Geometry Update Priorities and Progress

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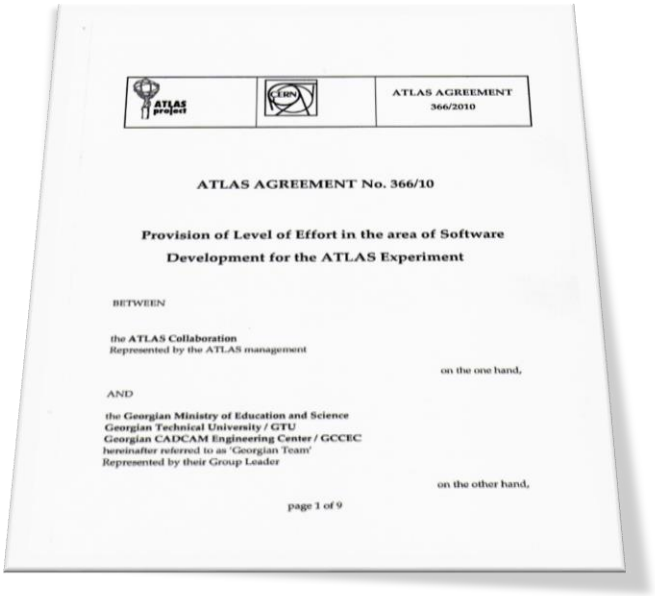
Georgian Technical University

About Current WP's

- Geometry update is on of the Working Package Georgian team is executing in the framework of Collaboration agreement AA366/10



ATLAS AGREEMENT
366/2010

ATLAS AGREEMENT No. 366/10

Provision of Level of Effort in the area of Software Development for the ATLAS Experiment

BETWEEN

the **ATLAS Collaboration**
Represented by the ATLAS management

on the one hand,

AND

the **Georgian Ministry of Education and Science**
Georgian Technical University / GTU
Georgian CADCAM Engineering Center / GCCEC
hereinafter referred to as 'Georgian Team'
Represented by their Group Leader

on the other hand,

page 1 of 9

WP01: "Checking G4 baseline geometry for Integration conflicts and Conformity with as-built geometry"

WP02: "Adding New Volumes in Geant4 Baseline Geometry"

- *Staff:* 4FTE allocated at Georgian Technical University

Summary of Work has been Done

WP1: Comparison of Geometries:

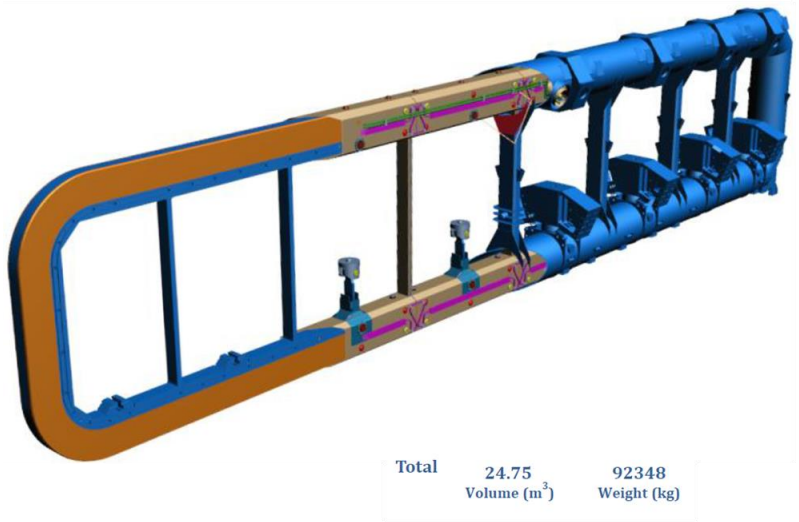
- Coils Study
- TGC1
- TGC2-3
- MDT
- ECT
- Integration

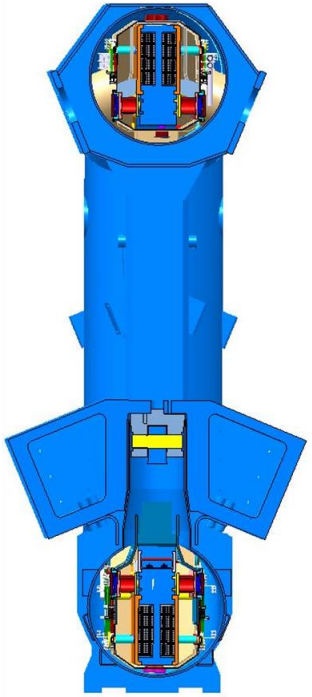
WP2: Adding New Geometries:

- NSW ver. 07/12/2012
- NSW ver. 31/03/2015
- NSW ver. 04/09/2015

WP1: Comparison of Geometries

- Coils Study
- TGC1
- TGC2-3
- MDT
- ECT
- Integration





- Source geometry has been taken from SmarTeam Engineering Database:

Path : ATLAS2009/Detector System/Magnets ATLAS/Toroid Magnets ATLAS/Barrel Toroid Magnet ATLAS/TB coils
Model: **ST0301587 TB COIL SEC2 (id: CAD000323373)**
Date : 01/11/2011

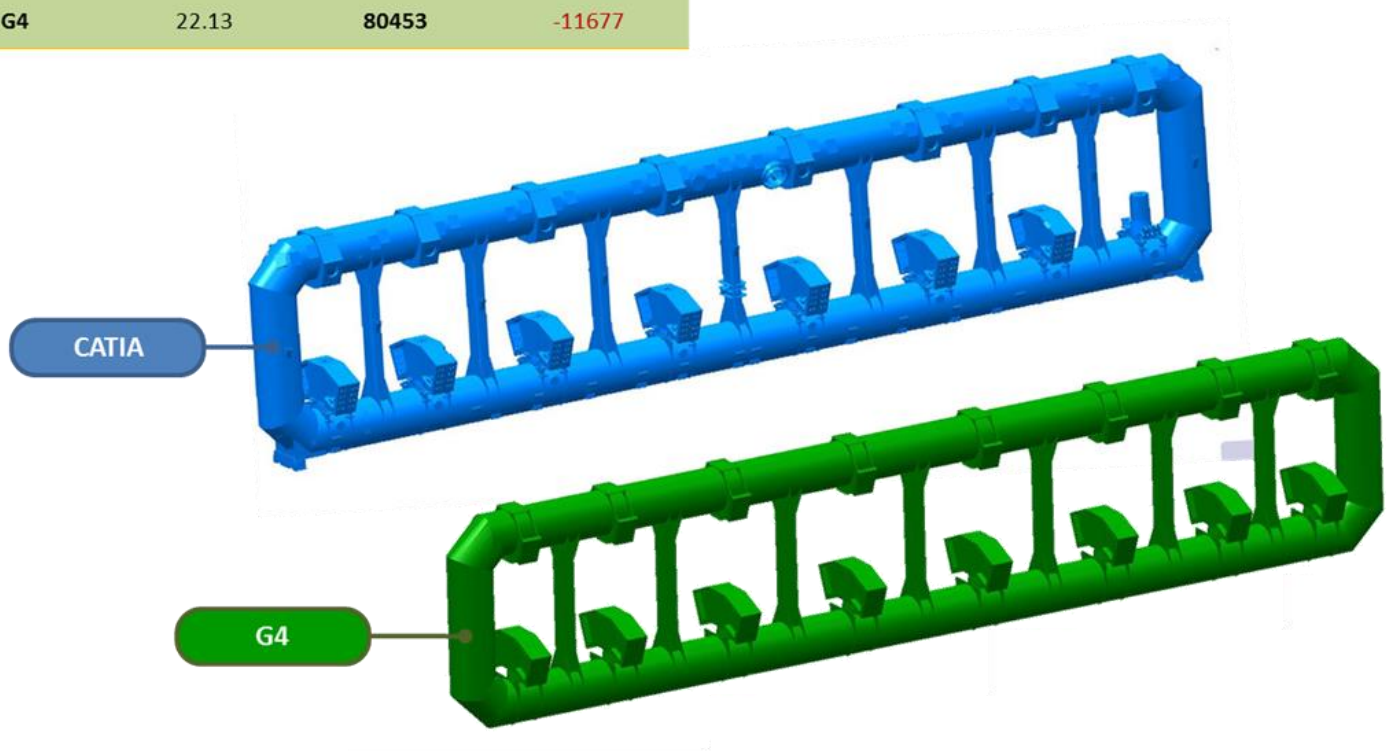
- 225 manufacturing drawings have been founded on CDD and missing parts was added to primary Smarteam geometry

WP1: Comparison of Geometries

- Coils Study
- TGC1
- TGC2-3
- MDT
- ECT
- Integration

Compare Analyses

Model	Volume (m3)	Weight (kg)	Difference (kg)
CATIA	24.75	**92130**	
G4	22.13	**80453**	-11677



WP1: Comparison of Geometries

- Coils Study
- **TGC1**
- TGC2-3
- MDT
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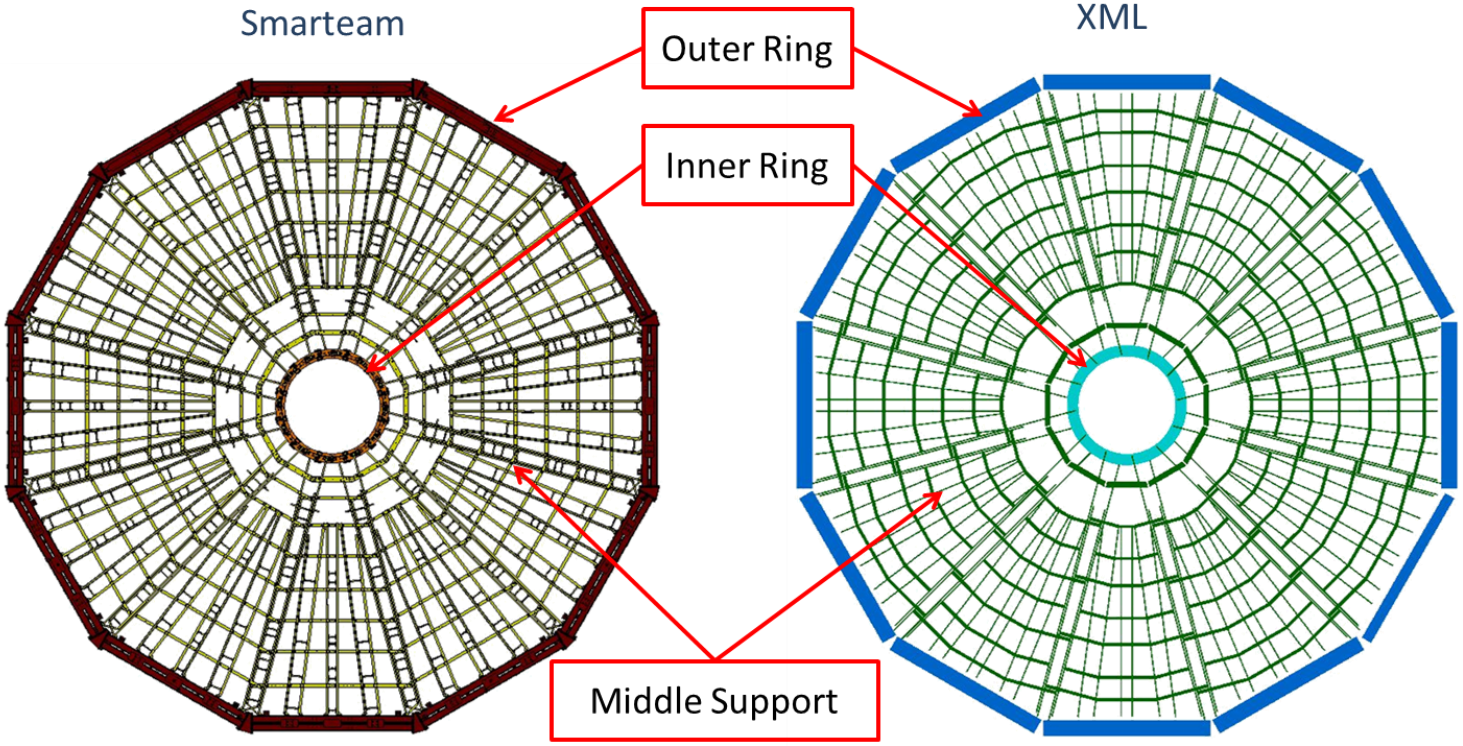
TGC1 Support Total discrepancy

	Model	Material	Density (kg/m3)	Volume (m3)	Weight (kgs)	Difference (kgs)
TGC1	**Smarteam Geometry**	Aluminum	2700	5.0351/5.038	13'594.8/13'597	
	XML Geometry	Aluminum	2700	2.79025/2.738	7'533.7/7'397	-6'200



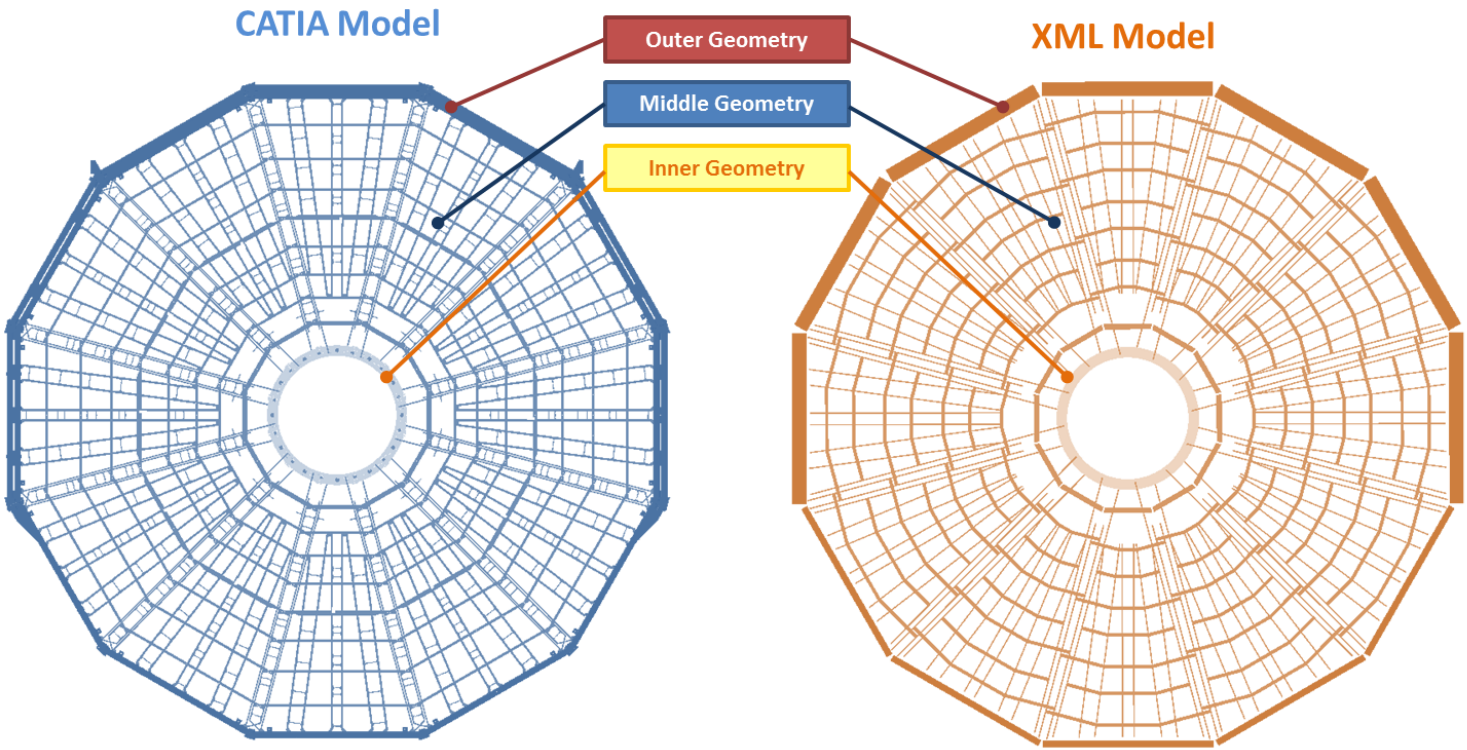
Geometrical Inaccuracy ~ 100 kg

WP1: Comparison of Geometries

- Coils Study
- TGC1
- **TGC2-3**
- MDT
- ECT
- Integration

Weight Discrepancy Between CATIA and XML

TGC 2-3	Volume (m^3)			Weight (kgs)		
	CATIA	XML	Diferance	CATIA	XML	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***



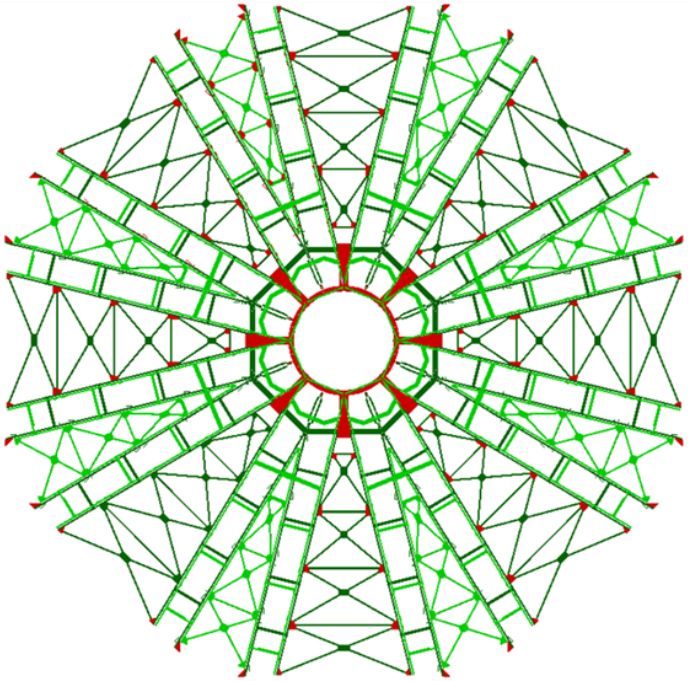
WP1: Comparison of Geometries

- Coils Study
- TGC1
- TGC2-3
- MDT
- ECT
- Integration

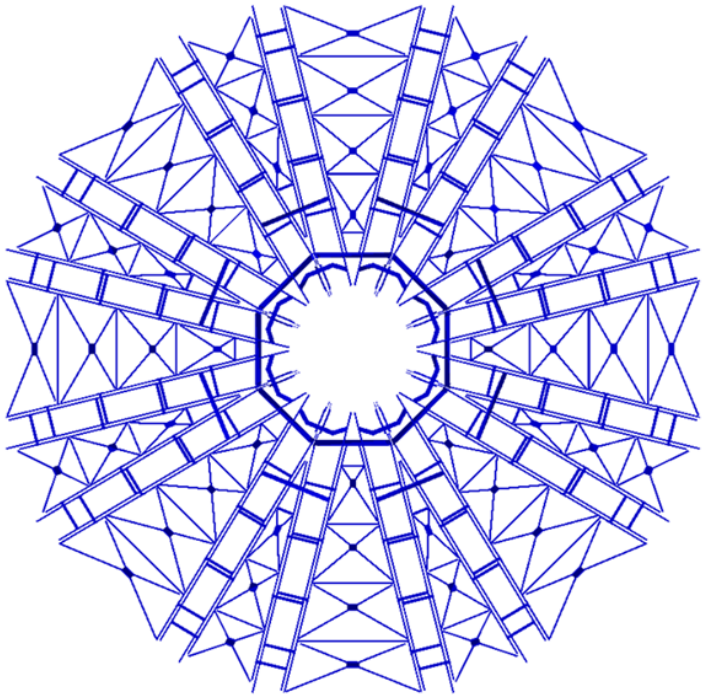
Compare Analyses

Model	Material	Density (kg/m3)	Volume (m^3)	Weight (kgs)	Missing (kgs)
CATIA	Aluminum/Stainless Steel	2700 / 8000	3.6723	**10'532**	
PERSINT/XML	Aluminum	2700	2.3184	**6'260**	**-4'272**

