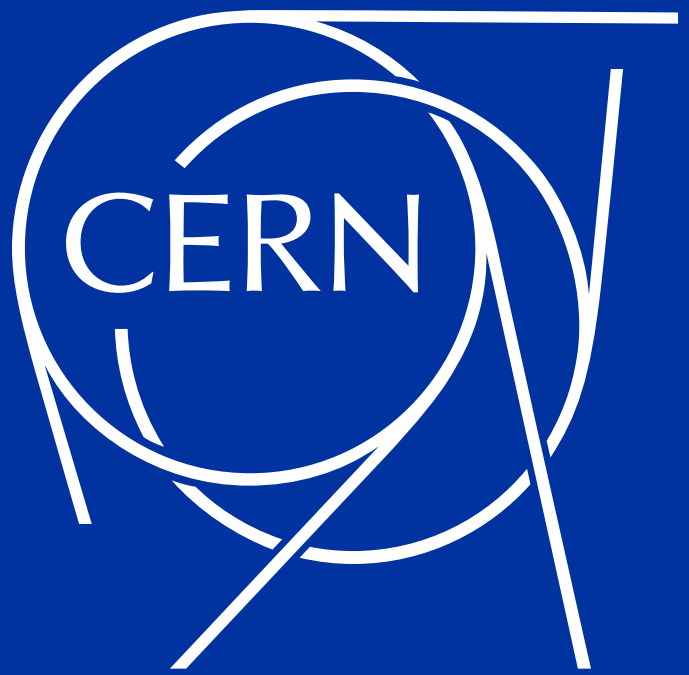
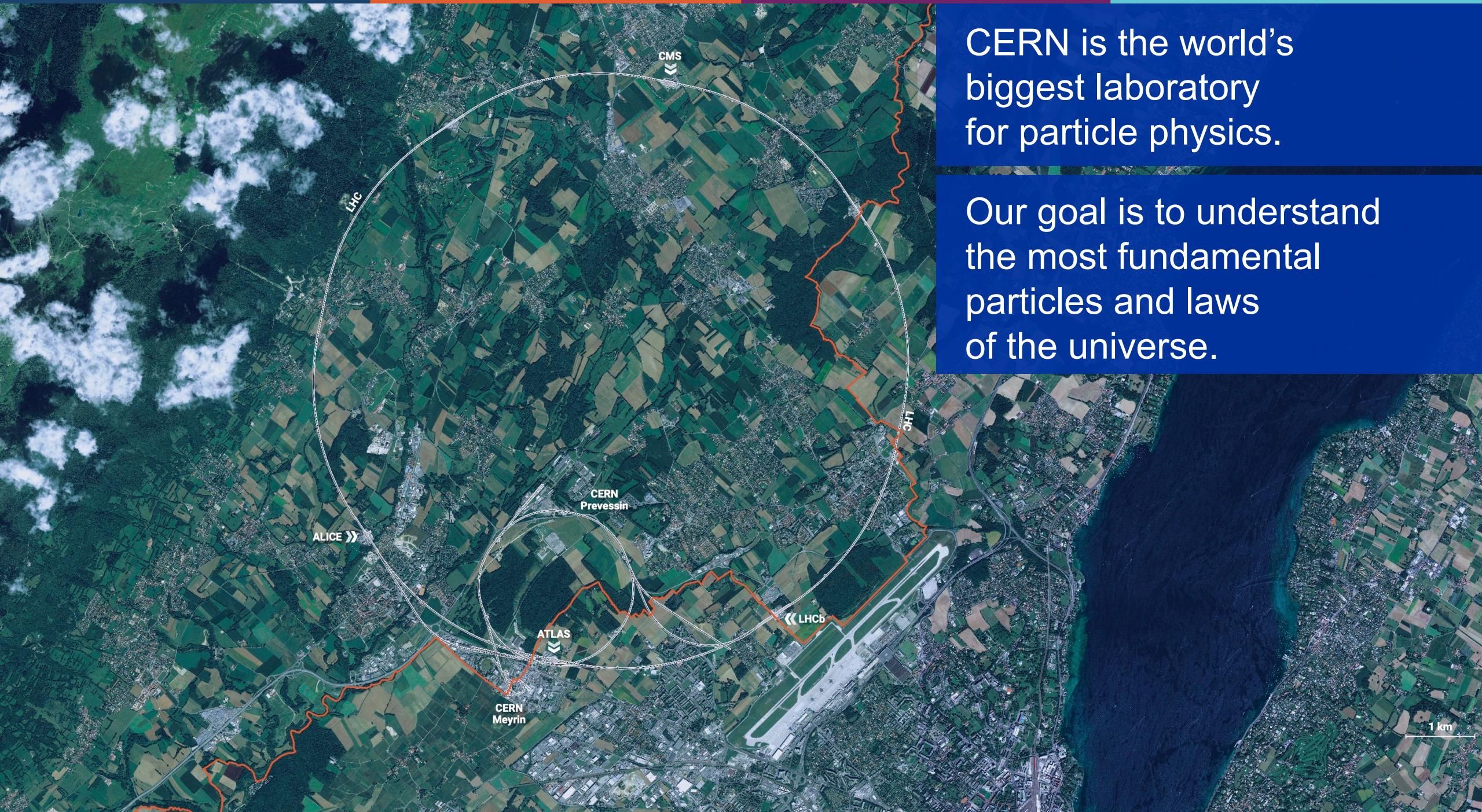

CERN

WELCOME

CERN OSPO Inauguration Event



CERN is the world's biggest laboratory for particle physics.

Our goal is to understand the most fundamental particles and laws of the universe.

