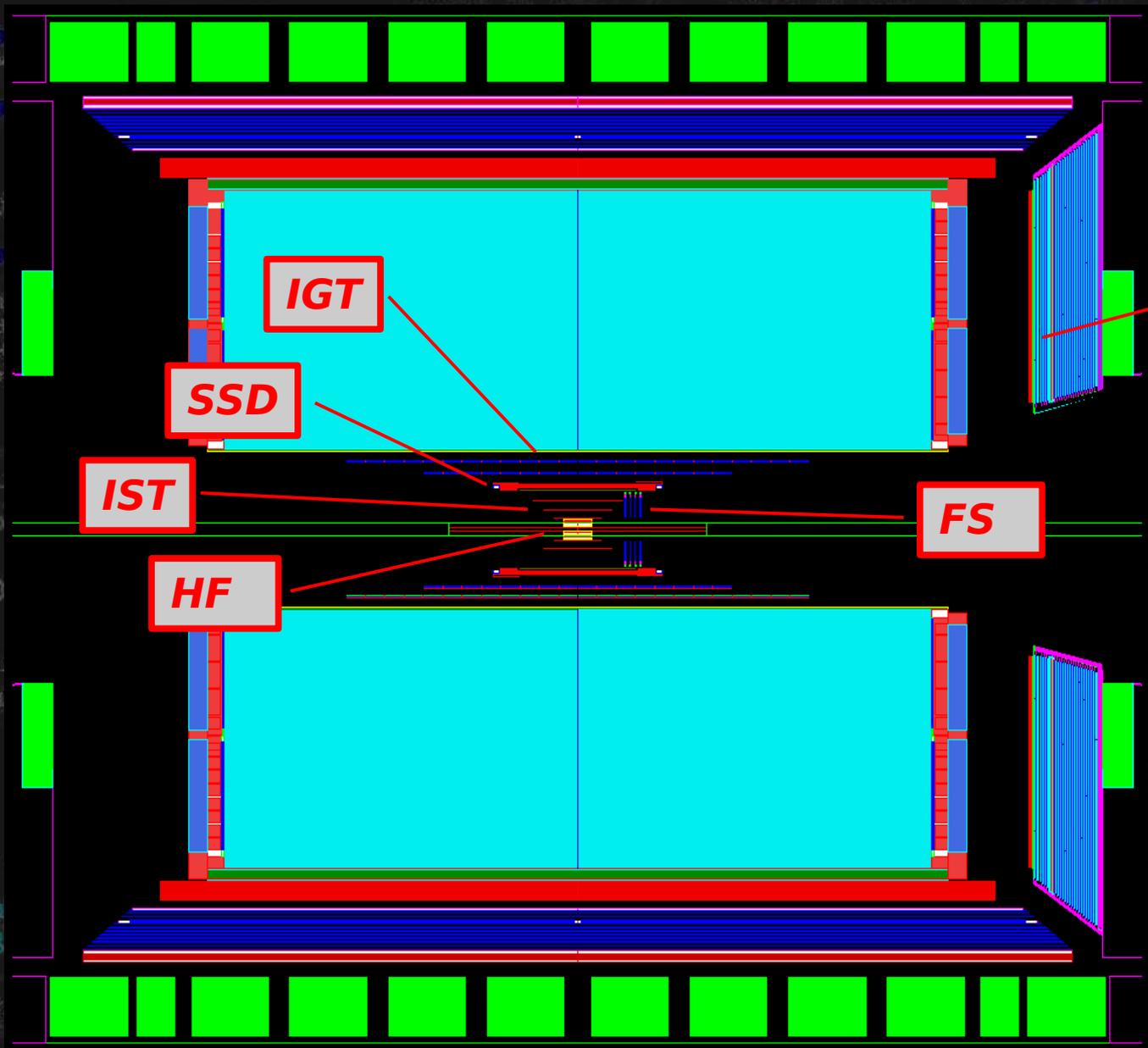


STAR Tracking Upgrade Simulation Status

Gerrit van Nieuwenhuizen
Bates R&E meeting
Bates, Dec. 13, 2005

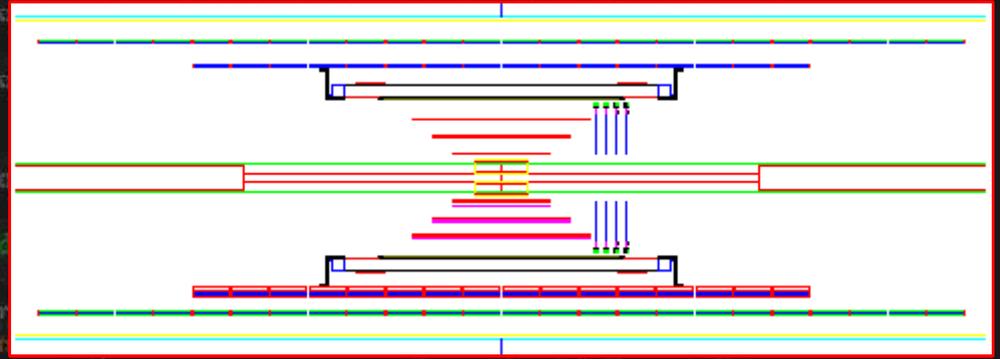
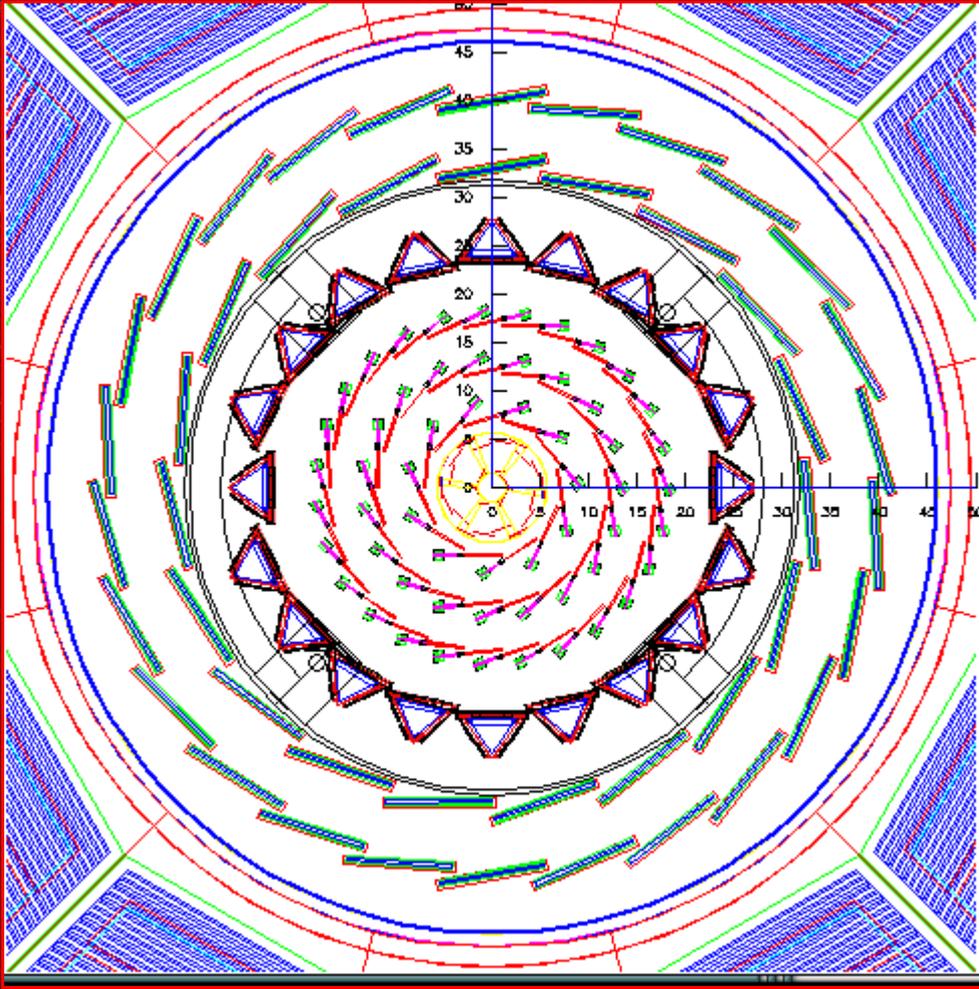


Upgrade overview



GvN Offset perpendicular to the length of the module/ladder; this to move the midpoint of the sensors back on the requi:

StarSim TUP geometry



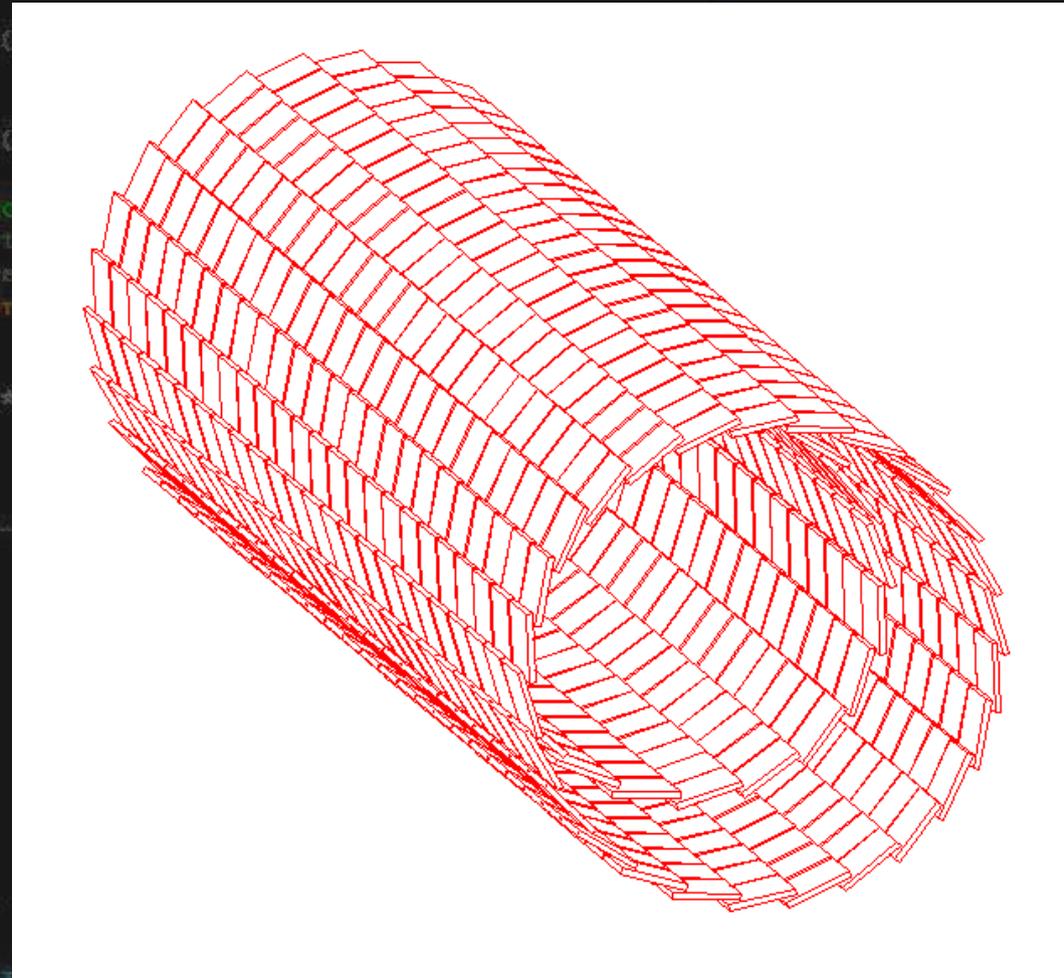
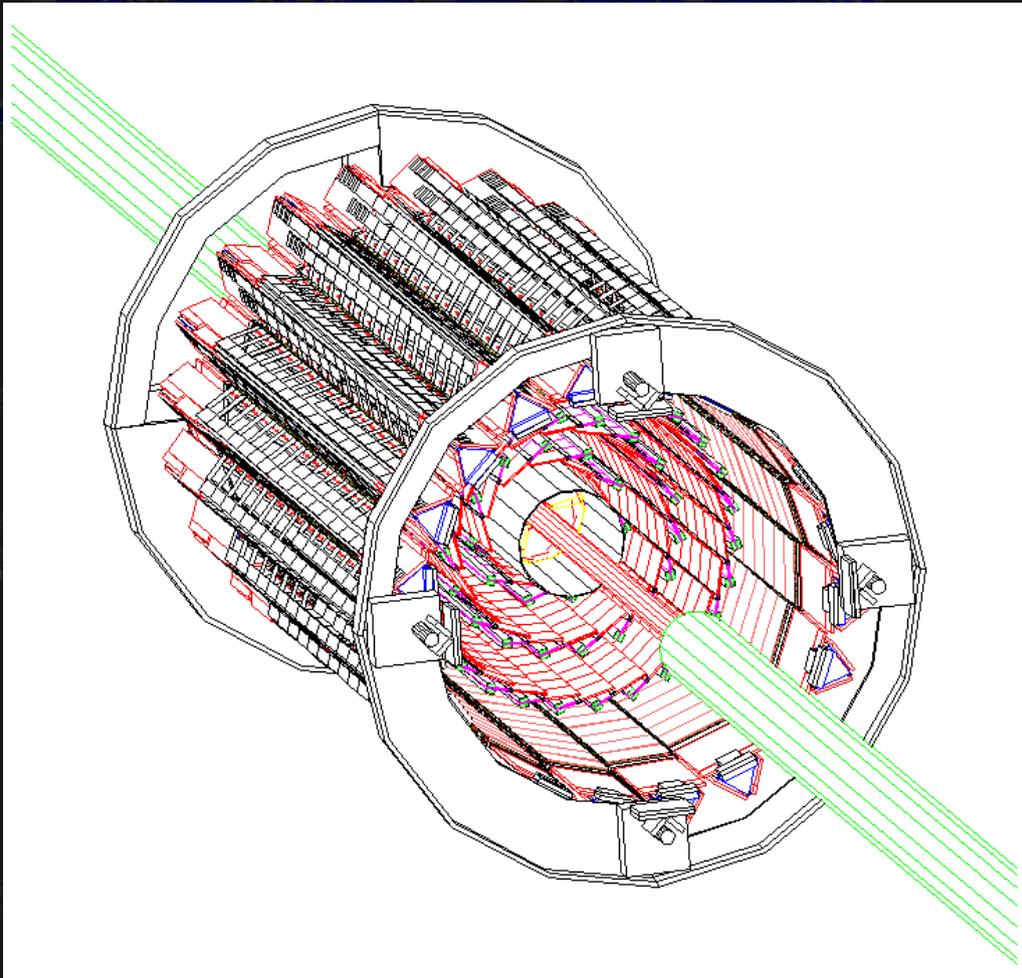
Fully implemented:
Inner STAR Tracker
Silicon Strip Detector
Inner GEM Tracker
Forward STAR Tracker
Forward GEM Tracker

**Heavy Flavor Tracker is in,
but need most recent version**

```
char params[100];  
counter=0;  
sprintf(params, "*****%d*****", counter);  
cout << "StarSim: " << GetTime() << endl;  
objevent = (StarEvent*) GetDataset("StarEvent");
```

```
write(*,*) '==>GEOINFO/istbgeo: Creating IST layer', ly  
USE ISBG Layer=ly | length and other parameters specific  
do nl=1, ISBG_nLadder | inner loop over ladder, which contains  
angle = (360.0/ISBG_nLadder)*nl | Base tilt, to be further  
GvN Offset perpendicular to the length of the module/ladder  
this to move the midpoint of the sensors back on the requi
```

