CERN Bulletin

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CLEANER CRUISES THANKS TO PARTICLE ACCELERATORS

Latvian tugboat provides first test-bed for new technology to clean exhausts from ships

The tugboat Orkāns, moored at the Riga shipyard on the Baltic Sea (Image: AIRES/CERN)

Maritime traffic is the single largest contributor to air pollution – a single cruise ship emits as much pollution as one million cars. Several technologies are being explored to reduce the pollutants in the exhausts of ships' diesel engines. Accelerator scientists have proposed a solution that involves breaking down particulate matter as well as molecules of sulphur and nitrogen oxides with an electron-beam accelerator of a few hundred kilovolts, before safely extracting them using water. The ARIES (Accelerator Research and Innovation for European Science and Society) Horizon 2020 project, coordinated by CERN, is working on a real-scale test of this technology.

A first test was performed recently on an old and rusty Soviet-era Latvian tugboat named Orkāns ("storm" in Latvian), moored at the Riga shipyard on the Baltic Sea. The small vessel, procured by the Riga Technical University in Latvia, has an old but powerful engine that could easily be made available for the duration of the tests.

A long pipe, equipped with several detectors, connected the tugboat to an accelerator-on-a-truck that was provided by the Fraunhofer FEP of Dresden in Germany.

(Continued on page 2)

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CLEANER CRUISES THANKS TO PARTICLE ACCELERATORS

On the truck, the exhausts were treated in a specially built chamber, with the electrons from the accelerator inducing molecular excitation, ionisation and dissociation to break down the pollutant molecules. Before finally being released into the air, the pollutants from the exhausts were washed out using water in a small “wet scrubber”, designed and built by the Institute of Nuclear Chemistry and Technology (INCT) of Warsaw in Poland, who originally proposed this novel accelerator-based approach.

“This long pipe actually connects two worlds, the world of shipping and the world of scientific particle accelerators. Their technologies and their languages are entirely different, but if we succeed in having them working together, we have the potential for a great advance.” – Test supervisor Toms Torims, Riga Technical University

The first measurements confirmed the expected reduction in pollutants. The final results will be made available only after a full analysis has been carried out at different engine powers and operating conditions. The data collected by this experiment will be used to finalise the proposal for the next step in the progress of this technology. A dedicated project will be submitted to Horizon 2020, with the goal of installing and testing a specially designed accelerator on a real cargo ship, to be made available by the Italian Grimaldi shipping company.

Read the full story in the latest issue of *Accelerating News*.

The pipe connecting the ship to the accelerator-on-a-truck (Image: AIRES/CERN)

Maurizio Vretenar

CELEBRATING 30 YEARS OF A GIANT LEP FOR HUMANKIND

The Large Electron–Positron collider was switched on in 1989

On this day thirty years ago, the Large Electron–Positron collider (LEP) saw its first collisions. Designed to study the recently discovered W and Z bosons, and to look for signs of the Higgs boson, it was a remarkable machine in many ways.

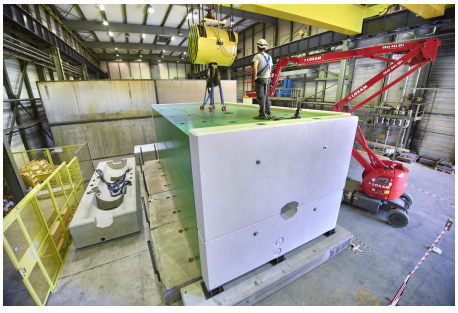
When LEP was switched on in 1989, it was the largest scientific instrument ever made. It was proposed in the late 1970s and it took over 20 million work-hours for the machine to be realised. Between 1983 and 1988 LEP was the largest civil-engineering project in Europe.

After eleven years of fruitful research, including helping determine that there are only three generations of neutrinos, the accelerator was decommissioned in 2000. However, its legacy lives on: LEP's 27-km tunnel was reused to house the Large Hadron Collider (LHC). Now, as particle physicists discuss an update to the European Strategy of Particle Physics and plan an accelerator that will eventually supersede the LHC, LEP is an important reminder of the long-term nature of pursuing fundamental knowledge.

This short video tells the story of LEP, from planning and construction to its invaluable research outputs: https://youtu.be/R3xSswz6Moc.

LS2 REPORT: NEW SPS BEAM DUMP TAKES SHAPE

The Super Proton Synchrotron will receive a new beam dump before the end of the second long shutdown of CERN's accelerator complex



The beam dump's shielding being assembled (Image: Maximilien Brice/CERN)

By the end of the second long shutdown (LS2) of CERN's accelerator complex, a nine-metre-long object with several hundred tonnes of shielding will be installed around the beam line of the Super Proton Synchrotron (SPS). But this object, the longest single component of the SPS, is no ordinary one. It contains the new beam dump of the SPS, designed to absorb beams of particles whose flight through the SPS needs to be terminated. Deep inside the complex device will sit the actual absorbing elements of the dump, containing graphite, molybdenum and tungsten. This core will be sheathed in layers of concrete, cast-iron shielding (painted green per CERN's colour schemes) and marble. The new beam dump will help absorb particle beams with a wide range of energies

– from 14 to 450 GeV – and is being built as part of the LHC Injectors Upgrade (LIU) project.

As discussed in a previous LS2 Report, the old beam dump of the SPS – located at Point 1 of the accelerator's ring – is being replaced by a new one at Point 5, in preparation for the High-Luminosity LHC (HL-LHC). Since the older object would be unable to cope with the higher beam intensities needed for the HL-LHC, which will come online in 2026, the SPS team decided five years ago to construct a new dump with the required properties. The redesign was needed because the higher intensities will result in the dump undergoing much larger mechanical forces over the course of its lifetime, necessitating a more robust device than before.

