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Improvement of Two-Mode Squeezing in the Presence of Loss with a Phase-Sensitive Amplifer TIAN LI, BRIAN ANDERSON, BONNIE SCHMITTBERGER, TRAVIS HORROM, Joint Quantum Institute, NIST and Univ. of Maryland, KEVIN JONES, Department of Physics, Williams College, PAUL LETT, Joint Quantum Institute, NIST and Univ. of Maryland and Quantum Measurement Division, National Institute of Standards and Technology — We demonstrate a phase-sensitive amplifier (PSA) to pre-amplify quantum correlations in twin light beams before degradation due to loss and detector efficiency. We use four-wave mixing (4WM) in Rb vapor to generate bright beams in a two-mode squeezed state. After which, a second 4WM interaction in a PSA configuration amplifies one half of the two-mode state before a loss is intentionally introduced. It is well known that, in the case of a PSA, no extra noise will be added given the correct relative phases (e.g. at the maximal amplification and the maximal deamplification) among the inputs. We thus lock our PSA phase at the phase where we are able to have the maximal, noiseless, amplification of one half of the two-mode squeezed state and compare with its twin beam. Due to this noiseless pre-amplification, we demonstrate that phase-sensitive amplification placed before losses can improve correlations between the beams, or squeezing.

Tian Li
Joint Quantum Institute, NIST and Univ. of Maryland

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