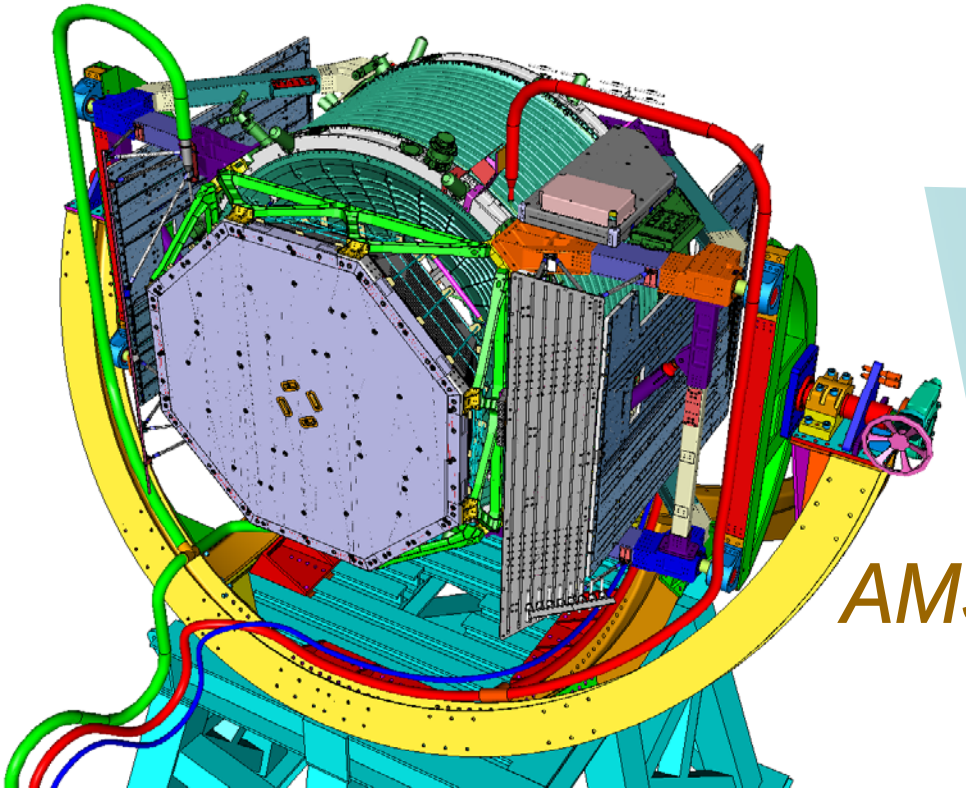
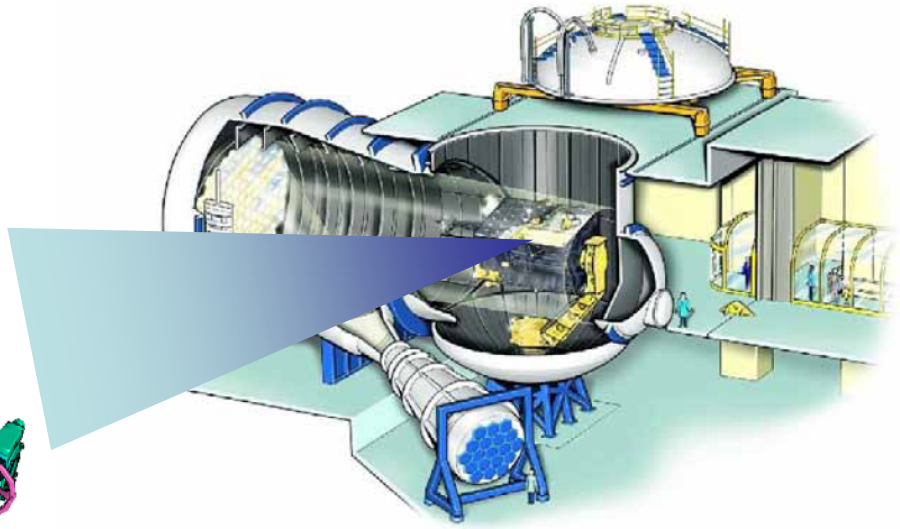




AMS TV TEST SETUP rev_1

Corrado GARGIULO
CERN, March 2009

TVT SET-UP

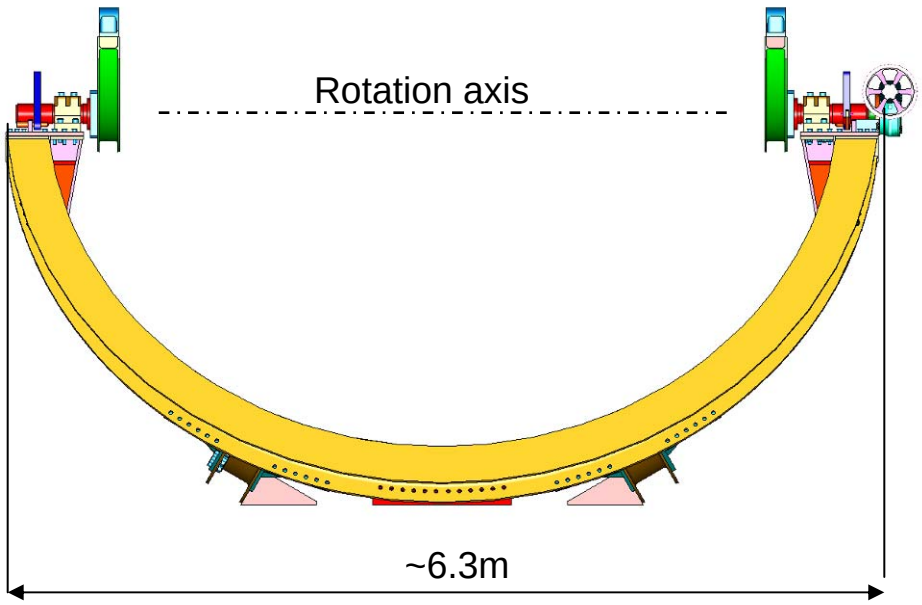
ACTION 1: GONDOLA INSTALLATION IN LSS
ACTION 2: SCAFFOLDING INSTALLATION IN LSS
ACTION 3: AMS INSTALLATION IN LSS
ACTION 4: Cryo Ground Support Equipment INSTALLATION
ACTION 5: TRD-GAS-Ground-Support-Equipment INSTALLATION
ACTION 6: INFRARED LAMPS INSTALLATION
ACTION 7: CABLING ROUTING
ACTION 8: LSS PLATFORM MLI INSTALLATION
ACTION 9: FUNCTIONAL CHECK OUT, TEST-GSE INSTALL AND REMOVE
ACTION 10: SCAFFOLDING REMOVAL FROM LSS
ACTION 11: LSS DOOR CLOSURE
ACTION 12: TEST RUNNING
ACTION 13: LSS DOOR OPEN
ACTION 14: SCAFFOLDING INSTALLATION IN LSS
ACTION 15: FUNCTIONAL TEST, TEST-GSE INSTALL AND REMOVE
ACTION 16: IR LAMPS, CGSE, AMS_02, GONDOLA,… REMOVAL FROM LSS

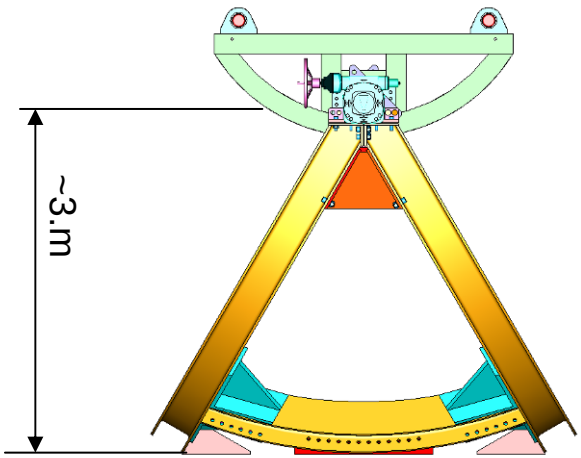
ACTION 1:GONDOLA INSTALLATION IN LSS

STEP_1: GONDOLA FEET BLOCKS POSITIONING IN THE LSS SEISMIC TABLE
STEP_2: GONDOLA DOWNLOADING FROM THE TRUCK AND CLEANING
STEP_3: GONDOLA MOVING INSIDE ESTEC TEST AREA BY ESTEC AIR PALLET
STEP_4: GONDOLA PREPARATION (MINOR ACTIONS)
STEP_5: GONDOLA MOVING INSIDE LSS BY CRANE
STEP_6: GONDOLA FIXATION TO LSS SEISMIC TABLE

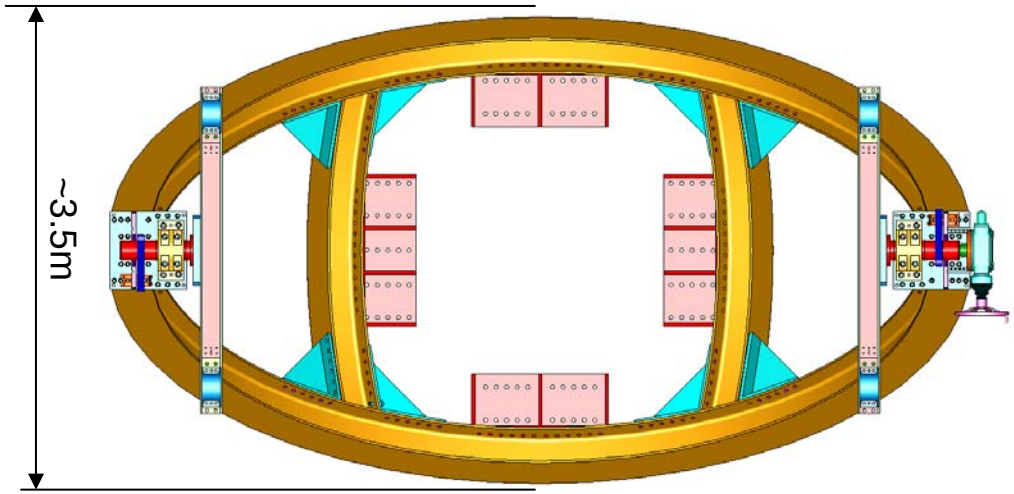
ACCESS NEEDED INSIDE LSS: *LSS seismic table*

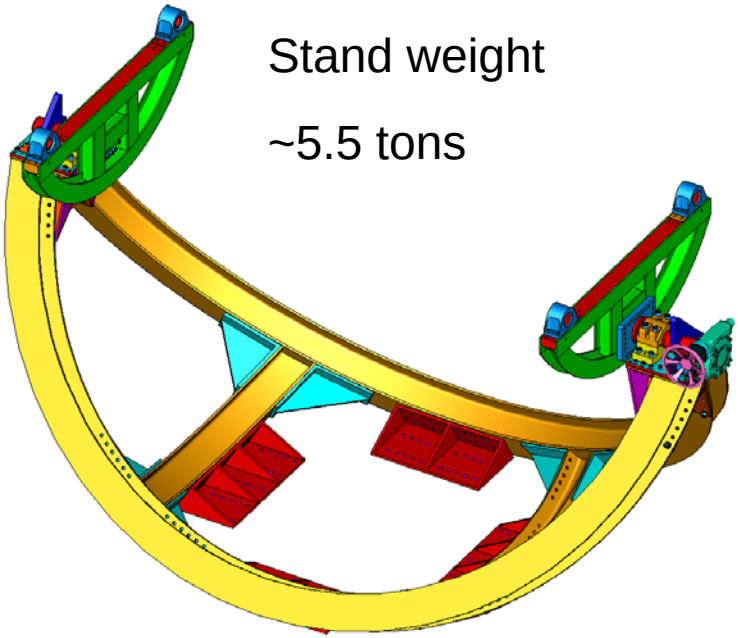
NOTE:
1)Gondola shall be installed before AMS arrival at ESTEC
2)Due to the small clearance between AMS/Gondola and the scaffolding, there shall be some reference marks on the LSS seismic plate that will provide the reference for the location of the Gondola respect to the LSS seismic table (accuracy needed about 1-2 cm)