“We considered building an external dump outside the SPS tunnel, similar to the one the LHC has,” explains Etienne Carlier, from CERN's Technology department. “But the large dynamic range of the SPS beams makes it impossible to extract the different beams with one system. So we decided to use an internal dump, which is part of the SPS itself.” Building this beam dump is one of the most important tasks in the framework of the LIU project and around 125 metres of the SPS tunnel will be modified to accommodate it. There are several challenges along the way, involving the dedicated infrastructure required, which includes new kicker magnets, an optical system to monitor the beam position and cooling and ventilation systems.

The kickers located before an accelerator's beam dump are responsible for deflecting the beam off its usual path and sweeping it into the dump block. At a precise instant, they need to generate suitable electromagnetic pulses in the vertical and horizontal planes to do so. The vertical kicker system generates a pulse of up to 650 MW during one SPS revolution with the help of the most powerful pulse-forming network built at CERN. It uses two newly developed redundant 36-kV solid-state switches, which will operate in parallel for machine protection, to transfer the stored energy to the magnet. “The kicker deflects and dilutes the beam in such a way that it can be absorbed along the length of the dump core,” notes Carlier. “And because it has to always deflect the beam at the same angle independent of the beam energy, the charge build-up in the capacitor bank is proportional to the energy of the circulating beams.”

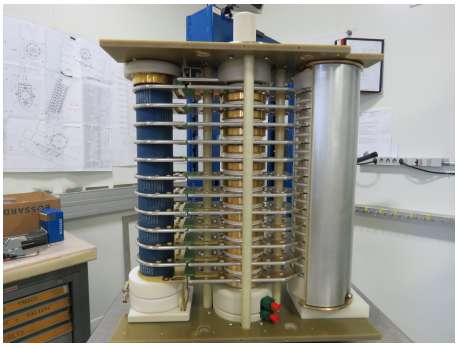
SPS operators need to know whether beams are being dumped correctly or not, by observing their shape and distribution as they enter the dump volume. “We need to have this information so we know that the dump has a uniform heat profile when the beams enter it,” Carlier says. The beam profile will be recorded by means of a screen that will be installed in the path of the beams being dumped, as part of the “Beam Instrumentation TV” system. This intricate system is made of a 17-m-long optical line with five high-quality mirrors that transfer the beam image from the screen to a well-shielded camera located outside the beam dump, which the operators can monitor remotely in real time.

The beam dump will have a dedicated vacuum sector surrounding the whole structure. The core itself is surrounded by copper shielding and will be water-cooled, while air ventilation will not only help with cooling but will also ensure that none of the air gets activated by the radiation of the core. After LS2, the dump will be baked out in the tunnel before the SPS receives beam, heating the graphite making up the dump core to 200 °C. Then, during machine operation, the dump block will be heated to higher temperatures by the impacting beams and the pressure within the dump will temporarily increase until the blocks are conditioned.

Preparations to house the gigantic structure are under way in the underground caverns and tunnels where the SPS sits, and the dump itself is taking shape on the surface. The abutment upon which the beam dump will sit is being assembled in the cavern known as ECX5, where once the UA1 detector operated. This abutment has to be made of a special concrete, containing extremely low levels of cobalt and europium. These elements are easily activated by radiation and would therefore stay hot for a long time. Avoiding them comes at a high cost but ensures that the abutment doesn't absorb too much radiation over the course of the dump's lifetime. The abutment's base will be affixed to the ground, while the layer just below the dump will be composed of movable concrete blocks.

The civil-engineering work is expected to last until the end of this year, after which the beam dump will start to be assembled in its designated abode. Over the remaining months of LS2, the beam dump and its services will be readied for the beams that will arrive in 2021, as the LHC begins its third run.

More photos of the beam dump's shielding no CDS: cds.cern.ch/record/2677262



The kicker switch (Image: CERN)

Achintya Rao

READY, STEADY, GOAL: TABLE FOOTBALL TOURNAMENT CONTINUES

32 teams. 127 matches. 1 winning team. What a week it was!

Engaged in battle (Image: Parul Pant/CERN)

The second edition of the Charity Table Football Tournament, organised by the CERN Table Football Club and the CERN & Society Foundation, took place from 24 to 26 July. All teams competed wholeheartedly for first place, showing great skill and determination. The winning team 'The Board' played incredibly well and claimed first place after their nail-biting final against runners up 'BYLY'.

All proceeds from the tournament have gone to the CERN & Society Foundation in support of the Non-Member State Summer Student Programme. With the help of the participants, a younger generation of scientists and engineers will have the chance to reach their full potential.

More information about the CERN Table Football Club: Established in 2017, the club encourages both beginners and advanced players to join the game. If you would like to know more, feel free to join them on Thursdays in R1 from 6.00 p.m. The club looks forward to seeing you there.

More photos on CDS: *http://cds.cern.ch/record/2685094*

CERN THEORIST SHARES SPECIAL BREAKTHROUGH PRIZE IN FUNDAMENTAL PHYSICS

Sergio Ferrara, Daniel Z. Freedman and Peter van Nieuwenhuizen are recognised for their 1976 discovery of an influential theory called supergravity

Peter van Nieuwenhuizen, Sergio Ferrara and Daniel Z. Freedman (left to right), photographed at CERN in 2016 on the occasion of supergravity's 40th anniversary (Image: CERN)

CERN theorist Sergio Ferrara has been awarded the Special Breakthrough Prize in Fundamental Physics, alongside Daniel Z. Freedman of the Massachusetts Institute of Technology and Stanford University and Peter van Nieuwenhuizen of Stony Brook University. The trio is recognised for their 1976 invention of the theory of supergravity, which combines Einstein's theory of general relativity with a theory called supersymmetry.

