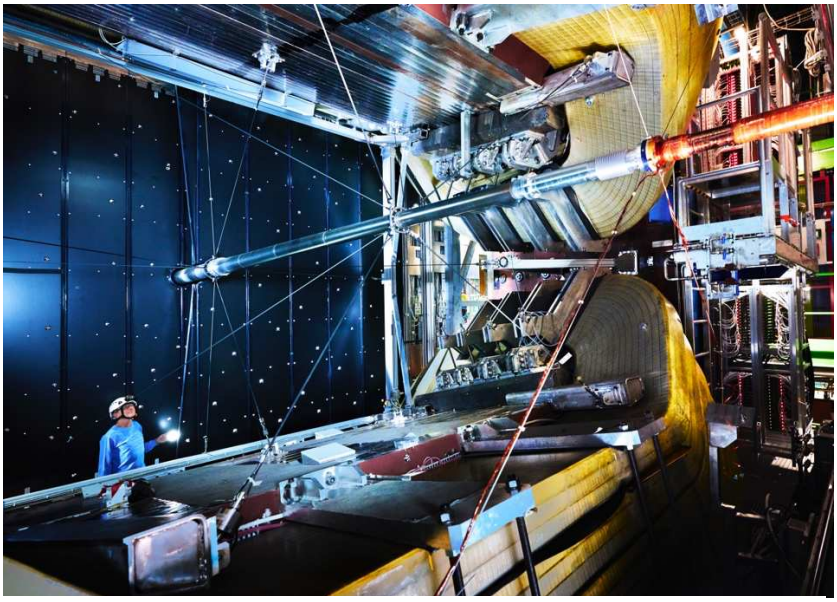
CERN Bulletin

Issue No. 25-26/2023 – 23 June 2023
http://home.cern/cern-people

LHCb tightens precision on key measurements of matter–antimatter asymmetry

The LHCb collaboration's new measurements of matter–antimatter asymmetry in decays of beauty particles are the most precise yet of their kind



The LHCb experiment. (Image: CERN)

The Big Bang is thought to have created equal amounts of matter and antimatter, yet the Universe today is made almost entirely of matter, so something must have happened to create this imbalance.

The weak force of the Standard Model of particle physics is known to induce a behavioural difference between matter and antimatter – known as CP symmetry violation – in decays of particles containing quarks, one of the building blocks of matter. But these differences, or asymmetries, are hard to measure and insufficient to explain the matter–antimatter imbalance in the present-day Universe, prompting physicists to both measure precisely the known differences and to look for new ones.

At a seminar held at CERN today, the LHCb collaboration reported how it has measured, more precisely than ever before, two key parameters that determine such matter–antimatter asymmetries.

Contents

In 1964, James Cronin and Val Fitch discovered CP symmetry violation through their pioneering experiment at Brookhaven National Laboratory in the US, using decays of particles containing strange quarks. This finding challenged the long-held belief in this symmetry of nature and earned Cronin and Fitch the Nobel Prize in Physics in 1980. In 2001, the BaBar experiment in the US and the Belle experiment in Japan confirmed the existence of CP violation in decays of beauty mesons, particles with a beauty quark, solidifying our understanding of the nature of this phenomenon. This achievement ignited intense research efforts to further understand the mechanisms behind CP violation. In 2008, Makoto Kobayashi and Toshihide Maskawa received the Nobel Prize in Physics for their theoretical framework that elegantly explained the observed CP violation phenomena.

It its latest studies, using the full dataset recorded by the LHCb detector during the second run of the Large Hadron Collider (LHC), the LHCb collaboration set out to measure with high precision two parameters that determine the amount of CP violation in decays of beauty mesons.

One parameter determines the amount of CP violation in decays of neutral beauty mesons, which are made up of a bottom antiquark and a down quark. This is the same parameter as that measured by the BaBar and Belle experiments in 2001. The other parameter determines the amount of CP violation in decays of strange beauty mesons, which consist of a bottom antiquark and a strange quark.

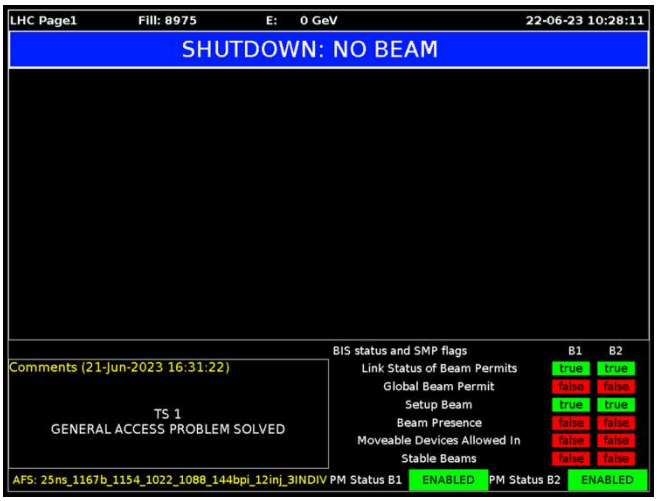
Specifically, these parameters determine the extent of time-dependent CP violation. This type of CP violation stems from the intriguing quantum interference that occurs when a particle and its antiparticle undergo decay. The particle has the ability to spontaneously transform into its antiparticle and vice versa. As this oscillation takes place, the decays of the particle and antiparticle interfere with each other, leading to a distinctive pattern of CP violation that changes over time. In other words, the amount of CP violation observed depends on the time the particle lives before decaying. This fascinating phenomenon provides physicists with key insights into the fundamental nature of particles and their symmetries.

For both parameters, the new LHCb results, which are more precise than any equivalent result from a single experiment, are in line with the values predicted by the Standard Model.

