# FELs OF EUROPE NEWS 1|19

8. ISSUE | www.fels-of-europe.eu

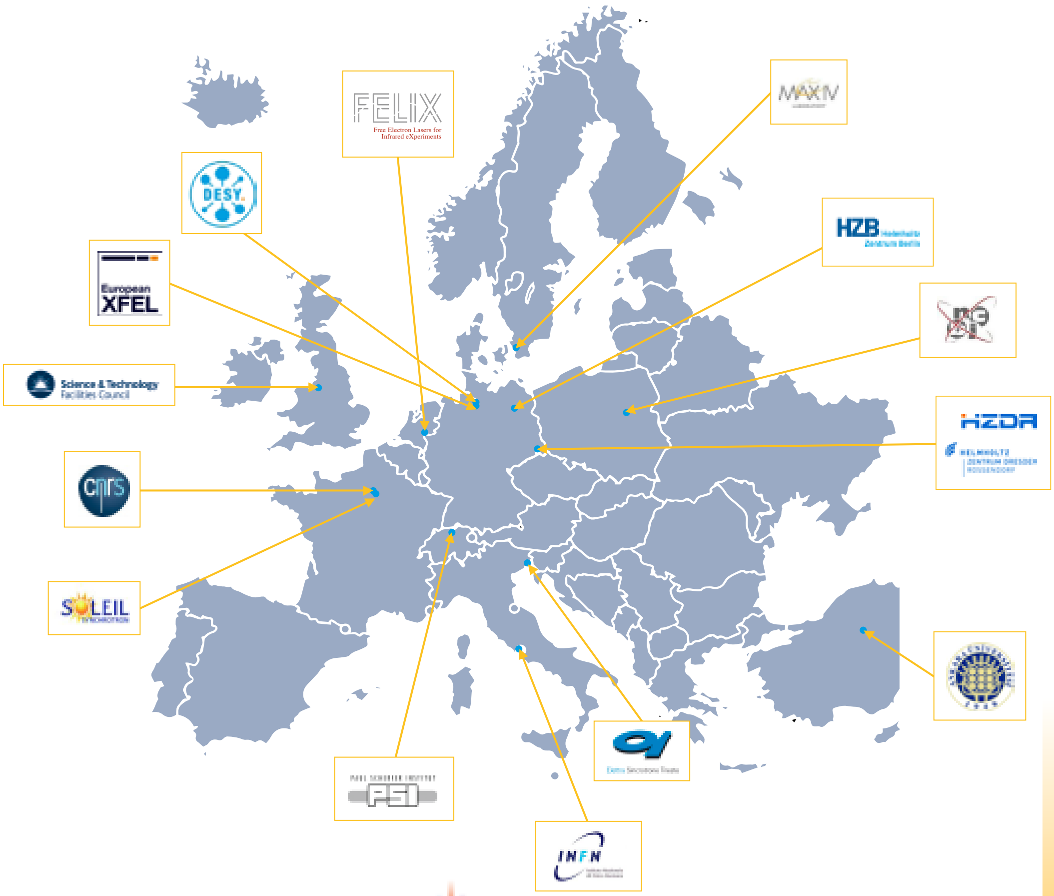
IN THIS ISSUE



FELs OF EUROPE is a collaboration of all free electron laser (FEL) facilities in Europe, including 14 nodes in 9 countries.

We aim to address the technological and scientific challenges of the rapidly developing FEL technology by providing a worldwide unparalleled, pan-European research infrastructure. A core goal is to exploit the full scientific potential of these unique accelerator based short-pulse light sources for multidisciplinary research with open access.

FELs of Europe is active in many areas including conferences, workshops, newsletters, special topic groups, collaborations, networking and policy making.




FELs OF EUROPE

## Editorial

The summer 2019 edition of the FELs OF EUROPE Newsletter, the eight issue in the series, contains a variety of significant information and updates from the partner facilities. In the research highlights section you will find results on the creation of large neutral peptide aggregates at the FELIX Laboratory, on the first SFX experiment using the large bandwidth mode at SwissFEL, on the demonstration of the EEHG scheme at wavelengths as short as 5.9 nm at FERMI and the description of a new tool for time-resolved XAS in operation at FLASH, also at the nitrogen and oxygen K-edges.

Facility news covers the latest developments towards full operation for users at the European XFEL, the plans for the FLASH2020+ upgrade and a detailed description of the BESSY-II slicing facility. Further, the FELs of EUROPE collaboration congratulates the Radboud University in Nijmegen on the occasion of the official opening of the new, combined building of the High Field Magnet Laboratory (HFML) and the FELIX Laboratory. This combination of static high magnetic fields and intense (far) infrared light will offer worldwide unique research opportunities to scientists at a single location.

The FELs OF EUROPE Steering Committee met last March at the Helmoltz Zentrum Berlin, as reported in the collaboration section. The assessment of the activities developed during 2018 shows important achievements in all areas covered by the collaboration. Two successful events were organized, the SCIENCE@FEL Conference and the PhotonDiag workshop; the Whitebook on Science with FELs was printed and distributed to all partners and FEL facilities worldwide; the extension until 2024 of the FELs OF EUROPE Memorandum of Understanding was signed by all 14 partners; several networking activities with European projects and collaborations were further developed, as for instance with LASERLAB Europe, EUCALL, CompactLight, CALIPSOplus and ESUO as reported in the last contribution of this Newsletter, and last but not least with LEAPS and its Strategy Groups on Storage Rings and Free Electron Lasers.

We are finally proud to announce that the Steering Committee decided to organize an own information point at the 39th International Free Electron Laser Conference (FEL2019) to be held at the University of Hamburg, Germany from August 26th to August 30th, 2019, chaired by DESY and the European XFEL. We are looking forward to welcome you at our booth, where you will find interesting information on FELs OF EUROPE, gadgets and a printed version of this Newsletter, with the possibility to subscribe to it directly at the info point.

