DESY inFORM.

03/2010
Newsletter of the
Research Centre DESY

Two times world-class

The way to FLASH II

Actually, it already has world-class status: the free-electron laser FLASH generates radiation with outstanding properties, users compete to secure the highly coveted measuring time for their experiments and, after the five-month shutdown, FLASH takes up operation better than ever before (see DESY inForm 01/2010). However, one of the features of key technologies, like the free-electron lasers or FELs, is their rapid development, and design engineers are continuously confronted with the challenges of the near and more distant future. Thus it is only logical that they do not simply rest on the successes of FLASH but that concepts for “FLASH II” take a concrete shape now.

FLASH II will have a second tunnel and a second hall near the existing FLASH facility.

Already in October 2008, DESY and the Helmholtz-Zentrum Berlin jointly submitted the proposal for FLASH II to the Helmholtz Association – getting top grades from all evaluators. From the scientific and technological point of view, FLASH II is a must for Germany to keep and further strengthen its leading role in the development and operation of free-electron lasers. Approval is expected in summer 2010. Till then, the concept for FLASH II will be further developed to a complete technical design.

FLASH II includes the construction of a second tunnel with undulators and a second hall for six experimental stations. These will double the user capacity of FLASH and cover the great demand. FLASH and FLASH II can be operated in parallel, with a largely independent adjustment of the wavelengths.

However, FLASH II will offer more than just additional measuring stations. The project includes substantial technical improvements to increase the beam quality and to optimise the experimental requirements. There are special plans to provide a so-called seeding experiment, currently installed in FLASH for a test phase. Seeding is achieved with an optical laser, so that the FEL pulses are perfectly synchronised with this laser. This is a prerequisite for the observation of very fast processes like chemical reactions. Moreover, it generates always the same pulse form which is extremely important for many experiments – currently, each pulse is different. In the future, it will also be possible to obtain even shorter pulse lengths of less than ten femtoseconds and shorter wavelengths of down to four nanometres.

CONTINUED ON PAGE 2

LHC running again

After the winter shutdown, the Large Hadron Collider LHC at CERN has again taken up operation on 28 February. The physics programme at the detectors, with collisions at 7 Tera electron volt, is to start already in March.

Construction work on building 1 delayed by ten weeks

Construction work on building 1 slows down due to a building firm filing for bankruptcy. Although it did not take long to find a new firm, work can only start under better weather conditions.

DIRECTOR'S CORNER

Dear colleagues,

the HASYLAB Users' Meeting took place on the last Friday in January, as is already tradition. It was preceded by the European XFEL Users' Meeting, a joint workshop on the latest FLASH results, the FLASH II Preparatory Phase Kick-off Meeting and a joint poster session. Parallel to this there were other workshops on special experimental techniques.

With a new record of 430 participants, there was a great demand for this series of events and it demonstrated the ever-increasing interest of the synchrotron radiation user community in the photon sources at DESY.

In the field of our light sources, plenty of progress has been made in the past months. You surely remember the official PETRA III inauguration with more than 800 guests. Prior to the winter shutdown, first external users have successfully carried out test experiments at PETRA III, the first publications are in preparation. Starting in mid 2010, the first beamlines will take up regular user operation, and we are looking forward to the good experiments that will then be possible.

Not only DESY is eagerly looking at the restart of FLASH. In the shutdown that started in September 2009, many essential new components have been integrated and part of the existing components had been replaced by new ones. Particularly the installation of the "third harmonic" RF module makes a difference: it will improve the accelerator's control and makes it possible to obtain even shorter photon pulses, thus opening up completely new experimental possibilities.

