CERN Bulletin

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ENRICA PORCARI AND BENOÎT DELILLE'S MESSAGES TO THE CERN COMMUNITY

Enrica Porcari (Information Technology – IT) and Benoît Delille (Occupational Health & Safety and Environmental Protection unit – HSE) bring our series to a close with their introduction messages

Enrica Porcari, Head of the Information Technology department (IT) and Benoît Delille, Head of the Occupational Health & Safety and Environmental protection Unit (HSE) (Image: CERN)

2021 marked the start of a new mandate for the management team at the helm of the Organization. In this video series, the newly appointed department heads introduce themselves to our community, tell us about their journeys and provide their vision for the future of their departments.

Enrica Porcari, the new Head of the Information Technology department and Benoît Delille, the new Head of the Occupational Health & Safety and Environmental Protection unit, close this series with their messages (below).

Enrica is a newcomer at CERN. Before joining our community four months ago as Head of the Information Technology department, Enrica managed numerous development projects for International Organizations such as CGIAR (Consortium of International Agricultural Research Centers) or the UN World Food Programme.

This video (https://videos.cern.ch/record/2786794) was recorded on 21 October.

Benoît is a trained mechanical engineer who worked in the private industry for six years before becoming a member of our community nearly twenty years ago.

(Continued on page 2)

A WORD FROM ...

ENTERING A NEW CHAPTER FOR THE HL-LHC PROJECT

The High-Luminosity LHC (HL-LHC), CERN's current flagship project, is the highest-priority project of the recent update of the European Strategy for Particle Physics. The project aims for a tenfold increase in the integrated luminosity and an extension of the LHC's lifetime well beyond the mid-2030s.

(Continued on page 2)

In this issue

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A WORD FROM ...

ENTERING A NEW CHAPTER FOR THE HL-LHC PROJECT

Therefore, it relies on resources and expertise from laboratories and teams worldwide – from America to Japan, from China to Italy – whose members join up every year with the CERN experts to take stock of the advancement of the project and find common solutions to the challenges ahead. The latest of these collaboration meetings ended on 22 October after four days of online plenary and parallel sessions.

More than 200 collaborators from around the world joined the talks, which were held virtually due to the travel restrictions that are still being imposed in many countries due to the COVID-19 pandemic. We only held plenary sessions last year while this year, for the first time, we also organised remote parallel sessions in which smaller groups of collaborators had the opportunity to meet and discuss detailed technical issues in different areas. This arrangement made for a dense and intense programme, but it was a pleasant surprise how smoothly it went. The initial timidity in the virtual coffee rooms quickly dissipated and led to enthusiastic and productive discussions between our collaborators.

The meeting of the Collaboration Board, the steering body of the HL-LHC project, which synchronises work between the various institutes, was also held in a virtual format, allowing participants to discuss the high-level stakes at hand, against the backdrop of a transition phase for the project. The R&D efforts for many of the HL-LHC's cutting-edge components, designed to prepare the accelerator for a sharp increase in the number of collisions, have been finalised in many areas and are making way for the production of components through industrial partnerships, as was also reported in the latest edition of the annual Collaboration Board newsletter.

Among the many impressive achievements reported during the meeting, our members learned about the latest test results of a whole range of new magnets developed specifically for the project, including AUP's (the Accelerator Upgrade Programme) Nb_3Sn triplet quadrupoles, four of which have already been built and fully qualified for operation to date. Another highlight was the achievement of nominal performance of the innovative nested-coil corrector magnets, which gave the green light to start their industrial production at Elytt Energy, in Spain, with the support of CIEMAT. Japan and Italy are both currently shipping prototypes of separation and recombination dipoles to CERN for final validation at cold, and the UK collaboration is starting to assemble the first cryomodule with crab cavities recently delivered by CERN. CERN has also received the first superconducting link cables and cryostats from industry, underlining the transition from prototyping to series production for the project.

The transition to this new chapter for the project was celebrated, along with the progress of the civil engineering works, both for surface buildings and for the new underground caverns housing the equipment for the accelerator upgrade, a cornerstone of the project that needed to be finalised during LS2. We look forward to inviting our collaborators to visit these new structures at Point 1 and see the full extent of the progress on the occasion of a future in-person meeting at CERN.

In the short term, the global health situation permitting, next year's meeting will likely be hosted by Uppsala University in Sweden, which recently built the pioneering FREIA laboratory to contribute to the testing of HL-LHC magnets and cavities.

This video (*https://videos.cern.ch/record/2786799*) is available on CDS.

Oliver Brüning, Markus Zerlauth
Oliver Brüning and Markus Zerlauth are at the helm of the HL-LHC Project

ENRICA PORCARI AND BENOÎT DELILLE'S MESSAGES TO THE CERN COMMUNITY

He left the Accelerators and Technology sector to bring his experience in safety engineering and project management to his new position as Head of the HSE unit.

This video (https://videos.cern.ch/record/2788715) was recorded on 26 October.

THE FOUR LHC EXPERIMENTS ARE GETTING READY FOR PILOT BEAMS

After over two years of upgrades and maintenance works, the four main LHC experiments are finalising preparations to receive pilot beams

The acceleration of LHC pilot beams is operated and live-streamed from the CERN Control Centre (Image: CERN)

Update: The first pilot beams circulated in the LHC on 19 October 2021. On 26 October, there were low-intensity test collisions at an injection energy of 450 GeV per beam and stable collisions of proton beams were declared on the morning of 27 October.

Since 2019, many places at CERN have been operating like beehives to complete the scheduled upgrades for the second long shutdown (LS2) of the accelerator complex. This period of intense work is now coming to an end with the injection of the first pilot beams into the LHC. This major milestone will be featured during a live event on CERN's social media channels on 20 October at 4 pm (CEST).

