

Welcome! But why?

Practicalities, CERN, and IdeaSquare

June 1st 2022 Laura Wirtavuori & Catarina Batista





Laura Wirtavuori

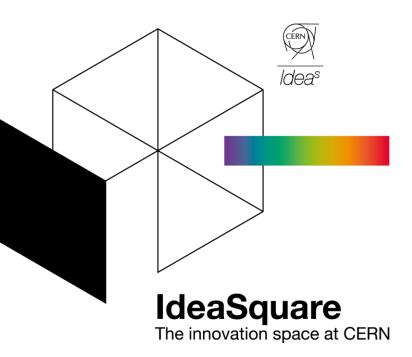
- Idea Shepherd at CERN IdeaSquare
- Working for students
- Studied industrial engineering and management, with organisational psychology as major
- Freeskier, climber, and outdoors lover



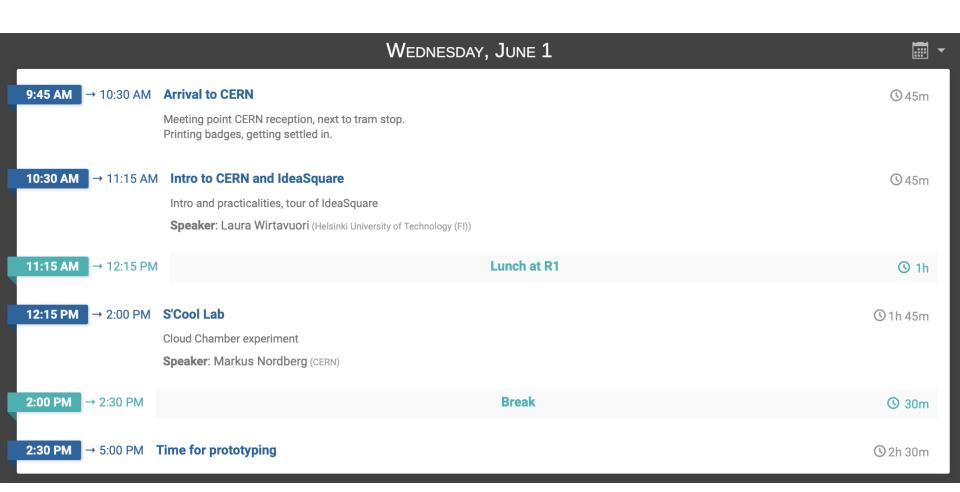
Catarina Batista

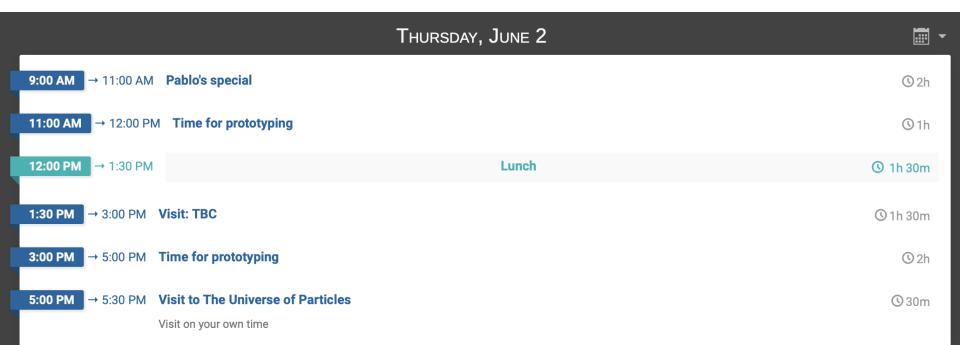
- Mindset Accelerator at CERN IdeaSquare
- Studied Product and Service Innovation and now Psychology
- Passionate about education
- European nomad, generalist and animal lover.

