

Abstract Submitted
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Ultrahigh quality factor SiN membrane resonators for cavity optomechanics SRIVATSAN CHAKRAM, LAURA CHANG, AIRLIA SHAFFER, YOGESH PATIL, MUKUND VENGALATTORE, Cornell University — We study the optomechanical properties of SiN membrane resonators through spectroscopic and interferometric imaging techniques. We demonstrate ultra-high quality factors of 50×10^6 and $f \times Q$ products of 1×10^{14} Hz. These values correspond to the largest yet reported for mesoscopic flexural resonators [1]. We describe a mathematical model of radiation loss that accurately predicts our measured quality factors. Building upon this identification of clamping losses as the dominant dissipation mechanism, we also demonstrate enhancement of the mechanical quality factors by engineering a phononic band gap in the substrate. Our work paves the way towards the realization of quantum limited mechanical systems at room temperature. This work is supported by the DARPA QuASAR program through a grant from the ARO.
[1] S. Chakram et al., arXiv:1311.1234v1

Srivatsan Chakram
Cornell University

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