GONDOLA OVERALL DIMENSIONS

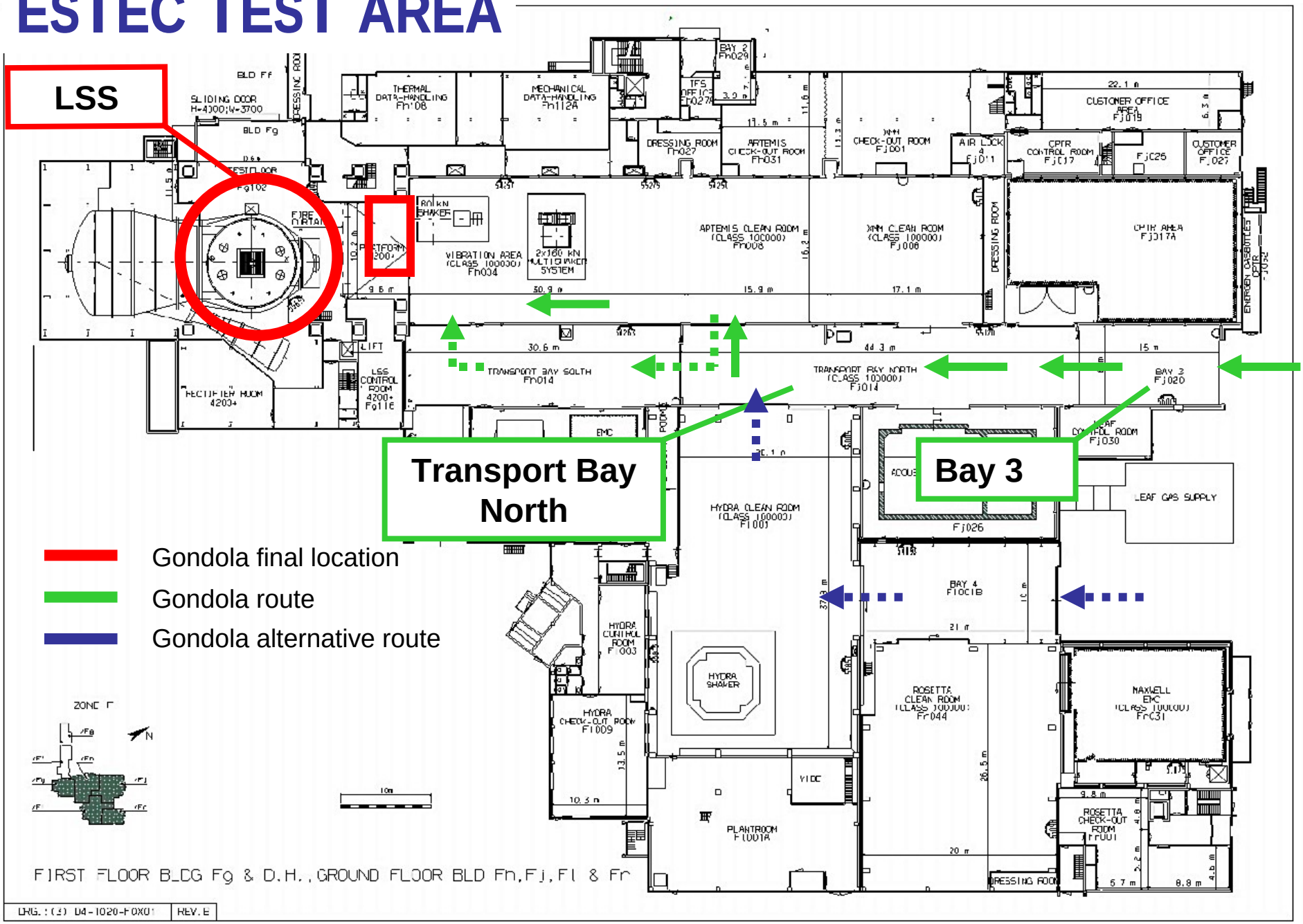




Stand weight

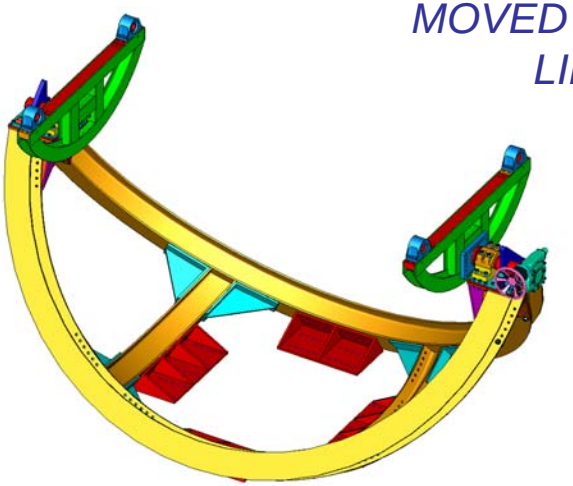
~5.5 tons

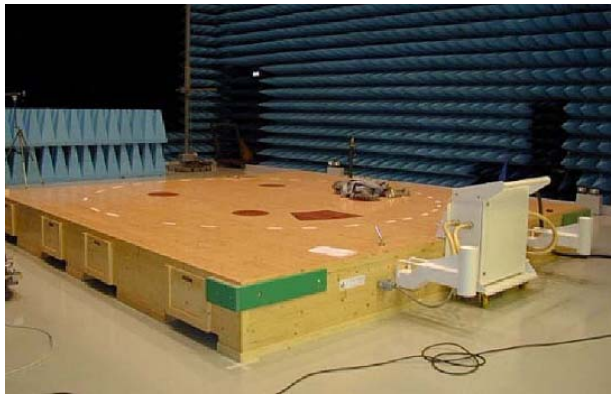
ESTEC TEST AREA



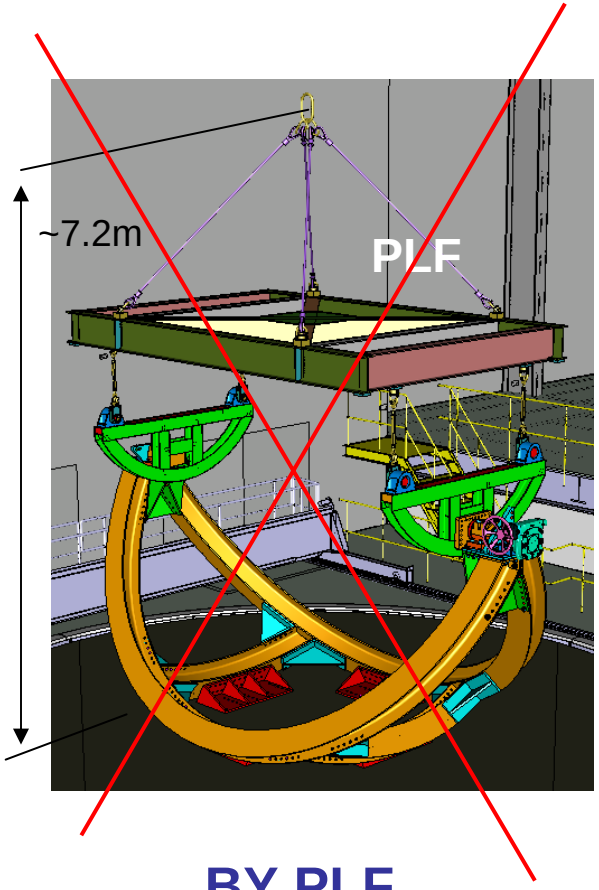
GONDOLA HANDLING at ESTEC

GONDOLA WILL BE
MOVED INSIDE ESTEC TEST AREA BY AIR-PALLET,
LIFTED INSIDE THE LSS BY 30T CRANE

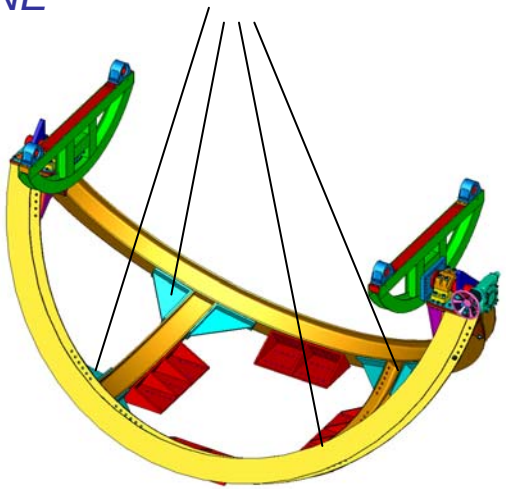


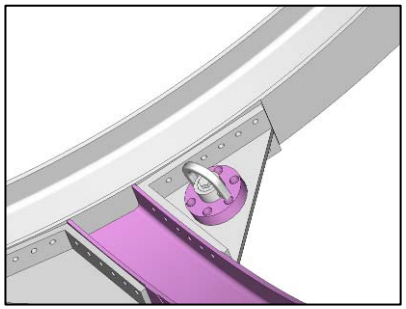


BY ESTEC AIR PALLET



BY PLF

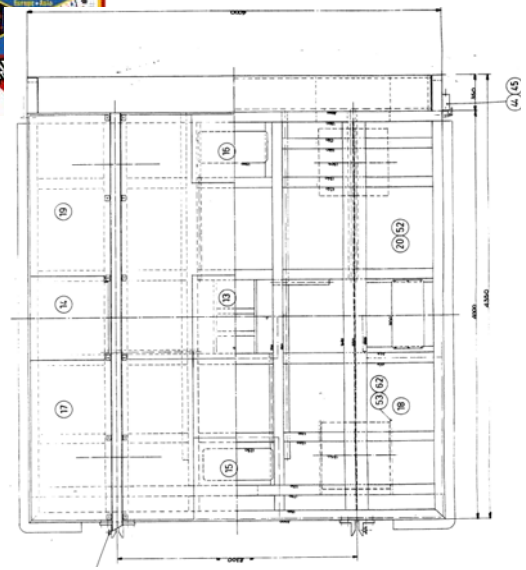


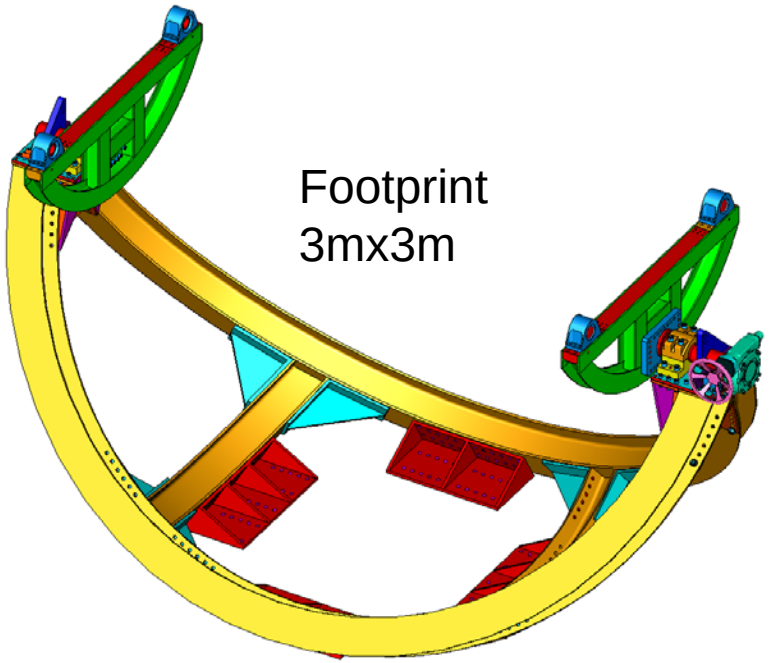


DIRECTLY BY CRANE

PLF not available

GONDOLA MOVING ON AIR PALLET

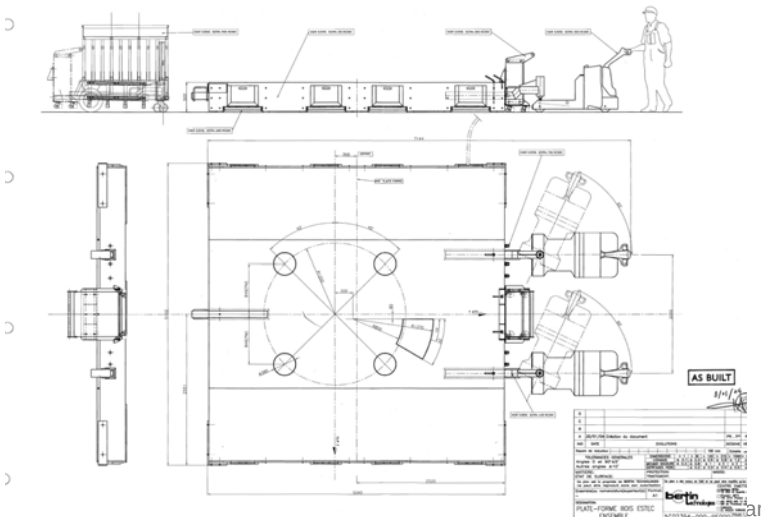


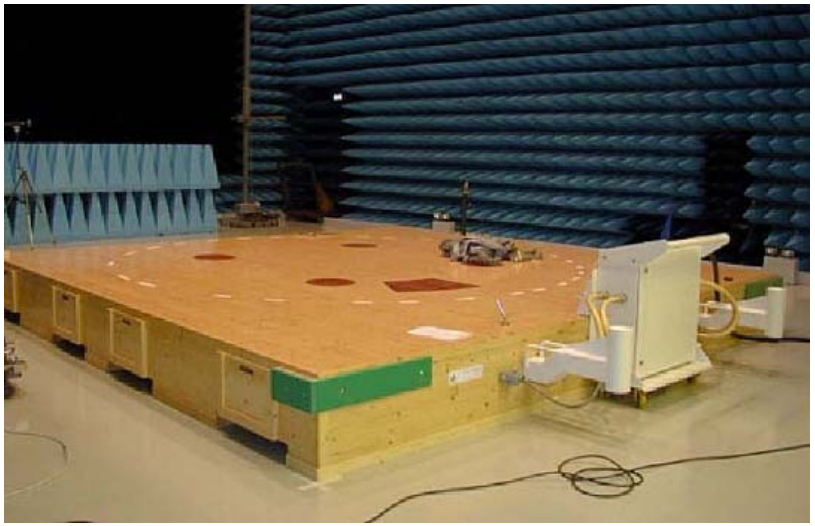


Steel air pallet 4x4m 20 ton

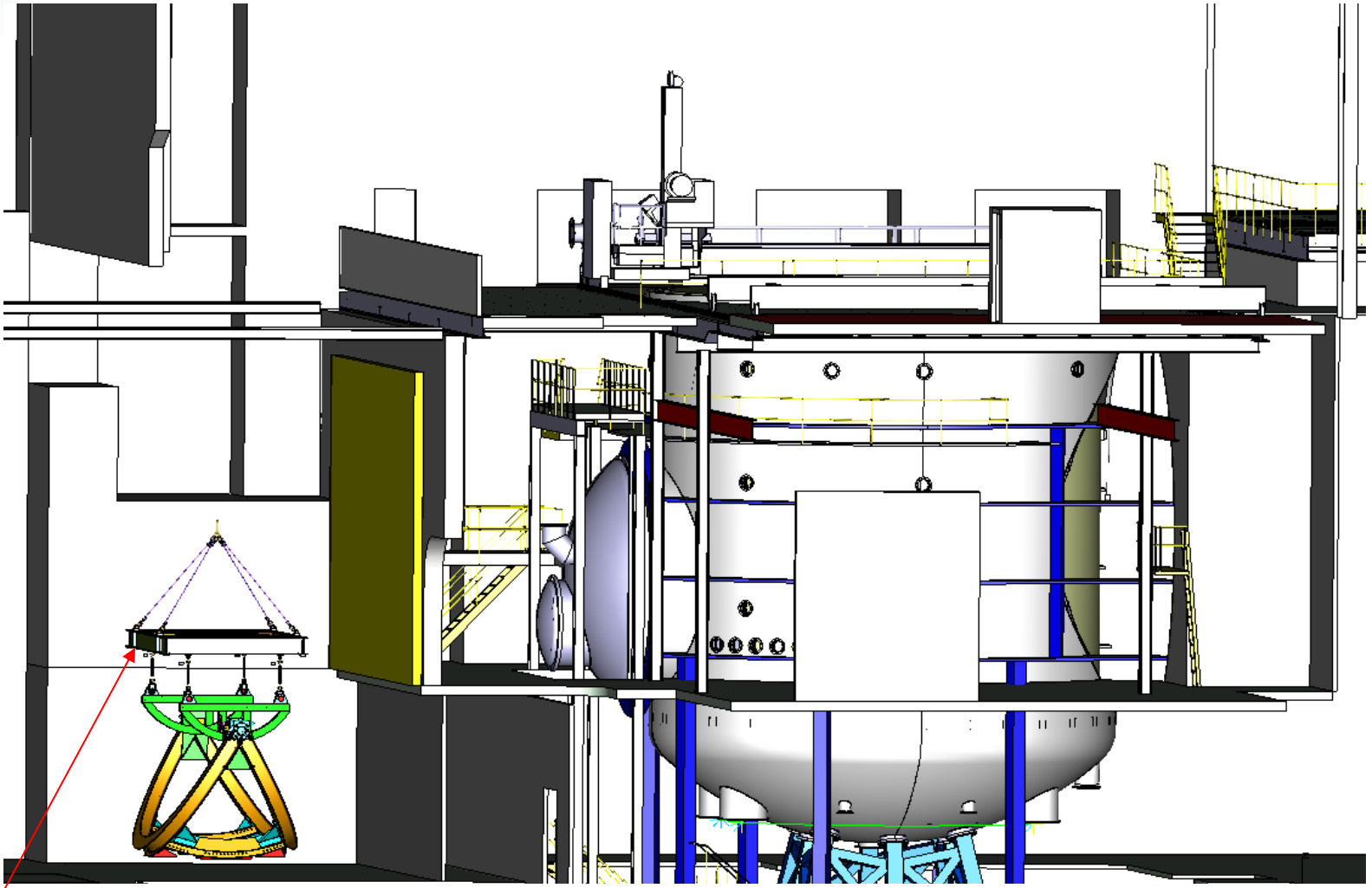
OR

Wooden air pallet 5x5m 15 ton





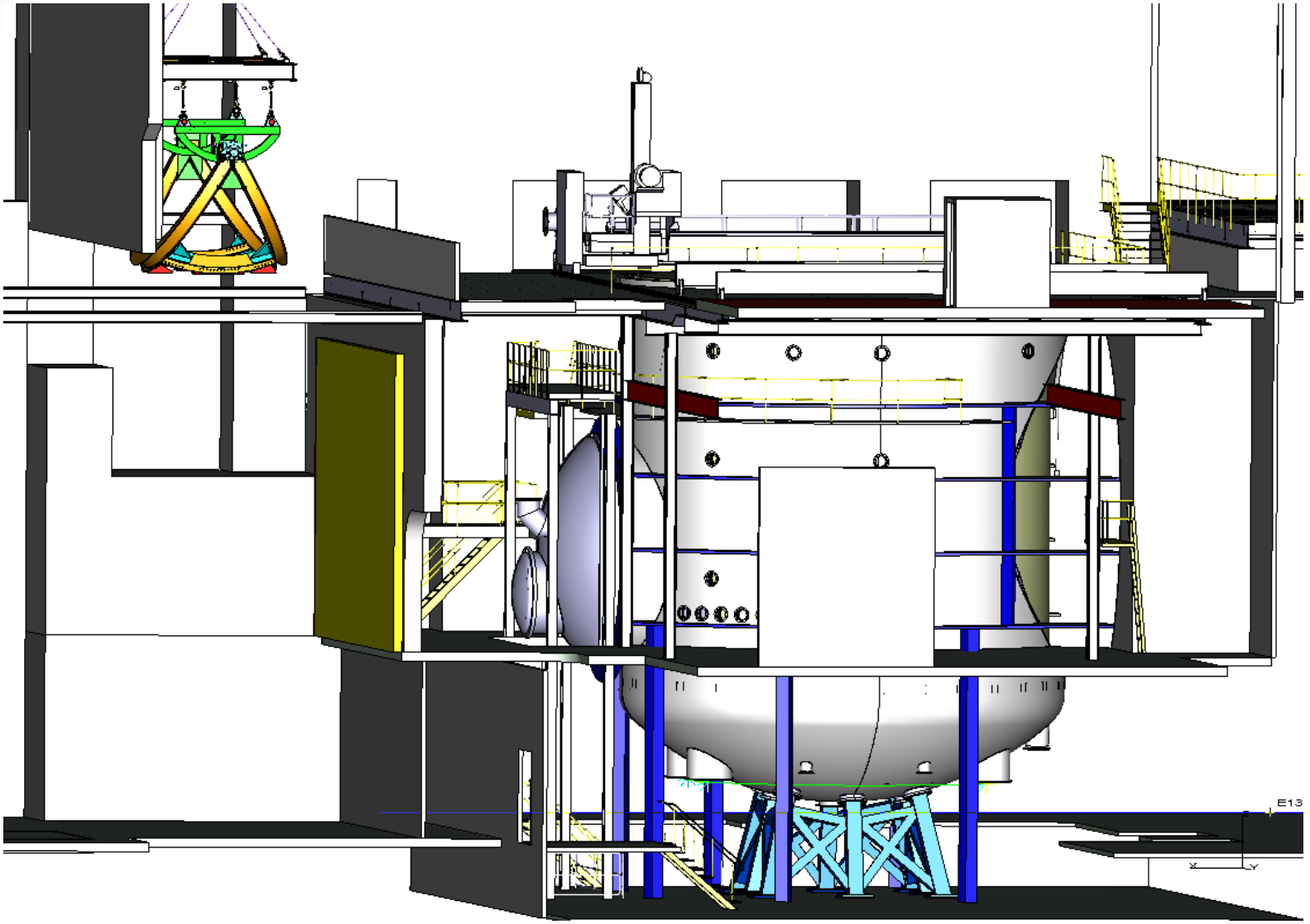
GONDOLA LIFTING



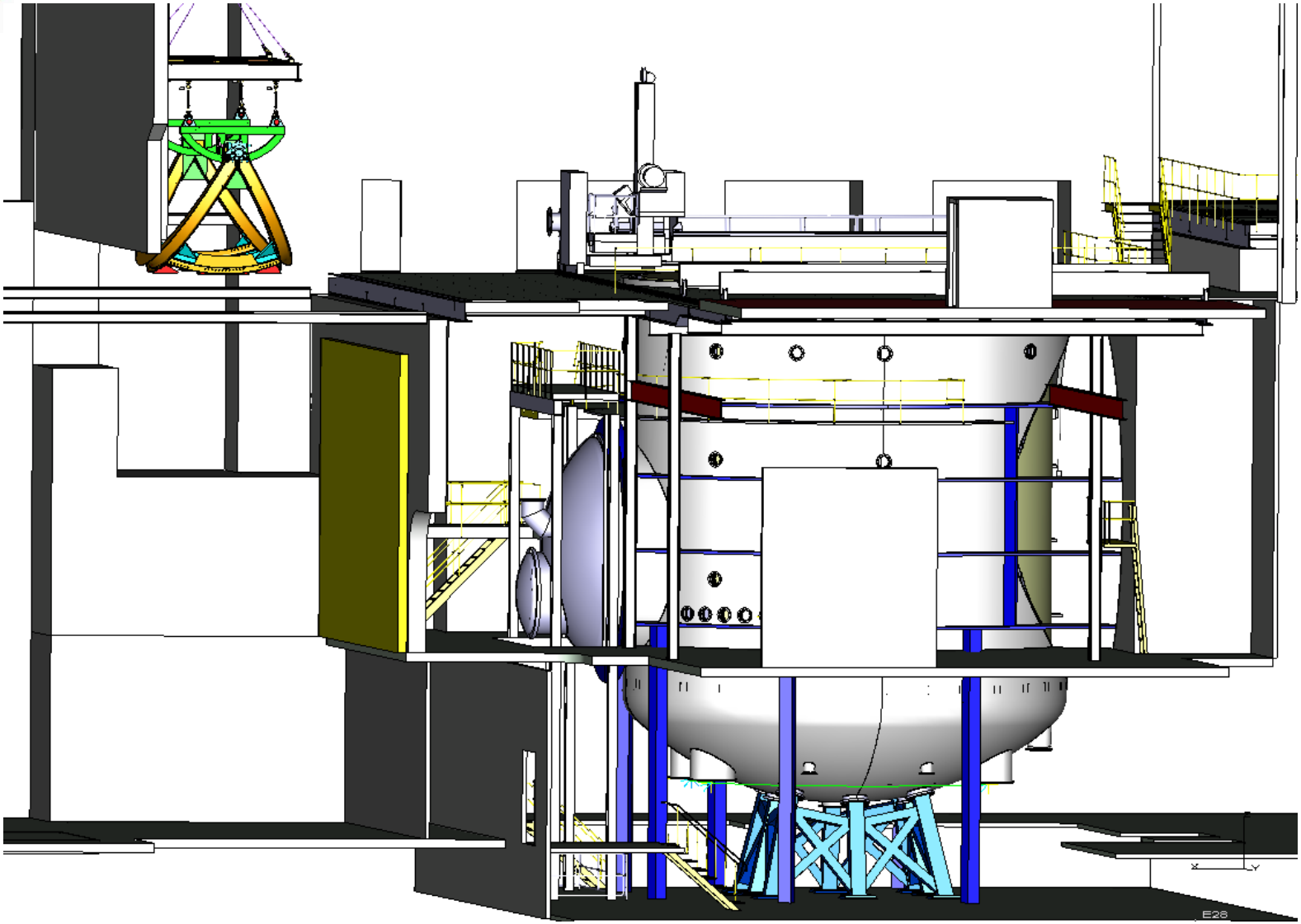
THIS PICTURE IS NOT UPDATED: IT SHOWS THE GONDOLA LIFTED BY THE PLF. THE GONDOLA WILL BE DIRECTLY CONNECTED TO THE CRANE .

