saitta

LOUVAIN U – D Favart, G Gregoire, V Lemaitre, L Michel

MOSCOW, ITEP – A Artamonov, P Gorbunov, V Khovansky,

V Shamanov, V Smirnitsky

LEBEDEV INST – M Adamovich, M Chernyavsky, G Orlova,

N Peresadko, V Rapoport, V Tsarev

NAPLES U, IFS & INFN, NAPLES – S Buontempo, A Ereditato,

P Palladino, P Strolin

ROME U & INFN, ROME – G Baroni, A Capone, U Dore,

S Di Liberto, P F Loverre, D Macina, M A Mazzoni, F Meddi,

D De Pedis, G Piredda, G Rosa, R Santacesaria

SALERNO U & INFN, SALERNO – G Grella, G Romano

AICHI U OF EDUCATION – K Kodama, N Ushida

GIFU U – K Nakazawa

KOBE U – S Aoki, H Fukushima, T Hara, T Takahashi

KINKI U, IZUKA – H Chikawa

NAGOYA U – K Hoshino, M Kobayashi, M Miyanishi,

M Nakamura, Y Nakamura, S Nakanishi, T Nakano, K Niu,

K Niwa, M Nomura, K Saito, O Sato, H Tajima, K Teraoka,

S Yoshida

OSAKA CITY U – K Nakamura, T Okusawa, M Teranaka,

T Tominaga, T Yoshida, H Yuuki

OSAKA PREFECTURE U – H Okabe, J Yokoto

TOHO U – M Adachi, T Jinya, M Kazuno, E Niu, H Shibuya,

M Tairadate, Y Umezawa

UTSUNOMIYA U – Y Sato, I Tezuka

YOKOHAMA NATIONAL U – Y Maeda

KANGWEON NATIONAL U – C H Hahn

GYEONGSANG NATIONAL U – K S Chung, S H Chung,

D C Kim, S H Oh, I G Park, M S Park, J S Song, C S Yoon

Accelerator CERN-SPS Detector Spectrometer, Calorimeter

#### Reactions

$\nu_\tau$  nucleon  $\rightarrow \tau^- X$

Comments The setup consists of a target region, an aircore magnet, a high-precision calorimeter, and a muon spectrometer. Nuclear emulsion stacks form the 800-kg mass of the fiducial target volume. Decays of short-lived particles, such as the  $\tau$ , are visualized with high efficiency. Tracks are located in the emulsion with high-precision scintillating fiber trackers, and read out with optoelectronic image intensifiers coupled to CCD cameras, thus permitting computer-assisted scanning. The hexagonal aircore magnet provides the measurement of the charge-sign of low energy hadrons and muons. The high-precision calorimeter, which is based on spaghetti technology, tags the  $\tau^-$  decay by its transverse momentum imbalance. The

## SUMMARIES OF CERN EXPERIMENTS

spectrometer identifies muons and measures their momentum and charge. In preparation (April 92).

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**CERN-WA-096** Approved Sep 1991.

### SEARCH FOR THE OSCILLATION $\nu_\mu \rightarrow \nu_\tau$

ALGIERS, ECOLE NAT POLYTECH – M Kadi-Hanifi,  
M R Ouared, Y Touaibia, N Zenine  
BOSTON U – R Cormack, E T Kearns, S Merritt, J L Stone  
CERN – L Camilleri, L Di Lella, C Sobczynski  
DORTMUND U – C Goessling, D Pollmann, V Sondermann  
DUBNA – S A Baranov, Y A Batusov, S A Bunyatov, O L Klinov,  
O M Kuznetsov, V V Lyukov, Y A Nefedov, V I Snyatkov  
ANNECY – M Gouanere, H Pessard, D Sillou  
PARIS, CURIE UNIV VI & PARIS, UNIV VII, LPNHE –  
P Astier, J Dumarchez, A Letessier, J M Levy, A M Touchard,  
F Vannucci (✓ Spokesperson)  
LUND U – T Akesson  
MELBOURNE U – S Tovey  
MICHIGAN U – G Ballocchi, D B Hubbard, O E Overseth,  
G R Snow  
PADUA U – M Baldo-Ceolin, F Bobisut, D Gibin, A Guglielmi,  
M Laveder, M Mezzetto, G Puglierin  
PAVIA U – G Ambrosini, P Cattaneo, M Fraternali, G Fumagalli,  
G Goggi, F Pastore, G Polesello  
PISA U – D Anterio, V Cavasinni, N DelPrete  
SACLAY – A Baldisseri, M Banner, J Bouchez, J P Meyer,  
X Stolarczyk, H Zaccone  
BOSKOVIC INST, ZAGREB – D Kekez, A Ljubičić, E Manola,  
M Stipčević, T Tustonić

Accelerator CERN-SPS Detector ?

Comments Searches for the oscillation  $\nu_\mu \rightarrow \nu_\tau$  in the wide-band neutrino beam. Aims at detecting  $\nu_\tau$  charged current interactions by observing the production of the  $\tau$  through its various decay modes by means of kinematical criteria. The detector reconstructs the event kinematics. It uses the CERN-UA-001 magnet. The target consists of 145 drift chambers, with a total mass of 2.9 tons. It is followed by transition radiation detectors and an electromagnetic calorimeter which includes a preshower detector. In preparation (April 92).

Comments Hyperons are expected to be a useful probe for the dynamics of hadronic matter under extreme conditions. In particular, the onset of a quark-gluon plasma phase in a heavy ion collision is expected to enhance the hyperon yield with respect to normal hadronic interactions. The experiment measures the spectra of hyperons and antihyperons produced in ultrarelativistic lead-lead interactions over a wide phase-space window. The principal aim is to compare the production of baryons carrying one unit of strangeness ( $\Lambda$ ) with those carrying two ( $\Xi^-$ ) and three units of strangeness ( $\Omega^-$ ). In preparation (March 92).

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**CERN-WA-097** Approved Sep 1991.

### STUDY OF BARYON AND ANTIBARYON SPECTRA IN Pb-Pb INTERACTIONS AT 160 GeV/c PER NUCLEON

BARI U & INFN, BARI – N Armenise, D Di Bari, M G Catanesi,  
C Evangelista, R A Fini, B Ghidini, M Girone, V Lenti,  
V Manzari, M T Muciaccia, E Nappi, F Navach, A Palano,  
F Posa, T Scognetti, S Simone, G Tomasicchio  
BERGEN U – E Anderson, L P Csernai, H Helstrup, A K Holme,  
G Lovhoiden, E F Staubo, T F Thorsteinsen  
BIRMINGHAM U – R P Barnes, J N Carney, C J Dodenhoff,  
D Evans, J B Kinson, O Villalobos-Baille, M F Votruba  
CERN – F Antinori, W Beusch, E Chesi, J P Dufey, B R French,  
A Jacholkowski, A Kirk, K Knudson, J C Lassalle, F Piuze,  
E Quercigh (Spokesperson), G Vassiliadis  
COLLEGE DE FRANCE – M Benayoun, A Diaczek, J Kahane,  
P Leruste, L Lima-Frances, A Malamant, J L Narjoux,  
M Pairat, K Safarik, M Sene, R Sene, A Volte  
GENOA U & INFN, GENOA – M Dameri, G Darbo,  
P Martinengo, B Osculati, L Rossi, C Salvo  
KOSICE, IEF – J Ban, J Boehm, L Sandor, J Urban, P Zavada  
LEGNARO – R A Ricci  
PADUA U & INFN, PADUA – M Morando, F Pellegrini, G Segato  
ROME U & INFN, ROME – H Beker, S Di Liberto, M A Mazzoni,  
F Meddi, G Rosa, T Virgili  
SALERNO U & INFN, SALERNO – G Grella, G Romano  
SERPUKHOV – U A Kachanov  
STRASBOURG, CRN – R Blaes, J M Brom, B Escoubes,  
W Geist, J L Jacquot, M E Michalon-Mentzer, A Michalon,  
J L Riestler, C Voltolini  
TRIESTE U & INFN, TRIESTE – A Bravar, A Penzo

Accelerator CERN-SPS Detector OMEGA

### Reactions

Pb Pb 260 GeV ( $T_{lab}/N$ )



# SUMMARIES OF CESR EXPERIMENTS

## CESR Experiments

**CESR-CLEO** Started Oct 1979.

**THE CLEO EXPERIMENT AT CESR**

CAL TECH - D S Akerib, B Barish, M Chadha, D F Cowen, G Eigen, J S Miller, J Urheim, A J Weinstein  
 UC, SAN DIEGO - D Acosta, G Masek, B Ong, H Paar, M Sivertz  
 UC, SANTA BARBARA - S Menary, R J Morrison, H Nelson, J Richman, D Schmidt, D Sperka, H Tajima, M Witherell  
 CARNEGIE MELLON U - M Procaro  
 COLORADO U - M Daoudi, W T Ford, D R Johnson, K Lingel, M Lohner, P Rankin, J G Smith  
 CORNELL U - J Alexander, C Bebek, K Berkelman, D Besson, T E Browder, D G Cassel, E Cheu, D M Coffman, P S Drell, R Ehrlich, R S Galik, M Garcia-Sciveres, B Geiser, M G D Gilchriese, B Gittelman, S W Gray, D L Hartill, B K Heltsley, K Honscheid, C Jones, J Kandaswamy, N Katayama, P C Kim, D L Kreinick, G S Ludwig, J Masui, J Mevissen, N B Mistry, S Nandi, C R Ng, E Nordberg, C O'Grady, J R Patterson, D Peterson, D Riley, M Sapper, M Selen, H Worden, M Worris, F Wuerthwein  
 FLORIDA U - P Avery, A Freyberger, J Rodriguez, R Stephens, J Yelton  
 HARVARD U - S Henderson, K Kinoshita, F Pipkin, M Saulnier, R Wilson, J Wolinski, D Xiao, H Yamamoto  
 ITHACA COLL - A J Sadoff  
 KANSAS U - R Ammar, S Ball, P Baringer, D Coppage, R Davis, M Kelly, N Kwak, H Lam, S Ro  
 MINNESOTA U - Y Kubota, M Lattery, J K Nelson, D Perticone, R Poling, S Schrenk, R Wang  
 SUNY, ALBANY - M S Alam, I J Kim, B Nemati, J J O'Neill, V Romero, H Severini, C R Sun, P Wang, M M Zoeller  
 OHIO STATE U - G Crawford, R Fulton, K K Gan, H Kagan, R Kass, J Lee, R Malchow, F Morrow, M K Sung, C White, J Whitmore, P Wilson  
 OKLAHOMA U - F Butler, X Fu, G Kalfbleisch, M Lambrecht, P Skubic, J Snow, P Wang  
 PURDUE U - D Bortoletto, D N Brown, J Dominick, R L McIlwain, D H Miller (✓ Spokesperson), M Modesitt, S F Schaffner, E I Shibata, I P J Shipsey  
 ROCHESTER U - M Battle, J Ernst, H Kroha, S Roberts, K Sparks, E H Thorndike, C Wang  
 SOUTHERN METHODIST U - R Stroynowski  
 SYRACUSE U - M Artuso, M Goldberg, T Haupt, N Horwitz, R Kennett, G C Moneti, S Playfer, Y Rozen, P Rubin, T Skwarnicki, S Stone, M Thulasidas, W Yao, G Zhu  
 VANDERBILT U - A V Barnes, J Bartelt, S E Csorna, V Jain, T Letson, M D Mestayer

Accelerator CESR Detector CLEO

Reactions

$e^+ e^- \rightarrow$ hadrons	9.0-12.0 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow e^+ e^-$	"
$e^+ e^- \rightarrow \mu^+ \mu^-$	"
$e^+ e^- \rightarrow e^+ e^-$ hadrons	"
$e^+ e^- \rightarrow \tau^+ \tau^-$	"

Particles studied  $\Upsilon(1S)$ ,  $\Upsilon(2S)$ ,  $\Upsilon(3S)$ ,  $\Upsilon(4S)$ ,  $B$ ,  $\tau$ ,  $D^+$ ,  $D^0$ ,  $D_s^+$ , charmed-baryon

Comments Studies  $e^+e^-$  interactions in the energy range of the  $\Upsilon$  resonances. Topics include  $b\bar{b}$  spectroscopy,  $b$ -quark decays, decays of the  $\Upsilon$ 's,  $\tau$  decays, charm spectroscopy and decays, and two-photon physics. The CLEO-II detector (operational since 1989) consists of drift chambers for tracking charged particles and measuring  $dE/dx$ , time-of-flight counters, a 7800-element cesium iodide electromagnetic calorimeter, a 1.5-Tesla superconducting solenoid, iron for flux return and muon identification, and muon chambers. Taking data (April 92).

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 B122 (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 B137 (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, 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, PL B183 (1987) 429, PL B191 (1987) 319, PRL 58 (1987) 183, PR D35 (1987) 19, PRL 58 (1987) 307, PRL 58 (1987) 1814, PR D35 (1987) 1081, PR D35 (1987) 2747, PR D35 (1987) 3533, PR D36 (1987) 690, PR D36 (1987) 1289, PRL 59 (1987) 22, PRL 59 (1987) 407, PRL 59 (1987) 1993, PRL 60 (1988) 1614, PR D37 (1988) 1719 [erratum: PR D39 (1989) 1471], PR D38 (1988) 2679 [erratum: PR D40 (1989) 1701], PRL 62 (1989) 8, PRL 62 (1989) 863, PRL 62 (1989) 1240, PRL 62 (1989) 2233, PRL 62 (1989) 2436, PR D39 (1989) 3528, PL B223 (1989) 470, PL B224 (1989) 445, PR D40 (1989) 263, PR D40 (1989) 712 [erratum: PR D40 (1989) 3790], PL B226 (1989) 192, PL B226 (1989) 401, PRL 63 (1989) 1667, PRL 64 (1990) 16, PRL 64 (1990) 2117, PRL 64 (1990) 2226, PRL 65 (1990) 1184, PRL 65 (1990) 1531, PRL 65 (1990) 2842, PR D41 (1990) 805, PR D41 (1990) 774, PR D41 (1990) 1401, PL B243 (1990) 169, PL B251 (1990) 223, PRL 67 (1991) 1692, PRL 67 (1991) 1696, PR D43 (1991) 651, PR D43 (1991) 1448, PR D43 (1991) 2836, PR D43 (1991) 3599, PR D44 (1991) 593, PR D44 (1991) 3383, PR D44 (1991) 3394, PRL 68 (1992) 1275, PRL 68 (1992) 1279, PR D45 (1992) 1, PR D45 (1992) 752, and PR D45 (1992) 2212.

**CESR-CUSB-II** (1978) Approved Jun 1984; Started Dec 1985; Completed May 1991.

**CUSB-II — HIGH RESOLUTION BGO CALORIMETER TO STUDY  $\Upsilon$  SPECTROSCOPY AND B PHYSICS**

COLUMBIA U - P Franzini (✓ Spokesperson), S Kanekal, P M Tuts (✓ Spokesperson), Q W Wu  
 SUNY, STONY BROOK - U Heintz, T M Kaarsberg, J Lee-Franzini (✓ 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  $\Upsilon(1S)$ ,  $\Upsilon(2S)$ ,  $\Upsilon(3S)$ ,  $\Upsilon(4S)$ ,  $\Upsilon(10860)$ ,  $\Upsilon(11020)$ ,  $\chi_{b0}(1P)$ ,  $\chi_{b1}(1P)$ ,  $\chi_{b2}(1P)$ ,  $\chi_{b0}(2P)$ ,  $\chi_{b1}(2P)$ ,  $\chi_{b2}(2P)$ ,  $B$ ,  $B^*$ , higgs, axion,  $\zeta(8300)$ ,  $\eta_b$ , s-quark

Comments Continues the CESR-CUSB-I experiment with an upgraded detector. The detector consists of a bismuth germanate (BGO) electromagnetic calorimeter inserted in the CUSB-I NaI and Pb-glass array. Covers a solid angle of about  $2/3$  of  $4\pi$ . A drift chamber between the beam pipe and the BGO cylinder provides charged-particle tracking.

Papers Includes CESR-CUSB-I 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 B114 (1982) 277, NP B206 (1982) 1, PRL 49 (1982) 1612, PRL 49 (1982) 1616, PL B118 (1982) 453, PRL 51 (1983) 160, PL B130 (1983) 439, PL B130 (1983) 444, PR D29 (1984) 2483, NP B242 (1984) 31, PL B138 (1984) 225, PL B139 (1984) 332, PL B141 (1984) 271, PR D30 (1984) 1985, PRL 54 (1985) 377, PRL 55 (1985) 36, PRL 56 (1986) 2672, PL B186 (1987) 233, PR D35 (1987) 2265, PR D35 (1987) 2883, NIM A263 (1988) 35, NIM A265 (1988) 243, PRL 62 (1989) 2077, PRL 65 (1990) 2749, PRL 65 (1990) 2947, NIM A309 (1991) 450, PL B273 (1991) 177, PRL 66 (1991) 1563, PRL 66 (1991) 2436, and PRL 66 (1991) 3113.

## SUMMARIES OF DESY EXPERIMENTS

### DESY Experiments

**DESY-DORIS-ARGUS** Approved 1979; Started Sep 1982.

**ARGUS — A NEW DETECTOR FOR DORIS**

DESY — H Albrecht, H I Cronstroem, H Erlichmann, T Hamacher, R P Hofmann, T Kirchhoff, A Nau, S Nowak, M Reidenbach, R Reiner, H Schroeder (✓ Spokesperson), H D Schulz, M Walter, R Wurth

DORTMUND U — R D Appuhn, C Hast, H Kolanoski, A Lange, A Lindner, R Mankel, M Schieber, T Siegmund, B Spaan, H Thurn, D Toepfer, A Walther, D Wegener

ERLANGEN U — M Paulini, K Reim, H Wegener

HAMBURG U — R Mundt, T Oest, W Schmidt-Parzefall

HEIDELBERG U, IHEP — W Funk, J Stiewe, S Werner

HEIDELBERG, MAX PLANCK INST — K Ehret, A Hoelscher,

W Hofmann, A Huepper, S Khan, K T Knoepfle, J Spengler

IPP, CANADA — D I Britton, C E K Charlesworth,

K W Edwards, E R F Hyatt, H Kapitza, P Krieger,

D B MacFarlane, P M Patel, J D Prentice, P R B Saull,

S C Seidel, K Tzamariudaki, R G Van de Water, T Yoon

KARLSRUHE U — D Rensing, M Schmidtler, M Schneider,

K R Schubert, K Strahl, R Walldi, S Weseler

STEFAN INST, LJUBLJANA & LJUBLJANA U — G Kernel,

P Krizan, E Kriznic, T Podobnik, T Zivko

LUND U — L Joansson

MOSCOW, ITEP — V Balagura, I Belyaev, M Danilov, A Drout-

skey, A Golutvin, I Gorelov, G Kostina, V Lubimov, P Murat,

P Pakhlov, F Ratnikov, S Semenov, V Shibaev, V Soloshenko,

I Tichomirov, Y Zaitsev

Accelerator DESY-DORIS-III Detector ARGUS

Reactions

$e^+ e^-$	9.3–10.6 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow$ charm X	"
$e^+ e^- \rightarrow$ bottom X	"
$e^+ e^- \rightarrow$ $\Upsilon$ (unspec)	"
$e^+ e^- \rightarrow$ hvy-lepton X	"

Particles studied charm, bottom,  $\Upsilon$ (unspec), hvy-lepton,  $\nu_\tau$

Comments Studies  $b$ -quark physics, and the  $\tau$  and  $\nu_\tau$ . The detector consists of a Si strip detector and a microvertex drift chamber surrounding the beam pipe, a tracking chamber, shower and TOF counters, solenoid coils, and a large iron yoke. Upgraded in 1990/91. Taking data (April 92).

Papers NIM 163 (1979) 77, NIM 195 (1982) 475, NIM 205 (1983)

125, NIM 216 (1983) 35, NIM 217 (1983) 153, PL B134 (1984) 137, PL B135 (1984) 498, PL B146 (1984) 111, NIM A235 (1985) 26, NIM A237 (1985) 464, PL B150 (1985) 235, PL B153 (1985) 343, PL B154 (1985) 452, PL B156 (1985) 134, ZPHY C28 (1985) 45, PL B157 (1985) 326, PL B158 (1985) 525, PL B160 (1985) 331, PL B162 (1985) 395, PL B163 (1985) 404, ZPHY C29 (1985) 167, NIM A249 (1986) 277, NIM A252 (1986) 384, PTE 2 (1986) 66, PRL 56 (1986) 549, PL B167 (1986) 360, ZPHY C31 (1986) 181, PL B179 (1986) 398, PL B179 (1986) 403, PL B182 (1986) 95, ZPHY C33 (1986) 7, ZPHY C33 (1987) 359, PL B185 (1987) 218, PL B185 (1987) 223, PL B185 (1987) 228, PL B187 (1987) 425, PL B192 (1987) 245, PL B195 (1987) 102, PL B195 (1987) 307, PL B196 (1987) 101, PL B197 (1987) 452, PL B198 (1987) 255, PL B198 (1987) 577, ZPHY C35 (1987) 283, PL B199 (1987) 291, PL B199 (1987) 447, PL B199 (1987) 451, PL B199 (1987) 457, PL B199 (1987) 580, PL B202 (1988) 149, ZPHY C39 (1988) 177, PL B207 (1988) 109, PL B207 (1988) 349, PL B209 (1988) 119, PL B209 (1988) 380, PL B210 (1988) 258, PL B210 (1988) 263, PL B210 (1988) 267, PL B210 (1988) 273, PL B211 (1988) 489, PL B212 (1988) 528, PL B215 (1988) 424, PL B215 (1988) 429, ZPHY C41 (1988) 1, ZPHY C41 (1988) 405, NIM A274 (1989) 189, NIM A275 (1989) 1, NIM A283 (1989) 544, NAT WISS 76 (1989) 52, ZPHY C41 (1989) 557, PL B217 (1989) 205, PL B219 (1989) 121, PL B221 (1989) 422, ZPHY C42 (1989) 349, ZPHY C42 (1989) 519, ZPHY C42 (1989) 543, ZPHY C43 (1989) 45, ZPHY C43 (1989) 181, ZPHY C44 (1989) 547, PL B229 (1989) 175, PL B229 (1989) 304, PL B230 (1989) 162, PL B230 (1989) 169, PL B231 (1989) 208, PL B232 (1989) 398, PL B232 (1989) 554, MPL A5 (1990) 73, ZPHY A335 (1990) 231, ZPHY C46 (1990)

9, ZPHY C46 (1990) 15, ZPHY C48 (1990) 183, ZPHY C48 (1990) 543, PL B234 (1990) 409, PL B236 (1990) 102, PL B241 (1990) 278, PL B245 (1990) 315, PL B246 (1990) 278, PL B247 (1990) 121, PL B249 (1990) 359, PL B250 (1990) 164, ZPHY C49 (1991) 349, ZPHY C50 (1991) 1, ZPHY C52 (1991) 353, PL B254 (1991) 288, PL B255 (1991) 297, PL B255 (1991) 634, PL B260 (1991) 259, PL B262 (1991) 148, PL B267 (1991) 535, PL B269 (1991) 234, ZPHY C53 (1992) 361, ZPHY C53 (1992) 367, PL B274 (1992) 239, and PL B275 (1992) 195.

**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, T Lesiak, B Muryn, G Nowak  
 DESY — H W Bartels, J K Bienlein, K Brockmueller, K Karch, T Kloiber, W Koch, W Maschmann, H Meyer, A Schwarz, T Skwarnicki, H Trost, A Voigt, K Wachs, P Zschorsch  
 ERLANGEN U — G Folger, G Glaser, M Kobel, B Lurz, J Schuette, U Volland, H Wegener  
 FLORENCE U & INFN, FLORENCE — A Bizzeti, A Cartacci, A Compagnucci, G Conforto, G Landi, B Monteleoni, P G Pelfer  
 HAMBURG U — C Bieler, K Graaf, F H Heimlich, F H Heinsius, T Kiel, S Krueger, R Lekebusch, R Nernst, D Sievers, V Stock, U Strobusch

HARVARD U — D Antreasyan, J Irion, P McBride, K Strauch  
 NIJMEGEN U & NIKHEF, NIJMEGEN — H Janssen, A C Koenig, W J Metzger, M Reidenbach, D J Schotanus, W Walk, R T Van de Walle

PRINCETON U — D Besset, R Cabenda, R Cowan  
 UC, SANTA CRUZ — M Cavalli-Sforza, D Coyne, D A Williams  
 SLAC — E D Bloom, R Clare, S Cooper (✓ Spokesperson), K Fairfield, A Fridman, J Gaiser, G Godfrey, S Leffler, W Lockman, S Lowe, H Marsiske, B Niczyporuk, B van Uitert, K Wacker

STANFORD U — D Gelpman, R Hofstadter, I Kirkbride, R Lee, A M Litke, B Pollock, J Tompkins

WURZBURG U — S Keh, H Kilian, K Koenigsmann (✓ Spokesperson), M Scheer, P Schmitt

Accelerator DESY-DORIS-II Detector CRYSTAL-BALL

Reactions

$e^+ e^- \rightarrow \gamma X$	4.4–11.2 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow$ hadron(s)	"
$e^+ e^- \rightarrow e^+ e^- \gamma \gamma$	"

Particles studied  $\Upsilon(1S)$ ,  $\Upsilon(2S)$ ,  $\chi_{b0}(1P)$ ,  $B$ ,  $\tau$ , meson

Comments An extension of earlier SLAC studies of quarkonium and gluonium to the upsilon system, with special emphasis on  $\gamma$  transitions. In addition,  $\tau$  and  $B$  decays, and light mesons in  $\gamma\text{-}\gamma$  reactions are studied. The detector consists of 712 sodium-iodide crystals arranged around the electron-positron interaction point.

Papers PL B135 (1984) 498, PRL 54 (1985) 2195, PR D32 (1985) 2893, PR D33 (1986) 1847, PR D34 (1986) 2611, ZPHY C36 (1987) 383, PRL 58 (1987) 972, PR D36 (1987) 2633, ZPHY C40 (1988) 49, ZPHY C40 (1988) 199, PR D38 (1988) 1365, PL B212 (1988) 123, ZPHY C42 (1989) 33, PL B228 (1989) 273, PR D41 (1990) 3324, ZPHY C46 (1990) 555, ZPHY C48 (1990) 553, ZPHY C48 (1990) 561, PL B249 (1990) 353, PL B251 (1990) 204, ZPHY C49 (1991) 225, PL B259 (1991) 216, and PL B267 (1991) 286.

**DESY-HERA-H1** (Jun 1985) Approved Jul 1986.

**H1: A DETECTOR FOR HERA**

AACHEN, TECH HOCHSCH, I PHYS INST — C Berger, W Braunschweig, H Genzel, H Martyn, F Raupach, J Tutas, E Vogel  
 AACHEN, TECH HOCHSCH, III PHYS INST — G Fluegge, H Graessler, H Jung, R Steinberg, W Struczinski  
 BIRMINGHAM U — J D Dowell, N N Ellis, I F Fensome, J Garvey, I R Kenyon

## SUMMARIES OF DESY EXPERIMENTS

- BRUSSELS U, IIHE - G Bertrand-Coremans, D Johnson, P Marage, J Moreels, R Roosen, J Sacton
- CRACOW - L Goerlich, L Hajduk, S Mikocki, G Nowak, K Rybicki, J Turnau
- UC, DAVIS - M Forbush, L Godfrey, R L Lander, S Mani, J R Smith
- DESY - W Bartel, H Behrend, F Brasse, J Buerger, L Criegee, E Deffur, A DeRoeck, G Eckerlin, F Eisele (✓ Spokesperson), E Elsen, M Erdmann, R Felst, J Ferencei, G Franke, J Gayler, M Gennis, R Gerhards, D Haidt, P Hill, G Knies, V Korbel, H Krehbiel, H Kuester, A Leuschner, E Levin, K H Meier, J Meyer, J E Olsson, M Savitsky, V Schroeder, L Smolik, P Steffen, J Strachota, G G Winter, M Zimmer
- DORTMUND U - H Kolanoski, A Lindner, K Wacker, A Walter, D Wegener
- ECOLE POLYTECHNIQUE - B Andrieu, J Cvach, F Moreau, S Orenstein, Y Sirois
- GLASGOW U - A J Campbell, J Marks, I O Skillicorn
- HAMBURG U - V Blobel, F Buesser, H H Duhm, E Fretwurst, J Harjes, G Heinzlmann, C Kleinwort, R Langkau, G Lindstroem, B Naroska, F Niebergall, V Riech, H Spitzer, G Weber
- MOSCOW, ITEP - A Babayev, M Danilov, V I Efremenko, A Fedotov, B Fomynich, I Gorelov, P Goritchev, V Lubimov, V Nagovizin, A Rostovtsev, A Semenov, V Shekelyan, I Tichomirov, V Tschernysov
- KIEL U - W D Dau, G Siegmon
- LANCASTER U - A B Clegg, R C W Henderson, D Newton, I W Walker
- LIVERPOOL U - S Burke, J B Dainton, E Gabathuler, T Greenshaw, S J Maxfield, S J McMahon, G D Patel
- LEBEDEV INST - V F Andreev, P S Baranov, A S Belousov, A M Fomenko, A I Lebedev, S V Levonian, E I Malinovski, S V Rusakov, I P Sheviakov, P A Smirnov, Y V Soloviev, A P Usik, J Vasdik
- LUND U - V Hedberg, L Joensson
- MANCHESTER U - P Biddulph, R J Ellison, J M Foster, K C Hoeger, M Ibbotson, D Kolya, G C Lopez, R Marshall
- MUNICH, MAX PLANCK INST - G Buschhorn, K Gamerding, G Grindhammer, C Kiesling, M Kuhlen, H Oberlack, P Ribarics, E Sanchez, P Schacht
- ORSAY, LAL - J C Bizot, V Brisson, A Courau, B Delcourt, A Jacholkowska, M Jaffre, C Pascaud, F Zomer
- PARIS, CURIE UNIV VII & PARIS, UNIV VII, LPNHE - E Barrelet, G Bernardi, L DelBuono, J Duboc, Y Feng, M Goldberg, D Hamon, H K Nguyen, C Vallee, T P Yiu
- KOSICE, IEF - J Ban, D Bruncko
- PRAGUE, INST PHYS - I Herynek, J Hladky, P Reimer, M Vecko, P Zavada
- CHARLES U - J Formanek, S Valkar, A Valkarova, J Zacek
- QUEEN MARY - WESTFIELD COLL - E Eisenhandler, P I P Kalmus, M P J Landon, W von Schlippe, G Thompson
- ROME U & INFN, ROME - F Ferrarotto, H Shoostari, B Stella
- RUTHERFORD - D Clarke, J A Coughlan, P S Flower, W J Haynes, J V Morris, D P Sankey
- SACLAY - M Besancon, C Coutures, G Cozzika, M David, J Feltesse, M A Jabiol, W Krasny, J F Laporte, P Verrecchia, J Villet
- WUPPERTAL U - B Kuznik, W Magnussen, H Meyer, D Schmidt
- BERLIN-ZEUTHEN ADW - H Baerwolff, H Henschel, H H Kaufmann, M Klein, P Kostka, T Naumann, A Schwind, M Winde
- ZURICH U - S Egli, C A Meyer, U Straumann, P Trouel
- ZURICH, ETH - R Eichler, C Grab, D Pitzl, J Riedlberger
- Accelerator DESY-HERA Detector H1
- Comments Measures energy and direction of electrons, photons, and particle jets. Identifies leptons by the shower shape, neutrinos by precise missing energy measurements. The detector consists of a large superconducting solenoid with tracking chambers and a liquid argon calorimeter inside. An additional iron absorber instrumented with streamer tubes is outside the solenoidal coil. Scheduled to run March 92.
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- DESY-HERA-ZEUS** (Jun 1985, Mar 1986) Approved Nov 1986.
- ZEUS: A DETECTOR FOR HERA**
- MANITOBA U - F Ikraiam, J Mayer, G Smith
- MCGILL U - F Corriveau, D Gilkinson, D Hanna, W Hung, M St Laurent, J Mitchell, P Patel, L Sinclair, D Stairs
- TORONTO U - D Bailey, D Bandyopadhyay, D Barillari, F Benard, S Bhadra, M Brkic, B Burow, F Chlebana, M Crombie, G Hartner, G Levman, J Martin, R Orr, J Prentice, C Sampson, R Teuscher, T S Yoon
- YORK U, CANADA - W Frisken, Y Iga
- BONN U - A Bargende, J Crittenden, H Dabbous, B Diekmann, J Gajewski, G Geitz, A Grunenberg, B Gutjahr, H Hartmann, J Hartmann, D Haun, K Heinloth, E Hilger, H Jakob, S Kramarczyk, M Kueckes, A Savine, U Muesch, E Paul, R Schattevoy, B Schneider, H Schneider, R Wedemeyer, M Zachara
- DESY - J K Bienlein, C Coldewey, A Dannemann, K Dierks, W Dorth, G Drews, P Erhard, I Fleck, A Fuertjes, R Glaeser, T Haas, L Hagge, D Hasell, H Hultschig, G Jahn, P Joos, M Kasemann, R Klanner, W Koch, U Koetz, A Kotanski, H Kowalski, A Ladage, B Loehr, D Lueke, J Mainusch, O Manczak, M Momayezi, S Nickel, D Notz, I Park, K U Poesnecker, M Rohde, A Savine, U Schneekloth, J Schroeder, W Schuette, W Schulz, F Selonke, D Trines, E Tscheslog, W Vogel, T Woeniger, G Wolf (✓ Spokesperson), C Youngman
- DESY, ZEUTHEN - K Deiters, H J Grabosch, A Leich, C Rethfeldt, S Schlenstedt
- FREIBURG U - A Bamberger, A Freidhof, T Poser, G Theisen
- HAMBURG U - U Behrens, U Holm, H Kammerlocher, B Krebs, W Kroeger, J Krueger, E Lohrmann, M Nakahata, N Pavel, G Poelz, T Tsurugai, K Wick, B H Wiik
- KERNFORSCHUNGSANLAGE, JULICH - P Cloth, D Filges, R D Neef, N Paul, C Reul, H Schaal, G Sterzenbach
- SIEGEN U - E Badura, H Chaves, M Rost, R J Seifert, A H Walenta, W Weihs, G Zech
- TEL AVIV U - R Heifetz, A Levy, D Zer-Zion
- WEIZMANN INST - Y Eisenberg, C Glasman, U Karshon, A Montag, D Revel, A Shapira
- BOLOGNA U - F Arzarello, G Barbagli, G Bari, M Basile, L Bellagamba, D Boscherini, G Bruni, P Bruni, M Chiarini, L Cifarelli, F Cindolo, F Ciralli, A Contini, S D'Auria, F Fiori, F Frasconi, P Giusti, G Iacobucci, G Laurenti, Q Lin, B Lisowski, G Maccarrone, A Margotti, T Massam, R Nania, V O'Shea, F Palmonari, C Del Papa, G Cara Romeo, G Sartorelli, M Scioni, R Timellini, M Willutzky, A Zichichi
- CALABRIA U - M Schioppa, G Susinno
- FLORENCE U - R Casalbuni, E Celeghini, S De Curtis, D Dominici, F Francescato, S De Gennaro, M Nuti, P Pelfer, R Salimbeni, U Vanni
- FRASCATI - G Anzivino, R Casaccia, B Dulach, I Laakso, S De Pasquale, S Qian, L Votano
- AQUILA U - R Scrimaglio
- PADUA U - R Brugnera, R Carlin, F Dal Corso, U Dosselli, C Fanin, F Gasparini, M De Giorgi, S Limentani, M Morandin, M Posocco, L Stanco, R Stroili, C Voci
- ROME U - M Bonori, U Contino, G D'Agostini, M Guida, M Iacovacci, M Iori, S Mari, G Marini, M Mattioli, D Monaldi, A Nigro
- TURIN U - C Aglietta, D Allasia, P Antonioli, M Arneodo, G Badino, A Castellina, M Costa, M Dardo, M I Ferrero, W Fulgione, P Galeotti, L Lamberti, S Maselli, L Panaro, C Peroni, O Saavedra, A Solano, A Staiano, G C Trincherro, S Vernetto
- TOKYO U, INS - T Hasegawa, M Hazumi, T Ishii, S Kasai, M Kuze, Y Nagasawa, M Nakao, H Okuno, K Tokushuku, T Watanabe, S Yamada
- TOKYO METROPOLITAN U - M Chiba, R Hamatsu, T Hirose, S Kitamura, S Nagayama, Y Nakamitsu
- NIKHEF, AMSTERDAM - S Bentvelsen, A Dake, J Engelen, P de Jong, P Kooijman, H van der Lugt, A Tenner, H Tiecke, H Uijterwaal, J Vermeulen, L Wiggers, E de Wolf, R van Woudenberg
- CRACOW - J Chwastowski, A Dwurazny, A Eskreys, Z Jakubowski, K Piotrkowski, L Zawiejski
- CRACOW, INST PHYS NUCL TECH - K Eskreys, K Jelen, D Kisielewska, T Kowalski, J Kulka, M Przybycien, E Rulikowska-Zarebska, L Suszycki
- JAGELLONIAN U - A Kotanski
- WARSAW U, IEP - H Abramowicz, M Adamus, K Charchula, J Ciborowski, K Genser, G Grzelak, M Krzyzanowski, K Muchorowski, R J Nowak, J M Pawlak, K Stojda,

## SUMMARIES OF DESY EXPERIMENTS

A Stopczynski, R Szwed, T Tymieniecka, R Walczak,  
 A K Wroblewski, J A Zakrzewski, A F Zarnecki  
 MADRID, AUTONOMA U - F Barreiro, G Cases, L Hervas,  
 L Labarga, J del Peso, J Terron, J F de Troconiz  
 BRISTOL U - D G Cussans, M Dyce, H F Fawcett, B Foster,  
 R Gilmore, G P Heath, T J Llewellyn, J Malos, C J S Morgado,  
 T L Short, R J Tapper, S Wilson  
 GLASGOW U - N H Brook, P J Bussey, A T Doyle, J R Forbes,  
 C Raine, D H Saxon  
 IMPERIAL COLL - T C Bacon, J Giddings, C Markou,  
 D McQuillan, D B Miller, M M Mobayyen, T J Mortimer,  
 A Vorvolakis  
 UNIVERSITY COLL, LONDON - F W Bullock, T W Jones,  
 A Khan, J Lane, G J Lush, P L Makkar, G Nixon, S F Salih,  
 J Shulman  
 OXFORD U - G Blair, M G Bowler, I M Butterworth,  
 R J Cashmore, A M Cooper-Sarkar, R C E Devenish,  
 D M Gingrich, P M Hallam-Baker, N Harnew, T Khatri,  
 M Lancaster, K R Long, P Luffman, P Morawitz, J Nash,  
 N C Roocroft, A Weidberg, F F Wilson  
 RUTHERFORD - J C Hart, N A McCubbin, T P Shah  
 ARGONNE - M Derrick, D Krakower, S Magill, B Musgrave,  
 J Repond, R Stanek, R Talaga, T Throh  
 BROOKHAVEN - B Radeka, R Rau  
 COLUMBIA U - A Bernstein, A Caldwell, D Chen, I Gialas,  
 A Parsons, S Ritz, F Sciulli, L Wai, S Wang, F Xu, J Xu  
 IOWA U - T Bienz, H Kreutzmann, U Mallik, M Roco  
 LOUISIANA STATE U - L Chen, R Gunashinga, R Imlay,  
 N Kartik, H Kim, R McNeil, W Metcalf  
 OHIO STATE U - B Bylsma, L S Durkin, C Li, T Y Ling,  
 K McLean, S K Park, T A Romanowski, R Seidlein  
 PENN STATE U - J N Lim, B Y Oh, J Whitmore  
 UC, SANTA CRUZ - N Cartiglia, C Heusch, B Hubbard,  
 K O'Shaughnessy, H F Sadrozinski, A Seiden  
 VIRGINIA TECH - K Blankenship, B Lu, L W Mo  
 WISCONSIN U - I Ali, B Behrens, U Camerini, C Fordham,  
 C Foudas, A Gossion, K Iordanidis, M Lomperski, R J Loveless,  
 D D Reeder, S Silverstein, W H Smith

Accelerator DESY-HERA Detector ZEUS

Comments Measures neutral and charged current processes in electron-proton interactions and searches for new processes. Emphasis is on accurate identification and measurement of jets and leptons. The main detector component is a high-resolution compensating uranium-scintillator calorimeter surrounding a superconducting coil equipped with drift chambers. An instrumented iron absorber catches the tail of hadronic showers and identifies muons. Bending magnets of the machine are used as a spectrometer for forward scattered protons. Scheduled to run April 92.

**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  
 (✓ Spokesperson), R Kotthaus, H Lierl, D Luers, T Meyer,  
 L Moss, H Oberlack, 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 ( $E_{cm}$ )

Comments The central part of the CELLO detector consists of proportional and drift chambers placed within a superconducting coil. The coil is surrounded by liquid argon calorimeters which measure electron and photon energies with high accuracy. Lead glass counter systems cover forwards and backwards directions. The detector is optimized for studies involving  $e^\pm$  and  $\gamma$ 's.

Papers PS 23 (1981) 610, PL B103 (1981) 148, PL B110 (1982) 329, PL B113 (1982) 427, PL B114 (1982) 282, PL B114 (1982) 287, PL B114 (1982) 378, ZPHY C14 (1982) 95, ZPHY C14 (1982) 189, ZPHY C14 (1982) 283, PL B118 (1982) 211, NP B211 (1983) 369, NP B218 (1983) 269, ZPHY C16 (1983) 301, PL B123 (1983) 127, PL B126 (1983) 384, PL B126 (1983) 391, PL B127 (1983) 270, ZPHY C19 (1983) 291, ZPHY C20 (1983) 207, ZPHY C21 (1984) 205, PL B138 (1984) 311, ZPHY C23 (1984) 103, ZPHY C23 (1984) 223, PL B140 (1984) 130, PL B141 (1984) 145, PL B144 (1984) 297, PL B158 (1985) 536, PL B161 (1985) 182, PL B168 (1986) 420, PL B176 (1986) 274, PL B178 (1986) 452, PL B181 (1986) 178, PL B191 (1987) 209, PL B193 (1987) 157, PL B193 (1987) 376, ZPHY C35 (1987) 181, PL B200 (1988) 226, PL B202 (1988) 154, PL B212 (1988) 515, PL B215 (1988) 186, ZPHY C41 (1988) 7, ZPHY C42 (1989) 367, PL B218 (1989) 493, ZPHY C43 (1989) 1, ZPHY C43 (1989) 91, PL B222 (1989) 163, ZPHY C44 (1989) 63, ZPHY C46 (1990) 397, ZPHY C46 (1990) 537, ZPHY C46 (1990) 583, ZPHY C47 (1990) 1, ZPHY C47 (1990) 333, PL B245 (1990) 298, ZPHY C49 (1991) 43, ZPHY C49 (1991) 401, ZPHY C51 (1991) 143, ZPHY C51 (1991) 149, ZPHY C51 (1991) 365, and PL B256 (1991) 97.

**DESY-PETRA-JADE** Approved Oct 1976; Started Jun 1978; Completed Nov 1986.

**A COMPACT MAGNETIC DETECTOR AT PETRA — JADE**

DESY - W Bartel, L Becker, T Canzler, D Cords, P Dittmann,  
 R Eichler, R Felst (✓ Spokesperson), D Haidt, S Kawabata,  
 G Knies, H Krehbiel, R Meinke, B Naroska, L H O'Neill,  
 J Olsson, P Steffen, H Wenninger, W L Yen, M Zachara,  
 Y Zhang

HAMBURG U - G Dietrich, E Elsen, J Hagemann, S Hegner,  
 G Heinzemann, M Helm, H Kado, K Kawagoe, C Kleinwort,  
 M Kuhlén, K Meier, T Oest, F Ould-Saada, A Petersen, D Pitzl,  
 R Pust, R Ramcke, U Schneekloth, A Wagner, G Weber

HEIDELBERG U, IHEP - K Ambrus, S Bethke, A Dieckmann,  
 H Drumm, J Heintze, K H Hellenbrand, R D Heuer,  
 S Komamiya, J von Krogh, P Lennert, H Matsumura,  
 H Rieseberg, J Spitzer, A Wagner

WUPPERTAL U - H Junge, N Magnussen, D Schmidt

LANCASTER U - A Bell, C Bowdery, D C Darvill, A Finch,  
 F Foster, G Hughes, T Nozaki, J Nye, H Wriedt

MANCHESTER U - J Allison, J Armitage, J Baines, A H Ball,  
 G Bamford, R Barlow, J Chrin, I P Duerdooth, I Glendinning,  
 T Greenshaw, J F Hassard, B T King, F K Loebinger,  
 A A Macbeth, H E Mills, P G Murphy, H Prosper, P Rowe,  
 K Stephens

MARYLAND U - R G Glasser, P Hill, B Sechi-Zorn, J A J Skard,  
 S Wagner, G T Zorn

RUTHERFORD - S L Cartwright, D Clarke, M C Goddard,  
 R Hedgecock, R Marshall, G F Pearce, J B Whittaker

HELSINKI U - J Huttunen, P Laurikainen, E Pietarinen

TOKYO U - M Imori, J Kanzaki, T Kawamoto, T Kobayashi,  
 M Koshiha, T Mashimo, M Minowa, M Nozaki, S Odaka,  
 S Orito, A Sato, T Suda, H Takeda, Y Totsuka, Y Watanabe,  
 S Yamada, C Yanagisawa

Accelerator DESY-PETRA Detector JADE

Reactions

$e^+ e^- \rightarrow$ hadrons	10-44 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow e^+ e^-$	"
$e^+ e^- \rightarrow \mu^+ \mu^-$	"
$e^+ e^- \rightarrow \tau^+ \tau^-$	"
$e^+ e^- \rightarrow \gamma \gamma$	"
$e^+ e^- \rightarrow e^+ e^-$ hadrons	"

## SUMMARIES OF DESY EXPERIMENTS

$e^+ e^- \rightarrow e^+ X$	"
$e^+ e^- \rightarrow e^- X$	"
$e^+ e^- \rightarrow \mu^+ X$	"
$e^+ e^- \rightarrow \mu^- X$	"
$e^+ e^- \rightarrow e^+ \mu^- X$	"
$e^+ e^- \rightarrow e^- \mu^+ X$	"

Particles studied  $\tau$ , quark, hvy-lepton,  $D^*$ (2010), s-particle

Comments Provides full solid angle coverage for both charged and neutral particles, dense sampling for charged tracks, and fine granularity for electromagnetic showers. Tests quantum electrodynamics down to very small distances, and studies hadronic processes. The main components of the detector are the inner track chamber, the lead glass array, and the muon filter.

Papers PL B88 (1979) 171, PL B89 (1979) 136, PL B91 (1980) 142, PL B91 (1980) 152, PL B92 (1980) 206, ZPHY C6 (1980) 295, PL B99 (1981) 277, PL B99 (1981) 281, PL B100 (1981) 364, PL B101 (1981) 129, PL B101 (1981) 361, ZPHY C9 (1981) 315, PL B104 (1981) 325, PL B107 (1981) 163, PL B108 (1982) 140, PL B113 (1982) 190, PL B114 (1982) 71, PL B114 (1982) 211, PL B115 (1982) 338, PL B119 (1982) 239, PL B121 (1983) 203, PL B123 (1983) 353, PL B123 (1983) 460, ZPHY C19 (1983) 197, ZPHY C20 (1983) 187, PL B129 (1983) 145, PL B130 (1983) 454, PL B132 (1983) 241, ZPHY C21 (1983) 37, PL B134 (1984) 275, PL B139 (1984) 327, ZPHY C24 (1984) 223, ZPHY C24 (1984) 231, ZPHY C25 (1984) 231, PL B145 (1984) 441, PL B146 (1984) 121, PL B146 (1984) 126, PL B146 (1984) 437, ZPHY C26 (1985) 507, PL B152 (1985) 385, PL B152 (1985) 392, PL B155 (1985) 288, ZPHY C28 (1985) 343, PL B157 (1985) 340, PL B158 (1985) 511, PL B160 (1985) 337, PL B160 (1985) 421, ZPHY C29 (1985) 505, PL B161 (1985) 188, PL B161 (1985) 197, PL B163 (1985) 277, ZPHY C30 (1986) 371, ZPHY C30 (1986) 545, ZPHY C31 (1986) 349, ZPHY C31 (1986) 359, PL B174 (1986) 350, PL B182 (1986) 216, ZPHY C33 (1986) 23, PL B184 (1987) 288, ZPHY C33 (1987) 339, ZPHY C36 (1987) 15, ZPHY C39 (1988) 1, PL B213 (1988) 235, ZPHY C42 (1989) 1, ZPHY C42 (1989) 7, ZPHY C42 (1989) 355, ZPHY C44 (1989) 567, ZPHY C46 (1990) 1, ZPHY C46 (1990) 349, ZPHY C46 (1990) 547, ZPHY C47 (1990) 343, ZPHY C48 (1990) 393, ZPHY C48 (1990) 401, ZPHY C49 (1991) 29, and ZPHY C51 (1991) 531.

**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, C Camps, V Commichau, E Deffur, H S Fesefeldt, U Hertel, D Hueser, W Krenz, D Linnhoefer, J Mnich, H Nierobisch, F P Poschmann, U Schroeder, J Schug, D Teuchert, M Tonutti, S X Wu

BROOKHAVEN – R R Rau (✓ Spokesperson)

CAL TECH – H Ma, H Newman, H Stone, R Y Zhu

DESY – S Ansari, M Hussain, K Nadeem, M Rohde, H G Wu, M F Wyne

MIT – U Becker, J G Branson, J D Burger, M Capell,

Y H Chang, M Chen, M L Chen, M Y Chen, M Dhina, D Fong, M Fukushima, G Hertel, 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, M Sachwitz, J Salicio

NIKHEF, AMSTERDAM – M Demarteau, P Duinker, D Harting, P Kuijter, E J Luit, G G Massaro, G M Swider

GENEVA U – M Bourquin, R Hausmann, M Nusbaumer

BEIJING, IHEP – C C Chang, H S Chen, Y K Chi, B Z Dong,

K Z Guo, R D Han, M C Ho, D Z Jiang, W Ma, H W Tang, K L Tung, M Q Wang, Z M Wang, B X Yang, X Yu, L S Zhang, Z H Zhang

BERLIN-ZEUTHEN ADW – K Deiters, W Friebel, M Klein,

R Leiste, W D Nowak, H J Schreiber, R Schulte, H Vogt

ZURICH, ETH – J Fehlmann, K Hangarter, H Hofer, Q Z Li,

M Pohl, D Ren, D Twerenbold, G Viertel

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, gluon, jet

Comments Measures asymmetries, looks for structures in the total hadronic cross section, determines properties of B mesons and gluons, searches for the t quark and a wide variety of new particles up to  $E_{cm} = 46.78$  GeV, studies hadronic jets, etc.

Papers PRL 42 (1979) 1110, PRL 42 (1979) 1113, PRL 43 (1979)

830, PL B85 (1979) 463, PRL 43 (1979) 901, PRL 43 (1979) 1915, PRPL 63 (1980) 337, PL B89 (1979) 139, PRL 44 (1980) 1722, PL B95 (1980) 149, PRL 45 (1980) 1904, PRL 46 (1981) 1663, PL B108 (1982) 63, PRL 48 (1982) 721, PRL 48 (1982) 967, PRL 48 (1982) 1701, PL B115 (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 B152 (1985) 439, PRL 54 (1985) 1750, PRL 55 (1985) 665, PL B179 (1986) 177, PL B180 (1986) 181, PR D34 (1986) 681, PL B194 (1987) 167, and PR D38 (1988) 2665. No other papers expected.

**DESY-PETRA-TASSO** (Jul 1976) Approved Oct 1976; Started Jan 1979; 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 Martyn

BONN U – H M Fischer, H Hartmann, J Hartmann, E Hilger, A Jocksch, R Wedemeyer

BRISTOL U – B Foster, A J Martin

DESY – E Bernardi, J Chwastowski, A Eskreys, K Genser, H Hultschig, P Joos, H Kowalski, A Ladage, B Locher (✓ Spokesperson), D Lueke, P Maettig, D Notz, J M Pawlak, K Poesnecker, E Ros, D Trines, R Walczak, G Wolf

DORTMUND U – H Kolanoski

HAMBURG U – J Krueger, E Lohrmann, G Poelz, W Zeuner

IMPERIAL COLL – D Binnie, J Hassard, J Shulman, D Su,

I Tomalin, A Watson

MADRID, AUTONOMA U – F Barreiro, G Cases, L Hervas, J del Peso

OXFORD U – M G Bowler, P N Burrows, R J Cashmore, M E Veitch

RUTHERFORD – J C Hart, D H Saxon

SIEGEN U – S Brandt, M Holder

WEIZMANN INST – Y Eisenberg, U Karshon, A Montag,

D Revel, E Ronat, N Wainer

WISCONSIN U – A Caldwell, D Muller, S Ritz, D Strom,

M Takashima, S Lan Wu, G Zobernig

Accelerator DESY-PETRA Detector TASSO

### Reactions

$e^+ e^- \rightarrow \text{hadrons}$	12–47 GeV ( $E_{cm}$ )
$e^+ e^- \rightarrow \text{lepton}^+ \text{lepton}^-$	"
$e^+ e^- \rightarrow \gamma \gamma$	"
$e^+ e^- \rightarrow e^+ e^- \text{ hadrons}$	"

Particles studied hvy-lepton, unspec

Comments Studies formation of jets, gluon bremsstrahlung, inclusive particle production, lifetimes of the  $\tau$ , charmed, and bottom particles, electroweak asymmetries in muon pair production, and inclusive and exclusive two-photon reactions. Tests QED and QCD, searches for new particles. TASSO stands for Two Arm Spectrometer Solenoid.

Papers PL B83 (1979) 261, PL B86 (1979) 243, PL B88 (1979)

199, PL B89 (1980) 418, ZPHY C4 (1980) 87, PL B92 (1980) 199, PL B94 (1980) 91, PL B94 (1980) 259, PL B94 (1980) 437, PL B94 (1980) 444, PL B97 (1980) 448, PL B97 (1980) 453, PL B99 (1981) 163, PL B100 (1981) 357, ZPHY C10 (1981) 117, PL B105 (1981) 75, PL B107 (1981) 290, PL B108 (1982) 67, PL B108 (1982) 71, PL B110 (1982) 173, PL B113 (1982) 98, PL B113 (1982) 499, PL B114 (1982) 65, PL B117 (1982) 135, PL B117 (1982) 365, ZPHY C16 (1982) 13, PL B121 (1983) 216, PL B122 (1983) 95, ZPHY C17 (1983) 5, PL B126 (1983)

## SUMMARIES OF DESY EXPERIMENTS

493, PL B130 (1983) 340, PL B130 (1983) 449, ZPHY C22 (1984) 13, PL B135 (1984) 243, PL B136 (1984) 130, PL B138 (1984) 219, PL B138 (1984) 317, PL B138 (1984) 441, PL B139 (1984) 126, ZPHY C22 (1984) 219, ZPHY C22 (1984) 307, PL B141 (1984) 264, PL B142 (1984) 135, PL B146 (1984) 443, PL B147 (1984) 487, ZPHY C26 (1984) 157, ZPHY C26 (1984) 181, ZPHY C26 (1984) 337, PL B149 (1984) 524, ZPHY C26 (1985) 521, ZPHY C27 (1985) 27, PL B154 (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, ZPHY C33 (1986) 13, ZPHY C35 (1987) 317, ZPHY C36 (1987) 349, ZPHY C37 (1988) 171, ZPHY C38 (1988) 543, ZPHY C39 (1988) 331, PL B214 (1988) 286, ZPHY C40 (1988) 163, ZPHY C41 (1988) 353, ZPHY C41 (1988) 359, ZPHY C41 (1988) 385, ZPHY C41 (1988) 533, ZPHY C42 (1989) 17, ZPHY C42 (1989) 189, ZPHY C42 (1989) 348, ZPHY C43 (1989) 549, ZPHY C44 (1989) 1, ZPHY C44 (1989) 365, ZPHY C45 (1989) 1, ZPHY C45 (1989) 11, ZPHY C45 (1989) 193, ZPHY C45 (1989) 209, PL B231 (1989) 548, ZPHY C47 (1990) 167, ZPHY C47 (1990) 181, ZPHY C47 (1990) 187, ZPHY C47 (1990) 499, and ZPHY C48 (1990) 433.

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# SUMMARIES OF FERMILAB EXPERIMENTS

## FNAL Experiments

**FNAL-581-704** (Jan 1978, Sep 1981) Approved Nov 1979, Dec 1981, Dec 1983; Completed Aug 1990.

### EXPERIMENTS WITH THE POLARIZED BEAM FACILITY

ARGONNE - K G Bailey, D P Grosnick, D A Hill, D Lopiano, Y Ohashi, T Shima, H Spinka, R W Stanek, D G Underwood, A Yokosawa (✓ Spokesperson)  
 SACLAY - J Bystricky, F Lehar, A De Lesquen, L K Van Rossum  
 FERMILAB - D C Carey, R Coleman, J D Cossairt, A L Read  
 HIROSHIMA U - K Iwatani  
 IOWA U - N Akchurin, A Nuval, Y Onel  
 KEK - S Ishimoto  
 KYOTO SANGYO U - F Takeuchi  
 KYOTO U - H Enyo, T Iijima, K Imai, S Makino, A Masaie, K Miyake, T Nagamine, N Tamura, T Yoshida  
 KYOTO U OF EDUCATION - R Takashima  
 ANNECY - K Kuroda, A Michalowicz  
 LOS ALAMOS - N Tanaka  
 NORTHWESTERN U - F Luehring, D H Miller, P N Shanahan  
 KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki  
 RICE U - D Adams, B Bonner, M D Corcoran, B Mayes, H E Miettinen, G S Mutchler, M Nessi, C T Nguyen, G C Phillips, J B Roberts, F Tedaldi-Nessi, J L White  
 SERPUKHOV - V Apokin, A A Derevchtchikov, N Galyaev, Y A Matulenko, A P Meshchanin, N Mikhailin, K Myznikov, S B Nurushev, D I Patalakha, V L Rykov, R A Rzayev, A Saraykin, A Shkuratov, V L Solovianov, V Solovjev, A N Vasiliev  
 TRIESTE U - F Bradamante, M Giorgi, A Martini, A Penzo, P P Schiavon, S Dalla Torre-Collautti, A Villari, A Zanetti  
 UDINE U - C Boneschi, G Pauletta, C Santini

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter, Wire chamber

<u>Reactions</u>	Polarized beam and target
$p p \rightarrow X$	200 GeV/c
$p p \rightarrow \text{pion } X$	"
$p p \rightarrow \Lambda X$	"
$p p \rightarrow \Sigma^0 X$	"
$\bar{p} p \rightarrow X$	"
$\bar{p} p \rightarrow \text{pion } X$	"

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 at large  $x$ . FNAL-581 ran for 400 hours, and FNAL-704 ran for 1200 hours.

Papers PRL 61 (1988) 1918, IJMP A3 (1988) 2753, PL B229 (1989) 299, PRL 64 (1990) 357, NIM A290 (1990) 269, PL B261 (1991) 197, PL B261 (1991) 201, and PL B276 (1992) 531.

**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 (✓ 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, P 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 Santiard, F Sauli  
 FLORIDA STATE U - D Kaplan

Accelerator FNAL-TEV Detector Spectrometer

#### Reactions

$p \text{ nucleus} \rightarrow \mu^+ \mu^- X$	400, 800 GeV/c
$p \text{ nucleus} \rightarrow e^+ e^- X$	"
$p \text{ nucleus} \rightarrow \text{hadron}^+ \text{hadron}^- X$	"

Particles studied axion,  $\Upsilon(1S)$ ,  $\Upsilon(2S)$ ,  $\Upsilon(3S)$

Comments Studies single and pair production of leptons and hadrons at very high transverse momenta. The nuclear targets include  $H_2$ ,  $D_2$ , Be, Cu, and W. The dilepton invariant mass resolution is exceptionally good. Ran for 3970 hours.

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, NIM A248 (1986) 69, PRL 57 (1986) 2101, PR D34 (1986) 2584, PR D38 (1988) 1016, NIM A273 (1988) 177, PR D39 (1989) 3516, PR D40 (1989) 2777, PRL 63 (1989) 2637, PR D43 (1991) 2815, and PRL 68 (1992) 452.

**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 Thomson (✓ 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

$K_L \rightarrow \pi^+ \pi^- \pi^0$	70-400 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. Data analysis in progress (April 92).

Papers PRL 59 (1987) 18, and PRL 63 (1989) 2717.

**FNAL-632** (May 1980) Approved Jun 1982; Completed Feb 1988.

### AN EXPOSURE OF THE 15-FOOT BUBBLE CHAMBER WITH A NEON-HYDROGEN MIXTURE TO A WIDE-BAND NEUTRINO BEAM FROM THE TEVATRON

BIRMINGHAM U - P J W Faulkner, G T Jones, R J Krawiec, K E Varvell  
 UC, BERKELEY - H C Ballagh, H H Bingham, W B Fretter, J E Lys, G P Yost  
 SACLAY - J Baton, C Coutures, M A Jabiol, P Kasper, M Neveu  
 CERN - H Foeth, K K Geissler, G G Harigel, D R O Morrison (✓ Spokesperson), H W Wachsmuth  
 FERMILAB - H I Bjelkhagen, J E Hanlon, W M Smart, L Voyvodic  
 HAWAII U - R J Cence, F A Harris, V Jain, M D Jones, M W Peters (✓ Spokesperson), V Z Peterson  
 ILLINOIS TECH - R A Burnstein, R Naon, H A Rubin  
 SERPUKHOV - V V Ammossov, G S Gapienko, A A Ivanilov, V A Korablev  
 IMPERIAL COLL - J R Campbell, E F Clayton, D B Miller, M M Mobayyen, P R Nailor, S Wainstein  
 MOSCOW, ITEP - A Andryakov, A E Asratyan, V S Kaftanov, M A Kubantsev, V Moskalev  
 JAMMU U - S K Badyal, Devanand, V K Gupta, N K Rao, S S Sambyal  
 BRUSSELS U, IIHE - M Barth, P Marage, J Moreels, J Sacton, L Verluyten, E A de Wolf  
 MUNICH, MAX PLANCK INST - M Aderholz, N Schmitz, W Wittek

## SUMMARIES OF FERMILAB EXPERIMENTS

MOSCOW STATE U – P Ermolov, I Erofeeva, V Kobrin,  
O Lukina, S Lyutov, V Murzin, S Ryasakov, S Sivokloloov,  
L Smirnova

OXFORD U – P P Allport, G Myatt

PANJAB U – M M Aggarwal, T K Chaterjee, J Kohli, I S Mitra,  
J Singh

RUTGERS U – D F Deprosopo, P Jacques, M S Kalelkar,  
M A Lauko, R J Plano, P E Stamer

RUTHERFORD – R L Sekulin

STEVENS TECH – E B Brucker, E L Koller

TUFTS U – H Akbari, T Kafka, R H Milburn, A Napier, D Pass-  
more, J Schneps, S Y Willocq

Accelerator FNAL-TEV Detector HLBC-15FT

### Reactions

$\nu_\mu$ nucleus $\rightarrow \mu^- X$	10–400 GeV/c
$\nu_\mu$ nucleus $\rightarrow \nu_\mu X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+ X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \bar{\nu}_\mu X$	"

Particles studied hadron, strange, charm,  $e^\pm$ , muon

Comments The main aim is an exploratory search for new particles and effects in a new energy range. Also studies like-sign dileptons, and neutral current interactions with the Internal Picket Fence to identify such events. Other topics include coherent effects, strange particle production, etc. Uses three conventional cameras with 500 micron resolution, and a high-resolution holographic optical system with 100 micron resolution in the central part of the chamber. Data analysis in progress (March 92).

Papers NIM 220 (1984) 300, AOPT 25 (1986) 4102, NIM A257 (1987) 614, NIM A279 (1989) 249, NIM A283 (1989) 24, NIM A284 (1989) 311, PRL 63 (1989) 2349, PR D41 (1990) 2057, NIM A290 (1990) 264, NIM A292 (1990) 313, NIM A292 (1990) 571, NIM A297 (1990) 364, and PR D45 (1992) 2232.

**FNAL-653** (May 1980) Approved Jul 1981; Completed Feb 1988.

### 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 Mokhtarani, V Paolone,  
J T Volk, P M Yager

CARNEGIE MELLON U – R M Edelstein, R Fisher, R J Lipton,  
W R Nichols, D Potter, J S Russ

CHONNAM NATIONAL U – J 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 – 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 $\rightarrow$	600 GeV/c
$p$ nucleus $\rightarrow$	800 GeV/c

Particles studied charm, bottom

Comments Ran for 1800 hours.

Papers PRL 66 (1991) 1819, PL B263 (1991) 573, PL B263 (1991) 579, and PL B274 (1992) 246.

**FNAL-665** (Oct 1980) Approved Jul 1981, Jan 1989; Started 1987; Completed Jan 1992.

### MUON SCATTERING WITH HADRON DETECTION AT THE TEVATRON

FREIBURG U – T Dreyer, M Erdmann, J Haas, M Lenski,  
W Mohr, G Seigert, H Stier, M Wilhelm

ARGONNE – D F Geesaman, R Gilman, M C Green,  
H E Jackson, S Kaufman, T B W Kirk, V Papavassiliou,

D Potterveld, S Tentindo-Repond, H Trost, A Zghiche  
UC, SAN DIEGO – R D Kennedy, H G E Kobrak, P Madden,

A Salvarani, R A Swanson

COLORADO U – E Kinney

FERMILAB – B R Baller, G B Coutrakon, J E Hanlon,  
S Krzywdzinski, H Melanson, H E Montgomery, J G Morfin,  
C Salgado, S A Wolbers

HARVARD U – J M Conrad, G Y Fang, A V Kotwal,  
D G Michael, R B Nickerson, F M Pipkin, M H Schmitt,  
R Wilson

ILLINOIS U, CHICAGO – M R Adams, D A Averill, T J Carroll,  
R Guo, C Halliwell, D E Jaffe, S R Magill, D W Mcleod,  
T McKibben

CRACOW – A Eskreys, J Figiel, P Malecki, K Olkiewicz,  
B Pawlik, P Stopa

CRACOW, INST PHYS NUCL TECH – K Dziunikowska

LIVERMORE – P Anthony, F S Dietrich

MARYLAND U – S Aid, S Kunori, S C O'Day, E J Ramberg,

A Skuja, G A Snow, P H Steinberg, R Talaga

MIT – M Baker, W Busza, L S Osborne, J J Ryan

MUNICH, MAX PLANCK INST – I Derado, V Eckardt,

H J Gebauer, D Hantke, G Jancso, A S Manz, N Schmitz,

H J Seyerlein, S Soldner-Rembold, M Vidal, W Wittek

NORTHWESTERN U – H M Schellman ( $\checkmark$  Spokesperson),  
P Spentzouris

OHIO U – H L Clark, R W Finlay, K H Hicks

PENN U – A Banerjee, K Griffioen

WASHINGTON U, SEATTLE – A A Bhatti, U Bratzler,

R Davisson, W Dougherty, D M Jansen, J J Lord, H J Lubatti,  
R S Perry, R J Wilkes, T Zhao

WUPPERTAL U – H M Braun, H Breidung, U Ecker, R Otten,  
A Roesser

YALE U – S K Dhawan, V W Hughes, K P Schueler,  
H Venkataramania

Accelerator FNAL-TEV Detector CCM

### Reactions

muon $p \rightarrow$ muon hadrons	< 750 GeV/c
muon deut $\rightarrow$ muon hadrons	"
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. The first run was completed in 1988, the second run, with a number of different targets and an upgrade of the vertex spectrometer tracking system, in 1990/91.

Papers IEEE TNS 33 (1986) 205, NIM A291 (1990) 533, and PL B272 (1991) 163.

**FNAL-667** Approved Mar 1990; Completed Aug 1990.

### STUDY OF PION-NUCLEUS INTERACTIONS IN PURE EMULSION STACKS AND EMULSION CHAMBERS AT ENERGIES ABOVE 500 GeV

CRACOW – A Dabrowska, R Holynski, M Szarska, W Wolter  
( $\checkmark$  Spokesperson), K Wozniak

LEBEDEV INST – N I Adamovich, M M Chernyavsky,  
S D Kharlamov, V G Larionova, G I Orlova, N G Peresadko,  
N A Salmanova, M I Tretyakova

LOUISIANA STATE U – M L Cherry, W Vernon Jones,  
K Sengupta, J P Wefel

TASHKENT, FTI – E Baklickya, L P Chernova, K G Gulamov,  
N Kasymova, N S Lukicheva, V Sh Nawotny, N Sh Saidkhanov,  
L N Svechnikova, S I Zhochova



## SUMMARIES OF FERMILAB EXPERIMENTS

Accelerator FNAL-TEV Detector Emulsion

Reactions

pion nucleus >500 GeV ( $T_{lab}$ )

Comments The aim is to study global characteristics of pion-nucleus interactions (minimum bias).

**FNAL-672A** (Feb 1981) Approved Jul 1981; Started 1987; Completed Jan 1992.

**A STUDY OF HADRONIC FINAL STATES PRODUCED IN ASSOCIATION WITH HIGH-MASS DIMUONS**

FERMILAB - J C Krider

ILLINOIS U, CHICAGO - H S Goldberg, R L Jesik, S Margulies

( $\checkmark$  Spokesperson), H Mendez, J Solomon, F Vaca

INDIANA U - R R Crittenden, A R Dzierba, A Gribushin,

S Kartik, R Li, T R Marshall, H J Martin, A Zieminski

( $\checkmark$  Spokesperson)

LOUISVILLE U - C L R Davis

MICHIGAN U - L J Dauwe

SERPUKHOV - V V Abramov, Y Antipov, B Baldin, S Denisov,

A Dyshkant, V Glebov, Y Gorin, V I Koreshev, A Krinitsyn,

A A Petrukhin, V I Sirotenko, R Sulayev

Accelerator FNAL-TEV Detector Spectrometer

Reactions

$p$  nucleus  $\rightarrow \mu^+ \mu^- X$  500, 800 GeV/c

$\pi^-$  nucleus  $\rightarrow \mu^+ \mu^- X$  500 GeV/c

Particles studied  $J/\psi(1S)$ ,  $\psi(2S)$ ,  $\chi_{c1}(1P)$ ,  $\chi_{c2}(1P)$ ,  $\rho$ ,  $\omega$ ,  $\phi$ , bottom

Comments Studies particles produced in association with vector mesons (including  $J/\psi$ ) and high mass dimuons. Ran with H, Be and Cu targets. Collected approximately 2M fully linked dimuon events (over 30K  $\psi$ 's) with different beams. Uses E672/E706 spectrometer. Data analysis in progress (April 92).

Papers NIM A270 (1988) 99, and PR D41 (1990) 1.

**FNAL-683** (Feb 1981) Approved Dec 1983, Apr 1987; Started 1990; Completed Jan 1992.

**PHOTOPRODUCTION OF HIGH  $p_t$  JETS**

BALL STATE U - W L Davis, G P Thomas

FERMILAB - C Cihangir, P H Kasper, J C Krider,

J M Marraffino

IOWA U - N Akchurin, J M Mcpherson, Y Onel

MARYLAND U - H Breuer, C Chang, H D Holmgren,

M Khandaker, D Naples

MICHIGAN U - H R Gustafson, M J Longo

RICE U - D Adams, S Ahmad, B Bonner, J M Clement,

M D Corcoran ( $\checkmark$  Spokesperson), D Lincoln, H E Miettinen,

G P Morrow, G S Mutchler, J B Roberts, J D Skeens,

M M Traynor, J Xu, Q Zhu

VANDERBILT U - P J Birmingham, J W Waters, M S Webster

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter

Reactions

$\gamma p \rightarrow$  jets X 200-400 GeV/c

$\gamma p \rightarrow \gamma$  jets "

$\gamma p \rightarrow$  pion X "

Comments Studies in particular 3- and 4-jet events and the A dependence of jet production. Photons are tagged with a momentum uncertainty of about 2%. The apparatus consists of a wide angle magnetic spectrometer, a large solid angle calorimeter, and a forward calorimeter.

