Grundlagenforschung in einer internationalen Perspektive

CERN – European Organization for Nuclear Research

The Organization, current research, and education.

Dr. Sascha Marc Schmeling

Science for peace

CERN was founded in 1954 with 12 European Member States

23 Member States

Austria – Belgium – Bulgaria – Czech Republic
Denmark – Finland – France – Germany – Greece
Hungary – Israel – Italy – Netherlands – Norway
Poland – Portugal – Romania – Serbia – Slovakia
Spain – Sweden – Switzerland – United Kingdom

3 Associate Member States in the pre-stage to membership

Cyprus – Estonia – Slovenia

7 Associate Member States

Croatia – India – Latvia – Lithuania – Pakistan
Türkiye – Ukraine

6 Observers

Japan – Russia (suspended) – USA
European Union – JINR (suspended) – UNESCO

CERN's annual budget is 1200 MCHF (equivalent to a medium-sized European university)

As of 31 December 2022
Employees:
2658 staff, **900** fellows
Associates:
11 860 users, **1516** others

Around 50 Cooperation Agreements with non-Member States and Territories

Albania – Algeria – Argentina – Armenia – Australia – Azerbaijan – Bangladesh – Belarus – Bolivia
Bosnia and Herzegovina – Brazil – Canada – Chile – Colombia – Costa Rica – Ecuador – Egypt – Georgia – Honduras
Iceland – Iran – Jordan – Kazakhstan – Lebanon – Malta – Mexico – Mongolia – Montenegro – Morocco – Nepal
New Zealand – North Macedonia – Palestine – Paraguay – People's Republic of China – Peru – Philippines – Qatar
Republic of Korea – Saudi Arabia – Sri Lanka – South Africa – Thailand – Tunisia – United Arab Emirates – Vietnam

A laboratory for people around the world

Distribution of all CERN Users by the country of their home institutes as of 31 December 2022

Geographical & cultural diversity
Users of **110 nationalities**
19.4% women

Member States 7147

Austria 85 – **Belgium** 129 – **Bulgaria** 43 – **Czech Republic** 244
Denmark 49 – **Finland** 90 – **France** 844 – **Germany** 1225
Greece 119 – **Hungary** 73 – **Israel** 64 – **Italy** 1527
Netherlands 169 – **Norway** 79 – **Poland** 305 – **Portugal** 100
Romania 109 – **Serbia** 33 – **Slovakia** 70 – **Spain** 383
Sweden 103 – **Switzerland** 406 – **United Kingdom** 898

Associate Member States in the pre-stage to membership **69**

Cyprus 15 – **Estonia** 30 – **Slovenia** 24

Associate Member States **382**

Croatia 38 – **India** 132 – **Latvia** 16 – **Lithuania** 14 – **Pakistan** 35
Türkiye 122 – **Ukraine** 25

Observers **2991**

Japan 216 – **Russia** (suspended) 873 – **United States of America** 1902

Non-Member States and Territories **1271**

Algeria 2 – **Argentina** 13 – **Armenia** 8 – **Australia** 21 – **Azerbaijan** 2 – **Bahrain** 4 – **Belarus** 18 – **Brazil** 122
Canada 199 – **Chile** 34 – **Colombia** 21 – **Costa Rica** 2 – **Cuba** 3 – **Ecuador** 4 – **Egypt** 20 – **Georgia** 32
Hong Kong 15 – **Iceland** 3 – **Indonesia** 5 – **Iran** 11 – **Ireland** 5 – **Jordan** 5 – **Kuwait** 4 – **Lebanon** 13 – **Madagascar** 1
Malaysia 4 – **Malta** 1 – **Mexico** 49 – **Montenegro** 4 – **Morocco** 19 – **New Zealand** 5 – **Nigeria** 1 – **Oman** 1
Palestine 1 – **People's Republic of China** 333 – **Peru** 2 – **Philippines** 1 – **Republic of Korea** 147 – **Singapore** 2
South Africa 52 – **Sri Lanka** 10 – **Taiwan** 45 – **Thailand** 17 – **Tunisia** 2 – **United Arab Emirates** 7 – **Viet Nam** 1

CERN Council

President: E. Rabinovici

Secretary: CERN DG

- (Associate) Member States: jeweils 2 Delegierte
- ex-officio
  - FC Vorsitz
  - SPC Vorsitz
- Verschiedene Beobachter auf Einladung, incl. ECFA Vorsitz

Finance Committee

Chairperson: L. Salzarulo

- (Associate) Member States: jeweils 1-3 Delegierte
- ex-officio
  - Council Präsident(in)
  - SPC Vorsitz

Scientific Policy Committee

Chairperson: H. Montgomery

- 14 individuelle Mitglieder
- ex-officio
  - ECFA Vorsitz
  - Vorsitzende von CERN Komitees (LHCC, MAC,SPSC, INTC)
- ständig Eingeladene
  - CERN DG, Council Präsident(in), FC Vorsitz

Audit Committee

Chairperson: J. Schieck

Tripartite Employment Forum

Chairperson: B. Åsman

Pension Fund Governing Board

Chairperson: O. Malmberg

CERN – Die Organisation

Council Secretariat
Legal Service

Director General
Fabiola Gianotti

Internal Audit
Health, Safety, and Environment Unit

Finance and Human Resources
Rafael Bello

Research and Computing
Joachim Mnich

Accelerators and Technologoy
Mike Lamont

International Relations
Charlotte Warakaulle

Finance and Administrative Procedures
Florian Sonnemann

Experimental Physics
Manfred Krammer

Beams
Rhodri Jones

Education, Communication, and Outreach

Human Resources
James Purvis

Theoretical Physics
Gian Giudice

Engineering
Katy Foraz

Diplomatic and Stakeholder Relations

Industry, Procurement, and Technology Transfer
Christopher Hartley

Information Technologies
Enrica Porcari

Systems
Brennan Goddard

Site and Civil Engineering
Mar Capeans

Technology
Jose Miguel Jimenez

CERN Labor-Organisation 2021-2025 (ab 30.06.2021)

