Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Initialization of a hole spin bound to an isoelectronic center PHILIPPE ST-JEAN, GABRIEL ETHIER-MAJCHER, SEBASTIEN FRANCOEUR, Polytechnique Montreal — Hole spins are promising candidates for solid-state qubits because they interact weakly with nuclear spins, leading to long relaxation and coherence times. In this work, we demonstrate the ability to optically initialize a single hole spin bound to an isoelectronic center, which is an atomic defect formed from a small number of isovalent impurities in a semiconductor host. Using time-resolved magneto-photoluminescence of a positive trion bound to a Te dyad in ZnSe, we measured the degree of polarization of the emission under various conditions of excitation and magnetic field. Under non-resonant excitation, the trion emission is partially polarized and becomes completely unpolarized under a longitudinal magnetic field. In contrast, resonant excitation of the heavy-hole valence band of the ZnSe host leads to highly polarized emission, implying that the hole has been initialized in a known spin state.

Philippe St-Jean
Polytechnique Montreal

Date submitted: 14 Nov 2014 Electronic form version 1.4