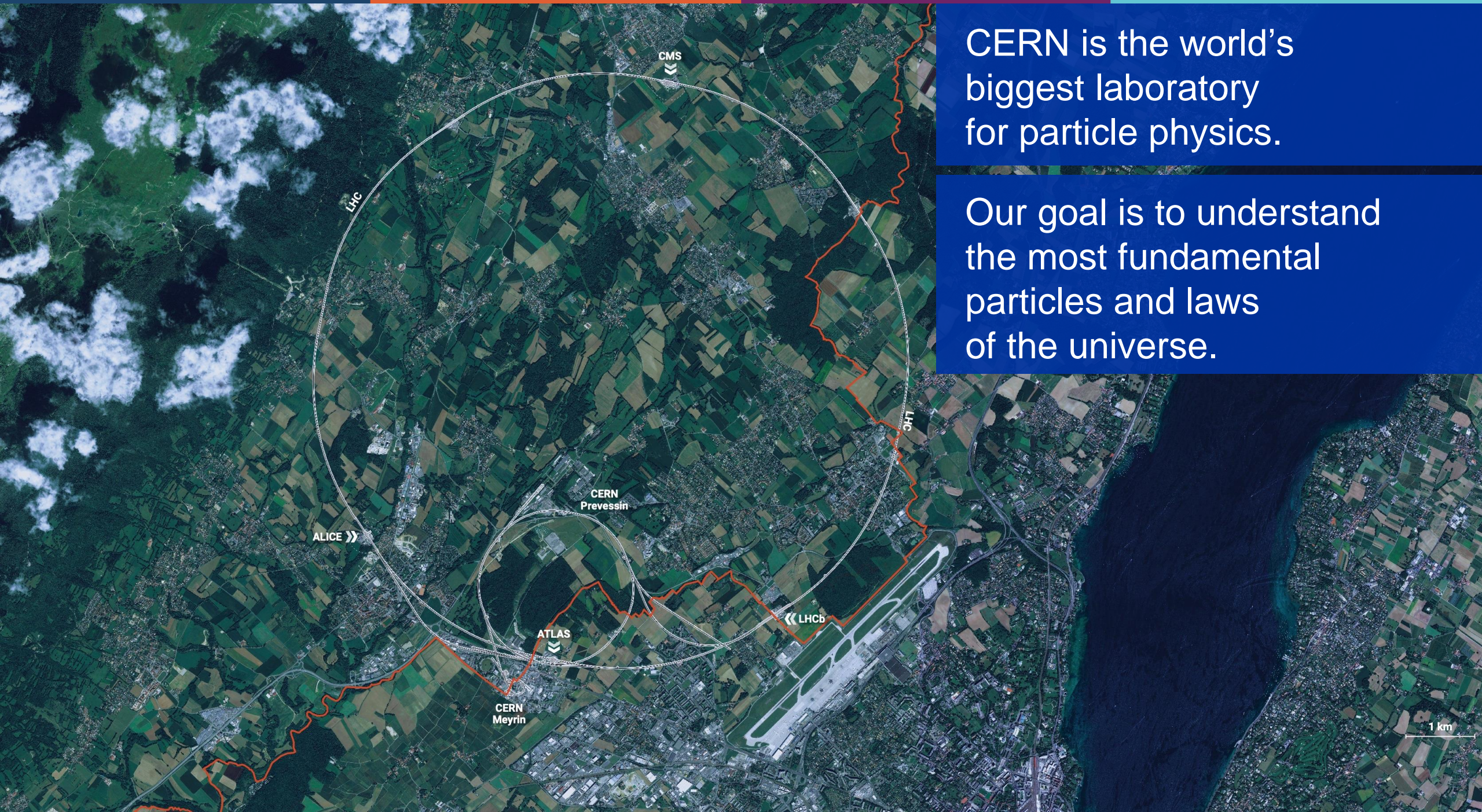


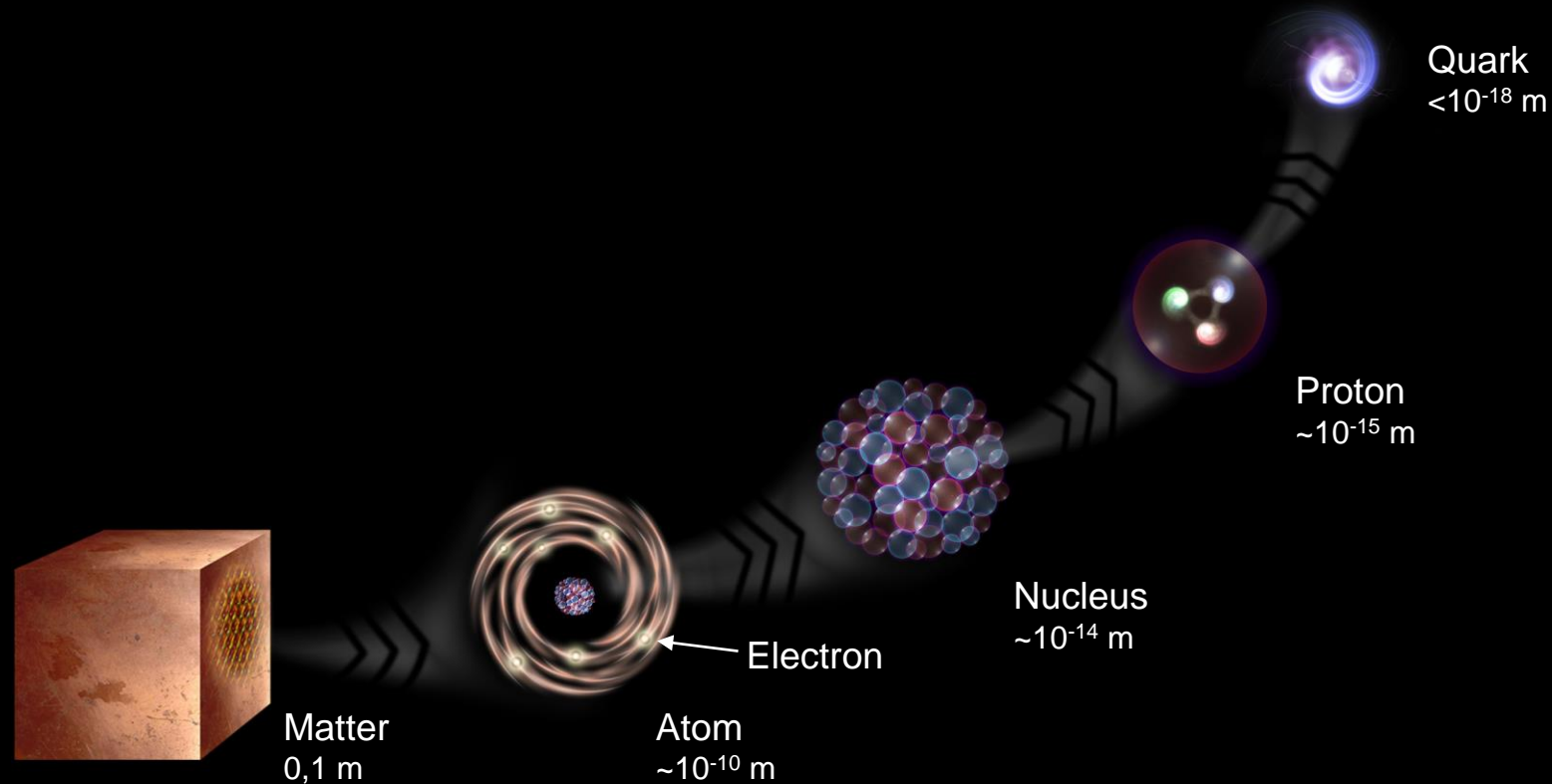
CERN is the world's
biggest laboratory
for particle physics.

