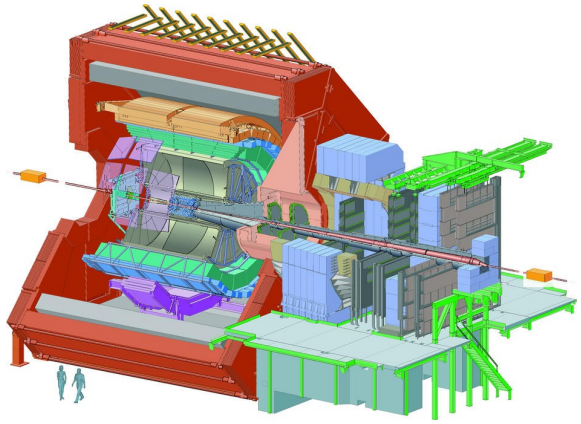
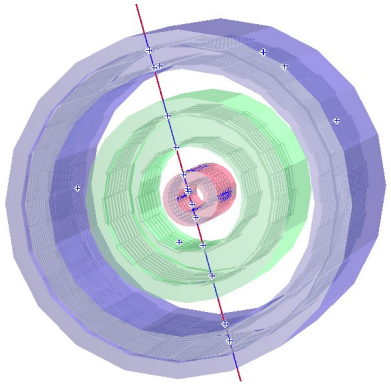
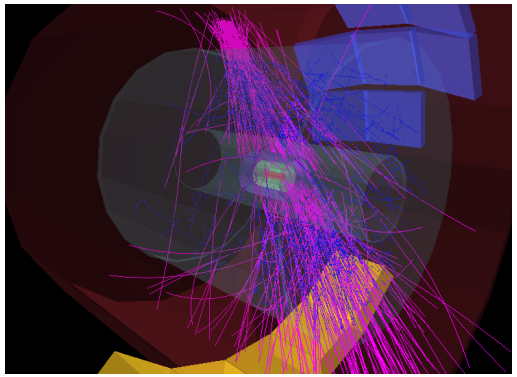
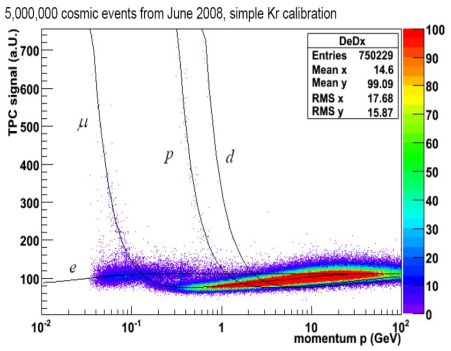
Overview of ALICE Progress

by Peter Christiansen (Lund)

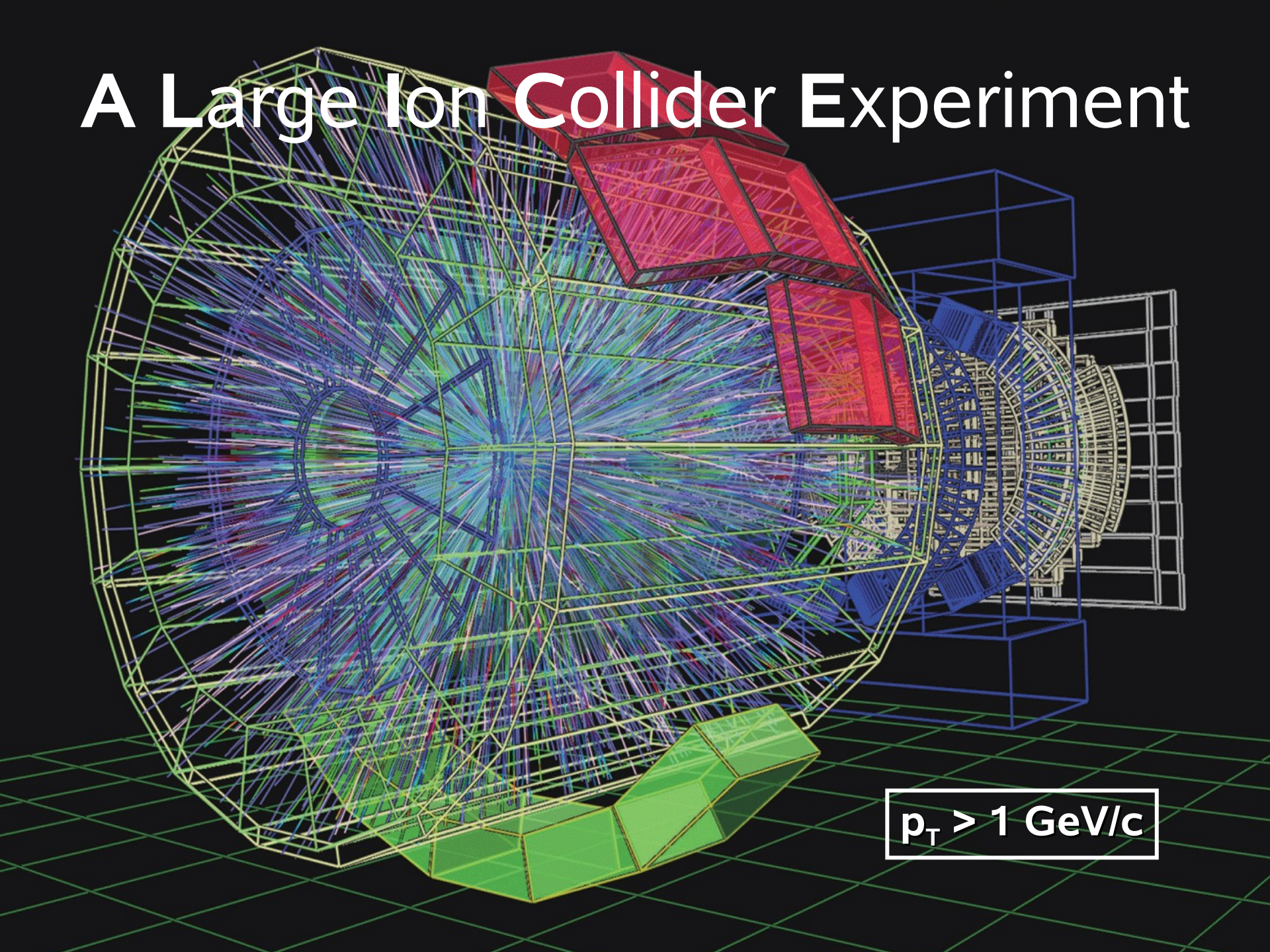




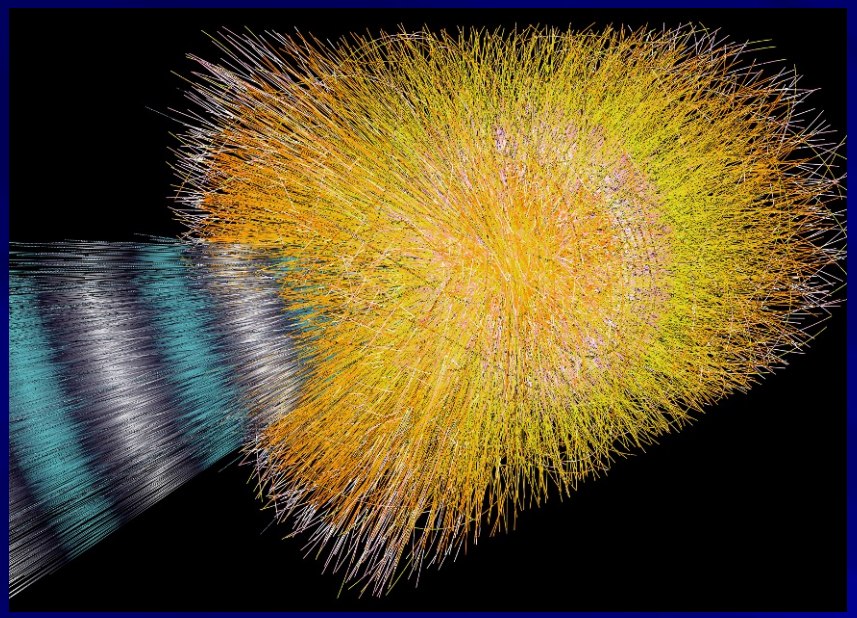




A Large Ion Collider Experiment



ALICE Design Considerations



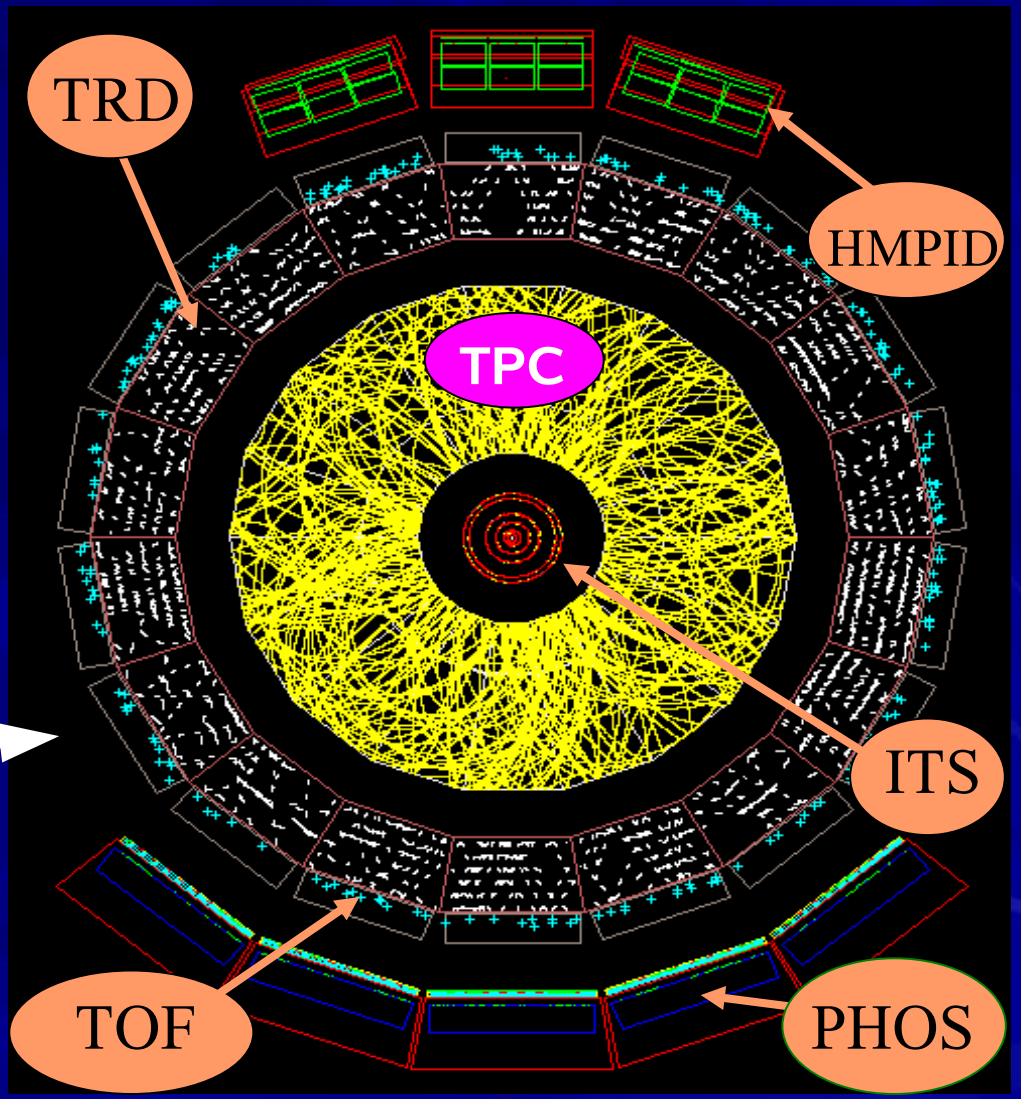
Pb+Pb simulated event

(dN/dy = 8000)

