CERN Bulletin

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CERN and Airbus partnership on future clean aviation

CERN and Airbus UpNext sign a collaboration agreement to assess the use of superconducting technologies for future zero-emission aeroplanes

CERN's High Temperature Superconducting (HTS) rare-earth barium copper oxide (also referred to as REBCO) power transmission cable used to study the feasibility of superconductivity for aircraft. (Image: CERN)

Today, CERN and Airbus UpNext, a wholly owned subsidiary of Airbus, have launched an innovative collaboration to explore the potential use of superconducting technologies developed by CERN for particle accelerators in the electrical distribution systems of future hydrogen-powered aircraft.

Superconducting technologies could drastically reduce the weight of next-generation aircraft and increase their efficiency.

The partnership focuses on the development of a demonstrator known as SCALE (Super-Conductors for Aviation with Low Emissions), bringing together CERN's expertise in superconducting technologies with Airbus UpNext's capabilities in innovative aircraft design and manufacturing.

If the expected performances and reliability objectives are achieved, the collaboration could reach the ambitious target of flying a fully integrated prototype within the next decade.

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A Word from Joachim Mnich

Looking back on a good year for physics

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Looking back on a good year for physics

With the accelerator complex having shut down for the year on 28 November, now is a good moment to take stock of the healthy position of our research. This year saw a wealth of new results across the programme. At the LHC, Run 1 and 2 data continue to deliver a rich seam of results. There has also been much to whet the appetite from the new data that the first period of Run 3 has delivered, and the non-LHC programme continues to thrive.

Throughout the year, we saw important new results coming from the full LHC Run 2 dataset. These included a measurement of the mass of the top quark with unparalleled precision from CMS and a measurement of top quark production along with a photon from ATLAS. This is a rare phenomenon that offers a tool for exploring new physics.

A highlight from the ALICE experiment was the first direct observation of a phenomenon known as the dead cone effect, which gives access to the mass of the charm quark. LHCb, meanwhile, continued to enlarge its inventory of new exotic particles, adding a new pentaquark and the first two tetraquarks ever to be observed. Such observations strengthen our understanding of the strong force that binds quarks together. LHCb's capacity for precision was also on display in the measurement of the largest matter-antimatter asymmetry so far observed in particle decays.

As we marked the 10th anniversary of the discovery of the Higgs boson, ATLAS and CMS both published comprehensive papers detailing all that we've learned about this intriguing particle so far. A good indicator of how far we've come is how precisely both ATLAS and CMS have measured the basic properties of the Higgs – we now know its mass to a precision of around 0.1% and its lifetime has been measured to be around 10^{-22} seconds, just as predicted by the Standard Model. For its part, the ALICE collaboration published a review of its journey to date through the quark–gluon plasma.

All of these results came from the analysis of existing data but, as the 2022 run came to an end, both the ATLAS and CMS experiments have published results based on Run 3 data. This was made possible thanks to the exceptional performance of the LHC this year, as described in the first of a series of Run 3 reports in this *Bulletin*.

These are just a handful of the results I could have chosen to highlight from the LHC this year, and the fact that I had to choose is testimony to the fantastic performance of the accelerator, the detectors and the computing infrastructures, along with the inventiveness of those who run them and analyse the data.

Of course, there is much more to the CERN programme than the LHC. Again, I have to be selective but, among the highlights of 2022, I could mention measurements of antiprotonic helium from the BASE experiment at the AD or important work at ISOLDE on thorium-229, which could pave the way for ultra-precise "nuclear clocks".

We've called time on 2022 running earlier than planned as a consequence of the energy crisis, and running next year will also be curtailed. This is important, necessary and not without pain for the experimental programme of this laboratory. However, what this year has shown is that the CERN community is able to rise to the challenge. Whatever 2023 has in store, I'm confident that more good physics will be a strong part of the mix.

Joachim Mnich
Director for Research and Computing

CERN and Airbus partnership on future clean aviation

>> "In its research, CERN pushes back the limits of science and engineering, and partners with industry to enable innovation, with a positive impact on the environment," said Raphaël Bello, CERN's Director of Finance and Human Resources. "Our technologies have the potential to be

adapted to the needs of future clean transportation and mobility solutions, as this agreement with Airbus demonstrates. This partnership is only a first step in our journey with the European leader in aviation, and shows how much we value the excellence of our Member States' industry."

"Our role at Airbus UpNext is to explore the full potential of technologies for future aircraft and to partner with the world's leaders to prepare for this future. Partnering with a leading research institute like CERN, which has brought the world some of the most important findings in fundamental physics, will help to push the boundaries of research in clean aerospace as we work to make sustainable aviation a reality", said Sandra Bour-Schaeffer, CEO of Airbus UpNext. "We are already developing a superconductivity demonstrator called ASCEND (Advanced Superconducting and Cryogenic Experimental powertraiN Demonstrator) to study the feasibility of this technology for electrically powered and hybrid aircraft. Combining knowledge obtained from our demonstrator and CERN's unique capabilities in the field of superconductors makes for a natural partnership."

"Superconducting technologies have fuelled some of the greatest discoveries in high-energy physics and, if applied to aircraft power distribution systems, would drastically reduce their weight and increase their efficiency. CERN has over 40 years of expertise in building world-record superconducting systems that are at the core of existing and next-generation particle accelerators. Such systems present negligible resistance to the flow of current, thus transmitting much higher intensities than traditional, heavier, non-superconducting cables," said José Miguel Jimenez, Head of the Technology department at CERN.

LHC Report: The switch was flipped, and the beams were dumped

Looking back on an exciting year for the LHC and its injector complex

CERN's Large Hadron Collider. (Image: CERN)

On Monday, 28 November at 6 o'clock in the morning, the LHC Engineer in Charge flipped the switch and the last proton beams of 2022 made a final turn around the LHC before being discarded into the dedicated beam dumps. This marked the end of the first of four years of Run 3 and the start of the year-end technical stop (YETS), a mere 21 weeks after the very first collision at 6.8 TeV per beam.

