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Geant4 Simulations Framework for nEDM@SNS!

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The nEDM@SNS simulations team has developed Geant4 based simulations of several key aspects of the experiment including: i) neutron-3He capture signal, ii) several sources of background (neutron activation, cosmic rays, neutron beta decay, etc.), iii) light collection (scintillation, wavelength shifting, and detailed photon propagation), iv) 3He spin precession, and v) UCN production in 4He. These simulations are currently being integrated into a single framework to accommodate design changes without the need for major code revisions. Many of the simulations have also been ported to an HPC environment on the Titan supercomputer at Oak Ridge. In this presentation we present several lessons learned and best practices to ensure accurate results and efficient execution of Geant4 simulations in the low energy neutron regime. Specifically, we will present ongoing work with the SNS neutronics team and Geant4 collaboration members to compare the low energy neutron scattering kernels in Geant4 against MCNP. We will also present results from a custom Geant4 process to simulate single phonon scattering of low energy neutrons in superfluid Helium.

Primary author: Mr LEGGETT, Jed (Mississippi State University)

Presenter: Dr LEGGETT, Jed (ORNL)

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