

Monte Carlo simulation of a dedicated neutron detector for the COHERENT experiment at the SNS, ORNL

Wednesday, May 11, 2022 4:08 PM (1 minute)

The COHERENT collaboration studies Coherent Elastic Neutrino-Nucleus Scattering (CEvNS) with high-quality pion-decay-at-rest neutrinos from the Spallation Neutron Source (SNS) at Oak Ridge National Lab, Tennessee. Through CEvNS detection we can know more about the properties of neutrinos and nuclei. Neutrons that survive thick shielding between the source and COHERENT detectors are a serious background for CEvNS detection. A dedicated neutron detector, MARS, is used to monitor this background. The performance of this detector has been characterized using various radioactive sources, including a DT neutron generator. A Geant4 Monte Carlo simulation package has been developed to evaluate the efficiency of neutron detection and to understand the detector response to neutrons at various energies. Reported here are the comparison of the recorded and simulated calibration data, as well as the simulated neutron detection efficiency. The efficiency is used to estimate the neutron background level of COHERENT detectors

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Session Classification: Poster Session

Track Classification: Nuclear Physics