Mechanical design of the ITK

Jinyu Fu

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Stave of the ITK outer barrel

Truss structure : section 38 x 54 x 54 mm, L= 2280 mm

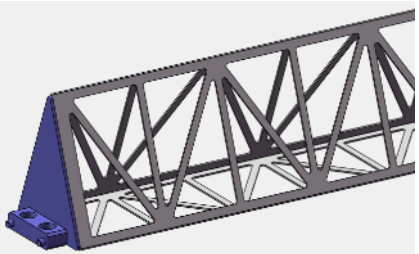
Material: CFRP M55 (M40 material also tried in static simulation)

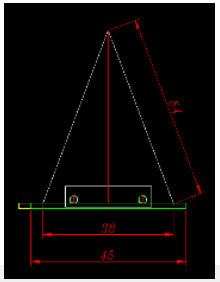
Thickness 0.5 mm

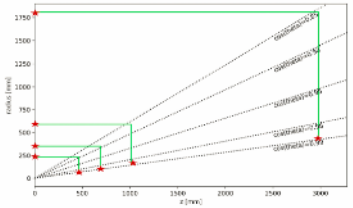
Material budget of the CFRP truss:

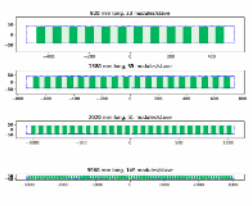
0.18% X_0 (smeared to 45 mm wide)

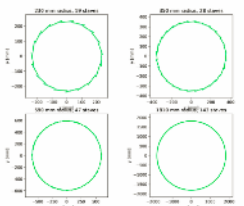
Layer	r [mm]	Z/2 [mm]	# staves	# modules
SIT 1	230	460	19	437
SIT 2	350	690	28	980
SIT 3	590	1010	47	2397
SET	1810	2980	143	21307

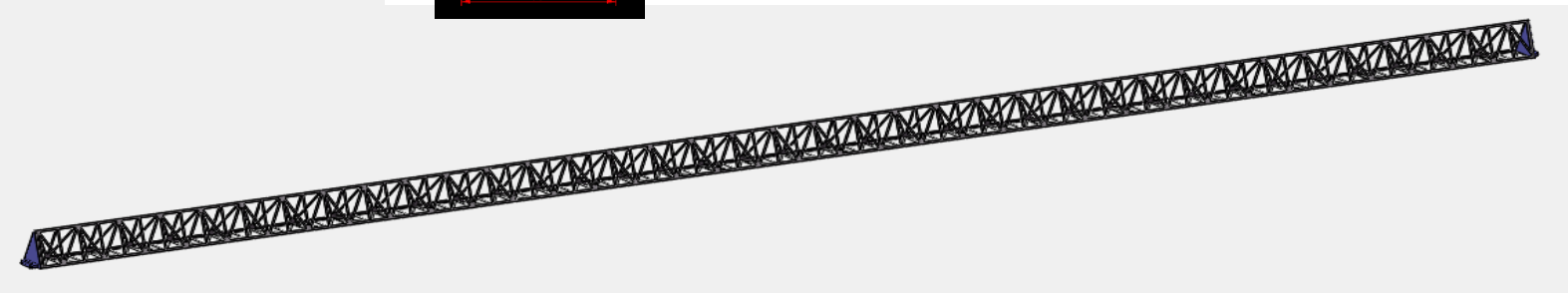












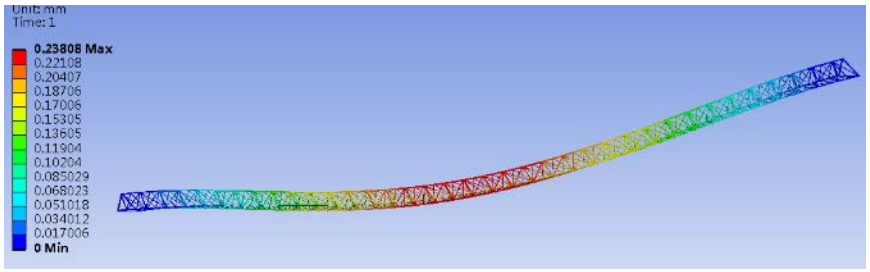
A wider stave design with 2 parallel modules (currently one module) under consideration?

