

Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Diffusion Constant Measurement of Dilute ^3He in Superfluid ^4He for UCN Experiments¹ CAMERON BLAKE ERICKSON, University of Illinois at Urbana-Champaign, NEDM@SNS COLLABORATION — Ultra cold neutrons (UCNs) are commonly employed in precise measurements of fundamental neutron properties such as in the neutron electric dipole moment experiment at ORNL. High densities of UCNs can be attained by down-scattering cold neutrons in superfluid ^4He , but ^3He impurities in the superfluid absorb neutrons, making it desirable to control the relative fraction of ^3He to ^4He in these experiments. The ^3He diffusion constant at concentrations at or below that of natural ^4He , around 1 ppm, is important for this control and determined by microscopic scatterings between ^3He and phonon excitations in the superfluid. This talk discusses a planned measurement of the ^3He spin diffusion constant using free induction decay for concentrations around 1 ppm and temperatures between 150 to 550 mK. This phase space covers both ^3He -phonon and ^3He - ^3He dominated diffusion, providing a check against theory and a complement to previous measurements.

¹NSF grants PHY1812377 and PHY1822502

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Date submitted: 07 Jan 2021

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