



DESY Photon Science Users' Meeting 2015

European XFEL Users' Meeting 2015

Jointly organized Users' Meeting of
DESY Photon Science and European XFEL





DESY Photon Science Users' Meeting 2015 European XFEL Users' Meeting 2015

January 28-30, 2015 in Hamburg - DESY Auditorium (Bldg. 5)



Wednesday January 28 European XFEL Users' Meeting (9:00-18:30 DESY Auditorium)

09:00–10:10	Registration		
10:10 -10:30	Opening Session		
10:10	Welcome	M. Altarelli	<i>European XFEL, Hamburg</i>
10:20	Opening address from the Council Chair	M. Meedom Nielsen	<i>Techn. Univ. of Denmark</i>
10:30–12:30	Project update session	Chair: M. Meedom Nielsen	
10:30	General Status of the Project	M. Altarelli	<i>European XFEL, Hamburg</i>
11:00	Electron Accelerator Status	H. Weise	<i>DESY, Hamburg</i>
11:30	Karabo: the Photon Beamline Control System	B. Heisen	<i>European XFEL, Hamburg</i>
11:50	X-Ray Beamline Optics and Photon Diagnostics	H. Sinn	<i>European XFEL, Hamburg</i>
12:10	Commissioning Plans and Parameters 1 st user run	W. Decking	<i>DESY, Hamburg</i>
12:30–14:00	Lunch break		
14:00–16:00	European XFEL instrument progress	Chair: R. Abela	
14:00	The FXE instrument	C. Bressler	<i>European XFEL, Hamburg</i>
14:20	The MID instrument	A. Madsen	<i>European XFEL, Hamburg</i>
14:40	The SPB instrument	A. Mancuso	<i>European XFEL, Hamburg</i>
15:00	The HED instrument	T. Tschentscher	<i>European XFEL, Hamburg</i>
15:20	The SQS instrument	M. Meyer	<i>European XFEL, Hamburg</i>
15:40	The SCS instrument	A. Scherz	<i>European XFEL, Hamburg</i>
16:00–16:30	Coffee break		
16:30–18:30	Science session: Highlights in XFEL Research	Chair: C. Schroer	
16:30	A Single Time-Dependent Order Parameter Concept for Photoinduced Phase Transitions	P. Beaud	<i>PSI, Villigen, Switzerland</i>
17:00	Tracking chemical reactions with ultrafast X-ray spectroscopies and scattering	W. Gawelda	<i>European XFEL, Hamburg</i>
17:30	Structure and Dynamics of Photosystem II	P. Fromme	<i>Arizona State University</i>
18:00	Fixed Target 2D and 3D Protein Crystallography	M. Frank	<i>LLNL, California, USA</i>
19:00	Reception for speakers and participants (DESY canteen, Bldg. 9)		

Thursday January 29 Soft X-ray FEL / FLASH experiments - jointly organized with European XFEL (9:00-13:00 DESY Auditorium)

09:00-10:30	Status of FLASH and FEL experiments	Chair: Th. Tschentscher	
09:00	Welcome	E. Weckert	<i>DESY, Hamburg</i>
09:10	First Lasing at FLASH2	M. Altarelli	<i>European XFEL, Hamburg</i>
09:35	FLASH – a Great Facility for Time-resolved Electron Spectroscopy on Solids and Interfaces	B. Faatz	<i>DESY, Hamburg</i>
10:00	Snapshots of Ultrafast Magnetization Dynamics	W. Wurth	<i>DESY, Univ. Hamburg</i>
10:30-11:00	Coffee break	J. Lüning	<i>Université Paris VI</i>
11:00-13:00	Using intense FEL radiation for experiments	Chair: J. Feldhaus	
11:00	Ultrafast Dynamics in Solids: coupled motion of the Lattice; Spins and Orbitals	S. Johnson	<i>ETH Zürich</i>
11:30	Cluster Experiments at the FERMI FEL	F. Stienkemeier	<i>Freiburg University</i>
12:00	Overview of the Results from the LDM Collaboration	C. Callegari	<i>FERMI, Trieste</i>
12:30	Electron Rearrangement Dynamics in Dissociating Molecules	K. Schnorr	<i>MPI Heidelberg</i>
13:00-14:00	Lunch break		
13:30-19:00	Satellite Meetings - Workshops	<i>see next page for details</i>	

SATELLITE MEETINGS - WORKSHOPS

13:30-16:30	GEMS: Status and perspectives of the Helmholtz-Zentrum Geesthacht Outstation at DESY	<i>CFEL SemRoom II (Bldg. 99)</i>
14:00-17:30	DESY - EXAFS Beamlines (P64 and P65)	<i>SemRoom 456 (Bldg. 25f)</i>
14:00-18:30	SAXS/WAXS/GISAXS - User Workshop@DESY	<i>SemRoom 4a&4b (Bldg. 01b)</i>
14:00-19:00	SFX data analysis workshop	<i>FLASH SemRoom (Bldg. 28c)</i>
14:30-18:00	High-Energy X-ray Scattering Seminar	<i>SemRoom 109 (Bldg. 25b)</i>
14:30-19:00	5. Workshop of X-ray nano-imaging of biological and chemical systems at PETRA III	<i>DESY Auditorium (Bldg. 5)</i>
15:50-19:00	HIBEF User Meeting and General Assembly	<i>CFEL SemRoom I (Bldg. 99)</i>
14:00-15:30	European XFEL HED Instrument User Workshop – Recent Developments	<i>CFEL SemRoom I (Bldg. 99)</i>
13:50-18:30	European XFEL Photon Beam Diagnostics	<i>University Hamburg Auditorium (Bldg. 61)</i>
13:30-18:00	European XFEL FXE Instrument User Workshop	<i>CFEL SemRoom III (Bldg. 99)</i>
19:00	Reception for speakers and participants (DESY canteen Bldg. 9)	

Friday January 30

DESY Photon Science Users' Meeting (9:00-13:00 DESY Auditorium)

08:30	Registration	Chair: W. Drube	
09:00	Welcome to DESY	E. Weckert	<i>DESY, Hamburg</i>
09:10	Photon science at DESY	E. Weckert	<i>DESY, Hamburg</i>
09:50	In situ surface crystallography with high-energy X-rays	J. Gustafson	<i>University Lund</i>
10:20-10:50	Coffee break		
		Chair: G. Grübel	
10:50	Hydrodynamic alignment and assembly of nano-fibrils resulting in strong cellulose filaments	F. Lundell	<i>KTH Stockholm</i>
11:20	Enabling flexible polymer tandem solar cells	J. W. Andreasen	<i>DTU Energy Conversion, TU Denmark</i>
11:50	Unraveling the activation principles of oncogenic colony stimulating factor 1 receptor: a feast of integrative structural biology	S. Savvides	<i>Ghent University</i>
12:20	Report of the DESY Photon Science Users Committee (DPS-UC)	P. Müller-Buschbaum	<i>DPS-UC Chair, TU München</i>
12:35	Report of the Komitee Forschung mit SR (KFS)	B. Murphy	<i>KFS Deputy Chair, Univ. Kiel</i>
12:50	Report of the Europ. Synchrotron User Organism (ESUO)	U. Pietsch	<i>ESUO Chair, Univ. Siegen</i>

13:00-14:00 Lunch break

14:00 – 17:00 POSTER SESSION - Jointly organized by DESY and European XFEL
13:00 – 18:00 Vendor exhibition

VENUE:

CFEL Foyer (Bldg. 99), Poster 1 - 165
 FLASH2 hall (Bldg. 28k) Poster 166 - 347
 FLASH1 seminar room (Bldg. 28c)

General Information:

Sessions	Oral sessions will be held in the DESY auditorium. The poster session will be held in the CFEL building (Bldg. 99) and in the FLASH2 experimental hall (Bldg. 28k).
Vendor exhibition	The vendor exhibition will take place next to the CFEL building (Bldg. 99), in the FLASH2 experimental hall (Bldg. 28k) and the FLASH seminar room (Bldg. 28c).
Registration	The registration will start on Wednesday 28 January at 08:30h in the foyer of the auditorium
Social event	The XFEL reception will take place on Wednesday 29 January at the DESY canteen (Bldg. 9) The DESY reception will take place on Thursday 30 January at the DESY canteen (Bldg. 9)
Meals	<i>Breakfast</i> If you stay at the DESY guest house you may have breakfast at the DESY cafeteria (opens at 07:00h, Bldg. 9) at your own expenses <i>Lunch</i> You may have lunch at the DESY canteen (Bldg. 9) at your own expenses
Supermarkets	LIDL From the main gate at Notkestrasse turn right and follow the street (700 – 800m). PENNY Form the main gate at Notkestrasse walk straight down the street “Zum Hünengrab” (700 – 800m).
Cash machine/ATM	You will find a cash machine in the foyer of the DESY canteen (Building 9)
DESY WLAN	Name: UserMeeting2015 WPA/WPA2-PSK: nXg7bdPT
Organizers	I. Gembalies (European XFEL) A. Schwarz (European XFEL) T. Roth (European XFEL) K. Fein (DESY) M. Kreuzeder (DESY) W. Laasch (DESY) F. Lehmkuhler (DESY) A. Rothkirch (DESY) D. Unger (DESY)

Main sessions
Abstracts of the talks

An order parameter concept for ultrafast phase transitions

Paul Beaud^{1,2}, Andrin Caviezel¹, Simon Mariager¹, Laurenz Rettig¹, Gerhard Ingold², Christian Dornes³, Shi-Wen Huang¹, Jeremy Johnson¹, Milan Radovic^{1,2}, Tim Huber³, Teresa Kubacka³, Andres Ferrer^{1,3}, Henrik Lemke⁴, M. Chollet⁴, Dilling Zhu⁴, James Glowina⁴, Marcin Sikorski⁴, Aymeric Robert⁴, Hiroki Wadati^{5,6}, Masao Nakamura⁷, Masashi Kawasaki^{5,7}, Yoshinori Tokura^{5,7}, Steven Johnson³, Urs Staub¹

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The exploration of the interaction of structural and electronic degrees of freedom in strongly correlated electron systems on the femtosecond time scale is an emerging area of research. One goal of these studies is to advance our understanding of the underlying correlations, another to find ways to control the interesting properties of these materials on an ultrafast time scale. An extreme example is the so-called 'ultrafast' phase transition, where a persistent phase change is induced by a sudden impulsive interaction from a femtosecond laser pulse. Different coordinates of the phase transformation, that in equilibrium are tightly linked to the conventionally defined order parameter, may undergo quite different dynamics. Whether a unified explanation of such dynamics exists remains an open question. Perovskite-type manganites are prototypical examples of strongly correlated electron systems which exhibit properties such as colossal magnetoresistance and insulator-to-metal transitions that are intrinsically related to symmetry changes of the atomic lattice and to fascinating ordering patterns of the spins, orbitals and charges. The application of an intense ultrashort optical pulse melts the electronic order [1] and launches a structural phase transition [2]. Taking advantage of the high flux of the LCLS free electron laser we recently probed with time-resolved resonant x-ray diffraction, both the long-range order of the electronic and the lattice subsystems during the transition [3]. Despite the complex nature of this phase transition that involves symmetry changes of valence charge, orbital order and atomic structure, a fairly simple description relying on a single time-dependent order parameter is sufficient to capture the most essential aspects of the change in symmetry in the time domain. The lattice dynamics occur in a potential surface defined by the magnitude of this single parameter. The resemblance of this concept to Landau theory points to a possible universal description of complex phase transitions in the time domain.

[1] D. Polli *et al.*, *Nature Mater.* **6**, 643–647 (2007).

[2] P. Beaud *et al.*, *Phys. Rev. Lett.* **103**, 155702 (2009).

[3] P. Beaud *et al.*, *Nature Mater.* **13**, 923–927 (2014).

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Tracking chemical reactions with ultrafast X-ray spectroscopies and scattering

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Ultrafast structural dynamics is an emerging field aiming to deliver a detailed understanding of the elementary steps in reacting chemical species, which involve changes in their nuclear, electronic and spin states. Such processes are vital ingredients in Chemistry and Biology, but also in technological applications, including efficient charge transport in solar energy converters and ultrafast switchable molecular magnets.

In order to unravel the complex dynamic behavior in photoexcited molecules we have implemented a suite of ultrafast X-ray spectroscopic and scattering tools to zoom into both the electronic and nuclear structures, with the goal to ultimately deliver a molecular movie of ongoing chemical processes. In view of the many potential applications in chemical and biological dynamics, it is desirable to increase the sensitivity level of such experiments, as well as to decrease the time resolution into the femtosecond time domain.

Here our benchmark results will be presented using a versatile setup that permits simultaneous measurements of ultrafast X-ray absorption and emission spectroscopies combined with X-ray diffuse scattering, which has been recently implemented by us at different synchrotrons and XFELs. It has been applied to study different photochemical reactions, ranging from nascent radicals in solution, molecular spin transitions and ligand exchange reactions to photocatalytic systems, with the goal to deliver a deeper understanding of the elementary steps in chemical reactivity.

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Structure and Dynamics of Photosystem II

Petra Fromme^{1,2}, Christopher Kupitz^{1,2,3}, Shibom Basu^{1,2} et al. (see ref. 10 for full list of authors)

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Biological processes are highly dynamic, while most of the structures of biomolecules determined by X-ray crystallography represent a static picture of the molecule. Serial Femtosecond crystallography (SFX) provides a novel concept for structure determination, where X-ray diffraction "snapshots" are collected from a fully hydrated stream of nanocrystals, using femtosecond pulses at the high energy X-ray free-electron laser, the Linac Coherent Light Source [1,2]. Diffraction data of nanocrystals of large membrane protein complexes are collected at room temperature in liquid jet. As femtosecond pulses are briefer than the time-scale of most damage processes, femtosecond crystallography overcomes the problem of X-ray damage in crystallography [3]. Data collected at the CXI LCLS beamline at higher energy showed that the concept of fs crystallography extends to atomic resolution [4],[5] and extends to membrane proteins crystallized in lipidic environments [6],[7].

The talk will focus on recent results on serial time-resolved crystallography of Photosystem II using a femtosecond X-ray laser and show the future prospective of time resolved femtosecond crystallography towards molecular movies of biomolecules using Photosystem II as an example. Femtosecond crystallography opens a new avenue for determination of protein dynamics. First experiments on the proof of principle for time resolved serial femtosecond nanocrystallography have been performed on Photosystem I-ferredoxin [8] and Photosystem II nano-crystals [9]. Conformational changes of the Mn_4CaO_5 cluster and its protein environment were observed for the first time in the transition from the dark to the double excited state [10]. These experiments pave the way the determination of molecular movies of the dynamics of membrane proteins "at work" at the European XFEL in the future, where the bunched time structure may allow us to move from molecular snapshots towards the determination of a molecular movies of water splitting.

References:

- [1] Chapman,HN, Fromme,P, Barty, A. et al Nature 2011, 470, 73-77
- [2] Fromme P., Spence JC. Curr Opin Struct Biol 2011, 21: 509-516
- [3] Barty,A, Caleman,C, Aquila,A et al. Nature Photonics 2012, 6, 35–40
- [4] Boutet S, Lomb L, Williams GJ, et al Science 2012, 337: 362-364
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- [9] Kupitz C, Grotjohann I, Conrad CE, Roy-Chowdhury S, Fromme R, Fromme P
Philos Trans R Soc Lond B Biol Sci 2014, 369
- [10] Kupitz, C, Basu, S, Grotjohann, I et al Nature 2014, 513, (7517), 261-5

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Fixed target 2D and 3D protein crystallography at XFELs

Matthias Frank,^{1,7*} Mark S. Hunter,^{1,2,7} Garth J. Williams,² Marc Messerschmidt,^{2,7} Nadia A. Zatsepin,^{3,7} Bill Pedrini,⁴ Anton Barty,⁵ W. Henry Benner,¹ Geoffrey Feld,¹ P. Fromme,^{3,7} Stefan P. Hau-Riege,^{1,7} Richard A. Kirian,^{3,5,7} Celestino Padeste,⁴ Tommaso Pardini,¹ Brent Segelke,^{1,7} M. Marvin Seibert,² John C. H. Spence,³ Ching-Ju Tsai,⁴ Jay-How Yang,^{3,7} Yun Zhao,^{3,7} Xiao-Dan Li,⁴ Gebhard Schertler,⁴ Sebastien Boutet,² Matthew Coleman,^{1,7} and James E. Evans⁶

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Serial femtosecond nanocrystallography (SFX) has been demonstrated successfully in a number of experiments at LCLS and SACLA over the last years. Most SFX applications to date have used 3-dimensional nano- or microcrystals and utilize a liquid-jet based sample introduction approach that requires large amounts of sample and/or are not conducive to measuring 2-dimensional (2D) protein crystals. 2D crystallography of membrane proteins has been developed originally in cryoelectron microscopy and is an avenue for obtaining structural information on membrane proteins that do not easily form 3D crystals. Here we describe a fixed target approach for 2D and 3D crystallography at XFELs that allows diffraction measurements on samples supported by thin substrates at room temperature. We present first promising results from experiments at LCLS that included 2D crystal samples of the membrane protein bacteriorhodopsin and 3D microcrystal samples of REP24, a soluble protein. We discuss strategies for reducing amounts of required sample and increasing speed of data acquisition further to render this approach a viable alternative to the liquid-jet based sample introduction approaches. The fixed-target approach is expected to open up new opportunities for time-resolved SFX on samples that are not abundant and/or require the sample to be flat.

This work was performed under the auspices of the US Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344 and Pacific Northwest National Laboratory under Contract DE-AC05-76RL01830. Parts of this research were carried out at the Linac Coherent Light Source (LCLS) at SLAC National Accelerator Laboratory. LCLS is an Office of Science User Facility operated for the US DOE Office of Science by Stanford University. Support was provided by the UCOP Lab Fee Program (award No. 118036), NIH grant number 5RC1GM091755, NSF award MCB- 1021557 and NSF STC award 1231306, LLNL Lab-Directed Research and Development Project 012-ERD-031 and the PNNL Chemical Imaging Initiative. Part of this material is based upon work supported by the STC Program of the National Science Foundation through BioXFEL under Agreement No. 1231306.

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First Lasing at FLASH 2

Bart Faatz for the FLASH team¹

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FLASH2 has been successfully taken into operation. It has achieved lasing in a wavelength range from 8.5 to 40 nm, most of the time while FLASH1 was delivering beam to user. It has been shown that wavelengths scans can be performed in a fraction of the time needed at FLASH1. Most of 2015 will be dedicated to further characterizing the radiation properties of FLASH2 and building up the remaining photon diagnostics and the first two beamlines for users.

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FLASH - a great facility for time-resolved electron spectroscopy on solids and interfaces

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Free electron lasers (FEL) are unique X-ray sources regarding pulse durations on a fs-scale, coherence properties and peak brilliance. Their potential to study ultrafast dynamics has been demonstrated in time-resolved x-ray spectroscopy experiments on solids, surfaces and in the gas phase.

Time-resolved photoelectron spectroscopy (TR-PES) is a very powerful tool to study non-equilibrium electron dynamics of condensed matter systems. In TR-PES experiments on solid targets the number of photoelectrons per pulse is limited by space charge considerations. Hence the signal-to-noise ratio in these experiments is governed by the detection efficiency for electrons and the repetition rate of the photon source. The superconducting free electron lasers FLASH at DESY and European XFEL operate at very high repetition rates, which is perfectly suited for TR-PES. Statistical fluctuations of the FEL's require single shot detection for ultimate time- and energy resolution. To make optimum use of the unique properties of high-repetition rate FEL's new electron analyzer and detection concepts are necessary.

The talk will review such new concepts, discuss the unique opportunities for TR-PES at FEL sources such as FLASH and give some examples for TR-PES experiments at FLASH illustrating the opportunities to follow ultrafast charge rearrangement in solids and at surfaces.

