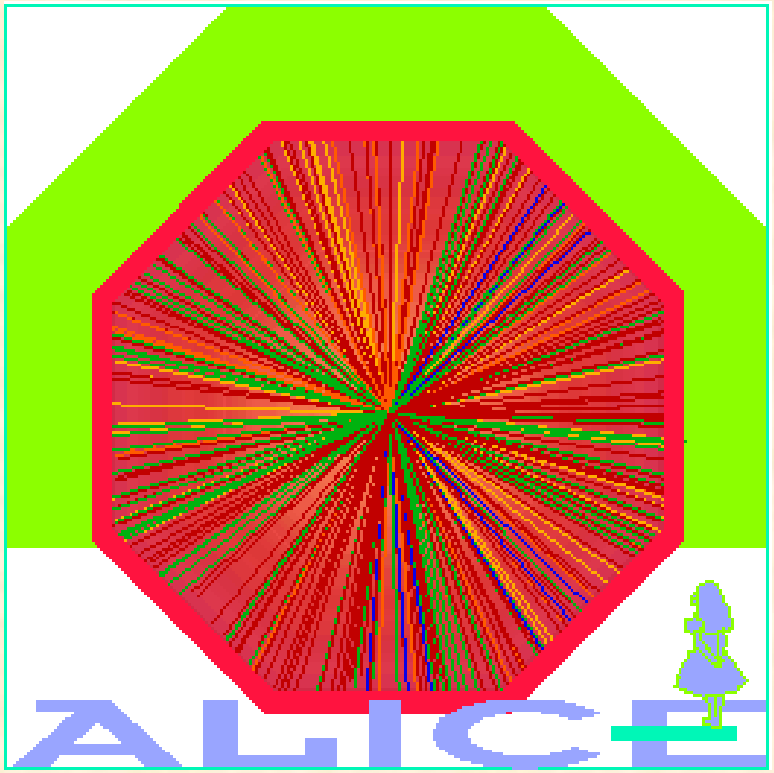
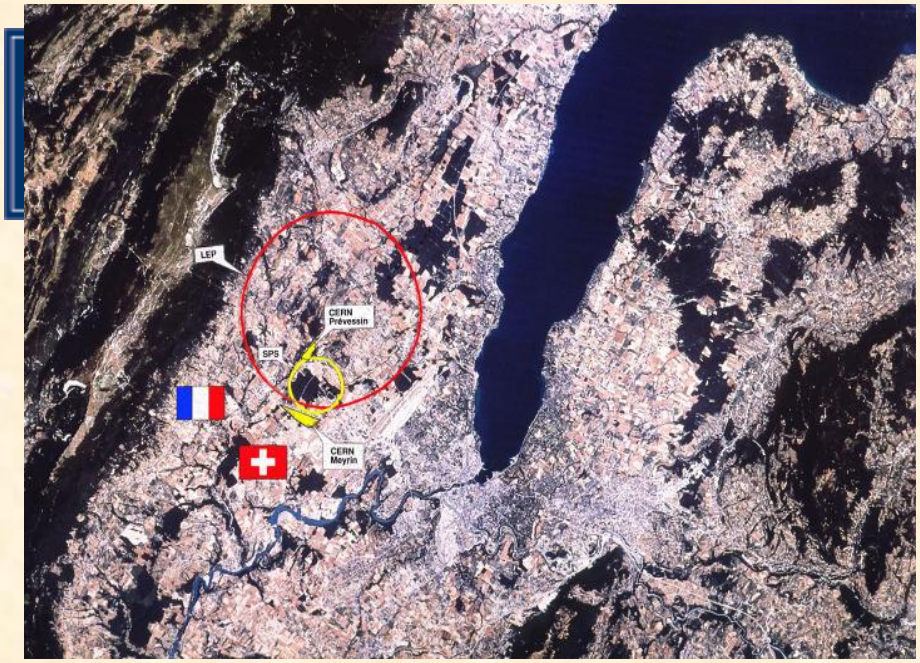
Fyzika ťažkých iónov

alebo malý tresk…

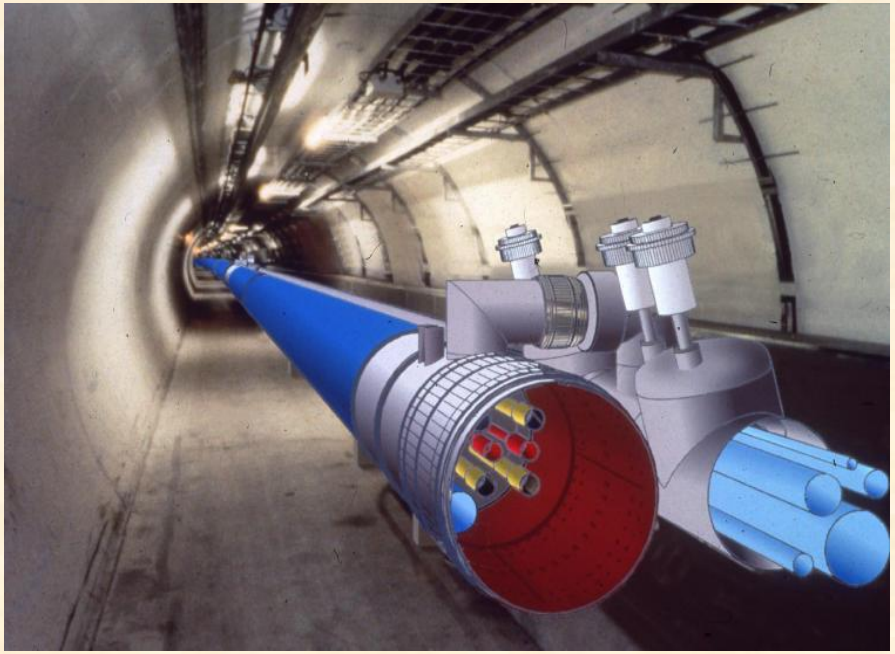
Detektor ALICE

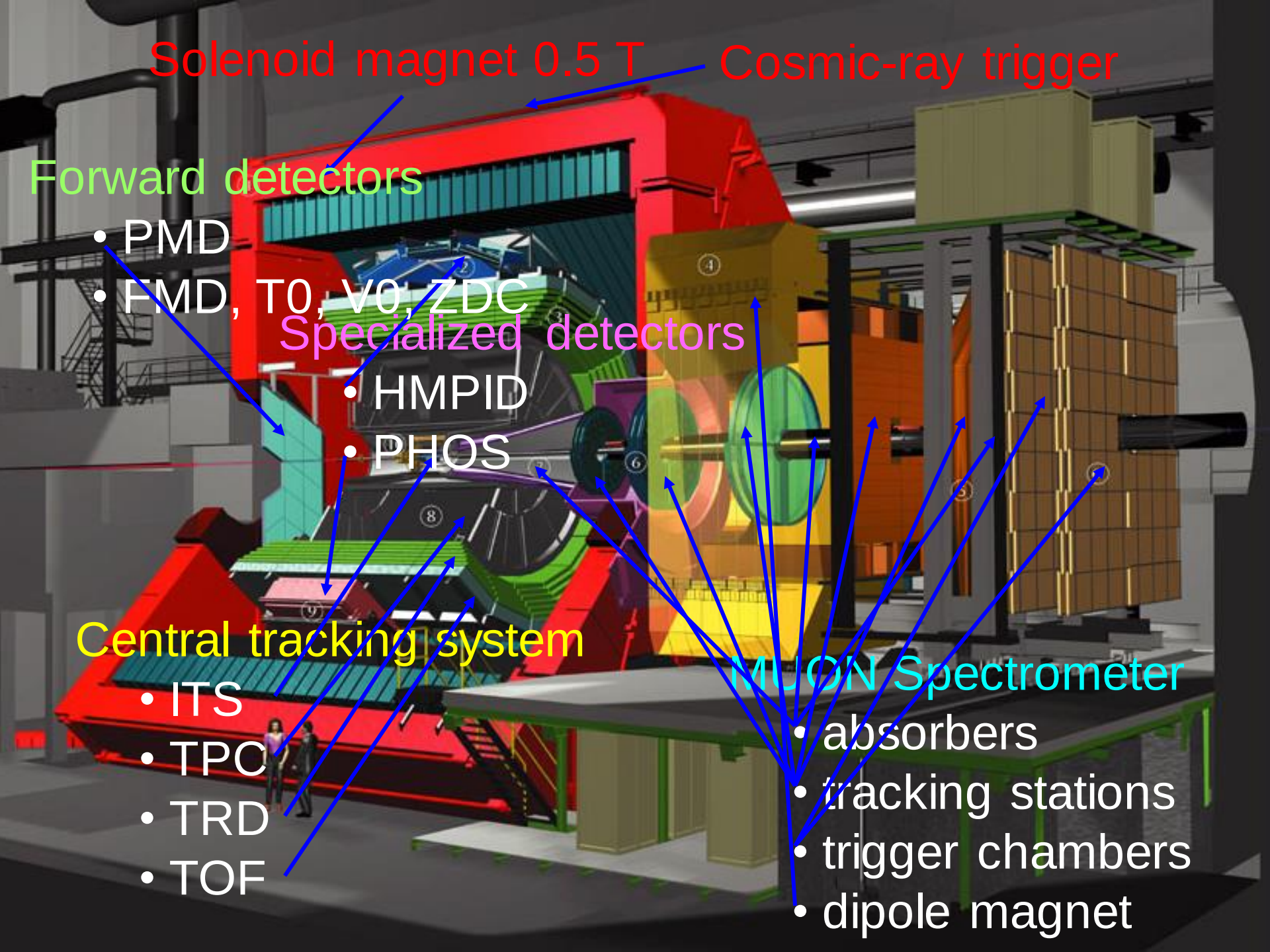




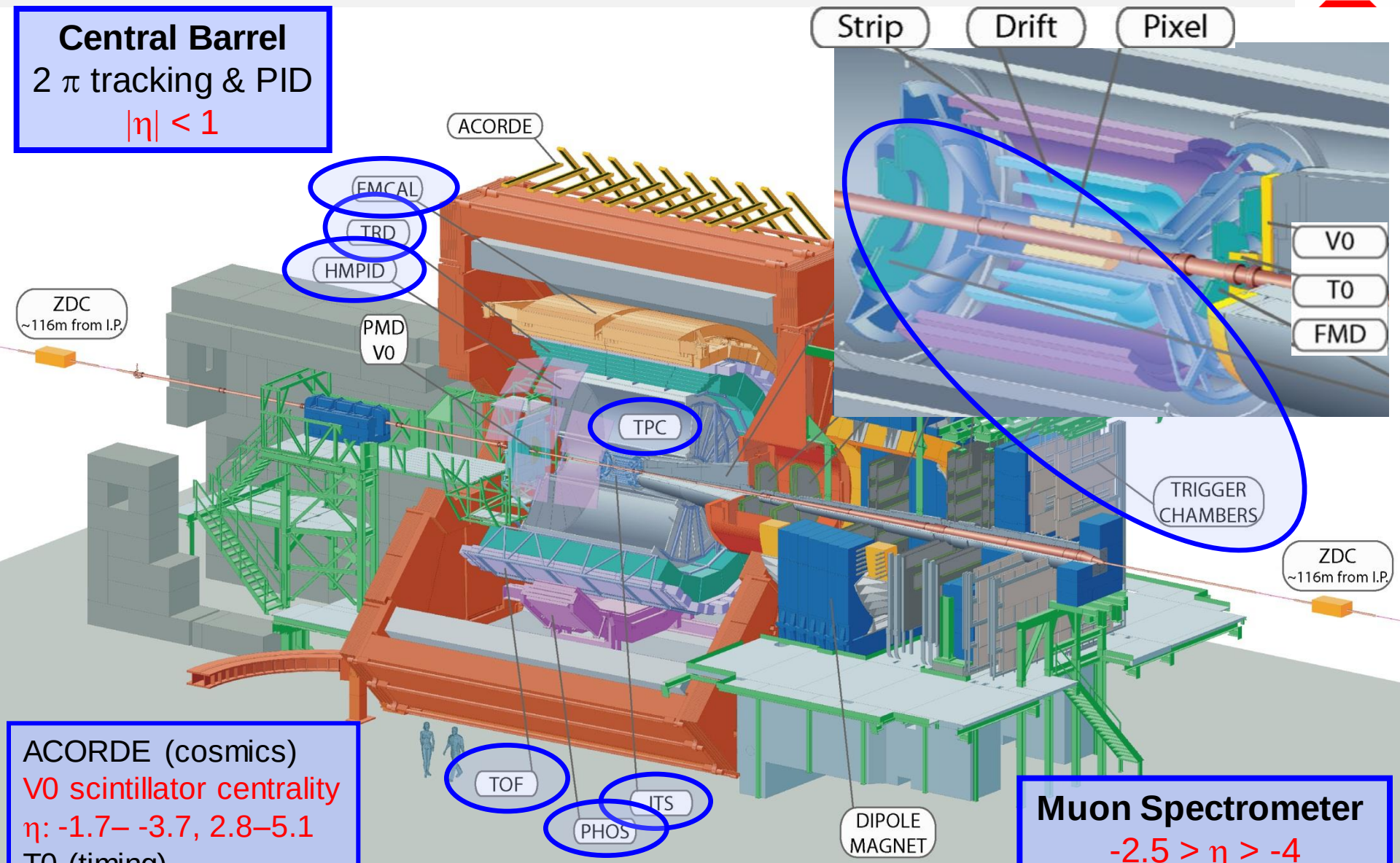
Future place for studying the Quark Gluon Plasma

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
2 π tracking & PID
$|\eta| < 1$



