DESY inFORM.

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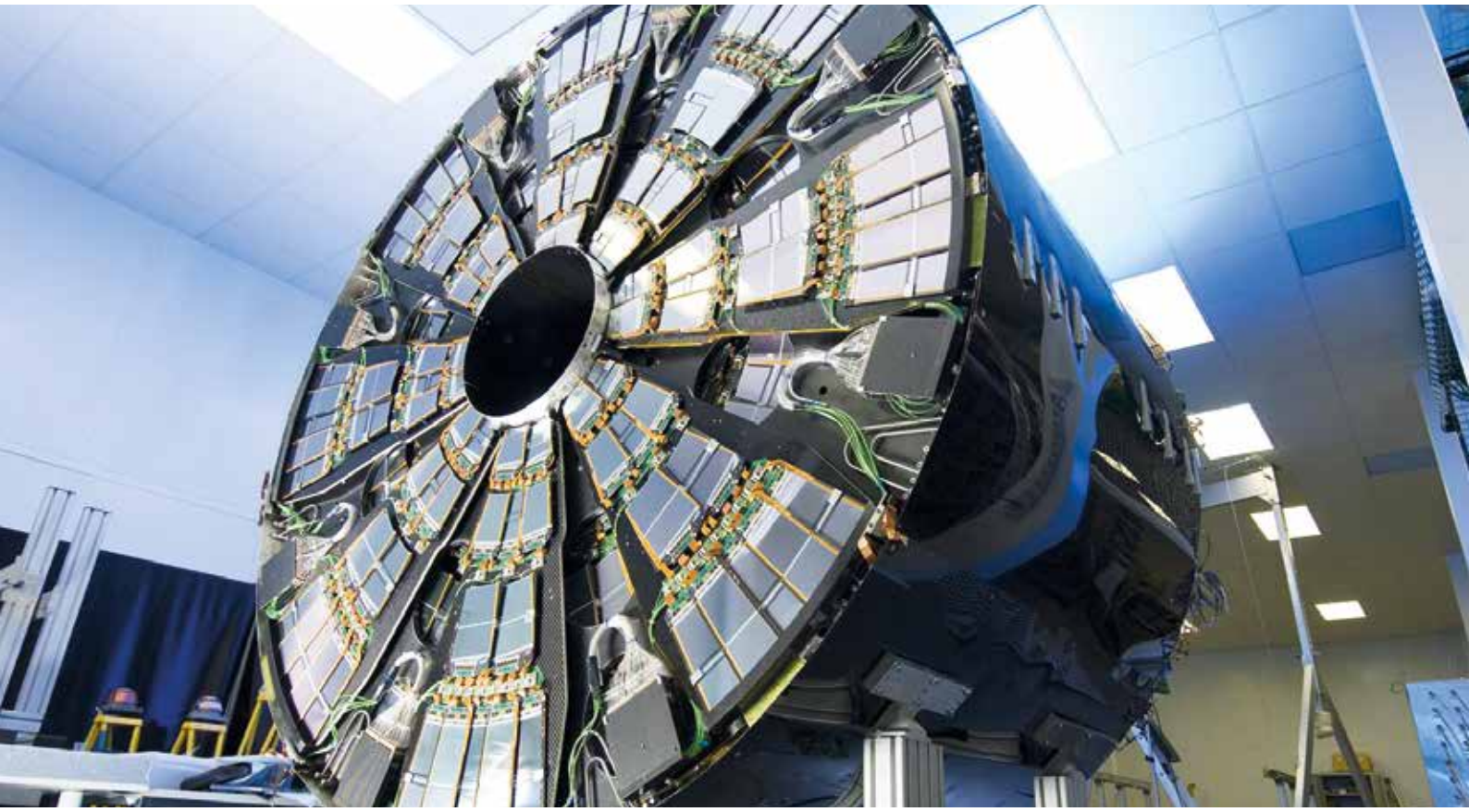
Staff Magazine of the Research Centre DESY

DESY prepares for the LHC upgrade

New detector components for CMS and ATLAS come from DESY's Detector Assembly Facility



At DESY among others, such a new end cap of the CMS tracker will be built. Photo: CERN

Without long-term planning, particle physics would not be feasable. All of the construction components are either single units or custom-made productions; nothing is prefabricated because scientists have very high standards for all the individual components. This is why DESY is now beginning some refurbishment and upgrade work for the creation of a new Detector Assembly Facility (DAF). The facility's end products, which will not be operational until 2026: two central new components for the huge detectors ATLAS and CMS at the Large Hadron Collider LHC at CERN will be built at DESY. The tasks are subdivided into three sectors: The setup of the entire infrastructure, the construction of the end-cap of the ATLAS tracker und the construction of the end-cap of the CMS tracker.