This work is supported by the BMBF priority program FSP-302: "Free-electron lasers"

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Snapshots of Ultrafast Magnetization Dynamics

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Since the discovery of the ultrafast demagnetization phenomenon by E. Beaurepaire and colleagues in 1996 [1], the field of femtomagnetism has developed to an active research area. Initial experiments relied mostly on all-optical pump-probe techniques, which raised concerns about optical artifacts affecting the measurement. Since these limitations can be overcome by X-ray based techniques, the advent of sources providing femtosecond short X-ray pulses was waited for by the interested community. In addition to giving access to the entire electronic structure of the valence band, X-ray techniques offer additional key advantages. First of all, this is their shorter wavelength, which matches naturally the nanometer length scales expected to be of relevance in ultrafast magnetization dynamics. Furthermore, X-ray techniques provide via the accessible core electron absorption resonances element sensitivity and offer a wide variety of magnetic dichroism effects that can be exploited as contrast mechanism, for example, in scattering experiments. This allows individual probing of the magnetization dynamics of components of complex, heterogeneous materials on the nanometer length scale.

Since the mid 2000's, experiments realized at the BESSY femtoslicing source have indeed fulfilled these expectations. With the advent of X-ray free electron lasers emitting in the XUV and soft X-ray photon energy range, however, unprecedented experimental capabilities became available. In this talk I will review how we [2-4] and others (e.g., Ref. [6]) have exploited the high intensity, the femtosecond short duration and the high degree of coherence of the XFEL pulses to obtain novel insight into the mechanisms underlying ultrafast magnetization dynamics. In particular, I will show how the combined nanometer spatial and femtosecond temporal resolution enabled us to obtain clear evidence for the occurrence of spin transport by the hot, polarized valence electrons, a phenomenon predicted theoretically in 2010 by Battiato and co-workers [6].

In the context of condensed matter experiments, the high peak fluence of the XFEL pulses raises concerns about sample modification and other experimental artifacts hindering the aimed for characterization of a material's property. This is in particular the case in the soft X-ray and XUV photon energy range, where absorption is generally strong. Indeed, we observe already for moderate X-ray fluence values that the intensity of the magnetic probe signal (e.g., the magnetic scattering) may not increase linearly with the intensity of the incident X-ray pulses. In the regime of extreme fluence values (J/cm^2) this can lead to a nearly complete suppression of the magnetic scattering signal [7]. A discussion of these observations and our current understanding of their origin will conclude the presentation.

References:

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Ultrafast Dynamics in Solids:

Coupled Motion of the Lattice, Spins and Orbitals

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The high photon energy and short wavelength of x-rays are uniquely well-suited to quantitatively study the atomic-scale structure of condensed matter. In equilibrium, x-rays have become a well-established means to selectively study different types of time-averaged structures. This has been particularly useful in efforts to better understand modern materials where interactions between the lattice, spins, charge and orbitals have key importance in driving many useful properties.

X-ray FELs have recently added femtosecond time-resolution to these measurements, opening a new frontier where it becomes possible to understand coupling among different degrees of freedom dynamically. Femtosecond time scales are of particular relevance since it overlaps strongly with the typical periods of fundamental excitations such as phonons and magnons.

Here I present a brief overview of some recent experiments that have used the intense short pulses of x-rays from XFELs to measure the dynamics of atomic, spin and orbital structure in solid-state systems. Particular attention will be given to the direct observation of the spin dynamics in a coherent electromagnon in TbMnO₃, where spin and lattice degrees of freedom both act together in a way that potentially opens up new avenues for the control of multiferroic domains [1].

References:

[1] T.Kubacka et al. Science 343, 1333 (2014).

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Cluster Experiments at the Free Electron Laser FERMI

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The ionization dynamics of atomic clusters in intense ultrashort laser pulses has been an active area of research in recent years at near-infrared (NIR), vacuum-ultraviolet, and soft x-ray wavelengths. Multi-component nanoplasmas and their dynamics turn out to be interesting model systems for realizing single-shot ultrafast diffraction imaging of large biomolecules in the x-ray domain. Helium nanodroplets are particularly attractive for studying strong field ionization due to their simple electronic structure and due to the homogeneous density distribution of He droplets. Furthermore, the capacity of He droplets to pick up dopant atoms which aggregate either in the droplet interior or at the droplet surface makes it possible to study heterogeneous systems. Recent experiments on doped helium droplets performed at the LDM beamline [1] at the XUV Free Electron Laser FERMI are presented, demonstrating the importance of highly collective processes driving nanoplasma formation [2,3]. Furthermore, water clusters are probed by XUV – UV pump-probe spectroscopy in order to study fundamental dynamics of electron hydration and atmospheric chemistry processes. The solvation dynamics triggered by the XUV FEL leads surprisingly to 3 isomers of the hydrated electron having individually different formation times.

[1] V. Lyamayev, et. al, J. Phys. B **46** 164007 (2013)

[2] A. LaForge, et al., Scientific Reports, **4**, 3621 (2014)

[3] Y. Ovcharenko, et al., Phys. Rev. Lett. **112**, 073401(2014)

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Overview of the results from the LDM collaboration

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#Now at European XFEL GmbH, Hamburg, Germany

The Low Density Matter (LDM) beamline has been built as part of the FERMI Free Electron Laser based in Trieste, Italy, to serve the atomic-, molecular-, and cluster-physics community, fully exploiting the unique characteristics (spectral purity and stability, full tunability, variable polarization, low-jitter) of FERMI [1].

The beamline is equipped with a set of actively-bendable focussing mirrors arranged in a Kirkpatrick-Baez configuration, capable of attaining a focal spot below 10 μm [2].

The LDM endstation [3] has been built as a modular instrument for electron and ion spectroscopy of the broadest possible class of samples. Beams of atoms, molecules, helium droplets, and clusters (rare gas, molecular, metallic) can be produced by interchangeable pulsed valves. An intermediate pickup chamber provides the possibility to dope clusters with other atoms and molecules.

The endstation is equipped with a Velocity Map Imaging (VMI) spectrometer, an ion Time of Flight (TOF) spectrometer, and a photon scattering spectrometer, which are designed to operate simultaneously or as standalone. In addition, the endstation is capable of accommodating user-supplied sources and detectors (notably, a metastable-atom detector [4], a XUV fluorescence spectrometer [5] a magnetic bottle spectrometer [6]).

After the commissioning phase, the LDM beamline has received the first external users at the end of 2012, and has since been heavily exploited for several users' experiments (both external and internal) as well as machine characterization experiments. The first results have just appeared in the literature [4,7, 8, 9] and will be presented along with most recent results and planned upgrades.

References:

- [1] E. Allaria et al., Nature Photonics **6**, 699 (2012); New J. Phys. **14**, 113009 (2012); Nature Photonics **7**, 913 (2013); Nature Communications **4**, 2476 (2014); Phys. Rev. X **4**, 041040 (2014).
- [2] D Cocco et al., Nucl. Instr. Methods A **616**, 128 (2010); C. Svetina et al., J. Synchrotron Radiation, submitted.
- [3] V. Lyamayev, et. al, J. Phys. B **46**, 164007 (2013)
- [4] M. Žitnik et al., Phys. Rev. Lett. **113**, 193201 (2014)
- [5] L. Poletto et al., Rev. Sci. Instrum. **85**, 103112 (2014)
- [6] J.H.D. Eland et al., Phys. Rev. Lett. **90**, 053003 (2003); L.J. Frasinski et al., Phys. Rev. Lett. **111**, 073002 (2013)
- [7] A. LaForge, et al., Scientific Reports **4**, 3621 (2014)
- [8] Y. Ovcharenko, et al., Phys. Rev. Lett. **112**, 073401 (2014)
- [9] T. Mazza et al., Nature Commun.

Electron rearrangement dynamics in dissociating molecules

Kirsten Schnorr¹, Georg Schmid¹, Sven Augustin¹, Arne Senftleben², Moritz Kurka¹, Artem Rudenko³, Kristina Meyer¹, Matthias Kübel⁴, Matthias Kling⁴, Björn Siemer⁵, Michael Wöstmann⁵, Helmut Zacharias⁵, Rolf Mitzner⁶, Stefan Düsterer⁷, Rolf Treusch⁷, Joachim Ullrich⁸, Claus-Dieter Schröter¹, Thomas Pfeifer¹, Robert Moshhammer¹

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Electron transfer and migration are the two driving mechanisms for many fundamental processes in physics, chemistry, and biology, ranging from X-ray astrophysics to DNA repair. Understanding and controlling these mechanisms are long-standing goals. For experiments on charge rearrangement it is crucial to locate the initial excitation and to trace the change in electron density over time. The advent of XUV and X-ray FELs has opened up exactly this possibility: The strong spatial localization of XUV radiation and X-rays combined with femtosecond pulse durations enables ultra-fast pump-probe experiments either with a delayed replica of the FEL pulse itself or a synchronized optical laser. Here, we use an XUV-pump–XUV-probe scheme to access electron-rearrangement dynamics in dissociating molecular iodine ions. A preceding pulse of 87 eV, delivered by FLASH, multiply ionizes and consequently fragments iodine molecules (I_2). Depending on its temporal delay with respect to the pump pulse, an identical probe pulse may induce electron transfer between the dissociating ions. For small delays and correspondingly small internuclear distances symmetrically charged fragments are observed because charge asymmetry is balanced by electron transfer. In contrast, electron transfer is blocked for large delays and large internuclear separations and we observe asymmetrically charged ion pairs. By means of a Reaction Microscope we record the yield of the various coincident ion pairs from dissociating multiply charged molecular ions as a function of the pump-probe delay. This way, we are able to determine the critical internuclear distances and corresponding time scales up to which electron transfer is possible for the multitude of occurring molecular break-up channels. Our results are in very good agreement with predictions of a classical *over-the-barrier* model demonstrating its validity in the so far unexplored low-energetic energy regime relevant for FEL, plasma and chemistry applications.

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In situ surface crystallography with high-energy X-rays

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Surface X-ray diffraction (SXRD) is one of few surface crystallography methods available for in situ studies under ambient conditions. However, a serious drawback of conventional SXRD, with X-rays in the range of 10-30 keV and a point or small two-dimensional (2D) detector, is the limited amount of data that can be acquired in a reasonable time frame. Exploring 2D maps from a substantial part of reciprocal space is extremely time-consuming, and mapping of the 3D reciprocal space with high resolution is currently impossible even with synchrotron radiation. As a result, the probed surface structure has to be known qualitatively from other measurements, and an unexpected structure may easily be left unnoticed, especially under harsh conditions. Furthermore, obtaining a quantitative data set (from an already qualitatively known structure) takes in the order of 10 hours with traditional use of SXRD. In this contribution I will demonstrate how the use of high-energy (HE) X-rays (85 keV) in combination with a large 2D detector accelerates the data collection by several orders of magnitude and enables full surface-structure determination by 3D mapping of reciprocal space on a time scale suitable for in situ studies [1,2]. In addition, the small diffraction angles, resulting from the high photon energy, and the large detector result in data that are easily presented in a more intuitive way, since each detector image contains the projection of a full plane in reciprocal space and straight lines in reciprocal space correspond to straight lines on the detector.

The demonstration of HESXRD, and how to extract the data, will be concentrating on the surface oxide formation on Pd(100) during CO oxidation under semirealistic conditions. Secondly, I will discuss the faceting of a stepped Pd(553) surface, depending on the O₂:CO ratio, also under semirealistic CO oxidation conditions. This latter example clearly shows how HESXRD gives a more intuitive view of an experimental system that, at least for the non-expert, is not straight-forward in surface diffraction.

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Hydrodynamic alignment and assembly of nano-fibrils resulting in strong cellulose filament

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Wide- and Small Angle X-ray Scattering (WAXS and SAXS) is used to characterise the nanostructure of filaments made from cellulose nano-fibrils, both during preparation and in the final material. Cellulose nanofibrils are obtained from trees and have considerable potential as a building block for biobased materials. Control of the nanostructure is a key to prepare materials with good properties. In this work (Nature Communications 5:4018, 2014) X-ray scattering is used to demonstrate that this control is obtained in an assembly process that combines hydrodynamic alignment and a dispersion-gel transition. The process is based on flow-focusing: a central stream with water and nanofibrils is focused by two outer streams. The fibrils are first aligned when the central stream is accelerated during the focusing. The aligned structure is then locked by the dispersion-gel transition that is induced by ions diffusing into the central stream from the outer stream. The result is a gel thread. After drying of the thread, smooth filaments with a specific ultimate strength that is higher than previously reported filaments made of cellulose nanofibrils are obtained. The specific ultimate strength and other mechanical properties (stiffness, strain-at-break) are functions of the degree of fibril alignment along the filament direction. The degree of alignment can be controlled if the alignment process is faster than gelation and this is achieved if the device is not too small.

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Enabling Flexible Polymer Tandem Solar Cells

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² *Deutsches Elektronen-Synchrotron DESY*

Various strategies are employed to improve the efficiency of polymer solar cells. A large effort is devoted to develop new materials, but also multijunction devices are investigated as a means of improving the power conversion efficiency per area. By using materials that absorb different parts of the solar spectrum in each subcell, a much larger part of the solar light energy is harvested, while also minimizing the loss by thermalization.

The realization of a complete tandem polymer solar cell under ambient conditions using only printing and coating methods on a flexible substrate results in a fully scalable process but also requires accurate control during layer formation to succeed. The serial process where the layers are added one after the other by wet processing leaves plenty of room for error and the process development calls for analytical techniques that allow *in situ* monitoring of structure formation in the photo-active layers during coating. This is accomplished by a newly developed, versatile *in situ* roll-to-roll coating setup for GISAXS/GIWAXS that may be used both at laboratory and synchrotron facilities.

Furthermore, to verify the successful coating of these complex multilayer devices, we have employed ptychographic tomography, that enables 3D reconstruction of the layer stack with the possibility to probe thickness and density of the individual layers in the stack. The use of ptychography on a complete 12-layer solar cell stack is presented and it is shown that this technique provides the necessary insight to enable efficient development of inks and processes for the most critical layers in the tandem stack such as the recombination layer where solvent penetration in fully solution processed 12-layer stacks is critical in eleven of the steps.

The completed device had an open circuit voltage close to the sum of the subcell open circuit voltages, demonstrating true tandem performance for the first time, for a fully roll-coated device.

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Unraveling the activation principles of oncogenic colony stimulating factor 1 receptor: a feast of integrative structural biology

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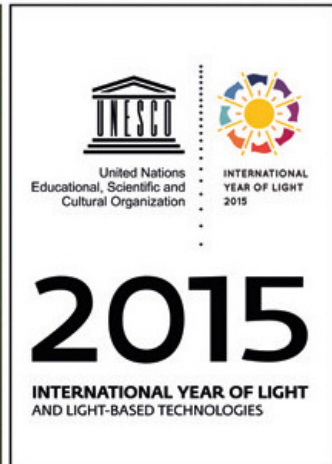
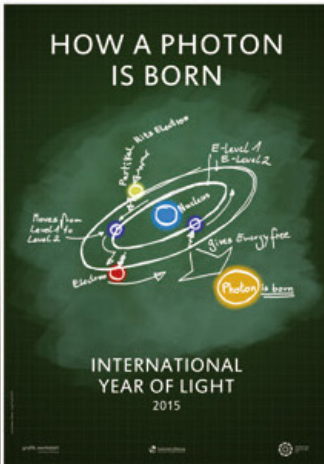
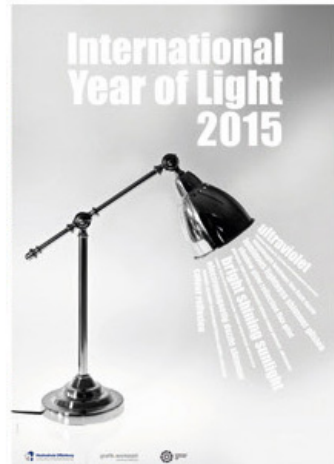
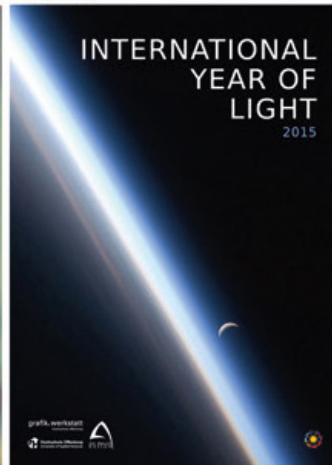
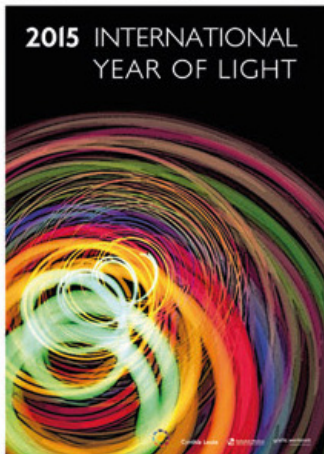
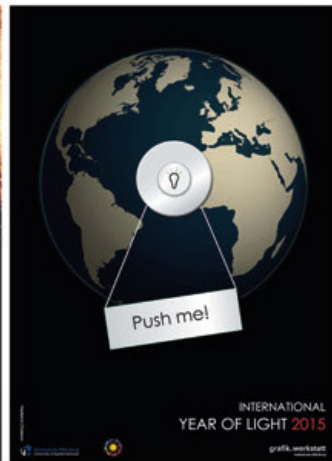
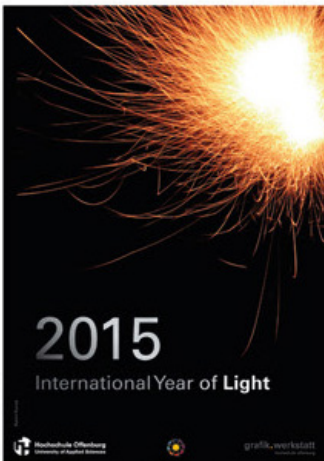
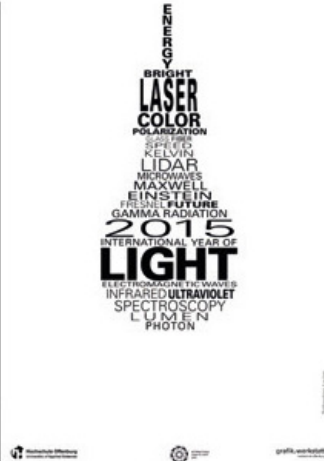
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Colony Stimulating Factor 1 receptor (CSF-1R or FMS) is unique among the hematopoietic class-III Receptor Tyrosine Kinases (RTKIII) because it is activated by two distinct cytokine ligands, CSF-1 and interleukin 34 that share no recognizable sequence similarity. CSF-1R plays pivotal roles in innate and adaptive immunity and is involved in inflammatory diseases and cancer. Despite nearly three decades of research in the (patho)physiology and cellular context of signaling mediated by human CSF-1R and as therapeutic antagonism of CSF-1R is gaining relevance in tumor therapy, detailed structural and mechanistic insights of the interaction interface between human CSF-1R and CSF-1 and a synthesis of mechanistic principles underlying their extracellular assembly have remained elusive. Here, we show via a series of structural undertakings and analyses that dimeric human CSF-1 dramatically restructures its cognate receptor to establish a cytokine-receptor interaction interface dominated by electrostatic interactions to drive the assembly of a ternary extracellular signaling complex featuring homotypic receptor interactions mediated by the fourth Ig-like domain proximal to the membrane. In this context, the inherent intersubunit plasticity of human CSF-1 in the unbound state enables switching to a single signaling-competent conformation. In addition, details of the CSF-1:CSF-1R interaction interface and comparisons with the functional counterpart observed in the human IL-34:CSF-1R complex delineate the structural determinants of the functional duality of CSF-1R. Importantly, recapitulation of diverse structural snapshots of CSF-1R and CSF-1 complexes in light of available structure-function data now establishes that concerted structural plasticity both in the cytokine and the receptor play critical roles in the assembly of a highly cooperative CSF-1:CSF-1R signaling complex. Finally, we map somatic mutations to the extracellular human CSF-1R segment associated with cancer and provide insights into their possible mechanistic consequences. Together, such structural insights allow consolidation of a wide array of available data and will be catalytic in future mechanistic interrogation of CSF-1R mediated signaling and its targeting for therapeutic purposes.