“These measurements are interpreted within our fundamental theory of particle physics, the Standard Model, improving the precision with which we can determine the difference between the behaviour of matter and antimatter,” explains LHCb spokesperson Chris Parkes. “Through more precise measurements, large improvements have been made in our knowledge. These are key parameters that aid our search for unknown effects from beyond our current theory.”

Future data, from the third run of the LHC and the collider’s planned upgrade, the High-Luminosity LHC, will further tighten the precision on these matter–antimatter asymmetry parameters and perhaps point to new physics phenomena that could help shed light on what is one of the Universe’s best-kept secrets.

Accelerator Report: LHC pausing production for maintenance to stay strong and highly performing



Even the most cutting-edge machines require moments of respite. That's why, in the early morning of Monday, 19 June, LHC operation was paused for one week to allow the technical teams to carry out preventive and corrective maintenance on the machine and its subsystems.

One week earlier, in the afternoon of Tuesday, 13 June, the beams were dumped, marking a break in a successful period of luminosity production to switch to a busy and tightly scheduled machine development (MD) programme, with no fewer than 14 different topics to cover, including studies on operating crystal collimators during the energy ramp and beam response, analyses of the diamond-detector-based beam-loss monitors, beam dynamics to better understand slow beam degradation from electron cloud effects, and beam instability measurements with different bunch intensities. In addition, time was allocated to set up cycles and beams for future physics runs that are scheduled after the technical stop.

For each MD, a procedure is drawn up by the proponents, detailing the goals of the MD and the required beam parameters and machine settings. These procedures are then scrutinised by the LHC Studies Working Group (LSWG) and restricted Machine Protection Panel (rMPP) before the topics are selected and scheduled in the MD slot planned in the yearly LHC schedule. Final approval is then given by the LHC Machine Committee (LMC). Although these MDs take time out of potential physics time, they are very valuable in order to better understand the machine and beam behaviour with a view to increasing beam performance not only during Run 3, but also post-LS3, for the HL-LHC era. One could say that they are a worthwhile investment for future luminosity production.

As I write, the machine is in the hands of the Technical Coordination team (EN department) to carry out the many technical stop (TS) activities on the entire LHC and in the experimental caverns. Of the many planned activities, two were already mentioned in the Accelerator Report of 6 April. The first is the reinstallation of the crystal collimator that broke and had to be removed from the ring during the last phase of hardware commissioning at the end of March. This activity is the reason why the TS was extended by a day – to complete the bake-out, pump-down and hardware tests of the crystal collimator. The second activity is the preventive replacement of the two rupture discs installed in April by two discs that have passed the recent pressure test.

The plan is that cryogenic conditions will be restored in the afternoon of Friday, 23 June; the LHC will then be handed back to the Operations team (BE department) at 16.00 to restart all the subsystems. However, the beam will remain off until the end of the afternoon of Saturday, 24 June in order to finalise the crystal collimator reinstallation. Once that is completed, beam operation will be re-established, initially for special physics runs and later for luminosity production.

The (preliminary) outcome of the MD studies will be presented at the LSWG on Tuesday, 27 June – an opportunity to discuss and gain a greater understanding of the machine and beam dynamics with a view to keeping the LHC's performance strong and increasingly efficient.

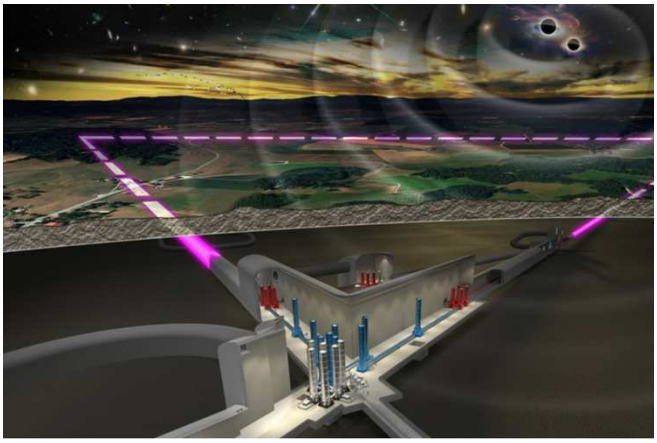
Rende Steerenberg

Connecting the small and the large scales

By collaborating with projects for future gravitational-wave observatories, CERN helps to find echoes from the past

Gravitational waves, like the discovery of the Higgs boson in 2012, have made their mark on a decade of extraordinary discoveries in physics. Unlike gravity, which is created when massive objects leave their mark in the fabric of spacetime, gravitational waves are very weak ripples in spacetime that are caused by gravity-accelerated masses. So far, researchers have been able to detect the gravitational waves produced by the melting together of very heavy objects, such as black holes or neutron stars. When this happens, these echoes from the past reverberate through the whole Universe and finally reach Earth, allowing us to piece together what happened millions of light-years ago.

Current gravitational-wave observatories can only detect a few gravitational waves as they cover just a narrow spectrum of the whole range of wavelengths that are emitted. Future gravitational-wave observatories, such as the Einstein Telescope, a CERN-recognised experiment, need to be larger in order to search for a larger bandwidth of gravitational waves that could tell us more about the Universe.



Artist's impression of the Einstein Telescope, a next-generation gravitational-wave detector. The Einstein Telescope Collaboration has entered into an agreement with CERN for the design of the detector's vacuum system. (Image: Nikhef)

A key ingredient of future gravitational-wave observatories is ultra-high vacuum technology. As the world-leading R&D facility for applications in this field, CERN is one of the few places where people know how to build very long ultra-high vacuum systems. CERN's decade-long experience of installing complex and ultra-pure vacuum systems underground is an additional benefit for the Einstein Telescope since it will be installed at least 200 metres below the Earth's surface. The lead institutes of the Einstein Telescope Collaboration therefore entered into a collaboration agreement with CERN in 2022. Building on this agreement, a workshop was held in March 2023 dedicated to brainstorming on how these systems might look and which materials would work best. The Collaboration hopes to complete a prototype vacuum pipe by the end of 2025. The findings from the workshop will help to reduce not only the cost of building the Einstein Telescope but also potentially the cost of future accelerators.

