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EXPLORING NEW WAYS TO SEE THE HIGGS BOSON

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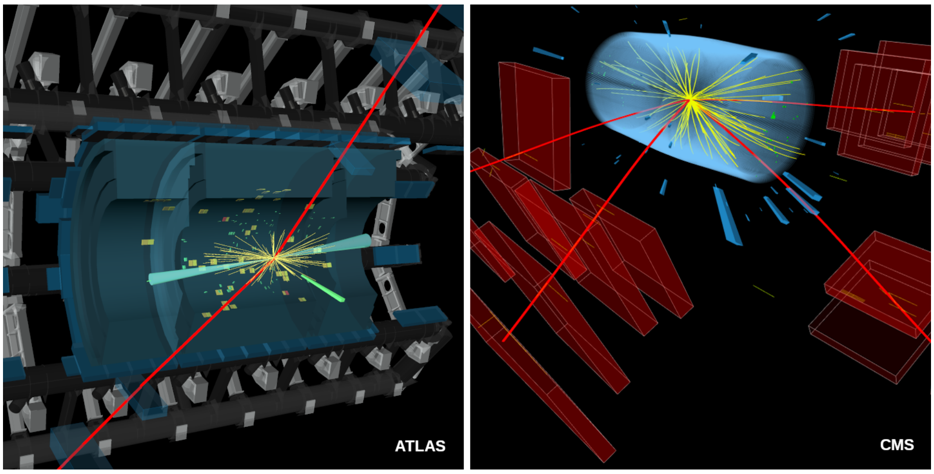

Collision events recorded by ATLAS (left) and CMS (right), used in the search for rare Higgs boson transformations (Image: CERN)

This media update is part of a series related to the 2020 Large Hadron Collider Physics conference, taking place from 25 to 30 May 2020. Originally planned to take place in Paris, the conference is being held entirely online due to the COVID-19 pandemic.

The ATLAS and CMS collaborations presented their latest results on new signatures for detecting the Higgs boson at CERN's Large Hadron Collider. These include searches for rare transformations of the Higgs boson into a Z boson – which is a carrier of one of the fundamental forces of nature – and a second particle. Observing and studying transformations that are predicted to be rare helps advance our understanding of particle physics and could also point the way to new physics if observations differ from the predictions. The results also included searches for signs of Higgs transformations into "invisible" particles, which could shine light on potential dark-matter particles. The analyses involved nearly 140 inverse femtobarns of data, or around 10 million billion proton–proton collisions, recorded between 2015 and 2018.

(Continued on page 2)

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EXPLORING NEW WAYS TO SEE THE HIGGS BOSON

The ATLAS and CMS detectors can never see a Higgs boson directly: an ephemeral particle, it transforms (or "decays") into lighter particles almost immediately after being produced in proton–proton collisions, and the lighter particles leave telltale signatures in the detectors. However, similar signatures may be produced by other Standard-Model processes. Scientists must therefore first identify the individual pieces that match this signature and then build up enough statistical evidence to confirm that the collisions had indeed produced Higgs bosons.

When it was discovered in 2012, the Higgs boson was observed mainly in transformations into pairs of Z bosons and pairs of photons. These so-called "decay channels" have relatively clean signatures making them more easily detectable, and they have been observed at the LHC. Other transformations are predicted to occur only very rarely, or to have a less clear signature, and are therefore challenging to spot.

At LHCP, ATLAS presented the latest results of their searches for one such rare process, in which a Higgs boson transforms into a Z boson and a photon (γ). The Z thus produced, itself being unstable, transforms into pairs of leptons, either electrons or muons, leaving a signature of two leptons and a photon in the detector. Given the low probability of observing a Higgs transformation to Zγwith the data volume analysed, ATLAS was able to rule out the possibility that more than 0.55% of Higgs bosons produced in the LHC would transform into Zγ. "With this analysis," says Karl Jakobs, spokesperson of the ATLAS collaboration, "we can show that our experimental sensitivity for this signature has now reached close to the Standard Model 's prediction." The extracted best value for the H→ Zγsignal strength, defined as the ratio of the observed to the predicted Standard-Model signal yield, is found to be $2.0^{+1.0}_{-0.9}$.

CMS presented the results of the first search for Higgs transformations also involving a Z boson but accompanied by a ρ(rho) or φ(phi) meson. The Z boson once again transforms into pairs of leptons, while the second particle transforms into pairs of pions (ππ) in the case of the ρand into pairs of kaons (KK) in the case of the φ. "These transformations are extremely rare," says Roberto Carlin, spokesperson of the CMS collaboration, "and are not expected to be observed at the LHC unless physics from beyond the Standard Model is involved." The data analysed allowed CMS to rule out that more than approximately 1.9% of Higgs bosons could transform into Zρand more than 0.6% could transform into Zφ. While these limits are much greater than the predictions from the Standard Model, they demonstrate the ability of the detectors to make inroads in the search for physics beyond the Standard Model.

