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With FLOTUS, aerosol precursor vapours age more quickly

FLOTUS is a new addition to the CLOUD experiment at CERN. By accelerating the oxidation of organic vapours before injecting them into the CLOUD chamber, FLOTUS allows more complex atmospheric phenomena to be studied

FLOTUS (FLOw TUbe System) is the new annex of the CLOUD experiment (this photo was taken when it was installed in November 2022). This 60-litre quartz chamber allows organic vapours to be aged by the equivalent of several days in the atmosphere before being injected into the main CLOUD chamber. (Image: CERN)

Located at the heart of CERN's East Area, the CLOUD experiment studies interactions between cosmic rays (simulated by a pion beam from the PS) and aerosol particles present in Earth's troposphere (the lowest layer of the atmosphere) in order to understand better the mechanisms at play in the formation of aerosols and the clouds they seed. Since the industrial revolution, human activities have significantly increased the quantity of aerosol particles in the atmosphere, but they remain persistently uncertain in global climate models, giving rise to a wide range of projections of climate warming.

The CLOUD experiment simulates selected regions of Earth's atmosphere. The 26 cubic meter stainless steel chamber is filled with humidified ultra-pure synthetic air, made from evaporated cryogenic nitrogen and oxygen into which the experimenters inject various vapours found in the atmosphere in minute concentrations (ozone, sulphur dioxide, nitric acid, ammonia, organic vapours, iodine, etc.).

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By adjusting parameters such as vapour concentrations, temperature, humidity, ultraviolet illumination and cosmic rays, the experimenters can simulate and very precisely control the atmospheric conditions they wish to study.

Due to losses of vapours and particles when they come into contact with the wall of the CLOUD chamber, the experiments can only last a few hours. "This gives us time to study many mechanisms like the role of iodic acids in the formation of aerosols [study performed in 2021], but not to take into account the slow transformation that some vapours undergo in the atmosphere over the course of a few days," says Jasper Kirkby, spokesperson of the CLOUD experiment.

And that is where FLOTUS (FLOw TUbe System) comes in. This new, 60-litre quartz chamber, which was added to the CLOUD experiment in November 2022, allows organic vapours to be "pre-aged" before being injected into the main CLOUD chamber, where their ability to form and grow aerosol particles can be studied in detail. "Organic vapours present in the atmosphere may pass through several oxidation steps in the presence of the sun's beams, ozone, nitrogen oxide etc. This process can occur over the course of several days," Jasper Kirkby explains. "With FLOTUS, we can accelerate this oxidation process to the point where we can reproduce, in the space of a minute, the level of oxidation reached in several days in the atmosphere."

FLOTUS was commissioned in April during a four-week technical run, and it achieved its design performance. "Building and installing FLOTUS was a huge technical challenge, brilliantly executed by the EN and EP departments", Jasper Kirkby adds. "Operating FLOTUS and CLOUD together has doubled the complexity of the experiments, making our research work all the more fun!" The next run, this time for physics, will be in the autumn. Watch this space.

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To find out more about the operation of CLOUD (before the arrival of FLOTUS), check out this video: https://videos.cern.ch/record/2154271.

Anaïs Schaeffer

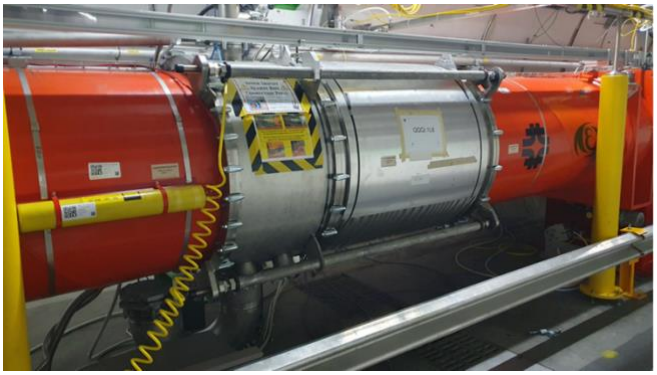
Accelerator Report: Leak repaired, cooling in progress

In our last Accelerator Report, we referred to a quench of an inner triplet magnet located to the left of Point 8 (LHCb) that had caused a small leak in the insulation vacuum of the inner triplet assembly. This vacuum barrier is crucial for preventing heat transfer from the surrounding LHC tunnel to the interior of the cryostat. We now know that the quench was triggered by the quench protection system (QPS) following an electrical disturbance on the general electricity grid.

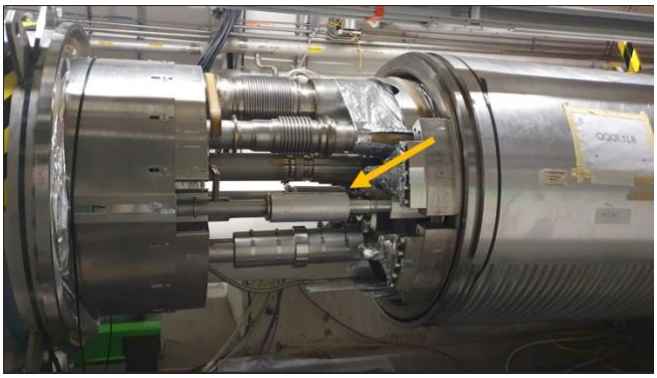
The insulation vacuum reached atmospheric pressure on the morning of Monday, 17 July, but it took another week to bring the magnets to room temperature, ready for a possible intervention. During that week (week 29), the cryogenic and vacuum teams identified the source of the leak, located between the magnet cold mass and the insulation vacuum. The size of the leak was estimated at approximately 1 mm^2, sufficiently large to "hear" the sound of the gas leaking out.

