# Simulation Geometry Update

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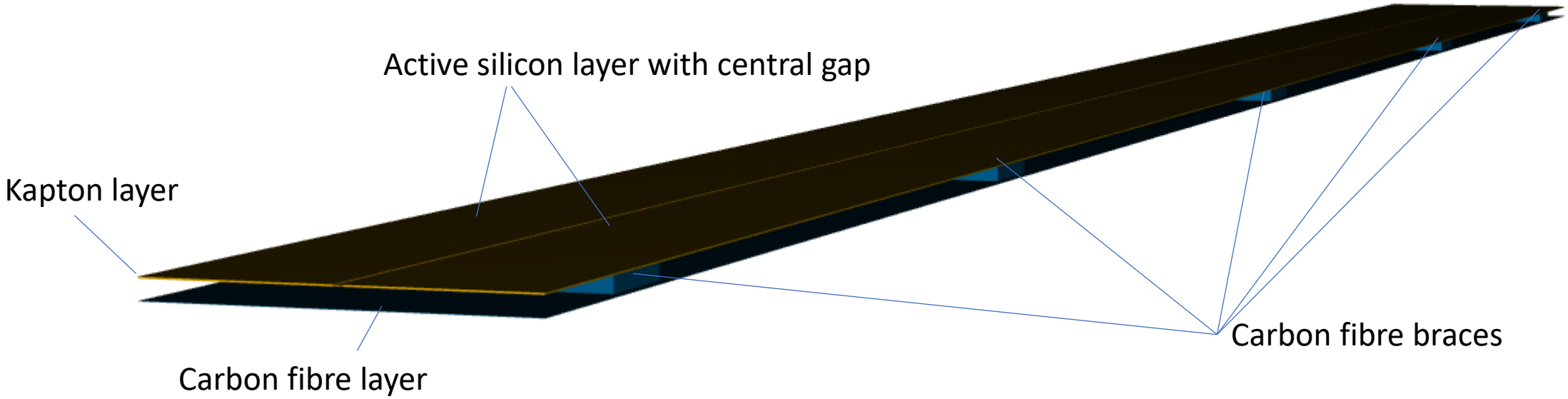
- **Full CAD-file version**: https://github.com/eic/epic/tree/SVTOB_UK
  - Previously reported bugs fixed
  - All material now included (including Bridge FPC and ultem end mounts)
  - Detailed hit maps and material thickness scans available
  - Currently not working with reconstruction software
  - Overlaps with other parts of simulation geometry (which need updating)
  - May be too complex and slow for routine simulations
- **Simplified flat component model**: https://github.com/eic/epic/tree/flat_OB
  - All flat components
  - Fully working
  - Github PR: https://github.com/eic/epic/pull/933
- Further work
  - Curved silicon surfaces
  - Separate modules on top and bottom of staves

# flat_OB geometry

- All flat components
- Carbon fibre braces to reproduce peaks on material thickness scan
- Gap in active silicon to reproduce dead area
- Castellated stave arrangement (alternate staves at +6mm radius)

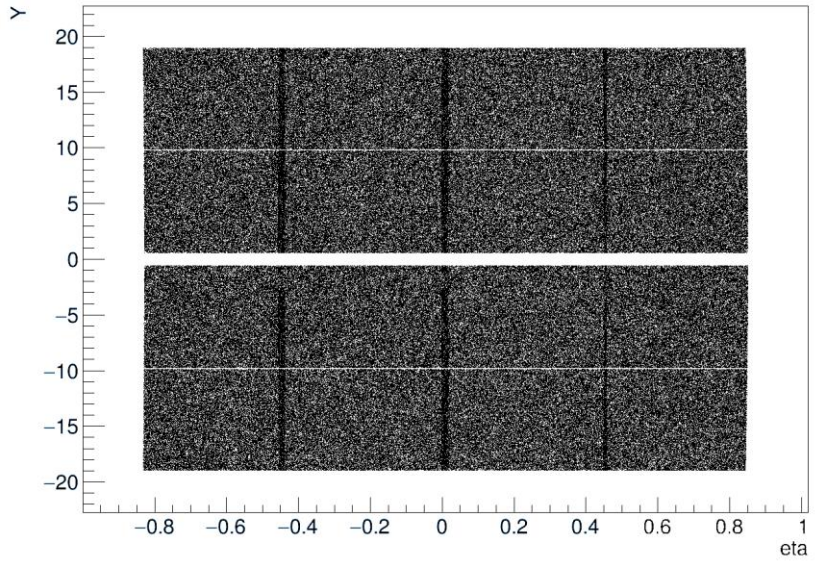
https://github.com/eic/epic/tree/flat_OB
https://github.com/eic/epic/pull/933
https://indico.bnl.gov/event/29542/#2-svt-ob-simulation-geometry-u

