DESY inFORM.

09/2011
Newsletter of the
Research Centre DESY

Light through the wall – take 2

Preparations for ALPS II are in full swing

ALPS: here still the small version, the huge one is yet to come

To bend a HERA magnet straight sounds quite bizarre; however, it is an important prerequisite for ALPS II. Last year, the "light shining through a wall" experiment ALPS did not find anything but it obtained the worldwide best exclusion limits for hidden light particles (see DESY inForm 5/2010). Thus, for the ALPS collaboration, there is no doubt that: "ALPS must become larger and more precise."

ALPS stands for „Any Light Particle Search". Since 2007, it searches for very light particles, as for example axions. For this purpose, laser light is sent through a HERA dipole with a wall in its centre. The general assumption is obvious: light shining through a wall – no way! However, in case axions do exist, this would be completely different. The laser light could transform into an axion in the magnetic field, traverse the wall and transform back into a photon again behind the wall. The result is light shining through the wall.

"A whole series of axion-like particles just tumble out of string theory," explains ALPS spokesman Axel Lindner. These extremely light particles – should they exist – could give answers to some open questions of particle physics. Extremely light particles could make up dark matter or explain dark energy – the 95 percent of our universe, which are so far unknown to us. Moreover, the low energy range becomes ever more fascinating, the longer high energy experiments as the LHC do not detect particles that might explain such phenomena.

The final location for the installation of ALPS II, planned for the time after the completion of the European XFEL, will be in the HERA tunnel. A giant version of ALPS is to increase the measuring precision: twelve superconducting magnets in front and twelve behind the wall – instead of one magnet in total – form the basic structure. Yet this confronts the ALPS collaboration – and the participating scientists from the Albert Einstein Institute Hannover, the Sternwarte Bergedorf observatory and the University of Hamburg – with challenges, because the beam pipe of the HERA dipoles is bended. In order to send light through all magnets, some of them have to be straightened! Apart from the mag-

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Speed Machines film online

Faster – higher – further: The film on DESY accelerators is now available. It completes the DESY movie series consisting of a general film and one film for each research field. You can watch them online at www.desy.de. →About DESY →DESY videos. A DVD which includes all films is currently in preparation.

ILC Interim Report published

The International Linear Collider scientists have summarised their recent research results in a "Technical Progress Report". The 164-page brochure is a milestone on the way to the Technical Design Report, expected end of 2012. Download the interim report at: www.linearcollider.org.

DIRECTOR'S CORNER

Dear colleagues,

summer is over! Those who had the opportunity to escape the rain were lucky. I hope those who had to stay were dressed properly. In Northern Germany, one says that there is no bad weather, but only bad clothes.

During the summer months, important projects were advanced. The construction of the tunnel for the European XFEL is one good example. TULA, the large tunnel boring machine reached its destination in Bahrenfeld. The two subsidences – this topic was also picked up by the press – fortunately caused no bigger damage. Thanks to all who, with great commitment, were cooperating in the assessment and limitation of the damage. We are planning to open the tunnel on one afternoon early next year for DESY staff members to take a walk through the completed tunnel from Schenefeld to Bahrenfeld. Use this opportunity to take a close look at the fascinating buildings that were constructed within the last two years.

All of you can see that DESY is not only building tunnels but also digging up roads and refurbishing many buildings. Also in Zeuthen, the renovation of the so-called "villa" and the construction of the school-lab are imminent. Thanks to all who endure these construction work disturbances with a lot of patience.

The second half of the year is usually a stressful time. With our large project and new activities, we have to accomplish many tasks. However, in spite of the current work situation, we must take the necessary time for the appraisal interviews to focus on the personal functions within the team.

I wish you an eventful, optimistic and – of course – sunny autumn time.

Yours,
Christian Scherf

nets, ALPS II includes a new superconducting detector, a stronger laser and a much more complex optical structure. In this final stage, ALPS would be able to search for axions and other superlight particles with more precision than the current astrophysical experiments in this field.

