CERN Bulletin

Issue No. 04-05/2023 – 25 January 2023
http://home.cern/cern-people

7.2-m-long niobium–tin quadrupole magnet manufactured at CERN reaches nominal current for the first time

The 7.2-metre-long version of this vital HL-LHC component reached nominal current plus an operational margin corresponding to a coil peak field of 11.5 T at 1.9 K during a test in SM18

The MQXFBP3 magnet after the test, during assembly with the nested dipole orbit corrector. (Image: CERN)

Another success for the HL-LHC magnet programme: after the successful endurance test of a 4.2-metre-long niobium–tin quadrupole magnet in the United States in spring 2022, the HL-LHC quadrupole's longer version proved its worth later in the year. "MQXFBP3", the third full-length quadrupole prototype to be tested at SM18, reached nominal current plus an operational margin in September–October 2022, confirming the success of the niobium–tin technology for superconducting magnets.

MQXFBP3 is the third in the series of HL-LHC triplet quadrupoles that have been produced and tested at CERN in recent years. These 7.2-metre-long superconducting magnets, along with their shorter counterparts currently being produced in the United States, will focus proton beams more tightly around the ATLAS and CMS collision points to allow the tenfold increase in integrated luminosity (the number of collisions) targeted by the HL-LHC.

Contents

News

Official news

Announcements

Ombud's corner

The first two magnets tested at CERN fell short of reaching nominal current, which prompted the Accelerator Technology department's magnet group to improve the design and the assembly processes of its prototypes as part of the so-called "three-leg strategy". The magnet cold mass was reworked to reduce the coupling between the welded outer stainless-steel shell and the aluminium structure of the magnet.

This updated version – the third prototype – was able to reach nominal current (corresponding to 7 TeV in operation) plus 300 A of operational margin with only one training quench at 1.9 K. This is the first MQXF cold mass assembly, tested horizontally with a welded outer shell (as in the final configuration), to achieve this performance, which corresponds to a peak field in the coil of 11.5 T. The magnet has been subjected to two warm-up–cooldown cycles, showing no performance degradation. Even though the magnet satisfies the acceptance criteria for operation in HL-LHC, the magnet was limited 3% below nominal current at 4.5 K. The localisation and phenomenology of these quenches is very similar to those of the limiting quenches of the first and second MQXFB prototypes.

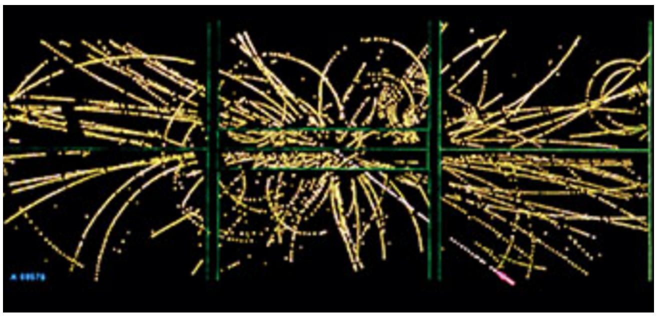
The MQXFBP3 magnet on its way to reaching nominal current in SM18.

After the test, the magnet was removed from its stainless steel shell and is now being assembled with the nested dipole orbit corrector, which was provided by the Spanish institution CIEMAT. A new test in this configuration will be carried out in mid-2023. Should the test confirm its performance, MQXFBP3 will be the second Q2 cryomagnet to be installed in the IT (inner triplet) STRING.

The positive outcome of the recent test is cause for satisfaction and relief, especially as niobium–tin technologies, known to be more brittle than niobium–copper components, have come under particular scrutiny. Even so, engineers in the magnet group have more tricks up their sleeves to bring the performance of the 7.2-m-long MQXFB to the same levels obtained in the short models and in the 4.2-m-long magnets manufactured in the US: MQXFB02, the stage-two magnet of the three-leg strategy, will include further technical improvements in the magnet assembly to eliminate the coil overstress during keying and bladdering operations that was observed on the first three prototypes. The magnet community is eagerly awaiting the outcome of the magnet's powering tests, which will continue throughout the first months of 2023 at SM18 – stay tuned!

W boson turns 40

Forty years ago today, physicists at CERN announced to the world that they had discovered the electrically charged carrier of the weak force, one of nature's four fundamental forces



First direct production of the W boson in the UA1 experiment in late 1982. (Image: CERN)

Exactly four decades ago today, on 25 January 1983, physicists at CERN announced to the world that they had observed a new elementary particle – the W boson. Together with its electrically neutral counterpart, the Z boson, which was discovered later in the same year, the electrically charged W boson mediates the weak force, one of nature's four fundamental forces.

Through this force, the W boson enables the nuclear fusion reaction that powers the Sun, without which life as we know it would not be possible. The W boson is also responsible for a form of radioactivity, called radioactive beta decay, that is widely used in medicine.

