

Sowing the seeds of light

The sFLASH seeding test takes up operation

The most valuable good at FLASH is time. FLASH is more or less the universal prototype for X-ray free-electron lasers; therefore, many scientists compete for every minute on it. This is not only true for the users who have been served in routine operation since 2005, but also for accelerator physicists and developers who never run out of ideas on how to improve the facility. They keep upgrading FLASH under the critical eyes of the researchers' world and show what this technology can do.

One of these improvements was now sent into the ring of FEL pilot facilities: in a collective research project with the University of Hamburg, a so-called seeding test section installed in during the FLASH upgrade last winter. At a 40-metre-long section between accelerator and SASE undulator magnets, the scientists built in four additional undulators through which the electron beam is threaded. The special feature: simultaneously with the electron bunch, the pulse of an optical laser is shot through this set of undulators. It "seeds" the light into the system which the undulators then amplify to an FEL pulse. Thus, the laser light does not have to come from the synchrotron light that is generated from the electrons at the beginning of the undulator – like in the SASE effect. This means that the FEL pulse becomes much more reproducible.

"Based on all kinds of calculations, the seeding will work in the soft X-ray



The undulators of the new seeding section in the FLASH tunnel.

range," says Jörg Roßbach, Björn Wiik Professor at the University of Hamburg and head of the research project. "At FLASH, we want to establish this technology in such a way that it can be used in experiments."

Seeding has already been successfully produced at two other research centres; albeit, with wavelengths well over 100 nanometres. The team around Roßbach wants to try out seeding at sFLASH with 38 nanometres at first and then proceed

step by step with smaller wavelengths. The injected seeding laser light comes from a container adjacent to the FLASH tunnel. The highly intense 800 nanometre basic wavelength is shot through an inert gas. From there, a small amount is produced with 38 nanometres, which is reflected into the seeding section. At the end of the undulator section, the generated shortwave light is deflected and analysed in a container near the FLASH

[CONTINUED ON PAGE 2](#)

Beginning of data taking at PETRA III and FLASH

On 23 August, PETRA III started its first official user period. Three beam lines are running for user operation, the others are being tested or equipped. FLASH also went into user operation after the upgrade. As of 2 September, scientists measure with FEL radiation down to 4.45 nanometres.

Roof truss for CFEL

Opposite the PETRA III experimental hall, the Center for Free-Electron Laser Science CFEL celebrated its topping out ceremony on 20 July. Although the construction of the "real" roof truss had to be delayed because of the cold winter, the "scientific roof" is already well built, said Hamburg's science minister Herlind Gundelach.

DIRECTOR'S CORNER



Dear colleagues,

with the restart of FLASH beam operation after extensive conversions and upgrades, we have already achieved milestone successes within a short time. In June, FLASH produced FEL light with a wavelength of 4.45 nanometres and an electron beam energy of 1.207 GeV. Prior to this, the optimum values had been 6.5 nanometres and 1.0 GeV. Thus, the extension of the linac with a seventh high-performance accelerator module has perfectly paid off and our

optimistic expectations have been entirely fulfilled. At the same time it was convincingly proved that the newly installed 3.9-GHz system has brought about a considerable improvement of beam dynamics and bunch compression. Last but not least, the commissioning of the seeding experiment sFLASH – carried out with the strong collaboration of the University of Hamburg – makes great progress as the third element of the FLASH upgrade.

sFLASH is a good example for new developments in

accelerator physics and technology. Apart from the everyday tasks and challenges of running projects and facilities, it is essential for DESY to also have an eye on new ideas and concepts to improve existing accelerators or design completely new ones. With the purpose to promote this continuous thinking process, the M-division has established the “accelerator marketplace of ideas”, a forum that – with a minimum of formalities and constraints – welcomes everyone to present accelerator topics and discuss them with other interested participants.

The first meeting in June was a complete success, with 36 contributions and more than 80 attendees, great enthusiasm among all people involved and lively discussions until late in the evening. The next meeting is already scheduled for November.

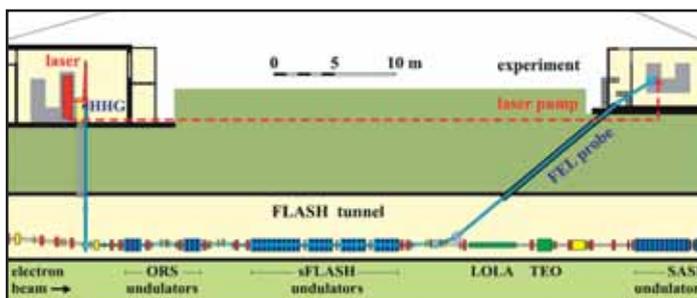
Yours,

Reinhard Brinkmann

tunnel. Later, it may even be used for experiments.

