CERN Bulletin

Issue No. 22-23/2019-Friday 31 May 2019
More articles at *http://home.cern/cern-people*

LS2 REPORT: THE INSULATION OF THE LHC DIODES HAS BEGUN

Work has begun to improve the electrical insulation of the diodes of the 1232 dipole magnets in the LHC

The electrical insulation of the diode of an LHC dipole magnet is improved (Image: CERN)

Since April, the teams involved in the DISMAC (Diode Insulation and Superconducting Magnets Consolidation) project have been working in the LHC tunnel. Their task is to improve the electrical insulation of the diodes of the accelerator's 1232 dipole magnets, replace 22 of the main superconducting magnets and carry out a series of other activities.

Each dipole magnet is fitted with a diode, a parallel circuit allowing the current to be diverted in the event of a quench. This diode is connected to the associated magnet via a copper bus bar.

Since 2006, nine short circuits involving these diodes have occurred. “These short circuits were caused by residual metallic debris present in the machine since the magnets were manufactured,” explains Jean-Philippe Tock, leader of the DISMAC project. “The heating and cooling phases of the accelerator, particularly during technical stops, result in significant flows of helium. These flows can cause the metallic debris to move, which may then go on to cause short circuits.”

To avoid this happening again, the electrical insulation of the diodes needs to be improved.

(Continued on page 2)

In this issue

Published by:
CERN-1211 Geneva 23, Switzerland writing-team@cern.ch
Printed by: CERN Printshop

CERN-ISSN: **Printed version:** 2011-950X
Electronic Version: 2077-9518

LS2 REPORT: THE INSULATION OF THE LHC DIODES HAS BEGUN

To do this, three steps are followed: remove as much as possible of the metallic debris; insulate the connection between the diodes and the bus bars (known as the half-moon connection); and insulate the bus bars themselves near to this connection.

Although it would not be feasible to eliminate all the debris present in the cold masses of the LHC dipole magnets (which are 15 metres long!), it is nonetheless possible to remove the debris that is within reach of a vacuum cleaner. The specially adapted DISMAC vacuum cleaner, which is fitted with an endoscope and is compatible with the radiation protection requirements, allows the debris located near to the interconnections to be eliminated.

To resolve the problems with the electrical insulation, made-to-measure insulating parts have been developed for the half-moon connections and bus bars in the framework of the DISMAC project. “The design of these parts was very tricky because the insulation must under no circumstances result in a degradation of the electrical properties of the diode connections, particularly their electrical resistance,” continues Jean-Philippe Tock. The insulating parts, which resemble caps, are currently being installed in sector 8-1 of the LHC. A total of 1232 sets of caps must be installed between now and the end of LS2.

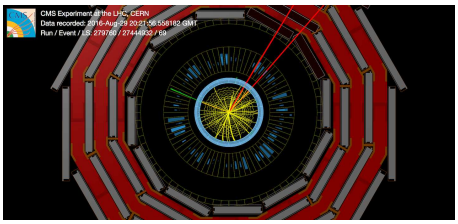
“Since 2017, we have been working a lot on developing and optimising our tools and installation procedures,” says Jean-Philippe Tock, “as the work needs to proceed at a rate of ten diodes per day at the interconnections, which are very restrictive locations in which to work.” The process involves the removal and refitting of the beam loss monitors [BE department], mechanical cutting [EN], opening of the interconnection [TE], cleaning [TE/BE], installation of the insulation [TE], electrical tests [TE], quality assurance tests [TE/BE], welding [EN] and more, so no fewer than 150 people from CERN, external firms and collaborating institutes are working in the LHC tunnel each day as part of the DISMAC “train”. A train? In the LHC? Not exactly... we call it that because the technicians work in a chain, moving from one interconnection to the next.

But not everyone involved in DISMAC is aboard the train. A special team, consisting of 20 people, has another job: the replacement of 19 dipole magnets and three quadrupole magnets, as well as the installation of the cryogenic assemblies for the HL-LHC project and the addition of instrumentation to study the heat loads caused by the beam. This team is also responsible for dealing with major instances of non-compliance. Finally, three specialists are taking care of the maintenance of the LHC's current leads. These provide the link between the copper cables at room temperature and the superconducting cables at 1.9 K (-271.3 °C) in order to transfer the electrical currents of up to 13 000 amps that power the magnets.

Anaïs Schaeffer

CMS HUNTS FOR DARK PHOTONS COMING FROM THE HIGGS BOSON

The CMS collaboration has searched for collision events in which the Higgs boson transforms into a photon and a hypothetical dark photon



A proton–proton collision event featuring a muon–antimuon pair (red), a photon (green), and large missing transverse momentum. (Image: CERN)

They know it's there but they don't know what it's made of. That pretty much sums up scientists' knowledge of dark matter. This knowledge comes from observations of the universe, which indicate that the invisible form of matter is about five to six times more abundant than visible matter.

One idea is that dark matter comprises dark particles that interact with each other through a mediator particle called the dark photon, named in analogy with the ordinary photon that acts as a mediator between electrically charged particles. A dark photon would also interact weakly with the known particles described by the Standard Model of particle physics, including the Higgs boson.

At the Large Hadron Collider Physics (LHCP) conference, happening this week in Puebla, Mexico, the CMS collaboration reported the results of its latest search for dark photons.

