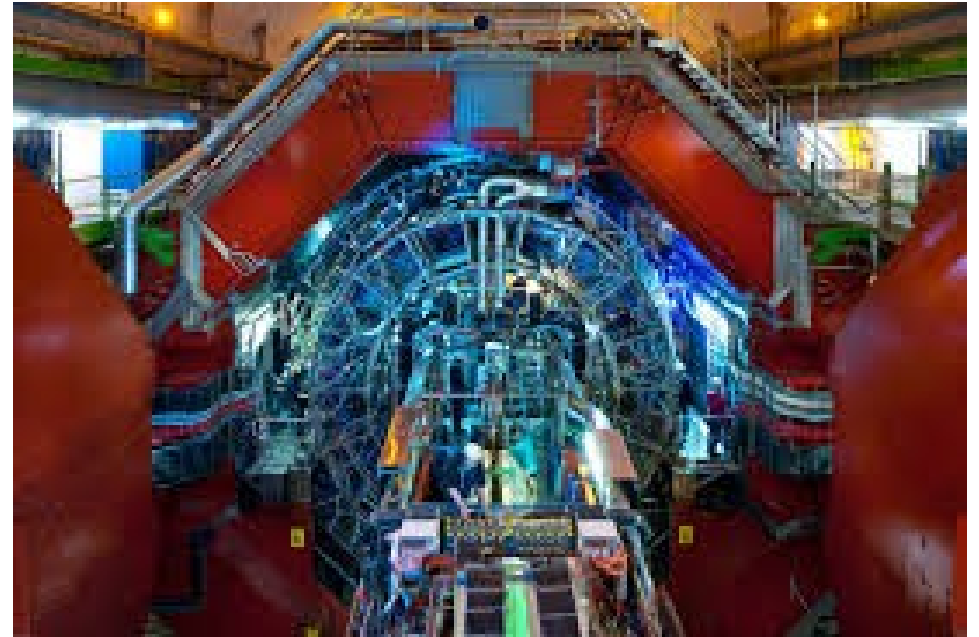
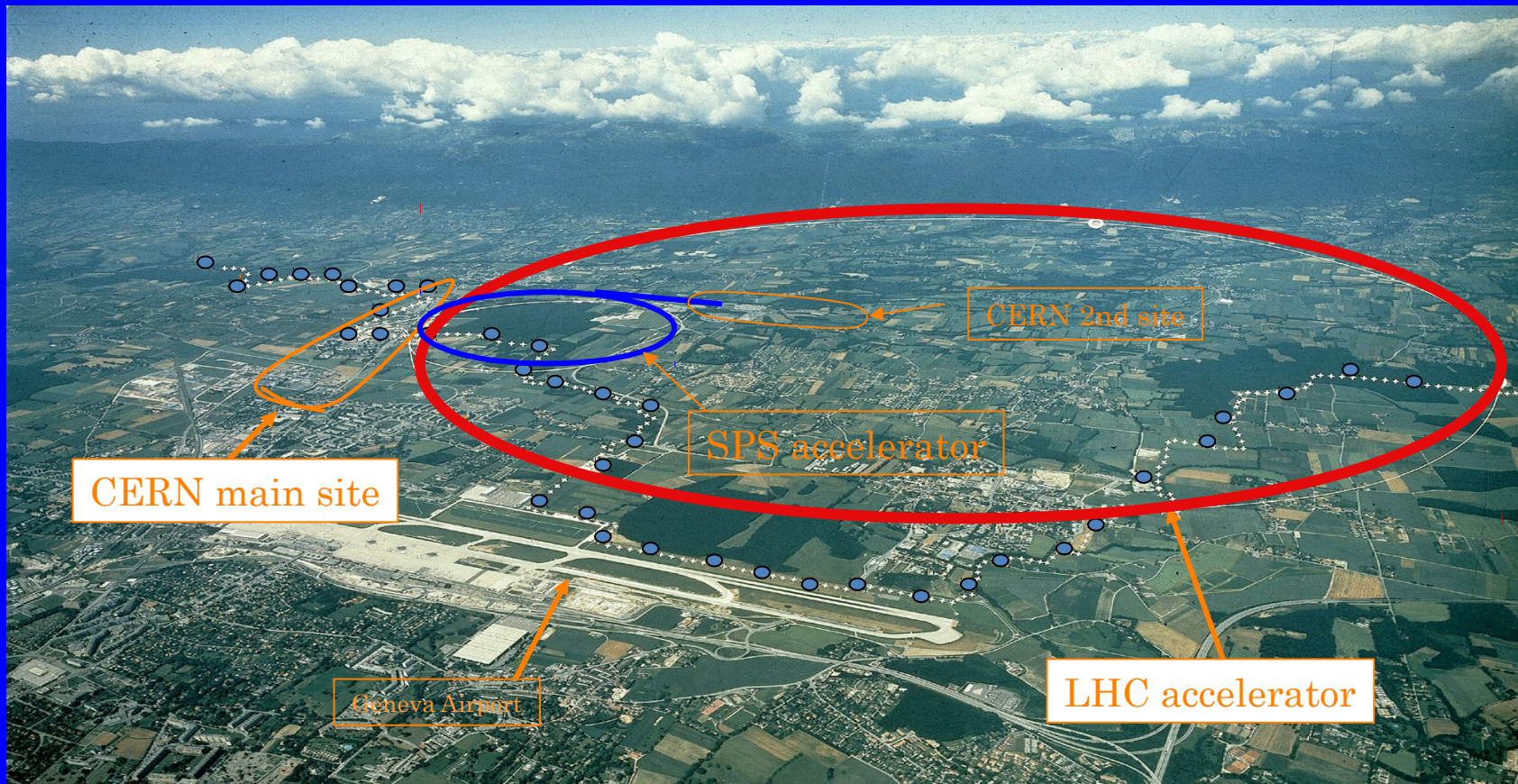




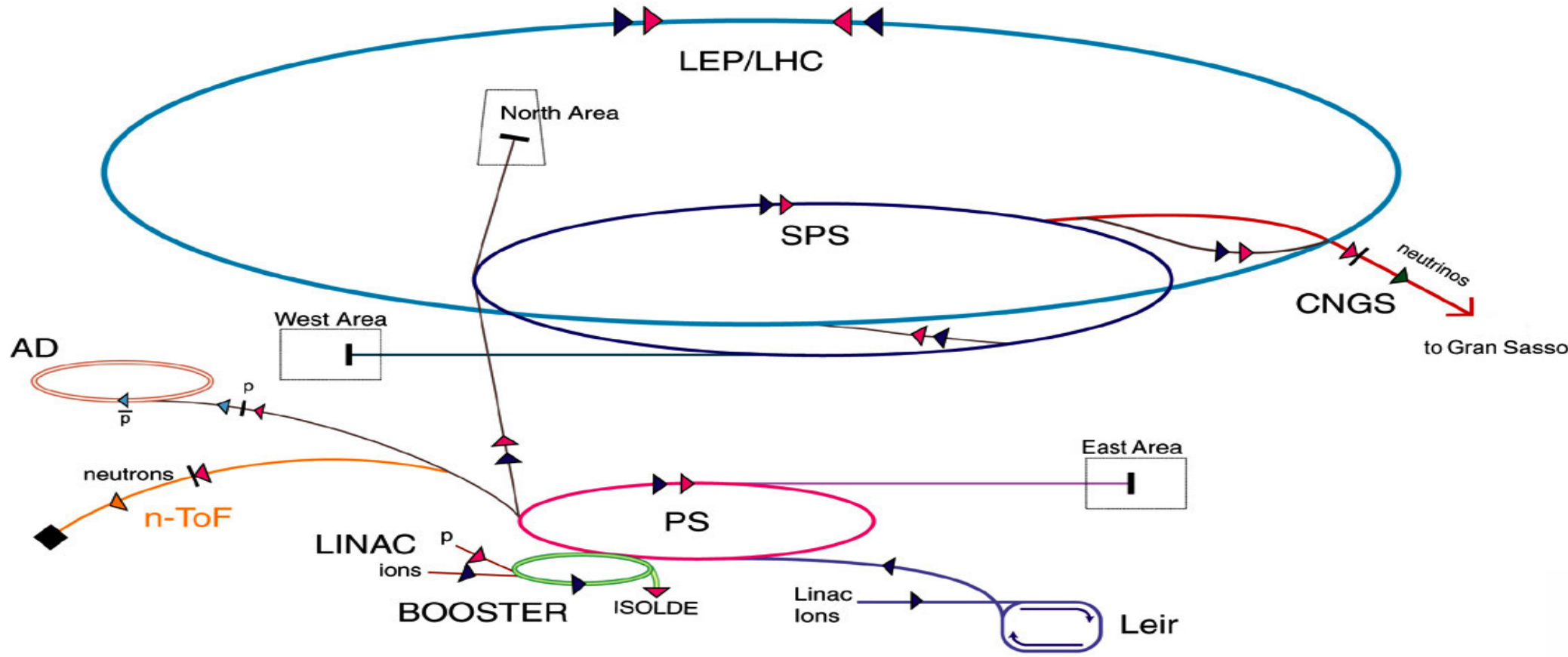
ALICE



Yannis Georis



CERN's mission : to provide accelerators for High Energy Physics (Particle Physics) experiments

