CERN Bulletin

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MADMAX AND CERN'S MORPUGO MAGNET

A new collaboration, MADMAX, will seize the chance to use a CERN magnet named Morpugo to test their dark-matter prototype

The Morpugo magnet, located in the North Area on the Prévessin site, will provide a magnetic field of up to 1,6 Tesla for the MADMAX prototype (Image: CERN)

MADMAX is preparing for a stopover at CERN from 2022. Mel Gibson, his artillery and quest for revenge will not be there, but instead a handful of physicists armed with an aged magnet will be searching for dark matter in CERN's North Area (not to be confused with a post-apocalyptic wasteland).

Indeed, the MADMAX collaboration (MAgnetized Disks and Mirror Axion eXperiment, external to CERN), humbly proposes to identify the nature of dark matter and to solve the enigma of the absence of CP symmetry violation in the strong sector, while detecting a particle that has eluded physicists for decades: axions.

To do so, the collaboration has developed a brand-new concept using a booster composed of dielectric disks and mirrors. The booster acts as a resonator to amplify the photon flux that hypothetical axions would produce under a magnetic field, if these axions exist. In order to validate the concept, a prototype needs to be tested under a magnetic field before the launch of the experiment, planned to be located at DESY in Germany.

Although such a magnetic field is difficult to obtain, the collaboration can rely on CERN's assistance.

(Continued on page 2)

In this issue

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MADMAX AND CERN'S MORPUGO MAGNET

On 16 September, CERN's Research Board agreed that the MADMAX prototype could use an old magnet previously used by the ATLAS experiment. The “Morpugo” magnet is located in the North Area, generates a field of up to 1.6 Tesla, and although it arrived at CERN in 1979, is still used to test ATLAS subdetectors. MADMAX physicists will jump in to mount and test their prototype during the inter-beam period, when ATLAS is not using the magnet. A solution that suits everyone: for MADMAX, a magnet that meets the prototype's criteria is provided free of charge, and for ATLAS, the space around the magnet is reorganised and optimised, which is necessary for the installation of the prototype.

The recycling and repurposing of equipment is common at CERN, in the spirit of pragmatism and sustainability. With successive generations of equipment, state-of-the-art accelerators go on to become injectors for their successors, and old magnets are reused for new experiments. This is the case, for example, with the CAST experiment, which uses an old LHC dipole prototype in its search for, once again, axions.

However, allowing external researchers to use CERN equipment, as in the case of MADMAX, is far from trivial. According to Pascal Pralavorio, the MADMAX contact person at CERN, this helps to develop new ideas: "Today, particle physicists are searching for new physics in many different directions, which naturally leads to experiments based on novel concepts. To validate them, we must make the most of the equipment that's already available, and that is what MADMAX and CERN are doing with the Morpugo magnet.

CERN's endeavours to benefit science around the world have long been visible whether through collaborations, prototyping, donating equipment and more, and this is set to continue. Although we don't need another hero, we wish the MADMAX researchers well in their quest for axions.

Thomas Hortala

LS2 REPORT: FIRST BEAM INSIDE THE UPGRADED HIE-ISOLDE FACILITY

Upgrades and repairs of the HIE-ISOLDE linear accelerator will enable experiments to delve deeper than ever into the physics of radioactive isotopes

One of the four cryomodules of the HIE-ISOLDE linac with its five radiofrequency cavities (Image: CERN)

Of all the protons accelerated at CERN, only 0.1% reach the LHC. Yet up to 60% smack into targets at the ISOLDE facility, creating radioactive isotopes for the many experiments housed there. To maximise the potential of this plethora of protons, scientists and engineers at ISOLDE have been repairing and upgrading the centrepiece of HIE-ISOLDE (High Energy and Intensity Isotope mass Separator On-Line): a compact linear accelerator (linac) for heavy isotopes.

The HIE-ISOLDE linac is a prowess of engineering: in the tight space left between the beamlines that carry the radioactive nuclei to the ISOLDE experiments, ISOLDE engineers have been able to squeeze in an accelerator composed of 20 superconducting radiofrequency cavities grouped into four cryomodules, each cooled at 4.9 kelvins. This accelerator brings the radioactive isotopes to speeds reaching 10% that of light. At this energy, the nuclei can merge or exchange nucleons (protons and neutrons) with the atoms of the experimental targets that they smash into after their race inside the linac. The high energy of the re-accelerated ISOLDE beams, which reached their highest energy in 2018, has led to interesting discoveries, such as the discovery of pear-shaped radium nuclei at HIE-ISOLDE. Embedding these radioactive isotopes into molecules could shed light on physics beyond the Standard Model.