THE CRANE HOOK WILL BE CLOSER TO THE GONDOLA.

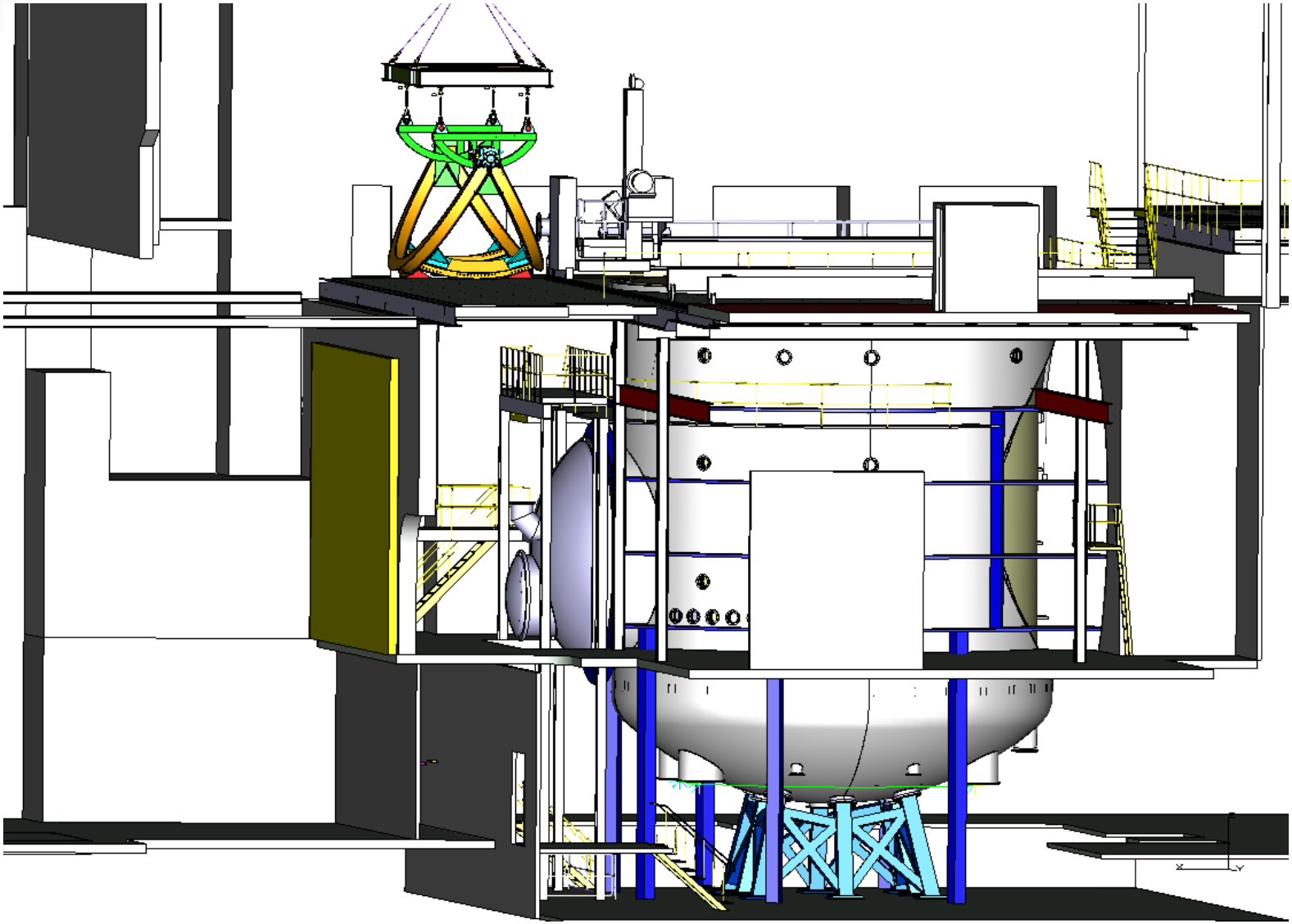
GONDOLA LIFTING



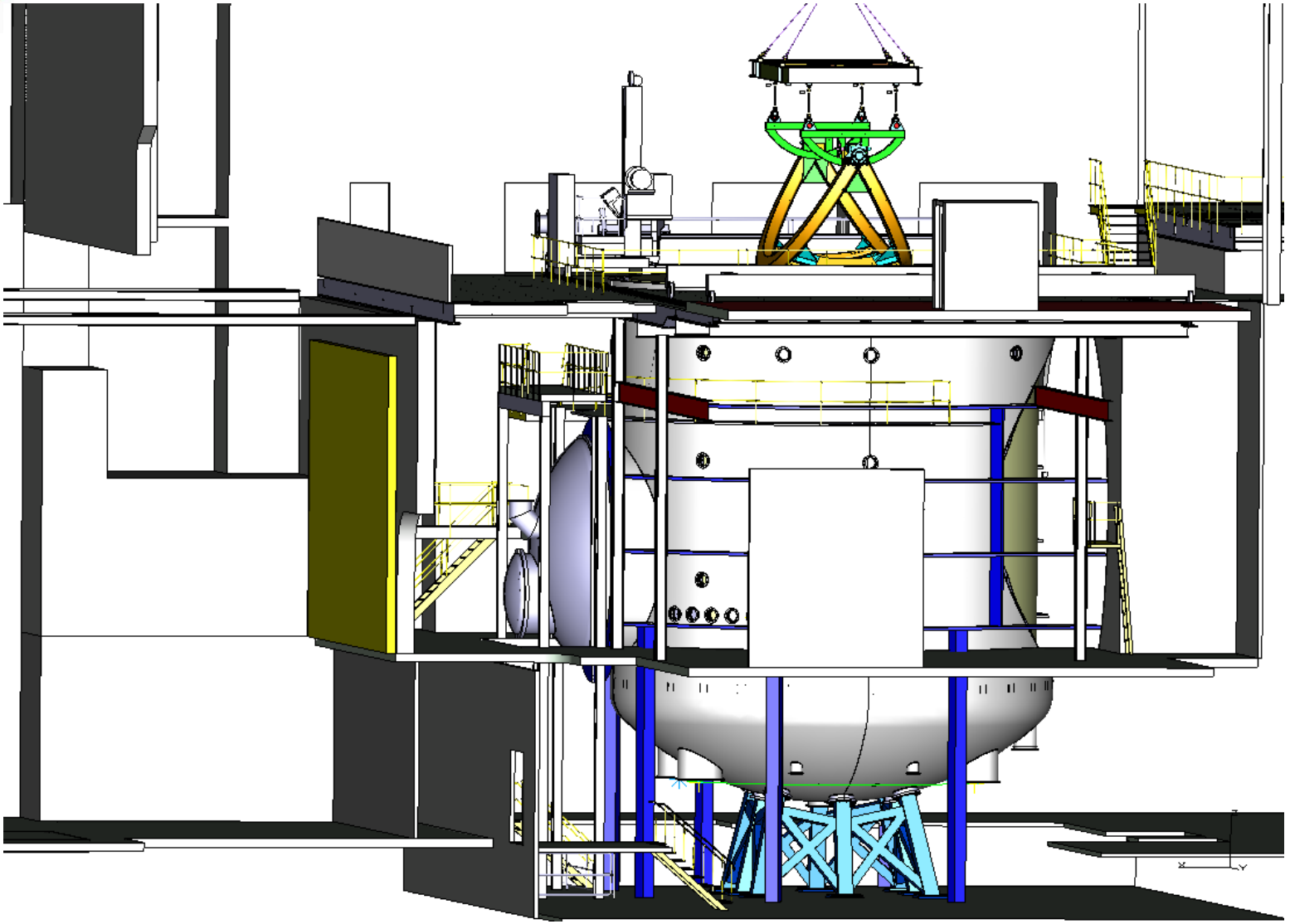
GONDOLA LIFTING



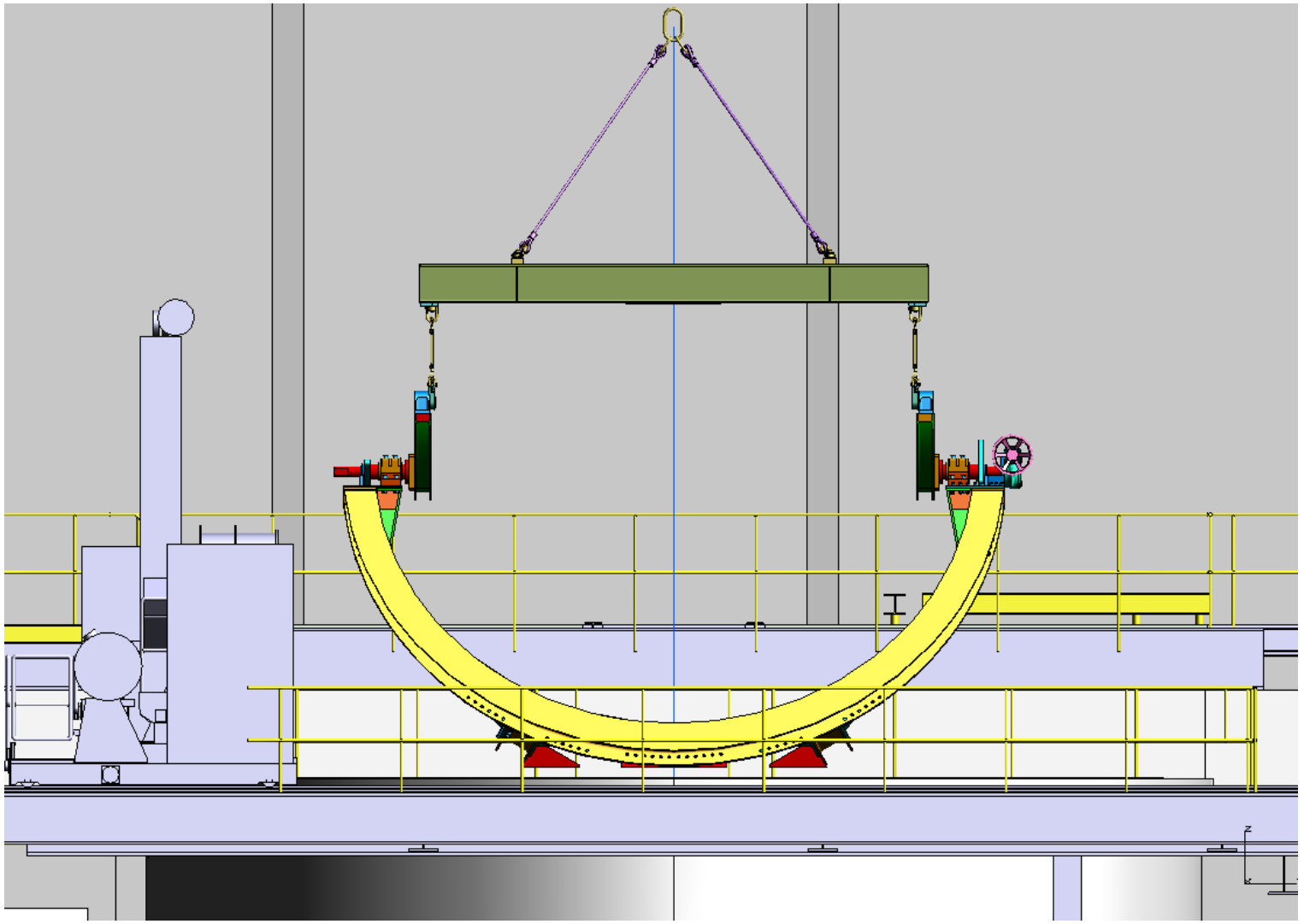
GONDOLA LIFTING



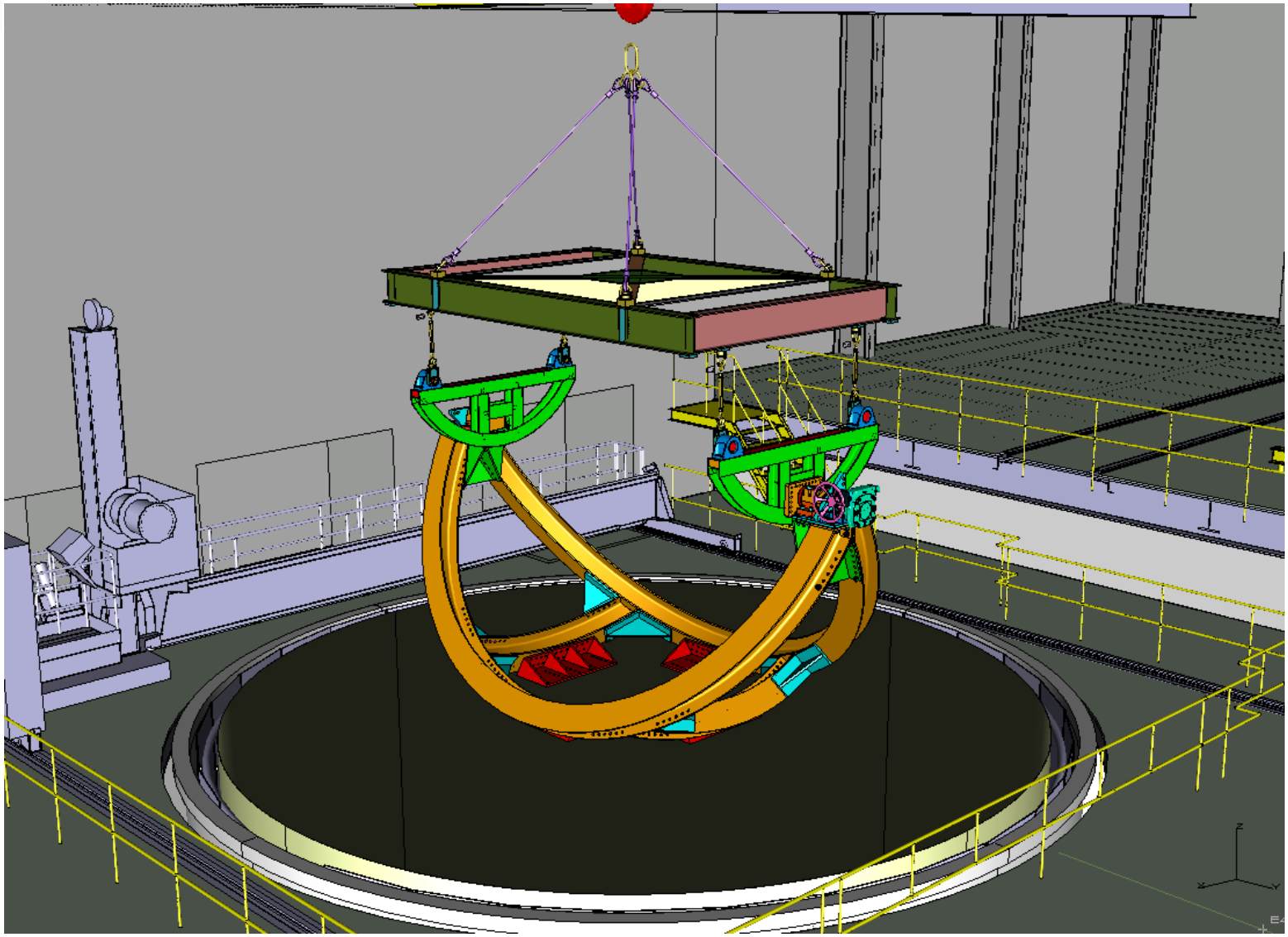
GONDOLA LIFTING



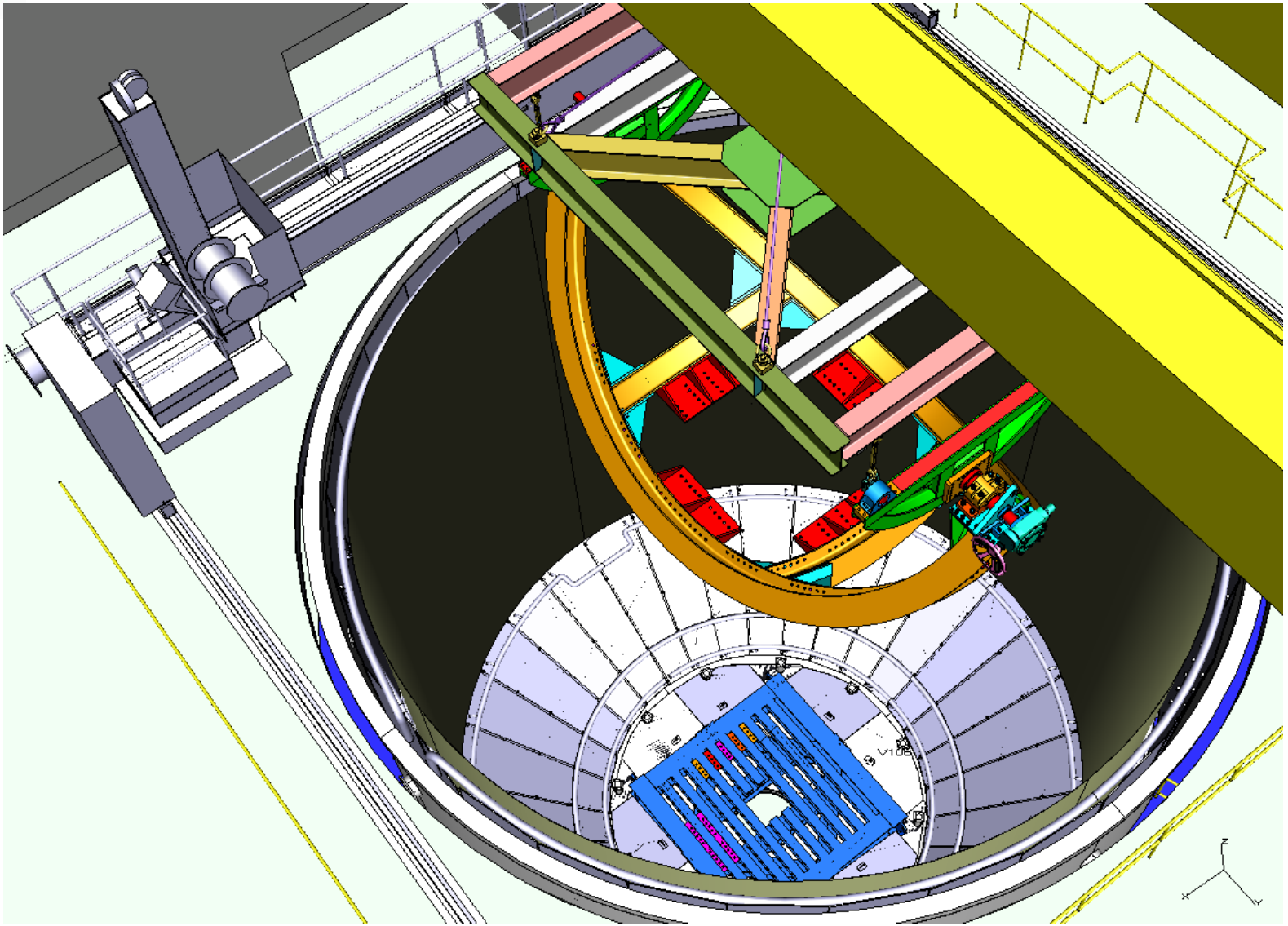
GONDOLA LIFTING

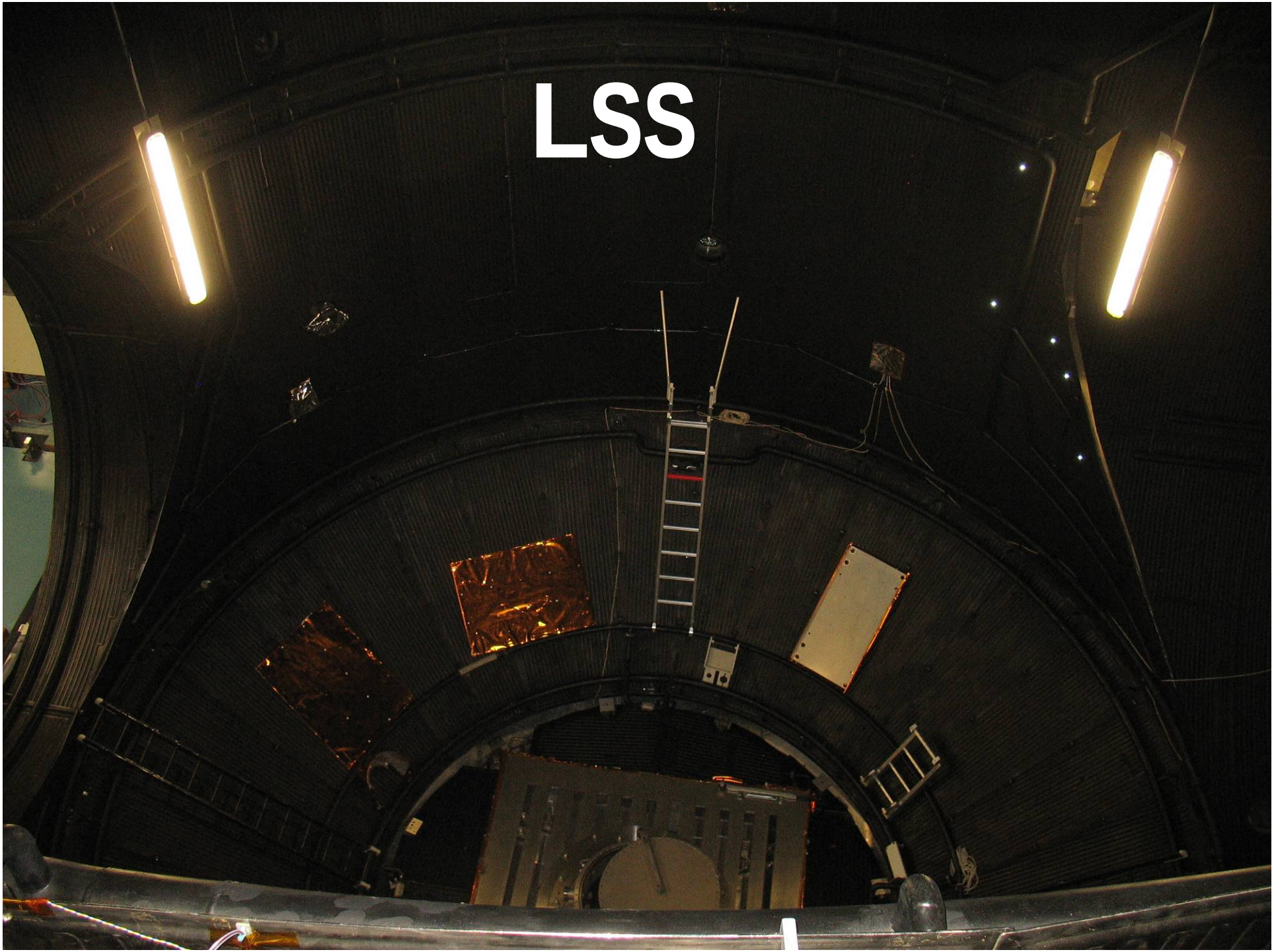


GONDOLA LIFTING



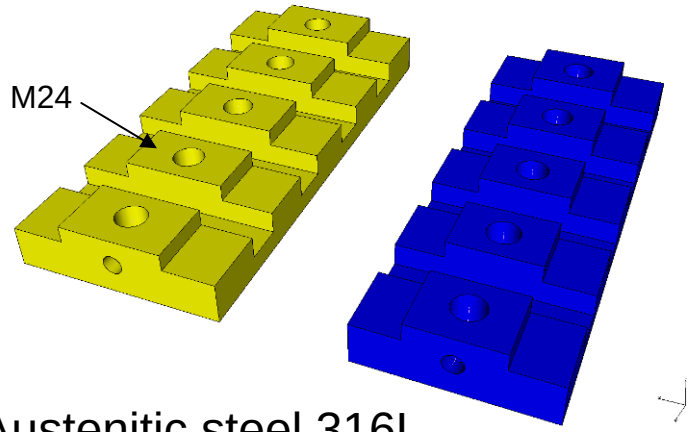
GONDOLA LOWERING



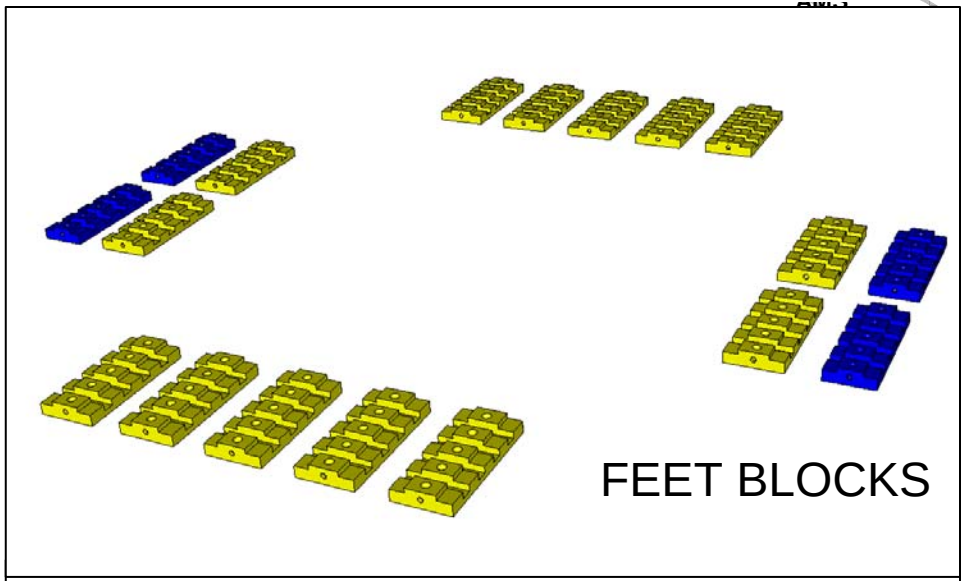

LSS