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



What is the universe made of?

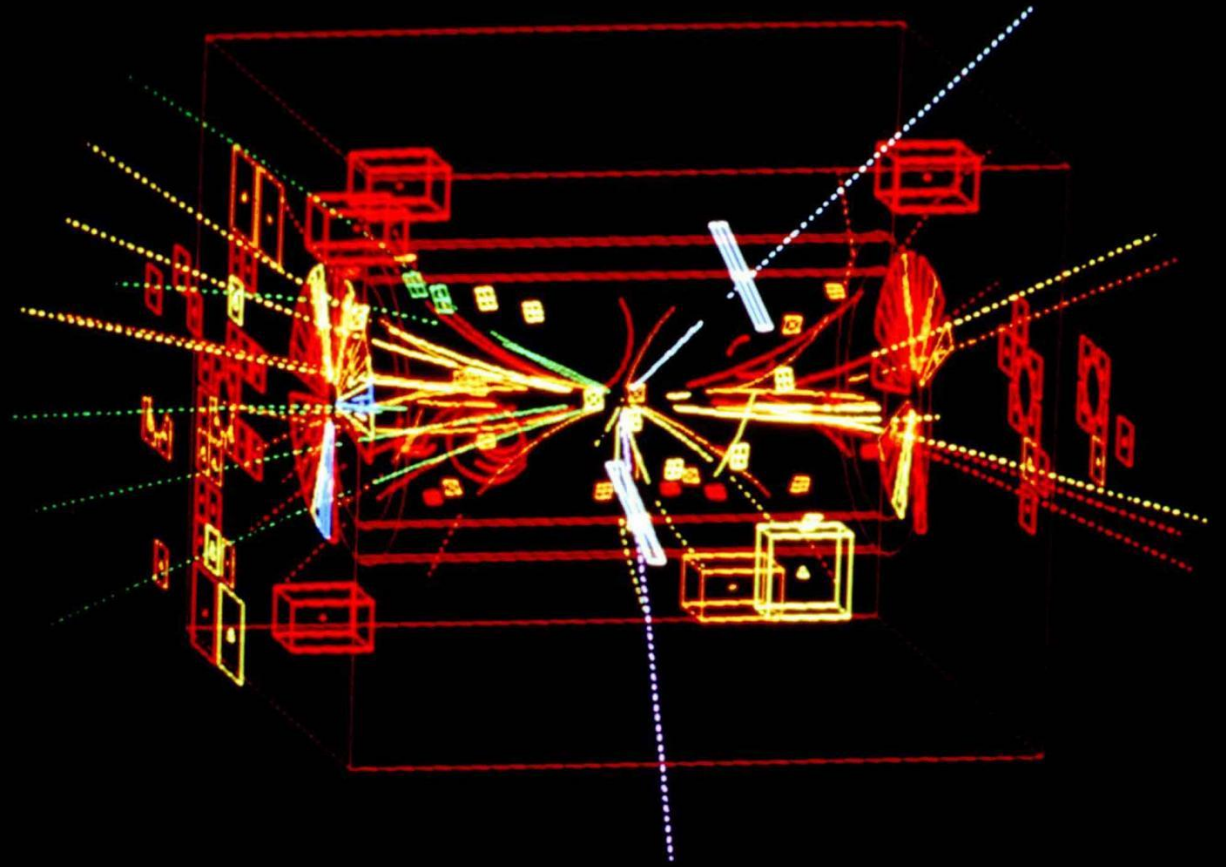
We study the elementary building blocks of matter and the forces that control their behaviour

