

Physics Division Seminar

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The Current Status of V_{ud} and the Top-Row CKM Unitarity Test: How Did We Get Here?

Host: Ben Kay

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The up-down element of the Cabibbo-Kobayashi-Maskawa (CKM) quark-mixing matrix, V_{ud} , dominates the top row sum, and with a fractional uncertainty of 0.021%, is the most precisely known value in the CKM matrix. The determination of this quantity relies nearly entirely on high-precision superallowed beta-decay ft value measurements and their associated theoretical corrections. For more than a decade, the top row sum has been consistent with the Standard Model prediction of unity, with the limiting uncertainty being the inner radiative correction that is applied to the superallowed data. Very recently, a new evaluation of this theoretical quantity resulted in a shift in the central value as well as a reduction in its uncertainty [PRL 121, 241804 (2018)]. This new result presents a problem to the Standard Model, as it now generates a 4 sigma tension with the top row unitarity constraint, and leaves V_{us} as the limiting factor on CKM tests. In this seminar, I will present a history of how we got to this point, where we are going, and discuss which few measurements for the extraction of V_{ud} are still relevant to the advancement of this field.