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Fast Single-Shot Hold Spin Readout in Double Quantum Dots ALEXANDER BOGAN, Univ of Waterloo, SERGEI STUDENIKIN, MAREK KORKUSINSKI, GEOF AERS, LOUIS GAUDREAU, PIOTR ZAWADZKI, ANDY SACHRAJDA, National Research Council, LISA TRACY, JOHN RENO, TERRY HARGETT, Sandia National Laboratories — Solid state spin qubits in quantum dots hold promise as scalable, high-density qubits in quantum information processing architectures. While much of the experimental investigation of these devices and their physics has focused on confined electron spins, hole spins in III-V semiconductors are attractive alternatives to electrons due to the reduced hyperfine coupling between the spin and the incoherent nuclear environment. In this talk, we will discuss a measurement protocol of the hole spin relaxation time T_1 in a gated lateral GaAs double quantum dot tuned to the one and two-hole regimes, as well as a new technique for single-shot projective measurement of a single spin in tens of nanoseconds or less. The technique makes use of fast non-spin-conserving inter-dot transitions permitted by strong spin-orbit interactions for holes, as well as the latching of the charge state of the second quantum dot for enhanced sensitivity [1]. This technique allows a direct measurement of the single spin relaxation time on time-scales set by physical device rather than by limitations of the measurement circuit. [1] S. A. Studenikin, J. Thorgrimson, G. C. Aers, A. Kam, P. Zawadzki, Z. R. Wasilewski, A. Bogan and A. S. Sachrajda, Appl. Phys. Lett. 101, 233101 (2012)

Alexander Bogan
National Research Council, University of Waterloo

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