Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Development of light-matter entanglement between trapped Ba+ ion and 780 nm photons JOHN HANNEGAN, IREAP University of Maryland, College Park, JAMES SIVERNS, IREAP University of Maryland, QUDSIA QURAISHI, ARL, IREAP University of Maryland — Entanglement between matter and flying qubits is essential to long-distance entanglement distribution. However, trapped ion-generated flying qubits typically have restricted propagation distances due to their blue photon wavelengths. Here, I will present our work aimed at the generation of 780 nm photons which are polarization entangled with a single 138Ba+ qubit. To ensure high-fidelity single shot state detection [1], we will shelve one of the Ba+ ion qubit states in a long-lived low lying D-state. We will discuss projected rates and entanglement fidelity using a configuration for optical frequency conversion of photons produced by the ion for both horizontal and vertical polarizations. With this setup, it is possible to generate matter-qubit entangled photons at 780 nm that extend networking distances by orders of magnitude and are compatible with neutral Rb systems [2,3]. [1] T. Noel et al., PRA, 85, 023401 (2012) [2] A. N. Craddock, J. Hannegan, D.P. Ornelas-Huerta, et. al, PRL, 123, 213601 (2019) [3] J. D. Siverns, J. Hannegan, Q. Quraishi Sc. Adv. 5 (10), eaav4651 (2019)

James Siverns
University of Maryland, College Park

Date submitted: 31 Jan 2020 Electronic form version 1.4