The so-called "dark sector" includes hypothetical particles that could make up dark matter, the mysterious element that accounts for more than five times the mass of ordinary matter in the universe. Scientists believe that the Higgs boson could hold clues as to the nature of dark-matter particles, as some extensions of the Standard Model propose that a Higgs boson could transform into dark-matter particles. These particles would not interact with the ATLAS and CMS detectors, meaning they remain "invisible" to them. This would allow them to escape direct detection and manifest as "missing energy" in the collision event. At LHCP, ATLAS presented their latest upper limit – of 13% – on the probability that a Higgs boson could transform into invisible particles known as weakly interacting massive particles, or WIMPs, while CMS presented results from a new search into Higgs transformations to four leptons via at least one intermediate "dark photon", also presenting limits on the probability of such a transformation occurring at the LHC.

The Higgs boson continues to prove invaluable in helping scientists test the Standard Model of particle physics and seek physics that may lie beyond. These are only some of the many results concerning the Higgs boson that were presented at LHCP. You can read more about them on the ATLAS and CMS websites.

Technical note When data volumes are not high enough to claim a definite observation of a particular process, physicists can predict the limits that they expect to place on the process. In the case of Higgs transformations, these limits are based on the product of two terms: the rate at which a Higgs boson is produced in proton–proton collisions (production cross-section) and the rate at which it will undergo a particular transformation to lighter particles (branching fraction).

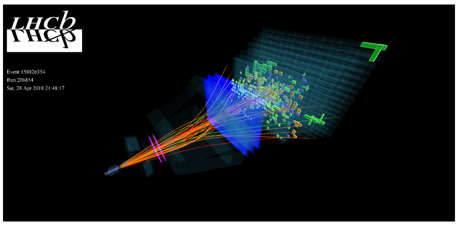
ATLAS expected to place an upper limit of 1.7 times the Standard Model expectation for the process involving Higgs transformations to a Z boson and a photon (H→ Zγ) if such a transformation were not present; the collaboration was able to place an upper limit of 3.6 times this value, approaching the sensitivity to the Standard Model's predictions. The CMS searches were for a much rarer process, predicted by the Standard Model to occur only once in every million Higgs transformations, and the collaboration was able to set upper limits of about 1000 times the Standard Model expectations for the H→ Zρand H→ Zφprocesses.

Links to the papers and notes

- ATLAS search for H→ Zγ: https://cds.cern.ch/record/2717799
- CMS search for H→ Zρor H→ Zφ: https://cds.cern.ch/record/2718949
- ATLAS search for "invisible" transformations of the Higgs boson: https://cds.cern.ch/record/2715447
- CMS search for Higgs transformations involving a dark photon: https://cds.cern.ch/record/2718976

ALLEN INITIATIVE – SUPPORTED BY CERN OPENLAB – KEY TO LHCB TRIGGER UPGRADE

From 2021, the first stage of LHCb's high-level trigger will be run using GPUs. Investigations into its feasibility were supported by CERN openlab



(Image: LHCb/CERN)

Last week, the LHC Experiments Committee formally accepted a proposal for a new first stage of the high-level trigger (HLT) for LHCb. LHCb is one of the four main experiments on the Large Hadron Collider (LHC). It is exploring what happened after the Big Bang that allowed matter to survive and build the Universe we see today.

Like the other experiments on the LHC, LHCb uses a 'trigger' system to filter the huge amount of data produced by particle-collision events within its detectors. About 1 in 500 collision events are selected for further analysis. This trigger system is split into two levels: HLT 1, which reduces the data rate from around 40Tbit/s to 1–2 Tbit/s, and HLT 2, which reduces this further to 80 Gbit/s. This is then sent to storage and analysed using the Worldwide LHC Computing Grid (WLCG).

Until now, both HLT 1 and HLT 2 have been carried out using a farm of traditional computer chips called CPUs, which stands for 'central processing unit'. The new system – set to go into production in 2021 – will see HLT 1 run instead on graphical processing units (GPUs). The highly parallelised structure of GPUs can make them more efficient than general-purpose CPUs for running algorithms that process large blocks of data in parallel.

Researchers at LHCb have been exploring the potential of GPUs for their trigger systems since around 2013. Building on that foundational work, this new system is the specific result of intense investigations carried out over the last two years, through an initiative called Allen, which is named after the pioneering computer scientist Frances Elizabeth Allen. The three lead developers for the Allen team are, Dorothea vom Bruch, a postdoctoral researcher from the French Laboratory of Nuclear and High-Energy Physics (LPNHE); Daniel Cámpora, a postdoctoral researcher from the University of Maastricht and the Dutch National Institute for Subatomic Physics (Nikhef), who was a PhD student during most of Allen's development, co-supervised between CERN and the University of Sevilla in Spain; and Roel Aaij, a software engineer at Nikhef, who also played a major role in the development and commissioning of LHCb's Run 1 and 2 HLT systems.

The Allen team's new system can process 40 Tbit/s, using around 500 NVIDIA Tensor Core GPUs. It matches – from a physics point of view – the reconstruction performance for charged particles achieved on traditional CPUs. It has also been shown that the Allen system will not be limited in terms of memory capacity or bandwidth. Plus, not only can it be used to perform reconstruction, but it can also take decisions about whether to keep or reject collision events.

