Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Anisotropic Non-Fermi Liquids SHOUVIK SUR, National High Magnetic Field Laboratory, and Florida State University, SUNG-SIK LEE, McMaster University, and Perimeter Institute for Theoretical Physics — We study non-Fermi liquids that arise at quantum critical points associated with spin (SDW) and charge density wave (CDW) transitions in metals with twofold rotational symmetry. We use the 'codimensional' regularization scheme, where a one-dimensional Fermi surface is embedded in $3 - \epsilon$ dimensional momentum space. In three dimensions, quasilocal marginal Fermi liquids arise at the SDW and CDW critical points. Below three dimensions, a perturbative anisotropic non-Fermi liquid state is realized at the SDW critical point, where not only time but also different spatial coordinates develop distinct anomalous dimensions. The stable non-Fermi liquid exhibits an emergent algebraic nesting as the patches of the Fermi surface are deformed into a universal power-law shape near the hot spots. Due to the anisotropic scaling, the energy of spin fluctuations disperse with different power laws in different momentum directions. In contrast, at the CDW critical point, the perturbative expansion breaks down immediately below three dimensions as the interaction renormalizes the speed of charge fluctuations to zero within a finite renormalization group scale.

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Date submitted: 07 Jan 2016 Electronic form version 1.4