

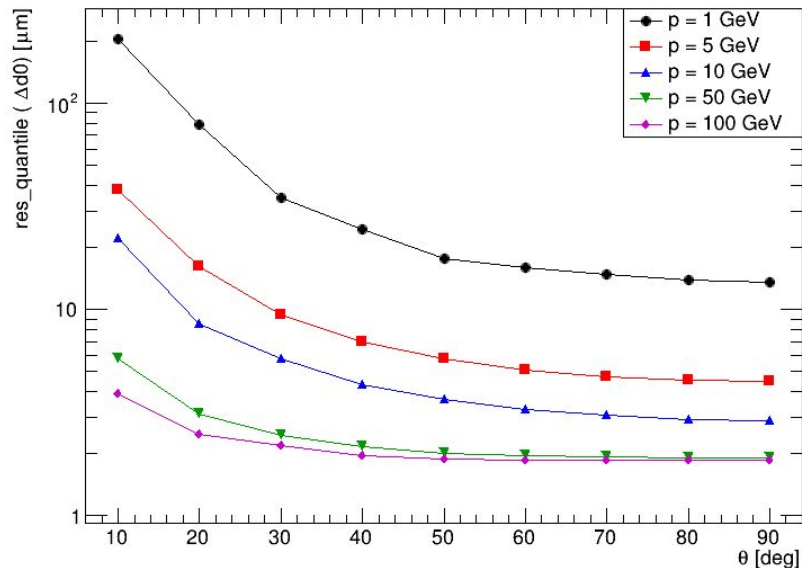
Week of 07/07/25 - 11/07/25

Estrella Cayuelas Solano

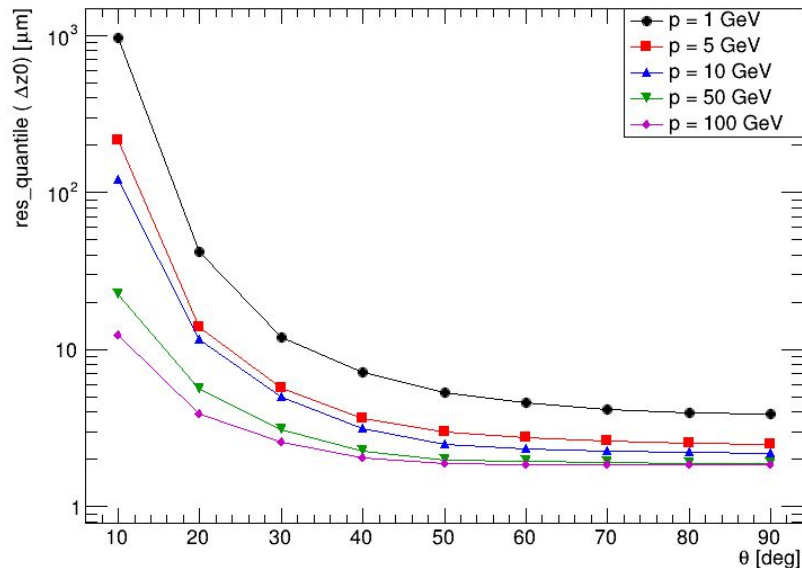
Recap: Why optimize Delphes?

- So we can characterize geometry without running on full-sim.

d0 resolution vs θ for IDEA_base25



z0 resolution vs θ for IDEA_base25



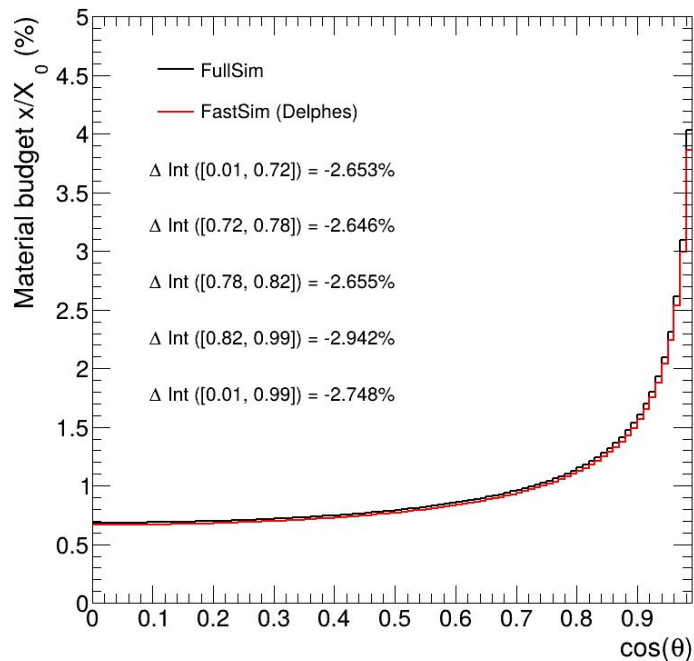
What does Delphes do?

