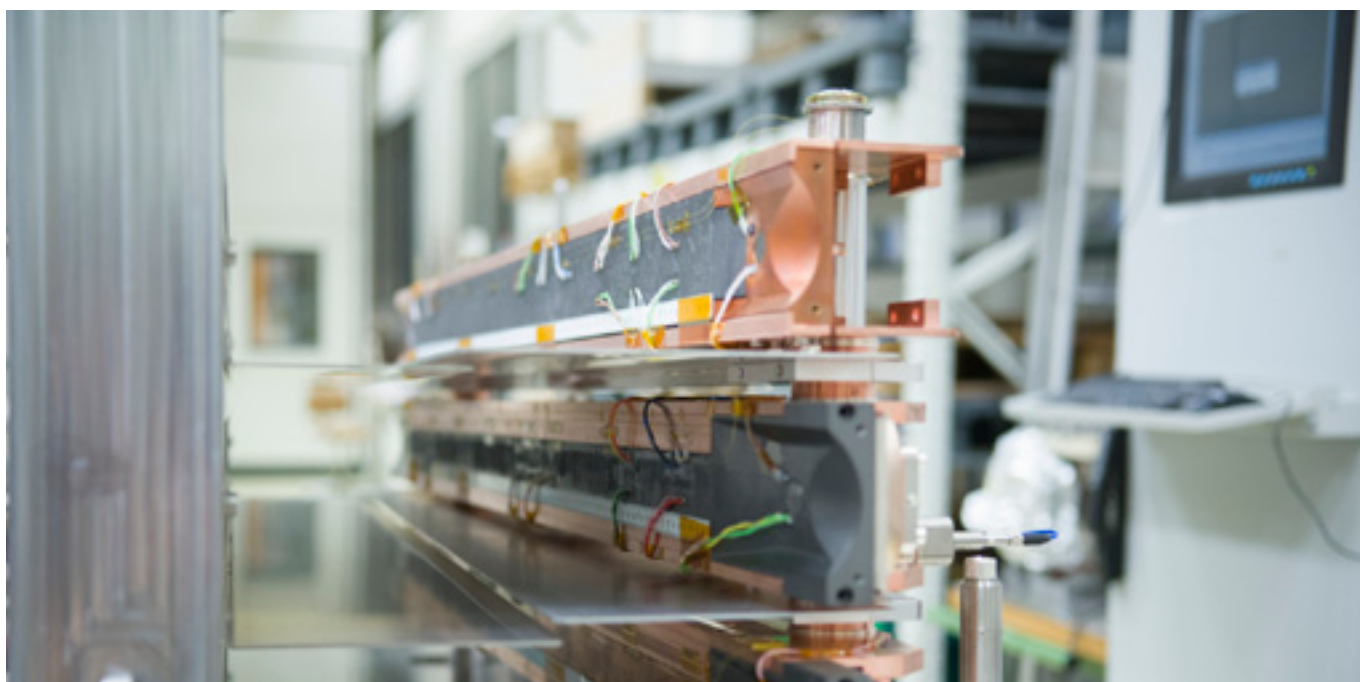


## PUT TO THE TEST

This summer, the HiRadMat (High Radiation to Materials) facility began testing the first HL-LHC collimator jaw prototypes. How they perform when bombarded with high-energy, high-intensity beams will go on to shape the particle accelerators of the future...



The three collimator jaws prior to installation in the HiRadMat facility. Preliminary results have found that molybdenum-graphite is by far the most robust of the novel materials. As copper-diamond is denser and more electrically conductive, it may have applications in the HL-LHC collimation system locations less exposed to beam accidents.

The HiRadMat facility uses SPS beams to test materials and accelerator components in extreme conditions. As accelerators grow more powerful, they require materials that can withstand extreme conditions of temperature and pressure as well as high levels of radiation.

