STS layout studies

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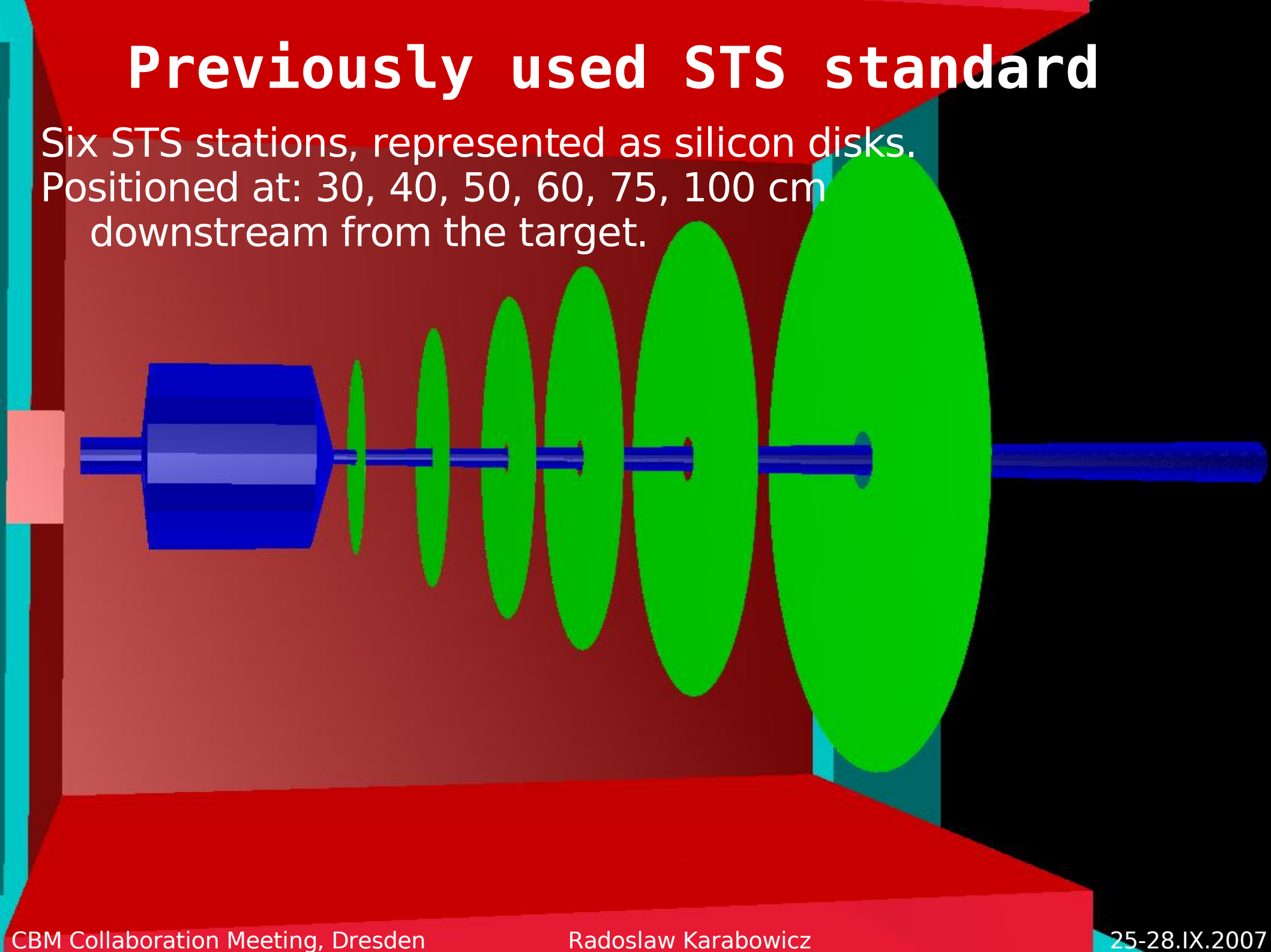
CBM Collaboration Meeting
Dresden, September 25-28, 2007

Previously used STS standard

Six STS stations, represented as silicon disks.
Positioned at: 30, 40, 50, 60, 75, 100 cm
downstream from the target.



Previously used STS standard

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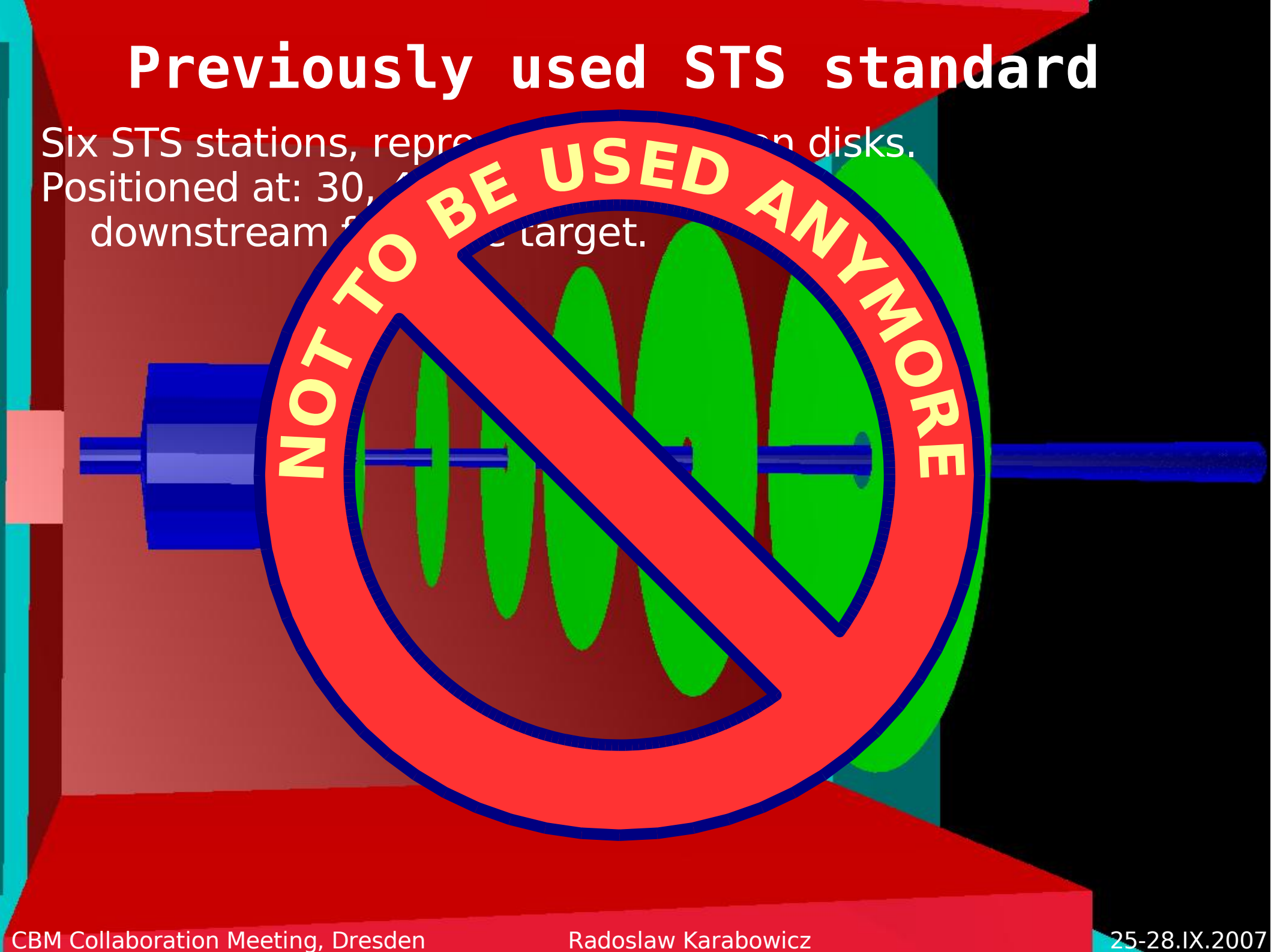
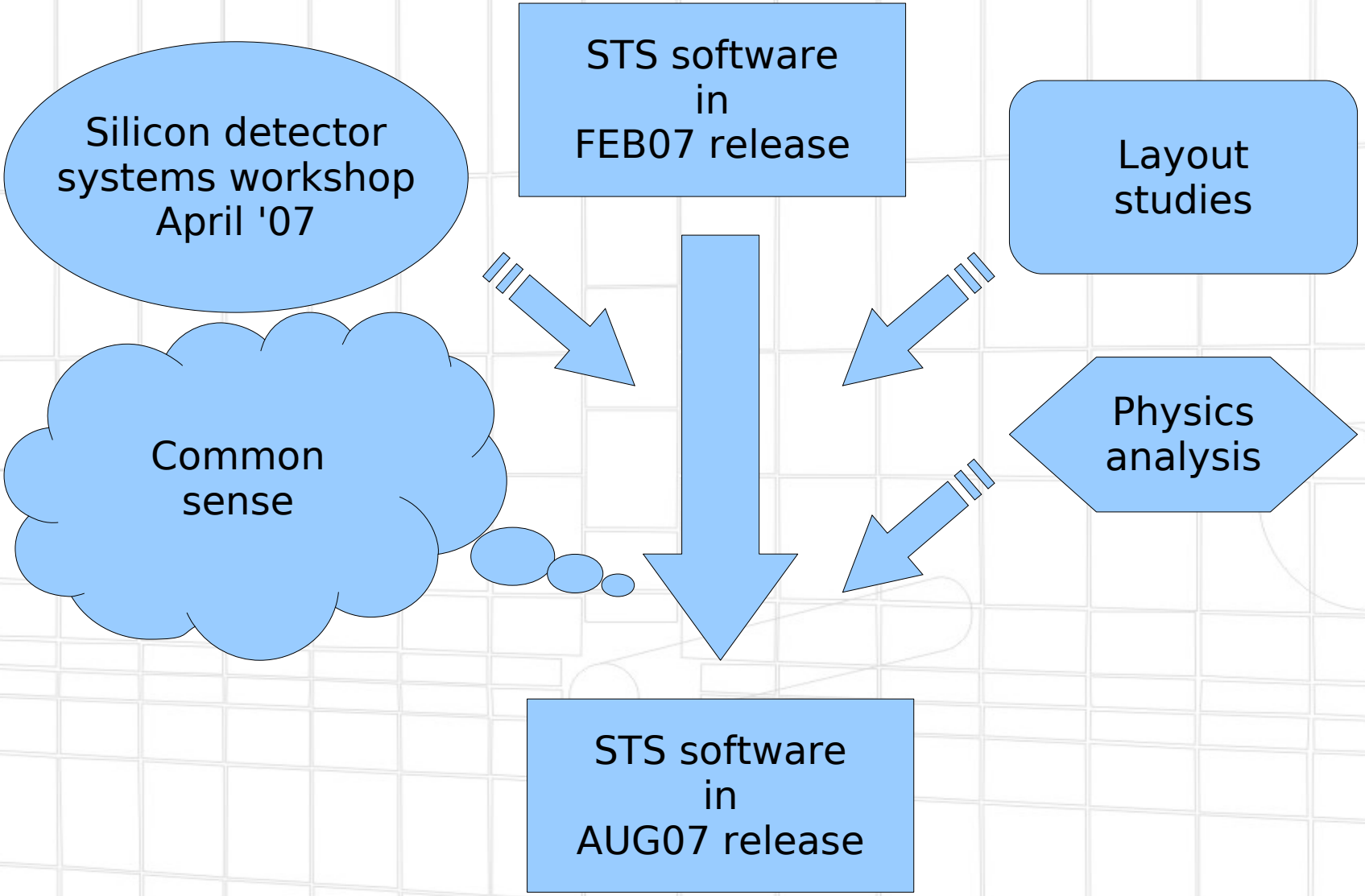


Presentation outlook

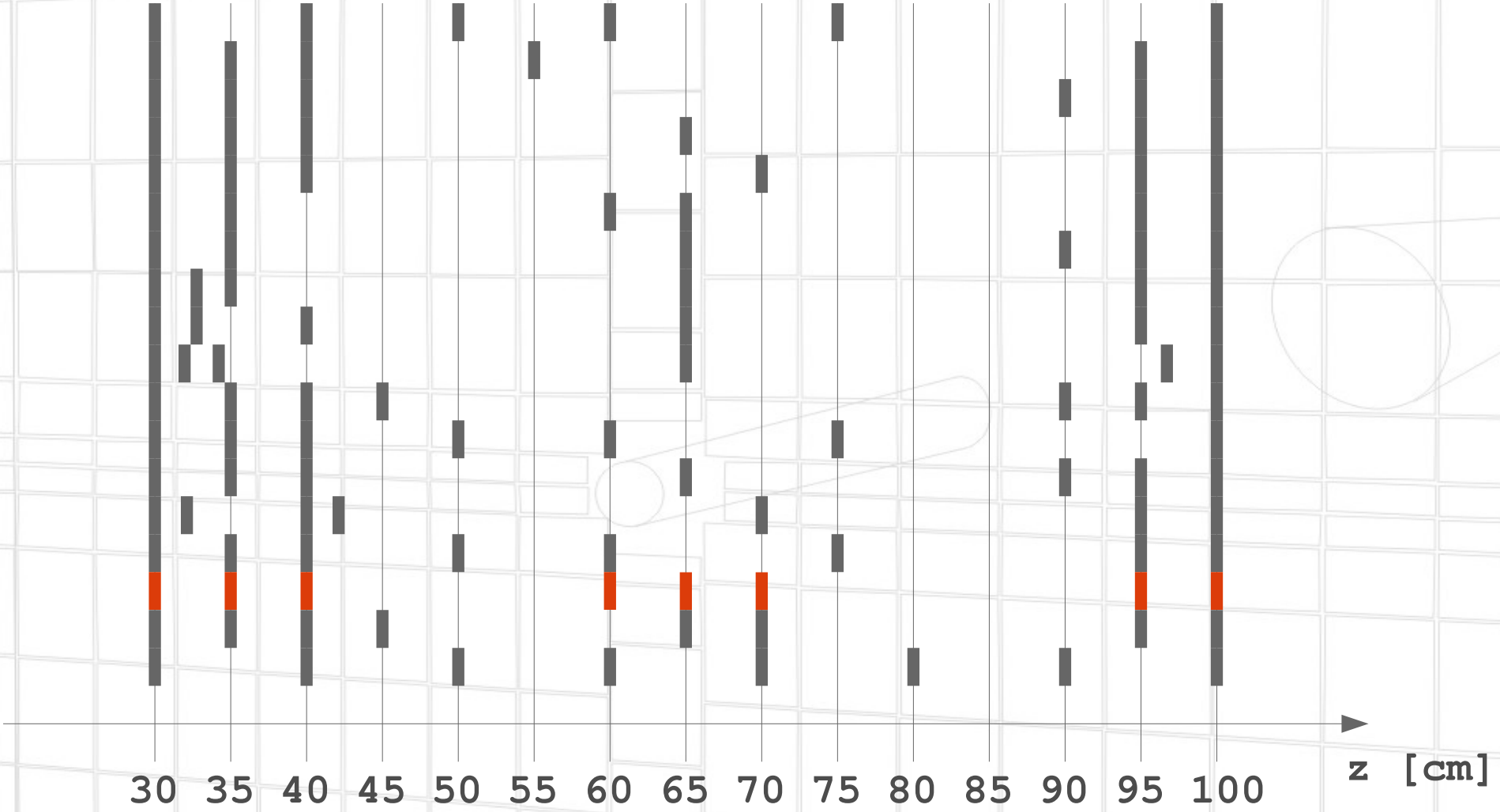
1. Motivations for changes
2. Introduced changes
3. Results
4. Full STS geometry
5. Ongoing projects

Motivations for changes



Introduced changes

1. Number of stations increased to 8,
   at: 30, 35, 40, 50, 60, 75, 95 and 100cm



Introduced changes

1. Number of stations increased to 8,
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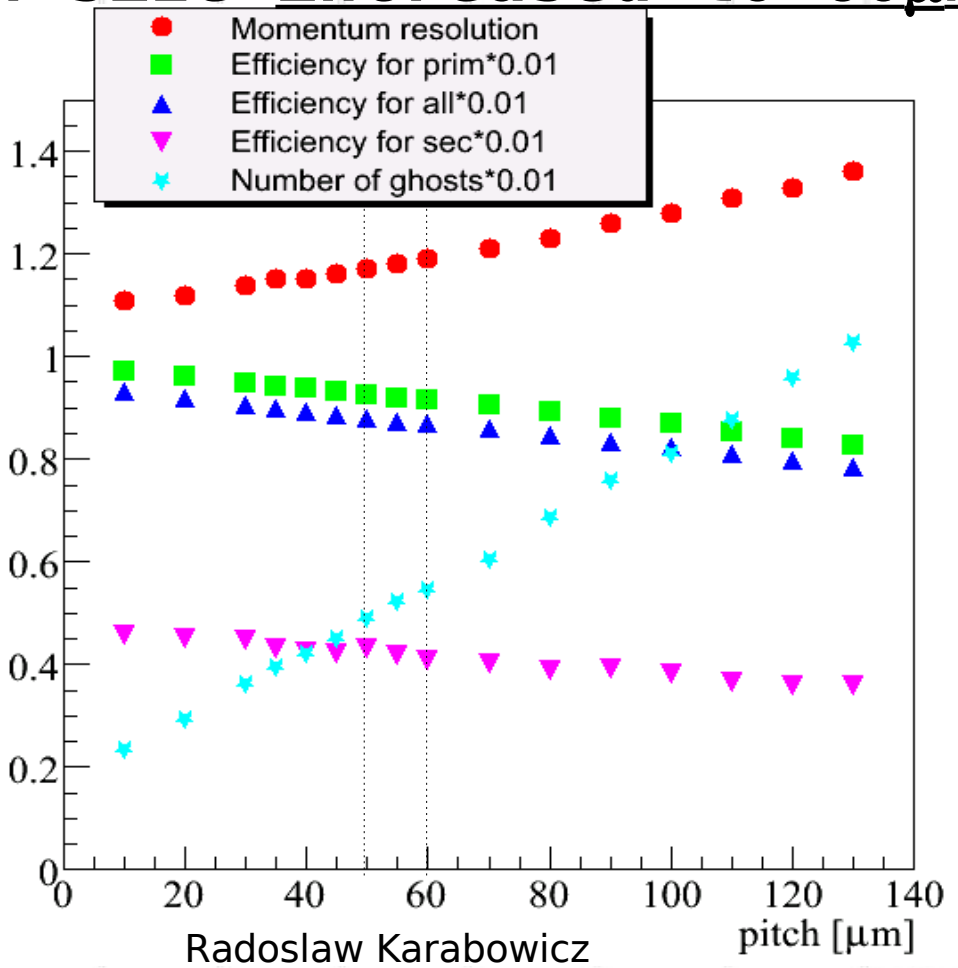
2. Strips: pitch size increased to 60µm