LSS SEISMIC TABLE

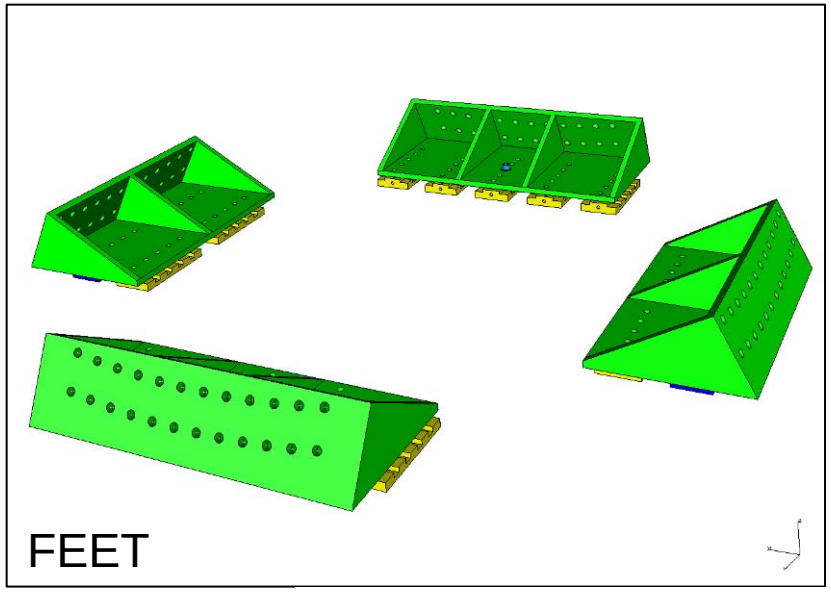
GONDOLA FIXATION TO LSS PLATFORM



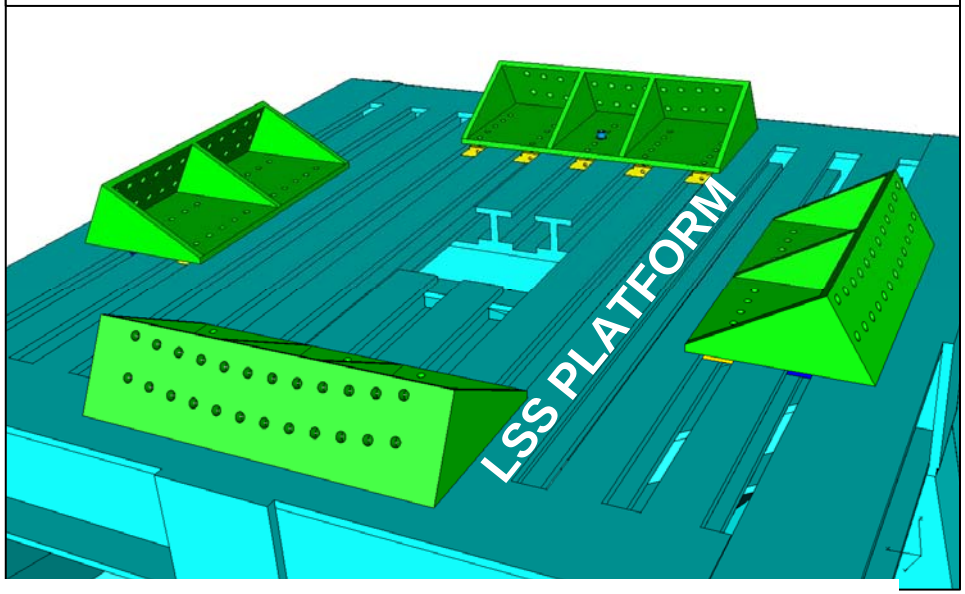
Austenitic steel 316L



FEET BLOCKS



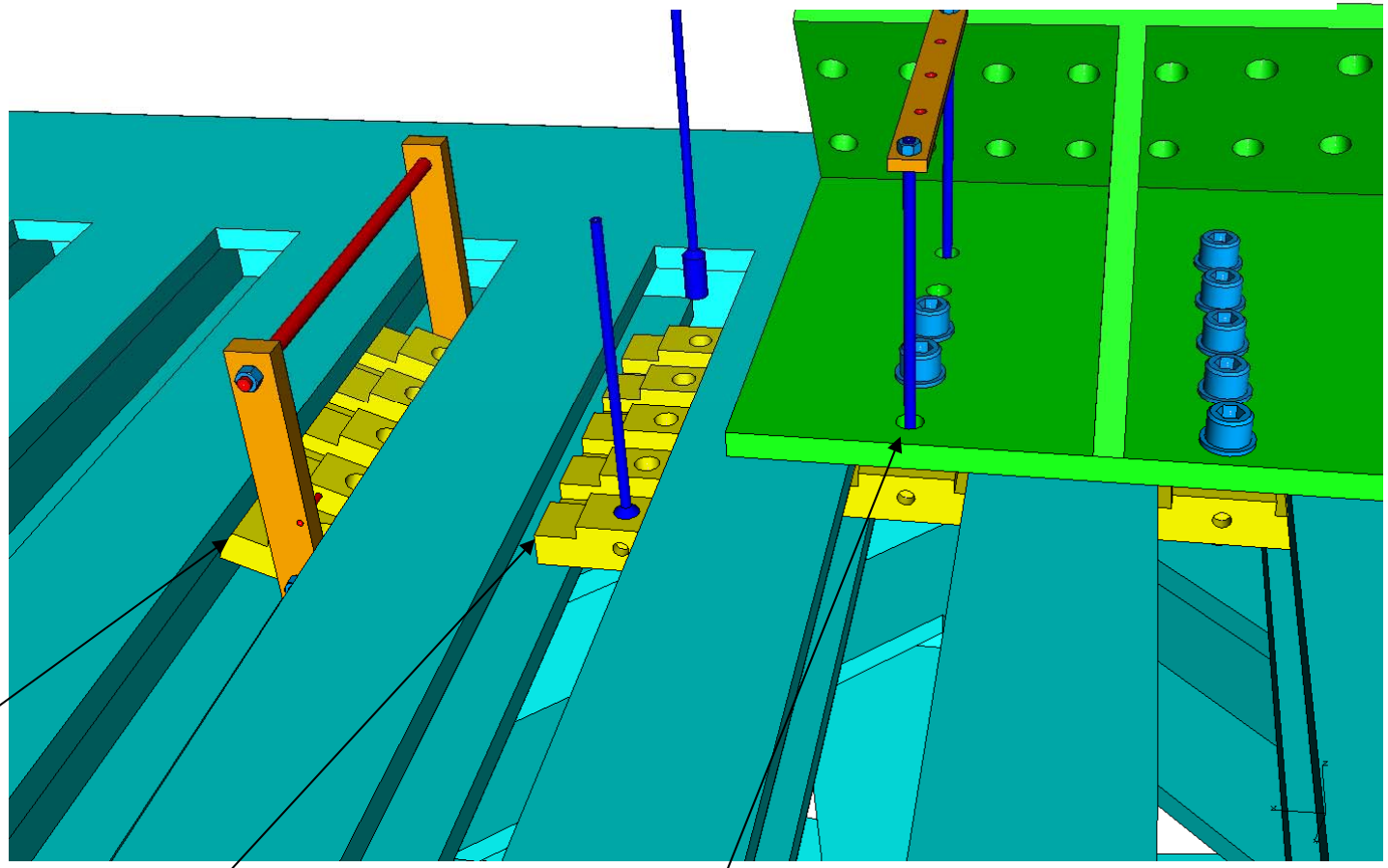
FEET



GONDOLA NOT SHOWN, FEET WILL BE PREMOUNTED TO THE GONDOLA

FEET BLOCKS WILL BE PRE-INSTALLED IN THE LSS SEISMIC PLATFORM

FEET BLOCK INSTALLATION INTO THE LSS PLATFORM



Feet-block insertion

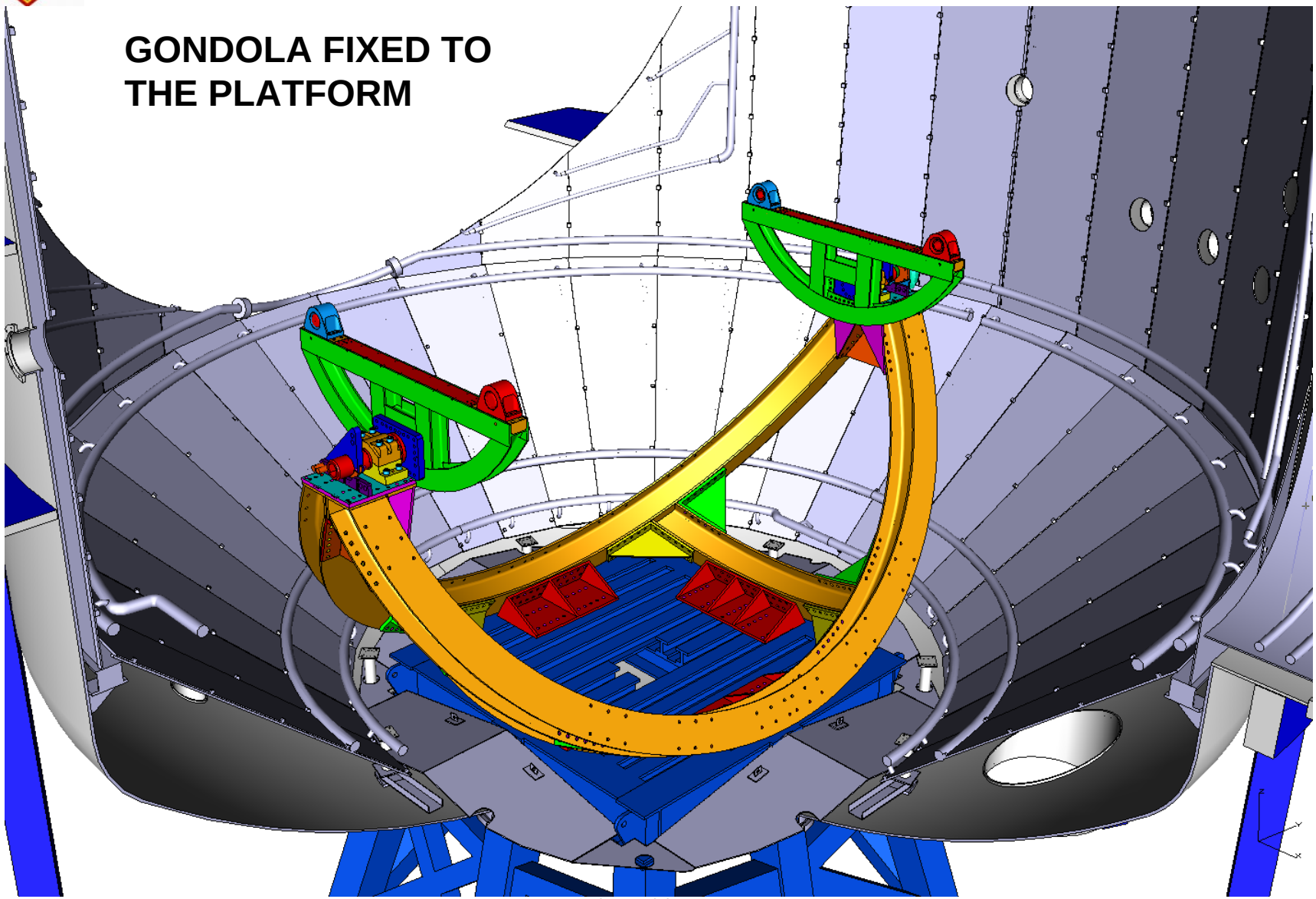
Feet-block rests on the bottom of the platform I beam

