



STT Simulations - update

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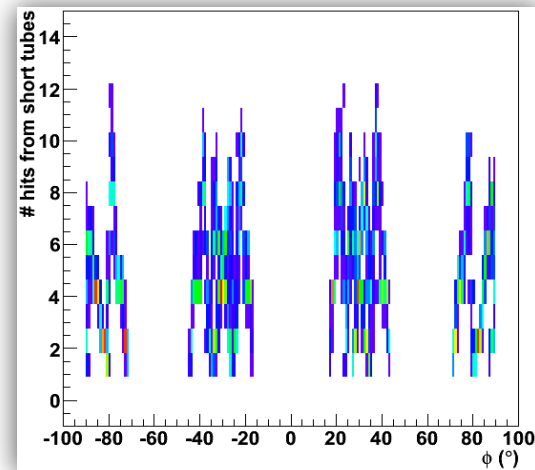
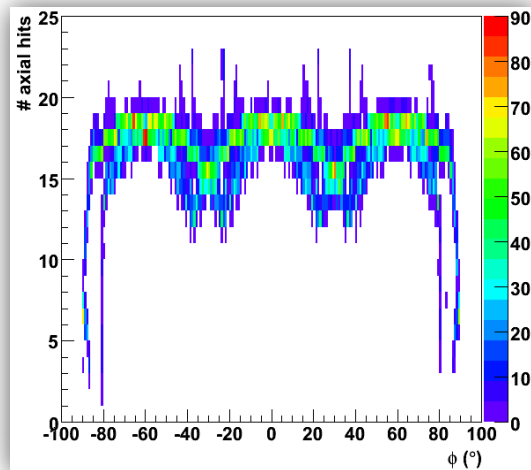
PANDA Collaboration Meeting

GSI, Darmstadt – Dec 2009

Outline

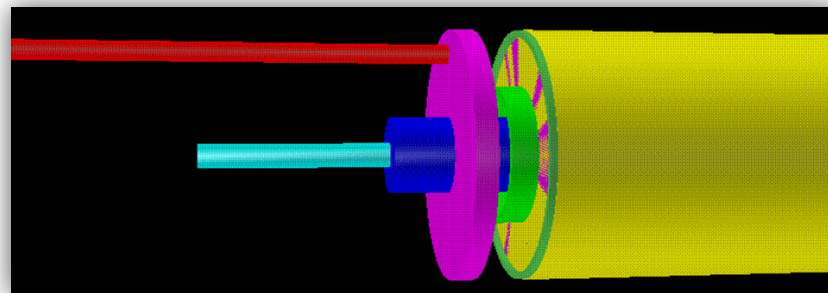
- *Advantages of the hexagonal STT layout*

studies of the distribution of the number of hits vs ϕ of the generated track



- *Towards a more realistic geometry:*

description of the new components added to the geometry file



hits vs ϕ studies

▣ Distribution of the number of hits coming from:

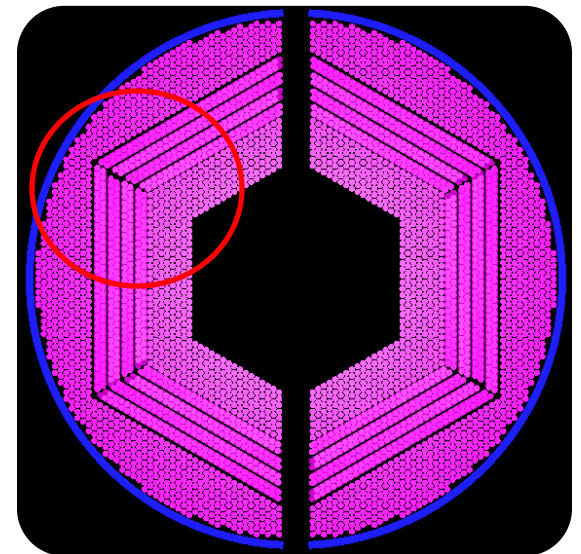
- ▣ Axial straws
- ▣ Skewed straws
- ▣ Short straws

vs ϕ angle of the generated track, at fixed θ

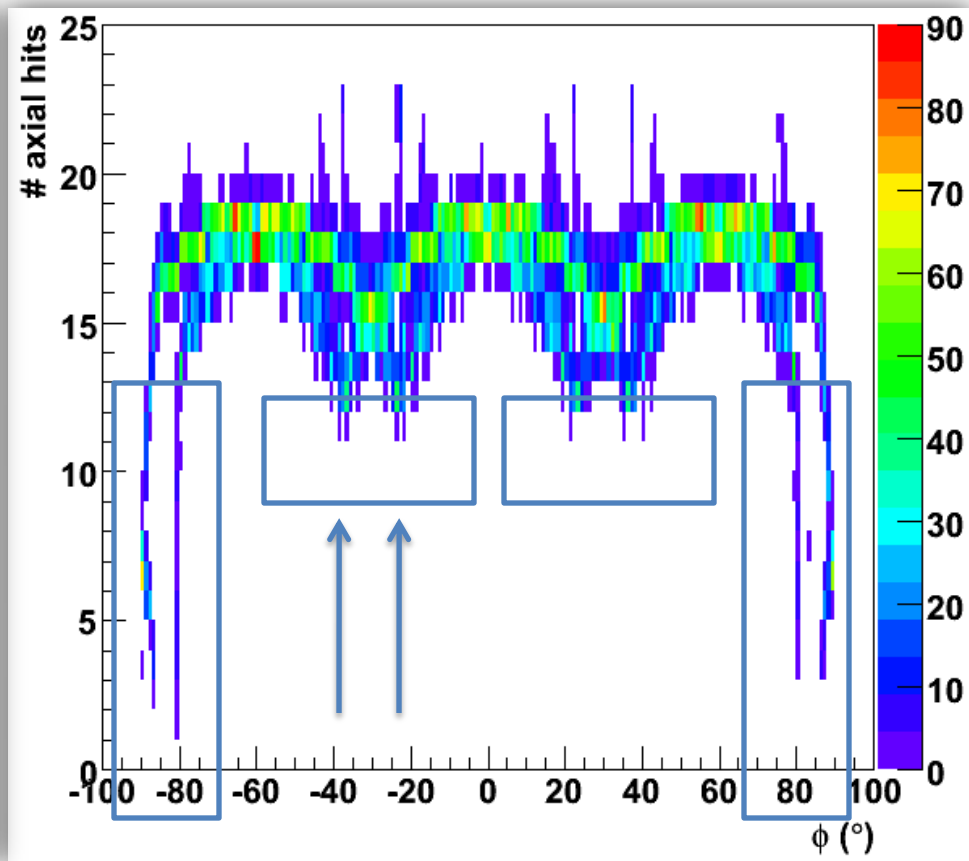
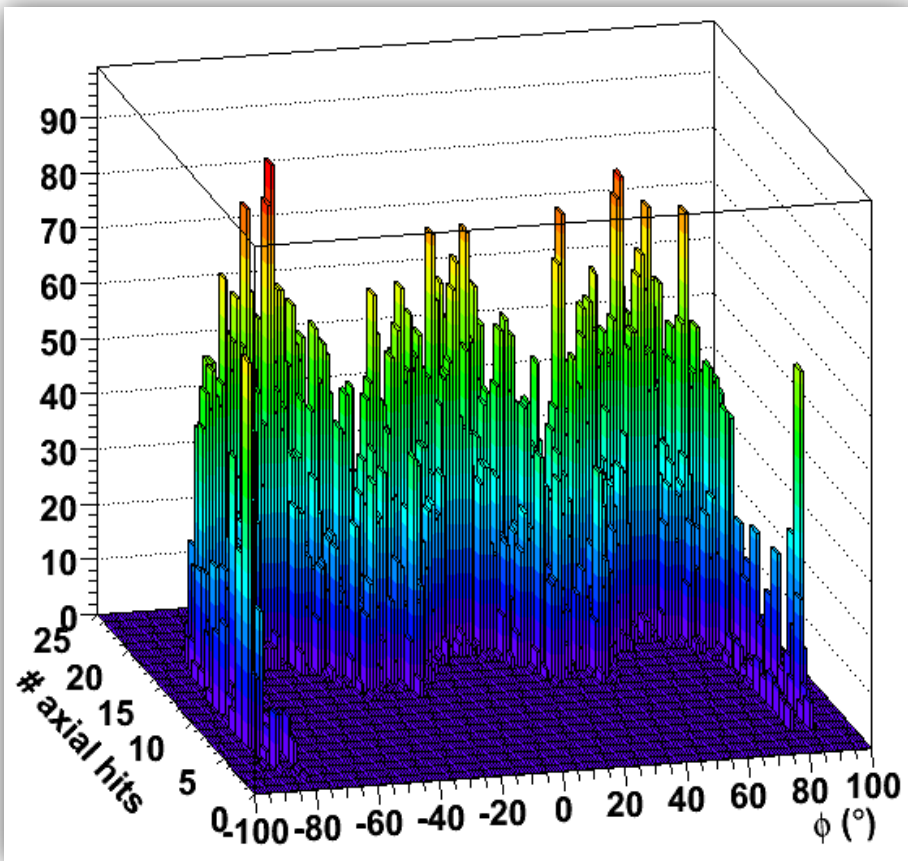
→ Particular attention to the corner regions (short tubes)

▣ Simulations:

- ▣ 10000 μ^+ & 10000 μ^-
- ▣ 1 GeV/c (total momentum)
- ▣ $\theta = [20^\circ \pm 5^\circ], [90^\circ \pm 5^\circ], [140^\circ \pm 5^\circ]$
- ▣ $\phi = [-90^\circ, +90^\circ]$