CATIA Model



GEANT-4 Model



WP1: Comparison of Geometries

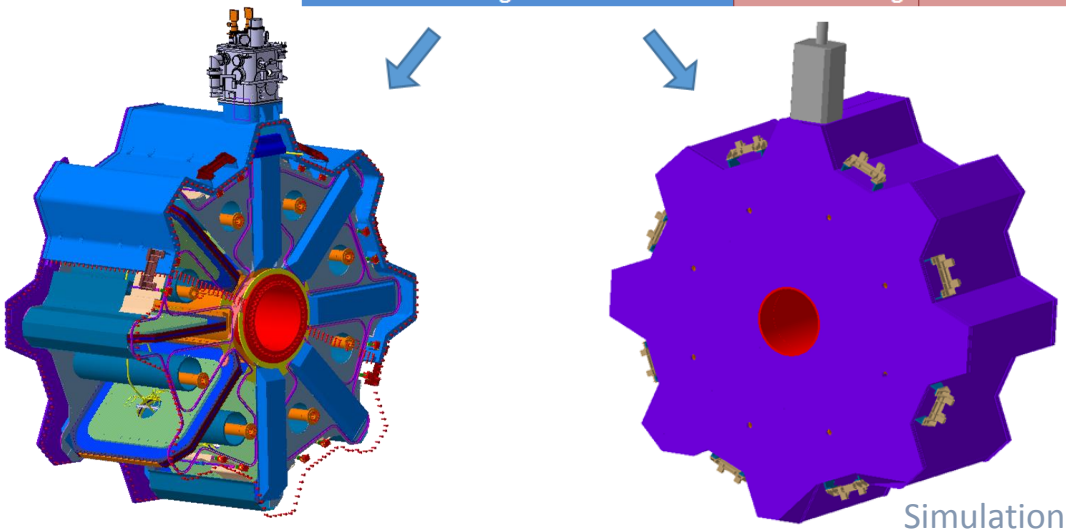
- Coils Study
- TGC1
- TGC2-3
- MDT
- **ECT**
- Integration

Source geometry has been taken from SmarTeam Engineering Database:

Path : ATLAS CURRENT/Detector System/Magnets ATLAS/Toroid Magnets ATLAS/Barrel Toroid Magnet
Model: **ST0268528 ECT assembly side C (id: CAD000628534)**

Missing parts have been created from 902 CDD Drawings

		CATIA	XML	Difference	%
1	Cold Mass	116740 kgs	123012 kgs	+6'272 kgs	5.4 %
2	Thermal Shielding	15988 kgs	15957 kgs	-31 kgs	0.2 %
3	Cover	57966 kgs	57185 kgs	-781 kgs	1.3 %
4	Bore Tube	13433 kgs	10208 kgs	-3'225 kgs	24.0 %
5	Yoke	1820 kgs	1338 kgs	-483 kgs	26.5 %
6	Stay Tube	2028 kgs	2214 kgs	+186 kgs	9.2 %
7	JTV Shielding	4161 kgs	4510 kgs	+349 kgs	8.4 %
8	Turret	2476 kgs	1512 kgs	-964 kgs	38.9 %
9	Tie Rod	3077 kgs	1268 kgs	-1'809 kgs	58.8 %
10	Bolts/	2965 kgs		-2'965 kgs	100.0 %
11	Services	869 kgs		-869 kgs	100.0 %



WP1: Comparison of Geometries

- Coils Study
- TGC1
- TGC2-3
- MDT
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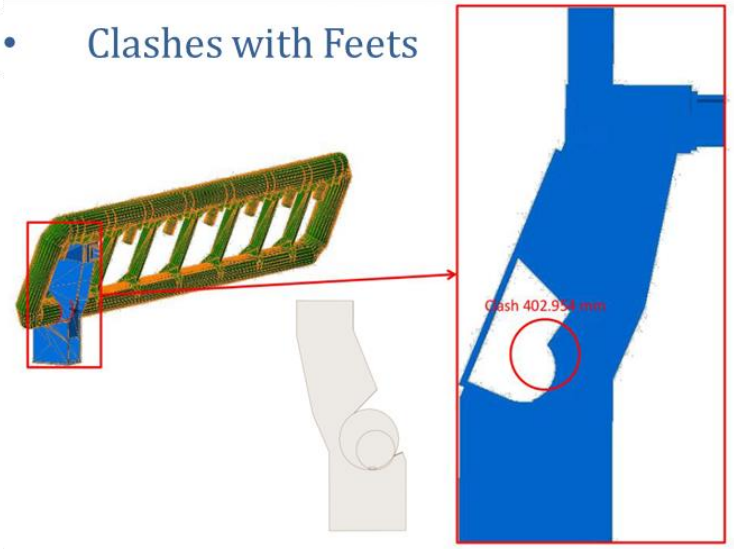
- Integration

Integration Conflicts Analyses

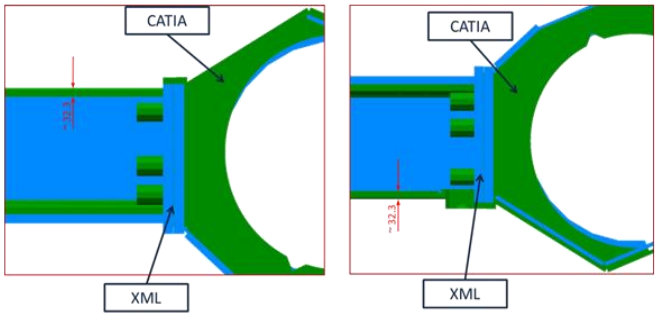
- COIL's + Warm Structure Displacement

$\Delta_{R1} = R1|_{CATIA} - R1|_{XML} = 9515\ mm - 9480\ mm = 35\ mm$
$\Delta_{R1} = R2|_{CATIA} - R2|_{XML} = 5295\ mm - 5270\ mm = 25\ mm$

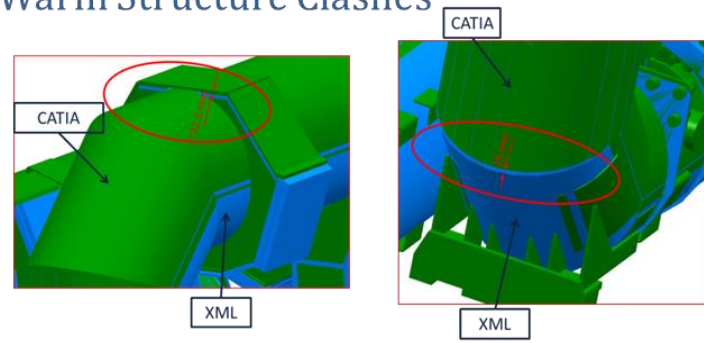
- Clashes with Feets



- Warm Structure Clashes



- Warm Structure Clashes



WP1: Comparison of Geometries

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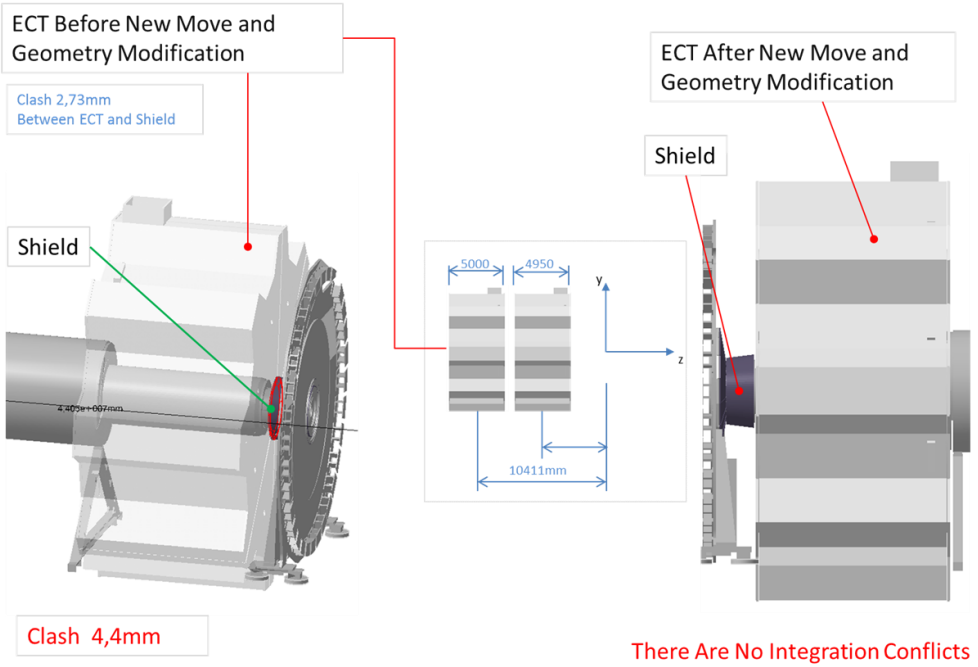
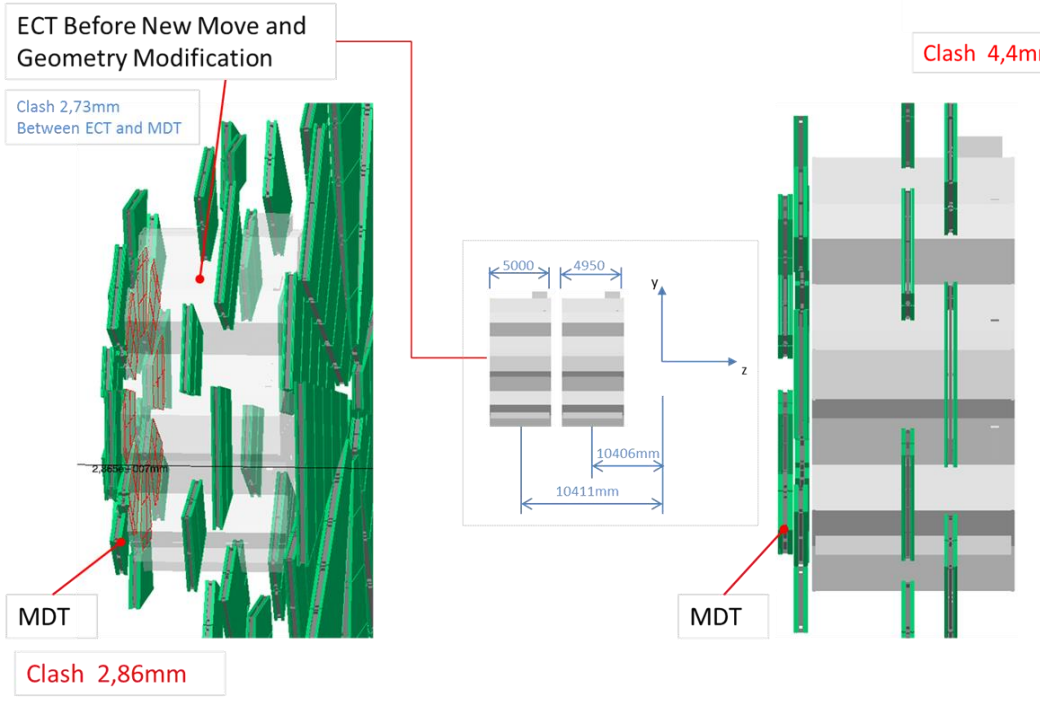
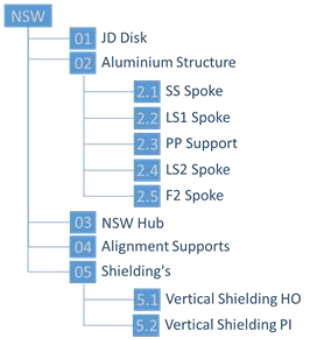




- External Conflicts of ECT

WP2: Adding New Geometries

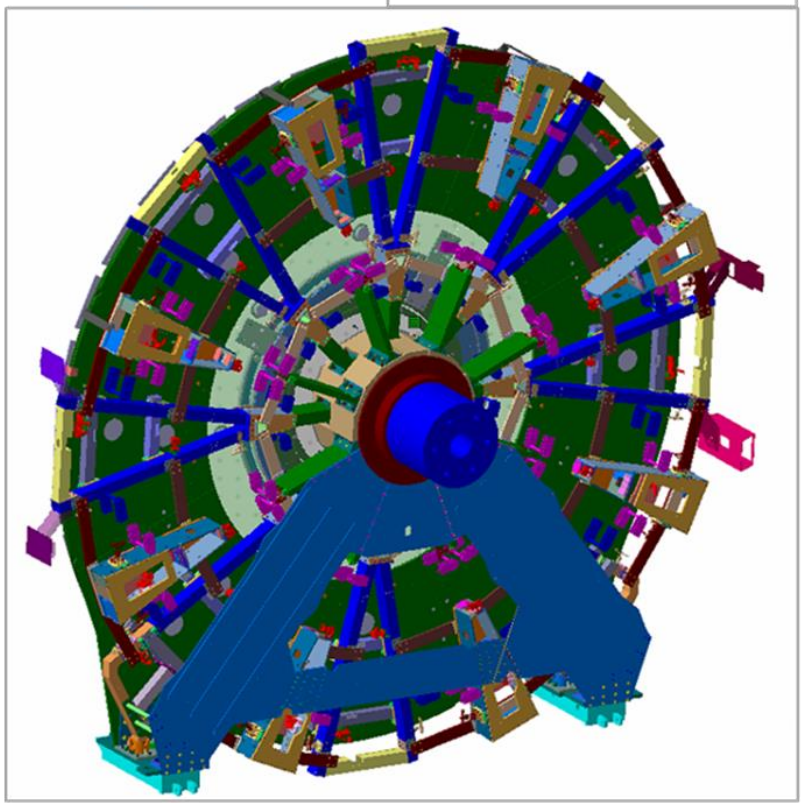
- New Small Wheel Geometry



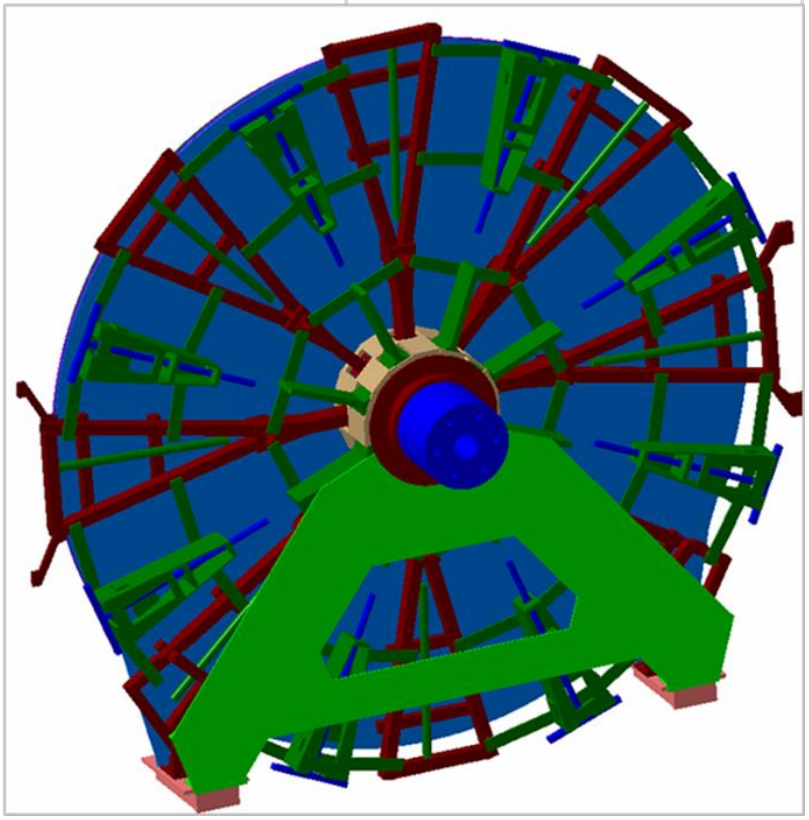
NSW Assembly

	Detailed	*Simplified*	Difference
Total Volume (m³)	**10,5158**	**10,5034**	0,0124
Total Weight (kg)	**72275.4**	**72232.3**	43.1