The pilot beams are part of the commissioning of the LHC machine in preparation for its Run 3, starting in 2022. With an integrated luminosity equal to the two previous runs combined, the four LHC experiments will be able to perform even more precise measurements. Yet, to stay apace with the accelerator's improved vigour, all of them had to undergo a series of upgrades and transformations.

After the refurbished Time Projection Chamber (TPC) and the revamped Miniframe joined the ALICE detector in the cavern, the reinstallation of its new Muon Forward Tracker subdetector followed. In May, a new Inner Tracking System (ITS), the largest pixel detector ever built, took the seat of the previous one, between the beam pipe and the TPC. The final piece of the ALICE puzzle – the Fast Interaction Trigger (FIT) – was installed in July.

At ATLAS, among the ongoing works, the muon spectrometer was upgraded, notably with the installation of one of the two New Small Wheels, which uses new technologies such as the novel small-strip Thin Gap Chambers (sTGC) and the Micromegas detectors. Its twin will be lowered into the detector's cavern in November.

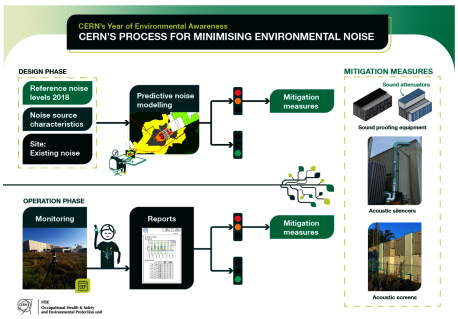
In 2020, the CMS experiment completed the installation of the first GEM (Gas Electron Multiplier) station, the brand new sub-detector system for detecting muons in the region closest to the beam pipe. This year, a new, redesigned beam pipe with a new vacuum pumping group was installed. Over the summer, after its design was improved and its innermost layer replaced, the Pixel Tracker was installed at the centre of the CMS detector, followed by the Beam Radiation, Instrumentation and Luminosity (BRIL) sub-detectors.

As for the LHCb experiment, an important metamorphosis happened during these two years. A new scintillating-fibre particle-tracking detector (SciFi) and upgraded ring-imaging Cherenkov detectors, RICH1 and RICH2, were installed this year, before the recommissioning of the beam pipe. The installation of a faster Vertex Locator (VELO) is planned for the coming months.

The first proton beams circulated in CERN's accelerator chain in December last year, with the first beam being injected into the PS Booster (PSB), connecting it for the first time to the new Linac4. The Proton Synchrotron followed, accelerating its first beam in March, while the Super Proton Synchrotron (SPS) saw its first beams accelerated in May.

Cristina Agrigoroae

ENVIRONMENTAL AWARENESS: CERN'S PROCESS FOR MINIMISING ENVIRONMENTAL NOISE



(Image: CERN)

In the design phase of a new project, CERN takes into account the 2018 reference levels for noise limits, the new noise source characteristics, and noise from existing infrastructure. The data is then processed by a 3D georeferenced modelling software. Mitigation measures are defined where needed, based on the results of the modelling.

Before the operation phase of new equipment, the Organization controls noise to verify that the levels remain within the set limits.

In addition, CERN monitors the noise impact of existing equipment through noise campaigns organised annually in the month of September.

Mitigation measures are defined where noise levels exceed the set limits.

Questions regarding environmental noise can be sent to environment.info@cern.ch

This infographic is part of the "CERN's Year of Environmental Awareness" series.

THE NORTH AREA IS GETTING A FRESH LOOK

The North Area, part of the Super Proton Synchrotron complex, will see a major two-phased facelift in the upcoming years

The NA61/SHINE experiment in the North Area in April 2021 (Image: CERN)

As the second-largest accelerator at CERN, the Super Proton Synchrotron (SPS) is an indispensable machine that provides beams not only to the LHC and AWAKE, but also to many fixed-target experiments, including SHINE, NA62, COMPASS, NA64 and NA65, and various R&D programmes, through 6 kilometres of beamlines supplying the North Area's experimental halls.

The first beams from the North Area, which was built in the 1970s, were sent to the experiments in 1978. Initially, the area was dedicated almost exclusively to physics experiments, but over the years many beam lines have also served a very dynamic programme of R&D and tests for experiments at CERN colliders, other labs and even in space. New experiments will also see the light of day in the future, following the Physics Beyond Colliders (PBC) initiative.

The initial design of the North Area (NA) was very sound, allowing for perpetual changing requirements for more than 40 years. However, most of the equipment and infrastructure is just as old, and the time has come to give the NA a fresh look and to prepare the beamlines and infrastructure for the coming decades. New experiments constantly require higher intensities, putting the equipment under strain and necessitating maximum reliability.

Discussions about the refurbishment of the NA began as early as 2013, when Long Shutdown 1 was about to start. As the area has been in operation since 1978, when the SPS was first switched on, the equipment hasn't really been touched since.

Initial consolidation work on the safety of the installations in the NA took place during LS2. However, the daily fixes needed on the power converters in the NA raised reliability questions that needed to be addressed.

As of 2021, a two-phased approach has been endorsed for the consolidation of the NA that will allow the full renovation costs to be staged. Phase 1, approved as of 17 June 2021 through the Medium-Term Plan, has already started and will focus on the replacement of the power converters in BA80 and BA2, covering the first 1.2 kilometres of beamlines upstream of the experimental halls. This replacement will take place during Long Shutdown 3, which is scheduled to end in mid-2027, so as not to hamper Run 3. The first visible result of the consolidation activities will appear in 2023, with the construction of a fifth cooling tower to handle the future cooling needs.

Phase 2, starting in 2027, will be the refurbishment of the experimental halls and of auxiliary technical buildings BA81 and 82. We are talking here of about 60 000 square metres of buildings, facilities including North Experimental Halls 1 and 2 (EHN1 and EHN2) and underground cavern ECN3, which are essential for the searches for rare processes in the framework of the PBC Study.