A diverse range of algorithms has been implemented efficiently on Allen. This demonstrates the potential for GPUs not only to be used as computational accelerators in high-energy physics, but also as complete and standalone data-processing solutions. Other LHC experiments are also investigating the potential of GPUs; the ALICE experiment already used them in production for their HLT in Run 2.

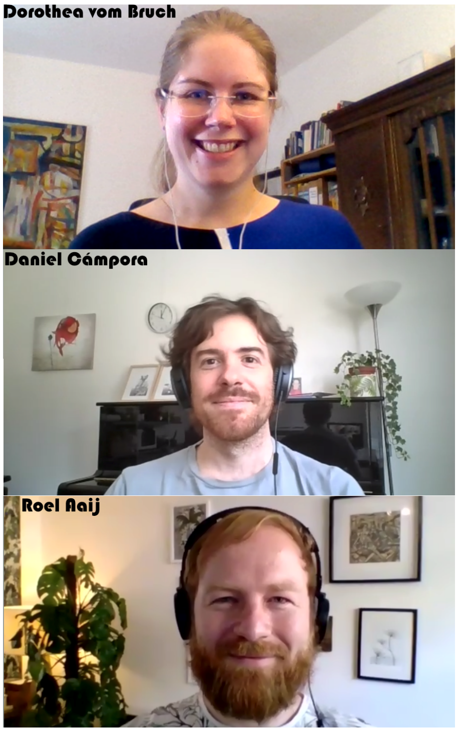
"We knew that this was an interesting avenue to explore, but we were surprised it worked out so quickly," says Vladimir Gligorov of LPNHE, who leads LHCb's Real Time Analysis project. "Over the last two years, the LHCb HLT team made the CPU HLT almost ten times faster, so it could work as planned, which is itself a huge achievement, and then this blue-skies project paid off as well. Now we can have the best of both worlds."

The Allen initiative has received support through a CERN openlab project with the Italian company E4 Computer Engineering, which deploys hardware from NVIDIA. This project provides a testbed for GPU-accelerated applications, with several use cases spread across various LHC experiments.

"Through the CERN openlab project, the team was able to capitalise on E4 Computer Engineering's expertise and strong links with NVIDIA," explains Maria Girone, CERN openlab CTO. "This helped ensure the team was supplied with GPUs on which to run tests, and meant there was a good link with the NVIDIA engineers, who provided advice for helping to make the code run as efficiently as possible on the GPUs. This kind of interaction with industry plays an important role in accelerating innovation and helps us to solve the computing challenges posed by the LHC's ambitious upgrade programme."

"CERN openlab has played an important role in bringing together various teams across the laboratory and the experiments who are exploring the potential of GPUs," explains Gligorov. "Seeing that others were exploring this technology too helped give us the confidence to push forward with these investigations. We're certainly glad we did, as they've really paid off."

This article originally appeared on the CERN openlab website. Read more about the new HLT 1 system in an article published on 30 April in the journal (https://link.springer.com/article/10.1007%2Fs41781-020-00039-7) Computing and Software for Big Science .

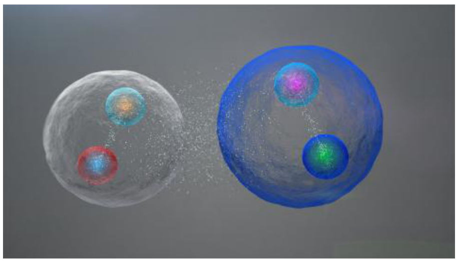


The lead developers of the Allen initiative (Image: CERN)

Andrew Purcell

CERN COLLABORATIONS PRESENT NEW RESULTS ON PARTICLES WITH CHARM QUARKS

The ALICE, CMS and LHCb collaborations present new measurements that show how particles containing charm quarks can serve as “messengers” of hadrons and the quark–gluon plasma, carrying information about these forms of matter



The Xc1(3872) hadron, which contains charm quarks, could be a pair of two-quark particles loosely bound together (Image: CERN)

This media update is part of a series related to the 2020 Large Hadron Collider Physics conference, taking place from 25 to 30 May 2020. Originally planned to take place in Paris, the conference is being held entirely online due to the COVID-19 pandemic.

The ALICE, CMS and LHCb collaborations at CERN present new measurements that show how charmed particles – particles containing charm quarks – can serve as “messengers” of two forms of matter made up of quarks and gluons: hadrons, which make up most of the visible matter in the present-day universe; and the quark–gluon plasma, which is thought to have existed in the early universe and can be recreated in heavy-ion collisions at the Large Hadron Collider (LHC). By studying charmed particles, physicists can learn more about hadrons, in which quarks are bound by gluons, as well as the quark–gluon plasma, in which quarks and gluons are not confined within hadrons.