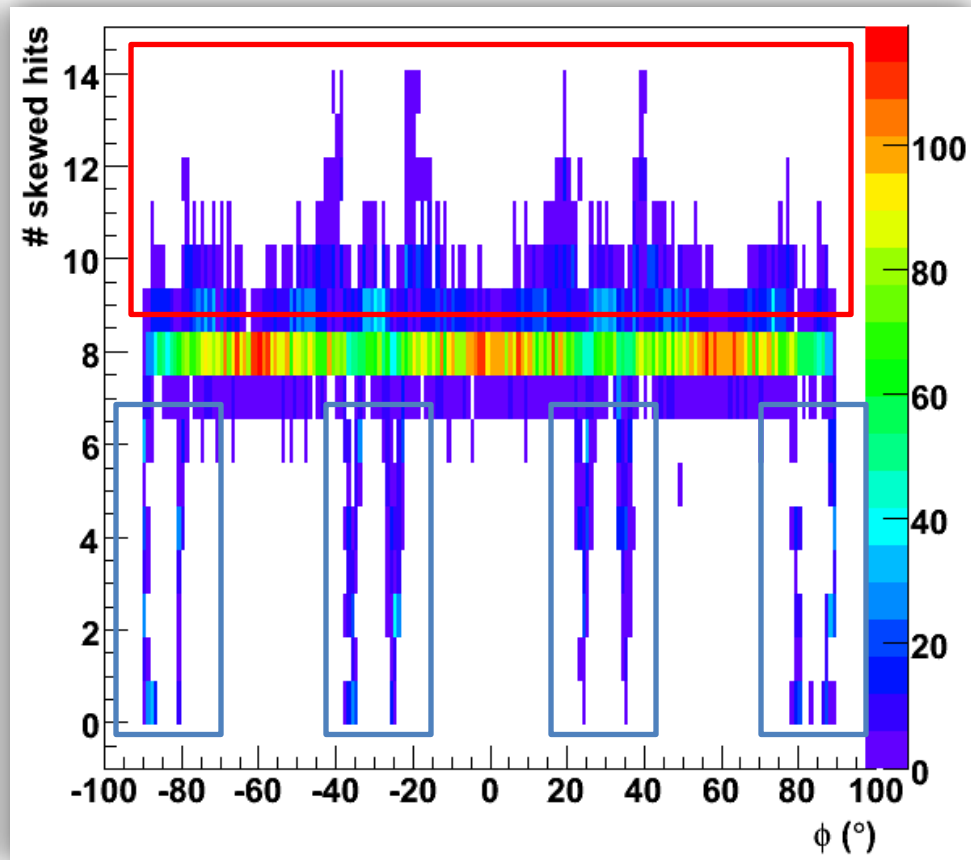
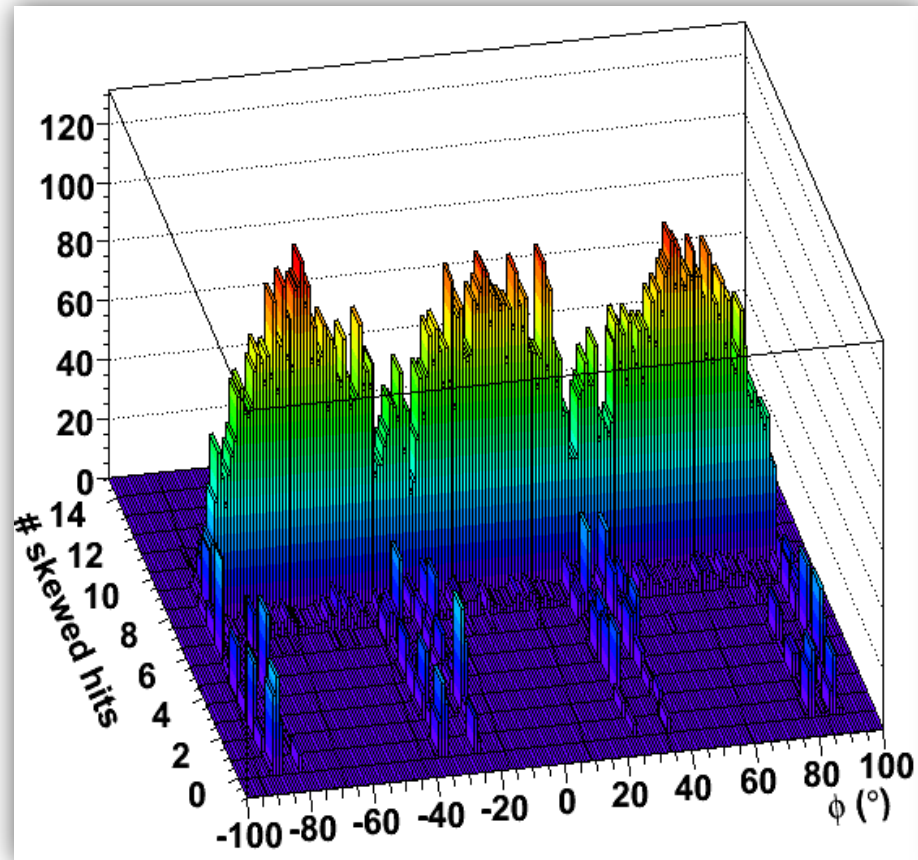


hits from axial straws ($\theta = 90^\circ \pm 5^\circ$)



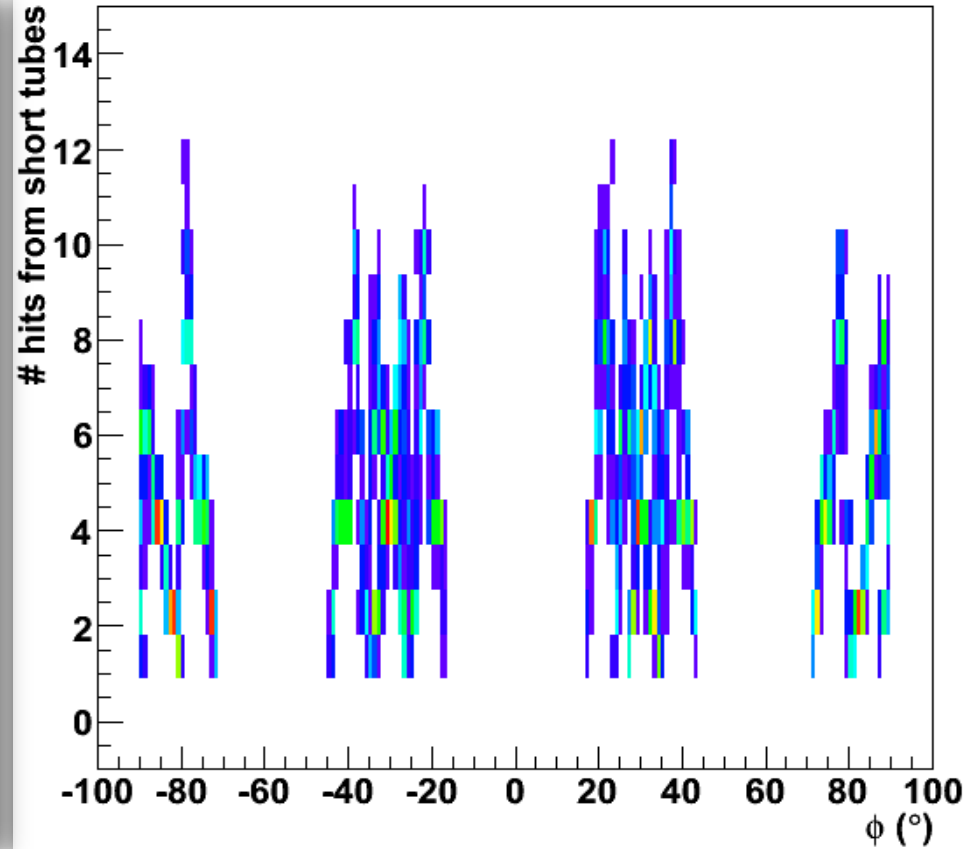
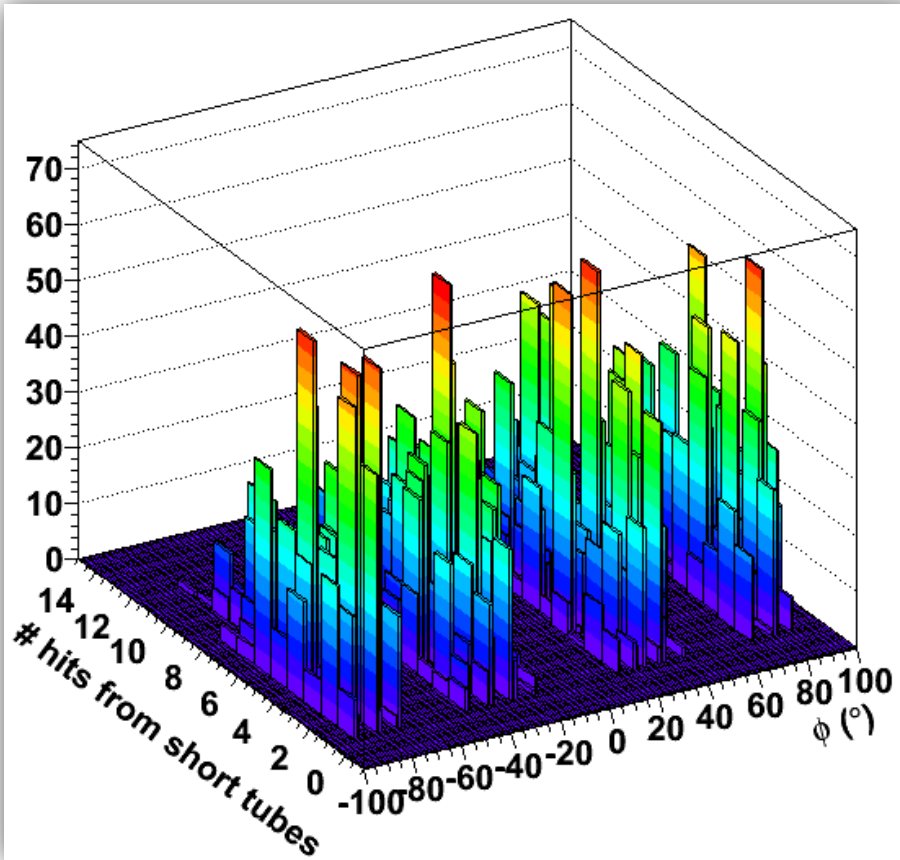
- Reduced number of hits in the corner and beam pipe regions ($\phi = \pm 30^\circ, \pm 90^\circ$)
- Double peaks in the corner/beam pipe regions due to the opposite curvatures of positive and negative charges

hits from skewed straws ($\theta = 90^\circ \pm 5^\circ$)



- 4 skewed double layers but, due to the track bending, more than 2 hits per double layer \rightarrow more than 8 hits
- Reduced number of hits in the corner and beam pipe regions. Here the hits come from short tubes

hits from short skewed straws ($\theta = 90^\circ \pm 5^\circ$)

