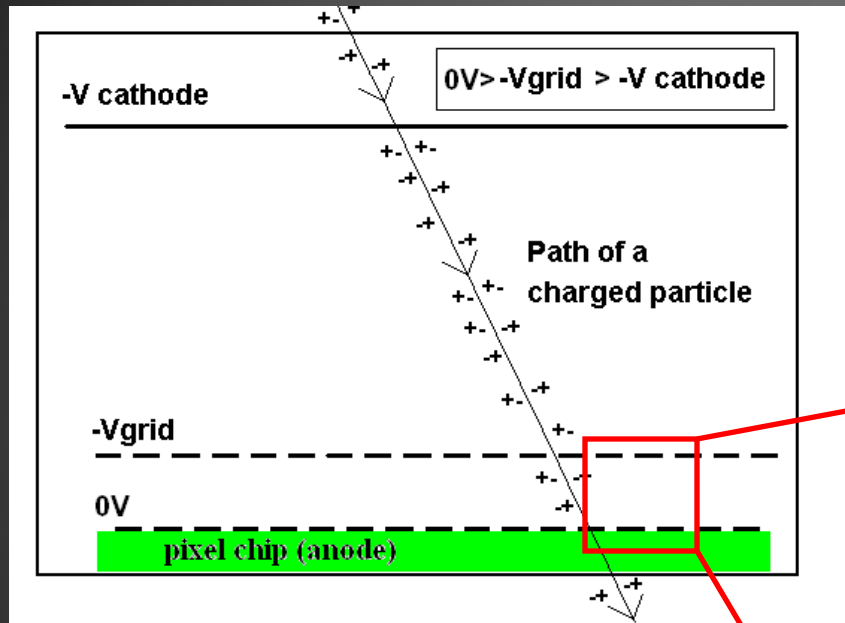


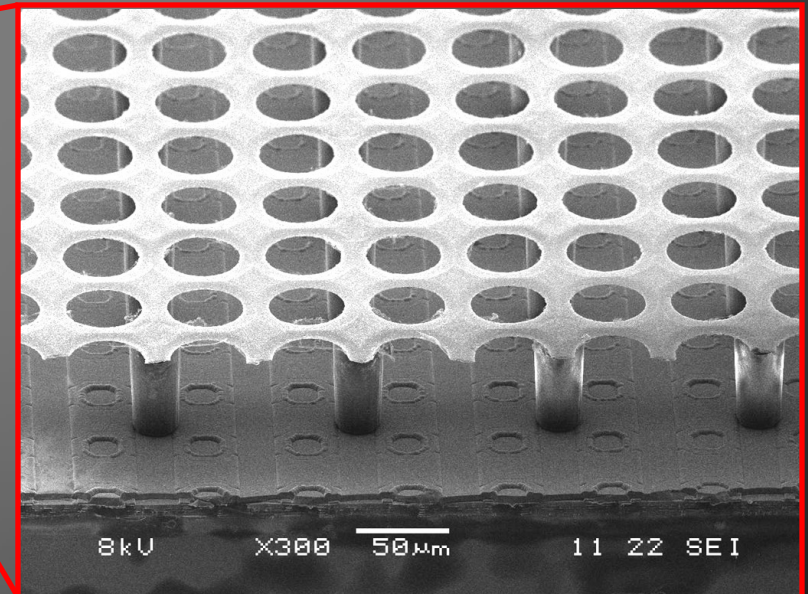
Gossip/GridPix
LHeC
Nov 12, 2010

HvdG
Nikhef

GridPix detectors

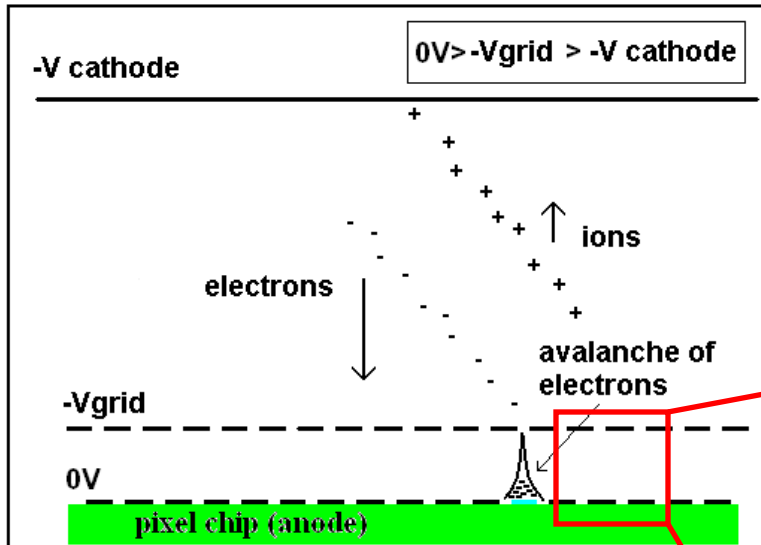


- Gas is the active medium
- Grid made by MEMS technology (Univ. of Twente)

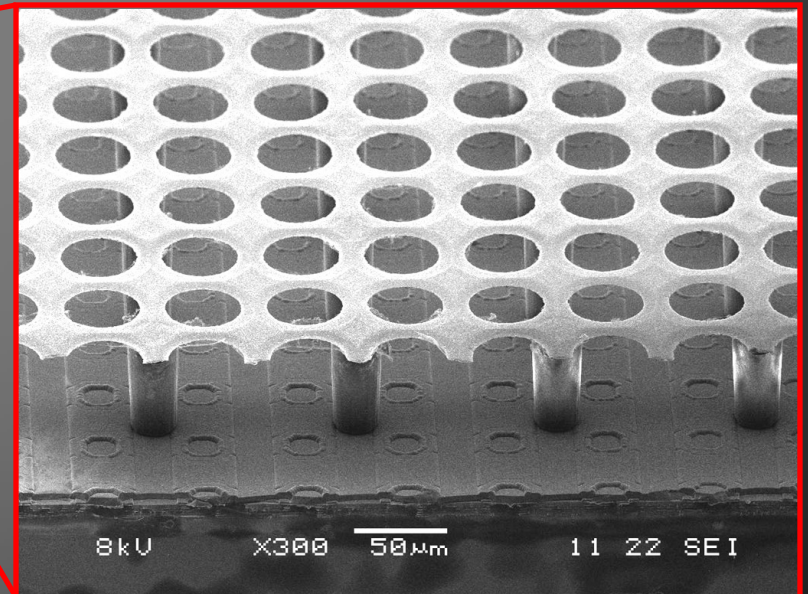


- Cathode
 - Drift volume ($\sim mm$ to $\sim m$)
- Grid
 - Gain region ($\sim 50\ \mu m$)
- Pixel readout chip

GridPix detectors

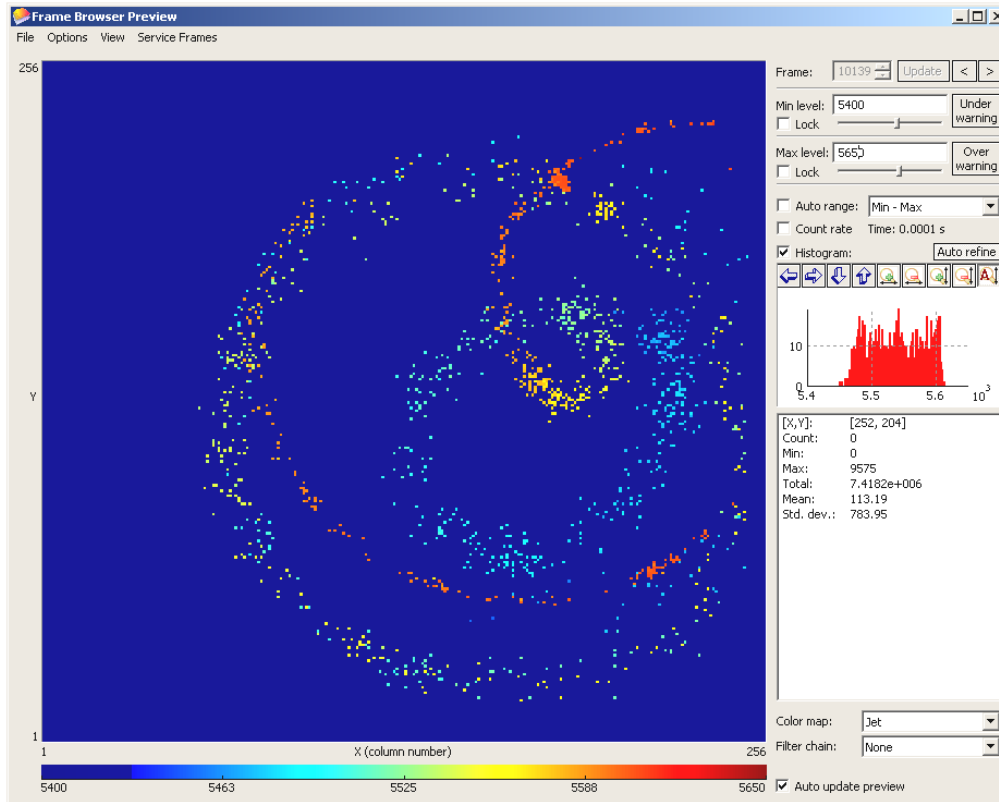


- Pixels of chip: x & y-coordinate
- Drift time gives z-coordinate
- Sensitive to single electrons

