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Octupolar quantum spin ice: controlling spinons in a U(1) quantum spin liquid YAODONG LI, GANG CHEN, Fudan University — We study the symmetry enriched U(1) quantum spin liquids (QSLs) on the pyrochlore lattice. We point out that the Ce local moment of the newly discovered pyrochlore QSL candidate Ce2Sn2O7, is a dipole-octupole doublet. The generic model for these unusual doublets supports two distinct symmetry enriched U(1) QSL ground states in the corresponding quantum spin ice regimes. These two U(1) QSLs are dubbed dipolar U(1) QSL and octupolar U(1) QSL. While the dipolar U(1) QSL has been discussed in many contexts, the octupolar U(1) QSL is rather unique. Based on the symmetry properties of the dipole-octupole doublets, we predict the peculiar physical properties of the octupolar U(1) QSL, elucidating the unique spectroscopic properties in the external magnetic fields. We further predict the Anderson-Higgs transition from the octupolar U(1) QSL driven by the external magnetic fields. We identify the experimental relevance with the candidate material Ce2Sn2O7 and other dipole-octupole doublet systems.

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