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Programs Satellite Meetings

SATELLITE WORKSHOP AT DESY PHOTON SCIENCE USERS' MEETING 2015

DESY – EXAFS beamlines P64 and P65

DATE Thursday, 29 January 2015, 14:00 h

VENUE Seminar Room 456, Building 25f

14:00	Welcome	
14:10	Status of beamline P64	W. Caliebe <i>DESY</i>
14:30	Status of beamline P65	E. Welter <i>DESY</i>
14:50	QEXAFS for time and spatially resolved studies in catalysis: Status and perspective for the new P64 beamline at PETRAIII	A. Gänzler <i>KIT</i>
15:10	Development of in situ cells for catalytic reactions at beamline P64	A. Jentys <i>TU München</i>
15:30	Coffee Break	
16:00	Status of the Q-EXAFS monochromator for beamline P64	O. Müller <i>Univ. Wuppertal</i>
16:20	Alternative solutions to challenging X-ray absorption measurements in the soft X-ray regime	Hasan Yavas <i>DESY</i>
16:40	Status of the high resolution emission spectrometer	A. Kalinko <i>Univ.Paderborn</i>
17:00	General discussion about the beamlines and current and future <i>Verbundforschung projects</i>	

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CHAIRS Edmund Welter & Wolfgang Caliebe (DESY)

SATELLITE WORKSHOP AT DESY PHOTON SCIENCE USERS' MEETING 2015

High-Energy X-ray Scattering

DATE Thursday, 29 January 2015

VENUE Seminar Room 109, Building 25b

14:30	Welcome	
14:30	Developments and overview for the next user run at P07-EH2	Uta Ruett DESY
14:50	Developments and overview for the next user run at P02.1	Jozef Bednarcik DESY
15:10	Investigating nucleation and growth of nanoparticles in chemical reactions	Ann-Christin Dippel DESY
15:30	Status of P21.2	Ulrich Lienert DESY
15:45	Status of P21.1	Martin von Zimmermann DESY
16:00	Coffee Break	
16:30	User presentations	
18:00	Closing remarks	

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CHAIR Uta Ruett & Martin von Zimmermann (DESY)

SATELLITE MEETING AT DESY PHOTON SCIENCE USERS' MEETING 2015

SAXS/WAXS/GISAXS-User Workshop @ DESY

DATE	Thursday, 29 January 2015
VENUE	Seminar Room 4a + 4b, Building 01b

14:00	Welcome	Rainer Gehrke <i>DESY</i>
14:10	Status of the MiNaXS Beamline	Stephan Roth <i>DESY</i>
14:30	Status of the Nanofocus Endstation	Christina Krywka <i>HZG</i>
14:50	Tailoring Zinc Oxide Nanostructures for Solar Cell Applications	Peter Müller-Buschbaum <i>TU München</i>
15:10	A Non-Equilibrium Transient State of FCC Nanoparticle Crystal Revealed by In Situ GISAXS Tracking of the Solvent Assisted Nanoparticle Self-Assembly	Karol Vegso <i>Institute of Physics, SAS, Bratislava</i>
15:30	In-Operando GISAXS Study of Metal Nanoparticles Growth on Polymer Films	Ezzeldin Metwalli <i>TU München</i>
16:00	Coffee Break	
16:30	Migration in Multicomponent Materials	Svenja Reinke <i>TU Harburg</i>
16:50	X-rays and Microfluidics: Current and Future Developments	Martin Trebbin <i>Univ. Hamburg, CUI</i>
17:10	Polyaddition and Quasiperiodicity in the Morphology of Strained Polyurethanes	Almut Stribeck <i>Univ. Hamburg</i>
17:30	Online Characterization of Cavitation in Rubber Materials Under Different Load Regimes	Konrad Schneider, Karsten Brüning <i>Leibniz-Institut für Polymerforschung, Dresden</i>
17:50	Unveiling the Rotary Diffusion of Nano-Scale Fibril Particles Due to Brownian Motion Under Hydrodynamic Shearing Conditions	Daniel Söderberg, Fredrik Lundell <i>KTH Royal Inst. of Technology, Stockholm</i>
18:10	Final Discussion	

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CHAIR Rainer Gehrke & Stephan Roth (DESY)

SATELLITE WORKSHOP AT DESY PHOTON SCIENCE USERS' MEETING 2015

SFX data analysis workshop

DATE	Thursday, 29 January 2015
VENUE	FLASH Seminar Room, Building 28c

14:00	Introduction to SFX	Henry Chapman <i>CFEL/DESY/Uni Hamburg</i>
14:30	Introduction to CrystFEL	Thomas White <i>CFEL/DESY</i>
15:30	Serial and multi-crystal data collection using synchrotron sources	Gleb Bourenkov <i>EMBL Hamburg</i>
16:00	Coffee Break	
16:30	Cheetah hit-finding software for crystals and single particles	Anton Barty <i>CFEL/DESY</i>
17:10	CrystFEL integration in Karabo for XFEL	Chunhong Yoon <i>CFEL/DESY/XFEL</i>
17:30 – 19:00	Tutorials and demonstrations of software	

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CHAIR Thomas White (CFEL/DESY)

SATELLITE WORKSHOP AT DESY PHOTON SCIENCE USERS' MEETING 2014

The German Engineering Materials Science Centre (GEMS): Status and perspectives of the Helmholtz-Zentrum Geesthacht Outstation at DESY

DATE Thursday, 29 January 2015

VENUE CFEL Seminar Room II (building 99)

13:30	Welcome and status of GEMS	A. Schreyer, M. Müller HZG
13:40	In-situ X-ray scattering during the Birth and Death of Cutting Tool Coatings	Jens Birch Linköping University
14:00	<i>In situ</i> observation of stress fields in TiN thin film performed by scanning X-ray nanodiffraction during indentation	Juraj Todt MU Leoben
14:20	<i>In situ</i> sample environments for nanofocused X-ray beams	Florian Wieland HZG
14:40	<i>In situ</i> high-energy X-ray diffraction experiments for the assessment of the thermal stability of zirconia microparticles	Elisabeth Leib University Hamburg
15:00	Coffee Break	
15:30	<i>In situ</i> measurements at high temperature with synchrotron and neutron probes used for the development of Co-Re-based high temperature alloys	Debashis Mukherji TU Braunschweig
15:50	<i>In situ</i> study of phase transformations during laser-beam welding of a TiAl alloy for grain refinement and mechanical property optimization	Jie Liu HZG
16:10	Final Discussion	

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CHAIR Martin Müller & Andreas Schreyer (HZG)

SATELLITE WORKSHOP AT DESY PHOTON SCIENCE USERS' MEETING 2015

5TH WORKSHOP ON X-RAY NANO-IMAGING OF BIOLOGICAL AND CHEMICAL SYSTEMS AT PETRA III ORGANIZED BY VH-VI-403 OF THE HGF IVF

DATE Thursday, 29 January 2015

VENUE DESY Auditorium, Building 5

14:30	Welcome & Introduction to X-ray Microscopy at PETRA III	C. G. Schroer <i>DESY/Univ. Hamburg</i>
15:00	X-ray powder diffraction mapping and tomography for analysis of (degraded) paint layer systems	F. Vanmeert <i>University of Antwerp</i>
15:20	Tomographic Ptychography of a Budding Yeast Cell Under Cryogenic Conditions	K. Giewekemeyer <i>European XFEL</i>
15:40	Zernike Phase Contrast in X-ray Microscopy	I. Vartiainen <i>PSI</i>
16:00	Coffee Break	
16:30	Cryo-X-ray Tomography of Biological Tissue and In-Situ Element Mapping	W. Schröder <i>DESY</i>
16:50	Water Window Ptychographic Imaging with Characterized Coherent X-Rays	M. Rose <i>DESY</i>
17:10	Nanodiffraction on Single InGaAs Nanowires	T. Stankevic <i>University Copenhagen</i>
17:30	Discussion & Coffee Break	
17:50	Application of X-ray microscopy and ptychography in heterogeneous catalysis	S. Baier <i>KIT</i>
18:10	DESY NanoLab	Andreas Stierle <i>DESY</i>
18:40	Closing remarks & end of meeting	

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CHAIRS Gerald Falkenberg (DESY) & Tim Salditt (Univ. Göttingen)

SATELLITE MEETING AT DESY PHOTON SCIENCE USERS' MEETING 2015

HIBEF USER MEETING AND GENERAL ASSEMBLY

DATE Thursday, 29 January 2015

VENUE CFEL Seminar Room I (building 99)

15:50	First experiences with high-intensity short-pulse laser experiments at XFELs	U. Zastrau <i>Univ. of Jena, Germany</i>
16:10	Ultra-Fast Structural Studies of Shock-Induced Phase Transitions in Bismuth	M. I. McMahon <i>Univ. of Edinburgh, UK</i>
16:30	<i>DiPOLE 100: A 100 J, 10 Hz solid-state laser system for science and industry</i>	T. Butcher <i>CLF STFC, UK</i>
16:50	<i>HIBEF-Status</i>	T. Cowan <i>HZDR, Germany</i>
17:20-19:00	HIBEF General Assembly	

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CHAIR R. Redmer (University of Rostock)

European XFEL HED Instrument User Workshop – Recent Developments

29 January 2015, DESY campus - CFEL, Seminar Room I

Organizers: Thomas Tschentscher, Karen Appel

The high energy density science instrument is one of the six baseline instruments at the European XFEL. With the completion of the technical design report in the first half of 2014, the instrument entered the detailed design phase. This workshop intends to provide to the user community an update on the status of design and proposed implementation. A specific topic is the actual status of the experimental chamber and the detector integration.

It further serves as a platform for communication with users with respect to their detailed requirements. In addition, the current status of the split and delay unit (SDU) will be shown. This optic is provided by the University of Münster in the frame of the BMBF Verbundforschung and will be installed at HED. The presentations will be followed by a time slot allowing for open discussion. This mini-Workshop after a coffee break will be followed by a workshop organized by the HIBEF user consortium.

Programme

Thursday, 29 January 2015

14:00	Welcome	T. Tschentscher	<i>European XFEL, Hamburg</i>
14:05–15:50	European XFEL HED user workshop		
14:05	Experimental chamber and detector integration	M. Nakatsutsumi	<i>European XFEL, Hamburg</i>
14:30	A multilayer-mirror based SDU: Enabling jitterfree hard x-ray pump / hard x-ray probe experiments at the HED instrument	S. Roling	<i>University of Münster</i>
14:50	Discussion with users		
15:30	Coffee Break		
15:50-19:00	DESY-HIBEF General assembly		
19:00	Closeout / Adjourn		

FXE Instrument User Workshop

29 January 2015, DESY campus, CFEL Seminar Room III

Organizers: Federico Boscherini (Bologna University), Christian Bressler (European XFEL)

The FXE instrument is one of the six baseline instruments at the European XFEL. It is specially optimized to permit combined x-ray spectroscopies and scattering experiments on liquid samples with hard x-radiation. This workshop seeks to extend its capabilities towards solid state applications, which includes the design of a special vacuum chamber around the sample position. The Agenda will include an overview of the FXE instrument including a suggestion to investigate key compounds for photocatalytic and photovoltaic applications, followed by presentations towards the solid state option.

Programme

Thursday, 29 January 2015

13:30	Coffee		
13:45	Welcome	C. Bressler F. Boscherini	European XFEL, Hamburg University of Bologna, Italy
14:00 - 14:30	The FXE Scientific Instrument	C. Bressler/N.N.	European XFEL
14:30 - 15:00	Science Case For Solid State Experiments	F. Boscherini	University of Bologna
15:00 - 15:30	Design Details for solid state experiments	M. Pedio	IOM-CNR, Trieste
15:30	Coffee Break		
16:00 - 18:00	Solid State FXE Experiments: User Requirements		
16:00	Femtosecond dynamics of local atomic and electronic structure by spectroscopic study	A. Soldatov / C. Lamberti	Uni Rostov Uni Rostov / Uni Turin
16:30	Exciton transport in Organic semiconductors	M. M. Nielsen	DTU Denmark
17:00	Coupling of structural dynamics in ferroelectrics and strongly correlated electron systems	S. Johnson	ETH Zürich
17:30	Femtosecond dynamics of photoexcited charge carriers in semiconductor photocatalysts	L. Pasquini	University of Bologna
18:00 - 19:00	Discussion: User Needs and Next Steps	F. Boscherini C. Bressler	University of Bologna European XFEL
19:15	Closeout / Adjourn		

Registration at www.xfel.eu/2015-users-meeting

Organizers: Jan Grünert (European XFEL) and Marco Zangrando (FERMI)

The Satellite Workshop on Photon Beam Diagnostics is organized as part of the European XFEL Users' Meeting, like in previous years (except 2014). The target of this Workshop is to bring together the experts in FEL Photon Diagnostics, to strengthen existing collaborations and create new ones, to share the latest progress but also to discuss new experimental methods and instrumentation that seems suited to be used as FEL photon beam diagnostics. Last but not least, progress in this field at the European XFEL facility is presented, and there will be sufficient time for discussions.

Programme

Thursday, 29 January 2015

13:50	Coffee		
14:00	Welcome	Jan Grünert	<i>European XFEL, Hamburg</i>
14:05	Wigner distribution measurement of the spatial coherence properties of FLASH	Tobias Mey	<i>LLG, Göttingen</i>
14:25	Current status of single-shot pulse-length metrology using autocorrelation techniques	Dimitrios Rompotis	<i>University of Hamburg</i>
14:50	Development of on-line spectral and timing diagnostics at SwissFEL	Pavle Juranić	<i>PSI, Villigen</i>
15:15	THz streaking: technical and scientific applications	Adrian Cavalieri	<i>CFEL, Hamburg</i>
15:40	X-ray optics & diagnostics at SACLA and applications to CDI	Changyong Song	<i>RIKEN, Japan</i>
16:05	Coffee Break		
16:20	Polarization monitoring of FEL radiation	Jens Buck	<i>European XFEL, Hamburg</i>
16:55	Gas Based Detectors for FEL Photon Diagnostics	Kai Tiedtke	<i>DESY-FS, Hamburg</i>
17:20	FERMI laser seeding system: general description and latest developments	Miltcho Danailov	<i>FERMI@elettra, Trieste</i>
17:45	A Fast Switching Mirror to precisely direct Photon Beams	Martin Sachwitz	<i>DESY, Zeuthen</i>
18:10-18:30	Discussion/Summary	Jan Grünert	<i>European XFEL, Hamburg</i>
		Marco Zangrando	<i>FERMI@elettra, Trieste</i>
18:30	Closeout / Adjourn		

Workshop: Early Science at MID

26-27 Jan 2015, Albert-Einstein-Ring 19, 22761 Hamburg. 3rd floor, Seminar Room 3.11

The aim of the workshop is to discuss experimental capabilities and science opportunities offered by the Materials Imaging and Dynamics (MID) station expected to begin operation in 2017. The emphasis will be on day one capabilities and early experiments. MID will feature setups for (coherent) scattering and imaging in the energy range 5-25 keV. A synchronized optical laser is available for pump-probe experiments and optional x-ray optics (e.g. monochromator, focusing lenses, mirrors, X-ray split-delay line) allow tailoring the beam parameters. The sample environment provides opportunities for SAXS and WAXS in combination with liquid sample injection, fast sample exchange or scanning, pulsed high magnetic fields, as well as a furnace/cryostat for high and low-temperature measurements. An area detector will be available that can acquire images at 4.5 MHz speed taking full advantage of the XFEL machine parameters.

Program

Monday, 26 January 2015

13:30	Welcome and status of MID instrument	A. Madsen	<i>European XFEL</i>
14:00	MID beam parameters and optics	T. Roth	<i>European XFEL</i>
14:30	MID sample environment and optical laser	J. Hallmann	<i>European XFEL</i>
15:00	Discussion		
15:30-16:00	Coffee Break		
16:00	XFEL science with nano-beams	C. Schroer	<i>DESY and Univ. Hamburg</i>
16:40	Correlations in space and time	C. Gutt	<i>Univ. Siegen</i>

Tuesday, 27 January 2015

9:00	Ultrafast XPCS	G. Grübel	<i>DESY</i>
9:40	Ultrafast pump-probe CXDI	I. Robinson	<i>University College London</i>
10:20-10:40	Coffee Break		
10:40	Ultrafast melting of colloidal crystals observed in pump-probe experiment at LCLS	I. Vartanants	<i>DESY</i>
11:20	Ideas for microfluidics experiments at MID	S. Köster	<i>Univ. Göttingen</i>
12:00	AGIPD: A 2d pixel detector for the European XFEL	H. Graafsma	<i>DESY</i>
12:40-14:00	Lunch Break		
14:00	New opportunities for 0.1-meV-resolution IXS at high-repetition-rate	Y. Shvyd'ko	<i>Argonne National Laboratory</i>
14:40	IXS for studies of collective dynamics: from glass forming systems to proteins	A. Sokolov	<i>Univ. Tennessee</i>
15:20	Dynamics of complex systems studied by XFEL IXS	G. Monaco	<i>Trento University</i>
16:00-16:20	Coffee Break		
16:20	Ultrafast scattering experiments in materials science	P. Gaal	<i>HZ Berlin & Univ. Hamburg</i>
17:00	Femtosecond protein dynamics using split-delay line crystallography	J. J. van Thor	<i>Imperial College London</i>
17:40	Discussion and Close Out		

List of Posters

Poster 1- 165
CFEL (Bldg. 99)

Poster 166 – 347
FLASH2 experimental hall (Bldg. 28k)

I Poster Session Topics

I.1 Instrumentation and techniques

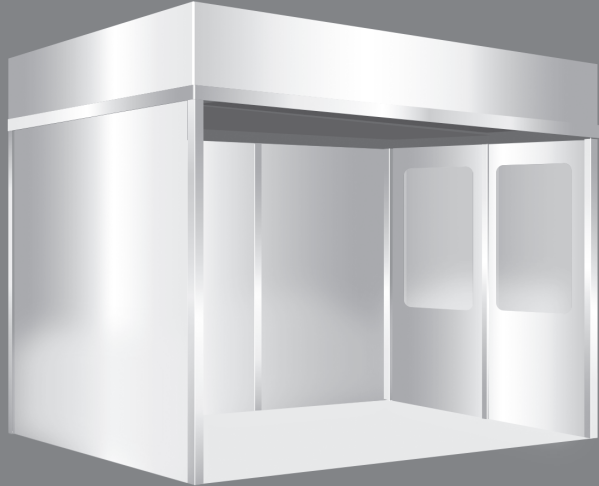
1. Wigner distribution measurements of the spatial coherence properties of FLASH
T. Mey, B. Schäfer, K. Mann, B. Keitel, M. Kuhlmann and E. Plönjes
2. The SFX User Consortia contributions to the SPB/SFX instrument of the European XFEL
S. Stern, H.N. Chapman and A.P. Mancuso
3. Holographic phase contrast imaging with X-ray waveguides
M. Krenkel, M. Töpperwien, M. Bartels, A. Ruhlandt, J. Haber, S. Hoffmann, R. Wilke and T. Salditt
4. PAL-XFEL
B.S. Kim, H.S. Kang, D.E. Kim, K.W. Kim, I.S. Ko and M. H. Cho
5. Current status of soft X-ray beamline at PAL-XFEL
S. Kwon
6. The PG1 beamline at FLASH. Status and perspectives.
S. Dziarzhytski, G. Brenner and H. Weigelt
7. ID09b beamline: upgrade program
A. Leshchev, B. Khakhulin, C. Newby, D. Ribault and E. Wulff
8. Photon Pulse Length Determination by Spectral Correlation Analysis at FLASH
G. Brenner, S. Düsterer and R. Engel
9. Swift: software for online monitoring of serial femtosecond X-ray diffraction experiments
B. Daurer, M. Hantke, C. Nettelblad and F. Maia
10. New Data Storage and Analysis facility for PETRA III Experiments
M. Gasthuber, S. Dietrich, U. Ensslin, M. Strutz, S. Aplin and M. Kuhn
11. COMO – State-, size-, and isomer-selected samples of polar molecules and clusters
J. Küpper
12. Phase Shifters for the FLASH2 FEL
M. Tischer, P. Neumann, A. Schöps and P. Vagin
13. Magnetic Tuning of FLASH2 Undulators
O. Bilani, T.L. Cheung, P. Neumann, A. Schöps, M. Tischer, S. Tripathi, P. Vagin and T. Vielitz
14. Recent developments of PALM setup at PSI for FEL pulse measurements
I. Gorgisyan, P.N. Juranić, R. Ischebeck, A. Stepanov, V. Schlott, C. Pradervand, L. Patthey, M. Radović, R. Abela, C. P. Hauri, B. Monoszlai, R. Ivanov, P. Peier, J. Liu, T. Togashi, S. Owada, K. Ogawa, T. Katayama, M. Yabashi and L. Rivkin
15. Magnetic Alignment and Pole Tuning Procedures for European XFEL Undulators
B. Ketenoglu, J. Pflüger, Y. Li, U. Englisch and F. Wolff-Fabris
16. Chamber system for consistent Residual Gas Analyzer to provide high quality measurement for vacuum acceptance test
T. Korsch, J. Eidam, A. Bartmann and P. Frankenberger
17. Gas-cluster targets dedicated for experiments with high power and high intensity laser systems
L. Wegrzyński, P. Wachulak, A. Bartnik, T. Fok and H. Hiedorowicz
18. Crystal bender for double crystal Laue monochromator at P21
A. Gutschmidt