CATIA Geometry



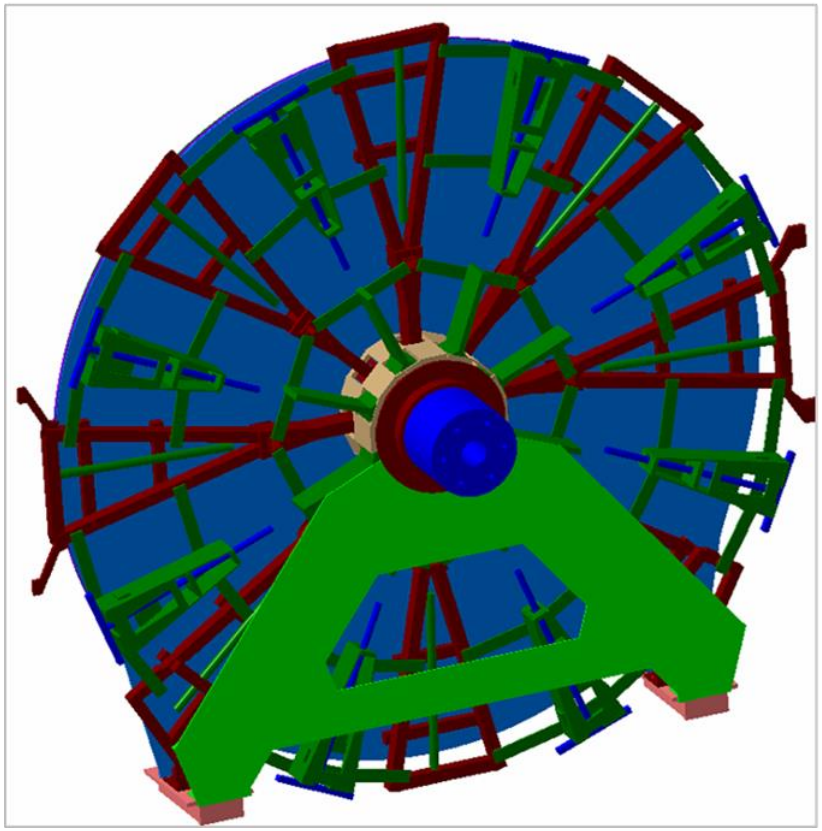
SIMPLIFIED Geometry



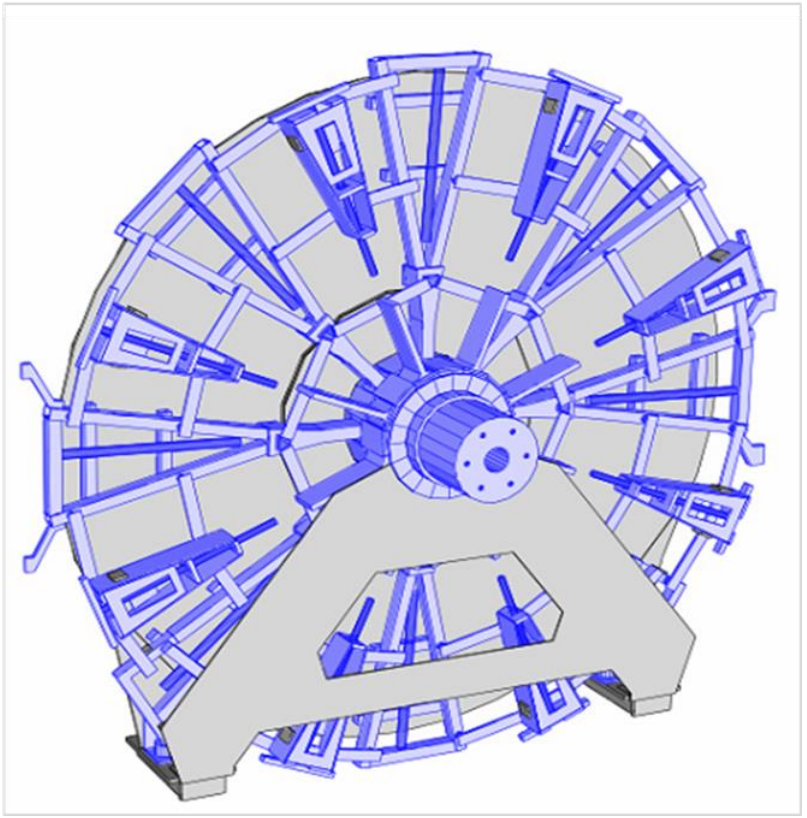
WP2: Adding New Geometries

- New Small Wheel Geometry

SIMPLIFIED CATIA GEOMETRY



XML GEOMETRY IN PERSINT



- Upcoming Priorities and Progress

Upcoming Priorities and Progress

WP1: Comparison of Geometries:

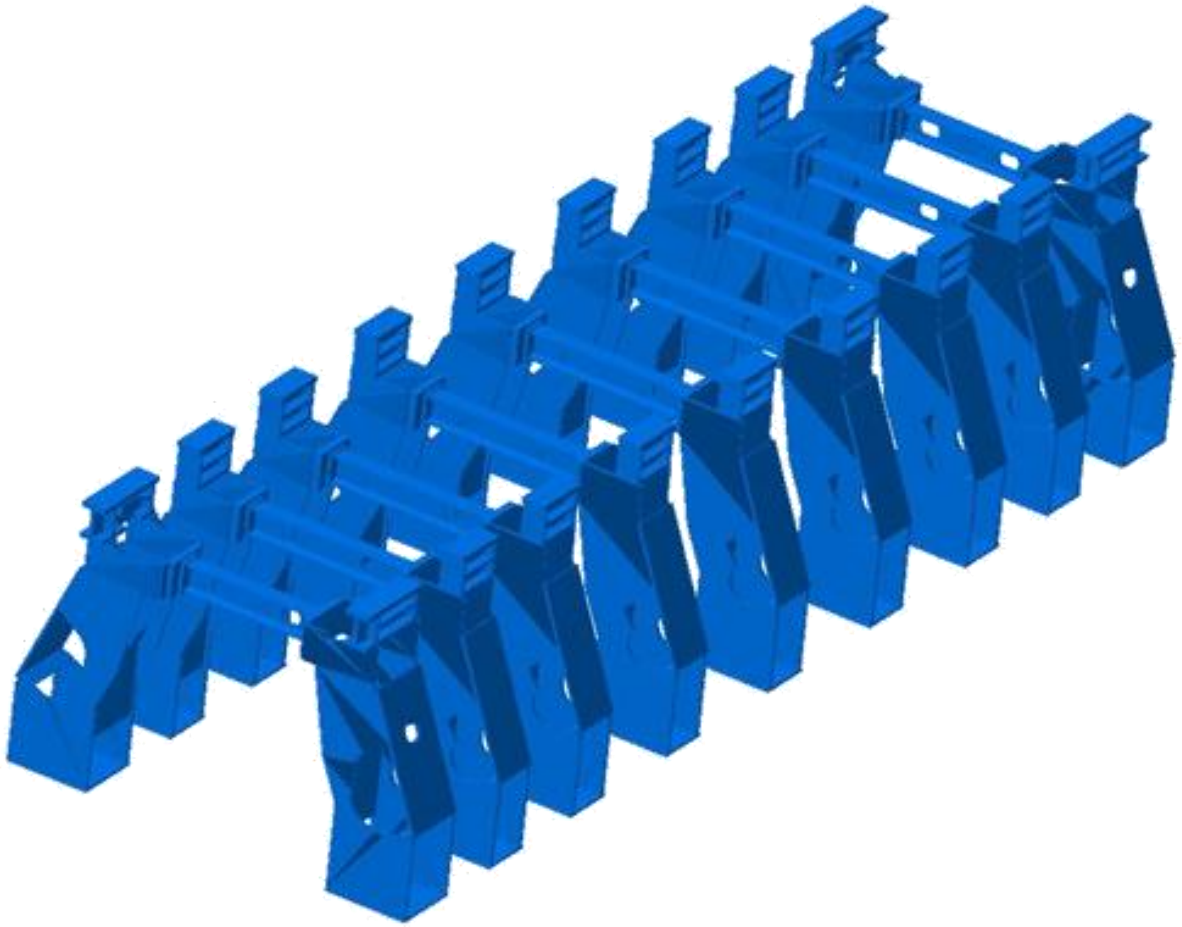
- Feet's
- Warm Structure
- ECT Tower
- Muon Chambers Cutouts

WP2: Adding New Geometries:

- NSW ver. July 2016
- Platforms
- GAP Services
- Services

WP1: Comparison of Geometries

- Feet's
- Warm Structure
- ECT Tower
- Muon Chambers



WP1: Comparison of Geometries

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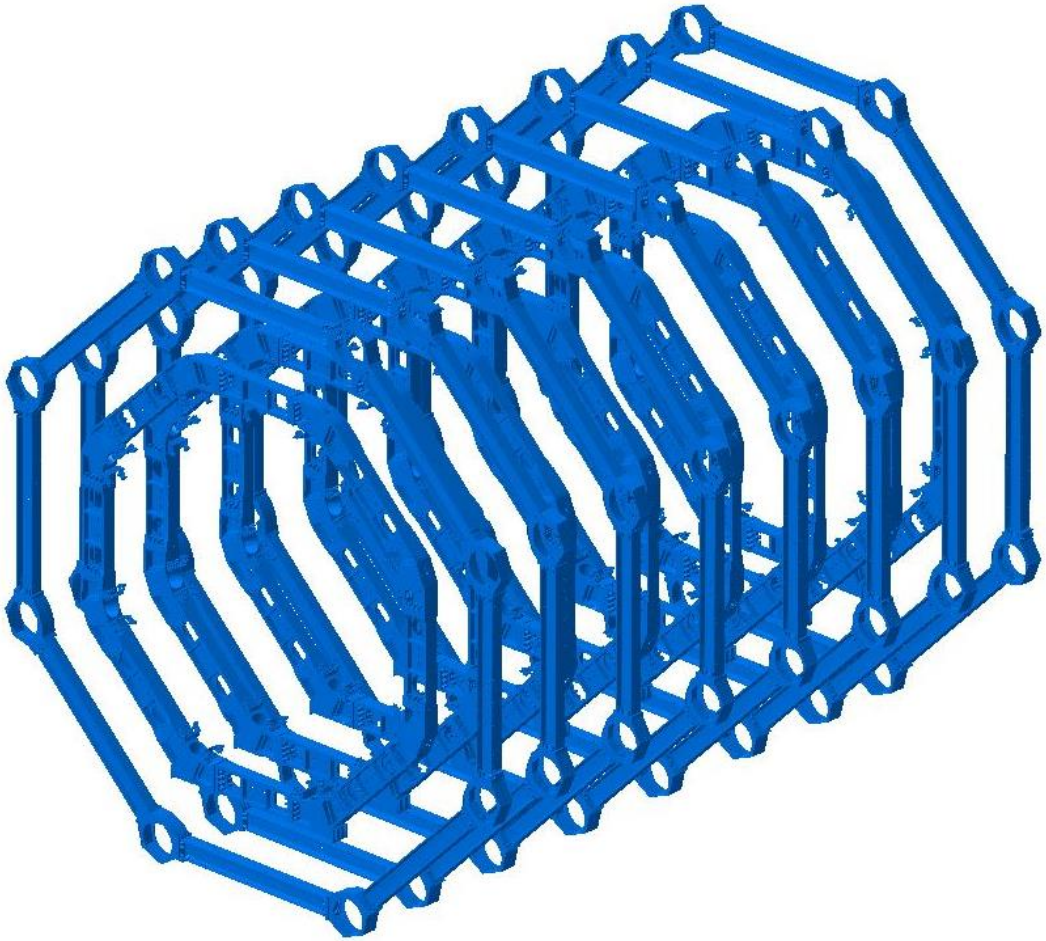

WP1: Comparison of Geometries

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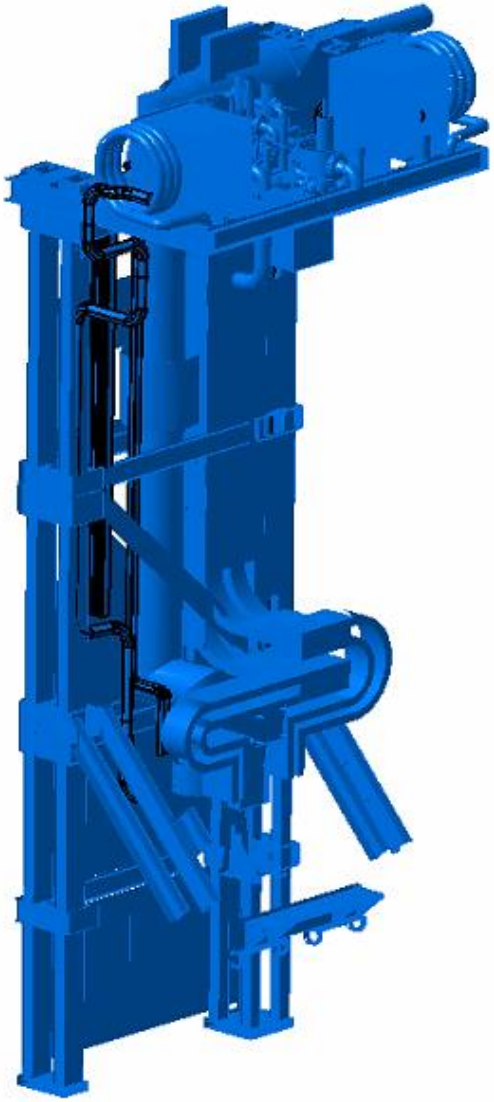
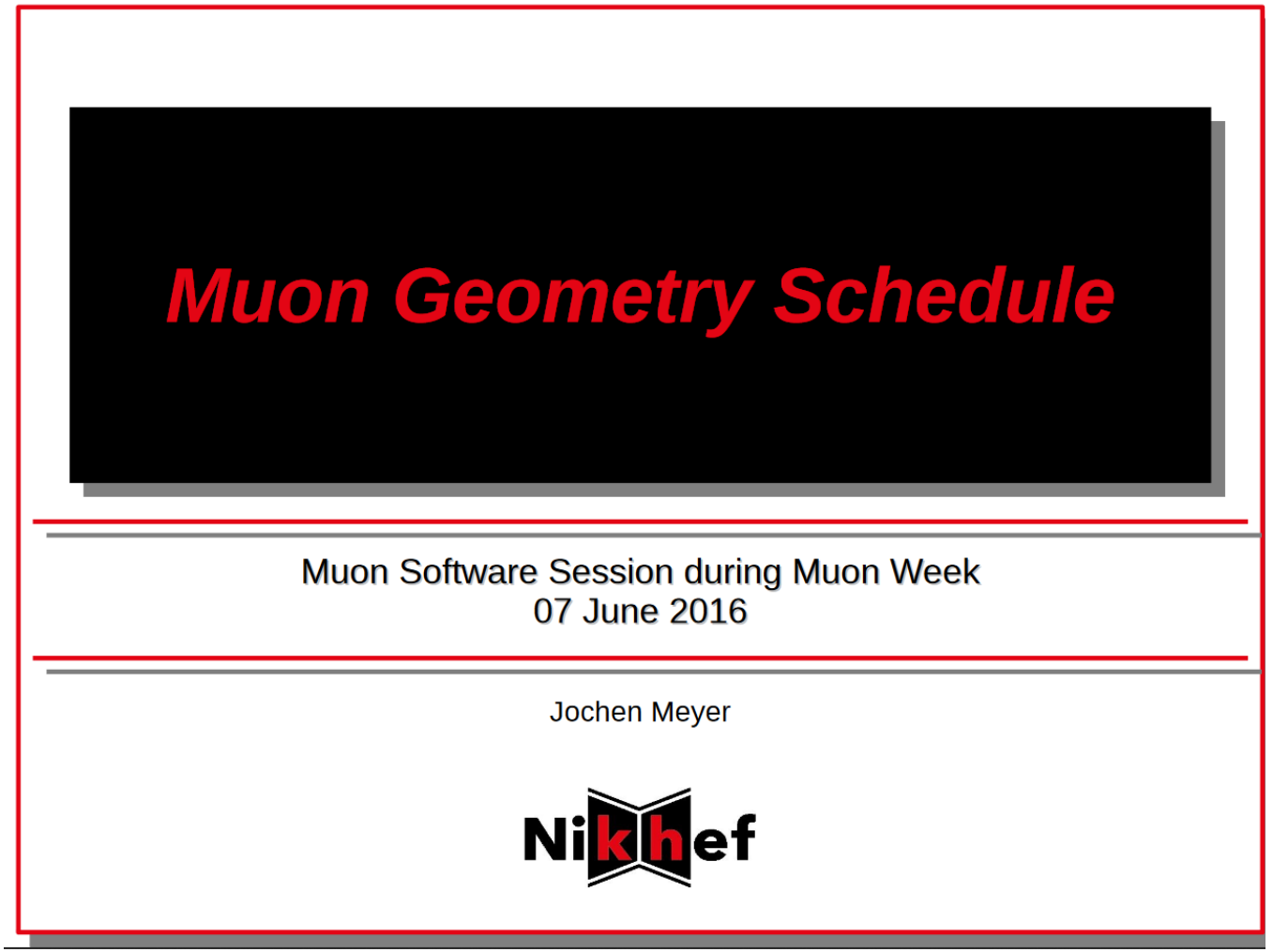
- Muon Chambers



WP1: Comparison of Geometries

- Feet's
- Warm Structure
- ECT Tower
- Muon Chambers

- We have just inspired by Jochen's talk last week



WP1: Comparison of Geometries

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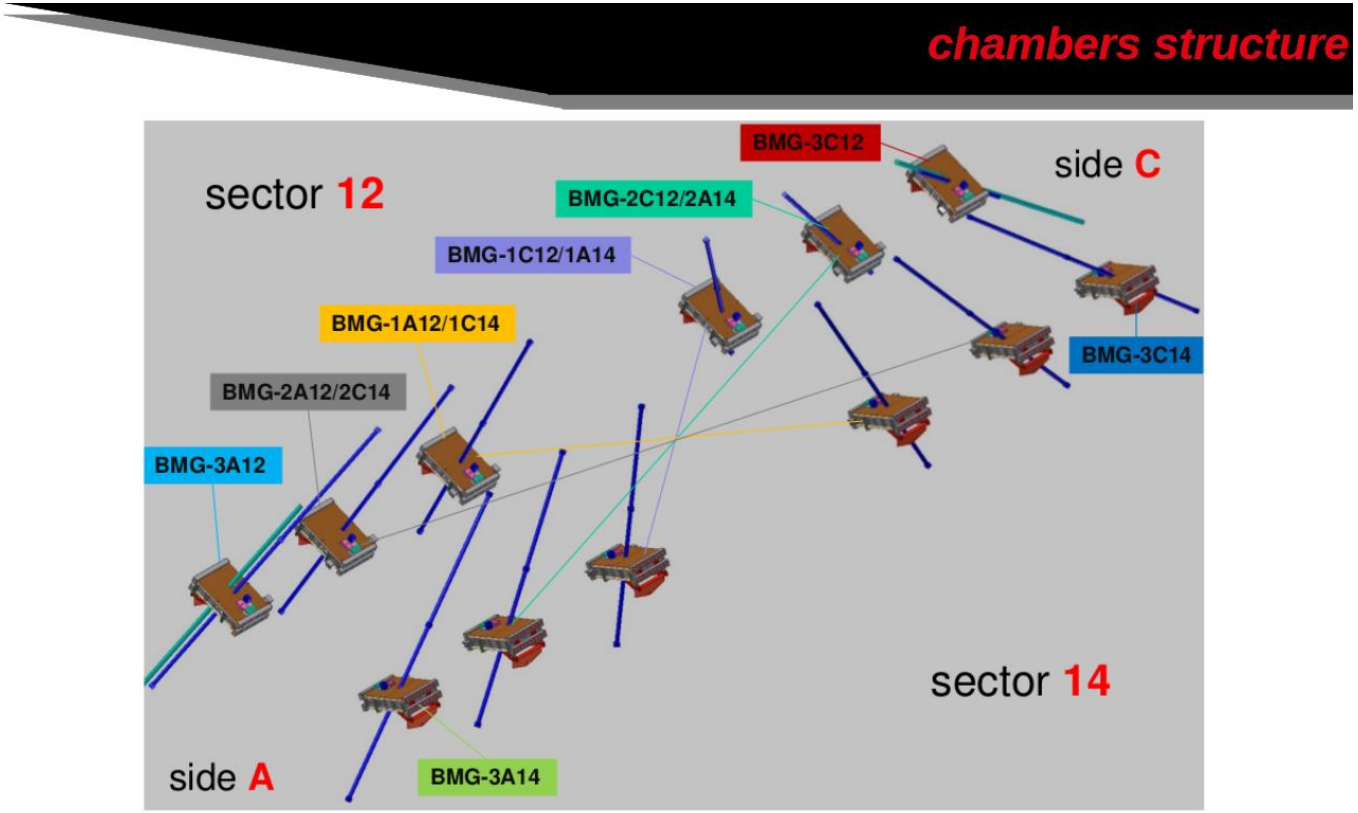


