DESY inFORM.

12/10 &
01/2011
Newsletter of the
Research Centre DESY

Caution! Work in progress

More construction and remodelling at DESY than ever before

They range from medium-sized to enormous, they are clearly visible or still quite hidden, and they will provide more space or new facilities for researchers and research: DESY's construction sites. CFEL, XFEL, the FLASH extension, ZOQ, the ARGUS exhibit, building 1 or AMTF – there is work in progress all over the campus. While progress at our "flagship construction sites" is visible every day, in this issue we want to present the smaller and hidden ones.

The AMTF hall, for example – we all remember it well from the DESY anniversary celebration, when it was still almost unequipped. In the meantime, the shields for the three module test benches and a number of compressors for helium processing have been installed. The construction of the hall is almost finished; works for helium and RF power supply for the test benches run at full speed and are even ahead of schedule. Temperatures down to minus five degrees pose no problem for outdoor work. Test operation of the European XFEL accelerator components will start in 2012.

There are also smaller construction projects. Many people have been wondering what is happening at the main gate, opposite to building 11. Recently, the ground plate for a new outdoor exhibit was cast: the 500-tonnes ARGUS detector – many visitors have seen it in the DORIS hall – will be installed in the open air and soon welcome visitors entering the campus. Currently, ARGUS is being prepared to cope with the classic Hamburg weather conditions; the erection of the detector is scheduled for next spring.

The „Café Soergel" - well known to DESY staff - in the front sector of building 1 was already removed with heavy machinery.

Another construction site is building 1. Currently the front building and 1a sector are being remodelled. Hardly visible from outside, the building is largely gutted and completely redesigned. Already in February, the first groups will return to the offices at the corridor; the front building will be finished in May. The next construction stage will take place in building 1b, starting in March.

First preparations for the FLASH extension are also underway. "We are currently clearing a number of trees in the east of FLASH and are draining the soakaway," says Lindemar Hänisch from the construction department. The first building measures for both the tunnel and the new experimental hall will start in the course of next year. There are also first preparations for the construction of the Nanolab, which will be erected between the FLASH extension and building 25f as of 2012.

With this and other future projects, the familiar construction site scenario will be with us also in the coming years. *(gh)*

DESY greetings around the world

The DESY Christmas cards are now available! New this year: the cards including envelopes can be ordered with the order number 65150 from the DESY central warehouse. In case you need only a small number of cards, these are also available at the PR office container, building 210.

Lightsources users' meetings

As usual, the jointly organised user meetings of the European XFEL and HASYLAB will take place end of January. From 26 to 28 January, there are meetings in the auditorium; a joint poster and industrial exhibition will take place in the AMTF hall. This time there will be a special session on archaeometry, the investigation of historic samples with synchrotron radiation.

DIRECTOR'S CORNER

Dear colleagues,

the year 2010 is coming to a close – another eventful year with many successes for DESY.

These are firstly the further development of our research facilities. With FLASH, we have a large-scale facility of superlatives for several years at our disposal, which now – having reached the "water window" at wavelengths of 4.15 nanometres – offers most exciting X-ray microscopy for the investigation of biological samples in an aqueous solution. With FLASH II, we will soon start the urgently needed extension, now that our project proposal has won the internal Helmholtz competition against strong competitors.

PETRA III has taken up routine user operation and – as the most brilliant X-ray source of the world – has reached all of its sophisticated design parameters.The European XFEL is in its second year of construction, and I expect that in 2014 we will see the first X-ray flashes of the best X-ray laser in the world.

The success of DESY has always been based on its world-class facilities and on staff members full of ideas. With CFEL, a cooperation across the institutions with the University of Hamburg and the Max Planck Society, we have created an ideal research platform that attracts the best scientists from around the globe. Recently, with two successful appointments, we managed to persuade top scientists from the United States to come to Hamburg: Robin Santra and Franz Kärtner. Particularly gratifying was also the award of a renowned Humboldt professorship for DESY and the University of Hamburg, and we are glad that we were able to win Brian Foster, a distinguished particle physicist from the University of Oxford, to assume this office. What we now have to do is to continue the successful Helmholtz Alliance "Physics at the Terascale", to remain pivotal for particle physics also in the future.

