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PROPOSAL TO STUDY THE INTERACTIONS OF 200 MeV $\pi^{\pm}$-MESONS WITH COMPLEX NUCLEI

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My main interest is to obtain a few plates irradiated to about 200 MeV π^+- and separately to 200 MeV π^--mesons. The principal motivation is to study pion absorption in nuclei at this energy via the production and subsequent interaction of the isobar (3/2, 3/2) i.e. $\triangle_\delta$ $\pi + N \rightarrow N^*$, $N^* + N \rightarrow N + N$. The possibility of this taking place has been pointed out by Zeev Fraenkel (Phys. Rev. Vol. 130, No 6, 2407-2416 (1963)). Recently, Dr. Fraenkel, in a private communication, has indicated that his predictions based on a Monte Carlo type calculation will soon be available and that it would be interesting to compare the interactions of pions in the energy range $\sim$ 200 MeV with his predictions. A study of pion absorption at lower energies, far away from the resonance region, is also of great interest. In fact much experimental effort in the last few years has been devoted to studies of the absorption of both π^+- and π^--mesons in light nuclei (mainly carbon) in the energy range 30-300 MeV and also of stopping π^- [(1-9)].

This interest persists because of the fact that the results obtained are contradictory and also that the opportunities afforded by pions for the study of nuclear structure are unique as pointed out by Ericson (Phys. Lett. 20, 280 (1962).

The study of the manner in which the total energy of the pion distributes itself and the fraction of it going into fast protons compared to the charged evaporation prongs can give one an estimation of the amount of absorption taking place on single nucleons, nucleon pairs or on larger clusters and also the rôle of the isobars, if any.

What is desired are two stacks of emulsions (Ilford K5) one each for π^+ and π^- and each consisting of 20 pellicles 30 cms x 15 cms x 600μ exposed to a beam of about 200 MeV. The beam may be centred on the middle of the stack so that the central 5 cms along the beam edge of the 10 central plates are principally exposed. The intensity should be such that one gets one π-track in $50\mu^2$, the total π flux to be about 6×10^6. If for some reasons this is too high a flux to be easily obtained, I would prefer fewer plates (say 5 or 6 instead of 10) with the same π intensity.

Precision on energy is not critical and one could tolerate variations up to 5-10%. In any case I would like the pions to come to rest at least one cm from the edge opposite to the beam edge. A total flux of 10^5 is enough, but if there are no technical problems, I would like to have sufficient plates to insure against accidents.

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