Deformation

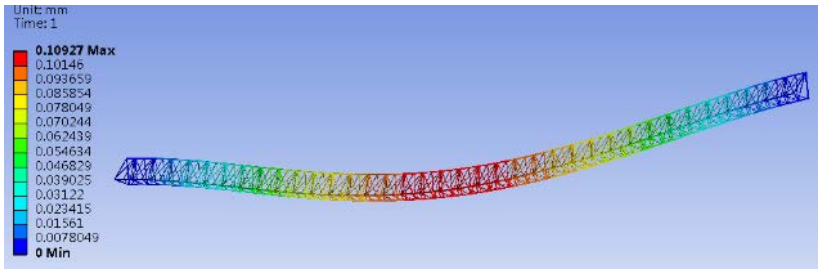
CFRP truss 78.7 g
Bare stave 107 g
Roughly estimated load : 144 g
Include: water cooling (pipe+water+CF+graphite), FPC, glue, chips, power bus?

CFRP truss vertically supported : 0.04 mm

Loaded stave horizontally supported: 0.24 mm

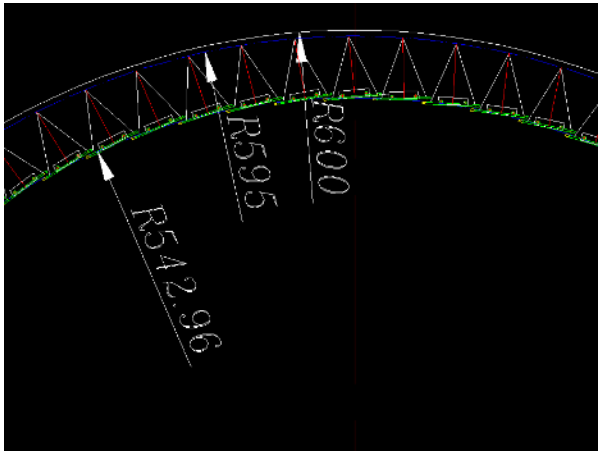


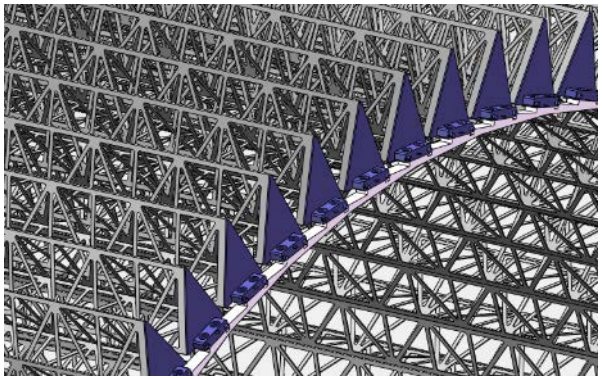
Loaded stave vertically supported: 0.11 mm



