# CyMBaL Geometry Update
# R&D EIC Meeting 03/27/2024
# +
# Fix/Additions

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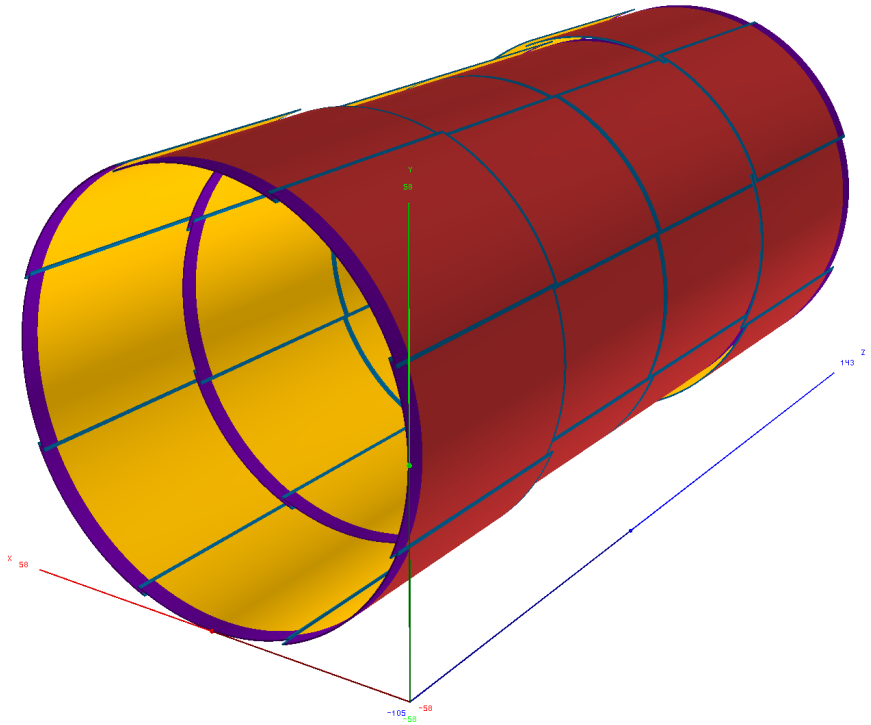
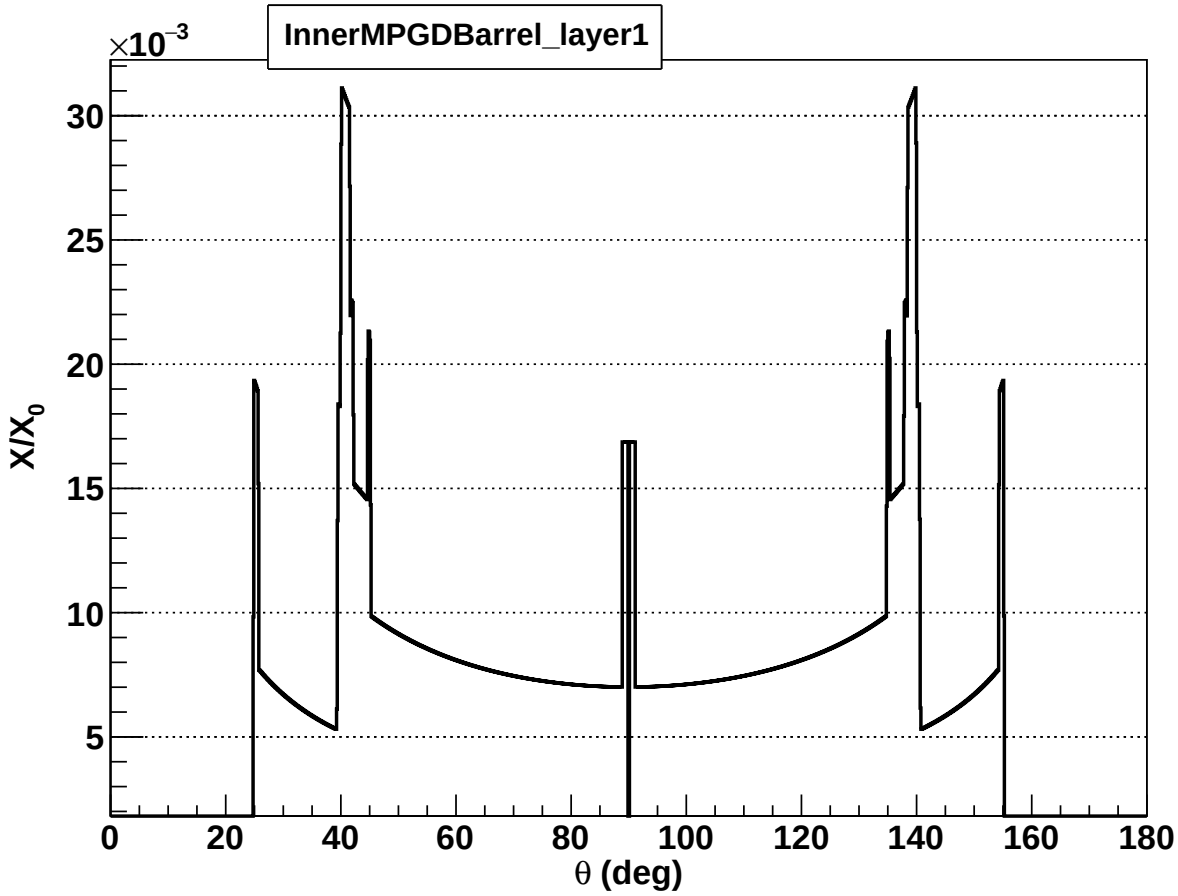
# CyMBaL Updated (*not committed yet...*)

