Muon Warm Structure
Compare Analyses Report

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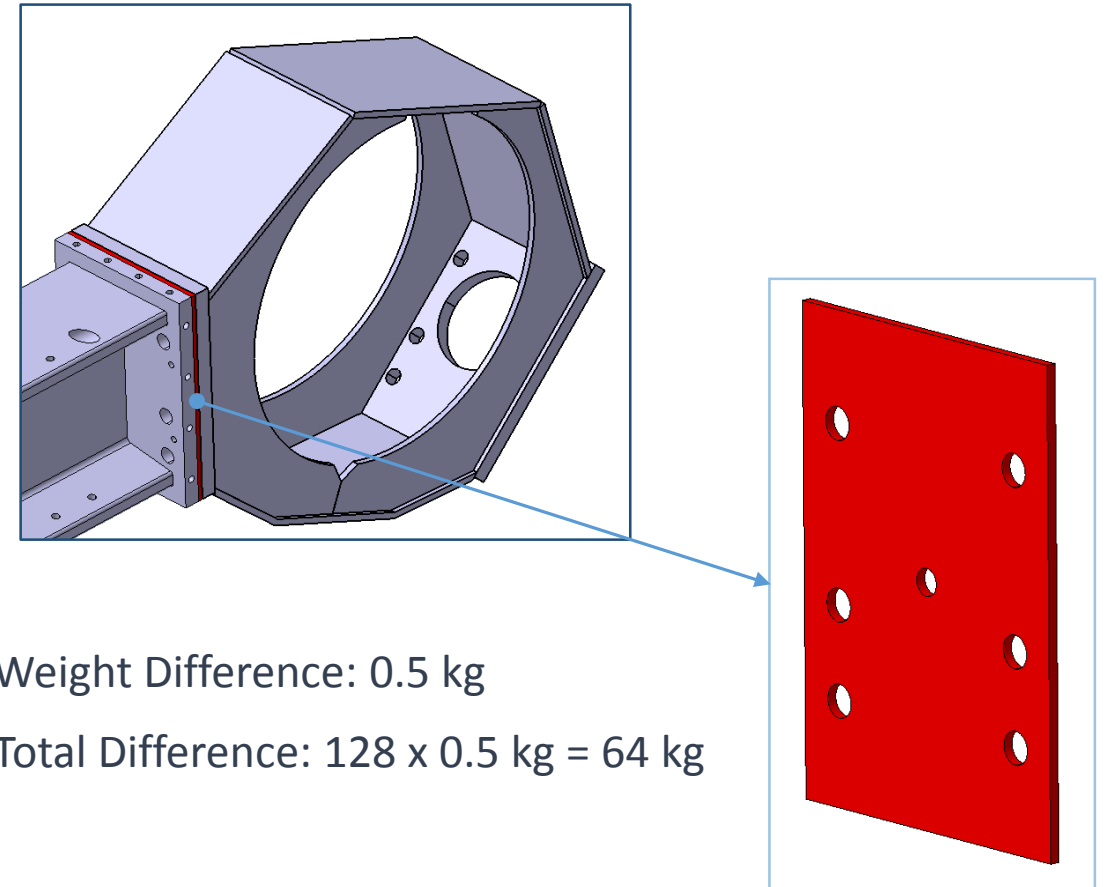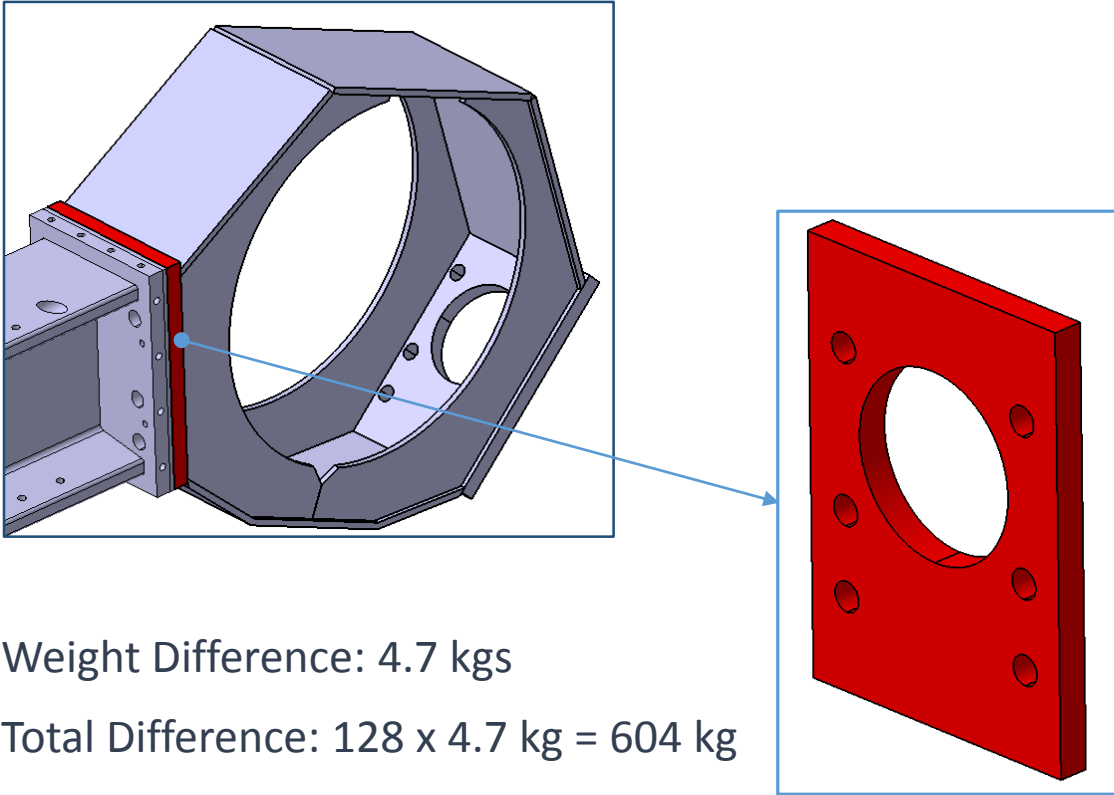
TSUTSKIRIDZE Niko
Georgian Technical University

ST0324344 TCn model => ST0969102 Reproduced model

- Holes were added:

Weight Difference: 4.7 kgs

Total Difference: 128 x 4.7 kg = 604 kg
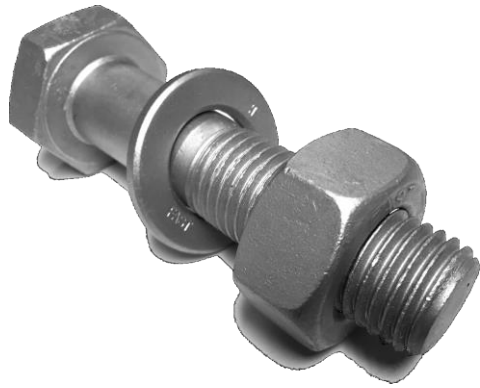
Weight Difference: 0.5 kg
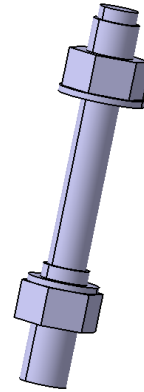
Total Difference: 128 x 0.5 kg = 64 kg

Reproduction of Smarteam Model

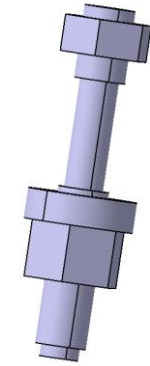## ST0324344 TCn model => ST0969102 Reproduced model

