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北京谱仪上的量子纠缠实验/ Quantum Entanglement Experiments at the Beijing Spectrometer

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The nonlocality of quantum correlations is a fundamental feature of quantum theory. The benchmark for distinguishing quantum theory from local hidden variable theories (LHVT) is the testing of Bell's inequalities. Recent advances in photon entanglement experiments have made significant progress, addressing potential loopholes and observing significant violations of Bell's inequalities. However, these violations do not completely rule out LHVT. To further exclude LHVT, in addition to massless photon entanglement experiments, it is also necessary to conduct particle entanglement experiments under strong and weak interactions. In this report, the examination of quantum nonlocal correlations using entangled hyperon events from the Beijing Electron-Positron Collider is presented. By testing three Bell's inequalities, the experimental results exclude LHVT at a statistical significance level exceeding 5.2 standard deviations, indicating that quantum nonlocal correlations are a fundamental characteristic of basic interactions in the microscopic world.

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