The Start point to discuss possible variants of a future Detector Set Up.

N.Smirnov, Physics Department, Yale University

(many thanks for preliminary discussions to R.Bellwied, A.Deshpande, J.Harris, B.Surrow, T.Ullrich, H.Wieman, J.Vavra, C.Woody)

March 15-17, 2004, EIC workshop, JLab.

There is a sense to discuss three detector set-up variants.

- A la ALEPH, DELPHI, H1, …(variant A)
  R of Magnet ~2.5 m (1.5 T)
  EMC – inside of Magnet
  Return yoke – H. Cal.

- A la ZEUS, …. (variant Z)
  R of Magnet ~1.0 m (2. – 3. T)
  EMC – outside of Magnet
  Return yoke – Hadr. Cal.

- A la CLEO, …. (variant C)
  R of Magnet ~1.5 m (1.5 T)
  EMC – inside of Magnet
  Return yoke – muon Detector

Detector Set Up (variant A).
{ SLD Magnet, HC, MD, LArC, …}

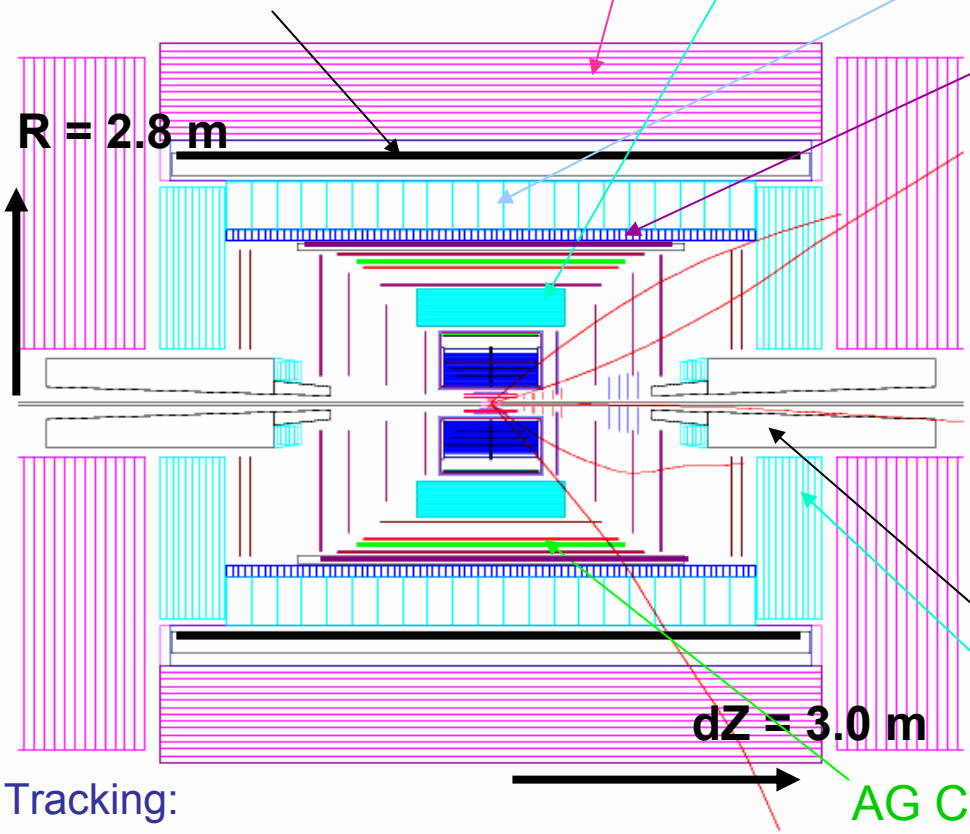
HC, “catcher” & Muon Detector. 15 planes,
(5. cm Fe, streamer tubes, 0.3 x 4 cm resolution)

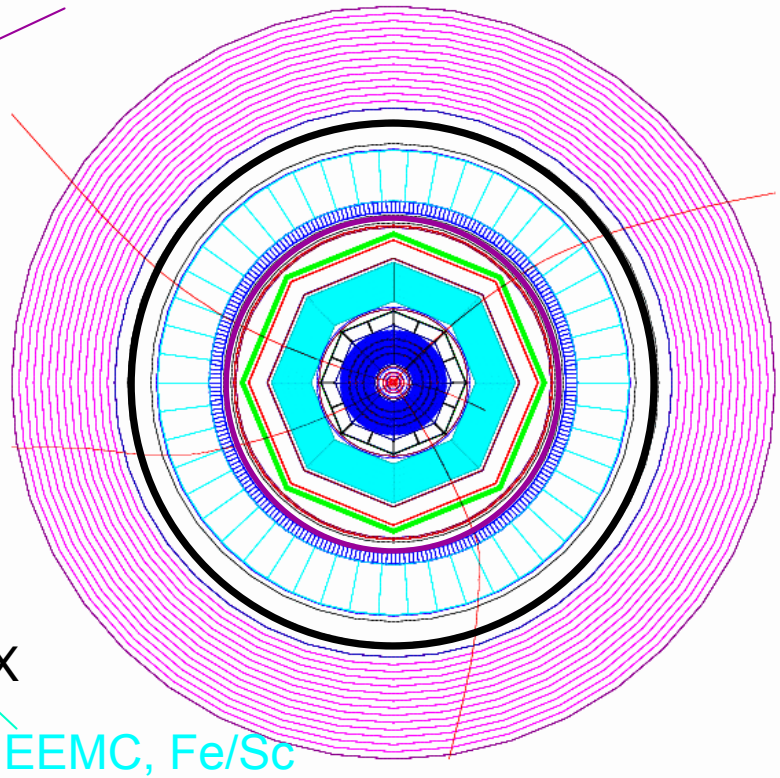
EMC; Crystals + Fe(Pb)/Sc (accordion type) or Liquid Argon (6x6 mrad towers)

