Development of MDT/TGC as-Built Descriptions for Investigation of Data/Monte-Carlo Discrepancies

SCGCCW'2014
South Caucasus Software / Computing Workshop & Tutorial
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Outline

- **BW MDT Supports Analysis**
- **Compare Analysis Between CATIA and Geant4 Models of BW MDT geometry**
- **Compare Analysis Between CATIA and Geant4 Models of BW TGC geometry**

Sources

Geometry parts have been created from CDD Drawings:

1. ATLMHHBM_0001
2. ATLMHHBM_0002
3. ATLMHHBM_0003
4. ATLMHHBM_0008
5. ATLMHHBM_0009
6. ATLMHHBM_0010
7. ATLMHHBM_0011
8. ATLMHHBM_0013
9. ATLMHHBM_0063
10. ATLMHHBM_0064
11. ATLMHHBM_0065
12. ATLMHHBM_0066
13. ATLMHHBM_0068
14. ATLMHHBM_0070
15. ATLMHHBM_0073
16. ATLMHHBM_0074
17. ATLMHHBM_0075
18. ATLMHHBM_0076
19. ATLMHHBM_0077
20. ATLMHHBM_0080
21. ATLMHHBM_0081
22. ATLMHHBM_0082
23. ATLMHHBM_0084
24. ATLMHHBM_0091
25. ATLMHHBM_0113
26. ATLMHHBM_0114
27. ATLMHHBM_0115
28. ATLMHHBM_0123
29. ATLMHHBM_0125
30. ATLMHHBM_0126
31. ATLMHHBM_0127
32. ATLMHHBM_0128
33. ATLMHHBM_0130
34. ATLMHHBM_0131
35. ATLMHHBM_0133
36. ATLMHHBM_0135
37. ATLMHHBM_0014
38. ATLMHHBM_0037
39. ATLMHHBM_0045
40. ATLMHHBM_0046
41. ATLMHHBM_0047
42. ATLMHHBM_0048
43. ATLMHHBM_0049
44. ATLMHHBM_0050
45. ATLMHHBM_0051
46. ATLMHHBM_0052
47. ATLMHHBM_0043
48. ATLMHHBM_0054
49. ATLMHHBM_0055
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54. ATLMHHBM_0060
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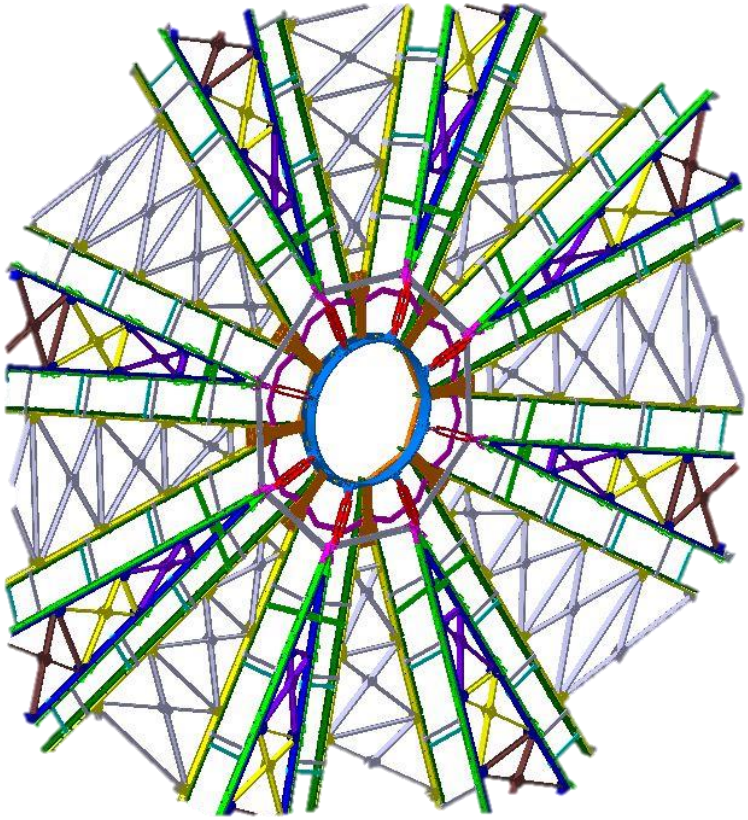
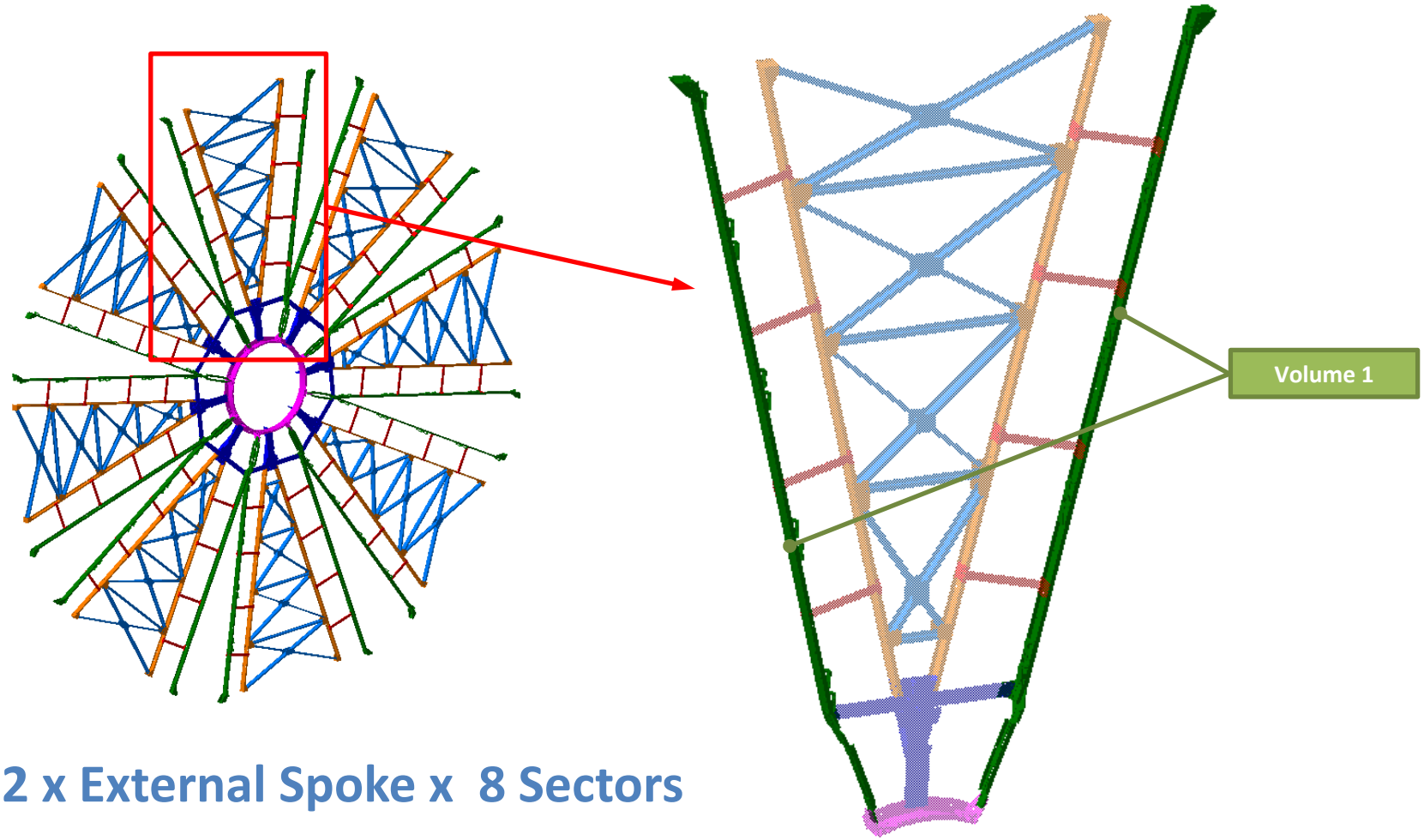
56. ATLMHHBM_0062
57. ATLMHHBM_0067
58. ATLMHHBM_0085
59. ATLMHHBM_0086
60. ATLMHHBM_0087
61. ATLMHHBM_0090
62. ATLMHHBM_0092
63. ATLMHHBM_0093
64. ATLMHHBM_0100
65. ATLMHHBM_0102
66. ATLMHHBM_0103
67. ATLMHHBM_0104
68. ATLMHHBM_0105
69. ATLMHHBM_0106
70. ATLMHHBM_0116
71. ATLMHHBM_0124
72. ATLMHHBM_0154
73. ATLMHHBM_0156
74. ATLMHHBM_0137



Volume 1 External Spokes

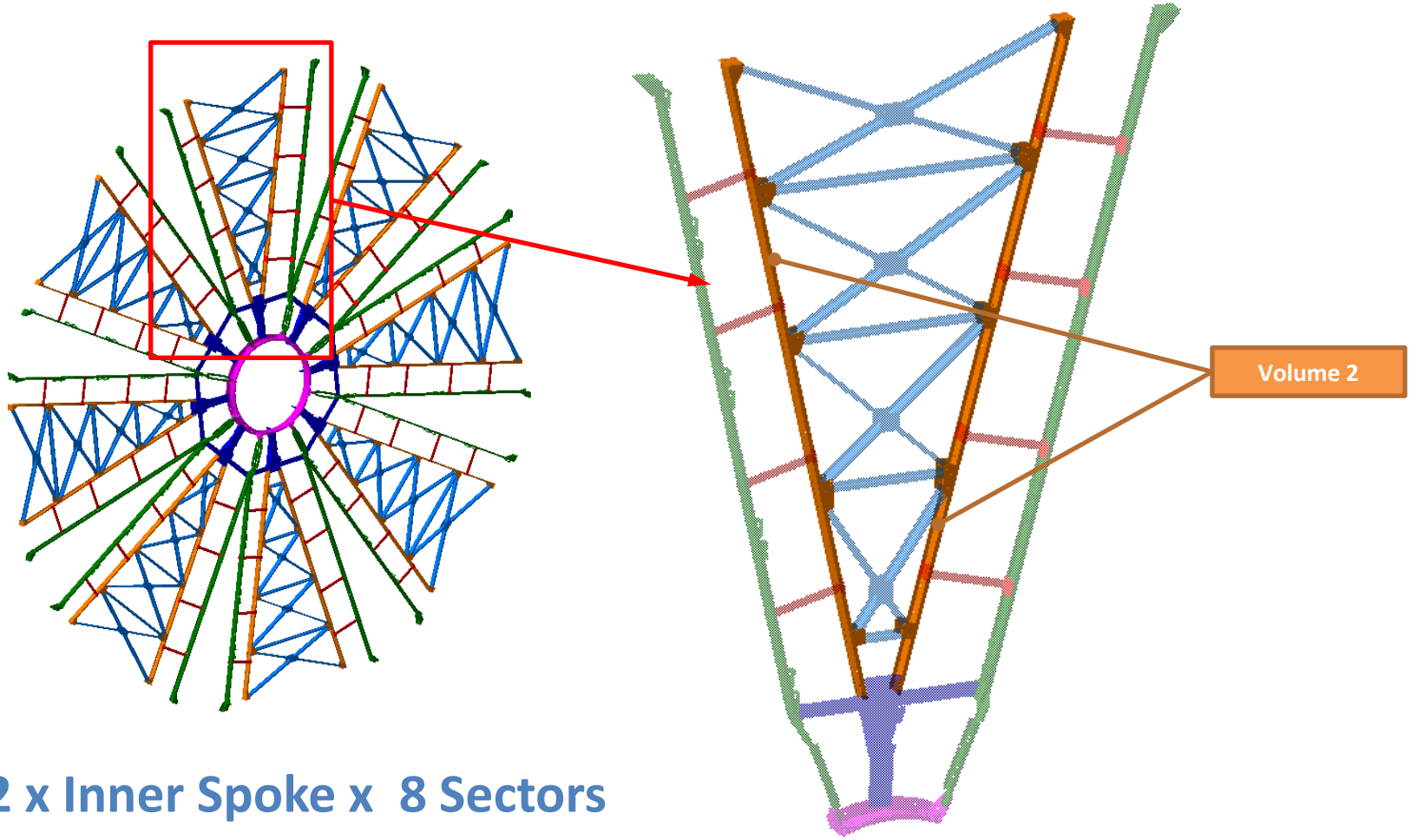
Volume 1	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	16	External Spoke	Assembly	Aluminum 6082	2700	0.03285	0.5256	1419
							Total Weight (kg): **1419**	



