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A nanoscale quantum interface for single atoms JEFF THOMPSON, TOBIAS TIECKE, Harvard University Department of Physics, ALEXEY AKIMOV, Harvard University Department of Physics; P.N. Lebedev Physical Institute RAS, CHUN YU, Harvard University Department of Chemistry and Chemical Biology, DARRICK CHANG, Center for the Physics of Information and Institute for Quantum Information, ALEXANDER ZIBROV, Harvard University Department of Physics, VLADAN VULETIC, MIT Department of Physics, HONGKUN PARK, Harvard University Department of Physics; Harvard University Department of Chemistry and Chemical Biology, MIKHAIL LUKIN, Harvard University Department of Physics — Neutral atoms are ideal quantum systems: they have long ground-state coherence times and strong optical cycling transitions that enable state detection and preparation. Building quantum networks of atoms interacting through photons is challenging, however, as many schemes for atom-photon interaction are inefficient or hard to scale. We propose a scheme to trap neutral atoms near silver nanowires, which are tightly confining waveguides for surface plasmons. The nanowire tip is used to generate a near-field optical trapping potential, and to enhance and efficiently collect spontaneous emission from the atom. For our experimental parameters, the enhancement may be up to a factor of 10, with a corresponding collection efficiency of 90%. In this poster, we will focus on recent experimental progress.

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