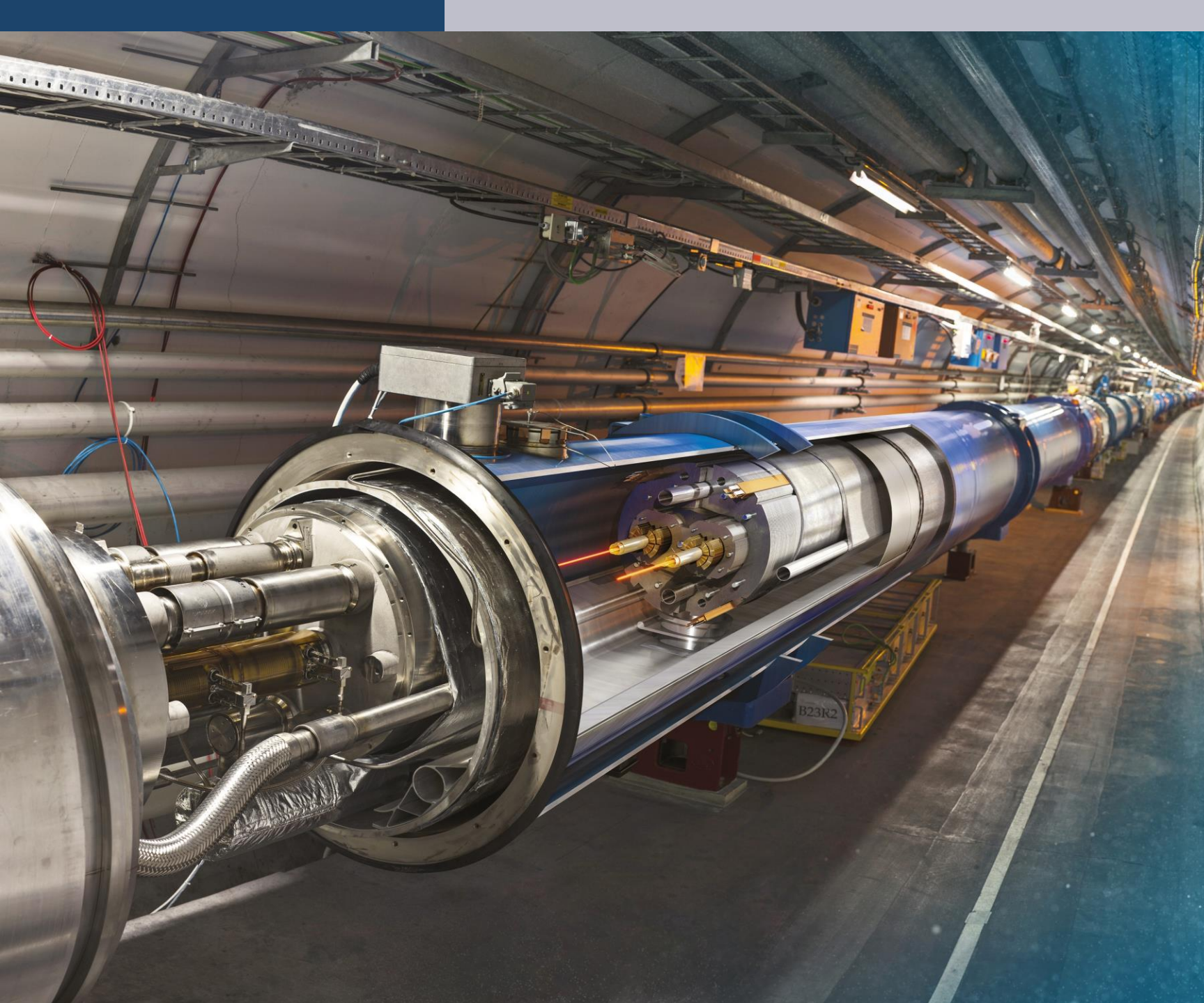


Four pillars underpin CERN's mission



Accelerators and Experiments



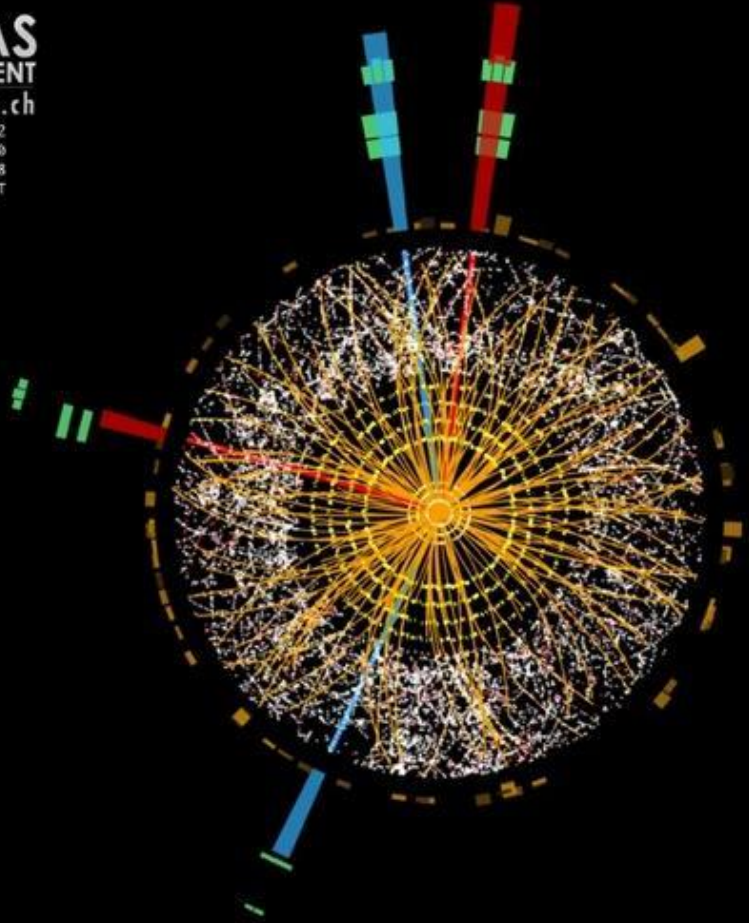


Large Hadron Collider (LHC)

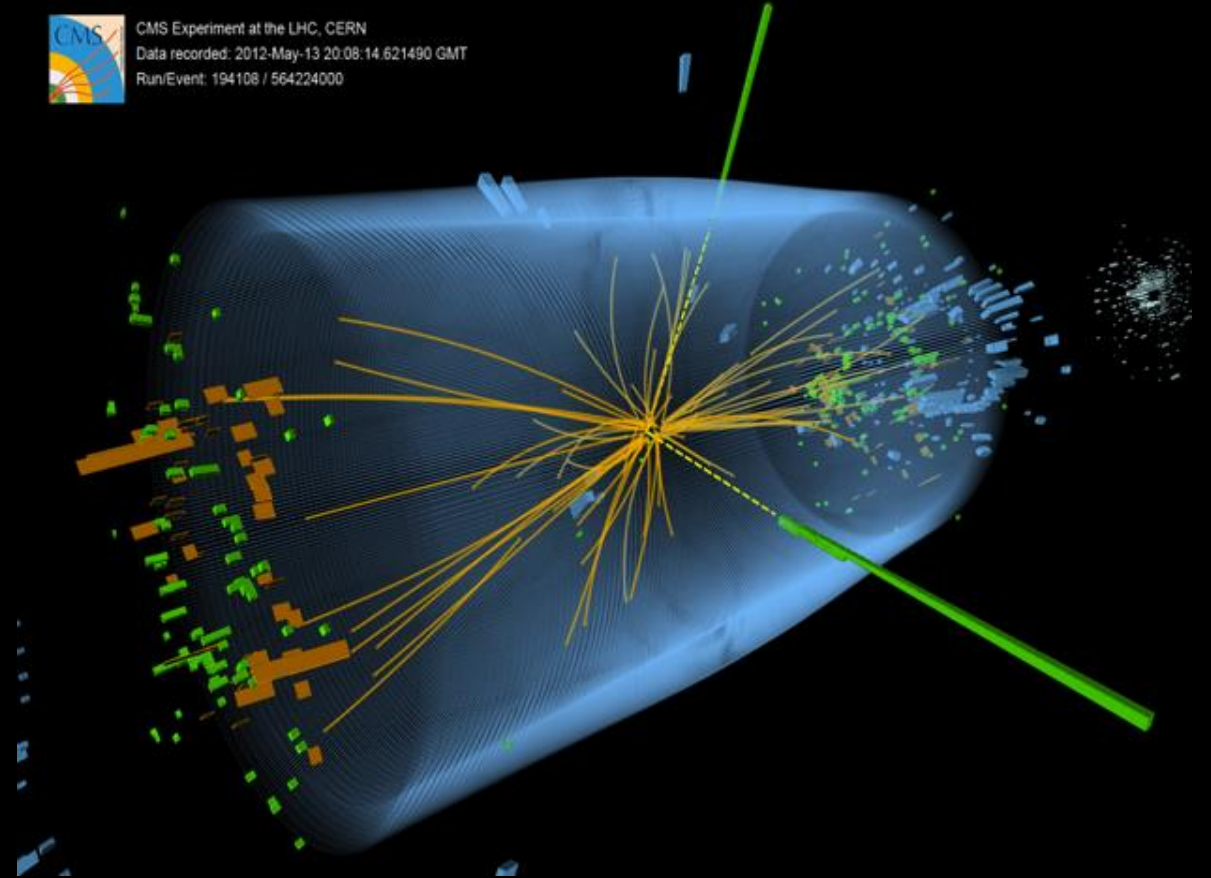
- 27 km in circumference
- About 100 m underground
- Superconducting magnets steer the particles around the ring
- Particles are accelerated to close to the speed of light

Higgs boson

ATLAS
EXPERIMENT
<http://atlas.ch>
Run: 203602
Event: 82614360
Date: 2012-05-18
Time: 29:28:11 CEST



CMS Experiment at the LHC, CERN
Data recorded: 2012-May-13 20:08:14.621490 GMT
Run/Event: 194108 / 564224000