- Simulate detector geometry
- Only cylinders and disks/rings
- Two parameters to adjust in terms of material budget:
 - Thickness of the layer
 - Material budget property (usually an average)

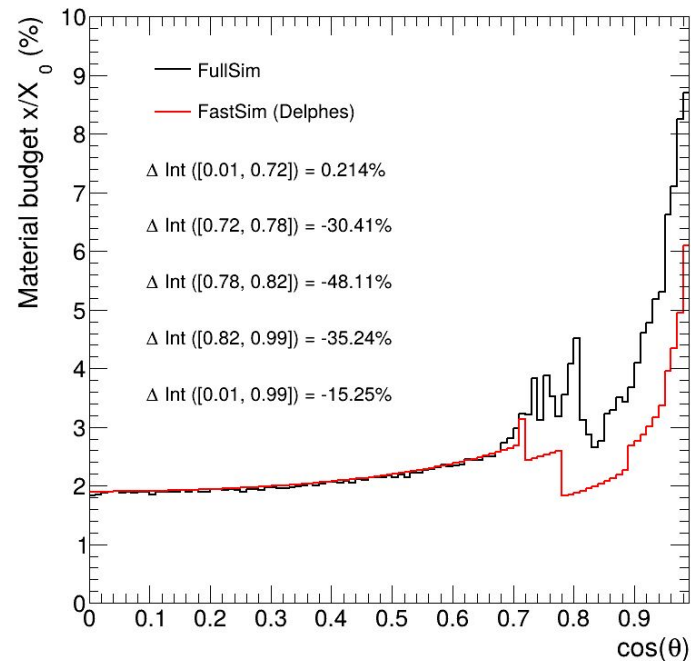
#	barrel	name	zmin	zmax	r	w (m)	X0	n_meas	th_up (rad)
1	PIPE	-100 100	0.01	0.00235	0.35276	0 0 0 0 0 0			
1	VTXLOW	-0.0965 0.0965	0.0137	0.0003076	0.0937	2 0 1.5708 3e-06 3e-06 1			
1	VTXLOW	-0.1609 0.1609	0.0237	0.0003076	0.0937	2 0 1.5708 3e-06 3e-06 1			
1	VTXLOW	-0.2414 0.2414	0.0340	0.0003076	0.0937	2 0 1.5708 3e-06 3e-06 1			
1	VTXHIGH	-0.1631 0.1631	0.130	0.000415	0.0937	2 0 1.5708 3e-06 3e-06 1			
1	VTXHIGH	-0.3263 0.3263	0.315	0.000415	0.0937	2 0 1.5708 7e-06 7e-06 1			