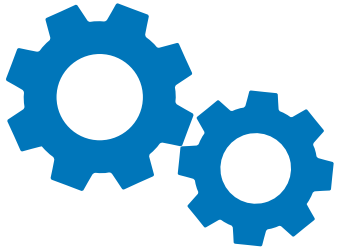
„Die Misson“

Grundlagenforschung

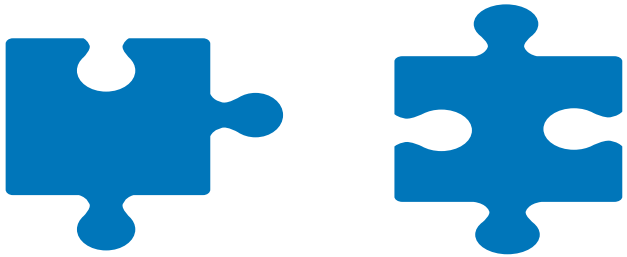
an der Grenze des menschlichen Wissens

Innovative Technologien

für die Forschung

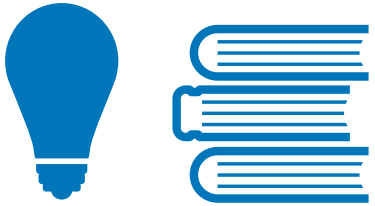


Zusammenarbeit



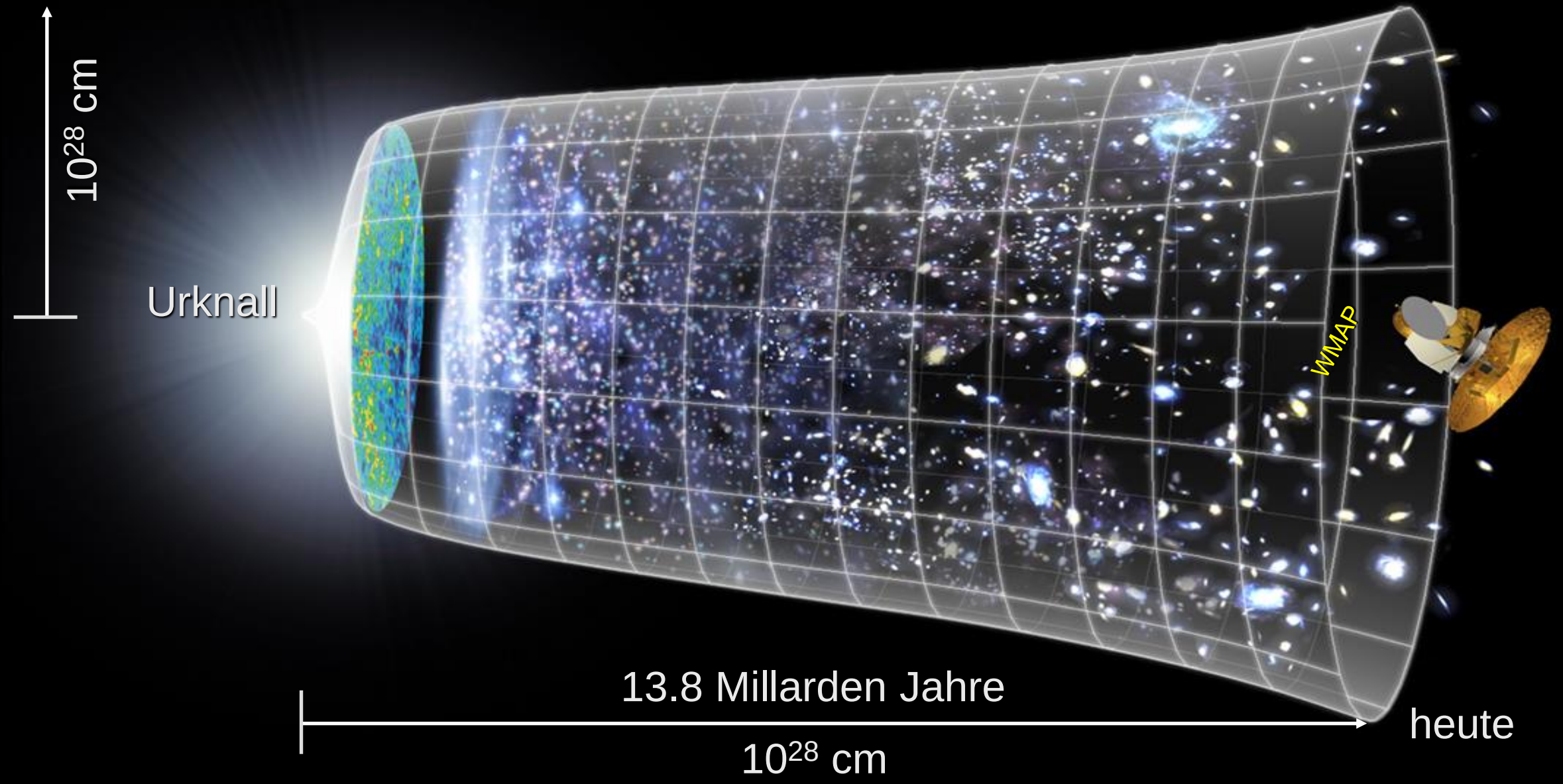
Bildung und Wissensvermittlung

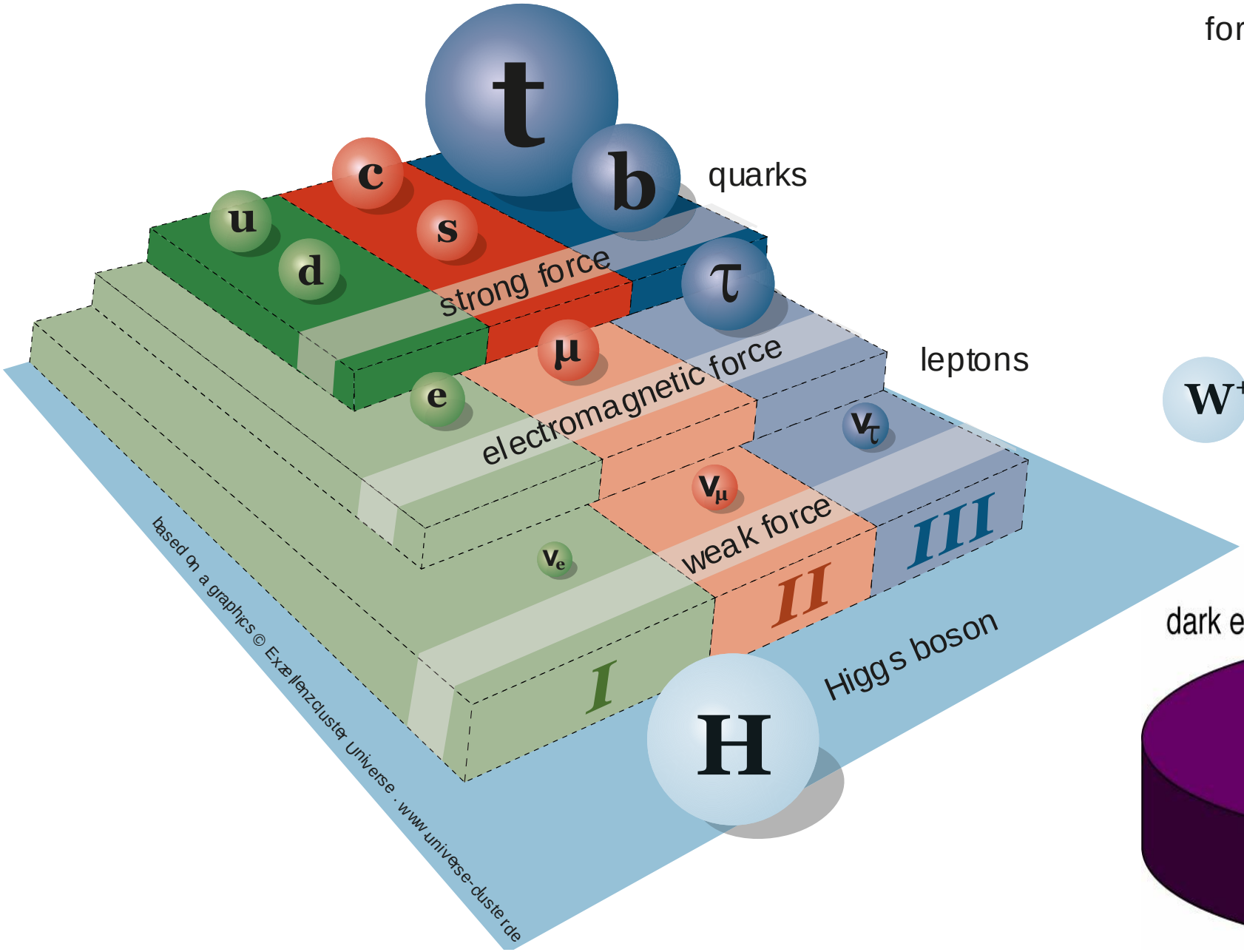
u.a. die Aus- und Weiterbildung von Wissenschaftler(inne)n und Ingenieur(inne)n.
aber eben auch Bildungsprogramme für Alle



Die Wissenschaftliche Herausforderung

Forschung über die Geschichte des Universums



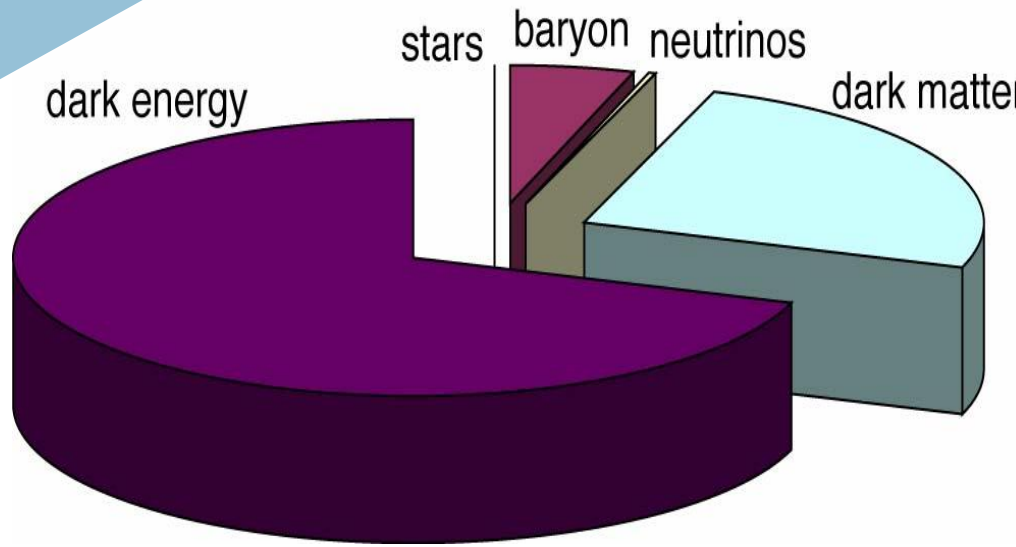


force carriers

g

γ

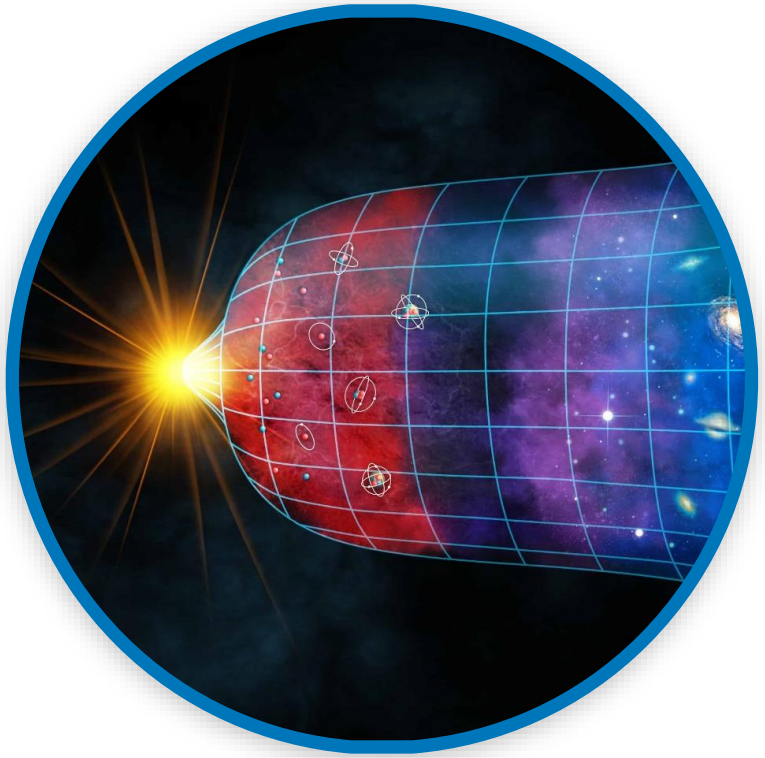
W^+ Z^o W^-



Standard Model

weitere Forschungsfragen

das frühe Universum



Antimaterie

Dunkle Materie

„Die Misson“

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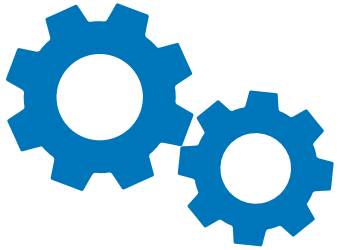
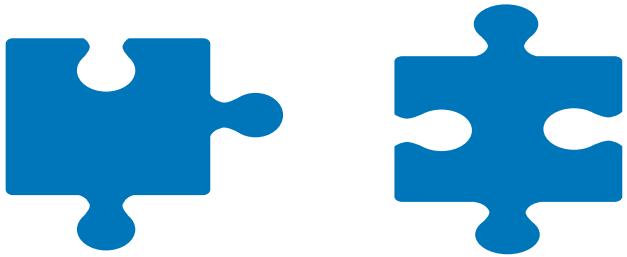


Zusammenarbeit



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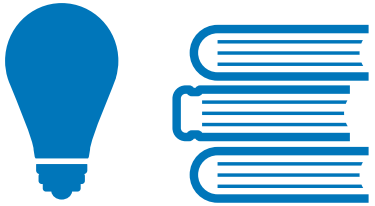
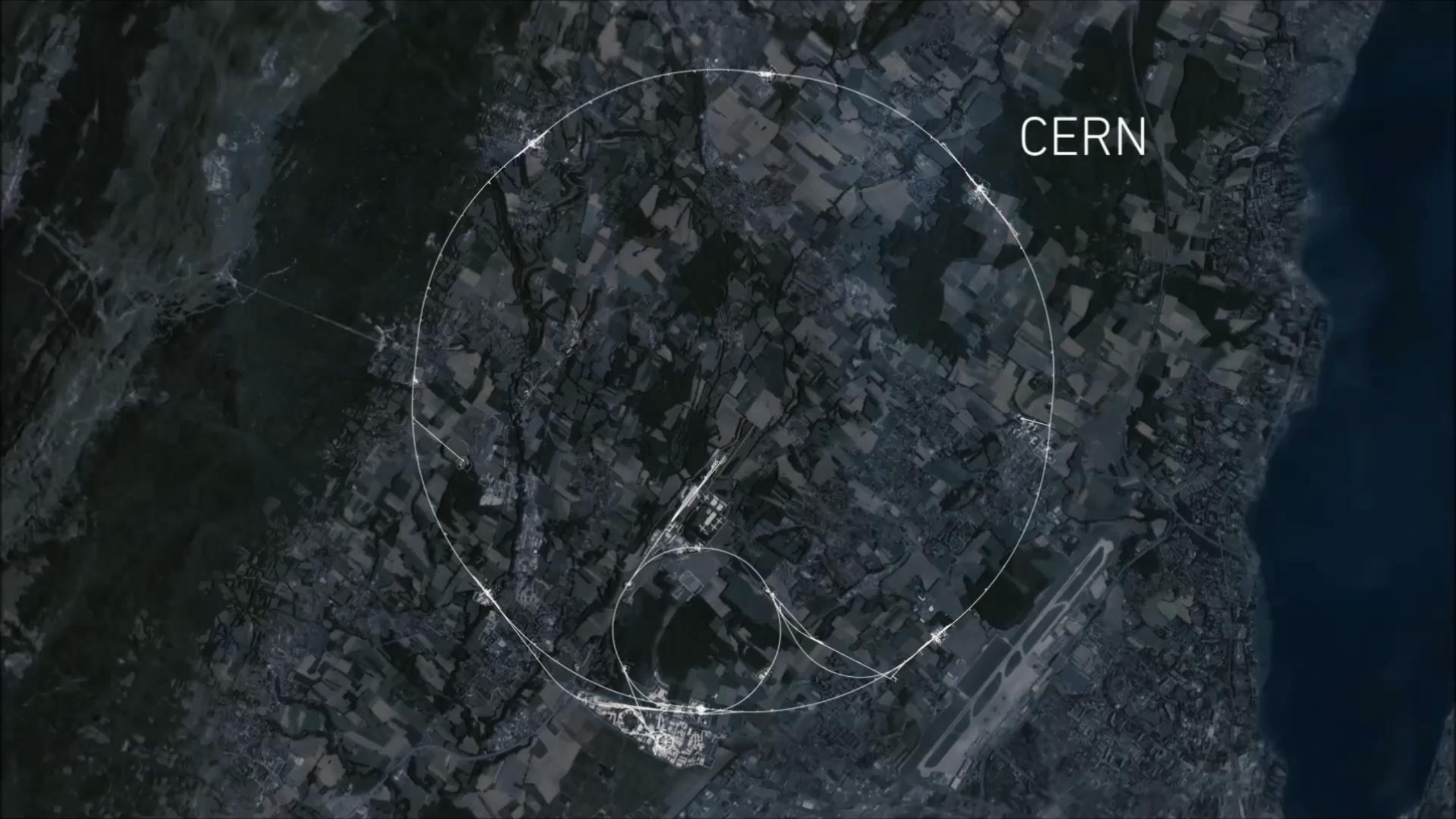
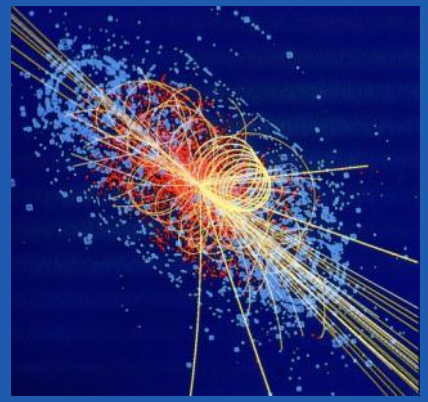