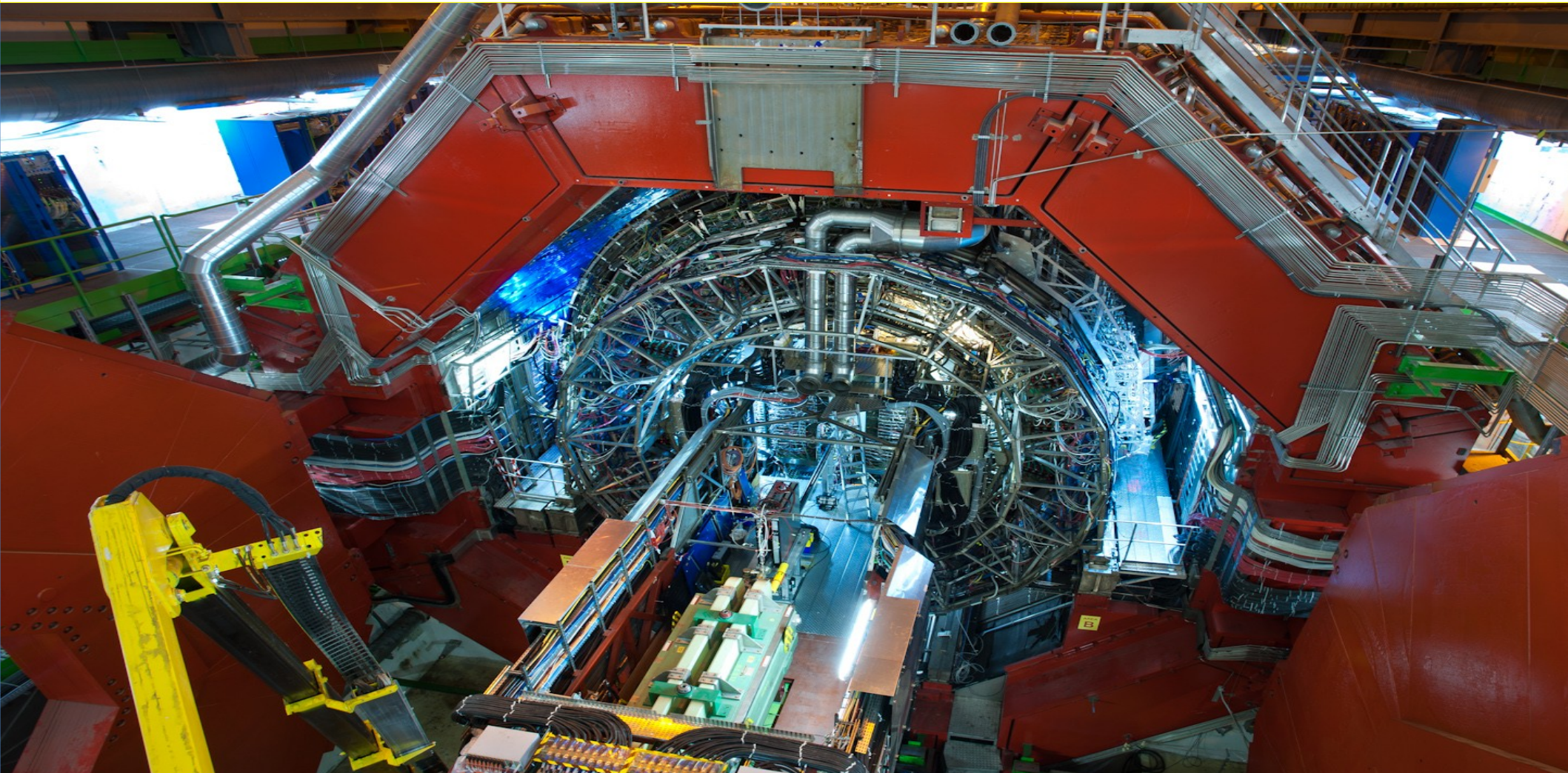


- ▶ p (proton)
- ▶ ion
- ▶ neutron
- ◀ \bar{p} (antiproton)
- ▶ ◀ proton/antiproton conversion
- ▶ neutrino

- AD Antiproton Decelerator
- PS Proton Synchrotron
- SPS Super Proton Synchrotron

- LHC Large Hadron Collider
- n-ToF Neutron Time of Flight
- CNGS CERN Neutrinos Gran Sasso³

