Magnetic quantum oscillations in the molecular conductor κ-(BEDT-TTF)2Cu[N(CN)2]Cl near and away from the Mott transition

Shamil Erkenov[1,2], Sebastian Oberbauer[1,2], Vladimir Zverev[3], Werner Biberacher[1], Natalia Kushch[4], and Mark Kartsovnik[1]

[1] Walther-Meißner-Institut,85748 Garching, Germany, e-mail: shamil.erkenov@wmi.badw.de
[2] Technische Universität München,85748 Garching, Germany
[3] Institute of Solid State Physics,142432 Chernoglovka, Russia
[4] Institute of Problems of Chemical Physics,142432 Chernoglovka, Russia

Magnetic quantum oscillations have been extensively used for exploring correlated-electron materials near various correlation-driven instabilities of the normal metallic state. Applying this technique to the quasi-two-dimensional superconductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl, in the close proximity to the Mott insulating state, we have recently disclosed several anomalies in the behavior of the effective mass and scattering rate, apparently inconsistent with theoretical predictions. For clarifying the role of the Mott instability in these anomalies it is instructive to track their evolution in a broader range of the phase diagram, both very close to and far away from the metal-insulator phase boundary. To this end, we have measured quantum oscillations of magnetoresistance in the pressure interval 20 to 1000 MPa, which drives the system from the very edge of stability of the metallic phase to a "good metal" region of the phase diagram. We have also studied the possibility of changing the balance between the charge correlations and magnetic interactions governing the insulating instability by applying a strong magnetic field.