CERN

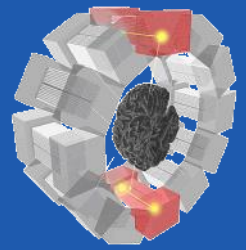


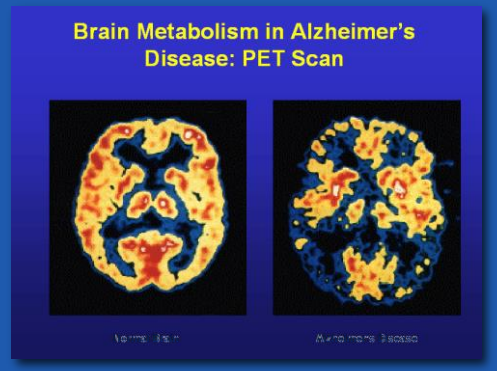
Particle Detection

Imaging

ClearPEM

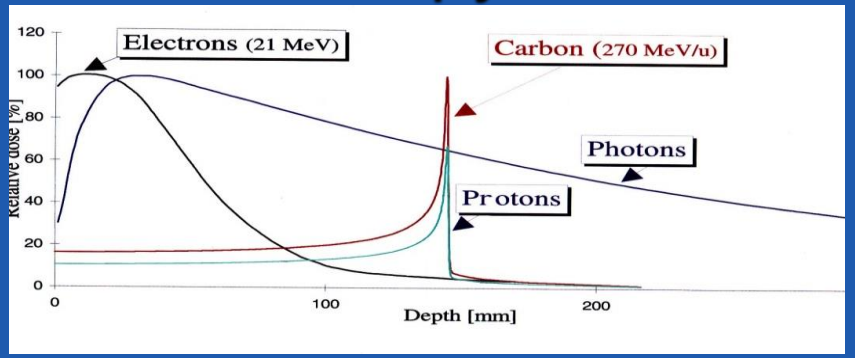
PET Scanner

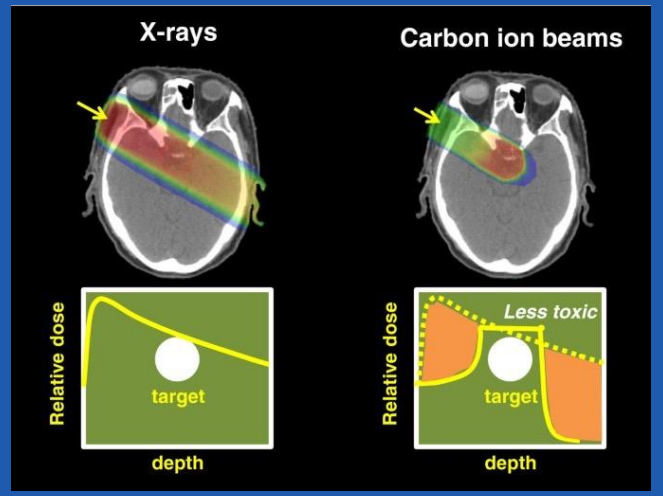




Accelerated Particle Beams

Hadron Therapy

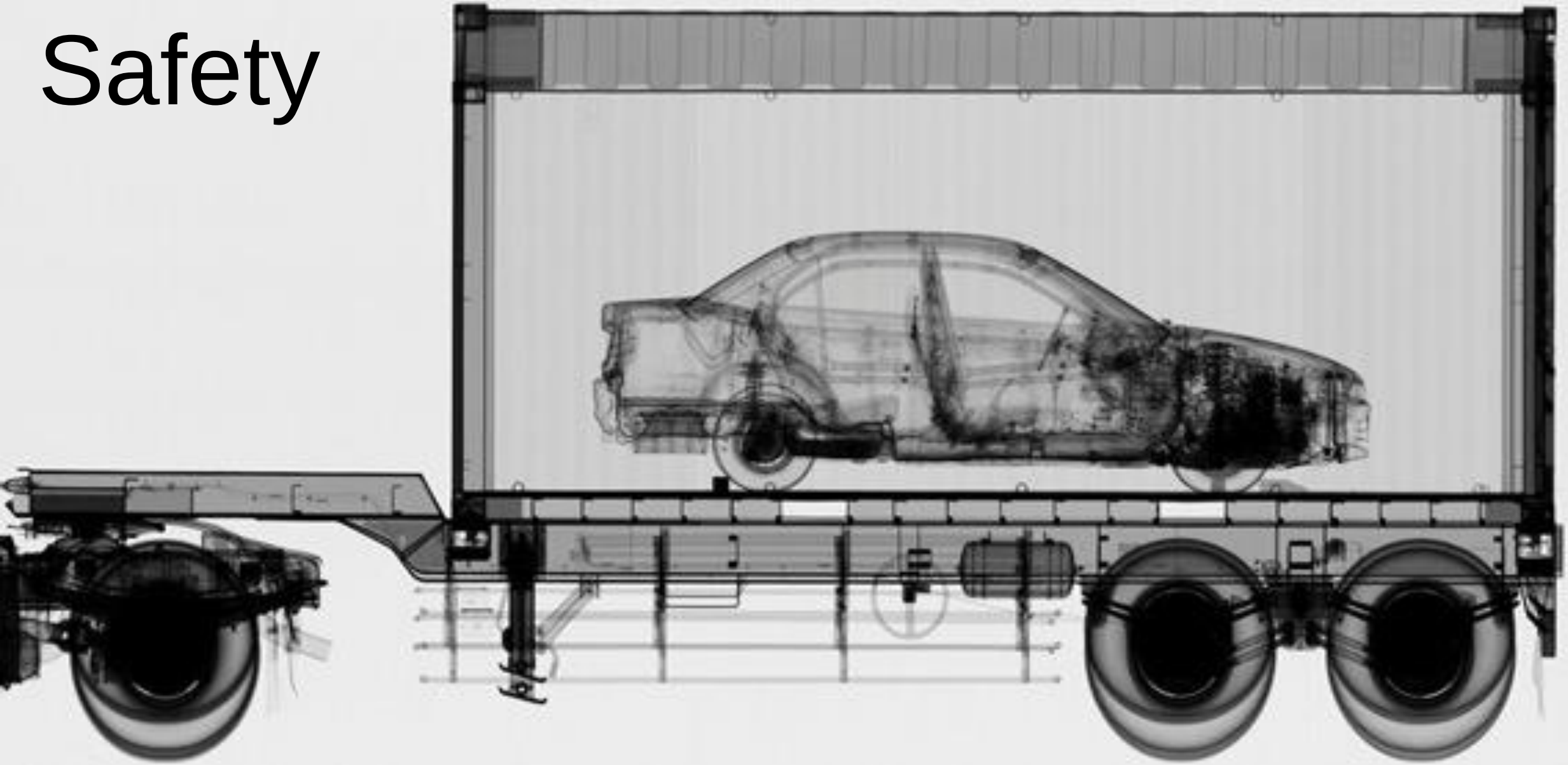


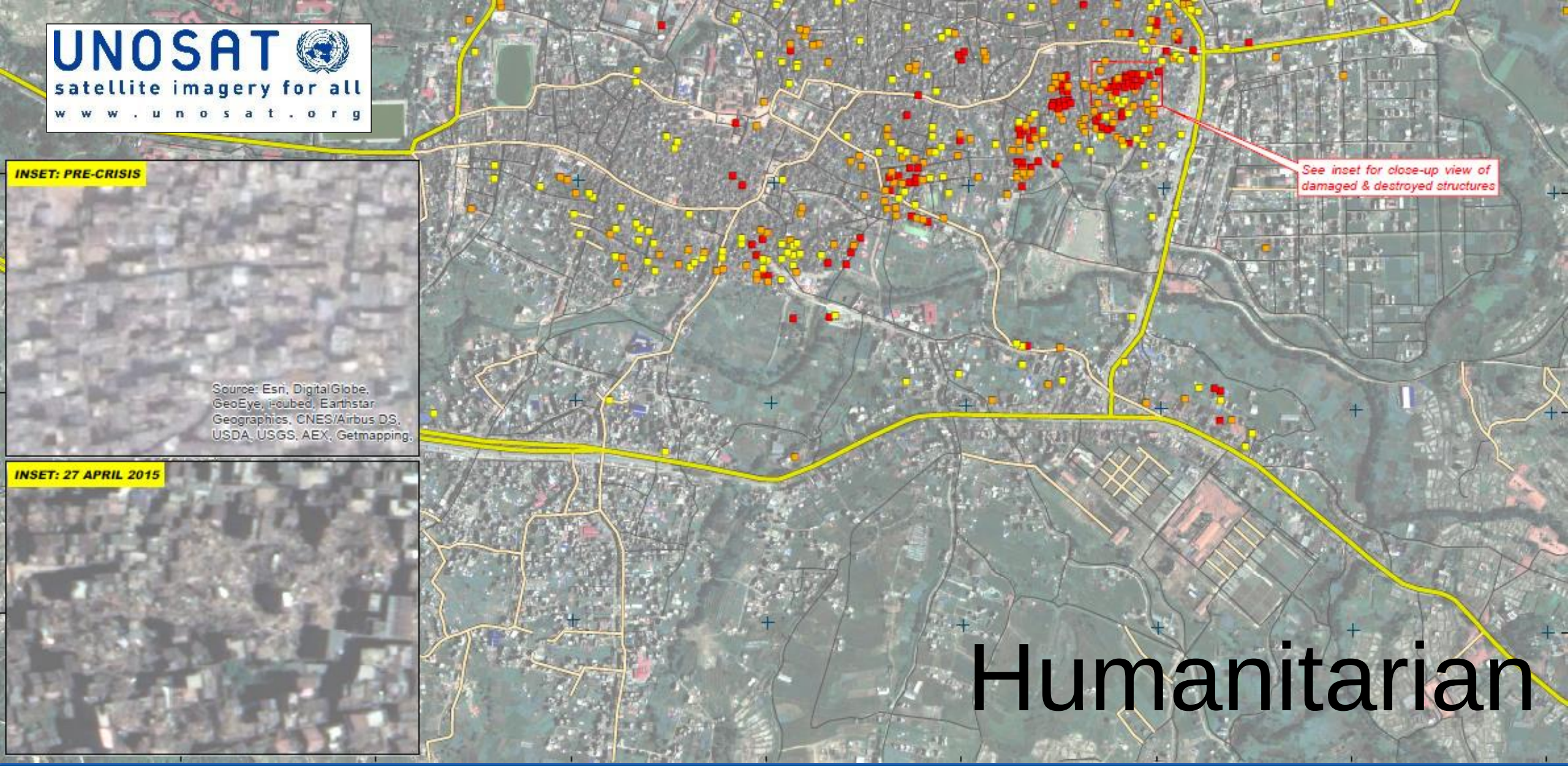


https://link.springer.com/article/10.1186/1878-5085-4-9

Medical Applications

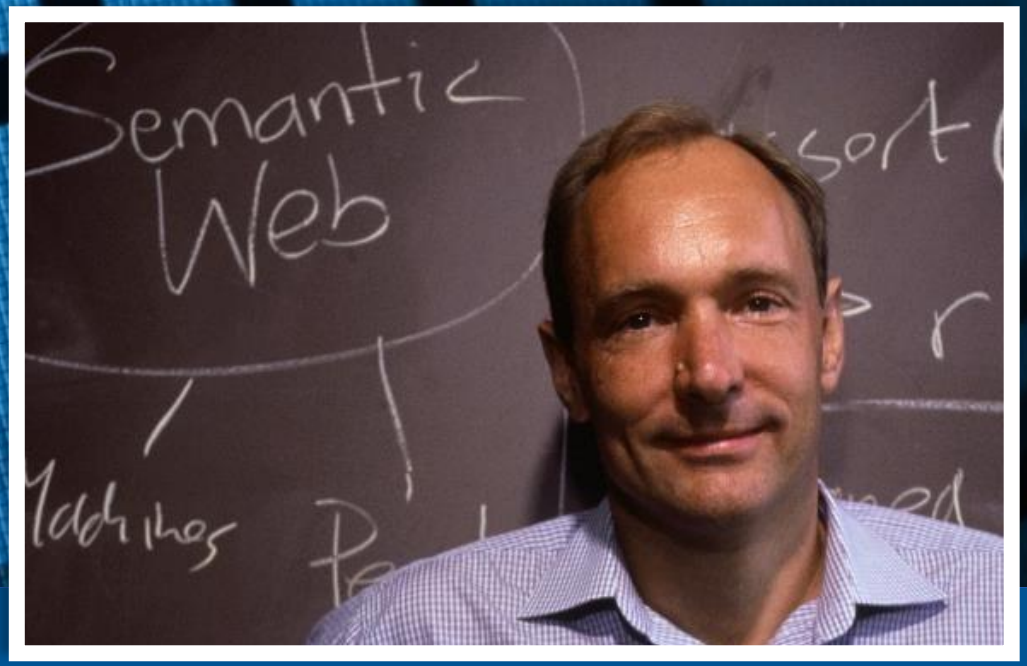
Safety





Humanitarian

World Wide Web



Was passiert gerade?

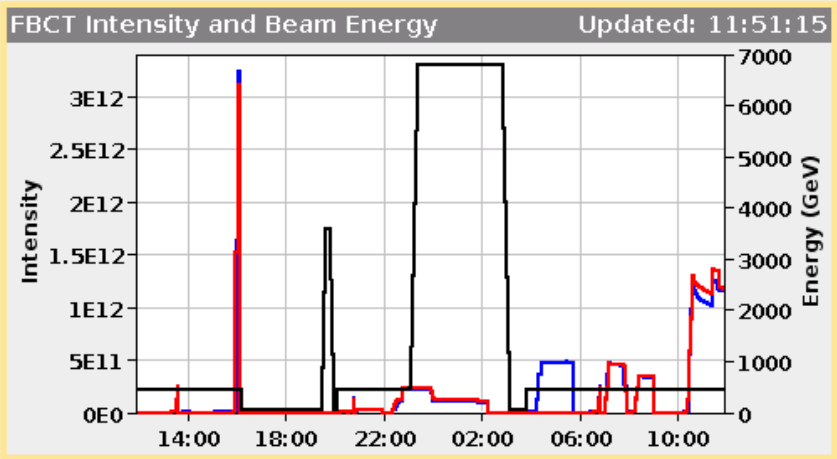
LHC Page1 | Fill: 9095 | E: 450 GeV | t(SB): 00:06:43 | 01-09-23 11:51:17

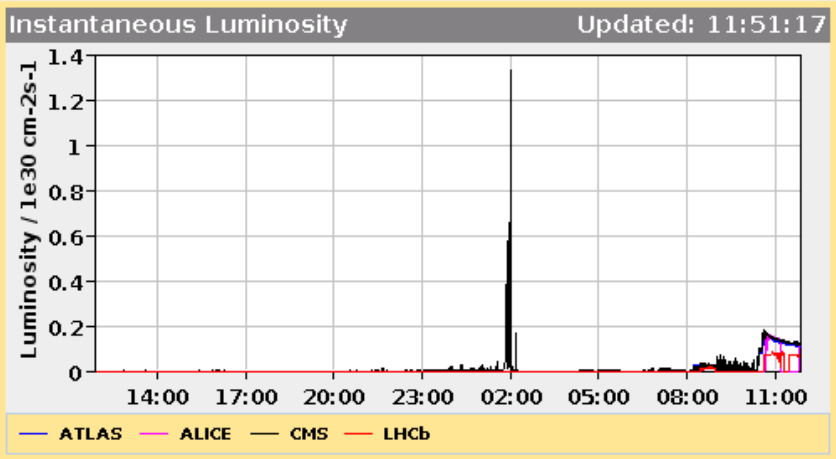
PROTON PHYSICS: STABLE BEAMS

Energy:	450 GeV	I B1:	1.16e+12	I B2:	1.20e+12

Beta* IP1:	11.00 m	Beta* IP2:	10.00 m	Beta* IP5:	11.00 m	Beta* IP8:	10.00 m

Inst. Lumi [(ub.s)^-1]	IP1: 0.11	IP2: 0.12	IP5: 0.11	IP8: 0.06





