Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Laser-cooled cesium atoms confined in a fiber-guided magic-wavelength dipole trap TAEHYUN YOON, CHRISTOPHER HAAPAMAKI, JEREMY FLANNERY, GOLAM BAPPI, RUBAYET AL MARUF, OMAR AL-SHEHRI, MICHAL BAJCSY, Institute for Quantum Computing, University of Waterloo — Strong light-matter interactions crucial for the achievement of optical nonlinearities with small photon numbers can be implemented by confining both photons and an atomic ensemble inside a hollow-core optical waveguide. We have developed an experimental setup trapping cesium atoms in a magneto-optical trap (MOT) and loading them into a hollow-core photonic crystal fiber (HCPCF) where they are transversely confined by a red-detuned optical dipole trap that is also guided by the fiber. This dipole trap is realized at cesium's 'magic wavelength' (935.6nm), which results in a state-insensitive trap and suppression of the radially varying AC-Stark shift for the confined atomic cloud. This was not possible with rubidium atoms used the previous experiments in this platform[1] since rubidium does not have a convenient magic wavelength for the red-detuned dipole trap. We report our procedure to load and probe the laser-cooled atoms inside the HCPCF and discuss the outlooks of this system for implementing nonlinear optics with single photons. We also describe our progress on integrating cavities into the the HCPCF that could potentially allow transforming the fiber into a cQED system in the strong coupling regime.

[1]M. Bajcsy et al., PRL 102, 203902 (2009)

Taehyun Yoon
University of Waterloo

Date submitted: 29 Jan 2016 Electronic form version 1.4