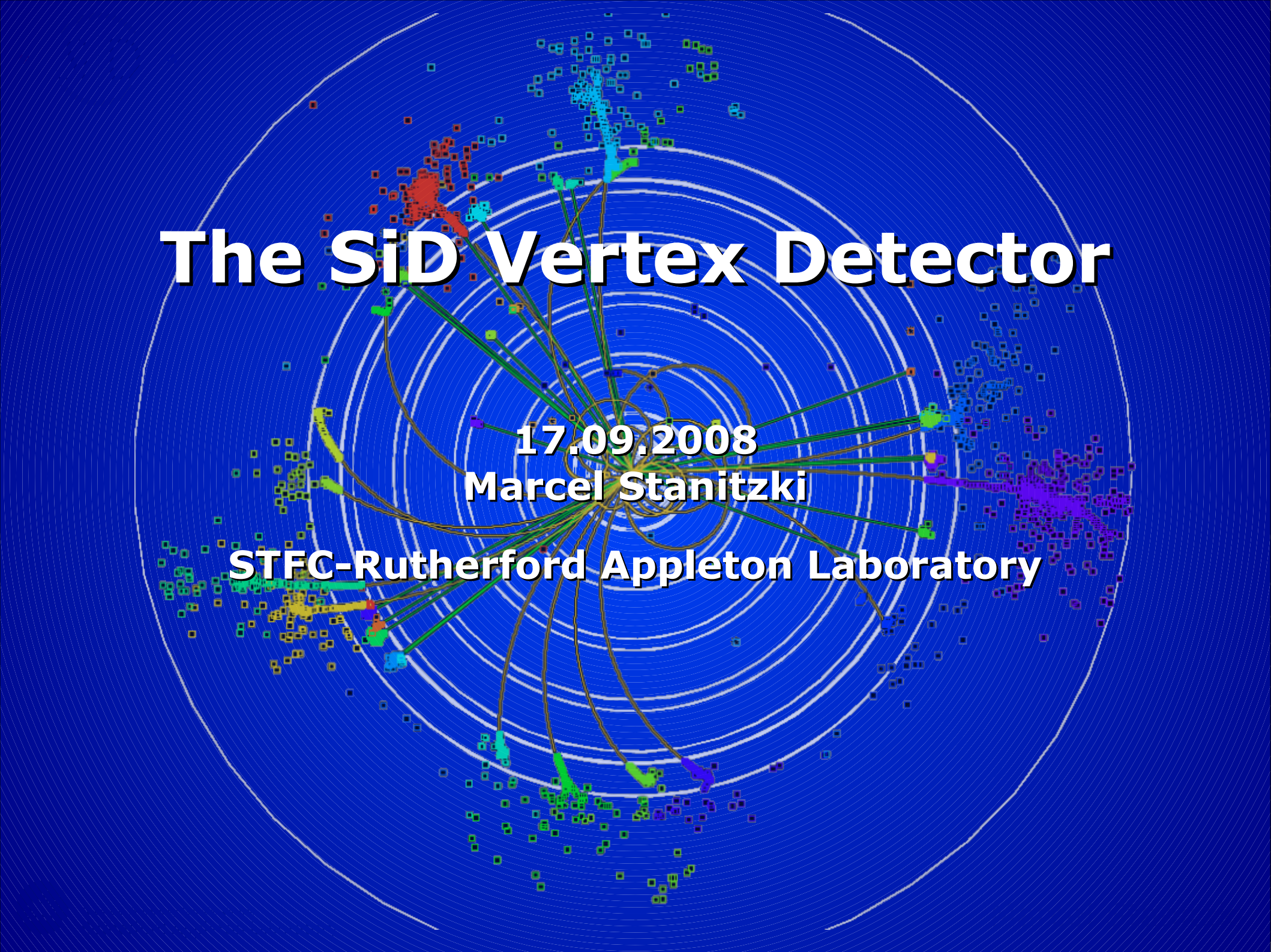

The SiD Vertex Detector

17.09.2008

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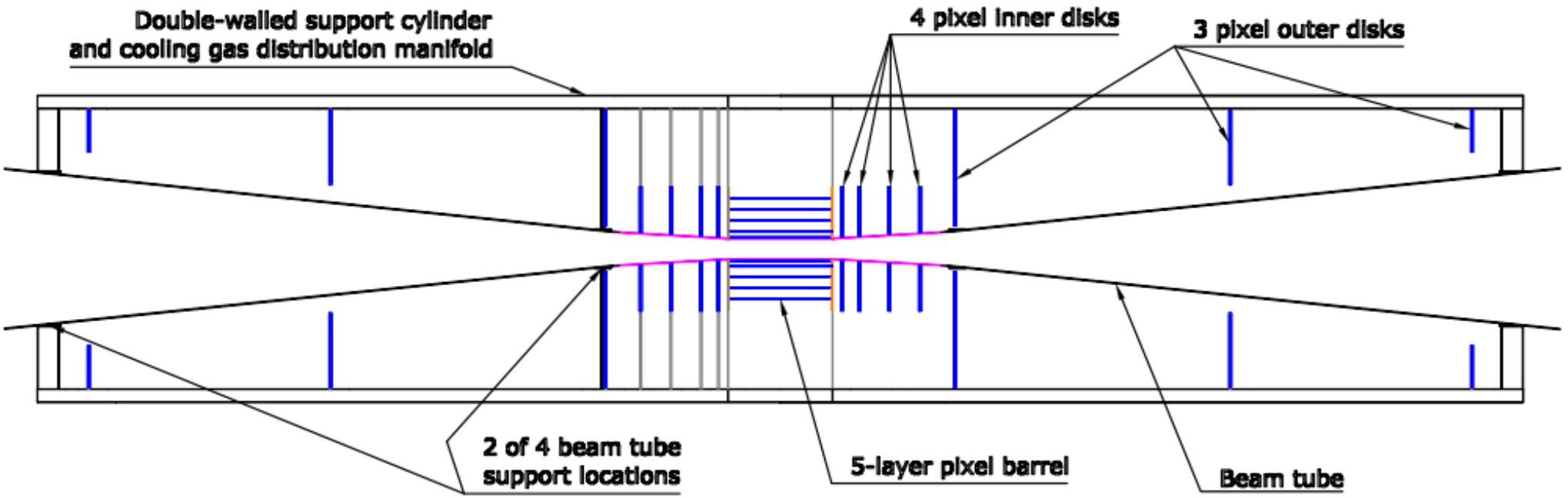
SiD Overview

- Compact PFA detector
  - Coil radius = 2.6 m
- High field
  - 5 T
- All silicon tracking