IDEA_base25 config: Delphes vs. full-sim

Beam-pipe



Vertex

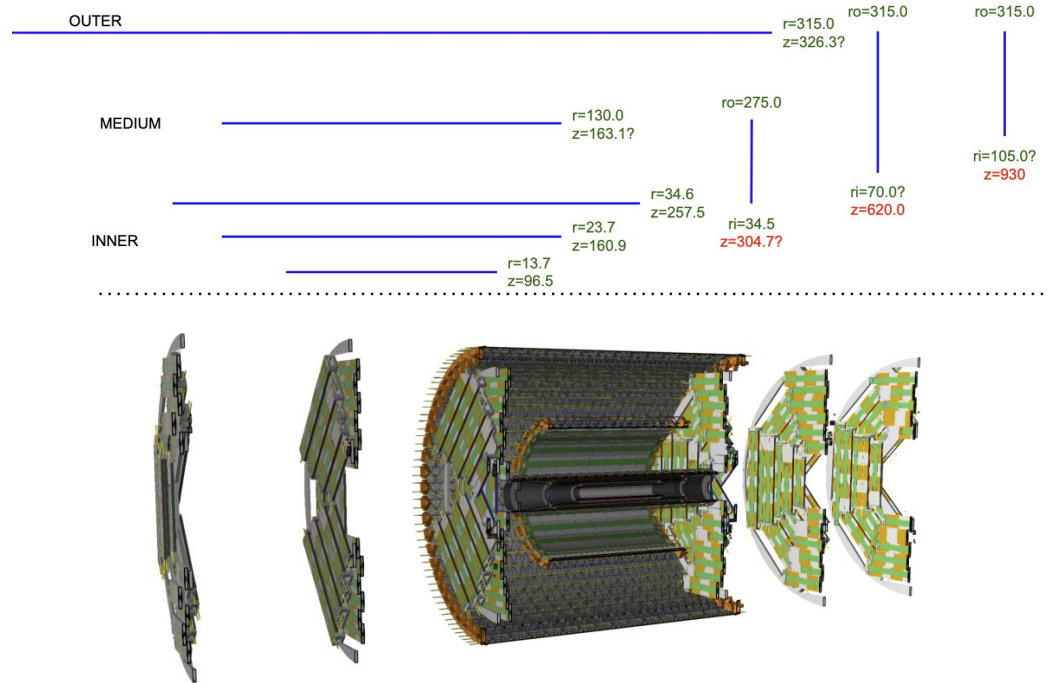


IDEA_base25 config: specifications

Inner barrel	
Parameter	Value (mm)
VTXIB_z1	96.5
VTXIB_z2	160.9
VTXIB_z3	241.4
VTXIB_r1	13.7
VTXIB_r2	23.7
VTXIB_r3	34.0

Outer barrel	
Parameter	Value (mm)
VTXOB_z1	163.1
VTXOB_z2	326.3
VTXOB_r1	130.0
VTXOB_r2	315.0

Disks	
Parameter	Value (mm)
VTXD_z1	279.06
VTXD_z2	609.086
VTXD_z3	918.641
VTXD_rmax 1	275.0
VTXD_rmax 2	315.0
VTXD_rmax 3	315.0
VTXD_rmin1	34.5
VTXD_rmin2	70.0
VTXD_rmin3	105.0



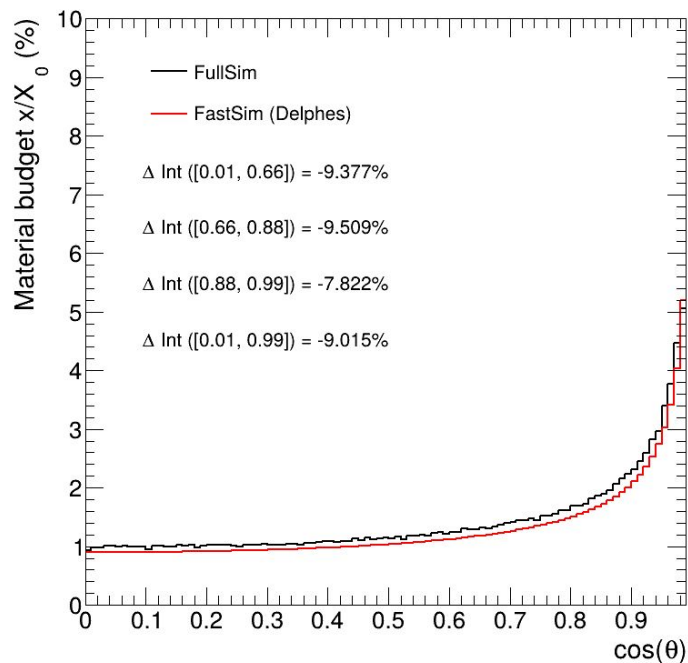
([Reference](#) 2025)

