CERN Bulletin

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THE DISCOVERY UNCOVERED

Almost exactly one hundred years after the publication of Einstein's paper on General Relativity, the LIGO and Virgo collaborations have published a paper in which they show a gravitational signal emitted by the merger of two black holes. The signal has been observed with 5-sigma accuracy and is the first direct observation of gravitational waves.

On Thursday, 11 February, Barry Clark Barish, one of the fathers of the LIGO experiment, presented the latest results in a packed Auditorium.

Ripples in space-time, the fabric of the Universe: this is how we can picture gravitational waves. In his visionary paper published in June 1916, Einstein predicted that masses deform space-time and, therefore, any change in their position causes a distortion that propagates at the speed of light, resulting in gravitational waves.

It wasn't until 1975, over 60 years later, that Russell Hulse and Joseph Taylor, who were awarded the Nobel Prize in 1993, inferred the existence of gravitational waves by observing the neutron star binary system PSR1913+16 in which the orbital period of the pulsar has decreased over the years: the measurement was perfectly in line with the loss of energy through gravitational waves predicted by General Relativity. However, we have had to wait another 40 years for the first direct observation: a beautiful, perfectly shaped signal coming from the unimaginable collision of two black holes with masses of around 36 and 29 times that of the Sun.

The signal was recorded by LIGO's interferometers on 14 September 2015, at the beginning of the new run following a long upgrade campaign from 2010 to 2015. The first ever gravitational signal shows a distortion that becomes more intense and reaches a higher frequency as the black holes spiral towards the collision point and fades out again after the collision, when a considerable part of the initial energy is dissipated in gravitational waves.

But don't imagine a huge explosion! There is no air out there so no sound (sound is a vibration or mechanical wave that needs a medium to

(Continued on page 2)

A WORD FROM THE DIRECTOR-GENERAL

CONGRATULATIONS ON THE DIRECT DETECTION OF GRAVITATIONAL WAVES

This week saw the announcement of an extraordinary physics result: the first direct detection of gravitational waves by the LIGO Scientific Collaboration, which includes the GEO team, and the Virgo Collaboration, using the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors located in Livingston, Louisiana, and Hanford, Washington, USA.

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In this issue

NEWS

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A WORD FROM THE DIRECTOR-GENERAL

(Continued from page 1)

CONGRATULATIONS ON THE DIRECT DETECTION OF GRAVITATIONAL WAVES

Albert Einstein predicted gravitational waves in a paper published 100 years ago in 1916. They are a natural consequence of the theory of general relativity, which describes the workings of gravity and was published a few months earlier. Until now, they have remained elusive.

Gravitational waves are tiny ripples in space-time produced by violent gravitational phenomena. Because the fractional change in the space-time geometry can be at the level of 10^{-21} or smaller, extremely sophisticated, high-sensitivity instruments are needed to detect them. Recently, the Advanced LIGO detector increased its sensitivity by almost a factor of four, which was crucial for the reported observation.

The by-now familiar GW150914 signal, recorded on 14 September 2015, is attributed to the merger of two massive black holes - 30-40 solar masses each - occurring at a distance of about 400 Megaparsecs. Since gravitational waves travel at the speed of light, this catastrophic event happened more than 1 billion years ago. This observation represents another crucial milestone in the experimental verification of general relativity, and opens the door to a new phase of exploration of the universe: gravitational wave astronomy.

The importance of this result for physics is huge. Much of what we take for granted in modern society rests on two pillars, theoretical frameworks that emerged at around the same time. General relativity is one. Quantum mechanics is the other. GPS positioning systems would not work without general relativity, while much of the electronics industry is built on quantum mechanics. Yet the two theories seem to be incompatible.

Four years ago at CERN, we dotted the "i"s and crossed the "t"s of the Standard Model of particle physics with the discovery of the Higgs boson, the messenger of the Brout-Englert-Higgs mechanism. This was the last missing ingredient of the Standard Model: the quantum theory that describes fundamental particles and all of their interactions, with the exception of gravity. This week's discovery paves the way to significant improvements in our understanding of gravity through future measurements of gravitational waves. Results such as these two come along only very rarely, and it is a privilege to be able to see them. They also spur us on to the greatest challenge of our time in physics: the reconciliation of general relativity and quantum mechanics.

Congratulations to the LIGO and Virgo Collaborations for this extraordinary contribution to fundamental physics!

To learn more about this new discovery, read the article "The discovery uncovered" on page 1.

Fabiola Gianotti

THE DISCOVERY UNCOVERED

(Continued from page 1)

propagate) and nothing but gravitational waves can escape from a black hole, not even light, so from our vantage point, everything happened in darkness and silence. Indeed, such an event can only be "seen" through the gravitational perturbation it causes. In other words, we now have a very powerful instrument to study previously invisible events in the Universe. And you don't have to worry about this catastrophic event happening anywhere near you: the paper reports that it occurred at about 1000 million light-years from the Earth. Nothing to worry about, then, but a huge discovery for humankind.

Antonella Del Rosso

LIGO, Virgo, and others

The teams behind the LIGO interferometer in the US, the Virgo interferometer in Italy and the GEO600 interferometer in Germany have been collaborating since 2004, and in 2007 they signed a Memorandum of Understanding to analyse their data together and exchange technologies. The current paper is jointly signed by the three collaborations.

Other interferometers are currently under development around the world: KAGRA under construction in Japan; the Indigo project submitted to the Indian Government; and, taking a longer term perspective, the Einstein Telescope to be located on the Earth's surface, and the LISA observatory, which will be orbiting in space.