  - 5 layer Vertex detector
  - 5 layer Tracker
- Barrel +Disks approach

The SiD Vertex detector

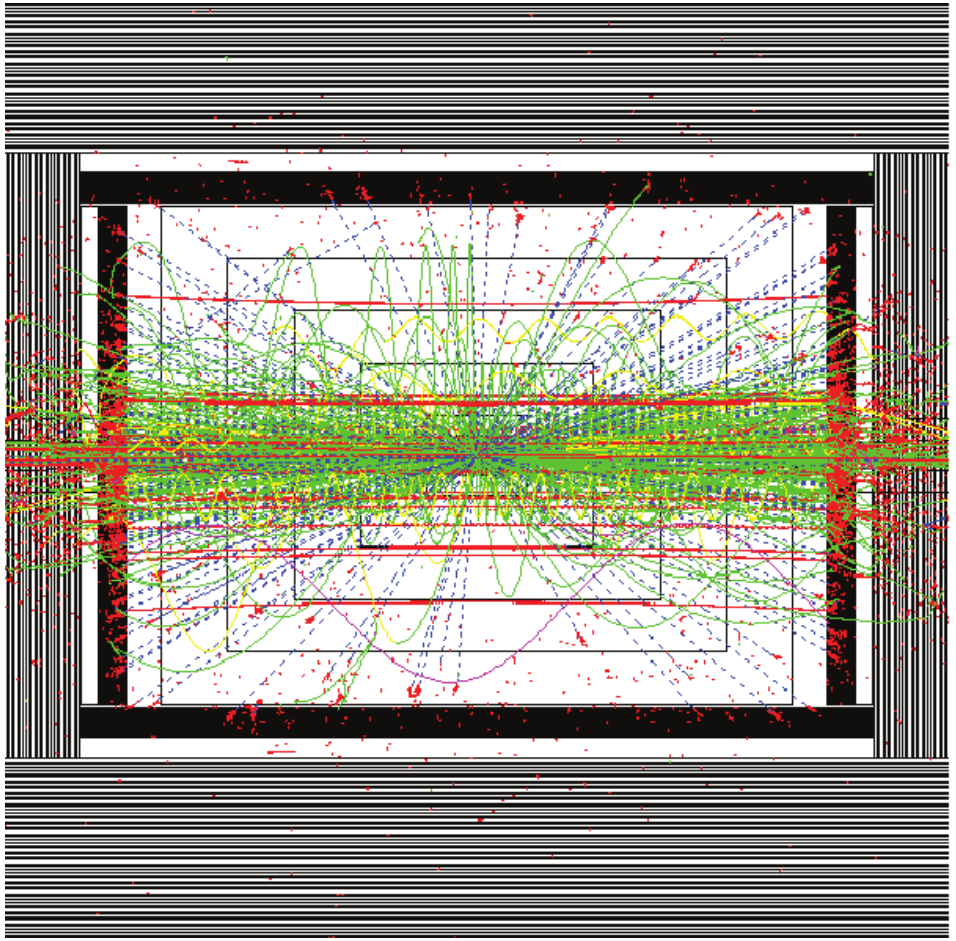


- 5 layers in the barrel
- 4 inner disks
- 3 outer disks
- single bunch-timestamping
- Sensor thickness of 75 μm assumed, with 20x20 μm2 pixel size