“This award comes as a complete surprise,” says Ferrara. “Supergravity is an amazing thing because it extends general relativity to a higher symmetry – the dream of Einstein – but none of us expected this.”

Ferrara, Freedman and van Nieuwenhuizen invented supergravity soon after the discovery of supersymmetry, an extension of the Standard Model of particle physics. Developed in the 1960s and early 70s, the Standard Model describes all known particles and has since been confirmed by experiments. However, it was clear from the beginning that the model is incomplete. Among other features, it cannot explain dark matter and it doesn't include gravity, which is described by Einstein's theory of general relativity.

Supersymmetry offered a way to fill some of the gaps in the model by giving each fermion and boson in the Standard Model a “superpartner”: fermions would be accompanied by superpartner bosons, while bosons would have superpartner fermions. But supersymmetry doesn't include gravity, and this is exactly what Ferrara, Freedman and van Nieuwenhuizen set out to fix.

Ferrara, who was a CERN fellow from 1973 to 1975 and has been a CERN staff member since the 1980s, started discussing the problem with Freedman at the *École Normale Supérieure* in Paris in 1975 and then teamed up with van Nieuwenhuizen at Stony Brook University. The three theorists conducted a series of calculations on a state-of-the-art computer that resulted in a supersymmetric theory that included the “gravitino”, a superpartner fermion to a hypothetical boson that mediates gravity called the graviton. This theory of supergravity was described in a paper that the trio published in 1976, and has since had a powerful impact on theoretical physics, including providing a basis for the ongoing effort to develop a full theory of quantum gravity.

The $3 million Special Breakthrough Prize in Fundamental Physics can be awarded at any time and, unlike the annual Breakthrough Prize in Fundamental Physics, is not limited to recent discoveries. Previous recipients include Stephen Hawking, seven CERN scientists who led the effort to discover the Higgs boson at CERN, the LIGO and Virgo collaborations for the detection of gravitational waves, and Jocelyn Bell Burnell for the discovery of pulsars.

Ferrara, Freedman and van Nieuwenhuizen will receive their prize at a ceremony at NASA's Hangar 1 on 3 November, where the winners of the annual Fundamental Physics prize and of the Breakthrough Prizes in Life Sciences and Mathematics will also be honoured.

See also the *CERN Courier* article.

SIXTY YEARS OF THE CERN COURIER

The magazine has published over 600 issues and now reaches tens of thousands of readers

From its first issue in 1959 to today, the CERN Courier has gone through several transformations, including a redesign for its 60th anniversary (Image: Cristina Agrigoroae/CERN)

In August 1959, when CERN was just five years old, and the Proton Synchrotron was preparing for beams, Director-General Cornelis Bakker founded a new periodical to inform staff what was going on. It was just eight pages long with a print run of 1000, but already a section called “Other people's atoms” reported news from other labs.

The *CERN Courier* has since transformed into an international magazine of around 40 pages with a circulation of 22 000 print copies, covering the global high-energy physics scene. Its website, which receives about 30 000 monthly views, was relaunched this month and provides up-to-date news from the field.

To celebrate its diamond jubilee, a feature in the latest issue reveals several gems from past editions and shows the ever-present challenges of predicting the next discovery in fundamental research.

You can peruse the full archive of all *CERN Courier* issues via the CERN Document Server.

Matthew Chalmers

HIGH-LUMINOSITY LHC: DIGGERS AT WORK 100 METRES UNDERGROUND

Work for the High-Luminosity LHC is in progress right under our feet

Dig, dig, dig. One hundred metres underground, excavation work is under way for the High-Luminosity Large Hadron Collider project. This next-generation LHC, which will begin operation in 2026, will reach luminosities five to ten times higher than its predecessor. This increased number of collisions will increase the chances of observing rare processes.

The worksites are Point 1 of the LHC in Meyrin (Switzerland), where the ATLAS experiment is located, and Point 5 in Cessy (France), which houses the CMS experiment. Following the excavation of two shafts around sixty metres deep in January, two underground halls and over a kilometre of technical galleries must now be dug.

At the surface, ten buildings, five on each site, will be built in the coming months, to house electrical, ventilation and cooling equipment. The work began in 2018 and should be completed in 2022.

Work for the High-Luminosity LHC is in progress (video): *http://youtu.be/5PKTKqtGrv8*

Elisa Pospieszny

HEP'S CONTRIBUTIONS TO MEDTECH PUBLISHED IN WIPO REPORT

WIPO's Global Innovation Index 2019 highlights knowledge transfer from fundamental research to medical applications

(Image: WIPO)

The World Intellectual Property Organization (WIPO) has published the 12th edition of its Global Innovation Index. This year's report, published on 24 July in India, is centred on medical innovation. CERN contributed a chapter entitled 'How Particle Physics Research at CERN contributed to Medical Innovation'. The chapter highlights success stories and challenges of knowledge transfer from fundamental research to medical technologies, and how this process happens at CERN.

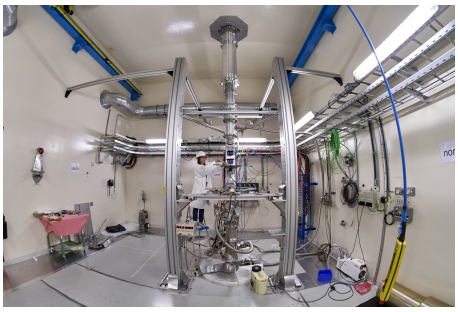
In healthcare, many state-of-the-art technologies were initially developed for fundamental research at institutions like CERN: radiotherapy devices deliver cancer treatment by means of particle accelerators, while PET scanners contain photon detectors. In particle-physics laboratories, innovative technologies are developed and fine-tuned to meet exacting research specifications. For them to drive innovation in the medical field, partnerships that bridge the gap between R&D and its application are often needed, as are effective dialogue with all relevant players, beneficial intellectual property (IP) policies and other knowledge-transfer strategies. CERN's contribution to the GII 2019 looks at these strategies and reflects on how they affect knowledge transfer at CERN.