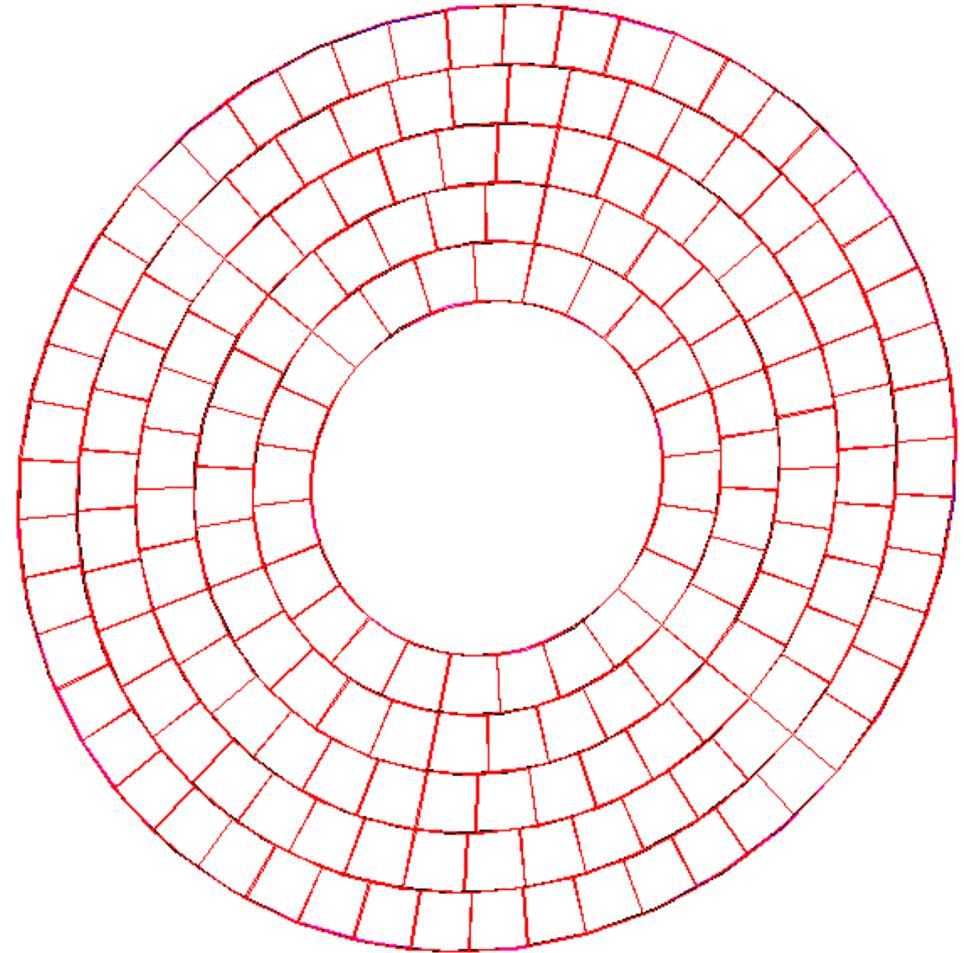
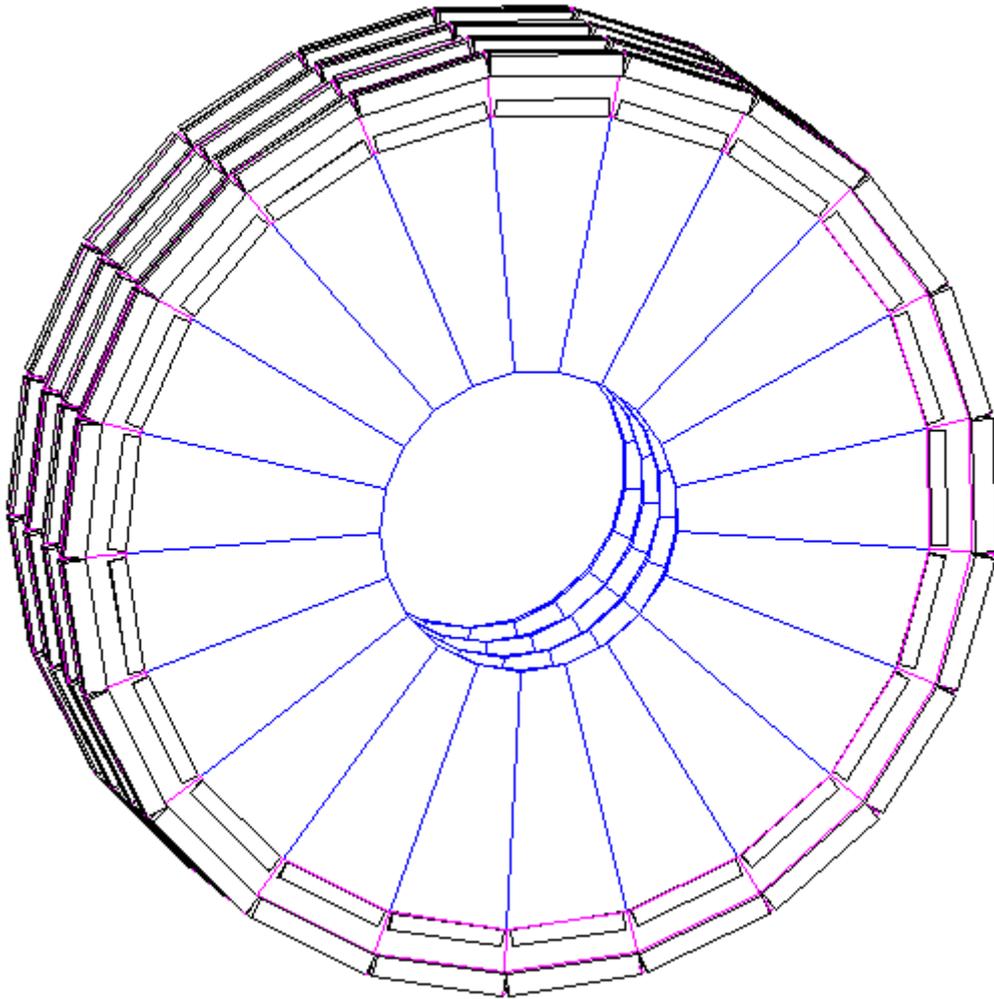
Inner tracking upgrade geometry



New beampipe + exoskeleton, Inner GEM Tracker option
HFT, IST and existing SSD

GvN Offset perpendicular to the length of the module/ladder
this to move the midpoint of the sensors back on the requi

Forward tracking upgrade geometry



Forward STAR Tracker

Forward GEM Tracker option

MC status so far

Starting point for single particle and W simulations
=====

1. Single particle:

a. electrons: 10k samples with

- $-1 < \eta < 2$
- pT: 1, 2, 5, 10, 15, 20, 25, 30, 35, 40 GeV/c
- delta eta: 0.2 (15 eta ranges)

Total: 10 X 15 X 10k samples

b. pions: 10k samples with

- $-1 < \eta < 2$
- pT: 1, 2, 5, 10, 15, 20 GeV/c
- delta eta: 0.2 (15 eta ranges)

Total: 6 X 15 X 10k

2. W simulations:

Total cross-section X BR(W+/->e+/e- final state):

W+: 135pb⁻¹

W-: 42pb⁻¹

For $1 < \eta < 2$:

W+: 14pb⁻¹

W-: 8pb⁻¹

Simulation request: 100K samples (e+/e- in final state!)

a. $1 < \eta < 2$

b. $-1 < \eta < 1$

Status pions:

Done, starsim MC and BFC conversion finished.

Results (.geant.root files) can be found on:

mit2.star.bnl.gov/data/nieuwhzn/MCTUP/PIONS

Status electrons:

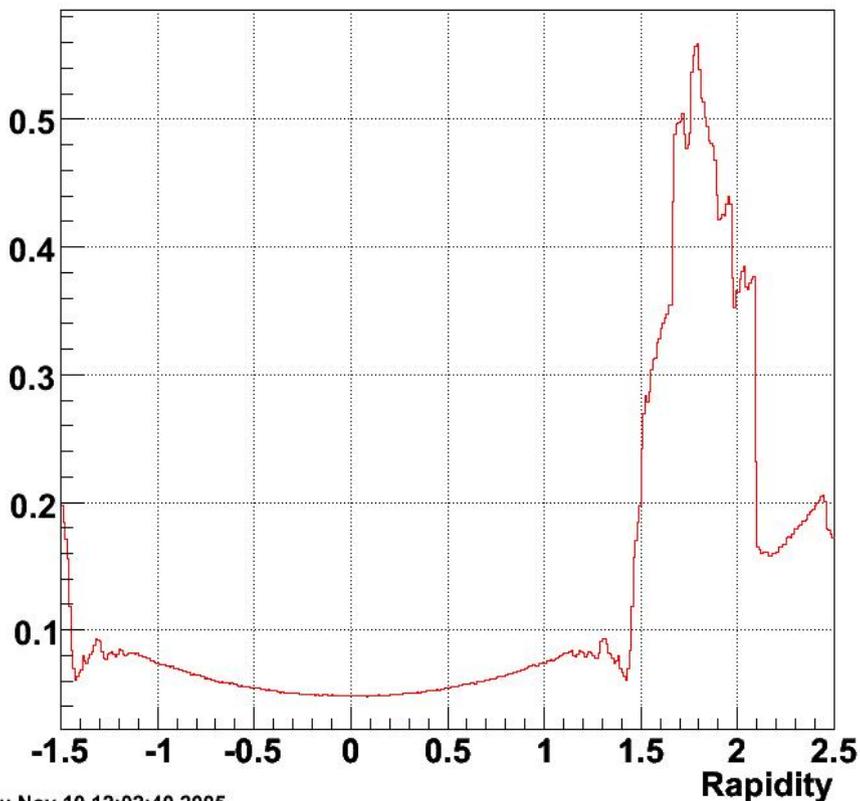
starsim MC production

ptRap	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X	X	X	X				
10	X	X	X	X	X	X	X	X	X	X					
15		X	X	X	X	X	X								
20															
25															
30															
35															
40															

