



Tunnel day at DESY

European XFEL accelerator tunnel handed over to DESY

Bright sunshine instead of red noses: carnival Monday began with a special event at DESY. Everybody who trudged through sand and puddles on the construction site, headed for the provisional entrance of the injector building of the European XFEL and walked down 180 steps into the moist concrete shell of the building was awarded with a view into the newly completed accelerator tunnel for the new X-ray laser. Due to safety regulations, it was not possible to walk the whole length of the two-kilometre tunnel but, it was an unforgettable experience for staff members of DESY and the European XFEL GmbH all the same. The special souvenir was a photograph of every visitor taken by a professional photographer in the tunnel for the future world's best X-ray light source.



In 2013, the first accelerator modules will be installed here: the European XFEL tunnel construction has now been completed (Photo: M. Mayer)

Especially for this day, the XFEL tunnel construction firm had ceded the accelerator tunnel to the building owner. The final handover of the tunnel with all the necessary inspection and acceptance procedures took place on 27 February. Now work in the accelerator tunnel really starts at DESY: first, a new platform must be built to enable access to the tunnel. This is followed by safety provisions like the installation of fire extinguishers and smoke detectors, and the necessary equipment for emergency communication and first aid. Tunnel lighting is next on the agenda. At the same time, the experts of the DESY geodesy and surveying department measure the tunnel very thoroughly. The installation of the accelerator requires extremely high precision; consequently the tunnel must also meet these special standards. The tunnel's maximum devi-

ation from the tube shape is only 5 centimetres. The 2-kilometre tunnel itself was bored with an accuracy of 2-3 centimetres along its axis.

As from mid-June, the floor in the accelerator tunnel will be opened at one side to lay cable racks, water pipes, reserve conduits for optical waveguides and, above all, pulse cables which will later provide the RF stations with pulsed radiofrequency. In September 2013 the first accelerator modules are scheduled to be installed in the tunnel. These will have been delivered from France and passed the comprehensive tests in the module test hall (AMTF). From then on, the rate of delivery of the modules determines the time schedule. Assuming

the delivery of one module per week, it will take about 100 weeks to assemble the complete machine.

Parallel to the activities in the accelerator tunnel, work will also continue at full speed at the three construction sites: DESY, Osdorfer Born and Schenefeld. Commissioning of the European XFEL is scheduled for 2015. The complete assembly is a very complex process with numerous international teams pursuing a common goal - to accelerate electrons to the required energy and to generate the world's best X-ray laser light which scientists will use to "film" atoms and molecules. (uw)

DIRECTOR'S CORNER



Dear colleagues,
in spite of many efforts in the past, women are still strongly underrepresented in the sciences. Even if today more than half of all students are women, only 20 per cent of all diploma, master or bachelor degrees in physics are obtained by women. The percentage of women is even smaller in engineering sciences, even though there is a shortage of natural sciences and technology staff on the job market – including at DESY. Therefore it is necessary to foster motivation and self-confidence for science and technology in girls at an early stage, so that the proportion

of women in these professions increases in the long run. On 26 April, the traditional Girls' Day takes place at DESY, offering many girls the possibility to discover the working world for one day. We hope for active participation and I would like to take the opportunity to thank all staff members who are engaged in this task in advance.

Moreover, we definitely must and want to offer more job opportunities to highly motivated and qualified women scientists at DESY. A very positive fact is that already for some years we have been able to fill half of

the young scientists' group positions at DESY with women. Some of our best ones have already managed to secure very sought-after professorships at German universities, and others are bound to follow. However, we must continue to make an effort to give highly qualified women the opportunity to take leading positions at DESY.

On 20 February - the "Tunnel day"- we invited you to join a DESY-wide walk to see the European XFEL tunnel building. There was a great deal of interest in the tour, and lots of visitors got a good impression of the

straight tunnel in the underground where, from 2015, we will accelerate electron bunches to generate extremely brilliant X-ray light. Meanwhile, management responsibility for the tunnel building has been handed over to us and the preparations for technical equipment are running at full speed. The installation of the first superconducting accelerator modules in the tunnel is scheduled for 2013.