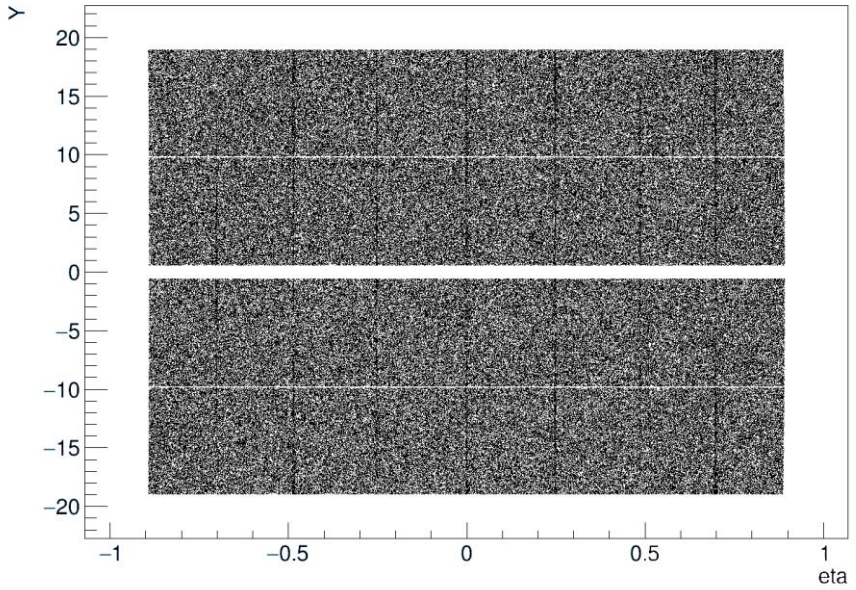


# Hit maps – single staves

Reproduce 1mm dead area in active silicon

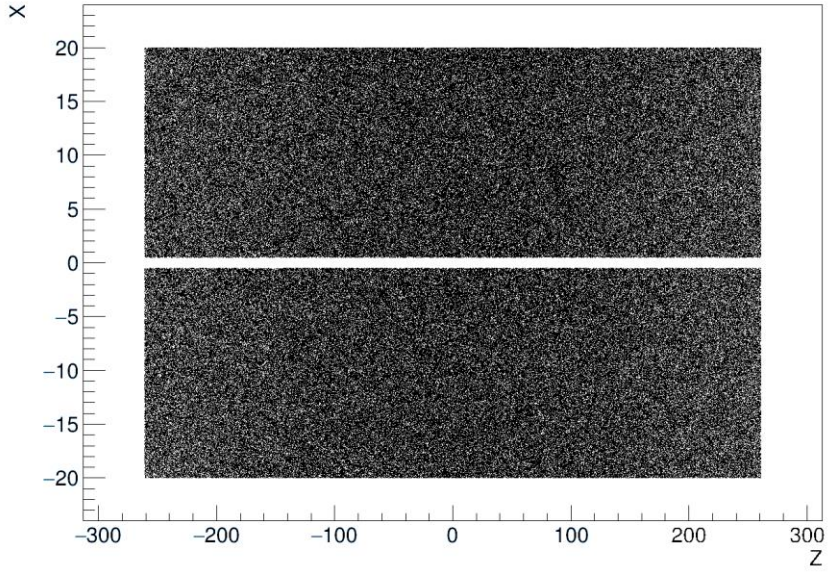
July CAD



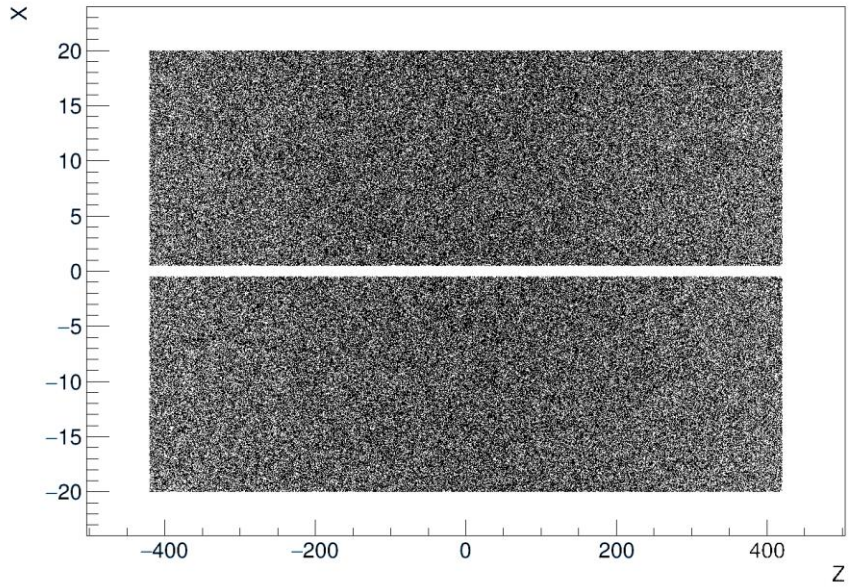




flat_OB

L3

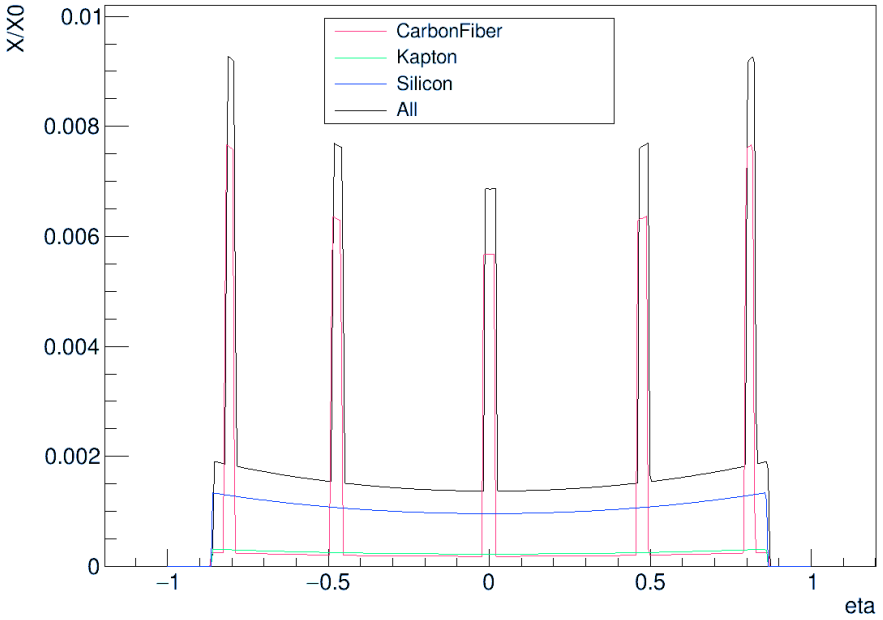


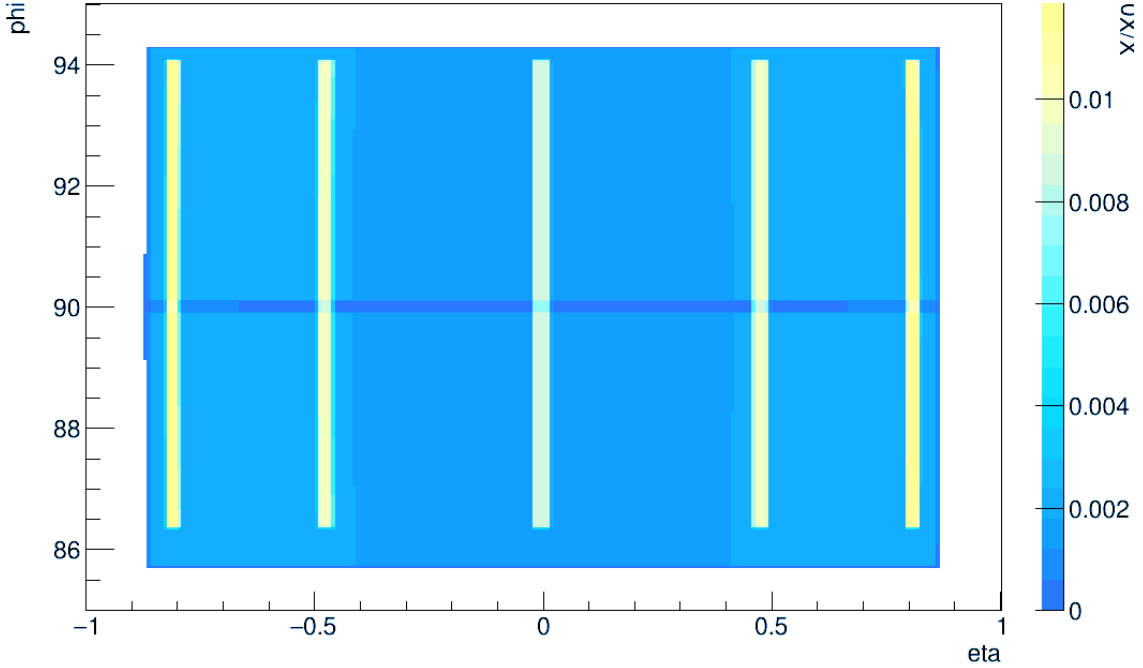

L4



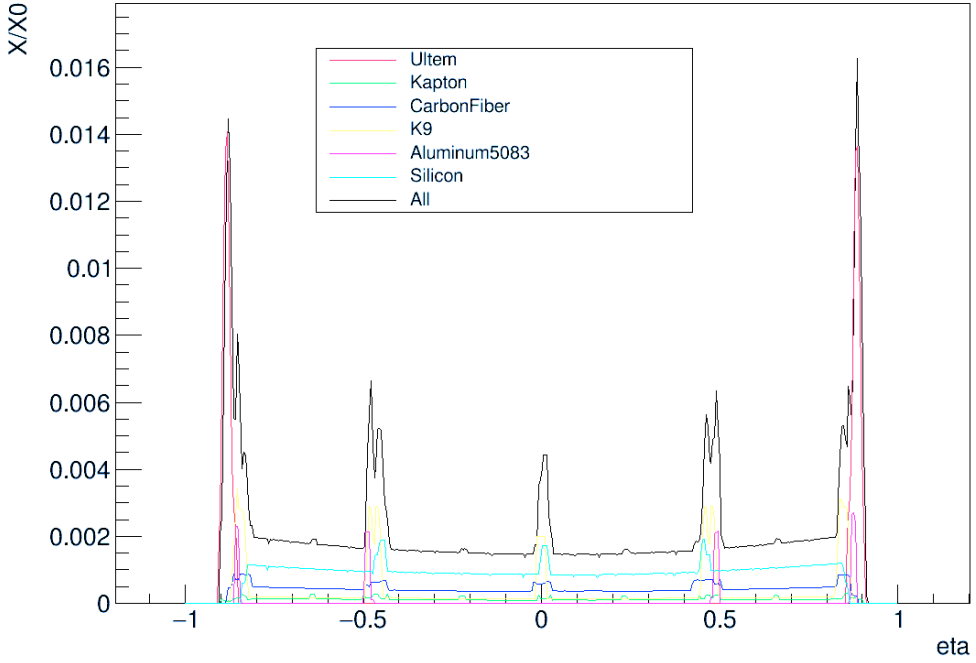
# Single stave material scans – L3

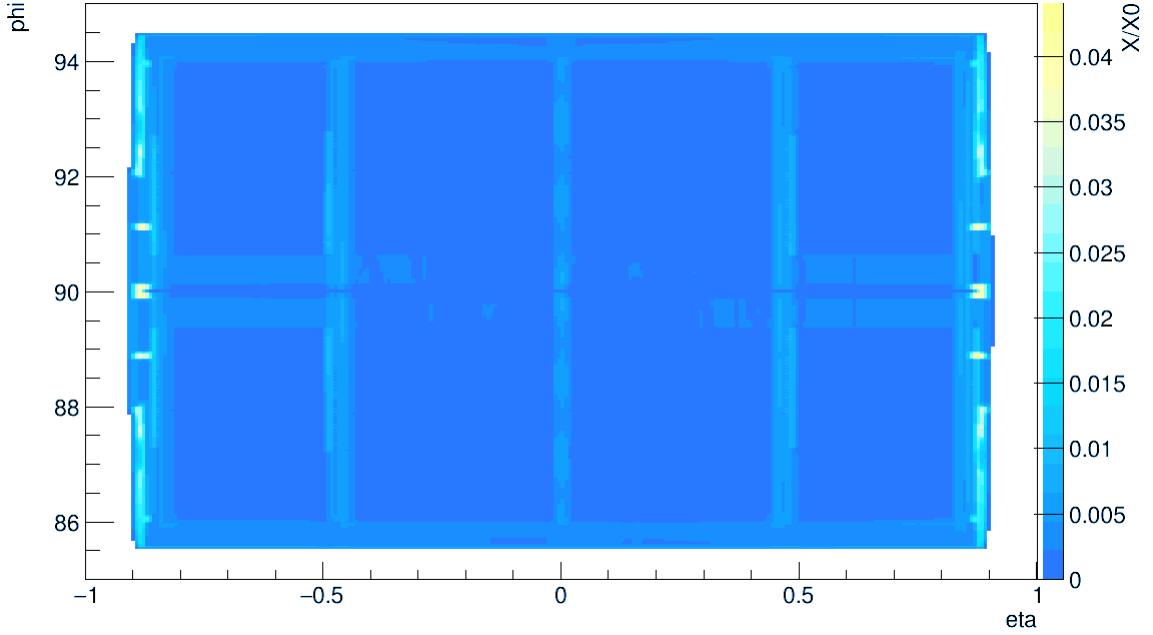
flat_OB



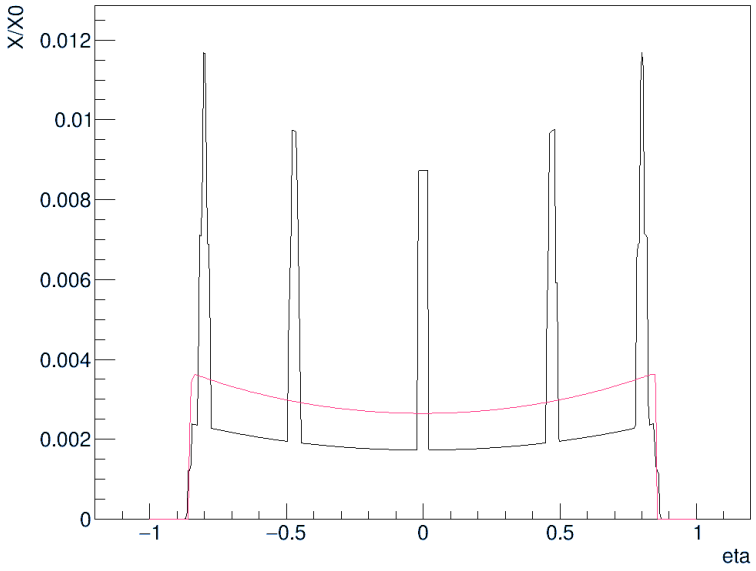

July CAD with Ultem and FPC



