

From CERN to Jupiter: Juice embarks on its historic journey

Before embarking on its journey, critical components of ESA's interplanetary mission were tested in the only facility on Earth capable of replicating Jupiter's harsh radiative environment



ESA's latest interplanetary mission, Juice, lifted off on an Ariane 5 rocket from Europe's Spaceport at 09:14 local time/14:14 CEST on 14 April 2023 to begin its eight-year journey to Jupiter. (Image: ESA)

It is not only in the tunnels of CERN that we learn about the origin and composition of the Universe. Look up, and space offers the most beautiful phenomena to study: black holes, dark matter, cosmic rays, etc. Studying planets, their structure and their composition teach us a lot about the formation of our own planet and might one day lead us to find a habitat and possibly life. One of the intriguing features of the biggest planet in our galaxy, Jupiter, is the sheer number of its moons, almost one hundred in total, three of which have large oceans under a huge ice crust. Today, the European Space Agency (ESA) is launching the Juice – Jupiter Icy Moons Explorer – mission to explore the gas giant and its icy moons.

Before setting off to meet the king of the gods and some of his many satellites (all named after his lovers), the Juice spacecraft had to be tested against the effects of the radiation environment induced by the magnetic fields surrounding the planet. Jupiter has a very strong magnetic field, which traps protons and electrons of energies up to several hundred megaelectronvolts with very large fluxes. The direct and indirect impact of high-energy electrons on modern electronic devices, and in particular their ability to cause SEE (single event effects), had never been studied before.

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Ombud's corner

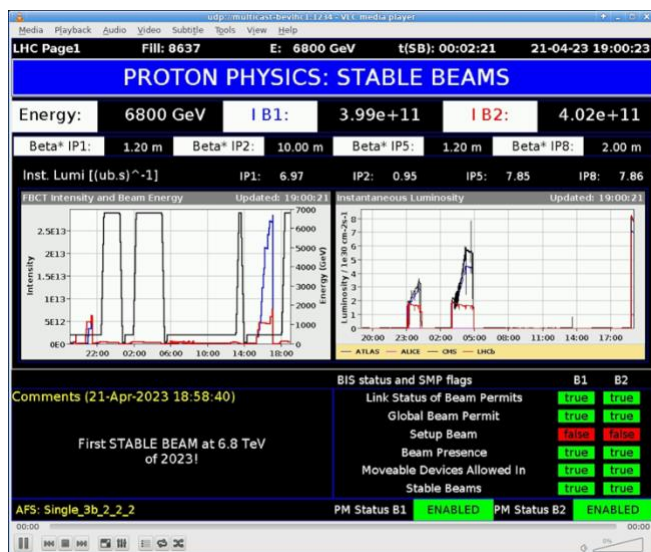
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CERN has the only facility on Earth that is able to replicate the most extreme phenomena of Jupiter’s harsh radiative environment. In 2018, in order to prepare the spacecraft for its exploration mission, ESA came to VESPER (the very energetic electron facility for space planetary exploration missions). There, engineers and physicists successfully tested the capacity of some of Juice’s critical electronic components to withstand high-energy electron fluxes for several years of operation. “The tests performed at CERN reinforce ESA’s planetary exploration ambitions and helped optimise the Juice spacecraft design,” says Giuseppe Sarri, ESA Juice project manager

“VESPER is part of CLEAR (the CERN Linear Electron Accelerator for Research). We are happy to have helped better understand, anticipate and mitigate the impact of Jupiter’s radiation. Godspeed Juice!”, says Roberto Corsini, CLEAR facility leader. CERN is a recognised expert in the testing of satellites and space components against radiation. Another irradiation facility available to space users is CHARM, which, at the instigation of a recent European-funded project, will become a leading facility in Europe for high penetration testing of space electronics using high-energy heavy ions.

Antoine Le Gall

Accelerator Report: Crescendo at the LHC following the first stable beams at 6.8 TeV



First stable beams, as could be observed from the LHC Page 1 displays around CERN and online: <https://op-webtools.web.cern.ch/Vistar/vistars.php>. The fifth row of the display shows the instantaneous luminosity per experiment (IP1, 2, 5 and 8). The values are still very low because of the small number of bunches in the machine. (Image: CERN)

Although just three bunches were circulated in clockwise and three bunches in anti-clockwise direction, it signalled the start of the data-taking season and the “intensity ramp-up” phase for the LHC.

During the past three weeks of beam commissioning, many checks and adjustments have been made to get the LHC ready for stable beam. One of the many important steps was the validation of the “loss maps”. The LHC collimation system protects the machine and its components, notably the superconducting magnets, against any possible damage induced by the beam. Therefore, the collimation and operations team must make sure that all the collimator positions and openings are well adjusted for all phases of the cycle, from injection until the last collision of the fill. To do so, they inject a few bunches, deliberately create controlled losses, and observe that these losses occur where expected. If not, the collimator hierarchy needs to be addressed. When the LHC was first started, this was a manual task that took many days and machine refills. Nowadays, the loss map process is highly automated and takes only three to four fills and a handful of shifts, even though the number of loss maps has increased quite a bit with the luminosity levelling that was introduced.

As soon as the first stable beams were achieved, the intensity ramp-up phase started, meaning that the machine will gradually be filled with more and more bunches until the full circumference is filled, leaving only a gap for the dump kicker to rise. This should be achieved with about 2400 bunches per beam. Initially, there will be three bunches per beam, followed by 75, then 400, 900, 1200, 1800 and, finally, 2400. Each step will require at least two fills and more than 15 hours in stable beams. At the end of each intensity step, equipment experts will be asked to validate the correct functioning of their equipment and machine protection, using a checklist. The next intensity step will be initiated only once the checklist is fully completed and validated.

As scheduled, the intensity ramp-up was interrupted this week to scrub the machine, with

the aim of reducing the formation of electron clouds in the vacuum chamber. These clouds negatively affect the quality of the beams and also put a strain on the cryogenics system, which must keep the beam screen cold by evacuating the heat induced by the electron bombardment. This is a necessary step to prepare the LHC for receiving longer bunch trains, which are needed in order to reach the requisite ~2400 bunches per beam.

