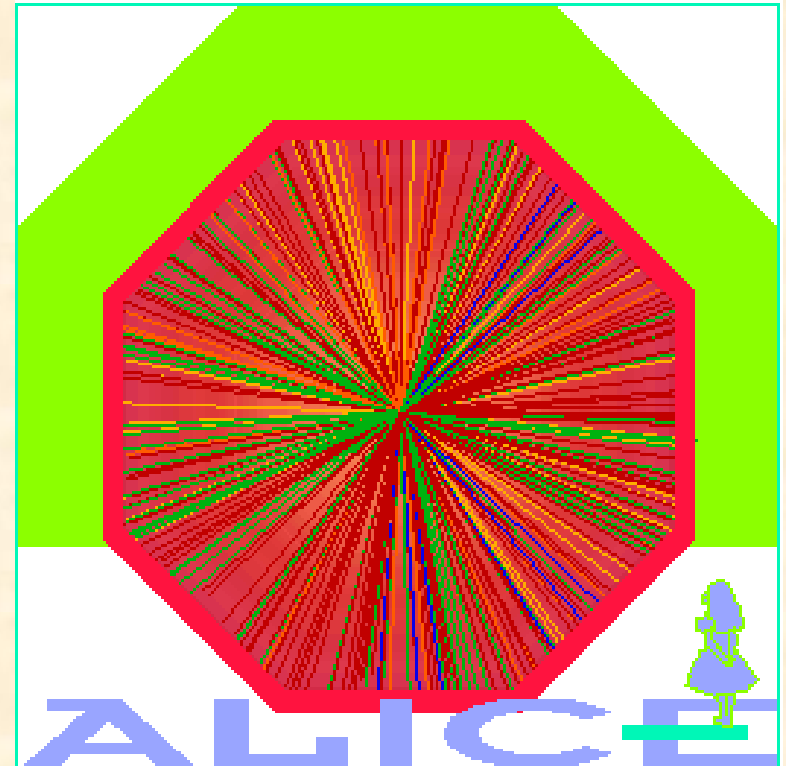
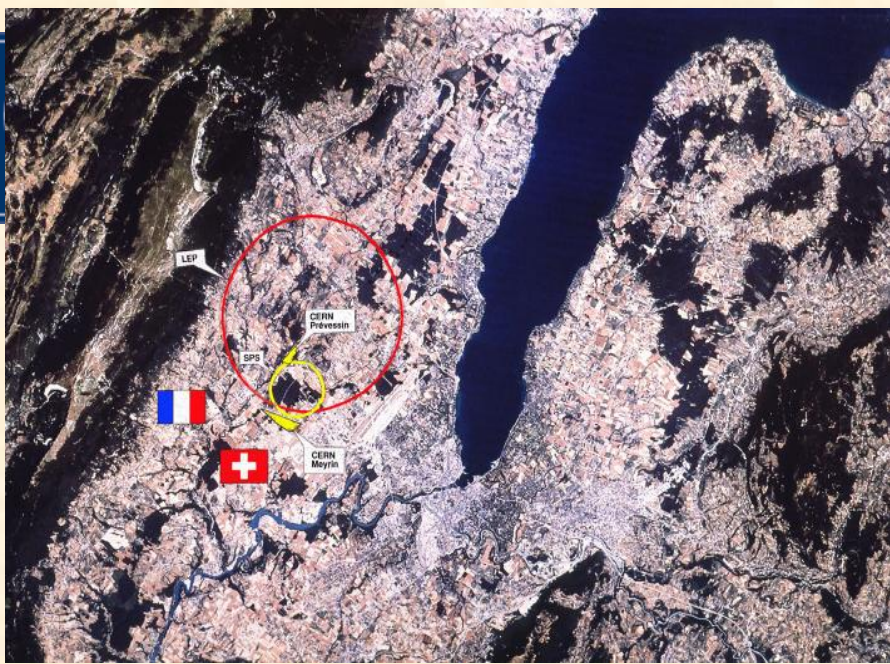




Fyzika t'azkých iónov alebo malý tresk...

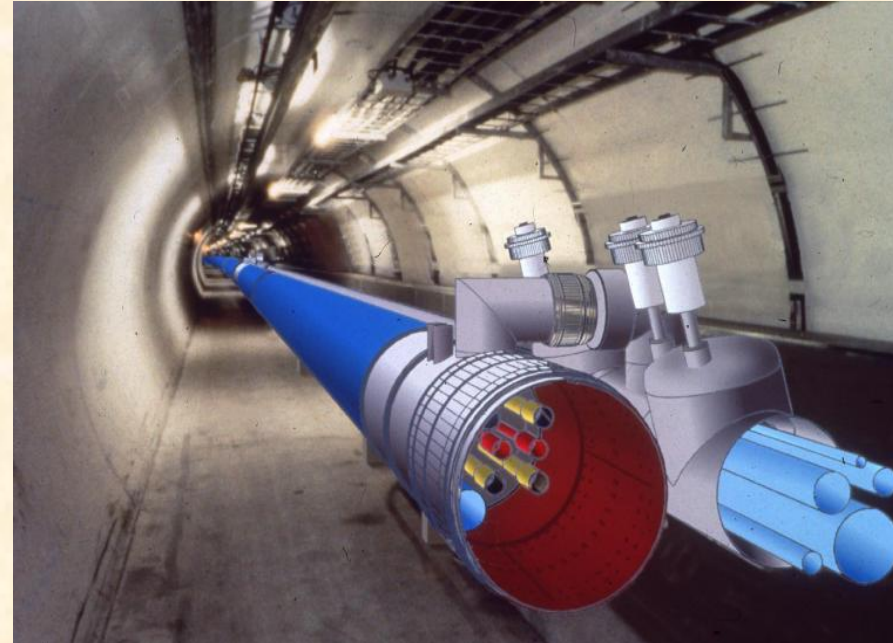
Detektor ALICE





Future place for studying the
Quark Gluon Plasma

The Large Hadron Collider



Solenoid magnet 0.5 T

Cosmic-ray trigger

Forward detectors

- PMD
- FMD, T0, V0, ZDC

Specialized detectors

- HMPID
- PHOS

Central tracking system

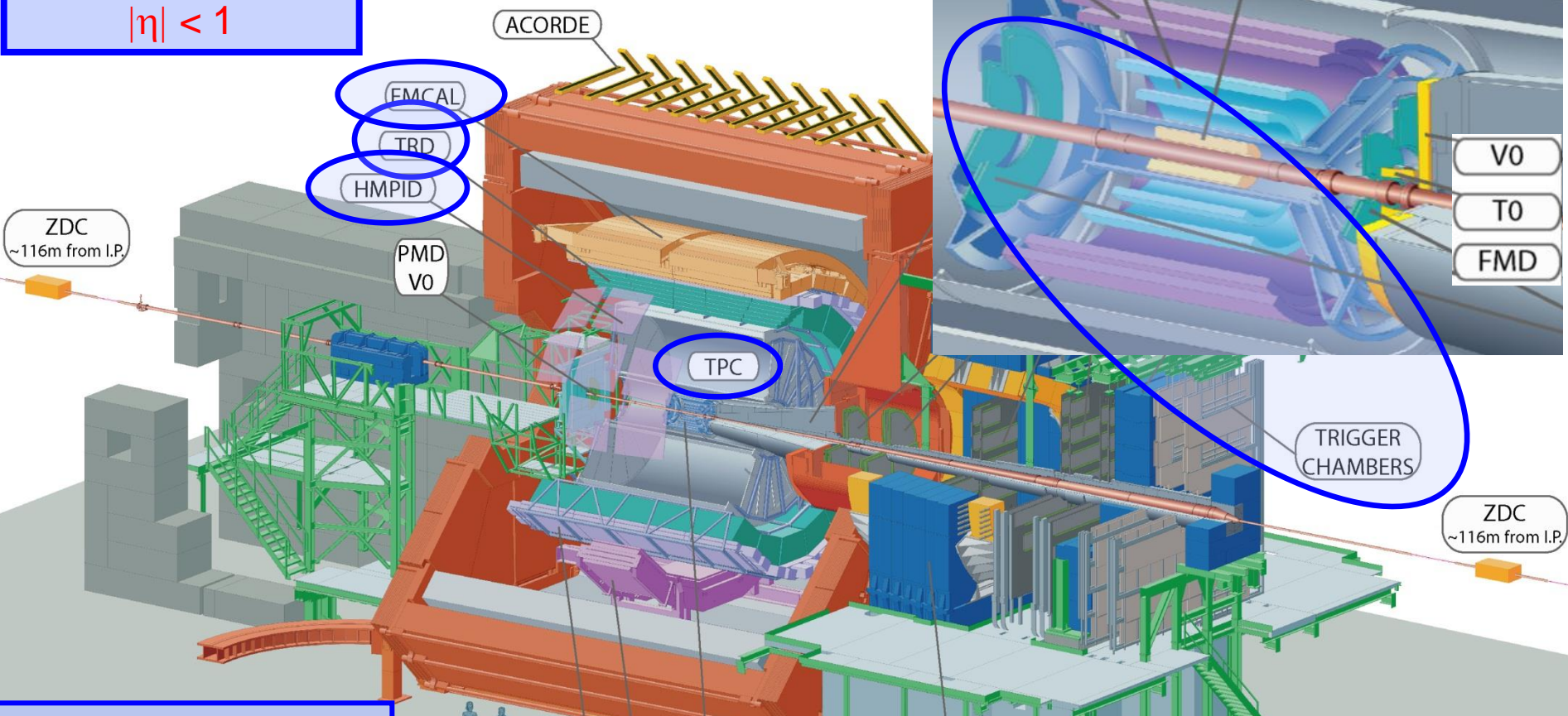
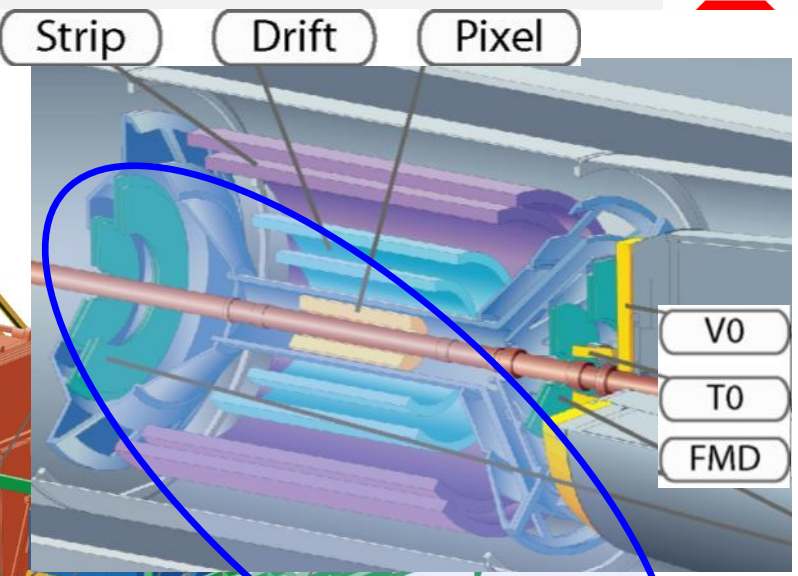
- ITS
- TPC
- TRD
- TOF

MUON Spectrometer

- absorbers
- tracking stations
- trigger chambers
- dipole magnet



Central Barrel
 2π tracking & PID
 $|\eta| < 1$



ACORDE (cosmics)
V0 scintillator centrality
 $\eta: -1.7 - -3.7, 2.8 - 5.1$
T0 (timing)
ZDC (centrality)
FMD (N_{ch} $-3.4 < \eta < 5$)
PMD (N_γ, N_{ch})

Muon Spectrometer
 $-2.5 > \eta > -4$

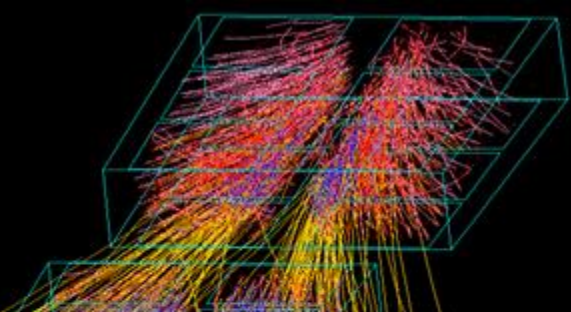
Detector:
Length: 26 meters
Height: 16 meters
Weight: 10,000 tons

