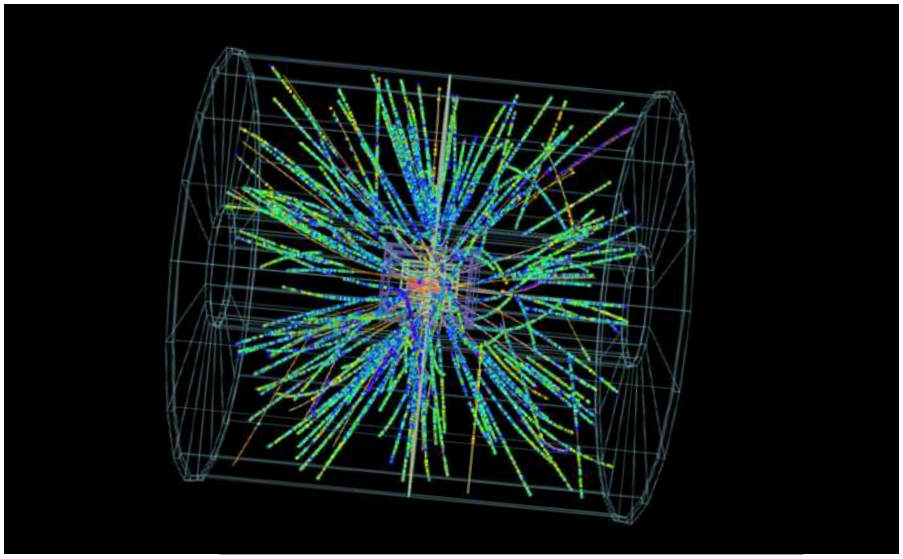
CERN Bulletin

Issue No. 33-35/2013 - Monday 12 August 2013
More articles available at: http://bulletin.cern.ch

THE AMAZING WORLD OF SMASHED PROTONS AND LEAD IONS

When a single proton (p) is smashed against a lead ion (Pb), unexpected events may occur: in the most violent p-Pb collisions, correlations of particles exhibit similar features as in lead-lead collisions where quark-gluon plasma is formed. This and other amazing results were presented by the ALICE experiment at the SQM2013 conference held in Birmingham from 21 to 27 July.



Event display from the proton-lead run, in January 2013. This event was generated by the High Level Trigger (HLT) of the ALICE experiment.

"Jet quenching" is one of the most powerful signatures of quark-gluon plasma (QGP) formed in high-energy lead-lead collisions. QGP is expected to exist only in specific conditions involving extremely hot temperatures and a very high particle concentration. These conditions are not expected to apply in the case of less "dense" particle collisions such as proton-lead collisions. "When we observe the results of these collisions in ALICE, we do not see a strong particle-jet suppression; however, when studying the most violent p-Pb collisions we observe signatures in particle production characteristic of a hydrodynamic nature," explains Mateusz Ploskon from the ALICE collaboration. "Indeed, some of the properties of the correlations of particles produced in proton-lead collisions resemble those associated with the formation of QGP in lead-lead collisions."

More data is needed to resolve the conundrum but in the meantime the physics community is excited as the phenomena observed in proton-lead collisions could have strong implications for our understanding of the QCD – the theory that describes the interactions of strongly interacting subatomic particles. "The p-lead data already provide an extremely useful baseline for the collisions of heavy ions; however, we need more time and more data to understand the intriguing observations from proton-lead collisions – it remains to be seen whether we learn something new about hadronic and nuclear collisions at high energies, and whether these observations have any unexpected implications for our understanding of QGP based on lead-lead collisions," says Mateusz.

(Continued on page 2)

SUMMER AT CERN: A TIME TO MAKE FRIENDS

Summer brings the opportunity for many of us to spend time enjoying the company of our families and friends. It also brings a new generation of young people to CERN – the summer students.

