DESY inFORM.

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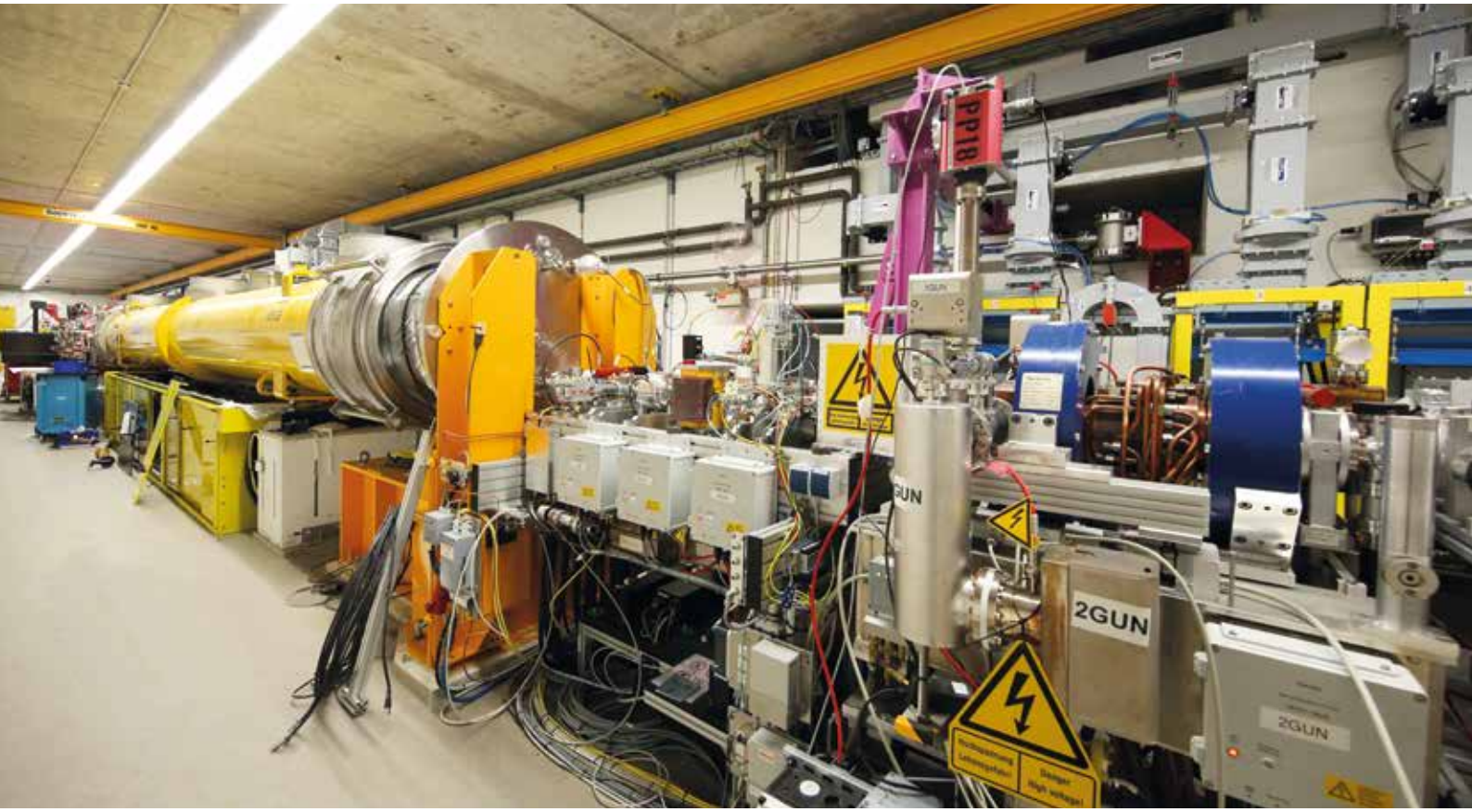
Staff Magazine of the Research Centre DESY

The particle race is on

The European XFEL injector started up in December



Starting point: The so-called gun (right) generates the electrons that are pre-accelerated by a superconducting accelerator module (yellow). Photo: Dirk Nölle, DESY

The logbook entry dates from 18 December 2015, 16.23h: “First beam up to the dump!” The first electron beam made its way through the European XFEL injector and reached the beam absorber at the end of the nearly 50-metre-long accelerator with an energy of 127 million electronvolts. One week earlier the first cooldown of the superconducting injector module to minus 271 degrees centigrade (2 Kelvin) had started and all safety and sensor checks were carried out successfully. After that it was only a matter of hours until the first beam hit the absorber. “Considering that we are commissioning this complex facility with all its infrastructure for the first time, everything went perfectly,” said Frank Brinker from the machine injector group who conducted the tests. The so-called cold compressors, for example, which cool down liquid helium from four to two Kelvin, were completely new machines in operation.

The injector is not only the source of electron bunches but a sophisticated system where tiny particle bunches out of several billions of electrons are being formed and pre-accelerated in order to set them off later on their onward journey through the main linear accelerator of the European XFEL. The electron bunches must not only consist of a very large amount of particles, but the bustling electrons must also have a high order so that they can be used for the laser-light-generating SASE process in the undulator magnets at the end of the accelerator. For this purpose, an ultraviolet laser pulse knocks out several billions of electrons from a caesium telluride cathode

CONTINUED ON PAGE 2

DIRECTOR'S CORNER

Dear DESY colleagues,

"Christian" once again – though younger, not as tall and only temporarily in the Director's Corner…

Nevertheless I am very happy to have the opportunity to address you here. First of all, I would like to thank many of you for the great support you gave me in the past months as a new DESY staff member. You helped me to find my way around very quickly and this way – particularly V1, but not only – helped that both internally and externally DESY can act as a professional partner for science, administration and in recent times also increasingly for industry.

