Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Towards Quantum Teleportation Between a Photonic Qubit and a Quantum Dot Spin State JIA JUN WONG, JIAN YANG, PAUL KWIAT, Univ of Illinois - Urbana — Quantum teleportation plays a vital role in quantum computation and communication, as it provides an interface between dissimilar qubits, allowing the possibility to exploit experimental advantages presented in different quantum systems. For example, a quantum dot spin qubit can be used for long storage time while a telecom wavelength photonic qubit can be used for robust information transfer between distant parties. Here we are developing a narrowband single-photon source with the aim of demonstrating quantum teleportation of a photonic state to a quantum dot spin state. To ensure high indistinguishability between the photon sources, cavity-enhanced spontaneous parametric down-conversion is used to generate narrowband photons of 200 MHz, matching the entangled spin-photon state emitted from the quantum dot. The source cavity mainly consists of three optical components in sequence, type-II nonlinear crystal (PPKTP), a KTP crystal for double-resonance tuning and a concave output coupler. By placing a polarizing beam splitter after the source, a single photon can be heralded at an expected rate of 13 kHz. To achieve high fidelity, an electro-optic modulator can be used to match the frequencies of the down-conversion and quantum dot photons.

Jia Jun Wong
Univ of Illinois - Urbana

Date submitted: 29 Jan 2015 Electronic form version 1.4