

Abstract Submitted
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Avoiding Loopholes with Hybrid Bell-Leggett-Garg Inequalities

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By combining the postulates of macrorealism with Bell-locality, we derive a qualitatively different hybrid inequality that avoids two loopholes that commonly appear in Leggett-Garg and Bell inequalities. First, locally-invasive measurements can be used, which avoids the “clumsiness” Leggett-Garg inequality loophole. Second, a single experimental ensemble with fixed analyzer settings is sampled, which avoids the “disjoint sampling” Bell inequality loophole. The derived hybrid inequality has the same form as the Clauser-Horne-Shimony-Holt Bell inequality; however, its quantum violation intriguingly requires weak measurements. A realistic explanation of an observed violation requires either the failure of Bell-locality, or a preparation-conspiracy of finely tuned and nonlocally-correlated noise. Modern superconducting and optical implementations of this test are considered.

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