2022 was, without a doubt, a commissioning year: our teams encountered problems related to Long Shutdown 2 (LS2) updates, as well as beam intensity limitations due to heat load, in particular in sector 7-8. Thankfully, these issues were effectively addressed, and alternative beam schemes were tested and used to overcome the limitations.

All in all, the machine and beam performance exceeded initial expectations. The integrated luminosity prediction for 2022 was 25 fb^{-1}, based on a beam availability factor of 30%, which matches average values for commissioning years. In fact, the beam availability factor for a major part of the physics run was closer to 50%, despite two extended stops in May and August–September and the longer YETS, which was brought forward by two weeks due to the worldwide energy crisis. Along with the good beam performance, this availability resulted in the delivery of 40 fb^{-1} for both ATLAS and CMS. However, the four-week

lead run, which was scheduled at the end of the year, was cancelled in favour of proton physics.
The LHC would not have achieved this impressive number of collisions without the considerable flexibility and good performance of the injector complex, which concluded its second year of Run 3 (already!) on 28 November 2022. The injectors are reaping the benefits of the LHC Injector Upgrade undertaken during LS2, and the intensity ramp-up towards HL-LHC beam parameters has made commendable progress over the past few months – the PS and its Booster have actually reached these parameters already in 2022.
Besides feeding protons to the LHC, the injectors have once again served the rich and varied fixed-target physics programmes of ISOLDE, the East Area, the n_TOF facility, the Antiproton factory, AWAKE, HiRadMat and the North Area. As an example, the SPS provided a record 2.3×10^{19} protons to the North Area while improving the quality of the beam spill, as requested by the users.
Although the lead ion run was cancelled at the LHC, lead ions were successfully fed to the North Area for a two-week physics run, down from four weeks. In addition, the commissioning of the slip-stacked LHC ion beam in the SPS was completed, and LHC experiments did register some lead–lead collisions as part of a two-day lead ion test run in November, during which slip-stacked bunches were injected.
Today, instead of particles, technicians and engineers are whizzing around the tunnels to ensure that the accelerator complex is properly maintained, and to prepare it for 2023 – another year of hopefully efficient operation and promising data taking.

Rende Steerenberg

The SM18 test facility in the HL-LHC era

A new metallic structure has been built at SM18 to house the HL-LHC IT string. (Image: CERN)

The SM18 test facility, located in France, near the Meyrin site, was originally built to test and validate the magnets and radiofrequency (RF) cavities of LEP (the Large Electron–Positron Collider). It has since seen over 1700 such components pass through it – including, of course, those of the LHC – and is now preparing to welcome the magnets and RF cavities of the future HL-LHC.
To test the LHC magnets, the SM18 hall was equipped with 12 similar test benches, allowing the cryoassemblies to be cooled down to 1.9 K and then powered in nominal conditions for validation. All magnets were tested individually in the different test benches before being installed in the accelerator.
Between 2009 and 2020, the configuration of the 12 benches was progressively changed: in the R&D phase of the HL-LHC, five vertical cryostats have been installed in SM18 to test the model magnets. Three of them were recovered from an existing test stand and two have been newly designed, specially manufactured and installed. These imposing new cryostats needed more space, resulting in the dismantling of two of the 12 benches to make space for a vertical test stand.
The major upgrade campaign that has been under way at SM18 since 2014 was justified by the fact that the new magnets employ new technologies, different from the LHC ones. In particular, the HL-LHC inner-triplet (IT) quadrupole magnets, which will focus proton beams more tightly around the ATLAS and CMS collision points, are built with niobium–tin (Nb_3Sn) coils, instead of the niobium–titanium (Nb-Ti) alloy currently used for LHC magnets.

The R&D phase for the HL-LHC magnets has been successfully closed; magnets are now being produced in their final configuration. These long magnets (up to 12 m) are now to be tested in their nominal (horizontal) position. Thus, four of the remaining 10 benches have also been modified with a powering system of up to 20 kA, instead of the existing 15 kA. This also comes with an innovative protection scheme, adapted to the magnets' higher energy.

In addition, a new test benches will host the superconducting link system – a versatile powering scheme infused with helium gas. "In the coming years, no fewer than 50 cryoassemblies and superconducting link systems will pass through these test benches," says Marco Buzio, a test engineer in the TE-MSC-TM section. "It will be a challenging job for all teams involved."

The inaugural run of the new cryoassemblies and of the prototype superconducting link system in a combined mode will take place within the HL-LHC IT string. To test the collective behaviour of these cryoassemblies with all warm and cold powering systems, just as it will be in the HL-LHC, the HL-LHC IT string has been created – an integrated test facility located at SM18.

Installed on a new metallic structure, the HL-LHC IT string is fully representative of the HL-LHC inner triplet that will be installed at Point 5. "It will allow for early development and validation of the installation procedures and individual systems tests. It also facilitates the execution of the entire hardware commissioning programme for many of the key technologies of the HL-LHC project," says Marta Bajko, leader of the IT string facility section (TE-MPE group). The installation and interconnection of the IT magnet chain is planned for the second quarter of 2023, while the operation period spans from 2024 to 2025. The validation of the systems, procedures and hardware commissioning steps will be one of the most important milestones for the HL-LHC.

A new exhibition at SM18

A new exhibition space is currently under construction inside SM18. Separated from the main hall via glass, it will be an immersive space that will showcase the cutting-edge technologies being developed and tested at SM18. Visitors will learn more about the new crab cavities with their new the superconducting link and will have a unique view on the HL-LHC IT string. This new exhibition will open its doors to the general public (and, of course, to CERN personnel) next summer. Stay tuned!

