Status of the Barrel DIRC Mechanical Design Concept

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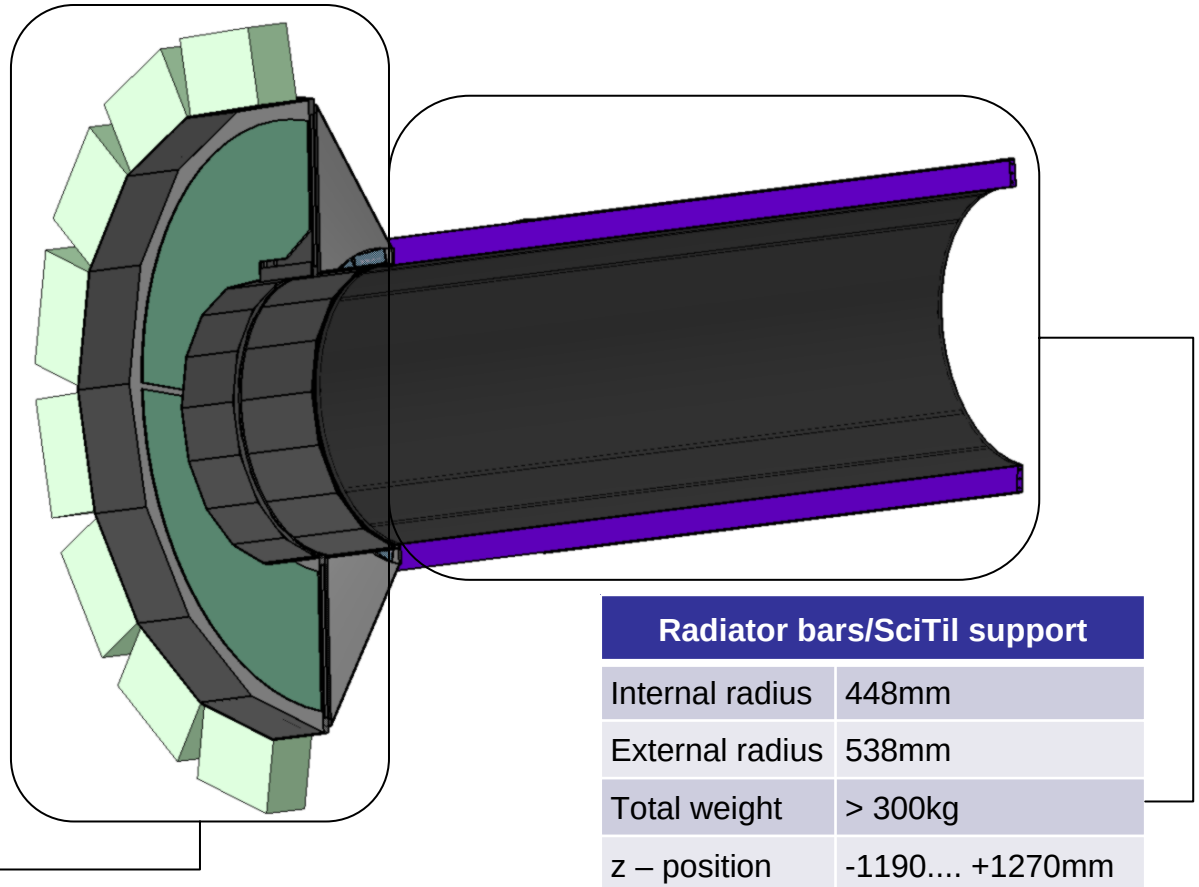
GSI

Outlines

- Dimensions Barrel DIRC Detector
- Overview of the Mechanical Design Concept
- FEM analysis of the barbox/SciTil support structure
- Design effects of potential modifications
- Outlook – What‘s next.....