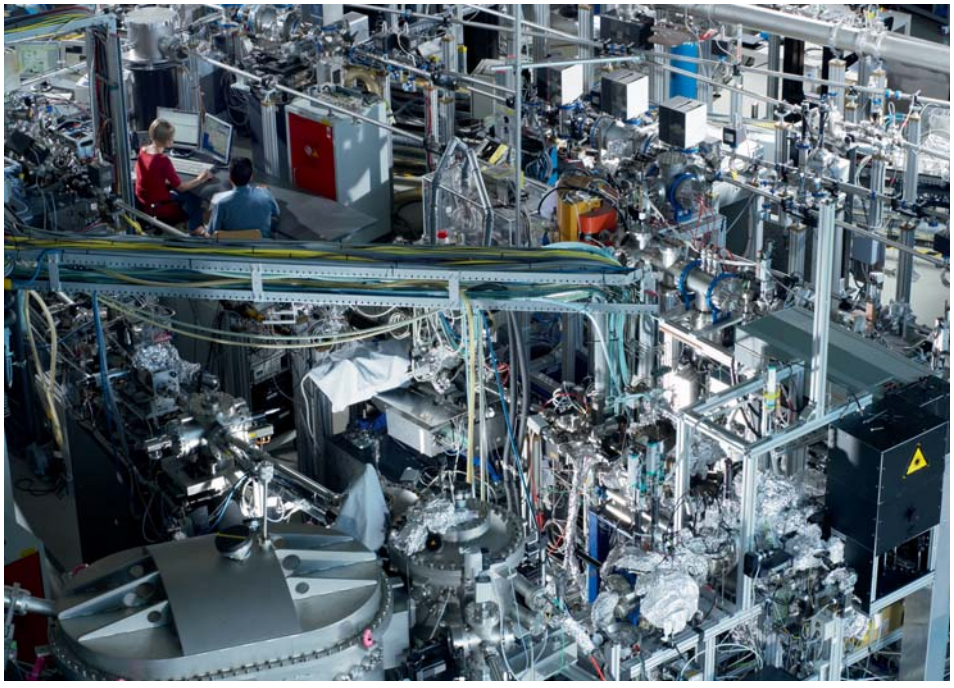
No less interesting is the FLASH experiment of "seeding" a free-electron laser (FEL) in the soft X-ray range, a joint collaboration of DESY and the University of Hamburg. The outcome will be very important for the development of FELs and form the basis for the upgrade project FLASH II. Now we are all very excited to see the results.

Yours,
Edgar Weckert

For experiments with magnetic materials, FLASH II will generate circularly or even variably polarised light. Currently, we have only linearly polarised light. Such new experiments will for example contribute to produce innovative magnetic memories for computers.

With the purpose to optimally coordinate machine capacity and users' needs, the FLASH II Preparatory Phase Kick-off workshop with about 200 participants was held in January, on the occasion of the HASYLAB Users' Meeting. A follow-up meeting is scheduled for September.

In case FLASH II is approved this summer, the tunnel construction could already start end of 2011 and start of commissioning could take place in 2013. *(uw)*



Scientists currently use the light of FLASH at five measuring stations. FLASH II will have a new hall with six more measuring stations.

PETRA III gets started

More user demand by scientists

After the 2009/2010 winter shutdown DESY's light source PETRA III has taken up operation again. On 18 February, the first particles were injected into the ring, since the beginning of March scientists are again doing research with light from PETRA.

Already before the winter break, six beamlines had sent synchrotron light to the experimental huts. At three of them user experiments are already possible while at the other three the properties and adjustments of the monochromators still need to be tested and optimised.

During the two months when the PETRA III light was switched off, construction work was continued mainly in the experimental hall. The machine crew equipped the accelerator with another undulator magnet; this means that nine of 14 undulators are now in place. The remaining experimental huts will be gradually installed as well. This work will be completed in summer.

The user demand has also increased substantially: at the joint users' meeting of HASYLAB and the European XFEL in January, a dozen external research groups applied to do their experiments as "first friendly users" before the official allotment of user time in summer. These groups happily accept that during this time the accelerator reliability might not be perfect.

From the second half of the year, measuring time for the first PETRA III beams will be allotted by an expert committee, which is also done at other light sources. They evaluate the submitted experiment proposals of the research groups and subsequently assign the experiment time. *(tz)*

The hot water drilling facility (on the right) is drilling the hole in front of the blue "Ice Cube Counting House" where alle IceCube data are collected.

One-two-three go!