Until then, many further steps are required. First, the scientists have to find out whether a straightened magnet works as well as a bended one. Parallel to this the laser technology will be tested – initially on a smaller scale, at 20 instead of 200 metres, in a new laser laboratory in the HERA hall west, and without magnets. This, however, is not only an ordinary test run; at this stage ALPS will also search for so-called hidden photons. This are other particles that might exist in the low energy range and which, in contrast to axion-like particles, might also appear without a magnetic field. "As soon as it becomes clear that the optics work in this small scale, we will expand the whole structure to 200 metres in the HERA tunnel – again without magnets at first," Axel Lindner illustrates the subsequent procedure. Only when everything is running well there, the DESY directorate will be asked to decide on the construction of ALPS II with a total of 24 magnets.

PhD student Jan Dreyling in the new ALPS laser laboratory

ALPS is not the only experiment searching for light particles in Hamburg. DESY is also collaborating in the Solar Hidden Photon Search experiment – SHIPS for short – at the Sternwarte Bergedorf observatory. Cooperation with CERN scientists is also in the air. "The axion research field becomes more and more exciting," says Lindner. "DESY's outstanding infrastructure and know-how provides the chance to continue to be in the front line of this new particle physics research field." *(gh)*

Wanted: source of information

Open day 2011

The DESY open day will take place on 29 October. On occasion of the 4th Night of Science, DESY will open its doors from noon until midnight and show all its facets. This event is very popular among people from Hamburg and its vicinity and, as usual, we are expecting a large number of visitors.
In 2009, about 800 volunteers showed our researchers´ world to more than 13 000 visitors. Our goal is to welcome an always larger number of visitors each open day, fascinate them and encourage them to participate in numerous events.

Help us to reach this goal and register at **http://registrierung-tdot.desy.de/**

We want our visitors to recognise you as DESY staff even from afar; therefore, all volunteers will get a T-shirt with the slogan “INFO QUELLE” (source of information). Please indicate your T-shirt size when you register, and become a source of information for our visitors. *(bl)*

INFO

Any questions? tdot@desy.de

After more than seven months of underground work, TULA’s cutterhead showed again.

TULA made it!

Boring of accelerator tunnel successfully completed

by Petra Folkerts

The civil engineering works for the European XFEL achieved a major milestone. TULA, the larger of the two tunnel boring machines, reached its goal dead-on at the end of July on the DESY-Bahrenfeld construction site. After more than 400 days of successful service and a total of 3084 metres of completed tunnel tube, TULA (TUnnel for LAser) has now finished its job. Shortly before the publication of this DESY inForm issue, TULA set out again on its journey by ship back to the manufacturer. At the end, however, the tunnel builders once again faced challenging times. On 27 July at around 22 h, the tunnel boring machine was outside the wall of its reception shaft. It then had to slowly drill through the 1.50-metre-thick diaphragm wall of the construction pit and pass through the round “TULA window” in the adjoining wall of the injector building. With a “landing precision” of one millimetre, TULA arrived in its travel-out panel on the western wall of the injector building, around 30 metres deep underground.
The construction of the 2010-metre-long tunnel was not yet over, however. Six reinforced concrete rings – the last of which connects the tunnel with the hall – were still missing. While TULA inched its way onto the large steel jack (the “shield cradle”) that was installed in the hall especially for this purpose, the tunnel builders assembled the last concrete rings. On Saturday, 6 August, the boring of the tunnel tube for the superconducting accelerator of the European XFEL was finally completed!
In the following days, the 550-tonne machine was dismantled inside the injector building so that it could be transported in parts through the narrow shaft back to the surface. At the end of August, TULA returned to the manufacturer by ship, as some of its components may be reusable, while others have at least a high scrap value. The dismantling of the infrastructure needed for the tunnel boring (catwalk, supply pipes, cables, and finally the tracks of the tunnel railway) started in parallel. Right afterwards, the tunnel will be fitted with a flat concrete floor. The construction consortium ARGE Tunnel XFEL will then presumably hand over the completed tunnel to the builder in January 2012.

