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Quantum correlations of light due to a room temperature mechanical oscillator HENDRIK SCHUETZ, VIVISHEK SUDHIR, RYAN SCHILLING, SERGEY FEDOROV, DALZIEL WILSON, TOBIAS KIPPENBERG, EPFL - Lausanne — The coupling of laser light to a mechanical oscillator via radiation pressure leads to the emergence of quantum mechanical correlations in the amplitude and phase quadrature of the laser beam. To date, these quantum correlations have only been observed in a handful of cryogenic cavity optomechanical experiments. Utilizing a high-cooperativity near-field optomechanical system, together with variational measurement of the transmitted light, we demonstrate the ability to efficiently resolve quantum correlations imprinted on an optical laser beam interacting with a room temperature nanomechanical oscillator. Direct measurement of the optical beam in a detuned homodyne detector at frequencies far from the resonance frequency of the oscillator, reveal quantum correlations at a few percent level. This measurement fosters the rise of optomechanical systems as a room temperature platform for quantum enhanced metrology and paves the road for the first observation of ponderomotive squeezing under room temperature conditions.

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