Comments (01-Sep-2023 11:44:42)

*** STABLE BEAMS ***

BIS status and SMP flags	B1	B2
Link Status of Beam Permits	false	false
Global Beam Permit	true	true
Setup Beam	false	false
Beam Presence	true	true
Moveable Devices Allowed In	true	true
Stable Beams	true	true

AFS: Single_12b_8_8_8_2018

PM Status B1: ENABLED | PM Status B2: ENABLED

Früher in 2023 …

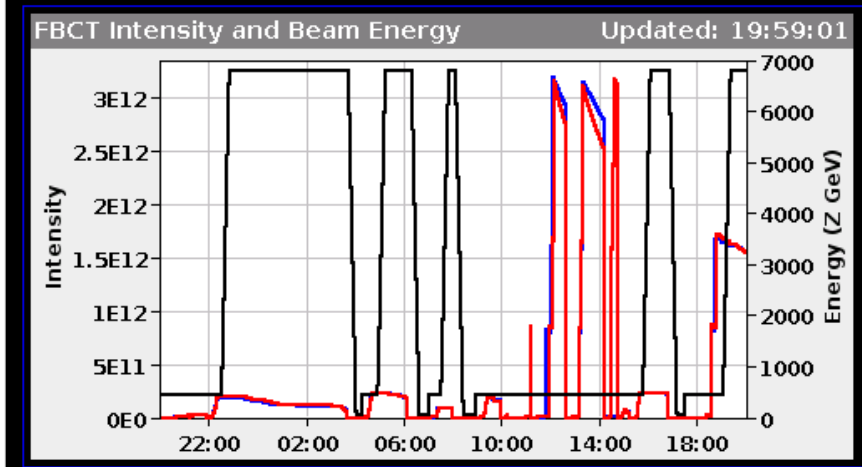
LHC Page1 | Fill: 9192 | E: 6799 Z GeV | t(SB): 00:12:03 | 26-09-23 19:59:01

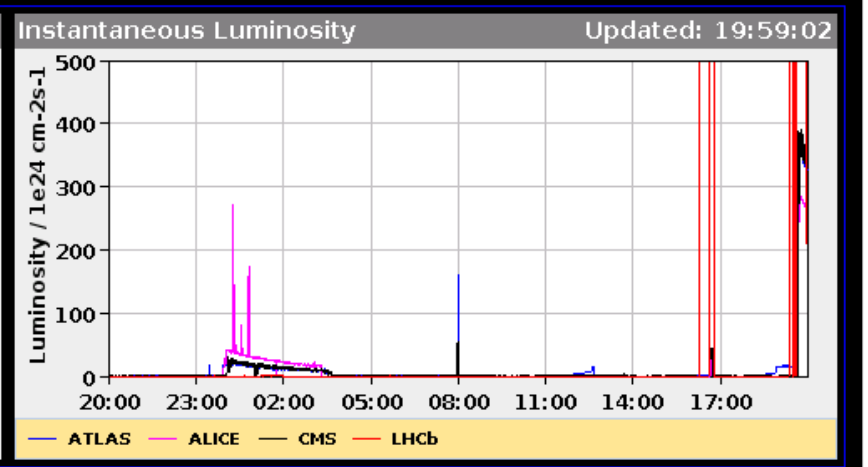
ION PHYSICS: STABLE BEAMS

Energy:	6799 GeV	I B1:	1.62e+12	I B2:	1.59e+12

Beta* IP1:	0.50 m	Beta* IP2:	0.50 m	Beta* IP5:	0.50 m	Beta* IP8:	1.50 m

Inst. Lumi [(b.s)^-1] IP1: 325.61 IP2: 262.97 IP5: 331.27 IP8: 215.32





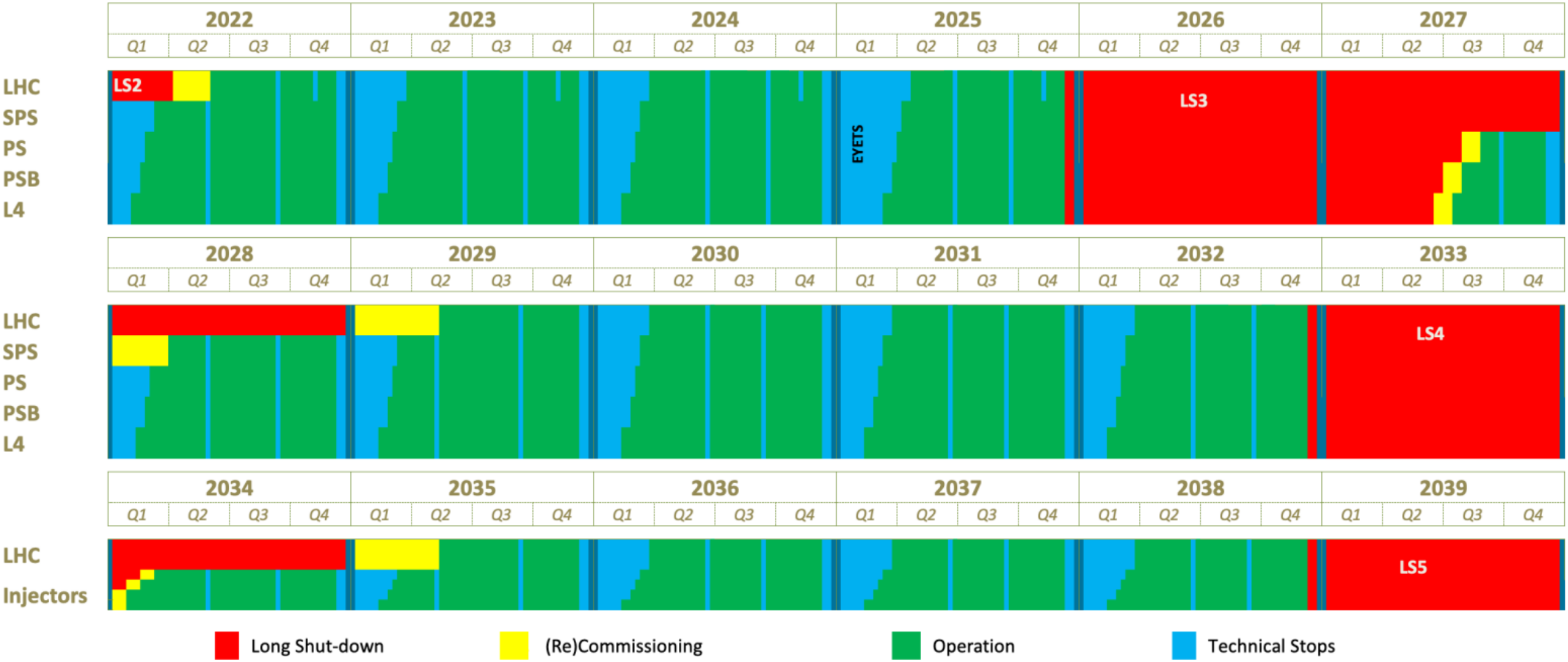
Comments (26-Sep-2023 19:57:58)

First STABLE BEAMS with heavy ion beams in Run 3 with crystal collimation!