**FNAL-687** (Jan 1981) Approved Dec 1983; Started 1987; Completed Jan 1992.

**HIGH ENERGY PHOTOPRODUCTION OF STATES CONTAINING HEAVY QUARKS AND OTHER RARE PHENOMENA**

BOLOGNA U - P L Frabetti, V Giordano, G Molinari

COLORADO U, BOULDER - C W Bogart, H W K Cheung,

P Coteus, S W Culy, J P Cumalat ( $\checkmark$  Spokesperson),

C Dallapicola, J Ginkel, V Greene, W E Johns, M Nehring

FERMILAB - J N Butler ( $\checkmark$  Spokesperson), S Cihangir, A Cotta-Ramusino, I Gaines, P H Garbincius, L Garren, S A Gourlay, D J Harding, P H Kasper, A E Kreymer, P L G Lebrun, S Shukla, M Vittone

FRASCATI - S Bianco, F Fabbri, M Giardoni, L Passamonti, V Russo, A Spallone, A Zallo

ILLINOIS U, URBANA - R L Culbertson, M Diesburg, R W Gardner, R Greene, G R Jaross, T Kroc, K L Lingel, J E Wiss

KOREA U - B G Cheon, J S Kang, K Y Kim

MILAN U & INFN, MILAN - G Alimonti, D Alliata, G Bellini,

B Caccianiga, W R Cavaletti, L Cinquini, M Di Corato,

P D'Angelo, M G Giammarchi, D Hazan, P Inzani, F Leveraro,

S Malvezzi, P F Manfredi, D Menasce, E Meroni, L Moroni,

D Pedrini, L Perasso, F Ragusa, A Sala, S Sala, D Torretta

NORTHWESTERN U - D A Buchholz, C Castoldi, D R Claes,

B Gobbi, B O'Reilly, S Park, R Yoshida

NOTRE DAME U - B W Baumbaugh, J M Bishop, J K Busenitz,

N M Cason, J D Cunningham, C J Kennedy, G N Kim,

T Lin, E J Mannel, R J Mountain, D Pusejlic, R C Ruchti,

W D Shephard, J A Swiatek, Z Y Wu, M Zanabria

PAVIA U - V Arena, G Boca, R Diaferia, S P Ratti, C Riccardi,

P Vitulo

UC, DAVIS - G P Grim, V Paolone, P M Yager

PUERTO RICO U, MAYAGUEZ - A Lopez

MEXICO, IPN - H Mendez

NORTH CAROLINA U - T F Davenport

WESTERN KENTUCKY U - J Filasetta

SOUTH CAROLINA U - J R Wilson

TENNESSEE U - G Blackett, W Bugg, K Danyo, T Handler,

G Kondo, M Phisharody

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. Studies the dynamics of heavy quark photoproduction.

Papers IEEE TNS 30 (1983) 3768, NIM 225 (1984) 619, NIM

A241 (1985) 107, NIM A251 (1986) 40, NIM A252 (1986) 366,

PL B251 (1990) 639, PL B263 (1991) 584, and NIM A305 (1991)

48.

**FNAL-690** (Feb 1981) Approved Jul 1981, Nov 1983, Apr 1987; Started 1990; Completed Jan 1992.

**STUDY OF HADRONIC PRODUCTION AND SPECTROSCOPY OF STRANGE, CHARM AND BOTTOM PARTICLES AT THE TEVATRON**

COLUMBIA U - A G Gara, E Gottschalk, B C Knapp

(Spokesperson), L R Wiencke

FERMILAB - D C Christian, G Gutierrez, S D Holmes,

J B Strait, A A Wehmann

GUANAJUATO U - A Antillon, C Avilez, B Hoeneisen, G Lopez,

M A Murguia

MASSACHUSETTS U - E P Hartouni, D A Jensen, B Klima,

M N Kreisler, S Lee, K Markianos, L M Mayhew, M S Z Rabin,

J Uribe

TEXAS A AND M - M Forbush, F R Huson, J T White, J White-  
man, J A Wightman

Accelerator FNAL-TEV Detector Spectrometer

Reactions

hadron  $p$  200-2000 GeV/c

Particles studied charm, bottom

Comments Initial goals include (1) a systematic study of exclusive reactions, particularly diffraction dissociation, (2) cataloging of the remaining stable charmed particles, with details of production and decay, and (3) determining the scale

## SUMMARIES OF FERMILAB EXPERIMENTS

of bottom production. Uses an innovative spectrometer with a hardware processor.

**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, M E Streetman

UC, SANTA BARBARA - A Bean, T Browder, J Duboscq, J Huber, S F McHugh, R J Morrison, G Punkar, J Raab, D M Schmidt, D Sperka, M S Witherell (✓ 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, W R Ross

CINCINNATI U - A L Shoup

Accelerator FNAL-TEV Detector TPS

Reactions

$\gamma p \rightarrow \text{charm X}$  100-260 GeV/c

Particles studied  $D^0, D^+, D^*(2010), D_s^+, J/\psi(1S), \Lambda_c^+, \Sigma_c(2455)^0$

Comments Ran for 1400 hours and collected 100 million events with a silicon microstrip detector. See also FNAL-516. Data analysis in progress (March 92).

Papers PRL 57 (1986) 3003, PRL 58 (1987) 311, NP B282 (1987) 626, PRL 58 (1987) 1818, NIM A260 (1987) 55, PRL 60 (1988) 897, PRL 60 (1988) 1239, PRL 60 (1988) 1379, PR D37 (1988) 2391, PRL 62 (1989) 125, PRL 62 (1989) 513, PRL 62 (1989) 722, PRL 62 (1989) 1587, PRL 62 (1989) 1717, PRL 62 (1989) 1721, PL B223 (1989) 267, PRL 64 (1990) 2885, PRL 65 (1990) 2503, PRL 65 (1990) 2630, PR D41 (1990) 801, PR D41 (1990) 2705, PR D42 (1990) 2414, PR D43 (1991) 635, PR D43 (1991) 2063, PR D44 (1991) 3371, and PRL 67 (1991) 1507.

**FNAL-704** (Sep 1981) Approved Dec 1981, Dec 1983; Completed Aug 1990.

**INTEGRATED PROPOSAL ON FIRST ROUND EXPERIMENTS WITH THE POLARIZED BEAM FACILITY**

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter, Wire chamber

Comments For description, list of participants, and published papers see FNAL-581/704.

**FNAL-705** (Oct 1981) Approved Dec 1981; Completed Feb 1988.

**A STUDY OF CHARMONIUM AND DIRECT PHOTON PRODUCTION BY 300 GeV/c  $\bar{p}$ ,  $p$ ,  $\pi^+$ , AND  $\pi^-$  BEAMS**

ARIZONA U - T Y Chen, K Lai, N Yao

ATHENS U, NUCL PHYS LAB - P Ioannou, C Kourkoumelis, A Manousakis-Kaftsikakis, P Premantiotis, L Resvanis, G Voulgaris

DUKE U - L Fortney, Q Shen, R Tesarek, T Turkington

FERMILAB - L Antoniazzi, S Delchamps, M Haire, C M Jenkins, P Mazur, C T Murphy, R Smith, L Spiegel, F Turkot, W Yang

FLORIDA A AND M U - B Etemadi, K Guffey, W P Tucker

MCGILL U - S Conetti, J Kuzminski, A Marchionni, M Rosati, A Simard, D Stairs, G Zioukas

NORTHWESTERN U - T LeCompte, J Rosen, Y Tan, S Tzamarias

PRAIRIE VIEW A AND M - D J Judd, L Turnbull, D E Wagoner

SHANDONG U - Z Cao, H Mao, C Shen, C Wang, N Zhang, X Zhang, B Zou

VIRGINIA U - M Arenton, B Cox (✓ Spokesperson)

Accelerator FNAL-TEV Detector Spectrometer

Reactions

$p \ ^7\text{Li} \rightarrow \gamma(s) X$  300 GeV/c

$p \ ^7\text{Li} \rightarrow J/\psi(1S) \gamma X$  "

$p \ ^7\text{Li} \rightarrow \chi_c(\text{unspec}) X$  "

$\bar{p} \ ^7\text{Li} \rightarrow \gamma(s) X$  "

$\bar{p} \ ^7\text{Li} \rightarrow J/\psi(1S) \gamma X$  "

$\bar{p} \ ^7\text{Li} \rightarrow \chi_c(\text{unspec}) X$  "

$\pi^+ \ ^7\text{Li} \rightarrow \gamma(s) X$  "

$\pi^+ \ ^7\text{Li} \rightarrow J/\psi(1S) \gamma X$  "

$\pi^+ \ ^7\text{Li} \rightarrow \chi_c(\text{unspec}) X$  "

$\pi^- \ ^7\text{Li} \rightarrow \gamma(s) X$  "

$\pi^- \ ^7\text{Li} \rightarrow J/\psi(1S) \gamma X$  "

$\pi^- \ ^7\text{Li} \rightarrow \chi_c(\text{unspec}) X$  "

Particles studied  $J/\psi(1S), \chi_c(\text{unspec})$

Comments Uses the upgraded FNAL-537 spectrometer, a large-aperture general-purpose detector with a high-resolution scintillating glass electromagnetic calorimeter. Ran for 3600 hours.

Papers NIM 219 (1984) 487, NIM 219 (1984) 491, NIM A236 (1985) 42, NIM A238 (1985) 315, NIM A238 (1985) 321, IEEE TNS 36 (1989) 112, IEEE TNS 36 (1989) 117, and IEEE TNS 36 (1989) 680.

**FNAL-706** (Oct 1981) Approved Dec 1981, Oct 1983; Completed Jan 1992.

**A COMPREHENSIVE STUDY OF DIRECT PHOTON PRODUCTION IN HADRON INDUCED COLLISIONS**

UC, DAVIS - J Bacigalupi, S Mani, D Pellett

DELHI U - B Chandra Choudhary, V Kapoor, R K Shivpuri, V Zutshi

FERMILAB - W F Baker, D C Carey, C Johnstone, P T Lukens, D D Skow, G Wu

MICHIGAN STATE U - L Apanasevich, C M Bromberg, D S Brown, J W Huston, A Maul, R J Miller, L Sorrell, C M Yosef

NORTHEASTERN U - G O Alverson, P Chang, W Dlugosz, W Faissler, D Garelick, M J Glaubman, C B Lirakis, E L Pothier, D L Striley, T Yasuda

OKLAHOMA U - P Gutierrez

PENN STATE U - K W Hartman, B Y Oh, W Toothacker, J Whitmore

PITTSBURGH U - S Blusk, W Chung, E Engels, P F Shepard, D Weerasundara

ROCHESTER U - L de Barbaro, M Begel, L Debarbaro,

W E Desoi, J Dunlea, G K Fanourakis, T Ferbel, J Ftacnik, G Ginther, F Lobkowicz, J P Mansour, G Osborne, E Prebys, R M Roser, P F Slattery (✓ Spokesperson), N Varelas, M Zielinski

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter

Reactions

$p \text{ nucleon} \rightarrow \gamma X$  530, 800 GeV/c

$p \text{ nucleon} \rightarrow \pi^0 X$  "

$p \text{ nucleon} \rightarrow \eta X$  "

$p \text{ nucleon} \rightarrow \pi^0 \pi^0 X$  "

$\pi^+ \text{ nucleon} \rightarrow \gamma X$  530 GeV/c

$\pi^+ \text{ nucleon} \rightarrow \pi^0 X$  "

$\pi^+ \text{ nucleon} \rightarrow \eta X$  "

$\pi^+ \text{ nucleon} \rightarrow \pi^0 \pi^0 X$  "

$\pi^- \text{ nucleon} \rightarrow \gamma X$  "

$\pi^- \text{ nucleon} \rightarrow \pi^0 X$  "

$\pi^- \text{ nucleon} \rightarrow \eta X$  "

$\pi^- \text{ nucleon} \rightarrow \pi^0 \pi^0 X$  "

Comments Triggers on high transverse momentum electromagnetic showers to study the gluon structure functions of hadrons and investigate gluon fragmentation by analyzing the production of direct  $\gamma$ 's and their accompanying hadrons in collisions of pions, kaons, and protons on hydrogen, beryllium, and copper. Uses a liquid argon calorimeter and a tracking spectrometer.

Papers NIM A235 (1985) 332, APP B17 (1986) 435, NIM A253 (1987) 523, NIM A279 (1989) 272, NIM A307 (1991) 292, PRL 68 (1992) 2584, and PR D45 (accepted).

## SUMMARIES OF FERMILAB EXPERIMENTS

**FNAL-710** (Feb 1982) Approved Jun 1982; Started 1988; Completed May 1989.

### MEASUREMENTS OF ELASTIC SCATTERING AND TOTAL CROSS SECTIONS AT THE FERMILAB $\bar{p}p$ COLLIDER

BOLOGNA U - M Bertani, G Giacomelli, M R Mondardini, M Spagnoli, I Veronesi, S Zucchelli  
 CORNELL U - J Orear ( $\checkmark$  Spokesperson)  
 FERMILAB - N A Amos, C Avila, W F Baker, D P Eartly, B Gomez, A J Lennox, J P Negret, S M Pruss, R Rubinstein ( $\checkmark$  Spokesperson), J Carlos Sanabria, S Shukla  
 GEORGE MASON U - R W Ellsworth  
 MARYLAND U - D A Dimitroyannis, J A Goodman  
 NORTHWESTERN U - M M Block, C M Guss, S Sadr

Accelerator FNAL-COLLIDER Detector Counter, Drift chamber

#### Reactions

$\bar{p}p$  300, 546, 1000, 1800 GeV ( $E_{cm}$ )  
 $\bar{p}p \rightarrow \bar{p}p$  "

Comments The range is  $0 < -t < 0.6 \text{ GeV}^2$ . Studies  $\sigma_T$ ,  $B$ , diffraction dissociation, and  $\rho$  for  $\bar{p}p$  interactions. Elastic scattering is measured by detectors in Roman Pots, the total rate is determined using a  $4\pi$  detector.

Papers NIM A252 (1986) 263, IJMP A2 (1987) 891, PRL 61 (1988) 525, PRL 63 (1989) 2784, NP (Proc. Suppl.) B12 (1990) 9, NP (Proc. Suppl.) B16 (1990) 431, PL B243 (1990) 158, PL B247 (1990) 127.

**FNAL-711** (Aug 1982) Approved Jul 1983; Completed Feb 1988.

### A STUDY OF THE ANGULAR AND ENERGY DEPENDENCE OF CONSTITUENT SCATTERING THROUGH MEASUREMENTS OF THE REACTION $pN \rightarrow$ HADRON HADRON X

FERMILAB - M B Crisler, S H Pordes  
 MICHIGAN U - M A Cummings, H R Gustafson  
 UC, DAVIS - J T Volk  
 FLORIDA STATE U - G L Boca, C Georgiopoulos, J H Goldman, S L Hagopian, V Hagopian, K Johnson, D M Kaplan, D A Levinthal ( $\checkmark$  Spokesperson), F V Lopez, J Streets, K R Turner, H B White, C J Young

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter

#### Reactions

$p \text{ Be} \rightarrow$  hadron hadron X 900 GeV/c

Comments Studies the energy, angular, and flavor dependence of the quark-quark scattering cross section. Ran for 1400 hours.

Papers NIM A261 (1987) 493, PRL 66 (1991) 864, and ZPHY C49 (1991) 543.

**FNAL-713** (Jan 1982) Approved Jun 1982; Completed May 1989.

### A SEARCH FOR HIGHLY IONIZING PARTICLES FOR THE D0 AREA AT FERMILAB

UC, BERKELEY - D M Lowder, H Park, P B Price (Spokesperson)  
 HARVARD U - K Kinoshita

Accelerator FNAL-COLLIDER Detector Plastic

#### Reactions

$\bar{p}p \rightarrow$  monopole X 300-2000 GeV ( $E_{cm}$ )

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.

Papers PRL 59 (1987) 2523.

**FNAL-731** (Feb 1983) Approved Jul 1983; Completed Feb 1988.

### A PRECISION MEASUREMENT OF THE CP VIOLATION PARAMETER $\epsilon'/\epsilon$ IN THE $K^0$ SYSTEM

CHICAGO U - A Barker, R A Briere, L Gibbons, G Makoff, V Papadimitriou, R Patterson, S V Somalwar, Y Wah, B Winstein ( $\checkmark$  Spokesperson), R Winston, H Yamamoto  
 ELMHURST COLL - E C Swallow  
 FERMILAB - G Bock, R Coleman, J Enagonio, B Hsiung, E Ramberg, K Stanfield, R Stefanski, R Tschirhart, T Yamanaka

SACLAY - P Debu, B Peyaud, R Turlay, B Vallage  
 PRINCETON U - G Gollin, M Karlsson, J Okamitsu

Accelerator FNAL-TEV Detector Spectrometer

#### Reactions

$K_L \rightarrow \pi^+ \pi^-$  50-150 GeV/c  
 $K_L \rightarrow \pi^0 \pi^0$  "  
 $K_L \rightarrow \pi^0 e^+ e^-$  "

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. Ran for 3100 hours.

Papers PRL 60 (1988) 1695, PRL 61 (1988) 2661, PRL 63 (1989) 28, PRL 64 (1990) 1491, PRL 64 (1990) 2976, PR D44 (1991) 573, and PRL 68 (1992) 2580.

**FNAL-733** (Feb 1983, Sep 1983) Approved Nov 1983; Completed Feb 1988.

### STUDY OF HIGH ENERGY $\nu$ INTERACTIONS WITH THE TEVATRON WIDE BAND TRIPLET BEAM

FERMILAB - D Bogert, G Koizumi, 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, E Gallas, R W Hatcher, D Owen, G J Perkins, M Tartaglia, H Weerts  
 FLORIDA STATE U - J K Walker, J Womersley

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. Ran for 4100 hours.

Papers NIM A267 (1988) 49, and NIM A278 (1989) 447.

**FNAL-735** (Apr 1983, Sep 1983) Approved Dec 1983; Completed May 1989.

### SEARCH FOR A DECONFINED QUARK-GLUON PHASE OF STRONGLY INTERACTING MATTER IN $\bar{p}p$ INTERACTIONS AT $E_{cm}$ NEAR 2 TeV

DUKE U - T G Carter, A T Goshaw, C A Loomis, S H Oh, W J Robertson, W D Walker, D K Wesson  
 FERMILAB - V H Areti, P C Bhat, C F Hojvat, C S Lindsey, D F Reeves, F Turkot  
 IOWA STATE U - E W Anderson, C Wang  
 NOTRE DAME U - S Banerjee, P Beery, J M Bishop, N N Biswas, V P Kenney, J M Losecco, A P McManus, J Piekarczyk, S Stampke, B V Varadarajulu, Y Zhan  
 PURDUE U - C C Allen, A T Bujak, D D Carmony, Y Choi, P L Cole, R J Debonte, L J Gutay (Spokesperson), A S Hirsch, T M McMahon, N K Morgan, N T Porile, A Rimai, R P Scharenberg (Spokesperson), B C Stringfellow  
 WISCONSIN U - T Alexopoulos, A R Erwin, C Findeisen, J R Jennings, K S Nelson, M A Thompson, S L Tufte

## SUMMARIES OF FERMILAB EXPERIMENTS

Accelerator FNAL-COLLIDER Detector Spectrometer

Reactions

$\bar{p} p$  2000 GeV ( $E_{cm}$ )

Comments Measures the transverse momentum distributions up to  $p_t = 1.4$  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.

Papers NIM A254 (1987) 212, NIM A269 (1988) 121, PRL 60 (1988) 1622, PRL 62 (1989) 12, NP A498 (1989) 181c, PRL 64 (1990) 991, and NP A525 (1991) 165.

**FNAL-740** (Sep 1983) Approved Feb 1984.

**STUDY OF  $\bar{p}p$  COLLISIONS USING A LARGE DETECTOR AT D0**

ANDES U, BOGOTA - J P Fernandez, B Gomez, L N Granda, B Hoeneisen, C Marin, D Mendoza, J P Negret, B Oostra, J Roldan  
 ARIZONA U - J Chen, D Fein, G E Forden, E James, K A Johns, M Li, A Milder, J P Rutherford, M A Shupe, A Smith  
 BROOKHAVEN - S H Aronson, M Fatyga, B Gibbard, H A Gordon, J M Guida, W Guryan, S A Kahn, S D Protopopescu, P Yamin  
 BROWN U - D Cullen-Vidal, D Cutts, J S Hoftun, R Lanou, F Nang, D Nestic, R Partridge, H Xu, R Zeller  
 UC, RIVERSIDE - K A Bazizi, B Choudhary, J A Ellison, R E Hall, T Huehn, D C Joyce, A Kernan, A Khachatouran, A Klatchko, S Wimpenny  
 RIO DE JANEIRO, CBPF - G Lima, A K A Maciel, V Oguri, A Santoro, M Souza, M Szajnberg, M Vaz  
 MEXICO, IPN - H Castilla, G Herrera  
 COLUMBIA U - I Adam, P Franzini, U Heintz, S Kanekal, P M Tuts  
 DELHI U - V Kapoor, R K Shivpuri  
 FERMILAB - S Abachi, S Ahn, N Amos, N A Amos, J F Bartlett, P C Bhat, F O Borcherding, A D Bross, J M Butler, J H Christenson, W E Cooper, N Denisenko, H T Diehl, M Diesburg, R L Dixon, D P Eartly, D Elvira, H E Fisk, S C Fuess, C Gao, K Genser, C Gerber, N Graf, D R Green, H B Greenlee, H F Haggerty, S Igarashi, A S Ito, M E Johnson, A M Jonckheere, H Jostlein, B Klima, S Krzywdzinski, R Li, R J Lipton, L Lueking, E Malamud, I Manning, H Mao, P S Martin, X Meng, W Merritt, H E Montgomery, C T Murphy, M Narain, N Oshima, A Para, C Park, A Peryshkin, H Prosper, P Quintas, R Raja, P Rapidis, A L Read, W Smart, R P Smith, D A Stewart, A Taketani, M A Tartaglia, D Wood, P Xie, R Yamada, M Yang, Y Zhou  
 FLORIDA STATE U - W Dharmaratna, M Goforth, S L Hagopian, V Hagopian, S L Linn, R Madden, H Piekarz, H Wahl, J Womersley, D Xiao, S Youssef  
 HAWAII U - J Balderston, R J Cence, M A Cummings, M Jones, M W Peters, C Y Yoshikawa  
 ILLINOIS U, CHICAGO - M R Adams, H S Goldberg, S Margulies, J Solomon  
 INDIANA U - G Alverson, T R Marshall, H J Martin, C Murphy, D Zieminska, A Zieminski  
 IOWA STATE U - W Anderson, J Hauptman, M Pang, A Zinchenko  
 LBL - H Aihara, L Chen, A R Clark, O I Dahl, A Goldschmidt, P Grudberg, L T Kerth, W O Koellner, S C Loken, R J Madaras, E Oltman, N A Roe, A L Spadafora, M L Stevenson, M W Strovink, T G Trippe, W A Wenzel  
 MARYLAND U - A Baden, N J Hadley, S Kunori, D Norman, K R T Streets  
 MICHIGAN U - K De, T L Geld, H R Gustafson, A Majumdar, H A Neal, L Oesch, G R Snow, S Zhang  
 MICHIGAN STATE U - M A Abolins, R Astor, R L Brock, D Edmunds, S Fahey, N L Grossman, J T Linnemann, J McKinley, P Mooney, D P Owen, B Pi, B G Pope, S Tisserant, H J Weerts, Y Xia  
 NEW YORK U - J Kotcher, J Kourlas, A Mincer, M Mudan, P Nemethy, J Sculli, J Yang, Q Zhu  
 NORTHEASTERN U - M Glaubman, S Reucroft, T Yasuda  
 NORTHERN ILLINOIS U - M R Fortner, J M Green, D R Hedin, R I Morphis, V Sirotenko, S Tentindo-Repond, S E Willis  
 NORTHWESTERN U - R E Avery, J Bantly, S K Blessing, D A Buchholz, B Gobbi, Y Liu, S Rajagopalan, H M Schellman

NOTRE DAME U - V Balamurali, B Baumbaugh, N N Biswas, J Jaques, R Kehoe, R C Ruchti, J Warchol, M Wayne  
 PANJAB U - S Beri, J Kohli, J Singh, P Sood  
 SERPUKHOV - Y M Antipov, B Baldin, V Bezzubov, N Bozko, S Chekulaev, D S Denisov, S Denisov, A Efimov, O Eroshin, V Evdokimov, V Glebov, A Kirunin, V Klyukhin, V Kochetkov, I Kotov, E Kozlovsky, Y Pischalnikov, V Podstavkov, V Riadovikov, A Shkurenkov, D Stoyanova, A Suhanov, A P Vorobiev  
 PURDUE U - D S Koltick, R L McIlwain  
 RICE U - D Adams, G Eppley, H E Miettinen, J Skeens  
 ROCHESTER U - G C Blazey, J P Borders, C Cretsinger, S J Durston, G K Fanourakis, T Ferbel, S Gruenendahl, R Hirosky, K Hodel, F Lobkowicz, E Pitts  
 SACLAY - Y Ducros, J Glicenstein, J R Hubbard, P Mangeot, B Mansoulie, A Pluquet, J Teiger, A Zylberstejn  
 SUNY, STONY BROOK - D Chakraborty, W Chen, D Claes, J H Cochran, M Demarteau, R J Engelmann, S Feher, G Finocchiaro, M L Good, P D Grannis (✓ Spokesperson), J A Guida, T Heuring, J Jiang, C B Klopfenstein, S Lami, G Landsberg, J Lee-Franzini, Q Li-Demarteau, S Lokos, M D Marx, R L McCarthy, K Ng, M F Paterno, D Pizzuto, L Rasmussen, M Rijssenbeek, P Rubinov, R D Schamberger, S Snyder, F Stocker, J Thompson, C Yanigasawa, J Yu  
 TATA INST - B S Acharya, M R Krishnaswamy, N K Mondal, V S Narasimham, P V Ramanamurthy, M V S Rao, P Vishwanath  
 TEXAS U, ARLINGTON - P Draper, J Li, L Sawyer, M Sosebee, A White  
 TEXAS A AND M - A Boehnlein, F R Huson, J T White, J A Wightman

Accelerator FNAL-COLLIDER Detector D0

Reactions

$\bar{p} p$  2000 GeV ( $E_{cm}$ )

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , bottom, top

Comments The experiment studies the properties of 2 TeV  $\bar{p}p$  collisions with particular emphasis on measurement and identification of leptons. The detector incorporates three main systems: a central detector, uranium-liquid argon calorimetry over nearly  $4\pi$  solid angle, and a magnetized iron muon spectrometer. The detector was commissioned in 1991. Expected to run in 1992/93.

Papers IEEE TNS 32 (1985) 1473, NIM A244 (1986) 356, NIM A247 (1986) 107, CPC 45 (1987) 245, IEEE TNS 34 (1987) 710, NIM A256 (1987) 305, NIM A257 (1987) 556, NIM A261 (1987) 420, NIM A263 (1988) 78, NIM A265 (1988) 157, NIM A269 (1988) 492 [erratum: NIM A273 (1988) 453], NIM A277 (1989) 401, NIM A279 (1989) 107, NIM A279 (1989) 243, NIM A279 (1989) 310, NIM A279 (1989) 331, NIM A279 (1989) 359, NIM A280 (1989) 36, IEEE TNS 36 (1989) 384, NIM A289 (1990) 438, NIM A289 (1990) 543, NIM A290 (1990) 122, NIM A290 (1990) 346, NIM A293 (1990) 125, NIM A297 (1990) 121, IEEE TNS 38 (1991) 286, and IEEE TNS 38 (1991) 398.

**FNAL-741** (Aug 1981) Approved Apr 1982.

**STUDY OF  $\bar{p}p$  COLLISIONS USING A LARGE DETECTOR AT B0—THE CDF DETECTOR**

ARGONNE - R E Diebold, W Li, E N May, L J Nodulman, J Proudfoot, P Schoessow, S Sergio, D G Underwood, R G Wagner, A B Wicklund  
 BRANDEIS U - J R Bensinger, M Contreras, L M Demortier, M R Fortner, S Gallo, T Kepler, P R Kesten, L E Kirsch, F Lomanno, B Maganson, R B Mattingly, S Moulding, L F Nakae, H Piekarz, R Poster, L J Spencer, S Tarem, R Xu, P Zografou  
 CHICAGO U - D Amidei, C Campagnari, M Campbell, P F Derwent, H J Frisch, C Grosso-Pilcher, T M Liss, R Mikawa, G Redlinger, A Roodman, M J Shochet (✓ Spokesperson), F D Snider, Y Tsay  
 FERMILAB - M Atac, E J Barsotti, J P Berge, M E Binkley, A E Brenner, J T Carroll, T L Collins, C T Day, J E Elias, G W Foster, J E Freeman, I Gaines, J Grimson, D R Hanssen, J Huth, H B Jensen, D E Johnson, R W Kadel, R D Kephart, C A Nelson, C Neumann-Holmes, T K Ohska, J F Patrick, R A Perchonok, D R Quarrie, S L Segler, M Shibata, D Theriot, A V Tollestrup (✓ Spokesperson), R Vidal, R L Wagner, R Yamada, G Yeh, J Yoh

## SUMMARIES OF FERMILAB EXPERIMENTS

FRASCATI - B Alpat, S Bartalucci, S Bertolucci, D Bisello, M Cordelli, A Esposito, P Giromini, S Miscetti, M Pallotta, M Pelliccioni, M Pistoni, A Sansoni, L Trasatti  
 HARVARD U - A Baden, T P Baumann, C A Blocker, G W Brandenburg, D N Brown, R M Carey, R St Denis, M W Eaton, S Geer, C P Jessop, E Kearns, J S T Ng, E Pare, T J Phillips, F Ptohos, T P Schaad, R F Schwitters, M Shapiro, W Trischuk, W A Worstell  
 ILLINOIS U, URBANA - G Ascoli, S Bhadra, R W Downing, S M Errede, L Fishback, A Gauthier, L E Holloway, P Hurst, D Kardelis, I Karliner, R Keup, H Keutelian, U E Kruse, C Luchini, A J Martin, R D Sard, V E Scarpine, P Schlabach, D A Smith, R L Swartz, T K Westhusing  
 KEK - Y Arai, Y Fukui, S Mikamo, M Mishina, Y Munehisa, I Nakano, K Ogawa, T Suzuki, K Takahashi, T Taniguchi, F Ukegawa, Y Watase  
 LBL - R E Beringer, M Bucher, W C Carithers, W Chinowsky, R P Ely, A Galtieri, M S Gold, C H Haber, R M Harris, B Hubbard, N Hunt, H S Kaye, M E Levi, A P T Palounek, J Siegrist, P Tipton, W C Wester, B L Winer  
 PENN U - M R Allen, D A Bauer, R Van Berg, M A Bershad, D F Connor, J W Cooper, L Feldscher, R S Foster, L Gladney, S R Hahn, R J Hollebeek, T Koch, N S Lockyer, M Miller, M Neucomer, M A Puglisi, K J Ragan, T F Rohaly, A M Rosenshine, P K Sinervo, J J Walsh, B Williams  
 INFN, PISA - S R Amendolia, F Bedeschi, G Bellettini, R Bertani, V Bolognesi, N Bonavita, L Bosisio, M Calvetti, R Castaldi, F Cervelli, G Chiarelli, M Curatolo, R Delfabbro, M Dell'Orso, F Donno-Raffaelli, B Esposito, E Focardi, F Gagliardi, P Giannetti, M A Giorgi, H Grassmann, M Mangano, A Menzione, F Morsani, A Nappi, R Paoletti, D Passuello, G Pierazzini, G Punzi, L Ristori, G Sanguineti, A Scribano, P Sestini, A Stefanini, C Tazziolli-Corazza, G Tonelli, R Tripicciono, C Vannini, F Zetti  
 PURDUE U - R Austin, M W Bailey, V E Barnes, S Behrends, A Byon-Wagner, K Chadwick, A Divirgilio, A F Garfinkel, B T Huffman, S E Kuhlmann, A T Laasanen, S Riggs, M Schub, J K Simmons, J Tonnison  
 ROCKEFELLER U - S Belforte, T J Chapin, R L Cool, N D Giokaris, K Goulianos, J Grunhaus, K A Jenkins, R Plunkett, H Sticker, S N White  
 RUTGERS U - P S Auchincloss, A F Beretvas, E J Buckley-Geer, T J Devlin, P Hu, U P Joshi, E W Kuns, J Lupton, N M Pearson, T L Watts, T Yang, Q M Zhang  
 TEXAS A AND M - T J V Bowcock, J R Buchholz, S Cihangir, D D Dibitonto, H Franke, T Hessing, T Kamon, L Keeble, F Marchetto, P M McIntyre, T Meyer, W M Sampson, X Shen, M J Shepko, J M Thane, M Timko, R C Webb  
 TSUKUBA U - F Abe, Y Asano, Y Funayama, K Hara, Y Hayashide, T Ino, H Iso, M Ito, Y Kikuchi, S Kim, S Kim, K Kondo, M Kurisu, M Masuzawa, T Mimashi, S Miyashita, H Miyata, S Mori, Y Morita, T Ozaki, F Sato, Y Seiya, M Sekiguchi, Y Takaiwa, M Takano, H Takayama, K Takikawa, H Tsuda, A Yamashita, K Yasuoka, M Yokoyama  
 WISCONSIN U - I Avgin, K Byrum, D L Carlsmith, D B Cline, R M Handler, J Lamoureux, R J Loveless, R Markeloff, L A Markosky, N K Mondal, E O'Brien, L G Pondrom, D D Reeder, J M Rhoades, M C Sheaff, J E Skarha, C Wendt

Accelerator FNAL-COLLIDER Detector CDF

### Reactions

$\bar{p} p$  500-2000 GeV (E<sub>cm</sub>)

Particles studied  $W^+$ ,  $W^-$ ,  $Z^0$ , higgs, top

Comments The first physics results were obtained during 1987, in an engineering run. In a year-long run in 88/89, an integrated luminosity of 4500 nb<sup>-1</sup> was achieved. Upgrades for the 1991 run are described in the FNAL-775 proposal. Another major improvement of the CDF detector is proposed for the 1993 run.

Papers NIM 204 (1983) 351, NIM 204 (1983) 361, NIM 205 (1983) 113, NIM 216 (1983) 127, NIM 219 (1984) 472, JdeP 45 (1984) 333, NIM A238 (1985) 18, IEEE TNS 34 (1987) 865, NIM A263 (1988) 199, NIM A267 (1988) 249, NIM A267 (1988) 257, NIM A267 (1988) 272, NIM A267 (1988) 280, NIM A267 (1988) 301, NIM A267 (1988) 315, NIM A267 (1988) 330, NIM A267 (1988) 351, NIM A268 (1988) 24, NIM A268 (1988) 33, NIM A268 (1988) 41, NIM A268 (1988) 46, NIM A268 (1988) 50, NIM A268 (1988) 75, NIM A268 (1988) 92, NIM A269 (1988) 33, NIM A269 (1988) 40, NIM A269 (1988) 51, NIM A269

(1988) 63, NIM A269 (1988) 68, NIM A269 (1988) 82, NIM A269 (1988) 93, NIM A271 (1988) 387, PRL 61 (1988) 1819, PRL 62 (1989) 613, PRL 62 (1989) 1005, PRL 62 (1989) 1825, PRL 62 (1989) 3020, PRL 63 (1989) 720, PRL 63 (1989) 1447, NIM A274 (1989) 443, NIM A281 (1989) 485, PR D40 (1989) 3791, NP A498 (1989) 193c, IEEE TNS 36 (1989) 35, IEEE TNS 36 (1989) 347, IEEE TNS 36 (1989) 440, IEEE TNS 36 (1989) 765, PRL 64 (1990) 142, PRL 64 (1990) 147, PRL 64 (1990) 152, PRL 64 (1990) 157, PRL 64 (1990) 348, PRL 65 (1990) 968, PRL 65 (1990) 2243, PR D41 (1990) 1717, PR D41 (1990) 1722, PR D41 (1990) 2330, PRL 66 (1991) 2951, PRL 67 (1991) 2418, PRL 67 (1991) 2609, PR D43 (1991) 664, PR D43 (1991) 2070, PR D44 (1991) 29, and PR D44 (1991) 601.

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**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, M C Touboul  
 DUKE U - A Goshaw, W Robertson, W Walker, C F Wild  
 FERMILAB - R Dixon, H C Fenker, J M Marrisfino, 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, B P Roe, M F Weber  
 MICHIGAN STATE U - C Bromberg, R Miller, A Nguyen  
 MONS U - J Baland, V P Henri, P Legros, P Pilette  
 NORTHEASTERN U - C Hamilton, I D Leedom, S Reucroft (✓ Spokesperson), C Zabounidis  
 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-ZEUTHEN ADW - 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

$p p \rightarrow \text{charm } X$  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 NIM A248 (1986) 301, PL B178 (1986) 124, PL B183 (1987) 110, PL B192 (1987) 478, and PRL 61 (1988) 2185.

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**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 Bernstein, R Blair, C Foudas, W C Lefmann, S Mishra, E Oltman, F Sciulli (Spokesperson), M Shaevitz, W Smith  
 FERMILAB - F O Borcherding, D A Edwards, H E Fisk, D Jovanovic, Q A Kerns, M Lamm, W Marsh, W Merritt, P Ravidis  
 ROCHESTER U - A Bodek, H Budd, K Lang

Accelerator FNAL-TEV Detector LAB-E

### Reactions

$\nu_\mu \text{ nucleus} \rightarrow \text{muon}(s) X$  < 400 GeV/c  
 $\bar{\nu}_\mu \text{ nucleus} \rightarrow \text{muon}(s) X$  "

## SUMMARIES OF FERMILAB EXPERIMENTS

Comments Studies opposite-sign dimuon events, same-sign dimuon events, and structure functions. Continues work of FNAL-616 and -701. Ran for 1900 hours.

Papers PRL 60 (1988) 1618, PRL 63 (1989) 132, and PL B252 (1990) 170.

**FNAL-745** (Sep 1983) Approved Dec 1983; Completed Feb 1988.

### MUON NEUTRINO EXPERIMENT USING THE TOHOKU HIGH RESOLUTION ONE METER BUBBLE CHAMBER

BROWN U - P Allen, M Aryal, D Brick, A Chen, K De, A Desilva, A Shapiro, M Widgoff

FERMILAB - N Gelfand, T Murphy

INDIANA U - E D Aleya, Jr

BEIJING, IHEP - C Mao, L G Mu, Y Tai, S Wang, Y Wu, S W Xu, C Zhao

MIT - D A Goloskie, E S Hafen, J Harton, I A Pless

SUGIYAMA JOGAKUEN U - S Fukui

OAK RIDGE - H O Cohn

TENNESSEE U - J E Brau, W M Bugg, G T Condo, Y C Du,

T Handler, J Hargis, E L Hart, R Kroeger, R Majoras, J Shimony

TOHOKU U - T Akagi, Y Chiba, K Furuno, H Hanada,

K Hasegawa, J Katayama, T Kitagaki (Spokesperson),

H Kurino, Y Morita, S Nakai, T Nakajima, K Numano,

M Sasaki, H Suzuki, T Takayama, K Tamai, S Tanaka,

A Yamaguchi, T Yamamura

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  $D^+$ ,  $D^0$ ,  $D_s^+$ ,  $\Lambda_c^+$

Comments Uses the Tohoku high-resolution 1-meter freon bubble chamber. Studies charm production and neutrino interactions in the high  $Q^2$  region. Took 553 KPIX.

Papers PL B214 (1988) 281, and NIM A281 (1989) 81.

**FNAL-756** (Oct 1984) Approved Jun 1985; Completed Feb 1988.

### MEASUREMENT OF THE MAGNETIC MOMENT OF THE $\Omega^-$

FERMILAB - C James, K B Luk ( $\checkmark$  Spokesperson), R Rameika

MICHIGAN U - P M Ho, M Longo, A Nguyen

MINNESOTA U - J Duryea, G Guglielmo, K Heller, K Johns,

M Shupe, K Thorne

RUTGERS U - T Diehl, S Teige, G Thompson, Y Zou

Accelerator FNAL-TEV Detector Spectrometer

#### Reactions

$p$  Be  $\rightarrow \Omega^- X$  800 GeV/c

$\Lambda$  Cu  $\rightarrow \Omega^- X$  300-800 GeV/c

$\Xi^0$  Cu  $\rightarrow \Omega^- X$  "

Particles studied  $\Omega^-$ ,  $\bar{\Omega}^+$ ,  $\Sigma^+$ ,  $\Sigma^-$ ,  $\Xi^-$ ,  $\bar{\Xi}^+$ ,  $K^+$ ,  $K^-$ ,  $\pi^-$

Comments Ran for 1700 hours.

Papers PRL 65 (1990) 1713, PR D44 (1991) 3402, PRL 67 (1991) 804, PRL 67 (1991) 1193, and PRL 68 (1992) 768.

**FNAL-760** (Mar 1985) Approved Jun 1985; Completed Jan 1992.

### INVESTIGATION OF THE FORMATION OF CHARMONIUM STATES USING THE $\bar{p}$ ACCUMULATOR RING

UC, IRVINE - D R Broemmelsiek, J E Fast, K E Gollwitzer, M A Mandelkern, J L Marques, J Schultz, A Smith, M F Weber, G Zioulas

FERMILAB - V K Bharadwaj, M Church, A A Hahn, S Y Hsueh, W L Marsh, J Peoples, S H Pordes, P A Rapidis, R E Ray, S Werkema

FERRARA U - D Bettoni, R Calabrese, P Dalpiaz, P Ferretti-

Dalpiaz, E Luppi, M Martini, F Petrucci, M Savrie

INFN, GENOA - A Buzzo, M Dameri, S Ferroni, M Macri,

M M Marinelli, L Mattera, S Passaggio, C Patrignani, M Pia,

A Santroni, F Tommasina, M Zito

NORTHWESTERN U - D A Dimitroyannis, M Masuzawa,

J L Rosen, M Sarmiento, K K Seth, S Trokenheim, J Zhao

PENN STATE U - T A Armstrong, M Abul Hasan, R A Lewis,

A Majewska, J D Reid, G A Smith

TURIN U - C Biino, G Borreani, A Ceccucci, R Cester

( $\checkmark$  Spokesperson), F Marchetti, E A Menichetti, A Migliori,

R Mussa, S Palestini, N Pastrone, L Pesando, G Rinaudo,

L Tecchio

Accelerator FNAL-COLLIDER Detector Calorimeter, Counter

#### Reactions

$\bar{p} p \rightarrow \psi$  (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 Studies charmonium states formed exclusively in  $\bar{p}p$  collisions, and their decays to electromagnetic final states. Uses a gas-jet hydrogen target in the Fermilab  $\bar{p}$  source. The detector consists of a tracking system, hodoscopes, and Čerenkov counters surrounded by a central lead-glass electromagnetic calorimeter, and a planar forward calorimeter.

Papers NIM A271 (1988) 417, NIM A277 (1989) 116, NIM A295 (1990) 73, NIM A301 (1991) 47, NIM A307 (1991) 254, and PRL 68 (1992) 1468.

**FNAL-761** (Apr 1985) Approved Jun 1985; Completed Aug 1990.

### STUDY OF HYPERON RADIATIVE DECAYS

BEIJING, IHEP - L Chengze, L Fengfei, T Fukun, D Lisheng,

H Shi, L Yunshan, W Zhao

RIO DE JANEIRO, CBPF - A M Freire Endler,

M C Pommet Maia

FERMILAB - R A Carrigan, P S Cooper, J Lach, A M Morelos-Pineda

IOWA U - E R McCliment, C R Newsom

MOSCOW, ITEP - P A Goritchev, M A Kubantsev

SAO PAULO U - C O Escobar, P Gouffon, J Mahon

ST PETERSBURG, INP - A S Denisov, V L Golovtsov,

V T Gratchev, A V Khanzadeev, A G Krivshich,

N P Kuropatkin, V M Samsonov, V A Schegelsky, N N Smirnov,

N K Terentiev, L N Uvarov, A A Vorobiev (Spokesperson)

YALE U - M Foucher

Accelerator FNAL-TEV Detector Spectrometer, Transition radiation

#### Reactions

$p$  nucleus  $\rightarrow \Sigma^+ X$  800 GeV/c

$p$  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. Uses a polarized charged hyperon beam and a new very high resolution spectrometer.

**FNAL-766** (Jul 1985) Approved Jul 1985; Completed Oct 1985.

### NEUTRON ENERGY SPECTRUM MEASUREMENTS IN THE TEVATRON TUNNEL — APPLICATION TO SSC

LBL - J McCaslin (Spokesperson), W P Swanson

FERMILAB - A J Elwyn, W S Freeman, P M Yurista

Accelerator FNAL-TEV Detector Neutron spectrometer

#### Reactions

$p$  nucleus  $\rightarrow n X$  —

Comments A test relevant to radiation damage at the SSC.

## SUMMARIES OF FERMILAB EXPERIMENTS

**FNAL-769** (Nov 1985) Approved Dec 1985; Completed Feb 1988.

### PION AND KAON PRODUCTION OF CHARM AND CHARM-STRANGE STATES

RIO DE JANEIRO, CBPF - G A Alves, S Amato, J C C Anjos, J R T de Mello-Neto, J M de Miranda, H da Motta, A C dos Reis, A F S Santoro, M H G Souza  
 FERMILAB - J A Appel ( $\checkmark$  Spokesperson), R Dixon, H Fenker, D Green, S Kwan, L Lueking, P M Mantsch, T Nash, W J Spalding, C Stoughton, M Streetman  
 MISSISSIPPI U - L M Cremaldi, A Rafatian, D Summers  
 NORTHEASTERN U - D Kaplan, I D Leedom, S Reucroft  
 TORONTO U - S B Bracker, C Gay, R Jedicke, G J Luste  
 TUFTS U - J Metheny, R Milburn, A Napier  
 WISCONSIN U - D Errede, M Sheaff  
 YALE U - C Darling, P Karchin, W R Ross, S F Takach, Z Wu

Accelerator FNAL-TEV Detector TPS

#### Reactions

pion nucleus $\rightarrow$ charm X	250 GeV/c
kaon nucleus $\rightarrow$ charm X	"
p nucleus $\rightarrow$ charm X	"

Particles studied  $D^0, D^+, D^-, D^*(2010), D_s^+, D_s^-, \Lambda_c^+$

Comments A sequel to FNAL-691. Ran for 1900 hours.

Papers IEEE TNS 34 (1987) 870, and IEEE TNS 36 (1989) 106.

**FNAL-770** (Dec 1985) Approved Dec 1985; Completed Feb 1988.

### NEUTRINO PHYSICS AT THE TEVATRON

#### CCFR COLLABORATION

CHICAGO U - F Merritt, M Oreglia, B Schumm  
 COLUMBIA U - C Arroyo, K T Bachmann, R E Blair, C Foudas, B J King, W C Lefmann, W C Leung, S R Mishra, P Z Quintas, S A Rabinowitz, F J Sculli, B Seligman, M H Shaevitz  
 FERMILAB - R H Bernstein, F O Borcherding, H E Fisk, D Jovanovic, M Lamm, W Marsh, W Merritt  
 ROCHESTER U - P de Barbaro, A Bodek, H Budd, W K Sakamoto  
 WISCONSIN U - T Kinnel, P H Sandler, W H Smith ( $\checkmark$  Spokesperson)

Accelerator FNAL-TEV Detector LAB-E

#### Reactions

pion nucleus $\rightarrow$ muon X	40, 70, 100 GeV/c
kaon nucleus $\rightarrow$ muon X	"
$\nu_\mu$ 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. Ran for 1600 hours. Several papers in preparation (March 92).

Papers NIM A294 (1990) 179, PR D42 (1990) 759, PL B252 (1990) 170, NIM A302 (1991) 254, and PRL 66 (1991) 3117.

**FNAL-771** (Feb 1986) Approved Apr 1987; Started 1991.

### BEAUTY PRODUCTION AND OTHER HEAVY QUARK PHYSICS ASSOCIATED WITH DIMUON PRODUCTION IN 800 (925) GeV/c pp INTERACTIONS

SOUTH ALABAMA U - R K Clark, C Merrill Jenkins  
 ATHENS U - S E Anassontzis, P Ioannou, S Katsanevas, C Kourkoumelis, A Manoussakis-Katsidak, T Pramantiotis, L K Resvanis, M Vassiliou, G Voulgaris  
 UC, BERKELEY - H C Ballagh, H H Bingham, W B Fretter, T Kaeding, J Lys, S Misawa  
 UCLA - A F Boden, D B Cline, S Ramachandran, J M Rhoades  
 DUKE U - L R Fortney, A T Goshaw, W R Kowald, S H Oh, W J Robertson, B Zou  
 FERMILAB - P O Mazur, C T Murphy, R P Smith, L Spiegel, W Yang  
 HOUSTON U - K H Lau, G Mo

DUBNA - J Budagov, D M Khazins, E Kladiva, G O Takhtamyshev, S Tokar, E Tsyganov, A Vodopyanov, A Volodko  
 LECCE U - P Creti, E Gorini, F Grancagnolo, O A Palamara, M Panareo, P Pistilli  
 MCGILL U - J M Trischuk  
 NANJING U - T Chen, N Yao  
 NORTHWESTERN U - M M Block, T J Lecompte, Y Tan  
 PAVIA U - L Antoniazzi, G Bressi, G Introzzi, A Lauza, G Liguori, S P Ratti, P Torre  
 PENN U - R Van Berg, A Blankman, W I Kononenko, W Selove, S Zhang  
 PRAIRIE VIEW A AND M - M L Haire, D J Judd, K H Paick, L Turnbull, D E Wagoner  
 SHINSHU U - Z Cao, M He, C Shen, C Wang, C Wei, N Zhang  
 VANIER COLL - M S Cooper  
 VIRGINIA U - M W Arenton, S Conetti, G Corti, B B Cox ( $\checkmark$  Spokesperson), E C Dukes, V Golovatyuk, P M Hanlet, A Ledovskoy, A P Mcmanus, K S Nelson, V Pogosyan, M Recagni, J Segal, B Su, J Sun  
 WISCONSIN U - T Alexopoulos, C Darandet, A Erwin, J Jennings

Accelerator FNAL-TEV Detector Spectrometer

#### Reactions

p Si $\rightarrow \mu^+ \mu^- X$	800-925 GeV/c
p Si $\rightarrow B \bar{B} X$	"
p Si $\rightarrow \chi_b(\text{unspec}) X$	"
p Si $\rightarrow \chi_c(\text{unspec}) X$	"

Particles studied  $B^+, B^0, \chi_b(\text{unspec}), \chi_c(\text{unspec})$

Comments Uses the FNAL-705 spectrometer augmented by a 16,000-channel silicon detector and a new single- and dimuon trigger to select  $B\bar{B}$  events at a high rate ( $\sim 10^7/s$ ).

**FNAL-772** (Mar 1986) Approved Jul 1986; Completed Feb 1988.

### STUDY OF THE NUCLEAR ANTIQUARK SEA VIA $pN \rightarrow \text{DIMUONS}$

LOS ALAMOS - D M Alde, H W Baer, T A Carey, G T Garvey, A Klein, C Lee, M J Leitch, J W Lillberg, P L McGaughey, C S Mishra, J M Moss ( $\checkmark$  Spokesperson), J C Peng  
 FERMILAB - C N Brown, W E Cooper, Y B Hsiung  
 ILLINOIS U, CHICAGO - M R Adams  
 NORTHERN ILLINOIS U - R Guo, D M Kaplan  
 SUNY, STONY BROOK - R L McCarthy  
 CASE WESTERN RESERVE U - G Danner, M J Wang  
 TEXAS U - M Barlett, G W Hoffmann

Accelerator FNAL-TEV Detector Spectrometer

#### Reactions

p deut $\rightarrow \mu^+ \mu^- X$	800 GeV/c
p nucleus $\rightarrow \mu^+ \mu^- X$	"

Comments A precise measurement of the  $A$  dependence of the Drell-Yan process with particular emphasis on the kinematic region  $M > 4 \text{ GeV}$ ,  $x > 0.2$ , which is most sensitive to the beam-valence-quark target-antiquark annihilation. Also measures the dependence of  $J/\psi$ ,  $\psi'$ , and  $\Upsilon$  resonances on  $A$ , for  $x(\text{Feynman})$  between  $-0.1$  and  $0.6$ . Uses the FNAL-605 spectrometer. Targets are deuteron, C, Ca, Fe, and W. Ran for 1700 hours.

Papers NIM A282 (1989) 62, PRL 64 (1990) 2479, PR D41 (1990) 2334, PR D41 (1990) 2924, PR D43 (1991) 954, PRL 66 (1991) 133, and PRL 66 (1991) 2285.

**FNAL-773** (Mar 1986) Approved Jul 1986, Jun 1989; Completed Sep 1991.

### MEASUREMENT OF THE PHASE DIFFERENCE BETWEEN $\eta_{00}$ AND $\eta_{+-}$ TO A PRECISION OF $0.5^\circ$

CHICAGO U - A R Barker, R A Briere, L K Gibbons, D Harris, G D Makoff, K Mcfarland, B Schwingenheuer, S Somalwar, Y W Wah, B D Winstein, R Winston  
 ELMHURST COLL - E C Swallow

## SUMMARIES OF FERMILAB EXPERIMENTS

FERMILAB – G J Bock, R N Coleman, J Enagonio, Y B Hsiung,  
D Jensen, E Ramberg, K C Stanfield, R S Tschirhart,  
T Yamanaka

ILLINOIS U, URBANA – E Collins, G D Gollin (✓ Spokesperson)  
RUTGERS U – P Haas, W P Hogan, S Kim, J N Matthews,  
S S Myung, G Ping, S R Schnetzer, G B Thomson, Y Zou

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 This experiment 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. One beam passes through a thin regenerator at the start of the fiducial decay volume, the other traverses a thick regenerator 12 meters further upstream. The regenerators switch beams between machine pulses. The experiment tests CPT invariance.

**FNAL-774** (Apr 1986) Approved Dec 1986; Completed Aug 1990.

### **ELECTRON BEAM DUMP PARTICLE SEARCH IN THE WIDE BAND HALL**

FERMILAB – A D Bross, M B Crisler (✓ Spokesperson),  
H C Fenker, S A Pordes, J T Volk  
ILLINOIS U, URBANA – S M Errede  
NORTHEASTERN U – I Leedom

Accelerator FNAL-TEV Detector Calorimeter, Spectrometer

### Reactions

$e^-$ nucleus $\rightarrow$	350 GeV ( $E_{lab}$ )
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Particles studied axion

Comments A search for short-lived particles that couple to the electron by looking for their decay in flight downstream from an electron beam dump. Inspired by the observation of an anomalous electron-positron pair production seen in heavy-ion collisions at the GSI.

Papers PRL 67 (1991) 2942.

**FNAL-775** (May 1986) Approved Apr 1987, Oct 1988, Jan 1989.

### **THE UPGRADED CDF DETECTOR AT FERMILAB**

ARGONNE – R E Blair, S E Kuhlmann, L J Nodulman,  
J Proudfoot, R G Wagner, A B Wicklund  
BRANDEIS U – S Behrends, J R Bensingler, C A Blocker,  
L E Kirsch, R B Mattingly, S Moulding  
UCLA – J Hauser, S Lummel, J Muller  
CHICAGO U – C Campagnari, M Contreras, S C Eno, H J Frisch,  
C Grosso-Pilcher, M Miller, M J Shochet (✓ Spokesperson),  
G Sullivan

DUKE U – A T Goshaw, S H Oh, W J Robertson, W D Walker

FERMILAB – M Atac, A F Beretvas, J P Berge, M E Binkley,  
A Caner, K Chadwick, S Cihangir, J W Cooper, D A Crane,  
F Dejongh, B H Denby, J E Elias, B Flaughner, G W Foster,  
J E Freeman, D Frei, T Fuess, S Geer, J Grimson, S R Hahn,  
R M Harris, J Huth, J Huyen, H B Jensen, R P Johnson,  
U P Joshi, D Jovanovic, R D Kephart, D H Kim, E Kovacs,  
P T Lukens, K Maeshima, J P Marriner, A Mukherjee,  
C A Nelson, C Neumann-Holmes, A Para, S Park, J F Patrick,  
R Plunkett, E Schmidt, S L Segler, D Theriot, P Tipton,  
S Tkaczyk, A V Tollestrup (✓ Spokesperson), R Vidal,  
R L Wagner, N Wainer, A Yagil, G Yeh, J Yoh, J C Yun

FRASCATI – S Bertolucci, G Chiarelli, M Cordelli, P Giromini,  
S Miscetti, A Sansoni

HARVARD U – T P Baumann, G W Brandenburg, A B Feldman,  
M Franklin, R Hamilton, C P Jessop, J Konigsberg,  
T J Phillips, F Ptochos, P Schlabach

ILLINOIS U, URBANA – S M Errede, A Gauthier, L E Holloway,  
I Karliner, R Keup, T M Liss, A J Martin

JOHNS HOPKINS U – B A Barnett, C M Boswell, J A Matthews,  
J E Skarha, F D Snider, S Vejckik

KEK – F Abe, Y Fukui, S Mikamo, M Mishina  
LBL – W C Carithers, W Chinowsky, R B Drucker,  
K F Einsweiler, R P Ely, A Galtieri, M S Gold, C H Haber,  
R W Kadel, M E Levi, M Shapiro, J Siegrist, W C Wester,  
B L Winer

MICHIGAN U – D Amidei, M Campbell, J Wehrley Chapman,  
P F Derwent, D Wu, S Y Zhang

OSAKA CITY U – T Okusawa, T Takahashi, Y Teramoto,  
T Yoshida

PADUA U – N Bacchetta, D Bisello, G Busetto, A Castro,  
S Centro, M Loreti, R Martinelli, L Pescara, J Wyss

PENN U – Y Cen, L Gladney, R J Hollebeck, R E Hughes,  
N S Lockyer, E H-L Low, M A Puglisi, K J Ragan, P K Sinervo,  
L Song, H H Williams

INFN, PISA – F Bedeschi, S Belforte, G Bellettini, F Cervelli,  
M Dell'Orso, P Giannetti, H Grassmann, M Incagli,  
M Mangano, A Menzione, R Paoletti, G Punzi, F Rimondi,  
L Ristori, A Scribano, D A Smith, A Stefanini, G Tonelli,  
T K Westhusing, A Zanetti, F Zetti

PITTSBURGH U – E Engels, P F Shepard

PURDUE U – M W Bailey, V E Barnes, A F Garfinkel,  
B T Huffman, A T Laasanan, M Shaw, J Tonnison

ROCHESTER U – P S Auchincloss, A Bodek, H S Budd,  
P Debarbaro, S L Olsen, W K Sakumoto, H Zheng

ROCKEFELLER U – T J Chapin, N D Giokaris, K Goulianos,  
S N White

RUTGERS U – E J Buckley-Geer, T J Devlin, C M Hawk,  
E W Kuns, J A Mueller, T L Watts

SSCL – D P Coupal, A Fry, M Turcotte

TEXAS A AND M – T J V Bowcock, T Kamon, L Keeble,  
P M McIntyre, R C Webb

TSUKUBA U – Y Funayama, K Hara, T Ino, S Kim, K Kondo,  
S Miyashita, Y Morita, I Nakano, Y Seiya, K Takikawa,  
K Yasuoka, M Yokoyama

TUFTS U – M T Bellino, K J Sliwa

WISCONSIN U – J N Bellinger, D L Carlsmith, R M Handler,  
J Lamoureux, P A Maas, L G Pondrom, C Wendt

Accelerator FNAL-COLLIDER Detector CDF

### Reactions

$\bar{p} p$	500–2000 GeV ( $E_{cm}$ )
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Comments The detector used in FNAL-741 is upgraded with the level-3 trigger, silicon vertex detector, and the muon detection system. Completed in 1991. See FNAL-741 for published papers.

**FNAL-776** (Aug 1986) Approved Jan 1987; Completed Feb 1988.

### **MEASUREMENT OF NUCLEAR CALIBRATION CROSS SECTIONS FOR PROTONS WITH ENERGIES > 400 GeV**

FERMILAB – R A Allen, S I Baker (✓ Spokesperson), P Yurista  
BROOKHAVEN – J B Cumming  
CERN – V Agoritsas

Accelerator FNAL-TEV Detector Photon spectrometer

### Reactions

$p \text{ Cu} \rightarrow {}^{24}\text{Na X}$	30, 150, 400, 800 GeV ( $E_{lab}$ )
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Comments Extends studies of FNAL-631. Copper samples are exposed to the proton beam, and then a gamma ray from  ${}^{24}\text{Na}$  (15-hour half life) is detected with a high-resolution Ge(Li) detector.

Papers PR C43 (1991) 2862.

**FNAL-777** (Oct 1986) Approved Jan 1987; Completed May 1987.

### **NEUTRON FLUX MEASUREMENT IN THE TEVATRON TUNNEL**

FERMILAB – J D Cossairt, A J Elwyn, W S Freeman, H Jostlein,  
C D Moore, P M Yurista

LBL – J B McCaslin (Spokesperson), R Sun, W P Swanson  
SSC CENTRAL DESIGN GROUP – D E Groom

Accelerator FNAL-COLLIDER Detector Neutron spectrometer



## SUMMARIES OF FERMILAB EXPERIMENTS

### Particles studied *n*

Comments Results of FNAL-766 indicate that the neutron flux associated with beam loss in the SSC may seriously degrade semiconductor components in the tunnel. This experiment aims at a better understanding of the situation, particularly of the correlation of neutron flux with the proton loss rate.

**FNAL-778** (Oct 1986) Approved Dec 1986; Completed Jan 1991.

### STUDY OF THE SSC MAGNET APERTURE CRITERION

CORNELL U - T Chen, R Talman ( $\checkmark$  Spokesperson)  
 FERMILAB - D A Edwards, D A Finley, A Gerasimov, R E Gerig  
 ( $\checkmark$  Spokesperson), G Goderre, M A Harrison, R P Johnson,  
 I Kourbanis, L Michelotti, S Peggs, S Pruss, S Saritepe,  
 T Satogata, M Syphers  
 LBL - L C Schachinger  
 SSCL - A W Chao, B Cole, D E Johnson, S Peggs, J M Peterson,  
 F Pilat, C Saltmarsh, C G Trahern  
 SLAC - C B Manz, N Meringa  
 NORTH TEXAS STATE U - G Tsironis

Accelerator FNAL-TEV Detector Other

### Reactions

*p* 150 GeV ( $E_{lab}$ )

Comments Tests assumptions made in the conceptual design of the SSC concerning the optimal magnet aperture. Studies (1) betatron oscillation amplitudes before and after introduction of nonlinear field components, (2) diffusive beam growth, yielding a phenomenological description, and (3) resonant detrapping of beam trapped in metastable states.

Papers PRL 61 (1988) 2752, PRL 68 (1992) 33, and PRL 68 (1992) 1838.

**FNAL-781** (Mar 1987) Approved Oct 1988.

### SEGMENTED LARGE-X BARYON SPECTROMETER (SELEX)

BEIJING, IHEP - L Chengze, W Dianrong, L Fengfei, T Fukun,  
 Z Jiaquan, X Yigang, L Yunshan, L Zhigang  
 BRISTOL U - V J Smith  
 CARNEGIE MELLON U - R M Edelstein, D Gibaut, D M Potter,  
 M Procaro, J S Russ (Spokesperson), S Yang  
 RIO DE JANEIRO, CBPF - A M Freire Endler,  
 M C Pommot Maia  
 FERMILAB - P S Cooper, J Lach, L G Stutte  
 IOWA U - K R Barger, U Mallik, E R McCliment, C R Newsom,  
 Y Onel  
 MOSCOW, ITEP - P A Goritchev, V D Khovansky,  
 M A Kubantsev  
 ROCHESTER U - T Ferbel, M Zielinski  
 SAO PAULO U - O P Eboli, C O Escobar, P Gouffon  
 ST PETERSBURG, INP - A S Denisov, V L Golovtsov,  
 V T Gratchev, A V Khanzadeev, A G Krivshich,  
 N P Kuropatkin, V M Samsonov, V A Schegelsky, N N Smirnov,  
 N K Terentiev, L N Uvarov, A P Vorobiev  
 TEL AVIV U - M Moinester  
 WASHINGTON U, SEATTLE - V Chaloupka, T Zhao

Accelerator FNAL-TEV Detector Spectrometer

Particles studied charmed-baryon

Comments Studies both charmed baryon production and decays. Trigger is based on impact parameter. The spectrometer deploys a number of existing detectors as well as the new silicon strip and pixel devices and a ring-imaging Čerenkov counter. Unscheduled (February 92).

**FNAL-782** (Feb 1987) Approved Jul 1987; Completed Jul 1990.  
**A MUON EXPOSURE IN THE TOHOKU HIGH RESOLUTION BUBBLE CHAMBER**

BEIJING, IHEP - F Bai, G Li, C Mao, H Ni, J Xi, S Xu, C Zhao  
 BROWN U - M M Aryal, M Widgoff  
 FERMILAB - G M Koizumi, C T Murphy  
 MIT - I A Pless

OAK RIDGE - H O Cohn  
 SHINSHU U - M Sasaki  
 SUGIYAMA JOGAKUEN U - S Fukui  
 TENNESSEE U - W M Bugg, G T Condo, P Y-C Du, T Handler,  
 E L Hart, R S Kroeger, C Shio  
 TOHOKU GAKUIN U - S Fujii, M Higuchi, Y Hoshi, H I Iso,  
 S Okuno, M Sato, O Suzuki  
 TOHOKU U - T Kitagaki (Spokesperson), H Suzuki, R Taka-  
 hashi, K Tamai, S Tanaka, A Yamaguchi

Accelerator FNAL-TEV Detector HLBC-1.4M-HYB

### Reactions

muon nucleus  $\rightarrow$  300 GeV/c

Comments Uses the Tohoku high-resolution freon bubble chamber. Studies (1) production of vector mesons and strange and charm particles down to small  $Q^2$ , (2) the energy dependence of meson-baryon pair production in strange and charm channels, (3) the comparison of neutrino and muon interactions in the same  $4\pi$  detector (see FNAL-745), (4) the structure function in the small  $Q^2$  region, and (5) the EMC effect.

**FNAL-784** (Mar 1987) Approved Jan 1989.

### PROPOSAL FOR RESEARCH & DEVELOPMENT: VERTEXING, TRACKING AND DATA ACQUISITION FOR THE BOTTOM COLLIDER DETECTOR

UC, DAVIS - P M Yager  
 FERMILAB - E J Barsotti, M J Bowden, S R Childress,  
 P L G Lebrun, J G Morfin, L Roberts, R J Stefanski,  
 L G Stutte  
 FLORIDA U - P Avery  
 HOUSTON U - K H Lau  
 ILLINOIS TECH - R A Burnstein, H A Rubin  
 IOWA U - E R McCliment, Y Onel  
 ANDES U, BOGOTA - H Castro, B Gomez, F Rivera, J Sanabria  
 NORTHEASTERN U - G O Alverson, W L Faissler,  
 D A Garelick, M J Glaubman, D M Kaplan, I Leedom,  
 S Reucroft  
 NORTHERN ILLINOIS U - S E Willis  
 OHIO STATE U - S G Frederiksen, N W Reay, R A Sidwell,  
 N R Stanton  
 OKLAHOMA U - G R Kalbfleisch, P L Skubic, J M Snow  
 PENN U - R Van Berg, R E Hughes, N S Lockyer (Spokesperson)  
 PRAIRIE VIEW A AND M - D J Judd, D E Wagoner  
 PRINCETON U - D R Marlow, K T McDonald, M V Purohit  
 PUERTO RICO U, RIO PIEDRAS - A M Lopez  
 SAN FRANCISCO DE QUITO U - B Hoeneisen  
 YALE U - P E Karchin, W Ross, A J Slaughter, S Utku

Accelerator FNAL-COLLIDER Detector BCD

Particles studied bottom

Comments The Bottom Collider Detector is to be a small, nearly  $4\pi$  magnetic detector optimized to identify prompt electrons and secondary vertices coming from bottom-quark decays. Aims are to study  $B^0\bar{B}^0$  mixing and  $CP$  violation, observe  $b$ -to- $u$  quark decays, measure  $B^+$  and  $B^0$  lifetimes, search for rare  $B$  decays, etc. Unscheduled (Feb 92).

**FNAL-789** (Nov 1987) Approved Oct 1988; Started 1990.

### MEASUREMENT OF THE PRODUCTION AND DECAY INTO TWO-BODY MODES OF $b$ -QUARK MESONS AND BARYONS

ABILENE CHRISTIAN U - L D Isenhower, M E Sadler  
 TAIWAN, INST PHYS - Y Chen, G Kiang, P Teng  
 CHICAGO U - L M Lederman, M Schub  
 FERMILAB - C N Brown, W E Cooper, D Finley, H Glass,  
 C Mishra

LBL - G Gidal, P Ho, M S Kowitt, K Luk, D Pripstein  
 LOS ALAMOS - T A Carey, D Jansen, M J Leitch,  
 P L Mcgaughey, J M Moss, J Peng ( $\checkmark$  Spokesperson)

NORTHERN ILLINOIS U - M Apolinski, D M Kaplan  
 ( $\checkmark$  Spokesperson), V Martin, R S Preston, V Tanikella

SOUTH CAROLINA U - R L Childers, C W Darden, J R Wilson

Accelerator FNAL-TEV Detector Spectrometer

## SUMMARIES OF FERMILAB EXPERIMENTS

Particles studied bottom, charm

Comments Studies low multiplicity decays of  $b$ - and  $c$ -quark hadrons. Essential to evaluating the suitability of dihadronic beauty decays for the study of  $CP$  violation in the  $B$  system. Sensitive also to dileptonic modes, allowing limits to be set on their branching ratios. Uses the existing FNAL-605/772 spectrometer with suitably upgraded trigger processor system. In progress (March 92).

**FNAL-790** (Jun 1987) Approved Dec 1987; Completed Aug 1990.

### CALORIMETER MODULE CALIBRATION FOR THE ZEUS DETECTOR

ARGONNE - J W Dawson, M Derrick, B Musgrave,  
J L Schlereth, R W Stanek, K Sugano, R Talaga  
COLUMBIA U - A Caldwell, I Gialas, S M Ritz, F J Sciulli  
( $\checkmark$  Spokesperson)  
IOWA U - U Mallik  
LOUISIANA STATE U - R L Imlay, H Kim, W Metcalf  
OHIO STATE U - T Ling, S Park, T A Romanowski  
PENN STATE U - B Y Oh, G A Smith, J J Whitmore  
VIRGINIA TECH - J R Ficenece, B Lu, L W Mo  
WISCONSIN U - U Camerini, C Foudas, T Kinnel, R J Lovelless, D D Reeder, P Sandler, S Silverstein, W H Smith  
( $\checkmark$  Spokesperson)

Accelerator FNAL-TEV Detector Calorimeter

#### Reactions

hadron	5-150 GeV/c
$e^\pm$	"
muon	"

Comments Testing of components and electronics of the HERA-ZEUS calorimeter by US members of the ZEUS collaboration. Principal goal is the precise resolution in the jet energy measurement.

**FNAL-791** (Nov 1987) Approved Jun 1988; Completed Jan 1992.

### HADROPRODUCTION OF HEAVY FLAVORS AT THE TAGGED PHOTON LABORATORY

RIO DE JANEIRO, CBPF - S F Amato, J Anjos, I Bediaga,  
I Costa, H Da Motta Filho, J M De Miranda, J De Mello Neto,  
A Reis, A F S Santoro, M H G Souza  
UC, SANTA CRUZ - G Blaylock, P R Burchat, P Gagnon,  
K Sugano  
CINCINNATI U - A D'Oliveira, A K Santha, M D Sokoloff  
FERMILAB - J A Appel ( $\checkmark$  Spokesperson), S Banerjee,  
S Bracker, T G Carter, K Denisenko, A M Halling, C C James,  
S Kwan, B G Lundberg, K A Thorne  
ILLINOIS TECH - R A Burnstein, P A Kasper, K C Peng,  
H A Rubin  
MISSISSIPPI U - L M Cremaldi, K Gounder, A Rafatian,  
J J Reidy, D J Summers, D Yi  
OHIO STATE U - D L Granite, A Nguyen, N W Reay, K Reibel,  
R A Sidwell, N R Stanton, N Witchey  
PRINCETON U - M V Purohit ( $\checkmark$  Spokesperson), A Schwartz,  
J Wiener  
RIO DE JANEIRO U - H Carvalho, F Marroquim, A J Ramalho  
TEL AVIV U - D Ashery, S Garzon, J Lichtenstadt, S Tal-Beck,  
D Trumer  
TUFTS U - R H Milburn, A Napier, J Schneps  
WISCONSIN U - S Radeztsky, M C Sheaff  
YALE U - C L Darling, R D Majka, J Sandweiss, A J Slaughter,  
S F Takach, E J Wolin

Accelerator FNAL-TEV Detector TPS

#### Reactions

$\pi^-$ nucleus $\rightarrow$ charm X	500 GeV ( $E_{lab}$ )
$\pi^-$ nucleus $\rightarrow$ bottom X	"

Particles studied charm, bottom

Comments Continues studies of FNAL-769. Emphasizes charm physics and a first look at bottom hadroproduction. Some 20 billion events are collected—more than 100,000 fully reconstructed charm particles are anticipated. Data analysis in progress (March 92).

