Abstract Submitted
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An Optomechanical Transducer for Microwave to Optical Quantum State Transfer[1] A. VAINSENCHER, J. BOCHMANN, G. PEAIRS, K.J. SATZINGER, UC Santa Barbara, D.D. AWSCHALOM, University of Chicago and UC Santa Barbara, A.N. CLELAND, UC Santa Barbara — Recent experiments have demonstrated that macroscopic optomechanical systems can be operated in the quantum regime[2,3,4]. Such systems offer a wide range of possibilities for new applications, potentially enabling coupling between disparate quantum systems. In this talk, we will describe our approach to using an optomechanical system as a microwave to optical transducer, with the eventual goal of coupling superconducting quantum bits to a light field. Our implementation uses an optomechanical crystal made of aluminum nitride, a strong piezoelectric. This choice of design and material offers the necessary optomechanical and electromechanical coupling rates that should make quantum state transfer possible. We will present recent results for our transducer concept, including classical operation[5], design improvements, and cryogenic operation.

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[2]Safavi-Naeini et al. Phys. Rev. Lett. **108**, 033602 (2012)
[3]Teufel et al. *Nature* **475**, 359 (2011)
[4]Chan et al. *Nature* **478**, 89 (2011)
[5]Bochmann, Vainsencher et al. *Nature Physics* **9**, 712 (2013)

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