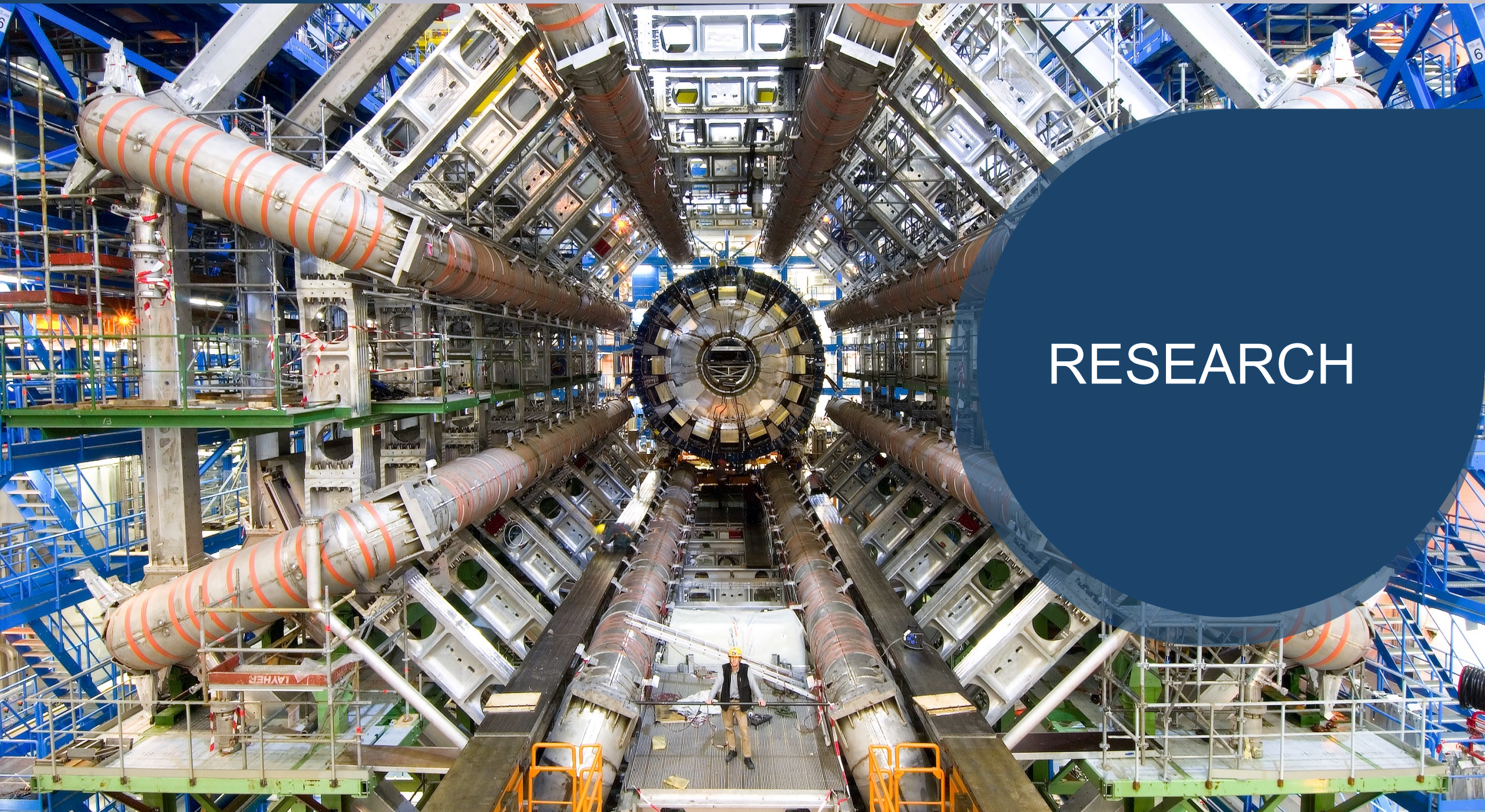
Four pillars underpin CERN's mission

RESEARCH

COLLABORATION

EDUCATION
& TRAINING