**FNAL-792** (Jan 1988) Approved Jan 1988; Completed Feb 1988.

### STUDY OF FRAGMENTATION PRODUCTS FROM THE REACTION $p^{197}\text{Au}$ AT 800 GeV

UPPSALA U - K Aleklett ( $\checkmark$  Spokesperson), L Sihver  
( $\checkmark$  Spokesperson)

OREGON STATE U - W D Loveland  
LOS ALAMOS - P L McGaughey  
HAHN-MEITNER INST - D H E Gross, H R Jaqaman  
Accelerator FNAL-TEV Detector Photon spectrometer

#### Reactions

$p^{197}\text{Au}$  800 GeV ( $E_{lab}$ )

Comments Measures angular distributions, target fragmentation cross sections, and range spectra.

Papers NP B (accepted). No other papers expected.

**FNAL-793** (Nov 1987) Approved Sep 1988.

### EMULSION EXPOSURE TO 1000 GeV, OR HIGHEST ENERGY PROTONS

KAZAKH STATE U - E V Kolomeets  
WASHINGTON NATURAL PHILOSOPHY INST - P Kotzer  
WASHINGTON U, SEATTLE - R Davisson, J J Lord  
( $\checkmark$  Spokesperson)

Accelerator FNAL-TEV Detector Emulsion

#### Reactions

$p$  Wt 1000 GeV ( $E_{lab}$ )

Comments Exposes six stacks of emulsion with 10  $\mu\text{m}$  tungsten targets and looks for evidence for the quark-gluon phase of matter. In preparation (March 92).

**FNAL-799** (Jan 1989) Approved Jun 1989.

### SEARCH FOR THE DECAY $K_L \rightarrow \pi^0 e^+ e^-$

UCLA - K Arisaka, J Quackenbush, D Roberts, W E Slater,  
M Weaver  
CHICAGO U - A R Barker, R A Briere, E Cheu, D Harris,  
G D Makoff, K Mcfarland, A Roodman, B Schwingenheuer,  
P Shawhan, S Somalwar, Y Wah ( $\checkmark$  Spokesperson), A Wilson,  
B D Winstein, R Winston  
ELMHURST COLL - E C Swallow  
FERMILAB - G J Bock, M Chrisler, R N Coleman, J Enagonio,  
Y B Hsiung, D Jensen, E J Ramberg, K C Stanfield,  
R S Tschirhart, T Yamanaka ( $\checkmark$  Spokesperson)  
ILLINOIS U, URBANA - E Collins, G D Gollin  
RUTGERS U - P M Haas, W P Hogan, S Kim, J N Matthews,  
S Myung, G Ping, S R Schnetzer, G B Thomson, Y Zou

Accelerator FNAL-TEV Detector Spectrometer, Calorimeter

#### Reactions

$K_L \rightarrow \pi^0 e^+ e^-$  50-150 GeV/c

Particles studied  $K_L$

Comments Phase-I adds to the existing apparatus of FNAL-731 and -773 a transition radiation detector for better  $\pi/e$  rejection. Phase-II uses a new beam line and a new detector including a new CsI calorimeter to improve the rejection of  $K_L \rightarrow e^+ e^- \gamma\gamma$  background from the  $K_L \rightarrow \pi^0 e^+ e^-$  signal. The sensitivity should approach the  $10^{-11}$  level. Phase-I completed data taking in January 92. Phase-II in preparation (March 92).

**FNAL-800** (Mar 1988) Approved Oct 1988; Completed Jan 1992.

### MEASUREMENT OF THE MAGNETIC MOMENT OF THE $\Omega^-$ HYPERON

ARIZONA U - K A Johns ( $\checkmark$  Spokesperson)  
FERMILAB - R A Rameika ( $\checkmark$  Spokesperson)  
MICHIGAN U - Y Gao, M J Longo  
MINNESOTA U - P M Border, D Ciampa, G M Guglielmo,  
K J Heller, N B Wallace, D M Woods

Accelerator FNAL-TEV Detector Spectrometer

## SUMMARIES OF FERMILAB EXPERIMENTS

### Reactions

$p \text{ Be} \rightarrow \Omega^- X$	800 GeV/c
$\Lambda \text{ Cu} \rightarrow \Omega^- X$	300-500 GeV/c
$\Lambda \text{ Cu} \rightarrow \Xi^- X$	"
$\Xi^0 \text{ Cu} \rightarrow \Omega^- X$	"
$\Xi^0 \text{ Cu} \rightarrow \Xi^- X$	"

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

Comments An extension of FNAL-756. Uses two methods to produce polarized  $\Omega$ 's. The spin transfer method uses 800 GeV protons to produce a secondary neutral beam of polarized  $\Lambda$ 's and  $\Xi^0$ 's, which is then used to produce a tertiary beam of polarized  $\Omega$ 's at 0 mr. The neutral production method uses a secondary beam of unpolarized  $\Lambda$ 's and  $\Xi^0$ 's incident at a production angle to produce polarized  $\Omega$ 's. The spectrometer consists of a set of silicon strip detectors and a set of multiwire proportional chambers.

**FNAL-802** (Dec 1988) Approved Feb 1989; Completed Dec 1991.

### DEEP INELASTIC MUON INTERACTIONS WITH NUCLEAR TARGETS USING THE EMULSION TELESCOPE TECHNIQUE

FERMILAB - C T Murphy  
 JADAVPUR U - L Chatterjee ( $\checkmark$  Spokesperson), D Ghosh  
 ( $\checkmark$  Spokesperson), J Roy

Accelerator FNAL-TEV Detector Emulsion

### Reactions

muon nucleus  $\rightarrow$  420 GeV ( $T_{\text{lab}}$ )

Comments Studies deep inelastic scattering and the EMC effect. Exposes a stack of nuclear emulsion plates 10 cm long to a flux of  $1.1 \times 10^7$  muons.

**FNAL-819** Approved Aug 1991; Completed Oct 1991.

### EMPACT MUON TELESCOPE EVALUATION AT FERMILAB

HOUSTON U - K H Lau, B W Mayes, L Pinsky, R Weinstein  
 INDIANA U - T R Marshall  
 MIT - J I Friedman, E S Hafen, P Haridas, H W Kendall,  
 L S Osborne ( $\checkmark$  Spokesperson), I A Pless, L Rosenson, R Verdier

Accelerator FNAL-TEV Detector Streamer chamber

Comments Tests a muon measuring subsystem envisaged for the EMPACT detector at SSC. Uses high energy real muons in the pair production region to study the accuracy and performance of the subsystem. The telescope is built of aluminum extrusion streamer chambers.

**FNAL-823** Approved Jul 1991.

### D0 DETECTOR UPGRADE

Accelerator FNAL-COLLIDER Detector D0

Comments The upgraded D0 experiment will continue the study of large-transverse-momentum, short-distance phenomena begun with the initial D0 program. Considerable stress will be made on making a combination of precision measurements ( $W$  mass, top-quark mass, forward-backward asymmetry of leptons from  $Z$ , etc.) to seek departures from the Standard Model. New opportunities for study of  $b$ -quark states include  $b$  production, mixing of  $B^0$  mesons, rare decays of  $b$  hadrons, and a search for  $CP$  violation. See FNAL-740 for the list of participants and published papers. In preparation (March 92).

**FNAL-830** Approved Jul 1991.

### PROPOSAL FOR AN UPGRADED CDF DETECTOR

Accelerator FNAL-COLLIDER Detector CDF

Comments A major upgrade is proposed for the CDF detector in order to exploit fully the physics opportunities of high luminosity running at the Tevatron. The upgrade is planned

for the 1993 run. For the list of participants, see FNAL-775. See also FNAL-741.

**FNAL-843** Approved Jul 1991; Completed Jul 1991.

### INTERACTIONS OF 50, 100, AND 490 GeV MUONS WITH EMULSION NUCLEI

CHONNAM NATIONAL U - J Kim, I T Lim  
 KOREA U - C O Kim ( $\checkmark$  Spokesperson)

Accelerator FNAL-TEV Detector Emulsion

### Reactions

muon nucleus  $\rightarrow$  muon nucleus 50, 100, 490 GeV  
 ( $T_{\text{lab}}$ )

Comments Studies the target diffractive excitation and the small-distance structure of nucleons and nuclei by exposing the C, N, O, Ag, and Br nuclei in nuclear emulsions to high energy muons.

**FNAL-855** Approved Nov 1991; Completed Dec 1991.

### TEST BEAM REQUEST TO DIRECTLY MEASURE $dE/dx$ OF HIGH ENERGY MUONS FROM 150 TO 650 GeV/c IN THE MUON LABORATORY

OKLAHOMA U - G R Kalbfleisch ( $\checkmark$  Spokesperson), D Lawrence  
 SSCL - R J Stefanski

Accelerator FNAL-TEV Detector Counter

### Reactions

muon 600 GeV ( $T_{\text{lab}}$ )

Comments The aim is to measure the three components (ionization, direct pair, and direct photon) of energy loss of muons above 200 GeV. Uses a thin and a thick active detector of each of two different materials, plastic scintillator and sodium iodide. Data analysis in progress (March 92).

## SUMMARIES OF INS EXPERIMENTS

### INS Experiments

**INS-ES-111** Started Jan 1986; Completed Mar 1986.  
**MEASUREMENT OF TRIPLET PHOTOPRODUCTION BY POLARIZED  $\gamma$ 's**

HIROSHIMA U - I Endo ( $\checkmark$  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  
Papers NIM A280 (1989) 144.

**INS-ES-112** Started Jun 1986; 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  
 $\gamma \text{ deut} \rightarrow \pi^0 \text{ deut}$  0.4-0.8 GeV ( $E_{\text{lab}}$ )  
Comments Uses a tagged  $\gamma$  beam. Measures over the c.m. angles 160 to 170°. See also INS-19-1 and INS-ES-103. Studied the effect of the single and double scattering terms. Found no indication for dibaryon resonances.

**INS-ES-113** Approved Jul 1985; Started Oct 1986; Completed Mar 1987.  
**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 ( $\checkmark$  Spokesperson)  
 KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki  
 MEIJI COLL, PHARMACY - Y Wada  
 SAGA U, JAPAN - H Ito  
 SASKATCHEWAN U - C Rangacharyulu  
 TOKYO INST TECH - H Shimizu  
 TOKYO U, INS - S Kato, K Maruyama, Y Murata, M Mutou, K Yoshida  
Accelerator TOKYO Detector TAGX

Reactions  
 $\gamma \text{ deut} \rightarrow p p \pi^-$  0.35-1.1 GeV ( $E_{\text{lab}}$ )  
 $\gamma \text{ deut} \rightarrow p n \pi^+ \pi^-$  "

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 central drift chambers. The geometrical acceptance is  $\pi$  sr.  
Papers NP A478 (1988) 523c, and PR C42 (1990) 837.

**INS-ES-116** (1986) Approved Jul 1986; Started Jun 1987; Completed Mar 1988.

**STUDIES OF THE PHOTONUCLEAR PROCESS ON He**  
 HIROSHIMA U - I Endo, M Harada, S Kasai, K Niki, Y Sumi  
 SAGA U, JAPAN - A Hisadomi, H Ito  
 SASKATCHEWAN U - C Rangacharyulu (Spokesperson)  
 TOKYO U, INS - S Kato (Spokesperson), K Maruyama, Y Murata, K Yoshida  
 KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki

AKITA U - A Sasaki  
 TOKYO INST TECH - H Shimizu  
 MEIJI COLL, PHARMACY - Y Wada  
Accelerator TOKYO Detector TAGX

Reactions  
 $\gamma \text{ He} \rightarrow p n X$  0.17-0.27 GeV/c  
Papers NIM A276 (1989) 451.

**INS-ES-117** (1986) Approved Jul 1986; Started Nov 1986; Completed May 1987.

**FEASIBILITY STUDY OF MEASUREMENT OF ATOMIC FORM FACTORS BY MEANS OF COHERENT BREMSSTRAHLUNG**

HIROSHIMA U - I Endo ( $\checkmark$  Spokesperson), M Harada, K Kitamura, T Monaka, Y Sumi, M Tobiyama  
 TOKYO U, INS - H Tsujikawa, K Watanabe, K Yoshida  
 TSUKUBA U - T Ohba  
 HIROSHIMA SHUDO U - K Baba  
 KURE, MARITIME SAFETY ACADEMY - H Motegi  
Accelerator TOKYO Detector Counter

Reactions  
 $e^- \text{ crystal} \rightarrow e^- \gamma X$  1.2 GeV ( $E_{\text{lab}}$ )  
Papers PRL 60 (1988) 2292.

**INS-ES-118** (1987) Approved 1987.

**RADIOCHEMICAL STUDY OF HIGH ENERGY PHOTONUCLEAR REACTIONS**

TOKYO U, INS - S Shibata ( $\checkmark$  Spokesperson)  
 KANAZAWA U - K Kawaguchi, Y Ohura, T Okui, K Sakamoto  
 NAGOYA U - M Furukawa  
 OTEMON GAKUIN U - I Fujiwara  
Accelerator TOKYO Detector Combination

Reactions  
 $\gamma \text{ nucleus}$  0.25 - 1.05 GeV/c ( $P_{\text{lab}}$ )

Comments Uses Ge and Si(Li) detectors.  
Papers PR C35 (1987) 254, NP A501 (1989) 693, PR C42 (1990) 1545, RCHA 55 (1991) 113, and RCHA 55 (1991) 139.

**INS-ES-119** (1988) Started Jul 1988; Completed Jan 1989.

**DETERMINATION OF ATOMIC FORM FACTORS BY MEANS OF COHERENT BREMSSTRAHLUNG**

HIROSHIMA U - I Endo ( $\checkmark$  Spokesperson), T Kino, T Monaka, A Sakaguchi, Y Sumi, M Tobiyama  
 TOKYO U, INS - K Watanabe, K Yoshida  
 TSUKUBA U - T Ohba  
 HIROSHIMA SHUDO U - K Baba  
 TOKYO U OF AGRIC TECH - T Emura  
Accelerator TOKYO Detector Counter

Reactions  
 $e^- \text{ crystal} \rightarrow e^- \gamma X$  1.2 GeV ( $E_{\text{lab}}$ )

Comments Uses Si, Ni, Al, and Zn crystals.  
Papers PL A146 (1990) 150.

**INS-ES-120** Approved Feb 1989; Started Feb 1989; Completed Nov 1989.

**MEASUREMENT OF SHORT RANGE N-N CORRELATIONS IN THE  $^4\text{He}$  NUCLEUS**

TAGX COLLABORATION

AKITA U - A Sasaki  
 HIROSHIMA U - I Endo, S Endo, K Niki, Y Sumi  
 TOKYO U, INS - S Kato, M Koike, K Maruyama ( $\checkmark$  Spokesperson), Y Murata, K Yoshida  
 MEIJI COLL, PHARMACY - Y Wada  
 KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki  
 SAGA U, JAPAN - H Itoh, S Maruo  
 SASKATCHEWAN U - C Rangacharyulu

## SUMMARIES OF INS EXPERIMENTS

TOHOKU U – K Maeda, T Suda  
TOKYO U OF AGRIC TECH – T Emura

Accelerator TOKYO Detector TAGX

Reactions

$\gamma$ He $\rightarrow$ p n X	130–450 MeV ( $E_{lab}$ )
$\gamma$ He $\rightarrow$ p n deut	"
$\gamma$ He $\rightarrow$ p p n n	"
$\gamma$ He $\rightarrow$ p $\pi^+$ X	"
$\gamma$ He $\rightarrow$ p $\pi^-$ X	"

Comments Uses tagged photons.

Papers PL B267 (1991) 460, NIM A290 (1990) 315, and NIM A294 (1990) 534.

**INS-ES-121** Approved Feb 1989; Started May 1989; Completed Dec 1989.

**RADIOCHEMICAL STUDIES OF HIGH ENERGY PHOTONUCLEAR REACTIONS**

TOKYO U, INS – M Imamura, S Shibata ( $\checkmark$  Spokesperson)  
KANAZAWA U – T Fukasawa, Y Hamajima, K Kawaguchi,  
Y Kuboto, A Kunugise, M Masatani, S Okizaki, M Ootani,  
Y Ooura, K Sakamoto, S R Sarkar, M Soto, M Yoshida  
NAGOYA U – M Furukawa  
OTEMON GAKUIN U – I Fujiwara

Accelerator TOKYO Detector Photon spectrometer

Reactions

$\gamma$ nucleus	< 1 GeV ( $E_{lab}$ )
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Comments Uses Ge and Si detectors.

Papers NP A510 (1989) 693, and PR C42 (1990) 1545.

**INS-ES-122** Approved Jan 1990; Started Apr 1990; Completed Jun 1990.

**STUDY OF THE SINGULARITY IN THE BREMSSTRAHLUNG PROCESS BY HIGH ENERGY ELECTRONS IN A SINGLE CRYSTAL**

HIROSHIMA U – I Endo ( $\checkmark$  Spokesperson), T Tanioka,  
M Tobiyama, H Uchida  
TOKYO U, INS – M Mitou, K Watanabe, K Yoshida  
TEIKYO U – T Ohba  
HIROSHIMA SHUDO U – K Baba  
TOKYO U OF AGRIC TECH – T Emura

Accelerator TOKYO Detector Counter

Reactions

$e^-$ Si $\rightarrow$ $\gamma$ X	1.2 GeV ( $E_{lab}$ )
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Comments Target is a silicon single crystal.

**INS-ES-123** Approved Jan 1990; Started Jan 1991; Completed Apr 1991.

**STUDY ON 2N-PHOTOABSORPTION IN THE  $\gamma^3\text{He} \rightarrow ppn$  REACTION**

TAGX COLLABORATION

AKITA U – A Sasaki  
HIROSHIMA U – S Endo, Y Sumi  
TOKYO U, INS – S Kato, M Koike, K Maruyama  
( $\checkmark$  Spokesperson), K Niki  
MEIJI COLL, PHARMACY – Y Wada  
KITAKYUSHU, UNIV OCCUP ENVIR HEALTH – T Maki  
REGINA U – G Huber, G J Lolos  
SAGA U, JAPAN – H Itoh, R Naridomi, T Ogata  
SASKATCHEWAN U – C Rangacharyulu  
TOHOKU U – O Konno, K Maeda, T Suda, H Yamazaki  
TOKYO U OF AGRIC TECH – T Emura, H Miyamoto

Accelerator TOKYO Detector TAGX

Reactions

$\gamma^3\text{He} \rightarrow p n X$	130–450 MeV ( $E_{lab}$ )
$\gamma^3\text{He} \rightarrow p p n$	"

Comments Uses tagged photons.

Papers NIM A307 (1991) 213.

**INS-ES-124** Approved Jan 1990; Started Apr 1991; Completed Jun 1991.

**SEARCH FOR ISOBAR COMPONENTS IN  $^3\text{He}$**

TAGX COLLABORATION

AKITA U – A Sasaki  
HIROSHIMA U – S Endo, Y Sumi  
TOKYO U, INS – S Kato, M Koike, K Maruyama, K Niki  
MEIJI COLL, PHARMACY – Y Wada  
KITAKYUSHU, UNIV OCCUP ENVIR HEALTH – T Maki  
REGINA U – G Huber, G J Lolos  
SAGA U, JAPAN – H Itoh, R Naridomi, T Ogata  
SASKATCHEWAN U – B Lasiuk, C Rangacharyulu

( $\checkmark$  Spokesperson)

TOHOKU U – O Konno, K Maeda, T Suda ( $\checkmark$  Spokesperson),  
H Yamazaki  
TOKYO U OF AGRIC TECH – T Emura, H Miyamoto

Accelerator TOKYO Detector TAGX

Reactions

$\gamma^3\text{He} \rightarrow \pi^- p X$	380–700 MeV ( $E_{lab}$ )
$\gamma^3\text{He} \rightarrow \pi^+ p X$	"

Comments Uses tagged photons.

**INS-ES-125** Approved Jan 1990; Started Sep 1991; Completed Oct 1991.

**TEST EXPERIMENT ON THE  $C(\gamma, K^+)$  REACTION WITH THE TAGGED PHOTON BEAM**

TAGX COLLABORATION

HIROSHIMA U – S Asano, I Endo, S Endo, H Ifuku, A Sakaguchi,  
Y Sumi, H Uchida  
TOKYO U, INS – M Koike, K Maruyama, K Niki, H Okuno,  
K Yoshida  
TOHOKU U – K Maeda (Spokesperson), T Sasaki, T Suda,  
H Yamazaki

Accelerator TOKYO Detector TAGX

Reactions

$\gamma^{12}\text{C} \rightarrow K^+ X$	780–1100 MeV ( $E_{lab}$ )
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Comments Uses tagged photons.

**INS-ES-126** Approved Jan 1991; Started Jul 1991; Completed Nov 1991.

**RADIOCHEMICAL STUDIES OF HIGH ENERGY PHOTONUCLEAR REACTIONS**

TOKYO U, INS – M Imamura, S Shibata ( $\checkmark$  Spokesperson)  
KANAZAWA U – K Kawaguchi, M Ootani, Y Ooura, K Sakamoto,  
S R Sarkar  
NAGOYA U – M Furukawa  
OTEMON GAKUIN U – I Fujiwara

Accelerator TOKYO Detector Photon spectrometer

Reactions

$\gamma$ nucleus	< 1 GeV ( $E_{lab}$ )
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Comments Uses Ge and Si detectors.

Papers RCHA 55 (1991) 113, and RCHA 55 (1991) 139.

**INS-ES-127** Approved Jan 1991; Started Sep 1991; Completed Oct 1991.

**A STUDY OF THE PHOTON ABSORPTION MECHANISM IN  $^6\text{Li}$  PHOTODISINTEGRATION**

TAGX COLLABORATION

TOKYO U OF AGRIC TECH – T Emura (Spokesperson),  
H Miyamoto, H Nagata  
AKITA U – A Sasaki  
TOHOKU U – O Konno, K Maeda, T Suda  
TOKYO U, INS – S Kato, K Maruyama, K Niki  
HIROSHIMA U – S Asano, Y Sumi  
SASKATCHEWAN U – C Rangacharyulu

## SUMMARIES OF INS EXPERIMENTS

REGINA U - G Huber, G Lolos

Accelerator TOKYO Detector TAGX

Reactions

$\gamma$   ${}^6\text{Li} \rightarrow p p X$  150-450 MeV ( $E_{\text{lab}}$ )

$\gamma$   ${}^6\text{Li} \rightarrow p p n X$  "

Comments Uses tagged photons.

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**INS-ES-128** Approved Jan 1991; Started Nov 1991; Completed Dec 1991.

**POLARIZATION MEASUREMENT OF COHERENT BREMSSTRAHLUNG FROM A SINGLE CRYSTAL**

HIROSHIMA U - M Asai, I Endo, A Isobe, Y Iwata

( $\checkmark$  Spokesperson), T Kobayashi, T Nishizuru, M Tobiyama

TOKYO U, INS - M Mutou, K Yoshida

TOKYO U OF AGRIC TECH - T Emura, K Nagata, Y Nagata

HIROSHIMA SHUDO U - K Baba

Accelerator TOKYO Detector Counter

Reactions

$e^-$  Si  $\rightarrow \gamma X$  1.2 GeV ( $E_{\text{lab}}$ )

Comments Measures the angular distribution of recoil electrons in triplet photoproduction. Target is a single silicon crystal.

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SUMMARIES OF ITEP EXPERIMENTS

ITEP Experiments

**ITEP-762** (1976) Approved 1976; Started 1977; Completed 1988.

**MEASUREMENT OF  $\pi^-d$  BACKWARD ELASTIC SCATTERING AT 1-3 GeV**

MOSCOW, ITEP - V M Abramov, E A Ajrapetov, L S Bagdasaryan, S A Bulychev, I A Dukhovskoy, V S Fedorets, V V Kishkurno, L A Kondratyuk, Y S Krestnikov, A P Krutenkova, V V Kulikov ( $\checkmark$  Spokesperson), M A Matsyuk, P A Murat, S V Proshin, I A Radkevich, U V Ralchenko, E N Turdakina, V P Yurov

Accelerator ITEP Detector MTS

Reactions

$\pi^- \text{ deut} \rightarrow \text{deut } \pi^-$  0.9-3.0 GeV/c

Papers NP A372 (1981) 301, PL B189 (1987) 295, YF 50 (1989) 1042 = SJNP 50 (1989) 650, and CZJP B39 (1989) 88. No other papers expected.

**ITEP-771** (1977) Approved 1977; Started 1978; Completed 1986.

**STUDY OF THE INCLUSIVE PROPERTIES OF DEEP INELASTIC NUCLEAR REACTIONS**

MOSCOW, ITEP - Y D Bayukov, P V Degtyarenko, B L Druzhinin, Y F Efremenko, V B Fedorov, B A Fominykh, V B Gavrilov, N A Goryainov, Y G Grishuk, O B Gushchin, F M Khassanov, N L Kornienko, M V Kossov, S V Kuleshov, L N Kuleshova, S G Kuznetsov, G A Leksin ( $\checkmark$  Spokesperson), S V Shevchenko, S M Shuvalov, B B Shvartsman, A V Smirnit-sky, D A Suchkov, V P Surin, A V Vlassov, L S Vorobyev

Accelerator ITEP Detector Spectrometer

Reactions

$p \text{ nucleus} \rightarrow p X$	1-9 GeV/c
$p \text{ nucleus} \rightarrow n X$	"
$p \text{ nucleus} \rightarrow \text{deut } X$	"
$p \text{ nucleus} \rightarrow \text{trit } X$	"
$p \text{ nucleus} \rightarrow {}^3\text{He } X$	"
$p \text{ nucleus} \rightarrow \pi^+ X$	"
$p \text{ nucleus} \rightarrow \pi^- X$	"
$\pi^+ \text{ nucleus} \rightarrow p X$	"
$\pi^+ \text{ nucleus} \rightarrow n X$	"
$\pi^+ \text{ nucleus} \rightarrow \text{deut } X$	"
$\pi^+ \text{ nucleus} \rightarrow \text{trit } X$	"
$\pi^+ \text{ nucleus} \rightarrow {}^3\text{He } X$	"
$\pi^+ \text{ nucleus} \rightarrow \pi^+ X$	"
$\pi^+ \text{ nucleus} \rightarrow \pi^- X$	"
$\pi^- \text{ nucleus} \rightarrow p X$	"
$\pi^- \text{ nucleus} \rightarrow n X$	"
$\pi^- \text{ nucleus} \rightarrow \text{deut } X$	"
$\pi^- \text{ nucleus} \rightarrow \text{trit } X$	"
$\pi^- \text{ nucleus} \rightarrow {}^3\text{He } X$	"
$\pi^- \text{ nucleus} \rightarrow \pi^+ X$	"
$\pi^- \text{ nucleus} \rightarrow \pi^- X$	"

Comments The targets are He,  ${}^6\text{Li}$ ,  ${}^7\text{Li}$ ,  ${}^9\text{Be}$ ,  ${}^{11}\text{B}$ , 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, YF 42 (1985) 377 = SJNP 42 (1985) 238, YF 42 (1985) 1415 = SJNP 42 (1985) 895, NIM A239 (1985) 527, PTE 3 (1986) 53, and ZETFP 49 (1989) 584 = JETPL 49 (1989) 670. No other papers expected.

**ITEP-783** (1978) Approved 1975; Started 1978.

**STUDY OF TRITIUM  $\beta$  DECAY TO MEASURE THE  $\bar{\nu}$  MASS**

MOSCOW, ITEP - S D Boris, A I Golutvin, L P Laptin, V A Lyubimov ( $\checkmark$  Spokesperson), V V Nagovitzin, E G Novikov, V Z Nozik, V A Soloshenko, I N Tikhomirov, E F Tretyakov

Accelerator NONE Detector Spectrometer

Reactions

$\text{trit} \rightarrow {}^3\text{He } e^- \bar{\nu}_e$  0 GeV/c

Particles studied  $\nu_e$

Comments Uses a tritium source. Inactive (March 92), but scheduled to run.

Papers PL B94 (1980) 266, ZETF 81 (1981) 1158 = JETP 54 (1981) 616, ZETFP 42 (1985) 107 = JETPL 42 (1985) 130, PL B159 (1985) 217, PRL 58 (1987) 2019, and ZETFP (1987) 267 = JETPL 45 (1987) 333.

**ITEP-802** (1980) Approved 1980; Started 1981; Completed 1989.

**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 E Luchmanov, A G Meshkovskiy, G S Mirosidi, A N Nikitenko, V A Shebanov ( $\checkmark$  Spokesperson), N N Shishov, N K Zom-bkovskaya

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 cumulative effects in xenon. The detector (DIANA) is a 700-liter xenon bubble chamber.

**ITEP-813** (1981) Approved 1981; Started 1982; Completed 1986.

**STUDY OF CUMULATIVE PARTICLE CORRELATIONS**

MOSCOW, ITEP - Y D Bayukov, P V Degtyarenko, E A Doroshkevich, Y V Efremenko, V B Fedorov, V B Gavrilov, N A Goryainov, Y G Grishuk, I A Klumov, M V Kossov, S V Kuleshov, L N Kuleshova, S G Kuznetsov, G A Leksin ( $\checkmark$  Spokesperson), S M Shuvalov, B B Shvartsman, A V Smirnit-sky, A V Stavinsky, D A Suchkov, A V Vlassov, L S Vorobyev, B V Zagreyev

Accelerator ITEP Detector Spectrometer

Reactions

$p \text{ nucleus} \rightarrow 2\text{nucleon } X$	3.0, 5.0, 7.5 GeV/c
$p \text{ nucleus} \rightarrow \text{deut } p X$	"
$p \text{ nucleus} \rightarrow \text{deut } p X$	7.5 GeV/c
$p \text{ nucleus} \rightarrow 2\text{deut } X$	"
$p \text{ nucleus} \rightarrow 3p X$	"
$p \text{ nucleus} \rightarrow \text{deut } 2p X$	"
$p \text{ nucleus} \rightarrow 2\text{deut } p X$	"
$\pi^- \text{ nucleus} \rightarrow 2\pi^+ X$	5.0 GeV/c
$\pi^- \text{ nucleus} \rightarrow 2\text{nucleon } X$	2.5, 3.0, 5.0 GeV/c

Comments The targets are Be, C, Al, Ti, Cu, Nb, Cd, Ta, Pb, and U.

Papers YF 39 (1984) 1482 = SJNP 39 (1984) 938, YF 44 (1986) 412 = SJNP 44 (1986) 263, PL B189 (1987) 291, YF 50 (1989) 712, YF 50 (1989) 719, YF 50 (1989) 1023 = SJNP 50 (1989) 638, YF 52 (1990) 480 = SJNP 52 (1990) 305, and YF 52 (1990) 489 = SJNP 52 (1990) 312. No other papers expected.

**ITEP-814** (1981) Approved 1981; Started 1982; Completed 1990.

**STUDY OF  $K^+$  DECAYS**

MOSCOW, ITEP - V V Barmin, V G Barylov, T A Chistyakova, G V Davidenko, V S Demidov, A G Dolgolenko,

## SUMMARIES OF ITEP EXPERIMENTS

A G Meshkovsky (✓ Spokesperson), G S Mirosidi, V A Shebanov  
(✓ Spokesperson), N N Shishov, N K Zombkovskaya

Accelerator ITEP Detector HLBC-1M

### Reactions

$K^+ Xe \rightarrow K^+ X$	0.56–0.81 GeV/c
$K^+ \rightarrow \pi^0 e^+ \nu_e$	—
$K^+ \rightarrow 2\pi^+ \pi^-$	—
$K^+ \rightarrow \pi^0 e^+ \nu_e \gamma$	—
$K^+ \rightarrow 2\pi^+ \pi^- \gamma$	—
$K^+ \rightarrow 2\pi^0 e^+ \nu_e$	—
$K^+ \rightarrow \mu^+ \nu_e \gamma$	—

Particles studied  $K^+$

Papers YF 45 (1987) 97 = SJNP 45 (1987) 62, YF 47 (1988) 1011 = SJNP 47 (1988) 643, YF 48 (1988) 1719 = SJNP 48 (1988) 1032, YF 50 (1989) 79, YF 52 (1990) 1595 = SJNP 52 (1990) 1006, and YF 53 (1991) 981 = SJNP 53 (1991) 606.

**ITEP-822** (1982) Approved 1982; Started 1983; Completed 1986.

### SEARCH FOR BOUND AND RESONANT STATES IN THE $\Lambda\Lambda$ SYSTEM

MOSCOW, ITEP – V M Berezin, E T Bogdanov, V I Chistilin, N P Dobrovolskaya, N D Galanina, E T Gedvillo, N A Khaldeeva, A M Lipkin, V N Markisov, V V Memelov, 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( $S = -2$ )

Papers YF 52 (1990) 1612 = SJNP 52 (1990) 1016. No other papers expected.

**ITEP-824** (1982) Approved 1982; Started 1984; Completed 1986.

### STUDY OF $K_L \rightarrow \pi e \nu \gamma$ AND $K_L \rightarrow 2\pi e \nu$ DECAYS

MOSCOW, ITEP – M Y Balats, V M Berezin, E T Bogdanov, V I Chistilin, N P Dobrovolskaya, G B Dzyubenko, N D Galanina, A D Kamensky, N A Khaldeeva, V S Lakaev, A M Lipkin, V N Markisov, V V Memelov, 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 Zhelmin

Accelerator ITEP Detector Spectrometer

### 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-826** (1982) Approved 1982; Started 1983; Completed 1986.

### IRREGULARITIES IN THE ANGULAR DISTRIBUTION OF CUMULATIVE PARTICLES AT $180^\circ$ IN THE LAB — VAN HOVE'S DETONATION OF HOT NUCLEAR MATTER?

MOSCOW, ITEP – P V Degtyarenko, B L Druzhinin, Y V Efrementko, V B Fedorov, V B Gavrilov, N A Goryainov, Y G Grishuk, O B Gushchin, L N Kondratiev, G A Leksin (✓ Spokesperson), A D Rogal, B B Shvartsman, A V Smirnitisky, L S Vorobiev

Accelerator ITEP Detector NHS

### Reactions

$\pi^- C \rightarrow p X$	1.5–3.0, 5.0 GeV/c
$\pi^- C \rightarrow$ deut X	"
$\pi^- C \rightarrow$ pion X	"
$\pi^- Pb \rightarrow p X$	"
$\pi^- Pb \rightarrow$ deut X	"
$\pi^- Pb \rightarrow$ pion X	"
$p C \rightarrow p X$	4.5, 7.5 GeV/c
$p C \rightarrow$ deut X	"
$p C \rightarrow$ pion X	"
$p Pb \rightarrow p X$	"
$p Pb \rightarrow$ deut X	"
$p Pb \rightarrow$ pion X	"

Papers YF 44 (1986) 1396 = SJNP 44 (1986) 908. No other papers expected.

**ITEP-827** (1982) Approved 1982; Started 1982; Completed 1987.

### STUDY OF $b_1(1235)^-$ MESONS PRODUCED IN THE REACTION $\pi^- p \rightarrow pb_1(1235)^-$ AT 4.5 GeV/c

MOSCOW, ITEP – Y D Aleshin (✓ Spokesperson), S Ya Nikitin, L A Prostova

Accelerator ITEP Detector HBC-2M

### Reactions

$\pi^- p \rightarrow p \pi^+ \pi^0 2\pi^-$	4.5 GeV/c
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Particles studied  $b_1(1235)^-$

Papers YF 45 (1987) 1800.

**ITEP-828** (1982) Approved 1982; Started 1982; Completed 1988.

### STUDY OF HELICITY NONCONSERVATION IN THE DIFFRACTION PRODUCTION OF $b_1(1235)^-$ MESONS IN THE REACTION $\pi^- p \rightarrow b_1(1235)^- p$

MOSCOW, ITEP – Y D Aleshin (✓ Spokesperson), V M Guzhavin, L A Prostova

Accelerator ITEP Detector HBC-2M, HBC-50CM, HBC-50CM

### Reactions

$\pi^- p \rightarrow p \pi^+ \pi^0 2\pi^-$	4.5 GeV/c
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Particles studied  $b_1(1235)^-$

Papers YF 48 (1988) 148 = SJNP 48 (1988) 92.

**ITEP-829** (1982) Approved 1982; Started 1982; Completed 1987.

### DETERMINATION OF THE PROTON POLARIZATION IN THE REACTION $\pi^- p \rightarrow p \pi^+ \pi^- \pi^-$ AT 4.35 AND 4.85 GeV/c

MOSCOW, ITEP – Y D Aleshin (✓ Spokesperson), S Ya Nikitin, L A Prostova

Accelerator ITEP Detector HBC-2M

### Reactions

$\pi^- p \rightarrow p \pi^+ 2\pi^-$	4.35, 4.85 GeV/c
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Papers YF 45 (1987) 1358.

**ITEP-831** (1983) Approved 1983; Started 1984; Completed 1989.

### MEASUREMENT OF $\pi^-, \pi^+, K^+, K^-, p, \bar{p}, {}^2\text{H}, {}^3\text{H}, {}^3\text{He}$ , AND ${}^4\text{He}$ 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, N Smirnov, N V Stepanov, Y V Trebukhovskiy (✓ Spokesperson), S V Voronin, I A Vorontsov

Accelerator ITEP Detector Spectrometer



## SUMMARIES OF ITEP EXPERIMENTS

### Reactions

$p$ nucleus $\rightarrow \pi^+ X$	3.7–9.2 GeV ( $T_{lab}$ )
$p$ nucleus $\rightarrow \pi^- X$	"
$p$ nucleus $\rightarrow K^+ X$	"
$p$ nucleus $\rightarrow K^- X$	"
$p$ nucleus $\rightarrow p X$	"
$p$ nucleus $\rightarrow \bar{p} X$	"
$p$ nucleus $\rightarrow$ deut $X$	"
$p$ nucleus $\rightarrow$ trit $X$	"
$p$ nucleus $\rightarrow$ $^3\text{He} X$	"
$p$ nucleus $\rightarrow$ He $X$	"
$p$ nucleus $\rightarrow$ $^6\text{He} X$	10.0 GeV ( $T_{lab}$ )

Papers CZJP B36 (1986) 985, YF 47 (1988) 1040 = SJNP 47 (1988) 662, YF 47 (1988) 1523 = SJNP 47 (1988) 966, YF 51 (1990) 1587 = SJNP 51 (1990) 1001, and YF 53 (1991) 191.

**ITEP-832** (1983) Approved 1983; Started 1988.

### A TRACKING EXPERIMENT FOR STUDY OF DOUBLE BETA DECAY IN $^{136}\text{Xe}$

MOSCOW, ITEP – M Ajnutdinov, V Artemiev, E Brakhman, A Karelin, V Kirichenko, V Knyazev, O Kozodaeva, V Lyubimov ( $\checkmark$  Spokesperson), A Mitin, O Zeldovich, T Zvetkova

Accelerator NONE Detector Spectrometer

### Reactions

$^{136}\text{Xe} \rightarrow ^{136}\text{Ba} 2e^-$	—
$^{136}\text{Xe} \rightarrow ^{136}\text{Ba} 2e^- 2\bar{\nu}_e$	—

Particles studied  $\bar{\nu}_e$

Comments Uses a 10-kg  $^{136}\text{Xe}$  target. The detector is a time projection chamber at atmospheric pressure. Taking data (March 92).

Papers NIM A303 (1991) 309, YF 54 (1991) 881, and YF 55 (1991) 15.

**ITEP-833** (1983) Approved 1983; Started 1985; Completed 1988.

### SEARCH FOR $^{136}\text{Xe}$ , $^{134}\text{Xe}$ , AND $^{124}\text{Xe}$ DOUBLE BETA DECAYS

MOSCOW, ITEP – A S Barabash ( $\checkmark$  Spokesperson)  
MOSCOW, INR – V V Kuzminov, V M Lobashev, V M Novikov, B M Ovchinnikov, A A Romansky ( $\checkmark$  Spokesperson)

Accelerator NONE Detector Spectrometer

### Reactions

$^{136}\text{Xe} \rightarrow ^{136}\text{Ba} 2e^-$	—
$^{136}\text{Xe} \rightarrow ^{136}\text{Ba} 2e^- 2\bar{\nu}_e$	—
$^{136}\text{Xe} \rightarrow ^{136}\text{Ba} 2e^-$ majoron	—
$^{134}\text{Xe} \rightarrow ^{134}\text{Ba} 2e^-$	—
$^{134}\text{Xe} \rightarrow ^{134}\text{Ba} 2e^- 2\bar{\nu}_e$	—
$^{124}\text{Xe} \rightarrow ^{124}\text{Te} 2e^+$	—
$^{124}\text{Xe} \rightarrow ^{124}\text{Te} 2e^+ 2\nu_e$	—
$^{124}\text{Xe} \rightarrow ^{124}\text{I} e^+$	—
$^{124}\text{Xe} \rightarrow ^{124}\text{I} e^+ 2\nu_e$	—

Particles studied majoron

Comments The above processes with the  $^{124}\text{Xe}$  to  $^{124}\text{Te}$  transition denote reactions in which Xe and Te atoms participate, and an electron from the xenon K-shell decays.

Papers PL B223 (1989) 273.

**ITEP-841** (1984) Approved 1984; Started 1985; Completed 1986.

### STRANGENESS AND POLARIZATION OF WARM NUCLEAR MATTER: DATA ON CUMULATIVE $\Lambda$ AND $K^0$ PRODUCTION (II)

MOSCOW, ITEP – P V Degtyarenko, Y V Efremenko, V B Fedorov, V B Gavrilov, Y G Grishuk, F M Khassanov,

M V Kossov, S V Kuleshov, S G Kuznetsov, G A Leksin ( $\checkmark$  Spokesperson), N A Pivnuk, S M Shuvalov, B B Shvartsman, A V Smirnitsky, L S Vorobiev, B V Zagreyev

Accelerator ITEP Detector NHS

### Reactions

$\pi^- C \rightarrow \Lambda X$	1.2, 3.0, 5.0 GeV/c
$\pi^- Al \rightarrow \Lambda X$	"
$\pi^- Cu \rightarrow \Lambda X$	"
$\pi^- Cd \rightarrow \Lambda X$	"
$\pi^- Pb \rightarrow \Lambda X$	"
$\pi^+ C \rightarrow \Lambda X$	3.0 GeV/c
$\pi^+ Pb \rightarrow \Lambda X$	"
$p C \rightarrow \Lambda X$	3.0, 7.5 GeV/c
$p Pb \rightarrow \Lambda X$	"

Papers YF 53 (1991) 732, and PTE 2 (1991) 49. No other papers expected.

**ITEP-842** (1984) Approved 1984; Started 1984; Completed 1987.

### STUDY OF HIGH ENERGY CUMULATIVE PARTICLE PRODUCTION IN PROTON NUCLEUS INTERACTIONS

MOSCOW, ITEP – S V Boyarinov, I I Evseev, S A Gerzon, Y T Kiselev ( $\checkmark$  Spokesperson), G A Leksin, A N Martemyanov, K R Mikhailov, V L Novikov, S V Semenov, V A Sheinkman, Y V Terekhov ( $\checkmark$  Spokesperson)

Accelerator ITEP Detector FHS-1

### Reactions

$p$ nucleus $\rightarrow p X$	10 GeV ( $E_{lab}$ )
$p$ nucleus $\rightarrow \pi^+ X$	"
$p$ nucleus $\rightarrow \pi^- X$	"
$p$ nucleus $\rightarrow K^+ X$	"
$p$ nucleus $\rightarrow K^- X$	"
$p$ nucleus $\rightarrow$ deut $X$	"
$p$ nucleus $\rightarrow$ trit $X$	"
$p$ nucleus $\rightarrow \bar{p} X$	"

Comments The detector is the Focusing Hadron Spectrometer. The nuclear targets are beryllium, aluminum, copper, and tantalum. Cumulative particles are measured at  $119^\circ \theta_{lab}$ .

Papers YF 46 (1987) 1472 = SJNP 46 (1987) 871, YF 47 (1988) 942 = SJNP 47 (1988) 600, and YF 50 (1989) 1605 = SJNP 50 (1989) 996. No other papers expected.

**ITEP-843** (1984) Approved 1984; Started 1985; Completed 1986.

### SEARCH FOR EXOTIC BARYON RESONANCES IN THE BARYON EXCHANGE REACTION $\pi^+ p \rightarrow p\pi^+\pi^+\pi^-$ AT 4 GeV/c

MOSCOW, ITEP – B M Abramov, B L Druzhinin, I A Dukhovskoy, V S Fedorets, V M Guzhavin, V V Kishkurno, Y S Krestnikov, A P Krutenkova, V V Kulikov, V F Kuzichev, M A Matsyuk, P A Murat ( $\checkmark$  Spokesperson), A F Nilov, S V Proshin, I A Radkevich, F D Ratnikov, N G Tkach, E N Turdakina

Accelerator ITEP Detector MTS

### Reactions

$\pi^+ p \rightarrow N_{5/2}^*(\text{unspec})^{+++} \pi^-$	4.0 GeV/c
$N_{5/2}^*(\text{unspec})^{+++} \rightarrow p 2\pi^+$	—

Particles studied  $N_{5/2}^*(\text{unspec})^{+++}$

Comments Uses a  $\pi^+$  beam with intensity  $10^5$  pions per burst, and a liquid hydrogen target.

Papers YF 53 (1991) 179. No other papers expected.

## SUMMARIES OF ITEP EXPERIMENTS

**ITEP-851** (1981) Approved 1985; Started 1986; Completed 1988.

### STUDY OF $\pi^-$ NUCLEUS INTERACTIONS WITH SINGLE PHOTON EMISSION

MOSCOW, ITEP - V V Barmin, V G Barylov, T A Chistyakova, G V Davidenko, V S Demidov, A G Dolgolenko, V E Luchmanov, A G Meshkovsky ( $\checkmark$  Spokesperson), G S Mirotsidi, V A Shebanov, N N Shishov, N K Zombkovskaya

Accelerator ITEP Detector HLBC-1M

#### Reactions

$\pi^- \text{Xe} \rightarrow \gamma \text{X}$  0.0, 0.4, 1.0 GeV/c

Papers YF 50 (1989) 3 = SJNP 50 (1989) 1.

**ITEP-852** (1985) Approved 1985; Started 1986; Completed 1988.

### SLOW PION PRODUCTION IN NUCLEUS-NUCLEUS INTERACTIONS

MOSCOW, ITEP - A I Dubinina, E D Kolganova, E A Pozharova, V A Smirnitsky ( $\checkmark$  Spokesperson)

Accelerator JINR Detector Emulsion

#### Reactions

Ne Ag  $\rightarrow$  pion X 4.1 GeV ( $E_{\text{lab}}/N$ )

Ne Br  $\rightarrow$  pion X "

Mg Ar  $\rightarrow$  pion X "

Mg Br  $\rightarrow$  pion X "

Papers ZETFP 48 (1988) 233 = JETPL 48 (1988) 251.

**ITEP-853** (1985) Approved 1985; Started 1987; Completed 1991.

### STUDY OF PIONIC NUCLEAR DEGREES OF FREEDOM IN ( $\pi, \pi\pi$ ) REACTIONS

MOSCOW, ITEP - Y D Bayukov, Y V Efremenko, V B Fedorov, F M Khassanov, M V Kossov ( $\checkmark$  Spokesperson), S V Kuleshov, G A Leksin ( $\checkmark$  Spokesperson), N A Pivnyuk, S M Shuvalov, B B Shvartsman, A V Smirnitsky, D A Suchkov, L S Vorobyev

Accelerator ITEP Detector FOCUS

#### Reactions

$\pi^- \text{Ti} \rightarrow \pi^- \pi^\pm \text{X}$  1.4 GeV/c

$\pi^+ \text{Ti} \rightarrow \pi^+ \pi^\pm \text{X}$  "

$\pi^- \text{Fe} \rightarrow \pi^- \pi^\pm \text{X}$  "

$\pi^+ \text{Fe} \rightarrow \pi^+ \pi^\pm \text{X}$  "

Comments Studies pion condensation and selective, unnatural parity excitations of  $\pi$ -like levels in nuclei. FOCUS is a modification of the NHS detector.

**ITEP-861** (1984) Approved 1984; Started 1987; Completed 1990.

### SEARCH FOR $^{76}\text{Ge}$ DOUBLE BETA DECAY

MOSCOW, ITEP - I V Kirpichnikov ( $\checkmark$  Spokesperson), V A Kuznetsov, A S Starostin, A A Vasenko  
YEREVAN PHYS INST - A G Djanyan, V S Pogosov, L A Pogosyan, A G Tamanyan

Accelerator NONE Detector Spectrometer

#### Reactions

$^{76}\text{Ge} \rightarrow ^{76}\text{Se} 2e^-$  —

$^{76}\text{Ge} \rightarrow ^{76}\text{Se} 2e^- 2\nu_e$  —

$^{76}\text{Ge} \rightarrow ^{76}\text{Se} 2e^-$  unspc —

Comments Uses the Ge semiconductor, 85% enriched  $^{76}\text{Ge}$ . The detector is in a Yerevan salt mine.

**ITEP-862** (1986) Approved 1986; Started 1986; Completed 1987.

### MEASUREMENT OF THE POLARIZATION OF LAMB-DAS PRODUCED BY NEUTRONS WITH MOMENTA FROM 4 TO 10 GEV/c ON NUCLEI

MOSCOW, ITEP - A N Alekseev, V M Berezin, E T Bogdanov, V I Chistilin, N P Dobrovolskaya, N D Galanina, S I Kartyshev, N A Khaldeeva, A M Lipkin, V N Markisov, V V Memelov, R A Menshchikov, A A Nedosekin, A Y Ostapchuk, V A Sadykov, M E Vishnevsky ( $\checkmark$  Spokesperson), M O Vlasova

Accelerator ITEP Detector Spectrometer

#### Reactions

$n \text{C} \rightarrow \Lambda \text{X}$  2-10 GeV/c

$n \text{Pb} \rightarrow \Lambda \text{X}$  "

**ITEP-863** (1986) Approved 1986; Started 1986; Completed 1988.

### BACKWARD TWO-PION PRODUCTION IN PION-DEUTERIUM INTERACTIONS AT 0.9-2.0 GeV/c

MOSCOW, ITEP - B M Abramov, S A Bulychjov, B L Druzhinin, I A Dukhovskoy, V S Fedorets, V V Kishkurno, L A Kondratyuk, Y S Krestnikov, A P Krutenkova, V V Kulikov, I A Radkevich, N G Tkach, E N Turdakina ( $\checkmark$  Spokesperson)

Accelerator ITEP Detector MTS

#### Reactions

$\pi^- \text{deut} \rightarrow \text{deut} \pi^0 \pi^-$  0.9-2.0 GeV/c

Comments Uses a  $\pi^+$  beam with intensity  $7 \times 10^5$  pions per burst, and a liquid deuterium target.

Papers YF 54 (1991) 1013. No other papers expected.

**ITEP-864** (1986) Approved 1986; Started 1987; Completed 1988.

### PION-PROTON ELASTIC SCATTERING AT LARGE ANGLES

MOSCOW, ITEP - B M Abramov, S A Bulychjov, I A Dukhovskoy, V S Fedorets, V V Kishkurno, Y S Krestnikov, A P Krutenkova, V V Kulikov ( $\checkmark$  Spokesperson), M A Matsyuk, P A Murat, S V Proshin, I A Radkevich, N G Tkach, E N Turdakina

Accelerator ITEP Detector MTS

#### Reactions

$\pi^- p \rightarrow p \pi^0 \pi^-$  0.9-2.0 GeV/c

Comments Uses a  $\pi^+$  beam with intensity  $7 \times 10^5$  pions per burst, and a liquid hydrogen target.

Papers YF 54 (1991) 550. No other papers expected.

**ITEP-865** (1986) Approved 1986; Started 1986.

### ANTIPROTON-NUCLEI ANNIHILATION CROSS SECTIONS WITH Be, C, Al, Fe, Cu, AND Pb TARGETS AT 1.26, 1.53, AND 2.50 GeV/c

MOSCOW, ITEP - B F Kuzichev, Y B Lepikhin, V A Smirnitsky ( $\checkmark$  Spokesperson)

Accelerator ITEP Detector Counter, Wire chamber

#### Reactions

$\bar{p} \text{Be} \rightarrow \text{X}$  1.26, 1.53, 1.76 GeV/c

$\bar{p} \text{C} \rightarrow \text{X}$  "

$\bar{p} \text{Al} \rightarrow \text{X}$  "

$\bar{p} \text{Fe} \rightarrow \text{X}$  "

$\bar{p} \text{Cu} \rightarrow \text{X}$  "

$\bar{p} \text{Pb} \rightarrow \text{X}$  "

Comments Taking data (March 92).

**ITEP-871** (1987) Approved 1987; Started 1988; Completed 1990.

### STUDY OF KAON-NUCLEUS INTERACTIONS WITH SINGLE PHOTON EMISSION

MOSCOW, ITEP - V V Barmin, V G Barylov, G V Davidenko, V S Demidov, A G Dolgolenko, V E Luchmanov, A G Meshkovsky ( $\checkmark$  Spokesperson), G S Mirotsidi, V A Shebanov, N N Shishov, A A Sibirtsev, N K Zombkovskaya

## SUMMARIES OF ITEP EXPERIMENTS

Accelerator ITEP Detector HLBC-1.5M

Reactions



Comments The detector (DIANA) is a 700-liter xenon bubble chamber.

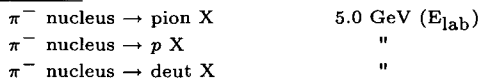
**ITEP-872** (1987) Approved 1987; Started 1988; Completed 1989.

**DETAILED STUDY OF BACKWARD PRODUCTION OF HADRONS IN  $\pi^-$  A INTERACTIONS**

MOSCOW, ITEP - Y V Efremenko, V B Fedorov, Y G Grishuk, F M Khassanov, M V Kossov, S V Kuleshov, G A Leksin ( $\checkmark$  Spokesperson), N A Pivnyuk, V S Serov, S M Shuvalov, B B Shvartsman, A V Smirnitsky, L S Vorobyev, B V Zagreev

Accelerator ITEP Detector NHS, Wire chamber

Reactions



Comments Studies the pion, proton, and deuteron backward production at  $180^\circ \theta_{\text{lab}}$ . Nuclear targets are carbon, copper, and lead.

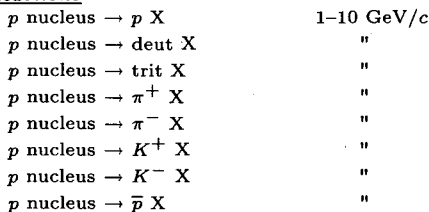
**ITEP-873** (1987) Approved 1987; Started 1987; Completed 1991.

**HIGH ENERGY CUMULATIVE PARTICLE PRODUCTION AT 10 GeV**

MOSCOW, ITEP - S V Bojarinov, I I Evseev, S A Gerson, Y T Kiselev ( $\checkmark$  Spokesperson), G A Leksin, A N Martemyanov, K R Mikhailov, V L Novikov, S A Pozdnyakov, V A Sheinkman, Y V Terekhov ( $\checkmark$  Spokesperson), V I Ushakov

Accelerator ITEP Detector FHS-2

Reactions



Comments Nuclear targets are beryllium, aluminum, copper, and tantalum. The production is studied at  $\theta_{\text{lab}} = 97^\circ$ .

Papers YF 54 (1991) 119.

**ITEP-874** (1987) Approved 1987; Started 1987; Completed 1987.

**MEASUREMENT OF THE TOTAL CROSS SECTION AT A PROTON MOMENTUM OF 2 GeV/c WITH  ${}^6\text{Li}$ ,  ${}^7\text{Li}$ , AND  ${}^9\text{Li}$  NUCLEI**

MOSCOW, ITEP - I A Dukhovskoy, Y S Krestnikov, V V Orlov, I A Radkevich, S F Sjemin, A N Starodumov, A I Sutormin ( $\checkmark$  Spokesperson), N G Tkach, V M Zaretsky

Accelerator ITEP Detector MTS

Reactions



Comments Uses a  $p$  beam with intensity  $6 \times 10^5$  protons per burst, and solid nuclear targets.

Papers YF 47 (1988) 1816. No other papers expected.

**ITEP-875** (1987) Approved 1987; Started 1987; Completed 1988.

**PRODUCTION OF STRANGE PARTICLES IN BARYON EXCHANGE PROCESSES**

MOSCOW, ITEP - V M Abramov, I A Dukhovskoy, V S Fedorets, A I Khanov, V V Kishkurno, Y S Krestnikov, A P Krutenkova, M A Matsyuk, P A Murat, V V Orlov, S V Proshin, I A Radkevich, F D Ratnikov, A N Starodumov, A I Sutormin ( $\checkmark$  Spokesperson), N G Tkach

Accelerator ITEP Detector MTS

Reactions



Comments Uses an unseparated  $\pi^+$  beam with intensity

$10^5$  pions per burst, and a liquid deuterium target. Detects backward kaons.

Papers YF 54 (1991) 550. No other papers expected.

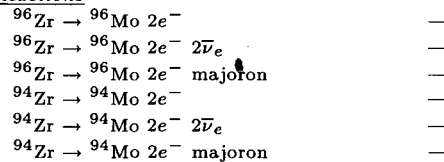
**ITEP-876** (1987) Approved 1987; Started 1987.

**SEARCH FOR  ${}^{94}\text{Zr}$  AND  ${}^{96}\text{Zr}$  DOUBLE BETA DECAYS IN PHOTOGRAPHIC EMULSION**

MOSCOW, ITEP - A S Barabash ( $\checkmark$  Spokesperson), E D Kolganova, E A Pozharova, T Yu Skorodko, V A Smirnitsky, MOSCOW, INR - A A Klimenko, A A Smolnikov

Accelerator NONE Detector Emulsion

Reactions



Particles studied majoron

Comments Taking data (March 92).

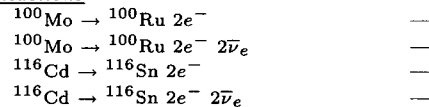
**ITEP-891** (1989) Approved 1989; Started 1989; Completed 1990.

**SEARCH FOR  ${}^{100}\text{Mo}$  AND  ${}^{116}\text{Cd}$  DOUBLE BETA DECAYS TO EXCITED  ${}^{100}\text{Ru}$  AND  ${}^{116}\text{Sn}$  STATES**

MOSCOW, ITEP - A S Barabash ( $\checkmark$  Spokesperson), MOSCOW, INR - V I Cherechovsky, A V Kopylov

Accelerator NONE Detector Spectrometer

Reactions



Papers PL B249 (1990) 186.

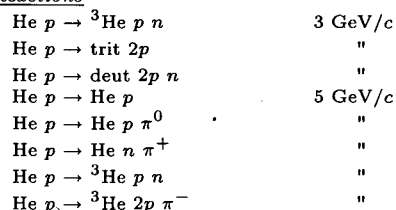
**ITEP-892** (1989) Approved 1989; Started 1989; Completed 1989.

**STUDY OF  ${}^4\text{He}$   $p$  INTERACTIONS**

MOSCOW, ITEP - S K Abdullin, A V Blinov, I V Chuvilo, V E Grechko, Y V Korolev, Y M Selektor ( $\checkmark$  Spokesperson), V N Shulyachenko, V V Solovyev, V F Turov, I A Vanyushin, S M Zombkovsky

Accelerator ITEP Detector HBC-2M

Reactions



## SUMMARIES OF ITEP EXPERIMENTS

He $p \rightarrow$ trit $2p$	"
He $p \rightarrow$ trit $2p \pi^0$	"
He $p \rightarrow$ trit $p n \pi^+$	"
He $p \rightarrow$ deut $2p n$	"
He $p \rightarrow$ deut $3p \pi^-$	"
He $p \rightarrow$ $4p n \pi^-$	"

Comments A measurement of the total and differential cross sections, and a search for the momentum distribution of particles inside the  $^4\text{He}$  nucleus.

**ITEP-893** (1989) Approved 1989; Started 1989; Completed 1990.

### STUDY OF $pp \rightarrow pp\pi^+\pi^-$ REACTION AT 0.91 GeV

MOSCOW, ITEP - B M Bobchenko, P V Dyagtyarenko, Y V Efremenko, V B Fedorov, Y G Grishuk, M V Kossov, S V Kuleshov, G A Leksin ( $\checkmark$  Spokesperson), N A Pivnyuk ( $\checkmark$  Spokesperson), S M Shuvalov, B B Shvartsman, A V Smirnitisky, L S Vorobyev ( $\checkmark$  Spokesperson)

Accelerator ITEP Detector NHS

#### Reactions

p $p \rightarrow$ $2p \pi^+ \pi^-$	1.6 GeV/c
p $p \rightarrow$ deut $\pi^+$	"
p $p \rightarrow$ deut $\pi^+ \pi^0$	"
p $n \rightarrow$ $2p \pi^0 \pi^-$	"
p $n \rightarrow$ deut $\pi^+ \pi^-$	"

Particles studied dibaryon

Comments Uses the modified forward Nonmagnetic Hadron Spectrometer. Targets are C and  $\text{CH}_2$ .

**ITEP-894** (1989) Approved 1989; Started 1990; Completed 1991.

### QUASIPARTICLE VELOCITY MEASUREMENTS

MOSCOW, ITEP - E A Doroshkevich, Y V Efremenko, Y G Grishuk, S V Kuleshov, A A Kurzenkov, G A Leksin ( $\checkmark$  Spokesperson), N A Pivnyuk, G A Safronov, A V Stavinsky, A V Vlassov ( $\checkmark$  Spokesperson), L S Vorobyev

Accelerator ITEP Detector NHS

#### Reactions

p nucleus $\rightarrow$ $2p X$	2.2, 7.5 GeV/c
p nucleus $\rightarrow$ deut $p X$	"
p nucleus $\rightarrow$ $2\text{deut } X$	"
p nucleus $\rightarrow$ p pion $X$	"

Comments Targets are C and Pb. Polar angles of secondary particles are  $10\text{-}20^\circ$  in the lab.

**ITEP-895** (1989) Approved 1989; Started 1991.

### DETAILED STUDY OF SPECTRA OF $\Lambda$ PARTICLES AND OF THE POLARIZATION IN THE NUCLEAR FRAGMENTATION REGION IN HADRON-NUCLEON INTERACTIONS

#### LAMBDA-III COLLABORATION

MOSCOW, ITEP - V I Chistilin, P V Dyagtyarenko, Y V Efremenko, V B Fyodorov, V B Gavrilov, N A Goryainov, Y G Grishuk, F M Hasanov, M M Katz, L N Kondratiev, I E Korolko, M V Kossov, S V Kuleshov, G A Leksin ( $\checkmark$  Spokesperson), N A Pivnyuk, N N Pomelov, V Yu Rusinov, V A Sadykov, S M Shuvalov, B B Shvartsman, A V Smirnitisky ( $\checkmark$  Spokesperson), L S Vorobyev, B V Zagreev

Accelerator ITEP Detector LAMBDA-METER

#### Reactions

p Al $\rightarrow$ $\Lambda X$	7.5 GeV/c
p Pb $\rightarrow$ $\Lambda X$	"

Comments The kinetic energy range of the detector is 10-300 MeV. Taking data (March 92).

**ITEP-901** (1990) Approved 1990; Started 1990.

### QUASIELASTIC ( $\pi^-$ , d) BACKWARD SCATTERING ON NUCLEI AT 0.7-1.3 GeV

MOSCOW, ITEP - B M Abramov, I A Dukhovskoy, V S Fedorets, A I Khanov, V V Kishkurno, Y S Krestnikov, A P Krutenkova ( $\checkmark$  Spokesperson), V V Kulikov, M A Matsyuk, P A Murat, V V Orlov, S V Proshin, I A Radkevich, A N Starodumov, A I Sutormin, N G Tkach, E N Turdakina

Accelerator ITEP Detector MTS

#### Reactions

$\pi^-$  nucleus  $\rightarrow$  deut  $\pi^- X$  0.7-1.3 GeV/c

Comments Uses a  $\pi^-$  beam with intensity  $5 \times 10^5$  pions per burst. Targets ( $^6\text{Li}$ ,  $^7\text{Li}$ , C,  $\text{H}_2\text{O}$ ,  $\text{D}_2\text{O}$ , etc.) are placed inside the MTS magnet. Measures momenta of backward pions. Taking data (March 92).

## SUMMARIES OF KEK EXPERIMENTS

### KEK Experiments

**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 Masaie,  
K Miyake, N Nagamine, T Nakamura, N Sasao (✓ 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

$$e^- Wt \rightarrow \text{axion } X \quad 2.5 \text{ GeV } (E_{\text{lab}})$$

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; Started Nov 1986.

#### TRISTAN $e^+e^-$ EXPERIMENTS BY THE VENUS COLLABORATION

TOHOKU U - K Abe, J MacNaughton  
KEK - K Amako, Y Arai, M Fukawa, N Ishihara, N Kanematsu, J Kanzaki, T Kondo, T Matsui, S Odaka, K Ogawa (✓ Spokesperson), T Ohama, H Sakamoto, H Sakuda, N Sato, J Shirai, T Sumiyoshi, F Takasaki, T Tsuboyama, S Uehara, Y Unno, Y Watase, Y Yamada  
TSUKUBA U - Y Asano, S Mori (✓ Spokesperson), I Nakano, S Shirakata, Y Takada, Y Yonezawa  
TOKYO METROPOLITAN U - M Chiba, T Fukui, F Hinode, T Hirose, N Hosoda, T Oyama, M Utsumi, F Yabuki  
HIROSHIMA U - Y Chiba, T Ohsugi  
WAKAYAMA MEDICAL COLL - M Daigo  
OSAKA U - J Haba, N Kanda, Y Nagashima, A Suzuki, H Takaki, M Takita  
KYOTO U - Y Hemmi, R Kikuchi, H Kurashige, A Okamoto  
TOHOKU GAKUIN U - M Higuchi, Y Hoshi, M Sato  
KOBE U - Y Homma, A Ono  
HELSINKI U - T T Korhonen  
MIYAZAKI U - T Nakamura  
TOHO U - H Shibuya  
IBARAKI COLL TECH - M Shioden  
OKAYAMA U - N Tamura  
KOGAKUIN U - K Tobimatsu  
NARUTO U OF EDUCATION - H Yoshida

Accelerator KEK-TRISTAN Detector VENUS

#### Reactions

$$e^+ e^- < 70 \text{ GeV } (E_{\text{cm}})$$

Comments In progress (April 92).

Papers NIM 217 (1983) 181, JJAP 23 (1984) 897, NIM A228 (1985) 309, NIM A238 (1985) 328, NIM A243 (1986) 58, NIM A253 (1986) 27, IEEE TNS 33 (1986) 73, JJAP 25 (1986) 1049, NIM A254 (1987) 35, NIM A254 (1987) 317, NIM A259 (1987) 430, NIM A259 (1987) 438, JJAP 26 (1987) 982, JPSJ 56 (1987) 3763, JPSJ 56 (1987) 3767, PL B198 (1987) 570, PRL 59 (1987) 2915, NIM A265 (1988) 457, NIM A269 (1988) 171, NIM A269 (1988) 522, NIM A270 (1988) 319, NIM A271 (1988) 432, NIM A272 (1988) 687, IEEE TNS 35 (1988) 300, PL B207 (1988) 355, PRL 61 (1988) 915, PL B213 (1988) 400, NIM A274 (1989) 183, NIM A281 (1989) 462, IEEE TNS 36 (1989) 665, IEEE TNS 36 (1989) 670, JJAP 28 (1989) 1981, PR D39 (1989) 3524, JPSJ 58 (1989) 3037, ZPHY C45 (1989) 175, PRL 63 (1989) 1776, PL B232 (1989) 425, PL B232 (1989) 431, ZPHY C48 (1990) 13, PL B234 (1990) 202, PL B234 (1990) 382, PL B240 (1990) 232, PL B246 (1990) 297, NIM A301 (1991) 497, NIM A303 (1991) 346, NIM A305 (1991) 71, PRL 66 (1991) 280, PL B264 (1991) 212, PL B266 (1991) 188, and PL B267 (1991) 309.

**KEK-TE-002** Approved Mar 1983.

#### STUDY OF $e^+e^-$ ANNIHILATION PHENOMENA BY A DETECTOR WITH PARTICLE IDENTIFICATION

#### TOPAZ COLLABORATION

TOKYO U - T Kamae, T Kishida, N Kusuki, A Shirahashi, T Takahashi, S S Yamamoto  
TOKYO U, INS - A Imanishi, T Ishii, S Kato, K Maruyama, T Ohshima, H Okuno, K Ukai, M Yoshioka  
NAGOYA U - I Adachi, J Fujimoto, R Kajikawa (Spokesperson), T Matsushita, A Sugiyama, S Suzuki, T Takahashi, H Takamura  
NARA WOMENS U - N Fujiwara, H Hayashii, N Iida, Y Kayahara, K Muramatsu, S Noguchi, S Yamashita  
OSAKA CITY U - Y Kato, A Maruyama, T Okusawa, A Shimonaka, T Takahashi  
TOKYO U OF AGRIC TECH - K Iwashiro, O Nitoh, S Onodera, K Shimozawa, K Takahashi  
TEZUKAYAMA U - F Ochiai  
KOBE U - K Fujii, T Fujii, K Fujiwara  
TOKYO INST TECH - Y Watanabe  
PURDUE U - B Howell, D Koltick  
KEK - M Doser, R Enomoto, H Fujii, K Fujii, H Ikeda, R Itoh, H Iwasaki, S Kawabata (Spokesperson), H Kichimi, M Kobayashi, A Miyamoto, R Sugahara, T Tauchi, T Tsukamoto, S Uno, M Yamauchi

Accelerator KEK-TRISTAN Detector TOPAZ

#### Reactions

$$e^+ e^- < 70 \text{ GeV } (E_{\text{cm}})$$

Comments Searches for new particles such as heavy quarks, heavy leptons, and various supersymmetric 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.

Papers NIM 225 (1984) 23, NIM A236 (1985) 55, NIM A252 (1986) 423, NIM A256 (1987) 449, NIM A269 (1988) 507, NIM A269 (1988) 513, NIM A270 (1988) 11, NIM A271 (1988) 404, PRL 60 (1988) 97, PL B200 (1988) 391, PL B208 (1988) 319, PR D37 (1988) 1339, PL B218 (1989) 105, PL B227 (1989) 495, PL B228 (1989) 553, PL B229 (1989) 427, NIM A297 (1990) 148, PL B234 (1990) 185, PL B234 (1990) 197, PL B234 (1990) 525, PL B240 (1990) 513, PL B244 (1990) 352, PL B249 (1990) 336, NIM A300 (1991) 575, PL B255 (1991) 613, PL B268 (1991) 457, and NIM A312 (1992) 440.