The basic principle of any laser interferometer for the direct observation of gravitational waves is based on an L-shaped design: the gravitational wave produces a distortion of the local metric such that one axis of the interferometer is stretched while the orthogonal direction shrinks. This distortion between the two arms oscillates with the frequency of the gravitational wave.

LATEST NEWS FROM THE YETS: ON THE HOME STRAIGHT, HANDOVER TO OPERATIONS IN SIGHT

With the PS Booster already in its hardware commissioning phase and the PS being handed over to the operations teams this week, the injector chain is almost ready for the restart of the LHC run, planned for the end of March.

After an intense maintenance campaign over the last few weeks, the PS is now being cleaned and prepared for commissioning.

At the SPS, the last access for YETS activities is planned for Friday, 19 February. More than 560 interventions have taken place over the past eight weeks. Since the beginning of the technical stop, 14 magnets have been changed and three more will be replaced before commissioning starts. The campaign for identifying obsolete cables is progressing well and will be completed on schedule.

The LHC operators are eager to restart the physics run around the end of March. For the time being, all maintenance operations are progressing according to schedule. In particular, all the repairs involving the cryogenic equipment have been completed but inspections are still under way to identify and fix any possible leaks. Wherever new hardware (in particular for the LHC beam absorber for injection, the so-called TDI) has been installed, the final position has been validated using X-ray technology. The cabling campaign is continuing, with new cables being installed for the ATLAS and TOTEM experiments.

A list of tests to be carried out in order to validate all the magnet circuits is being prepared by teams in the Technology department. New Electrical Quality Assurance (ELQA) tests have also been added to the list of jobs to be completed before powering. The Departmental Safety Officer (DSO) test will trigger the handover of the LHC to the operations teams.

Antonella Del Rosso

AUGMENTED REALITY FOR IMPROVED SAFETY

Sometimes, CERN experts have to operate in low visibility conditions or in the presence of possible hazards. Minimising the duration of the operation and reducing the risk of errors is therefore crucial to ensuring the safety of personnel. The EDUSAFE project integrates different technologies to create a wearable personnel safety system based on augmented reality.

The EDUSAFE integrated safety system uses a camera mounted on the helmet to monitor the working area.

In its everyday operation of machines and facilities, CERN adopts a whole set of measures and safety equipment to ensure the safety of its personnel, including personal wearable safety devices and access control systems. However, sometimes, scheduled and emergency maintenance work needs to be done in zones with potential cryogenic hazards, in the presence of radioactive equipment or simply in demanding conditions where visibility is low and moving around is difficult. The EDUSAFE Marie Curie Innovative Training Network project (see box) uses augmented reality (AR) to reduce the duration of the operation and to enhance the safety of the worker by decreasing the room for error.

"We are designing an innovative system that integrates some systems already in use, in particular the active dosimeter, with new technologies," explains CERN's Olga Beltramello, EDUSAFE Network Coordinator. "Through an electronic board that collects inputs from various sensors and a camera and sends them via a wireless connection, the worker is constantly monitored by operators located on the surface. At the same time, AR technologies allow the real-time computer-based identification and analysis of the objects in the worker's environment and project necessary information onto the display of his or her smart glasses."

An important requirement is fast pattern recognition and tracking of objects in an environment that is not fully predictable, frequently with bad and changing lighting. "We try to provide accuracy in the range of millimetres without losing speed and flexibility," says Giulio Aielli from the University of Rome Tor Vergata, who coordinates the AR technology development team. "Since this is something not yet achieved by the AR systems currently available, we are developing our own solution: the Weighting Resistive Matrix technology." Originally conceived in 1992 at the University of Rome Tor Vergata for high-energy physics experiments, the Weighting Resistive Matrix technology has been further developed in the framework of the EDUSAFE project and combined with the cutting-edge artificial vision computer technologies and pattern recognition software developed at EPFL in Lausanne.

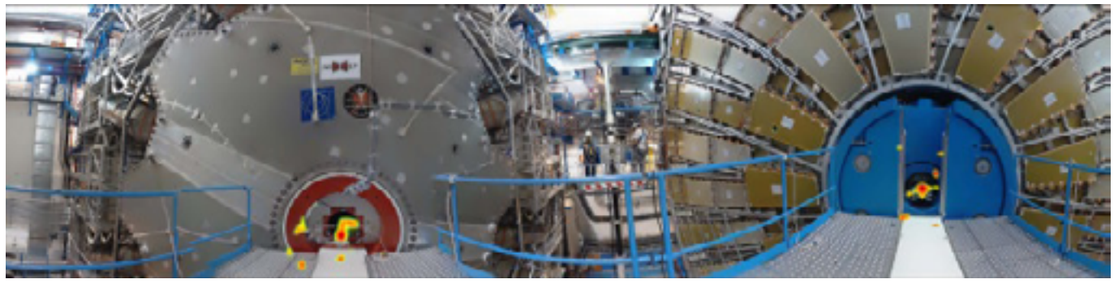
The safety equipment developed by EDUSAFE will be able to identify radioactive spots accurately. Using a gamma-ray camera – currently still being developed by Canberra, a company specialising in nuclear measurement solutions – the system will scan the environment and highlight radioactive spots via AR on the smart glasses worn by the operator. "The difficult part here is to think of the combination of measurements needed to quickly identify the source," explains Enzo

Paradiso of Canberra, a PhD student and early-stage researcher in EDUSAFE. EPFL's Alberto Crivellaro, another researcher involved in the project, adds: "We also need to locate the eyes with respect to the 3D world, and find a way to coherently overlay all this information."