"The expected sensitivity of the Einstein Telescope will be at least a factor of ten times that of Ligo-Virgo," says Michele Punturo, who began his career as a physicist at CERN and is now the spokesperson of the Collaboration. "Its low-frequency sensitivity will allow us to detect intermediate mass black holes."

The Einstein Telescope is designed to measure gravitational waves ten times more precisely than existing gravitational-wave detectors and will complement future space-based gravitational wave detectors. The experiment will send a laser beam down into the 120-km-long triangular-shaped tunnel. This beam will be then split into two beams, which are reflected by mirrors. The length of the tunnel has been chosen so that the two laser beams precisely cancel each other. If a gravitational wave crosses the laser signal, it will be perturbed, thus leaving behind an imprint of itself. The nature of this imprint will provide researchers with information about the event that created the gravitational wave in the first place.

Due to the high precision of the signal, the vacuum system in which the laser operates needs to be not only ultra-pure, but also free from vibrations as well as electromagnetic contamination, since both

can mimic the signal from the incoming gravitational wave.
Another potential source of modification of the gravitational wave frequency is dark matter, the elusive form of matter that seems to make up most of our Universe. Theorists are already working on models to verify whether a recorded signal could be influenced by dark matter. These searches would complement the searches for dark matter that are currently being carried out in collider and fixed-target experiments at CERN.

Kristiane Bernhard-Novotny

Fact box
- The Einstein Telescope became a CERN-recognised experiment on 16 March 2022
- A collaboration agreement with CERN on vacuum technologies was signed in October 2022
- The Einstein Telescope will comprise three nested detectors, each equipped with two interferometers
- The length of each interferometer will be 10 km
- One of the interferometers will detect low-frequency gravitational waves
- The other interferometer will detect high-frequency gravitational waves
- The Einstein Telescope will detect gravitational waves with frequencies of between 1 Hz and 10 000 Hz

Preparing for the next era of neutrino research

The teams at CERN's Neutrino Platform are currently upgrading and assembling multiple detectors to help large experiments in the USA and Japan to uncover these mysterious particles

Inside one of the ProtoDUNE cryostats at CERN's Neutrino Platform. (Image: CERN)

At CERN's Neutrino Platform on the Laboratory's Prévessin site in France sit two large boxes encased in a red grating. Inside these boxes are vast chambers surrounded by shiny stainless steel. The boxes are the cryostat modules of the ProtoDUNE experiment. Despite their large size, they are tiny in comparison to the future size of their successors for the Deep Underground Neutrino Experiment (DUNE), a vast neutrino experiment currently being built in the USA. The Neutrino Platform also houses an assembly station for the Tokai to Kamioka (T2K) experiment, another vast neutrino facility in Japan.
Neutrinos are one of the least well-known types of particles in the Standard Model. Although they are the most abundant massive particles in the Universe, neutrinos have very small mass and only interact through gravity and the weak nuclear force, making them difficult to study. However, neutrinos may hold the key to fundamental questions such as why the Universe is filled with matter and not antimatter. So-called long-baseline neutrino-oscillation experiments could help to answer these questions by studying how neutrinos change their "flavour", or oscillate, as they travel over a long distance, or baseline.
Once built in the USA, DUNE will send a beam of neutrinos from Fermi National Accelerator Laboratory (Fermilab) near Chicago, Illinois, over a distance of more than 1300 kilometres through the Earth to neutrino detectors located 1.5 km underground at the Sanford Underground Research Facility (SURF) in Sanford, South Dakota. The detectors themselves are vast cryostats filled with liquid argon. When neutrinos interact with the argon, which happens only occasionally, this

ionises the argon atoms. The loose electrons and argon atoms are then separated by an electric field that runs through the detector. The shape of the electron cloud created by the ionisation is conserved and detected by the electrode sensors located on the walls of the cryostat. This produces images of the trajectories of particles created by the neutrino interactions, allowing physicists to determine the neutrinos' properties such as their flavour and mass. These detectors, which use a combination of electric fields passing through a volume of fluid, are called time projection chambers.

Back to Prévessin. In 2018, ProtoDUNE began its first run. Both cryostats were tested until 2021, the first in a single-phase configuration of the experiment (ProtoDUNE-SP) and the second in a dual-phase configuration (ProtoDUNE-DP). The first run recorded over four million particle interactions, providing important information about the technology challenges associated with DUNE, and demonstrated that the full experiment was ready for construction. Since January 2023, the Neutrino Platform has been preparing for ProtoDUNE's second run. The two cryostats are both now single-phase, one measuring the drift of electrons across a horizontal electric field (ProtoDUNE-HD) and the other across a vertical field (ProtoDUNE-VD). Scientists will use this second run to determine how these technologies should be implemented in DUNE. The two cryostats will be filled with liquid argon soon and will begin taking data at the beginning of next year.

The Neutrino Platform also hosts the assembly platform for the T2K experiment. T2K has already been operating for over a decade in Japan, sending beams of neutrinos from Tokai on the East coast over a distance of 295 km to the Super-Kamiokande detector in Kamioka, close to the West coast. In 2011, T2K provided the first evidence of muon neutrino-to-electron-neutrino oscillations and has since hinted at neutrino matter–antimatter asymmetry. One of its detectors, ND280, is currently undergoing an upgrade, which the T2K collaboration hopes will allow it to increase the efficiency of the experiment and more accurately reconstruct the neutrino oscillations.