- Upgrade to latest ePIC dimensions $R_{min}$: 51.25 $\rightarrow$ 55 cm, $Z$: [-105,135] $\rightarrow$ **[-105,143]** cm
- New internal parameters:
  - Enlarged **frame facing outwards** to make for output connectors $\Rightarrow$ **Thickness = 5 cm**.
  - **Two distinct curvatures**: $R_{min}$ = **55.5** (*Inner modules*), **57.7** (*Outer modules*) **cm**.
  - **Along $Z$**: **67 cm** = 61 + 5 (*outward frame*) + 1 cm (*inward frame*).
    Filling **[-105,143] to the rim**. $\Rightarrow$ Sets overlaps (*letting aside small central gap*).
  - **Along $\varphi$**: **46.0 cm**. $\Rightarrow$ Sets overlaps.



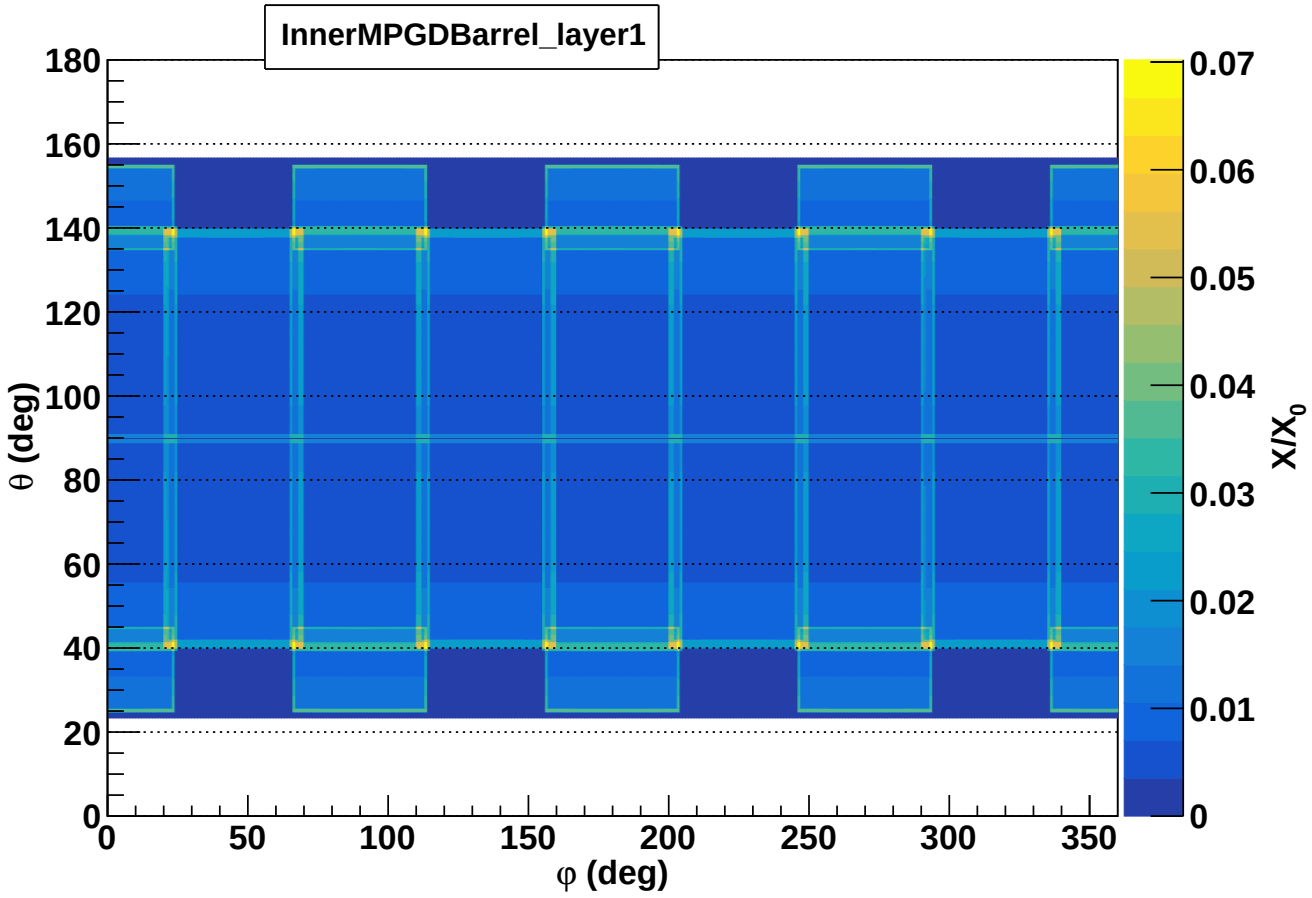
- Connections/Services to Inner modules:
  not yet in.

