



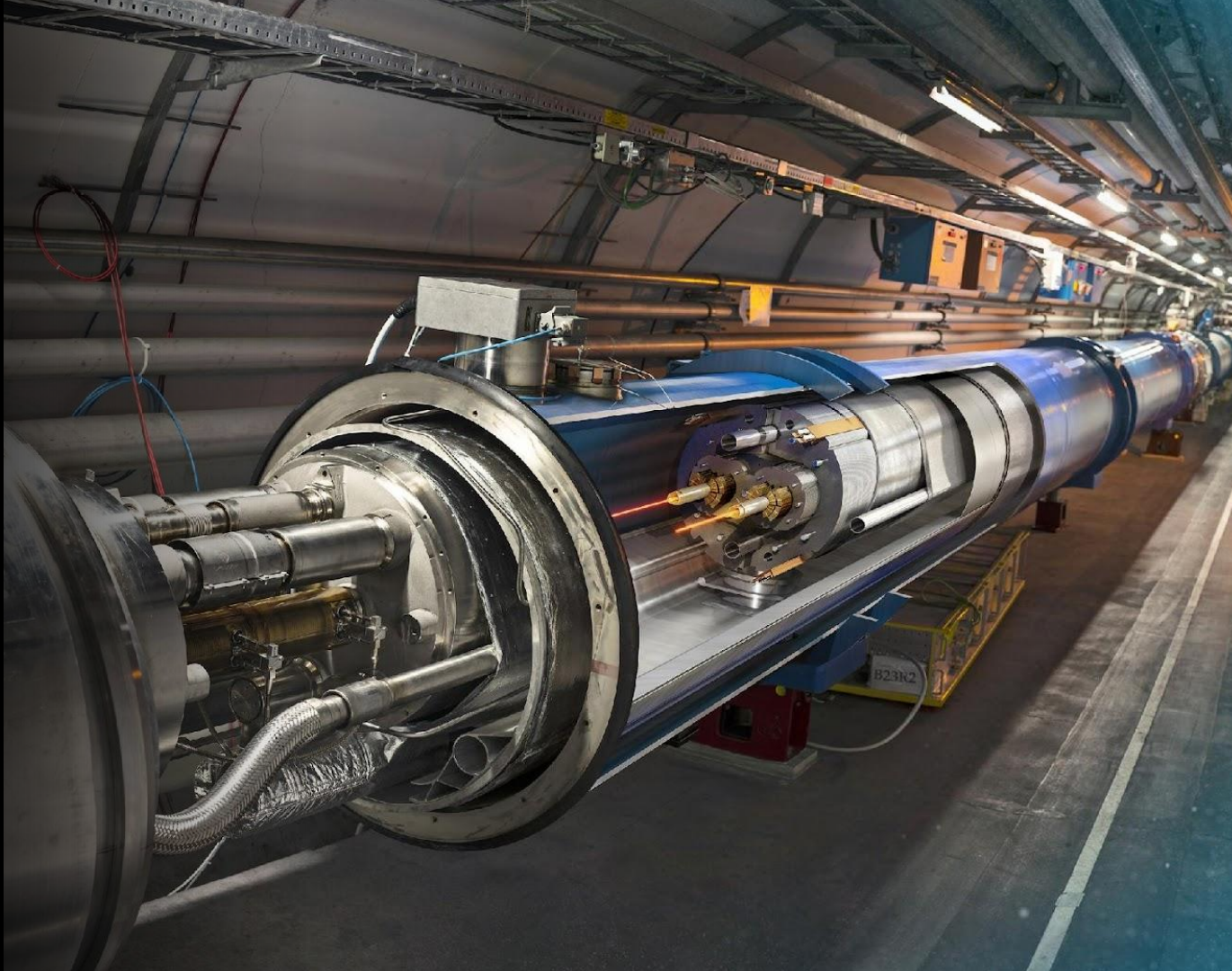
Accelerating Science



AlmaLinux at CERN

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CERN IT Department
Cloud and Linux
Infrastructure

AlmaLinux OS
Foundation Board
Member





CERN is the world's
biggest laboratory for
particle physics

Located near Geneva on the
Swiss-French border

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



How do we do it?