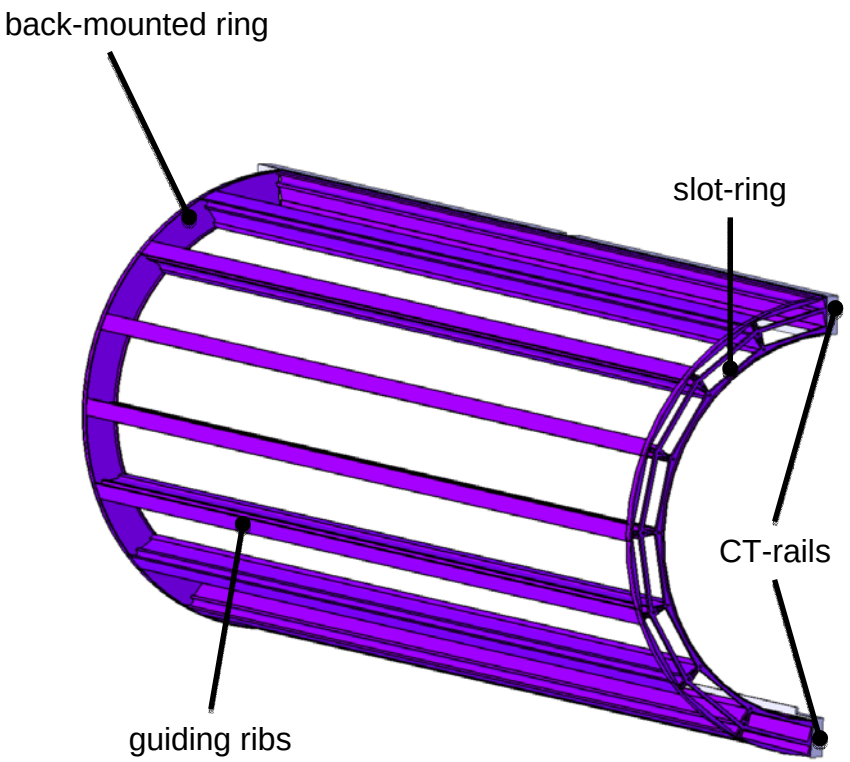
Dimensions Barrel DIRC

Expansion volume/Readout	
Internal radius	448mm
External radius	1270mm
Total weight	> 400kg
z – position	-1710...-1190mm
Δz	520mm



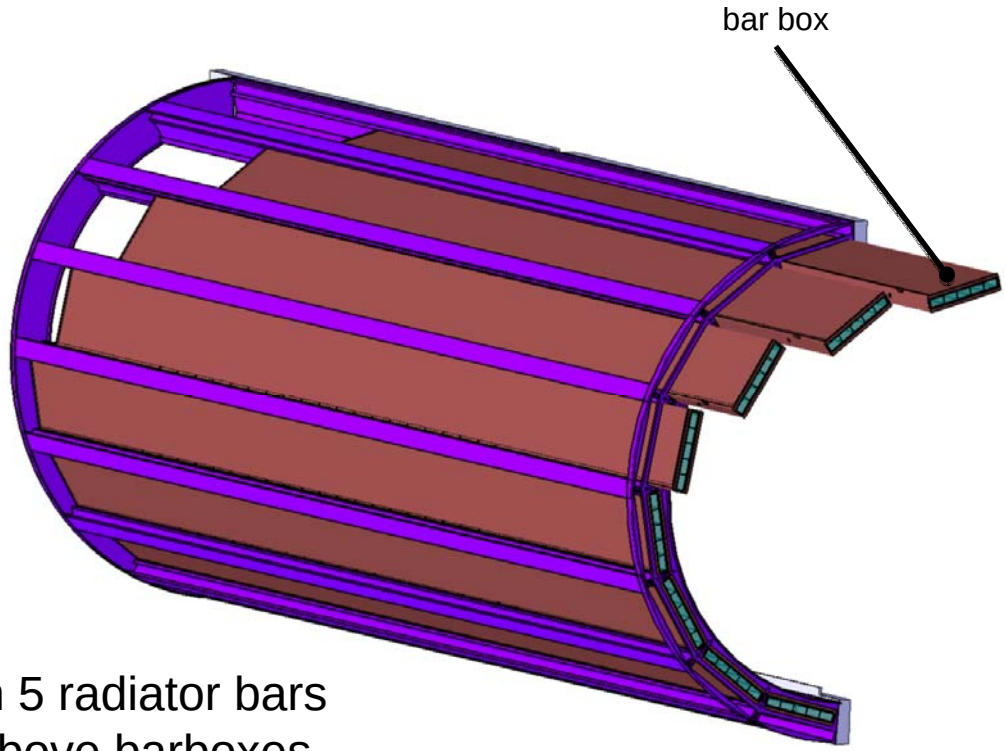
Radiator bars/SciTil support	
Internal radius	448mm
External radius	538mm
Total weight	> 300kg
z – position	-1190.... +1270mm
Δz	2460mm
bar dim.	32x17x2400mm