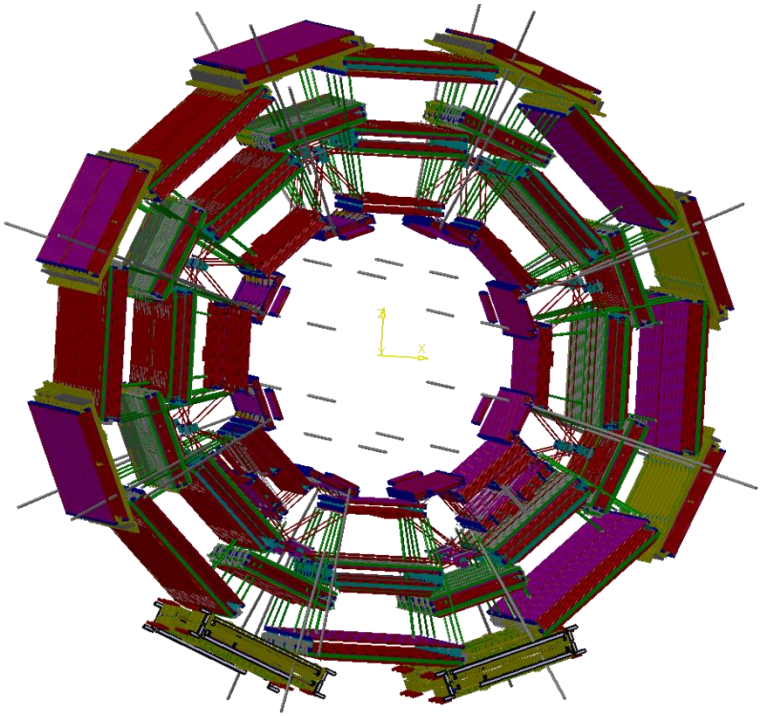
- same base design for all 12 chambers but 8 cutout schemes
- internal structure of chamber is significantly different from default chambers
- tube staggering exceptional (**not** mirror symmetric to YX)

4

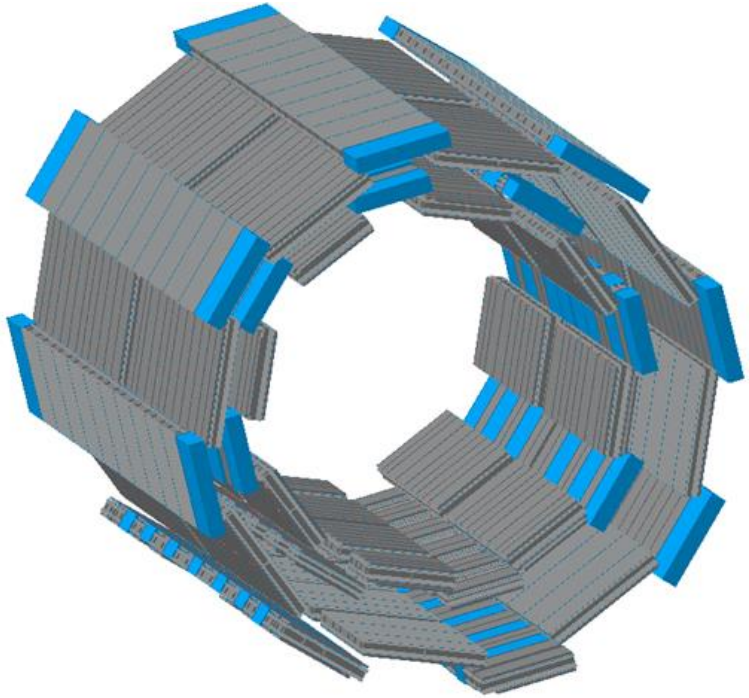
WP1: Comparison of Geometries

- Feet's
- Warm Structure
- ECT Tower
- Muon Chambers

- So we have might be interesting preposition:
- There are no cutouts on XML Chambers



As-built chambers



XML chambers

WP1: Comparison of Geometries

- Feet's
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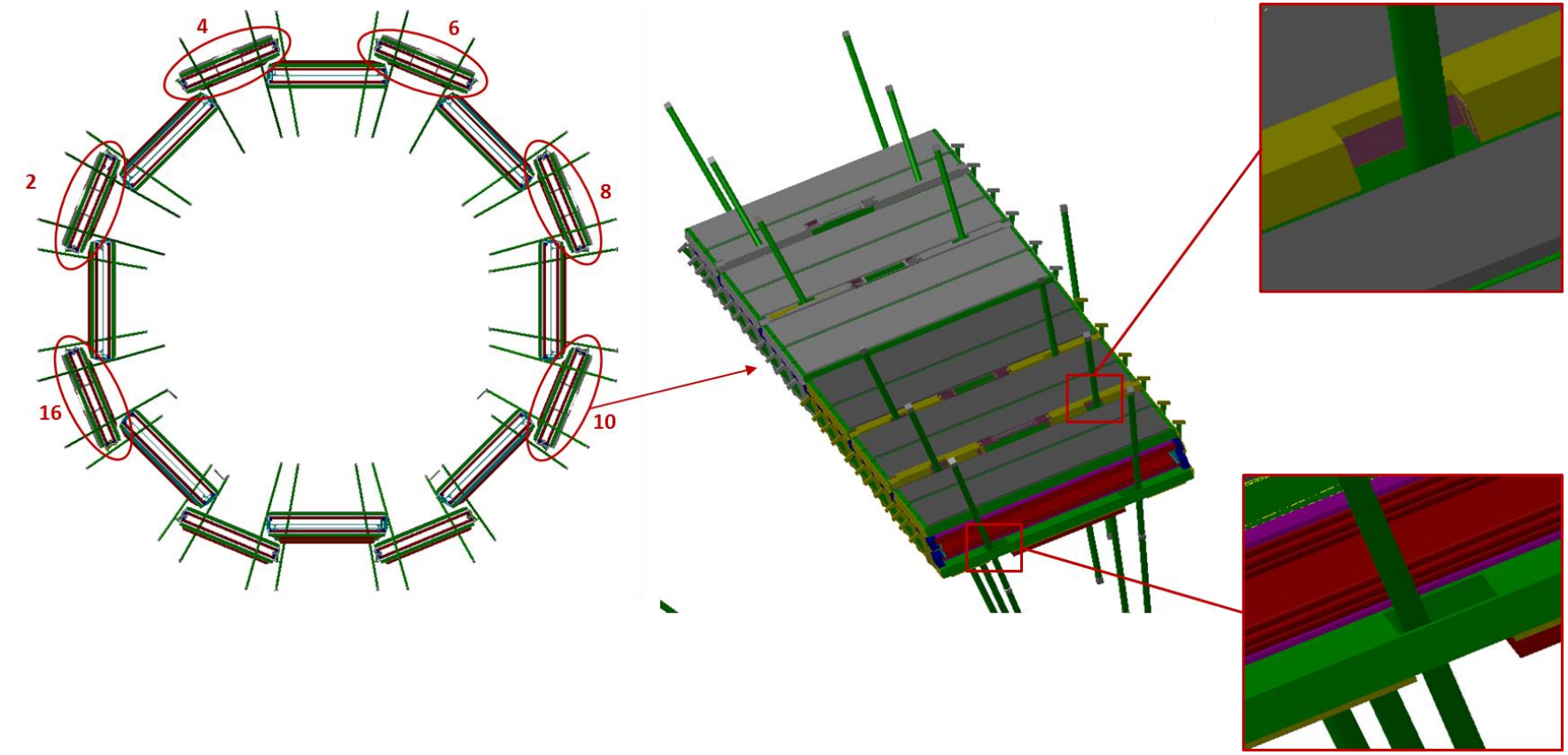
- Muon Chambers

- We can provide very detailed information about all cutouts



WP2: Adding New Geometries

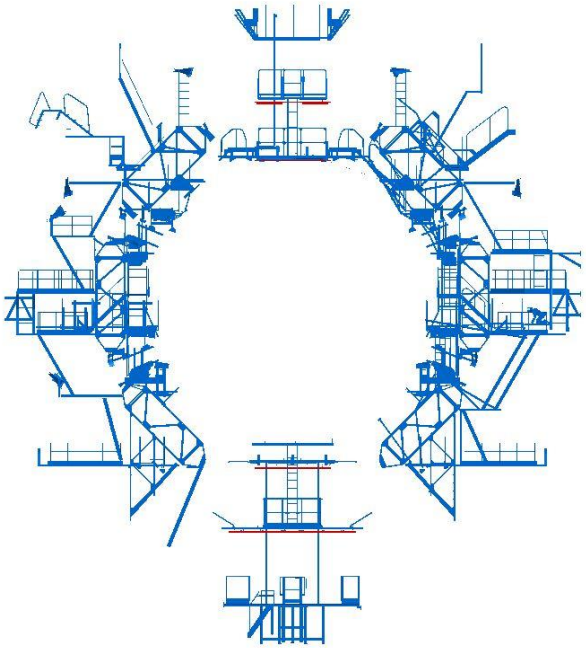
- NSW July 2016
- Platforms
- GAP Services
- Services

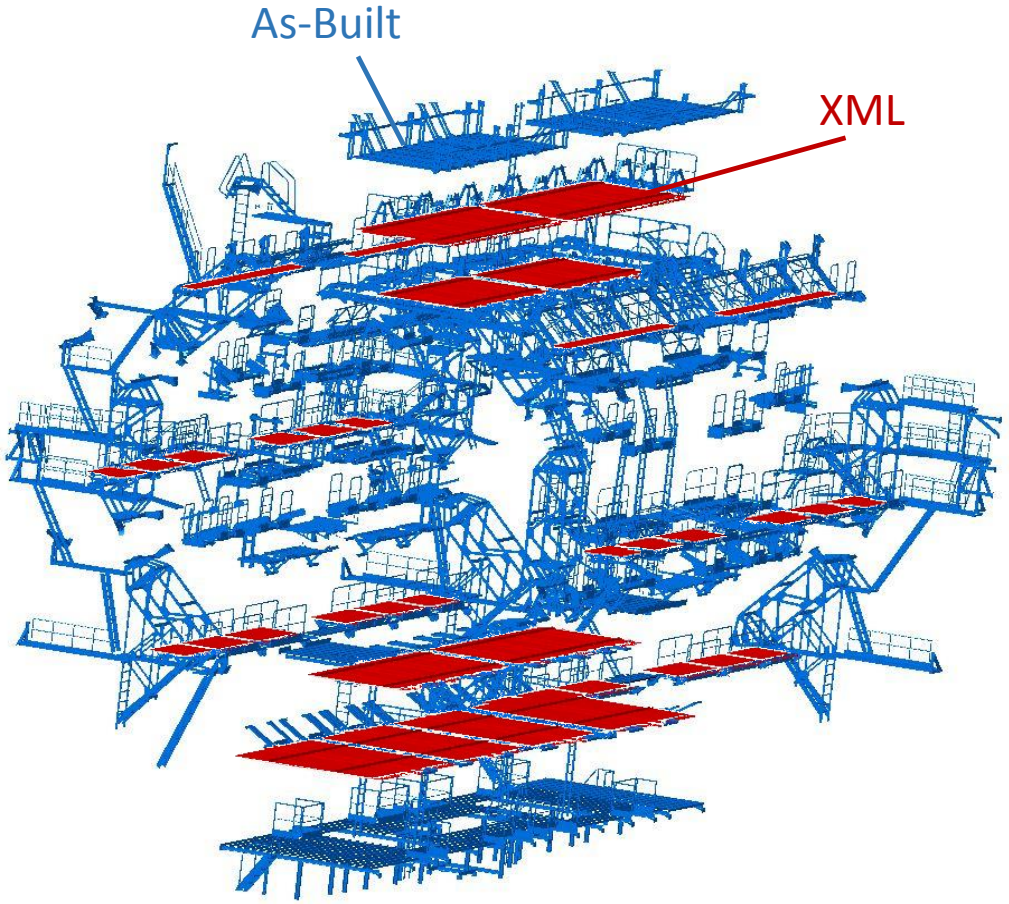
- I have confirmation from Stephanie to wait until mid of July and then produce new version of XML for NSW
- With my estimation it will be ready early in October (Summer holidays never helps)

WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

- It was agree with Christoph and Jochen





WP2: Adding New Geometries

- NSW July 2016
- Platforms
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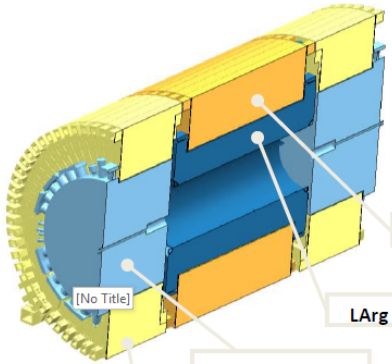
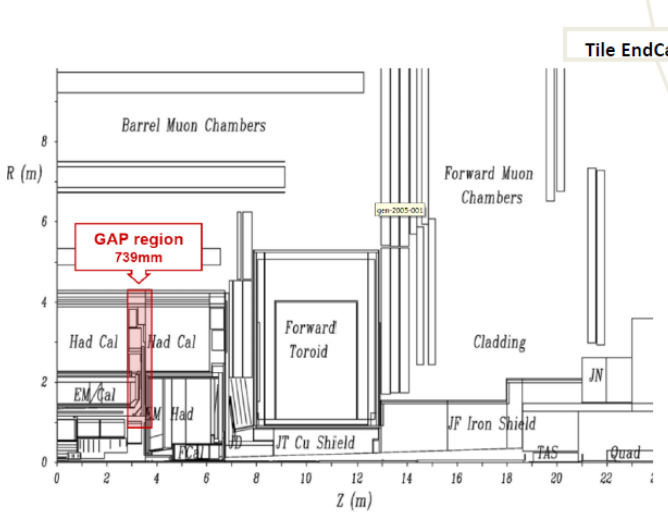
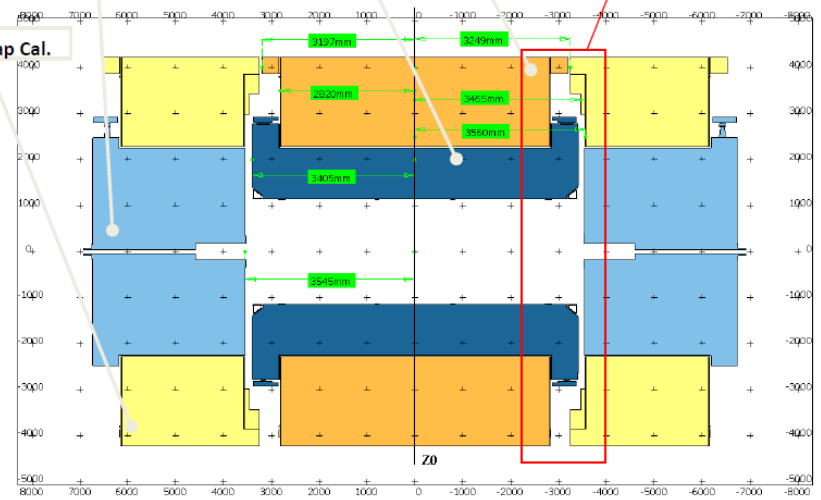
- It was discussed with Zach
- GAP Region







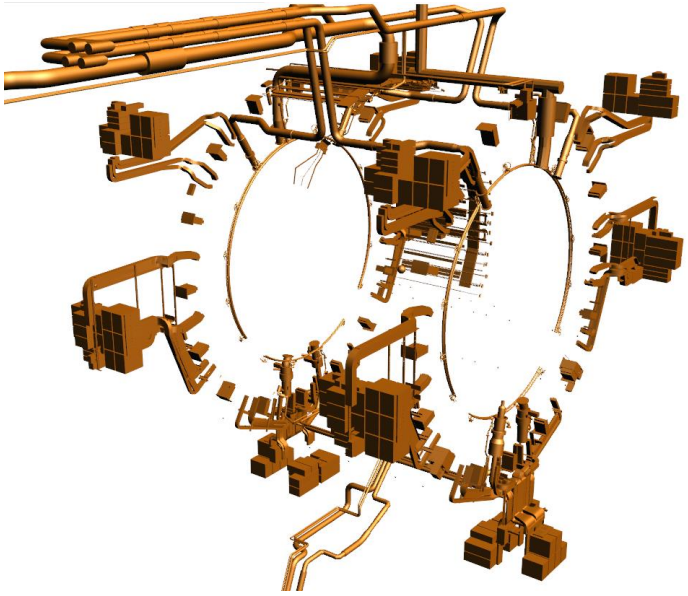
WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- 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