In 2012, in a HiRadMat experiment, six different materials were probed for possible use in collimators and absorbers. The results (see box) saw two standout performances from molybdenum-graphite and copper-diamond. These contenders have moved forward to the next round and three full collimator jaws (one typical LHC jaw and two made with the new materials for the future HL-LHC) are being put to the test in

a dedicated experiment – led by CERN's Mechanical and Materials Engineering (EN/MME) group, with support from several groups from the EN, BE, TE and PH departments. "These novel materials have undergone several years of development and optimisation," says Alessandro Bertarelli, team leader of the "Jaws" experiment. "They are now ready for harsh tests in their final configuration, that of a full-scale collimator jaw for the HL-LHC."

"We are doing detailed studies in different 'accident' situations, and seeing how the three jaws perform," adds Michael Guinchard, who is in charge of the experiment's complex instrumentation and data acquisition system.

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# PUT TO THE TEST

“We have recreated a beam injection error situation – that’s when bunches directly impact the jaw – and, so far, have found the results agree with our simulations. By the end of the year, we hope to validate which of the jaws will be mounted in a HL-LHC collimator prototype for final qualification.”

In addition to the electrical strain gauges, temperature gauges, laser doppler vibrometer and a high speed camera that adorned the 2012 experiment, the experiment team has added a whole new host of instrumentation for 2015. “Most notably, we are using optical fibres to study the jaw while it is being hit by beams,” says Guinchard. The optical fibres are

bonded directly to the surface of the jaws and, when impacted by beam, they deform. This leads to subtle changes in their signal, providing a highly sensitive picture of the jaw’s deformation, ideally complementing information from the electrical strain-gauges.

The team has also installed new ultrasound devices to map the inside of the materials. These small probes are just 8 mm in diameter and can work in high-temperature (350°C), high-radiation (1000 kGy) environments. “Ultrasounds will help us look beyond superficial damage and straight into the heart of the material,” says Federico Carra, who is in charge of HL-LHC collimator mechanical

design and engineering. “Now we can detect the propagation of cracks, internal melting and other non-visible defects.”

Molybdenum-graphite has also garnered attention from outside CERN. “In addition to being shock resistant, it is very light and extremely conductive, and so could be ideal for a broad range of applications,” says Carra. “For example, it could be used in high-end electronics, avionics or even advanced braking systems. We are working with CERN’s Knowledge Transfer group to explore further applications.”

Katarina Anthony

(Continued from page 1)

## The 2012 experiment



The 2012 experiment revealed! From left to right: Inermat 180, molybdenum, Glidcop, molybdenum-copper-diamond, copper-diamond, molybdenum-graphite (three different grades).

HiRadMat’s 2012 experiment tested 12 samples of six materials: Inermat 180 (tungsten compound), Glidcop Al-15 (an alumina-strengthened copper), molybdenum, molybdenum-copper-diamond composite, copper-diamond composite, and molybdenum-graphite composite. After over two years in radiation storage, this summer the team got its first “look” at the results of the experiment. “Although it was clear from the measurements which of the materials were the most promising, we were excited to see the samples in person,” says

Carra. “Now that we have access, we have just launched a comprehensive characterisation campaign of the impacted specimens, involving non-destructive observations by X-rays, ultrasounds and micrography, as well as destructive tests to evaluate the evolution of thermo-mechanical properties.”

# LHC REPORT: OUT OF THE CLOUDS (PART II)

**A large fraction of the LHC beam-time over the last two weeks has been devoted to the second phase of the scrubbing of the vacuum chambers. This was aimed at reducing the formation of electron clouds in the beam pipes, this time performed with 25-nanosecond spaced bunches. This operation is designed to prepare the machine for a smooth intensity ramp-up for physics with this type of beam.**

The scrubbing of the accelerator beam pipes is done by running the machine under an intense electron cloud regime while respecting beam stability constraints. When electron cloud production becomes sufficiently intense, the probability of creating secondary electrons at the chamber walls decreases and this inhibits the whole process. In this way, the scrubbing operation eventually reduces the formation of electron

clouds, which would otherwise generate instabilities in the colliding beams.