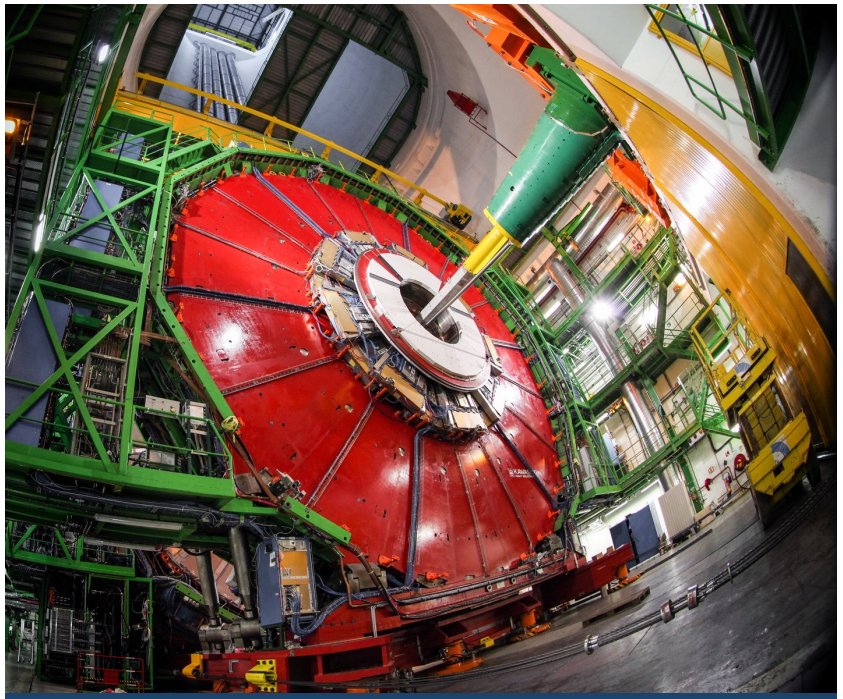
TECHNOLOGY
& INNOVATION



RESEARCH

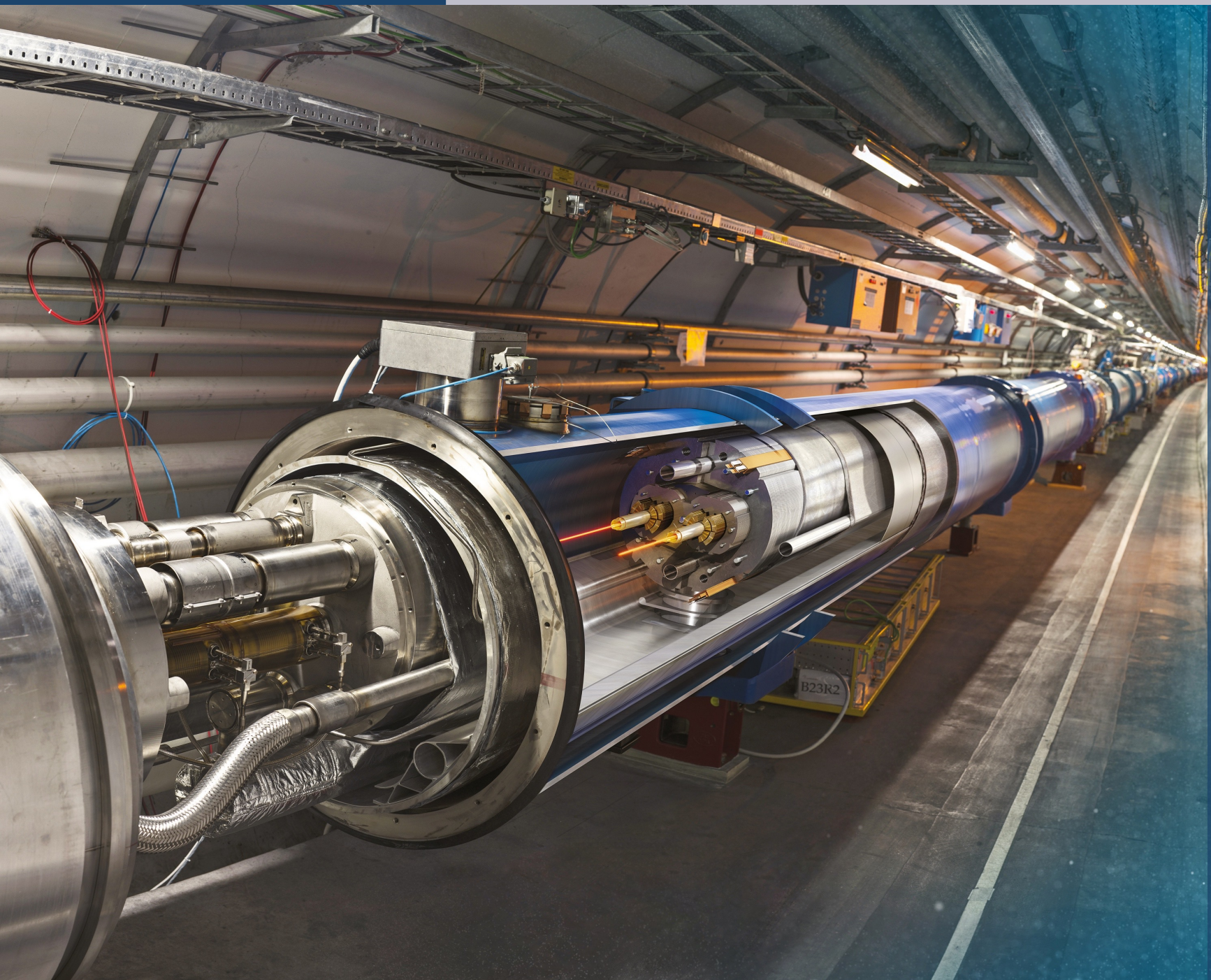
We develop technologies in three key areas

