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Transport and Charge Manipulation in a Single Electron Silicon Double Quantum Dot[1] K. WANG, C. PAYETTE, Y. DOVZHENKO, J.R. PETTA, Princeton University — Silicon is one of the most promising candidates for ultra-coherent qubits due to its relatively early position in periodical table and the absence of nuclear spin in its naturally abundant isotope. Here we demonstrate a reliable recipe that enables us to reproducibly fabricate an accumulation mode few electron double quantum dot (DQD). We demonstrate tunable interdot tunnel coupling at single electron occupancy in the device. The charge state of the qubit is monitored by measuring the amplitude of the radio frequency signal that is reflected from a resonant circuit coupled to a charge sensor. By applying microwave radiation to the depletion gates, we probe the energy level structure of the DQD using photon assisted tunneling (PAT). We apply bursts of microwave radiation and monitor the dependence of the PAT peak height on the burst period to extract the charge relaxation time, T_1. By experimentally tuning the charge qubit Hamiltonian, we measure the tunnel coupling and detuning dependence of T_1.

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