Michele Svandrlik

Visit the FELs OF EUROPE booth at the

## Characterization of large neutral peptide aggregates

**FELIX Laboratory**

Peptide aggregation is widely studied as it is related to neurodegenerative diseases. Until now only use small, charged peptide clusters could be used, due to experimental limitations. FELIX researchers demonstrate for the first time that it is possible to create and characterize large aggregates of neutral peptides under controlled conditions in the molecular beam mass spectrometer. This makes complementary studies on neutral biologically interesting peptides possible.

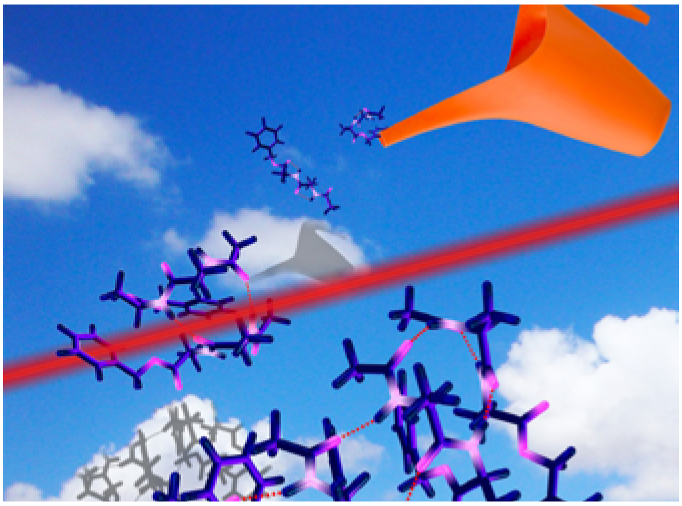
To understand the underlying principles of peptide aggregation, the early stages of fibril formation, elucidation of structure upon their formation is key. Ample methods have been developed to acquire structural information on the final stage, the so-called amyloid fibrils and plaques. But only a hand full of experiments study the lowly populated species on the pathway to form these fibrils.

Currently, this structural characterization of aggregates and their mechanism of formation are done on charged species. Experiments on neutral aggregates would complement these studies. However, due to experimental limitations, the formation of aggregates of neutral molecules is not straightforward and up till now no peptide clusters were reported larger than two monomeric peptides (dimers).

**Reference:**
Sjors Bakels, Sebastiaan B.A. Porskamp and Anouk M. Rijs, Formation of neutral peptide aggregates studied by mass selective IR action spectroscopy, Angew. Chem. Int. Ed, (2019)

FELIX researchers adjusted the way the molecules are brought into the gas phase using laser desorption. By doing so, they were able to make large aggregates of up to even fourteen peptides. They have showed that they can select each aggregate by size and subsequently characterize its structure using mass- and conformer selective IR action spectroscopy and high-level quantum chemical calculations. They could also visualize the competition between intra- and intermolecular hydrogen bond interactions upon aggregate formation. The results pave the way to complementary studies on neutral biologically interesting peptides such as the hydrophobic amyloidogenic peptides.

Anouk M. Rijs



Large neutral peptide aggregates were created using laser desorption and structurally assigned using infrared action spectroscopy.

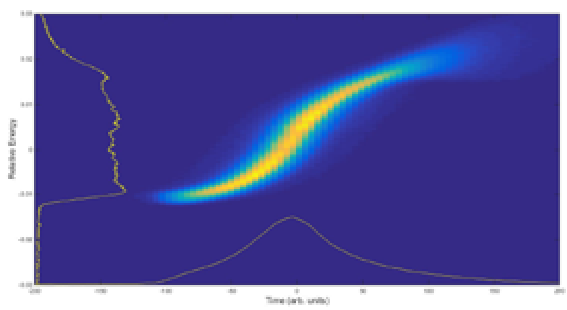
## First experiments using broadband mode at SwissFEL

**SwissFEL**

Recently, a team of PSI scientists in collaboration with scientists from the Centre for Free-Electron Laser Science (CFEL), Hamburg, performed the first serial femtosecond crystallography (SFX) experiment using the large bandwidth mode of SwissFEL. In this mode, SwissFEL takes advantage of some unique aspects of its electron accelerator design to produce energy chirped electron bunches (see Figure 1) that results in obtaining large bandwidth X-ray pulses with up to 4% ΔE/E.

In contrast to nominal SASE bandwidth (~0.2% ΔE/E), large-bandwidth XFEL pulses cover a large volume of the reciprocal space, helping to reduce the partiality problem in SFX. The large bandwidth mode of SwissFEL may not only be beneficial for SFX, but it creates new opportunities for other fields of research with FELs.

