

Passive Material Description

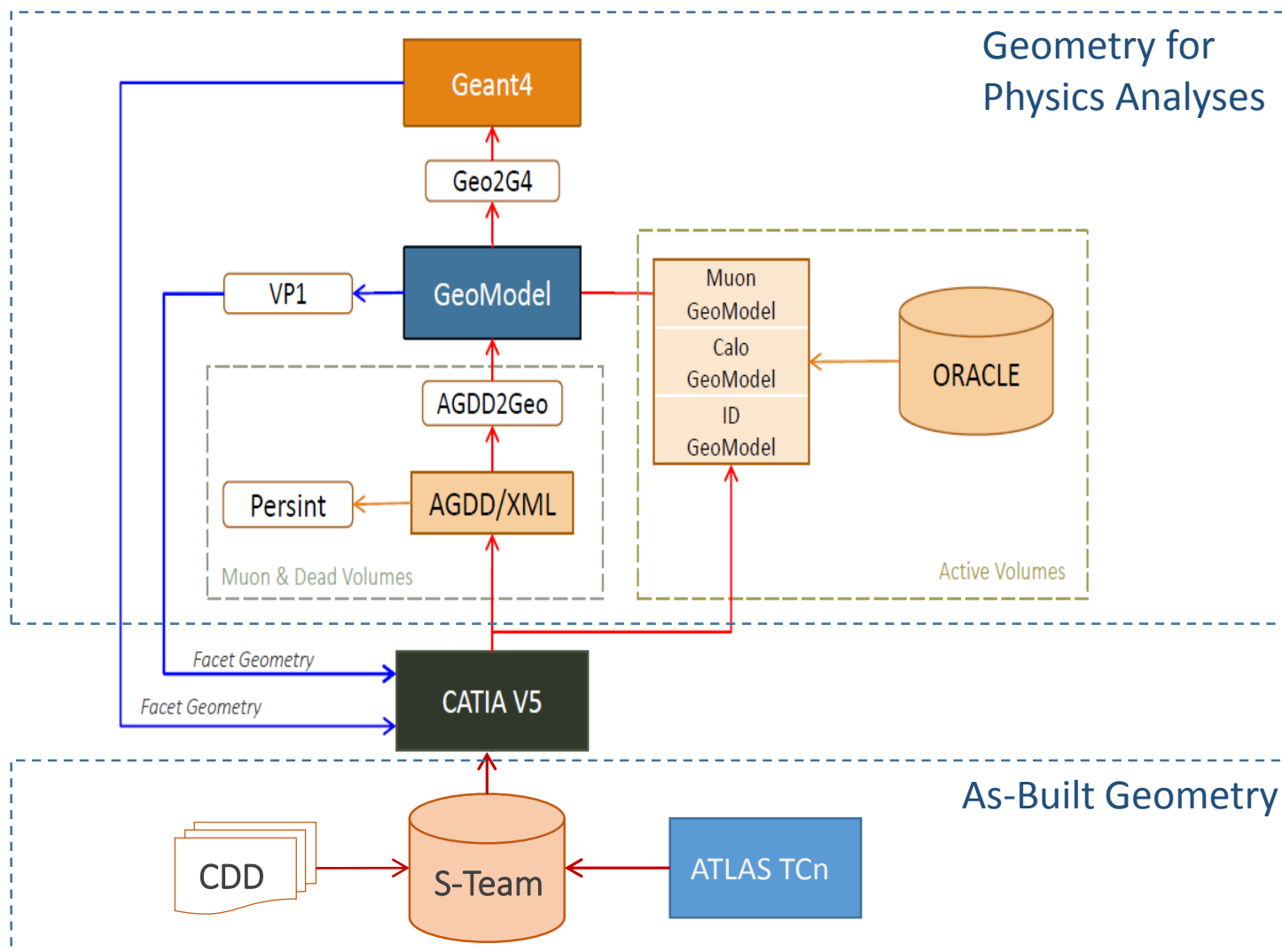
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TSUTSKIRIDZE Niko
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SHEKILADZE Davit
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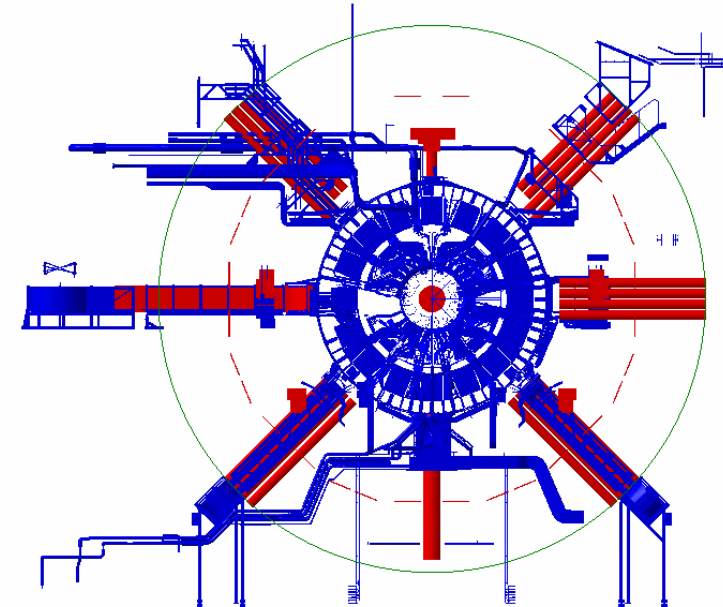
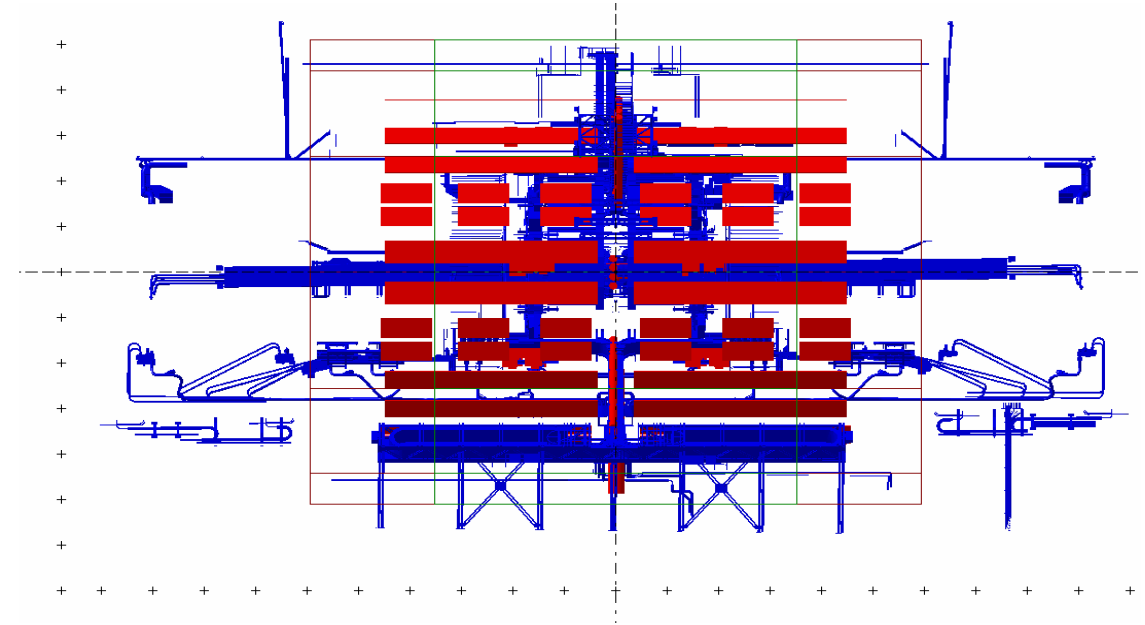
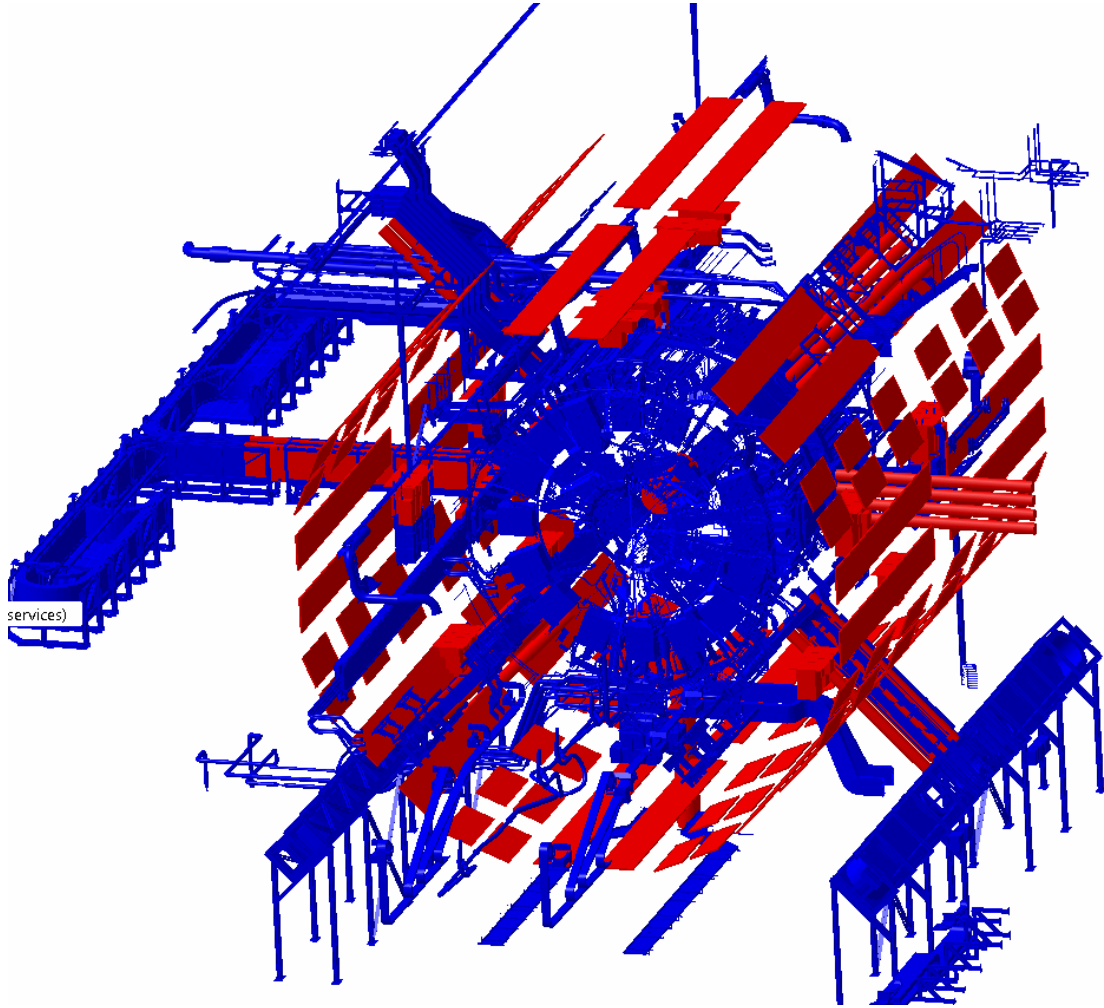
- Passive materials description development workflow on the base of CATIA