I can assure you that it is a pleasure to work with so many highly committed and brilliant minds to achieve the common goal which is to facilitate outstanding scientific insights. Indeed, it has its benefits to turn up in a phase with challenging tasks on the agenda, like the end of the European XFEL construction phase or the completion of the CSSB building, the advancement of the campus idea or the implementation of a DESY innovation concept.

During my daily work on these issues, it is gratifying for me to see that the DESY spirit of a common effort for excellence tolerates any change of persons and vacancies, even at key positions. This is why I am optimistic that I can use my time together with you as an acting director to contribute to the mentioned projects.

We have many things ahead of us…

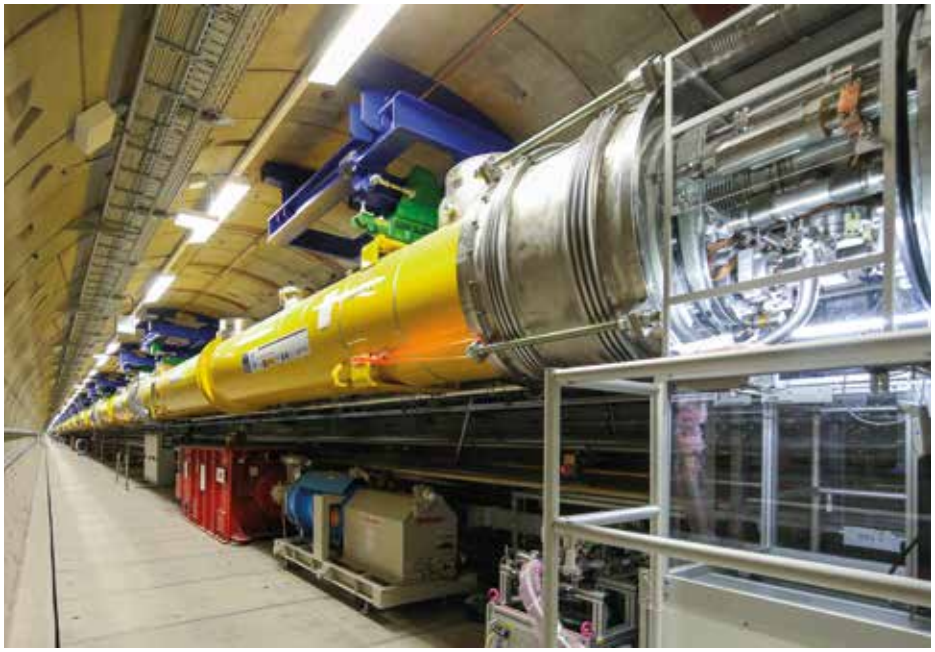
Christian Harringa

in the so-called gun. These electrons are then brought very quickly to high energies so that they do not have the opportunity to drift apart. They form an electron bunch with the length of approximately six millimetres which is accelerated by radio-frequency waves and compressed by intense magnetic fields. First, acceleration takes place in a short normal-conducting cavity made of copper which still is part of the gun. Then, a superconducting accelerator module – equivalent to the modules of the main accelerator and operated at minus 271 degrees celsius – generates another energy increase. A third-harmonic module operated at three times the accelerating frequency produces a particle bunch compression. This module went into test operation as well.

The injector will be thoroughly tested within the coming months; diagnosis and measuring instruments will be calibrated and the exact timing tuned. Meanwhile, not only single bunches but pulse trains with up to 30 electron bunches have rushed through the accelerator.

The installation of the main accelerator still continues. By now, more than 60 of up to 100 planned superconducting modules have been mounted to the ceiling of the tunnel – their future workplace. Every week, one or two are being added. In December, the assembly of the first SASE undulator line with 35 modules started as well.

Yet, the injector team does not only check the technology but also goes through all operation modes and procedures, such as starting up, restart, performance after power failure, etc. "When the main accelerator goes into test operation later on, we want to know the injector like the back of our hand and already carry out some kind of routine operation," said Brinker. *(tz)*



The European XFEL main accelerator is still under construction. Photo: Dirk Nölle, DESY

35 of these undulators will generate the extremely brilliant X-ray light in laser line SASE1. Photo: Frank Poppe, European XFEL

In Zeuthen, the first refugee took up scientific work at DESY. Within the framework of the Helmholtz initiative for refugees, 27-year old computer scientist Fuad Abu Sameer from Syria started a three-month work placement at IT in Zeuthen. The human resources department and the employment agency began intensive discussions on how to give other refugees a chance at both DESY institutes to do work in the field of science. Photo: DESY

Charity wave for refugees

DESY employees donate christmas presents and winter clothes

By Carolin Hahn

The fate of the many people who leave behind everything and risk their lives fleeing from war and terror concerns all of us. Many DESY people are already involved and helping – teaching German in their free time, accompanying refugees in administrative issues or lending a hand in one of the clothing stores. For them, aid to refugees is a personal matter.

Nevertheless, the organisers of a charity event on 10 December in Hamburg were still impressed of the enormous involvement of DESY staff and their families. “Our goal was to collect at least 35 packets with a small gift to bring a smile on the faces of children living in the refugee accommodations,” said Sonja Gebert from the human resources department, part of the organising team. “In the end, we were able to deliver more than 150 packets to the accommodations at August-Kirch-Straße and Holstenkamp.” An additional 60 packets were collected by Zeuthen staff members on their own initiative and distributed among young refugees.

Stefanie Fahlfeder from IT, who coordinated the donation of clothes for the Hamburg charity day, was very glad as well about the great success of this initiative: “We were able to transport more than 100 removal boxes full of pre-sorted warm clothes with a DESY lorry to the Hamburg clothing store.” A big thanks not only to the donors but also to the many helpers on site, to caretaker Anja Zaplinski and to the transportation group making all this possible.