Introduced changes

1. Number of stations increased to 8,
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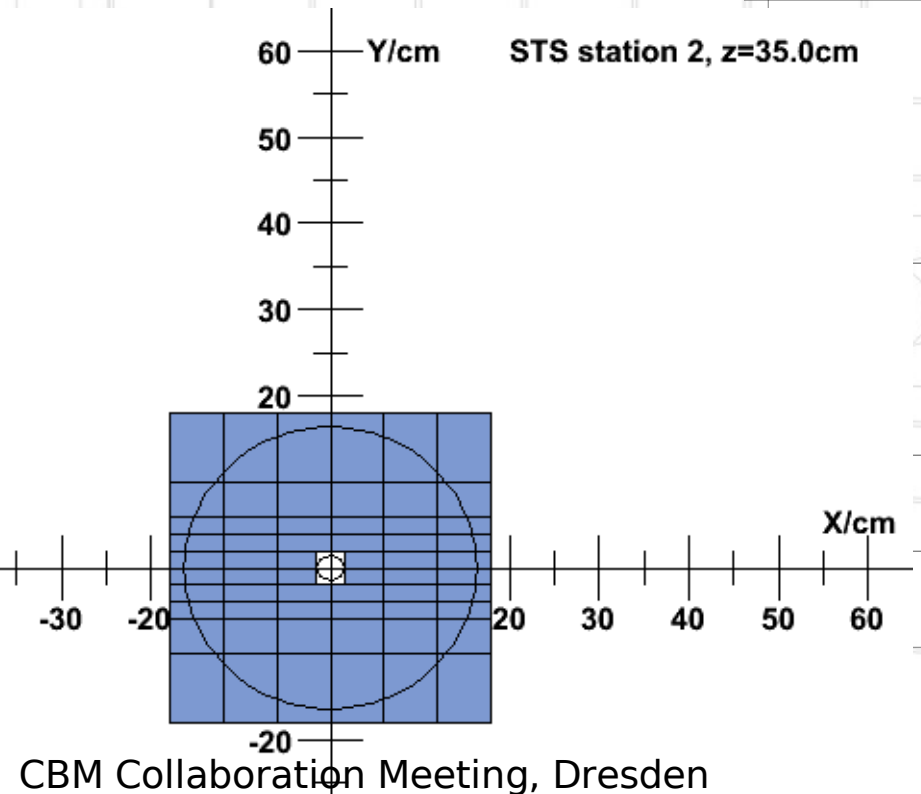
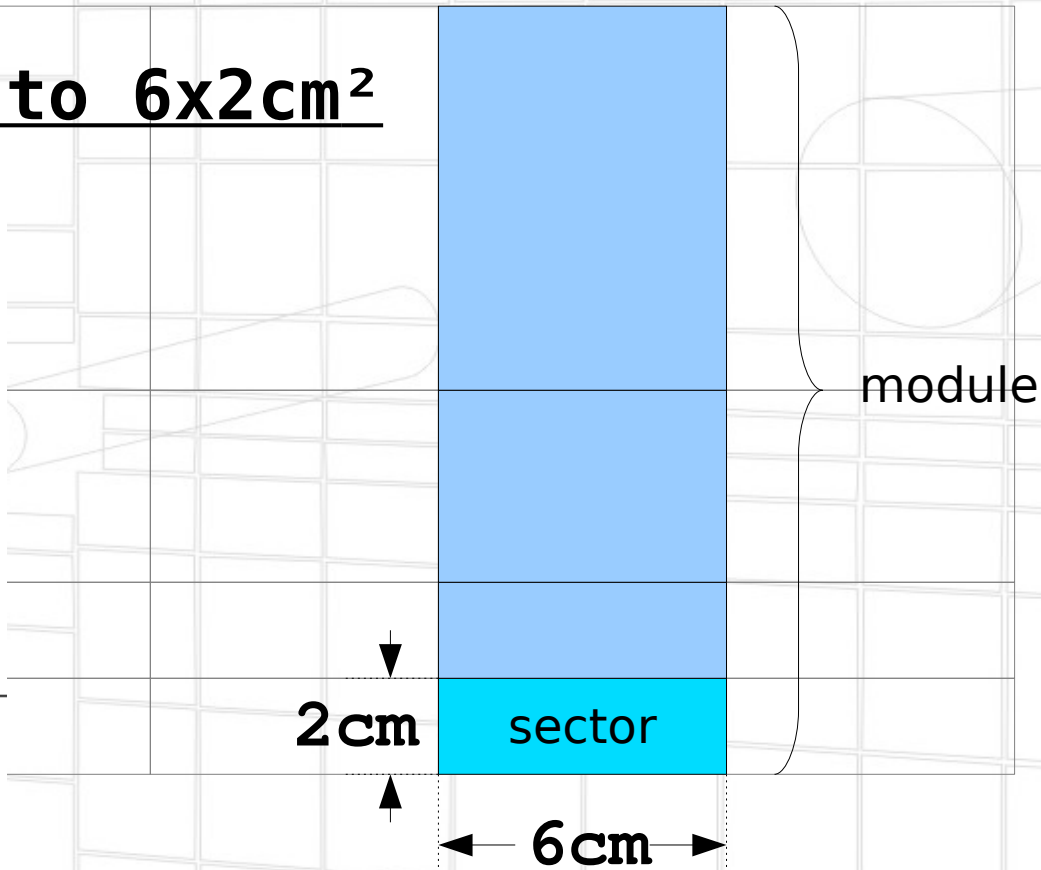
2. Strips: pitch size increased to 60μm

3. Sector size set to 6x2cm²





Introduced changes

1. Number of stations increased to 8,
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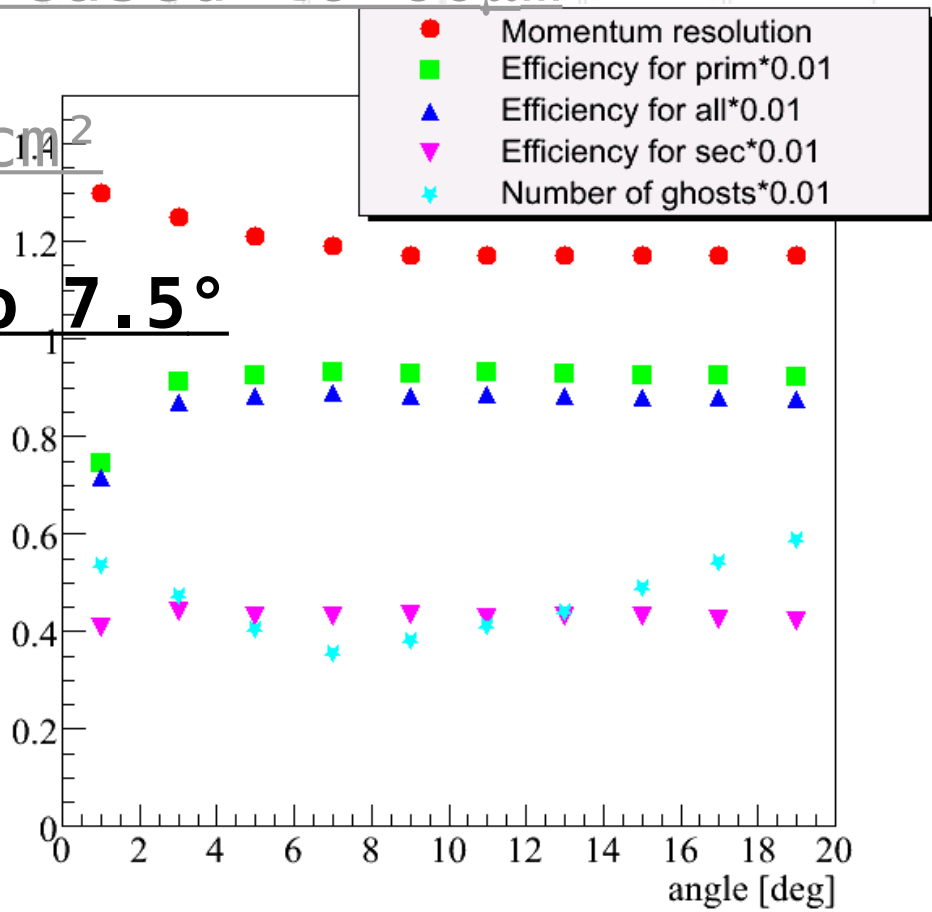
4. Stereo angle changed to 7.5°



Introduced changes

1. Number of stations increased to 8,
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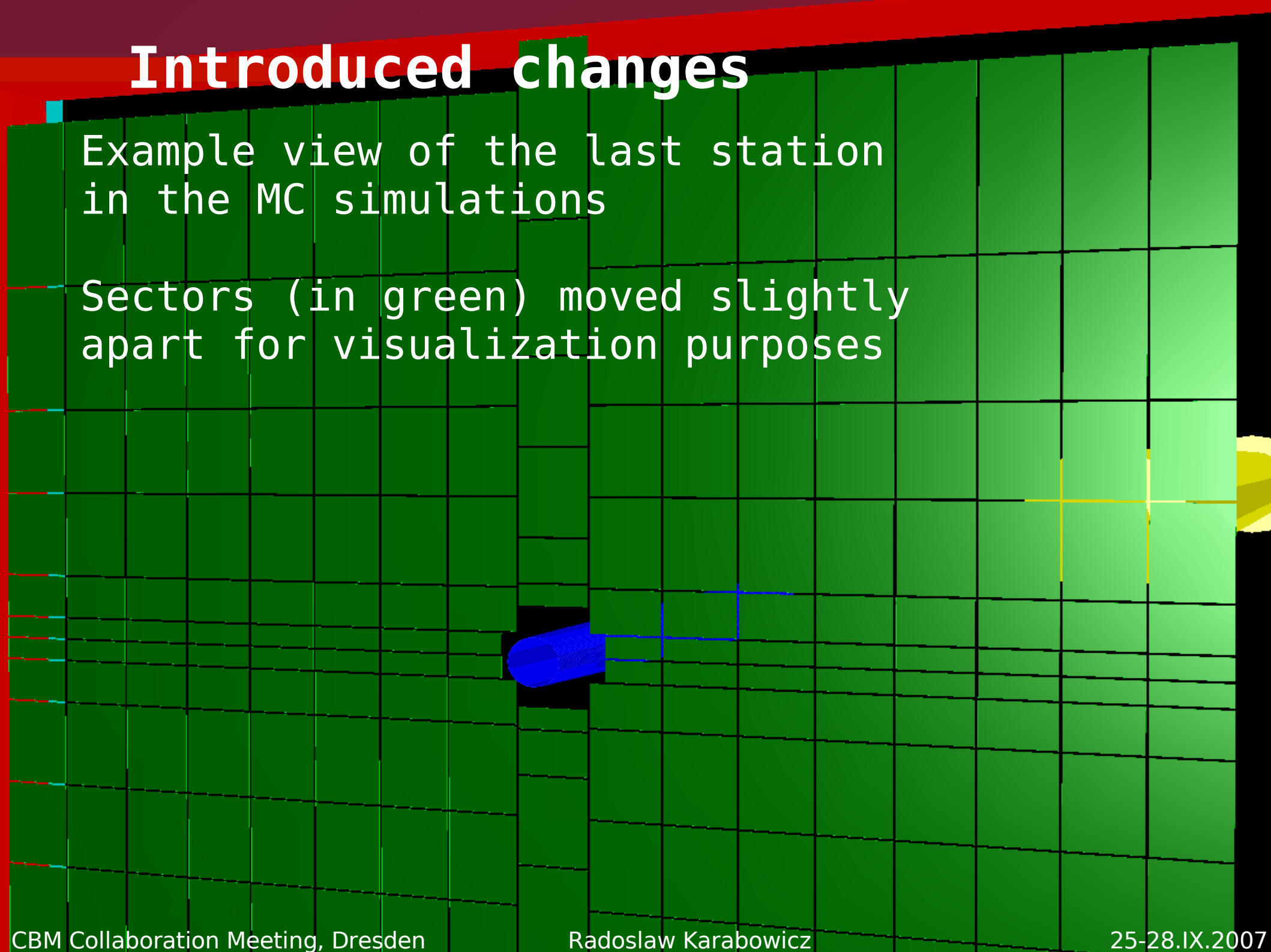
2. Strips: pitch size increased to 60μm
3. Sector size set to 6x2cm²
4. Stereo angle changed to 7.5°
5. **Station's layout in the MC simulation matching to sectorized geometry**

Introduced changes

Example view of the last station in the MC simulations

Sectors (in green) moved slightly apart for visualization purposes



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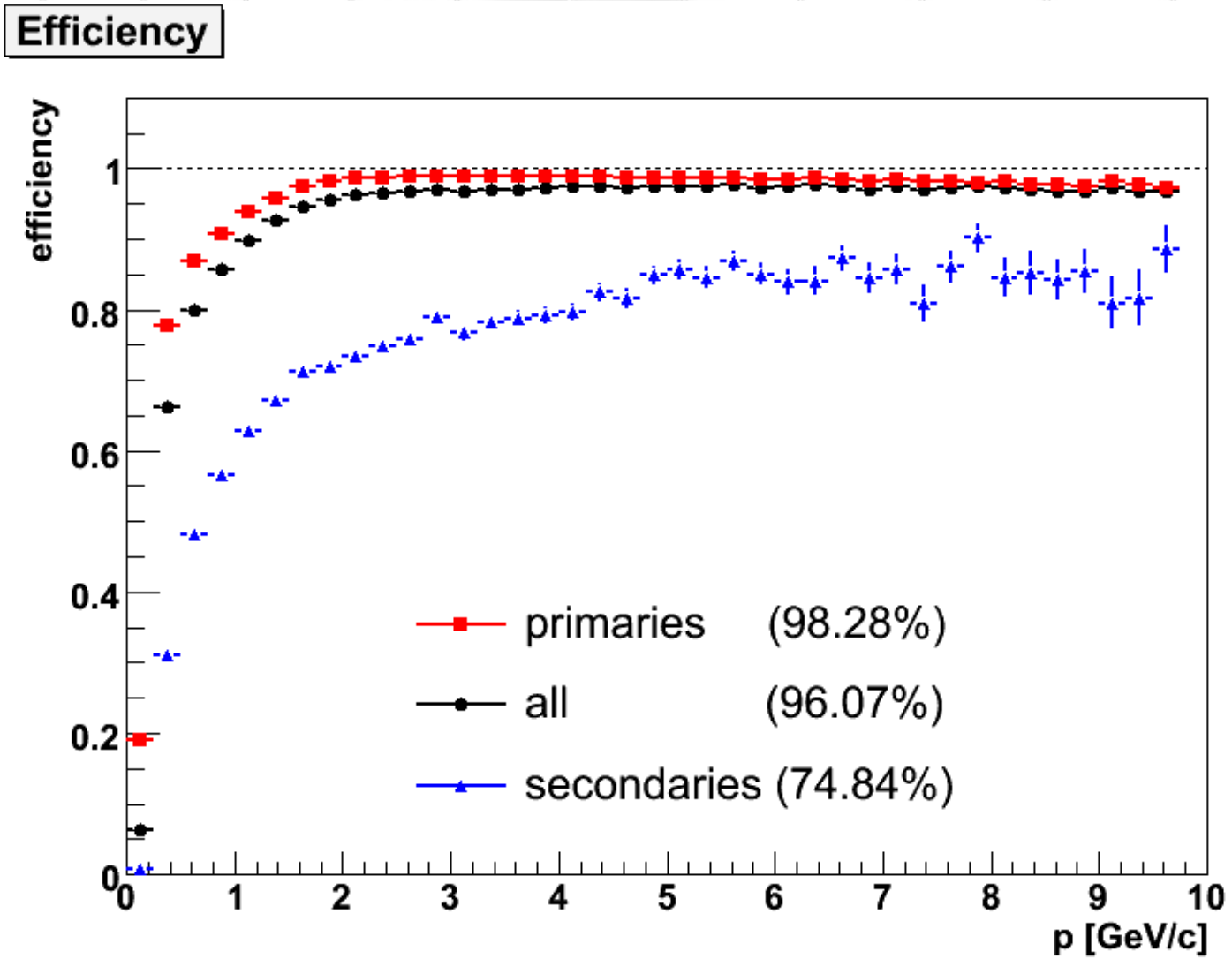
5. Station's layout in the MC simulation
   matching to sectorized geometry

Results – tracking efficiency

1000 Au+Au central events at 25AGeV
8 stations: 2 hybrids, 6 strips
sectorized geometry, default in Aug07 release

Average numbers of reconstructed tracks:
616 primaries
56 secondaries

17 ghosts
39 clones

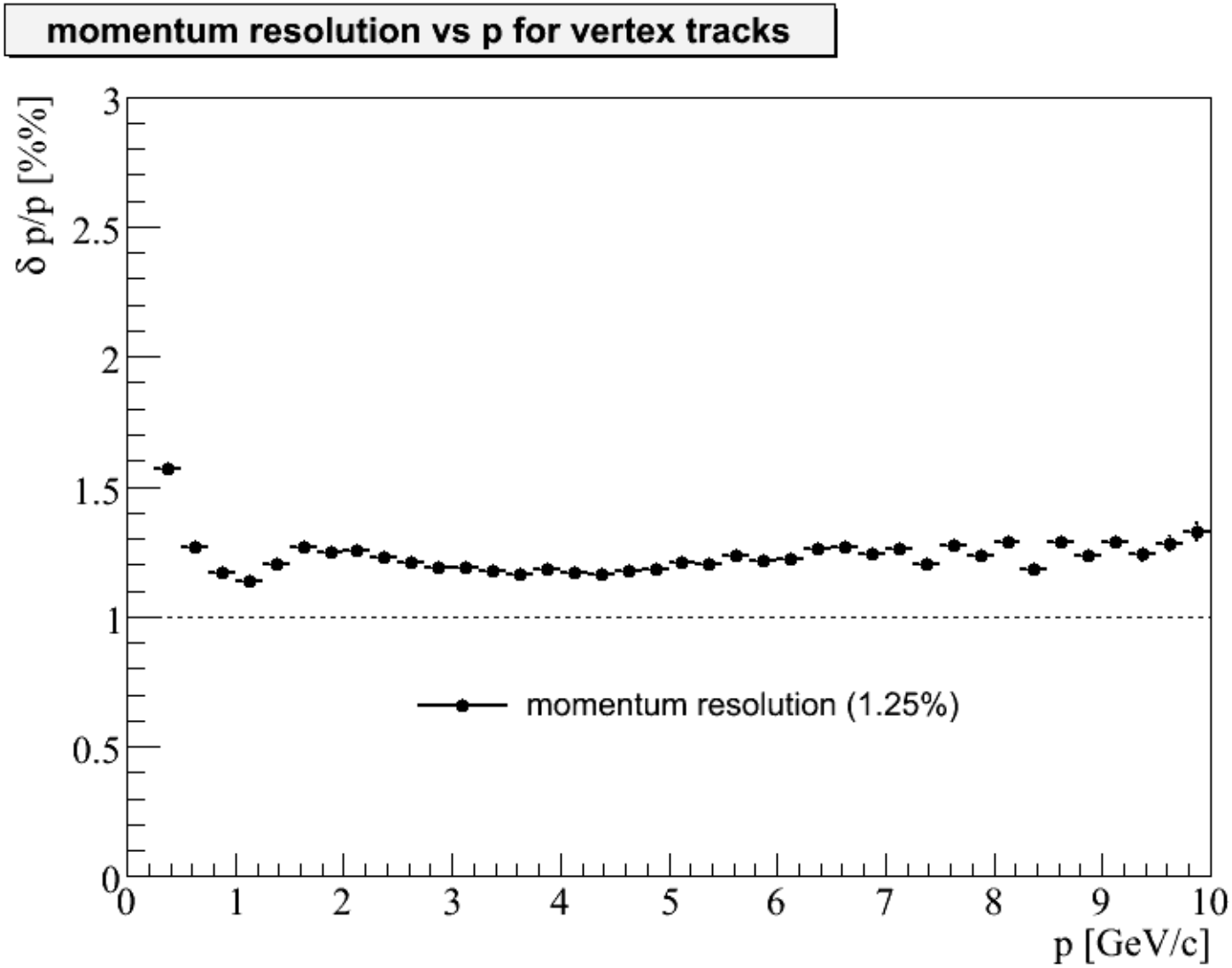


Results – momentum resolution

1000 Au+Au central events at 25AGeV
8 stations: 2 hybrids, 6 strips
sectorized geometry, default in Aug07 release

Average numbers of reconstructed tracks:
616 primaries
56 secondaries

17 ghosts
39 clones



Full STS geometry

Present in the Aug07 release.

