Chez Pierre

Presents ...

Monday, September 24, 2012
12:00pm
MIT Room 4-331

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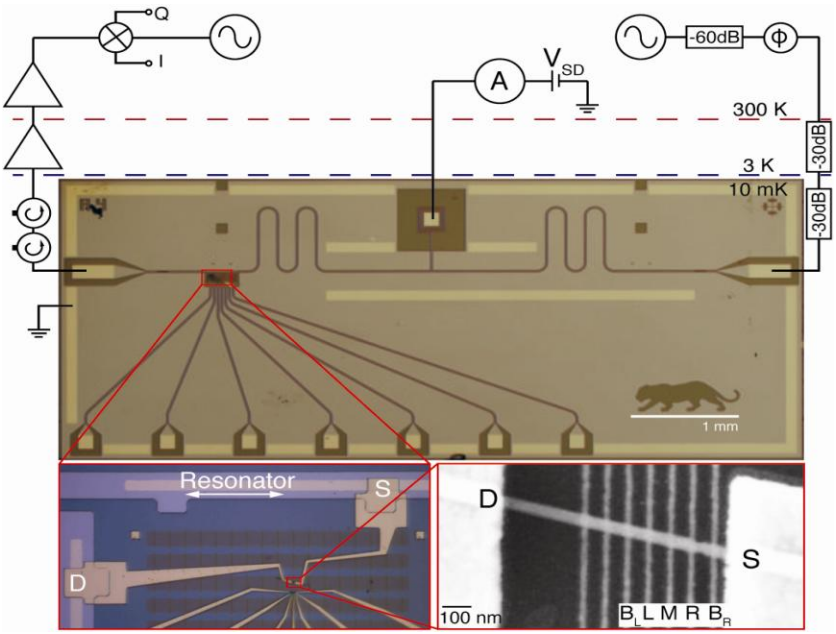
"Quantum Interconnects for Spin Qubits"

A single electron spin in an external magnetic field forms a two-level system that can be used to create a spin qubit. Single spins are controlled using electron spin resonance and nearest neighbor spin couplings are achieved using the exchange interaction. A major challenge is to develop methods for coherently coupling spin qubits that are separated by large distances. I will describe our recent efforts to couple a spin qubit to a superconducting quantum bus in the circuit quantum electrodynamics architecture. Our results show that spin dynamics can be controlled using electric fields and the spin-orbit interaction.1,2,3 We find that the microwave field of the superconducting resonator is sensitive to single spin dynamics. Our results suggest that a spin-cavity coupling rate of ~1 MHz may be feasible, allowing spatially separated spin qubits to be coupled by a microwave field.4



References:
M. D. Schroer, K. D. Petersson, M. Jung, and J. R. Petta, "Field Tuning the g Factor in InAs Nanowire Double Quantum Dots", Phys. Rev. Lett. 107, 176811 (2011).
M. Jung, M. D. Schroer, K. D. Petersson, and J. R. Petta, "Radio frequency charge sensing in InAs nanowire double quantum dots", Appl. Phys. Lett. 100, 253508 (2012).
M. D. Schroer, M. Jung, K. D. Petersson, and J. R. Petta, "Radio frequency charge parity meter", Phys. Rev. Lett. (in review).
K. D. Petersson, L. W. McFaul, M. D. Schroer, M. Jung, J. M. Taylor, A. A. Houck, and J. R. Petta, "Circuit quantum electrodynamics with a spin qubit", Nature (in press).