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Quantum Critical Phases in Strong Spin-Orbit coupling Systems: Application to Pyrochlore Iridates EUN GOOK MOON, CENKE XU, University of California, Santa Barbara, YONG BAEK KIM, University of Toronto, LEON BALENTS, Kavli Institute for Theoretical Physics — We study quantum critical phases in strong spin-orbit coupling systems which are protected by underlying symmetry and topology. Three semi-metallic stable phases are considered, and the absence of the energy gap and density of states at the Fermi level induces nontrivial screening effect. Thus, the Ground states of the phases receive characteristic corrections from the long range Coulomb interaction. The standard renormalization group method is used to investigate properties of the ground states. Considering symmetry breaking terms, we obtain phase diagrams, and generic features of the quantum critical theories between the phases are discussed. We apply our theory to pyrochlore iridates and implication of the presence of the quantum critical phases is discussed.

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