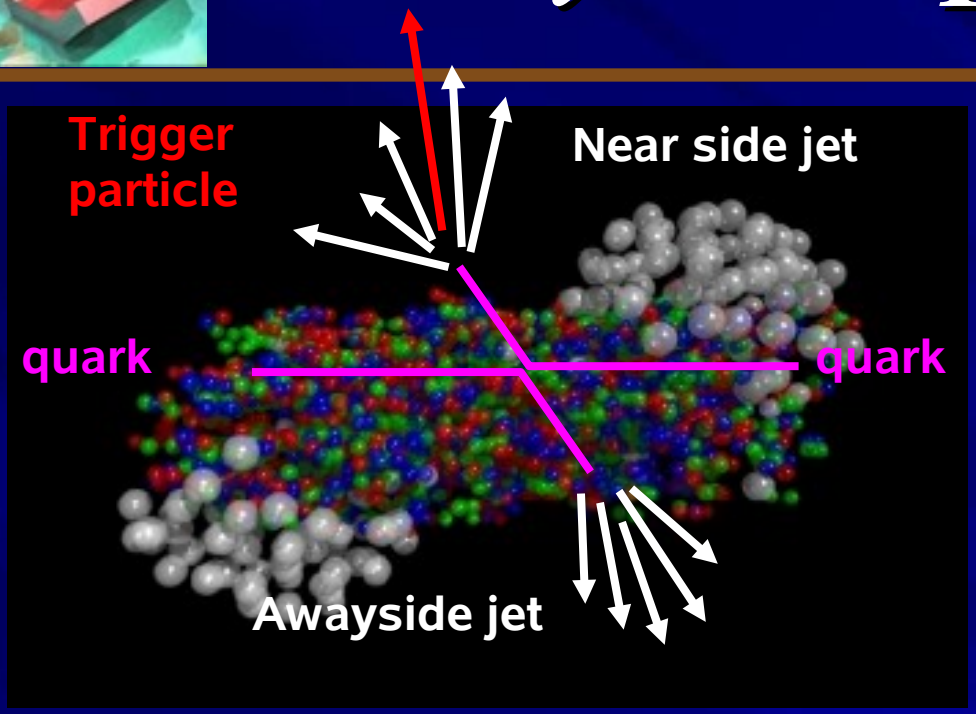
$\Delta\theta$ = 2° slice (~500 tracks)

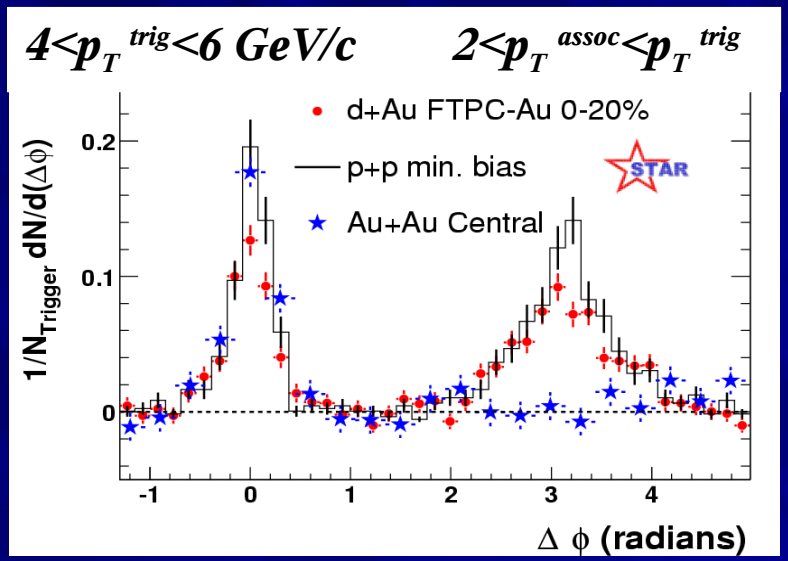
Pb+Pb rate~1000Hz!

→ Design is different from ATLAS and CMS



Why is low p_T interesting?

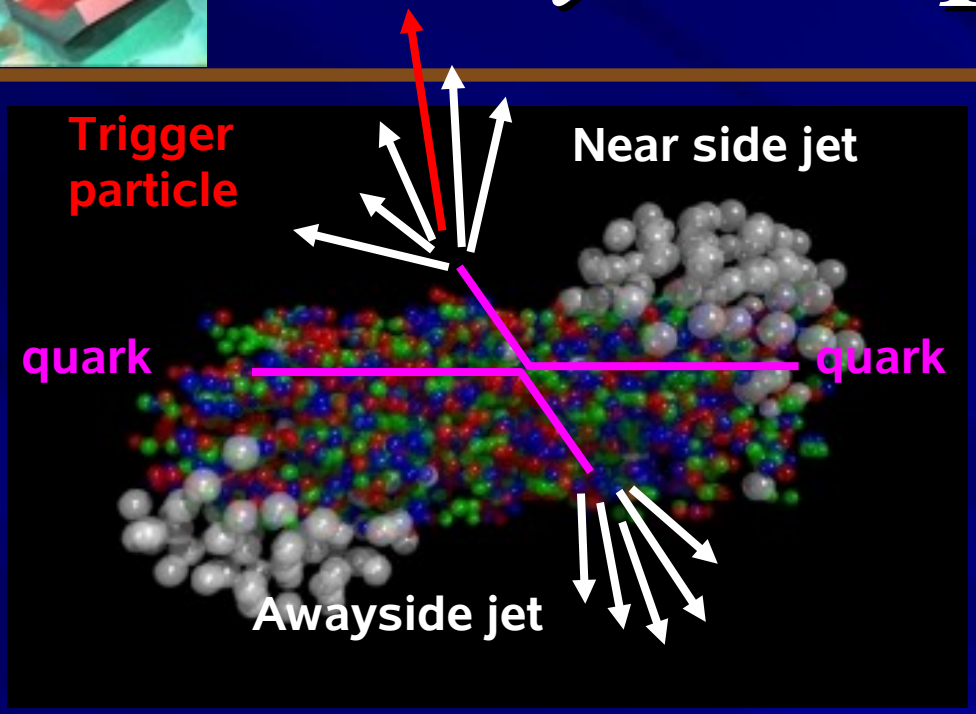


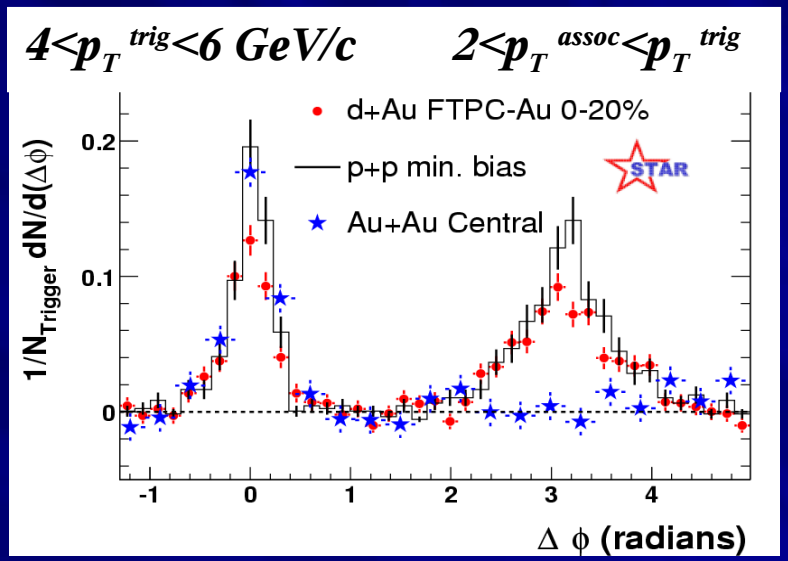


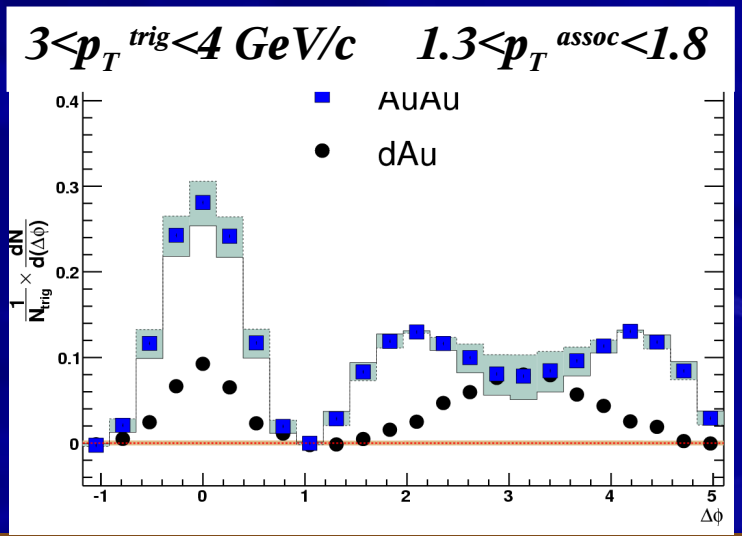
Jet quenching at RHIC:

- High p_T yield is suppressed
- Disappearance of away side jet

Why is low p_T interesting?



