JÜLICH
FORSCHUNGSZENTRUM

The STT Geometry Description in PANDAroot

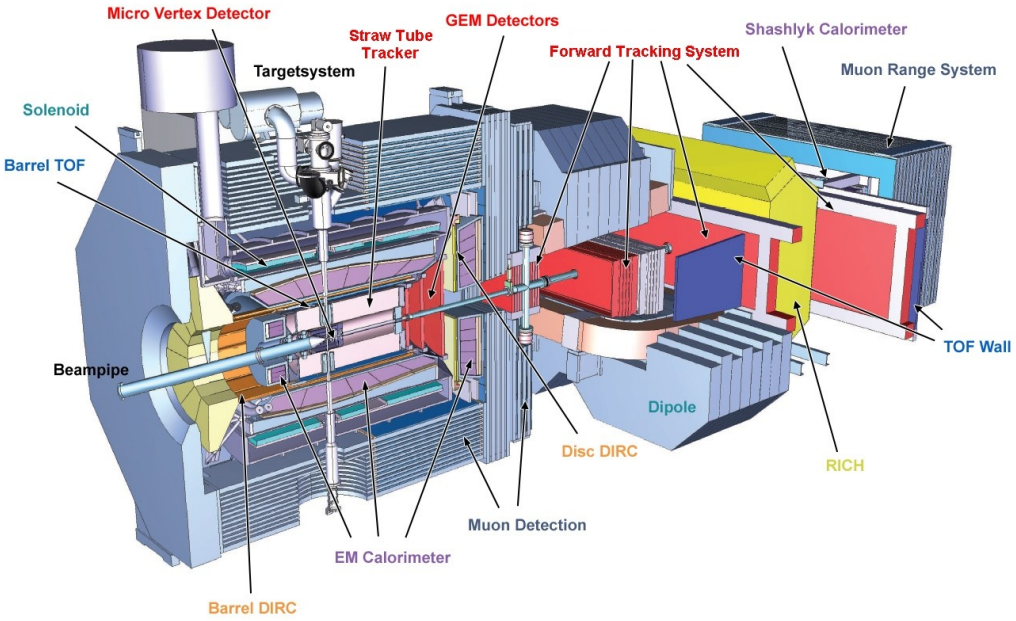
Thanachot Nasawasd

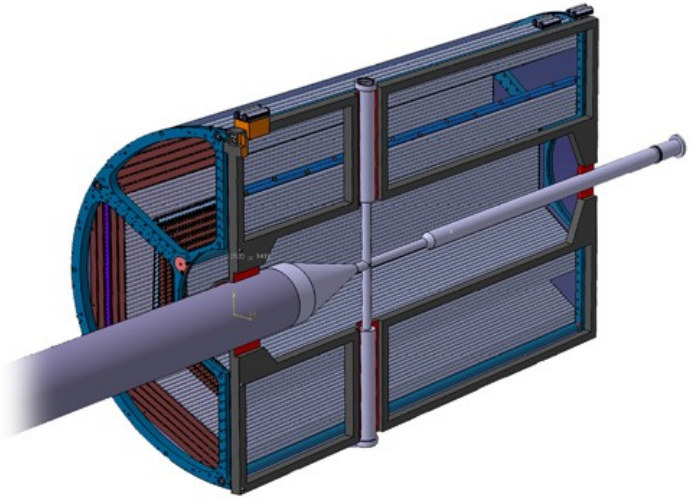
05 June 2018

Outline

- Straw Tube Tracker
- STT in Pandaroot (curent model)
- STT modeling
  I. *Tubes*
  II. *Straw tube arangment*
  III. *Mechanical frame*
  IV. *Gas systems*
- Outlooks

Straw Tube Tracker (STT)

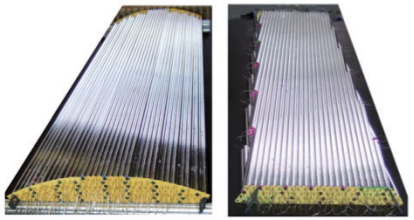




STT measure the particle momentum from the reconstructed trajectory and the specific energy loss of the particles

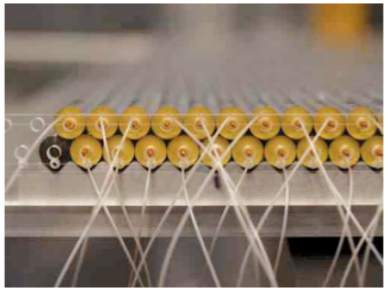
Straw Tube Tracker (STT)