From CERN to space: staff member selected to join the ESA 2022 astronaut class

Selected out of more than 22 500 applicants, CERN engineer Sławosz Uznański from Poland has been chosen as one of the 11 members of the ESA 2022 astronaut class in the reserve pool

Slawosz Uznanski. (Image: CERN)

On Wednesday, 23 November at 3.30 p.m. CET, the European Space Agency (ESA) unveiled the names and faces of the new European astronaut corps at a live media event broadcast from the Grand Palais Éphémère in Paris. Selected out of more than 22 500 applicants, CERN engineer Sławosz Uznański from Poland came the closest he's ever been to his childhood dream as he is now one of the 11 members of the ESA 2022 astronaut class in the reserve pool. The class includes five career astronauts (from Belgium, France, Spain, Switzerland and the UK), 11 reserve astronauts and one astronaut with a physical disability, who will be engaged in a feasibility project. This was the

first call for new ESA astronaut applicants since 2008 and it is the first time that ESA has established a reserve pool. While the career astronauts will be employed by ESA in early 2023, the 11 reserve astronauts remain with their current employers and receive a consultancy contract. They will start training when a flight opportunity for them is identified. With the advent of US commercial rockets and capsules, there is a good chance that this might happen soon.

Reached over the phone while celebrating with his new teammates at the ESA event in Paris, Sławosz said he was happy with the selection result. “This is just the beginning!” was his first comment. Answering questions from Polish journalists, he mentioned the AMS cosmic ray detector, built at CERN and currently installed on the International Space Station. “An upgrade of the detector is foreseen; the mission will probably take place in 2026/27. In my opinion, I would be an ideal candidate for this mission, as I know how these detectors are built – this is definitely my area – and I know the CERN infrastructure very well.”

Sławosz, who holds a PhD in microelectronics from the University of Marseille, has been working at CERN for the past 11 years as a project engineer in the Converter Controls Electronics section of the Electrical Power Converters group (SY/EPC/CCE). He has designed and built thousands of power converter control systems used by the Large Hadron Collider (LHC) and throughout the accelerator complex at CERN.

“Sławosz’s most impressive achievement has been the design of a radiation-tolerant power converter controller for the LHC, which has had an exceptional reliability since it was installed – it’s a crucial part of the system, and was a really challenging technical design,” says his supervisor, Benjamin Todd. From January 2018 to January 2019, Sławosz worked as Engineer in Charge of the LHC, where he led the operations of the accelerator 24/7. Passionate about space since early childhood – he was born on 12 April, which is International Astronaut Day – he has worked on interdisciplinary projects for space applications, such as designing methodologies of radiation-hardened integrated circuits for high reliability (ESA, Thales, CNES), creating a state-of-the-art software platform for the design and simulation of integrated circuits and assessing component failure rates in harsh environments. A keen science communicator, in his time off he is “outside testing my limits on multi-day mountaineering expeditions in the Alps/Himalayas, travelling in remote places or sailing into the unknown”.

As the Agency enters a new decade of space exploration, there will certainly be multiple opportunities for European astronauts to travel to the International Space Station and beyond. Concluding the live announcement event, ESA Director-General Joseph Aeschbacher said:

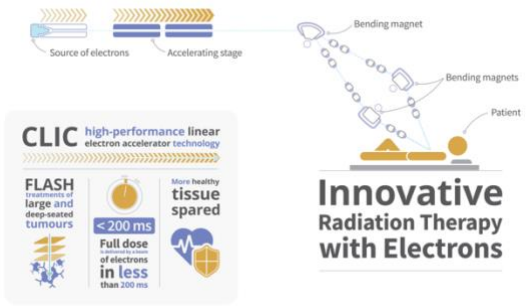
“We need to keep our eyes on our aim of living and working on the Lunar Gateway, then the Moon and – who knows – maybe even one day the surface of Mars. This new group of recruits will help keep our astronaut corps at full strength, ready for an exciting future.”

We have no doubt that Sławosz will be part of that future.

Paola Catapano

CERN, CHUV and THERYQ join forces for a world first in cancer radiotherapy

CERN, CHUV and THERYQ have signed an agreement for the development of a revolutionary FLASH radiotherapy device



The schematic shows the concept of a new revolutionary VHEE FLASH radiotherapy device (Image: CERN)

CERN, the Centre Hospitalier Universitaire Vaudois (CHUV) and THERYQ (ALCEN group) have signed an agreement for the development of a revolutionary FLASH radiotherapy device that will use very high-energy electrons (VHEE) to treat cancers that are resistant to conventional treatments, with greatly reduced side effects. The device is the first of its kind. Based on CERN technology, it will be installed at CHUV when ready.

This collaboration is another example of how fundamental research conducted at CERN promotes the development of new technologies that transform society, in particular through collaboration with key partners.

Today's milestone represents an important step forward. The tripartite agreement covers the development, planning, regulatory compliance and construction of the world's first radiotherapy device capable of treating large, deep-seated tumours using the FLASH technique. The device will include a compact linear accelerator based on CERN technology, and will be manufactured by THERYQ, which is part of ALCEN's healthcare division.

The device will use very high-energy electron beams of 100 to 200 MeV, allowing all types of cancers up to a depth of 20 cm to be treated using the FLASH technique. Its compactness allows it to be used in a hospital setting. Besides the health benefits to patients, it also has the potential to decrease the cost of treatment. It is expected to be operational within two years, with the first clinical trials planned for 2025.

Radiation therapy is one of the main forms of cancer treatment, along with chemotherapy, surgery and immunotherapy. Currently, one third of cancers are resistant to conventional radiation therapy. It is in this context that the head of the radiation oncology department at CHUV, Professor Jean Bourhis, and his team pioneered the method of FLASH radiotherapy, which has produced impressive results in pre-clinical animal studies. THERYQ, a spinoff of PMB-ALCEN, has supported the development of FLASH therapy since the beginning in 2013, in particular through a long-standing partnership with CHUV.

