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Quantum correlations of an entangled state propagating through a phase-sensitive amplifier[1] TIAN LI, BRIAN ANDERSON, TRAVIS HORROM, Joint Quantum Institute, NIST and UMD, College Park, MD 20742, RYAN GLASSER, Department of Physics and Engineering Physics, Tulane University, New Orleans, LA, 70118, KEVIN JONES, Department of Physics, William College, Williamstown, MA 01267, PAUL LETT, Joint Quantum Institute, NIST and UMD, College Park, MD 20742 — We investigate the advance and delay of information transmitted through an optical phase-sensitive amplifier (PSA). We start with a two-mode entangled state created by four-wave mixing in hot ^{85}Rb vapor and measure the mutual information shared by the two modes. We then pass one of these two modes through a PSA and investigate the shift of the mutual information as a function of the PSA phase. The cross-correlation between the two modes of a bipartite EPR state can be advanced by propagation through a fast-light medium[U. Vogl, *et al.*, New J. Phys. **16**, 013011 (2014)]and, the extra noise added by a phase-insensitive amplifier has been shown to limit the advance of entanglement, preventing the mutual information from traveling superluminally[J. B. Clark, *et al.*, Nat. Photon. **8**, 515 (2014)]. In the case of a PSA, however, it is well known that no extra noise will be added for the correct PSA phase (e.g. at the maximal amplification and the maximal deamplification). It is therefore of interest to examine the behavior of the dispersion and the mutual information when passing a signal through a PSA operated at different phases. The behavior of other correlation measures like the quantum discord will be presented as well.

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Tian Li
Joint Quantum Institute, National Institute of Standards and Technology
and the University of Maryland, College Park, MD 20742, USA

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