Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Interfacing single photons from a quantum dot with fiber-confined cold atomic ensemble[1] DIVYA BHARADWAJ, PAUL ANDERSON, JIAWEI QIU, YUJIA YUAN, MOHD ZEESHAN, RUBAYET AL MARUF, Institute for Quantum Computing, University of Waterloo, PHILIP POOLE, DAN DALACU, National Research Council of Canada, Ottawa, MICHAEL REIMER, MICHAL BAJCSY, Institute for Quantum Computing, University of Waterloo, QUANTUM PHOTONIC DEVICES LAB COLLABORATION, BAJSCY NANOPHOTONICS AND QUANTUM OPTICS LABORATORY COLLABORATION, NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA COLLABORATION — We report our progress on development of a proof-of-principle hybrid quantum repeater. We generate entangled photon pairs from InAsP quantum dots (QD) embedded in semiconductor nanowire and store them in a quantum memory based on an ensemble of laser-cooled caesium atoms confined inside a hollow-core optical fiber. We also investigate the wavelength conversion of single photons generated by the QD (894.6 nm) to telecom wavelength through four-wave mixing in the fiber-confined cloud. Our approach combines the advantages available from a deterministic and tunable solid-state source of bright entangled photon pairs with the potential for long-lived quantum memory and high-efficiency wavelength conversion that are achievable in laser cooled atomic cloud with large optical depths and tight confinement.

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Date submitted: 31 Jan 2020 Electronic form version 1.4