- We build the largest machines to study the smallest particles in the universe
- We develop technology to advance the limits of what is possible
- We perform world-class research in theoretical and experimental particle physics

ACCELERATORS

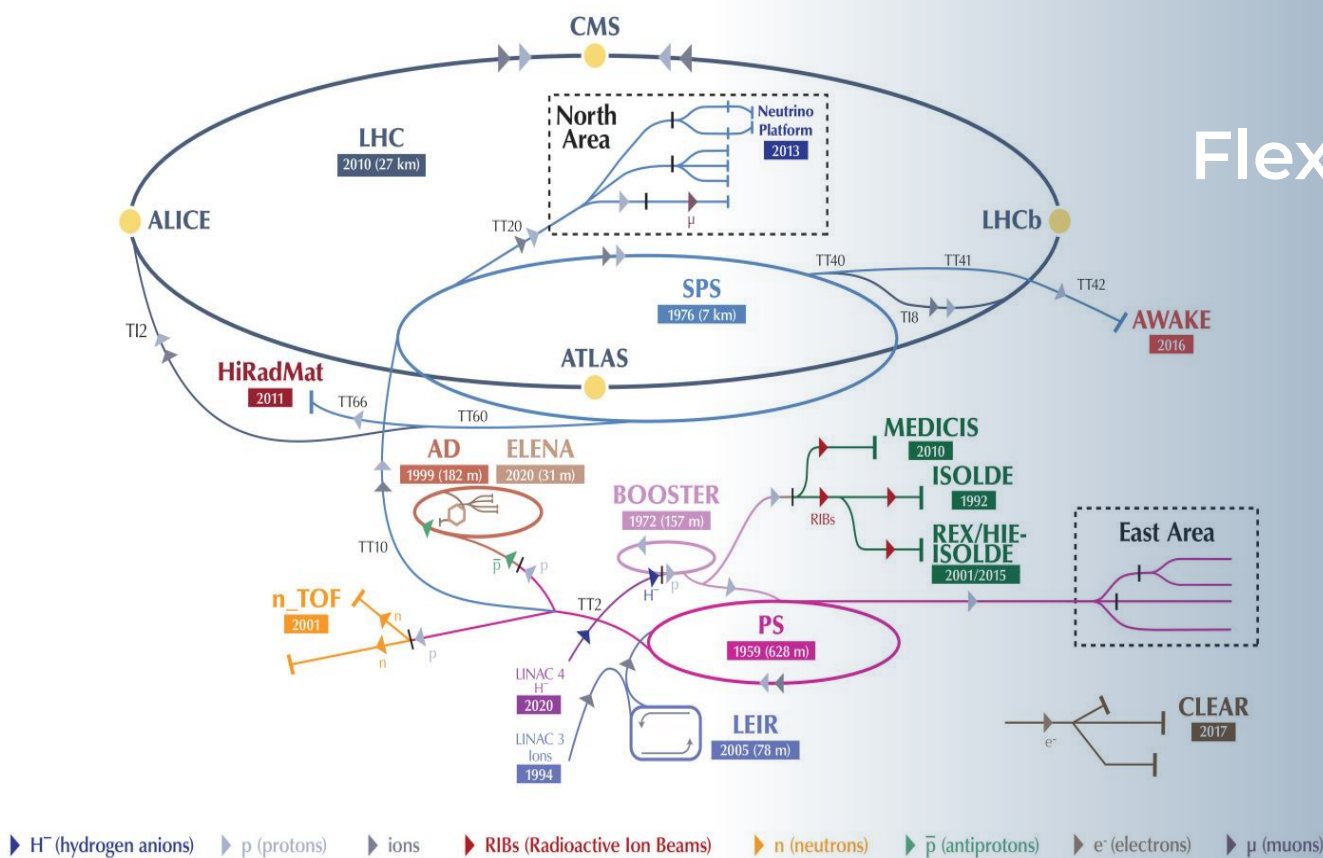
DETECTORS

COMPUTING

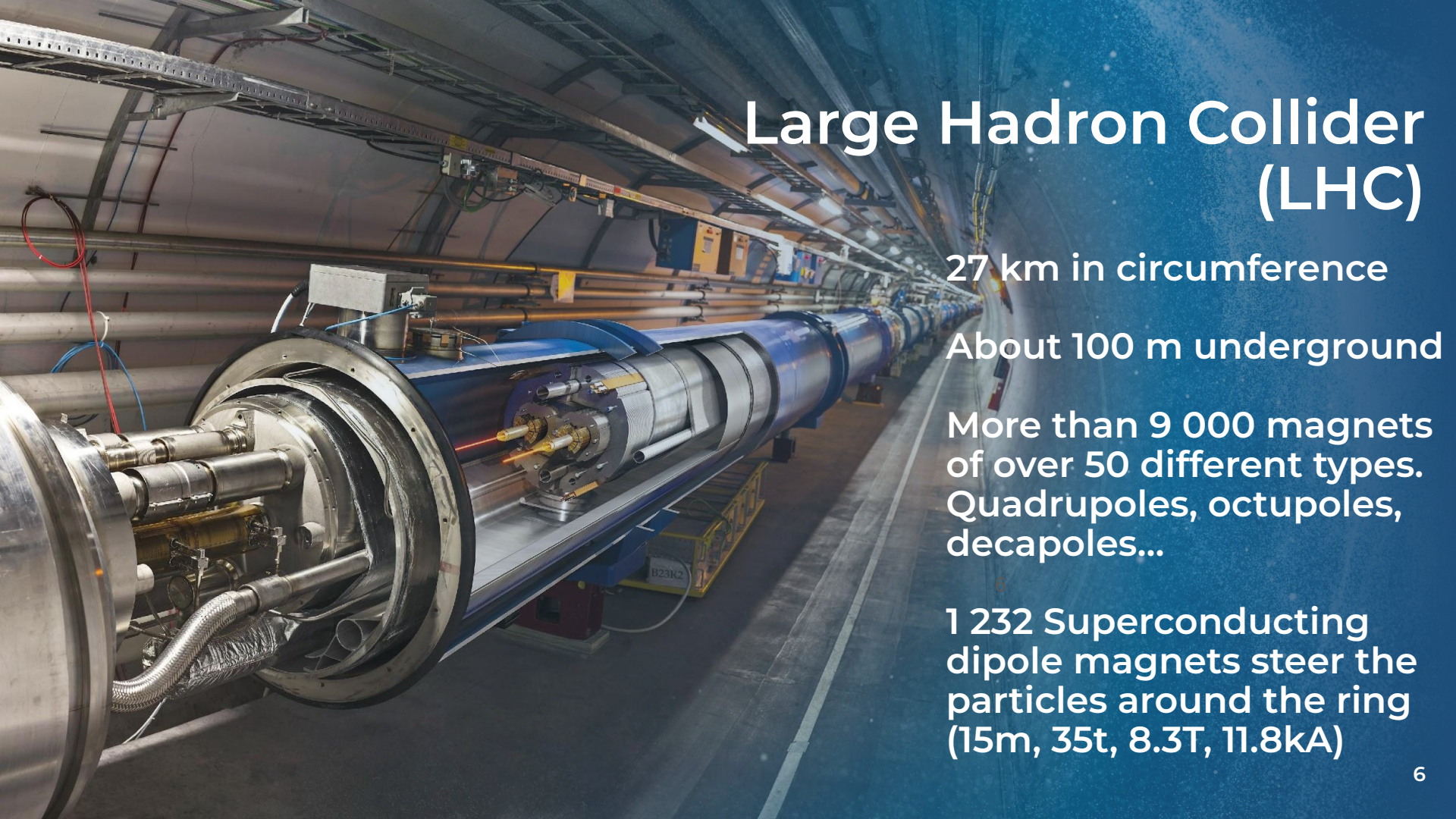
Flexible Accelerator Complex

Multiple interconnected machines

Accelerator	Speed (% c)	Energy
LINAC 4	52.0	160 MeV
Booster	91.6	1.4 GeV
PS	99.93	25 GeV
SPS	99.9998	450 GeV
LHC	99.9999991	7 TeV



LHC - Large Hadron Collider // SPS - Super Proton Synchrotron // PS - Proton Synchrotron // AD - Antiproton Decelerator // CLEAR - CERN Linear Electron Accelerator for Research // AWAKE - Advanced WAKEfield Experiment // ISOLDE - Isotope Separator OnLine // REX/HIE-ISOLDE - Radioactive Experiment/High Intensity and Energy ISOLDE // MEDICIS // LEIR - Low Energy Ion Ring // LINAC - LINear ACcelerator // n_TOF - Neutrons Time Of Flight // HiRadMat - High-Radiation to Materials // Neutrino Platform