The second phase of LHC scrubbing started on Saturday, 25 July, when 25 ns beams were circulated again in the LHC. Trains of 72 bunches from the SPS, which were used to fill the LHC at the beginning, still showed typical signs of beam degradation induced by the electron cloud. The transition to trains of

144 bunches took place only when the quality of these beams had visibly improved. Over the following days, the beam quality continued to steadily improve over time, proving that the scrubbing of the beam chambers was successfully having the desired effect.

By the end of the first week, the number of bunches in the LHC had reached about 2400 per beam, which is the maximum number that can be injected into the LHC in trains of 144 bunches. The quality of these beams at the end of the injection process, however, was still significantly degraded by the electron cloud phenomenon, in part due to the long time needed to complete the injection process. Further scrubbing was

performed during the second week, leading to beam lifetimes of 10 to 20 hours at injection energy, in spite of the continued presence of a dense electron cloud in the machine that was evidenced by the heat load measured by the cryogenics system in the arcs.

During this second scrubbing run, the machine experts also made the first attempts to boost the scrubbing process by injecting into the LHC the so-called “doublet” beams, i.e. pairs of bunches (each bunch is 5 ns apart from the other), spaced by 25 ns from one another. The idea is based on the expected increase of electron cloud production in the LHC using this beam scheme, as predicted by simulations and proved by experiments in the SPS.

Initially, a few machine operation shifts were devoted to the operational development

needed to enable the LHC to “accept” beams with this unusual beam structure. Subsequently, after the main issues had been resolved, trains of doublets (12, 24, 36) were injected into the LHC in the middle of the second scrubbing week. An entire day was devoted to tests to assess the scrubbing potential of this type of beam.

As expected, the doublet beams created much more electron cloud than the 25 ns beam. However, they also produced severe instabilities caused by the electron cloud they produce. Although it was possible to store several trains of 24 widely spaced doublets in the LHC, they were affected by electron cloud instabilities and large losses at the end of the trains that were injected later in the process. To allow doublet beams to be used effectively in the future, a necessary condition is to first reach a more advanced degree of scrubbing

with 25 ns beams. While their use turned out to be premature at the present stage, doublet beams will remain an important weapon to be kept in store for future scrubbing sessions, should these become necessary at a later stage.

The final step of the second scrubbing run consisted of validating the physics filling schemes with 1176 bunches with 25 ns spacing and assessing the machine settings needed to provide these beams. This was successfully completed in the morning of last Saturday, 8 August. The LHC is now ready to take trains of 1176 bunches with 25 ns spacing for physics, and this will potentially increase as the limitations to the speed of the injection process are overcome and further scrubbing is achieved with physics fills.

Giovanni Rumolo for the LHC team

# TOUCH BASE

**In a recent *Nature* article (see: <http://cern.ch/go/8wMF>), the BASE collaboration reported the most precise comparison of the charge-to-mass ratio of the proton to its antimatter equivalent, the antiproton. This result is just the beginning and many more challenges lie ahead.**



CERN's AD Hall, where the BASE experiment is set-up.

The Baryon Antibaryon Symmetry Experiment (BASE) was approved in June 2013 and was ready to take data in August 2014. During these 14 months, the BASE collaboration worked hard to set up its four cryogenic Penning traps, which are the heart of the whole experiment. As their name indicates, these magnetic devices are used to trap antiparticles – antiprotons coming from the Antiproton Decelerator – and particles of matter – negative hydrogen ions produced in the system by interaction with a degrader that slows the antiprotons down, allowing

scientists to perform their measurements. “We had very little time to set up the whole experiment but we eventually succeeded in taking data and we are very happy to already have such good results,” says Stefan Ulmer, spokesperson of the experiment.

For the charge-to-mass ratio measurement, BASE developed techniques to have one particle upstream of the measurement trap and another one downstream of the trap. The charge-to-mass ratio is extracted from the cyclotron frequency of the particles

measured in exactly 120 seconds, which corresponds to one AD cycle. Scientists are able to perform the measurement for each particle – the antiproton and the hydrogen ion – separately and then compare the two measurements, with a very high sampling rate. Any discrepancies in the fundamental properties of matter and antimatter would provide scientists with important clues to understanding physics beyond the standard model. “Our measurement tests one of the most fundamental principles of relativistic field theory, CPT invariance [see box],” says



Ulmer. “Stable matter-antimatter systems such as the proton and the antiproton or bound systems such as hydrogen and anti-hydrogen are particularly attractive, since the stability of these systems allows infinite observation times, and thus, makes high-precision investigations possible.”