**KEK-TE-003** (1983) Approved Nov 1983.

#### AMY - A HIGH RESOLUTION LEPTON DETECTOR FOR TRISTAN

##### AMY COLLABORATION

ROCHESTER U - A Bodek, H Budd, A Fry, H Harada, S Kanda, B J Kim, T Kumita, Y K Li, S L Olsen (✓ Spokesperson), A Sill, E H Thorndike, K Ueno, C Velisarris, R Walker  
LOUISIANA STATE U - P Kirk, R McNeil  
OHIO STATE U - M Frautschi, H A Kagan, R D Kass  
VIRGINIA TECH - A Abashian, K Gotow, K P Hu, A Z Lai, M Mattson, L Pillonen, K Sterner  
MINNESOTA U - R Poling, T Thomas  
UC, DAVIS - R E Breedon, W Ko, R Lander, J Rowe, J Smith, D Stuart  
SOUTH CAROLINA U - S Lusin, C Rosenfeld, A Wang, S Wilson  
RUTGERS U - S K Kim, F Sannes, S Schnetzer, B Stone, J Vinson  
NIIGATA U - Y Ishi, K Miyano, H Miyata, T Sasaki  
SAITAMA U - T Ishizuka, K Ohta  
SAGA U, JAPAN - S Kobayashi, A Murakami  
KONAN U - F Kajimo  
NIHON DENTAL COLL - Y Yamashita  
KOREA U - J S Kang, M H Lee  
PHILIPPINES U, QUEZON CITY - A Bacala, J Canete  
KYUNGPOOK NATIONAL U - S K Choi, D Son  
BEIJING, IHEP - W G Yan, M H Ye, Z P Zheng  
CHUO U, TOKYO - S Matsumoto, R Tanaka  
KEK - A Abe, Y Fujii, Y Higashi, Y Kurihara, F Liu, A Maki (✓ Spokesperson), T Nozaki, T Omori, H Sagawa, Y Sakai, Y Sugimoto, Y Takaiwa, S Terada

Accelerator KEK-TRISTAN Detector AMY

#### Reactions

$$e^+ e^- < 70 \text{ GeV } (E_{\text{cm}})$$

## SUMMARIES OF KEK EXPERIMENTS

Papers IEEE TNS 23 (1987) 520, NIM A260 (1987) 361, NIM A265 (1988) 141, PRL 60 (1988) 93, PRL 60 (1988) 2359, PRL 61 (1988) 911, NIM A274 (1989) 95, NIM A283 (1989) 665, PL B218 (1989) 112, PL B218 (1989) 499, PL B223 (1989) 476, PL B228 (1989) 548, PRL 62 (1989) 1713, PRL 63 (1989) 1342, PRL 63 (1989) 1772, PRL 63 (1989) 1910, PRL 63 (1989) 2341, PR D41 (1990) 2675, PR D42 (1990) 737, PR D42 (1990) 949, PR D42 (1990) 1339, PL B234 (1990) 534, PL B240 (1990) 243, PL B244 (1990) 573, PL B252 (1990) 491, PRL 64 (1990) 984, and IJMP A6 (1991) 2583.

**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

$e^+ e^-$  50–60.8 GeV (Ecm)

Particles studied monopole

Papers PRL 60 (1988) 1610, and PL B228 (1989) 543.

**KEK-125** (Sep 1983) Approved Feb 1984; Started Jan 1986; Completed Mar 1986.

### STUDIES OF $dd$ INTERACTIONS IN THE RANGE 2–4 GeV/c

TOKYO U - K Ishikawa, T Kishida, M Kuze, F Sai,  
S S Yamamoto (✓ Spokesperson)  
TSUKUBA U - I Arai, A Manabe, H Nunokawa  
KITAKYUSHU, UNIV OCCUP ENVIR HEALTH - T Maki  
KEK - H Koiso, T Tsuboyama

Accelerator KEK-PS Detector Counter, Wire chamber

#### Reactions

deut deut  $\rightarrow$  X 1.5–4 GeV/c

deut Al  $\rightarrow$  X "

deut C  $\rightarrow$  X "

Comments Measured the total cross sections.

Papers JJAP 26 (1987) 1348, NIM A270 (1988) 6, JJAP 28 (1989) 495, and PR C41 (1990) 180.

**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 $\pi^+ \pi^-$

KOGAKUIN U - T Fujii (✓ Spokesperson)  
TOKYO U, INS - S Homma, M Sudou  
KEK - Y Fujii, S Ishimoto, K Nakamura, K H Tanaka,  
T Tanimori  
KYOTO U - Y Sugimoto  
HIROSHIMA U - S Kohnno, Y Morita, Y Sumi

Accelerator KEK-PS Detector Wire chamber, Drift chamber

#### Reactions

$\bar{p}p \rightarrow K^+ K^-$  360 – 760 MeV/c ( $P_{lab}$ )

$\bar{p}p \rightarrow \pi^+ \pi^-$  "

Particles studied  $X(1935)$

Papers PR D37 (1988) 583, and PR D41 (1990) 744.

**KEK-132** (Oct 1984) Approved Apr 1985; Started Jun 1986; Completed Dec 1986.

### A STUDY OF CUMULATIVE $\Lambda$ PRODUCTION IN HIGH ENERGY HADRON-NUCLEUS REACTIONS

TSUKUBA U - I Arai (✓ 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

Accelerator KEK-PS Detector FANCY

#### Reactions

$\pi^+ {}^{12}\text{C} \rightarrow \Lambda X$  4 GeV/c

$\pi^- {}^{12}\text{C} \rightarrow \Lambda X$  "

$p {}^{12}\text{C} \rightarrow \Lambda X$  "

Comments Measures inclusive cross sections and polarizations, and studies multi-nucleon correlations in nuclei.

Papers PRL 63 (1989) 490.

**KEK-135** (Sep 1984) Approved Feb 1985; Started Jan 1986; Completed Jul 1986.

### MESON SPECTROSCOPY BY CHARGE-EXCHANGE REACTIONS

NAGOYA U - N Horikawa, T Iwata, T Kinashi, M Kurashina,  
I Maeda, T Matsuda, T Nakanishi, C Ohmori  
KEK - S Inaba, T Inagaki, K Ohmi, T Sato, K Takamatsu,  
T Tsuru (✓ Spokesperson), Y Yasu  
KYOTO U - Y Inagaki, T Nakamura  
MIYAZAKI U - Y Ishizaki  
KYOTO U OF EDUCATION - R Takashima  
NAGOYA UNIV COLL MEDICAL TECH - K Mori  
SUGIYAMA JOGAKUEN U - S Fukui

Accelerator KEK-PS Detector SUPERBENKEI

#### Reactions

$\pi^- p \rightarrow \eta \pi^+ \pi^- n$  8.95 GeV/c

$\pi^- p \rightarrow \pi^+ \pi^- 4\gamma n$  "

Particles studied  $f_0(1590)$ ,  $X(1700)$ ,  $f_2(1720)$

Papers PL B202 (1988) 441, PL B257 (1991) 241, and PL B267 (1991) 293.

**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 Nagamine, T Nakamura, N Sasao  
(✓ Spokesperson), Y Yamada  
TOKYO, METROPOLITAN COLL TECH - I Yamauchi

Accelerator KEK-PS Detector Wire chamber, Counter

#### Reactions

$p$  nucleus  $\rightarrow$  hadron X 12 GeV ( $E_{lab}$ )

Particles studied longlived

Comments Searches for  $R$ -hadrons, containing one gluino, in the mass range 1.2 to 1.5 GeV/ $c^2$ . Sensitive also to exotic hadrons with the charge of  $-5/2$  and mass less than 2 GeV/ $c^2$ .

Papers PR D39 (1989) 1261.

**KEK-137** Approved Oct 1985; Started Dec 1987; Completed May 1990.

### STUDY OF THE RARE DECAY $K_L \rightarrow \mu e$

KEK - T Inagaki (✓ Spokesperson), M Kobayashi, T Sato,  
T Shinkawa, F Suekane, K Takamatsu, Y Yoshimura  
TOKYO U - R Fukuhisa, K Ishikawa, T Kishida,  
T K Komatsubara, M Kuze, F Sai, J Toyoura, S S Yamamoto  
KYOTO U - Y Hemmi  
TOHOKU U - T Akagi

Accelerator KEK-PS Detector Double-arm spectrometer

#### Reactions

$K_L \rightarrow \mu\text{on } \mu\text{on}$  2–8 GeV/c

$K_L \rightarrow \mu^+ e^-$  "

$K_L \rightarrow \mu^- e^+$  "

$K_L \rightarrow e^+ e^-$  "

## SUMMARIES OF KEK EXPERIMENTS

Particles studied  $K_L$

Comments  $K_L$  beam is produced at 0 to 2° from a primary proton beam. The decay products are identified by a gas Čerenkov counter, an electromagnetic shower counter, and a muon identifier.

Papers PR D40 (1989) 1712, PRL 67 (1991) 2614, and PRL 67 (1991) 2618.

**KEK-150** (Feb 1986) Approved Feb 1986; Started Jun 1986; Completed Mar 1988.

### STUDY OF A HYPERNUCLEI VIA THE ( $\pi^+$ , $K^+$ ) REACTION

KYOTO SANGYO U - F Takeuchi  
 KYUSHU U - K Kimura  
 KEK - J Chiba, M Nomachi, O Sasaki, K H Tanaka  
 LOS ALAMOS - J F Amann, J A McGill, H A Thiessen  
 OSAKA U - M Akei, H Ejiri, M Fukuda, A Higashi, T Irie, Y Iseki, A Kashitani, T Kishimoto, H Nagasawa, H Noumi, H Ohsumi, K Okuda, H Sano, Y Umeda  
 TOHOKU U - K Maeda  
 TOKYO U & TOKYO U, INS - T Fukuda, O Hashimoto (✓ Spokesperson), S Homma, Y Matsuyama, T Nagae, C Nagoshi, K Omata, T Shibata (✓ Spokesperson), F Soga, S Toyama, Y Yamanoi, N Yoshikawa  
 YAMAGATA U - S Kato

Accelerator KEK-PS Detector Spectrometer

#### Reactions



Comments Uses the PIK spectrometer consisting of a beam analyzer, equipped with four high-rate drift chambers, and a wide solid angle, large momentum acceptance kaon spectrometer.

Papers NIM A283 (1989) 46, NC 102A (1989) 457, and NP A534 (1991) 478.

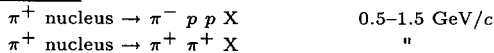
**KEK-157** (1986) Approved Jun 1987; Started Dec 1987; Completed Feb 1988.

### STUDY OF THE PION-INDUCED DOUBLE CHARGE EXCHANGE REACTION AND DOUBLE PION PRODUCTION USING A LARGE SOLID ANGLE SPECTROMETER

KEK - J Chiba, T Kobayashi (Spokesperson), K Nakai  
 TOKYO U - T Nagae, H Sano, S Sasaki, K Tokushuku  
 TSUKUBA U - I Arai, M Kurokawa, A Manabe, M Ninomiya, M Tanaka  
 TOKYO INST TECH - H Yokota

Accelerator KEK-PS Detector FANCY

#### Reactions



**KEK-159** (1987) Approved Feb 1987; Started May 1987; Completed Oct 1987.

### MEASUREMENT OF THE ANALYSING POWER ( $A_y$ ) IN $\bar{p} d \rightarrow pd$ SCATTERING AT 3.5 GeV

NAGOYA U - N Horikawa (✓ Spokesperson), T Iwata, T Kinashi, I Maeda, T Matsuda, T Nakanishi, C Ohmori, M Okumi, T Toyama  
 NAGOYA UNIV COLL MEDICAL TECH - K Mori  
 TOKYO U, INS - T Hasegawa  
 HIROSHIMA U - H Hasai, K Iwatani, F Nishiyama  
 TOHOKU U - Y Kobayashi, T Nakagawa  
 KEK - S Hiramatsu, S Ishimoto, Y Mori, H Sato, T Tsuru  
 KYUSHU U - A Ueno  
 TEXAS A AND M - J A Holt

Accelerator KEK-PS Detector Single-arm spectrometer

#### Reactions



$p \text{ Cu} \rightarrow p p X$  "

Comments Measures the analyzing power for the elastic scattering of protons by deuterons, and for several quasi-elastic processes. The beam polarization is 31%.

Papers NIM A278 (1989) 705, PL B230 (1989) 27, and PL B243 (1990) 29.

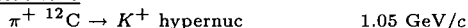
**KEK-160** (Feb 1987) Approved Mar 1989; Started Nov 1989; Completed Dec 1990.

### POLARIZATION OF WEAK DECAYS OF HYPERNUCLEI

OSAKA U - H Ejiri (✓ Spokesperson), A Higashi, Y Iseki, T Kishimoto, H Noumi, H Ohsumi, H Sano  
 TOKYO U, INS - T Fukuda, O Hashimoto, T Nagae, T Shibata  
 TOHOKU U - K Maeda  
 KYUSHU U - K Kimura

Accelerator KEK-PS Detector Wide-angle spectrometer

#### Reactions



Comments The polarization of the hypernucleus is measured by the asymmetry of the weak decay.

Papers NIM A283 (1989) 46, PL B225 (1989) 35, and PL B232 (1989) 24.

**KEK-162** (1987) Approved Oct 1987.

### MEASUREMENT OF THE CP-VIOLATING DIRECT AMPLITUDE IN $K_L^0 \rightarrow \pi^0 e^+ e^-$ DECAY

KYOTO U - H Kobayashi, A Konaka, K Miyake (Spokesperson), T Nakamura, N Sasao  
 KEK - M Noumachi, O Sasaki, T Taniguchi

Accelerator KEK-PS Detector TOKIWA

#### Reactions



Particles studied  $K_L$

Comments The apparatus consists of large drift chambers, a UV-sensitive Čerenkov counter for detection of electrons, and an electromagnetic CsI calorimeter with a good energy resolution. The drift chambers use argon and CF<sub>4</sub> gas. Sensitive to branching ratios smaller than 10<sup>-10</sup>. Scheduled to begin running in the 1991/92 FY.

Papers NIM A270 (1988) 106, and NIM A283 (1989) 709.

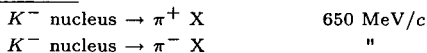
**KEK-166** (1987) Approved Feb 1987; Started May 1987; Completed Oct 1987.

### SYSTEMATIC STUDY OF P-SHELL $\Sigma$ HYPERNUCLEAR STATES USING THE STOPPED $K^-$ METHOD

TOKYO U - R S Hayano, T Ishikawa, M Iwasaki, H Outa, E Takada (Spokesperson), H Tamura  
 TOKYO U, INS - T Yamazaki  
 KEK - K H Tanaka  
 HEIDELBERG, MAX PLANCK INST - W Bruchner, H Doebbeling, S Paul, B Povth, A Sakaguchi

Accelerator KEK-PS Detector Double-arm spectrometer

#### Reactions



Papers NP A479 (1988) 137c, NP A479 (1988) 161c, PR C40 (1989) 479, PR C40 (1989) 483, and NC 102A (1989) 572.

**KEK-167B** (1988) Approved Feb 1988; Started May 1988; Completed Feb 1989.

### SEARCH FOR A $\Sigma$ HYPERNUCLEAR GROUND STATE BY KAON ABSORPTION ON ${}^4\text{He}$

TOKYO U - R S Hayano (Spokesperson), T Ishikawa, M Iwasaki, H Outa, H Sakurai, E Takada

## SUMMARIES OF KEK EXPERIMENTS

TOKYO U, INS - H Tamura, T Yamazaki  
 HEIDELBERG, MAX PLANCK INST - A Sakaguchi  
Accelerator KEK-PS Detector Double-arm spectrometer  
Reactions  
 $K^-$  nucleus  $\rightarrow \pi^- X$  —  
Papers NC 102A (1989) 437, PL B231 (1989) 355, and PRL 63 (1989) 1590.

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**KEK-173** (1987) Approved Oct 1987; Started Oct 1988; Completed Mar 1989.  
**STUDY OF  $\Delta$  PRODUCTION IN NUCLEI USING  $(p, n)$  REACTIONS**

KEK - J Chiba ( $\checkmark$  Spokesperson), T Kobayashi  
 TOKYO U, INS - T Nagae  
 TOKYO U - H Sano  
 TSUKUBA U - I Arai, A Manabe, M Ninomiya, M Tanaka, K Tomizawa  
 OSAKA U, RES CTR NUCL PHYS - H Sakai  
Accelerator KEK-PS Detector FANCY

Reactions  
 $p$  nucleus  $\rightarrow n X$  1.5 GeV/c  
 $p$  nucleus  $\rightarrow \Delta(\text{unspec}) X$  "  
 $p$  nucleus  $\rightarrow \Delta(1232 P_{33})^{++} X$  "  
Papers PRL 67 (1991) 1982.

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**KEK-174** (1987) Approved Jun 1987; Started May 1988; Completed Dec 1988.

$A_Y(E, \theta)$  MEASUREMENTS FOR NN REACTIONS  
 TEXAS A AND M - G Glass, J Hiebert, J A Holt, R Kenefick, S Nath, L C Northcliffe ( $\checkmark$  Spokesperson)  
 TEXAS U & ARGONNE - P Riley, H Spinka  
 KYOTO U - K Imai, M Iwaki, O Kamigaito  
 TOKYO INST TECH - H Ohnuma, H Shimizu ( $\checkmark$  Spokesperson)  
 TOHOKU U - K Maeda  
 KEK - S Hiramatsu, H Sato  
 NAGOYA U - T Tomiya

Accelerator KEK-PS Detector Wire chamber, Counter  
Reactions Polarized beam  
 $p p \rightarrow p p$  1-3.5 GeV ( $E_{\text{lab}}$ )  
 $p p \rightarrow \pi^+ \text{ deut}$  "  
 $p n \rightarrow p n$  "

Comments The momentum dependence of the analyzing power is measured in various reactions using an internal target.  
Papers PR C42 (1990) 483.

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**KEK-175** (1987) Approved Jun 1987; Started Nov 1987; Completed Nov 1987.

**SURVEY OF  $\Lambda$  DECAY LIFETIME IN HEAVY NUCLEI**  
 TOKYO U - R S Hayano, T Ishikawa (Spokesperson), M Iwasaki, H Ota, E Takada  
 TOKYO U, INS - H Tamura, T Yamazaki  
 HEIDELBERG, MAX PLANCK INST - A Sakaguchi  
Accelerator KEK-PS Detector Wire chamber

Reactions  
 $K^-$  nucleus 650 MeV/c

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**KEK-176** (1987) Approved Jun 1987; Started May 1988; Completed Mar 1989.

**SEARCH FOR  $\Lambda\Lambda$  HYPERNUCLEI AND/OR THE  $H$  PARTICLE**  
 KYOTO U - T Iijima, K Imai ( $\checkmark$  Spokesperson), A Masaiki, T Nakano, H Togawa  
 NAGOYA U - S Aoki, K Hoshino, K Kodama, M Miyanishi, M Nakamura, S Nakanishi, K Niu, K Niwa, H Tajima  
 KOBE U - T Hara  
 OSAKA CITY U - M Teranaka

GIFU U - K Nakazawa, S Tasaka  
 TOHO U - M Kazuno, H Shibuya  
 AICHI U OF EDUCATION - N Ushida  
 YOKOHAMA NATIONAL U - Y Maeda  
 UTSUNOMIYA U - Y Sato  
 OSAKA PREFECTURE U, SCI EDUC INST - J Yokota  
 KEK - K H Tanaka  
 KYOTO SANGYO U - F Takeuchi  
Accelerator KEK-PS Detector Spectrometer, Counter  
Reactions  
 $K^-$  nucleus 1.65 GeV/c  
Comments Uses an emulsion target, an emulsion-counter hybrid method, and a  $K^+$ -spectrometer.  
Papers PRL 65 (1990) 1729, PTP 85 (1991) 951, and PTP 85 (1991) 1287.

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**KEK-179** (1987) Approved Feb 1988; Started Nov 1988; Completed May 1990.

**STUDY OF  $\eta\pi^\pm$  RESONANCES — SEARCH FOR EXOTIC PARTICLES WITH  $I = 1, J^{PC} = 1^{-+}$**   
 KEK - S Inaba, S Ishimoto, K Ohmi, K Takamatsu, M Takasaki, T Tsuru ( $\checkmark$  Spokesperson), Y Yasu  
 TOKYO INST TECH - H Shimizu  
 NAGOYA U - N Hayashi, N Horikawa, T Iwata, T Kinashi, T Matsuda, S Nakagawa, S Nakamura, T Nakanishi, M Okumi, C Omori, T Samoto, K Tsuchiya, A Wakai  
 NAGOYA UNIV COLL MEDICAL TECH - K Mori  
 TOHOKU U - K Kobayashi, T Nakagawa  
 MIYAZAKI U - T Hasegawa, T Nakamura  
 SUGIYAMA JOGAKUEN U - S Fukui  
 SAGA U, JAPAN - S Kobayashi, T Tsubaki  
 CHIBA U - H Kawai  
 TOKYO U, INS - Y Ishizaki

Accelerator KEK-PS Detector BENKEI  
Reactions  
 $\pi^+ p \rightarrow \eta \pi^+ p$  6 GeV/c  
 $\pi^- p \rightarrow \eta \pi^- p$  "

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**KEK-187** (1988) Approved Jul 1988; Started Jun 1989.

**STUDY OF BACKWARD  $\Lambda$  PRODUCTION IN HIGH ENERGY HADRON-NUCLEUS REACTIONS**  
 TSUKUBA U - I Arai ( $\checkmark$  Spokesperson), N Kato, H Kitayama, Y Nagasaka, M Tanaka, K Tomisawa, K Yagi  
 KEK - J Chiba, T Kobayashi, A Manabe  
 TOKYO U, INS - T Nagae, M Sekimoto  
 WAKO, RIKEN - I Nomura  
 MOSCOW, INR - V S Pantuev

Accelerator KEK-PS Detector FANCY  
Reactions  
 $\pi^- {}^6\text{Li} \rightarrow \Lambda X$  4 GeV/c  
 $\pi^- {}^6\text{Li} \rightarrow \Lambda K^0 X$  "

Comments Measures inclusive and semi-inclusive cross sections and studies multi-nucleon corrections in nuclei.  
Papers COLL PHYS C6 (1990) 591.

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**KEK-195** (1988) Approved Jul 1988; Started Apr 1989; Completed Jul 1989.

**PRECISE MEASUREMENT OF  $\mu^+$  LONGITUDINAL POLARIZATION IN THE DECAY  $K^+ \rightarrow \mu^+ \nu$**   
 KEK - J Imazato ( $\checkmark$  Spokesperson), M Takasaki, K H Tanaka  
 TOKYO U - R S Hayano, M Iwasaki, H Tamura  
 TOKYO U, INS - M Aoki, H Ota, T Yamazaki  
 WAKO, RIKEN - Y Kawashima  
 TOKYO, NAT INST RADIOLOGICAL SCI - E Takada

Accelerator KEK-PS Detector Spectrometer  
Particles studied  $K^+, \mu^+$   
Comments Uses a beam line spectrometer in the  $\pi\mu$  channel.



## SUMMARIES OF KEK EXPERIMENTS

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**KEK-215** Approved Nov 1989; Started Dec 1990; Completed Feb 1991.

**STUDY OF META-STABLE STATES OF THE  $\bar{p}$  ATOM IN LIQUID HELIUM**

TOKYO U - R S Hayano ( $\checkmark$  Spokesperson), T Ishikawa, M Iwasaki, S N Nakamura, K Shigaki, Y Shimizu, H Tamura  
 TOKYO, NAT INST RADIOLOGICAL SCI - E Takada  
 TOKYO U, INS - M Aoki, P Kitching, H Outa, E Widmann, T Yamazaki

Accelerator KEK-PS Detector Counter

Reactions

$\bar{p}$  He  $\rightarrow$  pion X                      519 MeV/c ( $P_{lab}$ )

Papers PRL 67 (1991) 1246

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**KEK-217** Approved Nov 1989; Started Apr 1990; Completed Nov 1990.

**STUDY OF ABSORPTION OF 1 GeV/c PIONS**

TOKYO U, INS - T Fukuda, M Miyachi, T Nagae ( $\checkmark$  Spokesperson), M Sekimoto  
 WAKO, RIKEN - I Nomura  
 TSUKUBA U - I Arai, H Kitayama, Y Nagasaka, K Tomizawa, S Ueno, K Waki  
 TOHOKU U - S Itoh, K Maeda, H Matsuyama, T Suda, T Terasawa  
 ALBERTA U - P Kitching  
 MOSCOW, INR - M A Prokhvatilov, V I Razin  
 MIT - D C Rowntree  
 KEK - T Kobayashi

Accelerator KEK-PS Detector Counter

Reactions

$\pi^+$  He  $\rightarrow$  p p X                      1.0 GeV/c ( $P_{lab}$ )  
 $\pi^+$  He  $\rightarrow$  p n X                      "  
 $\pi^+$   $^{12}\text{C}$   $\rightarrow$  p p X                      "  
 $\pi^+$   $^{12}\text{C}$   $\rightarrow$  p n X                      "

Comments Uses a neutron hodoscope.

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**KEK-218** Approved Mar 1990.

**STUDY OF THE FORMATION OF  $^4_{\Lambda}\text{H}$  BY USING  $\pi\pi$  COINCIDENCE**

TOKYO U - H Tamura (Spokesperson), et al.

Accelerator KEK-PS Detector Spectrometer

Comments Measures the momentum of  $\pi^-$  emitted during the hyperon production stage in coincidence with the  $\pi^-$  emitted during the  $^4_{\Lambda}\text{H}$  decay stage. Uses a superconducting toroidal spectrometer. Approved for 50 shifts.

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**KEK-224** Approved Mar 1990; Started Mar 1991; Completed Jan 1992.

**SEARCH FOR THE H-DIBARYON WITH A SCINTILLATING FIBER TRACK DETECTOR**

KYOTO U - H En'yo, H Funahashi, Y Goto, T Inuma, K Imai ( $\checkmark$  Spokesperson), Y Itow, S Makino, A Masaike, N Saito, S Yamashita, S Yokkaichi, K Yoshida, M Yoshida  
 KYOTO U OF EDUCATION - R Takashima  
 KYOTO SANGYO U - F Takeuchi  
 KEK - M Ieiri  
 KOBE U - S Aoki  
 TOKYO U, INS - T Fukuda, A Higashi, T Nagoshi, M Sekimoto, P Tlusty  
 OSAKA CITY U - T Yoshida  
 TOKYO, INST PHYS CHEM RES - I Nomura  
 SASKATCHEWAN U - Y M Shin, S Wiebe  
 KOREA U - J K Ahn, M S Chung, I S Park, K S Sim  
 YONSEI U - K S Chung, J M Lee

Accelerator KEK-PS Detector KURAMA

Reactions

$K^-$  nucleus  $\rightarrow$   $K^+$  X                      1.65 GeV/c ( $P_{lab}$ )

Comments Uses KURAMA, a wide-angle spectrometer with a scintillating fiber track detector. Approved for 120 shifts.

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**KEK-231** Approved Jul 1990.

**STUDY OF VIOLATION OF TIME REVERSAL INVARIANCE IN NEUTRON REACTIONS**

KEK - T Adachi, M Doi, Y Masuda ( $\checkmark$  Spokesperson), H Sato  
 TOHOKU U - K Sakai, S Tanaka, A Yamaguchi

Accelerator KEK-PS Detector Counter

Reactions Polarized beam and target

$n$   $^{139}\text{La}$   $\rightarrow$  n X                      —  
 $n$   $^{81}\text{Br}$   $\rightarrow$  n X                      —

Comments Approved conditionally.

Papers NIM A264 (1987) 169, and NP A504 (1989) 269.

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**KEK-235** Approved Nov 1990.

**DIFFERENTIAL CROSS SECTION FOR  $p(n, \gamma)d$**

HIROSHIMA U - Y Mizuno,  
 KENTUCKY U - T P Gorringer, M A Kovash ( $\checkmark$  Spokesperson), M A Pickar  
 KYOTO U - S Sawada  
 MIYAZAKI U - T Hasegawa  
 NAGOYA U - N Horikawa  
 TOKYO U, INS - T Shibata

Accelerator KEK-PS Detector Wire chamber

Reactions

$n$  p  $\rightarrow$   $\gamma$  deut                      1.0 - 3.0 GeV ( $E_{lab}$ )

Comments The angular distribution of the cross section is measured over a large range of energies and angles for the purpose of testing QCD-inspired models of this exclusive photonuclear reaction. The deuteron is detected with a MWDC and a dipole magnet, gammas with a converter, MWDC, and Pb-glass. Data taking scheduled for April 93.

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**KEK-246** Approved Jul 1991.

**SEARCH FOR T-VIOLATING MUON POLARIZATION IN  $K^+ \rightarrow \pi^0 \mu^+ \nu$  DECAY USING STOPPED KAONS**

KEK - J Imazato (Spokesperson), Y Kuno, H H Tanaka  
 TOKYO U, INS - M Aoki, H Outa, S Sugimoto, T Yamazaki  
 TOKYO U - R S Hayano, T Ishikawa, M Iwasaki, A Kawachi, S N Nakamura, K Shigaki, Y Shimizu, H Tamura, T Yokoi  
 MOSCOW, INR - A P Ivashikin, M M Khabibullin, Y G Kudenko, V M Lobashev, O V Mineev, V Popov  
 TSUKUBA U - Y Asano  
 TOKYO INST TECH - S Shimizu  
 SASKATCHEWAN U - Y M Shin  
 YONSEI U - J M Lee  
 KOREA U - I S Park  
 KYUNGSUNG U - K S Choi, Y M Park

Accelerator KEK-PS Detector Spectrometer

Reactions

$K^+ \rightarrow \pi^0 \mu^+ \nu$                       0 GeV/c ( $P_{lab}$ )

Comments Uses a superconducting toroidal spectrometer. Approved for 450 shifts.

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**KEK-248** Approved Jul 1991.

**SEARCH FOR H PARTICLES IN THE  $pp \rightarrow K^+ K^+$  REACTION**

CHIBA U - H Kawai ( $\checkmark$  Spokesperson)  
 HAMAMATSU U - K Matsuda  
 KEK - S Inaba, S Ishimoto, K Takamatsu, T Tsuru, Y Yasu  
 MIYAZAKI U - T Hasegawa, Z Kai, H Nakayama  
 NAGOYA U - H Horikawa, J Iizuka, T Iwata, G Kato, T Kinashi, T Matsuda, K Mori, T Nakanishi, A Ogawa, T Sasaki, A Wakai  
 SUGIYAMA JOGAKUEN U - S Fukui  
 TOHOKU U - T Nakagawa, A Narita  
 TOKYO, METROPOLITAN COLL TECH - I Yamauchi  
 TOKYO INST TECH - Y Tajima

## SUMMARIES OF KEK EXPERIMENTS

YAMAGATA U - K Fukunaga, S Kato, H Shimizu, H Y Yoshida

Accelerator KEK-PS Detector SUPERBENKEI

Reactions

$p p \rightarrow K^+ K^+ X$  12 GeV ( $E_{lab}$ )

Comments Approved for 160 shifts.

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**KEK-251** Approved Jul 1991; Started Feb 1992.

**HYPERON-NUCLEON SCATTERING EXPERIMENT I:  
 $\Sigma^+ p$  SCATTERING**

KEK - M Ieiri (✓ Spokesperson), Y M Shin  
KYOTO U - M S Chung, H En'yo, H Funahashi, Y Goto,  
T Iinuma, K Imai, Y Itow, A Masakike, Y Matsuda, S Mihara,  
N Saito, S Yamashita, S Yokkaichi, M Yoshida  
TOKYO U, INS - T Fukuda, A Higashi, T Nagae, P Tlusty  
KYOTO U OF EDUCATION - R Takashima  
KYOTO SANGYO U - K Okada, F Takeuchi  
YONSEI U - W M Chung, J M Lee  
PUSAN NATIONAL U - G D Kim  
KYUNGSUNG U - I S Park, Y M Park

Accelerator KEK-PS Detector Single-arm spectrometer

Reactions

$\Sigma^+ p \rightarrow \Sigma^+ p$  0.2 - 0.6 GeV/c ( $P_{lab}$ )

Comments Uses a three-dimensional plastic scintillating fiber detector. Approved for 60 shifts.

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**KEK-257** Approved Dec 1991; Started Apr 1992.

**SUBTHRESHOLD ANTIPROTON PRODUCTION IN  $dA$   
REACTIONS**

KEK - J Chiba (✓ Spokesperson), K H Tanaka, Y Yoshimura  
TOKYO U, INS - M Koike, T Nagae, M Sekimoto  
KYOTO U - H Ito, T Murakami, Y Nakai, S Sawada  
TOKYO, INST PHYS CHEM RES - T Kobayashi, T Suzuki  
NIIGATA U - K Miyano

Accelerator KEK-PS Detector ?

Reactions

$p \text{ nucleus} \rightarrow \bar{p} X$	3.5 - 5.0 GeV/c
$p \text{ nucleus} \rightarrow K^- X$	"
$p \text{ nucleus} \rightarrow \pi^- X$	"
$\text{deut nucleus} \rightarrow \bar{p} X$	3.5 - 5.0 GeV/N ( $P_{lab}$ )
$\text{deut nucleus} \rightarrow K^- X$	"
$\text{deut nucleus} \rightarrow \pi^- X$	"

Comments This is a beam line experiment. Approved for 40 shifts.

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SUMMARIES OF LOS ALAMOS EXPERIMENTS

LAMPF Experiments

**LAMPF-225** (Feb 1975) Started Sep 1983; Completed Dec 1986.

**A STUDY OF NEUTRINO-ELECTRON SCATTERING**

UC, IRVINE - R C Allen, H H Chen, P J Doe, R Hausamman, W P Lee, X Q Lu, H J Mahler, M E Potter, K C Wang  
 LOS ALAMOS - T J Bowles, R L Burman (✓ Spokesperson), 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 ( $T_{lab}$ )  
 $\nu_e {}^{12}C \rightarrow e^- {}^{12}N$  "  
 $\nu_e {}^{12}C \rightarrow e^- X$  "

Comments A 15-ton detector system giving  $234 \pm 35$  elastic events in three 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  ${}^{12}C$ , and a search for anomalous neutrino events. Data analysis in progress (May 92).

Papers PRL 55 (1985) 2401, PRL 64 (1990) 1330, PRL 64 (1990) 1871, PL B252 (1990) 177, PR D43 (1991) 1, PR D44 (1991) 6, PL B263 (1991) 534, PR D45 (1992) 975, and PR C45 (1992) 2450.

**LAMPF-455** (Nov 1978) Started Jul 1981; Completed Sep 1986.

**HIGH-PRECISION STUDY OF THE  $\mu^+$  DECAY SPECTRUM**

LOS ALAMOS - H L Anderson (✓ Spokesperson), J D Bowman, C M Hoffman, W W Kinnison (✓ Spokesperson), H S Matis, R J McKee, D E Nagle

CHICAGO U - M Yang

NATIONAL RESEARCH COUNCIL, OTTAWA - C K Hargrove, H Mes

Accelerator LAMPF Detector Spectrometer

Reactions Polarized beam

$\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$  0 MeV/c

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.

Papers NIM A270 (1988) 126.

**LAMPF-583** (Jun 1980) Started Aug 1983; Completed 1987.

**MEASUREMENT OF  $C_{LL}$  IN THE COULOMB INTERFERENCE REGION**

UCLA - B Aas, G J Igo, J B McClelland, G Pauletta (Spokesperson), C A Whitten

ARGONNE - K Imai, H Spinka

MINNESOTA U - M M Gazzaly

LOS ALAMOS - J J Jarmer

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam and target

$p p \rightarrow p p$  650, 800 MeV ( $T_{lab}$ )

Comments Measures  $C_{LL}$  in the coulomb interference region,  $3-30^\circ$  c.m.

Papers PRL 58 (1987) 1084.

**LAMPF-589** (Jun 1980) Completed 1986.

**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, S Nath, L C Northcliffe (✓ Spokesperson)

WASHINGTON STATE U - G E Tripard

IOWA U - C R Newsom

ARGONNE - K F Johnson, H Spinka, R Stanek

NEW MEXICO STATE U - J A Faucett, M W Rawool

MONTANA U - R H Jeppesen

Accelerator LAMPF Detector Counter

Reactions Polarized beam

$n p \rightarrow n p$  800 MeV ( $T_{lab}$ )

Comments Measures the forward-angle neutron analyzing power. Ran for 343 hours.

Papers PR C41 (1990) 2732.

**LAMPF-645** (Nov 1980) Started Jun 1987; Completed Sep 1989.

**A SEARCH FOR NEUTRINO OSCILLATIONS AT LAMPF**

OHIO STATE U - L S Durkin, R Harper, T Y Ling

(✓ Spokesperson), J Mitchell, T A Romanowski

(✓ Spokesperson), E Smith, M Timko

ARGONNE - S Freedman, J Napolitano

LOUISIANA STATE U - W C Choi, A Fazeley, R Imlay,

W J Metcalf

CAL TECH - B Fujikawa, R B McKeown

LOS ALAMOS - R D Carlini, J Donahue, G T Garvey,

V D Sandberg

LBL - K Lesko

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 the signature for the second reaction. Ran for 9000 hours. Data analysis in progress (March 92).

Papers PRL 61 (1988) 1811.

**LAMPF-665** (Jun 1981) Completed 1986.

**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 Burleson (✓ Spokesperson),

J A Faucett, C Fontenla, R Garnett, M W Rawool

ARGONNE - W R Ditzler, D Hill, J Hoftiezer, K F Johnson,

D Lopiano, T Shima, H Shimizu, H Spinka, R Stanek,

D Underwood, R Wagner (✓ Spokesperson), A Yokosawa

LOS ALAMOS - R Damjanovich, J J Jarmer

TEXAS A AND M - T S Bhatia, G Glass, J C Hiebert,

R A Kenefick, S Nath, 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 ( $T_{lab}$ )

$n p \rightarrow$  deut pion "

Comments Ran for 2019 hours. Data analysis in progress (March 92).

Papers PRL 59 (1987) 1645, and NIM A270 (1988) 361.

**LAMPF-685** (Jun 1981) Completed 1986.

**SPIN CORRELATIONS IN THE REACTION  $d(p,p)d$  AT 500 MeV**

UCLA - B Aas, A Azizi, E Bleszynski, M Bleszynski

(✓ Spokesperson), J Geaga, M Hajisaed, G J Igo

## SUMMARIES OF LOS ALAMOS EXPERIMENTS

(√ 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  
deut  $p \rightarrow p$  deut 500 MeV ( $T_{lab}$ )

Comments Continued as LAMPF-818. Data analysis in progress (March 92).

**LAMPF-709** (Nov 1981, Jun 1987) Started Aug 1983; Completed.

**MEASUREMENTS OF  $A_{NN}$ ,  $A_{SS}$ , AND  $A_{SL}$  IN THE COULOMB INTERFERENCE REGION AT 650 AND 800 MeV**

MINNESOTA U - M Gazzaly  
UCLA - B Aas, G J Igo, G Pauletta (Spokesperson), C A Whitten  
ARGONNE - K Imai, H Spinka  
LOS ALAMOS - J Amann, O B van Dyck, J J Jarmer, J B McClelland, N Tanaka

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam and target  
 $p p \rightarrow p p$  650, 800 MeV ( $T_{lab}$ )

Comments Measures in the coulomb interference region, 3-30° c.m.

Papers PRL 58 (1987) 1084, and PL B211 (1988) 19.

**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 Dombek (√ Spokesperson), H Kruse (√ 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  
 $\nu_\mu^{12}C \rightarrow \mu^- X$  "  
 $\nu_\mu^{Al} \rightarrow \mu^- X$  "  
 $\nu_\mu^{12}C \rightarrow \mu^-^{12}N$  "

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  $\sin^2(2\theta) < 0.001$ . Neutrinos are produced in decays of  $\pi^+$ 's with momenta  $< 400 \text{ MeV}/c$ .

Papers PL B194 (1987) 591.

**LAMPF-767** (Oct 1982) Approved Jan 1983; Completed 1986.

**$\pi^\pm d$  ELASTIC SCATTERING AT THREE ENERGIES BETWEEN 30 AND 80 MeV**

VIRGINIA TECH - M Blecher, K Gotow (√ Spokesperson)  
OAK RIDGE - F E Bertrand, E E Gross, F E Obenshain, T P Sjoeren

SOUTH CAROLINA U - G S Blanpied, B M Freedom, B G Ritchie, C S Whisnant (√ Spokesperson)

LOS ALAMOS - R L Burman, M V Hynes, E Piasetzky  
MARYLAND U - N S Chant, P G Roos

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^+$  deut  $\rightarrow \pi^+$  deut 30-80 MeV ( $T_{lab}$ )  
 $\pi^-$  deut  $\rightarrow \pi^-$  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. Ran for 217 hours.

Papers No journal papers expected.

**LAMPF-770** (Nov 1982) Approved Jan 1983; Completed Dec 1985.

**THE MEASUREMENT OF  $np$  ELASTIC-SCATTERING SPIN-CORRELATION PARAMETERS WITH L- AND S-TYPE POLARIZED BEAM AND TARGET BETWEEN 500 AND 800 MeV**

ARGONNE - V Carlson, W R Ditzler, D Hill, K F Johnson, D Lopiano, Y Ohashi, T Shima, H Shimizu, H Spinka (√ Spokesperson), R Stanek, D Underwood, R Wagner, A Yokosawa

NEW MEXICO STATE U - M Beddo, G R Burleson (√ Spokesperson), J A Faucett, C Fontenla, R Garnett, G Kyle, C Luchini, M Rawool

LOS ALAMOS - J J Jarmer  
TEXAS A AND M - T S Bhatia, G C Glass, J C Hiebert, S Nath, L C Northcliffe

MONTANA U - R H Jeppesen  
WASHINGTON STATE U - G E Trippard

Accelerator LAMPF Detector Wide-angle spectrometer

Reactions Polarized beam and target  
 $n p \rightarrow n p$  500-800 MeV ( $T_{lab}$ )  
 $n p \rightarrow$  deut pion 500-650 MeV ( $T_{lab}$ )

Comments Measures the initial-spin correlation parameters  $C_{SS}$ ,  $C_{LS}$ , and  $C_{LL}$  from 35 to 172° c.m. Complementary to LAMPF-665. Ran for 3691 hours. Data analysis in progress (March 92).

Papers NIM A270 (1988) 361, and PR D40 (1989) 1708.

**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 (Spokesperson), F Sperisen, C A Whitten  
MINNESOTA U - M M Gazzaly, N M Hintz  
LOS ALAMOS - J F Amann, B E Bonner, J J Jarmer, J B McClelland, N Tanaka  
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  
 $p p \rightarrow$  deut  $\pi^+$  650, 800 MeV ( $T_{lab}$ )

Comments Measures  $A_{LL}$ ,  $A_{SL}$ ,  $A_{SS}$ , and  $A_{NN}$  at forward and backward angles, and  $A_{SS}$  at 13° lab. The tensor polarization  $T_{20}$  of the deuteron will be deduced. Uses same polarized target as LAMPF-583 and -709. Approved for 80 hours.

**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  
 $p$  deut  $\rightarrow$  trit  $\pi^+$  800 MeV ( $T_{lab}$ )  
 $p$  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

## SUMMARIES OF LOS ALAMOS EXPERIMENTS

possible charge-dependent  $np$  spin-orbit force. Approved for 200 hours.

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### LAMPF-806 (Nov 1982) Approved Jan 1983; Completed 1986. MEASUREMENT OF SPIN-ROTATION PARAMETERS A AND R IN $\pi^+p \rightarrow \pi^+p$ AND $\pi^-p \rightarrow \pi^-p$

UCLA - D B Barlow, R S Kessler, G Kim, B M K Nefkens  
( $\checkmark$  Spokesperson), C Pillai, J W Price, J A Wightman  
GEORGE WASHINGTON U - S D Adrian, W J Briscoe  
( $\checkmark$  Spokesperson), L H Kramer, A Mokhtari, A M Petrov,  
C J Seftor, M F Taragin  
ABILENE CHRISTIAN U - S Hall, D W Lane, S R Loe,  
L K Morton, M E Sadler ( $\checkmark$  Spokesperson)  
LOS ALAMOS - J F Davis  
BOSKOVIC INST, ZAGREB - I Supek

Accelerator LAMPF Detector Wide-angle spectrometer

Reactions Polarized target  
 $\pi^+p \rightarrow \pi^+p$  471-625 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. Ran for 1604 hours.

Papers PRL 62 (1989) 1009.

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### LAMPF-808 (Jan 1983) Approved Jan 1983; Started Nov 1983; Completed Mar 1986.

#### 0° EXCITATION FUNCTION FOR $\pi^-p \rightarrow \pi^0n$

LOS ALAMOS - H W Baer, J D Bowman, M D Cooper  
( $\checkmark$  Spokesperson), D H Fitzgerald ( $\checkmark$  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  
 $\pi^-p \rightarrow \pi^0n$  100-150 MeV/c

Comments Established the depth of the  $\pi N$  destructive interference minimum between the  $S$  and  $P$  waves. Ran for 71 hours.

Papers PR C34 (1986) 619. No other papers expected.

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### LAMPF-818 (Nov 1983) Approved Jan 1984; Started Dec 1986; Completed Sep 1987.

#### $pd$ ELASTIC SCATTERING AT 800 MeV: TWO- AND THREE-SPIN OBSERVABLES

UCLA - D Adams, E Gulmez, G J Igo ( $\checkmark$  Spokesperson), A Ling,  
M Moshe  
MINNESOTA U - M M Gazzaly  
LOS ALAMOS - M McNaughton  
TEXAS U - K H McNaughton, P Riley

Accelerator LAMPF Detector JANUS

Reactions Polarized beam and target  
 $p$  deut  $\rightarrow$   $p$  deut 800 MeV ( $T_{lab}$ )

Comments Extends results of LAMPF-685 to larger momentum transfers.

Papers PR C45 (1992) 22.

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### LAMPF-828 (Nov 1983) Approved Jan 1985; Completed. TOTAL AND DIFFERENTIAL CROSS SECTIONS FOR $\pi^+d \rightarrow pp$ BELOW 20 MeV

VIRGINIA TECH - M Blecher, B I Fick, K Gotow  
( $\checkmark$  Spokesperson), D Wright  
VIRGINIA U - G Das, R C Minehart ( $\checkmark$  Spokesperson)  
MARYLAND U - N S Chant, B G Ritchie ( $\checkmark$  Spokesperson),  
P G Roos  
SOUTH CAROLINA U - G S Adams, G S Blanpied, B M Preadom,  
C S Whisnant

Accelerator LAMPF Detector Counter

Reactions  
 $\pi^+$  deut  $\rightarrow$   $pp$  5, 10, 15 MeV ( $T_{lab}$ )

Comments The aim is to determine the  $S$ -wave  $\pi$  absorption amplitude. The expected errors for the total cross section are about 4%. Ran for 258 hours. Extended through LAMPF-1085.

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### LAMPF-849 (Nov 1983) Approved Jan 1984; Completed 1988. A MEASUREMENT OF THE DIFFERENTIAL CROSS SECTION FOR $\pi^-p \rightarrow \pi^0n$ AT 0 AND 180° IN THE MOMENTUM REGION 471-687 MeV/c

LOS ALAMOS - H W Baer, J D Bowman, M D Cooper,  
N S P King, J C Peng, E Piasetzky, N Stein  
GEORGE WASHINGTON U - W J Briscoe (Spokesperson),  
M F Taragin  
ABILENE CHRISTIAN U - M E Sadler (Spokesperson)  
CATHOLIC U - D I Sober  
TEL AVIV U - M A Moinester

Accelerator LAMPF Detector Spectrometer

Reactions  
 $\pi^-p \rightarrow \pi^0n$  471-687 MeV/c  
 $\pi^-p \rightarrow \pi^-p$  "  
 $\pi^+p \rightarrow \pi^+p$  "

Comments The charge-exchange reaction is measured from 0 to 40° and 150 to 180°, the elastic scattering reactions at 180°. Ran for 594 hours.

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### LAMPF-853 (Nov 1983) Approved Jan 1984; Completed 1986. 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  
 $p$  deut  $\rightarrow$   $p$  deut 500, 650, 800 MeV ( $T_{lab}$ )

Comments The angular range is 3-36° in the lab. Measures the differential cross section and  $D_{SS}$ ,  $D_{SL}$ ,  $D_{LL}$ , and  $A_Y$ . Ran for 404 hours. Data analysis in progress (March 92).

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### LAMPF-869 (Nov 1983) Approved Jan 1984; Completed 1988. HIGHER PRECISION MEASUREMENT OF THE LAMB SHIFT IN MUONIUM

YALE U - A Badertscher ( $\checkmark$  Spokesperson), S Dhawan,  
V W Hughes ( $\checkmark$  Spokesperson), D C Lu, M Ritter, K Woodle  
HEIDELBERG U, PHYS INST - M W Gladisch  
( $\checkmark$  Spokesperson), H Orth, G zu Putlitz  
WILLIAM AND MARY COLL - M Eckhause, J Kane  
MISSISSIPPI U - J Reidy  
LOS ALAMOS - F G Mariani

Accelerator LAMPF Detector ?

Reactions  
 $\mu^+e^- \rightarrow$  muonium 5 MeV/c

Comments An extension of LAMPF-724. Measures the Lamb shift to 0.1% and the hfs interval in the  $2^2P_{1/2}$  state to 1%. Uses a microchannel plate and UV sensitive PM's. Ran for 2046 hours.

Papers PRL 52 (1984) 914.

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### LAMPF-876 (May 1984) Approved Aug 1984. SPIN TRANSFER MEASUREMENTS FOR $np$ ELASTIC SCATTERING

LOS ALAMOS - K Koch, M W McNaughton ( $\checkmark$  Spokesperson),  
I Supek, N Tanaka

## SUMMARIES OF LOS ALAMOS EXPERIMENTS

TEXAS U - D A Ambrose, J D Johnson, K H McNaughton,  
 P J Riley, A Smith  
 TEXAS A AND M - G Glass, J C Hiebert, L C Northcliffe,  
 A J Simon  
 RICE U - D L Adams  
 RUTGERS U - D B Clayton, R D Ransome  
 ARGONNE - H M Spinka  
 MONTANA U - R H Jeppesen  
 WASHINGTON STATE U - G E Tripard

Accelerator LAMPF Detector Spectrometer, JANUS

Reactions Polarized beam

$n p \rightarrow n p$  647, 800 MeV ( $T_{lab}$ )

Comments Measures the  $np$  spin-transfer parameters  $K_{NN}$ ,  $K_{SS}$ ,  $K_{LL}$ , and  $K_{LS}$  from 50 to 180° c.m. Requires an intense polarized source. Ran 1254 hours as of February 92. Scheduled for completion July 92.

Papers PR C44 (1991) 2267.

**LAMPF-898** (Jul 1984) Approved Aug 1984; Started Apr 1985; Completed 1986.

### PION ELASTIC SCATTERING FROM $^4\text{He}$ — A TEST OF CHARGE SYMMETRY

LOS ALAMOS - C L Morris (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 ( $T_{lab}$ )  
 $\pi^- \text{He} \rightarrow \pi^- \text{He}$  "

Comments Tests charge symmetry by estimating the mass splitting between charge states of the  $\Delta(1232)$ . Ran for 125 hours.

**LAMPF-960** (Jul 1985) Approved Aug 1985; Started 1987; Completed 1988.

### MEASUREMENT OF $\Delta\sigma_L$ IN FREE $np$ SCATTERING BETWEEN 300 AND 800 MeV

ARGONNE - R Garnett, D Grosnick, D Hill, K F Johnson  
 (✓ Spokesperson), D Lopiano, Y Ohashi, T Shima, H Spinka,  
 R Stanek, D Underwood, A Yokosawa  
 LOS ALAMOS - J J Jarmer, S Penttila  
 NEW MEXICO STATE U - M Beddo, G R Burleson  
 (✓ Spokesperson), J Faucett, S Gardiner, G Kyle  
 TEXAS A AND M - G Glass, R A Kenefick, S Nath,  
 L C Northcliffe (✓ 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 ( $T_{lab}$ )

Comments Measures at seven energies. A new beam buncher allows time-of-flight neutron energy measurements. Ran for 2217 hours.

Papers PL B258 (1991) 24.

**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 - G Glass, J C Hiebert, J A Holt,  
 R A Kenefick, S Nath, L C Northcliffe (Spokesperson)  
 LOS ALAMOS - T S Bhatia, J J Jarmer  
 NEW MEXICO STATE U - J A Faucett, G Kyle  
 MONTANA U - R H Jeppesen  
 WASHINGTON STATE U - G E Tripard  
 ARGONNE - D P Grosnick, D Lopiano, I Ohashi, T Shima,  
 H Spinka, R Stanek

TEXAS U - P J Riley, S Sen

Accelerator LAMPF Detector Wire chamber

Reactions Polarized beam and target

$n p \rightarrow n p$  790 MeV ( $T_{lab}$ )

Comments Measures  $A_{NN}$  from 48 to 149°. Ran for 986 hours.

Papers PR D39 (1989) 3520.

**LAMPF-969** (Jul 1985) Approved Aug 1985.

### MEGA — SEARCH FOR THE RARE DECAY $\mu^+ \rightarrow e^+\gamma$

UCLA - D Barlow, B M K Nefkens, B Tippens  
 CHICAGO U - J Crocker, S C Wright  
 FERMLAB - P S Cooper  
 HOUSTON U - M Dziedzic, J Flick, E V Hungerford,  
 K Johnston, K Lan, B W Mayes, R Phelps, L Pinsky,  
 W von Witsch  
 LOS ALAMOS - J F Amann, K Black, R D Bolton, S Carius,  
 M D Cooper (✓ Spokesperson), W Foreman, C M Hoffman,  
 G E Hogan, T Kozlowski, M Kroupa, R E Mischke, F J Naivar,  
 M A Oothoudt, C Pillai, R D Werbeck, D Whitehouse,  
 C Wilkinson

QUEENS U, KINGSTON - A Hallin  
 STANFORD U - E B Hughes, C Jui, J N Otis, M W Ritter  
 TEXAS A AND M - L Van Ausdell, C Gagliardi, G Kim, F Liu,  
 R E Tribble, X Tu, X Zhou  
 VALPARAISO U, INDIANA - R Fisk, D D Koetke,  
 R W Manweiler, S Stanislaus  
 VIRGINIA U - R Marshall, B Wright, K O H Ziock  
 HAMPTON U - K Baker, L Tang  
 INDIANA U - J Knott, K M Stantz, J Szymanski  
 VIRGINIA TECH - L E Piilonen, Y Zhang  
 WYOMING U - A R Kunselman  
 YALE U - J Markey

Accelerator LAMPF Detector MEGA

Reactions Polarized beam

$\mu^+ \rightarrow e^+ \gamma$  0 MeV/c  
 $\mu^+ \rightarrow e^+ \gamma \gamma$  "  
 $\mu^+ \rightarrow e^+ \gamma \nu \nu$  "

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  $2 \times 10^{-13}$ , a factor of 250 better than the Crystal Box detector. Data taking scheduled for June 92.

Papers NIM A303 (1991) 298.

**LAMPF-973** (Jul 1985) Approved Aug 1985; Started Oct 1985.

### SEARCH FOR NARROW RESONANCES IN THE $B = 2$ MISSING-MASS SPECTRUM FROM $p \text{He}$ REACTIONS AND IN THE EXCITATION FUNCTIONS OF THE $pp\pi$ PRODUCTION

TEXAS U - M Barlett, D Ciskowski, G Hoffmann, G Pauletta  
 (Spokesperson), M Purcell  
 UDINE U - R Garfagnini, L Santi  
 MINNESOTA U - M Gazzaly  
 LOS ALAMOS - K Jones, C Morris, S Seestrom-Morris, N Tanaka  
 VIRGINIA U - L C Smith, R Whitney

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p \text{ } ^3\text{He} \rightarrow \text{deut X}$  370, 630, 730, 800 MeV ( $T_{lab}$ )  
 $p \text{He} \rightarrow \text{trit X}$  "  
 $p \text{He} \rightarrow \text{ } ^3\text{He X}$  "

Particles studied dibaryon

Comments Ran for 72 hours in 1985, and additional 462 hours in 1990.

Papers PR C38 (1988) 2466.

## SUMMARIES OF LOS ALAMOS EXPERIMENTS

**LAMPF-979** (Nov 1985) Approved Aug 1985; Completed Oct 1987.

**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 (Spokesperson),  
C L Morris (Spokesperson)

TEXAS U - G W Hoffmann, C F Moore, G Pauletta  
MINNESOTA U - M Gazzaly, S J Seestrom-Morris

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^+$  deut  $\rightarrow \pi^- X$  200-300 MeV ( $T_{lab}$ )

Particles studied dibaryon

Comments Uses the clamshell spectrometer. Ran for 837 hours.

**LAMPF-981** (Jul 1985) Approved Aug 1985; Completed Oct 1988.

**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

$\pi^-$  deut  $\rightarrow \pi^+ n n \pi^-$  292 MeV ( $T_{lab}$ )

Particles studied dibaryon

Comments Searches for an  $nn\pi^-$  bound state. Ran for 534 hours.

**LAMPF-985** (Nov 1985) Approved Feb 1985; Completed 1986.

**SEARCH FOR MUONIUM-TO-ANTIMUONIUM SPONTANEOUS CONVERSION**

HEIDELBERG U, PHYS INST - M Gladisch, G zu Putlitz  
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 R Kane  
( $\checkmark$  Spokesperson)

YALE U - K P Arnold, F Chmely, V W Hughes ( $\checkmark$  Spokesperson),  
S Kettell, Y Kuang, J Markey, B Matthias, B Ni, H Orth

( $\checkmark$  Spokesperson), R Schaefer, K Woodlee

MISSISSIPPI U - J J Reidy

Accelerator LAMPF Detector CRYSTAL-BOX

Reactions

muonium  $\rightarrow$  muonium

Comments A search at a level of sensitivity of about  $7.5 G_F$  for the conversion coupling constant (compared to a best so far of less than  $42 G_F$ ). Ran for 564 hours.

Papers PRL 59 (1987) 2716, and NP A478 (1988) 757.

**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

$\pi^+$  He  $\rightarrow$  trit  $p \pi^+$  180 MeV ( $T_{lab}$ )

$\pi^-$  He  $\rightarrow$  trit  $p \pi^-$  "

Comments A test of charge symmetry by measuring the ratio of the cross sections. Ran for 180 hours.

Papers PR C42 (1990) 807, PR C (submitted).

**LAMPF-1027** Approved Aug 1986; Started Jun 1987; Completed Aug 1987.

**DEVELOPMENT OF A HIGH ENERGY POLARIMETER BASED ON COULOMB-NUCLEAR INTERFERENCE AND MEASUREMENT OF THE SPIN-AVERAGED SLOPE PARAMETER FOR  $pp$  ELASTIC SCATTERING BETWEEN 1.1 AND 1.5 GeV/c**

TEXAS U - M Barlett, D Ciskowski, G Hoffman, G Pauletta  
(Spokesperson), M Purcell

UDINE U - R Garfagnini, L Santi

MINNESOTA U - M Gazzaly, N Hintz, S Nanda

ANNECY - K Kuroda, A Michalowicz

TRIESTE U - A Penzo

LOS ALAMOS - N Tanaka

Accelerator LAMPF Detector LAHRS, Counter

Reactions Polarized beam

$p p \rightarrow p p$  1.1-1.5 GeV/c

Comments Measures the differential cross section and analyzing power from 3 to  $15^\circ \theta_{lab}$  at eight energies. Ran for 272 hours.

**LAMPF-1035** (Nov 1986) Started Aug 1987; Completed Dec 1987.

**TWO- AND THREE-SPIN MEASUREMENTS IN  $pp \rightarrow pp$**

LOS ALAMOS - M W McNaughton ( $\checkmark$  Spokesperson), S Penttila

TEXAS U - K H McNaughton, P J Riley

UCLA - D L Adams, J Bystricky, E Gulmez, A G Ling

Accelerator LAMPF Detector Spectrometer, JANUS

Reactions Polarized beam and target

$p p \rightarrow p p$  733 MeV ( $T_{lab}$ )

Comments Covers between 35 and  $76^\circ$  c.m. Measures  $P, A_{LV}, A_{SV}, D_{NN}, D_{LV}, D_{SV}, K_{VS}, K_{VL}, (NV, SO), (NV, LO), (SV, NO)$ , and  $(LV, NO)$ , where  $V$  is the target polarization, oriented between  $L$  and  $S$ , perpendicular to the recoil proton in the lab frame. The addition of the differential cross section makes this a complete set.

Papers PR C41 (1990) 2809. No other papers expected.

**LAMPF-1054** (Dec 1986) Approved Feb 1987; Started 1991.

**ULTRAHIGH PRECISION MEASUREMENTS ON THE MUONIUM GROUND STATE: HYPERFINE STRUCTURE AND MUON MAGNETIC MOMENT**

LOS ALAMOS - D Ciskowski

HEIDELBERG U, PHYS INST - K Jungmann, B Matthias,  
G zu Putlitz ( $\checkmark$  Spokesperson)

SYRACUSE U - P A Souder ( $\checkmark$  Spokesperson)

WILLIAM AND MARY COLL - M Eckhause, P Guss, J Kane

YALE U - S Dhawan, V W Hughes ( $\checkmark$  Spokesperson)

Accelerator LAMPF Detector Other

Particles studied muon, muonium

Comments An ultrahigh precision measurement of the muonium hyperfine structure interval  $\Delta\nu$  and of the microwave magnetic moment ratio  $\mu_\mu/\mu_p$  with the goal of determining  $\Delta\nu$  to 5 ppb and  $\mu_\mu/\mu_p$  to 50 ppb. Uses the microwave magnetic resonance spectroscopy method, with an intense and pure subsurface  $\mu^+$  beam, a large superconducting homogeneous solenoid, and a line-narrowing method involving a chopped  $\mu^+$  beam. Approved for 1200 hours. Expected to run till 1995.

**LAMPF-1072** (Jun 1987) Approved Aug 1987; Started Jun 1988; Completed Sep 1988.

**THE  $pp$  ELASTIC ABSOLUTE CROSS SECTION**

UCLA - E Gulmez, A G Ling, C A Whitten

LOS ALAMOS - J F Amann, M W McNaughton

( $\checkmark$  Spokesperson), T Noro

RICE U - D L Adams

RUTGERS U - V R Cupps, R D Ransome

TEXAS A AND M - G Glass, A J Simon

TEXAS U - K H McNaughton, P J Riley

## SUMMARIES OF LOS ALAMOS EXPERIMENTS

Accelerator LAMPF Detector Wire chamber, Counter

Reactions

$p p \rightarrow p p$  500-800 MeV ( $T_{lab}$ )

Comments Measures the  $pp$  differential elastic cross section from 15-90° c.m. to an absolute accuracy of 1%. Ran for 732 hours. Data analysis in progress (March 92).

Papers NIM A297 (1990) 7.

**LAMPF-1073** (Jun 1987) Approved Aug 1987; Started Jun 1988.

**MEASUREMENT OF MUONIUM TO ANTIMUONIUM CONVERSION WITH IMPROVED SENSITIVITY**

WILLIAM AND MARY COLL - M Eckhause, J Kane  
HEIDELBERG U, PHYS INST - H J Mundinger, G zu Putlitz,  
H J Rosnekrantz  
MISSISSIPPI U - J Reidy  
YALE U - H Ahn, V W Hughes (Spokesperson), S Kettell,  
Y Kuang, B Matthias, B Ni, H R Schaefer (Spokesperson)

Accelerator LAMPF Detector Spectrometer, Wire chamber

Reactions

muonium  $\rightarrow$  muonium

Particles studied muonium

Comments The proposed sensitivity is  $G_{MM} \approx 10^{-2} G_F$ , an improvement by a factor 100 over previous experiments. Ran for 1590 hours.

**LAMPF-1085** (Jul 1987) Approved Aug 1987; Started Aug 1988; Completed Oct 1988.

**TOTAL AND DIFFERENTIAL CROSS SECTIONS FOR  $\pi^+ d \rightarrow pp$  BELOW 20 MeV**

VIRGINIA U - K Giovanetti, R C Minehart (✓ Spokesperson),  
L C Smith  
ARIZONA STATE U - T D Averett, B G Ritchie  
(✓ Spokesperson), D Rothenberg, J R Tinsley  
SOUTH CAROLINA U - G S Blanpied, B M Freedom

Accelerator LAMPF Detector Counter

Reactions

$\pi^+ deut \rightarrow p p$  3.7, 5.0, 9.6, 15.2, 20.5 MeV ( $T_{lab}$ )

Comments Ran for 613 hours.

Papers PRL 66 (1991) 568.

**LAMPF-1096** (Dec 1987) Approved Jan 1988; Started Jun 1988; Completed Jul 1988.

**STUDY OF THE  $(\pi NN)_{T=2}$  BOUND SYSTEM BY  $d(\pi^\pm, \pi^\mp)$  REACTIONS**

LOS ALAMOS - C L Morris (Spokesperson), J D Zumbro  
TEL AVIV U - D Ashery (Spokesperson), J Lichtenstadt,  
E Piasetzky  
ARGONNE - R Gilman  
NEW MEXICO STATE U - M W Rawool  
TEXAS U - B Boyer, A Fuentes, K Johnson, J McDonald,  
C F Moore, S Mordechai, M J Smithson, A Williams, S H Yoo

Accelerator LAMPF Detector Spectrometer, Counter

Reactions

$\pi^+ deut \rightarrow p p \pi^+ \pi^-$  220-300 MeV ( $T_{lab}$ )  
 $\pi^- deut \rightarrow n n \pi^+ \pi^-$  "

Comments Measures the angular distribution of pions at 256 MeV lab kinetic energy in 5 or 10° steps and excitation functions at fixed angle and fixed momentum transfer at 220 and 300 MeV. The presumed  $pp\pi^+$  and  $nn\pi^-$  bound states decay only weakly in these charge states, so resonances should be narrow. Ran for 396 hours.

Papers PL B215 (1988) 41.

**LAMPF-1119** (Jun 1988) Approved Aug 1988; Started Aug 1988; Completed Oct 1988.

**UNPOLARIZED DIFFERENTIAL CROSS SECTIONS FOR  $pd$  ELASTIC SCATTERING AT INTERMEDIATE ENERGIES**

TEXAS A AND M - A J Simon  
LOS ALAMOS - M W McNaughton, J R Santana  
TEXAS U - M L Barlett, K H McNaughton, P J Riley  
UCLA - S Beedoe, E Gulmez (✓ Spokesperson), T Jaroszewicz,  
A G Ling, C A Whitten  
RUTGERS U - V R Cupps  
RICE U - D L Adams

Accelerator LAMPF Detector Wire chamber, Counter

Reactions

$p deut \rightarrow p deut$  650, 800 MeV ( $T_{lab}$ )

Comments Measures the absolute  $pd$  elastic scattering cross sections from 35 to 115° c.m. at 650 MeV and from 35 to 140° c.m. at 800 MeV with a typical accuracy of 2 or 3%. Uses MWPC's. Ran for 170 hours.

Papers NIM A297 (1990) 7, NIM A297 (1990) 17, and PR C43 (1991) 2067.

**LAMPF-1135** (Jul 1988) Approved Aug 1988; Started Oct 1988; Completed Oct 1988.

**FEASIBILITY STUDY OF TAGGED  $\eta$  MESON PRODUCTION IN  $p^3H \rightarrow ^4He \eta$**

UCLA - D B Barlow (✓ Spokesperson), B M K Nefkens, C Pillai  
(✓ Spokesperson), J W Price, M J Wang, J A Wightman  
LOS ALAMOS - K W Jones, M J Leitch, C S Mishra  
(✓ Spokesperson), C L Morris, J Peng  
BOSKOVIC INST, ZAGREB - I Šlaus  
TAIWAN, INST PHYS - P K Teng  
ARIZONA STATE U - J M Tinsley

Accelerator LAMPF Detector LAHRS

Reactions Polarized beam

$p trit \rightarrow He \eta$  756.5, 785, 800 MeV ( $T_{lab}$ )

Comments Aimed to obtain  $\eta$ 's tagged by  $^4He$  detectors for use in investigating rare and weak  $\eta$  decays. Problems with tritium targets prevented this study. Instead, the beam time was used to collect data on some of the background reactions. Ran for 92 hours.

Papers PR C45 (1992) 293. No other papers expected.

**LAMPF-1173** (Jul 1989) Approved Jan 1990.

**SEARCH FOR  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  OSCILLATIONS WITH HIGH SENSITIVITY**

LSND COLLABORATION

UC, IRVINE - G Yodh  
UC, RIVERSIDE - J H Kang, W Strossman, G J VanDalen  
UC, SANTA BARBARA - D Bauer, D Borden, D Caldwell, A Lu,  
S Yellin  
EMBRY-RIDDLE AERONAUTICAL U - D Smith  
UCIRPA, SLAC - A Eisner, M Sullivan, W Vernon, Y Wang  
LINFIELD COLL, OREGON - I Cohen, D Schnitzler  
LOS ALAMOS - R D Bolton, R Burman, J Donahue,  
F Federspiel, W Foreman, G T Garvey, T Kozłowski, W C Louis  
(✓ Spokesperson), J Margulies, V Sandberg, M Schillaci,  
D H White, D Whitehouse, D Wilkinson  
LOUISIANA STATE U - A Fazely, R Imlay, C Lyndon,  
W Metcalf, G Singha  
NEW MEXICO U - B B Dieterle, C P Leavitt, R Reeder,  
F Schaefer  
PENN U - M Albert, A K Mann  
TEMPLE U - C Athanassopoulos, L B Auerbach, P Hermida,  
V Highland, D Works, Y Xiao  
VALPARAISO U, INDIANA - D D Koetke, R Manweiler

Accelerator LAMPF Detector SCINT

Reactions

$\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  < 200 MeV ( $T_{lab}$ )  
 $\nu_\mu \rightarrow \nu_e$  "



## SUMMARIES OF LOS ALAMOS EXPERIMENTS

$\nu_e C \rightarrow e^- \text{ nucleon}$  " "  
 $\nu_\mu C \rightarrow \mu^- \text{ nucleon}$  " "  
 $\nu C \rightarrow \nu C^*$  " "  
 $\nu_\mu p \rightarrow \nu_\mu p$  " "

**Comments** A search for neutrino oscillations to the level  $\sin^2 \theta = 3 \times 10^{-4}$ , where  $\theta$  represents the mixing angle if there was two-generation mixing. Uses neutrinos produced by both at-rest and in-flight decaying pions. The detector consists of a tank with 200 t of liquid scintillator and with 1224 photomultiplier tubes mounted on the inside tank surface. Other physics goals include a search for rare decays  $\pi^0 \rightarrow \nu\bar{\nu}$  and  $\eta \rightarrow \nu\bar{\nu}$ , and the measurement of  $\nu_\mu p$  elastic scattering. Scheduled to run May 93.

**LAMPF-1178** (Jul 1989) Approved Aug 1989.  
**POLARIZATION ASYMMETRY MEASUREMENTS FOR  $^1\text{H}(\pi^-, \pi^0)n$  BETWEEN 45 AND 100 MeV**

ARIZONA STATE U - R Alarcon, C Allgower, J R Comfort ( $\checkmark$  Spokesperson), J Goergen, C Mertz  
 NEW MEXICO STATE U - G Burleson ( $\checkmark$  Spokesperson), G Kyle  
 LOS ALAMOS - J Jarmer, J O'Donnell, S Penttila, M Rawool-Sullivan  
 MINNESOTA U - D Dehnhard, J Langenbrunner, M Palarczyk, C M Riedel  
 OLD DOMINION U - A Klein  
 COLORADO U - S Hoiibraten, J Peterson  
 MARYLAND U - N Chant, P Roos  
 TEXAS U - G Hoffmann  
 TRIUMF - G Smith

**Accelerator** LAMPF **Detector** Spectrometer

**Reactions** Polarized target  
 $\pi^- p \rightarrow \pi^0 n$  45 - 100 MeV ( $T_{\text{lab}}$ )

**Comments** Measures the analyzing powers from 15 to 115° c.m. This is the first measurement at such low energies. Expected to run in 1994.

**LAMPF-1179** (Jul 1989) Approved Aug 1989; Started Oct 1990.

**REACTION  $\pi^+ p \rightarrow \pi^+ \pi^0 p$  NEAR THRESHOLD**

VIRGINIA U - K A Assamagan, J P Chen, D Day, E Frelz, K J Keeter, R M Marshall, J S McCarthy, R C Minehart, D Počanić ( $\checkmark$  Spokesperson), L C Smith  
 STANFORD U - W J Cummings, G E Dodge, S S Hanna, B H King, S E Kuhn  
 LOS ALAMOS - J D Bowman, J N Knudson

**Accelerator** LAMPF **Detector** Spectrometer, Plastic

**Reactions**  
 $\pi^+ p \rightarrow \pi^+ \pi^0 p$  265 - 375 MeV/c ( $P_{\text{lab}}$ )

**Comments** Measures inclusive and exclusive cross sections for  $\pi^0$  production near threshold in order to obtain a new constraint on the  $I = 2$ ,  $s$ -wave  $\pi\pi$  scattering length. Uses a  $\pi^0$  spectrometer and a plastic scintillator counter array. Ran for 520 hours. Next run scheduled for June 92.

