TECHNISCHE UNIVERSITÄT WIEN

INSTITUT FÜR FESTKÖRPERPHYSIK
Institute of Solid State Physics

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EINLADUNG zum IFP-SEMINAR

Quantum oscillations in electrically and microwave driven 2D materials

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Host: Andrei Pimenov

Termin: Mittwoch, 06. Oktober 2021, 16:00 Uhr CEST

Ort: Institut für Festkörperphysik, TU Wien

Wiedner Hauptstraße 8-10, 1040 Wien

Seminarraum DB gelb 09 (gelber Bereich, 9. OG)

Bei Anwesenheit vor Ort, ist eine Anmeldung bis spätestens 05.10.2021unter andrei.pimenov@tuwien.ac.at unbedingt erforderlich.

oder via ZOOM,
https://tuwien.zoom.us/j/94727910558?pwd=bXdKWEI3dHppcnVrdzBIZk5JS3dlQT09

Abstract:

This talk will present an overview of quantum transport phenomena which emerge under application of a moderately strong magnetic field in various high-mobility 2D electron systems (2DES) including GaAs/AlGaAs, ZnO/MnZno, and Si/Ge heterostructures, electrons on surface of liquid He, graphene, and surface states of topological insulators.
These phenomena include famous microwave induced resistance oscillations (MIRO) which can be so strong that the total dc conductivity of the system turns negative leading to a phase transition into a zero resistance state (ZRS) with spontaneously formed electric field domains. Apart from MIRO, I will describe several other kinds of magnetooscillations including Hall-induced resistance oscillations due to resonant impurity-assisted tunneling between Landau levels in the nonlinear dc response, and phonon induced resistance oscillations due to resonant phonon-assisted transitions in the linear dc response.
After an overview of experimental results, I will present a relatively simple perturbative kinetic description of these interrelated phenomena and demonstrate deep links between them that manifest in a nonlinear mixing of different kinds of magnetooscillations. I will also shortly touch the nonperturbative multiphoton regime of MIRO which includes tunneling in strong dc fields as a limiting case at very low driving frequency.
In the last part, I will address recent experiments conducted in TU Wien which clearly detect long-sought quantum oscillations in the microwave dynamic conductivity of 2DES and shed light on the polarization immunity paradox of MIRO providing spectacular results which sharply contrast the previous findings.