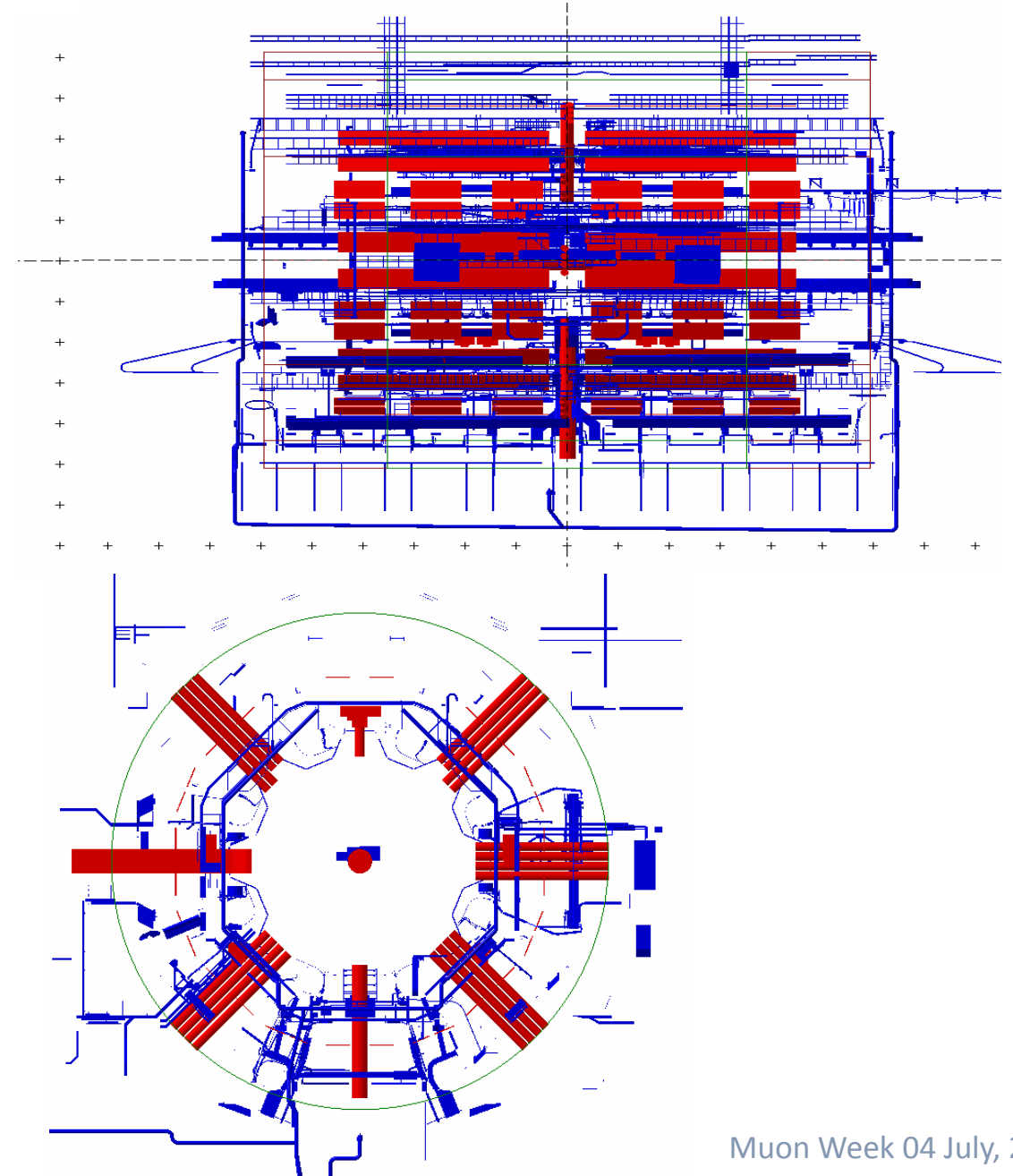
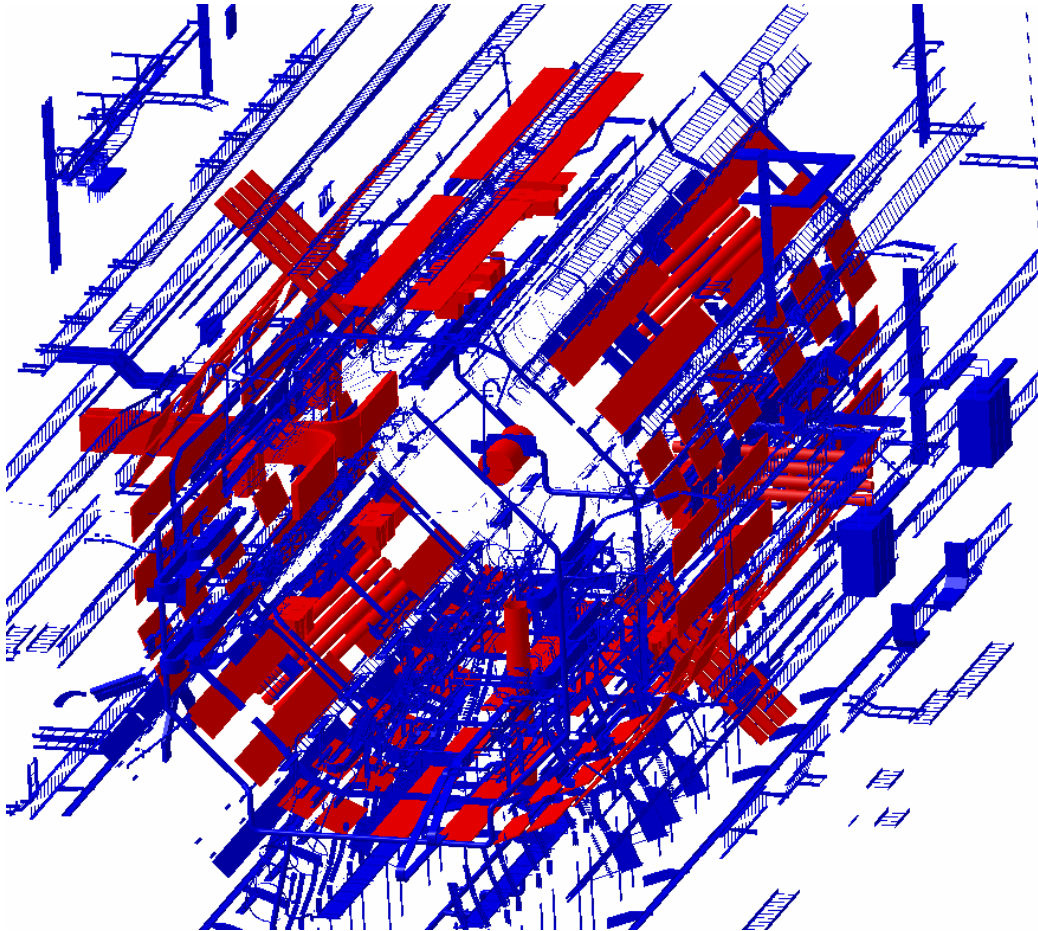
- Adding New volumes into the Geant based on as-build descriptions
 - Compare of existing volumes on conformity with as-build descriptions
- We are using CATIA as a hub to collect geometries from various platforms