ACCELERATORS



DETECTORS

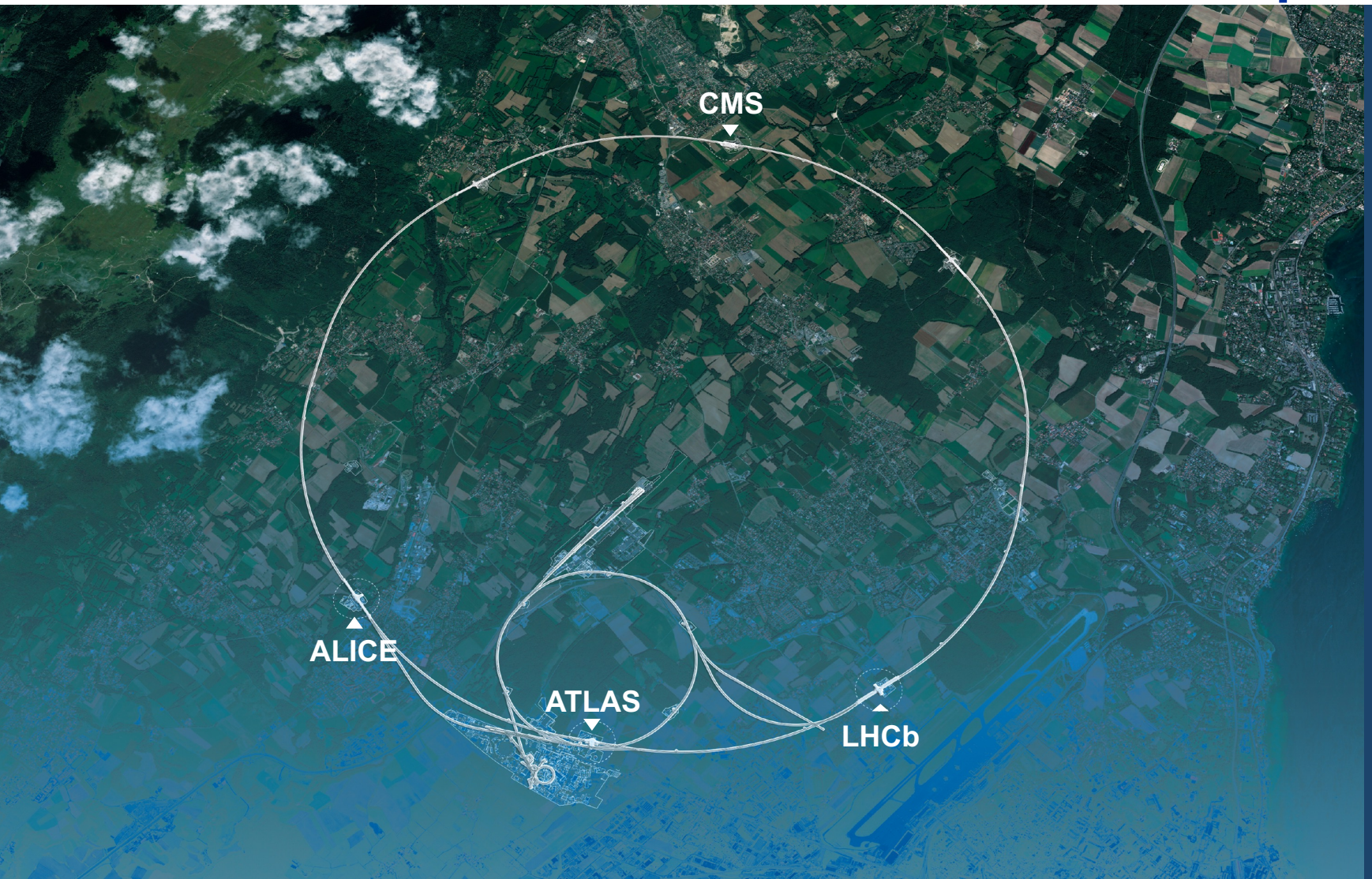
COMPUTING

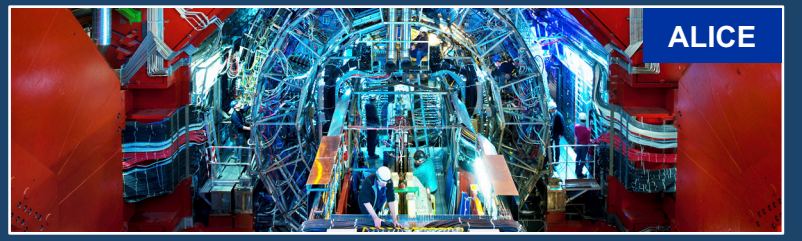


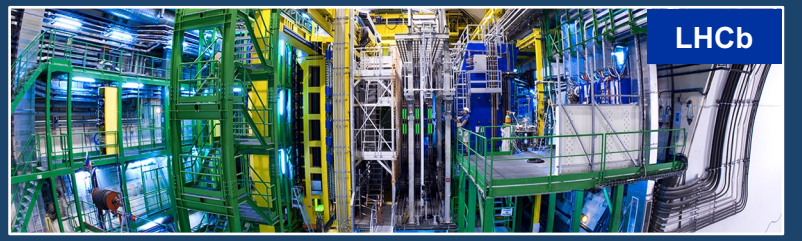
Large Hadron Collider (LHC)

- 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

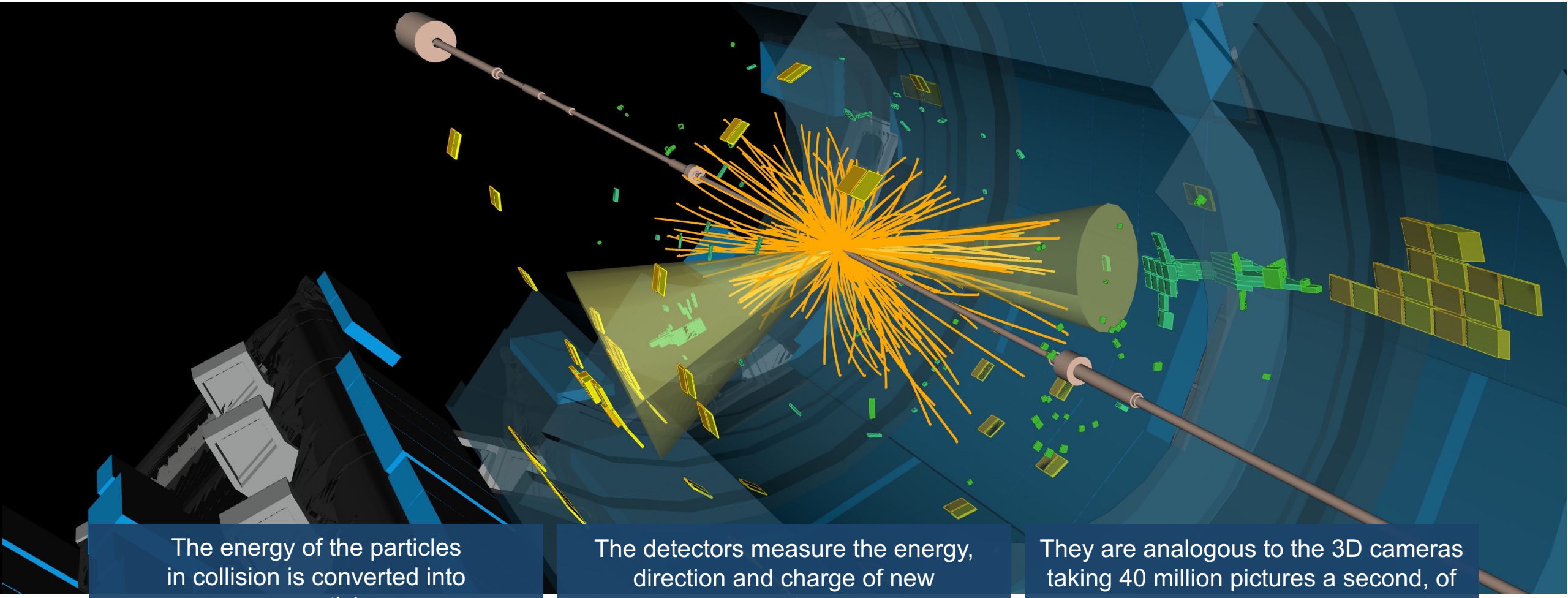
Giant detectors record the particles formed at the four collision points