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Published by:
CERN-1211 Geneva 23, Switzerland
Tel. + 41 22 767 35 86 ***Printed by:*** *CERN Printshop*
© 2013 CERN - ***ISSN:*** *Printed version: 2077-950X*
Electronic version: 2077-9518

A word from the DG

(Continued from page 1)

SUMMER AT CERN: A TIME TO MAKE FRIENDS

We often talk about the extended CERN community as a being like a big family, where the common bond is the science we do. The summer students who join us every year are in many ways the newest additions to this family.

This year we have welcomed 276 students in total, with an impressive 133 from non-Member states. As usual they are joining in the learning experience that the programme offers and taking the opportunity to socialise. However, this year they are showing a particular enthusiasm for developing activities together that are linked to spreading the message about CERN.

They've shown great support for the CERN Summer Student Webfest – now in its second year - where they were invited to work in teams and design web apps that will encourage the public to learn more about science, CERN, the LHC and particle physics. The judges were impressed both by the numbers participating and by the range of ideas. A member of the winning team will go to the Mozilla Festival in October, where they'll be able to mix with inventors and thinkers from around the world who are passionate about the web.

So the summer school programme is not only an occasion for students from all kinds of backgrounds to learn together. It's also a chance for them to collaborate in organising their own activities. And it's a great opportunity to meet new people and form friendships, which in many cases last for a long time, with people from all around the world.

Welcome to the family!

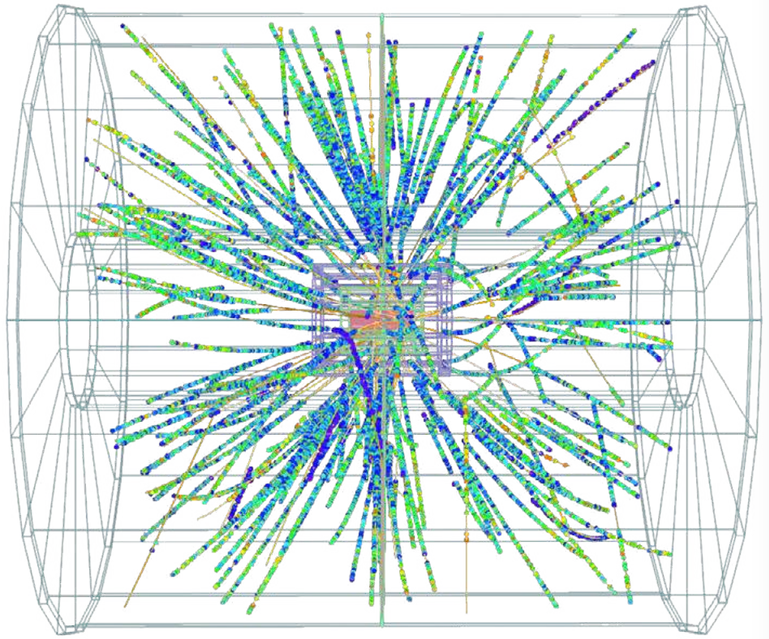
Rolf Heur

THE AMAZING WORLD OF SMASHED PROTONS AND LEAD IONS

(Continued from page 1)

At the "Strangeness in Quark Matter" conference, the ALICE collaboration also presented results on the behaviour of heavy quarks and quarkonia (bound states of charm or beauty quark-antiquark pairs) in proton-lead and lead-lead collisions. "The data we have show that the charm quark travelling through QGP loses significantly more energy (jet quenching) compared to the much heavier beauty quark. These findings, combined with the clear indication that the relatively heavy charm quark flows together with the light quarks and gluons of the QGP, present an important challenge to existing theoretical models. We are exploring the hot and dense matter as we never did before, but we still need more accurate information. Many of the puzzles we are facing today will be clarified in the new LHC runs beyond 2015," concludes Mateusz.

