

The “Weltmaschine” does physics

First 7-TeV collisions at the LHC

“This is the culmination of years of work of many scientists and at the same time the start into a completely new era of particle physics,” research director Joachim Mnich beamed. Just a few minutes before on 30 March, the LHC started its physics programme with the first 7-TeV particle collisions after years of planning and construction.

The accelerator physicists at CERN made an exciting event out of it. They had invited the world press to an early start on 30 March; the attempts to collide beams were broadcast live via the internet. Media representatives witnessed the particle physics event of the year at many research facilities in Germany. Journalists at both DESY locations were also eagerly waiting for the first collisions in the remote control rooms of the LHC experiments. However, twice during the morning the circulating particle beams were lost in the LHC. A warning system and a preaccelerator had disturbed the LHC system. The trips were cleared within a short time, but the superconducting magnets had to first be prepared for the next injection.

Shortly before noon four proton bunches were shot into the ring, expected to mark first physics at the LHC. When they were travelling stably in the accelerator, they were simultaneously brought to collision at all four experiments. At 13:02 h, loud applause



Beaming particle physicists in the CMS control room: the LHC has just produced its first 7-TeV collision.

and cheers came from the DESY CMS remote control room: a new team had just started their shift when they saw the first particle collisions in the CMS detector. At 13:06 h, all experiments had seen 7-TeV collisions; CMS recorded about 300 collisions per second.

“It’s a great day to be a particle physicist,” said CERN Director General Rolf Heuer at a press conference and congratulated his international team via videoconference from Japan – the date of a meeting with the Japanese science

minister had been fixed a long time before the day of first physics at the LHC, which the scientists were only able to predict with some certainty one week in advance.

By now the injection of particles into the LHC has become routine. The accelerator physicists are currently trying to achieve better collision rates by improving the focussing of the particles in the experiments, and to increase step

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New head of CFEL group

R. J. Dwayne Miller becomes head of a Max Planck research group of the Centre for Free Electron Laser Science. The renowned expert in the field of ultra-short-time spectroscopy with photons and electrons and currently professor at the University of Toronto will assume office at CFEL on 1 July.

CTA Consortium meets in Zeuthen

More than 170 scientists are expected to attend the CTA Consortium Meeting at DESY in Zeuthen on 10 to 12 May. For three days they will concretise and optimise the planning for the Cherenkov Telescope Array. The large array of gamma ray telescopes will be used to study sources of high-energy gamma radiation.



DIRECTOR'S CORNER

Dear colleagues,

the successful start of the LHC physics programme end of March was an outstanding event for particle physics worldwide, and of course also for DESY. After decades of planning and building the accelerator and experiments, data taking with proton-proton collisions at 7 TeV finally started – the highest centre-of-mass energy ever reached in an accelerator. In the past years, many DESY colleagues have also contributed to this success that gained recognition all over the world.

In the DESY CMS centre, we cheered for the first collisions, with the press watching here, at CERN and many other centres around the world.

The spirit of optimism was already noticeable two weeks earlier at this year's German Physical Society (DPG) conference in Bonn where – with numerous valuable contributions – DESY was well presented as the particle physics centre for Germany.

The scientific harvest of the LHC will last many years and all of us are looking forward

to ground-breaking discoveries that will broaden our view of the microcosm. DESY will take part in this, together with our international partners and especially in close collaboration with our German partners of the Helmholtz Alliance "Physics at the Terascale".

DESY is not only occupying a prominent position in the analysis of these unique data but is already now developing plans to contribute in the further upgrade of the detectors, thus strengthening DESY's role in international particle physics.

Another important factor for the future is the renovation of building 1 which makes good progress. The first groups have already moved into the refurbished building wing 1e.