On the hook

On 22 August the TULA 52-ton cutterhead was recovered. In the picture you can see it hanging on the crane with which it was lifted out from the injector complex building at 35 metre depth. After the recovery, all of TULA's components were shipped back to the manufacturer. (On the right side of the picture you can see the modulator hall which is still under construction.)

September

5-6 TERASCALE (www.terascale.de/singletop2011)
Single Top Workshop
DESY, Hamburg

14 Science Café DESY (http://sciencecafe.desy.de)
Die Grenzen des Wissens
Ilja Bohnet, DESY Bistro, 17 h

14 Public Lecture
Der Alte würfelt nicht – Einsteins Dialog mit Gott
Thomas Naumann, DESY, Hamburg, auditorium, 19 h

14-16 4. HAXPES-Workshop (http://haxpes2011.desy.de)
Hard X-ray photoelectron spectroscopy
DESY, Hamburg

27-30 Theory Workshop
Cosmology Meets Particle Physics: Ideas & Measurements
DESY, Hamburg

28 Science Café DESY (http://sciencecafe.desy.de)
Anfänge der Wahrscheinlichkeitsrechnung – Ist Glück berechenbar?
Waldemar Tausendfreund, DESY Bistro, 17 h

28 Hertz Lecture
The Origin of Matter
Tsutomu T. Yanagida (IPMU, Tokio),
DESY, Hamburg, auditorium, 17:30 h

28 Public Lecture
Die Stringtheorie – Der neue Blick auf Raum und Zeit
Jörg Teschner, DESY, Zeuthen, seminar room 3, 19 h

October

4-7 TERASCALE (www.terascale.de/limits2011)
School on Data Combination and Limit Setting
DESY, Hamburg

17-20 Workshop (http://llrf2011.desy.de)
LLRF-Workshop
DESY, Hamburg

19 Science Café DESY (http://sciencecafe.desy.de)
Spuk im Labor – Wissenschaftliche Erforschung rätselhafter Phänomene
Walter von Lucadou, Axel Lindner, DESY Bistro, 17 h

19 Informationsveranstaltung Gesund Bleiben
Männergesundheit
Christian Wülfing, DESY, Hamburg,
Seminar room 7a, 16 h

21 Fest-Kolloquium
Verabschiedung von Ulrich Gensch
DESY, Zeuthen, 14 h

26 Public lecture
Die Tierwelt auf dem DESY-Gelände
Jan Tolkiehn, DESY, Hamburg, auditorium, 19 h

29 Event
DESY's Open Day and Night of Knowledge
DESY, Hamburg, 12 - 24 h

+++ 23 November: Tag der Weltmaschine (DESY, Hamburg and nationwide) +++
All upcoming events at: www.desy.de/events

Don't Panic!

Some virus attacks are only faked

by Carsten Porthun

"Your computer contains various signs of viruses and malware programs presence. Immediate anti-virus check is required. Microsoft Security Assessment Tool will perform a quick and free online checking of your PC." When these kind of alerts pop up while you are surfing in the internet, you are obviously visiting a hacked website and are the victim of a so-called scareware attack. In this case, don't do anything! The treacherous thing about this is that either way – by clicking „OK" or cancelling – you see a fake system test running on your computer which certainly finds spyware and malicious software. Of course, the required software to clean your computer is also provided. When you fall into this trap, you are downloading and installing malicious software on your PC.

Scareware is malicious software trying to encourage users via specific warnings to act imprudently, with the aim to install malware on their computers. Therefore, it is recommended to act sensibly. Already the first pop-up window is a tough one. The feigned dialogue is actually an image. No matter where you click, you will always start the virus scan. You can only properly close the "window" when you exit the web browser – preferably with the keys "Alt-F4" – or turn off your computer. But even if you start the "virus scan" by accident, it is generally not too late. Ignore all other action.