Gas RICH

SC Magnet Coil, 1.5 T

ToF, ALICE/STAR clone





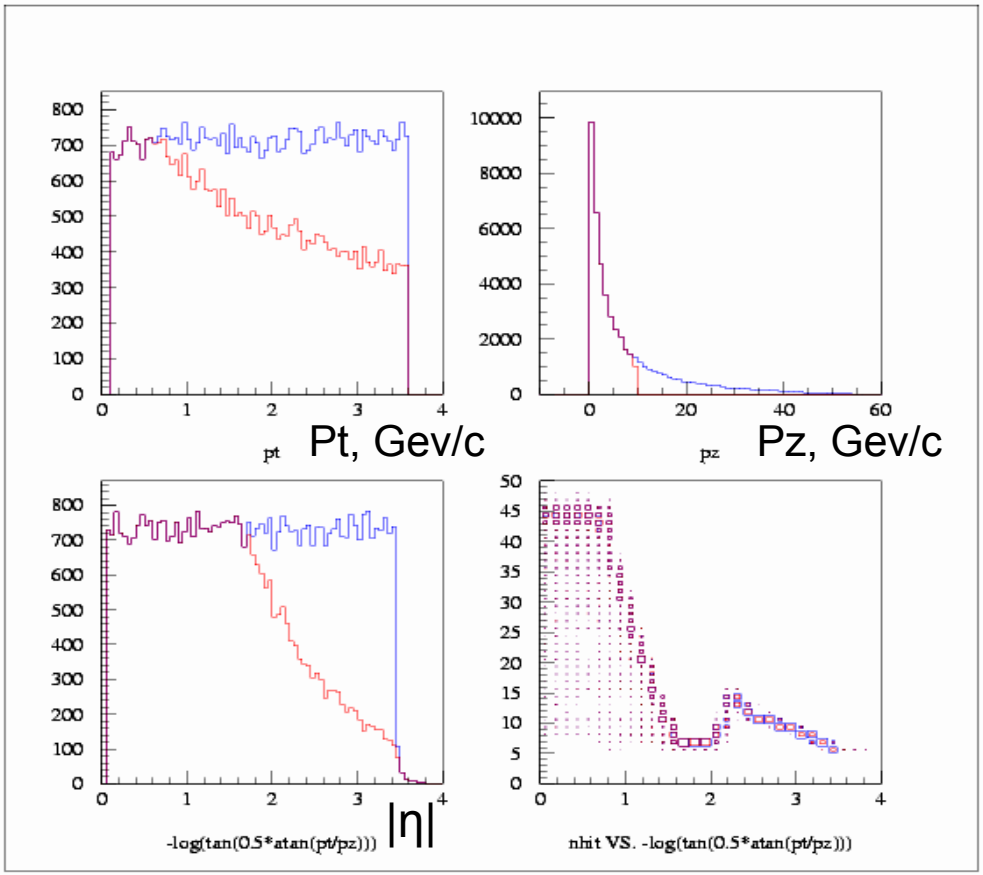
DX

EEMC, Fe/Sc

AG ChD

Tracking:
Si Vertex Detector, miniTPC ~35 pad rows,
Pad Detectors in Barrel and End Caps (micro-pattern technology). Si + Pad Detectors in Forward

