Contribution ID: **37** Type: **Poster Presentation**

Variationally optimizing infinite projected entangled-pair states at large bond dimensions: A split corner transfer matrix renormalization group approach

Projected entangled-pair states (PEPS) have become a powerful tool for studying quantum many-body systems in the condensed matter and quantum materials context, particularly with advances in variational energy optimization methods. A key challenge within this framework is the computational cost associated with the contraction of the two-dimensional lattice, crucial for calculating state vector norms and expectation values. The conventional approach, using the corner transfer matrix renormalization group (CTMRG), involves combining two tensor network layers, resulting in significant time and memory demands. We present an alternative "split-CTMRG" algorithm, which maintains separate PEPS layers and leverages new environment tensors, reducing computational complexity while preserving accuracy.

https://journals.aps.org/prb/abstract/10.1103/PhysRevB.111.235116

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Session Classification: C - Poster Session