- Bolts were added:
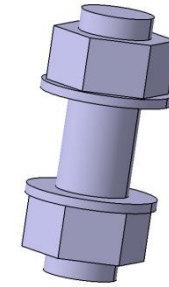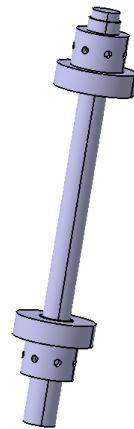
M36 Bolts

Mass   : 5.4 kg
Quantity : 768

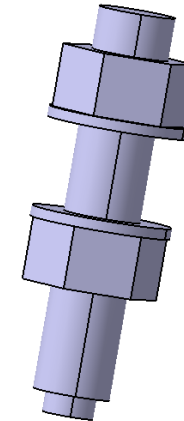Mass   : 2.9 kg
Quantity : 1'024

Mass   : 2.1 kg
Quantity : 740

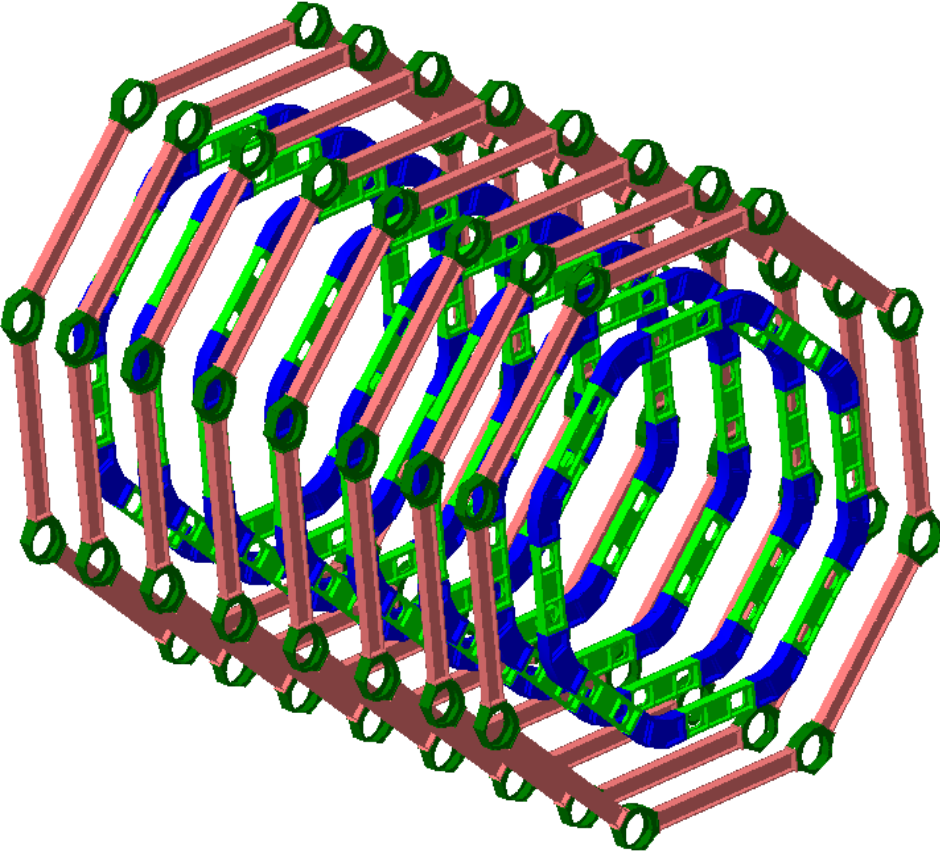Mass   : 6.5 kg
Quantity : 2'048

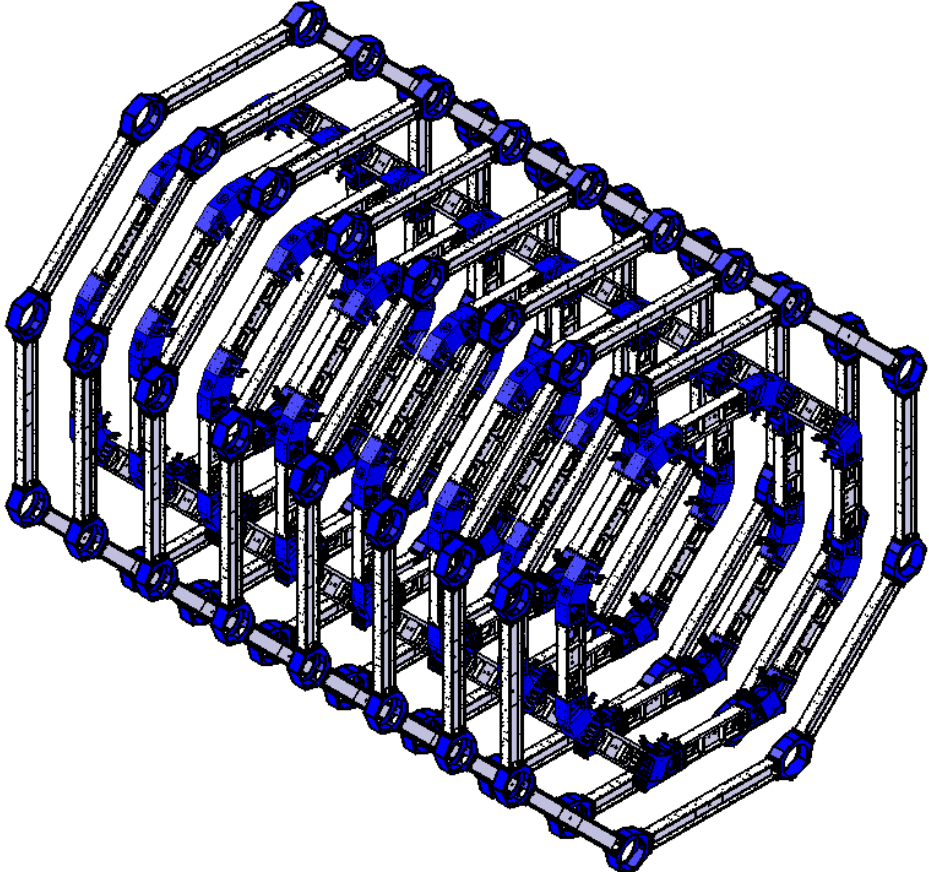Mass   : 2.5 kg
Quantity : 768

Total weight: 23'840 kg

Warm Structure's to be Checked in the Loop

Geant4: amdb_simrec.r.08.01

CATIA: ST0969102

VS

Results of Compare Checking

	Name	Geant4		SmarTeam		Difference		
		Volume (m³)	Mass (kg)	Volume (m³)	Mass (kg)	Volume (m³)	Mass (kg)	%
#01	StrutBar	23.67	63'909	27.92	75'384	-4.25	-11'475	15%
#02	Voussoir	25.36	68'472	24.764	66'862	0.596	1'610	3%
#03	Plate Between Voussoirs and Connecting Boxes	-	-	0.825	2'227.5	-825	-2'227.5	100%
#04	Wing Box	5.86	46'118	5.26	42'080	0.6	4'038	10%
#05	Connectiong Box	31.86	86'022	33.31	89'937	-1.45	-3'915	4%
#06	Bolts	-	-	2.98	23'840	-2.98	-23'840	100%
#07	ConboxShaft	0.316	853.2	0.312	1397.7	0.004	-544.5	39%

