



EARLY STAGE RESEARCHER

Jan Lahl

PROJECT: Ultrafast molecular dynamics studied using photoelectron diffraction techniques

Host institution: Lund University

Supervisors: Per Johnsson, James Milnes, Daniel Rolles

Start date: 01/04/2015

General info: Founded 1425, 41000 students today



LUND UNIVERSITY



CURRICULUM VITAE

- Born 27/05/1987 Germany
- Bachelor of Sc., TU Berlin 02/2012:
Time-resolved photoelectron spectroscopy on chromophores in aqueous solution
MBI Berlin, supervised by Andrea Lübcke
- Master of Sc., TU Berlin 12/2014:
Setup and characterization of a THz radiation source
Supervised by Maria Krikunova, collaboration with MBI Berlin
- Ph.D. student at Lund University since 04/2015
- MEDEA network early stage researcher and student representative for 2016

- Publications:

Time-resolved photoelectron spectroscopy of adenine and adenosine in aqueous solution, Buchner et al., Phys.Chem.Chem.Phys., 2013, 15, 11402

Efficient Autoionization Following Intense Laser-Cluster Interactions, Schütte et al., PRL, 2015, 114, 123002

Autoionization following nanoplasma formation in atomic and molecular clusters, Schütte et al., Eur. Phys. J. D, 2016, 70, 115

SCIENTIFIC SCOPE OF THE PROJECT

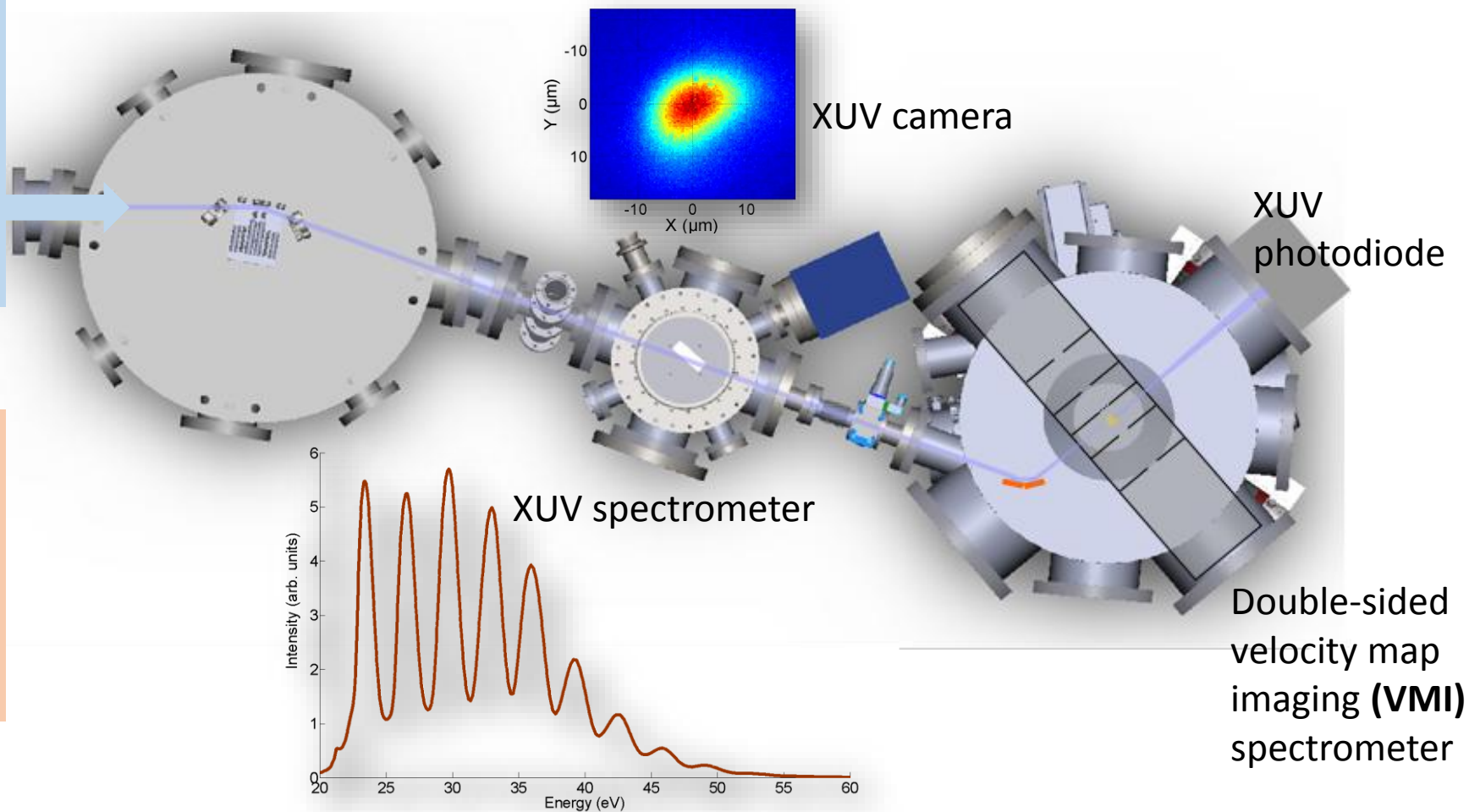
INTENSE XUV ATTOSECOND BEAMLINE @ LUND LASER CENTRE