**LAMPF-1182** (Jul 1989) Approved Aug 1989.

**MEASURING THE NEUTRON-NEUTRON SCATTERING LENGTH AND EFFECTIVE RANGE USING THE  $^2\text{H}(\pi^-, 2n)\gamma$  REACTION**

LOS ALAMOS - C L Morris  
 MINNESOTA U - M M Gazzaly  
 TEXAS U - C F Moore, G Pauletta  
 ALBERTA U - H W Fielding, L G Greeniaus, F C Khanna, G C Nielson  
 KING FAHD UNIV - A H Hussein (Spokesperson)

**Accelerator** LAMPF **Detector** SCINT

**Reactions**  
 $\pi^- \text{ deut} \rightarrow n n \gamma$  > 30 MeV ( $T_{\text{lab}}$ )

**Comments** Measures low energy  $nn$  scattering parameters. The reaction products are detected in triple coincidence.

**LAMPF-1188** Started Oct 1987.  
**SEARCH FOR TIME REVERSAL SYMMETRY VIOLATION AND PARITY VIOLATION AT THE PROTON STORAGE RING**

LOS ALAMOS - C D Bowman, J D Bowman ( $\checkmark$  Spokesperson), J J Szymanski, V Yuan  
 PRINCETON U - D Benton, G Cates, K P Coulter, A B McDonald  
 HARVARD U - T E Chupp  
 CHALK RIVER, AECL - E D Earle

**Accelerator** LAMPF **Detector** Counter

**Reactions** Polarized beam and target  
 $n$  nucleus

**Comments** Searches for time-reversal and parity violation in low-lying nuclear states. Preliminary results have detected parity violation in states of  $^{139}\text{La}$ ,  $^{165}\text{Ho}$ ,  $^{232}\text{Th}$ ,  $^{235}\text{U}$ , and  $^{238}\text{U}$ . The neutron beam is 57% polarized from 1 eV to 20 keV. Continues taking data (February 92).

**Papers** PR C39 (1989) 1721, PRL 65 (1990) 1192, PRL 67 (1991) 564, and PR C44 (1991) 2187.

**LAMPF-1190** (Jul 1990) Approved Aug 1990; Started Aug 1991.

**PION-PROTON INTEGRAL CROSS SECTION MEASUREMENTS**

COLORADO U - S Hoiibraten, M Kohler, J J Kraushaar, B Kriss, D S Oakley, R J Peterson, R A Ristinen ( $\checkmark$  Spokesperson), W R Smythe  
 LOS ALAMOS - C L Morris  
 TRIUMF - J T Brack, G R Smith

**Accelerator** LAMPF **Detector** SCINT

**Reactions**  
 $\pi^+ p \rightarrow \pi^+ p$  50-250 MeV ( $T_{\text{lab}}$ )

**Comments** Measures the integral cross section at 15 energies. Uses a liquid hydrogen target. Tests the currently accepted phase shift predictions, and provides new data on  $\pi p$  elastic scattering. Ran in August 91. Next run scheduled for June 92.

**LAMPF-1208** (Nov 1990) Approved Jan 1991; Started Jun 1991.

**NEUTRON-PROTON BREMSSTRAHLUNG**

LOS ALAMOS - J Koster, R O Nelson, M E Schillaci, S A Wender ( $\checkmark$  Spokesperson)  
 UC, DAVIS - F P Brady  
 LIVERMORE - M Blann, V R Brown, D Krofcheck  
 GRENOBLE U - D Lebrun, H Nifenecker, J Pinston  
 SASKATCHEWAN U - D Skopik

**Accelerator** LAMPF **Detector** SCINT

**Reactions**  
 $n p \rightarrow n p \gamma$  50-400 MeV ( $T_{\text{lab}}$ )

**Comments** Measurements include  $\gamma$  detection,  $\gamma$ - $p$  coincidence, and possibly triple  $\gamma$ - $p$ - $n$  coincidence. In progress (March 92).

**LAMPF-1213** (Nov 1990) Approved Jan 1991.

**MEASUREMENT OF THE NEUTRINO CAPTURE CROSS SECTION IN  $^{37}\text{Cl}$  AND  $^{127}\text{I}$  WITH  $\mu^+$  DECAY NEUTRINOS**

LOS ALAMOS - R L Burman, B T Cleveland  
 PENN U - T Daily, R Davis, J Distel, K Lande (Spokesperson), C K Lee, A Weinberger, P Wildenhain  
 WASHINGTON U, SEATTLE - W C Haxton  
 HERBERT LEHMAN COLL - J Ullman

**Accelerator** LAMPF **Detector** Other

**Reactions**  
 $\nu_e \text{ } ^{37}\text{Cl} \rightarrow e^- \text{ } ^{37}\text{Ar}$

## SUMMARIES OF LOS ALAMOS EXPERIMENTS

$\nu_e \text{ }^{127}\text{I} \rightarrow e^- \text{ }^{127}\text{Xe}$  —

Particles studied  $\nu$

Comments Measures neutrino capture cross sections for complex nuclei used in solar neutrino experiments. Checks the calibration of the Homestake chlorine solar neutrino detector. Uses neutrinos from  $\mu^+$  decay at the LAMPF beam stop, and radiochemical methods of detection.

**LAMPF-1234** (Nov 1990) Approved Jan 1991; Started Aug 1991; Completed Sep 1991.

**$K_{LL}$  AND  $P$  FOR  $np$  ELASTIC SCATTERING**

LOS ALAMOS — K Koch, M W McNaughton ( $\checkmark$  Spokesperson),

I Supek

TEXAS U — D A Ambrose, P Coffey, K Johnston,

K H McNaughton, P J Riley

TEXAS A AND M — G Glass, J C Hiebert, L C Northcliffe,

A J Simon

COLORADO U — D J Mercer

RICE U — D L Adams

ARGONNE — H Spinka

MONTANA U — R H Jeppesen

WASHINGTON STATE U — G E Tripart

CENTRAL ARKANSAS U — H Woolverton

Accelerator LAMPF Detector JANUS, Spectrometer

Reactions

$n p \rightarrow n p$  500, 580, 650, 730 MeV ( $T_{\text{lab}}$ )

Comments Measures spin-transfer  $K_{LL}$  and asymmetry  $A_n$  in two independent ways. Uses a liquid deuterium target, and the Scylla spectrometer. Clarifies a normalization discrepancy affecting older  $np$  data at LAMPF.

Papers PR C (submitted).

**LAMPF-1240** (Jul 1991) Approved Aug 1991.

**MEASUREMENT OF THE MICHEL PARAMETER  $\rho$  WITH THE MEGA POSITRON SPECTROMETER**

UCLA — D Barlow, B M K Nefkens, B Tippens

CHICAGO U — J Crocker, S C Wright

FERMILAB — P S Cooper

HOUSTON U — M Dziedzic, J Flick, E V Hungerford,

K Johnston, K Lan, B W Mayes, R Phelps, L Pinsky,

W von Witsch

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, T Kozlowski, M Kroupa, R E Mischke, F J Naivar,

M A Oothoudt, C Pillai, R D Werbeck, D Whitehouse,

C Wilkinson

QUEENS U, KINGSTON — A Hallin

STANFORD U — E B Hughes, C Jui, J N Otis, M W Ritter

TEXAS A AND M — L Van Ausdeln, C Gagliardi, G Kim, F Liu,

R E Tribble, X Tu, X Zhou

VALPARAISO U, INDIANA — R Fisk, D D Koetke,

R W Manweiler, S Stanislaus

VIRGINIA U — R Marshall, B Wright, K O H Ziock

HAMPTON U — K Baker, L Tang

INDIANA U — J Knott, K M Stantz, J Szymanski

VIRGINIA TECH — L E Pilonen ( $\checkmark$  Spokesperson), Y Zhang

WYOMING U — A R Kunselman

YALE U — J Markey

Accelerator LAMPF Detector MEGA

Reactions Polarized beam

$\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$  28 MeV/c

Comments An improved measurement of the Michel parameter  $\rho$ . A precision of  $\delta\rho/\rho = 0.001$  is expected. Approved for 336 hours. Scheduled to run September 92.

**LAMPF-1256** (Dec 1991) Approved Jan 1992.

**$\pi^\pm p$  ANALYZING POWERS AT 45 AND 67 MeV**

ARIZONA STATE U — R Alarcon, C Allgower, J R Comfort

( $\checkmark$  Spokesperson), J Gorgen, C Mertz

NEW MEXICO STATE U — G Burleson ( $\checkmark$  Spokesperson), G Kyle

LOS ALAMOS — S Greene, J Jarmer, C Morris, J O'Donnell,

S Penttila, M Rawool-Sullivan

MINNESOTA U — D Dehnhard, J Langenbrunner, M Palarczyk,

C M Riedel

ABILENE CHRISTIAN U — D Isenhower, M Sadler

BOSKOVIC INST, ZAGREB — I Supek

OLD DOMINION U — A Klein

TEXAS U — G Hoffmann

WYOMING U — G Rebka

Accelerator LAMPF Detector Spectrometer

Reactions

$\pi^+ p \rightarrow \pi^+ p$  45, 67 MeV ( $T_{\text{lab}}$ )

$\pi^- p \rightarrow \pi^- p$  "

Comments Measures the analyzing powers from 30 to 160° c.m. This is the first measurement at such low energies. Approved for 500 hours. Expected to run in 1993.

## SUMMARIES OF NOVOSIBIRSK EXPERIMENTS

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### NOVOSIBIRSK Experiments

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**NOVOSIBIRSK-CMD-2** (1984) Approved 1985; Started 1991.

**THE CRYOGENIC MAGNETIC EXPERIMENT AT VEPP-2M**

NOVOSIBIRSK, IYF - R R Akhmetshin, G A Aksenov, E V Anashkin, V M Aulchenko, B O Baibusinov, V S Banzarov, L M Barkov (Spokesperson), S E Baru, N S Bashtovoi, G A Blinov, A E Bondar, S I Eidelman, V E Fedorenko, G V Fedotovitch, A A Grebeniuk, D N Grigoriev, P M Ivanov, B I Khazin, A S Kuzmin, I A Loop, A V Maksimov, Y I Merzlyakov, A B Nomerotsky, V S Okhapkin, S G Pivovarov, T A Purlats, S I Redin, N M Ryskulov, Y M Shatunov, A I Shekhtman, M A Shubin, B A Shwartz, V A Sidorov, A N Skrinsky, V P Smakhtin, I G Snopkov, E P Solodov, V M Titov, I B Vasserman, Y V Yudin, V G Zavarzin, I V Zhuravkov  
 BOSTON U - D H Brown, L B Roberts, W Worstell  
 PITTSBURGH U - J A Thompson, C H Yang  
 YALE U - S K Dhawan, V W Hughes

Accelerator NOVO-VEPP-2M Detector CMD-2

Reactions

$e^+ e^- \rightarrow \text{charged}^+ \text{charged}^-$  0.36-1.4 GeV (Ecm)  
 (charged) (neutrals)

Particles studied  $\rho, \omega, \phi$

Comments Measures the hadronic part of the anomalous magnetic moment of the muon. Studies the dynamics of multihadron production, and rare decays of vector mesons. The magnetic detector consists of a 1.5-T superconducting solenoid, drift chamber, Z-chamber, muon identification system, CsI barrel calorimeter, and BGO endcap calorimeter.

Papers NIM A252 (1986) 299, and NIM A283 (1989) 752.

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**NOVOSIBIRSK-ND** (1978) Approved 1979; Started 1982; Completed 1987.

**THE NEUTRAL-SPECTROMETER EXPERIMENT AT VEPP-2M**

NOVOSIBIRSK, IYF - S I Dolinsky, V P Druzhinin, M S Dubrovina, S I Eidelman, V B Golubev, V N Ivanchenko, E V Pakhtusova, A N Peryshkin, S I Serednyakov  
 (✓ Spokesperson), Y M Shatunov, V A Sidorov, A N Skrinsky

Accelerator NOVO-VEPP-2M Detector NEUTSPEC

Reactions

$e^+ e^- \rightarrow \pi^0 \gamma$  <1.4 GeV (Ecm)  
 $e^+ e^- \rightarrow \eta \gamma$  "  
 $e^+ e^- \rightarrow \omega \pi^0$  "  
 $e^+ e^- \rightarrow \eta \pi^+ \pi^-$  "  
 $e^+ e^- \rightarrow 2\text{pion}$  "  
 $e^+ e^- \rightarrow 4\gamma$  "  
 $e^+ e^- \rightarrow 3\text{pion}$  "  
 $e^+ e^- \rightarrow 4\text{pion}$  "  
 $e^+ e^- \rightarrow 2\text{pion} \gamma$  "  
 $e^+ e^- \rightarrow e^- e^+ 2\gamma$  "  
 $e^+ e^- \rightarrow 2e^- 2e^+$  "

Particles studied  $\rho, \omega, \phi$

Comments Studies radiative and rare decays of vector mesons, and nonresonant hadronic production. Tests quantum electrodynamics. The neutral detector consisted of 168 NaI(Tl) counters. The detector is now dismantled.

Papers NIM 227 (1984) 467, PL B144 (1984) 136, YF 41 (1985) 1176 = SJNP 41 (1985) 752, YF 41 (1985) 1183 = SJNP 41 (1985) 756, PL B174 (1986) 115, PL B174 (1986) 453, YF 44 (1986) 633 = SJNP 44 (1986) 409, ZETFP 43 (1986) 457 = JETPL 43 (1986) 588, ZETFP 44 (1986) 493 = JETPL 44 (1986) 634, PL B186 (1987) 432, ZPHY C37 (1987) 1, ZETFP 45 (1987) 118 = JETPL 45 (1987) 145, YF 45 (1987) 1004 =

SJNP 45 (1987) 622, YF 47 (1988) 1635 = SJNP 47 (1988) 1035, YF 48 (1988) 436 = SJNP 48 (1988) 273, YF 48 (1988) 442 = SJNP 48 (1988) 277, YF 48 (1988) 753 = SJNP (1988) 480, ZPHY C42 (1989) 511, YF 50 (1989) 999 = SJNP 50 (1989) 621, and PRPL 202 (1991) 99.

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**NOVOSIBIRSK-SND** (1986) Approved 1987.

**THE NEUTRAL-SPECTROMETER EXPERIMENT AT VEPP-2M**

NOVOSIBIRSK, IYF - V M Aulchenko, T V Baier, A D Bukin, S I Dolinsky, V P Druzhinin, M S Dubrovina, I A Gaponenko, V B Golubev, V N Ivanchenko, M D Minakov, E V Pakhtusova, A N Peryshkin, A A Salnikov, S I Serednyakov  
 (✓ Spokesperson), Y M Shatunov, V A Sidorov, Z K Silagadze, A N Skrinsky, Y V Usov

Accelerator NOVO-VEPP-2M Detector SND

Reactions

$e^+ e^- \rightarrow \pi^0 \gamma$  <1.4 GeV (Ecm)  
 $e^+ e^- \rightarrow \eta \gamma$  "  
 $e^+ e^- \rightarrow \omega \pi^0$  "  
 $e^+ e^- \rightarrow \eta \pi^+ \pi^-$  "  
 $e^+ e^- \rightarrow 4\gamma$  "  
 $e^+ e^- \rightarrow e^- e^+ 2\gamma$  "  
 $e^+ e^- \rightarrow 2e^- 2e^+$  "  
 $e^+ e^- \rightarrow 2\text{pion}$  "  
 $e^+ e^- \rightarrow 3\text{pion}$  "  
 $e^+ e^- \rightarrow 4\text{pion}$  "  
 $e^+ e^- \rightarrow 2\text{pion} \gamma$  "

Particles studied  $K^0, \rho, \omega, \phi$

Comments Studies radiative and rare decays of vector mesons, nonresonant hadronic production, and neutral kaon decays. Tests quantum electrodynamics. The Spherical Neutral Detector (SND) consists of 1680 NaI(Tl) counters. Scheduled to run in 1992.

## SUMMARIES OF PSI/SIN EXPERIMENTS

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### PSI/SIN Experiments

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**SIN-R-72-02** (Nov 1972) Approved 1973; Started 1976; Completed May 1988.

**EXPERIMENTS WITH NEUTRON BEAMS**

FREIBURG U - R Buechle, J Franz, V Grundies, A Klett,  
P Koncz, M Krauth, R Peschina, E Roessle (✓ Spokesperson),  
H Schmitt (✓ Spokesperson), L Schmitt

Accelerator PSI Detector Spectrometer

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 B90 (1980) 367, PL B91 (1980) 214, PL B93 (1980) 384, ZPHY A298 (1980) 253, NIM 192 (1982) 407, PL B141 (1984) 170, ZPHY A316 (1984) 43, PL B153 (1985) 382, PL B158 (1985) 15, NP A472 (1987) 733, PL B213 (1988) 125, NP A490 (1988) 667, NP A510 (1990) 774, and NP A515 (1990) 541.

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**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 Eroe (Spokesperson), Z Fodor,  
J Kecskemeti, P Koncz, Z Seres

Accelerator SIN Detector Counter

Reactions

$n \text{ nucleus} \rightarrow \text{pion } X$	0.8-1.2 GeV/c
$n \text{ nucleus} \rightarrow p X$	"
$n \text{ nucleus} \rightarrow \text{deut } X$	"
$n \text{ nucleus} \rightarrow \text{trit } X$	"

Comments The nuclear targets are carbon, copper, and bismuth. Measures energy spectra of  $\pi^+$ ,  $\pi^-$ ,  $p$ ,  $d$ , and  $t$  from 51 to  $165^\circ$ .

Papers PL B153 (1985) 382, NP A472 (1987) 733, PL B213 (1988) 125, NP A510 (1990) 774, and NP A515 (1990) 541.

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**SIN-R-80-11** (Dec 1980) Approved Jan 1981; Started Feb 1982; Completed.

**SEARCH FOR ADMIXTURE OF HEAVY NEUTRINOS IN  $\pi^+ \rightarrow \mu^+ \nu_\mu$  DECAY**

VIRGINIA U - R C Minehart (✓ Spokesperson), K O H Ziock  
(✓ Spokesperson)  
PSI, VILLIGEN - M Daum, P R Kettle  
ZURICH, ETH - B Jost

Accelerator PSI 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, and PR D36 (1987) 2624.

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**SIN-R-81-02** (Aug 1981) Approved Sep 1981; Started 1984; Completed 1987.

**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 (Spokesperson)  
PSI, VILLIGEN - R Abela

Accelerator SIN Detector Counter

Reactions

$\mu^- \text{ nucleus}$	0 MeV/c
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Comments Ran for 800 hours.

Papers PR A38 (1988) 4395, PS T22 (1988) 90, and PR A39 (1989) 1610.

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**SIN-R-82-04** (Apr 1983) Approved May 1983; Started 1985; Completed Sep 1988.

**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, D Frei, M Hess, C Hug, E Hugentobler,  
W Krebs, U Moser (✓ Spokesperson), D Muster, G Stucki  
PSI, VILLIGEN - R Abela, D Renker, E Steiner

Accelerator PSI Detector Counter, Calorimeter

Reactions

$\pi^+ \rightarrow e^+ \nu_e$	85 MeV/c
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Particles studied  $\pi^+$

Comments The detector includes a  $4\pi$  BGO calorimeter with an average thickness of 18 radiation lengths. The resolution for 100 MeV electrons is 4% FWHM. Publication in preparation (December 92).

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**SIN-R-83-20-2** (Nov 1983) Approved Jan 1984; Started Jun 1984; Completed Nov 1989.

**MEASUREMENT OF THE 2S-2P ENERGY DIFFERENCE IN MUONIC  $^4\text{He}$  AT LOW GAS DENSITY**

ZURICH, ETH - H P von Arb, P Hauser, H Hofer, F Kottmann  
(Spokesperson), C Luechinger, R Schaeren

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. Publication in preparation.

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**SIN-R-83-29** (Dec 1983) Approved Jan 1984; Started Dec 1985; Completed 1988.

**MEASUREMENT OF THE  $\xi$  PARAMETER IN  $\mu$  DECAY**

ZURICH, ETH - H Burkard, R von Dincklage, W Fetscher  
(✓ Spokesperson), H Gerber, K Goering, K F Johnson  
PSI, VILLIGEN - M Salzmann  
MAINZ U, INST KERNPHYS - F Scheck

Accelerator PSI Detector Wire chamber

Reactions

$\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$	150 MeV/c
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Particles studied  $\mu^+$

Comments Ran for 600 hours.

Papers HPA 60 (1987) 1, and PL B194 (1987) 326.

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**PSI-Z-84-02** (Dec 1984) Approved Jan 1985; Started May 1986; Completed Jul 1988.

**HIGH PRECISION ANALYZING POWER MEASUREMENTS OF PROTON-PROTON SCATTERING AT ENERGIES AROUND  $E_p = 25 \text{ MeV}$**

ERLANGEN U - M Haller, W Kretschmer (Spokesperson),  
H Loeh, F Post, A Rauscher, R Schmitt, W Schuster, D Voetisch  
ZURICH, ETH - M Bittcher, C Forstner, W Gruebler  
(Spokesperson), V Koenig, P A Schmelzbach, D Singy, J Ulbricht, B Vuaridel

Accelerator PSI Detector Counter

## SUMMARIES OF PSI/SIN EXPERIMENTS

Reactions Polarized beam  
 $p p \rightarrow p p$  221, 272 MeV/c

**PSI-Z-85-06** (Nov 1985) Approved Nov 1985; Started 1986; Completed 1987.

### PARITY VIOLATION IN PROTON-DEUTERON SCATTERING

ZURICH, ETH - S Kystriin, J Lang, J Leichti, T Maier, R Mueller, M Simonius (✓ Spokesperson), J Smirsky  
 WISCONSIN U - W Haerberli

Accelerator PSI Detector Wire chamber

Reactions Polarized beam  
 $p \text{ deut} \rightarrow p X$  300 MeV/c

Comments The parity-violating longitudinal analyzing power obtained is  $A_Z = (0.39 \pm 0.74) \times 10^{-7}$ .

Papers PL B219 (1989) 58. No other papers expected.

**SIN-R-85-10** (Jan 1985) Approved Mar 1985; Started Aug 1984; Completed Aug 1985.

### PRECISION MEASUREMENT OF THE $\pi^0$ - $\pi^-$ MASS DIFFERENCE

PSI, VILLIGEN - J F Crawford, M Daum (✓ Spokesperson), R Frosch (✓ Spokesperson), B Jost, P Kettle  
 VIRGINIA U - R M Marshall, B K Wright, K O H Ziock

Accelerator PSI Detector Counter

Reactions  
 $\pi^- p \rightarrow \pi^0 n$  0.0 MeV/c  
 $\pi^- p \rightarrow \gamma n$  "

Particles studied  $\pi^0$

Comments Studies the  $\pi^0$ - $\pi^-$  mass difference. The kinetic energy distribution of the  $\pi^- p$  atoms in liquid hydrogen at the time of charge exchange has a component extending up to about 1 eV, and a tail up to about 70 eV.

Papers PRL 56 (1986) 1043, PL B213 (1988) 391, and PR D43 (1991) 46. No other papers expected.

**SIN-R-85-11** (1985) Approved 1985; Started 1986.

### PION ABSORPTION ON TRITIUM

BASEL U - G Backenstoss (Spokesperson), R Powers, P Salvisberg, M Steinacher, H J Weyer  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE & KARLSRUHE U - A Hoffart, H Ullrich (Spokesperson)  
 ZAGREB U - M Furić, T Petković

Accelerator SIN Detector Counter

Reactions  
 $\pi^- \text{ trit} \rightarrow n n n$  50-220 MeV ( $T_{\text{lab}}$ )  
 $\pi^+ \text{ trit} \rightarrow p p n$  "  
 $\pi^+ \text{ He}$  "  
 $\pi^- \text{ He}$  "

Comments The  $^4\text{He}$  reactions are for quasifree  $2N$  absorption and exclusive  $3N$  absorption.

Papers NP A501 (1989) 765, and NP A517 (1990) 413.

**PSI-R-85-13-3** (Jan 1989) Approved Jan 1989; Started May 1989.

### MEASUREMENT OF ELASTIC $\pi^\pm p$ SCATTERING BELOW 100 MeV

KARLSRUHE U - C Joram, W Kluge (✓ Spokesperson), R Wieser  
 TUBINGEN U - R Bilger, H Clement (✓ Spokesperson), K Foehl, K Heitlinger, G J Wagner  
 PSI, VILLIGEN - D Renker

Accelerator PSI Detector Spectrometer

Reactions  
 $\pi^\pm p \rightarrow \pi^\pm p$  30 - 100 MeV ( $T_{\text{lab}}$ )

$\pi^- p \rightarrow \pi^- p$  "

Comments Angular distribution of cross sections between 10 and 125° in the laboratory system and the analyzing power are measured to determine with high accuracy the  $s$  and  $p$  wave phase shifts below 100 MeV pion energy. The goal is a test of the chiral perturbation theory of QCD as outlined in a series of papers by Gasser and Leutwyler *et al.* The size of the  $\sigma$  term evaluated from experimental data by means of forward dispersion relations is here the crucial number.

Papers PR D40 (1989) 3568, NIM A297 (1990) 444, and RPP 54 (1991) 1251.

**SIN-R-85-14** (Feb 1985) Approved Mar 1985; Started Oct 1985; Completed 1987.

### MEASUREMENT OF THE $\pi^0 \rightarrow e^+e^-$ BRANCHING RATIO WITH SINDRUM

ZURICH U - S Egli, R Engfer, M Grossmann-Handschin, E A Hermes, F Muheim, H S Pruijs, A van der Schaaf (✓ Spokesperson), D Vermeulen  
 ZURICH, ETH - R Eichler, L Felawka, T Kozlowski, C Niebuhr (✓ Spokesperson), S M Playfer, H K Walter  
 PSI, VILLIGEN - W Bertl, N Lordong  
 SACLAY - J Martini  
 AACHEN, TECH HOCHSCH, III PHYS INST - U Bellgard  
 BRITISH COLUMBIA U - R Meijer-Drees, C E Waltham

Accelerator PSI Detector SINDRUM

Reactions  
 $\pi^- p \rightarrow \pi^0 n$  0.0 MeV/c  
 $\pi^- p \rightarrow \pi^0 X$  "  
 $\pi^- p \rightarrow e^+ e^- n$  "  
 $\pi^0 \rightarrow e^+ e^-$  —  
 $\pi^0 \rightarrow X \gamma$  —  
 $\pi^0 \rightarrow e^+ e^- \gamma$  —

Particles studied  $\pi^0$

Comments Another paper in preparation.

Papers PR D40 (1989) 2796, and PR D (accepted).

**SIN-R-86-02** (Dec 1985) Approved Jan 1986; Started Sep 1986; Completed Dec 1989.

### STUDY OF THE REACTION $\pi^- p \rightarrow \pi^+ \pi^- n$ IN THE REGION OF $\Delta$ DOMINANCE

ERLANGEN U - R Baran, U Bohnert, M Dillig, P Helbig, G Herrmann, A Hofmann (✓ Spokesperson), O Jaekel, H Krueger, D Malz, W Menzel, R Mueller, H Ortner (✓ Spokesperson), L Schweinzer, S Wirth  
 KERNFORSCHUNGSZENTRUM, KARLSRUHE - W Kluge, H Matthaey

Accelerator PSI Detector Spectrometer

Reactions  
 $\pi^- p \rightarrow \pi^+ \pi^- n$  350-450 MeV/c

Comments Data were collected in a reasonable part of the phase space, in- and out-of-plane. Good statistics permit determination of the triple differential cross section.

Papers PRL 64 (1990) 2759, and NP A511 (1990) 733.

**PSI-R-86-05** (Jun 1987) Approved Jun 1987; Started Nov 1988.

### CRYSTAL DIFFRACTION OF PIONIC HYDROGEN AND DEUTERIUM X-RAYS

NEUCHATEL U - E D Bovet, D Chatellard, J Egger (✓ Spokesperson), G Fiorucci, E Jeannet  
 ZURICH, ETH - A Badertscher (✓ Spokesperson), W Beer, J Gilot, P F A Goudsmit, A J Rusi El Hassani, H J Leisi, D Sigg, S Thomann, W Volken, Z G Zhao  
 PSI, VILLIGEN - E C Aschenauer, K Gabathuler, J Missimer, L M Simons

Accelerator PSI Detector Photon spectrometer

## SUMMARIES OF PSI/SIN EXPERIMENTS

### Reactions

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

**Comments** Uses a bent crystal spectrometer with CCD's as 4 keV X-ray detectors. Ran for 12 weeks. Next data taking is scheduled for May/June 92.

**Papers** PL B261 (1991) 16.

**PSI-R-86-14** (Apr 1986) Approved Apr 1986; Started Apr 1986; Completed Mar 1988.

### EXPERIMENTS WITH POLARIZED NEUTRONS IN nE1: SPIN CORRELATIONS AND TOTAL CROSS SECTIONS

FREIBURG U - R Binz, J Franz, N Hamann, R Peschina-Klett, E Roessle, H Schmitt (✓ Spokesperson)  
 GENEVA U - P Demierre, G Gaillard, R Hess (✓ Spokesperson), C Leluc-Lechanoine, D Rapin  
 PSI, VILLIGEN - B Van den Brandt, M Daum, J Jaccard, J A Konter, S Mango  
 SACLAY - F Lehar

**Accelerator** PSI **Detector** Wire chamber, Counter

**Reactions** Polarized beam and target

$n p \rightarrow p n$  0.55-1.2 GeV/c

**Comments** Ran for 800 hours. Measured  $\Delta\sigma_L$  and  $\Delta\sigma_T$ . The parameters  $A_{0NN}$ , etc., are being analyzed.

**Papers** PL B231 (1989) 323, NP A508 (1990) 267c, and NP A533 (1991) 601.

**PSI-R-87-01** (Nov 1986) Approved Jan 1987; Started Dec 1988.

### PRECISION MEASUREMENT OF THE MUON MOMENTUM IN PION DECAY AT REST

PSI, VILLIGEN - M Daum, R Frosch (✓ Spokesperson), D Herter, R Horisberger, M Janousch, P Kettle, C Wigger  
 ZURICH, ETH - H Forrer  
 ZURICH U - C Broennimann, T Spirig

**Accelerator** PSI **Detector** Spectrometer

**Reactions**

$\pi^+ \rightarrow \mu^+ \nu_\mu$  0 MeV/c

**Particles studied**  $\nu_\mu, \pi^+$

**Comments** The muon momentum is measured to about 10 ppm. The experiment is continued with a surface muon channel.

**Papers** PL B265 (1991) 425.

**PSI-R-87-03** (Nov 1986) Approved Jan 1987; Started 1989.

### SEARCH FOR $\mu \rightarrow e$ CONVERSION WITH SINDRUM II

AACHEN, TECH HOCHSCH, III PHYS INST - C Dohmen, K Groth, B Heer, W Honecker, D Junker, G Otter, B Steinruecken, P Wintz  
 ZURICH, ETH - J Hofmann  
 PSI, VILLIGEN - W Bertl, J Egger, M Grossmann-Handschin, W D Herold, B Krause, D Renker, O Szavits, H K Walter  
 SWIERK, INST ATOMIC ENERGY - T Kozłowski  
 TBILISI STATE U - J Bagaturia, W Dzhordzhadze, D Mzavia  
 ZURICH U - S Eggli, R Engfer, C Findeisen, E A Hermes, C B Niebuhr, H S Pruys, A van der Schaaf (✓ Spokesperson)

**Accelerator** PSI **Detector** SINDRUM-II

**Reactions**

$\mu^- \text{nucleus} \rightarrow e^- \text{nucleus}$  90 MeV/c

**Particles studied**  $\mu^-$

**Comments** First ran in Fall 1989. Beam allocated for 20 weeks in 1991/92. Final run in 1994. The 1989 data will be submitted for publication in 1992.

**PSI-R-87-08** (Dec 1986) Approved Jan 1987; Started May 1987; Completed 1990.

### DIFFUSION OF MUONIC HYDROGEN ATOMS

WILLIAM AND MARY COLL - G Chen, A Hancock, J Kraiman, R Siegel (✓ Spokesperson), W Vulcan, R Welsh

PSI, VILLIGEN - C Petitjean, A Zehnder  
 VIENNA, OAW - W Breunlich, P Kammel (✓ Spokesperson), J Marton, J Zmeskal  
 MISSISSIPPI U - J Reidy (✓ Spokesperson), H Wolverton  
 MUNICH, TECH U - F Hartmann

**Accelerator** PSI **Detector** Counter

**Reactions**

$\mu^-$  34 MeV/c

**Comments** Measures initial velocity distribution and scattering cross sections for  $(\mu^- p)$  and  $(\mu^- d)$  atoms in  $^2\text{H}$  and  $^2\text{D}$ .

**Papers** PRL 63 (1989) 1942. Other publications to follow.

**PSI-R-87-12** (May 1987) Approved Jun 1987.

### n p ELASTIC SCATTERING: AN EXPERIMENT WITH POLARIZED NEUTRONS

FREIBURG U - J Arnold, J Franz, V Grundies, N Hamann, E Roessle, H Schmitt (✓ Spokesperson), H Urban  
 GENEVA U - P Demierre, N Goujon, E Heer, R Hess (✓ Spokesperson), C Leluc-Lechanoine, D Rapin, B Vuaridel  
 PSI, VILLIGEN - B van den Brandt, M Daum, A Konter, S Mango, P A Schmelzbach

**Accelerator** PSI **Detector** Wire chamber, Counter, Drift chamber

**Reactions** Polarized target

$n p \rightarrow p n$  0.5-1.2 GeV/c

**Comments** Measures the 2-spin and 3-spin transfer parameters  $K_{0PQ0}$ ,  $D_{0PQR}$ , and  $N_{0PQR}$ . Uses drift and multiwire proportional chambers, and a polarimeter. Scheduled to run March 92.

**PSI-R-89-01** (Jan 1989, May 1991) Approved Jan 1992.

### A PRECISE MEASUREMENT OF THE $\pi^+ \rightarrow \pi^0 e^+ \nu$ DECAY RATE

VIRGINIA U - K A Assamagan, J P Chen, D Day, E Frlež, K J Keeter, R M Marshall, J S McCarthy, R C Minehart, J H Mitchell, B E Nørum, D Počanić (✓ Spokesperson), O A Rondon-Aramayo, L C Smith, W A Stephens, B K Wright, K O H Ziock

PSI, VILLIGEN - M Daum, R Frosch, D Renker, C Wigger  
 SOLTAN INST, SWIERK - T Kozłowski

ARIZONA STATE U - B G Ritchie

DUBNA - V A Baranov, S Jakovlev, I V Kisel, A S Korenchenko, S M Korenchenko, D B Kozaikin, N P Kravchuk, N A Kuchinsky, A Moiseenko, K G Nekrasov

TBILISI STATE U - Y Bagaturia, W Djordjadze, G Melitauri, D Mzavia, T Sachelashvili

BOSKOVIC INST, ZAGREB & ZAGREB U - T Petković, I Supek

ZURICH U - C Broennimann, R Engfer, H Pruys

**Accelerator** PSI **Detector** Calorimeter, Wire chamber, Counter

**Reactions**

$\pi^+ \rightarrow \pi^0 e^+ \nu$  0 MeV/c  
 $\pi^+ \rightarrow e^+ \nu$  "

**Particles studied**  $\pi^+, \pi^0$

**Comments** The aim is to determine the branching ratio for the  $\pi^+ \rightarrow \pi^0 e^+ \nu$  decay to about 0.5% accuracy. Uses a 4π CsI calorimeter, MWPC's, and counters. Development runs scheduled for 1992. Data taking expected in 1993.

**PSI-Z-89-02** (Dec 1988) Approved Jan 1989; Started Sep 1989; Completed Jun 1991.

### NEUTRON MAGNETIC FORM FACTOR

BASEL U - J Jourdan (✓ Spokesperson), G Masson, I Sick  
 UTRECHT U - T S Bauer, E Joosse  
 NIKHEF, AMSTERDAM - P K A deWitt-Huberts, J Mitchell  
 VIRGINIA U - D Day, J Lichtenstadt

## SUMMARIES OF PSI/SIN EXPERIMENTS

Accelerator PSI Detector Plastic, Counter

Reactions

$e^-$  deut —

Comments Measures the ratio of cross sections  $d(e, e'n)$  and  $d(e, e'p)$ . The neutron detector is calibrated with the  $H(n, n'p)$  reaction. The goal is a measurement of the form factor with an accuracy better than 5% at momentum transfers of 1.4 and 1.7 fm<sup>-1</sup>. Uses two plastic neutron detectors preceded by 3  $\Delta E$  plastic veto counters. Ran also at NIKHEF.

**PSI-R-89-06** (Mar 1990) Approved Apr 1990; Started Apr 1990.

**SEARCH FOR SPONTANEOUS CONVERSION OF MUONIUM TO ANTIMUONIUM**

HEIDELBERG U, PHYS INST – B Braun, H Geerds, K Jungmann ( $\checkmark$  Spokesperson), F Maas, B E Matthias, G zu Putlitz, I Reinhard, W Schwarz, M Springer, L Willmann, L Zhang  
 ZURICH U – R Engfer, E A Hermes, R Menz, H S Pruys  
 PSI, VILLIGEN – R Abela, W Bertl ( $\checkmark$  Spokesperson), D Renker, H K Walter  
 AACHEN, TECH HOCHSCH, III PHYS INST – D Kampmann, G Otter, R Seeliger  
 SOLTAN INST, SWIERK – T Kozlowski  
 DUBNA – S Korentschenko, N Kuchinsky, K Nekrasov, N Zhuravlev  
 TBILISI STATE U – J Bagaturia, W Dzhordzhadze, A Mtchedlishvili, D Mzavia  
 YALE U – D Ciskowski, V W Hughes

Accelerator PSI Detector SINDRUM

Reactions

$\mu^+ e^- \rightarrow \mu^- e^+$  20 MeV/c ( $P_{lab}$ )

Particles studied  $\mu^-$ , muonium

Comments Studies lepton number violation. The  $\mu^-$  is detected by its decay electron, the atomic  $e^+$  is directly detected after acceleration by 10 kV. The reaction  $\mu^+ \rightarrow e^+ e^- e^+ \nu \nu$  is also studied. First data expected in Spring 1992.

**PSI-Z-89-06** (Dec 1988) Approved 1989; Started 1990; Completed 1991.

**SPIN DEPENDENT TOTAL CROSS SECTION  $\Delta\sigma_L$  IN  $np$  SCATTERING**

BASEL U – J Goetz, C Gysin, P Haffter (Spokesperson), M Hammans, R Henneck, J Jourdan, S Robinson, I Sick  
 PSI, VILLIGEN – B van den Brandt, J A Konter, S Mango

Accelerator PSI Detector Counter

Reactions Polarized beam and target

$n p$  60 MeV ( $T_{lab}$ )

Comments The transverse polarized proton beam is converted to a longitudinally polarized neutron beam. Paper is in preparation.

**SIN-R-89-07** (Jan 1989) Approved Jan 1989; Started Jun 1989.

**$\bar{n}p$  RADIATIVE CAPTURE**

BASEL U – P Haffter, M Hammans, R Henneck, J Jourdan, G S Masson (Spokesperson), S Robinson, I Sick

Accelerator PSI Detector Counter

Reactions Polarized beam

$n p \rightarrow deut \gamma$  68 MeV ( $T_{lab}$ )

Comments Studies analyzing power over a large angular range. NaI detectors measure the asymmetry of gammas observed in coincidence with deuterons.

**PSI-Z-90-07** (Dec 1989) Approved Jan 1990; Started Jul 1991.

**SEARCH FOR EXTENSIONS OF THE STANDARD MODEL BY A RELATIVE BETA POLARIZATION MEASUREMENT FROM POLARIZED NUCLEI**

ZURICH, ETH – M Allet, K Bodek, M Ferro-Luzzi, W Hajdas, J Lang, R Mueller, S Navert, O Naviliat-Cuncic ( $\checkmark$  Spokesperson), G Spiekerman, J Sromicki, J Zejma  
 LOUVAIN U – J Camps, J Deutsch, F Gimeno-Nogues, I Pepe, R Prieels, N Severijns, E Thomas  
 WISCONSIN U – P A Quin

Accelerator PSI Detector Spectrometer

Reactions Polarized beam

$p \ ^{12}C \rightarrow n \ ^{12}N$  70 MeV/c

Comments Measures the relative longitudinal polarization of positrons emitted from polarized  $^{12}\bar{N}$  nuclei produced in the reaction  $^{12}C(\bar{p}, n)^{12}\bar{N}$ . A new single-arm polarimeter has been designed and built.

**PSI-Z-90-12** (Jun 1990) Approved Jun 1990.

**DEVELOPMENT OF A SUPERCONDUCTING NEUTRINO AND DARK MATTER DETECTOR**

BERN U – C Berger, K Borer, G Czapek, U Diggelmann, I Flammer, M Furlan, S Janos, U Moser, K Pretzl ( $\checkmark$  Spokesperson), K Schmiemann  
 ANNECY – D Perret-Gallix  
 PSI, VILLIGEN – B van den Brandt, J A Konter, S Mango

Accelerator PSI Detector Other

Comments Uses 70 MeV neutrons to test a new detection method based on superheated superconducting granules. Taking data (Dec 91).

Papers NIM A306 (1991) 572.

**PSI-Z-91-02** (Dec 1990) Approved Dec 1990; Started Mar 1991.

**MEASUREMENT OF THE NEUTRON-PROTON SPIN CORRELATION PARAMETER AT FORWARD ANGLES**

BASEL U – D Fritschi, J Goetz, P Haffter, M Hammans, R Henneck, J Jourdan, G Masson, M L Qin, S Robinson, I Sick, A Trzcinski, M Tuccillo, B Zihlmann ( $\checkmark$  Spokesperson)  
 PSI, VILLIGEN – B van den Brandt, J A Konter, S Mango

Accelerator PSI Detector Counter

Reactions Polarized beam and target

$p n \rightarrow p n$  72 MeV ( $T_{lab}$ )

Comments Measures the spin correlation parameter  $A_{zz}$  in elastic  $\bar{p}\bar{n}$  scattering over a wide range of forward angles. Uses plastic scintillator.

**PSI-R-91-08** (Jun 1991) Approved Jul 1991.

**MEASUREMENT OF THE STOPPING POWER FOR MUONS ( $\mu^-$ ,  $\mu^+$ ) AT ENERGIES BETWEEN 2 AND 40 keV**

MUNICH, TECH U – P Baumann, H Daniel, F J Hartmann ( $\checkmark$  Spokesperson), M Muehlbauer, W Schott, P Wojciechowski  
 PSI, VILLIGEN – A Fuchs, K Lou, C Petitjean, D Taqqu ( $\checkmark$  Spokesperson)

ZURICH, ETH – P Hauser, F Kottmann

Accelerator PSI Detector Combination

Reactions

$\mu^+ C$  0.6–3.0 MeV/c

$\mu^- C$  "

Comments Muon detection via PPAC and secondary electron emission from thin foils. Uses carbon and other various targets. Scheduled to run Spring 1992.

SUMMARIES OF SACLAY EXPERIMENTS

SACLAY Experiments

**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  
SACLAY - J Ball, P Chaumette, J Deregel, 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 ( $T_{lab}$ )

Particles studied deut

Comments See also SACLAY-216 and -217.

Papers PR C43 (1991) 1532.

**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 (✓ Spokesperson)  
TRIESTE U - R Birsas, F Bradamante, S DallaTorre-Colautti, M Giorgi, L Lanceri, A Martin, A Penzo, P Shiavon, A Villari

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam  
 $p p \rightarrow p p$  0.94-2.44 GeV/c

Comments Uses a scintillating target.

Papers NP A505 (1989) 581.

**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 - M Arignon, J Ball, J Bystricky, P Chaumette, J Deregel, J Fabre, J M Fontaine (✓ Spokesperson), F Lehar (✓ Spokesperson), A de Lesquen, F Perrot, F Petit, L van Rossum

ANNECY - H Azaiez, A Michalowicz  
INFN, TRIESTE - S DallaTorre-Colautti, A Penzo, A Villari  
GENEVA U - W R Leo, Y Onel  
UCLA - V Ghazikhanian, C A Whitten

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam and target  
 $p p \rightarrow p p$  1.2-3.8 GeV/c

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. See also SACLAY-225.

Papers NIM A239 (1985) 131, NIM A262 (1987) 207, EPL 3 (1987) 1175, JdeP 48 (1987) 199, JdeP 48 (1987) 1273, JdeP 48 (1987) 1901, NP B294 (1987) 1001, NP B294 (1987) 1013, NP B296 (1988) 527, NP B296 (1988) 535, NP B297 (1988) 653, NP B315 (1989) 269, NP B315 (1989) 284, NP B321 (1989) 299, JdeP 51 (1990) 2689, and JdeP 51 (1990) 2747.

**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  
deut deut  $\rightarrow$  He  $\pi^0$  0.8-1.35 GeV ( $T_{lab}$ )

Comments Tests charge symmetry violation at the level of 1 pb/sr.

Papers PRL 58 (1987) 1922.

**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  
 $p p \rightarrow p p$  1.0-2.0 GeV/c  
 $n p \rightarrow n p$  "

Comments Uses a nucleon-nucleon polarimeter with neutron counters.

Papers NP A444 (1985) 597, NP B286 (1987) 635, and NP B304 (1988) 673.

**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 - M Boivin, Y Le Bornec

SACLAY & TOKYO U - F Soga

STRASBOURG, CRN - E Aslanides, D Benabdelouahed, A M Bergdolt, 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  $\rightarrow \pi^- X$  —

Papers PL B229 (1989) 33, PR C43 (1991) 973, and NP A528 (1991) 608.

**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  $\rightarrow {}^2\text{He } \text{nucleus}$  "



## SUMMARIES OF SACLAY EXPERIMENTS

**Comments** The ( $d, {}^2\text{He}$ ) reaction is a charge-exchange spin-transfer reaction like the ( $n, p$ ) reaction. Measures the tensor analyzing power.

**Papers** PRL 59 (1987) 974.

**SACLAY-117** (Nov 1985) Approved Nov 1985; Started 1986; Completed.

**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 500 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 - N Van Sen, Y Yanlin  
 ALBERTA U - J Cameron, C Lapointe, D M Sheppard  
 NEUCHÂTEL U - J F Germond  
 UNIVERSITY COLL, LONDON - C Wilkin

**Accelerator** SATURNE-II **Detector** SPES-IV

**Reactions** Polarized beam

deut  $p \rightarrow {}^3\text{He} \pi^0$  0.5-2.2 GeV ( $T_{\text{lab}}$ )

**Papers** PL B181 (1986) 28, and PL B214 (1988) 6.

**SACLAY-121** (Sep 1984) Approved Nov 1984; Started 1985; Completed 1991.

**SEARCH FOR DIBARYONS OF STRANGENESS  $S = -1$  BETWEEN THE  $\Delta N$  AND  $\Sigma N$  THRESHOLDS**

ORSAY, IPN - J P Didelez (✓ Spokesperson), R Frascaria (✓ Spokesperson), E Warde  
 SOUTH CAROLINA U - G Adams, G Blanpied, G Pignault, B Freedom (✓ Spokesperson)  
 NEUCHÂTEL 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 ( $S = -1$ )

**Papers** NC 102A (1989) 561, and NP A479 (1988) 389c.

**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**

$p p \rightarrow \text{deut } \pi^+$  336, 344, 350 MeV ( $T_{\text{lab}}$ )

**Particles studied** dibaryon

**Comments** Studies dibaryon resonances around 350 MeV.

**SACLAY-125** (Oct 1985) Completed.

**COMPARISON OF COHERENT AND INCOHERENT PRODUCTION OF  $\pi^0$  AND  $\eta$  ON NUCLEI**

INFN, TURIN & TURIN U - E Chiavassa, G Dellacasa, F Ferrero, M Gallio, N De Marco, A Musso, A Piccotti, E Vercellin

SACLAY - R Bertini (✓ Spokesperson), J M Durand  
 STRASBOURG, CRN - F Brochard

**Accelerator** SATURNE-II **Detector** PINOT

**Comments** PINOT is a high-resolution  $\pi^0$  and  $\eta$  detector.

**SACLAY-128** (Mar 1985) Started Aug 1986; Completed.

**FULL CALIBRATION OF THE SPES-I POLARIMETER FOR DEUTERONS BETWEEN 150 AND 400 MeV**

SACLAY - L Antonuk (✓ Spokesperson), J Arvieux, R Bertini, B Bonin, A Boudard, J M Durand, B Silverman, J Tinsley, J Yonnet

ALBERTA U - J Cameron, G Roy, D Sheppard  
 TRIUMF & ALBERTA U - D Hutcheon (✓ Spokesperson)

**Accelerator** SATURNE-II **Detector** SPES-I, POMME

**Reactions** Polarized beam

deut 150, 200, 250, 300, 350, 400 MeV ( $T_{\text{lab}}$ )

**Comments** Uses POMME, a medium energy deuteron polarimeter based on semi-inclusive deuteron-carbon scattering.

**Papers** NIM A288 (1990) 379, and NIM A288 (1990) 389.

**SACLAY-129** (Nov 1985) Started 1985; Completed.

**EXCITATION FUNCTION OF THE REACTION  $pp \rightarrow \text{DIBARYON}(2124) \rightarrow \pi^0 pp$  AT 0°**

ORSAY, IPN - J Didelez, M A Duval, R Frascaria (✓ Spokesperson), G Rappenecker, T Reposeur, R Siebert, E Warde

SOUTH CAROLINA U - G Blanpied, B Freedom, M Rigney  
 NEUCHÂTEL U - E Bovet, J Egger (✓ Spokesperson)

FRASCATI - G Battistoni, C Bloise, L Satta

SACLAY - J Laget, B Saghai  
 BONN U - F Hinterger

**Accelerator** SATURNE-II **Detector** SPES-0

**Reactions**

$p p \rightarrow p p \pi^0$  480-560 MeV ( $T_{\text{lab}}$ )

**Particles studied** dibaryon,  $\pi^0$

**Papers** NP A535 (1991) 445.

**SACLAY-132** (Nov 1985) Approved Nov 1985; Started May 1986; Completed.

**STUDY OF REACTIONS  $pp \rightarrow pn\pi^+$  AND  $pp \rightarrow pp\pi^+\pi^-$  WITH POLARIZED PROTONS FROM 0.8 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, CRN - F Brochard

**Accelerator** SATURNE-II **Detector** DIOGENE

**Reactions** Polarized beam

$p p \rightarrow p n \pi^+$  1.46, 3.31 GeV/c

$p p \rightarrow p p \pi^0$  "

$p p \rightarrow p p \pi^+ \pi^-$  3.31 GeV/c

**Comments** Uses a liquid hydrogen target.

**SACLAY-133** (Oct 1985) Approved Nov 1985; Started Jun 1986; Completed.

**DEPENDENCE ON  $A$  OF PION PRODUCTION IN THE REACTION  $p \text{ NUCLEUS} \rightarrow \pi X$**

STRASBOURG, CRN - D Benabdellouahed, G Bergdolt, O Bing, P Fassnacht, F Hibou (✓ Spokesperson)

ORSAY, IPN - Y Le Bornec (✓ Spokesperson), M P Comets, R Frascaria, B Tatischeff, N Willis

**Accelerator** SATURNE-II **Detector** SPES-III

**Reactions**

$p \text{ nucleus} \rightarrow \text{pion } X$  2.1, 2.7 GeV ( $T_{\text{lab}}$ )

**Comments** Studies pion production as a function of  $A$ .

**SACLAY-134** (Oct 1985) Approved Nov 1985; Started Mar 1986; Completed.

**STUDY OF DEUTERON BREAKUP IN THE REACTION  $d \text{ NUCLEUS} \rightarrow pX$  AT 2.5 AND 3.72 GeV/c**

## SUMMARIES OF SACLAY EXPERIMENTS

ORSAY, IPN - J P Didelez, R Frascaria, E Warde  
 SACLAY - R Beurtey, M Boivin, F Plouin, J Yonnet  
 (✓ Spokesperson)  
 WILLIAM AND MARY COLL - C Lyndon, C F Perdrisat  
 (✓ Spokesperson), V Punjabi, P Ulmer  
 VIRGINIA U - P C Gugelot  
Accelerator SATURNE-II Detector SPES-IV  
Reactions Polarized beam  
 deut nucleus  $\rightarrow p X$  3.72 GeV/c  
Comments Targets are H, He, and C. Measures the cross section  
 and analyzing power  $T_{20}$  at  $0^\circ$ .  
Papers PRL 59 (1987) 2840, and PR C39 (1989) 608. No other  
 papers expected.

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### SACLAY-137 (Oct 1985) Approved Jun 1986; Completed. FULL CALIBRATION OF THE "AHEAD" (ALBERTA HIGH EFFICIENCY ANALYZER FOR DEUTERONS) POLARIMETER FOR DEUTERONS BETWEEN 100 AND 260 MeV

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  $p \rightarrow p p n$  "  
Papers NIM A305 (1991) 257.

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### 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, M Boivin, A Boudard, L Goldzahl  
 (✓ Spokesperson), F Plouin, J Yonnet  
 ALBERTA U - G Roy  
 FRASCATI - F Fabbri, G Picozza, L Satta (✓ Spokesperson)  
 UCLA - V Ghazikhanian, J 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  $\pi^+$  "

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### SACLAY-140 (Oct 1985) Approved Nov 1985; Started Jul 1986; Completed.

**FIRST MEASUREMENT OF DIFFERENTIAL CROSS  
 SECTIONS AND ANALYZING POWERS FOR THE  
 REACTIONS  $np \rightarrow pp\pi^-$  AND  $np \rightarrow d\pi^+\pi^-$**   
 SACLAY - R Beurtey, B Bonin, A Boudard, G Bruge, P Couvert,  
 J Duchazeaubeneix, J Faivre, J 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  $\pi^+ \pi^-$  "

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### SACLAY-144 (Oct 1985) Approved Nov 1985; Started Dec 1985; Completed Dec 1990. NUCLEON-NUCLEON PROGRAM (PART II): $np$ SCAT- TERING UP TO 1.2 GeV

SACLAY - J Ball, J M Fontaine, C D Lac, F Lehar  
 (✓ Spokesperson), A de Lesquen, M de Mali, F Perrot  
 (✓ Spokesperson), L van Rossum

GENEVA U - J Bach, G Gaillard, R Hess (✓ Spokesperson),  
 D Rapin, P Sormani  
 FREIBURG U - R Binz, A Klett, R Peschina, E Rossle,  
 H Schmitt  
 DUBNA - L Barabash, B Khachaturov, Y Usov  
 PRAGUE, TECH U - Z Janout  
 ARGONNE - D Lopiano, H Spinka

Accelerator SATURNE-II Detector Combination  
Reactions Polarized beam and target  
 $n p \rightarrow n p$  0.312-1.10 GeV ( $T_{lab}$ )  
 $p p \rightarrow p p$  "

Comments Measures  $np \rightarrow np$  and  $pp \rightarrow pp$  using a polarized  
 deuteron beam, and also  $np \rightarrow np$  using a free polarized neu-  
 tron beam (the polarized neutrons come from polarized deuteron  
 breakup). Measures  $\Delta\sigma_L$ ,  $\Delta\sigma_T$ , the correlation parameter,  
 Wolfenstein parameters, and 3-spin index parameters. Compares  
 results for free and quasi-free scattering. Data analysis contin-  
 ues.

Papers PL B169 (1986) 241, JdeP 48 (1987) 985, NP B286  
 (1987) 635, PL B189 (1987) 241, NP B304 (1988) 673, ZPHY  
 C40 (1988) 193, and NP B358 (1991) 297.

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### SACLAY-145 (Jun 1987) Approved Nov 1987, Oct 1988. MEASUREMENTS OF $A_{ZZ}$ AND $P_Z$ FOR THE REAC- TION $\bar{d}p \rightarrow \bar{p}pn$ IN COMPLETE KINEMATICS

ST PETERSBURG, INP - S L Belostotsky (Spokesperson),  
 G A Korolev, O V Miklukho, M G Strikman, A A Vorobyov  
 BUDAPEST, CRIP - J Eroe  
 SACLAY - A Boudard, V N Nikulin

Accelerator SATURNE-II Detector SPES-IV  
Reactions Polarized beam  
 deut  $p \rightarrow p p n$  2 GeV ( $T_{lab}$ )

Comments A complete kinematics experiment to study the  
 behavior of the  $S$  and  $D$  waves in the deuteron.

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### SACLAY-155 (Nov 1986) Approved Jun 1987. ABNORMAL PRODUCTION OF LOW-ENERGY NEU- TRAL PIONS IN THE REACTION $pA \rightarrow \pi^0 X$ BETWEEN 300 AND 420 MeV BEAM KINETIC ENERGY

SACLAY - D Bachelier, C Cerruti, J M Hisleur, J Julien  
 (Spokesperson), B Saghai  
 GRENOBLE U - D Lebrun, V S Nguyen  
 KERNFORSCHUNGSANLAGE, JULICH - K Kilian  
 UPPSALA U - T Johansson  
 MOSCOW, INR - A Kurepin

Accelerator SATURNE-II Detector Counter  
Reactions  
 $p$  nucleus  $\rightarrow \pi^0 X$  300-420 MeV ( $T_{lab}$ )

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### SACLAY-157 (Dec 1986) Approved Jun 1987; Started Jun 1987.

#### MEASUREMENT OF THE MASS OF THE ETA AND CALIBRATION OF THE SATURNE BEAM ENERGY

SACLAY - J Banaigs, J Berger, R Beurtey (Spokesperson),  
 A Boudard, L Goldzahl, A Nakach, F Plouin (Spokesperson),  
 G Simonneau, C Whitten  
 ECOLE POLYTECHNIQUE - P Fleury  
 FRASCATI - L Satta

Accelerator SATURNE-II Detector SPES-IV  
Reactions Polarized beam and target  
 deut  $p \rightarrow {}^3\text{He } \pi^0$  0.65, 1.3, 1.6, 2.1, 2.4, 3.2 GeV/c  
 deut  $p \rightarrow$  trit  $\pi^+$  "  
 deut  $p \rightarrow {}^3\text{He } \eta$  "  
 deut  $p \rightarrow {}^3\text{He } \omega$  "  
 deut  $p \rightarrow {}^3\text{He } \eta'$  "

Particles studied  $\eta, \omega, \eta'$   
Papers PRL 61 (1988) 919.

## SUMMARIES OF SACLAY EXPERIMENTS

**SACLAY-166** (Feb 1988) Approved Jun 1988; Started Sep 1988; Completed 1991.

**REACTION  $H(d, 2p)n$  WITH POLARIZED DEUTERONS AT 200 MeV**

GRENOBLE U - J P Bocquet, J Carbonell, L Ghedira, S Kox (✓ Spokesperson), F Merchez, C Perrin, D Rebreyend  
SACLAY - J Arvieux, A Boudard, M Garcon, J Yonnet  
GENEVA U - G Gaillard  
STRASBOURG, CRN - G Guillaume  
RIKKYO U - T Motobayashi  
UNIVERSITY COLL, LONDON - C Wilkin

Accelerator SATURNE-II Detector EMRIC

Reactions Polarized beam

deut  $p \rightarrow p p n$  200, 350 MeV ( $T_{lab}$ )

Comments One of the aims is to demonstrate that the reaction  $^1H(d, 2p)n$  can be used to develop a new deuteron tensor polarimeter at intermediate energies. Measures the cross section and  $A_y$ ,  $A_{xx}$ , and  $A_{yy}$ , with an upgraded EMRIC detector. The detector is composed of an array of 25 CsI crystals working in conjunction with two MWPC's.

Papers PL B233 (1989) 69, and PL B266 (1991) 264.

**SACLAY-173** (Oct 1987) Approved Jun 1987; Started Nov 1987.

**ASYMMETRY IN  $pp$  SCATTERING IN SMALL STEPS OF ENERGY BETWEEN 130 AND 260 MeV**

SACLAY - J Arvieux, R Beurtey (Spokesperson), J M Durand, B Mayer, G Milleret, J Saudinos, Y Terrien

Accelerator SATURNE-II Detector Spectrometer

Reactions Polarized beam

$p p \rightarrow p p$  130-260 MeV ( $T_{lab}$ )

Comments Uses the beam polarimeter of the SD2 SATURNE extraction. The detector is a high energy scintillator with a good angular resolution.

**SACLAY-174** (1987) Approved Oct 1987; Started May 1988.

**PRODUCTION OF LIGHT MESONS  $X$  IN  $pp \rightarrow ppX$  AT THRESHOLD AND IN NUCLEAR MATTER**

STRASBOURG, CRN - A M Bergdolt, G Bergdolt, O Bing (✓ Spokesperson), A Bouchakour, F Brochard, R Ernwein, F Hibou

ORSAY, IPN - Y Le Bornec, M P Comets, P Courtat, B Tatischeff, N Willis

SACLAY - M Boivin, B Nefkens, F Plouin

BEN GURION U - A Moalem

Accelerator SATURNE-II Detector SPES-III

Reactions

$p p \rightarrow p p \eta$  1256, 1258, 1260, 1265, 1300,

1350, 1450, 1550 MeV ( $T_{lab}$ )

$p \ ^{12}C \rightarrow p p \ ^{11}B$  1260, 1450, 1550 MeV ( $T_{lab}$ )

$p \text{ deut} \rightarrow p \text{ deut } X$  905, 908 MeV ( $T_{lab}$ )

$p p \rightarrow p p \eta'$  2420 MeV ( $T_{lab}$ )

Comments In the first phase of the experiment (1989), the eta production near threshold in  $pp \rightarrow pp\eta$  and bound states of the  $\eta$  in  $p \ ^{12}C \rightarrow pp(\eta \ ^{11}B)$  were studied. The missing mass spectrum was reconstructed by detecting two photons in coincidence and at  $0^\circ$ . In 1990, the  $\eta'(958)$  meson was analyzed.

**SACLAY-177** (Oct 1988) Approved Jun 1988; Completed Oct 1989.

**DEUTERON VECTOR POLARIZATION AND POLARIZATION TRANSFER COEFFICIENTS IN THE REACTION  $pp \rightarrow d\pi^+$**

SACLAY - M Boivin, B Bonin, A Boudard, G Bruge, P Couvert, J M Durand, M Garcon, C Kerboul, B Mayer (✓ Spokesperson), Y Terrien, J Yonnet

ALBERTA U - R Abegg, L G Greeniaus, D A Hutcheon (✓ Spokesperson), W J McDonald, G A Moss

Accelerator SATURNE-II Detector SPES-IV, POMME

Reactions Polarized beam

$p p \rightarrow \text{deut } \pi^+$  1.2-2.9 GeV ( $T_{lab}$ )

**SACLAY-190** (Mar 1988) Approved Dec 1988; Completed May 1991.

**SPIN STRUCTURE OF THE  $\Delta$  EXCITATION**

ORSAY - D Bachelier, J C Jourdain  
COPENHAGEN U - C Gaarde (✓ Spokesperson)  
SACLAY - P Zupranski (✓ Spokesperson)

Accelerator SATURNE-II Detector SPES-IV

Reactions Polarized beam

deut  $p \rightarrow \ ^2He \Delta(1232 P_{33})^0$  —

Comments Measures  $T_{20}$  and  $T_{22}$ . A continuation of SACLAY-115. The analysis is in progress (February 92).

**SACLAY-192** (Mar 1988) Approved Jun 1988; Started Jul 1988; Completed Sep 1988.

**STUDY OF  $p$  NUCLEUS INTERACTIONS AT 0.8 AND 1.6 GeV**

SACLAY - J Gosset, D L'Hote, M C Lemaire (✓ Spokesperson), B Lucas, J Poitou, O Valette

STRASBOURG, CRN - P Gorodetzky (✓ Spokesperson)

CLERMONT-FERRAND U - J P Alard, J Augerat, N Bastid,

P Charmensat, P Dupieux, J L Marroncle, G Montarou

(✓ Spokesperson), M J Parizet, D Quassoud, A Rahmani

ORSAY, IPN - D Bachelier, J L Boyard, B Faure, T Hennino,

J C Jourdain, P Radvanyi, M Roy-Stephan

HEIDELBERG U, IHEP - D Pelte, M Trzaska

Accelerator SATURNE-II Detector Drift chamber

Reactions

$p$  nucleus 0.8, 1.6 GeV ( $T_{lab}$ )

Comments Charged pions and light nuclei have been measured in the interaction of proton beams with C, Nb, and Pb targets. A pictorial drift chamber of the DIOGENE large solid-angle detector has been used.

Papers PR C43 (1991) 2711.

**SACLAY-197** (Mar 1988) Approved Jun 1988; Started Nov 1988.

**STUDY OF  $pd \rightarrow \ ^3He X$  AT THRESHOLD FOR  $X = \omega$  OR  $\eta'$  AND FOR  $m_X = 1-1.5$  GeV**

SACLAY - R Beurtey, M Boivin, W Briscoe, P Fleury, J Martino,

B Mayer, A Moalem, F Plouin (Spokesperson)

ORSAY, IPN - D Bachelier, J L Boyard, T Hennino

UCLA - R Kessler, B M K Nefkens, J Price

Accelerator SATURNE-II Detector ?

Reactions

$p \text{ deut} \rightarrow \ ^3He X$  —

Particles studied  $\omega, \eta', \phi$

Comments A continuation of SACLAY-157.

**SACLAY-198** (Mar 1988) Approved Dec 1988; Started Nov 1990; Completed.

**MEASUREMENTS OF SOME RARE DECAY MODES OF THE  $\eta$**

SACLAY - A Baldisseri, A Boudard, B Fabbro, M Garcon,

W Jacobs, C Kerboul, B Mayer (✓ Spokesperson), J Poitou,

J Saudinos, E Tomasi, S Vigdor, F Wellers

UCLA - R Kessler, B M K Nefkens (✓ Spokesperson), B Tippens, M Wang

ZURICH U - E A Hermes, C Niebuhr, A van der Schaaf

GEORGE WASHINGTON U - W Briscoe, A Petrov

TRIUMF - R Abegg, W van Oers

## SUMMARIES OF SACLAY EXPERIMENTS

DUBNA - L Lytkin

Accelerator SATURNE-II Detector SPES-II

Reactions

$p \text{ deut} \rightarrow {}^3\text{He } \eta \quad > 896 \text{ MeV } (T_{\text{lab}})$

Particles studied  $\eta$

Comments Measures the  $\eta$  branching ratio to  $\mu^+\mu^-$  with 12% accuracy. The muons are detected by a two-range telescope. Events are identified by using constraints like coplanarity, angular correlation, total energy conservation, and the invariant mass of the two muons. Data analysis in progress (January 92).

**SACLAY-202** (Oct 1988) Approved 1988; Started 1989; Completed.

**STUDY OF THE PROTON POLARIZATION IN  $\vec{d}A \rightarrow \vec{p}X$  REACTION AT  $0^\circ$  AND 2.1 GeV**

WILLIAM AND MARY COLL - E Cheung, C F Perdrisat  
( $\checkmark$  Spokesperson)

NORFOLK STATE U - V Punjabi

SACLAY - R Beurtey, M Boivin, F Plouin, J Yonnet  
( $\checkmark$  Spokesperson)

TRIUMF - R Abegg

VIRGINIA U - P C Gugelot

INDIANA U - W W Jacobs

Accelerator SATURNE-II Detector SPES-IV, POMME

Reactions Polarized beam

$\text{deut nucleus} \rightarrow p X \quad 2.1 \text{ GeV } (T_{\text{lab}})$

Particles studied  $p$

Comments Measures the proton polarization and studies the  $D$  state of the deuteron. Results are submitted for publication (January 92).

**SACLAY-206** (Nov 1988) Approved Dec 1988.

**MEASUREMENT OF THE CROSS SECTION NEAR THRESHOLD FOR  ${}^6\text{Li } p \rightarrow {}^7\text{Be } \eta$**

SACLAY - M Boivin, H Catz, P Couvert, B Mayer, A Moalem,  
B Nefkens ( $\checkmark$  Spokesperson), E Tomasi, F Wellers

UCLA - D Barlow, R Kessler, C Pillai

ORSAY, IPN - D Bachelier, J L Boyard

GEORGE WASHINGTON U - W Briscoe

TRIUMF - R Abegg

Accelerator SATURNE-II Detector SPES-IV

Reactions

${}^6\text{Li } p \rightarrow {}^7\text{Be } \eta \quad 3944\text{--}4500 \text{ MeV } (T_{\text{lab}})$

Comments Running awaits the availability of a  ${}^6\text{Li}$  beam. In preparation (January 92).

**SACLAY-209** (Mar 1989) Approved 1989; Started 1990; Completed Nov 1991.

**CROSS SECTION FOR THE REACTION  $pp \rightarrow pp\pi^0$**

BONN U - G Anton, J Arends, M Breuer, K Buchler, G Noeldeke  
SOUTH CAROLINA U - G Blanpied ( $\checkmark$  Spokesperson), C Djalali,

M A Duval, B Freedom, M Rigney

ORSAY, IPN - G Berrier-Ronsin, J P Didelez ( $\checkmark$  Spokesperson),

A Elayi, R Frascaria, E Hourani ( $\checkmark$  Spokesperson),

G Rappenecker, L Rosier, R Siebert, E Warde

FRASCATI - G Battistoni, C Bloise, L Satta

NEUCHATEL U - J P Egger

SACLAY - B Saghai

Accelerator SATURNE-II Detector SPES-0

Reactions

$p p \rightarrow p p \pi^0 \quad 325\text{--}1000 \text{ MeV } (T_{\text{lab}})$

Particles studied  $\pi^0$

Comments Measures the differential cross section and asymmetries for the reaction, from threshold to 1000 MeV. Uses the SPES0-2 $\pi$  detector.

**SACLAY-212** (Feb 1989) Approved 1989; Started 1989.

**STUDY OF REACTIONS  $\vec{p}p \rightarrow \Delta n$ , AND  $\vec{p}p \rightarrow \Delta\Delta$  AT 1500, 1800, AND 2100 MeV**

ORSAY, IPN - Y Le Bornec, M P Comets ( $\checkmark$  Spokesperson),  
P Courtat, R Gacougnolle, E Loireux, F Reide

( $\checkmark$  Spokesperson), B Tatischeff, N Willis

SACLAY - M Boivin

Accelerator SATURNE-II Detector SPES-III

Reactions Polarized beam

$p p \rightarrow \Delta(1232 P_{33})^{++} n \quad 1.5, 1.8, 2.1 \text{ GeV}$

$p p \rightarrow \Delta(1232 P_{33})^{++} \Delta(1232 P_{33})^0 \quad (T_{\text{lab}})$

Particles studied  $\Delta(1232 P_{33})^{++}$

Comments The  $\Delta^{++}$  is detected by its decay products,  $p$  and  $\pi^+$ .

**SACLAY-213** (Feb 1989) Approved Jan 1989, Jan 1991.

**MEASUREMENT OF SPIN OBSERVABLES IN THE REACTION  $pp \rightarrow pK^+Y^*$**

TURIN U & INFN, TURIN - F Balestra, S Bossolasco,  
M P Bussa, L Fava, L Ferrero, R Garfagnini, A Grasso,

A Maggiora, D Panzieri, G Piragino, F Tosello, G Zosi

INDIANA U - L C Bland, W W Jacobs, S E Vigdor

SACLAY - J Arvieux, Y Bedfer, R Bertini ( $\checkmark$  Spokesperson),  
F Brochard

DUBNA - I V Falomkin, V I Lyascenko, G B Pontecorvo,  
V Serdyuk, V I Travkin, B Zalikhhanov

Accelerator SATURNE-II Detector Combination

Reactions Polarized beam

$p p \rightarrow p K^+ \Lambda \quad 3.8 \text{ GeV}/c$

$p p \rightarrow p K^+ \Sigma \quad "$

$p p \rightarrow p K^+ Y^*(\text{unspec}) \quad "$

Particles studied strange

Comments The experiment will measure differential cross sections, spin observables,  $A_{y0}$ ,  $D_{yy}$ ,  $P_\Lambda$ , and  $P_\Sigma$  at highest energies available at SATURNE-II. Expected to run in 1994. The detector, a magnet with chambers and counters, is under construction (February 92).