These achievements were made possible by the HIE-ISOLDE machine, despite some technical issues experienced after the last cryo-module had been installed during the 2017–2018 winter break. One of the 20 radiofrequency cavities was found defective after its installation. Thus, up to now, the beam has “only” been accelerated by the remaining 19 cavities. Additionally, some unexplained beam losses hampered the operation of the accelerator to full specifications. The second long shutdown (LS2) provided an opportunity to fix these issues and also to upgrade the electron gun of the charge breeder, which strips some electrons from the isotopes before injection into the linac for more effective acceleration.

Some of you may remember road closures in January 2020 for a truck driving at an average speed of 0.5 km/h. This truck was bringing back to ISOLDE the entire cryomodule containing the problematic cavity that had just been repaired at SM18 with the utmost care. “A cryomodule is like a spaceship: they consist of some 10 000 pieces each, all assembled in a dedicated cleanroom in the SM18 assembly hall. Knowing that the slightest grain of dust or the slightest bump on the road on the way back could ruin the superconductivity or the alignment of the cavities inside the cryomodule, we are extremely cautious when installing these devices in the machine. Once installed, there is no easy way back,” explains Erwin Siesling, technical coordinator for HIE-ISOLDE.

Despite these challenges and after the excruciatingly slow ride, the cryomodule reached HIE-ISOLDE, along with the new diagnostics boxes that have been installed along the path of the old normal conducting linac (REX-ISOLDE), which serves as a pre-injector to the HIE-ISOLDE linac. These new diagnostics boxes have already begun cracking the mystery of the beam losses.

Before protons resume flooding the ISOLDE facility from the Proton Synchrotron Booster, a stable neon beam from an independent source has been injected into the upgraded machines to tune the cavities: so far, everything works like a charm. Armed with the extra energy provided by the repaired cavity and a higher beam intensity thanks to the brand-new electron gun, HIE-ISOLDE is ready to accelerate heavier elements to higher energies to push the frontiers of nuclear physics.

Thomas Hortala

UNANIMOUS VOTE TO EXTEND SCOAP3 OPEN-ACCESS PUBLISHING TO 2024

Researchers and scientists will be able to enjoy open-access high-energy physics literature through SCOAP3 for two additional years

The SCOAP3 governing council gathered virtually to decide on the extension of the programme (Image: CERN)

The Governing Council (GC) of the SCOAP^{3}collaboration has voted unanimously to extend the programme for an additional two years. This global initiative, hosted by CERN, has transitioned 90% of the literature in high-energy physics to open access. This extension represents the collective support of the global partnership to help secure continued open-access publishing for researchers from CERN, as well as authors from around the world, in the leading journals in the discipline until the end of 2024.

The Sponsoring Consortium for Open Access Publishing in Particle Physics, SCOAP^3, is a partnership of 3000 libraries, funding agencies and research organisations from 42 countries and 3 intergovernmental organisations. In cooperation with leading scientific publishers and learned societies, SCOAP ^{3}has supported the transition to open access of key journals in the field of high-energy physics since 2014, and has served as inspiration for several other open-access initiatives around the world. During the almost seven years of operation, more than 20 000 scientists from 120 countries have benefited from the opportunity to publish over 38 000 open-access articles free of charge.

In its 10th annual meeting held on 21 and 22 October (the first to be conducted entirely virtually), the SCOAP^{3}Governing Council deliberated over the recommendation of the SCOAP^{3}Tender Working Group (STWG) on the future strategy for the programme beyond its current phase, which concludes at the end of 2022. The STWG – comprising a diverse group of experts from across the collaboration – recommended a two-year extension of the programme in its current structure. This would provide institutions and publishers of the SCOAP^{3}partnership with stability during the financial uncertainty resulting from the COVID-19 pandemic. There was broad agreement that SCOAP^{3}provides excellent value for money when benchmarked against other open-access initiatives, and that it should be prioritised for support over other options in the current economic context. As a result, the GC voted unanimously to support this proposal.

CERN will now commence negotiations with publishers to secure contract extensions, and pending the approval of the Finance Committee, a formal announcement of the two-year extension of SCOAP^{3}is expected to be made in mid-2021. SCOAP^{3}users should thus not expect changes in their access to high-energy physics literature for the coming years.

WHEN RESEARCH RADIATES BEYOND THE LAB

With experience ranging from cancer therapy to combatting COVID-19, meet Marco Silari of the radiation protection group in the latest of our Knowledge Transfer spotlight series

Marco Silari, section leader for special projects in the radiation protection group (Image: CERN)

"I am an applied physicist; I like to see research leading to real-world applications." Marco Silari , section leader for special projects in the radiation protection group (HSE-RP), is no stranger to the knowledge-transfer process.