You can read the report by visiting https://globalinnovationindex.org/gii-2019-report.

Daniela Antonio

N_TOF FACILITY EXPLORES NEUTRON IMAGING

The n_TOF facility is investigating the potential of one of its neutron beams for imaging the interior of materials



The n_TOF facility's second experimental area, where a neutron-imaging station was set up (Image: CERN)

X-ray imaging is a widely used technique to image the interior of materials – anyone who has had their teeth or another part of their body X-rayed will be familiar with the images it produces. Less used is neutron imaging, which is better than X-ray imaging in some cases, for example imaging the interior of dense metals. The reason is that neutron beams that are intense enough for imaging are not easy to produce and are available at only a few facilities worldwide.

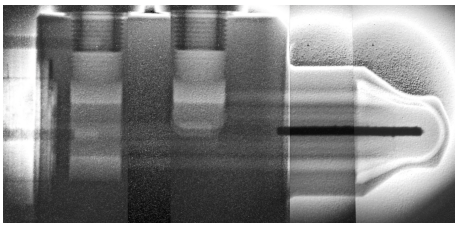
The n_TOF facility at CERN has two intense neutron beams and normally uses them to study interactions between neutrons and atomic nuclei. However, the facility has recently started to explore the feasibility of also using one of its beams for imaging. And the first results from this exploration look good: imaging of particle-producing targets that have been used or are designed to be used at the neighbouring Antiproton Decelerator (AD) to produce antiprotons (the antiparticles of protons) has shown that the beam can reveal the samples' internal structure.

Neutron imaging is based on recording the attenuation of a neutron beam as it passes through a sample. The quality of the resulting image depends on several factors, including the energy of the neutrons at the sample's position and the distance between the sample and the collimator that focuses the beam. Using a commercially available neutron-imaging camera, the n_TOF researchers set up a neutron-imaging station at n_TOF and analysed some of these factors. They then set out to test the imaging station with five antiproton-producing targets: two targets from the AD, which produces antiprotons by taking an intense proton beam from the Proton Synchrotron accelerator and firing it into a target made of dense metal; and three potential new targets for the AD that had previously been tested at the HiRadMat facility.

One of the two AD targets was a spare, never used, whereas the other AD target and the three HiRadMat targets had been subjected to intense proton beams that could have damaged them. The n_TOF imaging of the targets showed their internal structure with good contrast and, in the case of the targets that had been exposed to proton beams, revealed deformation, bending or cracking of their interior. For two of the targets, the damage observed was confirmed by opening the target, and for one of these targets the damage was also confirmed by imaging at a neutron-imaging station at the Paul Scherrer Institute.

The results served two purposes: they demonstrated the feasibility of using n_TOF's neutron beam for imaging and they offered two-dimensional images of the inside of the antiproton-producing targets that would otherwise have been more difficult to obtain. Conventional imaging techniques such as X-ray imaging cannot penetrate the dense metals from which the targets are made to reveal their internal state and, if they were to be imaged with specialised imaging facilities outside of CERN, the targets would need to be transported and subjected to inspection before being handled.

The next steps towards developing a full-fledged imaging station at n_TOF include improving the collimation system, which would lead to higher-resolution images, and adding equipment that would allow three-dimensional rather than two-dimensional images to be obtained.



Neutron image of one of the AD targets studied, showing damage to the target's core (uneven boundaries of the thin black strip). Neither the damage nor the core itself can be seen with X-ray imaging (Image: n_TOF collaboration)

Ana Lopes

CERN TAKES OVER THE PRESIDENCY OF EIROFORUM

CERN's Director-General will chair EIROforum, the consortium of eight European intergovernmental research organisations

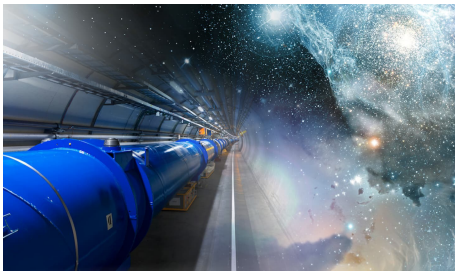
On 1 July 2019, CERN (the European Organization for Nuclear Research) took over the Presidency of EIROforum from EUROfusion. Fabiola Gianotti, CERN's Director-General, will chair EIROforum for a one-year period from July 2019 to June 2020.

EIROforum, which was created in 2002, is a consortium that unites eight of Europe's large intergovernmental research organisations in promoting the quality and impact of European research.

“I am very honoured to take over as Chair of EIROforum from Tony Donné of EUROfusion, and I will do my best to continue the excellent work done by my predecessors,” says EIROforum's new Chair, Fabiola Gianotti. “Important activities and initiatives that EIROforum will pursue in the coming year include continuing support and promotion of science, technology, and STEM training and education. We will also seek to strengthen cooperation with the European Commission, establish partnerships with other stakeholders in Europe and beyond, and we'll be preparing the future of the ATTRACT project and other initiatives for the Horizon Europe programme.”

“By joining forces, each EIROforum member contributes with greater impact to the discussion on future directions of science in Europe,” says previous EIROforum Chair Tony Donné (EUROfusion Programme Manager). “I am sure this impact will continue to be strengthened under CERN's leadership,” he concludes.

CERN AND ESA FORGE CLOSER TIES THROUGH COOPERATION PROTOCOL



(Image: CERN)

A new collaboration agreement between CERN and ESA, signed on 11 July, will address the challenge of operating in harsh radiation environments, which are found in both particle-physics facilities and outer space. The agreement concerns radiation environments, technologies and facilities with potential applications in both space systems and particle-physics experiments or accelerators.

