

Precision tests of the Electroweak SM from beta decay in trapped atoms

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Decay correlations in nuclear beta decay are sensitive to Beyond Standard Model (BSM) physics. Generally speaking, precise measurements of decay correlation parameters at the 1% uncertainty level (or better) act as searches for new couplings of leptons and quarks at the 0.5 TeV energy scale. The number of possible Lorentz invariant couplings reflecting new physics is large. To constrain BSM physics on a broad basis, many complementary experimental observables are necessary. Beta radioactive samples confined in traps for ions or neutral atoms offer a well-controlled, high-precision environment in which to perform sensitive measurements of decay correlations. Several existing programs both in the US and abroad have demonstrated the capabilities of these systems. In particular, measuring the recoil nucleus' momentum spectrum in coincidence with the beta offers full and precise reconstruction of the decay kinematics. This type of measurement offers comprehensive study of decay correlations and their energy dependence. Ideally, several beta-decaying systems should be studied for the sake of different sensitivities to BSM physics and to control various types of systematic error. Other beta decay observables can be studied in trapped samples, including Q values, lifetimes, and beta spectra. Future plans for US nuclear physics research should include support for these types of measurements at existing and new facilities.

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