The new year will still offer possibilities for everyone to get involved. Ideas include musical instrument lessons and a communal breakfast, with refugee families invited by DESY staff. As from now, every two weeks on Thursday, Zeuthen colleagues will regularly visit an institution that takes care of youths travelling alone. The kick-off was on 7 January, with two colleagues talking about adventures and research at the icy South Pole. “We welcome everyone who volunteers to entertain the youths – crafting, baking, playing, experiments – maybe there are completely different ideas,” said Ulrike Behrens from Zeuthen.

Additional ideas are highly welcome. You will find information on planned activities at the dedicated website – we recommend to take a look regularly.

INFO

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Strengthening cooperation, encouraging pioneering spirit

DESY supports interdisciplinary projects with a Strategy Fund

DESY is developing dynamically and at a breathtaking pace. With the aim of strengthening the corporate mission of the research centre the directorate has created a DESY Strategy Fund. The idea is to support cooperation between the fields of research and between the DESY institutes and to provide non-bureaucratic start-up financing to pioneering projects with a strategic potential, as DESY Director Helmut Dosch explains.

Why does DESY need a Strategy Fund?

There are three reasons. In the first place is the strategic change of DESY's main research topics which transformed the former "single-mission lab" to a multi-topic research centre. Moreover, research partners with interdisciplinary research structures collaborating with DESY have established themselves on the DESY campus in Hamburg, like the European XFEL, the European Molecular Biology Laboratory EMBL, Helmholtz-Zentrum Geesthacht, as well as the University of Hamburg and the Max Planck Society at the Center for Free-Electron Laser Science CFEL and elsewhere. Last but not least there is the interdisciplinary Centre for Structural Systems Biology CSSB.

Thirdly, DESY research is organised at the two institutes in Hamburg and Zeuthen. DESY in Zeuthen is in the course of developing into an internationally visible hub for astroparticle physics and therefore contributes independently to the common mission of the research centre.

These three aspects show very clearly the great dynamics and innovative strength of our research centre, which significantly contribute to its high scientific reputation and to secure its future. However, they also bear the insidious danger of dispersing the research activities. As a consequence, this could cause the loss of the common mission and the DESY brand.

The DESY Strategy Fund (DSF) is to promote cooperation between the DESY devisions and between both DESY institutes, and with the DESY partners on the Hamburg campus, and – meant as start-up financing – it is supposed to support new activities with a strategic potential.

What is the strategic goal of the fund?

A central strategy of DESY is to present itself and act as *one* laboratory with *one* mission and not as a centre with several main thrusts. This is why it is important to create incentives for interdisciplinary cooperation between the fields of research and between the Hamburg and Zeuthen institutes. We also intend to particularly promote courageous ideas of our young researchers.

Photos: Heiner Müller-Elsner, DESY

What is the difference of DSF compared to other funding instruments?

The DSF is intended as a non-bureaucratic funding instrument which offers rapid start-up financing for good ideas and thus provides a location advantage to our scientists.

How is the DSF endowed?

The DSF was initiated in 2014 and, last year, first projects could be started with DSF funding. The directorate decided to gradually increase the DSF budget in the coming years. The goal is to make available nearly one percent of DESY's basic funding to the DSF in 2020 – approximately two million euros. This will be the maximum. Last year, we started with 500 000 euros; 600 000 euros are at disposal this year for already approved and new projects.

Which projects are already being supported?

Within the first two application rounds, a total of six applications were included in the funding. Among them also very audacious projects which I regard as very exciting since these projects cannot easily be integrated into routine business at DESY. In total, the funded projects cover a broad spectrum of DESY research; from linking gamma astronomy with the search for unknown light elementary particles, to laser development and through to new accelerator concepts.

Who can submit an application and who decides upon funding?

The DSF is open to all DESY scientists. The decisive factor is that the application must be supported by at least two divisions or institute locations and in some circumstances even co-financed. The applications are surveyed by a DESY internal selection committee, the DSF board, which then issues a recommendation to the chairman of the board of directors. Upon this basis, he then decides on the funding.

Sucessfully applied

The projects that are already funded by the DSF include:

- Laser-Driven Focusing and Deflecting Elements for Dielectric Electron Accelerators
  (Ingmar Hartl, Ralph Aßmann)
- 3 GHz Gun Laser Prototype for Multibunch Operation of REGAE
  (Ingmar Hartl, Klaus Flöttmann)
- Gamma Rays and Axion-like Particles in Astrophysics
  (Gernot Maier, Andreas Ringwald, Rolf Bühler, Axel Lindner)
- Laboratory Astroparticle Physics
  (Martin Pohl, Jens Osterhoff, Frank Stephan)
- Advanced Transverse Flat-top Beam Shaping for Photocathode Gun Lasers
  (Lutz Winkelmann, Klaus Flöttmann, Frank Stephan)
- N-Doping Treatment and Centrifugal Barrel Polishing for Improved Performance of SRF Nb Cavities
  (Waldemar Singer, Andreas Stierle)

INFO

More information and application:
www.desy.de/dsf
Contact person at the directorate's office:
Arik Willner, arik.willner@desy.de,
Phone -4888
Deadline of current application round:
15 April 2016

Wolfgang Sandner

1949 - 2015

By Helmut Dosch

On 5 December 2015, Wolfgang Sandner passed away unexpectedly at the age of 66 years. Wolfgang Sandner had been a leading scientist at DESY since 2013 and at the same time Director General of the European laser research centre Extreme Light Infrastructure (ELI-DC). His seat and office was at the DESY institute in Zeuthen and, as one of the most influential and prominent figures in laser science, he focused with great vision on the establishment of the world's first international laser research centre ELI at three locations in Eastern Europe.

From 1993 to 2013, Sandner was director at the Max Born Institute for Nonlinear Optics and Short-Pulse Spectroscopy in Berlin. During this time, he established close scientific cooperation with DESY in the field of photocathode lasers. These laser developments are today's basis for the generation and injection of electrons at DESY's large-scale facilities PITZ and FLASH, as well as at the European XFEL. The relationship deepened when Sandner became chairman of the European Association of National Research Facilities (ERF), and when he participated in the design of an international Helmholtz beamline at the European XFEL. Be it in these functions or as president of the German Physical Society – with his profound knowledge and his experience in research policy, Sandner was an important driver for the positioning of national research laboratories such as DESY within the framework of European research policy and he was a close advisor and instigator in many committees being of strategic importance to DESY.