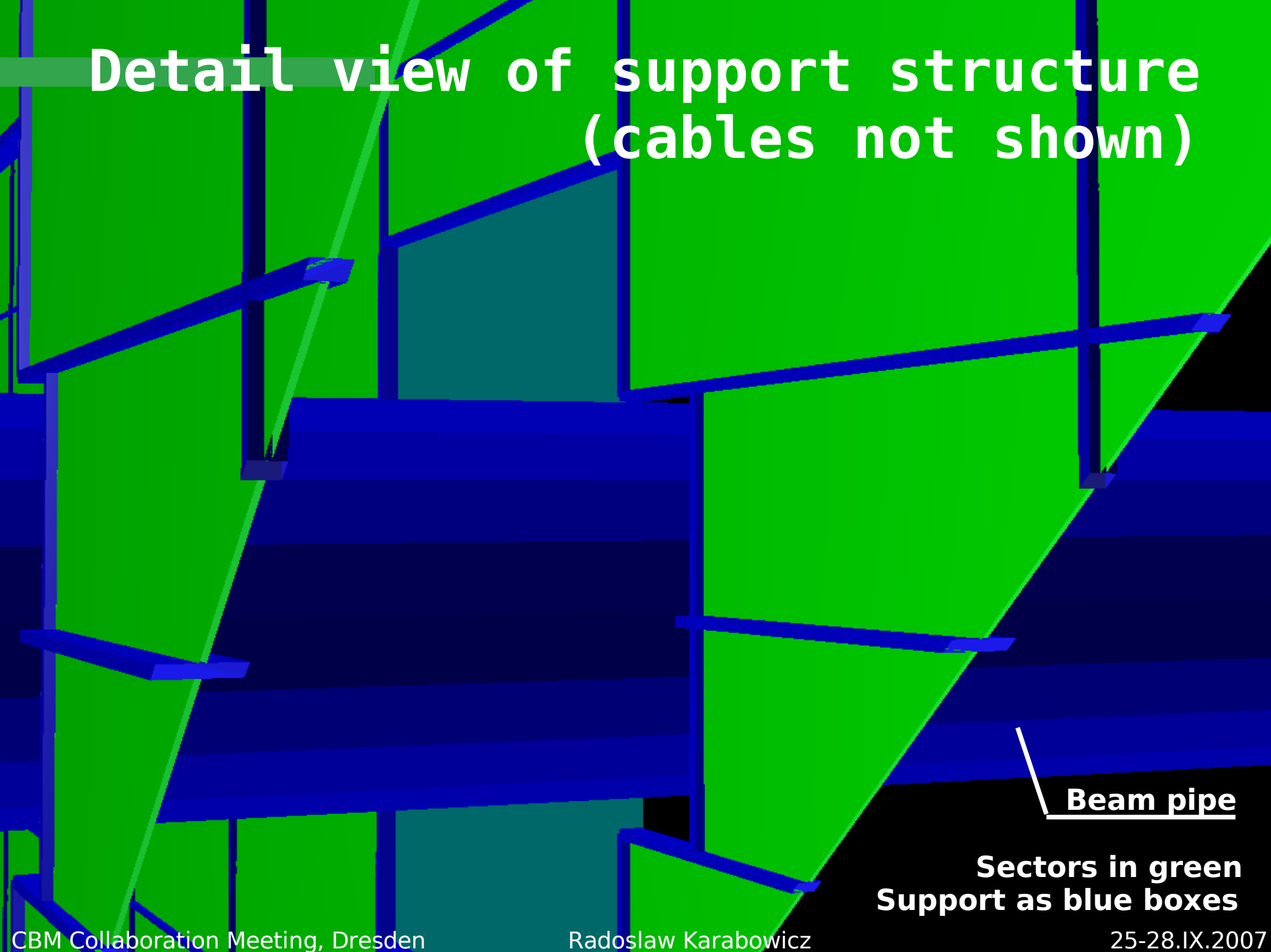
Additional material present in the simulations to mimic:

Support structure: carbon boxes with a width of 1mm and a thickness of 2-5mm

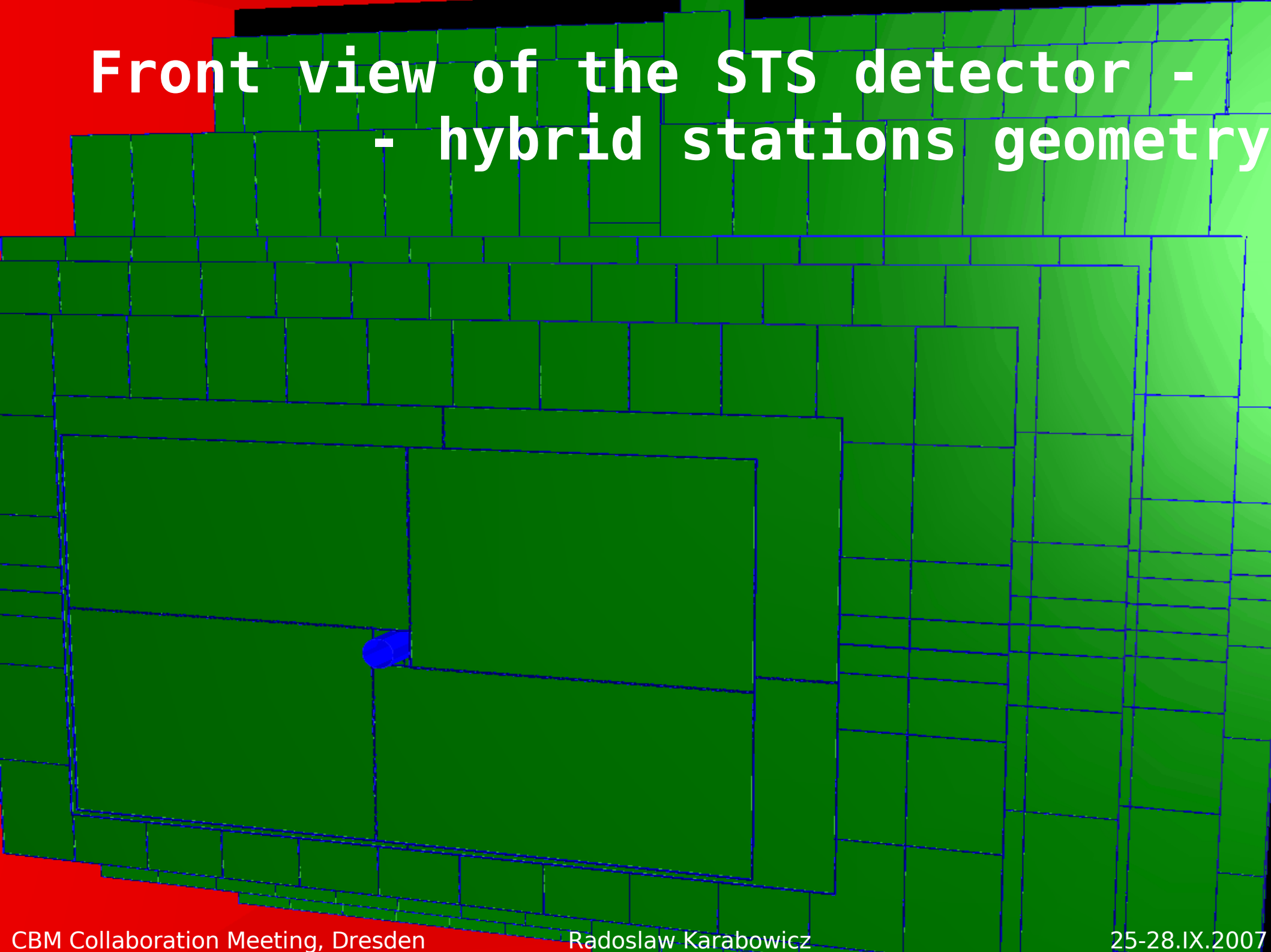
Readout electronics at the top and bottom of the stations: 5mm thick layer of silicon and 2mm thick layer of aluminium

Cables (200μm thick kapton) extending from the sectors to the readout structures at an angle of about 2.5°

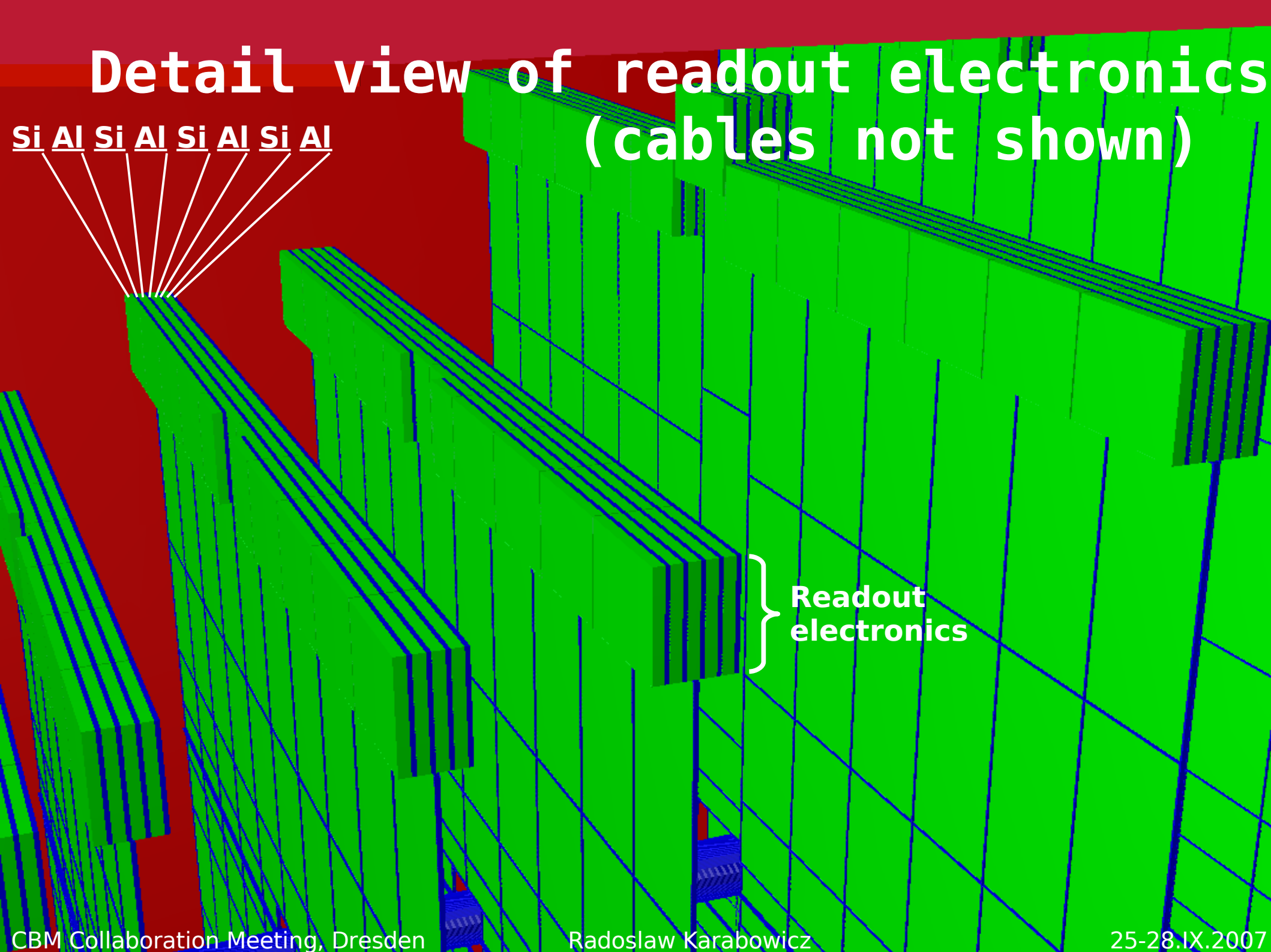
Detail view of support structure (cables not shown)



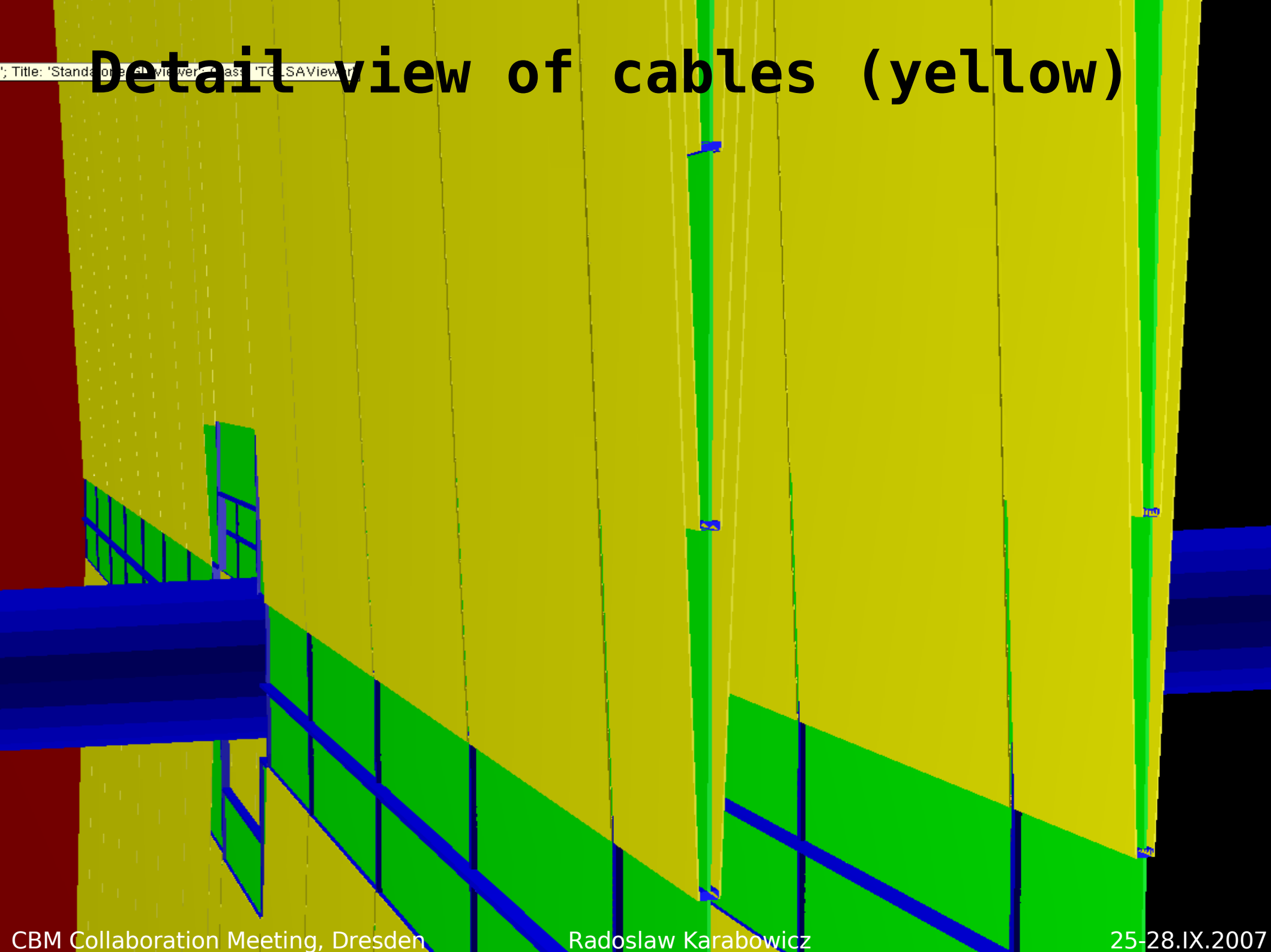
Front view of the STS detector - - hybrid stations geometry

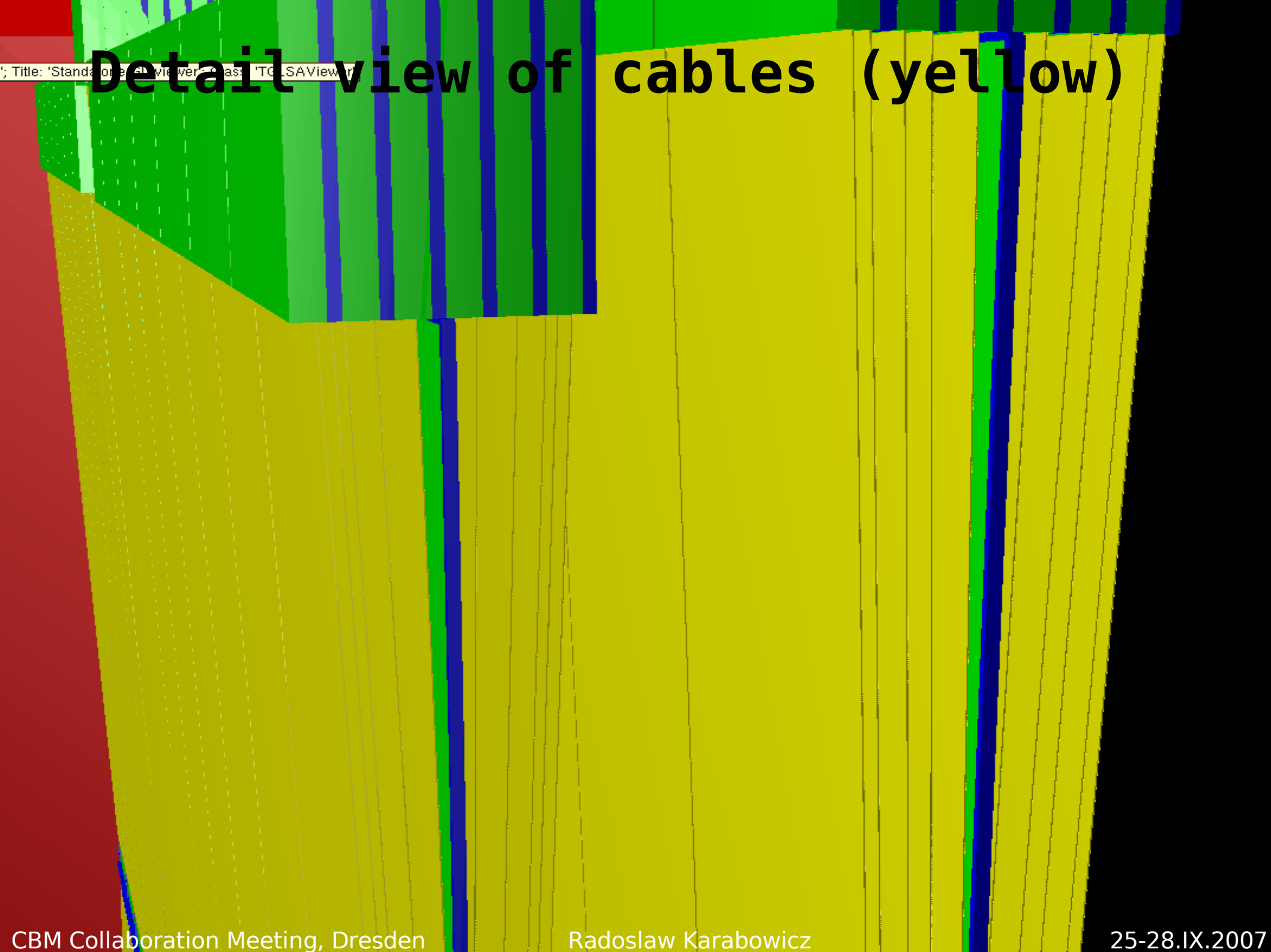


Detail view of readout electronics (cables not shown)



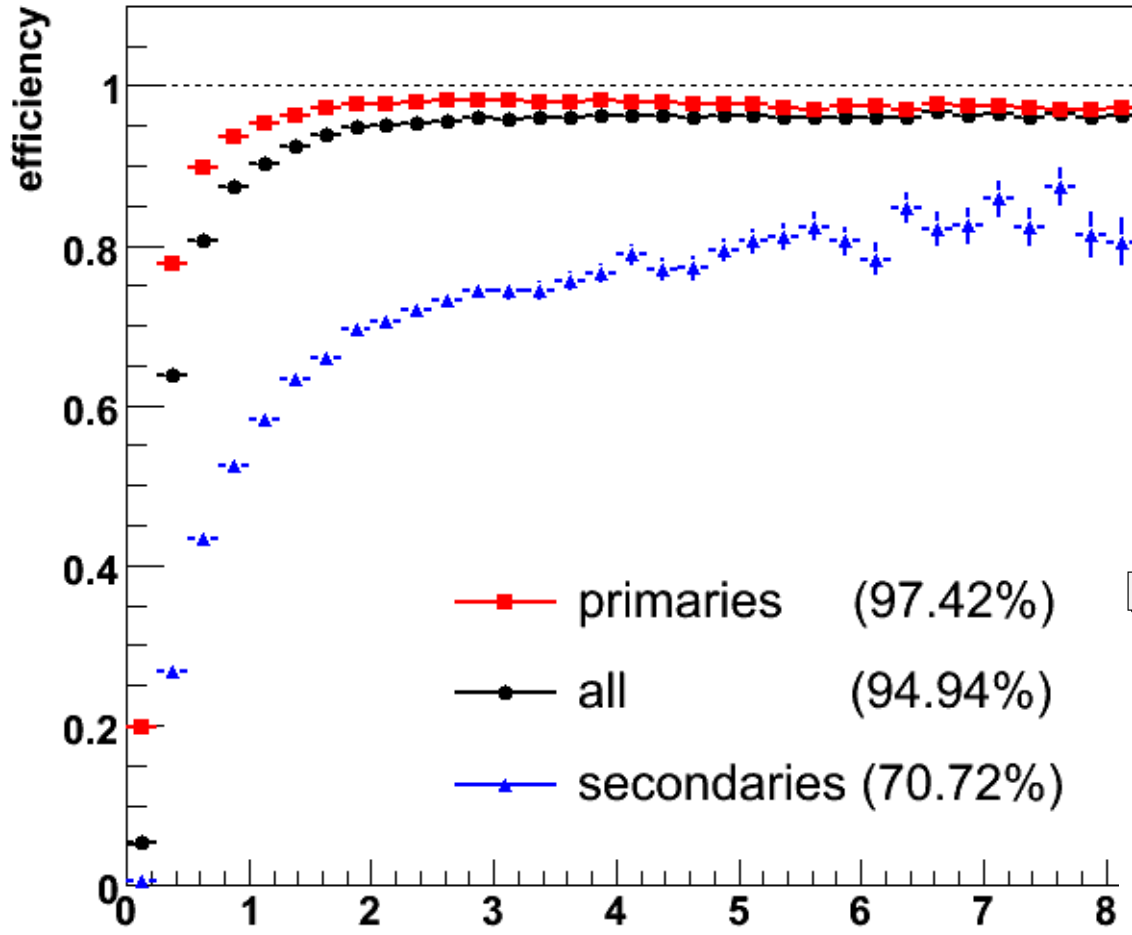
Detail view of cables (yellow)