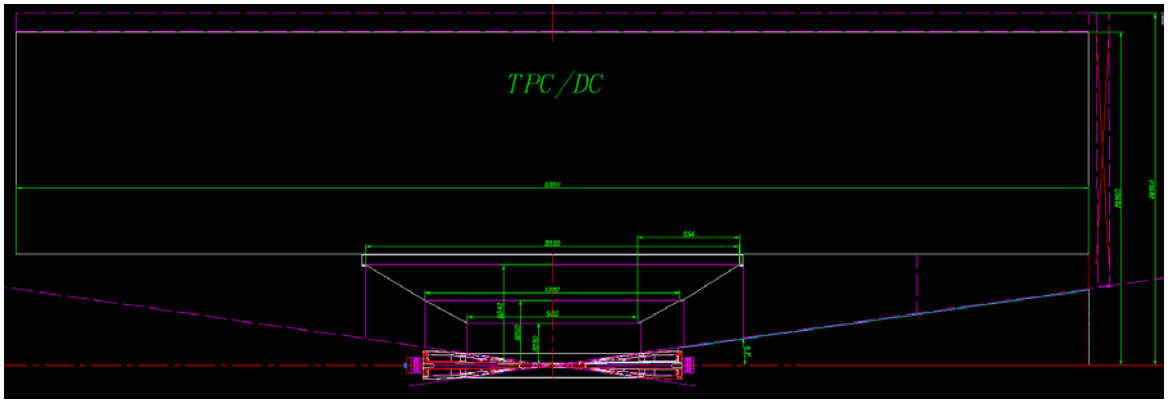
Outer barrel of the ITK

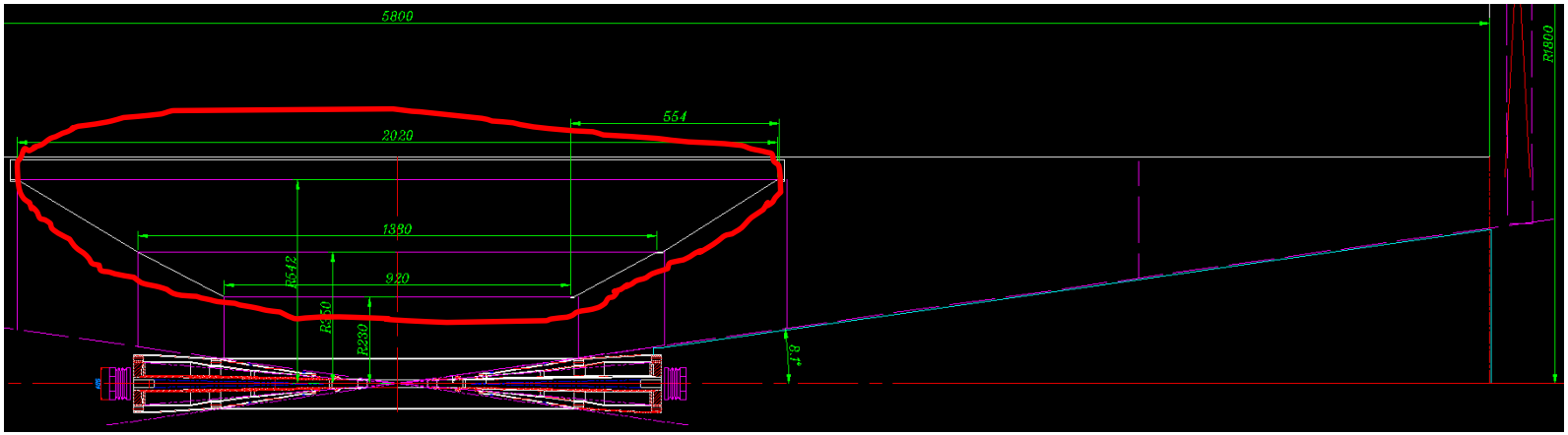
Number of Staves: 82
Gross weight: ~ 20.6 kg





ITK-barrels assembly



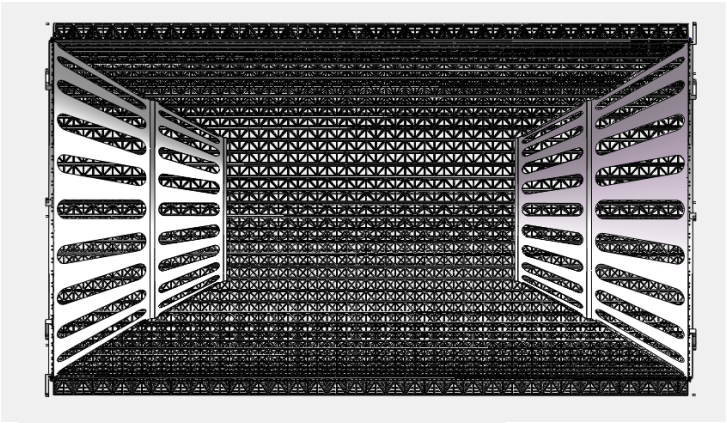


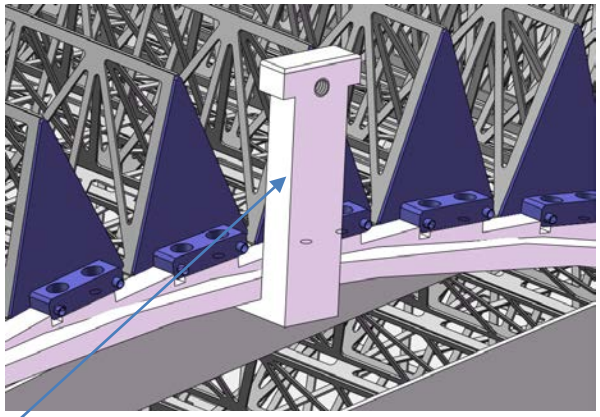
Plan to integrate 3 barrel to one assembly. The barrels assembly mounted on the inner side of the TPC/DC…?

