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Improving the Precision of the Half Life of ^{34}Ar V.E. IACOB, J.C. HARDY, M. BENCOMO, L. CHEN, V. HORVAT, N. NICA, H.I. PARK, Cyclotron Institute, Texas A&M University — Currently, precise *ft*-values measured for superallowed $0^+ \rightarrow 0^+\beta$ transitions provide the most accurate value for $V_{\rm ud}$, the up-down quark mixing element of the Cabibbo-Kobayashi-Maskawa (CKM) matrix. This enables the most demanding test of CKM unitarity, one of the pillars of the Standard Model. Further improvements in precision are possible if the *ft* values for pairs of mirror $0^+ \rightarrow 0^+$transitions can be measured with 0.1% precision or better. The decays of ^{34}Ar and ^{34}Cl are members of such a mirror pair, but so far the former is not known with sufficient precision. Since our 2006 publication of the half-life of ^{34}Ar [1], we have improved significantly our acquisition and analysis techniques, adding refinements that have led to increased accuracy. The ^{34}Cl half-life is about twice that of ^{34}Ar. This obscures the ^{34}Ar contribution to the decay in measurements such as ours, which detected the decay positrons and was thus unable to differentiate between the parent and daughter decays. We report here two experiments aiming to improve the half-life of ^{34}Ar: The first detected positrons as in [1] but with improved controls; the second measured γ rays in coincidence with positrons, thus achieving a clear separation of ^{34}Ar decay from ^{34}Cl. [1] V. Iacob *et al.* Phys. Rev. C **74**, 055502 (2006)

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