VHEE FLASH technology has several advantages in addition to being capable of reaching deep-seated tumors. High-energy electrons can be focused and oriented in a way that is almost impossible with X-rays, and radiotherapy devices based on CERN's electron accelerator technology will be significantly more compact and less expensive than current proton-based therapy devices. CERN has responded to the challenge of producing a high dose of very high-energy electrons in less than 100 milliseconds, as required for FLASH radiotherapy, by designing a unique accelerator based on CLIC (Compact Linear Collider) technology.

"At CERN, part of our mission is knowledge transfer and we actively work to find applications for our breakthroughs outside the domain of particle physics for the benefit of society at large. This collaboration demonstrates how CERN technologies and expertise, combined with strong partnerships with experts in other fields, can really make an impact," says Mike Lamont, CERN Director for Accelerators and Technology.

Outreach award for initiative to teach high-school physics with CERN detectors in Spain

Minipix detectors can be directly connected to computers, which allows them to be used in classrooms. (Image: CERN)

Since their inception at CERN in the framework of the Medipix collaborations, the Medipix and Timepix families of chips have proved their worth in various technical and scientific fields, from medical imaging to astrophysics – Timepix chips are flying on the Artemis I mission this month. Yet, in parallel, these extremely compact and highly accurate particle detectors are infiltrating a more ordinary environment: secondary school classrooms.

CERN microelectronics experts, secondary school teachers in Catalonia and researchers at the University of Barcelona have teamed up to facilitate the dissemination of Minipix detectors (a commercially available USB readout system incorporating the Timepix chip) in Spanish secondary schools, while similar initiatives are flourishing in other European countries too. The project team has established a network of schools that share Minipix detector systems and prepared classroom activities to help teachers maximise the chips' educational potential.

With nothing more than the Minipix detector and a computer, background radiation can be visualised in real time and perfectly safely. Different naturally occurring particle species (alphas, betas, gammas and cosmic muons) can be distinguished by the characteristic traces they leave in the detector. Experimenting with the device can help pupils attain their educational goals in physics and technology, of course, but also in biology, computer science and mathematics, as laid out in the document presenting the project to the Spanish National Centre for Particle, Astroparticle and Nuclear Physics (Centro Nacional de Física de Partículas, Astropartículas y Nuclear, CPAN).

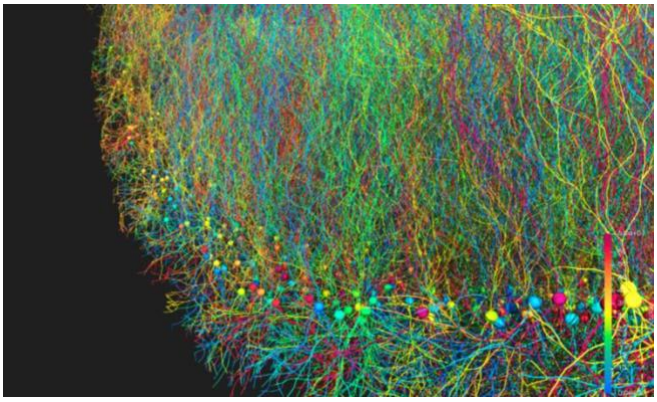
The initiative was granted an outreach award by a panel of CPAN judges on 25 November. Daniel Parcerisas (Sagrada Familia, Gava) accepted the award at the CPAN 2022 annual meeting in Bilbao, Spain, on behalf of the awarded team, composed of Rafael Ballabriga (EP-ESE-ME, CERN), Eugeni Graugés (University of Barcelona), Anna Argudo (University of Barcelona), David Corrons (La Salle Manlleu), Iolanda Huguet (INS Mollerusa IV), Esther Pallares (University of Barcelona), Hernan Pino (Institut Sant Nicolau, LIWU), Francesc Salvat (SY-STI-BMI, CERN) and Sonia Tarancon (Santo Angel).

The jury rewarded the project's originality and didactic potential and underlined the efforts made by the team to adapt the experiments to students with special educational needs. The award, besides providing further financial support, bolsters the project and similar initiatives throughout Europe, showcasing the role that institutions such as CERN can play in improving the way physics is taught in schools.

Thomas Hortala

BioDynaMo modelling platform accelerates biological simulation and more

The BioDynaMo project, launched by CERN openlab in 2015, has now reached maturity and is seeking new applications



A simulation created with the BioDynaMo platform. (Image: CERN)

BioDynaMo (Biology Dynamics Modeller) is an open-source software platform for creating, running and visualising all kinds of 3D agent-based simulations. Agent-based modelling focuses on the individual active components of a system. It is a powerful methodology for studying complex systems in biology, epidemiology, economics, social sciences, medicine and more.

The BioDynaMo project was launched in 2015 as part of CERN openlab's work with Intel on code modernisation, and received support from the CERN budget for knowledge transfer for medical applications. Its primary goal was to accelerate biological simulation.

The main advantage of BioDynaMo compared with similar tools is that it has been heavily optimised to take full advantage of modern (multi-core and GPU) hardware and can greatly reduce simulation time, thus allowing researchers to simulate several scenarios in a reasonable time frame. These features have convinced several laboratories to switch to BioDynaMo for running their simulations. For example, the platform has been used to simulate the spread of COVID-19 in enclosed spaces and to examine socio-economic inequities in the Netherlands.

The technical coordination of the BioDynaMo project has now been transferred from CERN to the University of Cyprus. This marks a significant milestone in the lifecycle of the project. The project team thanks Fons Rademakers and his colleagues for the excellent job they have done guiding BioDynaMo's development and is now actively seeking new applications for this powerful platform. "We are proud to have incubated this successful project," says Alberto Di Meglio, head of CERN openlab. "With BioDynaMo having reached a sufficient level of technical maturity, the time is right for the consortium to explore new applications in and partnerships with other research fields, ensuring maximum impact for society."

BioDynaMo is one of the technologies selected for the CERN Technology Impact Fund, a new scheme that supports CERN technologies with a strong potential to address global societal issues.

