

From the home of the gods into the proton

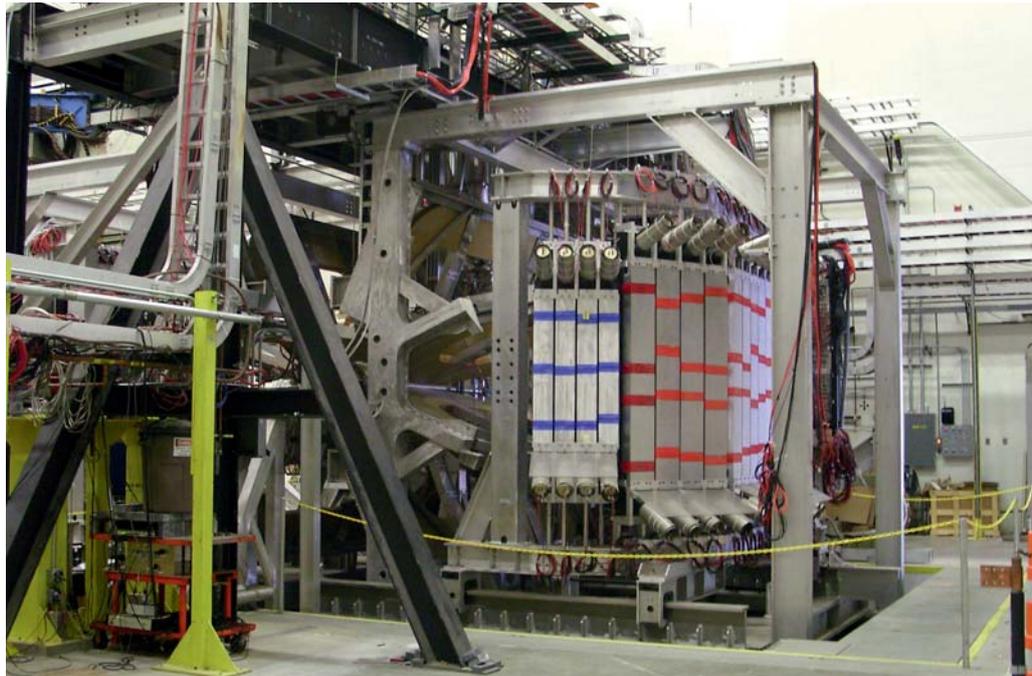
With OLYMPUS scientists try to solve the mystery of the proton

What does it look like inside the proton? This is a question that scientists at DESY have been concerned with for a long time. For 15 years, HERA offered the possibility to look inside the proton. Now, there is a new experiment – this time at DORIS – that took up this question: OLYMPUS.

OLYMPUS is a comparatively small experiment. The complete detector weighs only about 50 tons – a lightweight, compared to, for example, the 3600 tons of the HERA experiment ZEUS. “Apart from its size, this is due to the fact that the detector has no iron yoke,” Uwe Schneekloth, one of two technical coordinators of the experiment, explains. Moreover, the area surrounding the interaction point is not completely equipped with electronics, as this is the case in large detectors.

With the HERA experiments, for years, scientists measured inelastic electron-proton collisions, thus accurately determining the structure of the proton. With the help of the so-called elastic scattering – collisions without destroying the protons – OLYMPUS will provide additional information about the electrical and magnetical charge distribution in the proton.

By the middle of this year, the assembly of OLYMPUS will start at the site of the ARGUS detector, which until last year was used to show visitors the structure



The BLAST detector of MIT's accelerator BATES will be reassembled at DESY to a large extent and become OLYMPUS.

of a particle detector. However, prior to the assembly, the detector has to be shipped to Germany. OLYMPUS will not be completely new, but it mainly consists of the BLAST detector, operated from 2002 to 2005 at the BATES accelerator at MIT (Massachusetts Institute of Technology) in the United States.

