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Non-Fermi liquid phase and non-Gaussian itinerant quantum criticality of Weyl semimetals[1] PALLAB GOSWAMI, University of Maryland, College Park — A Weyl semimetal is a gapless topological phase in three dimensions, for which the touching points between two nondegenerate bands act as monopoles and antimonopoles of Abelian Berry curvature, with monopole strength m. Such a gapless phase can support m Fermi arcs as the protected, zero energy surface states. We consider the stability of a generalized Weyl semimetal with $m > 1$ in the presence of interaction and disorder by employing a renormalization group analysis, which is controlled by the parameter $\epsilon = \left(1 - \frac{1}{m}\right)$. For any $m > 1$, we show how the long range Coulomb interaction gives rise to an infra-red stable, non-Fermi liquid phase without any sharp quasiparticle pole. In the presence of sufficiently strong short range interactions, the non-Fermi liquid can transform into a translational symmetry breaking, axionic insulator. We demonstrate that the associated itinerant quantum critical point possesses non-Gaussian scaling properties. We establish the stability of the emergent non-Fermi liquid phase and the itinerant quantum critical point against weak disorder. Finally, we discuss the scaling properties of physical quantities, the fate of the Fermi arcs, and the experimental relevance of our results for some candidate materials.

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