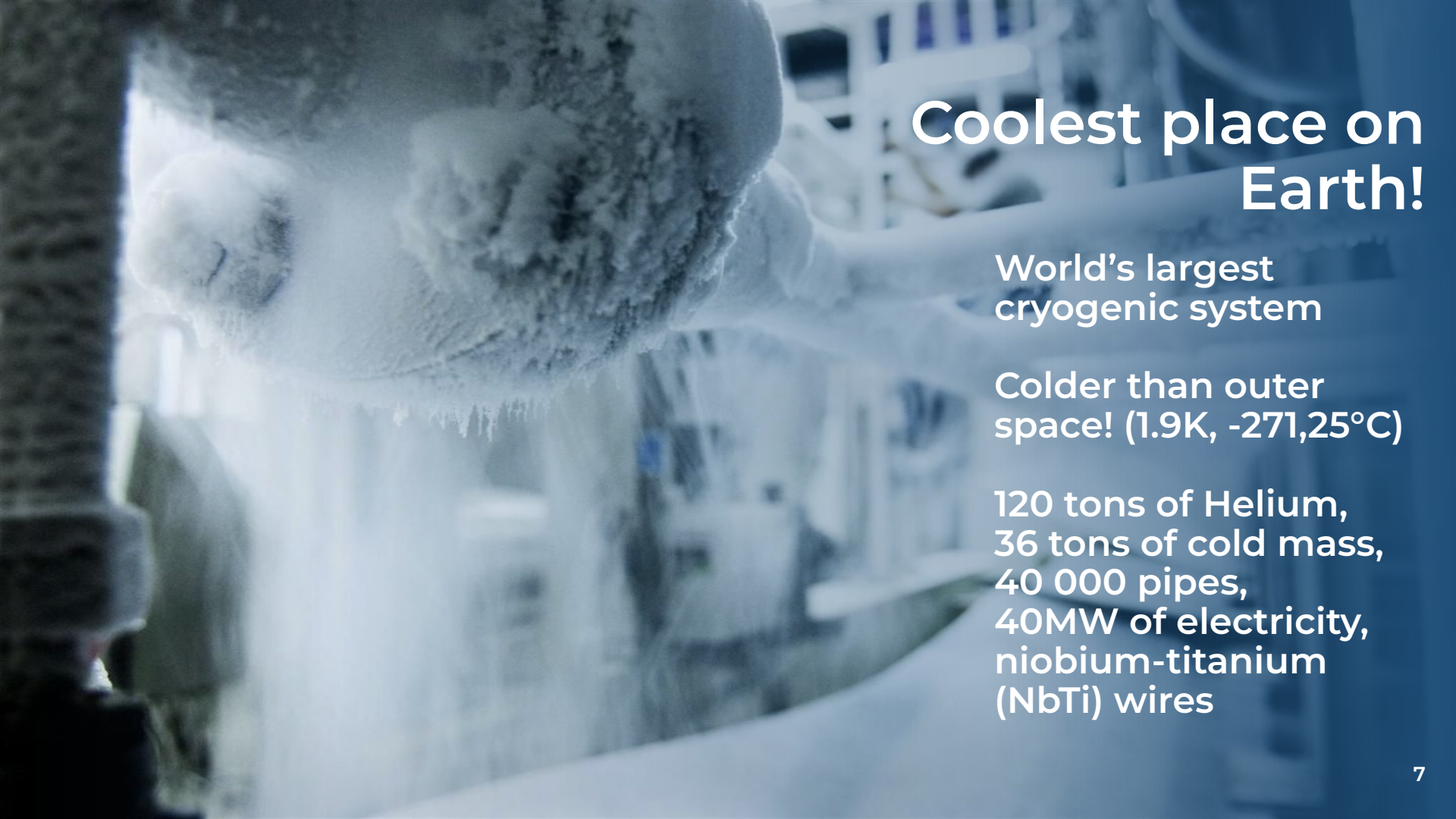
Large Hadron Collider (LHC)

27 km in circumference

About 100 m underground

More than 9 000 magnets of over 50 different types. Quadrupoles, octupoles, decapoles...

1 232 Superconducting dipole magnets steer the particles around the ring (15m, 35t, 8.3T, 11.8kA)

