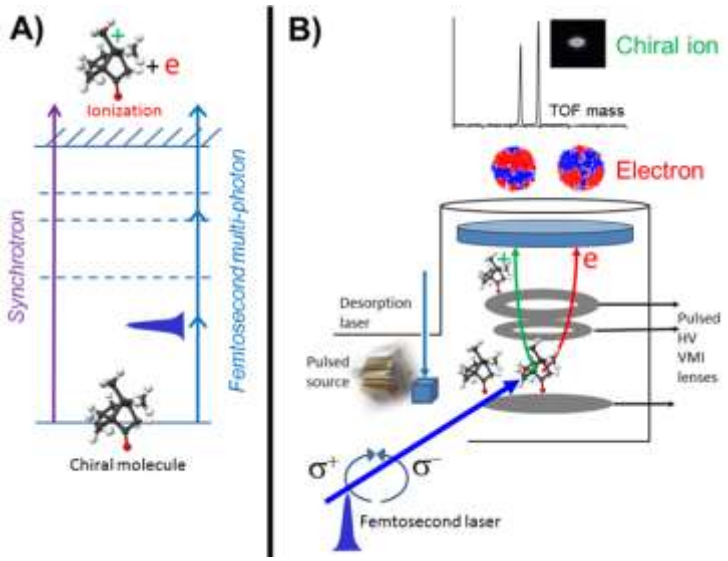
CFEL SCIENCE

SEMINAR

06th October 2011 - 10:15 a.m.
building 28c (FLASH hall) - seminar room

Maurice H. M. Janssen
LaserLaB Amsterdam and Chemistry Department VU University Amsterdam

The Reaction Microscope: Imaging and Pulse Shaping Control in Photodynamics



Herein, we review the current capabilities and potential of advanced single-particle imaging techniques to study the photodynamics of isolated molecules [1-3]. These reaction microscopes are able to measure the full three-dimensional energy and angular distribution of (correlated) particles such as electrons and molecular fragments ejected after photoexcitation of molecules. In particular, we discuss the performance and capabilities of a novel photoelectron–photoion coincidence imaging spectrometer constructed at LaserLaB Amsterdam. This microscope was developed for the study of nonadiabatic effects in ultrafast time-resolved experiments. It is specifically targeted at optimal control studies of photodynamics to foster and advance our understanding of mechanisms in optimal control with shaped ultrafast laser pulses. We review a few recent experimental results illustrating the wealth of detailed information that can be obtained in such imaging experiments about the interplay between (shaped) laser fields, molecular dynamics, ionization processes and competing multichannel pathways. Furthermore, the recently developed femtosecond mass-selective photoelectron–circular-dichroism imaging technique to detect enantiomers and to study chirality effects will be discussed [4], as a further illustration of the potential of modern reaction microscopes.

[1] Vredenborg et al., *ChemPhysChem* **12** (2011), 1459
[2] Lipciuc et al., *Phys. Chem. Chem. Phys*. **13** (2011), 8549
[3] Lehmann et al., *Faraday Discussions* **153** (2011), DOI: 10.1039/C1FD00047K
[4] Bhargava Ram et al., submitted (2011).

Host: Jochen Küpper - Coherent Imaging Division - Controlled Molecule Imaging