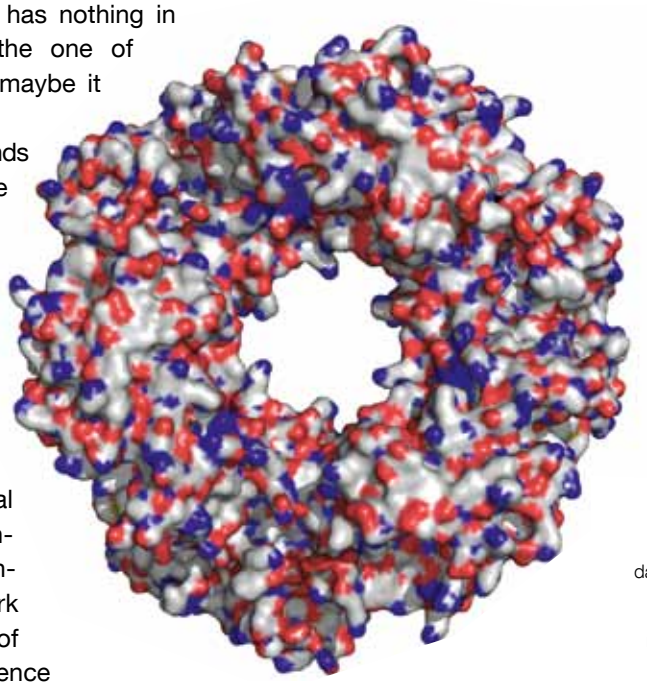
Indeed, you should definitely not ignore messages from the virus scanner installed on your computer. Here, too, a window will pop up, but it includes the name of the infected file, the detected malware and a report on what kind of action the virus scanner performed.

If you are not sure what to do, please contact the User Consulting Office (phone: 5005) or your administrator.

SDI at DESY!

Research to fend off immune attacks

What exactly is SDI? Older people will perhaps remember this acronym of the space-based anti-missile shield from the Cold War period. There is also SDI at DESY, but it has nothing in common with the one of past days – or maybe it does?
This new SDI stands for "Structure and Dynamics in Infection", a doctoral programme at the University of Hamburg and the University Hospital Hamburg-Eppendorf, funded within the framework of the State of Hamburg Excellence Initiative. The focus is placed on the training of young scientists at the interface of physics and life sciences. With the help of cutting-edge structural biology methods, the scientists want to make visible the attacks of pathogens against the human body and thus create a fundament for tailor-made medication – an anti-missile shield in fact, but against infection.



Beautiful, but dangerous: the lassa virus nucleoprotein

Viruses, bacteria and parasites use different strategies to creep into the body undetected to do mischief. Some throw around protein molecules to disturb the immune system, others directly dock to human cells and are incorporated.

The key for infection – and therefore also for new medication – is always the three-dimensional structure of the proteins involved. The crucial factor is that the proteins of the penetrating germs dock to the human proteins – fitting together like the key and the lock. By inhibiting this first contact, it is possible to make the germ harmless.