# Material Budget as f(θ)



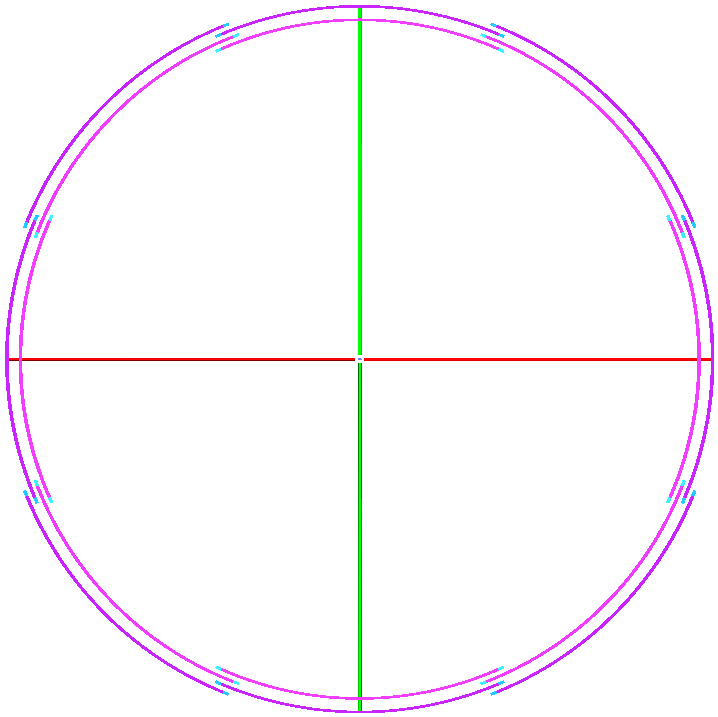

- Still fulfilling the **∼0.5%X0** requirement.
- Sticking out = Frames, Overlaps along $Z$.
- *I don't understand the drop at* ***40/140 deg.*** *for Outer modules...*

# Material Budget as f(θ,φ)



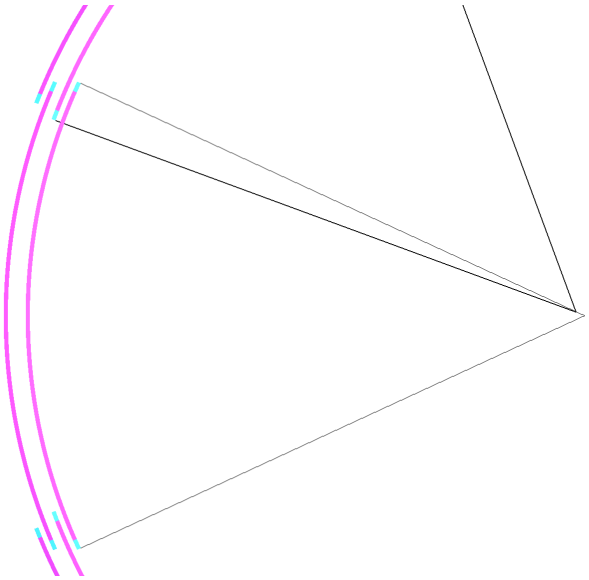

- *I don't understand the alternating feature along* φ *on both* θ *edges...*

# Axial view



- Modules **not centred** on beam axis. Instead: neighbours along $\varphi$ **offset** $w.r.t.$ each other.
  $\Rightarrow$ Fewer curvature radii
  $\Rightarrow$ Makes assembly and installation easier. Fewer tools required.
- Two distinct **models** for Inner ($smaller$) and Outer sectors
  ($xml\ description\ still\ provides\ for\ 4\ distinct\ radii\ w/o\ any\ offset.$)

# Sector Models



- <constant name="MMInnerSector_R" value="55.5*cm"/>
- <constant name="MMOuterSector_R" value="57.7*cm"/>
- <constant name="MMRadial_offset" value="1.0*cm"/>