Before arriving at CERN in 1996, he worked for 12 years for the National Research Council of Italy. There, from 1991 until 1995, he was the project leader for a feasibility study led by the TERA

Foundation, which focused on the development of a clinical centre for the treatment of tumours with both ions and protons. The work resulted in the National Centre of Oncological Hadron Therapy (CNAO), the first dual-ion facility in Italy for ion cancer therapy. “CNAO was founded many years after I left, but it was based on a lot of things from that study,” Marco explains.

Today at CERN, he leads the special projects section of the HSE-RP group. Approximately two-thirds of the section's activities relate to detector R&D and one-third to radiological clearance projects.

His first KT-funded project was B-RAD : a detector technology for radiation safety in strong magnetic fields. The original prototype was developed in collaboration with *Politecnico di Milano* for use at CERN, and the project's aim was to make a pre-industrial version of the device that could also be used in other domains, such as radiation surveys for Positron Emission Tomography–Magnetic Resonance Imaging (PET–MRI). His involvement in this project helped him realise that, in his words: “There's a very big step from the lab to the market.” Indeed, the device had to go through several iterations before it was ready to be sold commercially.

These efforts paid off: in 2015, B-RAD was successfully licensed to an Italian company, ELSE NUCLEAR, and can now perform gamma dose rates and gamma spectrometry measurements, with ongoing developments for measurements of surface contamination and neutron dose rate. “B-RAD became much more than what was originally planned.”

He has also worked on several other projects funded by the Knowledge Transfer (KT) Fund and Medical Applications (MA) Budget, including GEMPix – a detector combining GEMs and the Timepix ASIC – and RaDoM – a radon gas-detection technology, which has been licensed to a Swiss start-up company, BAQ.

More recently, Marco has been involved in the CERN against COVID-19 task force, exploring whether ionising radiation can be used for the sterilisation of medical equipment – just one of the many different ways in which CERN is helping during the COVID-19 pandemic.

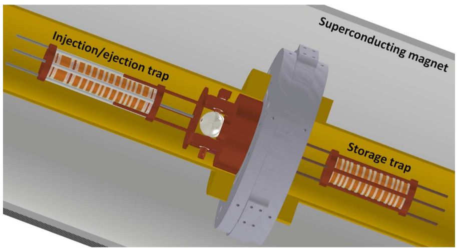
He encourages others to consider applications of their work outside of high-energy physics, while stressing that they should not assume that they need to have invented something revolutionary for it to be marketable: “Very often, inventions are improvements of existing things. Innovations are not always born out of radically new ideas.” He also highlights the support provided by the KT group, particularly in advising where to go and who to contact. “If anyone would like to see their development at CERN taken into the real world they should collaborate with KT. It is very difficult to do it alone.”

Learn more about how to get involved in CERN's knowledge transfer activities here (*http://kt.cern/*) **.**

Amy Bilton

A TRANSPORTABLE ANTIPROTON TRAP TO UNLOCK THE SECRETS OF ANTIMATTER

The BASE collaboration is developing a transportable antiproton trap to make higher-precision measurements of the properties of antimatter



The layout of the transportable antiproton trap that BASE is developing. The device features a first trap for injection and ejection of the antiprotons produced at CERN's Antiproton Decelerator, and a second trap for storing the antiprotons. (Image: Christian Smorra)

The BASE collaboration at CERN has bagged more than one first in antimatter research. For example, it made the first ever more precise measurement for antimatter than for matter, it kept antimatter stored for a record time of more than a year, and it conducted the first laboratory-based search for an interaction between antimatter and a candidate particle for dark matter called the axion. Now, the BASE team is developing a device that could take antimatter research to new heights – a transportable antiproton trap to carry antimatter produced at CERN's Antimatter Decelerator (AD) to another facility at CERN or elsewhere, for higher-precision antimatter measurements. These measurements could uncover differences between matter and antimatter.

The Big Bang should have created equal amounts of matter and antimatter, yet the present-day universe is made almost entirely of matter, so something must have happened to create the imbalance. The Standard Model of particle physics predicts a certain difference between matter and antimatter, but this difference is insufficient to explain the imbalance, prompting researchers to look for other, as-yet-unseen differences between the two forms of matter. This is exactly what the teams behind BASE and other experiments located at CERN's AD hall are trying to do.

BASE, in particular, investigates the properties of antiprotons, the antiparticles of protons. It first takes antiprotons produced at the AD – the only place in the world where antiprotons are created daily– and then stores them in a device called a Penning trap, which holds the particles in place with a combination of electric and magnetic fields. Next, BASE feeds the antiprotons one by one into a multi-Penning-trap set-up to measure two frequencies, from which the properties of antiprotons such as their magnetic moment can be deduced and then compared with that of protons. These frequencies are the cyclotron frequency, which describes a charged particle's oscillation in a magnetic field, and the Larmor frequency, which describes the so-called precessional motion in the trap of the intrinsic spin of the particle.