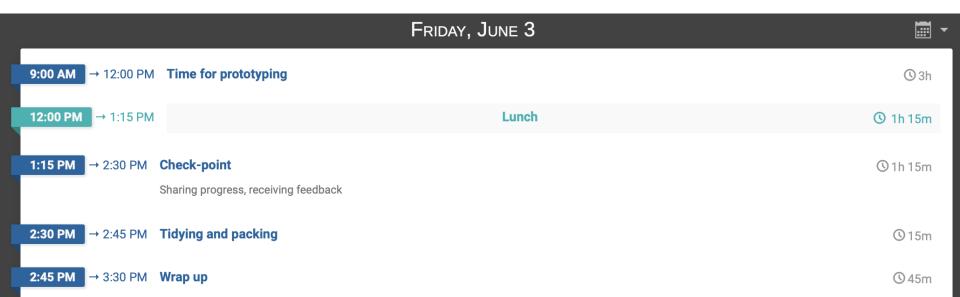


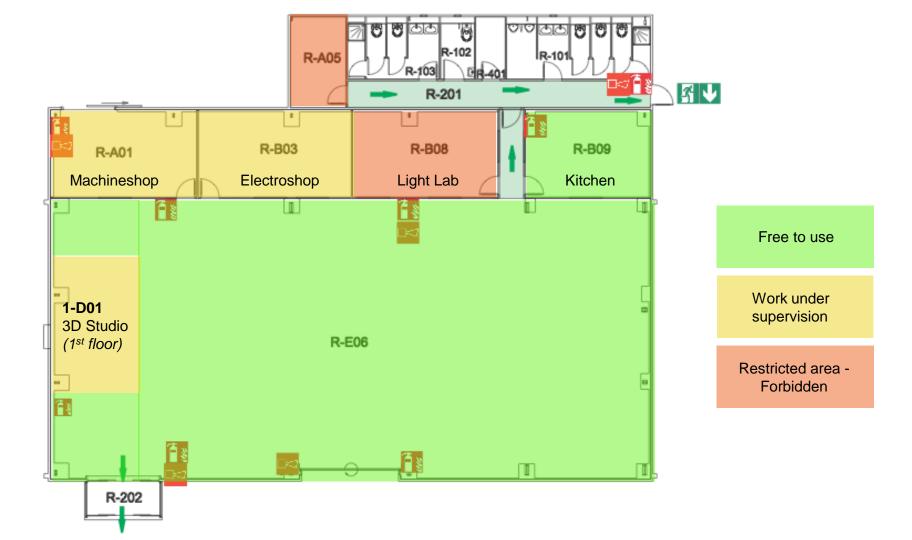


Practicalities





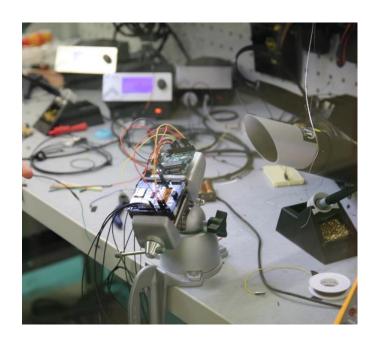




Keep in mind that you are on CERN site

- CERN is fun, but not an amusement park. Respect the work of others, keep your voice down when walking in CERN corridors.
- Do not go around the CERN site alone. While moving around CERN, you should always be accompanied by an authorized person (IdeaSquare staff or someone from teaching team)

Workshop Safety



You are allowed to modify things, you are not allowed to modify yourself.

- Jami Sarnikorpi

- Handheld tools? OK
- Electrically powered tools? Check with Jami
- Do not work alone

Don't know how something works? Ask!

Make sure to unplug electrical equipment when you are not using it. This is especially important for the glue guns.

In case of emergency

While evacuating, always go away from the danger!



Do NOT return to collect your belongings



Walk quickly and calmly to your building's designated assembly point or as advised by an Emergency Guide or Fire Brigade personnel



Wait at the assembly point until counted and released by the TSO/DSO or the Fire Brigade.

Give to the Fire Brigade all the information they need! +41 22 767 44 44

DO...

- ...forget about climbing on top of the containers or the bus
- ...refrain from consuming or storing alcohol inside IdeaSquare
- ...walk around with your visitor card and ID
- …leave using illegal software or downloading illegally to when you are not connected to the CERN network

Keeping places tidy

- Please, please:
 - Bring all coffee cups, plates, dishes to kitchen, and put them inside the dish washer.
 - Clean more than you mess to fight the enemy called entropy.





Covid things

How **NOT** to Wear a Mask



"The Escape Hatch"



"The Earring"



"The Sniffer"



"The Stache"



"The Nose Plug"



"The Neckbeard"

- wear a mask
- keep washing your hands
- do not come in if you feel sick
- let us know if you feel sick

