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Exact Matrix Product States for Quantum Hall Wave Functions
ROGER MONG, California Institute of Technology, MICHAEL ZALETEL, University of California, Berkeley — We show that the model wave functions used to describe the fractional quantum Hall effect have exact representations as matrix product states (MPS). These MPS can be implemented numerically in the orbital basis of both finite and infinite cylinders, which provides an efficient way of calculating arbitrary observables. We extend this approach to the charged excitations and numerically compute their Berry phases. Finally, we present an algorithm for numerically computing the real-space entanglement spectrum starting from an arbitrary orbital basis MPS, which allows us to study the scaling properties of the real-space entanglement spectra on infinite cylinders. The real-space entanglement spectrum obeys a scaling form dictated by the edge conformal field theory, allowing us to accurately extract the two entanglement velocities of the Moore-Read state.

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