The BASE team has been making ever more precise measurements of these frequencies, but the precision is ultimately limited by external disturbances to the set-up's magnetic field. “The AD hall is not the calmest of the magnetic environments,” says BASE spokesperson Stefan Ulmer. “To get an idea, my office at CERN is 200 times calmer than the AD hall” he says, smiling.

Hence the BASE team's proposal of making a transportable antiproton trap to take antiprotons produced at the AD to a measurement laboratory with a calmer magnetic environment. The device, called BASE-STEP and led by BASE deputy spokesperson Christian Smorra, will consist of a Penning-trap system inside the bore of a superconducting magnet that can withstand transport-related forces. In addition, it will have a liquid-helium cooling system, which allows it to be transported for several hours without the need of electrical power to keep it cool. The Penning-trap system will feature a first trap to receive and release the antiprotons produced at the AD, and a second trap to store the antiprotons.

The overall device will be 1.9 metres long, 0.8 metres wide, 1.6 metres high and at most 1000 kg in weight. “These compact dimensions and weight mean that we could in principle load the trap into a small truck or van and transport it from the AD hall to another facility located at CERN or elsewhere, to further our understanding of antimatter,” says Smorra, who received a European Research Council Starting Grant to conduct the project.

The BASE team has started to develop the device's first components and expects to complete it in 2022, pending decisions and approvals. Stay tuned for more developments.

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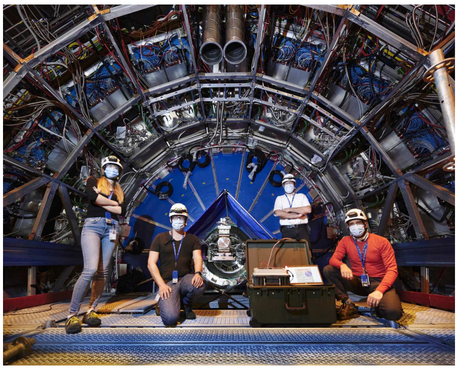
Read more about BASE-STEP in this Experimental Physics newsletter article (https://ep-news.web.cern.ch/node/3200).

See also this story (https://home.cern/news/news/physics/making-antimatter-transportable) on making antimatter transportable for nuclear-physics research.

Ana Lopes

THE CABLING OF THE LHC DETECTORS MOVES UP A GEAR THANKS TO THE AUTOMATION OF TESTING

The development of the “HiPotCT” system initiated by the cabling team of EN-EA-AS has considerably increased the speed of cabling activities in the LHC detectors



The HiPotCT development team (from left to right, Maria Papamichali, Stian Juberg, Hubert Reymond and Gianluca Canale) with the HiPotCT device inside the ALICE detector (Image: CERN)

Cables are omnipresent in the four large LHC detectors. During the second Long Shutdown (LS2), the cabling team led by Gianluca Canale installed 3700 signal cables (81 km in total!) and 6000 connectors to the ALICE detector. More than 800 connectors have been installed in ATLAS, where they will power the detector's new small wheels. These achievements, which are helping to keep the LS2 moving forward, are the results of the efficiency of the cabling team within the Experimental Area group (EN-EA) in charge of the testing and installation of the cables. The team's efficiency has been boosted by the development of an automated cable testing system in collaboration with the Measurement, Test and Analysis section of the Survey, Mechatronics and Measurements group (EN-SMM-MTA).

Testing the cables in the experiments is crucial as the smallest error can take on unexpected proportions. As Gianluca Canale explains, cables are normally replaced only as a last resort, after the breakdown of a machine - whether a detector or an aeroplane - as the replacement process is painstaking. Consequently, there is no room for error in the tests that are carried out before their installation. Until recently, the tests were carried out manually, by measuring the leakage current between the many filaments of an individual cable subjected to a current of up to 5000 V. A single cable test thus involved a hazardous two-hours long handwork for two technicians, around 80% more than the time it takes for a “HiPotCT” automated test. In the case of the ATLAS and ALICE cabling campaigns, automation has reduced the testing time by a total of 350 hours, which equates to a saving of 16,000 CHF.

The “HiPotCT” is a compact box that can be transported deep into the heart of the detectors. It analyses with great precisions the internal electrical characteristics of the cables such as their leakage current. The software, developed by Stian Juberg, who was a technical student in the EN-SMM-MTA section at the time, allows all the cable filaments to be programmed for testing, thanks to a relay system coupled with a laptop. The process simply requires the cable to be connected and the software to be launched; after half an hour or so of humming, the device delivers its diagnosis to Maria Papamichali, leader of the “HiPotCT” project. In her role as a member of the VIA (“*volontariat international en* *administration*") programme and then as a fellow, Maria was behind the specifications of the system and was in charge of all the electronic aspects and their final integration into a portable system.