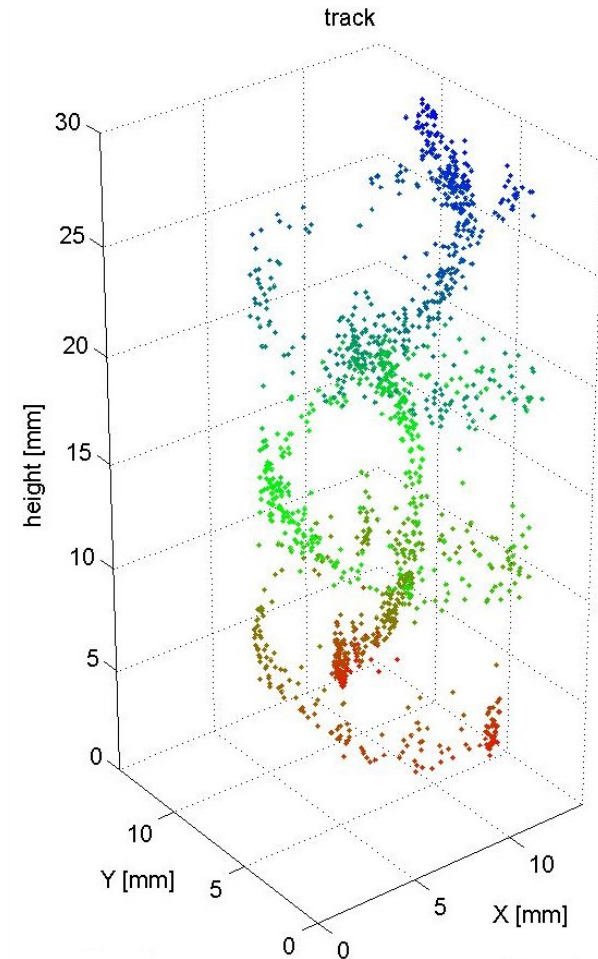


- Cathode
 - Drift volume (~ 0.1 -few kV/cm)
- Grid
 - Gain region (~ 50 - $150\ kV/cm$)
- Pixel readout chip

GridPix detectors



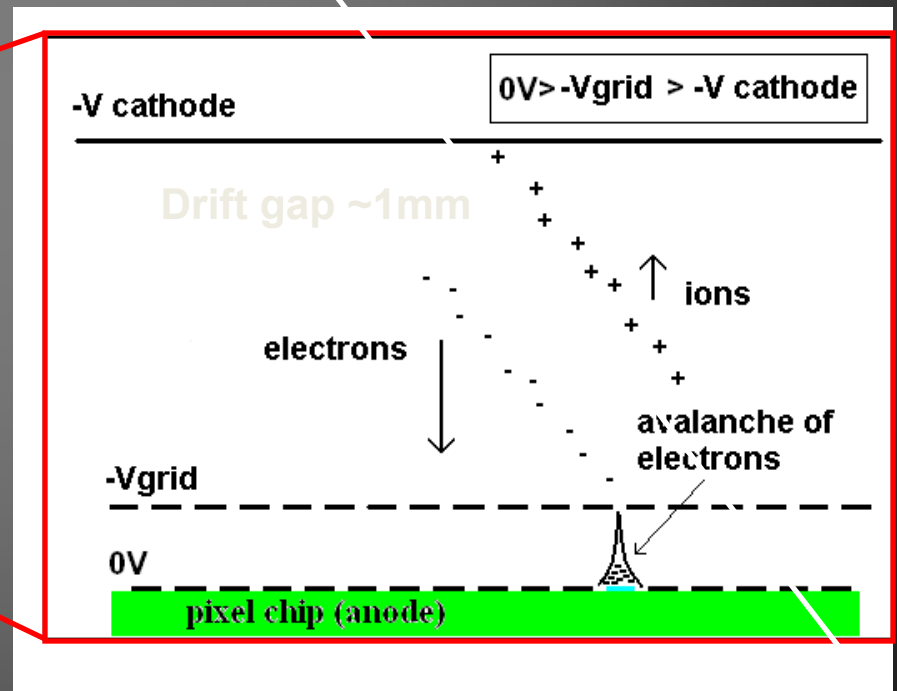
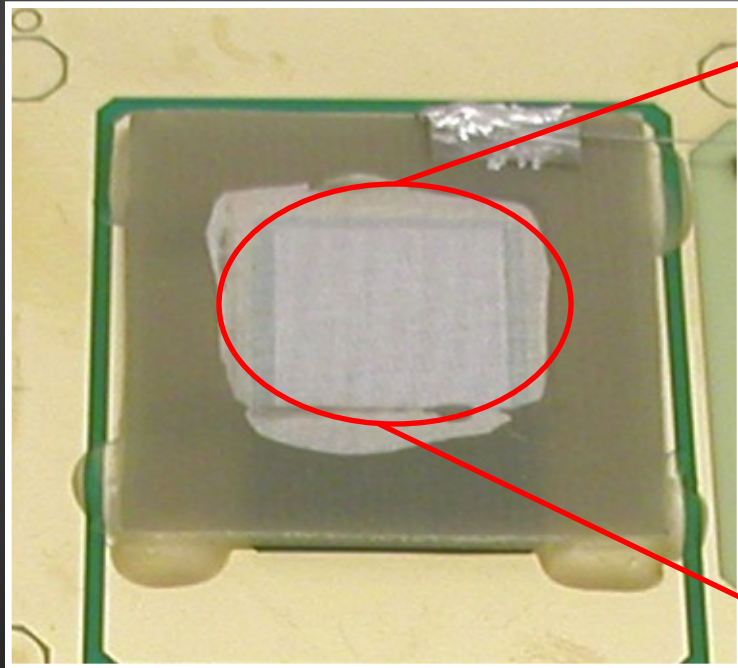
Projection of tracks of two β particles in B field
(Pixelman software: IEAP, Prague)



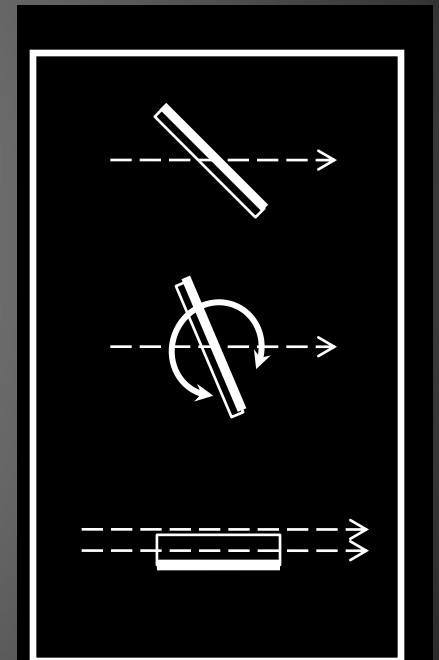
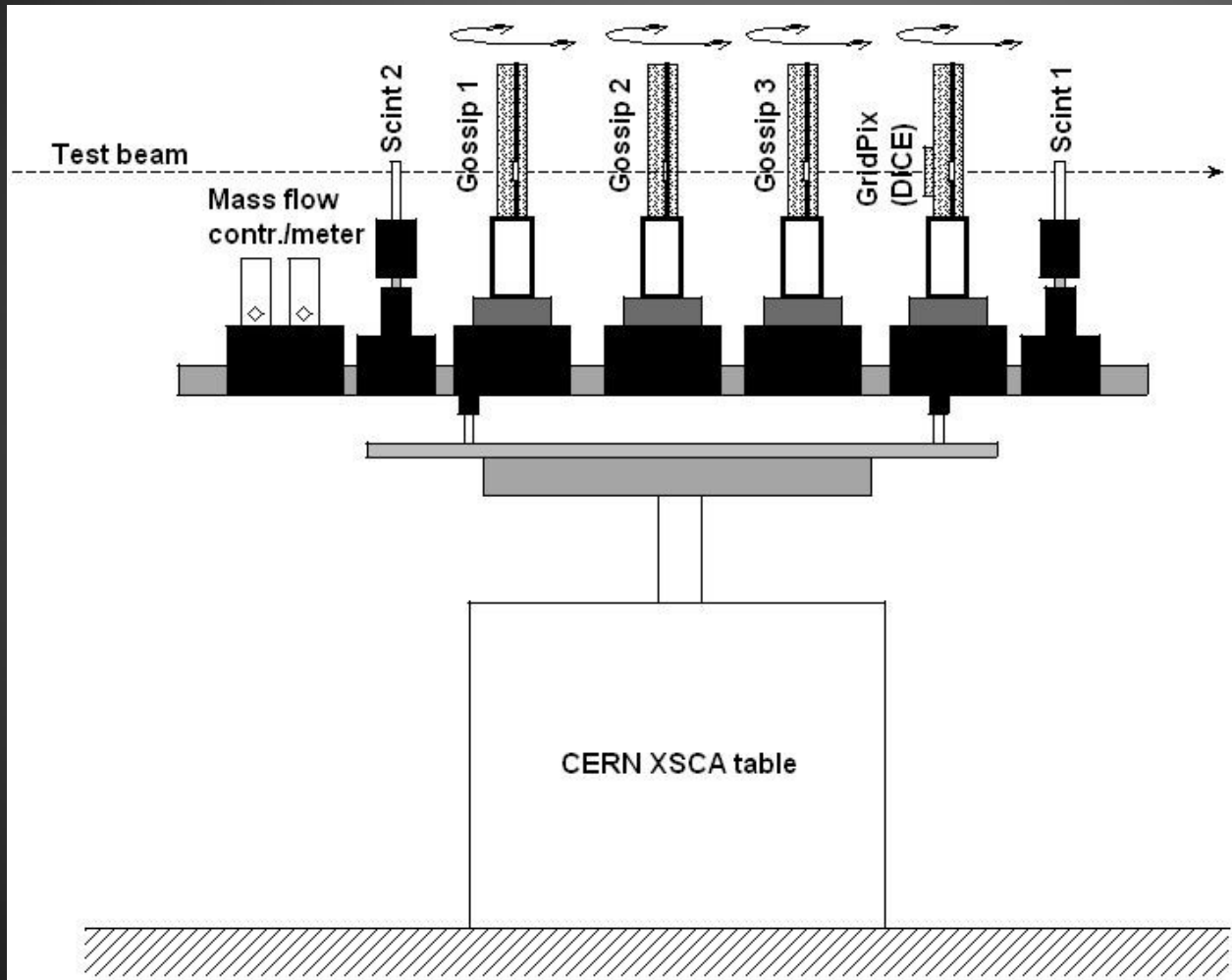
3D reconstructed tracks, dots
represent single electrons