IDEA_base25 config: card

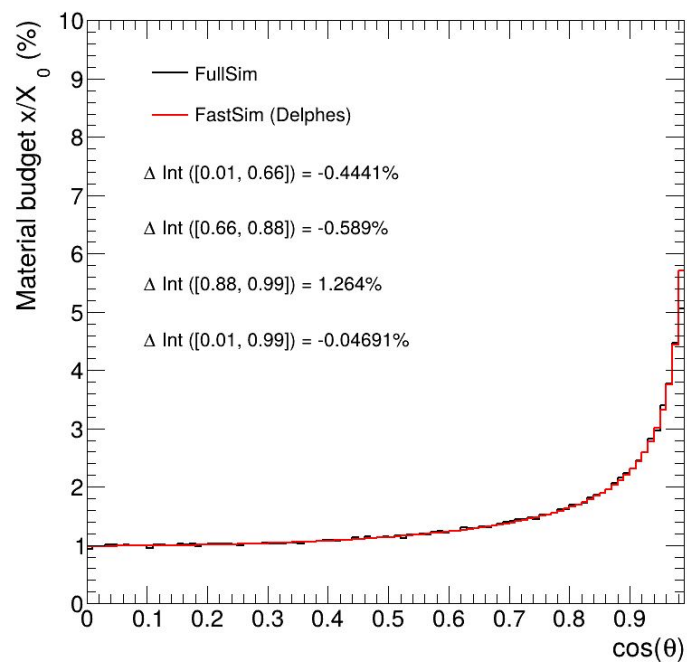
- Modified
https://raw.githubusercontent.com/delphes/delphes/refs/heads/master/cards/delphes_card_IDEA.tcl
- Changed dimensions according to the geometry in previous slide.
- Left width and material budget untouched
- **Issue: material budget is not accurate.**
 - Solution: Adjust with of the layers in Delphes to match material budget

