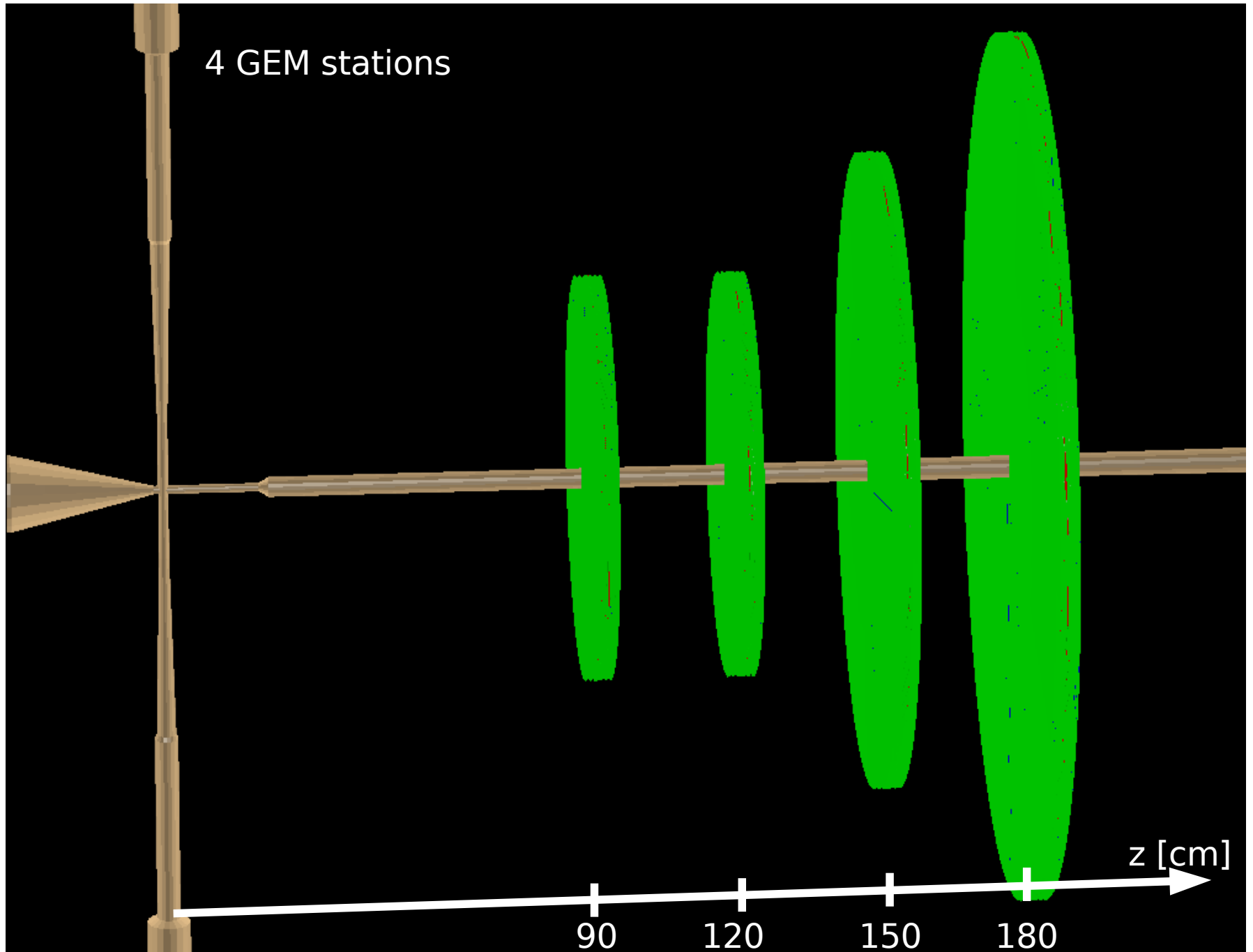


GEM Detector Status

Radoslaw Karabowicz
GSI

Panda Collaboration Meeting March 2009, GSI

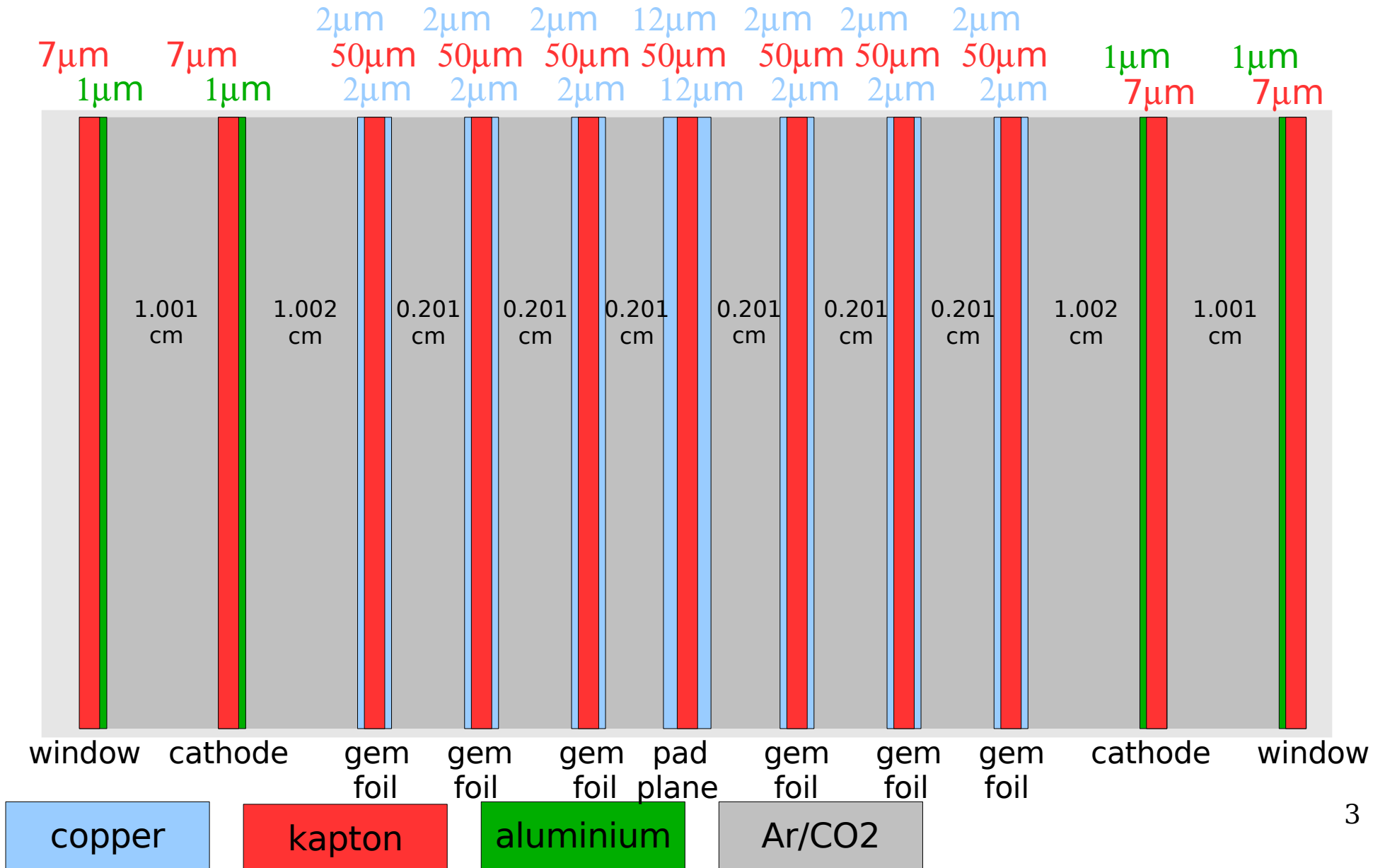
GEM Detector stations



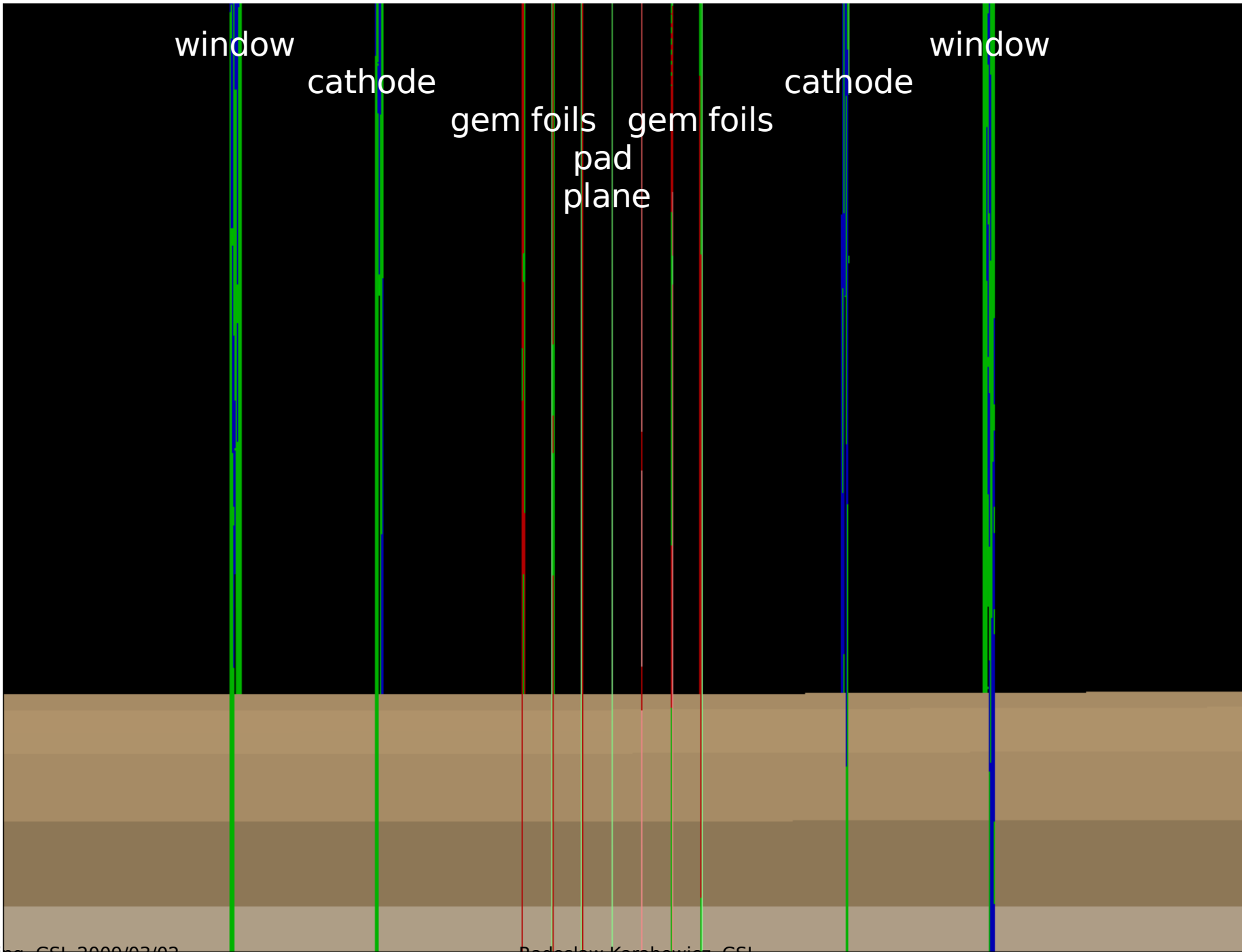
GEM Station

4 stations at $z = 90, 120, 150, 180\text{cm}$

