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Electroweak axial structure functions and CKM unitarity PETER BLUNDEN, Univ of Manitoba, KYLE SHIELLS, Center for Nuclear Femtography, 1201 New York Ave., NW, Washington DC, 20005, WALLY MELNITCHOUK, Jefferson Lab, Newport News, Virginia 23606 — The γW box radiative correction is the largest source of hadronic uncertainty in the determination of the CKM matrix element V_{ud} from super-allowed nuclear β-decay. The recent development of computational methods using dispersion relations allows for a systematic improvement to the calculation of the axial-vector part of the γW box amplitude $\Box_A^{\gamma W}$ in terms of the isoscalar part of the $F_3^{\gamma W}$ interference structure function, with improved and quantifiable estimates of the hadronic uncertainties. Using the latest available phenomenology for $F_3^{\gamma W}$ from the nucleon elastic, resonance, deep-inelastic, and Regge regions, we find the real part of the box correction to be $\Box_A^{\gamma W} = 3.90(9) \times 10^{-3}$. This gives a theoretical estimate of the CKM matrix element $|V_{ud}|^2 = 0.94805(26)$, which represents a 4σ violation of unitarity. Implications for the γZ interference radiative corrections applicable to parity-violating electron-proton scattering are also discussed.

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