

Abstract Submitted  
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**Simulating cavity quantum electrodynamics with a trapped ion system**<sup>1</sup> GUIN-DAR LIN, CHEN-YU LEE, National Taiwan University — We theoretically investigate the possibility of constructing a phonon cavity on a large ion crystal. We propose to use optical tweezers to locally pin one or several ions so that they can effectively form cavity walls and the subset array between walls contributes to cavity phonons. We calculate the associated cavity properties such as the quality factor, finesse, and loss rate, and find how these quantities scale with tweezers strength, thickness of walls (number of tweezers), and the cavity local eigenmode spectrum. By coupling the internal states and collective sidebands, we can simulate interesting cavity quantum electrodynamical Hamiltonians. We thus look into the lasing mechanism for phonons with such systems.

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