FELs OF EUROPE NEWS 2|18

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PhotonDiag Conference 2018 in Hamburg

IN THIS ISSUE

The seventh issue of the FELs OF EUROPE Newsletter contains a bright collection of scientific results from the partner FEL user's and test facilities. Starting from the THz facility TELBE in Dresden, to the mid-infrared FEL CLIO at Orsay, all the way through the European XFEL, that celebrated in September its first year of user operation, in a timely fashion with the first publication reporting results from an experiment performed at the facility. SwissFEL is as well quickly taking off to the first operation for users that will begin very soon in January 2019. A detailed description of the COXINEL line designed and built at SOLEIL and now installed at the LOA, with interesting results, is also included in the Newsletter.

The PhotonDiag 2018 workshop, together with the Science@FELs conference one of the two major events of the FELs of EUROPE collaboration, was organized last September at DESY and European XFEL in Hamburg. It was very well attended by around 100 participants, for four days of exciting presentations, intense discussions and working group meetings. The next workshop will take place in 2020 at PSI.

You will then find information on the other activities of the FELs OF EUROPE collaboration, for instance the SC meeting at SOLEIL in October and the continuation of the EUCALL collaboration. FELs of EUROPE involvement within LEAPS is increasing significantly, in particular within the Strategy Group on FELs. At the first LEAPS plenary meeting in Hamburg the two Strategy Groups, on synchrotrons and on FELs presented an overview of the grand challenges to be faced in terms of scientific areas in the next decade.

We wish you an enjoyable reading of the FELs of EUROPE Newsletter and we take the opportunity to wish you our warmest SEASON'S GREETINGS 2019!

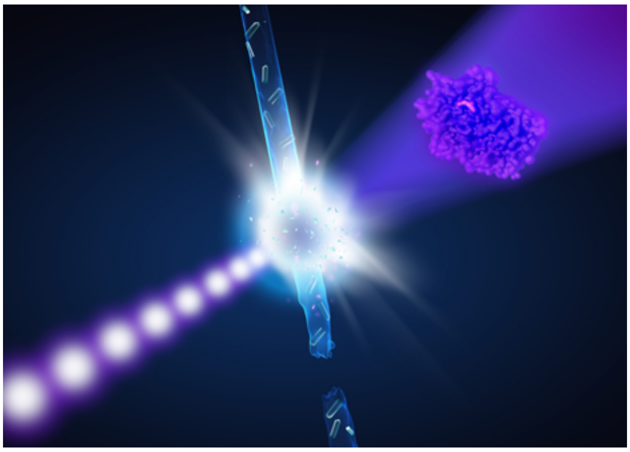
Michele Svandrlik

First results of European XFEL experiments published

At the end of August, just days before the first anniversary of the start of user operation at European XFEL, the first results based on research performed at the facility were published. In *Nature Communications*, a team headed by Prof. Ilme Schlichting from Max-Planck-Institute for Medical Research in Heidelberg, Germany, together with colleagues from Rutgers State University of New Jersey, USA, France, DESY and European XFEL described their work using the European XFEL to study a mixture of three plant proteins – an enzyme known as urease, concanavalin A, and concanavalin B. They demonstrated, for the first time that, under the conditions used at the time of the experiment a Megahertz pulse rate as produced by the European XFEL can be successfully used to determine the structure of biomolecules. The team were able to collect enough data of high enough resolution to be able to distinguish between the three proteins, and construct 3D models of the concanavalin A and B proteins.

A few weeks later, the results of the very first scientific experiment run at European XFEL were published by a large international collaboration, including European XFEL scientists, also in *Nature Communications*. The group of over 120 researchers from over 30 institutions was led by DESY scientist Anton Barty from the Center for Free-Electron Laser Science (CFEL). The composition of the group and the experiment design was the result of open discussion involving scientists from across the scientific community and European XFEL staff. In their study, the researchers were able to reveal the structure of a protein complex consisting of the enzyme CTX-M-14 β -lactamase from the bacterium *Klebsiella pneumoniae* together with the compound avibactam. In multidrug-resistant strains of *K.pneumoniae,* a concern in hospitals worldwide, the β-lactamase works like a molecular scissors, cutting open penicillin derived antibiotics and rendering them useless. Avibactam is therefore often administered together with antibiotics, where it inhibits the function of the lactamase. While both the avibactam and the lactamase structures were known, the structure of the two molecules in complex is the first novel protein structure to be solved at the facility. Both studies, performed at the SPB/SFX beamline at European XFEL, demonstrate the potential of the Megahertz pulse rate of the European X-ray beam for studying biomolecules.

Rosemary Wilson



Artist's impression of the experiment: When the ultra-bright X-ray flashes (violet) hit the enzyme crystals in the water jet (blue), the recorded diffraction data allow to reconstruct the spatial structure of the enzyme (right). Credit: DESY/Lucid Berlin

Observation and analysis of interferences on undulator coherent radiation stored in an optical cavity

We have measured [1] the interferences of the coherent radiation, produced in the undulator, and stored in the optical cavity at the CLIO mid-infrared FEL. The FEL laser power drops to zero by increasing the optical cavity length, i.e. toward the abrupt side of laser detuning curve. This cancels the laser amplification, but not the Spontaneous Emission (SE), nor its coherent part (CSE) which is due to the not gaussian longitudinal profile of the electron bunches.In our case the CSE is dominant and can be observed behind the FEL cavity mirror extraction hole.

This cavity detuning produces a shift of the stored light pulses at each cavity round trip. The superposition of the pulses in the cavity, separated from each other by a distance $2\Delta L$, creates an interference pattern along the longitudinal axis. The periodicity of this patern is dependant on cavity length increasing ΔL, and on the resonance wavelength λ_R of the emission. The figure shows the interference pattern as a function of the undulator gap, i.e. versus resonance wavelength. The periodical peaks can be written as a series of wave numbers σ_n, where n is the interference number and $\Delta\sigma = \sigma_{n+1} - \sigma_n = 1/2\Delta L$, where $\Delta L=0$ corresponds to the perfect synchronism condition. The measurement of $\Delta\sigma$ gives the value of distance $\Delta L=L_{cav}-L_o$ between actual cavity length L_{cav} and the perfect synchronism length L_o. This effect is not equivalent to interferences obtained in a Favry-Perot, which only make a redistribution of the radiation energy. Here, it is a Coherent Emission process due to a coupling between photons and electrons, and producing an additional amount of energy, which occurs periodically as a function of cavity length detuning. We have shown that the vanishing point of interferences ΔL_V occurs when the interference order n is equal to the number of undulator periods ($n=N_u$) or when the distance $c\Delta t=2\Delta L$ between light pulses is equal to the coherence length : $2\Delta L=N_u\lambda_R$.