Mechanical Design Concept



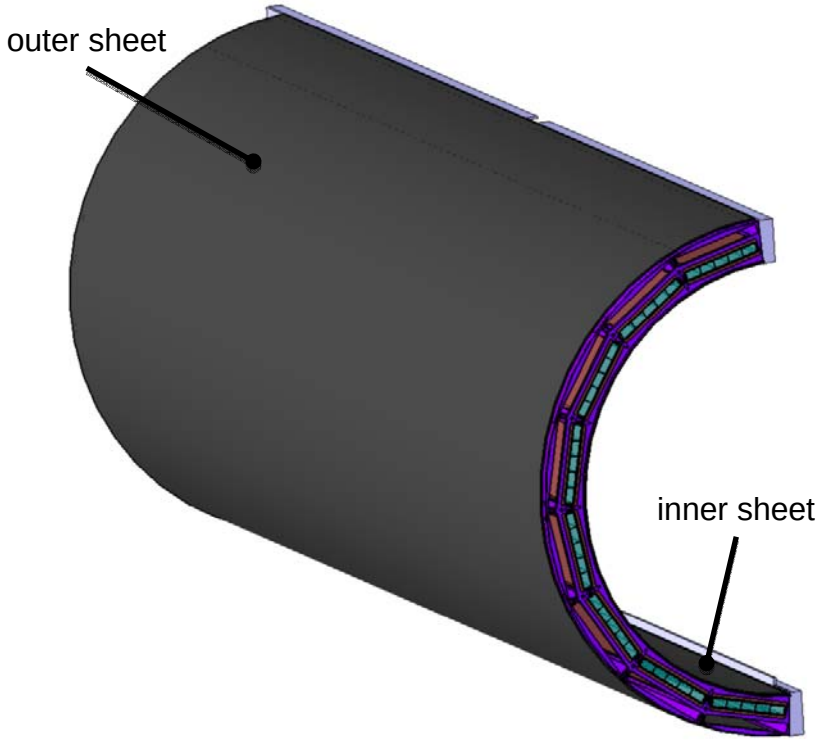
- BaBar based design
- Supported on two CT-rails
- Support-flange of back-mounted ring shared with GEM-Tracker
- Separated SciTil- /radiator bar slots
- Homogeneous radiation length profile
- Low mass material with high stiffness preferred: CFK

Mechanical Design Concept



- 16 barboxes populated with 5 radiator bars
- Independent SciTil boxes above barboxes
- Precise, repeatable positioning
- Boxes pre-assembled in cleanroom
- Installation with rotatable device