This first implementing protocol of CERN-ESA bilateral cooperation covers a broad range of activities, from general aspects such as coordination, financing and personnel exchange, to a list of irradiation facilities for joint R&D activities. It also states the willingness of both organisations to support PhD students working on radiation subjects of common interest.

The agreement identifies seven specific high-priority projects: high-energy electron tests; high-penetration heavy-ion tests; assessment of EEE commercial components and modules (COTS); in-orbit technology demonstration; “radiation-hard” and “radiation-tolerant” components and modules; radiation detectors, monitors and dosimeters; and simulation tools for radiation effects.

In some cases, important preliminary results have already been achieved: high-energy electron tests for the JUICE mission were performed in the CLEAR/VESPER facility to simulate the environment of Jupiter. Complex components were also tested with xenon and lead ions in the SPS North Area at CERN for an in-depth analysis of galactic cosmic-ray effects. These activities will continue and the newly identified ones will be implemented under the coordination of the CERN-ESA Committee on Radiation Issues.

Franco Ongaro, Director of Technology, Engineering and Quality and Head of ESTEC, European Space Agency (left) with Eckhard Elsen, CERN Director for Research and Computing (Image: Julien Ordan/CERN)

A NEW CENTRE FOR ASTROPARTICLE PHYSICS THEORY

On 10 July, CERN and APPEC founded EuCAPT, a research centre for astroparticle physics theory

From left to right: Gian Giudice, head of CERN's Theory department, Teresa Montaruli, Chair of APPEC, Eckhard Elsen, CERN Director for Research and Computing, and Job de Kleuver, APPEC Secretary-General. (Image: CERN)

Moves are afoot to structure and strengthen the field of astroparticle physics, which sits at the junction between particle physics and astrophysics. On 10 July 2019, CERN and APPEC (the Astroparticle Physics European Consortium) created a new research centre for astroparticle physics theory, EuCAPT (European Centre for Astroparticle Theory), with the aim of coordinating and promoting theoretical physics in the fields of astroparticle physics and cosmology in Europe.

The centre is led by an international steering committee that comprises 12 theorists from institutes in France, Portugal, Spain, Sweden, Germany, the Netherlands, Italy, Switzerland and the United Kingdom, and from CERN.

For the first five years, CERN will be the central node of this network that brings together a dozen European institutes active in astroparticle physics, with others already having expressed an interest in joining. CERN plans to organise meetings and thematic workshops to advance theory in this field.

Gianfranco Bertone, the spokesperson of GRAPPA, the centre of excellence in gravitation and astroparticle physics at the University of Amsterdam, is EuCAPT's inaugural director.

Camille Monnin

COMPUTER SECURITY: CLICK ME – NOT!

In late June, CERN was subjected to a wave of seemingly targeted e-mails containing a potentially malicious PDF or DOC attachment

In late June, CERN was subjected to a wave of seemingly targeted e-mails containing a potentially malicious PDF or DOC attachment. Opening those attachments and eventually following the embedded links could lead to your computer being compromised. However, this time, fortunately, these e-mails were part of the annual e-mail awareness campaign...

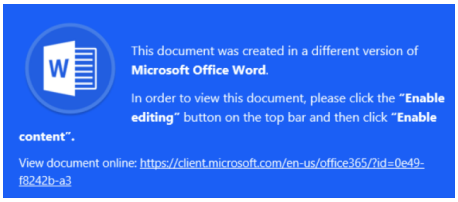
The e-mails sent by
“Anne.Darenport-Smid@cern.ch”,
“Federico.Campesi@cern.org”,
“Michel.Dutoit@cern.com”,
“Ralf.Brant@cerm.ch” and
“Sonia.Abelona@cem.ch” were based on real malicious attacks against the Organization earlier this year. Back then, the e-mails contained a very short, rather generic text, along with a Word or PDF attachment. Opening that document would have started an unfortunate malicious chain of action against your computer, eventually leading to it being fully compromised. And with that, your professional life and even your and your family's private life (see also “Protect your family”) would have been compromised. Worse, in those real attacks, the attackers were using the e-mail addresses of real CERN group leaders and sending their messages just to members of those leaders' groups. Easy as pie, as CERN is quite open: many organigrams are public (just search for “organigram site:cern.ch”); as is the CERN phonebook and its advanced search feature, so filtering for members of a particular group is easy. And something else that is easy as pie: the e-mail protocol allows you to spoof any sender (just like you can easily spoof the name on a snail mail envelope, put a stamp on it, and – albeit not very cheaply! – “spam” any recipient). So there it is, your targeted attack on the group of your choice... Fortunately, then, our e-mail filtering systems detected those malicious attachments in good time and prevented any havoc...

Based on those attacks, the CERN Computer Security Team sent similar e-mails to about 22 000 owners of CERN e-mail addresses, all within the space of 90 minutes. The sender addresses, i.e. “Anne.Darenport-Smid”, “Federico.Campesi”, “Michel.Dutoit”, “Ralf.Brant” and “Sonia.Abelona” (all fake, of course), sending domain (“cern.ch”, “cern.org”, “cern.com”, “cerm.ch” and “cem.ch”) and the contents (“your input to our results”, “report on pension fund balance situation”, “confidential design report”, “new IT security measures”, “your 2019 contract amendment request”) were randomly assigned. In addition, half of the recipients got an e-mail with a Word.DOC attached, the other half one with a PDF. In both cases, the documents were literally empty: the Word document claimed to be “created in a different version of Microsoft Office Word.” and stated: “In order to view this document, please click the ‘Enable editing’ button on the top bar and then click ‘Enable content’” – a technique to bypass Microsoft Office's basic protection mechanism. To no avail, as that document also offered the option to “View document online” – leading to a page controlled by the attacker and certainly not hosted by “Microsoft.com”. The PDF just asked users to “Please click the link below to access your PDF document.” – leading to a similar page to the one used for the Word document.

