

Particle Physics at the Bottom End of the Energy Scale

The ALPS experiment on the brink of a new research field

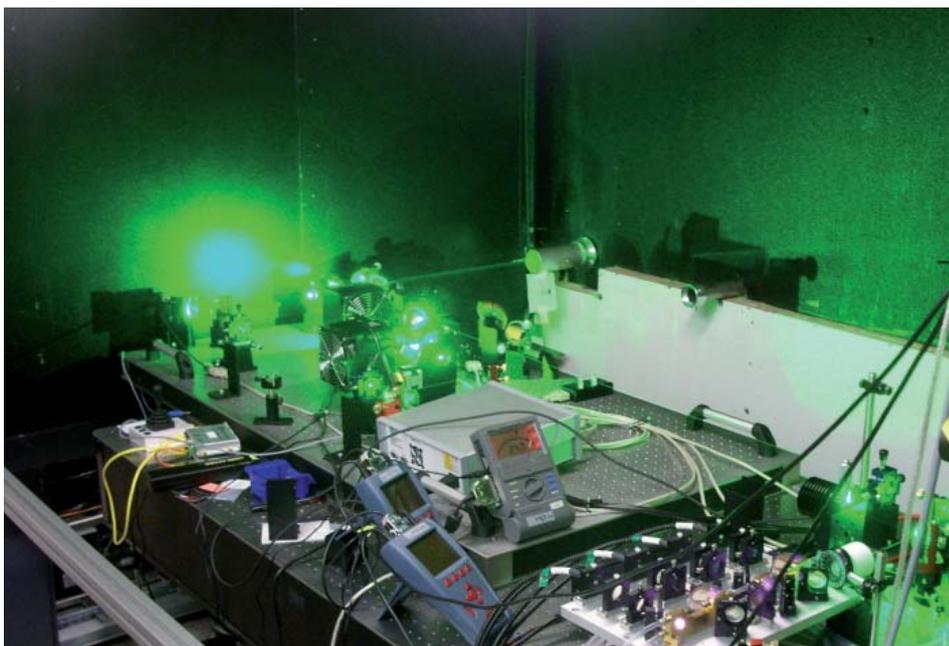
“What we know is a drop. What we don’t know is an ocean,” Issac Newton once said. The kind of particle physics which, like the ALPS (Axion-like Particle Search) experiment at DESY, does research at the bottom end of the energy scale may be standing at the edge of this ocean. Scientists assume that new particles are hidden in the low-energy range in a so far unexplored parameter space. Called “weakly interacting sub-eV particles” (WISPs), theorists describe them as very light particles that interact very weakly with matter.

When the PVLAS-Collaboration in Italy published the indirect evidence of an Axion-like Particle, that belongs to the WISPs, about two years ago, they received a lot of international attention.

A short time later, DESY scientists used existing infrastructures on site to set up the ALPS experiment for testing this evidence. (DESY inForm, issue 02/2007, s. web archive) In September 2007 they made the first measurements to find the hypothetical particles.

In the meantime, the Italian publication had a stimulating effect also among theorists. According to the most recent publications, it looked like there could be a great variety of light particles beyond the Standard Model in the low-energy mass range (below 1 eV). The motivation to search for WISPs thus increased.

Even when the PVLAS group announced at a workshop that they had not been able to reproduce their results, the international community recovered surpris-



ALPS: Precisely aligned mirrors direct the green laser beam to the measuring pipe (centre). Thermal fluctuation tends to deteriorate the optics, thus the scientists keep an eye on the laser power measuring device with a webcam.

ingly soon from this setback. The new frontiers promised by the theorists were explored again with a somewhat modified experimental setup.

At ALPS a new laser with the power of 15 Watts – equal to about 15,000 laser pointers – now sends its beam of light through the strong magnet field of a HERA dipole magnet. With the help of this laser, the sensitivity was increased to detect WISPs in a mass range of less than one milli-electronvolt.

The Laser Zentrum Hannover will provide a more powerful equipment in spring and ALPS will be able to set the world limits for the measurement

of the WISP featherweights. Theorists and physicists are expecting results in summer. Already in June the next international Axion-WIMP workshop will take place at DESY, possibly with more evidence for the exploration of the new frontiers in science. (she)

INFO

Website: <http://alps.desy.de>
Seminars on „Physics at the low-energy frontier“ will be held in the first term of 2008.