Total Discrepancy :   40%

#01: StrutBar

Geant4

A - A

64X
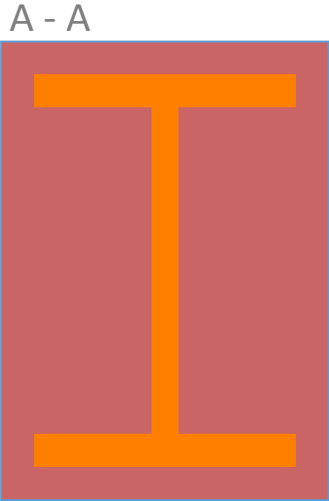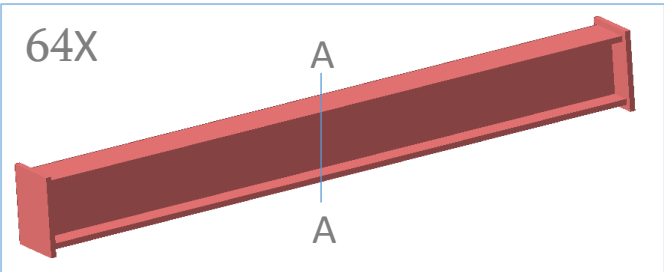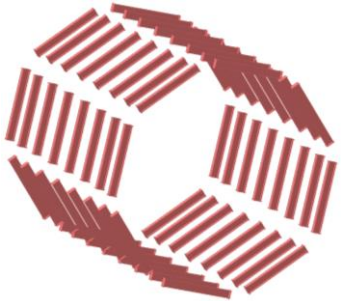
Volume (m³)	23.67
Mass (kg)	63'909
Material	Aluminum
Density (kg/m³)	2'700

CATIA

A - A
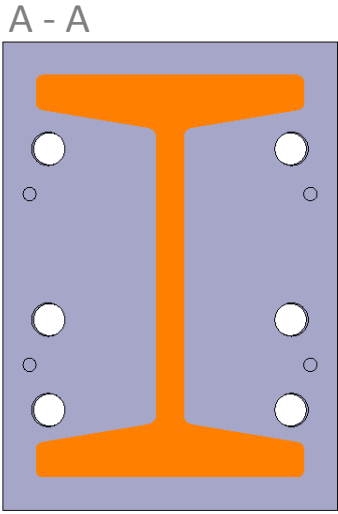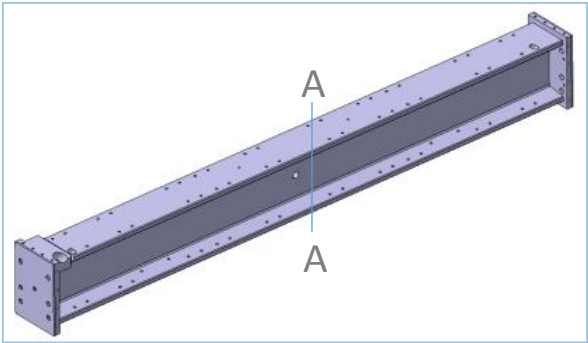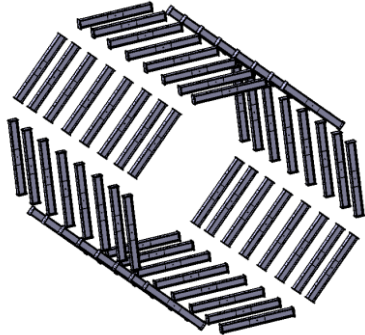
Volume (m³)	27.92
Mass (kg)	75'384
Material	Aluminum
Density (kg/m³)	2'700

Diff: -11'475 kg

#02: Voussoir

Geant4
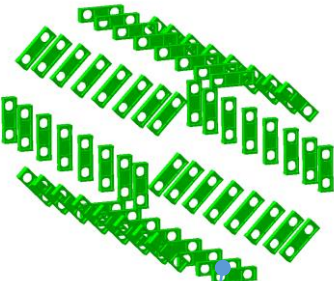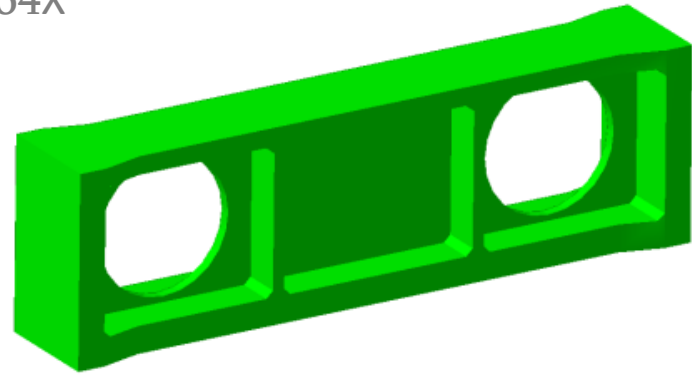
Volume (m³)	25.36
Mass (kg)	68'472
Material	Aluminum
Density (kg/m³)	2'700

CATIA
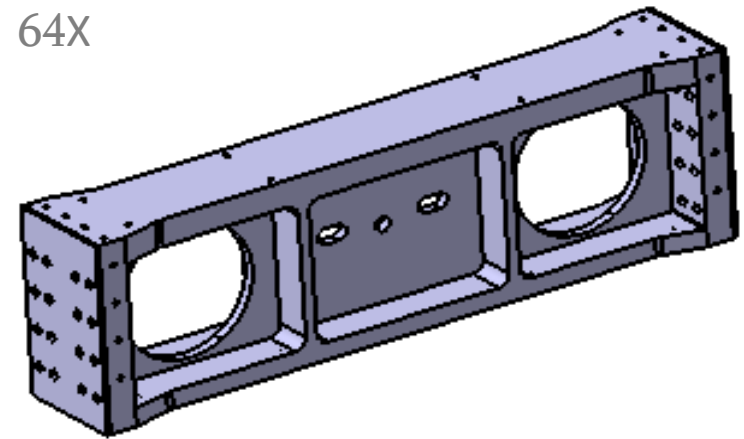
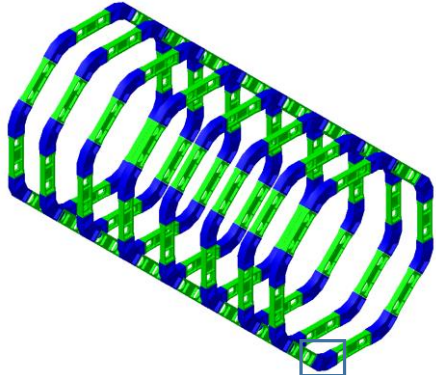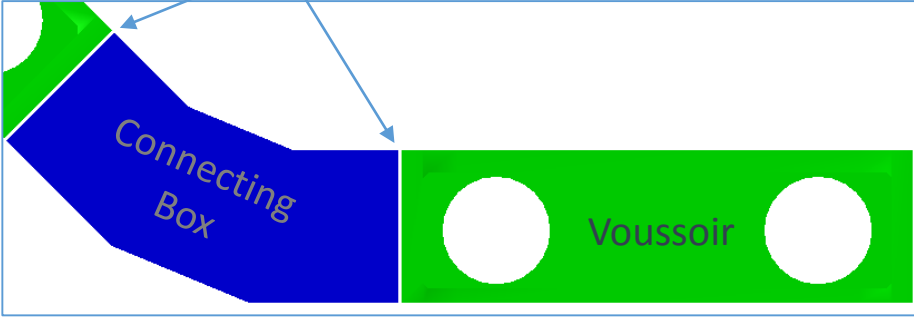|	
Volume (m³)	24.764
Mass (kg)	66'862
Material	Aluminum
Density (kg/m³)	2'700

