$$\times P_2(\cos\theta)\Big\}^2 d\sigma_M.$$

For the effective cross section, averaged over all directions of the vector **q**, we have

$$d\sigma_{MM} = \left\{1 + \frac{[3M^2 - L(L+1)]^2}{180L^2(2L-1)^2Z^2} q^4D_0^2\right\} d\sigma_M. \quad (9)$$

For the transition $(M, M+1)$ (initial spin state of the nucleus M, final, $M+1$) we have

$$d\sigma_{M,M+1} = \frac{q^4D_0^2(2M+1)^2(L+M+1)(L-M)}{16L^2(2L-1)^2Z^2} \quad (10)$$

$$- d\sigma_M(1-\cos^2\theta)\cos^2\theta.$$

The effective cross section, averaged over all directions of the vector **q**, is given in the form

$$d\sigma_{M,M+1} = \frac{q^4D_0^2(2M+1)^2(L+M+1)(L-M)}{120L^2(2L-1)^2Z^2} d\sigma_M. \quad (11)$$

Finally, transitions $(M, M+2)$ are possible:

$$d\sigma_{M,M+2} = \frac{q^4D_0^2 d\sigma_M}{64L^2(2L-1)^2Z^2}(L+M+2) \quad (12)$$

$$\times (L-M-1)(L+M+1)(L-M)(1-\cos^2\theta)^2.$$

The expression, averaged over the directions **q**, has the following form:

$$d\sigma_{M,M+2} = \frac{q^4D_0^2(L+M+2)}{120L^2(2L-1)^2Z^2} \quad (13)$$

$$\times (L-M-1)(L+M+1)(L-M)\, d\sigma_M.$$

In this case, when there is a certain distribution of the directions of the nuclear spin relative to the field, the effective differential cross section, averaged over the initial states and summed over the final, will have the form

$$d\sigma = \frac{1}{(2L+1)}\sum_M a_L(M)[d\sigma_{MM} +$$

$$\times\, d\sigma_{M,M+1} + d\sigma_{M,M+2}],$$

where $a_L(M)$ is the probability of finding the nuclear spin L with projection M before scattering, $d\sigma_{MM}$, $d\sigma_{M,M+1}$, $d\sigma_{M,M+2}$ are given by the corresponding formulas (9), (11) and (13). The transitions $(M, M-2)$ $(M, M-1)$ are not considered here, since they correspond to inelastic scattering in the case of polarized nuclei.

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Nuclear Capture of a Negative Heavy Meson

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THERE has been found in type *R* photographic plates with an emulsion thickness of 300 μ exposed in the stratosphere, an event, the microphotograph of which is represented in the drawing. The visible track of particle 1 consists of 495 μ. From the change in ionization and scattering along the track, it is obvious that particle 1 stopped at point *A*. From this point there start two tracks: one gray and one very short black track ($\sim 1\,\mu$). The presence of the short black track is evidence for nuclear capture of the first particle, which, therefore, can be either a negative π meson or a heavier negative particle.

Particle 2 leaves the emulsion after traveling 674 μ. Its ionization is 3.2 $\pm$0.3 times minimum. From this it follows that particle 1 is heavier than a π meson since, even if it is assumed that particle 2 is a proton, then its energy must be $\sim$ 200 mev. A proton of such energy cannot be formed upon nuclear capture of a π meson.

A direct determination of the mass of the secondary particle from its ionization and multiple scattering leads to a value of $(350 \pm 200)m_e$. It is more realistic to consider this particle as a π meson. Then its energy is $\sim$ 30 mev.

Comparison of the multiple scattering and gap count along the track of the first particle with the range indicates that its mass lies between that of the π meson and the proton.

All this is interpretable as the nuclear capture of a stopped negative heavy meson. Rather striking is the exceptionally small energy release and the production of a π meson with energy $\sim$ 30 mev, the same as upon decay of a Λ^0 particle.

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