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Mermin Devices for Generalized Dicke States

Abstract

We present here several new exact results for a number of entangled states: the W-state of three qubits and its generalization -- Dicke states for more than three qubits. We derive these results by bounding the expected values of the Bell-Mermin operators. We review the three qubit GHZ Mermin device, make its generalization to four qubits, and then construct analogous Mermin devices for the generalized Dicke states of three and four qubits. As a result of studying if their operations can be fully explained by Mermin's instructional sets, we show that the GHZ and Dicke states of three qubits and the GHZ state of four qubits do not allow such a description. However, among the two generalized Dicke states of four qubits, one does allow and the other does not allow such a description.