Twenty new IceCube strings deployed

by Christian Spiering

No one had expected this: ten days earlier than scheduled, all of the 20 strings equipped with 1200 photomultipliers that were shipped end of 2009 to the South Pole have been deployed: a new record. On 20 January, the scientists lowered the last string into a 2.5-kilometre deep hole that had been melted into the polar ice crust with pressurised hot water. Three weeks later, the Antarctic season 2009/2010 came to an end and the scientists returned home, leaving behind only 46 overwintering team members (two of them in charge of IceCube).

At present, IceCube is 90 percent finished and will be completed in December 2010, after the deployment of the last seven strings. The coming five years will be the most exiting period for the IceCube experiment. Data from the uncompleted detector from the years 2007 and 2008 are already available. Among other things, it was possible for the first time to detect large-scale anisotropies of cosmic radiation in the southern sky. Moreover, a large number of record exclusion limits have been established, for example for the flux of extraterrestrial neutrinos from active galaxies and gamma ray flashes, or for neutrinos emerging from the annihilation of dark matter.

When IceCube is completed and after a measuring period of two or three years, the accumulated statistics will make visible effects that are a thousand times lower than those identified by the largest underground neutrino detectors, and thirty times lower than those obtained from seven years of data taking from IceCube's predecessor detector AMANDA. This brings us to new territories! Should IceCube provide us with discoveries, this will surely happen in these years.

HERA-B in the best light

HERA-B was one of four HERA detectors, used to discover some of the secret of nature. The picture shows the detector's five-metre-high electromagnetic calorimeter.
Since February, HERA-B is a new DESY tour attraction for visitors (see page 7).

March

2 Physics Seminar (http://physikseminar.desy.de)
Illuminating Hidden Worlds – Particle Physics at Lowest Energies
Axel Lindner, 17 h, DESY, Hamburg, auditorium

3 Science Café DESY (http://sciencecafe.desy.de)
Sonne, Sand, Sterne und Bücher – Eine Karawane in die arabische Astronomie
Susanne Hoffmann, 17 h, DESY Bistro

3 Public Lecture
Arabische Nächte – Geschichten zur arabischen Astronomie
Susanne Hoffmann, 19 h, DESY, Hamburg, auditorium

8-12 TERASCALE (www.terascale.de)
Introductory School Terascale Physics
DESY, Hamburg, auditorium

9 Physics Seminar (http://physikseminar.desy.de)
LHC – First Results and running experience
Takanori Kono (ATLAS), Alexei Raspereza (CMS)
17 h, DESY, Hamburg, auditorium

24 Science Café DESY (http://sciencecafe.desy.de)
Science Fiction – Zwischen Wissenschaft und Fiktion
Ilja Bohnet, 17 h, DESY Bistro

29 Authors' Reading
Freitags isst man Fisch
Ann-Monika Pleitgen, Ilja Bohnet
16 h, DESY, Hamburg, auditorium

30 Physics Seminar (http://physikseminar.desy.de)
DESERTEC – Clean power from deserts for a world with 10 billion people
Gerhard Knies, 17 h, DESY, Hamburg, auditorium

April

13 Physics Seminar (http://physikseminar.desy.de)
SuperB (Frascati)
Adrian Bevan, 17 h, DESY, Hamburg, auditorium

14 Science Café DESY (http://sciencecafe.desy.de)
Die Welt besser verstehen – Forschung mit Licht
Julia Herzen, 17 h, DESY Bistro

27 Physics Seminar (http://physikseminar.desy.de)
Investigating the Spin Structure of the Proton at RHIC
Christine Aidala, 17 h, DESY, Hamburg, auditorium

28 Science Café DESY (http://sciencecafe.desy.de)
Freie Elektronen Laser – Biomaschinen bei der Arbeit zusehen
Rolf Treusch, 17 h, DESY Bistro

19 May: DESY50 Fest as closing event for DESY's 50th anniversary +++
7-12 June: Physics at the LHC 2010 +++

Saving energy the clean way

The new cleanroom ist not only free of dust, but also saves energy

Building 28 sports an impressive new cleanroom on exactly the same spot where the old one had been for 20 years. The outer walls are the original ones, but everything else is new.