Diff: +1'610 kg

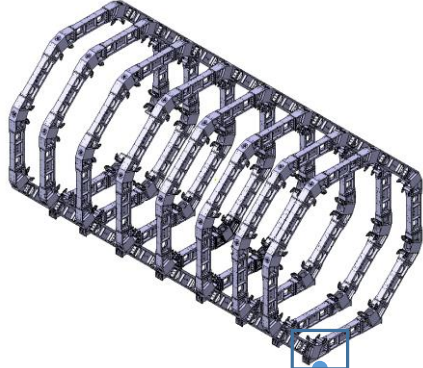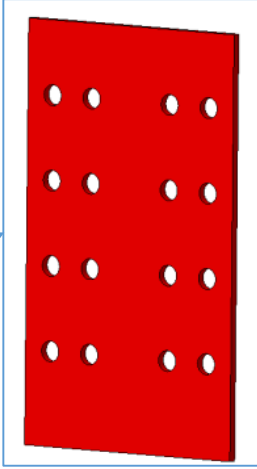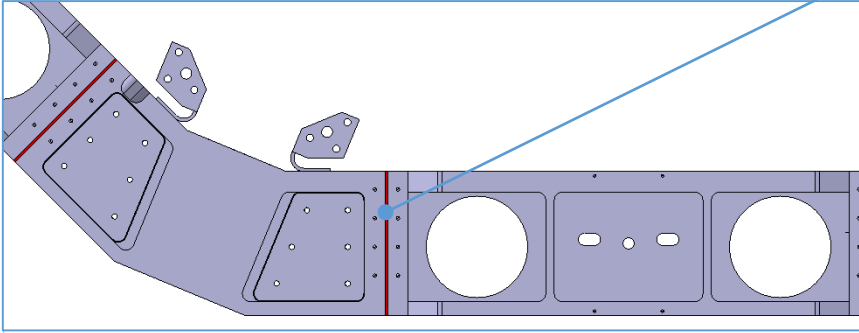# #03: Plate Between Voussoirs and Connecting Boxes

Geant4

CATIA

16.7 mm Gap

Connecting Box

Voussoir

128X

Diff: -2'227.5 kg

Geant4	
Volume (m³)	
Mass (kg)	**Don't Exists in Geant4**
Material	
Density (kg/m³)	

CATIA	
Volume (m³)	0.825
Mass (kg)	2'227.5
Material	Aluminum
Density (kg/m³)	2'700

#04: Wing Box
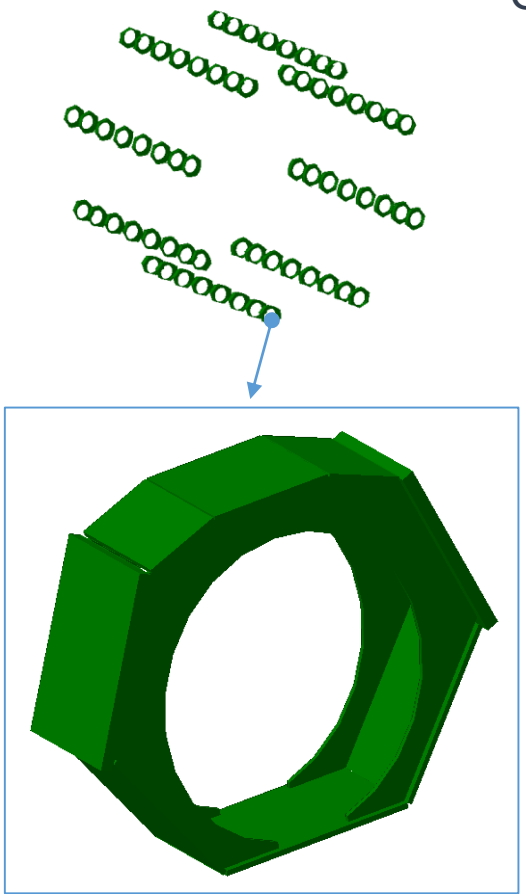
Geant4

64X

Volume (m³)	5.86
Mass (kg)	46'118
Material	Iron
Density (kg/m³)	7'870
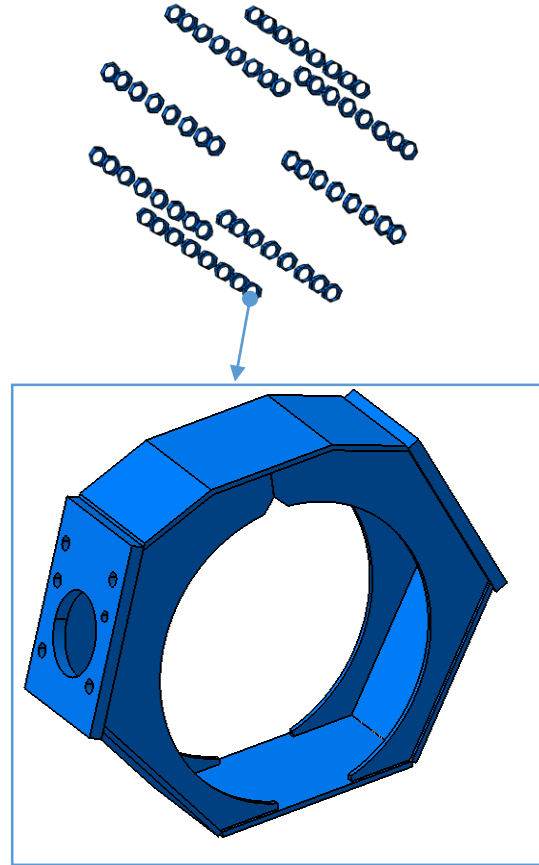
Diff: +4'038 kg

CATIA

64X

Volume (m³)	5.26
Mass (kg)	42'080
Material	Stainless Steel
Density (kg/m³)	8'000

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#05: Connecting Box

Geant4
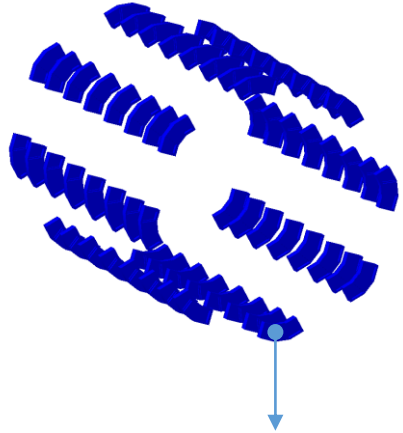
64X
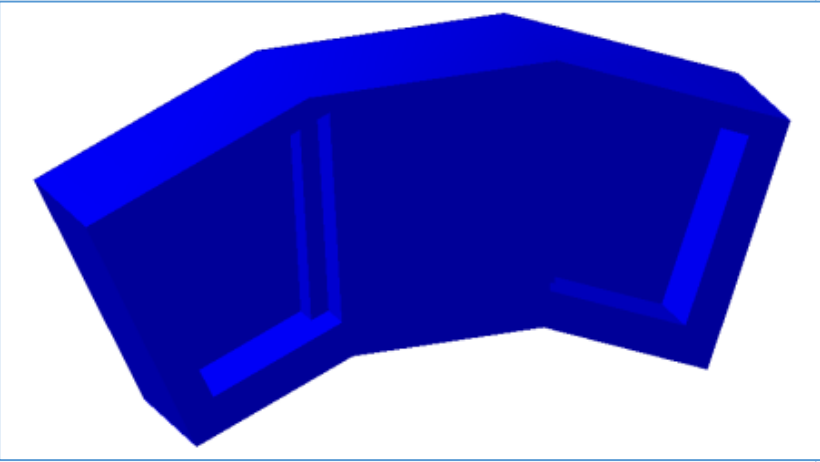
Volume (m³)	31.86
Mass (kg)	86'022
Material	Aluminum
Density (kg/m³)	2'700
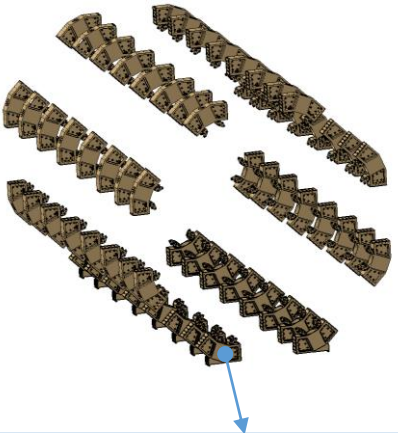
CATIA