Two existing buildings will be extensively converted for the Detector Assembly Facility. In May, workers will be in building 25c, the former building of Helmholtz-Zentrum Geesthacht, and start the construction of a cleanroom of class ISO6, laboratories and other new infrastructure. In this building, the modules for the end-caps of the trackers will be produced. In 2017, building 26, the historical "Hall 1", will also become part of DAF. Later on, the complete end-caps – 2.5 by 2.5 metres in size – will also be assembled in the cleanroom. The Foundation Council has just approved the necessary funding of about ten million euros.

But why do we need new detector components, given that ATLAS and CMS are already complete and operating at CERN and the first major discoveries have already been made? In 2024, the detectors will definitely need an over-

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ALPS II searches for new elementary particles

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DIRECTOR'S CORNER

Dear colleagues,
DESY is the national laboratory for particle physics and a strong partner in numerous international collaborations. This role becomes very clear these days and it will also be further extended.
The international particle physics community is now looking forward to the LHC starting operation again. During the LHC winter shutdown, many DESY colleagues contributed to the maintenance of the detectors and the analysis of data taken in the past year. Over the course of the next few years, the number of proton-proton collisions will increase substantially, thus expanding the search for areas that are accessible for new physics.
Regarding the improvement and upgrade of the LHC detectors, we are working at the forefront. DESY is one of the leading institutes in the construction of the new CMS pixel detector. This technically very challenging project has made good progress in the past year and we are confident to complete the module production on time this summer.
For the longer term, the LHC moves to the high-luminosity phase in the next decade, including the replacement of larger detector components. DESY and other German and international partners will build a large end-cap for each of the new ATLAS and CMS tracker detectors. Preparations have already started. As of May, a Detector Assembly Facility (DAF) will be set up for this purpose in building 25c and, starting in 2017, in Hall 1.
The DESY test beam also plays an increasingly important role for the development and construction of new detectors. At the moment, a key measuring campaign is starting here for the tracker detector of the Belle II experiment currently under construction at the SuperKEKB in Japan. The prototype will be extensively tested at DESY. Some 50 colleagues from the Belle II experiment are carrying out measurements and analyses together with the Belle group here at DESY. All this demonstrates the enormous importance of the DESY facilities and activities for global particle physics projects.

Yours,
Joachim Mnich

haul because they will have been in operation for about 15 years. Moreover, in 2024, the LHC will undergo a massive upgrade which will enable it to produce a ten times higher rate of particle collisions than before. "This is a great challenge for the sensitive electronics and materials in the detectors because they will have to withstand ten times more radiation," explains Günter Eckerlin, head of DAF.

After each step each component is thoroughly tested to avoid or correct mistakes. "We will need roughly six years for the complete process, and if we want to have the end-caps for system tests in 2024 at CERN, we'd better start now so that the infrastructure is ready on time at DESY," says Eckerlin. The special thing at this facility is that the components of the two detectors ATLAS and CMS, joined

Günter Eckerlin, head of the Detector Assembly Facility at DESY. Photo: DESY

The tracker detectors, based on silicon sensors, are located very close to the collision point and register the tracks of the traversing particles. They consist of a barrel-shaped central component and two end-caps which complete the tracker detector on each side. One of each of the end-caps will be built at DESY. Approximately, 3500 single small modules are needed for CMS as well as 4000 for ATLAS, and DESY will build about half of these. The rest will be built at other institutes participating in the experiment with a strong involvement of German universities. At DESY, in building 25c, all components will be tested and made into silicon detector modules. The ATLAS modules will be integrated into bigger support structures, so-called petals.

in friendly competition, are assembled more or less side by side.