Collaboration:
> 1000 Members
> 100 Institutes
> 30 countries



Tracking Challenge

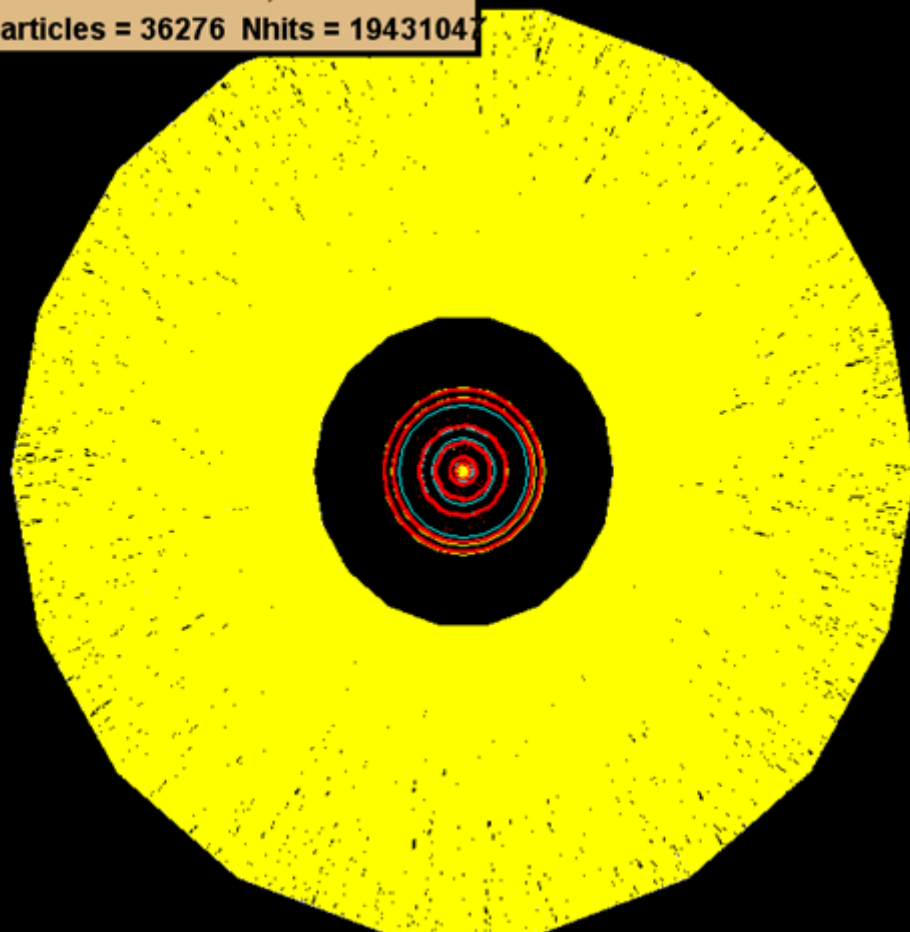
NA49



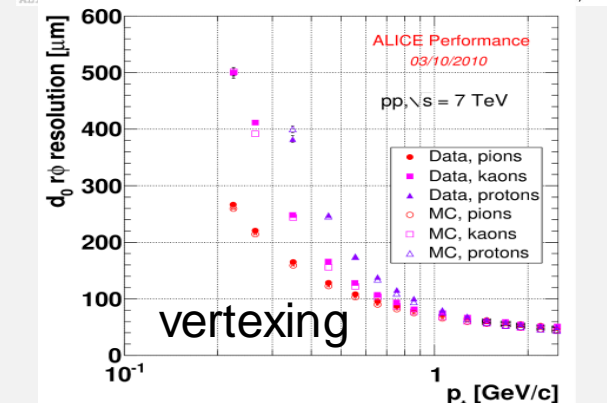
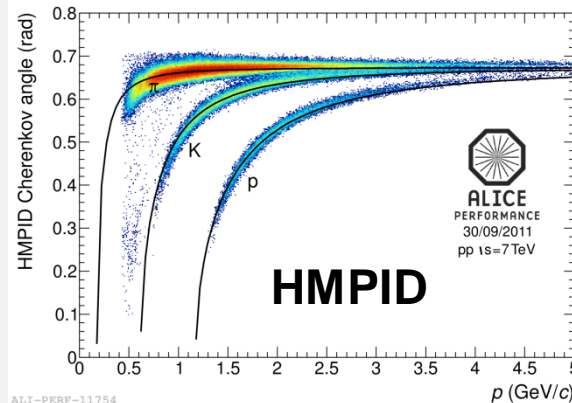
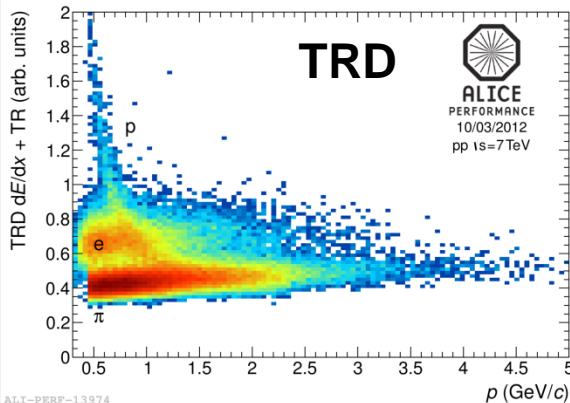
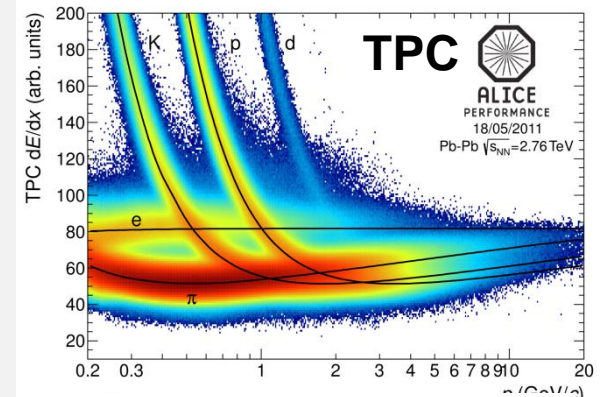
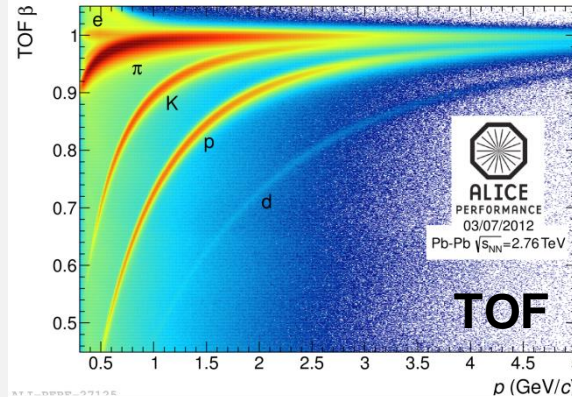
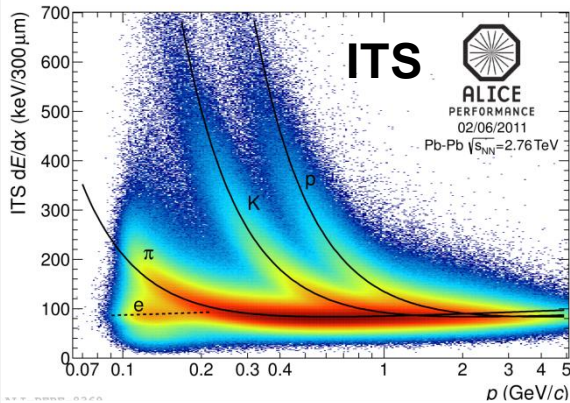
ALICE 'extreme' scenario:
 $dN/dy_{ch} = 8000$



Alice event: 0, Run:0
Nparticles = 36276 Nhits = 19431047



ALICE – dedicated heavy-ion experiment at the LHC



- particle identification (practically all known techniques)
- extremely low-mass tracker $\sim 10\%$ of X_0
- excellent vertexing capability
- efficient low-momentum tracking – down to ~ 100 MeV/c



ITS: Many electronics developments

(all full-custom designs in rad. tol., 0.25 μm process)



ALICE PIXEL CHIP

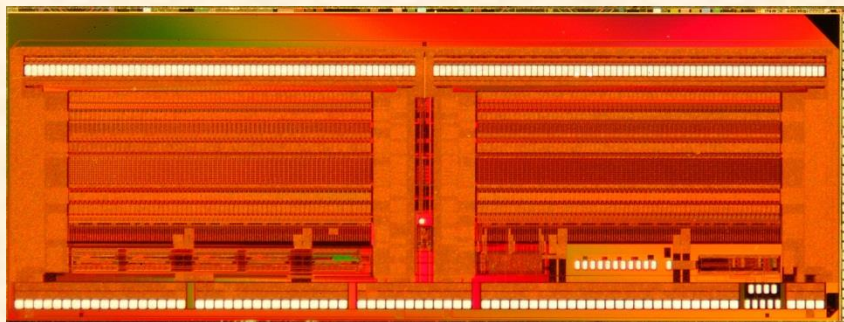
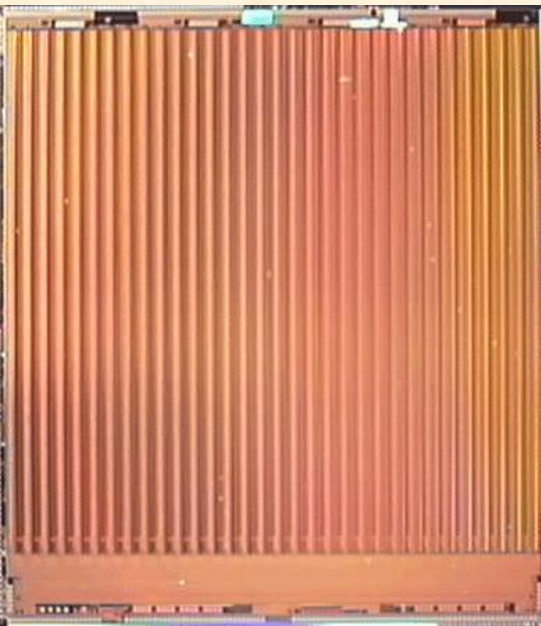
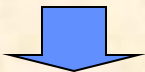
50 μm x 425 μm pixels

8192 cells

Area: 12.8 x 13.6 mm²

13 million transistors

~100 μW/channel



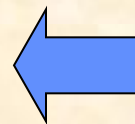
ALICE SSD FEE

HAL25 chip:

128 channels

Preamp+s/h+

serial out



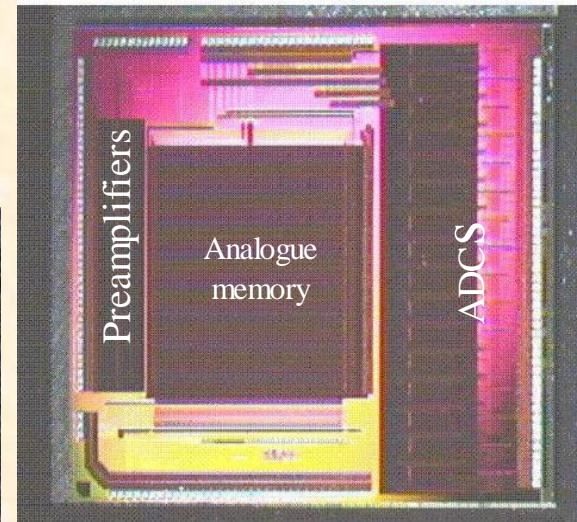
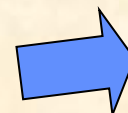
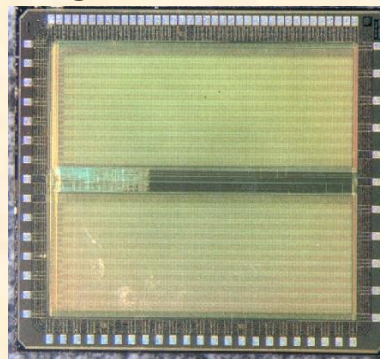
ALICE SDD FEE

Pascal chip:

64 channel preamp+ 256-deep
analogue memory+ ADC

Ambra chip:

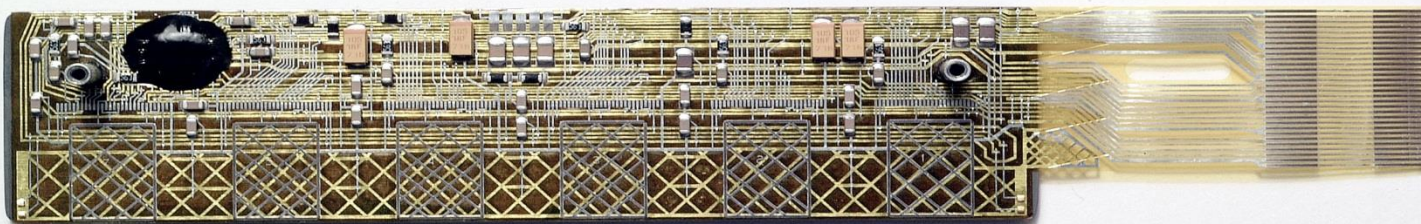
64 channel
derandomizer
chip

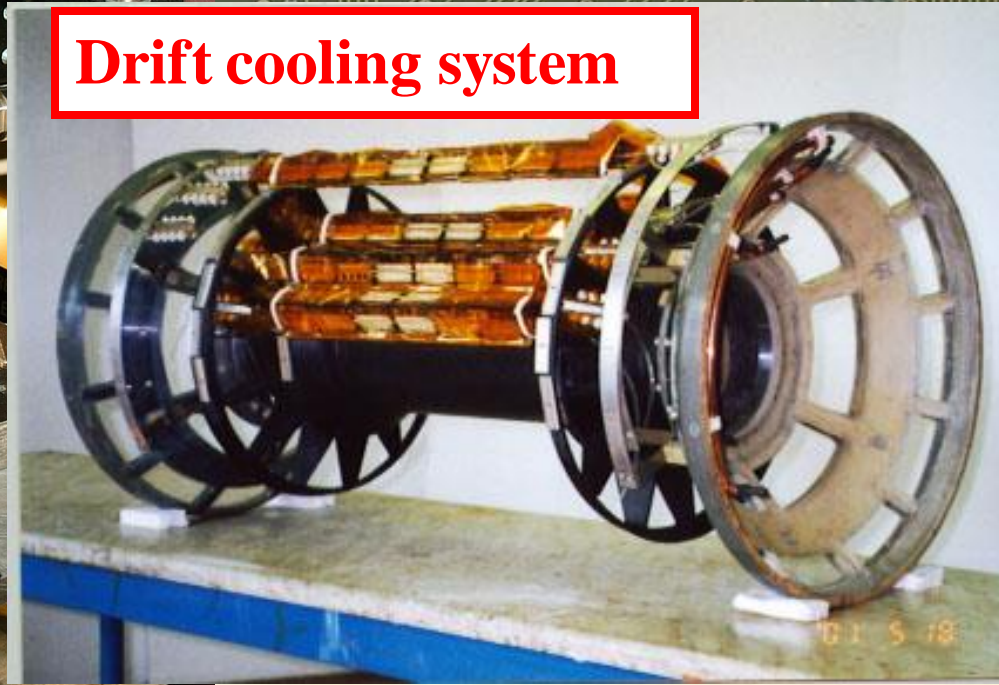
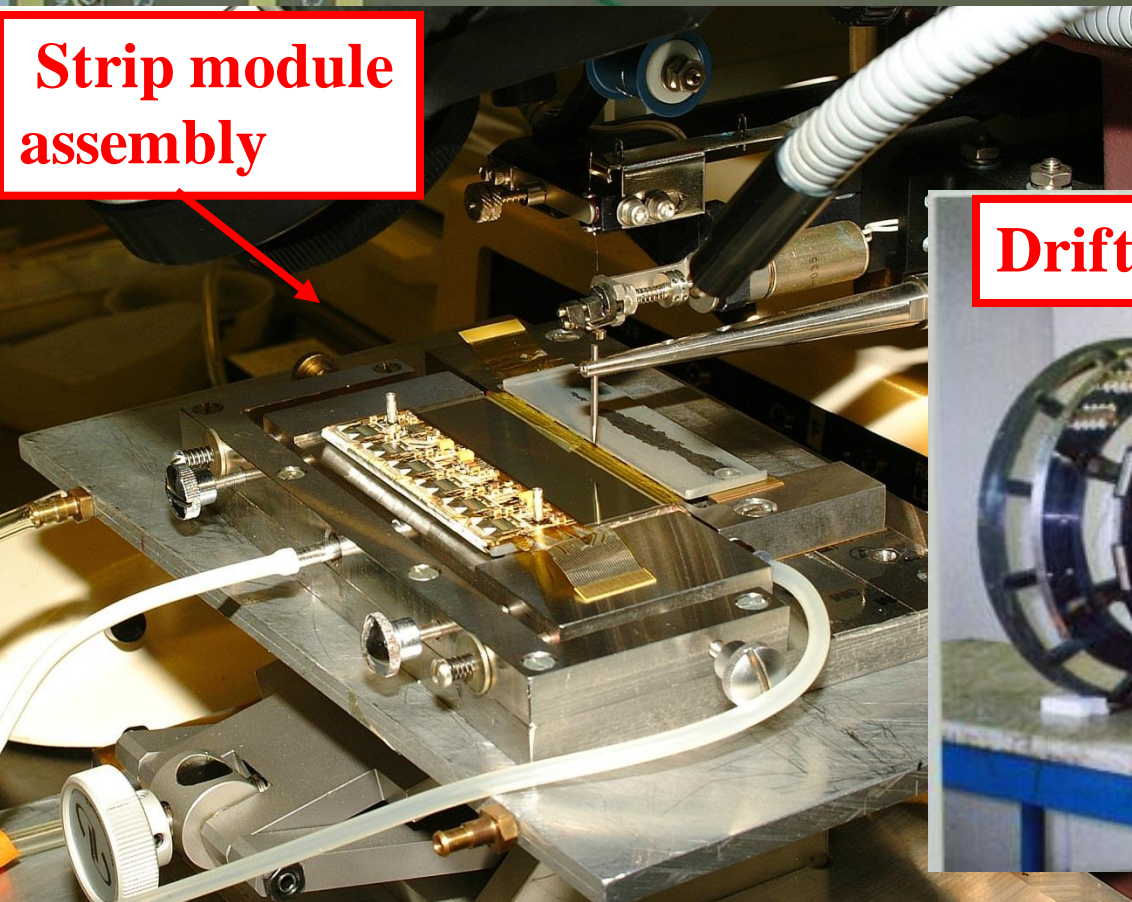
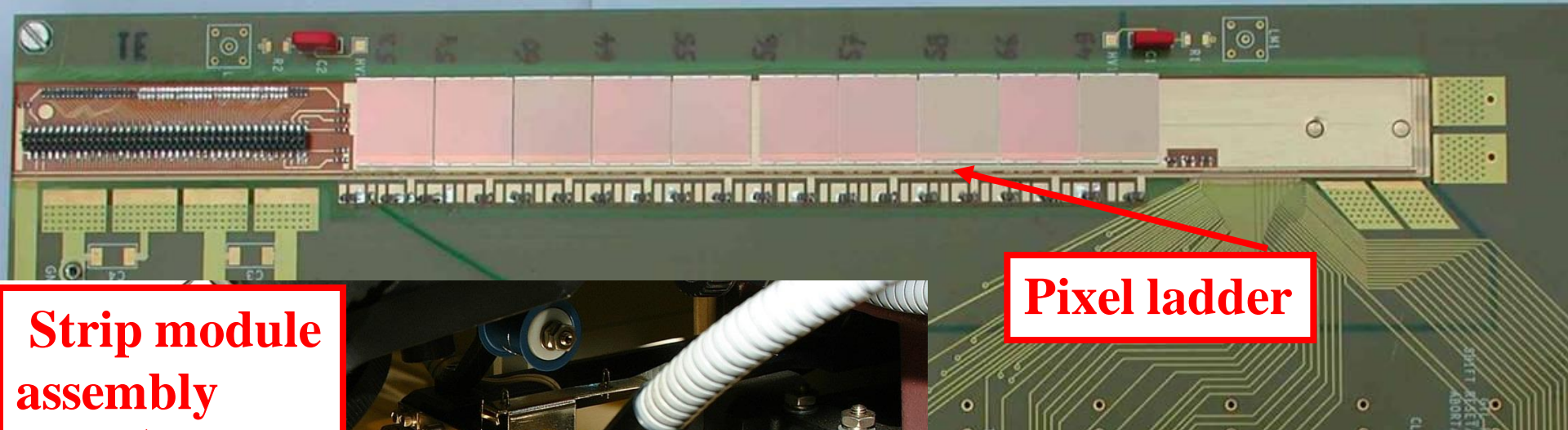