The technological applications of this innovative AR equipment are countless and the collaboration has already identified possible synergies with the medical field. "We are looking into developing novel solutions to be employed by surgeons," explains Beltramello. "Indeed, when combined with medical imagery, AR can be a useful tool to guide the surgeon during the operation. The surgeon will be able to give a voice command and the AR system will recognise and position in space the specific tools needed with extreme accuracy, giving the surgeons a new field of vision."

The EDUSAFE project is scheduled to complete its mandate this August when the first prototype of the smart system will be ready for release.

Stefania Pandolfi



Panoramic view of the ATLAS cavern: the radioactive spots are highlighted on the smart glasses worn by the operator via AR.

The EDUSAFE collaboration

EDUSAFE (Education in Advanced VR/AR Safety Systems for Maintenance in Extreme Environments) is an international collaboration lead by CERN, which hosts the project headquarters at IdeaSquare.

The collaboration includes the following European institutions and companies:

- CERN
- Canberra France (France)
- Università Degli Studi Di Roma Tor Vergata (Italy)
- Prisma Electronics ABEE (Greece)
- École Polytechnique Fédérale De Lausanne (Switzerland)
- Institute of Accelerating Systems and Applications (Greece)
- E. Kasderidis & SIA E.E. (Greece)
- Technische Universität München (Germany)
- Athens University of Economics and Business - Research Center (Greece)
- CAEN University (France)
- Democritus University of Thrace (Greece)
- Aristotle University of Thessaloniki (Greece)
- National Technical University of Athens (Greece)

It provides training for ten early-stage researchers and two experienced researchers, with very diverse backgrounds and originally coming from all around the world. Find out more on the EDUSAFE website (**http://cern.ch/go/klC8**).

AWAKE'S PLASMA CELL ARRIVES AT ITS DESTINATION

By harnessing the power of wakefields generated by a proton beam in a plasma cell, the AWAKE project aims to produce accelerator gradients hundreds of times higher than those achieved in current machines. Far from being just a dream, the AWAKE tunnel is progressively being filled with its vital components. This week, the plasma cell has been moved to its final position.

The proof-of-principle AWAKE experiment is being installed in the tunnel previously used by the CNGS facility. In AWAKE, a beam of protons from the SPS will be travelling through a plasma cell and will generate a wakefield that, in turn, will accelerate an electron beam. A laser will ionise the gas in the plasma cell and seed the self-modulation instability that will trigger the wakefield in the plasma. The project aims to prove that the plasma wakefield can be driven with protons and that its acceleration will be extremely powerful, hundreds of times more powerful than that achieved today.

On Thursday, 11 February, the plasma cell – a 10-metre-long component developed by the Max Planck Institute for Physics in Munich – was lowered into the tunnel and moved to its position at the end of the proton line. The next step will be the installation of the laser, the vacuum equipment and the diagnostic system for both laser and proton beams. Beam commissioning is scheduled to start this summer.

Antonella Del Rosso

AWAKE's 10-metre-long plasma cell in the experiment tunnel.

WHEN IDEAS GROW UP

Challenge: to use basic-research technologies to enhance mobility. A group of Finnish students accepted this challenge in 2014 and now they have come back to CERN's IdeaSquare to develop their idea: a smart hip protector to protect elderly people in the event of a fall.

The smart hip protector protects elderly people if they fall. (Image: George Atanassov/Aalto University)

The intelligent hip protector features two airbags and three different sensors – an accelerometer, a gyroscope and a magnetometer. When the three sensors simultaneously show that the person is falling, a CO_2 cartridge releases gas into the airbags and quickly inflates them, thus softening the impact with the ground.

"This idea came about during the Challenge-Based Innovation course in 2014, in which participants were asked to use technologies developed for basic research in new solutions to facilitate mobility," explains Enna Rane, a member of the team. "Together with students from the *Istituto Europeo di Design* in Barcelona and the Polytechnic University of Catalonia, we decided to focus on the prevention of hip fractures in elderly women." Indeed, 80% of hip fractures occur in ageing women, since they are at a high risk of suffering from osteoporosis. At the final CBI gala, the students presented a prototype for a hip-protecting skirt called Inde, which, despite being in its first stage of development, was already working perfectly.

Given the initial promising results, some members of the team decided to go ahead with the project and, since then, two main aspects have been improved. First, the algorithm that controls the inflation has been refined in sensitivity in order to distinguish better actual falls from other everyday activities, such as sitting, that might mimic dangerous situations and therefore trigger an unwanted airbag inflation. The design has also been improved, since elderly people are often embarrassed to wear awkward and visible protective devices. The original skirt has now been transformed into mid-layer shorts that can also be worn by men; the wearability has been improved by reducing the size of all the components; and the comfort has been increased thanks to the fabrics selected. "We hope that these improvements will encourage elderly people to wear our smart shorts, which are designed to protect them while remaining invisible under their clothes," says Jaakko Laukkanen, another member of the team, in charge of the development of the marketing strategy.

The team of Finnish students plans to continue developing the smart hip protector. They have renamed it Smarthip and, over the course of this year, they plan to create their own start-up, to seek investment and to start clinical trials.

Find out more about the Smarthip team and their project on: ***http://cern.ch/go/m6Sg.***

Stefania Pandolfi

LOVE SCIENCE? TELL US ABOUT IT AND WIN!

FameLab is the exciting competition for young researchers that is conquering the world of science communication. Last year, the CERN winner, Lillian Smestad, finished in second place at the international festival. Will you do better?