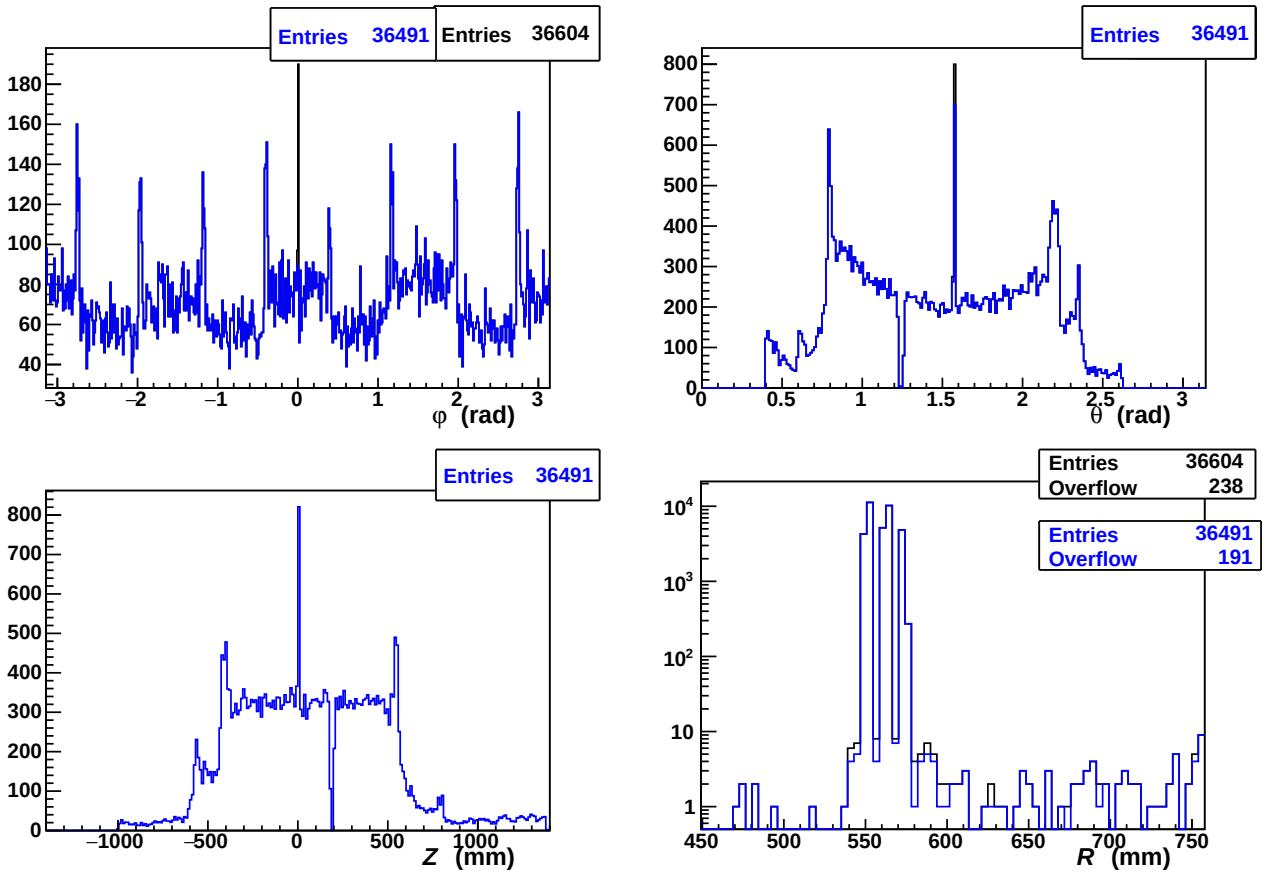
- Introduce new tags model service:

```
<model name="MMInnerSector" rmin1="MMInnerSector_R" rmin2="MMInnerSector_R"
  offset="MMRadial_offset"/>
<model name="MMOuterSector" rmin1="MMOuterSector_R" ... etc ...

<service name="MMInnerService" material="Kapton"
  thickness="MMInnerService_thickness" vis="TrackerServiceVis" />
```

# Hits

- `ddsim: SIM.gun` $45 < \theta < 135$ deg. $1 < P < 10$ GeV




- 8 peaks in $\varphi$ corresponding to overlaps ($+$ *one artefact* $\varphi \equiv 0$)
- *I don't understand the* $R$ *distribution... Expecting 4 peaks instead of 3.*