And extreme lightweight interconnection techniques:

SSD tab-bondable

Al hybrids

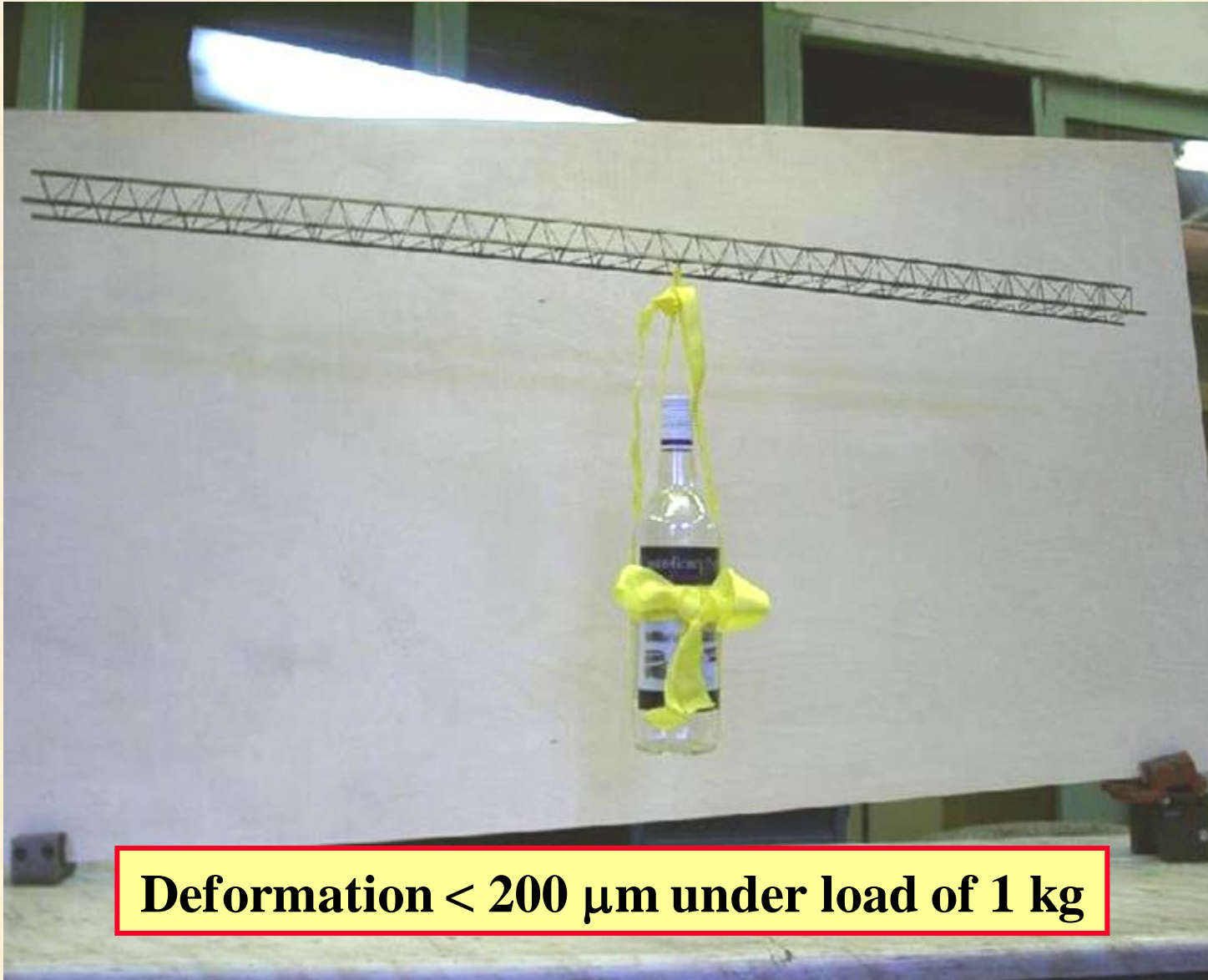
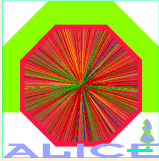




System testing and setting up of series production

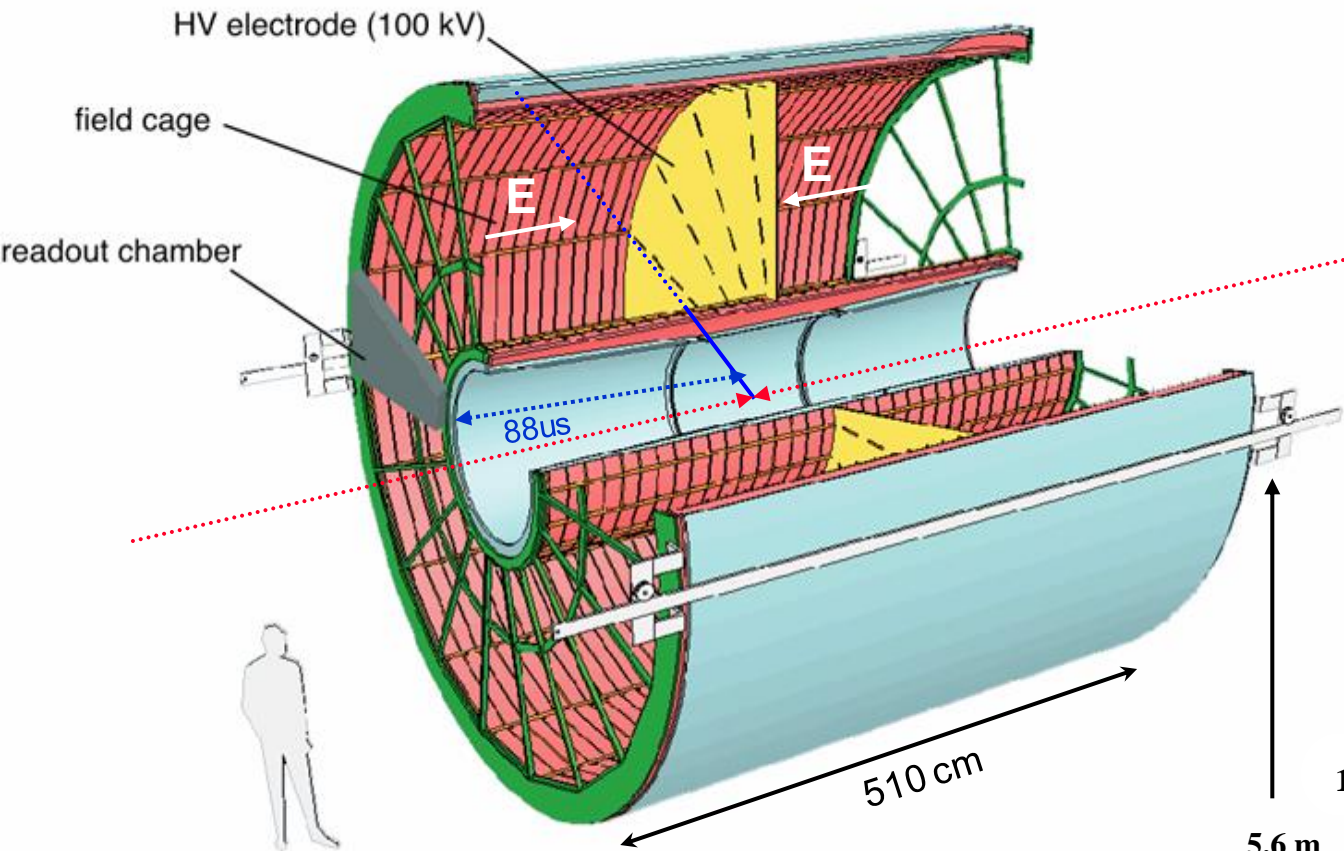
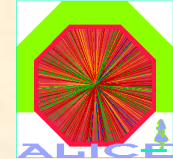


