HYPERON DECAYS AND A LIMIT ON LEFT-RIGHT MIXING

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Left-right symmetrical models, based on the group $SU(2)_L \times SU(2)_R \times U(1)$ have often been discussed as a somewhat minimal extension of the standard group $SU(2)_L \times U(1)$. As far as low-energy charged current gauge interactions are concerned, we need to introduce two new parameters, namely the mass of the hypothetical right-handed boson, M_R and its mixing with the left-handed boson, characterized by $\sin\xi$ which lead respectively to effective $(V+A)(V+A) \cdot \frac{G_F}{\sqrt{2}} \cdot M_L^2/M_R^2$ and $(V+A)(V-A) \cdot \frac{G_F}{\sqrt{2}} \cdot \sin\xi$ four-fermion interactions.

Existing limits on these two parameters usually rely on the measurement of leptonic polarization. However, in the popular case where right-handed neutrinos possess a large Majorana mass, making them impossible to produce at current accelerator energies, the leptonic charged current is effectively purely left-handed. Some information on M_R may be gained from the study of neutral currents, assuming a specific Higgs structure; this, however, gives no handle on the parameter ξ. One thus has to probe directly the charged hadronic current.

We have suggested that a Majorana mass-independent limit on ξ be obtained by considering deep inelastic $\bar{\nu}$ scattering at large values of x and y (various Q^2 should be considered to eliminate potential higher twist contributions). The limit obtained in this way by the CDHS group is independent of any Majorana mass and gives[1] $|\sin\xi| < 10\%$. On the other hand, more speculative, but more sensitive tests can be extracted from the consideration of non-leptonic decays. Obviously the picture is obscured here by the presence of strong interaction corrections to the g_A coupling (Adler-Weisberger relation).

A limit can, however, be obtained by isolating some special channels and kinematical regions where contribution from LR mixing would be considerably enhanced. This is found to be the case for the $\Delta I = 3/2$ amplitude of hyperon decays. We have shown that, taking into account chiral considerations and radiative corrections enhances the left-right contribution in P-conserving decays by a factor of 120, leading to

$$\frac{A^L(\Delta I=3/2) + A^{LR}(\Delta I=3/2)}{A^L(\Delta I=3/2)} \sim 1 - 120 \sin\xi$$

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for p-wave contributions, while s-wave contributions are unaffected if L and R Cabibbo mixings are taken to be equal.

Comparison with present data on these amplitudes then suggests $|\sin\xi| < 1\%$ as a reasonable limit.[2]

REFERENCES

1. H. Abramowicz et al., Zeit, fur Phys. C12, 225 (1982).
2. For more details, see I.I. Bigi and J.-M. Frere, Phys. Lett. 110B, 255 (1982) and references therein.