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A study of recoil terms for beta transitions in mirror and triplet nuclei.

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In the Standard Model the Hamiltonian of the weak interaction consists of a vector and a axial-vector part, but in the most general Lorentz-invariant form of this Hamiltonian a tensor and a scalar part are in principle possible. In beta decay these are searched for by precise determinations of the corrected Ft values of superallowed Fermi transitions and precision measurements of correlations between the spins and momenta of the particles involved.
In recent years the precision of such measurements has improved significantly and is now at the level of 1% or better with even better precisions being possible in the near future.
For measurements at the precision of 1% or better, higher order corrections can mimic the effects of physics beyond the Standard Model and should therefore be included in the vector and axial-vector part of the Hamiltonian. The most important of these are the so-called recoil terms related to induced weak currents, which occur because the decaying quark couples to the weak field as a bound particle in the nucleon, and not as a free particle. The formalism of these recoil terms is written down by B. R. Holstein [HOL1974] in terms of form factors. The most important ones are the weak magnetism b and the induced tensor d. These terms modify the correlation coefficients in the order of several permil up to about several percent in extreme cases.
Here we present a study of the recoil terms and their effects in correlation coefficients for a number of beta transitions between mirror nuclei and between triplet nuclei. The weak magnetism form factor is experimentally derived using the CVC hypothesis [CAL1976]. The matrix elements leading to the form factors relevant for the recoil terms are calculated in the nuclear shell model using the impulse approximation and, if possible, compared with experimental values.

[Hol1974] B.R. Holstein, Review of Modern Physics 46 (1974) 789
[Cal1976] F.P. Calaprice and B.R. Holstein, Nuclear Physics A 273 (1976) 301

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