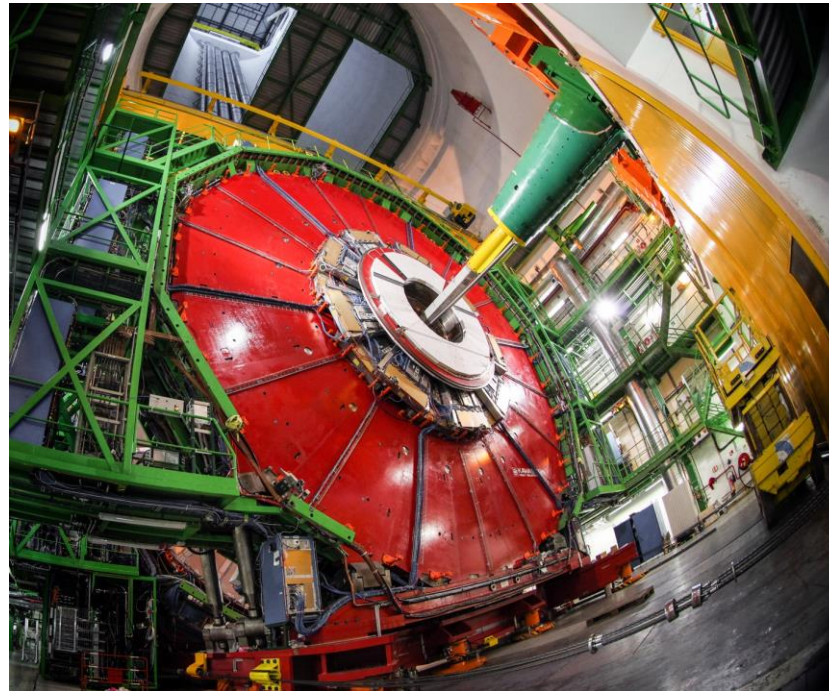


Discovered in 2012

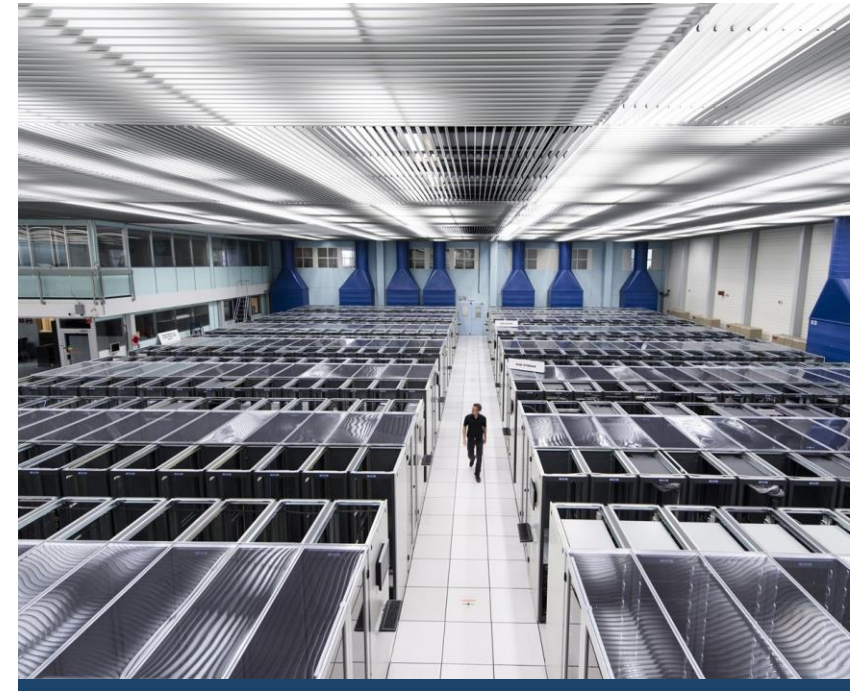
We develop technologies in three key areas