No further MC's since summer

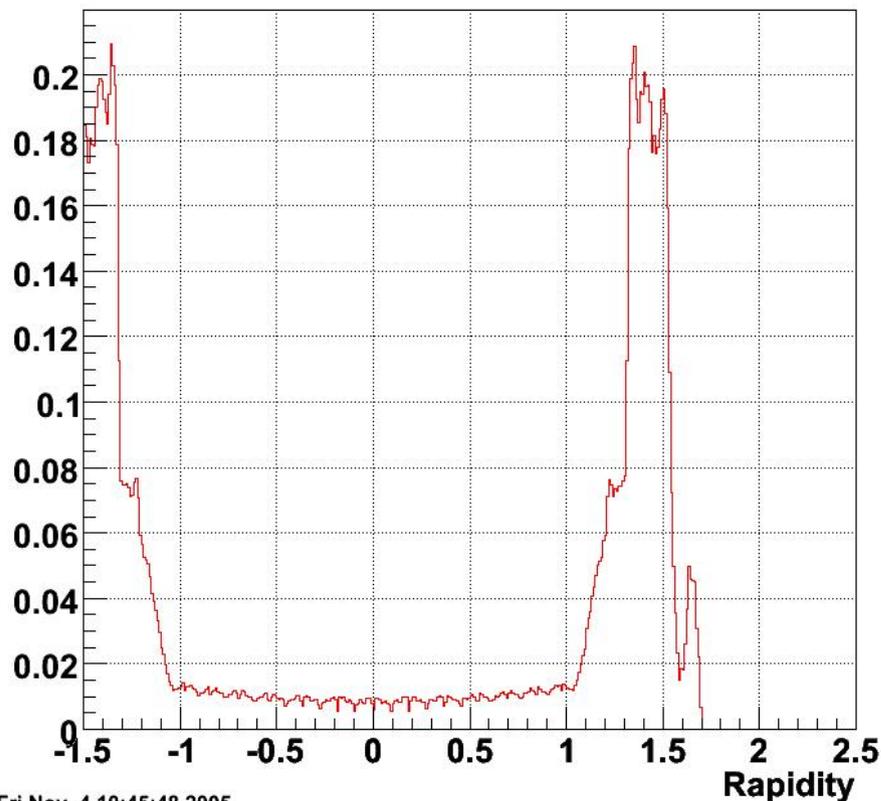
Existing SVT, SSD and Nose-Cone

Material Budget SVT

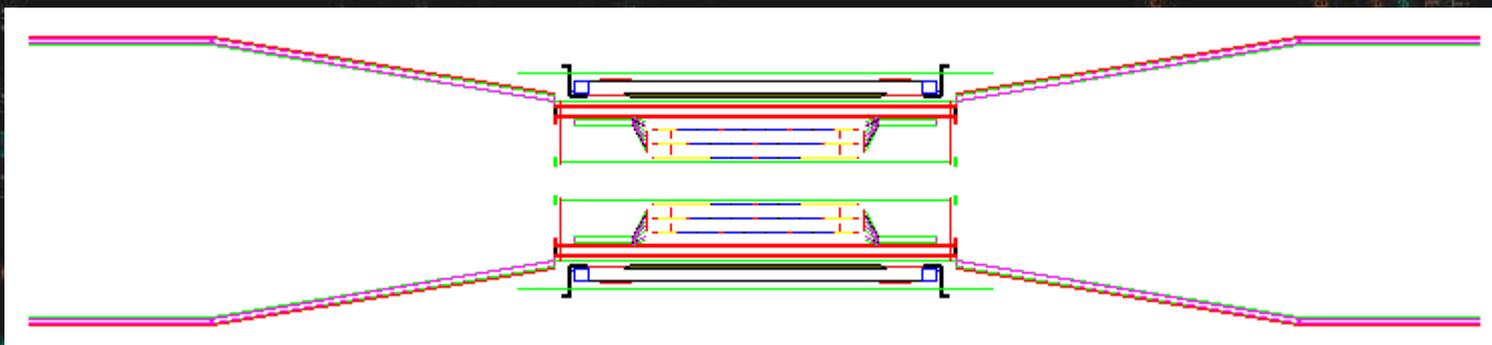


Thu Nov 10 12:02:40 2005

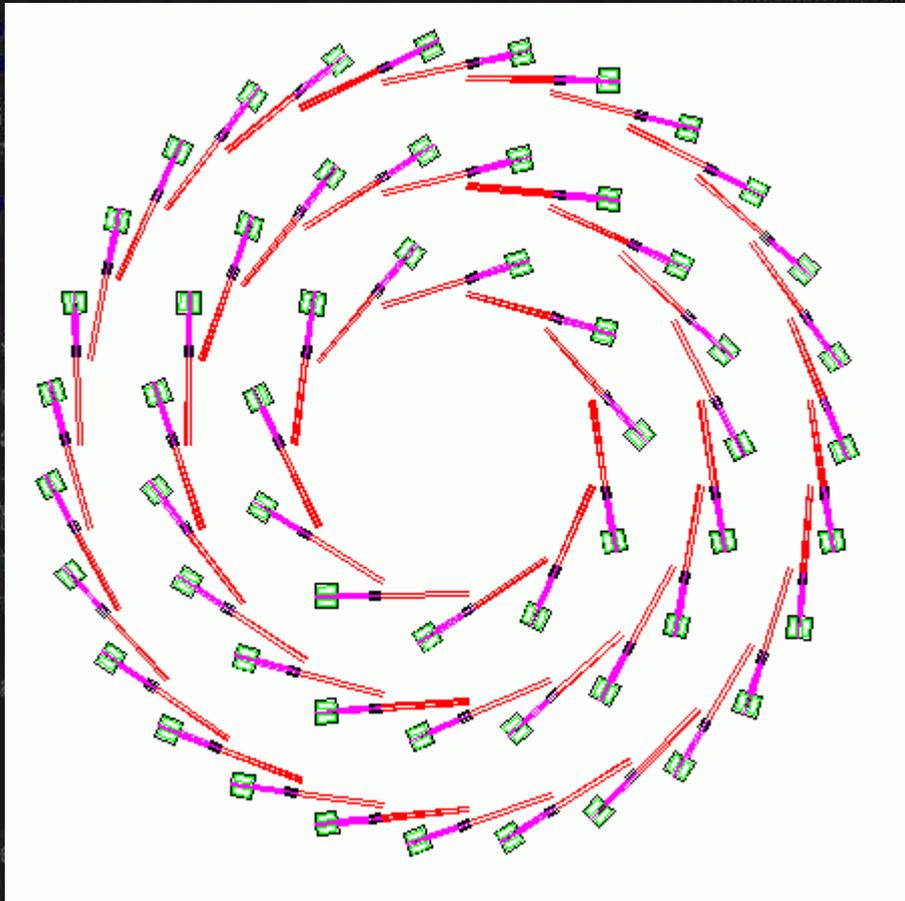
Material Budget SSD



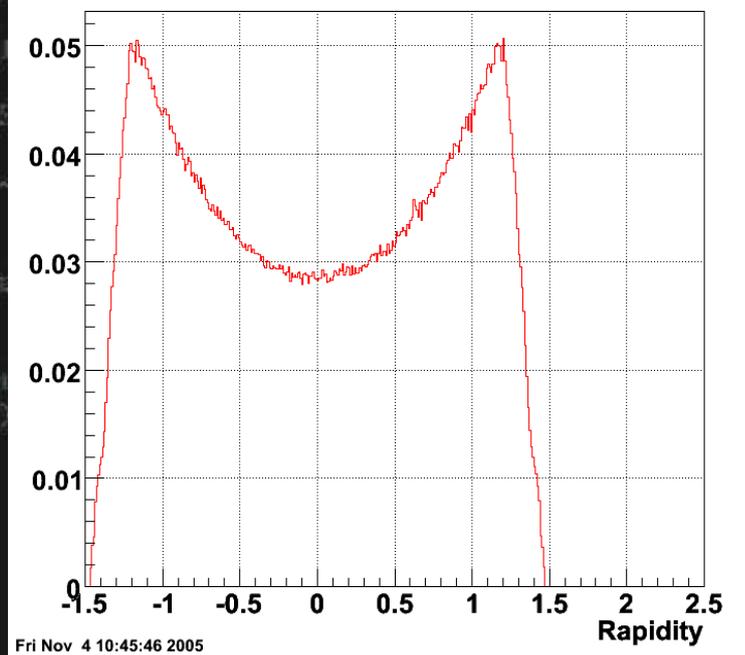
Fri Nov 4 10:45:48 2005



Material budget IST

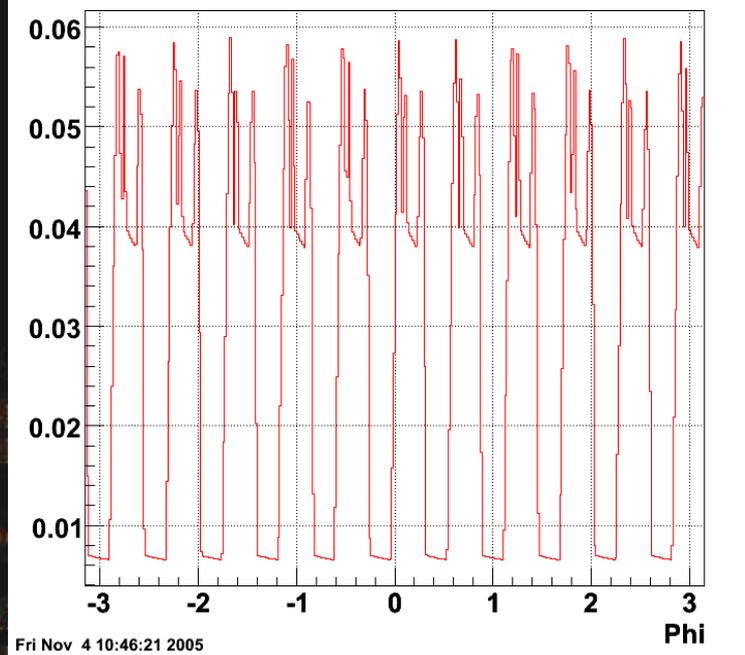


Material Budget IST layer 1