- Middle Services

- Outer Services



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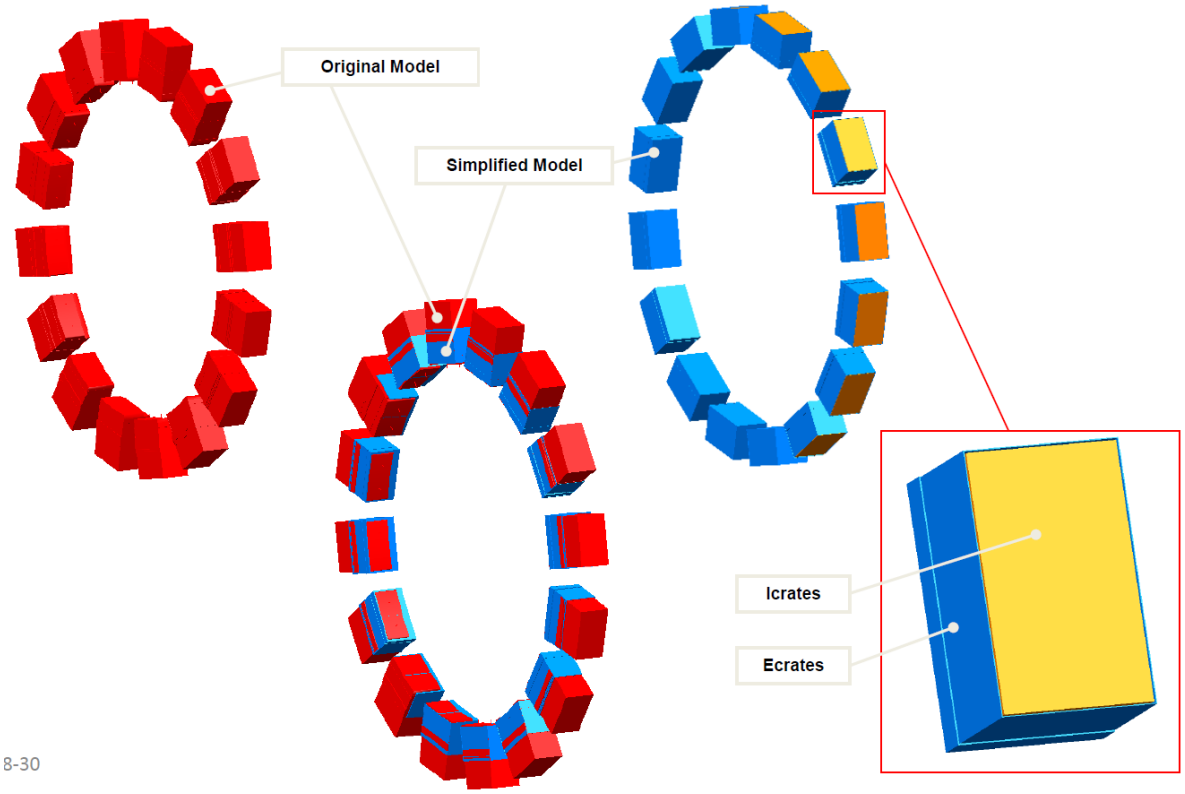
- R08 – Electronic Boxes



8-30

WP2: Adding New Geometries

- NSW July 2016
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- GAP Services
- Services

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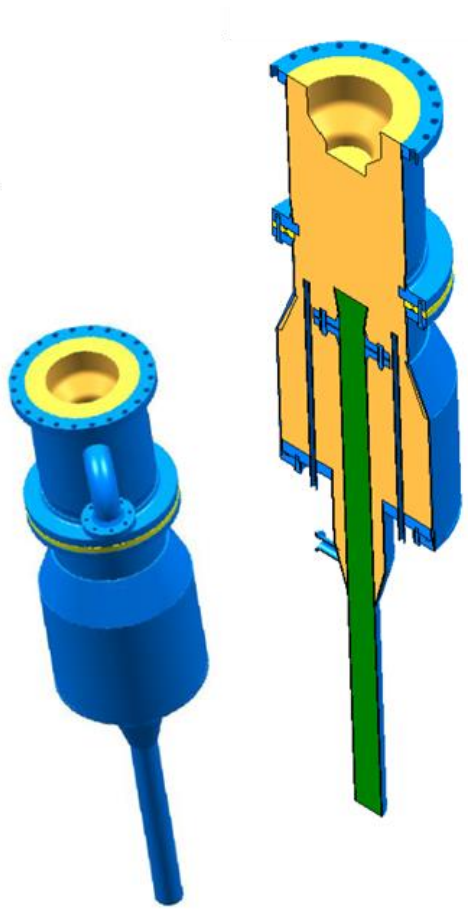
- R09 – LA Drain Line



WP2: Adding New Geometries

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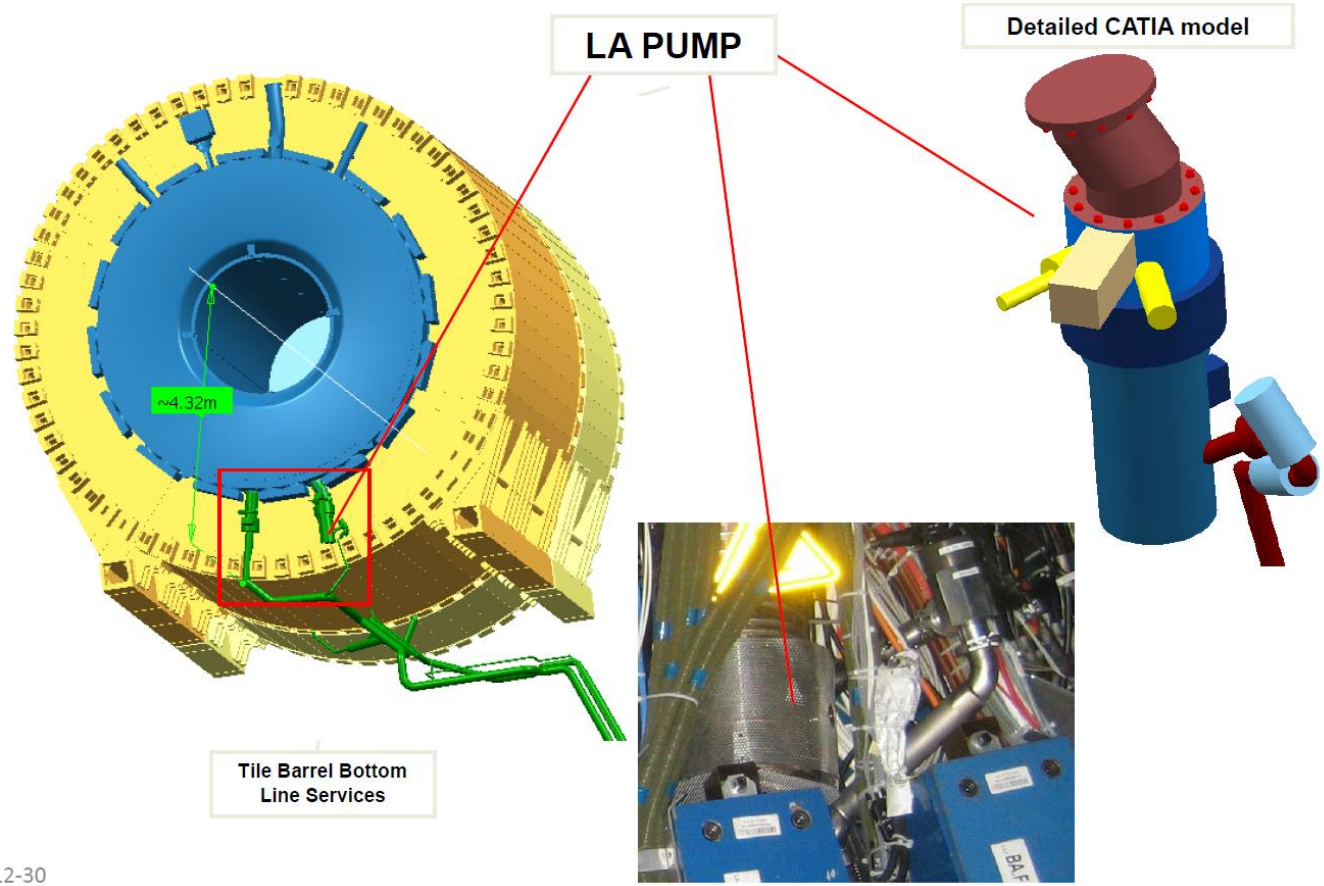
- R10 – LA Pump



L2-30

WP2: Adding New Geometries

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- Platforms
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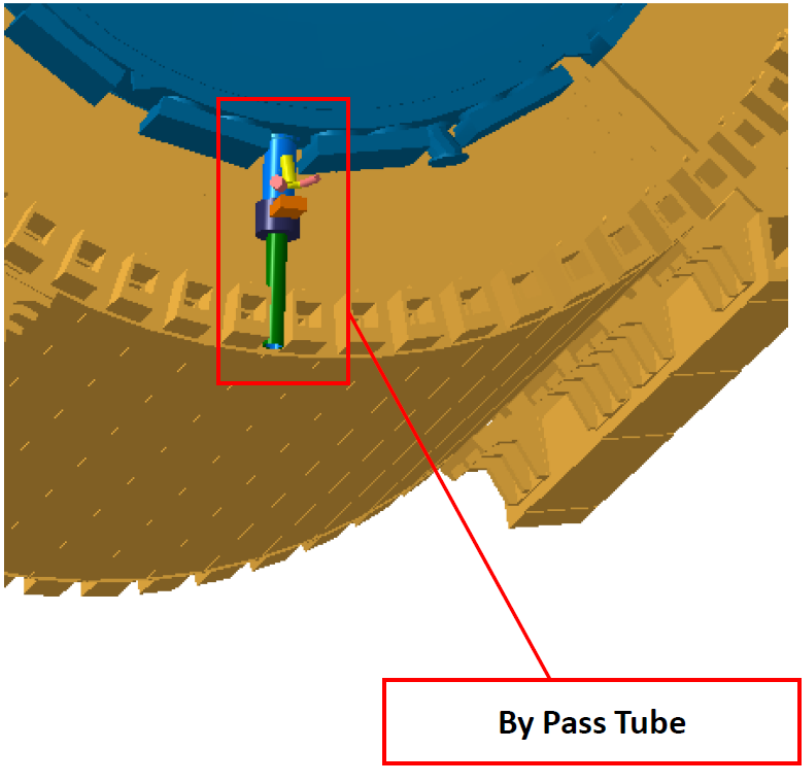
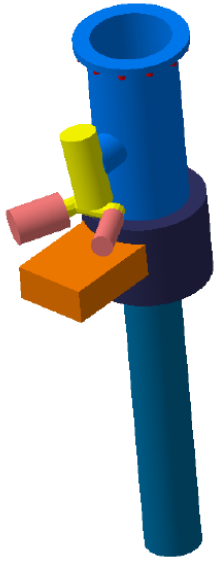
- R11 – By Pass Tube



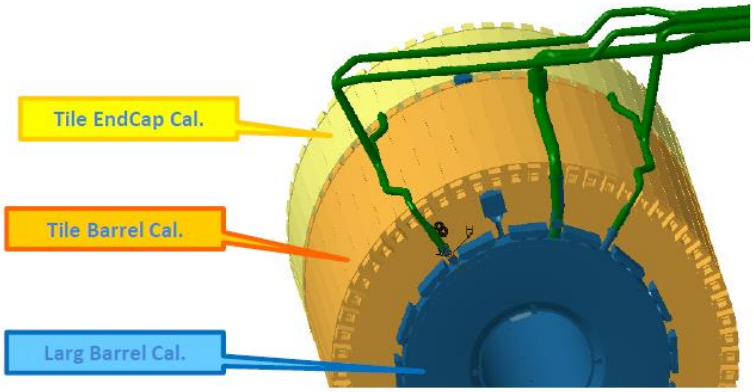


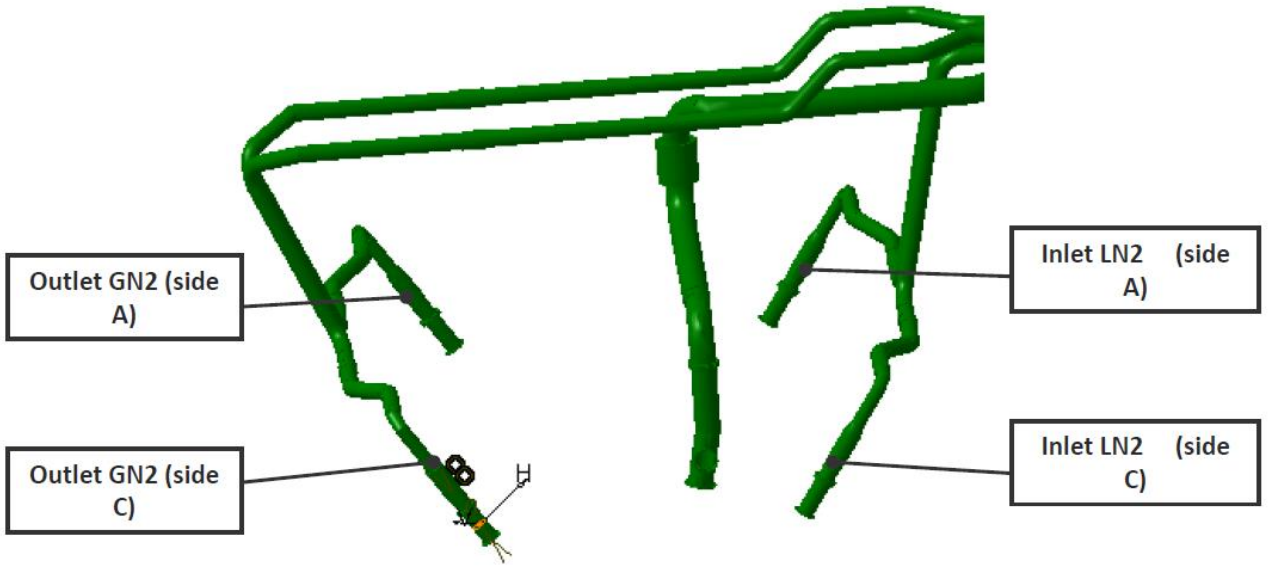
WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- 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

- R13 – LN2-GN2 Lines





WP2: Adding New Geometries

- NSW July 2016
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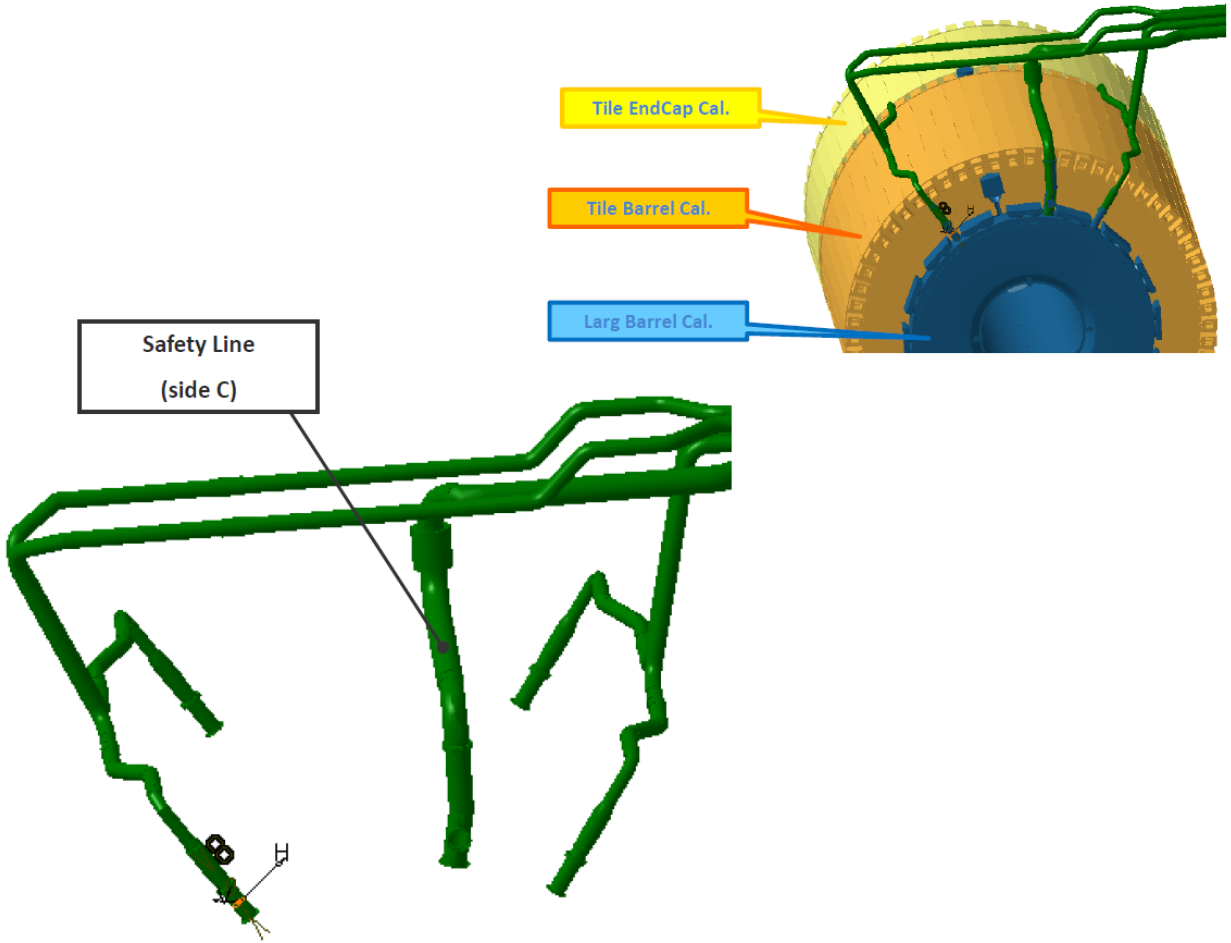
9. R17 : Middle Services – S1 Cabels
10. R18 : Middle Services – S1 Pipes

