Role of metastable charge states in a quantum-dot spin-qubit readout

JEFFREY MASON, University of Waterloo, SERGEI STUDENIKIN, ALICIA KAM, ZBIG WASILEWSKI, ANDREW SACHRAJDA, National Research Council Canada, JAN KYCIA, University of Waterloo — Readout of a singlet-triplet qubit requires a spin-to-charge conversion mechanism, typically employing the spin blockade phenomenon, by which each spin state is mapped to a unique charge state followed by a charge state measurement using an electric field sensor such as a quantum point contact. We investigate alternative mechanisms for spin-to-charge conversion involving metastable excited charge states made possible by an asymmetry in the tunneling rates to the leads. This technique is used to observe Landau-Zener-Stückelberg oscillations of the S-T+ qubit within the (1,0) region of the charge stability diagram. The oscillations are π phase shifted relative to those detected using the standard technique and display a non-sinusoidal waveform due to the increased relaxation time from the metastable state.

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