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Precision beta-decay measurements to test the Standard Model

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Despite its success, the Standard Model (SM) has several shortcomings leading to its scrutinization at the energy, intensity and precision frontier. One probing mechanism for new physics is the unitarity test of the Cabibbo-Kobayashi-Maskawa quark mixing matrix, which up to until recently has followed the SM-predicted unitarity. However, recent radiative correction calculation results, used for the determination of the biggest matrix element, V_{ud} , now generates a three standards deviation of tension with unitarity, leading to renewed interest on the experimental and theoretical fronts. As such, in the past few years, a research program aimed at solidifying the determination of V_{ud} from superallowed beta-decay transitions between mirror nuclei was initiated using radioactive ion beams from the Twin Solenoid (TwinSol) separator at the Nuclear Science Laboratory of the University Notre Dame. The first part of the program is centered on precision half-life measurements and the second part aims at measuring the beta-neutrino angular correlation parameter “little-a”. Recent half-life measurements and the current development status of an ion trapping system to measure “little-a” in many mirror decays for the first time will be presented.