# *A posteriori* Fix

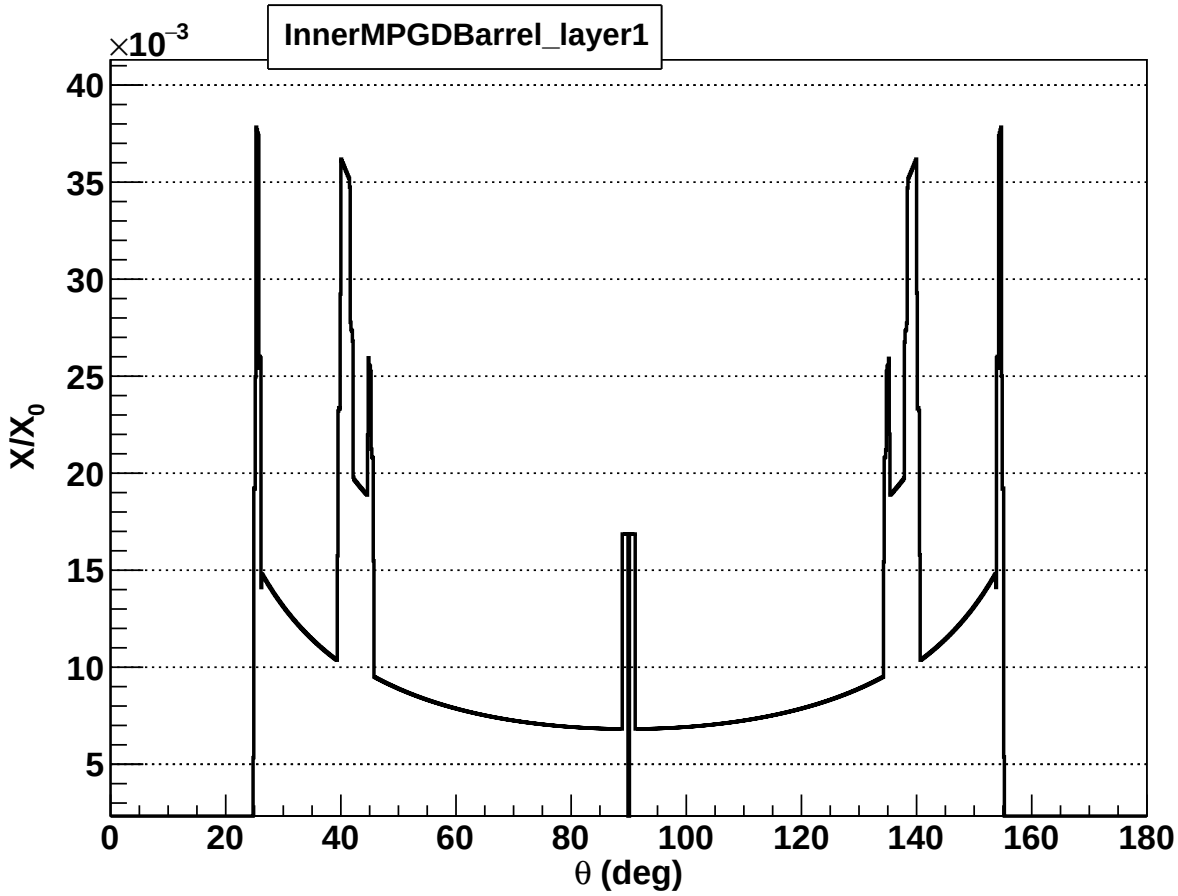
- Francesco found the explanation for the enigmatic behaviours mentioned supra. . .
  . . . affecting %X0 1D and 2D and hits distribution along $R$.

- The mistake was a too small `rmax` for the layer volume. . .
  . . . *i.e. the mother volume of all the modules.*

- Increasing `rmax` 57.05 $\rightarrow$ 59.2 cm fixes all.
  (*Note: I could not find how to get the minimally working* `rmax` *directly from from* `TGeometry`.)