Each station is composed of several disks placed as presented below:



GEM Station



GEM detector response

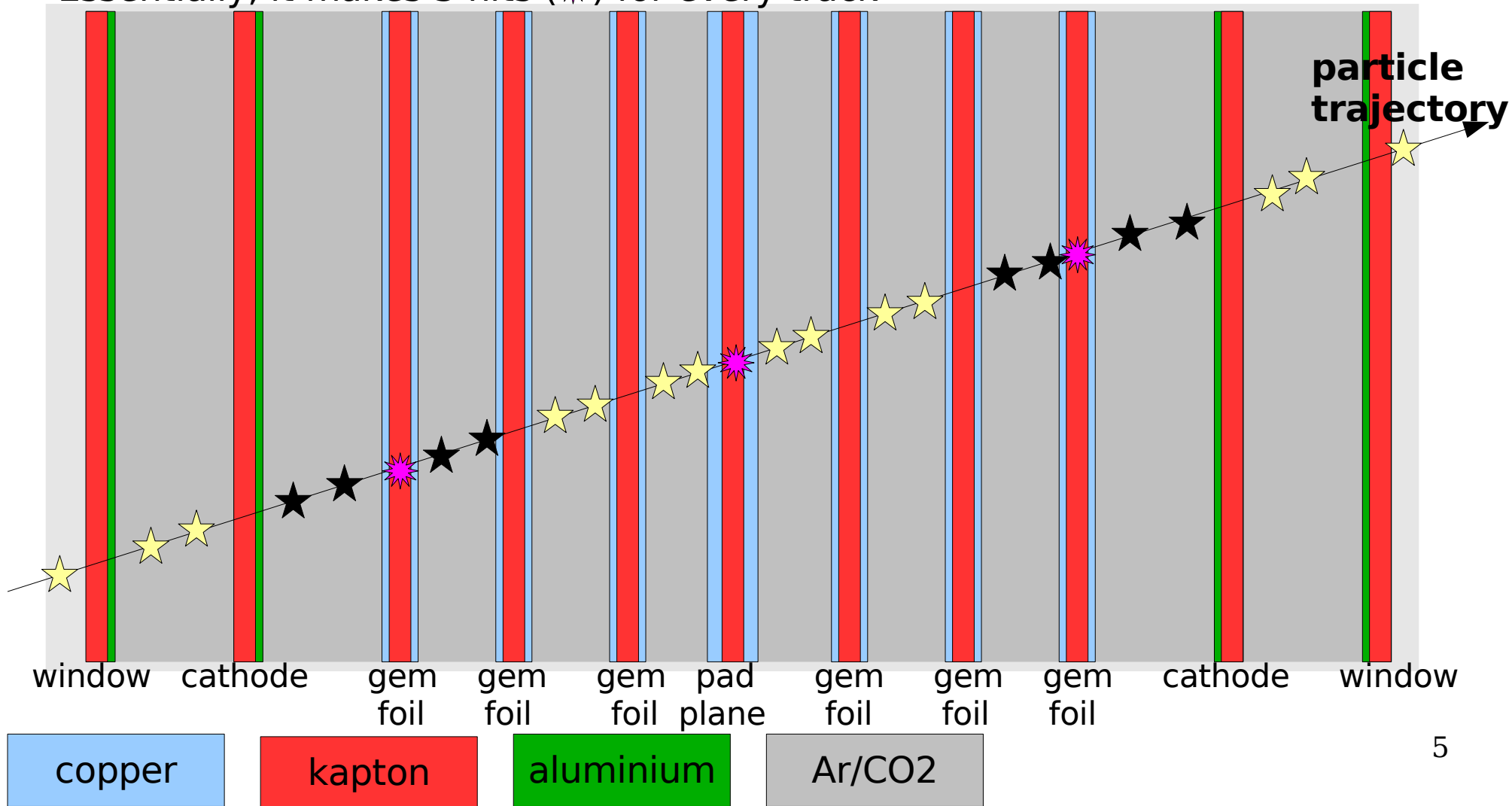
Gas is ionized everywhere along the particle trajectory (★)

Measurable signal on the pad plane is left only by the ionization created in the vicinity of the outermost gem foil (★)

