

Flexible Chain (Sector 9)

CATIA vs Geant Compare Analyse Report

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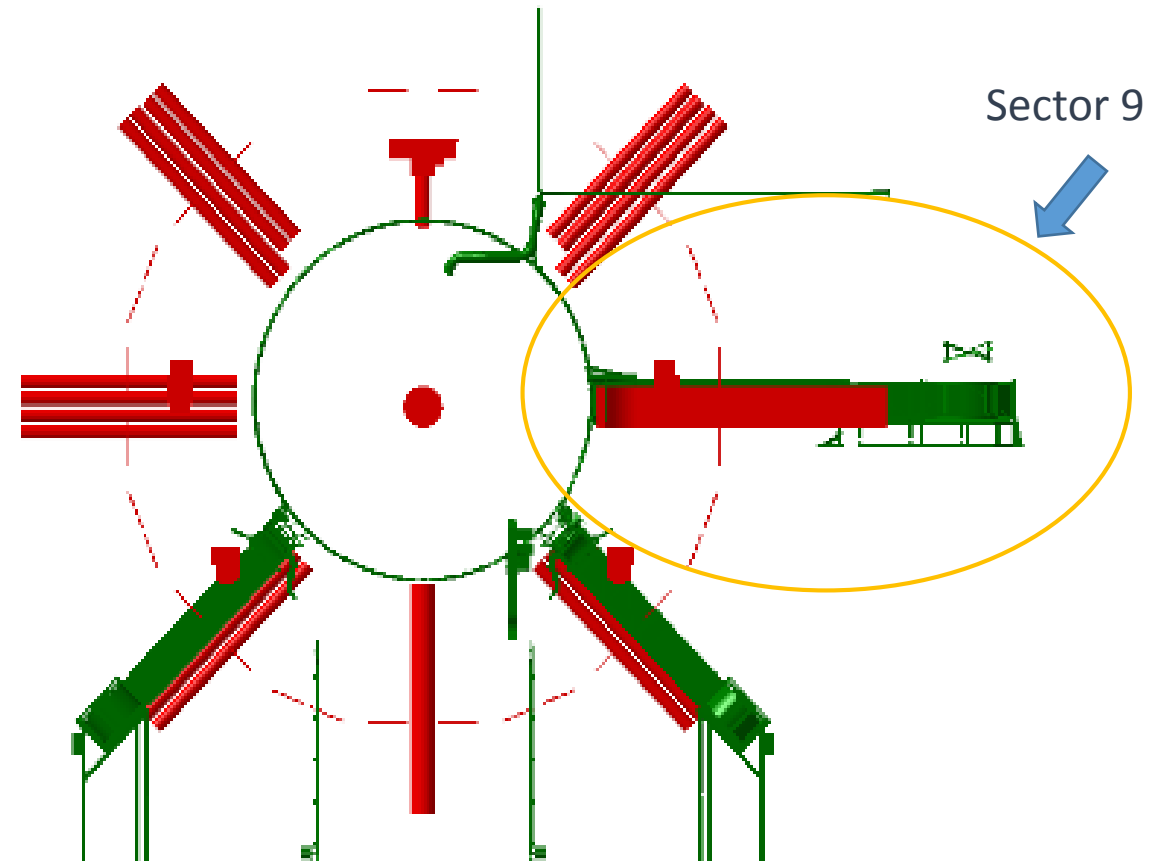
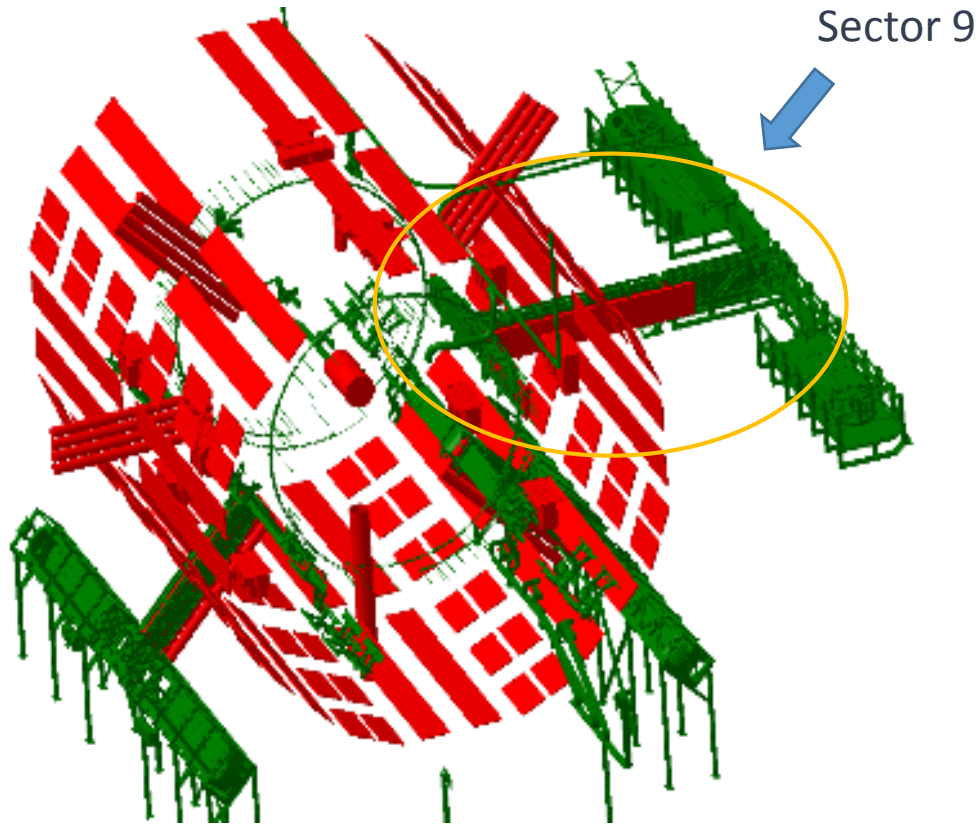
TSUTSKIRIDZE Niko
Georgian Technical University

SHEKILADZE Davit
Georgian Technical University



Flexible Chain in Sector 9

- Flexible Chain is structure with cable bundles, pipes and flexible supports enables movement of services during the detector open-close phases for installation and maintenance.

