Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **544** Type: **Oral (Non-Student) / Orale (non-étudiant(e))**

Strain control of flying spins

Wednesday 9 June 2021 13:15 (15 minutes)

With the increasing complexity of quantum devices, the ability to connect non-neighbouring qubits is critical. Flying spin qubits present one solution to connect quantum gates at remote points in a single device. While the coherent transport of spins using moving potential dots defined by a surface acoustic wave (SAW) has been previously shown, we demonstrate the ability to gate the polarization of the flying spins. The polarization of the electron spins is controlled via spin precession around the internal magnetic field experienced by the spin, which is associated with the spin-orbit interaction and travels with the spin. The spin-orbit interaction has multiple components, but it is the strain term resulting from the SAW is shown to dominate the interaction. The strong dependence of the spin precession with strain, itself dependent on the SAW power, is well described by theoretical models. For spins transported in a GaAs nanostructure, we realize the ability to control the spin state of an electron by varying the strength of the SAW. In fact, with the amplitude of the carrier wave acting as a gate, the electron spin orientation can be flipped during transport within the spin coherence time.

Authors: STOTZ, James (Queen's University); Dr SANTOS, Paulo (aul-Drude-Institut für Festkörperelektronik); Mr HELGERS, Paul (aul-Drude-Institut für Festkörperelektronik); Dr BIERMANN, Klaus (aul-Drude-Institut für Festkörperelektronik)

Presenter: STOTZ, James (Queen's University)

Session Classification: W2-12 Magnetic North VII - Session 6 / Nord magnétique VII - session 6

Track Classification: Magnetic North/Magnétisme Nord