In "Hall 1", which will be ready for occupancy in mid-2018, work continues with the mounting of the components onto several support structures and with the completion of the end-caps. Subsequently, everything will be "integrated", i.e. bolted, glued, wired and connected to the cooling system and, of course, tested again. The German universities involved in ATLAS and CMS will also contribute to integration and testing at DAF." At the end, we will test the CMS detector here at DESY at its operating temperature of minus 20 degrees Celsius," says Eckerlin. "Do all channels work? Does it hold its power? Can it be delivered to CERN? These will be exciting times here at DESY." *(baw)*

Participants of the DLSR workshop. Photo: Matthias Kreuzeder, DESY

The perfect light source

From 2026 PETRA IV is supposed to reach the best possible brilliance

In March, more than 150 experts from eleven synchrotron research laboratories met for a three-day international workshop at DESY to discuss planned next-generation synchrotron radiation sources. These sources of the so-called 4th generation will be a hundred times brighter than today's sources, thus reaching the limits of what is physically possible with storage rings. DLSR (Diffraction Limited Storage Ring) is the magic word. In such a ring, the light cone of all electrons stored in a bunch would not be larger than that of a single particle – but would be much more brilliant.

Scientists have been thinking about DLSR for a long time. The first facility of this kind, MAX IV, will take up operation this summer in Lund, Sweden. DESY is also planning the perfect storage-ring light source: researchers from the photon science and accelerator departments started investigating how PETRA III can be upgraded to a 4th-generation source. "With PETRA IV, we want to have beamlines which are a hundred times more brilliant than today's," says Christian Schroer, scientific head of PETRA III. "Here, we would reach a fundamental limit which allows for a nano-focus of the complete X-ray beam. This facilitates the use of all X-ray techniques on microscopic scales that currently need the whole beam and are only applicable on large scales."

PETRA III stands out because of the length of its storage ring. For example, it allows for the installation of additional magnet structures that dampen the electron motion within the circling particle bunches. This minimises the size of the electron bunch and improves the bundling of the emitted light beam. Currently, PETRA III is the best source of its kind – its X-ray light brilliance is already at a world record level. In order to further optimise the bundling of electron bunches, the particles must travel through the ring as smoothly and steadily as possible. This, however, cannot be achieved with the existing PETRA III bending and focusing magnets, as they still give the particle bunches "a good shake".

A much larger number of compact bending and focusing units with better synchronisation is necessary. The result will be a remarkably increased light intensity with a smaller light spot compared with current synchrotron radiation sources. This would allow for spatially resolved investigations which are not possible with current technology. "This way, we get an ultimate 3D microscope and we will be able to observe physical and chemical processes virtually live," says Schroer. "For example, we can trace the development of battery charging and discharging or the microchip ageing process during operation and on length scales down to the atomic level."

In January, DESY submitted an application to the federal ministry of education and research (BMBF) to include PETRA IV on the German roadmap for research. According to the application, the design of the new facility will be developed in detail by the end of this decade. Secure funding provided, the prototype development and pre-production of components could start in 2020. Installation into the PETRA ring is then planned for the middle of the next decade. PETRA IV could start operation in 2026, thus becoming a facility with globally unique measuring conditions for X-ray nano-analytics for many years to come. *(tz)*

CNV scholarship for DESY PhD student Violetta Wacker

DESY PhD student Violetta Wacker from the FLASHForward project has been awarded a scholarship by the Christiane-Nüsslein-Volhard Foundation. The foundation established in 2004 by the 1995 German Nobel Laureate in Medicine supports young female scientists with children to make the double burden of work and family life easier for them. The CNV grants scholarship holders of all nationalities a monthly financial contribution for household help or additional child care. This support enables young women to create the freedom and mobility required to advance their scientific careers. The Foundation wishes to help prevent science from loosing excellent talents.

Doctoral thesis prize for Ihar Marfin

Ihar Marfin, until recently PhD student in the CMS group at DESY in Zeuthen, was awarded the prize for the best doctoral thesis 2015 by the Brandenburg University of Technology (BTU). His thesis „Search for Additional Higgs Bosons with Multi b-quark Final States at the LHC“ caught the attention of the international CMS science community because it sets new limits for theoretically possible additional Higgs particles with new procedures in statistical data analysis. The award ceremony took place on 27 January in the main auditorium of BTU in Cottbus.

KTH professorship for Stephan Roth

DESY scientist Stephan Roth was appointed adjunct professor at the Department of Fibre and Polymer Technology at the KTH Royal Institute of Technology in Stockholm. Subject of the professorship is the synchrotron-based characterisation of materials in fibre and polymer technology and it also includes lectures and supervision of theses. This extends the cooperation of DESY with the Swedish KTH institute. At DESY, Roth is head of measuring station P03 at the synchrotron ring PETRA III.