The collaboration used a large proton–proton collision dataset, collected during the Large Hadron Collider 's second run, to search for instances in which the Higgs boson might transform, or “decay”, into a photon and a massless dark photon. They focused on cases in which the boson is produced together with a Z boson that itself decays into electrons or their heavier cousins known as muons.

Such instances are expected to be extremely rare, and finding them requires deducing the presence of the potential dark photon, which particle detectors won't see. For this, researchers add up the momenta of the detected particles in the transverse direction – that is, at right angles to the colliding beams of protons – and identify any missing momentum needed to reach a total value of zero. Such missing transverse momentum indicates an undetected particle.

But there's another step to distinguish between a possible dark photon and known particles. This entails estimating the mass of the particle that decays into the detected photon and the undetected particle. If the missing transverse momentum is carried by a dark photon produced in the decay of the Higgs boson, that mass should correspond to the Higgs-boson mass.

The CMS collaboration followed this approach but found no signal of dark photons. However, the collaboration placed upper bounds on the likelihood that a signal would have been seen.

Another null result? Yes, but results such as these and the ATLAS results on supersymmetry also presented this week in Puebla, while not finding new particles or ruling out their existence, are much needed to guide future work, both experimental and theoretical.

For more details about this result, see the CMS website (*https://cms.cern/news/no-sign-dark-light-higgs-boson*).

Ana Lopes

ATLAS SURVEYS NEW SUPERSYMMETRY TERRITORY

New studies from the ATLAS collaboration search for hypothetical "supersymmetric" particles around uncharted corners

The ATLAS detector (Image: CERN)

Experiments have confirmed the Standard Model of particle physics time and again. But the model is incomplete. Among other features, it cannot explain dark matter, or the small mass of the Higgs boson or why the forces acting between particles do not unify at high energies. Give each particle a "superpartner", however, and these three problems could disappear. If such superpartners, which are predicted by an extension of the Standard Model called supersymmetry, exist and are not too weighty, then they could turn up in data from proton collisions collected by experiments at the Large Hadron Collider (LHC).

At the Large Hadron Collider Physics (LHCP) conference, taking place this week in Puebla, Mexico, the ATLAS collaboration reported new searches for three such superpartners around uncharted regions of particle masses.

The Standard Model classifies particles as either fermions or bosons depending on a property known as spin, which can be thought of as the rotation of a system around its axis. The fermions, which make up matter, all have half of a unit of spin. The bosons, which carry forces, have 0, 1 or 2 units of spin.

Supersymmetry predicts that each fermion or boson in the Standard Model has a superpartner with a spin that differs by half of a unit. That is, bosons are accompanied by superpartner fermions and vice versa. So, for example, an electron has a superpartner called selectron and a Higgs boson has a superpartner called a Higgsino; superpartners of bosons get the suffix "ino" and those of fermions get the prefix "s".

In its latest supersymmetry studies, the ATLAS collaboration has sifted through the entire proton–proton collision data collected by the experiment during the LHC's second run, which took place between 2015 and 2018, to look for signs of staus and higgsinos; staus are the superpartners of heavier versions of the electron called taus. Such superpartners are expected to be produced in very little amounts at the LHC and to be unstable, so the ATLAS team searched for them by tracking particles into which they can transform, or "decay".

In the search for staus, ATLAS looked for pairs of staus each decaying into a tau and a hypothetical "lightest supersymmetric particle", which would be invisible and a possible candidate for dark matter. Each tau further decays into composite particles called hadrons and an invisible neutrino. The invisible particles are detected by identifying missing momentum in the collisions: if the combined momentum of the particles that are produced in a proton–proton collision does not match the momentum of the two protons in the direction perpendicular to the axis of the proton beams, it is deduced that an invisible particle carried away the missing momentum.

The collaboration explored an unprecedented range of possible masses for the stau, but did not see any signs of this superpartner in the data. However, it was able to place the tightest limits yet on the stau mass.

Meanwhile, the higgsinos search focused on higgsinos transforming into pairs of electrons or muons with very low momenta; like the taus, muons are also heavier versions of the electron. Such low-momenta particles are very hard to catch, but the collaboration was able to expand this search to the lowest-yet measured muon momenta for ATLAS. Just like for the staus search, this search did not reveal any signs of higgsinos, but the results led to stronger limits on their mass than those previously obtained by ATLAS and by the LHC's predecessor the Large Electron–Positron collider.

For more information about these studies and the mass limits obtained, see the ATLAS website (*https://atlas.cern/updates/physics-briefing/searching-electroweak-susy*).

Ana Lopes

ALICE AND LHCB UPGRADE THEIR DATA CENTRES

In autumn 2018 and spring 2019, new data-centre modules were installed and commissioned at the ALICE and LHCb sites (points 2 and 8 of the LHC)

In the last few months, ten new computing modules have been delivered to ALICE and LHCb as part of their data centres' upgrades for Runs 3 and 4. These modular data-centres are provided by the Belgian company Automation. They will equip CERN with two modern data-centres, which use indirect free-air cooling and are designed to achieve a very respectable energy efficiency with less than 10% overhead energy consumption.

At ALICE, two modules have been delivered, installed and connected; two additional ones will arrive in July 2019. Each module includes 18 racks, representing a total power of 2.1 MW. These will constitute ALICE's new processing farm for use during Runs 3 and 4, and will host up to 750 servers with graphic processing units (GPUs).