Antonella Del Rosso



LS1 REPORT: THE CRYOGENIC LINE GOES THROUGH THE SCANNER

In spite of the complexity of LS1, with many different activities taking place in parallel and sometimes overlapping, the dashboard shows that work is progressing on schedule. This week, teams have started X-raying the cryogenic line to examine its condition in minute detail.

The LS1 schedule is pretty unfathomable for those who don't work in the tunnels or installations, but if you look down all the columns and stop at the line indicating today's date, you can see that all of the priority and critical items are bang on time, like a Swiss watch. More specifically: the SMACC project in the LHC is on schedule, with a new testing phase for the interconnections which have already been consolidated; preparations are under way for the cable replacement campaign at Point 1 of the SPS (about 20% of the cables will not be replaced as they are completely unused); and the demineralised water distribution line is back in service, as are the electrical substations for the 400 and 66 kV lines.

Last week, teams were able to begin the campaign to X-ray the cryogenic line in a first sector of the LHC. The experts had noticed leaks all along the line, corresponding to the compensators, which should have been leak-tight. To thoroughly investigate these unwanted anomalies, experts have X-rayed the cryogenic line components over a distance of 6 km.

In the other machines: at the AD, unused power supply cables have been removed from the experiment hall and the amplifiers for the stochastic cooling system have been reconnected; at LEIR, the cabling campaign has been completed; at the PS, the new ventilation systems are being installed; at the PS Booster, the teams have succeeded in moving the entire beam line and other equipment closer to the beam dump. The dump itself, 40 years old and made of carbon steel weighing 200 kg, will be replaced in the coming weeks with a block of copper alloy weighing approximately 2 tonnes.

CERN Bulletin

ALICE UPGRADES ITS POWERFUL EYES

The ALICE Photon Spectrometer (PHOS) is a high-resolution photon detector that measures the photons coming out of the extremely hot plasma created in the lead-lead collisions at the LHC. Taking advantage of the long accelerator shut-down, the ALICE teams are now repairing and upgrading the existing modules and getting ready to install the brand-new module in time for the next run. The upgraded PHOS detector will be faster and more stable with wider acceptance and improved photon identification.

The key feature and the main complexity of the ALICE PHOS detector is that it operates at a temperature of -25°C, which makes it the second-coldest equipment element at the LHC after the cryogenic superconducting magnets. Since 2009 when it was installed, the PHOS detector, with its cold and warm volumes, has been immersed in airtight boxes to avoid condensation in the cold volumes. The 10,752 lead tungstate crystals of the PHOS were completely insulated from the outer ALICE environment and its modules were kept at a stable operating temperature of -25°C and at very low humidity. This made access to the PHOS electronics impossible during the three years of ALICE operation. The health of the PHOS systems was monitored by the detector control system, but if anything happened to the front-end cards, they could not be replaced or repaired. It was like a satellite experiment: once launched in 2009, PHOS operated without any human access and was controlled remotely via telemetry.

Several problems and jobs to be done accumulated over the three years of operation. Some front-end electronics cards stopped working and needed repair. At the beginning of ALICE operation in 2010, a readout time of 850 µs was adequate to cope with the low luminosity. However, when the 2011 high-luminosity runs started, it was realised that the readout time was rather long. This readout time will be improved by almost a factor of 30 by changing the readout system. The upgraded readout system should also make the PHOS detector more reliable over the long term.