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

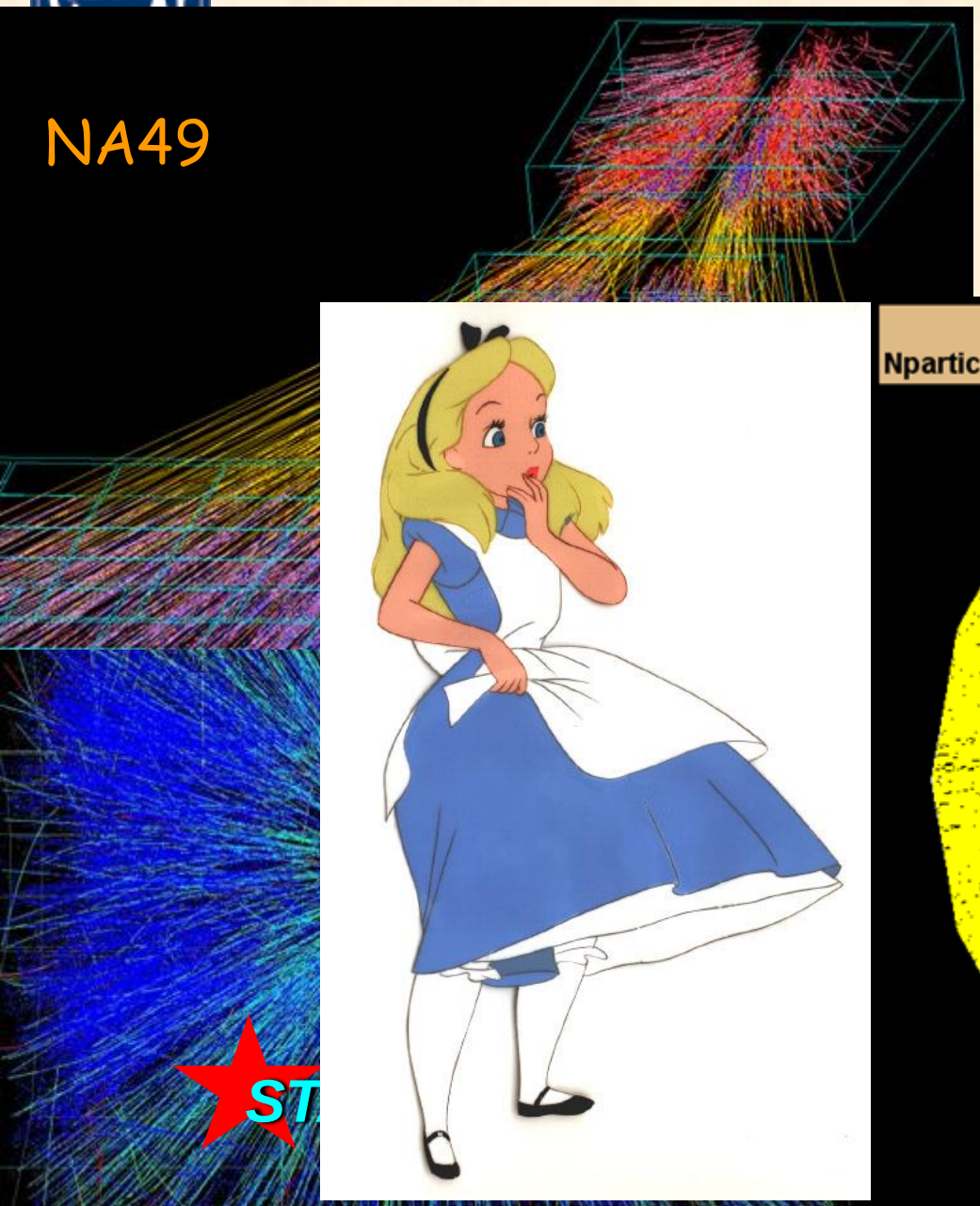
Muon Spectrometer
$-2.5 > \eta > -4$

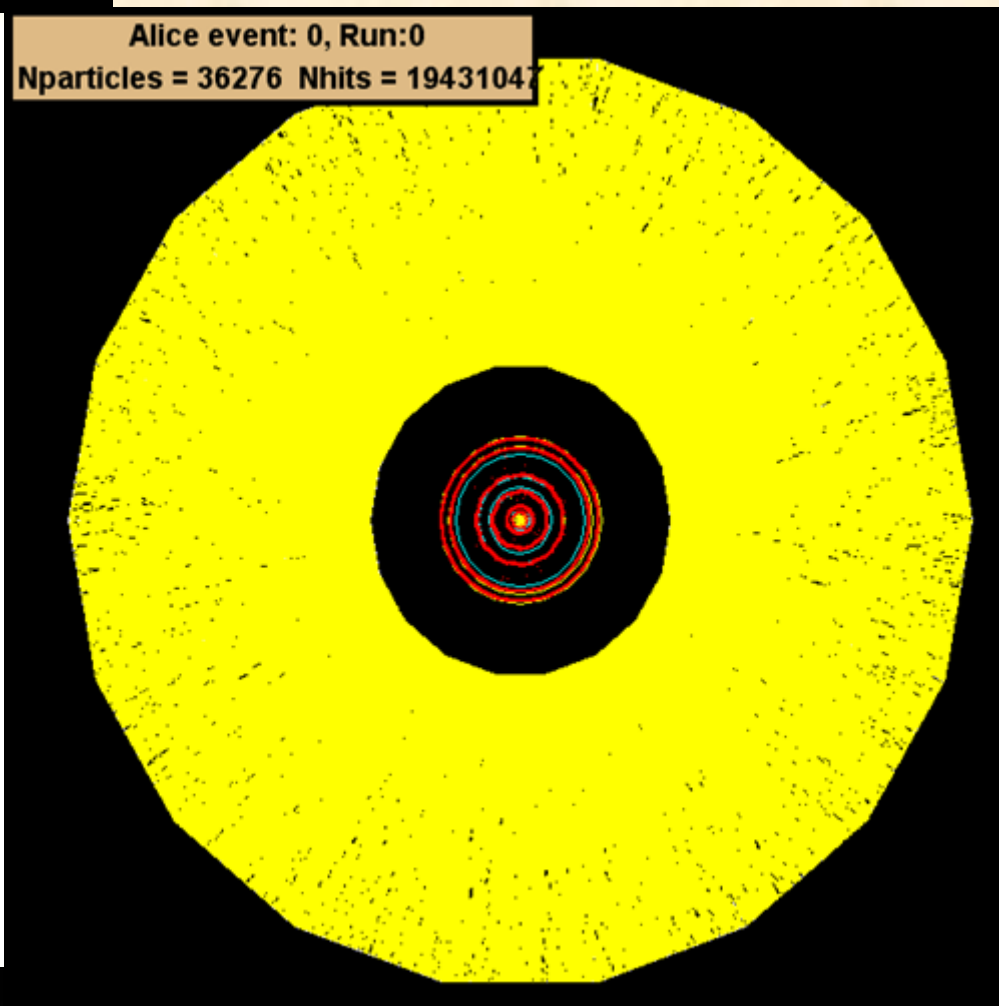
Detector:
Length: 26 meters
Height: 16 meters
Weight: 10,000 tons

Collaboration:
> 1000 Members
> 100 Institutes
> 30 countries

Tracking Challenge

NA49

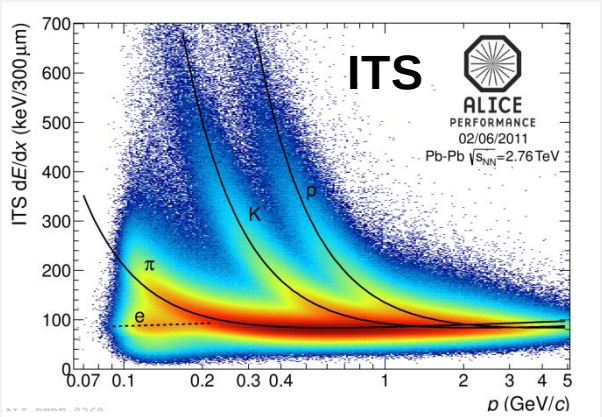


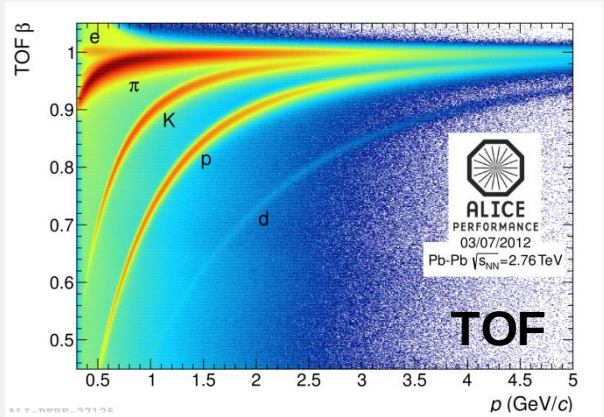


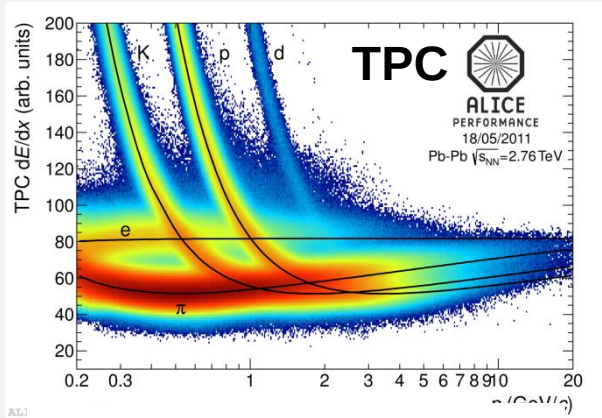
ALICE 'extreme' scenario:

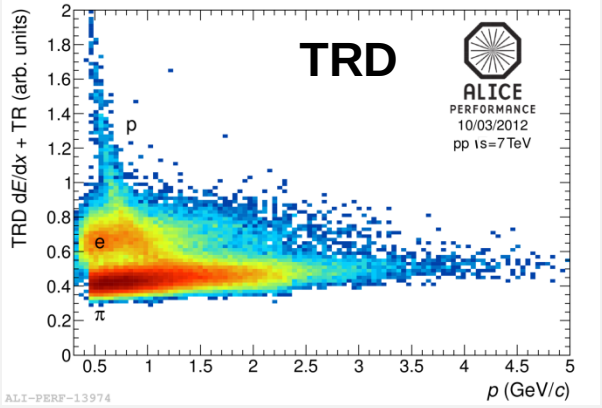
$dN/dy_{ch} = 8000$

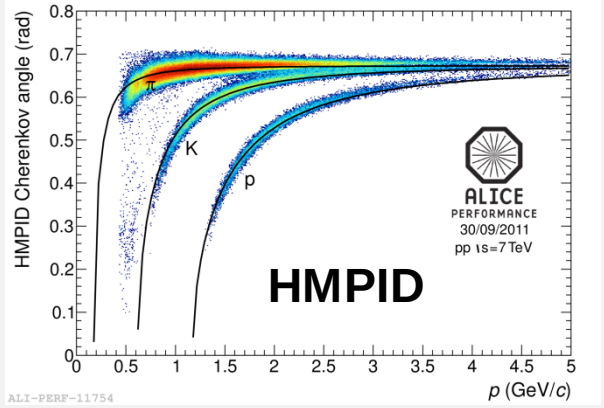
ALICE – dedicated heavy-ion experiment at the LHC

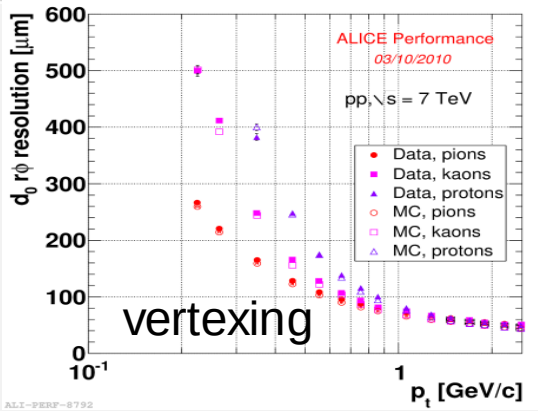










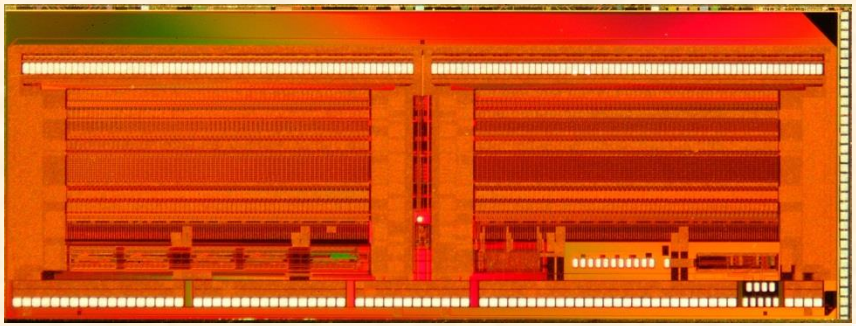


- particle identification (practically all known techniques)
- extremely low-mass tracker ~ 10% of X_0
- excellent vertexing capability
- efficient low-momentum tracking – down to ~ 100 MeV/*c*

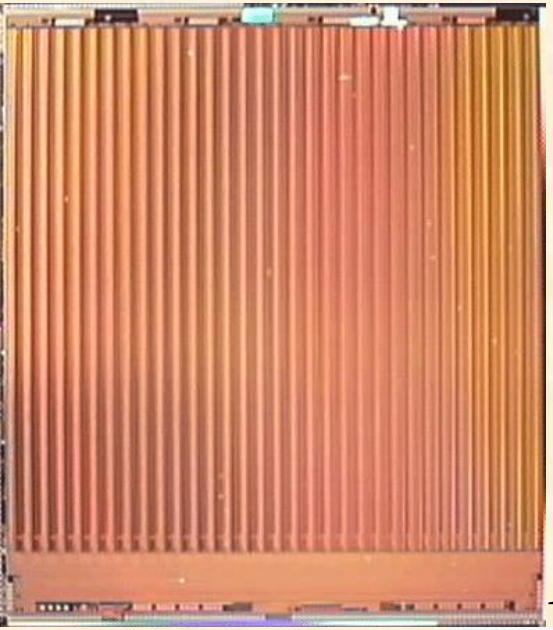
ITS: Many electronics developments

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

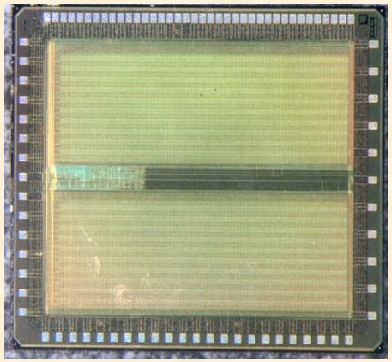
ALICE PIXEL CHIP
50 μm x 425 μm pixels
8192 cells
Area: 12.8 x 13.6 mm^2
13 million transistors
~100 μW/channel

