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Radio frequency operation of a quantum point contact charge detector MADHU THALAKULAM, Physics & Astronomy, Rice University, Houston, TX 77005, A.J. RIMBERG, Physics & Astronomy, Dartmouth College, NH 03755, L.N. PFEIFFER, K. W. WEST, Bell Laboratories, Lucent Technologies Inc., Murray Hill, NJ 07974 — Quantum point contact (QPC) charge detectors are sensitive electrometers, and their ease of fabrication and integration into semiconductor-based qubit systems makes them an attractive candidate as a readout device for spin or charge based qubits in quantum dots. Nevertheless, QPC performance to date has been limited by relatively low operational speeds and 1/f noise. Here we report the operation of a QPC charge sensor realized in an GaAs/AlGaAs two dimensional electron gas at radio- frequencies (RF-QPC), in a mode analogous to rf operation of the single electron transistor [1]. For a typical QPC detector coupled to a quantum dot (QD), a charge oscillation of one electron in the QD corresponds to a change in the QPC conductance of 1-3 percent. We simulate these operating conditions by applying a small ac voltage to the QPC gate to cause a similar change in the zero bias QPC conductance. When operated this way the signal to noise ratio of the RF-QPC is about 30dB, which corresponds to a charge sensitivity of about $7x10^{-4}e/\sqrt{Hz}$ referred to the dot charge. The operational characteristics of the RF-QPC at 4.2K also will be discussed. [1] R. J. Schoelkopf et al., Science 280, 12381242 (1998).

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