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Pulsed Quantum Optomechanics MICHAEL R. VANNER, University of Vienna, IGOR PIKOVSKI, GARRETT D. COLE, MYUNGSHIK KIM, CASLAV BRUKNER, KLEMENS HAMMERER, GERARD J. MILBURN, MARKUS ASPELMEYER — By combining quantum optics with mechanical resonators an avenue is opened to extend investigations of quantum behavior into unprecendented mass regimes. The field resulting from this combination - "cavity quantum optomechanics" – is receiving a surge of interest for its potential to contribute to quantum measurement and control, studies of decoherence and non-classical state preparation of macroscopic objects. However, quantum state preparation and especially quantum state reconstruction of mechanical oscillators is currently a significant challenge. We are pursuing a scheme that employs short optical pulses to realize quantum state tomography, squeezing via measurement and state purifcation of a mechanical resonator. The pulsed scheme has considerable resilience to initial thermal occupation, provides a promising means to explore the quantum nature of massive oscillators and can be applied to other systems such as trapped ions. Our theoretical proposal and experimental results will be discussed.

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