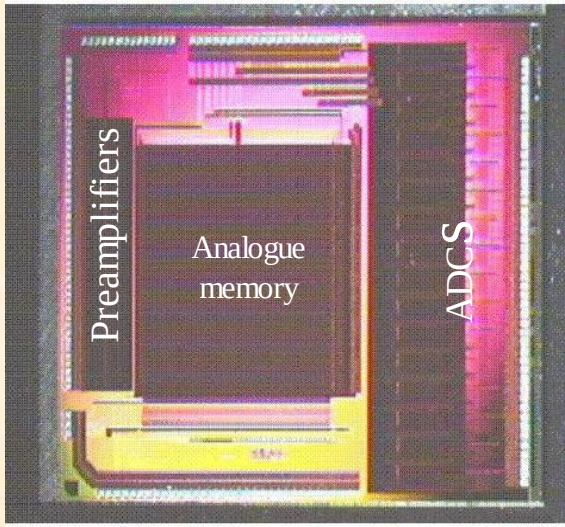


ALICE SSD FEE
HAL25 chip:
128 channels
Preamp+s/h+
serial out



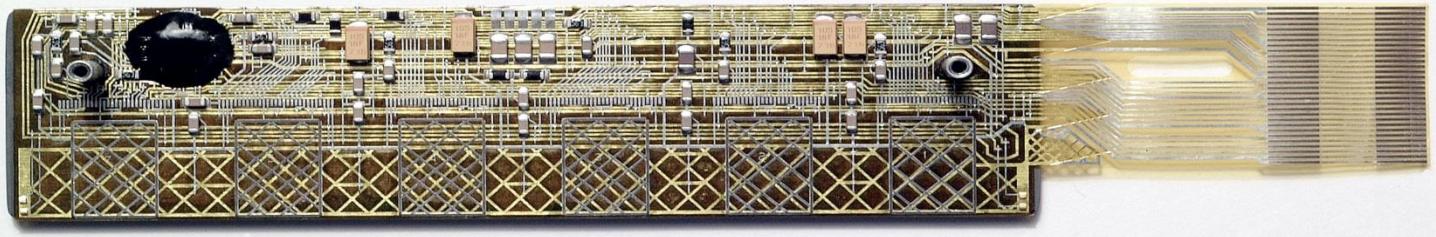
ALICE SDD FEE
Pascal chip:
64 channel preamp+ 256-deep analogue memory+ ADC
Ambra chip:
64 channel derandomizer chip

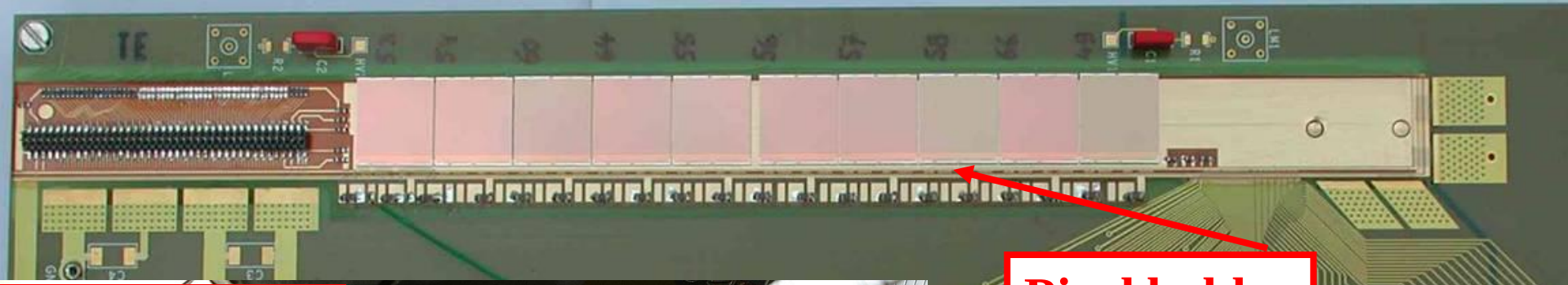




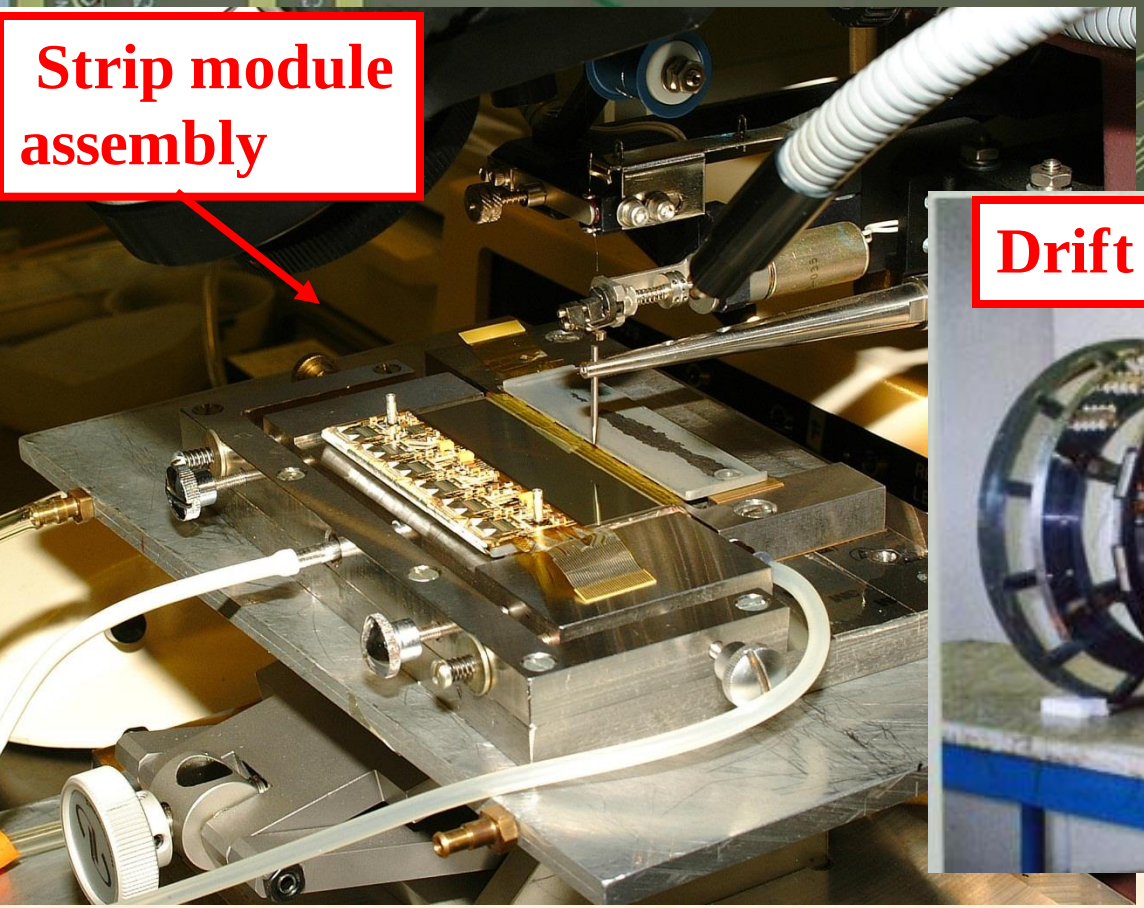
And extreme lightweight interconnection techniques:

SSD tab-bondable Al hybrids



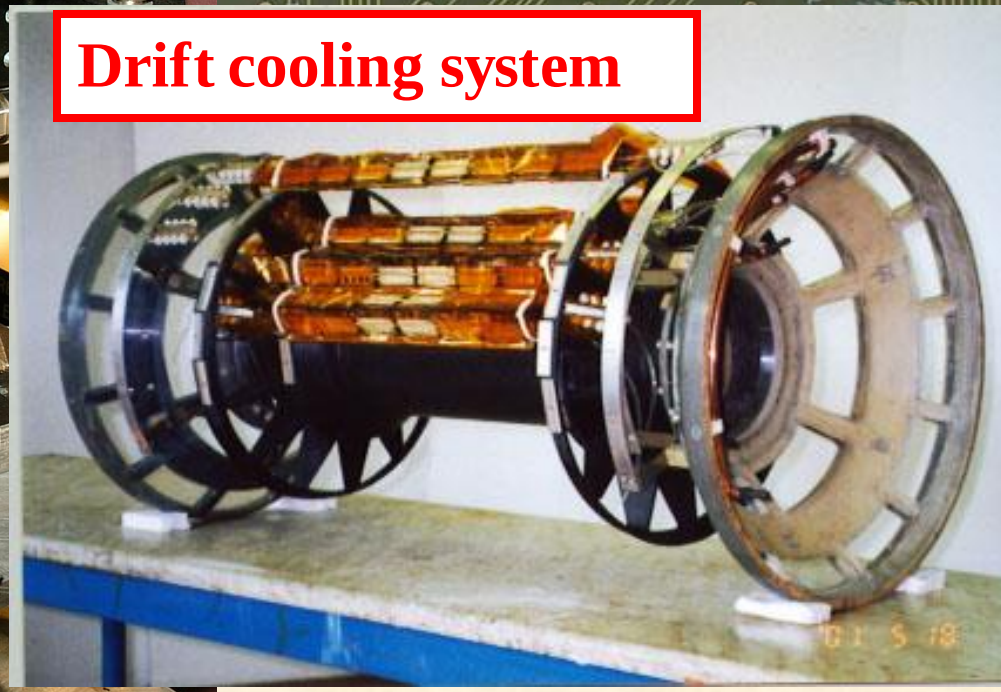


Pixel ladder



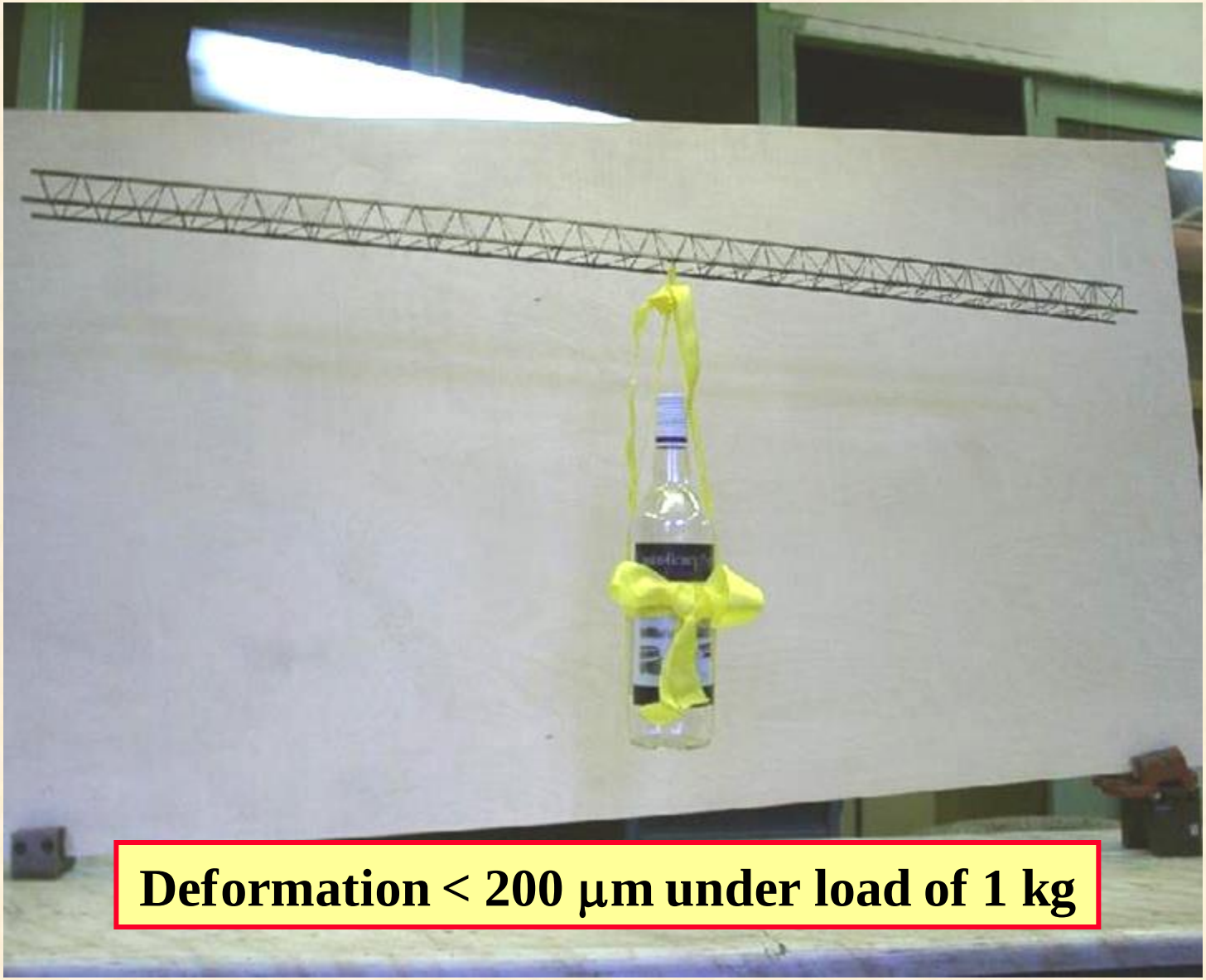
Strip module assembly

Drift cooling system

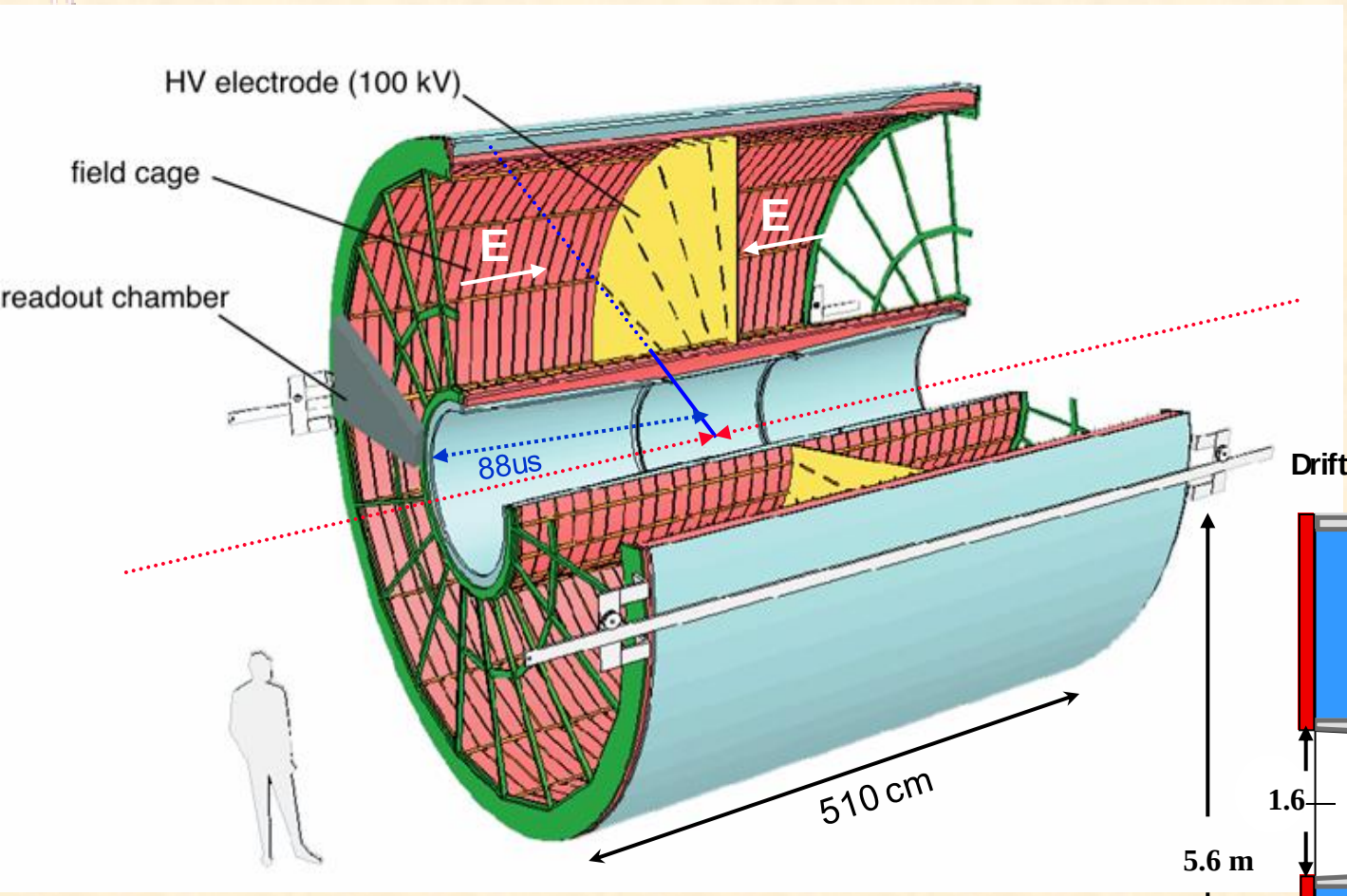


System testing and setting up of series production

ITS Ladder Acceptance Test

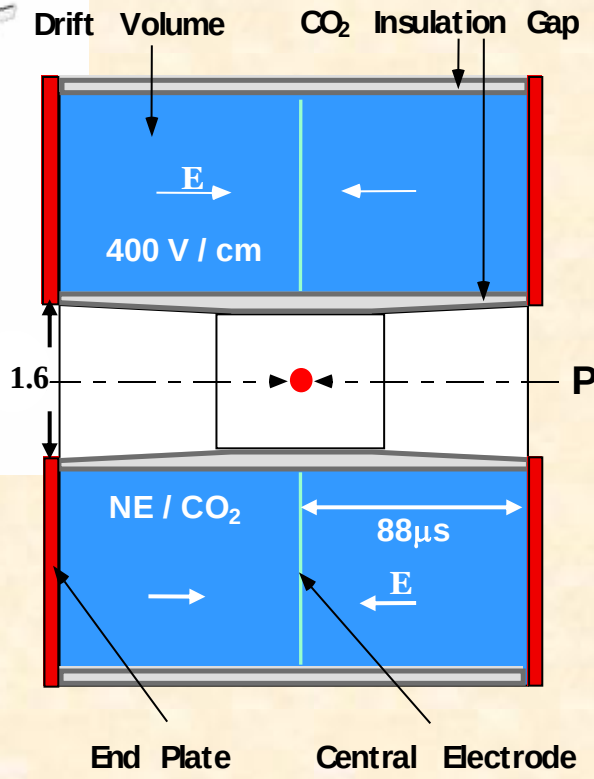


TPC layout



GAS VOLUME
88 m^3

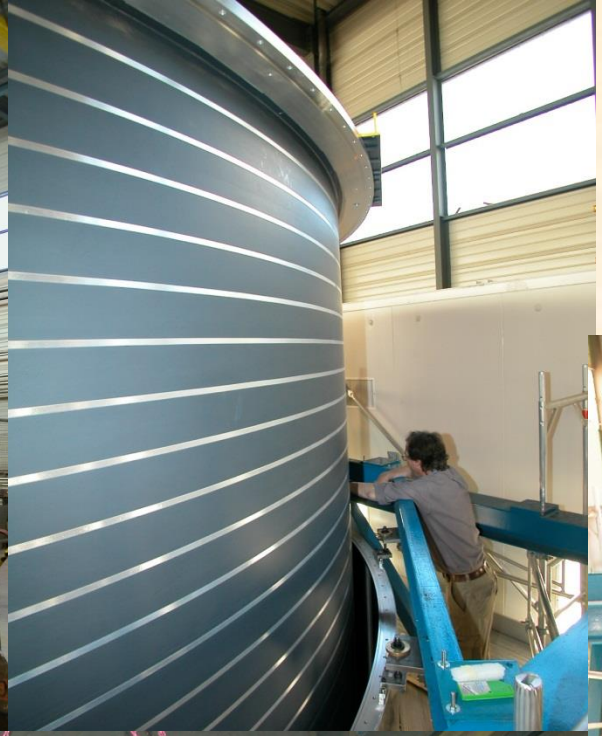
DRIFT GAS
90% Ne - 10%CO_2



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

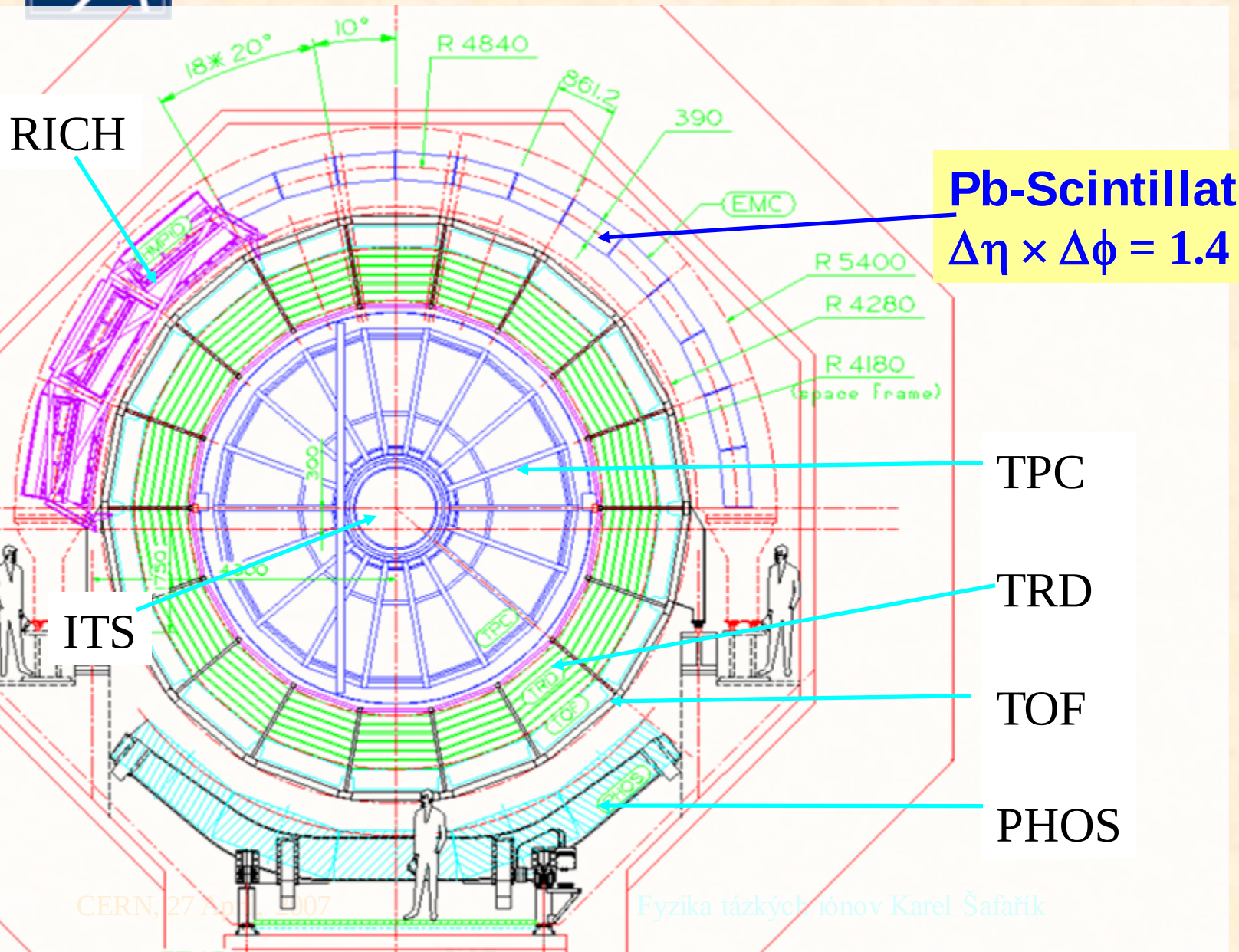
The ALICE TPC becomes real

(outer field cage and end plates)




ALICE TPC

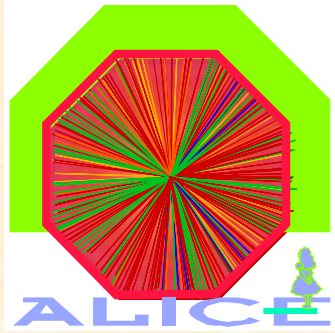
US EMCaL (under discussion)



Pb-Scintillator EMCal

$\Delta\eta \times \Delta\phi = 1.4 \times 120°$

ALICE Collaboration

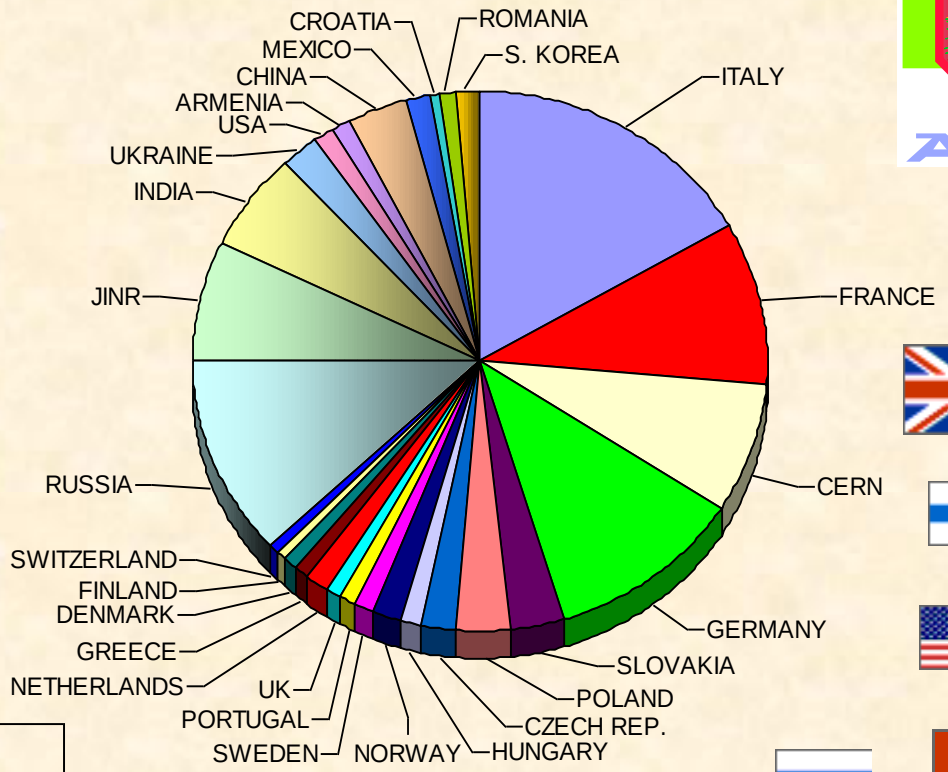


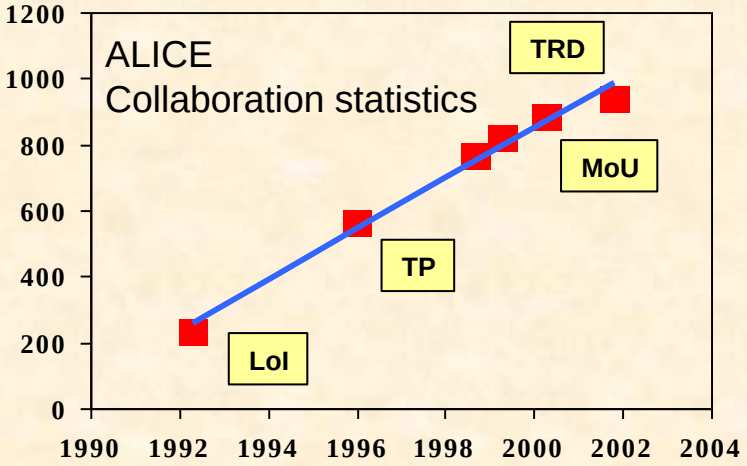
~ 1000 Members

(63% from CERN MS)