CAST-CAPP inches closer to axion dark matter

The CAPP axion haloscope at the CAST experiment has hunted for axions from the Milky Way's "halo" of dark matter, and has narrowed down the theoretical space in which to look for these hypothetical particles

The CAST experiment at CERN. The CAST-CAPP resonator was placed inside one of the two bores of CAST's magnet (blue). (Image: CERN)

Hypothetical particles called axions could solve two enigmas at once. They could account for dark matter, the mysterious substance that is thought to make up most of the matter in the Universe, and they could also explain the puzzling symmetry properties of the strong force that holds protons and neutrons together in atomic nuclei.

But the theoretical space of possibilities for axions is vast, both in terms of their mass and the strength of their interaction with other particles. Axion searches are therefore targeting different regions of this space, each search bringing with it the possibility of discovery and its results guiding future searches.

In a new paper published in Nature Communications, a team of researchers working on the CAST experiment at CERN report how they have repurposed part of the experiment to target a previously uncharted region of the axion space.

CAST was originally designed to hunt for axions originating from the Sun. In their new study, the CAST team placed a resonator consisting of four cavities inside one of the two bores of the experiment's magnet in order to build an axion detector that looks instead for axions from the Milky Way's "halo" of dark matter – an axion haloscope, which they named CAST-CAPP.

In a strong magnetic field, such as the one provided by CAST's magnet, axions should convert into photons. An axion haloscope's resonator is basically a radio that researchers can tune to find the frequency of these axion-converted photons. But the frequency of the axion "radio station" is not known, so the researchers must slowly scan a band of frequencies to try to identify the frequency of the axion signal.

The CAST-CAPP resonator can be tuned to pick up axion signals ranging from 4.774 to 5.434 GHz, corresponding to axion masses of between 19.74 and 22.47 microelectronvolts.

The CAST researchers scanned this 660 MHz band of frequencies in steps of 200 kHz for 4124 hours, from 12 September 2019 to 21 June 2021, and isolated known background signals such as the 5 GHz Wireless Local Area Network (WLAN), but did not pick up any signal coming from axions. However, the CAST-CAPP data places new bounds on the maximum strength of the interaction of axions with photons for axion masses of 19.74 to 22.47 microelectronvolts, narrowing down the space in which to look for axion dark matter.

The new bounds are complementary to results from previous axion searches, including those from another CAST haloscope, RADES, which took data in 2018.

The hunt for dark matter continues. Tune in to this station again to check for updates from CAST-CAPP or from other dark-matter investigations taking place at CERN, such as searches for dark matter that may be produced at the Large Hadron Collider.

Send a CERN e-card

Send colleagues, family and friends holiday greetings using the CERN e-card service.
You can create your own personalised electronic cards by signing in with your CERN account on this site: https://ecard.web.cern.ch

Computer Security: What's under the tree?

With the usual consternation, we see the end of the year is approaching apace*. That means it's time to review what Father Christmas and his elves, gnomes and reindeers, if you happen to believe in them, have put under the computer security tree. Time to see what gadgets you can expect to protect you in 2023, and what goodies you can use to make your personal and professional life more secure.
Neither this year's annual closure nor the New Year fireworks will stop any bad witches from poking into CERN. Like in 2022, when they kept the Computer Security team busy with the alleged extortion of 200 GB of data by some red-nosed script kiddies (where these 200 GB were found to be public files linked to CERN's "root" software), two one-hour distributed denial-of-service snowball attacks against CERN's outer perimeter firewall (which was nicely absorbed by the latter) and a "CEO-fraud" attack against one of our account managers aiming to steal some money (which was spotted before any transaction was approved). Internally, too, CERN was facing some "trouble": remember our annual phishing campaign?
So, it's time for some big presents! This winter, our elves and gnomes have filled your stocking with new anti-malware software for your personal devices used at home or at CERN for professional duties. Just take their voucher and install that protective software from the CERN app store for Windows ("ESET Endpoint Security") or via the Mac Self-Service ("ESET Endpoint Antivirus"). On top of that, you'll find some hardware tokens in your Christmas hamper. They call them "YubiKeys", in either USB-A or USB-C style, ready to better shield your CERN computing account. Join the community of 1500+ people who have already enrolled for the CERN two-factor authentication scheme for ultimate silver bullet protection. And, if you've already done so, pass your YubiKey on to some colleagues who haven't. Your personal present to them, handed over because you care and for their enjoyment. Last but not least, there are the usual gift cards: our security reindeers together with the unicorns in the IT department are just waiting for your feedback on how to better protect your systems and services, how to enhance their security stance and how to improve their software components and configuration. Just scratch off your scratch card to reveal that they are ready to help (ping them at Computer.Security@cern.ch to be sure).
Behind the scenes, our angels will continue to monitor your CERN computing account to spot weird abuses, like logins from "unusual locations" or when your password happens to be same as one that has been exposed via a data breach outside CERN. They'll also continue to scan your devices, systems and services for vulnerabilities, weaknesses and misconfigurations, and keep a watchful eye for malicious network traffic, logins or scorched Christmas turkeys. You'll get a Christmas card with the details of anything they spot.
We wish you brilliant and magical end-of-year festivities, surrounded by your friends and family. Whether you call it Christmas, Hanukkah or

nothing at all, remember that our presents – the anti-malware, the YubiKeys, the consulting cards – are there to protect your digital life, give you more security and spare you from the digital evil of this world. For a Happy New Year. Cheers!

**Physicists estimate that the end of the year approaches at the unbelievable speed of about 86 400 seconds per day every day!*

Computer security team

Official news

Preparing for the unlikely event of a blackout at CERN

While a blackout this winter is unlikely, CERN is prepared. Here's some information about what you should do if CERN's energy supply is cut

In response to the ongoing energy crisis in Europe, CERN has examined a range of potential scenarios that could occur at CERN over the coming winter. These include the unlikely event of a complete blackout on all sites, which would arise only if both the French and the Swiss electricity supplies were cut off at the same time. If this were to happen, CERN's diesel generators can provide emergency electricity, but this would not be sufficient to keep everything running. Each department has therefore put in place plans for dealing with a blackout, which have consequences for everyone working on the CERN sites. If this concerns you, please take a few minutes to acquaint yourself with the key points below.