Patents, licences, start-ups

PIER Innovation Day gives an overview on funding options

Lively discussion in plenary. Photo: Marta Mayer, DESY

By Christian Salzmann

Patents, licences and start-ups from science – Hamburg is right up there with other scientific locations in Germany. However, it is difficult to get an overview of the actors and their activities in Hamburg. Apart from numerous successful spin-offs, there are many institutions that counsel spin-offs or offer funding. In addition, there are theme-focused innovation clusters and metropolitan bodies to stimulate Hamburg's innovation culture. Last but not least, each scientific institution holds its own support and consulting organisation.

The PIER Innovation Day in March was aimed at giving a rough overview of this field. It consisted of two parts. In cooperation with the CUI Graduate Days, the first part included two workshops on spin-offs. During these workshops, PhD students and postdocs learned that the spin-off world is completely different and discovered how the various obstacles can be overcome. The second day involved several plenary talks giving an outline of the Hamburg innovation scene.

Apart from current successful spin-offs at the University of Hamburg and DESY, scientific support services presented themselves, e.g. the technology transfer departments of the University of Hamburg and DESY, the HITeC society from the department of informatics of the University of Hamburg or the TuTech from the Hamburg University of Technology. Two important Hamburg funding agencies, IFB Innovationsstarter and High-Tech Gründerfonds, presented their programmes. Moreover, Peter Grambow from Nanoinitiative Bayern talked about the relevance of networks for the advancement of nanotechnology in industry and research and, based on his vast experience, he provided helpful and energetic list of “do's” and “dont's.”

The workshop made clear that in the past few years there has been a great increase in activity in the field of innovation in Hamburg. Eight years after the launch of the Innovation Alliance Hamburg, the planning of incubators at three different locations in Hamburg brings new life to the project. At the same time, the PIER Innovation Day showed that there is even more potential, particularly on the DESY campus in Hamburg. To exploit this potential, a close cooperation between the various actors is of great importance. This enables powerful new formats to be further developed and advanced thus helping to transform an innovative research idea into an economically viable product.

Antimatter in focus

Particles turning inside upgraded SuperKEKB accelerator

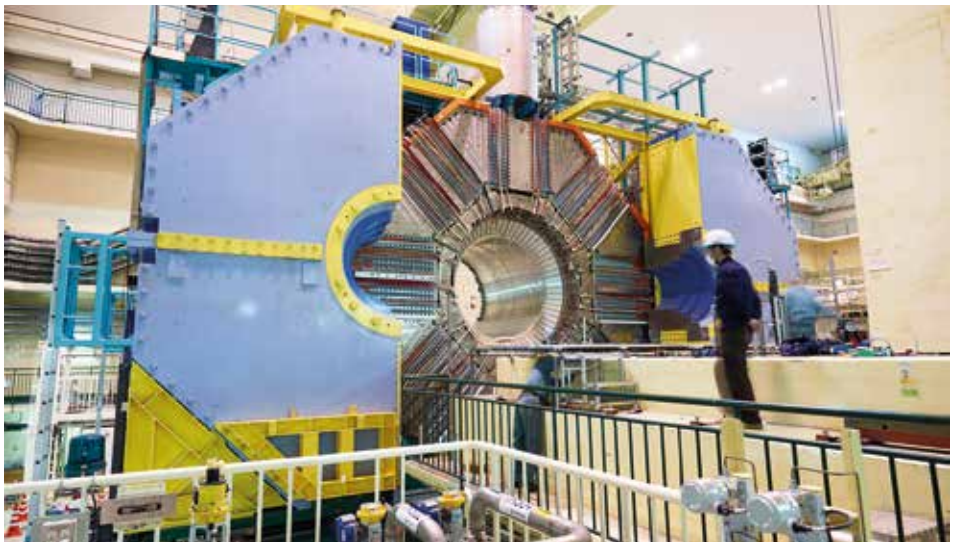
In February, for the first time after its five-year upgrade, particles started to circulate around the SuperKEKB accelerator ring at KEK in Japan. This is an important step towards producing particle collisions inside the similarly refurbished detector Belle II, which DESY is significantly involved. With the help of these collisions, physicists are hoping to figure out why the universe consists of matter even though equal amounts of matter and antimatter should have been produced in the Big Bang.

The research programme will officially start in two years. The upgraded SuperKEKB is expected to produce 50 times more collision data than its predecessor. More collisions also create greater demands on the detector. To manage these, the Belle II researchers are developing new detector components which will be arranged directly around the interaction region and which will be able to precisely record the tracks, decay products and other properties of the particles. One such component is the ultrasensitive vertex detector, part of which is being built by German research groups.

