Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Spin dynamics of magnetic ions in semiconductor optical cavities[1]

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— Magnetic atoms incorporated into semiconductor nanostructures are promising systems for studying local solid state environments due to the sensitivity of their electronic states to the local band structure. Additionally, coherence times for Mn atoms incorporated in Gallium Arsenide quantum wells are on the order of tens of nanoseconds, making them a candidate for quantum information and conventional magnetic storage applications. We extend previous studies to the time domain and find that in addition to the zero field Mn polarization and exchange splitting, the time-domain measurements reveal the presence of long electron spin dynamics and random strain fields. To elucidate the mechanisms involved, we utilize a combination of time resolved photoluminesence, time resolved Kerr rotation and optically detected magnetic resonance measurements. Furthermore, we incorporate these structures into solid state optical cavities to enhance optical coupling with the goal of isolating and manipulating a single magnetic atom in the solid state.

[1]This work supported by the NSF and ONR MURI.

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Date submitted: 01 Dec 2009 Electronic form version 1.4