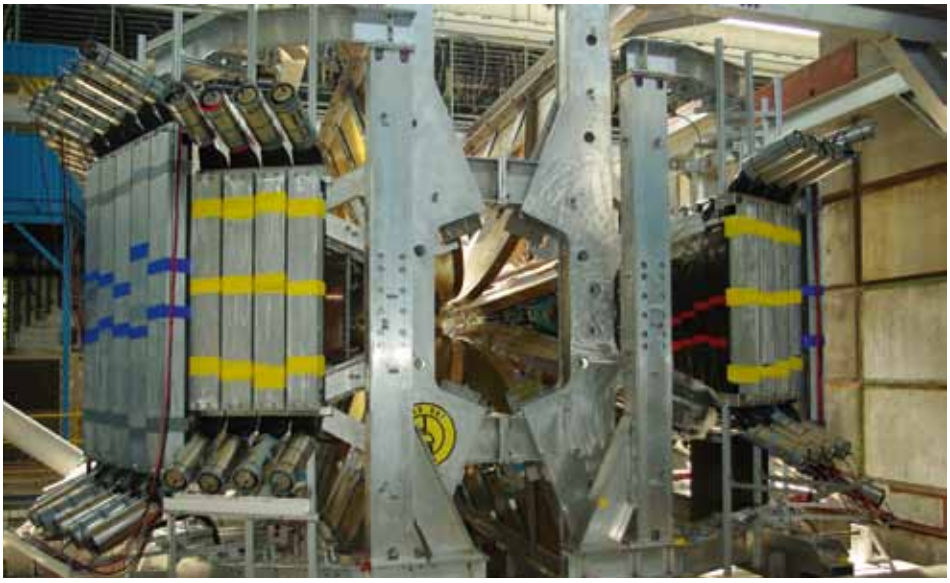
However, the first step is to decode the structure of the proteins concerned by using synchrotron radiation. For this purpose, the proteins involved in the infection are submitted to a complex process of separation, cleaning and crystallisation before being investigated with X-ray light. "We urgently need the light sources PETRA III, FLASH and European XFEL as super microscopes for these experiments," says SDI scientist Markus Perbandt. Indeed, the scientists are targeting notorious candidates, for instance the protozoan parasite *Plasmodium falciparum* that causes malaria, or the hospital-acquired *Staphylococcus aureus*, known as MRSA. Already today, vaccines and medication against these pathogens are of vital importance.

At a symposium organised by SDI that took place at DESY in July, with 120 participants and leading scientists from around the world, infection and structural biology moved one step forward towards closer cooperation. Perbandt, one of the organisers, is looking forward to the future experiments at DESY with their new possibilities: "With the start of PETRA III, the soon coming European XFEL and institutions like CSSB, structural biology is certainly uniquely positioned at DESY." *(tz)*

OLYMPUS in beam position

The experiment at DORIS passed the first final test with flying colours

The summer break was a very busy time at the OLYMPUS experiment: the collaboration and a team of DESY technicians and engineers used the DORIS shutdown days to bring the preassembled experiment into beam position for the first time and to carry out extensive tests. As of recently, OLYMPUS is under new management, with spokesman Michael Kohl (Hampton University) and deputy Alexander Winnebeck (MIT). As it is not unusual at final tests, unexpected difficulties had to be mastered. Despite the failure of the hall crane, it was possible to complete work at the given time: on 16 July, the OLYMPUS detector was brought into the final position in the DORIS ring, followed by the installation of the internal target and vacuum system. Punctually, on 5 August, the complete experiment was ready for operation. OLYMPUS will deliver precise information on the nature of lepton proton scattering and evidence on the proportion of electric and magnetic charge distribution in the proton. The first beam test at the DORIS accelerator started with a beam energy of 2 giga-electronvolts and, for the first time, the positrons collided with the new, extremely sensitive internal hydrogen target. “Our target passed the test with flying colours,” beamed project manager Uwe Schneekloth, “the temperature hardly increased during beam operation – and this under more difficult circumstances than formerly at HERA.” Meanwhile, DORIS started into synchrotron user operation. The first OLYMPUS measuring period is to take place beginning of 2012. Richard Milner from MIT is also participating, using his Humboldt Research Award for preparations and data taking at the OLYMPUS experiment. *(uw)*



The OLYMPUS detector, shortly before the installation at DORIS

Max Planck says goodbye

31 July was the official closing date: after more than 23 years of extremely successful research, the Max Planck working groups for structural molecular biology discontinued their work. Since 1988, the groups of Ada Yonath, Hans-Dieter Bartunik, and Eckhard and Eva Mandelkow have been investigating the structure of biomolecules with synchrotron radiation. Notable successes included the decoding of the ribosome structure awarded with the Nobel Prize, the decoding of the proteasome, the “waste disposal facility” of the cell, and Alzheimer disease research winning multiple awards. This kind of research will be carried on at the DZNE (Deutsches Zentrum für Neurologische Erkrankungen) in Bonn.