The W boson's discovery was the result of an idea proposed in 1976 by Carlo Rubbia, Peter McIntyre and David Cline. The trio of physicists suggested converting CERN's largest accelerator at the time, the Super Proton Synchrotron (SPS), from an accelerator of protons into a machine to collide protons and antiprotons (the protons' antimatter equivalents) at a high enough energy to produce W and Z bosons. Together with Simon van der Meer's ingenious "stochastic cooling" technique, which made it possible to reduce the size and increase the density of a proton and, later, an antiproton beam, this bold idea allowed the UA1 and UA2 experiments that were built around the converted SPS to begin hunting for the W and Z bosons in 1981.

Two years later, in a seminar on 20 January 1983 held in CERN's Main Auditorium, Rubbia, spokesperson of the UA1 collaboration, revealed six candidate collision events for the W boson. The following afternoon, Luigi Di Lella of the UA2 collaboration presented four candidate W events and, on 25 January 1983, CERN delivered the news of the discovery of the new particle to the world.

And if that wasn't enough to celebrate and crown the success of the converted SPS, the W boson discovery was followed a few months later by that of the Z boson, indirect evidence for which had been obtained a decade earlier at CERN's Gargamelle bubble chamber.

The observations of the W and Z bosons further confirmed the theory of the electroweak interaction that unifies the electromagnetic and weak forces and demands the existence of the Higgs boson, which was found at the Large Hadron Collider (LHC) in 2012. Developed in the 1960s by Sheldon Glashow, Abdus Salam and Steven Weinberg and cemented in the 1970s by Gerard 't Hooft and Martinus Veltman, this theory is now a cornerstone of the Standard Model of particle physics.

The W and Z discoveries were recognised with the 1984 Nobel Prize in Physics for Rubbia and Van der Meer, and helped secure the decision to build CERN's next big accelerator, the Large Electron–Positron Collider (LEP), which went on to study the W and Z bosons in detail.

Forty years on, and after many investigations at LEP and other colliders, including the LHC, the W and Z bosons continue to show their stripes and provide physicists with new ways of exploring the properties and behaviour of matter at the smallest scales.

To give a couple of examples, in 2021 the ATLAS collaboration reported the observation of the rare simultaneous production of three W bosons, and CMS obtained a high-precision measurement of the transformation of Z bosons into invisible particles. And in 2022, based on data collected by the former Tevatron accelerator, the CDF collaboration announced the most precise ever measurement of the W boson mass. However, the CDF W boson mass value is in tension with previous results, including the first at the LHC by ATLAS and LHCb, calling for new measurements with increased precision.

Research into these and other facets of the W and Z bosons will continue at the LHC and its planned upgrade, the High-Luminosity LHC.

Ana Lopes

Civil-engineering work for the major upgrade of the LHC completed

CERN celebrates the completion of the civil-engineering work for the High-Luminosity LHC (HL-LHC), the major upgrade of its flagship collider, the LHC

Today (20 January 2023), CERN celebrates the completion of the civil-engineering work for the High-Luminosity Large Hadron Collider (HL-LHC), the major upgrade of its flagship collider, the LHC. Approved in June 2016 and due to start operating in 2029, the HL-LHC will considerably improve the performance of the LHC by increasing the number of particle collisions and thus boosting the potential for discoveries. The completion of the civil-engineering work marks the start of the transition towards the HL-LHC era; the new components for the collider will be installed in the caverns and galleries that are now ready.

The HL-LHC is CERN's main scientific goal of the decade, recognised as one of the highest priorities for the field in the 2020 update of the European

Strategy for Particle Physics. This major upgrade builds on the success of the LHC since it started operating in 2010. While the LHC is able to produce up to 1 billion proton–proton collisions per second, the HL-LHC will increase this number, known as "luminosity", by a factor of between five and seven, allowing about ten times more data to be accumulated between 2029 and 2041, the period during which it will be operating.

To achieve this increase in luminosity, several innovative and challenging key technologies are being developed. These include new superconducting quadrupole magnets (based on niobium–tin instead of niobium–titanium) that will better focus the beam, and compact crab cavities to tilt the beams at the collision points thus maximising the overlap of protons. Other innovations include high-temperature superconducting links, new technologies for beam vacuum (prolonging the lifetime of the magnets) and beam collimation (protection from quenching), as well as very precise high-current power converters.

Most of these HL-LHC components will be integrated at Point 1 (Meyrin, Switzerland) and Point 5 (Cessy, France) of the LHC ring, where the high-luminosity detectors ATLAS and CMS are located.

"The civil-engineering work started in June 2018 and, despite the difficult global context, was successfully completed at the end of 2022. The technological developments are well advanced, so we really are at the start of the transition towards the HL-LHC era, one that will push the boundaries of technology and knowledge even further. It will allow physicists to study known mechanisms in greater detail, such as the Higgs boson, and observe rare new phenomena that might reveal themselves," says Oliver Brüning, HL-LHC project leader.

Aerial view of the HL-LHC Point 5 surface buildings (Cessy, France). (Image: CERN)

The HL-LHC is an international endeavour involving 43 institutions in 19 countries, including in CERN's Member and Associate Member States, as well as in the United States, Canada, Japan and China.

