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Excited-state spectroscopy in a Si/SiGe quantum dot using charge sensing and pulsed gate voltages MADHU THALAKULAM, C.B. SIMMONS, B.M. ROSEMEYER, B.J. VAN BAEL, D.E. SAVAGE, MARK FRIESEN, S.N. COPPERSMITH, M.A. ERIKSSON, University of Wisconsin-Madison — Excited states in semiconductor quantum dots are often measured using transport spectroscopy, in which the differential conductance through the quantum dot is measured as a function of source-drain bias. Such spectroscopy can be very difficult in the few electron regime. We describe the results of spectroscopy on a Si/SiGe single quantum dot using charge sensing and pulsed gate voltages, thus avoiding the need for transport through the quantum dot. The quantum dot and the charge sensing quantum point contact are defined by top-gates on a Si/SiGe heterostructure. Multiple excited states are observed as a function of increasing amplitude of the voltage pulse. We demonstrate a method to calibrate the ratio of gate voltage to dot energy without using transport through the quantum dot. The result is a quantitative spectroscopy that is efficient even in the absence of any measurable transport through the quantum dot itself. This work was supported in part by ARO and LPS (W911NF-08-1-0482), by NSF (DMR-0805045), by DOD, and by DOE (DE-FG02-03ER46028). This research utilized NSF-supported shared facilities at the University of Wisconsin-Madison.

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