where $\bar{u}_l$ (l denoting lepton) is $\bar{u}_e$ or $\bar{u}_\mu$, and, on invariance grounds

$$\langle\pi|j_\mu^{V,A}|K\rangle = c(p_K+p_\pi)_\mu + d(p_K-p_\pi)_\mu, \quad (7)$$

where c and d are functions of $(p_K-p_\pi)^2$. The conservation law would imply that

$$(p_K-p_\pi)_\mu\langle\pi|j_\mu^{V,A}|K\rangle = 0; \quad (8)$$

hence

$$d = \frac{m_K^2-m_\pi^2}{(p_K-p_\pi)^2}c. \quad (9)$$

It is now a simple matter to show that the decay rate ω is given by

$$\omega = \frac{1}{384\pi^3 m_K^3}\int_{m_l^2}^{(m_K-m_\pi)^2} d\lambda^2\,|c(-\lambda^2)|^2 \times\{[(m_K+m_\pi)^2-\lambda^2][(m_K-m_\pi)^2-\lambda^2]\}^{\frac{3}{2}} \times\left\{2-\frac{3m_l^2}{\lambda^2}+\frac{m_l^6}{\lambda^6}\right\}, \quad (10)$$

where m_l is the lepton mass (m_e or m_μ). The coefficient c depends on the pion energy through $\lambda^2 = m_K^2+m_\pi^2 - 2m_K E_\pi$ (in the K rest system). Although this function is unknown, it is clear that the present scheme implies rigorously $\rho \equiv \omega_{e3}/\omega_{\mu 3} > 1$. If one supposes that c is a constant, then $\rho = 2.5$. Experimentally, this ratio appears to be smaller than unity.[5] To the extent that this can be firmly established, one can rule out the scheme of conserved strangeness-violating currents.

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Possible Method of Investigating Gyromagnetic Ratios of Short-Lived Nuclear States with Fast Neutral Beams*

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It is well known that nuclear reactions, e.g., proton capture or Coulomb excitation, produced by a charged particle beam incident on unaligned nuclei, will in general produce a partial alignment of the product nuclei. Thus, for example, any gamma radiation emitted by the product nucleus may have an anisotropic angular distribution with the beam direction as the axis of symmetry. Further, if a magnetic field B is placed perpendicular to the beam direction, the excited product nucleus will precess with the Larmor frequency around the axis of the field with angular frequency

$$\omega_L = g(\mu_N/\hbar)B,$$

where g is the gyromagnetic ratio and μ_N is the nuclear magneton. This assumes that the effect of interatomic fields can be neglected. Thus at decay the axis of symmetry for gamma-ray emission is rotated through an angle

$$\theta = \omega_L t,$$

where t is the time the individual product nucleus spends in the magnetic field.[1] For $t \sim 10^{-10}$ sec and values of the gyromagnetic ratio $g \simeq 1$, a value of B of the order of 300 000 gauss would result in a precession angle of about 10 degrees.

Such high magnetic fields can be obtained by the use of pulsed magnets.[2] However, under these conditions, the deflection of the incident charged particle beam by the fringe field of the magnet would become excessive and obscure the precession effect.

To overcome this difficulty, it is proposed to use a fast atomic hydrogen beam H^0 in the 1–2 Mev range, which will remain undeflected by the fringe field. On entering the target material the atomic hydrogen is immediately stripped. Since the range of the resultant proton beam in the target is of the order 10^{-2} cm, the effect of the field on this portion of the particle trajectory is small. For example, a value of B of 300 000 gauss would turn a 2-Mev proton beam through an angle of 1 degree. The incident beam direction is therefore largely preserved.

We have generated a 1-Mev H^0 beam in the following way. An H_2^+ beam of 2-Mev energy was disassociated by allowing it to pass through a hydrogen gas stripper, thus producing an H^0 and an H^+ beam. The H^+ beam was swept away by a magnetic field leaving only the H^0 beam. The conversion efficiency for the process at this energy was found to be about 9%. Hence conventional high-voltage accelerators can be used to produce fast atomic hydrogen beams whose intensity is of order 10^{14} particles per second.

It is intended to use such beams in conjunction with pulsed fields of 500 000 gauss to investigate gyromagnetic ratios of states whose lifetime is of order 10^{-9} sec.

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