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Optical conductivity of a two-dimensional metal at the onset of spin-density-wave order DMITRII MASLOV, Department of Physics, University of Florida, ANDREY CHUBUKOV, Department of Physics, University of Wisconsin-Madison, VLADIMIR YUDSON, Institute for Optics and Spectroscopy, RAN, Troitsk, Russian Federation — We consider the optical conductivity of a clean two-dimensional metal at $T = 0$ near a spin-density-wave instability. Critical fluctuations destroy fermionic coherence at "hot spots" of the Fermi surface but a large part of the Fermi surface is neither "hot" or "cold" but rather "lukewarm," in a sense that quasiparticles there are strongly renormalized compared to the non-interacting case. We discuss the self-energy of lukewarm fermions and their contribution to the optical conductivity, $\sigma(\Omega)$, due to scattering off composite bosons made of two critical magnetic fluctuations. Recent study [S.A. Hartnoll et al., Phys. Rev. B **84**, 125115 (2011)] found that composite scattering leads to a singular fermionic self-energy of lukewarm fermions at the quantum critical point. We show that, at the lowest frequencies, the most singular, $\ln^3 \Omega/\Omega^{1/3}$ contribution to the conductivity is canceled between the self-energy, vertex-correction, and Aslamazov-Larkin diagrams. However, the cancellation does not extent beyond logarithmic accuracy, and the remaining conductivity still diverges as $1/\Omega^{1/3}$. At larger Ω, $\sigma(\Omega)$ scales in a marginal FL way, as $1/\Omega$.

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