The NA consolidation project will not result in the same energy savings as the East Area (EA) makeover. The main reason is its major energy consumer. The duty cycle, that is the fraction of the time during which beam is actually delivered, is much larger than in the EA. Moreover, the big experimental magnets run constantly and cannot be pulsed. Nevertheless, the upgrades of the beam equipment and interlock protection will help reduce beam losses, building refurbishments will allow for energy savings and the project will investigate further means to improve energy consumption in several related areas.

The facelift will bring the NA facilities into compliance with modern safety requirements. In parallel, the SPS itself will be upgraded. The beams to the NA will be accelerated by a new radiofrequency system, leading to an enhancement of the beam brightness provided by the SPS. A new beam dump has already been installed at Point 5 of the accelerator ring to cope with the higher intensity beams that will be needed as of 2026 for the High-Luminosity Large Hadron Collider.

This article is a part of the series "A quiet revolution is under way at Prévessin".

Cristina Coman

CERN ACCELERATOR SCHOOL TO CREATE NEW VIDEO ENCYCLOPAEDIA

After a long hiatus due to the pandemic, CAS has finally restarted its residential courses. This time with a new project: a CAS video encyclopaedia

CAS Introduction to Accelerator Physics group photo (Image: CERN)

It is a cool Tuesday afternoon in early October. In the shadow of the Jura mountains north of Geneva lies a hotel, where seventy students at the beginning of their accelerator physics careers are attending the CERN Accelerator School (CAS). They are joined by experts from various international accelerators who lecture, share their expertise and network with the students. This particular course, *Introduction to Accelerator Physics,* is CAS's first residential course since the beginning of the COVID-19 pandemic.

The school began in 1983, with a mandate of "assembling and disseminating knowledge on accelerator science". Hermann Schmickler, the current CAS director, explained that this mandate refers to "the theoretical aspects of beam dynamics, but also the technologies involved in building an accelerator and the various types of accelerators that exist around the world: colliders, synchrotrons, light sources and accelerators for medical applications".

In the centre of the *Introduction to Accelerator Physics* conference room stands a video camera, which betrays the beginning of an ambitious new project from the CAS team: CASopedia. Its aim is to record and catalogue all CAS lectures and to release all the content in open access on the CAS website – helpful not only to those who have been unable to attend an in-person course, but also to those who may wish to refresh their knowledge. Some institutions have also already expressed an interest in using the CASopedia footage as teaching material.

Schmickler explained that the team is planning to record every lecture on every course for the next five years, resulting in over 1600 hours of footage. "But listening attentively to a one-hour course if you are looking for specific information could be very frustrating". Instead, CAS intends to sort the videos in a searchable video encyclopaedia (hence the name). Searching keywords in the database will provide targeted five to ten-minute-long video explanations from accelerator physics experts.

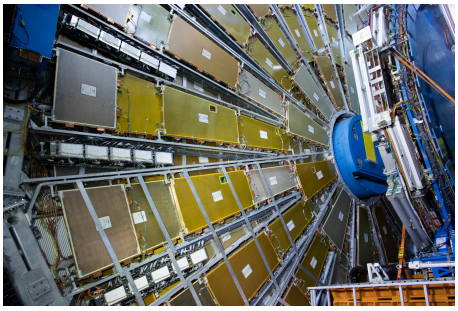
CASopedia is only one of many recent CAS developments. For instance, the introductory course was completely reviewed in 2018 by expert accelerator physicists, who will meet regularly to review the other courses. "This is like quality assurance", adds Schmickler.

Furthermore, before the pandemic, CAS started increasing the frequency of its courses throughout the year. Two general courses (a yearly introductory course and an advanced course every other year) and up to four specialist courses. However, during the pandemic, only two online courses took place. These had high attendance but, as the effects of the pandemic lessen, more residential courses are scheduled for next year in various venues across Europe.

Naomi Dinmore

BRINGING NEW LIFE TO ATLAS DATA

The updated version of the ATLAS analysis software will reprocess all ATLAS collision data from Run 2 over the coming months



The ATLAS detector (Image: CERN)

The ATLAS collaboration is breathing new life into its LHC Run 2 dataset, recorded from 2015 to 2018. Physicists will be reprocessing the entire dataset – nearly 18 PB of collision data – using an updated version of the ATLAS offline analysis software (Athena). Not only will this improve ATLAS physics measurements and searches, it will also position the collaboration well for the upcoming challenges of Run 3 and beyond.

Athena converts raw signals recorded by the ATLAS experiment into more simplified datasets for physicists to study. Its new-and-improved version has been in development for several years and includes multi-threading capabilities, more complex physics-analysis functions and improved memory consumption.

"Our aim was to significantly reduce the amount of memory needed to run the software, widen the types of physics analyses it could do and – most critically – allow current and future ATLAS datasets to be analysed together," says Zach Marshall, ATLAS Computing Coordinator. "These improvements are a key part of our preparations for future high-intensity operations of

the LHC – in particular the High-Luminosity LHC (HL-LHC) run beginning around 2028, which will see ATLAS's computing resources in extremely high demand."

This latest version of Athena already makes good headway in reducing the computing resources required for data analysis. For example, the computationally intensive job of taking individual signals from the inner detector and chaining them together to form particle tracks is now two to four times faster. Less disk space is needed to store the results and overall the software runs more smoothly.

The software improvements also feature new ways for physicists to study their data. For example, researchers will now, by default, be able to look for tracks that originate away from the collision point. These could be signatures of particles with long lifetimes and may lead to evidence of exciting beyond-the-Standard-Model physics processes. While such searches were possible with the earlier version of the ATLAS software, the heavy computing resources they required meant they could not always be carried out.

Finally, physicists have also made improvements to the databases containing all of the time-dependent status information of the detector components. These databases – on which Athena runs – now incorporate an improved understanding of the detector's operation during Run 2. "Every data-taking period is an opportunity for us to learn more about the detector and its subsystems," says Song-Ming Wang, ATLAS Data Preparation Coordinator. "Revisiting these databases with the benefit of hindsight will allow us to provide even better performance."