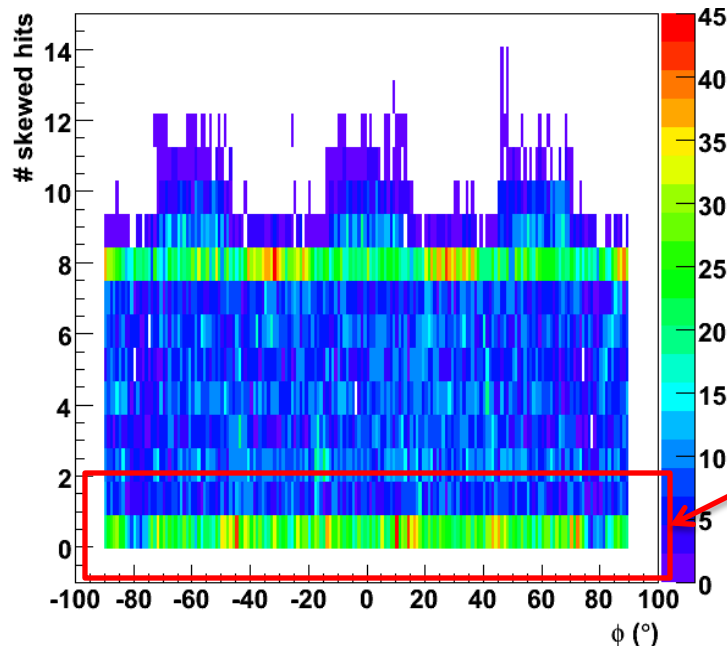
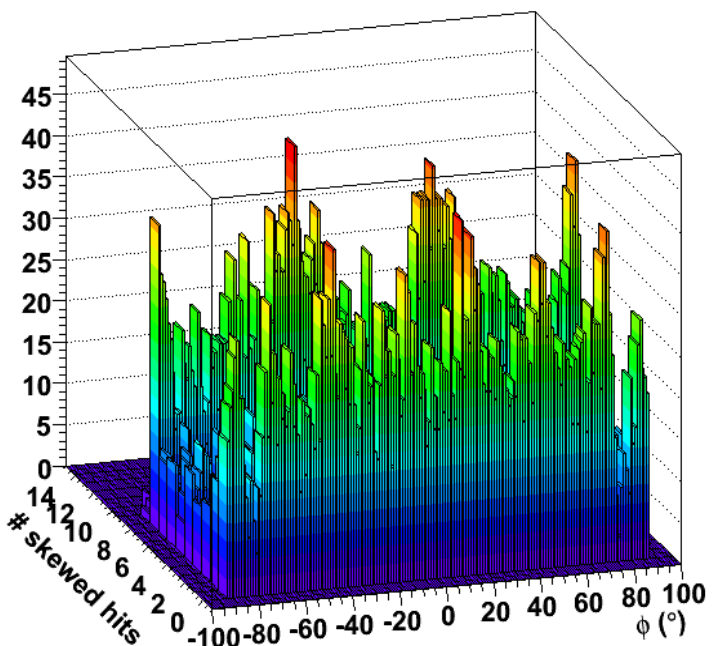
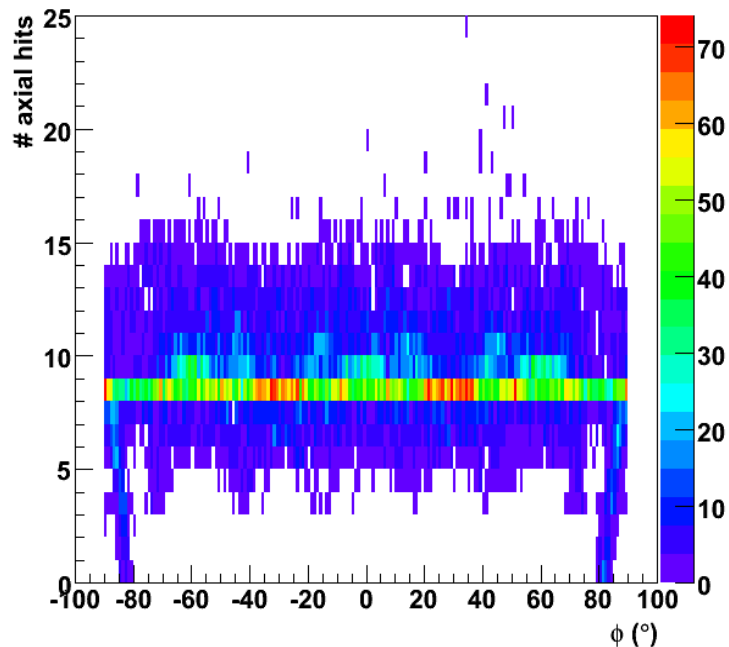
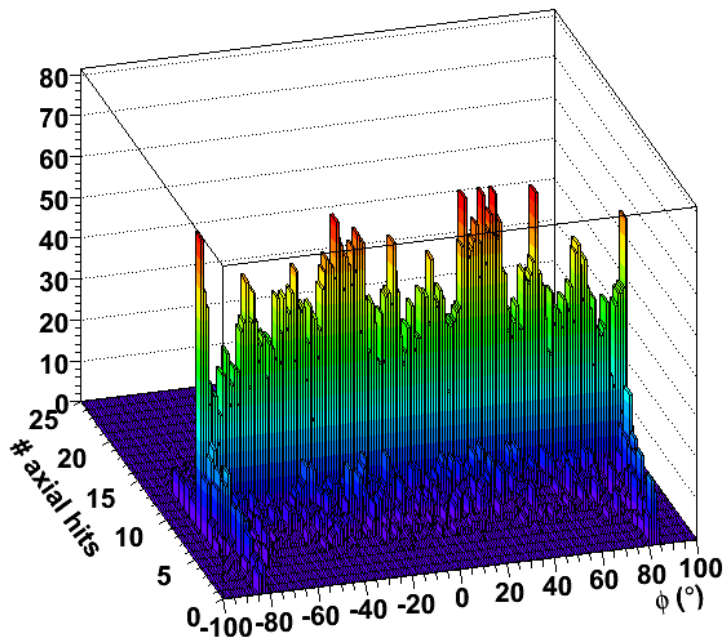


- Short skewed tubes contribute in the corner and beam pipe regions:
 - ✗ without short tubes: empty space \rightarrow no hits from there
 - ✓ with short tubes: high density of tubes \rightarrow raise in the efficiency



hits from axial/skewed/short straws ($\theta = 20^\circ \pm 5^\circ$)

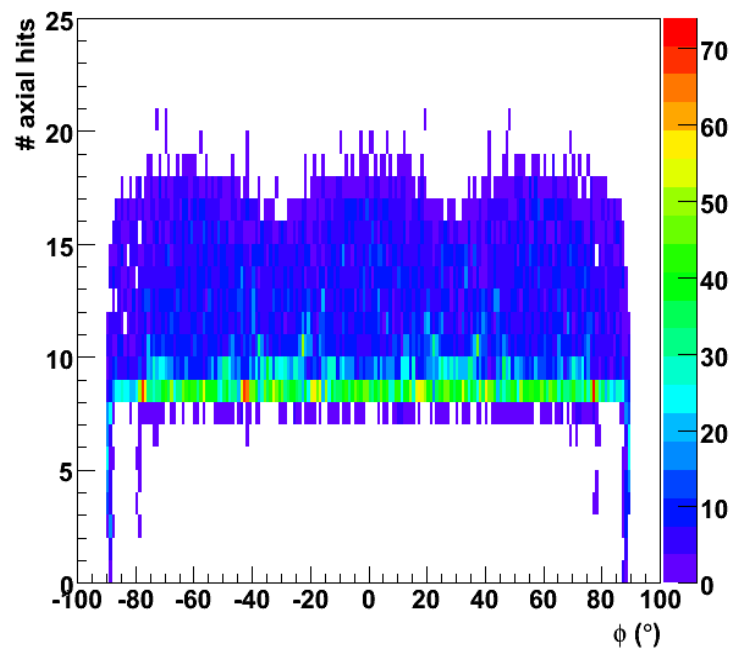
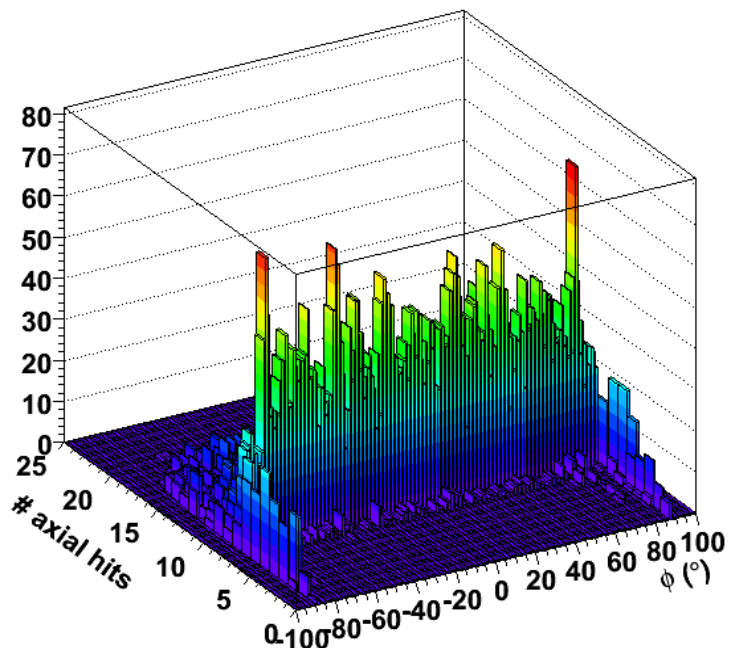
AXIAL
STRAWS



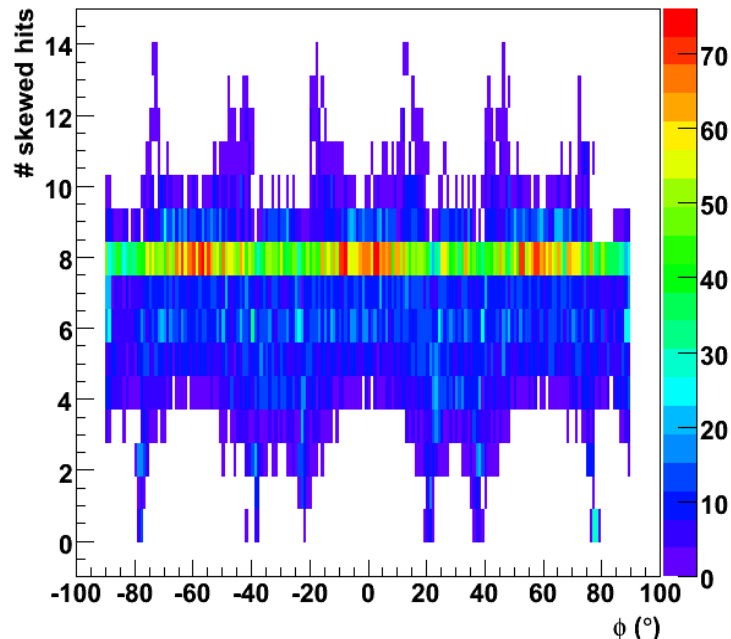
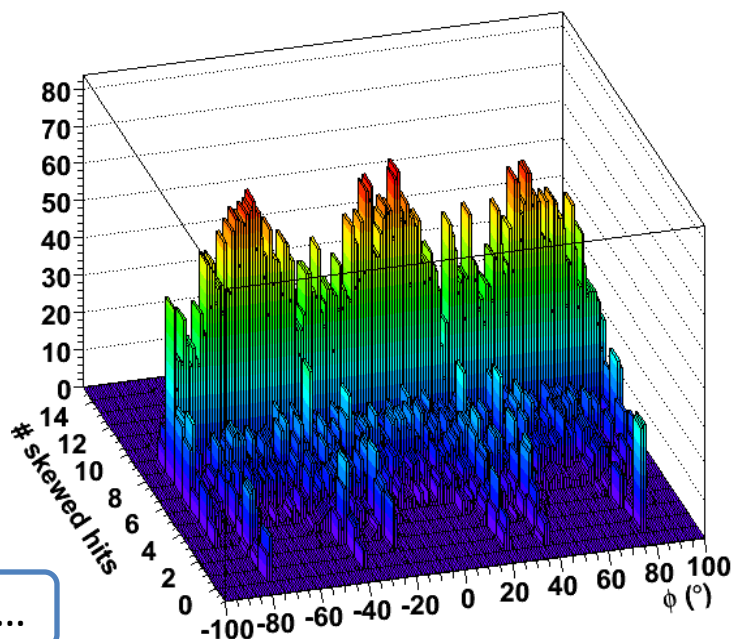
SKEWED
STRAWS

VERY
FORWARD
REGION

hits from axial/skewed/short straws ($\theta = 140^\circ \pm 5^\circ$)



