Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Spin dynamics of single erbium ions[1] MOUKTIK RAHA, CHRISTOPHER PHENICIE, ALAN DIBOS, SONGTAO CHEN, JEFFREY THOMPSON, Princeton University — Single Er^{3+} ions in solid-state hosts are promising single photon sources and quantum memories for quantum repeaters, because of their optical transition at 1.5 μm in the telecom C-band where fiber transmission losses are minimized. The central challenge of this approach is the low natural photon emission rate resulting from the dipole-forbidden nature of the 1.5 μm transition. We have demonstrated that this can be overcome by integrating the ions in a low loss, small mode-volume silicon nanophotonic cavity and Purcell enhancing the emission rate by over a factor of 650 [1], enabling the optical observation of single Er^{3+} ions for the first time. We will also discuss ongoing work to probe the dynamics of the Er^{3+} ions' spins and generate spin-photon entanglement, as well as studies of the interactions between nearby Er^{3+} ions in dense clusters. These results will pave the way towards developing scalable, long-distance quantum networks based on silicon nanophotonics and Er^{3+} ions.
[1] A. M. Dibos, M. Raha, C. M. Phenicie, J. D. Thompson, Phys. Rev. Lett. 120, 243601 (2018)

[1]NSF, AFOSR, NDSEG

Mouktik Raha
Princeton University

Date submitted: 01 Feb 2019 Electronic form version 1.4