

Abstract Submitted
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Magnetic Field Shape Optimization for the SNS nEDM apparatus, applications specific to spin species.¹ CHRISTOPHER SWANK, Caltech, SNS NEDM COLLABORATION COLLABORATION — Spin behavior undergoing Larmor precession in fluctuating fields is predicted by the spectrum of its field correlation function, which reduces to a sum of the field-image Fourier coefficients weighted by the conditional density of the spin species. Recently it was shown how scattering with energy exchange from an ensemble of scatterers in thermal equilibrium can be incorporated into the continuous time random walk. Results agree for models of 1,2 and 3 dimensions, previously in disagreement. The new model is incorporated into the magnetic field optimization to directly minimize the conditional probability weighted Fourier coefficients in the target region for the SNS nEDM experiment. The optimization technique directly minimizes terms responsible for the relaxation and frequency shifts over the total volume of the cell, and is implemented for the design of the Holding and RF fields used to manipulate the neutron and ^3He spins. Fabrication defects present in the coils may result in field inhomogeneities that require shimming in situ. Techniques for identifying these inhomogeneities include a magnetic probe array, position dependent sensitivity of an array of SQUIDS, and in theory, analysis of the spectrum of the neutron and ^3He can provide a sensitive and detailed field map.

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