TRIUMF E-823: Tests of the Standard Model from Nuclear Beta-Decay Studies at ISAC

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The goal of the E-823 experimental program is to measure precise half-lives and branching ratios for superallowed 0^+-to-0^+ beta emitters in medium-mass (A > 60) nuclei produced by the new ISAC1 radioactive-beam facility at TRIUMF. This is an important adjunct to our program at the Cyclotron Institute to probe CKM unitarity via superallowed beta decay [1]. In addition to the TAMU participants, the E-823 collaboration now includes members from TRIUMF, Simon Fraser University, Lawrence Berkeley National Laboratory, Queen's University, Argonne National Laboratory, Oak Ridge National Laboratory, Louisiana State University, University of Surrey, McMaster University, Georgia Institute of Technology, and the University of Guelph.

The focus of the collaboration for this past year has continued to be the decay of ^{74}Rb. The ISAC facility produces a separated ^{74}Rb beam of ~4000 ions/s, which is well suited to the requirements of precision measurements. During the year, we have made considerable progress in measuring branching ratios in the ∃-decay of ^{74}Rb. Four γ-ray and two conversion-electron transitions have been observed and some have been placed in the known level scheme of ^{74}Kr, its daughter. However, it is apparent that the observed transition strength in ^{74}Kr is insufficient to explain the ∃-decay of ^{74}Rb since, for example, if it is taken at face value it would indicate that the first-excited 2^+ state in ^{74}Kr is fed directly by ∃-decay with an *ft* value about five orders of magnitude smaller than any other known second-forbidden nonunique ∃-decay. Evidently, there are states at higher excitation being populated weakly by allowed ∃-decay, which de-excite via unobserved γ transitions to the first-excited 2^+ state (and, no doubt, others). This hypothesis is also supported by shell-model calculations [2].

Experimental improvements are being planned to improve our ability to see weak transitions in this decay.

References

[1] J. C. Hardy *et al., Progress in Research*, Cyclotron Institute, Texas A&M University (2001-2002), p. I-21.

[2] J. C. Hardy and I. S. Towner, *Progress in Research*, Cyclotron Institute, Texas A&M University (2001-2002).