ITS Ladder Acceptance Test



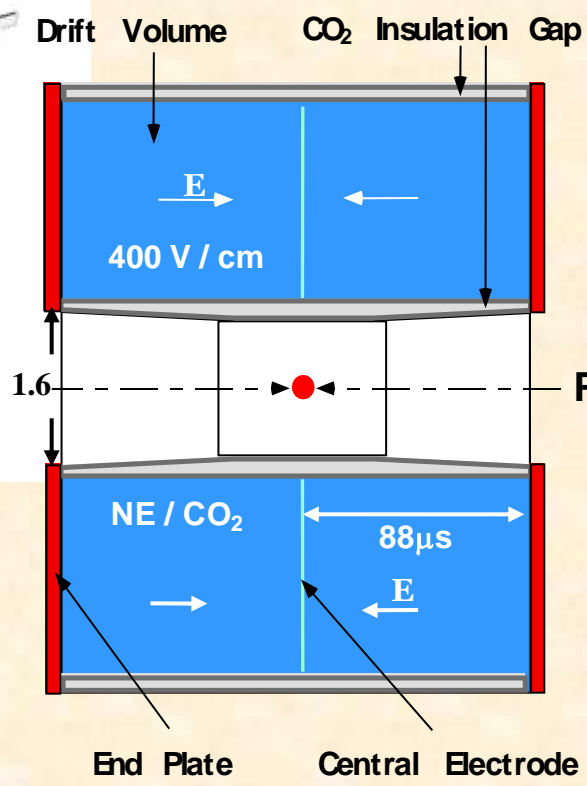


TPC layout

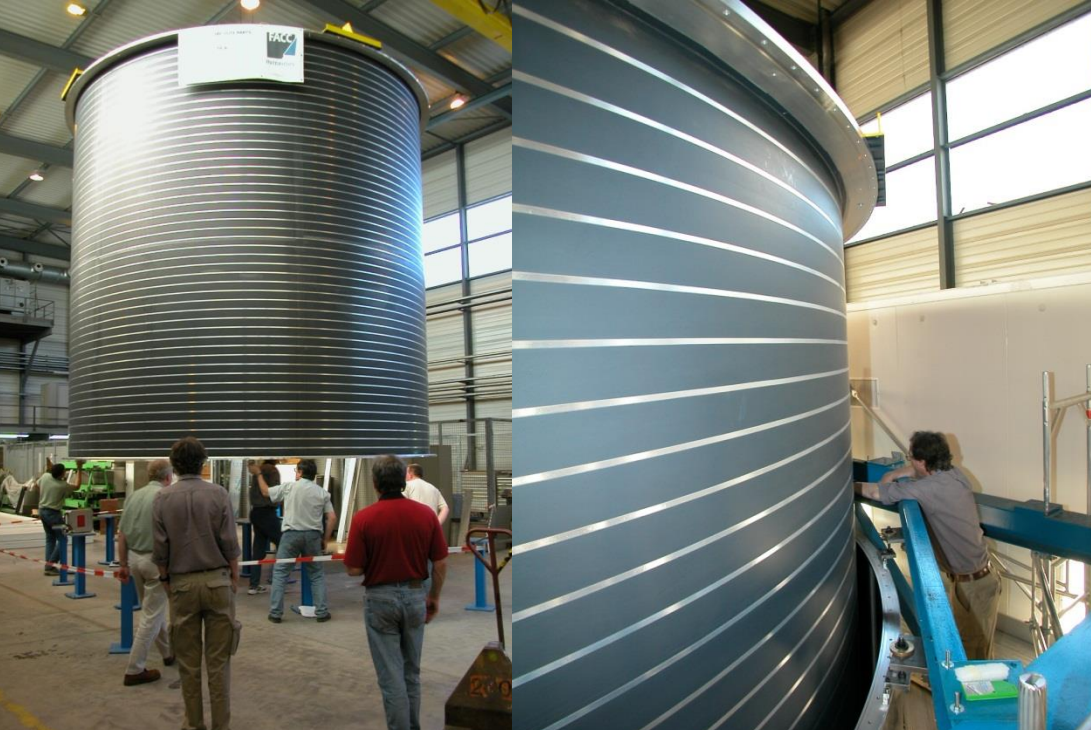


GAS VOLUME
88 m³

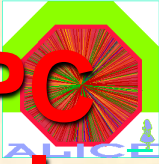
DRIFT GAS
90% Ne - 10%CO₂



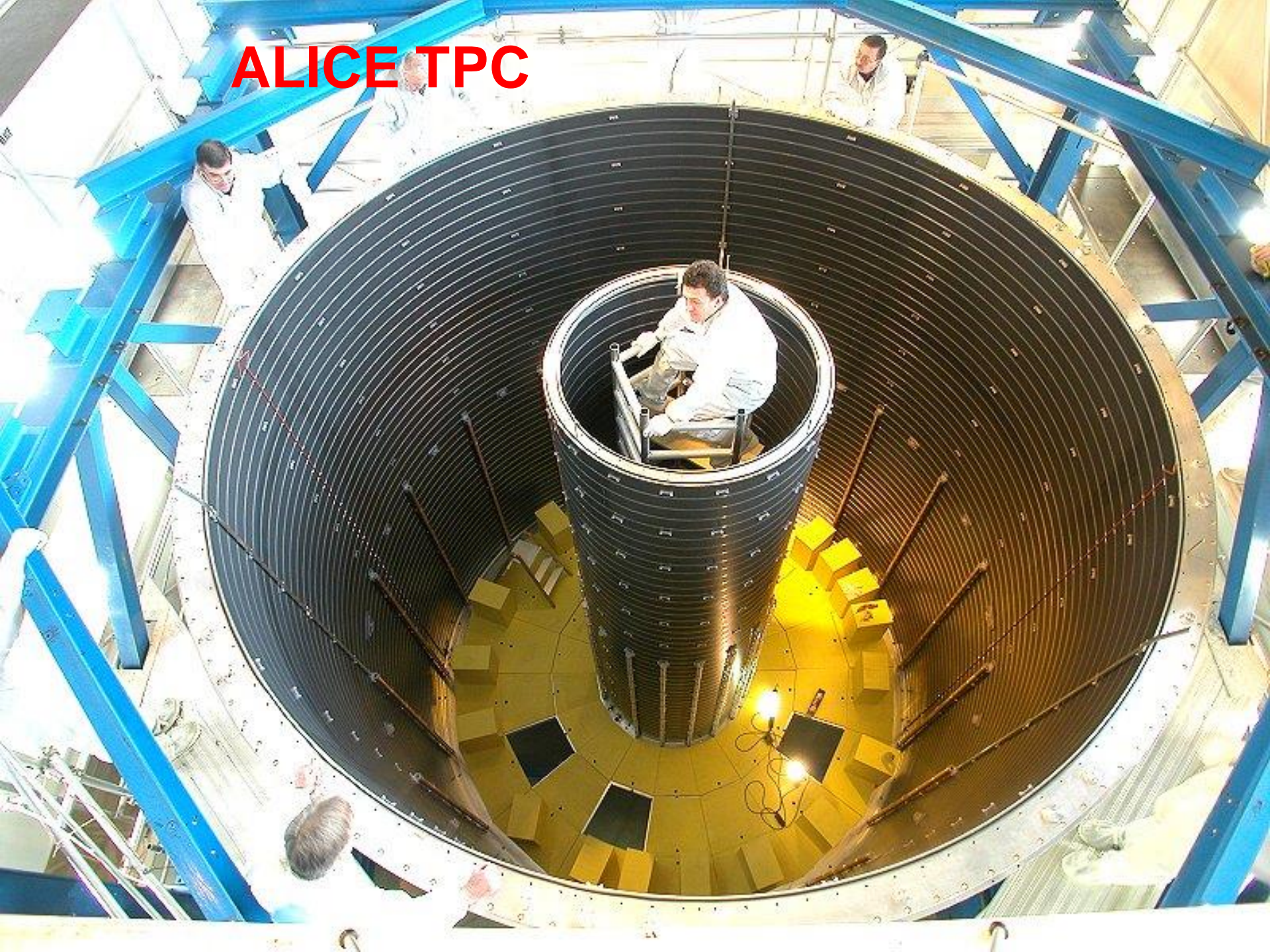
Readout plane segmentation
18 trapezoidal sectors
each covering 20 degrees in
azimuth



The ALICE TPC becomes real (outer field cage and end plates)

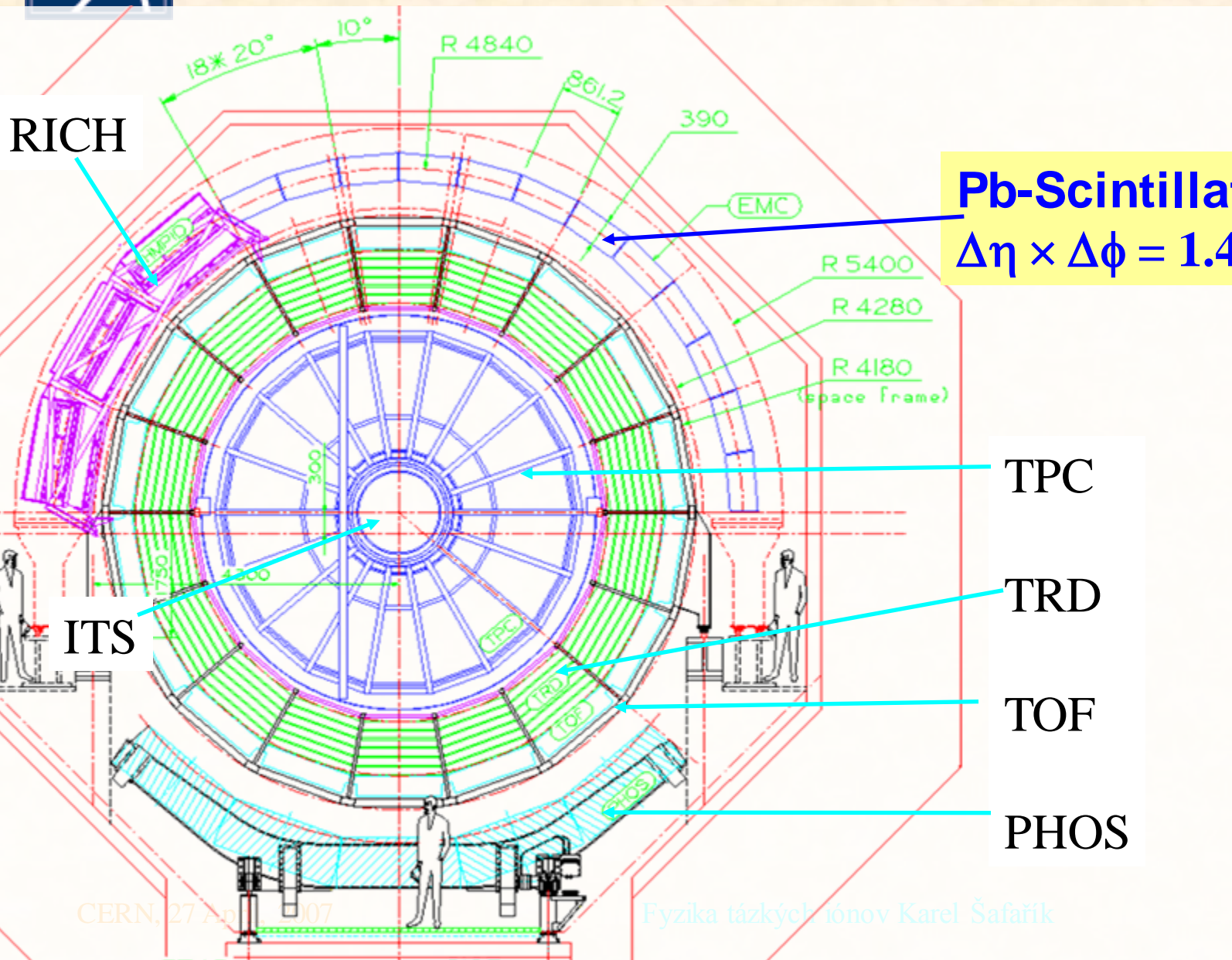


ALICE TPC





US EMCaL (under discussion)

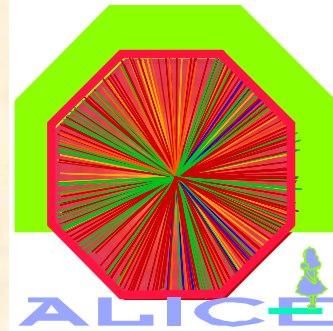


Pb-Scintillator EMCaL
 $\Delta\eta \times \Delta\phi = 1.4 \times 120^\circ$

- TPC
- TRD
- TOF
- PHOS



ALICE Collaboration

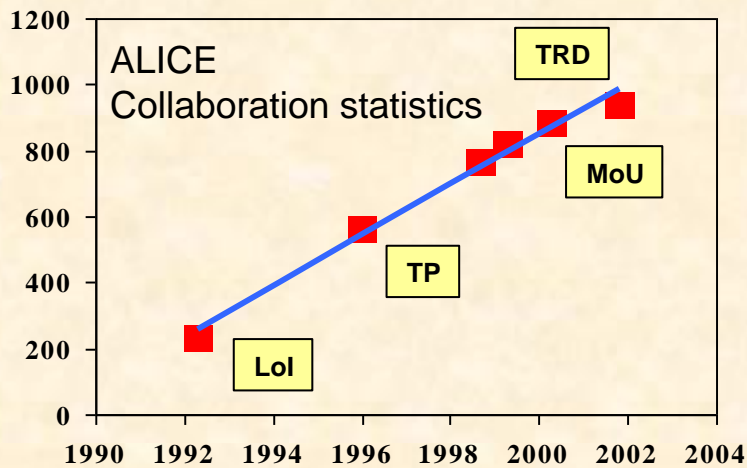
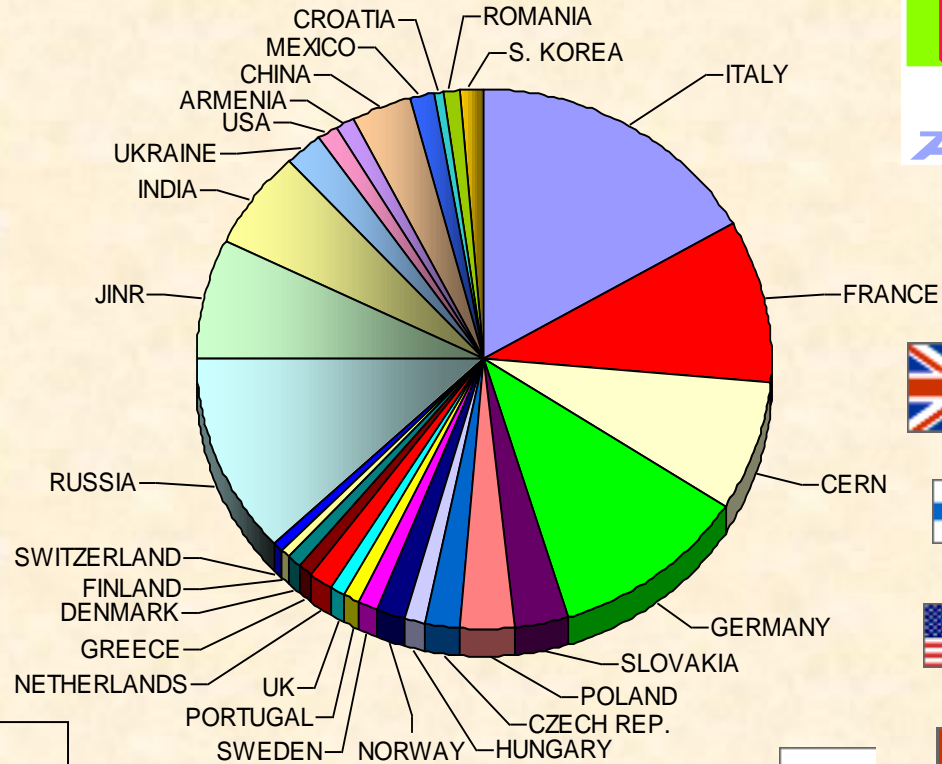


~ 1000 Members

(63% from CERN MS)

~30 Countries

~80 Institutes



CERN, 27 April, 2007

Fyzika tázkyen ionov Karel Šafánek

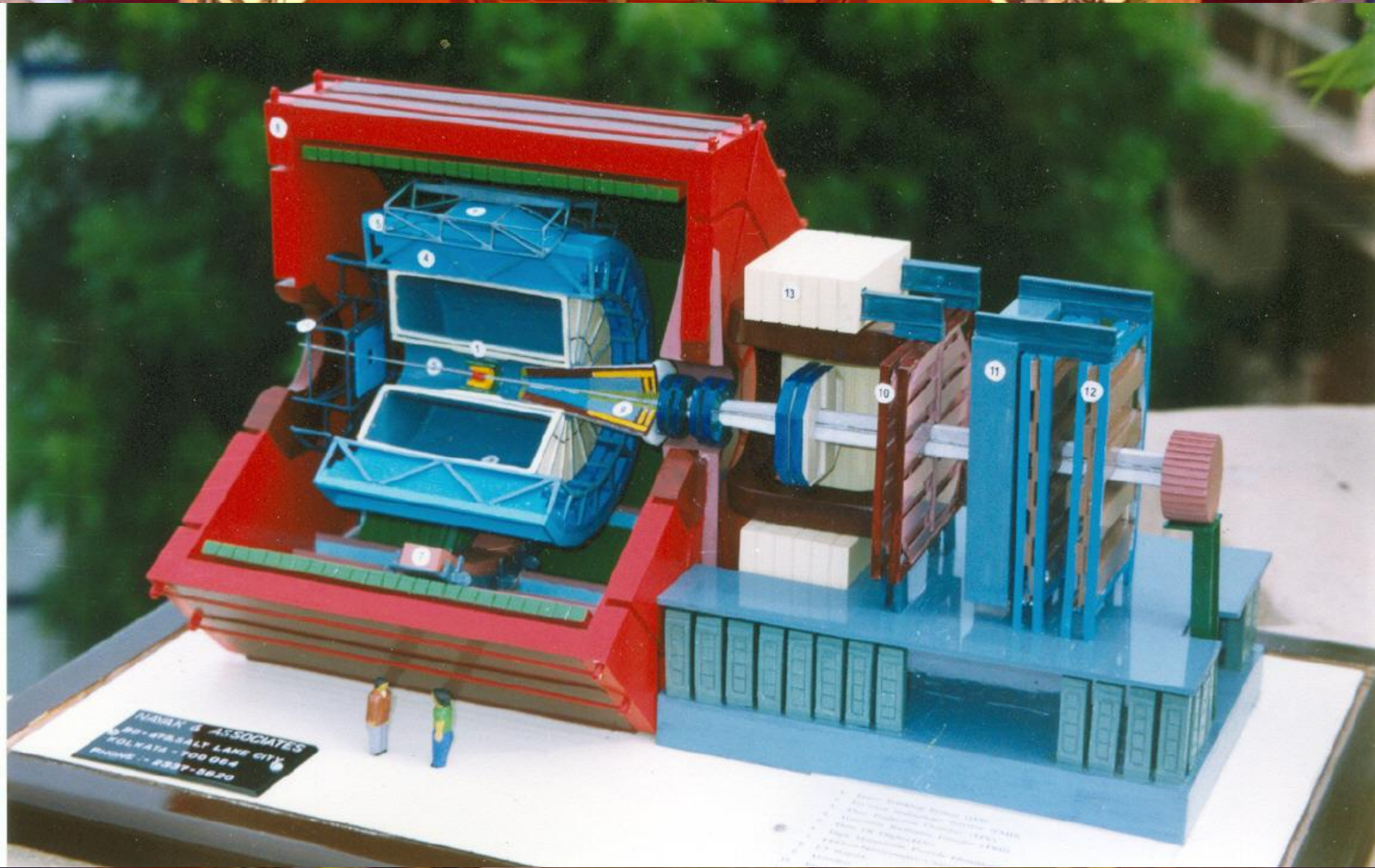
Very large International Collaborations...

ALICE today

- 1300 scientists, 138 institutions in 36 countries...