With the new Athena software now up and running, researchers have set out to reprocess the entire Run 2 dataset. This will take several months, as the dataset is quite substantial.

The expected results will be well worth this effort: ATLAS will have a significantly improved dataset that will allow for crisper measurements, more powerful searches and simpler combinations of past and future data.

Read the original article on the ATLAS website (https://atlas.cern/updates/news/reprocessing-Run2-data).

ATLAS collaboration

SUBSCRIBE TO THE "EU PROJECTS @ CERN" NEWSLETTER

CERN's EU Projects Office announces a relaunch of its newsletter starting in November 2021

Starting in November 2021, the "EU Projects @ CERN" newsletter will provide readers with news about European projects (Image: CERN)

Starting in November 2021, the " *EU Projects @ CERN*" newsletter will provide readers with a quarterly digest of news about European projects in which CERN is involved.

Each issue will focus on a specific topic related to European projects: the creation of project consortia, the search for suitable funding, etc.

The newsletter will not only provide information on EU support services and resources at CERN, but also particulars on deadlines and funding opportunities, such as open or upcoming calls for proposals of potential interest to CERN.

"With the revamped publication of our newsletter, we aim to display the diversity of European projects at CERN and to further encourage CERN teams to participate in the Framework Programme for Research and Innovation," explains Svetlomir Stavrev, Section Leader for EU Project Management and Operational Support. "The newsletter will also show how European projects contribute to the R&D programmes and objectives of the Organization."

CERN's long-standing cooperation with the European Commission is based on a Memorandum of Understanding signed by the two parties in 2009, and on the very successful participation of CERN in the EU Framework Programmes for Research and Innovation (100 projects in FP7 and 110 projects in H2020).

Subscribe to the newsletter by joining this e-group (*https://e-groups.cern.ch/e-groups/EgroupsSubscription.do?egroupName=H2020-newsletter*).

Antoine Le Gall

SEVEN LOCAL STUDENTS SHARED THEIR SCIENTIFIC PROJECTS AGAINST THE CLOCK

On Friday, 15 October 2021, seven students from Geneva and the Pays de Gex presented their high-school graduation projects as part of the cross-border scientific colloquium Partage ta science at CERN's Globe of Science and Innovation

(Image: CERN)

Formerly known as " *Mon TPE/TM en 15 minutes* ", the colloquium – presented by and for young people – was renamed " *Partage ta science* " this year. The event format was also changed to adapt to the new French curriculum and allow students pursuing vocational training in Geneva to take part.

For this tenth consecutive edition, four high-school students from the *Pays de Gex* each had five minutes to make a presentation for their new oral exam – the *grand oral*, while three high-school students from Geneva each had 15 minutes to present their *travail de maturité* or *travail personnel d'approfondissement*.

The presentations covered a wide range of subjects, from antibiotic resistance to dark matter, via the engineer Henri Pitot and sound waves. Some particularly topical matters were also addressed, such as artificial intelligence and the mathematical modelling of an epidemic.

Cartoonist Barrigue, the founder of the magazine *Vigousse* and of the association CrayonSolidaires, dessiner pour tous, was once again on hand to liven up the proceedings. He entertained the audience by drawing some quirky and occasionally provocative live reactions to the presentations.

You can find videos of the presentations and photos of the evening on the event website (*https://indico.cern.ch/event/1039087/*).

CERN CELEBRATES THE 2021 "FÊTE DE LA SCIENCE" IN FERNEY-VOLTAIRE AND ANNECY-LE-VIEUX

Over the weekend of 9 and 10 October, CERN scientists engaged with the public in Ferney-Voltaire and Annecy-le-Vieux, sharing their knowledge and imparting their passion for science on the theme "Eurêka! émotion de la découverte"

The show "A brief history of the detection of the invisible" (Image: CERN)

About 1000 visitors took part in the fun and games at the *Village des sciences* in Ferney-Voltaire and 400 in Annecy-le-Vieux. CERN was the guest of honour for the 30th anniversary of the Fête de la science, alongside entrepreneurs and associations like Pangloss Labs, and other scientific institutions including the Annecy Particle Physics Laboratory (LAPP), the Theoretical Physics Laboratory of Annecy-le-Vieux (LAPTh), the EUTOPIA platform and the Ecole Polytech. This was the third time CERN had taken part in such events in Ferney-Voltaire and the first time in Annecy-le-Vieux.

In Ferney-Voltaire, the five activities organised by CERN were a hit. In the gardens of the *Château de Voltaire*, the youngest visitors went on a treasure hunt to find routers and re-enact the internet browsing process. They also learned how to make pictures using pixels and got to grips with the basic principles of an electronic circuit through their own artistic creations. But the most popular attractions by far were the particle detection show and the interactive game. Visitors became detectives for a day, seeking clues to identify particles and learning about how particle detectors work.

In addition, an evening event to celebrate the birth of the World Wide Web was held on Wednesday, 6 October, with a special appearance by one of the internet's pioneers in Europe, François Fluckiger, which attracted an audience of around fifty.

In Annecy-le-Vieux, visitors of all ages were thrilled to meet scientists working at LAPP and take part in the CERN activities on offer. The organisers of S'Cool LAB presented their "Salad Bowl Accelerator", a simple and fun way of demonstrating how a particle accelerator works. In a similar vein, an exhibition called " *Accélérer le futur* " showcased the technological advances that could be applied to future accelerators like the one currently on the drawing board, the Future Circular Collider.

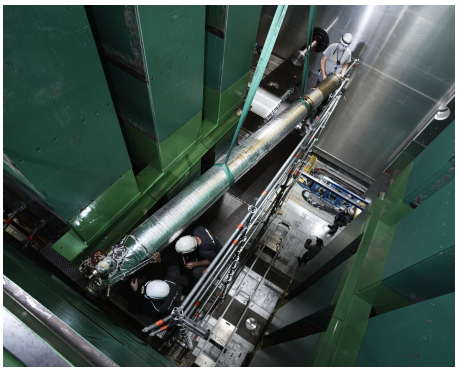
Many went away happily clutching their souvenirs, such as a photo of themselves in front of the Large Hadron Collider or a badge depicting the elementary particle best matching their personality.