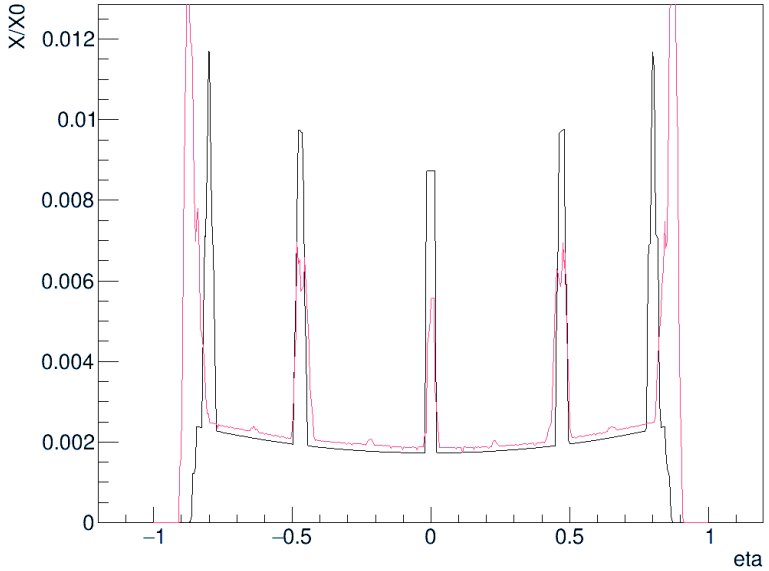



# Comparisons

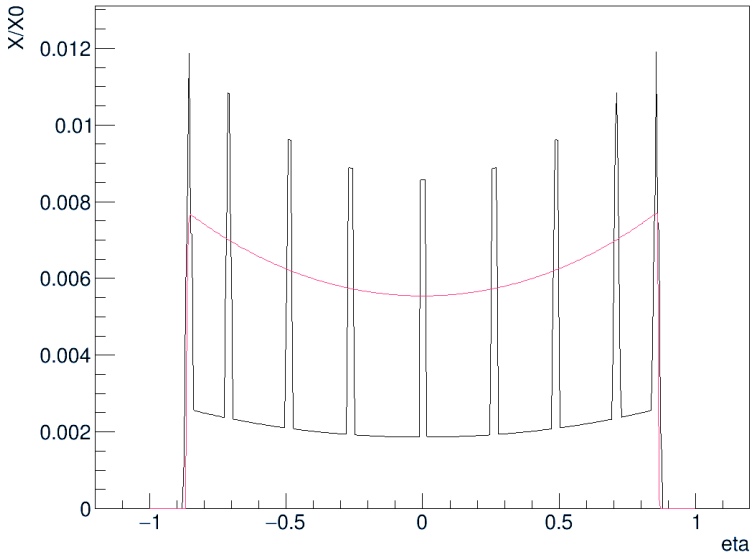
L3 flat_OB / epic-main average ratio 0.84



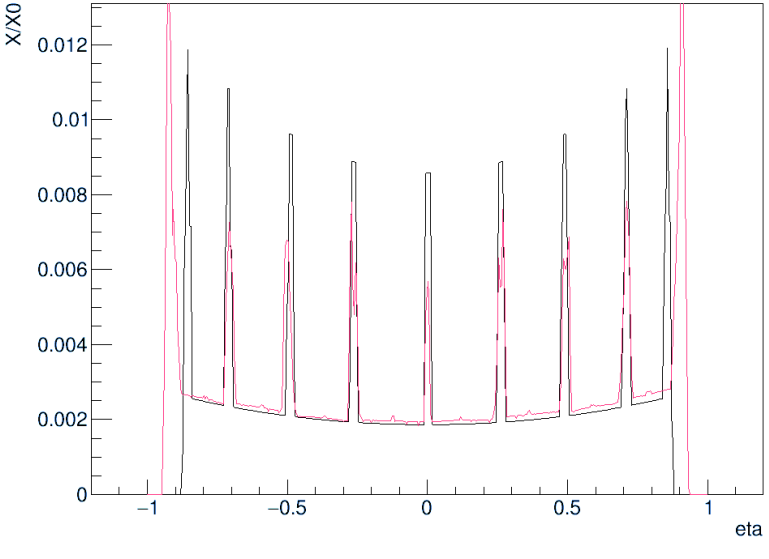

L3 flat_OB / July CAD average ratio 0.98




L4 flat_OB / epic-main average ratio 0.41

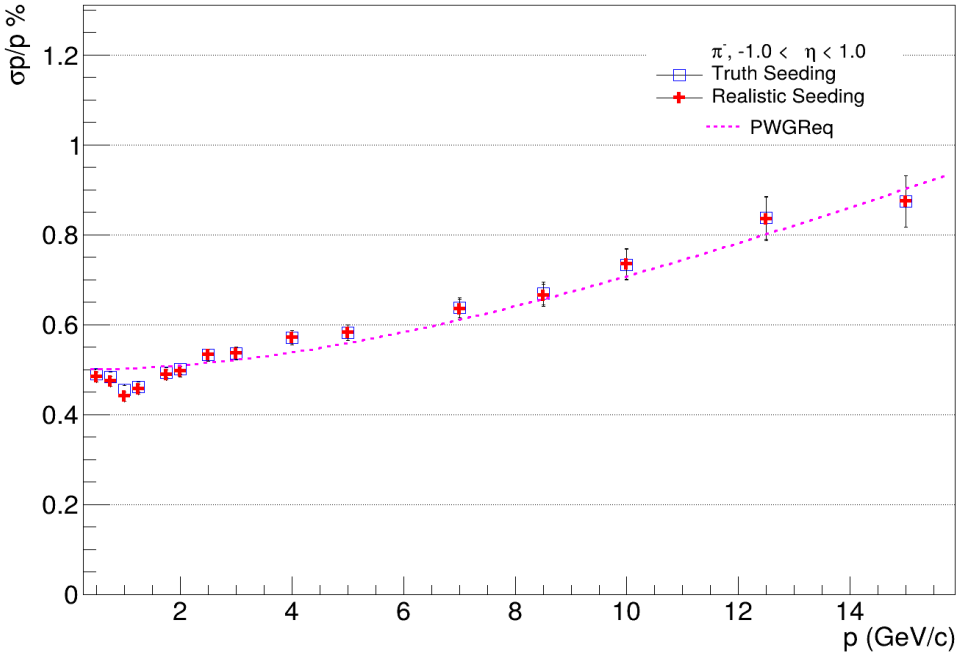



L4 flat_OB / July CAD average ratio 0.92

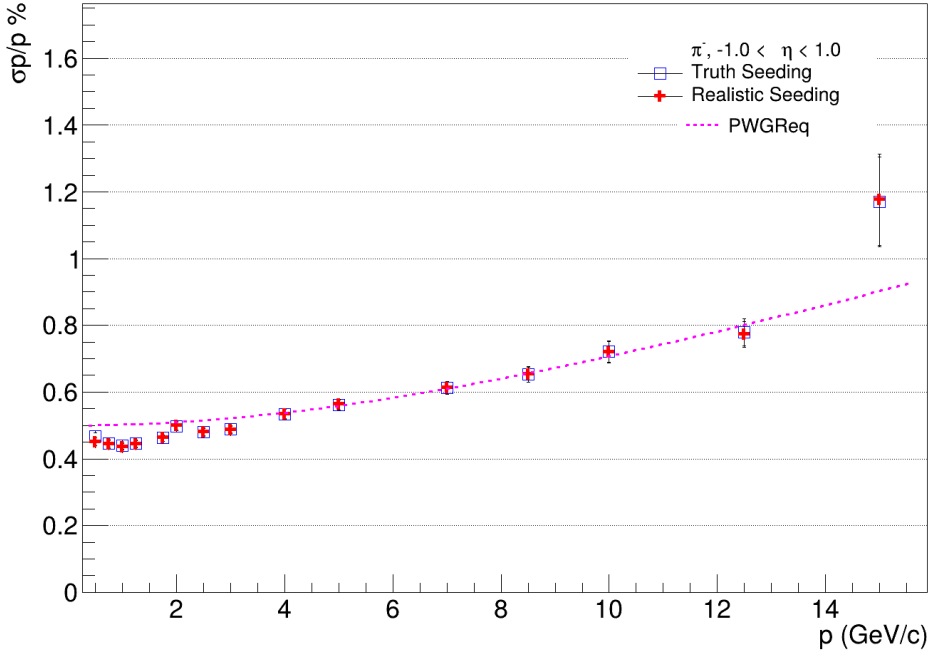


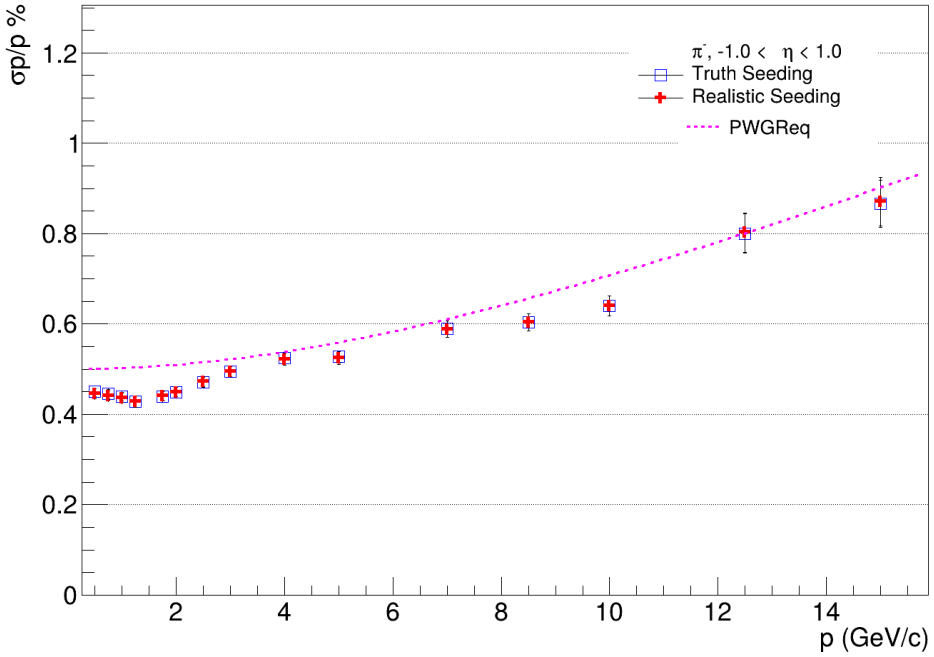
# Tracking benchmark – momentum resolution

epic-main




flat_OB (with updated material map)