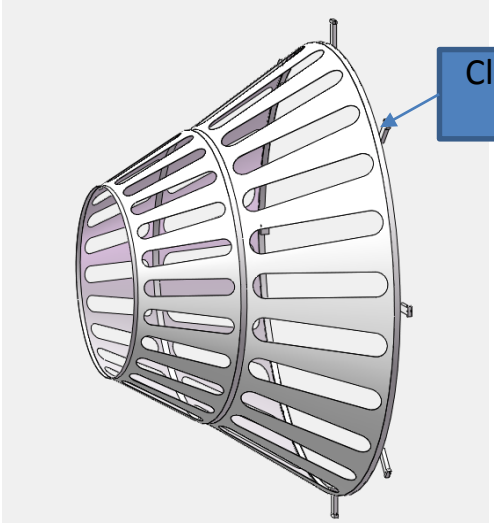
Endcaps: more input and discussion…?

Barrel support

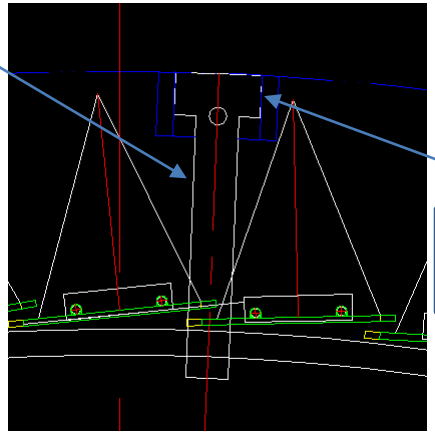
The snout shaped support design for 3 barrels assembly:







Claws for guide-sliding and fixation



Guide channel on TPC/DC?

FEA of the barrel support

Thickness 1 / 4 mm (shell/ring)

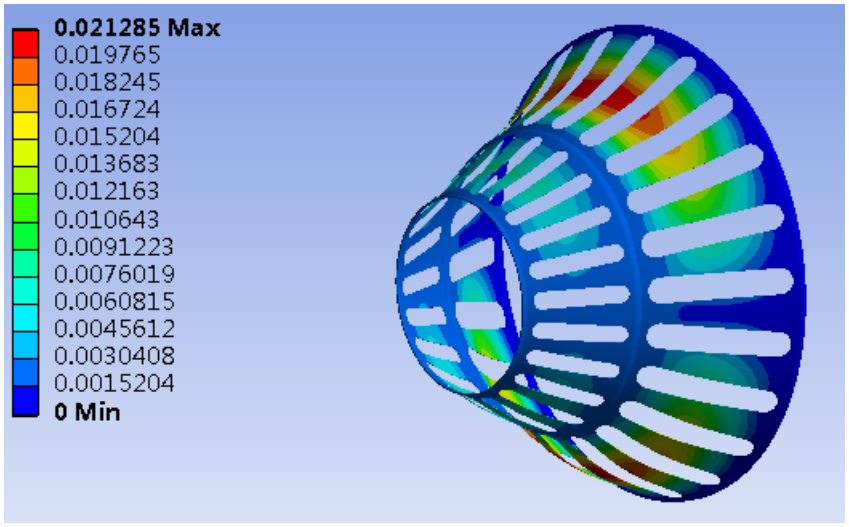
CFRP, Weight 1.97 kg

Load: 91/140/200 N (on the inner/middle/outer ring)

