



Friday, November 22<sup>nd</sup>, 2019 – 11:30 pm  
CFEL Seminar room IV (Bldg. 99)

Martin Eckstein

Friedrich-Alexander-Universität, Erlangen-Nürnberg

## Gauge issues in the description of solids with strong light-matter coupling

The rich physics of complex condensed matter systems is largely understood in terms of minimal tight-binding models, which describe interacting electron systems on a lattice with only few valence orbitals per site. To incorporate a strong light-matter coupling into such models, one can project the continuum theory on a given set of valence bands. However, alternative formulations arise when the projection is performed in different gauges. Here we first compare the dipolar and projected Coulomb gauge Hamiltonian for a one-dimensional solid, to describe sub-cycle light-driven electronic motion in the semiclassical limit and the polariton bands in the quantum limit. Second, we discuss an excitonic insulator in a cavity. We show that the correct treatment of the light-matter interaction is essential to capture the behavior of the collective modes and the effect of the cavity on the phase transition even on a qualitative level.

Host: Simone Latini, Angel Rubio