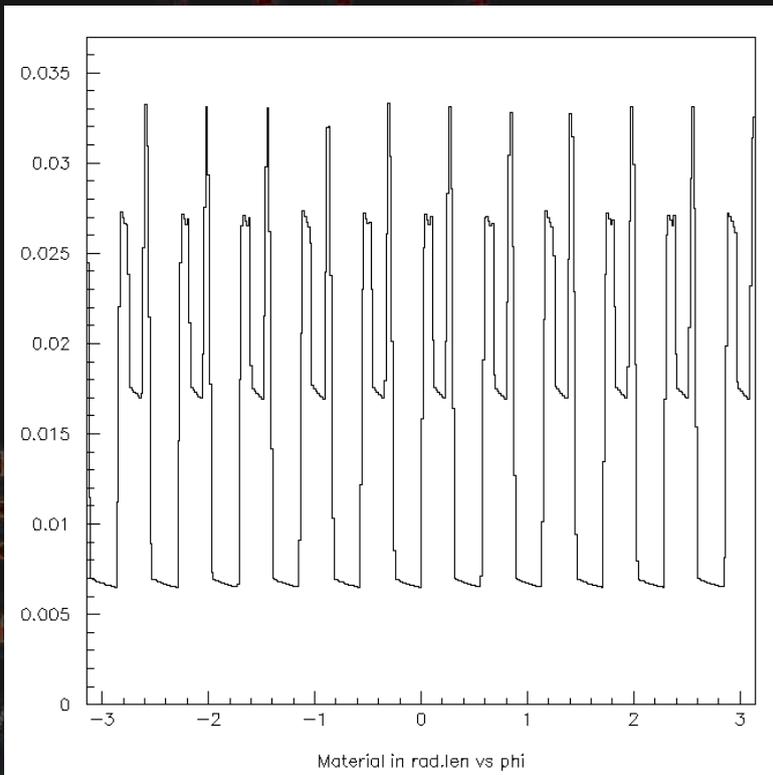
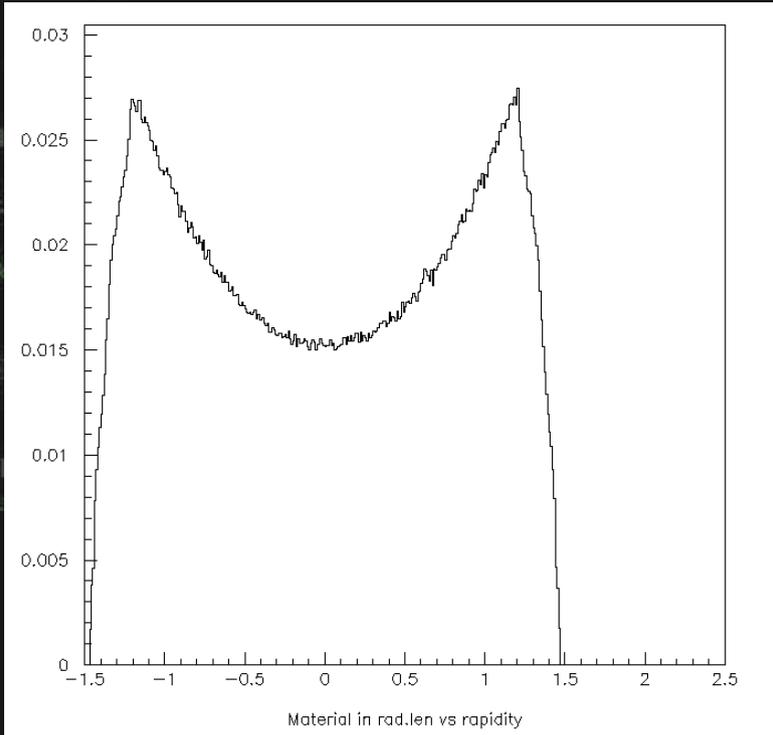
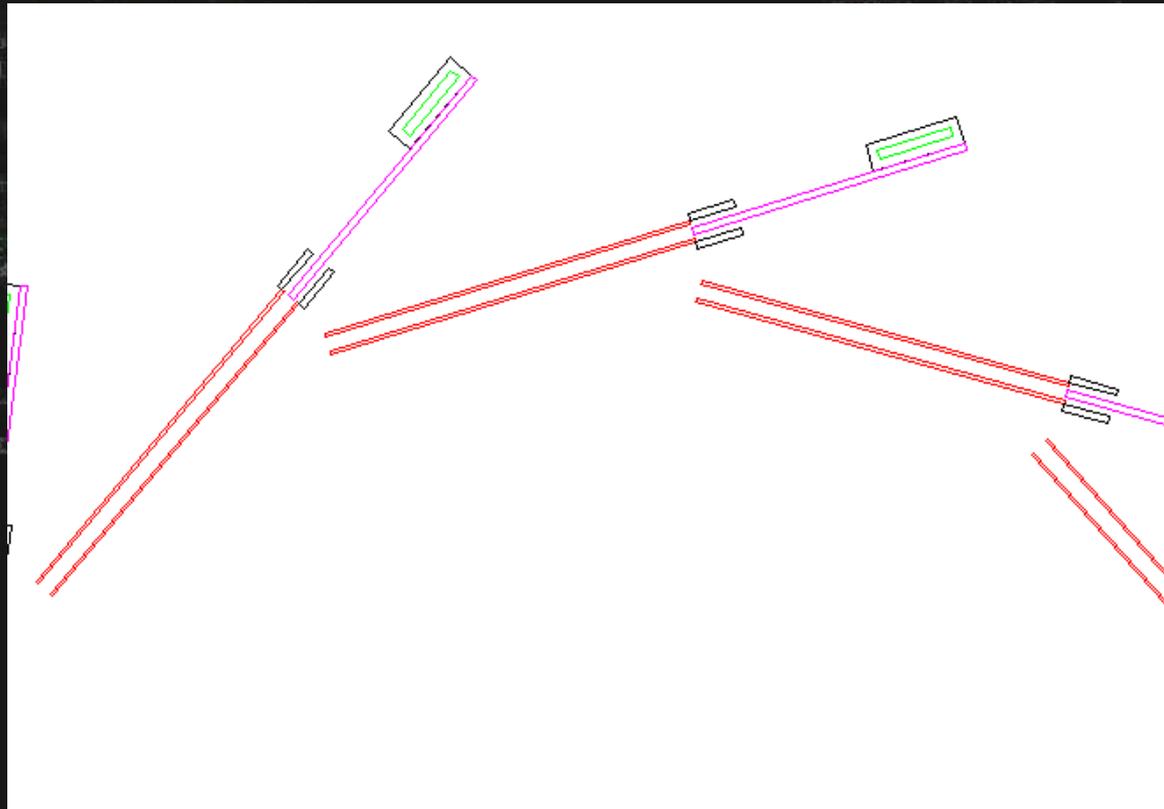


```
write(*,*) '==>GEOINFO/istbgeo: Creating IST layer'  
USE ISBG Layer=lv | length and other parameters s  
do nl=1,ISBG_nLadder | inner loop over ladders (whic  
  
angle = (360.0/ISBG_nLadder)*nl | Base tilt, to b  
  
GvN Offset perpendicular to the length of the modu  
this to move the midpoint of the sensors back on the
```

