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Detector characterization and background studies for β-decay experiments

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Neutron β-decay experiments provide access to important parameters of the Standard Model and are also sensitive to new physics Beyond the Standard Model. Modern neutron decay experiments aim to measure decay correlation parameters with a high sensitivity and therefore require very precise particle detection in either energy, time-of-flight, or both. The Nab experiment, which is under construction at the SNS at the Oak Ridge National Laboratory, will measure the a" andb" decay correlations by detecting 30 keV protons and up to 750 keV electrons, with a resolution of 3 keV. This will be achieved by using thick, large-area, and highly segmented (127 pixels) silicon detectors with a 100 nm thick dead layer. To reduce noise in the detector and the front end electronics, the detectors must be actively cooled. A prototype cooling system will be presented along with results from performance tests. Characterization of a small scale detector and electronics has been conducted at the Los Alamos National Laboratory on the UCNB experiment and a measurement of the ^{45}Ca β spectrum. Ongoing analysis and background studies from recent running will also be presented.

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