

Max Planck Research Department for Structural Dynamics May 13th, 2011 - 14:00 pm

## Seminar Room 108, DESY Bldg. 49

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## Ultrafast Vibrational Spectroscopy in solids and molecular systems

FEMTOSCOPY is an ERC project aimed to develop novel approaches for ultrafast vibrational spectroscopy. I will illustrate the main research lines fostered by this initiative through a couple of selected examples:

1) Broadband Picosecond Acoustics: building on classical picosecond ultrasonic we developed a pump-probe technique to generate coherent phonons in crystalline and amorphous solids and to detect them via photo-induced changes in phase matched white light continuum pulses. We determine acoustic properties (sound velocity and attenuation) in the 30-300 GHz range - a region uncovered by traditional spectroscopies such as Brillouin and Inelastic X-ray Scattering- in a single measurement and with unprecedented sampling efficiency. I will present recent results showing anomalous dispersion effects in STO and amorphous SiO<sub>2</sub>.

2) Femtosecond Stimulated Raman Scattering: combining a narrowband picosecond pulse ad a femtosecond white light continuum we probe transition states and reaction intermediates in molecular systems, circumventing time and energy resolution restrictions dictated by the Fourier limit. Femtosecond snapshots of molecular dynamics can be recorded measuring Stimulated Raman spectra with an energy resolution which would pertain to picosecond domain in the Heisenberg sense (a few cm<sup>-1</sup>). I will show the sub picosecond ligand dynamics of photolised Myoglobin captured with this technique.



E. Pontecorvo, M. Ortolani, D. Polli, M. Ferretti, G. Ruocco, G. Cerullo, and T. Scopigno, Appl. Phys. Lett. 98, 011901 (2011) Cover of the issue

Host: Andrea Cavalleri, Condensed Matter Division, MPSD, CFEL