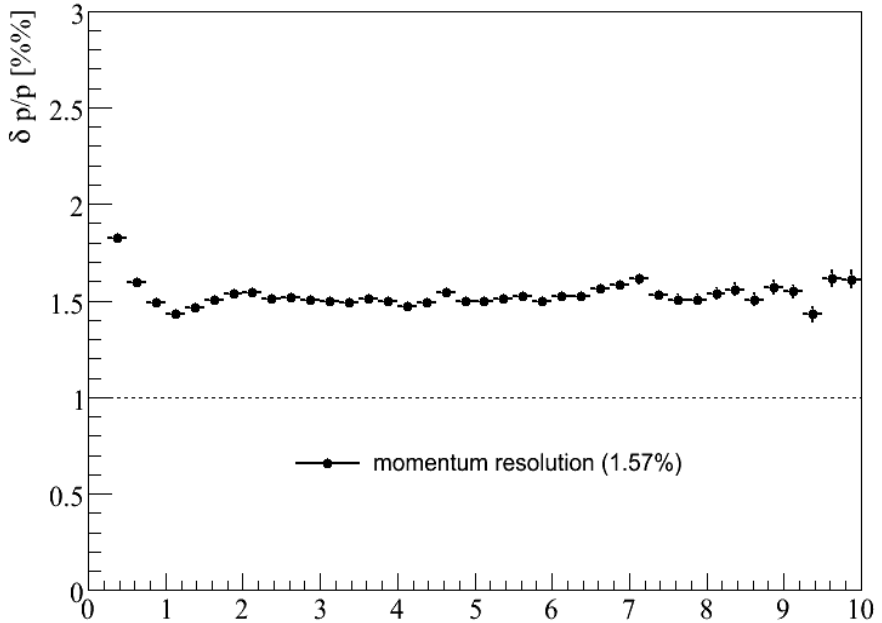

Detail view of cables (yellow)

Full detector setup - results

Efficiency



momentum resolution vs p for vertex tracks

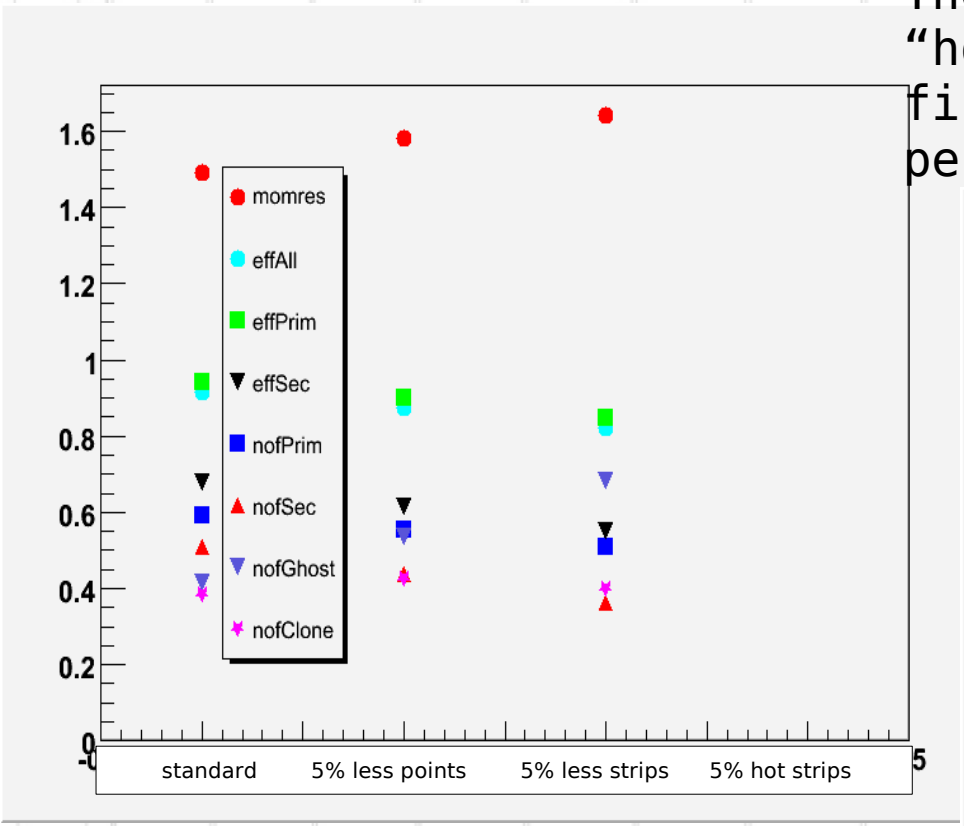


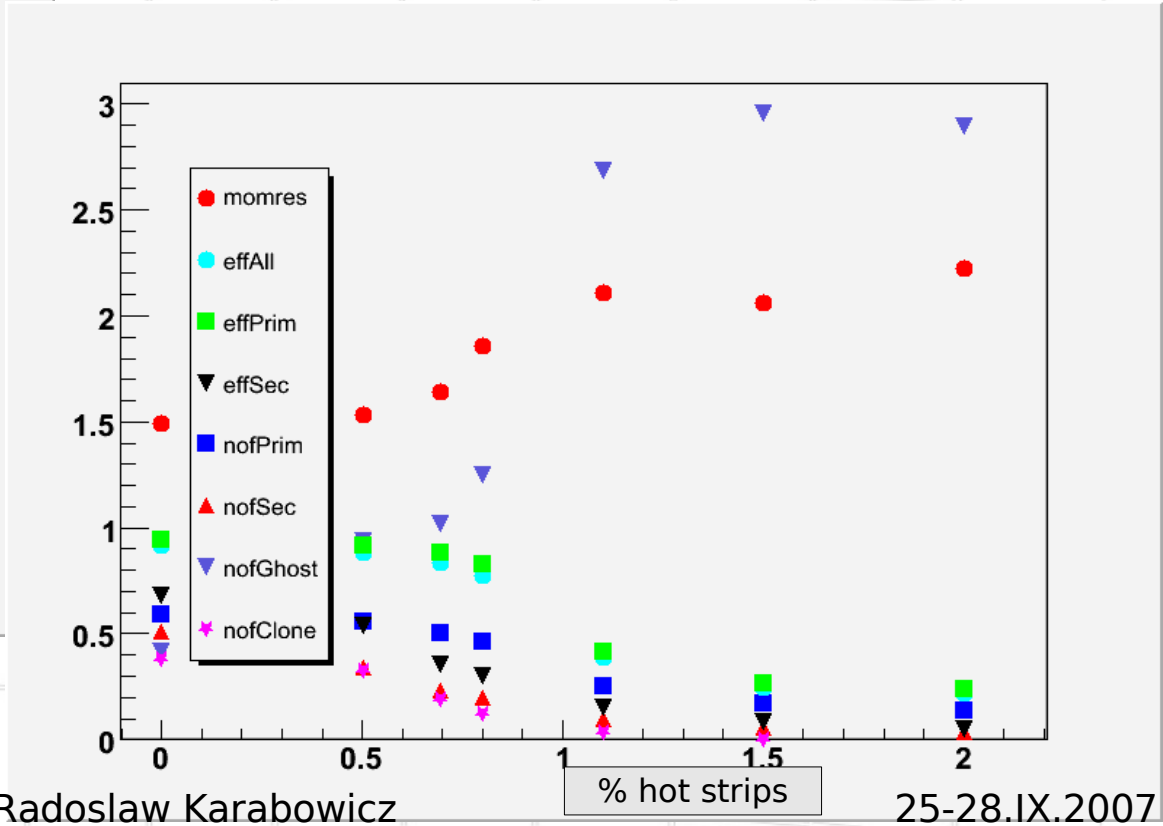
Ongoing projects

1. Effect of the detection inefficiencies and fake hits.

Preliminary studies shows that tracking software would deal with 5% hit inefficiencies.

The software performs also well with 0.5% “hot strips”, which doubled the number of fired strips per event. But beyond that performance drops drastically



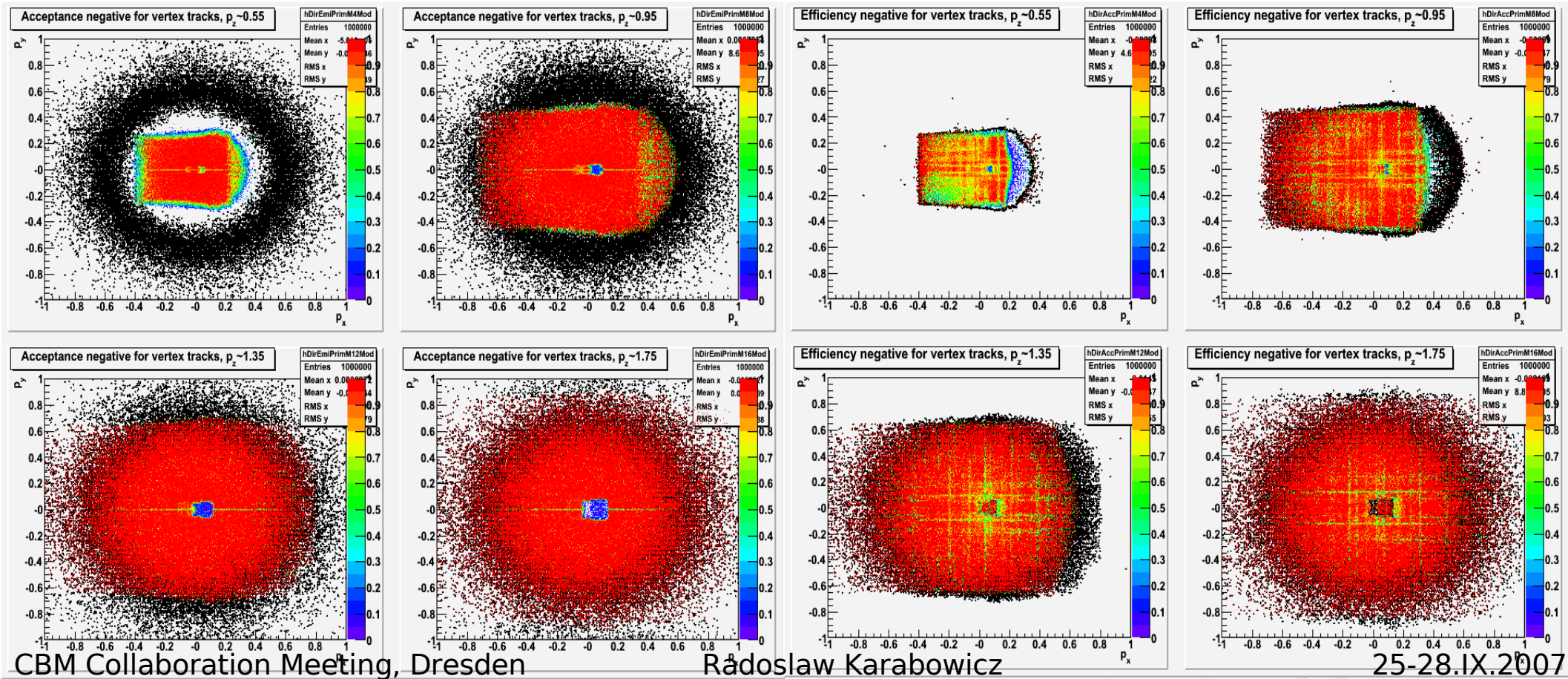


Ongoing projects

1. Effect of the detection inefficiencies and fake hits.

2. Acceptance and efficiency study.

   Identifying parts of the detector system, that either lack acceptance or efficiency



Ongoing projects

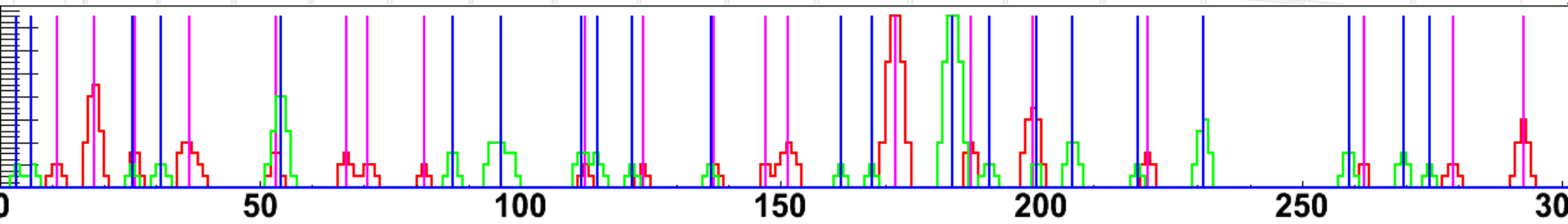
1. Effect of the detection inefficiencies and fake hits.

2. Acceptance and efficiency study.

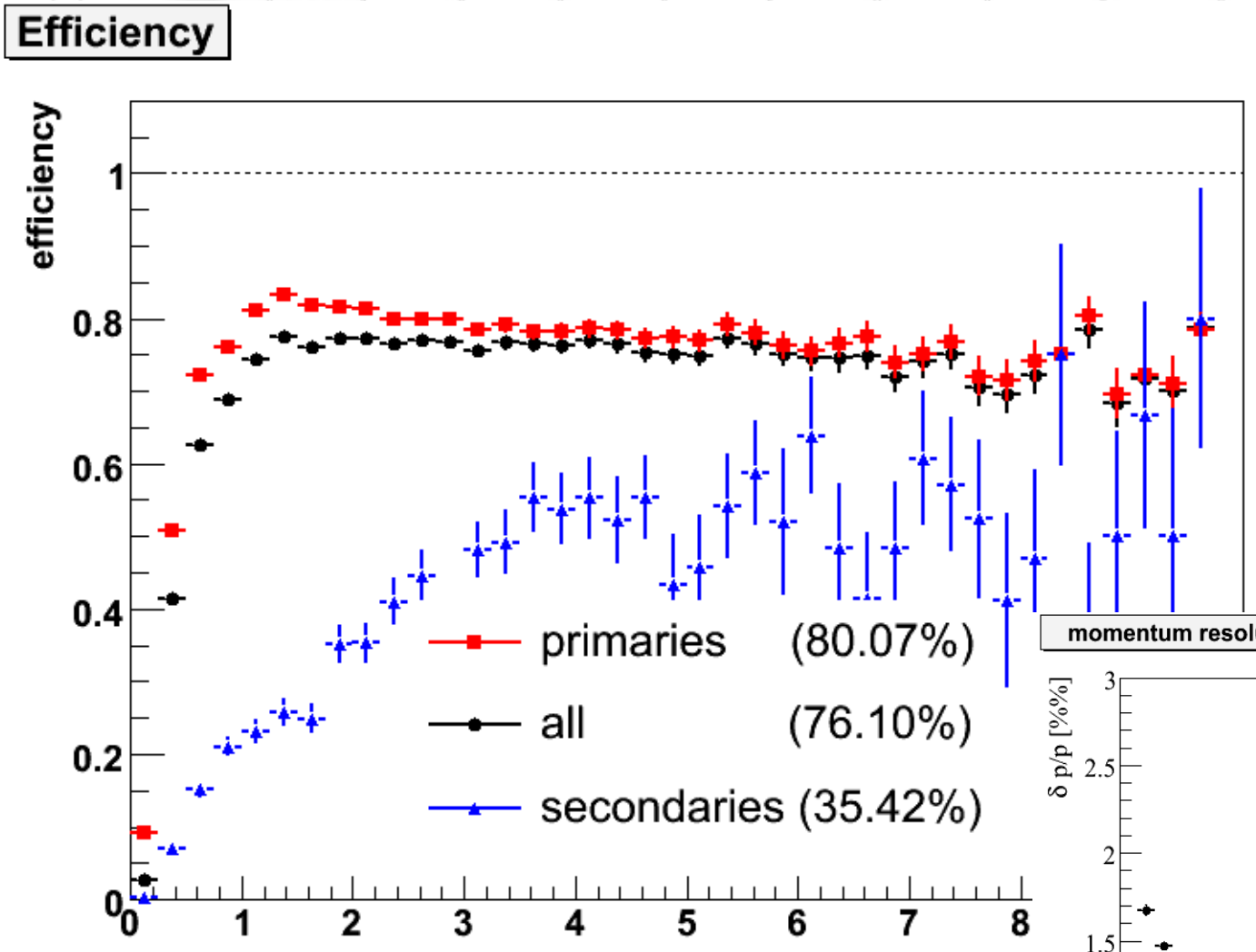
3. Realistic detector response.

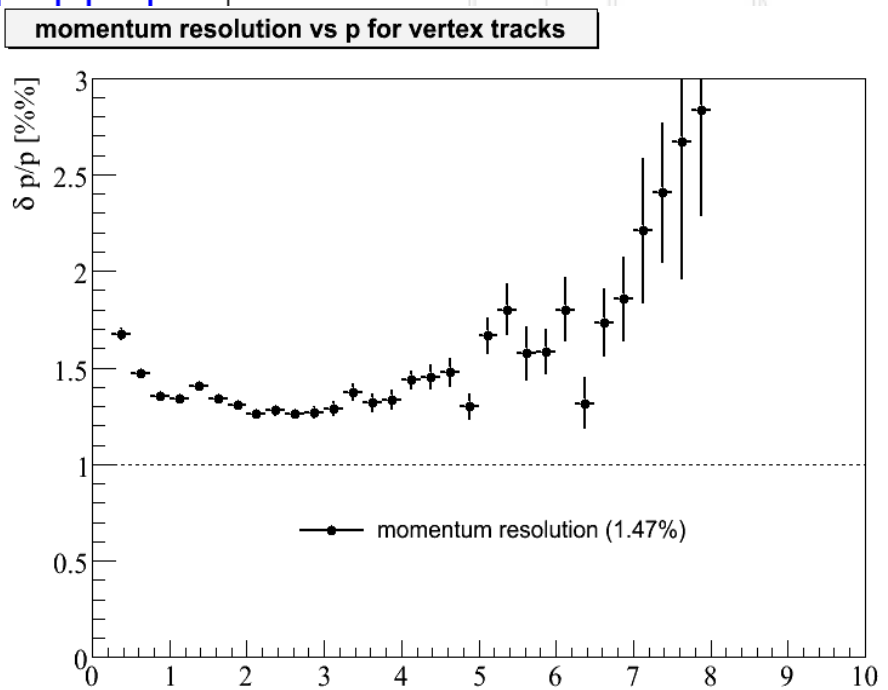
First attempt:
- signal height proportional to energy loss
- sharing of the signal between strips
- simple cluster finding

Results:
- tracking efficiencies worse by ~15%
- momentum resolution worse by ~10%