- Straw Tubes

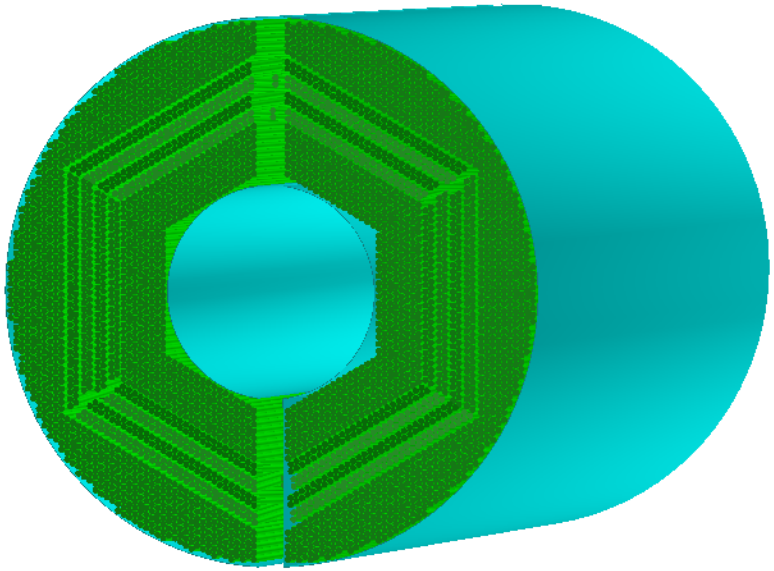


- Mechanical Frame

- Gas system



STT in PANDAroot: curent model



- Gases in cylindrical shape
- Wires

Differences from real STT

- Tube wall and end-caps
- Mechanical frame
- Gas system
- Tube arrangement

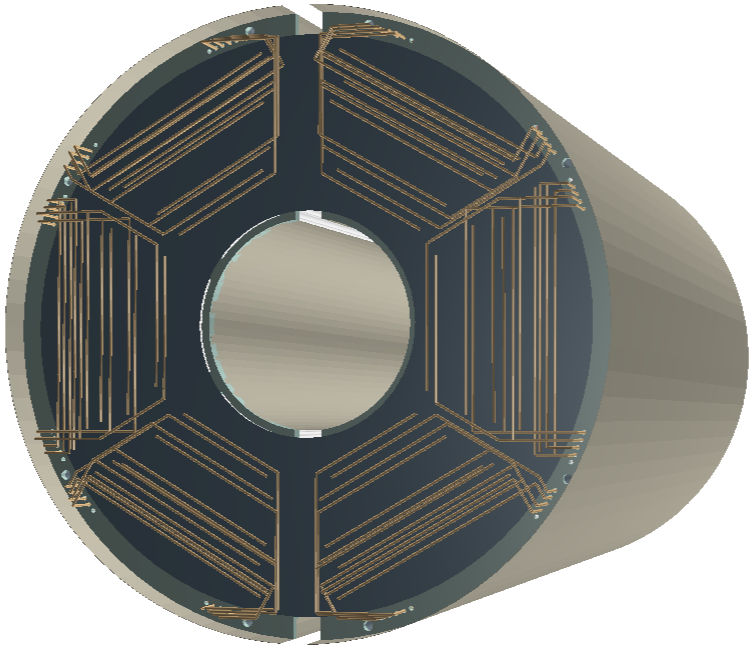
STT Modeling

I. Tubes

II. Straw tube arangment

III. Mechanical Frame

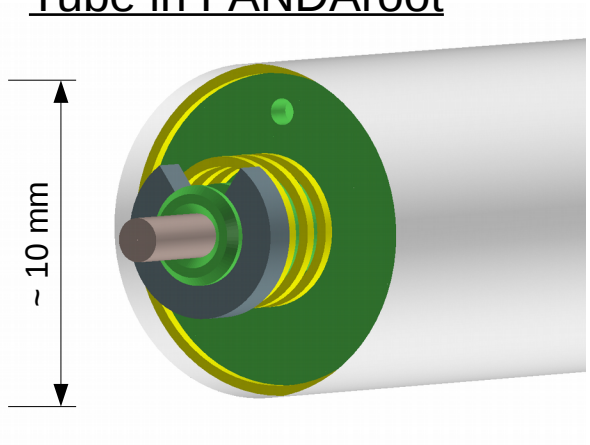
IV. Gas system



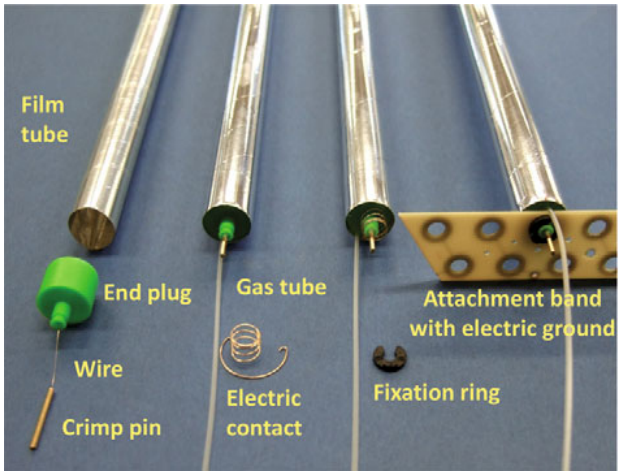
STT Modeling: Tube

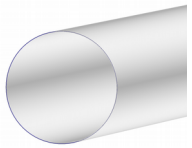
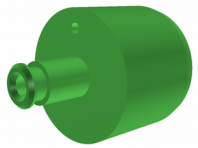
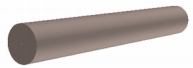
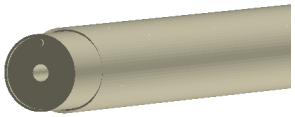
I. Tube

Tube in PANDAroot



The prototype



- Film tube 
- End plug 
- Electric contact 
- Wire 
- Crimp pin 
- Fixation ring 
- Gases 

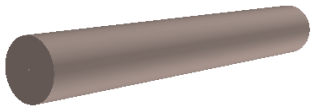
STT Modeling: Tube

Wire

The wire is made from
a gold-plated tungsten-rhenium

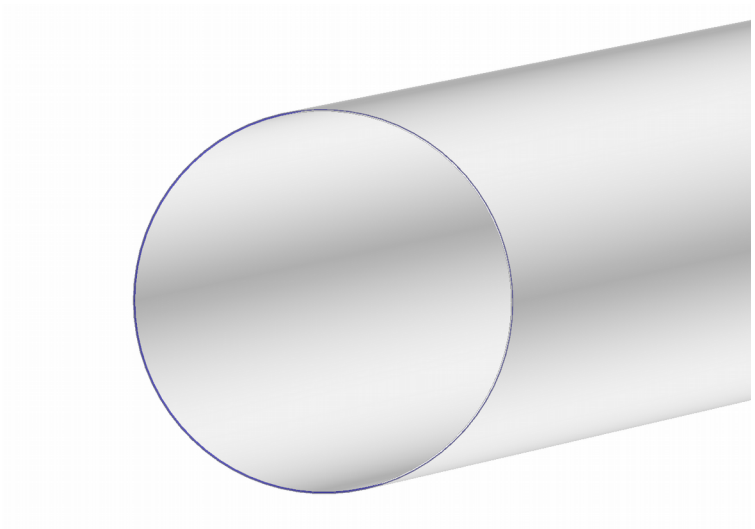
- Ignore the coated gold layer

Crimp pin



The crimp pin is made of
copper, holding the wire

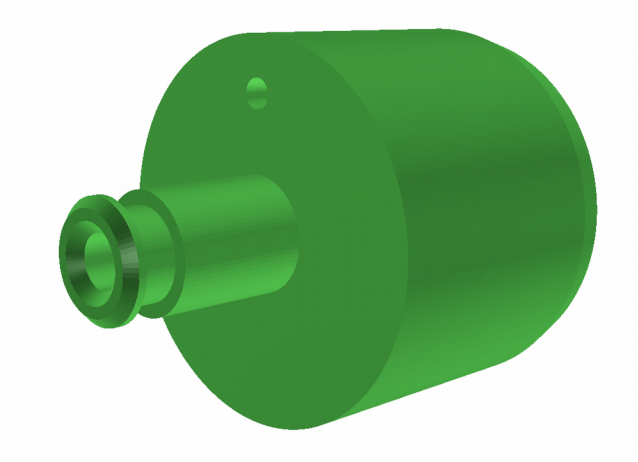
Film tube



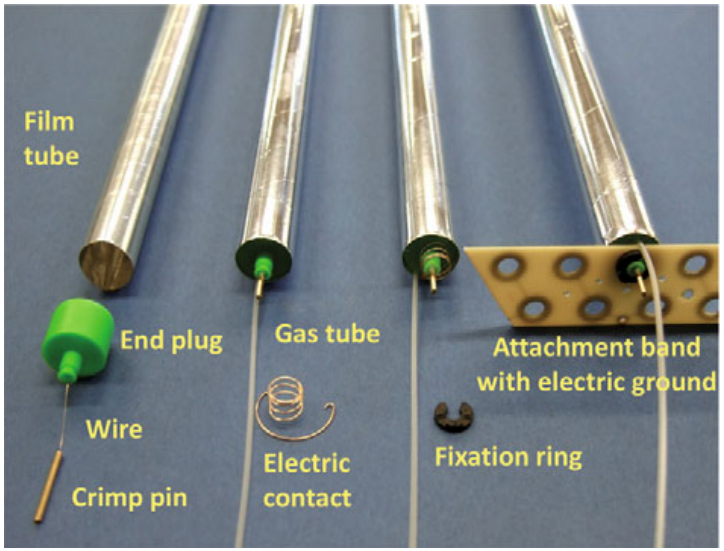
The thin Mylar layer (27 um)
is coated with AL (0.03 um)

STT Modeling: Tube

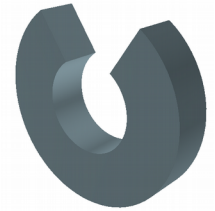
End plug



End plug is made from Acrylonitrile butadiene styrene(ABS).