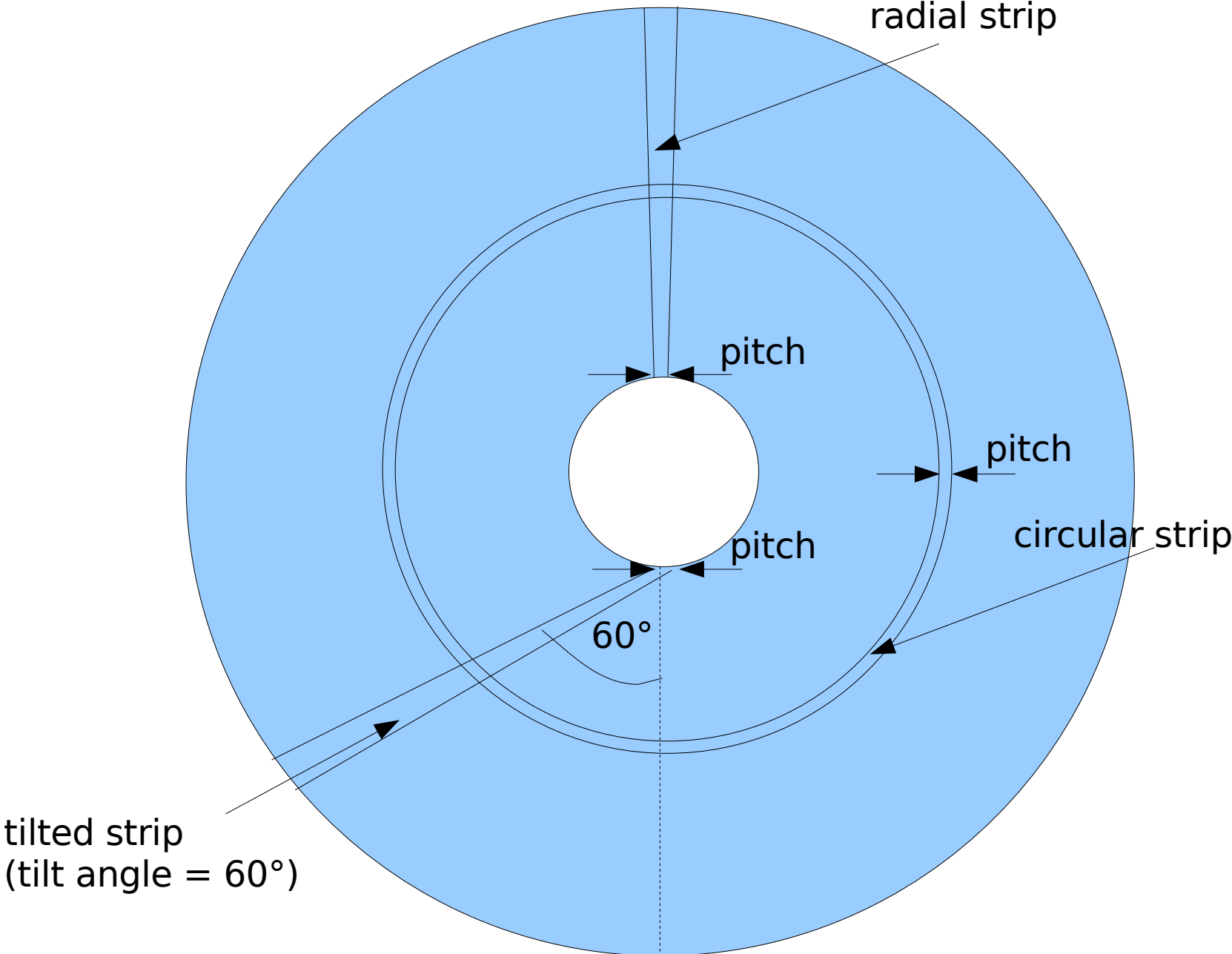
The MC point is created on these gem foils

For comparison the pad plane is also made active

Essentially, it makes 3 hits (★) for every track



GEM strip orientations

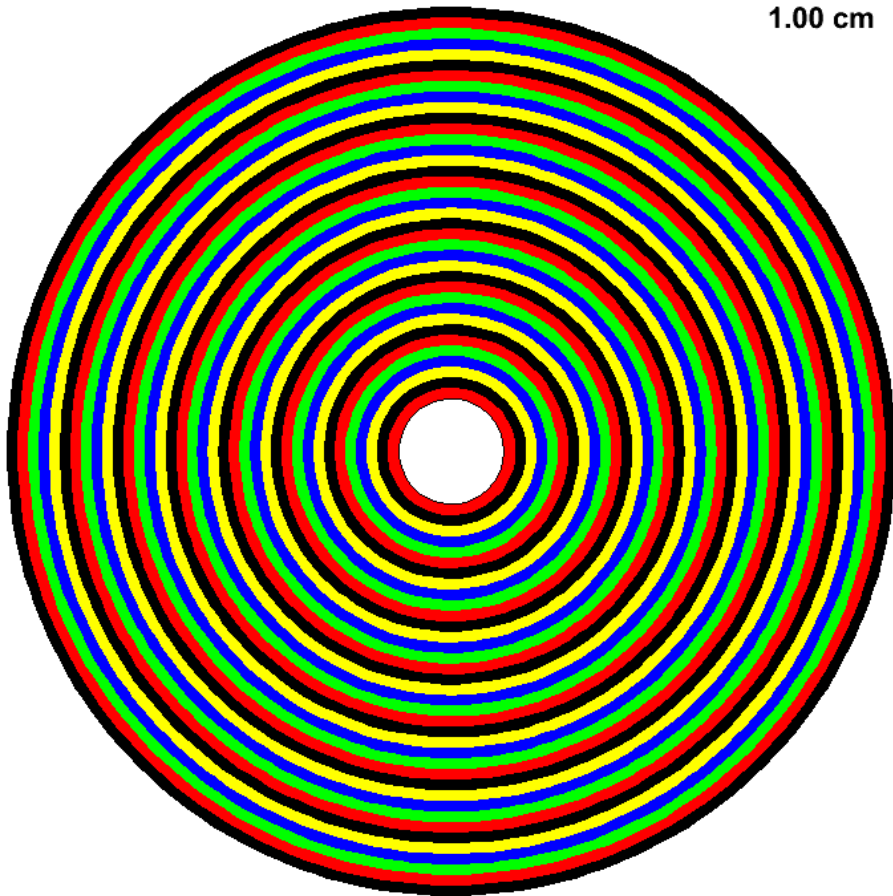


GEM digitization scheme

Front station digitization: 2 layers of strips

layer of circular strips

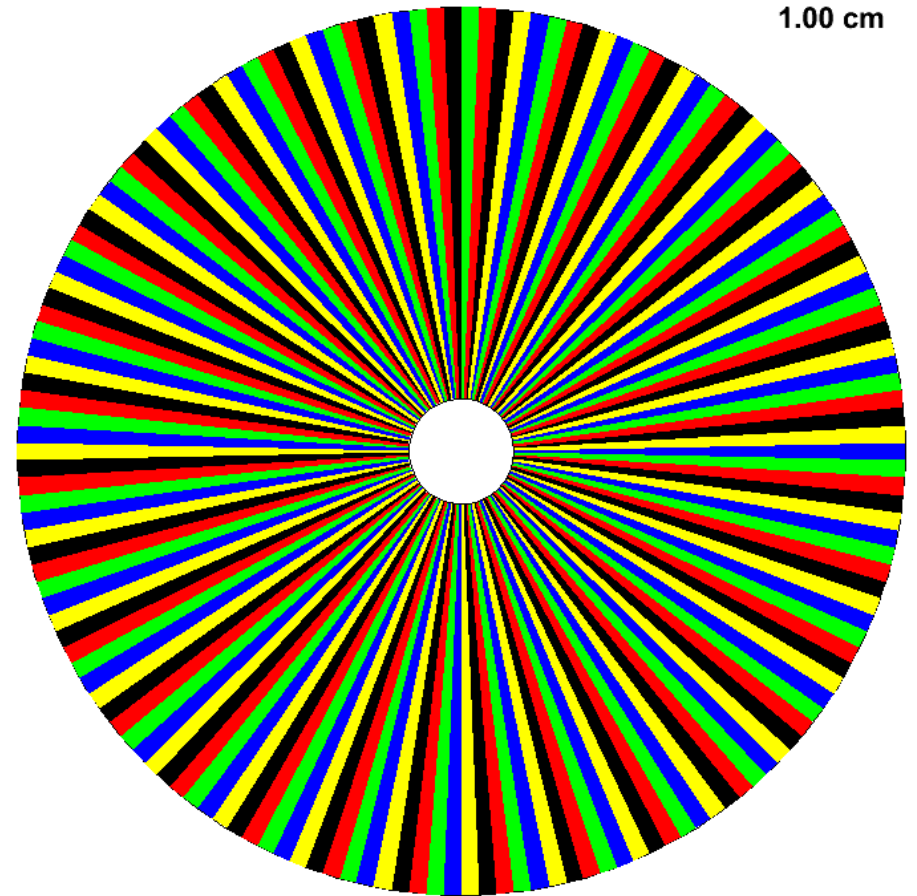
Station #1
1.00 cm



strip pitch: 200 μ m
~1850 strips on stations 1,2
~3050 strips on station 3
~4250 strips on station 4