Gas On Slimmed Silicon Pixels

- Low mass radiation hard vertex detector
- Use only ~1mm gas volume instead of silicon
- TimePix chips

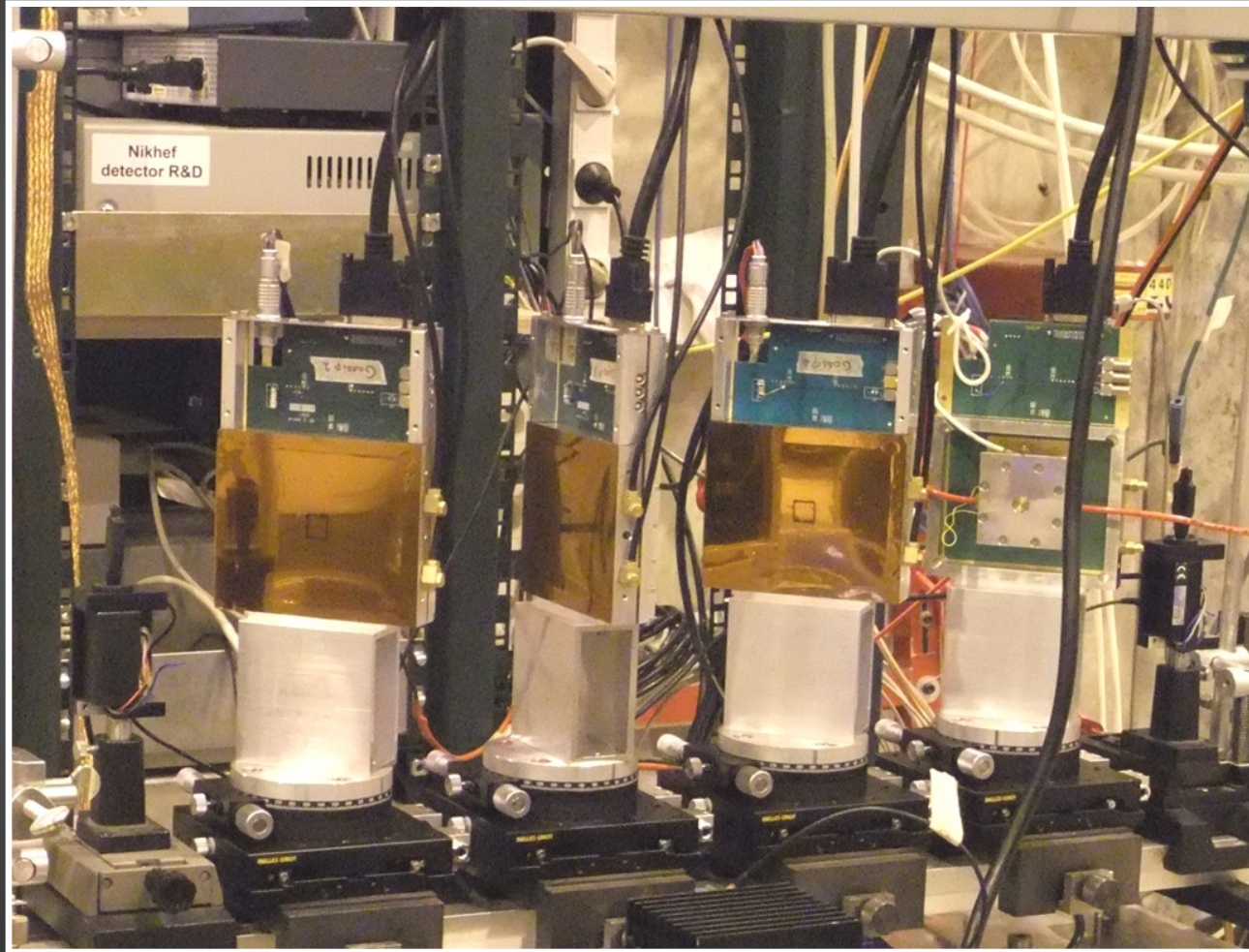


The Gossip set up



Testbeam: CERN, H4, SPS: RD51 area

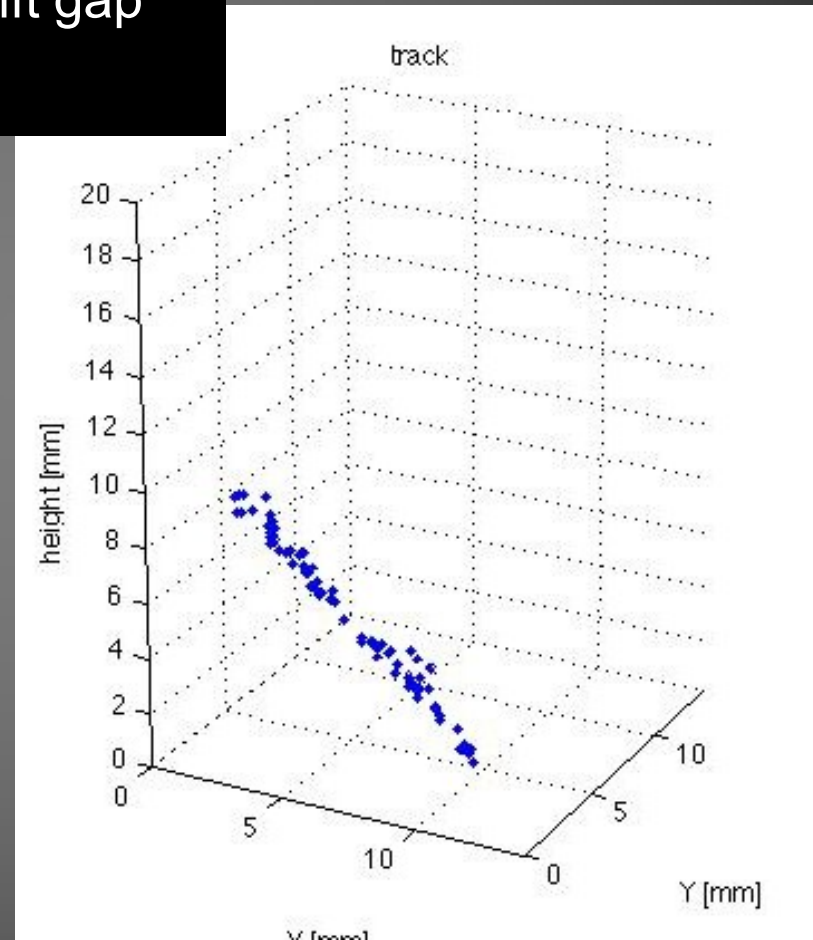
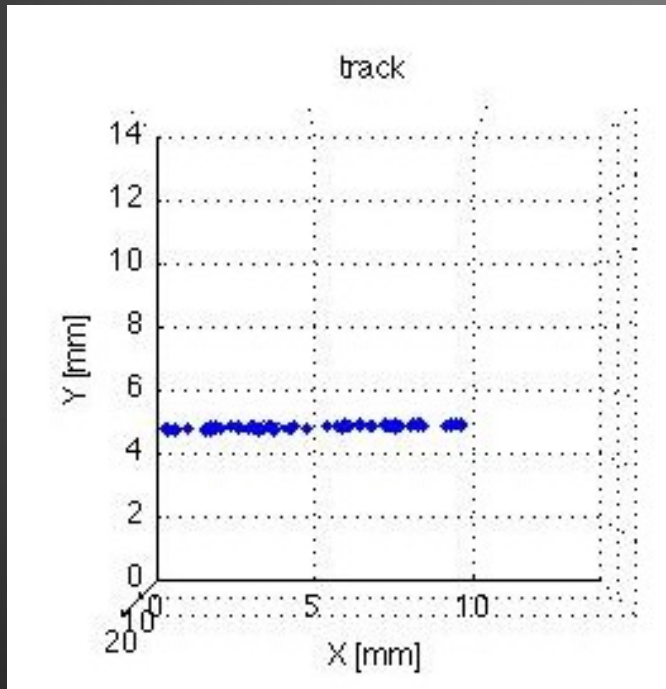
The Gossip set up