- Fixation ring

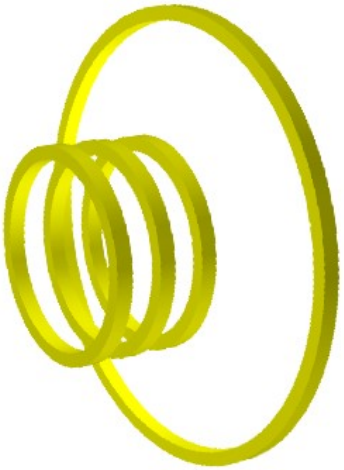


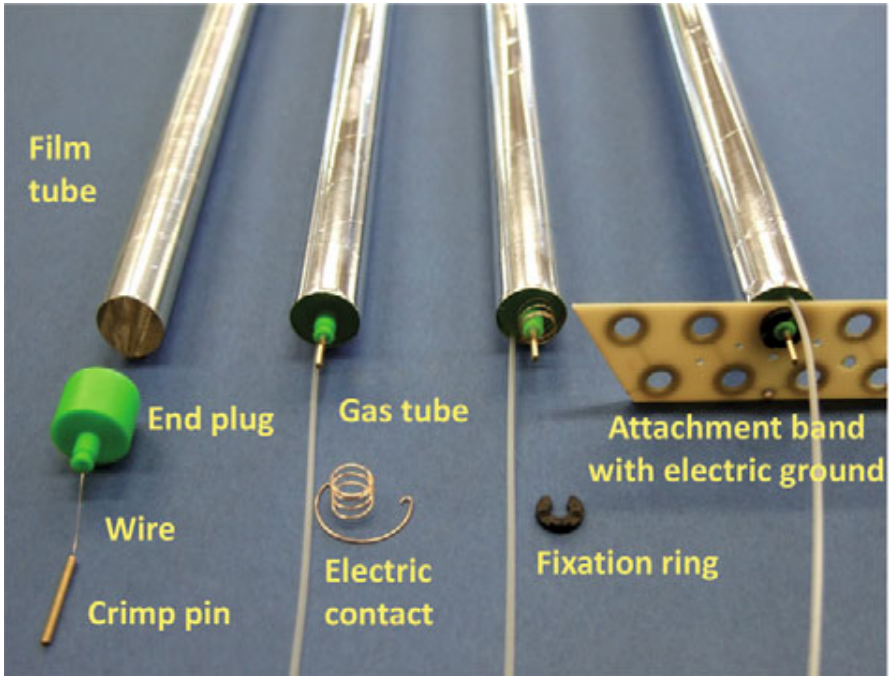
Fixation ring is made from PVC.

- In the simulation we use the sharp edges instead of smooth edges.

STT Modeling: Tube

Electric contact

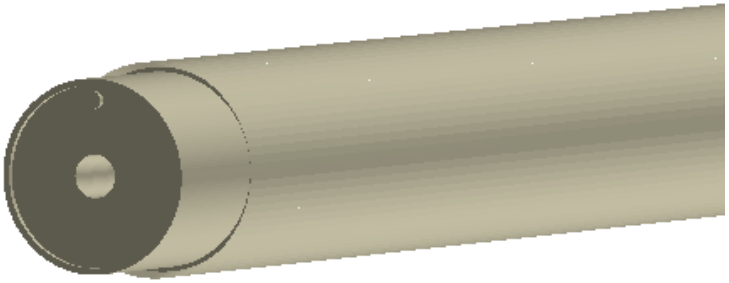




- Electric contact is made from a gold-plated copper-beryllium.
- In PANDAroot we use a ring shape instead of spring and ignore the coated gold layer.

STT Modeling: Tube

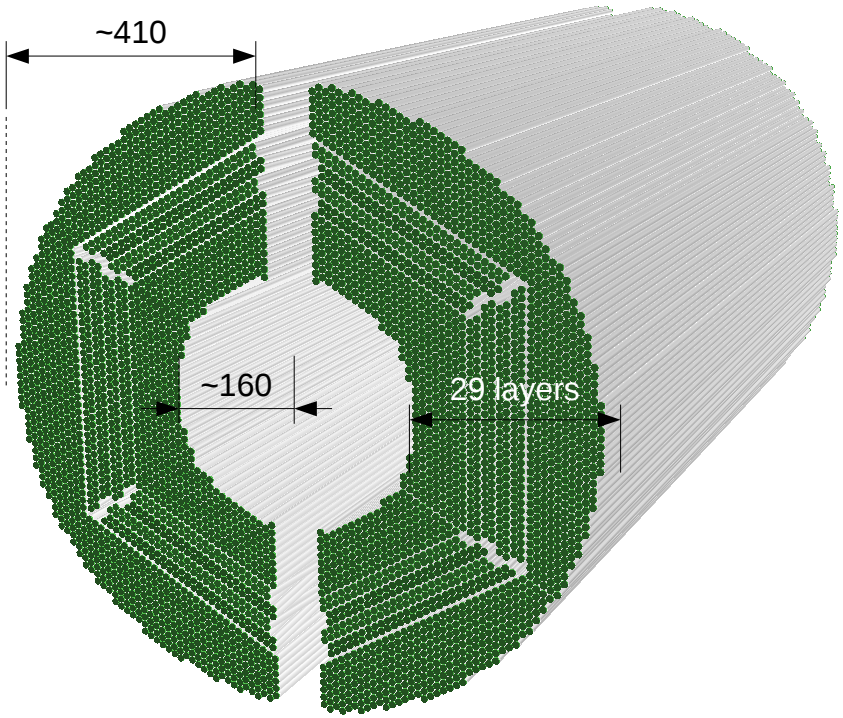
- Gases



Mixed gases
Ar 90% / CO_2 10%

STT Modeling: Straw tube arrangement

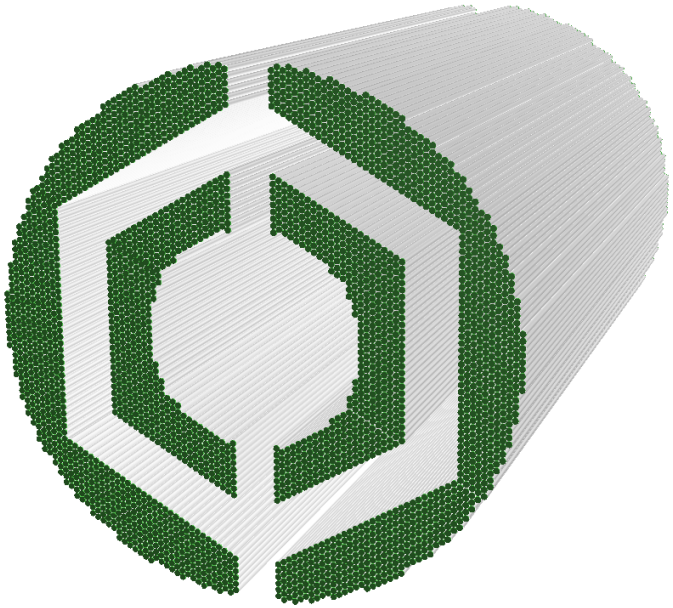
II. Straw tube arangment



- The STT detector consists of 4576 tubes arranged in 29 layers.