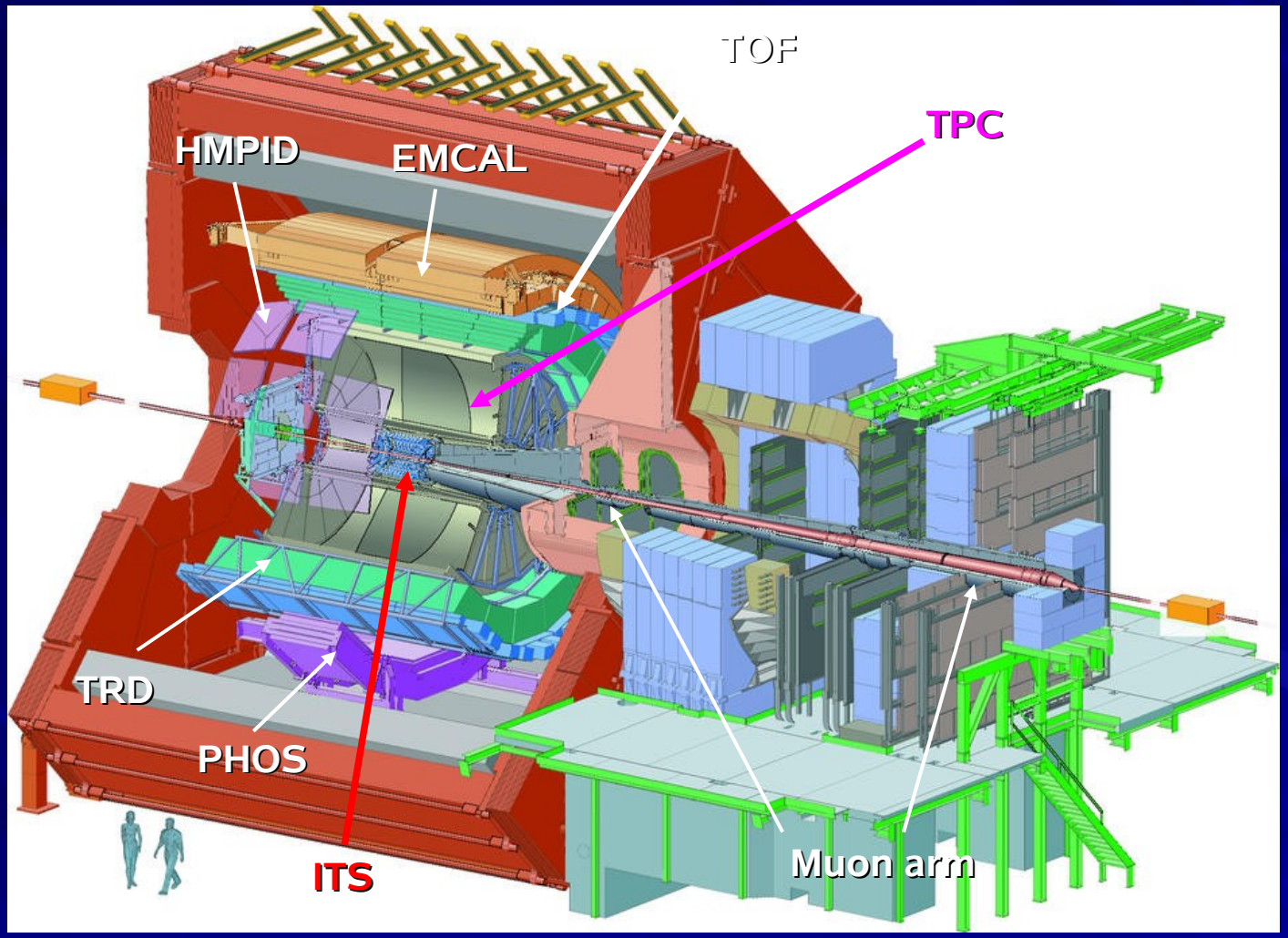




Jet quenching at RHIC:

- High p_T yield is suppressed
- Disappearance of away side jet
- Two peaks (re)appears at low p_T → Info on medium properties

The ALICE experiment



Complete:

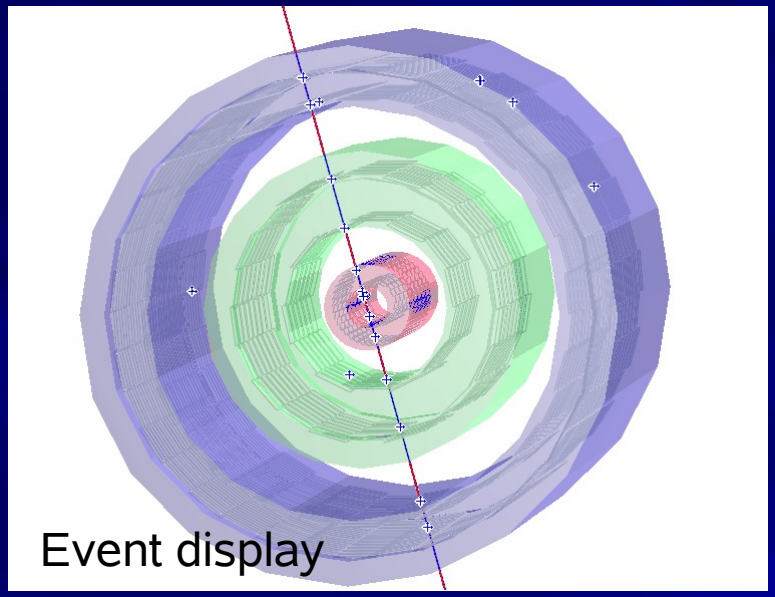
ITS, TPC, TOF,
HMPID, FMD,
T0, V0, ZDC,
Muon arm, Acorde

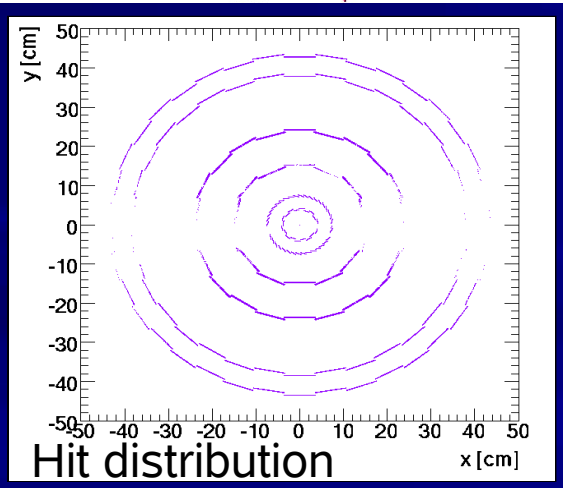
Partial installation:

1/5 PHOS
4/18 TRD
9/48 PMD
0/6 EMCAL
~ 40% DAQ/HLT

Commissioning ongoing since December 2007

Inner Tracking System (ITS)


Event display



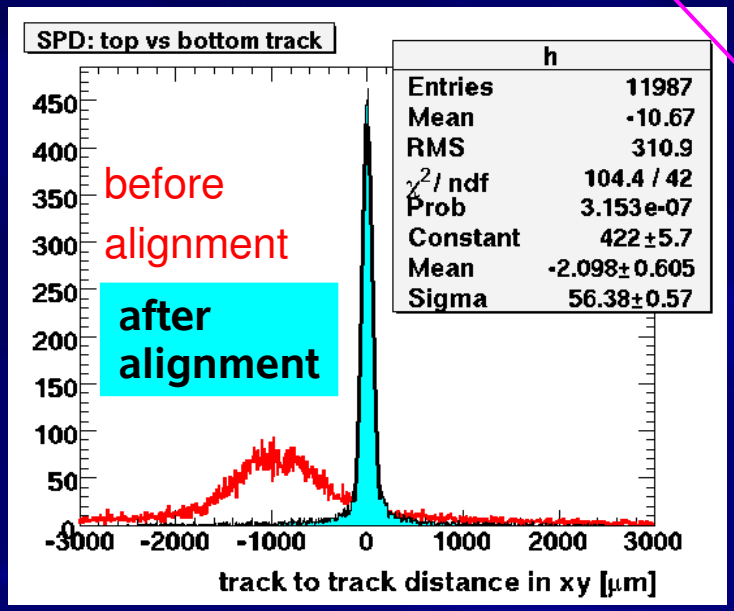
Hit distribution

- 6 layers of silicon
  - 2 x Pixels (inner, r=3.9 cm)
  - 2 x Drift
  - 2 x Strips (outer, r=43.0cm)
- Spatial resolution:
  - rϕ~12-35μm, z~25-800μm
  - two tracks: rϕ~100-300μm, z~600-2400μm
- 3d reconstruction (<100μm) of primary vertex
- Cosmic tracks (left) are used to calibrate/align the 6 layers
- **Pixels provides a fast (L1) multiplicity trigger**

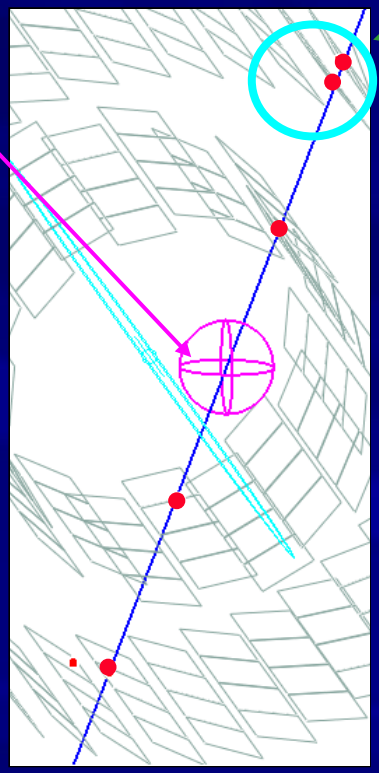
Pixel Alignment (of half ladders)

- Preliminary results for SPD (~80% of pixels aligned)