19. In-situ XRD and nanoindentation at PETRA III
J. Michalikova, S. Michalik, J. Bednarcik, G. Mohanty, J. Wehrs, P. Hvizdos, O. Milkovic, K. Saksl, H. Franz, J. Michler and J.-M. Brequet
20. Russian-German Nanodiffraction Beamline at PETRA Extension
D. Novikov and J. Raabe
21. dada: a web-based collaborative X-ray images visualisation and analysis tool
M. Osterhoff and T. Salditt
22. Sample Environment at the European XFEL Facility
S. Bari, C. Deiter, E. Delmas, M. Kitel, K. Lorenzen, J. Moore and J. Schulz
23. Mapping temperature gradients of cryo-cooler
J. Bednarcik, J. Pasztorova, A. Ehnes and H.-P. Liermann
24. The Online Photoionization Spectrometer OPIS at FLASH
M. Braune, G. Brenner, S. Dziarzhytski, S. Grunewald, M. Lomperski, F. Jastrow and K. Tiedtke
25. A Fast Solid Sample Scanner for the XFEL instruments
C. Deiter, M. Kittel, J. Moore and J. Schulz
26. The CAMP User Endstation at FLASH BL1 - First Results
D. Rolles, B. Erk, C. Bomme, R. Boll, E. Savelevy, E. Ploenjes-Palm, B. Keitel, K. Tiedtke, A. Sorokin, G. Brenner, S. Dziarzhytski, R. Treusch, R. Moshhammer, J. P. Müller, T. Möller and the CAMP collaboration
27. Stability issues on high heat-load cryo-cooled monochromators at PETRA III
R. Döhrmann, I. Sergeev, J. Heuer, J. Horbach and H. Schulte-Schrepping
28. Status of P64 - High-Flux EXAFS Beamline at PETRA III
W. Caliebe, U. Brüggmann and J. Rubeck
29. Obtaining high degree of circular polarization at X-ray FELs via a reverse undulator taper
E.A. Schneidmiller and M.V. Yurkov
30. Application of the longitudinal space charge amplifier in X-ray FEL facilities
E.A. Schneidmiller and M.V. Yurkov
31. Statistical properties of the radiation from SASE FEL operating in a post-saturation regime with and without undulator tapering
E.A. Schneidmiller and M.V. Yurkov
32. Optimization of a high efficiency free electron laser amplifier
E.A. Schneidmiller and M.V. Yurkov
33. Advances in design of gas focused micro jets
K. Beyerlein, J. Knoška, M. Heymann D. Oberthur, L. Chavas, M. Wiedorn, L. Adriano, H. Nakatsutsumi, H. Chapman, S. Bajt, B. Šarler, K. Mramor and R. Zahoor
34. In Situ Study of the Growth and Degradation Processes in Tetragonal Lysozyme Crystals on a Silicon Substrate by High-Resolution X-ray Diffractometry
M. Marchenkova, M. Kovalchuk, P. Prosekov, A. Blagov, Yu. D'yakova, E. Tereshchenko, Yu. Pisarevskii and O. Kondratev
35. Results on seeding development at FLASH
S. Ackermann, P. Amstutz, R. Assmann, A. Azima, J. Bödewadt, M. Drescher, N. Ekanayake, B. Faatz, K. Hacker, I. Hartl, R. Ivanov, S. Khan, T. Laarmann, L.L. Lazzarino, C. Lechner, Th. Maltezopoulos, R. Molo, J. Müller, T. Plath, J. Rossbach and T. Tanikava
36. Magnetic Field and Cryogenic Sample Environments at XFEL
J.D. Moore, C. Deiter and J. Schulz

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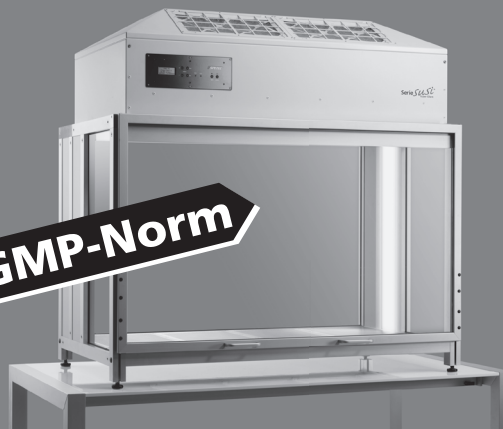
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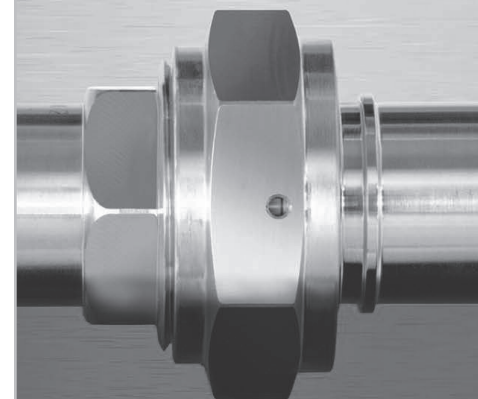


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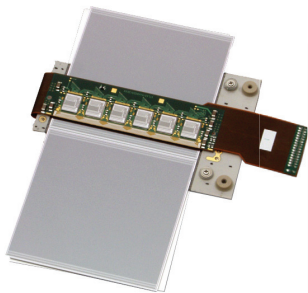
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37. Optical design of hRIXS for the European XFEL
Y.Y. Peng, A. Föhlisch, A. Scherz and G. Ghiringhell
38. The PERCIVAL soft X-rays detector
A. Marras, C.B. Wunderer, S. Lange, M. Viti, M. Bayer, S. Smoljanin, I. Shevyakov, Q. Xia, M. Zimmer, P. Goettlicher, B. Marsh, I. Sedgwick, D. Das, R. Turchetta, L. Stebel, G. Cautero, D. Giuressi, R. Menk, N. Tartoni, J. Marchal, T. Nicholls and H. Graafsma
39. AGIPD: The Adaptive Gain Integrating Pixel Detector at the European XFEL
A. Allahgholi, J. Becker, L. Bianco, A. Delfs, P. Göttlicher, H. Graafsma, H. Hirsemann, S. Jack, A. Klyuev, S. Lange, A. Marras, I. Sheviakov, U. Trunk, Q. Xia, J. Zhang, M. Zimmer, R. Dinapoli, D. Greiffenberg, D. Mezza, A. Mozzanica, B. Schmitt, X. Shi, R. Klanner, J. Schwandt, M. Gronewald, H. Krüger and S. Rah
40. LAMBDA pixel detector and high-Z sensors
D. Pennicard, S. Smoljanin, M. Sarajlic, J. Zhang, B. Struth, F. Pithan, H. Hirsemann and H. Graafsma
41. Status of the Extreme Conditions Beamline (ECB) P02.2
H. P. Liermann, Z. Konopkova, K. Glazyrin, W. Morgenroth and M. Wendt
42. Status of the High Resolution Powder Diffraction Beamline (HRDB, P02.1)
H. P. Liermann, J. Bednarcik, M. Hinterstein and M. Wendt
43. The Resonant Scattering and Diffraction Beamline P09
J. Strempler, S. Francoual, A. Skaugen, J. Mardegan and D. Reuther
44. Calibration and Calibration Data Processing Concepts at the European XFEL
S. Hauf, D. Boukhelef, P. Gessler, B. Heisen, M. Kuster, L. Maia, N. Raab, J. Sztuk-Dambietz, M. Turcato, K. Wrona, G. Weidenspointner and C. Youngman
45. The nanotomography endstation at the P05 beamline at PETRA III
M. Ogurreck, I. Greving, F. Wilde, F. Beckmann, T. Dose, F. Marschall, A. Last, J. do Rosario, E. W. Leib, M. Müller and A. Schreyer
46. Magnetic properties of XFEL.EU Insertion Devices obtained from moving wire measurements
M. Viehweger, M. Knoll and J. Pflüger
47. Preliminary Tests and Status of DSSC-Ladder Camera
M. Donato, K. Hansen, M. Kuster, M. Turcato and M. Porro
48. New Argus spectrometer for dynamic-XPS measurements at beamline P04
S. Babenkov, V. Aristov, O. Molodtsova, F. Scholz, J. Seltmann, I. Shevchuk, L. Glaser and J. Viehhaus
49. Macromolecular Crystallography at Beamline P11 at PETRA III
A. Burkhardt, T. Pakendorf, B. Reime, N. Stuebe, J. Roever, P. Fischer, J. Meyer, M. Warmer, D. Gories, S. Panneerselvam and A. Meents
50. Bestimmung von Korrosionseigenschaften von Implantatwerkstoffen
T. Dose, F. Wilde, F. Feyerabend and R. Willumeit-Römer
51. Coherence properties of SACLA and proof-of-principle XPCS in the hard X-ray regime
F. Lehmkuhler, P. Kwasniewski, W. Roseker, B. Fischer, M.A. Schroer, M. Sikorski, S. Song, J. Glowina, M. Chollet, S. Nelson, K. Tono, T. Katayama, M. Yabashi, T. Ishikawa, A. Robert, C. Gutt and G. Grübel
52. The Imaging Beamline P05 @ PETRA III - Characterizing Biomaterials with SR μ CT
I. Greving, J.U. Hammel, J. Herzen, M. Ogurreck, L. Lottermoser, A. Hipp, T. Dose, R. Kirchhof, H. Burmester, M. Müller, A. Schreyer, F. Wilde and F. Beckmann
53. Development of a Multi-hit Capable Time- and Spatially Resolving Detector for Time Resolved Electron Spectroscopy
N. Gerken, A. Oelsner, Y. Acremann, M. Scholz and W. Wurth

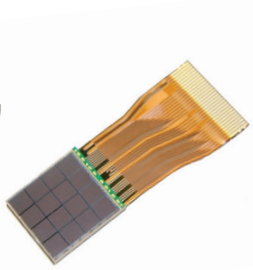
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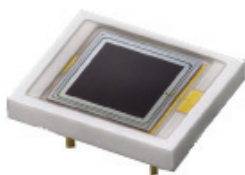
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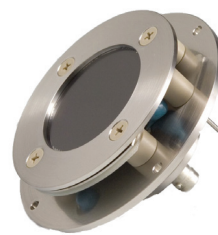
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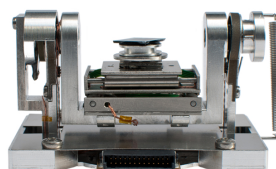
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TEM sample preparation



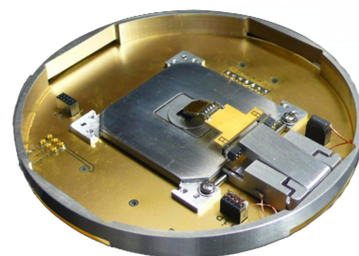
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in-situ AFM



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54. Space Charge Corrected Electron Momentum Microscope for Time-Resolved Hard X-ray Photoemission at the European XFEL
M. Scholz, G. Schönhense, Y. Acremann, K. Medjanik, N. Gerken and W. Wurth
55. X-ray Raman Spectroscopy of organic molecules in a liquid jet
M. Taherkhani, M. Harder, D. Ketenoglu and H. Yavas
56. Characterization of materials and electronic/molecular processes in a broad spectral range
V. Sablinskas, J. Bauzys and V. Balevicius
57. Non-Negative Factor Analysis Methods for XRF Imaging
M. Alfeld, M. Wahabzada, C. Bauckhage, K. Kersting, G. Wellenreuther and G. Falkenberg
58. Double-sided Fresnel zone plates
I. Mohacsi, I. Vartiainen, M. Guizar-Sicairos, P. Karvinen, V. A. Guzenko, E. Mueller, C. M. Kewish, A. Somogyi and C. David
59. Refractive Lamellar Lenses (RLL)
M. Scholz, F. Seiboth, J. Patommel, J. Reinhardt, R. Hoppe, F. Wittwer, G. Falkenberg, A. Jahn, M. Knaut and C. Schroer
60. Fabrication of wedged multilayer Laue lenses
M. Prasciolu, S. Bolmer, A. F. G. Leontowich, H. N. Chapman and S. Bajt
61. Status of the PETRA III extension EXAFS beamline P65
E. Welter, R. Chernikov and M. Herrmann
62. Laboratory Infrastructure for Detector Calibration & Characterization at XFEL.EU - Status and First Results
J. Sztuk-Dambietz and N. Raab on behalf of the Detector Development Group at XFEL.EU
63. Scientific Services at Vilnius University Physical sciences and technology center
J. Bauzys
64. High Accuracy shimming technique for the Phase Shifters of the European XFEL
Y. Li and J. Pflueger
65. IHEP Phase Shifter Results
H. Lu, S. Sun, Z. Li, L. Gong, Y. Yang, Y. Sun, Y. Li, W. Frederik and J. Pflueger
66. Very-high-intracavity-power thin-disk lasers
B. Deppe, G. Huber, C. Kränkel and J. Küpper
67. Liquid Jets for Experiments on Complex Liquids
I. Steinke, M. Walther, F. Lehmkuhler, J. Valerio, P. Wochner, S. Lee, M. Sikorski, S. Song, R. Hartmann, M. Huth, L. Strüder, A. Robert, P. Fuoss, G.B. Stephenson and G. Grübel
68. DiProl, the coherent diffraction imaging end-station at FERMI@Elettra FEL user facility: present status and future research opportunities.
F. Capotondi, E. Pedersoli, M. Manfreda, L. Raimondi, M. Zangrando, F. Bencivenga, C. Masciovecchio, M. Danailov and M. Kiskinova
69. GPU based data analysis on the example of time-of-flight spectroscopy
G. Hartmann, S. Duesterer and J. Viefhaus
70. Integrated Control System Environment for High-throughput Tomography
I. Khokhriakov and F. Beckmann
71. Instrumentation of the DESY endstation at the high energy X-ray beamline P07
O. Gutowski, M. v. Zimmermann and U. Rütt
72. The High Resolution Diffraction Beamline P08
K. Perumal, J. Wernecke, D. Reuther, O.H. Seeck and U. Rütt

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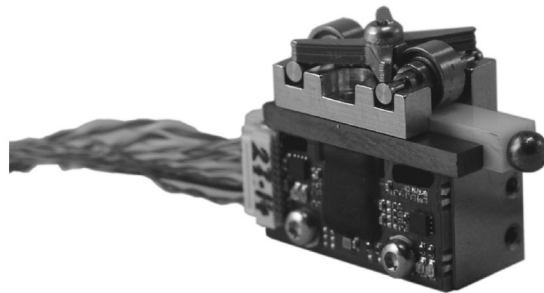


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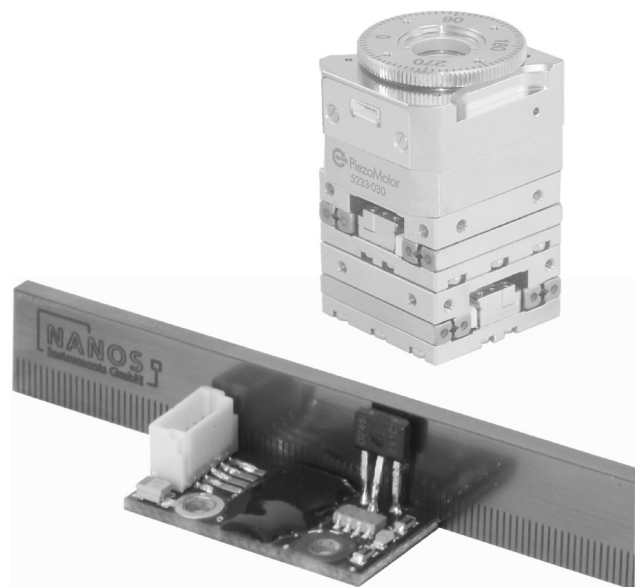
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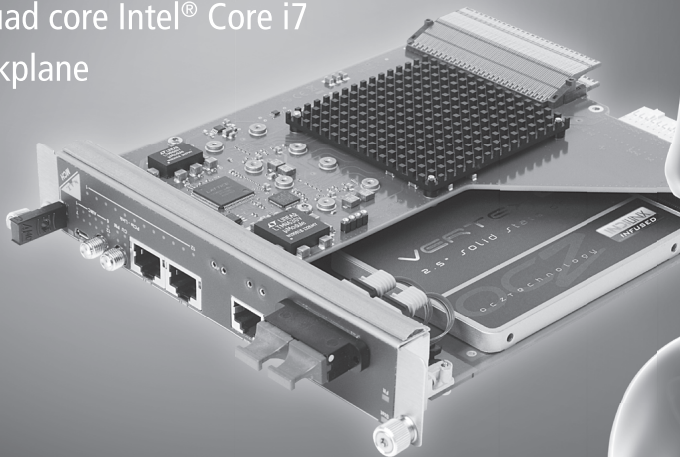
73. Planning status of the side station at P21
M. v. Zimmermann, R. Nowak, O. Gutowski, S. Gutschmidt and S. Sonntag
74. Intelligent detector for grating-based phase-contrast tomography
P. Lytaev, A. Hipp, L. Lottermoser, I. Greving, I. Khokhriakov, J. Plewka, J. Burmester, M. Caselle, M. Vogelgesang, S. Chilingaryan, A. Kopmann, M. Balzer, A. Schreyer and F. Beckmann
75. WPG: Interactive Framework for X-ray FEL Optics Design and Simulation
A. Buzmakov, O. Chubar, L. Samoylova and H. Sinn
76. Planned optical pump - X-ray probe option of the LISA Liquid Surface Diffractometer
J. Warias, C. Lemke, M. Greve, U. Rütt, O. Magnussen and B. Murphy
77. Structural rheology over all length scales
E. Stellamanns, S. Schulze and M. Sprung
78. High Efficiency Hard X-ray Point Focusing with Crossed Wedged Multilayer Laue Lenses
A. Kubec, K. Melzer, S. Niese, S. Braun and J. Patommel
79. Full spectro-temporal characterization of XUV FEL via SPIDER technique
B. Mahieu
80. Development of a scanning transmission X-ray microscope for the beamline P04 at PETRA III
K. Andrianov, T. Nisius, L. Lühl, W. Malzer, J. Ewald, B. Kanngießer and T. Wilhein
81. Femtosecond Pump-Probe Diffraction and Scattering Instrument ESB at SwissFEL
G. Ingold, P. Beau, C. Erny, U. Flechsig, R. Follath, S. Hunziker, P. Juranic, A. Mozzanica, L. Patthey, B. Patterson, L. Sala and R. Abela
82. Gas-monitor detectors for X-ray FELs
A.A. Sorokin, Y. Bican, S. Bonfigt, M. Brachmanski, M. Braune, U.F. Jastrow, S. Kreis and K. Tiedtke
83. Fabrication of ultrathin multilayer structures (metal/metal or metal/oxide) for X-ray and Synchrotron radiation optics.
V. Ksianzou and S. Sachrader
84. Spectrometer for Single Pulse Photon Energy Characterization at FLASH
S. Palutke, N. C. Gerken, K. Mertens, S. Klumpp, A. Mozzanica, B. Schmitt, C. Wunderer, H. Graaf-sma, K.-H. Meiwes-Broer, W. Wurth and M. Martins
85. Angle-, spin-, and position-resolving photoelectron spectroscopy at the variable polarization soft X-ray beamline P04
A. Quer, M. Kalläne, E. Kröger, T. Riedel, H. Bentmann, C. Seibel, H. Maaß, J. Viefhaus, F. Reinert, L. Kipp and K. Rossnagel
86. Inspection of the FLASH mirrors after 8 years of user operation
K. Tiedtke, F. Siewert, H. Schulte-Schrepping, R. Treusch and F. Scholze
87. The Long View: Automatic Powder Diffraction Data Reduction on Long Duration Experiments Using DAWN
M.T. Wharmby, J. Filik, M. Basham, P. Chang, B. El Kassaby, M. Gerring and A. Ashton
88. High resolution dispersive X-ray spectrometer at PETRA III P64 beamline: perspectives
A. Kalinko, W. Caliebe and M. Bauer
89. Nanodiffraction Meets Materials Science, at P03 beamline
C. Krywka, S. Hrkac, I. Krasnov, D.C.F. Wieland, S.V. Roth and M. Müller
90. Femtosecond X-ray Experiments: Towards an ultimate high-speed molecular camera
W. Gawelda, A. Galler, D. Khakhulin and C. Bressler
91. Design and Tests of X-ray Beam Diagnostic Imagers for the European XFEL
A. Koch, W. Freund, M. Planas and J. Gruenert

