Seminar/Talk

Ultrafast and electrically tunable coherent operations of hole spin qubits

Floris Braakman
University of Basel

Host: Georgios Katsaros

The spin state of single holes in Ge- and Si-based one-dimensional nanostructures can be used to encode a qubit with unique functionality. Such hole spin qubits potentially combine all-electrical control, ultrahigh clock speeds and small device sizes, promising a level of control that goes beyond that of conventional electron spin qubits. In particular, the spin-orbit interaction of holes in Ge/Si core-shell nanowires is predicted to be both very strong and electric field tunable. Such electrical tunability would enable to switch spin-orbit interaction either on, enabling fast quantum operations, or off, leading to improved coherence times. In recent experiments, we have demonstrated the presence of this strong spin-orbit interaction and have used it to show record spin qubit Rabi frequencies exceeding 400 MHz and entering the regime of strong driving. Furthermore, we find the Rabi oscillation frequency as well as the g-factor to be highly tunable through small changes in gate voltages, indicating electrical control over the spin-orbit interaction strength. These measurements demonstrate the viability of hole spin qubits in one-dimensional Ge- and Si-based nanodevices as a platform for the implementation of fast and scalable quantum computation.

Tuesday, December 17, 2019 11:00am - 12:00pm
Heinzel Seminar Room / Office Bldg West (I21.EG.101)

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.