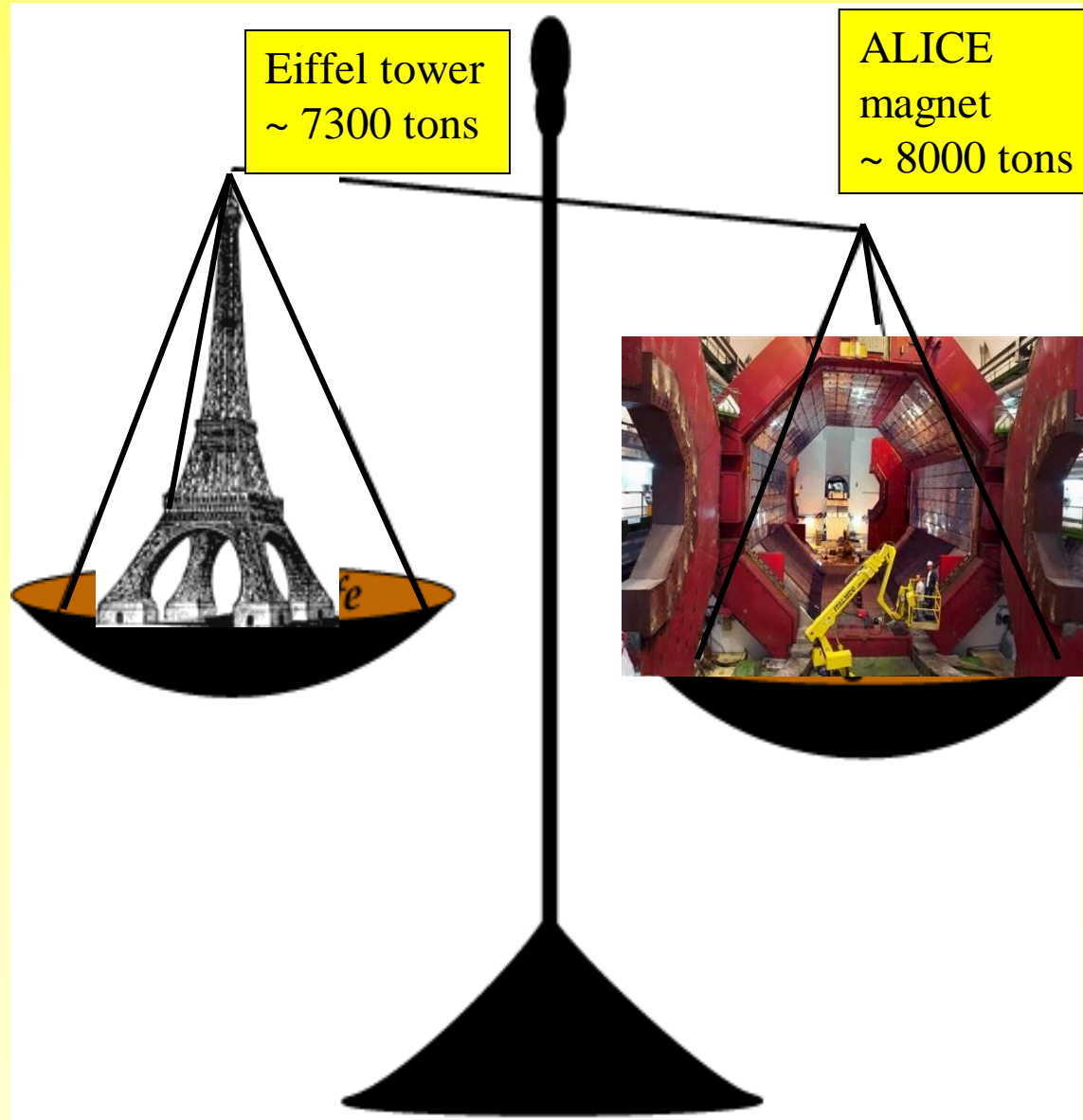


- Working for over 20 years to develop the technologies and build the detectors, and now to operate them



Nuclear Physics has changed...

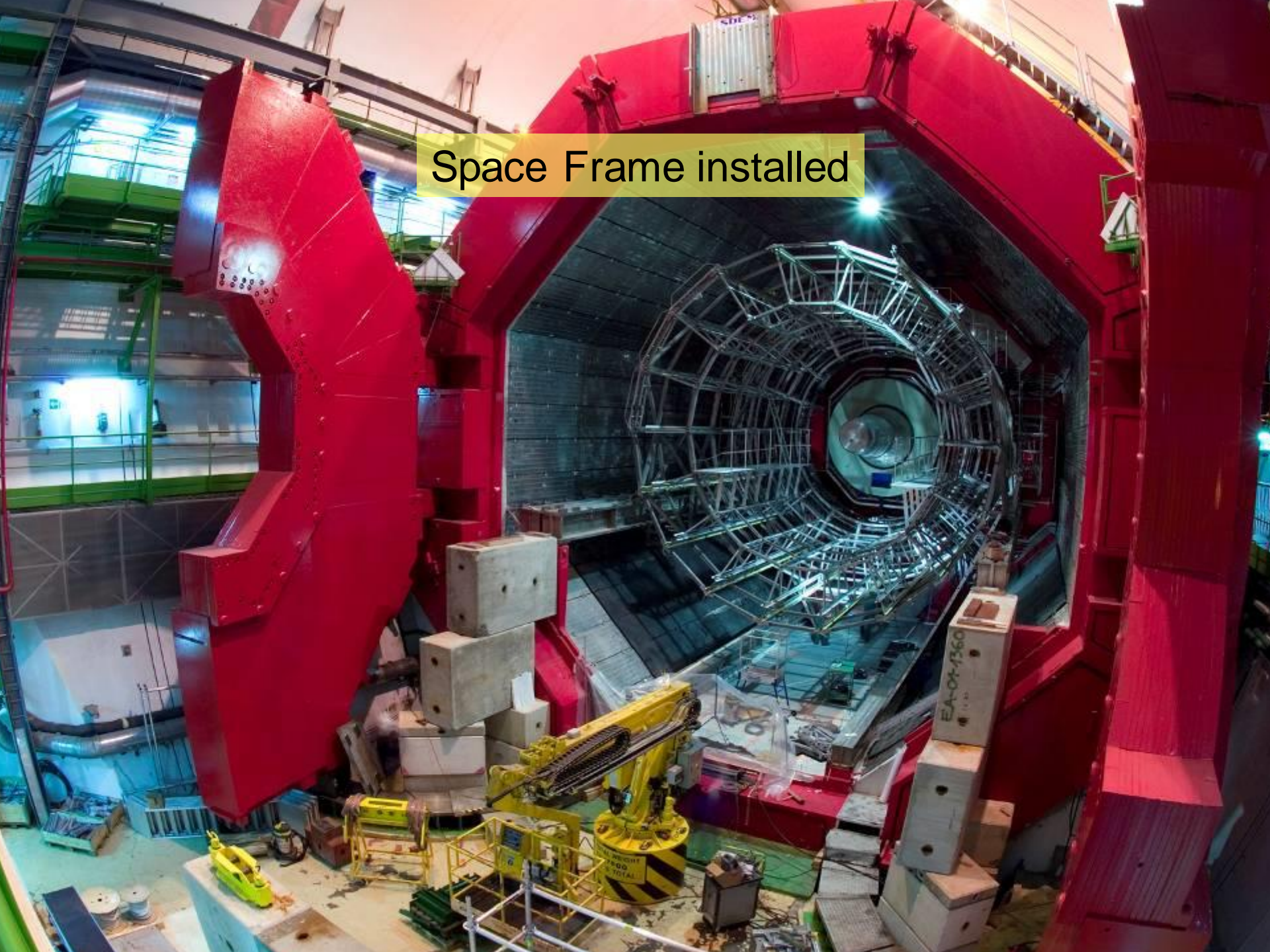
- Nuclear Physics experiments are nowadays worldwide high-tech projects of extreme complexity, which develop over decades!
- Experimental approaches common with HEP



Space frame

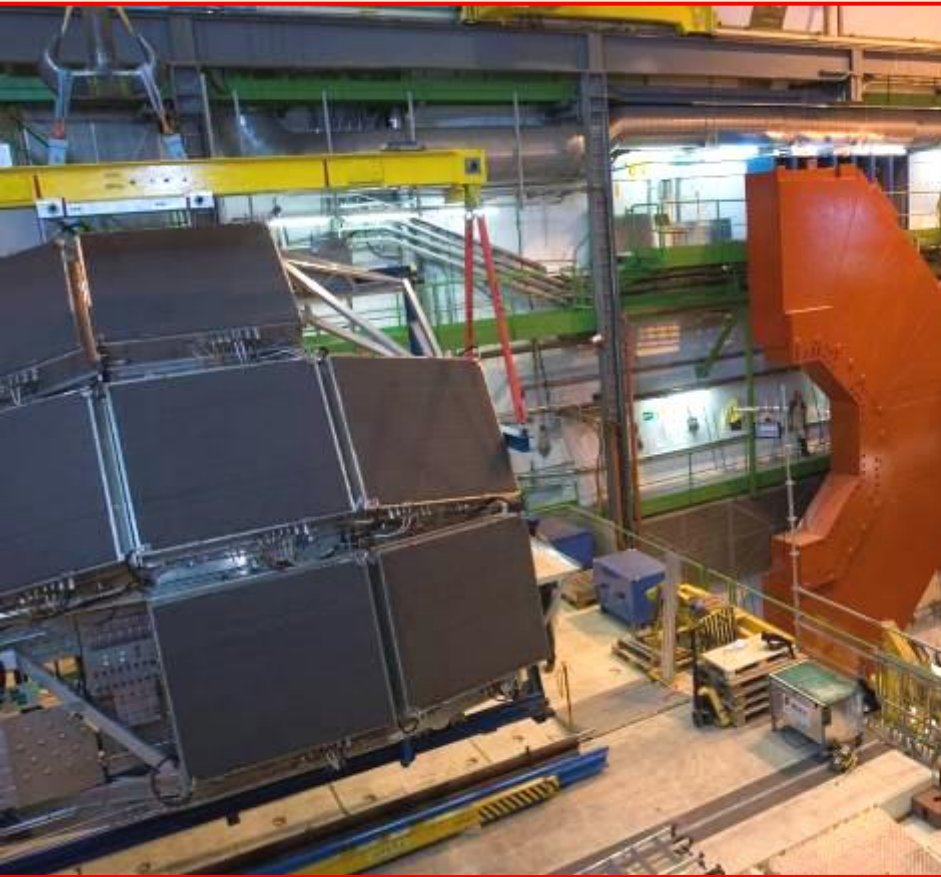
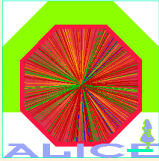


Space Frame installed





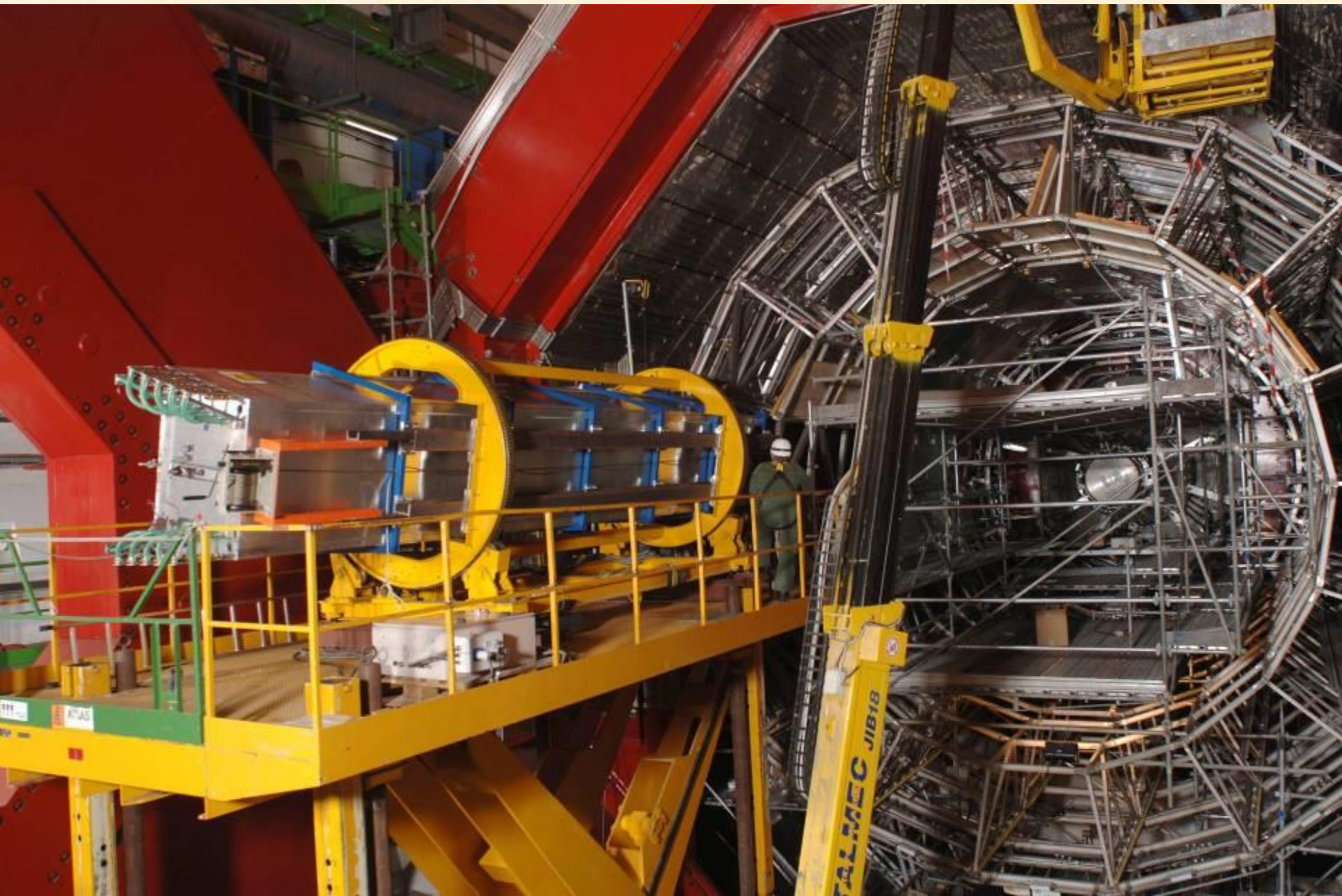
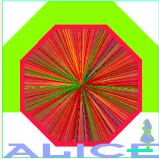
HMPID Installation



