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Observation of Strong Intermode Coupling in a MoS2 Mechanical Resonator CHANG-HUA LIU, IN SOO KIM, SPENCER PARK, KUNHO YOON, SARAH HOWELL, LINCOLN LAUHON, Northwestern University — Achieving the strong coupling regime in downscaled oscillators facilitates quantum control of macroscopic mechanics. Many approaches, including the use of dynamical backaction between mechanical resonators and photonic or superconducting cavities, require sophisticated device structures. We will describe strong mode coupling in a simple system: an ultrathin MoS2 mechanical resonator. Thermal fluctuations are exploited to study different vibrational modes of the resonator and observe avoided crossings in the vibrational spectra, indicating the entanglement of mechanical motion. Furthermore, when parametrically pumping the resonator with light, the dynamic optically induced strain leads to Stokes and anti-Stokes sidebands as well as normal-mode splitting. These signatures provide strong evidence that phonon populations can be redistributed between different vibrational modes, and also confirm that an MoS2 resonator can be operated into the strong coupling regime. These observations further suggest that 2D materials could offer a platform for developing full quantum control of nanomechanics.

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