Abstract Submitted
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Strongly-coupled 2D membrane resonators in superconducting electromechanical circuits[1] DAVID NORTHEAST, ROBERT KNOBEL, Queen's University, Kingston — Nanomechanical devices have allowed for the study of the motion of macroscopic objects near their quantum ground state for mechanical motion. Coupling these devices to resonant electrical circuits provides a method of measuring with standard laboratory electronics, and a means to interact and cool towards the ground state. We report on current work, in microwave LC resonators, toward the use of graphene and niobium diselenide ($NbSe_2$) membranes as one electrode in a parallel plate capacitor with a mechanical degree of freedom. The membrane's light mass, non-linear response to an applied force and tunability potentially enable stronger electromechanical amplification and coupling. Previous work using graphene in similar systems shows that graphene's electrical resistance is a limiting factor when attempting to cool via electromechanical sideband interactions. In contrast, $NbSe_2$ is a superconductor even in single layer form, and this property has the potential to provide a system with lower loss while driving with increasing photon number, as compared to the graphene-based systems. In this talk we show fabrication, modelling and progress towards quantum-limited measurements.

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