Contact: axel.lindner@desy.de
andreas.ringwald@desy.de

First Accelerator School

The Helmholtz Alliance “Physics at the Terascale” will host the first accelerator school at DESY from 10 to 14 March. Students in the sixth semester or higher will be able to gain insights into current particle physics and accelerator technology. Introductory lectures will be complemented by practical exercises. www.terascale.de/tas2008

New Materials in New Light

At the “7th Research Course on New X-Ray Sciences” from 5 to 7 March, 65 young researchers will learn about methods of materials’ testing with new light sources. In the FLASH experimental hall, 14 scientists will report on FELs and synchrotron radiation in the X-ray range. More information: www.desy.de/new-xray-sciences



DIRECTOR'S CORNER

Even if it might seem a little late I don't want to miss the opportunity to wish you all the best for 2008. Before I dare to glance at this year I would like to give a résumé of the last one. After the end of HERA and three years of preparation for the PETRA upgrade, PETRA III construction started on 2 July. All went according to plan and many of you will have noticed the construction traffic. Work went ahead quickly, not only on the construction site but also in the ring tunnel. The

removal of the old components was finished four weeks earlier than scheduled and more than half of the refurbished magnets with the corresponding vacuum chambers have already been installed again. Moreover, we have worked on the design of the experimental stations and were able to give the production go-ahead for a large number of components. After a long shutdown, FLASH started operation in October 2007, now with the design energy of 1 GeV.

Shortly afterward it generated SASE laser light with a wavelength of 6.5 nanometres. Currently the first user experiments' period is running and we are quite curious to see the results. Our working horse DORIS III ran for more than 5600 hours in 2007 for user operation. This is also reflected in this year's Annual Report with a record of nearly 1000 contributions, showing that DORIS is still a very attractive photon source. What will the new year bring? DORIS will be submitted to an

eight months' maintenance period before starting operation with fresh momentum in September. The FLASH activities will surely provide many new and fascinating scientific results. Most exciting will be PETRA III: Starting in late spring, the new experimental hall will be equipped, and in October the technical commissioning of the new storage ring will begin.

Sincerely yours,
Edgar Weckert

XFEL and ILC: Using the Synergies

ILC project manager and guest author Marc Ross describes how the projects can work together

by Marc Ross

The XFEL and the ILC are directly linked through their technology. And this extends beyond the hardware they use – it also links the teams. Very early in the development of TESLA, the collaboration planned uses other than particle physics: the free-electron laser XFEL.

With the two projects' international collaborations, the stage is set for superconducting RF technology to make major advances on two fronts in parallel. These two – industrial-style cryomodule production and high-gradient cavity performance – will lead us to a better understanding of how to apply this technology effectively for the ILC and future projects. With its roughly 100 cryomod-

ules as a basis, the XFEL will push the assembly, testing and installation process far beyond its present state. On the other hand, the gradient programme of around 400 cavity preparation and testing cycles during the next ILC phase is set to take advantage of new ideas and infrastructure around the world in order to demonstrate the specified ILC gradient performance and cavity production yield. The common activities into which both groups should invest are those with direct mutual benefits. Examples of such activities are the development of accelerator infrastructure, like a high-availability controls platform, or the development and deployment of the 3.9-GHz 'compressor' cavities and the perfection

of a post-electropolishing rinse to suppress field emission.

Both teams expect these connections to improve and mature over the next few years. Given the overwhelming need to meet schedules and keep the budget bottom line square, this will not be easy. It will require patience, understanding and a proactive imagination on all sides. Ultimately, those activities which are effective for all should be pursued, and finding these is the task we face.

Marc Ross is a project manager for the International Linear Collider. Formerly at SLAC, he is now based at Fermilab and is at home at labs around the world, having worked on many international projects including FLASH at DESY.

Boris Kayser from Fermilab will be guest of the Tuesday Seminar on 4 March: The theorist will give a talk on "Neutrinos: Results and Future". For many years Kayser has been one of the leaders in the field of neutrino research. He also writes neutrino articles for the "Review of Particle Physics" of the "Particle Data Group". Auditorium, 5 p.m.

In the auditorium, a Colloquium will be dedicated to Fridger Schrempp's going into retirement. For the last five years he has been head of the DESY Theory Group. On 19 February, 5 p.m., Andreas Ringwald and former Ph.D. student Sven-Olaf Moch, along with other colleagues, will pay him tribute with scientific lectures.

Goodbye, NT!

The DESYNT domain is shut down

A four-coloured flag against a dark starlit sky used to be the logo on Windows NT computers. Now this belongs to the past. On 22 January, at 7 p.m., the DESYNT file servers and domain controllers were shut down. Some of them had been in operation in the computing centre since 1997.

After the shutdown of HERA and complex conversions of the few remaining systems of the M sector, the parallel operation of two Windows domains came to an end.

This system started its life at DESY in 1995. At that time the Windows project group, headed by Wolfgang Krechlok, began to interlink the isolated Windows networks of the Hamburg and Zeuthen teams.

Starting in 1996, a lot of convincing was necessary to install the Windows domain DESYNT with log-on and file services in Hamburg and Zeuthen as the first multi-site IT infrastructure at DESY. With Windows 2000 and Active Directory, Microsoft later focussed on the Kerberos and LDAP log-on and directory services, well proven in the UNIX environment, which allow a better integration between the different operating systems. To make use of it, in a follow-up project starting in 2001, a new team under the leadership of IT installed today's Windows domain win.desy.de. The first users were able to migrate in 2003. DESYNT has since been mainly used for machine monitoring. (she)

INFO

Info for Windows domain
<http://adweb.desy.de>



75 workshop participants from all over the world discussed the most recent developments in their field of research.