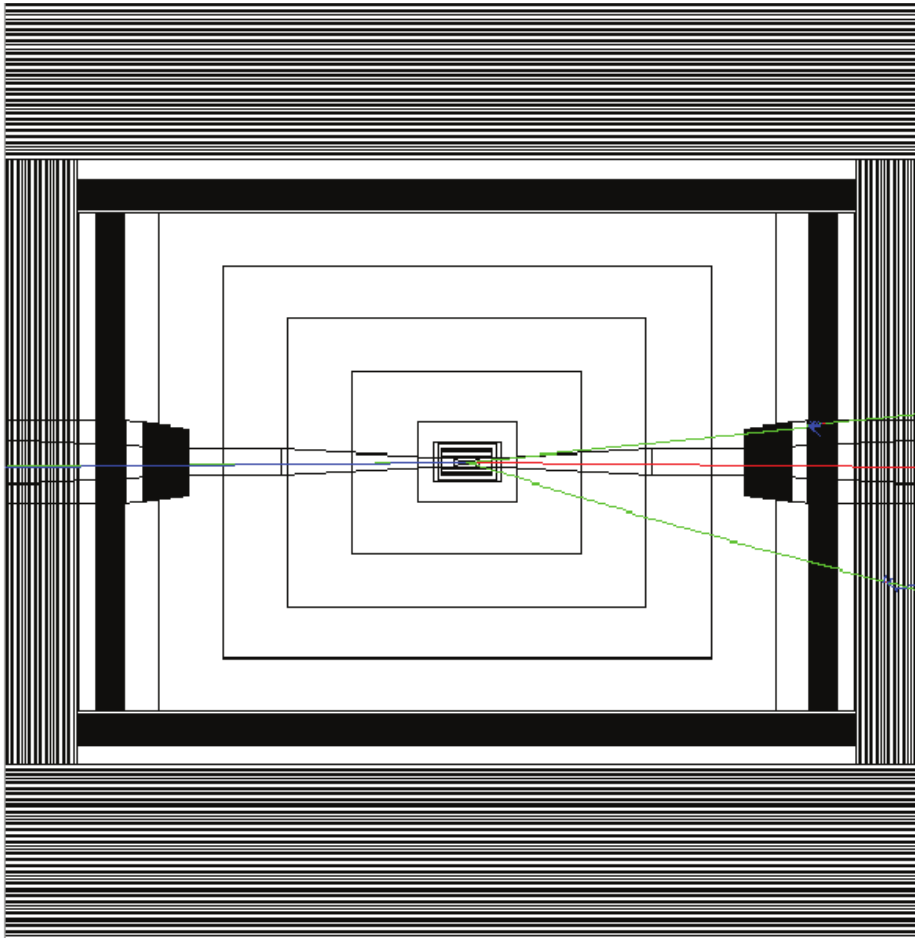
Pixel technology

- No decision in the Letter of Intent
- Should fulfill
  - Single-Bunch timestamping (300 ns)
  - Resolution requirements for vertexing
  - Material budget
- Many candidate technologies