ACCELERATORS



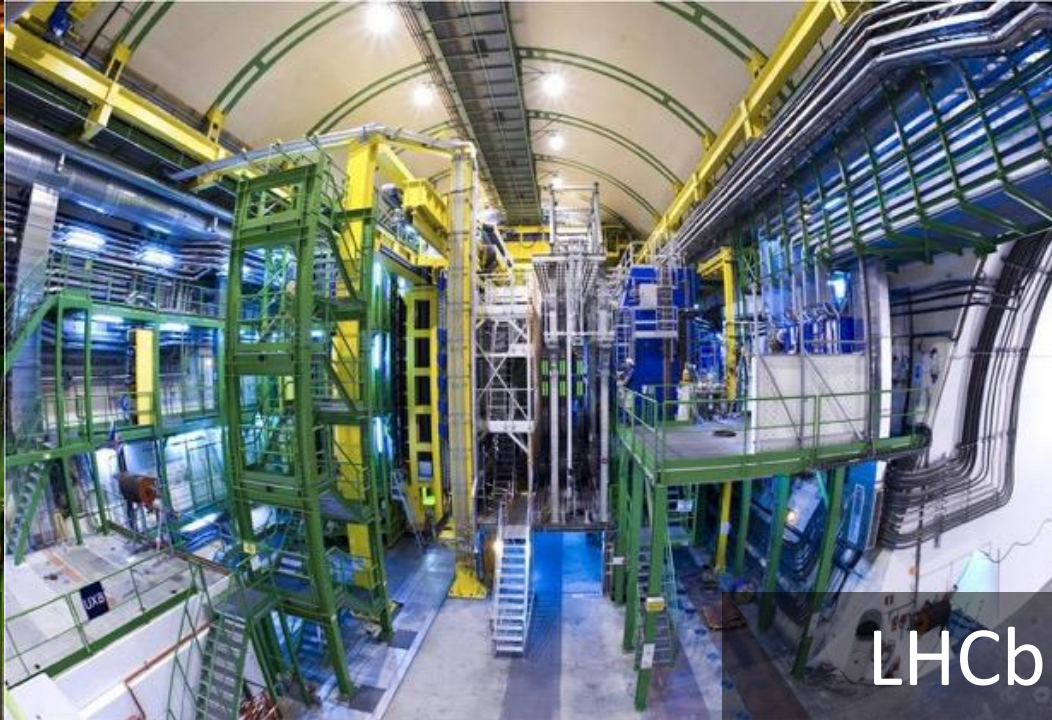
DETECTORS



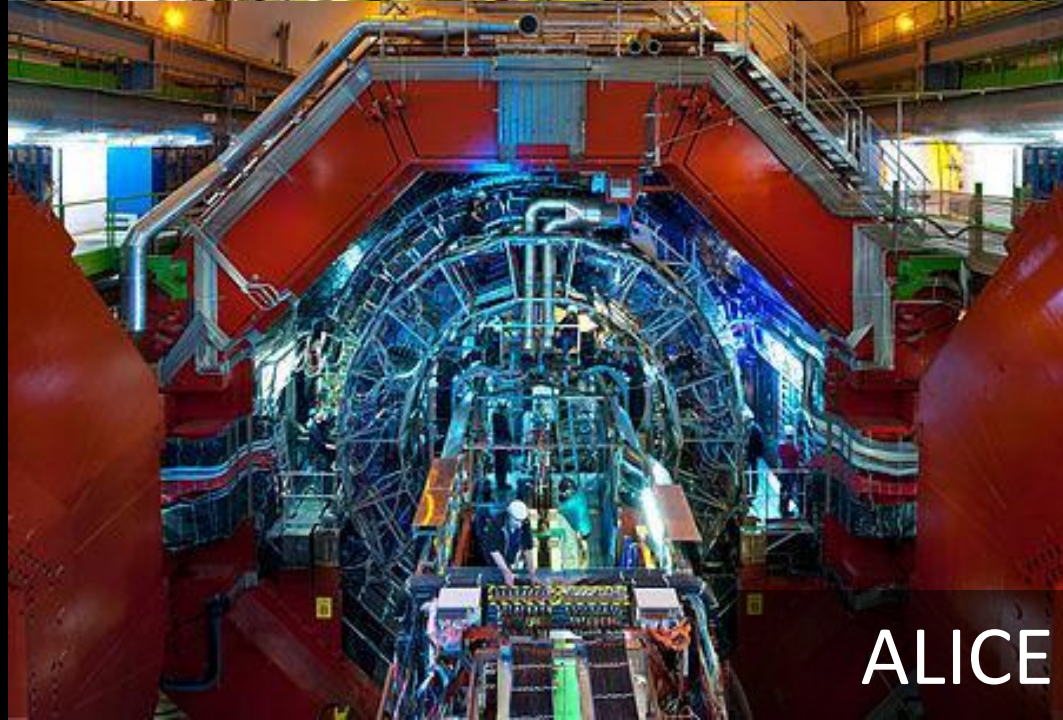
COMPUTING



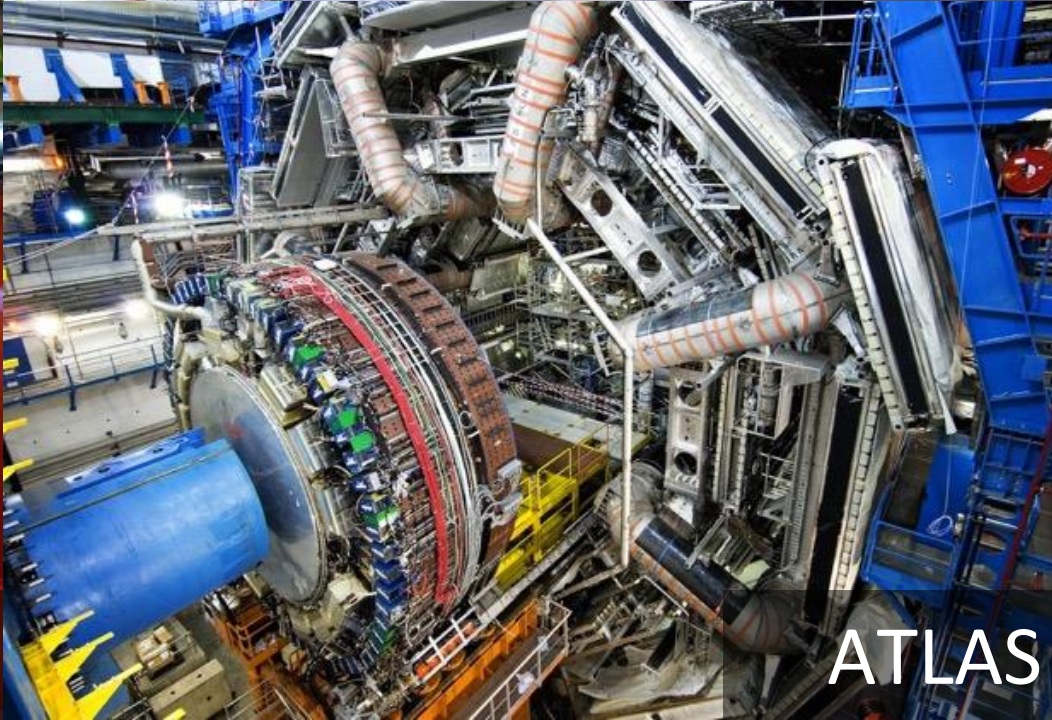
CMS



LHCb



ALICE



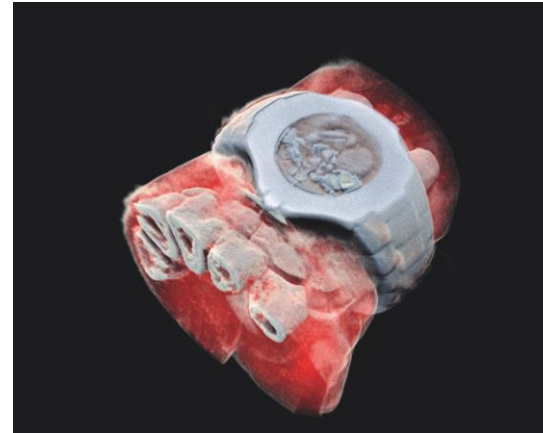
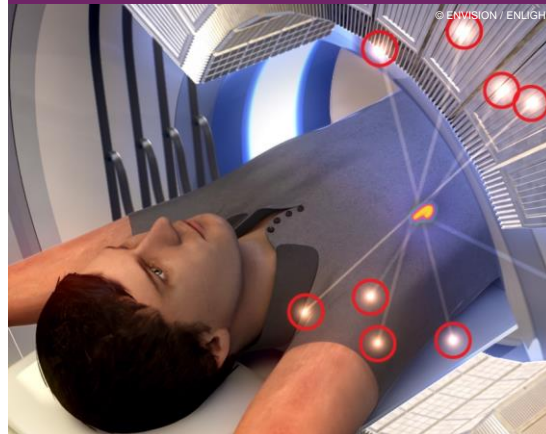
ATLAS

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



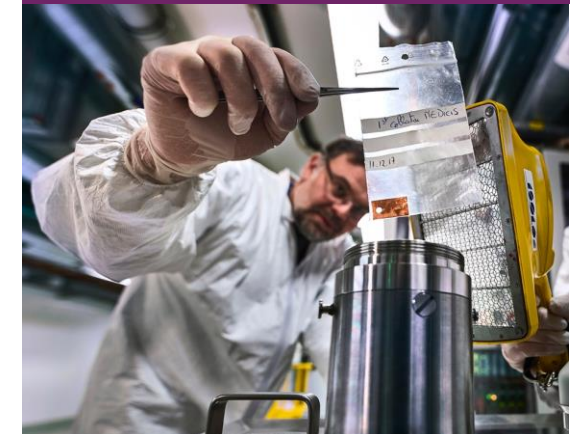
Accelerator technologies are applied in cancer radiotherapy with protons, ions and electrons.

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.



There are many unanswered questions in fundamental physics

Including

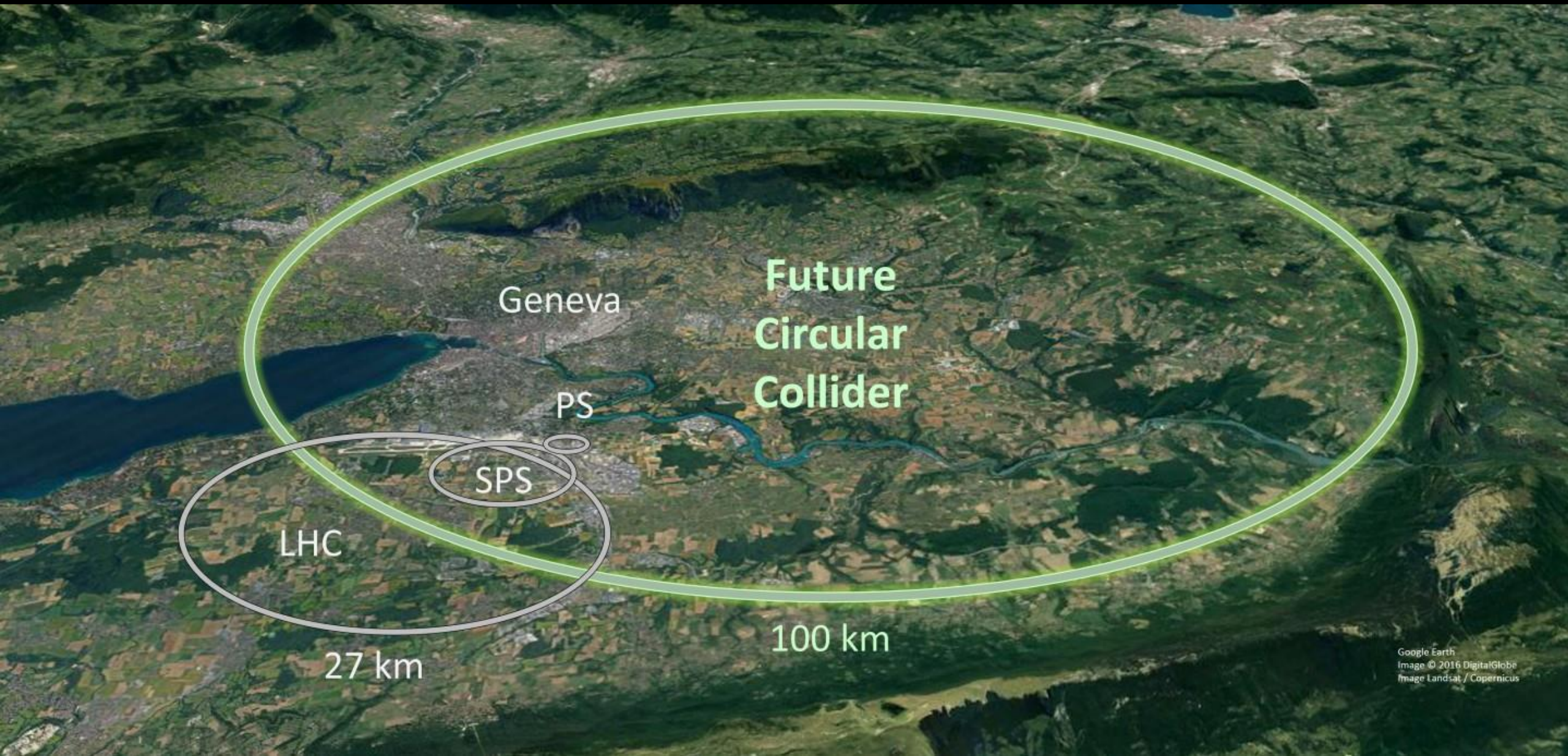
What is the unknown
95% of the mass
and energy
of the universe?