However, Max-Planck research will continue at DESY. The Society is strongly engaged at CFEL and will also be represented at the recently founded CSSB (Centre for Structural Systems Biology).

“With this photograph, we want to say goodbye to DESY,” says MPG administration manager Elke R. Spader, who worked here from the very beginning. “We always felt so much at home in the DESY community and we were perfectly supported – this makes us very grateful.” *(tz)*

Here's looking at you, kid. Compound eyes of an vagrant darter (Amax imperator)

Focus on DESY's wildlife

Jan Tolkiehn takes pictures of the DESY fauna

What would you do after a long DESY work day? This is no question for Jan Tolkiehn: getting home quickly is no option for the physics engineer. After work or at lunch break, the amateur photographer enthusiastic about biology grabs his Nikon and explores the DESY ground. He focuses on small and tiny creatures living on the campus. Since 18 months, he has taken pictures of all kinds of ants, butterflies and other insects – whatever gets in front of his camera – and he has found out remarkable things: "In the meantime, I have found at least 19 different kinds of dragonflies, even quite rare ones," says Tolkiehn, "and there is an enormous abundance of bee species at the FLASH wall."

He also has observed a variety of locusts, including the large marsh grasshopper and the very rare heath grasshopper which are both on the Red List of threatened species.

The hunt is followed by evaluation: Jan Tolkiehn sorts out and classifies his "prey", and he posts the best pictures on his website www.naturalis-historia.de. To identify the different species, he uses other fauna photographers' webpages and forums.

In the meantime, he has compiled ten thousands of photos. Jan Tolkiehn will present the best ones in a public lecture on 26 October in the auditorium at DESY in Hamburg: "Wildlife on the DESY campus" (in German). *(tz)*

INFO

www.naturalis-historia.de

HELMHOLTZ ASSOCIATION

Virtual summit conquest

Everyone is now able to crest Mount Everest, but only virtually. Experts headed by Frank Lehman from the DLR Institute of Robotics and Mechatronics have mapped Mount Everest in 3D, using optical satellite data at a resolution of 50 centimetres. These 3D images are the outcome of a collaborative venture between the DLR Institute of Robotics and Mechatronics and the firms "3D RealityMaps GmbH" and "DigitalGlobe". A video allows all interested people to follow the route taken by an expedition to the summit of Mount Everest: www.helmholtz.de/dlr-mount-everest-3d.

DigitalGlobe provided the Berlin-based DLR researchers with data from the two optical Earth observation satellites WorldView 1 and WorldView 2. This material was completed by images taken by Germany´s RapidEye satellite system. With software developed by their institute, the DLR scientists placed satellite images taken from different viewing angles on top of each other to calculate the altitude profile and produce a 3D model with software from RealityMaps.

www.helmholtz.de/hermann

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Materlik member of the Royal Society

In May, Gerhard Materlik was elected Fellow of the British Royal Society. In the last decades, Materlik significantly contributed to the development and extension of synchrotron radiation research. Before he became director of the British synchrotron Diamond, he was director of HASYLAB at DESY for many years.

Wilson Lattice Award

The first Ken Wilson Lattice Award, presented at the Lattice 2011 conference, was given to a work of the NIC group at DESY. It was presented to Xu Feng, Marcus Petschlies, Karl Jansen, and Dru B. Renner for their paper titled "Two-flavor QCD correction to lepton magnetic moments at leading-order in the electromagnetic coupling".