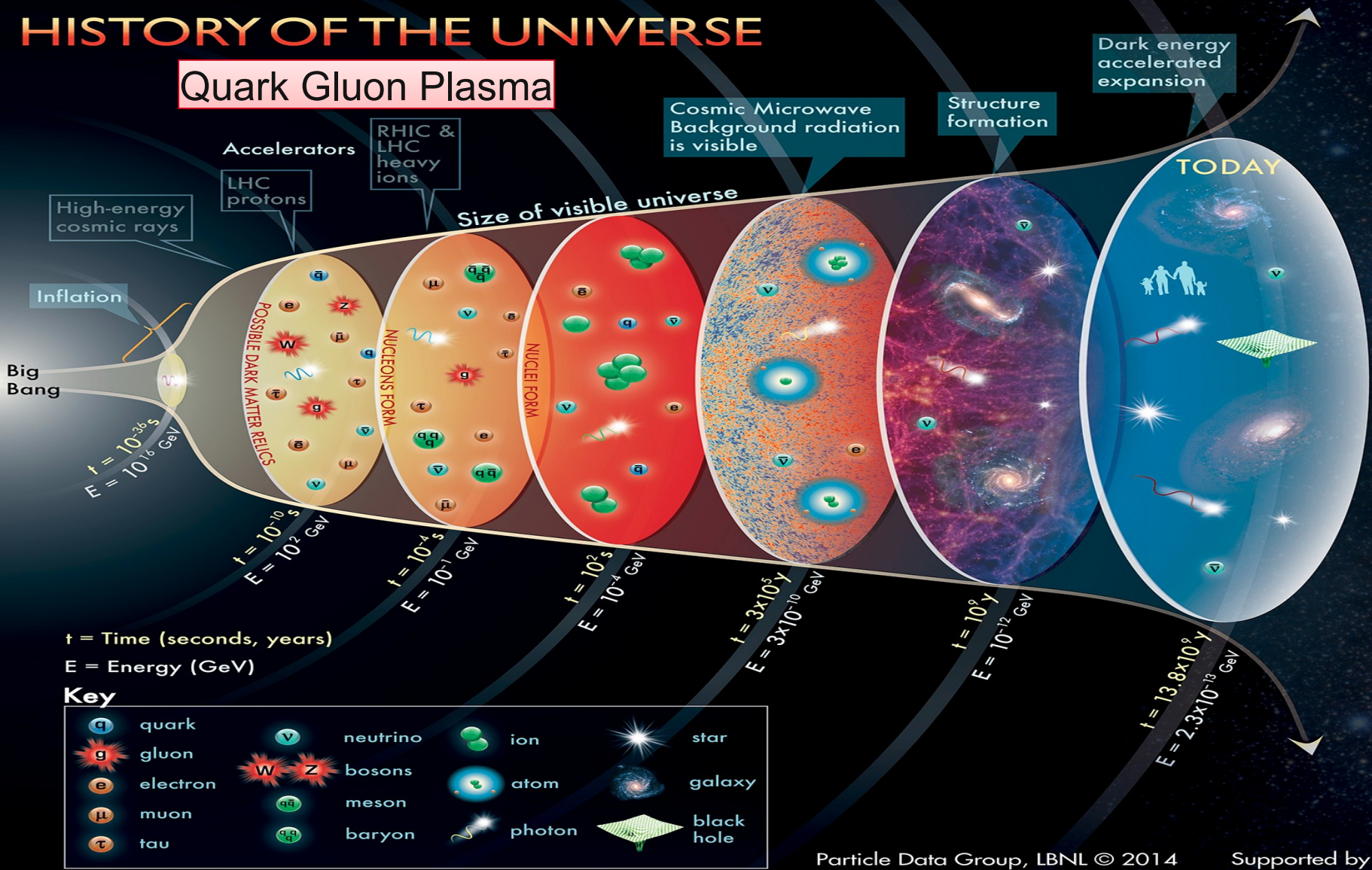
ALICE : A Large Ion Collider Experiment



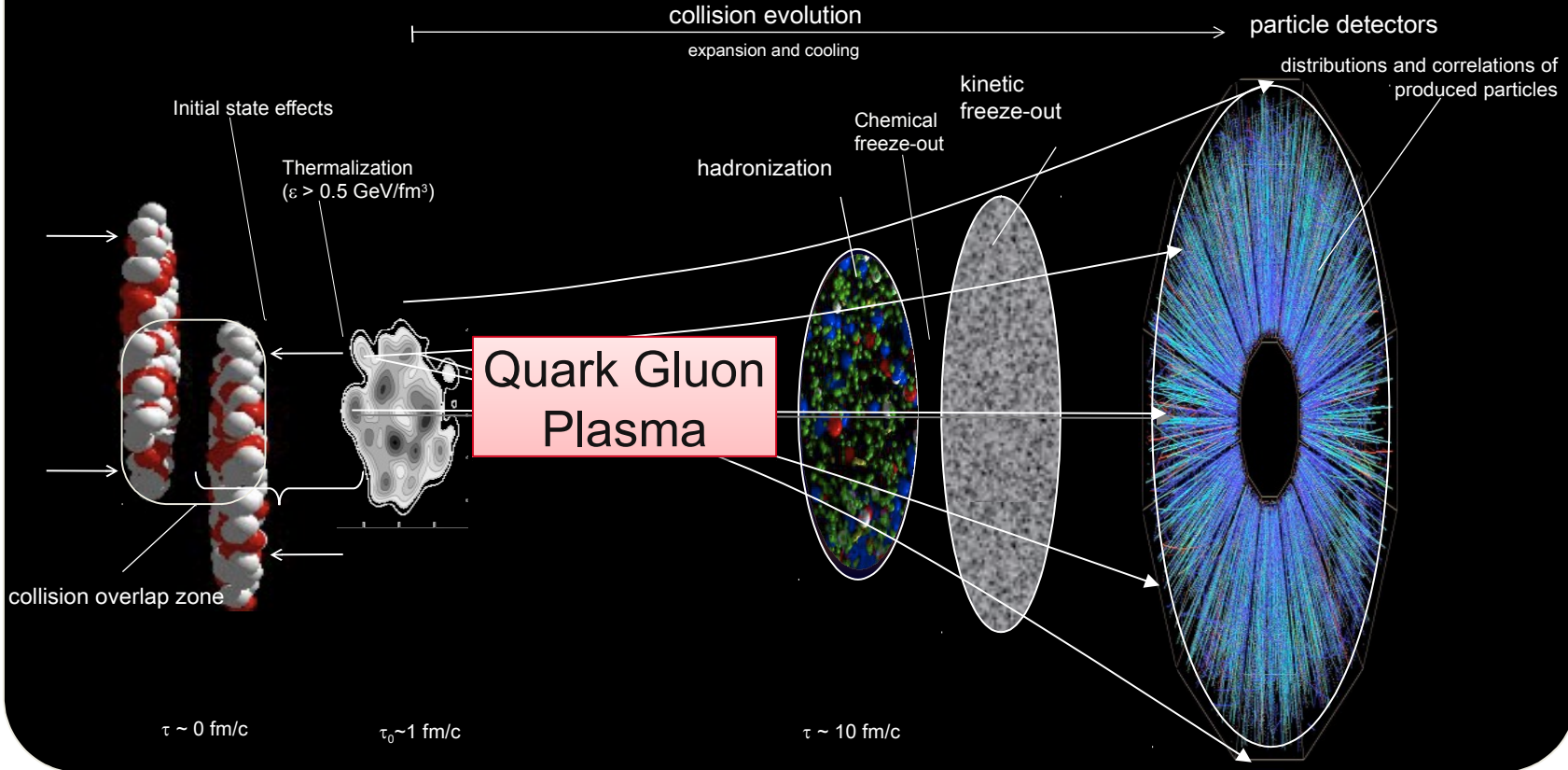
16 m x 16 m x 26 m 10 000 tons installed 56 m underground (@ point 2 of LHC)