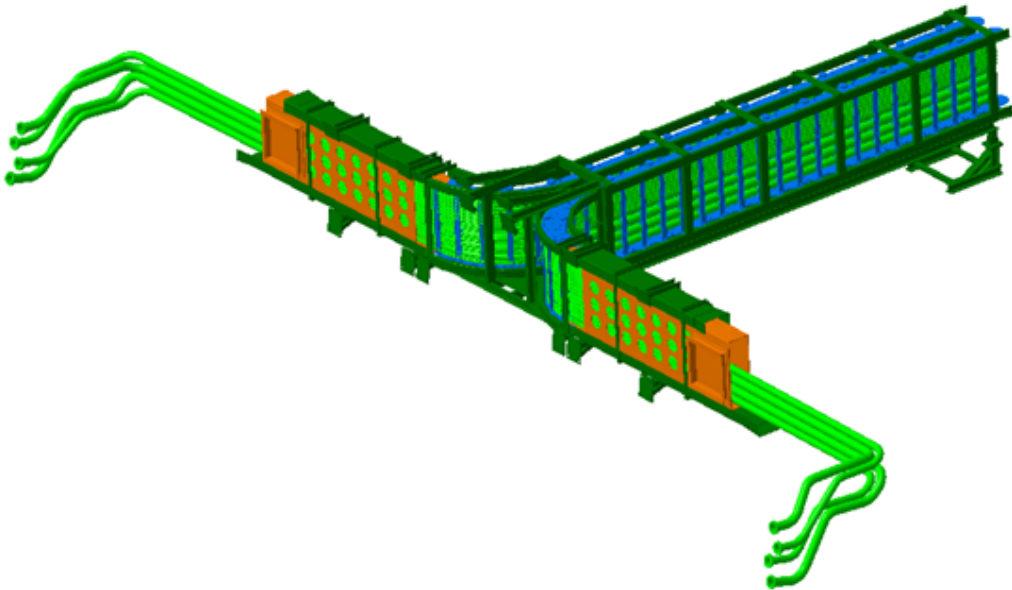


Compare Analyses

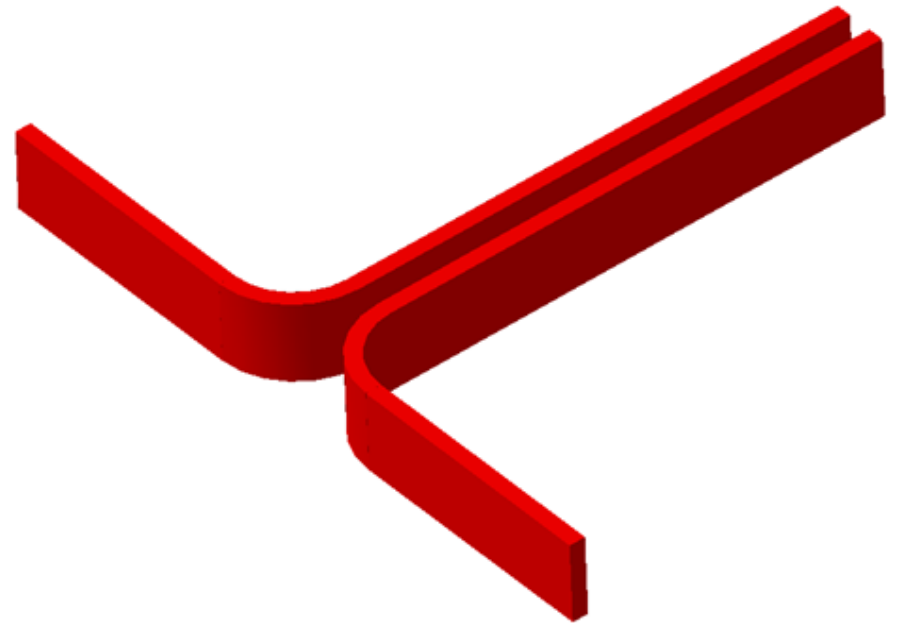
The purpose of project is checking on consistency Geant and CATIA descriptions:

- Anatomy
- Volume
- Weight

CATIA



Geant



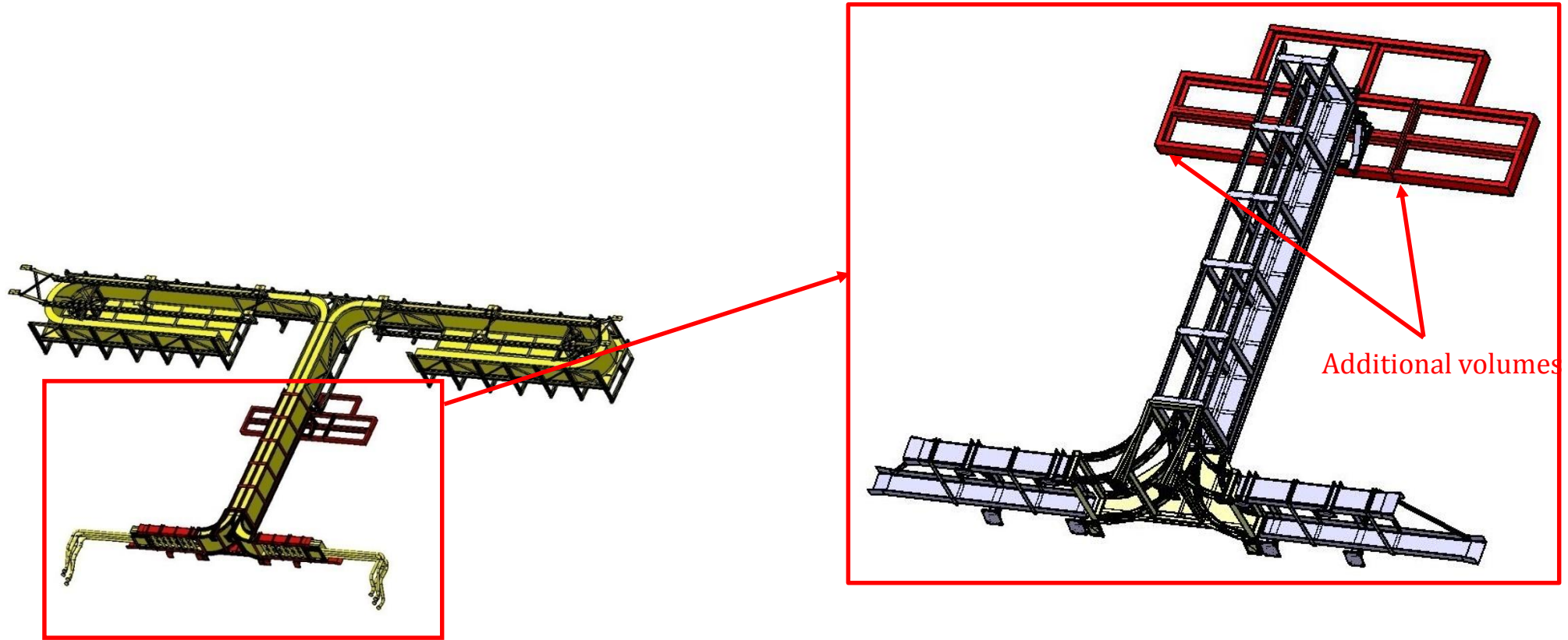
VS

Phase I: Reproduction of CATIA description

SmarTeam model numbers ST0160355_01
 ST0861817_05

Phase I: Reproduction of CATIA description

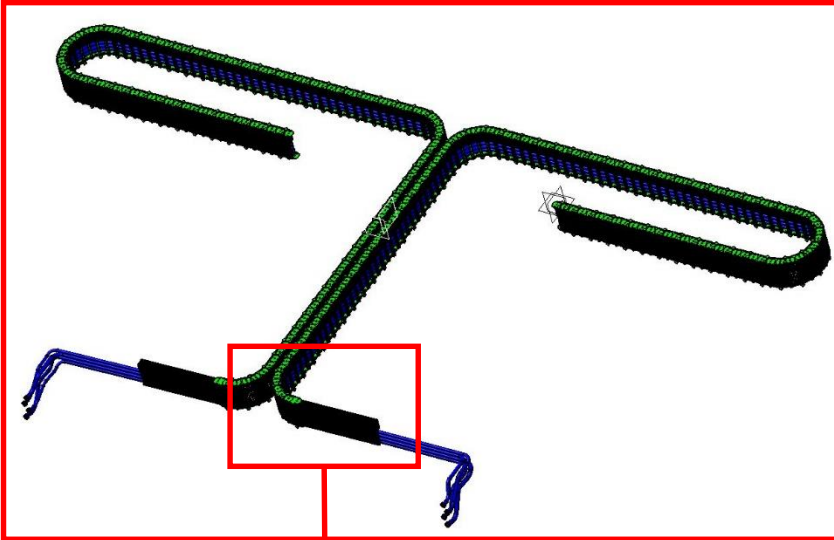
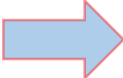
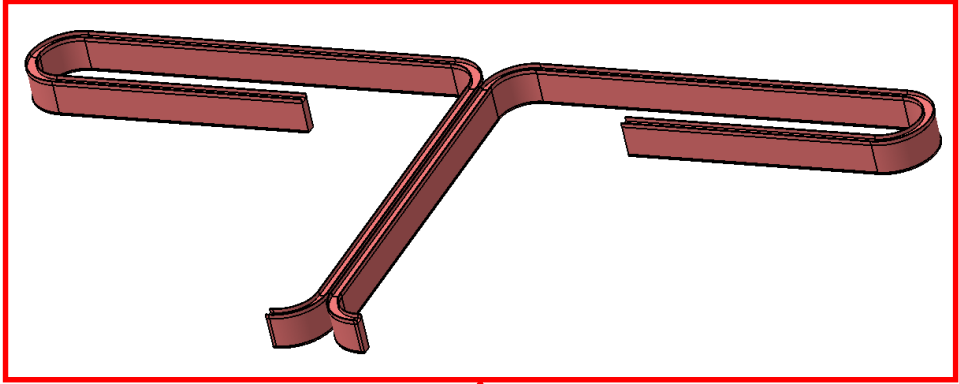
Step 1: Removal of additional volumes



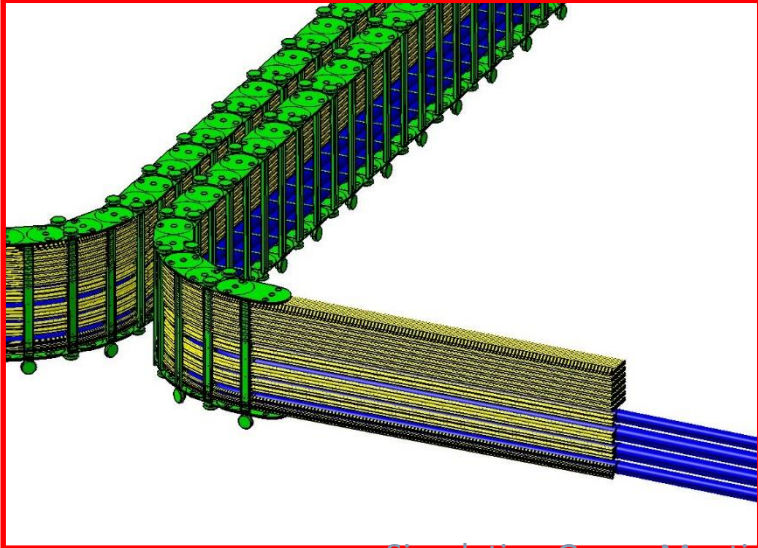
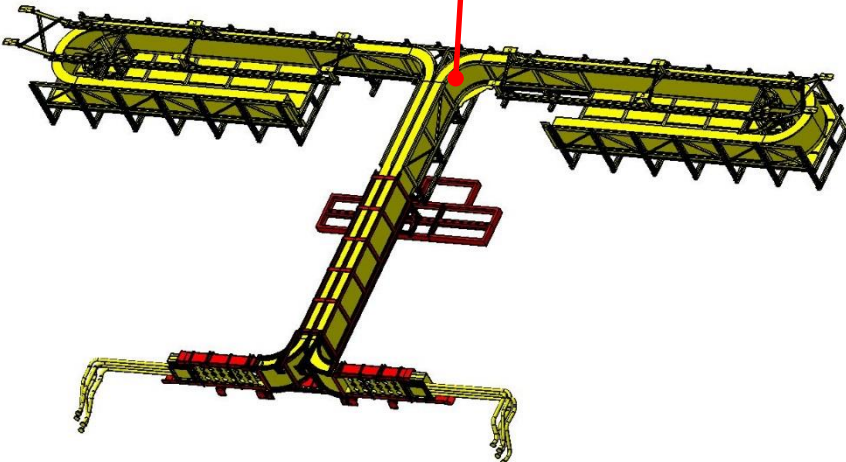
Phase I: Reproduction of CATIA description

Step 2: Adding detalization

Smarteam Model

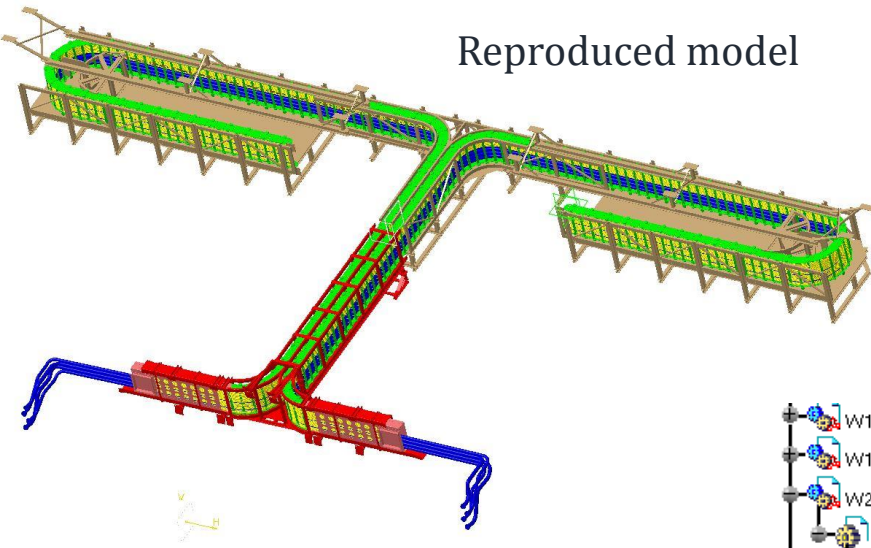
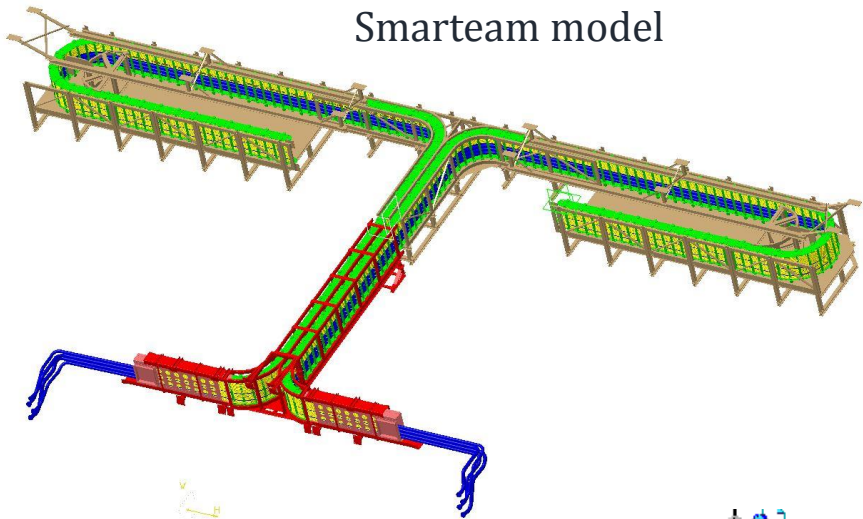