layer of radial strips

Station #1
1.00 cm



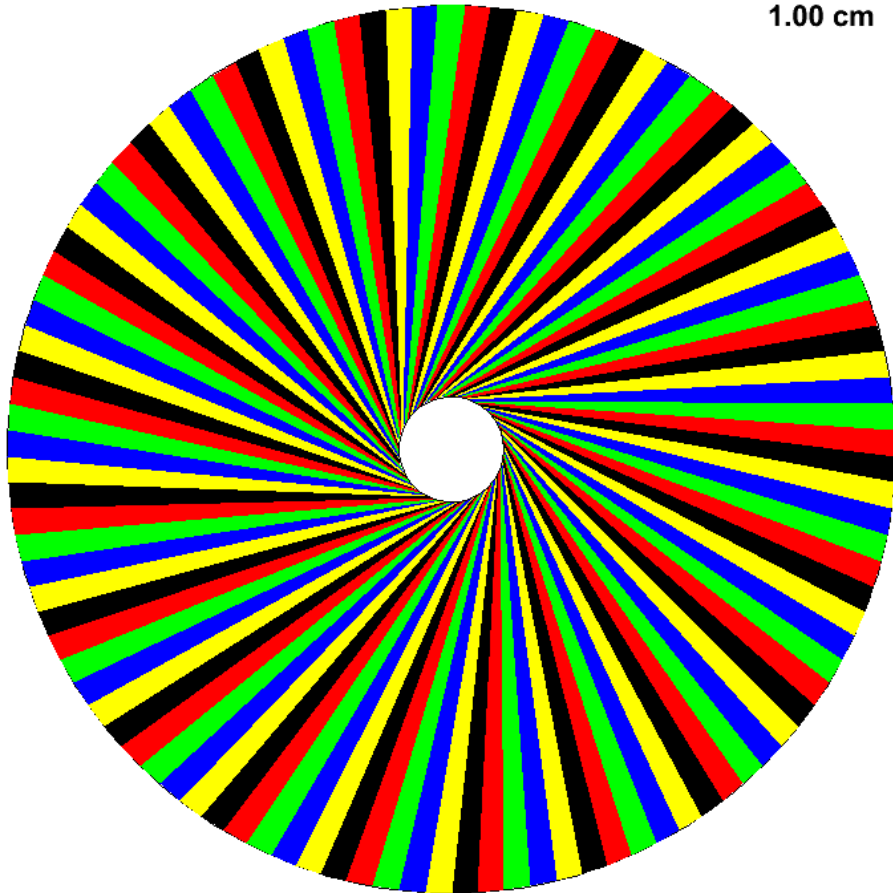
strip pitch: 200 μ m at the
inner radius
~1048 strips per station

GEM digitization scheme cont'd

Back station digitization: 2 layers of tilted strips

first layer

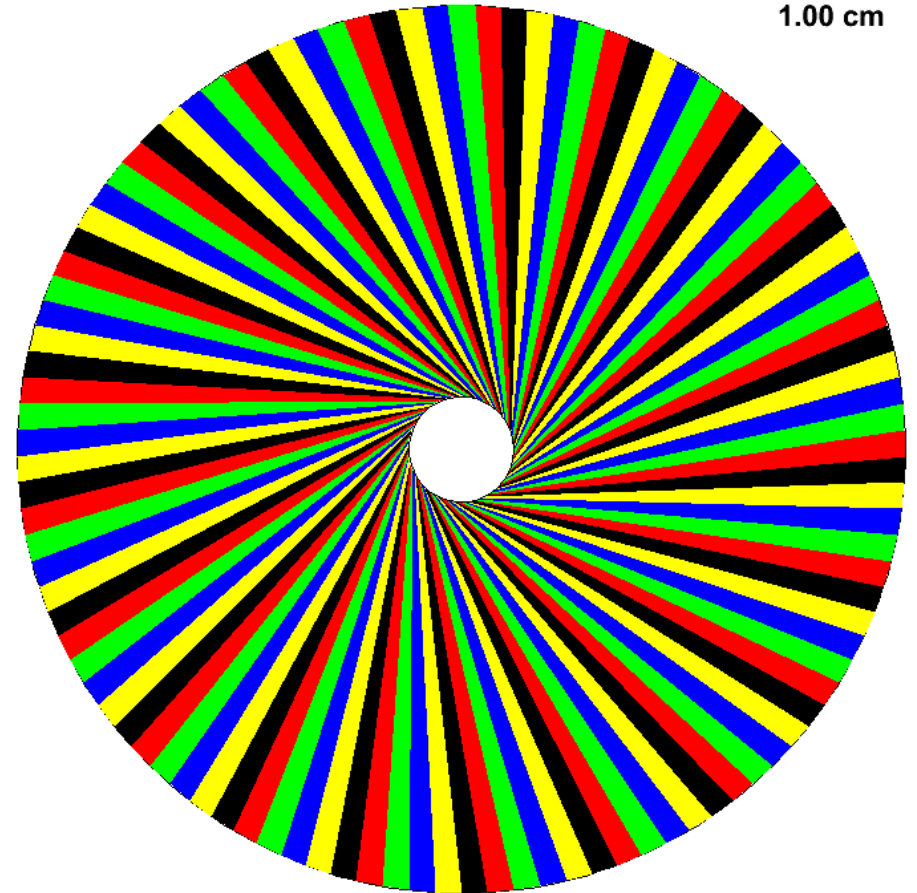
Station #1
1.00 cm



strip pitch: $300\mu\text{m}$ at the inner radius
strips tilted by 60° to radial strips at the inner radius
 ~ 1571 strips per station

second layer

Station #1
1.00 cm



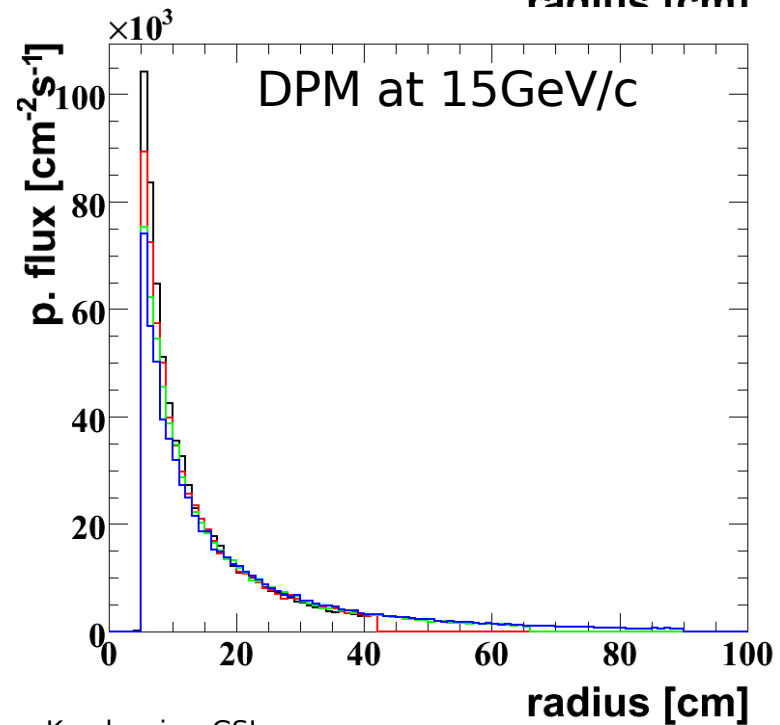
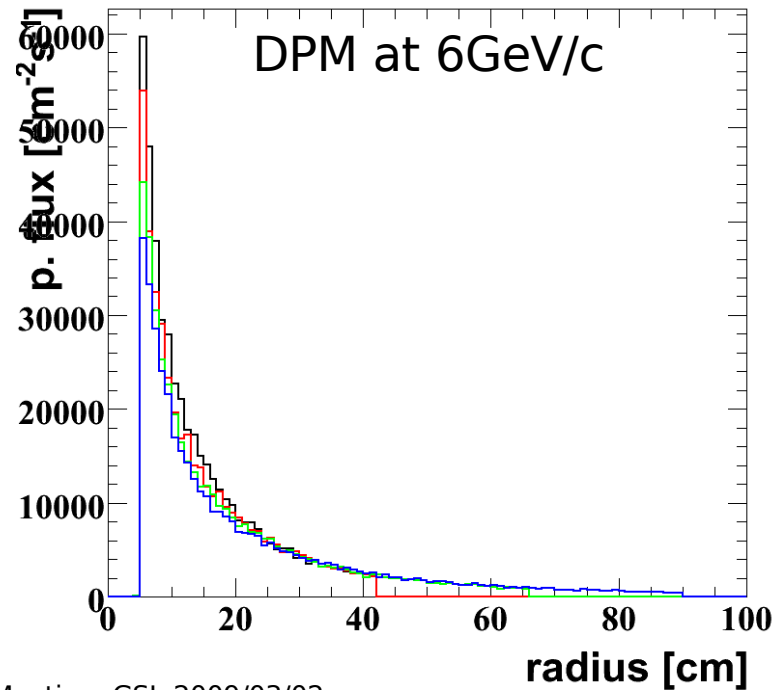
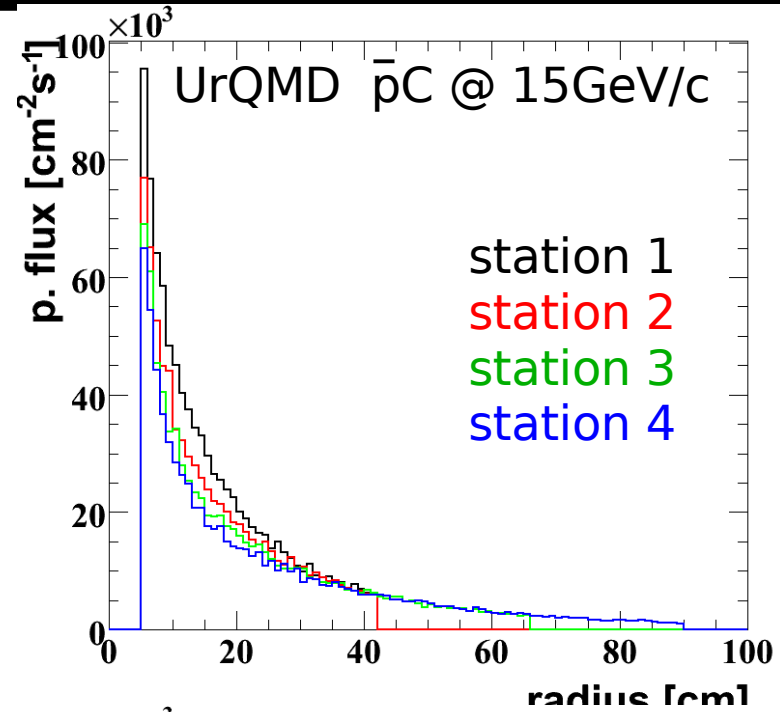
strip pitch: $300\mu\text{m}$ at the inner radius
strips tilted by -60° to radial strips at the inner radius
 ~ 1571 strips per station