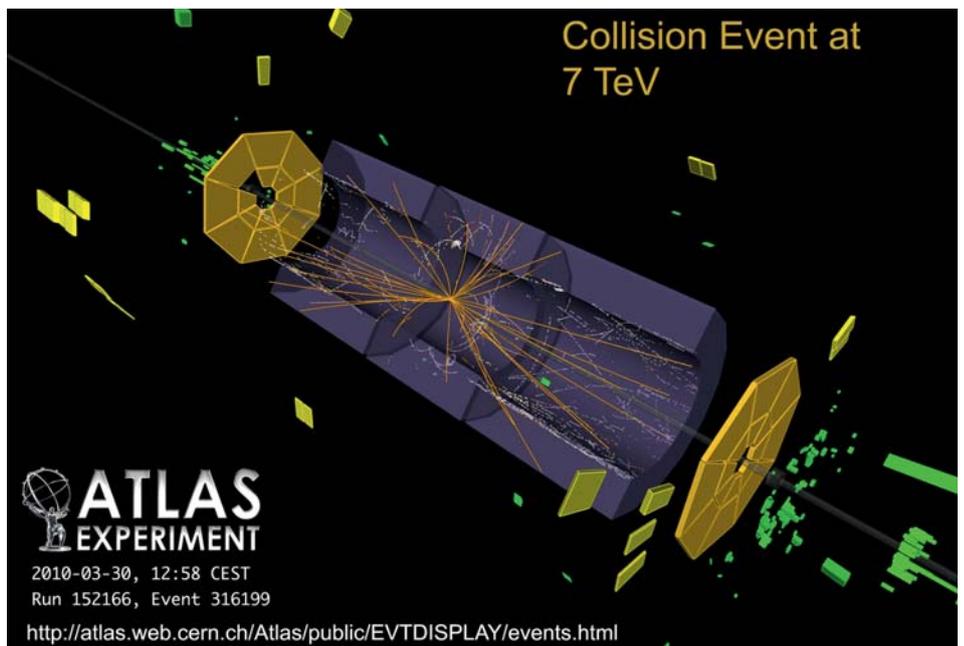
The renovation will be completed in about two years and provide new and modern offices to many colleagues.

Yours,
Joachim Mnich

by step the intensity of the proton beams in the LHC.

A kind of routine also returned to the CMS centre at DESY. The daily data quality monitoring shifts can be managed by one person. However, a lot happens behind the scenes: the 7-TeV data are immediately reconstructed and analysed. "According to our plan there will be presentations of the first results at the 'Physics at the LHC' conference at DESY in June," said Kerstin Borrás, head of the DESY CMS group. "Now everybody is doing analysis work at full speed."

For about two years, the LHC will collide particles and increase the beam intensity more and more to provide the detectors with enough data for exciting analyses. Afterwards, it will be prepared for operation at the designed energy of 14 TeV, i.e. 7 TeV per beam. (tz)



All LHC experiments (here an event from ATLAS) saw collisions at 7 TeV on 30 March.

INFO

CERN homepage:
www.cern.ch



The ALPS experiment at DESY.

As you can see, there is nothing to see!

ALPS extends the exclusion limits for hidden light particles

ALPS came, saw nothing and conquered anyway. The “light through the wall” experiment, looking for very light particles in so far unenlightened realms of our world (see DESY inForm 07/2009) has now published its results. So did they find axions or similar light particles? Unfortunately not. “But we have the most sensitive experiment in this field and we were able to considerably extend the exclusion limits for such particles,” explains ALPS spokesman Axel Lindner. He is particularly pleased that after a development period of two years the experiment was able to make measurements with much higher precision than expected. The group, made up of scientists from DESY, the Albert Einstein Institute and the Laser Zentrum in Hanover, and the Hamburger Sternwarte, wanted to find photons that transform into hidden light particles in the magnetic field of a superconducting HERA magnet. For this purpose, they sent green laser light back and forth in a

so-called optical cavity in the front part of the magnet. Had any hidden particles emerged they would have traversed the wall in the middle of the magnet and would have transformed back into light in the second half of the magnet. However, there was only darkness during the complete 36 hours of data taking.

Nevertheless, Lindner remains confident and plans the continuation of ALPS. “There are many hints for axion-like particles in many sectors of physics,” he explains. “We only have to measure with more precision.” According to theorists’ calculations, it is necessary to look about 10 000 times more precisely to detect these particles. In order to do that the complete experiment has to be refurbished and equipped with a stronger laser, more magnets and a more sensitive detector.

The follow-up experiment ALPS II will be equipped with an infrared laser beam

instead of a green one, with at least 150 times more power, and with the advantage that the optical cavity will be built with custom-tested components. A second cavity in the rear part will enhance the probability of a conversion of the hidden particles back to light. Two LHC dipoles or four HERA proton magnets, for example, could be used as magnets for ALPS II. In comparison to the single magnets currently in use, there is the advantage of building part of the cavities’ mirror system between the magnets, which makes them better accessible and adjustable.

For measuring the light at the end of the magnet a superconducting detector could be installed which would also improve the measuring sensitivity by a factor of 100. A possible site is also available for the installation of the experiment: the XFEL mock-up tunnel, which will be become available in 2013 at the latest.

In about one year, the ALPS collaboration will have completed the Technical Design Report for ALPS II. And when Lindner is talking of “his” experiment, you won’t doubt for a second that this is going to happen. (tz)

ALPS and the light particles

The “light-through-the-wall” experiment is seeking for very light or low-energy particles ($<1\text{eV}$). According to string-theory-inspired extension of the Standard Model, a large variety of these particles may exist. These WISPs (weakly interacting sub-eV particles) only have an extremely low interaction with normal matter. They are not visible in high

energy collisions as in the LHC, but they might emerge from light and be detected in highly sensitive experiments as ALPS.