Reprinted Model

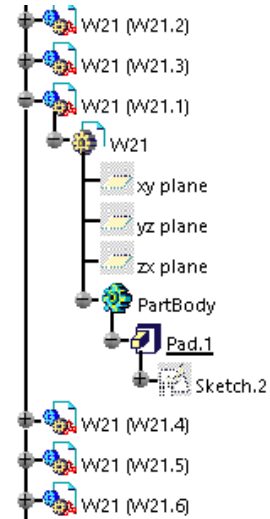
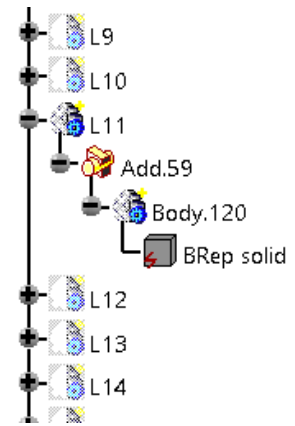


Reproduction of Flexible Chain

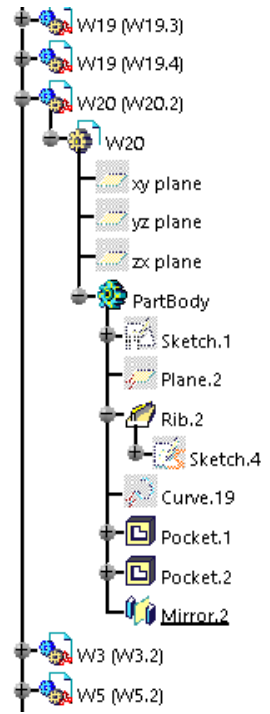
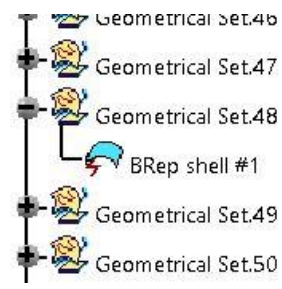
Step 3: Adding history



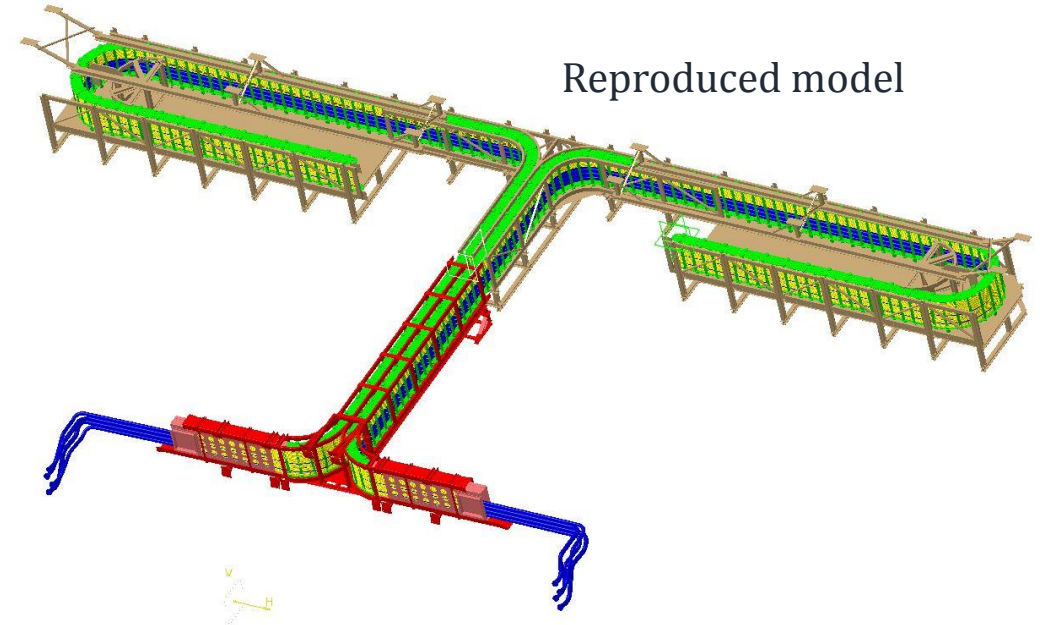
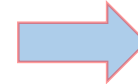
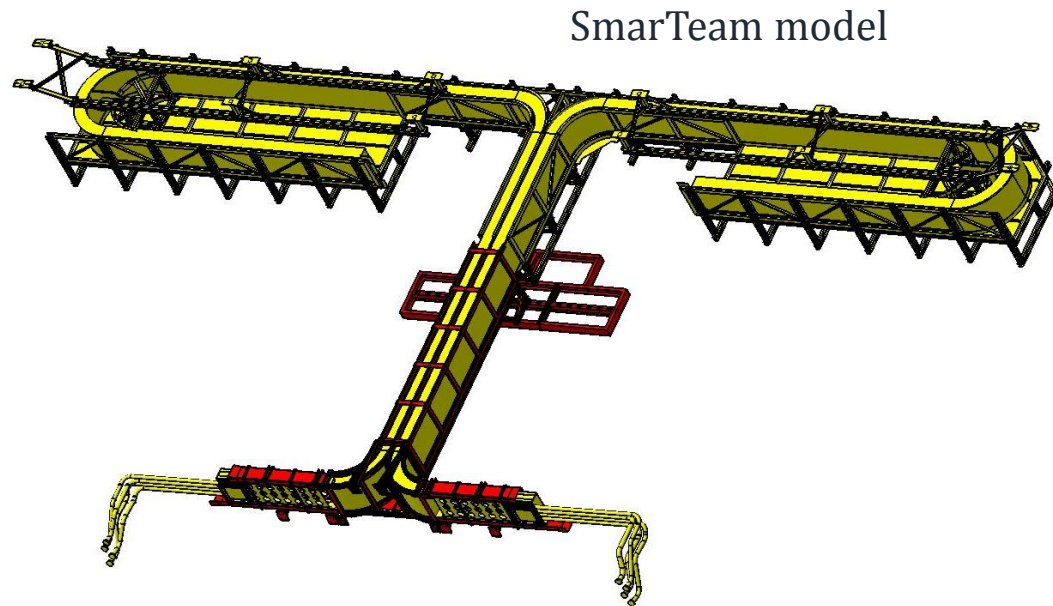
BRep solid



