

Abstract for an Invited Paper  
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**Coupling MEMS to photons: a new approach to macroscopic quantum phenomena**

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Radiation pressure couples the electromagnetic field to the center-of-mass motion of macroscopic objects. This coupling offers a promising means for observing quantum phenomena on surprisingly large scales. Experimental progress on this topic has been extremely rapid and the field now stands at the edge of the quantum regime. I will describe a new type of opto-mechanical system that seems to resolve a number of the remaining technical and fundamental challenges. This system has demonstrated laser cooling from room temperature to 7 mK, and allows us to realize a “position-squared” measurement. Position-squared readout is a crucial ingredient for QND measurements of both photons and phonons, but in the past have been difficult to realize. I will describe how near-degeneracies in the spectrum of an optical cavity’s higher-order transverse modes can be used to realize position-squared measurements strong enough to observe real-time quantum jumps in a micromechanical oscillator.