64X
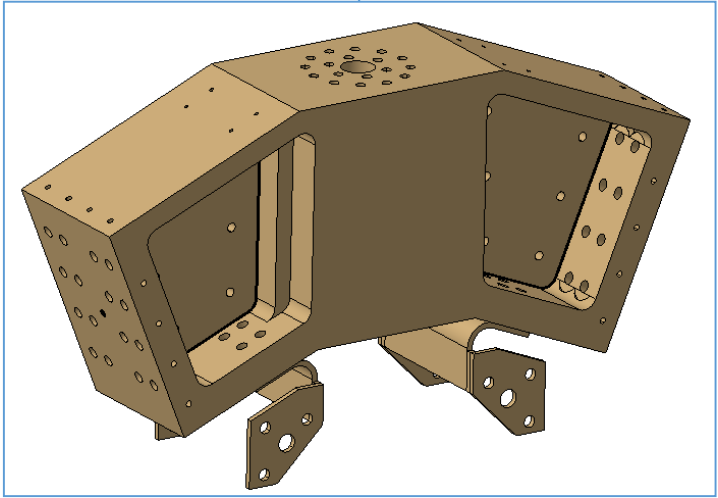
Volume (m³)	33.31
Mass (kg)	89'937
Material	Aluminum
Density (kg/m³)	2'700

Diff: -3'915 kg

#06: Bolts

Geant4

Don't Exist

Volume (m³)	
Mass (kg)	
Material	
Density (kg/m³)	

CATIA
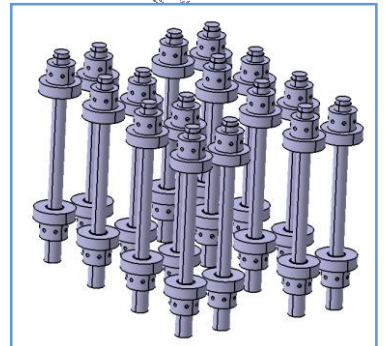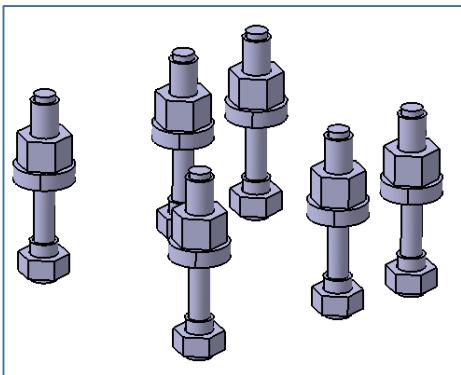
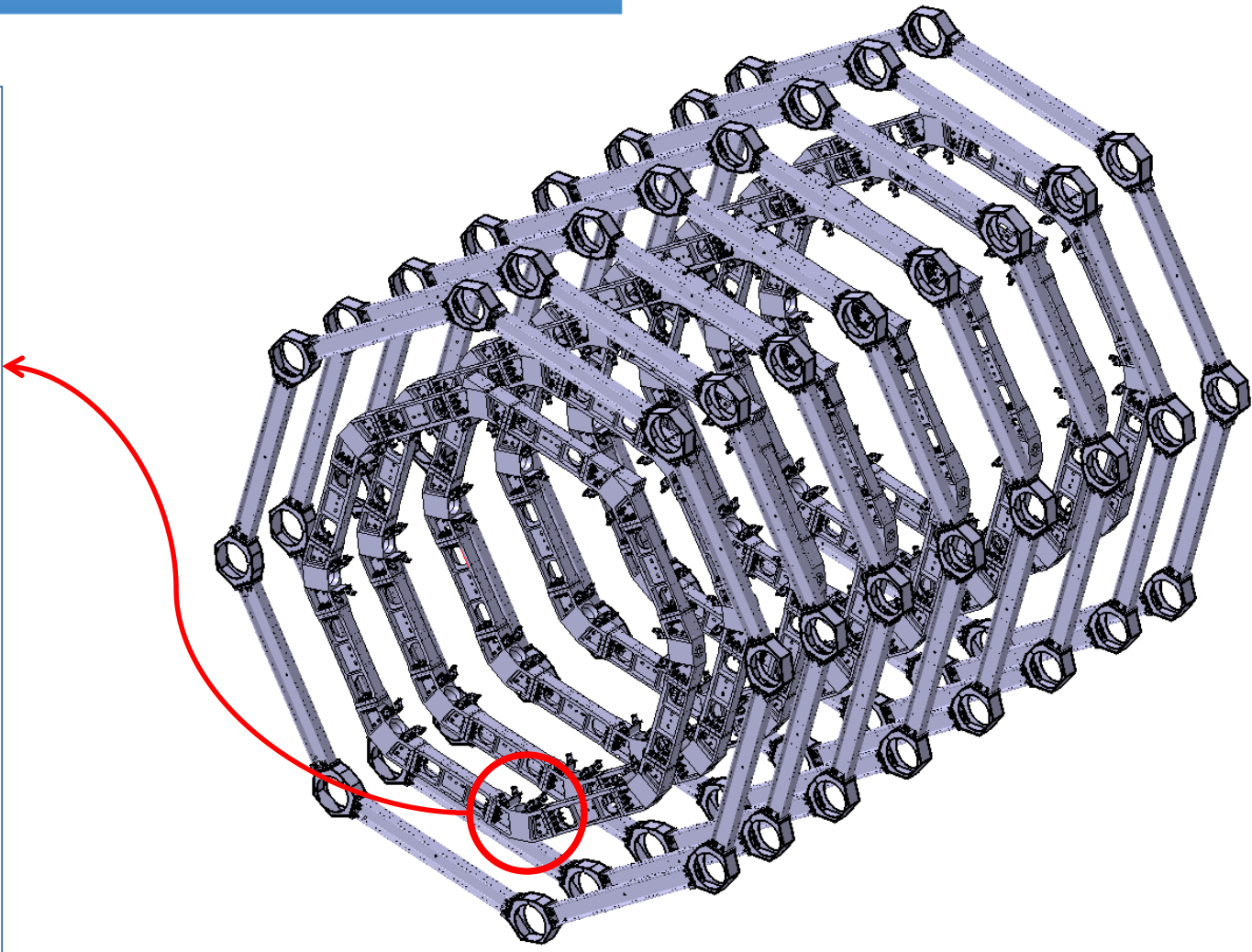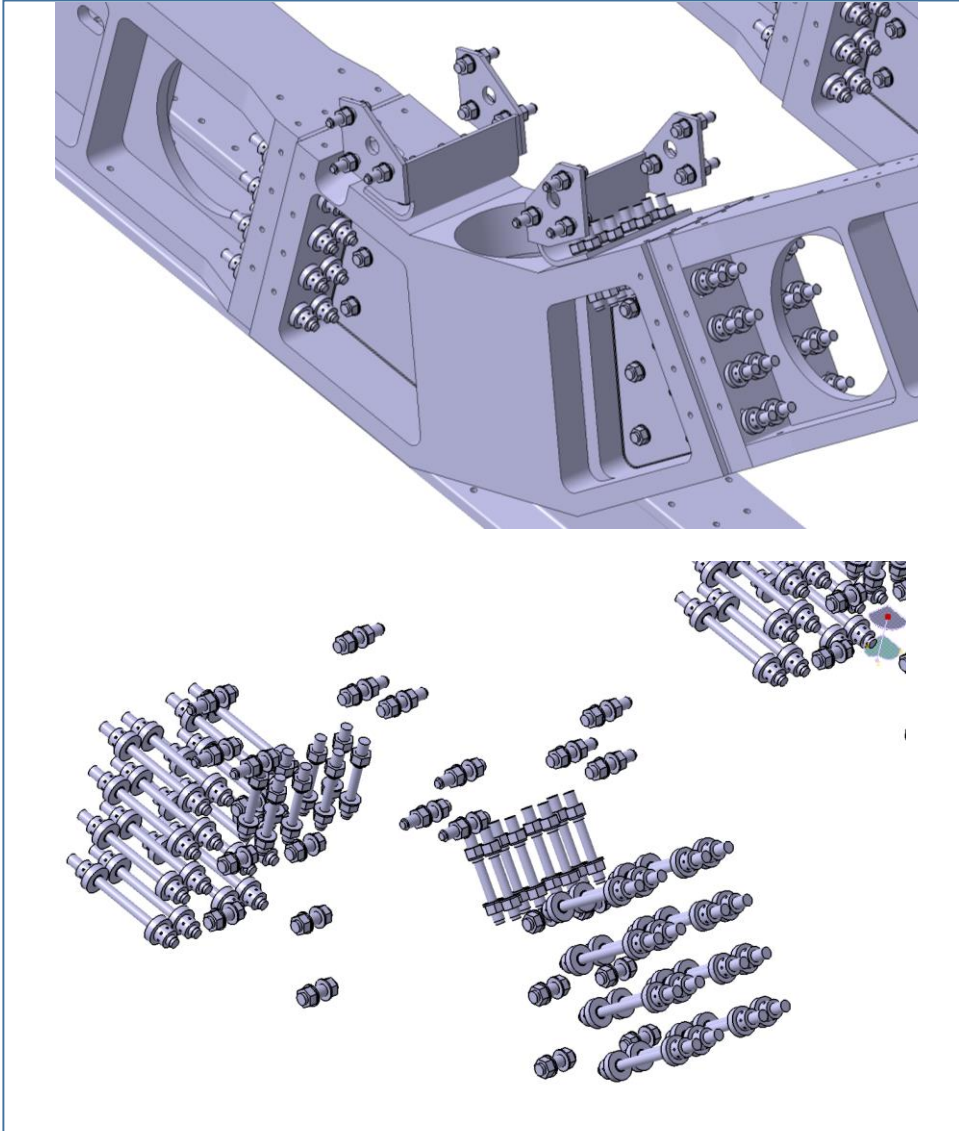| Volume (m³)	2.98
Mass (kg)	23'840
Material	Stainless Steel
Density (kg/m³)	8'000