These particles might help to explain various physics effects, for example, dark matter might consist of these particles.

INFO

<http://alps.desy.de>



European XFEL boring machine

The first tunnel boring machine for the European XFEL tunnel at the manufacturer's. It will be assembled in Schenefeld as of mid-May. The machine with its diameter of 6.17 metres will bore the first two branching tunnels and the 2.1-kilometre-long linac tunnel. Before it starts digging, however, tunnel and tunnel boring machine will be christened in a ceremony on 30 June to which all DESY colleagues will be invited. (Photo: European XFEL)

WHAT'S ON AT DESY

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
Official ceremony to conclude the 50th anniversary year
DESY, Hamburg, AMTF hall
- 26** Science Café DESY (<http://sciencecafe.desy.de>)
Faszination Kreisel – Vom Spielplatz bis ins Weltall
Ralf Röhlberger, DESY Bistro, 17 h
- 26** Public Lecture
Neutrinos – Geheimschrift des Kosmos
Christian Spiering, DESY, Zeuthen, SR 3, 19 h

June

- 5** Lange Nacht der Wissenschaften in Berlin
www.langenachtderwissenschaften.de
- 7-12** LHC Conference (<http://plhc2010.desy.de>)
Physics at the LHC 2010
DESY, Hamburg
- 9** Science Café DESY (<http://sciencecafe.desy.de>)
Am Anfang war ... – Wie ist eigentlich unser Universum entstanden?
Isabell Melzer-Pellmann, DESY Bistro, 17 h
- 23** Science Café DESY (<http://sciencecafe.desy.de>)
Kunst trifft Wissenschaft
Axel Lindner, DESY Bistro, 17 h
- 29** Betriebsversammlung
DESY, Hamburg, Hörsaal, 9:30 h
- 30** European XFEL (www.xfel.eu/tunnelfest)
First tunnel and borer christening ceremony
Schenefeld, construction site, 11 h

Solar energy for Science

A linked science and energy supply agreement for a sustainable DESY

by Stephan Haid

Global developments like climate change, population growth as well as the worldwide quest for increased wealth and the associated requirements in rising energy and water needs pose unprecedented challenges to humanity. DESY, as a research centre with international presence and an operator of research facilities with high power consumption cannot and will not evade the climate debate, and therefore pursues the vision of a climate neutral research centre by 2020.

In connection with a visit of DESERTEC initiator and former DESY colleague Gerhard Knies last year, the idea was born to import solar thermal power directly or indirectly from the desert regions of the Middle East and North Africa, as part of a sustainable energy supply concept, and simultaneously make contributions with scientific collaboration for a sustainable development and growth in this region.

On 19 February, the DESY directorate and representatives of the Helmholtz Association, of the international office of the German research ministry, of the



Workshop participants in February.

Hamburg authorities, of DESERTEC and experts of the climate policy and development collaboration discussed the idea of a linked science and energy supply agreement.

Cooperation on a scientific basis can basically create a stimulus and trust to reduce political and regulatory barriers and to raise funds to realise to a certain extent the power supply from the deserts of the Middle East or North Africa. At the same time, value is added with the development work in this region, thus contributing to stability, wealth and peace.

The presented draft quickly met with wide approval of the experts. For the realisation of the vision of a climate-neutral research centre, the Helmholtz Association will now be more involved in the draft development and contacts will be established with potential project partners in the Middle East and North Africa.

INFO

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Röntgen Medal for Helmut Dosch

The Chairman of the DESY Board of Directors has been awarded the Röntgen Medal 2010. During a ceremony with about 150 participants, he received the medal from the city of Remscheid and he signed the Golden Book of the city.

The native town of Wilhelm Conrad Röntgen presents the Röntgen Medal every year to individuals who have rendered outstanding services to promote and disseminate in science and in practice the discoveries made by Röntgen. Award winner Helmut Dosch is thus getting in line with top-class scientists. Former laureates for example were Arthur Holly Compton, William Laurence Bragg and Rolf Wideröe. (tz)



Award winner Helmut Dosch with Beate Wilding, Mayor of the city of Remscheid and Ulrich Mödder, Chairman of the Society of Friends and Supporters of the German Röntgen Museum. (Photo: Deutsches Röntgen-Museum)

Masterclasses expand to “particle world”

Pupils on the trail of the Big Bang

Like every year, DESY took part in the well established International Masterclasses. On 23 and 24 February, DESY in Zeuthen and the Humboldt University in Berlin Adlershof jointly organised one day for 15 teachers and one for 65 pupils. At these events, the participants had the opportunity to experience the fascinating world of elementary particles. Lectures, data analysis and a subsequent video conference to discuss the results gave them an idea of the everyday work of a particle physicist.