Rui Prezares

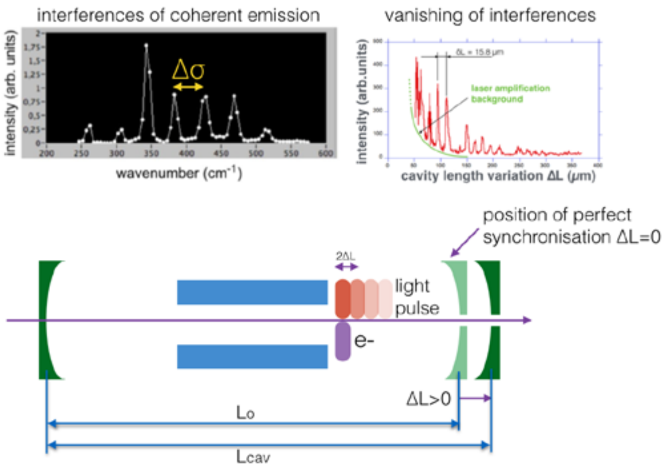


Figure: It is a simple method to determine the zero detuning position, which cannot be measured directly since it is hidden within the FEL detuning curve. Analytical simulations (not shown here) agree well with these results.

Original publication:

[1] R. Prazeres, F. Glotin, and J.-M. Ortega, Phys. Rev. Acc. & Beams, 21, 110703 (2018)

Imaging of continuum and bound electronic wave functions in nonlinear photoionization

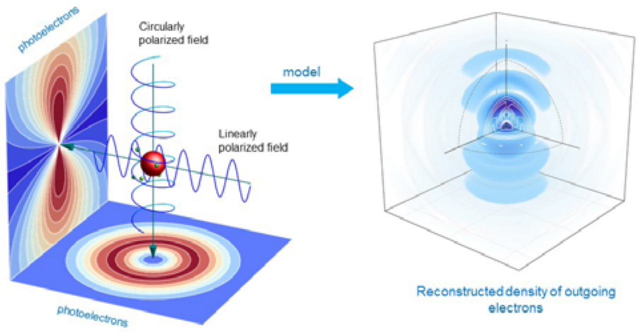
Photoionisation is a fundamental process in the interaction of matter with light in the extreme ultraviolet and soft X-ray spectral range: a quantum of light is adsorbed and an electron is ejected from the system. The outgoing electronic wave packet consists of several partial waves, whose amplitudes and relative phases are required to reconstruct the total outgoing electronic wave function. Also the bound electronic wave function left in the ion is subject to similar fundamental laws. The complete characterisation of the photoionisation process requires the reconstruction of both the continuum and bound electronic wave functions of the system interacting with the external radiation.

An international team has recently demonstrated the complete reconstruction of electronic wave functions in the two-photon double ionisation process in Neon atoms. The experiment was performed at the Low-Density Matter (LDM) end-station at the Free Electron Laser (FEL) FERMI and it took full advantage of the unique capabilities of FERMI, which can generate tunable, intense ultrashort pulses in the extreme ultraviolet with circular and linear polarization. Since the experiment may be complete only within a certain theoretical model, the role of theory is also hard to overestimate.

In the experiment, the photoelectron angular distributions were measured for circular and linear polarization of the FEL radiation, as schematically shown in the figure (left panel). The high intensity of the FEL enables the sequential absorption of two photons and the emission of two electrons, leading to the formation of doubly ionized atoms. The angular distributions of the photoelectron peaks can be used as parameters in a suitable theoretical model to derive full information on the amplitude and relative phase of the outgoing partial waves, as shown in the figure (right panel). At the same time, complete information on the electronic wave functions left in the ion can be derived.

The results have important implications for the investigation of nonlinear processes triggered by novel, ultrashort extreme ultraviolet and X-ray sources. Among several nonlinear processes, two-photon sequential double ionization plays a fundamental role, as it represents the dominant ionisation mechanism in the intensity regime 1013-1014 W/cm^2, which can be achieved by the XUV FELs currently available.

Giuseppe Sansone



(copyright figure E. V. Gryzlova)

Original publication:

P. A. Carpeggiani, E. V. Gryzlova, M. Reduzzi, A. Dubrouil, D. Facciálá, M. Negro, K. Ueda, S. M. Burkov, F. Frassetto, F. Stienkemeier, Y. Ovcharenko, M. Meyer, O. Plekan, P. Finetti, K. C. Prince, C. Callegari, A. N. Grum-Grzhimailo and G. Sansone, 'Complete reconstruction of bound and unbound electronic wavefunctions in two-photon double ionization' Nature Physics (2018) DOI: 10.1038/s41567-018-0340-4