But why is the experiment disassembled at MIT and reassembled at DESY? This is due to the extraordinary conditions offered by DESY accelerators, being almost the only facility worldwide where

the preaccelerators can be operated with both electrons and positrons. Moreover, it is possible to switch from one to the other kind of particle within ten minutes. “For our measurements, we need both electrons and positrons,” said Schneekloth. The particles are shot onto a hydrogen target inside the detector. At MIT, this experiment could only be carried out with electrons. However: “Only with both kinds of particles we can get evidence of so far undiscovered

CONTINUED ON PAGE 2

ATLAS future week at DESY

From 20 to 24 May, an ATLAS upgrade meeting will take place at DESY in Hamburg. The participants will talk about design, research and development for the replacement of the ATLAS inner detector, to be used to detect the smallest particles at the LHC in Geneva. Building a detector takes about five to ten years, and since the ATLAS inner

detector is to be replaced after about ten years, it is now necessary to get the planning underway. This is the first time that the upgrade week takes place outside CERN, and it is also the largest meeting ever held for ATLAS at DESY, with 250 expected participants.



DIRECTOR'S CORNER

Dear colleagues,

we have gotten serious about realising the European XFEL project. This fact can hardly be overlooked since the beginning of last year, when the extensive underground civil engineering work started.

Last summer the construction of the AMTF hall added another large building site to the DESY campus. The hall was built with impressive speed and is now nearly complete. Soon we will be able to equip the hall with utilities and install the test benches for the supercon-

ducting cavities and accelerator modules.

Here, and in many other work packages of the European XFEL accelerator complex, we closely collaborate with a total of 17 partner institutes of the international accelerator consortium. Currently the consultation with the partners and the synchronisation of all contributions require extensive activities in project coordination and in the participating DESY groups. Parallel to this, the timely realisation of DESY's own project contributions need to be organised.

Project work at many external institutes is also rapidly progressing. This includes building and expanding the local infrastructure, new production plants and test facilities, as well as the preparation and release of substantial procurement measures.

The signing of the foundation documents and the establishment of the European XFEL GmbH on an international basis on 30 November 2009 was an important signal for all project partners, giving new verve to the already running project. Full of verve and cheerful was also the big

party that followed in the afternoon. On this occasion, you were also able to see the director of the accelerator division in a completely different role...

I had a lot of fun!

Yours
Reinhard Brinkmann

higher-order contributions." Switching at regular intervals between both kinds of particles also leads to more precise investigations.

A number of small alterations are necessary to make possible the acceleration of both electrons and positrons, as well as quick switching between the two particles. In fact, since 1993 DORIS has been used to produce synchrotron radiation, accelerating positrons for this purpose. All the work for and with OLYMPUS, for example work at DORIS and experimental operation, will only take place when DORIS does not provide beams for synchrotron radiation users. Since the use of DORIS for OLYMPUS is also not possible during the operation of DORIS as a light source and the operation of PETRA III, OLYMPUS will only take data when neither accelerator is running for user operation.



The OLYMPUS detector will be assembled at the DORIS ring in summer. The measurements will start at the beginning of 2012.

The first series of measurements will start at the beginning of 2012; the second follows at the end of that year. "In these three months of measuring

time we can collect enough data to learn more about the inside of the proton," Schneekloth beams. (gh)

Change at the top

Danish nanophysicist Robert Feidenhans'l is new chair of European XFEL Council

by Ilka Flegel and Petra Folkerts

"It will be thrilling and exciting to participate in this European endeavour with its currently eleven partner countries at a leading level," said Robert Feidenhans'l, Professor at the University of Copenhagen, about his new function. "But it is also a challenge with respect to research policy to bring Europe to the forefront of the scientific field that these new X-ray laser light sources open up." Robert Feidenhans'l succeeds Helmut Dosch, who led the committee for the transitional first five months after the foundation of the European XFEL GmbH, during which DESY was initially the only shareholder. Meanwhile, shareholders from five other countries have joined the company and sent delegates to the Council, which now enabled it to elect its chairperson. At its last meeting the Council also approved the budget of the European XFEL GmbH for the current year.



The non-profit limited liability company (GmbH), which cooperates closely with DESY, is responsible for the construction and operation of the new European XFEL X-ray laser. Its supreme organ is the Council, which functions as the shareholders' assembly. The governments of the partner countries appoint the shareholders (research institutes, as a rule) which join the company and whose representatives form the Council. Alongside DESY (Germany) shareholders from Denmark, Russia, Slovakia, Sweden and Switzerland have so far joined the company. Other partners will follow soon.