Simulation conditions

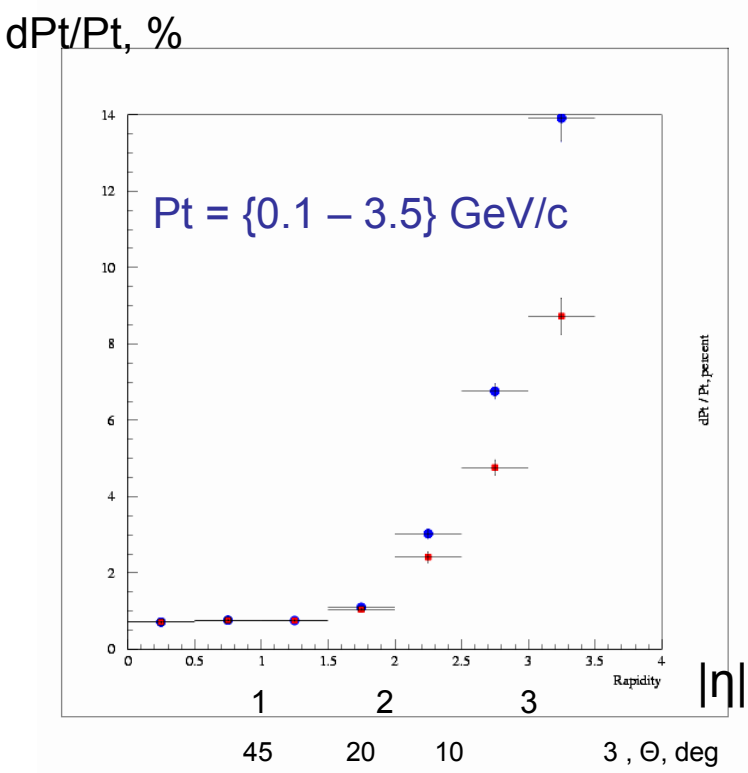


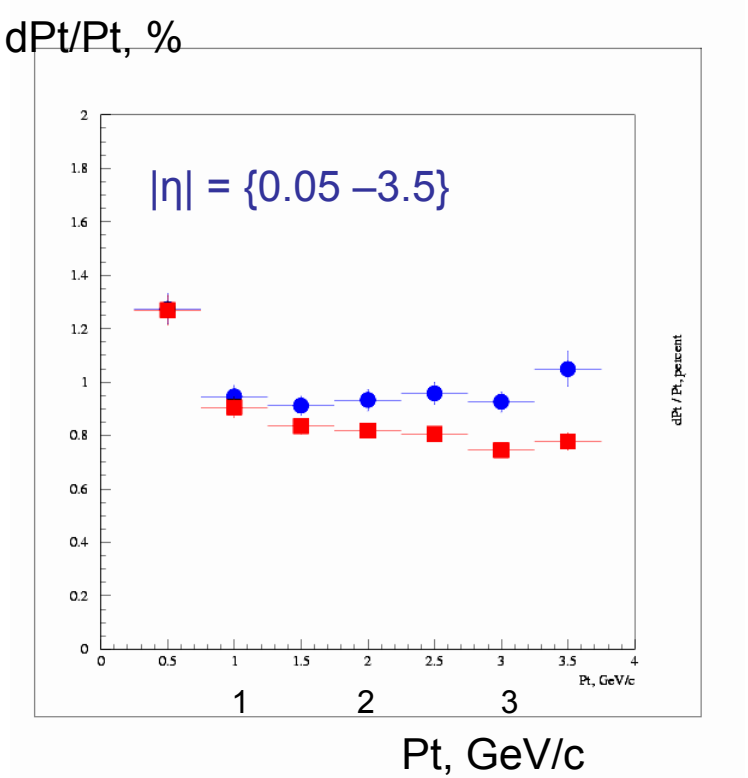
N of hits/track VS |η|

- one pion / event
- minimum 6 hits / track
- more-less “realistic” detector response (100% hit efficiency)

All momentum; P < 10. GeV/c

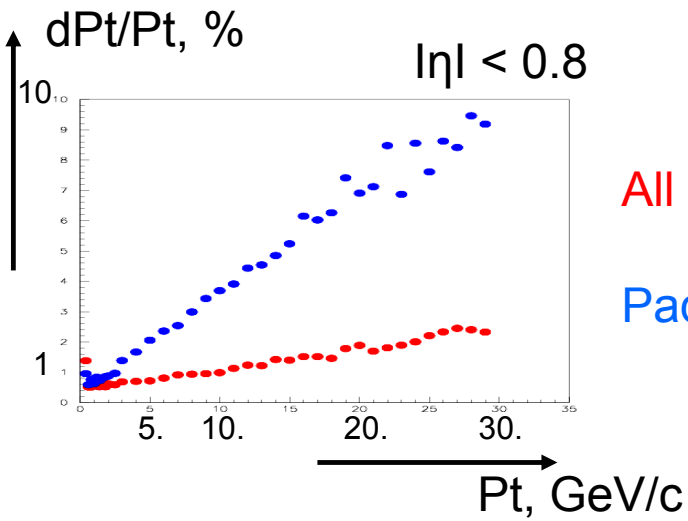
Detector setup, Variant A
Pt reconstruction performance.





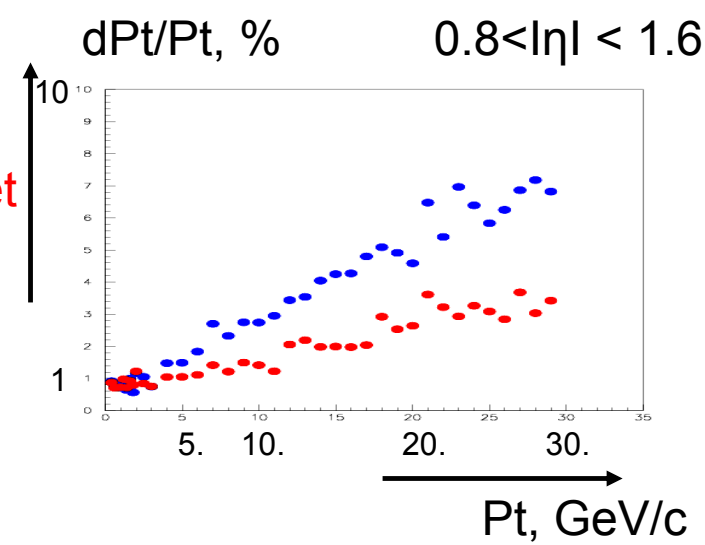
All momentum; P < 10. GeV/c

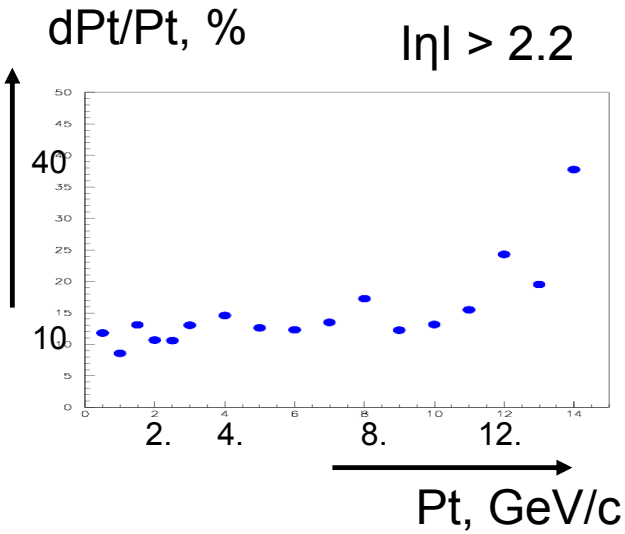
Momentum reconstruction performance (high Pt)