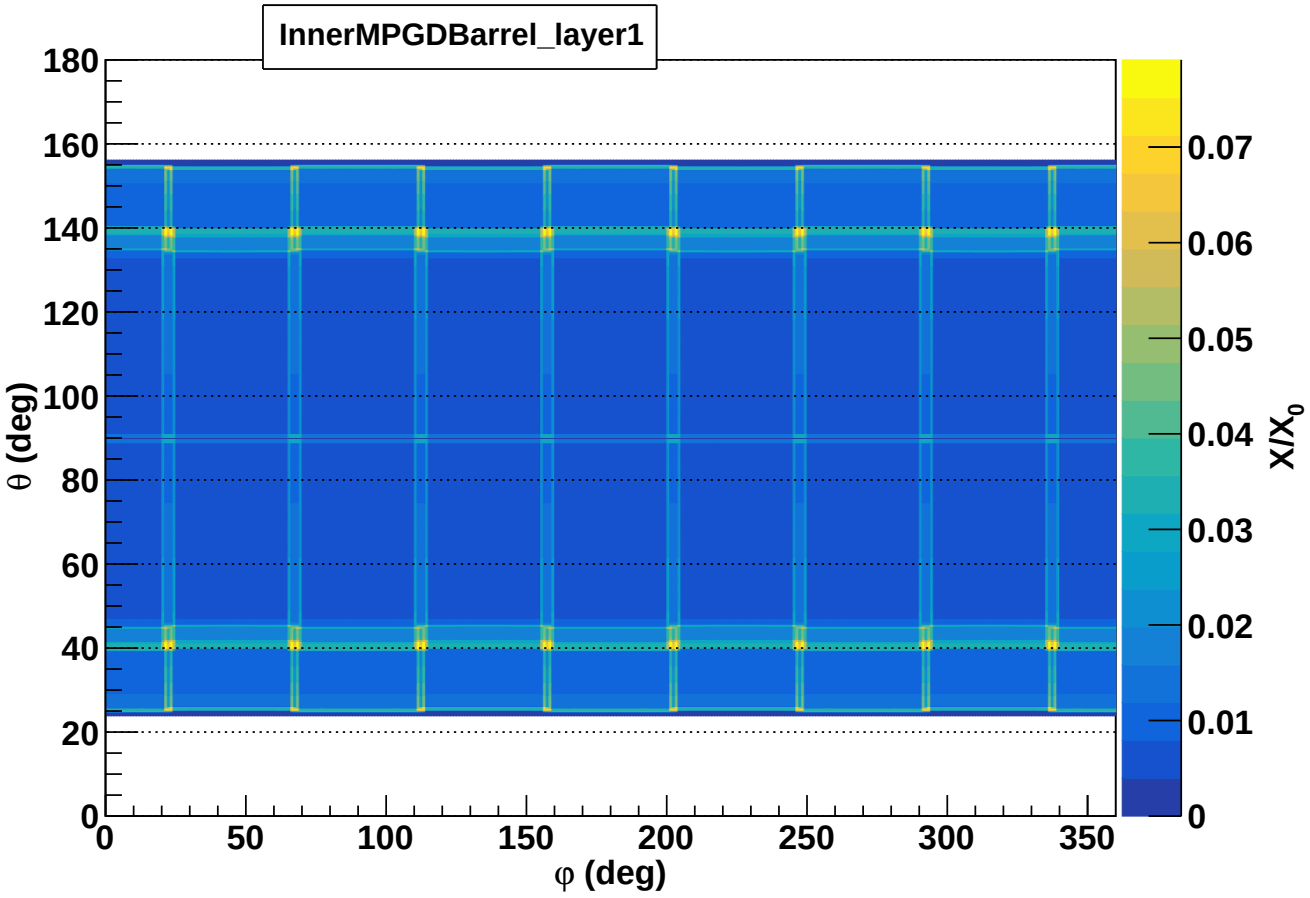
- I also reduced the radial `offset`: $\pm$0.6 $\rightarrow$ 0.5 cm.
  (*Niv had it equal to* $\pm 0.25cm$ .)