I wish every success to all involved.

Yours,
Helmut Dosch

Women in focus

DESY inForm special issue highlighting International Women's Day



Sylvie Faverot-Spengler, equal opportunity commissioner at DESY

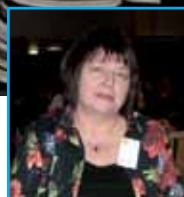
In celebration of the International Women's Day 2012, DESY dedicates the March issue of DESY inForm to all women at DESY. At the end of the year 2000, the percentage of women at DESY was 21.6, now it is 26 per cent. With 226 new female colleagues in the past eleven years, the proportion of women has slowly but steadily increased. You can find them in all working areas, including increasingly in scientific and technical professions. Looking at some examples from DESY everyday life, we will highlight women who contribute to the scientific success of DESY in cooperation with their male colleagues. We are committed to ensure that the number of women in these professions will increase within the coming years – also in the management.



Women's representatives at DESY (f.l.t.r.)

Katrin Lando, Brunhilde Racky,
Meike Flammer, Sylvie Faverot-Spengler,
Jenny List, Isabell Melzer-Pellmann.

Small Photo: Hannelies Kluge (Zeuthen)



Prof. Dr. Beatrix Borchard, head of the musicological institute of the Hamburg University of Music and Theatre will give a talk on Clara and Robert Schumann. Sacrifice and effort characterised the life of musician Clara Schumann who in spite of her talent and success as a composer had to make way for her husband. The lecture will be complemented by a choice of her songs, sung by the DESY choir.

We are looking forward to welcoming you at this event. Bring along family and friends!

In celebration of the International Women's Day, we cordially invite you to a public lecture (in German) on 8 March 2012 at 7 p.m. in the DESY auditorium.

Hunting the Higgs at the LHC

First analyses of the full 2011 data set



Kerstin Borras is head of the CMS Group at DESY



Kerstin Tackmann is leader of a Helmholtz Young investigator Group at ATLAS

An army of physicists is hunting for the Higgs boson at the Large Hadron Collider (LHC) and DESY scientist are at the heart of the hunt. First results from the full 2011 data set recorded by the two experiments ATLAS and CMS were presented at CERN in December. Updated analyses have now been submitted for publication. They say that the Standard Model Higgs boson, if it exists, is likely to have a mass within the range 115-131 GeV. This narrowing down of the mass range is a significant improvement over previous results. However, the tantalising glimpses of the Higgs, seen by both experiments, are not strong enough to claim a discovery.

The LHC produced an immense amount of data in 2011. The CERN management recently decided to run the LHC at the slightly higher energy of eight tera-electronvolts (TeV) in the year 2012 increasing the sensitivity for the Higgs search by about 10 percent. The aim is to deliver three times more collisions than in 2011, which will enable the experiments to draw more significant conclusions.

The Higgs has been on the particle physics missing persons list for decades.



Real CMS proton-proton collision events in which four high energy electrons (green/red) are observed. The event shows characteristics expected from the decay of a Higgs boson but is also consistent with background Standard Model physics processes.

It is a crucial ingredient of the Standard Model, which describes elementary particles and their fundamental forces, and offers a mechanism to answer the key question of the origin of mass. The ATLAS and CMS groups at DESY, contributing strongly to the operation of the experiments, are deeply involved in the searches for the Higgs boson. Within each group, a Helmholtz young investigator team of postdocs and PhD students is analysing the data with different methods.

Both the discovery or the exclusion of the Standard Model Higgs will be exciting: a

discovered Higgs boson will be studied in greatest detail, while an exclusion would hint to a fundamental incompleteness of the Standard Model. In this case, the mechanism for creating mass must lie either in an extended model with a non-Standard-Model Higgs or in a completely new mechanism.

The future prospects are bright: after improvements and upgrades in 2013 and 2014, the collision energy will increase to about 14 TeV, opening the door to even more unexplored territory.

CMS Achievement Award for Ekaterina Kuznetsova

Every year the CMS Collaboration hands out prizes for outstanding contributions to the experiment. In 2011 20 young post-docs and PhD students were awarded in ten different categories, including DESY's Terascale Alliance fellow Ekaterina Kuznetsova.