The construction of the neutrino telescope IceCube at the South Pole will come to an end at the turn of the year. We stride towards the realisation of the newest astroparticle physics project, the Cherenkov telescope CTA, to measure ultrahigh energy gamma radiation from the early universe. With the subsequent regulation of the head management at DESY in Zeuthen, we will substantially strengthen our excellent astroparticle physics activities in Zeuthen.

For decades, there has been a successful collaboration between the University of Hamburg and DESY. Together, we will be a strong team also in the future. Next year, we will seal a strategic partnership and put our collaboration in promising key fields on a completely new structural basis. Our vision for the coming years is that the Bahrenfeld campus develops into an interdisciplinary science environment which will be highly attractive and stimulating for the best actors in the world.

At the end of the year we received the good news that in 2011, the Stern-Gerlach Medal will be presented to Günter Wolf, one of our particle physics pioneers. He will be honoured for his life work of research in the world of smallest particles. This wonderful award perfectly matches the highly successful LHC operation, with DESY's visible collaboration and prominent role in the two large experiments.

Dear colleagues, Christmas and the days until the turn of the year give us some rest in our fast-paced times. Let us take a break and spend the festive season with our family and friends. I wish you a pleasant Christmas season and I am looking forward to seeing you again – safe and sound – after New Year.

Yours,
Helmut Dosch

Chinese glass in DESY light

Metallic glasses are examined with DESY's synchrotron sources

by Ilja Bohnet

During the International Science and Technology Cooperation Conference a formal ceremony on 27 October in Hangzhou, China, extended DESY's cooperation with Zhejiang University in the field of metallic glasses research. The development and characterisation of metallic glasses – alloys that do not have crystalline but amorphous, i.e. irregular atomic structures – is currently one of the most dynamic fields of materials science. For many years, the cooperation headed by Hermann Franz and professor Jianzhong Jiang works on the development of deformable metallic glasses which are of great interest for industrial use. The synchrotron radiation sources DORIS and PETRA III offer excellent conditions to investigate the correlation between mechanical properties of the metals produced at the University of Zhejiang, and their atomic structures.

In Hangzhou, Jianzhong Jiang and Ilja Bohnet signed the agreement for the extension of cooperation.

Since 2007, this cooperation is supported within the framework of the Impulse and Network Fund of the Helmholtz Association; because of its success, the third-party funding of the project was extended for another two years. So far, the results of this cooperation brought more than 50 publications in international journals.

The earth is constantly bombarded with particles from cosmic particle accelerators.

Thousands of accelerators

The Cherenkov Telescope Array CTA – the future of gamma astronomy

by Gernot Maier und Stefan Schlenstedt

The universe is full of particle accelerators – we can find them in supernova explosions, binary star systems or active galactic nuclei. So far, we only know about a hundred of these objects and we only have a rough physical understanding of these fascinating systems. The Cherenkov Telescope Array will observe thousands of these accelerators with an unprecedented precision. The CTA Consortium held a meeting at the Rutherford Appleton Laboratory in November; this was the first meeting after the start of the preparatory phase that will run until 2013 and is funded by the EU. During this time, CTA will be optimised, industrial production of CTA elements will be prepared, and prototypes of building components and telescopes will be developed.

In this phase, DESY in Zeuthen is responsible for the construction of the telescope structures with twelve-metres diameter mirror area, and coordinates the entire building of these telescopes. Moreover, DESY makes substantial contributions to the control and monitoring of the telescope array, the electronics, trigger optimisation and processor-intensive analyses and simulations. In order to bring forward all these subjects, new postdocs were recruited in the past weeks. In addition, DESY issues the financial regulations and cost structures in this international consortium with 132 institutes from 25 countries.

In January, a group of young scientists began their work. Their main topics include gamma emission of cosmic jets, indirect search for dark matter, as well as Monte Carlo and analysis developments for CTA. The members of this group work are involved in the analysis of data of the VERITAS telescopes in Arizona.

Within the framework of the Berlin-Brandenburg Cluster, the CTA group at DESY in Zeuthen closely collaborates with the University of Potsdam and the Humboldt University in Berlin. It is also a member of the astroparticle physics Helmholtz Alliance, still in the application phase, which will cover the fields of high energy sources and search for dark matter.