Containers



Double container

14 people



Red bus

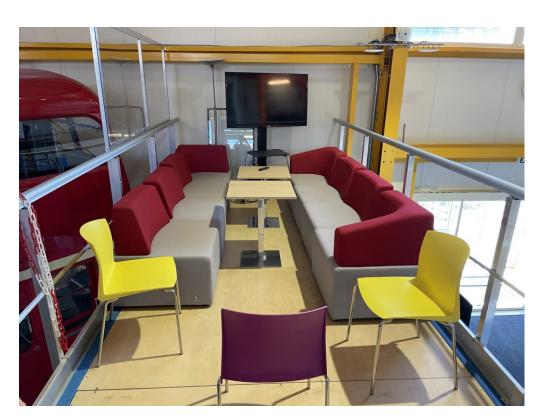
8 people upstairs,

10 people downstairs



Open meeting area

7 people

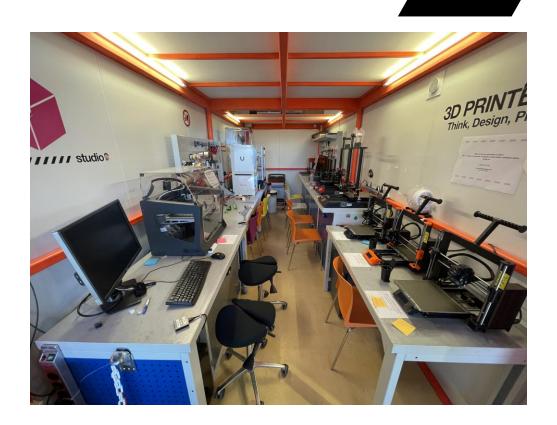


Workshops

3d studio: 5 people

machine shop: 6 people

electro shop: 7 people



Kitchen

6 people



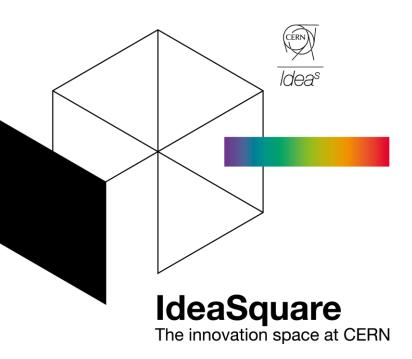


This is a CO₂ monitoring device.

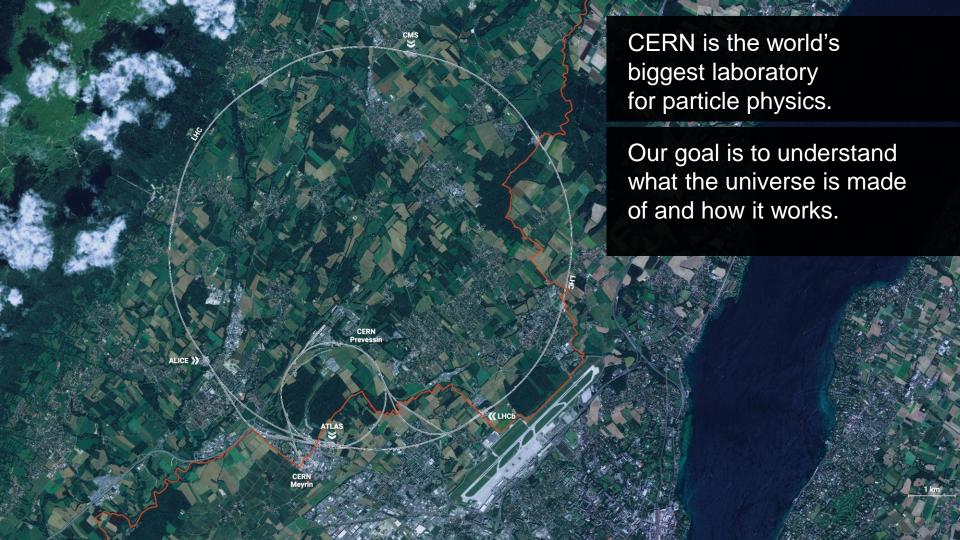
There is one in every room inside ID2.

If the value is over 900ppm:

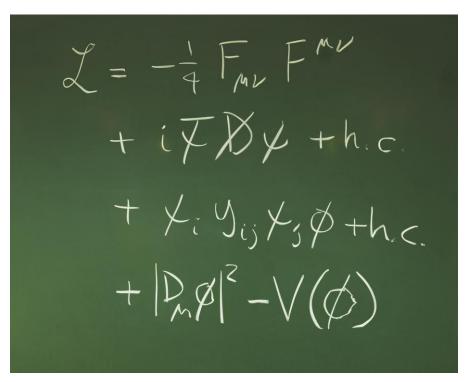
- Leave the room you are in to let it ventilate until the CO₂ concentration goes below 600 ppm.;
- Ask one of the ID2 members to open the main doors to ventilate the whole space.



What is CERN



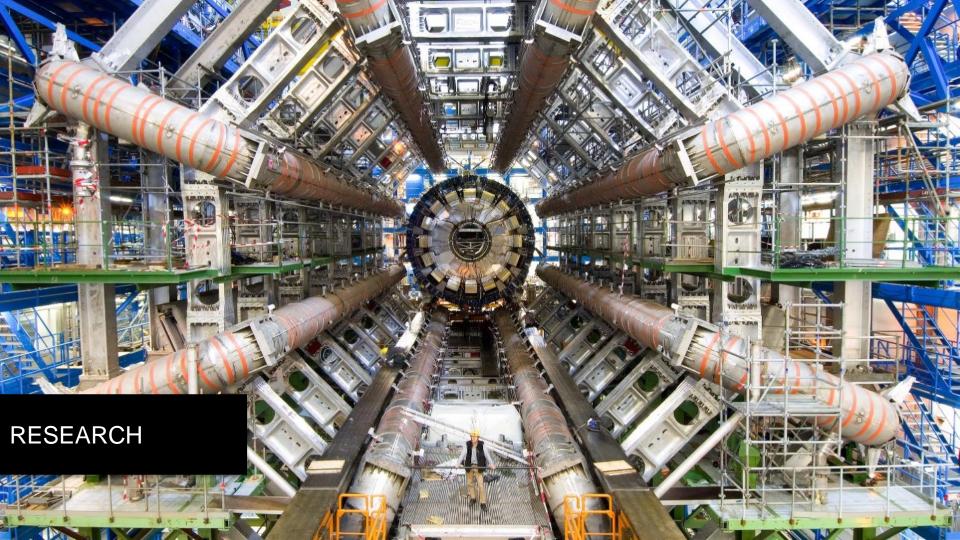
CERN's Mission



CERN provides a range of particle accelerators for scientists to push the frontiers of knowledge.