Before the vertex detector can be exposed to particle collisions, however, the scientists are building a sort of high-tech dummy detector which will be installed first in order to study the background in greater detail. This dummy dectector is called BEAST II (Beam Exorcism for A STable Belle II) and will start recording data in autumn of 2017.

DESY is one of eleven German and altogether 98 institutes from 23 nations that are jointly developing and building the Belle II detector. They will also analyse the data it produces. Some 20 research scientists at DESY are making sure that BEAST II and prototypes of the final vertex detector are tested under realistic conditions in DESY's test beam, and can later be safely integrated in the Belle II detector. In addition to this, they share responsibility for the complex cooling system and must ensure that all the components of the detector are perfectly aligned and properly calibrated, and that the magnetic field is accurately measured. Furthermore, Belle II will produce huge quantities of data, which will have to be stored, reconstructed and analysed. DESY is in charge of a significant proportion of the storage and computing capacity.

Given their close cooperation for the Belle II project and other projects in the field of particle physics, accelerator development and photon science, DESY and KEK recently extended their cooperation agreement for another five years. *(baw)*



The Belle II detector at the SuperKEKB accelerator. Photo: KEK

NEWS

Polish research prize for two DESY scientists

Particle physicists Hannes Jung and Tord Riemann have been distinguished by the Polish science foundation FNP with the Alexander von Humboldt Polish Honorary Research Scholarship. The research award includes a six-month stay at a research institute in Poland.

The CMS scientist Hannes Jung from Hamburg who made substantial contributions to Monte Carlo simulations of particle collisions at highest energies will go to Cracow and work with local scientists on developing these simulations further to improve the analytical precision of LHC collisions.

The Zeuthen theorist Tord Riemann does research in the field of quantum field theories and the phenomenology of the standard model. With the research prize Riemann will intensify his long-standing close cooperation with the University of Silesia in Katowice to develop high-precision simulations for physics at the planned ILC and so-called meson factories.

Enormous data volume at Fermilab thanks to dCache

The Large Hadron Collider LHC is not only the world's largest particle accelerator, but also produces a data volume of about 300 megabytes per second. This roughly corresponds to a pile of CDs as high as the Eiffel Tower being produced each week. These data recorded at the LHC are stored and processed at more than 250 computing centres around the world to explore new physics. One of them is at the Fermi National Accelerator Center (Fermilab) near Chicago.

In January, with the help of dCache, Fermilab for the first time topped the 100 petabyte mark of stored data volume. One hundred petabytes are equal to 100 million gigabytes. For comparison: a state-of-the art mobile phone has an average storage capacity of 32 gigabytes.

dCache is a system which stores and recalls extremely large amounts of data distributed across a large number of server nodes. These server nodes may be located in different countries and support both, disk drives or tape systems – thus creating a uniform and connected file tree.

DESY is the head office of dCache.org and eight of the twelve team members are from DESY, including the project leader. Moreover, DESY-IT provides dCache.org with the necessary computer infrastructure for professional software development, verification, distribution and support. Fermilab is co-developer, partner of dCache.org and at the same time one of the largest users of this technology.

Light for the future

First undulator line installed in the European XFEL

Thirty-five segments of the first of three X-ray light-generating undulator lines have been installed in the European XFEL. The undulator lines of the European X-ray laser, whose main contractor is DESY, are up to 210 metres long. With their X-ray light flashes, scientists will obtain pioneering new insights into the nanocosm, which are of particular importance for many scientific disciplines, such as biochemistry, astrophysics and materials science.

The installation of the undulator segments is an important step towards the completion of the 3.4-kilometre-long European X-ray laser. “The X-ray flashes are the basis for the future research at the European XFEL,” European XFEL Managing Director Massimo Altarelli points out. “We are looking forward to 2017, when scientists will use these flashes for the first time to investigate the smallest details of the structure and function of matter.”

Each of the 35 segments is five metres long and weighs 7.5 tons. The European XFEL undulators were built through a multinational collaboration. Under the leadership of the undulator group of the European XFEL, DESY and many other research institutions and firms, from Russia, Germany, Switzerland, Italy, Slovenia and Sweden were involved in the challenging production. “This was a truly synergetic collaboration”, says Joachim Pflüger, head of the European XFEL undulator group. “DESY’s resources and experience were essential for the development of the undulator systems. Now, there is a great mutual benefit!”

This first completed undulator line will generate short-wavelength X-rays that will be used for experiments to investigate biomolecules and other biological samples and to observe ultrafast chemical reactions. All three of the undulator lines planned for the first operating phase will be completely mounted and ready for use this year.