His endeavour was to advance the European and international collaboration in research. He always had great objectives in mind. With Sandner DESY does not only lose an outstanding scientist and internationally distinguished research manager but also a close friend and long-time partner. He was an interationally highly regarded, most reliable and charismatic personality of science; his sudden death is a big loss.

ERC Starting Grant for Kerstin Tackmann

DESY physicist Kerstin Tackmann will receive over 1.3 million euros from the European Research Council (ERC) in order to carry out research aimed at a more detailed characterisation of the Higgs boson. She will use this ERC Starting Grant to set up a research group to investigate the properties of the Higgs boson in great detail, as part of the international ATLAS Collaboration. These measurements are an important step towards identifying whether the particle fits the Standard Model of particle physics. The five-year project starts in 2016.

Helmholtz International Fellow Award for John Spence

The X-ray laser pioneer John C.H. Spence, who is professor at Arizona State University, will receive a Hemholtz International Fellow Award, having been nominated by DESY. The Australian-born physicist will use the 20000 euros associated with the award to fund an extended visit to DESY. Spence is considered an outstanding expert in the application of X-ray lasers, especially as a means of investigating the atomic structure of biomolecules. Beyond this, he is one of the world's leading researchers in the development and application of electron microscopy at atomic-scale resolution.

Making progress

Report from construction activities on the DESY campus in Hamburg

There's no rest for the construction machines on the DESY campus in Hamburg. Existing research facilities are being expanded, new institutions develop and underline the major and trans-regional importance of DESY as a top-level research centre with worldwide recognition.

Experimental hall East of PETRA III extension. Photo: Edgar Weckert, DESY

Upgrade of the free-electron laser FLASH

Two beamlines have been set up in the new experimental hall "Kai Siegbahn" and technical commissioning will start at the end of January. First user experiments are already scheduled for 2016. Some of them involve a so-called reaction microscope (REMI) that microscope records chemical reactions on the molecular level. This instrument had already operated successfully at FLASH and will now be permanently installed in the new hall.

Beamline of FLASH extension in the experimental hall "Kai Siegbahn". Photo: Rolf Treusch, DESY

PETRA III extension

There is also progress on the PETRA III extensions North and East. During the PETRA III measuring period from March to November 2015, the hall infrastructure was installed and the beamlines P64 and P65 of the North extension were set up. At P65, first experiments were carried out from end of October until shutdown on 12 November 2015. User operation at both beamlines will start in summer of this year including X-ray absorption and X-ray spectroscopy experiments. There is a great deal of interest and demand considerably exceeds available beamtime.

In the East extension, the measuring huts have already been installed. Instrumentation and technical equipment will be installed until the end of the year. Beamlines P22 to P24 are currently assembled in the PETRA tunnel. Beamline P21 will be completed one year later. Experiment operation at all beamlines is scheduled for 2017.

PETRA III is currently shut down and user operation will start again on 7 April 2016.

Centre for Structural Systems Biology (CSSB)

Construction of the CSSB building began in 2014, the topping-out ceremony took place in September 2015. By the end of January, the frontage will mostly be closed and a bridge will be built to enable access to the experimental hall "Max von Laue" from the CSSB building. Construction work is to be completed until the end of the year. Afterwards, the building service facilities will be fitted during trial operation. Building inspection will take place in the first quarter of 2017, followed by residual work. The building will be ready for occupancy in April 2017.

New photon science building

The new photon science building, the future home of DESY NanoLab, will be added on building 25f. It will host several DESY workgroups, one workgroup of Helmholtz-Zentrum Geesthacht and guest groups. The building application has already been submitted and the approval procedure is pending. Construction start is planned for autumn 2016, occupancy is scheduled for 2018. It will include 725 square metres of laboratory space and offices for about 120 employees.

The NanoLab workgroup is currently accommodated in building 3. There, the DESY scientists can find instrumentation for spectroscopy methods, an X-ray diffraction laboratory microscopy and equipment for microscoping and structuring methods. These facilities may also be used by external PETRA III users within the framework of approved measuring times. With a scanning electron microscope, it is possible to make a precise, very fast and high-resolution characterisation of the morphology and surface properties of samples. Moreover, it is possible to apply markers with nanometre precision at interesting spots on sample surfaces which will then be investigated in an experiment at PETRA III. Without marker, it is almost impossible to find these spots in the experiment which were previously selected for analysis in the laboratory. Already today, the NanoLab has a large stock of excellent tools for precise preparation of nanostructured samples for complementary investigation at PETRA III. This allows deep insights into the properties of new materials and their correlation with structure and chemical composition.

Architectural design of the new Photon Science building. Image: RBA

Center for Hybrid Nanostructures (CHyN)

The University of Hamburg established the Center for Hybrid Nanostructures on the Bahrenfeld campus. The institute develops and investigates hybrid nanostructures of solids and biological materials. The new research building will be equipped with vibration-free cleanrooms for lithography, deposition and nanostructure technology as well as bio-cleanrooms. On 17 December the topping-out ceremony took place in the presence of Hamburg's Science Senator Katharina Fegebank. The building will be ready for occupancy beginning of 2017. *(hw)*

Three Helmholtz Young Investigators Groups for DESY

The Helmholtz Association has awarded DESY grants to set up three new Young Investigators Groups. With annual funds of 250 000 euros each, Sadia Bari, Martin Beye and Sarah Heim can set up their own research groups at DESY over a period of five years. Altogether, the Helmholtz Association is supporting 17 new Young Investigators Groups at its 18 centres. "I am very happy that no fewer than three of our candidates were able to convince the jury with their projects. This shows the outstanding quality of the young scientists we have at DESY", says Helmut Dosch, chairman of DESY's Board of Directors. DESY itself will be supplying half the overall funds in each case.