The main results are:

The LHCb team obtained the most precise yet measurements of two properties of a particle known as $\chi_{c1}(3872)$, a hadron containing charm quarks. The particle was discovered in 2003 and it has remained unclear whether it is a two-quark hadron, a more exotic hadron such as a tetraquark – a system of four quarks tightly bound together – or a pair of two-quark particles weakly bound in a molecule-like structure. Pinning down the nature of this hadron could extend physicists' understanding of how quarks bind into hadrons. “Our results are consistent with $\chi_{c1}(3872)$ being a pair of two-quark particles loosely bound together, but it does not fully rule out the tetraquark hypothesis or other possibilities,” says LHCb spokesperson Giovanni Passaleva.

The CMS collaboration observed for the first time the transformation, or “decay”, of another particle, called B^0_s, into the same $\chi_{c1}(3872)$ particle. The researchers compared this decay with the previously observed decay of the B^+meson, which had led to the first detection of the $\chi_{c1}(3872)$

in 2003. Both types of decay link the behaviour of this hadron to the up and strange quarks. “Measured differences in the decay rates are intriguing and could provide further insight into the nature of the $\chi_{c1}(3872)$, which has not yet been fully established,” says CMS spokesperson Roberto Carlin.

The ALICE collaboration measured the so-called elliptic flow of hadrons containing charm quarks, in heavy-ion collisions. The hadrons are created during collisions that also create a quark–gluon plasma. Hadrons containing heavy quarks, like the charm quark, are excellent “messengers” of the quark–gluon plasma, meaning they carry important information about it. “The pattern observed by ALICE indicates that the heavy charm quarks are dragged by the quark–gluon plasma's expansion,” says ALICE spokesperson Luciano Musa.

Looking forward, the LHC collaborations aim to make more precise measurements of these messengers of the quark world using data from the next LHC run, which will benefit from largely upgraded experiment set-ups.

Read more below for a comprehensive description of these results.

Charm quark results related to hadrons

The LHCb and CMS collaborations describe results from their studies of a hadron known as $\chi_{c1}(3872)$. The particle was discovered in 2003 by the Belle experiment in Japan but it has remained unclear whether it is a two-quark hadron, a more exotic hadron such as a tetraquark – a system of four quarks tightly bound together – or a pair of two-quark particles weakly bound in a molecule-like structure.

Pinning down the nature of $\chi_{c1}(3872)$ could extend physicists' understanding of how quarks bind into hadrons. The new studies by the CMS and LHCb collaborations shed new light on – but do not yet fully reveal – the nature of this particle.

Using sophisticated analysis techniques and two different datasets, the LHCb team obtained the most precise measurements yet of the particle's mass and determined for the first time and with a significance of more than five standard deviations the particle's “width”, a parameter that determines the particle's lifetime. Until now researchers had only been able to obtain upper limits on the allowed values of this parameter. The LHCb researchers detected $\chi_{c1}(3872)$ particles in their datasets using the classic “bump”-hunting technique of searching for an excess (the bump) of collision events over a smooth background. Each dataset led to a measurement of the mass and width, and the results from both datasets agree with each other.

“Our results are not only the most precise yet, they also show that the mass of $\chi_{c1}(3872)$ is remarkably close to the sum of the masses of the $D^0$and D^{*0}charmed mesons,” says LHCb spokesperson Giovanni Passaleva. “This is consistent with $\chi_{c1}(3872)$ being a pair of two-quark particles loosely bound together, but it does not fully rule out the tetraquark hypothesis or other possibilities.”

Meanwhile, analysing a large dataset recorded over the course of three years, the CMS collaboration observed for the first time the transformation, or “decay”, of the B^0_s particle into the $\chi_{c1}(3872)$ and a φmeson. This two-quark particle, B^0_s, is a relative of the B^+meson, in the decay of which the Belle experiment first detected $\chi_{c1}(3872)$. Like the LHCb team, the CMS team detected $\chi_{c1}(3872)$ using the bump technique.

“Our result is particularly interesting because we found that the rate at which the B^0_s decays to the hadron $\chi_{c1}(3872)$ and the φmeson is similar to that of the B^0into $\chi_{c1}(3872)$ and an anti-K^0meson, whereas it is about twice as low as that for the previously observed B^+decay into $\chi_{c1}(3872)$ and the K^+meson,” says CMS spokesperson Roberto Carlin. “In these decays, different quarks, other than the bottom quark, play a role,” Carlin explains. “The fact that the decay rates do not follow an obvious pattern may shed light on the nature of $\chi_{c1}(3872)$.”

Charm quark results related to the quark–gluon plasma

At the other end of the quark-binding spectrum, the ALICE collaboration measured the so-called elliptic flow of hadrons containing a charm quark, either bound to a light quark (forming a D meson) or to an anticharm (making a J/ψmeson) in heavy-ion collisions. Hadrons containing heavy quarks, charm or bottom, are excellent messengers of the quark–gluon plasma formed in these collisions. They are produced in the initial stages of the collisions, before the emergence of the plasma, and thus interact with the plasma constituents throughout its entire evolution, from its rapid expansion to its cooling and its eventual transformation into hadrons.