- R14 – Cryostat Safety Line



WP2: Adding New Geometries

- NSW July 2016
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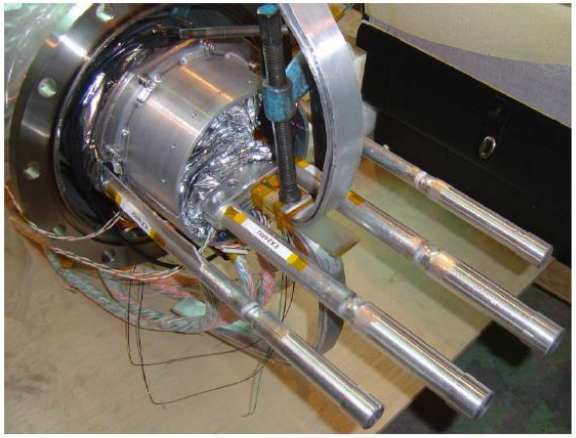
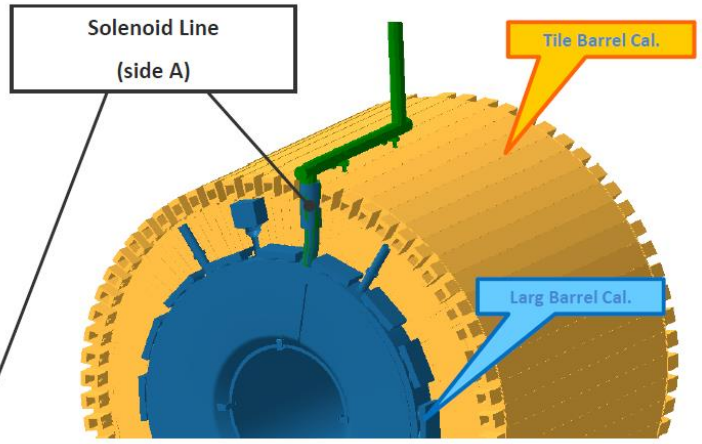
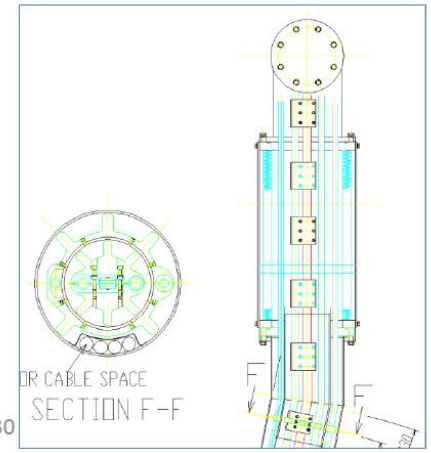
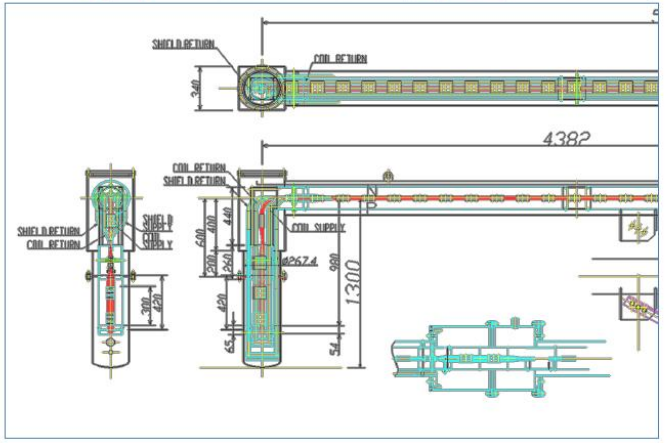
10. R18 : Middle Services – S1 Pipes

R15 – Solenoid Line









WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

1. R08 : Electronic Boxes
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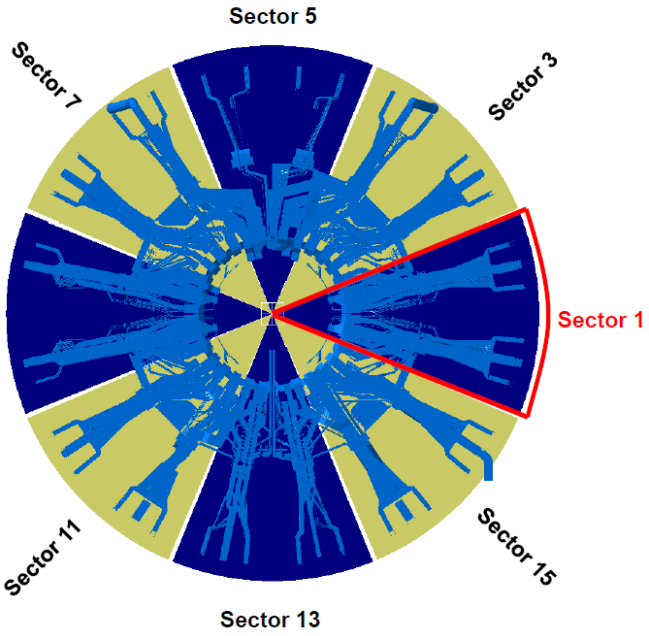
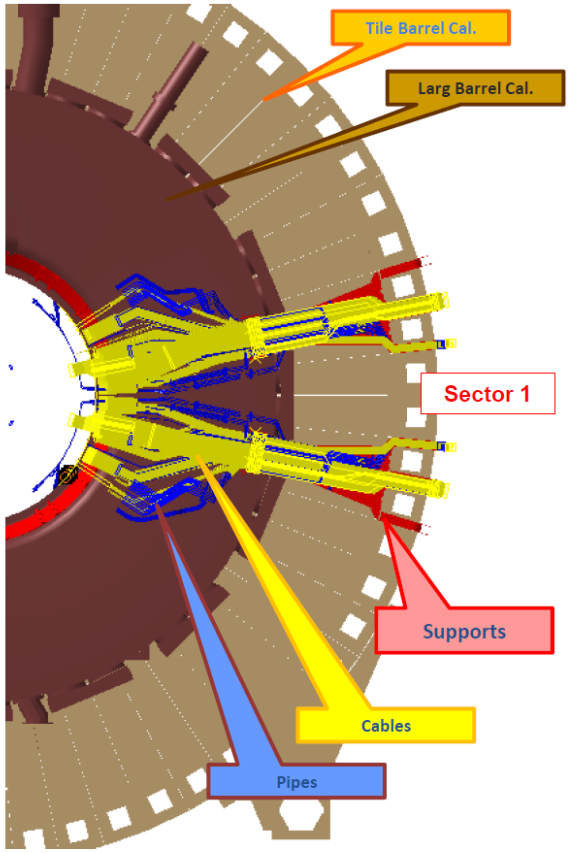
10. R18 : Middle Services – S1 Pipes

- R16 – Middle Services – S1 Supports





WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

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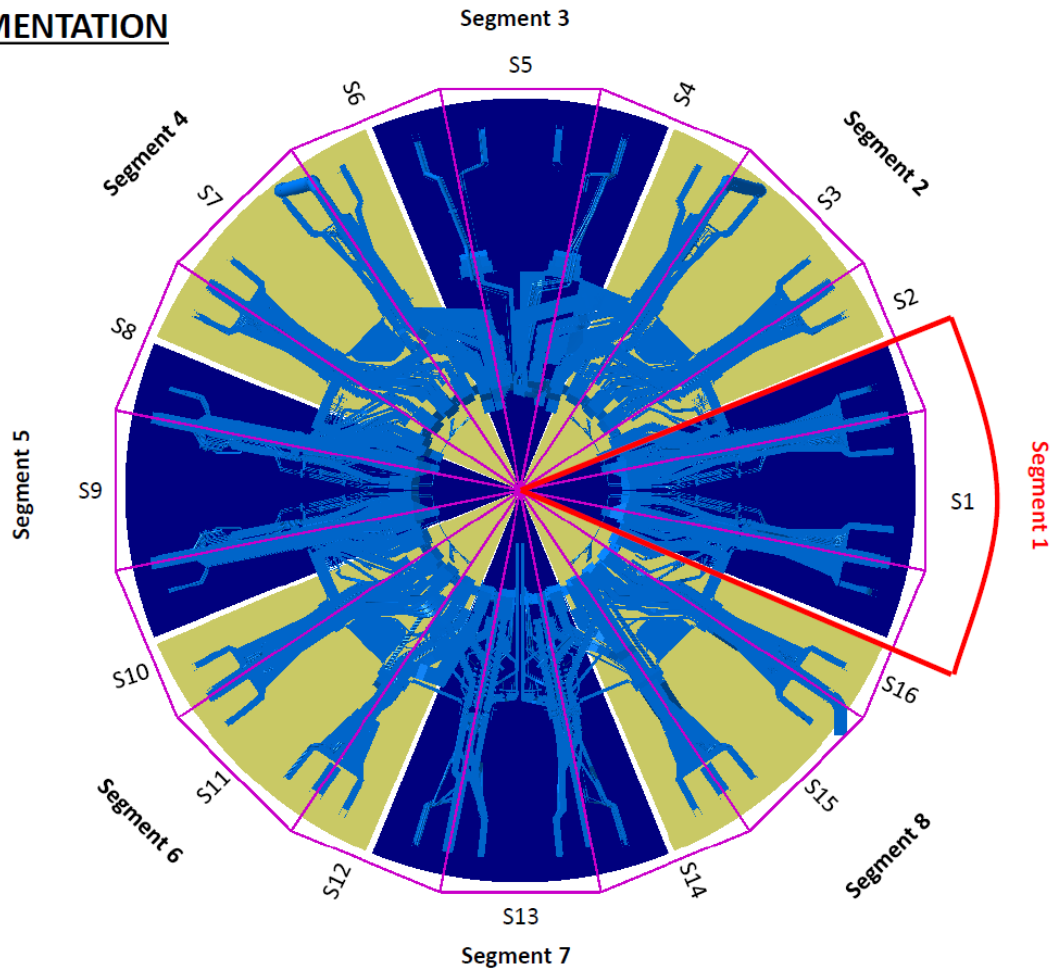
9. R17 : Middle Services – S1 Cabels
10. R18 : Middle Services – S1 Pipes

- R17 – Middle Services – S1 Cables



WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

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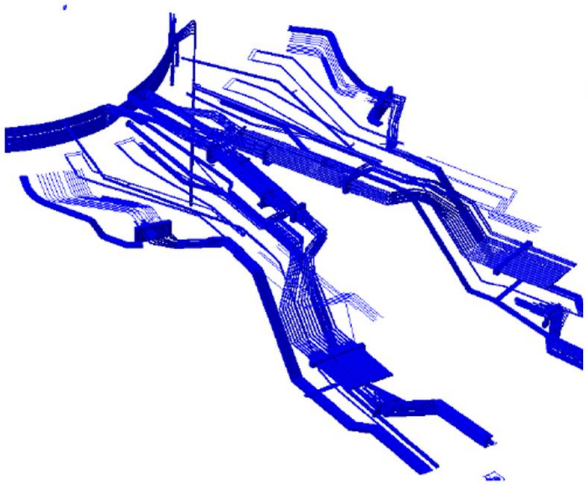
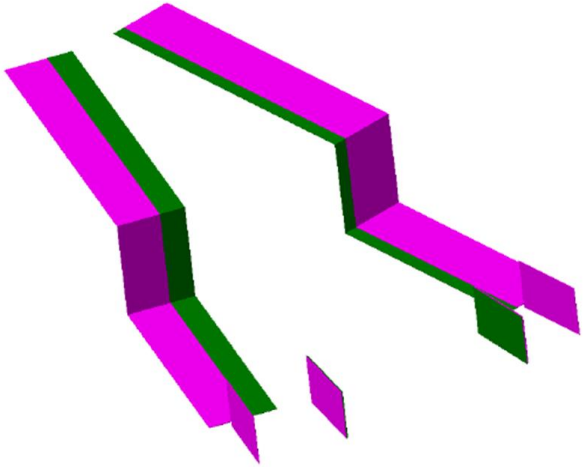
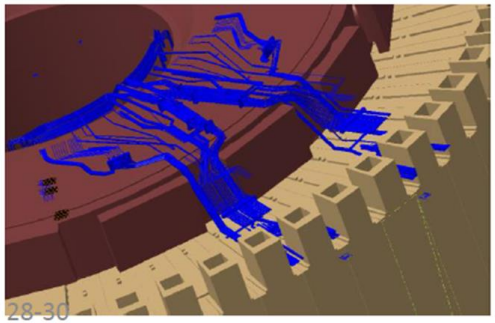
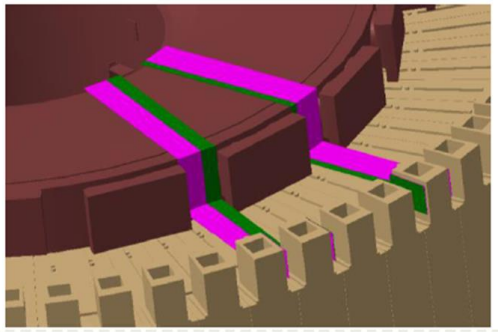
10. R18 : Middle Services – S1 Pipes