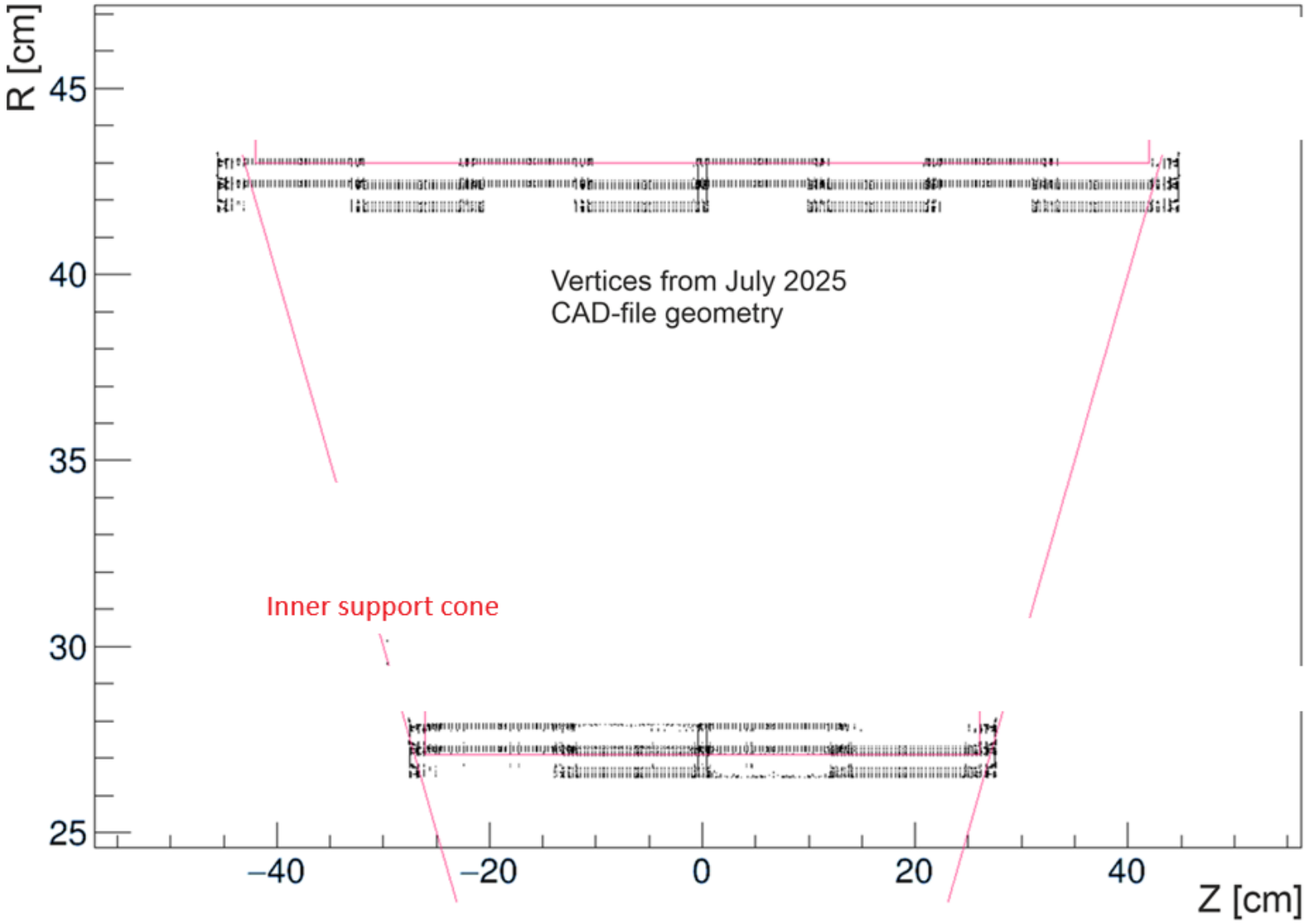




flat_OB v3
Changed stave widths
(with updated material map)

# Overlaps – CAD file geometry does not fit in current epic geometry

We can’t update the simulation geometry until all the pieces fit together.

Sub-detector boundaries need to be agreed, finalised, and communicated to everyone involved.



# Further improvements

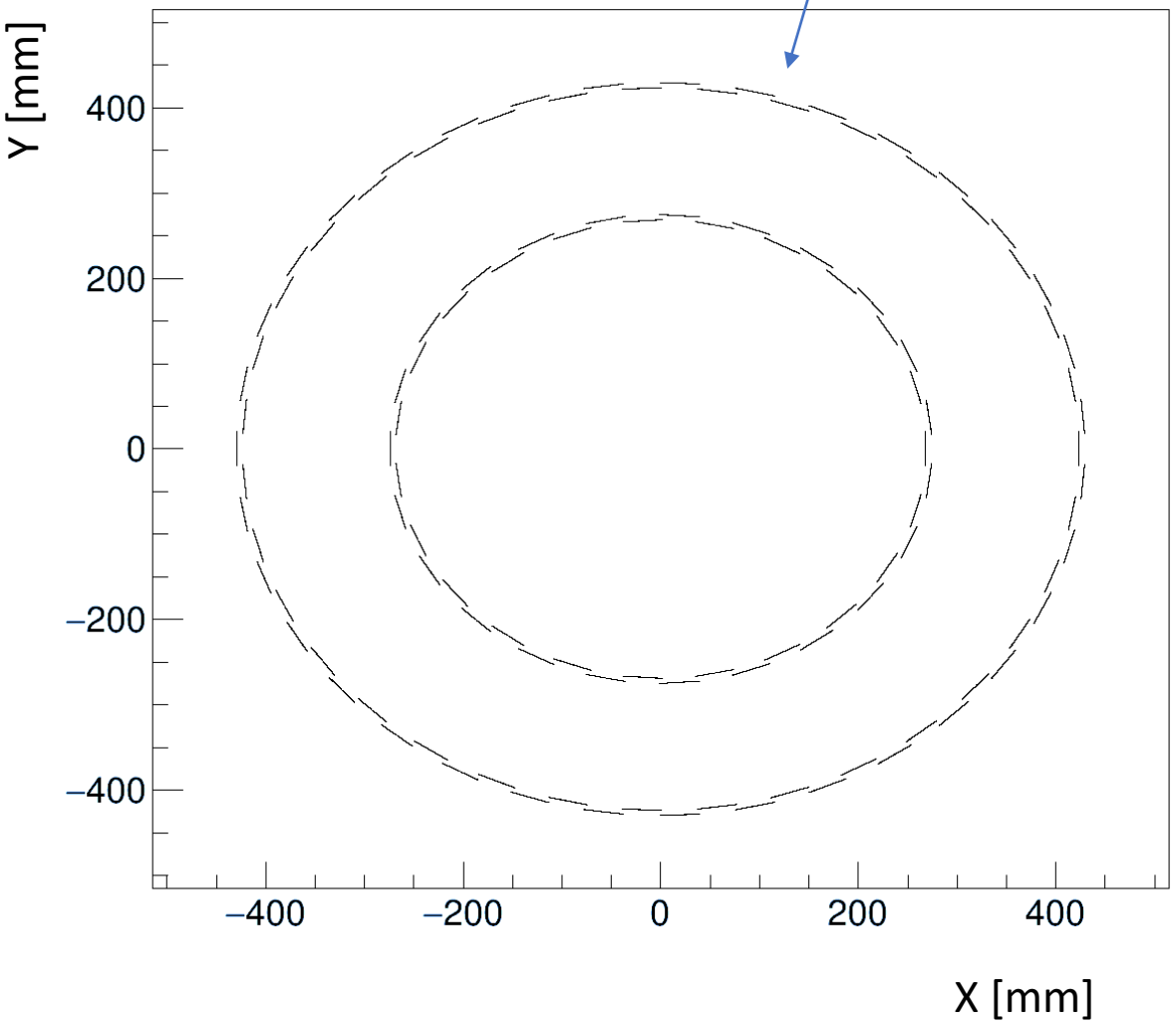
**Curved silicon**

- First attempt failed - DD4HEP CylindricalGridPhiZ readout segmentation only works for main barrel cylinders
- Next steps:
  - Model curved surface as series of flat strips
  - Modify CylindricalGridPhiZ to accommodate cylinders with displaced axes
- Separate modules on top and bottom of stave
  - Done for flat modules – needs testing
- Final goal: hybrid model with simplified curved surface for active silicon, and support structure from CAD files