When heavy nuclei do not collide head on, the plasma is elongated and its expansion leads to a dominant elliptical modulation of the hadrons' momentum distribution, or flow. The ALICE team found that, at low momentum, the elliptic flow of D mesons is not as large as that of pions, which contain only light quarks, whereas the elliptic flow of J/ψmesons is lower than both but distinctly observed.

“This pattern indicates that the heavy charm quarks are dragged by the quark–gluon plasma's expansion,” says ALICE spokesperson Luciano Musa, “but likely to a lesser extent than light quarks, and that both D and J/ψmesons at low momentum are in part formed by the binding, or recombination, of flowing quarks.”

Another measurement performed by the ALICE team – of the flow of electrons originating from decays of B hadrons, containing a bottom quark – indicates that bottom quarks are also sensitive to the elongated shape of the quark–gluon plasma. Upsilon particles, which are made up of a bottom quark and its antiquark, as opposed to a charm and anticharm like the J/ψ, do not exhibit significant flow, likely because of their much larger mass and the small number of bottom quarks available for recombination.

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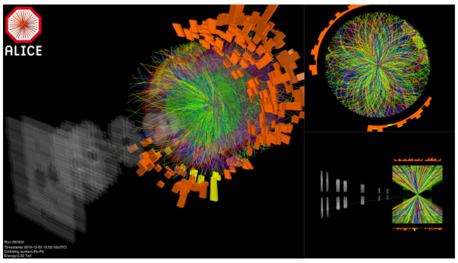
Read more on the CMS and LHCb websites:

- https://cms.cern/news/discreet-charm-x3872
- https://lhcb-public.web.cern.ch/Welcome.html#X(3872)2020

Original papers:

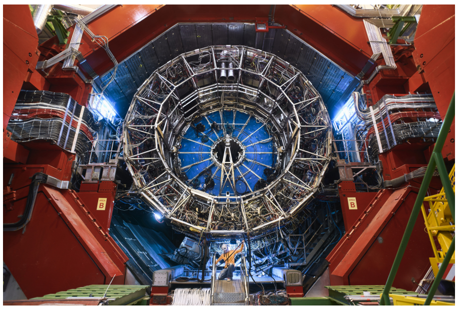
- ALICE: https://arxiv.org/abs/2005.11131
- ALICE: https://arxiv.org/abs/2005.11130
- ALICE: https://arxiv.org/abs/2005.14518
- CMS: https://arxiv.org/abs/2005.04764
- LHCb: https://arxiv.org/abs/2005.13422
- LHCb: https://arxiv.org/abs/2005.13419



An illustration of heavy-ion collisions recorded by ALICE. The colored lines represent the reconstructed trajectories fo charged particles produced from the collision (Image: CERN)

FRESH ANTIMATTER STUDY BY ALICE COLLABORATION WILL HELP WITH THE SEARCH FOR DARK MATTER

The study of light antinuclei – from creation to annihilation – will bolster future indirect dark matter searches



A view of the underground ALICE detector used in the study of the antideuteron (Image: CERN)

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The ALICE collaboration has presented new results on the production rates of antideuterons based on data collected at the highest collision energy delivered so far at the Large Hadron Collider. The antideuteron is composed of an antiproton and an antineutron. The new measurements are important because the presence of antideuterons in space is a promising indirect signature of dark matter candidates. The results mark a step forward in the search for dark matter.

Recent astrophysical and cosmological results point towards dark matter being the dominant form of matter in the universe, accounting for approximately 85% of all matter. The nature of dark matter remains a great mystery, and cracking its secrets would open a new door for physics.

Detecting antideuterons in space could be an indirect signature of dark matter, since they could be produced during the annihilation or decay of neutralinos or sneutrinos, which are hypothetical dark matter particles.

Various experiments are on the hunt for antideuterons in the Universe, including the AMS detector on the International Space Station. However, before inferring the existence of dark matter from the detection of these nuclei, scientists must account for both their rates of production by other sources (namely, collisions between cosmic rays and nuclei in the interstellar medium) and the rates of their annihilation caused by encountering matter on their journey. In order to assert that the detected antideuteron is related to the presence of dark matter, the production and annihilation rates must be well understood.

By colliding protons in the LHC, ALICE scientists mimicked antideuteron production through cosmic ray collisions, and could thus measure the production rate associated with this phenomenon. These measurements provide a fundamental basis for modelling antideuteron production processes in space. By comparing the amount of antideuterons detected with that of their matter counterparts (deuterons, which do not annihilate in the detector), they were able to determine, for the first time, the annihilation probability of low-energy antideuterons.

These measurements will contribute to future antideuteron studies in the Earth's vicinity, and help physicists determine whether they are signatures of the presence of dark matter particles, or if on the contrary they are manifestations of known phenomena.

In the future, these types of studies at ALICE could be extended to heavier antinuclei. “The LHC and the ALICE experiment represent a unique facility to study antimatter nuclei,” says ALICE Spokesperson Luciano Musa. “This research will continue to provide a crucial reference for the interpretation of future astrophysical dark matter searches.”