Now, before I go any further, let me remind you what an inner triplet is. Before they enter an experiment detector, particles must be squeezed closer together in order to increase the collision rate – this is the job of the inner triplets. Three quadrupoles are used to create an inner triplet. There are eight inner triplets in the LHC, two on either side of the four large LHC detectors: ALICE, ATLAS, CMS and LHCb.

Equipment to measure sensitive vibrations was installed in the inner triplet in question, in the interconnections between the quadrupoles, which indicated that the probable location of the leak was at the interconnection between the Q1 (the closest quadrupole to the LHCb interaction point) and the Q2 quadrupoles.



The interconnection between the Q1 (left) and Q2 (right) magnets when closed. (Image: CERN)



The same interconnection when opened, revealing the various lines for cables, helium and beam vacuum. The arrow indicates the location of the leak. (Image: CERN)

In parallel, the cryogenic team drew up various possible recovery scenarios. The standard procedure would have implied the full warm-up to room temperature of the entire sector, in which case more than three months would have been required to bring the sector back to beam conditions. So an alternative, less restrictive, scenario was developed: the sector would be left to drift up slowly in temperature with all liquid helium removed from the magnets and all cryogenic lines depressurised for a limited duration intervention – estimated at 10 days maximum.

Just one week after the incident, the magnet and vacuum teams opened the large bellows around the interconnection between Q1 and Q2. The exact location of the leak was identified that same day: it was located on a flexible bellow installed on one of the lines between the two magnets. The decision was taken to perform an in-situ intervention to replace the faulty bellow with a spare one.

Easier said than done… as this type of bellow is delivered as an integral part of the triplet magnets. A completely new in-situ welding strategy had to be developed as the work progressed. Despite challenging working conditions for the welders, the new bellow was in place and the absence of a leak confirmed by the end of the week. On the evening of Friday, 28 July, the interconnection was closed again.

Over the weekend, the vacuum team successfully pumped down the insulation vacuum. After a final high pressure and electrical integrity test, cool-down started on Tuesday, 1 August, just in time to avoid a complete warm-up.

As I write this article, cool-down is in progress. Despite the challenges and the unprecedented nature of the incident, we succeeded in limiting its impact on the run: LHC beam operation is expected to resume in the first half of September, in time for the 2023 LHC ion run. Once again, this was made possible by the hard work and collaborative spirit of all the teams involved.

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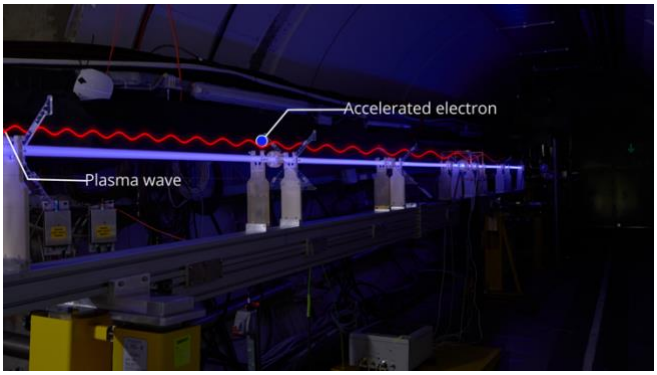
Take a look at the various stages of this incredible operation in pictures* (https://home.cern/news/news/accelerators/lhc-leak-repair-short-photostory)*, and for full technical details, watch this video interview (https://videos.cern.ch/record/2298375) with Paul Cruikshank, from the TE department.

Jorg Wenninger

AWAKE introduces a stronger wave to accelerate particles

Plasma accelerator AWAKE has tested scalability and is all set to begin its second phase of data taking with an upgraded plasma source



A glimpse of the recently tested discharge plasma source, which is a potential candidate for AWAKE after Long Shutdown 3. (Image: CERN)

"Plasma wakefield acceleration is like surfing," says Edda Gschwendtner, leader of the AWAKE accelerator R&D project at CERN.

AWAKE is all set to begin its second phase of data taking on 31 July – with a brand-new plasma source. While various future collider proposals aim to increase the size of an accelerator to increase the energy of the particles, AWAKE would help to figure out the opposite: how to shrink the size of a particle accelerator while still achieving higher energies, using a new way of accelerating particles.

"Imagine a boat on a lake and surfers waiting for a wave. The boat passes by the surfers and creates waves, the surfers jump on the wave and also get accelerated. We do the same in plasma wakefield acceleration. We have plasma (the lake) in which the beam (the boat) drives waves, and then we inject particles (surfers) on the waves to get accelerated," explains Gschwendtner in her TEDxCERN talk.