2 x External Spoke x 8 Sectors

Big sector *Volume 2* Inner Spoke

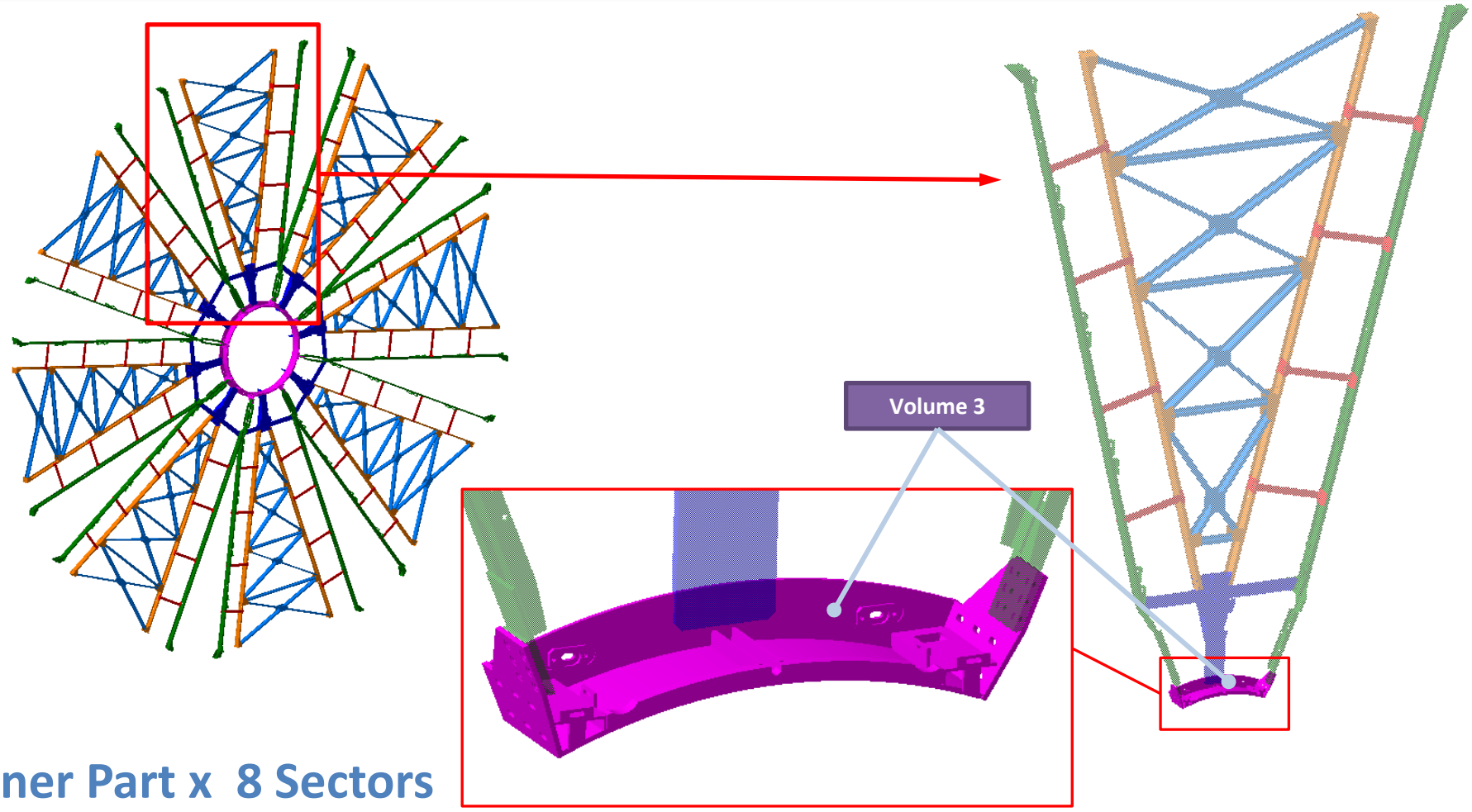
	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
Volume 2	16	Inner spoke	Assembly	Aluminum 6082	2700	0.02125	0.34	918
							Total Weight (kg): **918**	



2 x Inner Spoke x 8 Sectors

Big sector *Volume 3* Inner Part 1

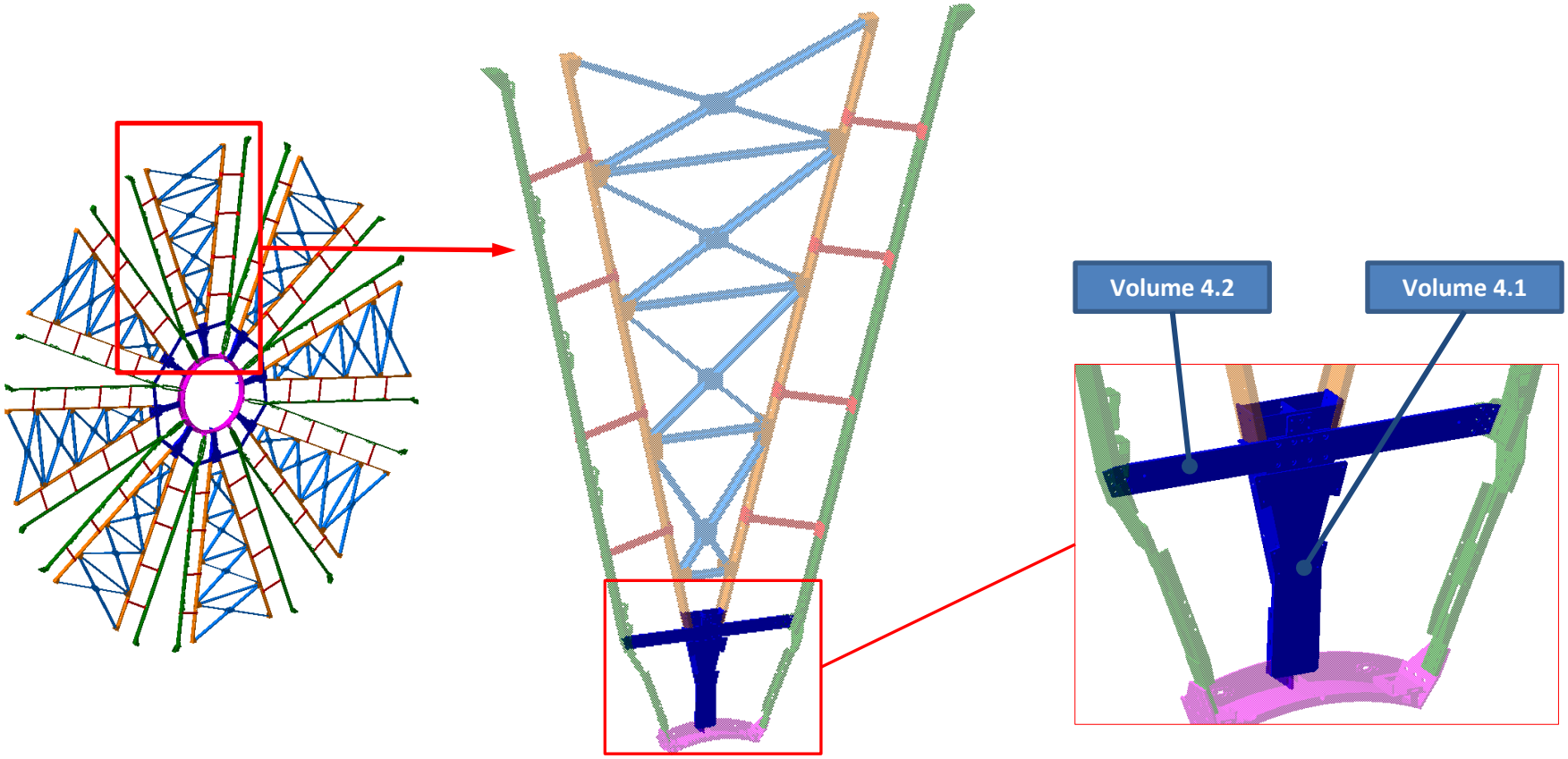
Volume 3	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	8	Inner Part	Part	Aluminum 6082	2700	0.0157	0.1256	339
							Total Weight (kg): **339**	



Inner Part x 8 Sectors

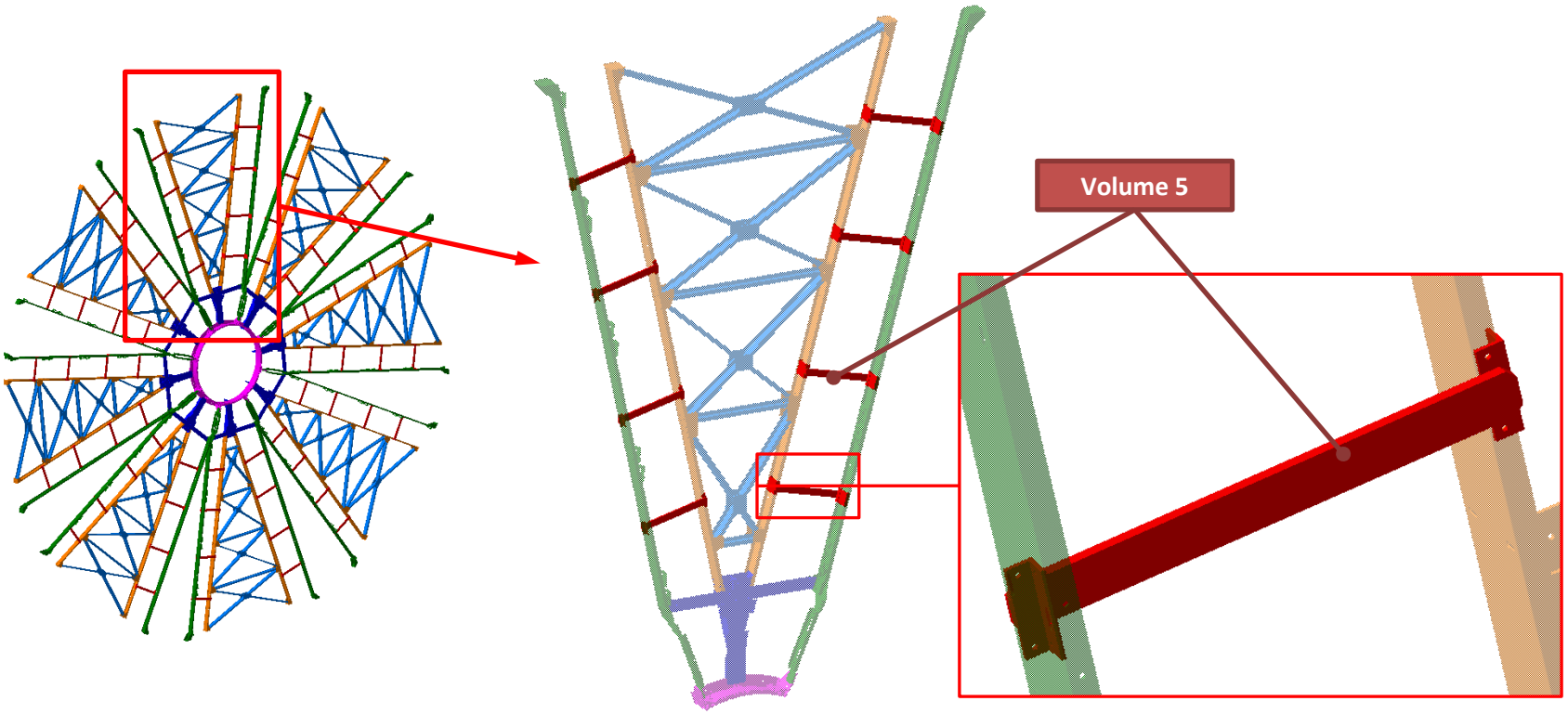
Big sector *Volume 4* Inner Part 2

Volume 4	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	8	Inner Part 2	Part	Aluminum 6082	2700	0.0255	0.204	551
	8	Transversal Beam	Part	Aluminum 6082	2700	0.0103	0.0824	222.5
							Total Weight (kg): **773.5**	



Big sector *Volume 5* Reinforcing Bar

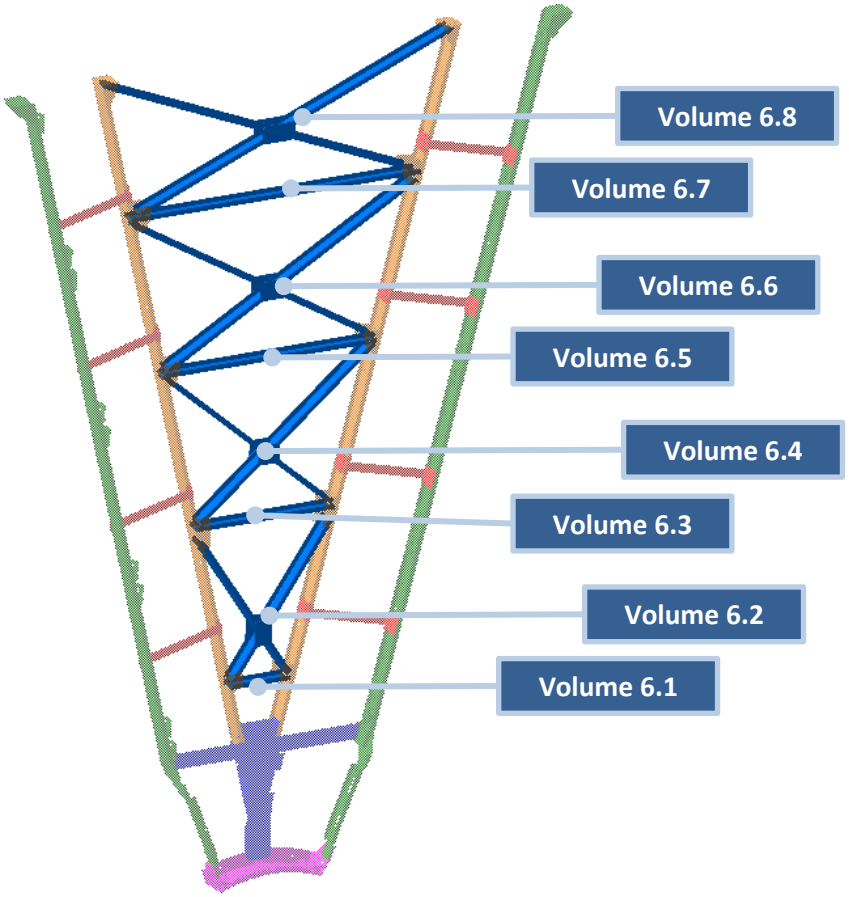
Volume 5	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	64	Reinforcing Bar	Part	Aluminum 6082	2700	0.0041	0.2624	708.5
							Total Weight (kg): **708.5**	