Helmholtz grant for young DESY scientists

Two young scientists at DESY have been awarded grants by the Helmholtz Association. Over the next three years, Janna Katharina Behr and Anne-Laure Calendron will each be receiving 300000 euros as part of the Helmholtz Postdoc Programme, in order to pursue a research topic of their own choosing and to establish themselves in their field of research. DESY and the Helmholtz Association will each contribute half of the funds. Behr will be working as part of the ATLAS Group at DESY and intends to search for new elementary particles. Calendron will study high-speed magnetisation processes in complex materials.

Katharina Behr

Ann-Laure Calendron

Presentation of PhD Thesis Prize 2015

The 2015 PhD thesis prize awarded by the Association of the Friends and Sponsors of DESY was split equally between Denise Erb and Timon Mehrling. Both worked at DESY and the University of Hamburg for their theses. Denise Erb developed a technique to produce nanomaterials by self-organisation. Timon Mehrling focussed on the preservation of beam emittance in modern plasma accelerators.

Big run on the DESY DAY

Hands-on science

A total of 18401 curious people were registered at Germany's largest accelerator centre and its partner institutes on the DESY campus in Hamburg at the open day on 7 November. With more than 120 attractions, lectures and hands-on activities, the staff members of DESY and guest and partner institutes presented their work on site. In the experimental halls, labs, accelerator tunnels, workshop, engineering design departments, computer centre and school-labs, they demonstrated what distinguishes a large research centre.

The traditional open day on the DESY campus took place for the sixth time within the framework of the Hamburg Night of Science. Already hours before the Night of Science's official start, DESY opened its doors. This opportunity to come to the DESY campus earlier, between 12 and 17h, was taken by more than 12 000 curious visitors, many families among them. More than 1200 voluntary helpers from DESY and its partner institutes were prepared to tirelessly answer questions and to show that research does not only involve fascinating high-tech machines but also and above all engaged and enthusiastic staff members.

"We are glad that the Hamburg campus of knowledge attracts so many people of all ages and we would like to thank the public for their great interest for our work," said Helmut Dosch, Chairman of the DESY Board of Directors. The DESY DAY and the Hamburg Night of Science again and again show in a very spectacular way how people of this region are fascinated by the adventure of research."

With more than 30 000 visitors, this year's Night of Science once more hit the record of participants. Throughout the city, about 1000 events made inquisitive people take a discovery tour through Hamburg's world of science.

Photos:
Axel Heimken, Marta Mayer, DESY

Sustainable energy for science

On 29 and 30 October 2015, the two-days workshop „Energy for Sustainable Science at Research Infrastructures“ took place at DESY in Hamburg. It was organized by DESY and the Association of European-level Research infrastructure Facilities ERF in cooperation with other European research laboratories as CERN and the European Spallation Source ESS. In the focus of this workshop was the discussion of energy topics at research facilities and (accelerator based) large-scale facilities, which evidently have a high energy and power consumption. For two full days, 100 international participants, including technical experts, planners, operators and managers of large scientific-technological research facilities met in various plenary and parallel sessions to discuss measures to increase energy efficiency, energy saving potentials on the basis of new technological developments, as well as general energy and sustainability concepts and plans at current and newly planned large-scale research facilities.

The present DESY workshop continued the success of the first two predecessor workshops in Lund (2011) and at CERN (2013), to kick off new Europe-wide and international projects and cooperation aimed at advancing sustainability at and around large research infrastructures. A concrete follow-up activity from the workshop now is the creation of a sustainability charter for European research infrastructures which will include guidelines and best practice examples. More information on the workshop is available at
http://erf.desy.de/energyworkshop

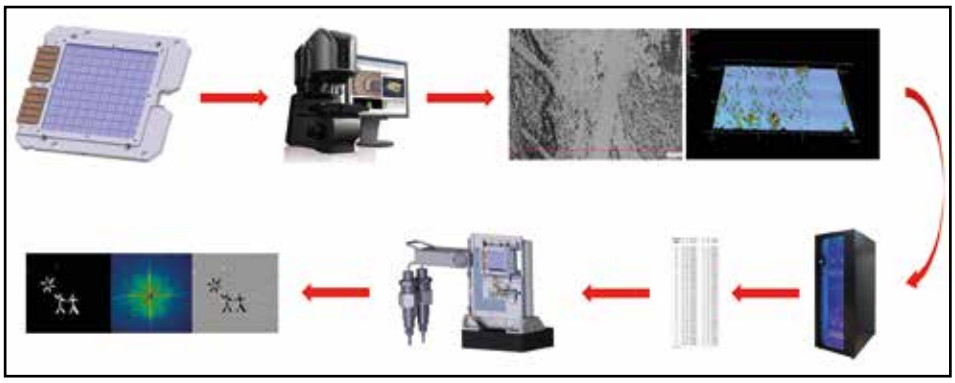
Research and industry in Baltic Sea region

A project led by DESY and aiming to link research centres and universities with industrial enterprises is to receive some three million euros in funding from the European Union’s Baltic Sea region programme. As part of “Baltic TRAM”, national hubs are due to be set up in Sweden, Germany and Poland over the next three years, especially at universities. These hubs will serve as a network offering measurement and other services to industrial customers, locally and also by international exchange.

The Baltic TRAM (Transnational Research Access in the Macroregion) project is one of several activities of the ScienceLink network, which is currently chaired by DESY. ScienceLink is a cooperative venture involving leading universities, research centres and regional development partners in the Baltic Sea region, whose aim is to turn scientific findings into innovations more swiftly.