Inner barrel modifications wrt IDEA_base25

base25: 280 mm width

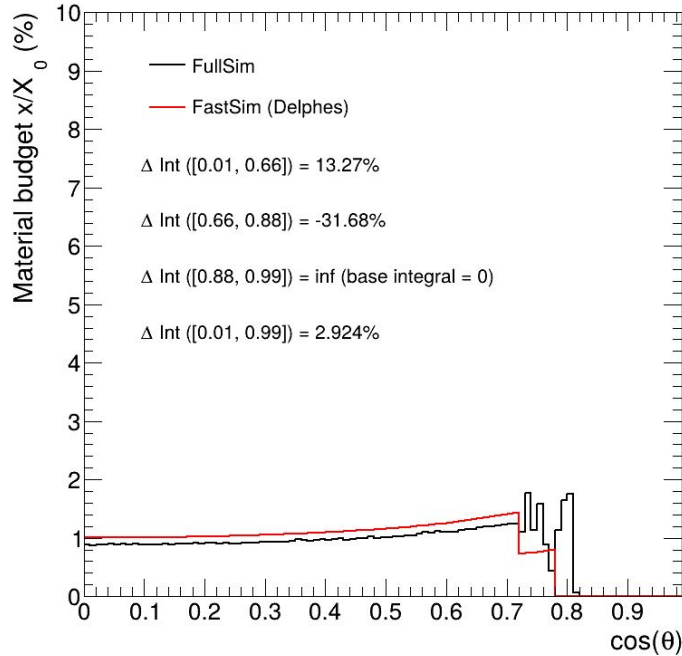


base25_new: 307.6 mm width

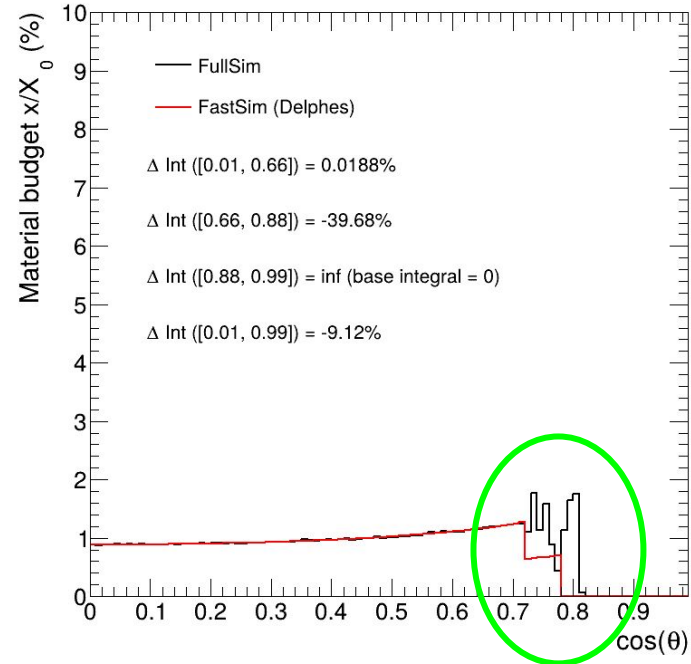


Middle + outer barrel modifications

base25_old: 470 mm width



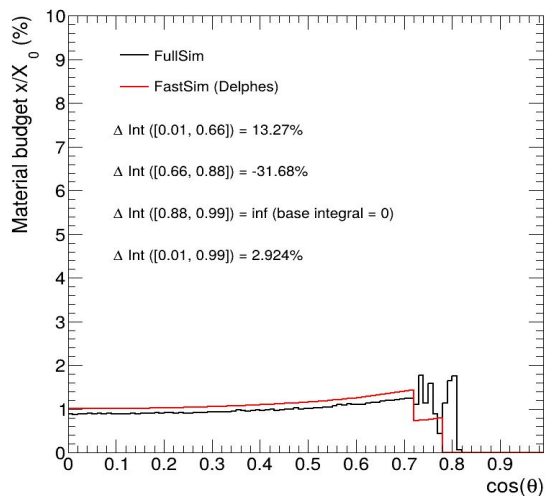
base25_new: 415 mm width



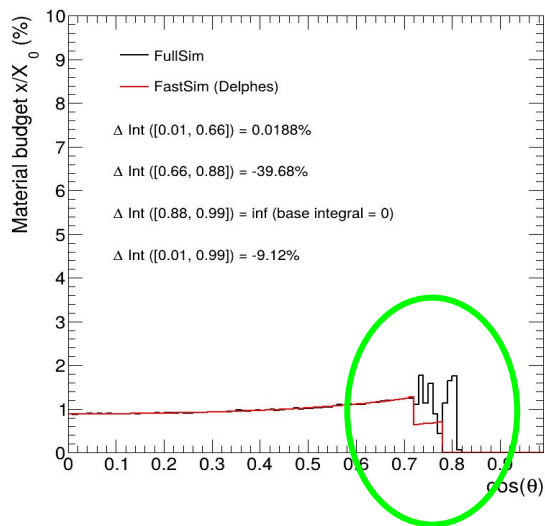
Middle + outer barrel with filler

- Delphes cards fail to account for support structure.
- Added filler (non sensitive) to match material budget.