These awards were initiated to especially appreciate extraordinary and excellent work in hardware areas, which are vital for the experiment.

The CMS Achievement Award for Ekaterina Kuznetsova is a strong recognition of her crucial and tireless work for the construction, operation and calibration of the CASTOR calorimeter in the forward region of the CMS experiment, to which DESY delivered essential components.



WHAT'S ON AT DESY

March

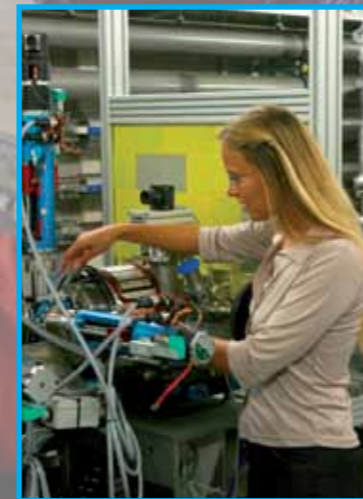
- 5-9** Terascale workshop (www.terascale.de/intro2012)
Introductory School "Terascale Physics"
DESY, Hamburg
- 8** Lecture on International Women's Day
Liebe, Musik und Geld: Clara und Robert Schumann
DESY, Hamburg, auditorium, 19 h (in German)
Beatrix Borchard, University of Music and Theatre, Hamburg
- 6-7** LHC-Workshop (<http://masterclasses.desy.de>)
Masterclasses
DESY, Zeuthen and HU Berlin
- 12-15** Terascale workshop (www.terascale.de/mc2012)
Monte Carlo School 2012
DESY, Hamburg
- 21** CFEL Colloquium
Watching chemistry in the molecular frame
Henrik Stapelfeldt (University of Aarhus)
DESY, Hamburg, auditorium, 15 h
- 22** BRIDFAS Lecture
The History of Windsor Castle and its Royal Occupants
Oliver Everett,
DESY, Hamburg, auditorium, 20 h
- 28** Science Café DESY (<http://sciencecafe.desy.de>)
Keplers Traum – Von der Alchemie zur Naturwissenschaft
Ilja Bohnet, DESY bistro, 17 h

April

- 2-5** Terascale workshop (www.terascale.de/statistics2012)
School on Statistics Tools 2012
DESY, Hamburg
- 19-20** Meeting
NIC-Wissenschaftlicher Rat
DESY, Zeuthen
- 23** Students laboratory day (www.eintagvorort.de)
DPG - Ein Tag vor Ort
DESY, Zeuthen
- 24** Informationsveranstaltung Gesund Bleiben
Schlafgesundheit
DESY, Hamburg, Sem. Rm. 1, 16 h (in German)
Dr. Holger Hein, Facharzt für Innere Medizin,
Schlafmedizin
- 25** Science Café DESY (<http://sciencecafe.desy.de>)
Der kleinste magnetische Datenspeicher der Welt
Sebastian Loth, DESY bistro, 17 h
- 26** <http://zukunftstagbrandenburg.de>
Zukunftstag für Mädchen und Jungen
DESY, Zeuthen
- 26-27** Meeting (<http://prc.desy.de>)
73. PRC-Treffen
DESY, Hamburg



Women at DESY – versatile and creative



PITZ – A ten-year story of success in Zeuthen

Electron gun generates world-leading beam quality



Anne Oppelt, technical coordinator at PITZ

The successful operation of free-electron lasers like FLASH and the European XFEL requires electron beams of extremely good quality. For the development of this kind of electron sources, the photo injector test facility at DESY in Zeuthen (PITZ) went into operation ten years ago, and today

delivers world-leading beam quality.

The decision to build PITZ was taken in 1999. After a short time of construction and installation, on 13 January 2002 this facility generated the first photoelectrons. This was followed by a period of intensive update of subsystems. In 2004, the first electron gun optimised at PITZ went into operation at the Hamburg X-ray laser FLASH.