Karol Nass, Christopher Milne

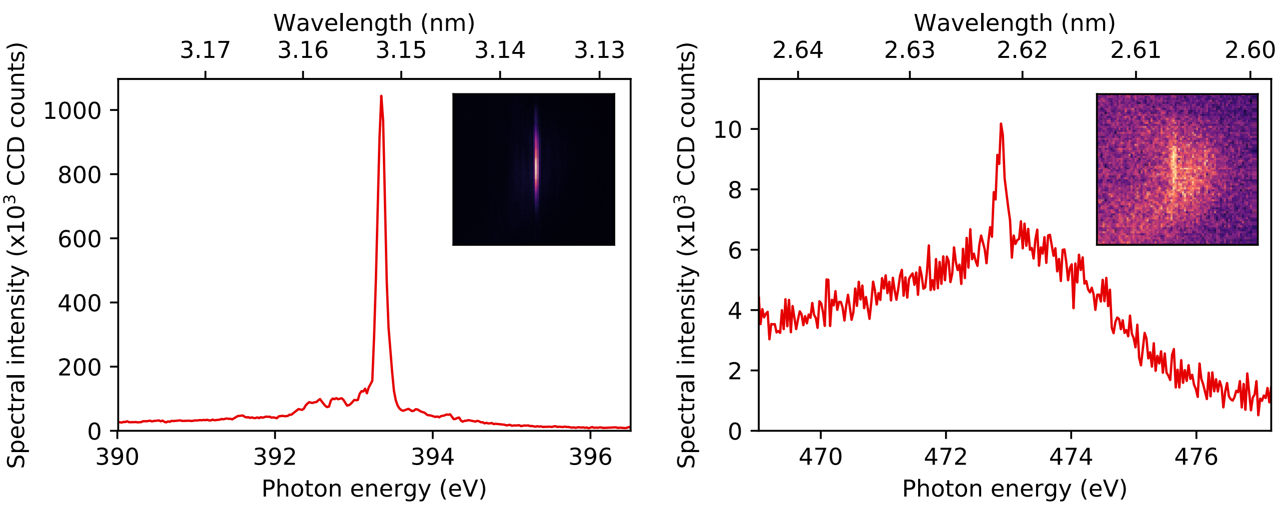


## Echo-enabled harmonic generation lasing at the FEL in Trieste

**FERMI**

The free-electron laser (FEL) FERMI is a unique facility, providing users with laser-like pulses in the XUV and soft x-ray spectral regions. FERMI employs high-gain harmonic generation (HGHG) to produce highly coherent pulses with tunable spectro-temporal properties. In HGHG, a (single) conventional laser (typically in the UV) is used to shape the relativistic electron-beam and trigger the amplification process. In a cascade setup, HGHG can be used to generate high-order harmonics of the seed laser with wavelengths down to 4-5 nm. However, at such short wavelengths, the sensitivity to electron-beam instabilities, which develop during the acceleration stage, becomes critical and may severely affect the FEL radiation in terms of longitudinal coherence, pulse energy, and shot-to-shot stability.

An international team of researchers led by Elettra Sincrotrone Trieste implemented a new method at the FERMI FEL, called echo-enabled harmonic generation (EEHG), originally proposed by Gennady Stupakov from SLAC. In EEHG, two external conventional lasers are used to precisely tailor the electron-beam phase space before emission of light. The method allowed them to generate intense and nearly fully coherent pulses at wavelengths as short as 5.9 nm. Coherent, narrow band (although not amplified) emission was observed even at 2.6 nm. Because the technique is virtually insensitive to electron-beam instabilities, it may be possible to extend the lasing region down to 1 nm, opening the door to new experiments with coherent light.




Coherent emission spectra from the FERMI FEL at nm (394 eV) (left) and nm (474 eV) (right), obtained with EEHG.

FERMI is currently the only soft x-ray laser that can operate in this configuration. The method will allow generation of intense and coherent laser-like pulses with wavelengths of only a few nanometers, which could be used to study the structure and dynamics of biological samples and to perform entirely new experiments in the emerging field of nonlinear x-ray optics.

Enrico Allaria, Primoz Rebernik Ribic

**Original publication:**

P. R. Ribič et al., “Coherent soft x-ray pulses from an echo-enabled harmonic generation free-electron laser”, Nature Photonics (2019).

## New normalization scheme for single-shot X-ray absorption spectroscopy at a free-electron laser

**FLASH**

One of the most frequently applied techniques in X-ray spectroscopy is X-ray absorption spectroscopy (XAS) because of its experimental simplicity and large information content for a variety of fields, providing element-specific information on the electronic structure which encodes the geometry, symmetries, chemical surrounding and spin configurations around the interrogated element. Moreover, it has been shown that time-resolved XAS can track ultrafast nuclear and electronic structure dynamics during chemical reactions or phase transitions. However, the application of time-resolved XAS at SASE free-electron lasers with femtosecond time resolution, sufficient energy resolution and high sensitivity to small absorption changes remains extremely challenging. The reasons are inherent shot-to-shot fluctuations of intensity and spectrum of the incident beam, caused by the stochastic nature of the SASE process. The fluctuations require high detector linearities and improved normalization schemes.

To solve this issue, a setup for dispersive XAS has been implemented and tested at the soft X-ray FEL FLASH in Hamburg, employing a new reference scheme [1]. The work has been carried out in collaboration with colleagues from the PSI X-ray Optics and Applications group headed by Christian David. Similar to the approaches realized at SACLA [2] and LCLS [3], a diffractive transmission grating (TG) is used to split the FEL beam into two copies (signal and reference). The spectral content of both beams is simultaneously measured for intensity normalization within the FEL bandwidth on a shot-to-shot basis.

The color-coded center plot in the Figure shows a single shot of FLASH at around 143 eV photon energy, where the three beams are separated by the TG in horizontal direction (+/- 1$^{st}$ order being the signal and reference beams), while the vertical dispersion plane of the high-resolution monochromator resolves the modes in the SASE spectrum. The horizontal separation of approx. 2 mm is determined by the TG design, however, the beams can be independently steered using mirrors along the beamline. The right part of the Figure displays the relative intensity ratio between the 0$^{th}$ order and +/-1$^{st}$ order diffraction of the TG measured at the monochromator focal plane. On the left the projection of this intensity distribution onto the energy axis for the three orders is also depicted. The black line shows the dominant zero order beam, while the overlapping red and blue lines display the spectral distribution in the first order beams. As can be seen from this graph, there is excellent correlation between the signal and reference beams within a few percent for single bunch operation.