Material Budget IST layer 1

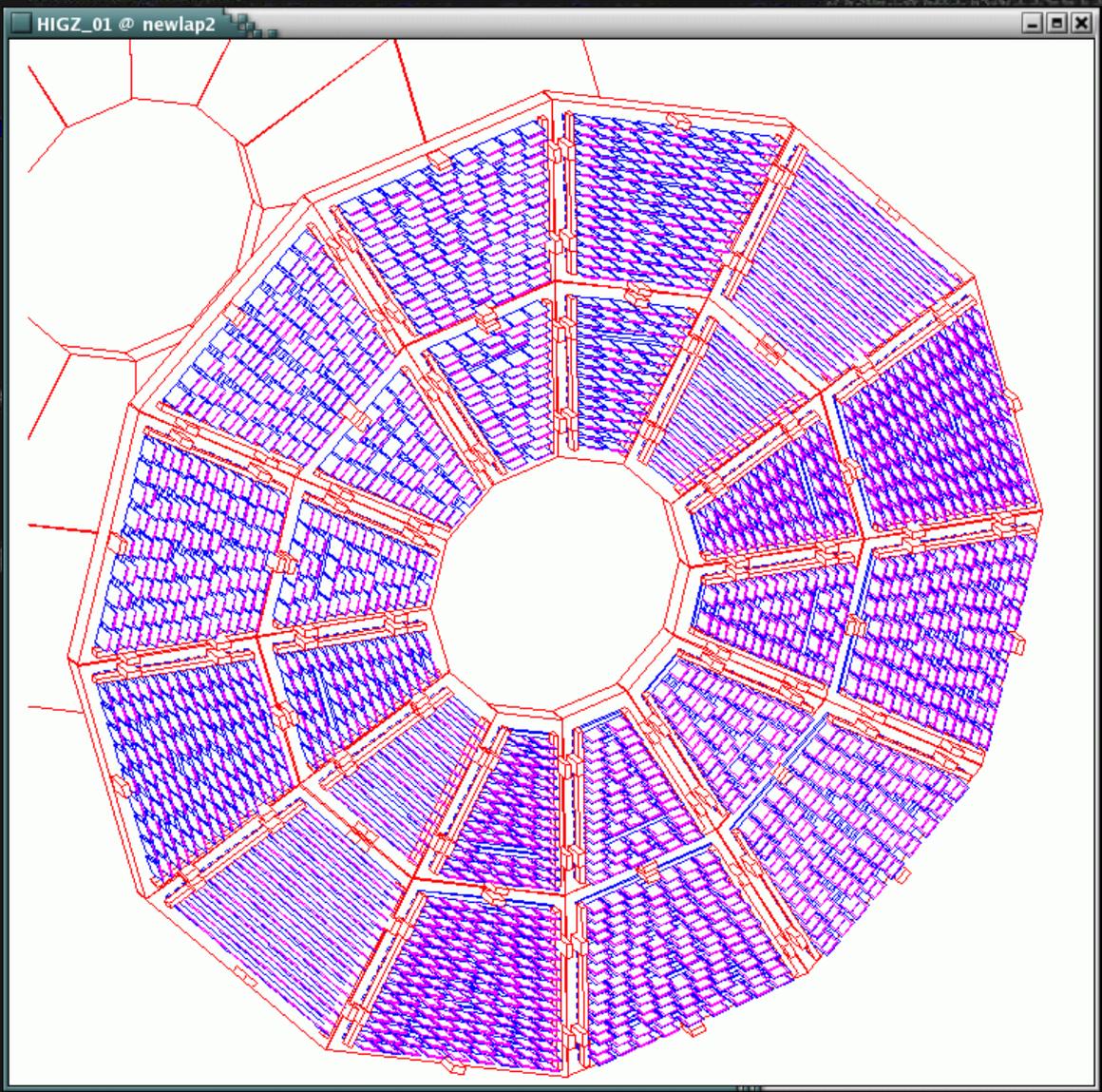


New Material budget IST



Removed one cooling channel and made remaining channel thinner
Removed 2 AlN chip carrier substrates

TPC endcap

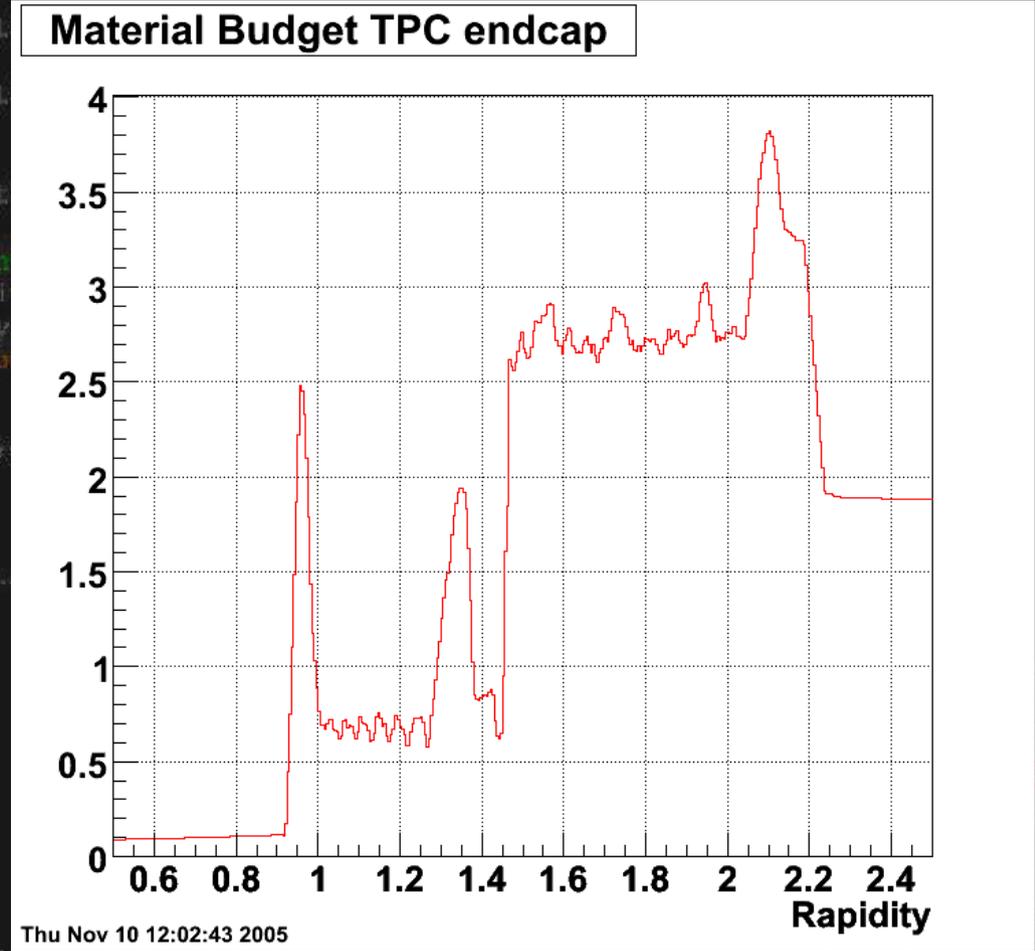
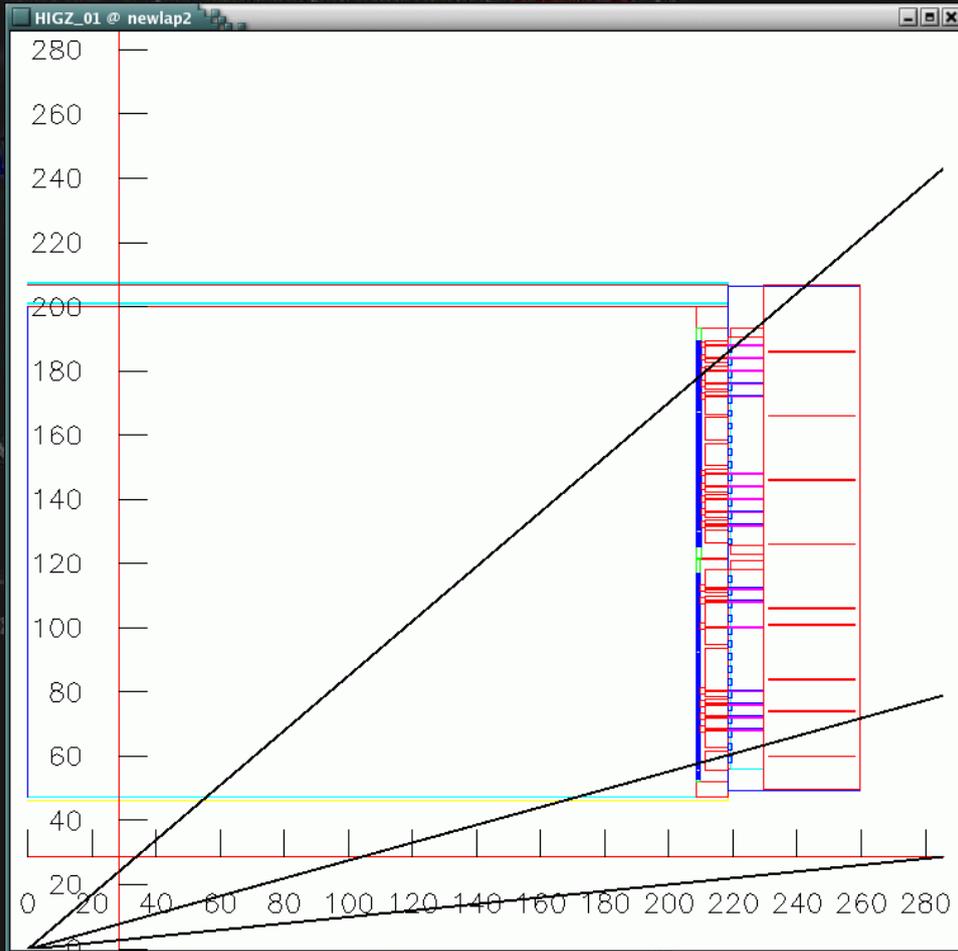