Diff: -23'840 kg

#06: Bolts

Orientation in Space
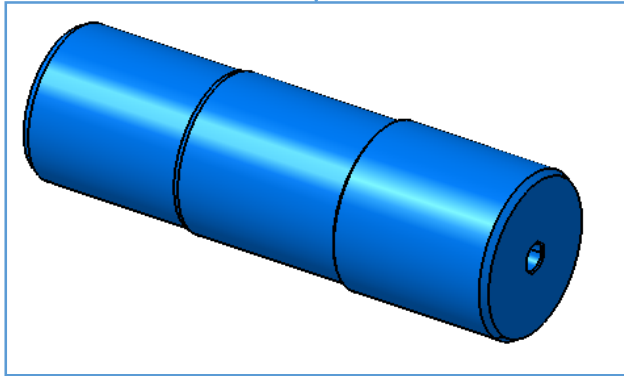
#07: ConboxShaft

Geant4

64X
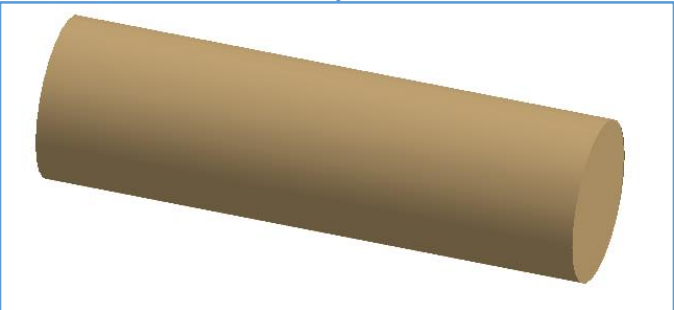
Volume (m³)	0.316
Mass (kg)	853.2
Material	Aluminum
Density (kg/m³)	2'700