Further reading:

- Measurement of the low-energy antideuteron inelastic cross section [PDF]: arXiv:2005.11122
- (Anti-)Deuteron production in pp collisions at $\sqrt{s} = 13$ TeV [PDF]: arXiv:2003.03184

CERN'S KNOWLEDGE TRANSFER GROUP INVITES YOU TO MAKE AN IMPACT ON SOCIETY

As part of its knowledge-transfer mission, CERN's Knowledge Transfer group (CERN KT) supports the application of CERN's technology and its researchers' advanced skills and knowledge in many different areas.

The people working at CERN possess unique know-how and expertise, and cutting-edge technologies are continuously being developed at the Laboratory. These may have great potential outside of CERN, and could have a positive impact on whole industries, as well as society in general. However, this does not happen all by itself, and sometimes it can be helpful to have support during the process of commercialisation.

The CERN KT group has knowledge and experience in the various aspects of taking innovative ideas to the market, and can help you understand the potential of your technology, assisting you through any stage of the technology transfer process with a tailored strategy, while supporting your work with dedicated funds and incentives. More specifically, we offer assistance with:

- Market assessment
- Patentability studies
- Technology disclosure
- Intellectual Property management
- Contract negotiation
- Financial support
- Assistance in spin-off creation
- Formal and practical training in business, entrepreneurship and knowledge transfer

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Find out about the ways you can get involved in CERN's Knowledge Transfer activities on: kt.cern/cern-community

Contact us: kt@cern.ch

Discover CERN's Knowledge Transfer Highlights 2019 [PDF] (https://kt.cern/sites/knowledgetransfer.web.cern.ch/files/file-uploads/annual-report/knowledge-transfer-highlights-2019.pdf)

COMPUTER SECURITY: DON'T ANSWER ME

Last year, the CERN Security Operations Centre detected 27 CERN hosts contacting so-called “tracking domains” used for reconnaissance and associated with national state-sponsored actors

Sometimes, occasionally, maybe not very often, it is good to pretend you're not there. Pretend you haven't heard. Or ignore what just has been sent. Because you just don't want to interact. Because you just don't want to talk. Or because you just don't want to reply. With regard to e-mails, however, your e-mail client might expose your reluctance against your will...

Last year, the CERN Security Operations Centre detected 27 CERN hosts contacting so-called “tracking domains” used for reconnaissance and associated with national state-sponsored actors. A CERN researcher was using a shady Google Chrome extension (installed from the official Google Chrome Web Store) for e-mail tracking, and sent a number of legitimate e-mails to many people and lists, via Gmail in Chrome. The shady Google Chrome extension silently added malicious HTML code to each of the e-mails sent via Gmail. As a result, the recipients who had not disabled “Remote Content Loading” in their e-mail client inadvertently visited the malicious tracking domains (see our corresponding monthly report (*https://cern.ch/security/reports/en/monthly_reports.shtml*)). And it is this “Remote Content Loading” which, when enabled, exposes you to the e-mail sender, telling him or her that you at least opened that e-mail (and, subsequently, most likely read it).

If enabled in your e-mail client, the “Remote Content Loading” feature automatically downloads any embedded images, photos or similar content from a remote webpage once you open an e-mail with remotely provided content. Nice for those who like colourful texts. Or not, as this also implies that the remote site knows to whom to send that remote content, i.e. you, and can link this to the time when the content is loaded. Overall, this allows the remote site to know at which particular time you opened, checked out and read a specific e-mail...

Usually, lots of SPAM but also legitimate e-mail advertising campaigns (those to which you have subscribed) use this feature in order to better track and monitor your e-mailing behaviour, e.g. whether and when you read the e-mail. Even individuals can use that feature to learn quickly whether you read their e-mail even if you were not replying to it (e.g. by using that aforementioned Chrome extension). You can imagine how this can create conflicts: “I sent you that e-mail the other day.” “I haven't received it...” “You DID actually!”...

Hence, in order to enhance your privacy, we suggest that you turn off the “Remote Content Loading” feature of your preferred e-mail client. Unfortunately, this is not the default for all e-mail clients, so it's worth checking if you value your privacy: Kopano, Outlook, Thunderbird, MacOS Mail, iOS Mail app, Gmail and while you are at it, check also that the automatic sending of “Read Receipts” is toggled to off.

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

EASING OF THE RESTRICTIONS CONCERNING ENTRY INTO SWITZERLAND AND FRANCE

Switzerland

As of 15 June 2020, controls at the borders between Austria, France, Germany and Switzerland will be abolished, travel restrictions will be lifted and the free movement of people between the four countries will be fully re-established.

If the status of the pandemic in Switzerland and in the member states of the European Union and the European Free Trade Association (EFTA) so permits, the Swiss Federal Council is expected to lift the restrictions on entry into Switzerland from all Schengen states by 6 July 2020 at the latest.

A decision on whether to lift entry restrictions for those arriving from non-Schengen countries will be taken at a later date, in consultation with the Schengen member states.