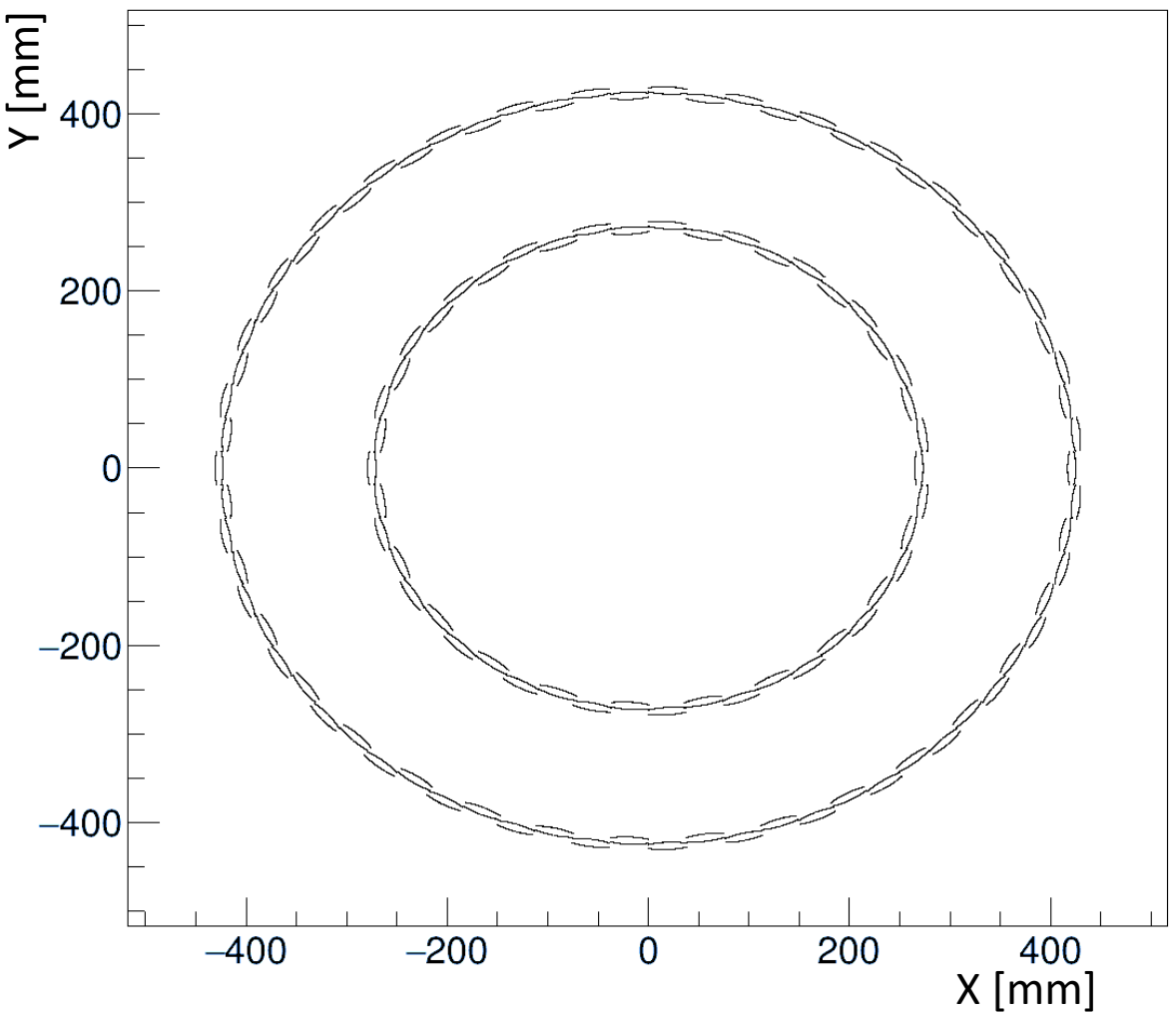
# Hit Maps

Castellated staves – alternate staves have radius offset by 6mm

New flat_OB geometry

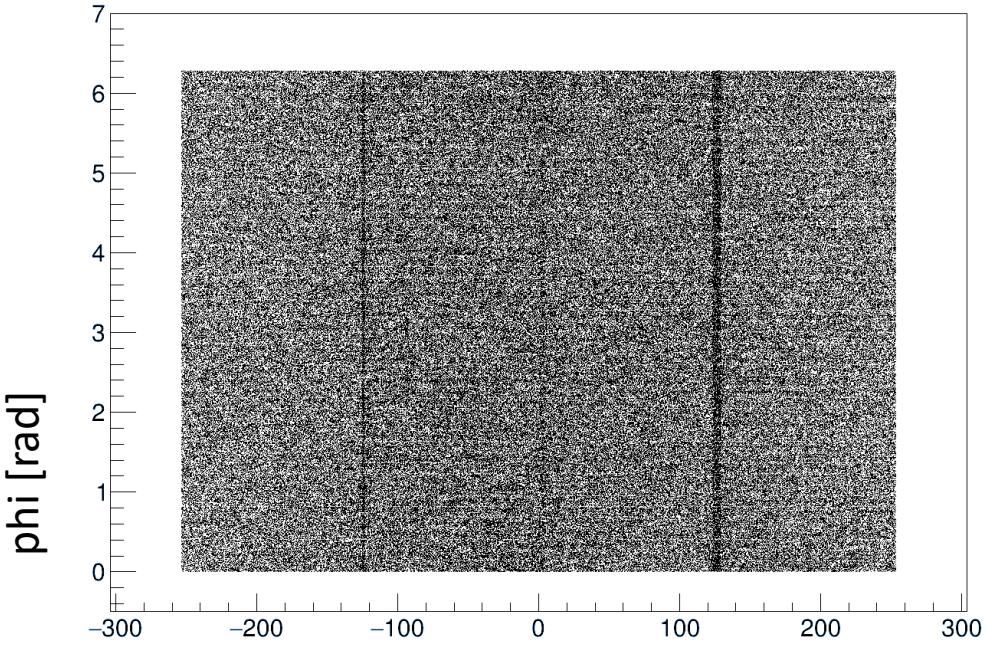


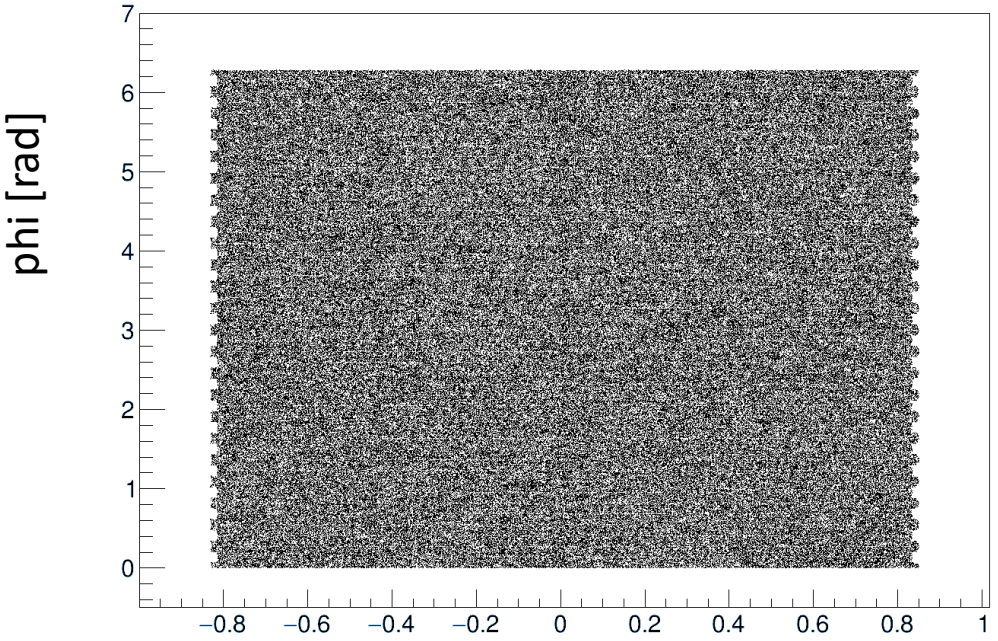

July CAD geometry



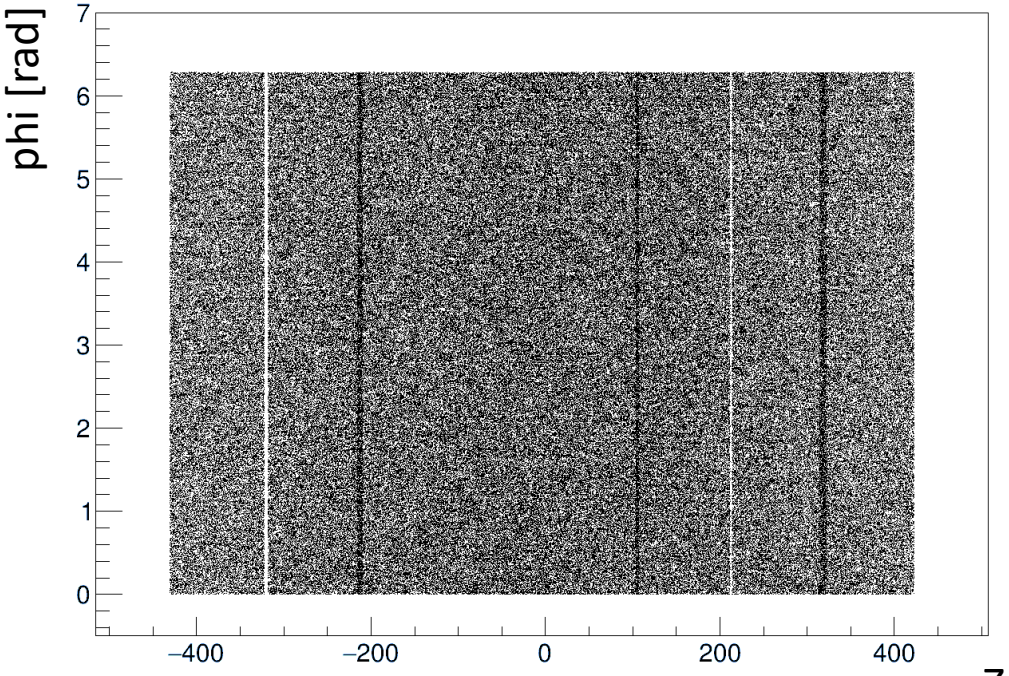
# Hit maps July CAD

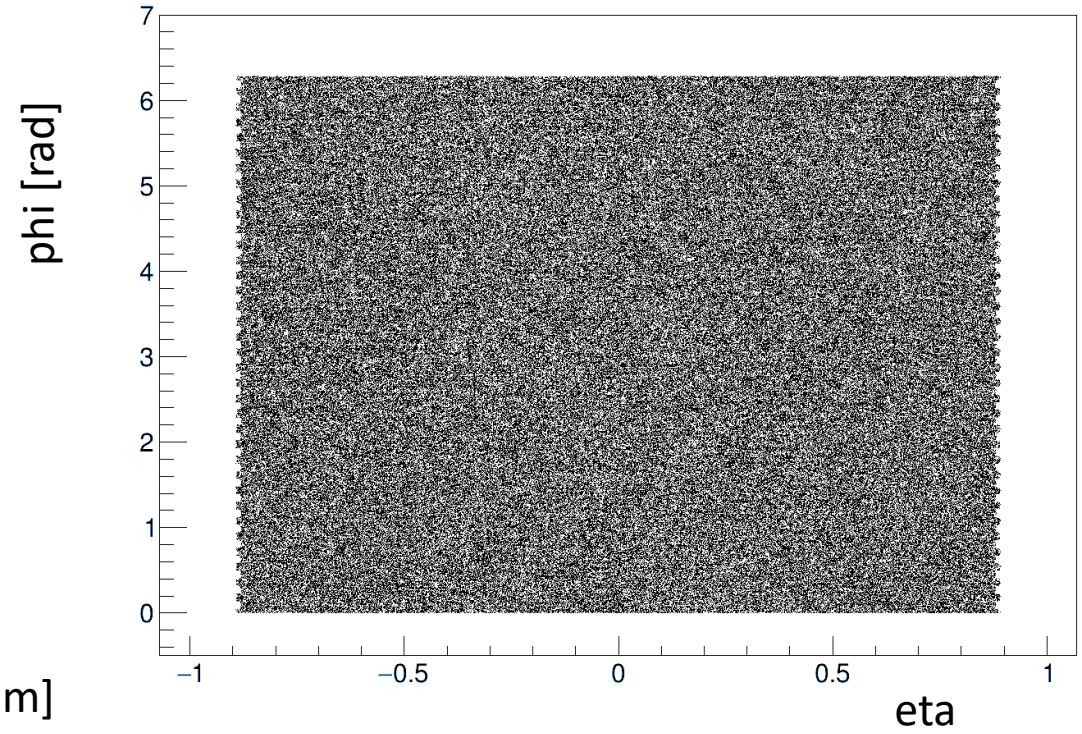
L3