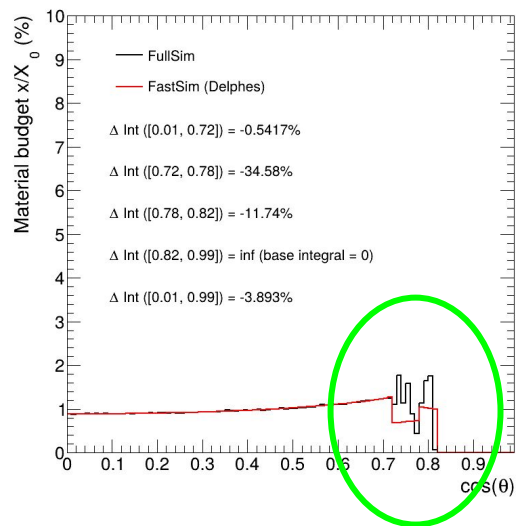
base25_old: 470 mm width



base25_new: 415 mm width

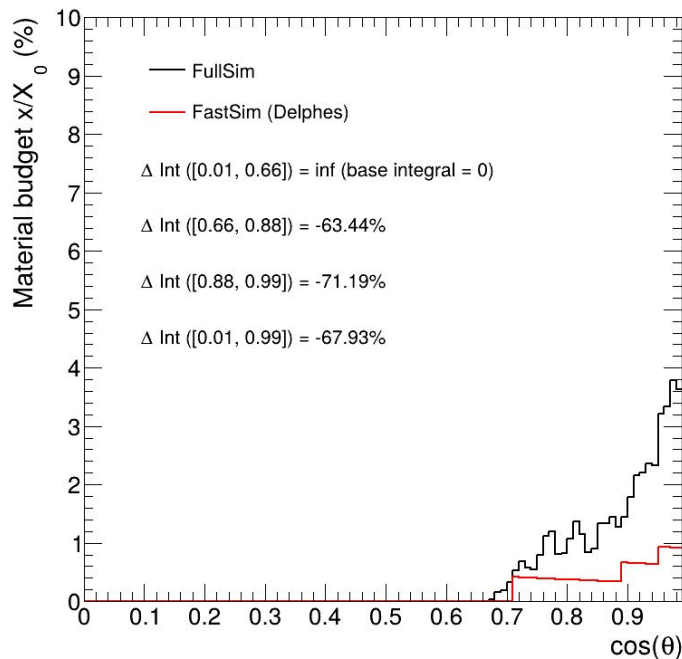


base25_new: 415 mm width + filler

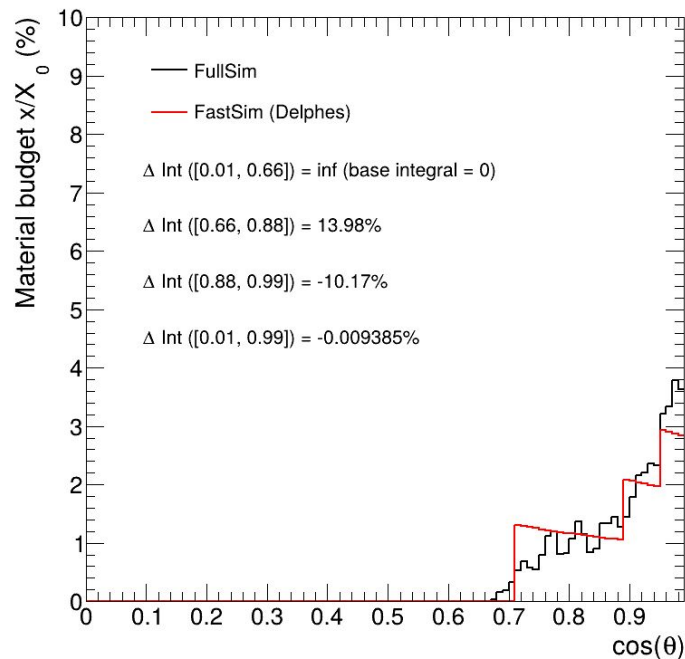


Disk modifications