GEM particle flux

Results:

Particle flux vs radius on GEM stations

Event rate of $2 \cdot 10^7 \text{ s}^{-1}$

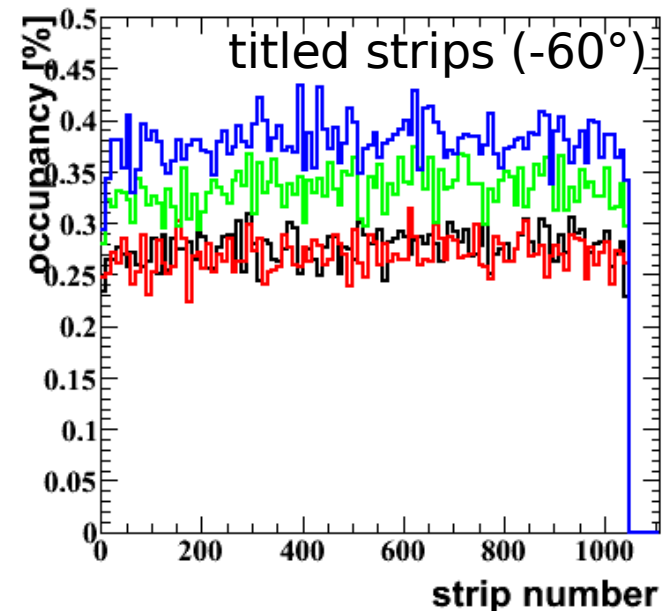
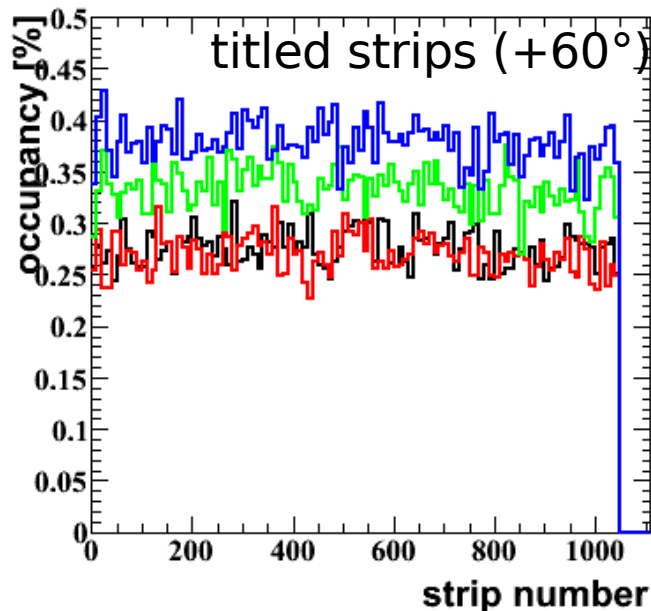
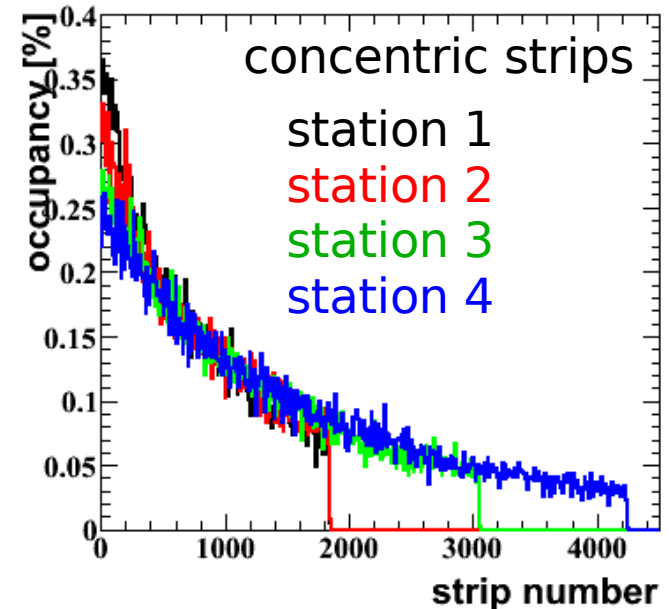
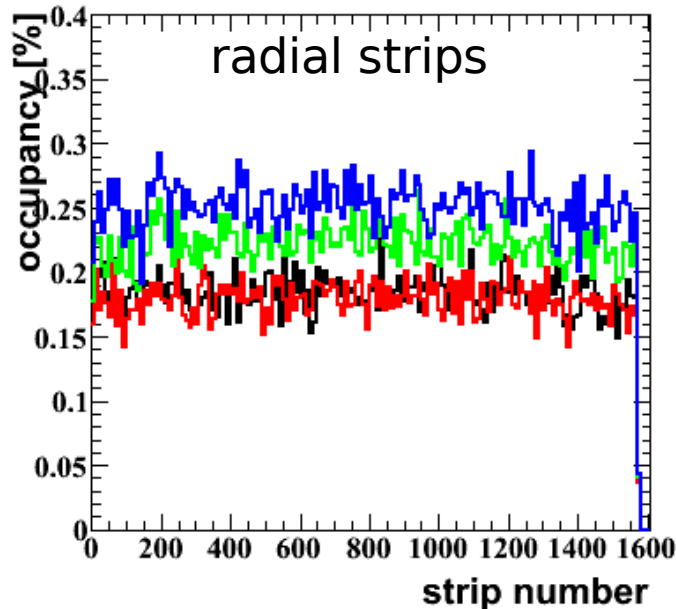


GEM occupancy

Number of fired strips per 15 GeV/c DPM event

No strip sharing – only one fired strip per view per MC hit

Realistically, a charge spread is up to 1.2 mm which results in ~6 times larger strip occupancy