HISTORY OF THE UNIVERSE

Quark Gluon Plasma

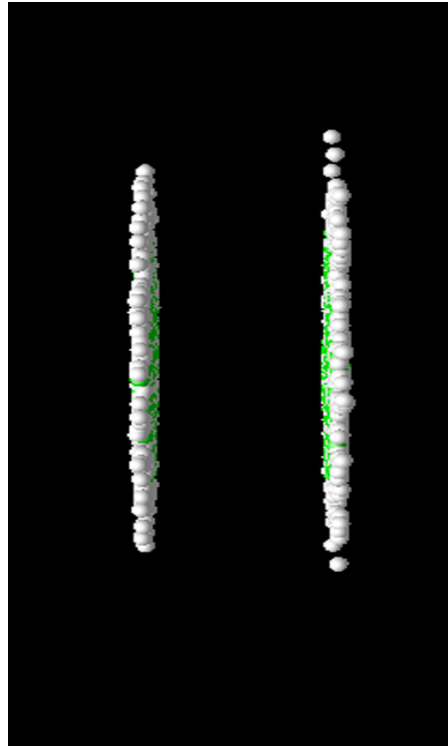


HEAVY ION COLLISIONS

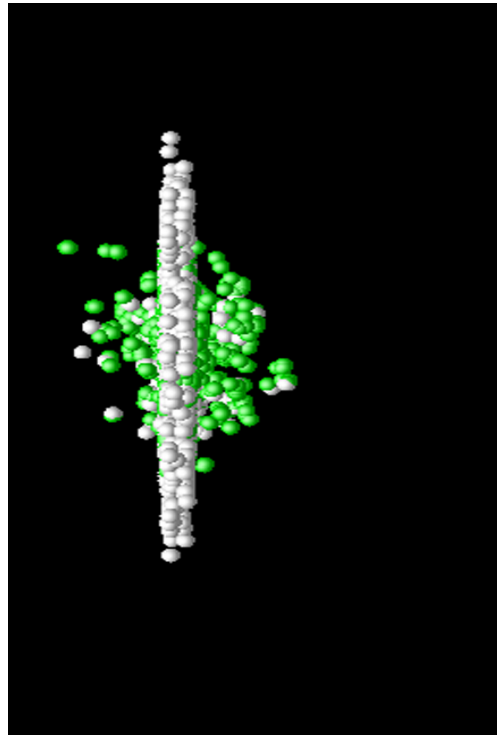


Le mini Big Bang

1. Les noyaux accélérés vont subir une collision frontale



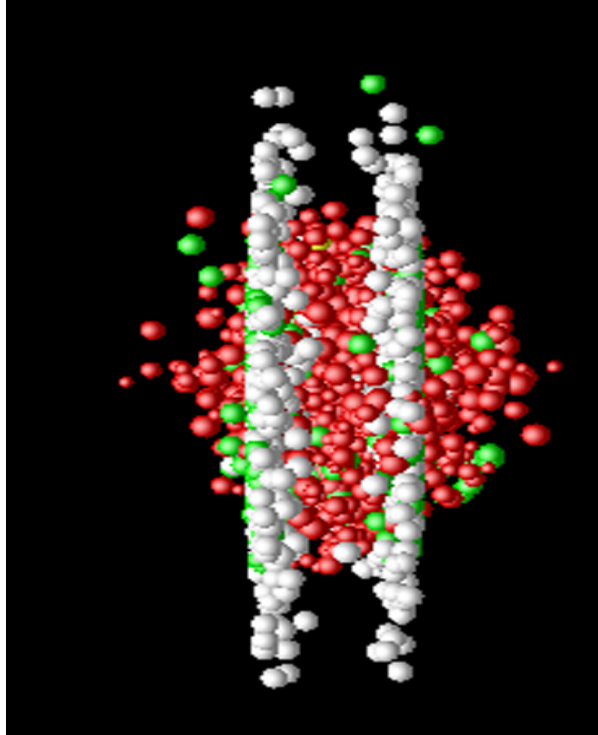
Le mini Big Bang



1. Les noyaux accélérés vont subir une collision frontale

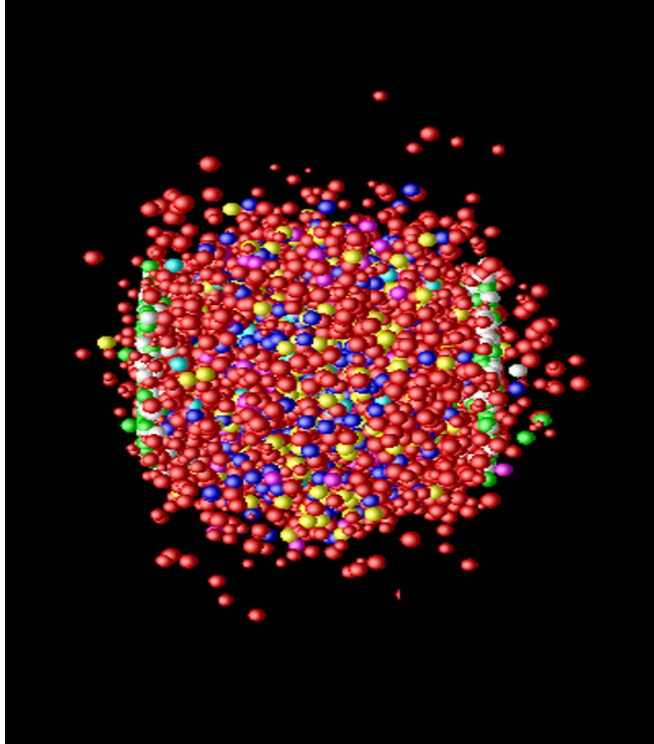
2. L'énergie de la collision se matérialise sous forme de quarks et gluons

Le mini Big Bang



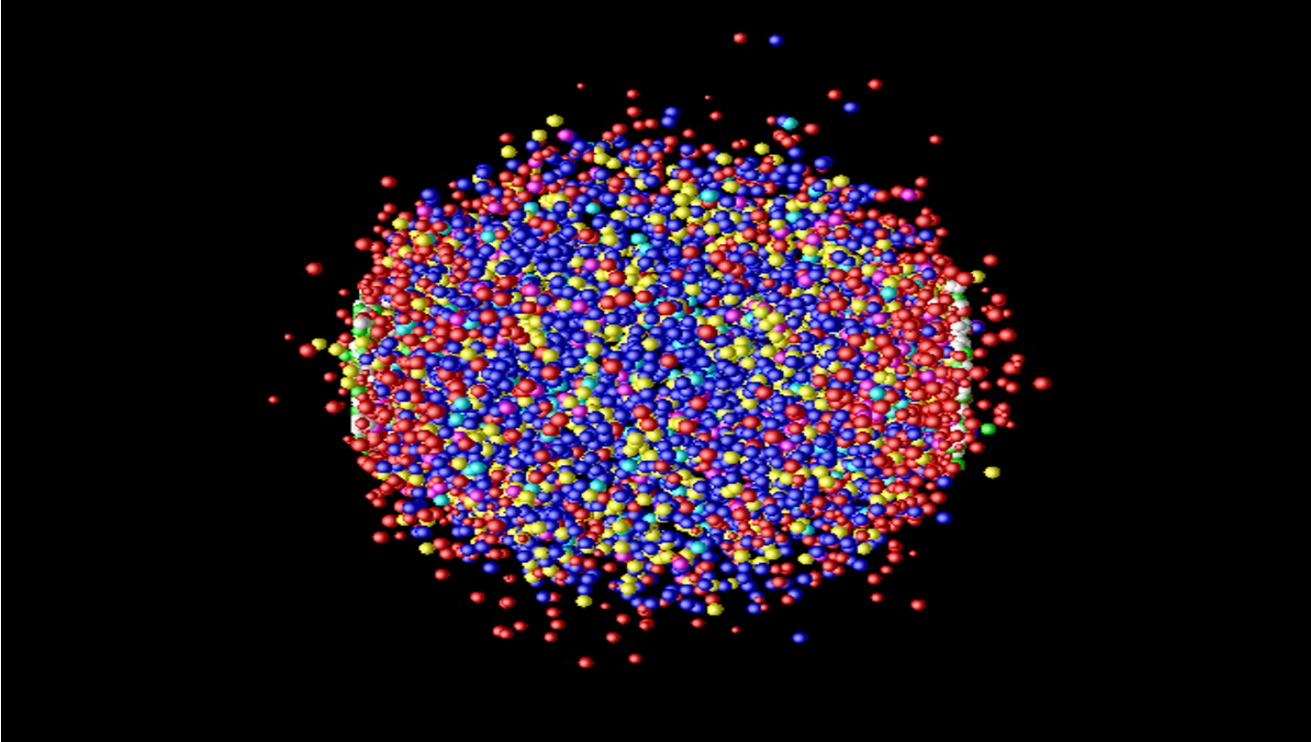
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3. Les quarks et gluons interagissent sous l'effet de l'interaction forte: la matière tend vers l'équilibre

Le mini Big Bang



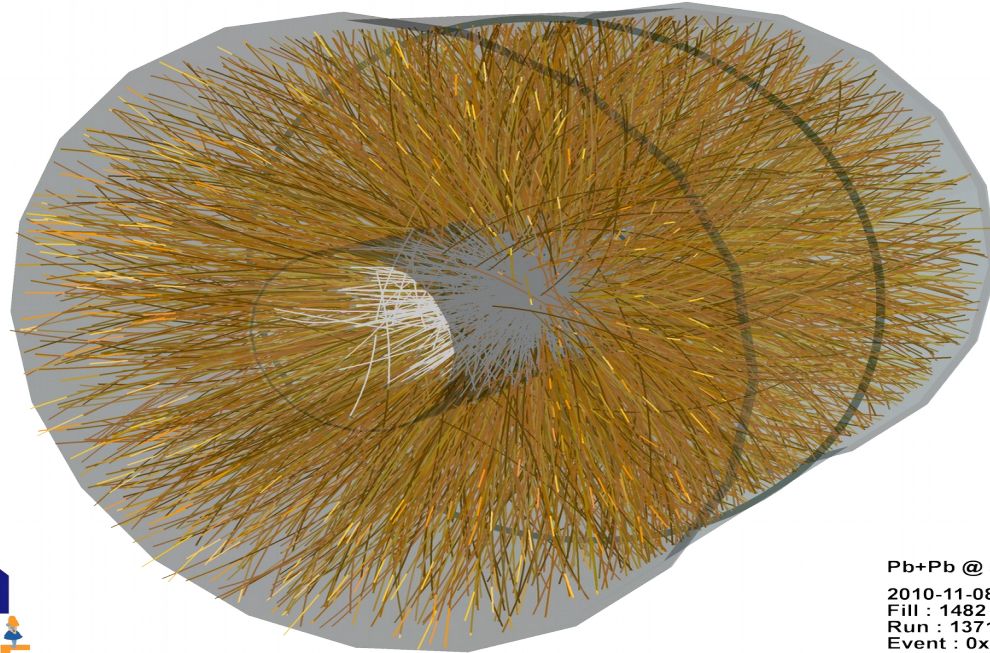
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4. Le système se dilue et se refroidit