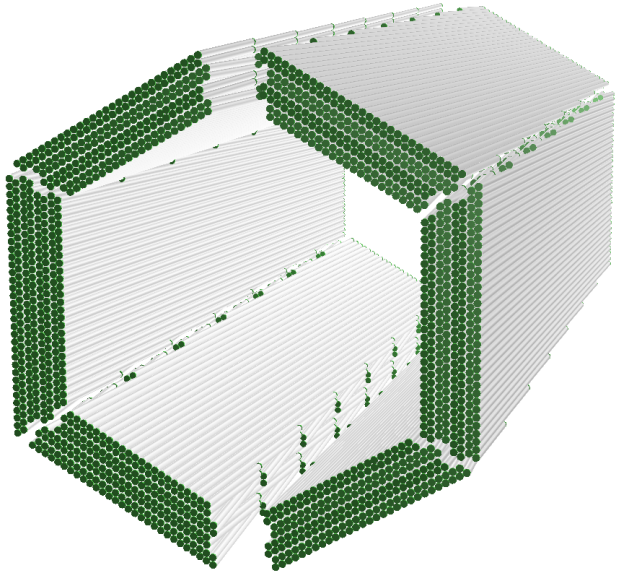
STT Modeling: Straw tube arrangement

Parallel straw



- The straw are parallel with the beam axis, to detect radial positions.

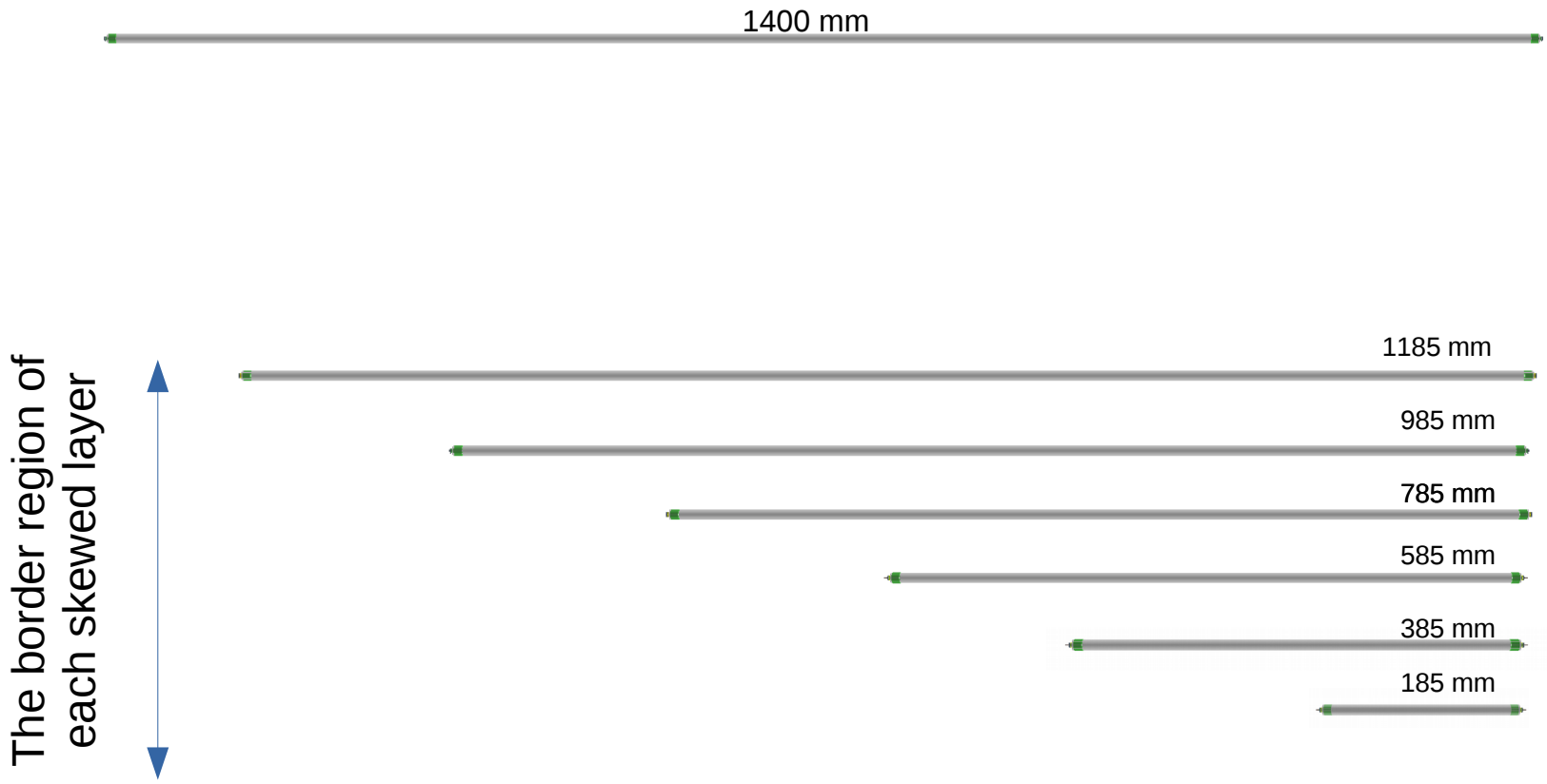
Skewed straw



- The straw are skewed relative to the aligned straws in the same sector by a small angle of +2.9 ◦ and −2.9 ◦.