Includes Dave Underwood's observations

Needs to be realistic to study effect on FGT in front of calorimeter

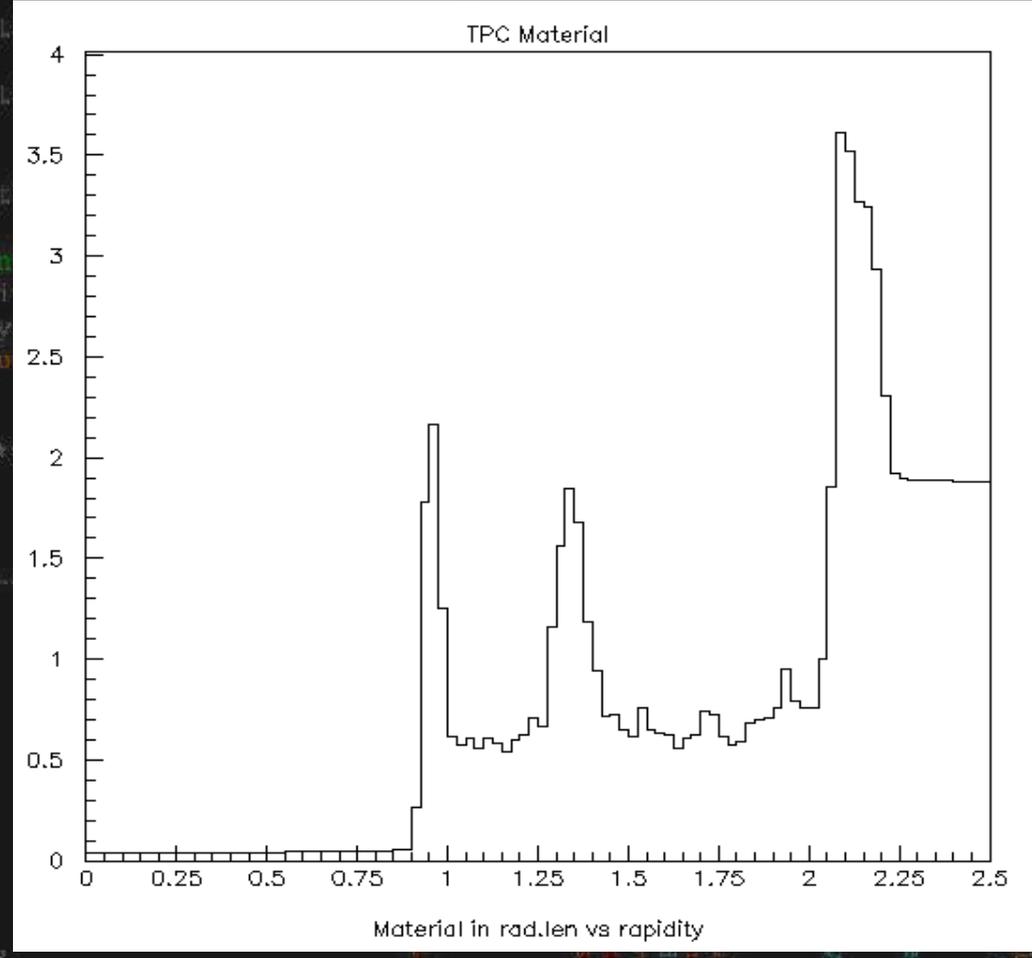
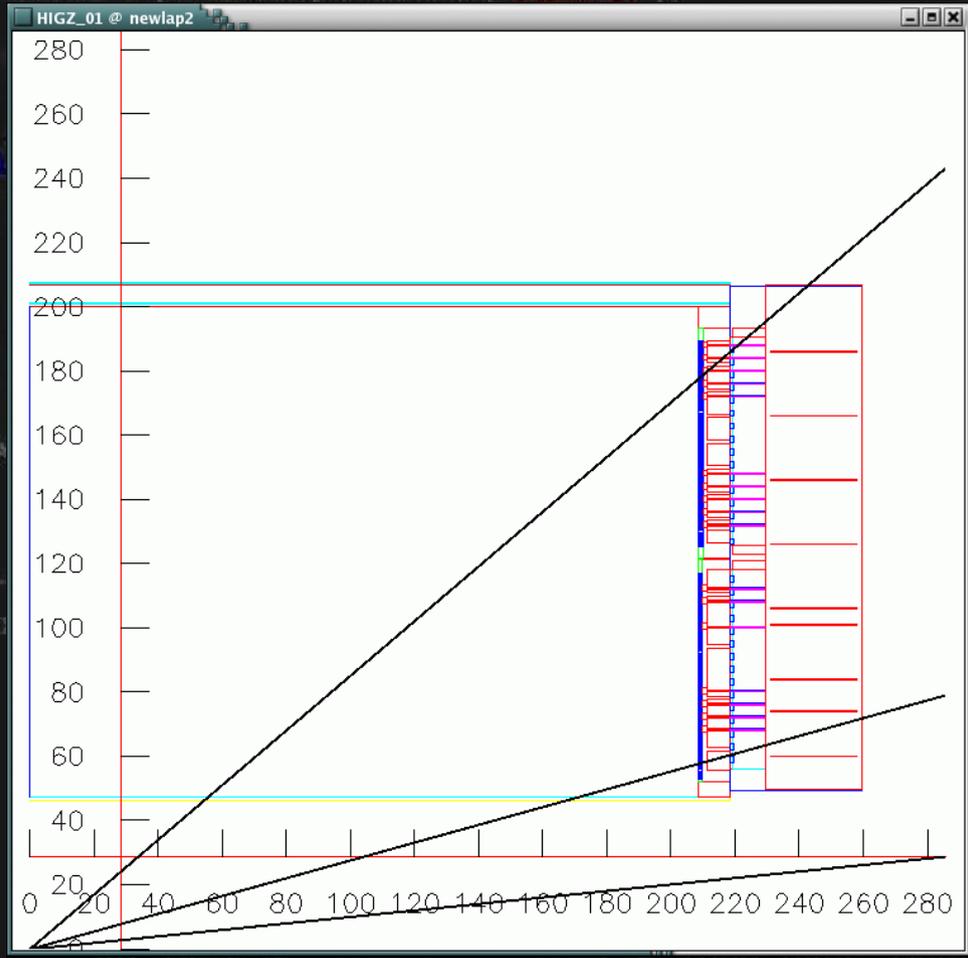
$angle = (360.0/ISBG_nLadder) * nl$ | Base tilt, to be further
GvN Offset perpendicular to the length of the module/ladder
this to move the midpoint of the sensors back on the requi

Material budget TPC endcap



Support beams clearly visible
Much more material in inner padrows?
Need to investigate.....

