

Abstract Submitted
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Pushing the Experimental Limits of Bell Inequalities JOSEPH ALTEPETER, EVAN JEFFREY, PAUL KWIAT, University of Illinois at Urbana-Champaign — Using pairs of polarization-entangled photons, we report measurements of Bell’s inequalities near the limits of physically allowable violations. As there are several methods by which one can judge the significance of a violation, we report the largest violation to date measured in both standard deviations (2417-sigma) and absolute size (2.826 ± 0.005). These extremely precise and extremely non-classical results were obtained by carefully characterizing each experimental loss and inefficiency. Unfortunately, accounting for these losses and inefficiencies in the system requires auxiliary assumptions, assumptions which strictly fail to exclude local hidden variable models, and therefore also fail to rigorously test local realism. We therefore additionally report on progress towards a “loophole-free” test of Bell’s inequality, whereby these experimental losses and inefficiencies are virtually eliminated, and along with them, the need for auxiliary assumptions about the nature of the systems being measured.

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