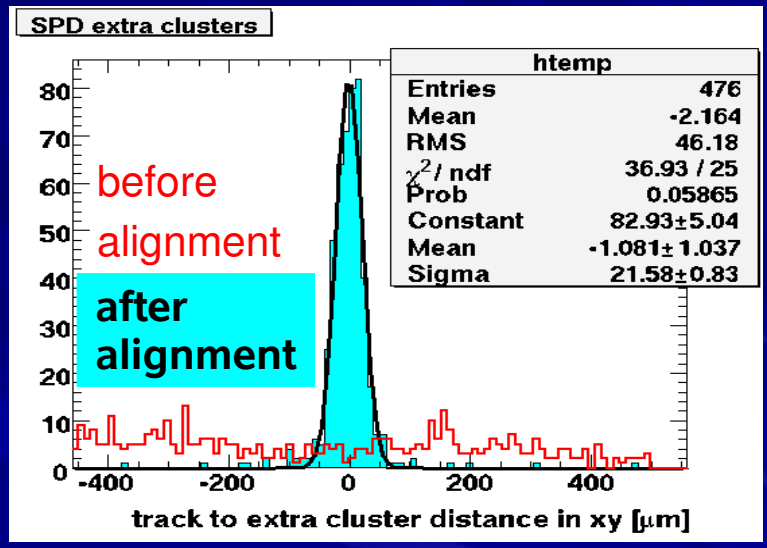
Track-to-track (top vs bottom) distance in transv. plane



σ = 55 μm (vs 40 μm in simulation without misalignment)



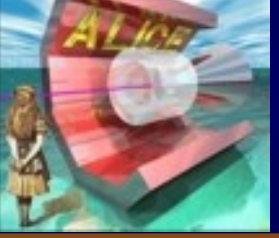
Track-to-"extra clusters" distance in transv. plane (sensor overlap)

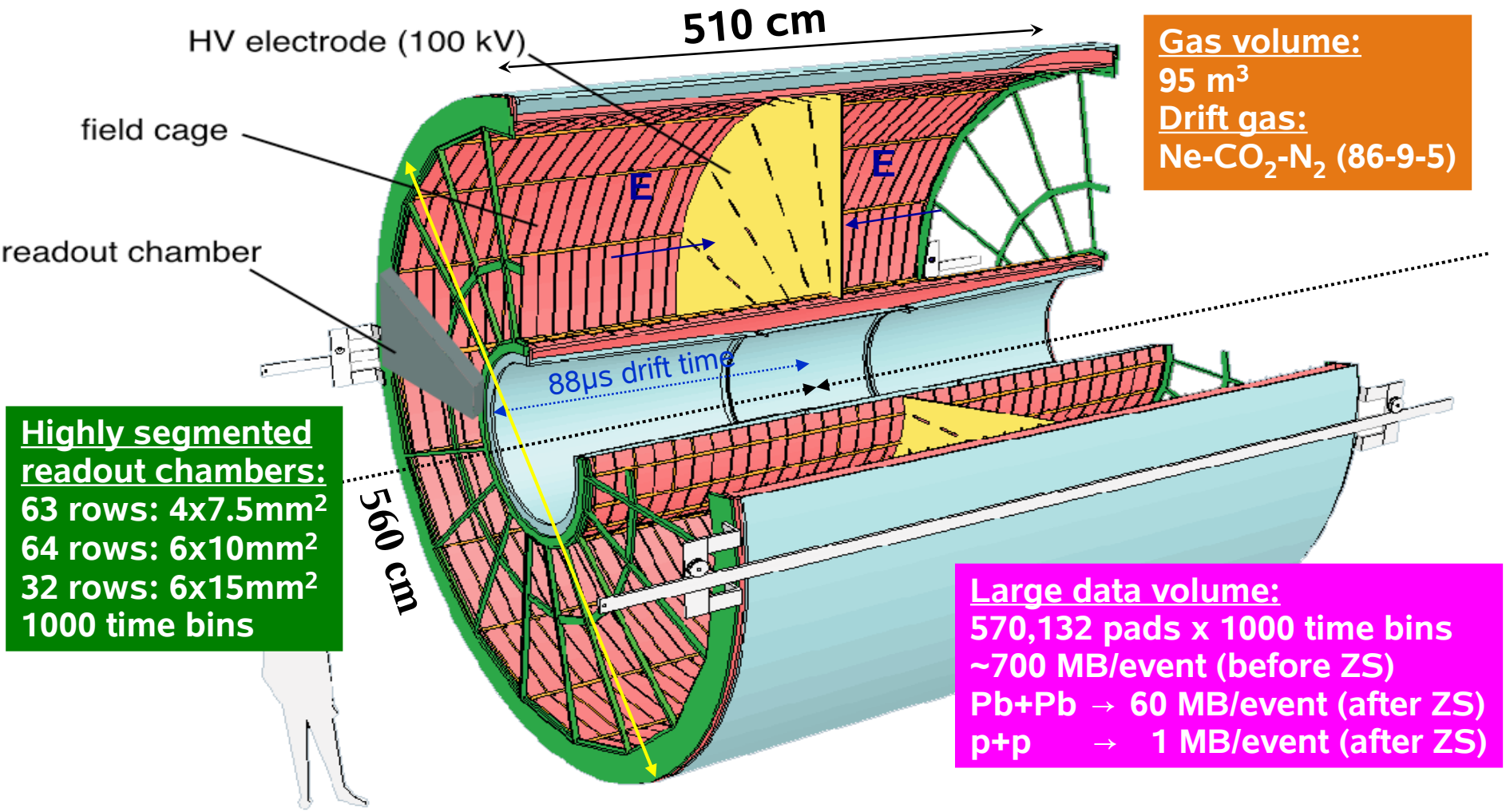


σ = 21 μm (vs 15 μm in simul. without misalignment)

- Residual misalignment < 10 μm (resolution ~ 12 μm in rϕ)

The ALICE TPC





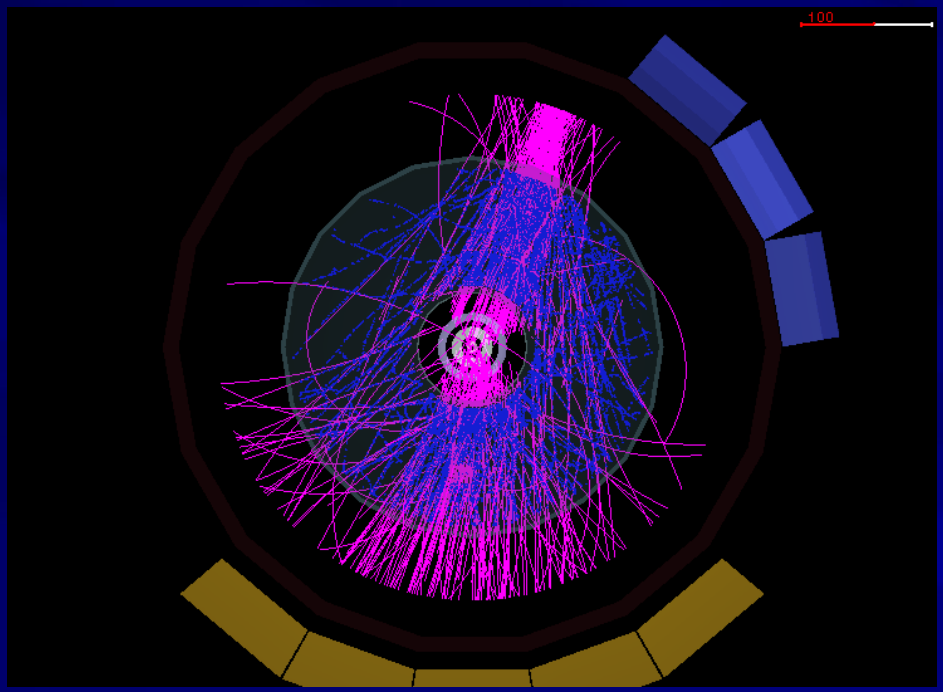
Gas volume:
95 m^3
Drift gas:
Ne-CO_2-N_2 (86-9-5)

Highly segmented readout chambers:
63 rows: 4x7.5mm^2
64 rows: 6x10mm^2
32 rows: 6x15mm^2
1000 time bins

Large data volume:
570,132 pads x 1000 time bins
~700 MB/event (before ZS)
Pb+Pb → 60 MB/event (after ZS)
p+p → 1 MB/event (after ZS)

