

Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Quantum optomechanics of a two-dimensional atomic array¹

EPHRAIM SHAHMOON, MIKHAIL LUKIN, Harvard University, SUSANNE YELIN, Harvard University and University of Connecticut — We demonstrate that a two-dimensional (2D) atomic array can be used as a novel platform for quantum optomechanics. Such arrays feature both nearly-perfect reflectivity and ultra-light mass, leading to significantly-enhanced optomechanical phenomena. Considering the collective atom-array motion under continuous laser illumination, we study the nonlinear optical response of the array. We find that the spectrum of light scattered by the array develops multiple sidebands, corresponding to collective mechanical resonances, and exhibits nearly perfect quantum-noise squeezing. Possible extensions and applications for quantum nonlinear optomechanics are discussed.

¹The Authors acknowledge financial support from the NSF, the MIT-Harvard Center for Ultracold Atoms, and the Vannevar Bush Faculty Fellowship.

Ephraim Shahmoon
Harvard University

Date submitted: 01 Feb 2019

Electronic form version 1.4