I. Current status of Passive Materials Description in GEANT

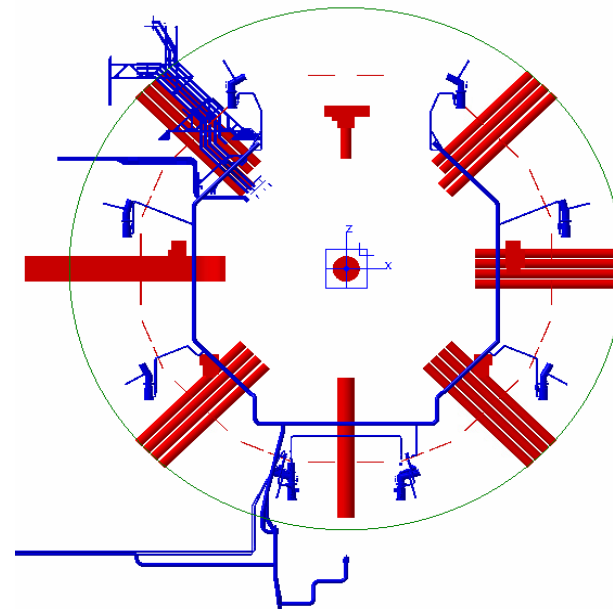
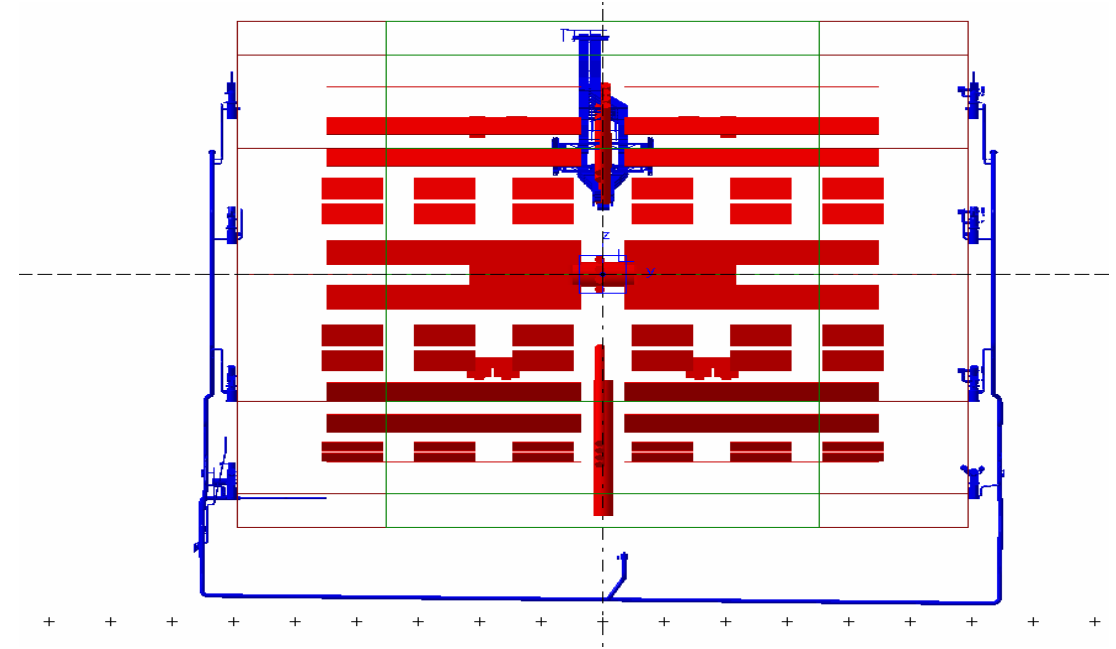
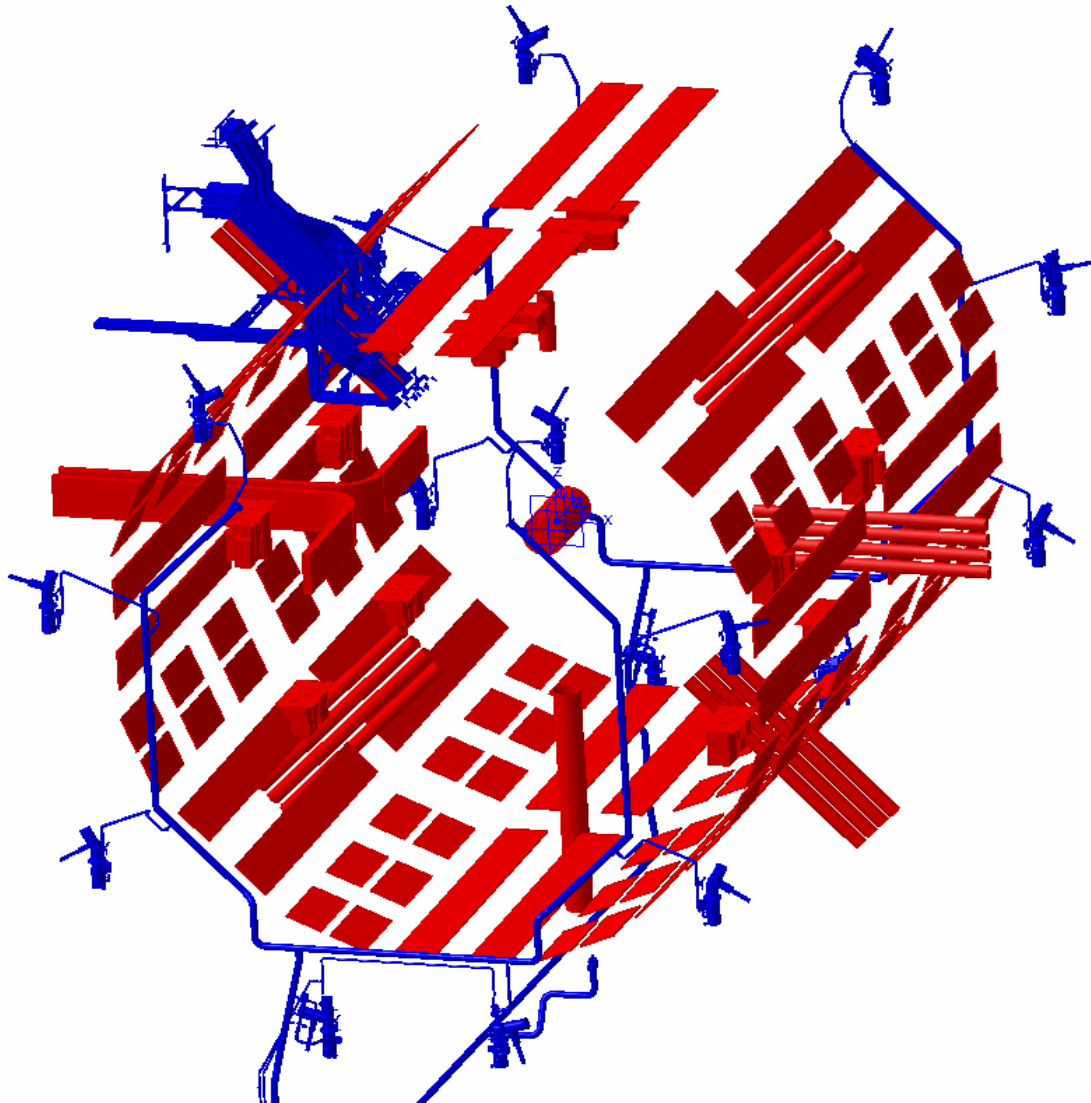
- Calorimeter Services



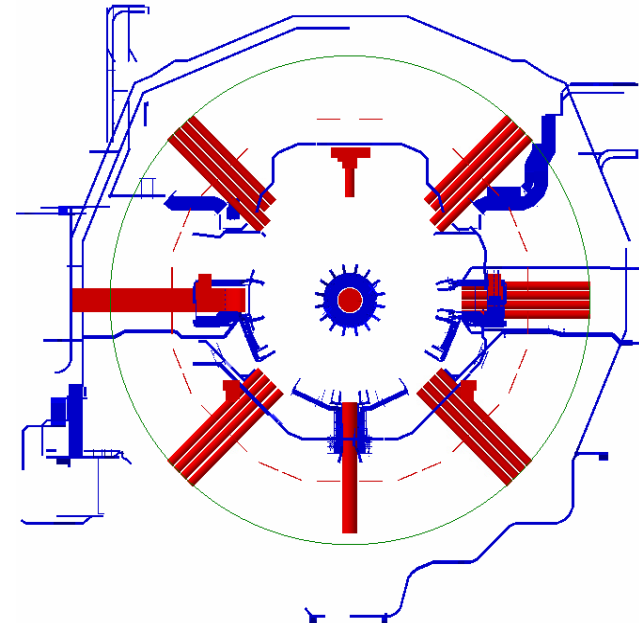
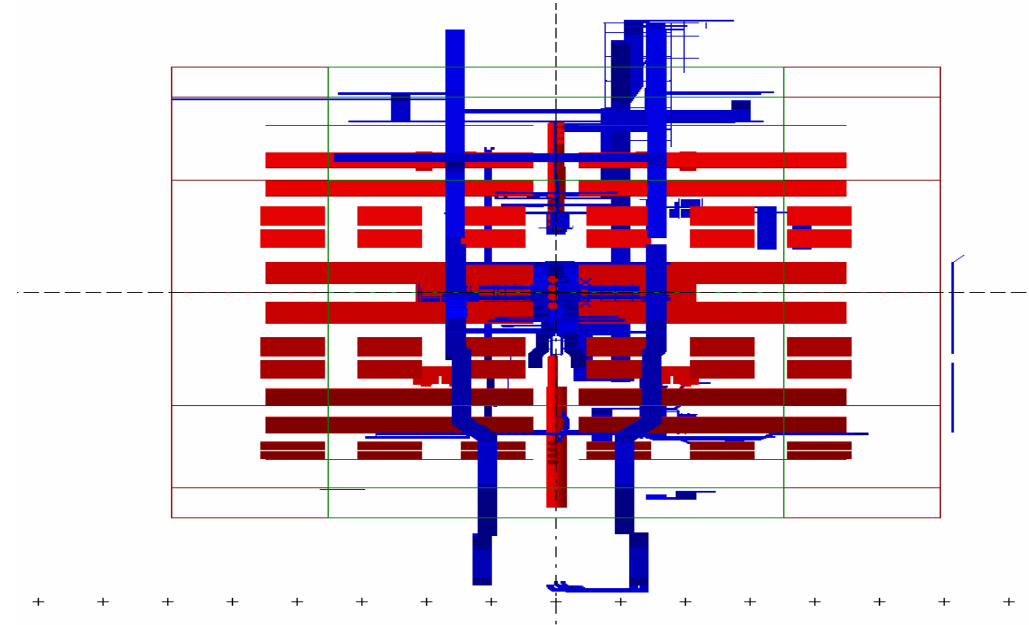
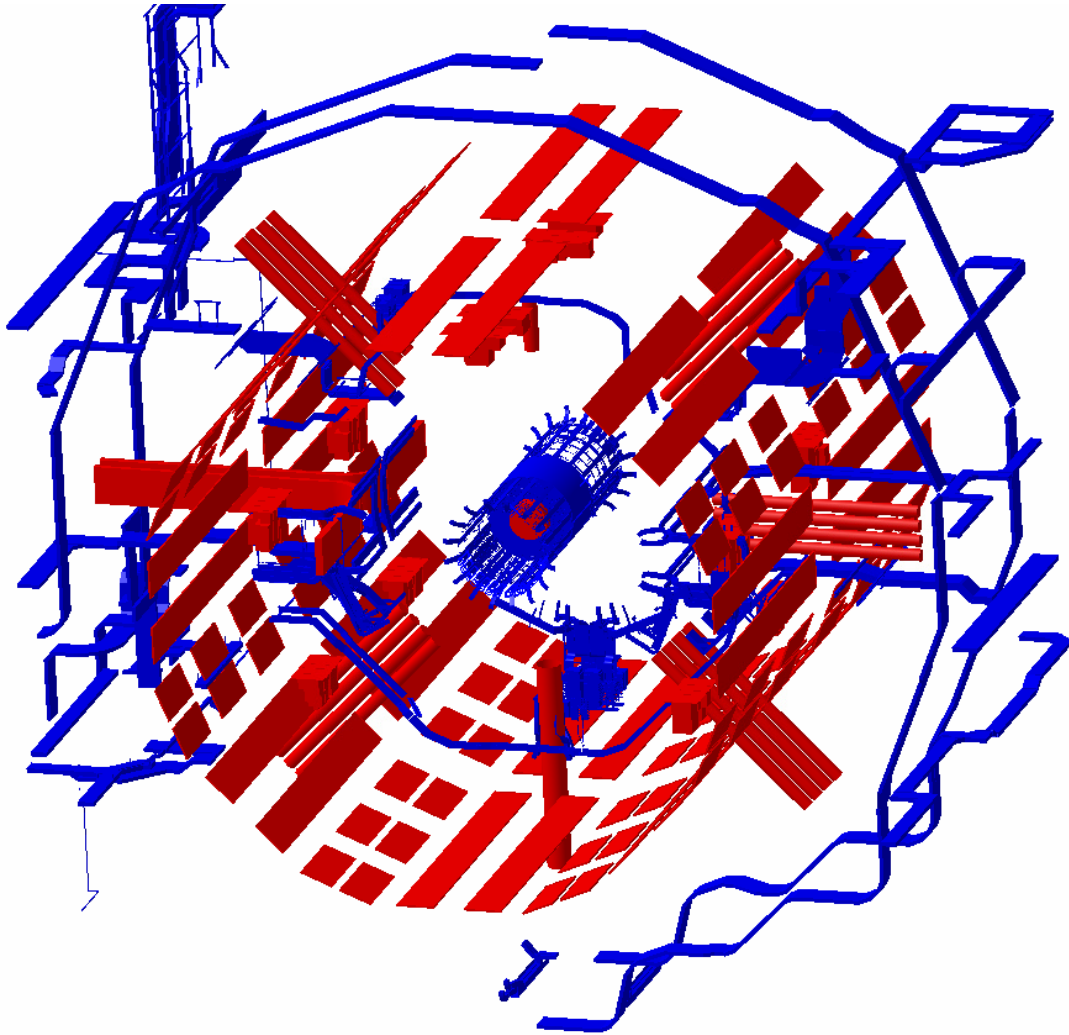
- Muon Services