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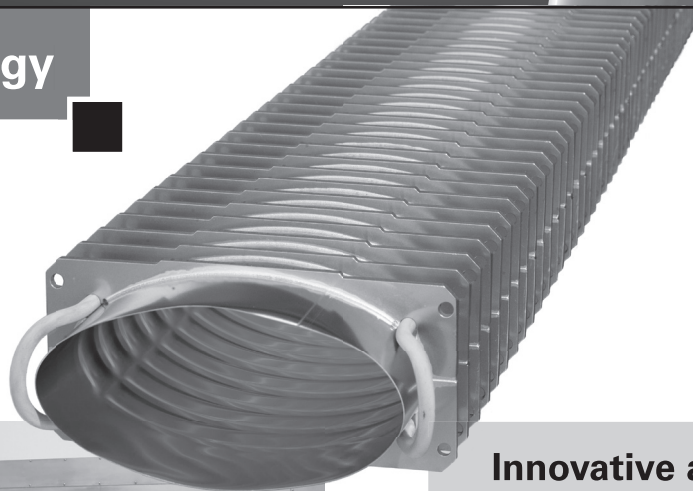
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92. Status of the K-monochromator system for undulator commissioning
W. Freund, A. Koch and J. Gruenert
93. FLASH2 Photon Beamlines
M. Kuhlmann and E. Ploenjes
94. Status of mechanical design of diagnostic devices
M. Planas, J. Buck, F. Dietrich, W. Freund, J. Grünert, A. Koch and J. Liu
95. X-ray Raman Scattering Measurements at P01-PETRA III
D. Ketenoglu, M. Harder, M. Taherkhani, J. Herda, A. Siemens, F.U. Dill, H.C. Wille and H. Yavas
96. Resonant Inelastic X-ray Scattering Spectrometer with 26 meV Resolution at Cu K-edge
D. Ketenoglu, M. Harder, M. Taherkhani, J. Herda, A. Siemens, F.U. Dill, H.C. Wille and H. Yavas
97. Experimental Station A at SwissFEL
G. Knopp, C. Milne, J. Szlachetko, T. Penfold, B. Patterson and R. Abela
98. Current status and developments @ P24.2 (PEX-E)
C. Paulmann, A. Berghaeuser, D. Ropers and U. Bismayer
99. On the problem of measurements of polarization of the FEL radiation
S.V. Bobashev and A.A. Markova
100. xrt - open source ray tracing tool
R. Chernikov and K. Klementiev
101. Steering a jet of particles by optically induced forces
N. Eckerskorn, R. Bowman, R. A. Kirian, S. Awel, J. Küpper, H. N. Chapman, M. J. Padgett and A. V. Rode
102. Measurement of X-ray excited optical luminescence with femtosecond time resolution
H. Redlin, N. Gerasimova, S. Dziarzhyski, A. Kotlov, T. Malyi, N. Schirmel and H. Weigelt
103. Iterative phase retrieval using GPGPU
L. Mikes
104. Visualizing aerosol-particle injection for diffractive-imaging experiments
S. Awel, R. Kirian, N. Eckerskorn, A. Rode, J. Küpper and H. Chapman
105. Labor zur Einzelanalyse von funktionellen Nanopartikeln: SingleParticleLab
B. Langer, M. Eritt, D. Duft, M. Nachbar, T. Leisner and E. Rühl
106. High Speed Atomic Force Microscopies for SR techniques
L. Costa, M.V. Vitorino, M.S. Rodrigues, A. Panzarella and F. Comin
107. The Swedish Beamline at the PETRA III Extension: In-line branch
S. Gutschmidt, S. Haas and U. Lienert
108. Phase retarder plates and fast circular polarization switching at beamline P09 at PETRA III at DESY
S. Francoual, J. Strempler, L. Bouchenoire, C. Mazzoli, H. Walker, D. Reuther, T. Spitzbart, H. Zink, R. H. Morris and V. Kapaklis
109. A high fringe visibility glancing-angle grating interferometer for high-energy X-ray phase-contrast CT
A. Sarapata, J. W. Stayman, M. Finkenthal, J. H. Siewerdsen, F. Pfeiffer and D. Stutman
110. Quantitative multi-contrast imaging using high-energy grating-based X-ray phase-contrast CT for biomedical and materials science applications
A. Sarapata, M. Willner, M. Walter, T. Duttendorfer, K. Kaiser, P. Meyer, C. Braun, A. Fingerle, P.B. Noel, F. Pfeiffer and J. Herzen
111. First Stability Results at PETRA III Extension Monochromators
J. Horbach, I. Sergeev, J. Heuer and R. Döhrmann

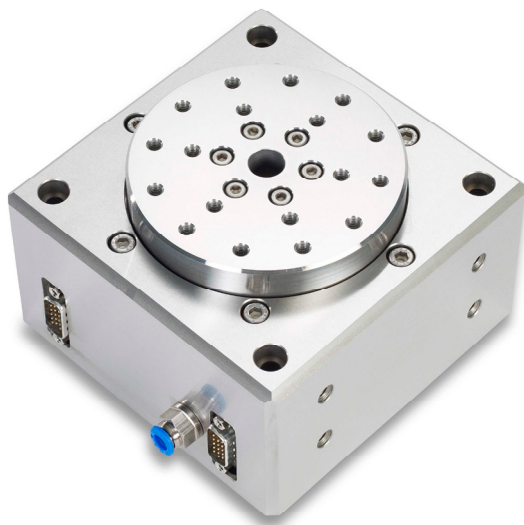
112. Direct phasing of Finite crystals illuminated with a free-electron laser
K.R. Beyerlein, R. A. Kirian, R. J. Bean, M. Barthelmess, C.H. Yoon, F. Wang, F. Capotondi, E. Pedersoli, J. Chen, R. Milane, A. Barty and H. N. Chapman
113. Dedicated UHV magnetron sputtering and cathodic arc deposition system for in-situ high energy X-ray scattering during industrially-relevant thin film growth
J. Schroeder, W. Thompson, B. Howard, L. Rogström, N. Schell, M. Johansson, M. Odén, N. Ghafoor, E. Nothnagel, A. Shepard, A. Schreyer, J. Greer and J. Birch
114. Spatial and temporal coherent properties of the FEL from the hard X-ray delay line
W. Roseker, S. Lee, M. Walther, B. Fischer, A. Robert, F. Lehmkuhler, I. Steinke, M. Sprung, P. Fuoss, G.B. Stephenson and G. Grübel
115. Optimizing coherence and flux by astigmatic prefocusing
J. Patommel and C. G. Schroer
116. Stereo imaging using single FEL pulse diffraction
F. Wang, H. Fleckenstein, A. Morgan, M. Barthelmess, K. Beyerlein, R. Bean, R. Kirian, V. Mariani, L. Gumprecht, A. Barty, K. Sokolowski-Tinten, S. Bajt and H. N. Chapman
117. Fluorescence chemical dosimetry of ionizing radiation pulses in aqueous solutions
M. Precek, P. Kubelik, L. Juha, U. Schmidhammer, J. Ma, P. Jeunesse, A. Demarque, J.-P. Larbre and M. Mostafavi
118. Hard X-ray High Resolution Single-shot Spectrometer for X-ray Photon Diagnostics at the European XFEL
N. Kujala, J. Rehanek and J. Gruenert
119. Multimode high-resolution ptychographic imaging
K. Stachnik, I. Mohacsi, I. Vartiainen, N. Stuebe, M. Warmer, J. Meyer, C. David and A. Meents
120. Spin polarization in the ultrafast regime: design and commissioning of a dedicated set-up
T. Pincelli, V. Petrov, R. Ciprian, G. Cautero, G. Brajnik, R. Sergo, G. Panaccione and G. Rossi
121. The SPB/SFX Instrument at the European XFEL
R. Bean, K. Giewekemeyer, A. Aquila, G. Borchers, M. Messerschmidt, S. Raabe, N. Reimers, S. Stern, T. Sato, P. Vagovic, A.P. Mancuso and SFX Consortium
122. Kurchatov synchrotron-neutron research facility. Beamlines and applications
R.A. Senin, Y.V. Zubavichus, V.T. Em, E.Kh. Mukhamedzhanov and M.V. Kovalchuk
123. Water Window Ptychographic Imaging with Characterized Coherent X-rays
M. Rose, P. Skopintsev, D. Dzhigaev, O. Gorobtsov, T. Senkbeil, A.R. von Gundlach, T. Gorniak, A. Shabalin, J. Viehhaus, A. Rosenhahn and I. A. Vartanyants
124. Semi-Transparent Central Stop in High-Resolution X-ray Ptychography
M. Vassholz, R.N. Wilke and T. Salditt
125. Ion Based Hit-Finding of Aerosolized Particles at the Repetition Rate of the European XFEL
J. Bielecki, N. Timneanu, A. Zani, J. Andreasson and J. Hajdu
126. A micro-patterned silicon chip as sample holder for macromolecular crystallography experiments with minimal background scattering
P. Roedig, I. Vartiainen, R. Duman, S. Panneerselvam, N. Stuebe, O. Lorbeer, M. Warmer, G. Sutton, D.I. Stuart, E. Weckert, C. David, A. Wagner and A. Meents
127. Current Status of the Von-Hamos Spectrometer at XFEL and PETRA III
M. Harder, H. Yavas, A. Galler, C. Bressler, T. Büning and C. Sternemann
128. Commissioning the Microfocus Optics for the CAMP Chamber at FLASH
J. P. Müller, B. Erk, R. Boll, C. Bomme, E. Savelyev, G. Brenner, S. Dziarzhytski, B. Keitel, M. Kuhlmann, E. Plönjes, K. Tiedke, R. Treusch, M. Sauppe, A. Swiderski, L. Gumprecht, T. Tilp, F. Siewert, T. Zeschke, T. Möller, D. Rolles and CAMP Collaboration

129. Progress at the Variable Polarization XUV Beamline P04 at PETRA III
L. Dammann, L. Glaser, G. Hartmann, S. Heisch, F. Scholz, J. Seltmann, I. Shevchuk and J. Viefhaus
130. Spatial coherence measurements utilizing Non-Redundant Arrays of slits at P04 beamline at PETRA III
P. Skopintsev, A. Singer, J. Bach, L. Müller, B. Beyersdorf, S. Schleitzer, O. Gorobtsov, A. Shabalin, R. Kurta, D. Dzhigaev, O.M. Yefanov, L. Glaser, A. Sakdinawat, Y. Liu, G. Grübel, R. Frömter, H.P. Oepen, J. Viefhaus and I.A. Vartanyants

I.2 Biology and life sciences

131. Recent spectroscopic insights into the electronic structure of FeMo cofactor in nitrogenase
J. Kowalska, R. Bjornsson, F. A. Lima, F. Neese and S. DeBeer
132. Full-field phase contrast tomography in a divergent X-ray beam
M. Krenkel, M. Töpperwien, M. Bartels, A. Ruhlandt, A. Markus, C. Dullin, F. Alves, W. Möbius and T. Salditt
133. Propagation-based phase contrast tomography of neuronal tissue
M. Töpperwien, M. Krenkel, A. Ruhlandt, J. Goldschmidt, P. Lingor and T. Salditt
134. Understanding the toxicity of arsenic, cadmium and copper in the model plant *Ceratophyllum demersum* using μ XRF tomography and μ -XANES
H. Küpper, G. Wellenreuther, S. Mishra, E. Andresen, G. Thomas and M. Alfeld
135. Complementary X-ray tomography techniques for histology-validated 3D imaging of soft and hard tissues using plaque-containing blood vessels as examples
M. Buscema, M.N. Holme, G. Schulz, H. Deyhle, A. Khimchenko, P. Thalmann, S. Hieber, T. Weitkamp, F. Beckmann, J.A. Lobrinus, F. Rikhtegar, V. Kurtcuoglu, I. Zanette, T. Saxer and B. Müller
136. The sample preparation & characterization facility EMBL@PETRA3
R. Meijers, S. Kozak, V. Vieira and S. Boivin
137. Insights into the Stratum Corneum Lipid Organization in an Epidermal Cell Culture Model by Means of SAXS
J. Kuntsche, A. Herre, A. Fahr, S. Funari and P. Garidel
138. Looking inside human cerebellum by X-ray tomography
M. Czyzycki, M. Lankosz, P. Wrobel, D. Adamek and L. Chmura
139. Cryogenic Analysis of Frozen Hydrated Biological Tissue at the Hard X-ray Micro-Probe Beamline P06 at PETRA III
W. H. Schroeder, B. DeSamber, T. Claußen, E. Vergucht, J. Garrevoet, U. Boesenberg, P. Alraun, M. Alfeld, M. Czyzycki, M. Roeb, P. Bhargava, J. Patommel, C. Schroer, B. Vekemans, L. Vincze and G. Falkenberg
140. Structural biology using in vivo grown protein crystals
L. Redecke, M. Klinge, R. Schönherr, F. Lübber, J.M. Rudolph, S. Schneegans, C. Gati, G. Bourenkov, K. Nass, D. Rehders, D. Oberthür, F. Stellato, B.P. Sommer, T.A. White, A. Barty, J. Martinez-Costas, T.S. Schneider, H.N. Chapman, M. Duszynko, R. Duden and C. Betzel
141. Preparation of protein nano crystals and scoring by dynamic light scattering on the basis of their radius distribution pattern
R. Schubert, A. Meyer, M. Künz, K. Dierks, M. Perbandt and Ch. Betzel
142. Diffraction tagging of self-assembled lipid nanoparticles for membrane protein research
J. Oertel, E. Fischermeier, A. Sayed, G. Gabernet and K. Fahmy
143. The influence of the composition of selected solid drug forms on the release of iron ions
A. Lisik, L.E. Cavlaz and W. Musial

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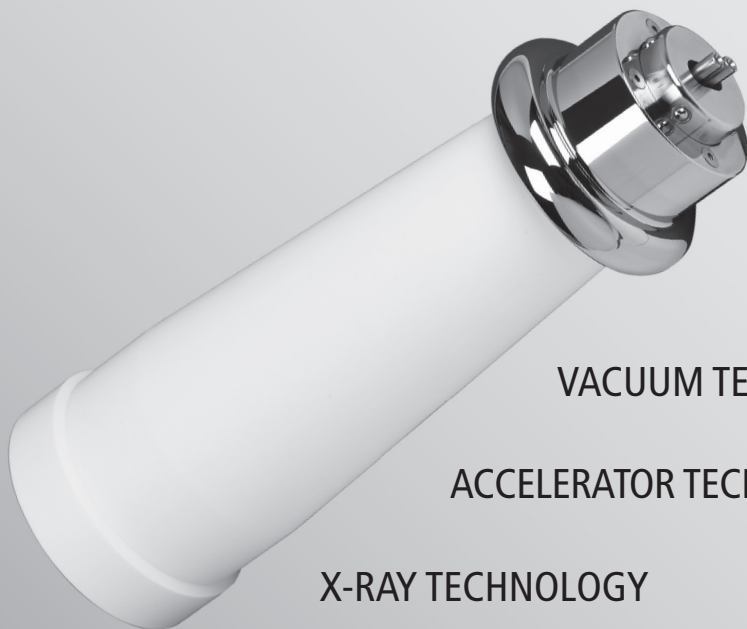
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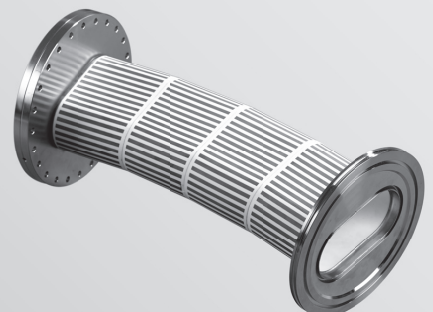
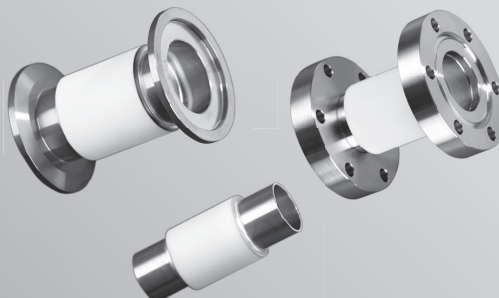
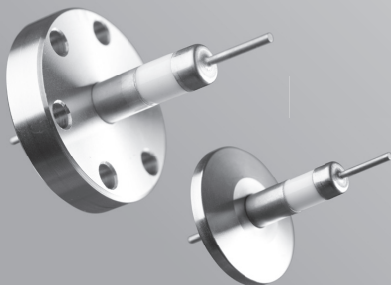
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144. Application of cellulose films in the release experiments performed in the course of the evaluation of pharmaceutical availability of calcium salt
A. Lisik, D. Wojcik-Pastuszka and W. Musial
145. The influence of viscosity of the semisolid drug forms on the applicative properties
E. Szewczyk and W. Musial
146. The micro- and nanostructured artifacts in semisolid drug forms - influence of technological factors
E. Szewczyk and W. Musial
147. Photosystem II rows-of-dimers superstructure: Natures tiny solar panels
M. Bommer, J. Hellmich, A. Burkhardt, M. Ibrahim, J. Kern, A. Meents, F. Mueh, H. Dobbek and A. Zouni
148. Nuclear inelastic scattering on iron protein single crystals
S. Rackwitz, I. Faus, J.A. Wolny, H. Auerbach, K.K. Andersson, H.P. Hersleth, K. Achterhold, H.-C. Wille, K. Schlage and V. Schünemann
149. Vibrational properties of the dimetallic-carboxylate-cofactor of R2loxI from *Geobacillus kaustophilus*
J. Marx, R. Kositzki, J. J. Griese, P. Schrapers, S. Rackwitz, J. A. Wolny, D. Bessas, R. Rüffer, M. Högbom, M. Haumann and V. Schünemann
150. Brilliant Biological Solution SAXS at EMBL Hamburg
C. Blanchet, M. Gräwert, A. Spilotros, D. Franke, C.M. Jeffries, A.G. Kikhney, S. Fiedler and D.I. Svergun
151. X-ray Micro- & Nano-Diffraction Imaging on Human Mesenchymal Stem Cells and Closely Related Celllines
M. Priebe, F. Rehfeldt and T. Salditt
152. On mappings between distance matrices - exploration of direct and reciprocal space of X-ray diffraction patterns.
L. Mikes, D. Horvath and J. Ulicny
153. Laser-induced jet towards sample pulsed-delivery for SFX experiments
T. Sato, R. Kirian, H. Dadgostar, D. Oberthür, H. Chapman and L. Chavas
154. Perspective X-ray studies of cells flowing in micro-channels
R. Graceffa, O. Saldanha, C. Hémonnot and S. Köster
155. Room temperature serial synchrotron crystallography
F. Stellato, D. Oberthür, M. Liang, C. Gati, R. Bean, O. Yefanov, A. Barty, A. Burkhardt, P. Fischer, L. Galli, R. Kirian, J. Meyer, S. Paneerselvam, C.H. Yoon, T. White, C. Betzel, A. Meents and H.N. Chapman
156. X-ray imaging of human hard and soft tissues
H. Deyhle, S.E. Hieber, I. Dziadowiec, F. Beckmann, A. Khimchenko, P. Thalmann, G. Schulz, R. Schmitz, M. Dominietto and B. Müller
157. Orientation recovery for simulated single protein imaging at the European XFEL
K. Ayyer, O. Yefanov, G. Geloni and E. Saldin
158. SASBDB, a repository for small-angle scattering data
E. Valentini, A.G. Kikhney, G. Previtali, C.M. Jeffries and D. I. Svergun
159. Understanding Photosynthetic Water Splitting - Towards Mn L-edge Absorption Spectroscopy of Photosystem II
M. Kubin, J. Kern, T. Kroll, M. Lundberg, M. Odelius, H. Löchel, P. Loukas, J. Rehanek, W. Quevedo, B. O'Cenneide, R. Mitzner, A. Erko, A. Föhlisch, V. Yachandra, Ph. Wernet and J. Yano
160. High-intensity phasing with XFELs
Sang-Kil Son, Lorenzo Galli, Henry Chapman and Robin Santra