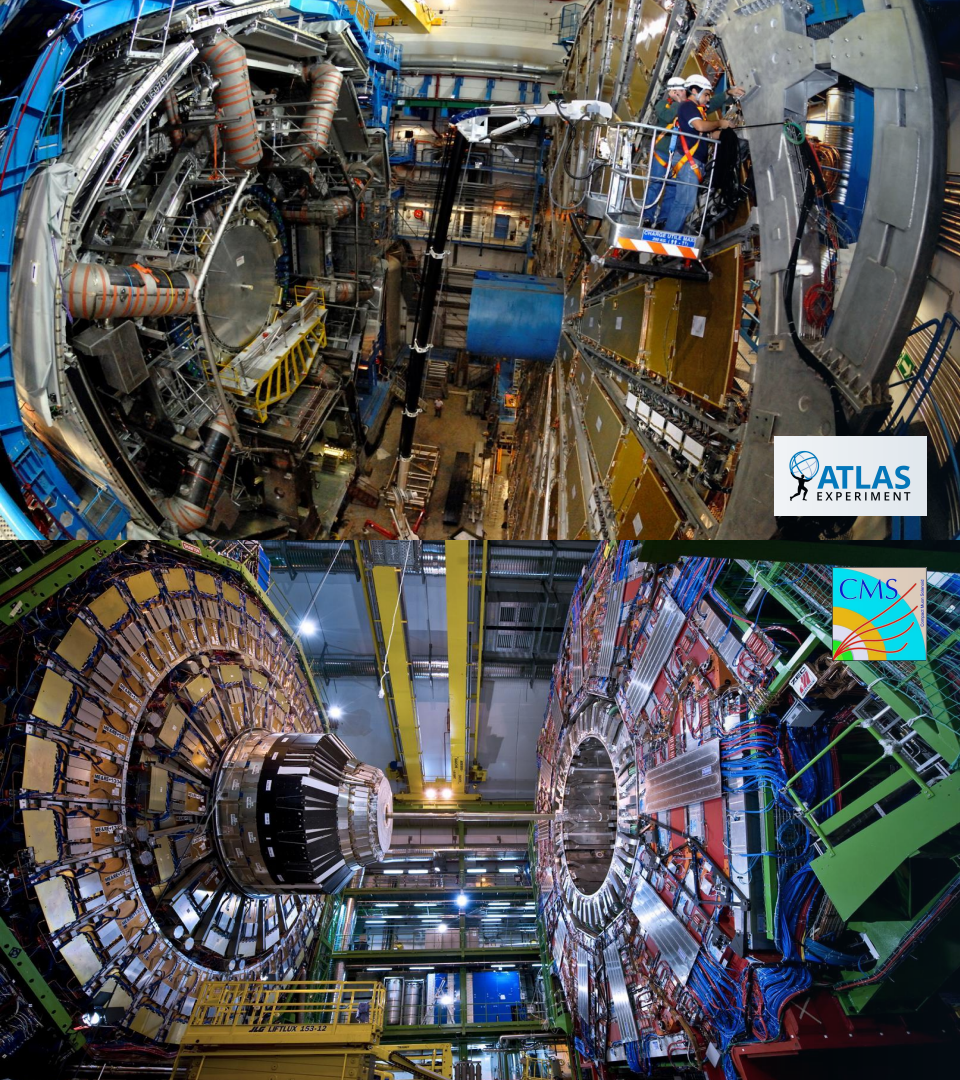


Coollest place on Earth!

World's largest
cryogenic system

Colder than outer
space! (1.9K, -271,25°C)

120 tons of Helium,
36 tons of cold mass,
40 000 pipes,
40MW of electricity,
niobium-titanium
(NbTi) wires



Four main detectors

ATLAS and CMS are general-purpose detectors

ALICE is dedicated to heavy-ion physics

LHCb specializes in investigating the slight differences between matter and antimatter