The LHC produces more than 1 billion particle collisions per second

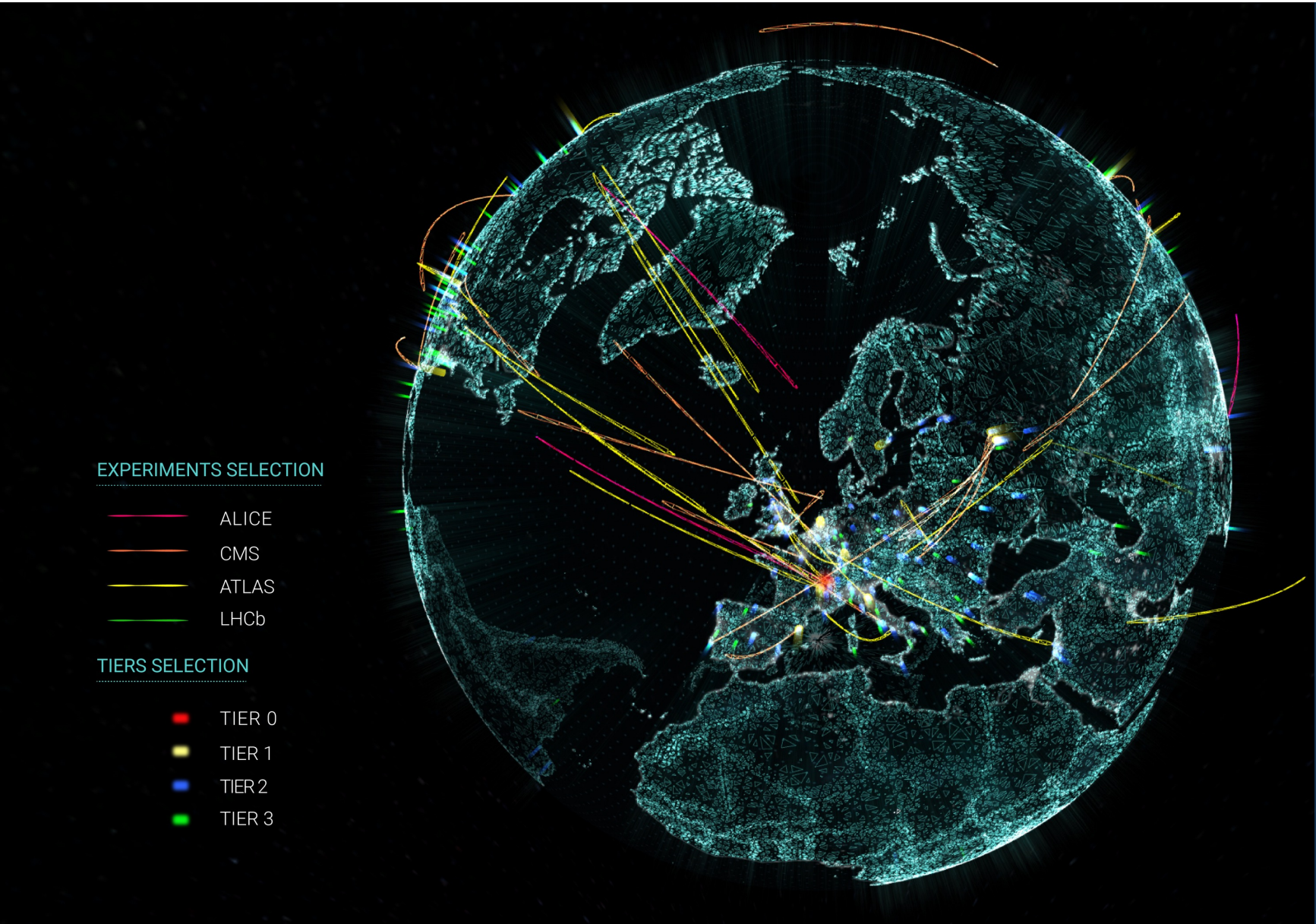


The energy of the particles in collision is converted into new particles.

The detectors measure the energy, direction and charge of new particles formed.

They are analogous to the 3D cameras taking 40 million pictures a second, of which 1000 are selected and recorded.

The Worldwide LHC Computing Grid (WLCG)