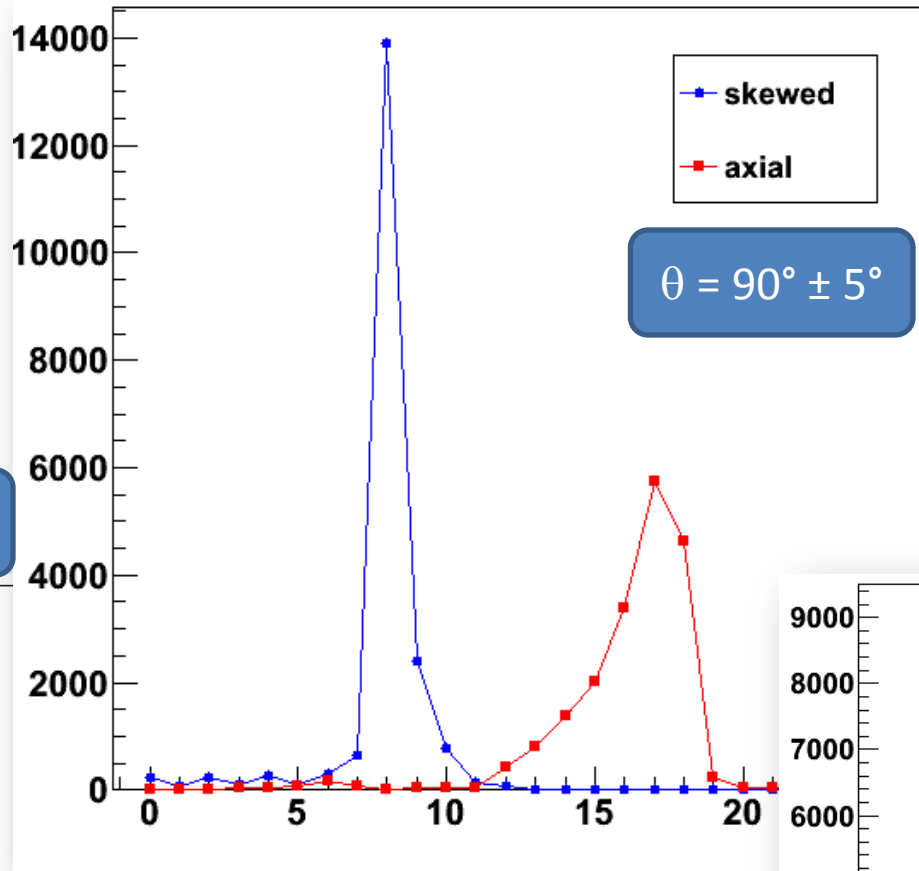
AXIAL
STRAWS



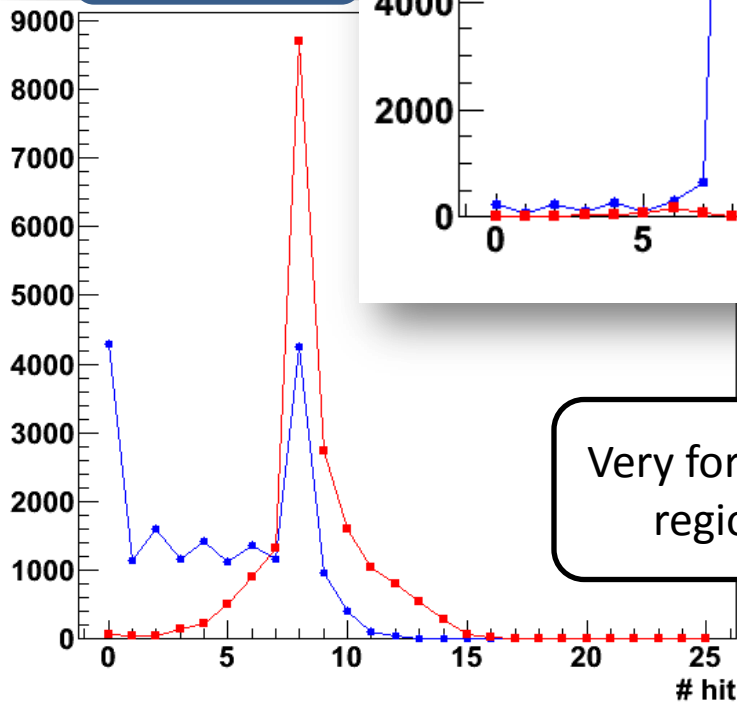
SKEWED
STRAWS

... same remarks ...

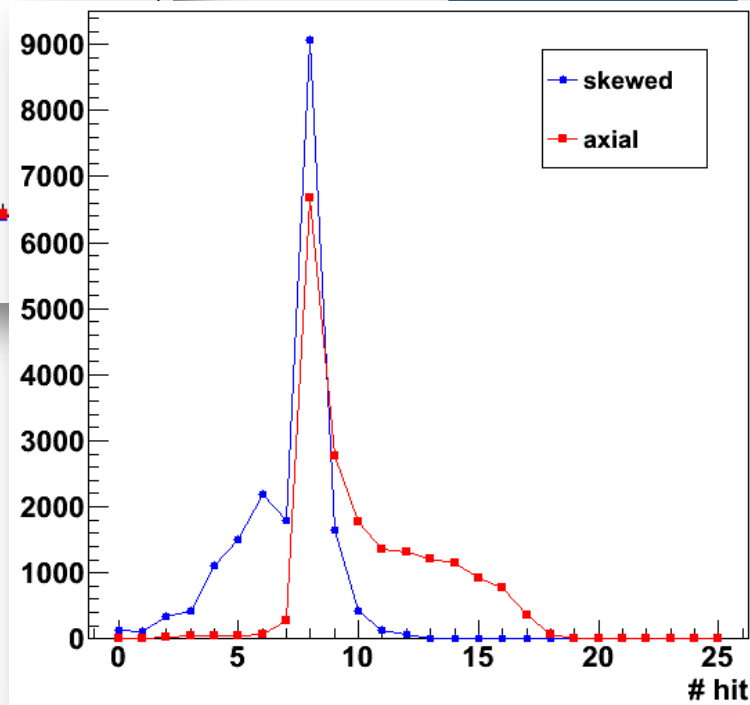
of hits: summary



$\theta = 20^\circ \pm 5^\circ$



$\theta = 140^\circ \pm 5^\circ$



Very forward/backward regions \rightarrow losses

hits vs ϕ – conclusions

- Mean number of hits from skewed straws: 8
- More than 8 hits from skewed straws due to the high density of the tubes:
 - bending tracks hit more than 2 tubes in the same double layer
- Losses in the number of hits from skewed straws for the very forward / backward regions:
 - the short straws are not so many and cover only a limited angular range
- Short tubes cover the regions where long tubes don't fit
 - hits from corner / beam pipe regions come from short tubes
 - raise in the efficiency



OPTIMAL GEOMETRY LAYOUT !!!

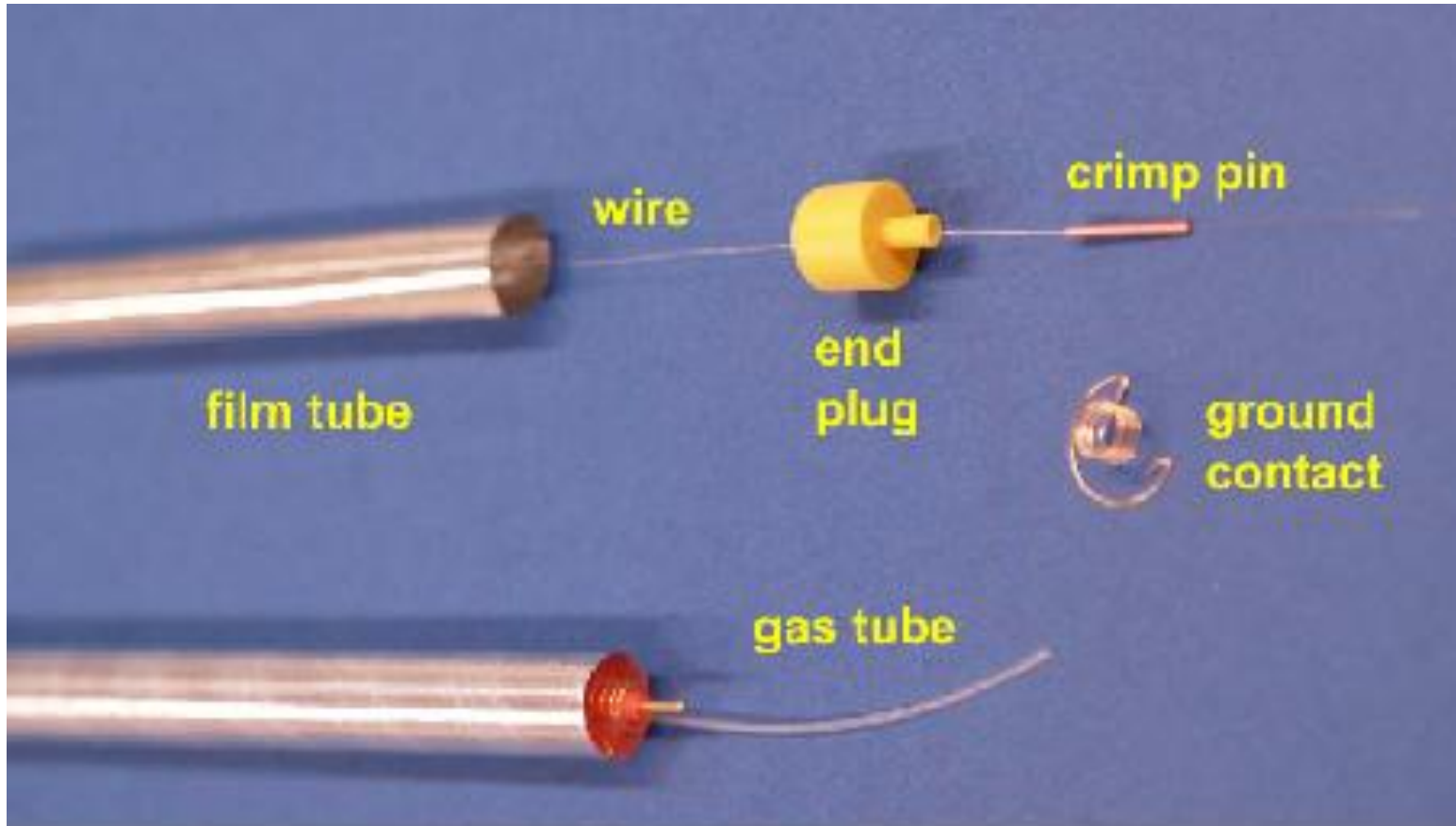
A Straw Tube and its components

Only film tubes, filling gas and wires are implemented in the “old” geometry file