Yellow installation platform

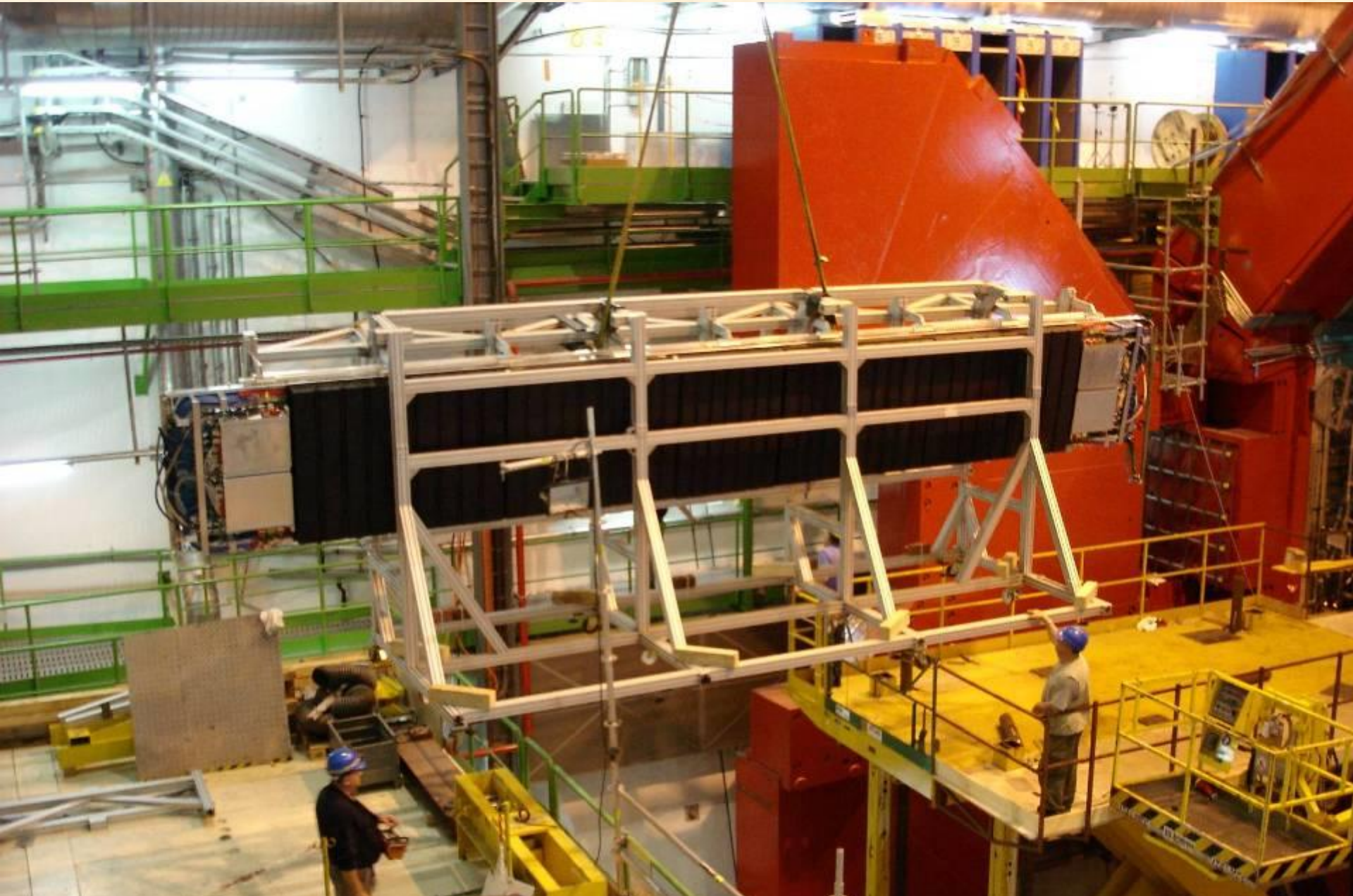
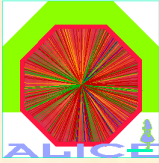


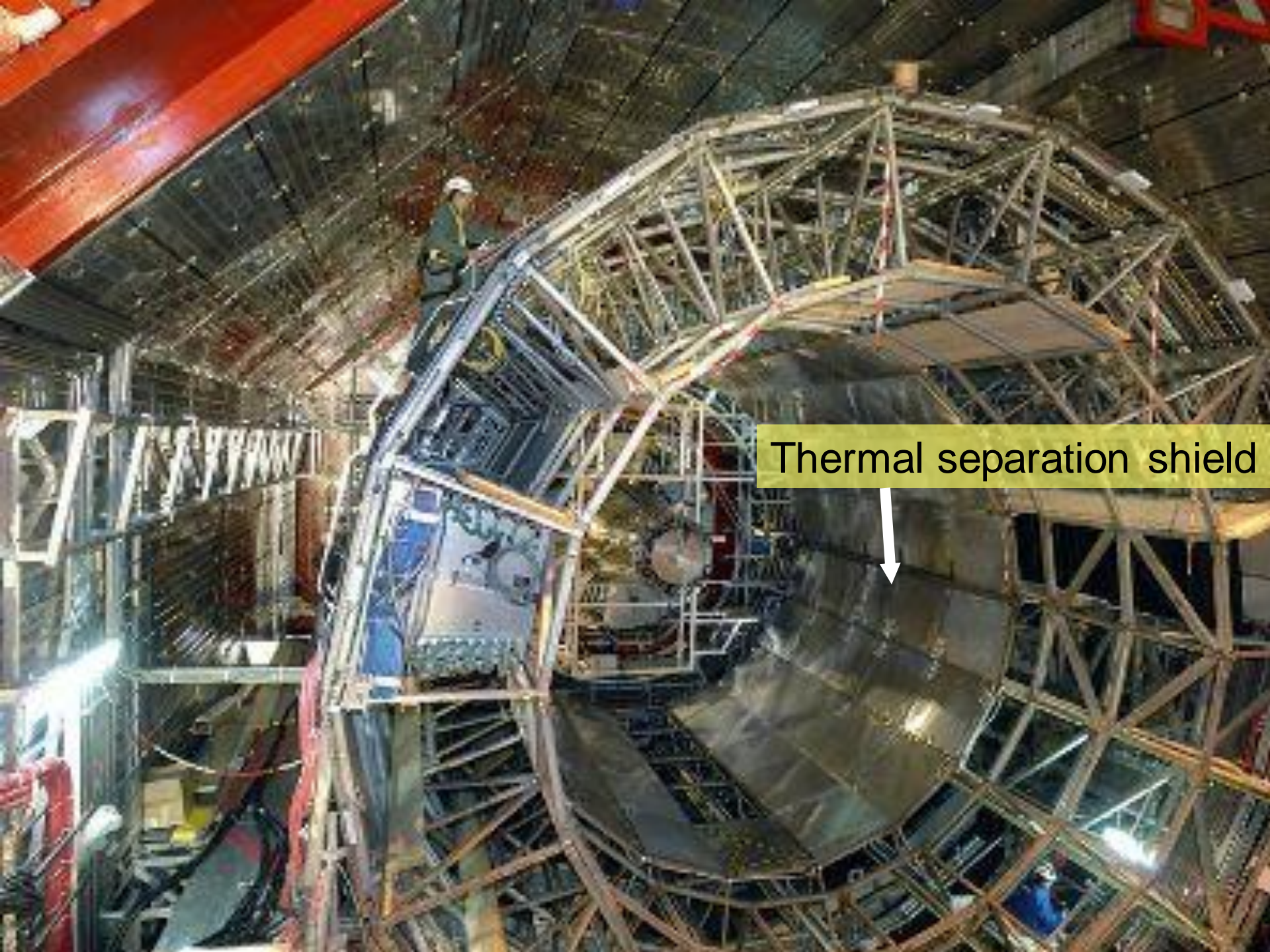
Installation of the TRD detector





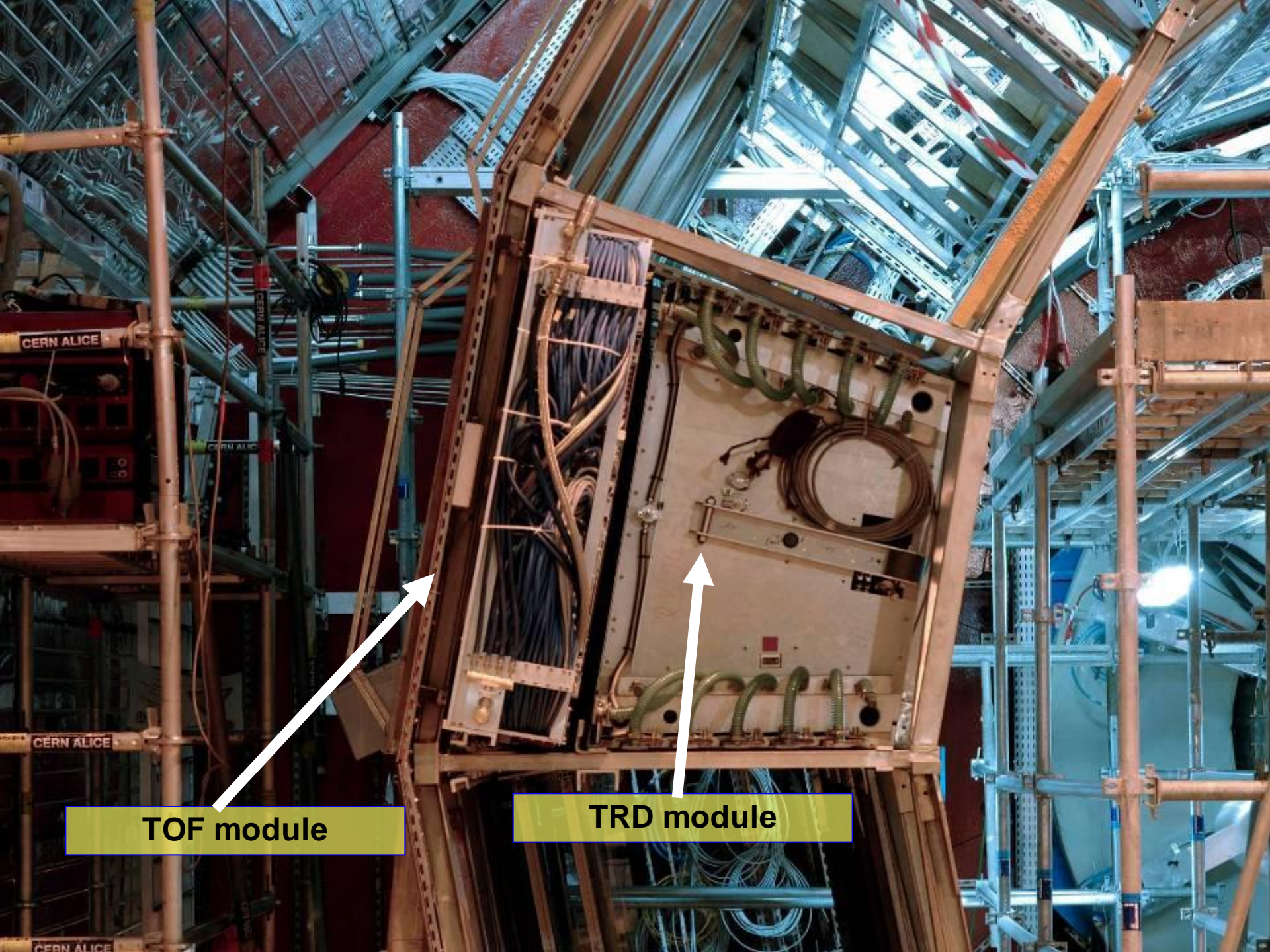
Installation of the TOF detector





Thermal separation shield



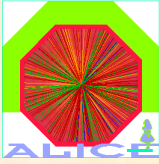


TOF module

TRD module



TPC



TPC Installation (January 2007)

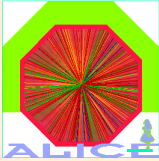
Position Monitor



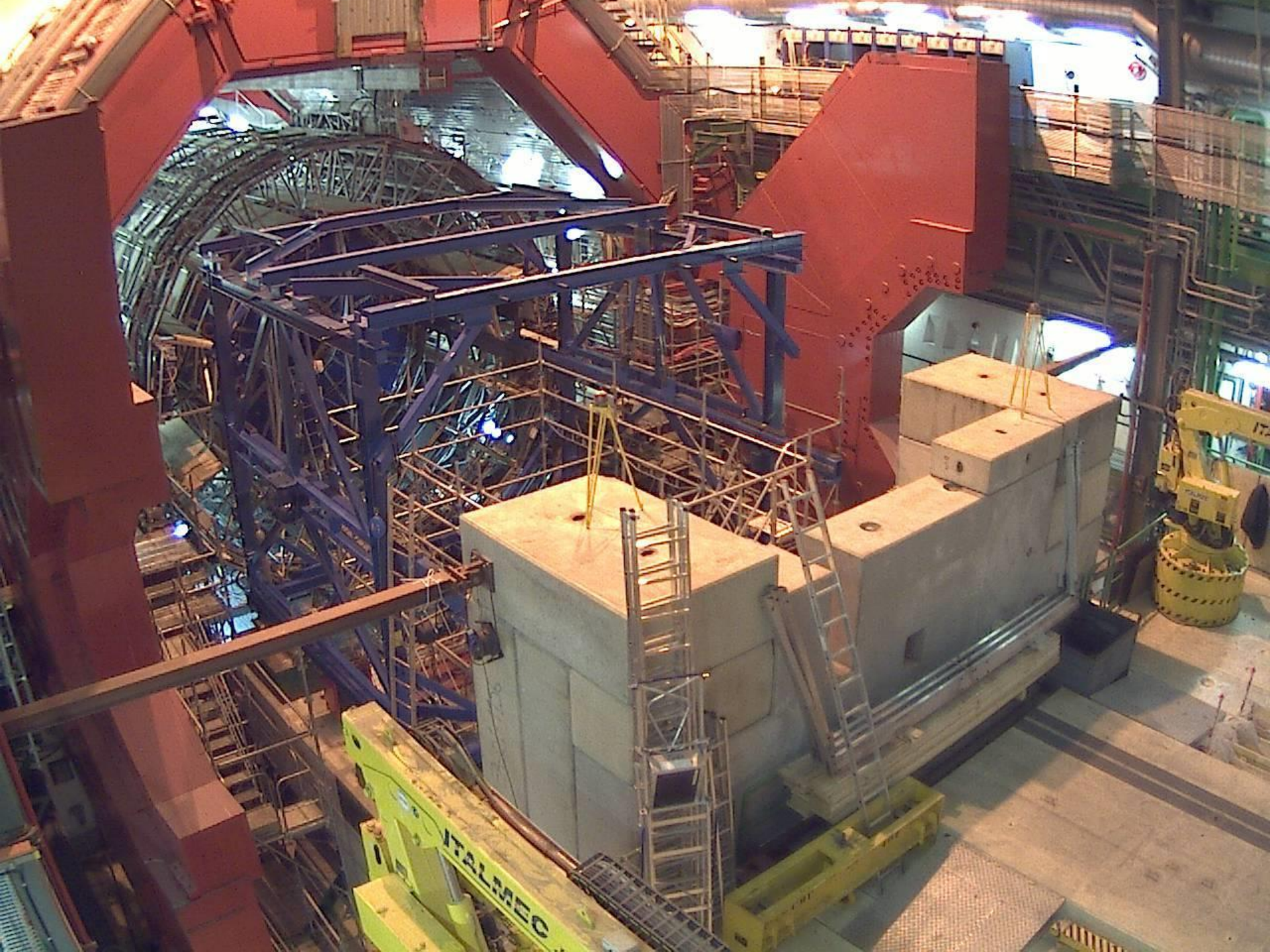
< 100 m horizontal, < 100 m vertical in 2 days
<v> = 4 m/hour