"Working in close collaboration with Stian on the development process led to something that industry does not offer by targeting the specific requirements of HiPotCT, without excluding the possibility of adapting the device to work with other cables and connectors in the future", says Maria. The project, financed by LETEM (LHC Experiments Technical and Engineering Meeting) has benefitted from bringing together the expertise acquired by the MTA team in the context of projects to automate high-voltage measurements, such as the LHC magnet tests in SM18, and the expertise of the cabling team, which is the result of a desire to create a centre of excellence in this field at CERN.

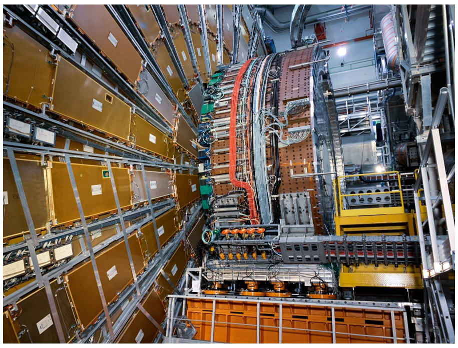
Thanks to "HiPotCT", cabling campaigns are faster and the risk of breakdowns during machine operation is reduced. Over and above this technical aspect, however, Gianluca underlines that his team's commitment is the key to the success of the major LS2 cabling campaigns: a professional and enthusiastic team consisting of fellows and members of the VIA programme, who have been given the opportunity to take on responsibility and to innovate. The result: as far as detector cabling is concerned, the LS2 work is almost complete.

Do not hesitate to contact the cabling team for your cabling needs in experimental areas at en-ea-cabling-team@cern.ch

Thomas Hortala

ATLAS SETS NEW LIMITS ON EXOTIC TYPES OF LONG-LIVED PARTICLES

The result surpasses previous best mass limits achieved with CERN's predecessor collider to the LHC



To identify collision events in which long-lived particles could be decaying far away from the LHC collision point, the ATLAS collaboration focused on signals from the experiment's calorimeter and muon spectrometer (both pictured here). (Image: S. Goldfarb/ATLAS collaboration)

Scientists at CERN's Large Hadron Collider (LHC) are finding novel ways to search for new particles. Elusive, long-lived particles could be decaying into other particles away from the LHC collision point – leaving an unusual signature in a detector. The ATLAS collaboration has broadened its extensive search programme to look for these unconventional collision events. In the process, they've drastically improved the limits on new massive long-lived particles decaying into particles called leptons.

Long-lived particles are a feature of the Standard Model, although for relatively low-mass particles only. Massive long-lived particles can occur in theories of new physics beyond the Standard Model. A theory that encompasses new long-lived particles in some of its manifestations is supersymmetry (SUSY). SUSY predicts that each particle of the Standard Model has a "superpartner" particle, which differs from its corresponding particle in a quantum property known as spin. In its new study, the ATLAS collaboration looked for the superpartners of the electron, muon and tau lepton, called "sleptons" ("selectron", "smuon" and "stau", respectively).

The typical search for new physics with ATLAS data is oriented towards new particles that would decay instantaneously, the way heavy Standard Model particles do and also most new physics particles are expected to do. For their new search, ATLAS physicists had to develop new methods of identifying particles in order to increase the likelihood of discovering long-lived particles.

Because the particles created by the decay of a long-lived particle would appear away from the collision point, unusual background sources can arise: photons misidentified as electrons, muons that are mismeasured, and poorly measured cosmic-ray muons. Cosmic-ray muons come from high-energy particles colliding with Earth's atmosphere and can traverse the more than 90 metres of rock above the ATLAS detector, as well as the detector itself. Since they do not necessarily pass through the detector near the collision point, they can appear as if originating from a long-lived particle decay. ATLAS physicists have developed techniques not only for reducing but also for estimating the effects of these background sources.

The ATLAS collaboration found no evidence of long-lived particles in its search, but it was able to set limits on the mass and lifetime of long-lived sleptons decaying to Standard Model leptons inside the detector. For the slepton lifetime that the new search is most sensitive to (around 0.1 nanoseconds, corresponding to a flight length of about 30 centimetres), the researchers excluded selectrons and smuons up to a mass of around 700 GeV, and staus up to around 350 GeV. The previous best limits on these long-lived particles were around 90 GeV and came from the experiments on the Large Electron–Positron Collider (LEP) – CERN's predecessor to the LHC – more than 20 years ago. The new result was able not only to meet LEP's best limits but also to surpass them.

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Read more on the ATLAS website.

COMPUTER SECURITY: TELECOMPROMISED

In today's teleworking world, a nice new evil path opens up: malicious video-conferencing invitations. . .