A plasma wakefield is a type of wave generated by particles travelling through a plasma. AWAKE sends proton beams from the Super Proton Synchrotron (SPS) through plasma cells to generate these fields. A second beam – the "witness" electron beam (the surfers) – is then accelerated by the wakefields, gaining up to several gigavolts of energy. Striving to demonstrate the benefits of plasma wakefield acceleration over conventional technologies such as radiofrequency cavities, AWAKE has implemented new plasma-source prototypes and approaches.

AWAKE's new rubidium vapour plasma source is 10 metres long, similar to that used in previous runs, but this time it introduces a density step that allows stronger wakefields to be obtained. This new plasma source is split into segments whose temperature can be controlled independently along its entire length.

The old plasma source was removed from the tunnel a few months ago to welcome the upgraded version, which was developed jointly by the Max Planck Institute for Physics in Munich, Germany and Wright Design in the UK. This also offered a unique opportunity to test another prototype: the discharge plasma source, developed by IST-Lisbon in Portugal and the Vacuum, Surfaces and Coatings group at CERN. The discharge plasma source is a potential candidate for AWAKE's operation after CERN's third long shutdown. It has the potential to be scaled up beyond 10 metres to achieve multi-stage acceleration like in conventional accelerators, while remaining considerably shorter overall.

"The longer the plasma source, the higher the energy of the witness beam would be," says Alban Sublet, an applied physicist in the Vacuum, Surfaces and Coatings group, on the advantage of a scalable plasma source. "We managed to perform a variety of measurements during the test with the discharge plasma source, for example we investigated how different gases such as helium or xenon, different gas pressures and different plasma lengths affect the proton beam and the wakefields."

Both the rubidium vapour source and the discharge plasma source aim to achieve the same properties of the plasma but in different ways: by laser ionisation for the rubidium source and by pulsed direct current (DC) discharge in different gases for the discharge plasma source. Thanks to its clear scientific roadmap, AWAKE has already come a long way and is looking ahead to its first particle physics applications for the next decade.

“The AWAKE experiment started in 2016 and the first two years were proof of concept. We managed to show that indeed we can use the proton beam from the SPS to drive the wakefield in a 10-metre-long plasma source. We also managed to accelerate electrons already to a very high energy. We were very happy about that,” says Gschwendtner. “Now we are moving on to the next phase in the experiment, in which we want to demonstrate that we can accelerate electrons to high energies and control the beam quality. This is very important because this is what we need for a real accelerator for particle physics applications.”

Chetna Krishna

CERN Science Gateway: science and fun for kids (and everyone else)

A large number of visitors are expected at CERN Science Gateway from this autumn, and the youngest ones will be given special treatment

A wide range of workshops will be offered in the educational labs at CERN Science Gateway. Find out more at: https://visit.cern/labs. (Image: CERN)

CERN Science Gateway will soon be opening its doors to the general public, and we're already looking forward to the excitement that will reign there: a huge number of visitors, of all ages and from all walks of life, are expected. Among them, the youngest visitors, aged 5 to 19, will be given special treatment: a tailor-made educational programme awaits them at Science Gateway.

“Many of the educational activities on offer have been developed especially for Science Gateway,” explains Julia Woithe, CERN Science Gateway education labs coordinator. “Before that, the S'Cool LAB, CERN's hands-on particle physics learning lab and education research facility [which closed its doors in 2022 in anticipation of the opening of Science Gateway], could only accommodate young people aged 15 and over. We therefore had to adapt and create activities for children aged 5 to 15 – a colossal task, but our team rose to the challenge with great enthusiasm.” Some school groups in the local area, as well as the children from the *Jardin des Particules* (CERN's school) – a particularly discerning audience! –, were invaluable in fine-tuning the activities.

Educational activities (for kids and everyone else) fall into three main categories: lab workshops, science shows and online content.

The labs

On the first floor of the reception building, two laboratories for up to 24 participants each will allow school groups, families and individual visitors to conduct hands-on experiments supported by CERN guides. School groups will be able to take part in various workshops lasting between 45 and 90 minutes, in many different languages and adapted to the age of the participants. The aim is to encourage teamwork and to make links with authentic research challenges and objects highlighted in the various Science Gateway exhibitions.

Science shows

Scheduled in the Science Gateway auditorium or in the Globe of Science and Innovation, the science

shows are aimed at a very wide audience, while being adaptable to different categories of visitors. The shows, a mixture of demonstrations and interactive stories on subjects as varied as the states of matter, particle detectors and "Frozen", are given in English and French and last from 30 to 45 minutes.

Online learning

"Unfortunately, not everyone will be able to come to Science Gateway in person, and it has always been important for us to offer rich and varied educational content online," continues Julia Woithe. "These resources will also be invaluable for those who want to learn more after their visit, particularly teachers and students." This material will soon be available online on a dedicated website: educational videos, online courses, DIY projects… – everything will be there to encourage independent learning.

Without wishing to turn all visitors into particle physicists (even if there's the secret hope to awaken a vocation in one or two of them), the Science Gateway educational programme aims to change the image of scientists, by showing them as they are (and CERN guides have a wonderful role to play in this!) – because science suits everyone.