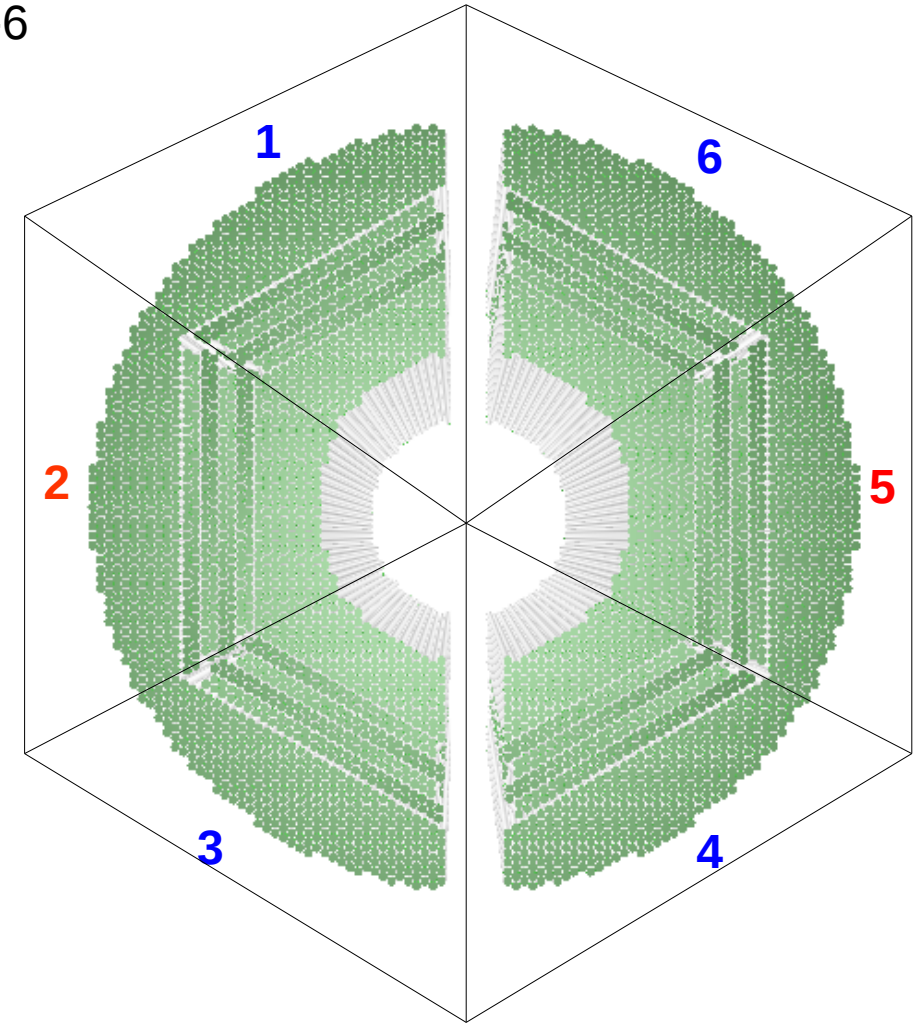
STT Modeling: Straw tube arrangement

Tubes Length

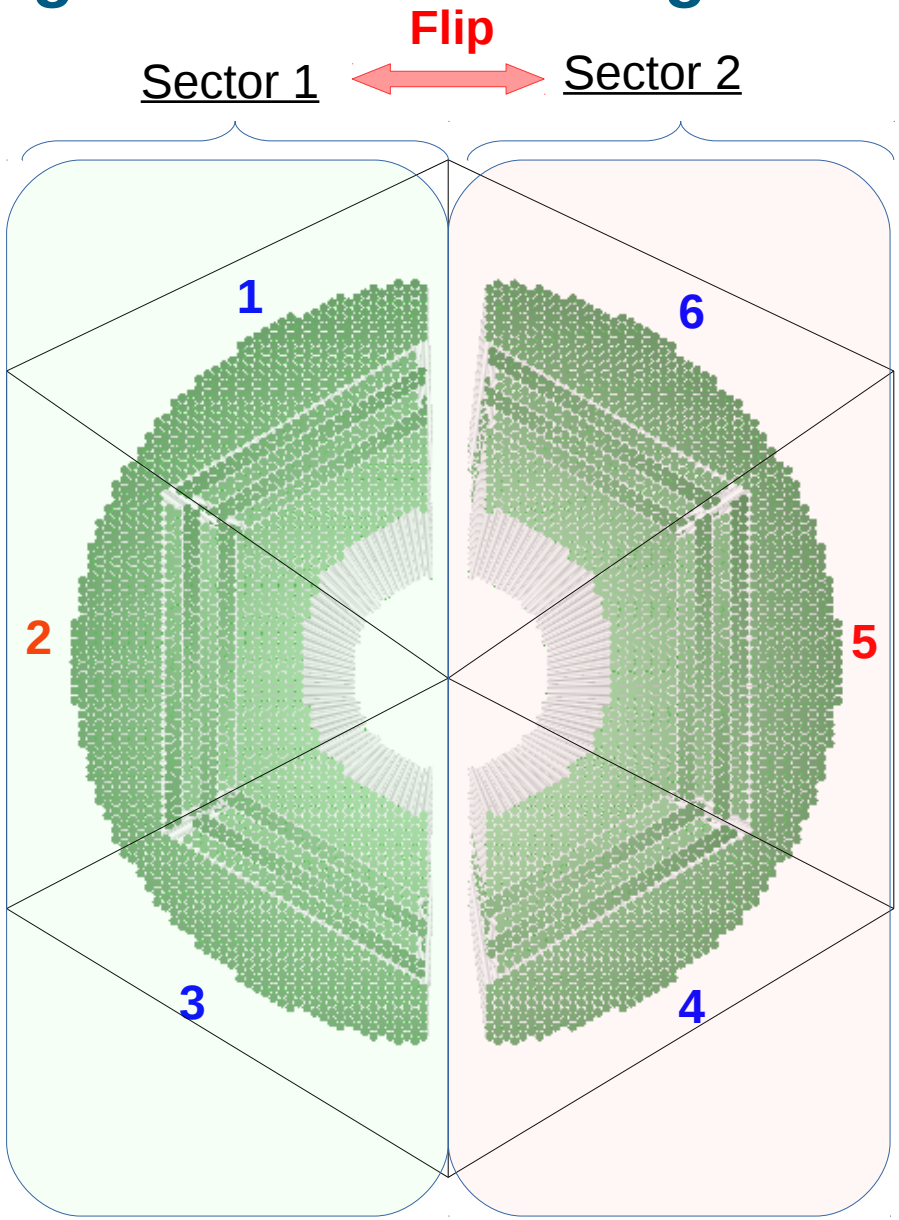


STT Modeling: Straw tube arrangement

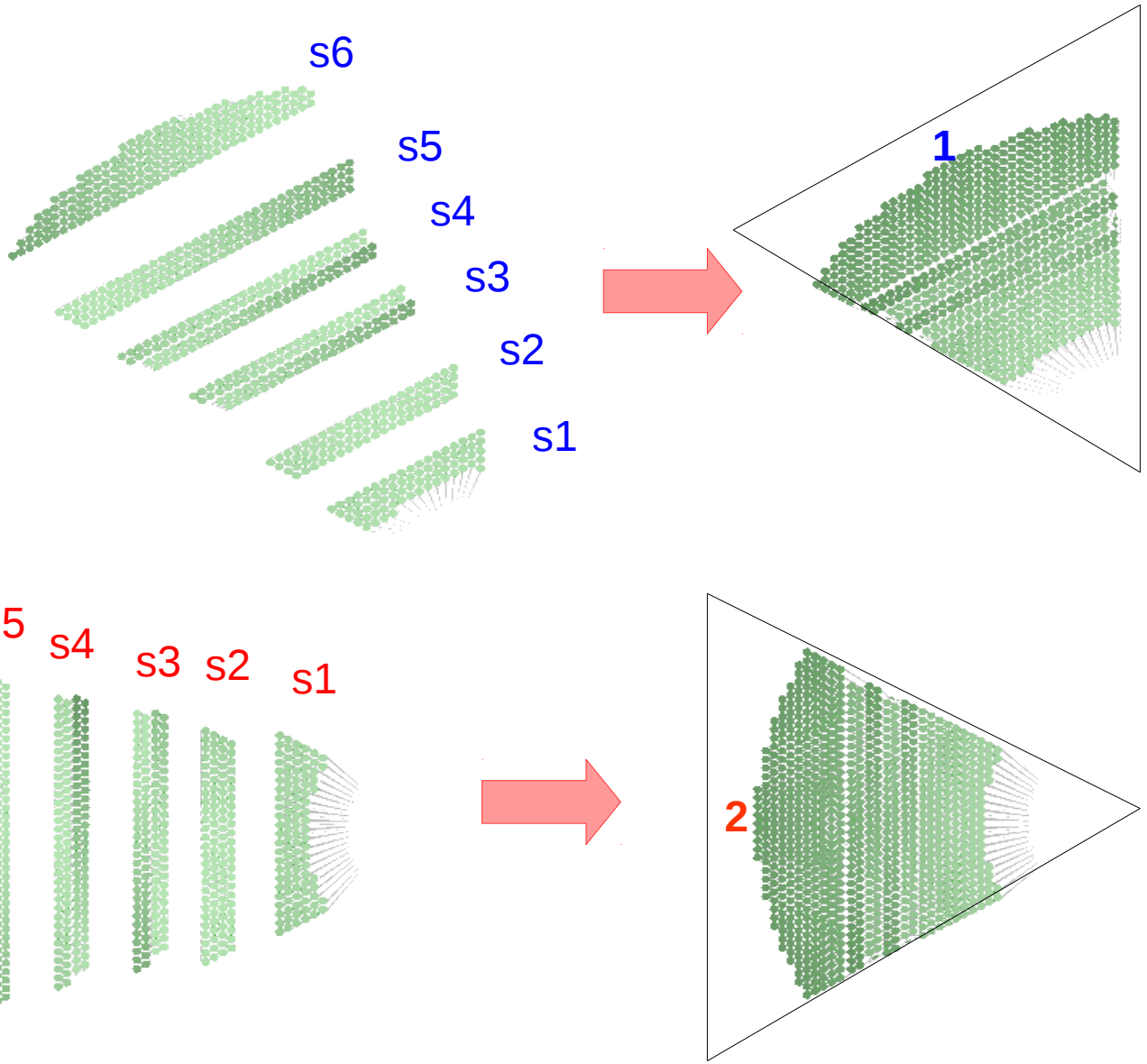
Group 1-6



STT Modeling: Straw tube arrangement



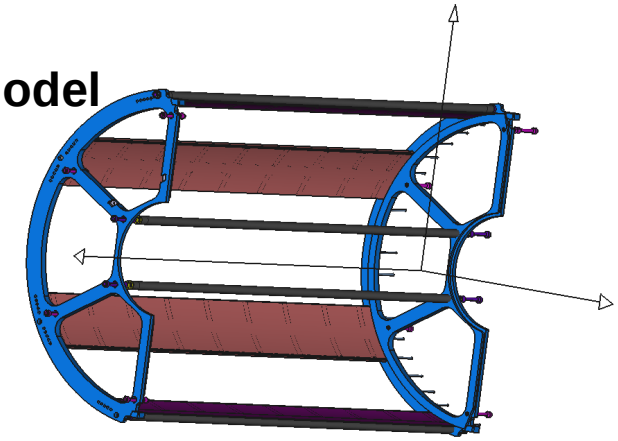
STT Modeling: Straw tube arrangement



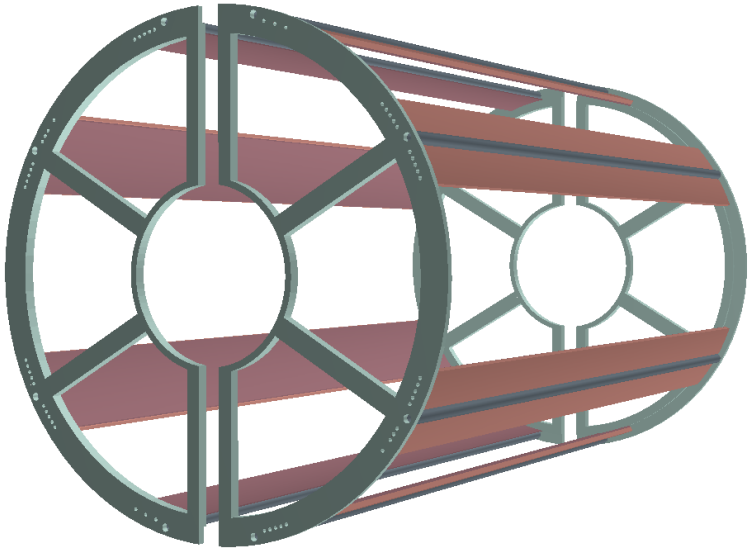
STT Modeling: Mechanical Frame

III. Mechanical Frame

- **Model**



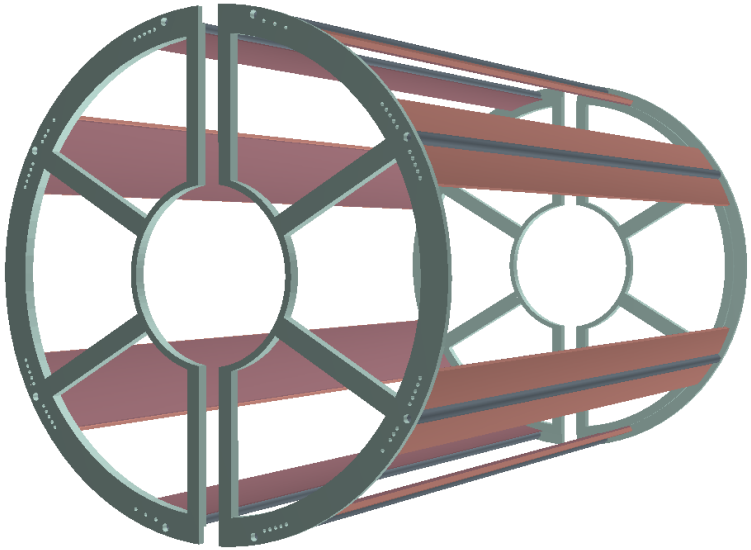