Image: European XFEL

From metal sheet to particle accelerator – part 3

Into the yellow pipes

European XFEL accelerator module with fully mounted tailor-made waveguides.

By Ricarda Laasch

For the operation of the European XFEL, 800 cavities will be installed in 100 accelerator modules. The cavity production has already been outlined in the two previous issues of DESY inForm. For their assembly, there is a weekly transport of cavities to France. From there, they return to DESY as operational modules where they are tested and provided with a custom-made "energy supply" before they are transferred into the tunnel.

The assembly of the modules takes place at the research centre CEA (Commissariat à l'énergie atomique) in Saclay near Paris. Lorries transport the cavities directly to the gates of the so-called XFEL Village where staff members of the industrial contract partner ALSYOM receive and "check in" the cavities. "We from CEA regard ourselves as the connecting link between research and industry; so it was clear to us to get industry on board with ALSYOM," explains Olivier Napoly, project leader of the XFEL project in Saclay. "With this, we had a two-tiered learning phase: first, CEA learned from DESY how to assemble XFEL modules; then, we passed on our new knowledge to ALSYOM."

The whole infrastructure and almost all tools of the XFEL Village are provided by CEA. The main contribution of ALSYOM is the technical staff. In its seven-week production time, each module stays for one week at one of the seven assembly stations. "We finish one module per week," says Napoly. "In the beginning, this rate was a real challenge; however, with a good cooperation and by optimising our organisation and personnel, we made it. In 2015, at times we even completed one module every four working days."

The first two stations are located in dust-free cleanrooms. There, the cavities get the "cold part" of their new couplers and, in the string assembly area, they are assembled to a string of eight cavities. The so-called string is the core of the accelerator module. The next stations are located outside the cleanroom, in regular assembly halls. There, the strings are equipped with several sensors, the helium supply, cables and other parts which are necessary for future operation. This requires great accuracy and care at each individual procedure. No matter whether bolted, welded or stretched – everything must fit perfectly and stay clean. Finally, the module is packed into a large yellow vacuum tank. "Of course, we carry out a thorough quality control at each step. This ensures that each module leaving Saclay is fully operational," says Napoly.

As soon as the completed module has successfully passed the final test, it starts its one-day journey to DESY. Here, it is again received by Jacek Swierblewski´s team in the AMTF hall. The Polish team from Cracow (see DESY inForm 1/2016) is also running the three module test stands. The test takes 21 days. The module is cooled

down to its operating temperature of 2 Kelvin (minus 271 degrees Celsius). The test includes many steps and measurements to ensure the function of the module. Moreover, the accelerating properties of the individual cavities are measured and the data are transferred to the waveguide experts. Waveguides secure the energy supply of the module – they transport the microwaves used for particle acceleration to the cavity.

Two colleagues from the WATF team measuring and tuning waveguide components.

"The measured data from the module tests help us to produce a tailor-made energy supply for each cavity," explains Stefan Choroba, head of the work package radio frequency system. "First, we calculate the required power distribution and subsequently we adapt the necessary parts." This customised production takes place in the so-called Waveguide Assembly and Test Facility (WATF), located in close proximity to the module test stands. At five stations, a 27-person team from Bulgaria, Russia and DESY assembles the complete waveguide supply for each individual module. "For the waveguides, we have a collection of standard components which are appropriately put together and tuned," explains Valery Katalev, head of the WATF team. The tuning – i.e. the adjustment to the requirements of each cavity – is carried out with great care. The tailor-made energy supply makes it possible to operate each cavity in each module with maximum capacity. Therefore, the module is not limited by its weakest cavity.

Simultaneously, two or three of these waveguide distribution systems are assembled and tested, thus producing a rate of one and a half completely installed distributors per week. "This rate is an enormous achievement of the team," says Choroba. "Within that time, not only customised production but also the attachment to the module must fit accurately to the millimetre." More than 80 000 bolts must be tightened for all 100 distributors without mechanically warping the couplers. "This exactitude and this rate could only be achieved by optimising the workflow," explains Katalev. "Before mounting and during the installation of all parts and connections, all components are double-checked by two colleagues."

When all components are assembled, a load test is carried out with full capacity of up to 2.5 megawatts per distribution system. With this, the colleagues ensure that everything will work in the accelerator as it should. When the distribution system passes this test, the WATF team will mount it at the module. After that, the module with the distribution system is ready for the final step of its journey: the installation into the accelerator tunnel.