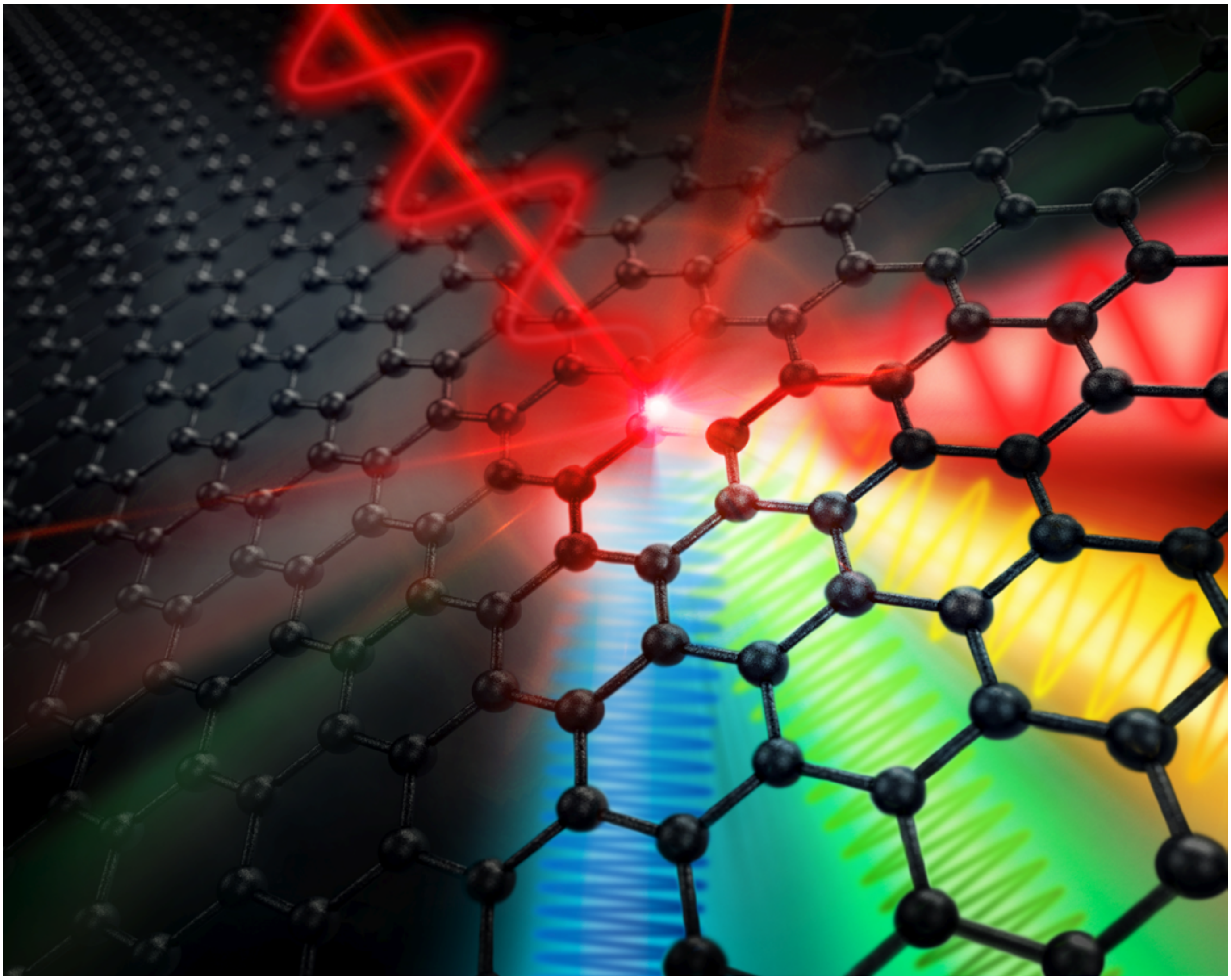
Graphene enables clock rates in the terahertz range

Graphene – an ultrathin material consisting of a single layer of interlinked carbon atoms – is considered a promising candidate for the nanoelectronics of the future. In theory, it should support the operation speed up to a thousand times faster than today's silicon-based electronics. Utilizing the recently commissioned superradiant THz user facility TELBE, scientists from the Helmholtz Zentrum Dresden-Rossendorf (HZDR) and the University of Duisburg-Essen (UDE), in cooperation with the Max Planck Institute for Polymer Research (MPI-P), have now shown for the first time that graphene can actually convert electronic signals with frequencies in the gigahertz range – which correspond to today's operation speed – extremely efficiently into signals with several times higher frequency. In the experiment the team utilized narrow-band, tunable, carrier-envelope-phase-stable THz pulses in the few hundred GHz range from TELBE to drive the free background electrons in single-layer graphene on ultra-fast timescales and detected the emitted THz high harmonics directly in the time-domain. A novel pulse-resolved detection and data analysis scheme developed within the frame of the EUCALL project provided for the required few 10 fs time resolution and high dynamic range.

Michael Gensch

Original publication:

Hassan A. Hafez, Sergey Kovalev, Jan-Christoph Deinert, Zoltan Mics, Bertram Green, Nilesh Awari, Min Chen, Semyon Germanskiy, Ulf Lehnert, Jochen Teichert, Zhe Wang, Klaas-Jan Tielrooij, Zhaoyang Liu, Zongping Chen, Akimitsu Narita, Klaus Müllen, Mischa Bonn, Michael Gensch, and Dmitry Turchinovich "Extremely efficient terahertz high harmonics generation in graphene by hot Dirac fermions", Nature 561, 507 (2018).



Narrow-band, tunable, carrier-envelope-phase-stable light pulses in the few hundred GHz range from TELBE drive the free background electrons in single-layer graphene on ultra-fast timescales and generate THz high harmonics.

Control of the transport of a plasma accelerated electron beam as a first step towards FEL amplification