Anaïs Schaeffer

Looking for sterile neutrinos in the CMS muon system

CMS presents results of searches for long-lived neutral particles

The muon system of the CMS experiment. (Image: CERN)

The CMS collaboration has recently presented new results in searches for long-lived heavy neutral leptons (HNLs). Also known as "sterile neutrinos", HNLs are interesting hypothetical particles that could solve three major puzzles in particle physics: they could explain the smallness of neutrino masses via the so-called "see-saw" mechanism, they could explain the matter-antimatter asymmetry of the Universe, and at the same time they could provide a candidate for dark matter. They are however very difficult to detect since they interact very weakly with known particles. The current analysis is an example of researchers having to use increasingly creative methods to detect particles that the detectors were not specifically designed to measure.

Most of the particles studied in the large LHC experiments have one thing in common: they are unstable and decay almost immediately after being produced. The products of these decays are usually electrons, muons, photons and hadrons - well-known particles that the big particle detectors were designed to observe and measure. Studies of the original short-lived particles are performed based on careful analysis of the observed decay products. Many of the flagship LHC results were obtained this way, from the Higgs boson decaying into photon pairs and four leptons to studies of the top quark and discoveries of new exotic hadrons.

The HNLs studied in this analysis require a different approach. They are neutral particles with comparatively long lifetimes that allow them to fly for metres undetected, before decaying somewhere in the detector. The analysis presented here focuses on cases where an HNL would appear after the decay of a W boson in a proton-proton collision, and would then itself decay somewhere in the muon system of the CMS detector.

The muon system constitutes the outermost part of CMS and was designed - as its name suggests - to detect muons. Muons produced in the LHC proton-proton collisions traverse the whole detector, leaving a trace in the inner tracking system and then another one in the muon system. Combining these two traces into the full muon track lets physicists identify muons and measure their properties. In the HNL search, a muon is replaced by a weakly interacting heavy particle that leaves no trace - until it decays. If it decays in the muon system it can produce a shower of particles clearly visible in the muon detectors. But - unlike a muon - it leaves no trace in the inner tracking detector, and no other activity in the muon system. This analysis is based on looking for "out-of-nowhere" clusters of tracks in the muon detectors.

The analysis started by selecting collision events with a reconstructed electron or muon from the decay of the W boson and an isolated cluster of traces in the muon system. Then, the analysis required the removal of cases where standard processes could imitate the HNL signal. After the full analysis, no excess of signal above expectation has been observed. As a result, a range of possible HNL parameters was excluded, setting the most stringent limits to date for HNLs with masses of 2-3 GeV.

Piotr Traczyk

Bright minds unite: 2023 CERN Webfest celebrates two winning projects and successful collaborations

The 2023 edition of CERN's annual hackathon took place from 21 to 23 July, with the theme "science, research and education"

Last week's hackathon gave rise to five amazing projects, on which 19 bright young people from across CERN worked together to develop useful apps that support science, research and education. The ideas covered in the 2023 CERN Webfest included web applications that facilitate the research process, quiz-like educational games and useful upgrades to pre-existing apps.

The projects were carefully assessed by a panel of four distinguished judges, and two teams were named the winners. "All projects were fascinating and creative, so it was a hard call – especially the two winning projects, SciFeed and CERNbot, which were both exceptionally impressive and well executed," says Alberto Di Meglio, the head of the Innovation section in the IT department and a jury member.

In only two days, participants had to come up with an idea for a project, assemble a team, describe the project's purpose, identify its technical requirements and work towards developing a fully functioning app. "Having only 48 hours to finish a project forces you to come up with practical solutions quickly, which puts your problem-solving skills to the test," says Angelo Petrellese, a member of CERNbot, one of the winning teams.

The hackathon not only offers participants the chance to develop their project ideas but also fosters networking and collaboration. More than 10 nationalities were represented in this year's Webfest, with people from various cultural backgrounds coming together to create something unique, exchange knowledge and learn from each other.

The projects were judged based on their originality, level of technical sophistication and potential for positive social impact. The highest score for the technical solution went to CERNbot, which is an interactive mobile application game that allows you to handle CERN robots in augmented reality.

The other winning project, SciFeed, in addition to being very strong technically, was also rated highly for the educational value it provides for the wider community. SciFeed is an online platform that curates content to allow students and STEM enthusiasts to engage with the science of CERN. "I am genuinely grateful for the recognition our idea received from the judges. Winning will always be a

cherished memory that we will share as a team but, more importantly, it will serve as a driving force, motivating us to delve deeper into our concept and explore its potential for further development," says Viona Cafo, a SciFeed member.

Marina Banjac

CERN and NASA join forces to commit to a research future that is open and accessible for all

A summit, entitled "Accelerating the Adoption of Open Science", took place at CERN from 10 to 14 July, bringing together representatives from 70 scientific institutions to discuss how to develop and implement open science policies across the globe

This year, 2023, has been declared the Year of Open Science. This is why, for the first time, over 100 open science practitioners and policy-makers gathered at CERN's Globe of Science and Innovation from 10 to 14 July. Co-organised by CERN, Europe's leading particle physics laboratory, and NASA, the USA's largest scientific agency, it brought together experts to discuss and learn how scientific bodies can promote and accelerate the adoption of open science. Over 70 different institutes were represented from five different continents.