The ND280 upgrade consists of multiple subdetectors, many of which were assembled and tested at the Neutrino Platform. These include new time projection chambers, one of which is now currently taking cosmic data at CERN. Other types of subdetectors are either already installed or ready to be shipped to Japan after assembly at the Neutrino Platform. As well as individual subdetectors, the new gas system for the whole ND280 detector was completely developed and tested at CERN. Still to be completed is the assembly of another time projection chamber, and its shipment to and installation at T2K. The ND280 upgrade is projected to be finalised in 2023. It is planned that the upgraded ND280 will also serve in the next generation long-baseline neutrino oscillation experiment known as Hyper-Kamiokande (HyperK).

Naomi Dinmore

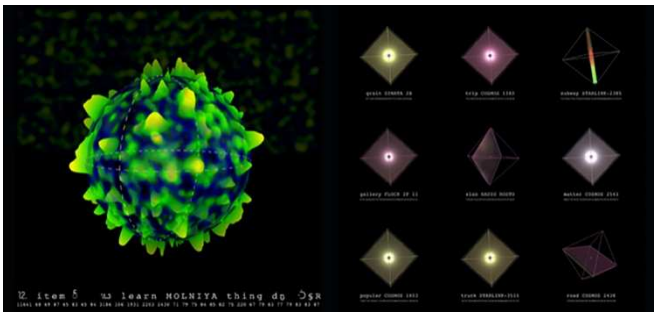
Joan Heemskerk wins CERN's Collide Copenhagen residency award

Joan Heemskerk, one of the pioneers of web-based art, has been selected as the winner of this year's edition

Following an international open call launched in collaboration with Copenhagen Contemporary in March, Arts at CERN announced today that Dutch artist Joan Heemskerk is the winner of the first Collide Copenhagen residency award.

Collide is the flagship programme of Arts at CERN, which invites artists worldwide from all creative disciplines to submit proposals for a research-led residency grounded on interactions with CERN's scientific community. The eleventh edition of Collide, and the first of Collide Copenhagen, attracted 592 project proposals from 90 different countries.

Referencing Tim Berners-Lee's proposal at CERN that all scientists should be able to exchange ideas, Joan Heemskerk's project, Alice & Bob after Clay +=-> Hello, world!, seeks to develop a new universal language. Through a re-assessment of the cryptographic characters Alice and Bob, the material clay and the computer programme Hello, World!, the produced message, in the form of a light-beam or a radio-signal or something else entirely, would transcend galactic and life-form boundaries.



On the left, artwork «Prototype», 2022, on the right, artwork «SAT-HEX», 2022. (Copyright: Joan Heemskerk)

Joan Heemskerk will complete a two-month residency, which will be split between CERN and Copenhagen Contemporary and dedicated to artistic research and exploration. She will work side by side with physicists, engineers and laboratory staff.

With the support of the curatorial teams of Arts at CERN and Copenhagen Contemporary, the residency will be followed by a phase of designing and producing a new artwork that will become part of an exhibition at Copenhagen Contemporary in 2025, which will examine the impact of technology on humanity.

"CERN has a long history of innovating ideas and is a unique environment for developing new forms of science and art. It fits within the mission of Arts at CERN to welcome an artist who has continually challenged our collective understanding and imagination of the digital realm. We are delighted to support Joan Heemskerk in exploring the possibility of a new language, in dialogue and with the support of our community", says Mónica Bello, head of Arts at CERN.

"At Copenhagen Contemporary we regard artists as primary investigators of contemporary culture. As a pioneer of digitally based art, Joan Heemskerk has challenged our notions of technology from the early days of the internet – and we are beyond excited to work with her on a new project", says Marie Laurberg, director of Copenhagen Contemporary.

About Joan Heemskerk

Joan Heemskerk works in photography, video, software, games, websites, performance and installations. She is a member of the art collective JODI, which pioneered web-based art in the mid-1990s. Their practice investigates conventions of the internet, computer programmes and video games, disrupting the languages of these systems: from visual aesthetics to interface elements, from codes and features to errors and viruses. They challenge the relationship between computer technology and users by subverting our expectations about the functionalities and conventions of the systems that we depend upon in our everyday lives.

About the jury

The jury consisted of Mónica Bello, curator and head of Arts at CERN; Irene Campolmi, curator and researcher; Vitor Cardoso, professor of Physics and Villum investigator at the Niels Bohr Institute, University of Copenhagen; Marie Laurberg, director of Copenhagen Contemporary; Filipa Ramos, PhD, writer, curator and lecturer at the Institute Art Gender Nature, Basel Academy of Art and Design; Iliana Tatsi, curator at CERN Science Gateway exhibitions; and Helga Timko, accelerator physicist at the LHC and member of the CERN Cultural Board.

CMS honours its 2022 Award and PhD Thesis Award winners

CMS PhD Thesis Award winners 2022

Every year, the CMS collaboration recognises the outstanding achievements of young scientists through this award, highlighting the exceptional contributions made by doctoral researchers in advancing the field of high-energy physics.

From the 32 nominations received this year, three winners were selected by the committee: Angira Rastogi, Willem Verbeke and David Walter.

The 32 nominees for this award had to defend their theses between 1 November 2021 and 31 October 2022. Theses covering various aspects of CMS-related work, including physics analysis, simulation, computing, detector development and engineering, were eligible for nomination. The CMS Thesis Award Committee, consisting of 30 scientists, evaluated the theses based on their content, originality and clarity of writing.