At LHCb, four modules have already been delivered. Six modules will ultimately be installed, which will together host 132 racks for a total power of more than 2 MW. The two central modules will be home to the readout system for Run 3, comprised of about 500 servers with special readout cards developed by LHCb and used also by ALICE. Over 14 000 optical fibres enter these two modules from the detector. They bring about 40 terabit/s of raw data and are distributed to the readout servers (each module can host more than 1000 servers). The remaining four modules will host the servers of the high-level trigger farm. LHCb will deploy at least 2000 servers at the start of Run 3 and at least 20 PB of storage.

The flexible and cost-efficient implementation of the data-centre modules made it possible to include head-room in terms of rack space and cooling capacity for future expansions of LHCb's computing infrastructure. During LS2 and Run 3, the modules will be shared with CERN's IT department in order to make efficient use of the facility. CERN IT has already installed 780 servers, relocated from the Wigner data centre, and has put them into operation.

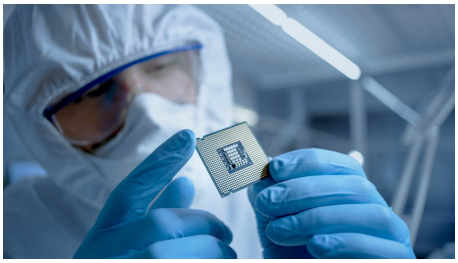
_____

A new computing module at ALICE (Image: CERN)

The four new modules at LHCb (Image: CERN)

ATTRACT FUNDING IS AWARDED TO 170 BREAKTHROUGH PROJECTS

The EU-funded programme announces the successful proposals in its call for projects. CERN scientists are involved in 19 of the projects selected



Many of the projects selected by the ATTRACT initiative involve the development of new sensors (Image: ATTRACT)

The Europe of innovation gathered last week at CERN. The leaders of the ATTRACT[1] initiative announced in CERN's Main Auditorium the 170 breakthrough projects that will receive funding. The ATTRACT project, which is part of the European Union's Horizon 2020 programme, finances breakthrough ideas in the fields of detection and imaging. The selection committee had to choose from 1200 proposals from scientists and entrepreneurs in Europe and beyond. "The 170 breakthrough ideas were selected based on a combination of scientific merit, innovation readiness and potential societal impact," explains Sergio Bertolucci, chair of ATTRACT's Independent R&D&I Committee. The selection committee gave priority to projects pledging to share their results in an open-innovation philosophy in line with the open-science policy promoted by CERN and its partners.

CERN scientists are involved in 19 of these projects. From magnets and cryogenics to electronics and informatics, many CERN teams and technologies were represented. The Laboratory's scientists were able to showcase their unparalleled expertise in the detection of the infinitesimal and in extreme environment technologies. Several of the selected projects involve the design of sensors or signal-transmission systems that operate at very low temperatures or in the presence of radiation. Many of the 19 projects target applications in the fields of medical imaging and treatment or in

the aerospace sector. Others seek industrial applications, such as the high-tech 3D printing of systems equipped with sensors, the inspection of operating cryostats or applications in environmental monitoring.

For the 170 winners, the clock now starts ticking again. They have one year to develop their ideas in the form of products or services, using the initial 100 k€ grant they will each receive, together with the support of innovation and business experts. The results will be presented in Brussels in autumn 2020 and the most promising projects will receive further funding.

More information on the selected projects can be found in the press release (*https://attract-eu.com/170-projects-disruptive-solutions-societal-challenges/*) from ATTRACT.

1- The ATTRACT initiative involves CERN, EMBL, ESO, ESRF, the European XFEL, ILL, Aalto University, the EIRMA association and ESADE. It is led by CERN and funded by the EU's Horizon 2020 programme under grant agreement No 777222.

Corinne Pralavorio

CERN ALUMNI NETWORK TURNS TWO

Celebrate the anniversary at CERN's Restaurant 1 from 3 to 7 June

Map of alumni on the occasion of the 2nd birthday of the network (Image: Fabienne Landua/CERN)

Launched on 8 June 2017, and after just two years of existence, the CERN Alumni Network has now grown to more than 4500 members across the world.

We will celebrate the network's anniversary throughout the week of 3 June, by installing a world map in CERN's Restaurant 1. We have asked our alumni to fill our world with their words, which we will attach to the map where each member of the CERN Alumni Network is located. Our alumni's messages demonstrate the far-reaching and diverse nature of the community.

Pass by and meet the Alumni Relations team on Tuesday lunchtime, from 12.15, to find out more about the network and to read the myriad greetings sent by our alumni as a sign of support and of their strong links with the Laboratory.

CERN Alumni Relations team

CERN'S DIVERSITY ON DISPLAY AT ETHNOPOLY IN MEYRIN

For the tenth year running, CERN took part in Ethnopoly, a life-size scavenger hunt that invites primary school pupils to discover Meyrin's wealth of cultural diversity

(Image: CERN)

On Friday, 17 May 2019, ten and eleven-year-olds from every school in the Meyrin-Cointrin district took part in the “Ethnopoly” intercultural game in the *commune* of Meyrin. The aims? To soak up cultural wealth, promote diversity and bring people together.

Some 70 individuals, institutes and associations opened their doors to groups of children in order to present an aspect of their home culture or a particular feature of the *commune* : paella recipes, how to drape a sari, roadside recycling and... international collaboration at the largest particle physics laboratory in the world!