This tool is now in routine operation at FLASH for time-resolved XAS also at the nitrogen and oxygen K-edges, using radiation in the harmonics. This scheme naturally combines with open slit dispersive operation and provides high-energy resolution measurements across the full SASE bandwidth without scanning the monochromator, paving the way towards single-shot X-ray absorption spectroscopy.

**Martin Beye and Günter Brenner**

**References:**
[1] G. Brenner et al., Opt. Lett. 44, 2157 (2019).
[2] T. Katayama et al., Appl. Phys. Lett. 103, 131105 (2013).
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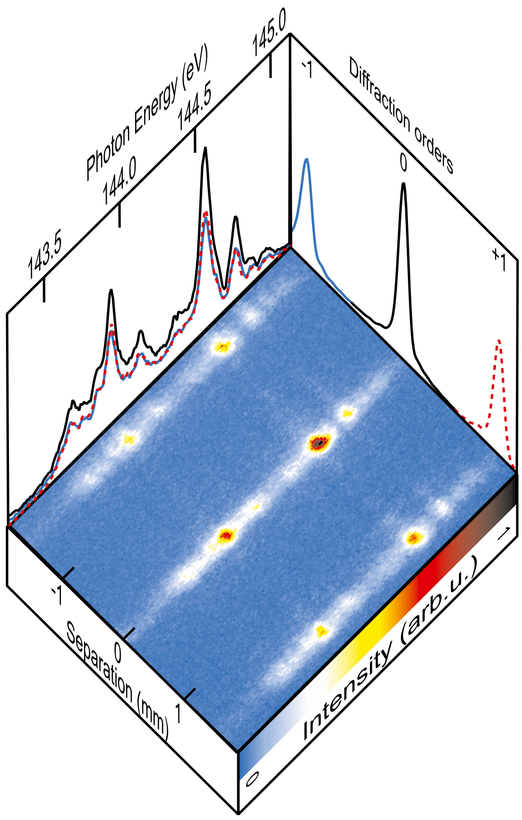

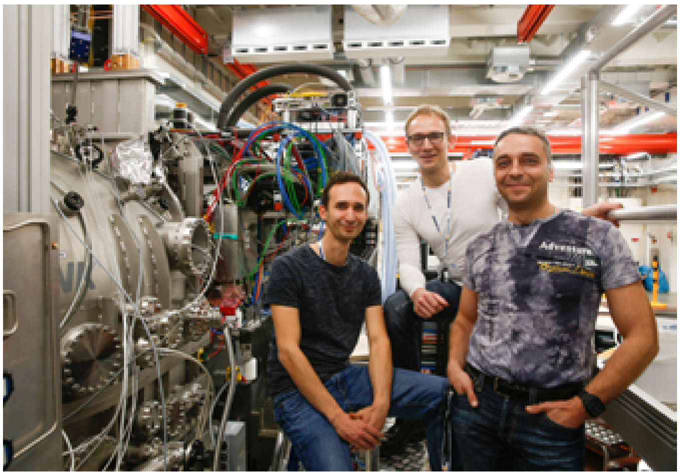

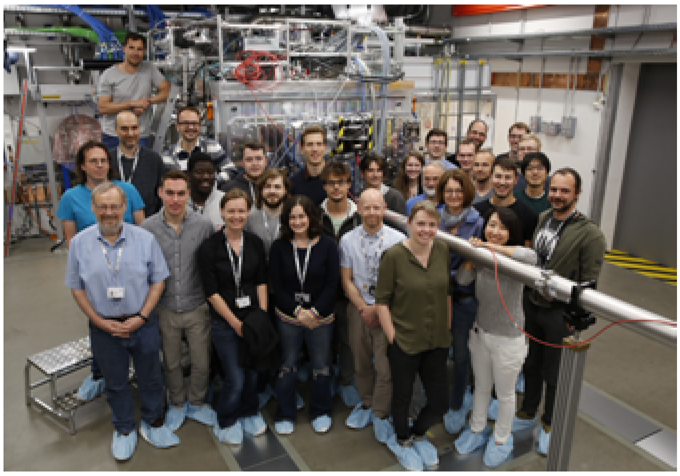

## On the road to full operation

**European XFEL**

Since the autumn of 2018 European XFEL has tripled the potential number of experiments that can be carried out at the facility at any one time. A total of six instruments are now operational on three SASE beamlines. This completes the original design configuration of the facility. As of May 2019, a total of 50 user experiments have been carried out at the facility since operation began in September 2017. From May 2019 until the end of 2019, around an additional 40 will be scheduled. While progress is rapid, there is still some way to go until full capabilities are reached. In March 2019 the first users arrived for experiments at the instrument for Materials Imaging and Dynamics (MID). MID, the 5$^{th}$ instrument to start operation, will be used to determine the structure and dynamics of disordered materials at the nanoscale. The first experiments went well, however, a lower number of pulses delivered to the instrument than planned meant that the data sets were not as complete as anticipated. Thanks to the hard work of the DESY accelerator team, the accelerator and FELs were able to achieve record high pulse energies a few weeks later however, helping to solve the problem. More recently, the sixth and final instrument of the current configuration to start operation was the instrument for High Energy Density (HED) experiments. The first users arrived in May 2019. The HED instrument is built in close collaboration with the HiBEF consortium led by Helmholtz Zentrum Dresden-Rossendorf (HZDR). Both MID and HED are on the SASE 2 beamline.