Building 180's metamorphosis

The renovation that was completed in 2022 has transformed the appearance of CERN's second-biggest building in terms of surface area while also improving its energy performance

The reuse of equipment is inherent to the technological success that has always made and continues to make CERN what it is. The Proton Synchrotron is certainly the prime example of this – commissioned in 1959 and upgraded multiple times since, it is still tirelessly injecting protons into the accelerator chain. Another facility that fits perfectly into this paradigm is Building 180, CERN's second-biggest building in terms of surface area (13 500m2) and home to the Large Magnet Facility (LMF), which has regularly been relocated over the years to adapt to the Organization's evolving needs. The building got another makeover during the renovation work that was completed in 2022, readying the world's biggest magnet factory to take on the challenges of the HL-LHC era and beyond.

Originally designed to house fixed-target experiments (most notably the Gargamelle bubble chamber), the facility was converted in the 1980s into the factory for magnets and detector components that we know today. It is now home to the LMF, where the LHC dipoles were assembled, and to several ATLAS workshops.

Much of the equipment that criss-crosses the LMF Hall today – including its powerful presses – actually dates back to the facility's origins in the 1960s. These machines have survived through the generations thanks to the efforts made to breathe new life into them:

"A group of young engineers with the freedom to exercise their creativity has been able to find new purposes for equipment that has only rarely been used since the decline of the fixed-target experiments. This new lease of life is all the more welcome because the equipment in question is rare and no longer manufactured. Some of the presses are now used to make components for the future HL-LHC – and they work very well!" says a delighted Rosario Principe, from the Accelerator Technology department.

A similar approach was taken to the year-long renovation of Building 180, which was completed in 2022. While the building's envelope was being redone to improve its long-term sustainability, steps were taken to ensure that operations could continue throughout the renovation process. The main aim of the works, which also encompassed the adjacent Building 183, was to remove asbestos from the vast hall, improve its insulation and waterproofing, and modernise the façade, windows and roof. This was no mean feat given the sheer size of the building and the need for work to continue in the LMF and the ATLAS workshops, where the New Small Wheels, which went on to be installed in the detector during the renovation period, were being assembled.

"Initially, a lot of uncertainty surrounded the project, which we approached with a certain degree of caution. Carrying out such large-scale works on a building that is so vital for CERN was a major challenge, but we pulled it off," says David Rodriguez, the construction project leader. The key to the success of the works was effective coordination between CERN, the building's users and the six contractors making up the consortium carrying out the works.

The refurbished Building 180 in 2022 (Image: CERN)

"All the parties involved agreed that the bulk of the work would be performed from outside the building, via scaffolding erected against the façade. This allowed us to minimise our impact on the activities inside and to stay on good terms with the building's users. We would particularly like to thank the building's TSO, Rodrigue Faes, for facilitating communication among the teams," adds Milton Morais, the construction manager.

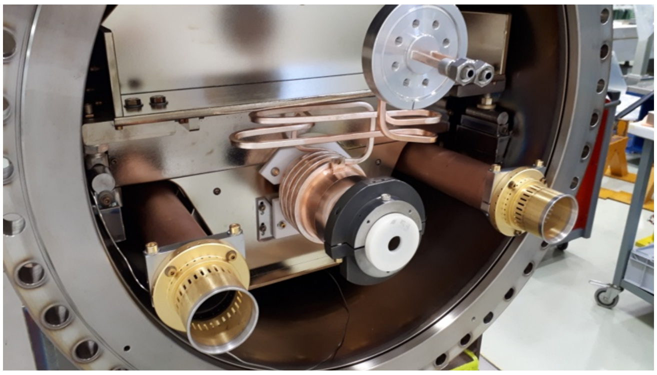
The renovated building is not only safer and more elegant, but the new insulation significantly improves the working conditions of the users, who enjoy a warmer working environment while consuming less energy overall. This improvement in the building's energy performance earned CERN a subsidy from Geneva's cantonal energy office.

Following its metamorphosis, Building 180 is all set to remain at the heart of CERN's activities for years, if not decades, to come.

Thomas Hortala

Cool kickers for the HL-LHC

The first “MKI-Cool” was installed in early January – water-cooled ferrite cylinders will protect the LHC’s kicker magnets from increased heat load in the high-luminosity era



MKI-Cool inside vacuum tank. (Image: CERN)

Much of the research and development work for the High-Luminosity LHC (HL-LHC) aims to protect the accelerator’s fragile components from the detrimental effects of high luminosity, such as radiation and increased heat. The installation of the “MKI-Cool” LHC kicker magnet (MKI), the first of a series of eight, during this year-end technical stop marks another successful milestone in this endeavour: a water-cooled toroidal ferrite cylinder will lower the projected heat load deposited onto the kicker magnet yokes to allow the HL-LHC to operate well.

The LHC’s two kicker systems, each made up of four magnets and pulse generators, are found at the intersection of the LHC ring and its two transfer lines that funnel particles from the SPS. As their name suggests, kicker magnets give each injected bunch a kick to put it on the LHC orbit. As the kick must leave the circulating LHC beam untouched, each magnetic field pulse lasts only 8 microseconds: kicker magnets must be swift and precisely timed.

