Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Suppression of Pauli Spin Blockade in Few Hole Laterally Gated Double Quantum Dots. LOUIS GAUDREAU, ALEX BOGAN, SERGEI STUDENIKIN, MAREK KORKUSINSKI, GEOF AERS, PIOTR ZAWADZKI, ANDY SACHRAJDA, National Research Council of Canada, LISA TRACY, JOHN RENO, TERRY HARGETT, Sandia National Laboratories, NATIONAL RESEARCH COUNCIL TEAM, SANDIA LABS TEAM — Hole spins have attracted increasing attention as candidates for qubits in quantum information applications. The p-type character of their wavefunction leads to smaller hyperfine interaction with the nuclei resulting in longer coherence times. Additionally, strong spin-orbit interaction allows for enhanced all-electrical manipulation of spin qubit states. Single hole spins have been electrically studied in InSb [1] and Si [2] nanowire quantum dots, however, electrostatically confined hole spins in a 2D hole gas have thus far been limited to the many hole regime. In this talk we will present a full description of the two-hole spin spectrum in a lateral GaAs/AlGaAs double quantum. High-bias magneto-transport spectroscopy reveals all four states of the spectrum (singlet and triplets) in both the (1,1) and (2,0) configurations, essential for spin readout based on Pauli spin blockade. We show that spin-flip tunneling between dots is as strong as spin conserving tunneling, a consequence of the strong spin-orbit interaction. This suppresses the Pauli spin blockade. Our results suggest that alternate techniques for single hole spin qubit readout need to be explored. [1] Pribiag et al. Nat. Nanotech. 8, 170 (2013) [2] Voisin et al. Nano Lett. 16, 88 (2016)

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Date submitted: 08 Nov 2016 Electronic form version 1.4