Abstract Submitted
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Bell Experiment with Classical Optical Fields[1] BETHANY LITTLE, XIAO-FENG QIAN, JOHN HOWELL, J. H. EBERLY, University of Rochester — We theoretically and experimentally explore the implications of entanglement in statistically classical optical fields [2]. The description of these fields in terms of polarization and amplitude degrees of freedom can take a non-separable form which employs a mathematical description of entanglement often associated with quantum phenomena. By subjecting these optical fields to a Bell analysis, we examine the role of entanglement in marking the quantum-classical boundary. We report a value of the Bell parameter greater than $\mathcal{B} = 2.54$, many standard deviations outside the limit $\mathcal{B} = 2$ established by the Clauser-Horne-Shimony-Holt Bell inequality [3]. This suggests that Bell violation has less to do with quantum theory than previously thought, but everything to do with entanglement.

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[2]X.-F. Qian, Bethany Little, John Howell, and J. H. Eberly, Optica **2**, 611-615 (2015).
[3]John F. Clauser, Michael A. Horne, Abner Shimony, and Richard Holt. Phys. Rev. Lett. **23**, 880-884 (1969)

Bethany Little
University of Rochester

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