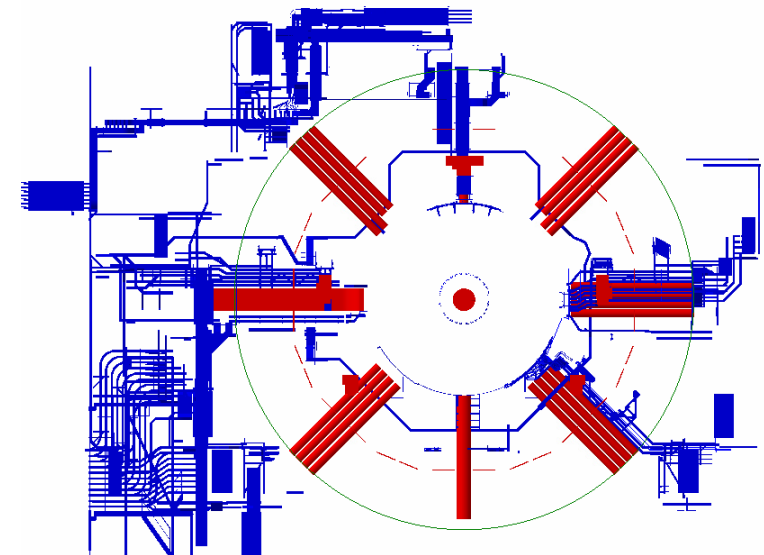
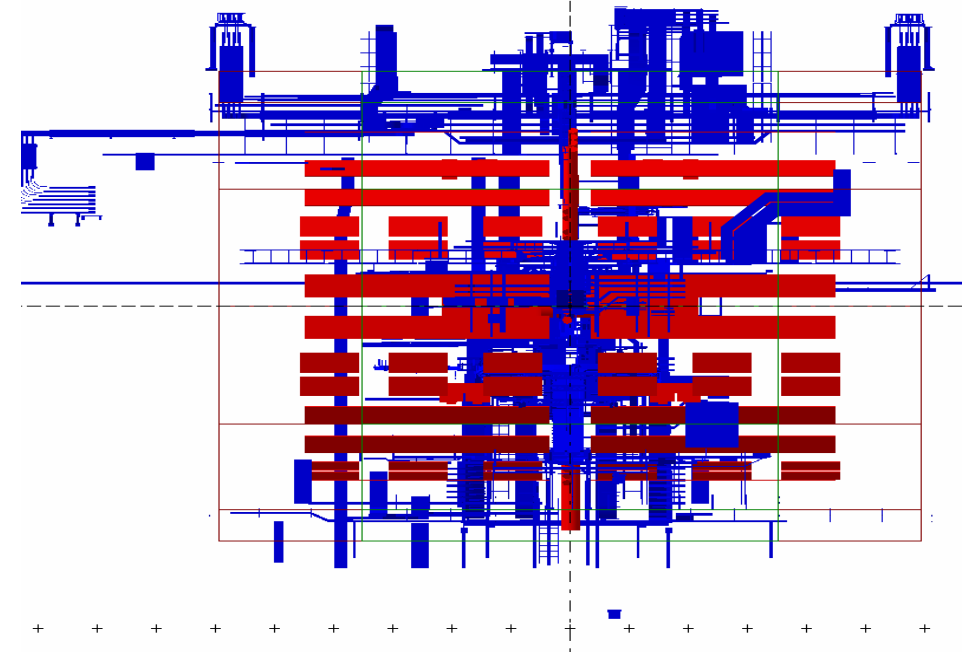
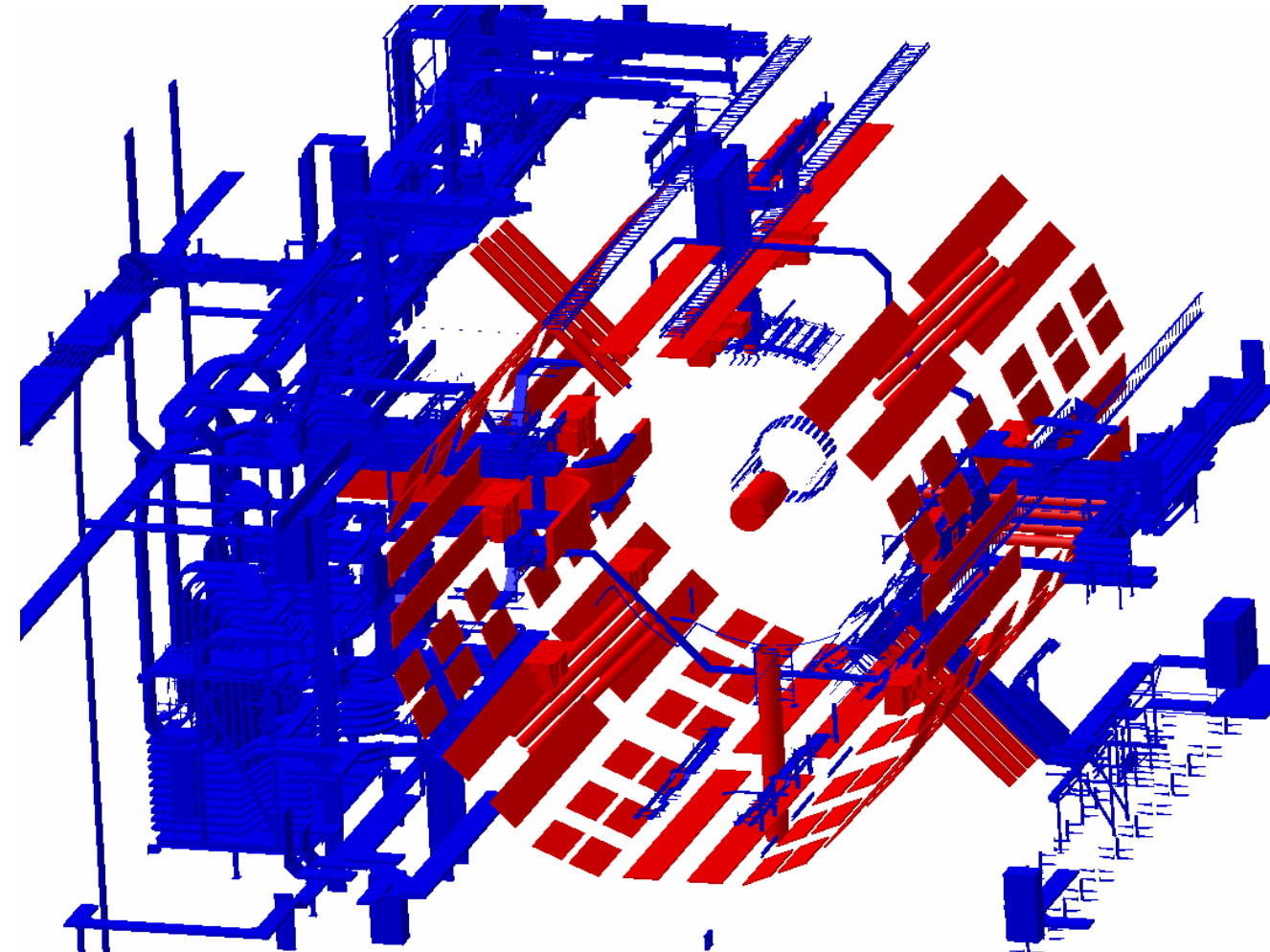
- Magnet Services