Le mini Big Bang



1. Les noyaux accélérés vont subir une collision frontale
2. L'énergie de la collision se matérialise sous forme de quarks et gluons
3. Les quarks et gluons interagissent sous l'effet de l'interaction forte: la matière tend vers l'équilibre
4. Le système se dilue et se refroidit
5. Quarks et gluons condensent pour former des hadrons

A COLLISION IN ALICE



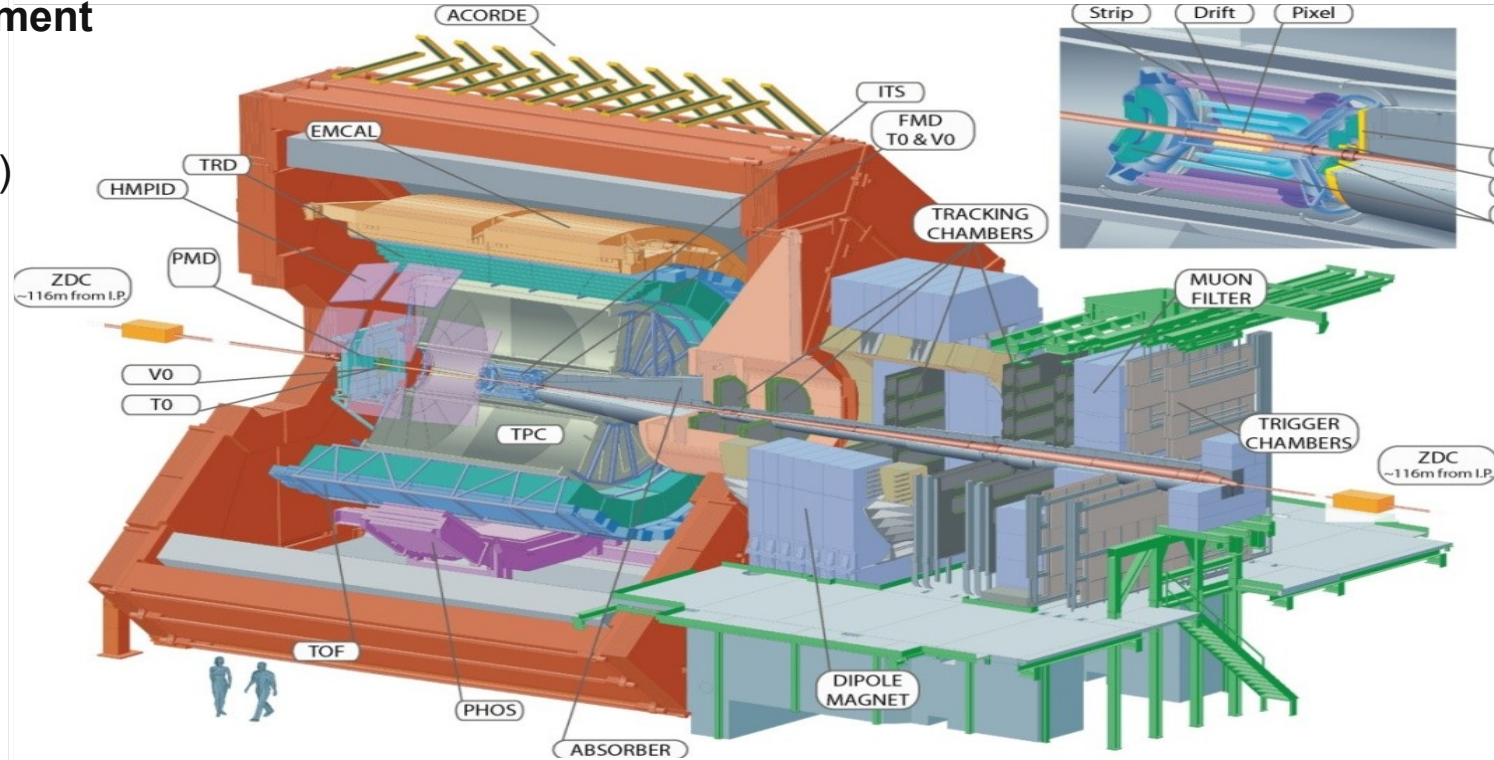
Pb+Pb @ $\sqrt{s} = 2.76$ ATeV
2010-11-08 11:30:46
Fill : 1482
Run : 137124
Event : 0x00000000D3BBE693

~ 1600 charged particles per rapidity unit in central collisions!

ALICE

A Large Ion Collider Experiment

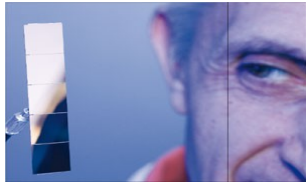
- Particle tracking (low momentum)
- Particle Identification (PID)



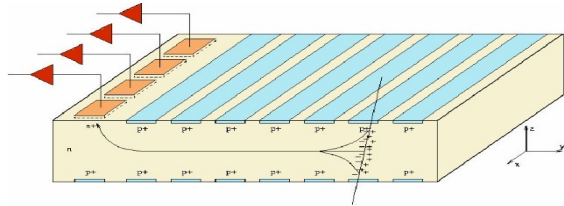
INNER TRACKING SYSTEM

6 layers of silicon detectors for high track and vertex reconstruction with **high spatial resolution**

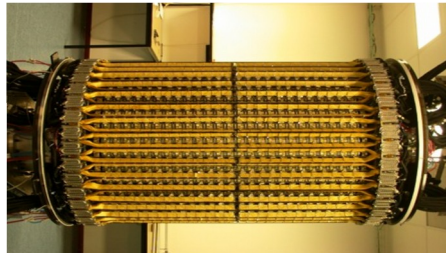
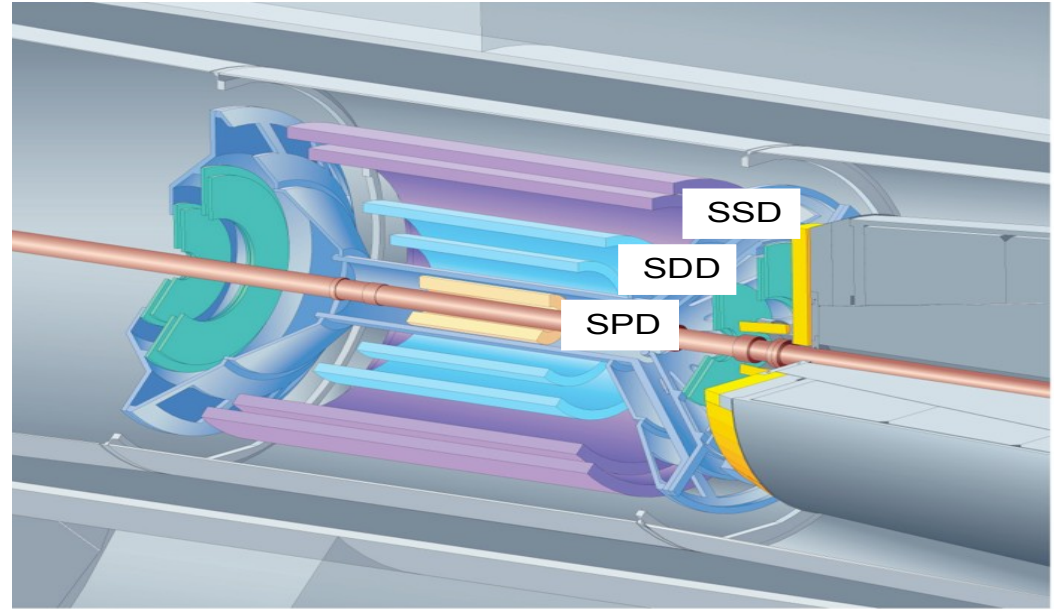
- Silicon Pixel Detector (SPD)