Since then, PITZ has been continuously extended to facilitate an even more comprehensive diagnosis of the generated electron beams. Essential improvements in the photocathode laser system and the installation of a more powerful RF system were carried out and, the necessary beam quality for the European XFEL was outperformed for the first time in 2009.

FLASH powers up

Soft X-ray laser will be running again for user experiments



Katja Honkavaara is an accelerator physicist

After 3.5 months of shutdown starting in autumn 2011, DESY's free-electron laser (FEL) FLASH was restarted as scheduled in January 2012. It shows a very good performance with even higher average photon pulse energies than last year: up to 500 microjoules at 13 nanometres wavelength. From the middle of March to the end of 2012 FLASH will be running for user experiments again.

Due to the high demand on beamtime - FLASH is permanently overbooked - and to allow more flexibility for FLASH operation, DESY is constructing a second undulator beamline called FLASH 2. FLASH 2 will use the same electron linear accelerator (linac) as the present FLASH facility, but the new undulator beamline will be located in a separate building. Also a second experimental hall will be constructed. FLASH 2 will be connected to the FLASH linac in early 2013.

FLASH - the first soft x-ray free-electron laser (FEL) user facility in the world - has been providing high-brilliance FEL radiation for user experiments since



Katja Honkavaara at work in the FLASH tunnel (Photo: Heiner Müller-Elsner)

summer 2005. During its third user period from September 2010 to September 2011, a total of 3740 hours of FEL radiation was delivered to 29 user experiments with more than 30 different photon wavelengths between 4.7 nanometres and 45 nanometres. In addition, FLASH

beamtime has also been allocated for FEL and accelerator physics studies and developments related to the X-ray free-electron laser European XFEL currently being built at Hamburg and to the planned International Linear Collider (ILC).



Last year, PITZ eventually reached stable operation with world-leading beam quality. The beam properties were optimised over a wide range for the electron bunch charge from 0.02 to 2 nanocoulomb, meaning improvements have been made in the whole range of beam quality factors.

There are sophisticated plans for the future of PITZ. Apart from providing the

electron source to start the injector at the European XFEL in 2014, new tests are on the agenda for photocathode laser systems and beam diagnostic elements. Among other things, getting involved in the hot research topic of plasma acceleration is also envisioned.

PETRA makes iron invisible

First PETRA experimente in "Nature"



It's the first PETRA III paper in "Nature" and it's a hit: at the high-brilliance synchrotron light source PETRA III, a team of DESY scientists headed by Ralf Röhlsberger succeeded in making atomic nuclei transparent with the help of X-ray light. Their discovery does not only pave the way to a completely new class of quantum-optical experiments of highest sensitivity, it is also a new way to realise an optically controlled light switch that can be used to manipulate light with light, an important ingredient for efficient future quantum computers.

The photo with multiple images of two objects located between two parallel mirrors illustrates the principle of the experiment: the scientists positioned two three-nanometre-thin layers of iron-57 atoms in an optical cavity, an arrangement of two parallel platinum mirrors that reflect X-ray light multiple times. When the light wavelength and the distance between both iron layers in this optical cavity are in just the right proportion, the iron becomes almost transparent for the X-ray light. (tz)

More than a silver lining

DESY PhD student wins first place at microscopy contest

Nano materials often behave quite differently from their macroscopic counterparts. How materials properties change at the transition into the nanocosm is investigated by Denise Erb, PhD student at DESY in the field of photon science. With her particularly enlightening atomic force microscope image of tiny silver islets on a polymer surface structured through self-organisation, she won the microscopy ProIMAGE Contest of the microscope manufacturer NT-MDT that takes place every year. Erb's winning image shows a 0.001-by-0.001-millimetre section of insular silver structures (green) with a diameter of approximately 10 nanometres (millionth of a millimetre), grown on a chemically and topographically structured polymer mixture.