BIS status and SMP flags	B1	B2
Link Status of Beam Permits	true	true
Global Beam Permit	true	true
Setup Beam	false	false
Beam Presence	true	true
Moveable Devices Allowed In	true	true
Stable Beams	true	true

AFS: 50ns_119b_58_51_58_56bpi_9inj_3INDIV_4NC_PbPb PM Status B1 ENABLED PM Status B2 ENABLED

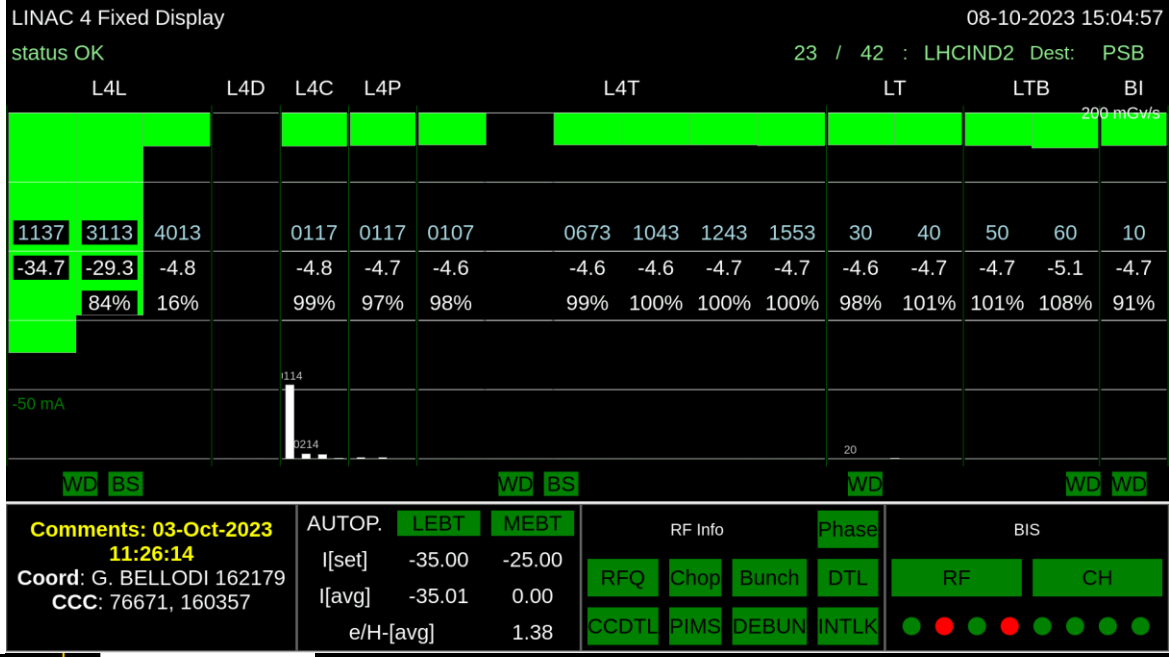
Long Term Schedule for CERN Accelerator complex

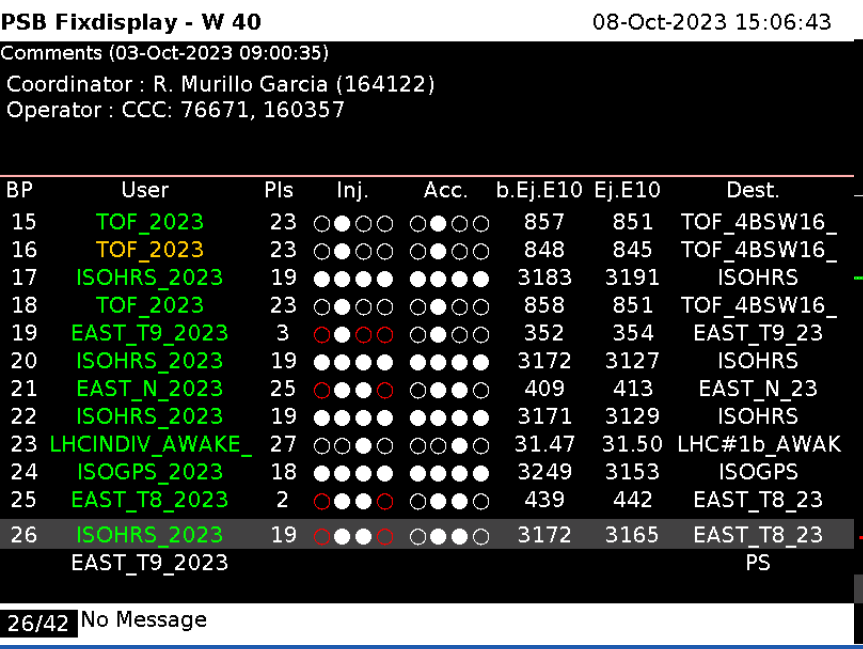


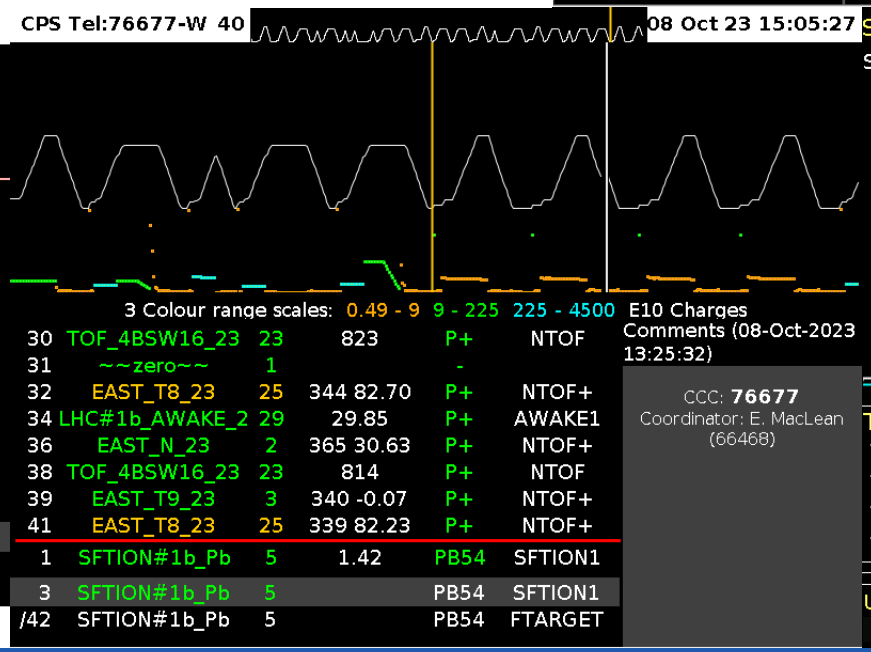
EDMS No.	REV.	VALIDITY
2311633	2.0	RELEASED

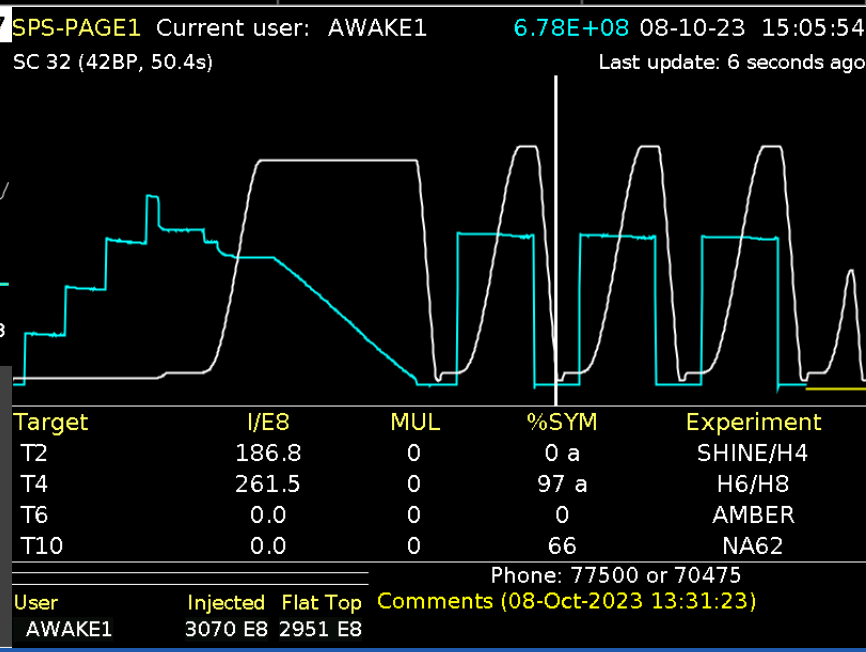
REFERENCE
ACC-PM-MS-004

- Follow CERN accelerator operations online at
  - https://op-webtools.web.cern.ch/Vistar/vistars.php









OP Vistars

Und dann?


2020 UPDATE OF THE EUROPEAN STRATEGY
FOR PARTICLE PHYSICS
by the European Strategy Group

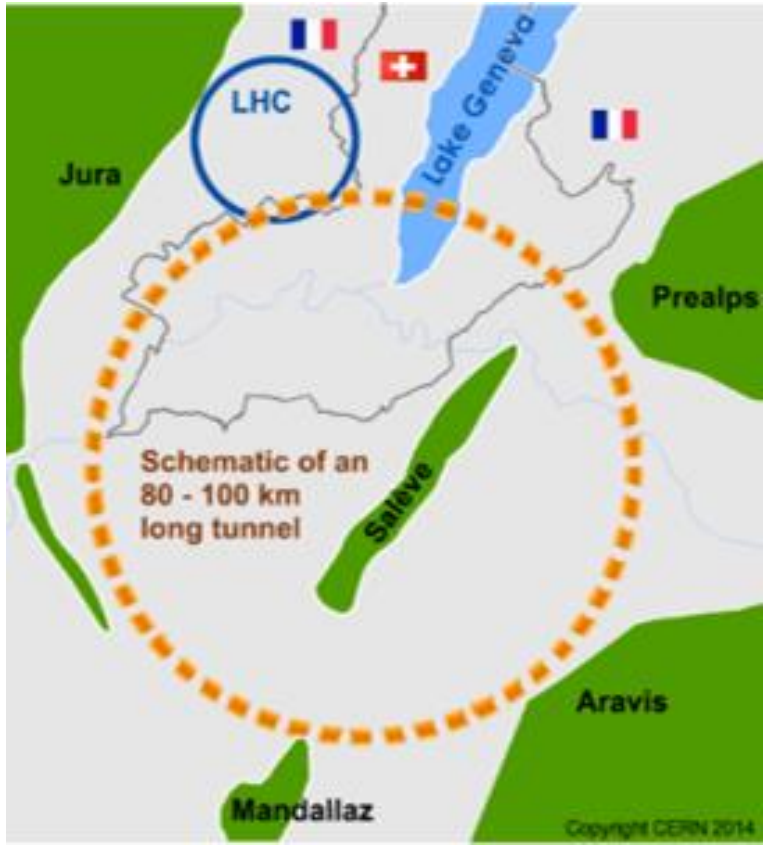
CERN Scientific Priorities for the Future

Implementation of the recommendations of the **2020 Update of the European Strategy for Particle Physics**:

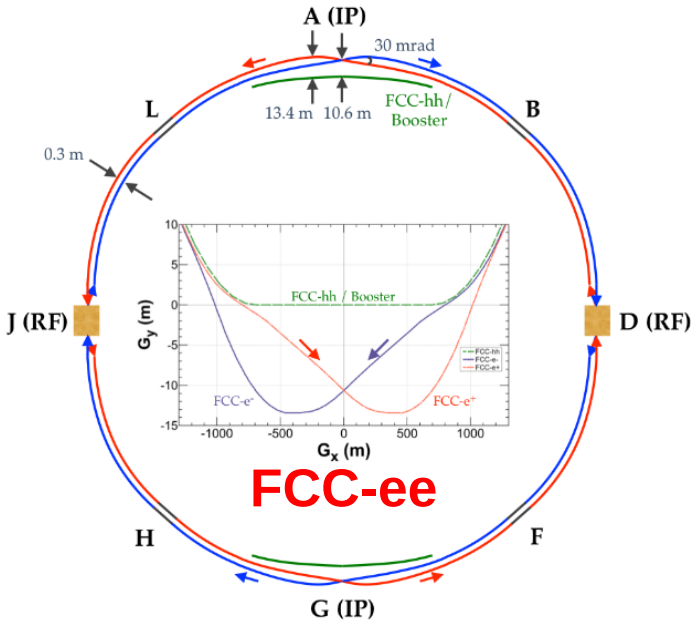
- Fully exploit the LHC & HL-LHC.
- Build a Higgs factory to further understand this unique particle.
- Investigate the technical and financial feasibility of a future energy-frontier 100 km collider at CERN.
- Ramp up relevant R&D.
- Continue supporting other projects around the world.

