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Long-range Coulomb interaction in nodal ring semi-metals YEJIN HUH, University of Toronto, EUN-GOOK MOON, KAIST, YONG BAEK KIM, University of Toronto — Recently there have been several proposals of materials predicted to be nodal ring semi-metals, where zero energy excitations are characterized by a nodal ring in the momentum space. This class of materials falls between the Dirac-like semi-metals and the more conventional Fermi-surface systems. As a step towards understanding this unconventional system, we explore the effects of the long-range Coulomb interaction. Due to the vanishing density of states at the Fermi level, Coulomb interaction is only partially screened and remains long-ranged. Through renormalization group and large-N_f computations, we have identified a non-trivial interacting fixed point. The screened Coulomb interaction at the interacting fixed point is an irrelevant perturbation, allowing controlled perturbative evaluations of physical properties of quasiparticles. We discuss unique experimental consequences of such quasiparticles: acoustic wave propagation, anisotropic DC conductivity, and renormalized phonon dispersion as well as energy dependence of quasiparticle lifetime.

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