The recorded tracks

The last detector has a 19.3 mm drift gap

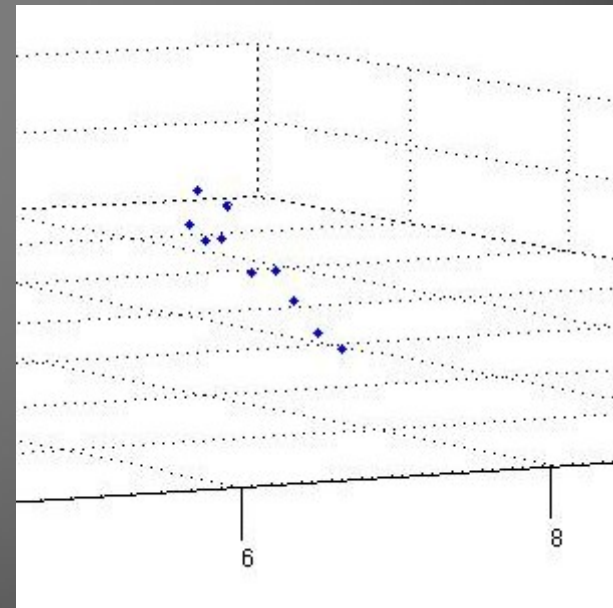
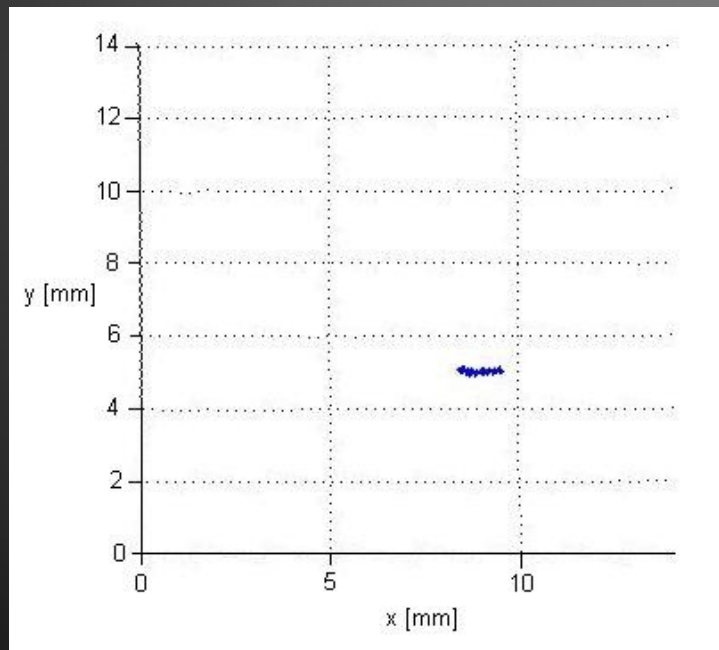
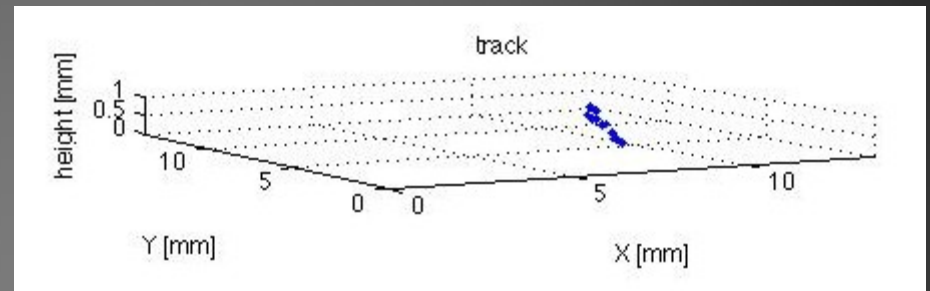
- many electrons released



