Dresden University of Technology

Faculty of Physics

PHYSICS COLLOQUIUM

Speaker: **Prof. Claude Monney**
Professor of Physics
Department of Physics,
University of Fribourg,
Switzerland

Topic: **A Momentum-Resolved View of Quantum Materials under Optical Control**

Time and place: Tuesday, December 8, 2026, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.
Online participation possible:
Zoom-Meeting: Meeting-ID: 642 8554 1414 / passcode: w8$nSJjy
https://tu-dresden.zoom-x.de/j/64285541414?pwd=6UOwTkSBlWvNv16PgF2K1qZtoUC8cS.1

Host: Prof. Sebastian F. Maehrlein

Abstract: Understanding and controlling quantum materials far from equilibrium is one of the central challenges of modern condensed matter physics. Tailored light pulses provide a powerful route to transiently engineer new states of matter. Their observation can be achieved using time- and angle-resolved photoemission spectroscopy (trARPES), which offers a unique momentum-resolved view of the electronic structure of solids on ultrafast timescales. In this seminar, I will illustrate how trARPES can reveal and control emergent quantum phenomena using two recent studies from our laboratory at the University of Fribourg. First, I will show how a finely-tuned optical driving can induce a transient band inversion in a semiconductor, creating a topological state through Floquet engineering (see figure) [1]. Second, I will discuss how resonant optical excitation generates excitons in a narrow-gap semiconductor and how their subsequent decoherence can be tracked in momentum space, providing direct insight into the formation of dark excitonic states [2]. These examples highlight how ultrafast spectroscopy not only observes nonequilibrium quantum states but can actively manipulate them, opening new possibilities for the optical control of material properties.

[1] F. Chassot et al., Nature Physics 22, 1282 (2026). [2] G. Kremer et al., arXiv:2605.28611

Bio: Claude Monney is Professor of Physics at the University of Fribourg, Switzerland, where he leads research on the ultrafast properties of quantum materials since 2018. He did his PhD at the University of Neuchatel, Switzerland, in the field of static photoemission spectroscopy and obtained his PhD in 2009. He spent then two years learning resonant inelastic x-ray scattering at the Paul Scherrer Institute in Switzerland. From 2012 to 2014, he was postdoc at the Fritz Haber Institute in Berlin in the

Mitglied von:
DRESDEN concept
Exzellenz aus Wissenschaft und Kultur

department of Prof. Martin Wolf, where he developed expertise in time-resolved techniques. Later, he was senior researcher at the University of Zurich.
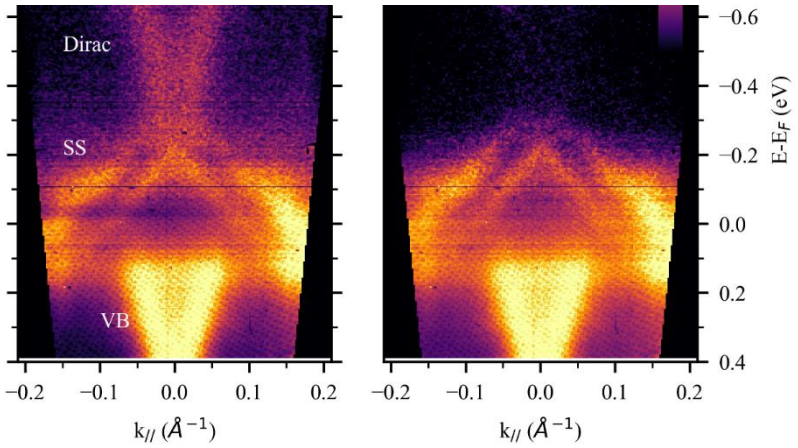
Figure 1: (left) at time 0, a transient Dirac cone appears in the band gap of the semiconductor SnTe under optical control. (right) at later time, the full band gap recovers.