Position adjusted

Gondola lowered on the LSS platform, block pulled in position and bolted

GONDOLA IN LSS

GONDOLA FIXED TO THE PLATFORM



GONDOLA PRODUCTION

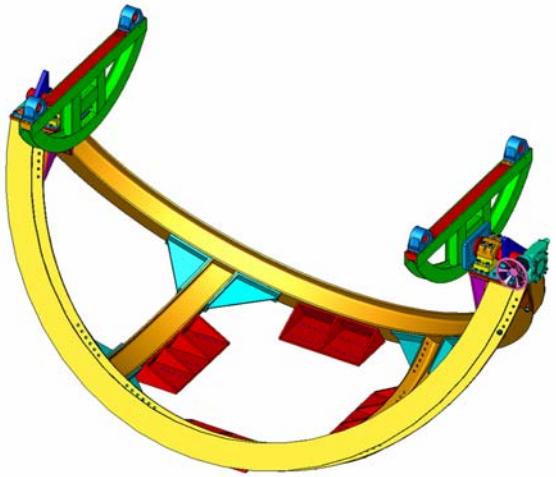
GONDOLA IS PRODUCED IN ITALY SUPPORTED BY ASI/INFN

INVOLVED IN THE PRODUCTION PROCESS

INFN Pisa (A.Basti, F.Bosi) is controlling production process at the Company, will support Gondola installation in LSS.

INFN Perugia (S.Lucidi, I.Panico) is supporting in the administrative aspects

INFN Roma (C.Gargiulo)



The production has been divided in two steps

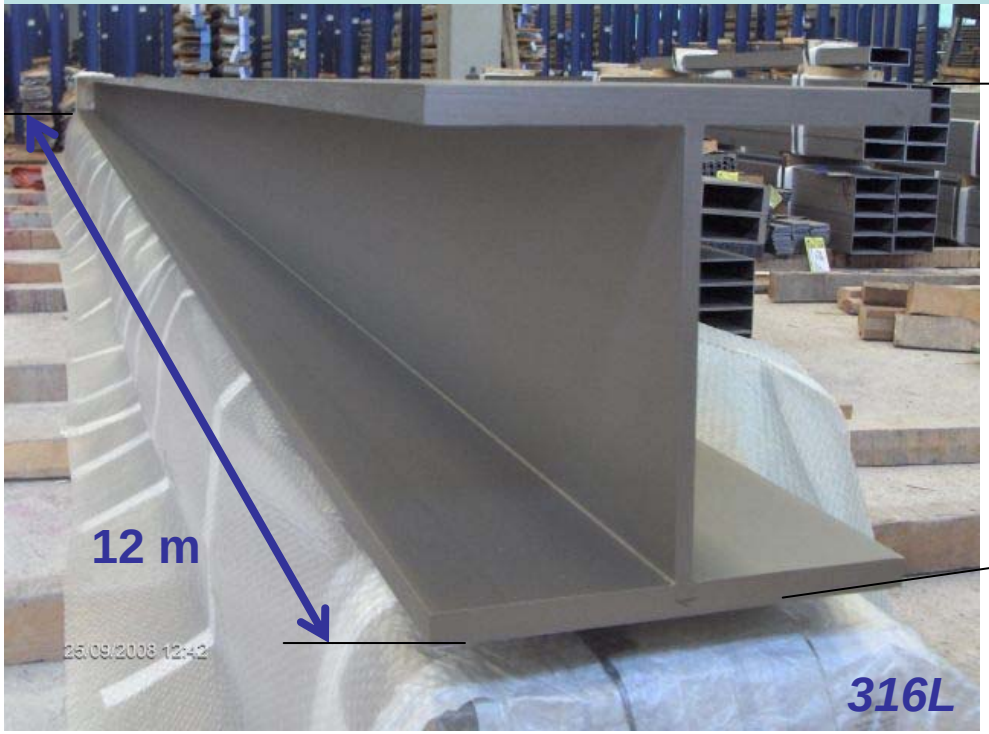
1) BEAMS production COMPLETED

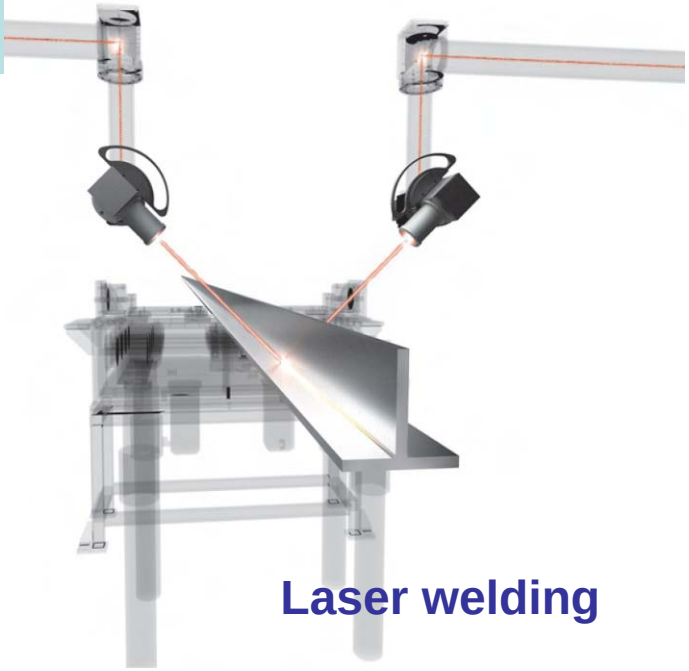
2) GONDOLA production STARTED :

Production Start *1st March 09*

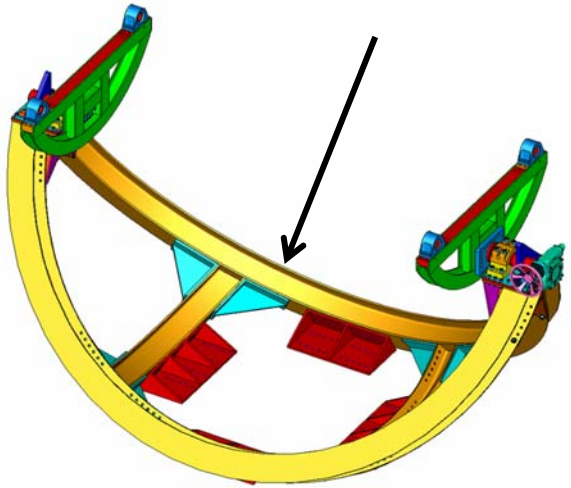
Production End *30th June 09*

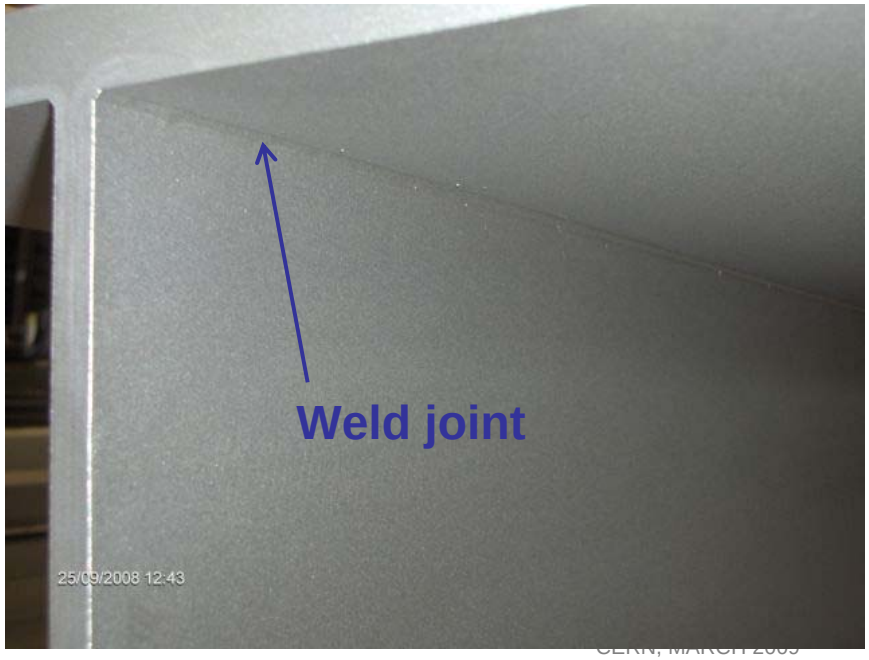
BEAMS HAVE BEEN PRODUCED



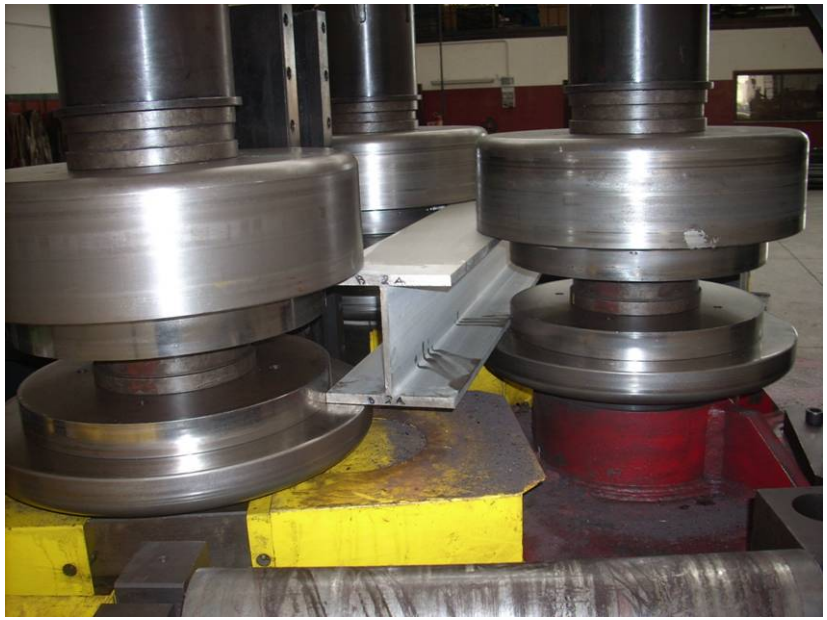


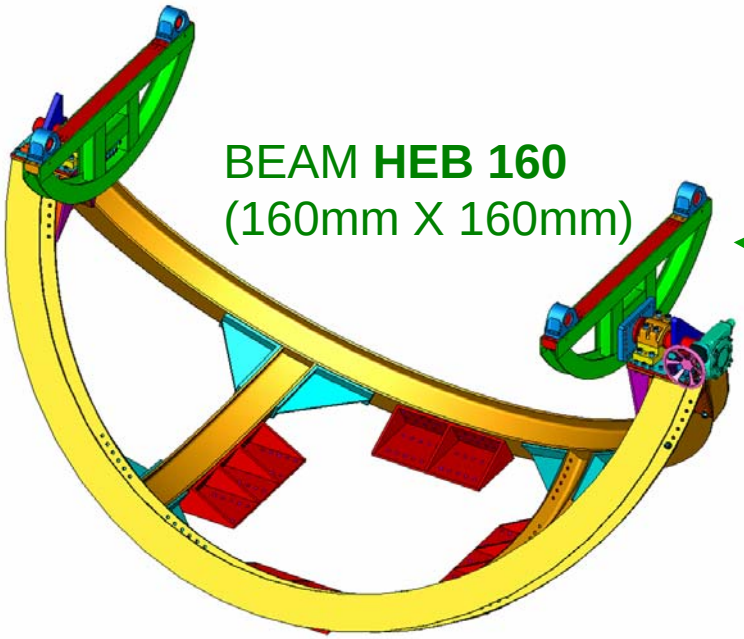
All beams produced, SEPT 2008





GONDOLA PRODUCTION PROCESS VALIDATION



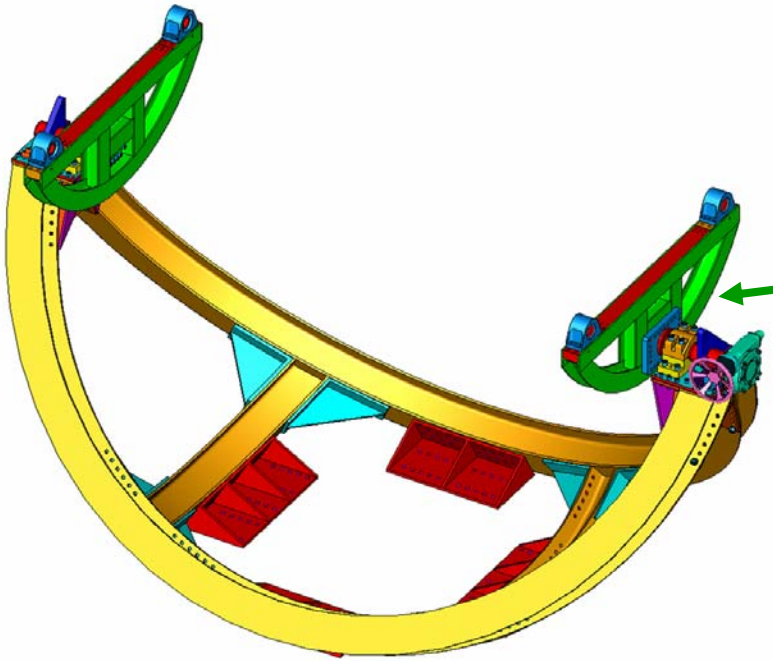


BEAM **HEB 160**
(160mm X 160mm)

GONDOLA PRODUCTION

WELDS INSPECTED
(dye penetrant)
AFTER CALENDERING
DON'T SHOW ANY DEFECT

BEAM **HEB 160**
(160mm X 160mm X 6000)



GONDOLA PRODUCTION

ALL THE BEAMS HAVE PASSED THE TESTS FORESEEN

TESTS BEFORE AND AFTER CALENDERING ON THE BEAM

Linear beam

-WELDS CHECK
- -Etching acid test
- -Dye penetrant test

-MAGNETIC PERMEABILITY MEASURE

Calendered beam

-WELDS CHECK
- -Dye penetrant test

-MAGNETIC PERMEABILITY MEASURE

ACTION 2: SCAFFOLDING INSTALLATION

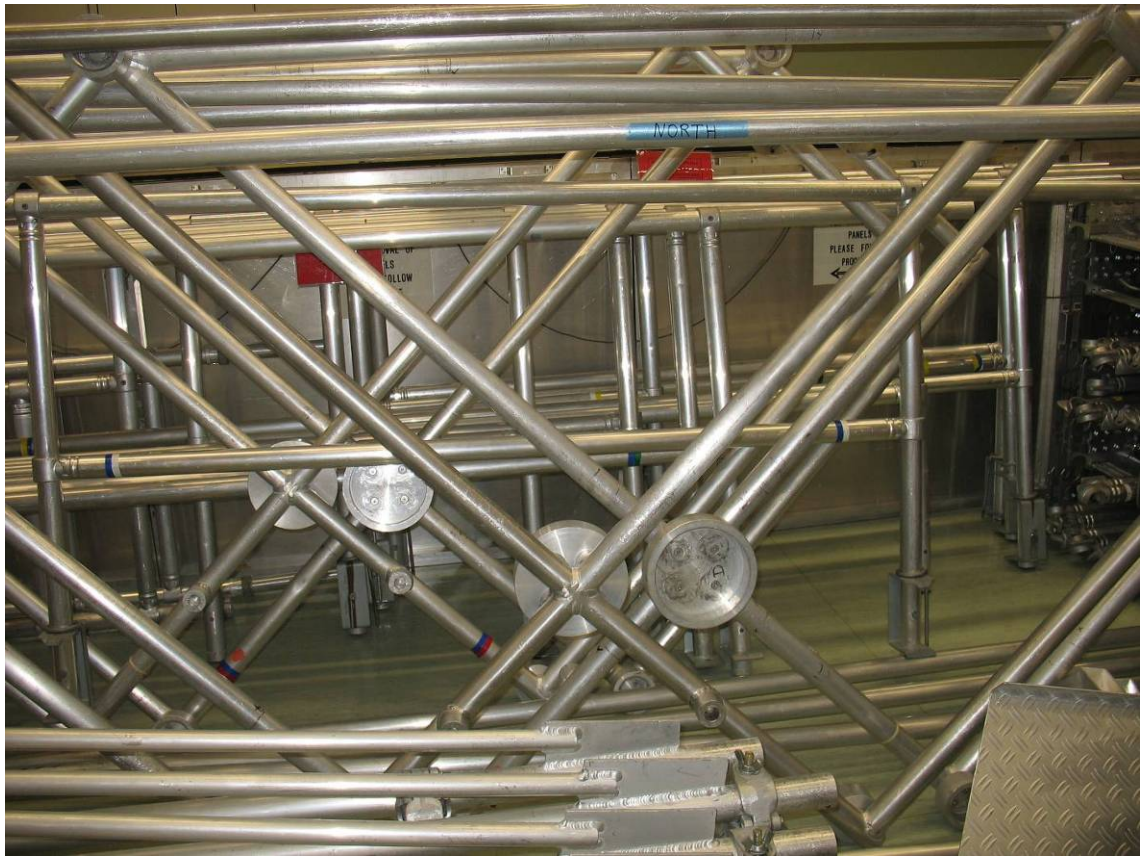
STEP_1: SCAFFOLDING PARTIAL INSTALLATION BEFORE AMS ARRIVAL IN THE LSS
STEP_2: SCAFFOLDING INSTALLATION FINALIZATION AFTER AMS 90° ROTATION

ACCESS NEEDED INSIDE LSS: LSS seismic platform

NOTE:
A standard scaffolding is provided by ESTEC
In order to be used it needs to be modified. If modification will be not minor AMS shall contribute to these modifications.
Scaffolding modifications are under discussion with ESTEC.