Suppression of Beam background



150 Bunch crossings

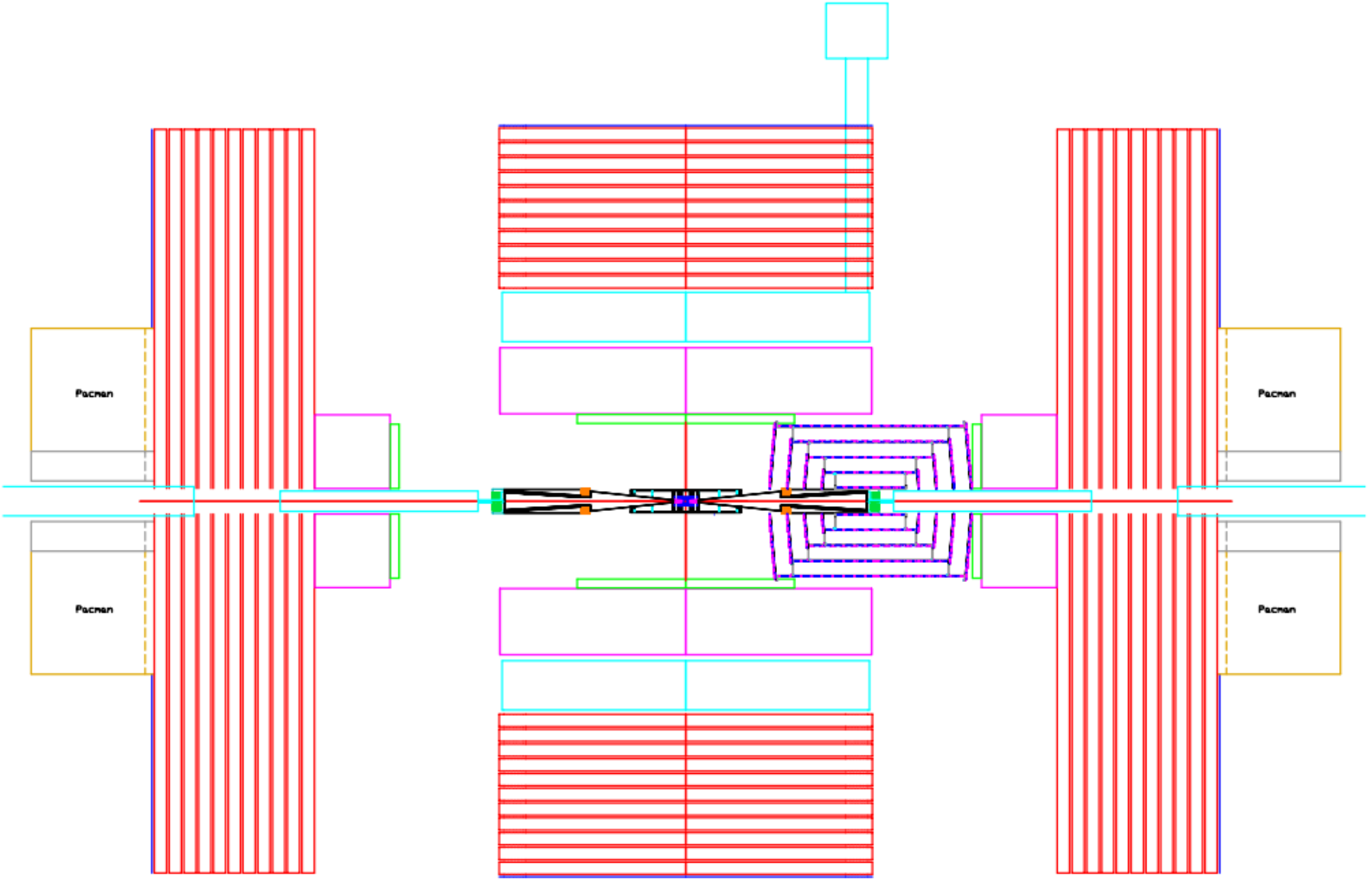


Single Bunch crossing

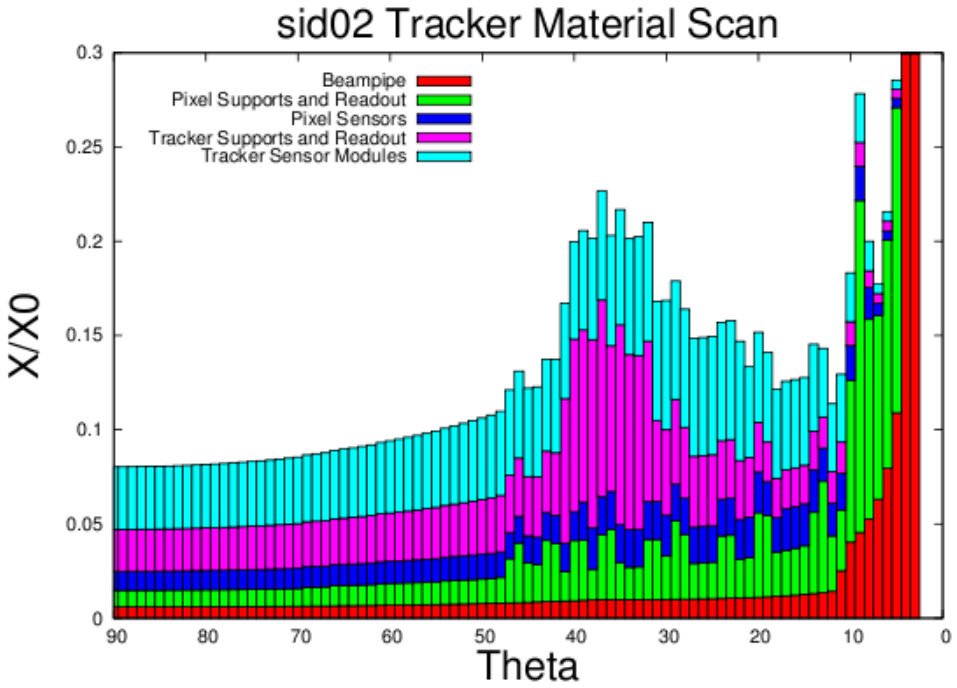
Detector Overview

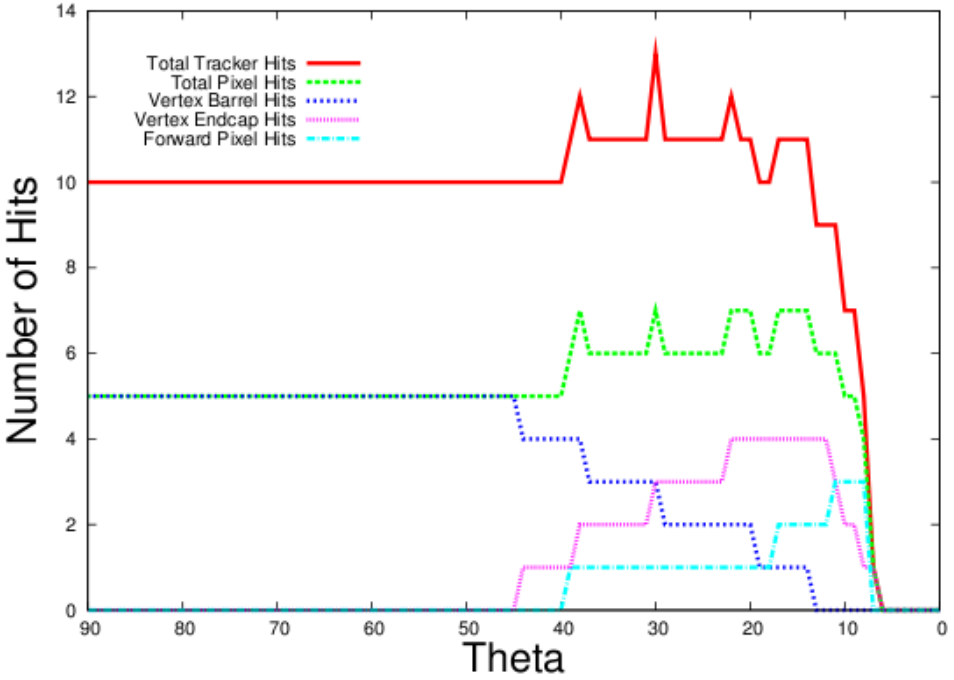
Barrel Region	R (mm)	Length (mm)	Number of sensors in φ
Layer 1	14	125	12
Layer 2	21	125	12
Layer 3	34	125	20
Layer 4	47	125	28
Layer 5	60	125	36
Disk	R_{inner}	R_{outer}	z_{center}
Disk 1	15	75	76
Disk 2	16	75	95
Disk 3	18	75	125
Disk 4	21	75	180
Forward Disk	R_{inner}	R_{outer}	z_{center}
Disk 1	28	166	211
Disk 2	76	166	543
Disk 3	118	166	834