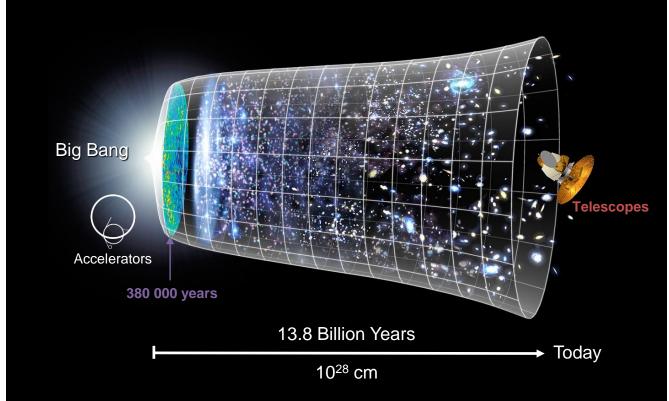
- Answer questions about the beginning and the nature of the universe;
- Unite people from different countries
- and cultures;
- Train the next generation of scientists and engineers;
- Facilitate the transfer of new technologies.

CERN is a peace project, funded in the wake of the second world war.



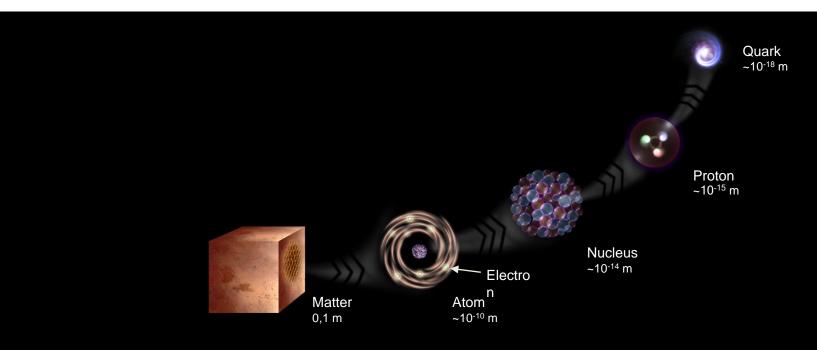
How did the universe begin?

We reproduce the conditions a fraction of a second after the Big Bang, to gain insight into the structure and evolution of the universe.



What is the universe made of?

We study the elementary building blocks of matter and the forces that control their behaviour.

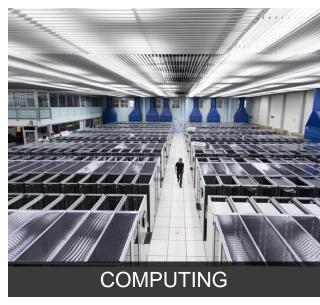


How do we do it?

- •We build the largest machines to study the smallest particles in the universe.
- •We prototype! Developing technology to advance the limits of what is possible.

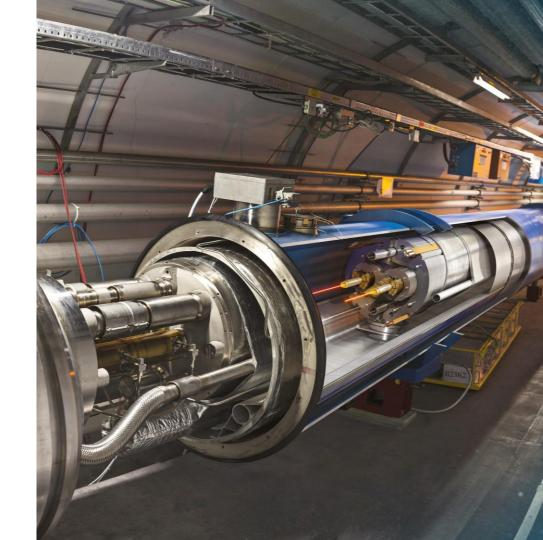




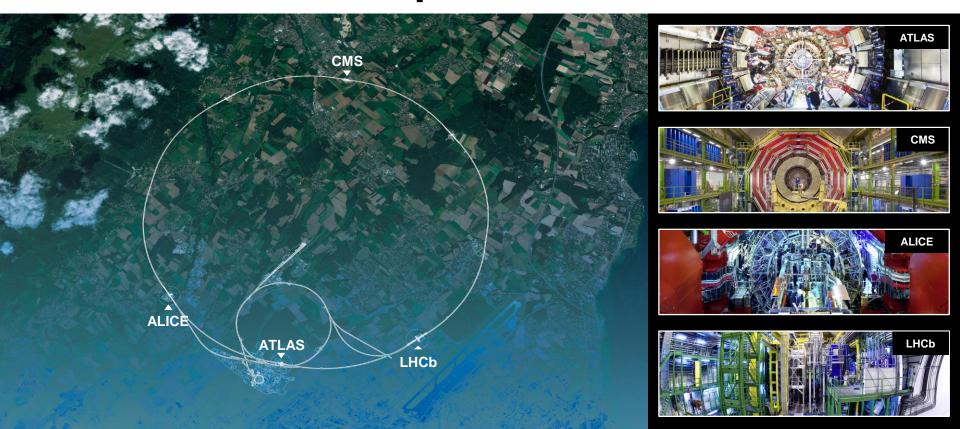


Large Hadron Collider (LHC)