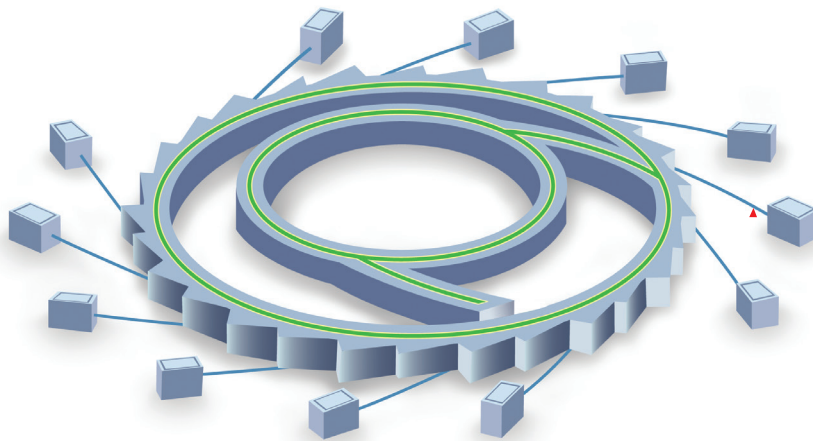
161. Synchrotron X-ray scattering investigation of recombinant and native influenza A matrix protein M1 self assembly
E.V. Shtykova, C.M. Jeffries, J. Klingbeil, L. Redecke and D.I. Svergun
162. Structural and functional analysis of the MERS-CoV papain-like protease
J. Lei, J.R. Mesters, C. Drosten, S. Anemüller and R. Hilgenfeld
163. Towards the observation of the distribution of DNA folds in complex environments using Correlated X-ray Scattering
G. Schenk, B. Krajina, A. Spakowitz and S. Doniach
164. First structural insights into the N-terminal nickase domain of parvovirus H1 NS1
M.Klinge, S. Weingart, J. Nüesch, J. Rommelaere and L. Redecke
165. Interaction of lipid membranes with Ece1-III - the toxic peptide of the fungus *Candida albicans*
J. Wernecke, C. Nehls, O.H. Seeck and T. Gutschmann

I.3 Atoms, molecules, clusters, ions and plasmas

166. Non-Born-Oppenheimer electron-hole dynamics after valence photo-ionization
Z. Li, M. El-Amine Madjet, O. Vendrell and R. Santra
167. Imaging instantaneous interatomic electron current with ultrafast resonant X-ray scattering
D. Popova-Gorelova and R. Santra
168. Dynamics of biomolecule in solid-state asymmetric nanopore and detection of fluorescent signals from single nucleotides for DNA sequencing
V. Nosik and E. Rudakova
169. Dose-photoreduction quantification and possible prediction at the metal XAS L-edge
M.M. van Schooneveld, J. Kowalska and S. DeBeer
170. Dielectric function in optical limit calculated for a FEL irradiated system
V. Tkachenko, N. Medvedev and B. Ziaja
171. Angularly resolved X-ray scattering measurements of shock and ramp compressed polycrystalline diamond
M.J. MacDonald, L.B. Fletcher, E.J. Gamboa, M. Gauthier, H.J. Lee, E. Galtier, A. Ravasio, A. Gleason, S. Hamel, J. Vorberger, D.O. Gericke, Z. Chen, D. Kraus, B. Barbreil, S. Funk, J.B. Hastings and S.H. Glenzer
172. Ultrafast recombination dynamics of triiodide ions after laser excitation
A. Leshchev, B. Khakhulin, C. Newby, D. Ribault and E. Wulff
173. Synthetic Scattering Images from Laser-Plasma Interaction – Methods
A. Hübl, M. Bussmann, R. Pausch, R. Widera, L. Huang, C. Gutt, T.E. Cowan and T. Kluge
174. Synthetic Scattering Images from Laser-Plasma Interaction – SAXS
T. Kluge, M. Bussmann, H. Chung, C. Gutt, L.G. Huang, A. Hübl and T.E. Cowan
175. Synthetic Scattering Images from Laser-Plasma Interaction - RCXD
T. Kluge, M. Bussmann, H. Chung, C. Gutt, L.G. Huang, A. Hübl, M. Zacharias and T.E. Cowan
176. Synthetic Scattering Images from Laser-Plasma Interaction – Heating and Ionization
L. G. Huang, M. Bussmann, H. K. Chung, M. Zacharias, T.E. Cowan and T. Kluge
177. Modeling of picosecond-time evolution of clusters irradiated by XFEL pulse
V. Saxena, Z. Jurek, B. Ziaja and R. Santra
178. XMDYN: a versatile tool for modeling high-intensity X-ray induced dynamics in matter
Z. Jurek, V. Saxena, Malik M. Abdullah, B. Ziaja and R. Santra

179. Auger-pumped Superradiance at 108.9nm in Xenon
W.-T. Liao, C. Weninger, L. Mercadier and N. Rohringer
180. Theoretical calculation of above-threshold ionization of xenon involving the giant dipole resonance
A. Karamatskou, R. Santra, T. Mazza and M. Meyer
181. X-ray Spectroscopy of Dense Laser Produced Plasmas
T.R. Preston, O. Ciricosta, S.M. Vinko, D.S. Rackstraw and J.S. Wark
182. The influence of periodic gas puff target parameters on high-order harmonics generation
T. Fok, L. Wegrzyński, V. Nefedova, J. Nejd, M. Kozlova, A. Bartnik, P. Wachulak, R. Jarocki and H. Fiedorowicz
183. Breakthrough in near-K-edge photoionization of singly and multiply charged ions
A. Müller, D. Bernhardt, A. Borovik, T. Buhr, J. Hellhund, K. Holste, A.L.D. Kilcoyne, S. Klumpp, M. Martins, S. Ricz, J. Viehhaus and S. Schippers
184. Stepwise contraction of the nf Rydberg shells in the 3d photoionization of multiply-charged xenon ions
S. Schippers, A. Borovik Jr. and T. Buhr, J. Hellhund, K. Holste, A.L.D. Kilcoyne, S. Klumpp, M. Martins, A. Müller, S. Ricz and S. Fritzsche
185. Ultrafast Energy Transfer from Solvent to Solute induced by sub-ps Highly Intensed THz Pulse
P. K. Mishra, O. Vendrell and R. Santra
186. Optical control of the 2nd step Auger cascade in photoexcited Ne 1s-1np
A. De Fanis, S. Deinert, M. Anwar, M. Wieland, T. Mazza, H. Zhang, A.J. Rafipoor, L. Glaser, M. Meyer, J. Viehhaus and M. Drescher
187. Electron dynamics in He nanodroplets resonantly induced by intense XUV pulses
Y. Ovcharenko, A. LaForge, M. Mudrich, P. O’Keeffe, A. Ciavardini, O. Plekan, P. Finetti, M. Devetta, P. Piseri, A. Mika, R. Richter, K.C. Prince, M. Drabbels, C. Callegari, F. Stienkemeier and T. Möller
188. Diffractive imaging of aligned molecules with X-rays and electrons
N.L.M. Müller, S. Stern, S. Trippel and J. Küpper
189. Mesh-free plasma simulations: their potential use for describing the interaction of ultra-short laser pulses with matter
M. Mašek, P. Gibbon and L. Juha
190. Structural dynamics of water solvation, studied with theoretical approaches and ultrafast X-ray methods
P. Vester, M.M. Nielsen, K.B. Møller and K. Haldrup
191. X-ray Tracking of Electronic and Structural Dynamics During Chemical Reactions Using Free Electron Lasers
M. Laursen, K. Haldrup, M. Nielsen and K. Møller
192. Femtosecond nonlinear resonant auger spectroscopy
S.B. Zhang, V. Kimberg and N. Rohringer
193. Dynamic studies of carbon under extreme conditions at LCLS
D. Kraus, J. Vorberger, D. Gericke, J. Helfrich, S. Frydrych, B. Bachmann, B. Barbreil, L. Fletcher, E. Gamboa, M. Gauthier, S. Goede, E. Granados, H. J. Lee, B. Nagler, G. Schaumann, W. Schumaker, M. Roth, T. Doepfner, S. Glenzer and R. Falcone
194. Structural studies of Cu complexes with 1,2,4-triazole-3-thione ligands
B. Mirosław, M.T. Klepka, A. Drzewiecka-Antonik and A. Wolska
195. Absorption Spectroscopy of complex Systems using PIPE and Traptor
S. Klumpp, K. Mertens, K. Schubert, K. Wies, R. Laasch, A. Guda, S. Palutke, I. Baev, J. Hellhund, S. Schippers, A. Müller and M. Martins

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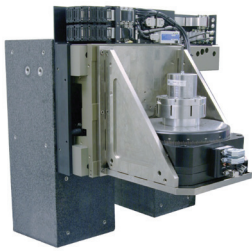


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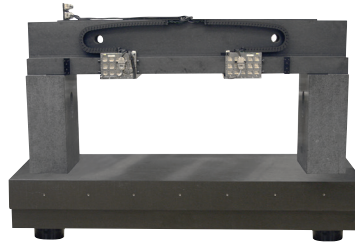
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196. The high energy density (HED) science instrument at European XFEL
K. Appel, M. Nakatsutsumi, A. Pelka, G. Priebe, I. Thorpe and Th. Tschentscher
197. Density Functional Theory Studies of Dense Plasmas
P. Hollebon
198. Liquid crystal films for high repetition rate laser applications
P. Poole, C. Willis, G. Cochran, R. Hanna, C. Andereck, E. Chowdhury and D. Schumacher
199. Photoionized plasmas created using Prague Asterix Laser System (PALS)
A. Bartnik, P. Wachulak, H. Fiedorowicz, T. Fok, Ł. Węgrzyński, R. Jarocki, J. Kostecki, A. Szczurek, M. Szczurek, T. Pisarczyk, T. Chodukowski, Z. Kalinowska, E. Krousky, M. Pfeifer, J. Skala, J. Ullschmied, J. Dostal, R. Dudzak, J. Cikhardt, D. Klir, K. Rezac, J. Hrebicek, T. Medrik and B. Cikhardtova
200. Photoionized plasmas created using laboratory scale, laser-produced plasma EUV sources
A. Bartnik, P. Wachulak, H. Fiedorowicz, T. Fok, Ł. Węgrzyński, R. Jarocki, J. Kostecki, A. Szczurek and M. Szczurek
201. Spin dependent vibrational properties of $[\text{Fe}(\text{pyz})\text{Pt}(\text{CN})_4]$ spin crossover polymers
J.A. Wolny, S. Rackwitz, I. Faus, F. Dahms, A. I. Chumakov, K. Schlage, H.C. Wille and V. Schöne-mann
202. K-Shell Photoionization of Oxygen Isonuclear Sequence
M.F. Gharaibeh, B.M. McLaughlin, J.M. Bizau, D. Cubaynes, M.M. Al Shorman, S. Guilhaud, I. Sakho and C. Blancard
203. Detailed characterization of a nanosecond-lived excited state: X-ray and theoretical investigation of the quintet state in photoexcited $[\text{Fe}(\text{terpy})_2]_{2+}$
G. Vankó, A. Bordage, M. Pápai, K. Haldrup, P. Glatzel, A. M. March, G. Doumy, A. Britz, A. Galler, T. Assefa, D. Cabaret, A. Juhin, T.B. van Driel, K.S. Kjær, A. Dohn, K.B. Møller, H.T. Lemke, E. Gallo, M. Rovezzi, Z. Németh, E. Rozsályi, T. Rozgonyi, J. Uhlig, V. Sundström, M.M. Nielsen, L. Young, S.H. Southworth, C. Bressler and W. Gawelda
204. Theoretical investigation on coherent ionization dynamics in extended systems
A. Brand, B. Kaiser and V.M. Axt
205. Fragmentation cross-sections of DNA constituents for ion impact
B. Rudek, A. Arndt, D. Bennett, M. Wang and H. Rabus
206. Detection of vacuum birefringence in nonlinear QED
H.-P. Schlenvoigt, T. Heinzl, I. Uschmann, U. Schramm and T.E. Cowan
207. Detecting self-generated Mega-Gauss magnetic fields in laser-plasma-interaction via Faraday Rotation
H.-P. Schlenvoigt, J. Metzkes, L. Obst, K. Zeil, B. Marx-Glowna, K.S. Schulze, H. Bernhardt, T. Kämpfer, U. Zastra, I. Uschmann, U. Schramm and T.E. Cowan
208. Electronic damage for short high-power X-ray pulses: its effect on single-particle X-ray imaging for 100 as - 10 fs pulse durations.
O. Gorobtsov, U. Lorenz, N. Kabachnik and I. Vartanyants
209. XUV-Pump THz-Probe Experiments on Neon at FLASH
G. Schmid, K. Schnorr, S. Augustin, A. Senftleben, S. Zhang, A. Rudenko, M. Kübel, L. Foucar, M. Gensch, Y.H. Jiang, J. Ullrich, A. Al-Shemmary, T. Golz, N. Stojanovic, C.D. Schröter, T. Pfeifer and R. Moshhammer
210. A Reaction Microscope as Endstation for FLASH II
S. Augustin, K. Schnorr, G. Schmid, G. Brenner, S. Düsterer, R. Treusch, C.D. Schröter, T. Pfeifer and R. Moshhammer

211. Separating Para and Ortho water
D.A. Horke, Y.-P. Chang, T. Kierspel, K. Długołęcki and J. Küpper
212. Photoionization and Photofragmentation of Multiply Charged $\text{Lu}_3\text{N@C}_{80}$ Ions near the carbon K-shell
J. Hellhund, A. Borovik Jr. and K. Holste, S. Klumpp, M. Martins, S. Ricz, S. Schippers and A. Mueller
213. Ultrafast dynamics in single clusters captured with X-ray imaging
D. Rupp, M. Adolph, L. Flückiger, T. Gorkhover, M. Krikunova, B. Langbehn, J. Müller, M. Müller, Y. Ovcharenko, M. Sauppe, S. Schorb, A. Ulmer, D. Wolter, I. Barke, H. Hartmann, K.H. Meiwes-Broer, T. Fennel, S. Toleikis, R. Treusch, C. Bostedt and T. Möller
214. Improving molecular orientation with strong fields
J. Kienitz, S. Trippel, R. González-Férez, K. Dlugolecki and J. Küpper
215. Correlation of crystallographic texture with sheet anisotropy of different steel sheets
D. Gao, M. Fricke, Z. Zhong and H.-G. Brokmeier, N. Schell
216. Structural Dynamics of Photoexcited Molecules Probed with Complementary X-ray Techniques
A. Britz, T. Assefa, A. Galler, W. Gawelda, D. Khakhulin and C. Bressler
217. Photoinduced Charge Transfer in Ir(ppy)_3 Investigated by Time-Resolved XAFS
D. Goeries, P. Roedig, B. Dicke, N. Stuebe, J. Meyer, M. Warmer, E. Weckert and A. Meents
218. Polaritons in nuclear optical lattices
J. Haber, K. Schlage, D. Schumacher, K.S. Schulze, H.C. Wille, I. Uschmann, R. Rüffer and R. Röhls-berger
219. Non-linear spectroscopy of rare gases at FLASH
T. Mazza, M. Ilchen, S. Bakhtiarzadeh, A.J. Rafipoor, T.J. Kelly, N. Walsh, J.T. Costello, P. O’Keeffe, S. Fritzsche, A. Karamatskou, R. Santra and M. Meyer
220. Time-resolved X-ray diagnostics of heterogeneous clusters excited by femtosecond laser pulses
I.A. Zhvaniya, S.A. Pikuz, V.M. Gordienko and V.T. Platonenko
221. Self-consistent finite difference approach to calculate X-ray absorption spectra of photoexcited molecules
A.A. Guda, S.A. Guda, M.A. Soldatov, G. Smolentsev, Ch. Bressler and W. Gawelda
222. Present status of the SQS instrument
A. De Fanis, T. Mazza, H. Zhang and M. Meyer

I.4 Earth and environment

223. Spinels under high pressure and high temperatures, a XRD insitu study
M. Wehber, C. Lathe, F. Schilling, H.J. Mueller and J. Lauterjung
224. Plumbonacrite Identified by X-ray Powder Diffraction Tomography as a Missing Link during Degradation of Red Lead in a Van Gogh Painting
F. Vanmeert, G. Van der Snickt and K. Janssens
225. X-ray Raman scattering at high pressure and high temperature
G. Spiekermann, A. Nyrow, M. Wilke, C. Sternemann, F.-U. Dill, M. Taherkhani, H. Yavas, H.-C. Wille and M. Tolan
226. Impact on atomic scale: phase transitions in the SiO_2 system
E.-R. Carl, A. Danilewsky, G. Trullenque, T. Kenkmann, H.-P. Liermann, A. Rothkirch and L. Ehm
227. CONSERVATION Calixarene From Phenol And Aldehyde To Reduce Metal Ion Pollution In Maritime
A.K. Miharja

228. In-situ XRD of fast compressed iron: analysis of stress and strain in diamond anvil cell
Z. Konopkova, H.P. Liermann, A. Rothkirch, A.K. Singh and S. Speciale
229. Recent LVP-techniques for extreme conditions geophysics
H.J. Mueller, J. Lauterjung and C. Lathe
230. Critical behavior of (MgFe)O in the vicinity of iron spin state transition
K. Glazyrin, R. Sinmyo, V. Cerantola and L. Dubrovinsky

I.5 Films, surfaces and interfaces

231. An RF-Magnetron Sputtering Chamber for In Situ Investigation of Thin Film Growth.
P. Walter, A.-C. Dippel and U. Klemradt
232. Metal-polymer nanocomposite films: Structure and properties
E. Metwalli, Y. Yao, V. Körstgens, W. Weijia, S. Yu, G. Santoro, M. Schwartzkopf, S.V. Roth and P. Müller-Buschbaum
233. Study of roughness of periodic multilayer mirrors with GISAXS method
N. Mukharamova, I. Subbotin, I. Makhotkin and S. Yakunin
234. A non-equilibrium transient state of FCC nanoparticle crystal revealed by in situ GISAXS tracking of the solvent-assisted nanoparticle self-assembly
K. Vegso, P. Siffalovic, M. Jergel, E. Majkova, S. Luby, A. Buffet and S.V. Roth
235. In-house research at P08 - Epitaxy of GeSbTe based films
K. Perumal, C. Dieter, J. Wernecke, D. Reuther, U. Rütt and O. Seeck
236. P03: In-Situ and in-Operando Studies of Advanced and Functional Materials
S. Koyiloth Vayalil, P. Zhang, M. Schwartzkopf, G. Santoro, T. Boese, J.F.H. Risch and S.V. Roth
237. CuPcF4 matrix with embedded metal (Au, Al, Ag) nanoparticles
S. Babenkov, O. Molodtsova, I. Aristova, O. Vilkov, M. Tchapyguine and V. Aristov
238. Resonant X-ray scattering study of domain sizes in wedged multilayer samples
R. Frömter, J. Bach, B. Beyersdorff, C. Weier, R. Adam, L. Müller, S. Schleitzer, M. Berntsen, G. Gröbel and H.P. Oepen
239. 3-D hybrid organic-inorganic structures: CuPc matrix with metallic nanoparticles
O. Molodtsova, I. Aristova, O. Vilkov, A. Pietzsch, M. Tchapyguine, S. Babenkov, V. Kveder and V. Aristov
240. Pristine and potassium doped MnPc: morphology, ordering and electronic properties
O. Molodtsova, S. Babenkov, V. Maslyuk, I. Mertig, T. Bredow and V. Aristov
241. Graphene multilayers on cubic-SiC(001): atomic structure and electronic properties
V. Aristov, O. Molodtsova, S. Babenkov, D. Marchenko, J. Sánchez-Barriga, A. Varykhalov, B.E. Murphy, S. Krasnikov, I. Shvets and A. Chaika
242. Nanostructured graphene on the surface of SiC(001)
V. Aristov, O. Molodtsova, A. Zakharov, D. Marchenko, J. Sánchez-Barriga, A. Varykhalov, M. Portail, M. Zielinski, I. Shvets and A. Chaika
243. Magnetic and Electronic Properties of Mn,N-codoped Ge
B. Toydemir, A. C. Önel and L. Colakerol Arslan
244. Versatile AFM setup for diffraction mapping at the Coherence Beamline P10 of PETRA III
A.V. Zozulya, T. Slobodskyy, R. Tholapi, M. Fester, W. Hansen and M. Sprung
245. Spin precession mapping at ferromagnetic resonance via nuclear resonant scattering
L. Bocklage, C. Swoboda, K. Schlage, H.-C. Wille, L. Dzemiantsova, S. Bajt, G. Meier and R. Röhlberger