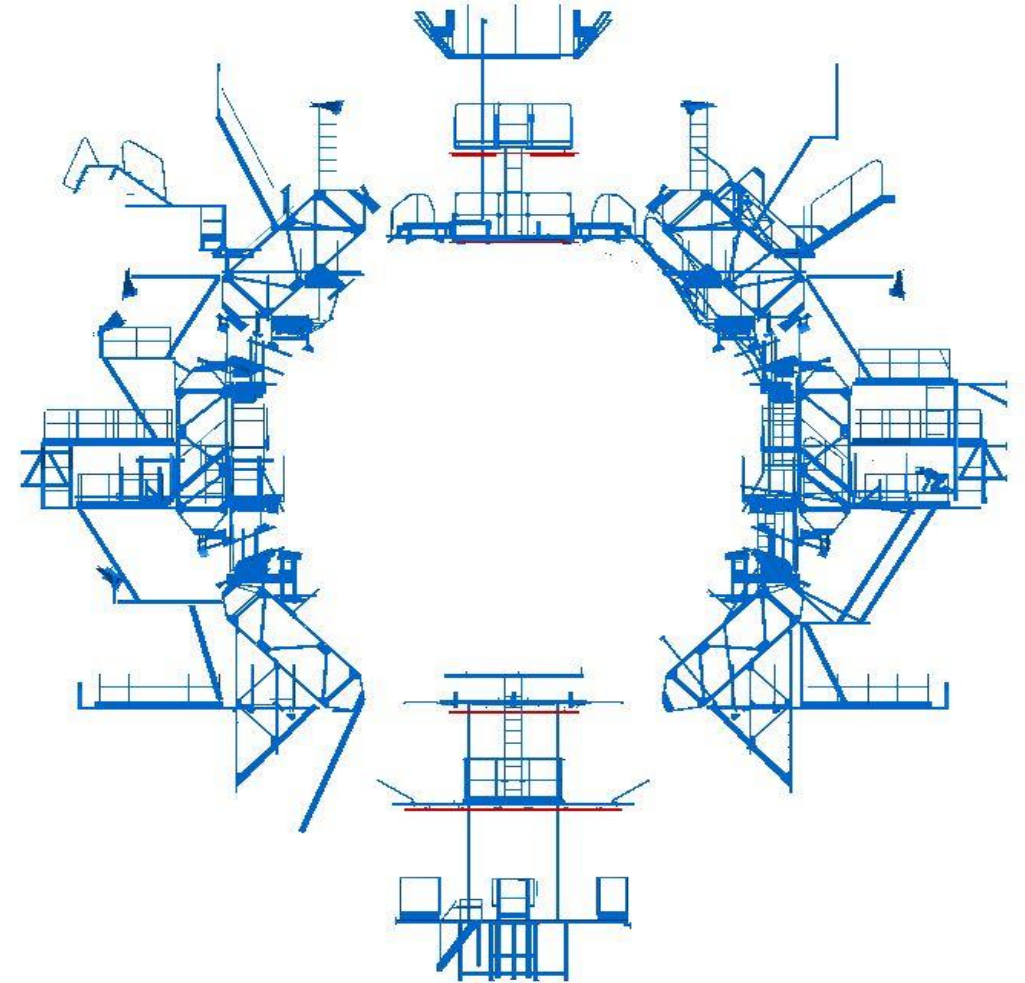
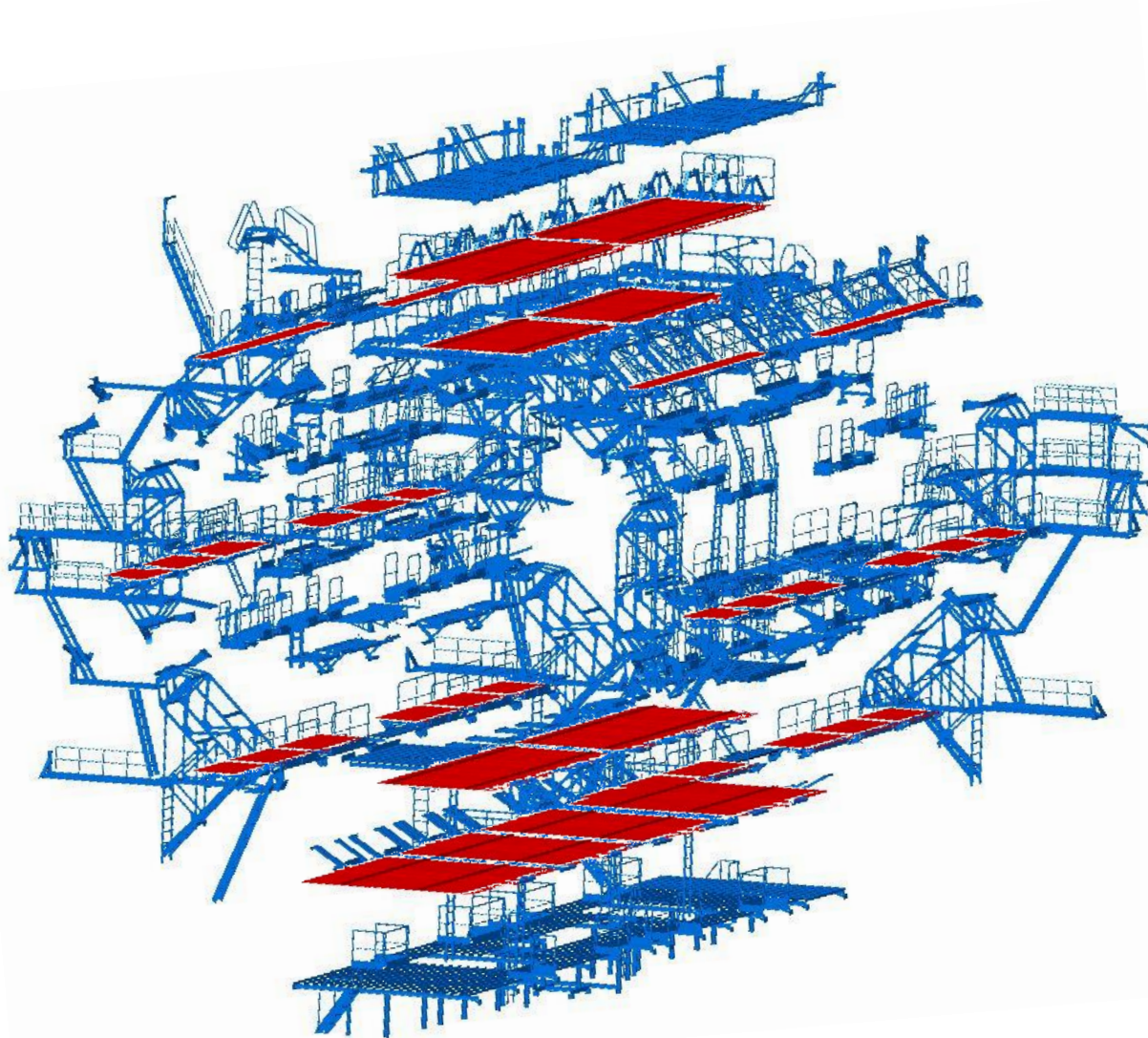
- JD Services



