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Bell's inequalities: derivation, violation, and implications LOUIS SICA, Naval Research Laboratory (Retired) — Cross-correlations among jointly present data sets satisfy the Bell inequality as a fact of mathematics. Violation of Bell's inequalities by data correlations obtained in independent trials of quantum mechanical correlation experiments shows that a wide-sense spatially stationary (in angle) process cannot account for the Bell cosine correlation. Since the correlations usually measured are cosinusoidal, at least one variable pair of those constrained by a Bell's inequality must have a correlation function different from the usual cosine in order to satisfy the inequality. When nonlocal information is used to construct correlations among real and counterfactual measurements, the correlation functions obtained are not all of the simple cosine form, and the set of correlations satisfies the Bell inequalities. Thus, the resulting correlations are not based on a wide-sense stationary process. The same conclusion holds for properly correlated experimental data. These considerations may be extended to the domain of well-known inequalities in probabilities that follow from the correlational inequalities upon assuming a simple symmetry condition. Such results imply that a proof of nonlocality based on Bell's inequality violation must use different reasoning from that used historically.

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