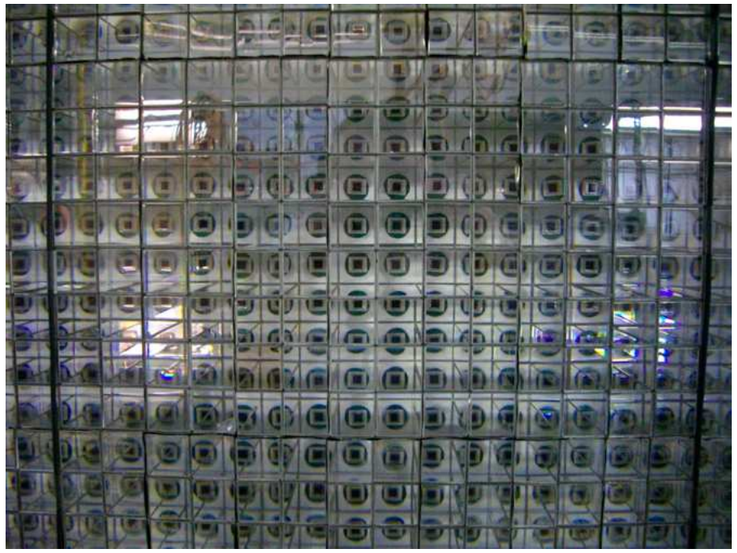
Other subsystems of the PHOS detector such as the monitoring system, the trigger and the cooling system also required maintenance, repair or reprogramming. All these tasks require access to the inner components of the PHOS. The PHOS team is therefore taking advantage of the current long shutdown to repair broken front-end cards, reprogram their firmware and improve the remote control of the internal PHOS systems.

The current long accelerator shutdown is also being used to assemble and commission the new, fourth PHOS module and one module of the Charged Particle Veto detector (CPV).

During the upcoming second run of the LHC, the one CPV and the four PHOS modules will have been installed together with the new electromagnetic calorimeter DCal, which will sit on the new support structure.

The installation of the upgraded PHOS is scheduled for the autumn of 2014. Several months will be needed to complete the integration of the PHOS and CPV detectors into the new ALICE environment, in time for the LHC restart in 2015.

Yuri Kharlov, ALICE Collaboration



PHOS crystal matrix during repair.

A COOL WEB CHALLENGE ON A HOT WEEKEND

The CERN Summer Student Webfest took place last weekend and brought dozens of young web enthusiasts to the Main Auditorium. Fifteen projects were presented in the Friday pitching session and after that the challenge was launched. And the winner is…

… the "Mother hunting" game! An end-state particle explores CERN to try to reconstruct his (or her) family history of decay mothers and ancestors. Along the way, the particle meets famous physicists who teach it physics. A globe sphinx asks physics questions before the player can progress to various stages. Targeted at high school students, the game features very appealing 3D graphics, which accurately reproduce the layout of CERN.

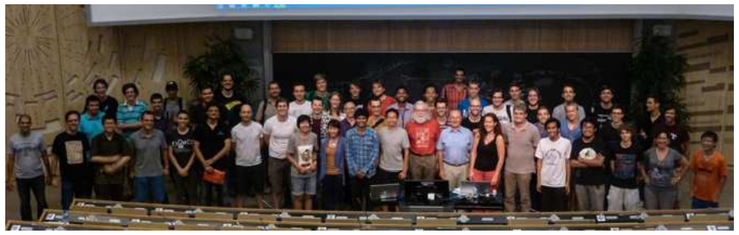
"Mother hunting" was one of the 15 projects presented at the CERN Webfest, an event organised by the Citizen Cyberscience Centre, a partnership involving CERN, the University of Geneva and the UN Institute for Training and Research. "CERN is a natural host for this sort of gathering, sometimes called hackfests," says François Grey, co-ordinator of the Citizen Cyberscience Centre. "Science laboratories like CERN build their success on the creativity of their staff. With the CERN Summer Student Webfest, we give summer students a chance to demonstrate their creativity and software skills, too. This is particularly important in a field like IT where things move extremely fast. Some of these students are on the cutting edge of what can be done with open-source software and data visualization tools."

Five of the six members of the team behind the "Mother hunting" project during a brainstorming session. Image: Jiannan Zhang.

This year's call for project proposals was very successful: the projects ranged from solutions for scientists and developers to collaborate on projects, to games based on physics for kids and students. Twelve projects survived the intensive weekend. "Judging was even more difficult this year than last year. There were many good ideas. I think some of them have real potential to be taken up by the particle physics community," says John Ellis, a long-time theorist at CERN and a member of the Webfest jury.