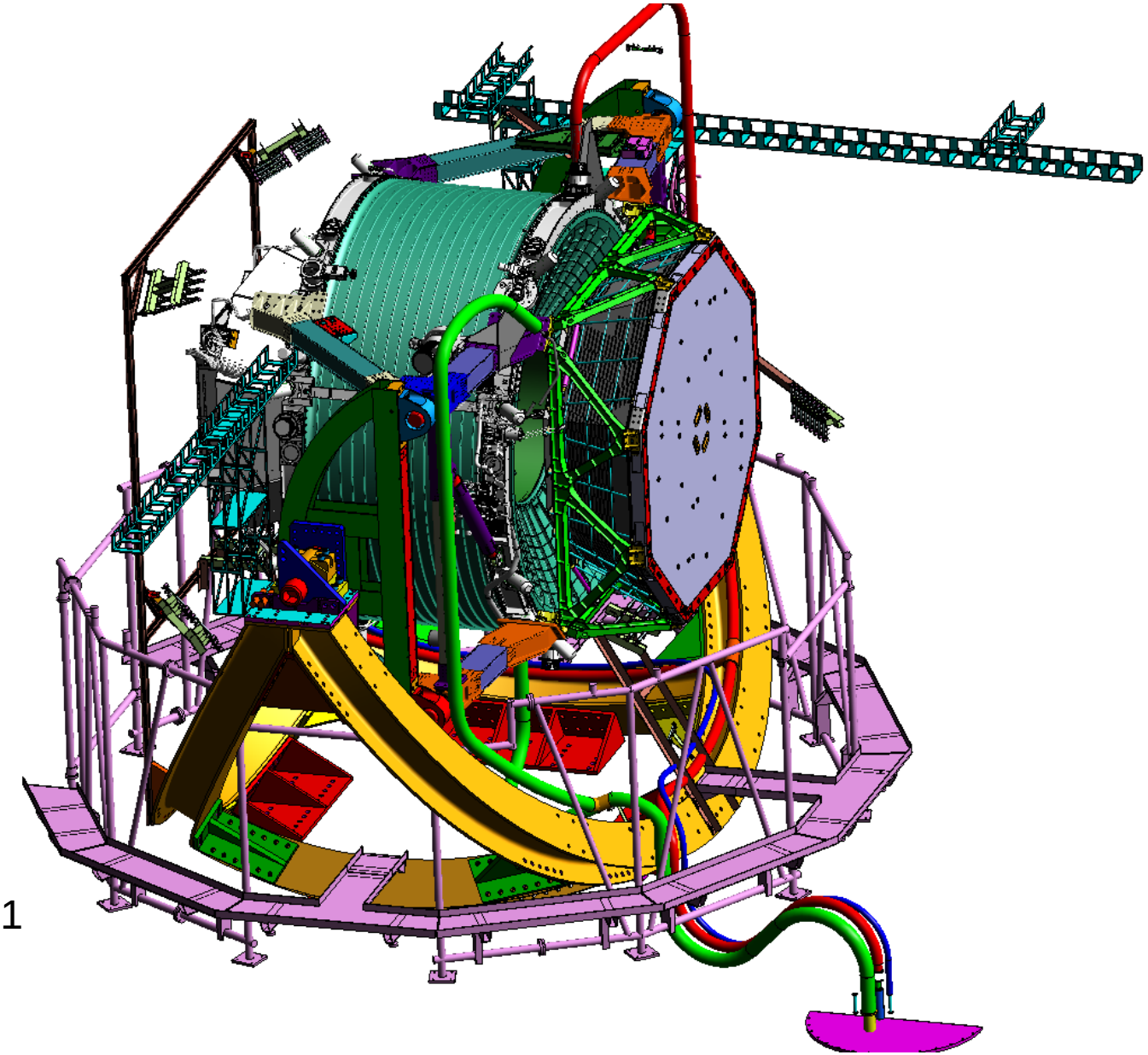
Access points to AMS in the LSS, foreseen up to now, for all the different actions, are listed in this document in green.
The definition of the points that require access and the time when this access is needed are relevant to minimize scaffolding modification and installation sequence

SCAFFOLDING



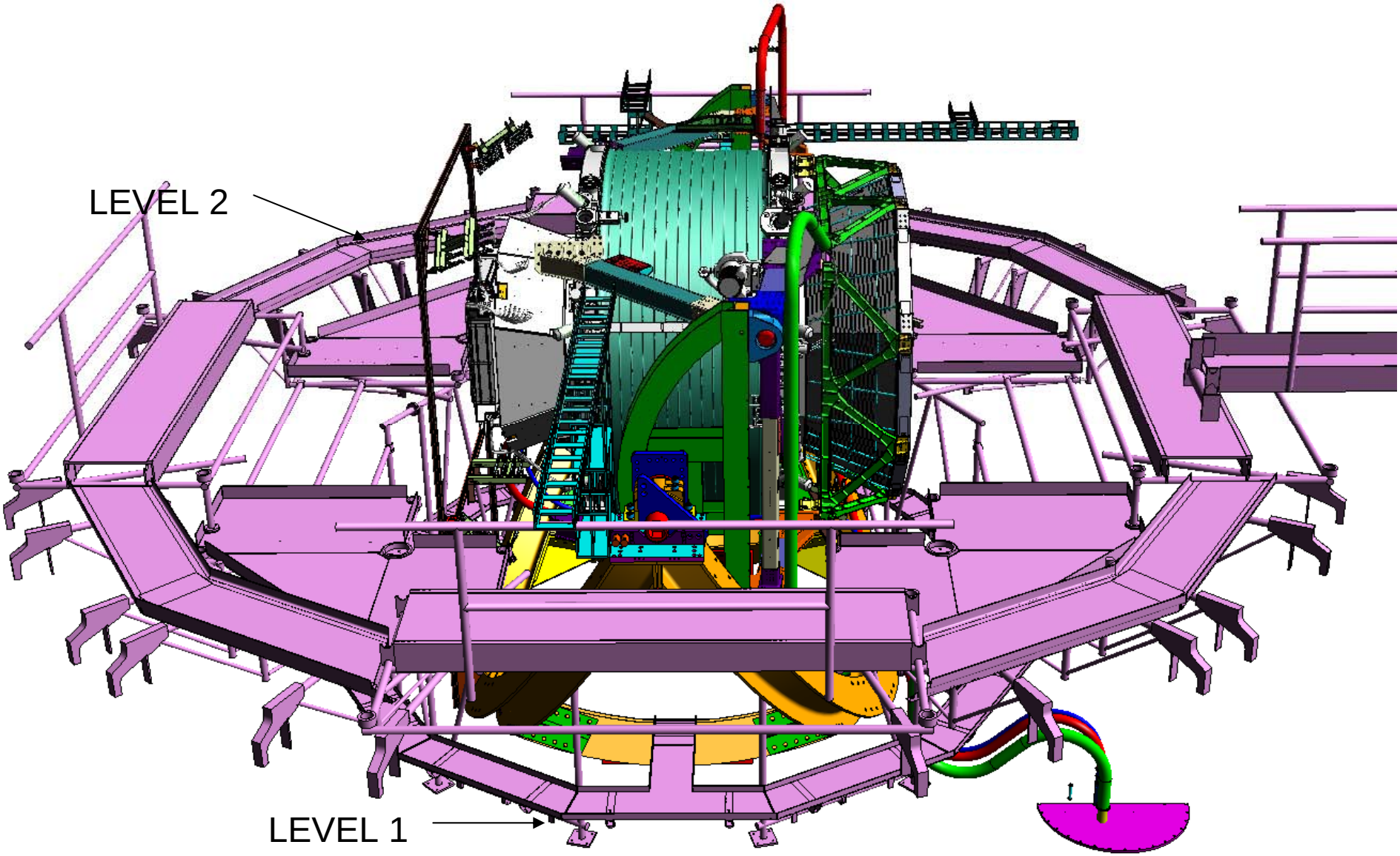
THE SCAFFOLDING IS PROVIDED BY ESTEC, MODIFICATIONS TO THE SCAFFOLDING ARE NEEDED BECAUSE OF INTERFERENCE WITH GONDOLA AND AMS

SCAFFOLDING

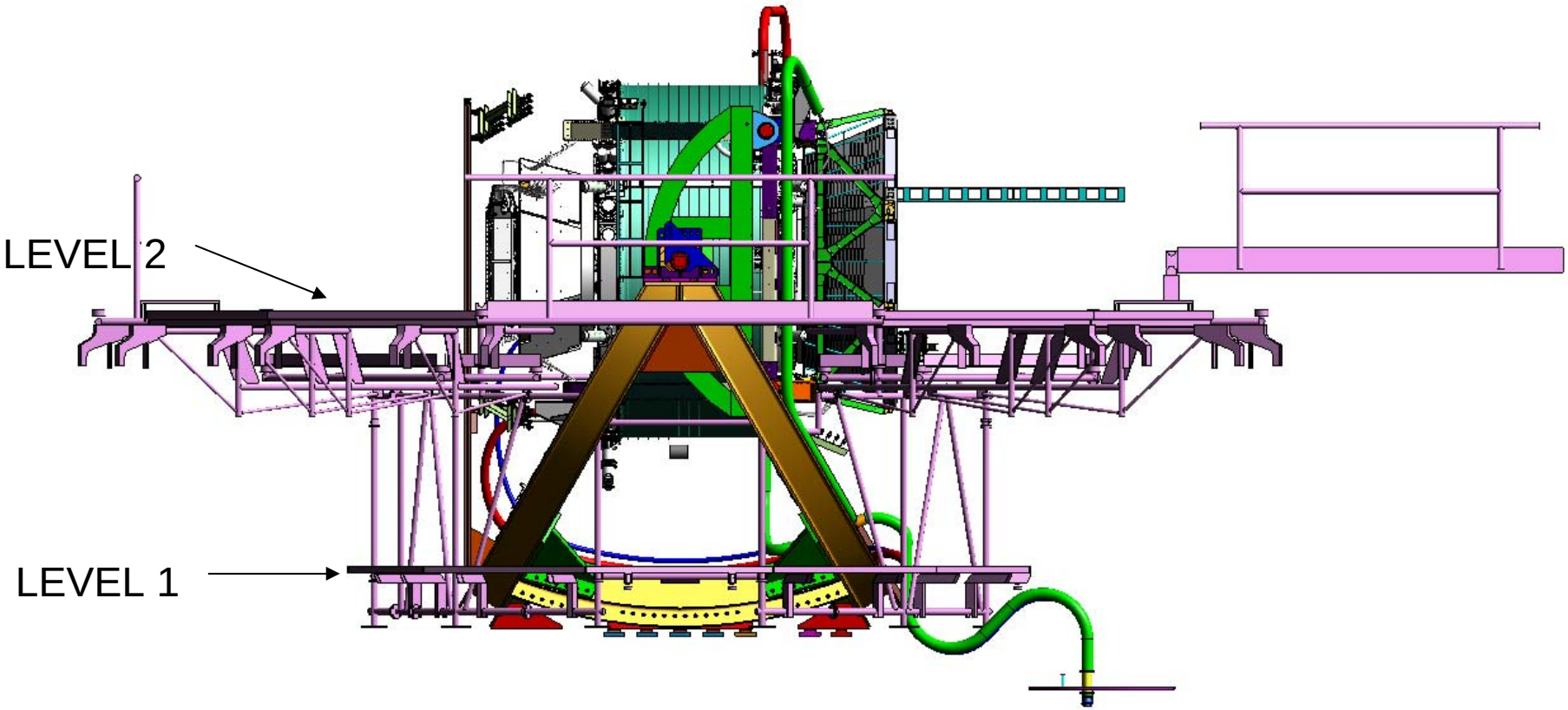


LEVEL 1

SCAFFOLDING

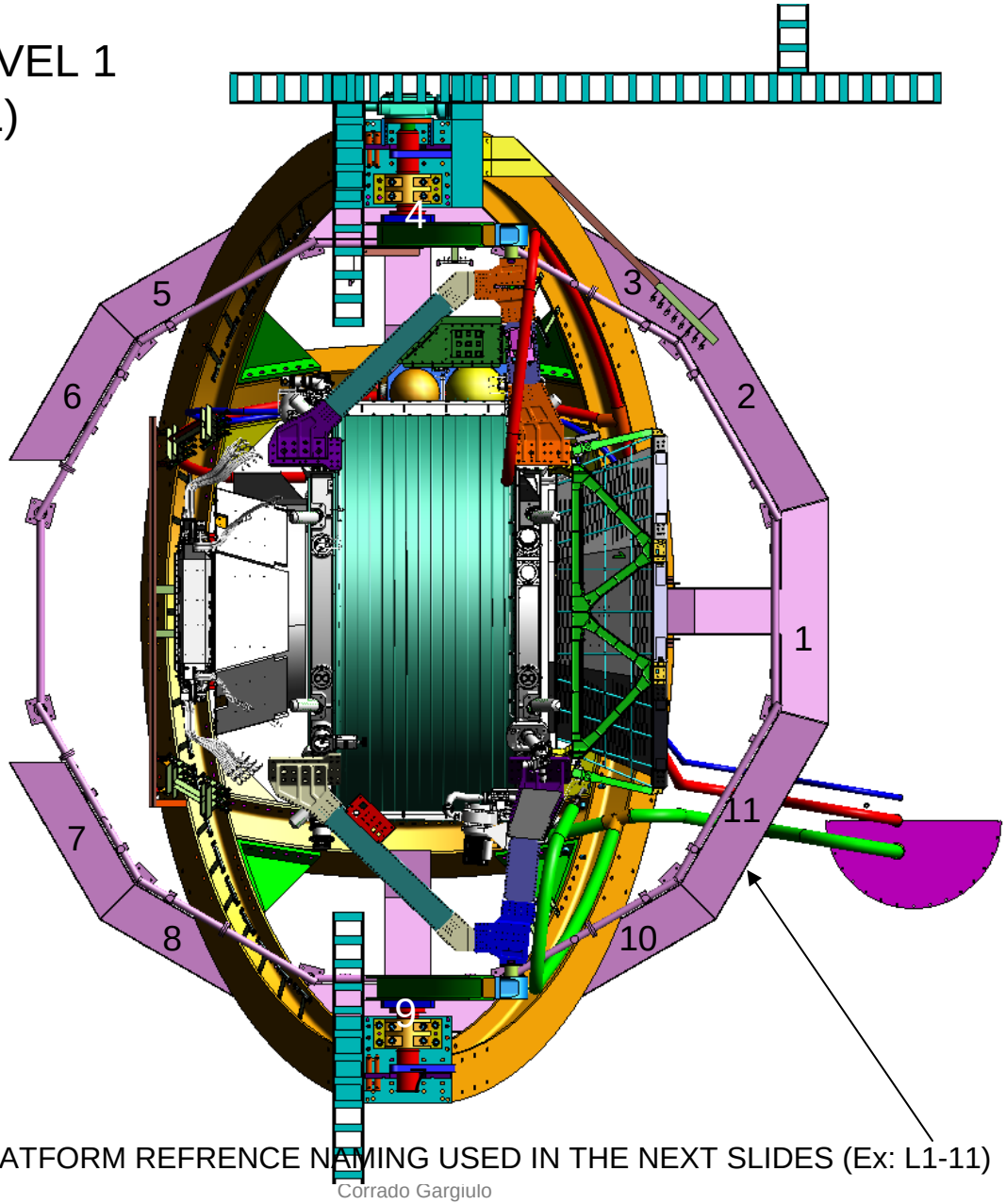


SCAFFOLDING



SCAFFOLDING NAMING

LEVEL 1
(L1)