Many thanks to everyone who made both events possible and ensured that fun was had by all, in full compliance with the health and safety measures in force. Thanks also to the CERN volunteers who gave up their free time and were perfect ambassadors of the Organization. There's nothing more to say than... roll on next year!

Electronic postcards (Image: CERN)

SUCCESSFUL BEAM PIPE INSTALLATION AT LHCB

The beam pipe was reinstalled in the LHCb detector over the summer, marking a new milestone in the experiment's upgrade



The stainless-steel section of the LHCb beam pipe is lifted up to the beamline with a crane and put in place between the filters of the muon system. (Image: CERN)

The LHC experiments are nearing the completion of maintenance and upgrade works carried out in the framework of the second long shutdown of CERN's accelerator complex. Of all the experiments, LHCb is undergoing the most significant metamorphosis during these two years, namely the installation of a faster Vertex Locator (VELO), a new scintillating-fibre particle-tracking detector (SciFi), and upgraded ring-imaging Cherenkov detectors, RICH1 and RICH2. While the installation of LHCb's subdetectors and infrastructure in preparation for commissioning is still under way, its beampipe was successfully reinstalled over the summer, marking a milestone in the detector's preparation for Run 3 of the LHC.

The LHCb beam pipe has a conical shape through the whole of the LHCb detector, which makes it different from that of the other experiments. Along its total length of 19 m, its diameter ranges from 50 mm close to the LHCb interaction point to 380 mm in the experiment's muon system. The beam pipe is composed of four sections, all of different lengths. Three of these sections are made of beryllium and measure 11.6 m, giving LHCb the longest beryllium beam pipe of all the LHC experiments. The last and biggest section is made of stainless steel. Both the shape and material of the beam pipe were chosen to optimise its transparency to particles emerging from the collisions that take place at the LHC.

The beam pipe has a spider-web-like support structure in the aperture of the LHCb magnet, with beryllium collars and carbon-fibre ropes and rods ensuring that the amount of material is kept to a minimum. Installed during the first long shutdown, it was the first such structure ever used in an experiment and remains unique in the world today. The support structure may seem fragile, but is able to keep the beam pipe in place under the huge force that it exerts on itself when under vacuum.

The installation of the LHCb beam pipe, which involved engineers and technicians across multiple departments, started in April. The first smaller section was inserted through the RICH1 subdetector and connected to the VELO vacuum tank surrounding the interaction point. The installation and careful alignment of the spider-web-like structure followed in mid-July. The remaining sections were installed afterwards in a well-defined order: first, the longest (7 m) beryllium section was slid through the inner cylindrical sheath of the RICH2 subdetector. Then, the stainless-steel cone, the heaviest (160 kg) and biggest section, was lifted up to the beamline with a crane and then slid into place in the centre of the muon system. Finally, the lightest beryllium section (about 4 kg) was carefully installed by hand, sliding it into place on its spider-web support in the magnet.

Once the sections had been connected with bellows and checks had been carried out to make sure that there were no leaks in the connections, the bake-out procedure to improve the quality of the vacuum started in mid-August. For this step, the beam pipe was wrapped in heating blankets, allowing it to be heated up to 250 °C. The VELO vacuum tank and the very thin radio-frequency foil that separates the LHCb detector vacuum from the LHC beam vacuum were also heated at the same time as the beam pipe. After final checks of the vacuum quality, the heating blankets were removed and the beam pipe was filled with neon gas at atmospheric pressure to keep it ready for beams to circulate in October.

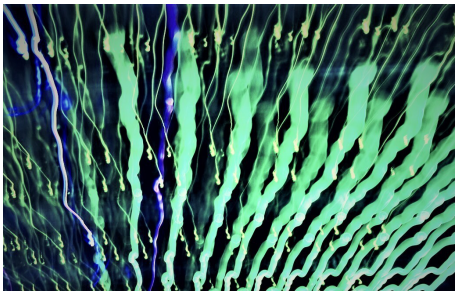
This video (*https://videos.cern.ch/record/2784412*) is available on CDS.

The smallest of the beryllium sections is slid inside its spider-web-like support (Image: CERN)

Cristina Agrigoroae

CERN QUANTUM TECHNOLOGY INITIATIVE UNVEILS STRATEGIC ROADMAP SHAPING CERN'S ROLE IN NEXT QUANTUM REVOLUTION

CERN QTI reaches its next milestone today, with the unveiling of a first roadmap defining its medium- and long-term quantum research programme



The picture is a modified variant of the original Veronika McQuade's computer centre shot. (Image: CERN)

Geneva, 14 October 2021. The CERN Quantum Technology Initiative (CERN QTI) reaches its next milestone today, with the unveiling of a first roadmap defining its medium- and long-term quantum research programme. The roadmap details the CERN QTI goals and strategy, and outlines its governing structure and the composition of its international advisory board, as well as the activities to support the exchange of knowledge and innovation with the high-energy physics community and beyond in the extensive field of quantum technologies. Through CERN QTI, CERN is disseminating its enabling technologies – such as quantum state sensors, time synchronisation protocols, and many more from the cryogenics, electronics, quantum theory and computing domains – to accelerate the development of quantum technologies.

Today's information and communication technology grew out of the knowledge and development of quantum mechanics during the last century. CERN QTI will see the CERN community play their part in a global effort to bring about the "next quantum revolution" – whereby counterintuitive phenomena such as superposition and entanglement are exploited to build novel computing, communication, and sensing and simulation devices.

