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Blockade in a silicon double quantum dot via the valley degree of freedom JUSTIN PERRON[1], Cal State Univ - San Marcos, MICHAEL J. GULLANS[2], JACOB M. TAYLOR[3], Joint Quantum Institute, National Institute of Standards and Technology, Gaithersburg, Maryland, 20899, M. D. STEWART, JR., NEIL M. ZIMMERMAN, National Institute of Standards and Technology, Gaithersburg, Maryland 20899, USA — Measuring electrical transport through double quantum dots (DQDs) is a useful way of illuminating several aspects of the states of the carriers. We show transport measurements through a silicon DQD formed in a mesa etched nanowire. Comparing the data at positive and negative bias voltage we observe a size asymmetry in the region of allowed current typically associated with Pauli spin blockade (PSB). However, the qualitative features of the asymmetry in our data, including i) lack of odd/even filling, ii) same polarity of asymmetry across many bias triangles, iii) lack of systematic dependence on magnetic field, and iv) a dependence on gate voltages, are all in disagreement with the predictions of PSB. In contrast, we have developed a model based on the selective filling of valley states in the DQD and the conservation of the valley degree of freedom during tunneling that predicts all of the qualitative features in our data.

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