Title
SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 16, 1950

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Henry P. Kramer

April 7, 1950

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Mesons Produced in p-p Collisions. V. Peterson.

The deflected proton beam of the 184-inch cyclotron is being used for the production of heavy positive mesons in a line target of liquid hydrogen, it is believed, by the reaction

$$p^+ + p^+ = p^+ + n + \pi^+ \quad .$$

Since the free hydrogen nuclei have no internal momentum they may be considered to be at rest with respect to the 345 Mev protons. Assigning an energy of 1 Mev to each of the escaping nucleons results in a value of 25 Mev for the energy in the center of mass system of the π^+ meson and a value for their speed that is 0.5 of that of light. Since the center of mass is moving with a speed that is equal to about 0.4 of the speed of light, one expects the energy range in the laboratory system to be the interval from 0 to 76 Mev with a peak in the forward direction as shown in Fig. 1.

The apparatus for the production and detection of mesons is shown in Fig. 2. The liquid hydrogen target is cooled by means of a jacket containing liquid nitrogen. Target and jacket are contained in a vacuum. Mesons produced in the liquid hydrogen must possess at least 20 Mev in the laboratory system in order to escape the target and pass through the walls surrounding it into photographic emulsions embedded in copper and attenuators placed at the end of deep and narrow channels inclined at different

angles to the axis of the target. The angular discrimination of the channels gives an uncertainty of about 3°.

Because the protons lose a considerable portion of their energy in passing through the line target, a point source is being developed.

Fig. 3 shows a comparison of the theoretical curves that have been calculated for the production cross section as a function of the meson energy for mesons produced at 90° to the beam and the experimental points that correspond to 50 $\pi - \mu$ decay tracks. The reason for the displacement of the experimental curve towards higher energies was thought to be due to the back scattering of high-energy mesons originally emitted in the forward direction. However, an examination of the geometry of the apparatus has not supported this view.

As yet only a few points are available at other angles of emission. The experiment is continuing and more data are forthcoming. The present meagre results agree fairly well with those obtained by Richman and Wilcox.

Short Term Effect of At on the Blood Picture in Rats. P. Wallace.

In conjunction with the investigation of the effect of At^{211} on the thyroid and parathyroid glands of the rat it was necessary to take blood counts in order to decide whether or not the animals were sufficiently close to death to make necessary their sacrifice in order to preserve the cell structure for microscopic examination.

The blood count showed time wise behavior that is reminiscent of the effects of total body radiation.

It is of special interest to compare the action of I^{131} to that of At^{211} since both concentrate to some extent the thyroid region. It was found that with respect to the effect on blood count about 50 microcurie

of At^{211} are equivalent to 900 microcurie of I^{131}.

Several slides of sections of the thyroid region were shown to demonstrate the difference in extent and manner of thyroid destruction between At^{211} and I^{131}. The short range alphas from At^{211} cause complete destruction of the thyroid gland without extensive damage to the parathyroid, whereas in order to achieve similar destruction of the thyroid with I^{131} an amount must be administered such that the long range betas from I^{131} will completely penetrate and render useless the vital parathyroid.

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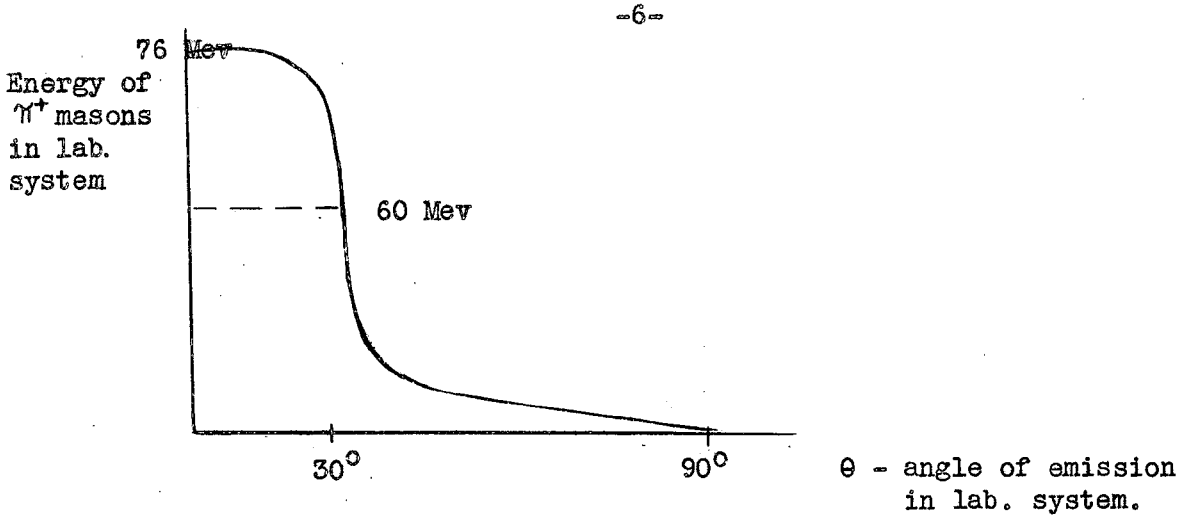

