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Towards Near IR and Telecom Photons Entangled With Ba+ JAMES SIVERNS, JOHN HANNEGAN, JAKE CASSELL, Joint Quantum Institute and IREAP, University of Maryland, QUDSIA QURAISHI, United States Army Research Laboratory — Towards Near IR and Telecom Photons Entangled With Ba^+ J. D. Siverns, J. Hannegan, J. Cassell, and Q. Quraishi Quantum memories with matter-flying qubit entanglement may be used to establish a quantum network, however photons from trapped ions have limited range. We present our progress in generating matter-entangled photons either at telecom wavelengths or at wavelengths compatible with neutral Rb[1,2]. This platform provides both long distance compatible, and user-defined, wavelengths for entanglement-based networking. A high-NA lens is used to collect single 493-nm photons, polarization-entangled with a single Ba^+ ion, and a nonlinear waveguide converts these photons to 780-nm in a single stage or to telecom wavelengths using two-stages. We discuss single-photon production rates, conversion efficiencies, noise properties and factors affecting the entanglement fidelity. Finally, we examine potential rates and fidelities for homogenous Ba^+-Ba^+ entanglement as well as for hybrid Ba^+-Rb entanglement. [1] J. D. Siverns, J. Hannegan, Q. Quraishi, Sci. Adv. 5 (10), eaav4651 (2019) [2] A. N. Craddock, J. Hannegan, D. Ornelas, et al., PRL, 123, 213601 (2019)

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