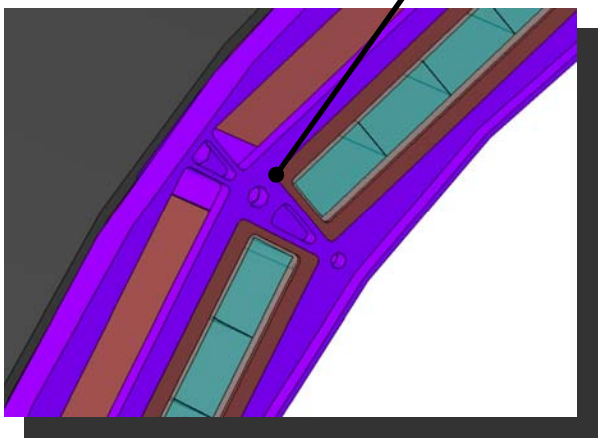
Mechanical Design Concept



- Thin inner/outer sheet to reach a higher stiffness
- Shape of the sheet depends on manufacturing process etc.
- No round, precise shape needed
- Openings in outer sheet for SciTil cablings etc.

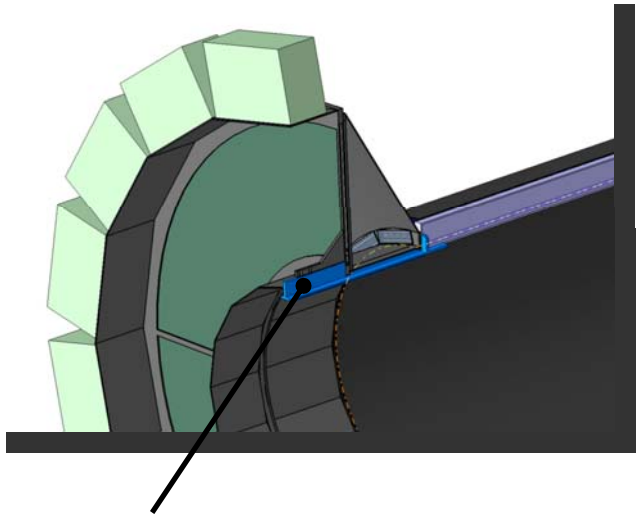