Open science is when institutes make their research freely available to other scientists and collaborators and, to some extent, the public. This encompasses sharing data from experiments, open-source hardware, open-source software and open infrastructure. It also involves a commitment to education and outreach. These should all be made available according to FAIR – findable, accessible, interoperable and reusable – practices, leading to ease of collaboration, reproducibility of scientific results and efficient advancement of science.

In the context of the global challenges we face, it has never been a more appropriate time to push for a way of doing science that is more open and collaborative. "In late 2022, a small group got together and started thinking: CERN and NASA both have open science policies. What can we do to push open science forward and make a difference?" explains Chelle Gentemann, leader of NASA's Transform to Open Science mission and conference co-chair. While NASA and CERN are both large scientific organisations with already-developed open science policies, many attendees of the conference came from institutes that are just beginning to bring these values to the forefront of their organisations. However, the summit offered an opportunity for all to learn from each other and harmonise open science practices across borders.

The conference itself consisted of daily talks, each focused on a different aspect of open science. Those plenary talks and panel discussions were broadcasted to 200 registered remote participants. Crucially, the afternoons were reserved for more hands-on workshops and for opportunities for representatives from different institutions to dive into how open science works in action, according to their own specific laws, limitations and sensitivities.

"We're having conversations that many people here have not necessarily had before, and addressing issues that may not yet have been addressed," says Kamran Naim, Head of Open Science at CERN and conference co-chair. "As an organisation, we believe we have an obligation to share what we have learned and our technologies like Zenodo across the scientific community, not because it's the politically right thing to do for CERN, but because it's the right thing to do for science."

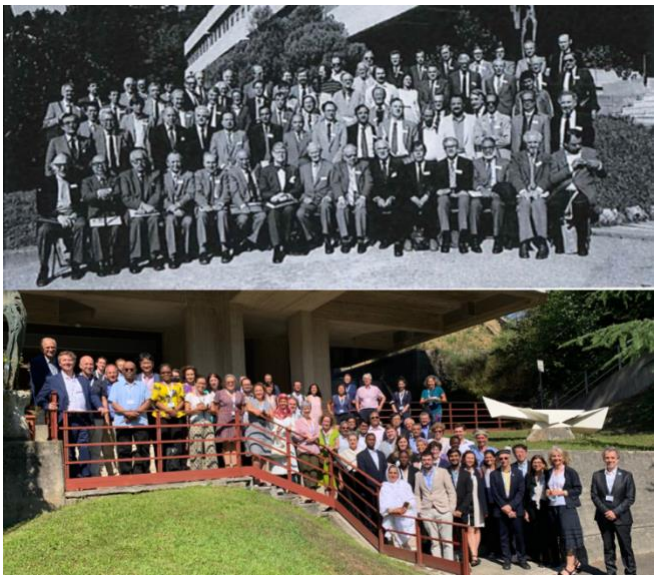
While the concept of open science is relatively new, the same values of openness and collaboration have been enshrined in the CERN Convention since its creation in 1953. "CERN is an example of the power of collaboration," says Charlotte Warakaulle, CERN Director for International Relations. "We need to work

together to promote open science. We hope this summit will serve to foster new links and new collaborations in support of open science."
While it is the first of its kind, this summit marks the beginning of a work in progress: a new era where open, FAIR, efficient and collaborative science can be practised in the same way across borders and disciplines. The team hope to follow up with the participants in six months' time to see how open science has been implemented in their institutes. "We hope that this conference offers the opportunity to engage and develop links in open science across diverse groups," says Kevin Murphy, Chief Science Data Officer at NASA. "We need everyone to be able to transform to an open, equitable and transformative scientific future."

Naomi Dinmore

IUPAP holds the 8th edition of the International Conference on Women in Physics

CERN and IUPAP collaboration that led to the formation of the IUPAP Women in Physics working group has come a long way



A glimpse of the 18th IUPAP General Assembly in 1984 and the 31st IUPAP General Assembly in 2022, both held at the ICTP, Trieste. This year IUPAP held its triennial International Conference on Women in Physics as a virtual event hosted by India. (Image: CERN)

The global scientific union dedicated to physics, the International Union of Pure and Applied Physics (IUPAP), holds the International Conference on Women in Physics every three years. This year, the 8th edition was organised by India as the host country, in the form of a virtual event organised by the Gender in Physics working group of the Indian Physics Association and the Tata Institute of Fundamental Research.
The conference brings together men and women from around the world with a mandate to monitor the situation of women in physics in their countries and suggest means to increase gender diversity and inclusion in the practice of physics. The Conference Proceedings available online become a key source of statistics and good practice worldwide. This year, over 500 participants from 70 countries attended. The conference underlined the role of physics education and issues of access and equity in the classroom and assessed practices in physics through an intersectionality lens. Some resolutions also came out of this year's edition.
"A key resolution that was made was to maintain a gender balance in decision-making bodies. Countries like Thailand and Myanmar are known to have more women in science than men according to the latest UN report and it would certainly be interesting to explore the practices in these countries," say Vandana Nanal and Srubabti Goswani from the Gender in Physics working group, the co-organisers of this year's conference.
Over the years, CERN and IUPAP have forged a long-standing partnership. Recently, CERN became a corporate associate member of IUPAP.
The Women in Physics (WIP) working group was founded in 1999 to survey the situation of women in physics, report to the IUPAP Council and Liaison Committees and suggest recommendations for improvements.
"Initially, the IUPAP WIP working group had members from just three continents but today all

