CFEL SCIENCE

SEMINAR

2nd November 2016 - 2:00 p.m.

CFEL-bldg. 99, seminar room IV

Konstantin Dorfman

SIMTech, Singapore

Nonlinear optical spectroscopy with nonclassical light, photon counting detection and extreme wavelengths techniques

The progress in quantum optics utilizes a unique photon state configuration for engineering of the ultimate light-matter interactions with relatively simple material systems. It results in a broad range of photonic applications including radiation sources, quantum communication, information, computing and nanotechnology. The development of the ultrafast multidimensional nonlinear spectroscopy that has been enabled by progress in ultrafast optical technology provides a unique tool for probing complex molecules, semiconductors, nanomaterials by classical light fields. I will show how new quantum phenomena in complex systems can be studied and controlled using advances in both quantum optics and nonlinear spectroscopy. In particular I demonstrate how to probe and control the dynamics of the complex excitonic systems using quantum light and reveal the information, which is not accessible by conventional classical photonics. I further show the power of the time-and-frequency resolved photon counting techniques that complement existing multidimensional optical techniques. I will finally utilize the newly developed X-ray Stimulated Raman spectroscopies to control electron transfer processes and collect information about molecular systems such as conical intersections, core and valence dynamics with the attosecond precision.

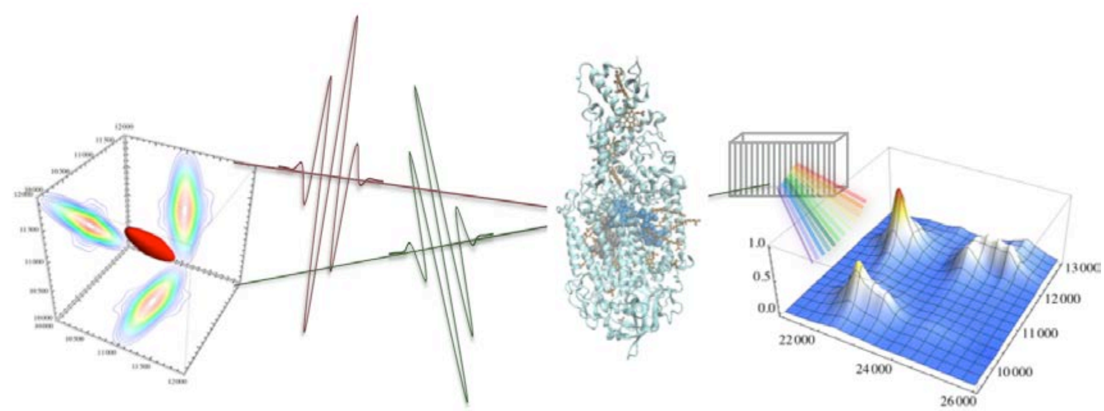

Figure 1: A pair of entangled photons showing strong time-frequency correlations (left) is directed onto a molecular aggregate (center), and one transmitted beam is frequency-dispersed and detected. The resulting signal (right) can be controlled by the correlations.

Host: Angel Rubio – MPSD-CFEL Theory Department