The first tests with sFLASH have just started. One of the major problems is clocking. Seeding laser pulse and electron bunch – both incredibly small – must traverse the undulator simultaneously and on the same track. Therefore, in their first tests, the scientists elongated the electron bunch as much as possible and tried to hit it with the laser flash - a time-consuming game.

But the effort is worth it. “Seeding has become a kind of holy grail of FEL science. With it, we are able to eliminate two problems of SASE lasing: repeatability of laser pulses and synchronisation of pump probe experiments,” says Roßbach. In these experiments, a state is excited by an optical laser which the free-electron laser photographs with a certain time lag. The synchronisation of



Scheme of sFLASH (view from top): Laser light generated in a container is amplified in four undulators in the FLASH tunnel and led into a diagnostics container.

laser and FEL pulse at this kind of experiments is of course easier when only one laser does both, the excitation and the FEL pulse.

As always, starting is the most difficult phase and the experimental time at FLASH is limited. The user period at FLASH is imminent, and a problem with the injector lost valuable time. However, if seeding runs as required, one of these days these experiments may run parallel

to the FEL experiments in the large FLASH experimental hall. Roßbach is satisfied with the current achievements: “We have already seen SASE laser light from our magnets. Now we hope for a repeatable seeding signal.” Nobody is able to predict whether this will happen within hours or months – another situation in which the valuable FLASH measuring time plays a key role. In any case, the FEL world is again looking expectantly at FLASH. (tz)



Going down on one's knees before HERA: for a good perspective, the photographers made great efforts. One of the photowalk stars: the broom in hall 3 (photo: Nadine Fuhrmann).

Particles in front of the camera

DESY triggers a Global Particle Physics Photowalk

The HERA tunnel is used to publicity. For years, camera teams and professional photographers have come to film and take photos of it. An old broom in hall 3, however, would never have dreamed of getting the same kind of attention. Nevertheless, the broom was one of many stars at this year's photowalk – it was photographed just as often as high-voltage signs, cable spaghetti and crane chains.

At a photowalk, amateur photographers meet to take pictures of special sites. It was the second photowalk at DESY – last year, there were so many enthusiastic participants (and even more that could not be accepted because of the limited number of participants) that it was obvious that another event of this kind had to happen. This one, on 7 August 2010, was special: it did not only take place at DESY but on the very same day also at KEK in Japan, CERN in Switzerland, Fermilab in the United States and TRIUMF in Canada. That's why it was called "Global Particle Physics Photowalk" and includes a worldwide competition for the best photo. The first

submissions are already presented on the photo website flickr.

At DESY, 50 photowalkers focussed their lenses on different aspects of particle physics at five stations. Five groups named after particles were guided by our PR students ("All electrons this way, please!"), and for half an hour at each station, they had the opportunity to capture on camera everything that pleased. They entered the HERA tunnel, saw detector veterans and prototypes in hall west, investigated test huts in the DESY test beam, walked in on a shift in the CMS control room and admired cavities in hall 3. Some of them even admired brooms. It was already rather obvious on the day that the photographers had a perspective on things that DESY people would consider ordinary and not noteworthy: who would kneel down in front of a HERA magnet or lay down under a cavity to get another angle of view?

First, the local winners will be selected by a Hamburg jury made up by two DESY directors and also by Hamburg's

state minister of science and research and two professional photo editors from "Gruner + Jahr" and from the photo agency "focus". The best photos of each research centre will enter the international competition. The national and international winners will of course appear on the corresponding websites; moreover, exhibitions are planned at laboratories and in downtown areas. (baw)

Due to the great interest and the long waiting lists, the organising team decided to offer an internal photowalk for DESY staff members and their partners. It will take place on 9 October, starting at 11 h.

Are you interested? Then send an email to: photowalk@desy.de

INFO

All about the Photowalk:
www.desy.de/photowalk
www.interactions.org/photowalk

Reopening of the cafeteria

After a six-week remodeling, on 19 August, the DESY cafeteria reopened in new splendour.