One of the members of the winning team will be invited to go to the Mozilla Festival that will be held in London in October. After a very busy and intense weekend, the work of the Webfest participants will not stop. Several of them will continue working on their projects and try to encourage open-source communities to join them. If you missed the fun and you want to catch up with one or more of these projects and participate throughout the summer, join the CERN Webfest Facebook group.

Antonella Del Rosso



2013 "Webfesters" group photo. Image: Julie Gould.

I liked… Some quotes from the participating students:

"… that everyone was able to sit down and work on a project together! As summer students, we see each other socially but only get to work with one or two of our peers, if at all. This gave us a chance to build a working relationship and pick up some valuable skills."

"… the chance to work together with people I'd never seen before on a really cool project I could never have started myself."

"… the quality and the variety of different projects."

"… becoming part of a team that self structures and works in total harmony for a nice project! - No civilian casualties observed."

HIGHLIGHTS FROM E-EPS: NEW MILESTONE REACHED FOR THE EUROPEAN XFEL CONSTRUCTION

***e-EPS News* is an addition to the *CERN Bulletin* line-up, showcasing articles from e-EPS – the European Physical Society newsletter – as part of a collaboration between the two publications.**

In June 2013 an important milestone was reached for the European X-ray free-electron laser [XFEL] with the completion of its underground portion. Located in the Hamburg area (Germany), the European XFEL is one of the largest and most ambitious European projects to date. Starting full operations in 2016, the European XFEL is expected to generate intensive, ultrashort X-ray flashes that will open up entirely new areas of research with X-rays that are currently inaccessible.

Organisations from 12 European countries, Denmark, France, Germany, Greece, Hungary, Italy, Poland, Russia, Slovakia, Spain, Sweden and Switzerland are members of the European XFEL consortium, with the Deutsches Elektronen-Synchrotron [DESY] as the main shareholder. The total length of the facility will be 3.4km and the final complex will consist of a tunnel system as well as several buildings on the campus of DESY in Hamburg-Bahrenfeld, at the Osdorfer Born site, and on the main Schenefeld site. The tunnels will open into a 4,500 m^2 underground experiment hall, with dimensions comparable to those of a hockey field.

On the DESY campus in Hamburg-Bahrenfeld, a 2km long accelerator tunnel leads to the Osdorfer Born site. A particle accelerator will be located in this tunnel. Here, electrons will be accelerated to almost the speed of light. Then, the fast particles will be distributed to the so-called photon tunnels, where X-ray light will be produced. For this purpose, the European XFEL will use undulators – periodic arrangements of magnets that force electrons onto a tight slalom course. In the curves, the particles will emit light flashes. The course will be set up in such a way that the light flashes — as in a laser — reinforce each other to an intense pulse. The five photon tunnels end in the underground experiment hall, where the X-ray flashes will be guided to up to 15 scientific instruments.

Producing 27,000 X-ray flashes per second and a brilliance that is a billion times higher than that of the best conventional X-ray sources, the European XFEL will open up completely new opportunities for science. For instance, researchers will be able to map the atomic details of viruses and even film ultrafast processes such as the formation of molecules.

Next year, the construction of the main building for the European XFEL will continue, together with the installation of the infrastructure, scientific instruments and technical equipment. The remaining buildings will be completed in 2015, and the new X-ray laser will start user operation in 2016.

For more information, please visit the European XFEL website : **https://www.xfel.eu/**

Jorge Rivero González

CERN TAKES A BOW AT THE MONTREUX JAZZ FESTIVAL

A year after CERN announced the discovery of a Higgs boson on the world stage, several of the participating scientists found themselves in a new and unfamiliar arena – the renowned Montreux Jazz Festival.