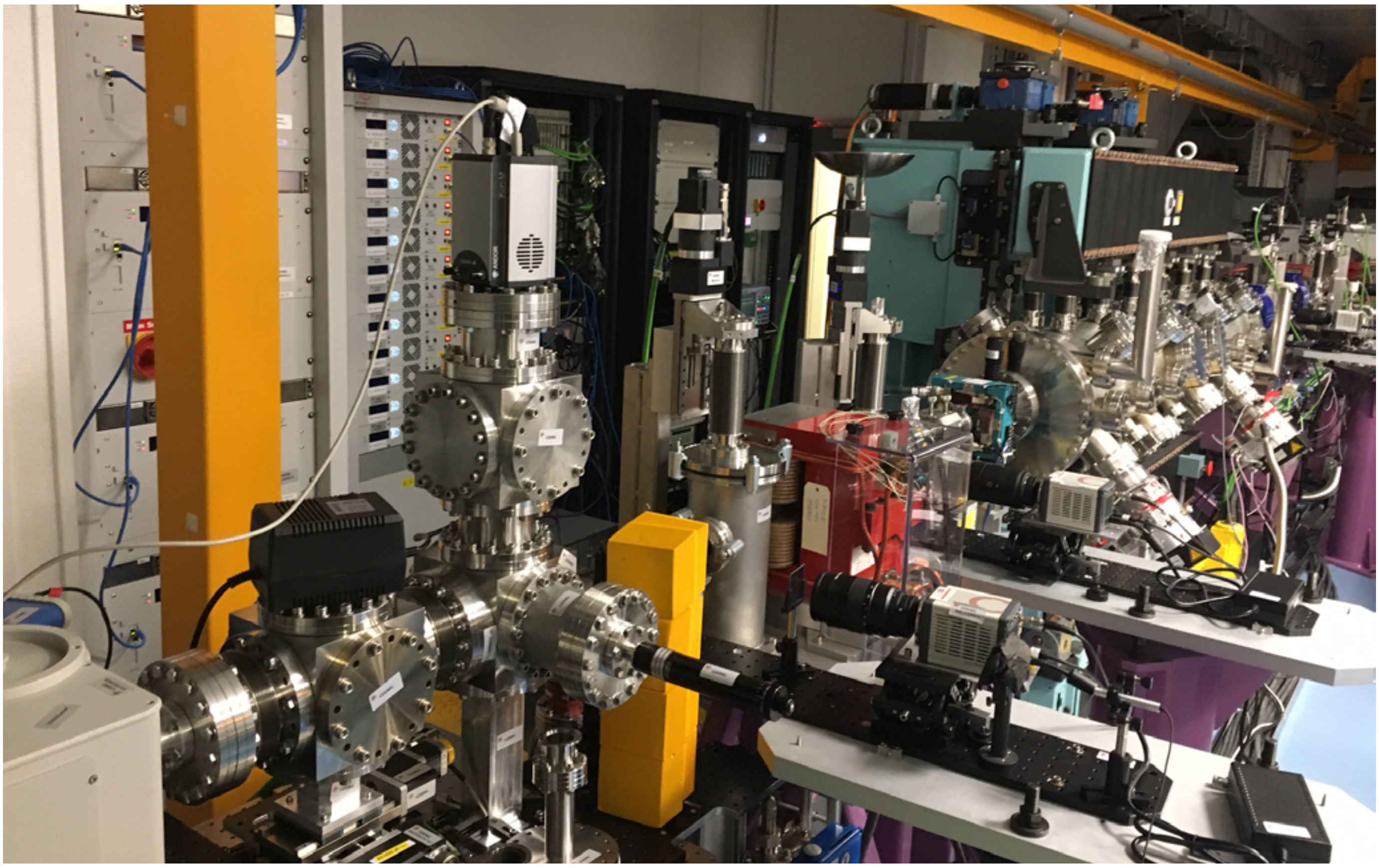


Fig. 1 : Picture of the COXINEL line with its associated equipment

The laser discovery followed by the FEL invention led to the advent of X-ray FELs opening new areas for matter investigation. The parallel development of high accelerating gradient LPA [1] is promising : 100 MeV – 10 GeV energy, kA peak current, ultra-short bunches, 1ϖmm.mrad normalized emittance beams can be produced. The hopes put in Laser Plasma Acceleration (LPA) to drive undulator radiation and free electron lasers (FEL) light sources are challenged by LPA parameters that do not meet conventional accelerator state-of-the-art performance, in particular for the energy spread and for the divergence [2]. Demonstrating of a proper electron beam control is the first challenge to overcome in the path towards LPA based FELs.

In the frame of an ERC Advanced Grant COXINEL (PI M. E. Couprie), a specific manipulation line has been designed (see Fig. 1) and built [4] at Synchrotron SOLEIL considering 200-400 MeV beams with 1 % energy spread, 1 mrad divergence, 1 μm size and 4 kA peak current. It is now installed at Laboratoire d'Optique Appliquée, where the LPA electrons are produced and accelerated. The divergence is rapidly mitigated (5 cm away from the source) via strong focusing with a triplet of so-called QUAPEVA permanent magnet quadrupoles of variable strength and of adjustable magnetic center position [5]. A magnetic chicane then longitudinally stretches the beam, sorts electrons in energy and selects the energy range of interest via a removable and adjustable slit mounted in the middle of the chicane. A second set of quadrupoles matches the beam inside an in-vacuum undulator (typical SOLEIL 2 m long U20, cryo-ready U18 or 3 m cryo-ready U15 prototype) [3]. The electron beam can be monitored with current transformers and cavity beam position monitors or by inserting scintillator screens along the line.

The LPA development (LOA, Salle Jaune) in the frame of an ERC Advanced Grant X-FIVE uses a Ti:Sapphire laser system delivering 1.5 J, 30 fs FWHM pulses. For the COXINEL experiment (see Fig. 2 of the installed line), the laser is focused into a supersonic jet of He-N_2 gas mixture for the LPA to operate in the robust ionisation injection, providing beams of up to 100 pC in a broad energy range up to 200 MeV with 1-5 mrad divergence. Transfer line components and LPA laser are aligned within ± 100 μm on the same reference axis.

After a first rough beam transport along the line where chromatic effects play an important role, a Beam Position

