

# Principles of time- and angle-resolved photoelectron spectroscopy

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Time- and angle-resolved photoelectron spectroscopy (trARPES) is the potentially most direct and comprehensive, energy- and momentum-selective probe of ultrafast processes in solids that couple to the electronic degrees of freedom. Angular resolution enables one in this context to monitor the temporal evolution of the valence electronic band structure of a solid at selected - and possibly critical - points in momentum space. The lecture will give an introduction into the main principles of the trARPES technique. A particular focus will be set on challenges in the implementation of different operation schemes. The capabilities of the technique will be illustrated by different examples addressing ultrafast processes in correlated materials.

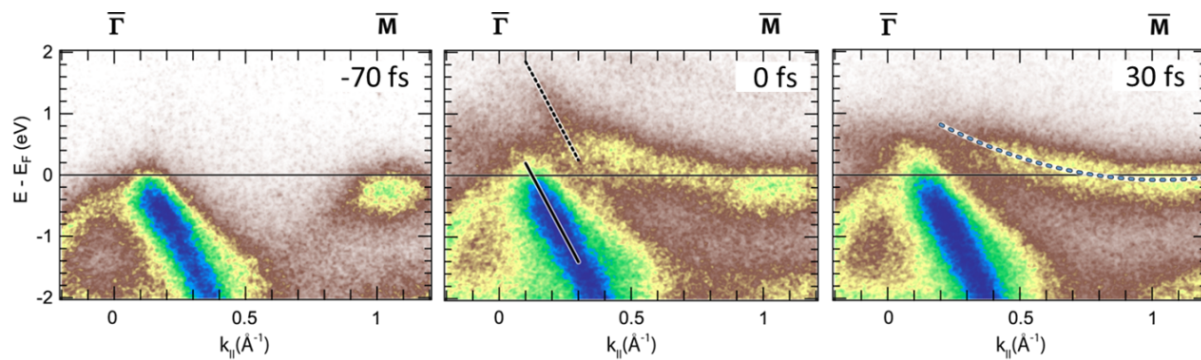


Figure 1: Photo-induced melting of a charge-ordered state in 1T-TiSe<sub>2</sub> probed by time-resolved ARPES. (Figure taken from [1].)

[1] T. Rohwer, S. Hellmann, M. Wiesenmayer, C. Sohrt, A. Stange, B. Slomski, A. Carr, Y. Liu, L.M. Avila, M. Kalläne, S. Mathias, L. Kipp, K. Rossnagel, and M. Bauer, *Collapse of long-range charge order tracked by time-resolved photoemission at high momenta*, Nature **471**, 490 (2011)