Empty or not, however, it doesn't matter. Just by opening the document, you would have put your computer, laptop, tablet or smartphone at risk (“I love you”) – and, indeed, 17% of all recipients did

(21% for the DOC; and more than 14% for the PDF). By clicking on the embedded link, the chances of your device being compromised would increase even more ("Curiosity clicks the link"). In total, 10% of people managed to ignore all the security features (e.g. clicking "enable macros" in Word or following the link in the attachments) and reached our dedicated information page (*https://cern.ch/security/malicious_attachment.shtml*).
By this point, their device would have been compromised. Lucky for them that this was "just" an awareness campaign. Looking in more detail, the attachment on "your 2019 contract amendment request" generated more clicks (i.e. 24% opened it), while the "confidential design report" and the "new IT security measures" were more likely to be ignored (15% each). Also, people spotted the malicious domains "cerm.ch" and "cern.org" easily and refrained from opening the attachments (only 15% and 17% did, respectively), while the "cern.ch" domain of course looked legit and led 20% to open the attachment... And in terms of the different departments? The trophies go to the FAP department and the Pension Fund, whose click rates were way below average. Well done, folks! For everyone else, next time, beat them: STOP – THINK – DON'T CLICK should be your mantra, in particular for e-mails which look weird, come from unknown sources, contain blatant typos, or are just not really relevant to you... Hints on how to spot this kind of malicious e-mail can be found on our computer security pages (*https://cern.ch/security/recommendations/en/malicious_email.shtml*). And if you spot such a malicious e-mail, forward it to us. Once we know about them, we can block the malware from being downloaded and thus protect everyone at CERN. In this particular campaign, it took just a few minutes until the first alerts were received by the Computer Security Team. Blocking would have dropped the click-rate to below 2%, unless you happen to click on the link outside the CERN network – a location where we can't provide any protection...

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

Official communications

SAFE CHARGING OF PORTABLE LITHIUM BATTERIES

Some precautions to bear in mind in order to minimise the fire risk from the use of lithium batteries

Fires caused by lithium batteries sporadically make the news, and CERN is not immune from this phenomenon. CERN has experienced several fires caused by a lithium battery in the course of being charged. The subsequent investigations revealed lessons for all of us.

Lithium-ion or lithium-polymer batteries are typically used in electric cars, e-bikes, computers and other power-operated equipment as well as smartphones or e-cigarettes. Even when they're small these batteries are miniature power plants.

Here are some precautions to bear in mind in order to minimise the fire risk from the use of these batteries:

Things you should do :

- **Use according to the manufacturer's instructions**
  Read and follow the manufacturer's instructions precisely!
- **Use safe batteries**
  Make sure your batteries are safe: regularly check the condition (damage, deformation, leakage...) of the battery and immediately replace any damaged battery.
- **Use a suitable charger**
  Use the charger supplied with the battery. It is designed to monitor the charge and avoid overcharging. If the original charger is not available, you may also use a CE certified charger approved for the particular device.
- **Charge under supervision**
  Supervise the charging of your batteries, in particular for powerful ones like e-bikes batteries, for example.
- **Remove battery from device**
  Where batteries are designed to be removed for charging, always remove the batteries from the device before charging.
- **Unplug**
  Unplug the charger once the battery

is charged.

- **Dispose safely**
  When not in use leave your batteries, in particular powerful ones, in a fire-proof cupboard or bag, if possible. Batteries are hazardous waste that must be disposed of following the appropriate procedures: https://smb-dep.web.cern.ch/en/Waste/What_goes_where#Batteries. As batteries are never fully discharged it is recommended to seal the electrical poles with tape and/or put them in fire-proof bags prior to disposal.

Things you should avoid :

- **Charge under high temperatures**
  Don't charge a battery when the ambient temperature is above 35 °C.
- **Charge close to combustible materials or hazardous substances**
  Do not charge batteries close to combustible materials or hazardous substances (chemicals, explosives...). Avoid charging underground if possible.

Immediate actions you should take in case of overheating or fire

In the event your battery is overheating, swelling, melting, emitting smoke or a clacking sound evacuate the premises, close the door, warn your colleagues and call the CERN fire brigade at 74444 or +41 22 767 4444.

Announcements

INTELLIGENCE AND ETHICS IN MACHINES – UTOPIA OR DYSTOPIA?

Artificial intelligence raises a host of ethical questions. Vivek Nallur of University College Dublin will give an overview of these on 21 August

On Wednesday, 21 August, Vivek Nallur will give a talk on ethical issues related to artificial intelligence. His talk will be held in the main auditorium at 10.30 a.m. The presentation, which has been organised by CERN openlab, will address how intelligence, agency and ethics in machines will likely affect society at large. In particular, Nallur will provide an overview of machine ethics implementations in robots and software agents, as well discussing other emerging challenges.

Vivek Nallur is an assistant professor at the School of Computer Science at University College Dublin in Ireland. He obtained his master's degree at Carnegie Mellon University, US, and his PhD at the University of Birmingham, UK. Nallur has worked for small start-up companies in India and the UK, large software companies in the US, and several research and educational institutions.

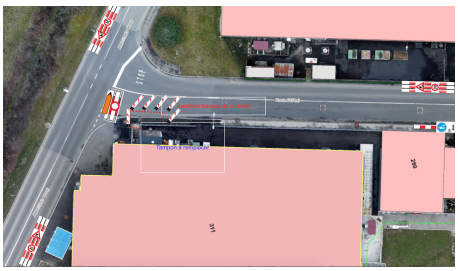
For more information, visit indico.cern.ch/event/837519 (*https://indico.cern.ch/event/837519/*).