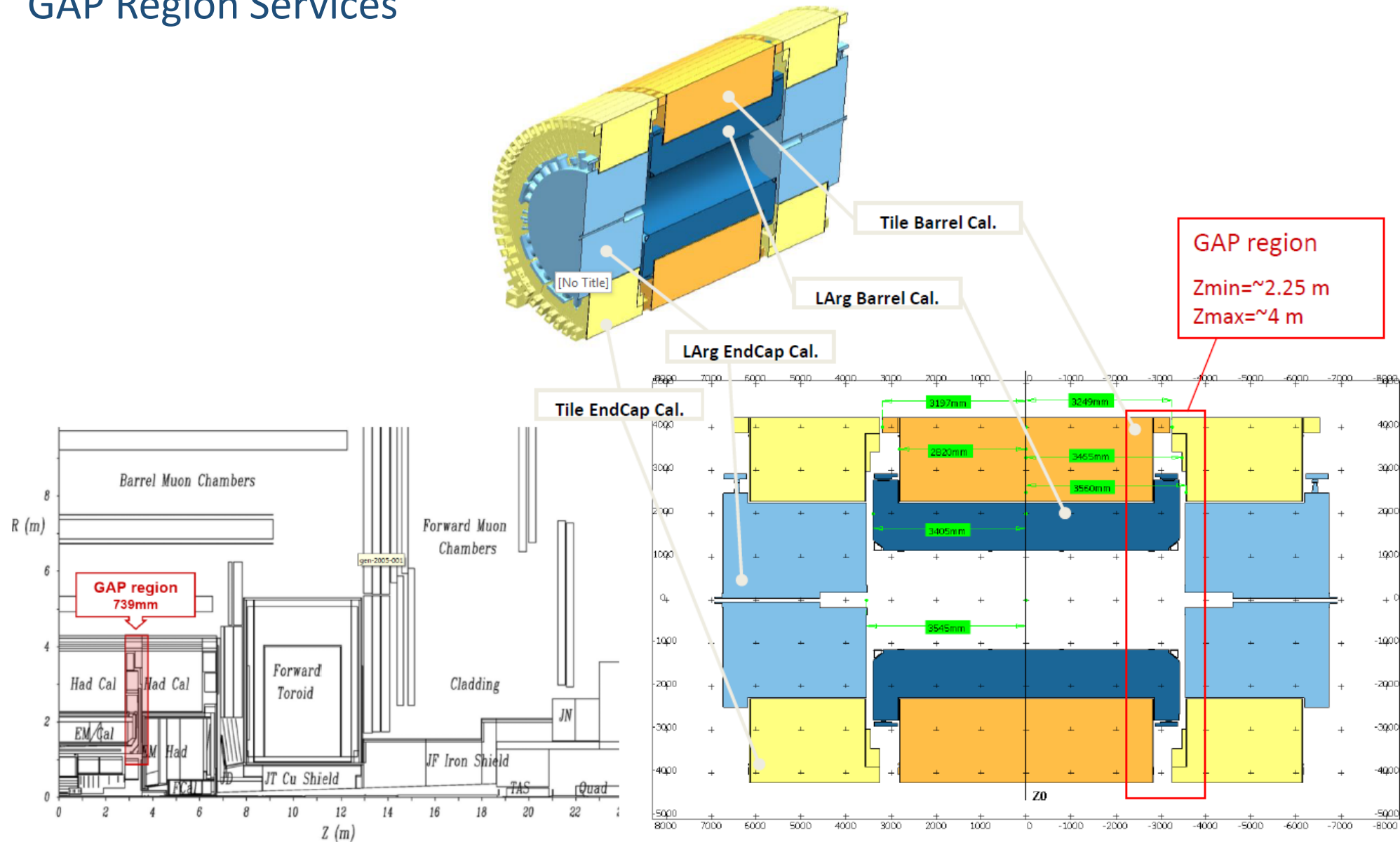
- Racks, Cable Trays



- Platforms



- GAP Region Services



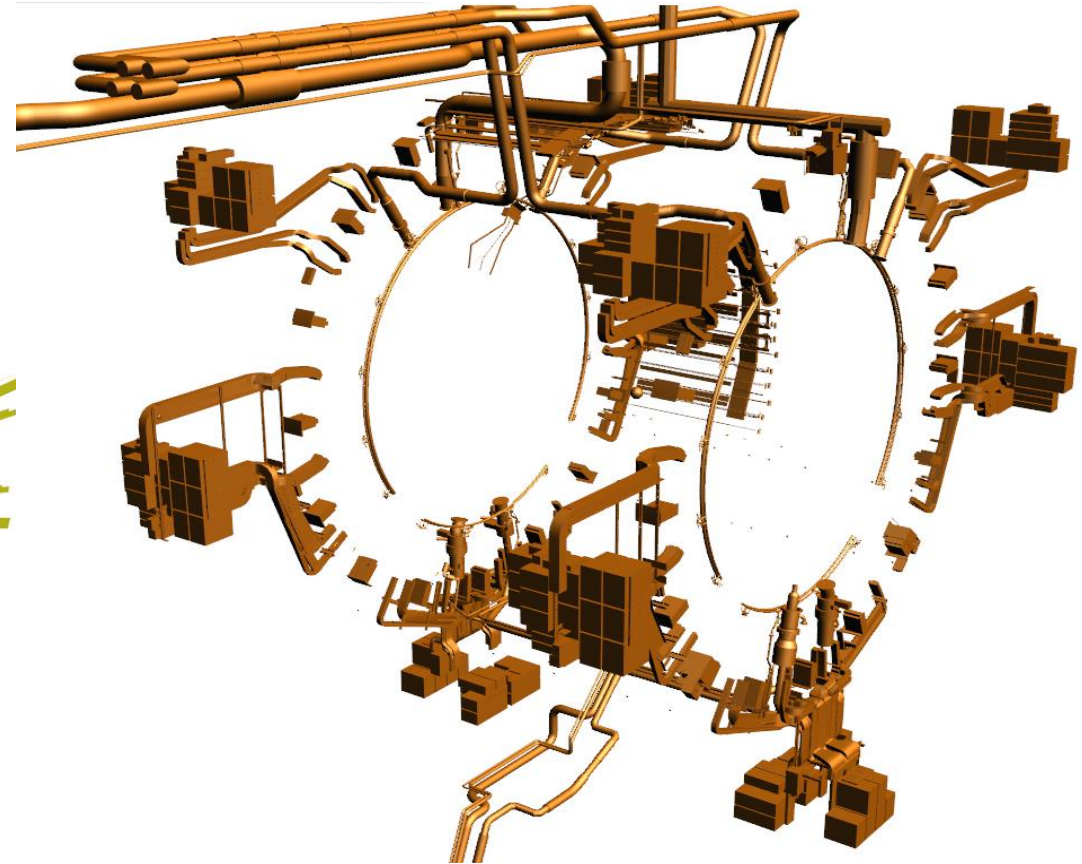
■ GAP Region Services

■ Middle Services

- 1 R08 : Electronic Boxes
- 2 R09 : LA Drain Line
- 3 R10 : LA Pump
- 4 R11 : By Pass Tube
- 5 R13 : LN2-GN2 Lines
- 6 R14 : Cryostat Safety Line
- 7 R15 : Solenoid Line
- 8 R16 : Middle Services – S1 Supports
- 9 R17 : Middle Services – S1 Cabels
- 10 R18 : Middle Services – S1 Pipes



■ Outer Services



- Considering above described status we have todo list for both activities

I. Adding New Descriptions:

- #01: Outer Services in GAP region
- #02: JD Services in Sector 13
- #03: Middle Services in GAP region
- #04: CALO Services
- #05: Flexible Chain in Sectors 11
- #06: Flexible Chain in Sectors 15
- #07: Platforms in missing Sectors
- #08: NSW Passive Materials

II. Compare Existing Descriptions:

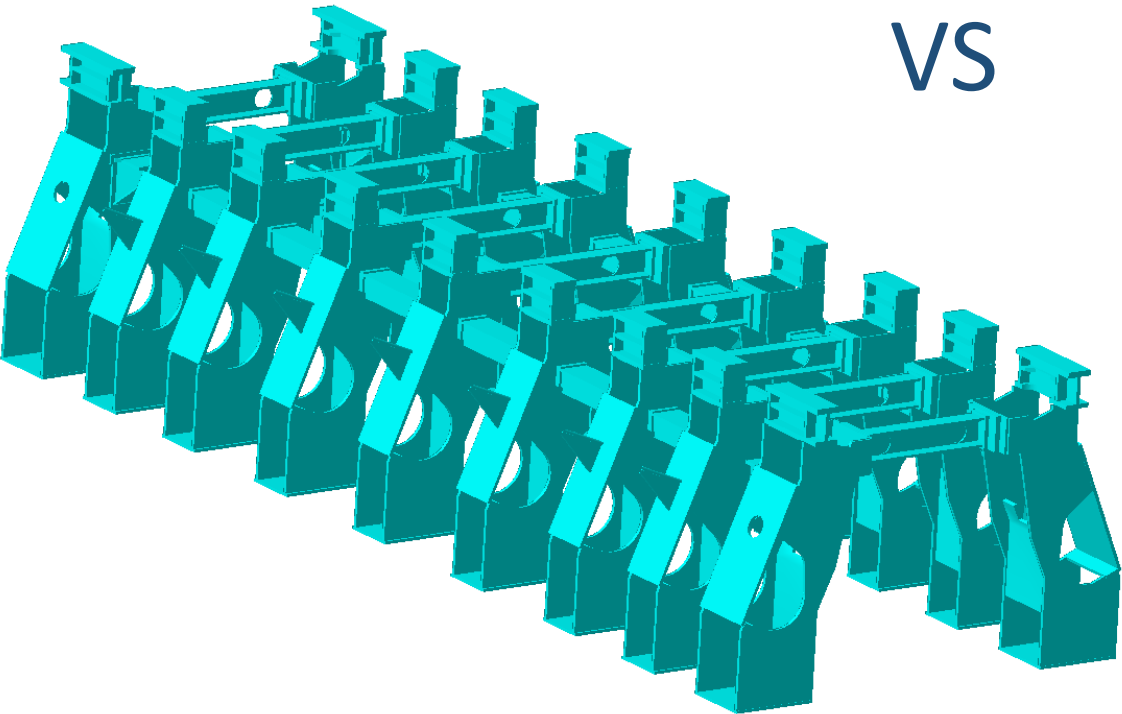
- #01: Warm Structure
- #02: Flexible Chain in Sector 9
- #03: Feet's
- #04: Services of Magnet System in S.7
- #05: JD Services in Sectors 7 and 9
- #06: Platforms in Sector 5 and 13
- #07: CALO Services

II. Recent Compare Checking project of ATLAS Feet's

Project Summary:

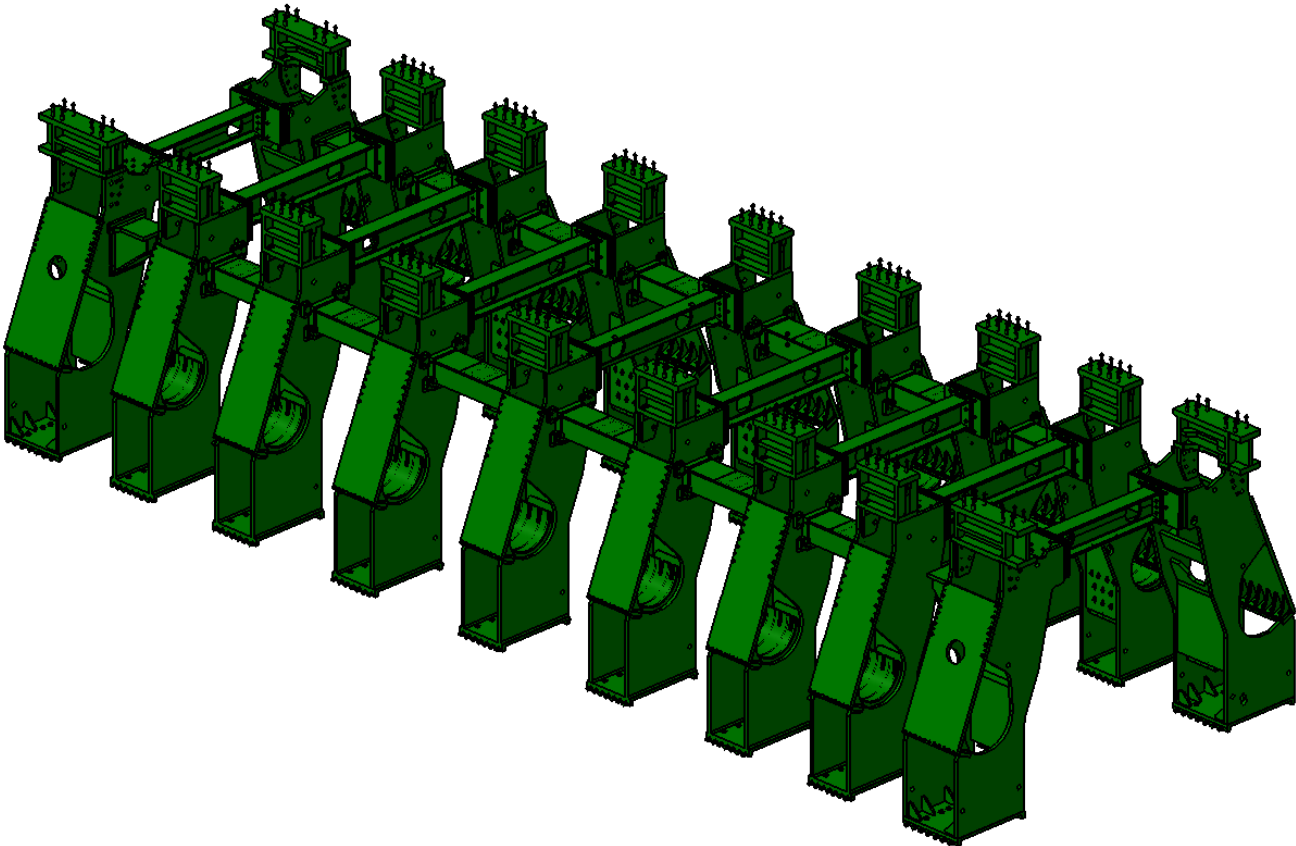
- Started 1st of March, 2019 and finished 5th of June, 2019.
- 1.5FTE involved
- 16 working tasks were executed
- 63 CDD drawings converted into 3D geometry and added to existing CATIA geometry in order to reproduce as-built description of Feet's

GEANT



VS

CATIA



499 Volumes

Volume (m³)	43.457
Mass (kg)	331'307
Material	Iron/Aluminum
Density (kg/m³)	7'870/2700

371 Volumes

Volume (m³)	48.575
Mass (kg)	367'060
Material	Stainless Steel/Aluminum
Density (kg/m³)	8'000/2'700

- Whole GEANT geometry split into 10 sub volumes for Analyses:

- Standard Foot
- Extremity Foot
- Rail Support
- Extremity Rail Support
- Girder
- Extremity Girder
- FEET_Standard Strut
- FEET_Extremity Strut
- Bolts
- Slanted ConnPlate Bracket

- CATIA vs GEANT comparison final results:

		CATIA	Geant4	Difference
1	Standard Foot	213'248 kgs	186'401 kgs	-12.6 %
2	Extremity Foot	66'864 kgs	58'647 kgs	-12.3 %
3	Rail Support	31'944 kgs	31'448 kgs	-1.6 %
4	Extremity Rail Support	11'040 kgs	10'900 kgs	-1.3 %
5	Girder	24'096 kgs	18'305 kgs	-24 %
6	Extremity Girder	4'576 kgs	4'430 kgs	-3.2 %
7	FEET_Standard Strut	8'523.9 kgs	16'611 kgs	+48.7 %
8	FEET_Extremity Strut	2'448.9 kgs	4'427.5 kgs	+44.7 %
9	Bolts	4'320 kgs	- kgs	- 100 %
10	Slanted ConnPlate Bracket	- kgs	138 kgs	+ 100 %
	Total	367'060 kgs	331'307 kgs	34.84 %

Phase II.