the geographical continents are represented to embrace a broader cultural spectrum and a rich scope of collaboration," says Lilia Meza Montes, Vice-Chair of the WIP working group. "The working group has created bonds with unions from different disciplines, giving rise to multidisciplinary worldwide actions such as the project, A Global Approach to the Gender Gap in Mathematical, Computing, and Natural Sciences."

At CERN, the Diversity and Inclusion (D&I) programme is also working towards a "25 by '25" goal to boost the nationality and gender diversity of the staff and fellows population over the next five years. D&I reports a 7.5% increase in female employees in the five years from 2018 to 2022. The progression is even greater for roles in STEM (science, technology, engineering and mathematics), with an increase from 15.5% of women in STEM roles in 2018 to 23.3% in 2022.

IUPAP celebrated its centennial last year and continues to develop and to expand its global reach with other initiatives beyond WIP. IUPAP was the driving force behind the proclamation of the International Year of Basic Science for Sustainable Development (IYBSSD) by the United Nations. CERN Science Gateway, a new flagship project for science education and outreach opening this year, expects to host the IYBSSD closing ceremony to conclude the year celebrating basic sciences from all disciplines.

Chetna Krishna

ATLAS sets record precision on Higgs boson's mass

New result from the ATLAS experiment at CERN reaches the unprecedented precision of 0.09%

In the 11 years since its discovery at the Large Hadron Collider (LHC), the Higgs boson has become a central avenue for shedding light on the fundamental structure of the Universe. Precise measurements of the properties of this special particle are among the most powerful tools physicists have to test the Standard Model, currently the theory that best describes the world of particles and their interactions. At the Lepton Photon Conference this week, the ATLAS collaboration reported how it has measured the mass of the Higgs boson more precisely than ever before.

The mass of the Higgs boson is not predicted by the Standard Model and must therefore be determined by experimental measurement. Its value governs the strengths of the interactions of the Higgs boson with the other elementary particles as well as with itself. A precise knowledge of this fundamental parameter is key to accurate theoretical calculations which, in turn, allow physicists to confront their measurements of the Higgs boson's properties with predictions from the Standard Model. Deviations from these predictions would signal the presence of new or unaccounted-for phenomena. The Higgs boson's mass is also a crucial parameter driving the evolution and the stability of the Universe's vacuum.

The ATLAS and CMS collaborations have been making ever more precise measurements of the Higgs boson's mass since the particle's discovery. The new ATLAS measurement combines two results: a new Higgs boson mass measurement based on an analysis of the particle's decay into two high-energy photons (the "diphoton channel") and an earlier mass measurement based on a study of its decay into four leptons (the "four-lepton channel").

The new measurement in the diphoton channel, which combines analyses of the full ATLAS data sets from Runs 1 and 2 of the LHC, resulted in a mass of 125.22 billion electronvolts (GeV) with an uncertainty of only 0.14 GeV. With a precision of 0.11%, this diphoton-channel result is the most precise measurement to date of the Higgs boson's mass from a single decay channel.

Compared to the previous ATLAS measurement in this channel, the new result benefits both from the full ATLAS Run 2 data set, which reduced the statistical uncertainty by a factor of two, and from dramatic improvements to the calibration of

photon energy measurements, which decreased the systematic uncertainty by almost a factor of four to 0.09 GeV.

“The advanced and rigorous calibration techniques used in this analysis were critical for pushing the precision to such an unprecedented level,” says Stefano Manzoni, convener of the ATLAS electron-photon calibration subgroup. “Their development took several years and required a deep understanding of the ATLAS detector. They will also greatly benefit future analyses.”

When the ATLAS researchers combined this new mass measurement in the diphoton channel with the earlier mass measurement in the four-lepton channel, they obtained a Higgs boson mass of 125.11 GeV with an uncertainty of 0.11 GeV. With a precision of 0.09%, this is the most precise measurement yet of this fundamental parameter.

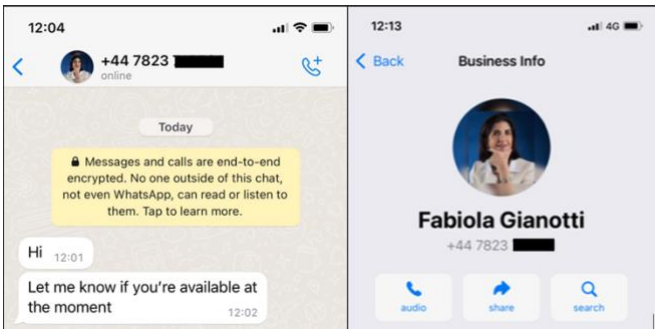
“This very precise measurement is the result of the relentless investment of the ATLAS collaboration in improving the understanding of our data,” says ATLAS spokesperson Andreas Hoecker. "Powerful reconstruction algorithms paired with precise calibrations are the determining ingredients of precision measurements. The new measurement of the Higgs boson’s mass adds to the increasingly detailed mapping of this critical new sector of particle physics.

