Condensed Matter 232 WQ 2019

Prof. Sergey Syzranov **Homework 3**

Solve by 13 February 2019

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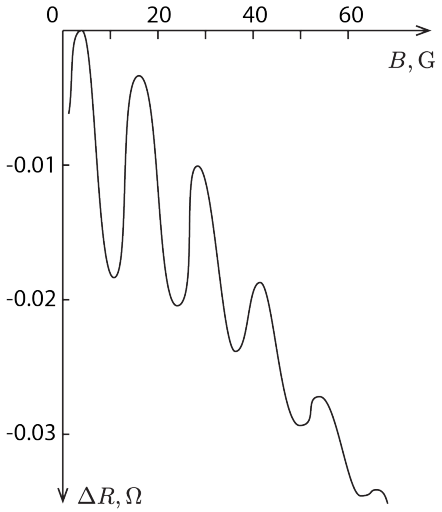
1. "Minimal metallic conductivity" in 2D

Thin films may be characterised by resistance per square $R_\square$, i.e. the resistance of a square of arbitrary size $L \times L$. Estimate $R_\square$ (in Ω) for a system with "minimal metallic conductivity", where the mean free path is on the order of the atomic length scale.

2. Coherent oscillations in Sharvin-Sharvin experiment

A thin layer of lithium was deposited on the surface of a quartz wire, thus forming a thin long conducting cylinder (whose length exceeds the quasiparticle coherence length). The change of the resistance of the cylinder as a function of magnetic field parallel to the axis of the cylinder is shown below. What is the diameter of the wire?



3. Thermal conductivity of a 3D metal

Compute the thermal conductivity of a 3D metal. Use the kinetic equation with a collision integral in the τ-approximation. The density of states at the Fermi surface is $\nu(\varepsilon_F)$; the Fermi velocity is v_F; the transport scattering time is τ.