The high-precision measurement performed by BASE shows no difference between the proton and the antiproton, with four times higher energy resolution than previous measurements. “This result is only the

beginning of our scientific programme,” says Ulmer. “One fundamental quantity of the proton and the antiproton, the magnetic moment, has not yet been compared with high precision and the physics goal of BASE is precisely this.”

Currently, the magnetic moment of the proton is known at a level of  $3.3 \times 10^{-9}$ , as measured by the BASE collaboration, while the magnetic moment of the antiproton is known at a level of  $4.4 \times 10^{-6}$ , as measured by the ATRAP collaboration in 2012. “We are currently

working on an advanced superconducting magnet system to make the magnetic field of our trap system more homogeneous and at the same time more stable,” explains Ulmer. “We plan to start measuring the magnetic moments within the 2015 antiproton run and hope to produce a ppb measurement by the start of the next long shutdown of the accelerators at the latest.” The collaboration expects to improve the current data by over a factor of 1000.

Antonella Del Rosso

### Did you know?

The final component of the BASE trap system is called the “reservoir trap”. This trap is able to store antiprotons for months on end, allowing the BASE collaboration to continue operating and measuring even

without beam. The results just published in *Nature* are based on 13,000 measurements performed over a 35-day campaign.

### CPT Invariance

All experimental observations so far confirm that the physics processes evolve in exactly the same way if, at the same time, charge is inversed (that is, if we exchange matter with the corresponding antimatter), parity is inversed (a right-handed coordinate system is changed into a left-handed one or vice versa, which is equivalent to looking at

the system in a mirror), and time is reversed (which also reverses the particle momenta). The combined CPT conservation is thought to be a fundamental property of physics laws. Experimental searches for CPT violation, including the recent result from BASE, have yielded negative results.

## THE CHILDREN OF THE NIGHT NEED YOUR HELP

The “Children of the Night” is a colloquial name given to children suffering from *Xeroderma pigmentosum* (XP), a genetic disorder that causes extreme sensitivity to ultraviolet light. When affected individuals are exposed to the sun, their skin undergoes alterations that can quickly develop into cancer. Special equipment has been developed to protect them from UV exposure but it is uncomfortable and very expensive. The association *THE Port* has a project to help the children afflicted by the disorder and their families and is looking for experts who can contribute.

Their homes are kept in darkness and they leave them only at nighttime. During the day they can’t go anywhere without a special suit that protects their skin and eyes from the sun’s rays. Mutant genes in their DNA impair their bodies’ capacity to repair and accurately replicate DNA damaged by UV light. This deficiency causes cancers to develop quickly and, in some cases, can result in neurological abnormalities.

In France, the association *Les enfants de la lune* helps children afflicted with the disorder and their families by participating, among other things, in the design of special equipment to improve their quality of life whilst providing complete UV protection. *THE Port*, an association that organises workshops, known as “hackathons”, devoted to solving humanitarian issues, is appealing for experts able to contribute to a project involving the design of a mask to be worn by the children when exposed to daylight. Such a mask already exists but it is uncomfortable and very expensive. An improved mask (see box) could significantly improve the children’s



Visiting the Synchrocyclotron.

quality of life by allowing them to do more of the things other children of their age simply take for granted.

A group of children suffering from XP visited CERN on Friday, accompanied by their brothers and sisters and members of the Organization (see photo). The visit was organised by the Visits Service, in cooperation with the Medical Service. The itinerary was

carefully chosen to allow the children to discover CERN without exposing them to ultraviolet rays. Following a session of *Drôle de physique*, the active learning workshop for young audiences, which offered them an introduction to the Laboratory, the visitors were given a tour of the Synchrocyclotron.

