

Abstract Submitted  
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**Addition and subtraction of single phonons in a trapped ion system**<sup>1</sup> DINGSHUN LV, SHUOMING AN, MARK UM, YAO LU, JINGNING ZHANG, KIHWAN KIM, Center for Quantum Information, Institute for Interdisciplinary Information Sciences, Tsinghua University — We introduce an addition and subtraction of single phonons in a trapped ion system. The creation  $\hat{a}^\dagger$  and annihilation  $\hat{a}$  operation have been realized with photons and used for the complete engineering of quantum states of light and the probe of fundamental quantum phenomena [1]. The mathematical description of photon is identical to that of phonon. However, phonon is a particle of quantized matter wave, which should be interpreted differently from photon. We implement the addition and the subtraction of phonon by applying an anti-Jaynes-Cummings type of operation on our trapped ion and performing projective measurements. Our realization can be used for the accurate measurement of position and momentum as well as their relation.

[1] V. Parigi, et al., Science 317, 1890 (2007).

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