These specs make kicker magnets particularly vulnerable to their harsh environment: while the highly energetic LHC beam whizzes through the magnet’s aperture, the MKI cannot be completely shielded from the beam-induced heating, as a shielding would interfere with its high-frequency magnetic field pulse. In addition, the high-voltage pulse required precludes any water-cooling of the MKI yoke, which constitutes a serious hurdle as the yoke loses its magnetic properties above the critical temperature of 125 °C. Under these conditions, with dysfunctional kickers, mis-kicked particles would cause quenches in the LHC superconducting magnets. Measures have already been taken to avert this risk in the current accelerator, but they would not suffice to guard the magnets from the expected four-fold increase of the heat load in the context of higher luminosity.

The MKI-Cool system is an ingenuous solution thought up by the Accelerator Beam Transfer group (SY-ABT) to sustainably protect the kicker magnets. A toroidal ferrite cylinder is mounted upstream of the MKI-Cool aperture to absorb a significant portion of the beam-induced heating, thus reducing the heating of the magnet’s yoke. In addition, the ferrite cylinder is cooled using water (hence the name, MKI-Cool). The MKI-Cool ferrite yoke is expected to stay below a temperature of 100 °C, even with high-luminosity beams.

The first MKI-Cool was installed at LHC Point 8 on 11 January, replacing a standard MKI. Once the LHC is restarted, the interaction of the particle beam with the MKI-Cool will test the technology’s performance. Provided this test yields positive results, the seven remaining MKI-Cools will be installed before the start of HL-LHC operations.

International Day of Women and Girls in Science on 11 February: local activities for all ages

Estel Perez Codina assembling the sTGC detectors for the New Small Wheel for ATLAS (image: CERN)

The International Day of Women and Girls in Science was adopted by the United Nations General Assembly in order to promote full and equal access and participation for women and girls in science. 11 February is an opportunity to celebrate the essential role that women and girls play in science and technology.

For the seventh year running, CERN is getting involved by organising local activities for all ages.

Presentations in local schools

From 30 January to 3 February 2023, around a hundred volunteers – all female scientists and engineers from CERN, Scienscope (UNIGE), the École Polytechnique Fédérale de Lausanne (EPFL) and the Annecy Particle Physics Laboratory (LAPP) – will be visiting some 240 schools in the canton of Geneva, the Nyon area, the Pays de Gex and the Annecy conurbation to talk to the pupils about their professions. They will talk about their career history and the projects and experiments in which they are involved, and in some cases give a short demonstration. The aim is to change how young people in our region view scientific, technical and technological professions and to show them that careers in science, technology, engineering and maths are just as accessible to girls as to boys. And, who knows, the presentations might even help some to discover their vocation!

Show "La Forza Nascosta – Scienziate nella Fisica e nella Storia" (suitable for all ages)

CERN will host the show "La Forza Nascosta – Scienziate nella Fisica e nella Storia" (The Hidden Force – Women Scientists in Physics and History) at 8.00 p.m. on Wednesday, 8 February in the Globe of Science and Innovation. This musical theatre production tells the story of physics in the twentieth century through the eyes of four renowned women scientists: astronomer Vera Cooper Rubin, nuclear physicist Marietta Blau, and particle physicists Chien-Shiung Wu and Milla Baldo Ceolin.

The show, in Italian with English subtitles, has been conceived of, written and promoted by a group of women physicists from the Italian National Institute for Nuclear Physics and the University of Turin's Physics Department.

For more information and to register: http://voisins.cern/en/events

Interactive theatre-forum "Coffee Machine" event (for the CERN community)

The CERN Diversity & Inclusion Programme, in collaboration with the diversity offices of ALICE, CMS and LHCb, will host the interactive theatre-forum "Coffee Machine" event, open to all CERN personnel.

The event aims to raise awareness of how sexist behaviour can limit the full participation of women in the workplace. Through an interactive theatre piece performed by a Geneva-based group, we will observe subtle forms of such behaviour and learn how to intervene in a timely and effective manner. This creative activity reminds us how we can all contribute towards an inclusive and conducive scientific research environment.

The event will take place on 9 February from 2.00 to 4.00 p.m. in the Globe. Places are limited, so for more information and to register please click here (https://indico.cern.ch/e/coffee_machine).

Members of the “CoE RAISE” EU project – developing AI approaches for next-generation supercomputers – meet at CERN

54 members of the CoE RAISE project met at CERN from 17 to 20 January. (Image: CERN)

Last week, members of the EU’s CoE RAISE project met at CERN for their “All Hands” meeting. This innovative project is developing artificial-intelligence (AI) approaches for next-generation “exascale” supercomputers, for use across both science and industry. Use cases explored through the project include the optimisation of wind-farm layouts, design of efficient aircraft, improved sound engineering, seismic imaging with remote sensing, and more.

CoE RAISE – the European Center of Excellence in Exascale Computing “Research on AI- and Simulation-Based Engineering at Exascale” – is funded under the EU’s Horizon 2020 research and innovation programme. The project launched in 2021 and runs for three years.