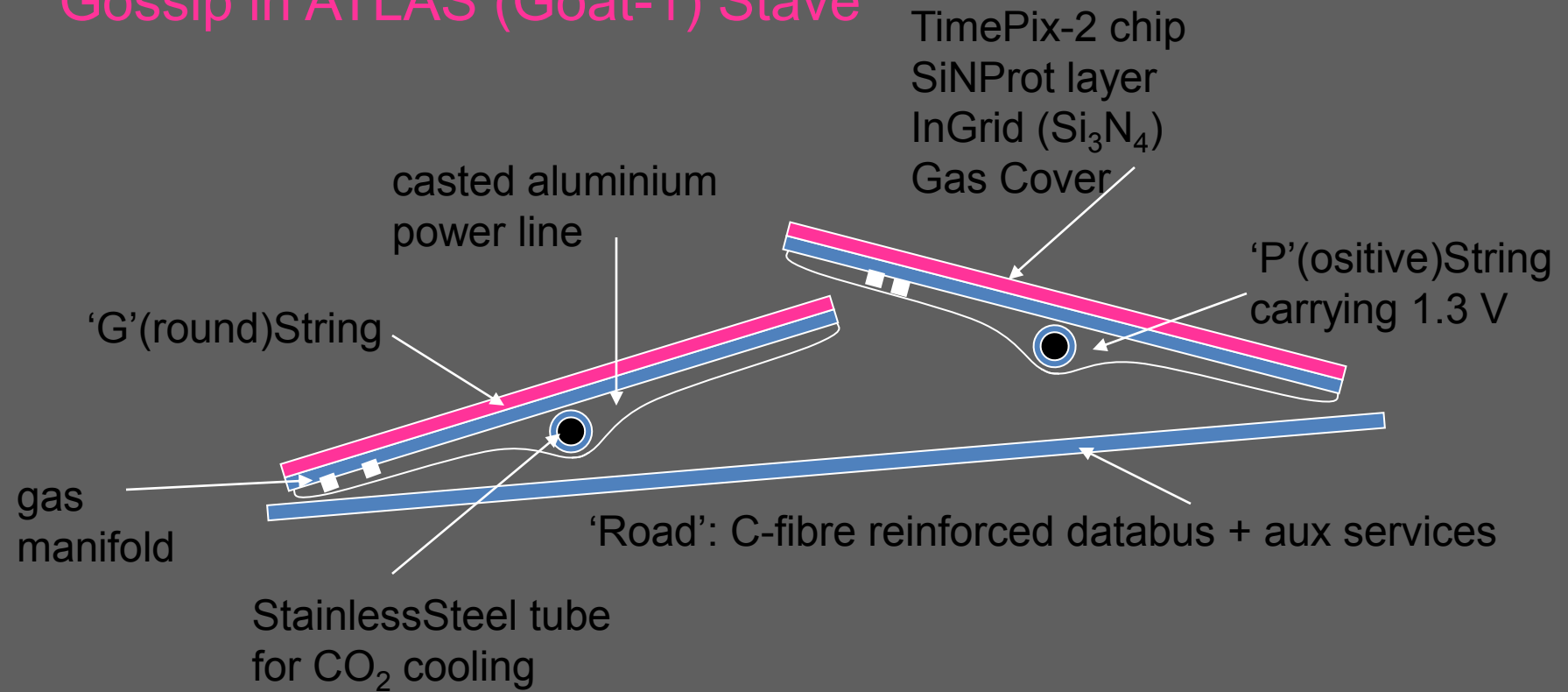
The recorded tracks

Gossips have $< 1\text{mm}$ drift gap

- under 45deg , 1.4 mm track
- only few electrons released



Gossip in ATLAS (Goat-1) Stave

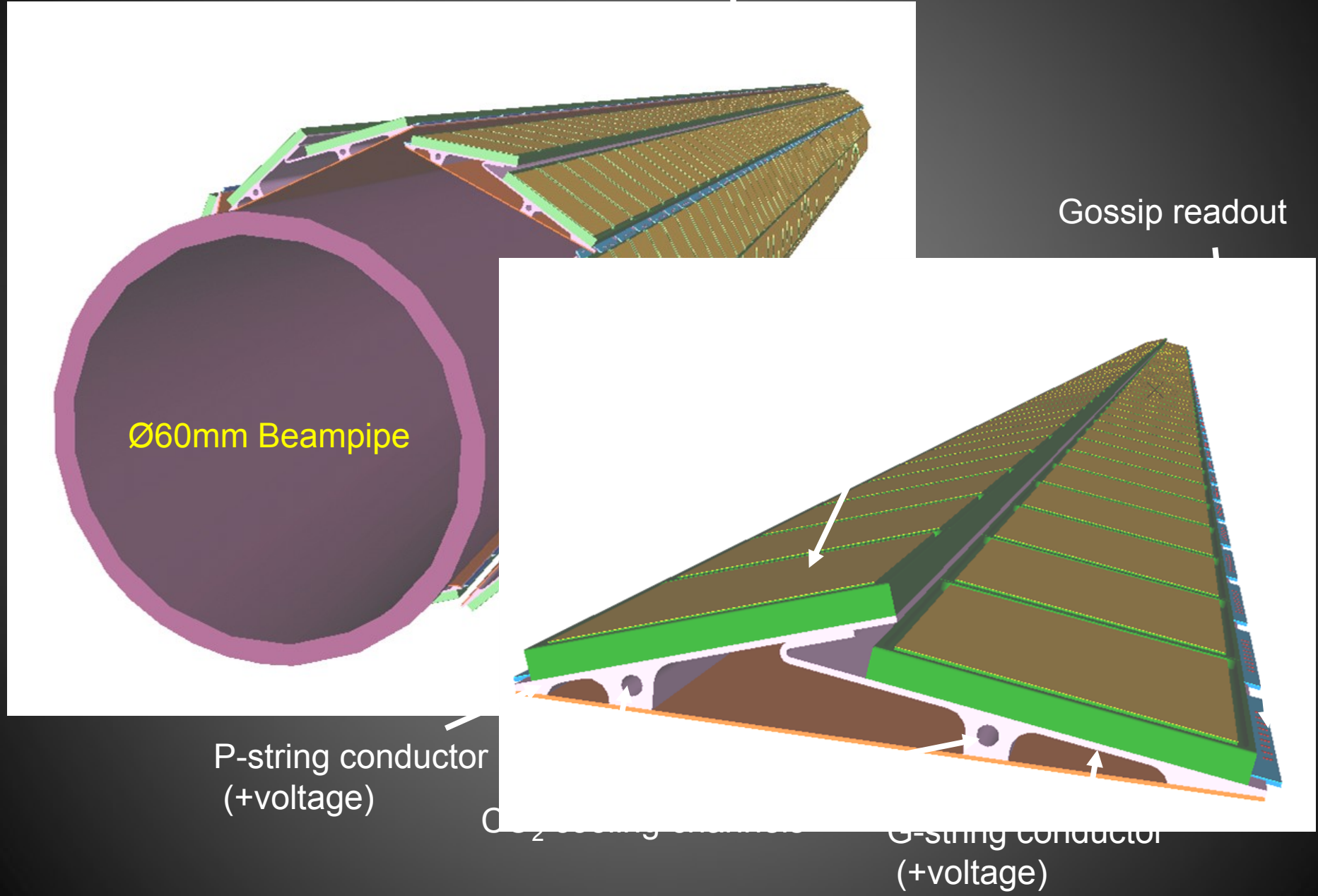


Stiff, light Stave formed by

G-string
P-string
Road

triangle

GOAT: **GO**ssip in **AT**las



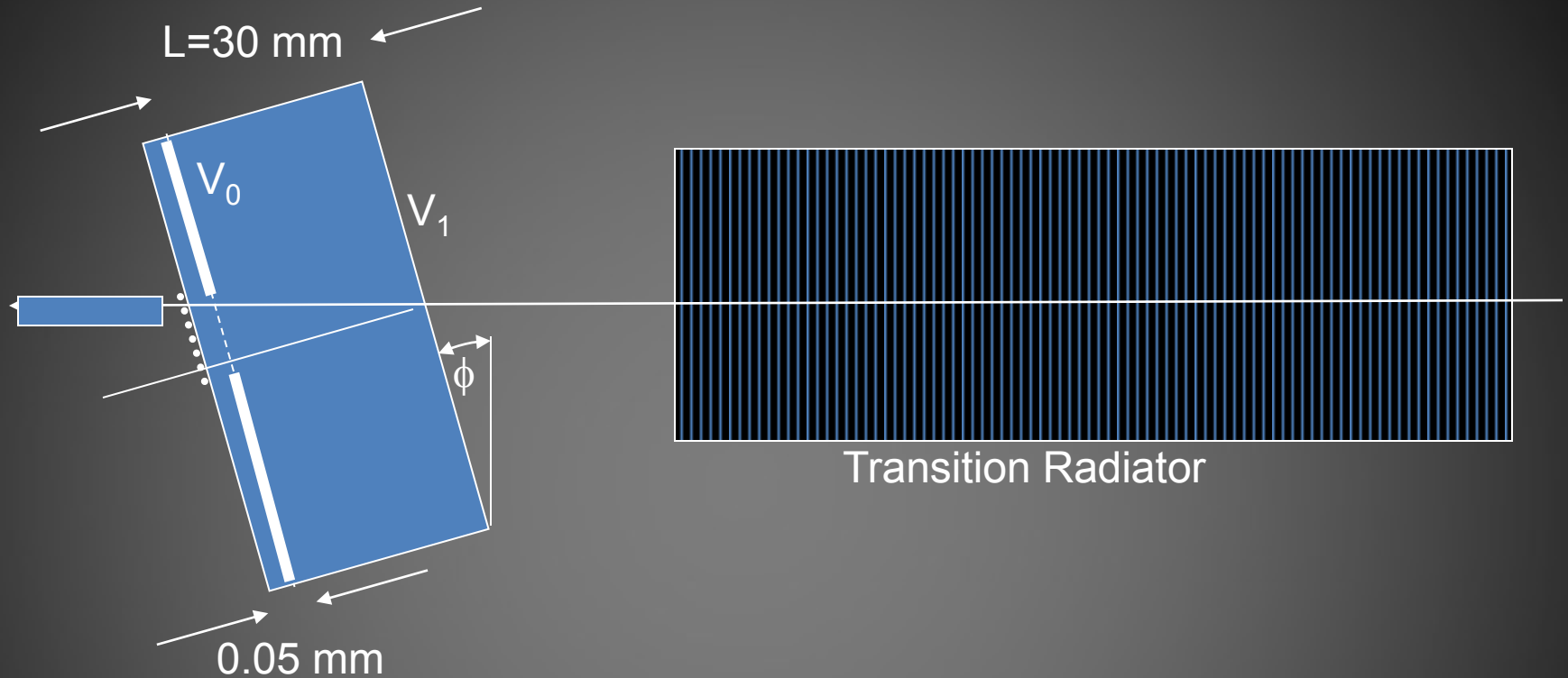
$\text{\O}60\text{mm}$ Beampipe

Gossip readout

P-string conductor
(+voltage)

G-string conductor
(+voltage)