First Technical Milestone

EU project EUCALL connects laser-driven and accelerator-driven X-ray radiation sources



HIREP’s confocal microscope sample pre-investigation workflow. Samples are automatically screened via microscope and points of interest identified and logged. From the generated coordinates, a sample is raster scanned for analysis. Image: EUCALL

By Graham Appleby

In October, the European Cluster of Advanced Laser Light Sources (EUCALL) project officially started and the first technical Milestone was completed on 1 December. This achievement was made by the High Repetition Rate Sample Delivery (HIREP) Work Package. The HIREP members, from six different radiation facilities, developed an agreement about the types of advanced sample holder and sample stages which they will develop under EUCALL. With HIREP‘s milestone, the first steps towards an integrated concept for decentralised sample characterisation and fast sample positioning at EUCALL’s facilities have successfully been made. It shows that scientists from EUCALL‘s network are successfully cooperating just two months into the three-year project period.

EUCALL’s objective is to generate collaboration and synergy between large-scale sources of laser-driven and accelerator-driven X-ray radiation. The lead project partner is the European XFEL, while the other partners are DESY, the Extreme Light Infrastructure (ELI), ESRF, Helmholtz Zentrum Dresden-Rossendorf, Lund University, PSI and Elettra Synchrotron. EUCALL received funding of 7 million euros from the EU’s Horizon 2020 research and innovation program and runs until September 2018.

DESY’s scientists participate in all scientific work packages of the project. “EUCALL is a great opportunity to create and shape a broad, sustainable collaboration between laser-based and accelerator-based light source infrastructures,” says Josef Feldhaus, DESY’s representative on EUCALL’s steering committee. “This will substantially contribute to improved performance and output of these large investments to the benefit of science and innovation. Our facilities are based on highly specialised, complex systems, therefore we are eager to collaborate in the further development and integration of techniques: we contribute our knowhow, benefit from partners’ knowhow and find optimised solutions. We exploit synergies, we avoid duplication of effort, and we standardise soft- and hardware components. This facilitates access for users who need to use different facilities for their research, and optimises the efficient use of the facilities.”

INFO

www.eucall.eu

Giant planetary interior simulator

Largest press at a synchrotron enters operation at DESY

Scientists at DESY have installed a giant press that can simulate the interior of planets and synthesise new materials. The Large Volume Press (LVP) can exert a force of up to 500 tons on each of its three axes. “This corresponds to 300 000 times atmospheric pressure or 900 kilometres below the Earth‘s surface”, explains the DESY scientist in charge, Norimasa Nishiyama. The apparatus, measuring 4.5 metres in height and weighing 35 tons, can compress samples as large as one cubic centimetre, depending on the desired pressure. That is about the size of a standard die used in board games and exceptionally large for high-pressure experiments. “This makes our press the largest at any synchrotron light source in the world,” underlines Nishiyama.

Researchers can use the bright X-ray light from DESY‘s synchrotron light source PETRA III to peer inside samples under high pressure and investigate changes in their structure under these conditions. “We can not only compress the cubic volume homogeneously, we can also deform it,” says Nishiyama. Additionally, samples can be heated to more than 2000 degrees Celsius. Together, this opens the way to investigating many dynamic processes occurring inside rocky planets like the Earth. “For instance, we can simulate seismic activity and volcanism,” says Nishiyama. “With the press we can create artificial magma and watch it flow.”

While other techniques like diamond anvil cells (DAC) can achieve higher pressures, the new installation can compress exceptionally large volumes. This is not only interesting for simulating dynamic processes in the Earth’s interior, but also for synthesising and studying super-hard materials that only form under high pressure. “For instance artificial diamond or cubic boron nitride, which is the second hardest material in the world after diamond, or stishovite, which is the hardest oxide,” explains Nishiyama. These compounds are also interesting for industrial applications. “Also, many new superconductors can only be synthesised using this type of instrument,” says the physicist.

The six anvils of the press are able to exert that is 300 000 times the atmospheric pressure.
Image: Max Voggenreiter GmbH

The Large Volume Press has been installed in the PETRA III extension hall North and already started operation, although there is no X-ray beam available yet. “We use the instrument for materials synthesis whenever there is no beam,” explains Nishiyama. This does not only apply to the installation period in the new hall or to maintenance shut-downs of PETRA III, as Nishiyama shares the X-ray beam at his beamline P61.2 with colleagues from the Helmholtz-Zentrum Geesthacht (HZG) setting up beamline P61.1. Whenever P61.1 uses the beam, the LVP will do material synthesis experiments.

The LVP installation is funded by the German Federal Ministry of Research BMBF (grant no. KEI0500009612).
Photo: Dirk Nölle, DESY

Even after the new beamline is complete, the operation of the giant press will probably need some practice, as Nishiyama points out: “Nobody has tried to use such an instrument at a synchrotron. It is very unique, and it‘s a challenge, too.” *(tim)*

From metal sheet to particle accelerator – part 2

Into the cold: cavities for the European XFEL put to the test

By Ricarda Laasch

Eight hundred superconducting cavities for the European XFEL have to be passed through the hands of experts. Their industrial production which was completed in September was covered in the previous issue of DESY inForm. However, it is still a long way to go for DESY and its partners to a complete particle accelerator. In this issue, you can read more about the sophisticated inspection of the finished cavities and why these tests are meticulously documented.

One of two cryostats for vertical cavity tests in the AMTF hall

Red and green containers with resonating cavities reach DESY by lorries and are unloaded in the so-called Accelerator Module Test Facility (AMTF). The red containers come from the company Research Instruments in Bergisch Gladbach, the green ones come a long way from E. Zanon in Italy. In the AMTF hall, which was custom-built for the testing of accelerator modules, the cavities are delivered to Jacek Swierblewski and his 40-member team of technicians and engineers. The whole team comes from the Institute of Nuclear Physics of the Polish Academy of Science (IFJ-PAN) in Cracow, Poland. The team working at DESY represents an in-kind contribution of the institute providing labour to the construction of the European XFEL. The team settled in easily: “Collaboration with DESY is working out well, the important contact partners are always present and open for questions,” said Swierblewski. An important contact partner at DESY is Detlef Reschke. As the so-called Cavity Owner, he always keeps an eye on all delivered cavities. “My work goes hand in hand with the Polish team,” said Reschke. “The team carries out the cavity measurements and I evaluate the results and decide how to further proceed with each cavity.” However, Detlef Reschke does not have to do the job alone, he too gets support from the AMTF team and from DESY experts in order to cope with the large amount of cavities and measurements. A clearly defined structure and sequence provides for an equal inspection and testing of each individual cavity.

