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Simulation of the "little a" Neutron Beta Decay Experiment at the SNS EMIL FRLEZ, University of Virginia — We present the GEANT4 Monte Carlo simulation of an experimental apparatus being developed to measure the electron-antineutrino correlation in the free neutron beta decay ("little a") at the SNS. The proposed method relies on the measurement of the proton time-of-flight distribution using a pair of large area Silicon detectors. The design calls for systematic uncertainties of a few parts in a thousand. We address the practical issues related to a MC simulation of $\simeq 10^9$ events in the 4π hermetic magnetic spectrometer. We discuss modeling the required precision of the electromagnetic field maps, p-e coincidence trigger efficiencies, TOF timing spreads due to neutron beam size and position, charged particle detector energy thresholds and backscattering processes.

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