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**Control and measurement of an electro-mechanical system with a phase qubit** FLORENT LECOCQ, JOHN TEUFEL, MICHAEL ALLMAN, KATARINA CICAK, FABIO DA SILVA, ADAM SIROIS, JED WHITTAKER, JOE AUMENTADO, RAY SIMMONDS, NIST Boulder — We discuss a hybrid device that merges an electro-mechanical system with a metastable phase qubit. The phase qubit can act as a single photon source and detector, allowing the preparation and readout of a lumped element electrical resonator, whose capacitance is formed by a mechanically compliant vacuum-gap capacitor. Via radiation pressure induced parametric coupling, we can map the quantum state of the 10 GHz electrical resonator on to the long-lived, $\sim$10 MHz fundamental mode of the mechanical oscillator. This work opens the way toward the preparation of complex phonon states of mechanical motion. We will discuss current progress with this device.

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