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Weak Interaction Parameters from Superaligned Beta Decay

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A critical survey of world data on superallowed beta decay, which closed in late 2004, has confirmed two tenets of the Conserved Vector Current hypothesis with improved precision: a) G_V is demonstrated to be constant to three parts in 10^4 ; and b) the induced scalar current is limited to $f_s < 0.0013$ in electron rest-mass units. An improved value is also obtained for the up-down quark-mixing element, V_{ud} , of the Cabibbo-Kobayashi-Maskawa (CKM) matrix. This is a key result for testing CKM unitarity and probing the possible existence of right-hand currents. The precision obtained for the parameters extracted from superallowed decays is currently limited by the small theoretical correction terms applied to the data. One can test the terms that are nuclear-structure dependent experimentally by determining their detailed effectiveness in removing the nucleus-to-nucleus variations in the measured ft values. This is the focus of modern experiments, which aim to improve the precision of known ft values or to extend measurements to new cases with large predicted corrections. The results included in the survey strongly support the calculated corrections terms but a new measurement of the ^{46}V decay energy by Savard *et al.* (Phys. Rev. Lett., to be published) does raise some interesting questions. In collaboration with I.S. Towner, Cyclotron Institute, Texas A&M University, College Station TX 77843.