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Strong acoustic coupling to a superconducting qubit MARTIN GUSTAFSSON, THOMAS AREF, ANTON FRISK KOCKUM, MARIA EKSTRÖM, GÖRAN JOHANSSON, PER DELSING, Chalmers University of Technology — Micromechanical resonators can be used to store quantum information, as shown in several recent experiments. These resonators typically have the form of membranes or beams, and phonons are localized to their vibrational eigenmodes. We present a different kind of mechanical quantum device, where *propagating* phonons serve as carriers for quantum information. At the core of our device is a superconducting qubit, designed to couple to Surface Acoustic Waves (SAW) in the underlying substrate through the piezoelectric effect. This type of coupling can be very strong, and in our case exceeds the coupling to any external electromagnetic modes. The acoustic waves propagate freely on the surface of the substrate, and we use a remote electro-acoustic transducer to address the qubit acoustically and listen to its emission of phonons. This presentation focuses on the basic properties of our acoustic quantum system, and we include experimental data that demonstrate the quantized coupling between the qubit and the propagating acoustic waves.

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