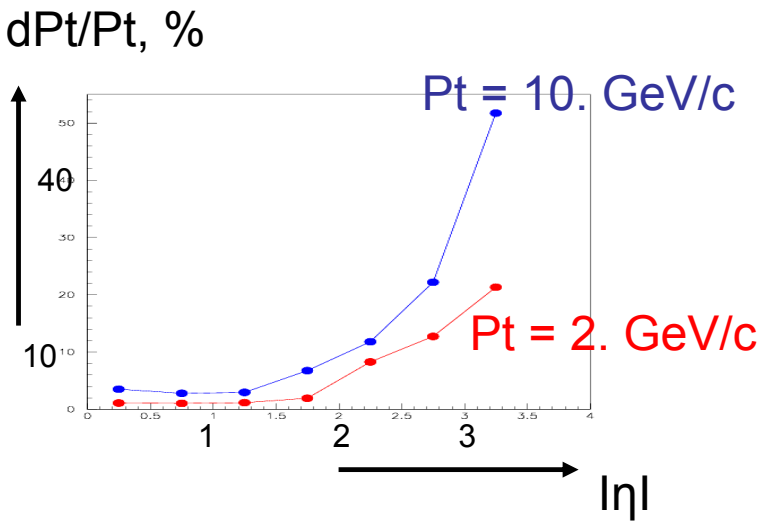


All Tracking Det

Pad Det. only

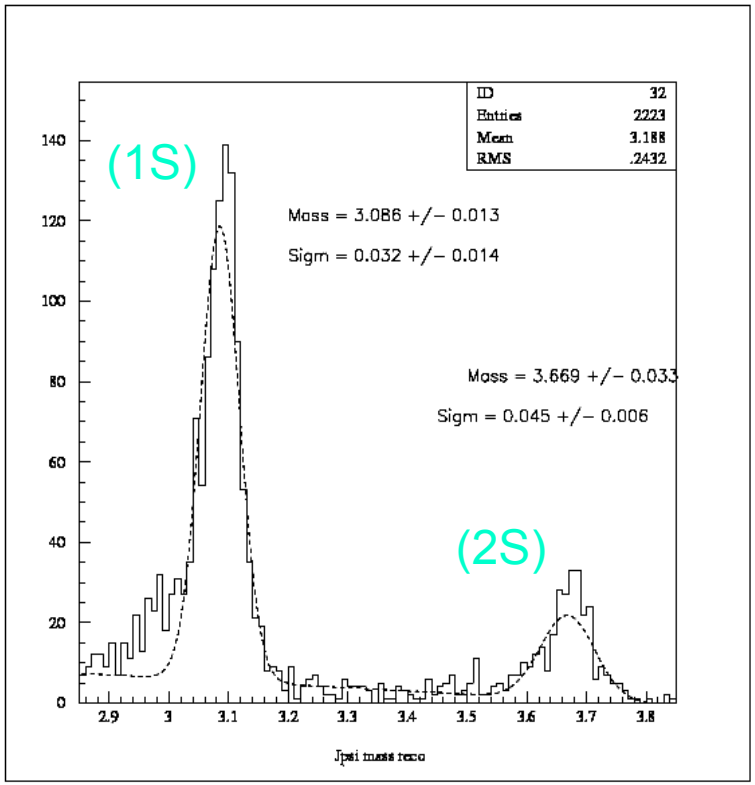




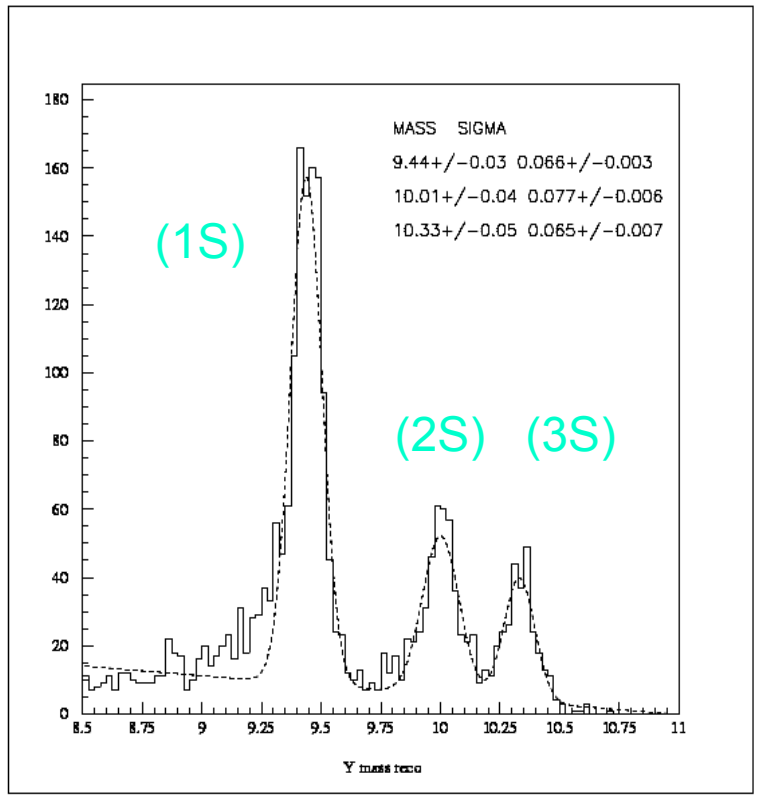


Mass reconstruction performance (variant A)

