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Energy Dependent Tunneling in a Silicon Double Quantum Dot
MARK FRIESEN, University of Wisconsin-Madison, C. B. SIMMONS, NAKUL SHAJI, R. H. BLICK, S. N. COPPERSMITH, M. A. ERIKSSON — We study transport currents in a few-electron Si/SiGe double quantum dot. A detailed analysis is made of the recently discovered phenomenon of lifetime enhanced transport (LET), in which current may flow in a regime typically considered to be blockaded. To understand this effect, a rate equation model is developed, including both singlet and triplet transport channels. Making use of a simple model of tunneling across a quantum barrier, we map out the energy dependence of the tunneling. This allows us to obtain quantitative estimates for the tunneling rates and transport currents throughout the reverse bias regime. We are then able to identify both resonant and non-resonant phenomena, and provide a physical understanding of the different blockade regimes. In particular, we provide detailed predictions for the conditions under which LET may be observed.

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