CMS Award 2022

Every year, the CMS Award Committee honours some of the CMS collaboration's members for their outstanding work and dedication to the CMS subdetectors. Nominations can be made by any CMS member, for work in a variety of fields, ranging from detector systems and coordination to outreach.

Two special prizes were awarded in 2022, one in memory of Meenakshi Narain and one to the ECAL team that repaired the leak in the ECAL endcaps. In total, sixty awardees were recognised for their remarkable contribution in 2022.

CMS collaboration

LHCb celebrates prizewinners

LHCb awarded its annual prizes at its recent collaboration week. As usual, prizes were awarded for outstanding contributions made by early-career scientists and for the best PhD theses. In addition, for the first time, awards were given for outstanding technical contributions to LHCb. The final industry award for contributions to LHCb Upgrade I was also presented.

The following early-career scientists won prizes for their outstanding contributions:

- Abhijit Mathad, for his development of an offline analysis tool;
- Christina Agapopoulou and Marian Stahl, for their contributions to the high-level trigger software;
- Edoardo Franzoso and Gary Robertson, for their commissioning work on the RICH detector;
- Florian Reiss, Sophie Hollitt, Jake Reich and Biljana Mitreska, for their contributions to the alignment of the detector;
- Giovanni Bassi, for the implementation of FPGA-based VELO clustering.

The following collaboration members won awards for their outstanding technical contributions, in the category's inaugural year:

- Pascal Sainvitu, for his work on the construction and installation of all LHCb subdetectors;
- Karol Sawczuk, for his contributions to the operation of the Data Centre;
- Kevin McCormick, for his activities on the construction of the VELO detector;
- Petr Gorbounov, Dimitra Andreou, Federico de Benedetti and Mark Tobin, for their efforts on the construction and installation of the UT detector;

- Rodolphe Gonzales, Norbert Adjadj, Magali Magne, Christophe Insa and Andreas Zosgornik, for their contributions to the construction and installation of the scintillating fibre detector.

The winners of the 2023 LHCb thesis prize are Saverio Mariani (Fixed-target physics for the LHCb experiment at CERN) and Peter Švihra (Developing a silicon pixel detector for the next-generation LHCb experiment).

The LHCb industry award, which recognises excellence in collaborations between companies and institutes, was presented to the German company ADCO for their production of carbon composite components for the scintillating fibre detector. Michael König, Herbert Schneider and Martin Solowski represented the company at CERN to receive their trophy.

Many congratulations to all the winners!

LHCb collaboration

Bike2Work at CERN reaches new heights

More than 1000 Cernois have joined a "Bike to Work" team – take part in the upcoming Critical Mass event to celebrate this achievement!

CERN Critical Mass event 2022. (Image: CERN)

When CERN joined the Swiss national "Bike to Work" campaign for the first time back in 2012, we warned you that cycling could become addictive (https://cds.cern.ch/record/1439938). Eleven years of Bike to Work at CERN have proven us right: for the first time since CERN entered the competition, more than 1000 Cernois have joined a team, thereby committing to cycling at least half of all working days over a period of two months (May and June). This makes CERN, with its 1008 cyclists and 17 817 cycling days registered as of Friday, 16 June, the largest participant in French-speaking Switzerland, challenged only by EPFL (with 913 participants and 18 346 cycling days).

To celebrate this success, the next CERN Critical Mass will take place on 23 June. On this occasion, all CERN cyclists are invited to meet up at Restaurant 2 at 11.45 a.m. for a ride around the Meyrin site starting at 12.00 p.m. and finishing at R1. The event aims to increase the visibility of the cycling community at CERN, with the hope of improving conditions for cyclists. Upon arrival at R1, a group photo will be taken and teams will have the opportunity to take individual photos with large posters featuring each team's name and logo. Participants are encouraged to wear the very first Bike2Work t-shirt they ever owned. We look forward to finding out how many editions can fit in the same photo, as the CERN Bike2Work t-shirts have become a collector's item over the years.*

Mobility patterns are changing at CERN. In recent years, the conditions for cycling on the CERN site and in the local area have improved significantly, yet there is still room for improvement. Any concrete suggestions to improve soft mobility at CERN can be sent to jens.vigen@cern.ch.

And, above all, do not forget to fill in your Bike2Work calendar: EPFL is still ahead of CERN in terms of cycling days and the race is still on!

** A gallery showing the different t-shirt designs over the years can be accessed here (https://bike-to-cern.web.cern.ch/?page_id=280).*

A diverse meeting for a diverse fire brigade

CERN's Fire and Rescue service hosts the 18th meeting of the CTIF Commission for Women in Fire and Rescue Services

Attendees of the 18th meeting of the Commission for Women in Fire and Rescue Services of the CTIF at CERN. (Image: CERN)

On 12 and 13 June, the CERN Fire and Rescue service (CFRS) hosted the 18th meeting of the Commission for Women in Fire and Rescue Services of the CTIF (Comité technique international de prévention et d'extinction de feu), an international association of firefighters.

The CTIF was founded in 1900 with the aim to better understand and continuously improve working conditions for firefighters through ongoing dialogue, analysis and sharing of lessons learned from incidents, accidents and fires throughout the world. Its membership spans 38 countries. The CTIF publishes scientific research, articles and reports. It operates through various commissions, working groups, events and seminars.

The first Women's Committee of CTIF was formed in 1912. Its activities were interrupted by the First World War and it was not reformed until exactly 100 years later, in 2012, when the Commission for Women in Fire and Rescue Services was created to increase the participation of women in the field, share good practice and research and work on issues regarding gender and equal opportunities. The Commission has addressed, inter alia, harassment, maternity and pregnancy-related practices, and equipment issues.