The Canettes Blues Band of the CERN Music Club performing live on the Music In The Park stage at the Montreux Jazz Festival, on 18 July.

CERN and the Montreux Jazz Foundation teamed up this summer to host a series of seminars and performances titled "The Physics of Music and the Music of Physics". The seminars took place in the historic *Petit Palais* and included a variety of presentations on the interplay between science and sound.

Sound artist Bill Fontana kicked off the series by presenting the concepts and methods behind the creation of "sound sculptures". As the current Collide@CERN artist-in-residence, Fontana has been placing microphones and sensors on accelerators, detectors and other objects at CERN to listen in on the rich sounds of our world of physics.

Mark Lewney, a scientist with a PhD in Guitar Acoustics, gave a dynamic and musical presentation entitled "Rock Guitar in 11 Dimensions". A capacity audience enjoyed participating in demonstrations that included vibrating springs, tossed bricks and a variety of musical riffs from Vivaldi to AC/DC, to present concepts ranging from acoustics to string theory.

LHC physicists Lily Asquith (ATLAS) and Piotr Traczyk (CMS) completed the seminar sessions, using music and sound as methods to describe and celebrate the hunt for and discovery of the Higgs boson.

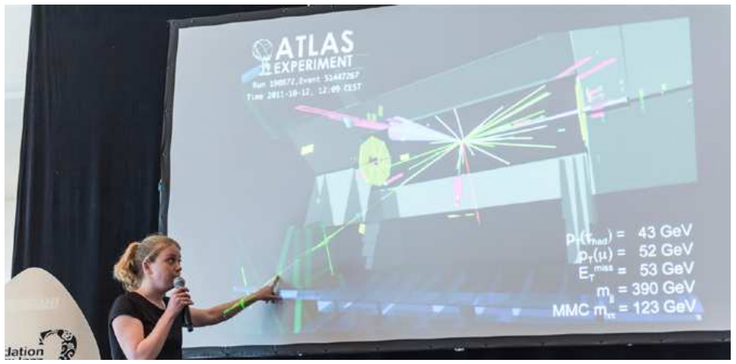
Asquith presented LHC Sound, a project that "sonifies" ATLAS Higgs candidate events by mapping physical parameters of each event to sound qualities, making it possible to "hear" various aspects of the data. Traczyk played his famous guitar, featuring a jigsaw puzzle image of the CMS detector, and used puzzle parts and playing cards to demonstrate the challenge of finding a Higgs boson, as well as the significance of its discovery to the world.

A guitar duet of "Bohemian Rhapsody" by Traczyk and Lewney was met with delighted laughter and applause and brought the seminars to a humorous and celebratory end.

CERN's popularity at the festival became evident later in the afternoon, as large crowds gathered at the Music In The Park stage next to the famous Stravinsky Auditorium to cheer on the CERN bands. The Funky Associates (Jazz Club) and the Canettes Blues Band (Music Club) performed to a full house – well, field – surprising the audience with their musical talent and showmanship, and receiving invitations from the announcers to return next year.

Event organisers Ariane Koek (CERN Cultural Specialist) and Steven Goldfarb (ATLAS Outreach Coordinator) were thrilled by the outcome of the event, especially the very warm and enthusiastic reception of the Montreux audiences, and look forward to fostering a long-term relationship with the Montreux Jazz Festival.

CERN Bulletin



ATLAS physicist Lily Asquith presents the LHC Sound project, which maps sounds qualities to the physical parameters of real Higgs candidate events, to an enthusiastic audience.

The Funky Associates band takes a bow after a successful performance on the Music In The Park stage.

Computer Security

AFTER PRISM & TEMPORA: HOW MUCH MONITORING IS OK FOR CERN?

Edward Snowden's revelations about the "Prism" and "Tempora" surveillance operations, run by the NSA in the US and GCHQ in the UK respectively, created quite a stir! Why has the witch hunt of a whistle-blower dominated newspaper headlines when there appears to have been no outcry over the fact that two countries have deeply penetrated our digital lives for so long?!