GOAL: implement **all the other components** of a straw tube

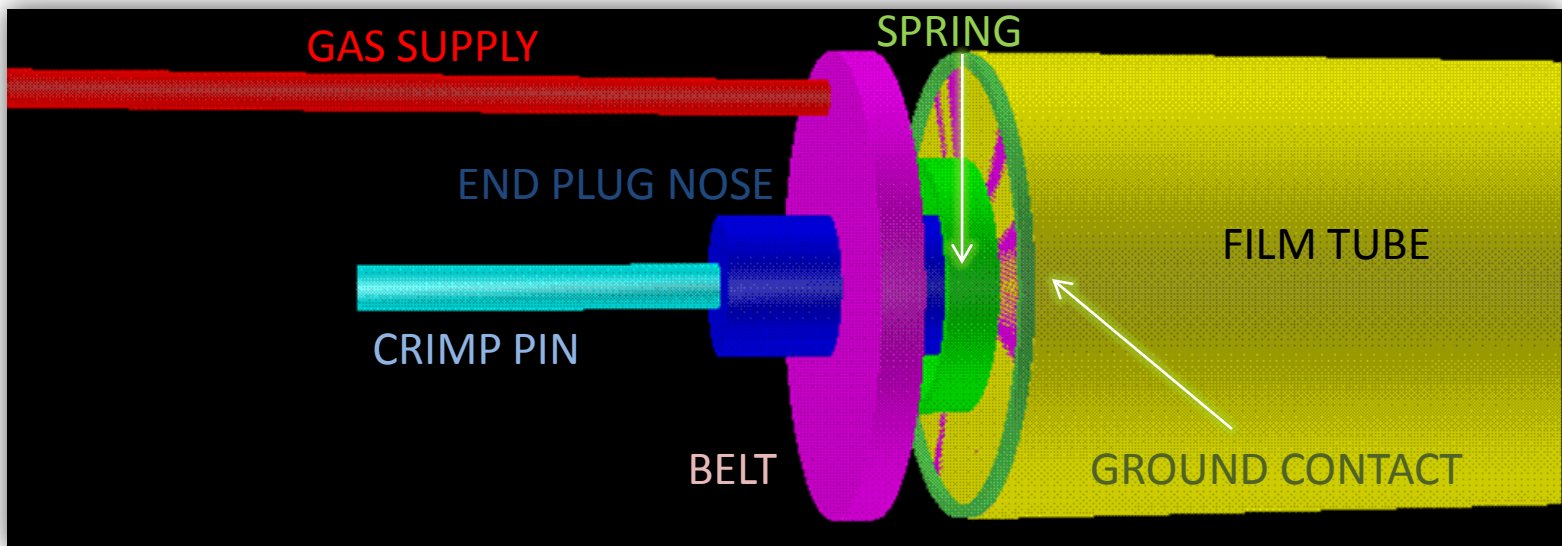
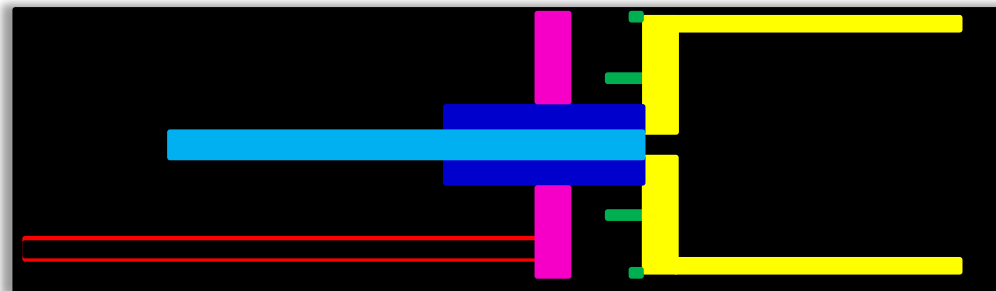
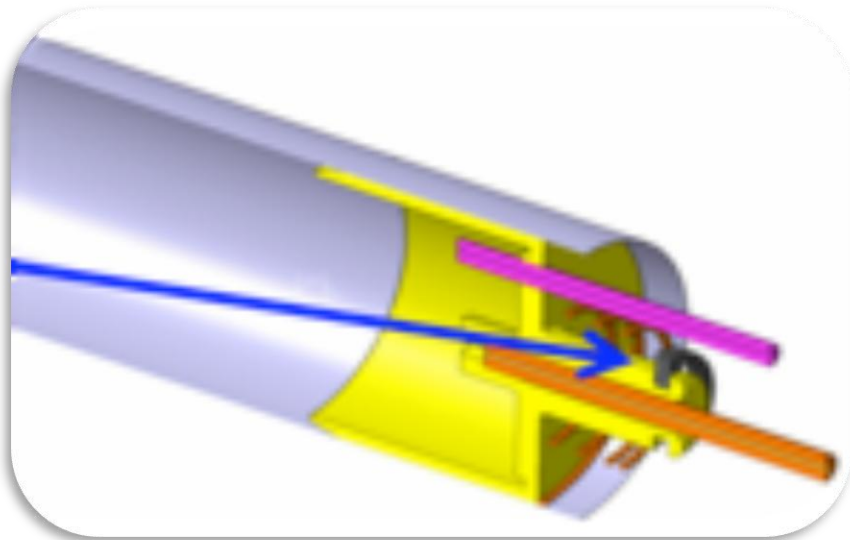
Ⓢ to have a more realistic geometry design

Ⓢ to estimate the background production due to dead material in the active region



What is in now?

- ✓ End plugs
- ✓ Crimp pins
- ✓ Gas supply tubes
- ✓ Ground contacts and springs
- ✓ Side bands



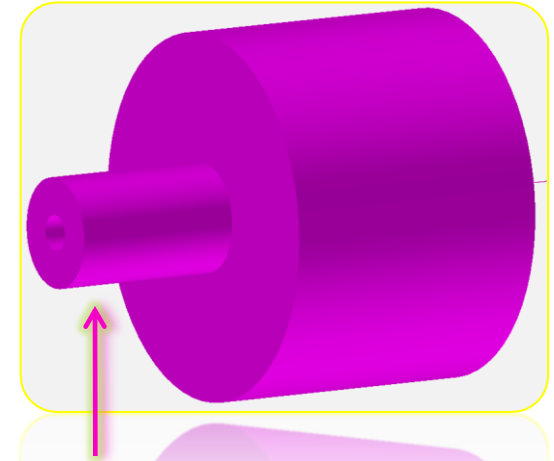
New components – end plugs



3 cylinders:

- Top cap
- Body
- Nose

Material: ABS



TOP CAP

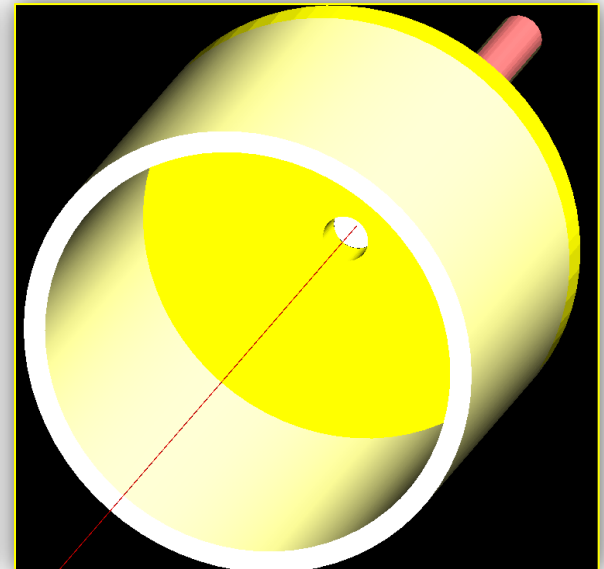
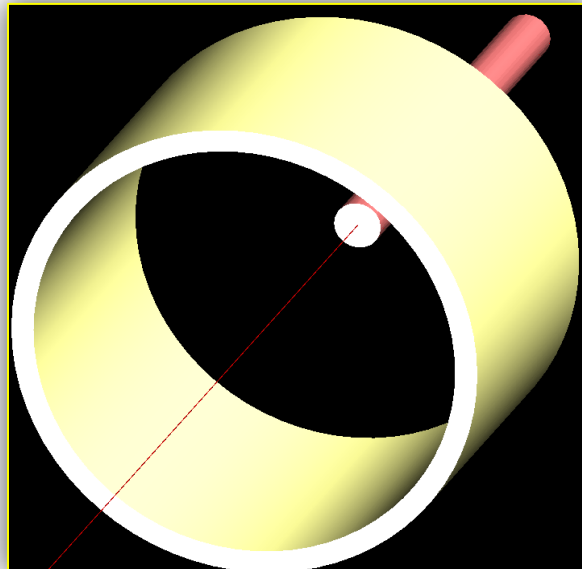
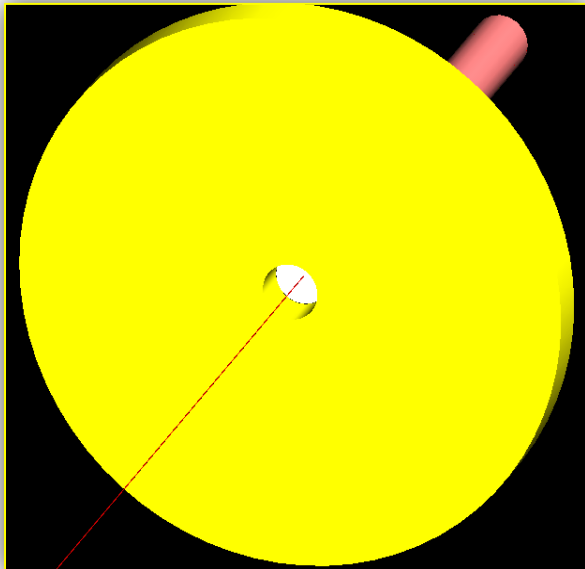
- Inner diameter: 1 mm
- Outer diameter: 9.95 mm
- Length: 0.8 mm

BODY:

- Inner diameter: 9 mm
- Outer diameter: 9.95 mm
- Length: 7.2 mm

NOSE:

- Inner diameter: 1 mm
- Outer diameter: 3 mm
- Length: 5 mm



New components – gas supply tubes, crimp pins, ground contact and springs



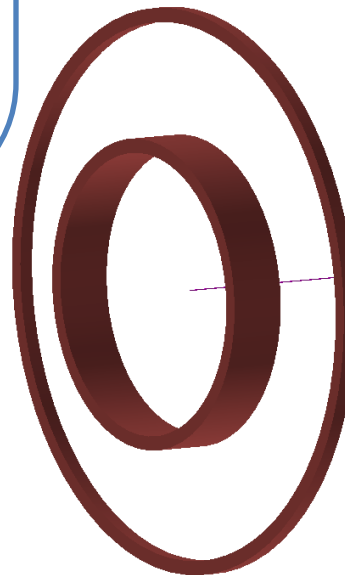
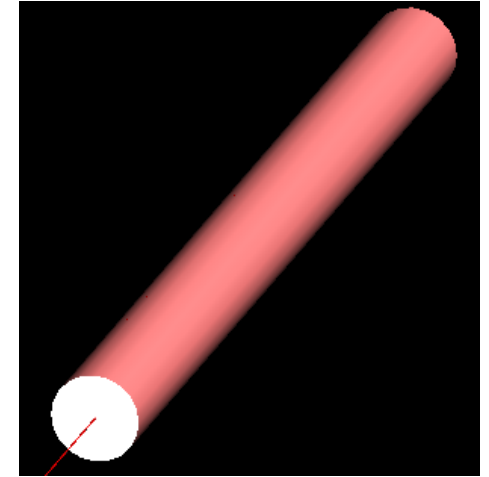
GAS SUPPLY TUBE

- Inner diameter: 0.5 mm
- Outer diameter: 0.8 mm
- Length: 30 mm
- Material: PVC



CRIMP PIN

- Inner diameter: 0.02 mm
- Outer diameter: 1 mm
- Length: 12 mm
- Material: Copper