Mechanical Design Concept

Integrated supply lines



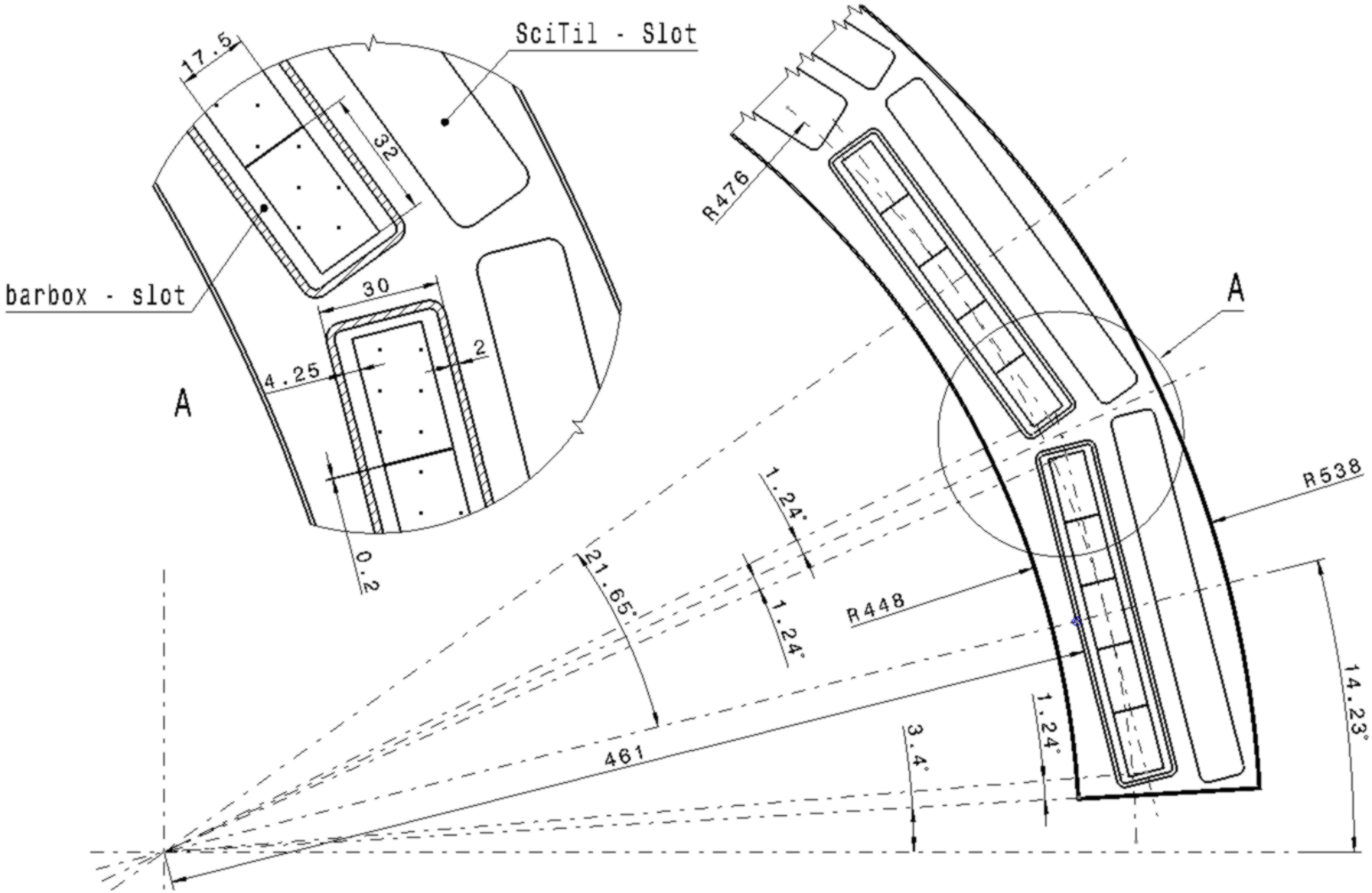
- Integrated supply lines in every guiding profile
- Usable for nitrogen-purging of all bar boxes to prevent soiling by outgassing of used materials
- Usable for a possible SciTil cooling-System

