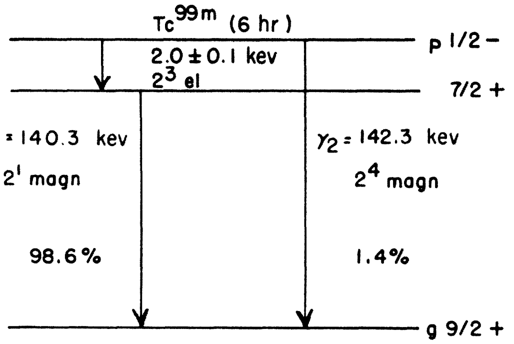

FIG. 2. Decay scheme of Tc^{99m}.

In the decay scheme shown in Fig. 2 we prefer to denote the first excited state of spin 7/2 and even parity as 7/2+ rather than $g_{7/2}$ for the following reason: a splitting of 140 kev between the $g_{9/2}$ and $g_{7/2}$ levels would seem to be too small to be compatible with the otherwise very successful assumption of strong spin-orbit coupling, from which one would expect a splitting of the order of 1–2 Mev. A still smaller splitting between a $g_{9/2}$ and a 7/2+ level (9.3 kev) has been observed in Kr^{83} by Bergström.[7] It is therefore plausible that the experimentally found small splittings are due to low-lying 7/2+ states of the configuration $(g_{9/2})^3$ (in Tc^{99}) and $(g_{9/2})^7$ (in Kr^{83}). This conjecture has been further generalized:[6] for the configurations $(g_{9/2})^{3,5,\text{or }7}$ the 7/2+ and the $g_{9/2}$ states reverse positions in about half the cases, thus accounting for the occurrence of electric 2^3-pole isomeric transitions in the $g_{9/2}$ shell $(7/2+\rightarrow p_{1/2})$.

Our thanks are due Mr. E. L. Church and Dr. G. Friedlander for valuable help.

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Neutral Mesons Produced in the Capture of π^- Mesons in Hydrogen*

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THE spectrum of the gamma-rays emitted in the interaction of π^- mesons with hydrogen has been measured by Panofsky, Aamodt, and Hadley.[1] They observe two groups of gamma-rays, one at 130 Mev and one at 70 Mev. The analysis of the experiment and the conclusions which may be derived from it rest on the assumptions (a) that the gamma-rays are due to mesons, (b) that these mesons have come to rest, and (c) that the low energy gamma-rays are the decay products of neutral mesons. We have experimentally verified these assumptions for the low energy group.

The experimental arrangement (Fig. 1) is the following: Mesons produced in the Columbia cyclotron are magnetically analyzed in the fringing field of the main magnet. They are collimated and monitored in two stilbene crystal counters, 2½ in. in diameter. They are decelerated from an initial energy of 80 Mev in absorber A, and enter the vessel B. This is filled with hydrogen at a pressure of 2500 lb/in.^{2} and cooled to 80°K, corresponding to a density of 0.04 g/cm^3. On each side of the container, behind 1.5 radiation lengths of lead converter, two 3¼-in. diameter liquid scintillators are placed. All six counters are in coincidence, with a resolving time of 10^{-8} sec between pairs 1–2, 3–6, and 4–5. The coincidences are measured with and without lead converters, with hydrogen and helium gas fillings, and with various amounts of absorber.

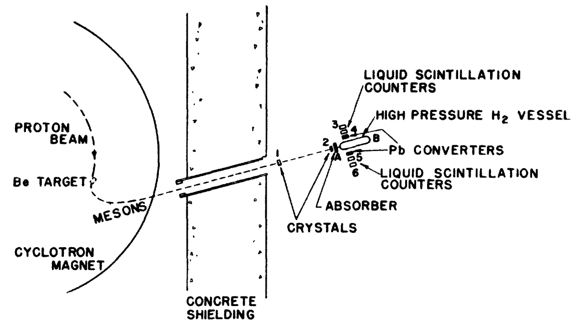

FIG. 1. Experimental arrangement.

The counting rate without converters is negligible. This shows that gamma-rays are detected. The fact that two gamma-rays are detected in coincidence shows that they are the decay products of a neutral meson. The counting rate with the helium-filled target is also negligible compared to that with hydrogen, showing that the coincidences are indeed due to a reaction in hydrogen. Finally, the variation of coincidence rate with absorber thickness shows that the gamma-rays are produced by stopping mesons (Fig. 2).

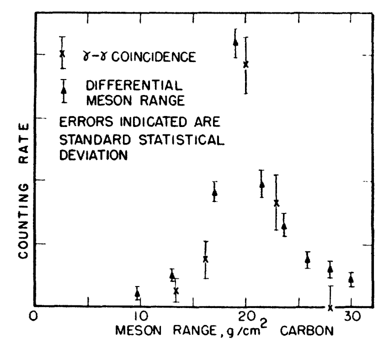

FIG. 2. Counting rate of gamma-gamma-coincidences as a function of the thickness of absorber *A*, showing that the coincidences are caused by stopped mesons.

It is therefore clear that some fraction of negative mesons coming to rest in the atomic orbits of hydrogen nuclei are converted into neutral mesons.

We wish to thank J. Spiro and H. F. Edwards for the operation of the cyclotron.

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An Attempt to Detect μ-Meson Pairs from 322-Mev Bremsstrahlung*

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IT has been suggested that high energy photons should create pairs of μ-mesons, either by an electromagnetic process (since it is thought probable that the μ-meson is a Dirac particle) or by virtue of recent considerations of Wentzel.[1] Steinberger suggested one might look for the effect using the Berkeley synchrotron.

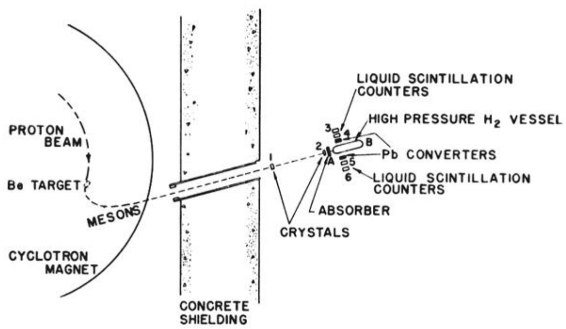

FIG. 1. Experimental arrangement.