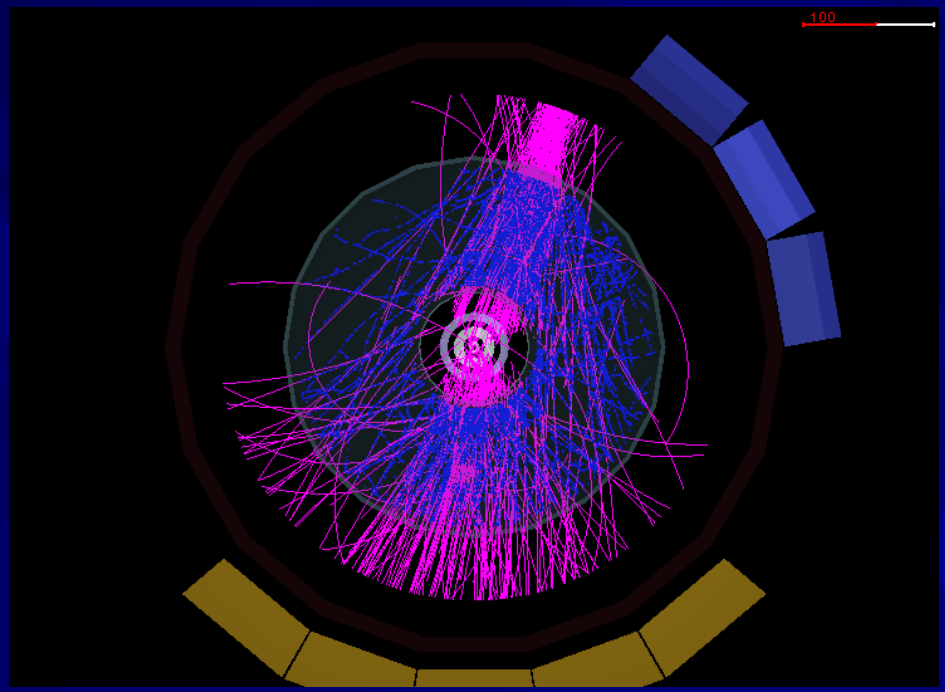
A TPC Cosmic event

End view

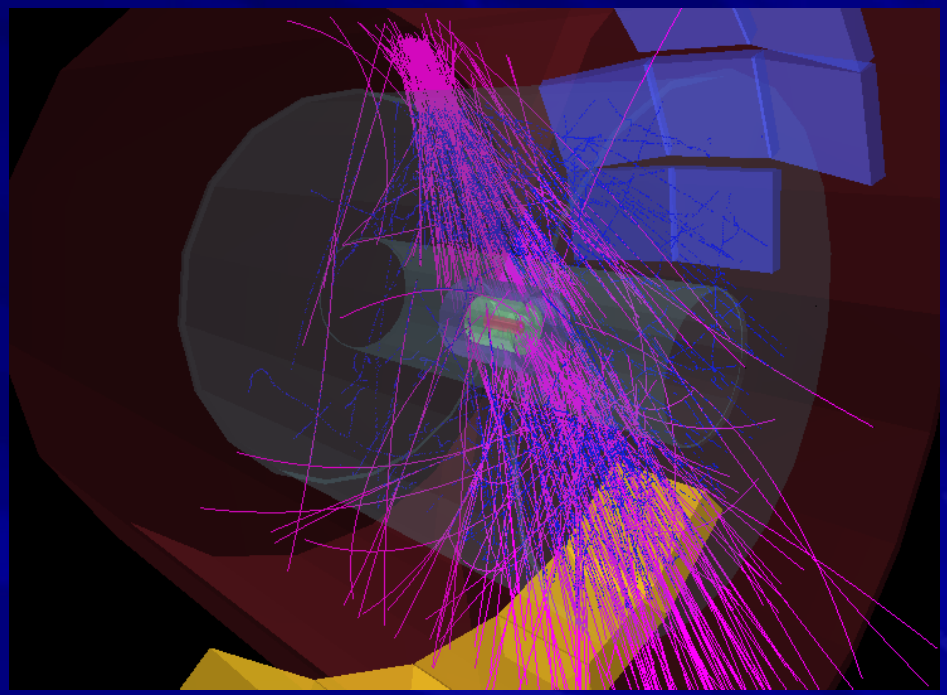


A TPC Cosmic event

End view

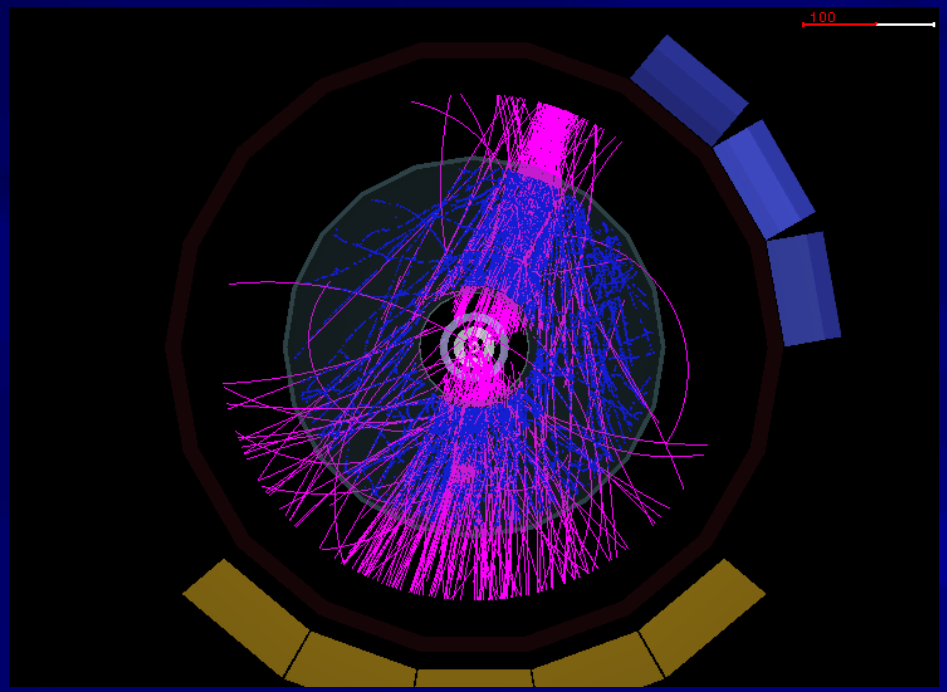


3d tracking

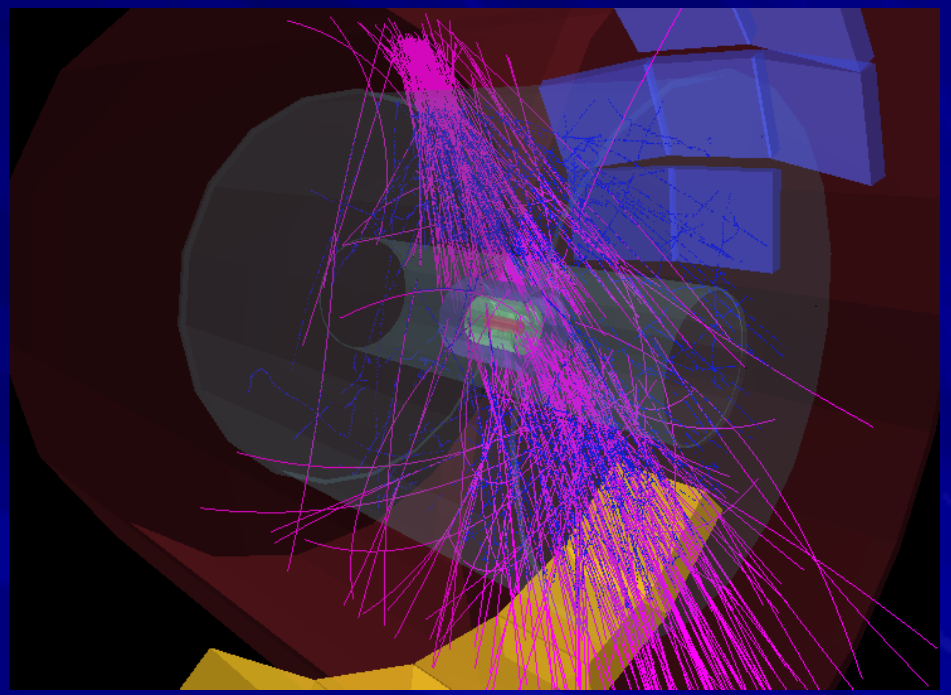


A TPC Cosmic event

End view



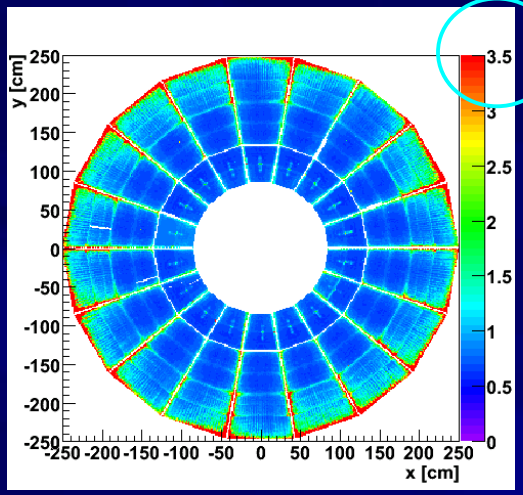
3d tracking

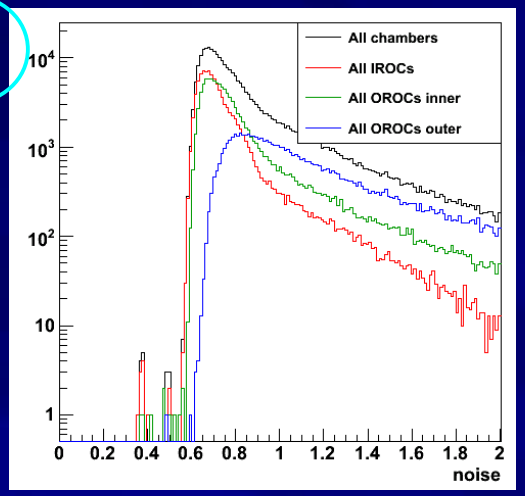


- TPC is being commissioned/calibrated with cosmic events, laser tracks, pulser events, and Krypton.
- TPC provides reference tracks calibrating other detectors!

TPC Noise Reduction

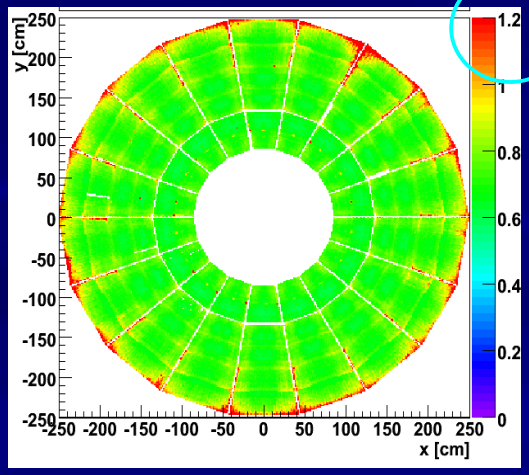
BEFORE:

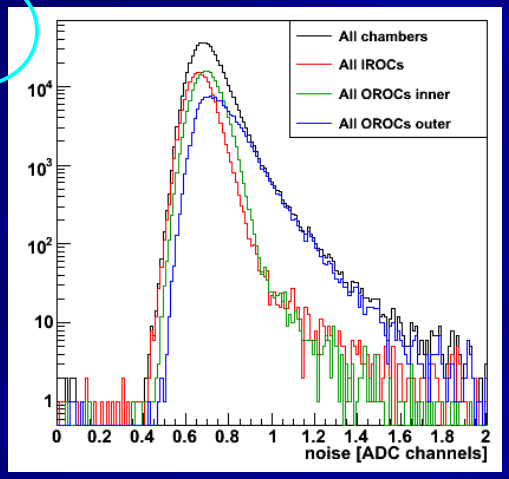


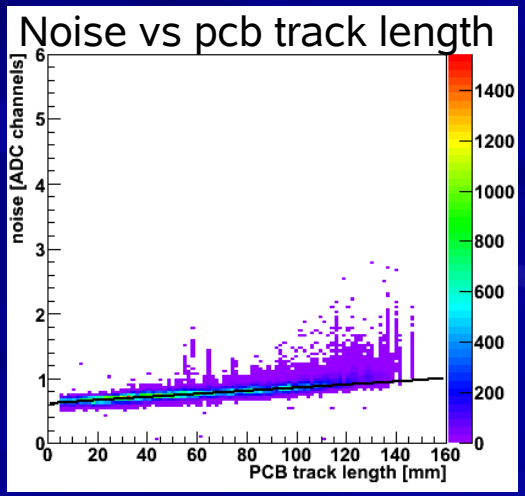


- Noise reduced by replacing the toroids in the LV PS
  - Critical for Zero Suppression
- Design:1000e = 1 ADC