At the soft X-ray instruments SQS and SCS on the SASE 3 beamline, both of which started operation at the end of 2018, installation and commissioning of additional components continues in parallel to user operation. At SQS, the Reaction Microscope (REMI), designed and built by Frankfurt University, arrived on site in January. After several weeks of installation and outgassing, it is now available for users to do ion and electron momentum imaging experiments in the gas phase. The Nano-size Quantum Systems (NQS) chamber, dedicated principally to the investigation of larger systems such as clusters and nano-particles, will be also installed at the SQS instrument during the next few months. The SQS instrument will then have three interaction chambers available for user experiments. At SCS the availability of the DSSC detector for experiments will likely be achieved by mid-2019. These developments will significantly expand the capabilities of both instruments and enable a wider portfolio of experiments. Experiment options and work flows at the two instruments to first start operation, SPB/SFX and FXE, also continue to be improved and expanded.

Now that all three SASE beamlines are operational, the next operational milestone will be to run all three for user experiments in parallel. SASE 1, which has been operational since 2017, and the soft X-ray beamline SASE 3 are designed so that electrons first generate X-rays in SASE 1 before moving into the SASE 3 beamline to generate X-rays for the instruments there. During the first attempts to operate both beamlines in parallel, interference was observed across the beamlines. Mitigation strategies are currently being tested with the aim to reach full parallel user operation of all three SASE beamlines later this year.
The facility now looks forward to welcoming a growing number of users for diverse and exciting experiments. As the construction and commissioning phase comes to an end and the facility enters full user operation, European XFEL will adapt its structures to address shifting work modes, to further improve communication between the groups, and to optimize resource management and task prioritization. As successor to Andreas Schwarz, who retired as director at the end of 2018, physicist Dr. Sakura Pascarelli will join European XFEL on 1 September from the European Synchrotron Radiation Facility, ESRF in Grenoble, France, as new member of the management board. She will be responsible for the development and scientific program of the four hard-X ray scientific instruments.

In April the European XFEL company restaurant 'BeamStop' opened its doors. In addition to the expanding scientific portfolio at European XFEL, European XFEL can now offer users, staff and visitors an additional place to meet, talk and recharge in relaxing atmosphere. Another eagerly awaited addition to campus life, the user guest house, is planned to be ready for users at the end of next year.

Rosemary Wilson

## The FLASH2020+ upgrade strategy: the next steps

**FLASH**

A first larger workshop on the "Future of Science at FLASH" took already place in September 2017. The three-day workshop at DESY, with more than 120 participants, focused on the key scientific challenges that can be solved with a high-repetition-rate XUV and soft Xray facility in the future. The program featured sessions on AMO physics, chemistry, molecular life sciences, and condensed matter physics. Based on the discussions during this workshop, the participants came up with parameters for a free-electron laser "dream facility".

The feedback from the FEL user community was further refined in another workshop at DESY in January 2019. The results sharpened the 'FLASH2020+' strategy, which is based on an envisioned development program of the two FEL lines and the accelerator including

- the operation of two independent FEL lines (FLASH1 and FLASH2), both with variable gap undulators for new lasing concepts and (at FLASH1) seeding with a high repetition rate of 100 kHz or more
- the extension of the wavelength range of the fundamental to the oxygen K-edge (at FLASH2), in order to reach the important elements for energy research and to cover the whole water window for biological investigations
- flexible pump/probe schemes for time-resolved experiments
- variable polarization, needed, e.g., for the investigation of the light-induced switching of magnetic storage media
- shortest pulses down to the attosecond regime.

The FLASH team just finished the Conceptual Design Report for FLASH2020+ in early April 2019 and presented it to the DESY Photon Science Committee (PSC), Machine Advisory Committee (MAC) and Laser Advisory Committee (LAC). First feedback from all three advisory bodies was very positive. After final approval of the upgrade plans by the DESY directorate and DESY Councils, the FLASH team will complete the Technical Design Report. The implementation phase is envisaged to start in 2021 with the upgrade of FLASH1 to an externally seeded high repetition rate FEL line with variable gap undulators.

Rolf Treusch

Participants of the "Future of Science at FLASH" Workshop (Foto: M. Mayer, DESY).

# Circularly Polarized fs Soft X-Rays Pulses from a Storage Ring: The BESSY II Slicing Facility

**BESSY**

These days, the Femtoslicing facility at the Helmholtz-Zentrum Berlin can look back on almost one and a half decades of highly successful operation and research with femtosecond soft X-ray pulses. Today, the facility provides the user community with 100 fs pulses in the soft x-ray regime with tunable photon energy and variable light polarization (linear and elliptical) for ultrafast time-resolved X-ray experiments (see Table 1) [1]. The particular properties of the fs-X-ray pulses from the BESSY II Slicing source successfully enable cutting-edge research focused mostly on ultrafast magnetic dynamics and photoinduced phase transitions in strongly correlated material systems. Here, the exploration of the complex interplay between spin, orbital, charge, and lattice degrees of freedom upon low energy optical excitation on an ultrafast timescale promise understanding and control of macroscopic functionality of these materials. Because of the highly active research in these fields, the Femtoslicing facility has experienced a constantly high number of beamtime requests from users of Europe, USA, and Asia since it was released into user operation in 2008.

| | |
|---|---|
| X-ray photon energy (linear and elliptical polarization) | 400-1400 eV |
| Repetition rate | 6 kHz |
| X-ray pulse length | 100 fs |
| Photons on sample | ~ $10^5$ ph / s / 0.1% BW |
| Intrinsic X-ray / laser synchronization | < 20 fs short term jitter<br>< 200 fs day-to day |

Table 1: Overview of the parameters of the BESSY II Femtoslicing source.