In this context, we remind you that:

- Members of the CERN personnel (and their family members) who are resident in countries for which the restrictions on entry into Switzerland have not been lifted but who need to enter Switzerland to take up their functions must be able to provide proof of the reason for their entry into Switzerland, even if they are not subject to visa requirements;
- To allow them to enter Switzerland, CERN must inform the Swiss mission of their arrival by means of a *note verbale* stating the reason for their travel, which must be submitted, accompanied by a copy of the passport, **at least five working days before the date of travel** ;
- The Swiss mission then draws up a document for each person concerned, authorising them to enter Switzerland;
- Transit via Switzerland continues to be authorised.

France

All travellers entering mainland France from abroad must complete and carry with them the appropriate international travel certificate (*https://www.interieur.gouv.fr/Actualites/L-actu-du-Ministere/Attestation-de-deplacement-et-de-voyage*).

From 25 May 2020, travellers must also, upon arrival in France, present a written self-declaration certifying that they do not have any symptoms of the COVID-19 virus.

Travellers arriving from outside Europe (all countries, except the members of the European Union [excluding Spain], Andorra, Iceland, Lichtenstein, Monaco, Norway, San Marino, Switzerland and the Vatican), and travellers arriving (by air only) from the United Kingdom (as of 8 June) and Spain, are invited, upon arrival on French territory, to undergo a period of 14 days of voluntary quarantine (*https://www.service-public.fr/particuliers/actualites/A14060*) at home or in dedicated premises made available to them.

Travellers arriving from within Europe (members of the European Union [excluding Spain], Andorra, Iceland, Lichtenstein, Monaco, Norway, San Marino, Switzerland and the Vatican) are not subject to any particular measures upon arrival on French territory, provided that they do not have any symptoms of the COVID-19 virus. The personnel of international organisations having their headquarters or an office in France, including CERN, together with their spouses and children, are exempt from the voluntary quarantine measure (unless they have symptoms).

Further information can be found in the following documents:

- Switzerland:
  - *Coronavirus: Further easing of entry restrictions from 8 June (https://www.admin.ch/gov/en/start/documentation/media-releases/media-releases-federal-council.msg-id-79248.html)* – Press release of 27 May 2020
  - *Coronavirus: Switzerland to reopen its borders with all EU/EFTA states on 15 June* (*https://www.admin.ch/gov/en/start/documentation/media-releases/media-releases-federal-council.msg-id-79365.html*) – Press release of 5 June 2020
- France: *Restrictions de circulation et mise en place de mesures sanitaires aux frontières (https://www.interieur.gouv.fr/Actualites/Communiques/Restrictions-de-circulation-et-mise-en-place-de-mesures-sanitaires-aux-frontieres)* (only in French) – Press release of 22 May 2020

Announcements

ENTRANCE B: CYCLISTS MUST EXIT THROUGH THE ACCESS CONTROL GATE

As of Wednesday, 10 June 2020, cyclists will be required to use the access control gate to the right of Entrance B when they leave the Meyrin site

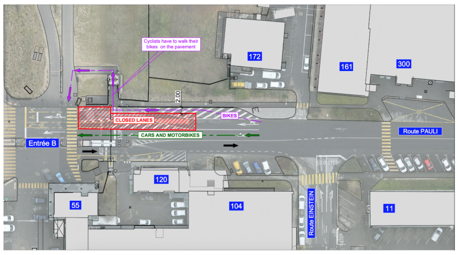
As of Wednesday, 10 June 2020, cyclists will be required **to use the access control gate to the right of Entrance B when they leave the Meyrin site** (see map) so that their exit can be registered (which is not the case when they use the road).

This gate, which is generally used by pedestrians and tour groups, registers all departures, making it possible to determine the number of people on the Meyrin site at a given moment.

This measure is being introduced in the context of COVID-19, because it is essential to know how many people are present on the CERN sites at all times.

Please note that the bicycle turnstiles at Entrances A, C and E, which already register departures, continue to operate normally.

Thank you for your understanding.



PREPARING FOR RETIREMENT: SEMINARS FOR STAFF

If you are a **staff member** and considering retirement in the next one or two years, we encourage you to participate in two special seminars, organised by the Human Resources Department.

Retirement marks the end of a person's professional career and the start of a new chapter in life. Research shows that this transition is easier for those who are well informed and prepared.

This programme consists of two seminars:

> **Leaving CERN** (half day): an information seminar at CERN, with presentations by internal speakers.

- organised once per year,
- next session scheduled on **Thursday 8 October**, afternoon.

> **Preparation for retirement** (2.5 days): a seminar organised at ILO, for international civil servants from different organisations in Geneva.

- organised once a year, with simultaneous translation in English/French,
- next session in the Autumn, exact dates not yet known but you can already enroll now.

Spouses and registered partners can also attend these seminars. Note that depending on the evolution of the pandemic, these seminars might be converted into online seminars.

Enrollment and more info via the CERN Learning Hub (Browse Catalogue, then select Your career@CERN, then Leaving CERN).