base25_old: 470 mm width

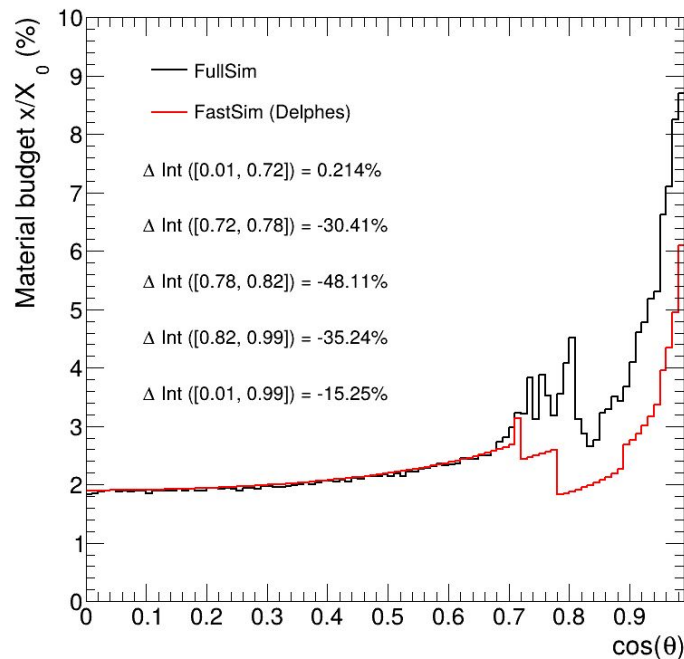


base25_new: 873 mm width

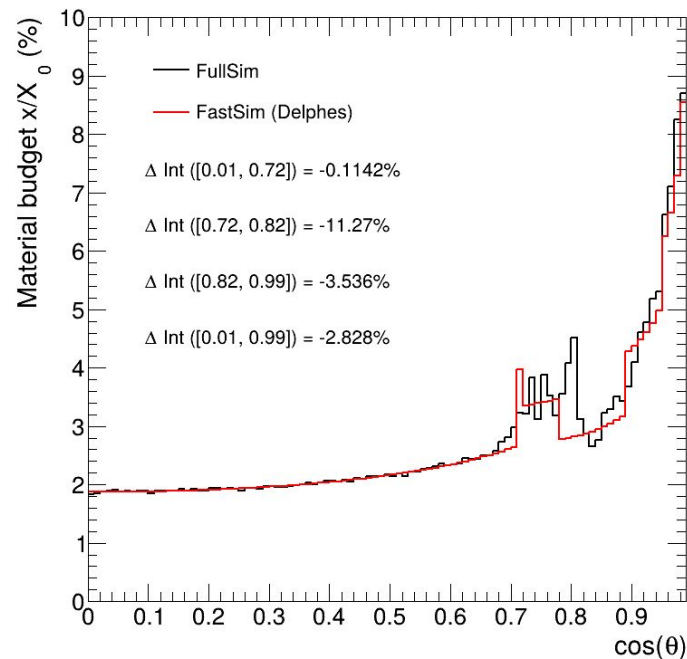


Full Delphes improvement with new widths

base25

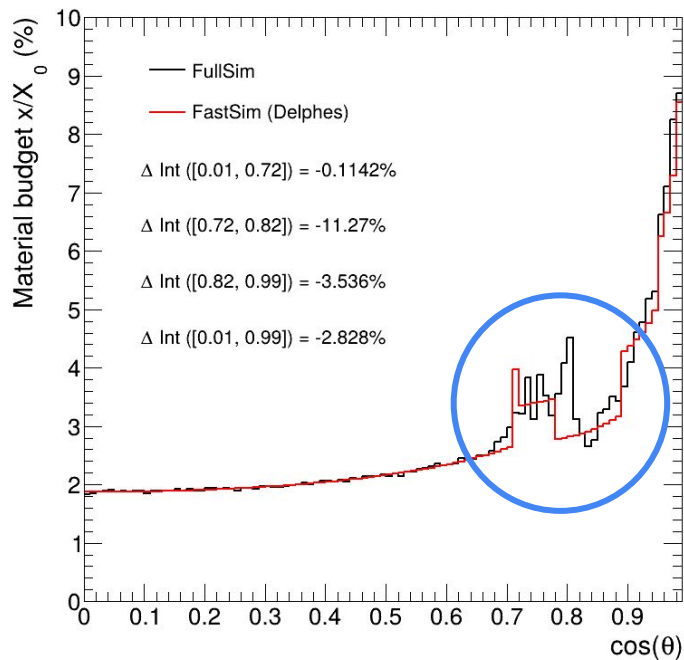


base25_new (without filler)