The FCC Integrated Programme
Inspired by successful LEP – LHC Programmes at CERN

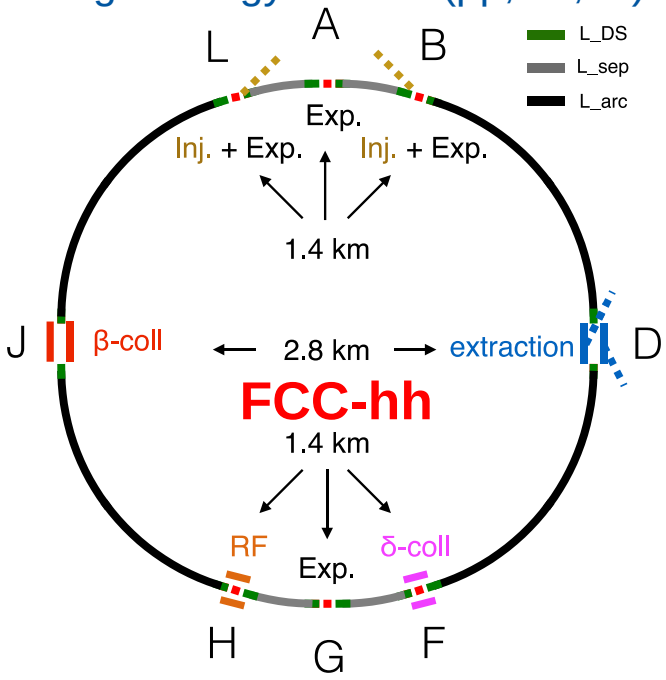
Complementary physics, common civil engineering and technical infrastructures, building on and reusing CERN's existing infrastructure, FCC integrated project allows seamless continuation of HEP after HL-LHC



Phase 1 : FCC-ee
electron – positron Collider
Higgs, Z, W, ttbar Factory at highest lumi



Phase 2 : FCC-hh
proton – proton Collider
High-energy frontier (pp,ion,eh)



2020 - 2040 | 2040 - 2055 | 2060 - 2090

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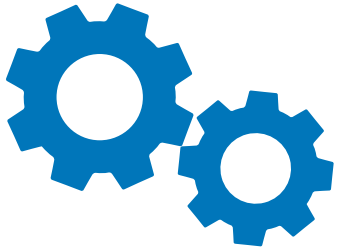
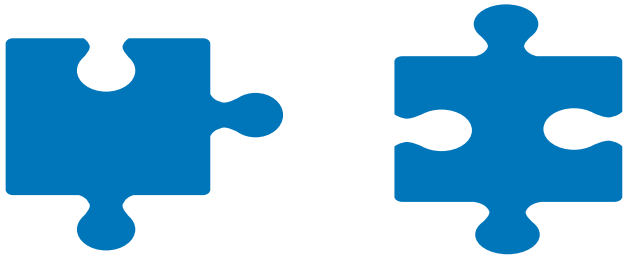


Zusammenarbeit



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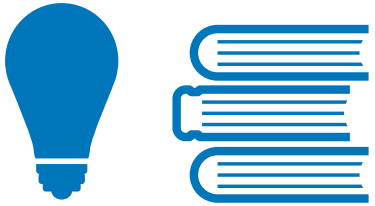
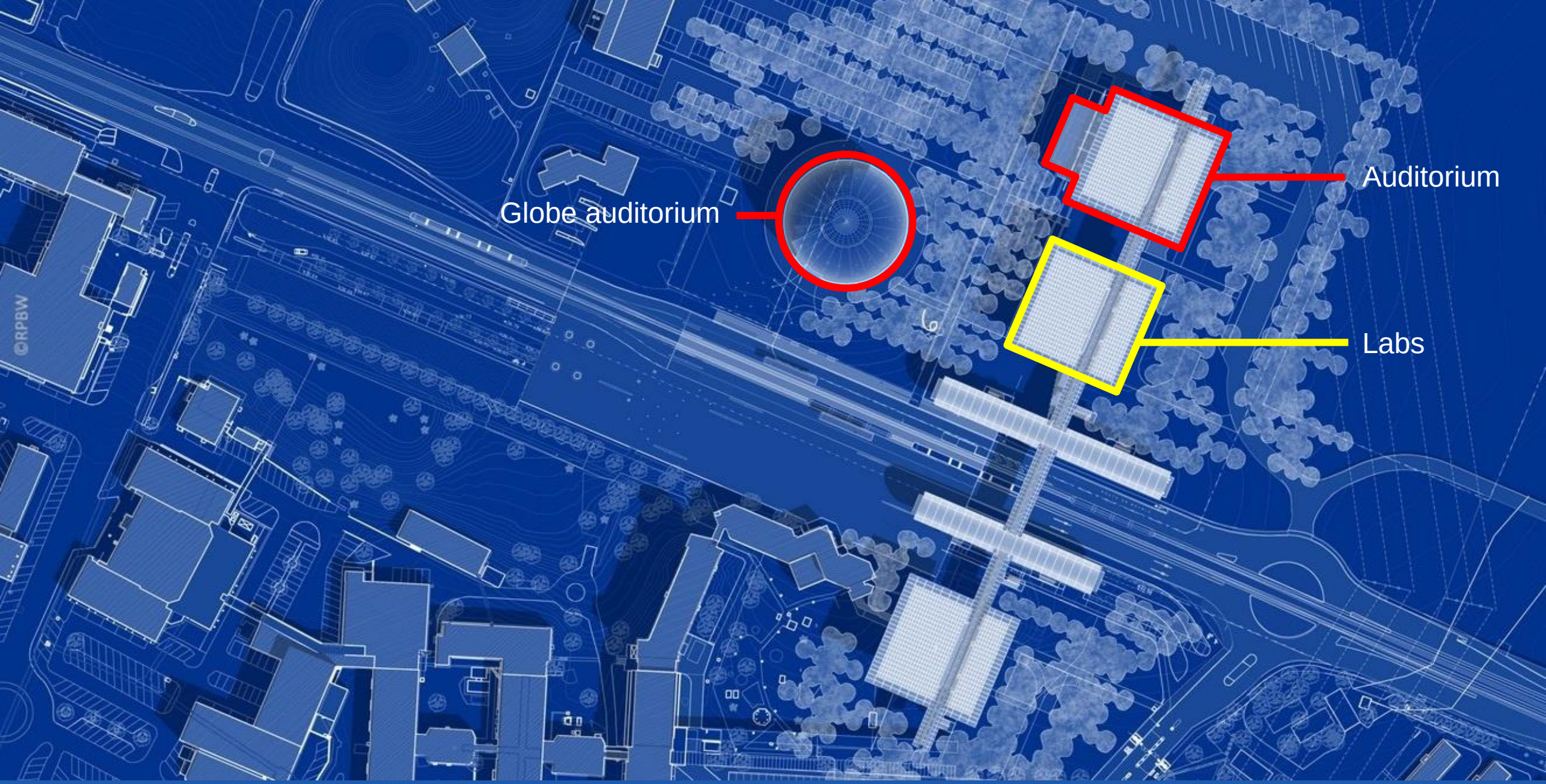
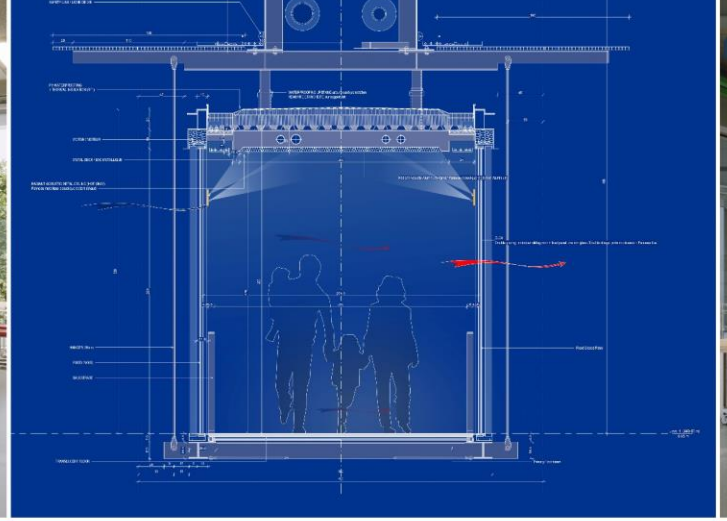
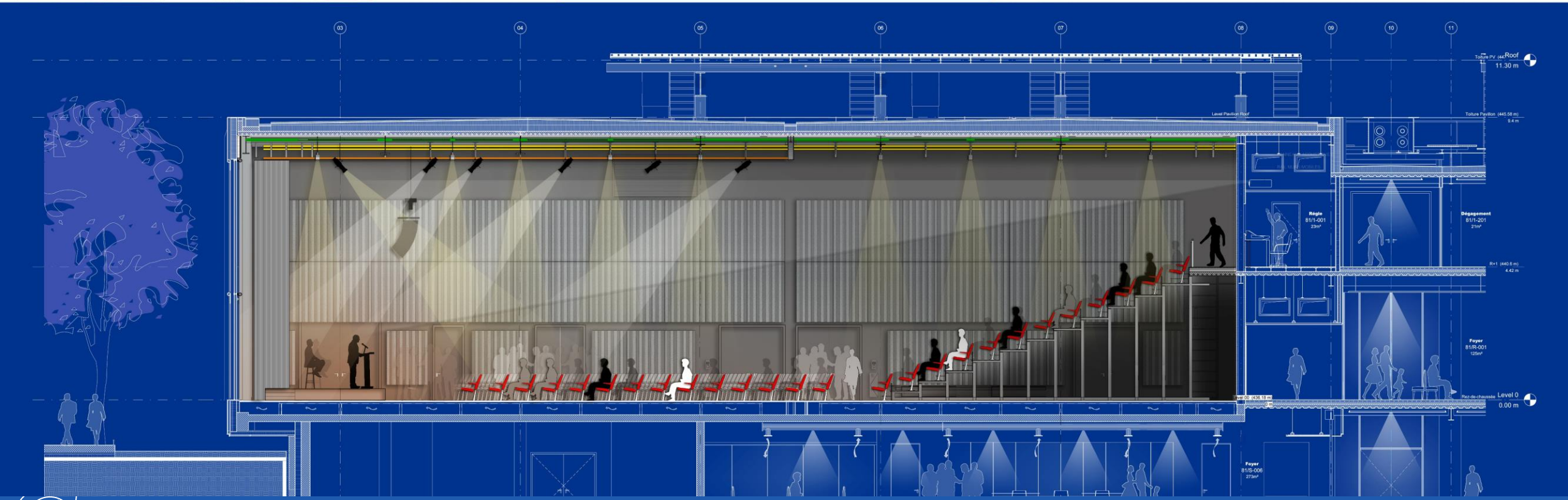