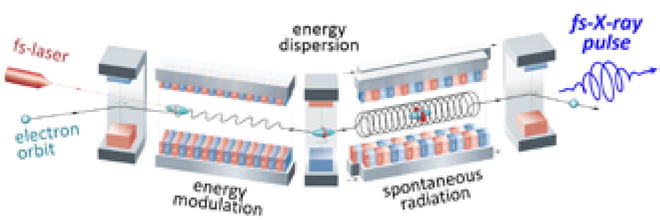


Figure 1: The principle of Femtoslicing at the BESSY II Slicing source. The generation of fs-X-ray from the electron storage ring BESSY II is achieved through the slicing principle. This is based on the electron energy modulation of a slice of electrons from a stored electron bunch by interaction with a synchronized fs-laser pulse. This fs-slice is subsequently separated from the main bunch by energy dispersion in a dipole-bending magnet. The slice finally produces spontaneous radiation in an Apple II type undulator. This principle ensures natural synchronization of fs-X-ray and fs-laser pulse.

After the pioneering experiments using X-ray Absorption Spectroscopy (XAS) and X-ray Magnetic Circular Dichroism (XMCD) as probing technique at a plane grating beamline [2], over time, further photon-in-photon-out probing methods like X-ray Resonant (Magnetic) Reflection Spectroscopy (XRMS), and X-ray (Resonant) Diffraction (XRD) have successfully been established. Moreover, continuous improvements on the slicing facility source, the laser-system, the technical equipment, and installation of a new dedicated high transmission reflection zone plate based beamline [3]

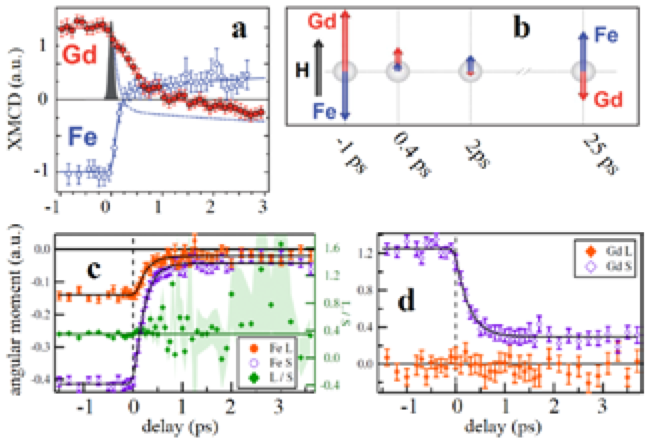


Figure 1: The principle of Femtoslicing at the BESSY II Slicing source. The generation of fs-X-ray from the electron storage ring BESSY II is achieved through the slicing principle. This is based on the electron energy modulation of a slice of electrons from a stored electron bunch by interaction with a synchronized fs-laser pulse. This fs-slice is subsequently separated from the main bunch by energy dispersion in a dipole-bending magnet. The slice finally produces spontaneous radiation in an Apple II type undulator. This principle ensures natural synchronization of fs-X-ray and fs-laser pulse.

have enhanced the performance and established a high degree of reliability and automation. In 2018, a novel permanent end station, DynaMaX, was installed allowing the use of all established X-ray methods in a single experimental chamber. DynaMaX is, moreover, equipped with a superconducting vector magnet which allows the use of magnetic fields of up to 1.5 Tesla along and up to 0.75 Tesla perpendicular to the X-ray beam, respectively.

Until today, the Femtoslicing Facility is the only fs soft X-rays source that provides circular polarization in a wide photon energy range in an almost year-round operation as standard. This unique feature makes it a powerful tool to explore in particular ultrafast magnetic dynamics. As a consequence a main focus of the facility's research has always been ultrafast magnetization dynamics. The scientific impact on the field is substantial: On the one hand, ferromagnetic order can be probed by the X-ray magnetic circular dichroic effect in an element selective manner. In a groundbreaking study, Radu et al. [4] probed the individual dynamics of the two ferromagnetic (FM) Gd and Fe sub-lattices in the ferrimagnetic GdFeCo alloy upon excitation with a fs-laser pulse.

Surprisingly, the sub-lattices show entirely different dynamics (see Figure 2 a, b). Even a transient ferromagnetic alignment could be evidenced. On the other hand, XMCD provides the means to separate the atomic spin and orbital momenta by using the spin

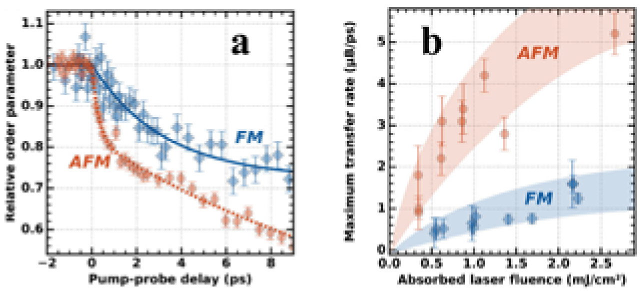


Figure 3: a) Quenching of the AFM and FM order in metallic Dysprosium under identical excitation conditions after laser excitation. The AFM can be quenched almost five times faster and more energy efficient (b) (figures form [6]).

and orbital sum rules. This microscopic view allows studying the physical quantities that are at the heart of any magnetic state and directly permit to observe the flow of angular momentum, which is a conserved quantity, out of and into the magnetic order in a material. Hennecke et al. [5] conducted such experiment using sum rule analysis again on the ferrimagnetic alloy GdFeCo and found a complete transfer of spin and orbital angular momentum to the lattice during the first hundreds of femtoseconds after excitation.

Soft X-rays not only allow studying ferromagnetic order dynamics but also the dynamics of antiferromagnetically (AFM) ordered materials. AFM order can efficiently probed by X-ray Resonant Magnetic Diffraction. A textbook example for such study has been performed by Thielemann et al. [6]: Here, the quench of magnetic order in the FM and AFM phase of metallic Dysprosium upon laser excitation was compared under identical experimental conditions. It was found that AFM order could be quenched up to five times faster than the FM order.

