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Nonlocal Interferometry Using Macroscopic Coherent States and Weak Nonlinearities[1] BRIAN KIRBY, JAMES FRANSON, University of Maryland, Baltimore County — Bell's inequality has been violated numerous times in microscopic systems with the use of nonlocal interferometry. Described here will be an extension of the Franson interferometer to the macroscopic case of coherent states entangled in phase. The entanglement is generated using weak nonlinearities, and the entanglement is probed using single photons and homodyne detection. Without loss the predicted nonlocal interference visibility of the interferometer is unity, and the inclusion of atomic absorption allows for a large number of photons to be absorbed with only a small reduction in the visibility. This interferometer can be extended in a straightforward manner to a quantum key distribution scheme using the Ekert protocol to insure security. A method for the extension of the entanglement distance using entanglement swapping is described. This nonlocal interferometer may therefore be of practical use in quantum communications in addition to being of fundamental interest.

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Brian Kirby
University of Maryland, Baltimore County

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