This year, the Masterclasses as well as experiments with cosmic radiation will take to the road, thus reaching a considerably larger group of people. Under the nationwide particle world network initiative, about 200 project days per year are planned in different venues. From Hamburg to Munich and Aachen to Berlin, doctoral students doing research in the field of particle physics will become mobile experts of the network, travelling to schools, museums and other educational institutions to carry out Masterclasses and cosmic projects. DESY and the Hum-



Participants of the Masterclasses at Humboldt University

boldt University will kick off local Masterclasses with about 90 pupils at a Berlin school.

The particle world network is based on the collaboration of numerous institutions: twenty German research institutes and CERN are participating. The network is supported by the Federal Ministry of Education and Research and

stands under the patronage and partnership of the German Physical Society. The project management is done by the TU Dresden. Within the framework of this nationwide network, more than 6000 young people per year could get the opportunity to travel to the Big Bang and to participate in the latest research results from the LHC experiments. (ub)

50 years of DESY – we have vision

Research, education and innovation in the future

For 50 years, DESY has been and still is one of the leading research centres worldwide in the field of accelerators, photon science and particle physics.

DESY has had great influence in many domains and will continue to play this role in the future. However, what does this mean for the development of the national and international research landscape in the coming 20 years? Will Hamburg be the capital of a federal state of Northern Germany? Will Helmholtz be the umbrella organisation for all major European research institutions? Will a world-leading “airline cluster Hamburg”, with the collaboration of DESY, GKSS, the Hamburg universities, acting in concert with Airbus, revolutionise aeronautics? Will there be solar



thermal plants for the production of energy in the desert? These are the topics of a round of talks on 19 May, moderated by TV host Gert Scobel from 3sat. Guests are Helmut Dosch (DESY), Jürgen Mlynek (Helmholtz), Massimo Altarelli (European XFEL), Dieter Lenzen

(University of Hamburg) and a representative from Airbus. The task is clear: create visions of the future 20 years.

We are curious! (cm)

INFO

Safety measures on 19 May

Special safety measures are necessary for the official ceremony on 19 May from 12 h.

Everybody who wants to attend the ceremony must undergo a short check – don't forget to bring your ID card. This check is also carried out on 19 May from 10 – 12 h in the foyer of building 1.

Satellites measure the ash cloud

After the Icelandic volcano Eyjafjalla ejected large quantities of ash and sulphur dioxide into the atmosphere, scientists from the German Aerospace Center (DLR) are evaluating the latest images of several environmental satellites to investigate the effects of the eruptions on the atmosphere.

Gases and ash particles are frequently catapulted 15 kilometres into the atmosphere or higher. They are then transported by large-scale air currents, often over many thousands of kilometres. The ash particles do not only affect the safety of air traffic, they can also change the amount of solar radiation that reaches the ground. Particularly fine soot particles could remain in the atmosphere for months and affect the temperature distribution or serve as condensation nuclei for cloud formation. The discharged ash clouds may also affect the higher air layers in the atmosphere, up to altitudes of about 100 kilometres.

www.helmholtz.de/hermann



First to arrive: the removal boxes.

A detector in every office

The first occupants return to building 1

Ever wanted to play particle detector? Stand outside in front of the north sector of building 1 in the evening (don't get confused: there is a new storey on top of building 1e) and spot your very own "people event". When all doors are open and someone walks through the inner corridor, all lights go on one by one, like a particle track in a detector. Appropriately enough, the scientists working on future tracking detectors are the first new occupants of building 1e and its new offices with movement-sensitive lighting. This means, of course, that these offices also do not allow long thinking breaks because the light will simply switch off...

There is still some scaffolding in front of the windows and building work is going on in the staircase, some doors, keys and ceiling tiles are still missing, but in

general, the FLA, FLC, Hermes and MEA groups are happy with their new offices. Apart from the movement-sensitive lighting, they have new floors, new windows and thermal insulation, newly painted walls, new ceilings and completely refurbished built-in cabinets in every office. Groups that collaborate closely are now also in close office proximity. Another topic of conversation in the renovated corridors: the building and room numbering. The completed wing is now building 1e and the corresponding storey is hidden in the room number.

The next sector to be refurbished will be 1d with corridor 1c, including the basement – some of the passageways and corridors will therefore be closed for the coming half-year. (baw)

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Spring concert

On 7 May the DESY Choir will once again entertain with a spring concert. Seasonable a capella pieces will welcome springtime. The concert, sponsored by the Association of Friends and Sponsors of DESY, is free of charge and starts at 20 h in the canteen annex. And gummy bears are available for everyone.

Kick-it - second tournament

Coinciding with the Football World Cup 2010, another DESY table football game will take place this year. Sixty-four double teams compete in three rounds. The finals are scheduled for 27 May at 15 h in the FEL seminar room. More information: www.desy.de/~kicker.