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(I) The Neutron Beta Decay Experiment (Nab) and Canada's Role using the Manitoba II 30 keV Proton Source

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Neutron beta decay is a fundamental nuclear process that provides a means to perform precision measurements that test the limits of our present understanding of the weak interaction described by the Standard Model of particle physics and puts constraints on physics beyond the Standard Model. The Nab experiment will measure 'a', the electron-neutrino angular correlation parameter, to a precision of $\delta a/a \sim 10^{-3}$ and 'b', the Fierz interference term, to a precision of $\delta b = 3 \cdot 10^{-3}$. The Nab experiment implements large area segmented silicon detectors to measure the proton momentum and the electron energy to reconstruct a and b. The Nab silicon detectors were being characterized with protons and electron sources prior to installation into the Nab experiment at the SNS at ORNL. This talk will present an overview and status of the Nab experiment and focus on preliminary measurements of the electronic response of the Nab detector pixels and the reconstructed energies of the incident radiation using proton and electron sources under various experimental conditions performed at the University of Manitoba. The reconstructed proton energy was measured while varying the detector temperature, the observed pixel location, the detector bias voltage, and the proton accelerating potential, respectively. The proton rates in neighbouring detector pixels, during an incremental deflection of the proton beam across the pixel boundary, were also measured.

Keyword-1

Precision Measurements

Keyword-2

Neutron Beta Decay

Keyword-3

30 keV Proton Source

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