FameLab is not just another talent show for scientists: its magic formula truly helps real scientists show off their communication skills. Successful candidates will have to impress the judges by giving an original and entertaining three-minute talk. In the words of one of the participants in the Swiss competition: "I enjoyed the fact that it wasn't only a competition, there were also plenty of opportunities to network with other young researchers and to get valuable feedback on our public speaking and science communication skills."

The contestants are judged on the content, clarity and charisma of their talks. The result is an amazing collection of speeches that are inspiring, educational and accurate, despite their brevity.

CERN has been a partner of FameLab in Switzerland since 2012 and in France since 2014. The 2015 FameLab International Final in Cheltenham, UK, was a triumph for CERN as Lillian Smestad, a member of the AEgIS collaboration from the Norwegian Research Council, finished in second place! The competition was tough, with 27 countries participating in the international semi-finals and only nine making it through to the finals. It was also the first year that CERN took part as a "country".

This year, CERN is again running its own FameLab event: if you want to become the new star of science communication, go to the website, read the rules, record a video of your talk (maximum three minutes long!) and send its URL to the organisers before 1 April 2016. The best entrants will be selected to participate in Masterclasses – an important training opportunity with coaches from the BBC and entirely funded by CERN – and will go on to compete for the title of "CERN winner" at the local final on 12 May.

The competition is open to young researchers (up to 35 years of age) with a valid CERN computing account. The winner will go on to participate in the international final that will be held during the 2016 Cheltenham Science Festival.

Enter now! Read the rules and visit the website for more detailed information (**http://cern.ch/go/JZ6R**).

Antonella Del Rosso

Computer Security

I KNOW WHERE YOU HAVE BEEN… SINCE FOREVER!

OK, the "forever" has to be taken with a pinch of salt. But generally speaking, if you were to pass near my office carrying your smartphone, I would be able to find out. It's all thanks to the wireless communication capabilities of your phone…

So how is it done? Every wireless network has a name (SSID: Service Set Identifier). At CERN, for example, you can find "eduroam", "CERN" or "CERNn" (any other SSIDs are rogue and should not be used). Whenever you connect to a wireless network, your phone keeps a record of the SSID it has connected to for future use. If your phone detects a wireless network, it tries every SSID it has in its list until a wireless access point answers positively, in order to establish a connection. And the longer you have your smartphone, the more SSIDs it has connected to around the world and the more it "knows" about where it has been. This is the information I can tap into.

A specialised rogue wireless access point, like the HAK5 "PineApple", can pretend to be any wireless network*. It just sends out a wireless beacon that your smartphone picks up and answers. The rogue wireless access point then records any SSID request your phone tries out from its internal list: "CERN", "StefanWLAN", "GVAairport", "Swisscom", "SBB-FREE", "HyattAtlantaGuest", "AmsterdamRoaming", "ITUwifi"… And, obviously, very often, the SSID name provides sufficient information about where you or I have been. Voilà.

So, how should you protect yourself? First, disable the option to join wireless networks automatically. If you do this this, you will see the SSIDs you can connect to and confirm as required. Alternatively, you can disable your smartphone's wireless capabilities completely and just enable them in places you know and trust. Resetting the network settings would be an even harsher step, but you would need to reconfigure those networks you regularly use… Finally, you could delete the SSID from your iCloud or Google account and reinstall the phone's operating system to get rid of it once and for all. But you would have to be really paranoid to do that, don't you think?

Of course, the deployment of such a rogue wireless access point at CERN would violate the CERN Computing Rules CERN Computing Rules (http://cern.ch/go/c8hc**).*

*For further information, questions or help, check: **https://security.web.cern.ch** or contact us at **Computer.Security@cern.ch**.*

*Do you want to learn more about computer security incidents and issues at CERN? Follow our Monthly Report: **https://security.web.cern.ch/security/reports/en/***

Stefan Lueders, Computer Security Team

Official news

SUMMER WORK FOR CHILDREN OF MEMBERS OF THE PERSONNEL

During the period from 13 June to 9 September 2016 inclusive, there will be a limited number of opportunities for summer work at CERN (normally unskilled work of routine nature), which will be made available to children of members of the personnel (i.e. anyone holding an employment or association contract with the Organization).

Candidates must be aged between 18 and 24 inclusive on the first day of the contract, and must have insurance coverage for both illness and accident. The duration of all contracts will be four weeks and the subsistence allowance will be CHF 1500.- for this period.

Candidates should apply via the HR department's electronic recruitment system: **https://jobs.web.cern.ch/job/11758.**

Completed application forms must be returned by 4 April 2016 at the latest. The results of the selection will be available by the end of May 2016.

For further information, please contact: **Virginie.Galvin@cern.ch** - Tel.: 72855 (**Geraldine.Ballet@cern.ch** - Tel.: 74151)

HR Department

Learning

RF SUPERCONDUCTIVITY AND ACCELERATOR CAVITY APPLICATIONS

We are happy to announce a new training course organised by the TE-VSC group in the field of the physics and applications of superconductors. The course provides an overview and update of the theory of radiofrequency and superconductors:

RF Superconductivity and Accelerator Cavity Applications https://cern.ch/course/?164VAC19

One timetable only:
Tuesday, 8 March 2016: from 2 p.m. to 4 p.m.
Wednesday, 9 March 2016: from 9.30 a.m to 11.30 a.m.
Thursday, 10 March 2016: from 9.30 a.m to 11.30 a.m.
Monday, 14 March 2016: from 9.30 a.m to 11.30 a.m.
Tuesday, 15 March 2016: from 9.30 a.m to 11.30 a.m.
Wednesday, 16 March 2016: from 9.30 a.m to 11.30 a.m.
Thursday, 17 March 2016: from 9.30 a.m to 11.30 a.m.