BRep solid



Reproduction of Flexible Chain



Overall number of:

- Assemblies - 1
- Parts - 10
- Bodies - 526
- Sketches - 601
- Geometric features - 6 206

Overall number of:

- Assemblies - 953
- Parts - 10 819
- Bodies - 16 284
- Sketches - 8 769
- Geometric features - 55 382

Project summary:

- 942 Assemblies added
- 10'819 parts added
- 956 man/hour spent

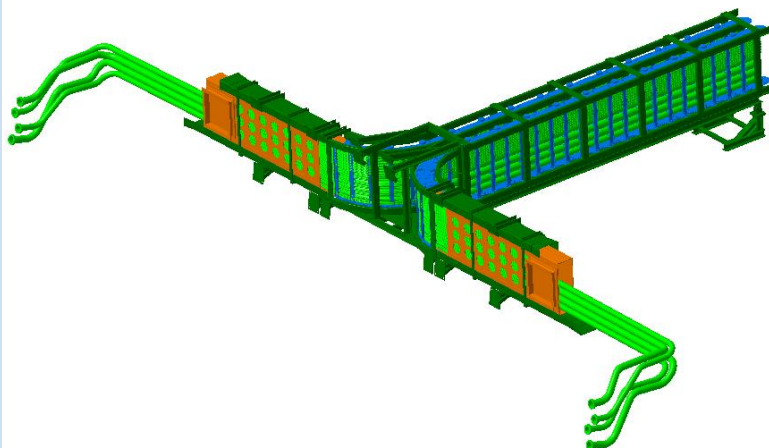
Phase II: Compare Analyses

AGDD/XML amdb_simrec.r.08.01

SmarTeam models number ST0160355_01
 ST0861817_05

Compare Analyses

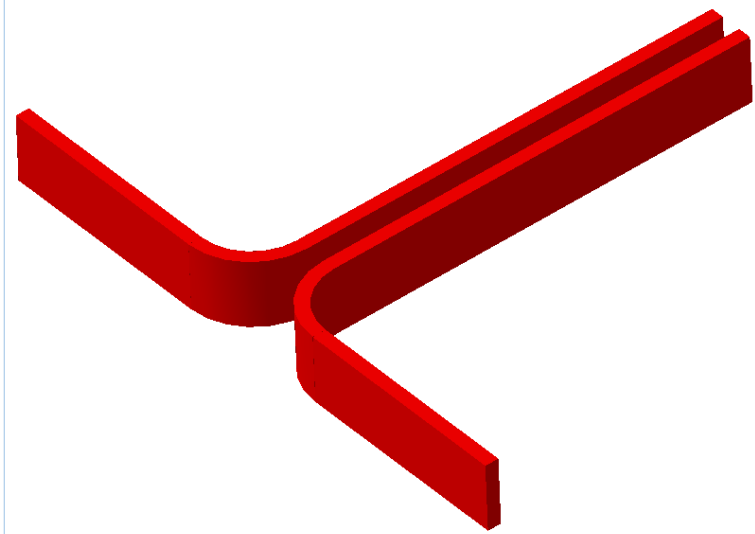
CATIA



Volume (m ³)	0.6456
Mass (kg)	5'253
Material	Stainless Steel/Cooper
Density (kg/m ³)	8'000/8960