Two hundred astroparticlephysicists from all over Germany came to DESY in Zeuthen to attend the conference. The agenda included both current research and future projects.

Astroparticle physics in Germany Status and perspectives

by Rolf Nahnauer

On 25 and 26 February 2010, 200 participants attended the sixth meeting of German astroparticle physicists at DESY in Zeuthen. A little more than ten years ago, the first meeting of this series took place in Zeuthen as well. Since then, an ever-increasing and well-networked astroparticle community has formed in Germany.

Together with the United States and France, Germany holds a top-level position in astroparticle physics. German scientists are leading in the currently largest international astroparticle projects: the IceCube detector at the South Pole, the Pierre Auger Observatory for cosmic rays in Argentina, and the gamma-ray telescopes H.E.S.S. in Namibia and MAGIC on the Canary Islands. Among the coming generations of experiments is the Cherenkov Telescope Array CTA, a follow-on project of H.E.S.S. and MAGIC that is ten times more sensitive, with DESY in a leading role. The new generation will reach costs of more than

100 million Euros – a dimension that requires national and international cooperation and prioritisation.

The Zeuthen meeting provided an impressive overview of activities in Germany and marked the beginning of a strategy debate which in a few months will lead to a German roadmap. This roadmap is to be developed under the coordination of the recently formed Committee for Astroparticle Physics in Germany. Christian Spiering (DESY) was elected chairman, becoming the successor of Johannes Blümer from KIT, Karlsruhe. The roadmap will include the fields of dark matter, neutrino masses, neutrino astrophysics at low energies, high-energy astrophysics with the sectors cosmic ray detectors, gamma-ray telescopes and neutrino telescopes, and finally gravitational-wave astronomy.

New start for FLASH

After the upgrade that lasted from 21 September 2009 to 12 February 2010, FLASH is now running again. One of the purposes for the upgrade was the energy increase of the electron beam from 1 GeV to 1.2 GeV, which needed an additional accelerator module. Additionally a new accelerator module built at Fermilab and operating at the triple frequency was inserted. This will improve the electron beam properties.

WHAT'S ON AT DESY

April

- 7** Public Lecture
Grundlagenforschung zur Alzheimerkrankheit:
Von der Proteinstruktur zum Pathomechanismus
Eckhard Mandelkow, DESY, Hamburg, auditorium, 19 h
- 14** Science Café DESY (<http://sciencecafe.desy.de>)
Die Welt besser verstehen – Forschung mit Licht
Julia Herzen, DESY Bistro, 17 h
- 28** Science Café DESY (<http://sciencecafe.desy.de>)
Freie-Elektronen-Laser – Biomachines bei der Arbeit zusehen
Rolf Treusch, DESY Bistro, 17 h
- 29** 69th Physics Research Committee Meeting
DESY, Hamburg, auditorium, 9 h

May

- 5** Science Café DESY (<http://sciencecafe.desy.de>)
Denken? Das macht jetzt mein Computer – Ein Ausflug
in die künstliche Intelligenz
Katja Kroschewski, DESY Bistro, 17 h
- 7** Choir Concert
Spring Concert of the DESY Choir
DESY, Hamburg, canteen annex, 20 h
- 17** Public Lecture
So werden wir Weltmeister - Die Physik des Fußballspiels
Metin Tolan, DESY, Hamburg, auditorium, 19 h
- 18** Physics Seminar (<http://physikseminar.desy.de>)
SLAC Linac Coherent Light Source
Jerome Hastings, DESY, Hamburg, auditorium, 17 h
- 19** DESY anniversary (<http://desy50.desy.de>)
Official ceremony to conclude the 50th anniversary year
DESY, Hamburg
- 26** Science Café DESY (<http://sciencecafe.desy.de>)
Faszination Kreisel – Vom Spielplatz bis ins Weltall
Ralf Röhlsberger, DESY Bistro, 17 h
- 26** Public Lecture
Neutrinos – Geheimschrift des Kosmos
Christian Spiering, DESY, Zeuthen, SR 3, 19 h

Discover the possibilities

DESY coordinates preparations for the foundation of the European consortium EuroFEL

Free-electron lasers – for example FLASH at DESY – make scientists' hearts beat faster. These new light sources offer unprecedented possibilities. At the same time, construction and operation of these so-called FEL's and its associated research are an extreme challenge for scientists and engineers. Research centres as for example DESY have lots of experience and solutions, especially in this field: the improved networking and cooperation of FEL research centres in Europe is more efficient than the sum of single activities.