If you would like to contribute your knowledge and expertise to the project (see box), which

might be the subject of the next Hackathon organised by *THE Port* scheduled for 2 to 4 October, please contact the organisers ([info@theport.ch](mailto:info@theport.ch)).

Antonella Del Rosso

### A mask to turn night into day

The association *THE Port* is looking for experts in several fields, including design, electronics, ventilation, materials and ultraviolet rays, with a view to designing a mask for children suffering from XP.

Help is needed in the design of the following components:

1. a more effective ventilation system to reduce the amount of steam that forms on the screen of the mask, especially in winter, and to

- improve the children’s breathing,
2. a more ergonomic visor,
3. different sizes of mask, i.e. one size for children and another for adults and teenagers,
4. a technical material for the hood,
5. a battery system indicating the run-time of the ventilation system.

## VOLUNTEERS FOR RESEARCHERS’ NIGHT WANTED

Every year, on the last Friday of September, the European Researchers’ Night (see: <http://cern.ch/go/8BWp>) takes place in about 300 cities all over Europe - promoting research in engaging and fun ways for the general public. This year, CERN will be participating once again, hosting dozens of events across the Balexert shopping centre – and we’ll need YOUR help to make the celebration a success.

Please contact [researchers-night@cern.ch](mailto:researchers-night@cern.ch) to sign up!

\*The mock-up tunnel will be removed on 12 September (volunteers needed). 10 September is a public holiday in Geneva.

Katarina Anthony

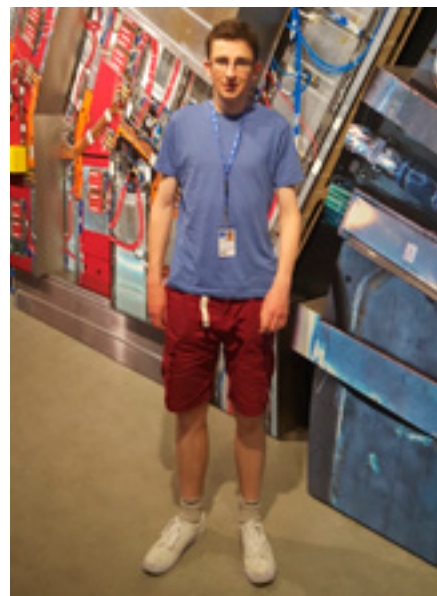


From film screenings and celebrity Q&A sessions to “Ask a Researcher” and build-your-own LEGO LHC events, this year’s Researchers’ Night is going to be jam-packed! The fun will kick off prior to the night itself with a mock-up of the LHC tunnel installed in the central court of the Balexert shopping centre, 8-12 September\*. CERN people will be on hand to speak to shoppers about the LHC, and to encourage them to participate in Researchers’ Night!

The CERN organisers are recruiting volunteers and support staff for Researchers’ Night and the LHC mock-up pre-event. Both English and French speakers are welcome – though a good level of spoken French is highly appreciated. In return: POP T-shirts, food and drinks, and a lot of fun!

# YOUNG EIROFORUM PRIZEWINNER VISITS CERN

On 27 to 31 July, CERN welcomed Paul Clarke, an 18-year-old Irish mathematician who won a CERN EIROforum prize (second place) at EUCYS 2014 (European Union Contest for Young Scientists).



Paul Clarke, visiting the new Microcosm exhibit.

In addition to a €5000 prize, Paul visited the Laboratory and its experiments, meeting and speaking with CERN physicists and computer scientists.

Paul's winning project is entitled "Contributions to cyclic graph theory." As the summary of the project suggests, graph theory is an area of pure mathematics which studies properties of linkages and networks. It has applications in several areas including computing, molecular structure, neuroscience, search engines, engineering etc. This project makes a profound contribution to the study of graphs. It identifies key concepts and provides the methodology to apply them to some long-standing major problems in the subject with great success.

Paul has just finished high school and would like to study mathematics at the University of Cambridge. We wish him all the best!

For more information about the European Union Contest for Young Scientists, see on: <http://cern.ch/go/9IHW>. For more about the 2014 contest and winners, see on: <http://eucys2014.pl/>.