WHAT'S ON AT DESY

September

- 1** Public Lecture
Die Entdeckung der ersten Elementarteilchen
Jost Lemmerich (Berlin), DESY, auditorium, 19 h
- 2** DESY staff assembly
DESY, Hamburg, auditorium, 9:30 h
- 8** Science Café DESY (<http://sciencecafe.desy.de>)
Was die Welt im Innersten zusammen hält – Die kleinsten Bausteine der Materie
Burkhard Reisert, DESY Bistro, 17 h
- 13-15** TERASCALE (www.terascale.de/mpi10)
Workshop on Multi-Parton Interactions at the LHC
DESY, Hamburg
- 13-17** IWAA (<http://iwaa2010.desy.de>)
11th International Workshop on Accelerator Alignment
DESY, Hamburg
- 15** Information Ihre Gesundheit
Wechseljahre – Na und?
Katrin Schaudig, DESY, Hamburg, bldg. 3, rm. BAH 1, 16 h
- 21-24** Theory Workshop
Quantum Field Theory – Development and Perspectives
DESY, Hamburg
- 22** Science Café DESY (<http://sciencecafe.desy.de>)
Die größten Rätsel und die kleinsten Teilchen des Universums – Die Weltmaschine LHC
Thomas Schörner-Sadenius, DESY Bistro, 17 h
- 22** Hertz Lecture
Holography and Unification
Joseph Polchinski (University of California)
DESY, Hamburg, auditorium, 17:30 h
- 29** Public Lecture
Gefahr und Nutzen von Vulkanen - Vulkanologie und Geothermie in Island
Sveinbjörn Björnsson (Island), DESY, Hamburg, auditorium, 19 h

October

- 9** DESYaner Photowalk
DESY, Hamburg, 11 h
- 13** physik.begreifen-laboratory dedication
Open student lab
DESY, Hamburg, bldg. 34a, 15 h
- 21-22** Conference (www.weltderphysik.de/lernwelten2010)
Lernwelten der Physik
- 27** Science Café DESY (<http://sciencecafe.desy.de>)
Mutabor – Magie der Hyperbeln
Waldemar Tausendfreund, DESY Bistro, 17 h
- 29** DESY Choir
Autumn concert
DESY, Hamburg, canteen annex, 20 h

Prof. Dr. Karl Lanius

Long-time director of the IfH Zeuthen dies at the age of 83

by Thomas Naumann

On 21 July, the former director of the IfH Zeuthen Karl Lanius passed away in Berlin. From 1962 to 1988, he had been director of the Institute for High Energy Physics in Zeuthen of the GDR Academy of Sciences. His scientific career began in 1952 at the former "Miersdorf Institute" where he worked in the field of nuclear and particle physics and cosmic radiation. He obtained his doctoral and postdoctoral degrees at Humboldt University, where he was appointed professor in 1964. Karl Lanius set up high-energy physics as the main area of research in Zeuthen, thus establishing particle physics in the former GDR. He always sought close collaboration with West European research institutions, particularly with CERN and DESY, and he created a non-dogmatic political atmosphere that was quite unusual in the GDR. With his research policy, Karl Lanius laid the foundation for the successful unification of the institute with DESY in 1992.



The Professors Volker Soergel, Karl Lanius and Paul Söding.

From 1973 to 1976, Karl Lanius was deputy director of the Joint Institute for Nuclear Research in Dubna, since 1969 member of the Academy of Sciences where he headed the Class Physics as its secretary from 1988 to 1992.

With Karl Lanius, we have lost an exceptional science promoter and internationally renowned physicist.

The 21st century becomes nano

EU-US nanotechnology workshop at DESY

by Frank Lehner

Nanotechnology is considered the key technology of the 21st century. Materials with completely new properties and functions can be produced with an exact adjustment of structural sizes ranging between one and a thousand nanometres. Thus, the mechanical, optical, magnetical, electrical and chemical properties of these nanostructures do not only depend on the kind of source material, but in the first place on their size and form. Nanotechnology has the potential to cope with the great challenges of the future, with a wide range of novel applications – in medicine, energy supply, environmental protection and information technology. In the United States, the National Nanotechnology Initiative NNI funds nano research at universities and research institutes – in the past decade with a total of 12 billion dollars. The European Union has also increased funds substantially and approved a nanotechnology action plan. In June, DESY was the host of the trans-

atlantic workshop "Long-Term Impacts and Future Opportunities of Nanotechnology." About 70 experts from the United States and Europe met to exchange ideas about the future main directions in nano science on both continents. Apart from the current state and possible new developments in the coming ten years, there was also a detailed discussion on potential risks, like free nano particles, and future strategies for safety, sustainability and provision were developed. There was agreement that large-scale facilities like synchrotron radiation sources, new X-ray lasers and neutron sources will play a substantial role in the development of nanotechnology. Therefore, DESY actually plans the establishment of an own nano lab.

The results of the workshop are supposed to be directly incorporated into the United States NNI activities and included in the new edition of the European nanotechnology action plan.

Postdocs to the lasers!

