Non-adiabatic Quantum Control of a Semiconductor Charge Qubit

YULIYA DOVZHENKO, JIRI STEHLIK, KARL PETERSSON, JASON PETTA, Princeton University, HONG LU, ARTHUR GOSSARD, University of California, Santa Barbara — A GaAs double quantum dot is configured in the single-electron regime and operated as a charge qubit. The two basis states correspond to the electron being in either the left or the right dot. Non-adiabatic voltage pulses are applied to the depletion gates to drive coherent rotations, and the double dot occupation is read out using a nearby quantum point contact charge sensor. In contrast with previous work, where a single non-adiabatic pulse was applied for quantum control, we apply multiple pulses working towards a charge echo.\[1,2\] Data for $\frac{\pi}{2} - \tau - \frac{\pi}{2}$ and the $\frac{\pi}{2} - \tau_1 - \pi - \tau_2 - \frac{\pi}{2}$ “charge echo” pulse sequences are obtained and compared with numerical simulations of the charge qubit evolution. References:


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