~30 Countries

~80 Institutes

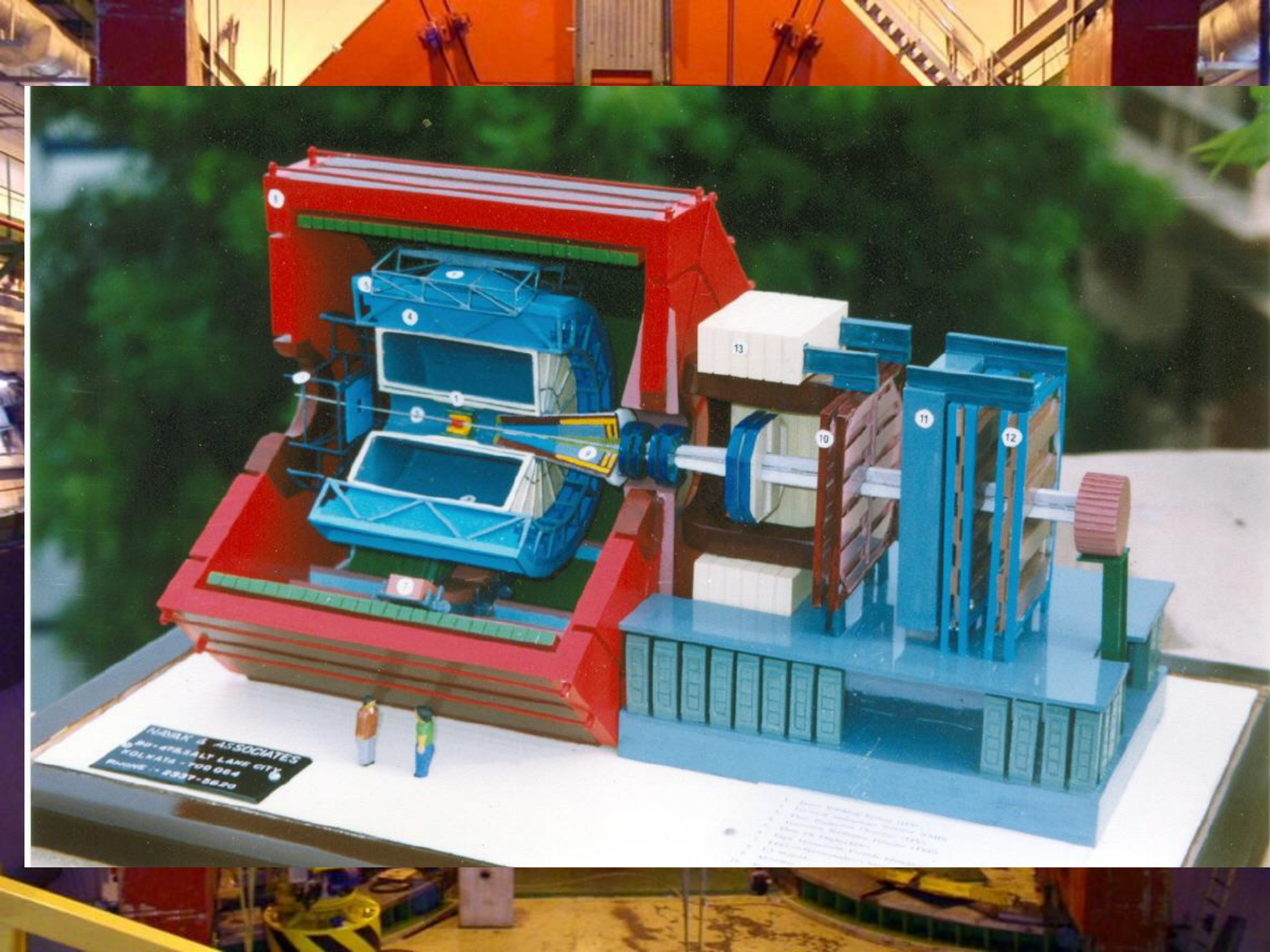




Very large International Collaborations… ALICE today

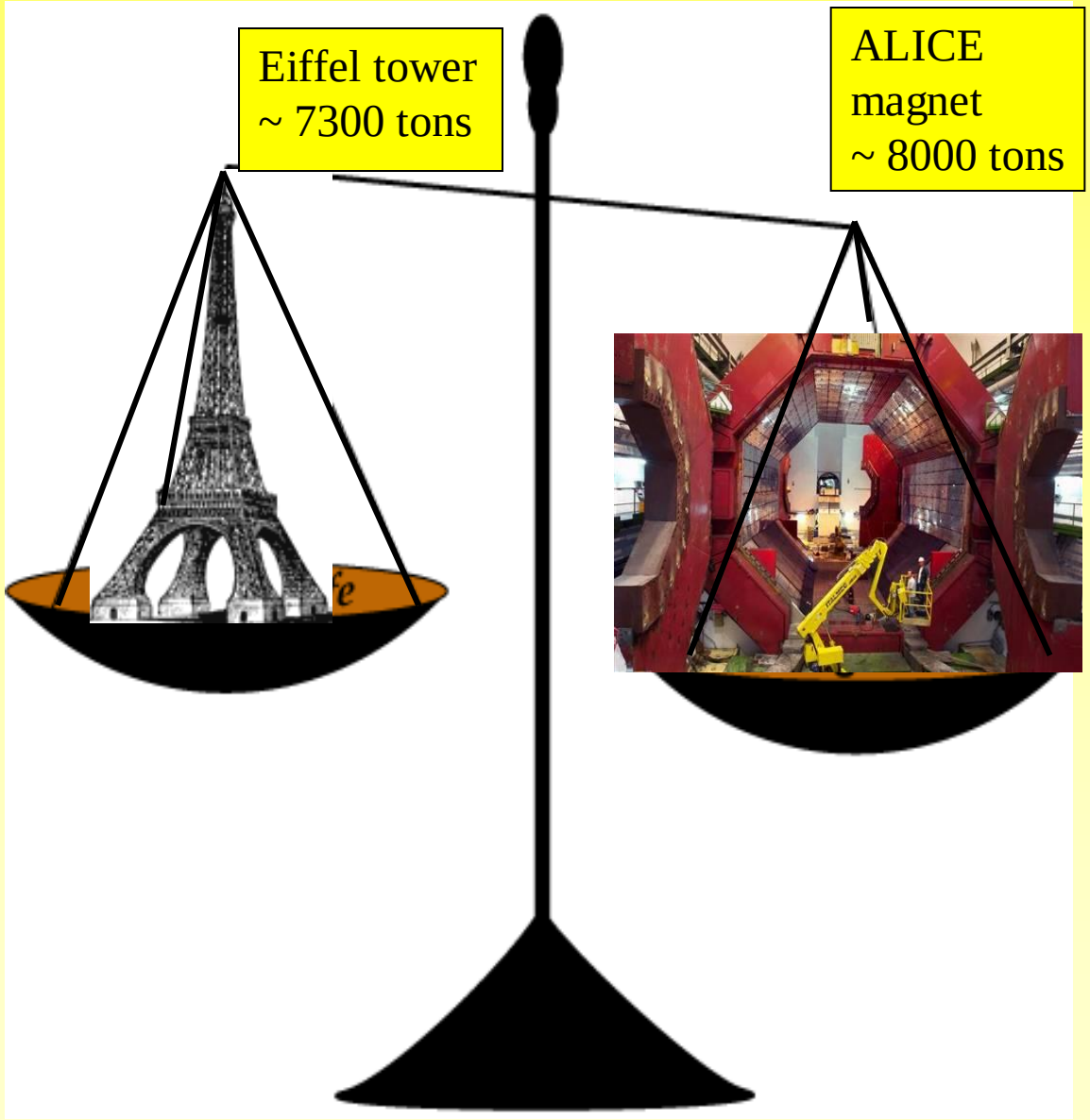
- 1300 scientists, 138 institutions in 36 countries…

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

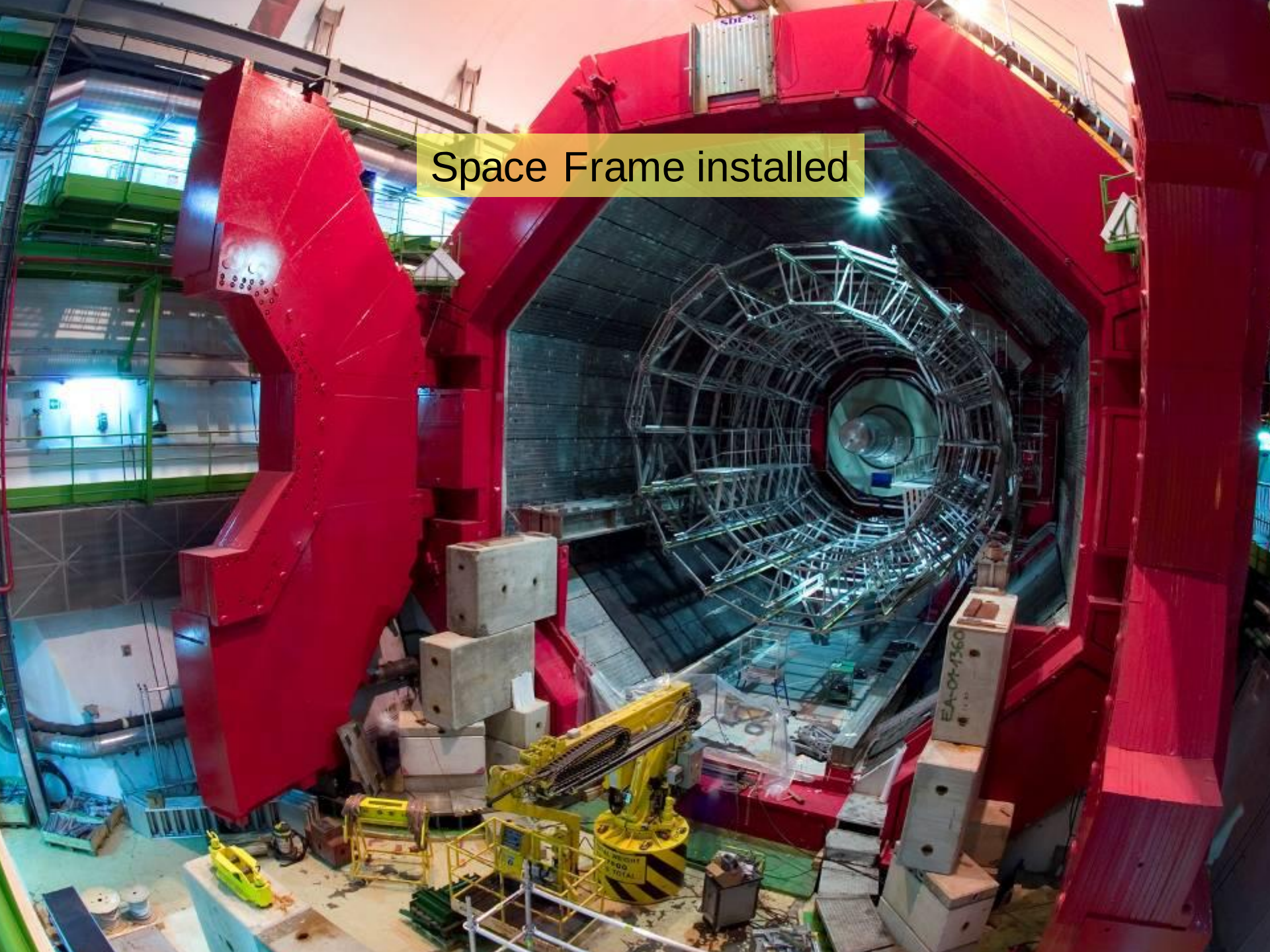

13
10
11
12

Nuclear Physics has changed…

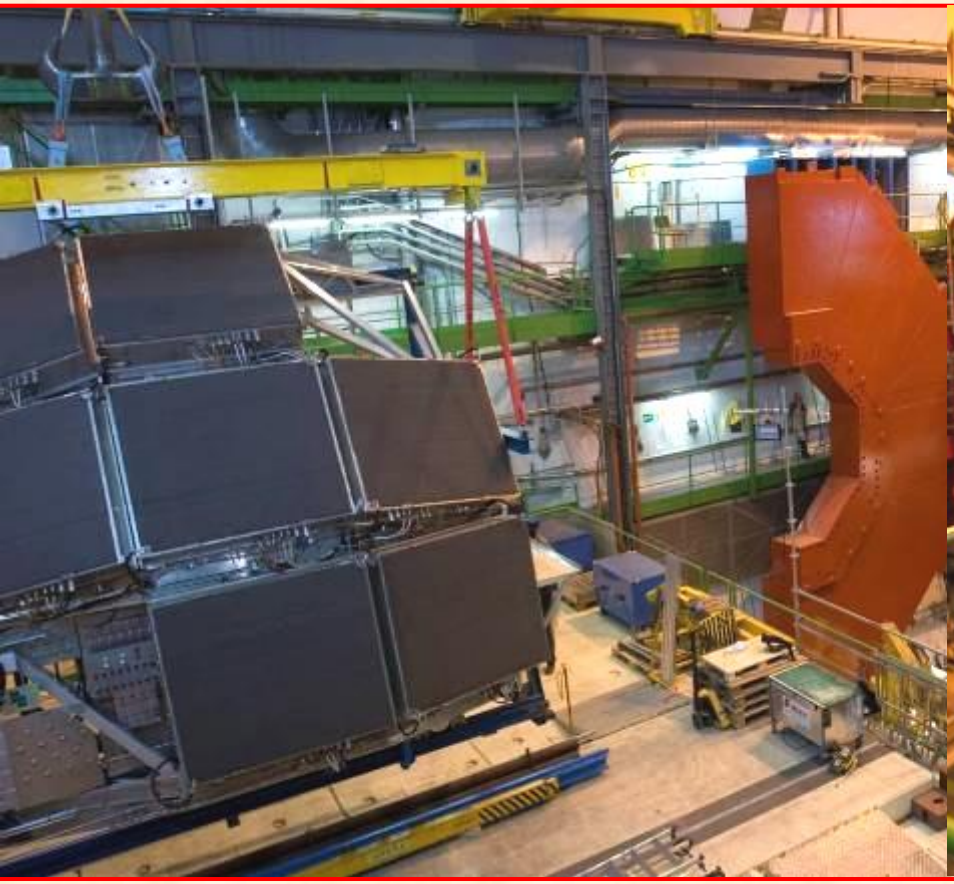
- Nuclear Physics experiments are nowdays world-wide high-tech projects of extreme complexity, which develop over decades!
- Experimental approaches common with HEP