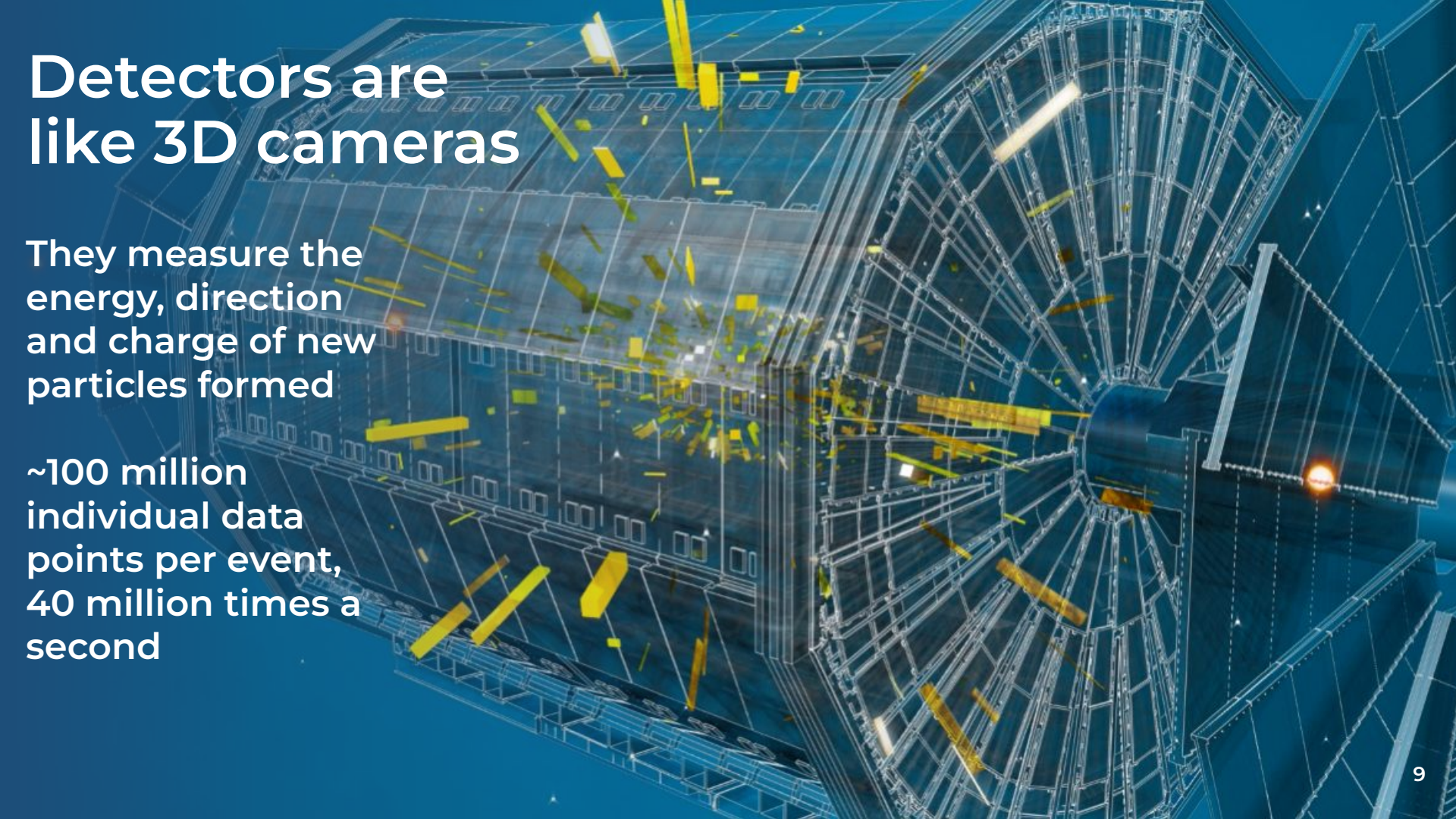
Separate International collaborations



ALICE



Detectors are like 3D cameras



They measure the energy, direction and charge of new particles formed

~100 million individual data points per event, 40 million times a second

Trigger system to filter data

From 40 million to
3 000 events per
second

Hardware-based
Level-1 Trigger
(FPGAs)
(100 kHz 300 GB/s)

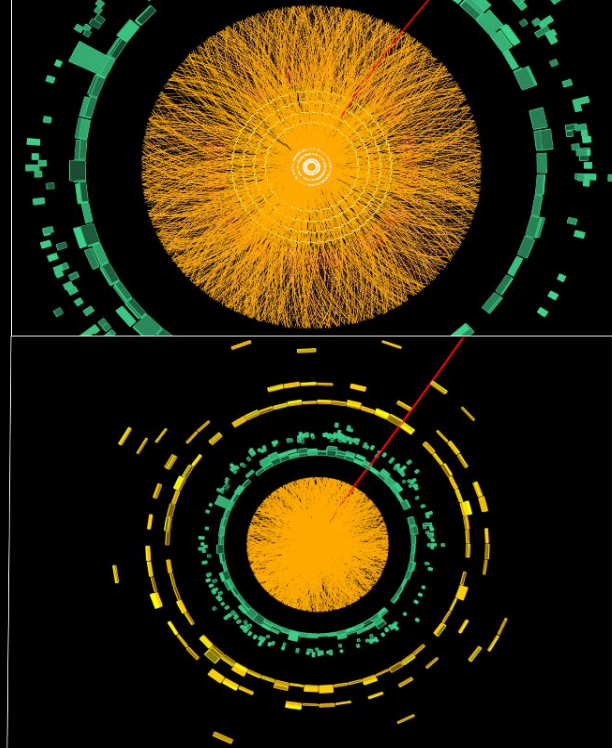
Software-based
High Level Trigger
(CPUs and GPUs)
(3 kHz 6 GB/s)



Event Reconstruction

HTCondor

5 400 servers,
420 000 cores,
1.6 PB of RAM



Run: 510493
Event: 30867432
2025-11-14 16:19:41¹¹ CET

Physics Storage

EOS: Disk cache
115 000 disks, 310 PB
150-200 GB/s from
experiments

CTA: Tape archive
1.32 Exabytes on tape,
+322 PB in 2025



The Worldwide LHC Computing Grid (WLCG)

