Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Coupling a single electron spin to a microwave resonator: Part I: controlling transverse and longitudinal couplings DANY LACHANCE-QUIRION, Université de Sherbrooke, FÉLIX BEAUDOIN, McGill University, JULIEN CAMIRAND LEMYRE, Université de Sherbrooke, WILLIAM A. COISH, McGill University, MICHEL PIORO-LADRIÈRE, Université de Sherbrooke — Novel quantum technologies can be combined within hybrid systems to benefit from the complementary capabilities of individual components. For example, microwave-frequency superconducting resonators are ideally suited to perform qubit readout and to mediate two-qubit gates, while spin qubits offer long coherence times and high-fidelity single-qubit gates. In this talk, we consider strong coupling between a microwave resonator and an electron-spin qubit in a double quantum dot due to an inhomogeneous magnetic field generated by a nearby nanomagnet. [1]. Considering realistic parameters, we estimate spin-resonator couplings of order ~ 1 MHz. Further, we show that the position of the double dot relative to the nanomagnet allows us to select between purely longitudinal and transverse couplings. While the transverse coupling may be used for quantum state transfer between the spin qubit and the resonator, the longitudinal coupling could be used in a new qubit readout scheme recently introduced for superconducting qubits [2]. [1] F. Beaudoin, D. Lachance-Quirion, W. A. Coish, and M. Pioro-Ladrière, Nanotechnology **27**, 1 (2016). [2] N. Didier, J. Bourassa, and A. Blais, Phys. Rev. Lett. **115**, 203601 (2015).

Dany Lachance-Quirion
Université de Sherbrooke

Date submitted: 13 Nov 2016 Electronic form version 1.4