Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

A Scanning Cavity Nanoscope BRENDAN SHIELDS, Dept. of Physics, Harvard Univ., DIRK ENGLUND, Dept. of Elec. Eng., Columbia Univ., KELLEY RIVOIRE, Dept. of Elec. Eng., Stanford Univ., FARIBA HATAMI, Dept of Physics, Humboldt-Univ. zu Berlin, JELENA VUCKOVIC, Dept. of Elec. Eng., Stanford Univ., HONGKUN PARK, MIKHAIL LUKIN, Dept. of Physics, Harvard Univ. — Techniques for imaging and manipulating individual quantum emitters with high spatial resolution are essential in areas ranging from single molecule spectroscopy to interfacing emitters in quantum networks. Optical cavities enable strong light-matter interaction and, when coupled to suitable imaging platforms, enable new approaches for single-atom microscopy. Here we demonstrate a scanning cavity nanoscope (SCN), based on a photonic crystal cavity, that enables simultaneous nanoscale localization of solid-state quantum emitters and modification of emitter properties via the Purcell Effect. We illustrate the power of the SCN by coupling individual nitrogen vacancy (NV) centres in diamond to the nanocavity. Scanning over an NV results in strong position-dependent modification of the spontaneous emission (SE) spectrum, including a six-fold enhancement of the SE intensity at the cavity frequency. The scanning nanocavity overcomes the traditional trade-off between spatial resolution and collection efficiency of near-field optical probes and enables a deterministic photonic interface for a wide range of quantum emitters.

Brendan Shields
Dept. of Physics, Harvard Univ.

Date submitted: 22 Jan 2010 Electronic form version 1.4