VS

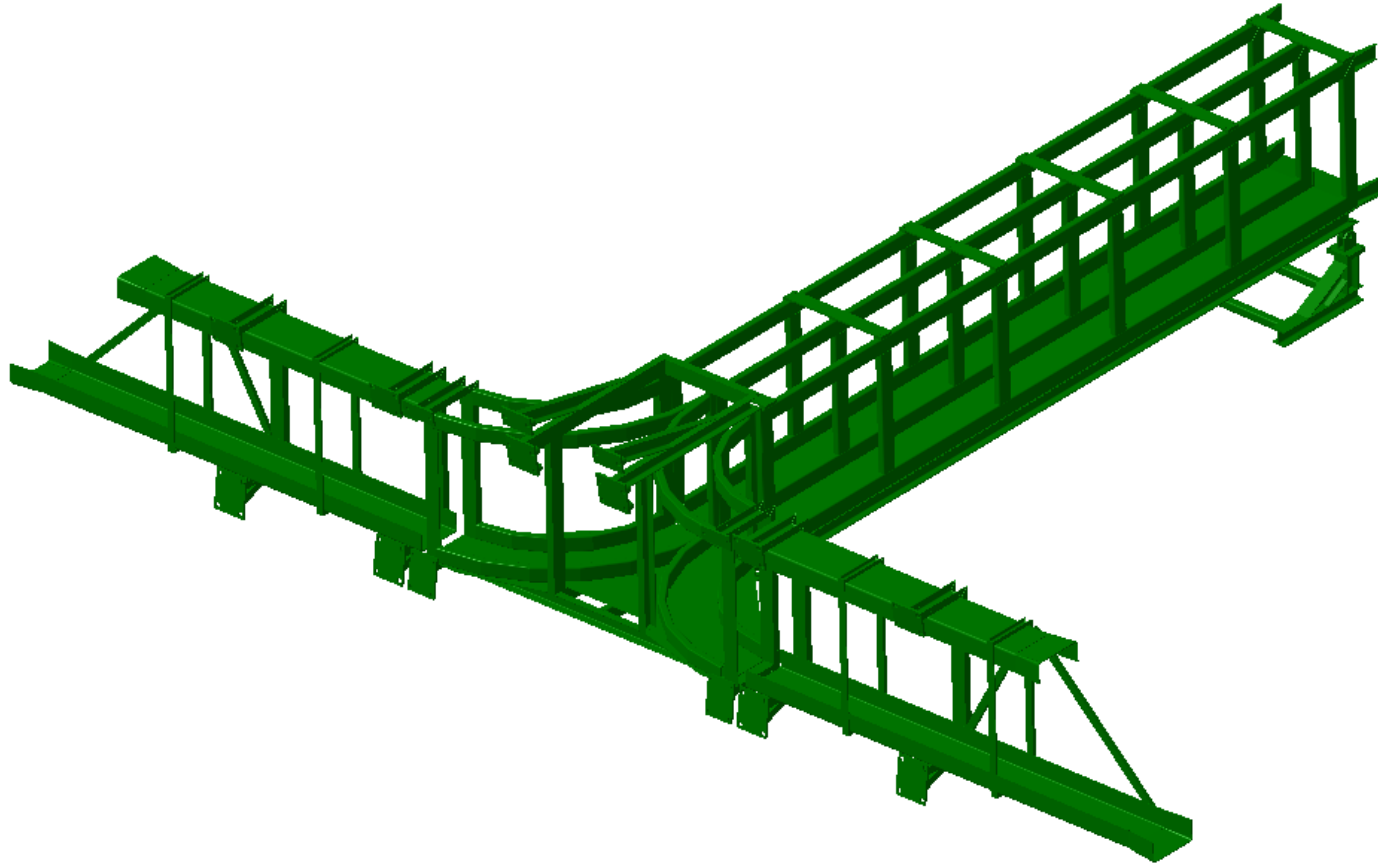
Geant



Volume (m ³)	4.399
Mass (kg)	11'877.3
Material	Aluminum
Density (kg/m ³)	2'700

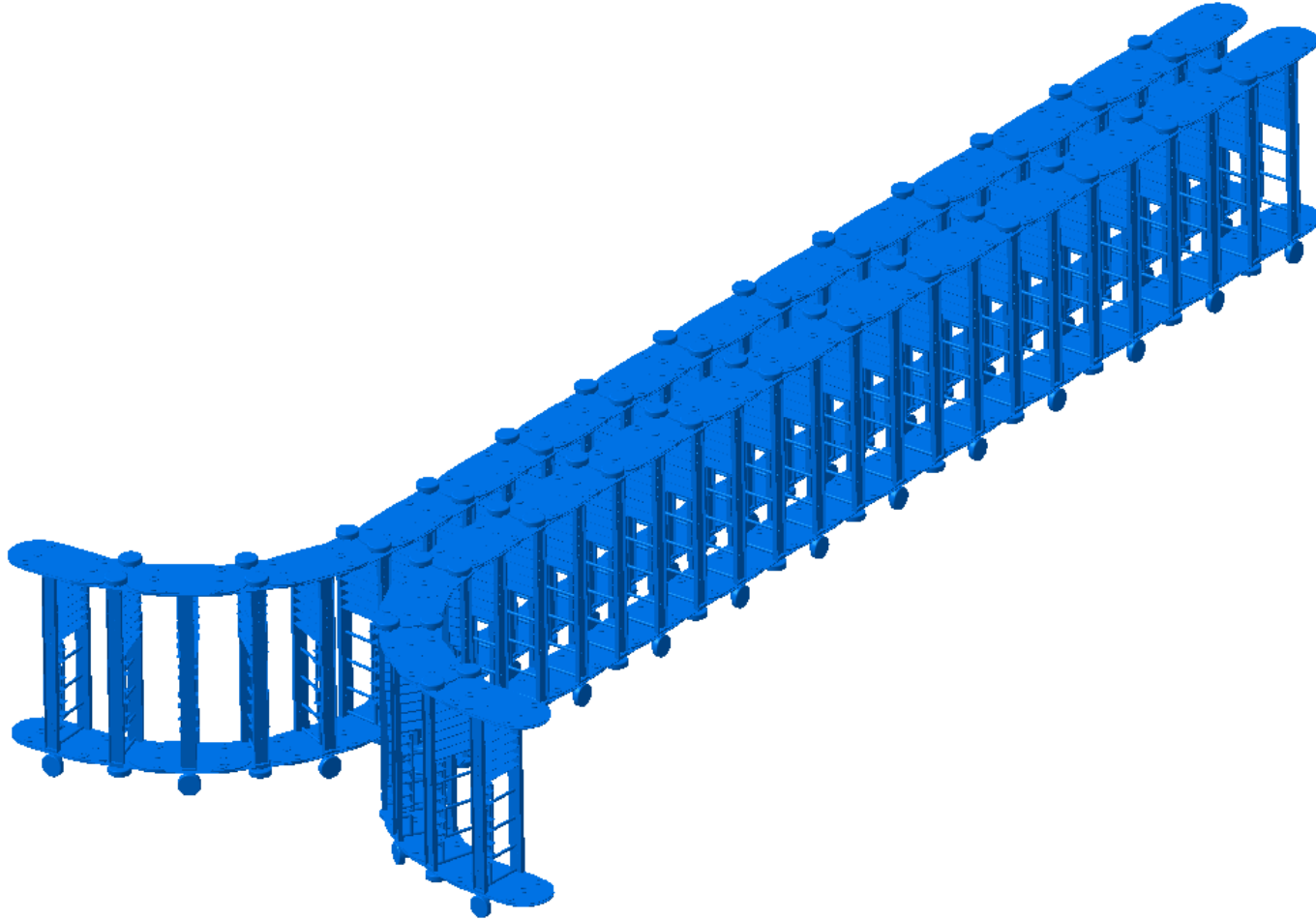
Diff: +6'624 Kg

Volume 1: Support



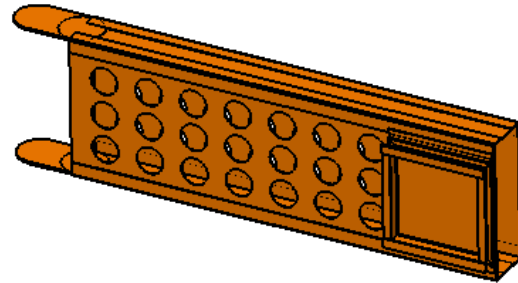
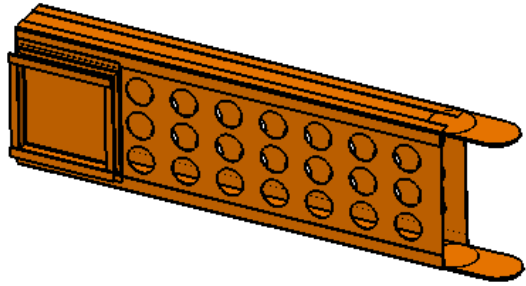
Volume (m³)	0.246
Mass (kg)	1'968
Material	Stainless Steel
Density (kg/m³)	8'000

