A tensor network approach to many-body localization[1] XIONGJIE YU, University of Illinois at Urbana-Champaign, DAVID PEKKER, University of Pittsburgh, BRYAN CLARK, University of Illinois at Urbana-Champaign — Understanding the many-body localized phase requires access to eigenstates in the middle of themany-body spectrum.While exact-diagonalization is able to access these eigenstates, it is restricted to systems sizes of about 22 spins.To overcome this limitation, we develop tensor network algorithms whichincrease the accessible system size by an order of magnitude. We describe both our new algorithmsas well as the additional physics about MBL we can extract fromthem. For example, we demonstrate the power of these methods by verifying the breakdown of the Eigenstate Thermalization Hypothesis (ETH) in the many-body localized phase of the random field Heisenberg model, and show the saturation of entanglement in the MBL phase and generate eigenstates that differ by local excitations.

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