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Efficient and sensitive capacitive detection of a radio frequency nanoelectromechanical device P.A. TRUITT, J. HERTZBERG, University of Maryland, K.C. SCHWAB, Laboratory for Physical Sciences — Nanomechanical resonators show promise for application in areas such as signal processing, force detection, and readout of quantum information devices. Unfortunately, the commonly used readout methods are complex to implement and often require extreme conditions: cryogenic temperatures or large magnetic fields. A simple and sensitive method for detecting the motion of a nanomechanical resonator is desired. We present such a method, demonstrating sensitive capacitive detection of a 10 MHz nanomechanical resonator, which is voltage biased with respect to a nearby gate electrode. We use an LC resonator to impedance match the high impedance nanoelectromechanical device to 50 ohms. We will present our recent sensitivity measurements, and expect detection noise temperatures of Tn$\sim$40K using a standard preamplifier, and Tn$<$1K with a PHEMT cryogenic preamplifier. This technique appears viable over a wide range of resonator frequencies and device temperatures; we are currently implementing this technique for the readout of quantum coherent devices using a dispersive interaction.

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