

Abstract Submitted  
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**Simulating a Quantum Phase Transition with a Surface Electrode Ion Trap** BICHEN ZHANG, OMID KHOSRAVANI, GANG SHU, KENNETH BROWN, Georgia Inst of Tech — The Rabi model describes the interaction of a two-level atom with a quantized electromagnetic field. The model is predicted to have a quantum phase transition (QPT) between a normal and superradiant phase depending on the strength of the interaction. A recent proposal describes how the QPT can be simulated using a trapped ion where the quantized modes of motion simulate the electromagnetic field <sup>1</sup>. The simulation is controlled by an external laser that drives transitions coupling the internal state of the ion to its motion. For this simulation it is critical that the carrier transition, which only changes the internal state, is suppressed. We have demonstrated that the relative coupling strength of ion-motion sidebands to the carrier can be controlled by positioning the ion in a standing wave beam <sup>2</sup>. Here we present our results on optimizing the suppression of the carrier and our progress towards simulating the QPT.

<sup>1</sup>Puebla, R., Hwang, M. J., Casanova, J., & Plenio, M. B., **arXiv** 1607.03781, (2016)

<sup>2</sup>Burkhardt, K. A., Vittorini, G., Merrill, J. T., Brown, K. R., & Amini, J. M., **Phys. Rev. A** 92(6), 061402, (2015)

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