CATIA

64X

Volume (m³)	0.312
Mass (kg)	1397.7
Material	Titan TA5E-ELI
Density (kg/m³)	4'480

Diff: -544.5 kg

Integration
Conflicts Checking

C1: Δ=32mm

C2: Δ=0mm

Geant4

SmarTeam

32.08 mm
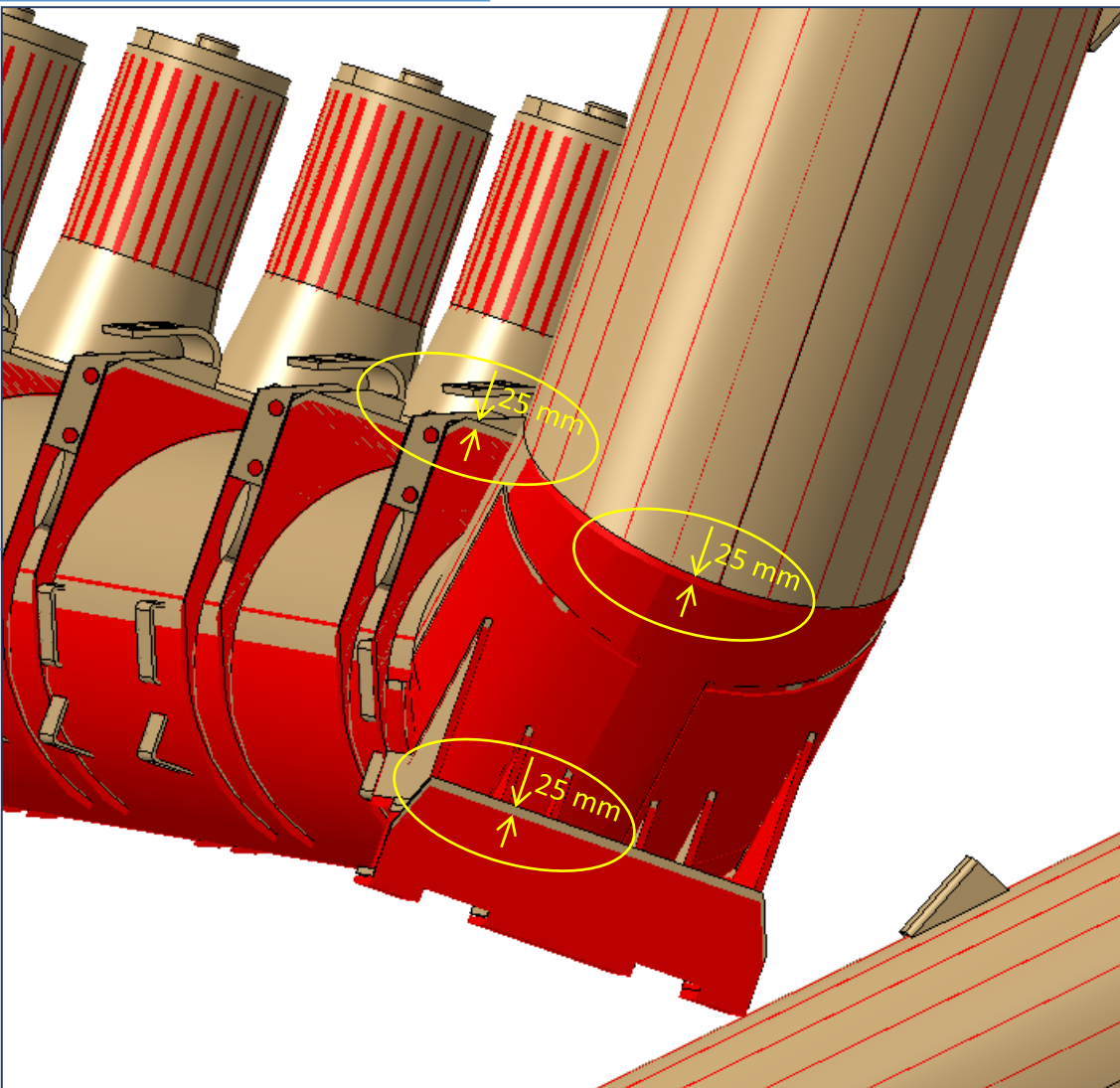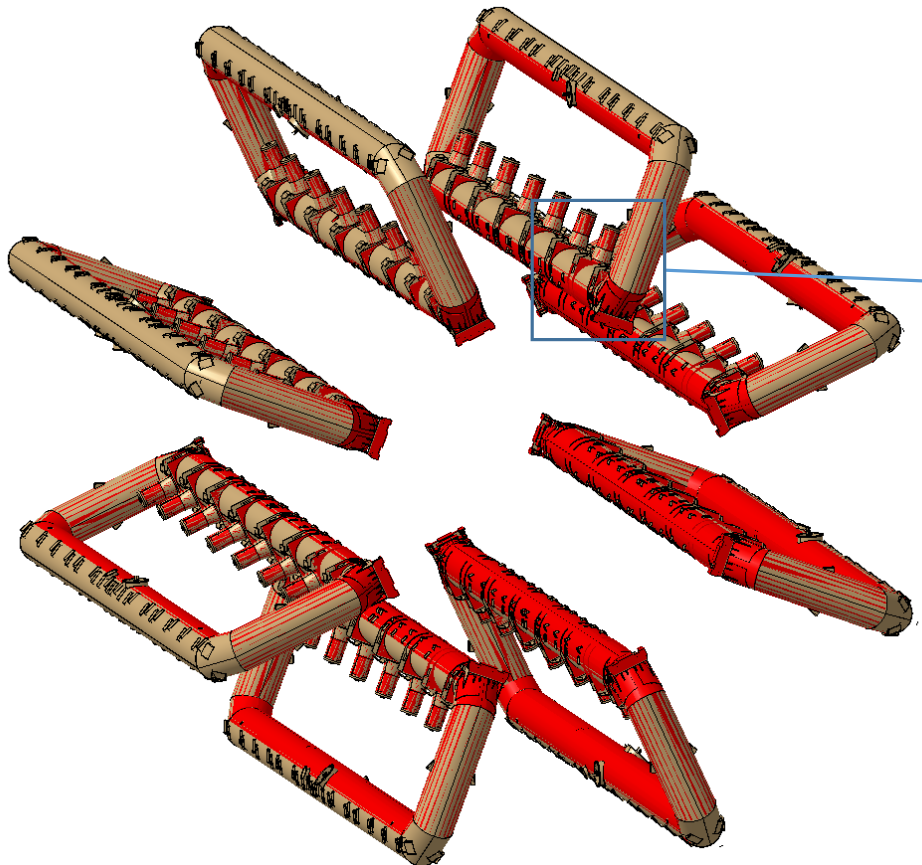
Outer ring is lowered down on 32mm in Geant
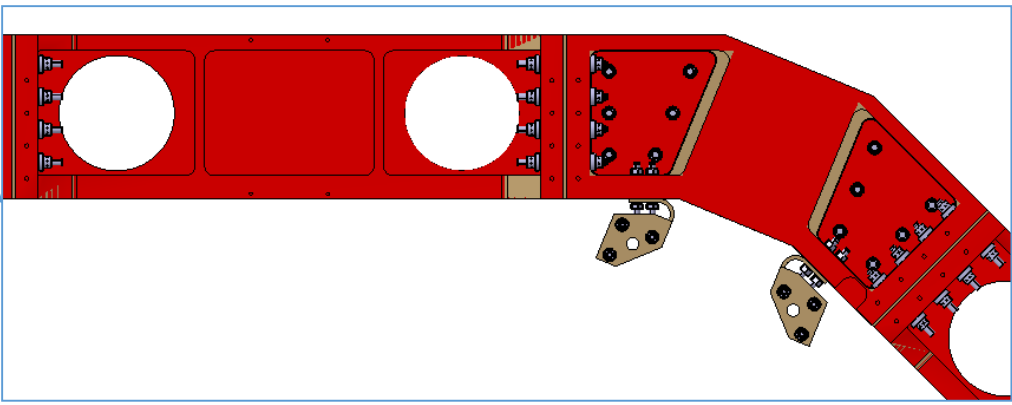
Voussoirs and Connecting Boxes are positioned correctly
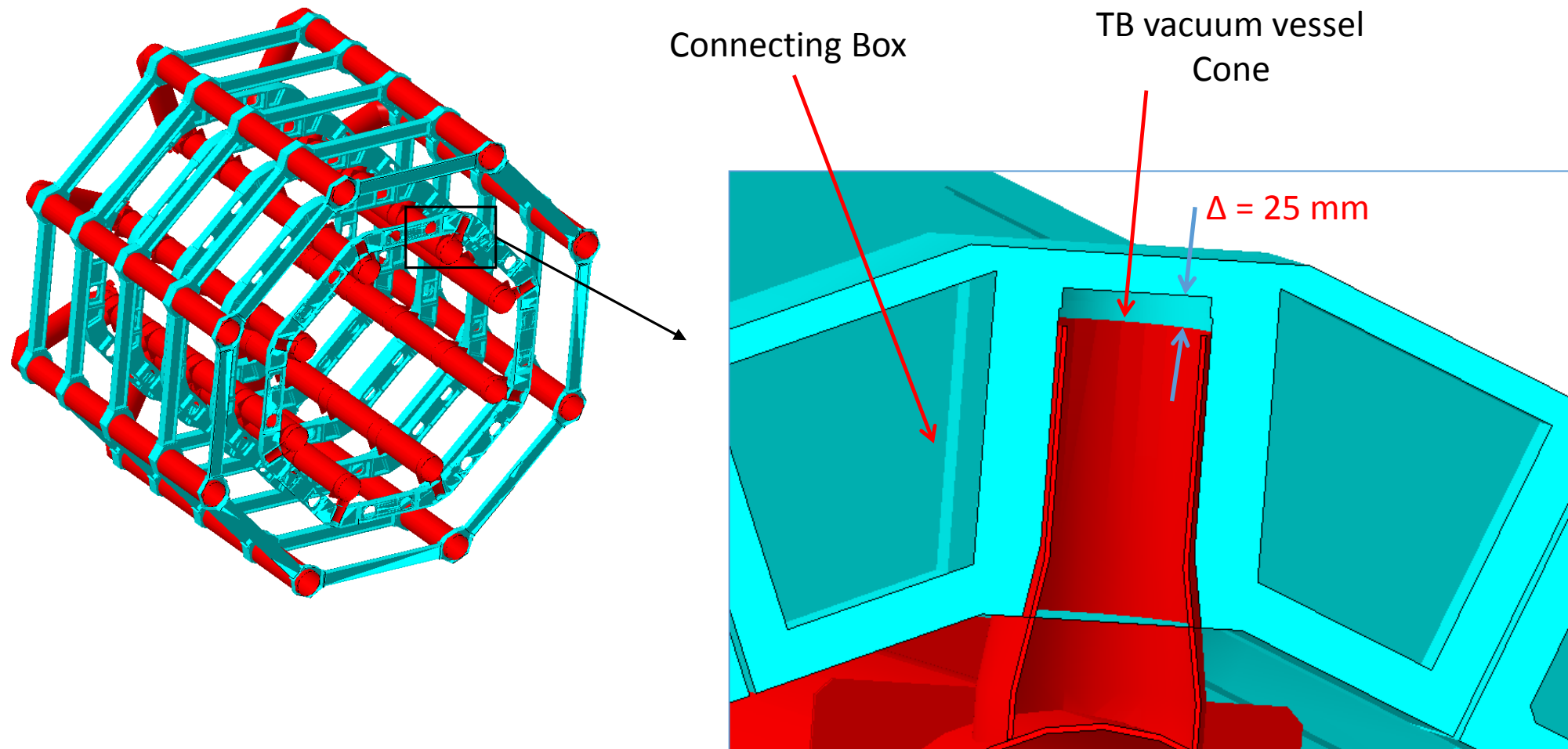
After-effect #01: Coils are lowered down on 25mm in Geant
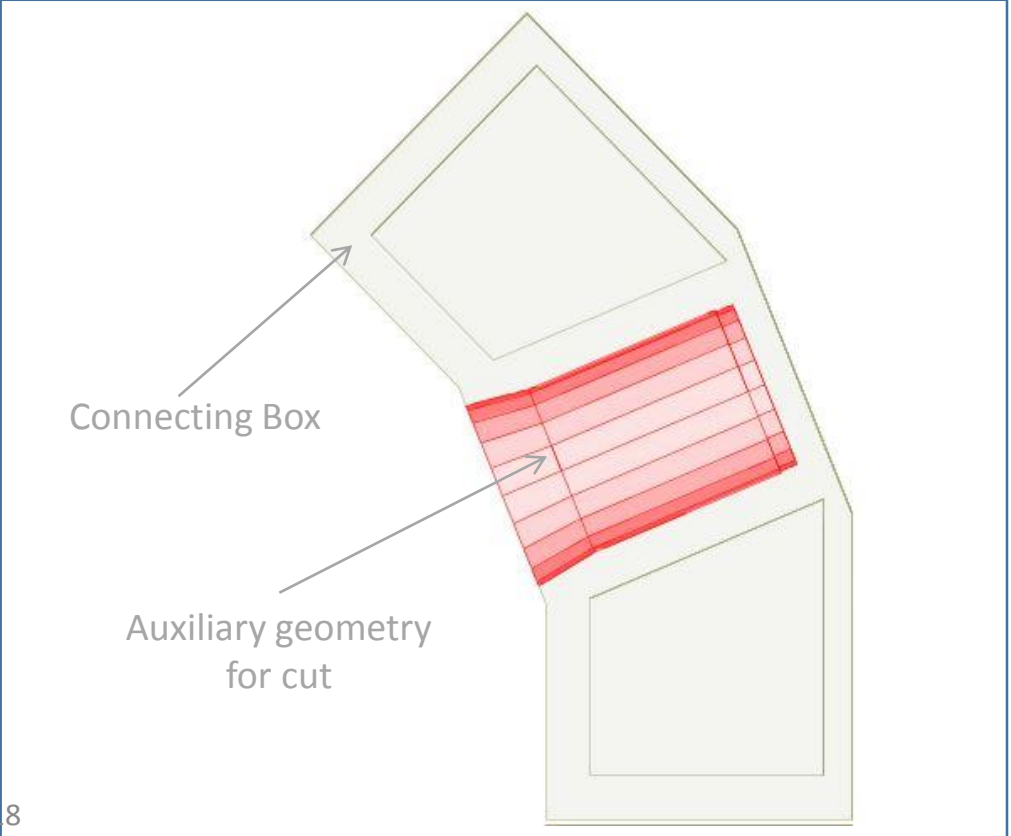
Issue#01: Warm Structure Displacement