“This refurbishment was overdue,” says Axel Matheisen, head of the MKS3 group. “The floor, the air conditioning and ventilation systems and the fans have been replaced.” Originally there had only been two fans that blew the air into the cleanroom, now we have 144 filter fan units, each individually controllable. “In case one of the fans breaks down, we just turn it off and replace it without interrupting cleanroom operation,” Axel Matheisen points out the advantages of the new fan system. In the past the breakdown of one of the two fans used to mean that the complete cleanroom could not be used.

The outside of the cleanroom has changed completely.

The fans help save energy, too. At night they are operated with less energy because the chief producers of dust – the people working in the cleanroom – are not there. During working hours, people produce air turbulences and dust particles and therefore, the fans’ output must be higher than in an empty cleanroom. So why not shut down the cleanroom during work breaks – not only during night time? This concept is currently being tested. In case it works – and with a newly installed ventilation system with heat recovery – it will save up to 30 percent in energy.

Energy saving, however, is not the only advantage in the new cleanroom. Its especially clean area – with only 10 dust particles of less than 0.3 micrometres in about three buckets of air – was enlarged from 20 to 50 square metres. Altogether, the upgrade that has been completed after only seven months was very successful. “The air distribution in our cleanroom has never been more homogeneous,” Axel Matheisen emphasises. *(gh)*

View of the new ATLAS remote monitoring room at DESY in Zeuthen

The ATLAS detector at the LHC at CERN can now be monitored from two shift workplaces at DESY. This makes travelling unnecessary and brings LHC physics directly to DESY. There are about 2900 physicists from more than 100 institutions worldwide on the ATLAS experiment. They usually have to go to CERN and work in shifts to control and monitor all detector systems. This means frequent travelling and absence from DESY.

However, just before the LHC restart at CERN, a control room to monitor the ATLAS experiment was completed in Zeuthen which makes it possible to monitor the data quality, the status of the detector components, data taking, offline computing and the trigger from DESY. A video conference system will bring the ATLAS control room events directly to DESY.

Test passed

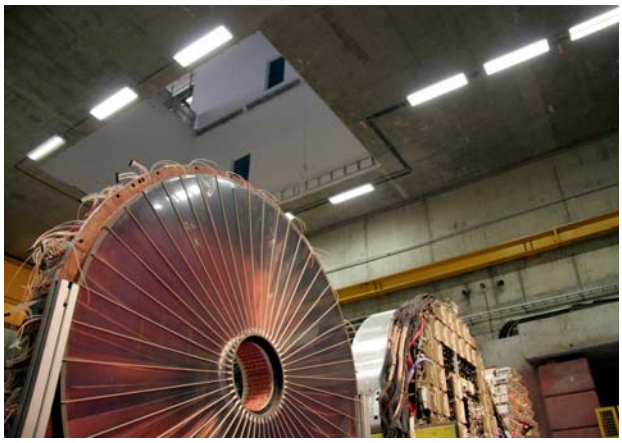
The largest of the two tunnel boring machines (TBM) required for the construction of the European XFEL passed the factory acceptance test in early February. With its colossal blue cutting wheel of 6.17 metres in diameter, the TBM number S-544 will bore the linear accelerator tunnel and the first two sections of the tunnel switchyard. The TBM uses a "liquid medium-supported mixshield", which is optimally tailored to the complex make-up of the ground in the Hamburg area. The pilot machine for S-544, by the way, was S-12, also known as HERAKLES, which drilled the ring tunnel for the HERA accelerator through the Hamburg soil in 1985 to 1987. HERAKLES was the first machine with such a mixshield constructed by manufacturer Herrenknecht. Several representatives of European XFEL and DESY also travelled to south Germany at the end of the test to appraise the TBM. The 71-metre-long machine will now be disassembled again for its transfer to the European XFEL construction site Schenefeld. Tunnel boring will begin in summer 2010.

Welcome to HERA!

HERA is DESY's new visitor attraction

Many of the 13 000 people who came to DESY during last year's open day and queued at HERA hall west to see HERA got a taste of what is to come. Germany's largest accelerator is still the flagship of DESY that many people want to see, and that is why the former experimental hall was turned into an official magnet for visitors.