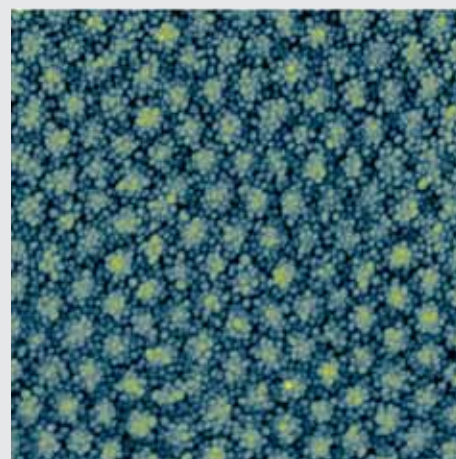
"The corresponding experiment wasn't actually successful," explains Erb. The scientists' aim had been to create metallic nano structures, arranged in a regular configuration. In the meantime this has been carried out successfully with iron. However, the submitted picture was regarded as the most convincing because of its attention to detail and scientific



information, so the jury of the contest awarded the DESY scientist the winner's prize of 3000 US dollars.

Denise Erb, PhD student in the field of photon science

According to Erb, these experiments still belong to basic research. "However in the future, this technique could also be used to produce a crystallisation template for proteins," the PhD student says. This could also be of advantage for protein analysis with synchrotron radiation, for example at PETRA III, thus having a direct application. (tim)



GEOMAR is a Helmholtz Centre

In January 2012, the Leibniz Institute of Marine Sciences (IFM-GEOMAR) joined the Helmholtz Association and now carries the name "GEOMAR Helmholtz Centre for Ocean Research Kiel". The centre contributes to the Helmholtz Association its expert knowledge in the field of ocean and deep sea research as well as unique deep sea technologies. Even though the basic organisation of research at GEOMAR will not change for the time being, the transition to the Helmholtz Association goes along with considerable changes. The new institute name and the new logo required a new public appearance, the management and control boards had to be newly appointed and there have been some changes in the administration as well. "All colleagues have taken upon themselves enormous additional effort to effect as smooth a transition as possible," says Professor Dr Peter Herzig, Director of GEOMAR. However, integration into the Helmholtz Association also opens up new opportunities. "By now, we have determined the main features for an application in the framework of programme-oriented funding as of 2014. This is of elementary significance for the basic financing of GEOMAR," says Herzig. Moreover, projects with Helmholtz funding have already been secured, for example a Helmholtz Young Investigators Group, a German-Russian young talents research group and a W3 professorship to ensure excellency. At the same time, the GEOMAR will continue its close cooperation with the Christian Albrechts University Kiel.

www.helmholtz.de/hermann



Photo: Lars Berg

Olaf Scholz versus Otto von Guericke

Power test at the DESY school lab



Karen Ong is head of the DESY school lab in Hamburg

Hamburg's First Mayor Olaf Scholz tried a special power test at the DESY school lab. On 15 February, Scholz came to DESY to inform himself about current research and planned projects. Before he went to see the PETRA III hall, he stopped by at the DESY school lab.

There, he met fourth-graders in the middle of doing vacuum experiments who explained to him why a light bulb's filament glows brighter in a vacuum than in the air (in the vacuum, there is no air that could cool the filament). Despite the crowd of high-ranking visitors, the children continued their experiments happily and full of concentration.

There were cheers all around when the Scholz did an experiment of his former mayor colleague Otto von Guericke, the mayor of Magdeburg from 1646 to 1687. 350 years ago, von Guericke made a spectacular demonstration of the power of air pressure by putting together two large copper hemispheres and evacuating the air between them. Not even 16 horses were able to pull apart the Magdeburg

hemispheres because they were so tightly compressed by the surrounding air. Scholz tried the same thing with smaller hemispheres and (surprise) did not succeed to pull them apart.

Scholz also visited the e-lab where students from upper secondary grades make experiments with electrons. The visit showed how a positive atmosphere can motivate students to work in natural sciences.

Later, Scholz and the directorate discussed the development of the research centre, its impact on the metropolitan region and economic cooperation possibilities. Scholz praised the development of DESY into an internationally unique interdisciplinary campus for top-level research and said that he "would also like to emphasise that this top-level research is not kept in the ivory tower but also includes an active communication with our city, its citizens and the local companies."

INFO

DESY school lab [physik.begreifen](http://physik-begreifen.desy.de/)
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