CERN, which was founded in Meyrin, has had a stand in the Forum Meyrin for ten consecutive games of Ethnopoly. Volunteers present the activities of the Laboratory, where more than 10 000 scientists and engineers of over 100 different nationalities work together to advance research, speaking one common language: science!

VICTORY FOR CERN RUNNERS AT THE GENEVA MARATHON

A CERN team was victorious at the Harmony Geneva Marathon for UNICEF winning the Challenge Entreprise with an average time of less than 3 hours for each runner!

Victorious CERN Geneva Marathon team (from left): Davide Bozzini, Vladimir Loncar, Harry Perkins (Image: CERN)

Despite the fatigue and depletion of energy, three CERN runners used muscular strength and mental force to secure first place for the CERN team in the Challenge Entreprise competition of the 15th edition of the Harmony Geneva Marathon for UNICEF (12 May 2019). The CERN team, made up of Vladimir Loncar, Harry Perkins and Davide Bozzini finished the 42.2km race in a combined time of 8:58:34, a massive 27 minutes faster than the team that came in in second place (HUG). In total, twenty-three teams from regional companies and organisations took part in the Challenge Entreprise race and a record 18,300 runners took to the start lines of the various race formats on offer at the event. In order to prepare for such a race, the three CERN runners explain that they train 4 to 6 times per week, averaging between 40km to 100km. All three had already run several marathons between them.

Furthermore, 20 runners from the CERN Running Club successfully finished in one of the proposed races at this year's Geneva Marathon event, amongst whom, CERN's Steffen Doebert won the half marathon in the Men 50+ category.

Rachel Bray

COMPUTER SECURITY: GO CLEVER! GO CENTRAL!

Running your own computing hardware, installation stack, (web) applications, databases, etc., is just not cost effective and usually you won't be able to commit the required attention to keeping those systems sufficiently secure

In times of scarce resources, time pressure, and the increasing complexity of running software applications, why not follow the herd and go clever? It just doesn't make any sense any more to reinvent the wheel and then just stand back. Running your own computing hardware, installation stack, (web) applications, databases, etc., is just not cost effective and usually you won't be able to commit the required attention to keeping those systems sufficiently secure. Just recently, CERN “lost” two locally managed “Jenkins” instances because they were not kept up to date (see our Monthly Report for details). So, wouldn't it be better to concentrate on the real job and delegate non-core responsibilities to CERN's professionals?

The CERN IT department provides you with a vast catalogue of centrally managed computing facilities, starting with hardware platforms to run your favourite operating system (“Openstack”) or application (e.g. “Apache”, “Grafana”, “Jenkins”, “Nexus”,.NET/Perl/PHP/Python/Ruby or “Rundeck” on “Openshift”). They also allow you to choose from a variety of centrally supported software applications for Windows (“CMF”), Linux (“Linuxsoft”) and Mac (“Mac Self-Service”). This includes dedicated and sophisticated software packages for engineering, mathematics and mechanical design. If you require your own database (“Database-on-Demand”) or need to store vast amounts of data (“EOS”; “CERNbox”) central professional IT services are there to help. And if you are running your own local computer cluster, CERN IT would be happy to discuss with you how to integrate your needs into the services provided by CERN's central computing centre.

This approach may not always provide a 100% match but, if you can compromise, it's a great way not only to reduce the time you spend maintaining layer upon layer of computing hardware and software, but also to relieve you from the need to check for new updates and worry about patches, and to avoid the hassle of implementing all necessary features in order to keep your application well protected and secured. So, take a look at CERN IT's full list of central computing services and/or join the next IT User's Meeting for the most recent news and deployments available to you. And if you need help, you can always contact the CERN IT Consultants to get an opinion on how best to cover your needs with CERN IT solutions.

And the IT department is not the only central entity providing you with professional IT services for free. The Business Computing group in the FAP department provides you with all the financial and HR applications you could possibly need. As does the EP-SFT group for physics computing, simulations and data analysis. And the CO and ICS groups of the BE department, which can provide you with all the necessary control system software you need to run your accelerator or experiment at CERN. Thanks to all of these, you can obtain professionally managed and well secured software, applications and computing services for free, instead of losing time through reinventing the wheel.

Last but not least, we'd also like to say a big thank you to another central service, the CERN Translation and Minutes Service, to whom we are grateful for the English proofreading and translation into French of all our Computer Security Bulletin articles!

Do you want to learn more about computer security incidents and issues at CERN? Follow our Monthly Report. For further information, questions or help, check our website or contact us at Computer.Security@cern.ch.

The Computer Security Team

Official communications

PROCEDURE FOR OBTAINING VISAS FOR SWITZERLAND AND FRANCE – SIGNATURE RIGHTS

In accordance with the Status Agreements with CERN, Switzerland and France facilitate the entry of members of the Organization's personnel on to their territories

In accordance with the Status Agreements with CERN, Switzerland and France facilitate the entry of members of the Organization's personnel on to their territories. Where relevant, detailed procedures for obtaining visas apply.

Within the framework of those procedures, only the following individuals are authorised to initiate the *Note verbale* procedure as well as to sign the Official Invitation Letters and the *Conventions d'accueil*.

