

**Joint CMP/CORE-CM Seminar  
Michigan State University**

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*Quantum dots in a photonic crystal: towards a quantum network*

The spin of a single electron localized in a semiconductor quantum dot can serve as the qubit in quantum information technologies. Recently we have succeeded in inserting a charged quantum dot into an optical cavity formed in a photonic crystal membrane. This type of solid-state optical cavity has both high Q and small volume, which greatly enhances the optical interactions with the spin qubit. With this system we enter a new regime of solid-state cavity electrodynamics in which the spin splitting is much larger than the cavity linewidth. I will present our current studies of spin-photon interactions that are enhanced through the cavity. For example, we are now studying two quantum dots that are coupled through spin exchange in a cavity. We anticipate that the quantum dot-cavity structures can ultimately serve as nodes in a quantum network connected through the exchange of single photons.

**Monday, September 15, 2014**

**4:10 PM**

**BPS 1400**

**Prof. John McGuire - Host**