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Quantitative Investigation of Quantum Dots Using Frequency Shift Microscopy at Low Temperatures. MARKUS BRINK, JUN ZHU, PAUL L. MCEUEN, LASSP, Cornell University, Ithaca, NY 14853 — We use frequency shift microscopy (FSM), an AFM-based scanned probe technique, to study quantum dots formed in carbon nanotubes at 4K. FSM requires the quantum dot to be coupled to only one charge reservoir, allowing us to probe quantum dots in single-terminal geometries; furthermore, FSM requires only weak coupling between the quantum dot and the charge reservoir, permitting measurements in poorly conducting regimes that are inaccessible to transport measurements. Charging events of individual quantum dots are detected with single-electron sensitivity down to the few electron regime. We describe a general method to extract the charging energy of a quantum dot from frequency shift measurements. Coupled dots show avoided crossings in FSM charge addition spectra, from which we extract their mutual capacitance.

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