First and foremost, please keep in mind that CERN's sites are intrinsically safe. Therefore, although most systems at CERN depend on electricity, a blackout is not a cause for alarm. If you are working underground, you should evacuate to the surface as soon as possible, after ensuring that any equipment you may have been using is left in a safe state.

Information, including the time of the start of the blackout, will be provided via CERN's mobile phone network and by email. Direct wired or wireless internet access is likely to be unavailable, but the mobile phone networks will continue to operate for up to two hours on the CERN sites. Although the Drupal web servers will not be running, it is planned that a simple web page will be available at home.cern, giving basic information about what you should do. Please note that Mattermost is unlikely to be available.

Leaving the sites will understandably be on everyone's mind if a blackout occurs during working hours and lasts more than 30 minutes. Nevertheless, unless you have pressing reasons, such as picking up children from a crèche or school, please do not leave immediately.

<u>If you are working on the Meyrin site</u>

In order to ensure a smooth flow of traffic, if you are not required by your department to remain on site and are leaving by car, please do so according to the table below, based on the last digit of your CERN Person ID number, as shown at the bottom of your access card. Jo Public, for example, should leave the site 35 minutes after the start of the blackout. When leaving, please ensure that any equipment you are responsible for is left in a safe state.

Gates A and E will be open for vehicles leaving the CERN site, while gate B will be open for entering the site. All the other gates will be closed to allow the security agents to be deployed at the other gates on the other sites.

When (min)	Who (last Person ID digit)
0 to 30	Anyone needing to leave the site for urgent reasons
30	0
35	1
40	2
45	3
50	4
55	5
60	6
65	7
70	8
75	9

<u>If you are working on the Prévessin site</u>

Those whose Person ID number ends with the digit 0, 1, 2, 3 or 4 should leave no earlier than 30 minutes after the start of the blackout, while those whose number ends with the digit 5, 6, 7, 8 or 9 should leave no earlier than 40 minutes after the start of the blackout.
If you are working on any other site, you may leave at your convenience if electricity has not been restored within 30 minutes.

<u>Pedestrians and cyclists</u>

Bicycle turnstiles will not be powered, so cyclists will have to use the car lanes. On the Meyrin site, they may use gates A, B or E but should be aware that traffic through gate B could be disrupted if the blackout affects the traffic lights.
Pedestrians leaving the Meyrin site may use gates A, B, C or E, as well as the Jura turnstile gate close to Building 33. It will not be possible to leave via the CERN reception area in Building 33.

<u>Further information</u>

A document containing full details of which services will be maintained, drawn up by the SCE department, is accessible on EDMS to anyone with a CERN account. A list of the services that the IT department expects to keep running can be consulted here. In the event of a blackout, up-to-date information on which services are actually running will be available on the IT service board.

Pensions payment dates in 2023

Friday 6 January
Tuesday 7 February
Tuesday 7 March
Thursday 6 April
Monday 8 May
Wednesday 7 June
Friday 7 July
Monday 7 August
Wednesday 6 September
Friday 6 October
Tuesday 7 November
Thursday 7 December

Amendment to Safety Code E: “Fire protection”

Integrating installation of axial-feed hose reels

Safety Code E, “Fire Protection”, was published in 1995. Article 3.2.2 of Annex VI concerning “Extinguishing appliances usable by those on the spot” stipulates that: “At least one axial-feed hose reel (referred to as robinet d’incendie armé (RIA) in France and poste incendie in Switzerland) must be fitted in any building with a wall 40 m or more long”.

This requirement is no longer in line with the Host States’ fire safety regulations* and has been subject to repeated requests for clarifications and derogations at CERN. Safety Code E is currently under revision and will be replaced by a fire safety rules cluster in the coming years. In the meantime, article 3.2.2 of Annex VI of Safety Code E has been amended, complete with a descriptive table, as follows: “Axial-feed hose reels shall be installed if

required, following a fire risk assessment carried out by the Department or Large Experiment concerned, in accordance with the guidelines below [see table]. Such risk assessments shall be submitted to the HSE Unit for approval."
This amendment entered into force on 6 December 2022 and can be consulted here. It does not apply to CERN buildings open to the public, for which article 6.2.3 of Safety Code E continues to apply.

For any further clarification, please contact the HSE Fire Safety Engineering team at hse-fset@cern.ch

*Cf. French Décret n° 2008-244 du 7 mars 2008 and, in particular, article R4227-30 of the Code du Travail (https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000018532077) and changes made to Swiss AEAI norms and directives in 2015.

Service availability during CERN's annual closure 2022/2023

General site services

As always, in addition to the Fire and Rescue service (+41 22 76) 74444, the Security service remains operational every day (24/7) and can be reached at (+41 22 76) 76666.
SCE department services that do not depend on continuous human presence will remain available, although at a reduced support level. In general, the response time for common issues will be half a day (but this is not guaranteed). To report urgent infrastructure issues during the annual closure, call the CCC TI operator at (+41 22 76) 72201.
Other services requiring human presence (such as Service Desk, CERN hostels, goods reception, shuttles, cleaning services, etc.) will not operate during the end-of-year closure.
The self-service Car Sharing service will remain available.
Please note that the cafeterias on the Meyrin site will be closed on Thursday 5 and Friday 6 January 2022, but restaurants 1-2-3 will be open.
For more information, please consult the CERN Service Portal.
In addition, please note that the heating on the Meyrin and Prévessin sites will be switched to low-heat mode to maximise energy savings during this period of low occupancy. This will lead to a slight drop in temperature.