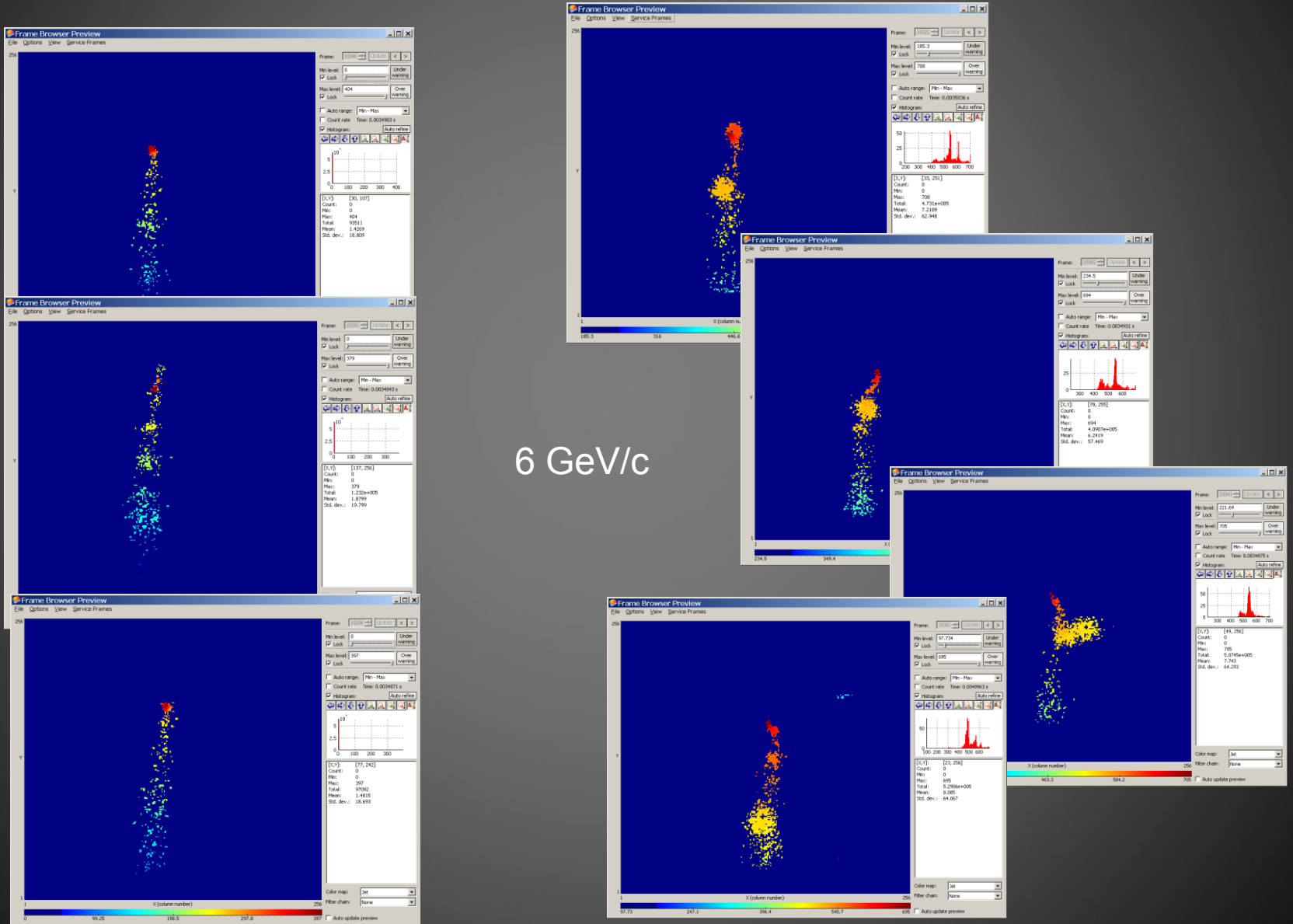
Testbeam Nov 5 – 12, 2007
PS/T9: electrons and pions, 1 – 15 GeV/c

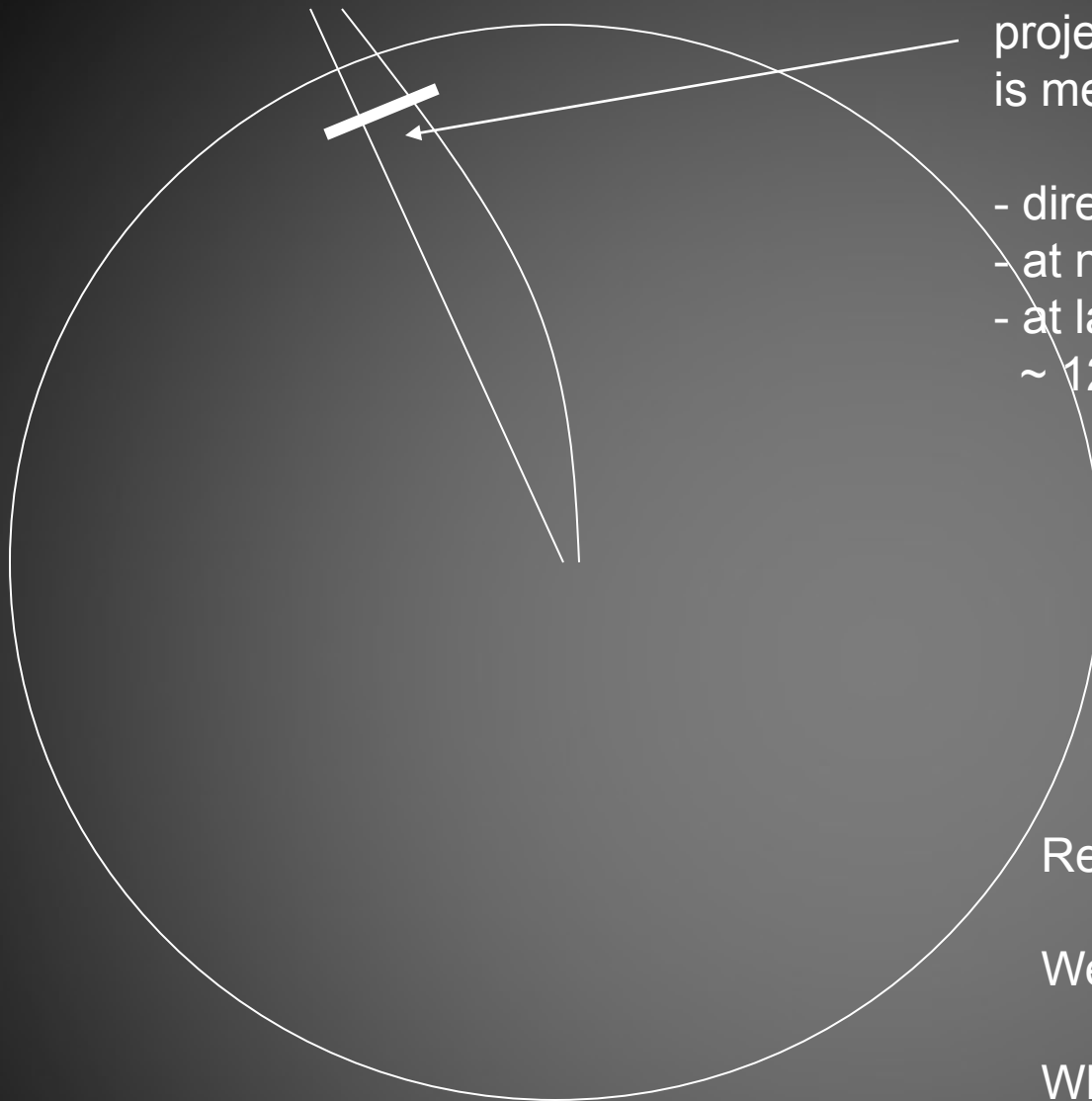


Anatoli Romaniouk, Serguei Morozov, Serguei Konovalov
Martin Fransen, Fred Hartjes, Max Chefdeville, Victor Blanco Carballo

Particle Identification

Samples pions (left) and electrons (right)





projected track length
is measure for momentum:

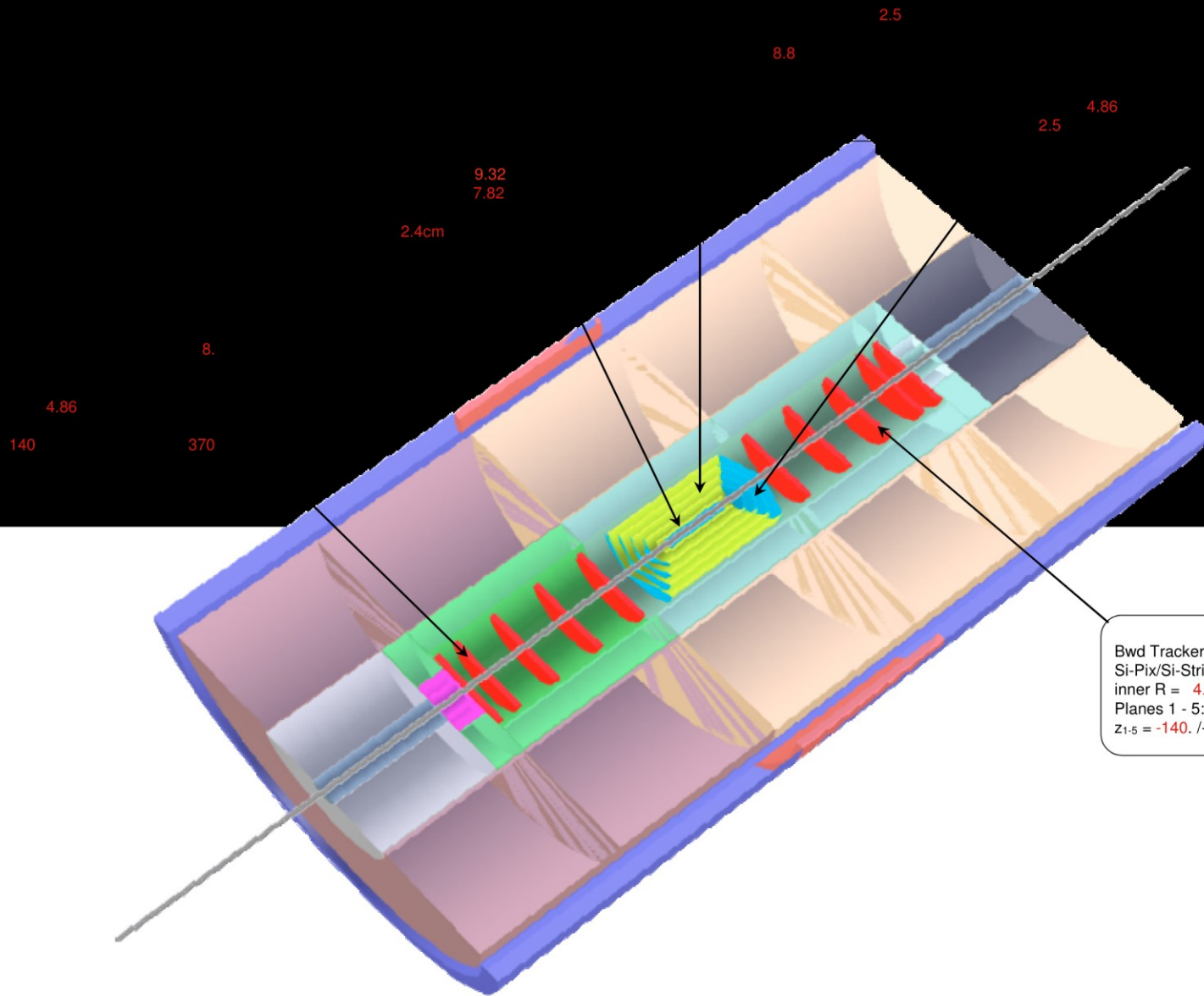
- directly available (LVL1)
- at no (extra) cost (mass, power)
- at larger R: gas drift gap ~20 mm
~ 12 BXs

Requires fast on-board processing

We are using 130 nm tech.

What about 45 nm tech?

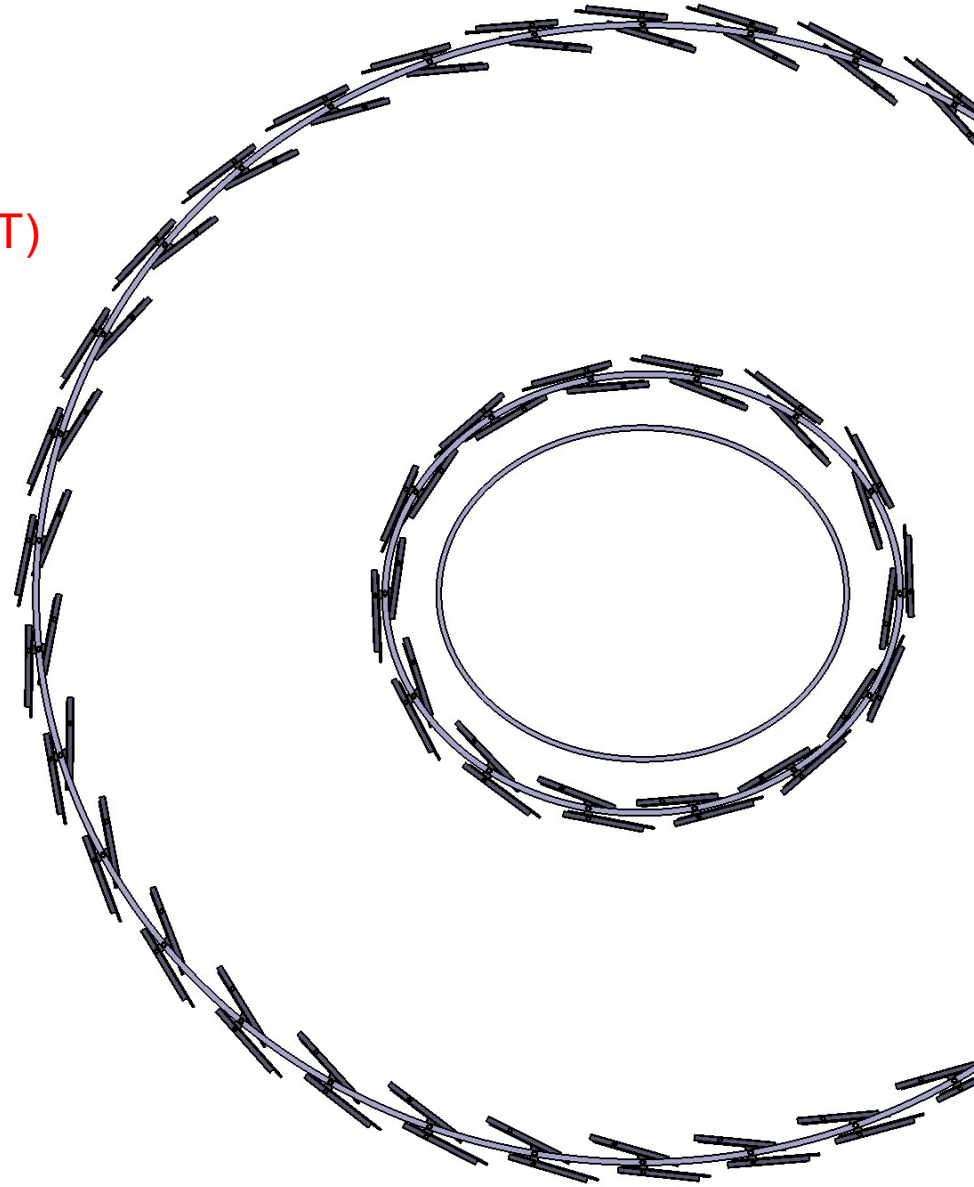
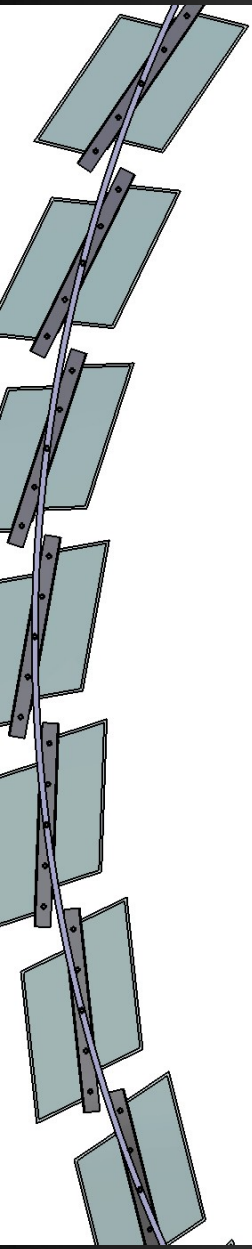
LVL1 trigger from inner tracker