CERN Science Gateway



Education spaces




03
04
05
06
07
08
09
10
11
Toiture PV (447.00 m)
Roof
11.30 m
Level Pavilion Roof
Toiture Pavillon (445.58 m)
9.4 m
Régie
81/1-001
23m²
Dégagement
81/1-201
21m²
R+1 (440.6 m)
4.42 m
Foyer
81/R-001
125m²
Rez-de-chaussée
Level 0
0.00 m
Foyer
81/S-006
273m²

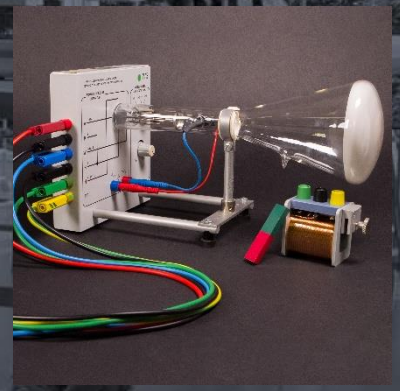
Workshops Education Labs












SCIENCE SHOWS

Discover the science and technology of CERN in a theatre setting

See science happening on stage

Take part in fun activities, facilitated by CERN scientists

For ages 5 and up

Teacher Progamme Participants 1998-2022 (Total: 13 871)

Member States 11 056
Austria 300 – Belgium 149 – Bulgaria 821
Czech Republic 171 – Denmark 348 – Finland 550
France 465 - Germany 1142 – Greece 952
Hungary 561 – Israel 56 – Italy 1139
Netherlands 227 – Norway 158 – Poland 588
Portugal 495 – Romania 20 – Serbia 84
Slovakia 307 – Spain 705 – Sweden 311
Switzerland 135 – United Kingdom 1372

Associate Member States in the pre-stage to Membership 165
Cyprus 16 – Estonia 105 – Slovenia 44

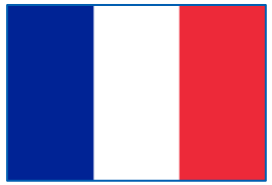
Associate Member States 889
Croatia 114 – India 15 – Latvia 76 – Lithuania 64
Pakistan 9 – Türkiye 403 – Ukraine 208

Observers 579
Japan 12 – Russia (suspended) 431
United States of America 136

Non-Member States and Territories 1182
Algeria 11 – Angola 11 – Argentina 3 – Armenia 3 – Australia 14 – Azerbaijan 2 – Bahrain 3 – Bangladesh 1 – Belarus 11
Bosnia & Herzegovina 36 – Brazil 273 – Burundi 2 – Cameroon 11 – Canada 20 – Cape Verde 5 – Chile 4 – Colombia 8
Costa Rica 4 – Dominican Republic 73 – Ecuador 2 – Egypt 3 – Eswatini 1 – Georgia 194 – Ghana 7 – Guinea Bissau 2
Indonesia 3 – Iran 15 – Ireland 10 – Jordan 13 – Kazakhstan 14 – Kenya 4 – Kuwait 1 – Kyrgyzstan 1 – Lebanon 21
Madagascar 2 – Malaysia 3 – Malta 51 – Mexico 113 – Moldova 4 – Mongolia 1 – Montenegro 17 – Morocco 2
Mozambique 24 – Nepal 6 – New Zealand 5 – Nigeria 2 – North Macedonia 13 – Palestinian Territories 5
People's Republic of China 3 – Philippines 2 – Qatar 1 – Republic of Korea 49 – Rwanda 20 – Sao Tome 8
Saudi Arabia 1 – Singapore 2 – South Africa 9 – Sri Lanka 3 – Taiwan 1 – Tajikistan 1 – Tanzania 1 – Thailand 23
Timor-Leste 10 – Uganda 3 – United Arab Emirates 1 – Uruguay 3 – Venezuela 1 – Vietnam 2 – Zimbabwe 1

Teacher Programmes

2017


2018



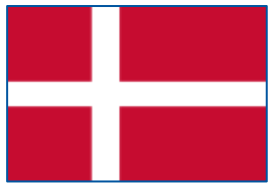


2019





2021


2022


Internship Programmes

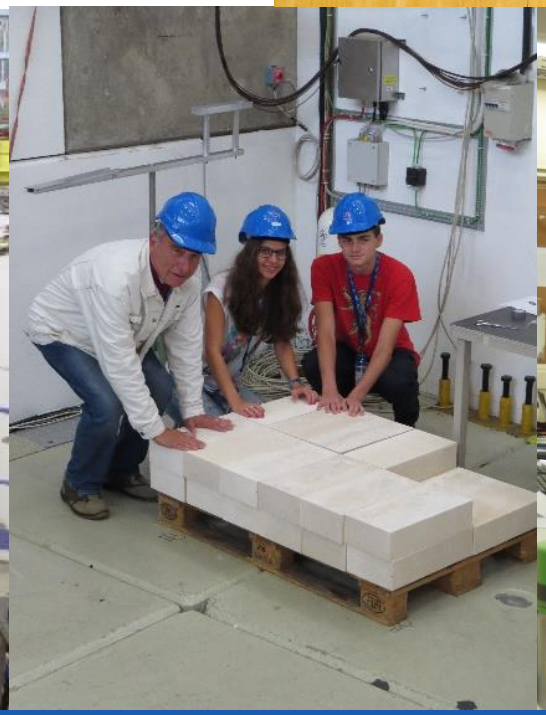
17 PARTNERSHIPS FOR THE GOALS
5 GENDER EQUALITY
4 QUALITY EDUCATION

