Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Solid Oxygen: Ultra-Cold Neutron Production from Magnetic Excitations as Illuminated by Inelastic Neutron Scattering CHRISTOPHER M. LAVELLE, CHEN-YU LIU, PATRICK M. MCCHESNEY, DAN J. SALVAT, GREG MANUS, Indiana University, MARK MAKELA, ANDY SAUNDERS, AARON COUTURE, CHRIS MORRIS, Los Alamos National Laboratory, ALBERT YOUNG, North Carolina State University, CRAIG M. BROWN, NIST NCNR — Ultra Cold Neutrons (UCN, E$\sim$100 neV) are supremely useful in the study of the weak interaction physics and provide a sensitive platform for theories beyond the standard model via measurement of the neutron electric dipole moment. UCN are produced from a cold neutron beam via excitation of collective modes in materials such as solid deuterium and liquid helium. Unfortunately, UCN sources are limited by low intensity. This provides an interesting point of collaboration between condensed matter and nuclear physics as we attempt to develop stronger sources. We have investigated the magnetic phases of solid oxygen as a potential UCN source by measuring UCN production from solid oxygen directly. Complete understanding of the results was elusive until we conducted a recent series of inelastic neutron studies scattering using the Disc Chopper Spectrometer time-of-flight instrument at NIST. Of particular interest is the high efficiency of magnetic inelastic scattering for UCN production, and the powerful influence of the spin ordering transition.

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Date submitted: 08 Dec 2009 Electronic form version 1.4