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Genuine tripartite entanglement and nonlocality in 3-qubit GHZ-class states SHOHINI GHOSE, NEIL SINCLAIR, SHANTANU DEBNATH, Wilfrid Laurier University, RENE STOCK, University of Toronto, PRANAW RUNGTA, IIS, India — Multiqubit entanglement is a crucial ingredient for large-scale quantum information processing and has been the focus of several recent studies. Entanglement between qubits can lead to violations of Bell-type inequalities that are satisfied by local hidden variable models, indicating the nonlocal nature of the correlations between qubits. For 2-qubit pure states, bipartite entanglement is simply related to the Bell-CHSH nonlocality parameter. No such analytical relation between multipartite entanglement and nonlocality has yet been obtained for systems of three or more qubits. We have derived relationships between genuine tripartite entanglement and nonlocality for families of 3-qubit GHZ-class pure states. We quantify tripartite entanglement by the 3-tangle and derive its relationship to the Svetlichny inequality for testing tripartite nonlocality. For the class of generalized GHZ states, although the 3-tangle is always non-zero, we identify some states that do not violate the Svetlichny inequality. Furthermore, we show that states known as the maximal slice states always violate the Svetlichny inequality and analogous to the 2-qubit case, the amount of violation increases with the 3-tangle. The generalized GHZ states and the maximal slice states have unique tripartite entanglement and nonlocality properties in the set of all pure states.

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