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A SQUID-based ^{3}He Co-magnetometer Readout for the SNS nEDM Experiment YOUNG JIN KIM, STEVEN CLAYTON, Los Alamos National Laboratory — A discovery of a permanent electric dipole moment (EDM) of the neutron would provide one of the most important low energy tests of the discrete symmetries beyond the Standard Model of particle physics. A new experimental neutron EDM search, to be conducted at the Spallation Neutron Source (SNS) at ORNL, has been proposed to improve the present experimental limit of 10^{-26} e·cm by two orders of magnitude. The experiment is based on the magnetic-resonance technique in which polarized neutrons precess at the Larmor frequency when placed in a static magnetic field; a non-zero EDM would be evident as a difference in precession frequency when a strong electric field is applied parallel vs. anti-parallel to the magnetic field. In addition to its role as neutron spin-analyzer via the spin-dependent n+^{3}He nuclear capture process, polarized helium-3 (which has negligible EDM) will serve as co-magnetometer to correct for drifts in the magnetic field. The helium-3 magnetization signal will be read out by superconducting gradiometers coupled to SQUIDs. We describe a proposed SQUID system suitable for the complex neutron EDM apparatus, and demonstrate that the field noise in the SQUID system, tested in an environment similar to the EDM apparatus, meets the nEDM requirement.

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