By mid-May, the LHC is expected to achieve stable beams with 1200 bunches per beam, which will provide a significant level of collisions for meaningful physics data taking. Two to three weeks later, physics with a full machine should be established.

Rende Steerenberg

HiLumi News: Recovery of an HL-LHC niobium–tin magnet

The successful replacement of a coil in an HL-LHC niobium–tin quadrupole magnet by the US Accelerator Upgrade Project team has showcased this crucial technology’s flexibility and cost-effectiveness

CERN and the US Accelerator Upgrade Project (AUP), based at Fermilab, are working in tandem to develop, build and test the HL-LHC’s triplet quadrupole magnets, one of the programme’s cornerstones. These magnets, which come in two sizes – a 4.2-metre-long version built in the US and its 7.2-metre-long counterpart built at CERN – will focus the beams into highly luminous regions at the collision points of ATLAS and CMS. The very strong magnetic field required to achieve this focus is made possible by the niobium–tin (Nb₃Sn) superconductor from which the magnet’s coils are made. A test carried out at Brookhaven National Laboratory (BNL) in the US in January 2023 demonstrated that, if the magnet’s performance is limited by one of its four coils, the performance limitation can be overcome by replacing the limiting coil.

It all started in October 2021, when the eighth quadrupole magnet produced by AUP (MQXFA08) showed performance limitations during a cryogenic test, making it impossible to reach the HL-LHC requirements. After the AUP team precisely identified the region and the reasons for a possible fault in one of the magnet’s four coils,

the limiting coil was sent to CERN, where the EN-MME team confirmed the presence of broken ~50-micron-thick Nb₃Sn sub-elements in the five-tonne object. “Finding the precise cause of the magnet’s limitation – introduced while operating under the unfavourable conditions of the COVID-19 pandemic – was more demanding than finding the proverbial needle in the haystack. Locating those broken filaments was therefore an achievement in itself, made possible by the fruitful collaboration between the two teams,” explains Giorgio Apollinari, head of the AUP.

With an incomplete three-coil quadrupole magnet now on their hands, the CERN and AUP groups needed one question answered: could the dysfunctional coil be replaced, or would the whole magnet need to be thrown away, incurring sizeable costs for the programme? “Although the principle of replacing individual coils within niobium–tin magnets had been demonstrated on small-scale prototypes, the process’s scalability to longer magnets was yet to be proven,” says Susana Izquierdo Bermúdez, engineer in charge of the MQXF quadrupoles at CERN.

The coil was replaced in the autumn of 2022 and, following cooldown, the magnet – now called MQXFA08b – reached its nominal current after four quenches. Two additional quenches were then needed to reach nominal current plus a margin of 300 A, and the recovered quadrupole magnet was deemed fit for assembly in the final cold mass. All training quenches occurred in the new coil, demonstrating good memory in the remaining three coils, which had been trained over the previous testing campaign. “What this result tells us is that, when necessary, we will be able to save whole magnets from going to waste when only one of their coils is faulty, thereby limiting extra costs. This is an encouraging result that

demonstrates the soundness of Nb₃Sn technology and of the mechanical design. We are just starting to use Nb₃Sn in the context of particle accelerators, and it still hasn’t revealed all its secrets,” adds Giorgio Apollinari.

This significant result brings new momentum to the triplet quadrupole programme, which is in full swing. So far, seven of the required twenty MQXFA quadrupoles have passed the vertical test at BNL, and the first pair of magnets has been assembled within a cold mass. This cold mass is now undergoing powering tests and will be delivered to CERN once it has been proven to meet the criteria for operation in the HL-LHC.

Thomas Hortalá

The Technical Galleries Consolidation Project is progressing well

5 km of technical galleries have been scanned and half of them 3D-modelled, and the work to renovate and replace their technical infrastructure is in full swing



One of the 660 welds already performed in the framework of the Technical Galleries Consolidation Project. (Image: CERN)

The Technical Galleries Consolidation Project started in 2021 with the aim of renovating CERN’s technical galleries, which form a 14 km-long maze beneath the Meyrin and Prévessin sites, and to make the technical infrastructure more reliable and environmentally friendly while at the same time improving safety.

The 3D modelling campaign, which began in May 2021 as a prerequisite for the project, is already well underway: 5 km of galleries have already

been scanned and half of them have been 3D-modelled. “The modelling phase represents an enormous amount of work which is completed with exemplary professionalism by the teams in charge”, says the project leader, Sébastien Evrard. Currently, two pilot galleries are being consolidated: gallery 835 on the Meyrin site and gallery 818 on the Prévessin site. More than 125 tonnes of old piping and material have already been removed – 2.92 km of old piping have been dismantled and replaced by 1.57 km of new piping. Some 660 welds and 80 non-destructive tests so far have been performed. New circuits have been installed for heating, compressed air and drinking water, with the layout of the drinking water network in the West Area of the Meyrin site having been completely revised and optimised.

Several decabling campaigns have also taken place to dispose of many obsolete cables, about 48 km to date, including cables with incredibly large cross-sections (up to 11 cm!). Some civil engineering work has also been completed in the West Area of the Meyrin site (drain networks, equipment and personnel access, metallic structures).

The project was initially scheduled to take place over a period of 10 years; it will not take less time than that to renovate the 14 km of galleries which

are so vital to the operation of the accelerator complex and CERN sites.

Anaïs Schaeffer

Probing fundamental symmetries of nature with the Higgs boson

The ATLAS collaboration tested Higgs-boson interactions with the carriers of the weak force, looking for signs of charge-parity symmetry violation

Where did all the antimatter go? After the Big Bang, matter and antimatter should have been created in equal amounts. Why we live in a Universe of matter, with very little antimatter, remains a mystery. The excess of matter could be explained by the violation of charge-parity (CP) symmetry, which essentially means that certain processes that involve particles behave differently to those that involve their antiparticles.