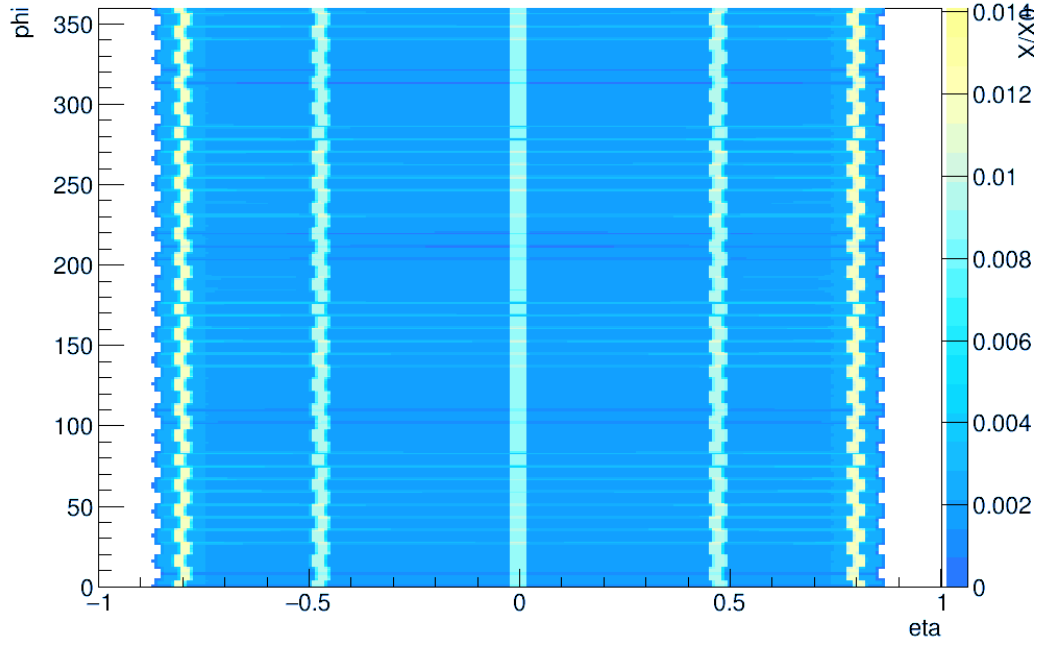

L4

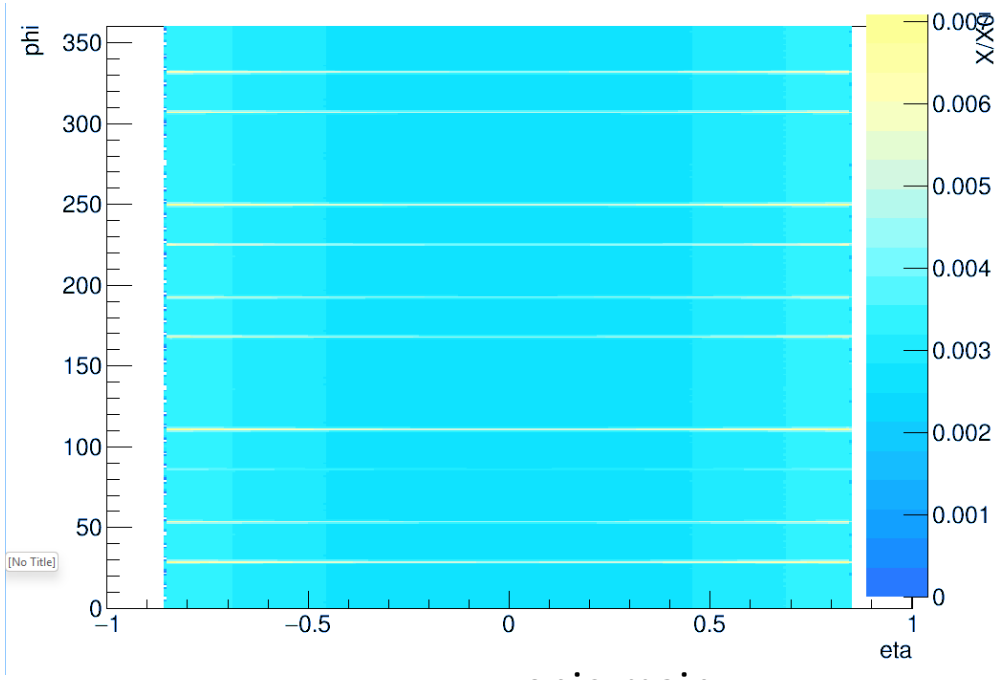


# L3 full barrel
# Material scans

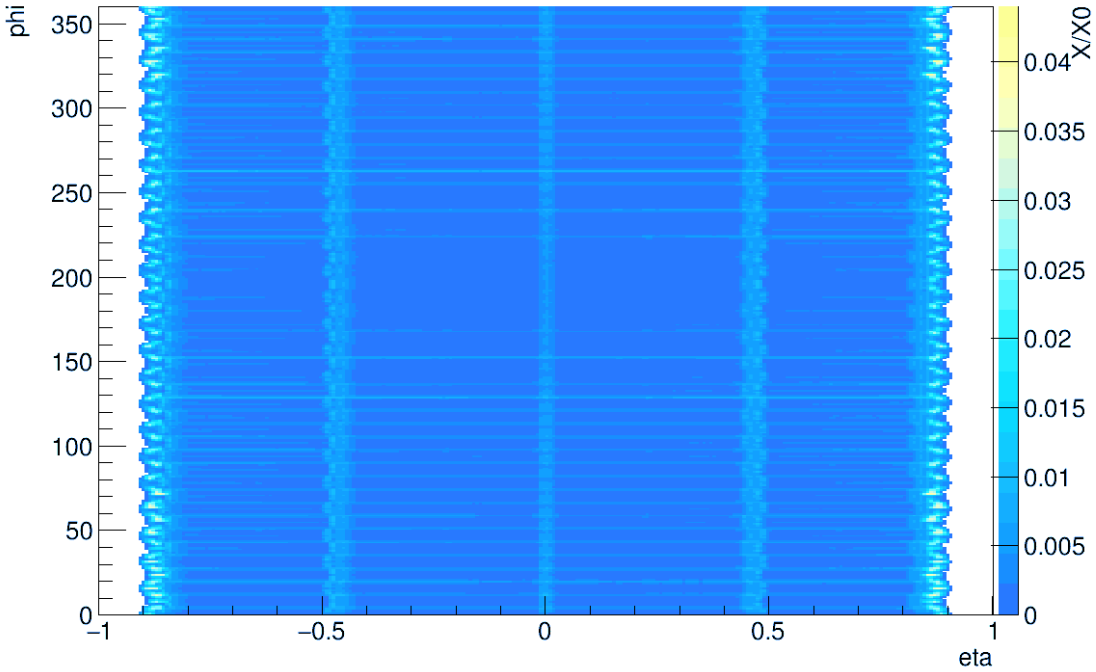
flat_OB




epic-main

July CAD



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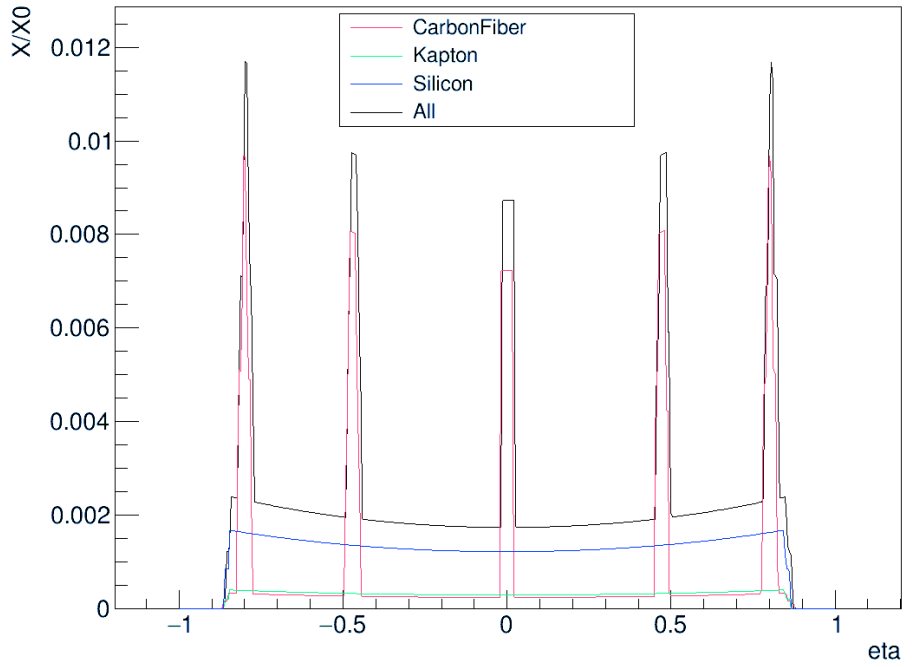
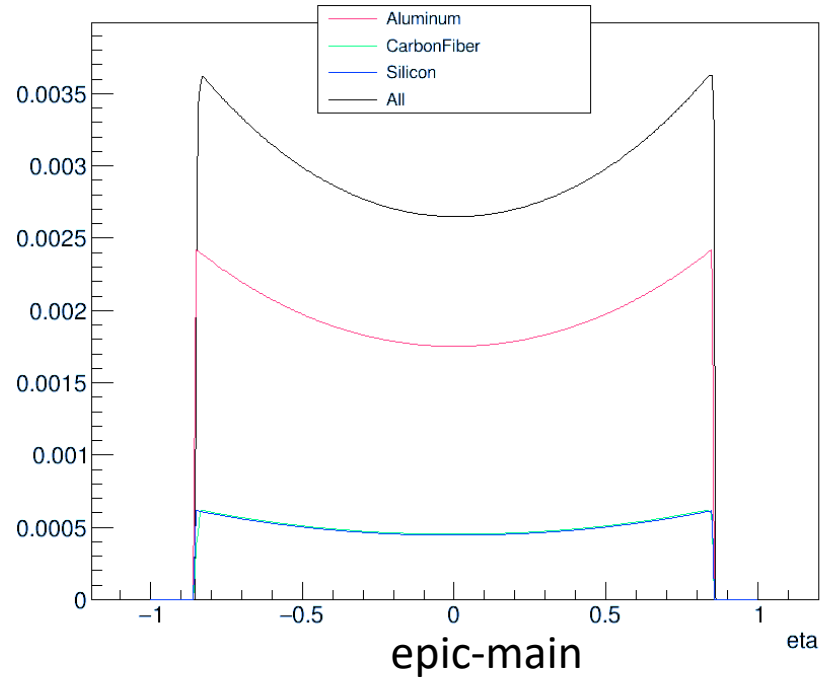
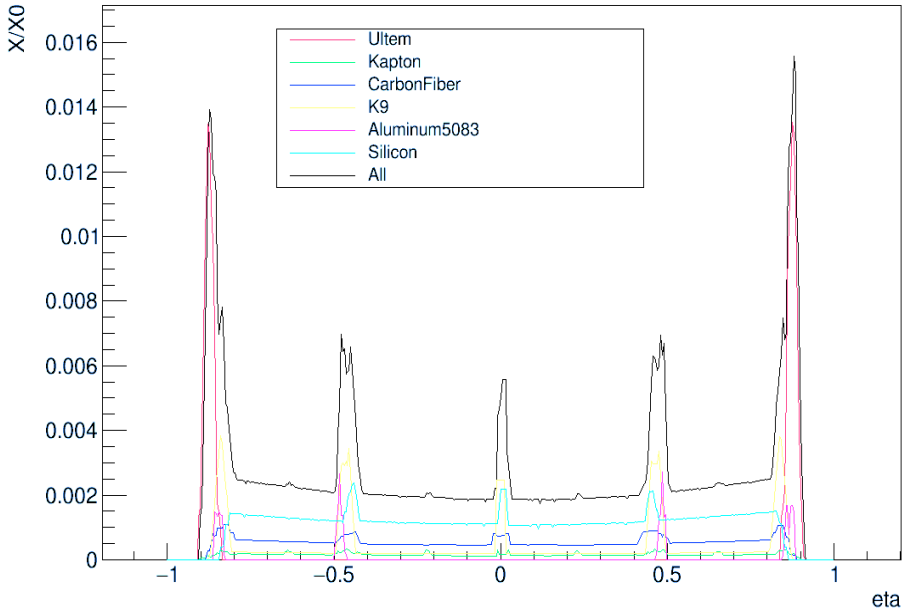
# Material scans