CERN Bulletin

## HARDRONIC FESTIVAL 2015

On 8 August, the Hardronic Festival took place on the terrace of Restaurant 3 in Prévessin. Ten bands from the CERN MusiClub played an assortment of excellent music in a non-stop show that lasted until the early hours. Hundreds of people gathered by the stage, favouring the Hardronic rhythms over the bangs and crackles of the *Fête de Genève* fireworks.

See the slideshow (photos: Viola Krebs):



Stefania Pandolfi

## Computer Security

### ANDROID'S ARMAGEDDON

**"The mobile world's equivalent to Heartbleed" and "Mother of all Android Vulnerabilities" - just two quotes from the media about the new vulnerability affecting all Android devices. While Google has been quick to fix this vulnerability, the big problem has been getting this fix to your Android devices: mobile phone manufacturers and providers are incredibly slow at passing it along...**

What can you do to get this fix? Basically, there's nothing to do but wait. If you run a recent Android operating system (version 2.2 or newer), you are completely exposed. This vulnerability in Android's "Stagefright" media playback engine can be exploited by just one MMS (Multimedia Messaging Service) message and you won't even be able to tell: the exploitation of your Android phone happens during the pre-processing of that message, i.e. in the "door-knocking"-phase. No warning. Nada. Worse, the people who found this vulnerability plan to disclose all details in the upcoming *BlackHat* conference in August, so we can expect the attacker community to jump on the wagon and misuse the vulnerability for their deeds. All they need is your mobile phone number...

Potential defences? Usually we recommend applying the corresponding fix made by Google. However, this requires your preferred

mobile phone provider to adapt that patch to your hardware. And this, as experience has shown, can take a while or might never happen. Alternatively, you can try to re-compile your Android's operating system yourself - but this is a feat recommended only for experts. As a stop gap measure, however, you can disable the MMS service on your phone. Some recommendations along these lines are at the end of this article (on: <http://cern.ch/go/C6tD>).

Thus, interesting times lie ahead. Not only for Androids but also for many other devices. Vulnerability disclosure cycles are getting faster and faster, and patching, i.e. fixing those vulnerabilities, must be done more promptly. With a world full of smartphones, the Internet-of-Things, inter-connected fridges and cars (see our *Bulletin* article on "Our life in symbiosis"), and SmartMeters, a new patching paradigm is needed... Today,

our patching methods are too slow and inflexible (see our *Bulletin* article on "Agility for computers"). Android's Armageddon is just another example.

For further information, questions or help, check: <https://security.web.cern.ch> or contact us at [Computer.Security@cern.ch](mailto:Computer.Security@cern.ch).

Do you want to learn more about computer security incidents and issues at CERN? Follow our Monthly Report: <https://cern.ch/security/reports/fr/monthly-reports.shtml>.

Stefan Lueders, Computer Security Team

## Official news

### 15 SEPTEMBER: ANNUAL INFORMATION MEETING OF THE PENSION FUND

**All members and beneficiaries of the Pension Fund are invited to attend the Annual Information Meeting.**

**CERN Council Chamber  
Tuesday, 15 September 2015  
9:30 a.m. - 11:30 a.m.**

Following a presentation by the Chief Executive Officer of the Fund there will be a Questions and Answers session. Members and Beneficiaries are welcome to send questions in advance of the meeting by post to:

Mr Matthew Eyton-Jones  
"Annual Information Meeting"  
CEO - CERN Pension Fund  
Office 5-5-012, Postbox C23800  
CH- 1211 Geneva 23 - Switzerland

Copies of the 2014 Pension Fund Financial

Statements are already available as a printable PDF on the Pension Fund website (<http://pensionfund.cern.ch/en/financial-management/financial-statements>) and will also be distributed at the annual meeting.