However, the CP-violating processes that have been observed so far are insufficient to explain the matter–antimatter asymmetry in the Universe. New sources of CP violation must be out there – and might be hiding in interactions involving the Higgs boson. In the Standard Model of particle physics, Higgs-boson interactions with other particles conserve CP symmetry. If researchers find signs of CP violation in these interactions, they could be a clue to one of the Universe's oldest mysteries.

In a new analysis of its full dataset from Run 2 of the LHC, the ATLAS collaboration tested the Higgs-boson interactions with the carriers of the weak force, the W and Z bosons, looking for signs of CP violation. The collaboration studied Higgs-boson decays into two Z bosons, each of which transforms into a pair of leptons (an electron and a positron or a muon and an antimuon), thus resulting in four charged leptons. The researchers also studied interactions in which two W or Z bosons combine to produce a Higgs boson. In this case, one quark and one antiquark are produced together with the Higgs boson, creating ‘jets’ of particles in the ATLAS detector.

These interactions are ideal testing grounds for CP violation. When CP symmetry is conserved, the

pattern of behaviour of the detected jets and leptons should be the same when particles are exchanged with their antiparticles and their directions of flight are reversed. However, if CP symmetry is violated, particles and antiparticles behave differently.

ATLAS scientists summarise all the information about the particles detected in these processes in a single number: the optimal observable. A special feature of this observable is that its value measured for antiparticles should be equal but opposite in sign to that of the particles. If a process conserves CP symmetry, the mean value of the optimal observable in the data should be zero. If it doesn't, the mean value would shift away from zero.

In its new analysis, ATLAS used the observed values of the optimal observable to directly place limits on the possible amount of CP violation. The researchers also measured how often each value of the optimal observable occurred in the data, after correcting for any experimental effects. This measurement enabled ATLAS to compare the data with theoretical predictions in a model-independent way and to test the validity of the underlying theoretical assumptions. This is the first time that a measurement of a Higgs-boson decay into four leptons has allowed physicists to detect potential signs of CP violation in a model-independent way, without strongly relying on aspects of the Standard Model prediction other than CP symmetry.

All the results look compatible with the Standard Model expectation, representing another important confirmation of the current theory of nature. However, this is just the first step. Small

CP-violating signals remain compatible with the data, and ATLAS is already collecting new collision data at unprecedented energies that will allow the precision of these measurements to be increased

– further homing in on the nature of the Higgs boson.

ATLAS collaboration

The 2023 Django Girls Geneva event was a resounding success!

Last weekend, 34 “Django Girls” discovered the world of computer programming and created their first website under the guidance of CERN mentors

On 21 and 22 April 2023, after two consecutive fully online events, CERN once again hosted an in-person Django Girls Geneva workshop at IdeaSquare. The event was organised jointly by CERN’s Women in Technology (WIT) community, its Visitors and Events Operations section and MicroClub in celebration of the International Girls in ICT Day (ICT = information and communication technologies).

At the evening launch event on Friday, 21 April and during the workshop on Saturday, 22 April, 34 highly motivated participants got to grips with computer programming for the first time. Guided in small groups by 17 CERN mentors, they learned how to create a blog and launch it online, all while having fun.

A positive and welcoming environment and inspiring interactions with digital technology specialists who were delighted to share their passion provided the ideal conditions to motivate some of the young women present in their choice

of future career. In her welcome speech, Maria Girone, head of CERN openlab, encouraged the participants to confidently pursue studies and careers in the field of information technologies, where women are still under-represented.

Django Girls is an initiative originating from a collaboration between Django – a free, open access website development platform, written in the Python programming language – and a female user community committed to promoting information technologies and making them available to women and girls. This non-profit organisation provides free tools and resources to help volunteers organise programming workshops all over the world. Since 2014, more than 1000 events have been organised by some 2300 volunteers in 108 countries, which adds up to around 22 900 “Django Girls” who have received training. This year’s edition was the sixth to be hosted at CERN.

New compact accelerator to help preserve heritage artworks

CERN and INFN have developed a compact, transportable accelerator for the non-destructive analysis of historical artifacts and artworks, providing a cheaper, more accessible method of analysing large or fragile items of this nature

Beyond fundamental research, accelerators are well known for their contribution to the medical field, especially to cancer therapy. However, they can also be used in more unexpected ways, such as for the analysis of historical artifacts and works of art.

Developed by INFN (the Italian National Institute for Nuclear Physics) and CERN, MACHINA

(Movable Accelerator for Cultural Heritage In-situ Non-destructive Analysis) is a compact, transportable accelerator designed specifically for cultural heritage applications. The portability of this type of accelerator is valuable for cultural heritage diagnostics because moving fragile and precious objects such as artworks and frescoes, even over short distances, can be challenging – or

sometimes frankly impossible – due to logistical, economic and safety issues.

MACHINA is the product of collaboration between CERN and INFN that started in 2017 and is based on a radio-frequency-quadrupole accelerating cavity designed at CERN. Following intensive testing in the second half of 2022, when all the initial requirements were met, the accelerator will soon become operational at the INFN-LABEC laboratory, where the first measurements using ion beam analysis (IBA) on reference samples will be carried out.

The accelerator will later be transferred to the Opificio delle Pietre Dure (OPD) in Florence, a renowned centre for art conservation, where it will become a part of their regular diagnostic activities. MACHINA will be used to analyse works of art in a non-destructive manner, using IBA techniques that allow measurements to be performed on a variety of objects that would otherwise be impossible to analyse because they are too fragile or too large to move. Although based in OPD, MACHINA can be further

transported for in situ measurements at other museums or conservation sites.

MACHINA's compact design, which features a 1m-long accelerating radio-frequency cavity, offers a portable solution that has a smaller impact on its surroundings in terms of footprint, weight, component availability, cost and noise compared to conventional IBA systems. Moreover, the accelerator's superior radiation protection ensures a safe working environment, enabling it to be used with confidence in any location.

The project was possible thanks to funding from the CERN Knowledge Transfer Fund and the Italian FISR (Fondi Speciali per la Ricerca) from the Ministry of Education, University and Research, with support from INFN's cultural heritage network CHNet and contributions from CERN's Mechanical and Materials Engineering and Radiofrequency groups. This recently published paper contains further details on MACHINA and the technologies behind it.