Fifteen representatives of the Commission, hailing from more than 10 different countries, came to CERN to share best practices and exchange views on the challenges of promoting diversity in the field. The Commission's decision to select Switzerland and, in particular, CERN as the location for their meeting was inspired by the 2022 CFRS recruitment campaign for firefighters and fire officers that resulted in perfect gender parity: the CFRS hired four women and four men. The combined efforts of the CERN Fire and Rescue service, the HSE communications team, IR-ECO and HR on the one hand, and CTIF on the other hand to increase the number of female applications contributed to this result.

As illustrated by their joint hosting of this event, HSE, the CFRS and HR hope to continue their collaboration in order to maintain this momentum for future recruitment campaigns. Beyond being aligned with CERN policy, the CFRS and the leaders of the HSE unit strongly believe in establishing a diverse and gender-balanced workforce.

The event also included a tour of CERN and, in particular, of the CFRS premises, following which the experienced CTIF experts from all over the world provided valuable feedback on steps the CFRS could take to improve and enhance its operations.

Computer Security: ChatNoSCRCY

Life has become easier. Instead of your former internet buddy, the good old search engine, giving you reams of answers to your search, the new hype on the market is "ChatGPT", which produces for you the one and only best answer out there amalgamed from its vast training set of data. Inspiration for your job application to CERN? There you go. Quickly dashing off a travel request in Swahili? Karibu*. A love letter in poetic French? Voilà, mon cœur. Producing a code snippet for a software you need? {int return(1)}. Even creating your "own" photographic artworks has become as easy as pie – not to mention films and music in the near future. Deepfakes, anyone?

So, life becomes easier. And more confusing. The truth is becoming blurred, as ChatGPT's answers are only as good as the information provided by its data set. So, beware: your application form, love letter or program code might not produce the quality and result you expected. Common sense, gut feelings, human intelligence and thinking for yourself are your best friends when it comes to assessing ChatGPT's "truth" (see "Hallucination" https://www.nytimes.com/2023/05/27/nyregion/avianca-airline-lawsuit-chatgpt.html).

But, apart from these sociological problems, there are also certain security and privacy aspects to consider. In ChatGPT there is no secrecy!

- Data exposure: Depending on who runs your ChatGPT platform, everything you type in could become mangled into other answers, eventually disclosing some confidential stuff you don't want to see in the public domain (we're aware of some CERN developers posting their code snippets into ChatGPT and asking it to find the bug – these might have included passwords or other secrets).
- Data disclosure during training: Any AI needs training. This training is based on lots and lots of training data which may or may not be considered sensitive/restricted. If adequate protection means are omitted, when the AI training mangles different trainings sets, including those of third parties, and if all the tenants are not well separated, your data might make it into the public domain. To third-party tenants or to creative users. It wouldn't be the first time that a company leaked data through inadequate data protection means.
- Data leakage: Even if you've secured the confidentiality of your training data, when it is exposed to third parties for usage or "questioning", clever people might be able to extract some confidential information by clever questioning.
- Copyright: The training set, and your subsequent result, might be based on copyrighted material. Currently, it is a legal grey area whether or not your new artwork, sound bite or video is subject to those copyrights and you should pay compensation to the owners of the pieces in question.
- Poisoning: This is where an attacker (or an inexperienced AI trainer) manipulates the training sets in such a way that the results are flawed or biased.
- Cheating: Finally, to the chagrin of schoolchildren and students, ChatGPT is a perfect tool to produce results that are not your own. Not your own painting. Not your own homework. Not your own paper. While it might be difficult to spot the real origin today, time may reveal that some authors plagiarised their work.

And, of course, like any other (cloud) software, there are the same computer security and privacy risks that require the same protective means: access control, active system maintenance and patching, encryption and data protection, back-up and disaster recovery, monitoring and logging, etc. So, like with any new technology, and while ChatGPT definitely has its merits and might well be the next game-changer in IT, it also comes with certain risks linked to copyright, privacy and SeCReCY. Make sure the benefits outweigh the potential harm!

** "Karibu": a Swahili word that in English would mean "don't hesitate" or "please".*

The Computer Security team

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. 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 – RM)
Catherine BRANDT (DG – DI)
Marilyse BRIFFOUILLIERE (EP – AGS)
Hanan BRIOUAL (IR – DO)
Michelle CONNOR (TH – GS)
Rachelle DECREUSE-MICHAUD (EN – PAS)
Gaëlle DUPERRIER (EP – AGS)
Nathalie GOURIOU (EP – AGS)
Donia GRANDCLAUDE (HR – CBS)
Nathalie GRÜB (EP – AGS)
Cassandra Marie HEIGHTON (BE – HDO)
Georgina HOBGEN (SY – AR)
Lucie MAINOLI (SY – AR)
Tania PARDO (EP – AGS)
Maria QUINTAS (HR – CBS)
Kate RICHARDSON (EP – AGS)
Emmanuel TSESMELIS (IR – DS)

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 time and prior to their arrival about the conditions of entry to Switzerland and France applying to them and ensure that they obtain the requisite visa, where applicable, in the country in which they are habitually resident. The application must be completed 6 months to 3 weeks before the travel. Useful information can be obtained from the Swiss and French diplomatic representations abroad, as well as from the following Web pages:

CERN Admin e-guide:
https://admin-eguide.web.cern.ch/en/procedure/visas-entry-and-stays-host-states;

Swiss State Secretariat for Migration:
https://www.sem.admin.ch/sem/en/home/themen/einreise/merkblatt_einreise.html;

Swiss permanent Mission in Geneva:
https://www.eda.admin.ch/missions/mission-onu-geneve/en/home/manual-regime-privileges-and-immunities/introduction/manual-visas/schengen-visas-entry-exit-travel.html;

French 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.