Simplification of CATIA detailed geometry

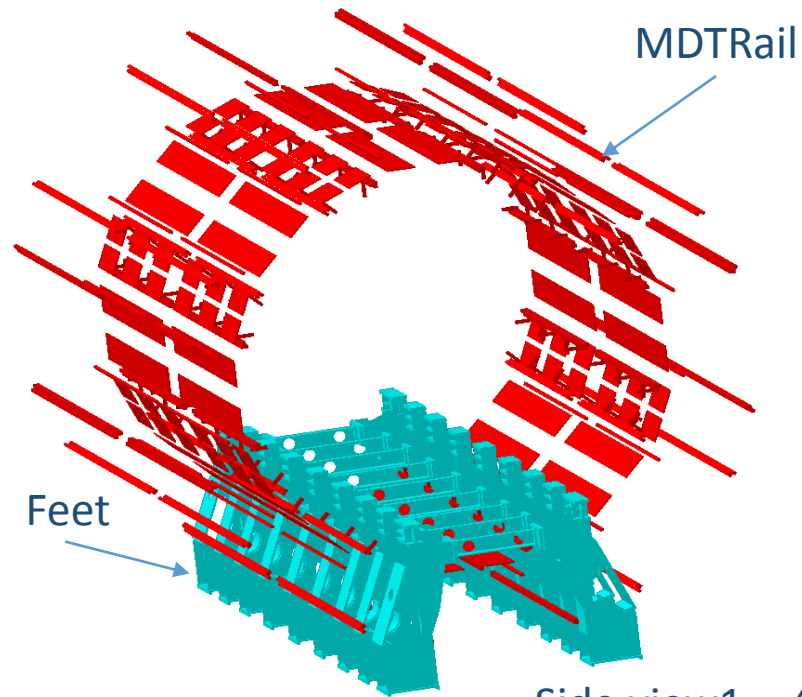
- Final results of Simplification

		Detailed	Simplified	Difference
1	Standard Foot	215'600 kgs	215'600 kgs	0 kgs
2	Extremity Foot	67'488 kgs	67'480 kgs	-8 kgs
3	Rail Support	32'672 kgs	32'672 kgs	0 kgs
4	Extremity Rail Support	11'248 kgs	11'248 kgs	0 kgs
5	Girder	24'497.6 kgs	24'500.8 kgs	+3.2 kgs
6	Extremity Girder	4'576 kgs	4'576 kgs	0 kgs
7	FEET_Standard Strut	8'523.9 kgs	8'525.3 kgs	+1.4 kgs
8	FEET_Extremity Strut	2'448.9 kgs	2'448.9 kgs	0 kgs
	Total	367'054 kgs	367'051 kgs	-3 kgs

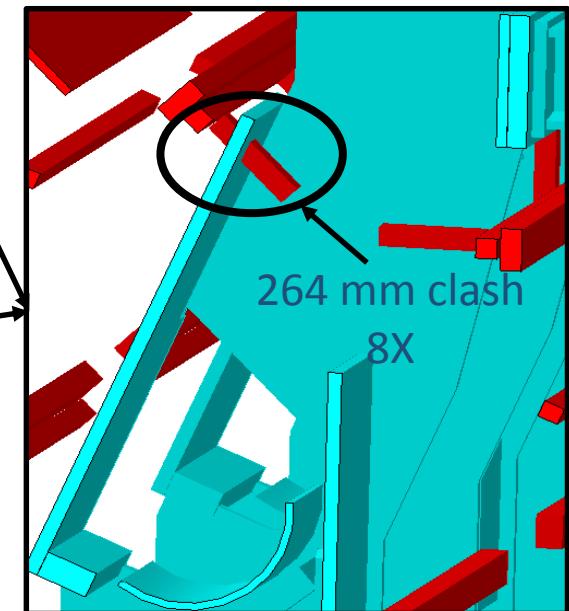
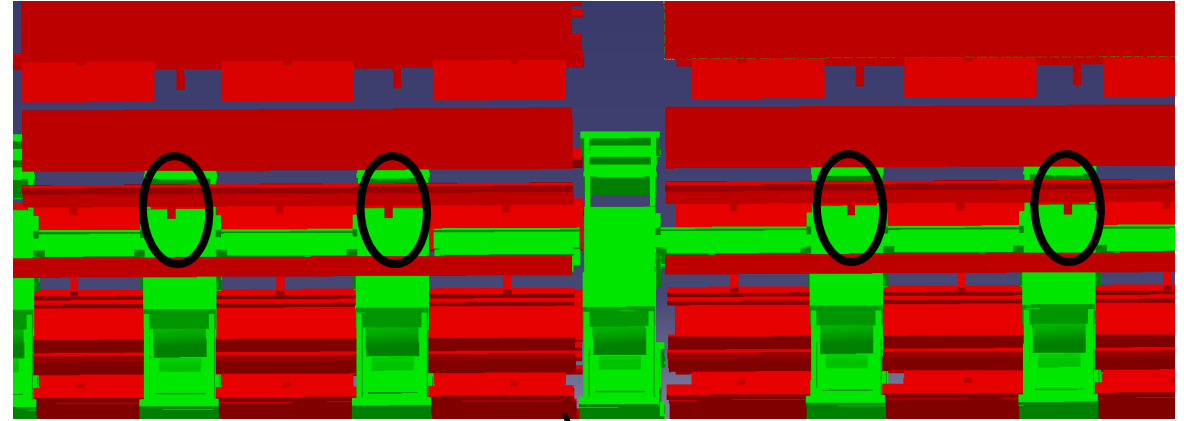
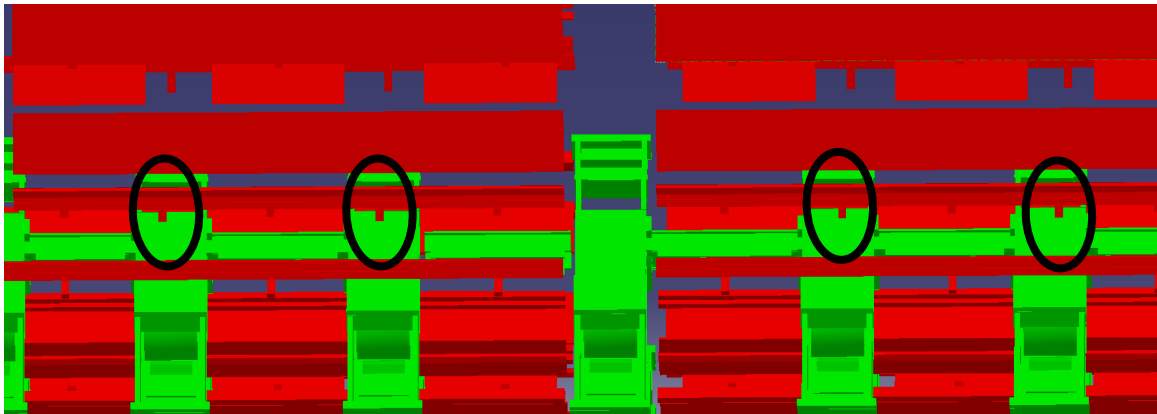
Phase III.