The number one vector for getting your computer compromised, your password disclosed, your data exposed and your digital life screwed up is social engineering, i.e. manipulating you in a way to make you trust an e-mail, a web URL or attachment, and lure you into clicking on a malicious link. One click and it's game over!

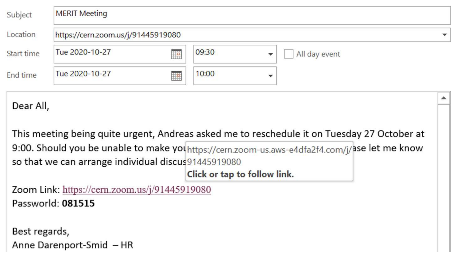
Indeed, we have covered the risk of browsing the web (remember “STOP – THINK – DON'T CLICK”?), malware and drive-by downloads as well as phishing in various recent *Bulletin* issues. In many cases, the primary attack vector boils down to convincing you to click on a malicious link (or open a malicious attachment). In today's teleworking world, a nice new evil path opens up: malicious video-conferencing invitations. . .

Collaboration in teleworking times requires us to use one or more different video conferencing tools. Skype. WebEx. Teams. Vidyo. Zoom. You name it. Scheduling of the corresponding meetings usually proceeds via e-mail and calendar invitations, like the one below. Looks familiar, no?

As with any other e-mail, the ultimate truth of this calendar invitation depends on many factors: the sender's name, the sender's e-mail address, whether or not the e-mail has been digitally signed, the message text and contents, typos, language, social hook and level of intimacy, etc. If this overall “package” looks reasonable to you, you will trust its contents and follow up. And if this is a sophistically crafted but evil message, you might fall for the trap and click the malicious link. Check the example above again! The link is indeed malicious and the meeting is not on CERN's default Zoom instance at cern.zoom.us. . . Instead, the link leads you to cern.zoom-us.aws-e4dfa2f4.com, which has nothing to do with Zoom nor with CERN, and which might not even host teleconferencing software, but is solely intended to infect and compromise your device. With just a few clicks: game over!

So, once again, hold on a second. Check your e-mail/invitation thoroughly. Did you expect it? Does the subject concern you? Do you know the sender? Is the content in a language you understand? Hover your mouse pointer over the provided URL: does the tooltip, the little pop-up box, correspond to the link displayed in the message? Does it point you to CERN's cern.zoom.us instance (i.e. http://cern.zoom.us/j/NNN) or to an external Zoom instance known to you, to CERN Vidyo (like https://vidyoportal.cern.ch/join/XXXX) or any other valid teleconferencing portal (definitely hard to tell!)? If you have answered “no”, watch out! STOP – THINK – DON'T CLICK! Contact the meeting organiser to cross-check, ideally via another channel than e-mail, or get in touch with Computer.Security@cern.ch. We are here to help you.

Do you want to learn more about computer security incidents and issues at CERN? Follow our Monthly Report. For further information, questions or help, check our website or contact us at Computer.Security@cern.ch.



The Computer Security Team

Announcements

LIBRARY OPENING

From 9 November, the Library premises (52/1-052) and services continue to be accessible with some arrangements

The Library desk staff will be present in their office in case of need. A sign at the Library entrance will show the name and office of the person on duty. Our offices are in the corridor just around the corner in building 3. We are available from 8:30 a.m. to 5 p.m.

You can return books in the red box in the Library entrance. You may continue to borrow books: email us at library.desk@cern.ch with the barcode (inside the book) to get your loan registered.

We thank you for your understanding and remain available to answer your questions.

CERN Library

REMOTE ACCESS TO LIBRARY ELECTRONIC RESOURCES

Continue to read journals and ebooks while you are working remotely

The instructions are available here (*https://scientific-info.cern/practical-information/remote-access-e-resources*). For any questions, do not hesitate to contact us: library.desk@cern.ch

CERN Library

THE “PARTICLE PHYSICS REFERENCE LIBRARY” IS NOW AVAILABLE ON EVERYBODY'S DESKTOP

A virtual book presentation with the editors and authors will take place on 24 November to celebrate the full release of the online library

Since the publication of the announcement “eBooks for all!” this summer, all volumes of the “Particle Physics Reference Library”, edited by Herwig Schopper, Chris Fabjan and Steve Myers, have been published. The reference library is a joint CERN-Springer initiative that provides revised and updated contributions based on previously published material in the well-known Landolt-Boernstein series on particle physics, detectors and accelerators (volumes 21A, B1, B2, C). Central to this new initiative is that the Particle Physics Reference Library is released in open access.

Readers worldwide have embraced the possibility to freely use the material. 50,000 chapter downloads have been recorded across the three volumes during the few weeks the books have been out.