After-effect #02: Coils geometry are identical in CATIA and Geant. Thus some wrong gaps were expected in inner ring (C2). After precise investigation we found wrong gaps (25mm) between coils and Connection boxes in inner ring.

Connecting Box
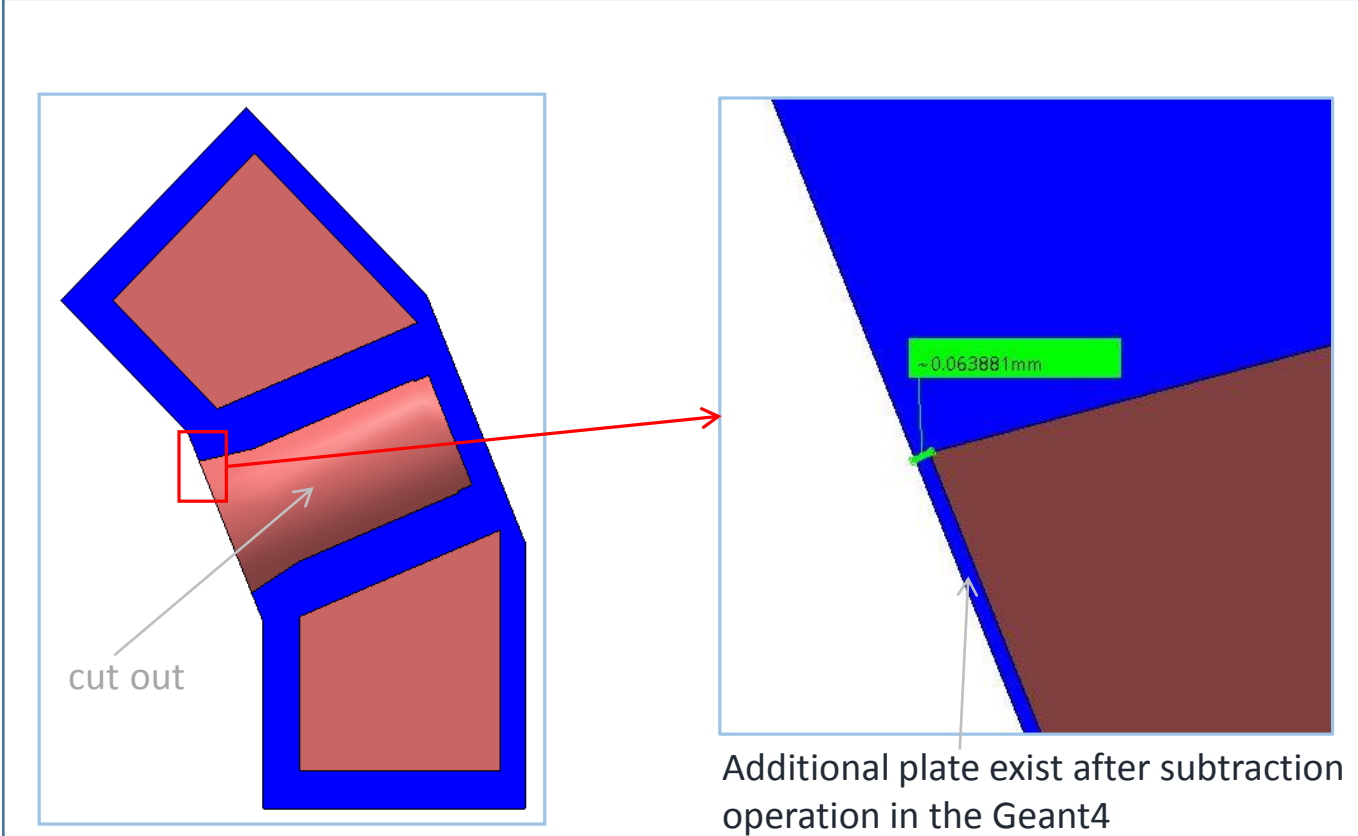
TB vacuum vessel Cone

Δ = 25 mm

Issue#02: Additional Plate in Connecting Box

This issue hopefully is coming from visualization side and not from geometry side. However it is always more reliable to subtract volume by bit larger volume when it is bounded with open surface. So we strongly recommend to modify size of auxiliary geometry (red volume) in XML.

Before Cut

Connecting Box

Auxiliary geometry for cut

After Cut

cut out

~0.063881mm

Additional plate exist after subtraction operation in the Geant4

Thanks!

Comments are welcomed

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