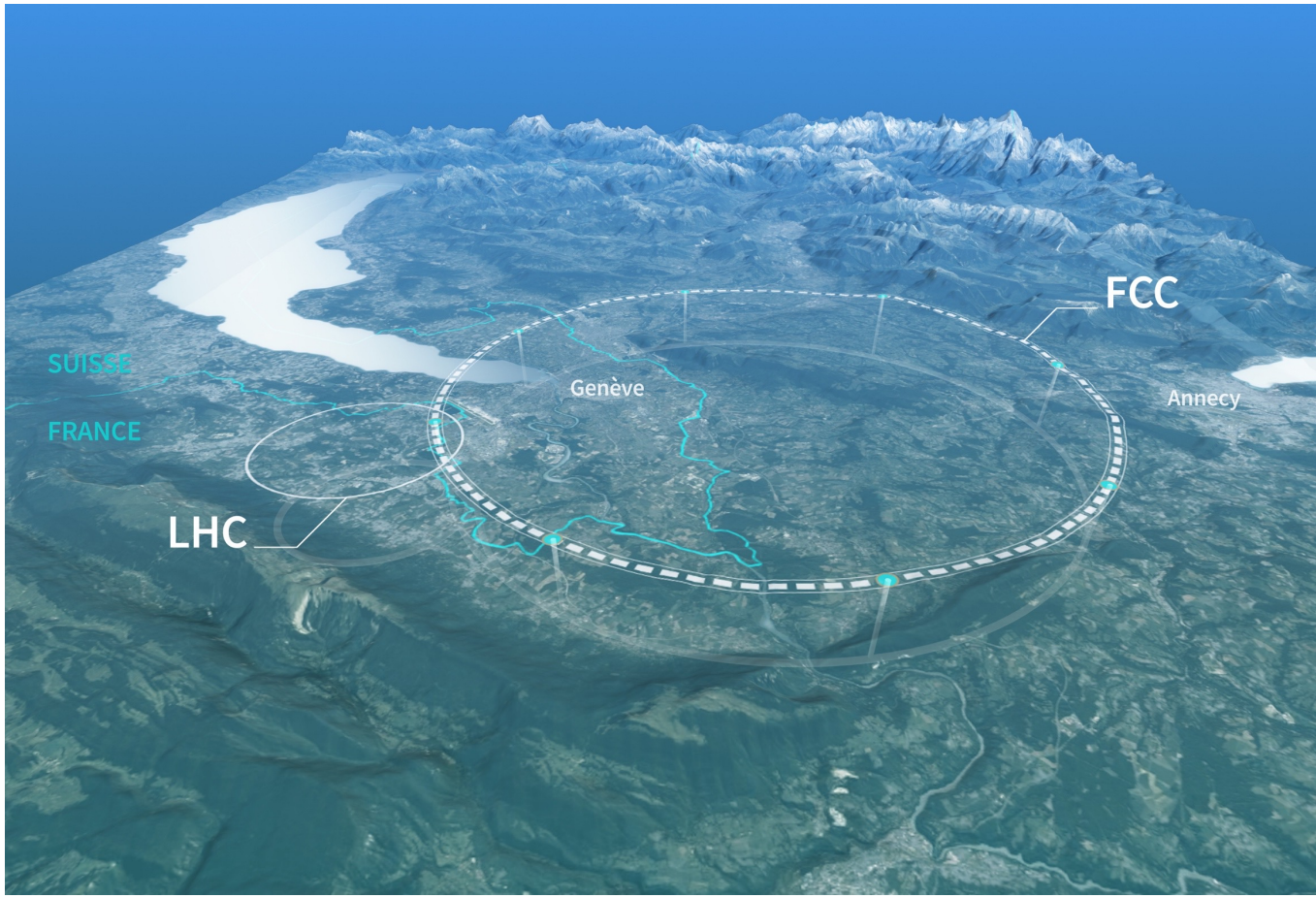
WLCG

- Stores, distributes, processes and analyses LHC experiments' data.
- 1.4 million processing cores in 170 data centres and more than 40 countries.
- 1500 Petabytes of CERN data stored world-wide.

CERN's future

Driven by the **2020 Update of the European Strategy for Particle Physics**

- Upgrade to High-Luminosity LHC (2029-2041)
- Technical and financial feasibility study of a Future Circular Collider (report for end 2025)
- Accelerator R&D to develop technologies for FCC and for alternative options
- Detector and computing R&D
- Maintain and expand a compelling scientific diversity programme
- Continue to support other projects around the world



COLLABORATION

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

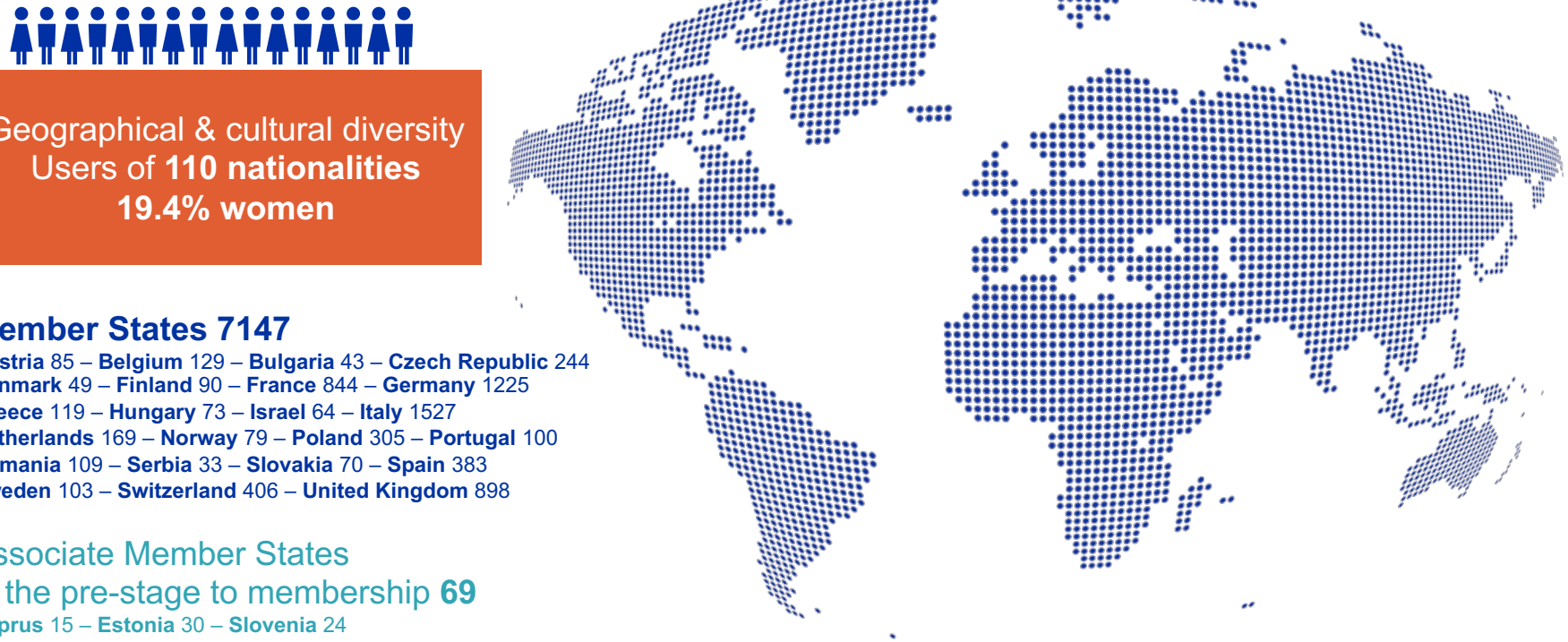
Associates:
11 860 users, **1516** others