Space frame


Space Frame installed

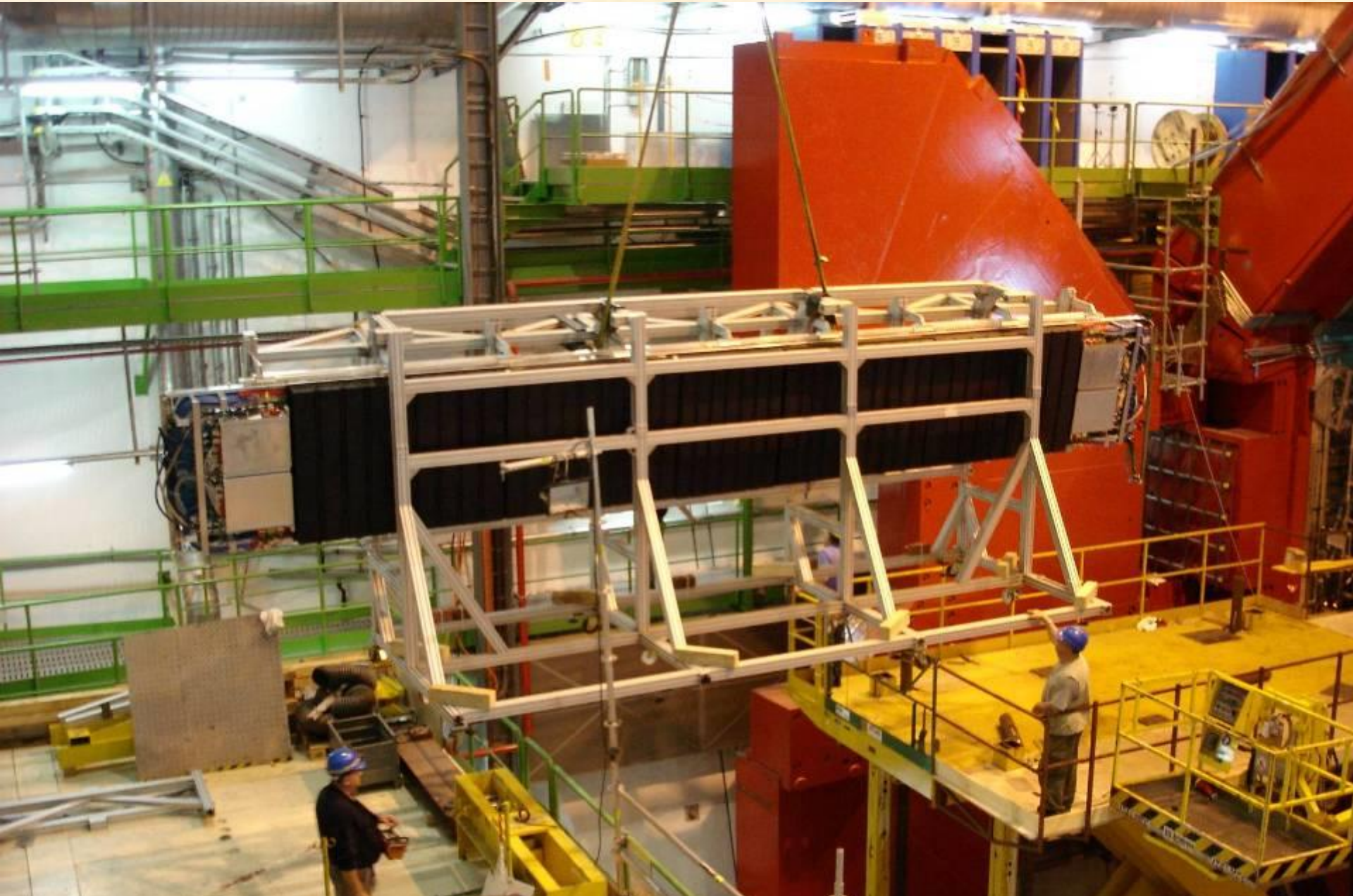
HMPID Installation

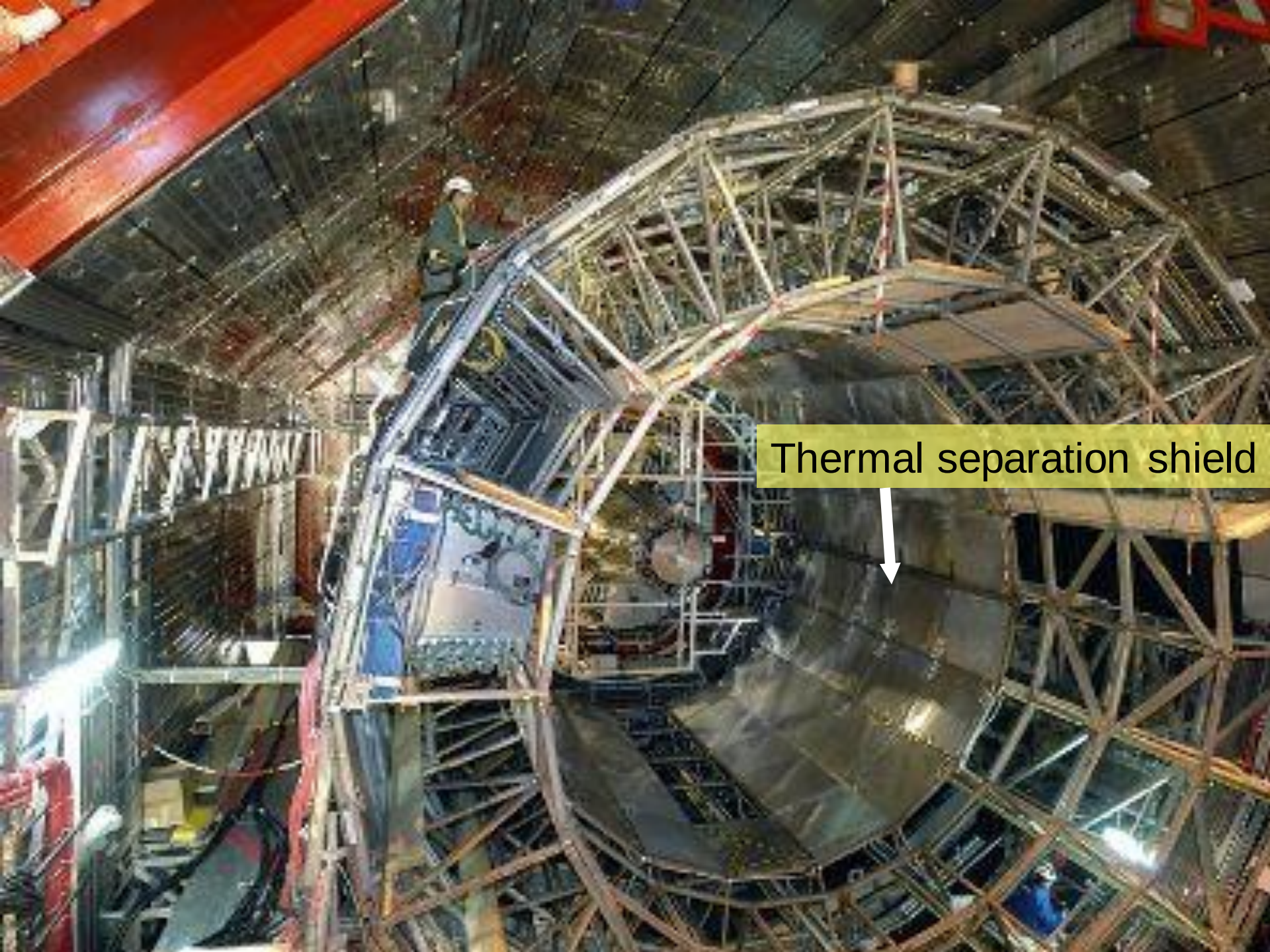


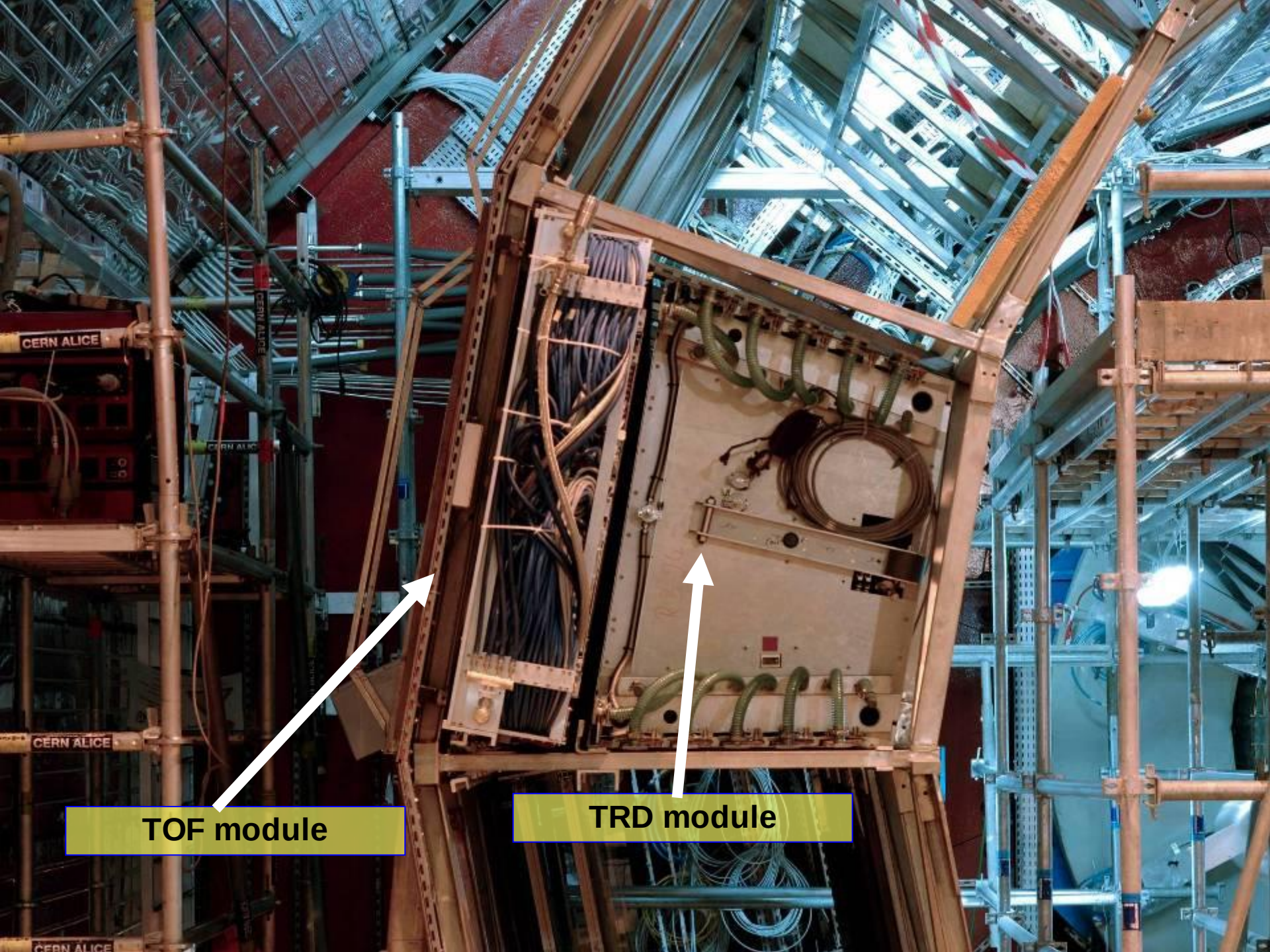
Yellow installation platform

Installation of the TRD detector