**SACLAY-216** (Mar 1989, Nov 1991)

**MEASUREMENT OF SPIN CORRELATION OBSERVABLES IN THE REACTION  $\vec{d}\vec{p} \rightarrow \vec{d}\vec{p}$  AT 1.6 GeV USING SCINTILLATING FIBER TRACKING DETECTORS**

UCLA - M Bleszynski, A Boutefnouchet, J Carroll,

V Ghazikhanian, G J Igo ( $\checkmark$  Spokesperson), T Jaroszewicz,

M Perdekamp, S Trentalange, C Whitten

SACLAY - J Arvieux, J Ball, A Boudard, J Bystricky, F Plouin,  
J Yonnet

Accelerator SATURNE-II Detector Counter

Reactions Polarized beam and target

$\text{deut } p \rightarrow \text{deut } p \quad 1.6 \text{ GeV } (T_{\text{lab}})$

Particles studied deut

Comments Continuation of the SACLAY-038-2 experiment. Uses a scintillating fiber hodoscope array.

**SACLAY-217** (Mar 1989)

**MEASUREMENT OF THE THIRD ORDER (SPIN TRANSFER) VECTOR AND TENSOR SPIN OBSERVABLES IN THE REACTION  $\vec{d}\vec{p} \rightarrow \vec{d}\vec{p}$  AT 1.6 GeV - DEUTERON BEAM ENERGY**

UCLA - J Carroll, Z Cherdoud, V Ghazikhanian, E Gulmez,  
G J Igo ( $\checkmark$  Spokesperson), T Jaroszewicz, S Trentalange,

C Whitten

SACLAY - J Arvieux, J Ball, A Boudard, J Bystricky,

J M Fontaine, F Plouin, J Yonnet

Accelerator SATURNE-II Detector Combination

## SUMMARIES OF SACLAY EXPERIMENTS

**Reactions** Polarized beam and target  
 $d + p \rightarrow d + p$  1.6 GeV ( $T_{lab}$ )

**Particles studied** deut

**Comments** The elastic  $dp$  scattering is studied with both  $N$ -type and  $L$ -type polarized proton targets. The spin-transfer observables are measured with considerably improved statistical accuracy. See also SACLAY-038-2.

**SACLAY-222** (Nov 1989) Approved 1989; Started 1990.  
**MESON PRODUCTION NEAR THRESHOLD FROM THE  $\phi$  TO THE  $f_1(1285)$**

ORSAY, IPN - J P Didelez, M A Duval, R Frascaria, M Morlet, R Siebert (Spokesperson), E Warde  
 SACLAY - J Arvieux, F Plouin  
 BONN U - J Bisplinghoff, J Ernst, F Hinterberger, R Jahn (Spokesperson), R Joosten, U Lahr, C Lippert, A Marx, R Wurzinger

**Accelerator** SATURNE-II **Detector** SPES-IV

**Reactions**

$p + d \rightarrow {}^3\text{He} + X$  —

**Particles studied**  $\phi$ ,  $f_1(1285)$

**Comments** Extends and refines existing measurements of the threshold excitation curve of meson production. An increasing degree of exclusivity is achieved by adding scintillator arrays to the SPES-IV detector. In the second phase, planned for March 1992, the regions around the  $K^+K^0$  threshold, and above 1.9 GeV, will be explored in 100 MeV steps.

**SACLAY-225** (Dec 1989) Approved Jun 1991; Started Nov 1991.

**DETERMINATION OF THE NUCLEON-NUCLEON SCATTERING AMPLITUDES IN THE ENERGY REGION FROM 1.1 TO 2.7 GeV AND A SEARCH FOR A STRUCTURE AROUND  $T_{kin} \sim 2.1$  GeV**

SACLAY - J Ball ( $\checkmark$  Spokesperson), J Bystricky, P Chesny, M Combet, J M Fontaine ( $\checkmark$  Spokesperson), R Kunne, F Lehar, M C Lemaire, A de Lesquen, M de Mali, J L Sans  
 GENEVA U - P Demierre, R Hess ( $\checkmark$  Spokesperson), D Rapin, B Vuaridel  
 ARGONNE - M Beddo, D Grosnick, D Hill, T Kasprzyk, D Lopiano, H Spinka ( $\checkmark$  Spokesperson), D Underwood, A Yokosawa  
 DUBNA - L S Barabash, E I Bunyatova, M Finger, V N Frolov, V A Kalinnikov, Y M Kazarinov, B A Khachaturov ( $\checkmark$  Spokesperson), E S Kuzmin, V N Mataphonov, I L Pisarev, A A Popov, Y A Usov  
 PRAGUE, TECH U - Z Janout

**Accelerator** SATURNE-II **Detector** Combination

**Reactions** Polarized beam and target

$p + p \rightarrow p + p$  1.1 - 2.7 GeV ( $T_{lab}$ )

$p + n \rightarrow p + n$  " "

**Comments** Uses a polarized proton beam, and polarized proton and deuteron targets. Measures various spin observables at 15 energies between 1.96 and 2.24 GeV, and spin dependent observables in  $pn$  quasielastic scattering at 8 energies between 1.1 and 2.7 GeV. The detector consists of a two-arm spectrometer, a polarimeter, and a large neutron counter hodoscope.

**SACLAY-233** (Nov 1990) Approved 1991.

**IN-FLIGHT BREAKUP OF THE POLARIZED  ${}^6\text{Li}$**

WILLIAM AND MARY COLL - E Cheung, C F Perdrisat ( $\checkmark$  Spokesperson), R Pourang  
 SACLAY - M Boivin, E Tomasi-Gustafsson, J Yonnet ( $\checkmark$  Spokesperson)  
 NORFOLK STATE U - V Punjabi  
 ORSAY, IPN - R Frascaria, R Siebert, E Warde  
 ST PETERSBURG, INP - S Belostotsky, O Miklukho, V Nikulin  
 TRIUMF - R Abegg  
 GEORGE WASHINGTON U - D Lehman

**Accelerator** SATURNE-II **Detector** SPES-IV, POMME

**Particles studied**  $p$ , deut,  ${}^3\text{He}$ , He

**Comments** Analyzes the breakup of polarized  ${}^6\text{Li}$  at 750 MeV/A, and compares results for  $(\text{Li}, d)$ ,  $(\text{Li}, \alpha)$ ,  $(\text{Li}, {}^3\text{He})$ , and  $(\text{Li}, {}^3\text{H})$  processes. Determines the  $D$ -state wave function in  $dd$  and  ${}^3\text{H}^3\text{He}$  projections of the  ${}^6\text{Li}$  ground state. More data taking scheduled for fall 1992.

**SACLAY-235** (Jan 1991) Approved Jan 1991, Dec 1991; Started Jul 1991.

**CALIBRATION OF POLDER, A NEW DEUTERON TENSOR POLARIMETER AT INTERMEDIATE ENERGIES**

GRENOBLE U - J P Bocquet, C Furget, S Kox ( $\checkmark$  Spokesperson), C Perrin, J S Real, D Rebreyend, E Voutier  
 SACLAY - M Garcon, E Tomasi-Gustafsson  
 ORSAY - L Bimbot, C Djalali, M Morlet, L Rosier, A Willis  
 RUTGERS U - G Edwards, C Glasshauser  
 SOUTH CAROLINA U - B Johnson

**Accelerator** SATURNE-II **Detector** POLDER

**Reactions** Polarized beam

$d + p \rightarrow p + p + n$  200 - 400 MeV ( $T_{lab}$ )

**Comments** Dedicated to the calibration of a new tensor polarimeter based on the  $H(d, 2p)n$  reaction. The polarimeter is to be operated in the deuteron energy range between 200 and 400 MeV. POLDER is particularly well designed for the  $t_{20}$  measurement of the recoiling deuteron in  $ed$  scattering at large momentum transfers. In progress (April 92).

**SACLAY-237** (Nov 1990) Approved Jan 1991; Started Jul 1991.

**STUDY OF THE  $pp \rightarrow pp\eta$  AND  $(p, \eta)$  REACTIONS ON NUCLEI AT  $T_p \geq 1.26$  GeV**

TURIN U & INFN, TURIN - E Chiavassa, G Dellacasa, F Ferrero, M Gallio, P Guaita, N De Marco ( $\checkmark$  Spokesperson), A Musso, A Piccotti, E Scomparin, E Vercellin ( $\checkmark$  Spokesperson)  
 MOSCOW, INR - S N Filippov, J K Gavrilov, V A Krasnov, A B Kurepin, A I Reshetin  
 SACLAY - J M Durand

**Accelerator** SATURNE-II **Detector** PINOT

**Reactions**

$p + p \rightarrow p + p + \eta$  —

$p + \text{nucleus} \rightarrow \eta + X$  —

$d + \text{nucleus} \rightarrow \eta + X$  —

**Comments** The aim is to study the first two reactions near threshold by detecting  $\eta$  mesons with the two-arm neutral meson spectrometer, PINOT. For the first reaction the total and doubly differential cross section  $d^2\sigma/d\Omega dT$  is measured. The  $(p, \eta)$  reaction on nuclei is studied at the same incident energies measuring the  $\eta$  kinetic energy distributions for  $\eta$ 's emitted forward in the laboratory. Also investigates the  $pd \rightarrow \eta X$  reaction in order to extract information on the  $pn \rightarrow \eta X$  elementary process, by comparing  $pd$  and  $pp$  induced reactions.

**SACLAY-244** (Apr 1991) Approved Jun 1991; Started 1991; Completed Sep 1991.

**STUDY OF THE REACTION  $\bar{p}p \rightarrow \pi^- \pi^- X$**

ORSAY, IPN - L Bimbot, Y Le Bornec, M P Comets, P Courtat, R Gacougnolle, T Kirchner, F Reide, B Tatischeff ( $\checkmark$  Spokesperson), N Willis  
 SACLAY - M Boivin, J Yonnet  
 STRASBOURG, CRN - A M Bergdolt, G Bergdolt, O Bing, F Hibou, A Taleb

**Accelerator** SATURNE-II **Detector** SPES-III

**Reactions** Polarized beam

$p + p \rightarrow \pi^- + \pi^- + X$  2.7 GeV ( $T_{lab}$ )

**Particles studied** dibaryon

**Comments** Studies the two-pion invariant mass, and production of high isospin dibaryons, particularly exploiting the mass region around  $2.156 \text{ GeV}/c^2$ . Analysis in progress (February 92).

## SUMMARIES OF SACLAY EXPERIMENTS

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**SACLAY-246** (May 1991) Approved Jun 1991.

$\pi^0$  PRODUCTION IN THE REACTION  $dp \rightarrow {}^3\text{He} \pi^0$   
**NEAR THRESHOLD**

SACLAY - A Baldisseri, A Boudard, B Fabbro, M Garcon,  
B Mayer ( $\checkmark$  Spokesperson), F Plouin, J Poitou, J Saudinos,  
E Tomasi

UCLA - B M K Nefkens ( $\checkmark$  Spokesperson), B Tippens, M Wang

DUBNA - L Lytkin

ZURICH U - C Niebuhr, A van der Schaaf

GEORGE WASHINGTON U - W Briscoe

TRIUMF - R Abegg, W van Oers

Accelerator SATURNE-II Detector SPES-II

Reactions Polarized beam

deut  $p \rightarrow {}^3\text{He} \pi^0$  0.4 GeV ( $T_{\text{lab}}$ )

Particles studied  $\pi^0$

Comments Scheduled to run July 92.

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SUMMARIES OF SERPUKHOV EXPERIMENTS

SERPUKHOV Experiments

**SERPUKHOV-UNK-001** (1988) Approved Apr 1988.  
**STUDY OF SPIN EFFECTS AT 400 TO 3000 GeV USING AN INTERNAL JET TARGET AT UNK**

SERPUKHOV - G A Alekseev, V D Apokin, Y I Arestov, N I Belikov, V V Borog, O V Buyanov, B V Chujko, V V Churakov, V S Datsko, A A Derevshchikov, A M Gorin, O A Grachev, V N Grishin, V A Kachanov, Y V Kharlov, V Y Khodyrev, V G Lapshin, V M Leontiev, I V Manujlov, Y A Matulenko, V A Medvedev, Y M Melnik, A P Meschanin, N G Minaev, V V Mochalov, A A Morozov, V K Myalitsyn, A I Mysnik, S B Nurusev, D I Patalakha, V A Polyakov, A F Prudkoglyad, A I Ronzhin, V I Rykalin, V V Rykalin, V L Rykov, L F Soloviev, V L Solovjanov (✓ Spokesperson), S M Troshin, M N Ukhanov, A N Vasilev, A E Yakutin, S V Yerin, A A Zajchenko, G V Zholobov

DUBNA - L S Barabash, S I Bilenkaya, N S Borisov, V A Budilov, V V Fimushkin, M Finger, N V Gorbunov, N L Gorshkova, V A Kalinnikov, A G Karev, Y M Kazarinov, B A Khachaturov, V S Kiselev, B Z Kopeliovich, M I Kulikov, R H Kutuev, E A Ladygin, A B Levkovich, M Y Liburg, V G Luppov, V N Matafonov, A B Neganov, V A Nikitin, P V Nomokonov, V P Obudkovsky, Y K Pilipenko, I L Pisarev, Y A Pliss, A A Popov, I K Potashnikova, M G Shafranova, V V Shutov, V I Snyatkov, Y A Usov, A I Valevich, V P Yershov, N K Zhydkov, I V Zhygulin, R Y Zulkarneev

TBILISI STATE U - N S Amaglobeli, Y S Bagaturia, B G Chiladze, G A Dzhambazishvili, L N Glonty, G G Macharashvili, A I Ocherashvili, R M Sakandelidze, T M Sakhelashvili

MOSCOW STATE U - L I Belzer, A I Demianov, A M Gribushkin, N A Kruglov, A S Proskuryakov, L I Sarycheva, N B Sinev, A A Yershov

MICHIGAN U - V A Anferov, R Baiod, J A Bywater, C M Chu, D G Crabb, D B Crandell, Y S Derbenev, W A Kaufman, A D Krisch (✓ Spokesperson), A M T Lin, D C Peaslee, R A Phelps, R S Raymond, D S Shoumkin, D P Stewart, J A Stewart, V K Wong

BROOKHAVEN - L G Ratner

MIT - G R Court, D Kleppner, A Yu

Accelerator SERPUKHOV-UNK Detector NEPTUN

<u>Reactions</u>	Polarized target	400-3000 GeV/c
$pp \rightarrow pp$		"
$pp \rightarrow \gamma X$		"
$pp \rightarrow e^- e^+ X$		"
$pp \rightarrow \mu^- \mu^+ X$		"
$pp \rightarrow \text{pion } X$		"
$pp \rightarrow K^\pm X$		"
$pp \rightarrow \eta X$		"
$pp \rightarrow \eta' X$		"
$pp \rightarrow \omega X$		"
$pp \rightarrow f_2(1270) X$		"
$pp \rightarrow \text{jet } X$		"
$pp \rightarrow \gamma \text{ jet } X$		"
$pp \rightarrow \Lambda X$		"
$pp \rightarrow \bar{\Lambda} X$		"
$pp \rightarrow p X$		"
$pp \rightarrow \bar{p} X$		"
$pp \rightarrow \text{hyperon } X$		"
$pp \rightarrow \Sigma^+ X$		"
$pp \rightarrow \Sigma^- X$		"
$pp \rightarrow \Xi^- X$		"
$pp \rightarrow \Lambda_c^+ X$		"

$p \text{ nucleus} \rightarrow \gamma X$	"
$p \text{ nucleus} \rightarrow e^- e^+ X$	"
$p \text{ nucleus} \rightarrow \mu^- \mu^+ X$	"
$p \text{ nucleus} \rightarrow \text{pion } X$	"
$p \text{ nucleus} \rightarrow K^\pm X$	"
$p \text{ nucleus} \rightarrow \eta X$	"
$p \text{ nucleus} \rightarrow \eta' X$	"
$p \text{ nucleus} \rightarrow \omega X$	"
$p \text{ nucleus} \rightarrow f_2(1270) X$	"
$p \text{ nucleus} \rightarrow \text{jet } X$	"
$p \text{ nucleus} \rightarrow \gamma \text{ jet } X$	"
$p \text{ nucleus} \rightarrow \Lambda X$	"
$p \text{ nucleus} \rightarrow \bar{\Lambda} X$	"
$p \text{ nucleus} \rightarrow p X$	"
$p \text{ nucleus} \rightarrow \bar{p} X$	"
$p \text{ nucleus} \rightarrow \text{hyperon } X$	"
$p \text{ nucleus} \rightarrow \Sigma^+ X$	"
$p \text{ nucleus} \rightarrow \Xi^- X$	"
$p \text{ nucleus} \rightarrow \Lambda_c^+ X$	"

Comments Studies spin effects when the 400 GeV and then 3 TeV protons in the UNK rings collide with a spin-polarized ultra-cold atomic-hydrogen internal jet target. Five different spectrometers will observe spin phenomena in various hadron-hadron reactions at small, medium, and large transverse momenta.

Papers PTE 3 (1991) 52, and PTE 4 (1991) 57.

**SERPUKHOV-UNK-002** (1988) Approved Apr 1988.  
**EXPERIMENTAL STUDY OF GLUON INTERACTIONS AND GLUEBALL PRODUCTION IN CENTRAL HADRON COLLISIONS IN THE ENERGY RANGE 500 GeV TO 3000 GeV AT UNK**

SERPUKHOV - S A Akimenko, V T Belousov, A M Blick, V S Datsko, A V Dolgoplov, S V Doñskov, A M Gorin, A V Inyakin, V P Kartashev, G V Khaustov, V N Kolosov, A K Konoplyannikov, A V Kulik, V M Kutjin, V G Lapshin, A A Lednev, I V Manuylov, Y M Melnik, A I Pavlinov, S A Polovnikov, V A Polyakov, Y D Prokoshkin (✓ Spokesperson), V B Rakhmatova, V I Rykalin, S A Sadovsky, V D Samoylenko, P M Shagin, A V Shtannikov, A V Singovsky, A S Soloviev, V P Sugonyaev, V G Vasilchenko, A E Yakutin, A A Zaichenko

DUBNA - V V Karpukhin, V I Komarov, V V Kruglov, A V Kuptsov, L L Nemenov

MOSCOW STATE U - L G Afanasyev, O E Gorchakov, A V Kulikov, V P Kurochkin, S V Trusov

KURCHATOV INST, MOSCOW - I I Gurevich, Y A Kozlov, V P Martemyanov, E P Solodov, G S Vidyakin, V N Vyrodov

NOVOSIBIRSK, IYF - L M Barkov, B I Khazin, P K Lebedev

MOSCOW, ITEP - V K Grigoryev, A P Grishin, V N Nozdrachev, V V Sokolovsky, V V Vladimirovsky

TBILISI, INST PHYS - A K Djavrishvili, D B Kapanadze, I Z Khalvashi, T A Lomtadze, G G Sekhneaidze

TBILISI STATE U - N S Amaglobeli, B G Chiladze, M D Tabidze

MOSCOW PHYS ENG INST - A M Baranov, A N Kalinovsky, Z Khorguashvili, S Y Smirnov

YEREVAN PHYS INST - A S Aleksanyan, A O Gasparyan

BRUSSELS U, IISN - F G Binon, J P Stroot

LOS ALAMOS - D B Alde, E A Knapp

ANNECY - J P Peigneux, M Poulet

KEK - S Inaba, M Kobayashi, K Takamatsu, T Tsuru

PISA U & INFN, PISA - R Bellazzini

Accelerator SERPUKHOV-UNK Detector GLUON

<u>Reactions</u>	500-3000 GeV/c
$p \text{ nucleon} \rightarrow p \text{ nucleon glueball}$	"
$p \text{ nucleon} \rightarrow p \text{ nucleon meson}^0$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \pi^- \text{ glueball}$	500-2500 GeV/c
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \pi^- \text{ meson}^0$	"
$K^+ \text{ nucleon} \rightarrow \text{nucleon } K^+ \text{ glueball}$	200-2000 GeV/c
$K^+ \text{ nucleon} \rightarrow \text{nucleon } K^+ \text{ meson}^0$	"

## SUMMARIES OF SERPUKHOV EXPERIMENTS

$p$ nucleon $\rightarrow J/\psi(1S)$ X	1000-3000 GeV/c
$p$ nucleon $\rightarrow \psi(\text{unspec})$ X	"
$p$ nucleon $\rightarrow \eta_c(1S)$ X	"
$p$ nucleon $\rightarrow \chi_c(\text{unspec})$ X	"
$p$ nucleon $\rightarrow \Upsilon(\text{unspec})$ X	"
$p$ nucleon $\rightarrow \eta_b$ X	"
$p$ nucleon $\rightarrow \chi_b(\text{unspec})$ X	"
$\pi^-$ nucleon $\rightarrow J/\psi(1S)$ X	500-2500 GeV/c
$\pi^-$ nucleon $\rightarrow \psi(\text{unspec})$ X	"
$\pi^-$ nucleon $\rightarrow \eta_c(1S)$ X	"
$\pi^-$ nucleon $\rightarrow \chi_c(\text{unspec}) \pi^-$ X	"
$\pi^-$ nucleon $\rightarrow \Upsilon(\text{unspec})$ X	"
$\pi^-$ nucleon $\rightarrow \eta_b$ X	"
$\pi^-$ nucleon $\rightarrow \chi_b(\text{unspec})$ X	"
$\pi^- p \rightarrow n \pi^0$	200-2400 GeV/c
$\pi^- p \rightarrow n \eta$	"
$\pi^- p \rightarrow n \eta'$	"
$\pi^- p \rightarrow n \omega$	"
$K^- p \rightarrow n \bar{K}^0$	"
$\bar{p} p \rightarrow n \bar{n}$	"

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

Papers NIM A302 (1991) 443.

**SERPUKHOV-UNK-003** (1988) Approved Apr 1988.

### THE MULTIPARTICLE SPECTROMETER

SERPUKHOV - S I Bitukov, G V Borisov, R I Dzhelyadin, V I Garkusha, Y P Gouz, V P Kartashov, A N Karyukhin, Y A Khokhlov, G A Klyuchnikov, V F Konstantinov, M E Kostrikov, V I Kotov, M A Kulagin, V V Lapin, V D Matveev, F N Novoskoltsev, V F Obratsov, A P Ostantkov, V K Semenov, N K Vishnevsky, E V Vlasov, A M Zaitsev ( $\checkmark$  Spokesperson)

DUBNA - A G Asmolov, G S Bitsadze, Y A Budagov, I E Chirikov-Zorin, Y I Davydov, V P Dzhelapov, A V Efremov, A A Feshchenko, V B Flyagin, N N Govorun, V G Ivanov, Y N Kharzheev, B Z Kopeliovich, Y F Lomakin, L K Lytkin, E I Maltsev, V N Pervushin, N A Rusakovich, A A Semenov, S V Sergeev, V V Vinogradov, A G Volodko

MOSCOW, INR - A I Berlev, V N Bolotov, E N Gushchin, V V Isakov, O V Karavichev, Y M Klubakov, V A Lebedev, V N Marin, E A Monich, Y V Musienko, A A Poblaguev, V E Postoev

TBILISI, INST PHYS - V V Beladidze, D I Hubua, V V Koshtoev, T A Lomtadze, I A Minashvili, R G Salukvadze, E G Tskhadadze

YEREVAN PHYS INST - A G Oganessian

MINSK, INST PHYS - A A Bogush, Y A Kulchitsky

BAKU, INST PHYS - O B Abdinov, V M Maniev

KOSICE, IEF - E Kladiva, L Shandor, I Shpalek

BRATISLAVA, INST PHYS - P Povinec, E Sitar, P Strmen

SOFIYA U - A B Iordanov, R V Tsenov

Accelerator SERPUKHOV-UNK Detector MPS

### Reactions

$p p \rightarrow \text{charm}$ X	3000 GeV/c
$p p \rightarrow \text{charm}$ X	"
$p p \rightarrow \text{bottom}$ X	"
$p p \rightarrow \text{bottom}$ X	"
$\gamma p \rightarrow \text{charm}$ X	<1500 GeV/c
$\gamma p \rightarrow \text{charm}$ X	"
$\gamma p \rightarrow \text{bottom}$ X	"
$\gamma p \rightarrow \text{bottom}$ X	"

Particles studied charm, bottom,  $B^+$ ,  $B^-$ ,  $B^0$ ,  $\bar{B}^0$ ,  $B_s$ ,  $\bar{B}_s$

**SERPUKHOV-UNK-004** (1988) Approved Apr 1988.

### THE UNIVERSAL CALORIMETRICAL DETECTOR FACILITY FOR COLLIDING BEAM EXPERIMENTS AT UNK

SERPUKHOV - S I Alekhin, V B Anikeev, Y M Antipov, E N Ardashev, I L Azhgirej, V V Babintsev, A V Batunin, S V Belikov, Y A Belokopytov, Y S Bodrov, W Y Bogolyubsky, G V Borisov, N K Bulgakov, V A Bumazhnov, A F Buzulutskov, S V Chekulaev, E V Chernyaev, P V Chliapnikov, N A Datsko, D S Denisov, S P Denisov ( $\checkmark$  Spokesperson), G V Djikia, A Y Dushkin, A O Efimov, V V Ermakov, S Y Ershov, V V Ezhela, Y V Fisyak, S S Gershtein, V Y Glebov, S N Gurdzhiev, V V Gusev, V F Kechkin, V A Khmelnikov, A G Kholodenko, A E Kiryunin, E P Kistenev, V I Klejmenov, S V Klimentko, V I Klyukhin, V I Kochetkov, I V Kotov, A I Kotova, E A Kozlovsky, A A Lebedev, A Y Levin, M S Levitsky, A K Likhoded, A G Liparteliani, V K Malyaev, M A Maslov, V Y Medved, V S Mikhailov, Y V Mikhailov, A M Minaenko, G Y Mitrofanov, V A Mizenko, A M Moiseev, N V Mokhov, E A Parshin, I M Perevozchikov, V A Petrov, Y F Pirogov, Y M Pishchalnikov, A V Pleskach, V M Podstavkov, K R Rudakov, V N Ryadovikov, R A Rzaev, A V Samarin, G I Selivanov, V A Senko, V A Sergeev, A N Shelkovenko, R S Shuvalov, V V Siksins, S R Slabospitsky, A A Sokolov, A P Soldatov, V N Solomko, E A Starchenko, D A Stoyanova, R M Sulyaev, N P Tkachenko, M N Ukanov, V A Uvarov, A V Uzunyan, I A Vishnyakov, G G Volkov, A P Vorobiev, O P Yushchenko, A Y Zotov

DUBNA - D Adam, G D Alekseev, N S Amelin, P Antonov, L S Azhgirej, A M Baldin, O Balea, D Y Bardin, B V Batyunya, S N Bazylev, Y Bem, K Beshliu, M S Bilenky, Y Biri, I V Boguslavsky, Y E Bonyushkin, S V Borodin, V A Butenko, S Cellar, S P Chernenko, P Chizhek, I N Churin, Y Cvah, D Damish, V K Dodokhov, V A Drozdov, L G Efimov, A V Efremov, L Ehn, I I Evsikov, B Fialkowski, N A Filatova, M Finger, I Formanek, P Geogiev, K Gladil, S V Goloskokov, V M Golovatyuk, O M Golubitsky, I A Golutvin, N V Gorbunov, Y D Gornushkin, N N Govorun, I M Gramenitsky, V G Grebenyuk, T S Grigalashvili, Y V Gusakov, Z Guzik, L Hajduk, S Hajduk, C S Hek, O Horvat, P Horvat, M A Ignatenko, I Ioan, I M Ivanchenko, A B Ivanov, V V Ivanov, S G Kadanzeev, R B Kadyrov, M N Kapishin, N N Karpenko, V Y Karzhavin, V S Khabarov, D M Khazins, B A Khomenko, N N Khovanskiy, P Khristova, Y T Kiryushin, D Kish, D Kisilewska, M Klein, K Koka, B Z Kopeliovich, B E Korneev, A V Korytov, B F Kostenko, V M Kotov, D Kovach, Y A Kozhevnikov, R Krasovski, A P Kretov, Z V Krumshtejn, P A Kulichin, A F Kuzmin, A S Kuznetsov, R Lednickiy, R Leitner, F V Levchanovsky, M Lokajcek, V Lomann, P Malinski, E I Maltsev, M Maly, P K Maniakov, P K Markov, M Mateev, E A Matyushevsky, E Y Mazepa, K S Medved, A L Menshikov, Y P Merekov, V A Meshcheryakov, G V Mitselmakher, P V Mojsenz, V P Moshkin, S A Movchan, E Nad, A Navrot, S Nedev, S Nemechek, T Nemes, A A Nikolina, P Nomokonov, G D Nowak, H Nowak, M Nowak, A A Nozdrin, I Odler, A G Olshevsky, L Ondrish, V V Palchik, A N Parfenov, I Patocka, V N Pervushin, V D Peshekhonov, K Piska, V V Polyakov, D Pose, V N Pozdnyakov, D B Prikhodko, A Prokes, A V Radyushkin, P Raimer, S V Razin, K Rybicki, V N Ryzhov, Y Rzidki, B M Sabirov, L Sabo, A B Sadovsky, K Safarik, A Sandacz, L Sandor, Y Sedlak, Y V Sedykh, A V Selikov, A E Senner, N E Sergeeva, M D Shafranov, G A Shelkov, S S Shimansky, V P Shirikov, A A Shirokov, S Y Shmakov, V G Sidorov, V Simak, P Simechek, A N Sinaev, N E Slavin, B Slovinski, V A Smirnov, D A Smolin, R Sosnowski, C Spasov, G D Stoletov, J Strachota, V Streit, V Streitova, M Suk, A Svind, V A Sviridov, E Taryan, P Temnikov, V G Timofeev, L G Tkachev, V Tlachala, V V Tokmelin, N V Toledo, R Toledo, V A Trofimov, V V Trofimov, E N Tsyganov, M Turala, I Turso, I A Tyapkin, M Uzhoki, K Vala, T Vamosh, A T Vasilenko, L S Vertogradov, A V Vishnevsky, A S Vodopianov, G Vojkulesku, V Vrba, S Vyskochil, I K Vzorov, I Wojtkowska, A Wrublewski, Y Yanchur, Y A Yatsunenkov, J Zacek, J Zafar, N S Zaikin, N I Zamyatin, Y V Zanevsky, S A Zaporozhets, A V Zharubin, V F Zavalov, V I Zayachki, Y D Zernin, V N Zhmyrov, N I Zimin, A I Zinchenko, V G Zinov, V Zita, B Zitova, I Zlatev, P V Zrelav

MOSCOW PHYS ENG INST - V D Ashitkov, V K Chernyatin, B A Dolgoshein, A N Kalinovsky, R P Kokoulin, A V Nikitin, A A Petrukhin

MOSCOW STATE U - G L Bashindzhagyan, S F Bereznev, M S Bitkov, G G Ermakov, P F Ermolov, V G Gavryushchev,



## SUMMARIES OF SERPUKHOV EXPERIMENTS

Y A Golubkov, Y V Grishkevich, V V Kozlov, A K Leflat,  
A N Marichev, V S Murzin, S M Puzin, V P Rukovichkin,  
N B Sarycheva, A N Shkurenkov, L N Smirnova, V Y Volkov,  
A G Voronin, S A Zotkin

LEBEDEV INST - E P Kuznetsov, S I Nikolsky,  
V P Pavlyuchenko, V A Tsarev, P S Vasiliev

ST PETERSBURG, INP - V A Khose, M G Ryskin,  
N N Smirnov, N K Terentiev, A A Vorobiev

TBILISI STATE U - N S Amaglobeli, D E Bakhtadze,  
V G Davitashvili, G R Dzibuti, S M Esakiya, G D Gogoladze,  
V G Kartvelishvili, G O Kuratashvili, A I Mgedlishvili,  
G G Senkhniadze, Y S Stolyarov, V F Tchunikhin,  
F G Tkebuchava, T P Topuriya

ALMA ATA, PHYS INST - E G Boos, B O Zhautykov

NOVOSIBIRSK, IYF - V V Anashin, E V Anashkin,  
V M Aulchenko, L M Barkov, A G Chilingarov, N S Dikansky,  
G V Fedotov, B I Khazin, S G Klimenko, P K Lebedev,  
A P Onuchin, V S Panin, V V Parkhomchuk, Y I Pril,  
V A Sidorov, A N Skirinsky, V P Smakhtin, E P Solodov,  
Y I Tikhonov

PAVIA U - J Liberali, V R Maloberti, P F Manfredi, D Marioli,  
V Speciale

MILAN U - A M Kassata, J Lobianko, K De Martinis,  
F Palombo, A Sala-Grabar

INFN, BOLOGNA & BOLOGNA U - P L Frabetti, L Stagni

Accelerator SERPUKHOV-UNK Detector UKD

### Reactions

$p p \rightarrow X$	6000 GeV (E <sub>cm</sub> )
$p p \rightarrow$ inelastic	"
$p p \rightarrow p p$	"
$p p \rightarrow p X$	"
$p p \rightarrow 2p X$	"
$p p \rightarrow$ charm X	"
$p p \rightarrow$ bottom X	"
$p p \rightarrow$ top X	"
$p p \rightarrow$ (jets) jet X	"
$p p \rightarrow \gamma$ (jets) jet X	"
$p p \rightarrow \mu^- \mu^+ X$	"
$p p \rightarrow$ quark X	"
$p p \rightarrow W^\pm$ (jets) X	"
$p p \rightarrow W^\pm$ 2hadron (hadrons)	"
$p p \rightarrow Z$ (jets) X	"
$p p \rightarrow Z$ 2hadron (hadrons)	"
$p p \rightarrow W^- W^+ X$	"
$p p \rightarrow$ higgs X	"
$p p \rightarrow W'^\pm X$	"
$p p \rightarrow X$ centauro	"
$p p \rightarrow Z' X$	"
$p p \rightarrow$ s-particle X	"
$p p \rightarrow q^* X$	"
$p p \rightarrow e^{*\pm} X$	"
$\bar{p} p \rightarrow X$	"
$\bar{p} p \rightarrow$ inelastic	"
$\bar{p} p \rightarrow \bar{p} p$	"
$\bar{p} p \rightarrow \bar{p} X$	"
$\bar{p} p \rightarrow$ charm X	"
$\bar{p} p \rightarrow$ bottom X	"
$\bar{p} p \rightarrow$ top X	"
$\bar{p} p \rightarrow$ (jets) jet X	"
$\bar{p} p \rightarrow \gamma$ (jets) jet X	"
$\bar{p} p \rightarrow \mu^- \mu^+ X$	"
$\bar{p} p \rightarrow$ quark X	"
$\bar{p} p \rightarrow W^\pm$ (jets) X	"
$\bar{p} p \rightarrow W^\pm$ 2hadron (hadrons)	"
$\bar{p} p \rightarrow Z$ (jets) X	"
$\bar{p} p \rightarrow Z$ 2hadron (hadrons)	"
$\bar{p} p \rightarrow W^- W^+ X$	"
$\bar{p} p \rightarrow$ higgs X	"

$\bar{p} p \rightarrow W'^\pm X$	"
$\bar{p} p \rightarrow X$ centauro	"
$\bar{p} p \rightarrow Z' X$	"
$\bar{p} p \rightarrow$ s-particle X	"
$\bar{p} p \rightarrow q^* X$	"
$\bar{p} p \rightarrow e^{*\pm} X$	"

Particles studied  $W^+, W^-, Z$ , centauro, top, s-particle,  $q^*$ ,  
 $\bar{q}^*$ , higgs,  $e^{*\pm}$ , hvy-lepton, gluino, higgsino, photino, s-lepton,  
s-quark,  $W'^\pm, Z'$

Comments Also studies exclusive decays of heavy quarks, Higgs bosons, W and Z bosons, and various supersymmetric particles.

**SERPUKHOV-UNK-005** (1988) Approved Apr 1988.

### STUDY OF HADRONIC INTERACTIONS AT UNK ENERGIES WITH THE STREAMER DETECTOR SYSTEM

TBILISI INST PHYS - L D Chikovani, L L Gabunia,  
Y U Gromov, E S Ioramishvili, A B Ivanova, A I Kharchilava,  
T V Khuskivadze, E G Korinteli, E S Kotlyarevsky,  
E S Majlyan, I Z Mandzhavidze, V A Mikhailov,  
R V Pirtskhalava, B K Rapava, L A Razdolskaya,  
N N Roinishvili, V N Roinishvili ( $\checkmark$  Spokesperson),  
L V Shalamberidze, G T Shergelashvili, G Z Shtemanetyan,  
A Y Staerman, A N Vysich

SERPUKHOV - I V Ajinenko, P V Chliapnikov, L N Gerdyukov,  
Y M Nosochkov, L P Petrovich, A M Rybin, O G Tchikilev

TBILISI STATE U - N S Amaglobeli, E S Garuchava,  
R Kvatadze, T G Makharadze, S S Shoshiashvili,  
A G Tomaradze

MOSCOW PHYS ENG INST - E M Gushchin, A N Lebedev,  
V P Protasov, V A Ryabov, S V Somov, G I Tipografshchik

Accelerator SERPUKHOV-UNK Detector TSD

### Reactions

$p p \rightarrow 2p$	6000 GeV (E <sub>cm</sub> )
$p p \rightarrow X$	"
$p p \rightarrow$ nucleus X	"
$p p \rightarrow X$ centauro	"
$p p \rightarrow$ charged X	"
$p p \rightarrow$ vee (vees) X	"
$p p \rightarrow K^0 X$	"
$p p \rightarrow \Lambda X + \bar{\Lambda} X$	"
$p p \rightarrow$ mult[charged] X	"
$p p \rightarrow$ (jets) jet X	"
$p p \rightarrow$ quark X	"
$\bar{p} p \rightarrow p \bar{p}$	"
$\bar{p} p \rightarrow X$	"
$\bar{p} p \rightarrow$ nucleus X	"
$\bar{p} p \rightarrow X$ centauro	"
$\bar{p} p \rightarrow$ charged X	"
$\bar{p} p \rightarrow$ vee (vees) X	"
$\bar{p} p \rightarrow K^0 X$	"
$\bar{p} p \rightarrow \Lambda X + \bar{\Lambda} X$	"
$\bar{p} p \rightarrow$ mult[charged] X	"
$\bar{p} p \rightarrow$ (jets) jet X	"
$\bar{p} p \rightarrow$ quark X	"

Particles studied centauro, quark

**SERPUKHOV-UNK-008** (1990) Approved 1990.

### STUDY OF MULTIMUON EVENTS IN $0.4 \times 3.0$ TeV $pp$ COLLISIONS WITH THE MULTIMUON SPECTROMETER (MMS)

SERPUKHOV - V V Abramov, I V Ajinenko, Y M Antipov  
( $\checkmark$  Spokesperson), V I Balbekov, B Yu Baldin, V A Bezzubov,  
A F Buzulutskov, D S Denisov, A S Dyshkant, A O Efimov,  
O V Eroshin, V N Evdokimov, A B Fenyuk, L N Gerdyukov,  
S S Gershtein, V Yu Glebov, Y P Gorin, G G Gurov,  
A N Gurzhiev, V G Kartasheva, A K Konoplyannikov,  
Y P Korneev, I V Kotov, A N Krinitsyn, V I Kryshkin,

## SUMMARIES OF SERPUKHOV EXPERIMENTS

A K Likhoded, I V Mandrichenko, K P Myznikov,  
 Y M Nosochkov, L P Petrovykh, A I Petrukhin,  
 V M Podstavkov, S R Slabospitsky, D A Stoyanova,  
 R M Sulyaev, O G Tchikilev, L K Turchanovich, A A Volkov,  
 TBILISI INST PHYS - K Ajobadze, L Chikovani, L Gabunia,  
 G Gogiberidze, T Houskivadze, A V Ivanova, A Kharchilava,  
 E Loramishvili, E S Mailyan, I Mandgavidze, V A Mikhailov,  
 R Pirtzkhvalava, B Rapava, N Roinishvili, V Roinishvili  
 (✓ Spokesperson), A Yu Shtaerman, V N Sokolov  
 TBILISI STATE U - E Garuchava, V Kartvelishvili, R Kvatzadze,  
 T Maharadze, Z Metreveli, S Shoshiashvili, E Toivtoiadze,  
 A Tomaradze  
 MOSCOW PHYS ENG INST - E M Gushin, A N Lebedev,  
 S V Somov, M K Timopheev, G I Tipografchik

Accelerator SERPUKHOV-UNK Detector MMS-UNK

### Reactions

$p p \rightarrow \text{top top X}$	2190 GeV ( $E_{cm}$ )
$p p \rightarrow W^- W^+ X$	"
$p p \rightarrow Z W^+ X$	"
$p p \rightarrow Z Z X$	"
$p p \rightarrow W^\pm X$	"
$p p \rightarrow Z X$	"
$p p \rightarrow W'^\pm X$	"
$p p \rightarrow Z' X$	"
$p p \rightarrow \text{bottom X}$	"
$p p \rightarrow \text{bottom X}$	"

Particles studied top,  $W'^\pm$ ,  $Z'$ ,  $W^+$ ,  $W^-$ ,  $Z$ , bottom, bottom

Comments Studies the production and leptonic decays of the  $W$ ,  $Z$ ,  $W'$  and  $Z'$ , and decays of the top, bottom, and charm quarks. MMS-UNK is a multimoon spectrometer for the  $0.4 \times 3.0$  TeV collider experiment at UNK.

**SERPUKHOV-107** Approved 1976; Started Feb 1976; Completed 1987.

### STUDY OF NEUTRINO AND ANTINEUTRINO INTERACTIONS WITH NUCLEI

SERPUKHOV - V V Ammosov (✓ Spokesperson), D S Baranov,  
 N A Chabrov, V I Ermolaev, V S Filipov, A A Ivanilov,  
 V I Khleborad, B T Konyushko, V M Korablev, V A Korotkov,  
 V A Krupnov, V V Makeev, A G Myagkov, N A Netyaga,  
 A Y Polyarush, Y G Ryabov, A A Sokolov, G G Volkov  
 LEBEDEV INST - E P Kuznetsov  
 BERLIN-ZEUTHEN ADW - H J Grabosh, H H Kaufmann,  
 R Nahnhauser, S Nowak, H E Roloff, S Schlenstedt

Accelerator SERPUKHOV Detector HLBC-SKAT

### Reactions

$\nu_\mu$ nucleus $\rightarrow \nu_\mu X$	3-30 GeV/c
$\nu_\mu$ nucleus $\rightarrow \mu^-$ hadron X	"
$\nu_\mu$ nucleus $\rightarrow \mu^- \gamma X$	"
$\nu_\mu$ nucleus $\rightarrow \mu^- \pi^0 X$	"
$\nu_\mu$ nucleus $\rightarrow \mu^- \pi^+$ nucleus	"
$\nu_\mu$ nucleus $\rightarrow \nu_\mu \pi^0$ nucleus	"
$\nu_\mu$ nucleus $\rightarrow \mu^- e^+ X$	"
$\nu_\mu$ nucleus $\rightarrow \mu^- e^- X$	"
$\nu_\mu$ nucleus $\rightarrow \mu^-$ charm X	"
$\nu_\mu$ nucleus $\rightarrow \rho^0 \mu^- X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \bar{\nu}_\mu X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+$ hadron X	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+ \gamma X$	"
$\bar{\nu}_\mu$ nucleus $\rightarrow \mu^+ \pi^0 X$	"
$\nu_e$ nucleus $\rightarrow e^- X$	"
$\nu_\mu n \rightarrow \mu^- p$	"
$\nu_\mu p \rightarrow \Delta(1232 P_{33})^{++} \mu^-$	"
$\bar{\nu}_\mu p \rightarrow n \mu^+$	"

Particles studied charm

Comments Studies neutral current processes, neutrino-electron scattering, charm decays, and dilepton production. Some 500,000 pictures ( $2 \times 10^{18}$  protons on target) were obtained in a

$\nu_\mu$  wide-band beam, and about 300,000 ( $1.5 \times 10^{18}$  protons on target) in a  $\bar{\nu}_\mu$  wide-band beam.

Papers YF 16 (1972) 546 = SJNP 16 (1972) 304, YF 17 (1973) 807 = SJNP 17 (1973) 420, YF 26 (1977) 110 = SJNP 26 (1977) 57, PL B70 (1977) 269, PL B76 (1978) 336, 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, ZETFP 30 (1979) 390 = JETPL 30 (1979) 362, ZETFP 30 (1979) 627 = JETPL 30 (1979) 590, PL B81 (1979) 255, PL B81 (1979) 258, PL B81 (1979) 261, PL B93 (1980) 191, ZETFP 31 (1980) 772 = JETPL 31 (1980) 728, ZETFP 34 (1981) 418, ZPHY C21 (1984) 189, ZPHY C21 (1984) 197, YF 40 (1984) 1454 = SJNP 40 (1984) 923, YF 41 (1985) 1520 = SJNP 41 (1985) 963, YF 43 (1986) 1186 = SJNP 43 (1986) 759, ZPHY C30 (1986) 175, ZPHY C30 (1986) 183, ZPHY C30 (1986) 569, ZPHY C31 (1986) 203, ZPHY C35 (1987) 329, YF 45 (1987) 1662 = SJNP 45 (1987) 1029, YF 46 (1987) 130 = SJNP 46 (1987) 80, YF 46 (1987) 1673 = SJNP 46 (1987) 998, PL B189 (1987) 245, YF 47 (1988) 113 = SJNP 47 (1988) 73, YF 47 (1988) 1630, ZPHY C40 (1988) 487, ZPHY C40 (1988) 493, YF 50 (1989) 106 = SJNP 50 (1989) 67, ZPHY C41 (1989) 527, ZPHY C42 (1989) 361, ZPHY C45 (1990) 551, YF 53 (1991) 986, and YF 53 (1991) 999.

**SERPUKHOV-112** (Jan 1976) Approved Jun 1976; Started Apr 1979; Completed 1989.

### POLARIZATION MEASUREMENT IN CHARGE-EXCHANGE REACTIONS AT 40 GeV/c

SERPUKHOV - V D Apokin, B N Chuyko, A A Derevshchikov,  
 V A Krendelev, Y A Matulenko, A P Meschanin, A I Misnic,  
 S B Nurushev (✓ Spokesperson), V I Rykalin, V G Rykov,  
 L F Soloviev, V L Solovyanov, A N Vasiliev

DUBNA - N S Borisov, E I Bunyotova, Y M Kazarinov  
 (✓ Spokesperson), B A Khachaturov, R K Kutuev, M Y Liburg,  
 A B Neganov, B S Neganov, I K Potashnikova, Y A Usov,  
 R Y Zulkarneev

Accelerator SERPUKHOV Detector PROZA

### Reactions

Polarized target	
$\pi^- p \rightarrow n \pi^0$	40 GeV/c
$\pi^- p \rightarrow n 2\pi^0$	"
$\pi^- p \rightarrow n \eta$	"
$\pi^- p \rightarrow n \eta'$	"
$\pi^- p \rightarrow n \omega$	"
$\pi^- p \rightarrow n f_2(1270)$	"
$K^- p \rightarrow n K_L$	"
$\pi^-$ nucleus $\rightarrow$ nucleus $\pi^0$	"
$K^-$ nucleus $\rightarrow$ nucleus $\pi^0$	"

Comments Ran for 4968 hours.

Papers YF 35 (1982) 382 = SJNP 35 (1982) 219, YF 35 (1982) 1465 = SJNP 35 (1982) 857, ZPHY C15 (1982) 293, YF 36 (1982) 1191 = SJNP 36 (1982) 694, YF 41 (1985) 116 = SJNP 41 (1985) 74, NP B255 (1985) 253, YF 42 (1985) 1146 = SJNP 42 (1985) 725, YF 42 (1985) 1152 = SJNP 42 (1985) 729, PTE 5 (1987) 46, ZPHY C35 (1987) 173, YF 45 (1987) 1355 = SJNP 45 (1987) 840, YF 46 (1987) 1108, YF 46 (1987) 1482, YF 47 (1988) 727 = SJNP 47 (1988) 465, YF 47 (1988) 1644 = SJNP 47 (1988) 1041, and YF 49 (1989) 445 = SJNP 49 (1989) 278.

**SERPUKHOV-115** (Nov 1975) Approved Jan 1976; Started 1982; Completed 1986.

### STUDY OF CHARGED PARTICLE RARE DECAYS

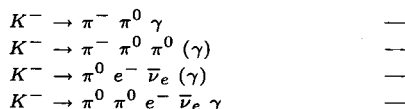
MOSCOW, INR - V N Bolotov (Spokesperson), R M Dzhlkibaev,  
 S N Grinenko, V V Isakov, Y M Klubakov, V D Laptev,  
 V M Lobashov, V I Marin, A A Poblagev, V E Postoev,  
 A N Toropin

Accelerator SERPUKHOV Detector Counter

### Reactions

$\pi^- \rightarrow e^- \bar{\nu}_e \gamma$

## SUMMARIES OF SERPUKHOV EXPERIMENTS



Particles studied  $\pi^-, K^-$

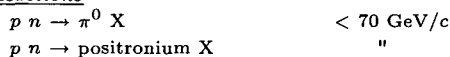
Papers ZETFP 42 (1985) 390 = JETPL 42 (1985) 481, ZETFP 43 (1986) 405 = JETPL 43 (1986) 520, YF 44 (1986) 108 = SJNP 44 (1986) 68, YF 44 (1986) 117 = SJNP 44 (1986) 73, YF 45 (1987) 1652 = SJNP 45 (1986) 1023, and ZETFP 47 (1988) 8 = JETPL 47 (1988) 7. No other papers expected.

**SERPUKHOV-119** (Dec 1976) Approved Jul 1977; Started May 1981.

### RELATIVISTIC POSITRONIUM PHYSICS

DUBNA - L G Afanasyev, G D Alekseev, V V Karpukhin, D M Khazins, V V Kruglov, A V Kuptsov, L L Nemenov ( $\checkmark$  Spokesperson), M V Nikitin  
 SERPUKHOV - K I Gubrienko, V I Kotor  
 MOSCOW STATE U - O E Gorchakov, A V Kulikov, S V Trusov  
Accelerator SERPUKHOV Detector Combination

#### Reactions



Particles studied positronium

Comments A test of special relativity. Studies  $\pi^0 \rightarrow \gamma +$  positronium decay, positronium oscillations, and interactions of relativistic positronium with matter. Ran for 800 hours.

Papers YF 40 (1984) 139 = SJNP 40 (1984) 87, PL B236 (1990) 116, and YF 51 (1990) 1040. For the theory see YF 15 (1972) 1047 = SJNP 15 (1972) 582.

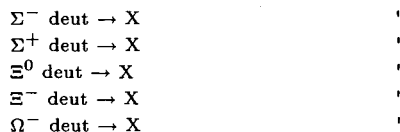
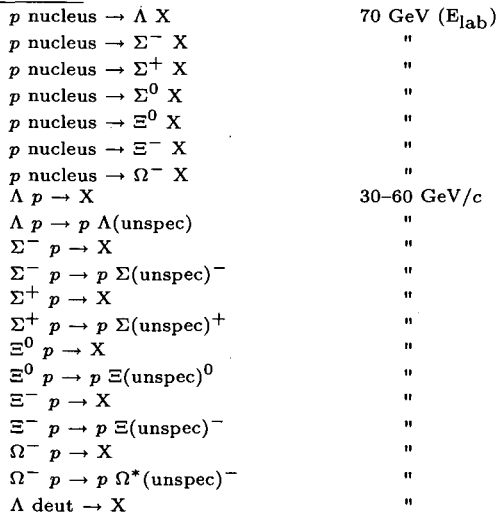
**SERPUKHOV-120** (1977) Approved Jul 1977; Started 1985; Completed 1990.

### 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 ( $\checkmark$  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 ( $\checkmark$  Spokesperson), D D Tokarev, A V Turbiner, G N Tyapkina, I A Veltitsky

Accelerator SERPUKHOV Detector SFINKS

#### Reactions



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 This experiment is replaced by SERPUKHOV-169.

Papers YF 52 (1990) 494.

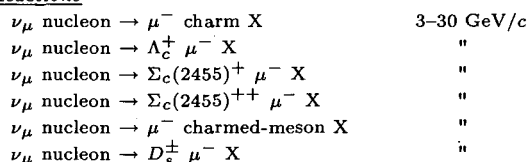
**SERPUKHOV-128** (1977) Approved 1984; Started 1987.

### SEARCH FOR NEW SHORT-LIVED PARTICLES IN NEUTRINO INTERACTIONS

SERPUKHOV - V V Ammosov, V I Baranov, A A Ivanilov, P V Ivenov, V M Korablev, V A Korotkov, V V Makeev, A G Myagkov, P V Pitukhin, A Y Polyarush, A A Sokolov  
 MOSCOW PHYS ENG INST - E Gushchin, A I Lebedev, S V Somov ( $\checkmark$  Spokesperson), G I Tipografshchik  
 MOSCOW, ITEP - Y A Aleshin, O K Egorov, E D Kolganova, A N Maksimov, I A Melnichenko, E A Pozharova, V I Silaev, V A Smirnitky, V A Smotryaev, I S Trostin  
 LEBEDEV INST - S I Kotelnikov, E P Kuznetsov, B I Lomonosov, L I Pervov, V A Ryabov, P S Vasiliev  
 MOSCOW STATE U - P F Ermolov, V S Murzin, S I Sivoklov  
 DUBNA - Y A Batusov, S A Bunyatov, O M Kuznetsov, V V Lyukov, V I Tretyak

Accelerator SERPUKHOV Detector Combination

#### Reactions



Particles studied charm

Comments The detector is a wide-angle spectrometer with a streamer chamber and emulsions.  $2 \times 10^{18}$  protons on target were taken. Running (March 92).

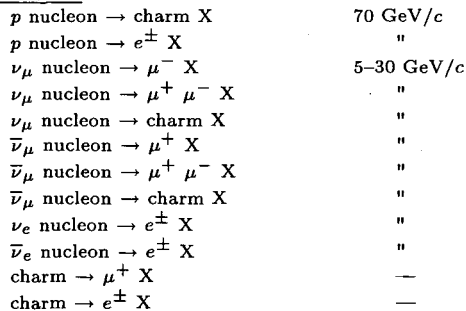
**SERPUKHOV-136** (1978) Approved Apr 1978; Started 1988.

### NEUTRINO DETECTOR

SERPUKHOV - A A Borisov, N I Bozhko, S K Chernichenko, G L Chukin, V N Goryachev, M M Kirsanov, A S Kozhin, V I Kravtsov, A V Kulikov, A I Mukhin, V N Rychenkov, Y I Salomatina, K E Shestermanov, V V Sytnik, V A Tumakov, A S Vovenko ( $\checkmark$  Spokesperson), Y A Zudin  
 DUBNA - L S Barabash, S A Baranov, Y A Batusov, S A Bunyatov ( $\checkmark$  Spokesperson), O Y Denisov, M Y Kazarinov, O L Klimov, V V Lyukov, S N Prakhov, V I Snyatkov

Accelerator SERPUKHOV Detector Calorimeter

#### Reactions



Particles studied charm

## SUMMARIES OF SERPUKHOV EXPERIMENTS

Comments This experiment includes the design and construction of a new neutrino detector. Running (March 92).

Papers YF 30 (1979) 702 = SJNP 30 (1979) 362, YF 33 (1981) 715 = SJNP 33 (1981) 371, YF 40 (1984) 739 = SJNP 40 (1984) 475, YF 49 (1989) 172, and ZPHY C51 (1991) 341.

**SERPUKHOV-140** (Dec 1976) Approved Jul 1977; Started Apr 1980; Completed Sep 1987.

**STUDY OF CHARGE-EXCHANGE REACTIONS AND SEARCH FOR NEW PARTICLES**

SERPUKHOV - S V Donskov, A V Inyakin, V A Kachanov, D B Kakauridze, G V Khaustov, A V Kulik, A A Lednev, Y M Melnik, Y V Mikhailov, Y D Prokoshkin (✓ Spokesperson), S A Sadovsky, V D Samoylenko, P M Shagin, A V Shtannikov, A V Singovsky, A V Startsev, V P Sugonyaev

BRUSSELS U, IISN - F Binon, C Bricman, P Duteil, T Mouthuy, J P Stroot

LOS ALAMOS - D Alde, E A Knapp, T Lopez

ANNECY - J Dufournaud, M Gouanere, J P Peigneux, M Poulet, M Spighel

TBILISI STATE U - M D Tabidze

CERN - A Possoz

Accelerator SERPUKHOV Detector GAMS-2000

Reactions

$\pi^- p \rightarrow n 2\gamma$	38 GeV/c
$\pi^- p \rightarrow n \gamma's$	"
$\pi^- p \rightarrow n \pi^0$	"
$\pi^- p \rightarrow n \eta$	"
$\pi^- p \rightarrow n b_1(1235)^0$	"
$\pi^- p \rightarrow n f_2(1270)$	"
$\pi^- p \rightarrow n \omega$	"
$\pi^- p \rightarrow n f_4(2050)$	"
$\pi^- p \rightarrow n f_0(1590)$	"
$\pi^- p \rightarrow n f_4(2220)$	"
$\pi^- p \rightarrow n \text{meson}^0$	"
$\pi^- p \rightarrow J/\psi(1S) \gamma X$	"
$\pi^- p \rightarrow \chi_{c1}(1P) X$	"
$\pi^- p \rightarrow \chi_{c2}(1P) X$	"
$\pi^0 \rightarrow 2\gamma$	—
$\omega \rightarrow \pi^0 \gamma$	—
$\chi_{c1}(1P) \rightarrow J/\psi(1S) \gamma$	—
$\chi_{c2}(1P) \rightarrow J/\psi(1S) \gamma$	—

Particles studied meson

Comments Studies charge-exchange production of the  $b_1(1235)^0$ ,  $f_2(1270)$ ,  $f_0(1590)$ ,  $f_4(2220)$ , and other mesons, and decays of these mesons. Ran for 6100 hours.

Papers YF 33 (1981) 1534 = SJNP 33 (1981) 825, LNC 32

(1981) 45, YF 36 (1982) 670 = SJNP 36 (1982) 391, NC 71A (1982) 497, YF 38 (1983) 934 = SJNP 38 (1983) 561, YF 38 (1983) 1199 = SJNP 38 (1983) 723, NC 78A (1983) 313, NIM 206 (1983) 373, NIM 214 (1983) 269, NIM 215 (1983) 103, PL B140 (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, YF 40 (1984) 1447 = SJNP 40 (1984) 918, NIM A240 (1985) 343, PTE 3 (1986) 70, NIM A248 (1986) 86, PL B177 (1986) 115, PL B177 (1986) 120, PL B182 (1986) 105, ZETFP 44 (1986) 441 = JETPL 44 (1986) 567, EPL 3 (1987) 553, ECHAYA 18 (1987) 210, ZPHY C36 (1987) 603, YF 45 (1987) 117 = SJNP 45 (1987) 75, YF 45 (1987) 405 = SJNP 45 (1987) 255, YF 45 (1987) 1341 = SJNP 45 (1987) 830, NIM A268 (1988) 112, YF 47 (1988) 385 = SJNP 47 (1988) 243, YF 48 (1988) 1724 = SJNP 48 (1988) 1035, YF 49 (1989) 1021 = SJNP 49 (1988) 636, PL B216 (1989) 447, PL B216 (1989) 451, PL B241 (1990) 600, YF 52 (1990) 779, YF 54 (1991) 751, YF 54 (1991) 754, and YF 54 (1991) 1311.

**SERPUKHOV-145** (1981) Approved 1984; Started 1987.  
**STUDY OF THE PRODUCTION AND DECAY PROPERTIES OF THE CHARMED BARYONS IN NEUTRINO INTERACTIONS WITH THE BUBBLE CHAMBER SKAT**

SERPUKHOV - G M Alexandrov, V V Ammosov (✓ Spokesperson), E N Ardashev, Y V Bardin, A P Bugorsky, N A Chabrov, V I Ermolaev, V S Fillipov, A A Ivanilov, V I Khleborad, V I Konyushko, V M Korablev, V A Korytkov, V V Makeev, G Y Mitrofanov, A G Myagkov, N A Netayaga, A Y Polyarush, A A Sokolov

Accelerator SERPUKHOV Detector HLBC-SKAT

Reactions

$\nu_\mu p \rightarrow \Sigma_c(2455)^{++} \mu^-$	5-20 GeV/c
$\nu_\mu n \rightarrow \Lambda_c^+ \mu^-$	"

Particles studied  $\Sigma_c(2455)^{++}$ ,  $\Lambda_c^+$

Comments The chamber fill is a light freon-propane mix.

$4 \times 10^{18}$  protons on target were taken. Running (March 92).

**SERPUKHOV-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 Takhtamyshev, P T Todorov, R K Trayanov

BERLIN-ZEUTHEN ADW - K Hiller, Z Novak, A V Pose, K E Risek

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 Burilov, V I Genchev, I M Geshkov, P K Markov, G G Sultanov

TBILISI STATE U - V P Dzordzhadze, V D Kekelidze, G I Nikobadze

Accelerator SERPUKHOV Detector BIS-2

Reactions

$n \text{ nucleus} \rightarrow \Lambda K^0 X$	40-60 GeV/c
$n \text{ nucleus} \rightarrow \Lambda K^+ \pi^- X$	"
$n \text{ nucleus} \rightarrow \Lambda \pi^+ \pi^0 \pi^- X$	"
$n \text{ nucleus} \rightarrow \Lambda K^+ K^0 K^- X$	"
$n \text{ nucleus} \rightarrow p \bar{p} \Lambda K^0 X$	"
$n \text{ nucleus} \rightarrow n \Lambda \bar{\Lambda} X$	"
$n \text{ nucleus} \rightarrow p \pi^+ \pi^- X$	"
$n \text{ nucleus} \rightarrow p K^+ K^- X$	"
$n \text{ nucleus} \rightarrow 2p \bar{p} X$	"
$n \text{ nucleus} \rightarrow p K^0 K^- X$	"

Comments Approved for 3300 hours.

Papers YF 36 (1982) 1420 = SJNP 36 (1982) 825, ZPHY C23 (1984) 333, ZPHY C25 (1984) 205, YF 43 (1986) 619 = SJNP 43 (1986) 395, YF 44 (1986) 1010 = SJNP 44 (1986) 652, CZJP B36 (1986) 1303, BJP 15 (1987) 3, ZPHY C36 (1987) 27, ZPHY C37 (1988) 243, ZPHY C47 (1990) 533, CZJP 40 (1990) 1293, and CZJP 41 (1991) 297.

**SERPUKHOV-147** (1982) Approved Mar 1982; Started 1984.

**STUDY OF REACTIONS WITH STRANGE PARTICLE PRODUCTION IN THE  $\pi^-$  AND  $K^-$  MESON BEAM OF THE IHEP ACCELERATOR**

MOSCOW, ITEP - B P Barkov, B V Bolonkin, I A Erofeev, O N Erofeeva, V K Grigoriev, A P Grishin, Y V Katinov, I Y Korolkov, V N Luzin, V V Miller, V N Nozdrachev,

## SUMMARIES OF SERPUKHOV EXPERIMENTS

Y P Shkurenko, V V Sokolovsky (✓ Spokesperson), A I Surtormin, G D Tikhomirov, V V Vladimirov

Accelerator SERPUKHOV Detector MIS

Reactions

$\pi^- p \rightarrow n \Lambda \bar{\Lambda}$	40 GeV/c
$\pi^- p \rightarrow n \Lambda \bar{\Lambda} \pi^0$	"
$\pi^- p \rightarrow p \Lambda \bar{\Lambda} \pi^-$	"
$\pi^- p \rightarrow n 2K_S$	"
$\pi^- p \rightarrow n K_S K_L$	"
$\pi^- p \rightarrow n 2K_S \pi^0$	"
$\pi^- p \rightarrow n K_S K_L \pi^0$	"
$\pi^- p \rightarrow p 2K_S \pi^-$	"
$\pi^- p \rightarrow p K_S K_L \pi^-$	"
$\pi^- p \rightarrow n \Sigma^0 \bar{\Sigma}^0$	"
$\pi^- p \rightarrow \text{glueball } X$	"
$\pi^- p \rightarrow f_2(1720) X$	"
$\pi^- p \rightarrow X C(1480)^-$	"
$K^- p \rightarrow \Lambda \bar{\Lambda} Y^*(\text{unspec})$	"
$K^- p \rightarrow K_S K_L Y^*(\text{unspec})$	"
glueball $\rightarrow 2K_S$	—
$f_2(1720) \rightarrow 2K_S$	—
$C(1480)^- \rightarrow K_S K_L \pi^-$	—

Particles studied  $f_0(975)$ ,  $a_0(980)^0$ ,  $f_2(1720)$ , glueball,  $C(1480)^-$ ,  $Y^*(\text{unspec})$

Comments Requested 2400-3000 hours. Running (March 92).

Papers YF 43 (1986) 1211, YF 43 (1986) 1487 = SJNP 43 (1986) 959, YF 46 (1987) 799, NP B309 (1988) 426, and YF 48 (1988) 1213 = SJNP 48 (1988) 770.

**SERPUKHOV-148** (Feb 1982) Approved Mar 1982; Started 1984; Completed 1990.

**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, D S Denisov, Y P Gorin, V G Kartasheva, I V Kotov, 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 Kulinich, R Leitner, G V Mitselmakher, A A Nozdryn, A G Olshevsky, V A Sviridov, V I Travkin, A V Vishnevsky

INFN, BOLOGNA - P L Frabetti  
 INFN, MILAN - F Palombo

Accelerator SERPUKHOV Detector SIGMA-AYAKS

Reactions

$\pi^- p \rightarrow \pi^- p$	40-50 GeV/c
$\pi^- p \rightarrow p n \bar{p}$	"
$K^- p \rightarrow K^- p$	"
$\bar{p} p \rightarrow \bar{p} p$	"
$\pi^- \text{ nucleus} \rightarrow \pi^- \mu^- \mu^+ X$	"
$\pi^- \text{ nucleus} \rightarrow p p X$	"
$\pi^- \text{ nucleus} \rightarrow p p \pi^- X$	"
$\pi^- \text{ nucleus} \rightarrow \text{dibaryon } X$	"
$\pi^- \text{ nucleus} \rightarrow \text{deut } \pi^- X$	"
$\pi^- \text{ nucleus} \rightarrow \text{deut } \pi^+ X$	"
$\pi^- \text{ nucleus} \rightarrow \pi^- X$	40 GeV/c
$\pi^- \text{ nucleus} \rightarrow K^- X$	"
$\pi^- \text{ nucleus} \rightarrow p X$	"
$K^- \text{ nucleus} \rightarrow p p X$	40-50 GeV/c
$K^- \text{ nucleus} \rightarrow \pi^- X$	40 GeV/c
$K^- \text{ nucleus} \rightarrow K^- X$	"
$K^- \text{ nucleus} \rightarrow p X$	"
$\bar{p} \text{ nucleus} \rightarrow p p X$	40-50 GeV/c

$\bar{p} \text{ nucleus} \rightarrow \pi^- X$	40 GeV/c
$\bar{p} \text{ nucleus} \rightarrow K^- X$	"
$\bar{p} \text{ nucleus} \rightarrow p X$	"
$\rho^0 \rightarrow \mu^+ \mu^-$	—
$a_1(1260)^- \rightarrow \pi^- \mu^- \mu^+$	—
$\pi_2(1670)^- \rightarrow \pi^- \mu^- \mu^+$	—
meson $\rightarrow \pi^- \mu^- \mu^+$	—

Particles studied  $\rho^0$ ,  $f_0(1300)$ ,  $f_2(1270)$ ,  $a_1(1260)^-$ ,  $\pi_2(1670)^-$ , meson $^-$ , dibaryon

Comments The nuclear targets are Be, C, Al, Cu, and Pb.

Exclusive dibaryon decays are also studied. Ran for 1500 hours. SIGMA-AYAKS is the new name for the modified spectrometers SIGMA and SIGMA-M.

Papers YF 37 (1983) 113 = SJNP 37 (1983) 63, ZETFP 48 (1988) 519 = JETPL 48 (1988) 561, YF 48 (1988) 138 = SJNP 48 (1988) 85, YF 48 (1988) 471 = SJNP 48 (1988) 297, YF 48 (1988) 1041, ZPHY C42 (1989) 185, EPL 11 (1990) 725, YF 51 (1990) 705, YF 53 (1991) 439, YF 53 (1991) 1314, and YF 53 (1991) 1324.

**SERPUKHOV-149** (1982) Approved 1984; Started 1986.

**STUDY OF ASYMMETRY IN INCLUSIVE REACTIONS  $\pi^- p \rightarrow \pi^{\pm 0} X$  AND  $\pi^- p \rightarrow K_L X$  AT 40 GeV/c, AND  $pp \rightarrow \pi^0 X$  AT 70 GeV/c**

SERPUKHOV - V D Apokin, Y I Arestov, N I Belikov, B N Chuyko, A A Derevshchikov, G V Dzholobov, O A Grachev, V Y Khodyrev, Y A Matulenko, A P Meshchanin, N G Minaev, A I Misnic, V V Mochalov, A A Morozov, V G Myalitsin, S B Nurushev (✓ Spokesperson), D I Patalakha, A F Prudkoglyad, V I Rykalin, V L Rykov, L F Soloviev, V L Solovyanov, A N Vasiliev

DUBNA - N S Borisov, E I Bunyatova, Y M Kazarinov (✓ Spokesperson), B A Khachaturov, R K Kutuev, M Y Liburg, V N Matafonov, A B Neganov, Y A Usov, R Y Zulkarneev

TBILISI STATE U - N S Amaglobeli, Y S Bagaturiya, B G Chiladze, L N Glonti, G G Macharashvili, A Ocharashvili, R M Sakandelidze, T M Sakhelashvili

MICHIGAN U - C M Chu, R S Raymond, J A Stewart

Accelerator SERPUKHOV Detector PROZA-M

Reactions

$\pi^- p \rightarrow \pi^- X$	40 GeV/c
$\pi^- p \rightarrow \pi^0 X$	"
$\pi^- p \rightarrow \eta X$	"
$\pi^- p \rightarrow \pi^+ X$	"
$\pi^- p \rightarrow K_L X$	"
$\pi^- \text{ deut} \rightarrow \pi^0 X$	"
$\pi^- \text{ deut} \rightarrow \eta X$	"
$K^- p \rightarrow \pi^0 X$	"
$\pi^- p \rightarrow \eta X$	"
$K^- \text{ deut} \rightarrow \pi^0 X$	"
$p p \rightarrow \pi^- X$	70 GeV/c
$p p \rightarrow \pi^0 X$	"
$p p \rightarrow \eta X$	"
$p p \rightarrow \pi^+ X$	"
$p p \rightarrow K_L X$	"
$p p \rightarrow \eta X$	"
$p \text{ deut} \rightarrow \pi^0 X$	"
$p \text{ deut} \rightarrow \eta X$	"

Comments Requested time is 2000 hours. Running (March 92).

Papers PTE 5 (1987) 46, YF 45 (1987) 1355 = SJNP 45 (1987) 840, YF 46 (1987) 1108 = SJNP 46 (1987) 644, YF 46 (1987) 1482 = SJNP 46 (1987) 877, ZPHY C35 (1987) 173, YF 47 (1988) 727, YF 49 (1989) 156 = SJNP 49 (1989) 97, YF 49 (1989) 165 = SJNP 49 (1989) 103, YF 49 (1989) 445, YF 50 (1989) 695, PL B243 (1990) 461, PL B261 (1991) 197, PL B261 (1991) 201, and PL B264 (1991) 462.