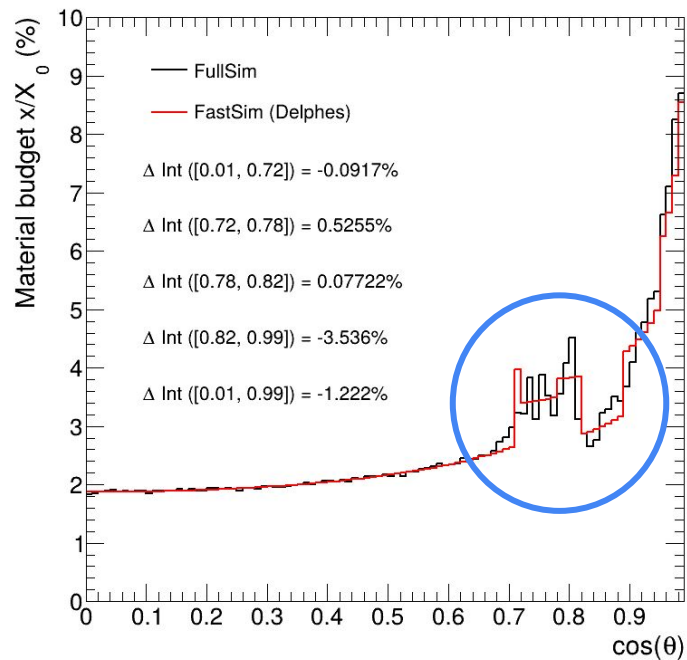


Filler effects

base25_new **without** filler



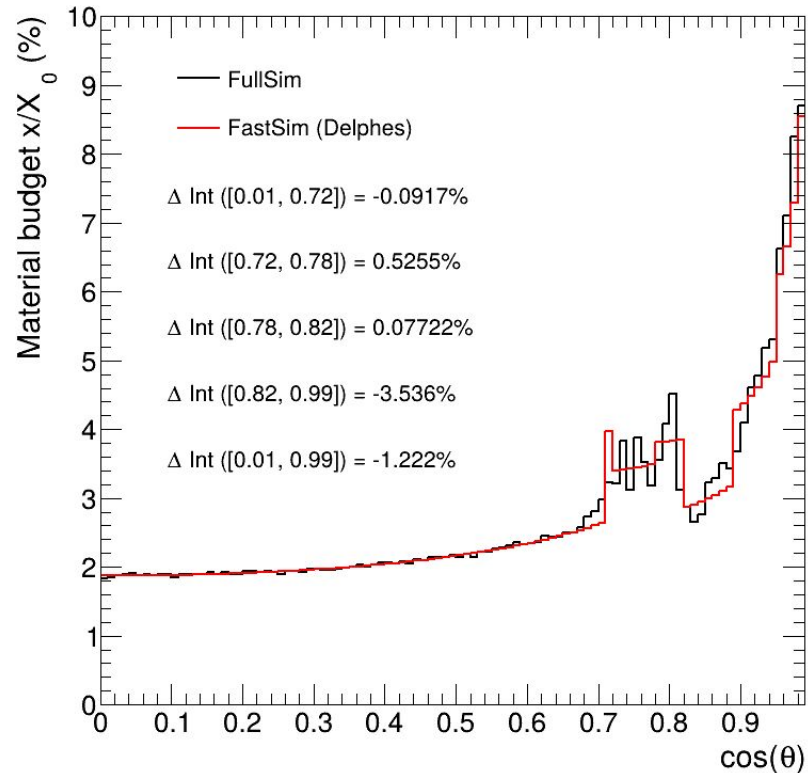
base25_new **with** filler



New baseline proposal

- To be discussed with experts

```
2 VTxFILLER 0.650 0.750 -0.931 0.000163 0.02 0 0 1.5708 0 0 0
2 VTxFILLER 0.750 0.9 -0.930 0.000005 0.02 0 0 1.5708 0 0 0
2 VTxDISK 0.105 0.315 -0.918641 0.000873 0.0937 2 0 1.5708 7e-06 7e-06 1
2 VTxDISK 0.070 0.315 -0.609086 0.000873 0.0937 2 0 1.5708 7e-06 7e-06 1
2 VTxDISK 0.0345 0.275 -0.27906 0.000873 0.0937 2 0 1.5708 7e-06 7e-06 1
2 VTxDISK 0.0345 0.275 0.27906 0.000873 0.0937 2 0 1.5708 7e-06 7e-06 1
2 VTxDISK 0.070 0.315 0.609086 0.000873 0.0937 2 0 1.5708 7e-06 7e-06 1
2 VTxDISK 0.105 0.315 0.918641 0.000873 0.0937 2 0 1.5708 7e-06 7e-06 1
2 VTxFILLER 0.750 0.9 0.930 0.000005 0.02 0 0 1.5708 0 0 0
2 VTxFILLER 0.650 0.750 0.931 0.000163 0.02 0 0 1.5708 0 0 0
```

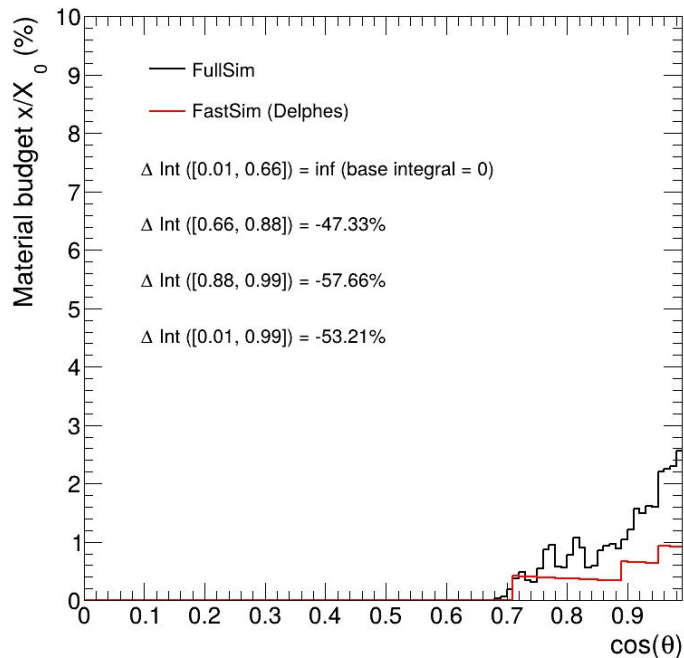


Next steps

- Once baseline approved: redo studies of optimal 1st, 2nd and 3rd inner barrel layer
- Build Delphes card for long barrel geometry

Back-up: PEEK material in disks

base25_old_NO_PEEK: 470 mm width



base25_new_NO_PEEK: 600 mm width

