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Metallic phase in a two-dimensional disordered Fermi system with singular interactions VICTOR GALITSKI, Physics Department, University of Virginia — We consider a two-dimensional disordered system of gapless fermions interacting with a singular transverse gauge-field. We study quantum corrections to fermion conductivity and show that they are very different from those in a usual Fermi liquid. In particular, the weak-localization effect is suppressed by magnetic field fluctuations. We argue that these fluctuations can be considered static at time scales of fermionic diffusion. By inducing fluxes through diffusive loops that contribute to weak localization, they dephase via the Aharonov-Bohm effect. It is shown that while the flux-flux correlator due to thermal fluctuations of magnetic field is proportional to the area enclosed by the loop, the correlator due to quantum fluctuations is proportional to the perimeter of the loop. The possibility of dephasing due to these quasistatic configurations is discussed. We also study interaction induced effects and show that perturbation theory contains infrared divergent terms originating from unscreened magnetic interactions. We show that due to singular small-angle scattering, the corresponding contributions to the density of states and conductivity are very large and positive indicating that the fermion-gauge system remains metallic at low temperatures.

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