TPC LOWERING

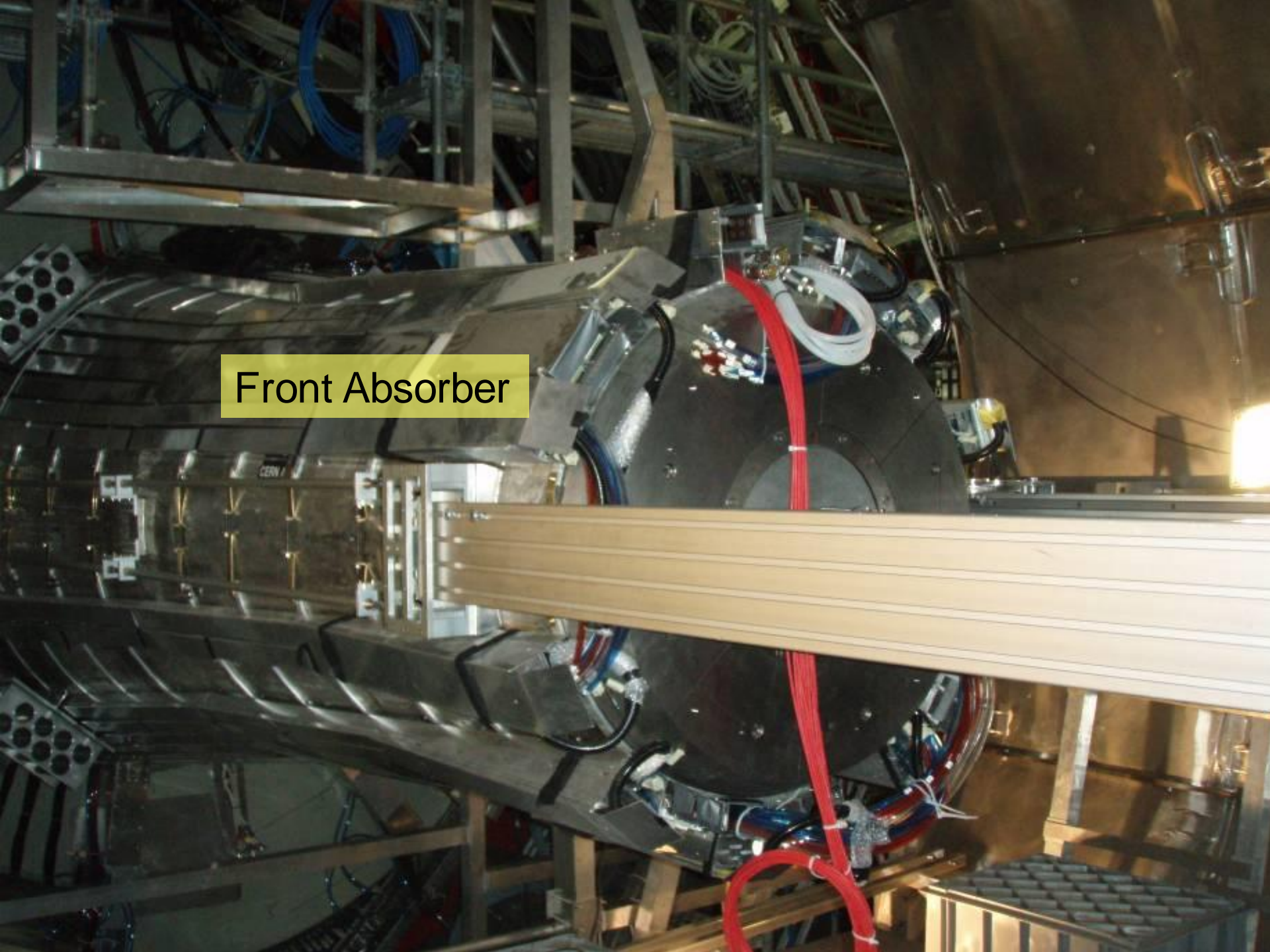






The image shows a complex laboratory setup for the installation of ITS rails. A large, circular, metallic structure is the central focus, surrounded by a dense network of aluminum rails and support beams. Numerous cables, including orange, green, and brown ones, are bundled and routed along the rails. The background is a blue wall with yellow labels. To the right, there are more complex mechanical assemblies and a stainless steel structure. The overall scene is a detailed view of a high-precision engineering installation.

ITS installation rails

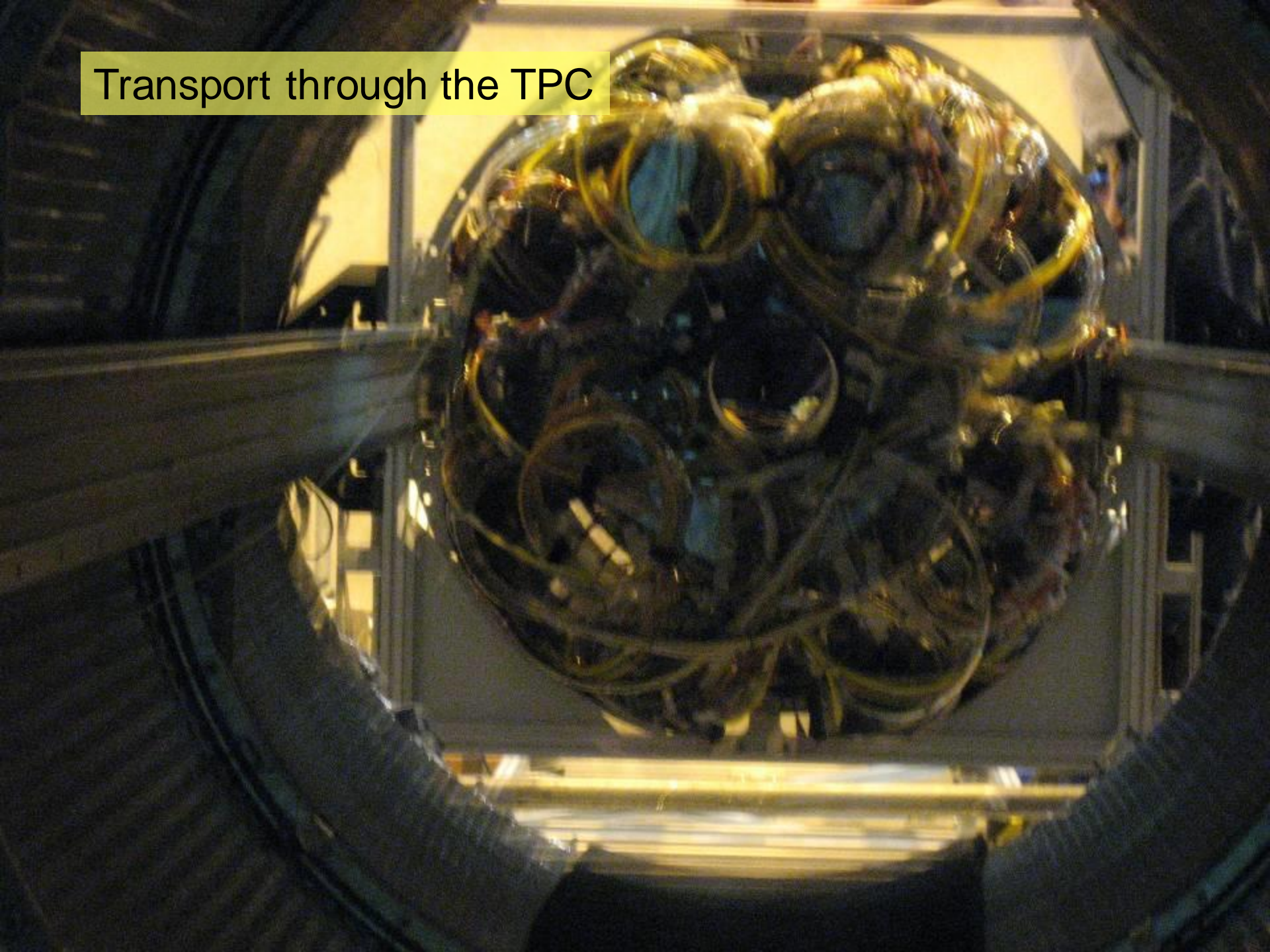
The image shows a complex scientific instrument, likely a particle detector, with a cylindrical front section. The front section is composed of several layers of material, possibly absorbers, and is surrounded by a network of cables and structural supports. A prominent feature is a large, dark, cylindrical component in the center, which is the front absorber. It is connected to various cables, including a thick red one. The entire assembly is housed within a large, metallic structure, possibly a cryostat or a shielding container. The background shows a dense network of metal beams and cables, indicating a highly complex and technical environment. The lighting is somewhat dim, with a bright light source visible on the right side of the image.