Regular visitor groups now have the chance to experience the real atmosphere of HERA experiments because in February HERA hall west became an official tour stop for all DESY visitors - nearly 8 000 per year. Guided tours take them 25 metres underground where they learn more about the experiments of the only accelerator that brought protons and electrons to collision. The main attractions, many original components from the HERA detectors and the remaining HERA B detector, are highlighted with scenic illumination. This makes the tour to the experimental hall a special experience, hopefully making complicated terms like "calorimeter", "vertex detector" or "trigger" more palatable to the visitors.



Twenty-five metres below ground, the visitors are not only fascinated by the exhibits but also by the feeling to experience the atmosphere of science.

Nevertheless, the hall is not just a museum. In the immediate vicinity of the visitors' walkway – insiders like to call it "catwalk" – DESY's scientists are busy doing research on the detectors of the next generation in the Helmholtz Detector Lab.

The remodelling of the hall was necessary because the former particle physics research tour stop, the ARGUS detector, is currently being removed, making room for the OLYMPUS experiment (more in one of the next issues of DESY inForm). Moreover, the best way to explain the notable physics contributions of HERA is to take the visitors to the place where it all happened.

Visitors to HERA hall west are not allowed to go into the accelerator tunnel and see HERA, but who knows, maybe one day it'll be possible to round off the HERA visit with a walk into the tunnel. *(tz)*

Almost completed: the new control desks are already installed but are still to be connected.

Home improvement - control room style

Accelerator control room gets a makeover

For 32 years, the green control desks haven given a characteristic look to the accelerator control room but in the end it was time to replace part of the furnishings and to give the control room a make over. The economic stimulus package and a carpenter from Norderstedt paved the way. The accelerator experts started the remodelling project last spring. First, they looked around for new ideas: “We wanted to see how others do this,” said Michael Bieler, who supervised the makeover. This included visits to the DESY computing centre and to the LHC experiments’ remote control rooms as well as to the control room of the Hamburg Transport Association. With this repertoire of information it was possible to start planning in detail. Offers were requested and furniture was tested. The furniture offer of a carpenter from Norderstedt stood out from the average catalogue products because it met the required specifications exactly. The close proximity was of advantage, too: “I could just pass by in the morning and talk to the people. This was quite helpful especially in the planning phase,” says Bieler. The refurbishment started in December, together with the DESY shut down.

The remodelling changes are clearly visible: daylight comes in through new windows – although only indirectly through the DORIS hall – and the narrower grey control desks leave more space in the middle of the control room. Only the technology has remained the same.

The completion of the new accelerator control room was a spot landing – the conversion was finished on 8 February, the exact day when the DESY accelerators took up operation again. “The last wires were installed that morning,” Bieler says proudly. *(gh)*

HELMHOLTZ ASSOCIATION

Quick help after natural desasters

From satellite data and aerial images, scientists from the Center for Satellite Based Crisis Information (ZKI) produced detailed maps immediately after the severe earthquake on 12 January in Haiti. These helped the relief organisations to get an overview of the damaged infrastructure, thus facilitating action planning.

“Immediately after the earthquake, the United Nations (UN) released the so-called ‘charter call’,” reported geographer Tobias Schneiderhan, coordinator of the tasks. The ZKI analyses al kinds of data from various satellites and processes them to meet the demands of relief organisations like Germany’s Agency for Technical Relief and the German Red Cross. “The first damage assessment mapping in Port-au-Prince are primarily based on optical data,” Schneiderhan explains. With radar data of TerraSAR-X and by bundling the capacities of various DLR research institutes, they could also analyse the earth movements and recognise faults and escarpments caused by earthquakes. For ten days, up to 25 scientists worked in parallel to process information.

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Detectors for everybody

Particle physicists and photon scientists have created a common seminar. The Joint Instrumentation Seminar takes place every two weeks on Friday at 16 h in the FLASH seminar room. The seminar topic is new detector developments needed by both groups of research.
More information: http: //instrumentationseminar.desy.de

Sound travelling

People who have colleagues and collaborations around the world have to do a lot of travelling. DESY’s medical service is now offering medical kits for business trips. Travellers are invited to call 2171 and pick up such a kit. It contains drugs for diseases like coughs, colds, sore throat or diarrhoea.