- Volume 1: *Theory and Experiments*
- Volume 2: *Detectors for Particles and Radiation*
- Volume 3: *Accelerators and Colliders*

Take a peek at the books before attending **the virtual book presentation at 4 p.m. on 24 November 2020**, when some of the editors and the chapter authors will meet the readers for an exchange and discussion – this time, you'll have to bring your own coffee and cakes!

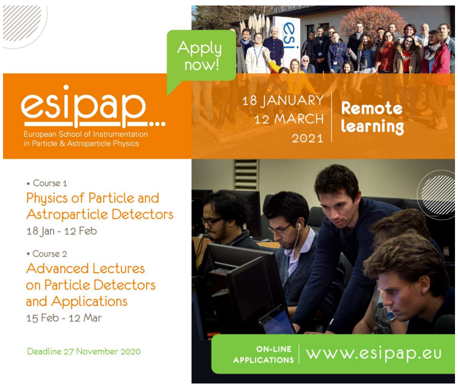
You can find more information on the event on Indico (*https://indico.cern.ch/event/970244/*).

CERN Library

SCHOOLS ON PARTICLE ACCELERATORS AND PARTICLE PHYSICS INSTRUMENTATION FROM JANUARY TO MARCH 2021 [ONLINE]

Applications are open until 27 November for two schools on research and engineering subjects: the European School of Instrumentation in Particle and Astroparticle Physics (ESIPAP) and the Joint Universities Accelerator School (JUAS). Please note that both courses will be organised in a remote teaching format.

All practical information including the courses' content and application details can be found in the posters below.



CLOSURE OF ROUTE WEISSKOPF AS OF 9 NOVEMBER

(Image: CERN)

Due to works, Route Weisskopf will be closed to traffic in front of building 18 from 9 November and for an estimated duration of 5 weeks.

Circuit n°1 of the shuttles will be affected: the stop at building 101 will not be served.

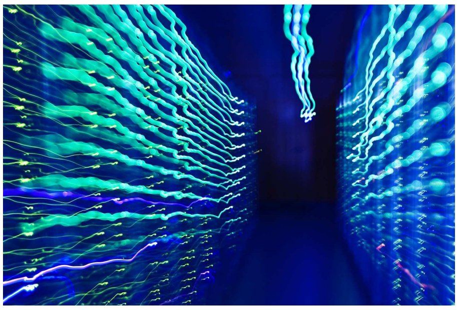
Please see the above plan.

Thank you for your understanding.

SMB Department

ONLINE INTRODUCTORY LECTURES ON QUANTUM COMPUTING FROM 6 NOVEMBER

No previous knowledge of quantum physics is required to follow these open, free lectures on quantum computing



(Image: CERN)

A series of weekly lectures on the basics of quantum computing will be broadcast via webcast starting 6 November 2020 at 10.30 a.m. CET. New lectures will be broadcast each Friday of the next seven weeks. The talks will focus on the practical aspects of quantum computing and are organised by *CERN openlab and the CERN Quantum Technology Initiative.* They will be given by Elias Fernandez-Combarro Alvarez, an associate professor in the Computer Science Department at the University of Oviedo in Spain since 2009 and a cooperation associate at CERN since earlier this year.

Quantum computing is one the most promising new trends in information processing. This course introduces basic concepts of the quantum circuit model (qubits, gates and measures) and important quantum algorithms and protocols, including those that can be implemented with a few qubits (BB84, quantum teleportation, superdense coding, etc.), as well as those that require multi-qubit systems (Deutsch-Jozsa, Grover, Shor, etc.). Some of the most recent applications of quantum computing in the fields of optimisation and simulation will be addressed (with special emphasis on the use of quantum annealing, the quantum approximate optimisation algorithm and the variational quantum eigensolver) along with quantum machine learning (for instance, through the use of quantum support vector machines and quantum variational classifiers). Examples of how these techniques can be used in chemistry simulations and high-energy physics problems will also be provided.

Beyond the practical aspects of quantum computing, the course will cover the implementation of algorithms in quantum simulators and actual quantum computers (such as the ones available through the IBM Quantum Experience and D-Wave Leap). No previous knowledge of quantum physics is required and only a good command of basic linear algebra is necessary. Some familiarity with the Python programming language would be helpful, but is also not required.

Individual links to each lecture are provided below.

- Lecture 1/7, Friday 6 November: https://indico.cern.ch/event/970903/

(Click here (*https://cds.cern.ch/record/2743724*) for a video recording of this first lecture)

- Lecture 2/7, Friday 13 November: https://indico.cern.ch/event/970904/
- Lecture 3/7, Friday 20 November: https://indico.cern.ch/event/970905/
- Lecture 4/7, Friday 27 November: https://indico.cern.ch/event/970906/
- Lecture 5/7, Friday 4 December: https://indico.cern.ch/event/970907/
- Lecture 6/7, Friday 11 December: https://indico.cern.ch/event/970908/
- Lecture 7/7, Friday 18 December: https://indico.cern.ch/event/970909/

Obituaries

STEPHEN REUCROFT (1943 – 2020)

It is with great sadness that we inform you of the death of our good friend and colleague Stephen (Steve) Reucroft after a long struggle against cancer.