Olivia Fabreschi

CERN marks the second World Quantum Day

Today, on 14 April, we celebrate World Quantum Day – an international initiative launched by scientists from more than 65 countries to promote public understanding of quantum science and technology worldwide. The date – “4.14” -- marks the rounded first 3 digits of Planck's constant, a crucial value in quantum mechanics that is used to describe the behaviour of particles at the subatomic level.

Officially launched in 2022, World Quantum Day already comprises more than 300 events held in 193 cities in 44 countries on 5 continents in 17 different languages. Scientists, engineers, educators, communicators, entrepreneurs, technologists, historians and artists all over the globe organise their own activities, such as outreach talks, exhibitions, workshops and panel discussions, to engage the general public with quantum science and explain how quantum technologies work and how they can impact our everyday life.

From quantum mechanics, quantum gravity, optics and information science to quantum computing, metrology and engineering, all domains of quantum science are celebrated, alongside their history, mathematical foundations and practical applications.

But what is quantum and why do we mark the date?

“Quantum” comes from the Latin word “quantus”, meaning “how much”/“of what size”. It is the smallest amount or unit of electromagnetic energy that can be measured. In short, quantum physics is the study of the smallest building blocks that make up our Universe. It seeks to describe the properties and behaviour of matter and energy at the most fundamental level. If you want to understand how atoms hold together, how electrons move through a computer chip or how magnets work, you will need to use quantum physics. A quantum-based theory can also help explore the origin of the matter-antimatter

asymmetry or the nature of dark matter and dark energy – phenomena that cannot be explained within the Standard Model.

Despite being recognised as the theoretical basis of modern physics, quantum science traces its origins back to the early 20th century when the German physicist Max Planck made a seemingly contradictory assumption that energy exists in individual units, which led to the first notion of quantum theory. Further investigations by Niels Bohr, Albert Einstein, Erwin Schrödinger and Richard Feynman made major contributions to the development of quantum mechanics, bringing a new dimension to the world of science.

As well as expanding our knowledge beyond the classical concepts, quantum physics lies at the core of some of the most profound technological advances. To give just a few examples, transistors, LEDs, lasers, GPS and medical imaging all rely on concepts of quantum physics. Quantum technologies also offer the potential to impact many other areas in the future: they hold great promise for improving how we secure communication and process information, for advancing the sensitivity of detectors and sensors and for changing the way we approach computing. For the high-energy physics community, applications of quantum technologies could mean new advantages and possibilities for track reconstruction, simulation and event classification and the computing needs of CERN's world-leading research infrastructure – the Large Hadron Collider (LHC) and its successors, the HL-LHC (High Luminosity Large Hadron Collider) and possibly the FCC (Future Circular Collider).

“Quantum science evolved from a hypothesis, a revolutionary idea, to become one of the foundations of modern physics that has changed the way we think about the world forever”, -- says

Alberto Di Meglio, coordinator of the CERN Quantum Technology Initiative (QTI). “Looking into the future, we can most certainly say that quantum science and technology will be a central cross-disciplinary field with a major impact on key societal and technological challenges. It is therefore important that we explore the potential of this breakthrough field and raise awareness about it today, pushing the boundaries of knowledge and technology. World Quantum Day is a great occasion to do this.”

In 2022, CERN QTI already took part in the World Quantum Day celebrations by developing and hosting the event management website and organising a special scientific symposium at CERN. During the event, talks outlined the early days of quantum science at CERN and what those pioneering efforts mean for modern research.

To mark this year's celebrations, the first-of-a-kind quantum workshop for high-school students will be held at CERN to introduce the young generation to the fascinating field of quantum science and promote early quantum physics education. Split into two parts, an introductory lecture and a hands-on session, the workshop will give a first insight into the concepts of quantum mechanics and explain how quantum science underpins the physical world around us and facilitates technological innovation. The event will be organised in close collaboration with Finland's QPlayLearn initiative, which uses innovative interactive tools to communicate the main aspects of quantum physics in a clear and accessible way to people of various ages and backgrounds.

To discover more about World Quantum Day, learn how to engage and find events taking place near you, visit: <https://worldquantumday.org>.

Anastasiia Lazuka

Computer Security: The symbiosis of your life

Following a surge of technological innovation starting at the end of the twentieth century, the twenty-first century has brought a major socio-biological evolution that not even Charles Darwin would have dreamed of: the *homo sapiens sapiens*

digitalensis, humans sociologically embedded in digital communication networks, “cyborged” with smartphones in their hands, exporting memories onto disks full of bits and bytes, and living in symbiosis with their digital devices. While they

were “just” *homo sapiens sapiens*, humans risked becoming “just” physical prey. Potential victims to thieves and criminals, bullies and mobsters. But as *homo sapiens sapiens digitalensis*, they have become digital prey, too. Potential victims to cyberpunks and cybercriminals of all kinds. The dark side of the symbiosis of your life.

Symbiosis, the merger of your physical and digital life. A shift of focus towards your smartphone and laptop. Communicating. Navigating. Informing. Buying and paying. Photographing and recording. Listening to music. Health monitoring and doing sport... There are only a few areas of our personal lives where our smartphones or laptops don't matter. You live in symbiosis with all the data stored on those digital devices. Your photos, films and TikToks. Your chats, tweets and posts. Your games, loot boxes and game scores. Your folders, files and documents. Your credit cards and bank account information. In short: your digital life. Data that is probably very personal, probably very important, probably very valuable. Data that is potential digital prey for cybercriminals.

And this symbiosis is profound. Just think of those sweaty-palm moments when you can't find your smartphone in your pocket or bag. When your laptop doesn't start, even when you press the power button over and over again. When you can't find that precious document in any of your folders! When your Wi-Fi doesn't let you in (or, worse, your ISP is down)*. Functionality being a potential digital prey for cyberpunks, too.