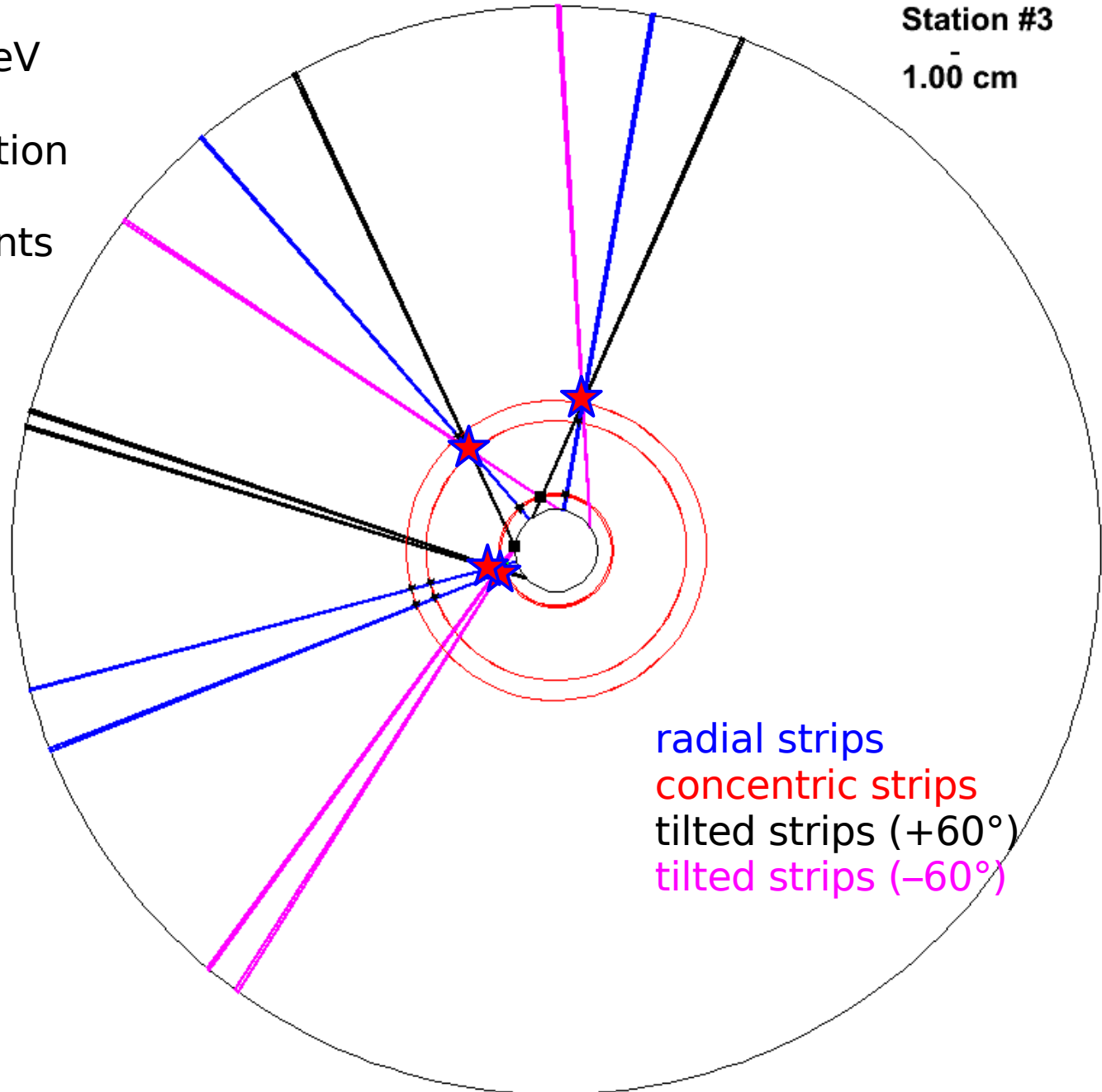
GEM digitizer – example

DPM event at 15 GeV

Hits on 3rd GEM station

There are 4 MC points

16 fired strips



GEM digitizer – example

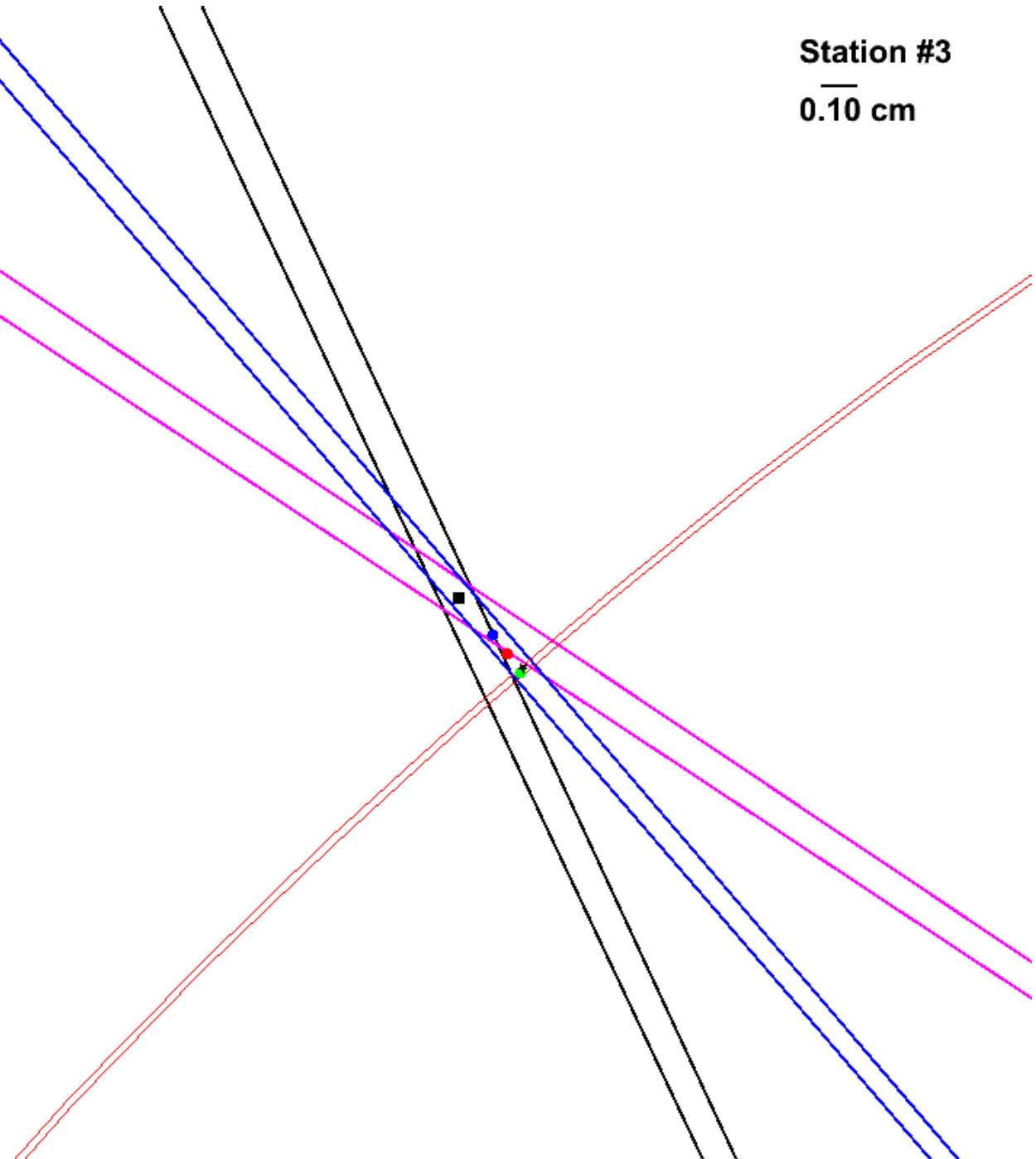
DPM event at 15 GeV

Hit on 3rd GEM station

1 MC hit – zoomed in

Station #3

0.10 cm

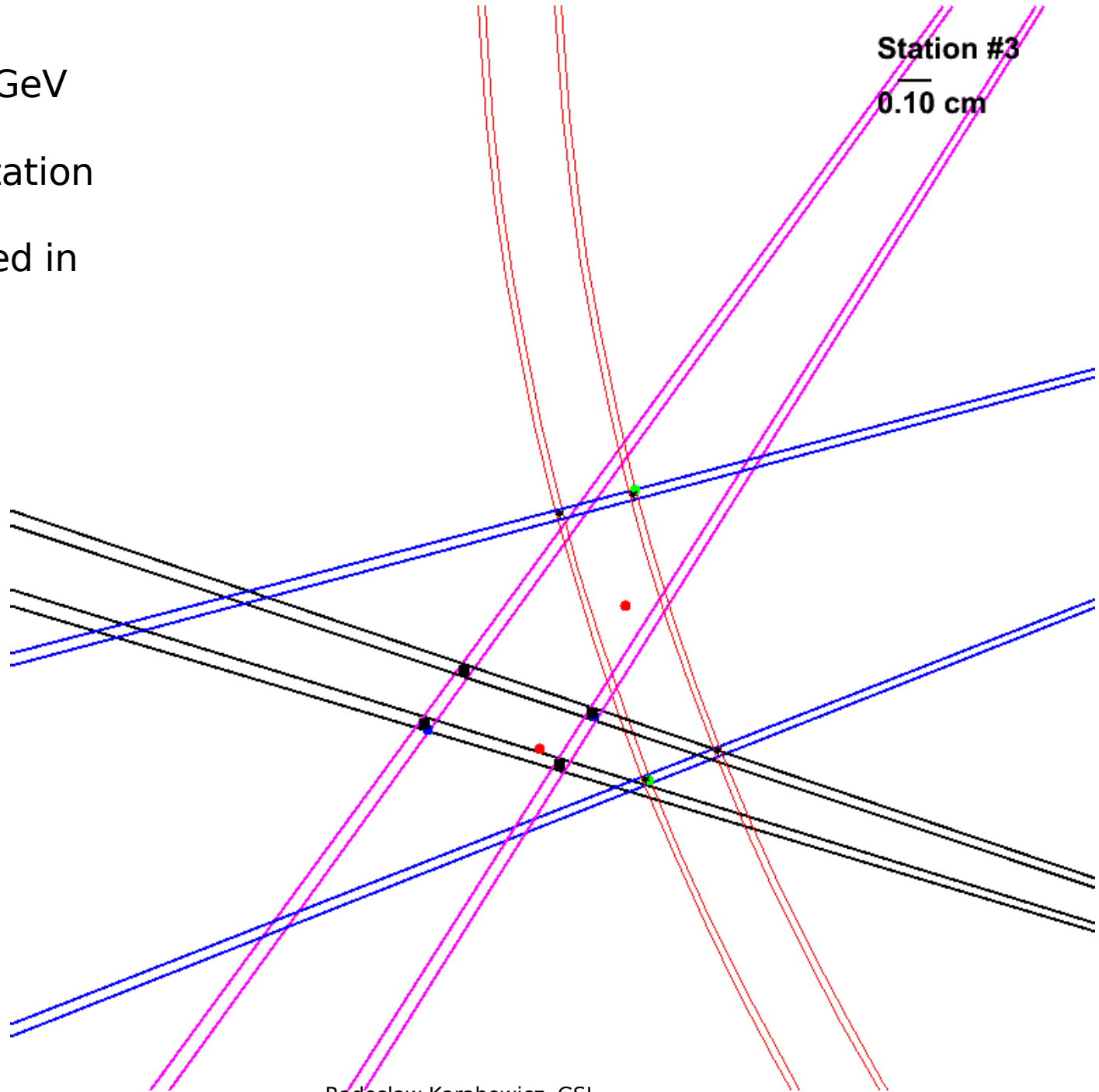