Volkswagen Foundation supports pioneering research at FELs

X-ray lasers are real grab bags of science. They fulfil an old dream of science by providing the possibility to get a sharp image of the fastest chemical, biological and physical processes on the atomic level. Until 2010, when the European XFEL will turn this dream into reality, the free-electron laser LCLS at SLAC in California will be the most powerful X-ray laser. Researchers have been gaining experimental experience with this facility since September 2009.

To ensure that this know-how will also be available in Germany when the European XFEL starts up, the Volkswagen Foundation offers young scientists the opportunity to carry out research in Stanford for up to two years, followed by another year at a research centre in Germany, thus funding a total of three years. These grants will be provided within the new funding initiative

"Free-electron laser science: Peter Paul Ewald Fellowships at LCLS in Stanford".

The Peter Paul Ewald Fellowships – named after Peter Paul Ewald (1888-1985), a pioneer of X-ray methods – aim at postdoctoral researchers who want to pursue novel research ideas at LCLS or the future European XFEL and who strive for an extended research stay in Stanford. Up to five fellowships are granted each year. Three application rounds are planned between 2011 and 2013. The deadline for the first application round is 25 January 2011. (tz)

INFO

Information and application:
www.volkswagenstiftung.de/ewald-fellowships

Coordinated acceleration

Hans Weise new head of XFEL accelerator consortium

Hans Weise was appointed leading scientist in the accelerator division at DESY in July. Apart from the superconducting accelerator sector, he assumes the leadership of the XFEL project at DESY, in connection with the coordination of the accelerator consortium for the European XFEL.

DESY organises the construction of the accelerator complex for the European XFEL and will also in future operate the superconducting linear accelerator. For the construction of all the components of the facility – the superconducting modules with RF power supply, transport routes for the accelerated electron beam and cryogenic technology – about two dozen institutes have become members of the accelerator consortium. “Among them, there are many institutes we already know well from the TESLA Technology Collaboration, but also a number of new ones,” said Hans Weise. He will be responsible for the timely delivery and for the coordination of the assembly of the single components and the corresponding tests. He will be assisted by a four-member team and by the

leaders of the individual work packages. One of Hans Weise’s first jobs was the commissioning of two industrial enterprises to deliver a total of 640 cavities for the accelerator. Currently, the firms are getting the technical equipment from DESY and are provided with pure niobium, to be able to fulfil the requirements of this order. Starting in 2012, the cavities will be tested in DESY’s AMTF hall. Subsequently they will be transferred to Saclay for the assembly of accelerator modules which later come back for a final test and the release for installation in the tunnel. (tz)

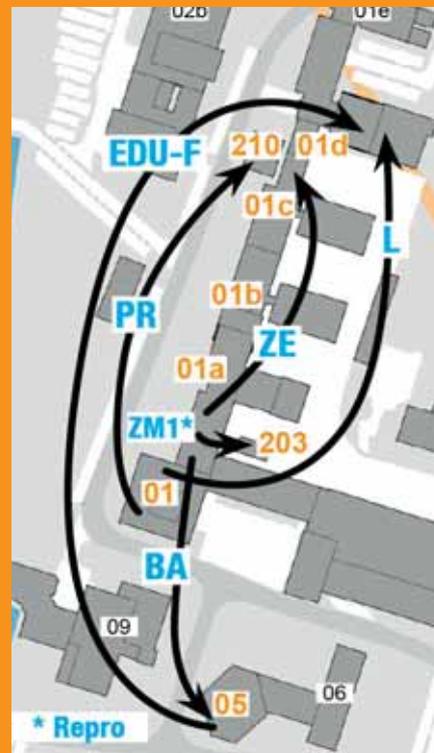


Hans Weise

Who, how, what?

Who goes where from building 1?

In September, the front section of building 1 will become a construction site. Instead of the DESY doctor, the library, the service centre electronics or the PR department, you will find dust, noise and demolition hammers. If you want to know where to find these services, this plan might help:



Tunnel vision for visionaries

Proposals for new uses of DESY’s tunnels at the accelerator marketplace of ideas

Suppose that HERA could be reborn as another accelerator, what would it be called? One possibility: HELMUT. HELMUT stands for Higgs and Elementary Light Mass UTility, and is the idea to transform HERA into a so-called Higgs factory. HELMUT’s intellectual father is Achim Geiser who presented his concept for a HERA succession at DESY’s first “accelerator marketplace of ideas” on 16 and 17 June.