- STT rail integrated in the expansion volume support structure

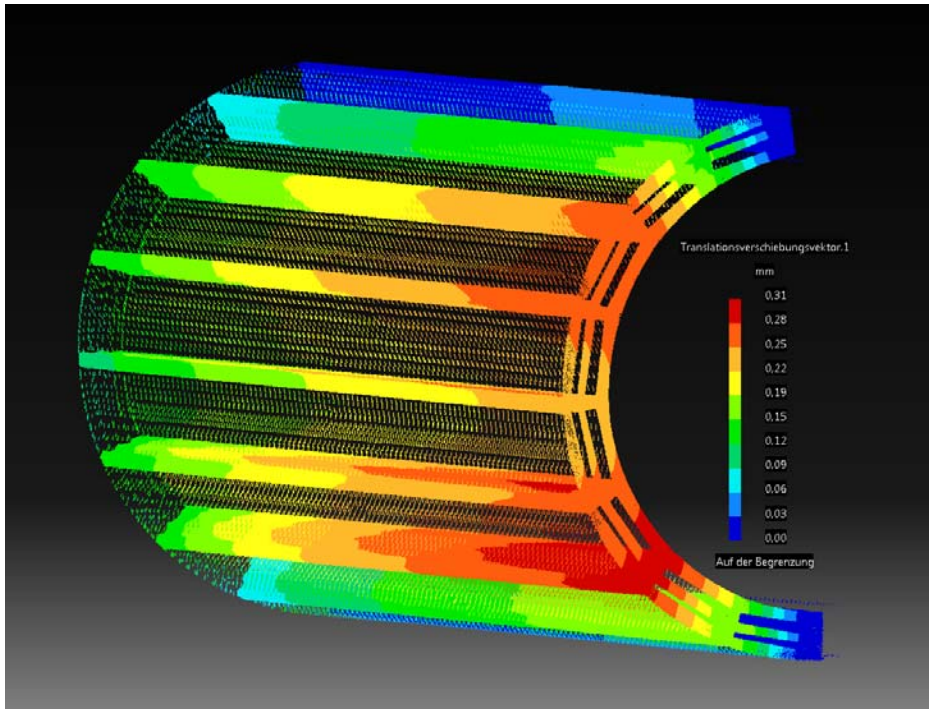


STT rail

Mechanical Design Concept



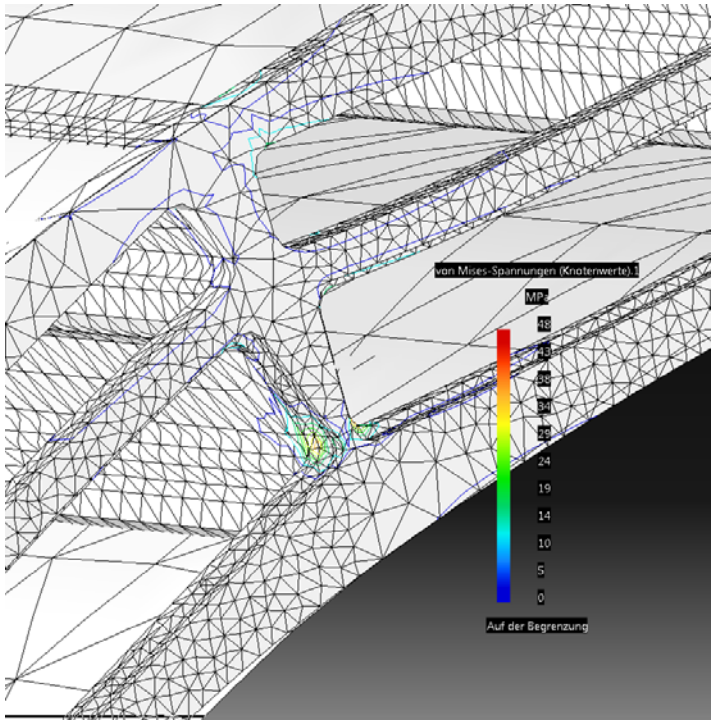
FEM analysis



	wall thickness
inner/outer sheet	1mm
half-rings	10mm
guiding ribs profile	1mm

- Goal: maximum deformation <0.5mm

FEM analysis

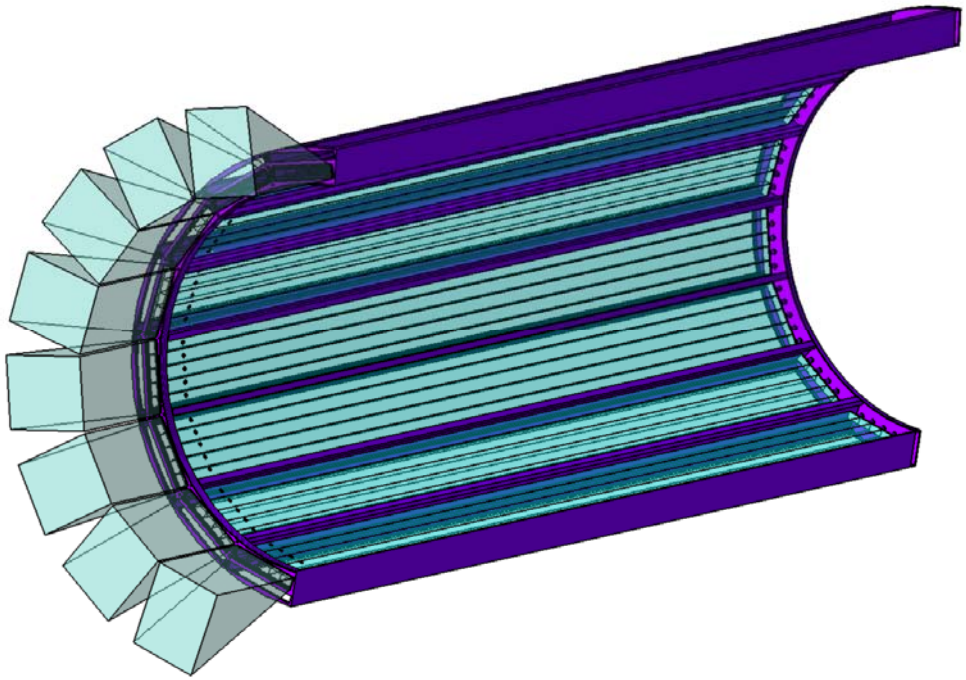


- Stress concentrations in the corners of the slots
- More things like mounting holes, threads e.g. needed in this area

Effects of potential modifications