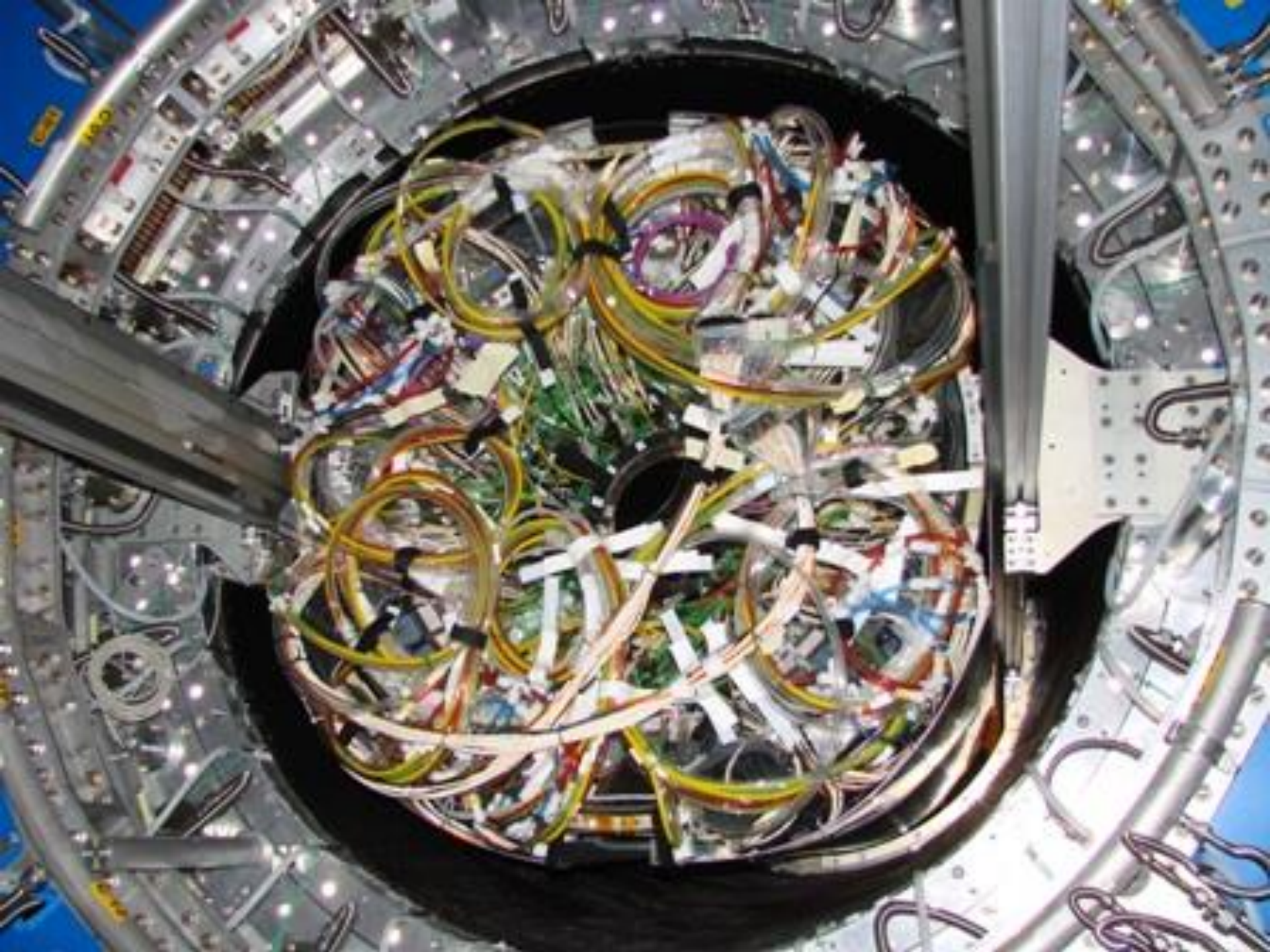
Front Absorber

Installing ITS SSD + SDD

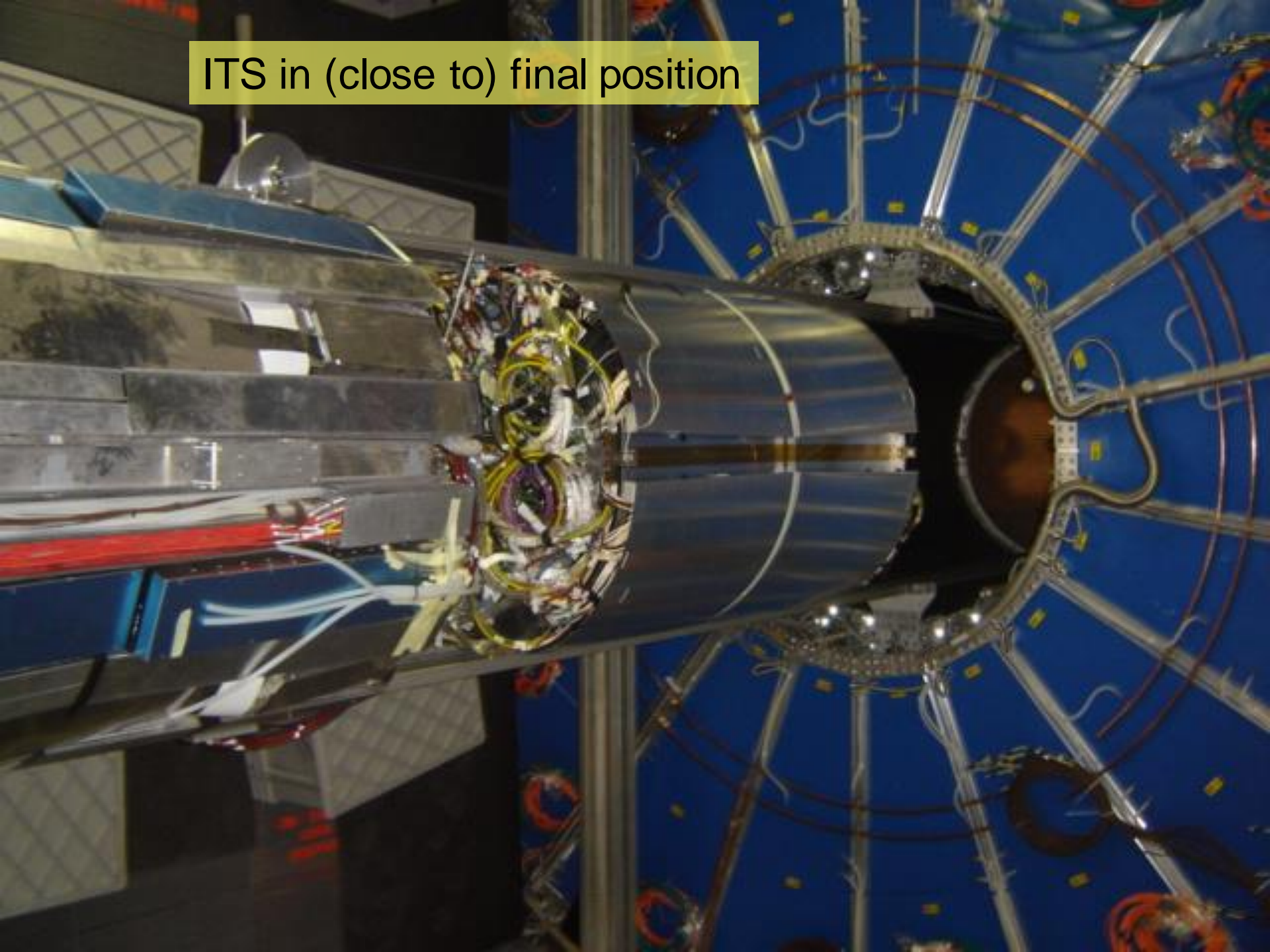


Transport through the TPC



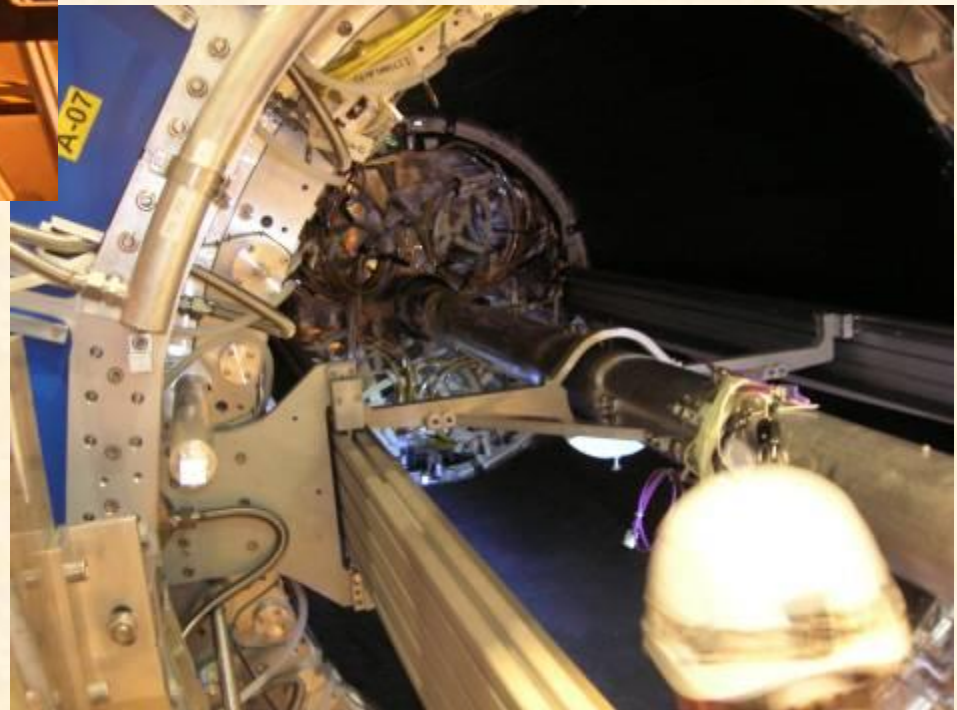
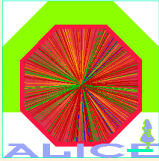


ITS in (close to) final position





Beampipe Installation and Bakeout

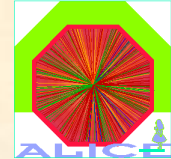


16.3. 2007

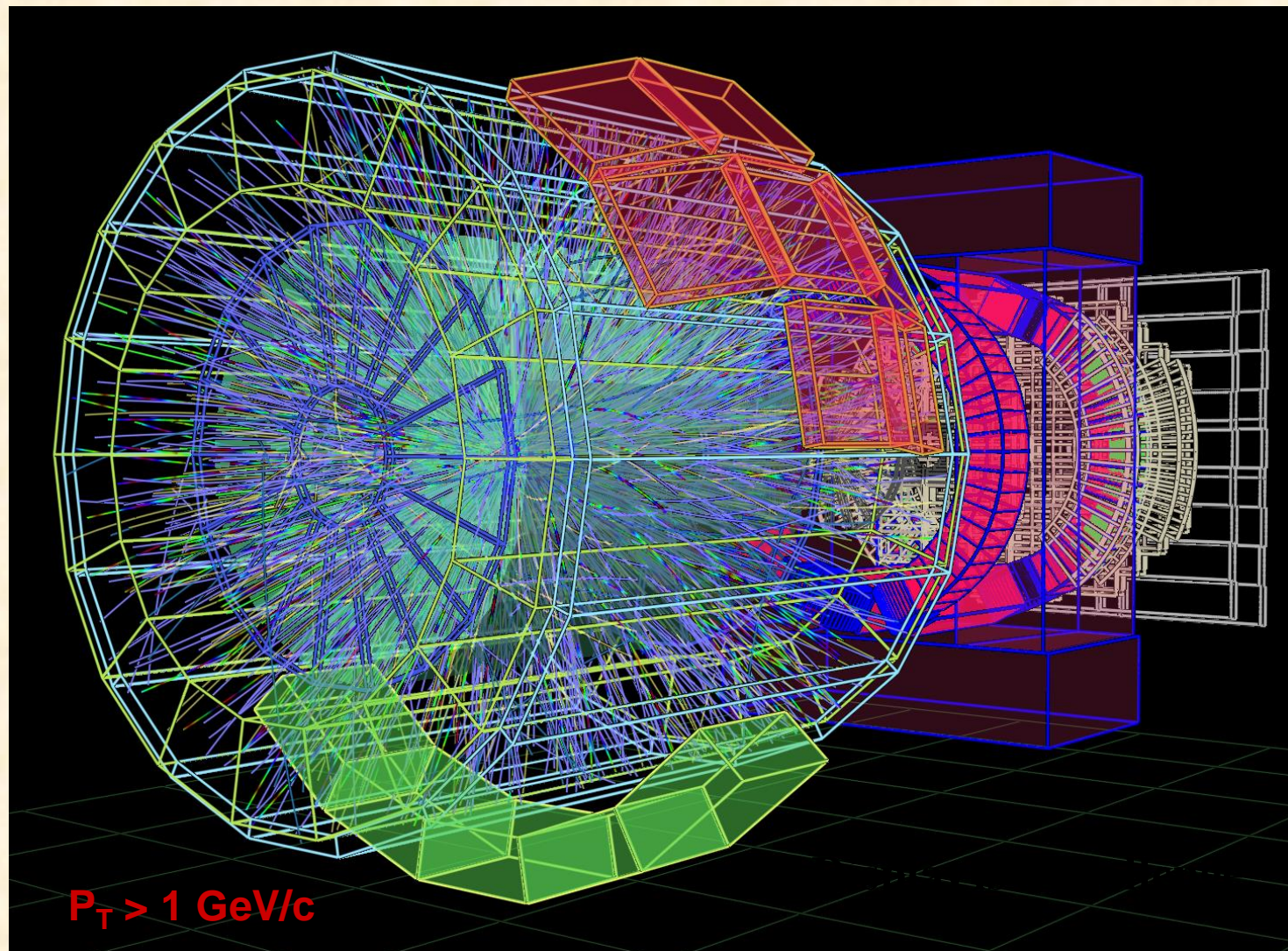




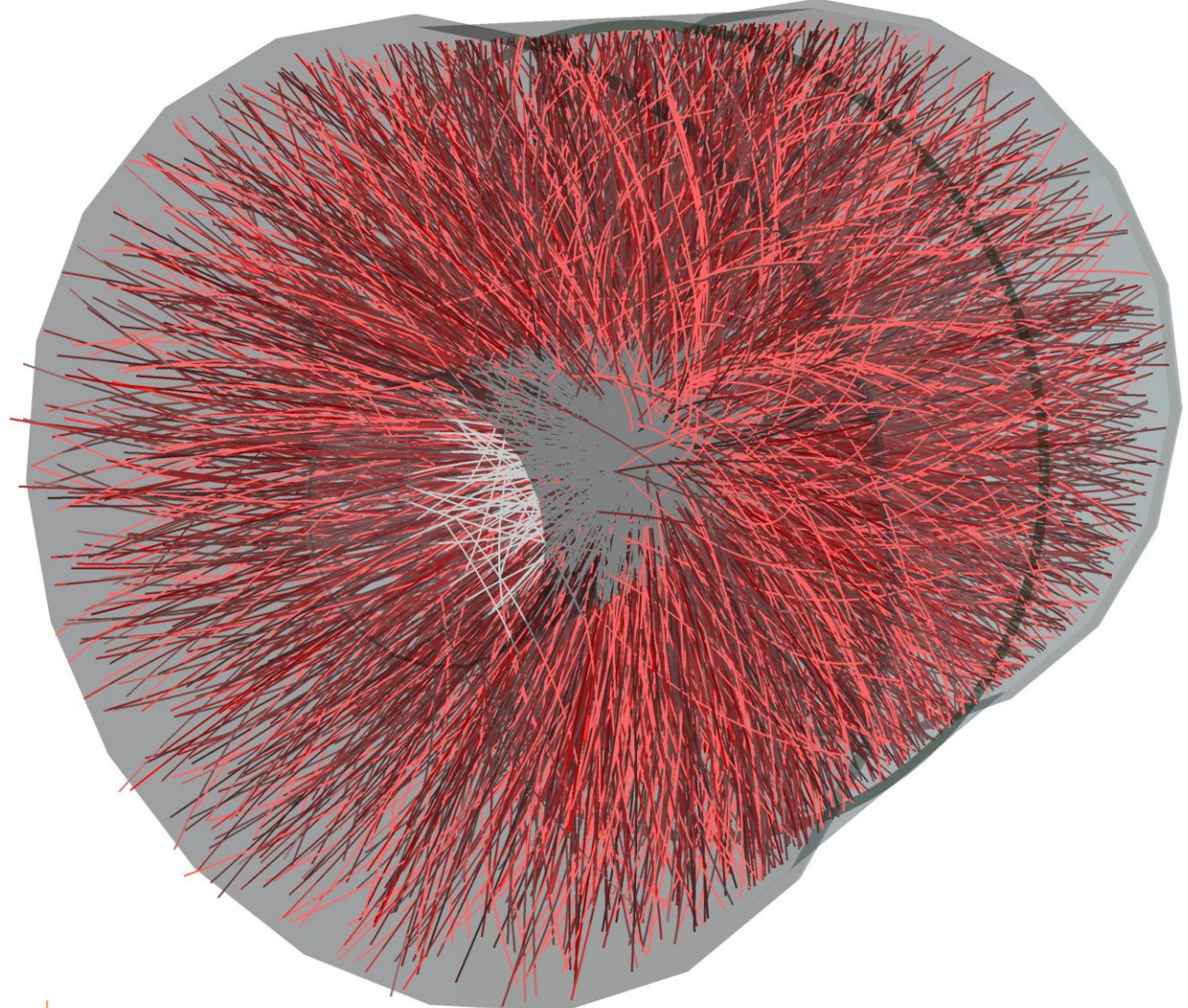
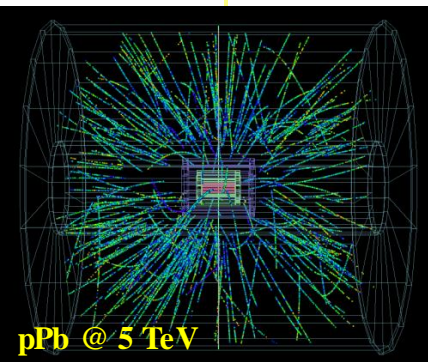
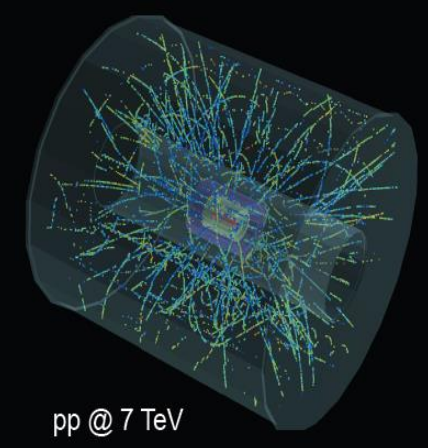
Lead-lead collisions with ALICE



- To see something just look at $p_T > 1 \text{ GeV}/c$!

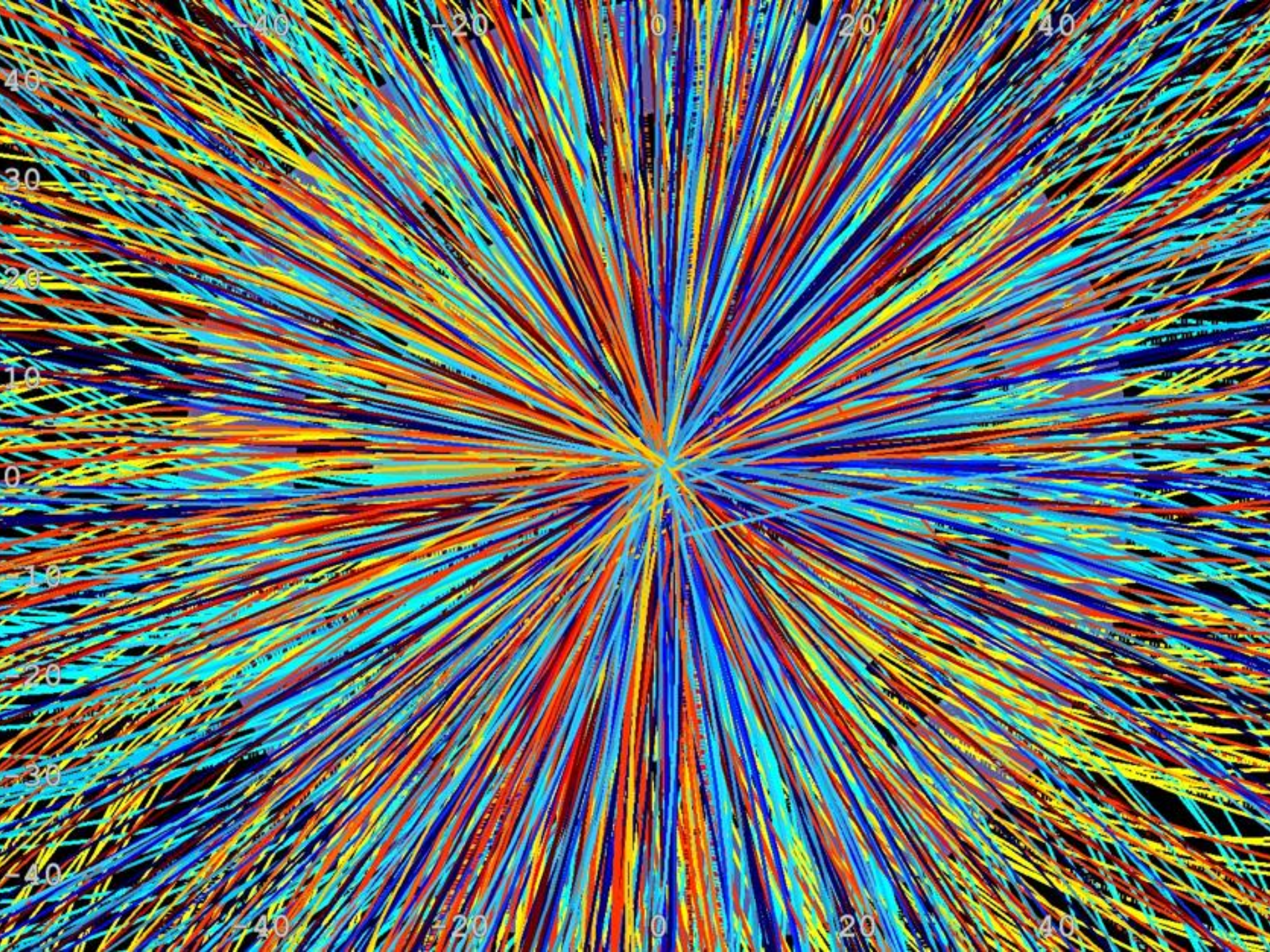


Collisions of Nuclei in the LHC: The world's most energetic collisions



ALICE

Very Complicated!





ALICE is open for new ideas

