The Possible β Decay of Hyperions and *K* Mesons

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AT the present time it is apparently possible to consider it established that the Λ^0 particle can enter into the composition of complex nuclei on a par with the nucleons. It is not known to what degree the properties of hyperions and nucleons are related*. In every case there are certain bases for considering a Λ^0 particle as a nucleon which exists in a certain excited state, with all the resultant consequences[1]. For example, such a nucleon could be beta active:

$$\Lambda^0 \rightarrow P + e^- + \nu. \qquad (1)$$

The aim of the present writing is to turn attention on the fact that due to the high upper limit for the disintegration energy, one should expect a short τ_β compared to the observed lifetime of Λ^0 particles, as in the case of $\tau_\pi(\Lambda^0 \rightarrow \pi^- + P)$.

Indeed, the lifetime of the free neutron is about 10 minutes, while the beta spectrum endpoint in this case is $E_0 \sim m_e c^2$. In the case of beta decay of Λ^0 particles, the beta spectrum endpoint is about 350 $m_e c^2$, and the probability of beta decay is approximately proportional to E_0^5. Thus,in deriving the probability of deta decay of Λ^0 particles, there appears a factor of the order of magnitude 10^{10}, which leads to a relatively short lifetime for the Λ^0 particle with respect to beta decay.

The detailed computation[1] shows that in the case of vector** variation (under the assumption that the Λ^0 particle is like the neutron, with $G \sim 10^{-44}$ erg cm^3), τ_β turns out to be $\sim 10^{-9}$ seconds. The Λ^0 particle, as is known, decays into a π^- meson and a proton, with a lifetime of about 10^{-10} seconds. At present, there are known many instances of the decay of a Λ^0 particle into a π^- meson and a proton, and, apparently, unrecorded cases of beta decay. This is evidence that either the Λ^0 particle does not appear as a particle in this case, according to its characteristics when near a nucleon, or else it possesses a higher spin which causes beta decay to be a forbidden transition. Some well-established correlating data point to a high spin for the Λ^0 particle.

The considerations indicated above may also be applied in the case of *K* mesons[2], if, for example, the spin of the latter is equal to zero and their decay can occur with the emission of Fermi particles. Here, the lifetime with respect to such decay will compete with the decay of *K* mesons to π mesons. At the same time the decay of *K* mesons with the emission of weakly interacting Fermi particles (μ mesons and electrons) would indicate the use of a low spin (0 or 1) by the *K* particles.

Data available in the literature appear to indicate the possibility of the decay of *K* mesons with the emission of Fermi particles[3].

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* The possibility is not excluded that the analogy between a Λ^0 particle and a nucleon is still a weak one, since the Λ^0 particle, for example, interacts weakly with a π field, but interacts strongly with nucleons through other fields (θ field, etc.).

** Pseudoscalar variant gives $\tau_\beta \sim 10^{-7}$ seconds.

[1] V. Stakhanov, Thesis, Moscow State University,1954
[2] M. A. Markov, Dokl. Akad. Nauk SSSR 101, 449(1955)
[3] W. Fry and M. Swami, Phys. Rev. 96, 235 (1954)

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Multiple Meson Production at Energies of 1-2.2 Bev

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IN a recent work[1] a study was made of the interaction of protons with neutrons of high energies obtained by means of a Cosmotron. The interaction was studied in a Wilson chamber filled with hydrogen. The authors investigated 154 three-prong stars. Not a single five-prong star was registered. Analysis of the results obtained showed conclusively that, during collisions of high energy nucleons, multiple production of mesons, namely the production of double mesons, takes place in a considerable number of cases. The authors give the following data for the ratio of the number of cases of the production of a single negative π meson (–) and the number of