GEM digitizer – example

DPM event at 15 GeV

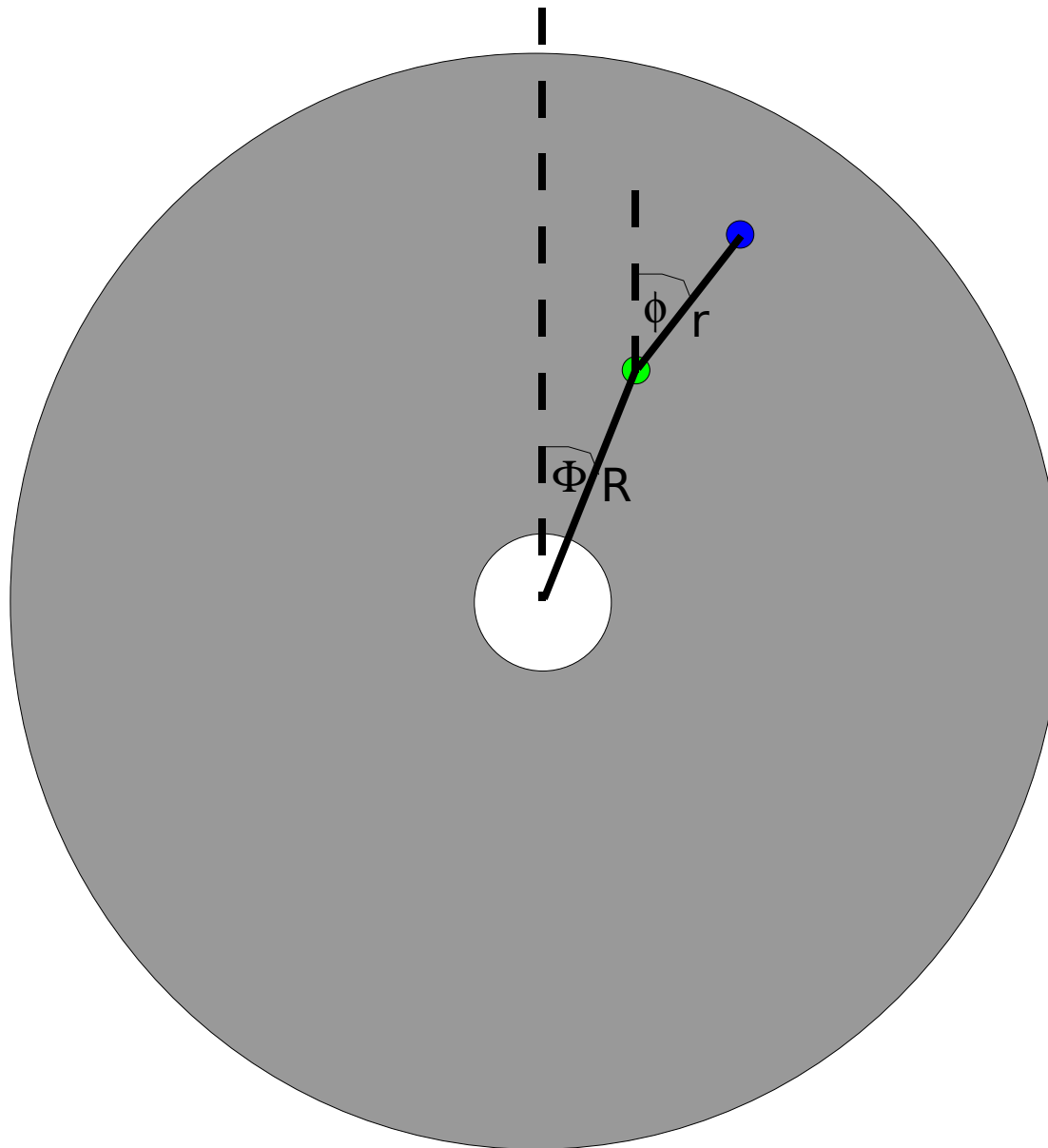
Hits on 3rd GEM station

2 MC hits – zoomed in



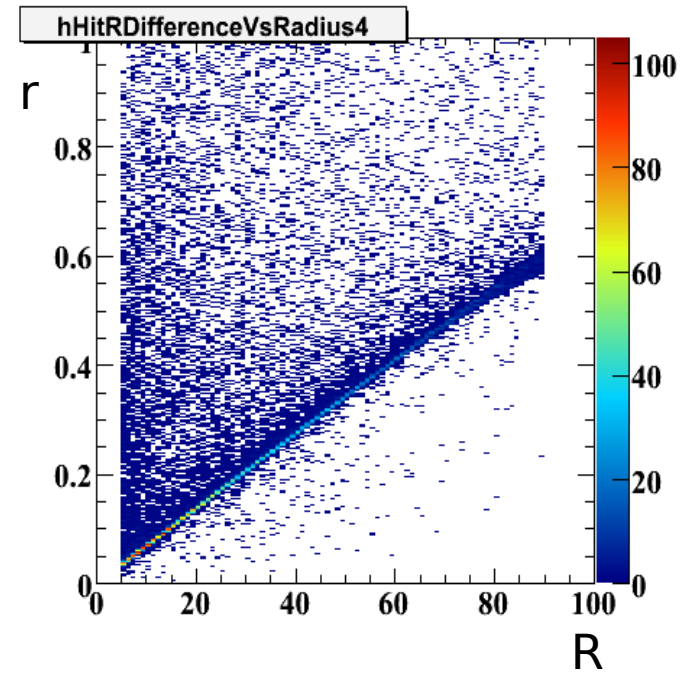
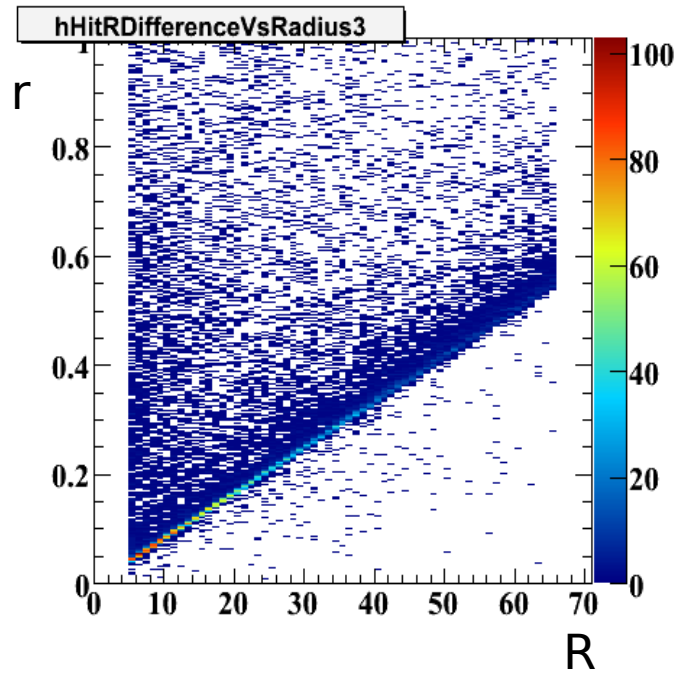
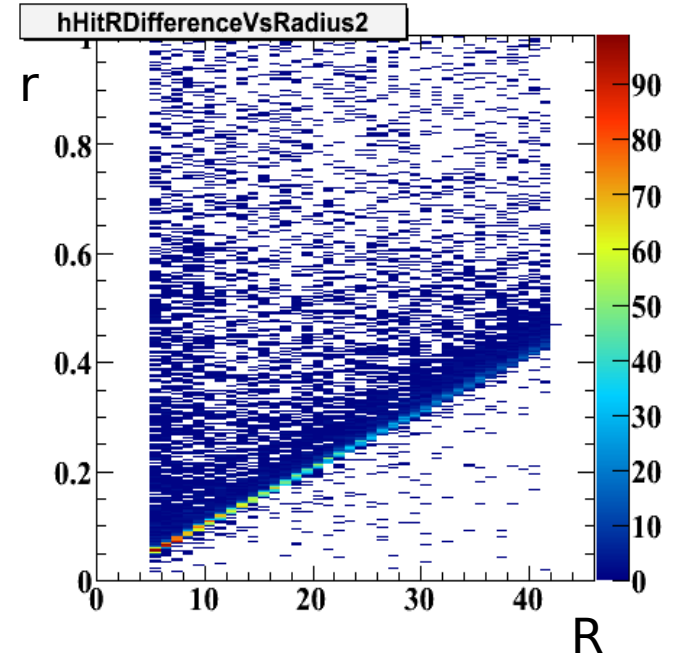
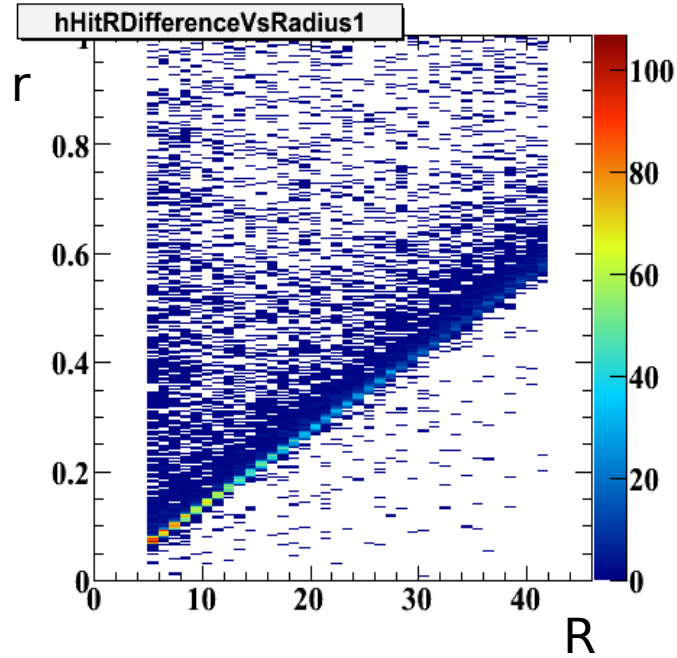
GEM hit correlations