Target audience: Experts in radiofrequency or solid state physics (PhD level).

Pre-requisites: Basic knowledge of quantum physics and superconductivity.

Duration: 14 hours

Price: 0 CHF

The trainer Professor Ruggero Vaglio (University of Napoli Federico II, Naples, Italy), has 25 years of teaching experience in different universities in Italy, both at undergraduate and graduate level. He has a track record of research experience in the field of the physics and applications of superconductors and oxide electronics.

There are still some places available, but due to the limited number of places it is first come first served. We would be grateful if you could please circulate this information to interested groups/participants in your department. We would like to thank Paolo Chiaggiato for having made this training available to other groups/departments.

Technical Training

MAD-X TRAINING COURSE – 2016

MAD-X 2016 is a annual course series at CERN, within the framework of the 2016 Technical Training Programme on the MAD-X tool used around the world for designing, studying and simulating beam physics for particle accelerators. The lecturer is Laurent Deniau from BE-APB, who has led the MAD team since 2011

Two courses are available:

1. Methodical Accelerator Design MAD-X: (**http://cern.ch/go/6ptj**) Beginners Session: 1-2 March (half day: mornings)
2. Methodical Accelerator Design MAD-X: (**http://cern.ch/go/nCS7**) Intermediate Session: 10-11 March (half day: mornings)

Target audience: Designed for those needing to become familiar with and acquire some practical experience of particle accelerator design with MAD-X.

Pre-requirements: The course requires some prior knowledge of accelerators and beam physics (e.g. optics) as the theory is not detailed.

The series will be composed of 4 half-day lectures, given in English with questions and answers also possible in French. Participation in all lectures is encouraged to allow people to gain maximum benefit from the course.

If you are interested in MAD-X 2016, please discuss with your supervisor. Registration is required, participants must sign up via the links to the training catalogue given above, and limited number of places are available! Attendance will be recorded in personal training records.

Organisers:
Laurent Deniau/BE-ABP
Technical Training/HR-LD

Take note

RECLAIMING UNUSED IPV4 ADDRESSES

As many people might know, the number of IPv4 addresses is limited and almost all have been allocated.

Although CERN has been allocated some 340,000 addresses, the way these are allocated across the site is not as efficient as we would like. As we face an increasing demand for IPv4 addresses with the growth in virtual machines, the IT Department's Communication Systems Group will be reorganising address allocation during 2016 to make more efficient use of the IPv4 address ranges that have been allocated to CERN. We aim, wherever possible, to avoid giving out fixed IP addresses, and have all devices connected to the campus network obtain an address dynamically each time they connect.

As a first stage, starting in February, IP addresses that have not been used for more than 9 months will be reclaimed. No information about the devices concerned will be deleted from LANDB, but a new IP address will have to be requested if they are ever reconnected to the network. Among other things, reclaiming these unused IP addresses will enable us to remove unused cable connections in the network starpoints, thus making space for the new cabling and switches we need to introduce campus-wide Wi-Fi services.

The second stage to reclaim IPv4 addresses will take place in the middle of the year when we move to a single range of dynamically allocated addresses for systems connected to the campus network. By replacing the two separate ranges allocated today (one for fixed addresses and one for portable devices), we can significantly reduce the total number of addresses that have to be reserved for campus devices, thus freeing up addresses that can be used for servers in the Computer Centre. More news about this second stage will be provided nearer the time, including information about how people can request a fixed IP address if necessary.

If you have any questions about these changes please contact the Service Desk who will follow up as necessary. Please note that systems connected to the Technical Network are not concerned by either of these changes.

IT Department

UPCOMING OPENING OF CERN'S NEW MOBILITY CENTRE

On 29 February, CERN's brand new Mobility Centre will open in the Globe car park. The Centre has been created to cater to the transport needs of everyone at CERN, to simplify procedures and to centralise all the transport services on offer: the rental of CERN bikes and cars, the CERN car-sharing scheme and SIXT car rental.

From 29 February onwards, the Mobility Centre in the Globe car park will be the place to go for all your duty travel needs:

- rental of CERN cars (with or without the CERN logo),
- SIXT car rental,
- CERN bike rental,
- distribution of cards allowing the use of CERN's self-service bike- and car-sharing schemes.

That same day, the premises currently housing the Car Pool in Building 130 will become the CERN garage, responsible for:

- upkeep and repairs on CERN bikes,
- minor maintenance work on CERN vehicles (e.g. replacing windscreen wipers, bulbs and fuses, refilling windscreen washer fluid, pumping up tyres, etc.),
- arranging and following up the repair and maintenance of CERN vehicles outsourced to external garages.

IMPORTANT: please note that the car and bike rental service located in Building 124 specifically aimed at users in the PH department will permanently close at **12 noon on 26 February**. All personnel from all departments are henceforth invited to go to the Mobility Centre for rental requests of any kind and to the garage in Building 130 for any repairs.

Mobility Centre – from 29 February
Open Monday to Friday from 8 a.m. to 12 noon and from 1 p.m. to 5 p.m.
Tel.: 72228

Garage, Building 130 – from 29 February
Open Monday to Friday from 8 a.m. to 12 noon and from 1 p.m. to 5 p.m.
Tel.: 72042.

