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Cavity-stimulated Raman emission from a single quantum dot spin

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The integration of solid state quantum emitters into photonic structures represents a scalable path to developing quantum information technologies. Unfortunately, solid state emitters suffer from spectral inhomogeneity, due to spectral wandering of a single emitter or intrinsic dissimilarity between different emitters. In this talk I will present a means to overcome spectral inhomogeneity with a Λ-type solid-state emitter that is coupled to an optical cavity. For this demonstration we used a charge controlled InAs/GaAs quantum dot that is coupled to a photonic crystal cavity [1]. We exploit a cavity-stimulated Raman process in this Λ-type system, which allows for the emission of a quantum dot to be detuned from its optical transition by at least 125 GHz [2]. This process not only overcomes spectral inhomogeneity but also can enable an efficient, tunable source of indistinguishable photons and deterministic entanglement of distant spin qubits in a photonic crystal quantum network.

[1] S. G. Carter, et. al., *Quantum control of a spin qubit coupled to a photonic crystal cavity*, Nat. Photonics, vol. 7, no. 4, pp. 329–334, Mar. 2013.

[2] T. M. Sweeney, et. al., *Cavity-stimulated Raman emission from a single quantum dot spin*, (submitted Nov. 2013).