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

TECHNOLOGY & INNOVATION

CERN’s technological innovations have applications in many fields

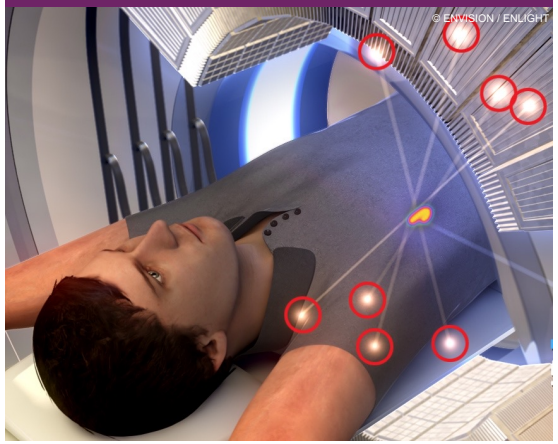
CERN is the birthplace of the World Wide Web

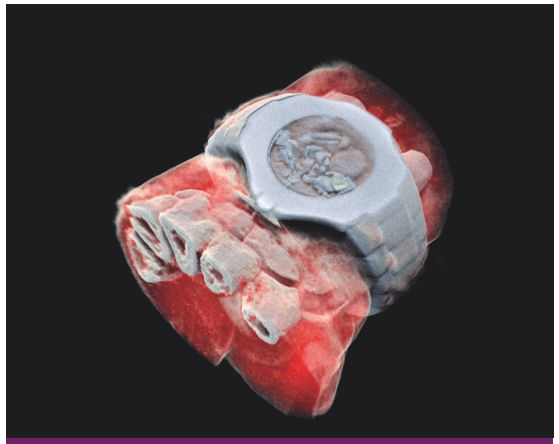
And there are many more examples
Medical imaging, cancer therapy, material science, cultural heritage, aerospace, automotive, environment, health & safety, industrial processes.

CERN’s technological innovations have important applications in medicine and healthcare

Accelerator technologies are applied in cancer radiotherapy with protons, ions and electrons.

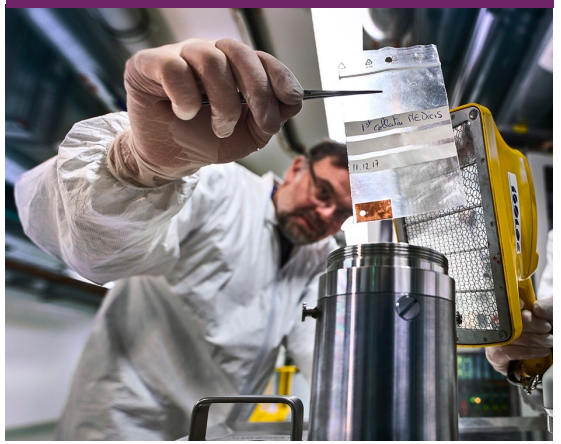
Technologies applied at CERN are also used in PET, for medical imaging and diagnostics.





Pixel detector technologies are used for high resolution 3D colour X-ray imaging.

CERN produces innovative radioisotopes for nuclear medicine research.



EDUCATION
& TRAINING

CERN's training, education and outreach programmes

900 graduates
(including Research Fellows)

3 000 PhD students

300 Undergraduate students in Summer programmes

>14 000 teachers participating in dedicated programmes, since 1998

Around **150 000 visitors** on guided tours of CERN, from >50 countries

4.7M followers on social media, from around the globe

CERN Science Gateway

CERN's new education and outreach centre for all publics aged 5-plus.

Inaugurated 7 October 2023.

Immersive exhibitions, education labs, events and shows.

CERN Convention

Founding principles of the Organization include that …
the results of its experimental and theoretical work shall be published or otherwise made generally available.

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CONVENTION

FOR THE ESTABLISHMENT OF A EUROPEAN ORGANIZATION
FOR NUCLEAR RESEARCH

PARIS, 1st JULY, 1953

As amended

CONVENTION

POUR L'ÉTABLISSEMENT D'UNE ORGANISATION EUROPÉENNE
POUR LA RECHERCHE NUCLÉAIRE

PARIS, le 1er JUILLET 1953

Telle qu'elle a été modifiée

ÜBEREINKOMMEN

ZUR ERRICHTUNG EINER EUROPÄISCHEN ORGANISATION
FÜR KERNFORSCHUNG

PARIS, 1. JULI 1953

Revidierte Fassung

Open Science at CERN

2012 — **Open Source Licence Task Force at CERN**

2014 — **CERN Open Access Policy released**
(highly successful: 95% of CERN articles published OA)

CERN Open Data Portal

Jun 2020 — **ESPP update:** "…shape the emerging consensus on Open Science … implement a policy of Open Science for the field."

