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ASSOCIATED PRODUCTION IN PION-NUCLEON COLLISIONS AND CHARGE INDEPENDENCE

Saul Barshay

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Using the method of Low,[1] we have derived the equation for the Heisenberg scattering amplitude describing the processes $\pi + N \rightarrow \Lambda + K$ and $\pi + N \rightarrow \Sigma + K$. In the "one-meson" approximation[1] with pair intermediate states omitted we obtain a linear integral equation for this amplitude. The inhomogeneous term is the Born approximation, and the kernel of the uncrossed one-meson term is the pion-nucleon scattering amplitude. The crossed one-meson term involves the pion-hyperon scattering amplitude and may be treated with the inhomogeneous term. A partial-wave study of the Born approximation has been made, using the Hamiltonian suggested recently by Gell-Mann[2] with the assumption of spin-parity 0^- for the K mesons and $(1/2)^+$ for the Λ and Σ hyperons. S, P, and D waves have been included to first order in an expansion in powers of the ratio of the intermediate-state baryon kinetic energy to its mass. At 1 Bev pion bombarding energy we find that a coupling of the form

$$g\,(\bar{\Lambda}\,N\,K - \bar{\Sigma}_a\,N\tau_a\,K + \text{hermitian conjugate})$$

yields the strong backward preference of the Λ hyperons in the center-of-mass system that has been observed experimentally.[3,4] Also in accord with

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[1] F. E. Low, Phys. Rev. 97, 1392 (1955).

[2] M. Gell-Mann, A Model for the Strong Couplings Phys. Rev. (to be published).

[3] Budde, Chrétien, Qeitner, Samios, Schwartz, and Steinberger, Phys. Rev. 103, 1827 (1956).

[4] D. Glaser, private communication.