This is exactly what the ESFRI Roadmap project EuroFEL aims at: a future Europe-wide coordination of national FEL activities in the fields of research, training, technology and innovation, and the external representation with one voice. With the foundation of a European research consortium, these activities will merge into a kind of "virtual" research centre. Within the framework of an EU project, DESY is coordinating the



Scientists from all over Europe met at Döllnsee to promote the EuroFEL project.

preparatory phase. EuroFEL is intended as a platform for FEL users and FEL facility experts, giving them the possibility to actively share information. Further technical development is to be synchronised and training possibilities at the research centres for scientists, engineers and technicians should be better coordinated and be available to all partners. There are many possibilities in this respect.

At the second annual meeting in Döllnsee, from 2 to 4 March, directors of the participating research centres, DESY, Elettra, HZB, INFN, MAX-lab, PSI and STFC emphasised the developed goals and core activities of the future FEL consortium. They all agreed that the new ERIC (European Research Infrastructure Consortium) of the EU is to be established as a legal form. (cm)

Shorter, faster, stronger laser pulses

DESY and Helmholtz Institute Jena heading for laser record

When Franz Tavella came to DESY two years ago, he already knew that the future laser systems for DESY's light sources – like FLASH – would be record-breaking. Future FEL experiments will need optical lasers with so far unprecedented power. Tavella and his team built such a world record laser last autumn. "It is a laser amplifier with the highest mean power ever reached with a pulse length smaller than 10 femtoseconds," said Tavella.

This development originated from a Helmholtz cooperation: the Helmholtz Institute Jena (HIJ), founded in summer 2009, contributed important components for the laser system. The HIJ is the first Helmholtz institute of Thuringia. It mainly combines the competence of the University of Jena in the field of high-power laser physics with the competence of DESY and the GSI in Darmstadt in the

field of accelerator physics. The scientists hope to find new approaches and solutions in the future for the development of the structure of matter research. The laser record is one of the first success stories in this recent cooperation.

"For our ultra-short pulse laser amplifier we needed a pump laser with a very high mean power and a relatively short pulse duration in the lower picosecond range," said Tavella. This kind of laser had at that time been "freshly" developed by the Jena scientists. Already in September last year, the scientists from Hamburg brought their equipment to Jena and built the novel laser system within a month. Until December it was optimised, reaching pulses of seven to eight femtoseconds with the pulse energy of more than 50 Microjoules and a repetition rate of up to 100 kHz.

"The laser amplifier is based on the principle of optical parametrical broadband pulse amplification, with a number of advantages compared to average amplifiers, like broadband amplification and a low thermal load," Tavella explained. A laser with such unique pulse characteristics is very attractive for the so-called pump probe experiments, for example for FLASH. In the future, this laser will be further developed for higher pulse energies and is to be used for the production of seeding pulses of a light source like FLASH. (jde)

Official ceremony on 19 May tops the anniversary year

50 Years of DESY – Insight starts here with us and the Chancellor

For more than 50 years, scientists at DESY have been investigating the structure and function of matter – research, education and innovation have always worked hand in hand in the research centre's history. On Wednesday, 19 May, the end of the anniversary year will be topped with an official ceremony. Invited are all DESY staff members and particularly ex-staff members – all of them have made DESY what it is today. Guest of honour: Chancellor Angela Merkel.

As a nationally and internationally renowned research centre, we are also inviting prominent guests: personalities from the world of politics and business, and directors and scientists from prestigious research centres and universities from all over the world that are collaborating with DESY. CERN, ESRF, Fermilab, SLAC, KEK, ETH Zurich and Oxford University have already accepted the invitation. Altogether, about 2500 guests are expected.