After a cavity has been delivered, the first step is an incoming inspection carried out by the AMTF team. “Now, the cavity’s mechanical manufacturing is tested,” explains Swierblewski. “Length, circumference, fit of bolts and position of all other components are checked with millimetre precision. If everything is allright mechanically, we control radio frequency and vacuum. This is followed by the real test.” The cavity is equipped with all electrical connections and, together with three other cavities, is lowered into one of the two large underground cryostats in the AMTF hall. The cryostat is filled with helium to cool down the cavity to its operating temperature of minus 271 celsius. Only this way is it possible to test its accelerating qualities.

“During a vertical RF test, two important parameters of the cavity are measured: quality and accelerator gradient,” says Reschke. Its quality (or: quality factor) is used as a standard for future thermal loss. This means that the higher the quality of the cavity, the less thermal loss is to be expected in future operation – which means lower operating costs.

The accelerator gradient indicates how much energy a particle will gain when traversing the cavity. This is defined by particle acceleration; however, the particle does not increase its speed but its energy, as even particles have a speed limit: the speed of light. This can be compared with a lorry driving on a German autobahn at a speed of 80 km/h. When the lorry is more heavily loaded, it gains weight and transports more goods to its final destination. Similarly, the additional energy of the particles can be used later on. Therefore, it is necessary to accelerate particles, i.e. load them with energy, just like empty lorries rarely tavel on the autobahn.

In the resonator preparation

The cold test itself takes about two and a half hours; if you count assembly and disassembly, it takes several days. When a cavity fulfils the accelerator gradient and quality requirements, it will be sent directly to Saclay near Paris. If not, it will get a follow-up treatment in the clean room. Almost 70 percent of the cavities delivered by the firms meet the required standards at the first RF test and can be transferred right away.

In the preparation area, six vessels can be equipped with four cavities each.
Photos: Dirk Nölle, DESY

The whole process is electronically documented. “Every step is recorded in a database,” says Swierblewski. „All data of the vertical tests, incoming inspection and every treatment of the cavity is being registered.” This includes the data of its development history which allow to trace the construction of the cavity to its source: the individual metal sheets. This accuracy and care of the whole documentation process pays off: “There are weak points in every production. With the help of the accurate documentation, it is possible to eliminate them at the right time – during the production process,” says Reschke. “In fact, so far this is the largest production of similar cavities in the field of science. We will of course evaluate the data scientifically. This will be beneficial for future projects like planned linear colliders and for the general understanding of this technology.”

The final document of a cavity provided by DESY is its outgoing inspection. “The out-going inspection is important because it determines the state of the cavity when loaded into the lorry,” says Swierblewski.

The cavities that went through the acid test can finally be installed into the accelerator modules. For this purpose, they are transported to Saclay via German and French motorways.

Read about the construction of the accelerator modules in the next issue.

New Ombudspersons
New DESY ombudsmen and -women started their term in January to ensure good scientific practice and procedures in case of scientific misconduct. The directorate appoints employees at the Hamburg and Zeuthen institutes for a period of three years. Their task is to counsel DESY members in issues of good scientific practice. In Zeuthen, Karl Jansen and Anne Oppelt continue to be the persons in charge; in Hamburg, this advisory function is carried out by Ilka Mahns, Andreas Ringwald and Ralf Röhlsberger.

"Jugend forscht" 2016 at DESY
On 25 and 26 February, for the fourth time, DESY as a mentoring institution will host the regional Hamburg Bahrenfeld youths science and experiments competition „Jugend forscht". About 100 pupils will present their research projects to the honorary experts panel in the school-lab premises. On 26 February between 9.30 and 11 a.m. the young researchers will show their projects to the public. DESY colleagues too are cordially invited to come and see the surprising results. The ceremony awarding the participants and presenting the winners will start at 11.30 h in the DESY auditorium.

New record: more than 1000 users registered for Photon Science Users' Meeting
There is an increasing interest for the annual DESY research light sources and European XFEL users' meeting: the 1000-mark was passed for the first time with about 1200 registrations. Topics of the three-day event from 27 to 29 January are current and future research at the X-ray light sources PETRA III, FLASH and European XFEL.
http://photon-science.desy.de/usersmeeting

StadtRAD bike hiring station at DESY Hamburg
DESY has been included into the growing network of bike hiring stations in Hamburg. The bicycles will be located at a newly installed station near building 6. After online registration, everyone can use the distinctive red bicycles. Call-a-bike customers registered with the German railway company Die Bahn can use this service as well. The bikes must be returned to one of the hiring stations. Stations near DESY include one at the ELBE shopping mall, at Othmarschen station and at Altona hospital.
http://stadtrad.hamburg.de

Celebration for PhD students

Reception of PIER Helmholtz Graduate School at DESY

Members of the PhD initiative DOIT were distinguished for their great commitment: Janis Kummer, Johann Haber, Julian Schweizer, Zhipeng Huang, Markus Dierigl, Laura Sagunski, Shruti Patel, Severin Luest. Photo: Marta Mayer, DESY

By Mirko Siemssen

The foyer of the Center for Free-Electron Laser Science (CFEL) was the venue for the first reception of the PIER Helmholtz Graduate School (PHGS), DESY and the University of Hamburg on 3 December. More than 100 PhD students with their academic supervisors, friends and relatives followed the invitation to honour the first graduates of the school and this year's scholarship winners, to welcome all new PhD students and to thank the PhD representatives of DOIT.
In her welcome address Stefanie Tepass, leading coordinator of PHGS, said: „With this reception, we would like to thank all of you who make the graduate school such a lively community for exchange, learning and research." This was followed by a very entertaining talk from science slammer Marc Wenskat, a recent graduate from DESY's accelerator section, who combined among others a flying guinea pig, a playground carousel and an illegitimate baby in order to illustrate a physicist's curiosity and to explain why it matters to discover new particles.

