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^3He polarization and injection system for the nEDM@SNS SOS apparatus

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The Systematic and Operations Studies (SOS) for the neutron electric dipole moment (nEDM) experiment at the Spallation Neutron Source (SNS) will measure the trajectory correlation functions of ^3He and neutrons in order the determine the expected frequency shift from the geometric phase effect in the nEDM@SNS experiment. To this end the SOS apparatus will utilize Metastability Exchange Optical Pumping (MEOP) to polarize ^3He to 80% polarization at room temperature. The ^3He is then injected into measurement cell inside the cryovessel where the experiment is performed with concentrations of ^3He as low as 10^{-10} and a temperature of 0.4 K. We describe the polarization and injection system as well as report on results from tests of the MEOP system, simulations of ^3He injection, and our calculations of trajectory correlation functions.

Primary author: RAO, Thomas (North Carolina State University)

Presenter: RAO, Thomas (North Carolina State University)

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