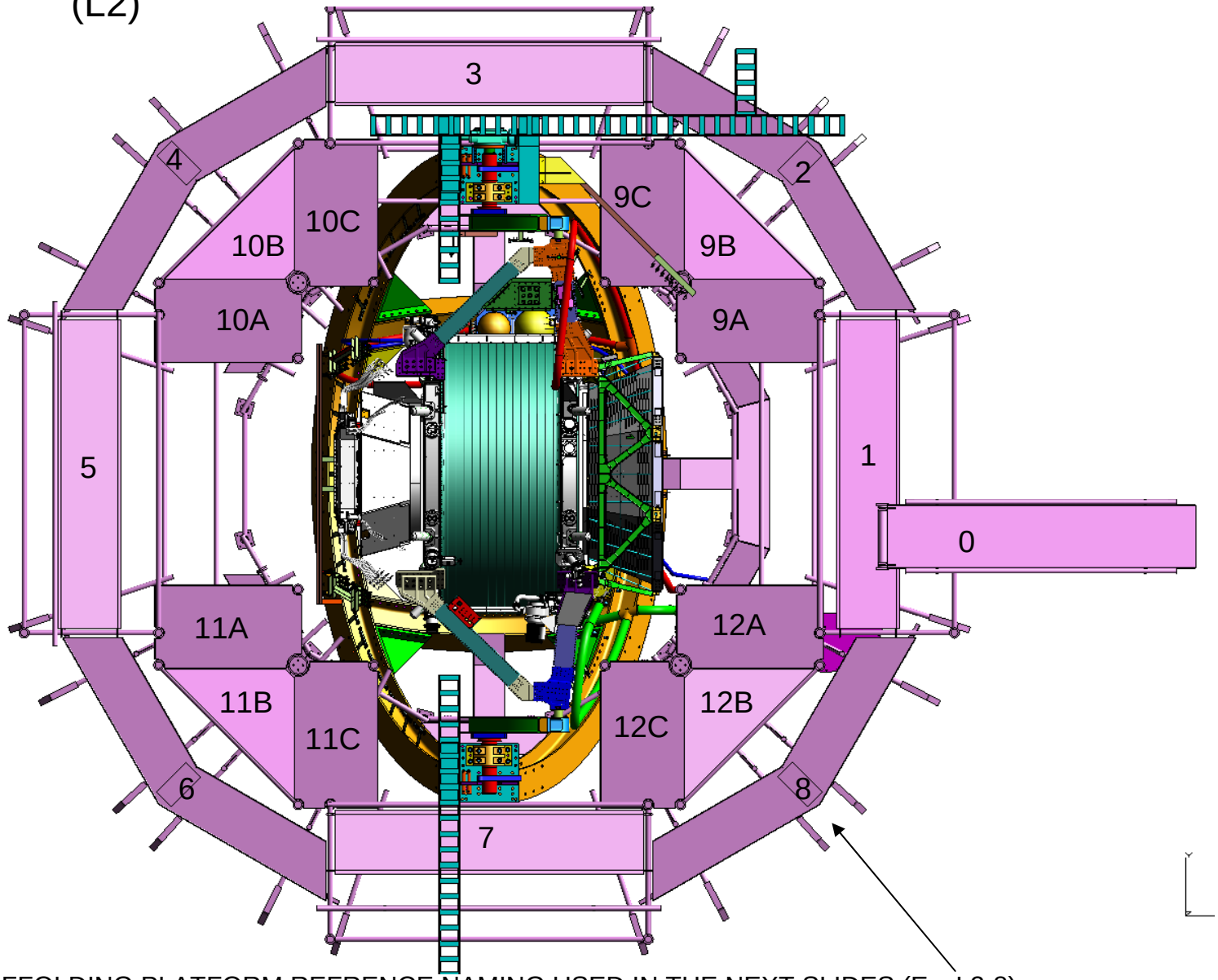
SOLAR
SIMULATOR

side

SCAFFOLDING PLATFORM REFRENCE NAMING USED IN THE NEXT SLIDES (Ex: L1-11)

SCAFFOLDING NAMING

LEVEL 2
(L2)

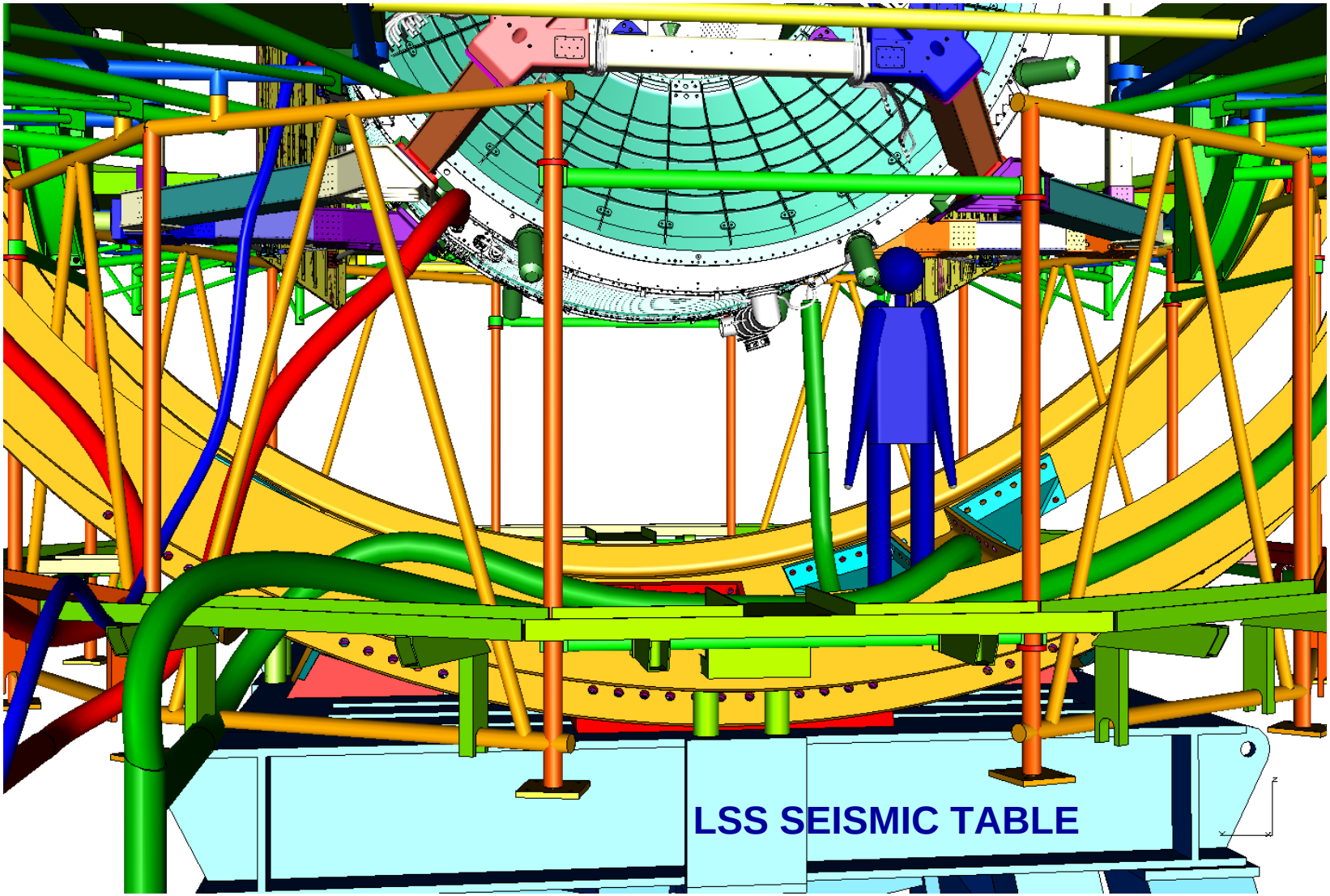


SOLAR
SIMULATOR

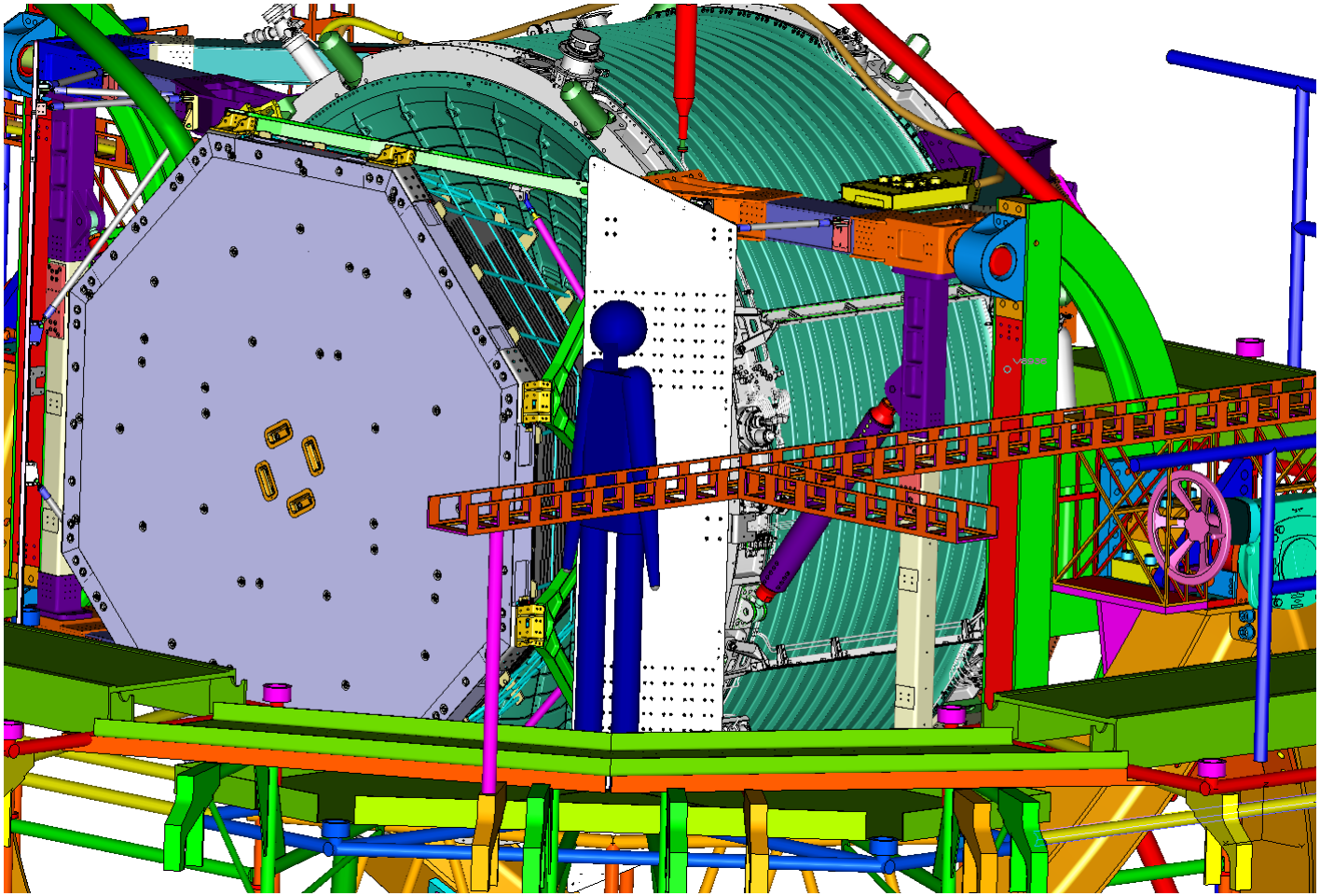
side

SCAFFOLDING PLATFORM REFRENCE NAMING USED IN THE NEXT SLIDES (Ex: L2-8)

ON LSS SEISMIC TABLE



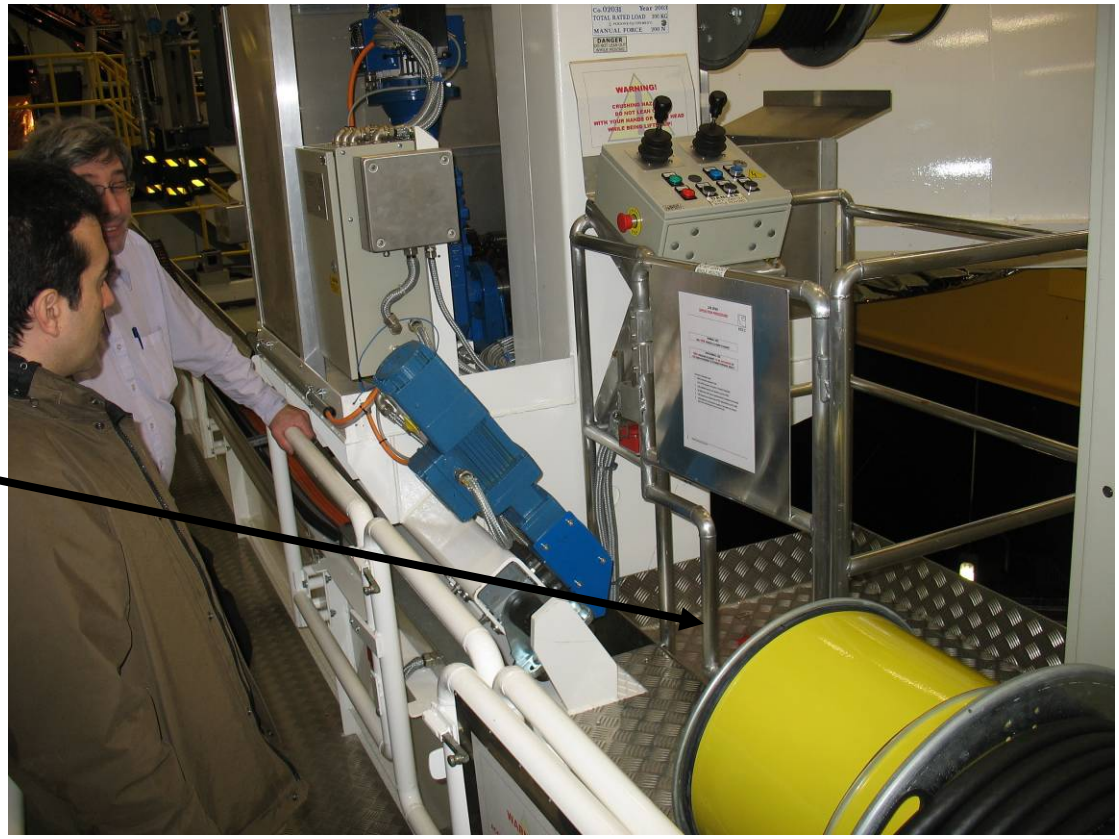
ON SCAFFOLDING AT LEVEL 2



AT LSS TOP

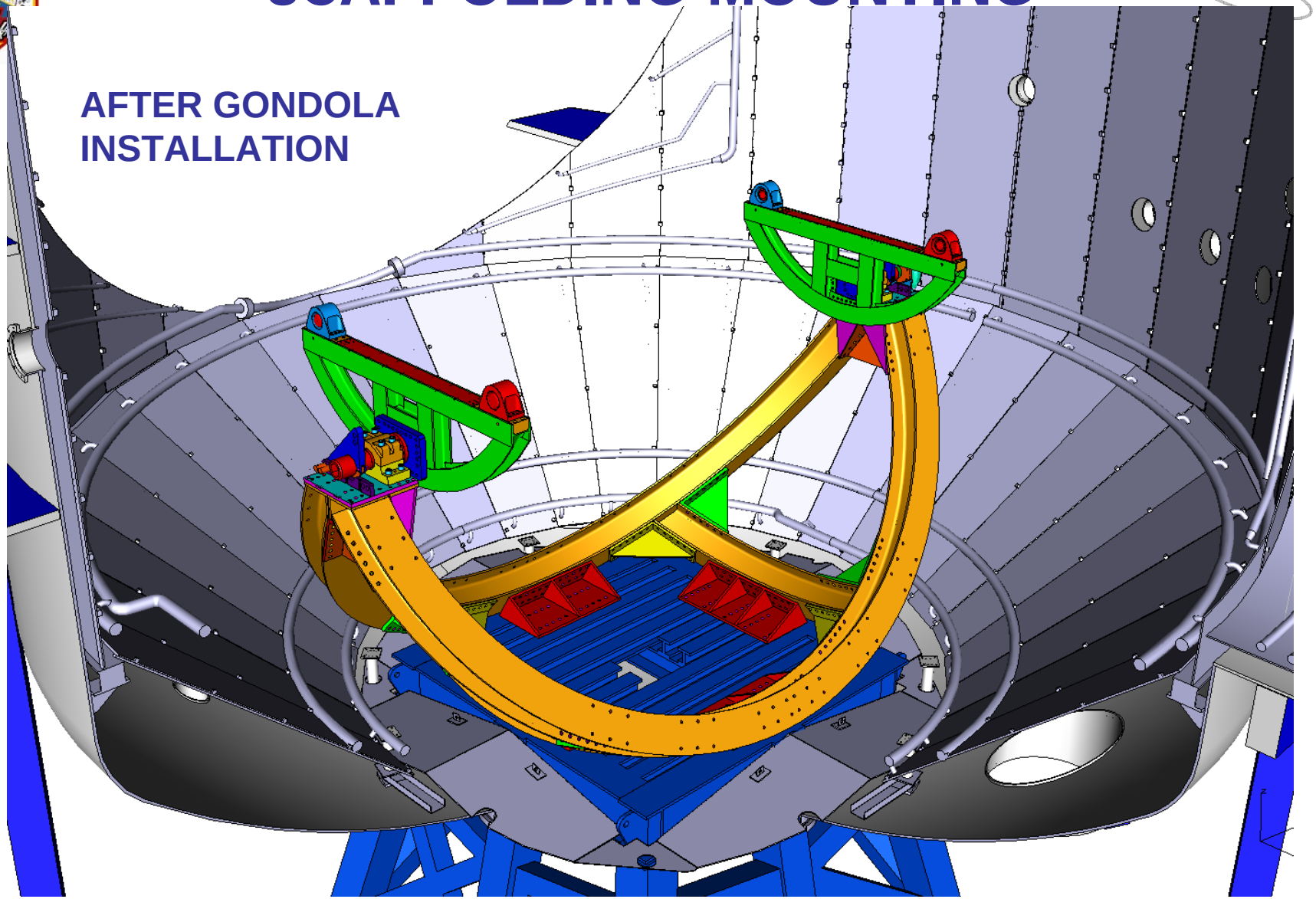
LSS MOVABLE PLATFORM

Used to access inside the LSS at AMS top,
in those locations not reachable from the scaffolding.
Note: some constraints exist on the platform use