\*Coffee and croissants will be served prior to the meeting as of 9:00 a.m.\*

CERN Pension Fund

### INDIVIDUAL BREAKDOWN OF PENSION RIGHTS AND END OF CONTRACT

**As in previous years, members of the CERN Pension Fund will shortly receive their "Individual breakdown of pension rights" by e-mail.**

In this respect, we would like to remind members that according to Articles II 1.11 - II 1.12 (calculation and payment of the transfer

value) and II 2.02 (retirement pension), several options are possible at the end of their contract (depending on their length of service in the Fund):

- payment of the transfer value into a personal bank account,
- payment of the transfer value into a new pension scheme,
- pension (deferred, anticipated or retirement).

Benefits Service  
CERN Pension Fund



EDUCATION FEES – NEW FORMS

The application forms for the payment of education fees have been updated and are now available in the Admin e-guide (under the “Useful Documents” heading):

- Payment of education fees (including language course fees) – AC12A (form to be used by staff members recruited before 1 January 2007, with the exception of former “local staff”).
- Payment of education fees – AC12B (form to be used by staff members recruited on

or after 1 January 2007, by fellows, scientific associates and guest professors and byformer “local staff” whose contracts started before 1 January 2007).

The Education Fees service will continue to accept the old forms until the end of the current academic year, i.e. until 31 August 2015.

Members of the personnel are reminded that any false declaration or failure to declare information with a view to deceiving others or achieving a gain that would result in a financial loss for CERN or in damage to its

reputation constitutes fraud and may lead to disciplinary action, in accordance with Article SVI 2.01 of the Staff Rules.

For more information (benefits, procedure, reference documents, etc.), please consult the pages of the Admin e-guide relating to the payment of education fees, as well as the corresponding FAQ section, which has also been updated.

Human Resources department  
schoolfees.service@cern.ch

Training

PLACES AVAILABLE - TECHNICAL TRAINING (UP TO THE END OF 2015)

Some upcoming courses (until December) are currently missing participants, required for the courses to take place.

For more details about a course and to register, please go to the Training Catalogue.

PLACES AVAILABLE - TECHNICAL MANAGEMENT COURSES (UP TO THE END OF 2015)

Please find below the courses in the field of technical management scheduled up to the end of 2015 and which have places available.

For more details about a course and to register, please go to the Training Catalogue.

If you need a course that is not in the catalogue, please contact your supervisor, your Departmental Training Officer or the HR-LD group at **Communication.Training@cern.ch**.

Upcoming Technical Management courses (in chronological order)

	Language	Next Session	Duration	Available places
Procurement of supplies at CERN up to 200 000 CHF – e-learning	English	n/a	1 hour	n/a
Achats de fournitures au CERN jusqu'à 200 000 CHF – e-learning	français	n/a	1 hour	n/a
Selecting the right person for CERN	English	17 September	1 day	2
Building up a good Marie Skłodowska-Curie project and writing a successful proposal	English	22-23 September	2 days	13
Introduction to knowledge transfer tools	English	1 October	4 hours	14
Selecting the right person for CERN	English	8 October	1 day	12
Dealing with Media questions!	English	9 October	1 day	10
PMI Project Management	English	12/13 October + 9/10 November	4 days	2
Project Scheduling and Costing	English	13/14 October	2 days	4
Managing by Project GDPM	English	21/22 October	2 days	3
Selecting the right person for CERN	English	19 November	1 day	12
Project Engineering	English	10/11 December	2 days	11

Take note

ROOF RENOVATION OF BUILDINGS 128 AND 129

The roof renovation of buildings 128 and 129 is scheduled to take place from 17 August to 15 October 2015.

During this period, access to the “raw material” workshop will be limited and controlled due to asbestos removal. Collecting your orders directly from the building will be difficult, or even impossible, and urgent requests will be difficult to carry out.

We therefore ask you to create your requests via EDH, so that delivery may be carried out as soon as possible.

Thank you for your understanding.

GS Department

YOUR PRIVATE TRIPS WITH CARLSON WAGONLIT TRAVEL

Your Carlson Wagonlit Travel agency at CERN (building 62) also organizes private trips!

Do not hesitate to contact the “Tourism” team, at your disposal from Monday to Friday from 8:30 a.m. to 4:30 p.m. Phone: 72763. E-mail: **cern@carlsonwagonlit.ch**.