Computing services

Essential services provided by the IT department – including WLCG production services – will remain available.
Most problems will be dealt with on a best-effort basis only and the availability of specific services might be limited by the availability of other services. No interventions are scheduled – in case of a failure, there is no guarantee that services will be restored, and changes requiring on-site human intervention will not be possible.
Incidents will be listed on the CERN Service Status Board for Computing.
The Computer Centre Operator service will be available and can be reached at (+41 22 76) 75011 or by email to computer.operations@cern.ch, where urgent problems can be reported.
Suspected computer-security incidents must be reported to Computer.Security@cern.ch or (+41 22 76) 70500 as usual.
Please remember to shut down and power off any equipment in your office whose operation is not required during the annual closure.

Official holidays in 2023 and end-of-year closure 2023/2024

(In accordance with Articles R II 4.38 and R II 4.39 of the Staff Regulations)

Official holidays in 2023 (in addition to the special leave during the annual closure):

-Monday, 2 January
(compensation granted for 1 January, New Year)
-Friday, 7 April
(Good Friday)
-Monday, 10 April
(Easter Monday)
-Monday, 1 May
(1 May)
-Thursday, 18 May
(Ascension day)
-Monday, 29 May
(Whit Monday)
-Thursday, 7 September
("Jeûne genevois")
-Monday, 25 December
(Christmas)
-Tuesday, 26 December
(compensation granted for 24 December, Christmas Eve)
-Friday, 29 December
(compensation granted for 31 December, New Year's Eve)

Annual closure of the site of the Organization during the end-of-year holiday period:

The Laboratory will be closed from Saturday, 23 December 2023 until Sunday, 7 January 2024 inclusive (without deduction of annual leave). The first working day in the New Year will be Monday 8 January 2024.

Extension of the pre-retirement programmes

Following a recommendation by the Standing Concertation Committee at its meeting on 22 November 2022 and approval by the Director-General, please note that:
the Part-Time Work as a Pre-retirement Measure Scheme and the Progressive Retirement Programme have been extended by one year, from 1 January 2023 until 31 December 2023.
Further information is available on the following links:

Progressive retirement programme: https://admin-eguide.web.cern.ch/en/procedure/progressive-retirement-programme-prp
Part-time work as a pre-retirement measure: https://admin-eguide.web.cern.ch/?destination=/en/procedure/part-time-work-pre-retirement-measure-ptp&check_logged_in=1

CERN Health Insurance Scheme (CHIS) - Opening hours of UNIQA offices during end-of-year closure

Please note that the UNIQA office at CERN (Main Building) will be closed during the Laboratory two-week end-of-year closure.

During that period, UNIQA's offices in Geneva will remain open daily from 8 a.m. to 5 p.m. (4 p.m. on 30 December 2022) and will be closed on 26 December 2022. During open periods you can also reach UNIQA by telephone on 022 718 63 00.

For urgent medical assistance, you may call UNIQA Assistance +41 22 819 44 77, 24h/day throughout this period. Please note that this service only provides medical advice and urgent assistance services and is not in a position to inform you on the coverage by CHIS of medical expenses.

Announcements

CERN colloquium on 12 January - "Twenty first century Nature" with Magdalena Skipper

Join the audience on 12 January at 4.30 p.m. for a CERN colloquium on "Twenty first century Nature" presented by Nature editor-in-chief Magdalena Skipper.

Magdalena Skipper will discuss how Nature of today is different from its former self, showing how the journal embraced changes towards a more open and transparent science and worked to facilitate them while staying true to its core mission: facilitating the prompt communication of key scientific developments to the research communities and fostering a greater appreciation of this important work among the wider public.

The colloquium will take place in person in the main auditorium and online attendance is possible via webcast. Tea and coffee will be served in the main auditorium from 4 p.m.

For more information, visit the Indico event: https://indico.cern.ch/event/1229048/

Space encounters: meet astronauts Paolo Nespoli and Slawosz Uznanski at CERN – 16 December

On the occasion of the Italian National Day of Space, ESA astronaut Paolo Nespoli shares his career highlights and the lessons learned from the perspective of his 3 flights in space for a total of 313 days in orbit. With the participation of CERN engineer Slawosz Uznanski, who has just been recruited in the 2022 class of the European Astronaut Corps.
Join the audience in CERN's main auditorium on 16 December at 11 a.m.. Organisation and

Moderation: Paola Catapano, IR-ECO-ECP, with the support of the Italian Embassy in Bern, of the Italian General Consulates in Geneva and Zurich, and with the collaboration of the CERN Library.

Paolo Nespoli

Major Paolo Angelo Nespoli (born 6 April 1957) is an Italian astronaut and engineer (ret.) at the European Space Agency (ESA). He was selected in 1998 and he first traveled to space on the Space Shuttle Discovery STS-120, a mission dedicated to the construction of the International Space Station (ISS). Then, in 2010 and 2011, he traveled to the ISS aboard the Soyuz TMA-20 for Expedition 26/27. Nespoli's third spaceflight started with Soyuz MS-05, which launched in July 2017 for Expedition 52/53. He spent a total of 313 days in orbit.

Slawosz Uznanski

CERN staff member Slawosz Uznanski, reliability engineer of the LHC new power converters in the Accelerator Systems department (SY), was selected in November to be in the reserve pool of the new class of ESA astronauts. Slawosz, who has held a passion for space and exploration since his early childhood, has successfully passed all the stages of a year-long extremely competitive selection process, which started in summer 2021 with more than 22 500 applicants from ESA Member and Associate Member States. This was the first call for new ESA astronaut applicants since 2008.

Swiss ban on laser pointers: how to return them for appropriate disposal

The Bulletin of 31 October 2022 featured a reminder concerning the ban on laser pointers on Swiss soil in 2019, as per articles 22 and 23 of the Ordinance to the Swiss Federal Act on Protection against the Risks associated with Non-Ionising Radiation and with Sound (O-NIRSA). This concerns a ban on all laser pointers belonging to classes 1M, 2, 2M, 3R, 3B and 4.