"As an international, open and neutral platform, and building on its collaborative culture and proven track record of innovation, CERN is uniquely positioned to act as an 'honest broker' between CERN Member States and to foster innovative ideas in the field of high-energy physics and beyond," says Professor Joachim Mnich, CERN Director for Research and Computing. "This is underpinned by several concrete R&D projects that are already under way at CERN."

Composed of prominent international experts nominated by the 23 CERN Member States, the recently formed advisory board contributed to the roadmap being published today.

"The roadmap builds on high-quality research projects already ongoing at CERN, with top-level collaborations, to advance a vision and concrete steps to explore the potential of quantum information science and technologies for high-energy physics," reported Kerstin Borras and Yasser Omar, co-chairs of the CERN QTI advisory board, in a statement unanimously approved by the board members. "CERN can play a key role as a facilitator of cross-disciplinary discussions about the role of quantum technologies in science, advancing the development of use cases and enabling technologies, promoting co-development, as well as being a key early-adopter of quantum technologies. The members of the advisory board will promote the collaboration between the quantum technologies and the high-energy physics communities in their respective countries, with CERN and its roadmap being a very important forum and instrument to develop fruitful cross-fertilisation."

The board will work together with the CERN QTI management team to guide the activities and create as many synergies as possible with national and international initiatives related to quantum technologies.

A year on from its launch, CERN QTI has already established collaborations and projects to explore how quantum technologies can best benefit high-energy physics and beyond in four main quantum research areas: quantum computing and algorithms; quantum theory and simulation; quantum sensing, metrology and materials; and quantum communication and networks. The current projects span multiple research topics and target applications such as quantum graph neural networks for track reconstruction, quantum support vector machines for particle classification, quantum anomaly detection for beyond the Standard Model searches, quantum generative adversarial networks for physics simulation, new sensors and materials for future detectors, and secure quantum key distribution protocols for distributed data analysis.

Education and training are also at the core of CERN QTI. Building on the success of its first online course on quantum computing, CERN QTI will be extending its academia–industry training programme to accelerate the process of cultivating competencies across various R&D and engineering activities for the new generation of scientists, from high-school students to senior researchers.

"CERN has demonstrated excellence in scientific research for many years, and has fostered great innovation in computing technologies. Building on its unique expertise and strong collaborative culture, CERN is in a distinctive position today to foster quantum developments in the European high-energy physics community and beyond," concludes Alberto Di Meglio, Coordinator of the CERN Quantum Technology Initiative.

About CERN QTI

The CERN Quantum Technology Initiative (CERN QTI) is a comprehensive R&D, academic and knowledge-sharing initiative to exploit quantum advantage for high-energy

physics and beyond. Given CERN's increasing information and communications technology and computing demands, as well as the significant national and international interest in quantum-technology activities, CERN QTI aims to provide dedicated mechanisms for the exchange of both knowledge and innovation.
Find out more at quantum.cern (*https://quantum.cern/*) and on Twitter (*https://twitter.com/CERNquantum*) and LinkedIn (*https://www.linkedin.com/showcase/cern-quantum-technology-initiative-cern-qti/about/*).
Link to roadmap: https://zenodo.org/record/5571809

COMPUTER SECURITY: BEAUTY UNDER THE HOOD

CERN hosts hundreds of web servers, thousands of websites and more than a million webpages. Most of them work and have a well-defined purpose, many are sleek and well done, modern or fancy, some are a bit 90s style, and some are outdated or obsolete. While the aesthetics can be discussed, disputed and depend strongly on subjective tastes, there are certain ground rules that all web servers, websites and webpages should follow – not on the surface but more “under the hood”. Some beauty is also appreciated there.

So, to all you webmasters here at CERN, think of your favourite webpage that you manage and maintain. Does your webpage's name make sense and is it sufficiently short and meaningful? What if I use the associated IP address instead – do I get the same content? And if I browse to a subpage, any subpage, do I get some meaningful content even if I misspelled the full URL (the webpage's full path)? Does your webpage catch errors appropriately and redirect accordingly (e.g. no pages that don't exist, requiring authentication or where access is plainly forbidden)? What about certificate errors? Or any other error or debugging message? Do you redirect to HTTPS, in particular when hosting sensitive and access-protected content?

If you answered “no”, “don't know”, “dunno”, “???”, or if you shrug, facepalm or twitch, the time has come to check! Make sure that you have a proper landing page or, if you don't think that you can have one, make sure that you redirect to, e.g., cern.ch. Configure the standard 401, 403 and 404 error messages in order to avoid disclosing error or debug information. If your page runs JavaScript, PHP or any other web content management software, catch any other error messages and make sure that they are not displayed to the end user. Similarly, remove all default information like Apache default pages or Tomcat default webapps, webinfo pages and other modules and options that are not necessary to provide the intended content. Redirect from HTTP (port 80/tcp) to HTTPS (port 443/tcp) to make sure that confidentiality and integrity are preserved. Make sure that the server doesn't support outdated encryption protocols like SSL or TLS versions older than version 1.2. Make sure that the site's certificate is valid, trusted and not expired. And don't forget the software running on the server. It should be developed with care and work with the server settings providing the required security features, like proper logging and error handling.

While overlooking any of these settings is not security-critical by itself, attackers might still get the impression that the overall set up is sub-optimal or mediocre and decide it's worth poking deeper (see our article on a “ Digital Broken Windows Theory ”. It also shows a lack of professionalism and puts CERN in a bad light. Hence, check your web server, website or webpage once more, and pimp it up. Fix those issues. Beautify it, also under the hood. Take advantage of external guidance. For example, CIS offers free benchmarks to harden not only the underlying operating system, but also several web server software and versions. Qualys SSL Labs provides a few SSL/TLS configuration analyses. And you can also check out the OWASP cheat sheet series for more specific hands-on guidance on web development. Finally, have a look, too, at our more general recommendations for software developers and webmasters (*https://security.web.cern.ch/recommendations/en/index.shtml*). Or, as always, reach out to us for help or advice or to request an independent look and security check: Computer.Security@cern.ch.