This symbiosis is prey. The cybercriminals are on the prowl for your digital life. Obtaining access to your devices. Following the applications, webpages and chats you access. Recording your every keystroke and mouse movement. Spying on your conversations by enabling the built-in microphone. Watching you at home (everywhere!) by switching on the embedded camera. Sifting through all your data, files and folders. Monitoring your activities and habits – when you log in, when you pause, when you sign out. Private activities and work-related ones. Profiling you for their malicious deeds. You are prey.

This symbiosis needs protection. Your digital life needs protection. Your symbiotic devices, smartphone and laptop need protection. As a *homo sapiens sapiens digitalens*, you should:

- Have a different strong and complex password for each of the computing accounts you use to access your work, personal or financial data, or any other treasured value to you. Mathematical formulas, poems or refrains do well. Don't reuse those passwords elsewhere. Try to memorise them or use a password vault, but make sure the vault's master password is extremely strong and complex.
- Employ the ultimate silver bullet of account protection: two-factor authentication. Your bank and many cloud services uses it already.
- Enable auto-update of your operating system and all other applications running on your devices (careful: “When auto-update is not so auto”).
- Permanently run good antivirus software and end-point protection.
- Ensure that your laptop or Macbook is encrypted by Bitlocker and Filevault, respectively. If not, your devices are just an open book in the hands of the malicious evil;
- Only install software from trustworthy sources (yes, this is a difficult one! – appearing top of your Google search doesn't mean anything). Stick to the Apple iTunes and Google Play stores, respectively. And respect copyrights and make sure you own the right licence.
- “STOP – THINK – DON'T CLICK” when not really sure that the URL you want to browse to is legitimate. The same holds true for QR codes, links in messages, chats and SMS, and attachments in emails.
- Keep a back-up of all your important data. Test those back-ups regularly. And don't have them permanently connected (as they might get compromised, too). If you work for CERN, CERNBox is your friend.

This symbiosis is your life. It comes with a lot of benefit, and with drawbacks. Following the hints above can make your digital life safer and more secure. You are a *homo sapiens sapiens digitalensis*: Behave like one. Act like one. Respond like one. Protect like one.

Official news

CERN Safety Rules: Management of Major Safety Incidents

The following CERN Safety Instruction has been published on the CERN website dedicated to the Safety Rules: Specific Safety Instruction SSI-SIM-2-1 “Major Safety Incident classification, investigation, analysis and follow-up”.

This SSI will replace the current Safety Code A 11 “Administrative procedure following a serious accident or incident” dated 2003.

It aligns the investigation procedure to be followed following a Major Safety Incident with the Safety Regulation “Responsibilities in Matters of Safety Incident Management at CERN” (SR-SIM), which was published in June 2021.

The new SSI takes into account the lessons learnt from Major Safety Incident investigations conducted at CERN in the last 10 years and reflects best practices the field. It introduces a clear distinction between Safety-related investigations and other CERN procedures (such as disciplinary procedures), which follow different objectives and fall within a different legal framework.

The CERN Safety Rules apply to all persons under the Director General’s authority. They are available at the following link: <http://www.cern.ch/safety-rules>.

HSE unit

One-to-one meetings with the French tax authorities for CERN members of personnel

Update on 25.04.2023:

Due the high level of interest in these individual sessions with the *Service des impôts des particuliers* (SIP), all available slots have now been booked.

Please note that slots may open up if appointments are cancelled, so we invite you to check the registration tool regularly.

Alternatively, you can consult the following resources:

- The SIP offers telephone appointments, similarly to those organised by CERN. You can request an appointment with the SIP by contacting them through this page: <https://www.impots.gouv.fr/portail/contacter>.

You can find more information

(opening hours, details) on this page in the admin e-guide (<https://admin-eguide.web.cern.ch/en/contact/valserhone-service-des-impots-des-particuliers-sip-private-citizens-tax-office>).

- The CERN admin e-guide offers several articles about tax issues. See for example the Income tax declaration in France page (<https://admin-eguide.web.cern.ch/en/procedure/income-tax-declaration-france>) and an FAQ (https://cds.cern.ch/record/1694110/files/FAQ_SIP_Bellegarde_e.pdf) available prepared by the Valserhône *Service des impôts des particuliers*.

In order to help Members of Personnel who may need assistance, the Organization has decided to set up individual tax consultation sessions with the French tax authorities (*Service des Impôts des Particuliers (SIP) de Valserhône*) to answer questions on income tax matters in France.

These consultations will take place on the Meyrin site, on Friday 28 April 2023 and will be run by four representatives of the SIP. The sessions will require pre-booking an appointment via this portal (<https://planning-hr.web.cern.ch/>).

There are a limited number of time slots available, so we recommend you sign up early.

Please note that these meetings will be in French. Should you need any assistance with the language, we advise you to ask a French-speaking colleague for help.

For any questions regarding these meetings, please contact SIPTax.support@cern.ch.

HR department

Private household employees: New procedure for issuing legitimisation cards applicable as of 1 March 2023 | Digitalisation of the CAGI's Employment Registration Desk

Since 2011, private household employees' entry, residence and working conditions in Switzerland have been defined by the Swiss Federal Council and are subject to the Private Household Employees Ordinance (PHEO) (see <https://www.eda.admin.ch/missions/mission-onu-geneve/en/home/manual-regime-privileges-and-immunities/introduction/private-household-employees-ordinance.html>).

The Swiss Permanent Mission in Geneva has informed CERN that the Swiss Federal Department of Foreign Affairs has put in place a stricter procedure, which came into force on 1 March 2023, with the aim of improving compliance with the PHEO provisions and preventing workplace disputes (see "Procedure for private household employees" on the Mission's website <https://www.eda.admin.ch/missions/mission-onu-geneve/en/home/manual-regime-privileges-and-immunities/introduction/private-household-employees-ordinance.html>).

Employers should note the new conditions set out in this procedure, which stipulates that, at the time of hiring, private household employees will henceforth be issued with a legitimisation card whose validity will initially be **limited to three months** and will thereafter be renewed annually upon presentation of, in particular:

- proof of compulsory social insurance cover or of exemption from such cover;
- monthly salary slips;
- schedule of working hours;
- proof of monthly salary payment.