- Kirsti ASPOLA (EP – CMO)
- Maria BARROSO LOPEZ (IT – DI)
- Ioana BERTHEREAU (HR – TA)
- Catherine BRANDT (DG – DI)
- Michelle CONNOR (TH – GS)
- Rachelle DECREUSE-MICHAUD (EN – ARP)
- Gaëlle DUPERRIER (EP – AGS)
- Nathalie GOURIOU (EP – AGS)
- Nathalie GRÜB (EP – AGS)
- Cassandra HEIGHTON (BE – HDO)
- Georgina HOBGEN (TE – PPR)
- Cécile NOELS (ATS – DO)
- Tania PARDO (EP – AGS)
- Maria QUINTAS (HR – TA)
- Kate RICHARDSON (EP – AGS)
- Christoph SCHAEFER (IR – REL)
- Emmanuel TSESMELIS (IR – REL)

The French and Swiss Authorities will reject any request signed by a person who is not on this list.

We would like to remind you that in accordance with the memorandum of 7 December 2000 issued by the Director of the Administration, (ref. DG/DA/00-119), "*the Organization shall not request any legitimisation document (or residence permit) or visa from the Host States for persons registered as EXTERNAL*" (people who do not hold a contract of employment, association or apprenticeship with CERN).

We would also like to remind you that those coming to CERN should find out in good timeabout the conditions of entry to Switzerland and France applying to them and ensure that they obtain the requisite visas, where applicable, in the country in which they are habitually resident.

Useful information can be obtained from the Swiss and French diplomatic representations abroad, as well as from the following Web pages:

- Swiss State Secretariat for Migration (*https://www.sem.admin.ch/sem/en/home/themen/einreise/merkblatt_einreise.html*)
- French portal of the Ministry for Europe and Foreign Affairs and Ministry of the Interior (*https://france-visas.gouv.fr/en_US/web/france-visas*)

The Authorities of the Host States have informed the Organization on a number of occasions that they insist upon scrupulous compliance with visa legislation.

Relations with the Host States Service
http://www.cern.ch/relations/
relations.secretariat@cern.ch
Tél. 72848/75152

LAUNCHING THE FELLOWS ENGAGEMENT AND SATISFACTION SURVEY: 4TH JUNE

On 4 June, CERN HR will be launching an engagement and satisfaction survey for all Fellows at CERN

(Image: CERN)

As announced in the DG's speech at the beginning of the year, on 4 June, CERN HR will be launching an engagement and satisfaction survey for all Fellows at CERN.

This survey is an ideal opportunity for all fellows at CERN to share what they appreciate or don't appreciate about their job, team, the Fellowship Programme and CERN as employer, which will help us to identify the strengths and areas to improve for the benefit of the current and future fellows in the Organization.

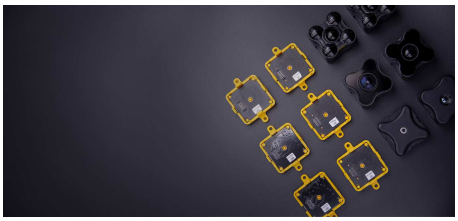
The feedback will be solely processed by Effectory, an external, industry-leading research company which has over 20 years in the employee survey business, and have proven that employees can make significant improvements by sharing their ideas and feedback. Openness and honesty are key, so we have ensured that all answers will be fully anonymous.

Fellows will receive further information including a link to complete this survey on 4 June (closing date 25 June), and results will be presented later this year.

Thank you in advance to all CERN Fellows for their participation!

A NEW SPIN-OFF POLICY TO PROMOTE CERN TECHNOLOGIES

A detailed framework has been set up to support companies that build on CERN technologies



Compact sensor modules developed by Terabee, using CERN Technology. (Image: Terabee)

As part of its knowledge-transfer mission, CERN encourages and supports the creation of companies that seek to build on its technologies and thus make CERN's technological research available to society. In order to clarify how the Organization supports companies established to use CERN technologies (spin-off companies), CERN adopted the CERN Spin-off Policy in August 2018.

The CERN Spin-off Policy complements the Policy on the Management of Intellectual Property (the CERN IP Policy), adopted in 2010.

The CERN Spin-off Policy summarises the framework of CERN's support to spin-off companies, in terms of technology licensing, financial benefits and the use of CERN's facilities and labels. It also details the Knowledge Transfer (KT) group's role and the possible ways in which CERN personnel can be involved in spin-off companies and, by extension, in other types of commercial activity.

In addition to having access to CERN technology, spin-off companies qualify for technical support as well as access to equipment and infrastructure, subject to the availability of resources and the constraints of CERN's international legal status. Access to the technology is granted through licence agreements that can cover different types of IP, as established by the CERN IP Policy.

These licence agreements detail, for example, the financial terms and conditions, the field-of-use limitations and the commitment to ensure all reasonable efforts are made to bring the technology to market. These are clauses that will typically be discussed in greater detail by the spin-offs' teams and the CERN KT group.

Even though spin-offs are not exclusively established by CERN personnel, one way that knowledge transfer happens is through CERN personnel founding or working with spin-off companies. As such, the individual involvement of members of the personnel in spin-off companies should follow the terms of the Spin-off Policy and IP Policy. For example, employed members of personnel (MPEs) and associated members of personnel (MPAs) must ensure that the proposed spin-off-related activity does not give rise to any potential conflict of interest. CERN personnel are also required to disclose to the KT group any equity or other interest they hold in a spin-off company, as well as any financial or other form of compensation they receive.

