

Abstract Submitted
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Multi-mode surface acoustic wave resonator on GaAs with high quality factors for acoustical many-body spin emulation¹ LUCAS R. SLETTEN, BRAD A. MOORES, JEREMIE J. VIENNOT, K.W. LEHNERT, JILA and Department of Physics, University of Colorado and NIST — A scheme coupling qubits to multiple cavity modes has been proposed as a means of creating distance-dependent qubit-qubit interactions. Despite the success of the circuit QED architecture, the dimensions required to implement an electromagnetic cavity with a narrow free spectral range are awkwardly large. In contrast, the slow propagation velocity of surface acoustic waves (several km/s) allow resonators with MHz mode spacing to be fabricated on chip, thus making them a promising means to achieve distance-dependent qubit coupling. In this talk, we will show that surface acoustic wave cavities fabricated on GaAs can support many resonant modes above 4 GHz with internal quality factors exceeding 105. We will also discuss the prospects for using these resonators to study multi-mode inter-qubit coupling with the ambition of investigating quantum spin chains with tunable and distance-dependent interactions.

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