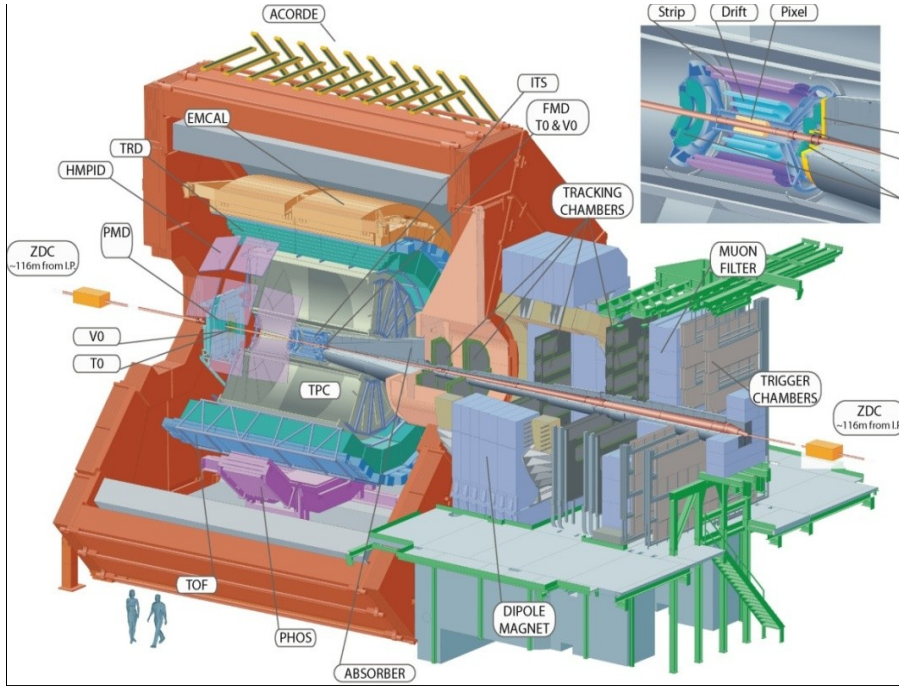
- Silicon Drift Detector (SDD)



- Silicon Strip Detector (SSD)



TIME PROJECTION CHAMBER

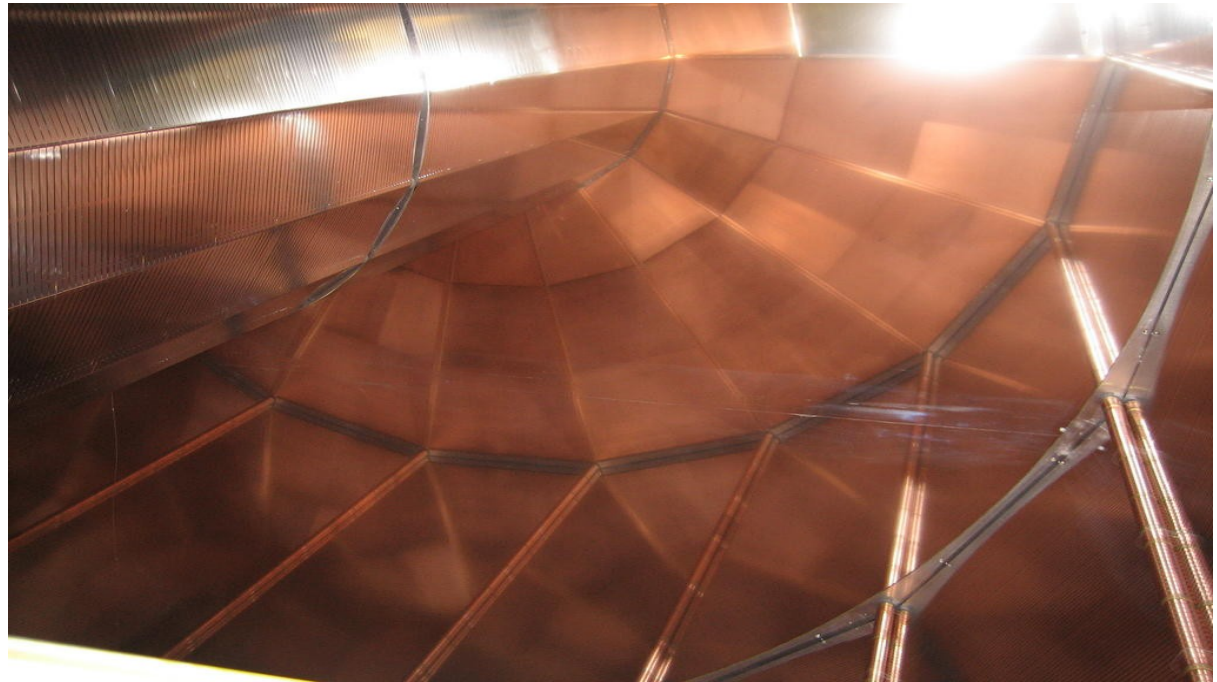


- The “heart” of ALICE
 - Tracking
 - Particle identification
- The largest ever built in the world: $\sim 90 \text{ m}^3$
- Designed to track up to 8000 particles per rapidity unit

