Avoiding Loopholes with Hybrid Bell-Leggett-Garg Inequalities
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By combining the postulates of macrorealism with Bell-locality, we derive a qualita-
tively 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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