The four-day meeting, which took place in CERN’s Council Chamber, was attended by 54 project members. The participants discussed progress made in their work to develop AI technologies for complex applications in Europe running on future “exascale” high-performance computing (HPC) systems. Exascale refers to the next generation of high-performance computers that can carry out over 1018 floating-point operations per second (FLOPS). Today, only the Frontier supercomputer at Oak Ridge National Laboratory in the United States has reached this level. However, with more exascale HPC systems just over the horizon, it is important to ensure that AI approaches used in science and industry are ready to capitalise fully on the enormous potential. In June, the European High Performance Computing Joint Undertaking (EuroHPC JU) announced that Forschungszentrum Jülich GmbH in Germany has been selected to host and operate Europe’s first exascale supercomputer, which is set to come online next year and will be known as JUPITER (the Joint Undertaking Pioneer for Innovative and Transformative Exascale Research).

CoE RAISE is developing innovative AI methods on heterogeneous HPC architectures involving multiple kinds of processor. Such architectures can offer higher performance and energy efficiency, but code must be adapted to use the different types of processors efficiently. The AI methods being developed are focused around nine key use cases and designed to scale well for running on exascale HPC systems.

CoE RAISE supports technology transfer to industry, particularly small- and medium-sized enterprises, as well as running education and training initiatives. On top of this, CoE RAISE also provides consulting and liaises with other European initiatives to maximise synergies, exploit opportunities for co-design and share knowledge. All aspects of the project’s work were discussed over the four days at CERN.

CERN is also a partner and brings one of the use cases to the project. This work focuses on the improvement of methods for reconstructing particle-collision events at the upgraded High-Luminosity Large Hadron Collider (HL-LHC), which is set to come online in 2029. The HL-LHC will see more particle collisions than ever taking place, producing exabytes of data each year, resulting in unprecedented computing challenges. To reconstruct particle collision events today (with data sets in the order of terabytes or petabytes), hundreds of different algorithms run concurrently: some are traditional algorithms optimised for particular hardware configurations, while others already include AI-driven methods, such as deep neural networks (DNNs). The members of the project team at CERN are working to increase the

modularity of systems and ensure that code is optimised to fully exploit heterogeneous architectures, as well as increasing the use of machine learning and other AI methods for reconstruction of collisions and classification of particles.
"Supercomputers are reaching the exascale and enabling the delivery of an unprecedented scale of processing resources for HPC and AI workflows," says Maria Girone, CERN openlab CTO, who leads CERN's contribution to the project. "The research performed in CoE RAISE will drive the co-design of HPC computing resources for future AI and HPC applications for both science and industry. This meeting enabled us to exchange and develop ideas and to bring new perspectives. It also gave researchers from other domains a unique insight into the environment and challenges facing CERN, promoting cross-fertilisation and understanding."

Andrew Purcell

Creating a community for radiological and environmental monitoring systems

The PulsRad22 workshop marked the completion of CERN's new state-of-the-art radiation monitoring system and the creation of a new forum for discussion

The PulsRad Workshop at the Globe of Science and Innovation. (Image: CERN)

At CERN, ionising radiation is produced by the collision of particle beams with matter. CERN's unique facilities require innovative approaches to minimising the exposure of workers, the public and the environment, making CERN one of the recognised leaders in this field. CERN's radiation protection (RP) is in line with best practice in Europe, and staying at the forefront in this area is a priority for the Organization.
In addition to the many RP controls and measures in place, CERN is equipped with a robust radiation and environmental monitoring system (REMS) to provide it with all means necessary to protect the public, the people working on site and the environment – both when the accelerators are being exploited to their full physics potential and during shutdowns.
CERN's legacy monitoring system – the Area Controller (ARCON) used since the 1980s – was replaced in 2021, with the completion of a project that started in 2014: CERN Radiation Monitoring Electronics (CROME). This brand-new generation of radiation monitoring systems was developed fully in house by a small team in the HSE Radiation Protection group (HSE-RP) with specific experience and know-how in measuring mixed and pulsed radiation fields present during accelerator operation. Its mass production was carried out almost entirely at CERN, thanks to interdepartmental collaboration with TE, BE, EN, IT and EP, and further supported by industrial partners from ten countries.
In the spirit of collaboration, knowledge exchange and technology transfer, the ambition to share the benefits of this REMS solution has been alive for some time, as explains Daniel Perrin, Leader of the Instrumentation and Logistics section in HSE-RP. "While many workshops, conferences and working groups exist in various fields such as electronics, software, radiation protection and dosimetry, we had nothing of this kind for REMS. With CROME's achievement, we felt it was high time to create such a forum."

This is how the first PulsRad workshop came about, to celebrate the success of the CROME project and to start building a community around REMS with a particular focus on pulsed radiation monitoring. The workshop took place from 5 to 7 December 2022 in the Globe of Science and Innovation, organised by the HSE-RP group at CERN and the European Spallation Source ERIC, with support from the ITER Organization and Fusion for Energy.

