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The Structure of Fixed-Point Tensor Network States Characterizes Pattern of Long-Range Entanglement ZHU-XI LUO, ETHAN LAKE, YONG-SHI WU, University of Utah — The algebraic structure of representation theory naturally arises from 2D fixed-point tensor network states, which conceptually formulates the pattern of long-range entanglement realized in such states. In 3D, the same underlying structure is also shared by Turaev-Viro state-sum topological quantum field theory (TQFT). We show that a 2D fixed-point tensor network state arises naturally on the boundary of the 3D manifold on which the TQFT is defined, and the fact that exactly the same information is needed to construct either the tensor network or the TQFT is made explicit in a form of holography. Furthermore, the entanglement of the fixed-point states leads to an emergence of pre-geometry in the 3D TQFT bulk. We further extend these ideas to the case where an additional global onsite unitary symmetry is imposed on the tensor network states.

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