The term “laser pointer” refers to a laser device that, on account of its size and weight, can be held in and guided by hand and that emits laser radiation for the purpose of pointing out objects and locations. These are most commonly used at CERN for giving presentations.

Swiss law is now more restrictive than French law, which authorises class 1, 1M, 2 and 2M laser pointers (décret n° 2012-1303 du 26 novembre 2012 – in French). The tightening of Swiss law follows various incidents in Switzerland involving the use of these lasers.

Following a recent incident in Switzerland involving people in possession of such devices, CERN has decided to ban their use on the whole site, including the French part. Class 1 pointers are still allowed for use in presentations. The ban will be included in the new rule on laser safety that is currently being drafted.

Laser pointers can be disposed of via the appropriate CERN waste pathways, as electronic waste, once the batteries powering them have been removed.

Should you be in possession of a laser pointer of class 1M or above, you can return it for appropriate handling and disposal by placing it in one of the dedicated blue containers for electronics provided by the SCE Storage, Recuperation and Sales service, or hand it in directly at Building 133.

Thank you for your cooperation.

Traffic disruption at Gate E and on Route Siegbahn from 8 December

Roadworks are scheduled by the SCE department at Gate E and on Route Siegbahn from Thursday 8 December 2022. Vehicles will enter the site on the left-hand lanes and alternating traffic will be put in place on Route Siegbahn.
Traffic disruptions are to be expected, we thank you in advance for your understanding.

6th FCC physics workshop in Krakow, 23–27 January 2023

A key recommendation of the 2020 update of the European Strategy for Particle Physics is that Europe, in collaboration with the worldwide community, should undertake a feasibility study for a next-generation hadron collider at the highest achievable energy, with an electron–positron collider as a possible first stage. The United States, following the 2021 Snowmass Community Planning Exercise, converged with that plan of action. The Future Circular Collider (FCC) feasibility study is currently ongoing and should conclude in 2025.

In this context, the 6th edition of the FCC physics workshop will take place in Krakow, Poland, from 23 to 27 January 2023, to monitor the progress achieved in the framework of the feasibility study, to strengthen the FCC community and to sharpen the physics case.
Please visit the Indico page of the event to register and find out how to submit your abstract.

CERN Alumni Virtual Company Showroom with Luxoft – 9 December

Join representatives from Luxoft to find out more about the company, potential job opportunities and the skills and talents they are now seeking.
The event will start at 11 a.m. on 9 December with a general presentation and will be followed by a Q&A session, come armed with your questions.
Please register here for the event to receive the zoom link.

About Luxoft

Luxoft is the analytics and engineering arm of DXC Technology, operating as an advisor and solution provider in the automotive, banking and capital markets.
More information on the Alumni website: https://alumni.cern/events/100907

Obituaries

Jean Mourier (1949 – 2022)

It is with great sadness that we announce the passing – at far too young an age, as all those who knew him will agree – of Jean Mourier, who worked at CERN from 1974 to 2009. He contributed to the Organization's activities in various ways throughout his long career, as well as leaving an indelible mark on the Micro Club.

Jean was born in Lyon in 1949. His family was from the Ardèche, a region to which he remained greatly attached all his life. After an initial stint at CERN as a service provider, followed by a foray into the private sector, he came back to the Laboratory, for good this time, in November 1974. Jean was a member of the PS division until 1985, when he moved to the Controls group (ABM) of the SPS division to work on beam instrumentation.

In 1993, he returned to the PS division, this time working on radiofrequency. He remained there until he retired in October 2009.

In his retirement, Jean took an interest in the CERN Micro Club and became involved in its repair service. He dedicated much of his free time to the Club, and his love for a job well done, his attention to detail and his meticulous nature got his colleagues out of difficulties on many an occasion. His friends and colleagues will remember his optimism and his love of life and human interaction. He was always ready to help, with a discretion that in no way belied his tremendous efficiency. His great kindness was matched by his devotion to his team and to the Micro Club.

Jean leaves behind him many memories and will be missed by the Club and by his friends. Let's remember him with the same smile that he bestowed on us every time we met.

Our thoughts are with his wife, Chantal, and his children and grandchildren.

His friends and colleagues from ABM and the CERN Micro Club

Ombud's corner

Let's make the most of the end-of-year break

As the year draws to a close, many of us will be thinking about the good and the not so good developments of the last 12 months – in both our private and our professional lives.

This year has brought us all plenty of bad news, not least the invasion of Ukraine by the Russian Federation and the ensuing energy crisis.

Part of the reason why this situation induces anxiety is the associated uncertainty and how it makes us feel we're losing control of our lives and our choices. More than ever, we need to support each other.

For most of us, CERN's end-of-year closure is a prime opportunity to recharge our batteries and regain the energy, motivation and desire we need to work together.

Here are a few ideas that I suggest we all try out in order to get the most out of the holiday season:

-Ditch the smartphones, tablets and other devices that keep us plugged into a constant stream of

information that we simply can't absorb and that quickly overwhelms our critical judgement.

-Enjoy the company of our nearest and dearest. Spend time with old friends and family who have always been there for us. Those of us who live far away from where we grew up don't see enough of them, and their affection and loyalty are such a tonic.

-Aim for a "green" Christmas by considering the carbon and human footprint of the presents we buy. Ignore the exhortations to consume, which offers only a short-lived thrill and leaves a bitter aftertaste that lasts a lot longer.

-Get lots of rest, sleep, exercise and fresh air! Our bodies can sometimes upbraid us for mistreating or forgetting to take care of them.

-Lastly, if a delicate situation needs handling at work, let's give our brains the chance to whir away in the background to find a solution. After articulating the problem as precisely as possible for ourselves, we can forget about it and relax. The solution(s) will emerge with much more clarity after a break.

Thank you for having shared your experiences and placed your trust in me this year. And a particular thank you to those of you who will carry on working during the end-of-year closure to protect CERN's safety and security.

I hope you all have a wonderful end-of-year break and come back feeling refreshed and re-energised.

Laure Esteveny