

Abstract Submitted
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Observation of Sequential Single Electron Charging in Vertical “Enhancement Mode” Quantum Dot Devices¹ EDWARD CROKE, GEOFFREY SIMMS, MARK GYURE, HRL Laboratories, LLC — The vast majority of devices currently being explored for quantum information processing with semiconductor quantum dots rely on multiple surface gates operating in reverse bias (depletion mode) to constrict a buried 2D electron gas to the few electron regime. Although successful in demonstrating one and two qubit operations, they are unlikely to scale to large arrays that are needed to perform practical quantum information processing. In this talk, we present the first experimental results from a new type of “enhancement mode” device that requires only a single gate electrode operating in forward bias to create a few electron quantum dot. We observe random telegraph signals in several well defined regions of gate voltage, indicative of single electrons tunneling between states of the quantum dot and the readout channel. The absence of these signatures below a particular gate voltage suggests that these quantum dots are in the few electron regime and can be easily depleted to contain only one electron.

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