Hamza Boukabache, Electronics Engineer and CROME Project Manager in HSE-RP-IL, who led the organisation of this hybrid workshop, highlighted its pioneering nature: "In industry, knowledge about radiation measurements is often kept confidential within companies. As a scientific organisation, we have the possibility to share our knowledge and experience of REMS with other research facilities. The idea is to create a space for discussion and exchange for engineers and scientists developing, deploying and operating REMS, to identify common problems and create synergies between different organisations in order to devise solutions as well as provide an entry point for newcomers to REMS."

And the objective was met. Some 75 participants joined physically and remotely from CERN and other large scientific facilities across the globe, including ITER, SLAC National Accelerator Laboratory, DESY, GSI Helmholtz Centre for Heavy Ion Research, CHUV – Lausanne university hospital, Paul Scherrer Institute and KEK, to name a few.

Alasdair Day, a former member of CERN's HSE-RP-IL section and now Senior Engineer for Radiation Monitoring at the European Spallation Source, was a driving force in the inception and organisation of PulsRad22: "This workshop is a beginning, and I'm really excited to see where it goes in the future. For me, being able to give assistance to specialists during a breakout session, whilst being given insights from other experts during different discussions, clearly demonstrated the worth of this event. It was an opportunity for participants to share experiences while taking something back to their facilities and institutes. This collegial fraternity can help not only us as individuals, but also our respective organisations and, from that, science as a whole."

This community has a bright future and the next event will take place in 2024, probably at ITER.

HSE Unit

Computer Security: Animal or plant?

Have you ever wondered about the purpose of the "Animal Shelter for Computer Mice" set up on the lawn in front of the CERN Data Centre? Put in place more than 10 years ago and resurrected once, it is intended as a monument to pure and perfect computer protection, as well as being a refuge for orphaned computer mice that constitute a primary risk to your computer and your computing account*.

Coupled with human curiosity – and as a CERN staff member or user you should be overflowing with such curiosity – just one innocent click of your computer mouse can put your digital life in danger. One click, to get malware installed. One click, to compromise your laptop. One click, to lose all your documents and data. One click, to hand over access to your account to some malicious person. Digital life gone. R.I.P. Game over. And game over for the Organization, too. Hence, we repeatedly warn people to "STOP – THINK – DON'T CLICK" when faced with unrelated URLs, unsolicited links or unexpected attachments. Clicking is risky. And your computer mouse is a dangerous collaborator.

Recently, however, we've been informed that it's not only computer mice that pose a threat to your digital well-being. No, trackpads do, too:

"I write to you with the greatest urgency. Dutifully following CERN's advice (like any self-respecting scientist), I have disconnected my mouse and sent it to the animal shelter. Yet, I find myself still at risk of clicking. Sacrilegiously, my laptop has a trackpad. I feel that it is my calling in life to raise the alarm when it comes to trackpads allowing for clicking. It is an utter torment. While I have discovered this relationship, I have failed to find potential solutions. It would seem, now that mice have been banished to the shelters, trackpads are going to take over the world. Given CERN's successful de-micing campaign, I request you – again with the highest urgency – to help us find a solution against the scourge that trackpads now represent."

Right this sender is. Indeed, trackpads are just as dangerous as computer mice. One click, and your digital life is gone. However, digging deeper into the biology of IT, we have come to the conclusion that trackpads are not the concern of the animal shelter ... as they are not animals but plants. Computer mice move and, hence, like any other moving object, can be considered animals. Your trackpad does not move at all and is hence, based on the aforementioned definition, a plant. Unfortunately, CERN has not yet created a specific garden for trackpad plants...

For the moment, therefore, we urge any concerned scientist who fears a computer security problem caused by trackpads – combined with their own inherent curiosity – to reinforce "STOP – THINK – DON'T CLICK" by putting (at their own risk!) a big thick sticker over their trackpad or covering the trackpad with a layer of glue, Nutella or, better, Vegemite.

Whatever you do, make "STOP – THINK – DON'T CLICK" your mantra when browsing the web, opening emails or faced with links and URLs. Pause for a second in order to protect your digital life and your work for CERN. "STOP – THINK – DON'T CLICK", with either your trackpad or your mouse. Thank you.

**Computer mice continue to be accepted at the shelter.*

The Computer Security team

Official news

CERN publishes its first Nuclear Safeguards Policy

CERN has recently published a Nuclear Safeguards Policy. This Policy formalises CERN's longstanding commitment to non-proliferation. It serves both for external communication purposes and as a basis for nuclear safeguards procedures within the Organization.

Nuclear safeguards cover the prevention or timely detection of diversion of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons. Safeguards are achieved by means of nuclear security (i.e. physical protection and nuclear material accounting and control).

Safeguards are implemented by states that are parties to the non-proliferation treaties of the International Atomic Energy Agency (IAEA). CERN, which manages some nuclear materials used for its scientific activities (such as thorium, uranium and plutonium), is not directly subject to these treaties. However, the Organization collaborates closely with the competent Host States authorities to help them fulfil their obligations towards the IAEA. CERN manages its nuclear materials responsibly, thanks to its nuclear materials controller, its accountants and custodians. The Nuclear Safeguards Policy is a first step in formalising these good practices.

The main principles of this Policy, and in particular the requirement to justify and minimise the use of any nuclear materials, will be implemented through a set of nuclear safeguards procedures currently being drafted. These will be published on the HSE website in due course.