Correlation
between MC
hits on the
front and back
planes of the
GEM detectors



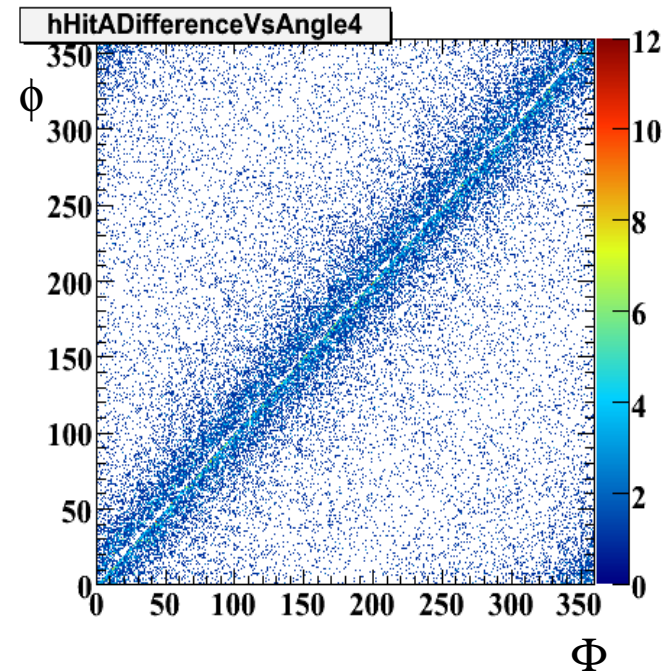
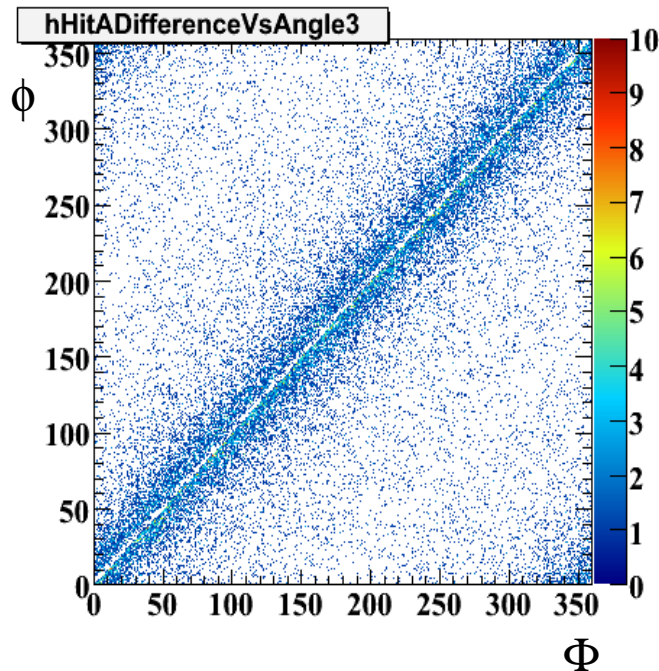
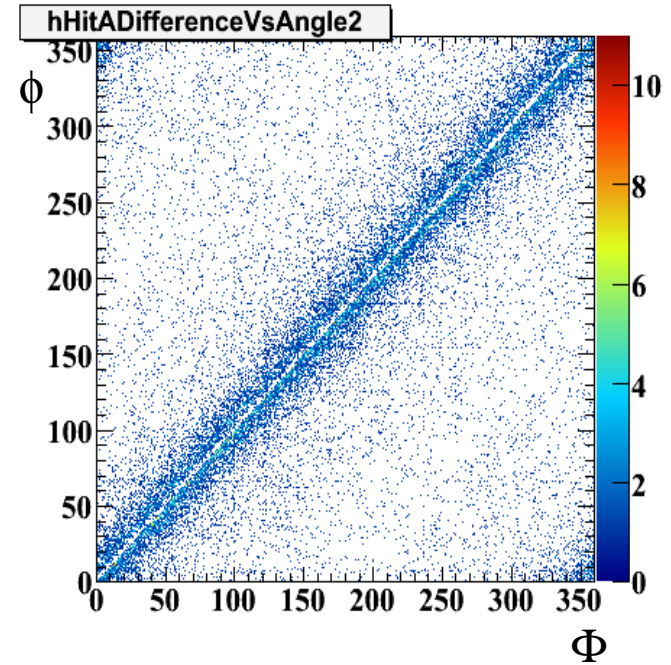
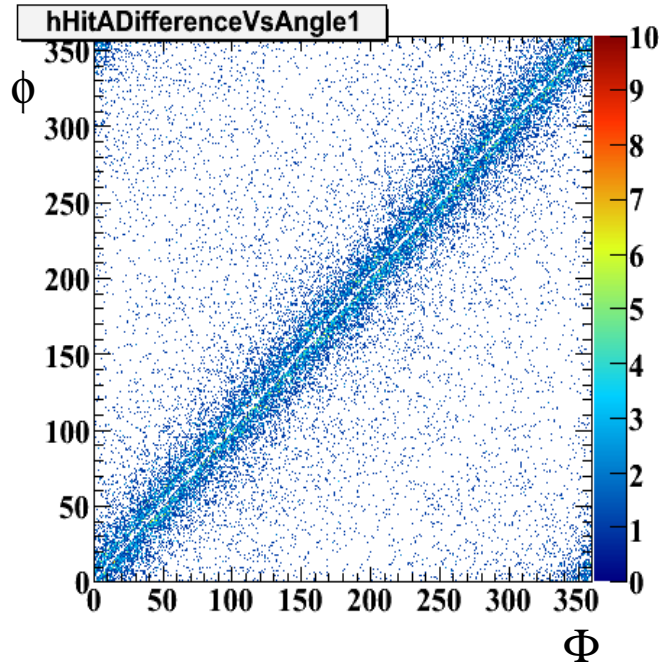
GEM hit correlations

Correlation in DISTANCE between MC hits on the front and back planes of the GEM detectors



GEM hit correlations

Correlation in ANGLE between MC hits on the front and back planes of the GEM detectors



Summary and plans

First version of the geometry and parameters is realized

First version of the digitization and hit finding is implemented

Particle flux reaches $100\text{k} / \text{cm}^2 / \text{second}$

Detector strip occupancy should not exceed 2.5% assuming current detector granularity (minimum strip pitch of $\sim 200\mu\text{m}$)

Preliminary results suggest possibility of creating some kind of tracklets already at the level of one station

Track finding and fitting are being implemented

Global tracking is the next step

Thank you for your attention!