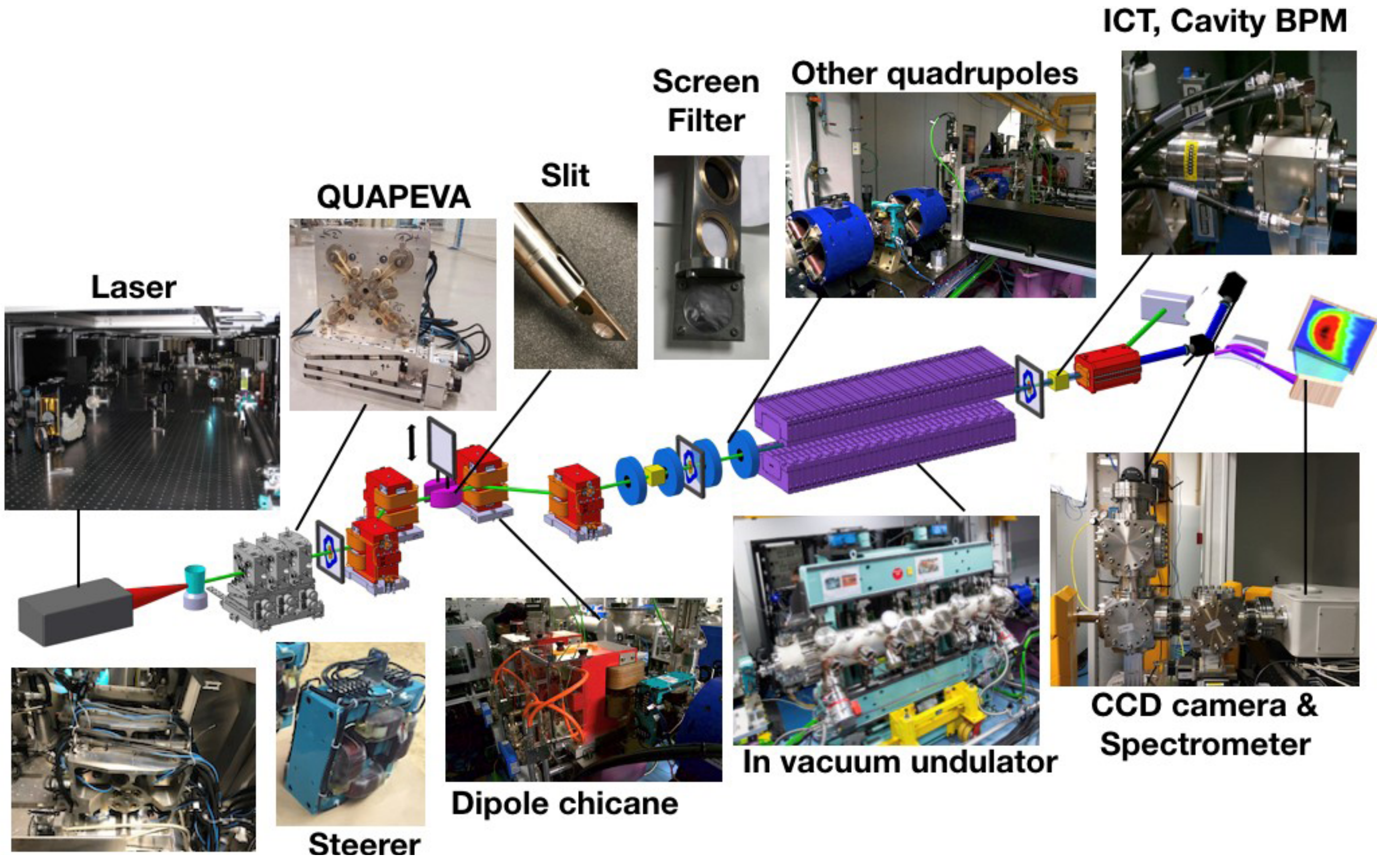


Fig. 2 : Picture of the installed COXINEL line.

Alignment Compensation strategy based on the matrix response approach is developed for separate correction of beam dispersion and position thanks to a proper setting of the QUAPEVA magnetic axis, enabling mitigation of pointing fluctuations [6]. The QUAPEVA strength is then slightly adjusted to optimize the focusing. The matched transported beam measurements agree with simulations for measured beam characteristics (dipole spectrometer and observation on a screen).

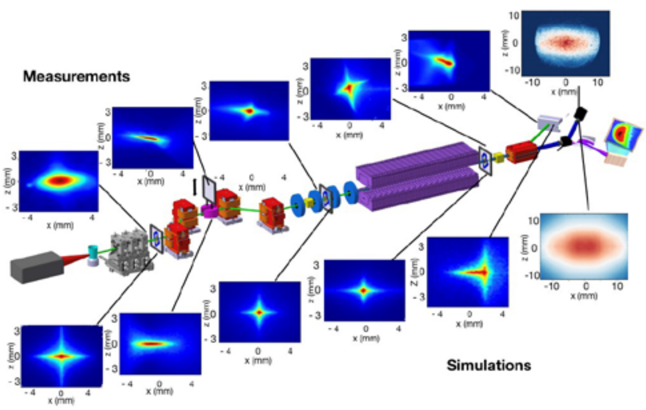


Fig. 3: COXINEL electron beam / photon measurements and simulations

A slit in the chicane selects the desired energy range. U18 undulator radiation is characterized with a CDD camera with some bandpass filters for spectral selection, and with a spectrometer equipped with a CCD camera providing a moon shape type profile enabling to provide some insight on the beam quality. The possibility to observe FEL amplification is mainly depending on the LPA beam parameters that can be experimentally achieved.

Marie-Emmanuelle Couprie

References:

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[4] M. E. Couprie et al., Plasma Physics and Controlled Fusion, Volume 58, Number 3 (2016)
[5] F. Marteau, et al., Appl. Phys. Lett. 111, 253503 (2017); Benabderrahmane, C., Couprie, M., Forest, F., Cosson, O. Adjustable magnetic multipole. URL https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016034490. Europe : PCT/EP2015/069649 of 27/08/2015, WOBL14SSOQUA / CA (2016).
[6] T. André, et al., Nature Comm. 1334 (2018)

One year user operation of European XFEL

DESY and European XFEL staff celebrate one year of user operation. l to r: European XFEL Managing Directors Nicolle Elleuche and Robert Feidenhans 'l, European XFEL Council Chair Maria Faury and DESY Accelerator Scientist Dirk Noelle

In September 2018, European XFEL celebrated one year of user operation (1). Over the first twelve months of operation, over 500 scientists from around the world have visited the facility in Schenefeld in north Germany to perform experiments at the first two operational instruments – SPB/SFX and FXE. Just days before the anniversary, the first results of experiments done at SPB/SFX were published (2), closely followed a few weeks later by a second publication (3). Both publications showed that the increased number of X-ray pulses per second as produced by the facility can be successfully used to determine the structure of biomolecules, paving the way for a wide range of different types of experiments at the instrument.