New experimental halls

This design submitted by the architectural firm Renner Hainke Wirth won the architectural contest for the planned second FLASH experimental hall and the PETRA III extension. Next autumn, construction will start for FLASH II.

December

1 Science Café DESY (http://sciencecafe.desy.de)
Man or monkey? – The search for our ancestors
Rosemary Wilson, DESY Bistro, 17 h

7 Information lecture Gesund Bleiben
Feldenkraismethode – Schwerkraftforschung am eigenen Körper
Heidje Duhme, DESY, Hamburg, bldg.1, rm. 4, 16 h

8 Public Lecture
Wenn Licht durch dicke Wände geht – Teilchenphysik bei kleinsten Energien
Axel Lindner, DESY, Zeuthen, SR3, 19 h

15 DESY's Christmas show
Heckers Hexenküche
Joachim Hecker, DESY, Hamburg, auditorium, 19 h

21 European XFEL event (by invitation only)
Second Tunnel and Borer christening ceremony
Schenefeld, Baustellengelände, 14:30 h

January

12 Science Café DESY (http://sciencecafe.desy.de)
Physik tief unter der Erde – Auf der Suche nach extrem seltenen Ereignissen
Christian Oldorf, DESY Bistro, 17 h

14 **Library Open Day**
DESY, Hamburg, bldg. 1d, Library, 10:30 h

26 Science Café DESY (http://sciencecafe.desy.de)
Teilchen schnell wie das Licht? – Der LHC-Beschleuniger als Rekordjäger
Sven Ackermann, DESY Bistro, 17 h

26-27 Users' Meeting
European XFEL Users' Meeting
DESY, Hamburg, auditorium

27-28 Users' Meeting
HASYLAB Users' Meeting
DESY, Hamburg, auditorium

February

9 Science Café DESY (http://sciencecafe.desy.de)
Hollywoods Filmtricks – Physikalische Irrtümer von Spielberg, Tarantino & Co
Marc Wenskat, DESY Bistro, 17 h

21-25 TERASCALE (http://terascale.de/intro2011)
Introduction to the Terascale
DESY, Hamburg

23 Science Café DESY (http://sciencecafe.desy.de)
Die spezielle Relativitätstheorie und ihre Anwendung in Physik und Technik
Peter Schmüser, DESY Bistro, 17 h

Surface subsidence in Osdorfer Feldmark

Unexpected surface subsidence caused by a rare geological situation

by Petra Folkerts

On 15 November, a sudden surface subsidence occurred in an empty horses' pasture in the Osdorfer Feldmark. TULA, the larger of the two tunnel boring machines for the European XFEL, had passed under that spot five days before in a depth of around 10 metres. The subsidence was filled with sand after a survey two days later to better observe possible further ground motion.

Two days after the subsidence occurred on the horses' pasture, it was filled with sand.

After now detailed studies, the tunnel experts came to the conclusion that the depression, which was around 1.20 metres deep and had a total area of around 15 square metres, was very probably caused by a rare geological situation. That means TULA presumably encountered an abrupt vertical transition between a hard layer of till and a loose layer of sand, which held several boulders. The tunnel boring then caused an underground void to form, into which sand slid down the following days.

It is certain that all technical guidelines and security rules for the tunnel boring were complied with. Beyond that, measures will now be taken to even further reduce the – already small – probability of such a subsidence occurring again. This means that the operating parameters shall be adjusted as if this exceptional geological formation were present along the whole remaining route of the machine.

In addition, the operating parameters will be analysed at even shorter intervals and in a combined way. This should enable the tunnel builders to spot possible voids early enough to fill them with mortar directly from the machine.

DESY: recommended by leading physicists

The German committee for elementary particle physics defines its future strategy in particle physics

There is always a grain of truth in every cliché, for example that Germans enjoy punctuality and like to plan ahead. The German particle physics community organised in the committee for elementary particle physics (KET) recently lived up to expectations: in a strategy workshop in Dortmund, they discussed their visions for the future of particle physics in Germany and Europe. The mandate was issued by the German Federal Ministry of Education and Research, with the aim to present the KET recommendations at next year's "European Strategy for Particle Physics" meeting of the CERN Council. In 2012, a new strategy for Europe is supposed to be finalised.