flat_OB



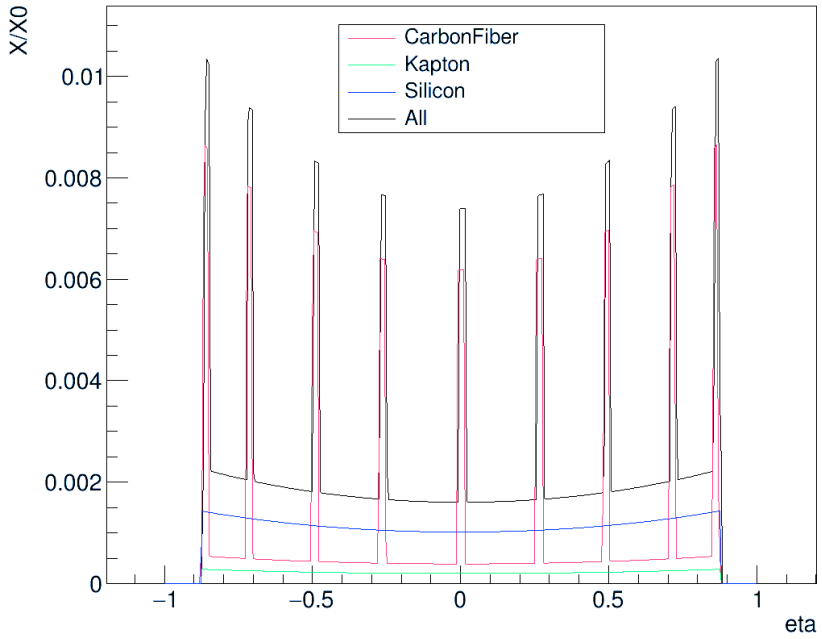



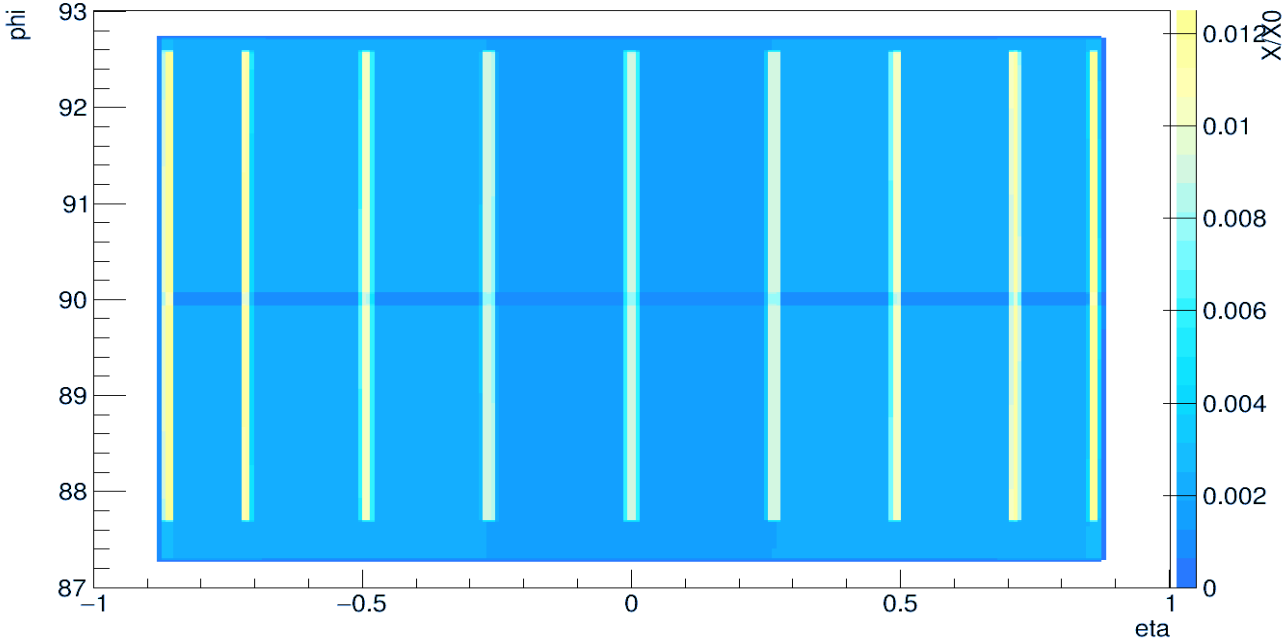

July CAD



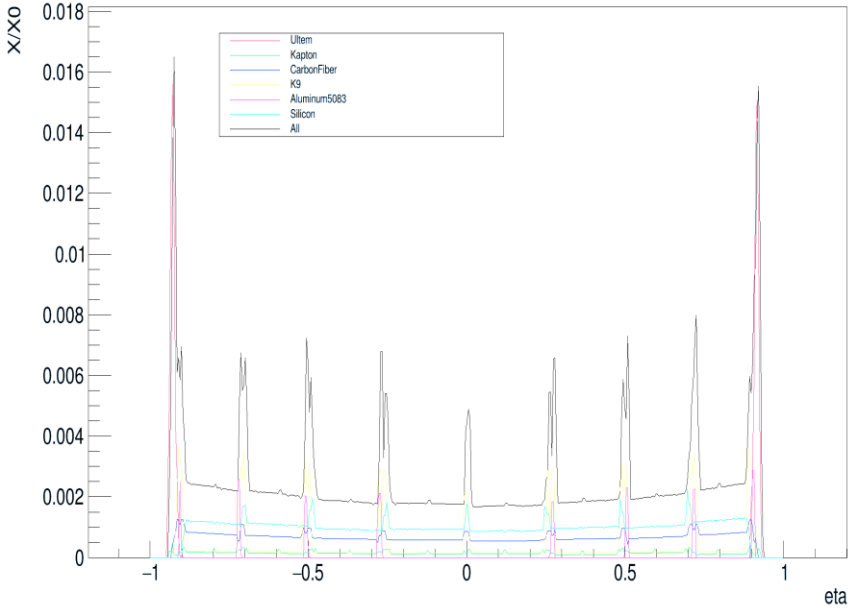
# Single stave material scans – L4

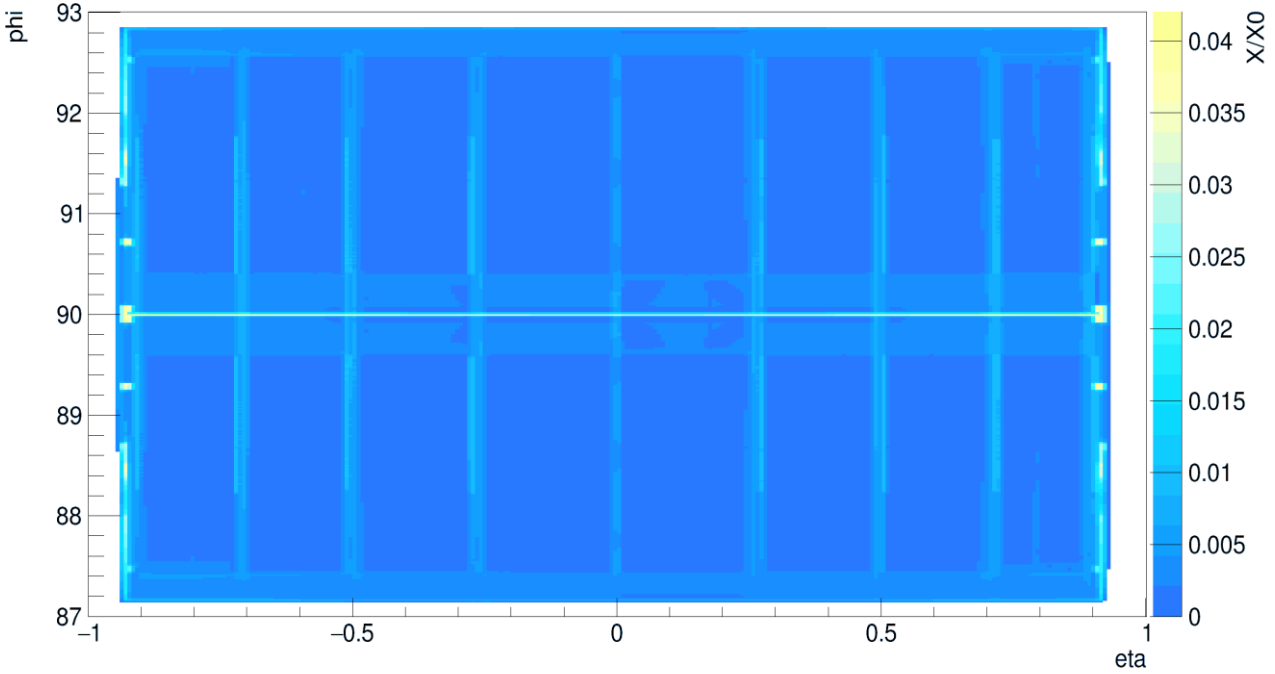
flat_OB



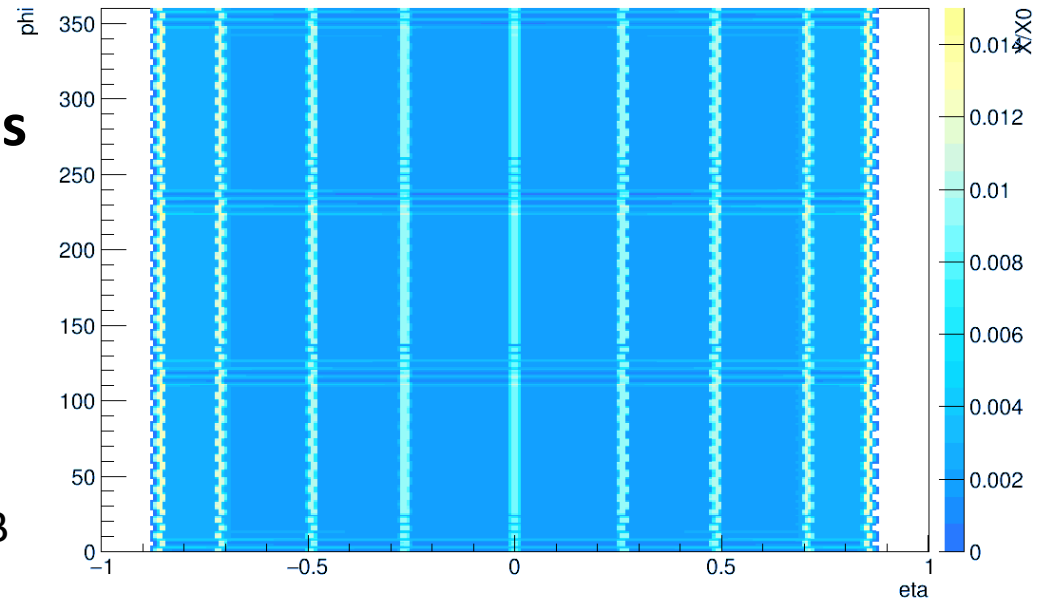

July CAD with Ultem and FPC