In addition, the Swiss Permanent Mission has informed CERN that the Employment Registration Desk of the International Geneva Welcome Centre (CAGI) has become an online service: <https://household.cagi.ch>.

*Host State Relations service
Tel.: 72848 / 75152
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Announcements

L&D micro-talk - "Challenging excellence: Bias as a threat to meritocracy"



Challenging Excellence:
Bias as a Threat to Meritocracy
Micro-Talk 60 min + 15 min Q&A

Experts: **Fiona McClement, EDI consultant**
Tomas Brage, Prof. of Physics, Lund University

28 April 2023 - 14:00-15:15
503/1-001 Council Chamber
Webcasted and Recorded
For more information and registration: <http://cern.ch/go/B8JM>

Library – Nucleonica web portal

Did you know that the CERN Library grants you access to the Nucleonica web portal?

In addition to providing the nuclear data of nuclides, the platform offers a range of web-based applications for calculations, including Decay Engine, Dosimetry & Shielding, Gamma Spectrum Generator, and Range & Stopping Power. A range of web-based display tools are also available on the platform: Nuclide Datasheets, Nuclide Search/Radiation Search, Fission Yields, and a variety of Nuclide Charts.

You can register for a basic account using your CERN email address and your account will be automatically upgraded to Premium. The Premium account gives you access to all nuclides and applications on the portal.

Nuclide charts in paper formats are available to borrow from the CERN Library Catalogue. They can also be ordered via the CERN Bookshop.

For any question, please contact: library.desk@cern.ch.

CERN Library

Register now for the 12th course of the International School of Radiation Damage and Protection in Erice, Italy

The upcoming course of the International School of Radiation Damage and Protection will be held at the Ettore Majorana Foundation and Centre for Scientific Culture in Erice (Sicily), Italy, from 23 to 30 October 2023. Registration is open on a first-come-first-served basis and a waiting list will be open throughout the entire process and will be considered afterwards.

The course aims to bring together experts in the field of radiation damage and activation with newcomers from science and industry in the unique setting of the Erice Centre near Trapani in Sicily. It gives an overview of the vast fields of radiation damage and related radiation protection in the context of accelerator facilities and space missions.

The participants will dive into the fundamental quantities and concepts, as well as computational and experimental tools and methods for the assessment of radiation damage of materials and electronics, as well as radio-activation aspects of accelerator components and shielding materials. The course also puts emphasis on applications and lessons learned from high-energy accelerators, experiments, high-power target facilities and light sources, and addresses synergies with other areas, such as space radiation applications and fusion facilities.

Further details on the venue, the Ettore Majorana Centre and registration formalities can be found on the course website (http://indico.cern.ch/e/RadSchool_Erice).

Spring is upon us – time to bike to work!

Bike to Work, the Swiss-wide cycling campaign, is back for its 2023 edition. The campaign encourages workers in companies all over Switzerland to commute by bicycle as often as possible.

Fancy taking up the challenge? You will first need to form a team of four, give your team a name and register it on the Bike to Work website. You can also request to join an incomplete team.

There are no registration fees and no minimum distance requirement, and part of your journey can be undertaken by public transport. Non-

cyclists are not left out: one team member is allowed to commute on foot, by skateboard or by any other means of non-motorised transport.

You can find all the details about the event, including our very own “Bike to CERN” which runs all year round, on the Bike to Work and Bike to CERN webpages.

Safety always: don't forget to consult the safety rules for cycling and to complete the online Road Traffic – Bike Riding course before getting in the saddle.

Now... on your bike!

INFIERI International Summer School 2023 | 28 August - 10 September, Brazil



Infieri 2023

27/8 to 10/9, 2023, in Sao Paulo, Brazil
at the USP Campus (*Scientia Vincet*)

<https://infieri2023.ime.usp.br>

VIIth edition of the International Summer School Series on
Intelligent Signal Processing for Frontier Research and Industry
Oxford-2013, USP-2023:10 years fostering cross-disciplinarity

Keywords: *Astrophysics, Applied Physics, Particle Physics, Technological Challenges for confronting Physics Objectives, Exploiting Synergies, Cross Disciplinarity*

Cutting edge instrumentation is a driving force for scientific progress, in Fundamental Research (e.g. Particle Physics or Astrophysics) as well as in many Applied Research fields like New Energies or Nanotechnologies. Novel sophisticated signal processing schemes are a key element in building the advanced instruments of the 21st century. It is around all the aspects of the signal processing chain that the scientific and technological program of the INFIERI schools is built. Following successful editions in Oxford, Paris, Hamburg, Sao Paulo, Wuhan, Madrid, the 7th edition will be held from August 27 to September 10, 2023, at the University of Sao Paulo (USP).

The program of the 2023 school will cover Advanced Semiconductors, 4D (time, space) Technologies, Photonics, Interconnects, Data Transmission, Big Data, High-Performance Computing, Artificial Intelligence, Quantum Technology, as well as their scientific motivations. The latter range from the exploration and understanding of the universe with large terrestrial telescope and space astronomy, of the elementary particle world with future accelerators and gigantic neutrino experiments and an opening on the applied world focused on new energies and the interface Nanotech, Nanobiology and Nanomedicine. The three-tier program comprises lectures, keynote talks and hands-on sessions.

The school will only offer in person attendance as essential to the traditions of the school are the laboratory sessions and the close interactions of students with international experts in fundamental research and instrumentation from Academia and Industry.

The target audience is M.Sc., Ph.D., postdocs & early-career researchers, mainly physicists and engineers.



INFIERI school in the time of COVID, summer 2021, at the Autònoma University, Madrid (SP)

For examples of the program of the previous schools: <https://indico.cern.ch/category/4891/>

Alumni event on 5 May: "Virtual company showroom" with ASML

Join representatives from ASML to find out more about the company, potential job opportunities and the skills and talents they are now seeking.

The event will start at 11 a.m. on 5 May with a general presentation and will be followed by a Q&A session, come armed with your questions. Please

register here (<https://alumni.cern/networks/events/112624>) for the event to receive the zoom link.