Computer Security: Don’t get socially engineered

“Social engineering” is the art of manipulating you to perform actions you would not normally perform. Like transferring money to someone you don’t know (“LOGISTICS SUPPORT REQUEST”). Disclosing sensitive information (“I have problems displaying that doc”). Opening doors to an unknown third party (“I forgot my access card”). Or handing out your CERN password, e.g. during our annual clicking campaigns (“Action Required – Warning!!”) intended to raise security awareness.

In order to achieve their goals, attackers try to forge a close connection with you. “Greetings to you and your family. How are you doing?” is still a very basic try, but given the information that can be found online about you, your family and social circle, your work and your hobbies, social engineers might delve much, much deeper. Just think of the information available about you on Facebook, Instagram, LinkedIn and CERN’s many webpages. How easily can your life be reconstructed from that information? How much “juicy” stuff is out there to allow them to connect with you, build up a trust relationship and lure you into actions you wouldn’t normally perform for a stranger? This social engineering is a long process, but an attacker is ready to go the distance if the outcome – i.e. you disclosing sensitive information, handing over your password or transferring money – is worth it. Think about your role in this Organization: there is definitely something worth attacking you for. Access to accelerator controls to conduct sabotage if you work in the accelerator sector; access to money or personal information if you work in finance and administration; or access to computing services, data and databases if you are an IT administrator.

Below is an attempt to connect with some of our colleagues, in this case using WhatsApp:



It wouldn’t be the first time that the Director-General’s authority has been abused for social engineering purposes. And it won’t be the last. Here, we can’t tell how that conversation would have continued, but usually it leads to a demand for a money transfer.

So, be vigilant if you are contacted by people you don’t know or receive requests that are unusual, from unsolicited contacts. Be careful if you are

asked to perform tasks you usually only perform in the execution of your job but never on direct request. “STOP – THINK – DON’T CLICK” when you get a link in an email, text message, WhatsApp message or through a QR code. And, maybe, rethink the plethora of information you voluntarily make public via your social channels – check your privacy and publication settings! − or on CERN webpages. Maybe a bit less information would do your privacy good and protect you a bit more from social engineering?

Computer security team

Announcements

Download the CERN Campus app from Friday, 11 August

This initial release centralises useful information in one mobile application

The CERN Campus app provides a wide range of information, accessible via your CERN login. This initial release includes the following functionalities:

- emergency notifications to receive alerts and updates regarding safety and security
- an SOS button to call CERN’s emergency number 74444
- CERN’s interactive map and phonebook
- restaurant menus, opening times and occupancy levels, as well as a full list of on-site food options
- news
- a variety of general information and links for campus services including housing, mobility, registration, the library, ADaMS and more

Your feedback will shape the future development of this application. Please use the dedicated “support & feedback” feature in the app or email us at CERN-CampusApp@cern.ch.

To begin using the app from Friday, 11 August, simply download it to your smartphone using this link (https://backend.pocketcampus.org/get_app.php?app=pccern) or the QR code below:

SCE and FAP departments

Lightning talks are ready to strike: discover the CERN openlab summer student projects

On Tuesday 15 and Wednesday 16 August, the 2023 CERN openlab summer students will present their work at the public “lightning talk” sessions :

- **session 1** (https://indico.cern.ch/event/1311334/),
- **session 2** (https://indico.cern.ch/event/1311339/).

Students will each give a five-minute presentation, introducing the audience to their project, explaining the technical challenges they have faced and describing the results they have found

during their projects. Each student will have the opportunity to showcase their progress while also informing the audience about different cutting-edge IT projects they have been working on.
Over nine weeks (June-August), the CERN openlab summer students have been working with some of the latest hardware and software technologies. 30 students representing 21 nationalities were part of this year's openlab Summer Student Programme. During their time at CERN, the summer students, alongside working on their projects, attended a series of lectures given by IT experts on advanced CERN-related computing topics.
Join us on 15 and 16 August to discover more about the exciting projects the students have been working on.

CERN openlab

Celebrating 40 years of the CERN Accelerator School

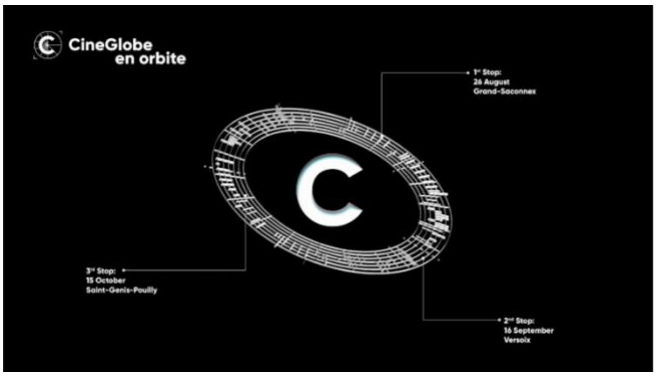
On 14 September, you're invited to a concert to celebrate the 40th anniversary of CAS

We take immense pride in continuing our legacy of bringing together and disseminating knowledge of accelerator science. Over the years, thousands of bright accelerator scientists and experts have been trained through the CERN Accelerator School (CAS), and we've successfully organised over a hundred accelerator schools worldwide. In addition, we have compiled more than fifty reports, contributing to advancements in accelerator science.