For more information on CERN's transport services following the changes on 29 February, see: ***http://cern.ch/go/klC8****. The website outlining the transport options available at CERN will be updated on 29 February.*

CERN'S PRÉVESSIN SITE POST OFFICE

The post office at CERN's Prévessin site (Building 866) is open Monday to Thursday from 9.30 a.m. to 12.30 p.m. for the following services:

- Sending parcels
- Purchasing stamps
- Sending money: postal money order/ express international money order

Telephone contacts:
Internal: 77071
From Switzerland: +41 22 767 7071
From France: 04 50 40 75 54

EVENT FOR THE LAUNCH OF THE GEORGES CHARPAK POSTAGE STAMP | 26-27 FEBRUARY | PRÉVESSIN SITE

At the end of February, the French post office is releasing a new €0.70 stamp featuring an image of Georges Charpak. CERN is taking part in this event by hosting a temporary post office on the Prévessin site, which will sell the stamp with a special "first day" postmark before it goes on general sale.

Georges Charpak arrived at CERN in 1959 and, in the late 1960s, revolutionised particle detection technology by developing the multiwire proportional chamber. This technique brought particle detectors into the electronic era, setting physicists free from the laborious task of studying photographs one by one. In 1992, he was awarded the Nobel Prize in Physics for his invention. Charpak chambers are still used today in the LHC detectors and have paved the way for the technology in numerous other modern detectors. In the 1990s, Charpak was involved in developing medical applications based on particle detection technology. He was also passionate about education and launched the *La main à la pâte* initiative in 1996, aiming to develop the teaching of science through investigation. The initiative has profoundly altered the way that science is taught in schools in France and has spawned similar schemes all over the world.

The temporary post office will be set up in the new Building 774, notable for its sustainable-development-inspired architecture that complies with the latest thermal insulation standards. As well as being able to buy stamps and related products, visitors will be given another opportunity to see the exhibition *A philatelic history*, which outlines the history of the relationship between CERN and its post office partners. They will also be able to watch clips of interviews with Georges Charpak, take a guided tour of the CERN Control Centre or stop for refreshments in the cafeteria.

Opening times of the temporary post office, exhibition and guided tours:

- Friday, 26 February, 2 p.m. to 5 p.m.
- Saturday, 27 February, 10 a.m. to 5 p.m.

Free admission to the exhibition, films and guided tours of the CERN Control Centre.

Seminars

WEDNESDAY, 17 FEBRUARY 2016

16:00 **Miscellaneous** York ATLAS meeting

SUNDAY, 21 FEBRUARY 2016

08:00 **Schladming Winter School of Theoretical Physics** 54th Schladming Winter School of Theoretical Physics

MONDAY, 22 FEBRUARY 2016

08:00 **European School in Instrumentation for Particle and Astroparticle Physics (ESIPAP)** ESIPAP 2016 - Module 2 - Detector technologies and applications

WEDNESDAY, 24 FEBRUARY 2016

14:30 **ISOLDE Seminar** TBA: Laser spectroscopy of neutron rich Ca
16:00 **Miscellaneous** York ATLAS meeting

FRIDAY, 26 FEBRUARY 2016

11:00 **Detector Seminar** Experience with the Hybrid OPERA Neutrino Detector **Salle Anderson**

MONDAY, 29 FEBRUARY 2016

08:30 **Safety** Radiation Protection - Experts **6959/R-001**
09:00 **inverted CSC** inverted CERN School of Computing 2016 **IT Amphitheatre**
13:00 **Workshop** Besøk fra Amalie Skram VGS, Bergen **Salle Curie**

TUESDAY, 01 MARCH 2016

08:30 **Monthly induction HR** INDUCTION PROGRAMME - 1st Part **Filtration Plant**

Supplemental

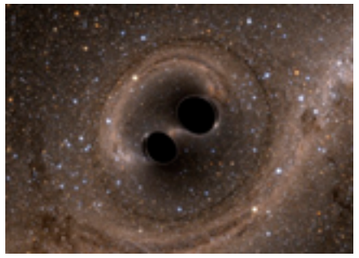
NEWS

FROM THE CERN WEB: GRAVITATIONAL WAVES, MAGIC NUMBERS, INNOVATION AND MORE

This section highlights articles, blog posts and press releases published in the CERN web environment over the past weeks. This way, you won't miss a thing...

The hills are alive, with the sound of gravitational waves

2 February – ATLAS Collaboration



Simulation of two massive black holes merging, based on data collected from the LIGO collaboration on 14 September 2015. (Image: LIGO Collaboration © 2016 SXS)

It's 16:00 CET at CERN and I'm sitting in the CERN Main Auditorium. The room is buzzing with excitement, not unlike the day in 2012 when the Higgs discovery was announced in this very room. But today the announcement is not from CERN, but the LIGO experiment which is spread across two continents. Many expect the announcement to be about a discovery of gravitational waves, as predicted by Einstein in 1916, but which have remained elusive until today…

Continue to read on:
http://cern.ch/go/l7Xf

Has the magic gone from Calcium-52?

9 February – by Harriet Jarlett and James Gillies

The laser launch stations at COLLAPS at the ISOLDE facility, where the new discovery was made. (Image: Samuel Morier-Genoud/CERN)

For the first time scientists have measured the radius of a calcium nucleus with 32 neutrons – indicating that nuclear physics theories don't describe atomic nuclei as well as previously thought.

The study, conducted by CERN scientists at the ISOLDE facility and published in the latest issue of the journal *Nature Physics*, aimed to understand whether calcium has more than two magic numbers.