Host State Relations Service
http://www.cern.ch/relations/
relations.secretariat@cern.ch
Tel. 75152

Prévessin site physical address

At the request of CERN, in order to facilitate several administrative procedures in France, the municipality of Prévessin-Moëns has registered a physical address for the CERN Prévessin site:
9001, route de Saint-Genis, 01280 Prévessin-Moëns, France.
This physical address must be used when a geographic localisation is necessary, for example in the context of declarations of secondment from CERN contractors working on the Prévessin site.
However, the postal address remains unchanged and postal items should be sent as before to: European Organization for Nuclear Research, F-01631 CERN CEDEX.

Host State Relations Service
www.cern.ch/relations - tel. 75152

Announcements

3rd International Conference on Detector Stability and Aging Phenomena in Gaseous Detectors

Gaseous detectors for particle physics are entering a phase where operation at current experiments and future facilities will require the capacity to work at unprecedent particle rate, higher rate capability, integrated charge and improved time resolution. In addition, new materials are in many cases needed to achieve these new requirements. Finally, the need to replace environmentally unfriendly gases has set an additional challenge to the community.
The third International Conference on Detector Stability and Aging Phenomena in Gaseous Detectors aims in offering an occasion for sharing new results, new ideas, new facility requirements...
The conference will be held at CERN in the main Auditorium from November 6th to 10th, 2023.
The conference will continue the initiative started in 1986 with the first workshop held at LBL (Berkeley) and in 2001 at DESY (Hamburg).
Conference topics will include:

- Detector stability and performance
- Aging phenomena
- Radiation hardness
- Material outgassing
- Novel materials
- Electrodes
- Photocathodes
- Plasma chemistry
- Environmentally friendly gases
- Gas and material analysis, characterisation, instruments
- Discharge damage and mitigation
- Test facilities
- Front End Electronics for detector stability and aging mitigation

The conference will have invited reviews and selected contributions, as well as a poster session. The conference proceeding will be published in peer-reviewed journal.

_____

More information on Indico: https://indico.cern.ch/event/1237829/

CERN to host international Quantum Techniques in Machine Learning conference

The 7th edition of the annual international Quantum Techniques in Machine Learning (QTML) conference will take place from 19 to 24 November 2023 at CERN. The goal of the conference is to gather leading academic researchers and industry players to interact through a series of scientific talks focused on the interplay between machine learning and quantum physics.

First hosted in Verona, Italy (2017), QTML has evolved from a successful two-day workshop to a large-scale conference bringing together experts from the fields of quantum computing and machine learning to discuss the latest progress and future perspectives within the rapidly evolving field of quantum machine learning. The previous editions were held in Durban, South Africa (2018), Daejeon, South Korea (2019), and Naples (Italy). In 2020 and 2021, the event took place online, hosted by Zapata Computing and Riken, respectively. This year, QTML 2023 will be held at CERN, Switzerland.

The one-week conference will comprise talks by key-note and invited speakers, as well as tutorials, on topics covering the application of quantum techniques in machine-learning tasks and the use of machine-learning algorithms for studying quantum systems. The research areas include (but are not limited to):

Quantum algorithms for machine learning,
Machine learning for quantum physics,
Quantum learning theory,
Quantum variational circuits,
Data encoding and processing in quantum systems,
Learning and optimisation with hybrid quantum-classical methods,
Tensor methods and quantum-inspired machine learning,
Quantum machine learning for chemistry, biology, finance and cybersecurity,
Machine learning for experimental quantum information,
Machine learning in quantum chemistry,
Quantum state reconstruction,
Quantum optimisation,
Quantum evolutionary algorithms,
Fuzzy logic for quantum machine learning,
Quantum-enhanced robustness in machine-learning models.

The conference will be followed by a workshop on quantum software, organised by Alessandra Di Pierro (University of Verona) and Carsten Blank (Data Cybernetics ssc GmbH), on Saturday, 25 November. A link to the call for papers will be posted soon on the conference web page.

Mark your calendar now, as registration will open shortly!

For more details and regular updates, please visit the event's website: https://qtml-2023.web.cern.ch/

Sunshine and cancer: know the risks

Join CERN's Medical Service and the LGC on 27 June to find out more about the impact of the sun on our health

The sun's rays have positive effects on people: they encourage metabolic processes, lift our mood and help us relax. However, the sun's ultra-violet rays can be damaging in both the short and long term. Today, more and more people suffer from skin problems brought on by sunlight. Between 50 and 70 percent of skin cancer cases result from excessive exposure to sunlight.

Switzerland ranks among the top ten countries in terms of incidence rates for skin cancer (WCRF, 2020). Every year 22 new cases of melanoma are diagnosed in Switzerland for every 100 000

people. Cases of non-melanoma skin cancer are even higher: around 50 per 100 000 people.
Mountains and lakes on our doorstep give ample opportunities for outdoor pursuits, and sunshine exposure and the associated risks are particularly high at this latitude.
Studies show that people are often not aware of the risks posed by natural and artificial ultra-violet light or of effective prevention measures.

CERN's Medical Service has invited the Ligue Genevoise contre le Cancer (LGC) to host a prevention campaign that will take place on 27 June from 10.00 a.m. to 3.00 p.m. in the foyer of the Main Building (outside Restaurant 1). At the stand, you'll find out more about the impact of the sun on our health and what you can do to protect yourself from its harmful effects.

Medical Service

Saturday, 8 July: the Hardronic Music Festival is back again!

The CERN MusiClub is very pleased to announce that the Hardronic Music Festival is back again!
For more than 30 years, Hardronic has been an opportunity for CERN staff, students, users and their friends and families to come to the site and enjoy live music, delicious food and cool drinks. This year's edition, featuring nine of the CERN MusiClub's finest bands, will take place on Saturday, 8 July 2023 on the Restaurant 3 terrace on the Prévessin site. Music will start at 3.00 p.m., and there will be lots more on offer to entertain you.