Used to store, distribute, process and analyse data

~1.3 million cores,
~3.7 Exabytes of data,
150 data centers in
42 countries



LAST DATA UPDATE

9.7 MB Downloaded Wednesday, 11 September 2019 14:05:12
Last transfer was on : Monday, 29 July 2019 08:00:00

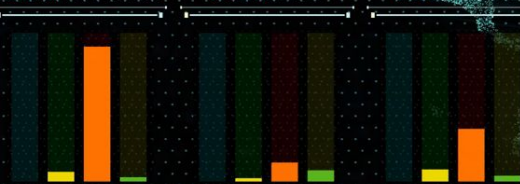
LOADING

100 %

VOLUME TRANSFERS

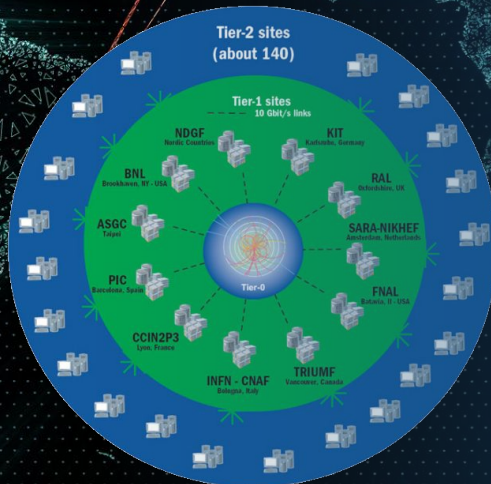
VOLUME FILES

VOLUME DATA



DATA TRANSFER CONSOLE

405047605 From UFlorida-HPC To UMassHEP, Monday, 29 July 2019 04:04:50
D From UCSD02 To INFN-T1, Monday, 29 July 2019 04:05:40
D From Vanderbilt To Nebraska, Monday, 29 July 2019 04:06:06
165672273 From IN2P3-CC To INFN-BARI, Monday, 29 July 2019 04:07:11
49302033 From FIJ-HP, P2 To CERN-PROD, Monday, 29 July 2019 04:08:20
7035810255 From INFN-T1 To GLOW, Monday, 29 July 2019 04:08:30
132292923 125 From INDACMS-TFR To pc, Monday, 29 July 2019 04:08:43
16762017016857 From CERN-PROD To RAL-UK, Monday, 29 July 2019 04:09:29
1874048 From MIT_CMS To FIJ-HP, T2, Monday, 29 July 2019 04:09:54
502021950 From INFN-T1 To CIT-CMS, T2, Monday, 29 July 2019 04:10:11
264120 From CERN-PROD To GLOW, Monday, 29 July 2019 04:10:04
D From UKI-SOUTHGRID-RALRP To GLOW, Monday, 29 July 2019 04:12:05
1661810772 From INFN-T1 To INFN-T1, Monday, 29 July 2019 04:12:10
12977867633333 From CERN-LEED To INFN-NA-2, Monday, 29 July 2019 04:12:10
2905786385 From SPRACE To JINR-T1, Monday, 29 July 2019 04:12:20
D From INFN-NA-2 To CERN-LEED, Monday, 29 July 2019 04:12:25
2244322951855566 From IN2P3-CC To prague02, Monday, 29 July 2019 04:13:03
496939 265866667 From UKI-SOUTHGRID-EX-HEP To CERN-PROD, Monday, 29 July 2019 04:13:11
D From Beijing-BE2 To CIT-CMS, T2, Monday, 29 July 2019 04:16:30
D From Vanderbilt To UCSD02, Monday, 29 July 2019 04:16:57
33658768 3792114 From RU-Prokine-HEP To CERN-PROD, Monday, 29 July 2019 04:25:10
165449794 From CERN-LEED To RU-Prokine-HEP, Monday, 29 July 2019 04:16:44



(brief) History of Linux at CERN

2000: Red Hat Linux 6.1

2004: Scientific Linux CERN
(RHEL 3, 4, 5, 6)

2015: CERN CentOS 7

Apr. 2020: CentOS Linux 8.1

Dec. 2020: “CentOS Project shifts
focus to CentOS Stream” (RH)

May. 2021: Moving to CentOS Stream

Feb. 2022: Moving to AlmaLinux



Why AlmaLinux?