Is there only one Higgs
boson, and does it
behave exactly as
expected?

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

Why is gravity so weak
compared to the other
forces?

The Future Circular Collider

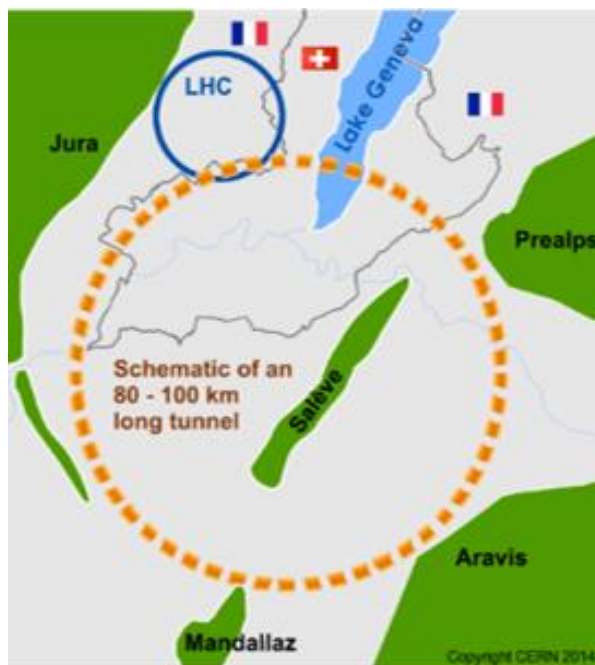


FCC integrated program

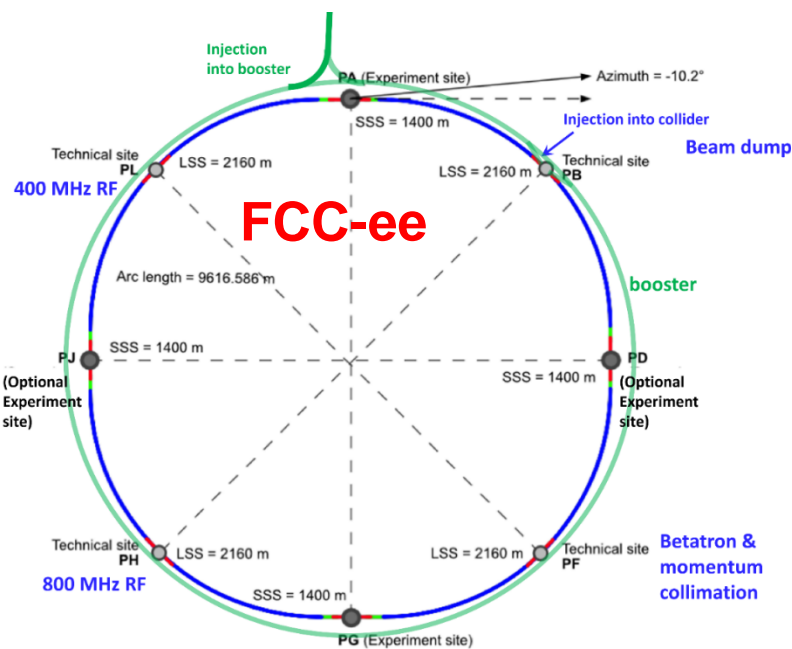
inspired by successful LEP – LHC programs at CERN

comprehensive long-term program maximizing physics opportunities

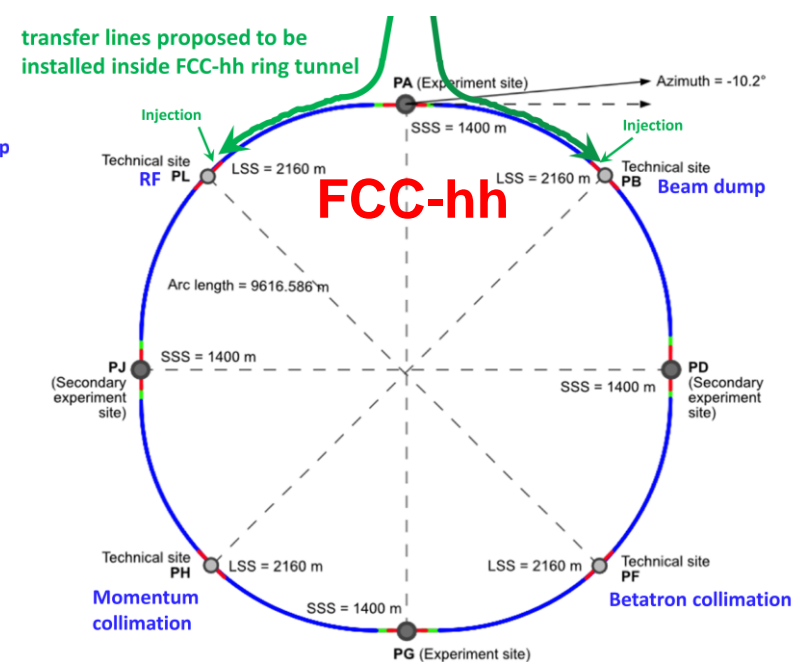
- stage 1: FCC-ee (Z, W, H, $t\bar{t}$) as Higgs factory, electroweak & top factory at highest luminosities
- stage 2: FCC-hh (~100 TeV) as natural continuation at energy frontier, with ion and eh options
- complementary physics
- common civil engineering and technical infrastructures, building on and reusing CERN's existing infrastructure
- FCC integrated project allows seamless continuation of HEP after completion of the HL-LHC program