8 x Reinforcing Bar x 8 Sectors

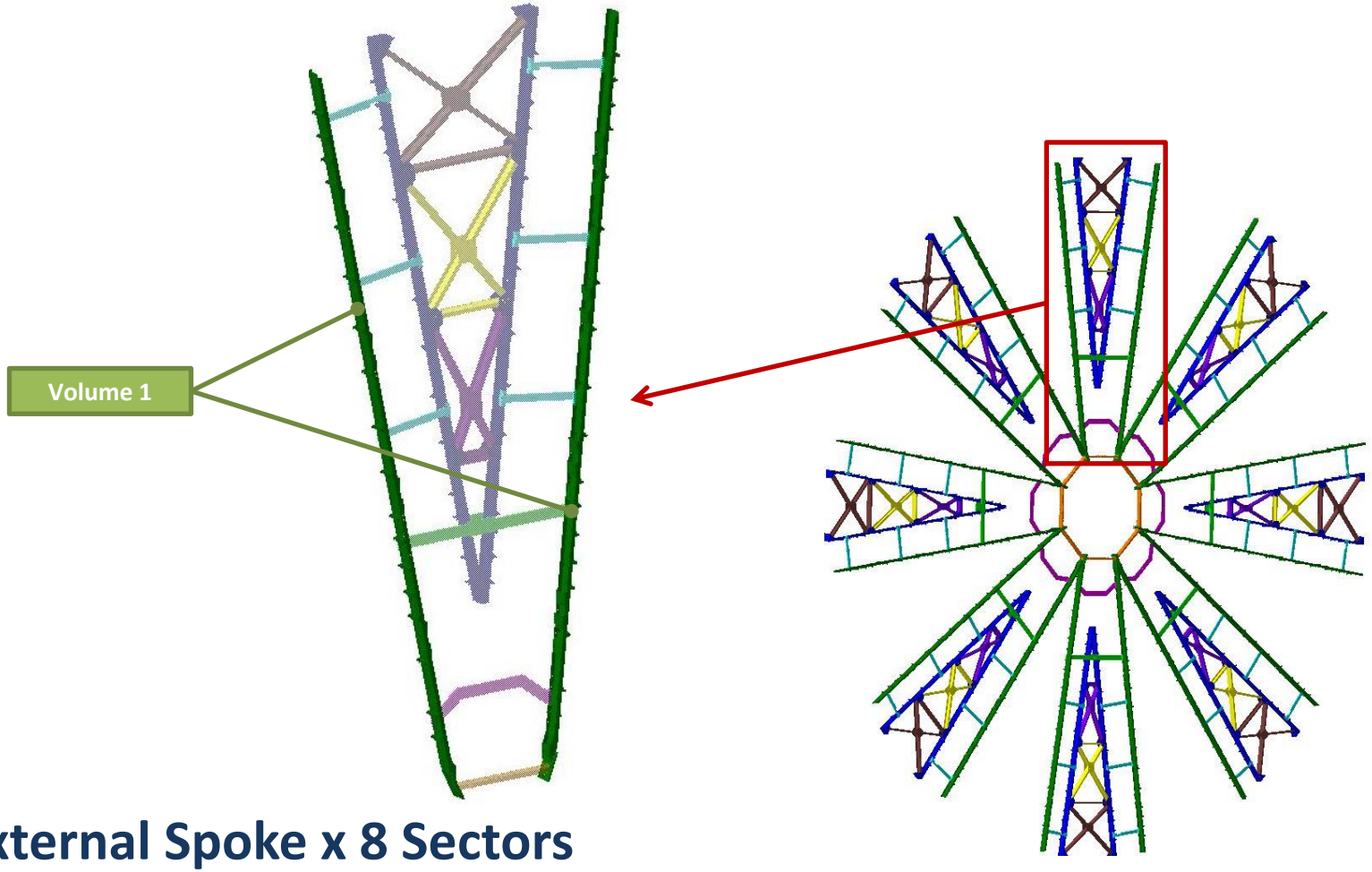
Big sector *Volume 6* Middle Supports

	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
Volume 6	8	Middle Bar 1	Part	Al 6082	2700	0.0011	0.0088	24
	16	Cross Bracing 1	Part	Al 6082	2700	0.0037	0.0592	160
	8	Middle Bar 2	Part	Al 6082	2700	0.0027	0.0216	58
	16	Cross Bracing 2	Part	Al 6082	2700	0.0047	0.0752	203
	8	Middle Bar 3	Part	Al 6082	2700	0.0041	0.0328	89
	16	Cross Bracing 3	Part	Al 6082	2700	0.00595	0.0952	257
	8	Middle Bar 4	Part	Al 6082	2700	0.0056	0.0448	121
	16	Cross Bracing 4	Part	Al 6082	2700	0.00705	0.1128	305
							Total Weight (kg):	**1216**



Small Sector *Volume 1* External Spoke

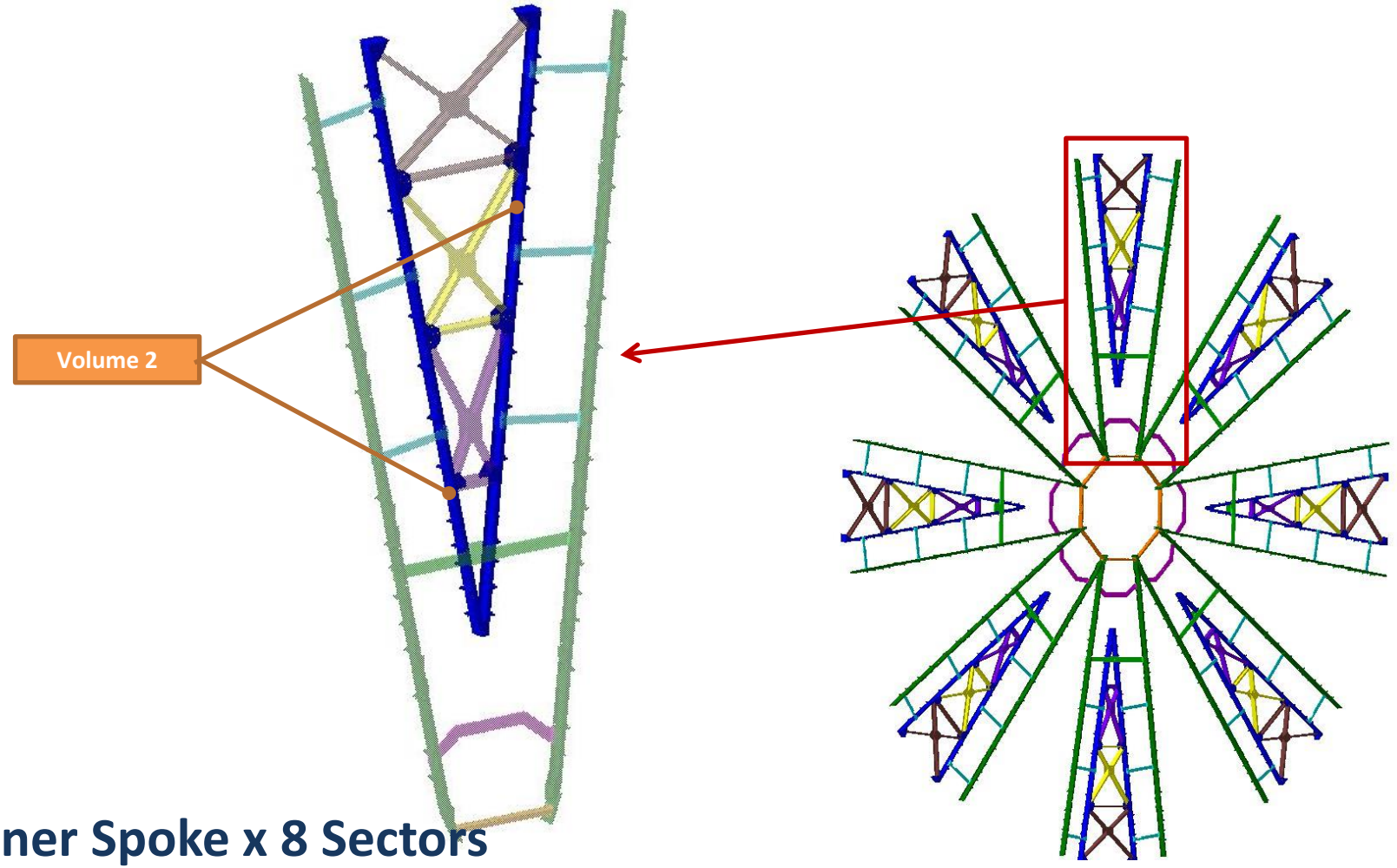
Volume 1	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	16	External Spoke	Assembly	Aluminum 6082	2700	0.0333	0.5328	1438.56
							Total Weight (kg): **1438.56**	



2 x External Spoke x 8 Sectors

Small Sector *Volume 2* Inner Spoke

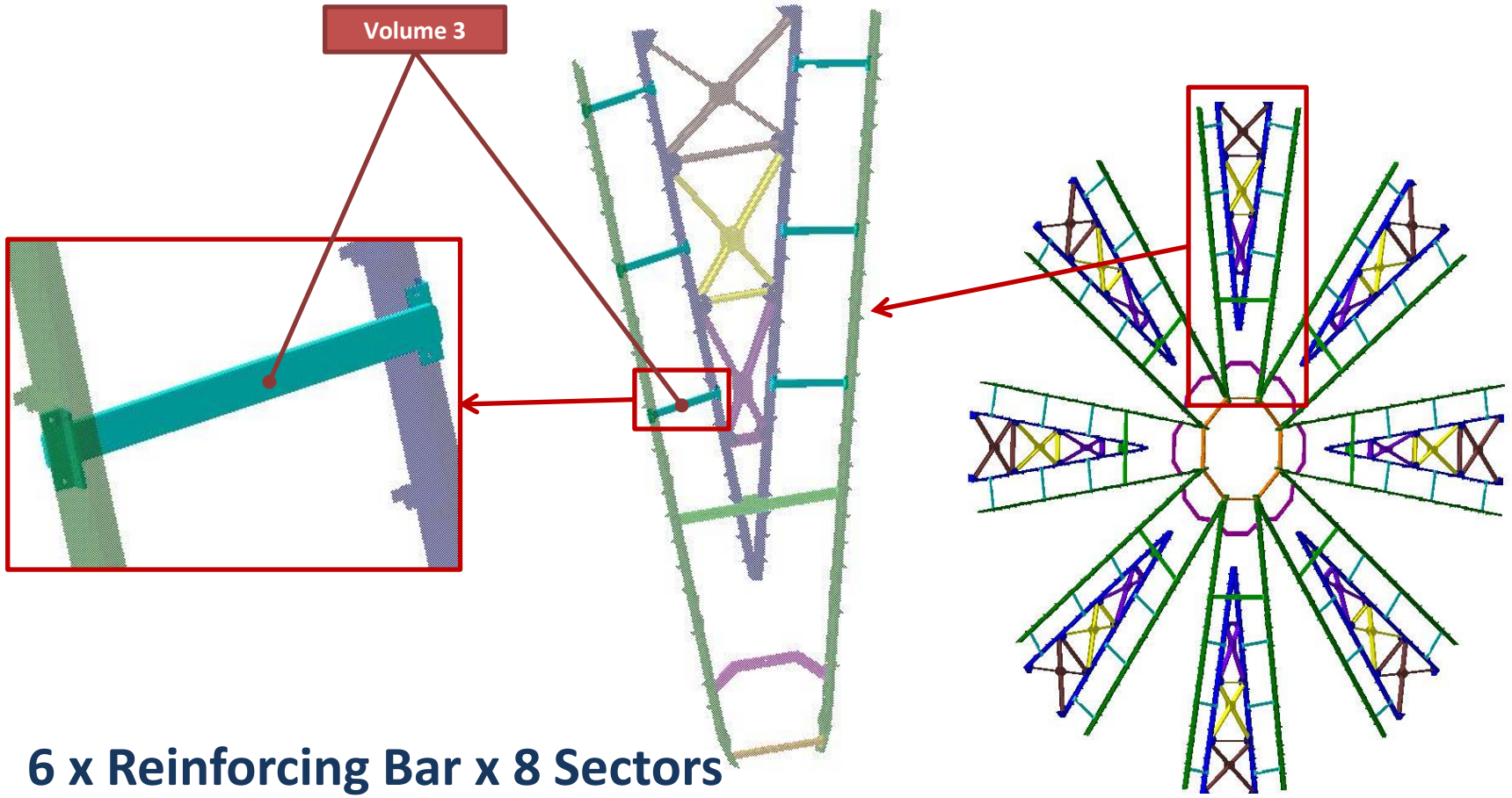
Volume 2	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	16	Inner spoke	Assembly	Aluminum 6082	2700	0.0243	0.3896	1051.92
							Total Weight (kg): **1051.92**	



2 x Inner Spoke x 8 Sectors

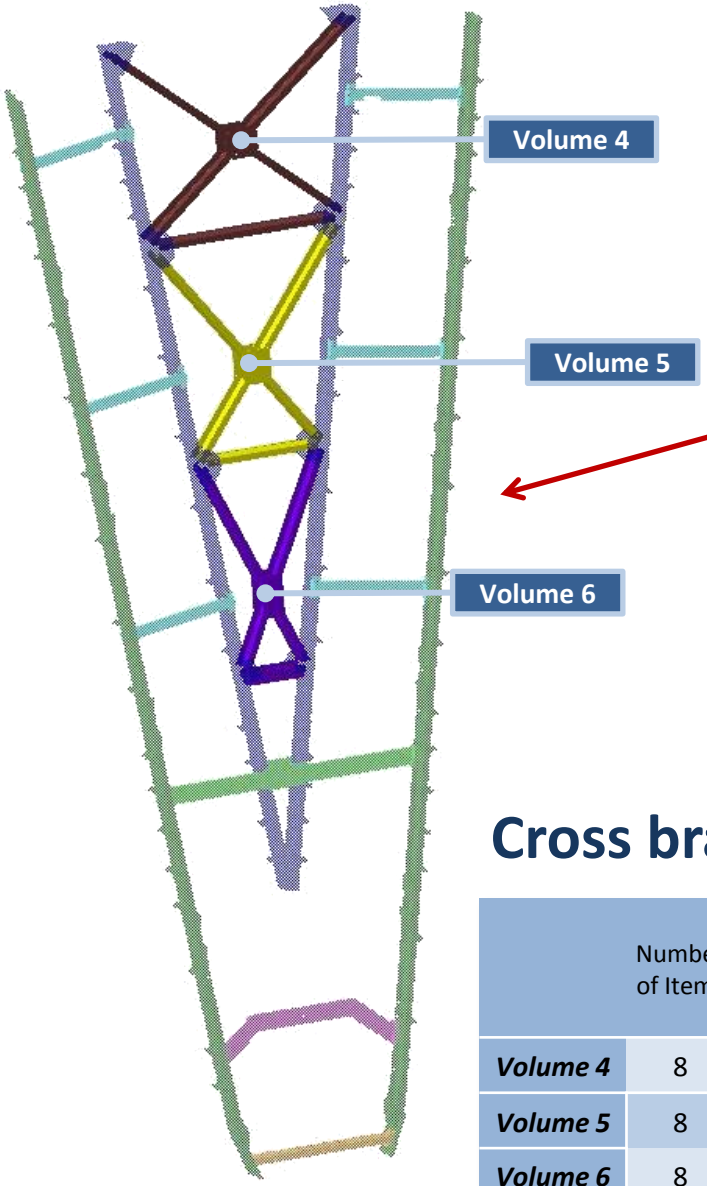
Small Sector *Volume 3* Reinforcing Bar

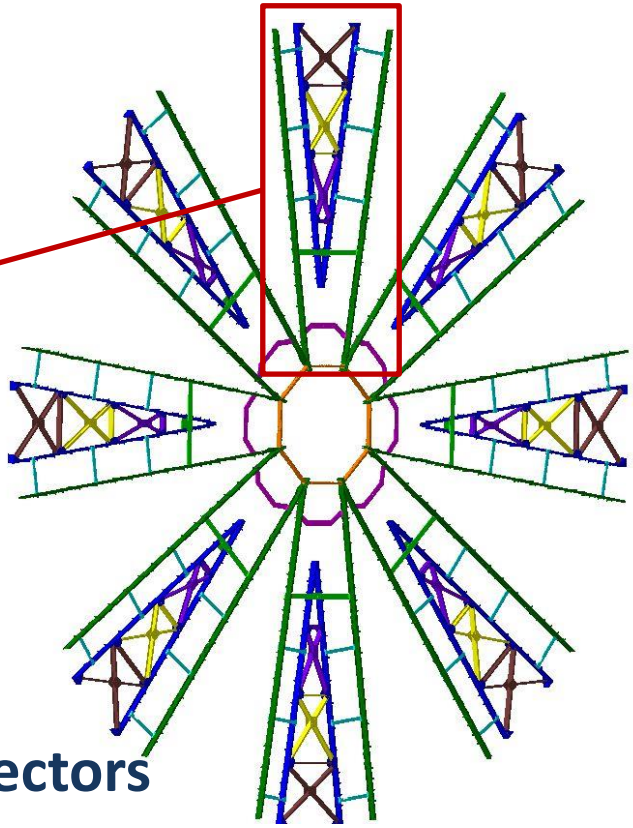
Volume 3	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	48	Reinforcing Bar	Part	Aluminum 6082	2700	0.003	0.1472	397.44
							Total Weight (kg): **397.44**	