## SUMMARIES OF SERPUKHOV EXPERIMENTS

### SERPUKHOV-152 (1983) Approved Aug 1984. NEUTRINO EXPERIMENT USING A TAGGED NEUTRINO BEAM

SERPUKHOV - V V Ammosov, V B Anykeyev, A A Bel'kov, S V Belikov, A P Bugorsky, A Chesnokov, A G Denisov, S P Denisov (✓ Spokesperson), A Yu Dushkin, N N Fedyakin, A N Galyaev, N A Galyaev, S S Gershtein, Y V Gilitsky, S N Gurzhiev, V I Kochetkov, T K Koroleva, I V Kotov, V I Kotov, A V Kozelov, V P Kryuchkov, V I Kurbakov, A A Lebedev, V N Lebedev, V V Lipajev, I Z Mandjavidze, A Y Maslov, S A Medved, V N Mikhailin, Y V Mikhailov, N V Mokhov, S A Mukhin, V A Onuchin, Y M Pishchalnikov, E A Razuraev, A V Schukin, I V Shein, A P Soldatov, A A Spiridonov, A P Starkov, D A Stoyanova, A V Uzunyan, A V Vasilyev, V P Zhigunov

INFN, PISA - C Cerri, G Gennaro, F Sergiampietri, G Spandre  
INFN, FLORENCE - G Conforto, A Marchionni  
BERLIN-ZEUTHEN ADW - J Baehr, G Bohm, R Nahnauer, S Nowak, A Schwind

DUBNA - J Cvach, V K Dodokhov, N G Fadeev, V Genchev, I A Golutvin, J Hladky, V G Kadykov, V Y Karzhavin, V S Khabarov, Y T Kiryushin, V G Krivokhizhin, V V Kukhtin, V N Lysyakov, P K Markov, S Nemecek, A A Popov, D Pose, A Prokes, P Reimer, S Rimani, I A Savin, G I Smirnov, D A Smolin, J Strachota, G Sultanov, L V Svetov, V A Sviridov, P Todorov, M Vinde, J Zacek, N I Zamyatin

Accelerator SERPUKHOV Detector Combination

#### Reactions

$\nu_e e^- \rightarrow e^- \nu_e$	< 70 GeV ( $E_{lab}$ )
$\nu_\mu e^- \rightarrow e^- \nu_\mu$	"
$\nu_e$ nucleon $\rightarrow e^- X$	"
$\nu_e$ nucleon $\rightarrow \nu_e X$	"
$\nu_e$ nucleon $\rightarrow \tau^- X$	"
$\nu_e$ nucleon $\rightarrow e^- \mu^+ X$	"
$\nu_\mu$ nucleon $\rightarrow \mu^- X$	"
$\nu_\mu$ nucleon $\rightarrow \nu_\mu X$	"
$\nu_\mu$ nucleon $\rightarrow \mu^+ \mu^- X$	"
charmed-meson $\rightarrow \mu^+ X$	—

Particles studied  $\nu_e, \nu_\mu, \tau^-,$  charmed-meson

Comments Studies  $\nu_e$ - $\nu_\mu$  universality,  $\nu_e \rightarrow \nu_\mu \rightarrow \nu_\tau$  oscillations, the ratio of charged to neutral currents, etc.

Papers YF 52 (1990) 1040.

### SERPUKHOV-153 (1983) Approved Dec 1983; Started 1983; Completed 1986.

#### STUDY OF CUMULATIVE HADRON PRODUCTION IN PROTON-NUCLEUS INTERACTIONS AT ENERGIES FROM 15 TO 65 GeV

DUBNA - O P Gavrishuk, N S Moroz, V F Peresedov, P A Rukojatkin, A Y Sukhanov, N V Vlasov, P I Zarubin, L S Zolin (✓ Spokesperson)

MOSCOW, ITEP - I M Belyaev, S V Frolov

Accelerator SERPUKHOV Detector Spectrometer

#### Reactions

$p$ nucleus $\rightarrow$ hadrons X	15-65 GeV ( $E_{lab}$ )
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Comments Uses the Cumulative Hadron Detector.

Papers PL B255 (1991) 321, and NP A523 (1991) 589.

### SERPUKHOV-155 (1983) Approved 1985; Started 1987. SINGLE AND PAIR HADRON PRODUCTION WITH LARGE MOMENTUM TRANSFER IN PROTON AND $\pi^-$ MESON BEAMS

SERPUKHOV - V V Abramov, B Yu Baldin, A F Buzulutskov, A S Dyshkant, A O Efimov, V N Evdokimov, V Yu Glebov, A N Gurzhiev, Y P Korneev, A V Kostritski, A N Krinitsyn, V I Kryshkin, Y M Melnik, V M Podstavkov, A I Ronzhin, R M Sulyaev (✓ Spokesperson), L K Turchanovich

Accelerator SERPUKHOV Detector FODS

#### Reactions

$p p \rightarrow$ hadron(s) X	70 GeV/c
$p$ nucleus $\rightarrow$ hadron(s) X	"
$\pi^- p \rightarrow$ hadron(s) X	40 GeV/c
$\pi^-$ nucleus $\rightarrow$ hadron(s) X	"

Comments Running (March 92).

Papers YF 45 (1987) 1362.

### SERPUKHOV-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 Dikusar, 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 Zrelow

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 SERPUKHOV Detector MIS-2

#### Reactions

$\pi^-$ Si $\rightarrow$ 3pion X	40 GeV/c
$K^-$ Si $\rightarrow$ kaon 2pion X	"

Particles studied meson

Comments Uses the modified spectrometer MIS, with additional spark chamber. Looking for new radial excitations of  $\pi, A_1, A_2, A_3,$  and  $K$  mesons. Requested 4720 hours. Running (March 92).

Papers YF 43 (1986) 917 = SJNP 43 (1986) 585.

### SERPUKHOV-159 (1983) Approved May 1986; Started 1992.

#### SEARCH FOR EXOTIC STATES WITH STRANGE QUARKS AND STUDY OF PRODUCTION AND DECAYS OF PARTICLES CONTAINING HEAVY QUARKS

DUBNA - A N Aleev, V A Arefiev, V P Balandin, V K Birulev, I I Evsikov, B N Gus'kov, I M Ivanchenko, M N Kaphishin, N N Karpenko, V D Kekelidze (✓ Spokesperson), D A Kirillov, I G Kosarev, N A Kuz'min, M F Likhachev, A L Lyubimov, A N Maksimov, P V Moisenz, A N Morozov, V V Pal'chik, A V Pose, T G Progulova, A Prokes, V V Rybakov, L A Slepets, V N Spaskov, A I Zinchenko

LEBEDEV INST - A S Belousov, M V Belov, E G Devitsin, A M Fomenko, A A Komar, V A Kozlov, S Yu Potashev, S V Rusakov, L N Shtarkov, P A Smirnov, Y V Soloviev, Y A Vazdyk, M V Zavertyaev

ALMA ATA, PHYS INST - G A Aralbaeva, A A Loktionov

BRATISLAVA, INST PHYS - C Koka, T Ponta, A Roshka

SERPUKHOV - S S Gershtein, A A Likhoded

MOSCOW, ITEP - A B Kaidalov

MOSCOW STATE U - E A Chudakov

SOFIYA, INST NUCL RES - I M Geshkov, P Khristov,

P K Markov, P Todorov

SOFIYA, INST CHEM TECH - V Zayachki

PRAGUE, INST PHYS - J Hladky, M Novak, M Smizanska, M Vecko

TBILISI STATE U - N S Amaglobeli, R A Kvatadze,

G A Kvirikashvili, N L Lomidze, M D Mosidze, A K Odishvili,

T G Pitskhelelauri, R G Shanidze, G T Tatishvili

Accelerator SERPUKHOV Detector EXCHARM

#### Reactions

$n$ nucleus $\rightarrow$ X(3100) X	< 70 GeV ( $E_{lab}$ )
$n$ nucleus $\rightarrow$ X(3250) X	"
$n$ nucleus $\rightarrow$ $N\phi(1950)$ X	"
$n$ nucleus $\rightarrow$ $\bar{D}^0$ X	"

## SUMMARIES OF SERPUKHOV EXPERIMENTS

$n$  nucleus  $\rightarrow \Sigma_c(2455)^{++} X$  "  
 $n$  nucleus  $\rightarrow \Sigma_c(2455)^0 X$  "  
 $n$  nucleus  $\rightarrow \Lambda_c^+ X$  "  
 $n$  nucleus  $\rightarrow \Xi_c^+ X$  "  
 $n$  nucleus  $\rightarrow \Xi_c^0 X$  "

Particles studied  $X(3100)$ ,  $X(3250)$ ,  $N\phi(1950)$ ,  $\bar{D}^0$ ,  $\Lambda_c^+$ ,  
 $\Sigma_c(2455)^{++}$ ,  $\Sigma_c(2455)^0$ ,  $\Xi_c^+$ ,  $\Xi_c^0$

Comments Uses the new EXCHARM detector, a major upgrade of the older BIS-2M.

Papers YF 46 (1987) 1127 = SJNP 46 (1987) 657, and ZPHY C37 (1988) 243.

### SERPUKHOV-161 (1983) Approved 1985; Started 1991. STUDY OF CHARMED PARTICLE PRODUCTION AT IHEP ACCELERATOR ENERGIES

SERPUKHOV - E A Ardashev, M Y Bogolyubsky, S V Chekulaev, N A Galyaev, V A Khmel'nikov, A E Kiryunin, A I Kotova, L L Kurchaninov, M S Levitsky, V V Maksimov, A A Minaenko, G Y Mitrofanov, A M Moiseev ( $\checkmark$  Spokesperson), E A Parshin, A V Pleskach, S R Slabospitsky, V N Zapolsky

MOSCOW STATE U - S G Basiladze, P F Ermolov ( $\checkmark$  Spokesperson), Y V Grishkevich, A N Larichev, A K Leflat, S N Orfanitsky, S A Riazanov, V P Rukovichkin, S M Ruzin, A M Vishnevskaja, V Yu Volkov

DUBNA - I V Boguslavsky, I M Gramenitsky ( $\checkmark$  Spokesperson), A I Grigoriev, Y V Khrenov, V D Kravtsov, A Ya Kutov, K S Medved, M D Shafranov, V T Tolmachev

TBILISI, INST PHYS - N S Amaglobeli, V A Davitashvili, V F Tchunikhin, T P Topuria

Accelerator SERPUKHOV Detector Combination

#### 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  $\Lambda_c^+$ ,  $\Sigma_c(2455)^0$ ,  $\Sigma_c(2455)^+$ ,  $\Sigma_c(2455)^{++}$

Comments Studies all charmed mesons and  $\Lambda$  and  $\Sigma$  charmed baryons.

### SERPUKHOV-163 (1985) Approved 1985; Started 1985; Completed Dec 1988.

#### STUDY OF EXCLUSIVE GLUEBALL PRODUCTION IN THE CENTRAL REGION OF HADRON COLLISIONS

SERPUKHOV - S V Donskov, A V Inyakin, V A Kachanov, G V Khaustov, A V Kulik, V G Lapshin, A A Lednev, Y D Prokoshkin ( $\checkmark$  Spokesperson), V I Rykalin, S A Sadovsky, V D Samoylenko, P M Shagin, A V Shtannikov, A V Singovsky, V P Sugonyaev

LOS ALAMOS - D Alde, E A Knapp, T Lopez

BRUSSELS U, IISN & CERN - F Binon, C Bricman, D Michotte, J P Stroot

ANNECY - M Gouanere, J P Peigneux

Accelerator SERPUKHOV Detector GAMS-2000, Calorimeter

#### Reactions

$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \eta \pi^-$	40 GeV/c
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \eta \pi^-$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \eta \pi^0 \pi^-$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } \pi^0 \pi^-$	"
$\pi^- \text{ nucleon} \rightarrow \text{nucleon } 2\pi^0 \pi^-$	"
glueball $\rightarrow 2\eta$	—

Particles studied glueball

Comments Looks for glueballs, particularly in final states with  $\eta$ . Ran for 1300 hours.

Papers ECHAYA 16 (1985) 584, NIM A256 (1987) 444, NIM A268 (1988) 112, and NIM A269 (1988) 101.

### SERPUKHOV-164 (1980) Approved May 1986; Started 1988.

#### INVESTIGATIONS OF THE $\pi^- p \rightarrow n\pi^+\pi^-\pi^+\pi^-(\gamma\text{'s})$ REACTION AT 40 GeV/c USING THE VERTEX SPECTROMETER

SERPUKHOV - S I Bityukov, G V Borisov, R I Dzhelyadin, Y P Gouz, Y M Ivanyushenkov, I A Kachaev, A N Karyukhin, Y A Khokhlov, G A Klyuchnikov, V F Konstantinov, M E Kostrikov, V V Kostyukhin, A A Kriushin, M A Kulagin, V V Lapin, V D Matveev, V F Obratsov, A P Ostankov, D I Ryabchikov, V K Semenov, E A Starchenko, N K Vishnevsky, E A Vlasov, A M Zaitsev ( $\checkmark$  Spokesperson)

TBILISI INST PHYS - G Beladidze, T A Lomtadze, E G Tskhadadze

Accelerator SERPUKHOV Detector Photon spectrometer, Counter

#### Reactions

$\pi^- p \rightarrow n 2\pi^+ 2\pi^- (\gamma\text{'s})$	37 GeV/c
$\pi^- p \rightarrow n 2\pi^+ 2\pi^-$	"
$\pi^- p \rightarrow n 2\rho^0$	"
$\pi^- p \rightarrow n f_2(1270)$	"
$\pi^- p \rightarrow n \rho_3(1690)^0$	"
$\pi^- p \rightarrow n f_4(2050)$	"
$\pi^- p \rightarrow n f_4(2220)$	"
$\pi^- p \rightarrow n \rho^0 \eta$	"
$\pi^- p \rightarrow n f_2(1270) \eta$	"
$\pi^- p \rightarrow n \rho_3(1690)^0 \eta$	"
$\pi^- p \rightarrow n 2\eta$	"
$\pi^- p \rightarrow n \eta' \rho^0$	"
$\pi^- p \rightarrow n f_2(1270) \eta'$	"
$\pi^- p \rightarrow n \rho_3(1690)^0 \eta'$	"
$\pi^- p \rightarrow n 2\eta'$	"
$\pi^- p \rightarrow n f_1(1285)$	"
$\pi^- p \rightarrow n \eta' \eta$	"
$\pi^- p \rightarrow n \omega \eta$	"
$\pi^- p \rightarrow n \text{ meson}$	"

Particles studied  $\rho^0$ ,  $\eta$ ,  $\eta'$ ,  $\omega$ ,  $f_2(1270)$ ,  $\rho_3(1690)^0$ , glueball, meson

Comments Uses Čerenkov counters together with a wide aperture magnetic spectrometer—VES. In addition to the reactions listed above, studies decays of the mesons produced in these reactions. Running (March 92).

Papers PL B268 (1991) 137.

### SERPUKHOV-166 (1987) Approved 1987; Started 1987.

#### STUDY OF ELEMENTARY-PARTICLE RARE DECAYS IN THE DETECTOR ISTRA-M

MOSCOW, INR - V N Bolotov ( $\checkmark$  Spokesperson), E N Gushchin, V V Isakov, O V Karavichev, Y M Klubakov, V A Lebedev, V N Marin, E A Monich, Y V Musienko, A A Poblaguev, V E Postoev, G N Semenuk, S A Volkov

SERPUKHOV - V F Konstantinov

DUBNA - G Kalmar, A Z Kitikyan, E V Komissarov, V S Kurbatov, V Z Serdyuk, V V Sidorov, A D Volkov, B Z Zalikhonov

Accelerator SERPUKHOV Detector ISTRA-M

#### Reactions

$K^- \rightarrow \pi^- \nu_e \bar{\nu}_e$	25 GeV/c
$K^- \rightarrow \pi^- \nu_\mu \bar{\nu}_\mu$	"
$K^- \rightarrow e^- \bar{\nu}_e \gamma$	"
$K^- \rightarrow \pi^- e^- e^+$	"
$K^- \rightarrow \pi^- \mu^- \mu^+$	"

Particles studied  $\pi^-$ ,  $K^-$

Comments Running (March 92).

## SUMMARIES OF SERPUKHOV EXPERIMENTS

**SERPUKHOV-167** (1975) Approved 1987; Started 1987; Completed 1991.

### STUDY OF RARE KAON DECAYS

SERPUKHOV - S A Akimenko, A A Belkov, V I Belousov, A M Blick, V N Kolosov, V M Kutjin (✓ Spokesperson), A I Pavlinov, V I Romanovsky, A S Soloviev  
 DUBNA - A M Artykov, A G Asmolov, G S Bitsadze, Y A Budagov (✓ Spokesperson), I E Chirikov-Zorin, Y I Davydov, V P Dzhelpev, A A Feshchenko, V B Flyagin, V V Glagolev, Y N Kharzhev, Y F Lomakin, L G Lytkin, S N Malyukov, V N Pervushin, N A Rusakovich, N L Rusakovich, A A Semenov, S V Sergeev, V B Vinogradov, A G Volodko

TBILISI STATE U - I Minashvili

SOFIYA U - A B Jordanov, L Litov, G V Vele  
 KOSICE, IEF - E Kladiava, L Shandor, I Shpalek  
 BRATISLAVA, INST PHYS - B Sitar, P Strmen, S Tokar  
 MINSK, INST PHYS - Y A Kulchitsky, A S Kurilin

Accelerator SERPUKHOV Detector HYPERON-II

#### Reactions

$K^+ \rightarrow \pi^+ 2\pi^0$  10 GeV/c  
 $K^+ \rightarrow \pi^+ \pi^0 \gamma$  "  
 $K^+ \rightarrow \pi^+ 2\gamma$  "  
 $K^+ \rightarrow \pi^+ e^- e^+$  "

Particles studied  $K^+$

Papers PL B259 (1991) 225.

**SERPUKHOV-168** (1987) Approved Jun 1987; Started 1990; Completed 1990.

### $K^-$ MASS MEASUREMENT WITH HADRONIC ATOMS USING THE CRYSTAL-DIFFRACTION METHOD

ST PETERSBURG, INP - A S Denisov, O L Fedin, M P Guriyev, Y M Ivanov, L P Lapina, P M Levchenko, V D Malakhov, A A Petrunin, Y P Platonov, A G Sergeev, V V Skorobogatov, A A Smirnov (✓ Spokesperson), G P Solodov, V M Suvorov, S N Taranets, A V Zhelamkov  
 SERPUKHOV - I S Baishve, S N Lapitsky, N V Mokhov, R A Rzaev, V P Sakharov, V S Seleznev, S I Striganov, V I Terekhov

Accelerator SERPUKHOV Detector QUARTZ

#### Reactions

$p C \rightarrow K^- X$  70 GeV/c  
 $p Mg \rightarrow K^- X$  "  
 $p Cu \rightarrow K^- X$  "

Particles studied  $K^-$

Comments QUARTZ is a crystal diffraction spectrometer for X rays with semiconductor detectors.

Papers ZETFP 54 (1991) 557.

**SERPUKHOV-169** (1977) Approved Jul 1977; Started 1985. INVESTIGATIONS OF HADRONIC SPECTROSCOPY WITH THE DETECTOR SFINKS

SERPUKHOV - V A Dorofeev, S V Golovkin, A S Konstantinov, A P Kozhevnikov, V P Kubarovsky, N Y Kulman, A I Kulyavtsev, V F Kurshetsov, A E Kushnerenko, L G Landsberg (✓ Spokesperson), V V Molchanov, V A Mukhin, V I Solyanik, V A Viktorov

MOSCOW, ITEP - I M Belvaev, M V Gritsuk, V M Guzhavin, G K Kliger, V Z Kolganov, A A Lebedev, G S Lomkatsi, A F Nilov, V T Smolyankin (✓ Spokesperson)

Accelerator SERPUKHOV Detector SFINKS

#### Reactions

$p$  nucleon  $\rightarrow$  nucleon baryon 70 GeV ( $E_{lab}$ )  
 $p$  nucleon  $\rightarrow$  nucleon hyperon  $K^+$  "  
 $p$  nucleon  $\rightarrow$  nucleon  $N\phi(1950)$  "  
 $p$  nucleon  $\rightarrow X(3100)^+ X$  "  
 $p$  nucleon  $\rightarrow X(3100)^0 X$  "  
 $p$  nucleon  $\rightarrow X(3100)^- X$  "

$p$  nucleon  $\rightarrow$  meson<sup>0</sup> X "  
 $p$  nucleon  $\rightarrow$  meson<sup>+</sup> X "  
 $p$  nucleon  $\rightarrow$  meson<sup>-</sup> X "  
 $p$  nucleon  $\rightarrow \Lambda_c^+ X$  "  
 $\pi^- p \rightarrow$  nucleon meson 32 GeV/c  
 $\pi^- p \rightarrow$  nucleon  $C(1480)$  "  
 $\pi^- p \rightarrow$  nucleon  $C(1480)^+$  "  
 $\pi^- p \rightarrow$  nucleon  $C(1480)^-$  "  
 $\pi^- p \rightarrow$  nucleon  $X(3100)^+$  "  
 $\pi^- p \rightarrow$  nucleon  $X(3100)^0$  "  
 $\pi^- p \rightarrow$  nucleon  $X(3100)^-$  "

Particles studied baryon, meson,  $X(3100)^+$ ,  $X(3100)^0$ ,  $X(3100)^-$ ,  $C(1480)$ ,  $C(1480)^+$ ,  $C(1480)^-$

Comments Looks for new or not completely established baryons and mesons such as the  $C(1480)$  and  $X(3100)$  in various hadronic modes. Studies exclusive decays of such baryons and mesons. Running (March 92).

**SERPUKHOV-170** (1985) Approved 1985; Started 1985; Completed 1989.

### THE CASCADE MAGNETIC SPECTROMETER

NOVOSIBIRSK, IYF - V N Bajer  
 KHARKOV, FTI - V B Ganenko, L Y Kolesnikov, A L Rubashkin  
 SERPUKHOV - V I Maishev, V N Zapolsky  
 LEBEDEV INST - V A Baskov, P A Cherenkov, B B Govorkov, V A Khablo, V V Kim, V I Sergienko (✓ Spokesperson)  
 MOSCOW PHYS ENG INST - B I Luchkov, V Y Tugaenko

Accelerator SERPUKHOV Detector KASKAD

#### Reactions

$e^-$  nucleus  $\rightarrow$  nucleus  $e^- \gamma$  ( $\gamma$ 's) 30 GeV ( $E_{lab}$ )  
 $\gamma$  nucleus  $\rightarrow$  nucleus  $e^- e^+$  5-25 GeV ( $E_{lab}$ )  
 $\gamma$  nucleus  $\rightarrow$  nucleus  $e^- e^+ \gamma$  ( $\gamma$ 's) "

Comments A study of electromagnetic interactions, including  $\gamma$  elastic and inelastic scattering on nucleons and nuclei. The detector consists of a single crystal target, a goniometer and a magnetic spectrometer.

Papers ZETFP 49 (1989) 533, ZETFP 50 (1989) 395, ZETFP 52 (1990) 740, NIM A297 (1990) 329, PTE 6 (1990) 69, and PTE 6 (1990) 73.

**SERPUKHOV-171** (1987) Approved 1987; Started 1987.

### DETERMINATION OF ENERGY DEPOSITION IN THICK TARGETS FROM CONSTRUCTION MATERIALS EXPOSED TO PROTONS WITH KINETIC ENERGIES OF 0.8-1.2 GeV/c

MOSCOW, ITEP - V I Belyakov-Bodin (✓ Spokesperson)

Accelerator SERPUKHOV Detector Calorimeter

#### Reactions

$p$  nucleus  $\rightarrow$  shower X 0.8-1.2 GeV ( $T_{lab}$ )

Comments Running (March 92).

Papers NIM A295 (1990) 140, and AEU 70 (1991) 70.

**SERPUKHOV-172** (1988) Approved May 1988.

### STUDY OF MESONS WITH AN ENHANCED GLUON COMPONENT (GLUEBALLS INCLUDED) AND MESONS WITH HIGH SPINS USING THE MULTIPHOTON $4\pi$ SPECTROMETER

SERPUKHOV - S V Donskov, A V Inyakin, G V Khaustov, A K Konoplyannikov, A V Kulik, G L Landsberg, V G Lapshin, A A Lednev, Y M Melnik, V K Myalitsin, S A Polovnikov, V A Polyakov, Y D Prokoshkin (✓ Spokesperson), V B Rakhmatova, V I Rykalin, S A Sadovsky, V D Samoylenko, P M Shagin, A V Shtannikov, A V Singovsky, V P Sugonyaev  
 MOSCOW PHYS ENG INST - A M Baranov, A N Kalinovskiy, Z Khorguashvili, S Y Smirnov  
 TBILISI STATE U - N S Amaglobeli, M D Tabidze



## SUMMARIES OF SERPUKHOV EXPERIMENTS

TBILISI, INST PHYS – A K Djavrishvili, D B Kapanadze,  
 I Z Khalvashi, T A Lomtadze, G G Sekhneaidze  
 LOS ALAMOS – D Alde, E A Knapp, T Lopez  
 BRUSSELS U, IISN – F Binon, J P Stroot  
 ANNECY – J P Peigneux, M Poulet  
 KEK – S Inaba, M Kobayashi, K Takamatsu, T Tsuru  
 CERN – M Boutemeur  
 MIYAZAKI U – T Nakamura

Accelerator SERPUKHOV Detector GAMS-4PI

Reactions

$\pi^- p \rightarrow n 2\pi^0$	32 GeV/c
$\pi^- p \rightarrow n 2\eta$	"
$\pi^- p \rightarrow n \eta' \eta$	"
$\pi^- p \rightarrow n \eta \pi^0$	"
$\pi^- p \rightarrow n \eta 2\pi^0$	"
$\pi^- p \rightarrow n 2\omega$	"
$\pi^- p \rightarrow n K^0 \bar{K}^0$	"
$\pi^- p \rightarrow n 2\text{meson}^0$	"
$\pi^- p \rightarrow \text{meson}^0 X$	"
$\pi^- p \rightarrow \text{glueball} X$	"
$\pi^- p \rightarrow J/\psi(1S) X$	"
$\pi^- p \rightarrow \psi(2S) X$	"
$\pi^- p \rightarrow \eta_c(1S) X$	"
$\pi^- p \rightarrow \chi_c(\text{unspec}) X$	"
$K^- p \rightarrow \text{meson}^0 X$	"

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

Comments Running (March 92).

Papers NIM A268 (1988) 112, NIM A276 (1989) 652, PTE 1  
 (1990) 68, PTE 2 (1990) 90, and PTE 5 (1991) 55.

**SERPUKHOV-173** (1991) Approved 1992; Started 1992.

**STUDY OF STRANGE PARTICLE RESONANT STATES  
 USING HADRON BEAMS WITH MOMENTA OF 40-70  
 GeV/c AT THE IHEP ACCELERATOR**

MOSCOW, ITEP – B P Barkov, B V Bolonkin, I A Erofeev,  
 O N Erofeeva, V K Grigoriev, A P Grishin, Y V Katinov,  
 I Y Korolkov, V I Lisin, V N Luzin, V V Miller, V N Noz-  
 drachev, Y P Shkurenko, V V Sokolovsky (✓ Spokesperson),  
 G D Tikhomirov, V V Vladimirovsky

Accelerator SERPUKHOV Detector MIS

Reactions

$\pi^- p \rightarrow n 2K_S$	40 GeV/c
$\pi^- p \rightarrow n 2K_S \pi^0$	"
$\pi^- p \rightarrow n K_S K_L \pi^+ \pi^-$	"
$\pi^- p \rightarrow n K_S K_L \pi^0$	"
$\pi^- p \rightarrow K_S \pi^+ \pi^- Y^*(\text{unspec})$	"
$\pi^- p \rightarrow p K_S K_L \pi^-$	"
$\pi^- p \rightarrow n \Lambda \bar{\Lambda}$	"
$K^- p \rightarrow 2K_S Y^*(\text{unspec})$	"
$K^- p \rightarrow n K_S \pi^+ \pi^-$	"
$K^- p \rightarrow \Lambda \bar{\Lambda} Y^*(\text{unspec})$	"

Particles studied  $C(1480)^+$ ,  $C(1480)^-$ ,  $C(1480)^0$ ,  $X(3100)$ ,  
 $\phi(1680)$ ,  $\phi_3(1850)$ ,  $f_2(1720)$ ,  $f_2(1810)$ ,  $f_2(2010)$ ,  $f_4(2050)$ ,  
 $f_4(2220)$

Comments Extends an earlier  $K_S K_S$  and  $\Lambda \bar{\Lambda}$  finite states study  
 (SERPUKHOV-147) to the range of masses between 1.8 and 2.5  
 GeV. Investigates the  $K_S K_L$  system using  $\pi^-$  and  $K^-$  beams  
 with a momentum of 40 GeV/c. Studies baryon-antibaryon and  
 $\phi\phi$  states. Searches for  $C(1480)$  mesons decaying into  $\phi\pi$ . Uses  
 two charge particle triggers. Requested 2100 hours.

**SERPUKHOV-174** (1986) Approved Apr 1986; Started May  
 1986.

**PHYSICS OF RELATIVISTIC DIMESON ATOMS**

DUBNA – L G Afanasyev, A S Chvyrov, M A Ivanov,  
 V V Karpukhin, A V Kolomyichenko, V I Komarov,

V V Kruglov, A V Kuptsov, L L Nemenov (✓ Spokesperson),  
 M V Nikitin, Z P Pustylnik  
 SERPUKHOV – A P Kurov  
 MOSCOW STATE U – O E Gorchakov, A V Kulikov, S V Trusov,  
 V V Yazkov

Accelerator SERPUKHOV Detector Combination

Reactions

$p n \rightarrow X$  < 70 GeV/c

Comments Searches for the ( $\pi^+$ ,  $\pi^-$ ) atom in inclusive pro-  
 cesses. Studies the lifetime of such atoms. Measures pion scat-  
 tering lengths. Running (March 92).

Papers YF 52 (1990) 1046, and PL B255 (1991) 146.

## SUMMARIES OF SLAC EXPERIMENTS

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### SLAC Experiments

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**SLAC-E-140** (1984) Approved Dec 1984; Started Nov 1985; Completed Jan 1986.

**MEASUREMENT OF THE  $x$ ,  $Q^2$ , AND NUCLEAR DEPENDENCE OF  $R = \sigma_L/\sigma_T$  AND  $F_2$**

AMERICAN U - L Andivahis, R G Arnold, D Benton, P E Bosted, G de Chambrier, A Lung, S E Rock (✓ Spokesperson), Z M Szalata  
 CAL TECH - B W Filippone, J Jourdan, R D McKeown, R G Milner, D Potterveld, R Walker  
 FERMILAB - A Para  
 LIVERMORE - K van Bibber, F Dietrich  
 MASSACHUSETTS U, AMHERST - J Button-Shafer, B Debebe, R Hicks  
 ROCHESTER U - P De Barbaro, A Bodek (✓ Spokesperson), S Dasu, H Hirada, M W Krasny, K Lang, E M Riordan  
 SLAC - R A Gearhart  
 STANFORD U - L Whitlow  
 TEL AVIV U - J Alster

Accelerator SLAC Detector Spectrometer

Reactions

$e^- p$	3-21 GeV/c
$e^- \text{deut}$	"
$e^- \text{Fe}$	"
$e^- \text{Au}$	"

Comments Measures the ratio  $R = \sigma_L/\sigma_T$  and  $F_2$  in the range  $0.2 < x < 0.5$  and  $1 < Q^2 < 10$  (GeV/c)<sup>2</sup>. Compares  $R$  with the QCD prediction, and studies the nuclear dependence of the ratio of structure functions,  $W_1/W_2$ , for various nuclear targets (EMC effect). Beams from the full linac and the Nuclear Physics Injector were used.

Papers PRL 60 (1988) 2591, PRL 61 (1988) 1061, PL B224 (1989) 353, PL B240 (1990) 522, and PL B (accepted).

**SLAC-E-140X** (1988) Approved Jul 1988; Started Aug 1991; Completed Sep 1991.

**MEASUREMENT OF THE  $x$ ,  $Q^2$ , AND HYDROGEN-DEUTERIUM DEPENDENCE OF  $R = \sigma_L/\sigma_T$**

AMERICAN U - L Andivahis, R G Arnold, P E Bosted, J Dunne, C E Keppel, A Lung, S E Rock (✓ Spokesperson), M Spengos, Z M Szalata, L Tao, J White  
 CEBAF - J Gomez  
 LIVERMORE - P L Anthony, K van Bibber, F Dietrich, L Stuart  
 MASSACHUSETTS U, AMHERST - J Button-Shafer, R Hicks, G A Peterson, K Wang  
 PENN U - A Banerjee, K A Griffioen  
 ROCHESTER U - P De Barbaro, A Bodek (✓ Spokesperson), R Walker  
 SLAC - S Dasu, R A Gearhart, G M Petratos, E M Riordan, S H Rokni  
 WASHINGTON U, SEATTLE - M Frodyma, C Hyde-Wright

Accelerator SLAC Detector Spectrometer

Reactions

$e^- p$	3-10 GeV/c
$e^- \text{deut}$	"

Comments Measures the ratio  $R = \sigma_L/\sigma_T$  and  $F_2$  in the range  $0.2 < x < 0.7$  and  $0.5 < Q^2 < 7.0$  (GeV/c)<sup>2</sup>. Looks for higher twist contributions beyond the next-to-leading order in QCD and target mass effects. Beam from the Nuclear Physics Injector in SLED and normal mode was used.

**SLAC-E-141** (1986) Approved May 1986; Started Jun 1986; Completed Jun 1986.

**SEARCH FOR SHORT-LIVED NEUTRAL BOSONS FROM A BEAM DUMP**

AMERICAN U - P Bosted, L Clougher, A Lung, S E Rock, Z M Szalata

CAL TECH - B W Filippone  
 CRACOW - M W Krasny  
 FERMILAB - M Crisler, A Para, R Walker  
 GEORGETOWN U - J M Lambert  
 MASSACHUSETTS U, AMHERST - J Button-Shafer, G A Peterson  
 PENN U - D Benton  
 ROCHESTER U - P De Barbaro, A Bodek, N Varelas  
 SLAC - J Bjorken, S Dasu, R A Gearhart, E M Riordan (✓ Spokesperson)  
 TEXAS U - K Lang  
 WASHINGTON U, SEATTLE - M Frodyma  
Accelerator SLAC Detector Spectrometer  
Particles studied axion

Comments An electron beam dump search for possible pseudoscalar particles with masses in the range 1-10 MeV and lifetimes of order  $10^{-14}$  to  $10^{-12}$  seconds, with dominant decay modes into  $e^+e^-$  or  $\gamma\gamma$  pairs. Electron beams of 9 and 18 GeV are stopped in copper/tungsten dumps ranging in length from 10-100 cm. A signal searched for is a high energy positron or photon downstream of the dump. An 8 GeV spectrometer set at  $0^\circ$  is used to detect positrons.

Papers PRL 59 (1987) 755. No other papers expected.

**SLAC-E-142** (Oct 1989) Approved May 1990.

**MEASUREMENT OF THE NEUTRON SPIN DEPENDENT STRUCTURE FUNCTION**

AMERICAN U - R G Arnold, P E Bosted, J Dunne, C E Keppel, S E Rock, M Spengos, Z M Szalata, J L White  
 BONN U - W Meyer  
 CLERMONT-FERRAND U - V Breton, H Fonville  
 HARVARD U - A K Thompson  
 LBL - G Shapiro  
 LIVERMORE - P L Anthony, K van Bibber, F Dietrich  
 MICHIGAN U - T E Chupp  
 PRINCETON U - G Cates, H L Middleton, N Newbury  
 SACLAY - H Borel, R Lombard-Nelsen, J Marroncle, J Morgenstern, F M Staley, Y D Terrien  
 SLAC - R A Gearhart, E W Hughes (✓ Spokesperson), T Maruyama, G M Petratos, R Pitthan, L S Rochester, S H Rokni, M B Woods, C C Young  
 STANFORD U - D M Kwall, S Kuhn, Z Meziari  
 SYRACUSE U - R Holmes, P A Souder, J Xu  
 WISCONSIN U - H Band, J R Johnson, R A Mair, R Prepost, G H Zapalac

Accelerator SLAC Detector Double-arm spectrometer

Reactions Polarized beam and target  
 $e^- {}^3\text{He}$  22.66 GeV/c ( $P_{\text{lab}}$ )

Particles studied  $n$

Comments Studies a polarized electron beam scattering off a polarized  ${}^3\text{He}$  gas target. The scattered electrons are detected by a two-arm fixed spectrometer. Tests the Bjorken polarization sum rule and nucleon spin models. Scheduled to run November 92.

**SLAC-E-143** (Nov 1991) Approved Dec 1991.

**MEASUREMENTS OF THE NUCLEON SPIN STRUCTURE AT SLAC IN END STATION A**

AMERICAN U - R G Arnold (✓ Spokesperson), P E Bosted, J Dunne, S E Rock, M Spengos, Z M Szalata, J L White  
 BASEL U - D Fritschi, J Jourdan, G Masson, S Robinson, I Sick  
 BONN U - W Meyer  
 CEBAF - J Gomez, J Mougey, S Nanda  
 CLERMONT-FERRAND U - V Breton, H Fonville  
 FERMILAB - R Walker  
 HARVARD U - A K Thompson  
 LIVERMORE - P L Anthony, K van Bibber, F Dietrich, M Mugge  
 MASSACHUSETTS U, AMHERST - J Button-Shafer  
 MICHIGAN U - T E Chupp  
 OHIO U - K Hicks  
 PENN U - D Benton, K A Griffioen  
 ROCHESTER U - P De Barbaro, A Bodek, W K Sakumoto, R Walker

## SUMMARIES OF SLAC EXPERIMENTS

SACLAY - H Borel, R Lombard-Nelsen, J Marroncle,  
J Morgenstern, F M Staley, Y D Terrien  
SLAC - W B Atwood, J Clendenin, T H Fieguth, R A Gearhart,  
E W Hughes, S J St Lorant, T Maruyama, K C Moffeit,  
A C Odian, G M Petratos, C Prescott, E M Riordan,  
L S Rochester, T Usher, M B Woods, C C Young  
STANFORD U - D M Kwall, S Kuhn, Z Meziani  
TEL AVIV U - J Lichtenstadt  
TOHOKU U - F Suekane, H Yuta  
VIRGINIA U - H Baghaei, J Chen, D G Crabb, D B Day,  
K J Keeter, R A Lindgren, R Lourie, R M Marshall,  
J S McCarthy (✓ Spokesperson), R C Minehart, J H Mitchell,  
B Norum, D Počanić, O A Rondon, L C Smith, S Van Verst  
WISCONSIN U - H Band, J R Johnson, R Prepost, G H Zapalac

Accelerator SLAC Detector Spectrometer

Reactions Polarized beam and target

$e^-$  deut 22.66 GeV ( $E_{lab}$ )

$e^-$  p "

Particles studied p, n

Comments Uses high energy polarized electron beams and a set of ammonia based polarized proton and deuteron targets. Studies the proton and neutron spin structure over the range  $0.03 \leq x \leq 1$  at momentum transfers greater than 1 ( $\text{GeV}/c$ )<sup>2</sup>. In preparation. Scheduled to run Fall 1993.

**SLAC-E-144** (Oct 1991) Approved Dec 1991.

**STUDY OF QED AT CRITICAL FIELD STRENGTH IN INTENSE LASER-HIGH ENERGY ELECTRON COLLISIONS AT SLAC**

PRINCETON U - J G Heinrich, C Lu, K T McDonald (Spokesperson)

ROCHESTER U - C Bamber, A C Melissinos (Spokesperson), D Meyerhofer, Y Semertzidis

SLAC - T L Barklow, D L Burke (Spokesperson), P Chen, R C Field, A C Odian, J E Spencer

SLAC & BROOKHAVEN - R B Palmer

Accelerator SLAC Detector ?

Comments Studies interactions of electrons and photons in collisions between focused picosecond pulses of UV light and a 50-GeV electron beam. The accessible phenomena include nonlinear Compton scattering, trident production, and Breit-Wheeler pair production. Measures the invariant-mass spectrum of  $e^+e^-$  pairs to clarify whether the positron peaks seen at Darmstadt in heavy-ion collisions are a strong-field QED effect. In preparation.

**SLAC-NE-01** (1984) Approved May 1984; Started Feb 1986; Completed Mar 1986.

**ELECTROPRODUCTION OF THE  $\Delta$  ISOBAR IN NUCLEI**

ARGONNE - D F Geesaman, M C Green, R J Holt, H E Jackson (Spokesperson), W E Kleppinger, R S Kowalczyk, T S H Lee, J P Schiffer, B Zeidman

Accelerator SLAC Detector Spectrometer

Reactions

$e^-$  deut 0.575, 0.650, 1.0, 2.0 GeV ( $E_{lab}$ )

$e^-$  <sup>12</sup>C "

$e^-$  <sup>56</sup>Fe "

Particles studied  $\Delta(1232 P_{33})$

Comments Measures electroproduction of the  $\Delta$  isobar in a variety of nuclear targets and over a range of kinematics. The aim is to study the location, size, and width of the isobar peak and to separate the longitudinal and transverse virtual photon cross sections. Uses the 1.6 GeV/c and 8 GeV/c spectrometers.

Papers PRL 61 (1988) 2530.

**SLAC-NE-03** (1984) Approved May 1984, Sep 1985; Started Jan 1985; Completed Jan 1986.

**INCLUSIVE ELECTRON SCATTERING FROM NUCLEI**

VIRGINIA U - R Altemus, D Day (Spokesperson), J S McCarthy, R Minehart, B Norum, R York

BASEL U - I Sick

Accelerator SLAC Detector Spectrometer

Reactions

$e^-$  He 3.6, 9.0 GeV ( $E_{lab}$ )

$e^-$  <sup>12</sup>C "

$e^-$  <sup>27</sup>Al "

$e^-$  <sup>56</sup>Fe "

$e^-$  <sup>197</sup>Au "

Comments Measures inclusive electron scattering from a series of nuclei in the kinematic domain spanning the energy loss region from inelastic threshold down to the quasi-elastic peak. The aim is to study high momentum components of nuclear wave functions. Uses the 8 GeV/c spectrometer.

**SLAC-NE-04** (1984) Approved May 1984, Sep 1985; Started Jun 1985; Completed Jun 1986.

**ELECTRON SCATTERING FROM DEUTERIUM AT LARGE MOMENTUM TRANSFER AT 180°**

AMERICAN U - R G Arnold, D Benton, P E Bosted

(✓ Spokesperson), G de Chambrier, L Clogher,

A T Katramatou, J M Lambert, A Lung, G Petratos, A Rahbar, S Rock, Z M Szalata

LIVERMORE - K van Bibber, F Dietrich

MASSACHUSETTS U, AMHERST - B Debebe, M Frodyma, R Hicks, A Hotta, G Peterson

SLAC - R Gearhart

TEL AVIV U - J Alster, J Lichtenstadt

Accelerator SLAC Detector Double-arm spectrometer

Reactions

$e^-$  p 0.73-1.28 GeV ( $E_{lab}$ )

$e^-$  deut "

Comments Measures the elastic and inelastic electron scattering from the deuteron at scattering angles around 180°, and elastic electron scattering from the proton. A double-arm spectrometer is assembled to detect scattered electrons and recoil deuterons. Ran for 426 hours.

Papers PRL 58 (1987) 1723, NIM A267 (1988) 448, PRL 61 (1988) 806, PR C42 (1990) 1, and PR C42 (1990) 38.

**SLAC-NE-05** (1984) Approved May 1984; Started Feb 1986; Completed Mar 1986.

**ELECTROEXCITATION OF  $\Delta$  IN NUCLEI**

VIRGINIA U - D Day, R Khalil, Z E Meziani, R Minehart,

R Sealock, S Thornton (Spokesperson), R York

FLORIDA STATE U - L Dennis, K Kemper

Accelerator SLAC Detector Spectrometer

Reactions

$e^-$  He 1.0, 1.5 GeV ( $E_{lab}$ )

$e^-$  <sup>12</sup>C "

$e^-$  <sup>27</sup>Al "

$e^-$  <sup>56</sup>Fe "

$e^-$  <sup>120</sup>Sn "

$e^-$  <sup>197</sup>Au "

Particles studied  $\Delta(1232 P_{33})$

Comments Studies the variation of position and width of the (3,3)  $\Delta$  resonance by electroexcitation for a range of nuclei and momentum transfers. Uses the 1.6 GeV/c spectrometer.

**SLAC-NE-08** (1986) Approved Jun 1986; Started Dec 1987; Completed Dec 1987.

**TWO-BODY PHOTODISINTEGRATION OF THE DEUTERON BETWEEN 0.6 AND 1.8 GeV**

ARGONNE - S J Freedman, D F Geesaman, R Gilman,

M C Green, R J Holt (✓ Spokesperson), H E Jackson,

R Kowalczyk, C Marchand, J Napolitano, J Nelson, B Zeidman

## SUMMARIES OF SLAC EXPERIMENTS

CAL TECH - D Beck, G Boyd, D Collins, B W Filippone,  
J Jourdan, R D McKeown, R G Milner, D Pottterveld, R Walker,  
C Woodward

NORTHWESTERN U - R E Segel, T Tung  
AMERICAN U - P E Bosted

MIT - E R Kinney  
STANFORD U - Z Meziani  
VIRGINIA U - R C Minehart

Accelerator SLAC Detector Spectrometer

Reactions

$\gamma$  deut  $\rightarrow$  p n                      0.8 - 1.8 GeV ( $E_{lab}$ )

Particles studied deut

Comments Studies the short range part of the deuteron wave function. Uses the 1.6 GeV/c spectrometer instrumented to detect protons.

Papers PRL 61 (1988) 2530.

**SLAC-NE-09** (1985) Approved Sep 1985, Jun 1986; Started Oct 1987; Completed Nov 1987.

**A PROPOSAL TO MEASURE THE TRANSVERSE AND LONGITUDINAL RESPONSE FUNCTIONS FOR SEVERAL NUCLEI AT MOMENTUM TRANSFERS NEAR  $Q^2 = 1$  (GeV/c)<sup>2</sup>**

VIRGINIA U - D Day, K Giovanetti, J S McCarthy, Z E Meziani (Spokesperson), R Minehart, O Rondon-Aramayo, R Sealock, S Thornton

FLORIDA STATE U - L Dennis, K Kemper

Accelerator SLAC Detector Spectrometer

Reactions

$e^-$  <sup>3</sup>He                      0.9 - 4.3 GeV ( $E_{lab}$ )

$e^-$  He                      "

$e^-$  <sup>27</sup>Al                      "

$e^-$  <sup>56</sup>Fe                      "

Comments Measures inclusive electron scattering cross sections at various scattering angles for several nuclei. Studies the  $Q^2$  and A dependence of the longitudinal and transverse response functions in the quasielastic region. Uses the 8 GeV/c spectrometer.

**SLAC-NE-11** (1987) Approved Apr 1987; Started Jan 1989; Completed Feb 1989.

**A PROPOSAL TO SEPARATE THE CHARGE AND MAGNETIC FORM-FACTORS OF THE NEUTRON AND PROTON AT LARGE MOMENTUM TRANSFER**

AMERICAN U - L Andivahis, R G Arnold, D Benton, P E Bosted ( $\checkmark$  Spokesperson), C E Keppel, A Lung, S E Rock, M Spengos, Z M Szalata, L Tao

CEBAF - J Gomez

UC, DAVIS - L Stuart

LIVERMORE - K van Bibber, F Dietrich

MARYLAND U - G C C Chang

MASSACHUSETTS U, AMHERST - R Hicks, R Miskimen,

G A Peterson, S Rokni

NIST, WASH, DC - W R Dodge

PENN U - K A Griffioen

ROCHESTER U - G M Petratos, W Sakumoto

SLAC - R Gearhart

STANFORD U - S Kuhn

TEL AVIV U - J Alster, J Lichtenstadt

WASHINGTON U, SEATTLE - C E Hyde-Wright, K Swartz

Accelerator SLAC Detector Spectrometer

Reactions

$e^-$  p                      1.5 - 10 GeV ( $E_{lab}$ )

$e^-$  deut                      "

$e^-$  Al                      "

Particles studied p, n

Comments Measures elastic and inelastic scattering from the proton and quasielastic and inelastic scattering from deuteron and aluminum. The principal aim is to separate the

charge and magnetic form factors of proton and neutron at momentum transfers from 1.75 to 7 (GeV/c)<sup>2</sup>. Uses the 8 GeV/c spectrometer to detect electrons at forward angles, and the 1.6 GeV/c spectrometer for electrons scattered at 90°. Ran for six weeks. Several publications in preparation (April 92).

**SLAC-NE-17** (1989) Approved Jun 1991; Started Aug 1991; Completed Oct 1991.

**TWO-BODY PHOTODISINTEGRATION OF THE DEUTERON AT FORWARD ANGLES BETWEEN 1.0 AND 3.0 GeV**

ARGONNE - K P Coulter, D F Geesaman, R J Holt

( $\checkmark$  Spokesperson), H E Jackson, D H Pottterveld, B Zeidman  
AMERICAN U - R G Arnold, P E Bosted, C E Keppel, A Lung,  
S E Rock, M Spengos, Z M Szalata, L Tao, J White

CAL TECH - J Arrington, E Beise, E Belz, B W Filippone,

H Gao, W Lorenzon, R D McKeown, B Mueller, T O'Neill

CAL STATE, LA - M Epstein, D Margaziotis

COLORADO U - E R Kinney

CEBAF - J Napolitano

ILLINOIS U, URBANA - D Beck

LIVERMORE - P Anthony, K van Bibber, F Dietrich

MIT, LNS - M Chapman, R Ent, O Hansen, K Lee, N Makins,

R G Milner, J Nelson

NORTHWESTERN U - R E Segel

STANFORD U - S Kuhn, Z E Meziani

SLAC - G M Petratos

WISCONSIN U - J van den Brand, H Bulten, C Jones

Accelerator SLAC Detector Spectrometer

Reactions

$\gamma$  deut  $\rightarrow$  p n                      1.0 - 3.0 GeV ( $E_{lab}$ )

Particles studied deut

Comments An extension of the SLAC-NE-08 experiment at higher momentum transfers. Makes use of bremsstrahlung photons produced from the SLAC electron beam. Uses the 8 GeV/c spectrometer instrumented to detect protons.

**SLAC-NE-18** (1989) Approved Feb 1990; Started Aug 1991; Completed Oct 1991.

**MEASUREMENT OF THE NUCLEAR DEPENDENCE AND MOMENTUM TRANSFER DEPENDENCE OF QUASIELASTIC ( $e, e/p$ ) SCATTERING AT LARGE MOMENTUM TRANSFER**

MIT, LNS - M Chapman, R Ent, O Hansen, K Lee, N Makins,

R G Milner ( $\checkmark$  Spokesperson), J Nelson

CAL TECH - E Beise, J E Belz, B W Filippone ( $\checkmark$  Spokesperson),

W Lorenzon, R D McKeown, T O'Neill, C Woodward

ARGONNE - K P Coulter, D F Geesaman, R J Holt, H E Jackson

AMERICAN U - R G Arnold, P E Bosted, C E Keppel, S E Rock,

M Spengos, Z M Szalata, L Tao, J White

CAL STATE, LA - M Epstein, D Margaziotis

COLORADO U - E R Kinney

STANFORD U - S Kuhn

SLAC - G M Petratos

WISCONSIN U - J van den Brand, H Bulten, C Jones

Accelerator SLAC Detector Spectrometer

Reactions

$e^-$  nucleon                      1.9 - 5.1 GeV ( $E_{lab}$ )

Comments Makes coincidence measurements of the quasielastic ( $e, e/p$ ) cross-section on several nuclei, from carbon to gold in the  $Q^2$  range of 1 to 7 (GeV/c)<sup>2</sup>. One of the aims is to look for evidence of color transparency. Uses the 1.6 GeV/c spectrometer for detection of electrons, and the 8 GeV/c spectrometer for recoil proton detection.

**SLAC-PEP-04-09** (Dec 1976) Approved Jan 1977; Started Oct 1982; Completed Oct 1990.

**THE TIME PROJECTION CHAMBER AND 2-GAMMA DETECTOR AT PEP**

LBL - A R Clark, O Dahl, D Lambert, G Lynch, R Madaras,

N A Nicol, D R Nygren, M Pripstein, M Ronan

## SUMMARIES OF SLAC EXPERIMENTS

( $\checkmark$  Spokesperson), R R Ross, G Shapiro, M L Stevenson,  
W A Wenzel  
UC, BERKELEY - H H Bingham, J Lys, G P Yost  
UC, DAVIS - D Pellett  
UC INTERCAMPUS INST - A M Eisner, M K Sullivan, Y Wang  
UC, SAN DIEGO - G Masek, W Vernon  
UC, SANTA BARBARA - D A Bauer, D O Caldwell, A Lu,  
S Yellin  
UCLA - R Berg, C D Buchanan, S Chun, S Khacheryan,  
Y Oyang, H Yamamoto  
AMES LAB - J M Hauptman  
HEIDELBERG, MAX PLANCK INST - W Hofmann,  
K T Knopfle, M F Spahn  
MASSACHUSETTS U, AMHERST - R Belcinski, R R Kofler  
( $\checkmark$  Spokesperson), M G Strauss  
SLAC - E Bloom, K Ecklund, K H Fairfield, G L Godfrey,  
R Holtzapple, H Marsiske, G H Zapalac  
Accelerator SLAC-PEP Detector TPC, 2-GAMMA

Reactions

$e^+ e^-$  29 GeV (Ecm)

Comments Physics objectives include the study of (1) hadronization of quarks into jets of hadrons, (2) particle composition of jets, (3) correlations in meson and baryon production, (4) properties of  $\tau$  lepton decays, and (5) two-photon processes. The detection apparatus consists of a time projection chamber (TPC), superconducting solenoid magnet, electromagnetic calorimeter, muon detector, and a forward detector for the  $2\gamma$  studies.

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, PL B184 (1987) 114, PL B184 (1987) 299, PRL 58 (1987) 97, PR D35 (1987) 1553, PR D35 (1987) 2650, ZPHY C34 (1987) 1, PRL 59 (1987) 751, PR D36 (1987) 3506, PRL 60 (1988) 2355, PR D37 (1988) 28, PR D38 (1988) 1, PL B209 (1988) 107, PRL 61 (1988) 1263, ZPHY C44 (1989) 357, PR D40 (1989) 2772, PRL 64 (1990) 172, PL B252 (1990) 499, PR D41 (1990) 2667, and PR D43 (1991) 29.

**SLAC-PEP-06** (Dec 1976) Approved Jan 1977; Started 1980; 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 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 Wisner, R W Zdarko  
UTAH U - D Groom ( $\checkmark$  Spokesperson), H Lee, E C Loh, P Verdini  
STANFORD U - H Nelson, L Rosenberg  
Accelerator SLAC-PEP Detector MAC

Reactions

$e^+ e^- \rightarrow \mu^+ \mu^-$	29 GeV (Ecm)
$e^+ e^- \rightarrow \tau^+ \tau^-$	"
$e^+ e^- \rightarrow e^+ e^-$	"
$e^+ e^- \rightarrow \text{quark quark}$	"
$e^+ e^- \rightarrow \mu^+ \mu^- \gamma(s)$	"
$e^+ e^- \rightarrow e^+ e^- \mu^+ \mu^-$	"
$e^+ e^- \rightarrow \gamma \gamma$	"
$e^+ e^- \rightarrow e^+ e^- \text{ hadrons}$	"
$e^+ e^- \rightarrow \gamma X$	"

Particles studied  $\tau, B$

Comments Studies lifetimes using the high-precision vertex chamber, measures  $\tau^\pm$  branching ratios and the  $\mu^+ \mu^-$  asymmetry. Other topics include production limits on supersymmetric particles,  $B$  lifetime determination, charge asymmetry in hadronic production,  $\gamma\gamma$  and  $e^+ e^-$  production, and  $\alpha_s$  determination from the shape of hadronic events. For a detailed description of the MAC detector, see NIM A281 (1989) 291.

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 D33 (1986) 3472, PR D35 (1987) 1, PR D35 (1987) 10, PR D35 (1987) 374, PR D35 (1987) 408, PRL 58 (1987) 640, PRL 58 (1987) 1080, NIM A261 (1987) 399, PR D36 (1987) 1971, PRL 59 (1987) 415, PL B198 (1987) 297, PL B200 (1988) 221, NIM A281 (1989) 291, PL B218 (1989) 369, and PR D40 (1989) 1385.

**SLAC-PEP-12** (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 Brom, C Jung, H Ogren, H W Paik, D Rust  
MICHIGAN U - C Akerlof, J Chapman, D Errede, M T Ken, D Meyer, H Neal, D Nitz, M Petradza, 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  
( $\checkmark$  Spokesperson), C R Ng, E Shibata  
LBL - B Cork

Accelerator SLAC-PEP Detector HRS

Reactions

$e^+ e^-$  29 GeV (Ecm)

Particles studied  $\tau, \nu_\tau, D^+, D^0, D^*(2010), D_s^+, f_2(1270)$

Comments Obtained a 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.

Papers NIM 169 (1980) 413, NIM 186 (1981) 513, NIM 203 (1982) 119, PR D30 (1984) 515, PRL 53 (1984) 1971, PL B146 (1984) 261, PL B149 (1984) 519, PR D31 (1985) 1, PL B153 (1985) 116, PR D31 (1985) 2352, PRL 54 (1985) 1775, PRL 54 (1985) 2568, PRL 55 (1985) 570, PL B156 (1985) 271, PL B158 (1985) 519, PL B161 (1985) 412, PL B164 (1985) 199, PL B165 (1985) 449, PL B166 (1986) 463, PL B166 (1986) 468, PL B168 (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 B181 (1986) 403, PL B182 (1986) 101, PL B183 (1987) 232, PR D35 (1987) 2269, PL B189 (1987) 260, PR D35 (1987) 2639, PR D35 (1987) 2880, ZPHY C35 (1987) 323, PRL 58 (1987) 2627 [erratum: PRL 59 (1987) 2388], PL B195 (1987) 301, PL B197 (1987) 291, PL B199 (1987) 151, PL B199 (1987) 585, PRL 59 (1987) 2519, PR D37 (1988) 577, PL B205 (1988) 111, PL B205 (1988) 407, PL B205 (1988) 411, PL B206 (1988) 551, PL B212 (1988) 533, PR D39 (1989) 123, NIM A276 (1989) 496, PR D40 (1989) 706, PR D40 (1989) 902, PL B226 (1989) 405, PR D41 (1990) 1414, PR D41 (1990) 2045, and PR D42 (1990) 2180.

## SUMMARIES OF SLAC EXPERIMENTS

**SLAC-PEP-21** (Mar 1983) Approved May 1983; Started Nov 1984; 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)  
 $e^+e^- \rightarrow e^+e^- \gamma \gamma$  "

Particles studied photino, s-electron, nuino,  $\nu$ ,  $\eta$ ,  $\eta'$

Comments Obtained a data sample of 117/pb integrated luminosity. Among other topics, searches for light particles predicted by supersymmetric theories. Photons are detected in a calorimeter of lead-glass blocks. No anomalous signal is seen. Places limits on number of neutrino generations with masses less than a few GeV, and on the mass of the selectron.

Papers PRL 56 (1986) 685, PRL 58 (1987) 1711, PR D39 (1989) 3207, and PR D41 (1990) 17.

**SLAC-SLC-SLD** (1983) Approved May 1984; Started Apr 1991.

**THE SLD DETECTOR FOR THE SLC**

ADELPHI U - R Steiner  
 BOSTON U - J Collier, A Johnson, J T Shank, M Tahar,  
 D Warner, J S Whitaker, B Wilson  
 BRUNEL U - P D Acton, G Agnew, P E L Clarke, R Cotton,  
 S Hedges, A K McKemey, S J Watts  
 CAL TECH - F DeJongh, G Eigen, D G Hitlin, M H Kelsey,  
 M Klein, A I Mincer, W J Wisniewski  
 COLUMBIA U - C Arroyo, Y Au, A O Bazarko, T Bolton,  
 L Camilleri, E Hyatt, P C Rowson, M H Shaevitz  
 INDIANA U - H Ogren, D Rust, A Snyder  
 INFN, BOLOGNA - A Benvenuti  
 FERRARA U - B Camanzi, E Mazzucato, L Piemontese, B Saitta  
 INFN, PISA - M Carpinelli, R Castaldi, R Dell'Orso, E Pieroni,  
 C Vannini, P G Verdini  
 KEK - J Fujimoto  
 FRASCATI - A Calcaterra, M Gallinaro, I Peruzzi, M Piccolo,  
 R De Sangro, P De Simone, S De Simone  
 LBL - M Kowitt, B Schumm, G Shapiro, H Steiner  
 MIT - O Bardon, P N Burrows, W Busza, S Cartwright,  
 R F Cowan, B Farhat, M J Fero, J I Friedman, S Gonzalez,  
 T Hansl-Kozanecka, H W Kendall, A Lath, T Lyons,  
 L S Osborne, A Palounek, J Quigley, L Rosenson,  
 U Schneekloth, F E Taylor, E Torrence, R Verdier,  
 B F Wadsworth, D C Williams, R K Yamamoto, J M Yamartino  
 NAGOYA U - R Kajikawa, A Sugiyama, S Suzuki  
 NORTHEASTERN U - H R Band  
 RUTGERS U - K G Baird, P Jacques, M Kalelkar, J N Matthews,  
 R J Plano, P Stamer, G B Word  
 RUTHERFORD - C J S Damerell, R L English, T Gillman,  
 L Lintern, R J Stephenson, D Su, G J Tappern, F J Wickens  
 SLAC - D F Alzofon, P Antilogus, W W Ash, D Aston,  
 W B Atwood, W Baker, F Barrera, R A Bell, R Berger,  
 E Beville, T Bienz, R Blumberg, J R Bogart, G R Bower,  
 R F Boyce, M Breidenbach ( $\checkmark$  Spokesperson), T E Browder,  
 B Burgess, D Burke, B L Byers, R Cassell, G B Chadwick,  
 D Chambers, R Claus, W Craddock, H Cutler, S Dasu, R Davis,  
 T Dean, R Dubois, W Dunwoodie, R D Elia, J Escalera,  
 F Fernandez-Texon, J Ferrie, J Flynn, J D Fox, M J Fox,  
 D R Freytag, G M Haller, G D Hallewell, V Hamilton,  
 M Hildreth, R C Hilomen, J Hodgson, J J Hoeflich, D Horelick,  
 M E Huffer, E W Hughes, C Jako, S Jones, T Junk, S Kaiser,  
 H Kang, H Kawahara, D Kharakh, P C Kim, R King,  
 P F Kunz, Y Kwon, J F Labs, R Larsen, D W G Leith,  
 H L Lynch, D Mansour, T W Markiewicz, T Maruyama,

H Masuda, G Mazaheri, R Messner, K C Moffeit, B Mours,  
 G Mueller, D Muller, T Nagamine, H Neal, D Nelson,  
 M Nordby, A Nuttall, J Olsen, R Ossa, G Oxoby, L Paffrath,  
 T J Pavel, H Petersen, M Petradza, C Y Prescott, G D Punkar,  
 G Putallaz, B N Ratcliff, P E Rensing, R Rinta, L S Rochester,  
 A Rothenberg, J J Russell, P Saez, O H Saxton, R H Schindler,  
 D Schultz, S L Shapiro, H Shaw, D J Sherden, C Simopoulos,  
 K Skarpaas, S R Smith, P Stiles, M Swartz, T Takahashi,  
 N Toge, T Usher, J Va'Vra, A P Waite, D Walz, R Watt,  
 T Weber, S H Williams, C Yee, A Yim, C C Young,  
 R W Zdarko  
 TOHOKU U - K Abe, K Hasegawa, Y Hasegawa, Y Iwasaki,  
 F Suekane, H Yuta  
 TRIUMF - D P Gurd, C Oram  
 UC, SANTA BARBARA - D A Bauer, A Bean, D O Caldwell,  
 R Dolin, J E Duboscq, D L Hale, J Huber, A Lu, L Mathys,  
 S McHugh, R J Morrison, J D Richman, S A Wickert,  
 M S Witherell, S J Yellin  
 UC, SANTA CRUZ - G Blaylock, M Cavalli-Sforza, P A Coyle,  
 D G Coyne, X Liu, T Schalk, M Schneider, A Seiden,  
 E N Spencer, D A Williams  
 PADUA U & INFN, PADUA - N Bacchetta, D Bisello, A Castro,  
 M Loreti, A Mazzucato, L Pescara, M Tecchio, J Wyss  
 PERUGIA U & INFN, PERUGIA - R Battiston, M Biasini,  
 G M Bilei, G Mancinelli, G Mantovani, M Pauluzzi, L Servoli  
 BRITISH COLUMBIA U - D A Axen, S Bougerolle, D Peters,  
 R L Shypit, R Sobie  
 CINCINNATI U - K Choi, A D'Oliveira, R A Johnson,  
 J L Martinez, B T Meadows, M Nussbaum, E Rutz,  
 A K Santha, A Shoup, M D Sokoloff, I E Stockdale  
 COLORADO U - C Alber, G J Baranko, J Carr, D D Durrett,  
 E Erdos, C Fan, N M Krishna, J Lauber, U Nauenberg,  
 P Rankin, G E Schultz  
 ILLINOIS U, URBANA - I Abt, D Blockus, R W Downing,  
 B I Eisenstein, K M Fortune, G Gladding, M J Haney, J M Izen,  
 I Karliner, W A Majid, J F McGowan, D J Mellor, G Stewart,  
 J J Thaler  
 MASSACHUSETTS U, AMHERST - R J Belcinski,  
 S S Hertzbach, R R Kofler, M G Strauss  
 OREGON U - J Brau, R Frey, K Furuno, H Hwang, H Park,  
 K T Pitts, C Zeitlin  
 TENNESSEE U - S C Berridge, B Bugg, H O Cohn, P Du,  
 T Handler, E L Hart, R S Kroeger, A W Weidemann, S L White  
 VICTORIA U & TRIUMF - A Astbury, G Beer, T A Hodges,  
 A Honma, R K Keeler, R R Langstaff, G R Mason,  
 P R Poffenberger, L P Robertson, P R Schenk, M Turcotte  
 WASHINGTON U, SEATTLE - T H Burnett, V Cook,  
 D A Forbush, J Harrison, H Y Kim, J Ma, P M Mockett,  
 J E Rothberg, A Szumilo, F Toevs, E Vella, R W Williams,  
 K K Young  
 WISCONSIN U - H R Band, J R Johnson, R Prepost, G Zapalac  
 VANDERBILT U - L Chen, R S Panvini, T W Reeves, J P Venuti  
 YALE U - C Baltay ( $\checkmark$  Spokesperson), R Ben-David, A Disco,  
 W T Emmet, S Manly, J A Snyder, J D Turk

Accelerator SLAC-SLC Detector SLD

Reactions

$e^+e^- < 100$  GeV (Ecm)

Particles studied  $Z^0$ , higgs, top

Comments Studies include (1) precision tests of the Standard Model of the electroweak interactions and the Z partial width to bottom states, particularly by measuring the left-right polarization asymmetry  $A_{LR}$ , (2) heavy quark physics of the B system, (3)  $B\bar{B}$  mixing with polarized beams, (4) tests of QCD in multi-jets, and (5) a search for new phenomena. The detector system consists of a high precision CCD vertex detector, a cylindrical central drift chamber with four circular endcap drift chambers, a Čerenkov Ring Imaging Detector, finely segmented projective tower geometry calorimetry, and a muon tracking system. Taking data (May 92).

Papers NIM A238 (1985) 489, IEEE TNS 33 (1986) 46, 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, IEEE TNS 33 (1986) 261, NIM A252 (1986) 295, NIM A257 (1987) 139, NIM A257 (1987) 625, IEEE TNS 35 (1988) 231, IEEE TNS 35 (1988) 282, IEEE TNS 35 (1988) 311, IEEE TNS 35 (1988) 398, NIM A264 (1988) 219, NIM A265

## SUMMARIES OF SLAC EXPERIMENTS

(1988) 99, NIM A273 (1988) 858, IEEE TNS 36 (1989) 23, IEEE TNS 36 (1989) 276, IEEE TNS 36 (1989) 339, IEEE TNS 36 (1989) 595, IEEE TNS 36 (1989) 675, IEEE TNS 36 (1989) 751, IEEE TNS 36 (1989) 822, IEEE TNS 36 (1989) 1657, NIM A275 (1989) 484, NIM A276 (1989) 94, NIM A277 (1989) 222, NIM A283 (1989) 582, NIM A283 (1989) 590, NIM A284 (1989) 339, IEEE TNS 37 (1990) 1132, IEEE TNS 37 (1990) 1191, NIM A288 (1990) 236, NIM A289 (1990) 449, NIM A289 (1990) 463, NIM A289 (1990) 577, NIM A290 (1990) 353, NIM A293 (1990) 136, NP (Proc. Suppl.) B23 (1991) 219, NP (Proc. Suppl.) B23 (1991) 227, and NIM A300 (1991) 501.

**SLAC-SLC-6** (Apr 1983) Approved May 1983; Started Apr 1989; Completed 1990.

### MARK II AT THE SLC

CAL TECH - B C Barish, M Kuhlen, J McKenna, B Milliken, C Peck, F Porter, R Stroynowski, A Weinstein, A Weir  
 CERN - J F Kral  
 COLORADO U - D D Durrett, W T Ford, D Hinshaw, P Rankin, J G Smith, P Weber  
 FERMI LAB - J Hylen, E Wicklund  
 HAWAII U - A M Breakstone, R Cence, F Harris, C Kenney, S Parker  
 INDIANA U - D A Averill, D Blockus, B Brabson, G G Hanson, W N Murray, H Ogren, D Rust, M Yurko  
 IOWA STATE U - J Hill, F K Wahn  
 JOHNS HOPKINS U - B A Barnett, P Dauncey, D Drewler, B D Harral, J Matthews  
 LBL - G S Abrams, S Bethke, G Gidal, G Goldhaber (✓ Spokesperson), R Harr, C Hearty, J A Kadyk, M Levi, F Rouse, M Schaad, B A Schumm, G Trilling  
 MICHIGAN U - J Chapman, M Chmeissani, E C Gero, S J Hong, W Koska, R P Thun, D Wu  
 OREGON U - R E Frey  
 SLAC - C Adolphsen, J Ballam, T L Barklow, A M Boyarski, F Bulos, D L Burke, D Cords, H DeStaebler, J Dorfan, R Elia, G Feldman (✓ Spokesperson), R C Field, B H Fong, D H Fujino, T Glanzman, T M Himel, D P Hutchinson, W Innes, J A Jaros (✓ Spokesperson), M E King, D S Koetke, L A Kowalski, W Kozanecki, V G Luth, T Mattison, K C Moffeit, C T Munger, K O'Shaughnessy, M L Perl, M G Petradza, R Pitthan, A E Snyder, E J Soderstrom, D P Stoker, M Swartz, R E Taylor, E L Veum, S R Wagner, M B Woods  
 SSCL - D P Coupal  
 UC, SANTA CRUZ - P Burchat, D E Dorfan, C Gatto, J Gomez-Cadenas, G Gratta, C A Heusch, J Kent, L Labarga, A Litke, H Sadrozinski, A Seiden, S Watson, C Zaccardelli, C Von Zanthier  
 VANDERBILT U - J E Bartelt

Accelerator SLAC-SLC Detector MARK-II

#### Reactions

$e^+ e^- < 100 \text{ GeV (Ecm)}$

Particles studied  $Z^0, B, \text{higgs, top, } \tau$

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, (3) a search for new heavy quarks and leptons, (4) a search for Higgs particles, (5) tests of QCD in multi-jets, (6) measurement of  $b$  fractions and properties of  $b$  events, and (7) a search for new phenomena. Uses an existing PEP detector, the Mark-II. A high resolution vertex detector system was installed in December 89 and successfully operated in 1990.

Papers PRL 63 (1989) 724, PRL 63 (1989) 1558, PRL 63 (1989) 2173, PRL 63 (1989) 2447, PRL 63 (1989) 2780, PRL 64 (1990) 987, PRL 64 (1990) 1091, PRL 64 (1990) 1211, PRL 64 (1990) 1334, PRL 64 (1990) 2877, PRL 64 (1990) 2881, PRL 64 (1990) 2980, PRL 64 (1990) 2984, PR D41 (1990) 3542, and PRL 67 (1991) 3347.

