Simulating the Neutron Detection of the CLAS12 Detector[1]

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— We have studied the expected performance of the CLAS12 detector that will be built at Jefferson Lab as part of the 12-GeV Upgrade. The Upgrade hopes to further our understanding of the internal structure of nucleons by studying nucleon properties such as form factors and generalized parton distributions. The CLAS12 detector will consist of drift chambers, scintillators, Cherenkov counters, calorimeters, and a vertex finder. The initial round of experiments for the 12-GeV upgrade include ones that require neutron detection and we are studying the neutron detection efficiency in preparation for such experiments. To study CLAS12's performance we generated the four-momenta of an electron and neutron after a relativistic, elastic collision and passed these data into the GEANT4-based program gemc. The code uses the four-momenta of these particles and simulates their interaction with the components of the detector. Reconstruction of the events was done with the program Socrat. By comparing the number of reconstructed neutron events to the number of thrown neutron events we extracted the efficiency of the outer time-of-flight scintillators. A precise knowledge of the neutron detection efficiency is required to keep systematic uncertainty low in future experiments.

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