CLOSURE OF ROUTE FERMI IN THE DIRECTION OF ENTRANCE B: 19-23.08

Due to roadwork, the pedestrian crossing of Route Fermi along building 311 will be closed from 19 to 23 August.

During this period, Route Fermi will be closed in the direction of Entrance B.

Thank you for your understanding.



The SMB department

DEFIBRILLATORS AND EMERGENCY EQUIPMENT IN THE LHC AND SPS TUNNELS

In the event of a medical emergency in the tunnel during LS2, use the defibrillators and emergency equipment available at the LHC and SPS access points

(Image: CERN)

Following discussions between the HSE-OHS/SV/ME-FB, EN-ACE/DHO and EP/ADO services, it was decided to install first-aid equipment and defibrillators at the bottom of the access shafts of the LHC and SPS tunnels for the duration of LS2.

This equipment is already operational and consists of 16 first-aid kits and defibrillators: nine in the LHC and seven in the SPS.

This substantially improves the level of safety, notably in terms of assisting any victims of accident or illness located underground during technical stops.

Everyone, even those who are not trained in first aid, can use this emergency equipment to reduce the delay in assisting the victim while waiting for the emergency services to arrive*. The equipment must be used ONLY in the event of an emergency.

By installing this new equipment, CERN has greatly increased its number of defibrillators, which now stands at 53.

*In the event of an accident or illness, the first few minutes are decisive. **Call the Fire and Rescue service without delay: +41 22 76 74444**.

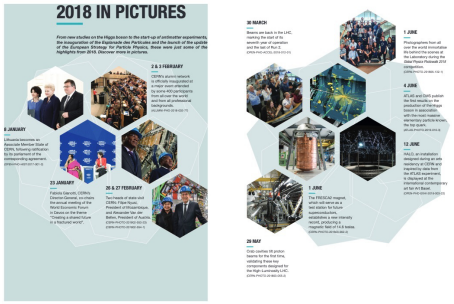
Links:

- Location of defibrillators (*https://gis.cern.ch/gisportal/*)
- “Defibrillator and chest compressions (*https://lms.cern.ch/ekp/servlet/ekp?TX=STRUCTUREDCATALOG&CAT=EKP000000490*)” training
- First-aid training (*https://lms.cern.ch/ekp/servlet/ekp?TX=STRUCTUREDCATALOG&CAT=EKP000000489*)

(Image: CERN)

THE 2018 CERN ANNUAL REPORT IS AVAILABLE

You can read it online or get a paper copy at the Library



(Image: CERN)

The 2018 CERN Annual Report is available.
It was presented to the CERN Council in June and highlights CERN's main achievements and activities from 2018.
You can read it online here.
Paper copies are available at the Library.

To help the report to be as useful as possible to our Member States, Associate Member States and other stakeholders, please could you complete this short survey: surveys.web.cern.ch/form/annual-report

CERN OPEN DAYS: VOLUNTEER REGISTRATIONS STILL OPEN

The deadline to register as a volunteer has been extended to the end of August. Please sign-up on the platform for CERN Outreach Events Volunteers

(Image: CERN)

On 14 and 15 September, more than 150 activities will be offered to the 80 000 visitors expected on our sites. Volunteers will be the key to the success of this exceptional event. More than 2400 volunteers have already signed-up but **we still need another 500 to fill the many roles that remain open**.

Whether you are a member of CERN personnel, contractor's personnel or Honorary Staff, everyone will have a role to play! The role assignments have already started. Instructions and other practical information can be found on cern.ch/od2019/volunteers.

BEAT THE HEAT!

With the weather set to stay hot, here are five tips on keeping cool and staying well

(Image: CERN)

1. Make sure you drink lots of water
2. Keep windows and shutters closed during the day where possible to keep the heat out
3. Wear loose-fitting, light-coloured clothing
4. Eat appropriately – fresh fruit, salads and vegetables are good choices
5. Avoid strenous exercise in the heat of the day

CERN Medical Service

LIGHTNING TALKS FROM THE 2019 CERN OPENLAB SUMMER STUDENTS

On Tuesday 13 August and Thursday 15 August, the CERN openlab summer students 2019 will present their work at a dedicated public Lighting Talk session

(Image: CERN)

On Tuesday 13 August and Thursday 15 August, the CERN openlab summer students 2019 will present their work at a dedicated public Lighting Talk sessions (Session 1, Session 2).

In a 5-minute presentation, each CERN openlab summer student will introduce the audience to their project, explain the technical challenges they have faced and describe the results of what they have been working on for the past few weeks.

It will be a great opportunity for the students to showcase the progress they have made so far and for the audience of people from the IT and other CERN departments to be informed about various information-technology projects, the solutions that the students have come up with and the potential future challenges they have identified.

This year, the CERN openlab summer student programme hosts 40 students from 19 different nationalities for 9 weeks. Undergraduate and graduate students in computer science and physics

have come from all over the world for a summer internship at CERN working on specialized advanced computing projects with applications in High Energy Physics.

As part of the CERN openlab summer-student programme the students have been also invited to attend a series of lectures given by IT experts on advanced CERN-related topics and had the opportunity to visit the CERN facilities and experiments as well as other research laboratories and companies such as IBM, ETH, and OpenSystems.

CERN openlab is a unique public-private partnership between CERN and leading ICT companies that has been created more than 15 years ago to tackle the LHC computing, data and infrastructure challenges. Its mission is to accelerate the development of cutting-edge solutions to be used by the worldwide LHC community.