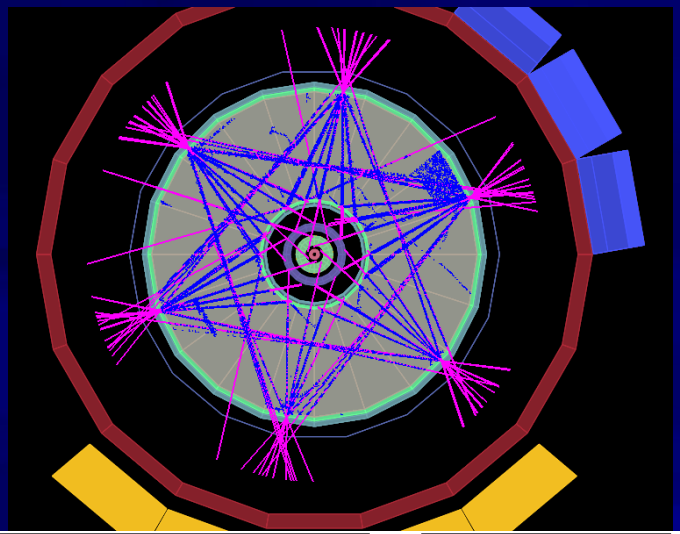
AFTER:

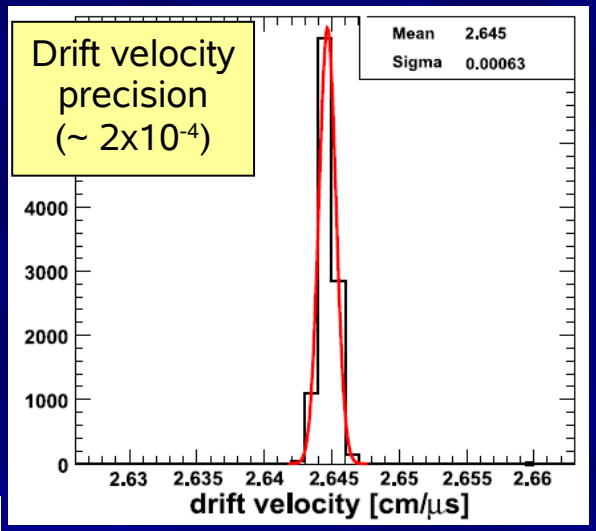


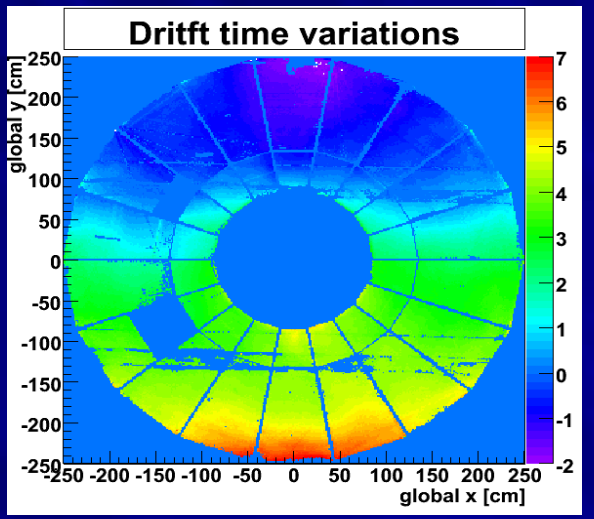


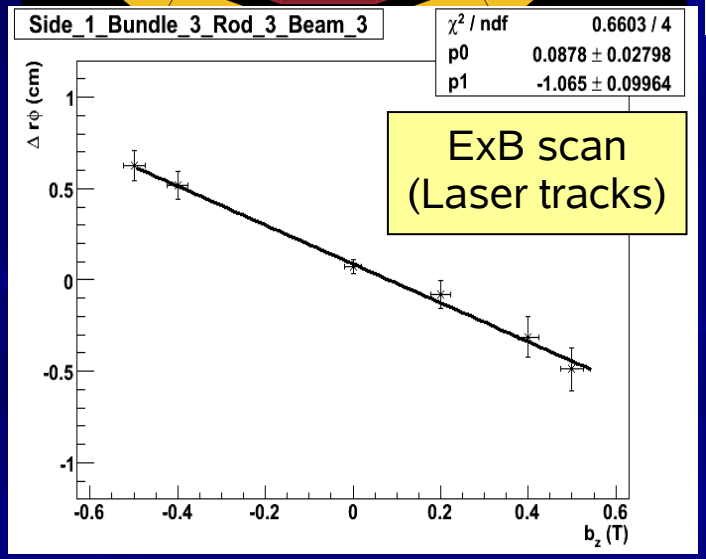


TPC Commissioning with laser



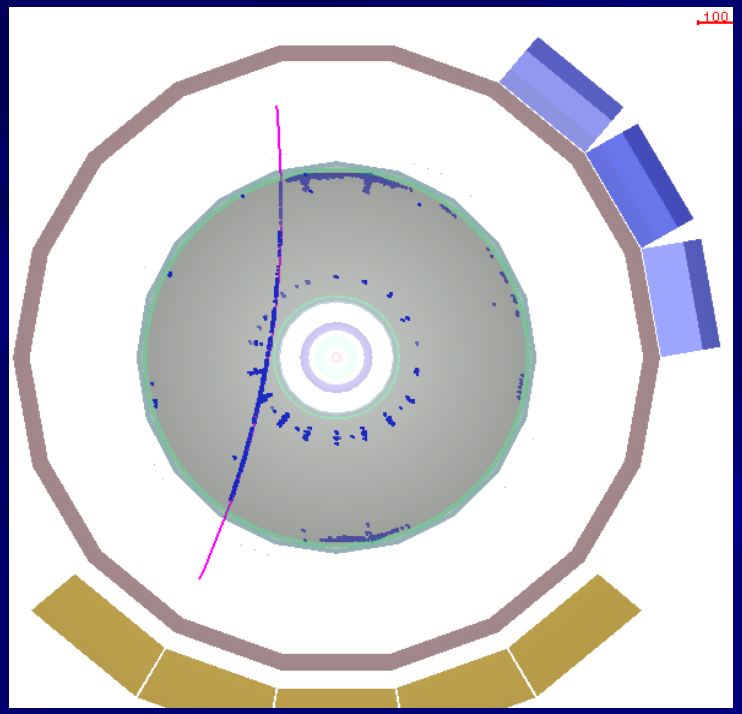


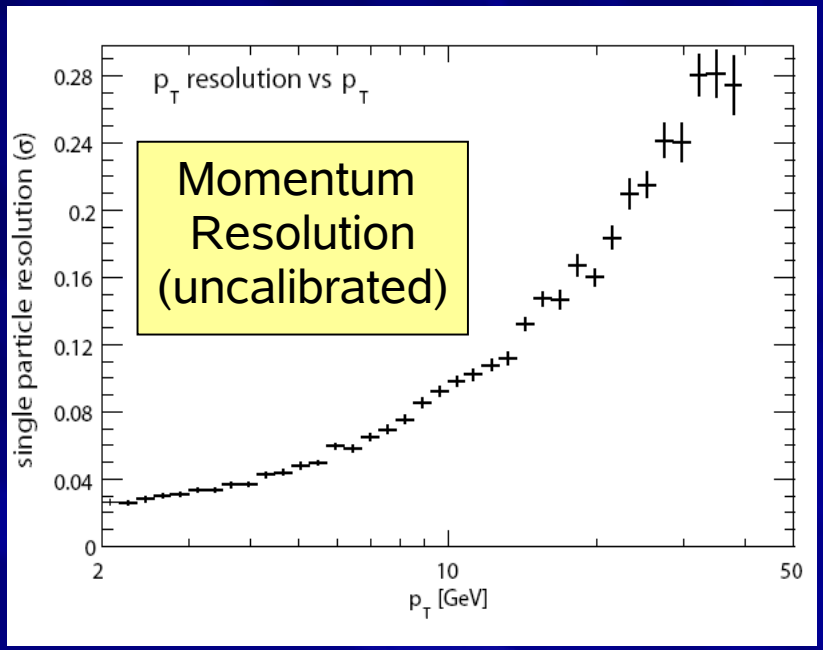




- Laser tracks can determine the drift velocity with high precision
- Central electrode reflection used for study of temperature variations
- ExB distortions under study with laser tracks