Maxim Potekhin's TPC endcap



Maxim material budget for the TPC endcap looks much more normal, i.e. same for inner and outer padrows
Conclusion: Gerrit should check his TPC geometry!

IST Strip Simulator

Afterburner to simulate silicon strip response

Internal strip geometry implemented

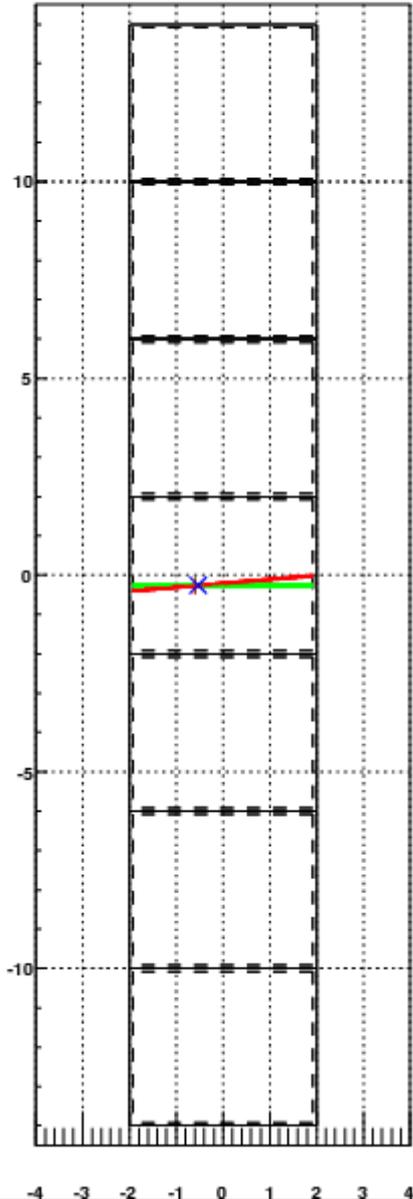
Finds hits, reconstructs hits from hit strips

Proper clustering is being worked on

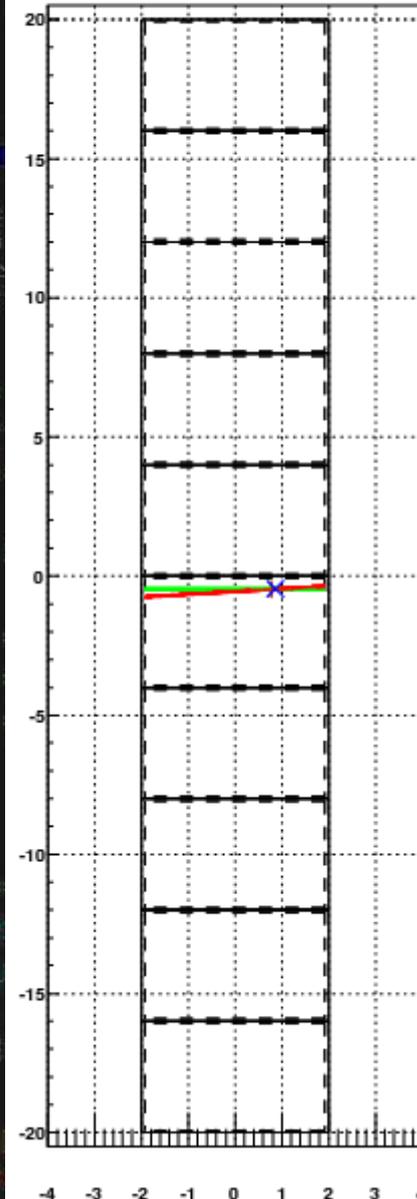
Need ITTF tracking!

Mike will spend a week with experts in January

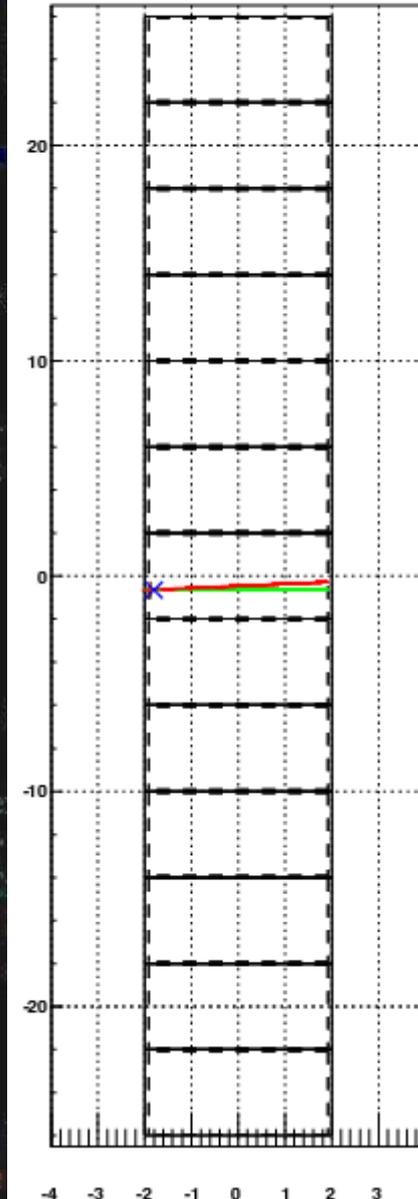
layer 1 and 2, ladder 9



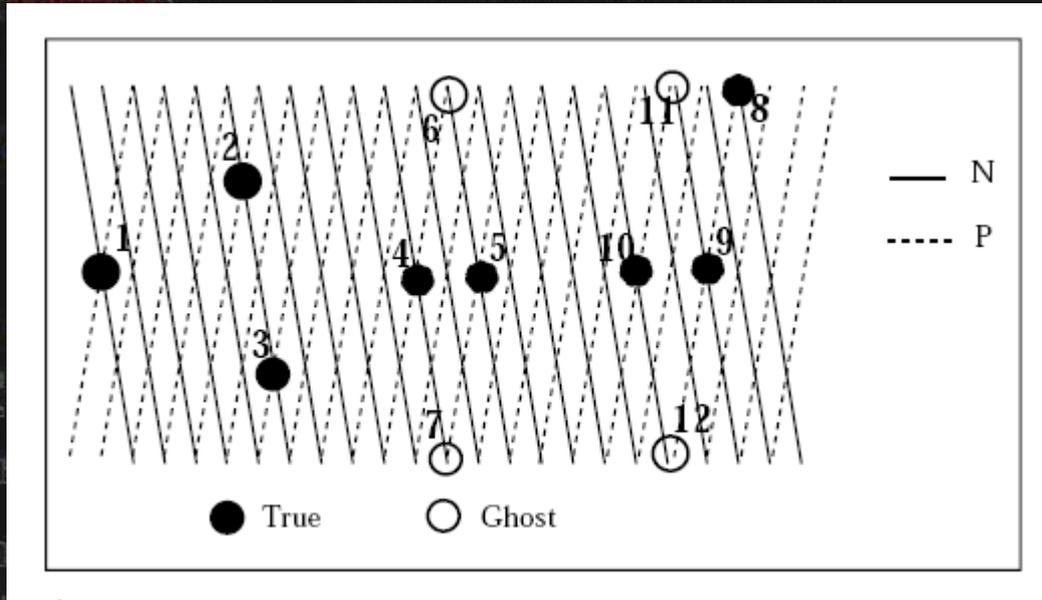
layer 3 and 4, ladder 16



layer 5 and 6, ladder 22



Stereo angle strip ambiguous hits (ghosts)



For Au+Au @ 200 GeV there are about 30 particles hitting a 40mm x 40mm sensor (15 real particles, 15 secondaries)
This leads to acceptable occupancies in the individual sensors
But, the chance of getting ghost hits is more than 100%
Making the stereo angle smaller reduces the amount of ghosts, but kills the resolution along the strips
Options: resolving the hits with the rest of the tracking
replacing second sensor with silicon pad sensor

Summary

All upgrade geometries have been implemented in StarSim

Monte Carlo studies have started

Initially will focus on occupancy in IST

Then will look at pointing resolution toward HFT

Desperately need of proper tracking (ITTF)

Studying material budget

Serious ghost levels at highest occupancies with existing strip geometry, looking at possible solutions