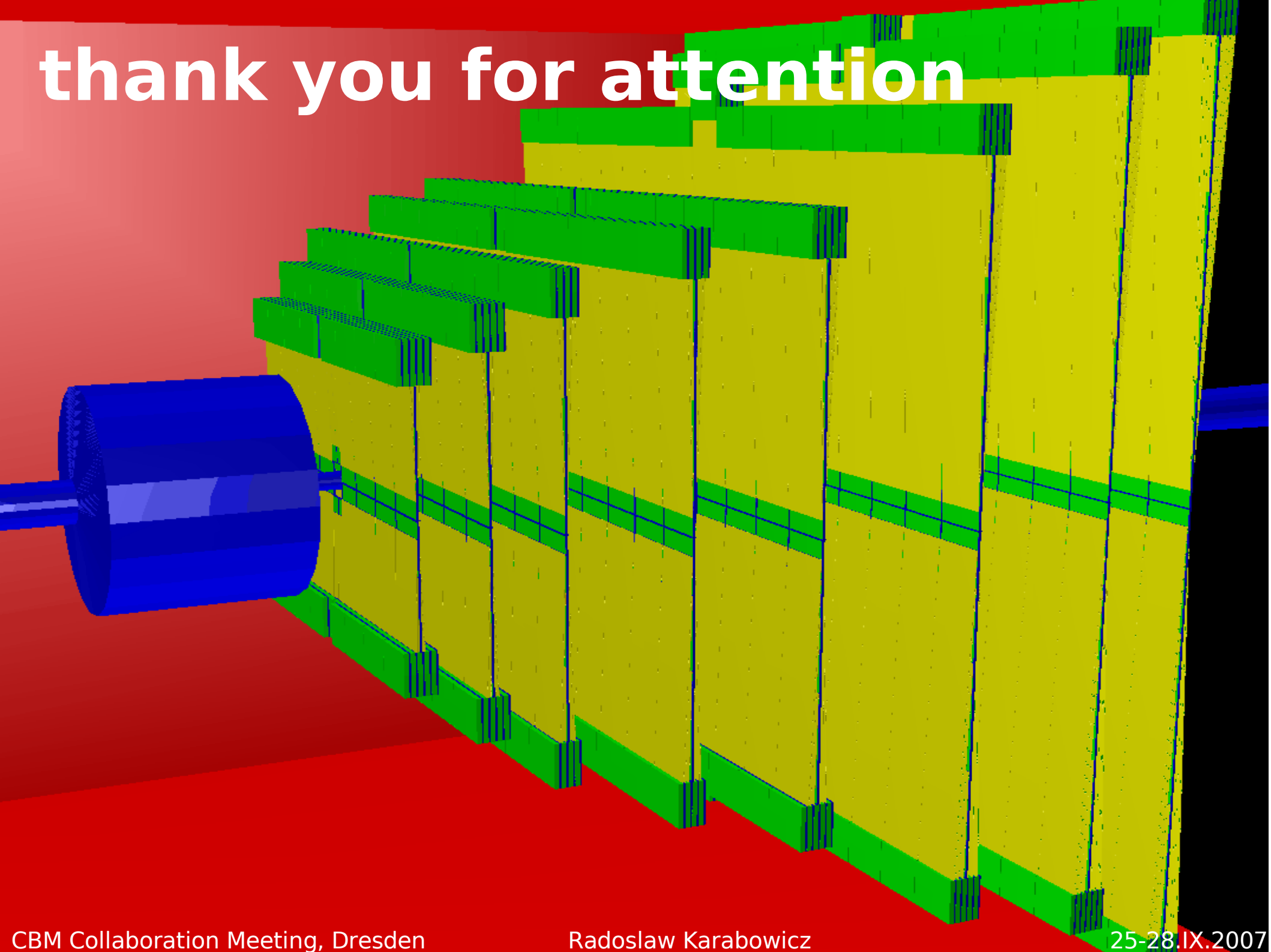


Realistic detector response - - results

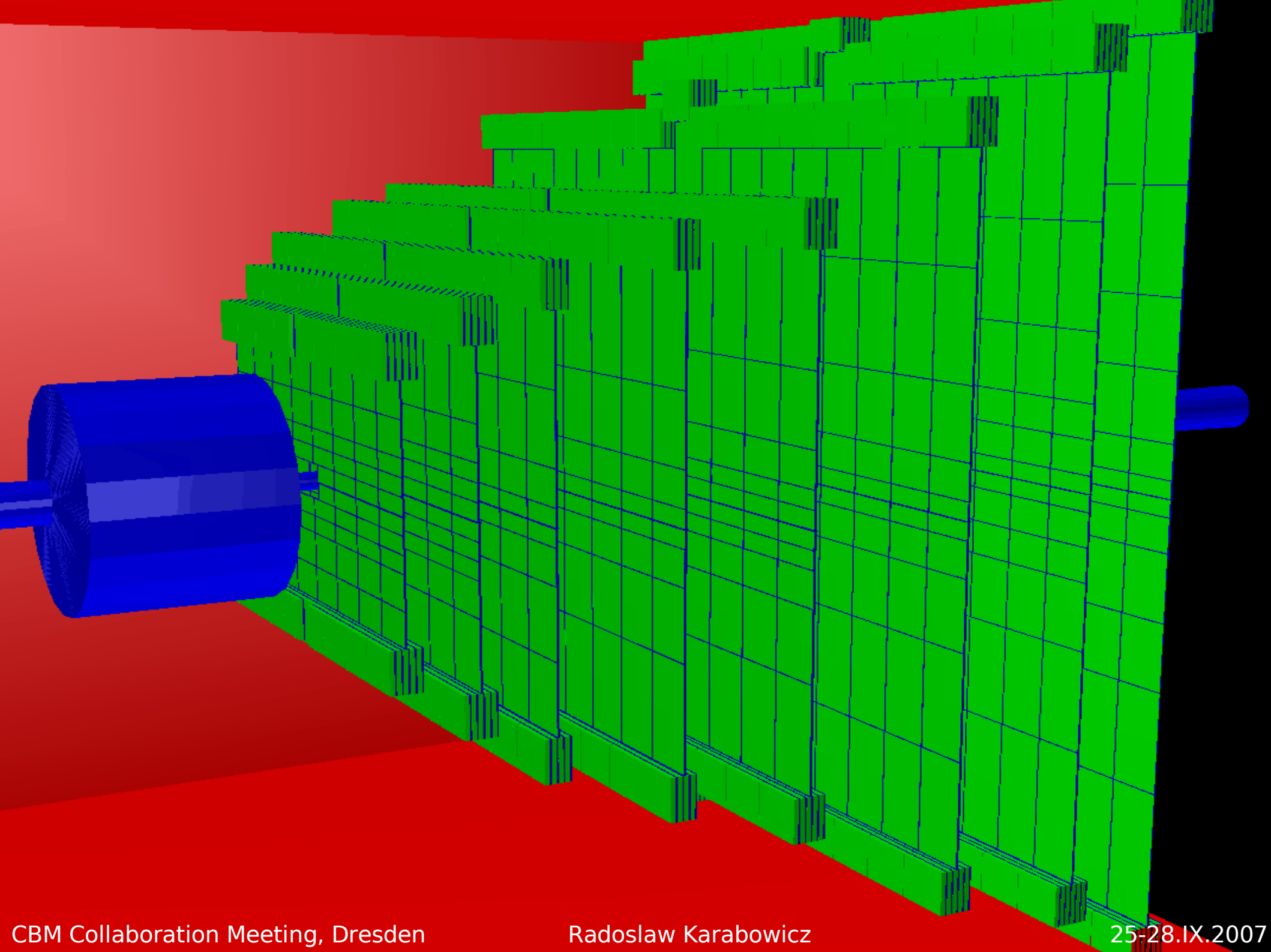


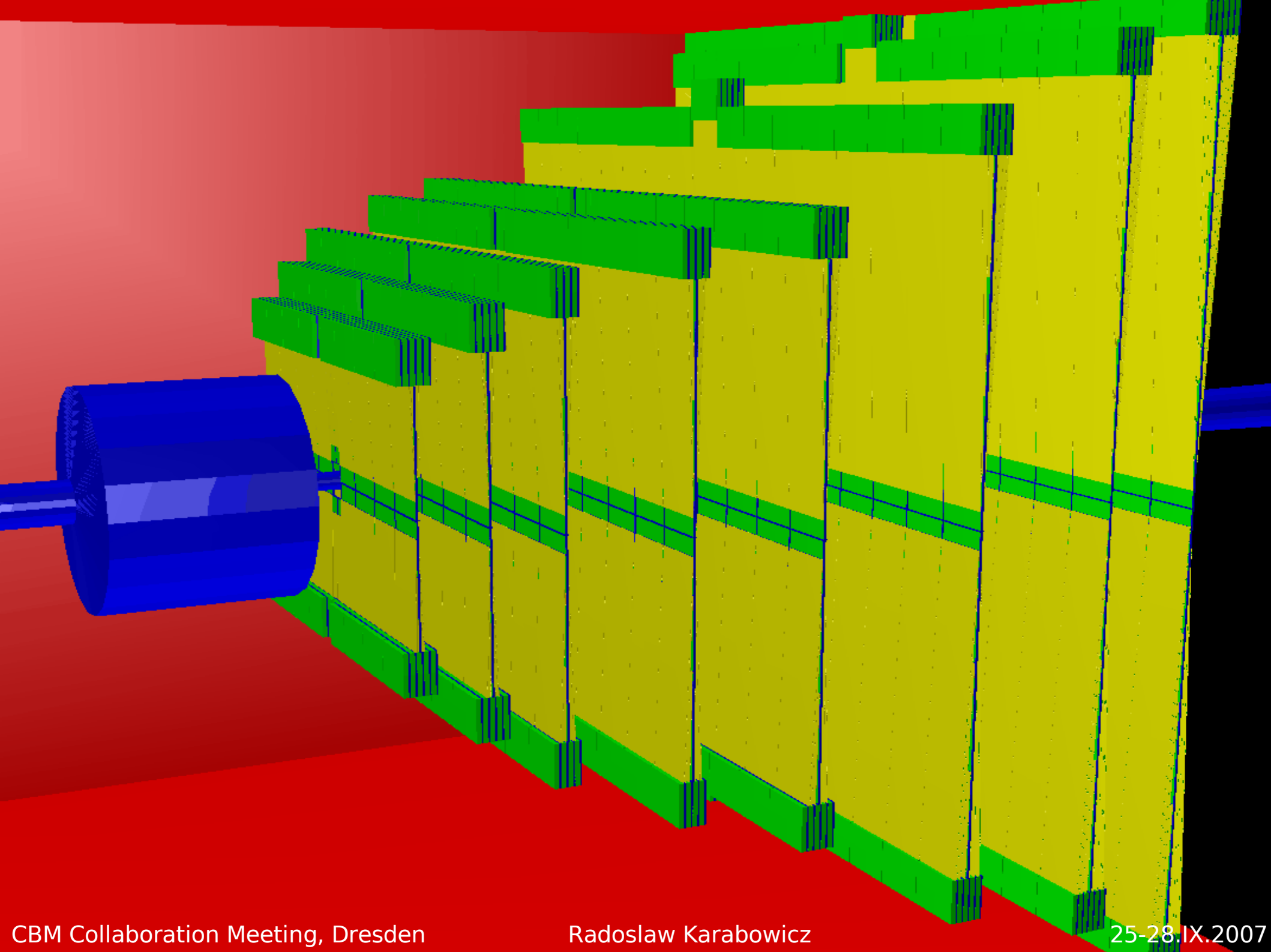


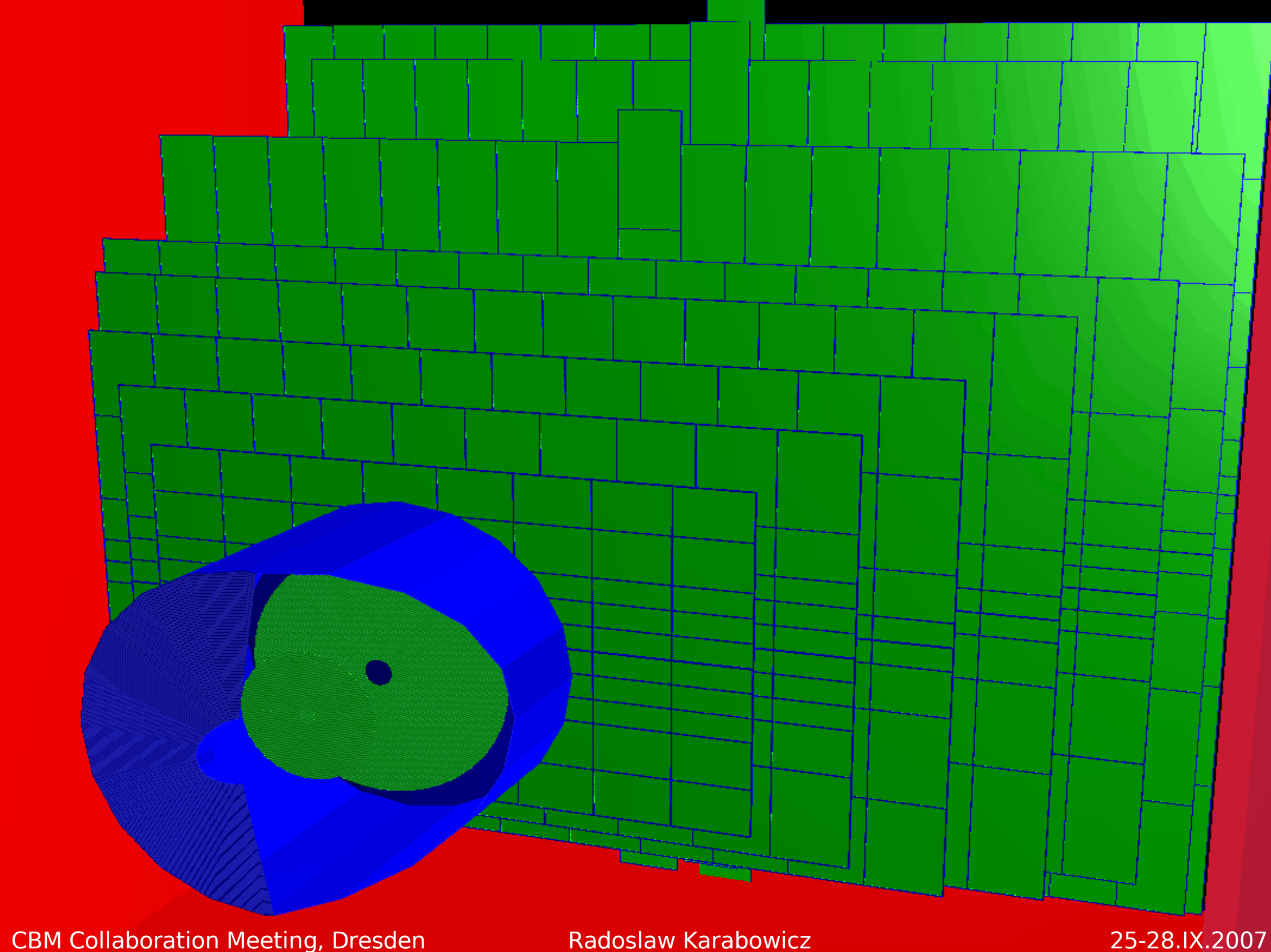
thank you for attention



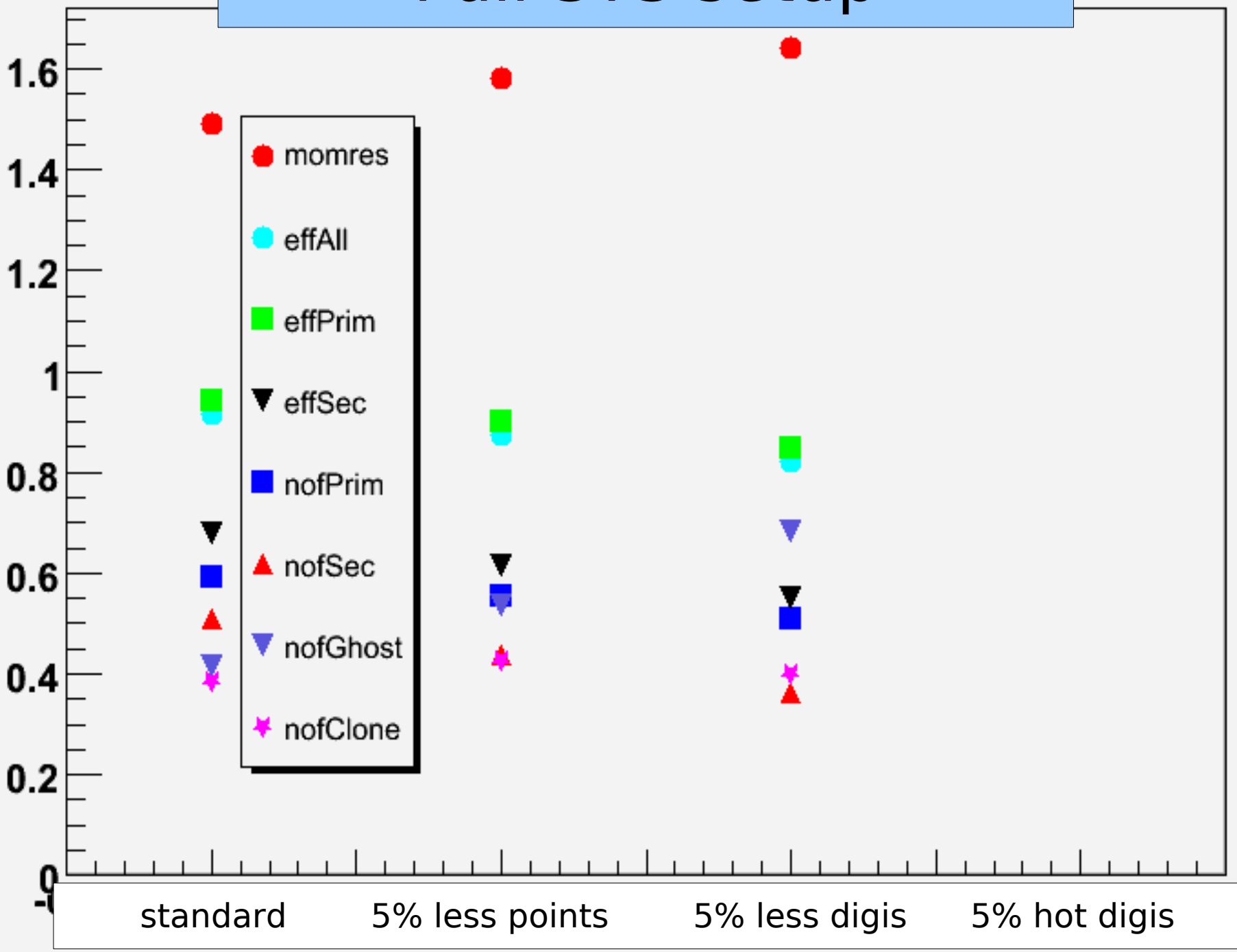
Backup slides



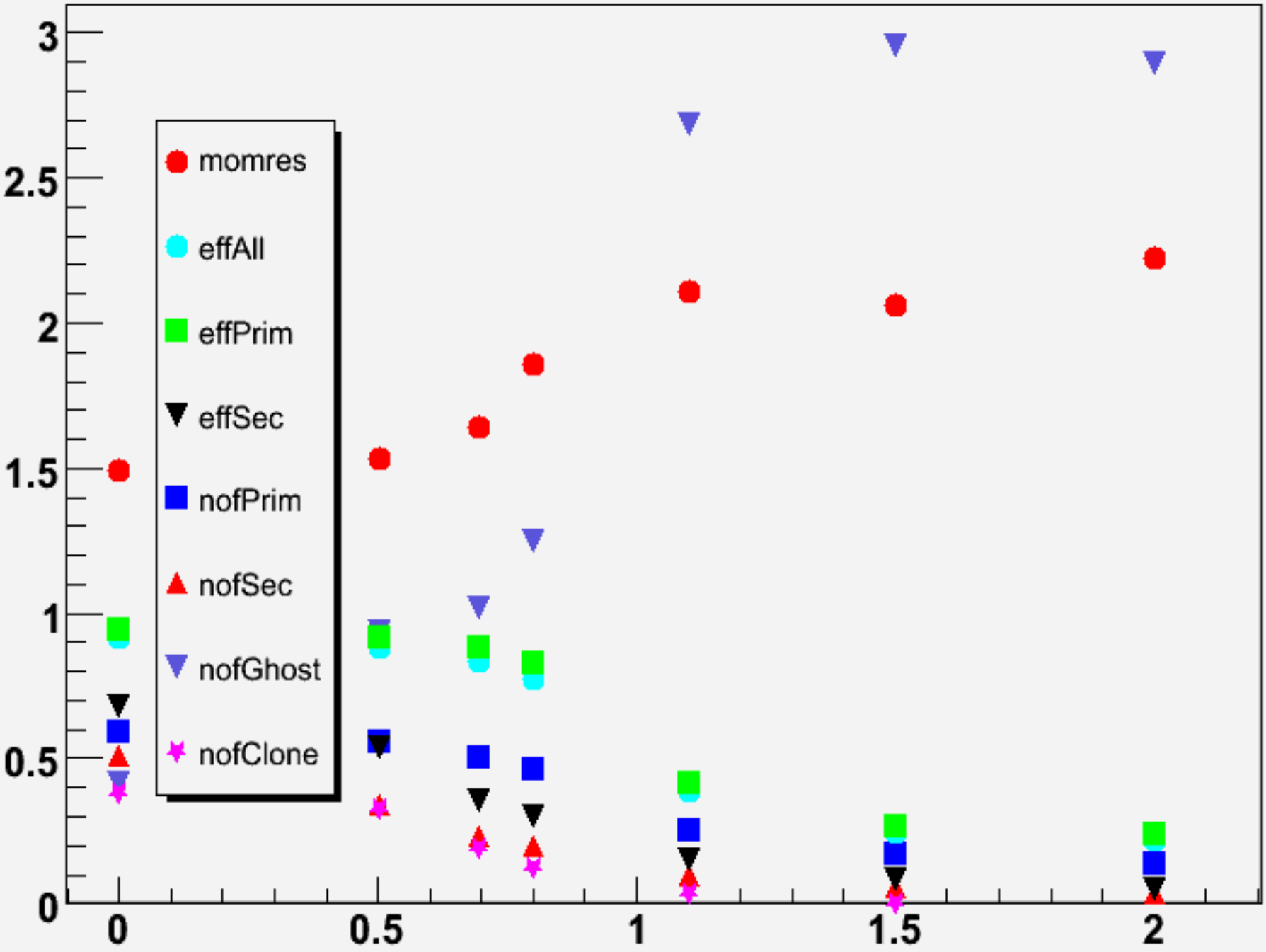


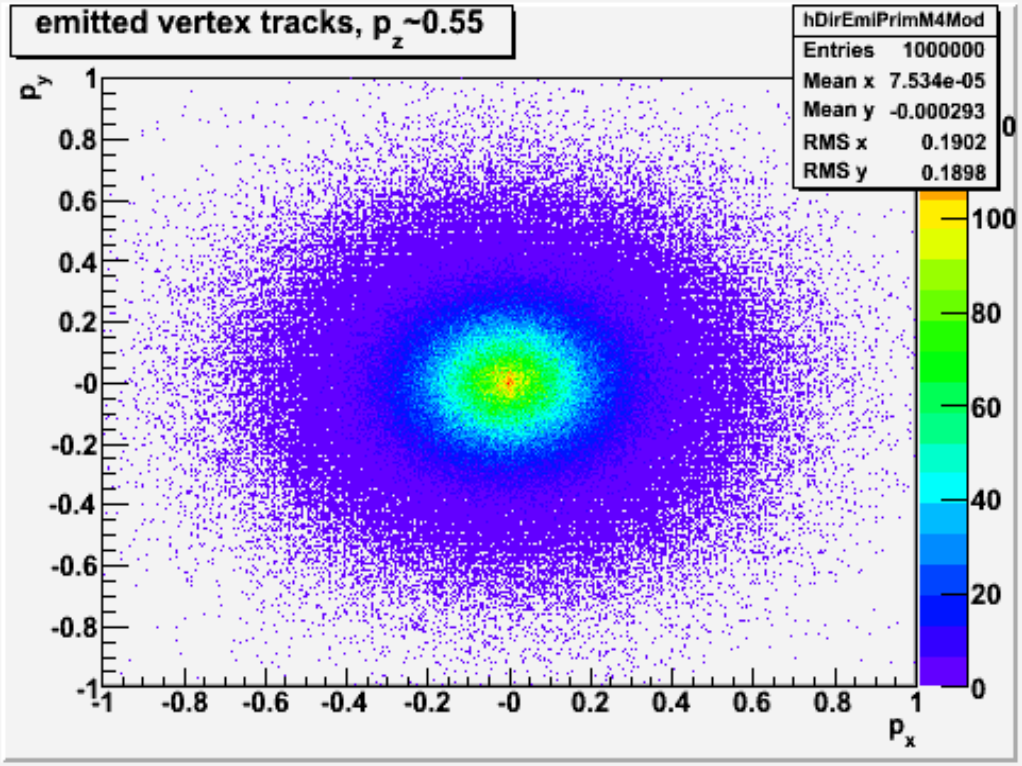


Full STS setup



x % hot digis


momres
effAll
effPrim
effSec
nofPrim
nofSec
nofGhost
nofClone
0
0.5
1
1.5
2
2.5
3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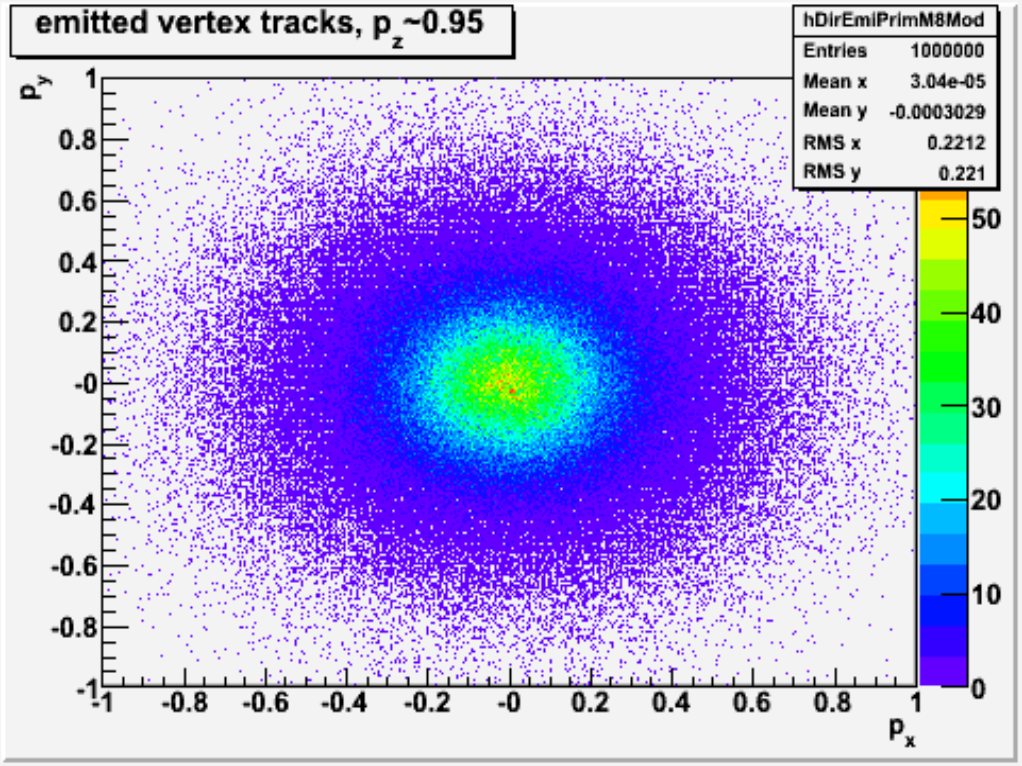
RMS y 0.1898
p_y
p_x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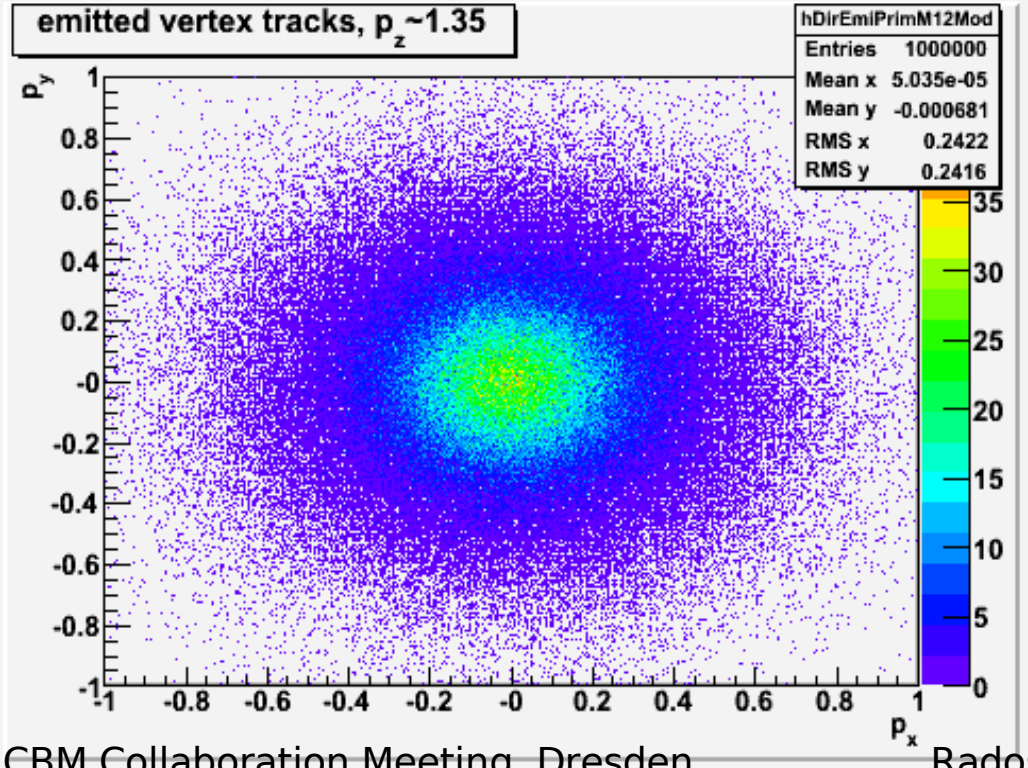
p_x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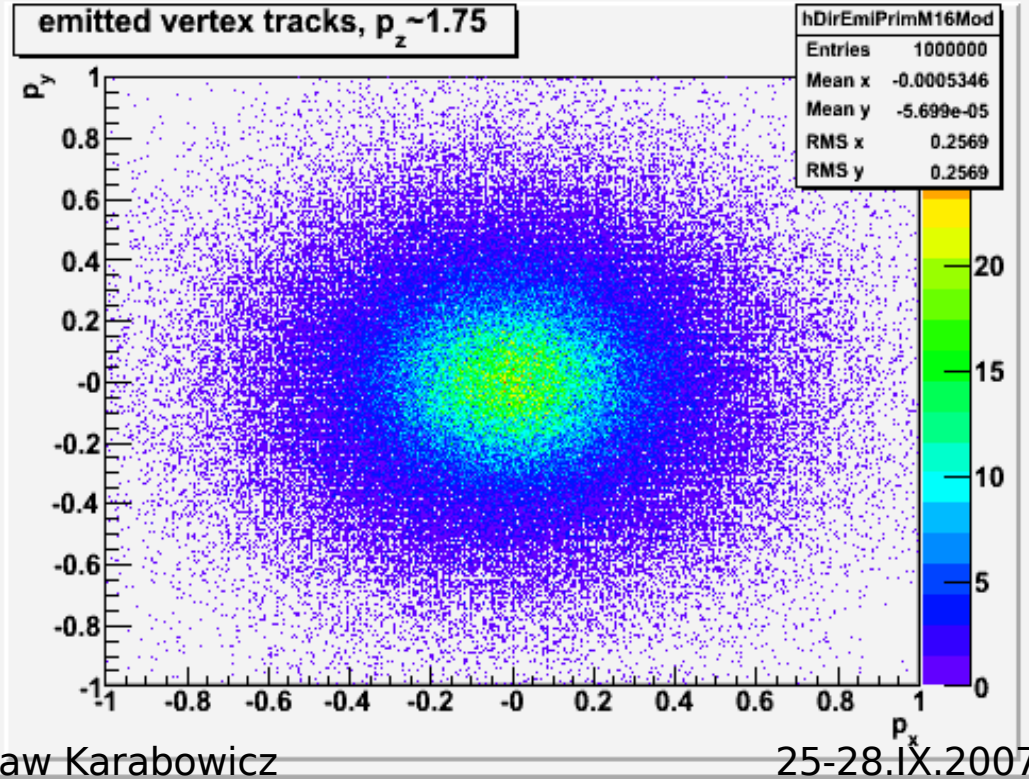
p_y
