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THE FORMATION OF SINGLE MESONS BY GAMMA QUANTA

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/A brief digest of the above report follows:/

The authors calculate the differential effective cross section of the formation of charged mesons by gamma quanta in the nucleons. The calculations are carried out for scalar, pseudoscalar, and vector (with tensor bond) theories. The angular distributions of the mesons generated are graphed.

The formation of mesons by photons was investigated by A. Sakharov (Zhur Eksper Teor Fiz, Vol 17, p 686, 1947), by Benoist-Guental, Prentki, and Ratier (Comptes Rendus, 1950), and by Foldy (Phy Rev, 1949). In these works, however, they did not pay sufficient attention to the angular distribution of the mesons formed, which is of well-known interest in connection with the experimental works of Steinberger and Bishop (Phy Rev, 1950), since the calculations were conducted only according to the scalar and pseudoscalar theories. The authors of the present article calculate also according to the vector theory.

To clarify the nature of the angular distribution of mesons for practical regions of energies of gamma quanta (several 100's Mev) one can with sufficient accuracy consider the nucleons as nonrelativistic particles. Therefore, it is expedient, in the Hamiltonian described in the relativistic form for a system consisting of a nucleon in electromagnetic and mesonic fields, as done by Bhabha (Proc Roy Soc, 1938) and Wentzel (Rev Mod Phy, 1947), to make a transition to Pauli's approximation for the nucleon (mesons, of course, are considered as relativistic particles). As a result of this transition, one obtains certain expressions for the interaction of nucleons with the mesonic field, namely, the (a) scalar variant, (b) pseudoscalar variant (in the case of gradient bond), and (c) vector variant.

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After a lengthy mathematical treatment the authors obtain the differential cross sections as a function of the angle for these three types.

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