Steve grew up in Morley, Yorkshire. He earned his BSc in Physics in 1965 and his PhD in Particle Physics in 1969 from the University of Liverpool. His early research career at CERN, the Max Planck Institute and Vanderbilt University focused on precision measurements using the high-resolution rapid-cycling bubble chambers HYBUC and LEBC at the CERN PS and SPS. These included resonance properties, hyperon magnetic moments, and charm particle production and decay. He was the CERN-EP group leader for the North Area experiments NA13, 16 and 27. Subsequently, he was spokesperson of E743, which took LEBC to Fermilab to successfully resolve a controversy about the energy dependence of the charm production cross-section.

Steve became Professor of Physics at Northeastern University, Boston in 1986, working at the highest energy colliders (CERN's LEP and LHC, Fermilab's Tevatron, and the SSC) and the Pierre Auger Observatory in Argentina. He developed novel scintillating fibre detectors that were used successfully in the L3 experiment and proposed for the SSC. He built up and led a large research group on the L3 and D0 experiments working on precision electroweak and QCD measurements, the discovery and study of the top quark, and confirmation that there are only three generations of light neutrinos. Steve was an early collaborator on the CMS experiment at the LHC, where he led a consortium of eight NSF-supported university groups in the construction phase of the detector. Steve and his group made major contributions to the electromagnetic calorimeter, especially the novel avalanche photodiode sensors, the software and computing systems and the physics analysis. Steve was Matthews Distinguished Professor and a Fellow of the American Physical Society.

Steve actively promoted technology transfer from academia to industry. He co-founded a non-profit technology transfer company in Boston and the first company to bring silicon photomultipliers to market, initiated a cloud service for the protection of elderly and fragile people, and launched a crowd funding campaign to further next-generation nuclear energy technologies.

Steve was a strong advocate for young scientists, advising more than 45 PhD students and postgraduates, and was very active in scientific outreach. He co-founded the Research Experience for Undergraduates (REU) programme at CERN, judged the Intel (now Regeneron) International Science and Engineering Fair, and co-wrote a science column for the Boston Globe newspaper. He wrote numerous academic papers, popular articles and books, and was elected to the National Association of Science Writers.

Steve's door was always open for a friendly chat about physics or life in general. He had a warm heart and was invariably cheerful with a unique sense of humour. He was a very good friend who will be much missed – for his trademark opener at coffee times, "what's new and exciting?", sharing a good dinner "*avec beaucoup de l'ail*", or simply enjoying a decent pint and a game of football. In the words of one of his close friends, "Steve just always made me laugh, which is one of the best things in life. I'll miss him."

Lucas Taylor, on behalf of Steve's many friends and colleagues

Ombud’s corner

CHANGING TIMES

In early October, Director-General Fabiola Gianotti presented the new structure of the CERN Management. Those changes at the head of the Organization will be followed by a restructuring of some organic units at various levels. Any reorganisation inevitably brings with it uncertainty and concerns, especially for those working on the ground, who sometimes feel that they're putting up with rather than participating in the changes.

Alberto* is one of those who have concerns: “A lot of rumours were flying around before our unit was restructured. No one asked my opinion about the activities I'm in charge of. New people are being brought in unannounced. What will their role be? How will my work be affected? Will I still have the same duties? What's the purpose of these changes?”

The resulting uncertainty can make people feel insecure, especially those who are furthest removed from the decision-making process. They may feel that they're not always consulted or lack information, which leads to them feeling sidelined. They may not see the point of or the need for change. And so, sometimes without them even realising it, they become resistant to change.

As a manager, what can you do to prepare for a reorganisation?

You know your team members: they each have different expectations and react differently to change. What will you do to pre-empt their reactions? How will you be transparent – informing them of your intentions and reasons in order to stop the rumours in their tracks? Your team members are experts in their field – how will you consult them? While the new structure is ultimately your decision, how will you involve your team in implementing that decision? How will you reassure those who are likely to struggle to adapt – what will you put in place for them? Are you flexible enough to adapt your decisions if some changes don't work out?

What seems obvious to you, as a manager, may not be obvious for everyone in the team. There are respectful ways to reduce and even overcome resistance and to help people accept the transition. By listening to everyone and involving your team members as much as possible in the process, you can make the transition smooth and keep your team on board with the new set-up you're aiming for.

*Name has been changed

Pierre Gildemyn

If you'd like to comment on any of my articles or suggest a topic that I could write about, please don't hesitate to e-mail me at Ombuds@cern.ch.