SiD Integration



Material Budget & Hits

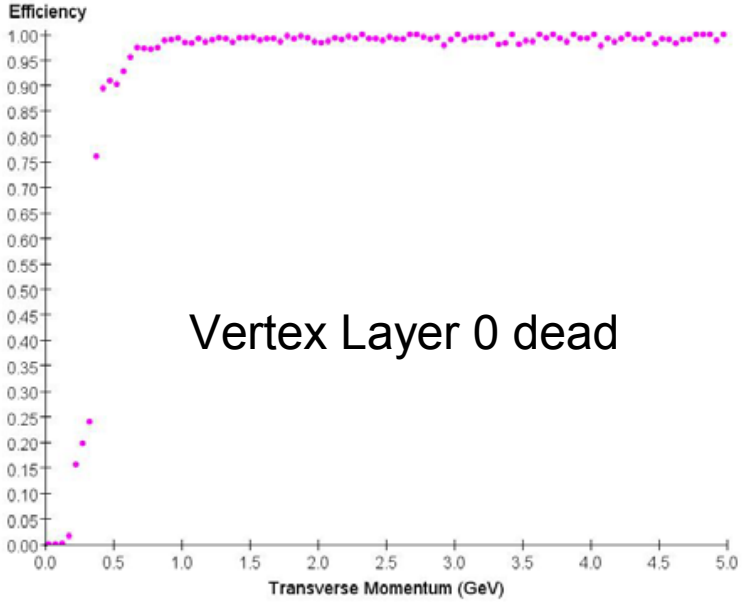




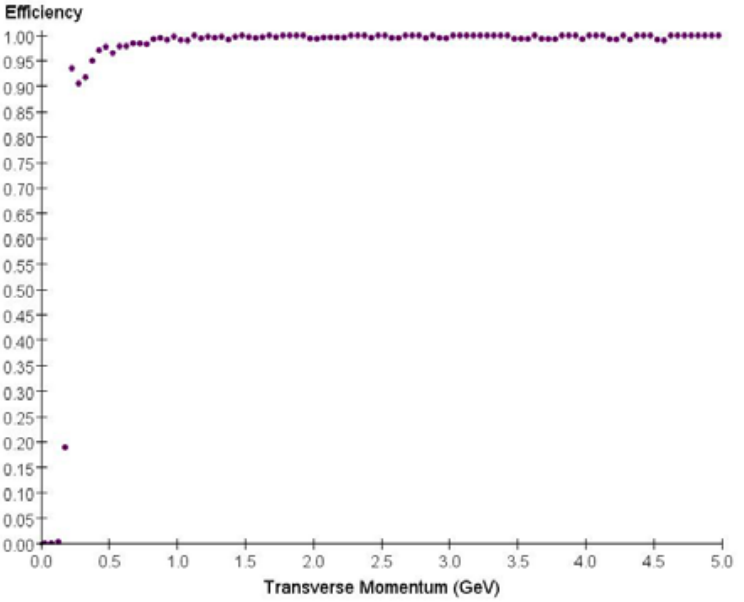
SiD Tracking

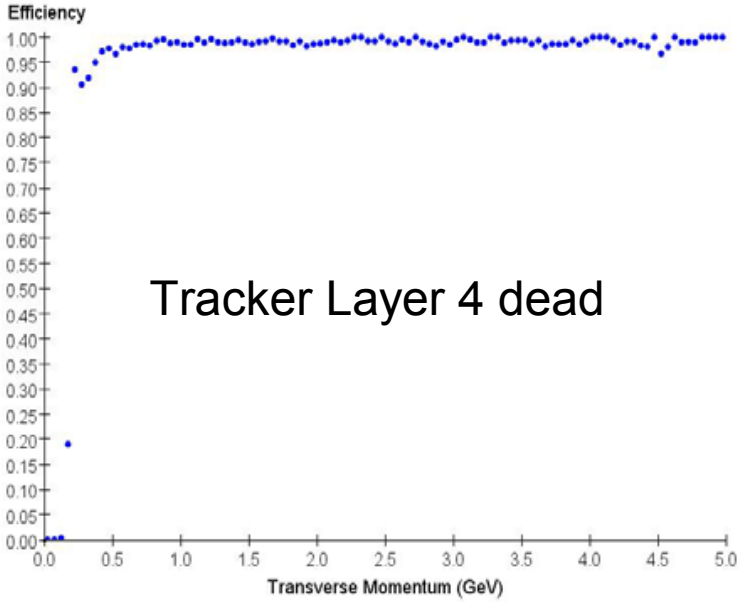
- Vertex Detector and Tracker are an integrated system
  - Tracking seeding can start form either end
- Need 7 Hits per track
- High tracking precision and purity achieved
- See e.g. LoI