beamline for schools

cern.ch/bl4s

10th EDITION

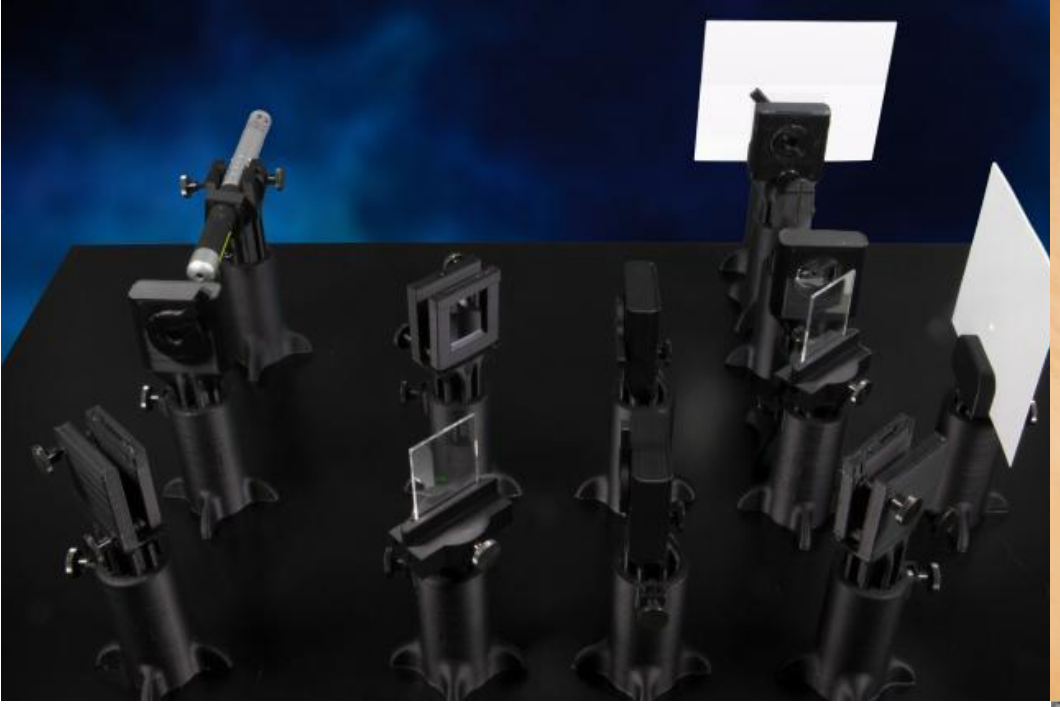
powered by CERN & DESY

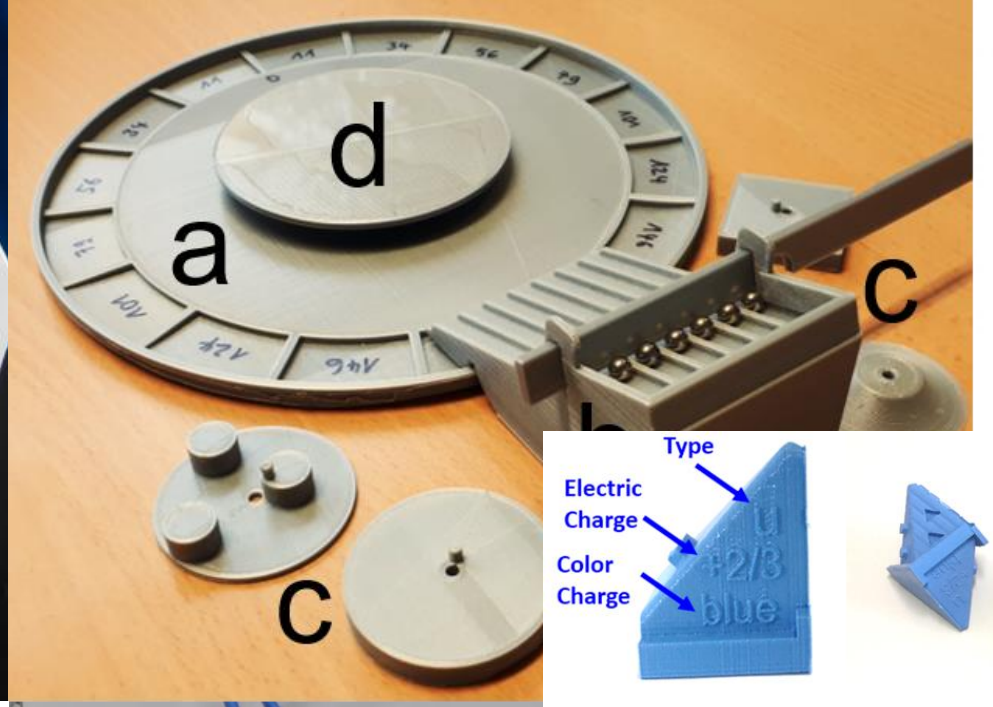


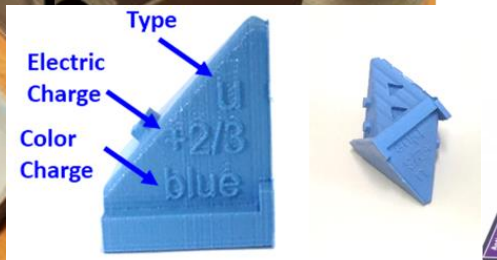
Beamline for Schools Competition

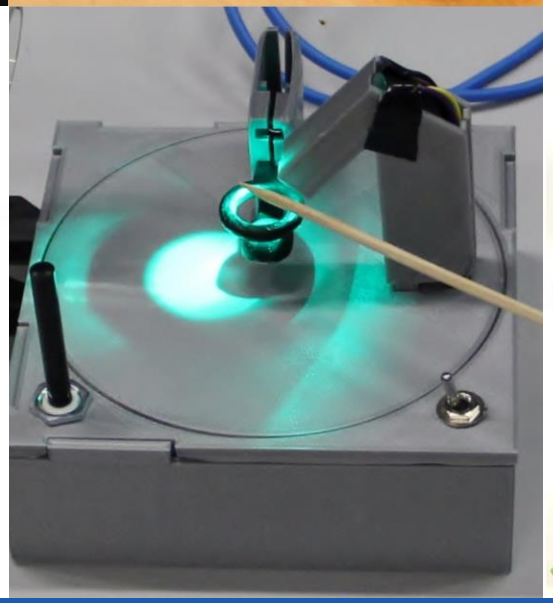
17 PARTNERSHIPS FOR THE GOALS

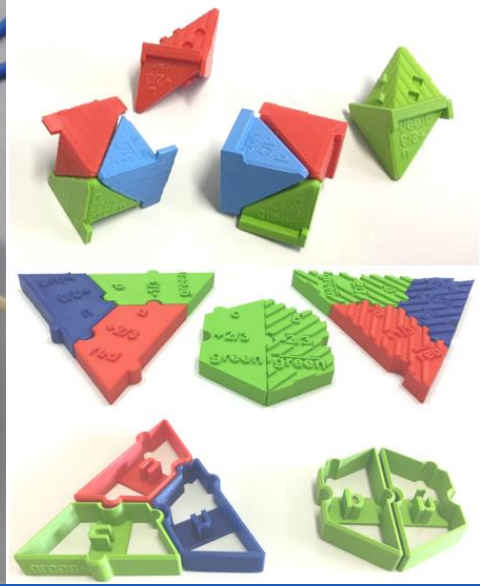
4 QUALITY EDUCATION











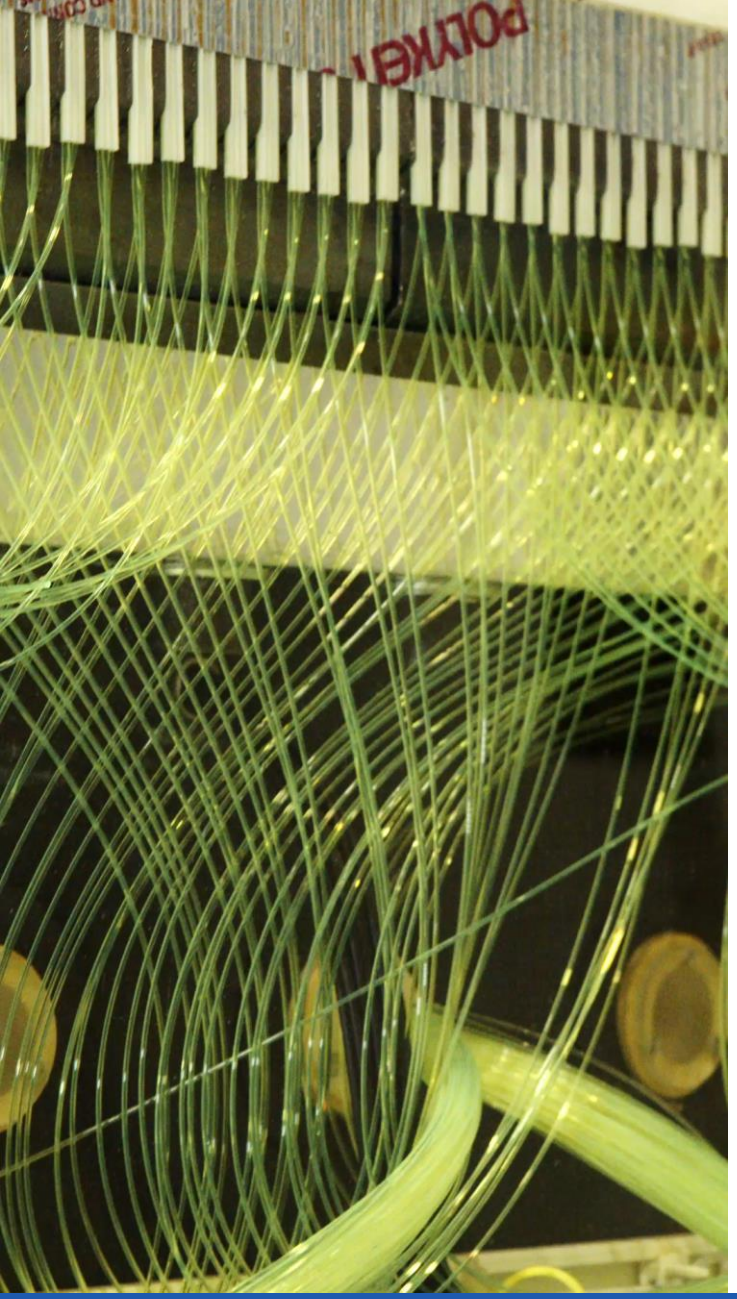
CERN

Low-Cost Material for the Classroom

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

10 REDUCED INEQUALITIES

4 QUALITY EDUCATION



CERN | SOLVAY Progress beyond

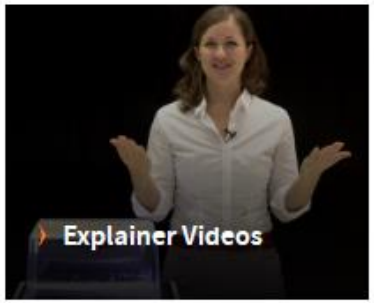
CERN Science Gateway

CERN-Solvay Education Programme

The CERN-Solvay Education Programme is designed to engage high-school students from around the world with exciting education content related to the scientific activities conducted at CERN. Funded by the Belgian science company Solvay, this programme combines the unique advantages of both online and on-site learning at CERN. It aims at triggering, fostering and building up the interest in STEM (science, technology, engineering, and mathematics) and in STEM careers among high-school students. On this website, you can find detailed information about each of the three levels which structure the programme:

- A collection of short videos for social media showcasing do-it-yourself STEM experiments aimed at a broad audience
- A series of explainer videos for 14 to 19-year-olds going beyond high-school physics to understand CERN physics
- A yearly student camp gathering 30 participants aged 16-19 from around the world for a week-long immersion at CERN

Happy browsing!



CERN-Solvay Education Programme

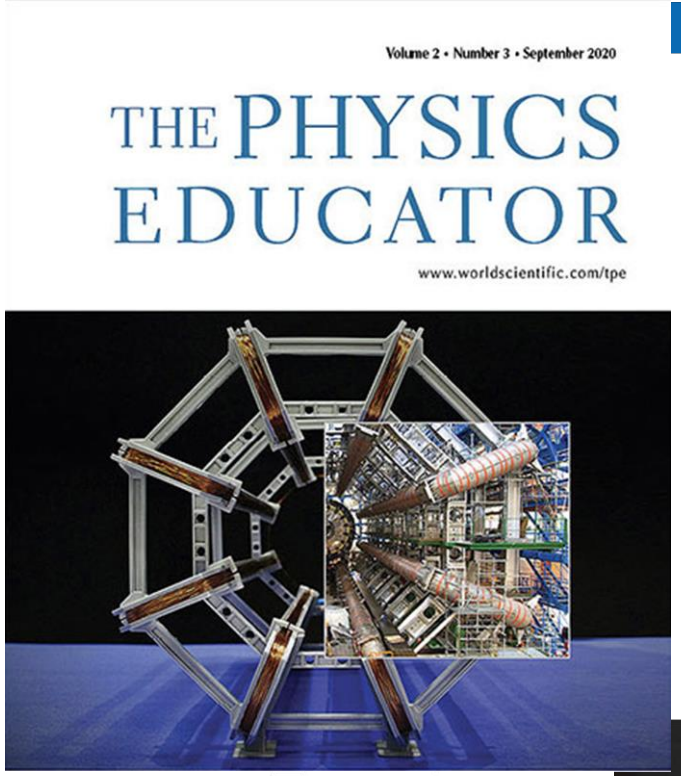
17 PARTNERSHIPS FOR THE GOALS

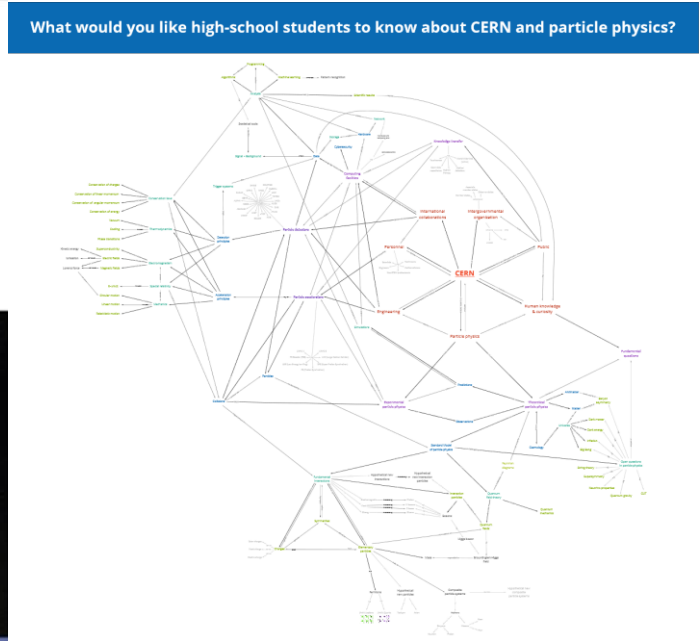
4 QUALITY EDUCATION

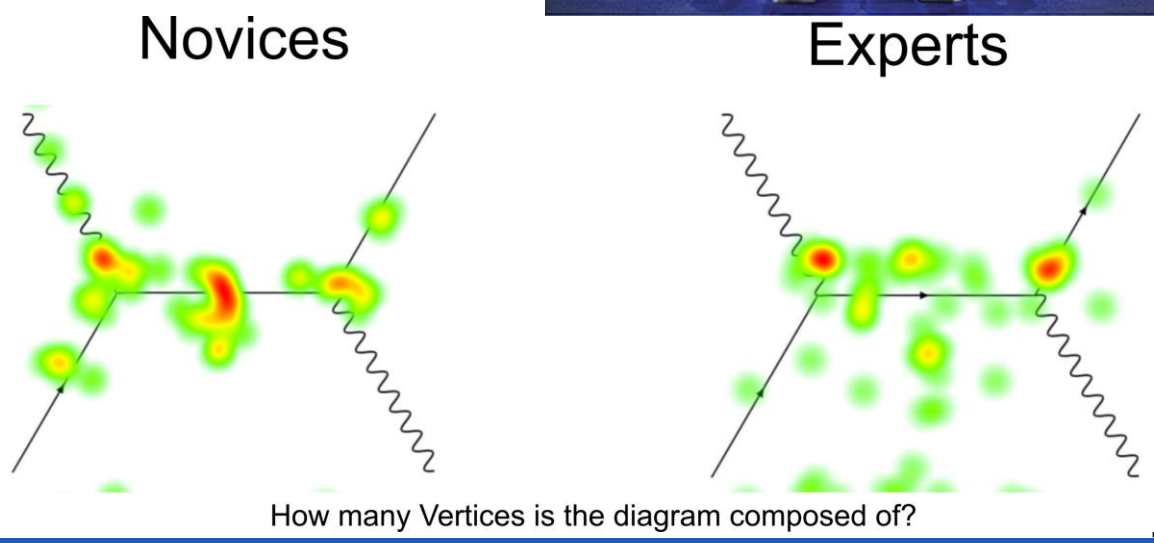
- Empirical Evaluation

- Design-Based Research
  - Facilities at CERN
  - Material for Education
  - Education Programmes

- Research on
  - Motivation
  - Curiosity
  - Impact







Accompanied by Research

Ihre Fragen