PURDUE UNIVERSITY

Joint PQSEI-AMO Physics Seminar

Scientific Director, Los Alamos National Laboratory

Malcolm Boshier leads a team attempting to harness atoms provided by a Bose-Einstein condensate to build a waveguide atom interferometer. Such a device would be extremely sensitive to any interaction that affects the energies of atoms and could be miniaturized to dimensions of just a few millimeters, which might make possible a new generation of ultra-sensitive miniature sensors.

Atomtronics for Quantum Sensing

Tuesday, November 12, 2019
12:00 – 1:00 p.m.; PHYS 242

Atomtronics is the emerging technology of building circuits where the current is a flow of ultracold atoms propagating as coherent matter waves inside suitable waveguides. In this talk I will describe our atomtronic technology in which the waveguides are created with laser light via the optical dipole potential, and then discuss two quantum sensors based on it. First, we have demonstrated the atomtronic analogue of the dc SQUID and shown that it exhibits the quantum interference that gives the Superconducting Quantum Interference Device its name. In the conventional SQUID this is seen as a periodic variation of critical current with magnetic flux. In the atomtronic SQUID it causes a periodic variation of critical current with rotation, enabling the device to function as a gyro. Second, we have just created an atomtronic version of the Fiber Optic Gyro, in which rotation is measured by the Sagnac effect. In our device a Bose-Einstein condensate is split, reflected, and recombined inside a waveguide that is translated so that the wavepackets travel around a loop and realize a waveguide Sagnac atom interferometer.

Faculty Host: Yong Chen and Chris Greene

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