6 x Reinforcing Bar x 8 Sectors

Small Sector *Volume 4, Volume 5, Volume 6* Cross bracing bay



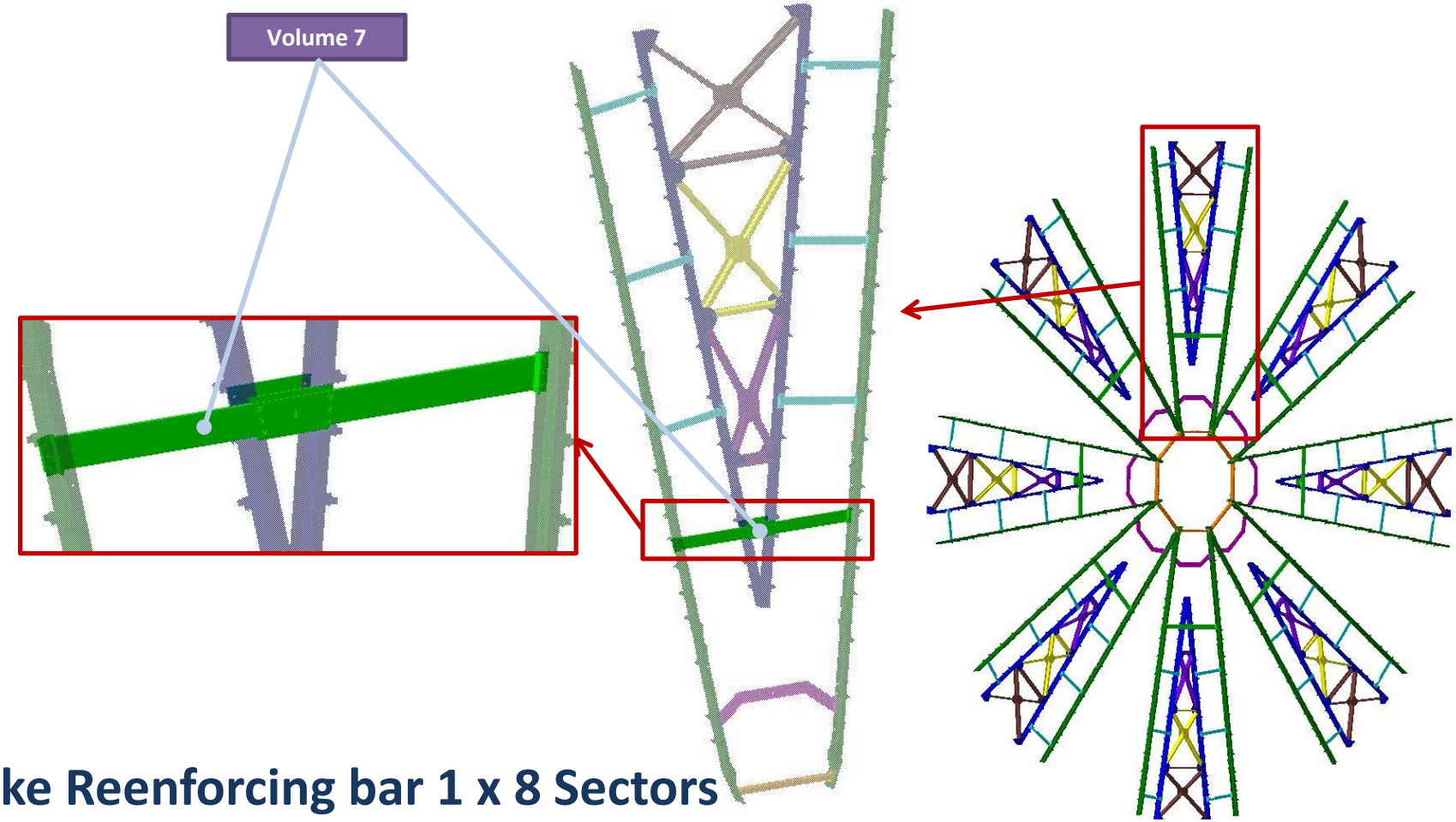


Cross bracing bay x 8 Sectors

	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
Volume 4	8	Cross bracing bay 1	Assembly	Al 6082	2700	0.0142	0.1136	306.72
Volume 5	8	Cross bracing bay 2	Assembly	Al 6082	2700	0.0115	0.092	248.4
Volume 6	8	Cross bracing bay 3	Assembly	Al 6082	2700	0.01	0.08	216

Small Sector *Volume 7* Spoke Reinforcing bar 1

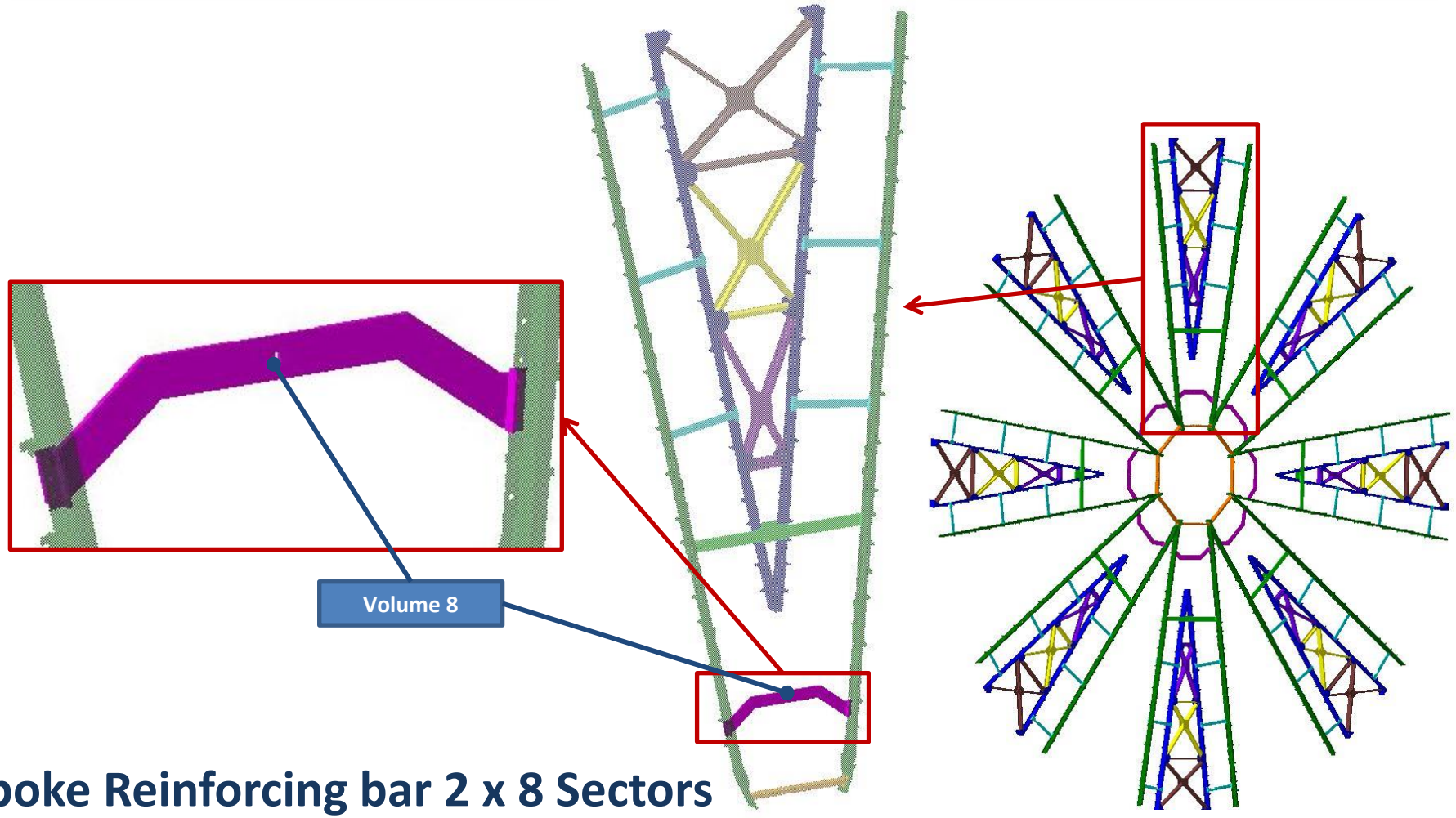
Volume 7	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	8	**Spoke Reinforcing bar 1**	Part	Aluminum 6082	2700	0.0111	0.0888	239.76
							Total Weight (kg): **239.76**	



Spoke Reenforcing bar 1 x 8 Sectors

Small Sector *Volume 8* Spoke Reinforcing bar 2

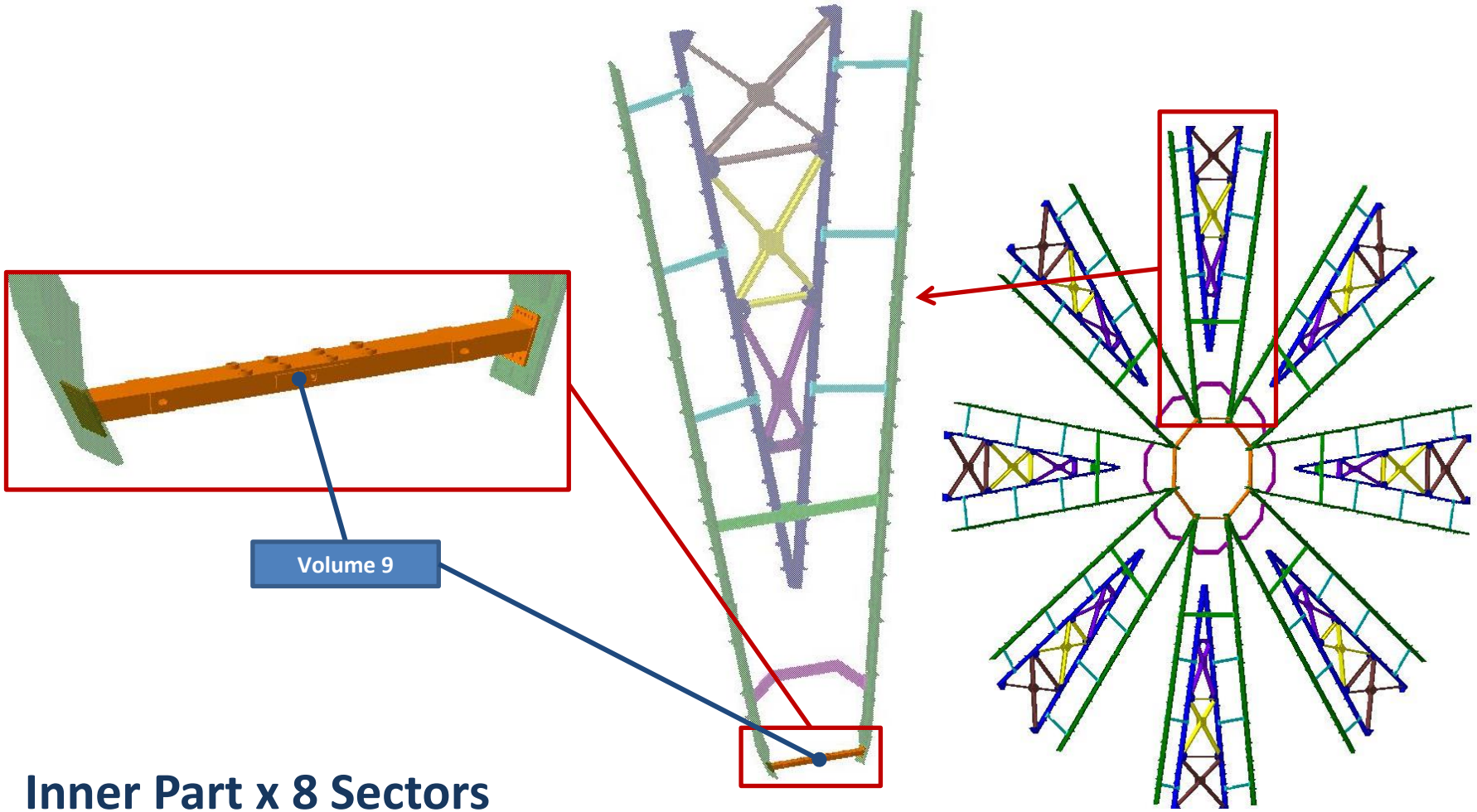
Volume 8	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	8	**Spoke Reinforcing bar 2**	Part	Aluminum 6082	2700	0.0075	0.06	162
							Total Weight (kg): **162**	