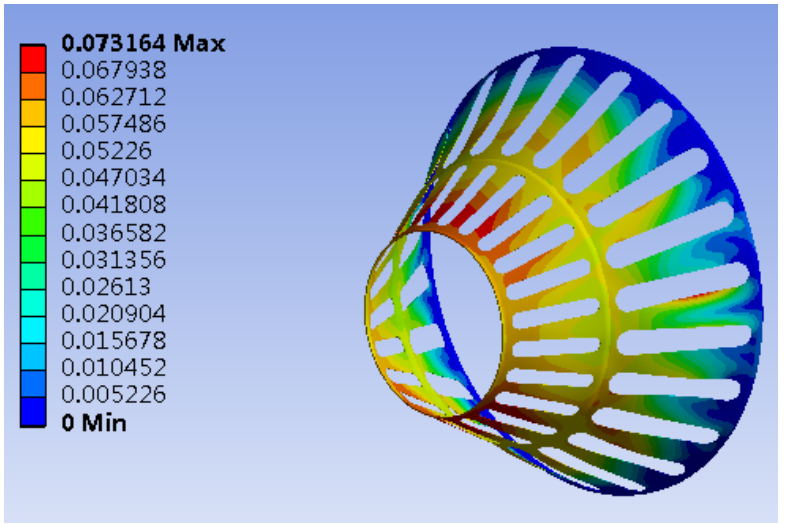
Intermediate fixing points on the outer ring

The given load resulted in small deformation:

Deformation mm - under self weight



Deformation mm - under full load

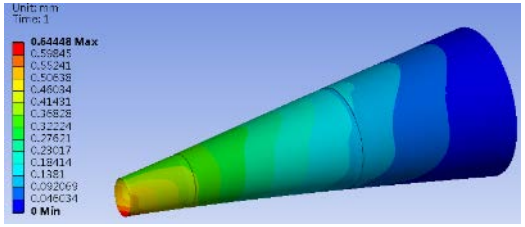


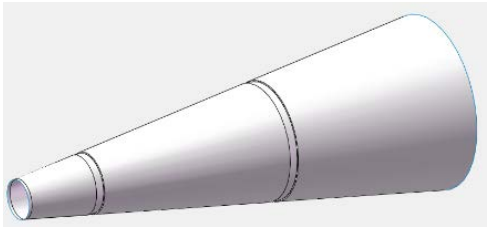
A scenario of ITK support

A very preliminary analysis based on a very conceptual design of the assumption that the endcaps and the beam pipe are supported by the conical support made of CFRP .

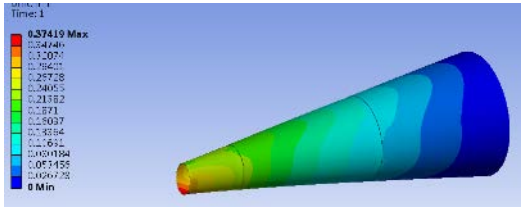
Two endcaps 300N, 350N; the free end 350N (weight of BP assembly)

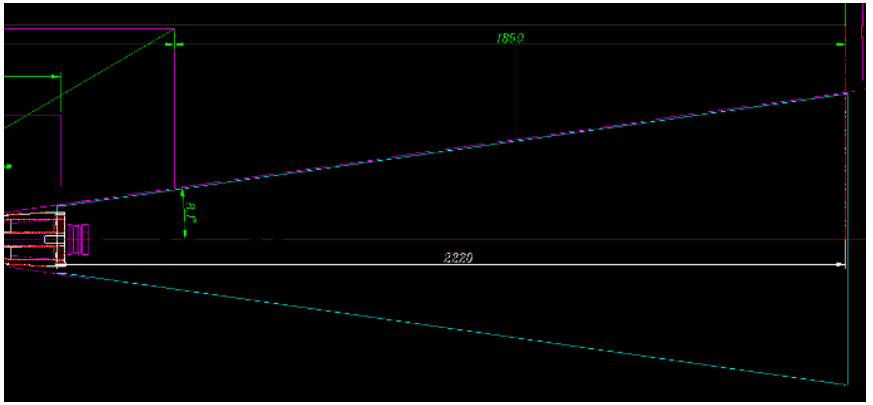
CFRP 1 mm thick the Max deformation 0.64 mm





CFRP 1.5 mm thick the max deformation 0.37 mm





This part can be deployed along the edge of or outside of the acceptance? --lower material budget.