The steps to obtain the appropriate authorisation for each type of involvement of CERN personnel are detailed in the CERN Spin-off Policy. The KT group may also offer advice on this subject.

The Spin-off Policy also introduces a new leave scheme, whereby an MPE, in the final months of employment with CERN, who can substantiate to the Head of the KT group a realistic and promising business plan for a spin-off company, may request authorisation for special leave for professional reasons to establish or join a spin-off company.

CERN's KT group offers support on this matter, by advising all parties interested in setting up a spin-off company on the terms of CERN's knowledge-transfer policies.

Since CERN provides access to its network of incubators and entrepreneur-minded individuals, the KT group might also be the point of contact for the spin-off companies to the network of Business Incubation Centres (BICs). The network aims at supporting the creation and development of companies in technical fields related to CERN's areas of expertise.

For more information, please consult the CERN Spin-off Policy (https://knowledgetransfer.web.cern.ch/Shibboleth.sso/?target=https%3A//knowledgetransfer.web.cern.ch/sites/knowledgetransfer.web.cern.ch/files/file-uploads/intellectual-property-reference/spin-policy.pdf).

Please contact kt@cern.ch if you do not work at CERN and are interested in consulting these documents.

Daniela Antonio

FAMILY BENEFITS – OBLIGATION TO PROVIDE INFORMATION

Members of the personnel are reminded that, pursuant to Articles R V 1.38 and R V 1.39 of the Staff Regulations, they are obliged to declare the following in writing to the Organization within 30 calendar days:

- any change in family situation (marriage, civil partnership, birth or adoption of a child, divorce or dissolution of a partnership, death of a spouse or dependent child)
- any change in the situation of a dependent child (end of studies, start of paid employment, military service, marriage or civil partnership, change of residence or dependence status of a spouse's child)
- the amount of any financial benefit of a similar nature to those stipulated in the Staff Regulations (e.g. family allowance, child allowance, infant allowance, non-resident allowance or international indemnity) to which the member of the personnel or a family member may be entitled from a source other than CERN.

The procedures to be followed are available in the *Admin e-guide (https://admin-eguide.web.cern.ch/en/procedure/change-family-situation).*

The Human Resources department also remains at your disposal to answer any questions: HR-Family.Allowance@cern.ch.

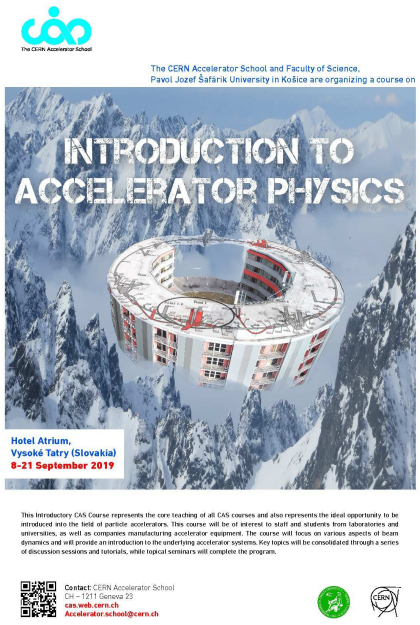
Members of the personnel are also reminded that any false declaration or failure to make a declaration with a view to deceiving others or achieving a gain resulting in a financial loss or loss of reputation for the Organization constitutes fraud and may lead to disciplinary action in accordance with Article S VI 2.01 of the Staff Rules.

HR department
HR-Family.Allowance@cern.ch

Announcements

CERN ACCELERATOR SCHOOL – INTRODUCTION TO ACCELERATOR PHYSICS

8 September – 21 September 2019, Vysoke-Tatry, Slovakia



(Image: CERN)

Registration is now open for the CERN Accelerator School's course on Introduction to Accelerator Physics, to be held in Vysoke-Tatry, Slovakia, from 8 to 21 September 2019.

This Introductory CAS Course represents the core teaching of all CAS courses and also represents the ideal opportunity to be introduced into the field of particle accelerators. This course will be of interest to staff and students from laboratories and universities, as well as companies manufacturing accelerator equipment. The course will focus on various aspects of beam dynamics and will provide an introduction to the underlying accelerator systems. Key topics will be consolidated through a series of discussion sessions and tutorials, while topical seminars will complete the program.

For more information and application, please visit the school website (*https://cas.web.cern.ch/schools/vysoke-tatry-2019*).

WASTE-SORTING SUPERHEROES

Find out more in restaurants and cafeterias from June 3

(Image: Kevin Moles/CERN)

From 3 June, check out the restaurants and cafeterias of CERN for a green metamorphosis. We can all become recycling champions!

Take part through a quiz and a photo competition...

NEW AT, FHR AND RC SECTOR WEBSITES

New websites have been launched for the Accelerators and Technology, Finance and Human Resources and Research and Computing sectors. They aim to facilitate access to information about the sector and departments, their committees, meetings and documentation, and to highlight some events and useful links.

- Accelerators and Technology: https://ats.web.cern.ch
- Finance and Human Resources: https://fhr.web.cern.ch
- Research and Computing: https://rcs.web.cern.ch

4-5 JUNE: HOLLAND AT CERN

On Tuesday 4 and Wednesday 5 June, 25 Dutch firms will be present at CERN.