The KET community counts more than 2000 scientists from 40 institutes, with DESY of course in a leading position. Hundreds of these scientists met in Dortmund and at the annual meeting in Bad Honnef to exchange and shape ideas and recommendations.

The result is, in the first place, to operate and optimise with highest priority the Large Hadron Collider LHC at CERN, including the luminosity upgrade. KET also recommends the continuation of development and planning in close international collaboration of an electron-positron linear collider like the ILC. German contributions to a Super B Factory and the promotion of neutrino physics are also on the list of recommendations.

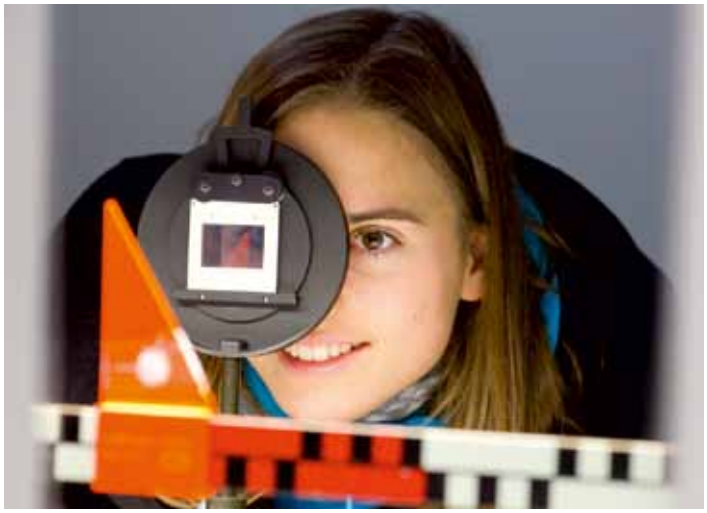
DESY staff members will be pleased to hear that the largest German particle physics research centre has been specially mentioned: according to KET, DESY's role as a national particle physics laboratory and coordination centre should be further strengthened, especially because of its expertise in the development of accelerator and detector technologies. After another decision round, the recommendations will be submitted to the German ministry by the end of the year. *(baw)*

Worlds of learning in natural science

Meeting at DESY networks different sites of learning

by Jens Kube

What is the best way for pupils to get in touch with current topics in science? Many institutions throughout Germany are working on this challenge: school labs (e.g. the DESY hands-on school lab), museums, science centres, school research centres and the like. More than 150 actors from this circle met at DESY on 21 and 22 October, on invitation of "Welt der Physik", to discuss their projects and to form networks.



Hands-on! Some guests brought their own school experiments to try out.

Unlike past meetings of the comparable initiative "Lernort Labor", this meeting was not restricted to school labs. It also included presentations of projects in the fields of teacher training, museums and school initiatives. This was the first meeting in this configuration – so it was also the first time that the participants had the opportunity to meet the actors of related or completely different projects in person.

Apart from the professional exchange which was summarised in a concluding panel discussion, the organisers put special emphasis on room and inspiration for personal discussions and networking. Although one hour for the coffee breaks was generously measured, the science teachers could hardly be persuaded to return to the lecture halls. A special highlight: the conference dinner in the Millerntor stadion, a suitable environment for Metin Tolan's famous lecture on the physics of football, already well known to DESY staff.

And what is the professional conclusion? In learning locations outside school, pupils experience the fun and fascination of the natural sciences. However, long-lasting effects can only be reached when the come back repeatedly. It is not clear how to establish and integrate these contacts into the curricula – a good subject to plan future "Worlds of Learning" meetings.

AWARDS IN NOVEMBER

Günter Wolf recieves Stern-Gerlach Medal 2011

Günter Wolf will be honoured with the Stern-Gerlach Medal 2011 of the German Physical Society (DPG). With the highest award presented by the DPG for achievements in experimental physics, the society honours the lifework of Günter Wolf. Since the beginning of DESY, Wolf (73) worked at the research centre and significantly influenced its scientific programme. In a leading position, he collaborated in the construction and experimental programme of large-scale particle detectors at the storage rings DORIS, PETRA and HERA and, among others, he was the spokesman of the TASSO and ZEUS collaborations. TASSO was one of the PETRA detectors where the gluon was discovered.
Günter Wolf receives the golden medal in March next year, at the annual conference of the DPG.