Since 1 January 2015, everyone working at CERN benefits from lower booking fees.

Carlson Wagonlit Travel

SUPERCAR EXPERIENCE | 6 SEPTEMBER | SAINT-JULIEN-EN-GENEVOIS



Supercars at the 2014 experience day. Photo: Kevin Mazzilli.

On Sunday, 6 September, don't miss the fourth Supercars Experience day organised by members of CERN and the Les Amis Porschistes du Léman association.

From 9.30 a.m. to 6 p.m., in the Vitam leisure centre car park (Saint-Julien-en-Genevois), the owners of around 50 supercars (Porsche, Ferrari, Lamborghini, Lotus, Venturi, and more) will be offering passengers rides lasting 10 to 15 minutes. For 10 euros, you can go for a spin in a sports car; for 50 euros, you can choose one of the most prestigious models. All of the money collected will go to the Kumansansa association, which helps disadvantaged children in Zambia.

“Since the first edition in 2012, the event has been a real success with the public, and the money collected each year allows us to put into action our initiatives with children in Zambia,” says François Butin, co-organiser with the Kumansansa association. “On Sunday, 6 September, the local authorities will be providing support in the form of the *Brigade d'Intervention d'Annemasse* (and its infamous blue Mégane RS), who will be on hand to remind the attendees about the dangers of speeding.”

For more background information about this event, see the article in issue 37-38/2014 of the Bulletin.

Owners of prestigious cars (GTI or other sports cars) are invited to sign up to take part via the association's website: **www.kumansansa.org**.

The Supercars Experience day organisers

CONFERENCE: SUPERCONDUCTIVITY, THEORY AND PRACTICAL CHALLENGES OF A QUANTUM PHENONEMON | 25 AUGUST | UNI DUFOUR

On Tuesday, 25 August, **J. Georg Bednorz** (Nobel prize in physics 1987, IBM Research Zurich) and **Louis Taillefer** (physicist and professor at the University of Sherbrooke, Canada, and at the Canadian Institute for Advanced Research) will give a conference on the fascinating theme of superconductivity.

“Superconductivity: theory and practical challenges of a quantum phenonemon”  
Uni Dufour  
Tuesday, 25 August at 7 p.m.

This conference is organized by the Faculty of science of the University of Geneva, as part of the International Congress Materials and Mechanisms of Superconductivity (M2S-2015). Discovered more than 100 years ago, superconductivity remains one of the most fascinating manifestations of the laws of physics, observable only at low temperatures. This phenomenon, which allows the transport of electricity without any loss of energy, leads to various technological applications, for example in magnetically levitated vehicles, in MRI and in the LHC, Large Hadron Collider at CERN.

**J. George Bednorz** will talk about the history of the subject, noting that for many years it was relegated to the realm of technological utopia, since no one imagined that superconductivity could occur at anywhere near room temperature. Dr Bednorz will describe how with the discovery of new classes of superconductors these limitations are gradually being overcome, in the process revolutionizing materials science and engineering.

For his part, **Louis Taillefer** will lead us to the heart of the quantum world, telling a fantastic story of electrons and scientists, featuring very low temperatures, huge magnetic fields and powerful microscopes. He will describe the faith which scientists place in promising new materials, in particular copper oxides that remain superconducting halfway to room temperature. However, Dr. Taillefer will remind us that scientists still do not know how to increase the quasi-magical force which induces the electrons to form pairs, the process which lies at the root of the phenomenon of superconductivity.

For more information, go to: **http://cern.ch/go/q7Tg**.

# Seminars

## TUESDAY AUGUST 25, 2015

11:00 LHC Seminar Seminar on CMS results **Main Auditorium**

## FRIDAY AUGUST 28, 2015

11:00 Detector Seminar The upgrade of the CMS Tracker for HL-LHC  
**Salle Dirac**

## MONDAY AUGUST 31, 2015

11:45 BND Schools BND School 2015

## TUESDAY SEPTEMBER 01, 2015

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

11:00 LHC Seminar Seminar on ATLAS results **Main Auditorium**