Niko Pontius

**References:**

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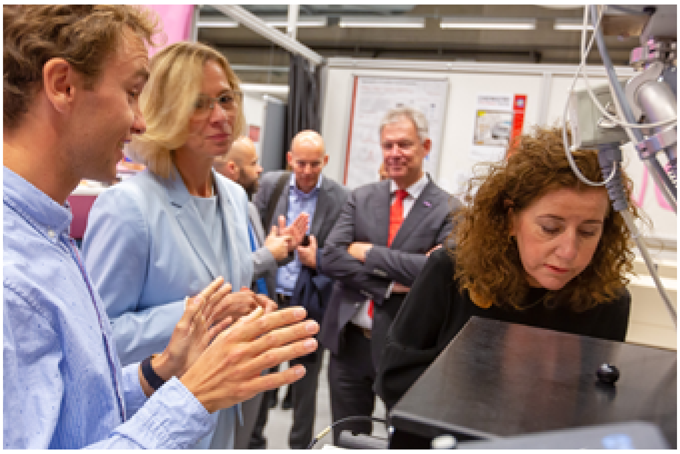
[2] C. Stamm et al.; Nat. Mater. 6, 740–743 (2007).
[3] M. Brzhezinskaya et al.; J. Synchrotron Radiat. 20, 522–530 (2013).
[4] I. Radu et al.; Nature 472, 205–208 (2011).
[5] M. Hennecke et al.; Phys. Rev. Lett. 122, 157202 (2019).
[6] N. Thielemann-Kühn et al.; Phys. Rev. Lett. 119, 197202 (2017).



## FELIX Laboratory offers FEL research combined with high magnetic fields

The FELIX Laboratory in Nijmegen is now coupled to the adjacent High Field Magnet Laboratory (HFML). This means it is possible to research matter and materials with intense infrared and THz free-electron laser radiation and simultaneously expose it to high magnetic fields.
The combined building of the FELIX Laboratory and the HFML was officially opened on Monday 8 July by the Dutch Minister of Education, Culture and Science. Afterwards, the HFML-FELIX user meeting started. Local research groups, external users and other interested scientists exchange experiences and the latest scientific news.
Do you want to use free-electron lasers and high field magnets for your research? Twice a year you can apply by submitting a proposal. Deadlines are May 15 and November 15.

See for more information: www.ru.nl/hfml-felix/access-facility/

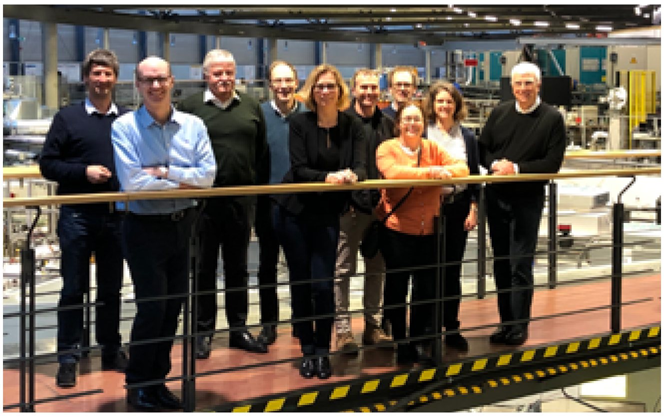
Marloes Gielen-Meynen

## FELS OF EUROPE STEERING COMMITTEE MEETING

The Steering Committee (SC) of FELs of Europe (FoE) met in Berlin at Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (HZB) premises on 25 and 26 March 2019. Representatives of 10 FoE partners attended the SC meeting. Jan Lüning welcomed everyone to HZB, introduced HZB and Adlershof, the slicing facility on BESSY-II and the plans for BESSY-III. Andreas Jankowiak introduced the BESSY-VSR project and coordinated, together with Karsten Holldack and Jens Knobloch a very interesting visit of the femtoslicing facility at BESSY-II, of SupraLab@HZB and of bERLinPro.

The first topic on the FoE SC agenda was LEAPS, which activities were presented, in particular the pilot projects elaborated by the working groups and how they will merge into a LEAPS proposal to be submitted to the HORIZON2020 INFRAINNOV-04-2020 call beginning of 2020. The role of Strategy Group 2, tightly linked to FoE, was then analyzed and the task of developing the science case for the 2030 vision was described. Finally an update of the EU Projects with relationships to FoE and its partners, namely ExPaNDs, CALIPSOPlus, CompactLight and EuPRAXIA, was given.

The FoE organization structure for the timeframe 2020-2022 was approved by the SC, along with the FoE budget. An assessment of the FoE 2018 activities was presented, showing the achievement of important results as reported in the editorial of this Newsletter.



From left to right: Jan Lüning (HZB), Jim Clarke (ALICE,CLARA, STFC), Pawel Krawczyk, (PolFEL, NCBJ), Manfred Helm ( FELBE, HZDR) Britta Redlich (FELIX, RU), Gregor Knopp (SwissFEL, PSI), Sverker Werin ( Max IV, MAXLAB) Marie-Emmanuelle Couprie (LUNEX 5, SOLEIL), Elke Plönjes-Palm (FLASH, DESY), Michele Svandrlik (FERMI, Elettra)

It was decided that FoE will be present at the FEL Conference 2019, end of August in Hamburg, with an own information point to promote its activities.

The guidelines for the future organizers of FoE events were approved by the FoE SC. Organization of the two events of 2020, the Science@FEL's conference that will be held at DESY on 14 – 16 Sept 2020, hosted jointly by European XFEL and DESY, and the PhotonDiag workshop scheduled for November 2020 at PSI, will start in the near future.