With echoes of George Orwell's *1984*, the two agencies collected a huge amount of Internet traffic, tapping into as much data per day as the LHC produces per year. How much privacy are we willing to give up in order to protect ourselves against terrorist attacks? How much monitoring of our Internet activity is justified in order to feel safer? And how much monitoring is OK in the academic environment of CERN?

As the world's largest high-energy physics research lab and the home of the LHC, CERN is a target for hacktivists and cyber-attackers. CERN must pro-actively protect its assets in order to safeguard its operations and its good reputation. While this protection (and incident prevention) is mainly in your hands, since at CERN you are responsible for securing your computers, networks, data, systems and services in the first instance, the Computer Security Team is ready to help you assume this responsibility (see our *Bulletin* articles on ""Security" is YOU!" and "Why "Security" is not ME…".

And protection is just one important facet: detection of abuse, attacks and infiltration is another. Therefore, the Computer Security Team also uses a series of automatic intrusion detection tools. Network-based intrusion detection systems such as "Snort" inspect all network traffic to and from the Internet in real time for malicious patterns. In particular, all web traffic is analysed live and logged for one year in order to facilitate retrospective incident forensics. Further real-time intrusion detection is based on statistical analysis of aggregated network traffic, so-called flows, which are also kept for one year. In parallel, DNS resolution calls, i.e. the process which converts domain names like "www.cern.ch" into machine-readable IP addresses, are compared to a list of malicious domains and, if they match, resolution is blocked automatically.

Aside from network monitoring, host-based intrusion detection tools run on all public Linux clusters, monitoring for suspicious activities like brute-force attempts, strange login patterns, or unusual or dangerous system calls and commands. Centrally provided anti-virus software is used to detect malicious files and programmes on centrally managed Windows PCs. Finally, we constantly scan web pages and web servers for basic vulnerabilities (e.g. those on the "OWASP" list of the ten most critical web application security risks), file systems for unprotected credentials like unprotected private SSH keys or passwords stored in publicly readable files, and all devices connected to our networks for an up-to-date inventory of running computing services.

Although this monitoring gives the Computer Security Team lots of sensitive data, it does not imply that we constantly spy on you and your activities. We never have and never will. First of all, we highly value CERN's Digital Privacy Statement and CERN's planned Data Protection Policy. In addition, the CERN Computing Rules (OC5) strictly define the scope of our work. The aforementioned monitoring tools run completely autonomously and automatically inform the parties concerned. Only upon an initial trigger – a suspicious activity reported to us – will the Computer Security Team take up the baton and try to understand the details of an incident, assess its impact and start incident response procedures. Similarly, we only get involved if there are legitimate requests for access to mailboxes and private files stored on AFS or DFS. The corresponding procedures for accessing such data are precisely defined in a subsidiary rule to OC5.

Thus, we believe we have a good balance between the academic freedom at CERN and our protective monitoring measures. Still, we are interested in your opinion: how much monitoring is OK for CERN? Please write to us at **Computer.Security@cern.ch**, and check our website for further information, answers to your questions or help. If you want to learn more about computer security incidents and issues at CERN, just follow our Monthly Report: : **https://cern.ch/Computer.Security**

Access the entire collection of Computer Security articles : **https://cern.ch/Computer.Security**

Computer Security Team

Take note

ENTRANCE C - NEW AUTOMATIC NUMBER PLATE RECOGNITION SYSTEM

Entrance C (Satigny) is now equipped with a latest-generation Automatic Number Plate Recognition (ANPR) system and a fast-action road gate.

During the month of August, Entrance C will be continuously open from 7.00 a.m. to 7.00 p.m. (working days only). The security guards will open the gate as usual from 7.00 a.m. to 9.00 a.m. and from 5.00 p.m. to 7.00 p.m. For the rest of the working day (9.00 a.m. to 5.00 p.m.) the gate will operate automatically.