- 27 km in circumference
- About 100 m underground
- Superconducting magnets steer the particles around the ring
- Particles are accelerated to close to the speed of light



Giant detectors record the particles formed at the four collision points



Are we done? Not quite...

There are many unanswered questions in fundamental physics

95% of the mass and energy of the universe is unknown.

Why is the universe made only of matter, with hardly any antimatter?

Why is gravity so weak compared to the other forces?







Geographical & cultural diversity
Users of 110 nationalities
~ 23% women

Member States 6632

Austria 82 – Belgium 122 – Bulgaria 37 – Czech Republic 221 Denmark 35 – Finland 79 – France 794 – Germany 1185 Greece 138 – Hungary 67 – Israel 63 – Italy 1388 Netherlands 166 – Norway 78 – Poland 272 – Portugal 80 Romania 99 – Serbia 35 – Slovakia 66 – Spain 325 Sweden 96 – Switzerland 329 – United Kingdom 875

Associate Member States **27** in the pre-stage to membership Cyprus 11 – Slovenia 16

Associate Member States 390

Croatia 38 – India 151 – Lithuania 13 – Pakistan 35 Turkey 124 – Ukraine 29

Observers 2050

Japan 211 - United States of America 1839



Other countries 1279

Algeria 2 – Argentina 15 – Armenia 10 – Australia 23 – Azerbaijan 2 – Bahrain 2 – Belarus 26 – Brazil 108 Canada 196 – Chile 22 – Colombia 15 – Cuba 3 – Ecuador 4 – Egypt 14 – Estonia 26 – Georgia 35
Hong Kong 20 – Iceland 3 – Indonesia 7 – Iran 13 – Ireland 6 Kuwait 2 – Latvia 6 – Lebanon 17
Malaysia 4 – Malta 3 – Mexico 49 – Montenegro 5 – Morocco 18 – New Zealand 11 – Oman 1

People's Republic of China 334 – Peru 2 – Puerto Rico 2 – Republic of Korea 132 – Singapore 3 South Africa 57 – Sri Lanka 8 – Taiwan 50 Thailand 16 – United Arab Emirates 2

ATLAS Collaboration ARTICLE INFO Article history The first measurements from proton-proton collisions recorded with the ATLAS detector at the Received 16 March 2010 are presented. Data were collected in December 2009 using a minimum-bias trigger during coll Received in revised form 22 March 2010 at a centre-of-mass energy of 900 GeV. The charged-particle multiplicity, its dependence on trans Accepted 22 March 2010 momentum and pseudorapidity, and the relationship between mean transverse momentum and cha Available online 28 March 2010 particle multiplicity are measured for events with at least one charged particle in the kinematic Editor: W.-D. Schlatter

properties at higher centre-of-mass energies. Most of the previous charged-particle multiplicity measurements were

P.P. Allport 73, S.E. Allwood-Spiers 53, J. Almond 82, A. Aloisio 102a, 102b, R. Alon 169, A. Alo

I. Alonso 14, M.G. Alviggi 102a, 102b, K. Amako 66, P. Amaral 29, G. Ambrosini 16, G. Ambros

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Charged-particle multiplicities in pp interactions at $\sqrt{s} = 900$ GeV measured

n < 2.5 and $p_T > 500$ MeV. The measurements are compared to Monte Carlo models of proton-r collisions and to results from other experiments at the same centre-of-mass energy. The charged-pa multiplicity per event and unit of pseudorapidity at $\eta = 0$ is measured to be 1.333 ± 0.003 (st 0.040(syst.), which is 5-15% higher than the Monte Carlo models predict.

Inclusive charged-particle distributions have been measured in pp and pp collisions at a range of different centre-13]. Many of these measurements have been used to constrain phenomenological models of soft-hadronic intera

Charged-particle Multiplicities

Minimum bias

900 GeV

ATLAS THC

data with a double-arm coincidence trigger, thus removing large fractions of diffractive events. The data were then remove the remaining single-diffractive component. This selection is referred to as non-single-diffractive (NSD). In so as inelastic non-diffractive, the residual double-diffractive component was also subtracted. The selection of NSD or in charged-particle spectra involves model-dependent corrections for the diffractive components and for effects of th events with no charged particles within the acceptance of the detector. The measurement presented in this Letter in strategy, which uses a single-arm trigger overlapping with the acceptance of the tracking volume. Results are pr inelastic distributions, with minimal model-dependence, by requiring one charged particle within the acceptance of

with the ATLAS detector at the LHC *, **

This Letter reports on a measurement of primary charged particles with a momentum component transverse to