Installation of the TOF detector



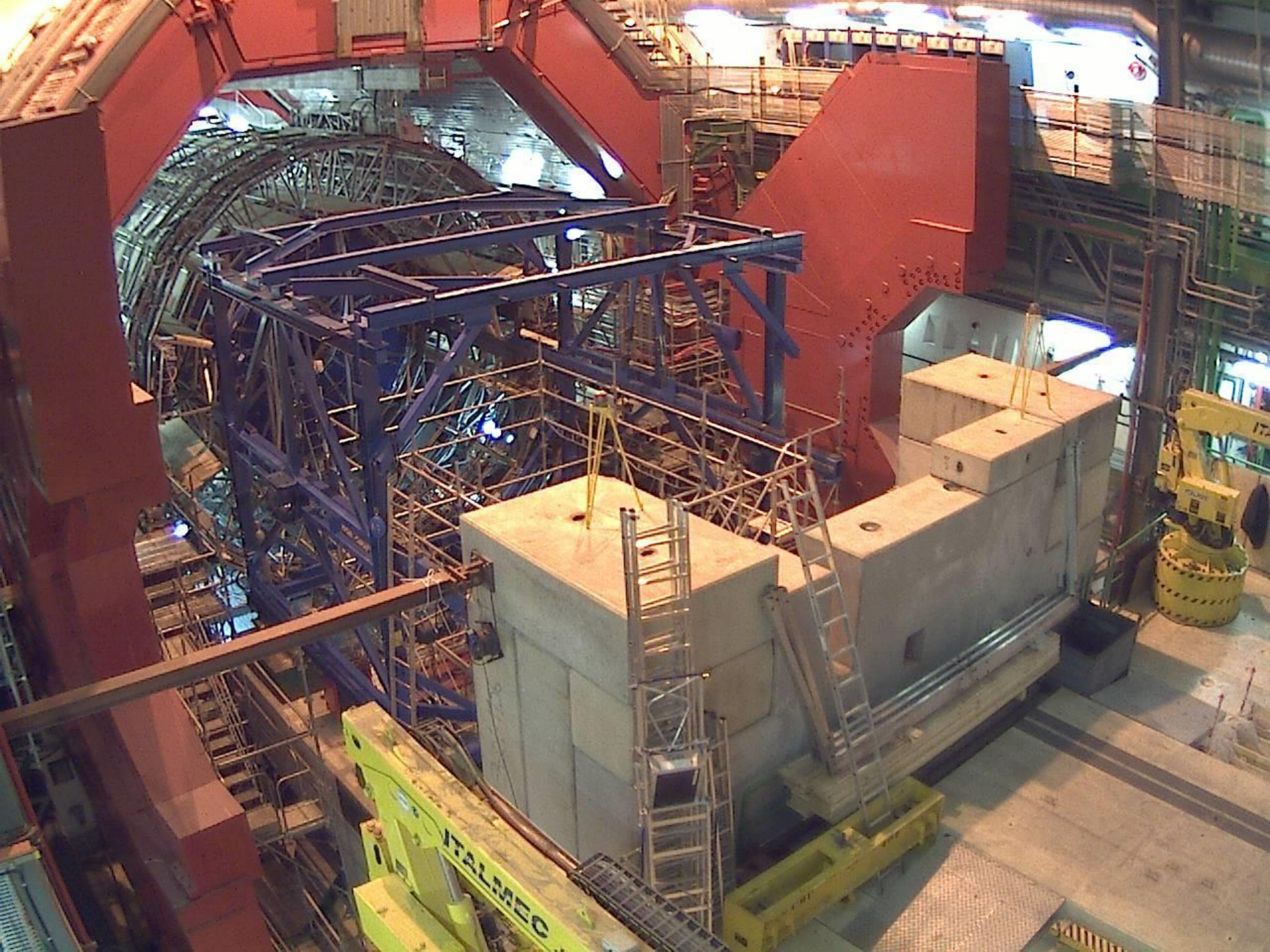

Thermal separation shield

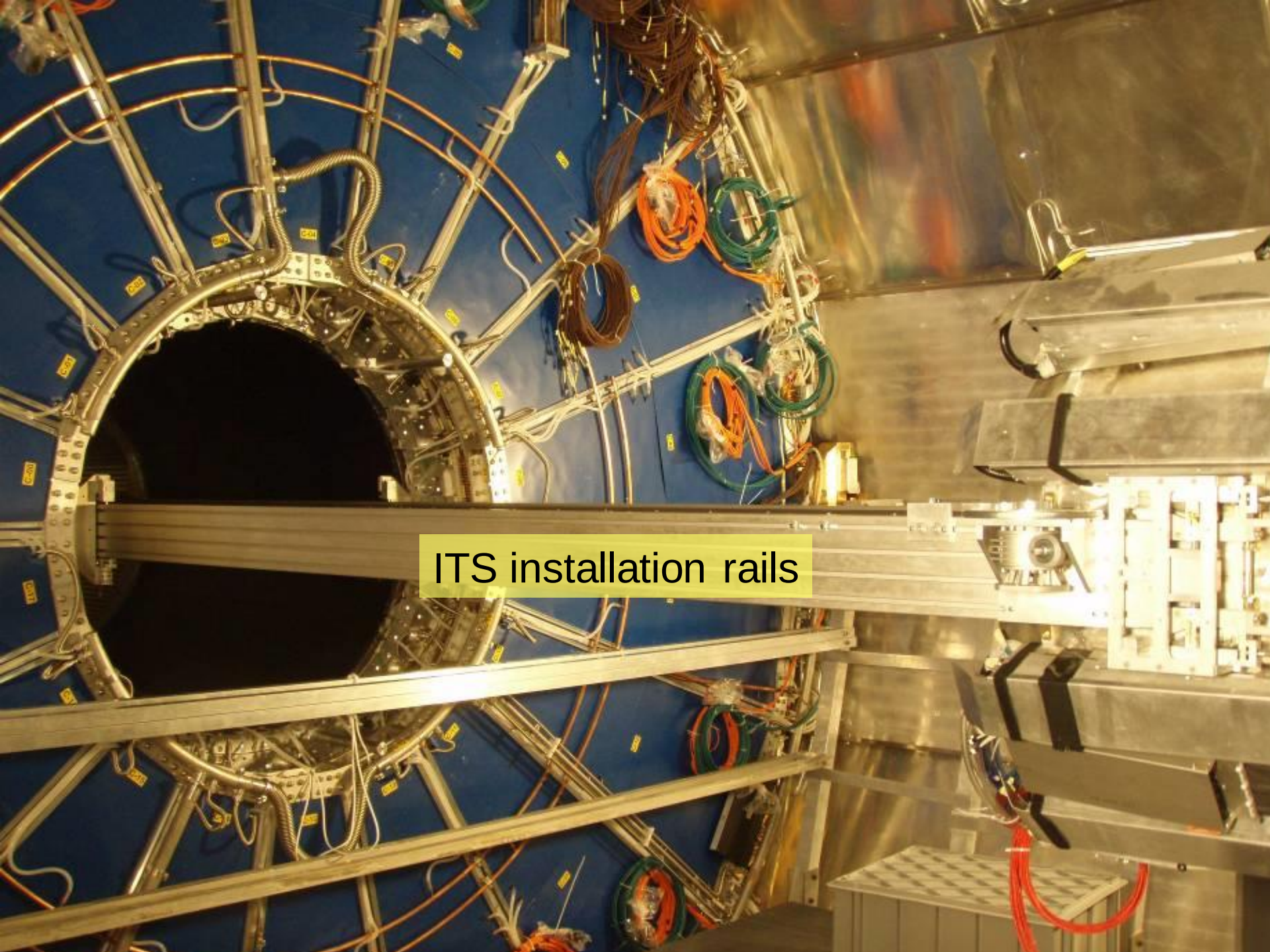

TOF module
TRD module

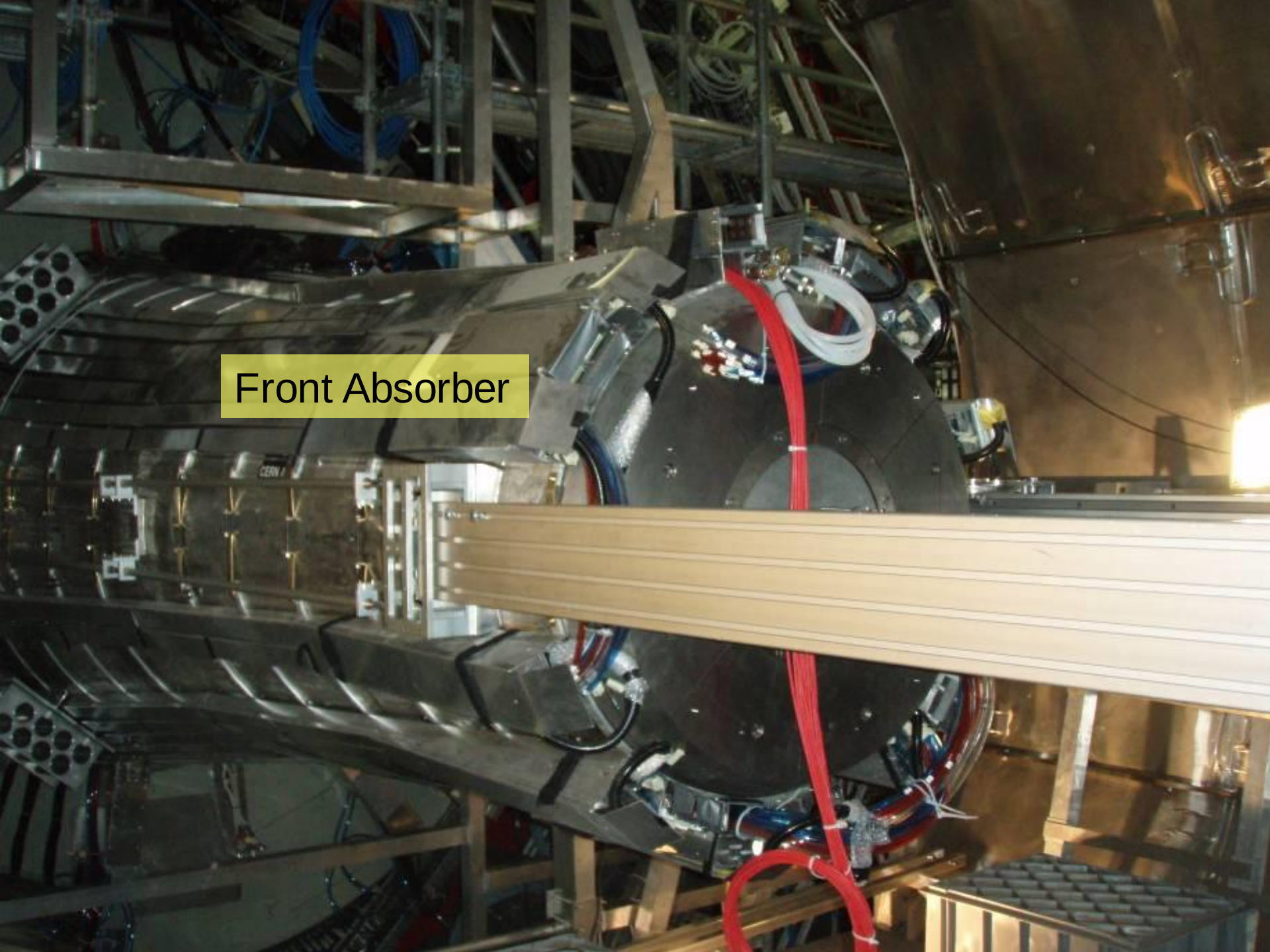
TPC

TPC Installation (January 2007)

