Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Correlation effects in 3D triple-Weyl semimetals SHI-XIN ZHANG, Tsinghua University, SHAO-KAI JIAN, HONG YAO, Institute for Advanced Study, Tsinghua University — We study interaction effects, including short-range interactions and long-range Coulomb interactions, in three-dimensional topological triple-Weyl semimetals whose triple-Weyl points are protected by crystalline symmetries. In the low-energy effective field theory of triple-Weyl semimetals, by considering symmetries and utilizing Fierz identity, we find that there are only four independent short-range interaction terms. We then perform Wilsonian renormalization group analysis to determine the effect of short-range interactions at low energy and long distance by finding fixed points as well as stable strong-coupling limits. For those strong-coupling limits due to short-range interactions, spontaneous symmetry-breaking ordering is expected and is analyzed by self-consistent mean-field calculations combined with RG flow. For long-range Coulomb interactions, we find anisotropic screening effect, similar with the one in double-Weyl semimetals, and hence a qualitatively different fixed point from the Gaussian one.

Shi-Xin Zhang
Tsinghua University

Date submitted: 06 Nov 2015 Electronic form version 1.4