TIME PROJECTION CHAMBER

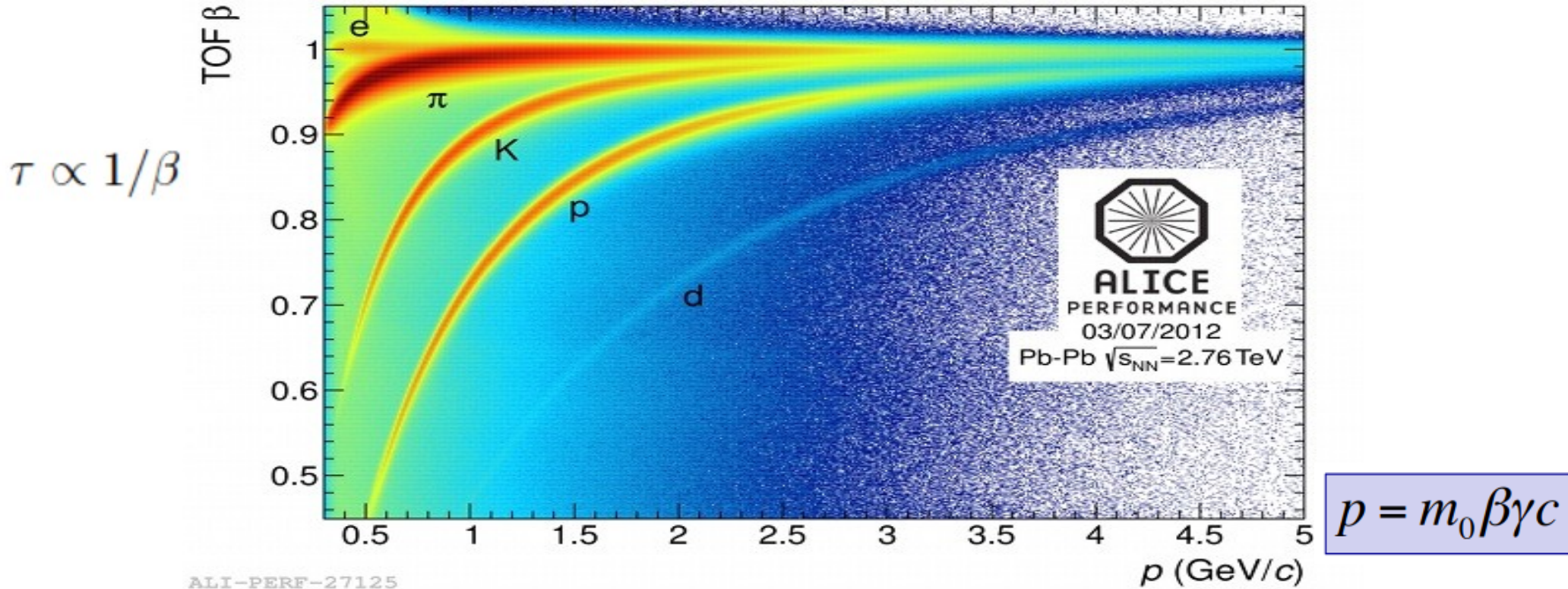


Readout chamber

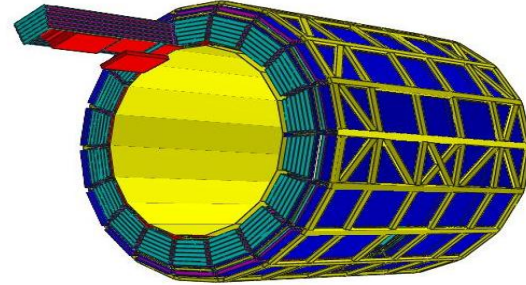


Field cage, looking at the central electrode

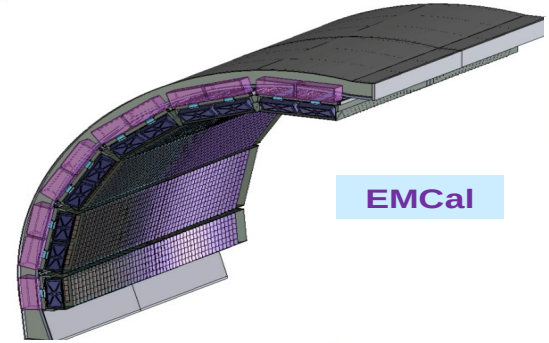
PID: TIME OF FLIGHT



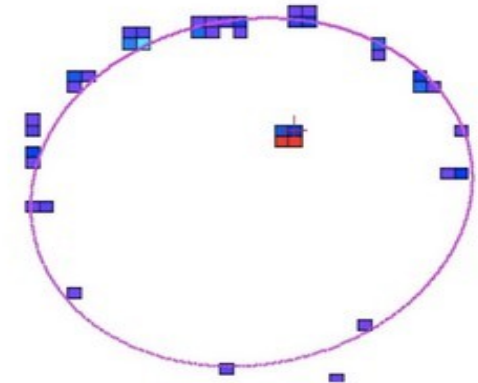
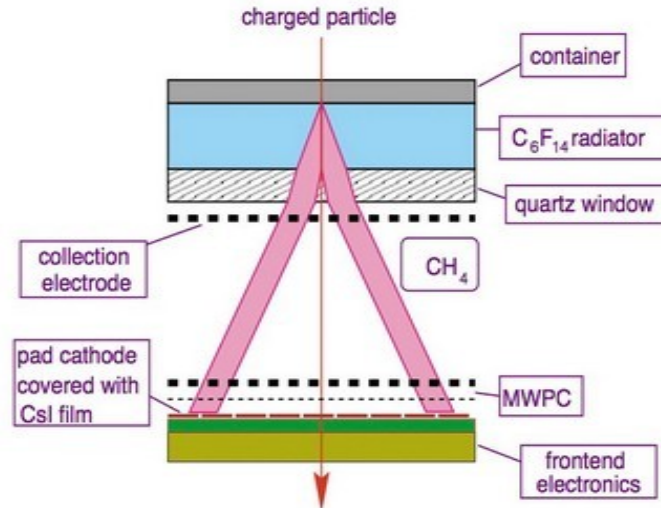
TRANSITION RADIATION DETECTOR



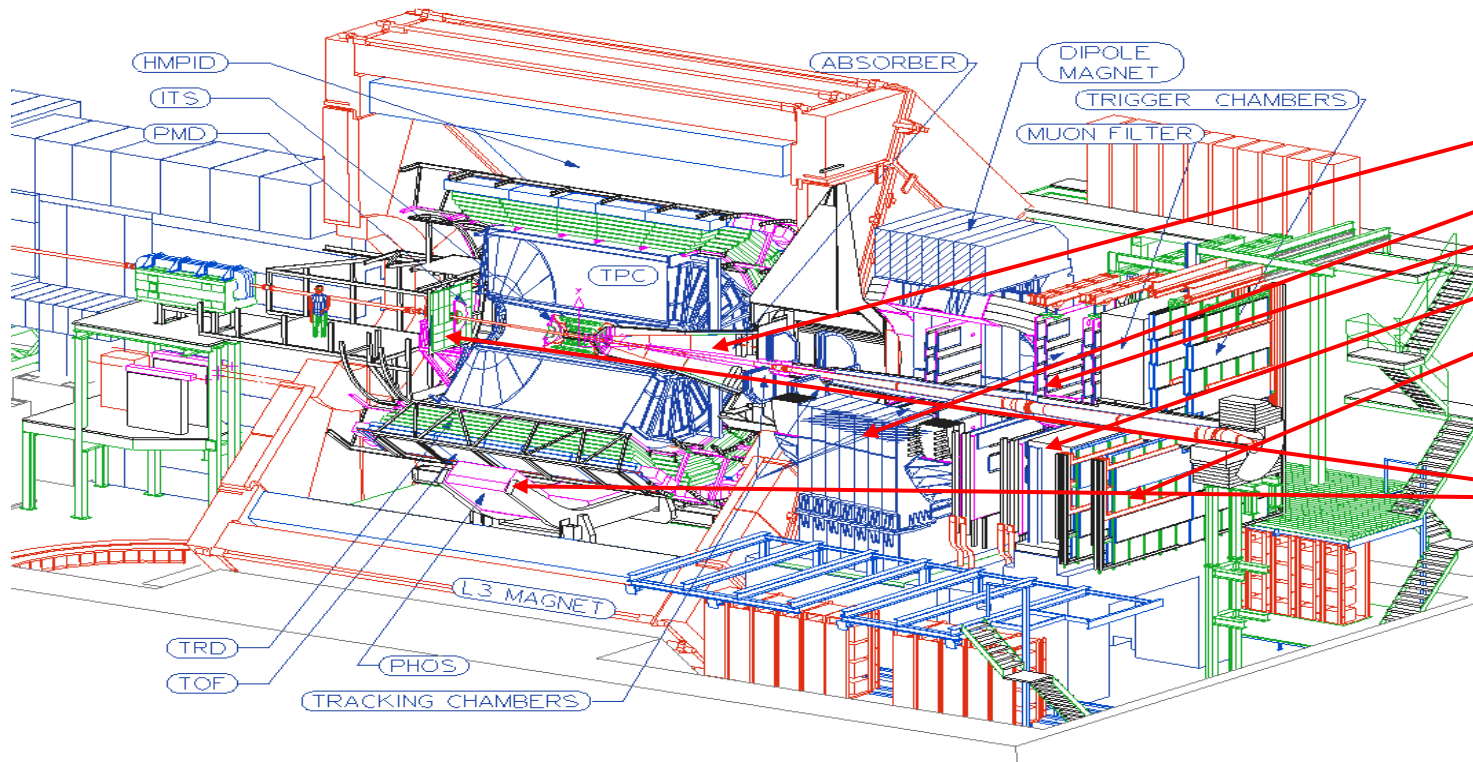
CALORIMETERS



CHERENKOV LIGHT DETECTOR



... et quelques détecteurs spécialisés



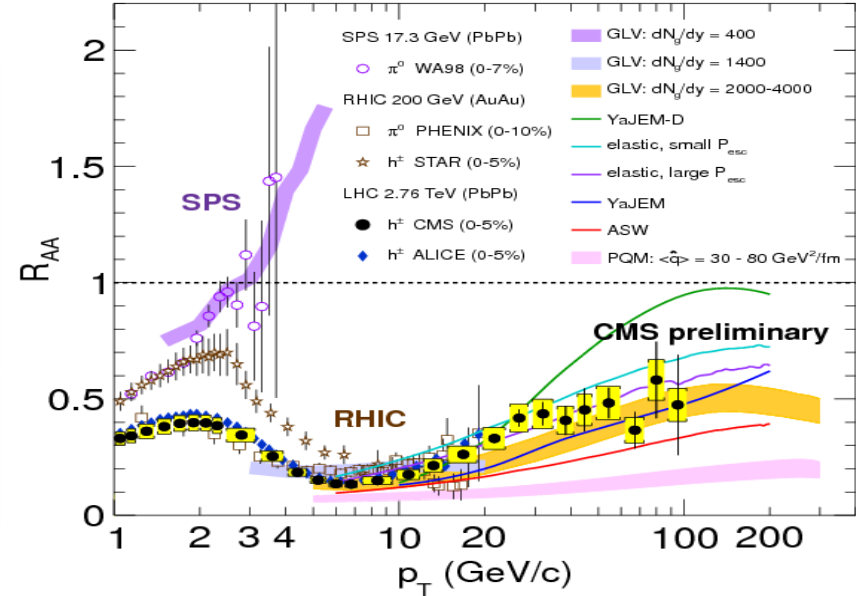
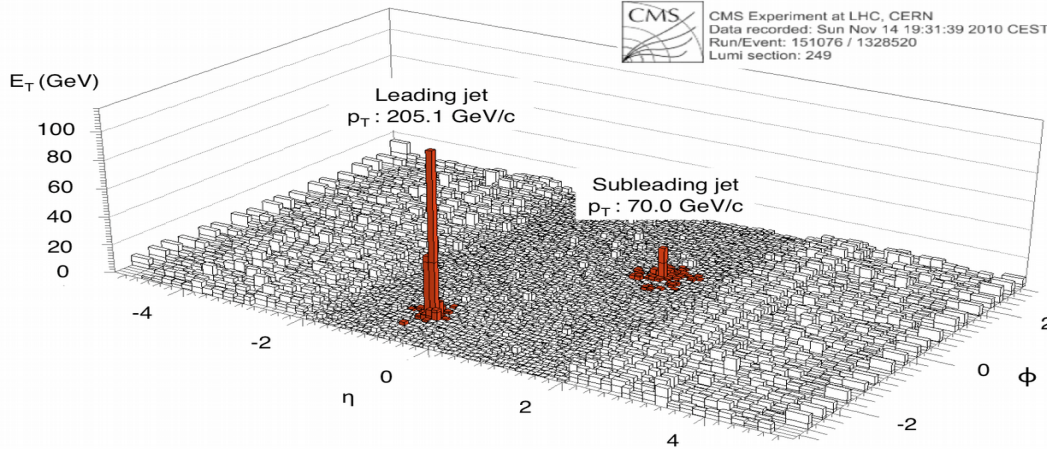
Spectromètre de muons :