TPC LOWERING

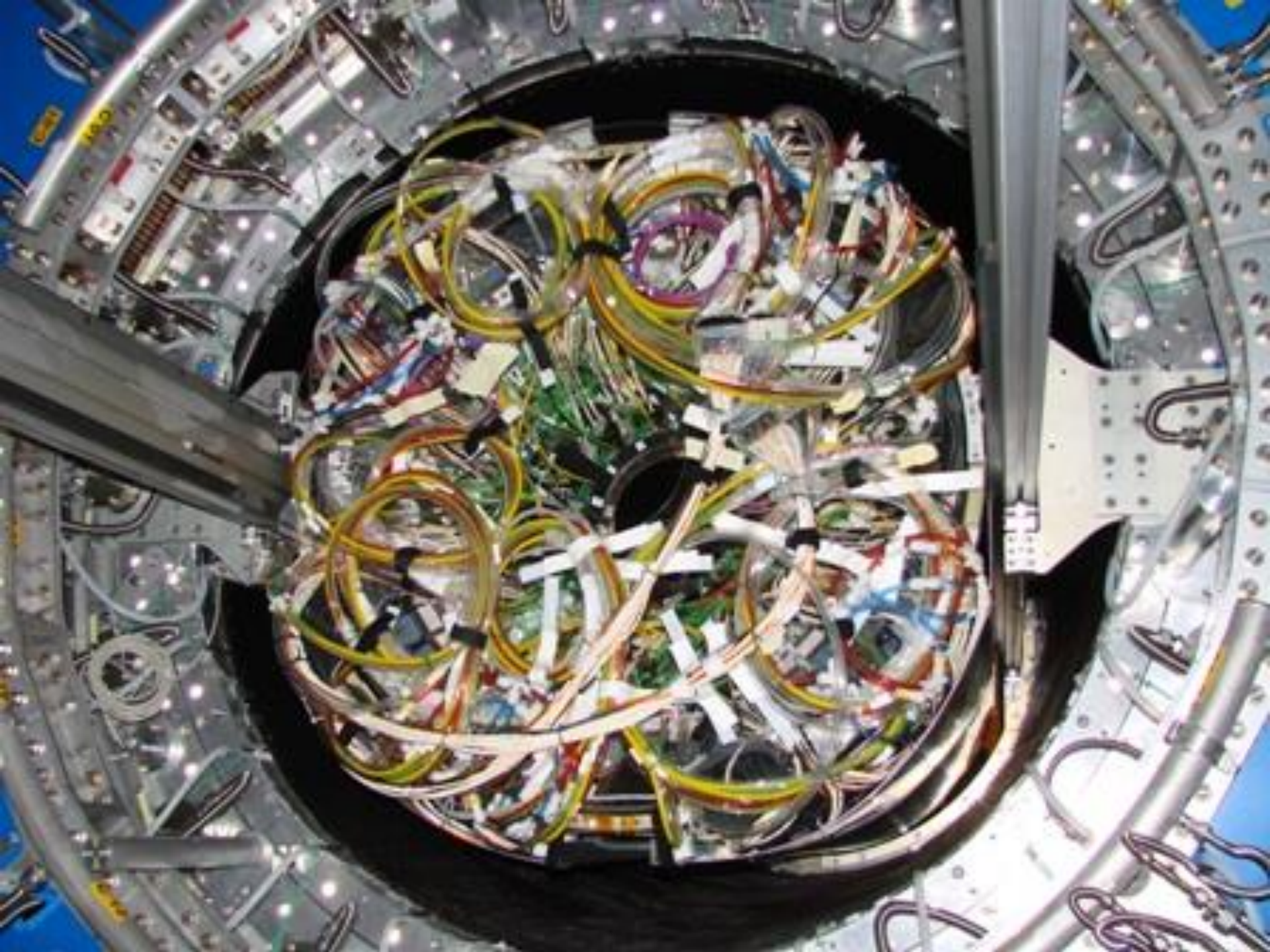

ITALMEC


ITS installation rails

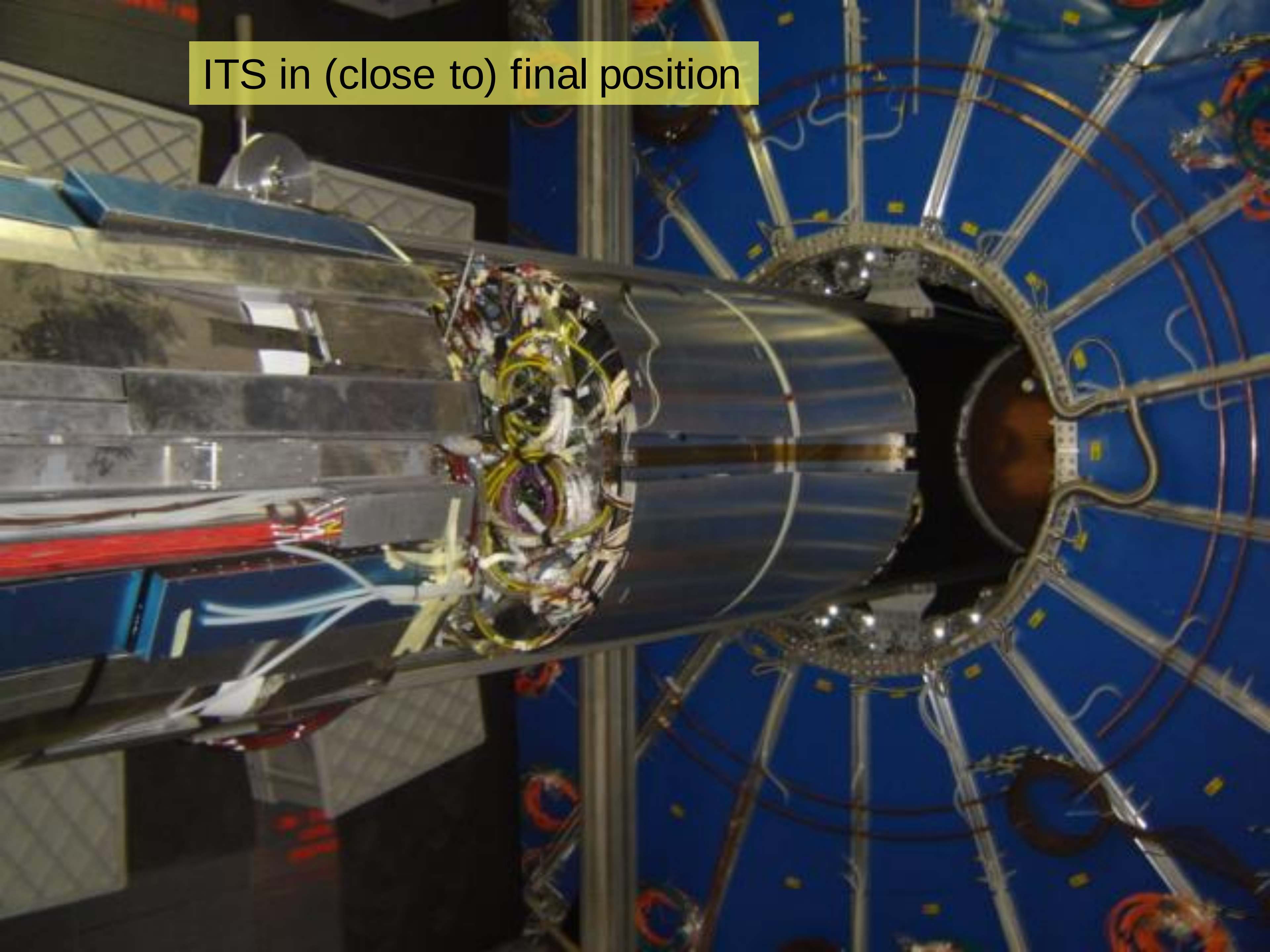

Front Absorber

Installing ITS SSD + SDD

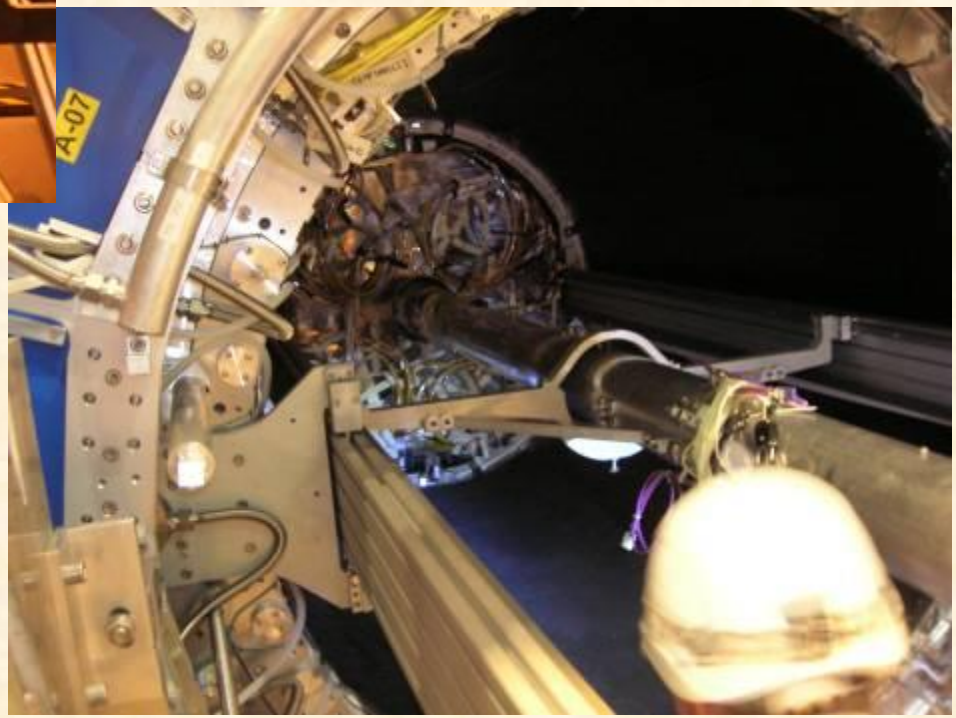
Transport through the TPC



ITS in (close to) final position



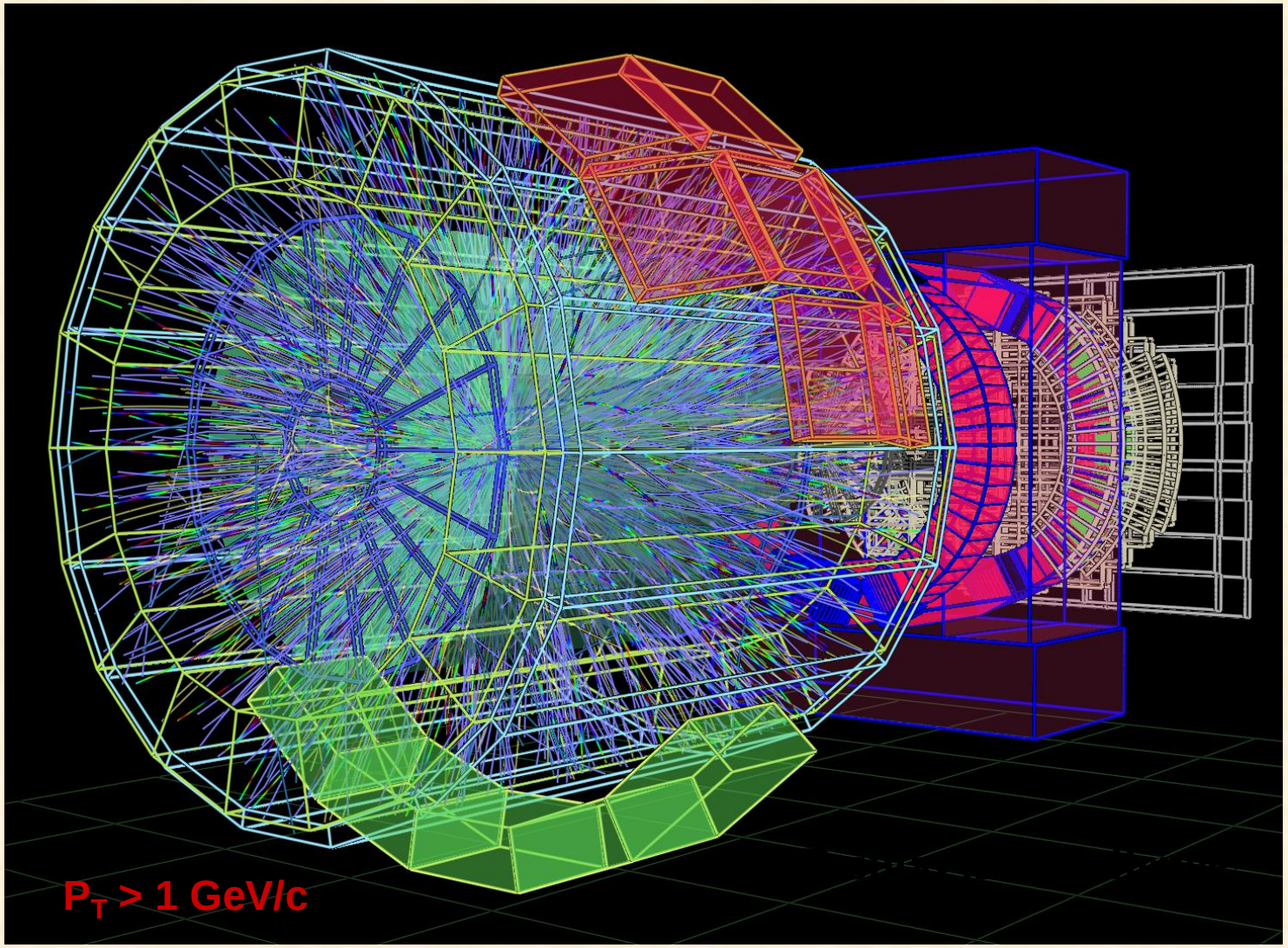
Beampipe Installation and Bakeout

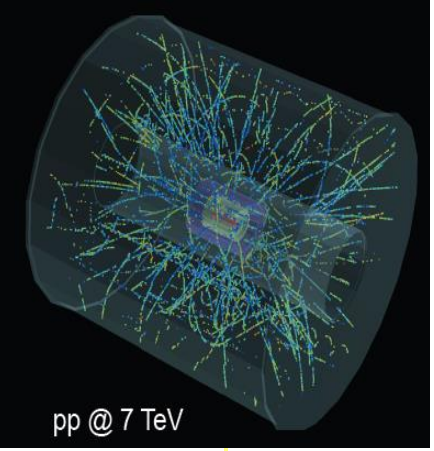


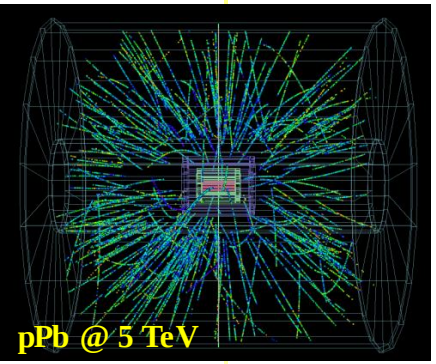
16.3. 2007

Lead-lead collisions with ALICE

- To see something just look at p_T > 1 GeV/c !

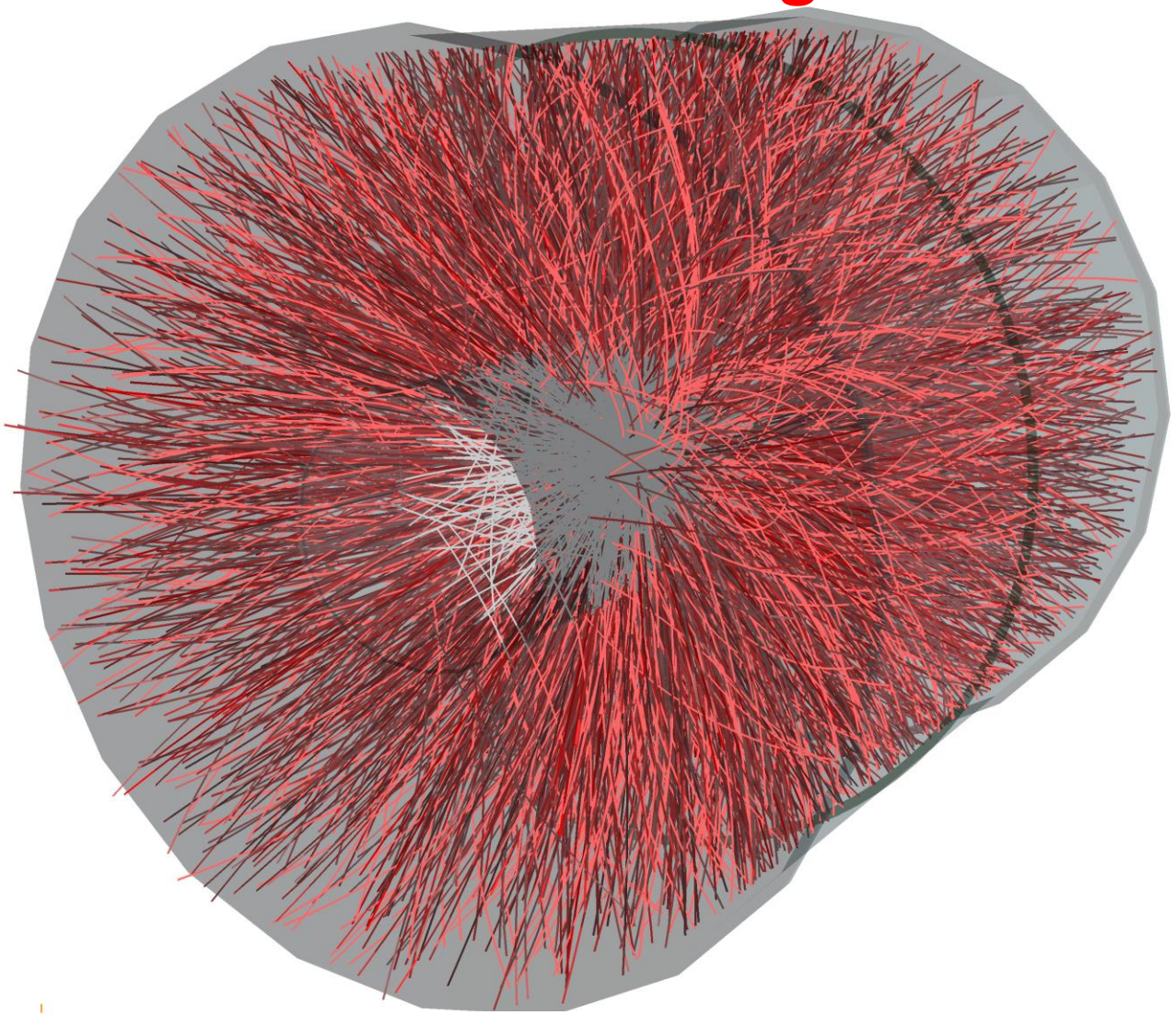






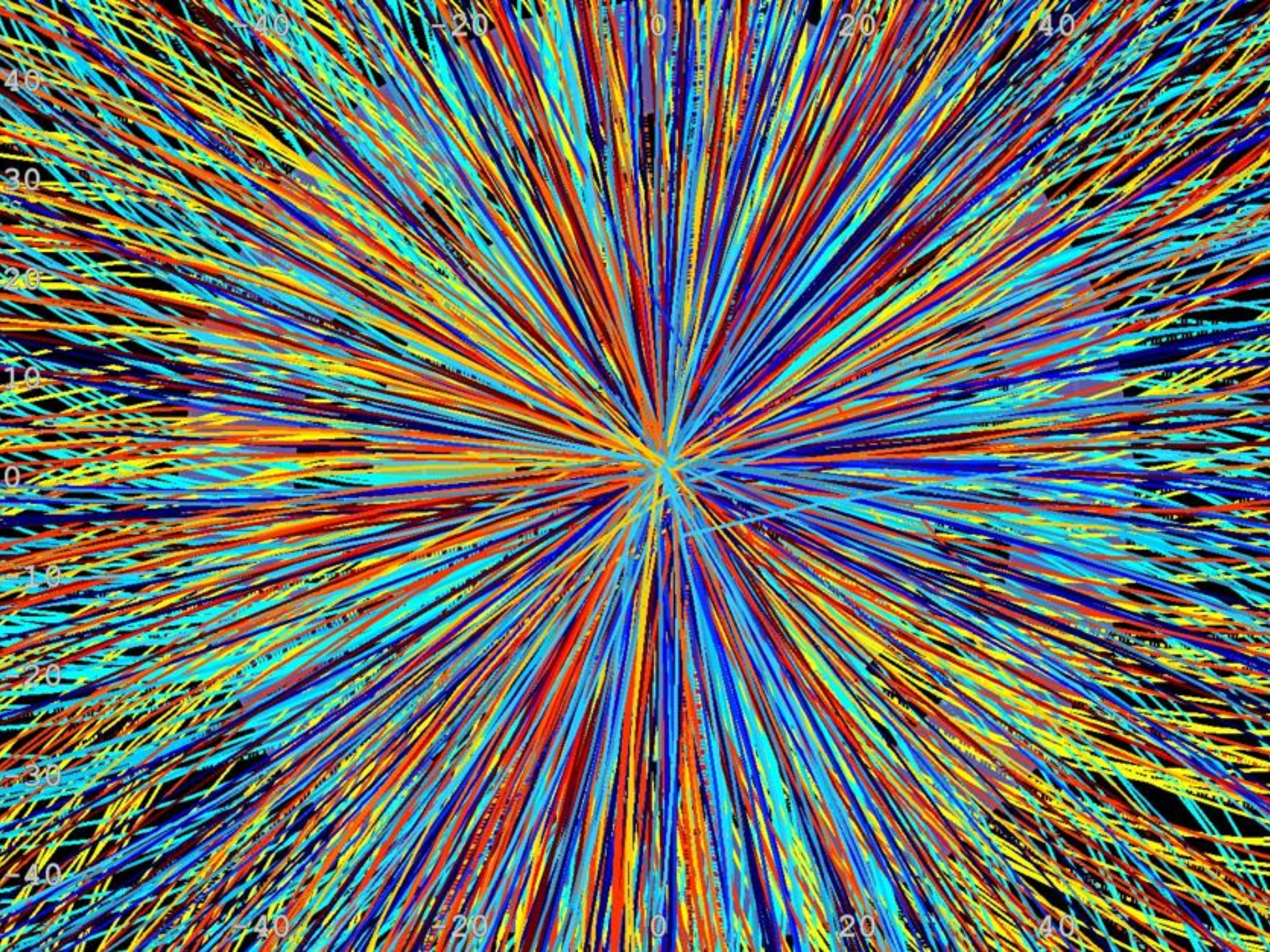
Collisions of Nuclei in the LHC:

The world's most energetic collisions



ALICE

Very Complicated!


−40
−20
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40
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−10
−20
−30
−40
−40
−20
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20
40

ALICE is open for new ideas