To mark this anniversary, we cordially invite you to the CAS40 concert on 14 September at 12.30 p.m. on the lawn in front of Restaurant 1. Come with your colleagues and friends to unwind, relish some delightful drinks and enjoy live music during your lunch break. A group photo capturing this joyous celebration will be taken using a drone, with the participants spelling out CAS40, and we would like you to be part of it!
In addition, that same week, you'll find a selfie machine set up at Restaurant 1. We invite the entire CERN community to seize this opportunity to take a selfie and share it on social media using @CERN and #CAS40 to spread awareness about the significance of education and scientific knowledge dissemination in driving technological progress.
Let's make this celebration unforgettable. See you there!

CERN Accelerator School

In 2023, the CineGlobe festival will orbit the local region before landing at Science Gateway



The CineGlobe festival was founded in 2007 and celebrates cinema inspired by science, with programmes of short films, feature films, cinema workshops and special events. Its aim is to select the best new films and to bring film-makers together.
In 2023, CineGlobe is returning for its 12th edition, with four special events in Geneva and neighbouring France. This year, the spotlight will be on science and society.
"CineGlobe in Orbit" will consist of three satellite events organised in partnership with the towns of Grand-Saconnex, Versoix and Saint-Genis-Pouilly. It kicks off with an event in Grand Saconnex on 26 August.

- **Orbit #1: 26 August in Grand-Saconnex**
- **Orbit #2: 16 September in Versoix**
- **Orbit #3: 15 October in Saint-Genis-Pouilly**

Finally, the festival will come to a close by landing **at CERN's Science Gateway on 9 November** for an event organised in collaboration with the artist collective Gruppe Laokoon and the Geneva International Film Festival (GIFF). That evening, festivalgoers will be treated to a must-see experimental play called Mauvais Je(ux), which will be performed as part of the official GIFF programme. This innovative production explores the technologies that influence our society and each and every one of us, using the digital data of a real but anonymous person, "je". Talented actors will bring to life four unique versions of "je", all based on the same data but seen from different perspectives.
CineGlobe has launched two calls for the play:

- Call for digital data (deadline: 21 August 2023)
- Casting call (deadline: 30 August 2023)

For more information about the festival and to register for events, visit the official CineGlobe website: https://cineglobe.ch

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Obituaries

Roberto Lopez (1979 – 2023)

We are deeply saddened to announce that Mr Roberto Lopez died on 7 August 2023. Roberto Lopez, born 7 July 1979, worked in the TE department and had been at CERN since 1 January 2005.

The Director-General has sent a message of condolence to his family on behalf of the CERN personnel.

Social Affairs service
Human Resources department

Ombud's corner

From lone wolf to inclusive leadership (Act III)

In this article, we again meet Stefano*, an experienced leader in the Organization who has decided to move from being a lone decision maker to an inclusive, open-minded leader.

As a first step, Stefano reflected on why he was so attached to his former authoritarian management style. In a second step, Stefano formed a vision of the type of leader he wanted to be and the many benefits that such a change would bring to him and to his team.

In this third and final act, we will see how Stefano takes practical action so that his team members and other stakeholders start to perceive him differently.

- When taking a decision, Stefano should **seek the perspectives of others**. Letting each member of the team offer an opinion on the options they are given will ensure that Stefano gets the most comprehensive picture of all possibilities, with nothing left off the radar. Not only will this ensure a higher probability of success but also, most importantly, it will foster creativity, collaboration and engagement.
- Stefano used to start by forming a clear idea of the option that he would take and then convince others that his position was right. In his efforts to change his management style, Stefano will give up his firm position and **consider his preferred solution to be an option** among other possibilities. This simple mind-change will make a huge difference in his discussions with team members, who will feel genuinely invited to make proposals and share their views.
- Last but not least, Stefano needs to fully **engage the team in the process**. Engagement is one of the CERN values and applies equally to teams and individuals. However, team engagement may be possible only if it is facilitated and organised by the leader. To reap the benefits of a fully engaged team, Stefano needs to make space for fruitful discussions in which the team may genuinely contribute to the decision making.

It can be really hard to let go of the need to be always in control and have the last word, but adopting an inclusive mindset and incorporating different perspectives and ideas will lead to better outcomes and a stronger team. Just as importantly, it will enrich Stefano's relationships with his team members and stakeholders and open the way for self-growth and a positive impact on others and on the Organization as a whole.

Laure Esteveny

** Name is fictitious.*

This article is inspired by a Harvard Business Review *article (March 2023),* Becoming More Collaborative — When You Like to Be in Control*.*

I would like to hear your reactions and suggestions – join the CERN Ombud Mattermost team at https://mattermost.web.cern.ch/cern-ombud/.

All information on the role of the CERN Ombud and how to contact her may be found at https://ombud.web.cern.ch/.