- **Prototype**



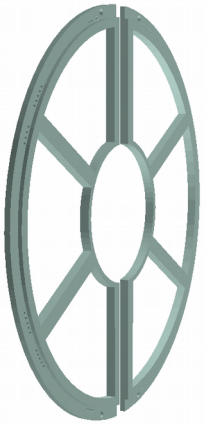
- **In PANDAroot**

STT Modeling: Mechanical Frame

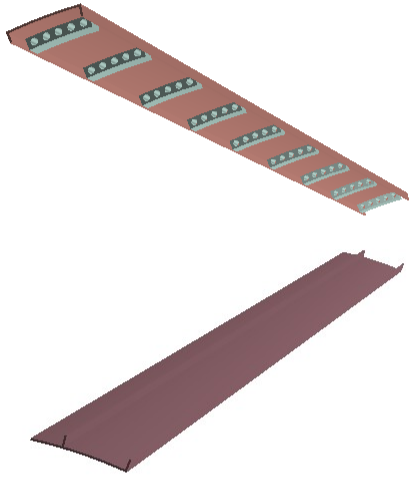
III. Mechanical Frame



- Stainless Frame



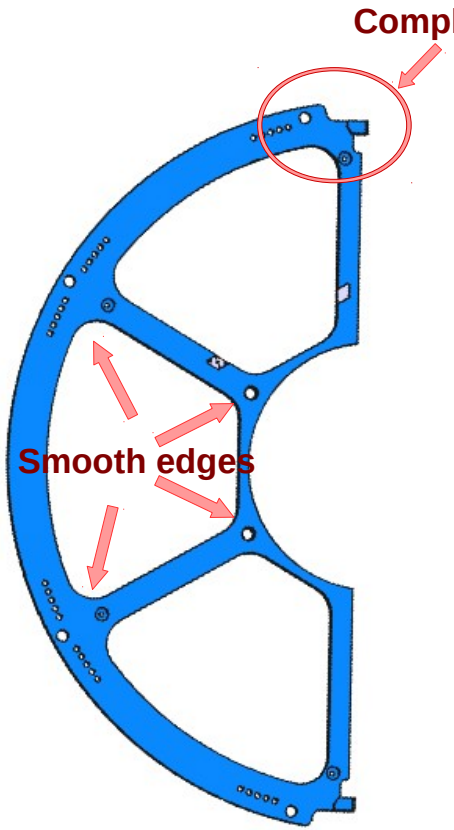
- Gas pipe holder

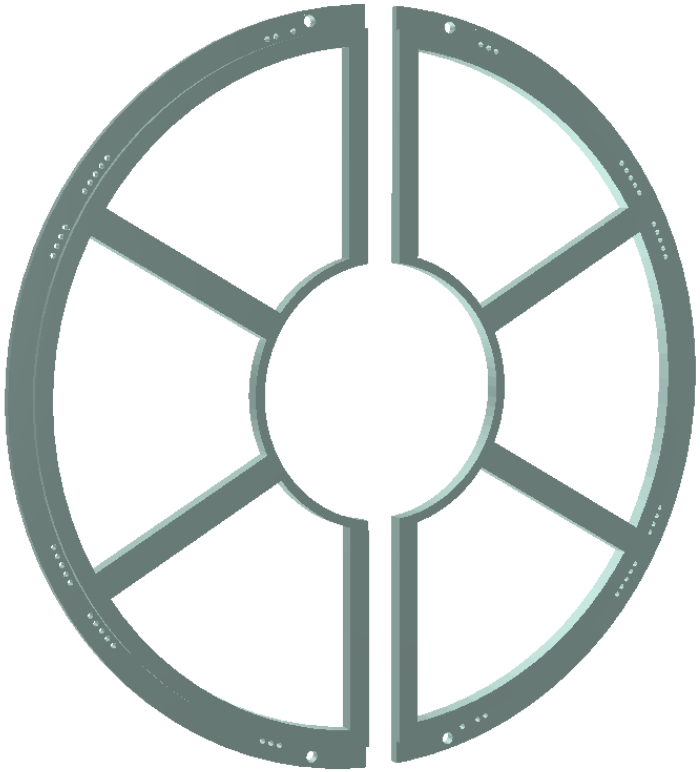


- Carbon-fiber tube

STT Modeling: Mechanical Frame

Stainless Frame





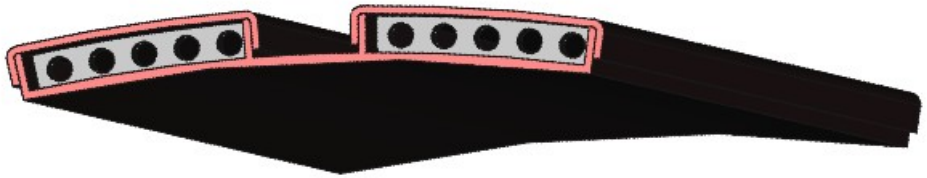
- **Model**
- **In PANDAroot**

STT Modeling: Mechanical Frame