 $p_T > 500$ MeV and in the pseudorapidity range $|\eta| < 2.5$. Primary charged particles are defined as charged particles

 $\tau > 0.3 \times 10^{-10}$ s directly produced in pp interactions or from subsequent decays of particles with a shorter lifetime tracks reconstructed in the ATLAS inner detector were corrected to obtain the particle-level distributions:

 $\frac{1}{N_{\rm ev}} \cdot \frac{dN_{\rm ch}}{dn}$, $\frac{1}{N_{\rm ev}} \cdot \frac{1}{2\pi p_{\rm T}} \cdot \frac{d^2N_{\rm ch}}{dn dp_{\rm T}}$, $\frac{1}{N_{\rm ev}} \cdot \frac{dN_{\rm ev}}{dn_{\rm ch}}$ and $\langle p_{\rm T} \rangle$ vs. $n_{\rm ch}$,

where $N_{\rm ev}$ is the number of events with at least one charged particle inside the selected kinematic range, $N_{\rm ch}$ is charged particles, n_{ch} is the number of charged particles in an event and (p_T) is the average p_T for a given number

ATLAS Collaboration

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O. Beltramello 29, A. Belymam 75, S. Ben Ami 150, O. I

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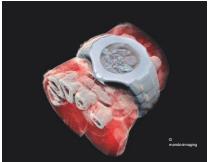






Accelerator technologies are applied in cancer radiotherapy with protons, ions and electrons. Technologies applied at CERN are also used in PET, for medical imaging and diagnostics.

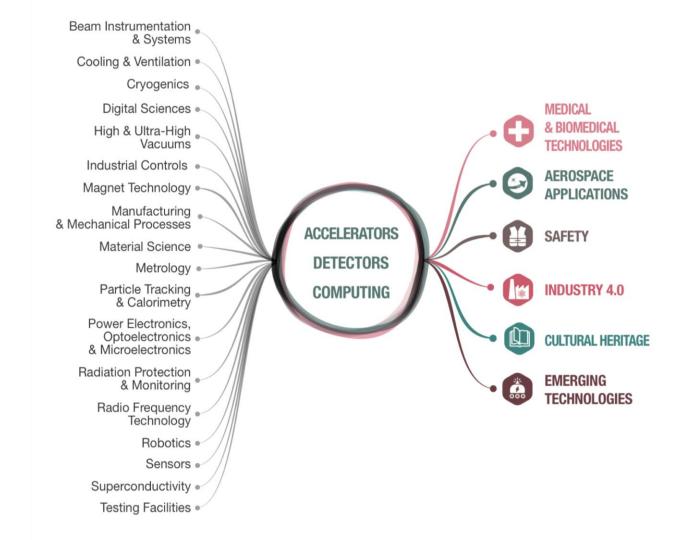




Pixel detector technologies are used for high resolution 3D colour X-ray imaging. cern produces innovative radioisotopes for nuclear medicine research.



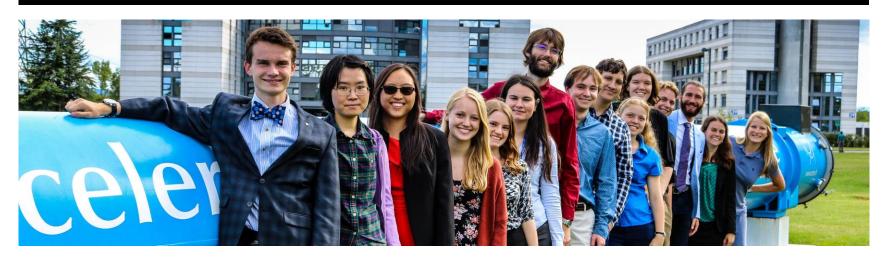
CERN's Knowledge Tranfer



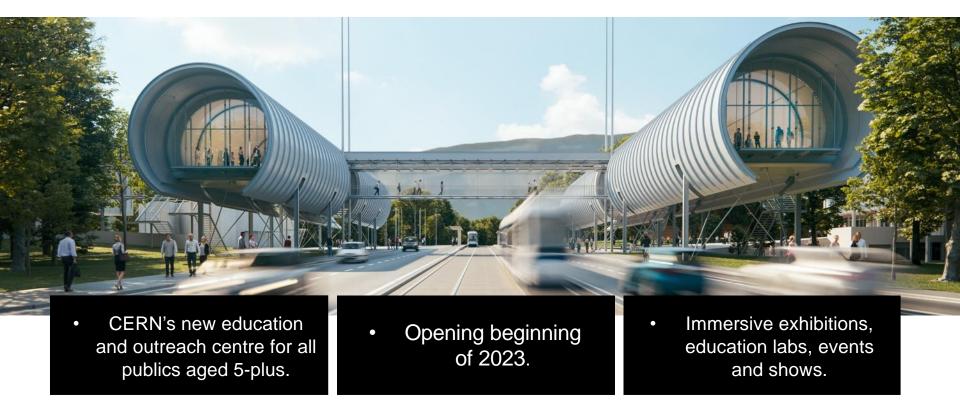


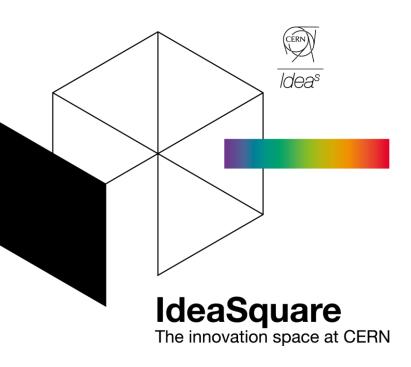
CERN trains the next generation of physicists, engineers and technicians