DESY director of research Joachim Mnich pointed out: „What makes the school unique, in my view, is the broad spectrum of research it covers. The school brings together PhD students from various scientific fields doing research at DESY, the University of Hamburg and at all other institutes on this campus." Also the vice-dean of Hamburg university's MIN faculty Ingenuin Gasser emphasised the importance of the PHGS considering the increasing internationalisation of science. Since its foundation in 2013, the graduate school has grown rapidly. "At the beginning, the school had 30 members. Meanwhile, there are 170 PhD students, of which more than 50 percent come from abroad," said Robin Santra, one of the PHGS spokespersons. "I think this reflects both the success of the school, and the growing attractiveness of the city of Hamburg, which is evolving as one of the most exciting places in the world to do science."
In a festive ceremony, Andrea Pauline Martin and Daniela Pfannkuche awarded six scholarships of the Joachim Herz Stiftung and six PIER fellowships to outstanding young scientists who will be writing their PhD theses in one of the following PIER research fields: particle and astroparticle physics, nanoscience, photon science, and infection and structural biology.

Go MINT 2015

Third MINT day for girls at DESY

By Ronja Pflügelbauer

Natural sciences are not only for boys – this was again confirmed at the "Go MINT" event on 8 October 2015. Seventy girls from school grades 8 to 13 took the opportunity to get to know DESY and to discuss with female professionals. The girls had the choice to meet professionals of wood or metal processing or to participate in the role model slam and then take a tour around the DESY campus. The event was again rounded off with the voluntary offer to get information on all aspects of job applications, which was very well accepted.

"Especially the exchange with the role models, who again did a perfect job, made evident how easily the girls can overcome their inhibitions regarding MINT fields and show enthusiasm when being adequately addressed," said Sylvie Faverot-Spengler, DESY's equal opportunity officer and co-organiser of the MINT day.

The role model slam is a good opportunity to overcome existing inhibitions regarding natural sciences.

Sylvie Faverot-Spengler introduces this year's role models to the girls. Photos: Marta Mayer, DESY

Experiencing natural sciences was also offered at two special school-lab events in September and December, where girls from school grades 7 and 8 did vacuum experiments and toured the campus.

No parking please!

The white stripes on the newly designed area between auditorium and building 1 in Hamburg are not the demarcation of a parking area but a guiding line for the blind and visually impaired. The DESY administration points out that these are tactile ground surface indicators that help visually impaired people find their way around campus. Please help viually impaired colleagues and visitors by keeping these indicators clear. Parking there is not allowed. This also applies to the area in front of building 1, there are only two car spaces for visitors. The directorate asks you to use the designated parking areas on the Hamburg campus. Parking offenders will find a reminder from the campus management on their vehicle.

Alman-Türk Bilim Günü*

More than 300 guests took part in the **German-Turkish Science Day*

By Frank Lehner

Turkey is an emerging science nation and shows a great interest in reinforcing scientific cooperation with DESY and European XFEL. With the aim to further promote this cooperation, several activities took place, supported by the Federal Ministry of Education and Research BMBF, including a one-week roadshow and a lecture series at Turkish universities in May 2015, organised by DESY and European XFEL.

At a German-Turkish Science Day on Saturday, 5 December Turkish fellow citizens in Hamburg were invited to get to know the fascinating research facilities on site. This "small Open Day" was particularly aimed at Hamburg school pupils of Turkish origin and was organised in collaboration with the Turkish Consulate-General.

More than 300 guests came to the campus in Hamburg Bahrenfeld. The young and older visitors to the Science Day took short tours of the facilities and workshops, as well as the European XFEL accelerator tunnel, saw exhibits about research at both facilities, presentations and hands-on activities for the whole family, and had the opportunity to talk directly with scientists. Short lectures informed about current research at DESY and the European XFEL, and about the long-standing scientific cooperation between Germany and Turkey. It was particularly rewarding to see that so many Turkish colleagues from DESY and European XFEL volunteered with great enthusiasm and successfully contributed to the German-Turkish Science Day program and its activities.

To further develop cooperation with Turkey, a professional workshop (http://kib.desy.de/bilim) took place at DESY in the run-up to the Photon Science Users' Meeting. The workshop was attended by many Turkish scientists, including more than 20 junior researchers. The aim was to further explore the actual participation opportunities at PETRA III, FLASH and European XFEL and to initiate first concrete research projects.

HELMHOLTZ ASSOCIATION

Helmholtz validation funding extended

Developing pioneering technologies and making them attractive for industry often requires a great deal of patience and perseverance. The Helmholtz Validation Fund (HVF) is therefore providing support to a number of particularly promising projects carried out by research teams in the Helmholtz Association. A total of 21 projects were selected for the first funding period from 2011 to 2015. Following a successful evaluation process, the programme will now continue from 2016 to 2020. The first three projects to be funded in the new programme phase were selected this December by the experts on the decision-making board. These projects could pave the way to discovering new and better ways of diagnosing and treating diseases such as cancer, osteoporosis and Alzheimer's.

Some of the projects from the first programme phase have already been successfully launched on the market. "That was one of the main reasons behind the success of the Validation Fund evaluation and the decision to extend it," says Rolf Zettl, Managing Director of the Helmholtz Association. "This also means a significant increase to the HVF budget so that we can translate even more exciting technologies from the 18 Helmholtz Centres into practice." A total of €7.5 million has been earmarked for the validation projects over the next five years. More flexible conditions are to be introduced in line with the recommendations made during the evaluation. In future, Helmholtz Centres and their partners from industry will be able to choose the amount of co-financing within a three-step system.

http://www.helmholtz.de/en/transfer/funding/helmholtz_validation_fund

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