CERN Graduate Programme impact on financial tools

From January 2023, many of the CERN financial tools have been updated for the new Graduate Programme announced by the HR department in 2022. The FAP department has provided updates to the Department Planning Officers and Resource Coordinators, and in addition, an information document (https://cds.cern.ch/record/2846107/files/GRAD_FinancialTools.pdf) is now available in the Admin e-guide, and can be useful for anyone involved in the planning and budgeting of GRADuates.

Announcements

IdeaSquare Open Doors | 15 and 16 February

On 15 and 16 February, IdeaSquare, the innovation space at CERN, will throw open its doors for you to explore how to make the most of our facilities. IdeaSquare is a rapid prototyping and multipurpose innovation space at CERN, freely accessible to members of the CERN community.
During the two-day event, you will be able to visit the facility, interact with the team and those using the space, and hear presentations about all of our activities, from prototyping to education and entrepreneurship.
Bring an idea from your workplace that you want to prototype or learn about different prototyping challenges from the CERN community. Join one of our hands-on exercises to challenge your way of thinking, as we do in our educational programmes. Find out more about the upcoming opportunities for the EU-funded ATTRACT programme. Get help to organise your next event or hackathon, and learn more about the forthcoming Science Gateway offerings. Discover our innovation knowledge journal. Hear from CERN alumni who have gone on to become successful entrepreneurs sharing their lessons on how to bring your deep tech innovation into the market.
In addition, we'll showcase R&D&I projects and prototypes made by some CERN colleagues and others addressing societal challenges. Projects created by multidisciplinary student teams collaborating with researchers at CERN will also be displayed. Finally, you can also join us for a special evening to watch the screening of Ghost Particle, a documentary film that features IdeaSquare.
The event will take place at IdeaSquare on 15 and 16 February from 9.00 a.m. both days. Building 3179 is located directly behind the Globe of Science and Innovation and you can access it through the Globe car park. The space is open to anyone with a CERN badge. The full agenda is available on the Indico page for the event and no registration is necessary.
Join us at our Open Doors event to discover how you can develop your prototype, contribute to training and inspiring the next generation, or how to use our space for your next event (https://indico.cern.ch/event/1148809/timetable/#20230215).

Preventing falls and other accidents now that winter is upon us

With the snow and the ice, pavements and road surfaces can resemble skating rinks, increasing the risk of slips and injuries. Winter sports are also a common source of accidents. At this time of year, the CERN infirmary sees more people coming in with musculoskeletal problems after a fall.

In 2021 in Switzerland, 195 000 people were injured after tripping, falling or slipping while walking or on the stairs (Suva, 2021). At CERN, in 2022, three people fell off their bicycles, resulting in one being signed off work for eight days, and one person fell while walking and was signed off for four days.

In addition, over 30 000 employees in Switzerland suffer winter sports injuries every year (Suva, 2021). According to a report published in 2021 by the French Observatoire d'accidentologie des sports d'hiver, more than 110 000 people experienced traumatic injuries in France in 2020.

In downhill skiing, sprained knees are the most common injury, accounting for almost a third of the total (32%), with shoulder injuries – mainly dislocated shoulders – accounting for 15%. Snowboarding most commonly results in wrist fractures (25%) or shoulder injuries (19%).

So how can you glide through the season smoothly and make the most of the winter sports opportunities?

Whether or not you’re a fan of snow sports, take care during your journeys and activities.

Whichever sport you choose, make sure that you’re prepared and have the right kit. Here are some basic tips for skiers and snowboarders in particular:

-Good physical preparation is key to reducing the risk of an accident. Strengthen your muscles and do cardiovascular workouts (see advice (in French) from the Swiss national accident insurance fund Suva on making the most of the season).

-Get your ski equipment checked every year; a lot of sprained knees are caused by badly adjusted fastenings or boots.

-Wearing a helmet reduces the risk of head injury by 35% in the event of an accident: get a helmet that meets the standards and is the right size for your head.

-Warm up / stretch before hitting the slopes.

-Wear wrist guards if you’re a snowboarder.

-Eat regularly and drink hot drinks to stay hydrated.

-Slow down.

Have a great winter!

Alumni event on 3 February: "Virtual company showroom" with Kompaflex

Join representatives from Kompaflex 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 3 February with a general presentation and will be followed by a Q&A session, come armed with your questions. Please register here (https://alumni.cern/events/105210) for the event to receive the zoom link.

About Kompaflex

With over 40 years of experience, Kompaflex is a recognised specialist in the advanced design and manufacturing of custom-made metallic expansion joints of all sizes, temperatures, pressures and materials.

Alumni event on 26 January: "News from the lab" with CERN KT on Healthcare

CERN contributes to medical innovation through its cutting-edge technologies, competencies and know-how. In this talk, Benjamin Frisch will discuss the close link between medicine and physics and give an overview of CERN’s contributions to healthcare.

