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Measurement of Electron Backscattering for Neutron β-Decay
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Electron backscattering from the surfaces of detectors complicates accurate beta spectroscopy in nuclear beta-decay experiments. For example, an upcoming measurement of the beta-asymmetry in neutron decay (the UCNA experiment at Los Alamos) will require an understanding of backscattering at the 20% level. The beta-asymmetry, when combined with the neutron lifetime, can be used to extract the standard model parameter V_{ud} governing weak transitions between u and d quarks. The existing measurements of electron backscattering are not detailed enough in the relevent energy range to make assessments of models of electron transport. We report on recent progress of measurements of electron backscattering at normal incidence from low Z bulk targets in the energy range 40 to 120 keV. The total backscattered fraction, and the energy and angular distributions of the backscattered electrons were measured for scattering from beryllium, silicon, and scintillator targets. In particular, the scintillator target data presented several additional interesting systematic effects which have now been characterized. Accuracy better than the experimental requirement has been achieved. The measurements have been compared with electron transport models based on the Geant4 and Penelope Monte Carlo codes.

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