Tracking Robustness

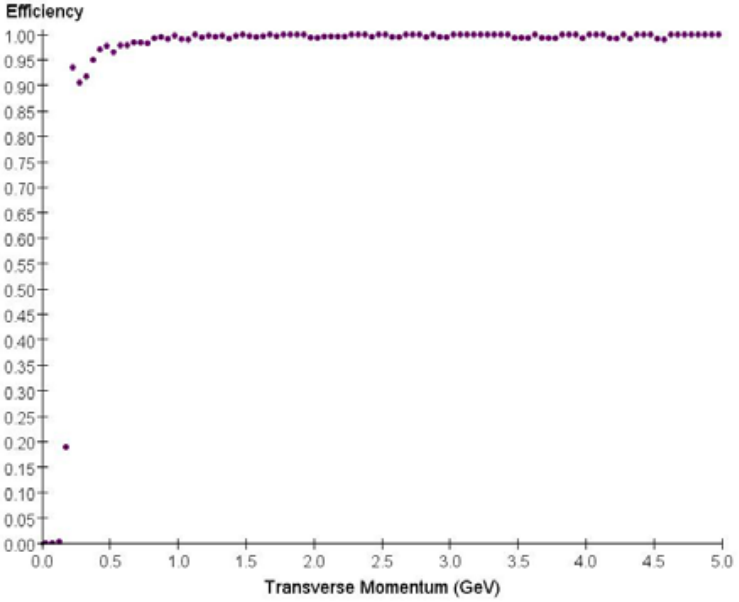


Vertex Layer 0 dead

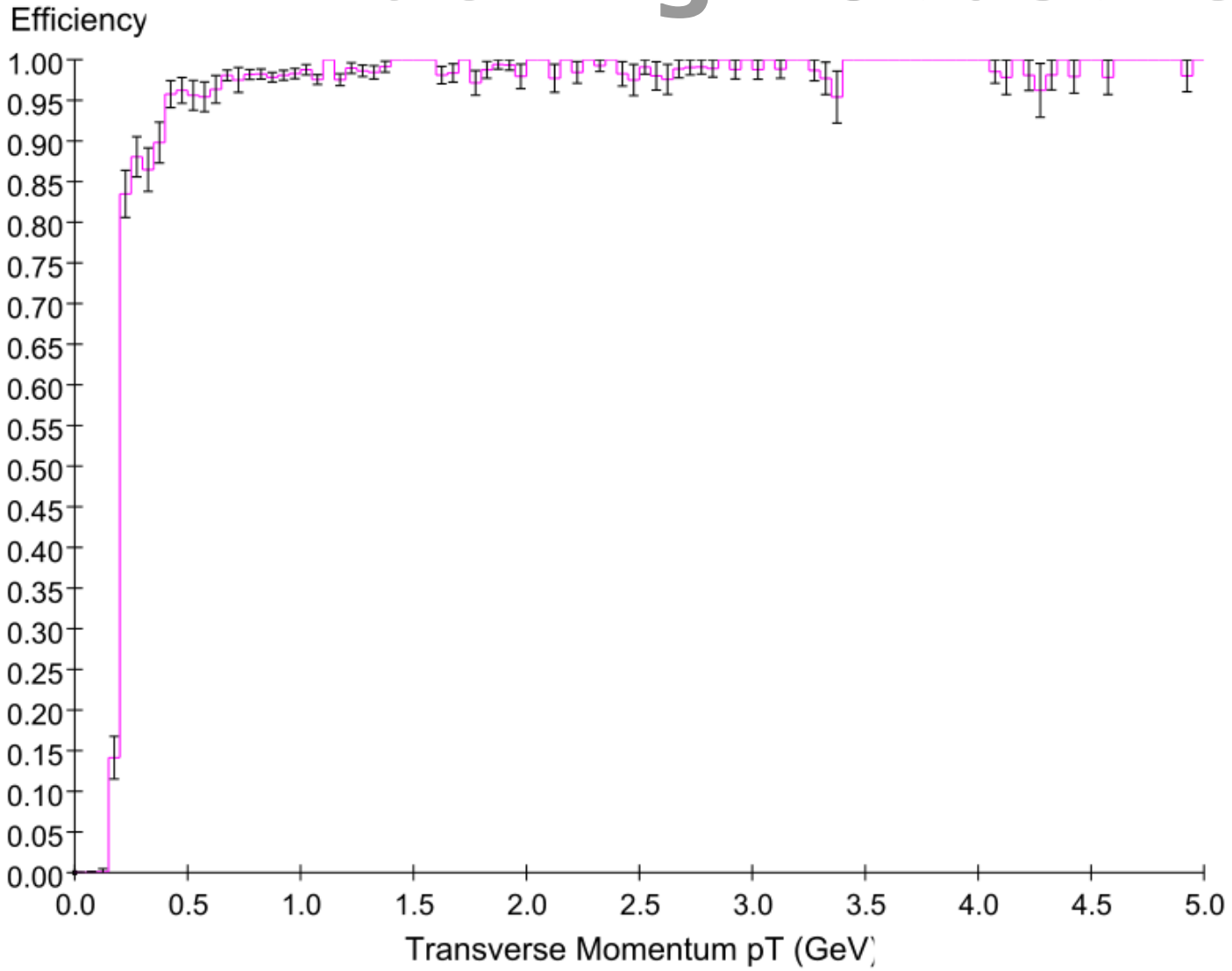




Tracker Layer 4 dead



Tracking Robustness



Tracking using **bb** events at 500 GeV

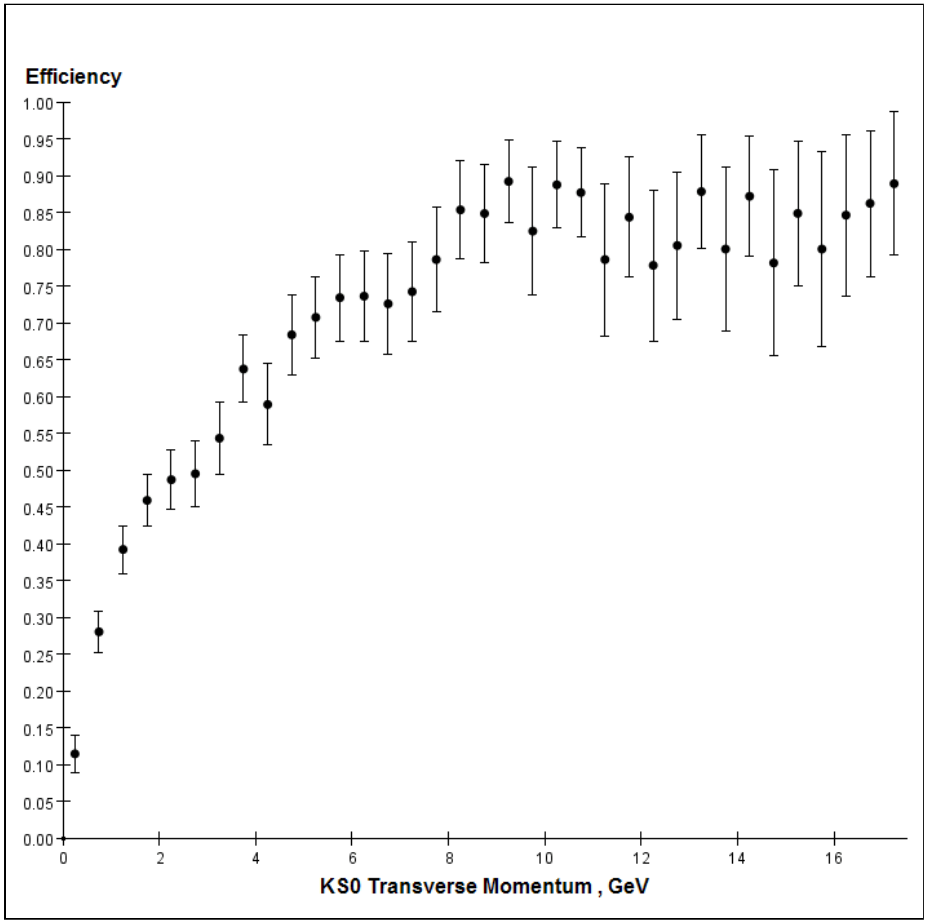
Beam backgrounds over 10 crossings have been added to all pixel devices in the detector. Tracker hits in-time only for a single bunch crossing.