Volume 2: Drag Chain



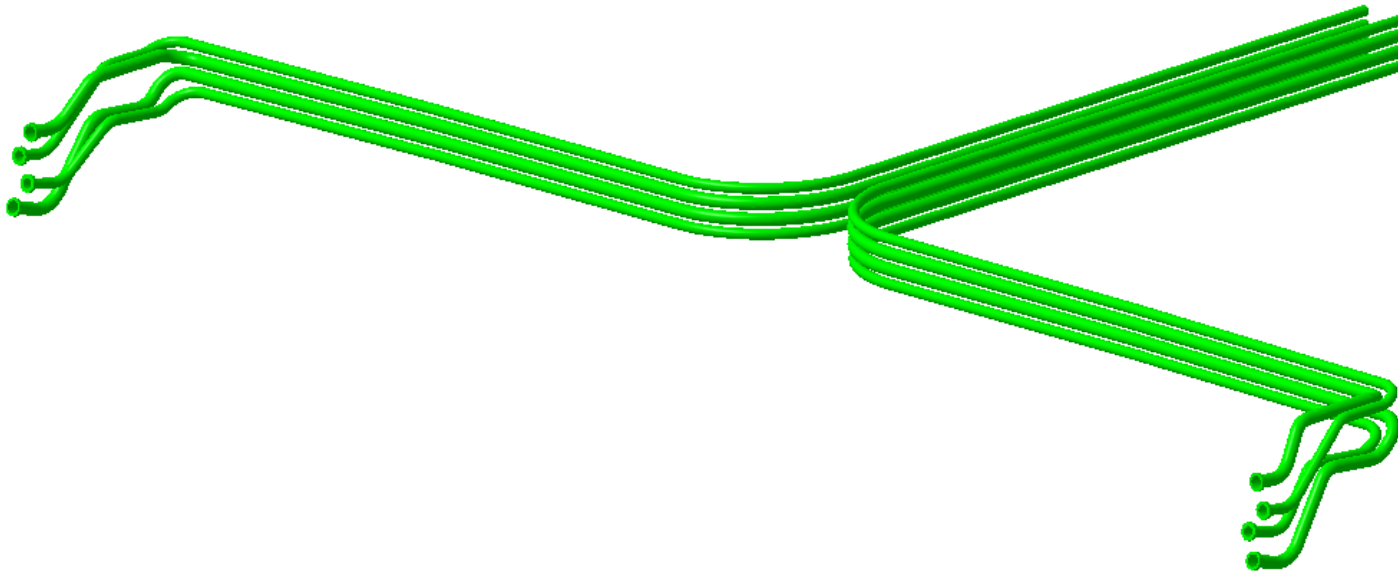
Volume (m³)	0.201
Mass (kg)	1'608
Material	Stainless Steel
Density (kg/m³)	8'000

Volume 3: Towing ARM



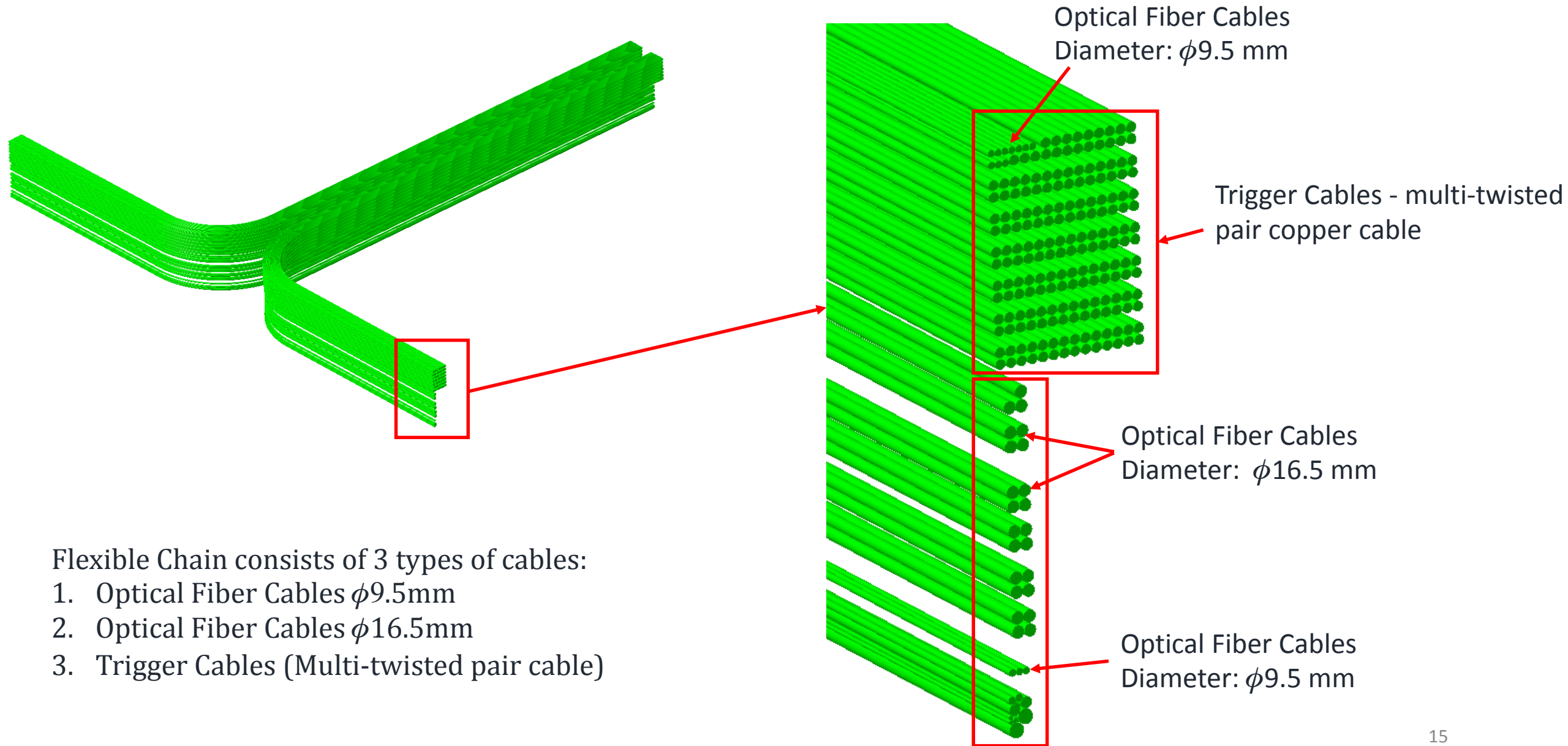
Volume (m³)	0.085
Mass (kg)	680
Material	Stainless Steel
Density (kg/m³)	8'000

Volume 4: Pipes



Volume (m³)	0.0215
Mass (kg)	172
Material	Stainless Steel
Density (kg/m³)	8'000

Volume 5: Cables



- Flexible Chain consists of 3 types of cables:
- 1. Optical Fiber Cables $\phi 9.5$ mm
 - 2. Optical Fiber Cables $\phi 16.5$ mm
 - 3. Trigger Cables (Multi-twisted pair cable)

Volume 5: Cables

Thanks to Oleg SOLOVYANOV to provide drawings details from NEXANS/Belden Co.

Trigger Cables - multi-twisted pair copper cable

Jacket	LSOH Type Megolon S304. Nominal RT = 1.30MM	12.20 ± 0.30mm
WEIGHT	194 kg/km (nominal)	
ELECTRICAL PARAMETERS		
Impedance	100 Ω +/- 10Ω Nominal	
Delay	4.5 nS/m Nominal	
Test voltage	500V DC	

Optical Fiber Cables
Diameter: 9.5 mm



MICRO UNIT MCU-W-04X12/H-E-H#S TZ

Part Number: **FW0480400Z**

Applications: Backbone and Riser cabling, Campus Backbone, Data-Centers/SANs, General purpose indoor LAN, Multifiber array for MPO connectors

General Construction: 12 color-coded graded index multimode 50/125 um OM-3 radiation hardened optical fibers, each with a 0.25 mm outer diameter, are protected by dielectric strength yarns and jacketed. These 4 numbered 3.0 mm microunits are stranded around a filler central member and overall jacketed.

