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Analyzing Two Photon Interference Between Trapped Ion and Rydberg Ensemble Systems in a Hybrid Quantum Network JOHN HANNEGAN, ALEXANDER CRADDOCK, JAMES SIVERNS, DALIA ORNELAS, ANDREW HATCHEL, Joint Quantum Institute, ELIZABETH GOLDSCHMIDT, University of Illinois Urbana-Champaign, J.V. PORTO, STEVE ROLSTON, Joint Quantum Institute, QUDSIA QURAISHI, United States Army Research Laboratory — Future quantum networks are likely to be hybrid in nature, relying on the strengths of disparate quantum systems. One way to entangle different quantum memories is through the interference of photons entangled with each matter system [1,2]. Here, we analyze the temporal and spectral factors contributing to the measured interference signal between 780-nm photons from a Rb-Rydberg ensemble and frequency-converted photons originating from a trapped Ba+ ion [3]. Additionally, we project potential entanglement rates that could be achieved using this interference in a hybrid quantum network. [1] C. K. Hong, Z. Y. Ou, and L. Mandel, PRL, 59, 2044 (1987) [2] Y. H. Shih and C. O. Alley, PRL, 61, 2921 (1988) [3] A. N. Craddock, J. Hannegan, D.P. Ornelas-Huerta, et. al, PRL, 123, 213601 (2019)

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