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Entangling Mechanical Motion with Microwave Fields TAUNO PALOMAKI, JILA, University of Colorado, JOHN TEUFEL, RAYMOND SIMMONDS, NIST, Boulder, KONRAD LEHNERT, JILA — We demonstrate entanglement between the motion of a mechanical oscillator and a propagating microwave field. The mechanical oscillator is coupled to a microwave resonator such that by applying a pump we can realize either a beam-splitter or parametric down-conversion interaction. We exploit both interactions to create two microwave pulses that are sufficiently correlated to be in an inseparable state. As the second pulse encodes the state of the mechanical oscillator, the first microwave pulses was consequently entangled with the mechanical oscillator. This result further demonstrates the potential for mechanical oscillators to both store and generate quantum mechanically useful states.

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