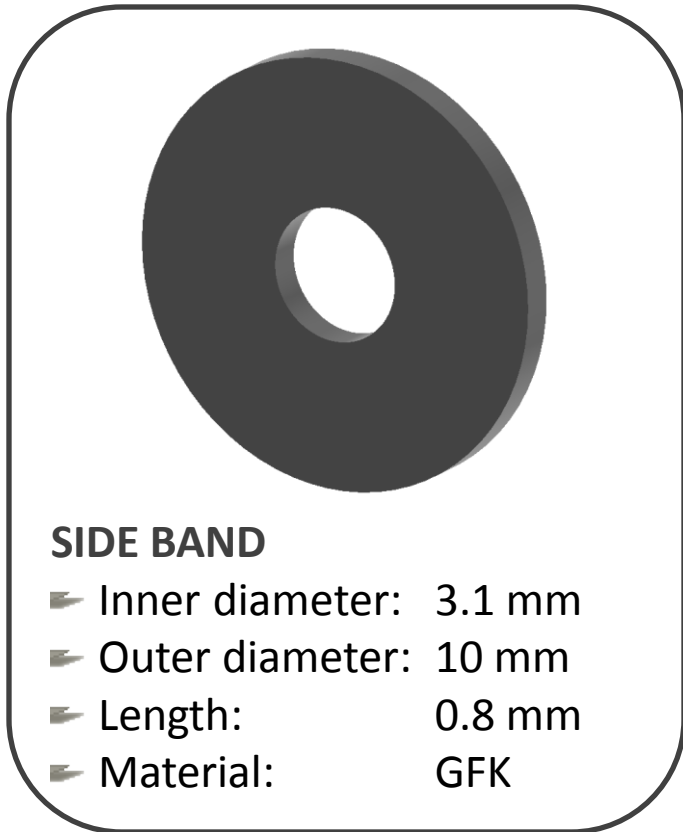
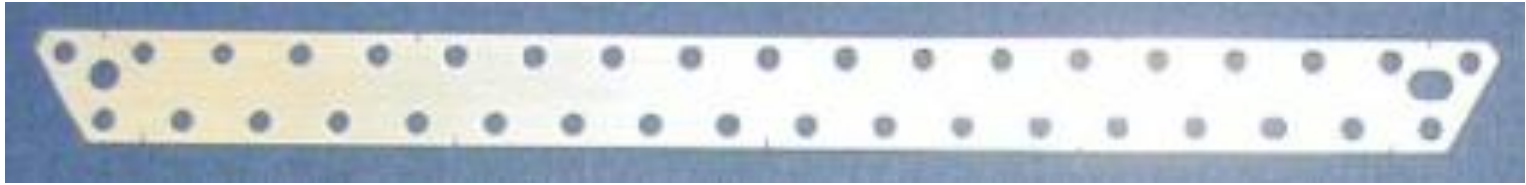
GROUND CONTACT

- Inner diameter: 9.5 mm
- Outer diameter: 10 mm
- Length: 0.25 mm
- Material: CuBe (98/2)

SPRING

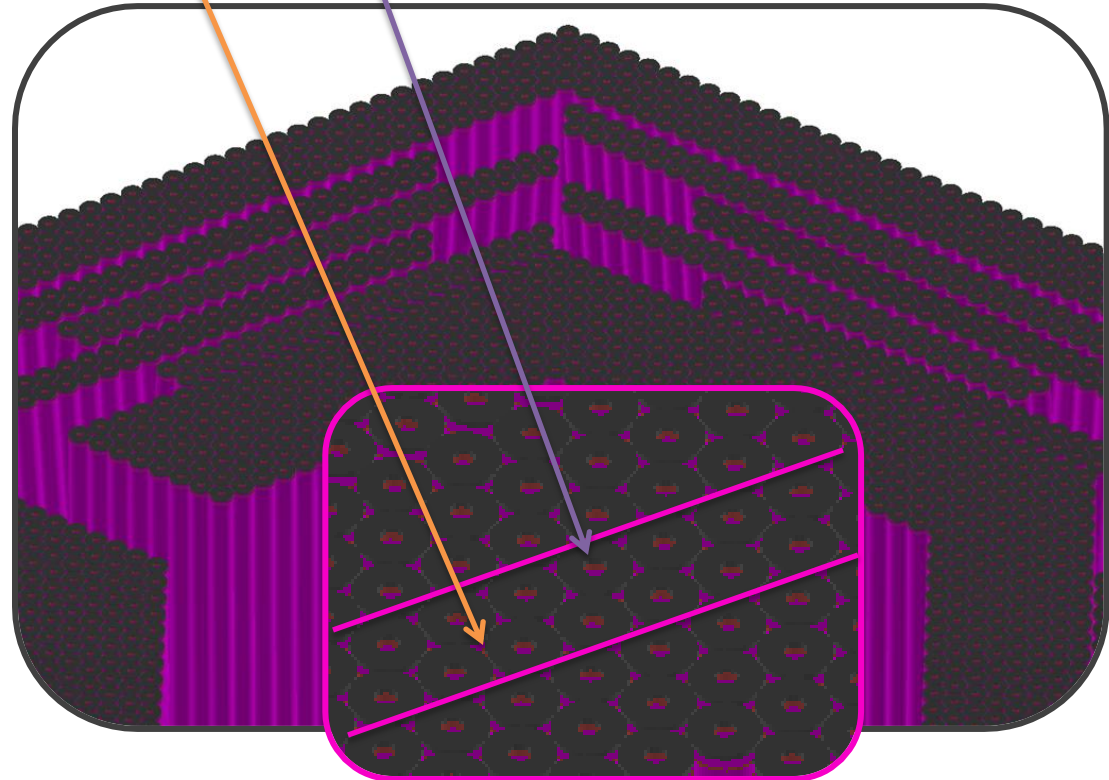
- Inner diameter: 5 mm
- Outer diameter: 5.5 mm
- Length: 1 mm
- Material: CuBe (98/2)

New components – side bands

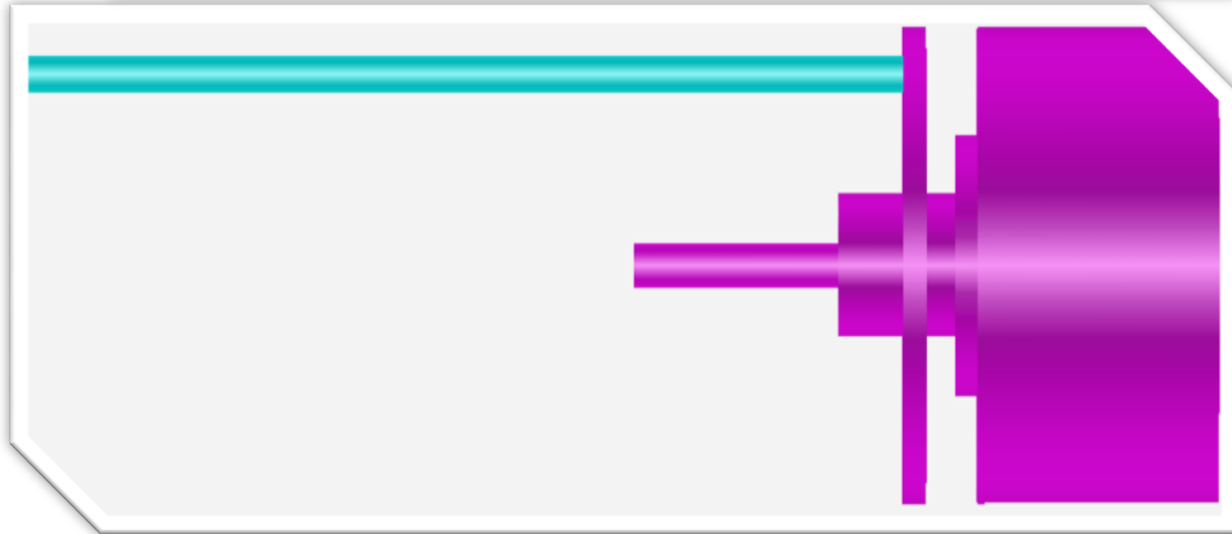
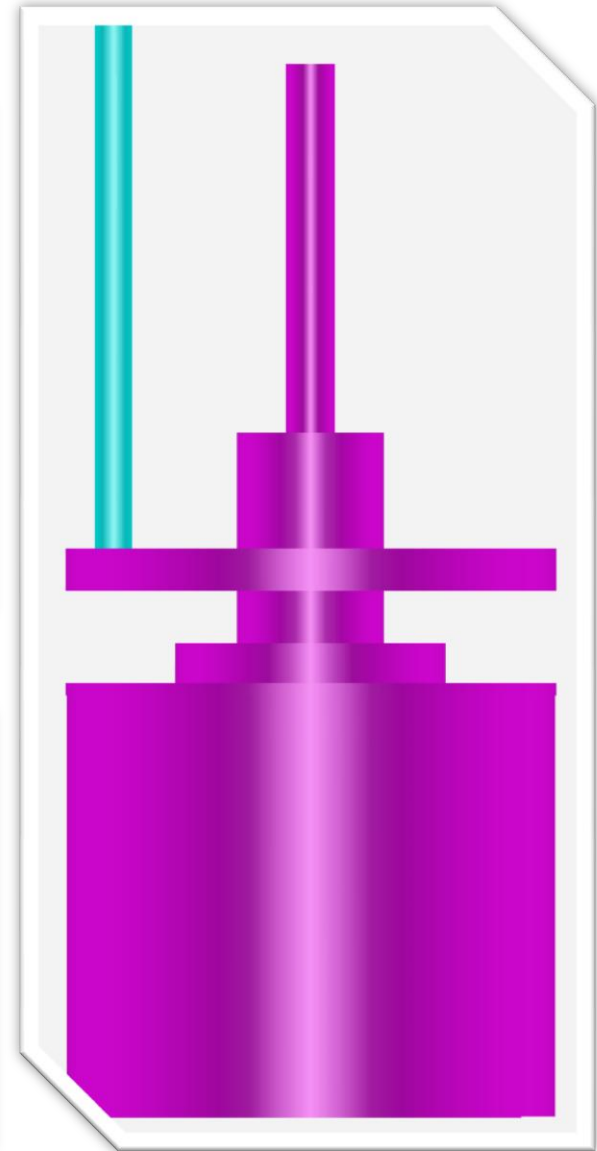
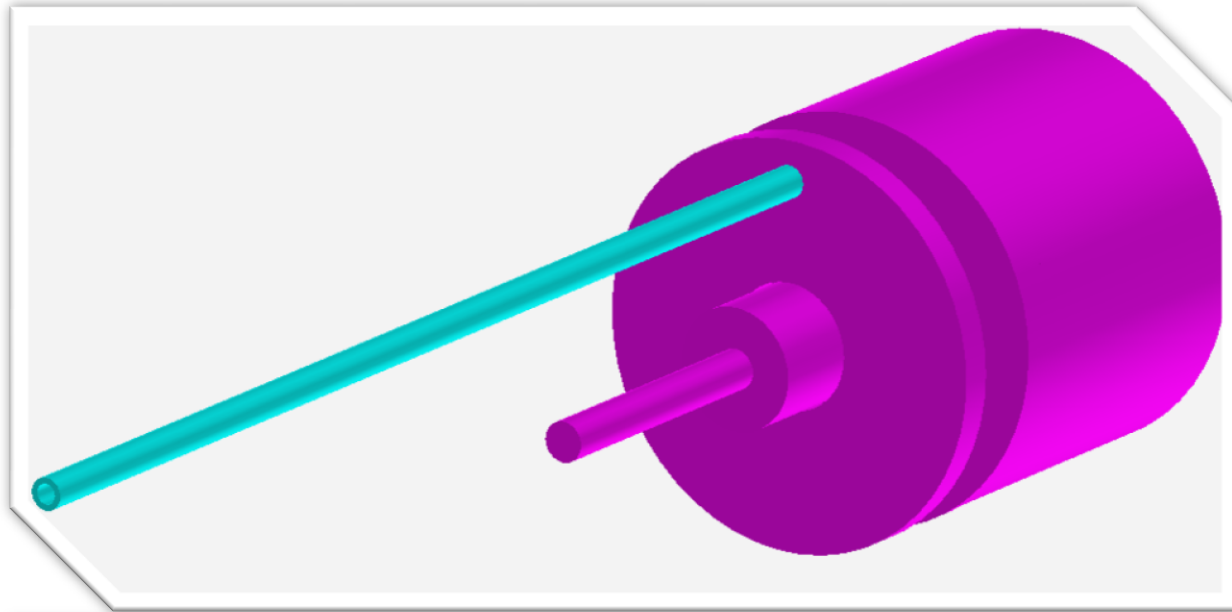