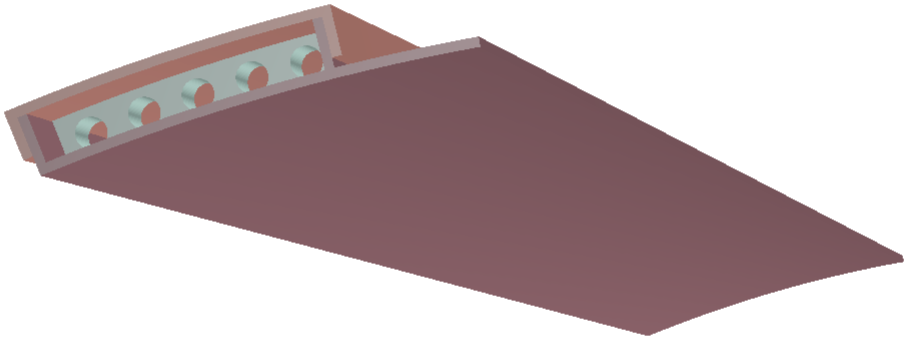
Smooth edge

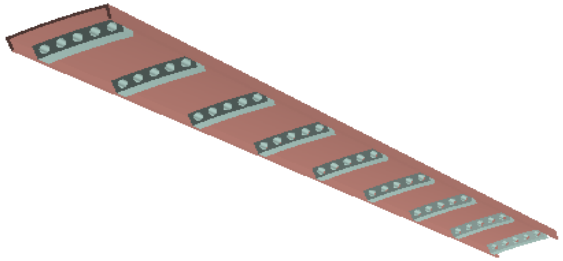
- **Model**

Gas pipe holder

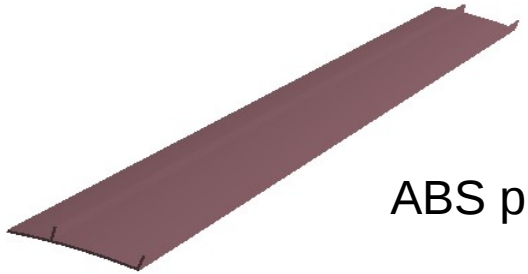


- **In PANDAroot**



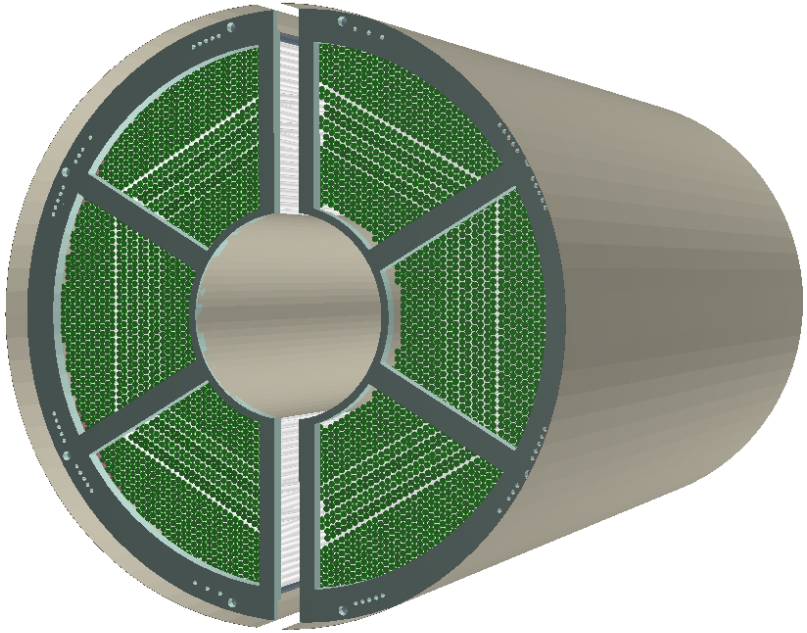


Stainless



ABS plastic

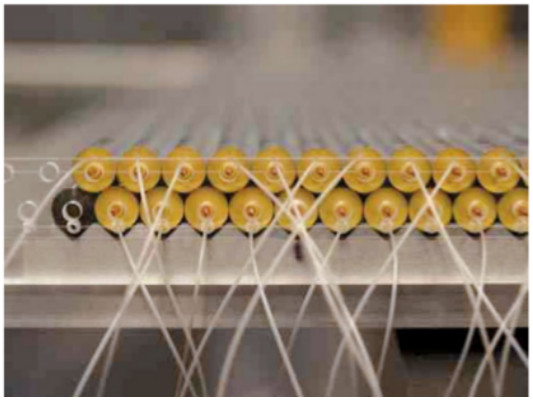
STT Modeling: Mechanical Frame

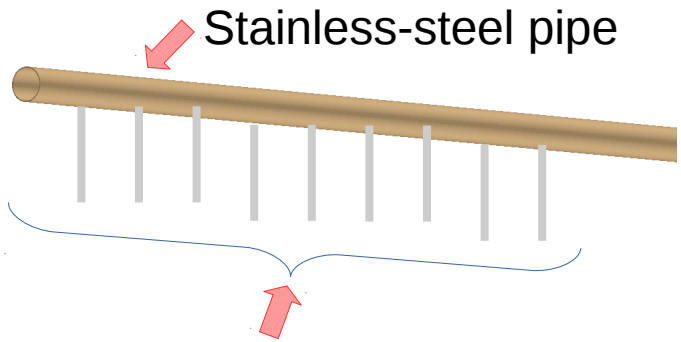


- The inner and outer surfaces of STT will be covered by a composite material, consisting of a 1 mm Rohacell layer with a 0.17 mm carbon fiber.