4 June:

- 11:30 - 13:30: companies will be at their stands
- 13:30 - 14:30: pitches from companies in the Council Chamber (503-1-001)

5 June:

- 11:30 - 13:30: companies will be at their stands

More information can be found here: https://www.bigscience.nl/files/brochures/Holland_at_CERN2019.pdf

SHARING KNOWLEDGE CONFERENCE 2019

The Sharing Knowledge Foundation is holding its annual conference at CERN on 7 and 8 June 2019

The Sharing Knowledge Foundation is holding its annual conference on the theme of “Science for Impact” at CERN on 7 and 8 June 2019.

Scientists, innovators, business leaders and policy makers from Europe, the Middle East and Africa will explore how science can be a vehicle for social and sustainable change. Issues that will be discussed include the European refugee crisis and the role of science and innovation for reconstruction and integration, gender equality in STEM, the importance of open access for scientific innovation and CERN's position as a innovation hub.

Technology and lab-to-market innovations will be at the forefront with presentations and pitching sessions involving startups.

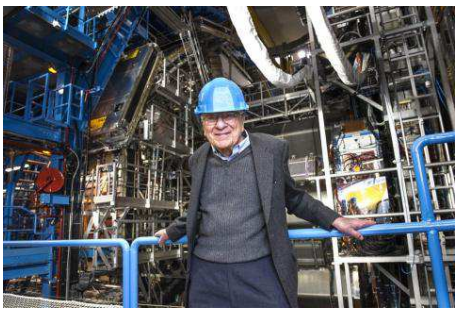
The conference will allow participants to meet some of today's and tomorrow's most prominent science and tech leaders, discover future applications of cutting-edge scientific research and reflect on the role of science for a social and sustainable impact.

Information and registration: https://indico.cern.ch/event/775100/

Obituaries

CERN PAYS TRIBUTE TO MURRAY GELL-MANN

The Nobel laureate, who coined the name “quarks”, passed away on 24 May



Murray Gell-Mann in the underground cavern of the ATLAS experiment during a visit in 2012 (Image: CERN)

Murray Gell-Mann, one of the foremost figures in the development of the Standard Model of particle physics, and who received the 1969 Nobel prize in physics, passed away on 24 May at the age of 89. Gell-Mann was responsible for naming quarks, the elementary particles found within hadrons such as protons and neutrons: he borrowed the term from James Joyce's *Finnegans Wake*.

In 1961, Gell-Mann had introduced a scheme called the Eightfold Way for classifying hadrons, based on the mathematical symmetry known as SU(3), for which he won the Nobel prize. Gell-Mann built upon this work in a new model that could successfully describe – among other phenomena – the magnetic properties of protons and neutrons. But Gell-Mann's model required there to be three new elementary particles, which he called quarks, whose existence he proposed in 1964. Independently, and in the same year, Georg Zweig also described these elementary particles, calling them “aces”.

The existence of quarks was experimentally demonstrated in the late 1960s by experiments at the Stanford Linear Accelerator Center (SLAC). Subsequently, results from the Gargamelle bubble chamber at CERN contributed evidence showing that these particles have charges of 13 or 23 that of an electron or proton, as predicted by Gell-Mann and Zweig.

Numerous experiments at CERN are exploring the theory that describes quarks and their interactions, called quantum chromodynamics. At the Large Hadron Collider (LHC), physicists are still discovering novel combinations of Gell-Mann and Zweig's particles, further testing the Standard Model.

Gell-Mann spent some time at CERN in the '60s, and returned in the late-'70s, when he lectured about the grand unification of the different forces in nature. In his later life, Gell-Mann turned his curiosity and attention to linguistics, among other fields, and led the Evolution of Human Languages programme at the Santa Fe Institute, which he co-founded. He was also the Robert Andrews Millikan Professor Emeritus at Caltech.

Also read:

- Gell-Mann's obituary published by Caltech (*https://www.caltech.edu/about/news/caltech-mourns-passing-murray-gell-mann*)
- Fifty years of quarks (published in 2014) (*https://home.cern/news/news/physics/fifty-years-quarks*)

OLGA BORISOVNA IGONKINA (1973 – 2019)

(Image: Radboud University)

It is with great sadness that we announce the passing of our friend and colleague Olga Borisovna Igonkina, Senior Researcher at Nikhef, and professor by extraordinary appointment at Radboud University Nijmegen.

Olga joined the ATLAS Collaboration in 2006 via the University of Oregon and moved to Nikhef in 2008. In ATLAS she has been a key member of the trigger group since Run 1 where she contributed to many activities with great ideas and enthusiasm: menu coordinator, tau trigger coordinator, B physics and LS trigger coordinator. She was so proud of the L1 topological trigger commissioning success, for which she also received an ATLAS outstanding achievement award in 2018. Physics-wise her passion was lepton flavour violation, in particular in tau decays, which already started well before when she joined BaBar in 2002. At Nikhef her LFV research accelerated thanks to numerous personal grants and she supervised many PhD students and postdocs on this topic. Olga was an enthusiastic teacher and also very active in outreach activities with masterclasses and at Open Days at Nikhef. Recently she organised The 15th International Workshop on Tau Lepton Physics in Amsterdam.

Olga was a great scientist with a memorably strong work ethos. Until the very last moment she gave little room for her illness to affect her work. She will be missed dearly, inside and outside Nikhef.