246. Structural investigations of Fe/GaAs(001) heterojunctions containing MgO tunneling barrier
R. Tholapi, L. Liefeth, T. Slobodskyy, M. Wachtel, A. Zozulya, M. Sprung and W. Hansen
247. Effect of X-rays radiations on structural and compositional characteristics of TiO₂ thin films deposited on Si
M. Ishfaq, H. Noei, A. Stierle, E. Garutti and A.S. Bhatti
248. Epitaxial growth of iron oxide thin films on MgO(001)
F. Bertram, T. Schemme, C. Deiter and J. Wollschläger
249. The Spontaneous Formation of Nano Patterns in Velocity-Dependent Dip-Coated Organic Films: From Dragonflies to Stripes
T.P. Corrales, M. Bai, V. del Campo, P. Homm, P. Ferrari, A. Diama, M. Retamal, M. Deutsch, H. Taub, K. Knorr, U.G. Volkmann and P. Huber
250. Influence of geometry on strain in magnetoelectric microstructures
S. B. Hrkac, M. Abes, C. T. Koops, C. Krywka, M. Müller, Y.K. Mishra, S. Kaps, R. Adelung, E. Lage, C. Kirchhoff, M. Burghammer, M. Stutzki, B.M. Murphy and O.M. Magnussen
251. CAFM on metal/semiconductor interfaces
T. Slobodskyy, G. Ekindorf, R. Tholapi, L. Liefeth and W. Hansen
252. Structural and Magnetic Characterization of Amorph and Crystalline Ge/Mn Films
A. C. Onel, B. Toydemir and L. C. Arslan
253. Watching crystals grow at the mercury-electrolyte interface: current and future time-resolved in-situ studies at LISA/P08
S. Festersen, A. Elsen, B. Runge, C.T. Koops, B.M. Ocko, M. Deutsch, O.H. Seeck, O.M. Magnussen and B.M. Murphy
254. Resonant X-ray Diffraction at Fe₃O₄/NiO Bilayers
J. Bosse, T. Schemme, O. Schuckmann, T. Kuschel, F. Bertram, J. Stremper, K. Küpper and J. Wollschläger
255. In-situ studies of interface coupling in magnetoelectric composites via grazing incidence diffraction
P. Jordt, S. Hrkac, O. Magnussen and B. Murphy
256. Effect of interfaces and growth parameters on magnetic properties at FeRh thin films
P. Aksu, A. Parabas, N. Yilmaz and F. Yildiz
257. Determination of the Temperature and Potential Dependent Surface Structure of the Mercury-Electrolyte Interface by X-ray Scattering
B. Runge, S. Festersen, C. T. Koops, M. Deutsch, B. M. Ocko, O.H. Seeck, B.M. Murphy and O.M. Magnussen
258. Anisotropy control in magnetic multilayer devices
K. Schlage, D. Erb, L. Bocklage, H.-C. Wille and R. Röhlberger
259. In-situ investigation of the organic and bioorganic layers on water surface
E. Tereschenko, M. Marchenkova, Yu. Djakova, A. Seregin, A. Rogachev, S. Yakunin and M. Kovalchuk

I.6 Materials science: hard condensed matter

260. In Situ Synchrotron X-ray Diffraction Analysis of Polycrystal Diffraction Elastic Constants of Ti_{2.5}Cu
E. Maawad, H.-G. Brokmeier, Z.Y. Zhong, N. Al-Hamdany, M. Salih, N. Schell, W.M. Gan, M. Müller, A. Schreyer, B. Schwebke and L. Wagner
261. Zr-based bulk metallic glass at cryogenic temperatures: in-situ XRD
M. Stoica, I. Kaban, J. Bednarcik and J. Eckert

262. Thermal and nonthermal melting of silicon under femtosecond X-ray pulse
N. Medvedev, Z. Li and B. Ziaja
263. Investigation of nonferroic domains in TeO_2 single crystals under external electric field using X-ray diffraction methods
N. Marchenkov, A. Kulikov, A. Blagov, Yu. Pisarevsky and M. Kovalchuk.
264. Nuclear GISAXS Superstructure Peaks for Characterization of Antiferromagnetically Ordered Nanostripes
L. V. Dzemiantsova, K. Schlage, L. Bocklage, D. Erb, H.-C. Wille, G. Meier and R. Röhlberger
265. In situ diffraction during high temperature deformation of ZK40 (Gd, Nd)
R. Buzolin, D. Tolnai, C.L. Mendis, A. Stark, N. Schell, K.U. Kainer and N. Hort
266. Dynamic DAC Experiments
W. Evans, Zs. Jenei, H.-P. Liermann and E. McBride
267. High resolution XRF with a Maia detector at P06, DESY
U. Boesenberg, M. Alfeld, R. Kirkham, C.G. Ryan and G. Falkenberg
268. X-ray diffraction analysis of $\text{K}_2\text{Co}_x\text{Ni}_{1-x}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ mixed single crystals
N. Vasilyeva, N. Sorokina, A. Antipin, I. Verin and A. Voloshin
269. Application of in-situ high-energy X-ray diffraction and small-angle scattering for the development of an intermetallic multi-phase gamma-TiAl based alloy
E. Schwaighofer, A. Stark, P. Staron, B. Rashkova, T. Lippmann, N. Schell, H. Clemens and S. Mayer
270. Photoluminescence of hexagonal boron nitride: Monocrystals and Nanotubes
L. Museur and A. Kanaev
271. Mapping strain in the single nanowire using nanofocused X-ray beams
T. Stankevici, D. Dzhygaev, M. Rose, A. Shabalin, Z. Bi, L. Samuelson, A. Mikkelsen, I. Vartanyants and R. Feidenhansl
272. Structural evolution of colloidal crystal films in the process of melting revealed by Bragg peak analysis
A. Shabalin, E. Sulyanova, A. Zozulya, J.-M. Meijer, D. Dzhigaev, O. Gorobtsov, R. Kurta, S. Lazarev, U. Lorentz, A. Singer, O. Yefanov, I. Zaluzhnyy, I. Besedin, M. Sprung, A. Petukhov and I. Vartanyants
273. Extracting supplementary information for the retrieval procedure by means of diffraction of XFEL fs-pulses in a crystal
A. Leonov, D. Ksenzov, A. Benediktovitch, I. Feranchuk and U. Pietsch
274. In-situ observation of texture formation during hot-forming of a multiphase gamma-TiAl based alloy
A. Stark, M. Rackel, A. Tchouaha Tankoua, F.-P. Schimansky, N. Schell, L. Lottermoser, A. Schreyer and F. Pyczak
275. In-situ investigation of the diffusion brazing of gamma-TiAl alloys using high-energy X-ray diffraction
K. Hauschildt, A. Stark, P. Staron, H. Eckerlebe, U. Lorenz, N. Schell, F. Pyczak and M. Müller
276. Soft X-ray free-electron laser induced damage to inorganic scintillators
T. Burian, C. Özkan and J. Gaudin
277. Damage to materials illuminated by multiple short-wavelength laser shots below the single-shot damage threshold: an overview
L. Juha, J. Chalupsky and M. Toufarova
278. Interplay between long and short range order in rare-earth hafnates
V. Kabanova, A. Menushenkov, V. Popov, A. Yaroslavtsev, R. Chernikov, Y. Zubavichus and E. Kulik
279. Structure features of multiferroic single crystal $\text{Gd}_{0.95}\text{Bi}_{0.05}\text{Fe}_3(\text{BO}_3)_4$
E. Smirnova, O. Alekseeva, I. Verin, A. Dudka, V. Artemov, K. Frolov and I. Lyubutin

280. Conductive properties and structures of the $R_{0.85}Sr_{0.15}F_{2.85}$ ($R=Nd, Pr$) single crystals
O. Khrykina, N. Bolotina, T. Chernaya, I. Verin, A. Antipin and B. Sobolev
281. Ternary rare-earth transition metal pnictides: high-pressure experiment
A. Geondzhian, A. Yaroslavtsev, R. Chernikov, A. Menushenkov and M. Shatruk
282. Structural features of phase transitions in CdTe
I.S. Volchkov, M.D. Pavlyuk and V.M. Kanevsky
283. Ptychographic Coherent Diffraction Imaging of Colloidal Crystals
I. Besedin, A.V. Zozulya, D. Dzhigaev, O. Gorobtsov, A. Shabalin, R.P. Kurta, J.-M. Meijer, A.V. Petukhov, E. Sulyanova, I. Zaluzhnyy, M. Sprung and I.A. Vartanyants
284. Strontium and Yttrium coordination in the carbonate-silicate glasses
V.Yu. Murzin, A.A. Veligzhanin, Ya.V. Zubavichus, O.G. Safonov, A.A. Shiryayev, K.V. Shablinskaya, J. Pohlenz and M. Wilke
285. In situ synchrotron radiation diffraction during solidification of $Mg_{15}Gd$
G. Szakács, C.L. Mendis, D. Tolnai, A. Stark, N. Schell, K.U. Kainer, J. Gröbner, R. Schmid-Fetzer and N. Hort
286. In-situ Nuclear Forward Scattering Investigation of High Valent Iron Decomposition
V. Prochazka, L. Machala, M. Miglierini, V. Sharma and R. Zboril
287. Characterization of light induced metastable spin states in a dinuclear iron(II) spin crossover complex
I. Faus, S. Rackwitz, J. A. Wolny, M. Schmitz, H. Kelm, H.-J. Krüger, K. Schlage, H.-C. Wille and V. Schünemann
288. Structural and Magnetic Dynamics in the Magnetic Shape Memory Alloy Ni_2MnGa
S.O. Mariager, C. Dornes, A. Caviezel, J.A. Johnson, S. Gröbel, P. Beaud, T. Huber, A. Ferrer, G. Jakobs, H.J. Elmers, S.L. Johnson and G. Ingold
289. Texture gradient after twist extrusion
V. Usov, M. Salih, Z. Zhong, H.-G. Brokmeier and N. Schell
290. X-ray Nanodiffraction with in situ nanoindentation and hydrostatic pressurization
C. Krywka, A. Zeilinger, J. Keckes, D. Laipple and M. Müller
291. In situ investigation of the microstructure in friction stir welded steels using high-energy X-ray diffraction
M. Blankenburg, P. Staron, A. Stark, T. Fischer, D. Laipple, N. Schell, J. Hilgert, L. Bergmann, J. dos Santos, N. Huber, A. Schreyer and M. Müller
292. Simulations of in situ X-ray Diffraction from Uniaxially-Compressed Highly-Textured Polycrystalline Targets
D. McGonegle, D. Milathianaki, J. Wark and A. Higginbotham
293. Synthesis of rutile-type solid solution in SiO_2 - GeO_2 system under high pressure and high temperature
A. Masuno, E. Khramov, E. Kulik, H.-C. Wille, N. Nishiyama, T. Katsura, V.Y. Murzin and Ya. Zubavichus
294. Nanocrystalline composite ceramics synthesized by high-pressure crystallization of amorphous materials
N. A. Gaida and N. Nishiyama
295. Atomic structure and mechanical behaviour of CuZrAl-based metallic glasses and composites
I. Kaban, B. Escher, T.D. Tran, K. Edström, G. Svensson and J. Eckert
296. Dislocation density evolution of Al7020 T6 investigated by in-situ synchrotron diffraction under tensile load
Z.Y. Zhong, H.-G. Brokmeier, E. Maawad, W.H. Gan and N. Schell

297. GrainMapper at the HEMS beamline
T. Fischer, L. Lottermoser, U. Lienert, N. Schell, M. Müller and A. Schreyer
298. Mechanical Interface Coupling in Functional Thin Film Composites
C. Koops, M. Abes, S. Hrkac, A. Petraru, H. Kohlstedt, O. Magnussen and B. Murphy
299. Dynamic Diamond Anvil: Phase Transitions in Gallium and Ultrafast Diffraction Setup at the European XFEL
E. E. McBride, M. Wendt, E. Wittich, R. J. Husband, I. Loa, M. I. McMahon, W. Evans, C.-S. Yoo and H.-P. Liermann
300. In situ diffraction of CaO dissolution during melting and solidification of Mg-20CaO alloy
B. Wiese, D. Tolnai, C.L. Mendis, A. Stark, N. Schell, H.-P. Reichel, K.U. Kainer and N. Hort
301. Analysis of resolidified tips of cored wires used in Twin Wire Arc Spraying utilizing μ CT and SEM
J. Nellesen, M. Abdulgader, W. Tillmann and F. Beckmann
302. Energy transport by ballistic electrons in silicon irradiated with intense femtosecond X-ray pulses
R. Sobierajski, A. Aquila, D. Klinger, I. Jacyna, P. Dłuzewski, M.T. Klepka, T. Burian, J. Chalupský, V. Hájková, Y. Inubushi, L. Juha, A.P. Mancuso, H. Ohashi, C. Özkan, H. Sinn, T. Koyama, K. Tono, T. Tschentscher, M. Yabashi and J. Gaudin
303. Luminescent properties of orthosilicate compounds in the film and crystal forms under synchrotron radiation excitation
Yu. Zorenko, V. Gorbenko, O. Sidletskiy and T. Zorenko
304. Luminescent properties of ZnO structure under synchrotron radiation excitation
L. Mosińska, W. Bała, P. Popielarski, Yu. Zorenko and T. Zorenko
305. Ultrafast Dynamics of Magnetic Domain Structures Probed by Coherent Free-Electron Laser Light
L. Müller, S. Schleitzer, H.P. Oepen, S. Eisebitt, J. Lüning, R. Santra, C. Gutt, G. Grübel et al.
306. Hard X-ray spectroscopy of magnetic materials for spintronic devices
A. Gloskovskii

I.7 Materials science: soft condensed matter

307. Exploring the Nanostructures in the Nanoimprinted Diblock Copolymer Thin Film with GISAXS
P. Zhang, H. Huang, Y. Chen, S. Yu, C. Krywka, S.K. Vayalil, S.V. Roth and T. He
308. Watching aging in organic solar cells with in-situ GISAXS
C.J. Schaffer, C.M. Palumbiny, M.A. Niedermeier, C. Jendrzewski, G. Santoro, S.V. Roth and P. Müller-Buschbaum
309. 3D Ptychographic Imaging Enabling Flexible Polymer Tandem Solar Cells
H.F. Dam, T.R. Andersen, E.B.L. Pedersen, K.T.S. Thydén, M. Helgesen, J.E. Carlé, P.S. Jørgensen, J. Reinhardt, R.R. Søndergaard, M. Jørgensen, E. Bundgaard, F.C. Krebs and J.W. Andreasen
310. In-Situ X-ray Experiments in Microfluidic Sample Environments
M. Trebbin, S. Roth and S. Förster
311. Structural investigations of highly magnetoresponsive microgels encapsulating iron-iron oxide nanopowder
R. Turcu, V. Haramus, I. Craciunescu, A. Petran, V. Socoliuc, I. Morjan and L. Vekas
312. Investigation of vimentin assembly and aggregation in continuous and segmented flow by small angle X-ray scattering
O. Saldanha, M. Brennich, C. Hémonnot, R. Graceffa and S. Köster

313. Small Angle X-ray Scattering and Scanning X-ray Micro-Diffraction on Keratin: Structural Changes Induced by Ions
C. Hémonnot, O. Saldanha, R. Graceffa, H. Herrmann, B. Weinhausen, M. Burghammer and S. Köster
314. Equilibration dynamics and conductivity of warm dense hydrogen
U. Zastrau, P. Sperling, A. Becker, S. Glenzer, T. Tschentscher, T. Döppner and R. Redmer
315. Pathway of lipid migration in multicomponent food material
S. Reinke, S.V. Roth, G. Santoro, F. Wilde, F. Beckmann, J. Vieira, S. Heinrich and S. Palzer
316. Confined liquids in slit geometry
M. Lippmann, A. Ehnes and O.H. Seeck
317. Photosensible organic-inorganic pHEMA-(nano)TiO₂ hybrids
E. Evlyukhin, L. Museur, M. Traore, A. Zerr and A. Kanaev
318. Spatially resolved X-ray studies of liquid crystals with strongly developed bond-orientational order
I. Zaluzhnyy, R. Kurta, E. Sulyanova, O. Gorobtsov, A. Shabalin, A. Zozulya, A. Menushenkov, M. Sprung, B. Ostrovskii and I. Vartanyants
319. Insights into the Interactions between surfactin, betaines and PAM by small-angle neutron and X-ray scattering
V. Haramus, J. Xiao, F. Liu, L. Almásy, U. A. Handge, B. Mu, A. Zou and R. Willumeit
320. IpyChord: A Python-based Package for Computing 2D Chord Distribution Function
X. Li and N. Strubeck
321. X-ray cross correlation analysis studies in 2D and 3D colloidal systems
D. Sheyfer, F. Lehmkuhler, M.A. Schroer, B. Fischer, P. Kwasniewski, M. Sprung and G. Grübel
322. Negative thermal expansion in a crystalline organic thin film studied by in situ X-ray diffraction
S. Bommel, L. Pithan, C. Weber, G. Santoro, S.V. Roth, E. Weckert and S. Kowarik
323. Effects of biological nanoaerosol particles on model lipid membrane. Grazing incidence diffraction and X-ray standing wave studies.
S.N. Yakunin, N.N. Novikova, M.V. Koval'chuk, V.N. Morozov, A.V. Rogachev and E.P. Mironov
324. In-situ SAXS and WAXS investigation of different approaches on Goethite synthesis
A. Schavkan, E. Stellamanns, F. Westermeier, A. Zozulya, B. Fischer, G. Grübel and M. Sprung
325. Confined matter in the light of X-rays: nanobubbles, co-adsorption and imbibition in SBA-15
T. Hofmann, D. Wallacher, J. Perlich, S. Roth, S. V. Koyiloth and P. Huber
326. In situ crystallisation of organic systems
E. Mikayelyan, L. Grodd and S. Grigorian
327. Destroying activity of magnetoferritin on lysozyme amyloid fibrils
P. Kopcansky, K. Siposova, L. Maelnikova, Z. Mitroova, V. Gdovinova, M. Timko, V. M. Garamus, V. I. Petrenko, M. V. Avdeev and Z. Gazova,
328. Structural properties of magnetoferritin by small angle X-rays and neutrons scattering methods
L. Melnikova, V.I. Petrenko, M.V. Avdeev, V.M. Garamus, L. Almasy, O.I. Ivankov, Z. Mitroova, K. Pospiskova, I. Safarik and P. Kopcansky
329. Electron Localization in Photoexcited Anatase Titania Nanoparticles by fs Time-Resolved X-ray Spectroscopy
J. Rittmann, F. G. Santomauro, A. Lübcke, E. Baldini, A. Ferrer, M. Silatani, P. Zimmermann, S. Grübel, J. A. Johnson, S. O. Mariager, P. Beaud, D. Grolimund, C. Borca, G. Ingold, S.L. Johnson and M. Chergui
330. Computer modeling for the time-resolved study of the biological complexes
A. Bugaev, A. Soldatov and I. Vartanyants