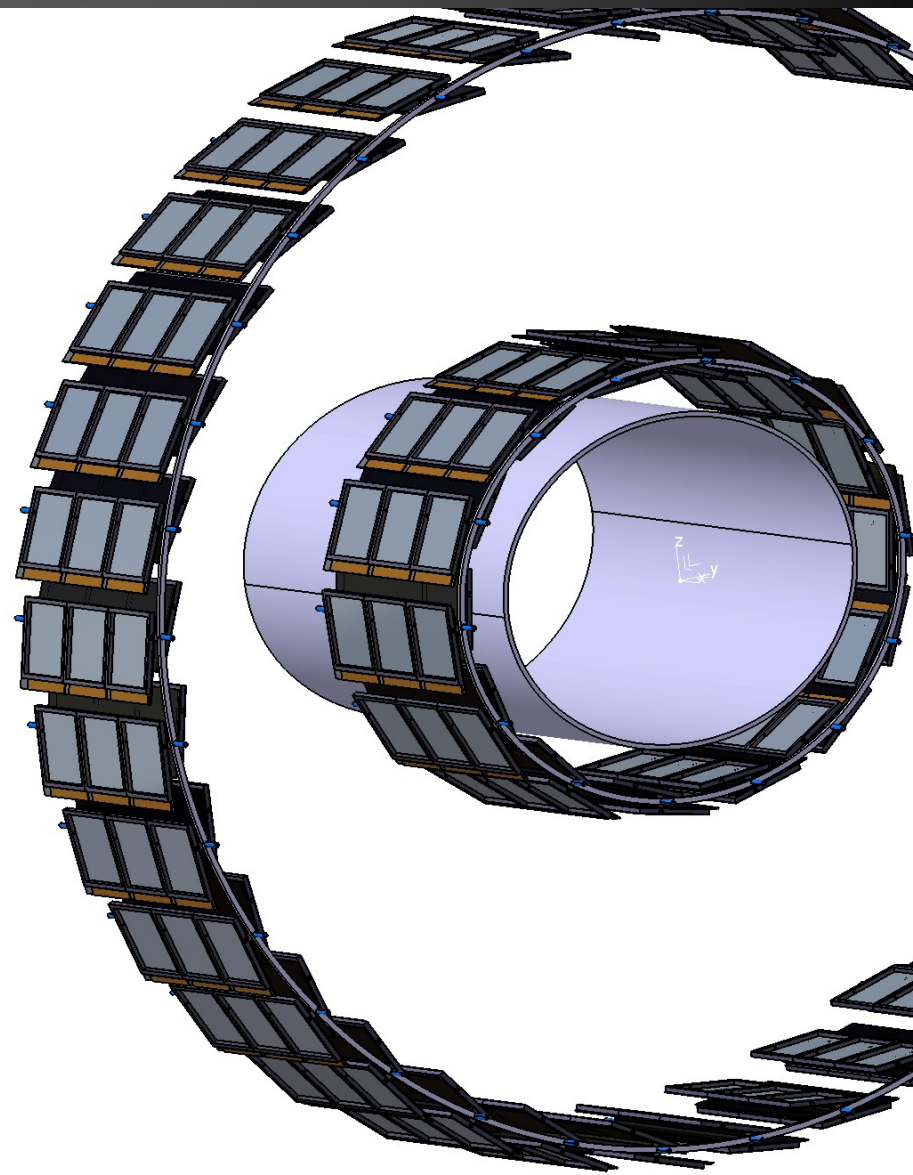
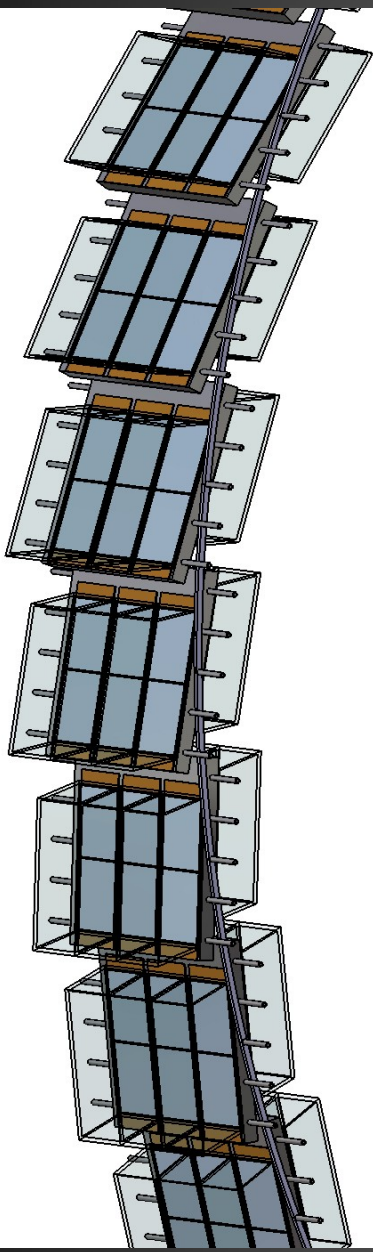


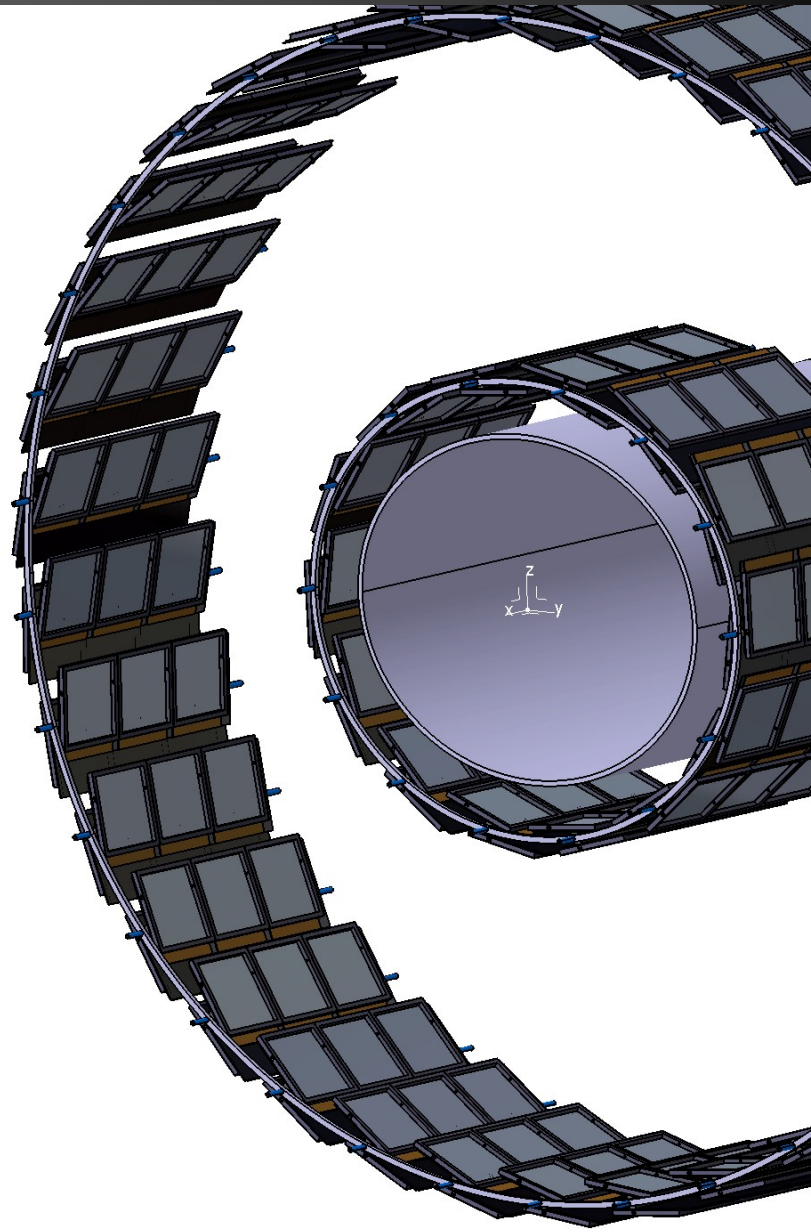
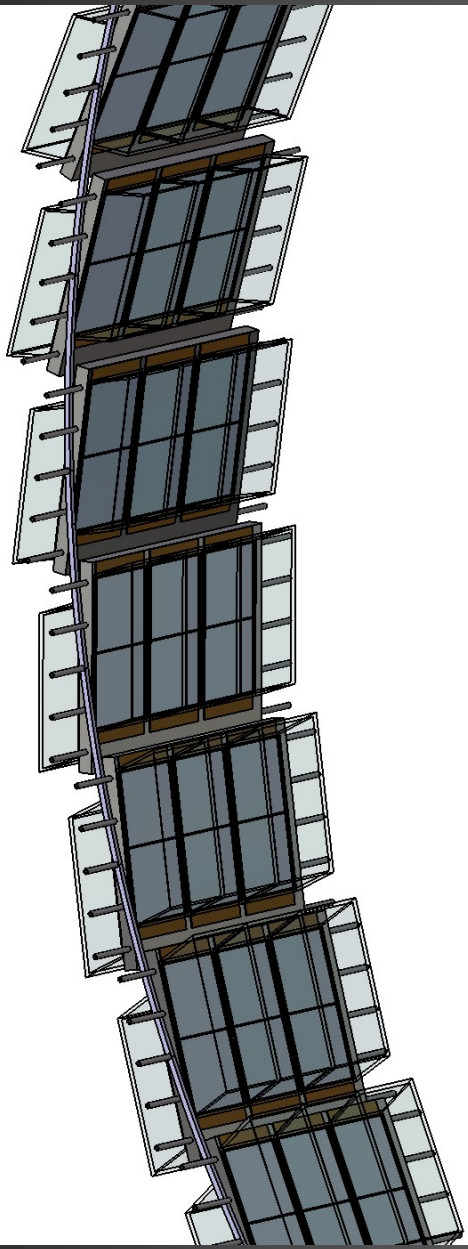
Bwd Tracker - active Thickness 8. cm each
 Si-Pix/Si-Strip/SiGas Tracker:
 inner R = 4.86 cm; outer R = 61.3 cm
 Planes 1 - 5:
 z₁₋₅ = -140. /-210. /-280. /-340. /-370. cm

Gossip/GridPix in LHeC

~ 4 layers pixel Gossips
1 (double) layer LVL1 (+ TRT)







See for many issues:

<http://www.nikhef.nl/~d90/gossip/RD51ATLASGossip.pdf>

- detector layer radiation length
- rate effects: space charge, occupancy
- ageing
- vertex layer performance:
 - track efficiency
 - position resolution
 - rate effects
- LVL1 performance
- TRT performance

Nikhef can deliver information & hardware

Nikhef can NOT participate in LHeC:
representative required