Her colleagues and friends

Opinions

LESSONS FROM GRANADA

The Granada symposium stimulated much lively discussion on the future of particle physics

Nearly seventy years ago, before the CERN Laboratory was established, two models for European collaboration in fundamental physics were on the table: one envisaged opening up national facilities to researchers from across the continent, the other the creation of a new, international, research centre with world-leading facilities. Discussions were lively, until one delegate pointed out that researchers would go to wherever the best facilities were. From that moment on, CERN became an accelerator laboratory aspiring to be always in the vanguard of technology to enable the best science. It was a wise decision, and one that I was reminded of while listening to the presentations at the European Strategy for Particle Physics Open Symposium in Granada earlier this month. Because among the conclusions of this very lively meeting was the view that providing world-leading accelerator and experimental facilities is precisely the role the community needs CERN to play today.

There was huge interest in the Symposium, as witnessed by the 600-plus participants, including many from the nuclear and astroparticle physics communities, as well as, of course, particle physicists. The vibrancy of the field was fully on display, with future hadron colliders offering the biggest leap in energy reach for direct searches for new physics. Precision electroweak studies at the few per cent level, particularly for the Higgs particle, will obtain sensitivities for similar mass scales. The LHC, and soon the High-Luminosity LHC, will go a long way towards achieving that goal of precision. Indeed, it's remarkable how far the LHC experiments have come in overturning the old adage that hadrons are for discovery and leptons for precision – the LHC has established itself as a precision tool, and this is shaping the debate as to what kind of future we can expect. Nevertheless, however precise proton-proton physics becomes, it will still fall short in some areas. To fully understand the absolute width of the Higgs, for example, a lepton machine will be needed, and no fewer than four implementations were discussed. So, one key conclusion is that if we are to cover all the bases, no single facility will suffice. One way forward was presented by the ACFA Chair, Geoff Taylor, representing the Asian view, who advocated a lepton machine for Asia, while Europe would focus on advancing the hadron frontier.

Interest in muon colliders was rekindled, not least because of some recent reconsiderations in muon cooling. The great and recent progress of plasma wakefield accelerators, including AWAKE at CERN, calls for further research in this field so as to render the technology usable for particle physics.

Methods of dark matter searches abound and are an important element of the discussion on physics beyond colliders, using single beams at CERN.

The Granada meeting was a town meeting on physics. Yet, it is clear to all that we can't make plans solely on the basis of the available technology and a strong physics case, but must also consider factors such as cost and societal impact in any future strategy for European particle physics. With all the available technology options and open questions in physics, there's no doubt that the future should be bright. The European

Strategy Group, however, has a monumental challenge in plotting an affordable course to propose to the CERN Council in March next year.

There were calls for CERN to diversify and lend its expertise to other areas of research, such as gravitational waves: one speaker even likened interferometers to accelerators without beams. In terms of the technologies involved, that statement stands up well to scrutiny, and it is true that technology developed for particle physics at CERN can help the advancement of other fields. CERN already formally collaborates with organisations like ITER and the ESS, sharing our innovation and expertise. However, for me, the strongest message from Granada is that it is CERN's focus on remaining at the forefront of particle physics that has enabled the Organization to contribute to a diverse range of fields. CERN needs to remain true to that founding vision of being a world-leading centre for accelerator technology. That is the starting point. From it, all else follows.

Eckhard Elsen

Ombud's corner

2018 OMBUD'S REPORT

I recently presented the 2018 Ombud's Report to the CERN Management and then to TREF, and I'd like to outline the main points for you here.

Around a hundred people per year have visited the Ombud's Office since it opened. In 2018, 104 of our colleagues (i.e. around 1.8% of CERN's personnel) came to see me. Just under half were staff members, on LD or IC contracts. It's worth noting that the number of fellows, students and users who have contacted the Ombud has increased over the years (as their numbers have increased at CERN). In 2018, as in previous years, the number of women who consulted me was two and a half times higher relative to CERN's female population than the number of men.

As in previous years, disputes with line management represented the majority of cases discussed. Some visitors complained of unexpected and apparently random role changes, while others cited problems with micromanagement and lack of autonomy.

In joint second place were disputes between colleagues and complaints about the working environment. Disputes between colleagues often centred around a perceived lack of respect, withholding of information and, in a small number of cases, aggressive or threatening behaviour.

In 2018, a few cases of sexist or sexual harassment of colleagues were brought to my attention. Other members of the personnel expressed concern about the general situation of equal opportunities between men and women.

Some fellows and students felt they might have been able to contribute more meaningfully to their section's work, while in other, rarer cases, they felt too much was being asked of them with respect to their level of experience and knowledge.

Conclusion

For several years now, significant efforts have been made to support supervisors in their challenging role. The least experienced supervisors need role models to help them in their tasks and it's important that the Organization should continue to encourage line managers to take on this role.

Regarding equal opportunities, CERN has a long tradition of commitmentto diversity and inclusion in the workplace, notably through its Diversity programme. Although women do occupy a number of key posts at CERN, in general, career progression for women in STEM (science, technology, engineering and mathematics), and particularly in physics, remains an area of concern. It's therefore important not to become complacent.

Due to their increasing numbers, particular attention has been paid to fellows and students over the last few years, which is beneficial.

Don't hesitate to make use of CERN's many available support structures.

Pierre Gildemyn

If you'd like to comment on any of my articles or suggest a topic that I could write about, please don't hesitate to e-mail me at Ombuds@cern.ch.