26 January - 6 p.m. Registration on the Alumni website (*https://alumni.cern/events/105217).*

Data Protection Day 2023: “Let’s talk about Artificial Intelligence”

The four EIROforum organisations - CERN, EMBL, ESA and ESO - join forces again in 2023 to bring you a shared webinar on data protection on Monday 30 January from 4 to 6 p.m.. More information on Indico (https://indico.cern.ch/event/1233356/).

Reminder: CERN Accelerator School: RF for Accelerators | 18 June - 1 July 2023

Registration is now open for the CERN Accelerator School’s course on "RF for Accelerators", 18 June – 1 July 2023, Berlin, Germany. This course is organised in collaboration with the Helmholtz-Zentrum Berlin (HZB).

This unique 2-week residential course will mainly be of interest to staff in accelerator laboratories, university departments or companies involved in producing RF equipment for accelerators. The course will include a review of the RF technology presently used in the field of particle accelerators as well as a recapitulation of the theoretical fundamentals.

Different RF equipment and RF technologies will be discussed along with their practical applications for various types of accelerators. Dedicated "hands-on" afternoon courses and seminars will complete the programme.

Due to the afternoon courses the maximum number of participants will be limited. The principle of "first come first served" will be applied.

For more information and to register, visit this Indico page: https://indico.cern.ch/event/1212689/

Ombud’s corner

A brain-friendly approach to providing feedback

Much has been written by my Ombud predecessors, at this time of the year when performance reviews take place, on how to approach these discussions and how to provide feedback, whether top-down or bottom-up. You may wish to have another look at their analysis and advice, which remain very valid and could help you, as both supervisor and supervisee, to prepare for MERIT interviews (see at: https://ombuds.web.cern.ch/blog/2023/01/brain-friendly-approach-providing-feedback).

Ideally, feedback should be provided continuously throughout the year. Still, giving feedback is not easy, and supervisors and supervisees might dread the interview when they have to discuss a performance issue, which can also be a management effectiveness issue.

In this article, I would like to offer another perspective on providing feedback, which is about minimising the initial reaction of mistrust and fear that we all have when we receive feedback on our performance*.

Negative feedback always packs a punch. It points to a problem in performance, which may include what is delivered or how it is delivered (the behaviour) or both, which is why most difficult conversations revolve around people defending themselves. No wonder, since it creates a threat for their brain. The negative emotions take over and colleagues will, often unintentionally, close themselves off to the discussion.

Focus on the desired outcome

When looking at problems, including performance problems, everyone tends to take a deductive, problem-solving approach, which is very appropriate for solving technical issues but will not get you very far when it comes to providing feedback.

Indeed, tackling a performance problem with a colleague will usually drag you further into the story of what, why, how, when, etc., revealing other problems. As the brain works, bringing problems to mind also brings emotions to mind which, in turn, trigger the limbic system into fear and defensiveness.

If you try to solve problems using your past experience, you will naturally make connections with past negative experiences. The more negative connections you make, the fewer resources you have for solving the real, most important, issue: the performance issue.

So why are we so problem-focused during performance reviews? It may be because there is some certainty and comfort in plunging into the past and re-examining the circumstances of failure. Your brain likes certainty and comfort and will automatically dig into experiences and try to match them with the current problem to solve, which will trigger more negative emotions. On the other hand, starting afresh and focusing on answers might initially seem more difficult since it can feel like diving into the unknown, and the brain does not like uncertainty.

An effective approach to tackling a performance problem is to focus on the desired outcome rather than on the past. The brain is a powerful ally but it cannot entertain both problems and solutions at the same time. So you have to choose :

- When you focus on the problems, you are more likely to activate the negative emotions connected to the problems.
- When you look for solutions, you scan your environment widely for cues, which apparently activates the right brain hemisphere. This is helpful for having insights**, which is how complex problems are solved.

Refrain from proposing solutions

Problem solving is exhausting, and you might be tempted to provide your colleague with a set of solutions. The thing is, providing a solution might make you seem smarter, which will threaten your supervisee's status. Moreover, they will feel like they are losing control of the situation. In addition, a solution that they themselves propose has a much greater chance of being implemented.

Try to refrain from giving in to the desire to solve the problem yourself. Waiting for someone to come up with their own ideas requires effort but, the more you are working out solutions for people, the more they feel threatened and might reject them.

Use the SCARF model

Facilitating insights in other people's mind in order to work around an impasse requires you to use the SCARF model. SCARF stands for status, certainty, autonomy, relatedness and fairness.

Reassure your colleagues that you respect their status, instead of asserting your authority and supervisory role. Increase their sense of certainty by being very clear and honest about what your objectives are. Respect their sense of autonomy by ensuring that they come up with their own proposals and solutions to performance problems. Relate to them, as you are both individuals with competences, roles and responsibilities as well as private lives. Reassure them that you conduct the process of evaluating performance fairly and equitably.

When all these conditions are met, the gut reaction to feedback – freeze or fight – is

neutralised, and both parties open up to the conversation and look for positive outputs.

Laure Esteveny

** This article is inspired by the book "Your brain at work" by Dr David Rock.*

*** An insight, here, is a solution that is not logical but recombines knowledge in your brain in a whole new way. Insights are at the heart of creativity for problem solving.*