Usage of prisms as expansion volume

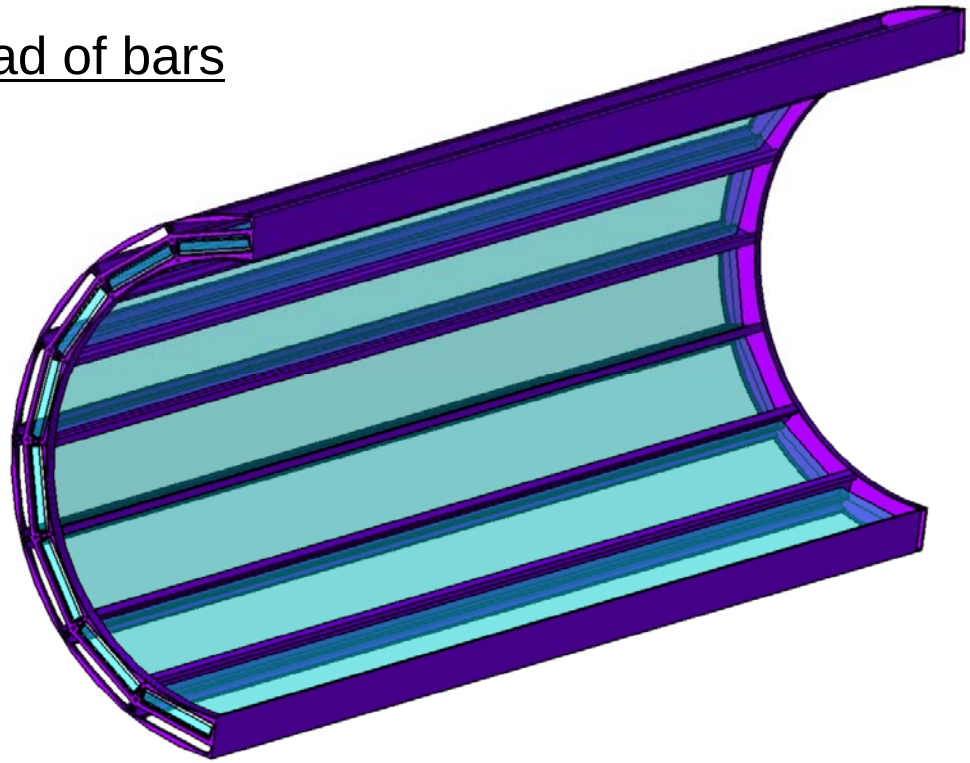
- Similar weight like oil volume
- More difficult to align!
- No specific mechanical design started until the decision is certified



Effects of potential modifications

Usage of quartz plates instead of bars

- Dimensions and weight equal to 5 bars
- Similar to align!
- Quickly integration in existing mechanical design anytime possible!



Outlook

- Detector components installation procedure
- Expansion volume support frame
- Detailed design of the barbox
- CFK barbox prototyp 2014