Do you want to learn more about computer security incidents and issues at CERN? Follow our Monthly Report (*https://cern.ch/security/reports/en/monthly_reports.shtml*). For further information, questions or help, check our website (*https://cern.ch/Computer.Security*) or contact us at Computer.Security@cern.ch.

Computer Security team

Announcements

COURIER WEBINAR ON FERMILAB'S INTERNATIONAL ENGAGEMENT ON 15 NOVEMBER

Join the audience for a live webinar at 5 p.m. CET on 15 November 2021, sponsored by Fermilab. Registration on the Courier website (*https://cerncourier.com/a/fermilab-a-future-built-on-international-engagement/*).

Future scientific breakthroughs in high-energy physics will require unprecedented levels of international engagement, building on the successful model of the Large Hadron Collider at CERN. Joe Lykken, Fermilab deputy director for research, will describe how Fermilab is moving forward rapidly with CERN and other international partners to realise this vision.

The questions under scrutiny range from the nature of the Higgs field to the question of whether neutrinos play a role in the matter-antimatter asymmetry observed in the universe. PIP-II, an upgrade to the Fermilab accelerator complex that includes a leading-edge superconducting linear accelerator, is already under construction, with major “in-kind” contributions and expertise from partners in India, Italy, the UK, France and Poland. PIP-II will enable the world's most intense beam of neutrinos for the Deep Underground Neutrino Experiment (DUNE), which will deploy 70,000 tonnes of liquid argon detectors in a deep underground site 1300 km from Fermilab. DUNE was formulated as an international project from the start, and now includes more than a thousand collaborators from 30 countries. Two large prototype detectors for DUNE have been successfully constructed and tested at the CERN Neutrino Platform. DUNE will have remarkable capabilities to determine how the properties of neutrinos have shaped our universe. At the same time, Fermilab has been developing and building next-generation superconducting magnets that will be deployed in the HL-LHC accelerator at CERN, and is the US lead for ambitious upgrades to the CMS experiment for the HL-LHC era. These technological capabilities will also make Fermilab an important partner for the proposed Future Circular Collider.

WRIGHT COLLOQUIUM FOR SCIENCE AT THE UNIVERSITY OF GENEVA IN NOVEMBER

The University of Geneva will host a special one-off public lecture on 2 November in the Dufour building and online to complement last year's Wright Colloquium for Science. This year's event continues the theme of last year's Colloquium: “The Art of Maths”, and accompanies a maths-themed sound and light show in the Parc des Bastions, which had to be postponed due to the COVID-19 pandemic.

You will be able to watch the “Maths et Brilliant” sound and light show at the Parc des Bastions every evening at 6 p.m., 7 p.m. and 8:30 p.m from 31 October to 21 November. In this show, the façade of the oldest building of the University of Geneva will be illuminated and animated to the rhythm of colourful paintings that evoke the beauty of mathematics.

The public lecture “Does randomness really exist?” will take place on 2 November at 6:30 p.m. Hugo Duminil Copin, Professor of mathematics at the University of Geneva and the Institut des Hautes Études Scientifiques, will discuss the extent to which seemingly random events are in fact deterministic. This talk is a last addition to the series of conferences on the theme of mathematics in the 2020 Colloquium.

The public lecture will be webcast and accessible on the Colloquium's website. Access to the public talk on campus and online is free of charge after online registration on the University of Geneva website. The conference is in French with simultaneous English translation.

CALL FOR VOLUNTEERS TO TAKE PART IN A REALISTIC EMERGENCY RESPONSE EXERCISE AT CMS

The exercise, organised by the CERN Fire and Rescue service in collaboration with the French and Swiss emergency services, will take place at CMS on 13 November

After the success of the emergency response exercise at the Globe in 2019, which took place in collaboration with the emergency services of CERN's Host States, the CERN Fire and Rescue service is organising another exercise – on 13 November, at Point 5 of the LHC. This large-scale exercise was originally planned for 2020 but was postponed because of the health crisis. Its purpose is to enhance interoperability and communication between the various emergency response teams and to improve knowledge and understanding of their respective working methods when implementing a multinational response to a major incident.

As part of the exercise, several subscenarios will be staged at Point 5 – on the surface, in the CMS technical cavern and in the HiLumi underground areas. Volunteers from the CERN community will be needed to make the exercise a success. They will be assigned to teams with specific tasks, according to their skillset. If you match one of the profiles outlined below and you would like to volunteer to take part in the exercise, you can sign up on the Indico (*https://indico.cern.ch/event/1088801/registrations/76696/*) page, specifying which team you would like to join and your profile. Please bear in mind that, depending on requirements, not all applicants may be chosen.

Four categories of volunteer have been identified:

- **Safety personnel** : You know CERN's infrastructure well, are capable of identifying dangerous situations and know how to handle them by guiding people to safety. Ideally, your everyday work is in safety and you are accredited to work underground.
- **Technical correspondents** : You are very familiar with CERN's activities and in particular those of CMS. As part of the exercise, you must be able to respond in French to the questions asked by the partner emergency services about the site – whether about the surface facilities or the underground installations.
- **Actors** : You play the role of visitors and/or the injured. No particular skills are required, but some visitors will need to be accredited to go down into the CMS and HiLumi technical cavern.
- **Exercise supervisors** : You are capable of supervising, coordinating, guiding, speeding up and slowing down the various sub-scenarios under the supervision of the exercise leader. You are also accredited to go down into the CMS and HiLumi technical cavern.

Apply to take part via Indico (*https://indico.cern.ch/event/1088801/registrations/76696/*) **by 3 November.**

SCIENCE GATEWAY: NIGHT-TIME TRAFFIC DISRUPTIONS EXPECTED FROM 25 OCTOBER TO 2 NOVEMBER ON THE ROUTE DE MEYRIN

Two new architectural features, a bridge and a second tubular structure, will soon be incorporated into the Science Gateway architectural complex

Artistic view of Science Gateway (Image: CERN, RPBW)

Science Gateway, CERN's new flagship centre for science education and outreach designed by the Renzo Piano Building Workshop and *brodbeck roulet architectes associés*, continues to take shape.