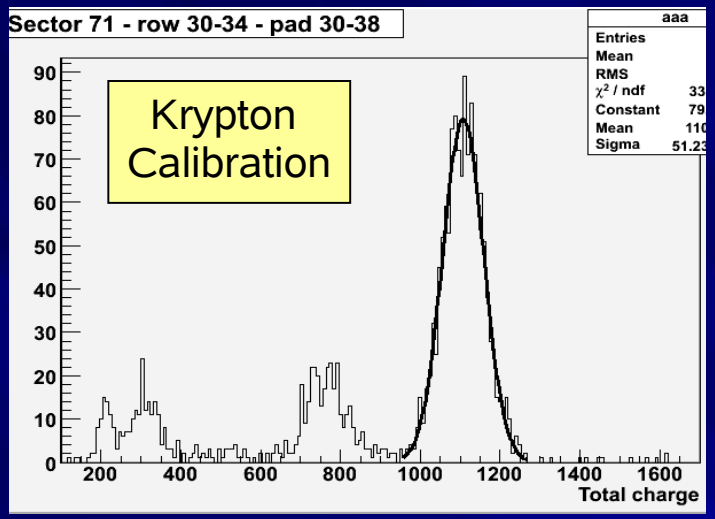
TPC Performance

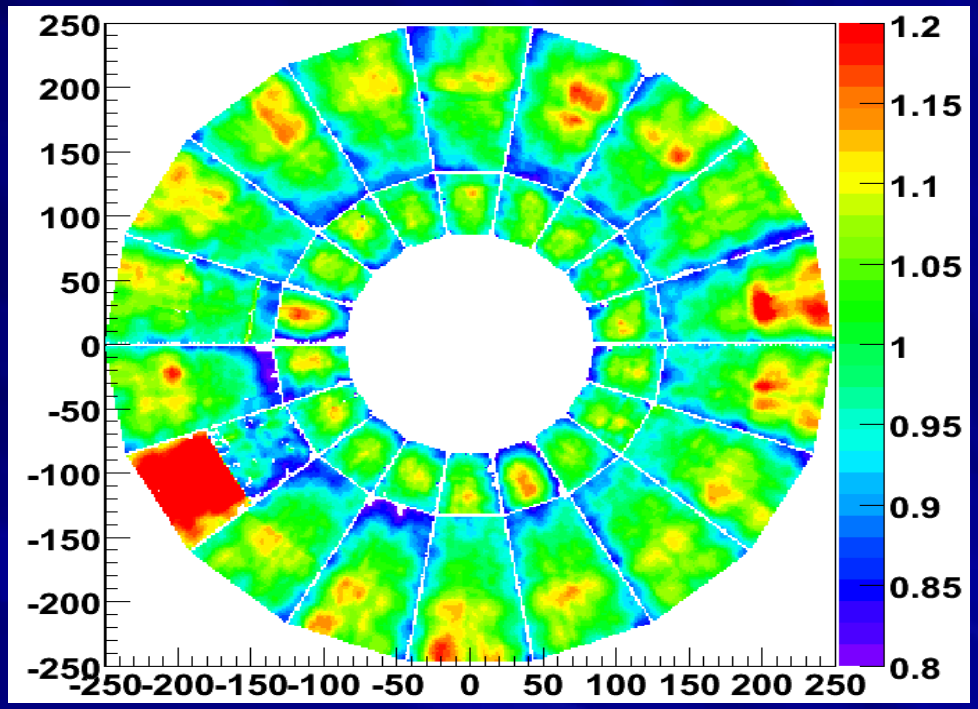




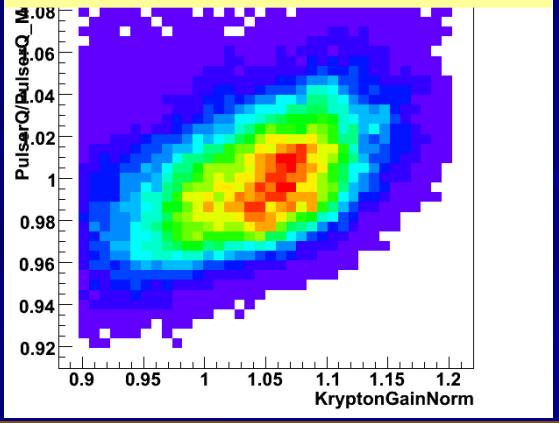
- p_t resolution (PPR goal: ~ 5% @ 10 GeV)
  - ~ 10% @ 10 GeV without any hit position calibration

TPC gain calibration with Krypton



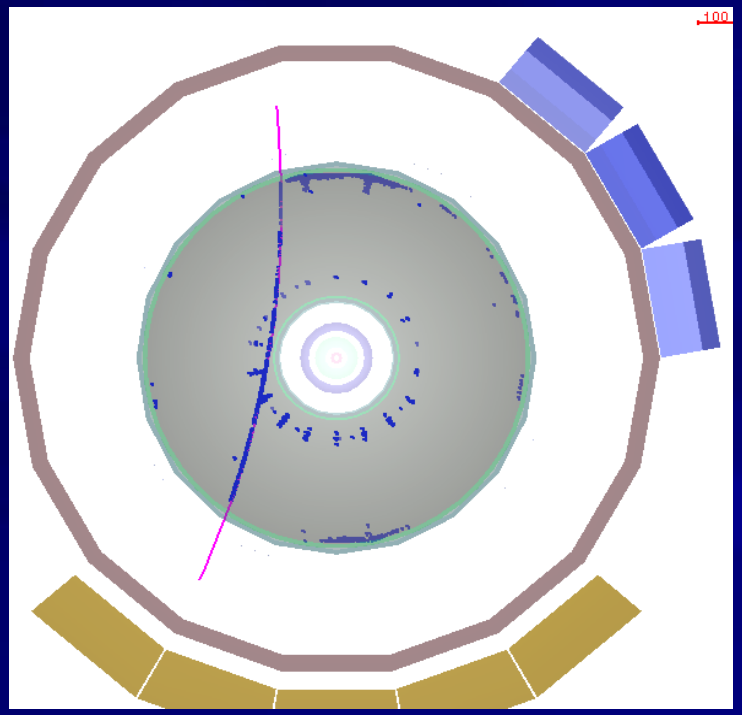


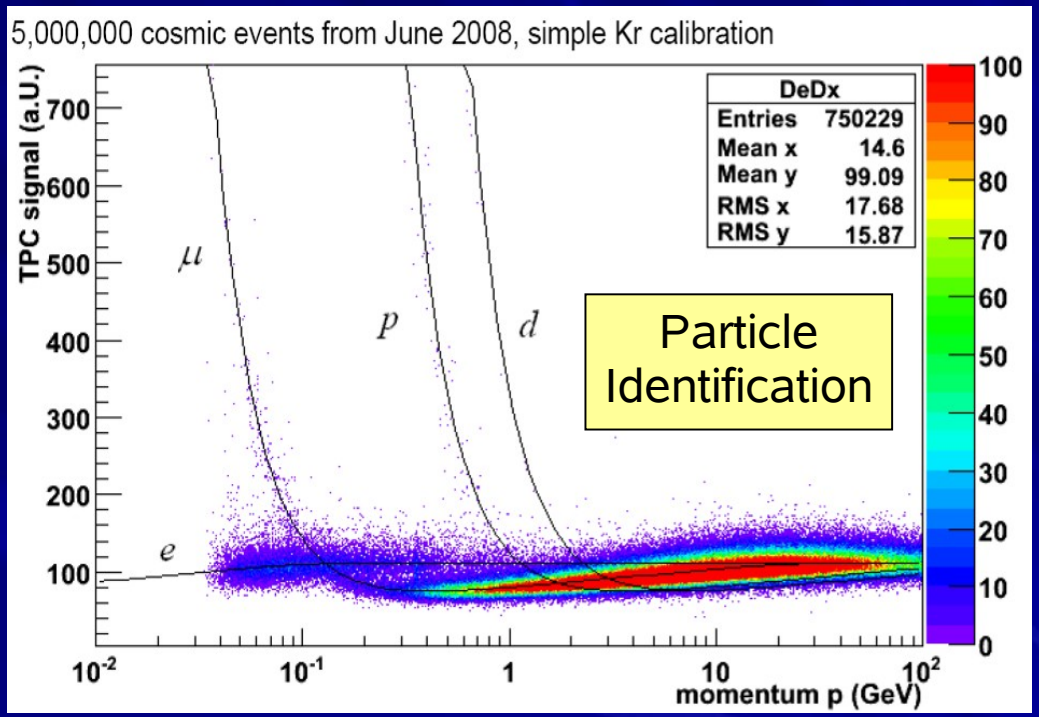
Pulser charge vs Krypton charge correlations



- Charge gain calibration done by injecting Krypton into the TPC
- Gain variations (±20%) prob. due to anode-padplane distance var.

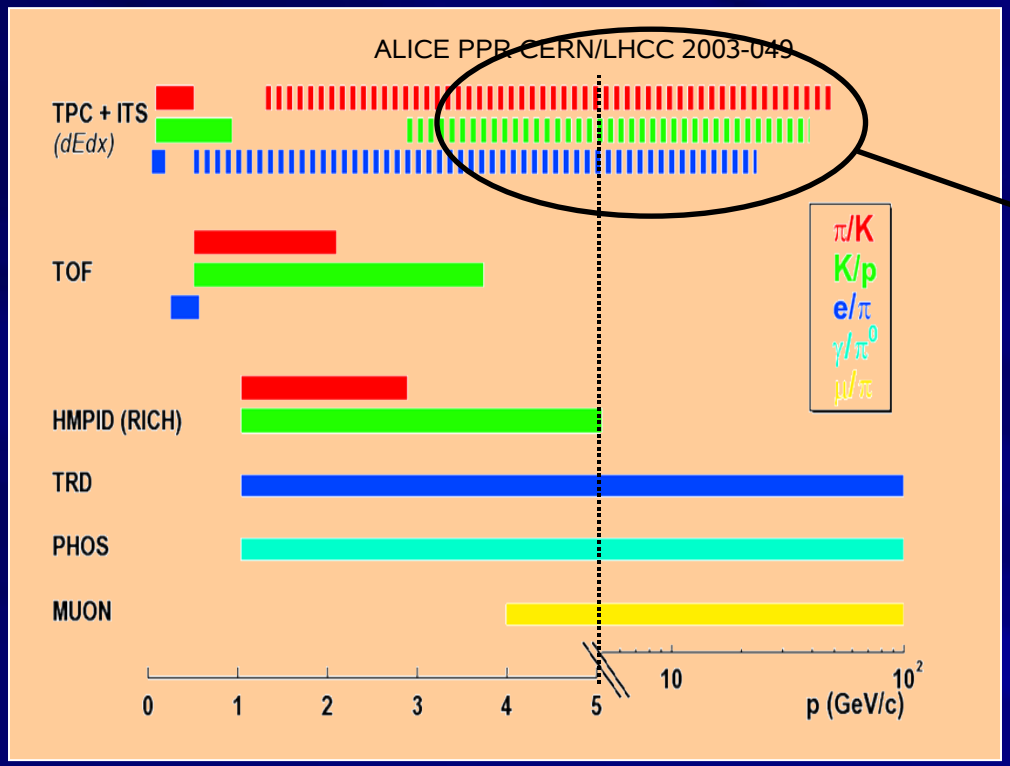
TPC Performance in cosmic ray runs

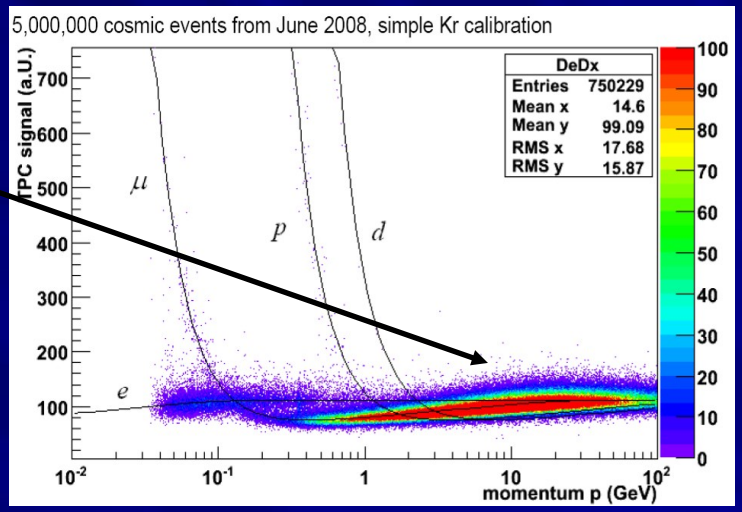




- dE/dx resolution (PPR goal: ~ 5.5%)
  - Already better than 6% for nominal track length