Magnetic Moments

XRMS 2008 workshop held at DESY

With a total of four meetings in the week of 21 January, we had a bit of a workshop marathon in the field of photon science. Apart from the well attended XFEL and HASYLAB Users' Meetings and a PETRA III Beamline Workshop, this time also XRMS 2008 (X-ray Spectroscopy of Magnetic Solids) was held at DESY. Since 2000 this workshop has been dealing with the investigation of magnetic properties of solids with the help of synchrotron radiation.

An important current research example is the reduction of size and further development of magnetic data memory. Last year's Nobel Prize for the discovery of Giant Magneto Resistance went to this field of research. But scientists don't believe that the development of magnetic storage has already come to an end. They think that media will become smaller and faster without losing their data security. Therefore, researchers work on the stabilisation of magnetic properties in smallest structures, but also on reading and writing with purely optical devices, which make it much faster than the conventional method.

An important workshop topic was, of course, the research possibilities at the new light sources FLASH, PETRA III and

XFEL. A topical highlight was the contribution on the first successful experiments for the investigation of magnetic nanostructures at FLASH. In the future, with the extremely thin and shortwave beams of PETRA III, it will be possible to detect the tiniest magnetic structures hidden deep in the material. With the FELs, researchers particularly want to make visible dynamic processes. In a joint session with the XFEL Users' Meeting, there were reports on new approaches to investigate ultrafast magnetisation dynamics and switching. (tz)

Full Auditorium for Jochen R. Schneider

More than 300 guests from all over the world met on 24 January in the DESY auditorium to attend the Colloquium for Jochen R. Schneider and watch his colleagues and friends taking a retrospect of his work.

Albrecht Wagner thanked Schneider for his leading role as a scientist and messenger of photon science world-

wide. With anecdotes from outside of the scientific world, the colleagues emphasised his sociable and humorous sides. For the last seven years, Schneider had been DESY Director for Research with Photons. Beginning of this year he went to the research centre SLAC, USA, where he will further promote FEL research.



Photo © CERN

An impressive performance: the 440-, 880-, und 1430-ton endcaps with a diameter of 15 metres "danced" past each other on special air cushions.

On the Home Stretch

CMS construction goes into its last round

At exactly the same time as the cooling down of magnets in eight sectors of the LHC ring, the construction phase of the CMS detector is also approaching its finale. Nevertheless time is still tight. After the scientists had assembled and tested the CMS detector above ground, the components were gradually lowered into the experimental hall 100 metres below. The last several-ton piece, the endcap YE-1, made its descent on 22 January. Still above ground, in December, the coordinators had shuffled the three remaining endcaps around. This logistic manoeuvre made it possible to lower the giants into the experimental hall in an altered sequence, which saved about four weeks. A leeway the team badly needed. At the moment they are busy

wiring detector components like endcaps and the tracker. This keeps several teams busy for several weeks. The job takes so much time because the connections are very sensitive. They consist of standard copper and fibre optic cables and are the veins and synapses of the detector. The fibres will later transmit the signals of a particle collision for data analysis. The next challenge comes at the end of February: the installation of the beam pipe. It is very thin, and with several detector components which have to be pulled apart for free access to the connecting pieces, precision work is required. The crew estimates that it will take about four months until the closing of the detector underground. (she)

Who Won the PETRA III Christmas Bet?

Warm bodies expand and cold ones contract. So when a 300-metre-long concrete slab cools about 40 degrees, the contraction should be clearly visible. How much would the new floor of the PETRA III hall shrink when cooling down? This question initiated a bet among construction and project parties involved. On 9 January, the previously agreed target date, measurements were made to find out how much the edge of the concrete floor had separated from the hall wall. The result: a 3.75-centimetre slit gaped between floor and hall wall after three and a half weeks after the fill.

The closest bet was made by Bernd Hillemeier from the civil engineering institute at TU Berlin. He predicted 3.9 centimetres, given the advantage that he had been the expert who had previously calculated the contraction. Second were both Hermann Franz (PETRA III) and Rainer Heuer (ZBAU), who predicted 4 and 3.5 centimetres respectively.

Bernd Hillemeier won a bottle of champagne which he immediately passed on to the construction team. (tz)

Imprint

Publisher
DESY-PR
Notkestraße 85
22607 Hamburg

Contact
email: inform@desy.de
telephon +49/40/8998-3613
www.desy.de

Editors
Sandra Hesping (editor-in-chief)
Christian Mrotzek (V.i.S.d.P.)
Barbara Warmbein
Thomas Zoufal

Production
Britta Liebaug (layout)
Veronika Werschner (translation)
Kopierzentrale DESY (print)



New access system: Blue Cards for DESY staff

Doors of the LINAC II, DESY and FLASH machine rooms have been equipped with new terminals. Immediately after releasing the company agreement for the pilot phase, project leader Sabine Brinker will hand out 425 blue identification cards the size of a credit card to authorised DESY staff. The blue cards and the terminals replace the four-

digit PINs and the combination locks at the doors. With a database it will be possible to check who had access. The first time these cards will be used will be at the LINAC II start, beginning of April at the earliest.