While scientists, engineers and users at SPB/SFX and FXE have been developing the instruments, standardizing protocols and workflows, and increasing their experiment repertoire, staff at European XFEL and DESY were also working hard to ensure the two instruments on the soft X-ray SASE 3 beamline would be ready for users by the end of the year. In July, first light was successfully directed into both instruments (4), and at the end of November SCS and SQS welcomed their first users. The SQS instrument is designed to study fundamental processes such as how—and how fast—chemical bonds break in molecules, or what happens on the atomic level when materials absorb many photons at the same time. The SCS instrument enables the investigation of fast changes in material properties, such as within magnetic materials, superconducting materials, and will also look into chemical reactions and light-matter interactions. The three experiments will run on the two SASE 3 instruments by the end of 2018.
At a further two instruments, MID and HED, commissioning is underway following first light at the end of the SASE 2 tunnel in October (5). Users are scheduled for the first half of 2019. The MID instrument will focus on the determination of the structure of disordered materials as well as dynamics at the nanoscale, and The HED scientific instrument will be able to generate matter under extreme conditions of pressure, temperature. A call for proposals for beamtime at all six instruments from July to November 2019 is currently open (6). With all six instruments operational next year, European XFEL will have tripled its capacity for user experiments. Once established, three instruments can be run in parallel.

Rosemary Wilson

The SCS (left) and SQS (right) instrument groups, both standing in front of the screens showing the first beams in their respective instruments.

Links:
[1]
https://www.xfel.eu/news_and_events/news/index_eng.html?openDirectAnchor=1574&two_columns=0
[2]
https://www.xfel.eu/news_and_events/news/index_eng.html?openDirectAnchor=1568&two_columns=0
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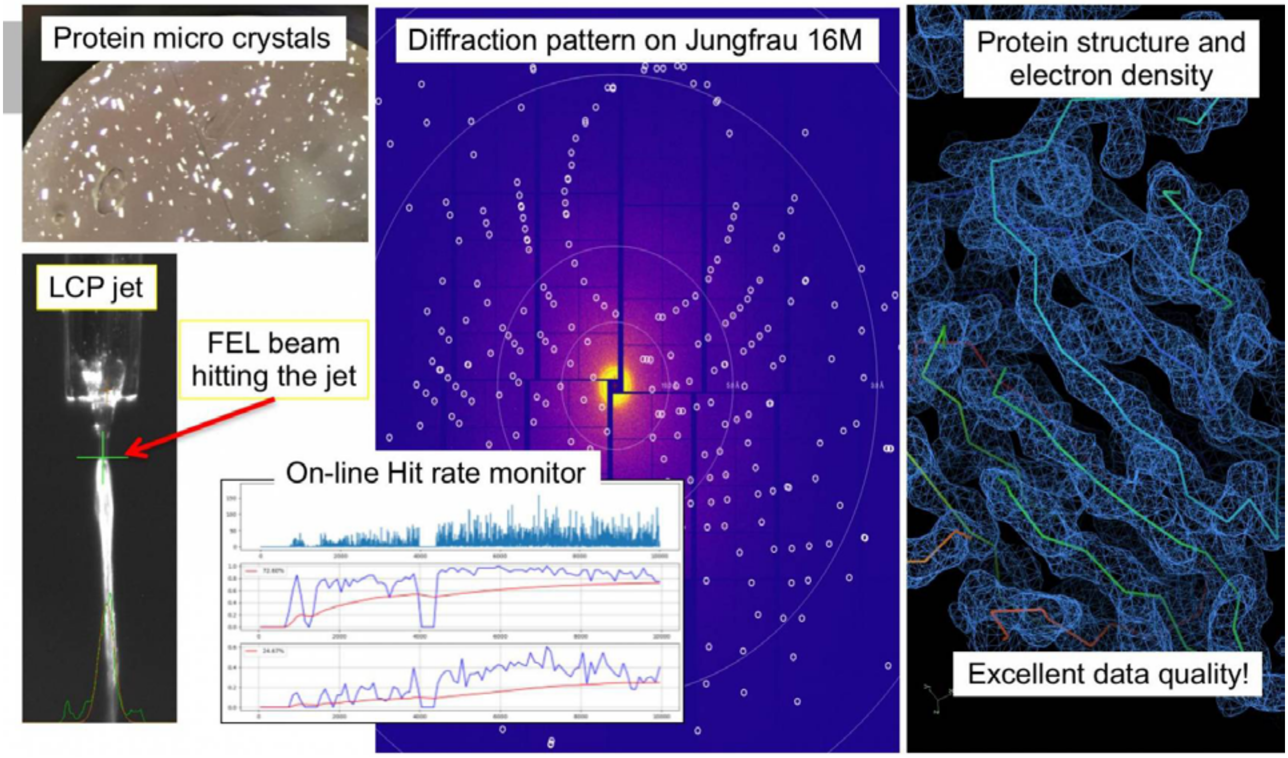
First serial femtosecond crystallography (SFX) pilot user experiment at SwissFEL



Serial protein crystallography (SFX) pilot experiment at Swiss FEL PI: Karol Nass (MX-SLS group) in collaboration with: MX-SLS, Joerg Standfuss SFX group, Alvra group, LeadXPro, Heptares, LBR, Bio, AIT Science IT, PSI Detector group

On the 7th to 12th of August 2018, a collaborative group of scientists from the Paul Scherrer Institute and members of the LeadXpro and Heptares pharmaceutical companies led by Karol Nass (PSI macromolecular crystallography MX-SLS group) performed the first serial femtosecond crystallography (SFX) pilot user experiment at the SwissFEL X-ray free electron laser (XFEL). Serial femtosecond crystallography is an emerging technique for structure determination of radiation sensitive micro-crystals that takes advantage of the ultra-short pulse durations from an XFEL and allows access to reaction time scales previously not reachable by conventional time-resolved crystallography. The goal of the first pilot user SFX experiment at SwissFEL was to commission the Alvra Prime station for future SFX experiments in preparation for user operation, which will begin in January 2019. The first pilot user SFX experiment successfully commissioned the vacuum/He atmosphere experimental chamber for SFX with the proven high-viscosity injector sample delivery system designed at Arizona State University, currently manufactured and operated in-house by PSI scientists. These experiments also operated for the first time the low-noise, gain-switching, high-dynamics range JUNGFRAU 16 mega pixel detector, which is the largest area detector operated at an XFEL to date. The JUNGFRAU detector has been developed by the PSI detector group for XFEL measurements that require charge integrating capabilities and can measure large numbers of photons (up to 104 at 12.4 keV) arriving in the very short time durations (femotoseconds) of an XFEL pulse.

