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Improving the measurement of squeezed states using noise subtraction techniques. SAFURA SHARIFI, TORREY CULLEN, Louisiana State University, NANCY AGGARWAL, Northwestern University, ROBERT LANZA, LIGO-MIT, PAULA HEU, DAVID FOLLMAN, GARRETT D. COLE, Crystalline Mirror Solutions, JONATHAN CRIPE, NIST, NERGIS MAVALVALA, Massachusetts Institute of Technology, GEORGIOS VERONIS, THOMAS CORBITT, Louisiana State University — Ponderomotive squeezing produced in an optomechanical cavity with a strong optical spring has some advantages over squeezed light sources that use nonlinear crystals. However, the cavity requires feedback to maintain stability, and excess noise is injected as a result. The excess noise may be removed from the squeezing measurement by time-domain subtraction. Here, we present a noise subtraction technique that relies on measuring the coherence between the feedback signal and the squeezed state to purify the squeezed state. The experimental setup consists of the optomechanical system and a subsystem used to detect transmitted light from a Fabry-Perot cavity with a 1064 nm Nd: YAG NPRO laser. A beam splitter is used to pick off 15% of the transmitted cavity light to a photodetector for locking the cavity, and the remaining 85% is used for combining with a local oscillator to detect squeezing. Our results at different quadratures show that the budgeted noise agrees with the measured subtracted noise, and that if this subtraction technique was not applied, no squeezing would be seen in any quadrature.

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