Spoke Reinforcing bar 2 x 8 Sectors

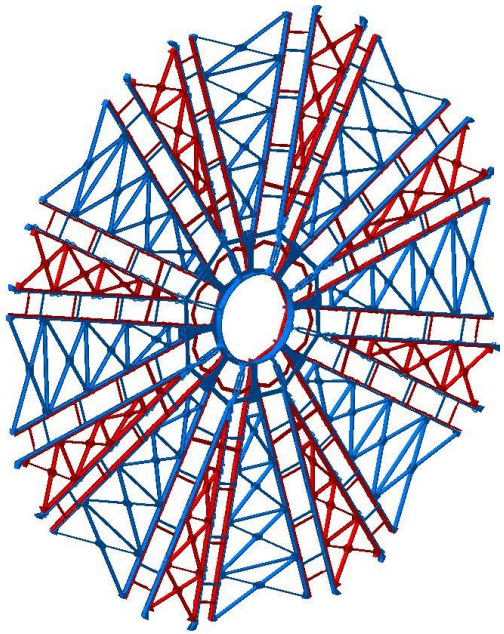
Small Sector *Volume 9* Inner Part

Volume 9	Number of Items	Part Name		Material	Density (kgs/m^3)	Volume (m^3)	Total Volume (m^3)	Total Weight (kgs)
	8	Inner Part 2	Part	Aluminum 6082	2700	0.0058	0.0464	125.28
							Total Weight (kg): **125.28**	



Inner Part x 8 Sectors

BW MDT Sectors reproduced in CATIA



Big Sectors

5822 kg | Total Weight = 1419kg | Vol.1 + 918kg | Vol.2 + 339kg | Vol.3 +
+773.5kg | Vol.4.1,4.2 + 708.5kg | Vol.5 + 1216kg | Vol.6.1-6.8
+448kg | Bolts&Nuts

2.0464 m^3 | Total Volume = 0.0657 m^3 | Vol.1 + 0.0425 m^3 | Vol.2 + 0.0157 m^3 | Vol.3
+0.0358 m^3 | Vol.4.1,4.2 + 0.0328 m^3 | Vol.5 + 0.0563 m^3 | Vol.6.1-6.8
+ 0.056 m^3 | Bolts&Nuts

Small Sectors

4710 kg | Total Weight = 1438.56 kg | Vol.1 + 1051.92 kg | Vol.2 + 397.44 kg | Vol.3
+ 306.72 kg | Vol.4 + 248.4 kg | Vol.5 + 216 kg | Vol.6
+ 239.76 kg | Vol.7 + 162 kg | Vol.8 + 125.28 kg | Vol.9
+ 524 kg | Bolts&Nuts

1.6159 m^3 | Total Volume = 0.5328 m^3 | Vol.1 + 0.3896 m^3 | Vol.2 + 0.1472 m^3 | Vol.3
+ 0.1136 m^3 | Vol.4 + 0.092 m^3 | Vol.5 + 0.08 m^3 | Vol.6
+ 0.0888 m^3 | Vol.7 + 0.06 m^3 | Vol.8 + 0.0464 m^3 | Vol.9
+ 0.0655 m^3 | Bolts&Nuts

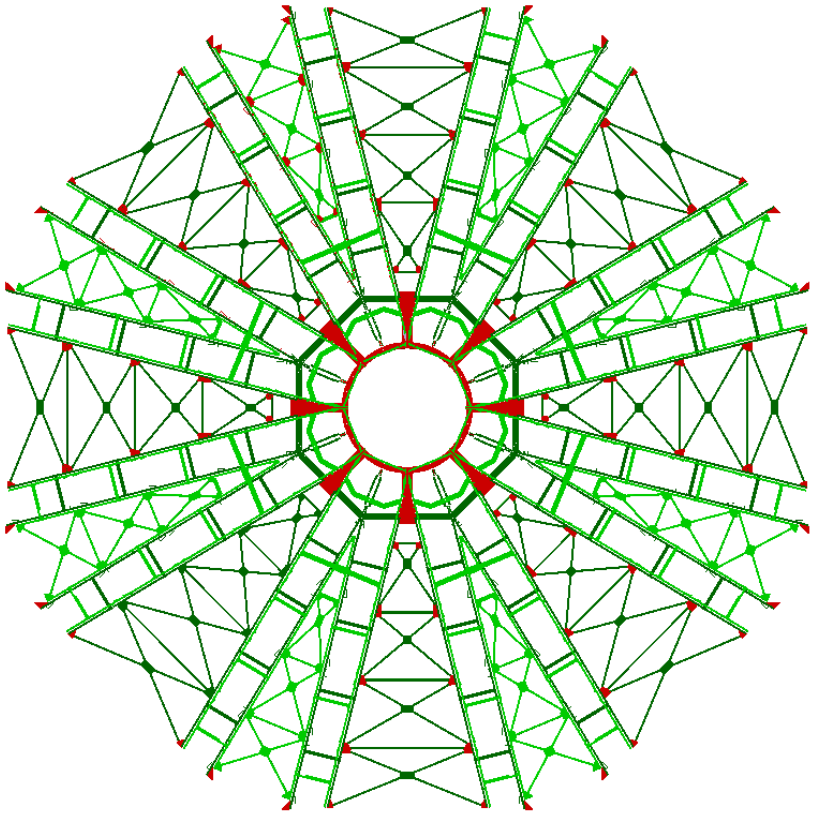
BW MDT All Sector Total	3.6723 Volume (m3)	10532 Weight (kg)

Weight Discrepancy Between CATIA and Geant4 Models

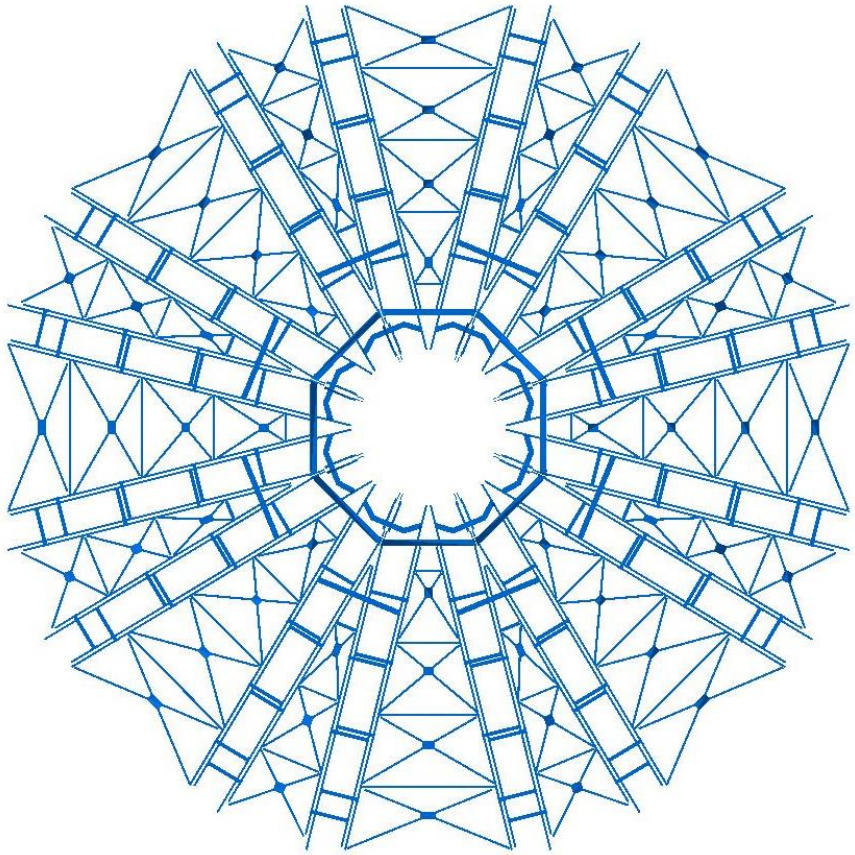
BW MDT

Model	Material	Density (kg/m3)	Volume (m3)	Weight (kgs)	Difference (kgs)
CATIA	Aluminum/Stainless Steel	2700 / 8000	3.6723	10 532	
Geant4	Aluminum	2700	2.3184	6259.68	-4272.32