p_x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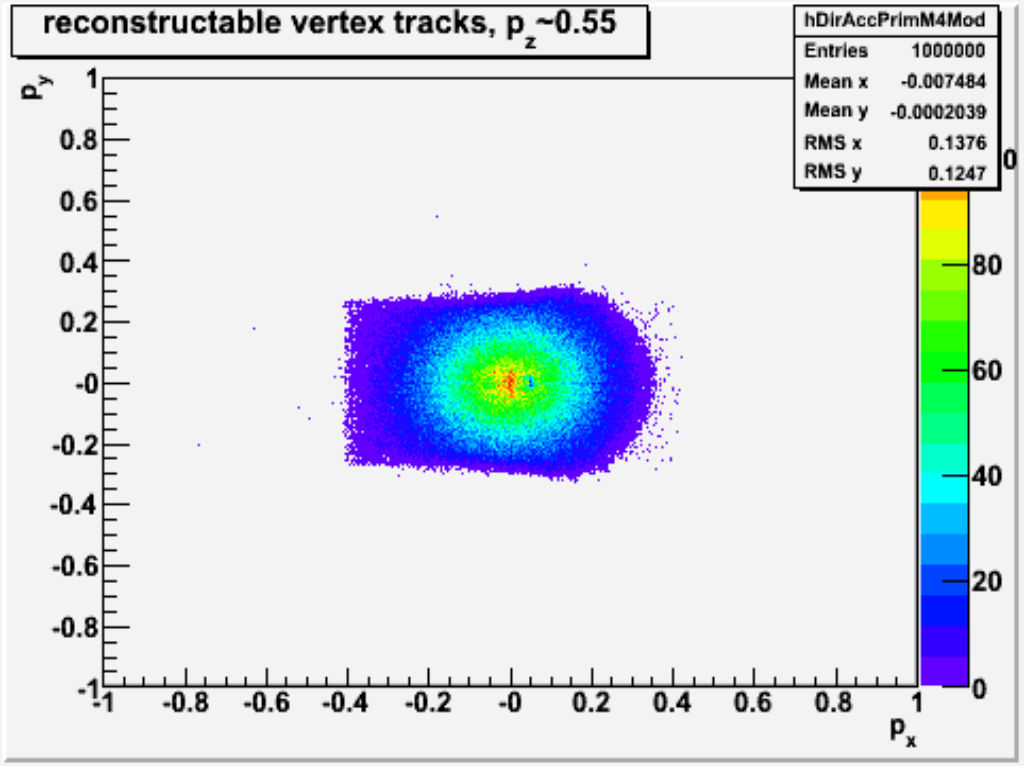
p_x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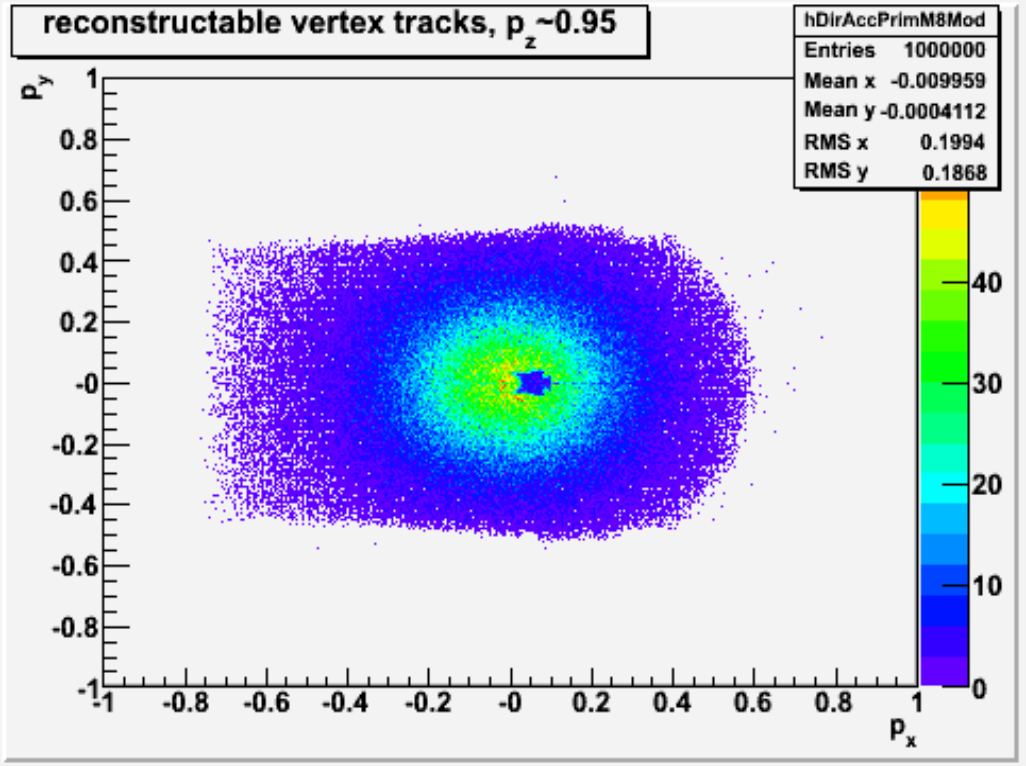
p_x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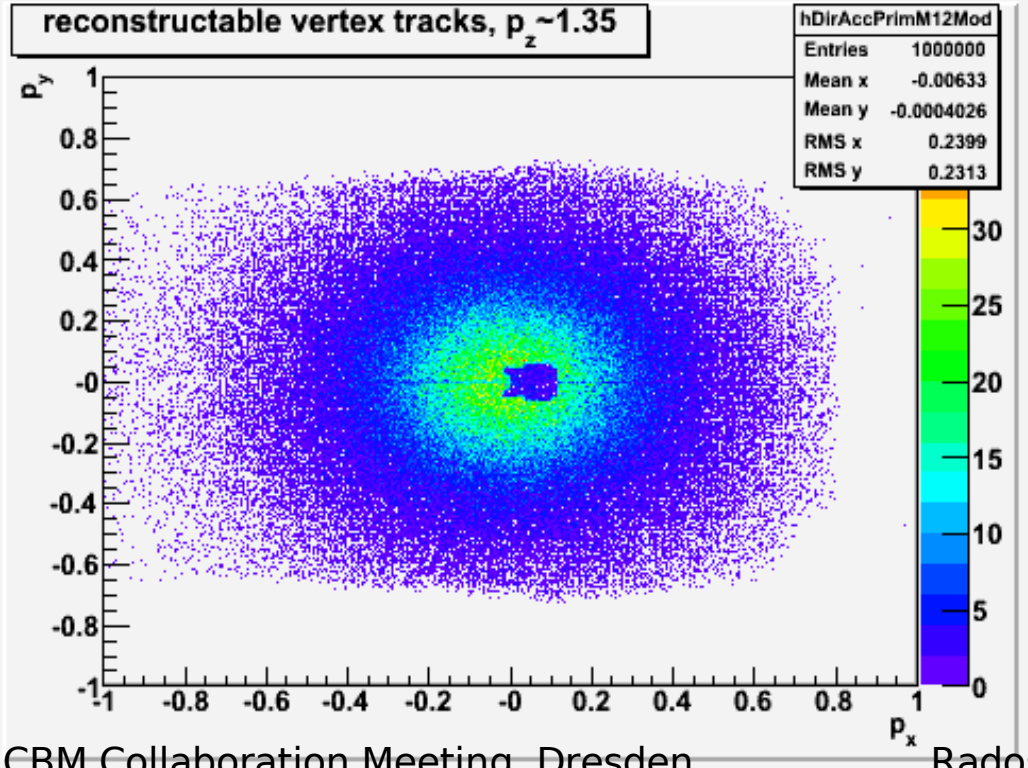
p_x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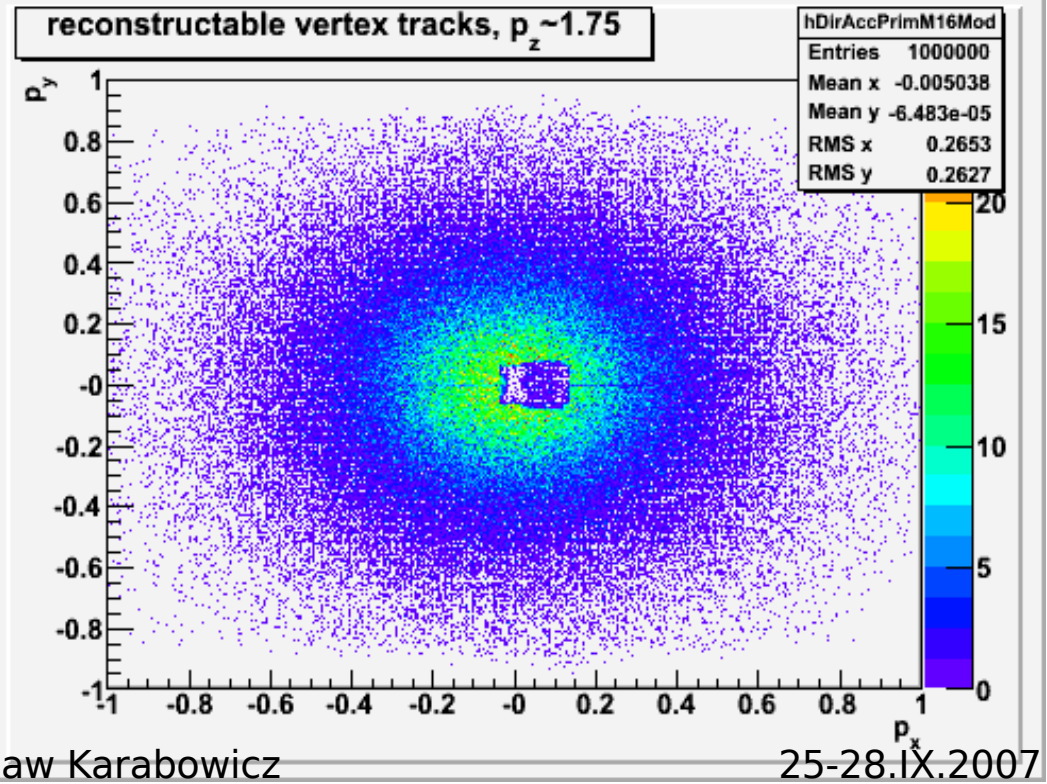
p_x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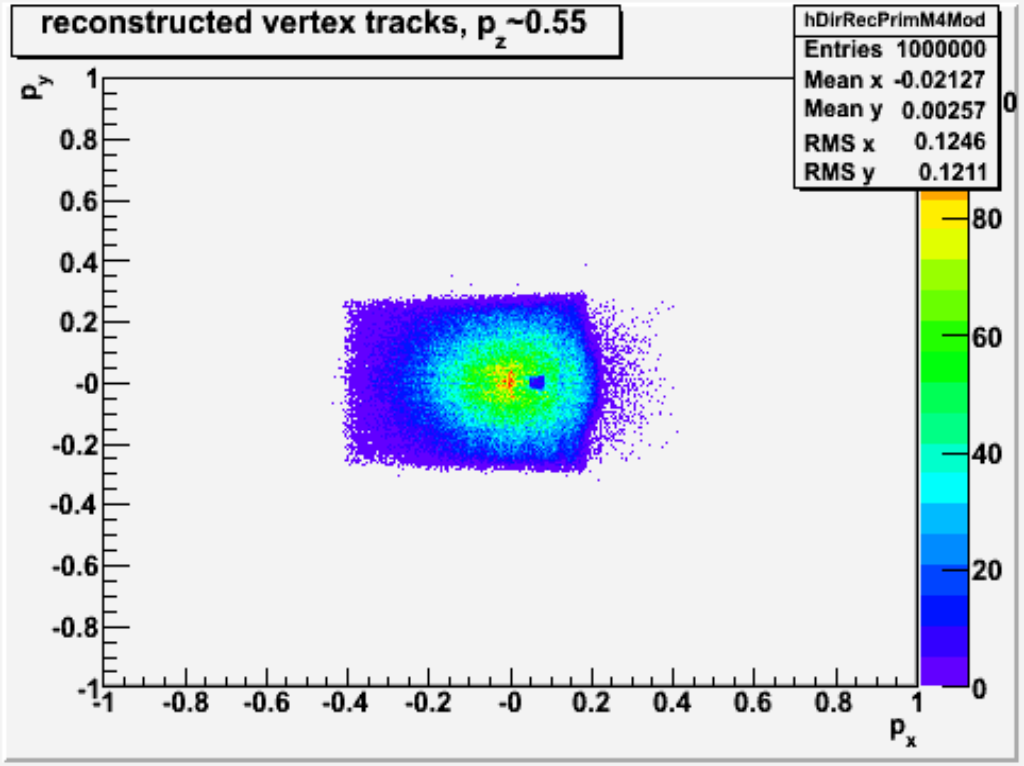
p_x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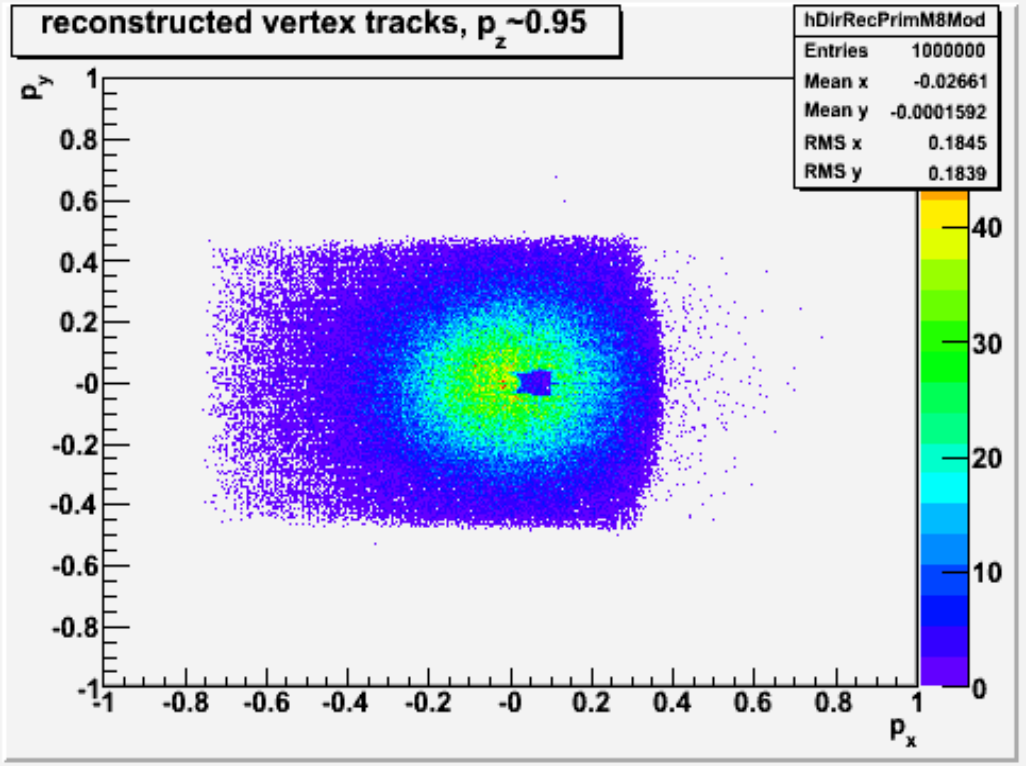
p_x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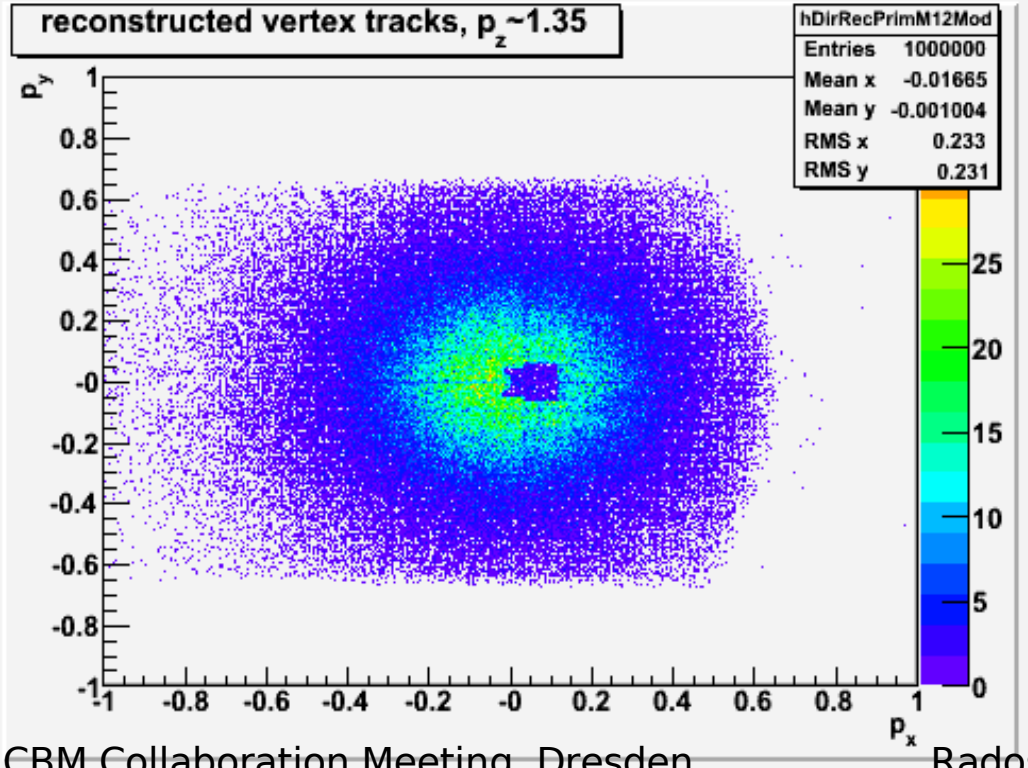
p_y
p_x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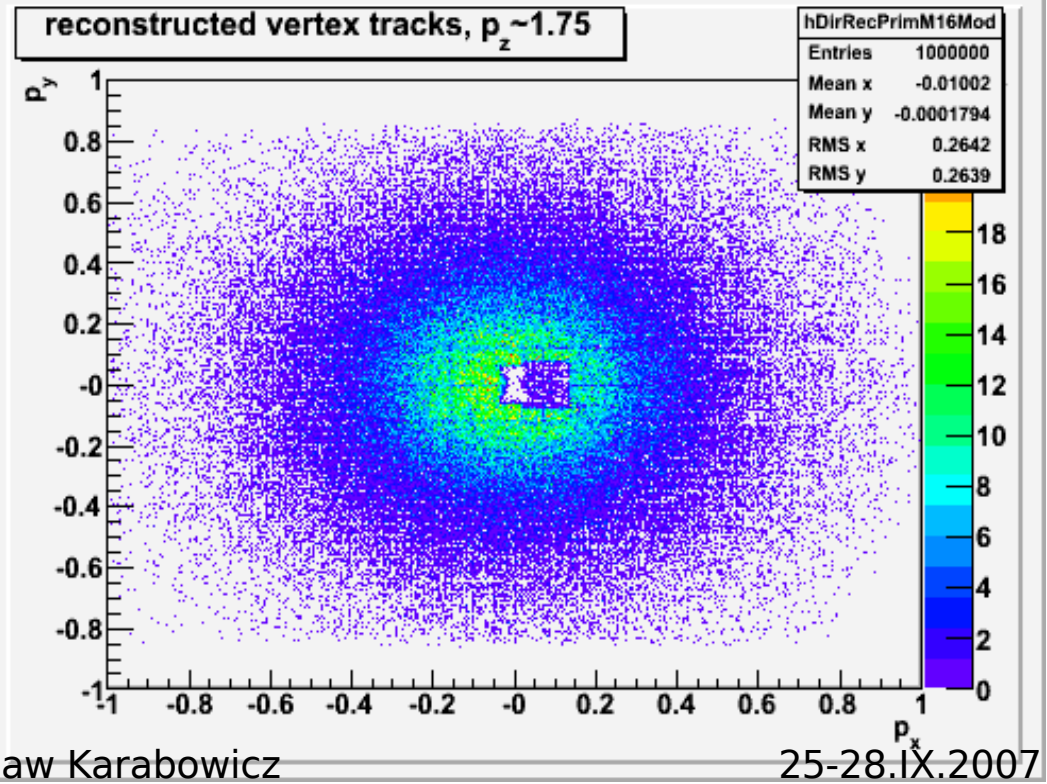
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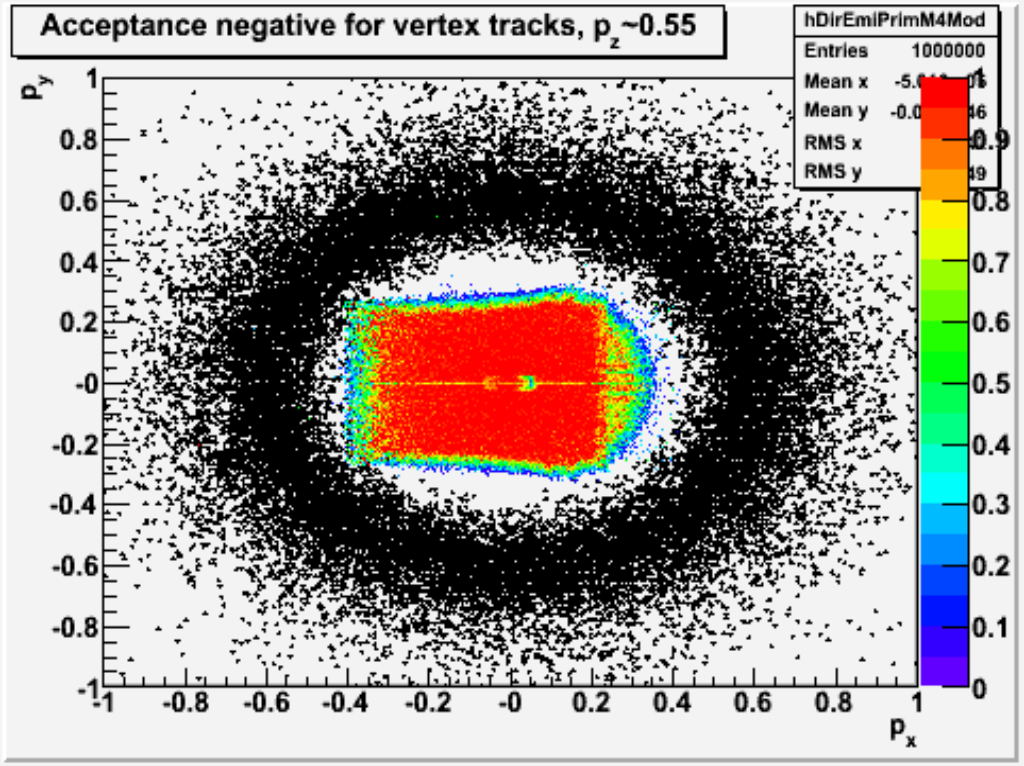
p_x