- R18 – Middle Services – S1 Pipes







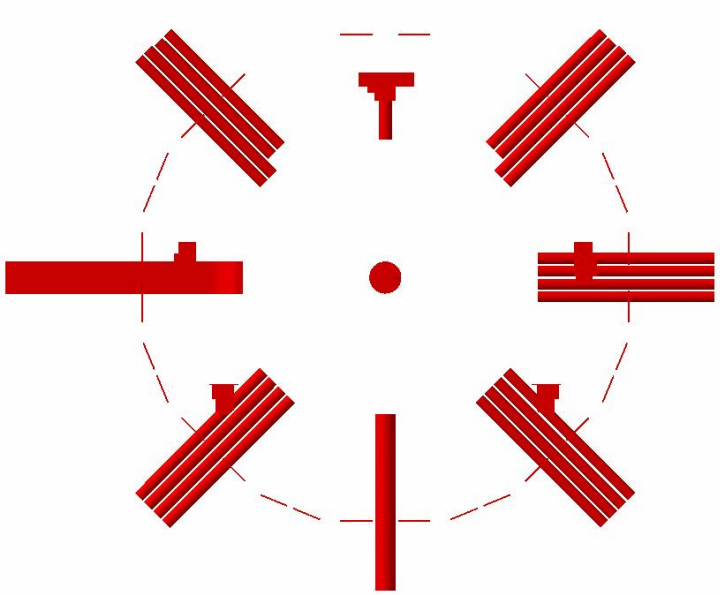


28-30

WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

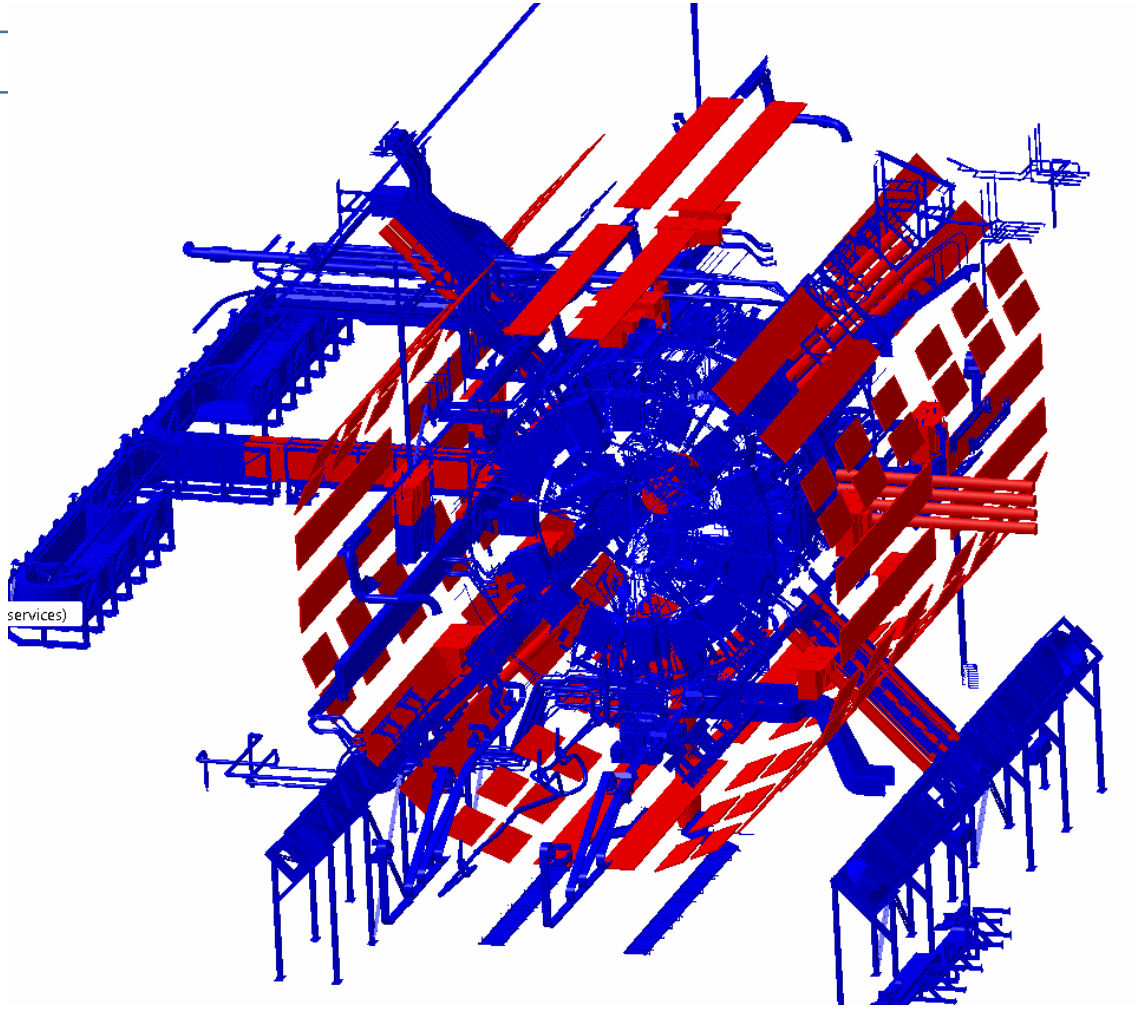
- GeoMODEL Services



WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

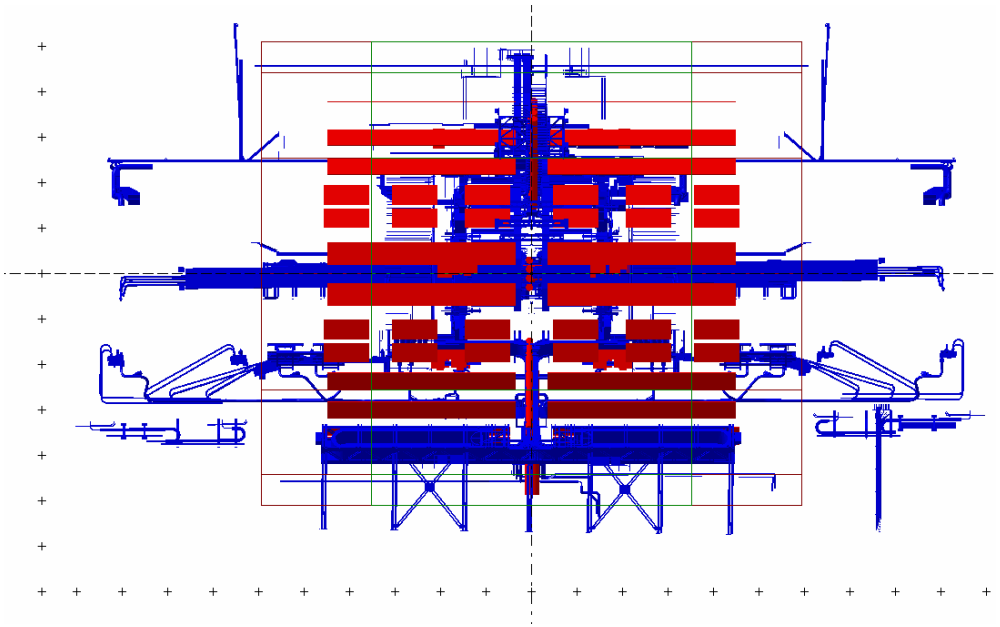
- Calorimeter Services

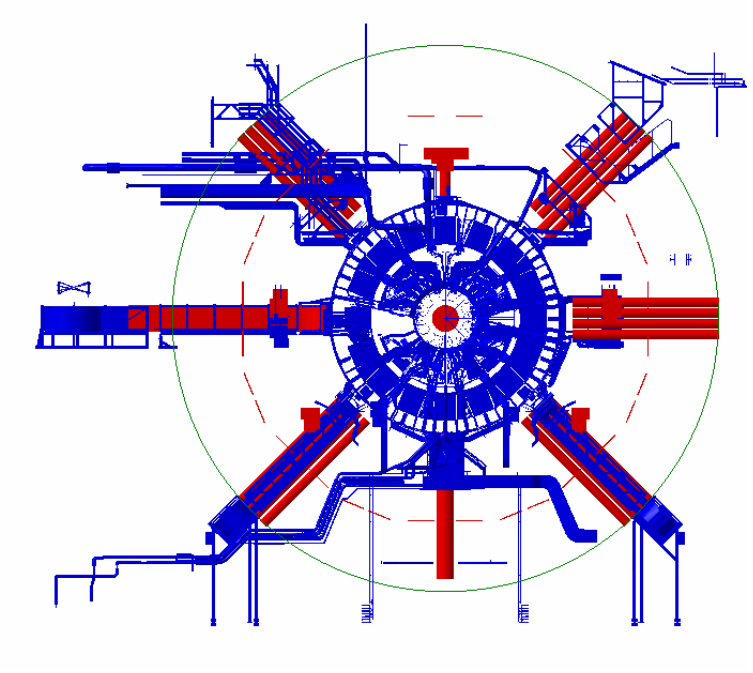


WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

- Calorimeter Services

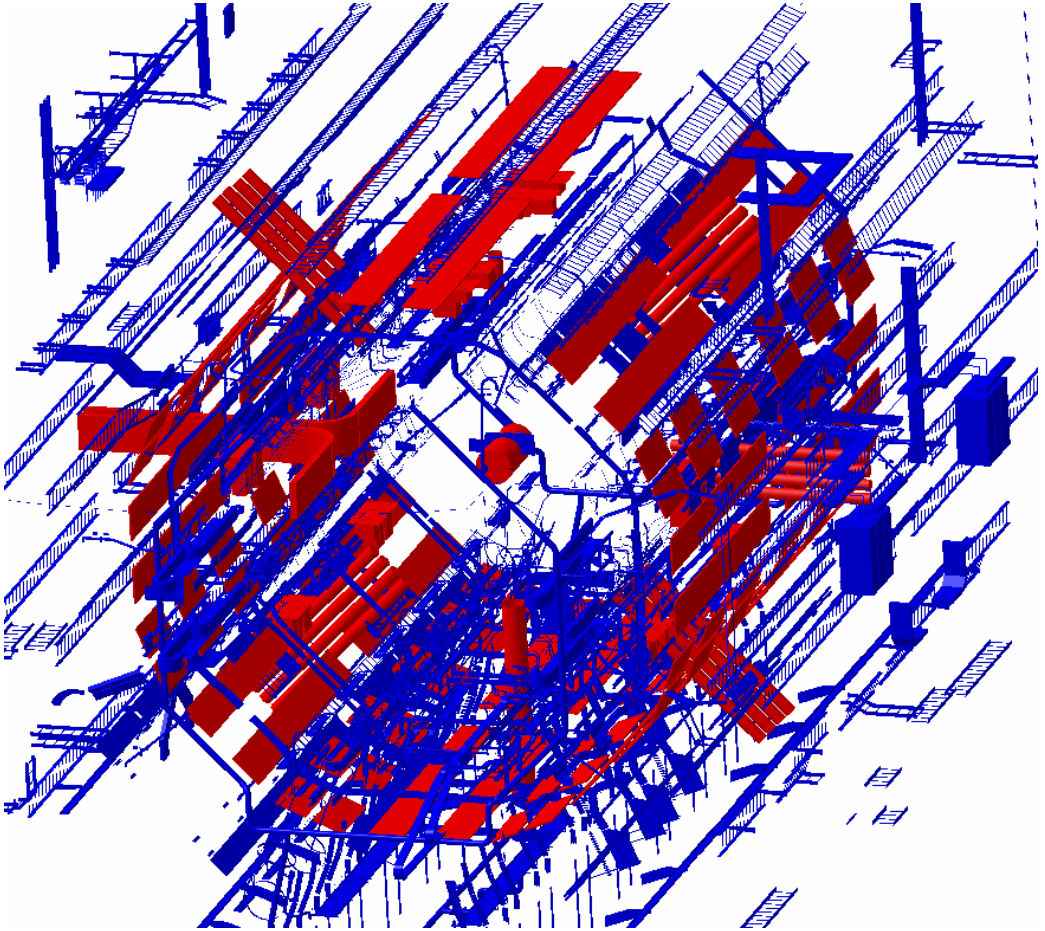




WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

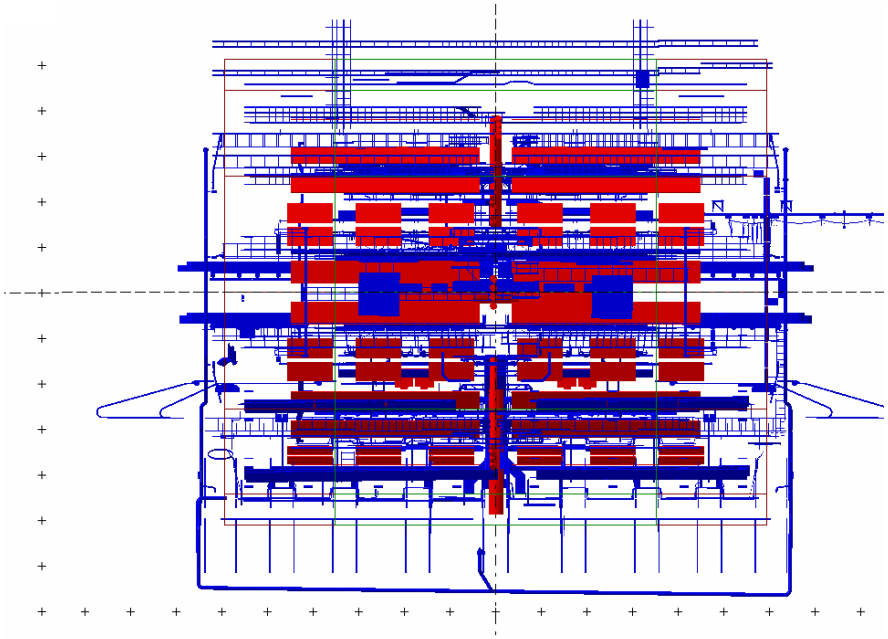
- Muon Services

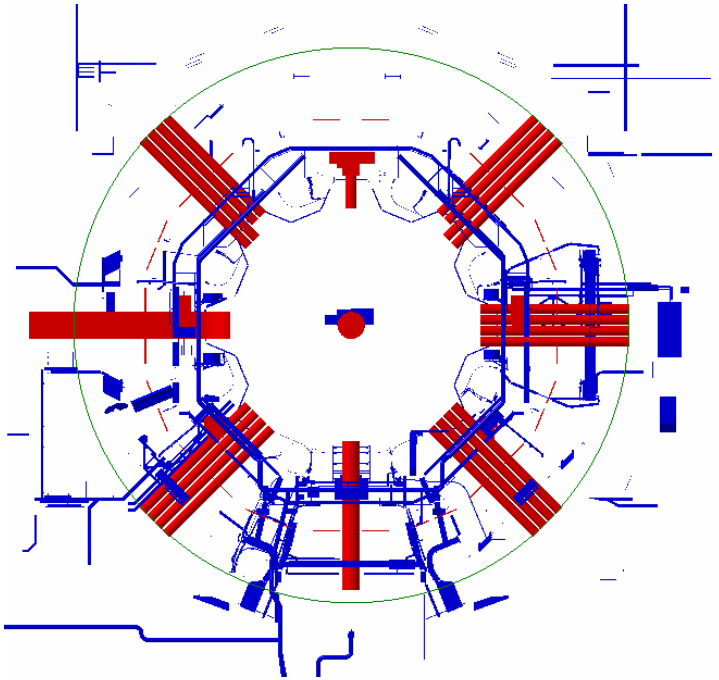


WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

- Muon Services

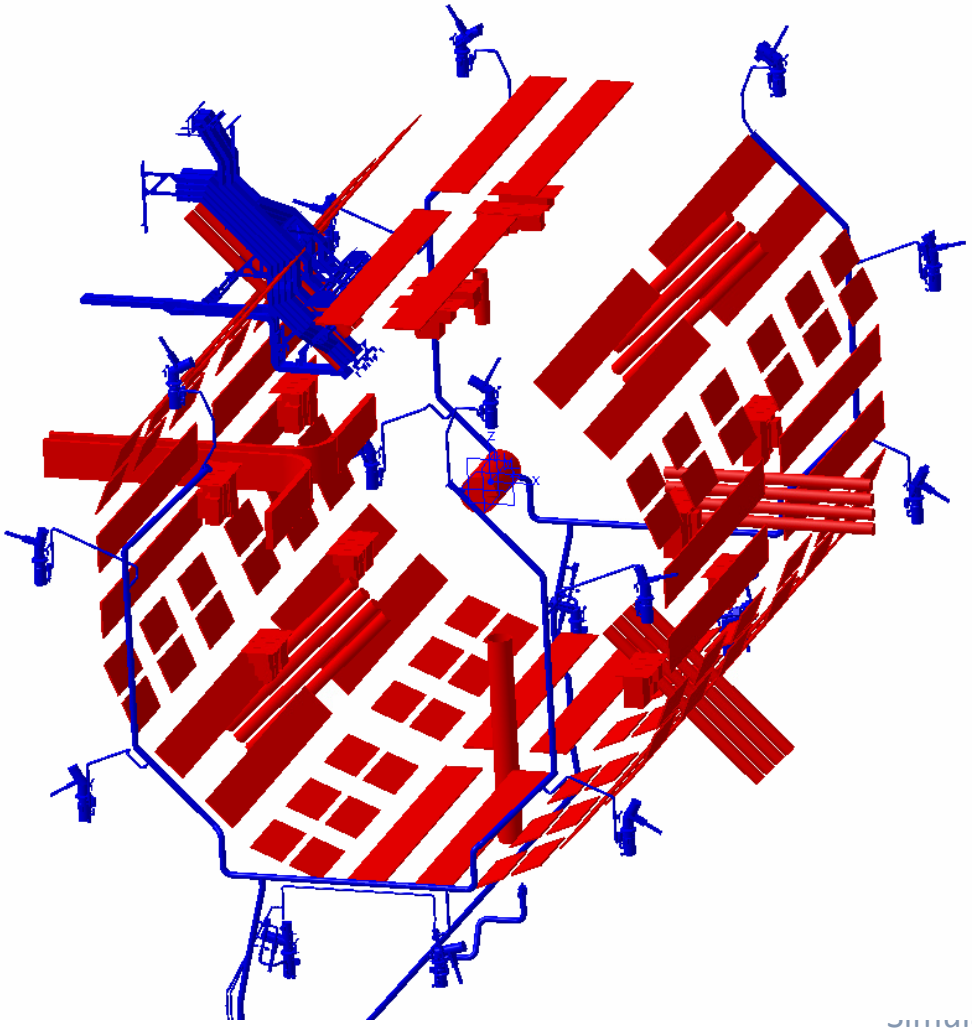




WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

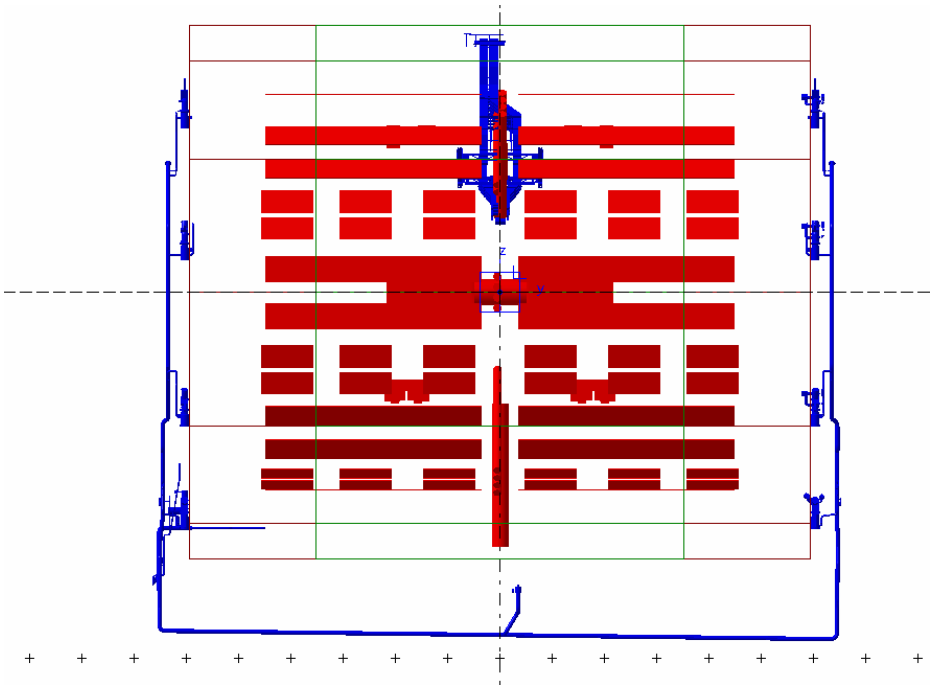
- Magnet Services

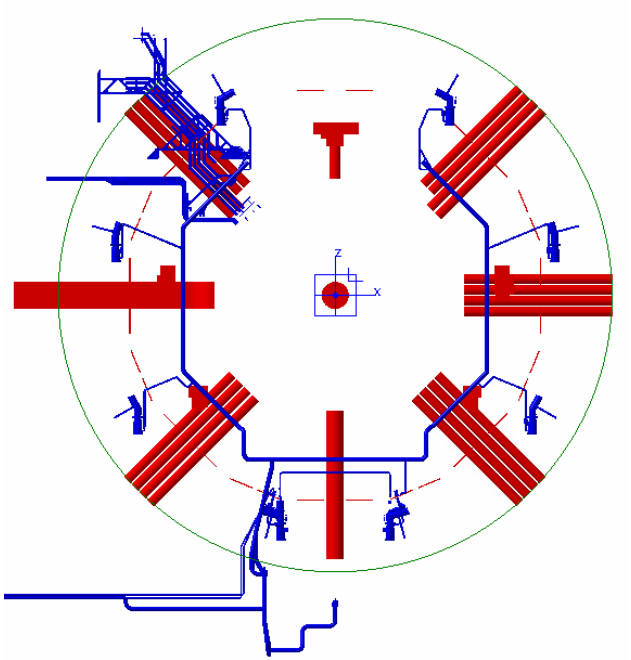


WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

Magnet Services

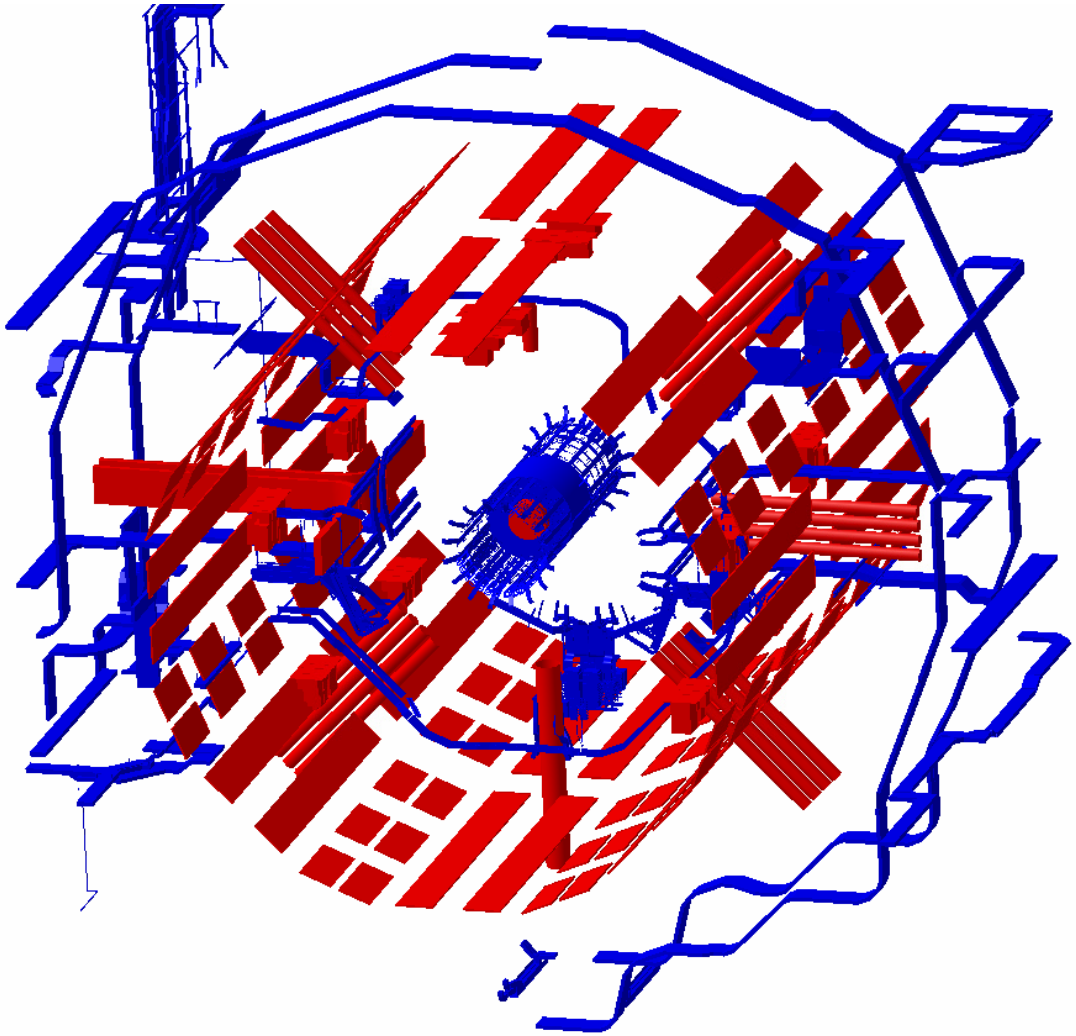




WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

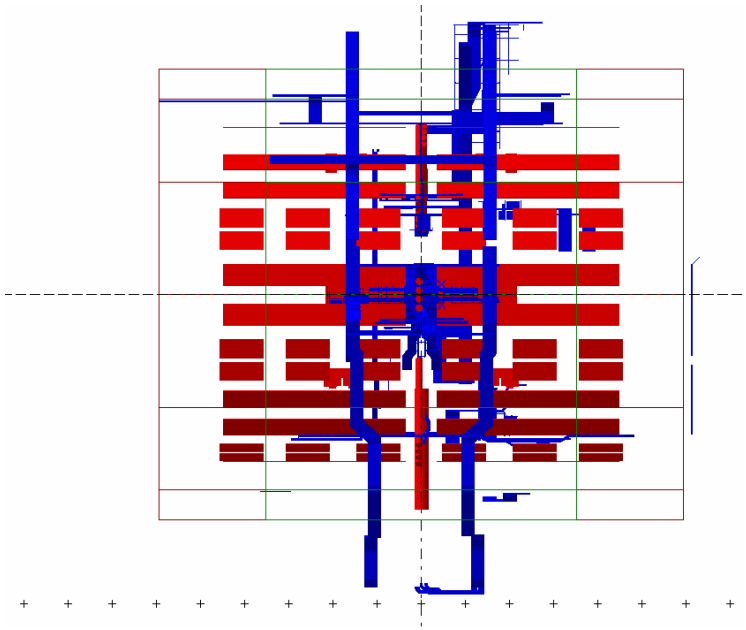
- JD Services