# Material Budget as f(θ): Fixed



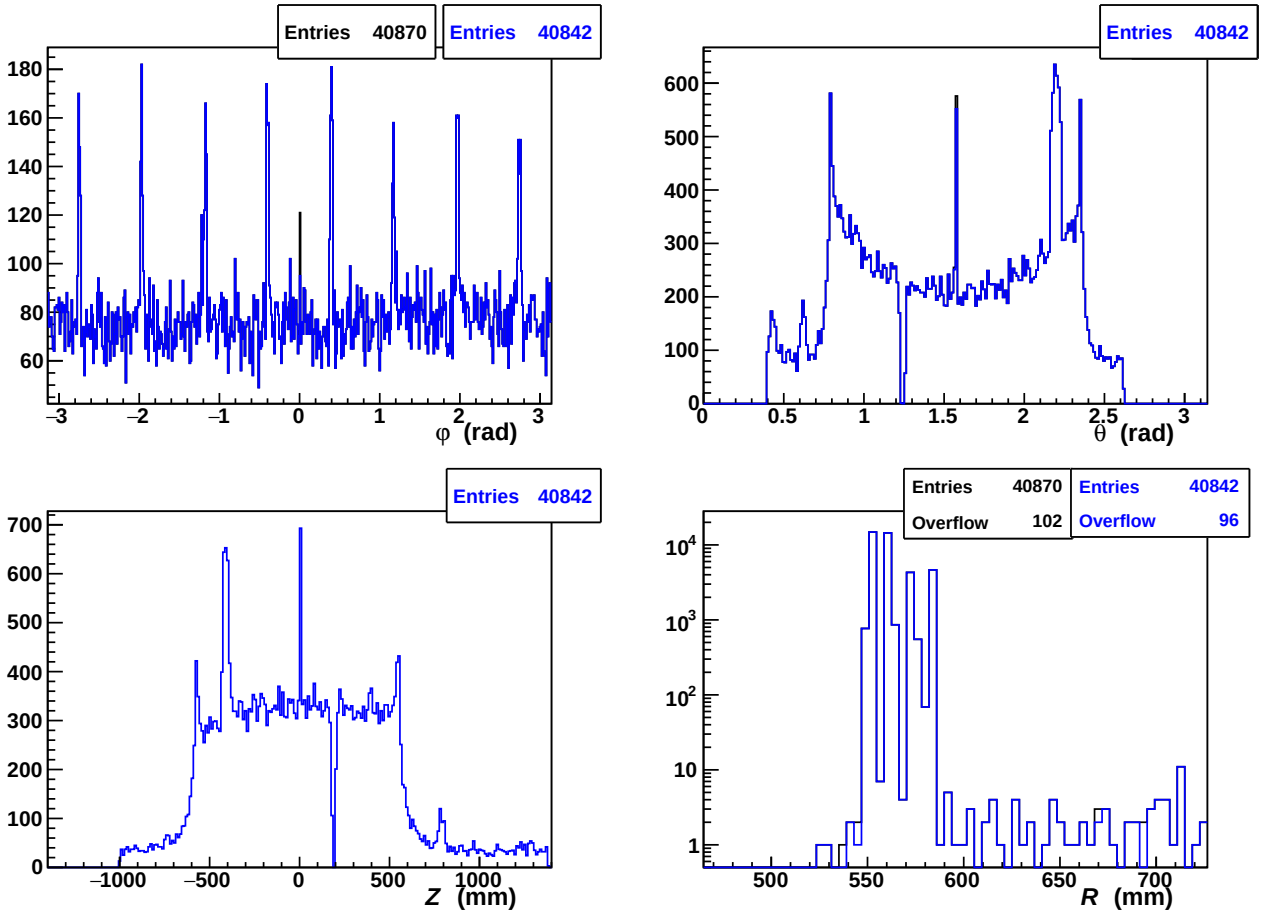

- The drop at **40/140 deg.** for Outer modules is gone.

# Material Budget as f(θ,φ): Fixed




- No empty volumes on the outside along φ any more.

# Hits: Fixed partially




- A flat baseline below the 8 peaks along $\varphi$, as expected.
  And artefact @ $\varphi \equiv 0$ less pronounced.
- 4 peaks in $R$, as expected.
- Still puzzling: structures (peaks, dips) in $\theta/Z$ and stray hits in $R$.