Fig. 1

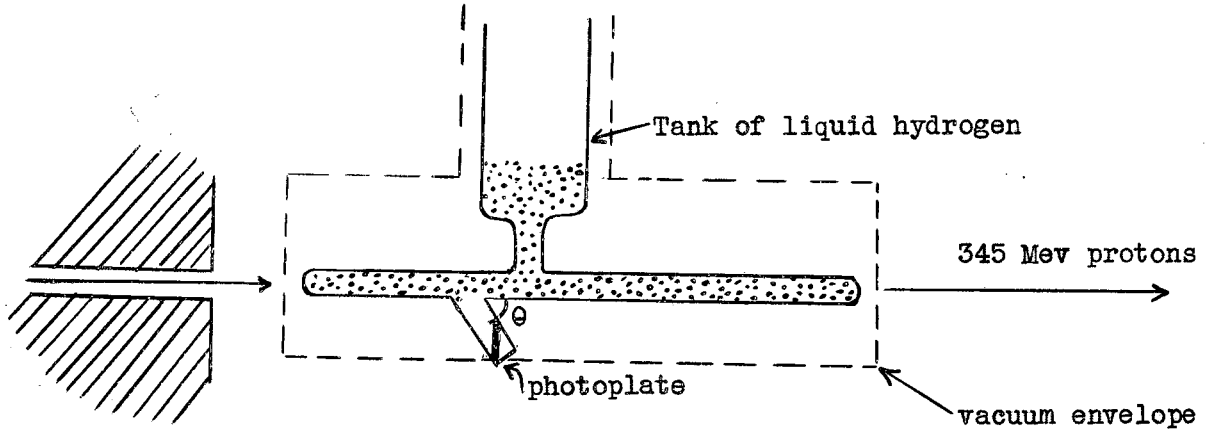

Fig. 2
Apparatus

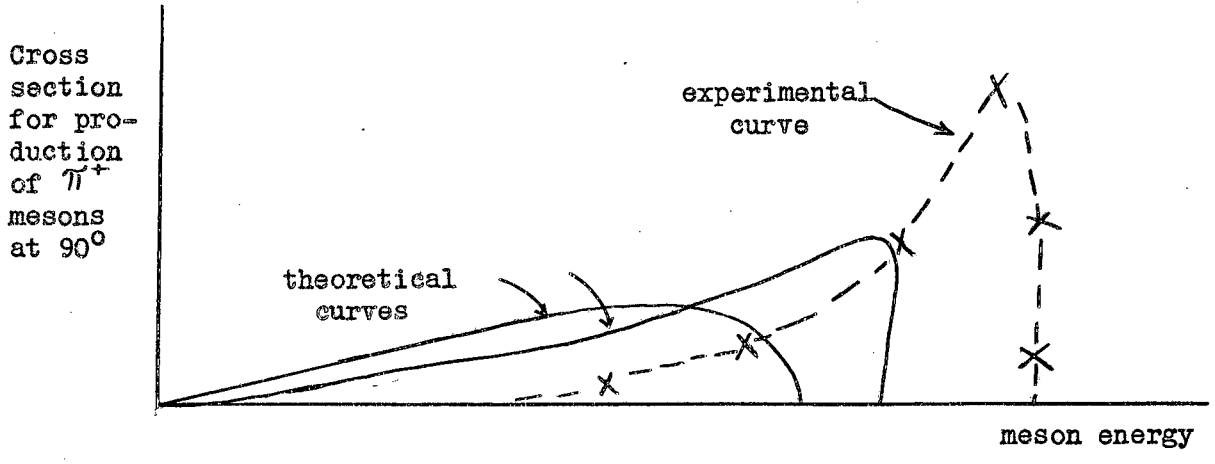

Fig. 3