The first tube structure was installed in August 2021 next to the *Esplanade des Particules*. Its tubular twin will be erected on 22 October on the other side of the road, causing no traffic disruptions. The two steel cylinders, measuring 10 metres in diameter and 85 and 67 metres in length, evoke the underground tunnels of the LHC. They will house CERN's permanent and temporary exhibitions, where people of all ages will have the chance to find out about CERN's discoveries.

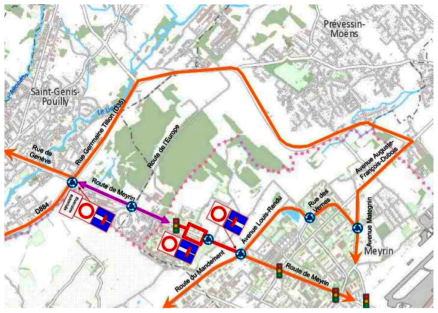
The tubular structures will be connected by a bridge sitting 6 metres above the Route de Meyrin. The installation of the bridge will take place between 25 October and 2 November 2021. To minimise traffic disruptions, this structure will be erected during the night from 11 p.m. to 5 a.m. The nights concerned are 25–26, 26–27 and 27–28 October and 1–2 November.

Motor vehicle traffic will be diverted through Rue Germaine Tillion (D35), crossing the communes of Prévessin-Moëns and Ferney-Voltaire in France and the town of Meyrin in Switzerland, via the Avenue

Auguste-François-Dubois. These disruptions will not affect cyclists, pedestrians or public transport (stops along lines 18 and 68 will be accessible at all times, except from 1 a.m. to 4.40 a.m.). Traffic officers will be present throughout the duration of the works.

Although everything is being done to limit the negative impact of these works, some unavoidable inconveniences may remain. CERN thanks residents for their understanding and recommends that drivers exercise caution and comply with road signage.

The architectural complex will include two striking features contributing to environmental sustainability: solar panels and a forest. Up to 1860 solar panels will be installed on the three pavilions that will house a large 900-seat amphitheatre, education labs, an exhibition, the reception area and the restaurant. The forest, with more than 400 trees, will provide a nature-filled experience for people exploring the area on foot. Science Gateway is due to open to the public in 2023.



Map showing traffic diversions (Image: CERN, GE-Transports)

WINTER TYRES MANDATORY IN FRANCE FROM 1 NOVEMBER

(Image: CERN)

From 1 November 2021 until 31 March 2022, several French *départements*, including Ain and Haute-Savoie, will require cars to be equipped with winter tyres or to have snow chains in the boot.

The aim of the new regulation is to enhance road safety by reducing the risks associated with driving on snowy or icy roads. It will also help to avoid traffic congestion in mountainous regions, where unequipped vehicles can slide and block lanes, thereby immobilising entire traffic axes.

Breaches of the new regulation will be tolerated this winter and penalised as of next, but everyone is strongly encouraged to comply.

More information on the regulation can be found on the French road safety agency's website (French only).

A full list of the *départements* and municipalities concerned can be found here.

Ombud's corner

THE "I NEED" BEHIND THE "I WANT"

Very often in the Ombud's Office, I hear the word " **want** " rather than " **need** ".

"I want an apology from her", "I want the guy to be fired", "I want to be taken off this project NOW", or even "I want you to resolve this issue for me".
These demands are, however, hardly realistic and, in any case, satisfying them would most probably not solve the issue.

In my discussions with my visitors, I try to understand, beyond their requests, which need is unmet. This is what they often describe:

- I need to be heard
- I need to be respected
- I need to feel valued
- I need to be treated with dignity
- I need to be affirmed, acknowledged and appreciated
- I need to feel safe
- I need to understand the intention behind the behaviour
- I need my supervisor to be open and honest with me
- I need to receive an explanation
- I need to be trusted and be able to trust the other person

These needs are very legitimate and the CERN Values and Code of Conduct confirm that **CERN commits** to creating an environment where the needs of its contributors will be met.

When making a request

A key difference between a "want" and a "need" is that, whereas there is only one way to satisfy a want – e.g. get an apology, fire the person or step away from a project – there are several ways to satisfy needs.
If you ask: "I want access to the LD2IC Board's papers", this is not possible. If you say that you need and are entitled to transparent and open feedback on your application, and that you are ready to receive it,

you open up a range of possibilities.
If you ask: “Stop talking to me”, this may not be possible. If you say: “I need to be respected and to feel safe, and when you talk to me this way I feel unsettled and frightened”, the message is very clear.

When in a conflict

At the heart of all conflicts, as at the heart of many other difficult situations, is a need that is not met. Unmet needs are always the catalyst for conflicts. However, if they are expressed as needs and not as wants, they may also be the catalyst for the resolution of those conflicts.

Very often, parties in a conflict have shared interests, such as a passion for their job, commitment to the success of their team or the will for their project to deliver. They also have convergent needs, such as those listed above. However, when entrenched in a conflict, they may no longer have this insight into their common grounds.
A facilitated discussion with the Ombud will allow the parties to identify their needs and focus on them, regain a sense of common interest and find a mutually acceptable path to move out of the conflict.

Whether you are making a request to a colleague or to your hierarchy or whether you find yourself in a conflictual situation, consider expressing your request in terms of what you need. Not only will you be listened to more attentively, but expressing your needs will also open a range of solutions. The Ombud can help prepare such discussions.

Laure Esteveny

I want to hear from you – feel free to email ombud@cern.ch with any feedback or suggestions for topics you would like me to address.

NB: *If you would like to be notified about posts, news and other communications from the CERN Ombud, please register for the CERN Ombud news.*