第147回

電子物理工学セミナー

Special seminar in Physics and Electronics Dept.

by **Prof. Ulrich Höfer**

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Date 2025年 1月29日 水 15:00-16:30

於：B4棟 東K301 ~~大会議室~~

Title **Time-resolved photoemission : From bandstructure to orbital movies**

Abstract Time-resolved photoemission combines femtosecond pump-probe techniques with angle-resolved photoelectron spectroscopy (ARPES). While the target of many early investigations was the dynamics of surface electronic states, recent developments enable the method to basically track electron motion in momentum space on ultrafast time scales. This capability allows to explore ultrafast electronic processes of a variety of novel materials by clear-cut experiments. In this talk, I will briefly introduce the state-of-the-art of the method and discuss a couple of examples from our recent work. These include bandstructure movies of the intraband acceleration of electrons in topologically protected Dirac surface states [1,2], of the birth and collapse of Floquet-Bloch states [3], and of the formation of momentum-forbidden and spin-forbidden dark excitons in TMDC monolayers [4]. Finally, I will outline the perspectives of photoemission orbital tomography [5] to take slow-motion movies of molecular orbitals while they are driven by lightwaves.

References

[1] J. Reimann *et al.*, "*Subcycle observation of lightwave-driven Dirac currents*", Nature **562**, 396 (2018)
[2] C. P. Schmid *et al.*, "*Tunable non-integer high-harmonic generation in a topological insulator*", Nature **593**, 385 (2021)
[3] S. Ito *et al.*, "*Ultrafast birth, rise, and collapse of a Floquet-Bloch band structure*", Nature **616**, 696 (2023)
[4] R. Wallauer *et al.*, "*Momentum-resolved exciton formation dynamics in monolayer WS_2*", Nano. Lett. **21**, 5867 (2021)
[5] R. Wallauer *et al.*, "*Tracing orbital images on ultrafast time scales*", *Science* **371**, 1056 (2021)

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