The SwissFEL Alvra experimental station, operated by Chris Milne, Claudio Cirelli and Gregor Knopp, is designed for performing a variety of X-ray scattering and spectroscopy experiments in the energy range of 2 to 12.4 keV with flexible X-ray focus. It consists of two instruments: Alvra Prime, which is a chamber capable of a variety of sample environments (vacuum, He, neutral atmosphere) that includes the 16M JUNGFRAU scattering detector and a double-crystal von Hamos dispersive X-ray emission spectrometer, and Alvra Flex, which consists of a flexible geometry, 3-crystal von Hamos spectrometer for a variety of user experiments including resonant X-ray emission spectroscopy (RXES/RIXS) and inelastic X-ray scattering (IXS). Alvra also includes a femtosecond laser system for pump-probe experiments, capable of generating a range of excitation laser conditions in the UV to IR wavelength range (240 nm to 2.5 μm), and support for a range of sample injectors, including the aforementioned viscous injector for protein samples and a variety of liquid injectors for chemistry experiments.

The target for the first experiments was a membrane protein and the structure was resolved to 2.5Å structural resolution. The results from the first SFX pilot user experiment confirm that accurate, high-resolution data from protein micro-crystals delivered to the interaction region with XFEL pulses using the high-viscosity (LCP) injector can be recorded on the JUNGFRAU 16M detector in an efficient manner at the Alvra Prime experimental station at SwissFEL using the SFX technique. This important milestone demonstrates that SwissFEL has now entered into production mode, where it will be capable of high-impact research in the areas of structural biology, optogenetics and biochemistry.

SwissFEL /PSI

PhotonDiag 2018 at DESY and European XFEL in Hamburg

The workshop series on FEL Photon Diagnostics, Instrumentation, and Beamline Design, PhotonDiag, is organized regularly by FELs of Europe. Following an international host, LCLS (Linac Coherent Light Source) of SLAC National Accelerator Laboratory in May 2017 in California, the fourth workshop in the series has been organized again by two FELs of Europe members, DESY and European XFEL from September 17-20, 2018.

Free electron lasers (FEL) for the soft and hard X-ray range are fourth generation light sources capable of producing high brightness light pulses, ten billion times more intense than those emitted by synchrotrons, and of very short duration, with a wavelength in the extreme ultraviolet to hard X-rays. A central area of research and development is focused on characterizing these exceptional photon sources in all beam parameters and transporting them to the experimental stations for users.

Scientists and engineers, around 100 participants from all over the world, gathered in Hamburg and Schenefeld to discuss photon diagnostics and beamline design for free electron lasers (see cover picture for a photograph of the conference). The invited speakers comprised many pioneers in the development of photon diagnostics and beamline design for free electron lasers as well as a number of new faces. Following two and a half day of exciting presentations and intense discussions, for the second time a half day working group meeting took place on Thursday to plan future joint activities and beamtimes at the different facilities. Wavefront sensing and damage studies of optical elements were recognized as topics of joint interest.

Again, a Journal of Synchrotron Radiation special issue will be published in connection with the PhotonDiag and is scheduled to appear in spring 2019. The next PhotonDiag will be organized by the SwissFEL team and take place in 2020 at PSI in Switzerland.

Elke Ploenjes-Palm

FELs of Europe Award on Photon Transport and Diagnostics 2018

Dr. Jaromír Chalupský, deputy head of the Department of Radiation and Chemical Physics (Institute of Physics of the Czech Academy of Sciences in Prague), was awarded the FELs of Europe Award on Photon Transport and Diagnostics 2018 recognizing his outstanding contribution to the development of novel techniques to diagnose non-Gaussian pulses of XUV and x-ray light and for his contributions to the study of related ablation and desorption processes.

The award was presented on the occasion of the PhotonDiag 2018 workshop and comprises of a certificate, a monetary sum of 1000 Euro, and the opportunity to present his results at the PhotonDiag workshop. With this prize, the FELs of Europe Collaboration recognizes outstanding contributions in the fields of free electron laser photon diagnostics, photon transport and beamline developments, as well as FEL instrumentation.

In 2017, for the first time, the award went in 2017 to Dr. Diling Zhu, a staff scientist in the Hard X-ray Department at the Linac Coherent Light Source (LCLS) in the Stanford Linear Accelerator Center (SLAC), Menlo Park, CA. This year, the award was presented for the second time. This year´s award acknowledges

Jaromír Chalupský's insight into the fundame tal problem to characterize an XUV/x-ray FEL beam at or in the vicinity of a focus. Due to the extreme fluence levels and strong shot-to-shot fluctuations conventional methods such as knife-edge scans commonly used at synchrotrons fail. More than one decade ago, Dr. Chalupský recognised the potential of the imprint technique for characterisation of focused XUV/x-ray laser beams. In particular, he developed the method to go far beyond just characterising the spot diameter by extending the imprinting technique to non-gaussian beams and to procedures for analysis of the longitudinal intensity distribution (caustic) in focused XUV/x-ray laser beams.

Elke Ploenjes-Palm

SOLEIL FoE SC committee meeting

The Steering Committee (SC) of FELs of Europe (FoE) met in Paris at SOLEIL premises on 15 and 16 October 2018. Representatives of 11 FoE partners attended the SC meeting. In his welcome address Jean Daillant, the Director of SOLEIL, gave a brief overview of the short pulses activities, in particular the slicing facility at SOLEIL and the COXINEL laboratory, both visited by the SC together with CLIO.

The meeting started with an interesting and extensive overview of the most recent activities and developments at the different partner facilities and laboratories. An impressive number of results, with a significant progress on the partner activities were presented. Information on three EU projects was then given, with updates on CALIPSOPlus, CompactLight and EUCALL. The latter ended last September, and FoE, network partner of EUCALL, signed the letter of intent to join the continuation of the collaboration, EUCALL Forum.

The two conferences organized as FoE activities, SCIENCE@FELs 2018 in Stockholm and PhotonDiag 2018 in Hamburg both were very successful, with significant participation and interest shown by the respective scientific communities. The latest PR material of FoE was presented, as well as the roll-up banners which will be distributed to all partner facilities. It was also decided to print out the FoE Whitebook on Science with FELs.


