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Towards an acoustical platform for many-body spin emulation: Transmon qubits patterned on a piezoelectric material BRAD A. MOORES, LUCAS R. SLETTEN, JEREMIE VIENNOT, K. W. LEHNERT, JILA and Department of Physics, University of Colorado and NIST — Man-made systems of interacting qubits are a promising and powerful way of exploring many-body spin physics beyond classical computation. Although transmon qubits are perhaps the most advanced quantum computing technology, building a system of such qubits designed to emulate a system of many interacting spins is hindered by the mismatch of scales between the transmons and the electromagnetic modes that couple them. We propose a strategy to overcome this mismatch by using surface acoustic waves, which couple to qubits piezoelectrically and have micron wavelengths at GHz frequencies. In this talk, we will present characterizations of transmon qubits fabricated on a piezoelectric material, and show that their coherence properties are sufficient to explore acoustically mediated qubit interactions.

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