About ASML

ASML is a leader in the manufacture of advanced technology systems for the semiconductor industry. The company designs, develops, integrates, markets and services advanced systems used by the major global semiconductor manufacturers.

CERN Alumni programme

Open day at the Jardin des Particules | 8 May 2023



The poster features a photograph of the Jardin des Particules building, a modern orange structure with large windows. A yellow circular graphic on the right contains the event dates: **Monday 08/05 - 12.30pm** and **Lundi 08/05 - 12h30**. Below the photo, the text reads: **OPEN DAYS**, **JOURNÉE PORTES OUVERTES**, **CERN FAMILIES**. It invites visitors to discover the Jardin des Particules and meet the pedagogical team. The bottom section includes the text: **Le Jardin des Particules**, **crèche et école**, and contact information: Tel.: 0041 22 767 36 04, infojdp@cern.ch, and <https://nurseryschool.web.cern.ch>. Three small images at the bottom show the interior of the nursery, the logo, and an outdoor play area.

IThEC2023: International conference on thorium energy at CERN

The International Thorium Energy Committee (iThEC), in cooperation with CERN and the International Atomic Energy Agency (IAEA), is organising iThEC23, an international conference on thorium as a sustainable energy resource. The conference will be held at CERN from Sunday September 24 to Thursday September 28, 2023. Ten years after ThEC13, the first thorium conference at CERN, thorium research has made considerable progress. Innovative thorium technologies are now close to becoming a game-changer in the field of carbon-free energy generation, recycling and transmutation of spent nuclear fuel.

After an introductory session on global energy issues, the iThEC23 conference will bring international experts together to present and discuss the state-of-the-art and future developments of thorium facilities, enabling technologies, national thorium policies, industrial environmental, and commercial prospects.

Register here:
<https://indico.cern.ch/event/1172822/registrations/84548/>
iThEC23 welcome page:
<https://indico.cern.ch/event/1172822/>.

LISA conference on radioactive ion beam research in Leuven — 22-26 May

The LISA (Laser Ionization and Spectroscopy of Actinides) consortium aims to train a new generation of experts in different fields of radioactive ion beam research and applications, with the underlying goal of improving knowledge of the elements known as the actinides using laser spectroscopy techniques.

The consortium is organising a conference in Leuven (Belgium) from 22 to 26 May 2023, during which a selection of talks and posters will be presented on the following topics:

- Radioactive ion beam facilities.
- Laser development.

- Medical applications of radionuclides.
- Ultra-trace analysis.
- Atomic and nuclear structure investigations.
- Development of laser ion sources, hot cavities, gas cells and jets.
- Production of actinide beams and samples.

To find out more about the conference and register, visit the event's Indico page (<https://indico.cern.ch/event/1231547/page/27949-general-information>).

Inauguration of the Prévessin site bus-stop on 4 May – save the date!

The new Prévessin site bus-stop, which has been operational for a few weeks now, will be officially inaugurated on Thursday 4 May.

To celebrate the occasion, CERN and the commune of Prévessin-Moëns are pleased to invite the users of TPG line 66 to coffee and

pastries at the "Prévessin, CERN" bus-stop at 8.00 a.m. on 4 May.

Bus route 66 provides a regular connection between the Thoiry shopping centre and Geneva Airport, via Saint-Genis Porte de France. It's a real alternative to the car, so you're all encouraged to get your kicks by coming to work on Route 66.

We share the same roads: it's all about respect

Thousands of us use the CERN roads every day. As the days get longer and lighter, we see an increased variety of modes of transport, with motorbikes, (e-)bicycles and (e-)scooters joining cars and pedestrians on the network.

Unfortunately, this also means an increase in road-related incidents. In the past two years, 134 road safety incidents were reported on the CERN sites. Of these, 58 involved bicycles. The total number is probably greater in reality as not all incidents are reported. Broadly, road incidents are on the rise.

In this context, one of CERN's health and safety objectives for 2023 is to reduce the number of road incidents and incivilities on site. A number of

dedicated measures will be implemented to this end, such as a mandatory e-learning and a test for users of CERN bikes.

CERN will further pursue its efforts to better adapt its infrastructure to ensure that cyclists and pedestrians can move safely among the stream of vehicles circulating daily. This is a process of continuous improvement and relies on people reporting incidents in order to understand where the hot spots are and to take measures to address them. Most recently, for example, the roundabout near Gate E was re-engineered for improved co-existence of cyclists and motorised traffic. If you are the victim or witness of an incident or a near

miss, whether inside or outside the CERN site, report it promptly using the incident declaration form to support CERN in its continuous improvement effort.

A dedicated Mobility Working Group comprising representatives of all the departments as well as the HSE unit regularly reviews road infrastructure matters and recommends measures to improve all aspects of mobility at CERN, including safety. These include how to improve traffic flow, develop cycle lanes and footpaths, and deliver optimised infrastructure for the benefit of all users, whatever their mode of transport.

Whether we are cyclists, motor vehicle users or pedestrians, we all have a role to play in keeping ourselves and each other safe.

The analysis of traffic incidents shows that the most common causes are a lack of attention or a lack of respect for other road users. Did you know that, of the 58 cycling incidents, 18 were linked to vehicles not giving way? Exercising common sense and mutual respect, and being mindful of the need to act with greater caution towards the most vulnerable users, are the cornerstones of road safety.

Everybody must follow the highway code on the site, in the same way as they do outside CERN, and, in particular, moderate their speed, respect pedestrian and cycle paths and be mindful of other users at junctions and crossings.

If you're a driver, give cyclists and pedestrians space, and take care when leaving parking spaces. An increasing number of car-park spaces are designed for reverse parking to avoid accidents: look out for the relevant signage.

If you're a cyclist or an e-scooter user, use the designated lanes where possible and observe all road signs. Be mindful of drivers' blind spots and wear a helmet, high-visibility jacket and reflectors. When using roads, inside and outside CERN, common sense and common courtesy prevail. Look out for other road users, and for yourself! Don't just think "safety first". Think "safety always".

Find out more on the road safety webpage: <https://hse.cern/safety-risks/road-safety>.