Learning & Development Group
HR Department
your.career@cern.ch

HR Department

JOIN OUR FIRST WORLDWIDE WEBFEST

The 'Webfest' – CERN's annual hackathon based on open web technologies – will take place online for the first time this year. It will be held over the weekend of 27-28 June (with a pitch session on Friday 26 June, and winners announced on Monday 29 June). The event is open to all, meaning that people from anywhere in the world can take part.

Held each year since 2012, the Webfest brings together bright minds to work on creative projects. Participants work in small teams, often designing web and mobile applications that help people engage with CERN's research, physics, or even science in general.

In previous versions of the Webfest, participants have worked on a wide range of exciting projects: from physics-themed video games to cheap mobile-phone cosmic-ray detectors, and from skills-sharing platforms to tools for translating sign language to text. And yes, these were all developed – or at least working prototypes were – over just one weekend!

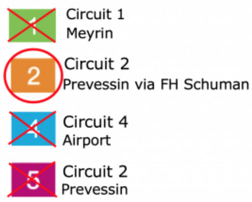
The Webfest isn't just for those that can code: anyone with an idea, a challenge, or other skills is welcome to take part.

The theme for this year's event is ' **working together apart: accelerating collaboration** '. Given the global COVID-19 crisis, we are particularly keen to see projects that address the evolving ways in which we work together. Building on CERN's strong history of international collaboration, the Webfest provides an excellent opportunity to create tools to support the changing ways in which we do science.

Join us via the web – born at CERN – to help shape the future scientific collaboration!

Please find more information on the Webfest and how to register here: https://webfest-online.web.cern.ch. Registration closes at 23:59 CEST on Wednesday 24 June.

CERN SHUTTLE SERVICE REOPENING



The gradual reopening of the CERN site will allow the shuttle service to restart **circuit 2 from Monday 15 June 2020 onwards.** Circuit 2 brings passengers from the main building on the Meyrin site (building 500) to the Prévessin site, stopping at Schuman Hostel in Saint-Genis-Pouilly.

The other circuits will remain inactive until further notice.

Thank you for your understanding,

Mobility services - SMB-SIS

8 JUNE: REOPENING OF ENTRANCE C AND CERN'S RECEPTION

Entrance C on the Meyrin site (Route Maxwell) will reopen to cars on Monday, 8 June (opening hours: 7.00 a.m. – 7.00 p.m.).

The CERN Reception (Building 33) will also reopen on Monday, 8 June, with the following opening hours: 8.00 a.m. to 5.45 p.m. Monday to Friday (except official CERN holidays).

Due to the civil engineering work currently under way in the vicinity, it will not be possible to reopen Entrance A (Route Bohr) in the immediate future.

Thank you for your understanding.

The SMB department

OPENING OF CERN RESTAURANT 1

CERN Restaurant 1 is now open for eating in from 7.00 a.m. to 3.00 p.m.

CERN Restaurant 1 is now open for eating in from 7.00 a.m. to 3.00 p.m.

It is also still possible to order your meals in advance via MyNovae (orders to be collected from Restaurant 1).

Please note that all other CERN restaurants and cafeterias remain closed.

Due to the current situation, we ask you to follow the hygiene measures recommended by HSE:

- it is compulsory to wear a mask, except when seated at a table to eat,
- maintain a distance of at least 2 metres between individuals,
- observe the signage for the flow of people,
- disinfect your hands before entering the restaurant and/or before picking up an order,
- work meetings and family meals are prohibited.

The whole restaurant team looks forward to welcoming you and thanks you for following the recommendations.

Ombud's corner

2019 OMBUD'S REPORT

I recently presented the 2019 Ombud's Report to the CERN Management and then to TREF, and I'd like to outline the main points for you here.

In 2019, 74 of our colleagues (around 1.3% of CERN's personnel) came to see me. Just under half were staff members, on both LD and IC contracts. As in previous years, the number of women who consulted me was two and a half times higher relative to CERN's female population than the number of men.

As was also the case in previous years, disagreements with the hierarchy represented the majority of the cases discussed. Among other matters, my visitors complained that their supervisors don't know enough about what's going on in their section, that they “micromanage” or that they could organise the section more effectively.

In second place were cases relating to the work environment. Half of these concerned sexism or sexual harassment, with all such behaviour being reported by female colleagues.

In third place came conflicts between colleagues: lack of respect, communication problems and unresolved disputes.

Joint next in line were complaints about career progression and non-compliance with CERN's Code of Conduct. In this last category, some of the people who came to see me reported abuse of power, conflicts of interest and withholding of information.

Conclusions:

I'm aware that my annual report is based on a small number of cases and, moreover, that it seems to contradict the results of the internal and external surveys carried out in 2019, which reflect a different reality, expressed by a representative number of surveyed individuals. However, what I hear in my office is also a concrete reality. Although the cases that people consult me about probably fall at the very end of the spectrum of problems encountered at CERN, it is important to be aware of their existence. The conclusions of my report take on their full significance when cross-referenced with the observations of the other support services over several years.

CERN's support services are a safety net for all of its personnel, whichever type of contract they hold, and it's partly thanks to these services, which include the Ombud's office, that the Organization can remain competitive on the job market. Never hesitate to use them.

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.