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**Identifying Non-Abelian Topological Order through Minimal Entangled States** WEI ZHU, SHOUSHU GONG, Department of Physics and Astronomy, California State University, Northridge, DUNCAN HALDANE, Department of Physics, Princeton University, D.N. SHENG, Department of Physics and Astronomy, California State University, Northridge — The topological order is encoded in the pattern of long-range quantum entanglements, which cannot be mea- sured by any local observable. Here we perform an exact diagonalization study to establish the non-Abelian topological order for topological band models through entanglement entropy measurement. We focus on the quasiparticle statistics of the non-Abelian Moore-Read and Read-Rezayi states on the lattice models with bosonic particles. We identify multiple independent minimal entangled states (MESs) in the ground-state mani- fold on a torus. The extracted modular S matrix from MESs faithfully demonstrates the Majorana quasiparticle or Fibonacci quasiparticle statistics, including the quasiparticle quantum dimensions and the fusion rules for such systems. These findings unambiguously demonstrate the topological nature of the quantum states for these flatband models without using the knowledge of model wavefunctions. We also establish that MESs manifest the eigenstates of nonlocal Wilson loop operators for the non-Abelian topological states and encode the full information of the topological order.

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