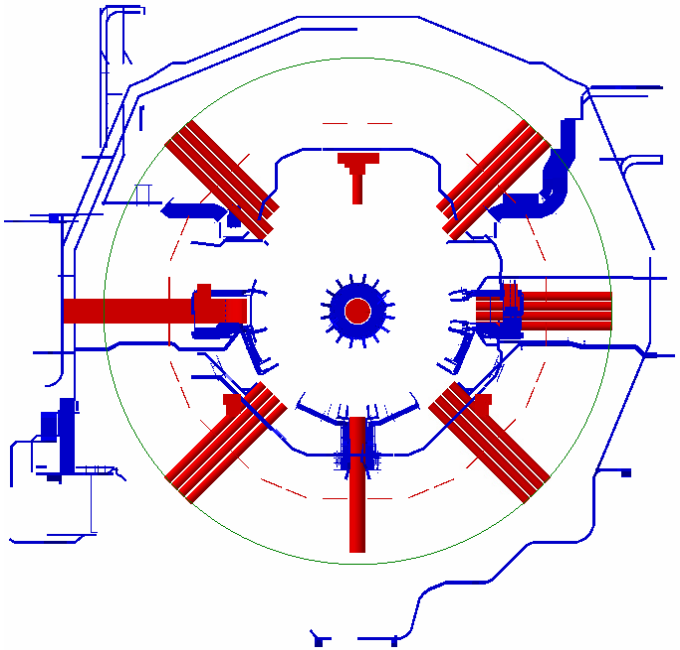


WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

- JD Services

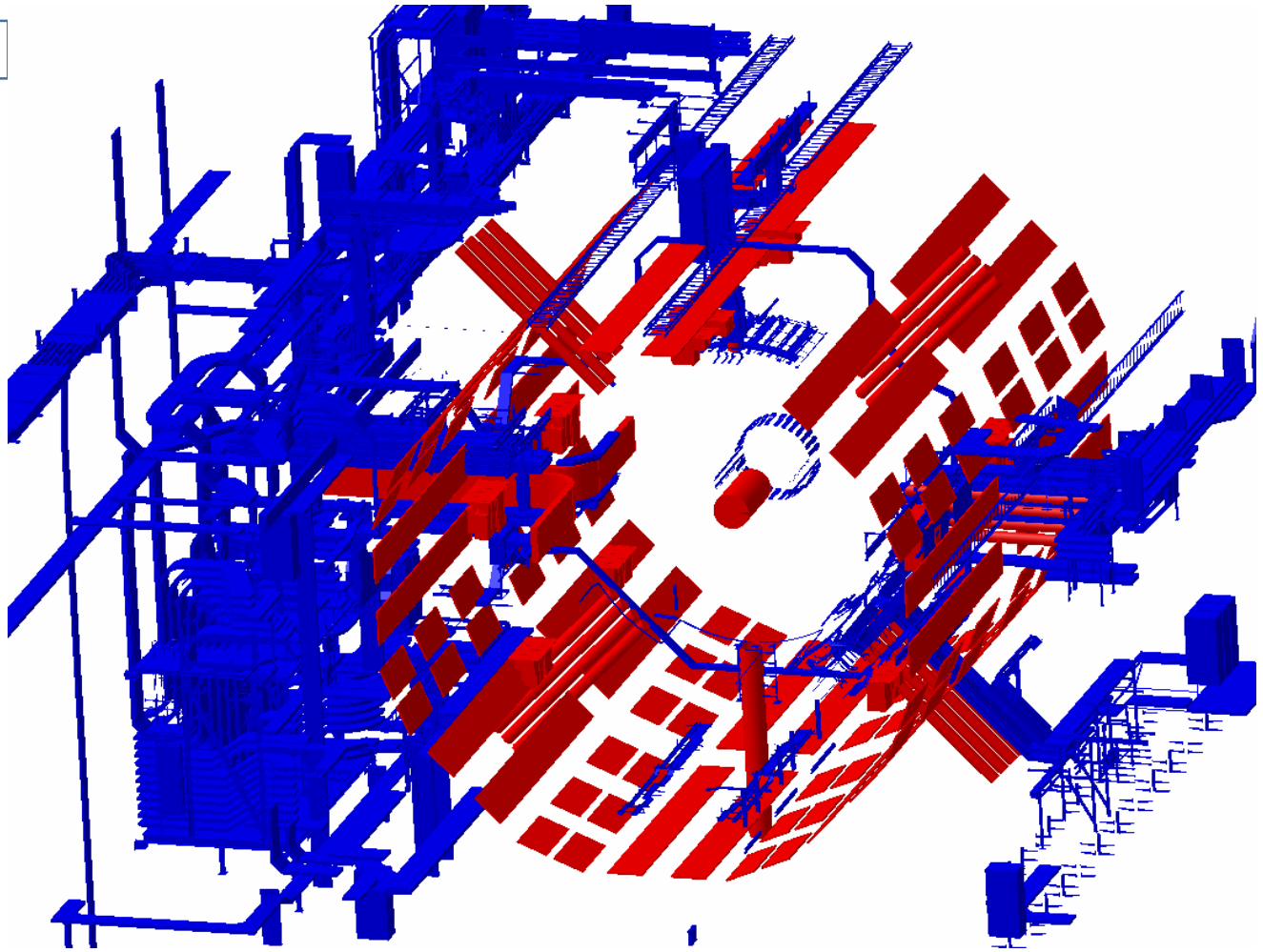




WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

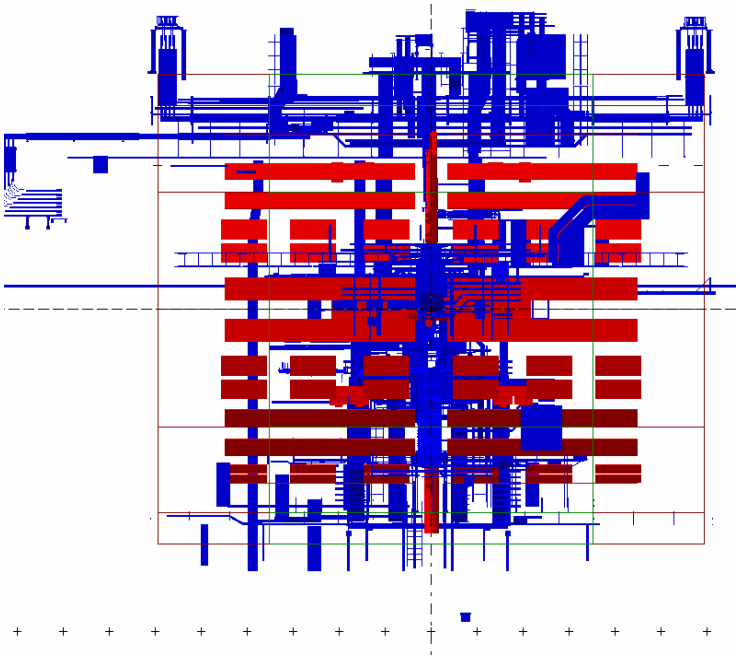
- Racks, Cable Trays

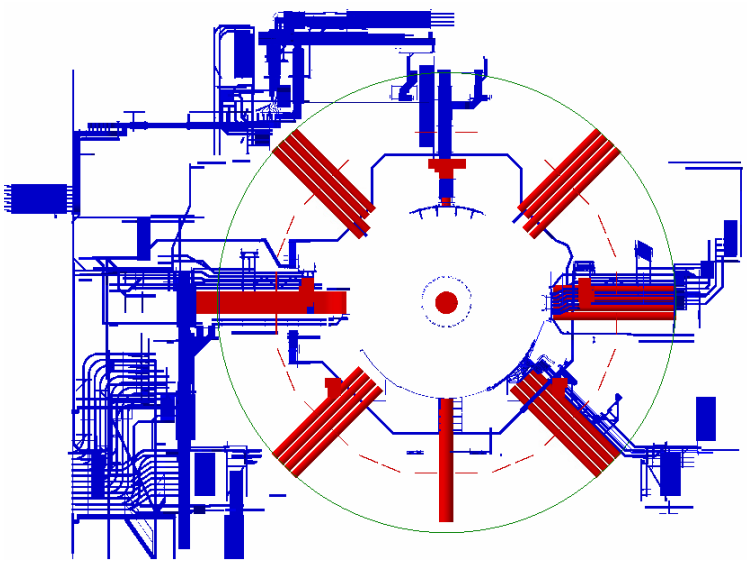


WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

- Racks, Cable Trays

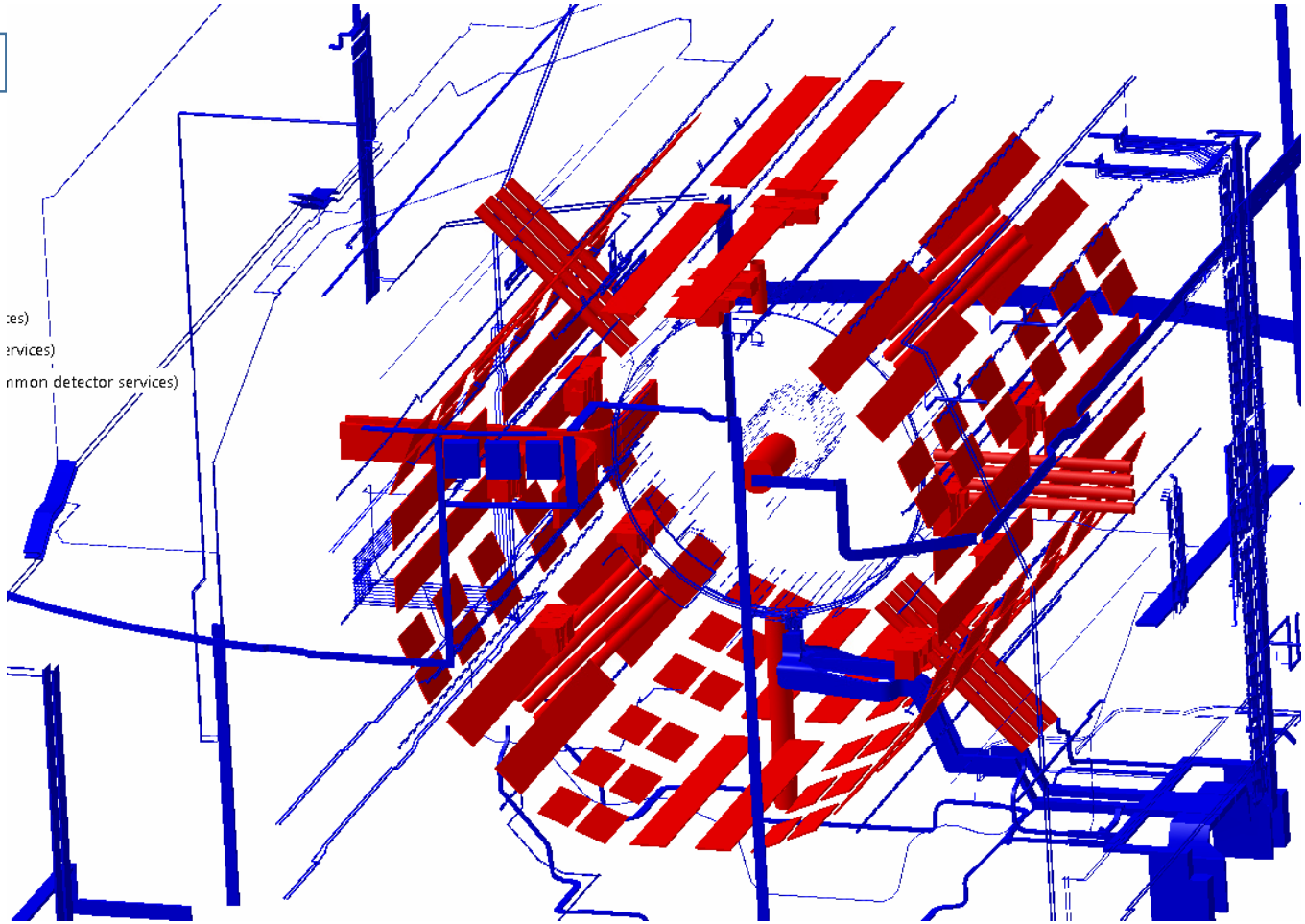




WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
- Services

- Cooling and Gas Pipes



WP2: Adding New Geometries

- NSW July 2016
- Platforms
- GAP Services
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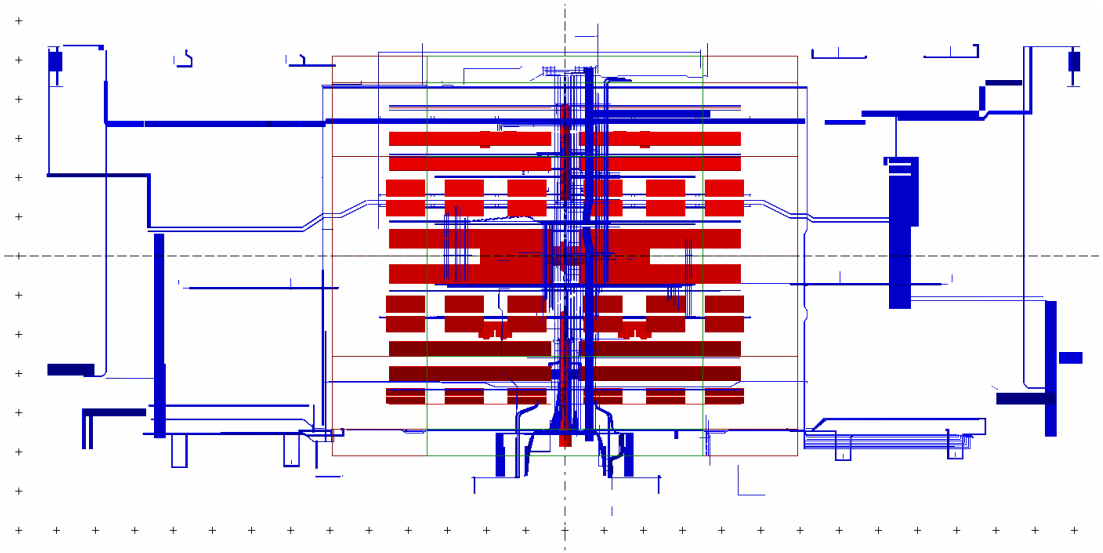
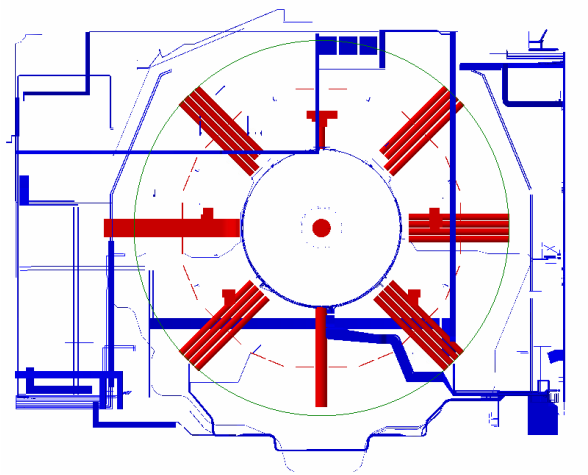
- Cooling and Gas Pipes





Conclusions

1. We would like to have feedback from Simulation team about importance of:
    1. Adding cutouts in Muon Chambers
    2. Adding GAP Services
    3. Adding of Services – which one? In which regions?
2. Important to identify priorities of work
    - For the moment looks like:

      NSW -> FEET's -> ECT Tower -> Platforms
3. Important working out WP's content for Addendum 2017

Thanks!