PhD students, Technical Students in applied physics, engineering and computing, administrative students, fellows, undergraduate students in summer programmes, KT run student programmes, and IdeaSquare!



CERN Science Gateway





IdeaSquare

The Small Human Collider



Lila MabialaCommunications



Laura Wirtavuori Edu programmes



Romain Muller EU projects



Jami Sarnikorpi Prototyping



Markus Nordberg Fixing things



Pablo Garcia Tello The bear from Mowgli



Laëtitia Pedroso Events



Catarina Batista Edu programmes



Claudia Marcelloni Communications

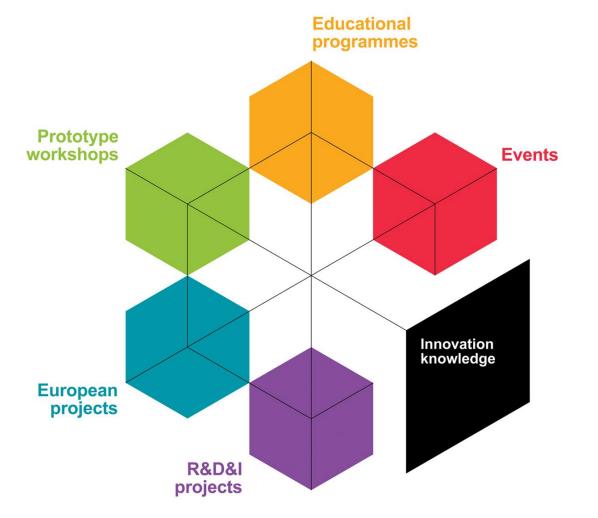


Tuuli Utriainen Cosmic collaborator

IdeaSquare

The Innovation Space at CERN

- collaborative methodologies
- access to CERN expertise
- cross-connectivity





Linking science innovation and the SDGs

#ATTRACT



- Provides funding for developing earlystage ideas and prototypes on detection and imaging
- Focuses on innovation with high potential outside research
- Engages with MSc-level, crossdisciplinary student activities, seeking for unforeseen entrepreneurial opportunities for the young
- Purpose is to create a new innovation ecosystem in Europe
- ATTRACT is coordinated by CERN (IdeaSquare)

Crowd4SDG



- A 3- years long project focused on citizen science
- Supporting citizen science teams across the globe to bring thei projects from idea to implementation



Connecting curious minds

Events, workshops and hackatons



When the building is not in full use, Ideasquare can offer access to its open work areas, rapid prototyping facilities and its meeting rooms for short, deadline driven Challenge Events, such as:

- Innovation Events,
- Workshops
- Hackathons (an event compressed into a short number of days where participants work towards a concept prototype).



Fast forward through prototyping

Our Prototyping Facilities

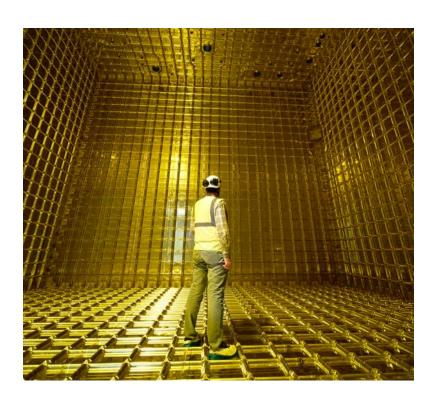


- An open space for ideation
- An electro shop
- A machine shop with a laser cutter
- 3D printing equipment



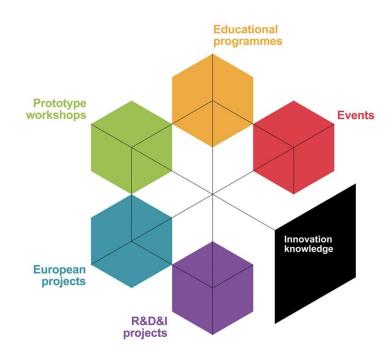
Stimulating instrumentation in research

Neutrino Platform



- Neutrino Platform (CENF) fosters fundamental research in the field of Neutrino Accelerator Physics
- CENF supports generic detector, neutrino beams R&D and large detector prototypes or demonstrators. It gives technical, financial and logistics support to approved projects
- Currently includes seven projects, including significant involvement in (Proto) Dune
- CERN & IdeaSquare provides a facility for R&D on future technologies (HW and SW) and partner in several neutrino research programs