J/Ψ → e+e-

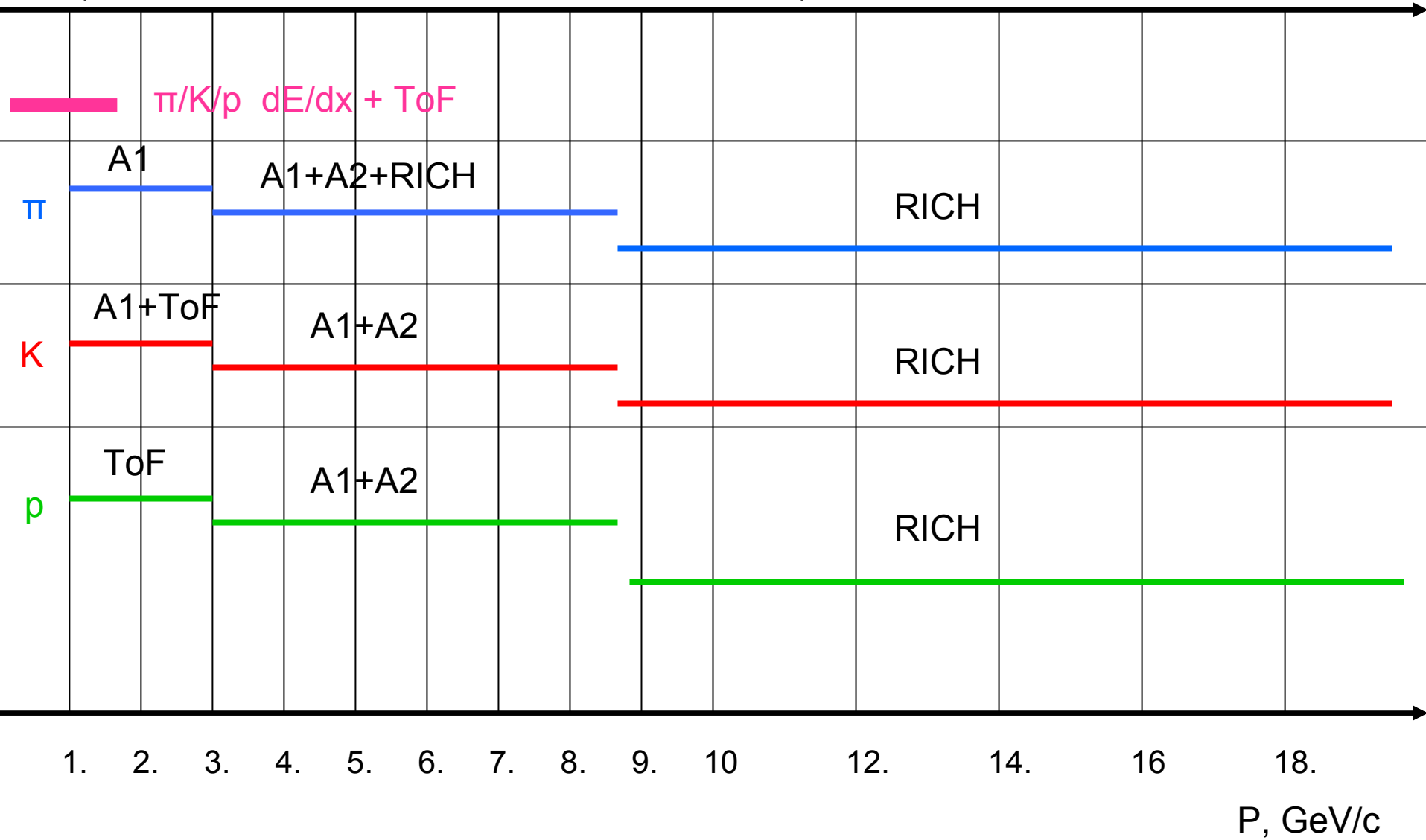


Y → e+e-

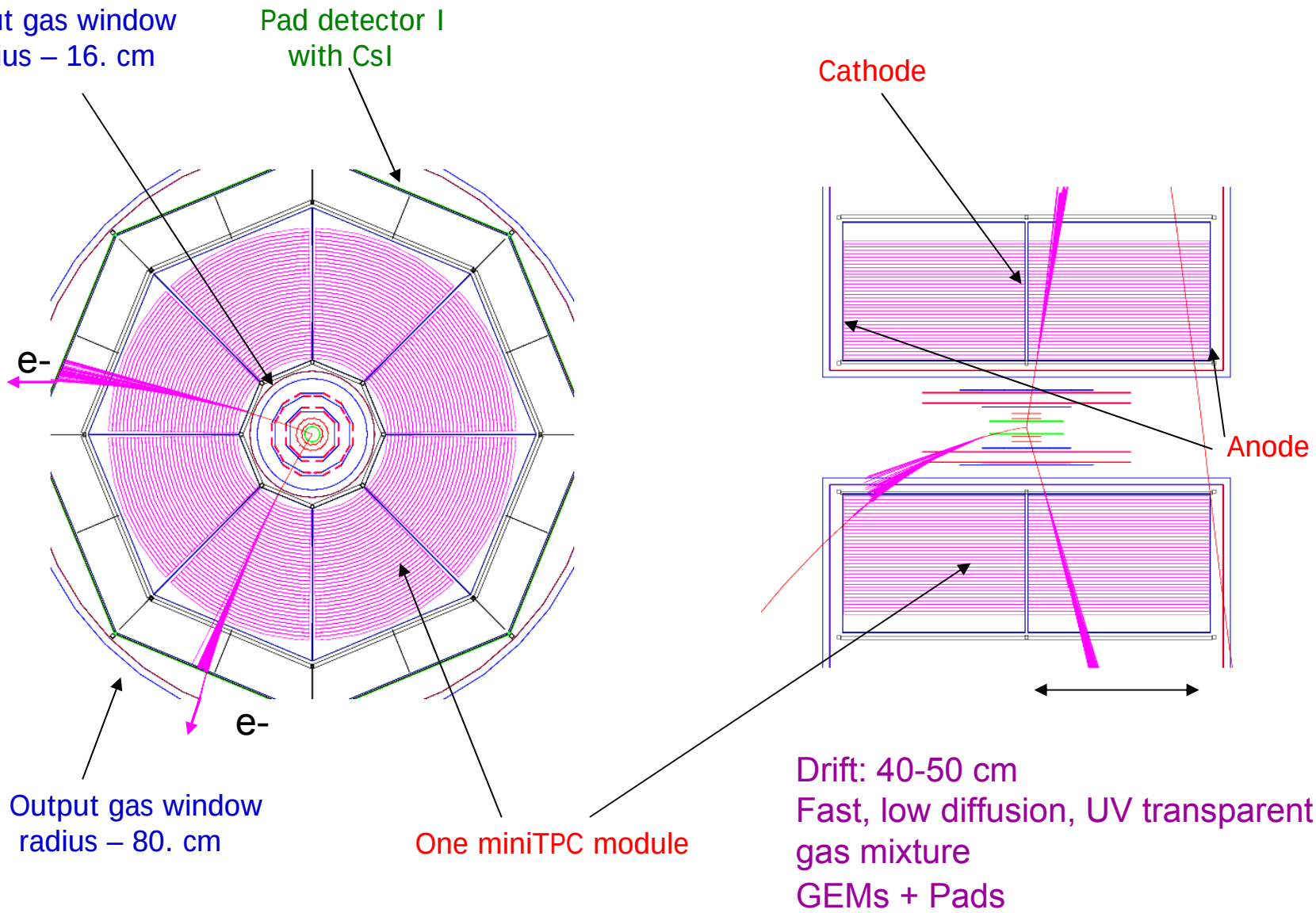


full scale simulation / reconstruction but not realistic background