Continue to read on:
http://cern.ch/go/sT67

Innovation for Change project starts at CERN

2 February

Students and researchers get to work at CERN's IdeaSquare facility as the Innovation for Change project begins. (Image: Joona Kurikka/CERN)

The Innovation for Change project started on 1 February at CERN. The project involves 50 students and researchers, with scientific and engineering backgrounds, who will be working for the next five months in Geneva and Turin. Split into several groups, but with a common goal: to apply the most advanced technology to societal challenges, such as how to achieve a better use of water resources in towns and farming, how to reduce the greenhouse gas emissions or how to increase power generation's efficiency.

Continue to read on:
http://cern.ch/go/nWh9

Last main ring components leave CERN for SESAME

1 February – by James Gillies

The final CESSAMag components left CERN for Jordan. The picture shows a SESAME dipole, supplied as part of the project, being moved to a test bench in February last year.

For close to three years, CERN has coordinated the production of magnets and power supplies for the pioneering SESAME research facility under construction in Allan, Jordan. A third-generation light source, SESAME is the first facility of its kind in the region, and the first intergovernmental research organisation to be established in the Middle East. Bringing together Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority and Turkey, SESAME will address research topics ranging from biological science to cultural heritage after its first beam lines are commissioned later this year.

Continue to read on:
http://cern.ch/go/Hnc8

CERN-recognised experiment to expand scientific capacity

1 February

Scientists from the CERN-recognised KM3NeT collaboration have publicly announced KM3NeT 2.0. KM3NeT 2.0, which is located at the bottom of the Mediterranean Sea. It will continue the work done by the experiment to study neutrino astronomy, but will also expand its scientific reach to study neutrino oscillations.

Continue to read on:
http://cern.ch/go/W9lP

While ALICE is sleeping

1 February – ALICE Collaboration

What is happening at ALICE during the shutdown? In order for the LHC and all the experiments to work properly throughout the year, certain changes need to be made. The right time for that is the year-end technical stop, or YETS. It usually begins in the last working week in December, right after the heavy-ion run, and lasts for about 10 weeks.

Continue to read on:
http://cern.ch/go/k9zB

International Particle Physics Outreach Group (IPPOG) Newsletter

February 2016

Learn about IPPOG highlights in this second number of newsletter!: **http://cern.ch/go/s6zs**

TAKE NOTE

REGISTRATION OF VEHICLES AT THE GEX SOUS-PRÉFECTURE: NOW BY APPOINTMENT ONLY

The Gex *sous-préfecture* has informed CERN that it has taken the following steps in order to reduce waiting times at its counters for the issue of *carte grise* vehicle registration certificates. As of 1 February 2016, you must book an appointment via the website http://www.rdv.ain.gouv.fr/ for all services relating to the registration of vehicles, in particular the:

- change of the holder of a registration certificate,
- issue of a *certificat de situation administrative* (administrative status certificate required for the sale of a vehicle),
- change of marital status (or company name in the case of legal entities),
- change of address,
- change in the technical specification of the vehicle,
- corrections to registration certificates,
- equests for duplicates (loss or theft of registration certificates),
- registration of a diplomatic vehicle (CERN),
- registration of a new vehicle,
- registration of vehicles purchased tax-free in the Pays de Gex free zone (formerly TTW series), and
- import of vehicles (from within the EU, from Switzerland, from outside the EU).

Further information about these services can be obtained by sending an e-mail to **pref-cartesgrises-gex@ain.gouv.fr** or by calling +33 4 50 41 51 51 on Mondays and Tuesdays between 2 p.m. and 4 p.m. and on Wednesdays between 9 a.m. and 12 noon. Please note that appointments cannot be booked by telephone.

WHERE STUDENTS TURN INTO TEACHERS: THE 9TH INVERTED CERN SCHOOL OF COMPUTING

Now in its ninth year, CERN's "Inverted School of Computing – iCSC2016" will take place at CERN on 29 February – 2 March 2016 in the IT Auditorium (Room 31/3-004).

Attendance is free and open to everyone, and will be webcast for those who cannot attend in person. The programme consists mainly of individual lectures on single topics, while some lectures are complementary to each other and can be followed as a series.

Registration is not compulsory, but will allow you to obtain a hard copy of the booklet, which includes the lecture slides and notes (while stocks last).

Programme & registration: https://indico.cern.ch/e/iCSC2016

iCSC2016

This year's programme, selected from a range of CSC2015 student proposals, focuses on challenging and innovative topics, including:

- Template Metaprogramming for Parallel Computing
- Detector Simulation for the LHC and beyond
- Event reconstruction in Modern Particle Physics
- Continuous Delivery and Quality Monitoring
- Multivariate Classification
- Formal Verification
- Shared memory and message passing
- Virtualisation Technologies
- Continuous Integration
- Accelerating C++ applications in Medical Physics

This year's lecturers are:

- Kim Albertsson, University of Technology, Lulea
- Anastasios Andronidis, Imperial College London
- Valentina Cairo, University of Calabria, Arcavacata
- Thomas Keck, KIT Karlsruhe
- Kamil Krol, CERN, Geneva
- Pedro Mendes Correia, University Of Aveiro
- Aram Santogidis, CERN, Geneva
- Daniel Saunders, University of Bristol
- Joshua Smith, Georg-August Universität Göttingen
- Jiří Vyskocil, Czech Technical University

About the iCSC

The Inverted Schools of Computing (iCSC) are part of an annual series of schools organised by the CERN School of Computing (CSC). The iCSC consists of lectures presented over several days by former CSC students, providing advanced training in specialist topics.