MIGRATION TO WINDOWS 10 DUE TO WINDOWS 7 END OF LIFE

Migration to Windows 10 is required during 2019 as Microsoft will end support for Windows 7 in January 2020.

Windows 7 was released in July 2009 and is now obsolete. It does not enable you to benefit from recent hardware and security features that are only available in Windows 10.

Windows 10 is already available for deployment at CERN. A migration campaign is starting and all computers with Windows 7 operating system will be targeted for an upgrade over the course of the year. You will receive a notification prior to the upgrade and will have the possibility to manually launch the upgrade at a time of your convenience during the three weeks before it is actually forced.

What is needed for this upgrade and what will happen?

For machines upgrading from a 64-bit version of Windows 7:

- You need 25 GB of free space on your hard disk
- The upgrade requires multiple reboots and usually takes between 45 and 60 minutes
- During migration, the machine can´t be used
- Documents, programs and settings will be preserved
- In case the upgrade process fails the machine will be rolled back to Windows 7 and you will need to perform the Windows 10 installation manually (*http://espace.cern.ch/winservices-help/NICEEnvironment/NICEInstallation/Pages/InstallationOfWindowsAtCERN.aspx*)
- Internet Explorer is no longer installed by default. You can find it as a CMF package
- If you are ready to upgrade already now:
  - Select the package “MS Windows 10 – upgrade b1809” on *http://cmf.web.cern.ch/cmf/ComputerFramework/AddRemove.aspx*
  - Launch the upgrade process by clicking on the CMF icon at the bottom right of your screen and selecting 'Start Now' in CMF Pending actions

For machines with a 32-bit version of Windows 7 or with less than 25 GB of free space on the hard disk:

- The upgrade procedure won't work, instead you need a full reinstallation
- You need to manually install Windows 10 from scratch (*http://espace.cern.ch/winservices-help/NICEEnvironment/NICEInstallation/Pages/InstallationOfWindowsAtCERN.aspx*)

If you use critical applications not installed through CMF, or if you configured dual-boot with another operating system, please check compatibility with Windows 10 with the software vendor. In case of known compatibility issues with Windows 10 or professional constraints requiring to postpone the upgrade, please contact us: w10-feedback@cern.ch.

CHANGE CONCERNING WINDOWS USERS: HOME DIRECTORIES WILL BE TRANSFERRED TO CERNBOX

As previously announced at the IT Users Meeting (ITUM) (*https://indico.cern.ch/category/2958/*), the migration of Windows Home Directories* from DFS to CERNBox (*https://cernbox.web.cern.ch/*) is planned for 2019.

What does that mean?
The servers storing your data will be replaced.

What does it change for you?
Daily tasks on your Windows computer(s) won't really change: clicking on the usual shortcuts such as Documents will simply target the new location.

Why change?
DFS has been used for many years but this storage system no longer answers current mobility needs. More and more we work on multiple devices, both on CERN sites and outside CERN. This is a trend seen globally outside CERN as well, hence the emergence of cloud file stores.

So, responding to these evolving needs, CERNBox will be used to replace DFS to store Windows Home Folders, and to offer new functionalities. And from the data protection perspective, we undertake to support the full spectrum of data classifications.

Finally what's new?
CERNBox includes many interesting features such as:

- Web access

- Collaborative online editing of documents
- Easy sharing
- Local copy of your files
- Synchronisation available from everywhere over the Internet
- Data available from any kind of device

How will this migration happen?
You will receive an email a few days prior to the migration with a date at which your machine will be targeted to install a CMF package called “DFS to CERNBox Migration”.

You will then be able to launch this package at the moment of your choice on the given date.

The full process requires two restarts and can take up to one hour depending on the size of data you have stored on DFS and your machine configuration.

If the forced migration date does not fit your professional constraints, please contact us on dfs-to-cernbox-migration-supporters@cern.ch to define a more appropriate schedule.

* *Home Directories are the default locations for Documents, Pictures, Videos, Music, Links, and Favourites.*

Ombud’s corner

WORK-LIFE BALANCE

“*I'm rushed off my feet! I don't know where to start. Even when I have time off, I just can't relax. So when Sunday evening comes around, I feel as if I haven't got anything done!*”

Does this sound familiar? If you have trouble combining your work life and home life, you're certainly not alone.

At work, we often have structure, constraints, deadlines, follow-up meetings, management systems, etc. that help us to manage our time on a daily basis. It's usually outside work that we have more trouble. Paradoxically, it's generally people who are the most busy at work who also manage their time best outside of work, because they structure their activities like they do their professional life.

Having a good work-life balance doesn't mean splitting time evenly between the two. We each need to find our own balance and activities that are the most rewarding for us. Barbara's* goal is to beat her personal best in the marathon, while Ben* wants to gaze at the wildlife and boats on the lake. Laure* needs to take regular breaks during the day, while David* can stay focussed all day but needs to read for half an hour before going to sleep. Work out what is important for you and then negotiate some leisure time with your family.

“*I have so many things to do that I use every free minute to solve problems and make progress, even when I'm not at work.*” That's why Mark* never manages to relax completely. Instead of focussing on his daughter's football match or chatting with his friends over a meal, he's constantly got his ear glued to his phone. His problems almost certainly won't get worse in the next few minutes and if he can learn to live 100% in the present with his children or his friends, he'll manage to put things into perspective and understand that the rest can wait.

Last but not least, many people save their skills for work and don't make use of them outside. Maria* is an excellent organiser at work, but she's found wanting when having to organise the rowing club's annual dinner for which she's responsible. That's a pity because she could get a lot of satisfaction from this activity with a minimum of effort.

Achieving a decent work-life balance means taking control of both compartments. Use the skills you deploy every day at work to enhance your home life, and make the most of your time off.

**Names have 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 .