Please observe the following points:

- Stop at the STOP sign on the ground
- Position yourself next to the card reader for optimal recognition
- Motorcyclists must use their CERN card
- Cyclists may not activate the gate and should use the bicycle turnstile
- Keep a safe distance from the vehicle in front of you

If access is denied, please check that your vehicle registration number is correctly registered in the database via **http://cern.ch/adams** - My Accesses - Tab "Personal". Contact the **Service-Desk@cern.ch** in case of problems.

GS Department

SUMMER SEASON | CAFETERIA CLOSURES

Please note the following cafeteria closures over the summer season:

Bldg. 54 closed from 29/07/2013 to 06/09/2013.
Bldg. 13: closed from 13/07/2013 to 06/09/2013.
Restaurant No. 2, table service (brasserie and restaurant): closed from 01/08/2013 to 06/09/2013.
Bldg. 864: closed from 29/07/2013 to 06/09/2013.
Bldg. 865: closed from 29/07/2013 to 06/09/2013.

Official news

VACANCY NOTICES FOR POSTS OPENED WITH A VIEW TO THE AWARD OF INDEFINITE CONTRACTS

We are pleased to inform you that the list of posts opening with a view to the award of indefinite contracts is now available on the intranet: https://jobs.web.cern.ch/ic/ld2ic-exercise.

The publication timeframe of the corresponding vacancy notices will be from 9 August to 8 September.

Interviews with candidates by the CERN Contract Review Boards (CCRB) will be held between end September and mid-November. A provisional schedule will be published for your reference on the intranet as soon as it is available.

Should you wish to apply for a post, please note that it is your responsibility to ensure your application is submitted by the deadline of 8 September.

Finally, we would like to invite you to attend one of the information sessions to explain the exercise on any of the following dates:

Date	Time	Place	Language
Tuesday 23 July	14:00-15:00	CERN Training Centre (Building 593) room 11 (Meyrin)	English
Tuesday 13 August	14:00-15:00	Building 864/2-B14 room J.B. ADAMS (Prévessin)	French
Thursday 15 August	14:00-15:00	CERN Training Centre (Building 593) room 11 (Meyrin)	French
Tuesday 20 August	14:00-15:00	Building 864/2-B14 room J.B. ADAMS (Prévessin)	English
Thursday 29 August	14:00-15:00	CERN Training Centre (Building 593) room 11 (Meyrin)	English
Tuesday 3 September	14:00-15:00	CERN Training Centre (Building 593) room 11 (Meyrin)	French

HR Department

Seminars

TUESDAY AUGUST 13, 2013

- **09:15** Summer Student Lecture Programme General **Student Sessions (1/3)** Main Auditorium
- **14:00** TH String Theory Seminar **Holographic excursions beyond hydrodynamics** TH Conference Room
- **20:00** HUPP Group - Turkish students meetings **Next Hupp Meeting**

WEDNESDAY AUGUST 14, 2013

- **09:15** Summer Student Lecture Programme General **Student Sessions (2/3)** Main Auditorium
- **14:00** TH Theoretical Seminar **Towards Natural Tuning** TH Conference Room

THURSDAY AUGUST 15, 2013

- **09:15** Summer Student Lecture Programme General **Student Sessions (3/3)** Main Auditorium
- **11:00** Collider Cross Talk **[TBA]** TH common room
- **14:00** TH BSM Forum **Sichun Sun, TBA** TH common room

SUNDAY AUGUST 18, 2013

- **08:00** CAS - CERN Accelerator School **Advanced Accelerator Physics Course 2013**

TUESDAY AUGUST 20, 2013

- **14:00** TH String Theory Seminar **TBA** TH Conference Room
- **20:00** HUPP Group - Turkish students meetings **Next Hupp Meeting**