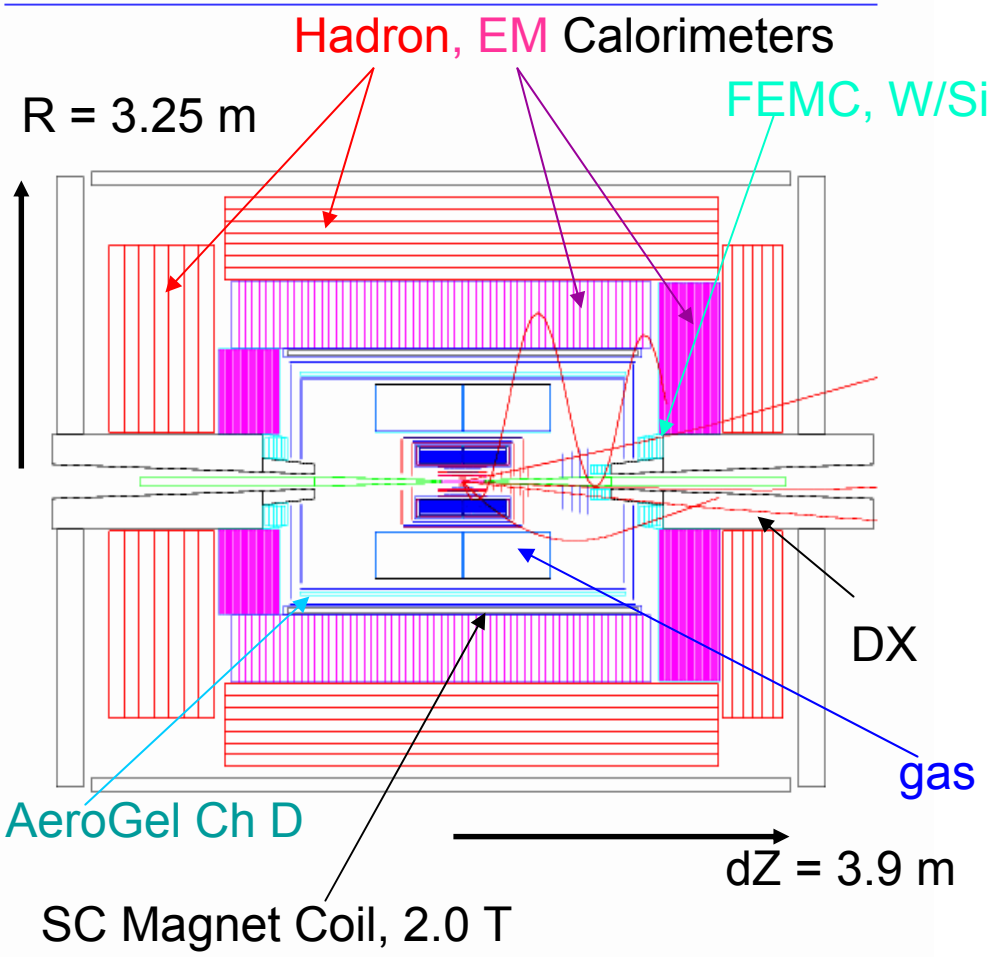
Particle Identification: dE/dX, ToF, AgChD, gas RICH, ECal, HCal/Muon Detector
(TRD or/and “mini TPC+Ch.Det” as more e/π)