Integration Conflicts Checking

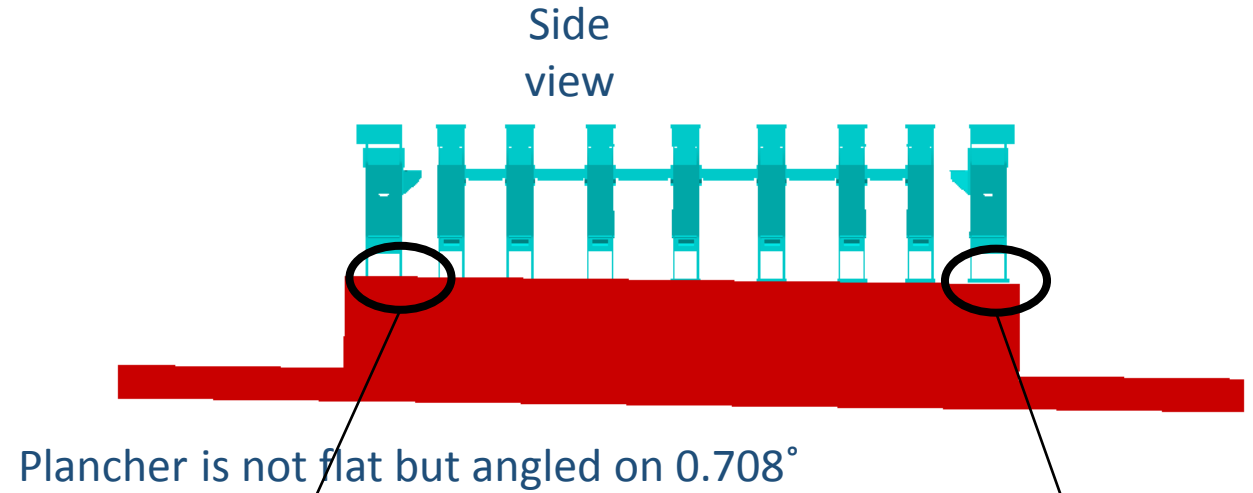
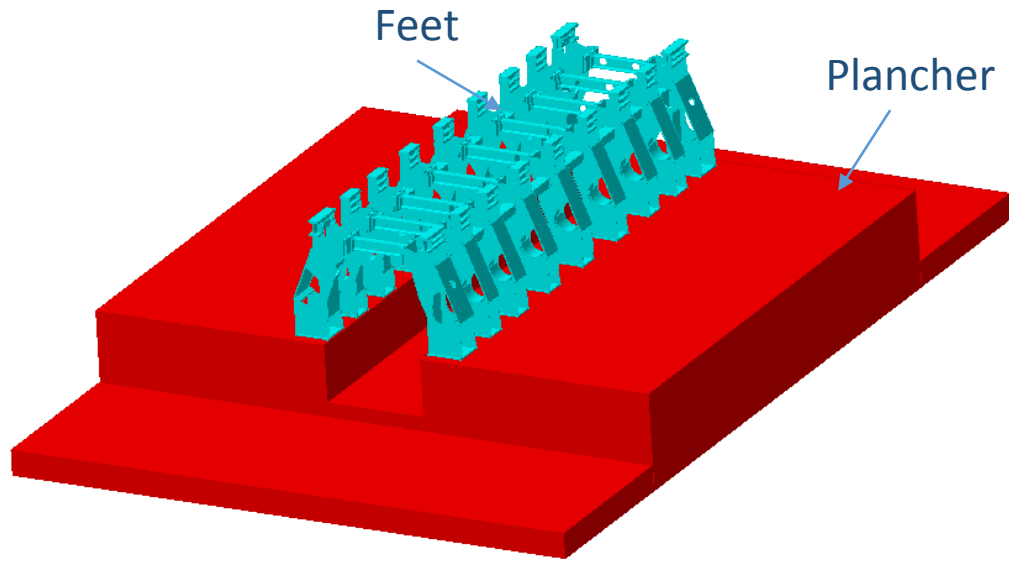
- Overlap #01: Feet vs MDT Rails



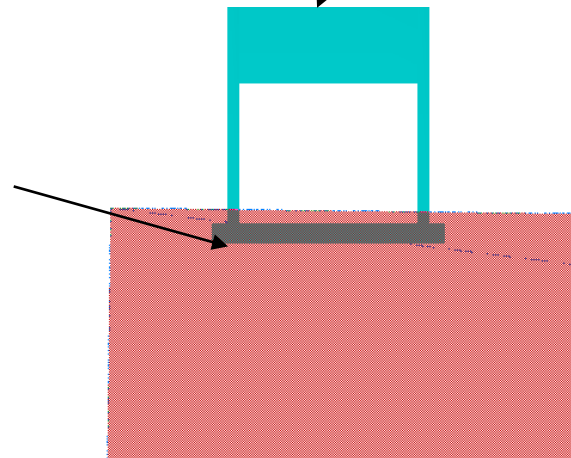
Side view1 – 4X Clashes



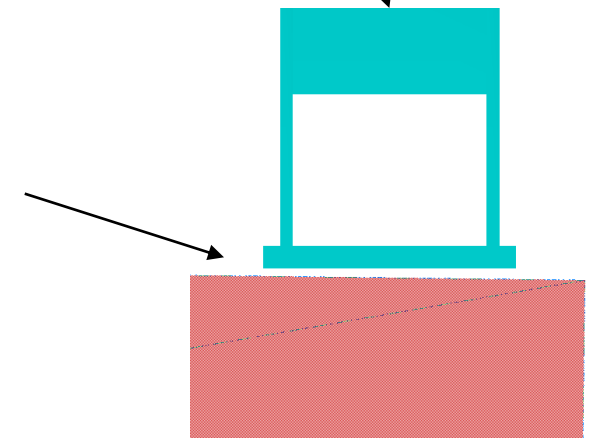
- Overlap #02: Feet vs Plancher



249 mm
clash



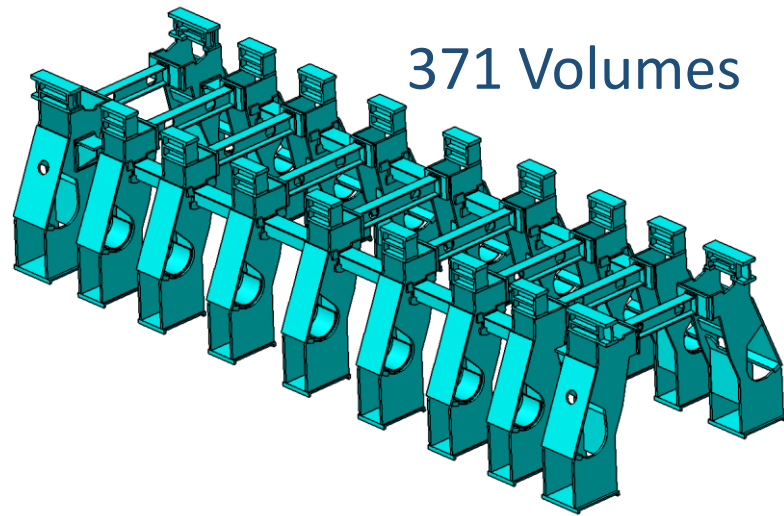
65 mm
Gap



Phase IV.

XML coding

- 371 volumes where separated for amdb structure which is less then baseline geometry volumes number – 499. So FEET new description will perform faster

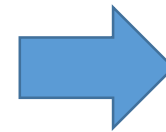


VS



- XML code produced and Merge Request generated on Gitlab

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1 <section name = "ATLAS Fast"
2   version = "0.0"
3   date = "20-05-2019"
4   author = "Niko Teutschkridze"
5   top_volume = "Fast"
6
7 <!-- Standard Feet -->
8 <gvxys name="Standard_Bottom_Plate" material="ShieldSteel" dZ="1100."/
9   <gvxy_point X_Y="820.5; 15.87"/
10   <gvxy_point X_Y="820.5; -75."/
11   <gvxy_point X_Y="814.; -75."/
12   <gvxy_point X_Y="814.; 75."/
13 </gvxys>
14
15 <gvxy name="Standard_MineSide_Plate" material="ShieldSteel" dZ="81.5"
16   <gvxy_point X_Y="1274.71; -2610."/
17   <gvxy_point X_Y="1274.71; -1884.217"/
18   <gvxy_point X_Y="1224.78; -883.87"/
19   <gvxy_point X_Y="950.09; -994.63"/
20   <gvxy_point X_Y="930.12; -830."/
21   <gvxy_point X_Y="634.5; -1052.5"/
22   <gvxy_point X_Y="400.94; -1052.5"/
23   <gvxy_point X_Y="27.91; -2.63"/
24   <gvxy_point X_Y="615.13; 640.42"/
25   <gvxy_point X_Y="40.20; 2020.2"/
26   <gvxy_point X_Y="40.29; 2030."/
27   <gvxy_point X_Y="559.49; 2030."/
28   <gvxy_point X_Y="1274.71; 2610."/
29   <gvxy_point X_Y="1274.71; 1820."/
30   <gvxy_point X_Y="906.15; 223.58"/
31   <gvxy_point X_Y="524.76; -687.17"/
32   <gvxy_point X_Y="524.76; -2610."/
33 </gvxy>
34
35
36 <tubs name="Standard_MineSide_Plate_CutTube" material="ShieldSteel" Rio_Z="0.; 615.; 85." nbPhi="32"/
37 <subtraction name="Standard_MineSide_PlateCut" >
38   <posXYZ volume="Standard_MineSide_Plate" /
39   <posXYZ volume="Standard_MineSide_Plate_CutTube" X_Y_Z="-406.956; -437.5; 0." rots=" 0.; 0.; 0."/
40 </subtraction>
41
42 <box name="Standard_Midd_Plate" material="ShieldSteel" X_Y_Z="297.; 153.6; 1100."/
43
44 <box name="Standard_Back_Top_Plate" material="ShieldSteel" X_Y_Z="59.3; 790.; 1040."/
45
46 <box name="Standard_Back_Plate" material="ShieldSteel" X_Y_Z="76.56; 1069.5; 896.0"/
47
48 <gvxys name="Standard_Inner_Back_Plate" material="ShieldSteel" dZ="44."
49   <gvxy_point X_Y="375.; -365."/
50   <gvxy_point X_Y="375.; 315."/
51   <gvxy_point X_Y="325.; 365."/
52 </gvxys>
53
54 <box name="Standard_Inner_Middle_plate" material="ShieldSteel" X_Y_Z="157.32; 680.; 630."/
55
56 <tubs name="Standard_Innert_Tub" material="ShieldSteel" Rio_Z="562.5; 685.5; 800." profile="213.; 134.8" nbPhi="32"/
57
58 <composition name="Standard_Inner_Parts" >
59   <posXYZ volume="Standard_Inner_Back_Plate" X_Y_Z=" 0.; 0.; 0." rots=" 0.; 90.; 0." /
60   <posXYZ volume="Standard_Inner_Middle_plate" X_Y_Z=" -335.3 ; -30.35 ; 0." rot=" 0.; 0.; -50." /
61   <posXYZ volume="Standard_Innert_Tub" X_Y_Z=" -754.18 ; 568.54 ; 0." /
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64 <gvxys name="Standard_Front_Cover" material="ShieldSteel" dZ="60.6"
65   <gvxy_point X_Y="550.; -1505."/
66   <gvxy_point X_Y="550.; -465."/
67   <gvxy_point X_Y="535.; -450."/
68   <gvxy_point X_Y="535.; 1505."/
69 </gvxys>
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72
73 <subtraction name="Standard_Front_CoverCut" >
```



atlas g4-xml

365 lines

1. We reproduced existing description of Feet in Smarteam DB by adding 65 CDD drawings
2. Compare analyses shows big difference between Geant-4 description of feet and as-built geometry - 35% overall difference
3. Decision for generation of new description + XML has been made
4. We received good result of simplification of detailed CATIA description – lose just 3 Kg
5. We have discovered 2 overlaps between Feet and other volumes. They are existing for both new and baseline geometries of Feet
6. For Overlap-#01 we propose to remove wrong parts from MDT Rails – modification in baseline Geant-4 description will needed
7. For Overlap-#02 we propose to change position of “Plancher” and make it flat (no 0.708°)– modification in baseline Geant-4 description will needed

Comments are welcome,

Thanks!