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Exotic topological order from quantum fractal code BENI YOSHIDA, California Institute of Technology — We present a large class of three-dimensional spin models that possess topological order with stability against local perturbations, but are beyond description of topological quantum field theory. Conventional topological spin liquids, on a formal level, may be viewed as condensation of string-like extended objects with discrete gauge symmetries, being at fixed points with continuous scale symmetries. In contrast, ground states of fractal spin liquids are condensation of highly-fluctuating fractal objects with certain algebraic symmetries, corresponding to limit cycles under real-space renormalization group transformations which naturally arise from discrete scale symmetries of underlying fractal geometries. A particular class of three-dimensional models proposed in this paper may potentially saturate quantum information storage capacity for local spin systems.

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