CATIA Model

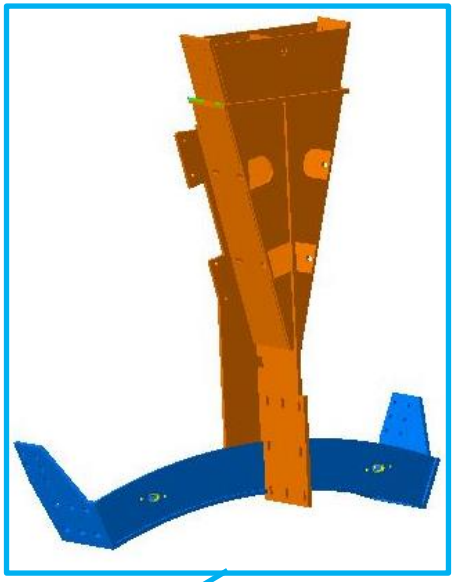


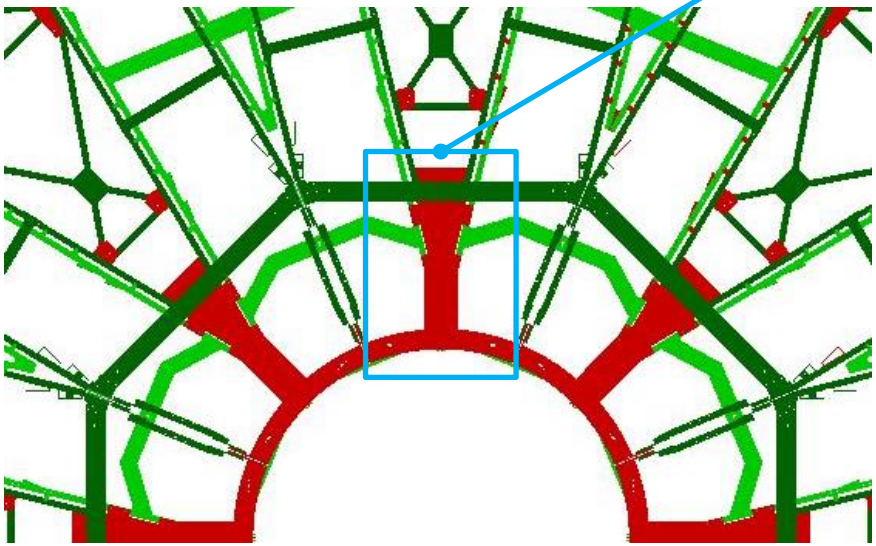
Geant4 Model

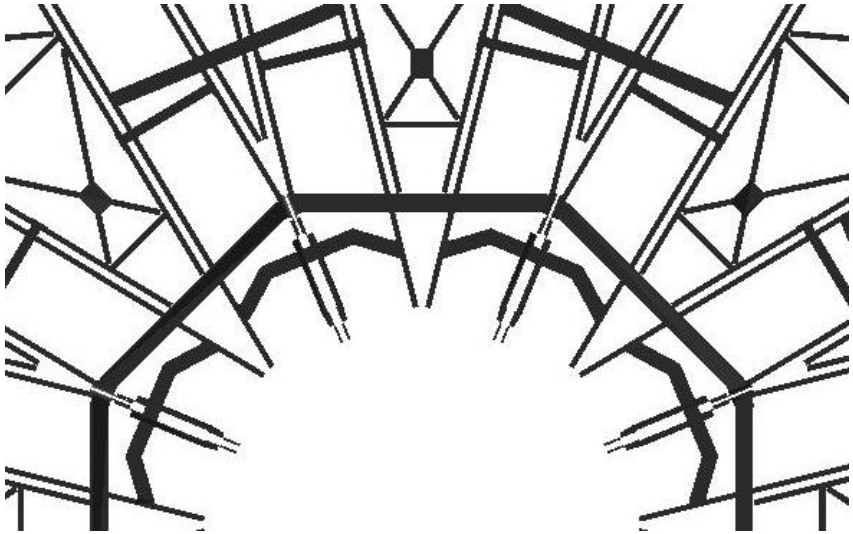


Case 1

Wight: ~ 886 kg
Volume:~ 0.328 m³







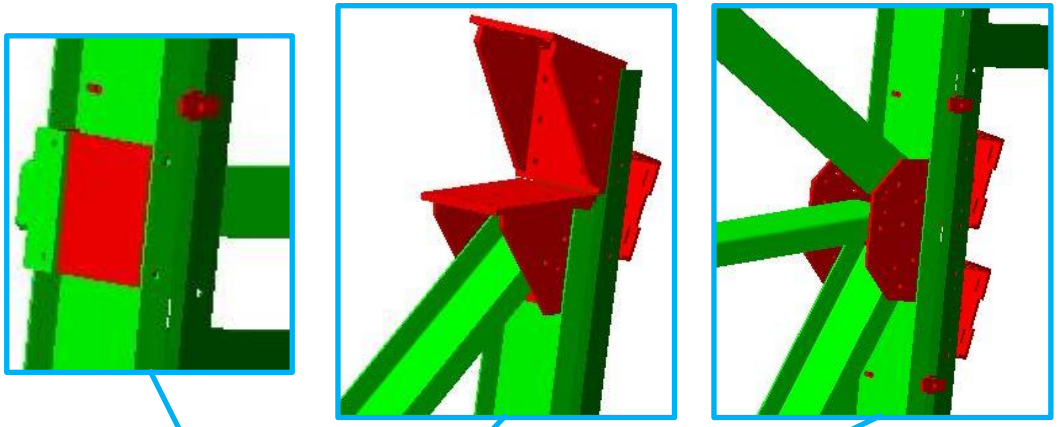
CATIA Model

Geant4 Model

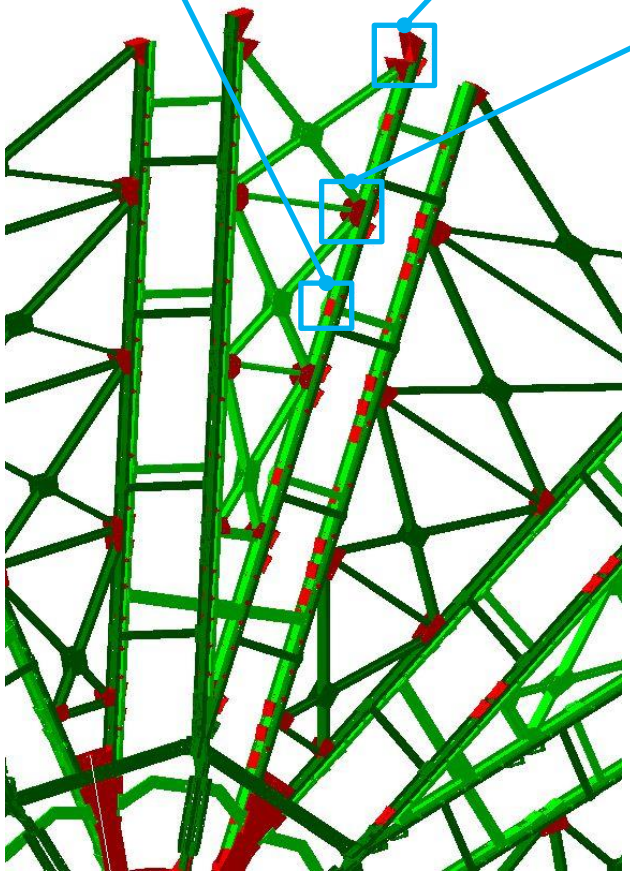
Case 2

Wight: ~ 695.52 kg

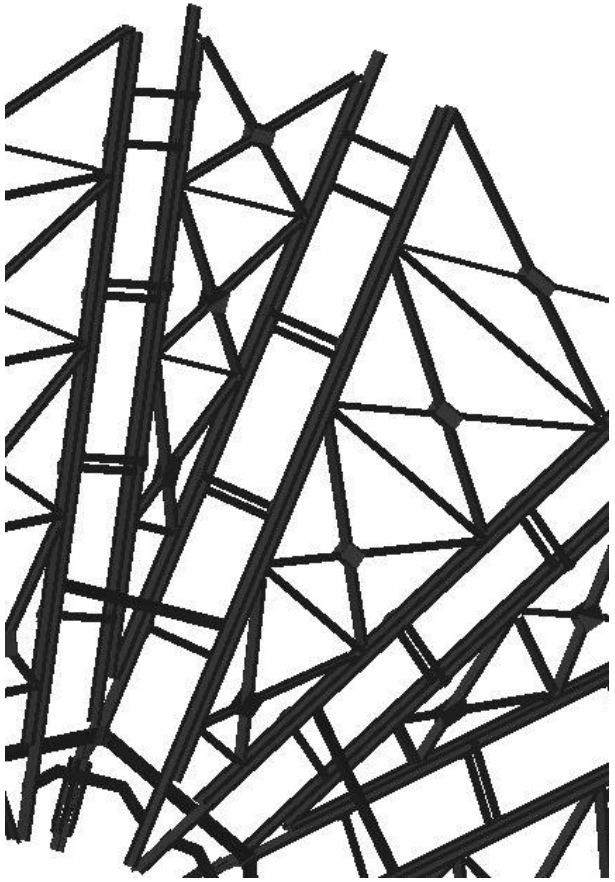
Volume:~ 0.2576 m³



Geant4 Model



CATIA Model

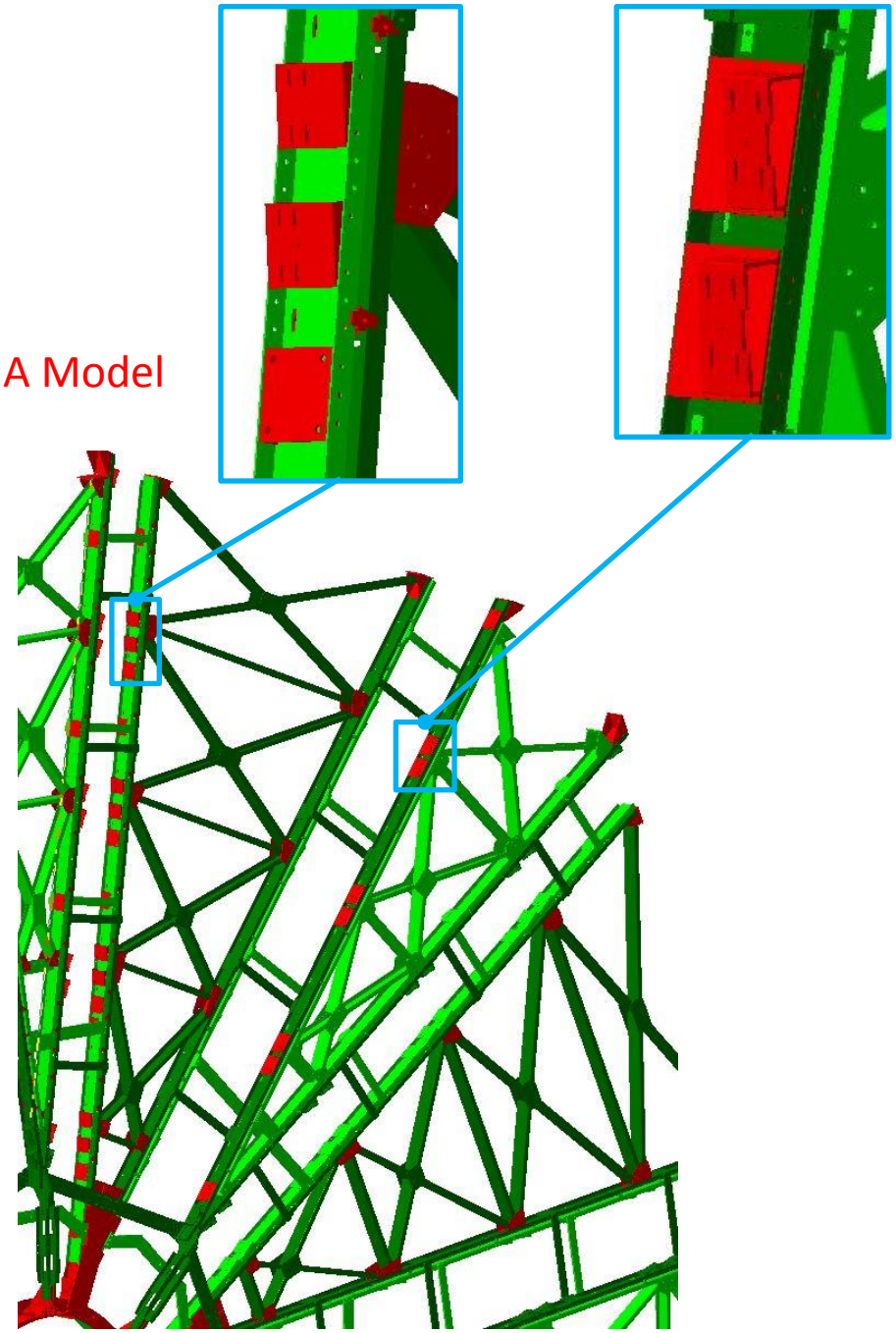


Case 3

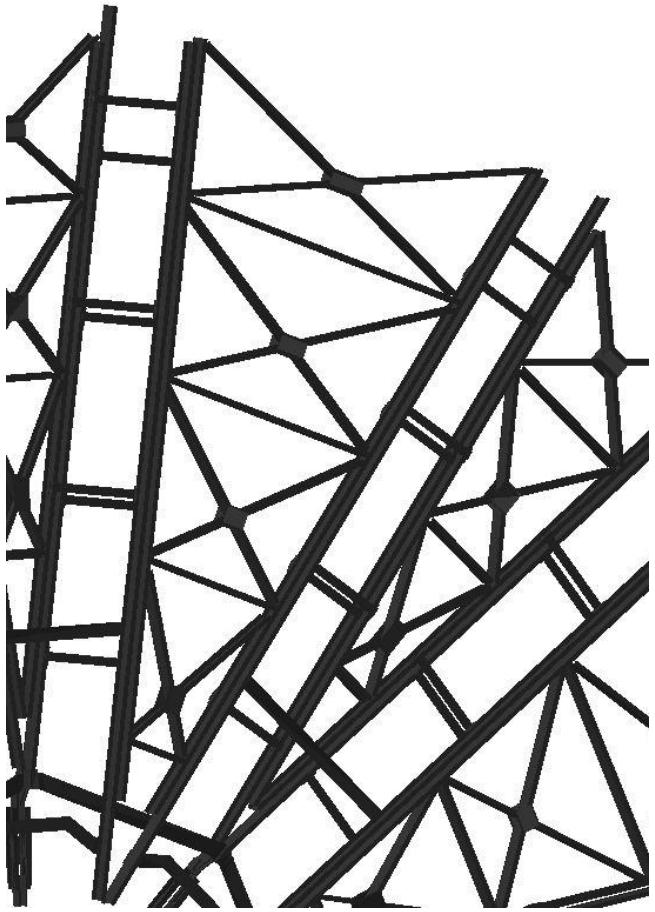
Wight: ~ 678.24 kg

Volume:~ 0.2512 m³

CATIA Model

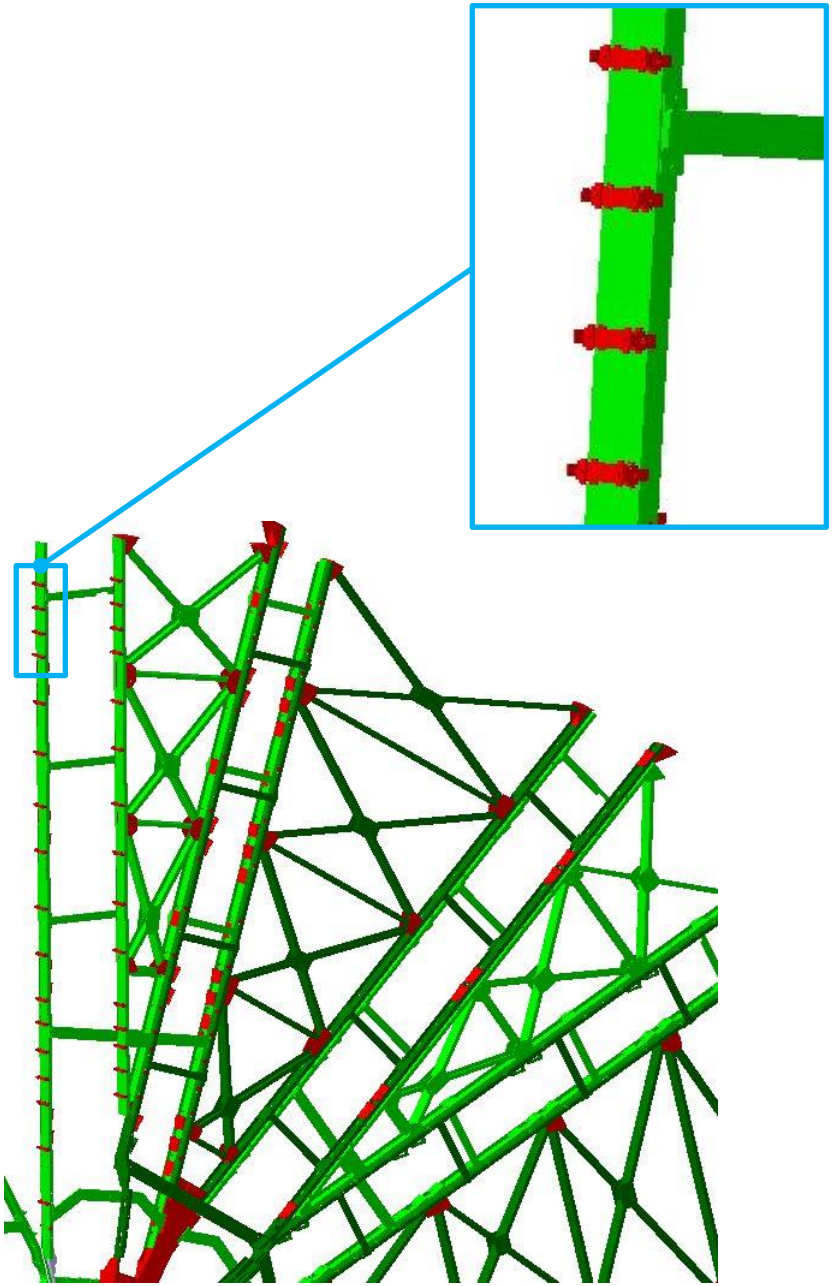


Geant4 Model

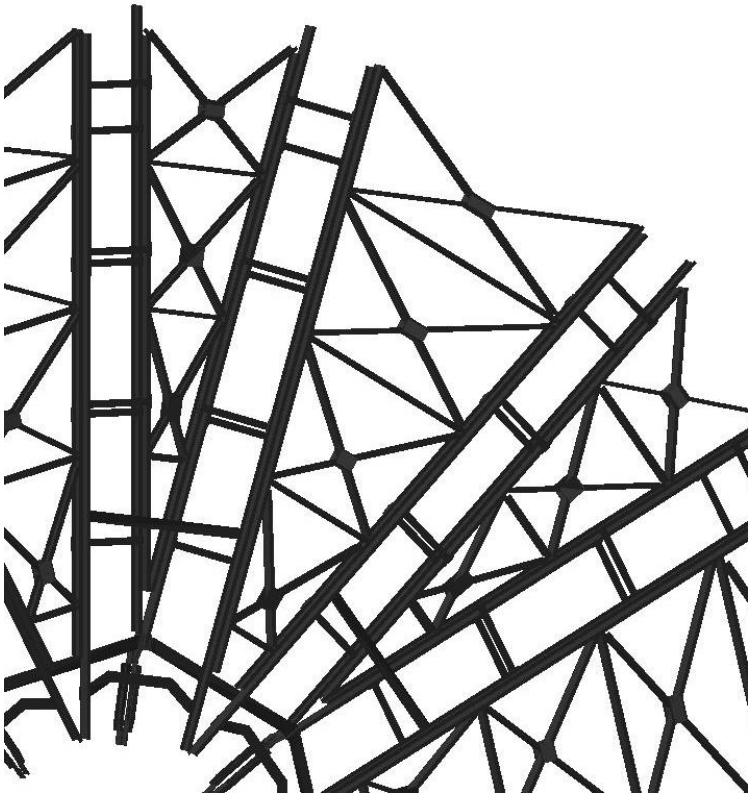


