Quantum Physics

Svetlichny's inequality and genuine tripartite nonlocality in three-qubit pure states

Ashok Ajoy, Pranaw Rungta

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The violation of the Svetlichny's inequality (SI) [Phys. Rev. D, 35, 3066 (1987)] is sufficient but not necessary for genuine tripartite nonlocal correlations. Here we quantify the relationship between tripartite entanglement and the maximum expectation value of the Svetlichny operator (which is bounded from above by the inequality) for the two inequivalent subclasses of pure three-qubit states: the GHZ-class and the W-class. We show that the maximum for the GHZ-class states reduces to Mermin's inequality [Phys. Rev. Lett. 65, 1838 (1990)] modulo a constant factor, and although it is a function of the three tangle and the residual concurrence, large number of states don't violate the inequality. We further show that by design SI is more suitable as a measure of genuine tripartite nonlocality between the three qubits in the the W-class states, and the maximum is a certain function of the bipartite entanglement (the concurrence) of the three reduced states, and only when their certain sum attains a certain threshold value, they violate the inequality.

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