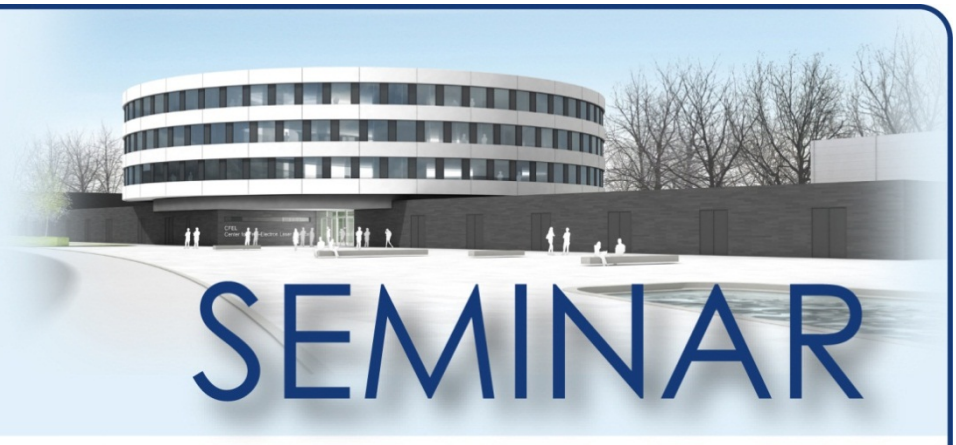
CFEL SCIENCE



SEMINAR

8th September, 2017 – 11:00 am
CFEL-bldg. 99, seminar room I (EG.076)

Timm Rohwer

Massachusetts Institute of Technology, Cambridge, USA

On the Ultrafast Transitions of Charge Density Waves in Solids

This talk will combine the characterization of both, the driving mechanisms of CDW's in solids - and the evolution of experimental techniques like trARPES and UED used to study the corresponding dynamics.

Charge Density Waves (CDW's) are the dominant perturbation in low dimensional crystals. Furthermore, CDW phases are most often associated with superconductivity at their quantum critical points. In this talk, I will present how the correlated dynamics of CDW's can be disentangled in the time-domain. A clear classification of the underlying driving mechanisms can be achieved by the study of the corresponding time scales of these nonthermal transitions.

Furthermore, this quest for the underlying nature of CDW's has fostered the development and enhancement of the time-resolved probing techniques themselves. Thus, the first part will discuss the improvement of time-resolved Angle Resolved Photo-Electron Spectroscopy (trARPES). trARPES has emerged as a leading technique in identifying dynamic key properties of complex electronic systems. Ever since the initial application of High-Harmonic Generation based ARPES on CDW systems [1], we were able to improve its parameters like energy resolution and repetition rate by orders of magnitude. I will face the benefits of these enhancement and discuss the technical advances and new insights that were necessary to achieve this new level.

The second part will take a closer look on the particular system of Charge Density Waves in rare earth tri-tellurites. The combination of trARPES with Ultrafast Electron Diffraction (UED) and transient optical spectroscopy enables us to record and compare the correlated dynamics in the electronic and lattice subsystem. An unexpected recovery behavior is observed and I will show how the combination of these complementary techniques provides a more complete picture of the nonthermal transition and allows a solid conclusion of its origin.

[1] T. Rohwer et al., Nature 471, 490 (2011)

Host: Franz Kärtner, CFEL-UX seminar