Case 4

Wight: ~ 427.68 kg
Volume:~ 0.1584 m³

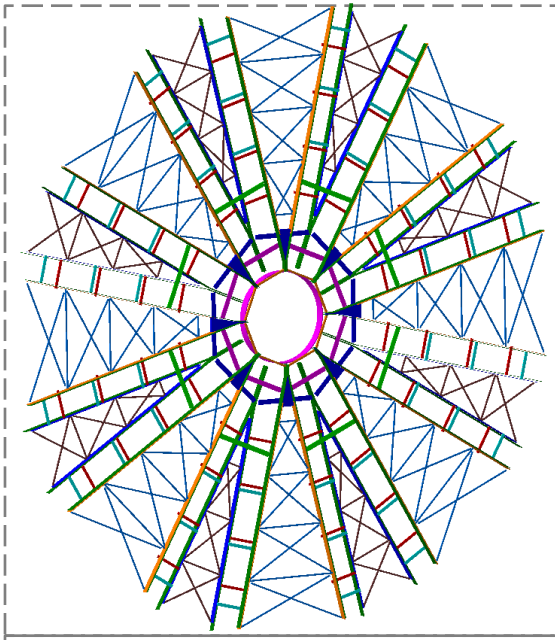


CATIA Model



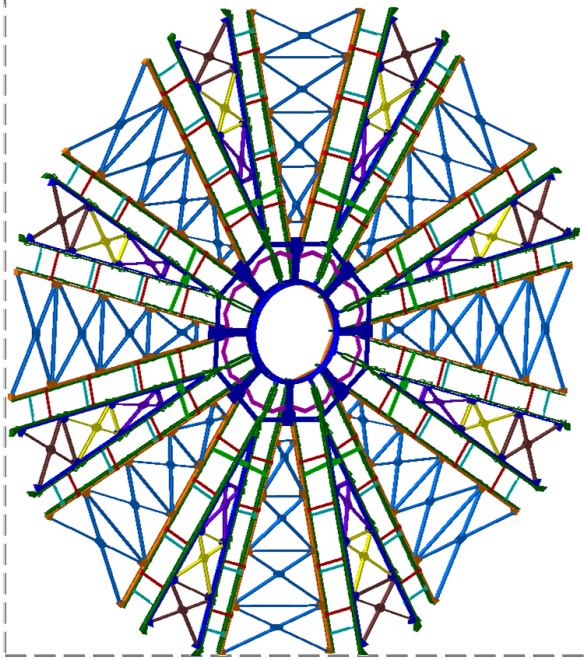
Geant4 Model

Detailed and Simplified Models of MDT Supports



Simplified Volumes

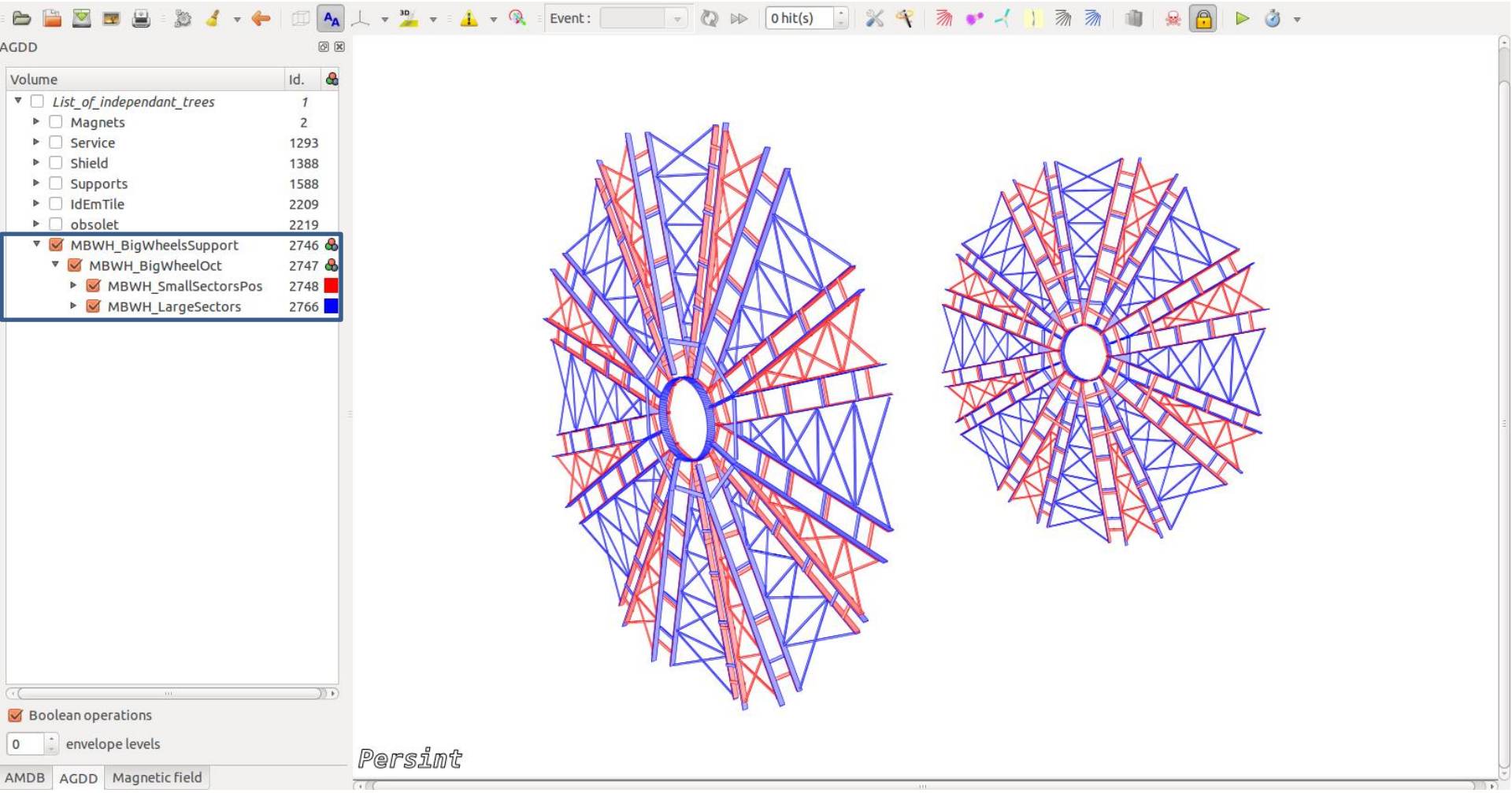
Total Volume: 3.5548 m3	
Total Weight: 9598.24 kg	
Total Volume: 3.5408 m3	***Difference:***
Total Weight: 9560 kg	***Total Volume: 0.014 m3***
	Total Weight: 37.8 kg



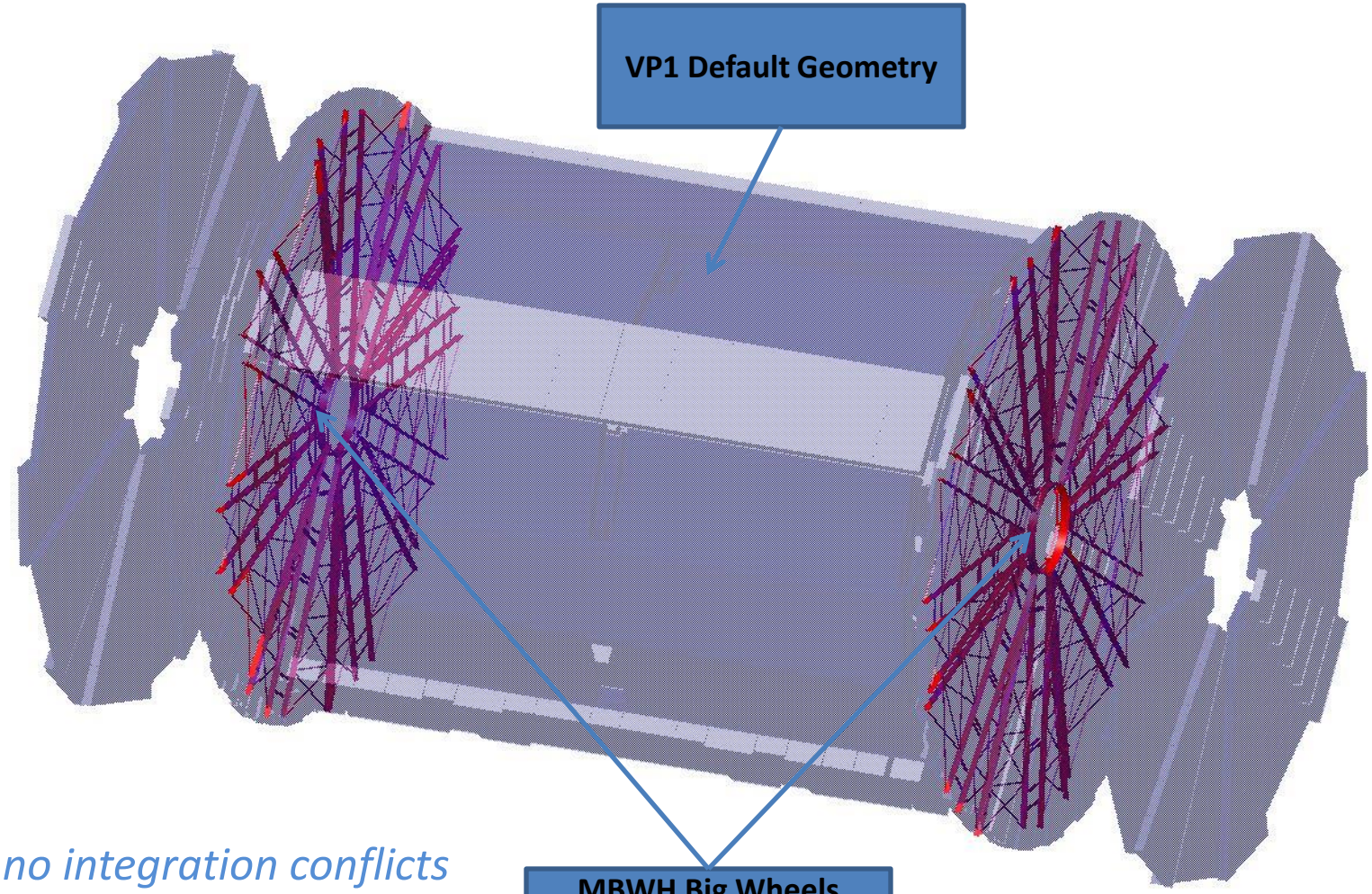
Detailed Volumes

MDT Support Dead material description code in XML

MBWH big wheels support is described in XML file (**amdb_simrec.r.06.01**), between 16397 – 16652 and 16709 – 16712 line numbers