Great community relations & integration

Good governance and project health

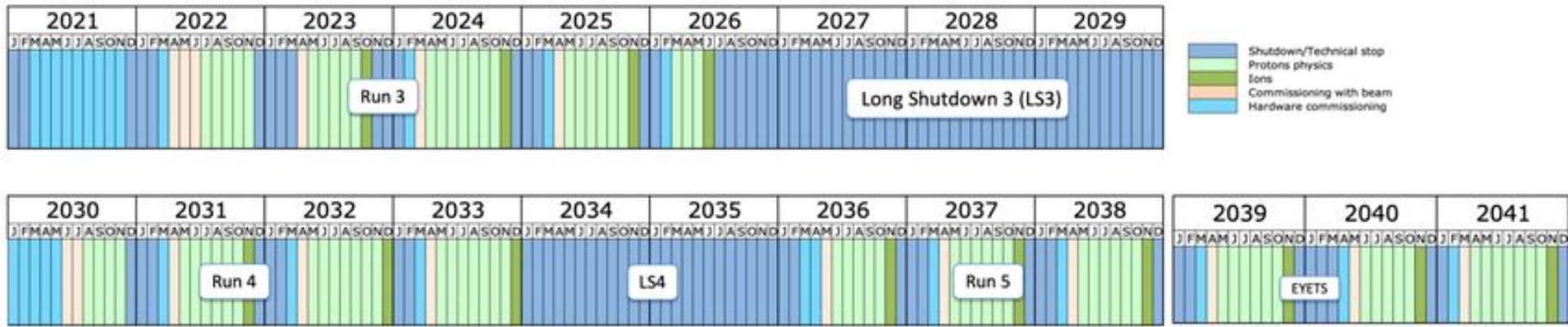
Full Errata support

Very fast releases and updates

Stability and Long-Term Support

Stability and Long-Term Support

CERN thinks in decades

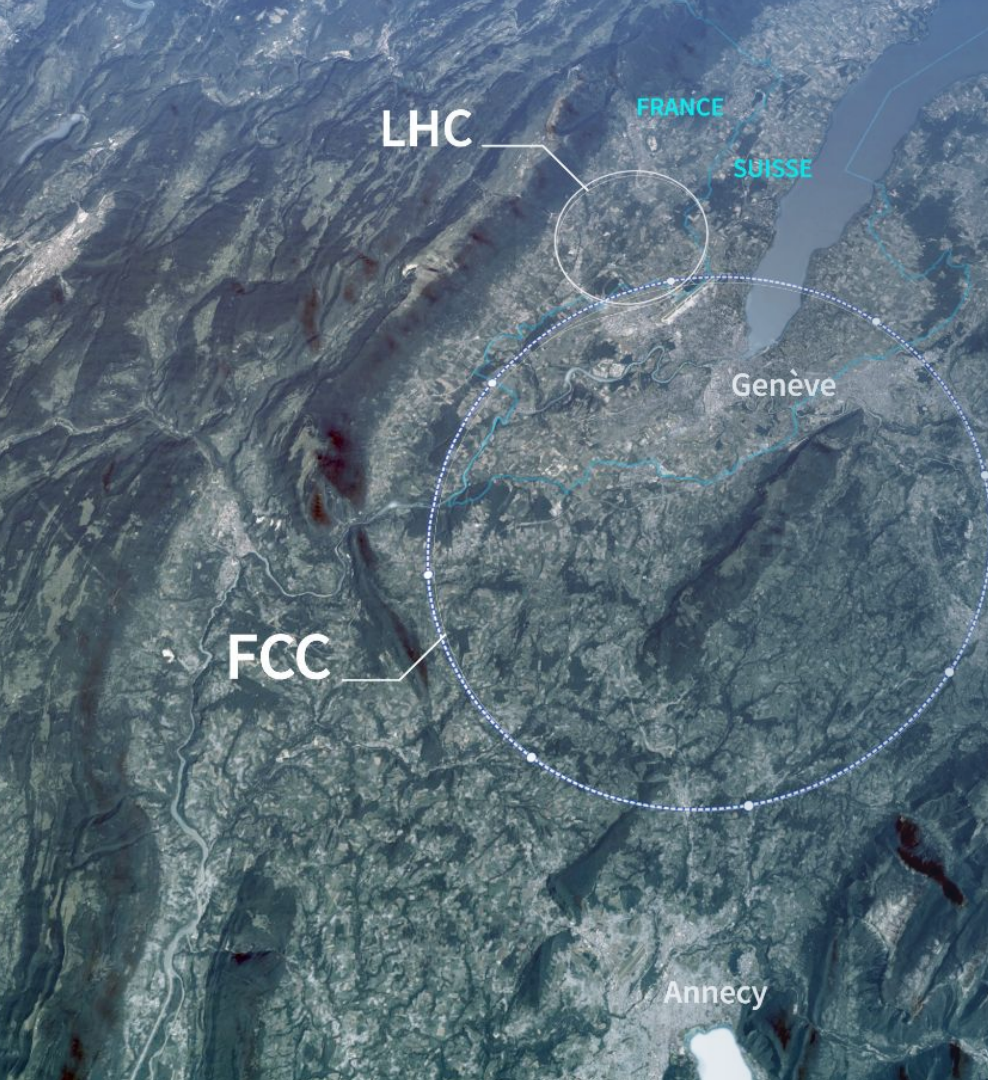


Future Circular Collider (FCC)

90.7 km in circumference
180-400m underground
150 institutes in 30 countries
~70 year research program

- 2025: Feasibility study
- 2028: Decision by Member States
- Early 2030s: Construction (~12 years)
- Mid 2040s: FCC-ee operation starts (~15 years)
- 2070s: FCC-hh operation starts (~25 years)

<https://fcc.web.cern.ch>



Thanks for your Attention!

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