HSE unit and SCE department

Save the dates for the famous CERN MusiClub summer events!

The CERN MusiClub invites you to two musical events to be held at CERN this summer, featuring some of the club's finest bands.

Saturday 10 June: *Music on the Lawn*, an informal concert on the terrace of Restaurant 1. Four bands will be playing live during the afternoon, with the music starting at around 2 p.m.

Saturday 8 July: the *Hardronic Music Festival* will return to the terrace of Restaurant 3 on the Prévessin site. For more than 30 years, *Hardronic* has been an opportunity for CERN people and their

friends and families to come to the site and enjoy live music, delicious food and cool drinks. This year's event will feature eight bands, starting at around 3 p.m.

Full details and line-ups will be published soon – keep an eye on our club website and on future issues of the *CERN Bulletin*.

The MusiClub would like to thank the Staff Association and CERN Management for their support.

CERN MusiClub

Vittorio Giorgio Vaccaro (1941 – 2023)



(Image: Andrea Passarelli)

Accelerator physicist Vittorio Giorgio Vaccaro passed away on 11 February 2023 in his hometown of Naples, Italy, after a short illness.

Vittorio graduated in 1965 from the University of Naples Federico II. He soon moved to CERN as a fellow, where he remained from 1966 to 1969, contributing to the design and commissioning of the first high-intensity hadron collider, the Intersecting Storage Rings. At CERN, Vittorio introduced the concept of beam-coupling impedance to model the instabilities that were experienced above transition energy, writing a seminal report (entitled “Longitudinal instability of a coasting beam above transition, due to the action of lumped discontinuities”), in which he described for the first time the action of discontinuities in the transverse section of a beam pipe as an impedance. His theory, which after his initial intuition he developed together with Andy Sessler, Alessandro G. Ruggiero and many other colleagues, has become a fundamental tool in the design of particle accelerators.

In 1969 he returned to his alma mater in Naples as professor of electromagnetic fields at the faculty of engineering, and continued teaching until he retired. He created an accelerator-physics team in

association with INFN within the faculty of physics, and throughout his career remained closely linked to CERN, where he visited regularly and sent many of his students.

Vittorio collaborated with practically all the studies and accelerator projects in Europe, from the CERN machines to DAFNE, the European Spallation Source and HERA-B at DESY. The group in Naples became, thanks to him, a reference in the world of accelerators for the development of the theory of beam-coupling impedance of accelerator components and the associated bench measurements. From the mid-1990s, he became increasingly interested in the development of linear accelerators for proton therapy, participating in a large collaboration with the TERA Foundation, CERN and INFN. In 2003 he led a new collaboration between the University of Naples and several sections of INFN, which produced the first linac module at 3 GHz capable of accelerating protons from a 30 MeV cyclotron.

In 2019 Vittorio was awarded the IPAC Xie Jialin Award for outstanding work in the accelerator field “for his pioneering studies on instabilities in particle-beam physics, the introduction of the impedance concept in storage rings and, in the course of his academic career, for disseminating knowledge in accelerator physics throughout many generations of young scientists”.

It is difficult to find the words to recall Vittorio’s immense human qualities, his deep culture and his profound humanity. Several of his students are now scattered around the world, continuing his efforts to propose technical solutions to accelerator-physics problems based on a deep understanding of the phenomena of beam instability. Vittorio was moved by a sincere passion for science and an irresistible curiosity for everything and everyone around him, which always brought him to approach anyone with an open and friendly spirit.

We will deeply miss a passionate mentor and colleague, his wide knowledge, energy, friendship and humanity.

His friends and colleagues

Ombud's corner

The voice/silence calculator

In my recent article “No, don’t do anything”, I shared with you my concern that colleagues very rarely authorise me to intervene, outside our discussion, to help them solve the issue they are confronted with.

They explain that their reluctance comes from the fear of negative consequences for their career and/or their professional relationships. They also express a feeling of pointlessness, i.e. that speaking up about a concern will not help.

Although the notion of a psychologically safe environment applies primarily to team collaboration, I see a clear link with the reluctance to speak up on interpersonal issues.

An ideally psychologically safe environment is an environment in which people believe that no one will be punished, excluded or humiliated for disagreeing with others, asking questions, proposing ideas, raising concerns or admitting mistakes*.

When Michel**, in a team, section or group, considers speaking up about a concern, a calculation takes place in his brain – partly unconsciously – before he decides whether to speak or to remain silent. He asks himself: who will benefit from me speaking up, when will they benefit and what is the likelihood that this benefit will actually materialise?

The responses are immediate and can be summarised in the voice/silence calculator below:

Choix	Pour qui est le bénéfice ?	À quel moment le bénéfice peut-il se concrétiser ?	Quelle est la probabilité que ce bénéfice soit réel ?
Je prends la parole	Pour l'Organisation	Dans le futur	Incertaine
Je me tais	Pour moi	Maintenant	Certaine

In other words, Michel quickly concludes that remaining silent will most probably benefit himself now, whereas raising a concern might possibly benefit the Organization in the mid to long term. Very often, Michel will choose to remain silent.

Still, teams with silent members are less likely to innovate and improve over time. In addition, remaining silent creates frustration, which will surface one way or the other.

The same voice/silence calculation takes place when I suggest to my visitors that I take some action, such as contacting the other party, organising a mediation, etc. They rarely accept. As the saying goes, “No one has ever been fired for remaining silent”.

If you are interested in finding out more about how psychological safety benefits everyone in an organisation, you may wish to revisit the excellent webinar given by Camilo Azcarate, Ombud for ESO, at <https://indico.cern.ch/event/1164651/>.

We need to actively balance the voice/silence calculation and give more weight to voicing concerns. Concerns raised in an honest, respectful and constructive way, and in the appropriate circle, should have a higher probability of being addressed rapidly, to the benefit of everyone: members of personnel and the Organization alike.

Laure Esteveny

* *The Fearless Organization*, Amy C. Edmondson, 2019

** *Names have been changed.*

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

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

*Ombud, please subscribe to receive the CERN
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