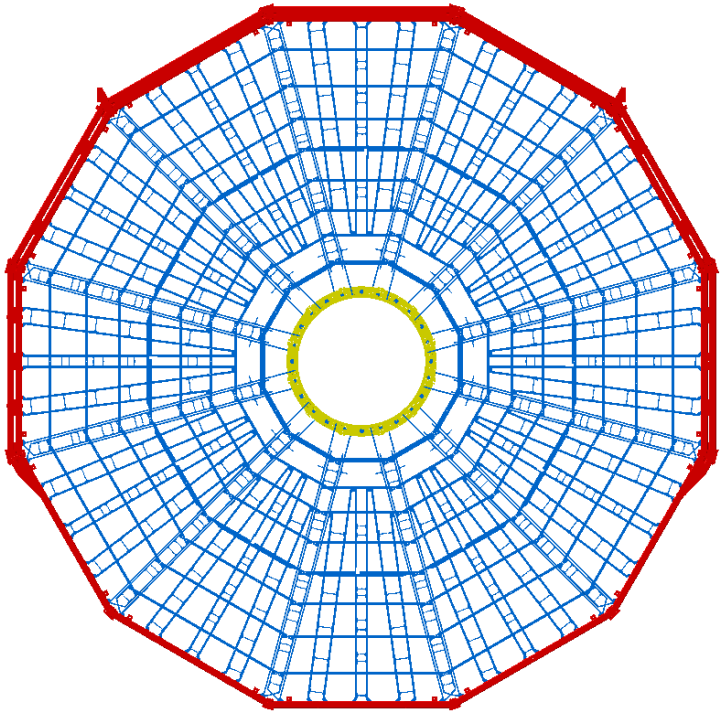
Integration Conflict Checking



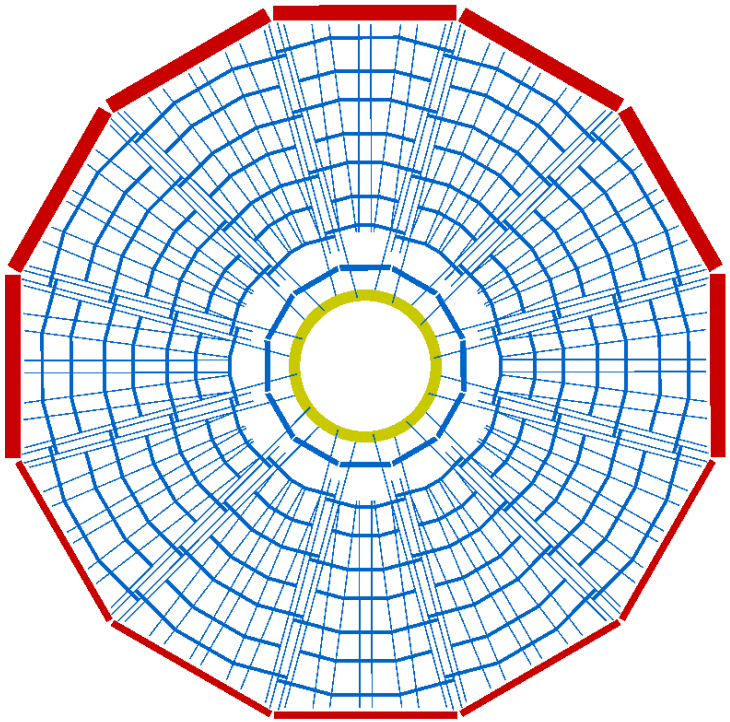
There is no integration conflicts

Compare Analysis Between CATIA and Geant4 Models of BW TGC geometry

CATIA Model



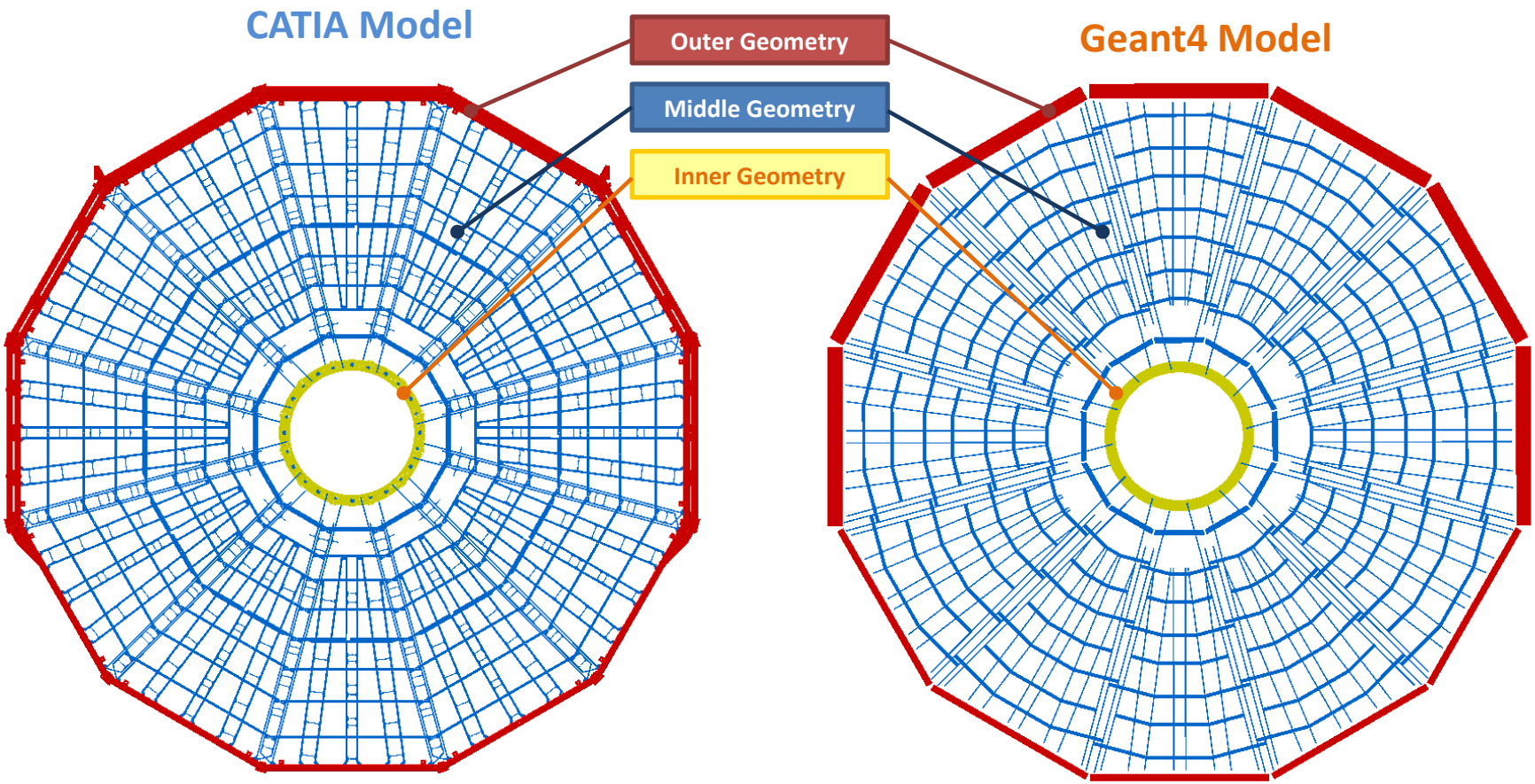
Geant4 Model



Weight Discrepancy Between CATIA and Geant4 Models

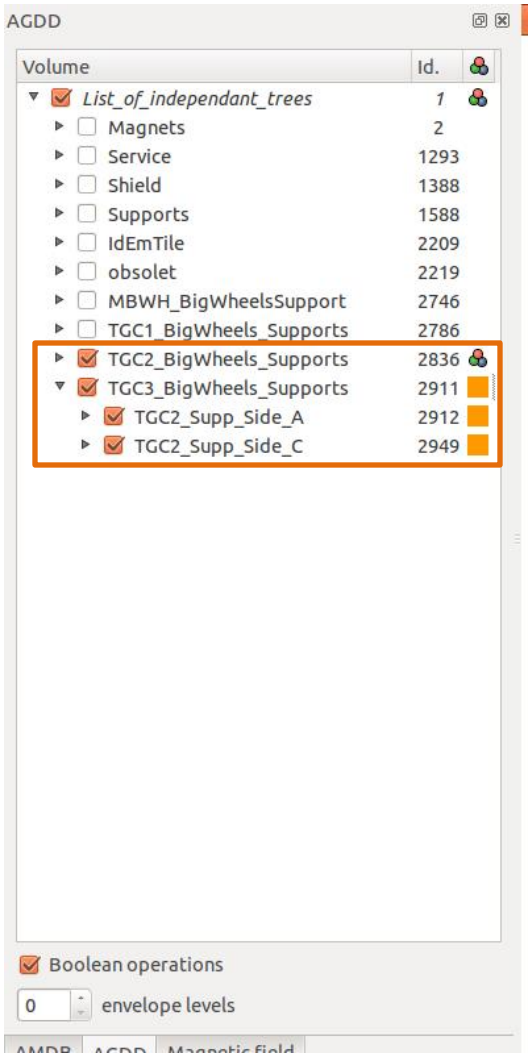
TGC 2-3

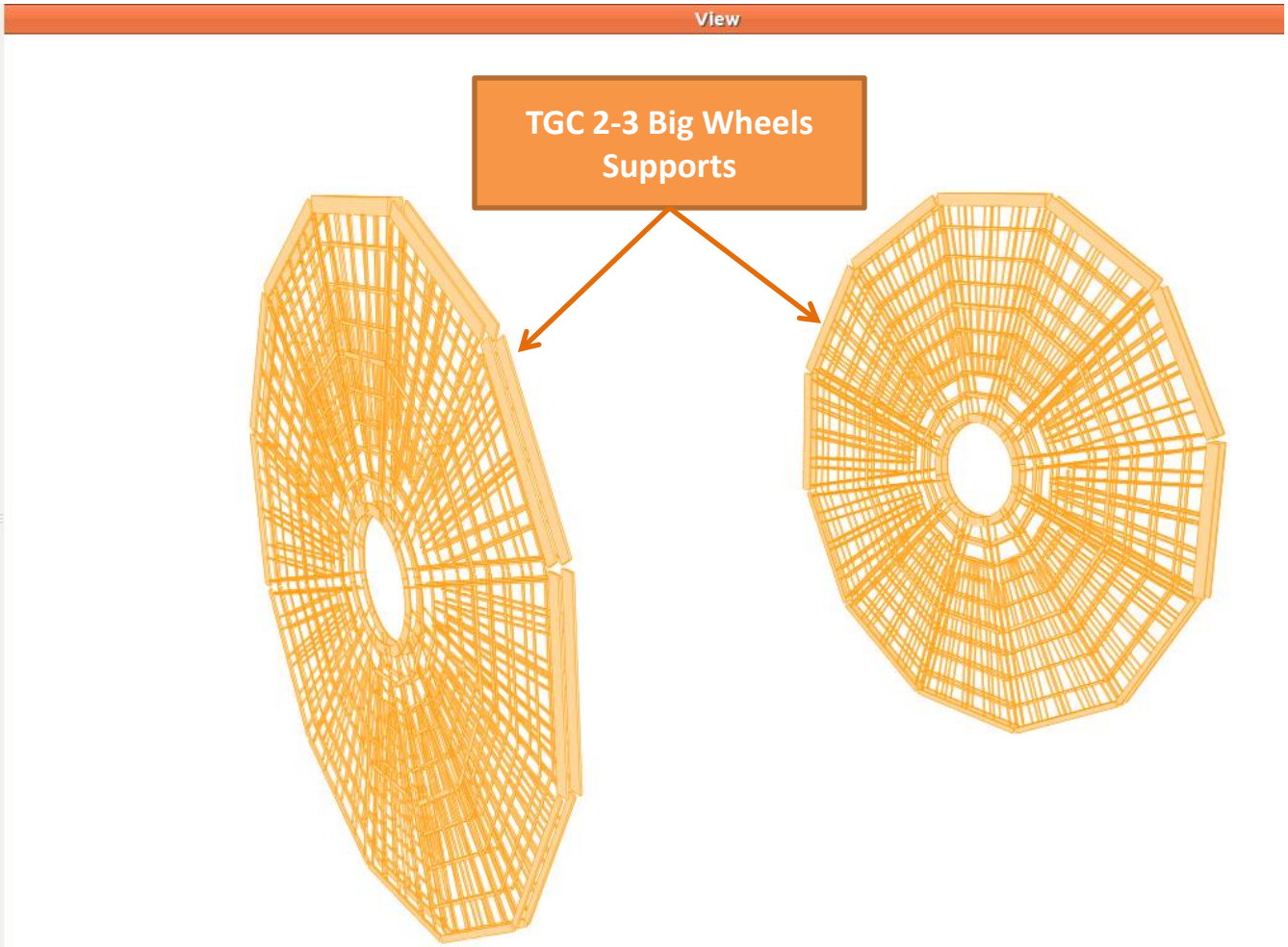
	Volume (m^3)			Weight (kgs)		
	CATIA	Geant4	Diferance	CATIA	GeatT4	Diferance
Outer Geometry	2.1552	0.7725	1.3827	5819	2086	3733
Middle Geometry	2.9936	2.0126	0.981	8083	5434	2649
Inner Geometry	0.265	0.1033	0.1617	716	279	437
Total	5.4138	2.8884	***2.5254***	14617	7799	***6819***



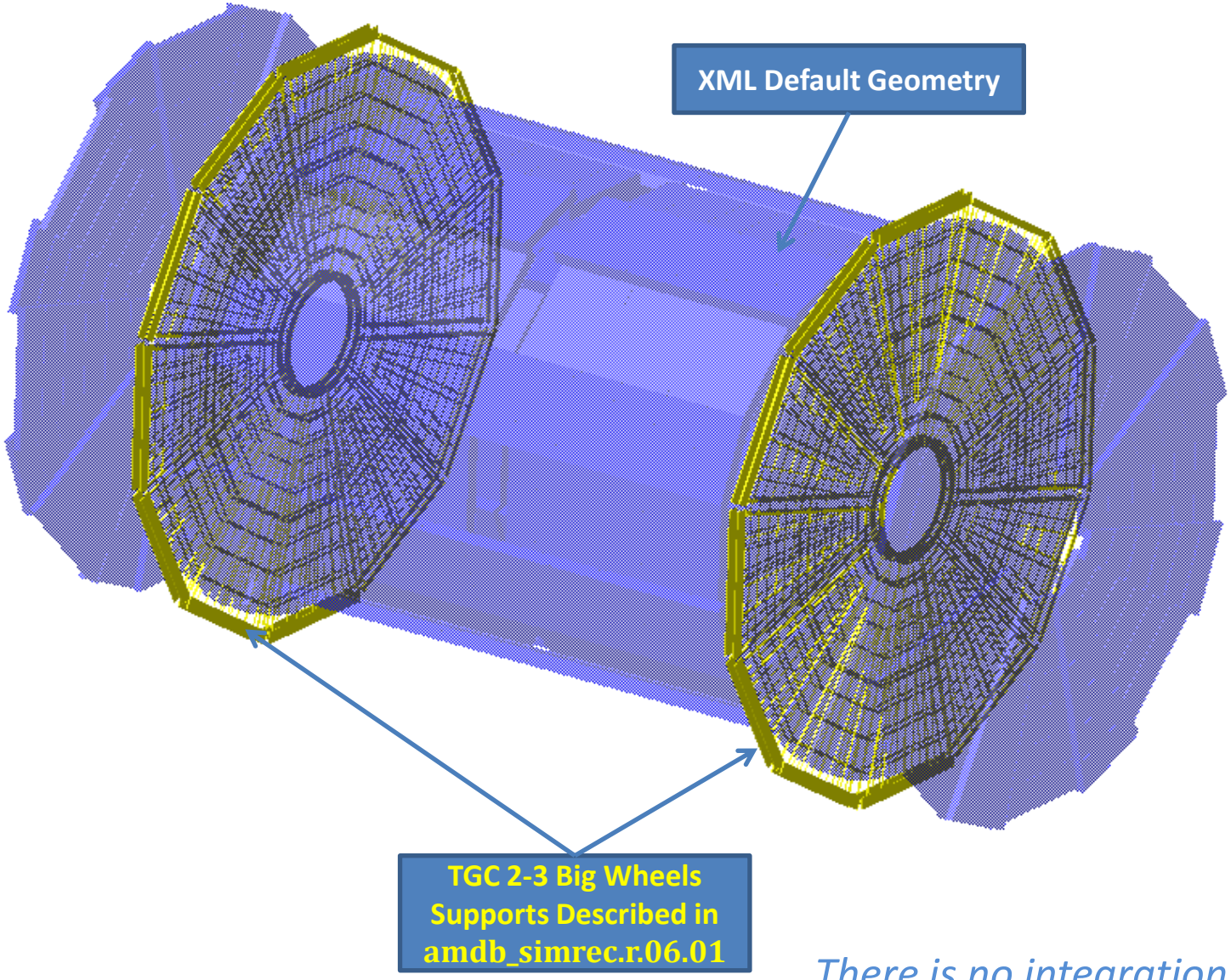
TGC 2-3 Big Wheels Supports Dead material description code in XML

TGC2-3 big wheels supports are described in XML file (**amdb_simrec.r.06.01**), between 16943– 16939 and 17002– 17004 line numbers





Integration Conflict Checking



There is no integration conflicts

Thank you for Attention

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