Seminar/Talk

Split-gate-induced 2x2 array of single-electron dots in silicon-oninsulator

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Host: Andrew Higginbotham

The recent demonstration of hole-based spin qubits in foundry fabricated silicon-on-insulator devices [1,2] energized the pursuit of similar structures with additional functionalities, including larger gate count, electron-, hole-, or dopant operation, variation in geometries, introduction of split-gate electrodes [3] for local control and top gates for global control. We study a 2x2 array of quantum dots, induced in an undoped silicon channel by two pairs of split-gate electrodes, and apply a combination of radio-frequency reflectometry and pulsed-gate measurements to characterize the electronic properties in the fewelectron regime. Each quantum dot can be depleted down to the last electron, devices can be thermally cycled to millikelvin temperatures yielding stable charge stability diagrams, and the overall strength of interdot tunneling couplings can be tuned by a global top gate. We also explain how we utilize one gate electrode for charge sensing within the 2x2 array, and report our progress towards utilizing the 2x2 dot-to-dot connectivities for manipulating single-electron movements in time domain, measurements of tunneling rates, and single-shot charge readout.[1] R. Maurand et al, Nature Comm., 7, 13575 (2016)[2] A. Crippa et al, Nature Comm., 10, 2776 (2019)[3] S. Barraud et al, Technologies, 4, 10 (2016)

Friday, August 23, 2019 11:00am - 12:00pm

Foyer seminar room Ground floor / Office Bldg West (I21.EG.128)

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