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Development of a dispersive read-out technique for quantum measurements of nanomechanical resonators[1] FRANCISCO ROUXINOL, MATT LAHAYE, Syracuse University — The development of techniques to observe non-classical behavior of micro- and nano- scale mechanical structures has received considerable attention in recent years because of the potential to use these systems for fundamental studies of quantum mechanics as well as their possible role as new technologies for applications ranging from the sensing of weak forces to quantum communication. One important route for observing such behavior is the coupling of micro- and nanomechanical resonators with superconducting qubits. Under certain conditions, qubit-coupled mechanical devices are formally analogous to Jaynes-Cummings systems which have been used in fields such as cavity QED for explorations of matter-radiation interactions and the quantum nature of light. Correspondingly, experiments in the last couple of years have begun to develop superconducting qubits as tools to manipulate and measure quantum states of mechanics. In this talk, we will discuss our efforts to integrate charge-type superconducting qubits as elements for dispersive (non-resonant) read-out and control of nanomechanical resonators, including preliminary system design and the prospects of implementing this system for read-out of the number-state statistics of nanomechanical modes.

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