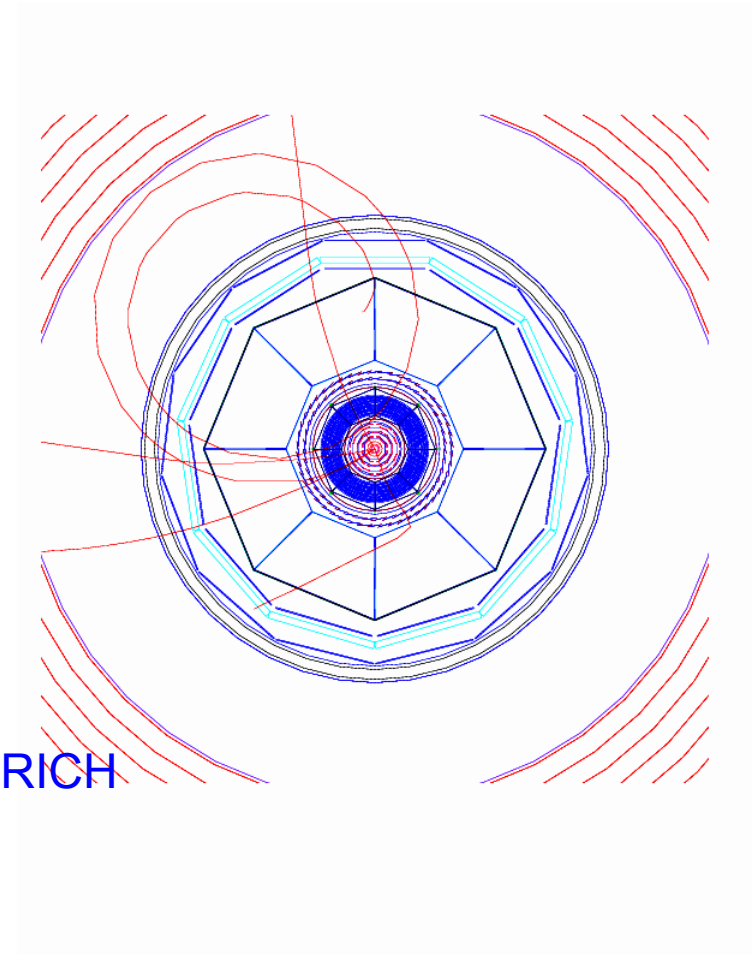


miniTPC + CsI Pad Detector, proposed variant

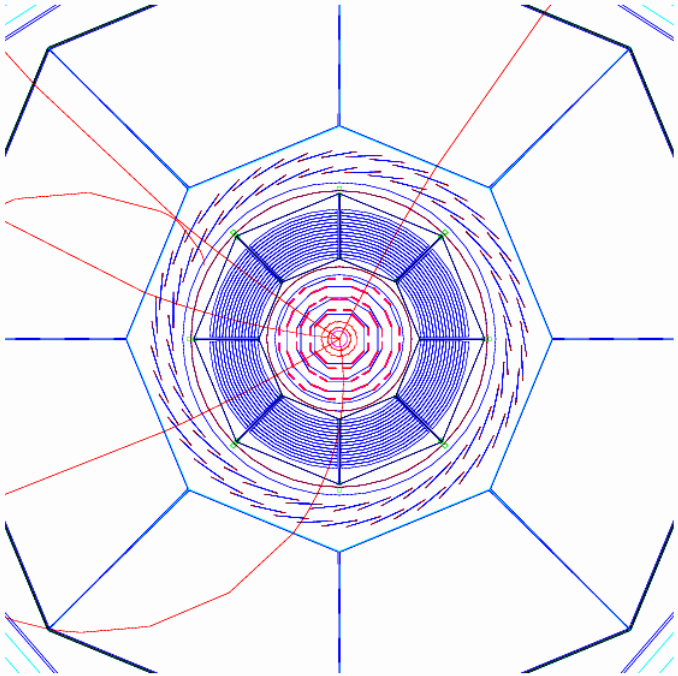


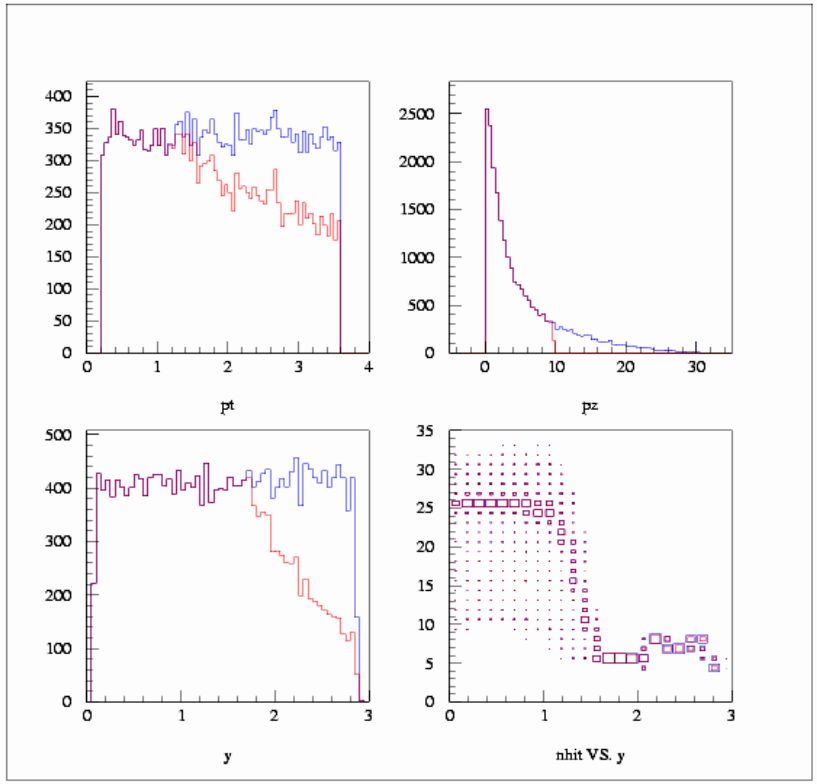
Detector Set Up, Variant Z





Detector Setup, Variant Z
Barrel tracking and Simulation conditions

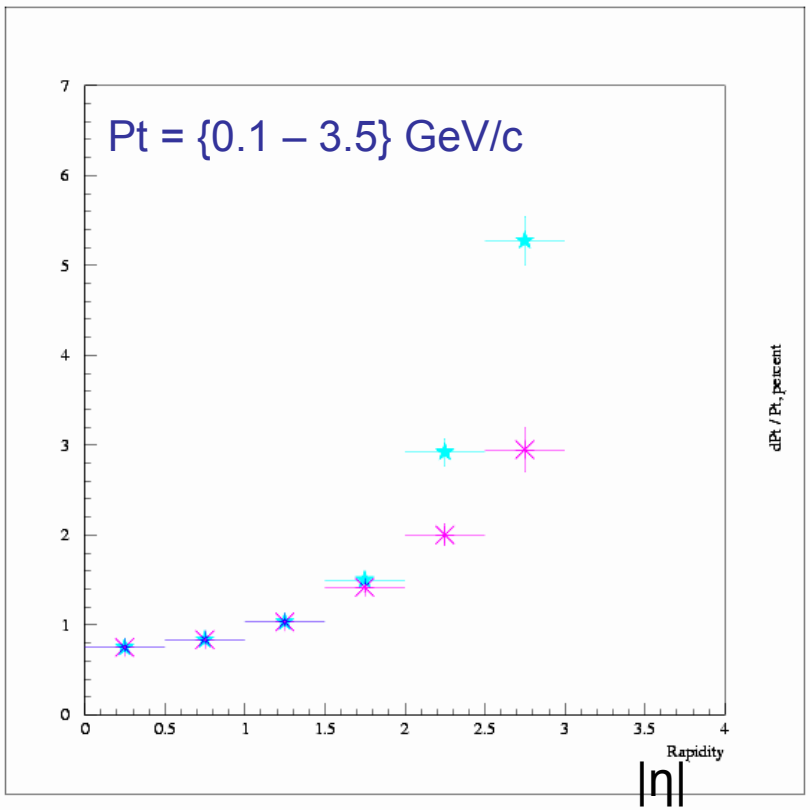




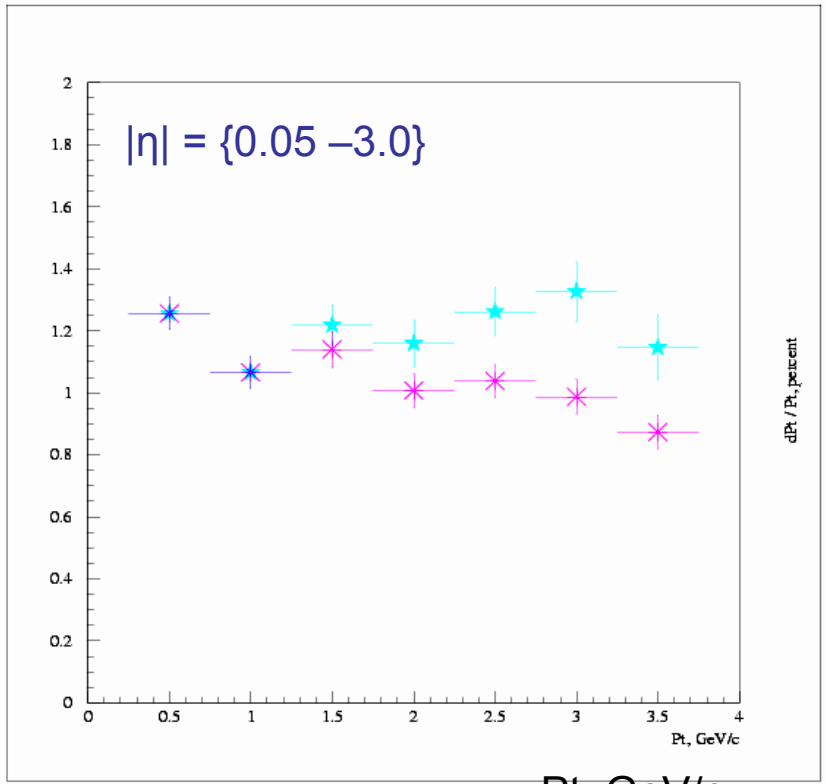
Tracking:
Si Vertex Detector, miniTPC ~15 pad rows, Si and Pad Detectors in Barrel and End Caps (micro-pattern technology). Si + Pad Detectors in Forward

Detector setup, Variant Z.
Pt reconstruction performance.

dPt/Pt, %



dPt/Pt, %



Pt, GeV/c

All momentum; P < 10. GeV/c

Instead of conclusion

- ✓ team should be organized