Acceptance negative for vertex tracks, p_z~0.55
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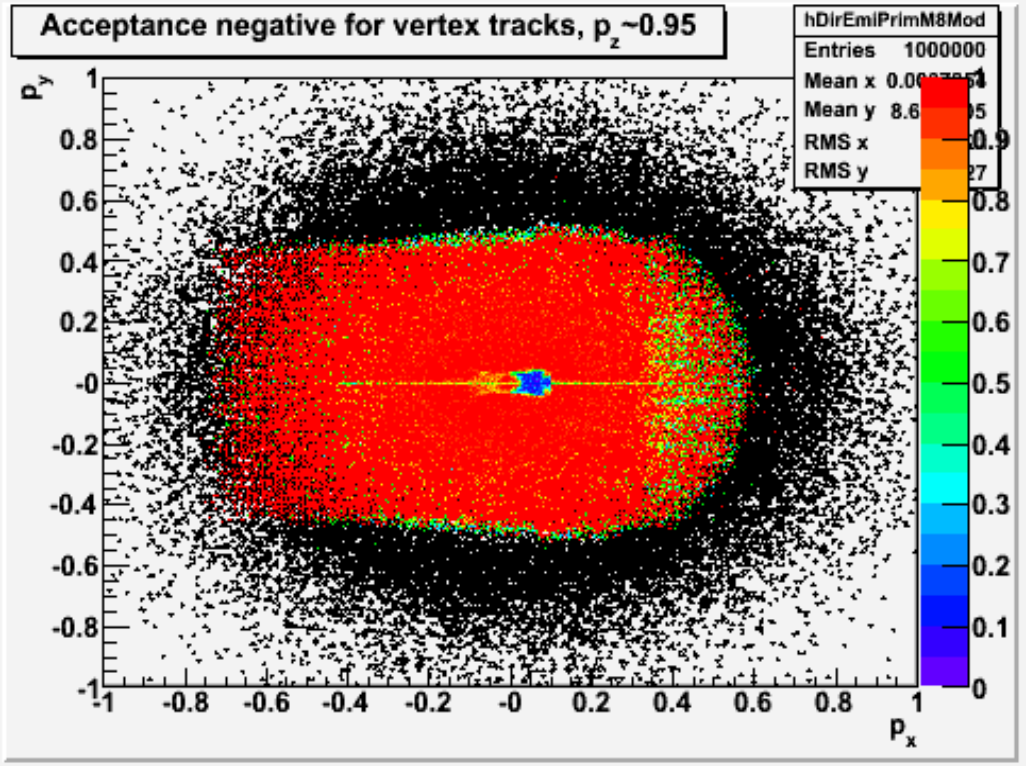
Mean x
Mean y
RMS x
RMS y
p_y
p_x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Entries 1000000
Mean x
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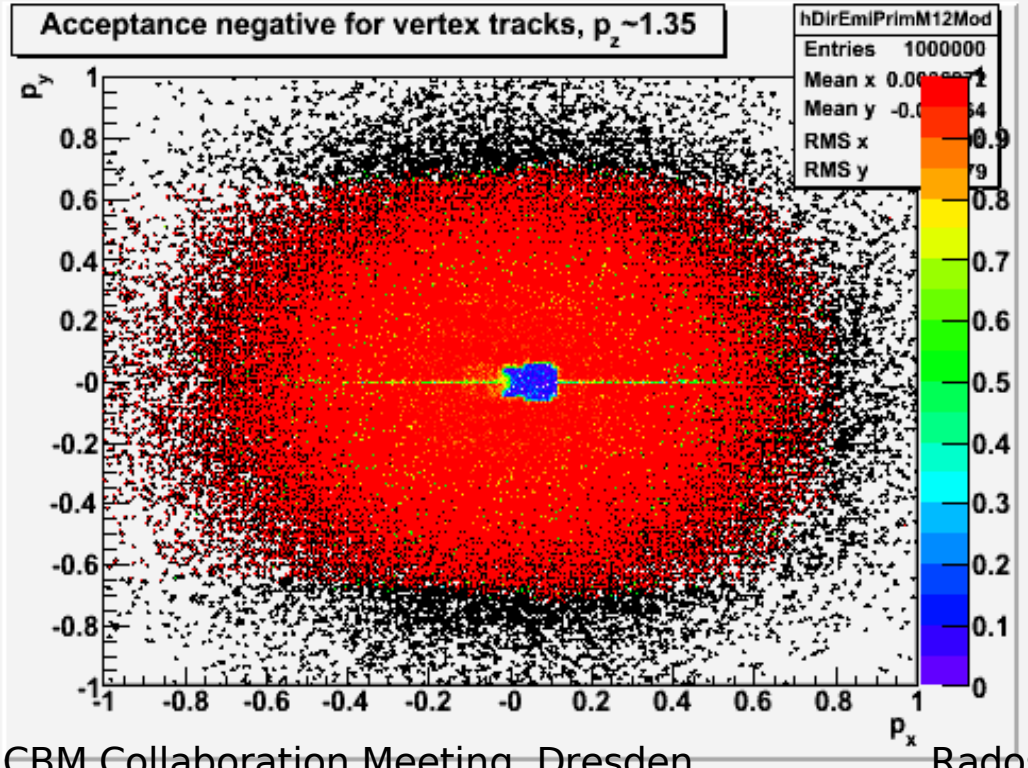
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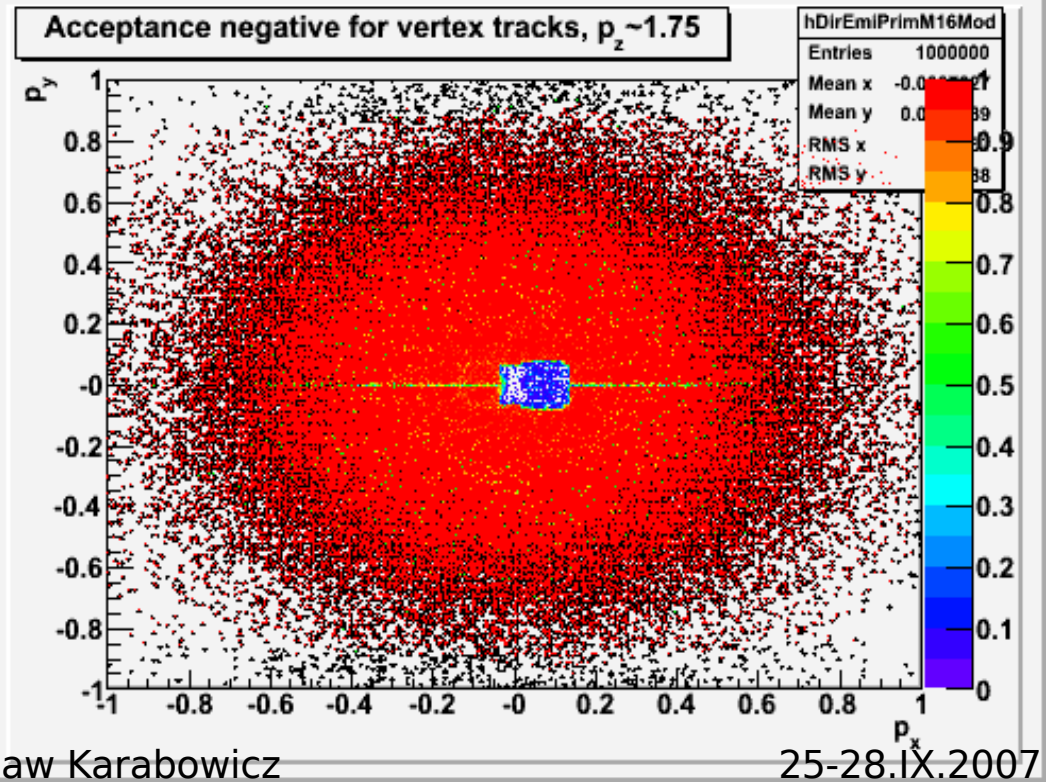
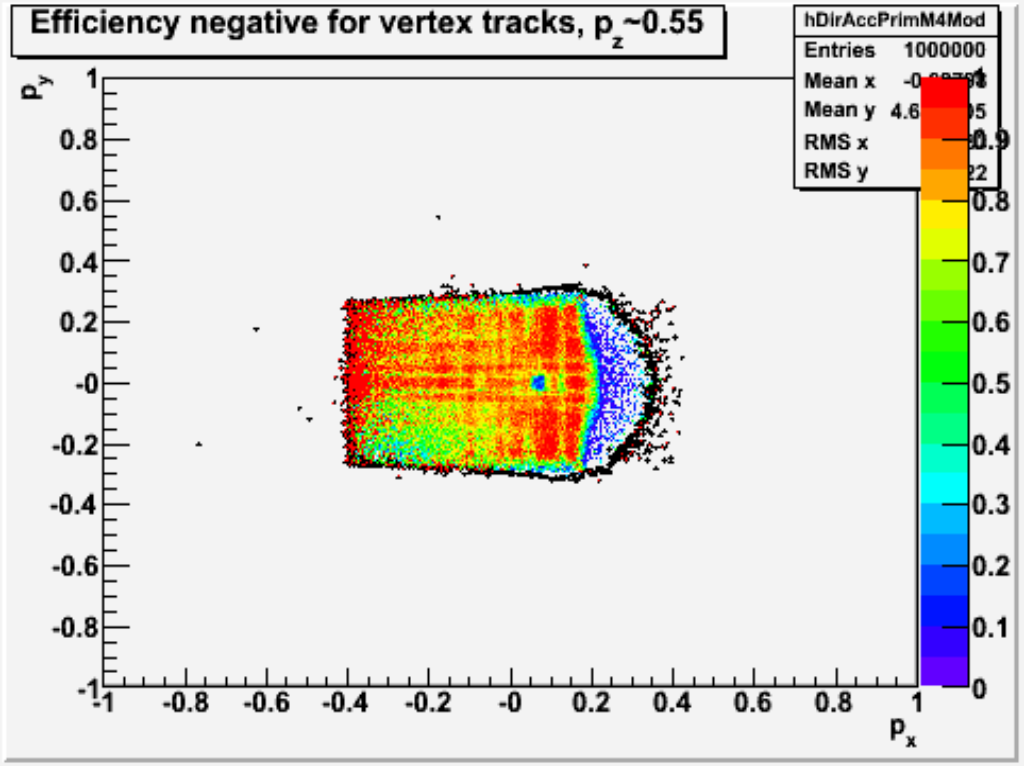
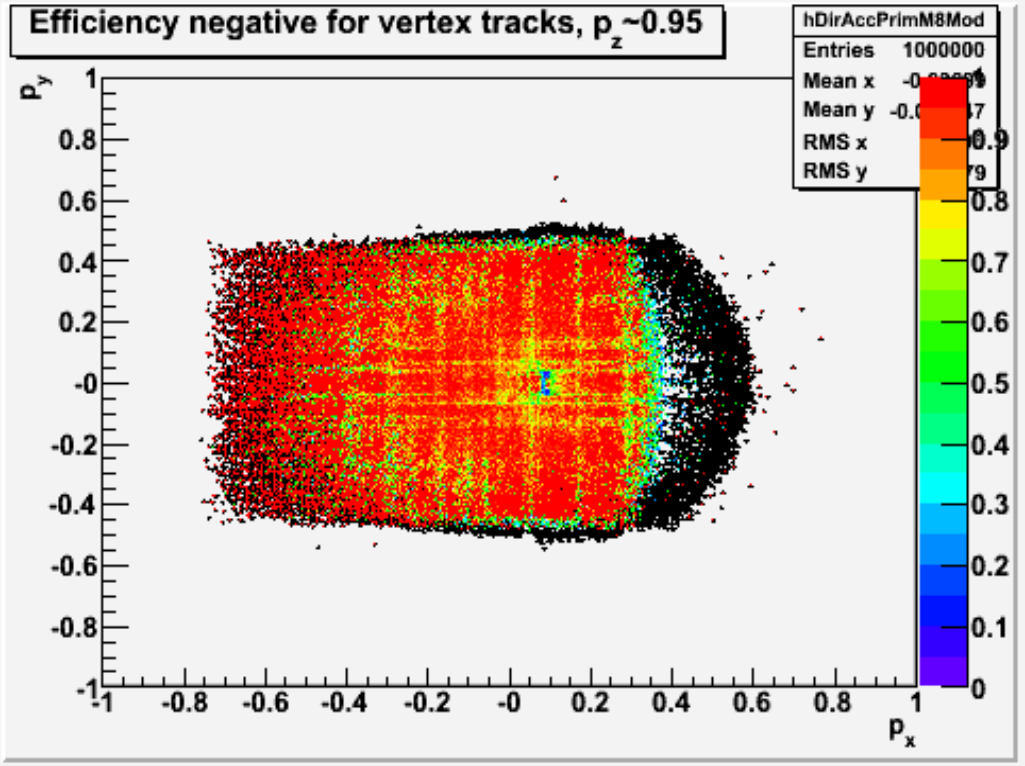
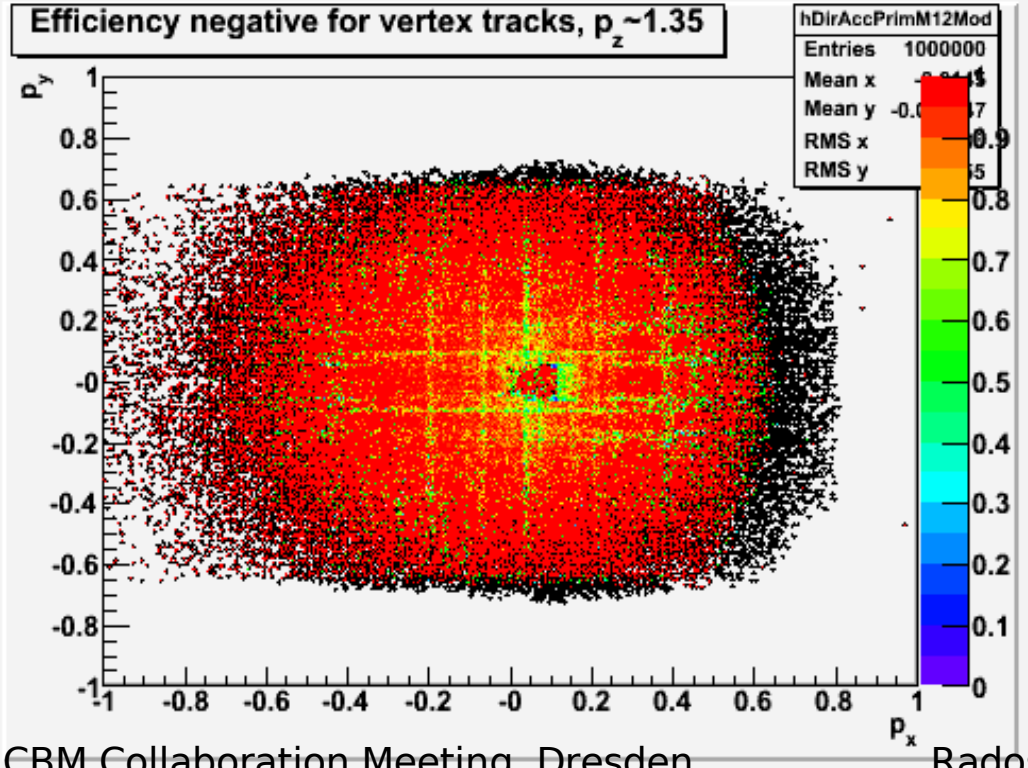
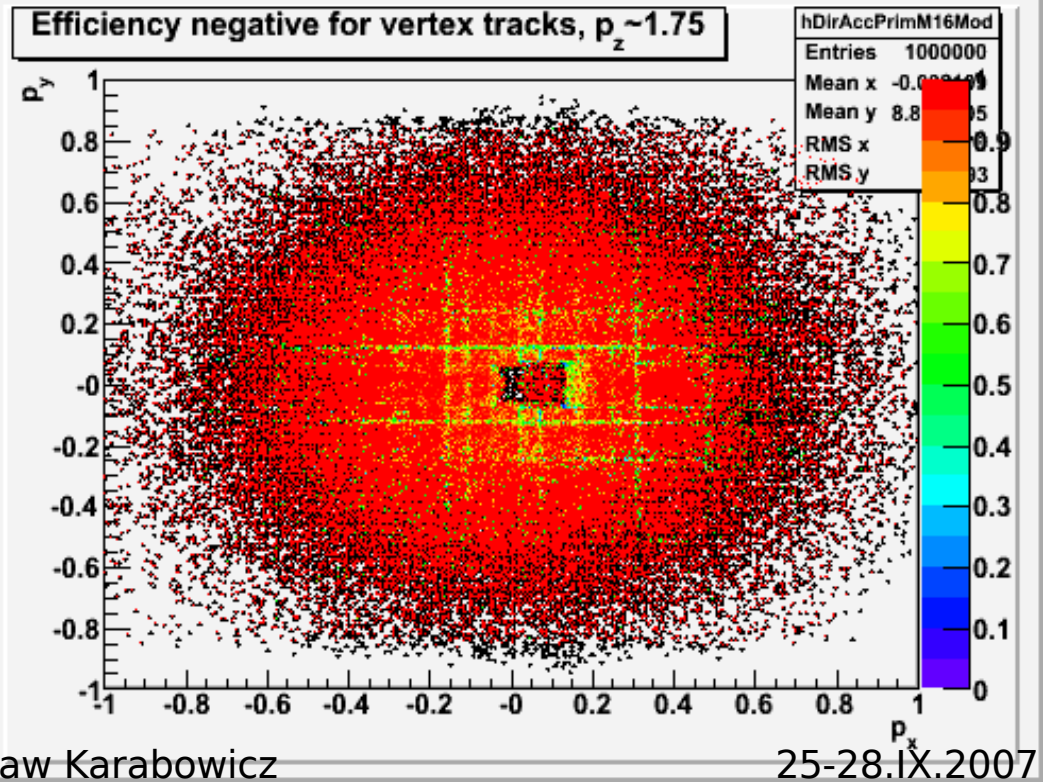
hDirEmiPrimM12Mod
Entries 1000000
Mean x
Mean y
RMS x
RMS y
p_y
p_x