Nov 2020 — **LHC Open Data Policy released**

Feb 2021 — **Creation of the Open Science Strategy Working Group**

Oct 2022 — **Open Science Policy released**

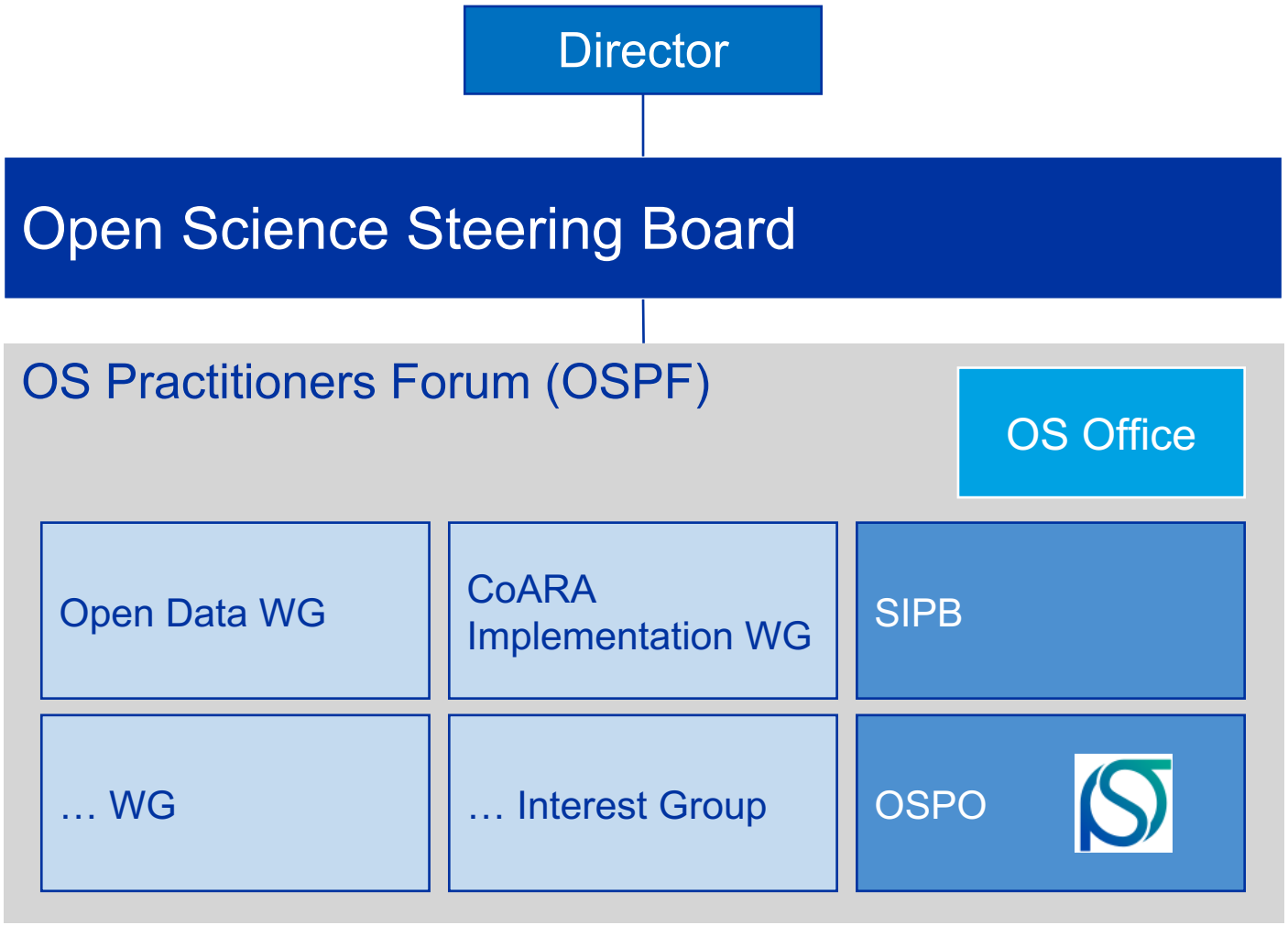
Apr 2023 — **Open Science Policy – implementation plan released**

Nov 2023 — **Open Source Programme Office and Open Science Office established**

Open Science Policy

1. Open access to publications
2. Open data
3. Open source software
4. Open hardware
5. Research integrity, reuse and reproducibility
6. Infrastructure provision for open science
7. Research assessment and evaluation
8. Education, training and outreach

CERN OS Governance Framework



- Responsible for OS strategy & policy
- Consists of department/experiment reps

- Open forum for CERN-wide exchange
- Meets at least 2x per year

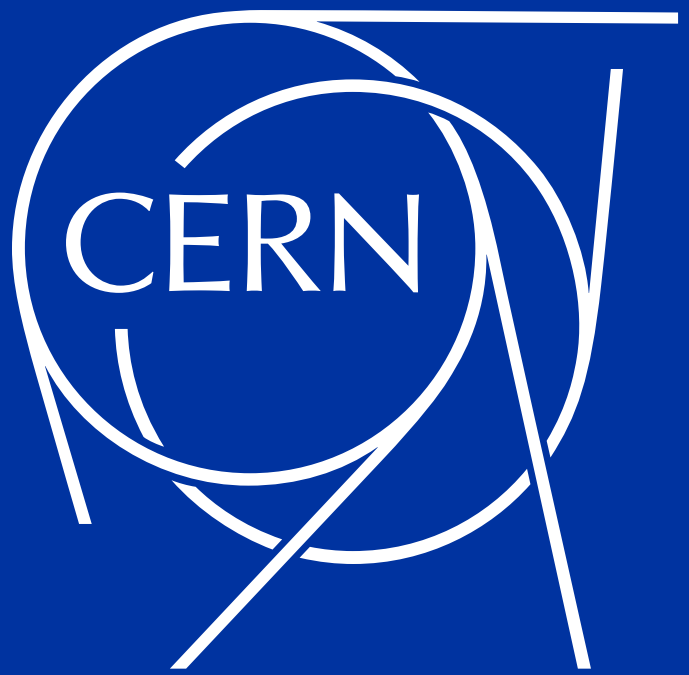
- Groups ensure OS implementation
- Provide input to annual OS Report
- CoARA - Coalition for Advancing Research Assessment
- SIPB – Scientific Information Policy Board
- OSPO is part of this new structure

CERN Open Source

- Open Source is fully embedded in CERN culture
  - WWW
- CERN Software available via Open Source Initiative licenses
  - Software to analyse experimental data, such as ROOT
- CERN hosts Open Source projects
  - Zenodo - platform for sharing research output
- CERN contributes to other Open Source initiatives
  - Software for IT infrastructures
- CERN established an Open Hardware License
  - White Rabbit to distribute precise timing across distributed systems

CERN OSPO

- Open Source Programme Office approved in May 2023 – now up and running with official launch today
- CERN OSPO covers Open Source Software and Hardware
- Spans all sectors with representatives from many departments, in particular Knowledge Transfer
- Internally – provide community support, create synergies across departments
- Externally – help to make CERN's expertise more visible, including synergies with other domains
- The OSPO team is integrated in the wider CERN community. Thanks to them for their commitment!


CERN