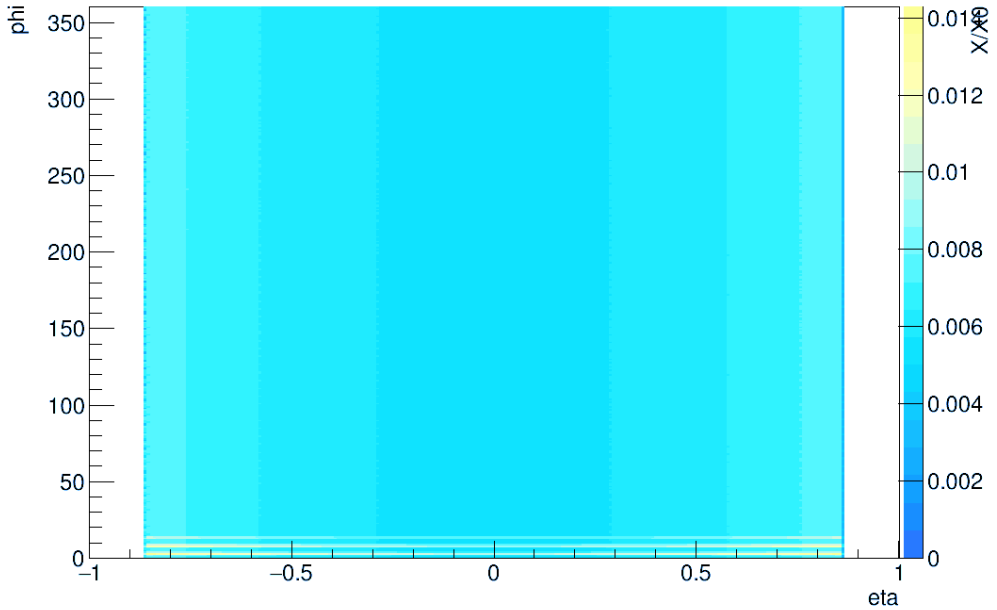


# L4 full barrel Material scans

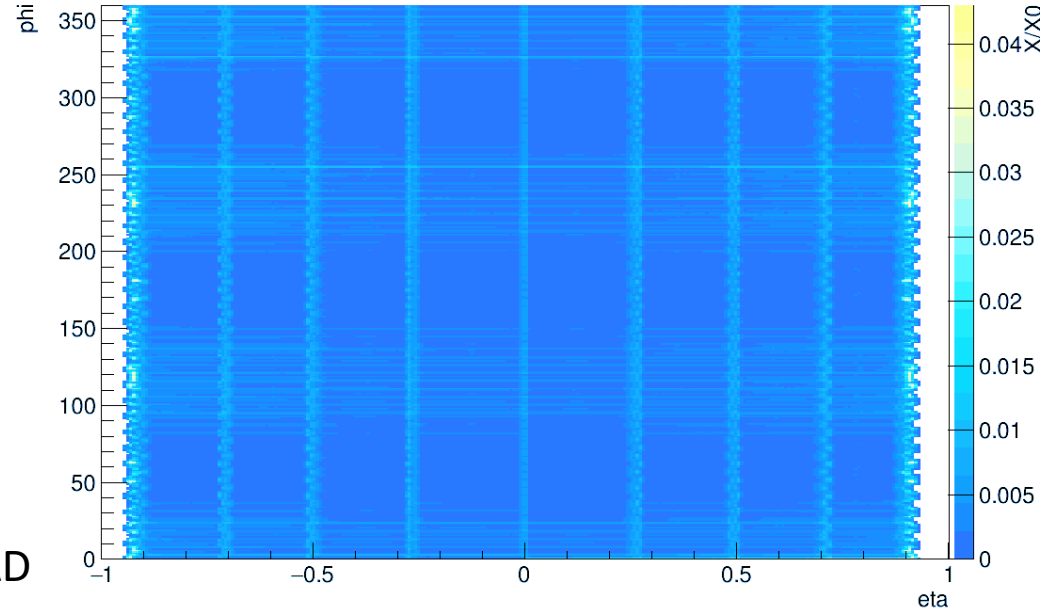
flat_OB




epic-main

July CAD



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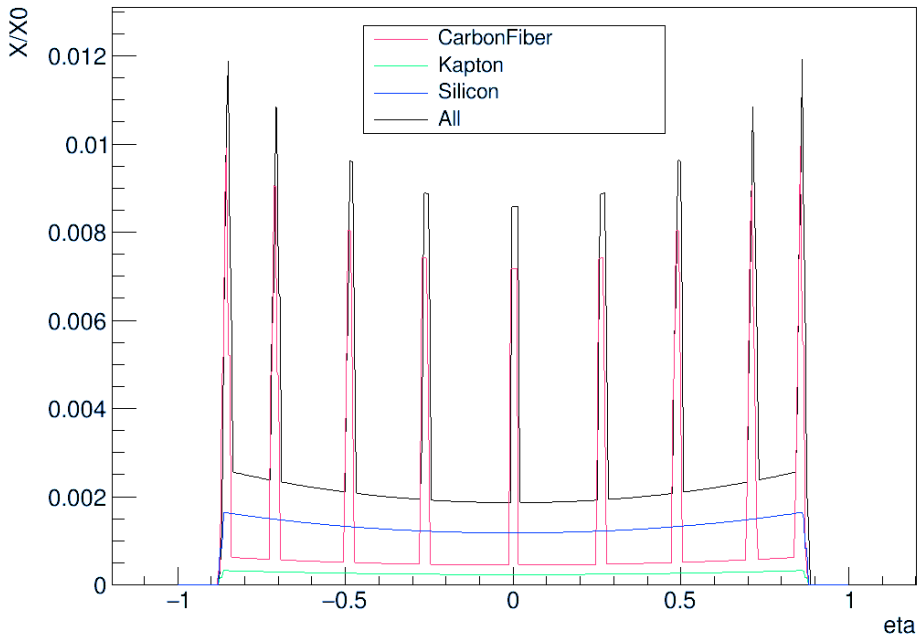
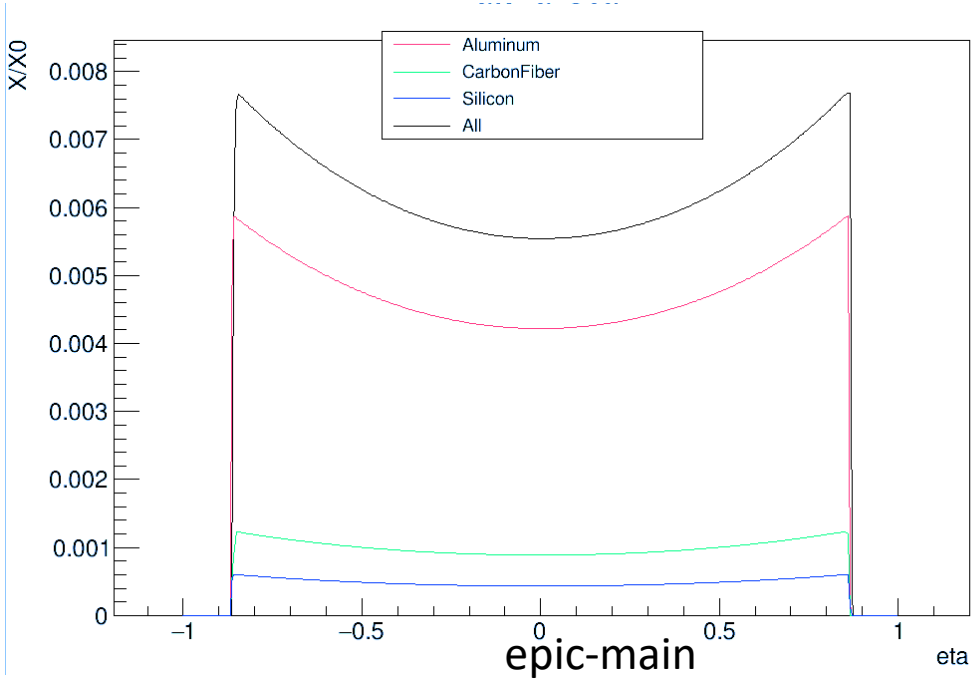
flat_OB




July CAD