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Search for an Entanglement Measure for N-Qubit States via Phase Symmetry[1] JOSHUA GELLER, University of Rochester — While quantitative measures of entanglement exist for two-qubit systems, there are no equivalent measures for larger systems. Phase patterns within multi-qubit density matrices could yield clues to constructing quantitative measures for these larger systems. One such pattern within the N-qubit density matrix is observed by reordering the matrix according to the types of coherence terms in the first row and first column so the number of phases in each element increases from left to right in the first row, and from top to bottom in the first column. The resultant matrix contains blocks on its diagonal with elements having only bipartite entanglement. All remaining diagonal elements are part of GHZ-type states in this configuration. A benefit to this matrix structuring is the ability to apply concurrence, a measure of two-qubit entanglement, to the sub-matrix blocks formed on the diagonal. Exploring the meaning of these concurrences with regard to the entanglement of the whole system of N-qubits represented by the full density matrix is a possible next step toward finding a measure of N-qubit entanglement.

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