Outer Jacket Material: FR-LSZH

Outer Diameter: 9.5 mm nom.

Weight: 88 kg/km



Optical Fiber Cables
Diameter: 16.5 mm



MICRO UNIT MCU-W-14X12/H-E-H#S TZ

Part Number: **FW1681401Z**

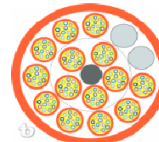
Applications: Backbone and Riser cabling, Campus Backbone, Data-Centers/SANs, General purpose indoor LAN, Multifiber array for MPO connectors

General Construction: 12 color-coded graded index multimode 50/125 um OM-3 radiation hardened optical fibers, each with a 0.25 mm outer diameter, are protected by dielectric strength yarns and jacketed. These 14 numbered 3.0 mm microunits are stranded, (with fillers if required) in two layers (5 + 11) around a dielectric central member and overall jacketed.

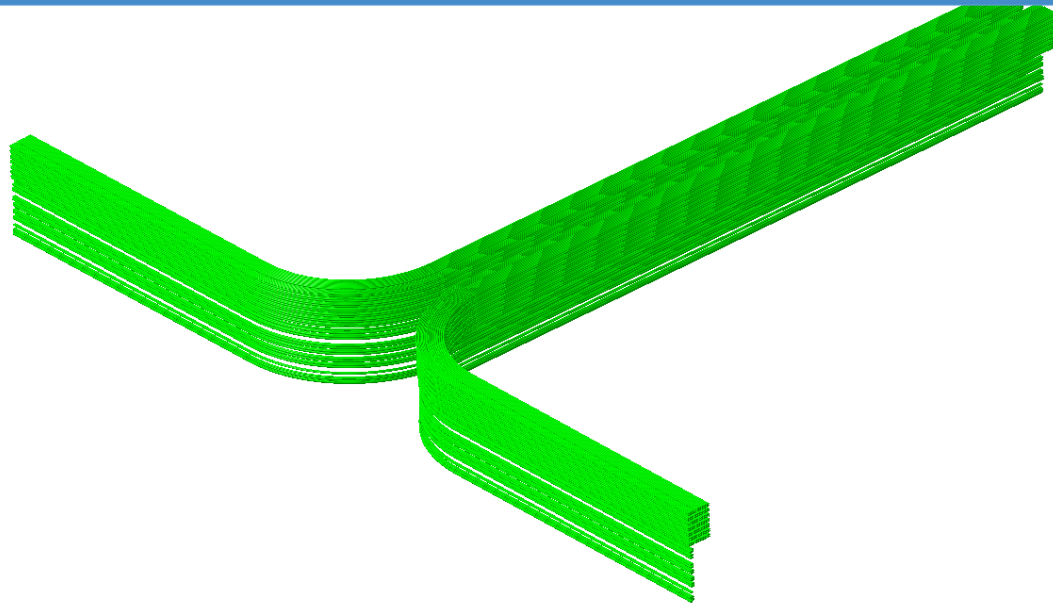
Outer Jacket Material: FR-LSZH

Outer Diameter: 16.5 mm nom.

Weight: 250 kg/km



Volume 5: Cables

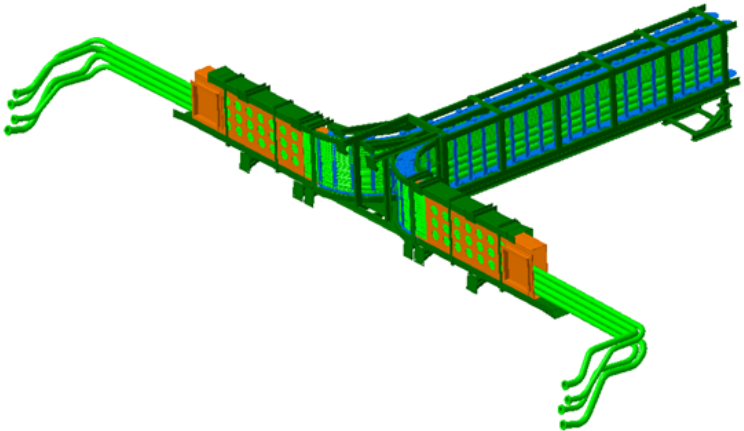


Cable Type	General Weight (kg/km)	Total Length in Flexible Chain (M)	Cables Weight of Flexible Chain (kg)
1. Optical Fiber Cable ϕ 9.5 mm	88	260	23
2. Optical Fiber Cables ϕ 16.5 mm	250	260	65
3. Trigger Cables (multi-twisted pair copper cable)	194	3800	737

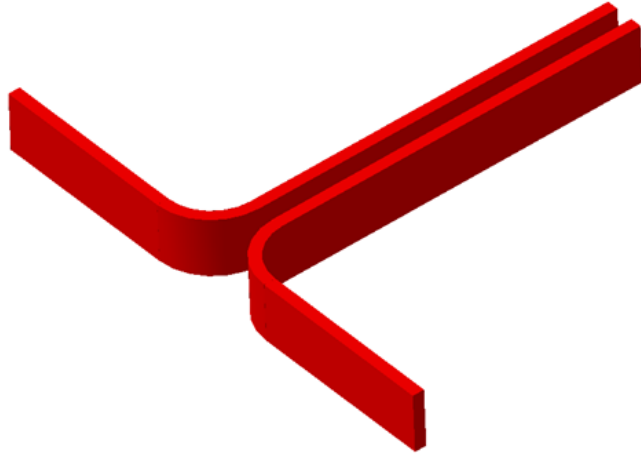
Compare Analyses

	CATIA	Geant	Difference
1 Support	1'968 kgs	11'877 kgs	83.4%
2 Drag Chain	1'608 kgs	- kgs	- 100%
3 Towing Arm	680 kgs	- kgs	- 100%
4 Pipes	172 kgs	- kgs	- 100%
5 Cables	825 kgs	- kgs	- 100%
Total	5'253	11'877	97%

CATIA



Geant



VS

Conclusions

- Reproduction of CATIA description brings good reference geometry of Flexible Chain in sector 9
- CATIA vs GEANT compare analyses shows big difference (97%) in weight and volume. Geant description has extra 6.6 tones of material
- Geant description presented as a mono material *one* volume which is wrong. In reality there are *five* big assemblies with different materials
- We strongly recommend to built new Geant description of Flexible Chain in sector 9 on the base of CATIA description
- Further steps should be done: simplification of CATIA geometry with keeping volume and weight parameters -> generation XML -> checking new XML geometry on integration conflicts with whole GEANT geometry

Upcoming Projects in 2018

1. CATIA vs GEANT compare analyses of Feet's
2. Adding new volumes of services in GAP region
3. Adding new volumes of Flexible Chains in Sectors 11 and 15

Thanks!