- Absorbent passif
- B dipole
- Trajectographe
- Filtre
- Déclencheur

Photons

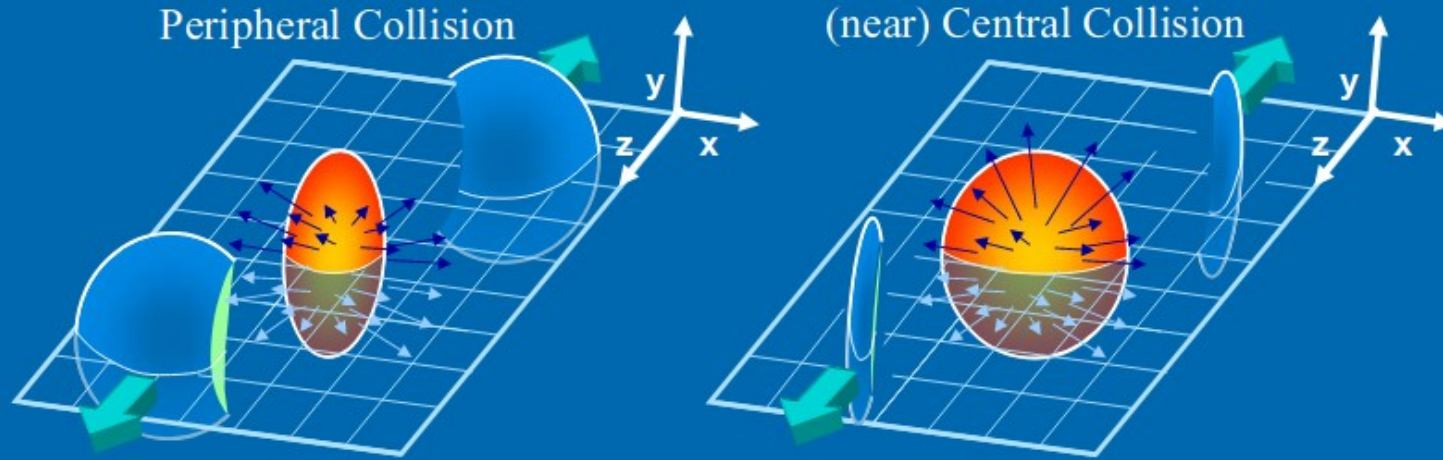
JET QUENCHING

CMS, Phys.Rev. C84 (2011) 024906



Energy loss of quarks in medium lead to quenching of jets and suppression of high p_T particles

Centrality Dependence



Centrality measured by the multiplicity of charged particles

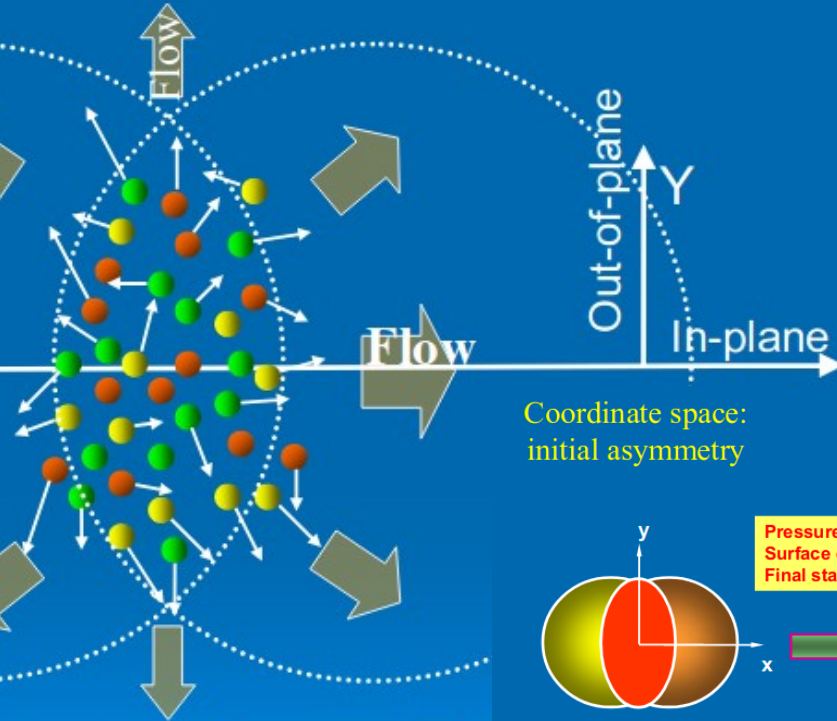
Collective behavior



Mid-central collision

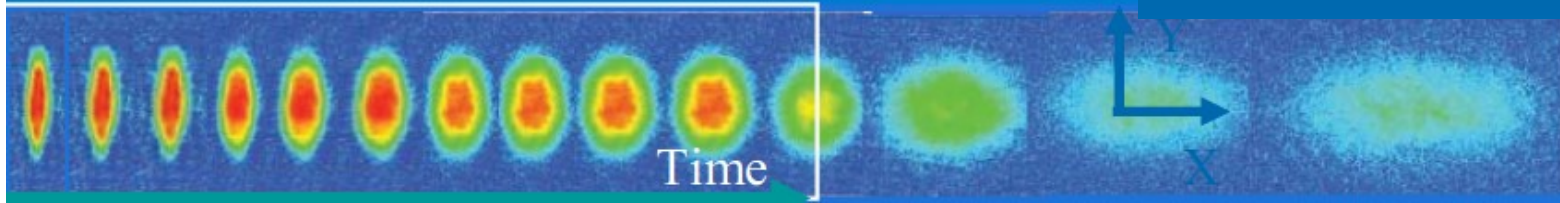
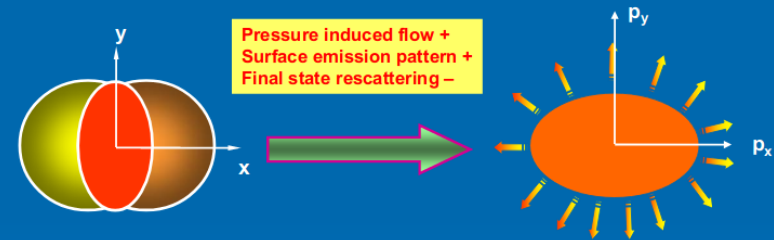
Reaction plane

Dashed lines: hard sphere radii of nuclei



Coordinate space:
initial asymmetry

Momentum space:
final asymmetry



Elliptic Flow

$$\frac{dX}{d\varphi} = \frac{X_0}{2\pi} (1 + 2v_1 \cos(\varphi - \Psi_{RP}) + 2v_2 \cos(2(\varphi - \Psi_{RP})) + \dots)$$

Elliptic flow coefficient

$$v_2 = \langle \cos(2(\varphi - \Psi_{RP})) \rangle$$