The iCSC lectures are specially chosen to create a unique educational programme. They are written and delivered by selected students from the previous year's CSC, who demonstrated a very high level of expertise in a given area during their participation at the annual Main School. So why not find a way to promote and share this knowledge, and turn the students into teachers?

The CERN Schools of Computing

The two other Schools that make up the annual CSC series are:

- The Thematic School (tCSC2016) in May in Split, Croatia
- The Main School (CSC2016) in August in Mol, Belgium

For further information on the CERN School of Computing, see: **http://cern.ch/csc** or email: **computing.school@cern.ch.**

Alberto Pace, Director of the CERN School of Computing

LEARNING

SAFETY TRAINING: PLACES AVAILABLE IN FEBRUARY 2016

There are places available in the forthcoming Safety courses. For updates and registrations, please refer to the Safety Training Catalogue on: http://cern.ch/go/kP8t.

Title of the course EN	Title of the course FR	Date	Hours	Language
Installation Specific Safety				
ALICE - Confined Space	ALICE - Espace confiné	01-Feb-16	09:00 - 12:00	English
ALICE - Underground - Guide	ALICE - Souterrain - Guide	09-Feb-16	14:00 - 16:00	English
		10-Feb-16	10:00 - 12:00	English
CMS - Shift Leader in Matters of Safety (SLIMoS)	CMS - Chefs d'équipe en matière de sécurité (SLIMoS)	05-Feb-16	13:00 - 17:00	English
		19-Feb-16		
CMS - Technical Shifter	CMS - Technical Shifter	12-Feb-16	14:00 - 17:30	English
		26-Feb-16	14:00 - 17:30	English
CMS - Underground - Guide	CMS - Souterrain - Guide	23-Feb-16	14:00 - 17:00	English
ISOLDE - Experimental Hall - Electrical Safety - Handling	ISOLDE - Hall d'expérience - Sécurité électrique - Manipulation	02-Feb-16 23-Feb-16	14:30 - 17:00	English
ISOLDE - Experimental Hall - Radiation Protection - Handling	ISOLDE - Hall d'expérience - Radioprotection - Manipulation			
Chemical Safety (C)				
Respiratory Protective Equipment - Fundamentals	Equipement de protection respiratoire - Fondamentaux	04-Feb-16	08:30 - 12:00	French
Electrical Safety (EL)				
Habilitation Electrique - Electrician Low Voltage - Initial	Habilitation électrique - Électricien basse tension - Initial	17-Feb-16 to 19-Feb-16	09:00 - 17:30	English
		01-Feb-16 to 03-Feb-16	09:00 - 17:30	French
Habilitation Electrique - Non-Electrician - Initial	Habilitation électrique - Non-électricien - Initial	11-Feb-16	09:00 - 17:30	English
		04-Feb-16	09:00 - 17:30	French
Habilitation électrique - Person making Tests in Labs or on Test Bench - Refresher	Habilitation électrique - Personnel réalisant des essais en laboratoire ou en plate-forme d'essai - Recyclage	15-Feb-16 to 16-Feb-16	09:00 - 17:30	English
Fire (FS)				
Fire Extinguisher	Extincteur d'incendie	01-Feb-16	10:30 - 12:00	English
			14:00 - 15:30	
		02-Feb-16	08:30 - 10:00	French
		12-Feb-16	10:30 - 12:00	
Mechanical Safety (M)				
Cryogenic Safety - Fundamentals	Sécurité Cryogénie - Fondamentaux	18-Feb-16	10:00 - 12:00	English

Cryogenic Safety - Helium Transfer	Sécurité Cryogénie - Transfert d'hélium	19-Feb-16	09:30 - 12:00	English
Forklift Truck - Driving - Refresher	Chariot élévateur - Conduite - Recyclage	03-Feb-16	09:00 - 17:30	French
Mobile Elevated Working Platform - Driving - Refresher	Plate-forme élévatrice mobile de personnel - Conduite - Recyclage	02-Feb-16	09:00 - 17:30	French
Overhead Crane - Operator and Slinger - Initial	Pontier-élingueur - Initial	11-Feb-16 to 12-Feb-16	09:00 - 17:30	French
Non-Ionizing Radiation (NIR)				
Magnetic Fields	Champs magnétiques	05-Feb-16	09:30 - 12:00	French
Radiation Protection (RP)				
Radiation Protection - Controlled Area - CERN Employees and Associates	Radioprotection - Zone contrôlée - Employés et associés CERN	08-Feb-16	09:00 - 17:00	English
		17-Feb-16		
		24-Feb-16		
		25-Feb-16	09:00 - 17:00	French
Radiation Protection - Experts	Radioprotection - Experts	29-Feb-16 to 11-Mar-16	08:30 - 17:30	English
Safety Organisation (SO)				
Safety in Projects	Sécurité dans les projets	09-Feb-16	14:00 - 17:00	English
Territorial Safety Officer (TSO) - Initial	Délégué à la sécurité territoriale (TSO) - Initial	09-Feb-16 to 11-Feb-16	08:45 - 17:30	English
Safety and Health (SH)				
Self-Rescue Mask - Initial	Masque auto-sauveteur - Initial	08-Feb-16	10:00 - 12:00	English
		17-Feb-16		
		22-Feb-16		
		04-Feb-16	14:00 - 16:00	French
		15-Feb-16	10:00 - 12:00	
		29-Feb-16		
Self-Rescue Mask - Refresher	Masque auto-sauveteur - Recyclage	04-Feb-16	10:00 - 12:00	English
		18-Feb-16		
		25-Feb-16		
		02-Feb-16		French
		09-Feb-16		
		16-Feb-16		
		23-Feb-16		