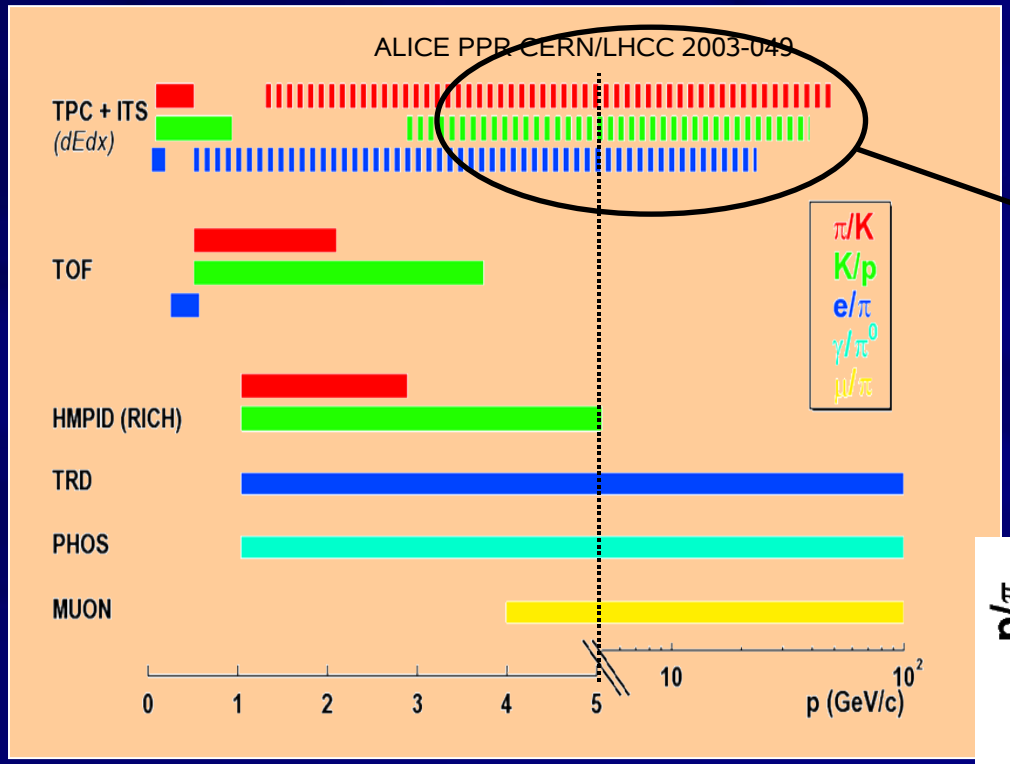
ALICE PID Systems

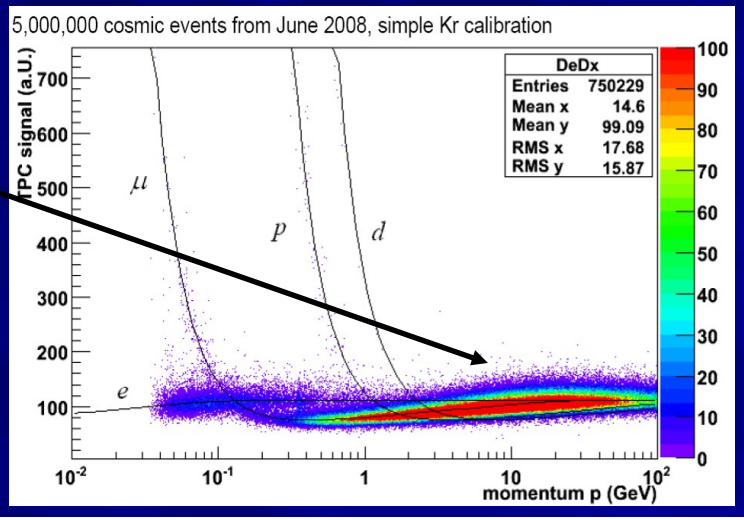


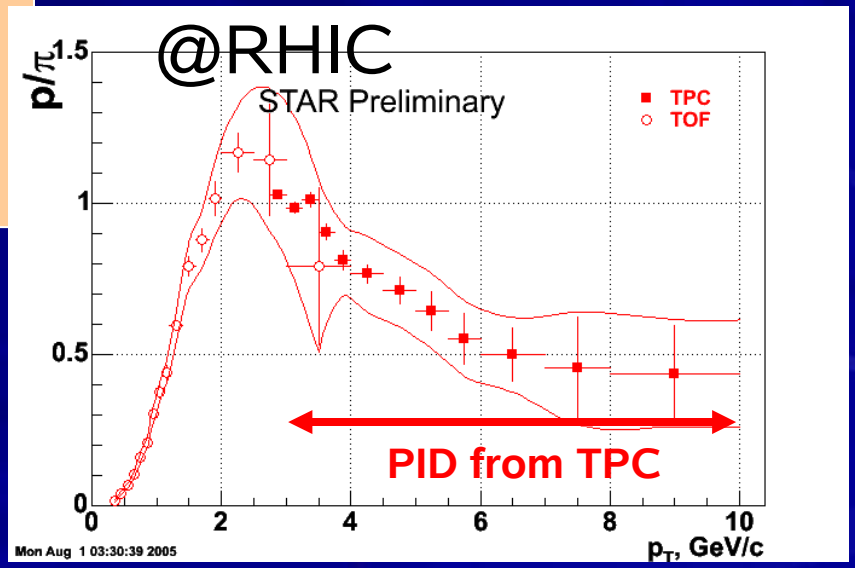


- TOF has similar coverage as TPC and is fully installed and being commissioned

ALICE PID Systems







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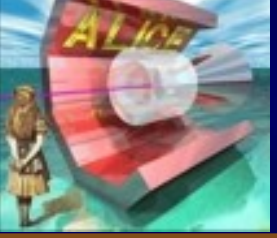
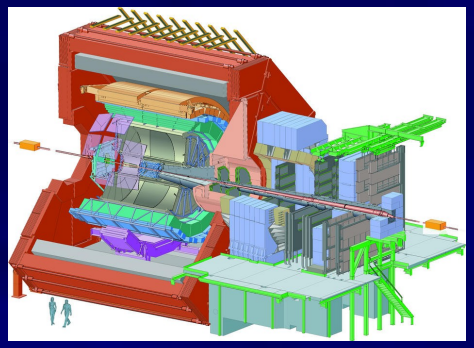
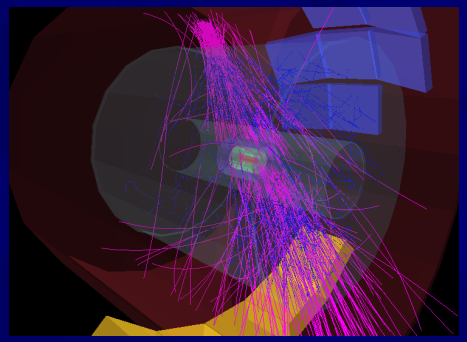
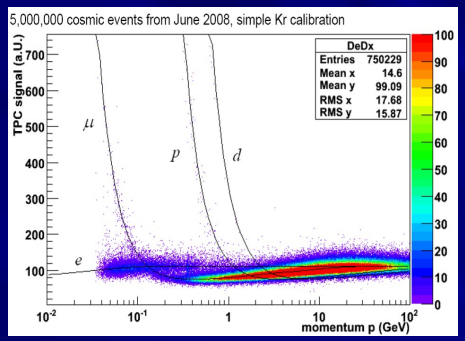
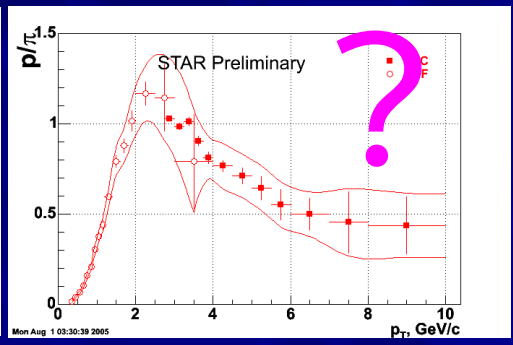


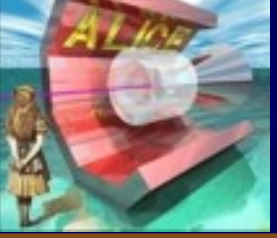
Summary: ALICE is in good shape











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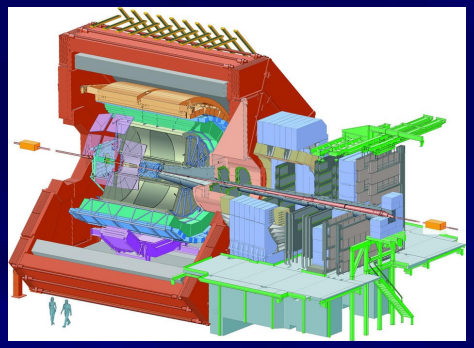

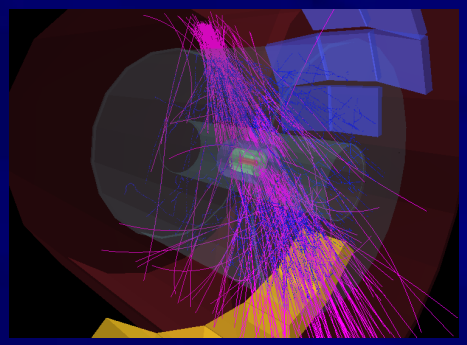

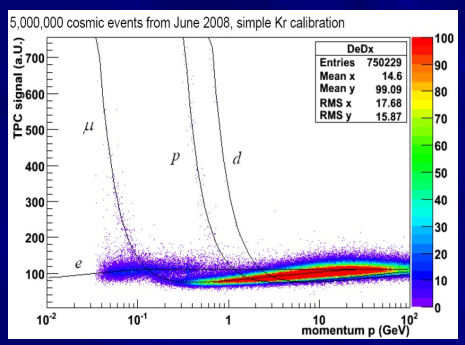

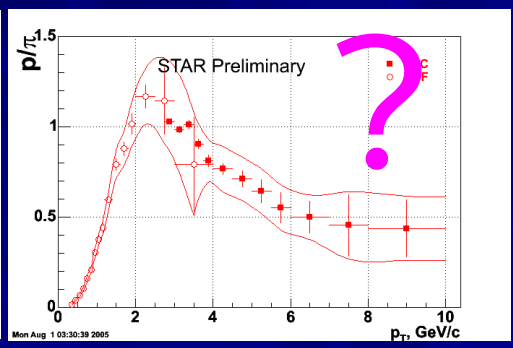

Preparation for the first p+p and A+A data from LHC.
February 4-6, 2009, Lund.