Henry Chapman was awarded the Bjørn H. Wiik-Prize

The Bjørn H. Wiik-Preis 2010 was presented to Henry Chapman on 15 November. The 43-year-old physicist and professor at the Centre for Free-Electron Laser Science (CFEL) at DESY is honoured for his groundbreaking experiments in the field of structural analysis of complex molecules at free-electron lasers. The British scientist Henry Chapman is a pioneer in research with free-electron lasers and a renowned expert in the field of three-dimensional imaging and phase retrieval. His development of investigation methods in this field is equally important for both materials science and biology.

Honory doctorate for Helmut Dosch

On 25 November, Helmut Dosch received an honorary doctorate from the Kurchatov Institute. In an official ceremony at the Russian research centre, Dosch was honoured for his outstanding contributions to the development of X-ray techniques of condensed matter investigation, including phase transitions, and for his contributions to the German-Russian research collaboration in the field of synchrotron radiation sources utilisation.

PhD thesis award 2010

The PhD thesis award 2010 of the Association of the Friends and Sponsors of DESY is awarded to Ulrike Frühling for her thesis on "Light field driven streak-camera for single-shot measurements of the temporal profile of XUV-pulses from a free-electron laser" and to Christoph Weniger for his thesis on "From SuperWIMPs to Decaying Dark Matter: Models, Bounds and Indirect Searches".
The Association presents this prize to award outstanding PhD theses that were concluded in the period of January 2009 till March 2010.

This is how it might look like when two lead ions smash into each other in the ALICE detector.

The LHC is no longer unleaded

First collisions of lead ions in the LHC

Eighteen thousand particles in just one collision can emerge when lead ions clash into each other in the LHC. Every year before the winter shutdown, the LHC will accelerate lead ions instead of protons – this year for the first time. At 575 Tera-electronvolts, the energy at these collisions is 15 times higher than the energy of the so far strongest accelerator for heavy ions, RHIC at Brookhaven National Laboratory in the United States.

With the collisions of lead ions, scientists want to investigate a state of matter that existed millionths of seconds after the Big Bang. In this so called quark-gluon plasma, quarks and gluons that are normally confined in the atomic nucleus are able to move virtually freely. It is especially interesting for scientists to see how our universe of today has developed from this original state.

The transition from proton to lead-ion operation ran smoothly: after extracting the last protons in the morning of 4 November less than 24 hours later the first lead ions were circling the LHC. The first collisions under stable conditions took place only three days later. After about four weeks, this year's operation with lead ions ended on 6 December.

The LHC now goes into winter shutdown and will be serviced together with the detectors. The next phase of proton collisions will start in February 2011 and the next one with lead ions in November 2011. *(gh)*

HELMHOLTZ ASSOCIATION

German Centre for Diabetes Research opened

About eight million people in Germany suffer from diabetes, and the number of patients is still increasing. Therefore, diabetes belongs to the diseases for which special German health centres are supposed to be established to close research gaps and obtain a faster progress for the benefit of the patients. The German Centre for Diabetes Research (DZD) was opened on 9 November by the Parliamentary State Secretary Helge Braun (Federal Ministry of Education and Research). At the DZD, five non-university and university partners will bundle and enhance national research competence in the field of diabetes: Helmholtz Zentrum München, German Diabetes Center Düsseldorf, German Institute of Human Nutrition Potsdam-Rehbrücke, University of Tübingen and University Hospital Dresden. Seat of the office is Munich. Following the German Centre for Neurodegenerative Diseases, the DZD is the second German Centre for Health Research. Four more centres will be founded next year to fight against widespread diseases in the field of infections, pulmonary and cardiovascular diseases, and cancer.

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European XFEL becomes a member of EIROforum

On 8 November, the European XFEL GmbH joined the EIROforum as its eighth member. EIROforum is a partnership of European research organisations with large-scale facilities. The aim of the members is to bundle and share the resources, facilities and professional competence, to promote European research and help develop its full potential. EIROforum supports and facilitates connections to the European Commission and other bodies of the European Union, to national governments, industry, teachers, students and journalists.