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Status of St. Benedict at the Nuclear Science Laboratory

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St. Benedict, the Superallowed Transition Beta-Neutrino Decay-Ion-Coincidence Trap, is in development at the University of Notre Dame's Nuclear Science Laboratory. This ion trapping system will be composed of three main components. The first component will be a large-volume gas cell which will thermalize ions through collisions with a buffer gas, coupled with a RF-funnel-based ion guide system followed by a sextupole ion guide (SPIG) for extraction. Then, a radiofrequency quadrupole (RFQ) will take the continuous beam from the gas catcher and produce a cooled, bunched beam for injection into a linear Paul trap. The Paul trap will hold the ions near rest until they decay, and surrounding detectors will be used to determine the kinematics of the decay particles. The β-decay spectrum can be extracted from this information, and used to determine the β-ν angular correlation coefficient, $a_{\beta\nu}$. This will allow for the determination of the Fermi to Gamow-Teller mixing ratio, ρ, for members of the ensemble of T=1/2 superallowed β decays whom have not had this quantity measured experimentally. The determination of ρ for these decays will allow for the calculation of a precision V_{ud} value complementary to the current precision limit provided by superallowed $0^+ \rightarrow 0^+$ decays. The current status of the project will be presented. This work is funded by the National Science Foundation Major Research Instrumentation grant PHY-1725711.

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