SLAC - K O Bunnell, R E Cassell, D H Coward, J Labs, A C Odian, R H Schindler (Spokesperson), W H Toki (Spokesperson), F Villa  
 UC, SANTA CRUZ - M Burchell, D Dorfan, C A Heusch, W Lockman, H Sadrozinski, T Schalk, A Seiden, R C Xu  
 ILLINOIS U, URBANA - B I Eisenstein, G E Gladding, J Izen, G Stewart  
 IOWA U - U Mallik, M Wang  
 WASHINGTON U, SEATTLE - T H Burnett, V Cook, A D Li, P Mockett, L W H Parrish

Accelerator SLAC-SPEAR Detector MARK-III

#### Reactions

$e^+ e^- 3.097, 3.686, 3.770, 4.14 \text{ GeV (Ecm)}$

Particles studied  $D^0, D^+, D^-, D_s^+, \psi(3770), J/\psi(1S), \psi(2S), \eta_c(1S)$

Comments Mark-III is a general purpose detector for the study of hadronic final states in  $e^+ e^-$  annihilation. It is optimized for the reconstruction of exclusive decays of charmed particles. The trigger chamber was replaced in 1986 by a new high resolution vertex detector. The physics program is focused on detailed studies of the  $J/\psi$  system and higher  $\psi$  states,  $D$  mesons (branching fractions, rare decays, mixing, dynamical features of decays), and the  $\tau$  lepton.

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, PRL 56 (1986) 2140, PR D35 (1987) 2077, PRL 58 (1987) 2171, PL B193 (1987) 147 [erratum: PL B198 (1987) 590], PR D36 (1987) 2185, PL B196 (1987) 107, PRL 59 (1987) 186, PRL 59 (1987) 1527, PR D37 (1988) 2023 [erratum: PR D40 (1989) 3788], PRL 60 (1988) 89, PRL 60 (1988) 1375 [erratum: PRL 63 (1989) 1658], PR D38 (1988) 2695 [erratum: PR D40 (1989) 3788], PL B208 (1988) 152 [erratum: PL B227 (1989) 501], PRL 62 (1989) 1821, PR D40 (1989) 906, PRL 63 (1989) 1211 [erratum: PRL 63 (1989) 2858], PRL 64 (1990) 169, PR D41 (1990) 1410, PRL 64 (1990) 2615, PRL 65 (1990) 686, PRL 65 (1990) 1309, PRL 65 (1990) 2507, PL B263 (1991) 135, PRL 66 (1991) 1011, NP A527 (1991) 753, and PRL 68 (1992) 282.

**SLAC-SP-032** (May 1981) Approved May 1981; Started Apr 1982; Completed Dec 1988.

### MARK-III AT SPEAR

CAL TECH - G P Dubois, G Eigen, D G Hitlin, C Matthews, A Weinstein, W Wisniewski

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## SSCL Experiments

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**SSCL-GEM** (Jun 1991) Approved 1992.

### **GAMMA, ELECTRON, AND MUON EXPERIMENT**

Accelerator SSC Detector GEM

Comments Exploits with the GEM detector the physics opportunities opened up by the new collider. The detector has a large superconducting open-geometry solenoid, emphasizing the detection of photons, electrons and muons with high precision. Muons will be tracked with a combination of drift tubes (in barrel region) and cathode strip chambers (end caps), with resistive plate counters in the barrel region to trigger on muons and tag beam crossings. The chambers surround the calorimeters and fill a large (16 m diameter, 30 m long), 0.8 T superconducting solenoid. Inside the calorimeters is a compact central tracker. The collaboration consists of 600 physicists from 15 countries, and is likely to grow. The development of a Technical Design Report is in progress (April 92). For further details, please contact the spokespersons, Dr. Barry Barish, Cal Tech, and Dr. William Willis, Columbia University.

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**SSCL-SDC** (1989) Approved Jan 1991.

### **SOLENOIDAL DETECTOR COLLABORATION**

SDC COLLABORATION

Accelerator SSC Detector SDC

Comments The major goal is to exploit the physics opportunities opened up by the SSC collider with its design luminosity of  $10^{33} \text{ cm}^{-2} \text{ s}^{-1}$  and counter-rotating beams of 20 TeV protons. The study will include the search for Higgs boson(s) and higher mass gauge bosons, new spectroscopies such as supersymmetry, and searches for compositeness effects and new phenomena not necessarily suggested by present theories. The detector has a large cylindrical volume (1.7 m radius by 8 m length), concentric with the beam and surrounded by a superconducting solenoid coil that produces a 2 T magnetic field. The volume is filled with tracking detectors which measure momenta and directions of charged particles emitted over the angular interval between  $10^\circ$  and  $170^\circ$ . Outside of the solenoid and tracking volume, there is an hermetic central calorimeter providing total energy measurements for electrons, photons, and hadron jets. The calorimeter includes a shower detector that provides position information on electromagnetic showers. Two forward calorimeters extend the coverage for calorimetry down to  $0.5^\circ$ , and up to  $179.5^\circ$ . On the outside of the central calorimeter there is an extensive system for identifying and triggering on muons. The collaboration consists of over 700 physicists and engineers from 12 countries, and is likely to grow. On April 1, 1992, the collaboration submitted the Technical Design Report, and hopes to initiate construction in early 1993. Physics operation is scheduled for 1999. For further details, please contact the spokesperson, Dr. George H. Trilling, LBL, Berkeley.

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## SUMMARIES OF TRIUMF EXPERIMENTS

### TRIUMF Experiments

**TRIUMF-182** Completed 1988.

**MEASUREMENT OF THE  $np$  SPIN CORRELATION PARAMETER  $A_{nn}$**

TRIUMF - R Abegg, L G Greeniaus, C A Miller  
 MANITOBA U - J Birchall, N E Davison, 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 Wire chamber, Counter

Reactions Polarized beam and target

$n p \rightarrow n p$  220, 325, 425 MeV ( $T_{lab}$ )

Comments Measures  $A_{nn}$ ,  $A_{0n}$ , and  $A_{n0}$ .

Papers PR C40 (1989) 2406, PR C40 (1989) 2684, and NIM A306 (1991) 432.

**TRIUMF-248** (Jul 1983) Approved Jul 1983; Started Oct 1983; Completed Jun 1986.

**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

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. Analysis of data in progress (February 92).

Papers PRL 56 (1986) 2241, and PR D37 (1988) 1131.

**TRIUMF-297** Completed Jan 1987.

**ENERGETIC NEUTRON SPECTRA FROM  $\mu^-$  CAPTURE IN THE DEUTERON**

JOHNS HOPKINS U - T J Hallman, Y K Lee (✓ Spokesperson),  
 L Madansky, E K McIntyre, Jr  
 VICTORIA U - G R Mason

Accelerator TRIUMF Detector Counter

Reactions

$\mu^- \text{ deut} \rightarrow n n$  0 MeV/c

Papers PL B188 (1987) 33. No other papers expected.

**TRIUMF-298** (Dec 1984) Approved Dec 1984; Completed Nov 1989.

**RESONANT STRUCTURE IN  $\text{Cu}(p, \pi^+)X$ : A POSSIBLE DIBARYON SIGNAL**

TRIUMF - R Abegg, S Burzynski, A Celler, D Frekers, R Helmer,  
 K P Jackson, J Lu, C A Miller, R Schubank, A Trudel,  
 M C Vetterli, Y S Wu, S Yen (✓ Spokesperson)

ST PETERSBURG, INP - I I Strakovsky

WESTERN ONTARIO U - W P Alford

Accelerator TRIUMF Detector Spectrometer

Reactions

$p \text{ Cu} \rightarrow \pi^+ X$  341-376 MeV ( $T_{lab}$ )

$p \text{ Cu} \rightarrow \pi^- X$  "

Particles studied dibaryon

Comments No resonant structure observed in the  $\pi^+$  or  $\pi^-$  yield.

Papers PL B269 (1991) 59. No other papers expected.

**TRIUMF-300** (Oct 1984) Completed 1987.

**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

$p p \rightarrow \text{deut } \pi^+$  510 MeV ( $T_{lab}$ )

Papers NP A503 (1989) 649.

**TRIUMF-301** (Oct 1984) Completed Sep 1986.

**THE REACTION  $pp \rightarrow pp\pi^0$  NEAR THRESHOLD**

BRITISH COLUMBIA U - D F Measday (✓ 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 ( $T_{lab}$ )

Comments Measures the  $\pi^0$  asymmetry and differential and total cross sections.

Papers PR C41 (1990) 1913, and PR C44 (1991) 2287. No other papers expected.

**TRIUMF-304** (Oct 1984) Approved Dec 1984; Started Jul 1985; Completed Aug 1988.

**MUONIUM-ANTIMUONIUM CONVERSION**

VICTORIA U - G A Beer, A C Janisson, G R Mason, A Olin  
 (✓ Spokesperson)

BRITISH COLUMBIA U - J B Warren

ARIZONA U - T Bowen, P G Halverson

WYOMING U - T Huber, A R Kunselman

TRIUMF - K Kendall, G M Marshall

SIMON FRASER U - B Heinrich, K Myrtle

Accelerator TRIUMF Detector Wire chamber, Counter

Reactions

$\mu^+ e^- \rightarrow \mu^- e^+$  20-29 MeV/c

Papers PRL 57 (1986) 611, PRL 61 (1988) 2189, PR D41 (1990) 2709, and PR A42 (1990) 161.

**TRIUMF-332** (Oct 1984) Completed 1988.

**RATIO OF SPIN TRANSFER PARAMETERS  $D_t/R_t$**

MANITOBA U - D Bandgopadhyoy, J Birchall, N E Davison,

W T H van Oers, S A Page, P R Poffenberger, D Ramsey

MANITOBA U & TRIUMF - C A Davis (✓ Spokesperson)

ALBERTA U - P W Green, C Lapointe, G Moss, R Tkachuk

ALBERTA U & TRIUMF - R Abegg, G Greeniaus, C A Miller

Accelerator TRIUMF Detector Counter

Reactions Polarized beam

$p \text{ deut} \rightarrow n p p$  220, 325, 425, 495 MeV ( $T_{lab}$ )

Comments Measures the ratio of the Wolfenstein parameters  $D_t$  and  $R_t$  for the  $np$  system. Uses a scintillator and DLC's.

Papers PR C38 (1988) 2173.

**TRIUMF-337** (Dec 1984) Approved Dec 1984; Completed Dec 1986.

**MEASUREMENT OF TENSOR OBSERVABLES IN THE  $\pi^+ d$  ELASTIC SCATTERING REACTION**

## SUMMARIES OF TRIUMF EXPERIMENTS

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 Teruvidis, P Trelle

Accelerator TRIUMF Detector Counter

Reactions Polarized target  
 $\pi^+$  deut  $\rightarrow$   $\pi^+$  deut 100-294 MeV ( $T_{lab}$ )

Papers PRL 57 (1986) 803.

**TRIUMF-360** (Nov 1985) Approved Dec 1985.

**POLARIZATION TRANSFER IN  $\pi^{\pm}$  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 (Spokesperson), N Stevenson  
 TORONTO U - T Drake, R Schubank

Accelerator TRIUMF Detector ?

Reactions Polarized target  
 $\pi^+$  deut  $\rightarrow$   $\pi^+$  deut 160 MeV ( $T_{lab}$ )

**TRIUMF-369** (Dec 1985) Approved Dec 1985; Started 1991.

**CHARGE SYMMETRY BREAKING IN  $np$  ELASTIC SCATTERING AT 350 MeV**

TRIUMF - R Abegg, P P J Delheij, P W Green, L G Greeniaus ( $\checkmark$  Spokesperson), D C Healey, R Helmer, P Levy, C A Miller  
 MANITOBA U - A R Berdoz, J Birchall, J R Campbell, C A Davis, N E Davison, W T H van Oers ( $\checkmark$  Spokesperson), S A Page, W D Ramsay, J Zhao  
 ALBERTA U - N Kolb, E Korkmaz, J Li, N Rodning, J Soukup, G M Stinson

Accelerator TRIUMF Detector Counter, Wire chamber

Reactions Polarized beam and target  
 $n p \rightarrow n p$  350 MeV ( $T_{lab}$ )

Comments Studies the isospin-mixing component of the  $np$  interaction by measuring the analyzing power differences. Uses a frozen spin target. In progress. Next run scheduled for August 92.

**TRIUMF-372** Approved Dec 1985; Completed Feb 1991.

**SINGLE PION PRODUCTION IN  $np$  SCATTERING**

MANITOBA U - A R Berdoz, J Birchall, J R Campbell, 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  
 TEXAS U - P J Riley  
 HOUSTON U - B W Mayes, L Pinsky  
 RICE U - D L Adams, G W Mutchler  
 CAL STATE, LA - M Epstein, D J Margaziotis

Accelerator TRIUMF Detector Wire chamber, Counter

Reactions Polarized beam  
 $n p \rightarrow p p \pi^-$  450 MeV ( $T_{lab}$ )

Comments Data analysis in progress (February 92).

**TRIUMF-375** Completed 1988.

**FEW BODY PHYSICS VIA THE PION-DEUTERON BREAKUP REACTION**

REGINA U - G Huber, G J Lolos, E L Mathie ( $\checkmark$  Spokesperson), S I H Naqvi, V Pafilis, 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  $p n$  134, 180, 228 MeV ( $T_{lab}$ )

Comments The experiment has two distinct parts. TRIUMF-375A measures unpolarized cross sections with a liquid target. Data taking for this phase was completed in 1986. TRIUMF-375B studies analysing powers with a polarized target. Data taking was completed in 1988. Pions and protons are detected by measuring the time of flight. Data analysis for both experiments is in progress (February 92).

Papers PR C41 (1990) 193.

**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 Teruvidis, 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 ( $T_{lab}$ )  
 $\pi^-$  deut  $\rightarrow$   $\pi^-$  deut "

Comments Measures differential cross sections and  $A_{\pi}$ .

**TRIUMF-387** (Nov 1985) Approved Dec 1985; Completed 1989.

**MEASURE OF BIRKS FACTOR IN TMP**

VICTORIA U - A Astbury ( $\checkmark$  Spokesperson), M Fincke-Keeler, R Keeler, P Poffenberger, L Robertson, M Rosvick, P Schenk  
 CERN - D Schinzel  
 ANNECY - A Gonidec  
 TRIUMF - C J Oram  
 BRITISH COLUMBIA U - R Sobie

Accelerator TRIUMF Detector ?

Reactions  
 $\pi^+$  50-400 MeV/c  
 $p$  "

Papers NIM A (submitted).

**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  
 REGINA U - E L Mathie

Accelerator TRIUMF Detector Counter

Reactions  
 $\pi^+ p \rightarrow \pi^+ p$  20-65 MeV ( $T_{lab}$ )  
 $\pi^- p \rightarrow \pi^- p$  "

Papers PR C41 (1990) 2202.

**TRIUMF-399** (May 1987) Completed Jul 1990.

**MEASUREMENT OF  $\pi^{\pm} d$  ELASTIC SCATTERING DIFFERENTIAL CROSS SECTIONS AT  $T_{\pi} = 30, 50, \text{ AND } 65 \text{ MeV}$**

COLORADO U - J T Brack, J J Kraushaar, R A Loveman, R J Peterson, R A Ristinen ( $\checkmark$  Spokesperson)  
 TRIUMF - D R Gill  
 REGINA U - E L Mathie  
 BRITISH COLUMBIA U - R R Johnson, R Olszewski, M Seviar, G R Smith ( $\checkmark$  Spokesperson), R P Trelle

Accelerator TRIUMF Detector Counter

## SUMMARIES OF TRIUMF EXPERIMENTS

### Reactions

$\pi^+$ deut $\rightarrow$ $\pi^+$ deut	30, 50, 65 MeV ( $T_{lab}$ )
$\pi^-$ deut $\rightarrow$ $\pi^-$ deut	"
$\pi^+$ p $\rightarrow$ $\pi^+$ p	66.8 MeV ( $T_{lab}$ )

Comments Results of the run at energies near 65 MeV have been published. The analysis of the data at 30 and 45 MeV is in progress (February 92).

Papers PR C38 (1988) 2427, and PR C44 (1991) 15.

**TRIUMF-441** (Nov 1986) Completed 1987.

### AMPLITUDE DETERMINATION OF THE PION-NUCLEON ELASTIC SCATTERING REACTION. PART 1: ANALYZING POWER

TRIUMF - D R Gill, D Healey, D Ottewell, G R Smith (Spokesperson), G D Wait  
 COLORADO U - J T Brack, J J Kraushaar (Spokesperson), R J Peterson, R A Ristinen  
 BRITISH COLUMBIA U - R R Johnson, G Jones, R Olszewski, M E Sevier, R P Trelle  
 REGINA U - E L Mathie

Accelerator TRIUMF Detector Counter

Reactions Polarized target

$\pi^+$ p $\rightarrow$ $\pi^+$ p	90, 120, 150, 180, 210, 240, 270 MeV ( $T_{lab}$ )
$\pi^-$ p $\rightarrow$ $\pi^-$ p	"

**TRIUMF-443** (Nov 1986) Completed 1987.

### STUDY OF THE $\pi^+$ d $\rightarrow$ $\pi^-$ $\pi^+$ pp REACTION AT $T = 250$ AND 280 MeV

TRIUMF - D R Gill  
 INFN, TRIESTE - N Grion  
 TRIESTE U - R Rui (Spokesperson)  
 BRITISH COLUMBIA U - M Hanna, R R Johnson, R Olszewski, F M Rozon, M Sevier, G Smith, V Sossi, P Trelle  
 TRIESTE U & INFN, TRIESTE - G Margagliotti  
 BRITISH COLUMBIA U & BEIJING, IHEP - Z Wu

Accelerator TRIUMF Detector Counter, Spectrometer

Reactions

$\pi^+$ deut $\rightarrow$ p p $\pi^-$ $\pi^+$	250, 280 MeV ( $T_{lab}$ )
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Papers NP A517 (1990) 455.

**TRIUMF-446** (May 1987) Completed Apr 1989.

### PION-PROTON BREMSSTRAHLUNG

OREGON STATE U - F Farzanpay, P Fuchs, A Stetz ( $\checkmark$  Spokesperson), L W Swenson, N Wen  
 ALBERTA U & TRIUMF - P Kitching ( $\checkmark$  Spokesperson)  
 TRIUMF - G Smith  
 ALBERTA U - W C Olsen  
 SASKATCHEWAN U - N Stevenson

Accelerator TRIUMF Detector Counter

Reactions Polarized target

$\pi^+$ p $\rightarrow$ $\pi^+$ p $\gamma$	265 MeV ( $T_{lab}$ )
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Comments Data analysis in progress (February 92).

**TRIUMF-452** (Nov 1986) Started Aug 1990.

### RADIATIVE MUON CAPTURE ON HYDROGEN

#### RMC COLLABORATION

BRITISH COLUMBIA U - C Q Chen, P Gumplinger, M D Hasinoff ( $\checkmark$  Spokesperson), A J Larabee, D G Sample, W Schott, S Veillette, N S Zhang  
 VIRGINIA TECH - D S Armstrong, M Blecher, A Serna-Angel  
 TRIUMF - T von Egidy, J A Macdonald, J Poutissou, R Poutissou, D H Wright  
 MELBOURNE U - R Henderson, S C McDonald, M Munro, G N Taylor  
 MONTREAL U - G Azuelos ( $\checkmark$  Spokesperson), P Depommier, B Doyle, G Jonkmans

PSI, VILLIGEN - W Bertl  
 KENTUCKY U - T P Gorringer  
 QUEENS U, KINGSTON - B C Robertson

Accelerator TRIUMF Detector Drift chamber

Reactions

$\mu^-$ p $\rightarrow$ n $\nu_\mu$ $\gamma$	0 MeV ( $T_{lab}$ )
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Comments Extracts the induced pseudoscalar coupling constant  $g_p$  of the weak hadronic current. In progress. Scheduled to run till December 92.

Papers IEEE TNS 37 (1990) 1116, and IEEE TNS 37 (1990) 1200.

**TRIUMF-460** (1989) Started 1987; Completed 1989.

### A MEASUREMENT OF THE CROSS SECTION AND ANALYZING POWER OF THE $pn \rightarrow pp(^1S_0)\pi^-$ REACTION AT TRIUMF ENERGIES

TEL AVIV U - D Ashery, H Hahn, M A Moinester  
 BRITISH COLUMBIA U - E G Auld, F Duncan, G Jones, M Sevier

TRIUMF - D Hutcheon, P L Walden ( $\checkmark$  Spokesperson)  
 BRITISH COLUMBIA U & TRIUMF - R R Johnson  
 ALBERTA U - E Korkmaz

Accelerator TRIUMF Detector Spectrometer, Counter

Reactions Polarized beam

$p$ n $\rightarrow$ p p $\pi^-$	345-495 MeV ( $T_{lab}$ )
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Comments The target is liquid deuterium. Uses a QQD spectrometer and a counter hodoscope. Ran in September 87 and in August 89. Data analysis in progress (February 92).

Papers PRL 63 (1989) 1792.

**TRIUMF-466** (May 1987) Completed 1988.

### MEASUREMENT OF $np \rightarrow d\pi^0$ CROSS SECTIONS NEAR THRESHOLD

TRIUMF - R Abegg, L G Greeniaus, D A Hutcheon ( $\checkmark$  Spokesperson), C A Miller  
 MANITOBA U - N E Davison  
 ALBERTA U - G W R Edwards, G A Moss, W C Olsen, Y Yanlin  
 WESTERN CAPE U - I J van Heerden

Accelerator TRIUMF Detector Spectrometer

Reactions

$n$ p $\rightarrow$ deut $\pi^0$	276, 277, 279, 283, 291 MeV ( $T_{lab}$ )
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Comments Measured total and differential cross sections.

Papers PRL 64 (1990) 176, and NP A535 (1991) 618.

**TRIUMF-478** (Oct 1987) Completed 1989.

### PROTON INDUCED $\pi NN$ RESONANCES

TRIUMF - R Abegg, D Frekers ( $\checkmark$  Spokesperson), K Hicks, J Iqbal, B Jennings, C A Miller, P Trelle, P Walden, S Yen  
 SASKATCHEWAN U - R Schubank  
 TORONTO U - R Azuma, C Chan

Accelerator TRIUMF Detector Spectrometer

Reactions

$^{12}\text{C}$ p $\rightarrow$ p p $\pi^-$ X	500 MeV ( $T_{lab}$ )
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$^{12}\text{C}$ p $\rightarrow$ p n $\pi^+$ X	"
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$^{13}\text{C}$ p $\rightarrow$ p p $\pi^-$ X	"
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$^{13}\text{C}$ p $\rightarrow$ p n $\pi^-$ X	"
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Comments Data were taken only for the first listed reaction, results were negative.

**TRIUMF-482** (Oct 1987) Completed Sep 1991.

### MEASUREMENTS OF SPIN TRANSFER COEFFICIENTS IN $pd$ ELASTIC SCATTERING

TRIUMF - R Abegg ( $\checkmark$  Spokesperson), D A Huchon, J Iqbal  
 TRIUMF & ALBERTA U - P W Green  
 ALBERTA U - G A Moss, W C Olsen, N Rodning

## SUMMARIES OF TRIUMF EXPERIMENTS

SASKATCHEWAN U - R Schubank, Y M Shin, N Stevenson  
 TRIUMF & TORONTO U - D Frekers

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized beam

$p$  deut  $\rightarrow$   $p$  deut 200, 290, 400 MeV ( $T_{lab}$ )

Comments Measures the spin transfer coefficients  $D_{NN}$ ,  $D_{SS}$ ,  $D_{LS}$ , and  $D_{LL}$ . Data analysis in progress (February 92).

**TRIUMF-496** (Oct 1987) Completed Oct 1989.

**MEASUREMENTS OF THE ANGULAR DISTRIBUTION OF THE SPIN TRANSFER PARAMETER  $D_{LS}$  IN  $pp \rightarrow d\pi^+$**

TRIUMF - R Abegg ( $\checkmark$  Spokesperson), L G Greeniaus, D A Hutcheon

ALBERTA U - D Mack, G A Moss, Y Ye  
 TRIUMF & ALBERTA U - P W Green

Accelerator TRIUMF Detector Spectrometer, Counter

Reactions

$pp \rightarrow$  deut  $\pi^+$  507 MeV ( $T_{lab}$ )

Comments Measures the spin transfer coefficient  $D_{LS}$ .

Papers NP A (to be published).

**TRIUMF-497-287** (Oct 1987) Approved Dec 1987.

**MEASUREMENT OF THE FLAVOR-CONSERVING HADRONIC WEAK INTERACTION**

MANITOBA U - A R Berdoz, J Birchall ( $\checkmark$  Spokesperson), J R Campbell, N E Davison, A Hamian, W T H van Oers ( $\checkmark$  Spokesperson), S A Page ( $\checkmark$  Spokesperson), W D Ramsay

LOS ALAMOS - J D Bowman, R E Mischke  
 TRIUMF - C A Davis, D C Healey, P Levy, P W Schmor  
 ALBERTA U - P W Green, E Korkmaz, G Roy, J Soukup, G M Stinson

Accelerator TRIUMF Detector Ionization

Reactions Polarized beam

$pp \rightarrow p p$  222 MeV ( $T_{lab}$ )

Comments Measures the parity-violating longitudinal analyzing power  $A_z$ , and the weak meson-nucleon coupling constant  $h_\rho$ . In the first phase, data-taking will be performed in the transmission mode. A scattering detector will be added at a later stage. In progress (February 92).

Papers PR D37 (1988) 1769, and NIM A307 (1991) 26.

**TRIUMF-498** (Oct 1987)

**ANALYZING POWER ZERO CROSSING ANGLES IN  $np$  ELASTIC SCATTERING BELOW 300 MeV**

MANITOBA U - A Berdoz, J Birchall, J Campbell, N E Davison, L Gan, W T H van Oers, S A Page, W D Ramsay

TRIUMF - C A Davis ( $\checkmark$  Spokesperson), L G Greeniaus  
 ALBERTA U - P W Green

Accelerator TRIUMF Detector Counter

Reactions Polarized beam

$np \rightarrow np$  180, 230 290 MeV ( $T_{lab}$ )

Comments Neutrons will be detected in scintillator counter arrays, protons with scintillators and DLC's. Scheduled to run in 1992/93.

**TRIUMF-502** (Nov 1988)

**MEASUREMENT OF ANALYZING POWERS IN LOW ENERGY  $\pi d$  ELASTIC SCATTERING**

KARLSRUHE U - E T Boschitz

TRIUMF - P Delheij, D R Gill, D Healey, B K Jennings, D F Ottewell, G Sheffer, G R Smith, G D Wait

TRIESTE U - N Grion, R Rui

BRITISH COLUMBIA U - M Hanna, R R Johnson, V Sossi, P Weber

REGINA U - E L Mathie, M Yeomans

COLORADO U - R A Ristinen

SASKATCHEWAN U - R B Schubank, Y M Shin, N R Stevenson (Spokesperson)

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized target

$\pi^+$  deut  $\rightarrow$   $\pi^+$  deut 50 MeV ( $T_{lab}$ )  
 $\pi^-$  deut  $\rightarrow$   $\pi^-$  deut "

**TRIUMF-503** (Oct 1987) Completed Dec 1987.

**SEARCH FOR A  $\pi NN$  BOUND STATE**

BRITISH COLUMBIA U - R R Johnson, R Olszewski, M F Rozon, M E Sevier, P Weber

REGINA U - E L Mathie

TRIUMF - D Frekers, D R Gill, D Ottewell, G R Smith  
 COLORADO U - R A Ristinen, R P Trelle ( $\checkmark$  Spokesperson)

SASKATCHEWAN U - R Schubank, N R Stevenson

Accelerator TRIUMF Detector Spectrometer

Reactions

$\pi^+$  deut  $\rightarrow$   $pp \pi^+ \pi^-$  256 MeV ( $T_{lab}$ )  
 $\pi^-$  deut  $\rightarrow$   $nn \pi^+ \pi^-$  "

Comments No firm evidence was found.

**TRIUMF-506** (Oct 1987)

**LOW ENERGY  $\pi d \rightarrow pp$  ANALYZING POWERS**

REGINA U - G J Lolos, E L Mathie ( $\checkmark$  Spokesperson), S I H Naqvi, D M Yeomans

WESTERN KENTUCKY U - D Humphrey

TRIUMF - D Healey, D Ottewell, G R Smith

BRITISH COLUMBIA U - G Jones

SASKATCHEWAN U - N R Stevenson

Accelerator TRIUMF Detector Counter

Reactions Polarized target

$\pi^+$  deut  $\rightarrow$   $pp$  25, 45, 65 MeV ( $T_{lab}$ )

Comments Measures the vector analyzing power  $iT_{11}$  and the tensor analyzing power. Data taking at 25 and 65 MeV was completed in 1990. Analysis in progress (February 92).

**TRIUMF-508** (Oct 1987)

**STUDY OF THE  $\pi^+ d \rightarrow \pi^- \pi^+ pp$  REACTION AT  $T = 240$  MeV**

TRIESTE U - P Camerini, R Rui (Spokesperson)

INFN, TRIESTE - N Grion

BRITISH COLUMBIA U - M Hanna, R R Johnson, R Olszewski,

F M Rozon, M Sevier, G Smith, V Sossi, P Trelle

VALENCIA U - E Oset, M J Vicente-Vacas

Accelerator TRIUMF Detector Counter, Spectrometer

Reactions

$\pi^+$  deut  $\rightarrow$   $pp \pi^+ \pi^-$  240 MeV ( $T_{lab}$ )

Comments Deferred for running on CHAOS.

**TRIUMF-530** (May 1988) Completed Dec 1988.

**$\pi^+ p$  TOTAL CROSS SECTIONS AT LOW ENERGIES**

HEBREW U - E Friedman ( $\checkmark$  Spokesperson), A Goldring

TUBINGEN U - G Wagner

SOREQ NUCLEAR RES CTR - A Altman

BRITISH COLUMBIA U - R R Johnson, O Meirav

TRIUMF - B K Jennings

Accelerator TRIUMF Detector Counter

Reactions

$\pi^+ p \rightarrow X$  51.5, 62.6, 66.8, 70.9, 91.5, 121.9, 125.9 MeV ( $T_{lab}$ )

Papers PL B231 (1989) 39, and NP A514 (1990) 601.

## SUMMARIES OF TRIUMF EXPERIMENTS

**TRIUMF-537** (May 1988) Completed Jun 1991.

### RADIATIVE DECAY OF THE $\Delta$ RESONANCE

BRITISH COLUMBIA U - D F Measday ( $\checkmark$  Spokesperson),

S Stanislaus, P Weber  
 KENTUCKY U - M A Kovash  
 NEW MEXICO U - B Bassalleck  
 BOSTON U - E C Booth, J P Miller

Accelerator TRIUMF Detector Photon spectrometer

Reactions Polarized target



Comments Measures  $\Delta^0$  radiative decay multipoles and differential cross sections. A polarized target has been successfully used in phase II of the experiment. Data analysis in progress (February 92).

**TRIUMF-541** (May 1988) Completed 1990.

### SPIN-MOMENTUM CORRELATIONS OF NUCLEONS IN POLARIZED $^3\text{He}$

SIMON FRASER U & TRIUMF - O Haeusser ( $\checkmark$  Spokesperson),  
 A Rahav

TRIUMF - P P J Delheij, R Henderson, K P Jackson,  
 C D P Levy, C A Miller ( $\checkmark$  Spokesperson)

HARVARD U - T E Chupp  
 SIMON FRASER U - J Mildenerger, M C Vetterli  
 WESTERN ONTARIO U - W P Alford

Accelerator TRIUMF Detector Counter, Spectrometer

Reactions Polarized beam and target



Comments The setup consists of a polarized  $^3\text{He}$  target, the Medium Resolution Spectrometer (MRS), and two arrays of plastic scintillators. The target was developed using the method of optical pumping of alkalide Rb vapor and spin exchange via atomic collisions with  $^3\text{He}$ . A similar experiment (TRIUMF-616) was completed at 220 MeV in 1991.

Papers PL B275 (1992) 259.

**TRIUMF-544** (May 1988) Completed Feb 1989.

### AN EXPERIMENTAL SEARCH FOR A NEW LIGHT BARYON

TRIUMF - R Abegg, D Frekers ( $\checkmark$  Spokesperson), R Helmer,  
 R S Henderson, K P Jackson, C A Miller, S Ram, S Yen  
 TEL AVIV U - D Ashery, S Nussinov, E Piassetzky, A Rahav,  
A I Yavin ( $\checkmark$  Spokesperson)

Accelerator TRIUMF Detector Spectrometer, Counter

Reactions



Comments Data taken, results are negative. Publication in preparation (February 92).

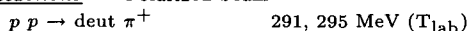
**TRIUMF-552** (Nov 1988) Completed 1990.

### $pp \rightarrow d\pi^+$ ANALYZING POWERS NEAR THRESHOLD

TRIUMF - R Abegg, L G Greeniaus, D A Hutcheon  
 ( $\checkmark$  Spokesperson), C A Miller  
 ALBERTA U - E Korkmaz, D Mack, W C Olsen, N L Rodning

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized beam



Papers NP A535 (1991) 637.

**TRIUMF-556** (Nov 1988)

### THE REACTION $\pi^+ \ ^4\text{He} \rightarrow pppn + \pi^+ \pi^-$

INFN, TRIESTE - P Camerini, N Grion, R Rui

BRITISH COLUMBIA U - R Johnson, O Meirav (Spokesperson),  
 M Seviar, V Sossi, D Vetterli, P Weber  
 TRIUMF - D Gill, G Smith

Accelerator TRIUMF Detector Spectrometer

Reactions



**TRIUMF-557** (Nov 1988) Started 1991; Completed 1992.

### ELASTIC SCATTERING OF 100 MeV $\pi^+$ FROM A POLARIZED $^3\text{He}$ TARGET

WESTERN ONTARIO U - A Celler  
 TRIUMF - P Delheij, D R Gill, R Helmer, P Levy, D F Ottewell,  
 P Schmor, S Yen

TRIUMF & SIMON FRASER U - O Haeusser ( $\checkmark$  Spokesperson)  
 TRIUMF & MELBOURNE U - R Henderson

OREGON STATE U - R H Landau  
 SIMON FRASER U - M Law ( $\checkmark$  Spokesperson), A Trudel,  
 M Vetterli

SASKATCHEWAN U - R B Schubank, N R Stevenson  
 BRITISH COLUMBIA U - V Sossi

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized target



Comments Measures the asymmetry parameter and differential cross section.

Papers PRL 67 (1991) 3356.

**TRIUMF-560** (Nov 1988)

### DETERMINATION OF THE $\Sigma$ TERM FROM A MEASUREMENT OF THE POLARIZATION IN $\pi^- p$ SCATTERING AT $T_\pi = 51 \text{ MeV}$

TRIUMF - D R Gill, D Ottewell, G R Smith (Spokesperson),  
 G D Wait

SASKATOON U - R Schubank, N Stevenson  
 BRITISH COLUMBIA U - R R Johnson, G Jones, O Meirav,

M E Seviar, V Sossi, D Vetterli, P Weber  
 REGINA U - E L Mathie

COLORADO U - R J Peterson, R A Ristinen

Accelerator TRIUMF Detector Spectrometer

Reactions Polarized target



**TRIUMF-561** (Nov 1988) Started Aug 1990; Completed Jan 1991.

### THRESHOLD MEASUREMENTS OF $H(\pi^-, \pi^+ \pi^-)n$ AND $H(\pi^+, \pi^+ \pi^+)n$

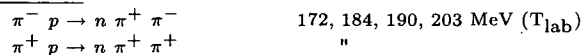
BRITISH COLUMBIA U - R R Johnson, O Meirav, M E Seviar  
 ( $\checkmark$  Spokesperson), V Sossi, D Vetterli, P Weber

BONN U - J Ernst

TRIUMF - D R Gill, D F Ottewell, G R Smith, G Wait

Accelerator TRIUMF Detector Counter

Reactions



Comments Measures the chiral symmetry breaking parameter  $\xi$ , together with  $I = 0$  and  $I = 2$   $\pi\pi$  scattering lengths. Ran with a  $\pi^+$  beam in August 90, and with a  $\pi^-$  beam in January 91. Analysis in progress (February 92).

Papers PRL 66 (1991) 2569.

**TRIUMF-598** (1990) Approved Jul 1990; Started Jul 1990.

### INTEGRAL CROSS SECTIONS FOR THE $\pi^+ p$ INTERACTION IN THE 3,3 RESONANCE REGION

HEBREW U - E Friedman ( $\checkmark$  Spokesperson), A Goldring  
 BRITISH COLUMBIA U - R R Johnson, D Vetterli  
 KARLSRUHE U - J Jaki, M Metzler

## SUMMARIES OF TRIUMF EXPERIMENTS

TRIUMF - B K Jennings

Accelerator TRIUMF Detector SCINT

Reactions

$\pi^+ p$  125-200 MeV ( $T_{lab}$ )  
 $\pi^- p$  "

Comments Measures integral cross sections using the transmission method. In progress. Scheduled to run till August 1992.

Papers PL B254 (1991) 40.

**TRIUMF-612** (Jul 1990) Approved Jul 1990.

**HYPERFINE DEPENDENCE OF EXCLUSIVE MUON CAPTURE ON  $^{19}\text{F}$ ,  $^{23}\text{Na}$ ,  $^{27}\text{Al}$ ,  $^{35}\text{Cl}$ , AND  $^{37}\text{Cl}$**

KENTUCKY U - J Bauer, T P Gorrige (Spokesperson),

B Johnson, M Kovash, M Pickar  
 BRITISH COLUMBIA U - P Gumplinger, M D Hasinoff,  
 D Measday, B Moftah, W Schott  
 VIRGINIA TECH - D S Armstrong  
 TRIUMF - D H Wright

Accelerator TRIUMF Detector Photon spectrometer

Reactions

$\mu^- ^{23}\text{Na} \rightarrow ^{23}\text{Ne} \nu$  0 MeV ( $T_{lab}$ )  
 $\mu^- ^{27}\text{Al} \rightarrow ^{27}\text{Mg} \nu$  "  
 $\mu^- ^{35}\text{Cl} \rightarrow ^{35}\text{S} \nu$  "

Particles studied  $p$

Comments Studies the weak pseudoscalar coupling  $g_p$ . Germanium semiconductor with a BGO Compton suppression shield is used as a photon detector.

**TRIUMF-624** (Nov 1990) Approved Nov 1990.

**THE ( $\pi, 2\pi$ ) REACTION, A TOOL TO DETERMINE SCATTERING LENGTHS AND COUPLING CONSTANTS**

TRIUMF - D Ottewell, G Smith  
 BRITISH COLUMBIA U - M Iqbal, R R Johnson  
 ( $\checkmark$  Spokesperson), C Jones, M Sevier ( $\checkmark$  Spokesperson), V Sossi,  
 D Vetterli

REGINA U - E Mathie, R Tacik  
 COLORADO U - R Ristinen  
 TRIESTE U - S Buttazoni, P Camerine, N Grion  
 ( $\checkmark$  Spokesperson), R Rui ( $\checkmark$  Spokesperson)

KARLSRUHE U - E Boschitz  
 HEBREW U - E Friedman  
 CARNEGIE MELLON U - M Rozon

Accelerator TRIUMF Detector CHAOS

Reactions

$\pi^+ p \rightarrow \pi^+ \pi^+ n$  230-350 MeV ( $T_{lab}$ )  
 $\pi^+ p \rightarrow \pi^+ \pi^0 p$  "  
 $\pi^- p \rightarrow \pi^+ \pi^- n$  "  
 $\pi^- p \rightarrow \pi^- \pi^0 p$  "

Comments Studies the  $\pi\pi$  scattering length, and  $\pi\pi$  phase shifts near threshold. Scheduled to run in summer 1993.

**TRIUMF-633** (Nov 1990) Approved Nov 1990.

**MEASUREMENT OF  $pp \rightarrow pn\pi^+$  AT 420 AND 500 MeV**

OHIO U - H Clark, R Finlay, K Hicks ( $\checkmark$  Spokesperson)  
 MANITOBA U - W Falk  
 TRIUMF - D Hutcheon, A Miller, I Strakovsky, P Walden, S Yen  
 ALBERTA U - E Korkmaz  
 REGINA U - G Huber

Accelerator TRIUMF Detector Single-arm spectrometer

Reactions

Polarized beam  
 $pp \rightarrow pn\pi^+$  420-500 MeV ( $T_{lab}$ )

Comments Measures differential cross section. Detectors are large magnetic spectrometers. Scheduled to run August 92.

**TRIUMF-643** (Jun 1991) Approved Jun 1991.

**TEST OF THE LOW ENERGY THEOREM FOR RADIATIVE PION CAPTURE**

NEW MEXICO U - B Bassalleck  
 WASHINGTON U, SEATTLE - C Gossett  
 TRIUMF - D Hutcheon ( $\checkmark$  Spokesperson), R Jacot-Guillarmod,  
 D Ottewell, R Schubank, N R Stevenson  
 KENTUCKY U - M A Kovash ( $\checkmark$  Spokesperson), K Liu  
 ALBERTA U - E Korkmaz, A Opper  
 BOSTON U - E Booth, J Miller  
 SASKATCHEWAN U - Y M Shin

Accelerator TRIUMF Detector Photon spectrometer

Reactions

$\pi^- p \rightarrow n \gamma$  10-20 MeV ( $T_{lab}$ )

Comments Scheduled to run in 1992.

**TRIUMF-645** (Jun 1991) Approved Jun 1991.

**ABSOLUTE DIFFERENTIAL CROSS SECTIONS IN THE  $\pi^\pm p \rightarrow \pi^\pm p$  REACTION AROUND THE  $\Delta$  RESONANCE**

BRITISH COLUMBIA U - A Feltham, G Jones, M M Pavan  
 ( $\checkmark$  Spokesperson), M E Sevier  
 BRITISH COLUMBIA U & TRIUMF - R R Johnson  
 TRIUMF - J Brack ( $\checkmark$  Spokesperson), B Jennings, D Ottewell,  
 G Sheffer, G R Smith  
 REGINA U - E L Mathie  
 COLORADO U - M Kohler, R J Peterson, R A Ristinen  
 ST PETERSBURG, INP - I Strakovski

Accelerator TRIUMF Detector SCINT

Reactions

$\pi^+ p \rightarrow \pi^+ p$  144-263 MeV ( $T_{lab}$ )  
 $\pi^- p \rightarrow \pi^- p$  "

Comments Uses flat, solid  $\text{CH}_2$  (polyethylene) targets as well as a supercooled flat-window liquid hydrogen target. Scintillator telescopes are used for coincidence detection. Scheduled to run May 92.

## SUMMARIES OF UNDERGROUND/UNDERWATER EXPERIMENTS

### Underground/Underwater Experiments

**UNDERGROUND-FREJUS** Started Feb 1984; Completed Sep 1988.

**NUCLEON DECAY EXPERIMENT WITH A MODULAR FLASH CHAMBER DETECTOR**

FREJUS COLLABORATION

AACHEN, TECH HOCHSCH, I PHYS INST - C Berger,  
M Froehlich, H Moench, R Nisius, F Raupach, P Schleper  
ORSAY, LAL - Y Benadjal, D Blum, C Bourdarios,  
B Dudelzak, P Eschstruth, S Jullian, D Lalanne, F Laplanche,  
C Longuemare, C Paulot, O Perdereau, P Roy, G Szklarz  
ECOLE POLYTECHNIQUE - L Behr, B Degrange, U Nguyen-  
Khac, S Tisserant  
SACLAY - C Arpesella, P Bareyre, R Barloutaud  
(✓ Spokesperson), A Borg, G Chardin, J Ernwein,  
J F Glicenstein, L Mosca, L Moscose  
WUPPERTAL U - J Becker, K H Becker, H J Daum, B Jacobi,  
B Kuznik, J Loeffler, H Meyer, R Moeller, M Schubnell, Y Wei,  
P Wintgen

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments A 900-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 4850 m of water equivalent underground. Searches for nucleon decays,  $n\bar{n}$  oscillations, studies high energy cosmic  $\nu_\mu$ 's from point sources, and atmospheric muons and neutrinos.

Papers PL B174 (1986) 118, NIM A262 (1987) 463, PL B227 (1989) 489, PR D40 (1989) 2163, NP B313 (1989) 509, ZPHY C48 (1990) 221, PL B240 (1990) 237, PL B245 (1990) 305, NIM A302 (1991) 406, ZPHY C50 (1991) 385, and PL B269 (1991) 227.

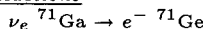
**UNDERGROUND-GALLEX** Approved Apr 1985; Started Jun 1990.

**GALLIUM EUROPEAN EXPERIMENT**

HEIDELBERG, MAX PLANCK INST - P Anselmann,  
W Hampel, G Heusser, J Kiko, T Kirsten (✓ Spokesperson),  
E Pernicka, R Plaga, B Povh, U Roenn, M Sann, C Schlosser,  
H Voelk, R Wink, M Wojcik  
KERNFORSCHUNGSZENTRUM, KARLSRUHE -  
R von Ammon, K Ebert, T Fritsch, K Hellriegel, E Henrich,  
L Stieglitz  
GRAN SASSO - M Balata, E Bellotti, C Cattadori, N Ferraris,  
H Lalla, S Pezzoni, T Stolarczyk  
MILAN U - O Cremonesi, E Fiorini, S Ragazzi, L Zanotti  
MUNICH, TECH U - F von Feilitzsch, R Moessbauer, U Schanda  
NICE U - G Berthomieu, E Schatzman  
ROME U - C Bacci, P Belli, R Bernabei, S D'Angelo, L Paoluzzi  
WEIZMANN INST - I Carmi, I Dostrovsky  
SACLAY - S Charbit, M Cribier, G Dupont, L Gosset, J Rich,  
M Spiro, C Tao, D Vignaud  
BROOKHAVEN - R L Hahn, F X Hartmann, J K Rowley,  
R W Stoenner, J Weneser

Accelerator NONE Detector Counter

Reactions



Particles studied  $\nu_e$

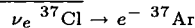
Comments This is a radiochemical neutrino experiment. Uses 30 tons of gallium in 8.2-molar GaCl<sub>3</sub> solution. Installed in the South wing of Hall A of the Gran Sasso Laboratory. Has an overhead shielding of about 3400 m of water equivalent. An interaction with neutrinos effectively transforms gallium chloride into GeCl<sub>4</sub>, which is then extracted from the solution with an appropriate gas purging system. Counted in extremely low-level proportional counters. Sensitive to the low energy neutrinos produced by the  $pp$  fusion in the Sun. Designed for an order of one event per day. Taking data (March 92).

**UNDERGROUND-HOMESTAKE** Started 1970.  
**THE HOMESTAKE CHLORINE SOLAR NEUTRINO EXPERIMENT**

PENN U - R Davis, Jr (Spokesperson), K Lande (Spokesperson)  
LOS ALAMOS - B T Cleveland  
BROOKHAVEN - J K Rowley

Accelerator NONE Detector Counter

Reactions



Particles studied  $\nu_e$

Comments The <sup>37</sup>Cl solar neutrino detector in the Homestake Gold Mine consists of 615 tons of tetrachloroethylene (C<sub>2</sub>Cl<sub>4</sub>), at a depth underground of 4000 m water equivalent. It uses radiochemical techniques to determine the <sup>37</sup>Ar production rate. The detector was built at BNL in 1965-67, and operated by Brookhaven until 1984. At that time the laboratory was transferred to Penn U. Collecting data regularly since 1970.

Papers PRL 47 (1981) 1507.

**UNDERGROUND-IMB** Started 1982; Completed Apr 1991.

**THE IRVINE-MICHIGAN-BROOKHAVEN EXPERIMENT**

UC, IRVINE - W Gajewski, P G Halverson, W R Kropp,  
C McGrew, L Price, F Reines (✓ Spokesperson), J Schultz,  
H W Sobel  
UC, IRVINE & WARSAW U, IEP - D Kielczewska  
BROOKHAVEN - M Goldhaber  
BOSTON U - D Casper, S T Dye, J L Stone, L Sulak  
CLEVELAND STATE U - C B Bratton  
HAWAII U - J G Learned, S Matsuno, G McGrath  
LOUISIANA STATE U - R S Miller, R Svoboda  
NOTRE DAME U - J M LoSecco  
MARYLAND U - T J Haines  
SLAC - R Becker-Szendy

Accelerator NONE Detector Counter

Particles studied  $p, n, \mu\text{on}, \nu, \text{monopole}$

Comments An 8000-ton water Čerenkov detector, 1570 m of water equivalent underground. The modified detector, IMB-3, has operated since May 86. It has 8-inch phototubes attached to wave-shifting plates. The PMT time resolution has been improved from 11 to 8 ns. Studies nucleon decays, stellar-collapse neutrinos, and high-energy cosmic  $\nu_\mu$ 's. Data analysis in progress (April 92).

Papers PRL 51 (1983) 27, PRL 51 (1983) 245, PRL 52 (1984) 720, PRL 52 (1984) 1092, NIM A239 (1985) 467, NP B252 (1985) 261, PRL 54 (1985) 22, PRL 54 (1985) 2299, PRL 55 (1985) 2114, PRL 57 (1986) 1986, PRL 57 (1986) 2872, PRL 58 (1987) 1494, NIM A261 (1987) 540, PL B184 (1987) 305, PL B188 (1987) 388, PR D35 (1987) 2073, PR D36 (1987) 30, ASTJ 315 (1987) 420, PR D37 (1988) 3361, PRL 61 (1988) 2522, NIM A264 (1988) 28, PR D38 (1988) 768, PRPL 163 (1988) 137, PR D39 (1989) 1492, PRL 62 (1989) 2069, PR D42 (1990) 2974, and PRL 66 (1991) 2561.

**UNDERGROUND-KAMIOKANDE-II-III** Started Nov 1985.

**THE KAMIOKANDE EXPERIMENT**

TOKYO U, ICRR - K S Hirata, K Inoue, T Ishida, T Kajita,  
K Kihara, M Nakahata, K Nakamura, S Ohara, A Sakai, N Sato,  
Y Suzuki, Y Totsuka (✓ Spokesperson), Y Yaginuma  
KEK - M Mori, Y Oyama, A Suzuki, K Takahashi, M Yamada  
TOKAI U, HIRATSUKA - M Koshihara, K Nishijima  
KOBE U - T Kajimura, T Suda, T Tajima  
NIIGATA U - K Miyano, H Miyata, H Takei  
OSAKA U - Y Fukuda, E Koderu, Y Nagashima, M Takita,  
H Yokoyama  
TOKYO INST TECH - K Kaneyuki, T Tanimori  
PENN U - E W Beier, R Van Berg, L D Feldscher, E D Frank,  
S B Kim, A K Mann, F M Newcomer, W P Zhang

## SUMMARIES OF UNDERGROUND/UNDERWATER EXPERIMENTS

GIFU U - S Tasaka

Accelerator NONE Detector Counter

Reactions



Particles studied  $p, n$ , monopole, muon,  $\nu$

Comments A 3000-ton water Čerenkov detector, 2700 m of water equivalent underground. The Kamiokande-I detector has been upgraded with new electronics, TDCs and 1000 20-inch phototubes surrounded by aluminized reflectors. Studies nucleon decays, solar, supernova, atmospheric, and high-energy cosmic neutrinos, high-energy muons, etc. The second phase was completed in April 90, the third phase started in October 90. (The Penn U. group does not participate in the third phase). Taking data.

Papers PRL 58 (1987) 1490, PRL 59 (1987) 2604, PL B205 (1988) 416, PR D38 (1988) 448, PRL 61 (1988) 385, PRL 61 (1988) 2653, PR D39 (1989) 1481, PL B220 (1989) 308, PRL 63 (1989) 16, ASTJ 359 (1990) 574, PRL 65 (1990) 1297, PRL 65 (1990) 1301, PR D43 (1991) 2843, PR D44 (1991) 2220, PR D44 (1991) 617, PR D44 (1991) 2241, PRL 66 (1991) 9, and PL B270 (1991) 89.

**UNDERGROUND-KGF** Started Oct 1980.

**THE KOLAR GOLD FIELD EXPERIMENT**

TATA INST - H Adarkar, S R Dugad, S D Kalmani, M R Krishnaswamy, J D Kulkarni, M G K Menon, N K Mondal, P S Murty, P Nagaraj, V S Narasimham (Spokesperson), B Satyanarayana, B V Sreekantan  
 OSAKA CITY U - Y Hayashi, N Ito, S Kawakami, T Mitsuyama, T Nakamura, K Tanaka  
 KANAGAWA U - S Miyake

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments Phase-I of the experiment was completed in 1985. The phase-II detector is a 260-ton iron tracking calorimeter with 60 layers of proportional counter tubes, 6600 m of water equivalent underground. A monopole detector has been added in phase-III. Studies nucleon decays, and searches for magnetic monopoles and point sources of high energy  $\nu_\mu$ 's. Has been taking data since November 85.

Papers PL B106 (1981) 339, PL B115 (1982) 349, PL B142 (1984) 99, NC 9C (1986) 167, NIM A284 (1989) 422, and PL B267 (1991) 138.

**UNDERGROUND-LVD** Approved Apr 1985.

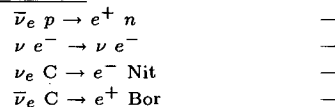
**SEARCH FOR STELLAR-COLLAPSE NEUTRINOS WITH THE LARGE VOLUME DETECTOR**

BOLOGNA U - G Bari, M Basile, G Bruni, A Castelvetri, L Cifarelli, A Contin, P Giusti, G Iacobucci, G Maccarrone, T Massam, R Nania, V O'Shea, F Palmonari, C Del Papa, E Perotto, G Cara Romeo, G Sartorelli, M Willutzky  
 BROWN U - M Aryal, K De, A M Shapiro, M Widgoff  
 CAMPINAS U - J A Chincellato, C Dobrigkeit-Chincellato, A C Fauth, A Turtelli  
 CERN - F Rohrbach, A Zichichi (✓ Spokesperson)  
 CALABRIA U - L Caputi, G Susinno  
 FLORENCE U - G Barbagli, G Conforto, G Landi, P Pelfer  
 FRASCATI - G Anzivino, S Bianco, R Casaccia, F Cindolo, Y Dong, M Enorini, F L Fabbri, M De Felice, C Jing, I Laakso, S Qian, Z Shi, A Spallone, Y Sun, L Votano, A Zallo  
 HOUSTON U - K Lau, F Lipps, B Mayes, G H Mo, L Pinsky, J Pyrlík, D Sanders, W R Sheldon, R Weinstein  
 BEIJING, IHEP - Y Dai, L Din, G Jing, Z Lu, P Shen, Q Zhu  
 INDIANA U - D Alyea  
 KINKI U, OSAKA - T Kitamura, Y Minorikawa  
 AQUILA U - G Di Sciascio, R Scrimaglio  
 LECCE U - P Rotelli  
 IOFFE PHYS TECH INST - G E Kocharov, V Vasilev  
 MIT, LNS - M Deutsch, E S Hafen, P Haridas, H H Huang, B Jeckelmann, G Ji, C S Mao, A Pitas, I A Pless, S W Wang, Y R Wu, Y R Yuan, C Z Zhao

MOSCOW, INR - V S Berezinsky, V L Dadykin, F F Khaichukov, E V Korolkova, P V Kortchaguin, V B Kortchaguin, V A Kudryavtsev, A S Markov, V G Ryassny, O G Ryazhskaya, V P Talochkin, V F Yakushev, G T Zatsepin  
 NORTHEASTERN U - E Von Goeler, J Moromisato, E Saletan, D Shambroom  
 OKAYAMA UNIV SCI - N Takahashi, I Yamamoto  
 OKAYAMA U - T Wada  
 PALERMO U - G D'Ali, S De Pasquale  
 PERUGIA U - B Alpat, F Artemi, P Diodati, M Italiani, P Salvadori  
 SAITAMA U - N Inoue, A Misaki  
 TOKYO U, ICRR - T Hara  
 TURIN U - C Aglietta, G Badino, L Bergamasco, C Castagnoli, A Castellina, G Cini, M Dardo, W Fulgione, P Galeotti, P Ghia, C Morello, G Navarra, L Periale, P Picchi, O Saavedra, G C Trincherio, P Vallania, S Vernetto  
 URBINO U - F Grianti, F Vetrano

Accelerator NONE Detector Counter, Streamer chamber

Reactions



Particles studied  $p, n$

Comments The multipurpose detector consists of a large volume (1520 tons) of liquid scintillator interlayered with streamer chambers. Studies stellar-collapse neutrinos, solar neutrinos, and nucleon decays. With an effective area of 800 m<sup>2</sup>, it is suitable for searching for magnetic monopoles and high energy cosmic  $\nu_\mu$ 's from point sources. Under construction in the north wing of Hall A of the Gran Sasso Laboratory. Has an overhead shielding of about 3800 m of water equivalent.

Papers NIM A264 (1988) 5, NIM A274 (1989) 177, NIM A277 (1989) 11, NIM A277 (1989) 17, and NIM A295 (1990) 466.

**UNDERGROUND-MACRO** Approved Apr 1985; Started Feb 1989.

**MONOPOLE, ASTROPHYSICS, AND COSMIC RAYS OBSERVATORY**

MACRO COLLABORATION

BARI U - R Bellotti, F Cafagna, M Calicchio, G DeCataldo, C DeMarzo, O Erriquez, C Favuzzi, P Fusco, N Giglietto, P Spinelli  
 BOLOGNA U - R Antolini, B B Bam, S Cecchini, G Giacomelli (✓ Spokesperson), G Mandrioli, A Margiotta-Neri, P Matteuzzi, L Patrizii, F Predieri, E Scapparone, P Serra-Lugaresi, M Spurio, V Togo  
 BOSTON U - S Ahlen, R Cormack, D Ficenec, E Kearns, S Klein, G Ludlam, A Marin, C Okada, J L Stone, L R Sulak, W Worstell  
 CAL TECH - B C Barish (✓ Spokesperson), S Coutu, J T Hong, E Katsavounidis, S Kyriazopoulou, G Liu, R Liu, D G Michael, C W Peck, N D Pignatano, K Scholberg, J Steele, C W Walter  
 DREXEL U - C Lane, R Steinberg  
 FRASCATI - G Battistoni, H Bilokon, C Bloise, P Campana, M Carboni, V Chiarella, A Cobis, C Forti, A Grillo, E Iarocci, A Marini, V Patera, F Ronga, L Satta, M Spinetti, V Valente  
 GRAN SASSO - C Gustavino, S Parlati, J Reynoldson  
 INDIANA U - A Habig, R Heinz, L Miller, S Mufson, J Musser, S Nutter  
 AQUILA U - A Di Credico, P Monacelli  
 LECCE U - P Bernardini, G Mancarella, D Martello, O Palamara, S Petrerà, P Pistilli, A Surdo  
 MICHIGAN U - E Diehl, C Lee, D Levin, M Longo, G Tarle  
 NAPLES U, IFS - M Ambrosio, G C Barbarino, D Campana, F Guarino, G Osteria  
 PISA U - A Baldini, C Bemporad, F Cei, G Giannini, M Grassi, R Pazzi  
 ROME U - G Auriemma, S Bussino, C Chiera, A Corona, L Foti, E Lamanna, P Lipari, G Martellotti, G Rosa, C Satriano, A Sciuuba, M Severi, G R Verdone, M De Vincenzi  
 TEXAS A AND M - R Webb  
 TURIN U - V Bisi, P Giubellino, A Marzari-Chiesa, M Masera, M Monteno, L Ramello, M Sitta



## SUMMARIES OF UNDERGROUND/UNDERWATER EXPERIMENTS

BARTOL RESEARCH INST - J Petrakis  
SANDIA - P Green

Accelerator NONE Detector Counter, Streamer chamber

Particles studied monopole

Comments The MACRO detector has been primarily designed to conduct a search for supermassive grand unified magnetic monopoles. When completed, it will have twelve supermodules in two levels, each instrumented to operate independently of the others. Each module consists of an array of two layers of liquid scintillation counters and ten layers of streamer tubes in between. The detector is located in Hall B of the Gran Sasso Laboratory. Has an overhead shielding of about 3800 m of water equivalent. Two lower supermodules collect data, the other sections are under construction (Feb 92).

Papers NC 9C (1986) 281, NIM A281 (1989) 213, PR D42 (1990) 1396, PL B249 (1990) 149, NIM A301 (1991) 275, and NP (Proc. Suppl.) B (accepted).

**UNDERGROUND-NUSEX** Started Jun 1982; Completed 1986.

### THE NUCLEON STABILITY EXPERIMENT

NUSEX COLLABORATION

TURIN U - M Aglietta, G Badino, G Bologna, C Castagnoli, A Castellina, W Fulgione, P Galeotti, G Mannocchi, B D'Ettore Piazzoli, P Picchi, O Saavedra, G Trincherio, S Vernetto

FRASCATI - G Battistoni, C Bloise, P Campana, V Chiarella,

A Ciocio, E Iarocci, G P Murtas, G Nicoletti, L Satta

MILAN U - E Bellotti, E Fiorini (✓ Spokesperson), C Liguori,

P Negri, A Pullia, S Ragazzi, M Rollier, L Zanotti

CERN - D C Cundy, M Price

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments The detector is 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 total mass is 150 tons. The experiment is located in the Mont Blanc tunnel, 5000 m of water equivalent underground. Searches for nucleon decays, and studies high energy cosmic  $\nu_\mu$ 's from point sources.

Papers NIM 202 (1982) 459, PL B118 (1982) 461, PL B133 (1983) 454, NIM 219 (1984) 300, NC 8C (1985) 76, PL B155 (1985) 465, and NIM A245 (1986) 277.

**UNDERGROUND-SAGE** Started May 1988.

### THE SOVIET-AMERICAN GALLIUM SOLAR NEUTRINO EXPERIMENT (SAGE)

SAGE COLLABORATION

MOSCOW, INR - O L Anosov, E L Faizov, V N Gavrin (✓ Spokesperson), A V Kalikhov, T V Knodel, I I Knyschenko, V N Kornoukhov, S A Mezentseva, I N Mirmov, A V Ostrinsky, A M Pshukov, N E Revzin, A A Shikhin, P V Timofeyev, E P Veretenkin, V M Vermul, G T Zatsepin

LOS ALAMOS - T J Bowles (✓ Spokesperson), S R Elliott,

J S Nico, H A O'Brien, D L Wark, J F Wilkerson

PENN U - B T Cleveland, R Davis, K Lande

LOUISIANA STATE U - M L Cherry

PRINCETON U - R T Kouzes

Accelerator NONE Detector GGNT

#### Reactions



Particles studied  $\nu_e$

Comments Uses the Gallium-Germanium Neutrino Telescope (GGNT) situated in an underground laboratory built in the Baksan Neutrino Observatory, Northern Caucasus, Russia. Has an overhead shielding of about 4700 m of water equivalent. Sensitive to the low energy neutrinos produced by the  $pp$  fusion in the Sun. Exploits the radiochemical procedure, and uses liquid metallic gallium (30 tons in the first stage, 57 tons in 1991). A removal of the cosmogenic  $^{68}\text{Ge}$  was carried out in 1988/89. The first data in the 1989 run had a high background. A purification procedure, implemented beginning with the

January 90 extraction, resulted in a significant background reduction. A calibration with a  $^{51}\text{Cr}$  artificial neutrino source of about 1 mC activity is planned. Taking data (April 92).

Papers PRL 67 (1991) 3332.

**UNDERGROUND-SOUDAN-II** Started 1988.

### THE SOUDAN-II PROTON DECAY EXPERIMENT

ARGONNE - I Ambats, D S Ayres, L J Balka, W L Barrett, K Coover, J W Dawson, T H Fields, M C Goodman, N Hill, J H Hoftiezer, D J Jankowski, F V Lopez, E N May, L E Price, J L Schlereth, J L Thron

MINNESOTA U - P Border, H Courant, B Dahlin, R N Gray,

U Das Gupta, K Heller, S Heppelman, K Johns, T Joyce,

S M Kasahara, N Longley, M Lowe, M L Marshak

(Spokesperson), W Miller, E A Peterson, D Roback, D B Rosen,

K Ruddick, D Schmid, M Shupe, S Werkema

OXFORD U - W W M Allison, G D Barr, C B Brooks, J H Cobb,

R H Giles, L M Kirby-Gallagher, D H Perkins, P D Shield,

M A Thomson, L M Tupper, N West

RUTHERFORD - G J Alner, D J A Cockerill, V W Edwards,

C Garcia-Garcia, P J Litchfield, G F Pearce

TUFTS U - D Benjamin, T Kafka, J A Kochocki, W A Mann,

L McMaster, R H Milburn, A Napier, W P Oliver, B Saitta,

J Schneps, N Sundaralingam

Accelerator NONE Detector Calorimeter

Particles studied  $p, n$

Comments A 1000-ton iron detector will use drift projection tubes arranged in an hexagonal array. The tubes are 15 mm in diameter separated by 1.6 mm of steel. The experiment is located in the Soudan mine, Minnesota, 2090 m of water equivalent underground. The data taking began in mid-1988 when 275 tons of detector was installed. New modules are added constantly, and it is expected that all 240 modules will be installed by the end of 1992. Physics topics include studies of proton decay and neutrino oscillations, and a search for magnetic monopoles and point sources of cosmic rays. Taking data.

Papers NIM A276 (1989) 371, NIM A283 (1989) 642, and PR D42 (1990) 2967.

**UNDERGROUND-SUDBURY** (1985)

### THE SUDBURY NEUTRINO OBSERVATORY (SNO)

QUEENS U, KINGSTON - H C Evans, G T Ewan

(Spokesperson), H W Lee, J R Leslie, J D MacArthur, H Mak,

W McLatchie, B C Robertson, P Skensved

OXFORD U - E W Hooper, N A Jelley, M E Moorhead, M Omori,

N W Tanner, D L Wark

BIRKBECK COLL - J C Barton, P T Trent

NATIONAL RESEARCH COUNCIL, OTTAWA - J D Anglin,

M Bercovitch, W F Davidson, C K Hargrove, H Mes, R S Storey

CHALK RIVER, AECL - E D Earle, G M Milton

GUELPH U - P Jagam, J J Simpson

PENN U - E W Beier (Spokesperson), R Van Berg, W Frati,

F M Newcomer

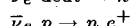
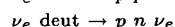
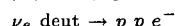
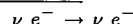
PRINCETON U - R T Kouzes, M M Lowry, A B McDonald

LAURENTIAN U - E D Hallman, R U Haq

CARLETON U - A L Carter, D Kessler

Accelerator NONE Detector Counter

#### Reactions



Comments The first phase of the experiment is in operation. Completion is expected in 1996. In the final phase, the detector will consist of a transparent tank with 1000 tons of pure heavy water. Phototubes will cover 40% of the surface area. Relativistic particles will be viewed by the Čerenkov light they produce. The detector is 5900 m of water equivalent underground. Aims to measure the solar  $^8\text{B}$   $\nu_e$  flux, spectrum,

## SUMMARIES OF UNDERGROUND/UNDERWATER EXPERIMENTS

and direction. Studies also the stellar-collapse neutrinos, and high energy cosmic  $\nu_\mu$ 's from point sources. In preparation (May 92).

*Papers* NC 9C (1986) 308, and PL B194 (1987) 321.

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**UNDERWATER-BAIKAL** (1984) Approved Jan 1984, Jan 1987; Started 1984.

### THE LAKE BAIKAL DEEP UNDERWATER NEUTRINO TELESCOPE, NT-200

#### BAIKAL COLLABORATION

MOSCOW, INR - I A Belolaptikov, L B Bezrukov, B A Borisovets, E V Bugaev, Z A M Djilkibaev, G V Domogatsky ( $\checkmark$  Spokesperson), L A Donskich, A A Doroshenko, M D Galperin, M N Gushtan, A M Klabukov, S I Klimushin, O J Lanin, B K Lubsandorzhev, N V Ogievietzky, A I Panfilov, I A Sokalsky, I I Trofimenko  
IRKUTSK STATE U - N M Budnev, A G Chensky, V I Dobrynin, O A Gress, A P Koshechkin, J B Lanin, G A Litunen, A V Lopin, V A Naumov, M I Nemchenko, Y A Parfenov, A A Pavlov, O P Pokalev, V A Primin, A A Sumanov, V A Tarashansky, V L Zurbanov

MOSCOW STATE U - A V Golikov, V B Kabikov, L A Kuzmichov, E A Osipova, E S Zaslavskaya  
TOMSK POLYTECHNIC INST - G N Dudkin, V Yu Egorov, A A Lukanin, A M Ovcharov, V M Padalko, A H Padusenko  
NOVGOROD POLYTECHNIC INST - S V Fialkovsky, V F Kulepov, M B Milenin  
MAKAROV ST PETERSBURG MARITIME UNIV - A A Levin, A I Nikiforov, M I Rosanov  
DESY, ZEUTHEN - R Heller, H Heukenkamp, J Krabi, T Mikolajski, C Spiering, T Thon, R Wischnewski  
BUDAPEST, CRIP & DUBNA - L Jenek, D Kiss, L Tanko  
IRKUTSK, LIMNOLOGY INST - Y S Kusner, V A Poleschuk, P P Sherstyankin

*Accelerator* NONE *Detector* Counter

*Particles studied*  $\nu$ , muon, monopole, exotic

*Comments* The deep underwater Čerenkov detector NT-200 will consist of nearly 200 optical modules arranged on 8 strings at 1000 m depth. The main component of a module is a highly sensitive phototube. The experiment studies muons generated in neutrino interactions, measures fluxes of muons generated in the atmosphere, searches for local sources of very high-energy particles, gives limit on the flux of heavy magnetic monopoles catalyzing proton decay, etc. Data already taken with single string variants. The completion of the detector is expected in 1993/94.

*Papers* NP (Proc. Suppl.) B14 (1990) 51, NP (Proc. Suppl.) B19 (1991) 388, and SJNP 52 (1990) 54.

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**UNDERWATER-DUMAND** (1980) Started Nov 1987.

### DEEP UNDERWATER MUON AND NEUTRINO TELESCOPE

#### DUMAND-II COLLABORATION

AACHEN, TECH HOCHSCH, III PHYS INST - P Bosetti, V Commichau, C Wiebusch  
BERN U - P K F Grieder, P Minkowski  
BOSTON U - S T Dye, E Hazen  
UC, SAN DIEGO - H Bradner  
HAWAII U - C M Alexander, J Bolesta, P Gorham, S Kondo, J G Learned ( $\checkmark$  Spokesperson), S Matsuno, M Mignard, R Mitiguy, V Peterson, A Roberts, V J Stenger, G Wilkins  
IOWA U - W Anderson, J Hauptman  
KIEL U - D Dau, P Koske  
KOBE U - K Kobayakawa  
KINKI U, IIZUKA - T Kitamura  
LBL - H Crawford, L Stevenson  
LOUISIANA STATE U - R Svoboda  
OKAYAMA UNIV SCI - Y Yamamoto  
SCRIPPS INST OCEANOGRAPHY - H Bradner  
TOHOKU U - T Hayashino, M Ito, H Kawamoto, S Tanaka, A Yamaguchi  
TOKYO U, ICRR - T Aoki, K Mitsui, Y Ohashi, A Okada  
KEK - M Sakuda, S Uehara  
VANDERBILT U - J Clem, M Webster

WASHINGTON U, SEATTLE - P E Boynton, J J Lord, R J Wilkes, K K Young

WISCONSIN U - U Camerini, J Gaidos, W Grogan, M Jaworski, T Narita, D Nicklaus

*Accelerator* NONE *Detector* Counter

*Particles studied* muon,  $\nu$

*Comments* In the first stage of the experiment, a test of the operation of 7 phototube modules has been completed. Measurements were made with a vertical string of modules suspended from a ship. Phase-II was approved in 1990. The plans call for an octagonal 9-string array, 24 tubes per string to be built by 1993. The array called DUMAND-II will be located at a depth of 4500 m, off the coast of the Hawaiian Islands. The aim of the experiment is to build a system capable of searching for point sources of high energy neutrinos of astrophysical origin, and very high energy cosmic ray muons. The detector is a 2-megaton Čerenkov counter, with a muon area of 20,000 m<sup>2</sup>, and an angular resolution of 1°. Under construction.

*Papers* NIM A276 (1989) 359, and PR D42 (1990) 3613.

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Requests for copies from the Americas, Australasia, and the Far East should go to:

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Berkeley, CA 94720  
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BERKELEY, CALIFORNIA 94720