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**Observation of quantum interference between separated
mechanical oscillator wavepackets**

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The ability of matter to be superposed at two different locations while being intrinsically connected by a quantum phase is among the most counter-intuitive predictions of quantum physics. While such superpositions have been created for a variety of systems, the in-situ observation of the phase coherence has remained out of reach. Using a heralding measurement on a spin-oscillator entangled state, we project a mechanical trapped-ion oscillator into a superposition of two spatially separated states, a situation analogous to Schrödinger's cat. Quantum interference is clearly observed by extracting the occupations of the energy levels.[1].

[1] D. Kienzler *et al.*, arXiv:1512.01838.

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This is an invited talk.

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This is a poster or hot topics talk.

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