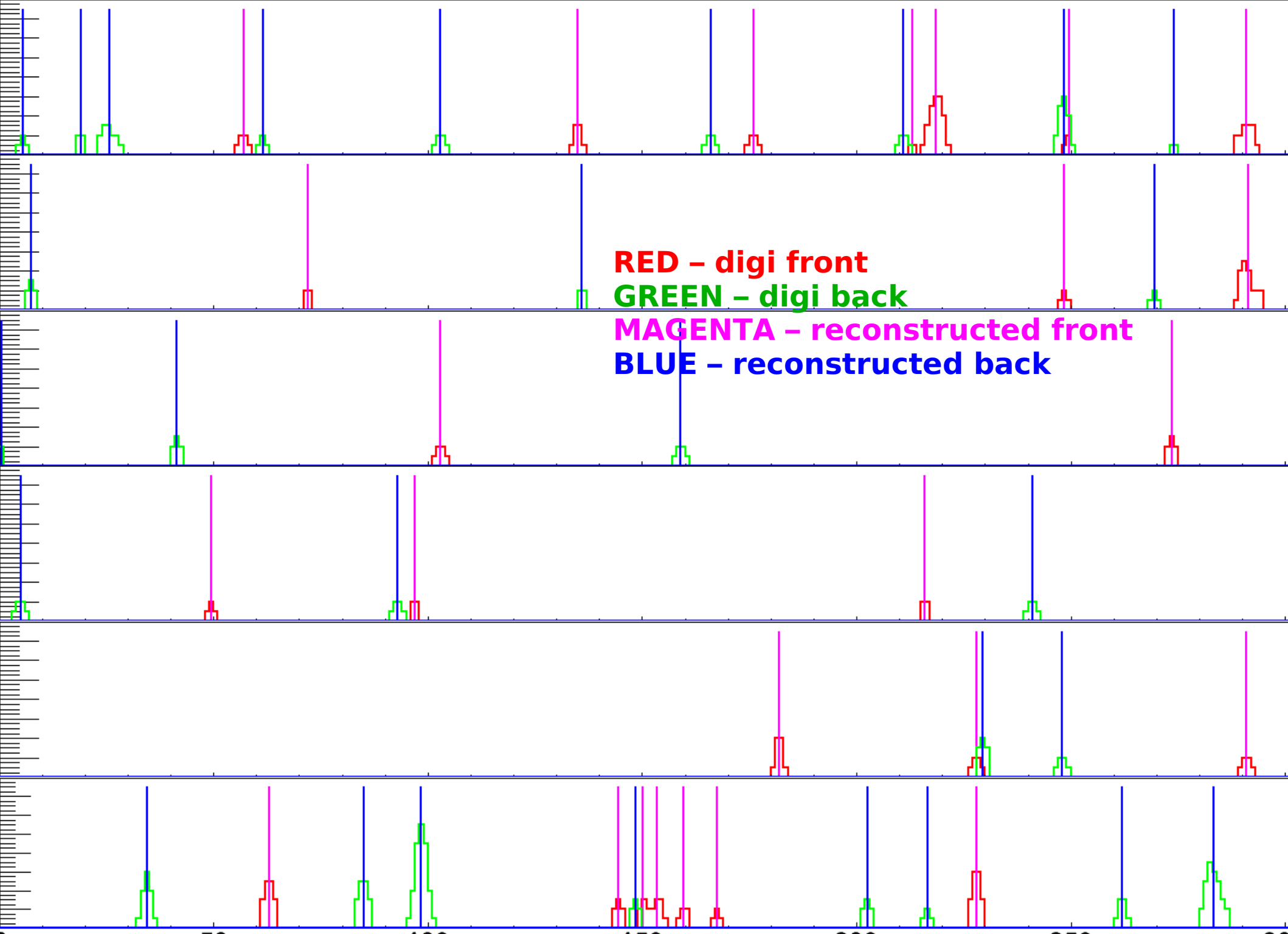

Acceptance negative for vertex tracks, p_z~1.75
hDirEmiPrimM16Mod
Entries 1000000
Mean x
Mean y
RMS x
RMS y
p_y
p_x

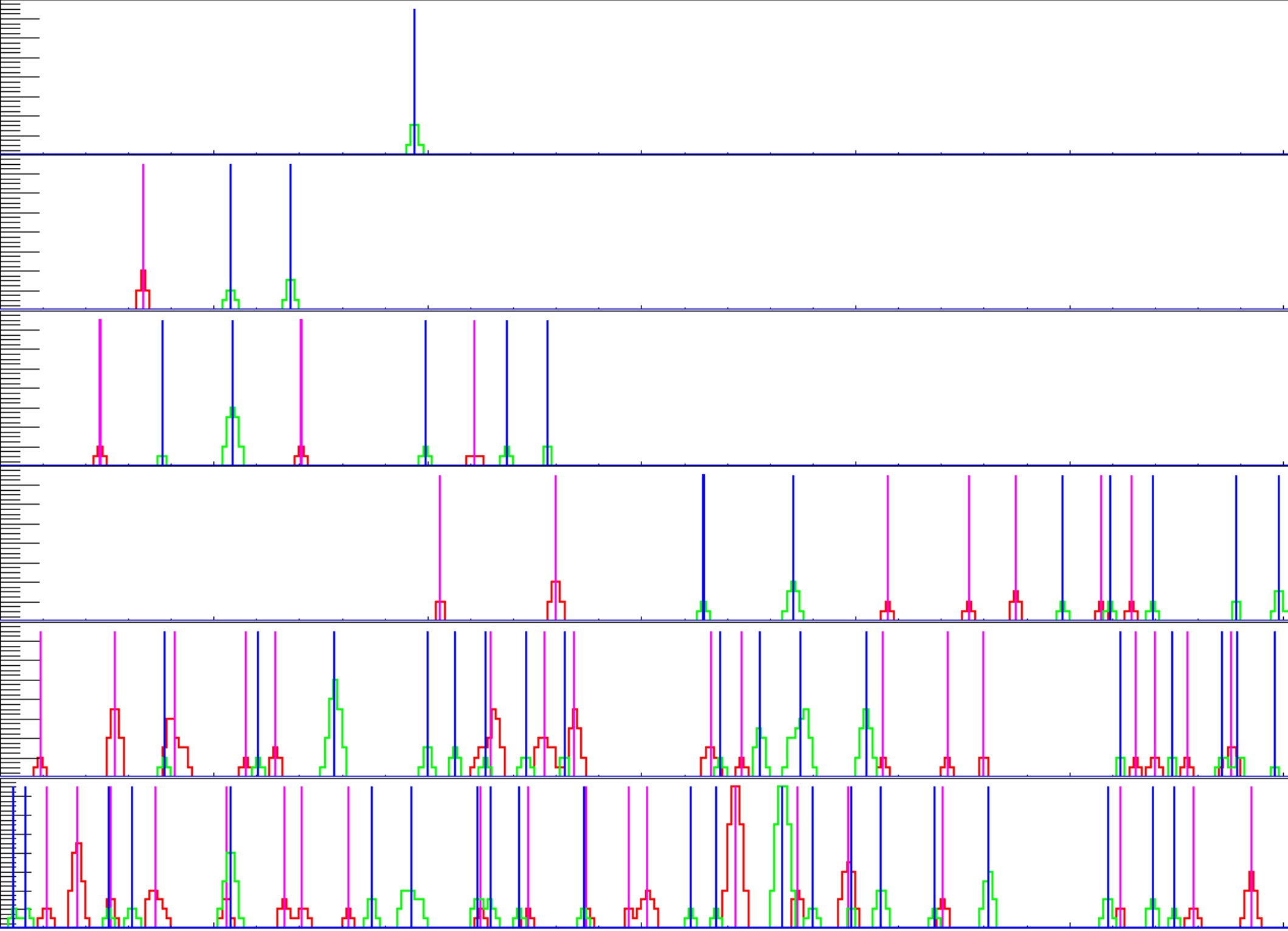

Efficiency negative for vertex tracks, p_z~0.55
hDirAccPrimM4Mod
Entries 1000000
Mean x
Mean y
RMS x
RMS y
p_y
p_x


Efficiency negative for vertex tracks, p_z~0.95
hDirAccPrimM8Mod
Entries 1000000
Mean x
Mean y
RMS x
RMS y
p_y
p_x


Efficiency negative for vertex tracks, p_z~1.35
hDirAccPrimM12Mod
Entries 1000000
Mean x
Mean y
RMS x
RMS y
p_y
p_x


Efficiency negative for vertex tracks, p_z~1.75
hDirAccPrimM16Mod
Entries 1000000
Mean x
Mean y
RMS x
RMS y
p_y
p_x


RED – digi front
GREEN – digi back
MAGENTA – reconstructed front
BLUE – reconstructed back
0
50
100
150
200
250
300


0
50
100
150
200
250
300