Entanglement Holographic Mapping of Many-Body Localized System by Spectrum Bifurcation Renormalization Group YI-ZHUANG YOU, University of Californian, Santa Barbara, XIAO-LIANG QI, Stanford University, CENKE XU, University of Californian, Santa Barbara — We introduce the spectrum bifurcation renormalization group (SBRG) as a generalization of the real-space renormalization group for the many-body localized (MBL) system without truncating the Hilbert space. Starting from a disordered many-body Hamiltonian in the full MBL phase, the SBRG flows to the MBL fixed-point Hamiltonian, and generates the local conserved quantities and the matrix product state representations for all eigenstates. The method is applicable to both spin and fermion models with arbitrary interaction strength on any lattice in all dimensions, as long as the models are in the MBL phase. In particular, we focus on the $1d$ interacting Majorana chain with strong disorder, and map out its phase diagram using the entanglement entropy. The SBRG flow also generates an entanglement holographic mapping, which duals the MBL state to a fragmented holographic space decorated with small blackholes.

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