Thanks to the kind support of the CERN Staff Association and Management, entry to the festival is completely free. A regular free shuttle bus will also be provided from the Meyrin site thanks to the SCE department. What's more, 100% of the profits from the bar will support the work of AidforAll, a local charity helping poor communities with basic needs, education and emergency health care in Viet Nam, India, Laos and, most recently, Ukraine.
For more information, please check out the festival website: http://cern.ch/hardronic/

Conference on "Privacy by Design" with R. Jason Cronk – 7 July

On 7 July 2023, R. Jason Cronk – privacy engineer, attorney and author of Strategic Privacy by Design, 2nd Ed. – will visit CERN to talk about "Privacy by Design: more than just a catchy phrase".
Jason is an active member of the privacy community and a pioneering voice in the development of privacy by design. Drawing from over two decades of experience, he will show us how privacy by design principles can be implemented in our daily activities.
Beyond the legal theory, this conference will be an opportunity to find out more about and exchange around privacy protection.
For more information, visit the event's Indico page (https://indico.cern.ch/event/1296702/).

Obituaries

Roger Bailey (1954 – 2023)

Roger front and centre during LHC commissioning. (Image: CERN)

It was with deep sadness that we learned that Roger Bailey passed away on 1 June while out mountain biking in Valais. He was 69. Roger began his career with a doctorate in experimental particle physics from the University of Sheffield in 1979, going on to a postdoctoral position at the Rutherford Appleton Laboratory until 1983. Throughout this time, he worked on experiments at CERN's Super Proton Synchrotron (SPS) and was based at CERN from 1977. In 1983 he joined the SPS Operations group, where he was responsible for accelerator operation until 1989. He then moved to LEP, playing a leading role through commissioning to operation, and was made Operations group leader in the late 1990s.

After LEP shut down in 2000, Roger became progressively more involved in the LHC, planning and building the team for commissioning with beam. He was actively involved in the LHC's early operation through to 2011, when he became Director of the CERN Accelerator School (CAS), sharing his wealth of experience and inspiring new generations of accelerator physicists.

Those of us that worked with Rog invariably counted him as a friend: it made perfect sense, given his calm confidence, his kindness and his generosity of spirit. He was straightforward but never outspoken and his well-developed common sense and pragmatism were combined with a subtle and wicked deadpan sense of humour. We had a lot of fun over the years in what were amazing times for the Lab. Looking back, things he said can still make us chuckle, even in the sadness of his untimely passing.

Rog had a passionate, playful eye for life's potential and he wasn't shy. There was an adventurous spirit at work, be it in the mountains or the streets of New York, Berlin or Chicago. His specialities were tracking down music and talking amiably to anyone.

A service to celebrate the life of Roger took place on Friday, 16th June across from the slopes of Verbier, where Roger enjoyed a lot of fun, friendship and snow. During the service a poem of his called *It's a Wrap* was read by his daughter Ellie, revealing a physicist's philosophical view on life in the Universe. There were fond reflections on his life by three of his old friends, and a variation for Roger on a poem by Roger McGough called *Big Hugs*. The first line asks the question "Before I go, who do I give a hug to?" – it was quite a long list.

Two of his favourite quotes were on the order of service:

Mae West's *"You only live once, but if you do it right, once is enough."*

Einstein's *"Our death is not an end if we can live on in our children and the younger generation. For they are us, our bodies are only wilted leaves on the tree of life."*

And another, by Hunter S. Thompson, was mentioned in the homage given by his son Rob:

"Life should not be a journey to the grave with the intention of arriving safely in a pretty and well-preserved body, but rather to skid in broadside in a cloud of smoke, thoroughly used up, totally worn out, and loudly proclaiming "Wow! What a Ride!"

Way to go, Rog, way to go.

His colleagues and friends at CERN

Ombud's corner

No judgement… Really?

The principles underpinning the Ombud's work, as set out in the Code of Ethics of the International Ombuds Association, are confidentiality, informality, independence, neutrality and impartiality.

In my opinion, another important principle – namely freedom from judgement – is not sufficiently reflected in the Code, even though it is partially covered by the concepts of neutrality and impartiality.

The Oxford English Dictionary gives us the following definitions of neutrality and impartiality:

Neutrality: a neutral policy or attitude between contending parties.

Impartiality: the quality or character of being impartial; freedom from prejudice or bias; fairness.

These definitions demonstrate that neutrality and impartiality cannot be defined without reference to a conflict between several parties. Freedom from judgement, on the other hand, is practised towards an individual without them necessarily being in a conflictual situation.

I recently had a visit from Sofia*, who contacted me to discuss a difficult situation.

After explaining to her, as I systematically do, how a visit to the Ombud works, I spontaneously added that I would consider any situations brought to me without judgement.

Sofia's immediate reaction was tinged with incredulity ("No judgement, really?") and I had to reassure her on that point, which resulted in us having a very profound conversation.

Firstly, I told her that I wasn't there to make any judgement about the facts she reported, whatever they might be. On the other hand, I might evaluate, together with her, to what extent those facts complied – or not – with CERN's Code of Conduct or other applicable texts. Then it was up to Sofia, and her alone, to determine what was best for her and what course of action to take.

But above all, and very importantly, the Ombud is not there to judge the person in question, their choices, opinions, preferences or values. Sofia, like any other visitor, was welcomed in all her diversity and complexity, without judgement.

In this bubble of trust and safety created by the Ombud, everyone can express themselves freely without having to worry that they or their actions are being judged.

Laure Esteveny

**Names have been changed*

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