I.8 Nano science

331. NEXAFS, XPS and X-ray diffraction studies of nanostructured systems
V. Sivkov, S. Nekipelov, A. Lomov, O. Petrova, D. Vyalikh and S. Molodtsov
332. X-ray diffuse scattering theory for crystal structure with quantum dots
D. Sivkov and V. Punegov
333. Real-time study of solvothermal nanoparticle formation on atomic scale
A.-C. Dippel, C. Tyrsted, K.M.Ø. Jensen, D. Saha, S. Birgisson, E.D. Bøjesen and B.B. Iversen
334. Towards multi-order hard X-ray imaging with multilayer zone plates
M. Osterhoff, R.N. Wilke, J. Wallentin, C. Eberl, F. Döring, H.U. Krebs, M. Sprung and T. Salditt
335. 60-nm spatial resolution water window microscope based on a double stream gas puff target SXR source
P. Wachulak, A. Torrisi, A. Bartnik, D. Adjei, J. Kostecki, L. Wegrzynski, R. Jarocki, M. Szczurek and H. Fiedorowicz
336. Characterization of a single GaN/InGaN core-shell nanowire with 2D and 3D Bragg ptychography
D. Dzhigaev, T. Stankevic, A. Shabalin, F. Seiboth, J. Wallentin, M. N. Strikhanov, G. Falkenberg, C. G. Schroer, A. Mikkelsen, R. Feidenhans'l and I.A. Vartanyants
337. Hard X-ray detection using a single 100 nm-diameter nanowire
J. Wallentin, M. Osterhoff, R. Wilke, K-M. Persson, L.E. Wernersson, M. Sprung and T. Salditt
338. Mapping the nanoscale distribution of crystalline phases in organic devices by infrared near-field and X-ray nano beams
S. Noever, C. Westermeier, C. Liewald, J. Roemer, R. Stable, F. Keilmann and B. Nickel
339. Near-field ptychography using lateral and longitudinal shifts
A.-L. Robisch, K. Kröger and T. Salditt
340. Magnet-structure dynamics in Fe/MnAs/GaAs(001): time-resolved scattering experiments at FERMI
C. Spezzani, F. Vidal, E. Ferrari, E. Allaria, A. Ciavardini, R. Delaunay, F. Capotondi, E. Pedersoli, H. Popescu, M. Eddrief, G. De Ninno, M. Kiskinova and M. Sacchi
341. Local structure of semicrystalline P3HT films probed by nanofocused coherent X-rays
R.P. Kurta, L. Grodd, E. Mikayelyan, O.Y. Gorobtsov, I.A. Zaluzhnyy, I. Fratoddi, I. Venditti, M.V. Russo, M. Sprung, I.A. Vartanyants and S. Grigorian
342. Temperature Dependence of Exchange Bias Properties of $[\text{Ni}/\text{Pt}/\text{CoO}]_x$ Multilayers
A. Sönmez, M. Öztürk, E. Demirci, M. Erkovan, U. Parlak, O. Öztürk and N. Akdoğan
343. Observation of nanoparticle twinning using correlated X-ray scattering
D. Mendez, J. Platt, H. Watkins, G. Schenk, T. Lane, D. Ratner and S. Doniach
344. High-Resolution Chemical Imaging with Hard X-ray Ptychography
J. Reinhardt, R. Hoppe, G. Hofmann, C. D. Damsgaard, J.-D. Grunwaldt and C. G. Schroer
345. In-situ X-ray studies of GaAs Nanowire growth onto silicon(111) substrate
S.M. Mostafavi Kashani, P. Schroth, H. Letzguss, M. Koehl, S. Bauer, T. Baumbach and U. Pietsch
346. Self-Assembly of Magnetic Nanostructure Patterns Studied by in-situ GISAXS and NRS
D. Erb, K. Schlage, H.-C. Wille and R. Röhlberger
347. The 3D-architecture of individual free silver nanoparticles captured by X-ray scattering
I. Barke, H. Hartmann, D. Rupp, L. Flückiger, M. Sauppe, M. Adolph, S. Schorb, C. Bostedt, R. Treusch, C. Peltz, S. Bartling, T. Fennel, K.-H. Meiwes-Broer and T. Möller

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II Author Index (Submitting author only)

(Submitting author and poster number)

AKSU, Perihan	256	DZEMIANTSOVA, Liudmila	264
ALFELD, Matthias	57	DZHIGAEV, Dmitry	336
ANDREI, Kanaev	270, 317	DZIARZHYTSKI, Siarhei	6
ANDRIANOV, Konstantin	80	ERB, Denise	346
ARISTOV, Victor	241, 242	EVANS, William	266
AUGUSTIN, Sven	210	FALKENBERG, Gerald	139
AWEL, Salah	104	FAUS, Isabelle	287
AYYER, Kartik	157	FESTERSEN, Sven	253
BABENKOV, Sergey	48, 237	FISCHER, Torben	297
BAGSCHIK, Kai	238	FOK, Tomasz	182
BARKE, Ingo	347	FRANCOUAL, Sonia	108
BARTNIK, Andrzej	199, 200	FREUND, Wolfgang	92
BAUZYS, Justinas	63	GAIDA, Nico Alexander	294
BEDNARCIK, Jozef	23	GAO, Dongyang	215
BERNHARDT, Marten	151	GARIDEL, Patrick	137
BERTRAM, Florian	248	GASTHUBER, Martin	10
BESEDIN, Ilya	283	GAWELDA, Wojciech	90
BEYERLEIN, Kenneth	112	GDOVINOVÁ, Veronika	327
BIELECKI, Johan	125	GEONDZHIAN, Andrey	281
BLANKENBURG, Malte	291	GERKEN, Nils	53, 54
BOBASHEV, Sergey	99	GHARAIBEH, Mohammad	202
BOCKLAGE, Lars	245	GIEWEKEMEYER, Klaus	121
BÖDEWADT, Jörn	35	GLAZYRIN, Konstantin	230
BOESENBERG, Ulrike	267	GOERIES, Dennis	217
BOMMEL, Sebastian	322	GORGISYAN, Ishkhan	14
BOMMER, Martin	147	GOROBTSOV, Oleg	208
BRAND, Andre	204	GRACEFFA, Rita	154
BRAUNE, Markus	24	GRÄWERT, Melissa	150
BRENNER, Günter	8	GUDA, Alexander	221
BRITZ, Alexander	216	GUTOWSKI, Olof	71
BUGAEV, Aram	330	GUTSCHMIDT, Sven	18
BURIAN, Tomas	276	HABER, Johann	218
BURKHARDT, Anja	49	HARAMUS, Vasyl	319
BUSCEMA, Marzia	135	HARDER, Manuel	127
BUSSMANN, Michael	173	HARTMANN, Gregor	69
BUZMAKOV, Alexey	75	HAUF, Steffen	44
CALIEBE, Wolfgang	28	HAUSCHILDT, Katja	275
CAPOTONDI, Flavio	68	HELLHUND, Jonas	212
CARL, Eva-Regine	226	HÉMONNOT, Clément	313
CHERNIKOV, Roman	100	HLOSKOVSKY, Andrei	306
COSTA, Luca	106	HOFMANN, Tommy	325
CZYZYCKI, Mateusz	138	HOLLEBON, Patrick	197
DAURER, Benedikt	9	HORBACH, Jan	111
DE FANIS, Alberto	186	HORKE, Daniel	211
DEITER, Carsten	25	HORVATH, Denis	152
DEPPE, Bastian	66	HRKAC, Stjepan	250
DEYHLE, Hans	156	HUANG, Lingen	176
DIPPEL, Ann-Christin	333	HUBER, Patrick	249
DÖHRMANN, Ralph	27	INGOLD, Gerhard	81, 288
DONATO, Mattia	47	JACYNA, Iwanna	302
DOSE, Thomas	50	JORDT, Philipp	255

JUHA, Libor	277	MARRAS, Alessandro	38
JUREK, Zoltan	178	MARX, Jennifer	149
KABAN, Ivan	295	MASEK, Martin	189
KABANOVA, Victoria	278	MAZZA, Tommaso	219
KALINKO, Aleksandr	88	MCBRIDE, Emma Elizabeth	299
KARAMATSKOU, Antonia	180	MCGONEGLE, David	292
KETENOGLU, Bora	15	MEDVEDEV, Nikita	262
KETENOGLU, Didem	95, 96	MEIJERS, Rob	136
KHOKHRIAKOV, Igor	70	MELNIKOVA, Lucia	328
KHRYKINA, Olga	280	MENDEZ, Derek	343
KIENITZ, Jens Sebastian	214	METWALLI, Ezzeldin	232
KIM, Bongsoo	4	MEY, Tobias	1
KLINGBEIL, Jens	161	MICHALIKOVA, Jana	19
KLINGE, Marco	164	MIHARJA, Arief Kurnia	227
KLUGE, Thomas	174, 175	MIKAYELIAN, Eduard	326
KLUMPP, Stephan	195	MIKES, Ladislav	103
KNOPP, Gregor	97	MIROSLAW, Barbara	194
KOCH, Andreas	91	MISHRA, Pankaj Kumar	185
KONOPKOVA, Zuzana	228	MOHACSI, Istvan	58
KOOPS, Christian	298	MOLODTSOVA, Olga	239, 240
KORSCH, Timo	16	MOORE, James	36
KOWALSKA, Joanna	131	MOSIŃSKA, Lidia	304
KRAUS, Dominik	193	MOSTAFAVI KASHANI, Seyed M.	345
KRENKEL, Martin	3, 132	MÜLLER, Alfred	183
KRYWKA, Christina	89, 290	MUELLER, Hans J.	229
KSIANZOU, Viachaslau	83	MÜLLER, Jan P.	128
KUBEC, Adam	78	MÜLLER, Leonard	305
KUBIN, Markus	159	MÜLLER, Nele	188
KÜPPER, Hendrik	134	MÜLLER-BUSCHBAUM, Peter	308
KÜPPER, Jochen	11	MUHAMMAD, Ishfaq	247
KUHLMANN, Marion	93	MUKHARAMOVA, Nastasia	233
KUJALA, Naresh G	118	MURZIN, Vadim	284
KULIK, Eleonora	293	NAKATSUTSUMI, Motoaki	196
KURTA, Ruslan	341	NELLESEN, Jens	301
KWON, Soonnam	5	NICKEL, Bert	338
LANGER, Burkhard	105	NOVIKOV, Dmitri	20
LATHE, Christian	223	OBERTHÜR, Dominik	155
LAURSEN, Mads	191	OERTEL, Jana	142
LEHMKÜHLER, Felix	51	OGURRECK, Malte	45
LEI, Jian	162	ONEL, Aykut Can	252
LEONOV, Aleksandr	273	OSTERHOFF, Markus	21, 334
LESHCHEV, Denis	7, 172	OVCHARENKO, Yevheniy	187
LI, Xuke	320	PALUTKE, Steffen	84
LI, Yuhui	64, 65	PATOMMEL, Jens	115
LI, Zheng	166	PAULMANN, Carsten	98
LIAO, Wen-Te	179	PEDERSEN, Emil	309
LIENERT, Ulrich	107	PENG, Yingying	37
LIERMANN, Hanns-Peter	41, 42	PENNICARD, David	40
LIPPMANN, Milena	316	PERUMAL, Karthick	235
LISIK, Anna	143, 144	PINCELLI, Tommaso	120
LYTAEV, Pavel	74	PLANAS, Marc	94
MAAWAD, Emad	260	POOLE, Patrick	198
MACDONALD, Michael	171	POPOVA-GORELOVA, Daria	167
MAHIEU, Benoît	79	PRASCIOLU, Mauro	60
MARCHENKOV, Nikita	263	PRECEK, Martin	117
MARCHENKOVA, Margarita	34	PRESTON, Thomas	181

PROCHAZKA, Vit	286	STEINKE, Ingo	67
QUER, Arndt	85	STELLAMANNS, Eric	77
RACKWITZ, Sergej	148	STERN, Stephan	2
REDECKE, Lars	140	STOICA, Mihai	261
REDLIN, Harald	102	STREMPFER, Joerg	43
REINHARDT, Juliane	344	SZAKÁCS, Gábor	285
REINKE, Svenja	315	SZEWCZYK, Ewa	145, 146
RITTMANN, Jochen	329	SZTUK-DAMBIETZ, Jolanta	62
ROBISCH, Anna-Lena	339	TAHERKHANI, Mehran	55
RODE, Andrei	101	TERESHCHENKO, Elena	259
ROEDIG, Philip	126	THOLAPI, Rajkiran	246
ROGACHEV, Alexander	323	TIEDTKE, Kai	86
ROLLES, Daniel	26	TKACHENKO, Victor	170
ROSE, Max	123	TÖPPERWIEN, Mareike	133
ROSEKER, Wojciech	114	TOLNAI, Domonkos	265
RUDAKOVA , Ekaterina	168	TOYDEMIR, Burcu	243
RUDEK, Benedikt	205	TREBBIN, Martin	310
RÜTT, Uta	72	TRUNK, Ulrich	39
RUNGE, Benjamin	257	TURCU, Rodica Paula	311
RUPP, Daniela	213	USOV, Valentin	289
SABLINSKAS, Valdas	56	V. ZIMMERMANN, Martin	73
SACCHI, Maurizio	340	VALENTINI, Erica	158
SALDANHA, Oliva	312	VAN SCHOONEVELD, Matti	169
SARAPATA, Adrian	109, 110	VANKÓ, György	203
ŠARLER, Božidar	33	VANMEERT, Frederik	224
SATO, Tokushi	153	VASILYEVA, Natalia	268
SAXENA, Vikrant	177	VASSHOLZ, Malte	124
SCHAVKAN, Alexander	324	VEGSO, Karol	234
SCHENK, Gundolf	163	VESTER, Peter	190
SCHIPPERS, Stefan	184	VIEFHAUS, Jens	129
SCHLAGE, Kai	258	VOLCHKOV, Ivan	282
SCHLENVOIGT, Hans-Peter	206, 207	WACHULAK, Przemyslaw	335
SCHMID, Georg	209	WALLENTIN, Jesper	337
SCHNEIDMILLER, Evgeny	29, 30	WALTER, Peter	231
SCHÖPS, Andreas	12, 13	WANG, Fenglin	116
SCHOLZ, Maria	59	WARIAS, Jonas	76
SCHROEDER, Jeremy	113	WEGRZYNSKI, Lukasz	17
SCHUBERT, Robin	141	WELTER, Edmund	61
SCHULZ, Joachim	22	WERNECKE, Julia	165
SCHWARTZKOPF, Matthias	236	WHARMBY, Michael	87
SENIN, Roman	122	WIESE, Björn	300
SHABALIN, Anatoly	272	WILDE, Fabian	52
SHEYFER , Dina	321	WOLFF-FABRIS, Frederik	46
SIVKOV, Viktor	331	WOLLSCHLÄGER, Joachim	254
SIVOV, Danil	332	WOLNY, Juliusz A.	201
SKOPINTSEV, Petr	130	YURKOV, Mikhail	31, 32
SLOBODSKYY, Taras	251	ZALUZHNYI, Ivan	318
SMIRNOVA, Ekaterina	279	ZASTRAU, Ulf	314
SON, Sang-Kil	160	ZHANG, Haiou	222
SONMEZ, AYSE	342	ZHANG, Peng	307
SOROKIN, Andrey	82	ZHANG, Song Bin	192
SPIEKERMANN, Georg	225	ZHONG, Zhengye	296
STACHNIK, Karolina	119	ZHVANIYA, Irina	220
STANKEVIC, Tomas	271	ZORENKO, Yuriy	303
STARK, Andreas	274	ZOZULYA, Alexey	244
STARON, Peter	269		

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30. Jan. 2015

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FLASH2 experimental hall (Bldg. 28k)



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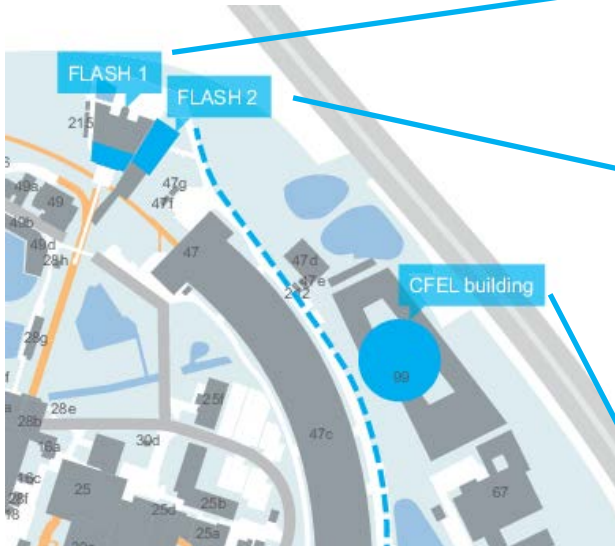
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	2	HORIBA Jobin Yvon GmbH
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	15	Spetec GmbH
<u>FLASH Seminar Room</u>	16	Alca Technology S.r.l.
	17	bsw TestSystems & Consulting AG / StanTronic Instruments GmbH
	18	Cryophysics GmbH
	19	DECTRIS Ltd.
	20	eltherm GmbH
	21	FMB Feinwerk- und Meßtechnik GmbH
	22	Goodfellow GmbH
	23	greateyes GmbH
	24	Hamamatsu Photonics Deutschland GmbH
	25	Infraserv Vakuumservice GmbH
	26	iseg Spezialelektronik GmbH
	27	LAPP Insulators Alumina GmbH
	28	Newport Spectra-Physics GmbH
	29	Oerlikon Leybold Vacuum GmbH
	30	Oxford Instruments Omicron NanoScience
	31	Pfeiffer Vacuum GmbH
	32	vacom Vakuum Komponenten & Messtechnik GmbH
	33	vaqtec-scientific
	34	VAT Deutschland GmbH
<u>CFEL</u>	35	Aerotech GmbH
	36	Agilent Technologies
	37	Beckhoff Automation GmbH
	38	Carl Zeiss Laser Optics GmbH
	39	Cryoandmore Budzylek GbR
	40	Dockweiler AG
	41	ess Mikromechanik GmbH
	42	Kleindiek Nanotechnik GmbH
	43	MEWASA AG
	44	OELZE Präzisions-Messzeugfabrik GmbH
	45	OWIS GmbH
	46	PREVAC sp. z o.o.
	47	Rohde & Schwarz GmbH & Co. KG
	48	SYMETRIE
		DESY Spin-offs:
		Class 5 Photonics GmbH
		sunaprecision GmbH
		X-Spectrum GmbH

30. Jan. 2015

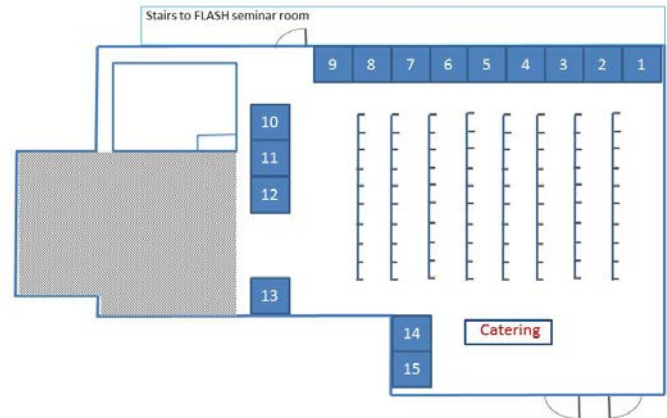
Poster session 14:00 – 17:00h

Vendor exhibition 13:00 – 18:00h

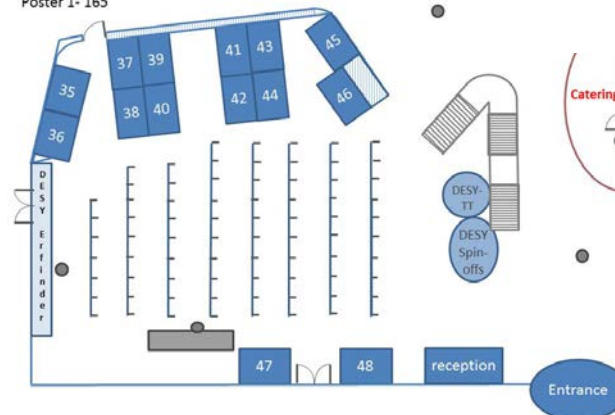
FLASH Seminar room (upper floor)
Industry exhibition



FLASH2 Experimental hall
Industry exhibition and
Poster 166- 347



CFEL Foyer, Bldg. 99
Industry exhibition and
Poster 1- 165



DESY-Campus Hamburg-Bahrenfeld