Michele Svandrlik

## CompactLight

The H2020 CompactLight Design Study Project (www.CompactLight.eu) aims at designing the next generation of compact X-ray Free-Electron Lasers, relying on very high gradient accelerating structures (X-band, 12 GHz), the most advanced concepts for bright electron photo injectors, and innovative compact short-period undulators. Compared to existing facilities, the design will benefit from a lower electron beam energy, due to the enhanced undulators performance, and will be significantly more compact as a consequence of the lower energy and the high-gradient X-band structures.

The three year design study collaboration, which comprises of 24 partners, is about half way through now. The photon specification for the output of the FEL was ratified at the annual meeting Barcelona at the end of 2018, following the User Meeting that was held at CERN in November, and is available online. The team are now focused on selecting the optimal accelerator technologies and layout to meet the demanding specification. The layout selected has two FELs side by side which can either feed a single experiment with two very different wavelengths or can support two independent experiments.

Group picture of the Barcelona meeting.

The collaboration is also looking in detail at the concept of increasing the repetition rate of the FELs as the accelerator gradient is reduced. In the extreme the team will aim to achieve up to 1 kHz in the soft X-ray region, when compared to 100 Hz at up to 16keV. This is recognized to be a very challenging target but it is by setting such targets that innovative ideas develop. The team will get together for a mid-term review in Helsinki in July 2019.

Jim Clarke

Group Picture 12th ESUO meeting (Victor Claessen, FELIX, RU)

## FELIX hosted 12th ESUO meeting

The FELIX Laboratory and Radboud University were proud to host the 12th meeting of the Euro-pean Synchrotron and Free Electron Laser User Organisation (ESUO) on March 20th-21st, 2019. ESUO is presently comprises volunteer delegates from 30 countries in Europe and the Middle-East and Radboud University welcomed national user representatives from 23 ESUO countries as well as CALIPSOplus participants from the project management and the Networking Activities. Several guests were present including the vice-chair of the European Neutron Scattering Associa-tion (ENSA) Dr. Lambert van Eijck, Dr. Özgul Öztürk as chair of the SESAME user committee and Prof. Frank de Groot (Utrecht, NL) as an observer.

In the framework of the 12th ESUO Annual Meeting it was a pleasure for ESUO to welcome Dr. Allen Orville (Diamond, UK) representing the FELs, who emphasized the importance for XFELs to work in a global rather than just a European context. And it was also a pleasure for ESUO to welcome Sari Granroth, chair of the Finnish Synchrotron Radiation User Organisation (FSRUO), as new national delegate representing Finland.

The meeting was focussed on

• the national reports by the delegates reporting about their country's synchrotron and FEL activities, user community size, organisation and challenges, to establish a common base for future actions and initiatives.

• the report on progress of the CALIPSOplus work packages involv-ing ESUO. Within the Horizon 2020 project CALIPSOplus, ESUO is fostering the involvement of current and po-tential light sources users, with a special focus on Widening Countries and the Middle East ones. The project reports included updates on the wayforlight.eu portal developments and the synergies with the Twinning team presenting the light sources in the so-called Wid-ening Countries[11].

• the update on the SESAME synchrotron facility in Jordan and the various EU and nationally funded ongoing initiatives: in particular, a new Horizon 2020 project just kicked-off in March 2019 with the aim to build a Tomography Beamline (BEAmline for Tomography at Sesame - BEATS) given by Dr. Özgul Öztürk

• The possible interaction with the League of European Accelerator-based Photon Sources (LEAPS) Consortium has been also extensively discussed during the meeting. Some ESUO delegates have been nominated members of a LEAPS strategy group on synchrotrons, creating in this way a natural link between the user community and LEAPS
• And in the course of the meeting ESUO also launched its new LinkedIn page.

To support the Hungarian Synchrotron and FEL user community the delegates unanimously signed a letter of concern addressed to the Hungarian Ministry for Innovation and Technology about the funding situation of the Hungarian Academy of Science.

One of the next initiatives of ESUO will be the 1st ESUO regional workshop , August 28th, 2019, as a satellite event of the Photonica 2019 conference (Belgrade, Serbia), co-organised by the Serbian ESUO representative prof. Bratislav Marinkovic and funded by CALIPSOplus.

On a sunny first day of spring the participants were invited to join a guided tour of both large-scale, open access research facilities in Nijmegen, the High Field Magnetic Laboratory (HFML) and the FELIX Laboratory, to learn about the scientific possibilities offered by the centers as well as the combination thereof. *"Radboud University hosting FELIX and HFML represents a benchmark for the interaction between different scientific communities, and in that spirit we warmly welcomed the ESUO delegates and the guests from the European facilities"*, stated Dr. Britta Redlich, Director of the FELIX Laboratory.

Cecilia Blasetti

## CURRENT AND UPCOMING CALLS FOR PROPOSALS

www.fels-of-europe.eu/user_area/call_for_proposals

For experiments at FELBE
Deadline: 23 October 2019

For experiments at FELIX
Deadline: 15 November 2019

For experiments at FERMI FEL-1 and FEL-2 at Elettra
Deadline: mid November

For experiments at FLASH
Deadline: 1 October 2019

For experiments at SwissFEL
Deadline: 15 September 2019

For experiments at CLIO:
Deadline: 5 January 2020

## UPCOMING EVENTS

FEL Conference Hamburg, DESY & European XFEL, August 2019

Science @ FELs 2020, DESY & European XFEL, September 2020

PhotonDiag 2020
Paul Scherrer Institute.

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FELs OF EUROPE is an initiative of the ESFRI projects EuroFEL and European XFEL. It is a collaboration of all free electron laser (FEL) facilities in Europe, with the goal to meet the technological and scientific challenges of these novel and rapidly developing technologies and to provide a worldwide unique, pan-European research infrastructure that enables exploiting the full scientific potential of these unique accelerator based short-pulse light sources. More info at: www.fels-of-europe.eu

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