This step will be the topic of the final article of this series, to be published in the next DESY inForm issue.

Overview of the Waveguide Assembly and Test Facility. Photos: Valery Katalev, DESY

On the track of lightweights

Particle physics experiment ALPS II searches for a new class of elementary particles

By Nina Laskowski

Large-scale accelerator facilities help physicists to hunt for ever-heavier elementary particles. This strategy has taken them into unexplored high-energy fields. It requires a considerable amount of effort, but this is well invested, as demonstrated recently with the discovery of the Higgs boson at the world's largest particle accelerator LHC in Geneva. However, undetected particles may not only hide at high energies, but also at the lower end of the energy scale. With the ALPS II experiment, a joint effort between DESY, the Albert Einstein Institute Hannover, the universities of Hamburg and Mainz and the University of Florida in Gainesville, physicists at DESY will look for undetected lightweight particles at low energies. These so-called WISPs (Weakly Interacting Sub-eV Particles) are promising candidates for the mysterious dark matter which is five times more abundant in the universe than the ordinary matter familiar to us. Funding for the experiment has now largely been secured, in part with grants from the US Heising-Simons Foundation and the National Science Foundation for the University of Florida

WISPs are weakly interacting particles with masses well below one electron volt (eV) – the best known among them being the hypothetical axion. From 2007 to 2010, a collaboration headed by the DESY scientists Axel Lindner and Andreas Ringwald searched for the axion-like particles with ALPS (Any Light Particle Search). Although this investigation did not lead to the discovery of unknown particles, the experiment set the best limits for the features of those WISPs. With an extended version of ALPS, the physicists want to further pin down the features of the hypothetical particles. "With ALPS II, we will get a realistic opportunity to detect the first axion-like particle," says ALPS spokesman Axel Lindner.

Aaron Spector, Postdoc of the University of Hamburg, working on the ALPS optics. Photo Marian Dürbeck, ALPS

The method ALPS uses to to detect lightweights is at the same time both simple but also amazing: With an intensive laser beam, the scientists attempt to shine light through a massive wall. The laser beam is sent through the strong magnetic field of the dipole magnets that were originally constructed for DESY's particle accelerator HERA. According to the theory, photons can be converted in a strong magnetic field into axion-like particles. Due to their weak interaction, the particles will pass the wall unimpeded. Another equally strong magnetic field behind the wall will reconvert a small amount of WISPs into photons. The result: light apparently shines through the wall. If the detector behind the wall observes any light, this would be regarded as evidence of axion-like particles.

Since 2010, the team of researchers has been working towards the launch of ALPS II, which will be installed around HERA hall North in the tunnel. For the over 200-metre long installation, 20 magnets originally constructed for HERA will be straightened and built in together with an ultrasensitive superconducting detector, a strong laser and optical cavities. "We can only realise the complex optics of ALPS II with the help and the experience which our Hannover and Florida partners have gained from the LIGO experiment," Lindner explains. "It would be fantastic if – after the discovery of gravitational waves – it would also be possible to detect new elementary particles with such optics."

Should ALPS II make a discovery, the answers to many open particle physics questions would be within reach. WISPs could not only explain the invisible dark matter but also solve many astrophysical questions and point the way to the unification of particle physics and gravitation – a dream of many physicists.

Photo: AIP

Windows to the universe

The human eye conceives only a tiny section of the cosmos. Our vision of the universe changes drastically, depending on the "window" we are looking through – from radio waves to visible light up to gamma radiation. These "windows to the universe" are visualised by an exhibition of the same name, which Brandenburg's minister of science Sabine Kunst together with Christian Stegmann (right), head of the DESY institute in Zeuthen, and Matthias Steinmetz (left) head of Leibniz-Institut für Astrophysik Potsdam (AIP) opened on 2 March within the premises of her ministry.

The concept for exhibit was developed jointly by AIP, the Max Planck Institute for Gravitational Physics at the science park Potsdam-Golm, the University of Potsdam and DESY. The exhibition is open until 29 April, Monday to Friday from 7 a.m. to 6 p.m., in the 2nd floor of the Ministry of Sciences, Research and Cultural Affairs building in Potsdam. Admission is free. *(ub)*

„Female refugees"

International Women's Day lecture at DESY

By Sylvie Faverot-Spengler

On 8 March, many accepted the invitation to attend the lecture on female refugees held on International Women's Day at DESY Hamburg. Claudia Meyerhöfer, deputy head of the refugee reception centre on Oktaviostraße in Hamburg, gave a vivid report about her daily tasks and experiences.