The accelerator marketplace of ideas is exactly what it says on the label: a marketplace for ideas for exciting projects that could be realised with or at DESY’s accelerators in the future. The idea for this marketplace of ideas came from Reinhard Brinkmann, director of the accelerator division, and the invitation (to all interested people inside and out-

side of DESY) was defined. The incoming results showed a great variety of proposals ranging from a new beam monitor and HERA as a synchrotron radiation source to “HELMUT”. A total of 36 concepts and ideas were on the market, with ten minutes for presentation and five minutes for discussion. With the help of an experts’ group, the ideas will be evaluated, commented and get a recommendation on whether and how to continue with the proposed concepts. Another market, based on the first one, will take place in November.

The ideas can be roughly divided into two categories: the proposals arising from scientific issues, for example the Higgs, Tau or Z factory, a muon collider test, double polarised HERA beams, an ultimate synchrotron radiation source in

the HERA tunnel or FEL concepts for the X-ray laser. The other proposals deal with problems and challenges in the field of accelerator physics, for example ideas for a plasma acceleration section in HERA or FLASH, a laser plasma booster for FLASH or improved beam diagnostics. “It really was a colourful mixture,” says Klaus Balewski, one of the organisers. “We hope that there will be cooperation and the proliferation of ideas as a result from this market. After all, good ideas should become reality.” (baw)

INFO

<http://beschleuniger-ideenmarkt.desy.de>

13 atoms of element 114 produced

At GSI Helmholtzzentrum für Schwerionenforschung, an international team of scientists succeeded in observing 13 atoms of the chemical element 114. Even though this is a small number of atoms, it is to the highest ever measured production rate for element 114.

Element 114 is one of the heaviest elements that exist. The production of element 114 is very difficult and requires dedicated particle accelerators. So far, this feat was achieved at only two other research centres, in the USA and Russia. For the detection of the transient element 114 at GSI, scientists employed the innovative new setup TASCA (TransActinide Separator and Chemistry Apparatus), which was developed in recent years. The aim of future experiments with this new setup is to advance to see yet heavier elements and possibly to discover new elements beyond element 118. This paves the way for future in-depth chemical, atomic, and nuclear physics measurements at extremely heavy elements. Recently, IUPAC officially recognised element 112, discovered at GSI, as the heaviest element thus far. Russian reports on the creation of elements up to atomic number 118 are yet unconfirmed.

www.helmholtz.de/hermann



The interns measured the muons in direct neighbourhood of the magnetic field test stand.

Measuring muons with magnet

Interns measure cosmic radiation with PETRA III magnet

Practical training during summer holidays, term papers for the high-school diploma or the bachelor thesis – all this can be done with a muon detector of the “physik.begreifen” school lab. This summer, three interns have already benefited from this opportunity and did research at DESY for several weeks.

Cosmic muons are useful for experiments: these heavy siblings of the electrons permanently rain down on our earth. That means that they can be used for experiments anytime and anywhere – an advantage the mobile muon detector makes use of. Schools may borrow the detector for free and offer more than the typical school experiments.

For the measurement of the so-called muon charge asymmetry in cosmic radiation, the basis detector was pimped

with the help of the MEA 1 group taking care of the magnetic field test stand. With a PETRA III dipole magnet, the young researchers were able to separate the positive and negative particles directly at the magnetic field test stand.

For the future the experiment will be upgraded: “At the moment we measure the muons that come in horizontally. It would be better, however, if we could measure the more frequent muons coming in vertically,” said Gordon Fischer, who supervises the interns. But this requires the construction of equipment that allows hanging the magnet in a vertical position – not easy with a weight of half a ton. But who knows, perhaps interns will soon be able to measure muons that fly in vertically. (gh)

Imprint

Publisher
DESY-PR
Notkestraße 85
D-22607 Hamburg

Contact
email: inform@desy.de
telephone +49/40/8998-3613
www.desy.de/inform
(online version + newsletter subscription)

Editors
Christian Mrotzek (V.i.S.d.P.)
Gerrit Hörentrup,
Barbara Warmbein,
Ute Wilhelmssen,
Thomas Zoufal (editor-in-chief)

Production
Britta Liebaug (layout)
Veronika Werschner (translation)
Kopierzentrale DESY (print)



Top in Europe

It's there! At the particle physics summer conference ICHEP in Paris, both large LHC experiments ATLAS and CMS presented their first top quark candidates – the first tops outside America. This means that the scientists have now rediscovered all known particles of the standard model and are able to set off towards new discoveries.

Clothes swapping at the DESY kindergarten

Kinderwelt@DESY invites all (female) DESY staff members to come on invites 24 September at 19 h to swap their clothes that are still in good condition, completely at no charge. It will be a pleasant evening accompanied with inexpensive organic wines and delicious organic snacks. For registration until 13 September, call 8998 4160.