High Harmonics Generation (HHG)

IR light ->
extreme
ultraviolet (XUV)
light

High intensity Ti:Sapph infrared (IR) laser

(10 Hz, 1.55 eV,
200 mJ, 40 fs)



SCIENTIFIC ACTIVITIES AND GOALS IN PROGRESS

- **Covariance** is a measure of the correlation between two (random) variables X and Y
- Detection scheme allows for synchronized acquisition of:
Ion-VMI, Ion time-of-flight (TOF), electron-VMI and XUV intensity

$$i. \quad cov(X, X) = var(X) = \langle X^2 \rangle - \langle X \rangle^2$$

$$ii. \quad cov(X, Y) = \langle XY \rangle - \langle X \rangle \langle Y \rangle$$

$$iii. \quad cov(X, Y; I) = cov(X, Y) - \frac{cov(X, I) - cov(I, Y)}{var(I)}$$

- X and Y are vectors/matrices and can be any combination of Ion-VMI/TOF and electron-VMI, whereas I is the (XUV)-light intensity
- Partial covariance (iii.) allows to correct for unwanted correlations introduced by light source fluctuations, in our case we correct for intensity variations by using the XUV photodiode synchronized

SCIENTIFIC ACTIVITIES AND GOALS IN PROGRESS

- Scientific campaigns:
 - Synchrotron campaigns in August and November 2015, @ Maxlab in Lund
 - Free electron laser (FEL) campaigns @ FLASH (DESY) in Hamburg, December 2015, February and October 2016
- Conference attendances:
 - FEMTO 12, July 12-17, 2015 in Hamburg
 - Faraday Discussion August 31 – September 2, 2016 in Edinburgh
- Schools:
 - Ultrafast X-ray Summer School 2015, DESY Hamburg, June 2015
 - MEDEA winter school Milan, January 2016
 - MEDEA summer school Crete, October 2016

- Publications:

Two-photon double ionization of neon using an intense attosecond pulse train, Phys. Rev. A 93, 061402

A Versatile Velocity Map Electron-Ion Covariance Imaging Spectrometer for High Intensity XUV Experiments, manuscript in preparation

SECONDMENTS, OUTREACH ACTIVITIES AND SOFT SKILLS TRAINING

2015

- November 23 - December 7, [DESY](#): FLASH experiment with Daniel Rolles et al. :

Time-resolved electron and ion imaging on Halomethanes

2016

- Teaching as a lab supervisor for undergraduates at [Lund University](#)
- February 6-17, [DESY](#): FLASH experiment with Mathieu Gisselbrecht, Robert Moshhammer et al.:

Two-color double photoionization of Helium with 3D electron spectroscopy

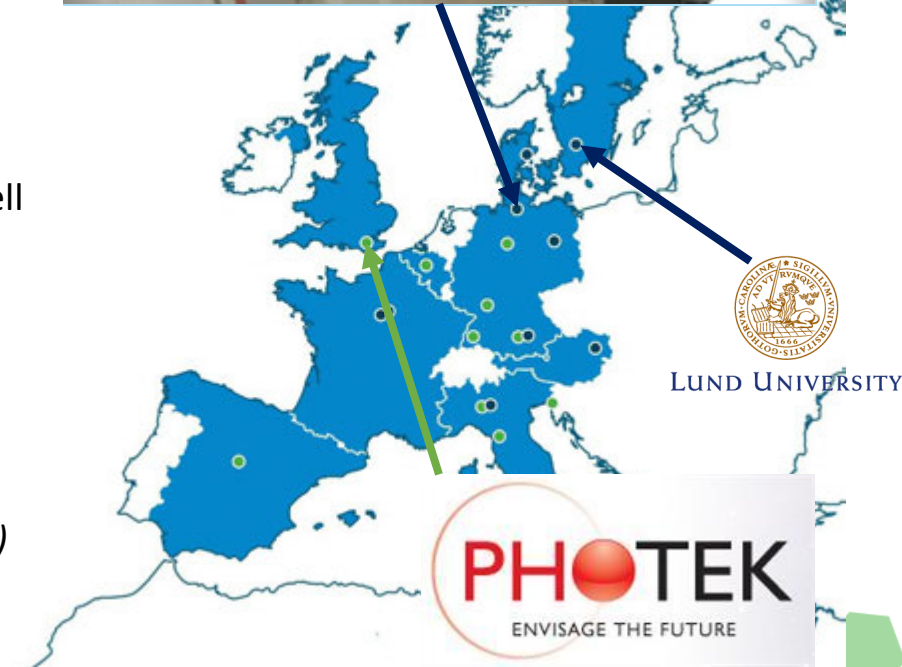
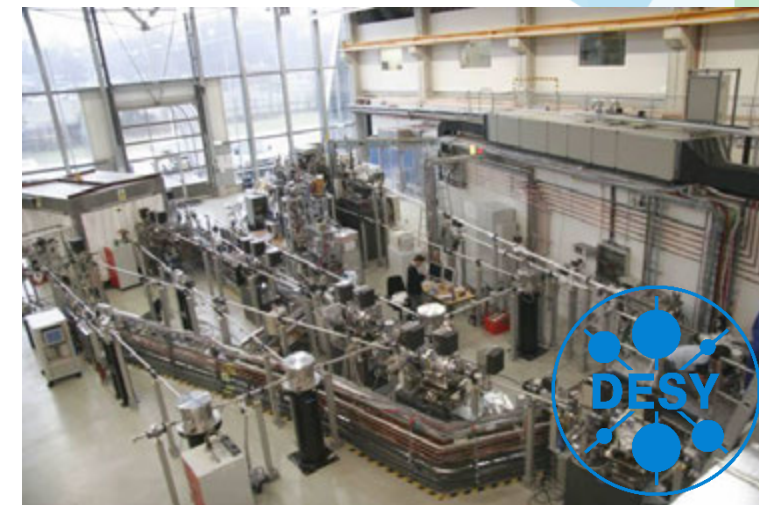
- October 10-14, [DESY](#): preparation of FLASH experiments with Melanie Schnell et al. and Rebecca Boll et al.:

The astrochemically relevant photophysics of polycyclic aromatic hydrocarbons

2017

- **PHOTEK**: Concrete plans for project and 1-2 months secondment during summer/fall:

design, simulations, procurement, assembly and tests of a (double-) velocity map imaging spectrometer



CAREER DEVELOPMENT PLAN AND FUTURE ACTIVITIES

- Continuation of covariance experiments and publication of results
- DESY: 1 or 2 FLASH beamtimes in 2017
- PHOTEK: future projects, depending on outcome of the first project
- MBI: future experimental collaboration
- Photonics explorer kit outreach activities
- MEDEA workshops/schools
- MEDEA JJs and webinars
- Conference presentations, attendance of summer schools
- Teaching at Lund University
- Taking courses at Lund University