Innovation Knowledge

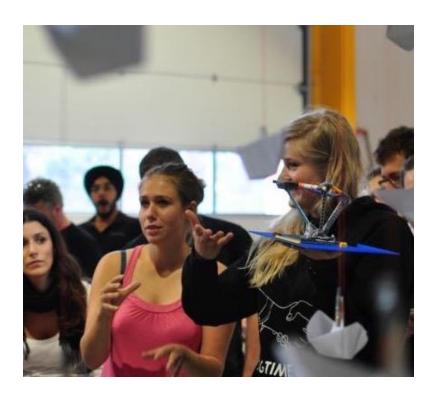


- IdeaSquare is uniquely positioned to collect knowledge on innovation practices.
- To collect and share this knowledge, we established CIJ – an open journal for experimental innovation.
- Additionally, our blogs and videos from the innovation café aim to harvest the success (or experimentations) stories of those at CERN that use our space or collaborate with us in any of our activities.



Training and experimenting with the innovators of the future

Educational programmes



- Ranging from two weeks to eight months in duration;
- Mostly with multidisciplinary teams;
- In collaboration with universities around the world;
- One proprietary course / methodology: Design the Future
- Incorporating sustainable development goals;
- Different outputs from conceptual videos to functioning prototypes, but with the same learning outcomes...

Students prototype to TEDxCERN installation

The cornerstones of Prototyping.



Diversity.



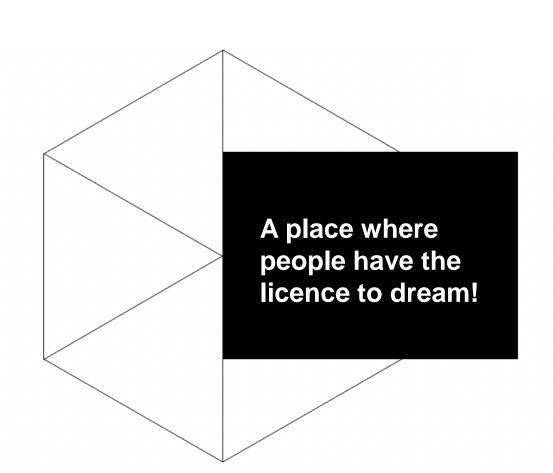
Questions.



Disclaimer: There are no silly questions!







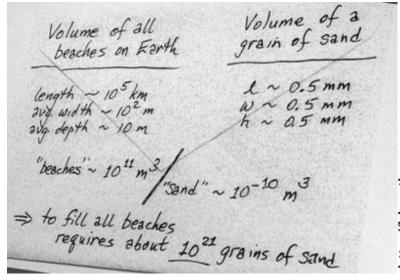




What do we mean?

We are serious about having a license to dream, but it does not mean that you should not support your dreams with reasoned assumptions and quantitative estimations as crazy as they might be.

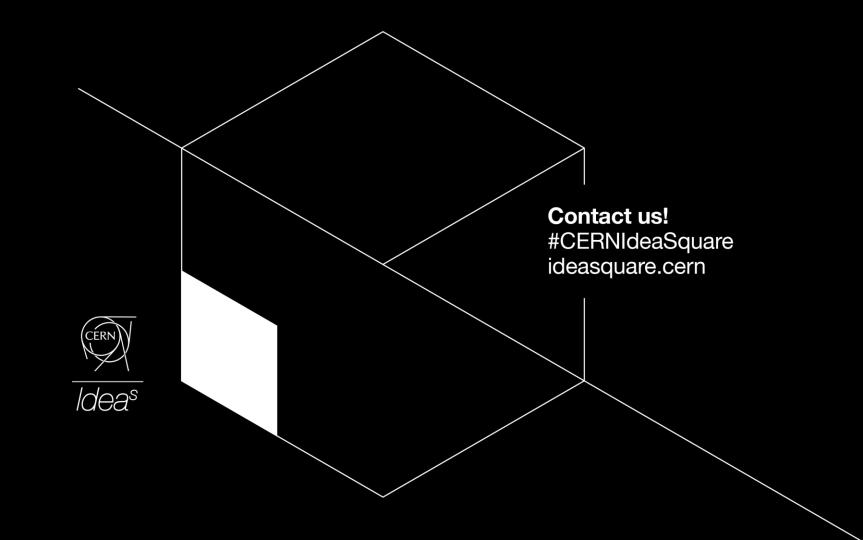
- Systemic thinking Nothing is so great there is nothing bad
- **Order of magnitude estimations** One step further than last Friday in the bar: "Do the math"
- Order of magnitude thinking or dreaming
 - A. Using 1/10 of the raw materials currently needed for car batteries
 - Using abundant and cheap materials for car batteries
 - C. Creating a new mode of transport



Why?

We believe that for fundamental change to be made, we need more than traditional innovation methods and mindsets.

What we are here to do is to help you imagine a future worth fighting for, and to give you the tools and confidence to start building that future.



Start-ups and spin-offs using CERN tech