SIDE BAND

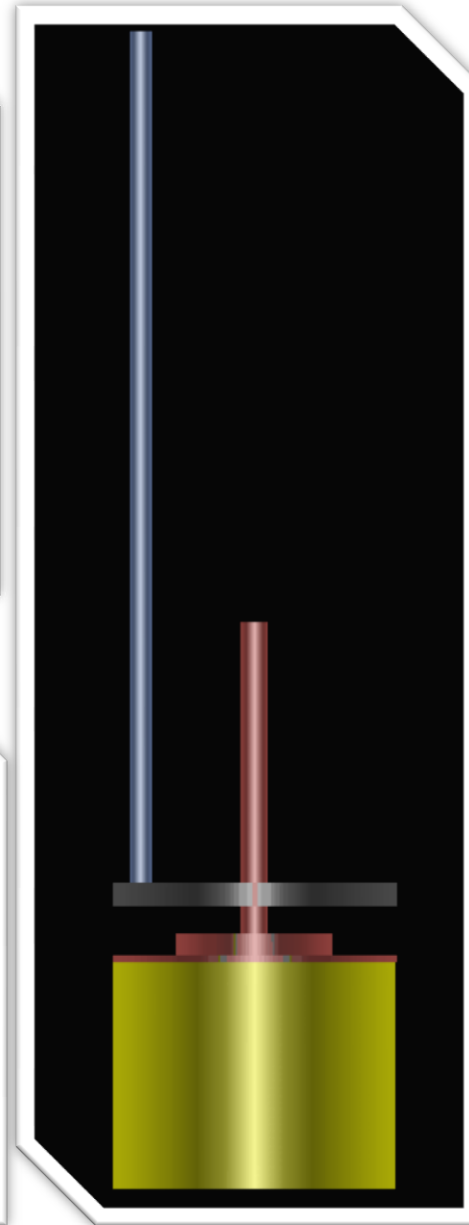
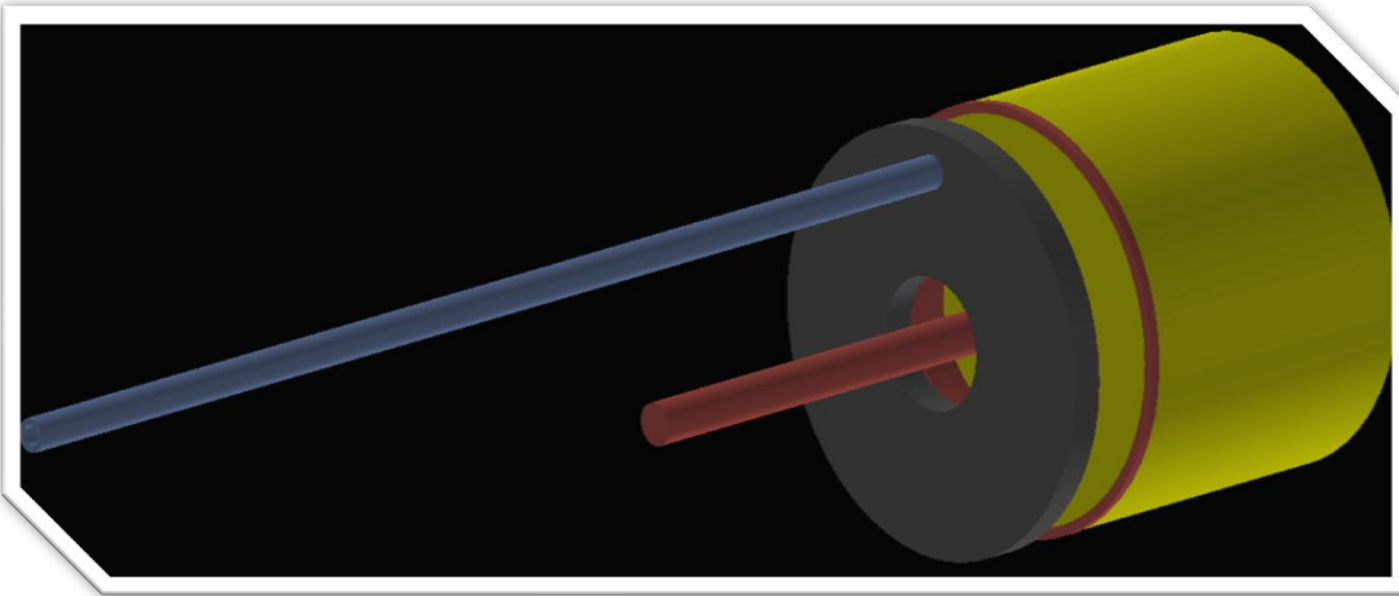
- Inner diameter: 3.1 mm
- Outer diameter: 10 mm
- Length: 0.8 mm
- Material: GFK