2020 - 2040



2045 - 2060

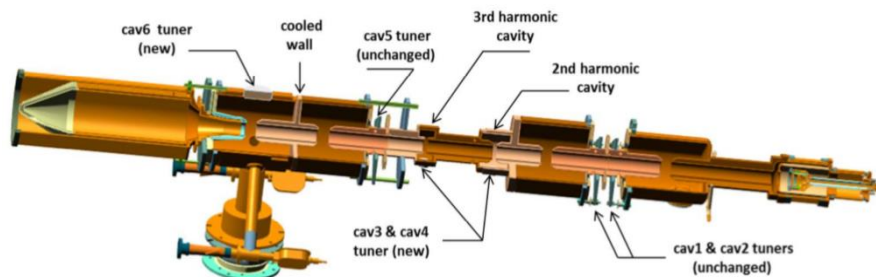


2065 - 2090

a similar two-stage project CEPC/SPPC is under study in China

efficient RF power sources (400 & 800 MHz)

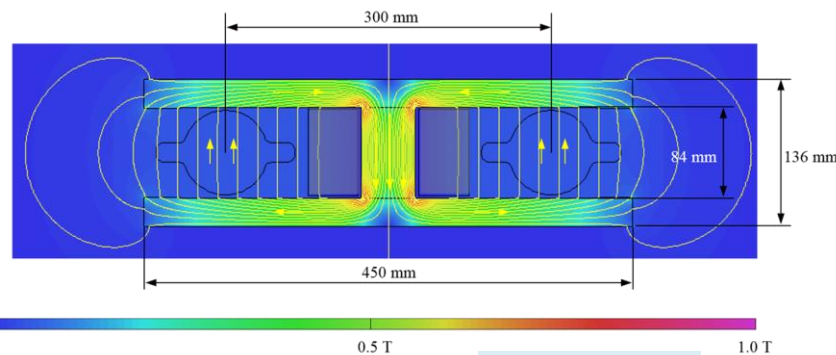
I. Syrathev



400 MHz
1-,2- & 4-
cell
Nb/Cu ,
4.5 K

FPC & HOM coupler, cryomodule,
thin-film coatings...

energy efficient twin aperture arc dipoles

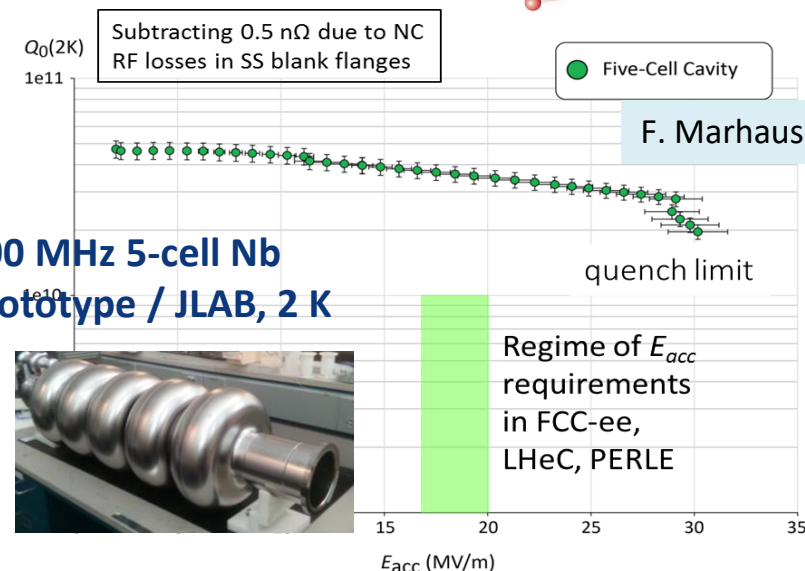


A. Milanese

efficient SC cavities



800 MHz 5-cell Nb
prototype / JLAB, 2 K

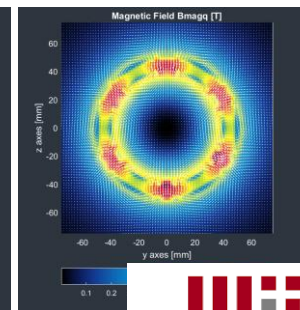
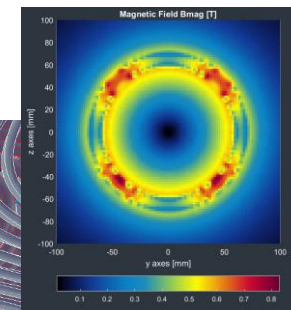
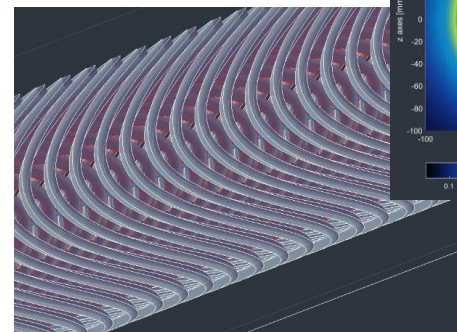


Jefferson Lab

F. Marhauser

under study: CCT HTS quad's & sext's for arcs

PAUL SCHERRER INSTITUT
PSI

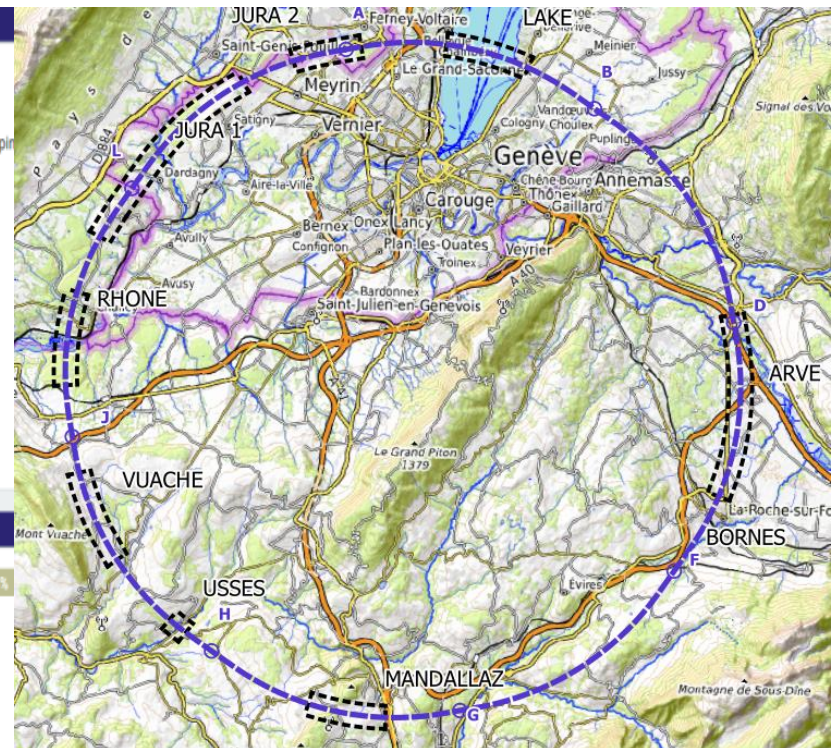
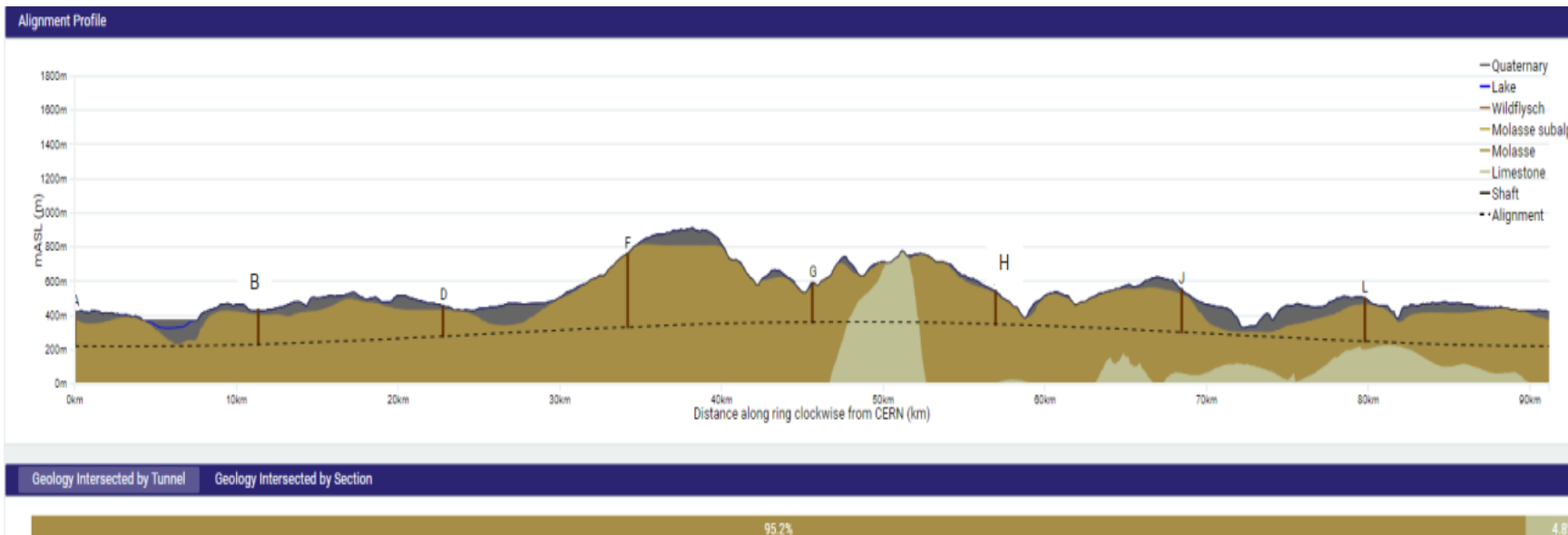