FELs of Europe Steering Committee ready to visit COXINEL.

Special focus was given to LEAPS and the connection between FoE and LEAPS via the Strategy Group 2 on FELs. SG2 is presently being formed by members of the FoE SC as facility representatives and by five representatives of the users of FELs. The role of SG2 within LEAPS was extensively discussed by the SC.

The host and date for the next meeting of the FoE SC was finally agreed: it will be held at Helmholtz-Zentrum Berlin - HZB on 25 and 26 of March 2019.

Michele Svandrlik

LEAPS holds its first Plenary Meeting

On 12th and 13th November, the League of European Accelerator-based Photon Sources (LEAPS) has celebrated the first Plenary Meeting, where 13 pilot research projects have been presented by the spokespersons of the different collaborations. Philippe Froissard (EU) and representatives from national funding agencies also contributed to explore different possibilities for funding common research projects.

DESY (Hamburg, Germany) has hosted the 1st Plenary Meeting of LEAPS that gathered more than 150 representatives from the 16 member facilities of LEAPS, coming from 10 different countries and counting with the presence of the directors of all the facilities.

The LEAPS meeting has shown the great progress of the collaboration in the last months. Helmut Dosch and Caterina Biscari, chair and vice chair of LEAPS, opened the session summarising the activities undergone by the consortium that is giving service to 25 000 users in Europe.

– I'm very happy to see that joining forces between the light source facilities in Europe is making great progress and I'm convinced this is the way to make science shine even brighter in the future, says Helmut Dosch.

LEAPS members have organised themselves in six different working groups, three related to new technology developments and three addressed to academic and industrial services and outreach.

– The first real result of this collaboration is the presentation in this meeting of 13 pilot research projects that cover a great variety of photon science fields. Our staff have effectively worked together to propose new solutions for a better science and a greater impact in our society, concludes Caterina Biscari.

During a roundtable, with the participation of members and directors from different facilities, it was clearly expressed the goal of promoting common development projects that will implement smart specialization and will also enable more efficient management, as well as the need of avoiding overlapping activities in favour of collaborative initiatives.

Picture of the delegates attending the LEAPS Plenary Meeting.

A landscape document was also presented where the current status of facilities as well as their future plans were depicted. This document, that will be periodically updated, will become an essential tool for the roadmaps to be developed within LEAPS. The grand challenges to be faced in terms of scientific areas, as health, energy, food security, engineering & manufacturing, heritage science and fundamental science, were presented by the Strategy Groups. In preparation for one of the final calls of H2020, dedicated to pilot activities in view of the future Horizon Europe, proposals of pilot projects have been prepared and presented in the second day of the meeting.
Representatives from eight of the total ten National Funding Agencies, together with Philippe Froissard, Deputy Head of the Research Infrastructure Unit of the directorate on Open Innovation & Open Science of the European Commission, participated in a roundtable about the funding possibilities of the LEAPS project. All of them agree that the LEAPS network is a great success of how facilities can organise themselves for better global results. Giorgio Rossi, Chair of the European Strategy Forum on Research Infrastructures, ESFRI, gave a talk on the importance of coordination between research infrastructures to enhance the outcome of the developments at RI's and the science performed there.

The event finished in the evening with a reception that was given by the Free and Hanseatic City of Hamburg in the atrium of the State Library hosted by state secretary Dr. Eva Gümbel, from the Ministry of Science, Research and Equalities.

More information: www.leaps-initiative.eu

Ute Krell / LEAPS

Final EUCALL meeting in Brussels FoE will join the EUCALL Forum collaboration

The European Cluster of Advanced Light sources (EUCALL) funded by the European Union's Horizon 2020 research and innovation programme, was the first project to analyze and address the overlap between advanced light sources based on accelerators and those based on optical lasers. The project stimulated and supported common long-term strategies and research policies across the ESFRI facilities European X-FEL, ESRF and ELI, in partnership with five national laboratories and universities, along with two networks, Laserlab Europe and FELs OF EUROPE (FOE). During the three years of funding EUCALL has made significant developments in:

- simulation software for photon science experiments
- ultrafast data acquisition software
- sample handling and positioning systems
- advanced x-ray beam diagnostic tools
- new concepts to optimise use of its facilities

As a network partner, FOE has actively participated to various EUCALL events and recently to the EUCALL Foresight Workshop *Future Strategies for Research Infrastructure Operation,* a one-day workshop held in Brussels on September 6, 2018. Goal of the workshop was to discuss specifically future strategies for the sustainable and synergetic operation of advanced light sources in Europe providing open access to users. FOE contribution has been primarily to focus on the benefits of cross-community

OTHER CONTRIBUTIONS

Letter of intent signed to establish the EUCALL Forum in the future.

clusters on technical developments. Several examples are available on how European XFEL could for instance benefit from the developments at high repetition rate at synchrotron laboratories, like the ESRF and DESY, or at optical laser laboratories, like ELI. As an example, the EUCALL gas-based X-ray monitor was set up at the European XFEL's FXE scientific instrument and tested during the instrument's commissioning in 2017.

The success of the EUCALL collaboration has encouraged the partners to maintain and further develop this cooperation after the termination of the actual EUCALL project on September 30, 2018. A letter of intent to continue the collaboration between accelerator and optical laser based light sources under the name "EUCALL Forum" and to negotiate a Memorandum of Understanding describing the underlying principles of this collaboration was therefore signed at the end of the workshop in Brussels. FoE interest in continuing the collaboration was confirmed by the FoE Steering Committee and thus FoE signed the letter of intent as well.

Michele Svandrlik

CURRENT AND UPCOMING CALLS FOR PROPOSALS

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

For experiments at European XFEL
Deadline: 17 December 2018

For experiments at CLIO
Deadline: 15 January 2018

For experiments at FELBE:
Deadline: 05 April 2019

For experiments at FELIX
Deadline: 15 May 2019

UPCOMING EVENTS

FELs of Europe Steering Committee Meeting, 25-26 March 2019, Helmholtz-Zentrum Berlin, Germany

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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

FELs OF EUROPE