北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Special Seminar

Quantum Matter in High Magnetic Fields

Uli Zeitler

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Time: 4:00pm, Nov. 16, 2017 (Thursday)

时间：2017年11月16日 （周四）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

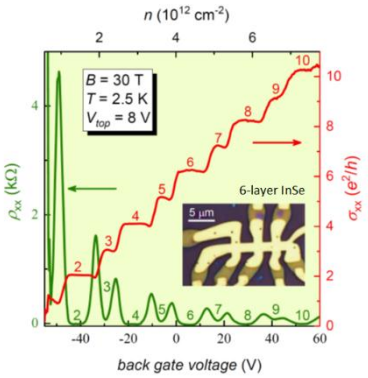
Abstract

High magnetic fields are an extremely powerful tool to investigate, to control and to manipulate the quantum properties of matter. In this talk I will present some recent results in this domain obtained at the High Field Magnet Laboratory (HMFL, member of the European High Magnetic Field Laboratory) at Radboud University in Nijmegen, the Netherlands.

After a general introduction into research performed at Radboud University, in particular concerning quantum-matter related research at the Institute for Molecules and Materials, I will give a short presentation of HMFL in general, and, more specifically the experimental Possibilities for external users exemplified by some recent research highlights on Soft Condensed Matter and Nanomaterials, Correlated Electron Systems and Semiconductors and Nanostructures.

In the second part of the talk I will present in some more detail three spectacular examples on our high field research in low-dimensional materials including the advanced experimental Methods (tilted-field magneto-transport, capacitance-voltage spectroscopy, tunneling spectroscopy and thermoelectric experiments) we use to perform them.

- Ising protected superconductivity in TMDs [1,2]
- Spin-splitting, valley splitting and chiral tunneling in graphene [3-6]
- Unveiling the electronic properties of topological matter [7, 8]



[1] J. M. Lu *et al.*, A full superconducting dome of strong Ising protection in gated monolayer WS_2, arXiv:1703.06369.

[2] J. M. Lu *et al.*, Evidence for two-dimensional Ising superconductivity in gated Mos_2, Science **350**, 1353 (2015).

[3] G. L. Yu *et al.*, Interaction phenomena in graphene seen through quantum capacitance, PNAS 110, 3282 (2013).

[4] F. Chiappini *et al.*, Lifting of the Landau level degeneracy in graphene devices in a tilted magnetic field, Phys. Rev. B 91, 92, 201412 (R) (2015).

[5] F. Chiappini ***et al.***, Magnetotransport in single layer graphene in a large parallel magnetic field, Phys. Rev. B 94, 085302 (2016).

[6] J. R. Wallbank, *et al.*, Tuning the valley and chiral quantum state of Dirac electrons in van der Waals heterostructures, Science 353, 575 (2016).

[7] S. Wiedmann ***et al.***, Temperature-driven transition from a semiconductor to a topological insulator, Phys. Rev. B 91, 205311 (2015).

[8] A. Jost ***et al.***, Electron–hole asymmetry of the topological surface states in strained HgTe, PNAS 114, 3381 - 3386 (2013).

About the speaker

Uli Zeitler is Professor of Semiconductors and Nanostructures in High Magnetic Fields at the Faculty of Science of Radboud University, Nijmegen, The Netherlands. He studied physics in Konstanz (Germany) and Grenoble (France) and obtained his PhD degree from the University of Konstanz in 1994 for work on "*Electronic Transport in 2D and 3D Semiconductors under Extreme Quantum Conditions* performed at the Grenoble High Magnetic Field Laboratory. After postdocs in Nijmegen (NL) and Nottingham (UK) he was appointed research and teaching associate at the Leibniz University Hannover (Germany) where he completed his habilitation thesis on "*Experiments on the Electron-Phonon and Electron-Electron Interaction in Quantum Hall* Systems" in 2001. He joined the Nijmegen High Field Magnet Laboratory (HFML) at Radboud University as an Associate Professor in 2002 and was promoted to a Full Professor in 2017. In his fifteen years at HFML he was actively involved in transforming it from a modest national research laboratory into a world-leading internationally recognized facility.