The refugee reception centre, headed by Meyerhöfer and Rahel Temesgen, who was unfortunately unable to participate due to illness, is one of the twelve centres in Hamburg. The centre was opened in August 2015 on a sports field to accommodate 700 people. Most of the refugees that are cared for come from Syria and Afghanistan, and Iraq, with a small number from Iran and Eritrea. Most of them are men. The tents have been replaced by containers that each house 4 individuals.

Apart from managing the accommodations, the managers' main tasks are in the social sector and include medical care and help with the obtainment of useful items such as clothing or working permits. Conversations are also extremely important, e.g. when conflicts arise or as a means for refugees to process their experiences.

There are currently 120 women living in the Oktaviostraße centre, 24 of whom are single. Meyerhöfer reported about the forms of violence which these women had to endure and also about the protection measures in place at the reception centre which make peaceful coexistence possible. The women are offered advice about motherhood, prenatal assistance, trauma counselling, child care and female only sports which gives them the opportunity to have social contacts.

After her talk, Meyerhöfer answered numerous questions and many lively discussions continued over coffee and cake in the auditorium foyer. This event demonstrated how the refugee issue concerns each of us and it stressed the particular difficulties female refugees face.

The eleven-year old Felix Eberle convinced the jury with investigations on a homemade parabolic mirror and won the 1st place in Physics at „Schüler experimentieren“. Photo: Marta Mayer

Creativity needs curiosity

4 th „Jugend forscht“ science competition in Hamburg Bahrenfeld

By Kim-Susan Petersen

For the fourth time, DESY hosted the regional „Jugend forscht“ youth science competition in Hamburg Bahrenfeld, which was one of four regional competitions in Hamburg. At the end of February, 74 participants met at the DESY “physik. begreifen” school-lab to present a total of 40 projects to a group of expert jurors. Half of the projects were part of the “Schüler experimentieren” competition which accepts applications from pupils in the 4th grade already. The other half were in the “Jugend forscht” competition for youths age 15 to 21 years.

The science competition encourages special achievements and talents in the fields of mathematics, natural sciences and technology with the aim to inspire lasting enthusiasm for these topics among young people. This year, the 40 projects represented a colourful mixture of subject areas including the world of work, biology, chemistry, mathematics/ informatics, physics and technology.

This competition is not only an exciting experience for the participants but also for the jurors who receive many positive impressions. Juror Ann-Christin Baur, a teacher at Lise-Meitner-Gymnasium, spoke about 12-year old Sara, who came to Germany just one and a half years ago. She presented a project focusing on the effects of several medical drugs on plants. “This girl held a wonderful talk. Her self-confidence which, after living in Germany for only one and a half years, enabled her to apply for this highly specialised competition just blew me away.”

Many interested visitors used the opportunity on the second day of the competition to have a look at the projects being explained by the young researchers. This was followed by a ceremonial event in the DESY auditorium during which Christian Harringa on behalf of the DESY directorate, Michael Just from the Hamburg school board, and Sophie Debuch from the “Jugend forscht” foundation presented diplomas to the participants. A total of six projects (including four “Jugend forscht” projects) were awarded a 1st prize, thus qualifying them for the Hamburg state competition.

HELMHOLTZ ASSOCIATION

Growing cucumbers in a high-rise building

Large arable land areas and food transport over long distances may soon be a thing of the past. Engineers from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have now joined forces with international partners in the “Vertical Farm 2.0” project – a kind of high-rise greenhouse which would enable the cultivation of plants in large cities. On different levels, lettuce, tomatoes, cucumbers and herbs could be cultivated and harvested year round. Each storey could yield approximately 630 tons of lettuce or 95 tons of tomatoes annually.

The greenhouse would occupy an area of no more than 74 by 35 square metres. The building would also house the administration, storage rooms and a logistics centre. The high-rise would have a modular structure, which would enable its adaptation to address consumer demands at each location. The plants would receive a precisely controlled nutrient solution and would be exposed to LED light. „Our products would not taste any different from the food that people buy in supermarkets today,“ says Conrad Zeidler from the DLR Institute of Space Systems. DLR scientists are currently testing optimum lighting, the best possible irrigation system and the ideal arrangement of the plants. The substantial amount of energy required by LED lighting is currently the greatest challenge.

http://www.helmholtz.de/perspektiven

Imprint

Publisher
DESY-PR
Notkestraße 85
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