Finding V⁰s

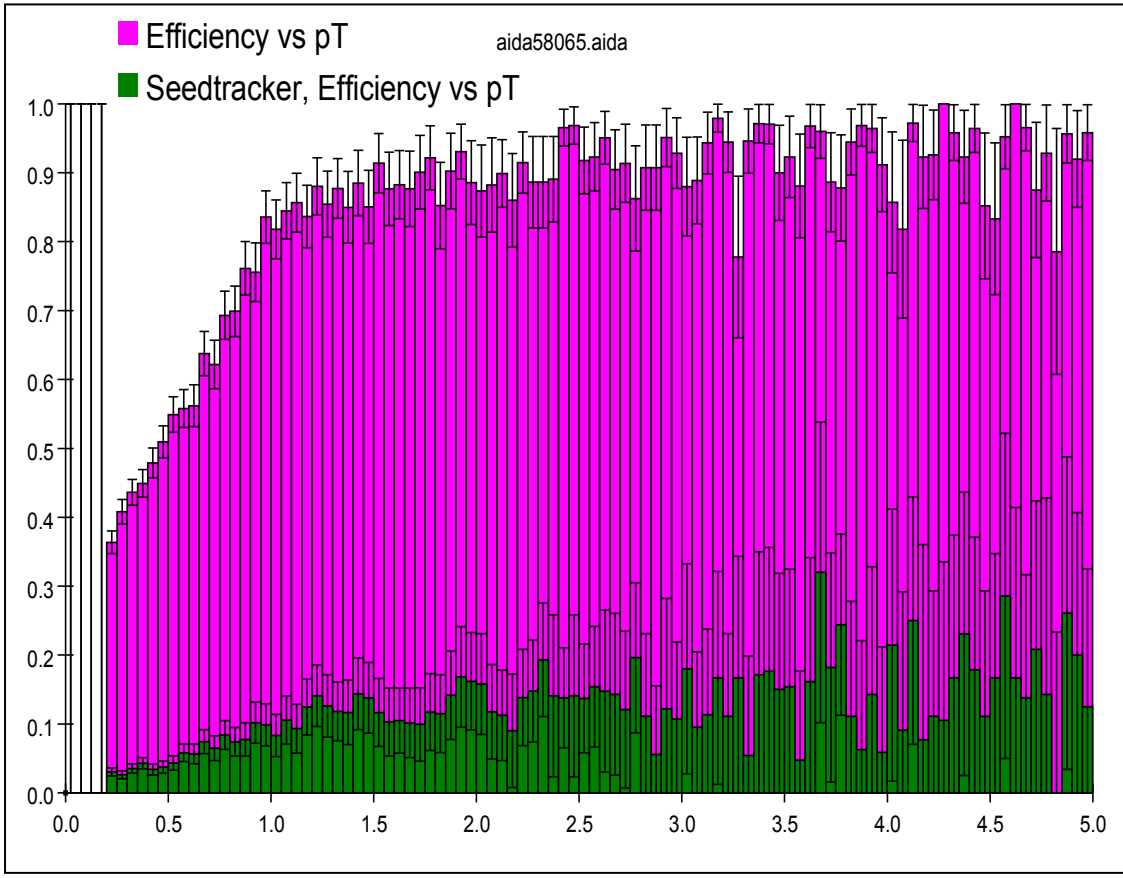
SiD02 detector, ttbar @ 500GeV

Out-of-the-box MipStubFinder

D. Onoprienko

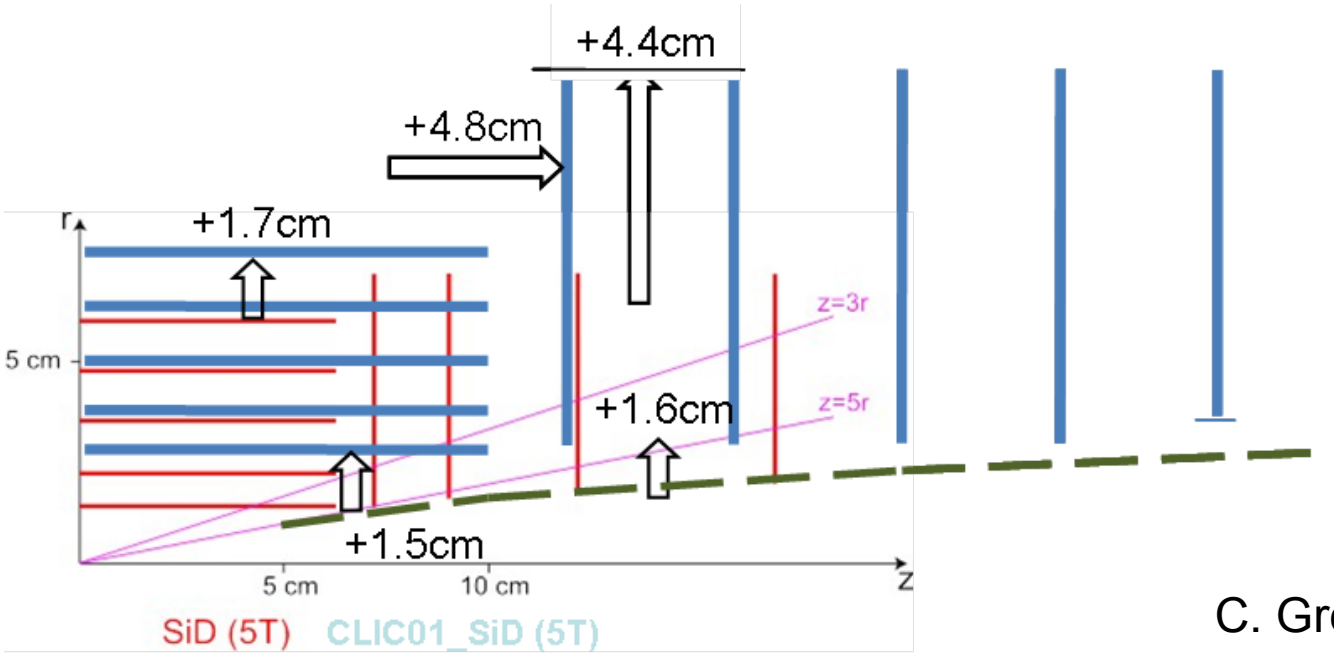


Findable K_S^0



Non-prompt tracks

SiD @ CLIC



C. Grefe

- Modifications needed due to beam background
  - Move barrel outwards by 1.5 cm
  - Move disks accordingly
  - Not optimized yet for CLIC