New components - view

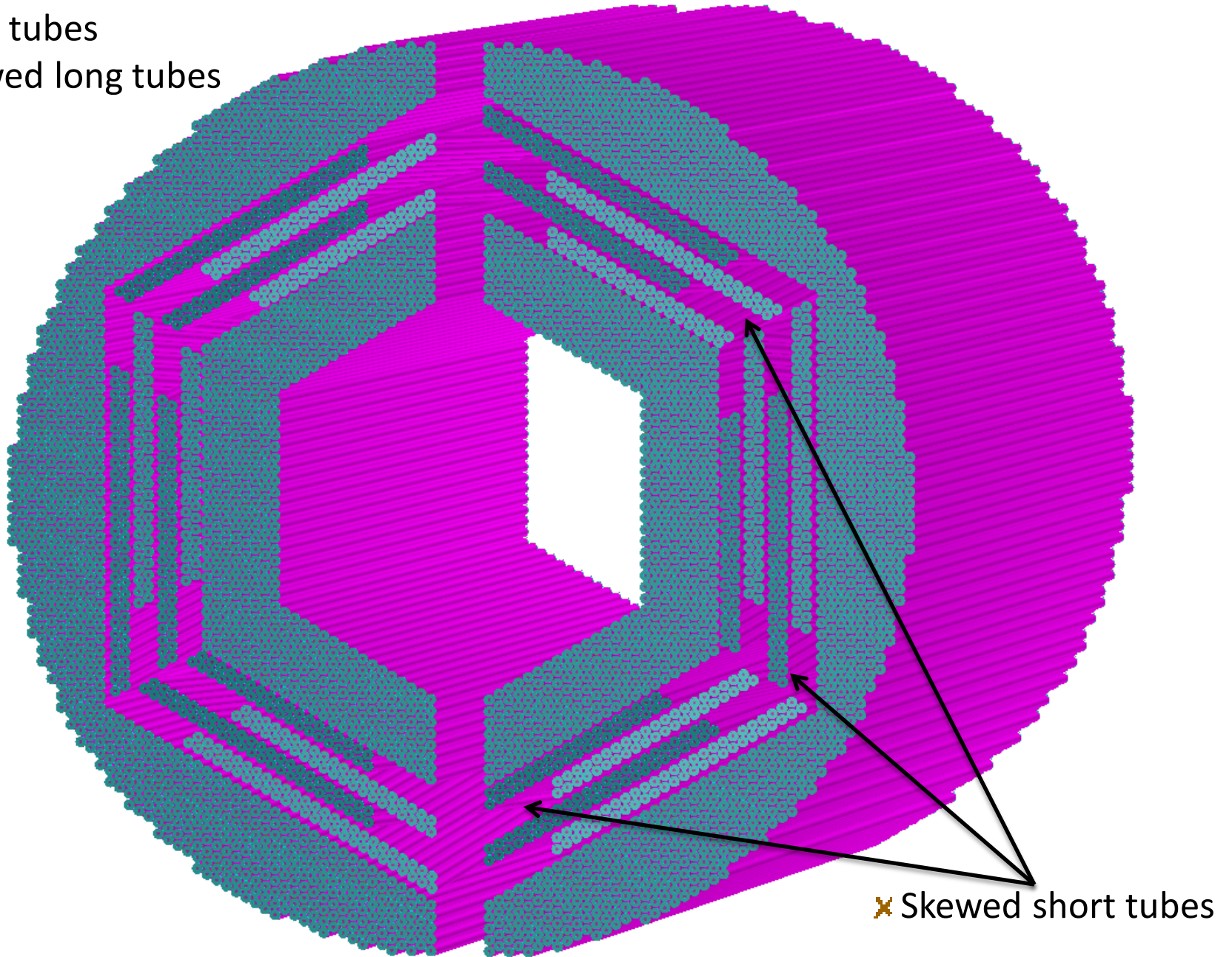


New components - view

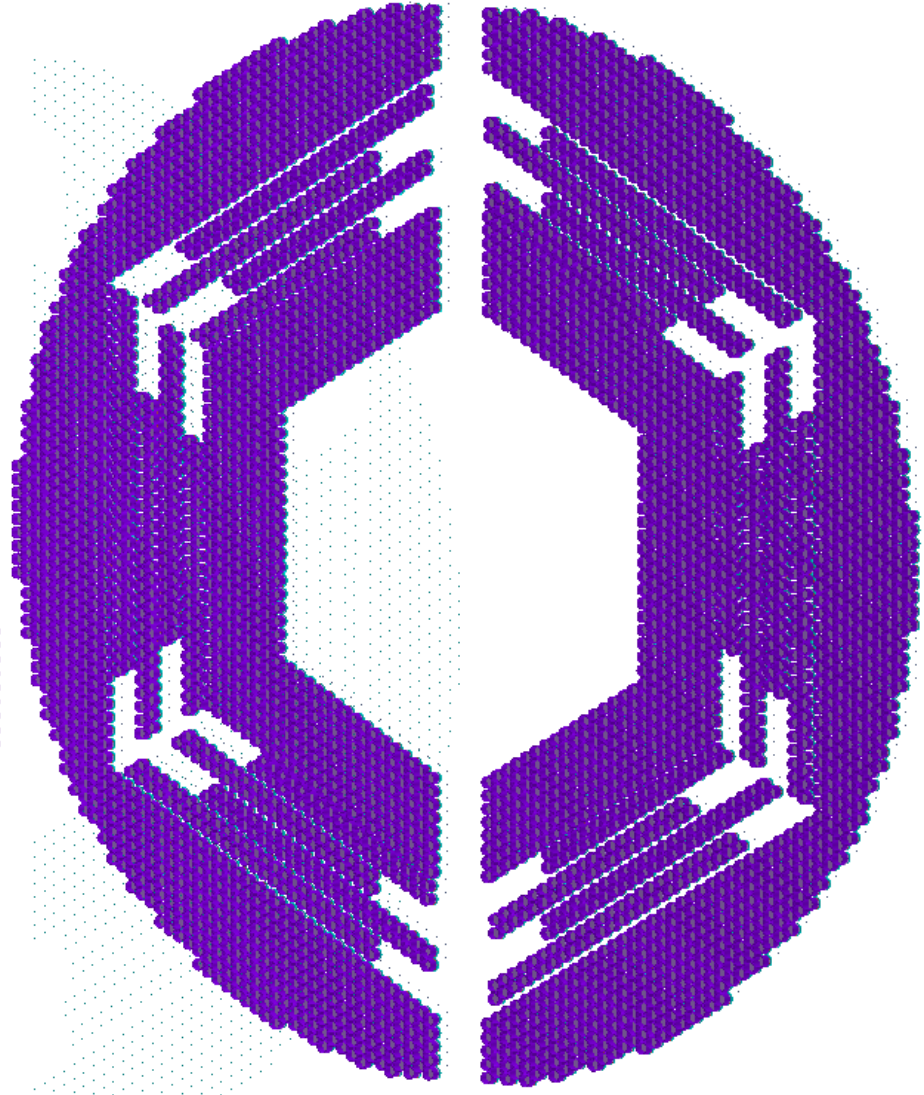
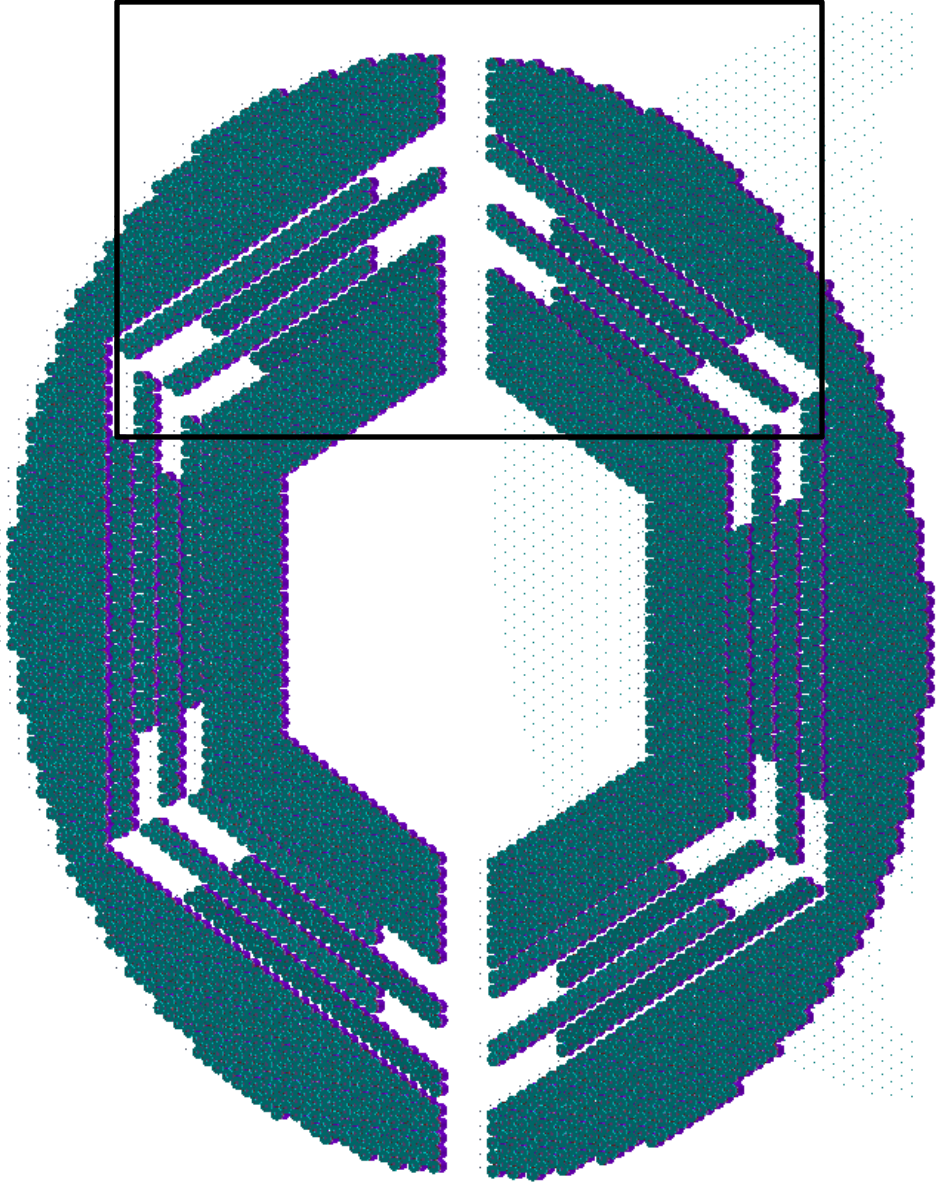


Status of the implementation

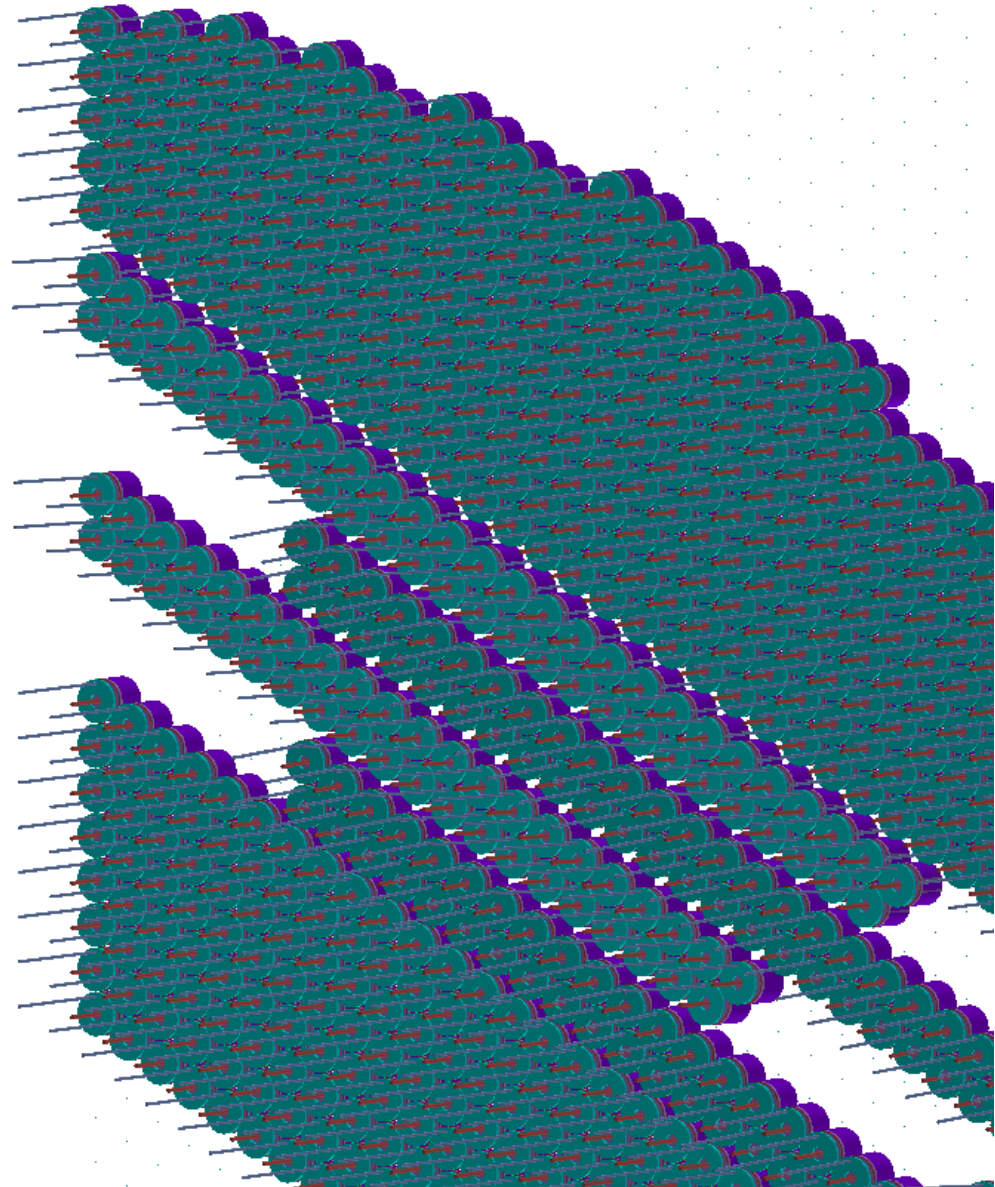
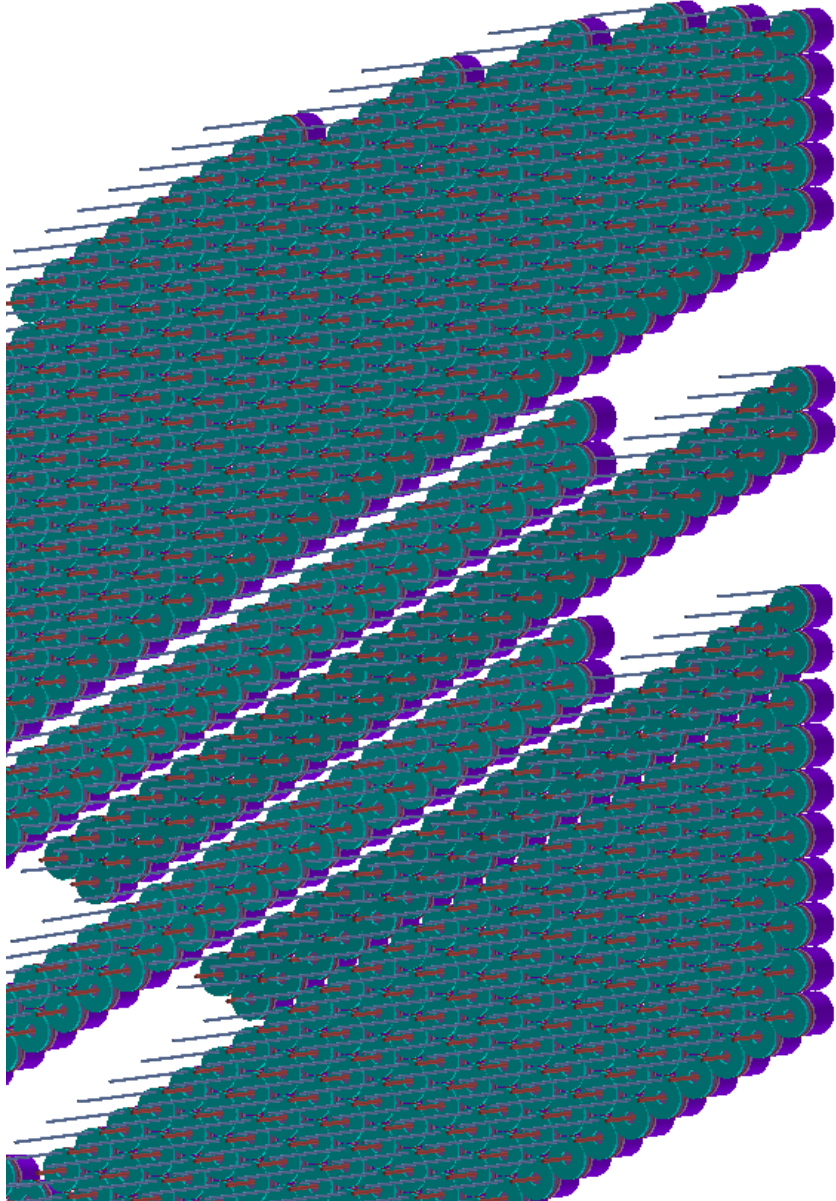
- ✓ Axial tubes
- ✓ Skewed long tubes



Status of the implementation – without tubes



Status of the implementation - detail



Geometry - conclusions

- ❏ End plugs, crimp pins, gas supply tubes, ground contacts, springs and side bands are now implemented for:
 - ✓ Axial tubes
 - ✓ Skewed long tubes
 - ✗ Skewed short tubes → work in progress
- ❏ Side bands are included but with a ring shape:
 - ❏ easiest way, since the ring is easily positioned on top of the tube and does not require the very precise positioning needed by the band
 - ❏ the amount of material is almost the same of the band
- good approximation
- ❏ Outlook:
 - ❏ studies of the background production due to the presence of dead materials in the active region → important in particular for short tubes



Thank you!