M. Koratzinos

MIT
Massachusetts
Institute of
Technology



FCC implementation - footprint baseline



Present baseline implementation

- 91 km circumference
- 95% in molasse geology for minimising tunnel construction risks
- 8 surface sites with ~5 ha area each.

Site investigations planned for 2024 and 2025 in areas with uncertain geological conditions:

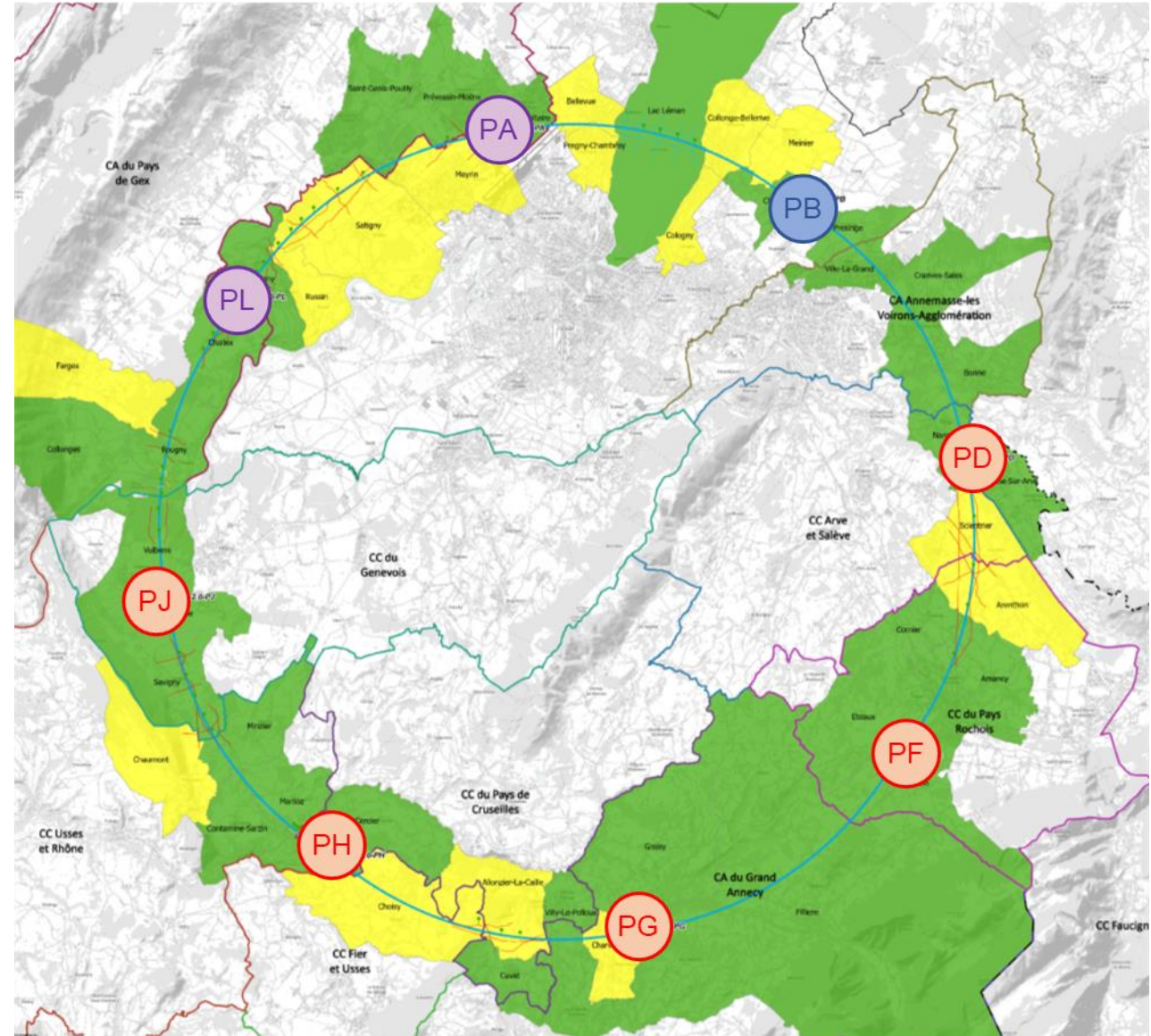
- Limestone-molasse border, karstification, water pressure, moraine properties, water bearing layers, etc.
- ~40-50 drillings, 100 km of seismic lines

1. **PA – Ferney Voltaire** (FR) – experimental site
2. **PB – Présinge/Choulex** (CH) – technical site
3. **PD – Nangy** (FR) – technical/experimental site
4. **PF – Etaux** (FR) – technical site
5. **PG – Charvonnex/Groisy** (FR) – experimental site
6. **PH – Cercier** (FR) – technical site
7. **PJ – Vulbens/Dingy en Vuache** (FR)
– technical/experimental site
8. **PL – Challex** (FR) – technical site

First meetings with communes concerned in France (31) and Switzerland (10)

Rencontrée

Rendez-vous proposé / programmé



FCC key points

- FCC-ee and FCC-hh are long-term largest-scale technology projects
- Requiring R&D in all technical areas with medium- and long-term opportunities for cooperation with industrial partners
- Development – production – operation – maintenance
- Looking forward to common R&D projects