- ✓ careful simulation / reconstruction job for different detector set-up variants (decision / selection in a future)
- ✓ R&D activity
- ✓ Maximum possible “yellow beam line shift” – “R space available for the Detector”
- ✓ IR design – “Z space available”

Detector Variant on the basis of SLD (variant A)

"E side"

HC, "catcher" & Muon Detector. 15 planes,
(5. cm Fe, streamer tubes, 0.3 x 4 cm resolution)

SC Magnet Coil, 1.5 T

EMC; Crystals + Fe(Pb)/Sc
(accordion type) or LAr variant, 6x6 mrad towers

ToF

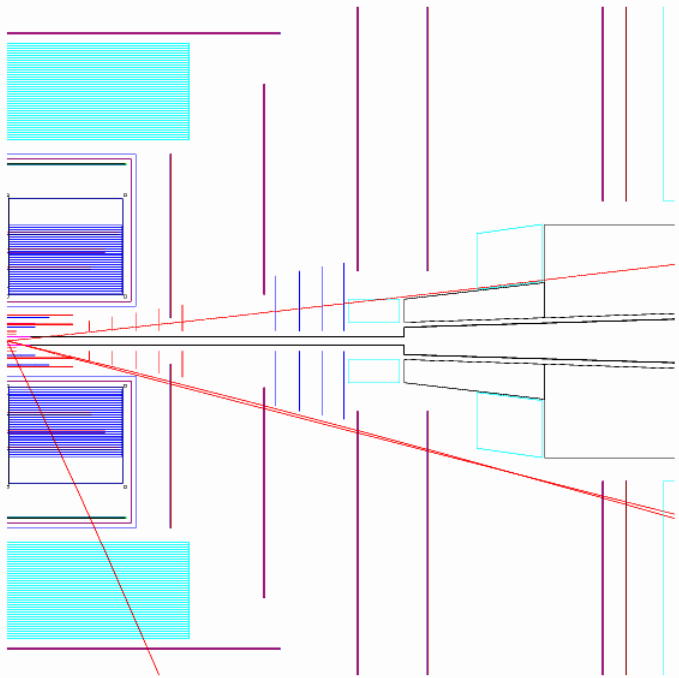
DX

R = 2.8 m

Gas RICH

dZ = 3.0 m

EEMC, Fe/Sc or W/Si



Tracking:
- Si Vertex Detector,
- miniTPC ~35 pad rows,
- 4-6 Pad Detectors in Barrel and End Caps, micro-pattern technology.
- Si + Pad Detectors in Forward