Chancellor Dr. Angela Merkel will give the official speech and the Senator for Science and Research of the Free and Hanseatic City of Hamburg, Dr. Herlind Gundelach, will give the welcome address. The official ceremony begins at 12:45 h. Starting from 15 h, DESY staff and guests may join guided tours to special

DESY sites, for example the European XFEL construction site, the FLASH and PETRA III experimental halls, or the detector lab in HERA hall west. At 17 h, everybody is invited to a gala reception with entertainment programme. (cm)



Detector experts plan the future

Workshop at DESY brings specialists together

Sometimes detector projects that are still at a planning stage can advise detector projects that are already taking data what hardware to use. This happened at a meeting that brought experts from all areas that use a new type of sensor called Silicon Photo Multiplier, or SiPM, together at DESY for two days in February.

The CALICE hadronic calorimeter (HCal) for a detector at the ILC has been using SiPMs for years. The final HCal will feature some eight million of these ultra-fast and ultra-precise photo detectors and an unprecedented resolution where each particle is reconstructed individually. The team around CALICE spokesman Felix Sefkow from DESY are thus regarded as experts in their use. The meeting at DESY took stock of the different sensors built by different companies, participants compared characteristics and exchanged experiences.



The experts for this kind of detector work at DESY.

“These sensors are a hot topic in physics,” says Kerstin Borrás, leader of DESY's CMS group and the initiator of the meeting. “We had more than twice as many registrations as expected: 45 people from 20 institutes in eight countries.” Her own experiment, the CMS detector at the LHC, is planning to use SiPMs for future upgrades in two of its subdetectors. Silicon PMs also have medical uses in PET scanners.

The participants left with a complete grid of sensor characteristics including size, amplification, dynamic range, recovery time, radiation hardness or resistance to magnetic fields. They now have a better idea which sensor to use for their purposes. Last point on the agenda: sight-seeing of the first large array of working SiPMs – the CALICE HCal prototype, currently resting from test beam activity at DESY. Because it is a hot current topic, the meeting was sponsored by the Landesexzellenzcluster “Connecting Particles with the Cosmos” in Hamburg. The meeting almost coincided with the third annual meeting of the Helmholtz-Russia Joint Research Group. DESY collaborates with the institutes MEPHI, ITEP and MSU. Topics in this research group are of course the SiPMs, calorimetry and physics at the LHC and the ILC. (baw)

Start of Energy Helmholtz podcast series

With the topic “fusion research“ the Helmholtz Association starts its podcast series to mark the “Year of Energy”. The March podcast of the Helmholtz Association takes a look into the future and explains which role nuclear fusion is playing regarding energy supply for future generations. The next podcast in April will deal with “power plants of the future”

„In the Year of Energy, themes from energy research gain centre stage in our monthly podcasts. The listener finds a fascinating mixture of topics: renewable energies, nuclear safety research, chances of solar thermal energy, and the prospects of nuclear fusion – all these examples of issues we will take up,“ explains Thomas Gazlig, Head of Communications and Media Relations of the Helmholtz Association. His advice is not to miss any of the podcasts, because “if you listen to the whole series, you will have a perfect overview on current energy research in Germany”.

At the moment there are only two podcasts available in English.

www.helmholtz.de/hermann



Kestrels have again moved into this nesting box.

Kestrels move in

A kestrel couple feels at home in the nesting box

by *Andreas Hoppe*

A kestrel couple is breeding on the DESY campus. Where? In a nesting box hanging at the side of building 2a; the couple has been making use of it for years. Even this year, the birds find their customary home convenient to breed - in spite of the large European XFEL construction site. Pictures from a camera show the kestrel hen already building a nest.

A new nesting box was installed this year, equipped with an infrared camera to watch and document the offspring's breeding and rearing process. Even at night it is possible to observe what happens in the birds' home. You can find the link on the “News” website.

For kestrels, egg laying season starts in the first half of April; the breeding period lasts about 30 days.



Kestrel cam

INFO

You can see the kestrels live at:
www.desy.de →News →DESY News
→Kestrels

Imprint

Publisher

DESY-PR
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DESY is on the run again

19 June is the starting shot date for the HSH Nordbank run, the ninth charity run across Harbour City. Last year, 27 DESY staff members plus family joined this event for the first time. This year, DESY will participate again. The donations will be transferred to the children's help society, run by the “Hamburger Abendblatt”. Whoever

wants to tackle the four kilometres across Hamburg's new neighbourhood should call Daniela Hildebrand (4604) for registration until 25 May. The entry fee is 20 Euros per person. More information: www.hsh-nordbank-run.de