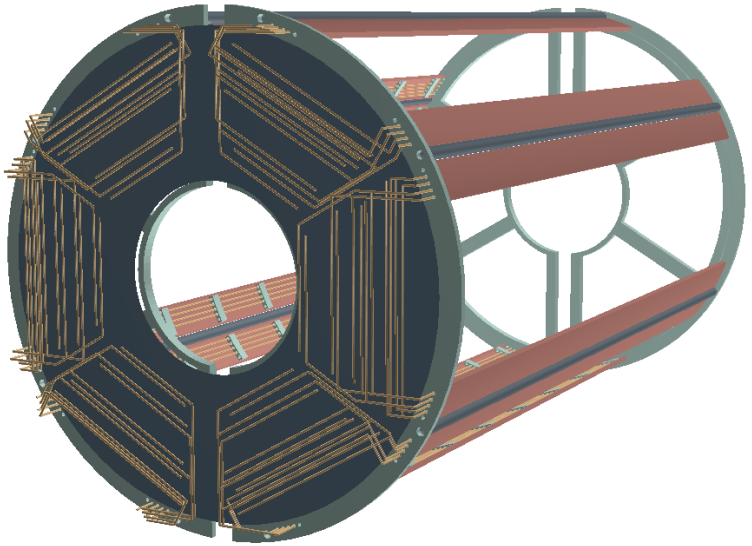
STT Modeling: The gas system

IV. The gas system





- **In PANDAroot**

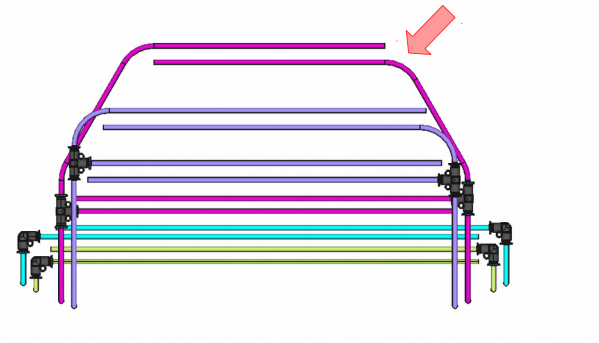


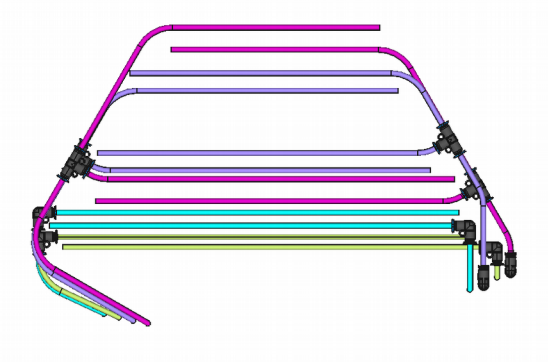
*** Thermoplastic tubes are connected to the individual straws.

STT Modeling: The gas system

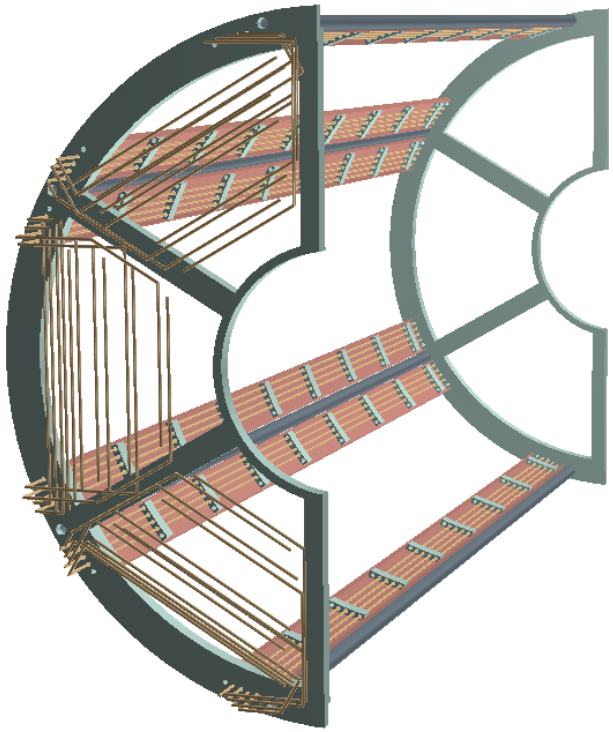
IV. The gas system

- **Model**





- **In PANDAroot**

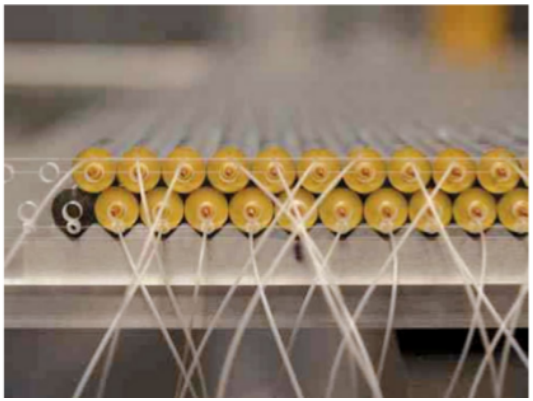


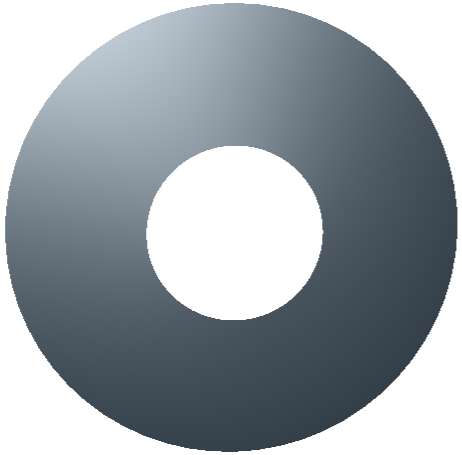
- Stainless-steel pipe

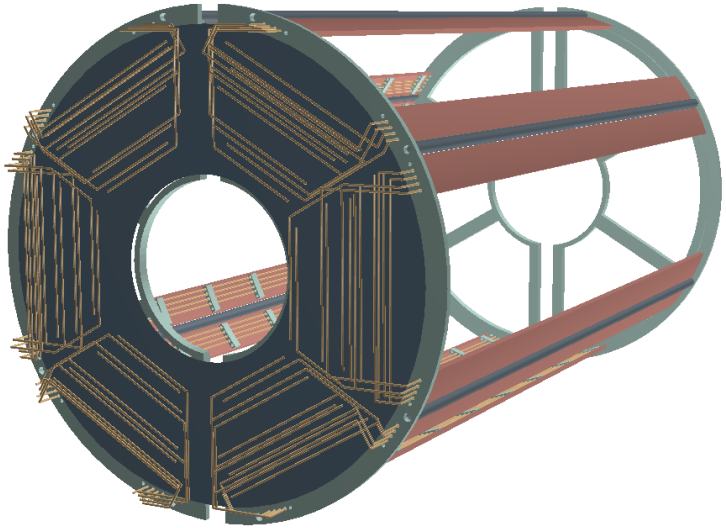
STT Modeling: The gas system

IV. The gas system

- We use the plate shape instead of the small thermoplastic tubes.







Thermoplastic tubes in PANDAroot

Outlooks

Digitization
- Straw number
- ADC deposit energy
- Time Over Threshold
- Waveform

Local Reconstruction
- Position
- Energy
- Time