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Estimating and characterizing electromechanical coupling of superfluid helium to a microwave resonator YANG GE, BING LI, University of Chicago, ANDREAS FRAGNER, ROB SCHOELKOPF, Yale University, DAVID SCHUSTER, University of Chicago — Electrons on helium is a unique two-dimensional electron gas system formed at the interface of a quantum liquid (superfluid helium) and vacuum. The motional state of single-electron quantum dots defined on such systems has been proposed as a good candidate for hybrid quantum computing and as a gateway to measuring the electron spin [1,2]. Incoherent fluctuations of the thickness or density of the helium film are potential sources of motional dephasing, hence require further experimental characterization. In addition, if these ripplons or phonons could be coherently coupled to an electromagnetic cavity one could realize a quantum electro-mechanical system. Here, I will present estimates and preliminary experimental characterization of the electromechanical couplings as well as progress with electrons on helium.

[1] S. Lyon, Phys. Rev. A. 74, 5 (2006)
[2] D.I. Schuster, et al. Phys. Rev. Lett. 105, 040503 (2010)

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