Local geometry of Fermi surfaces and spectra of cyclotron waves in metals

GRIGORY M. ZIMBOVSKY, Urals State Mining University, Yekaterinburg, Russia, 620144, NATALYA A. ZIMBOVSKAYA, University of Puerto Rico at Humacao, PR 00791 — It is well known that transverse modes could propagate in metals along the external magnetic fields, whose frequencies at small wave vectors are close to the electron cyclotron frequency. These collective excitations occur due to the electron-electron interactions described within the framework of the Fermi-liquid theory. Here, we show that when the Fermi surface of a metal includes nearly parabolical segments, this strongly affects spectra of the Fermi-liquid cyclotron waves. Both frequency and wave vector ranges of these modes become significantly broadened, and the dispersion curves could appear extended into the low frequency region. The effect arises due to the singularity in the dielectric function at the boundary of the transparency region which could be strengthened for a certain Fermi surface geometry. Possible manifestations of the effect in experiments are discussed.

Natalya A. Zimbovskaya
University of Puerto Rico at Humacao, PR 00791

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