Contribution ID: **45** Type: **Poster presentation**

Feasibility of quantum coherence with ultracold neutrons

Tuesday, 12 September 2017 18:00 (1 hour)

Two new experimental capabilities developed at LANL, the unprecedented ultracold neutron (UCN) source intensity and a highly accurate imaging UCN spectroscopy [1, 2], open door to precision UCN physics including quantum physics. UCNs provide one of the most sensitive probes for quantum physics and fluctuations since neutrons carry no electric charge and have already shown energy sensitivity approaching 10-14 eV or 0.01 peV at micron length scales, a regime inaccessible by using charged particles (limited by Coulomb interaction) or even ultracold atoms (due to electric dipole or Van der Waals interaction). By scattering UCNs off nanostructures (the wavelength of a typical UCN is around 100 nm), we can look for signatures of quantum coherence such as angular-dependent interference fringes and intensity correlations between two detectors, similar to the Hanbury-Brown & Twiss effect for photons. Another goal of the project is to investigate the feasibility of a source of coherent UCNs. Some preliminary theoretical results will also be given.

References: [1] Z. Wang, M. A. Hoffbauer, C. L. Morris, N. B. Callahan, et al, 'A Multilayer Surface Detector for Ultracold Neutrons.' Nucl. Instrum. Meth Phys. Res. A 798, (2015) 30-35. [2] W. Wei, L. J. Broussard, et al., 'Position-sensitive detection of ultracold neutrons with an imaging camera and its implications to spectroscopy.' Nucl. Instrum. Meth Phys. Res. A 830, (2016) 36-43.

Primary author: Dr WANG, Zhehui (Los Alamos National Laboratory)

Co-authors: Prof. YOUNG, Albert R. (North Carolina State University); Dr SAUNDERS, Alexander (LANL); Dr MORRIS, Christopher L. (LANL); Dr YOO, Jinkyoung (LANL); Dr HOFFBAUER, Mark (Los Alamos National Laboratory); Dr MAKELA, Mark (LANL)

Presenter: Dr WANG, Zhehui (Los Alamos National Laboratory)

Session Classification: Poster

Track Classification: Precision experiments with cold neutrons