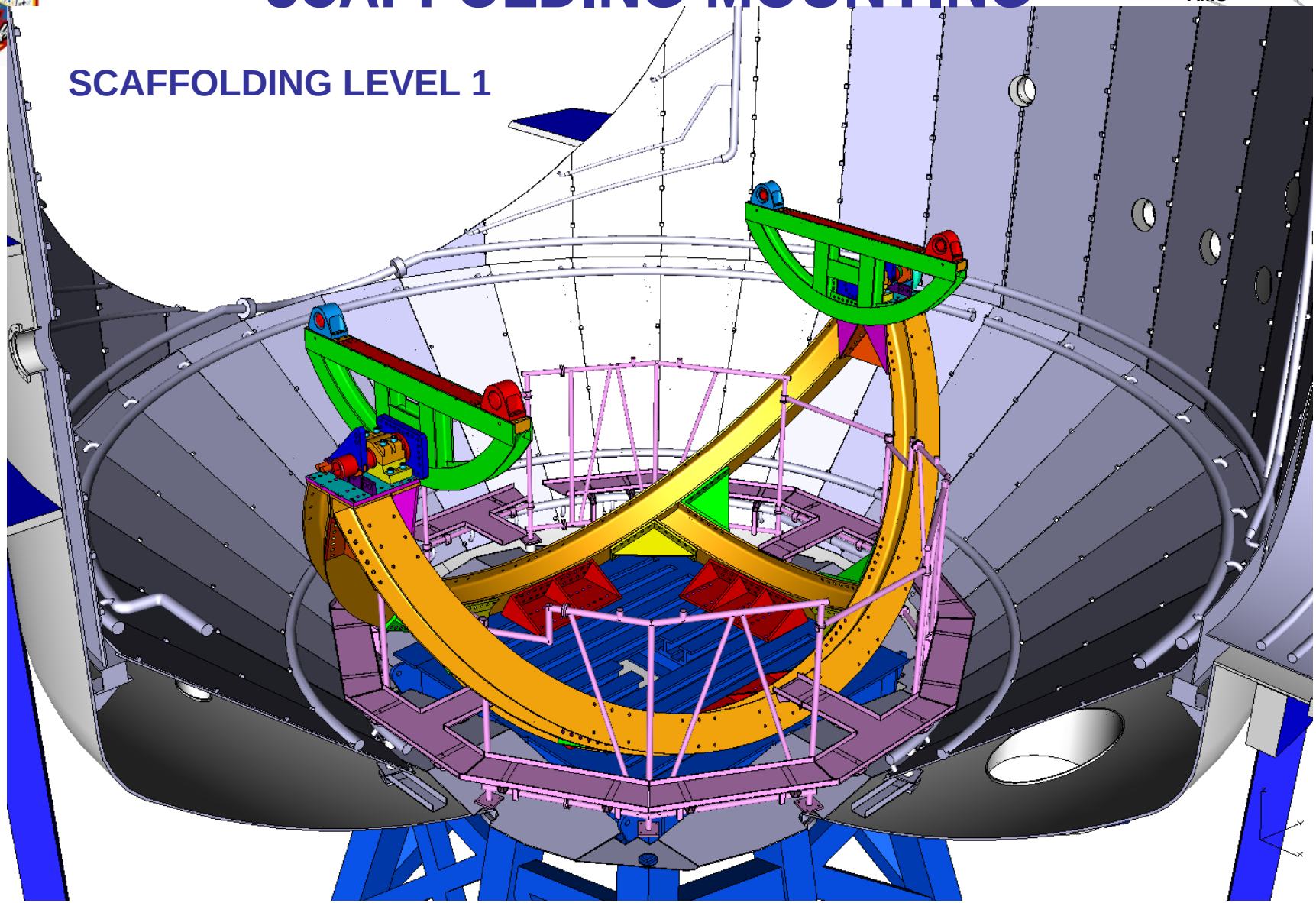
SCAFFOLDING MOUNTING

AFTER GONDOLA INSTALLATION



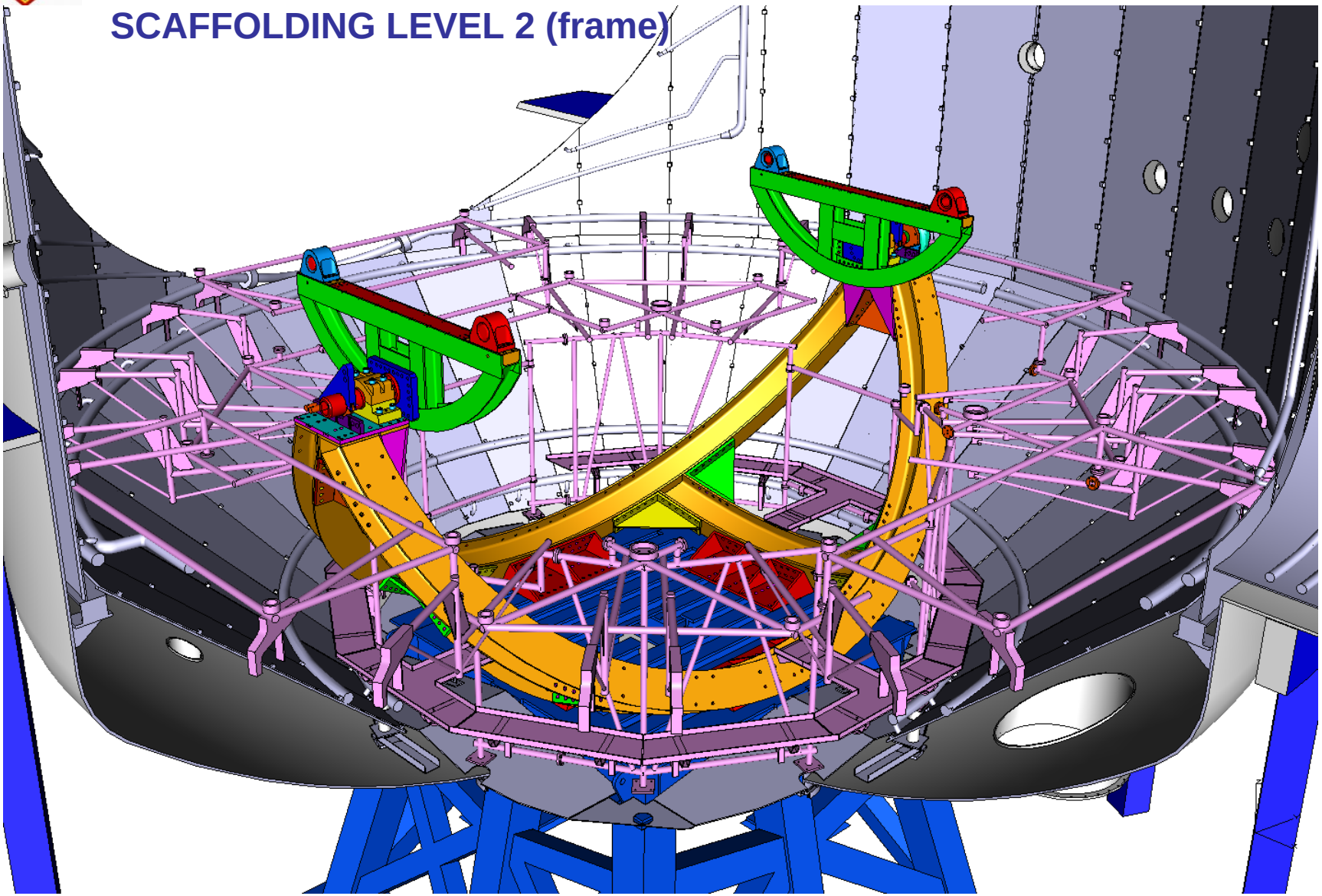
SCAFFOLDING MOUNTING

SCAFFOLDING LEVEL 1



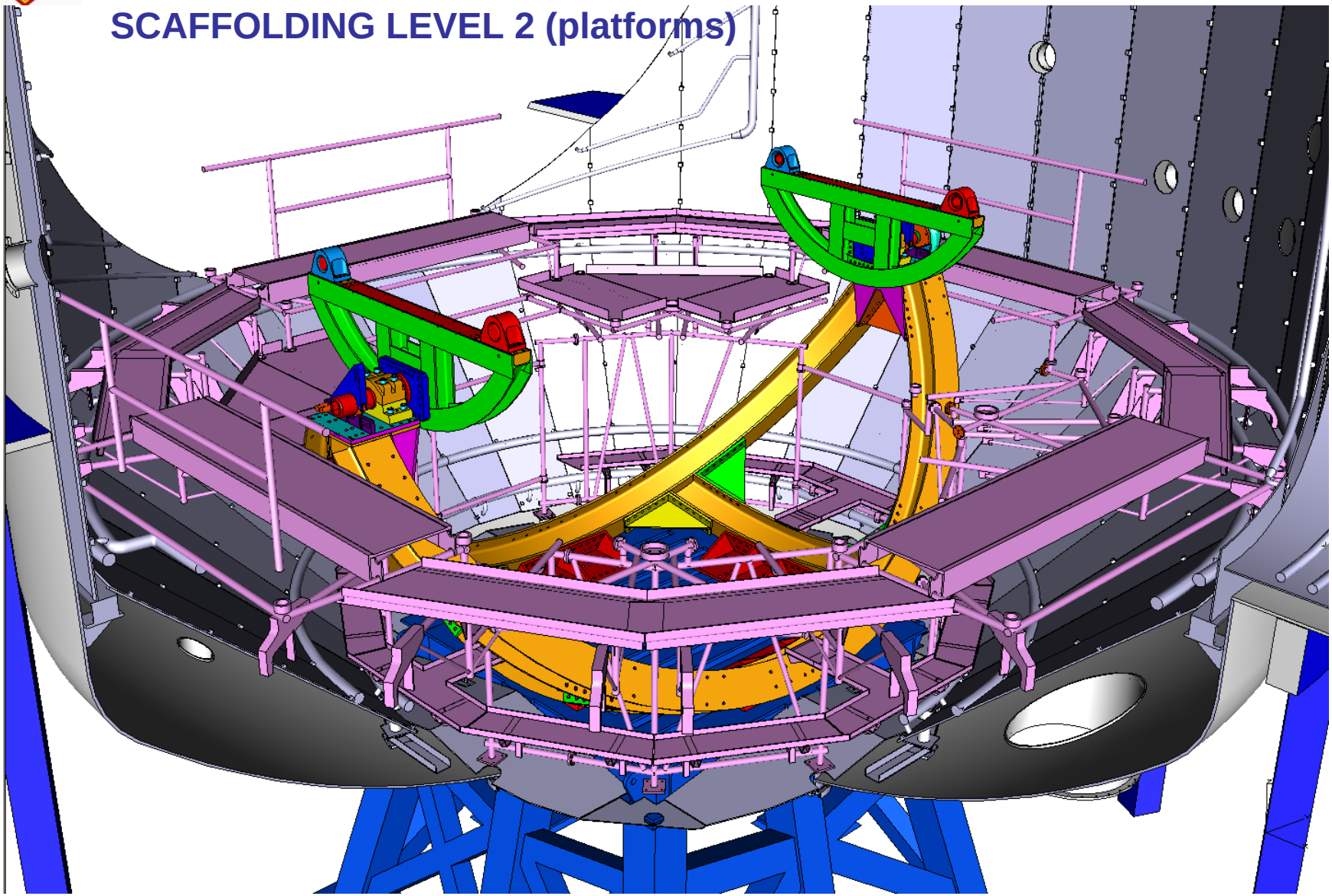
SCAFFOLDING MOUNTING

SCAFFOLDING LEVEL 2 (frame)

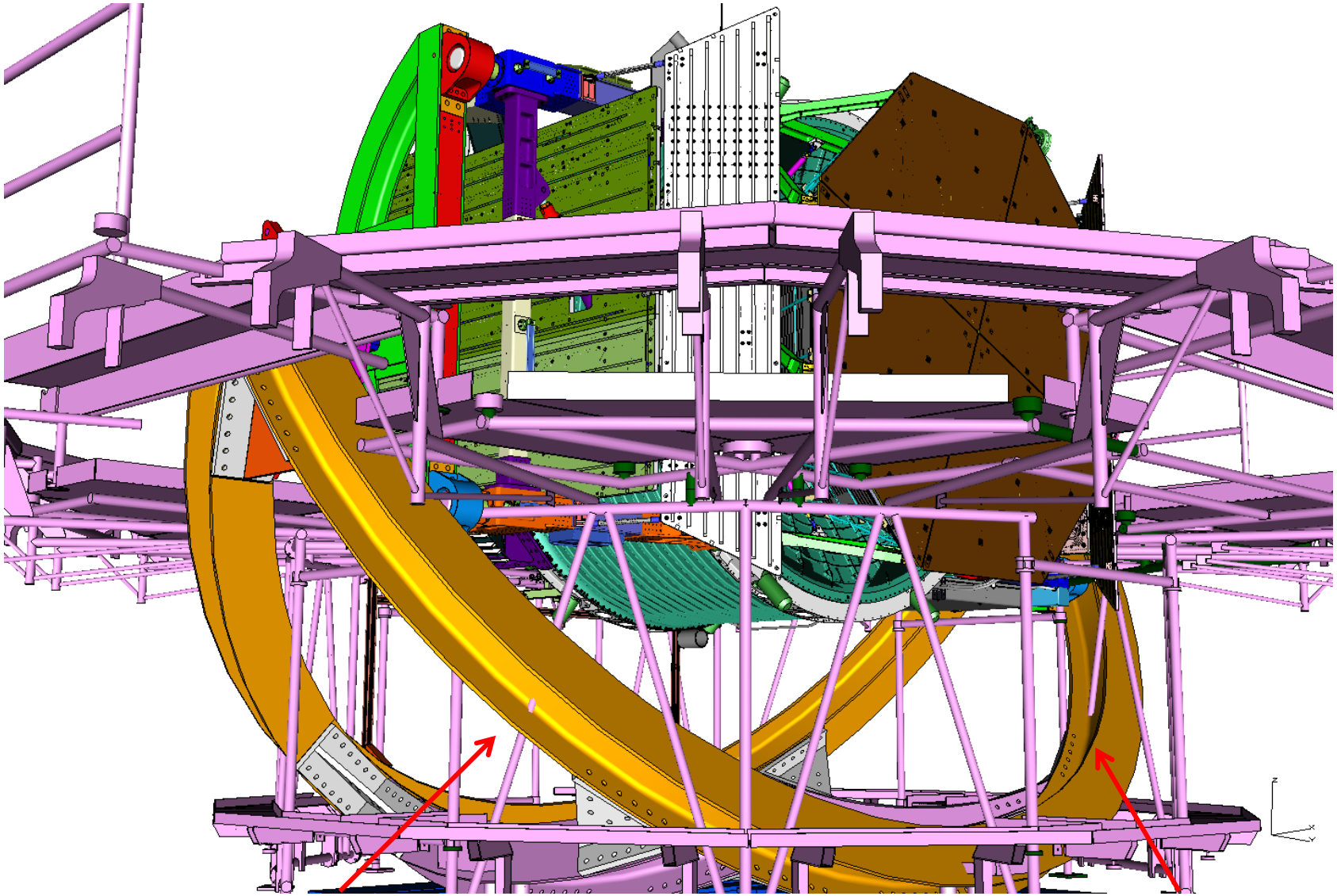


SCAFFOLDING MOUNTING

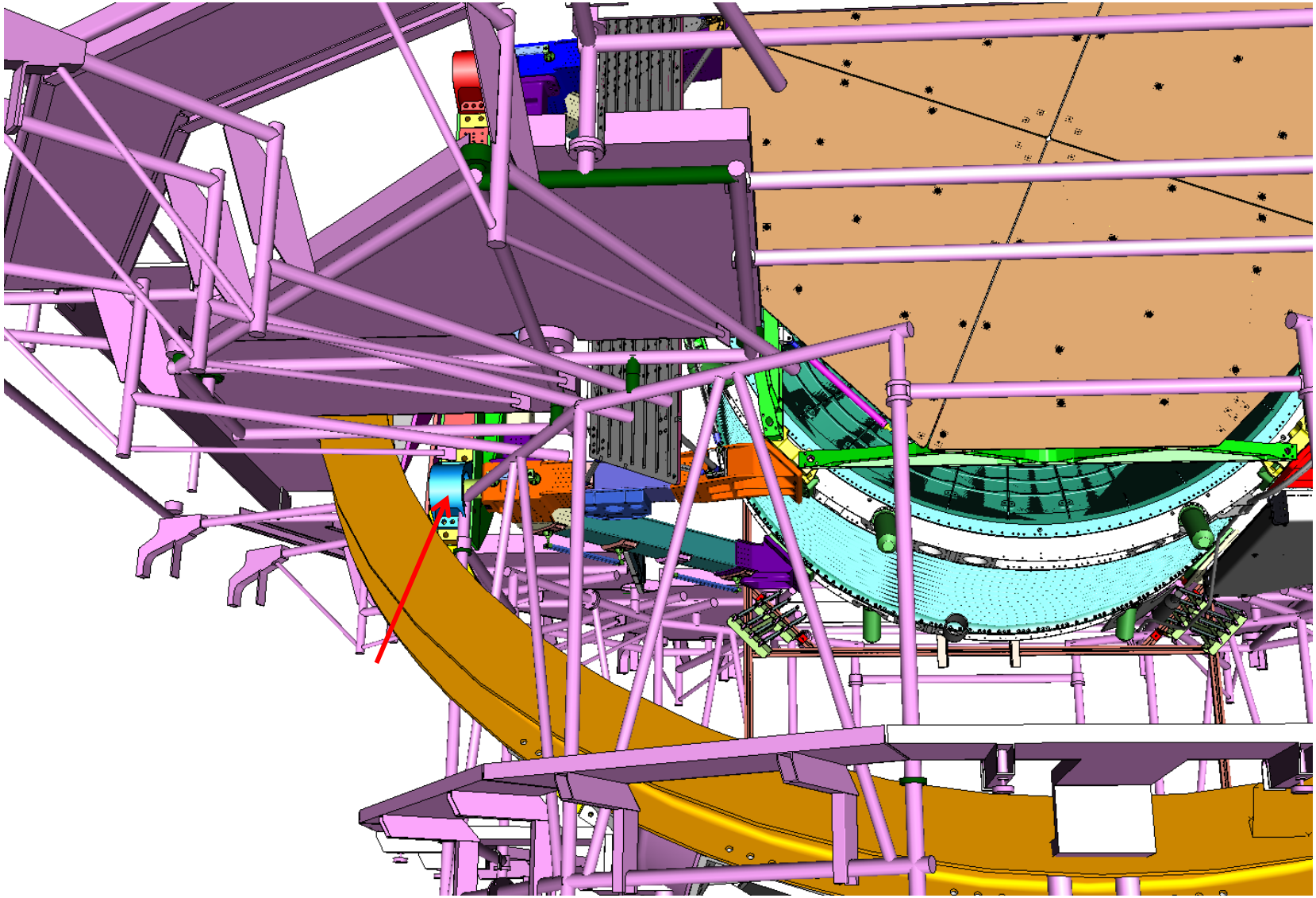
SCAFFOLDING LEVEL 2 (platforms)



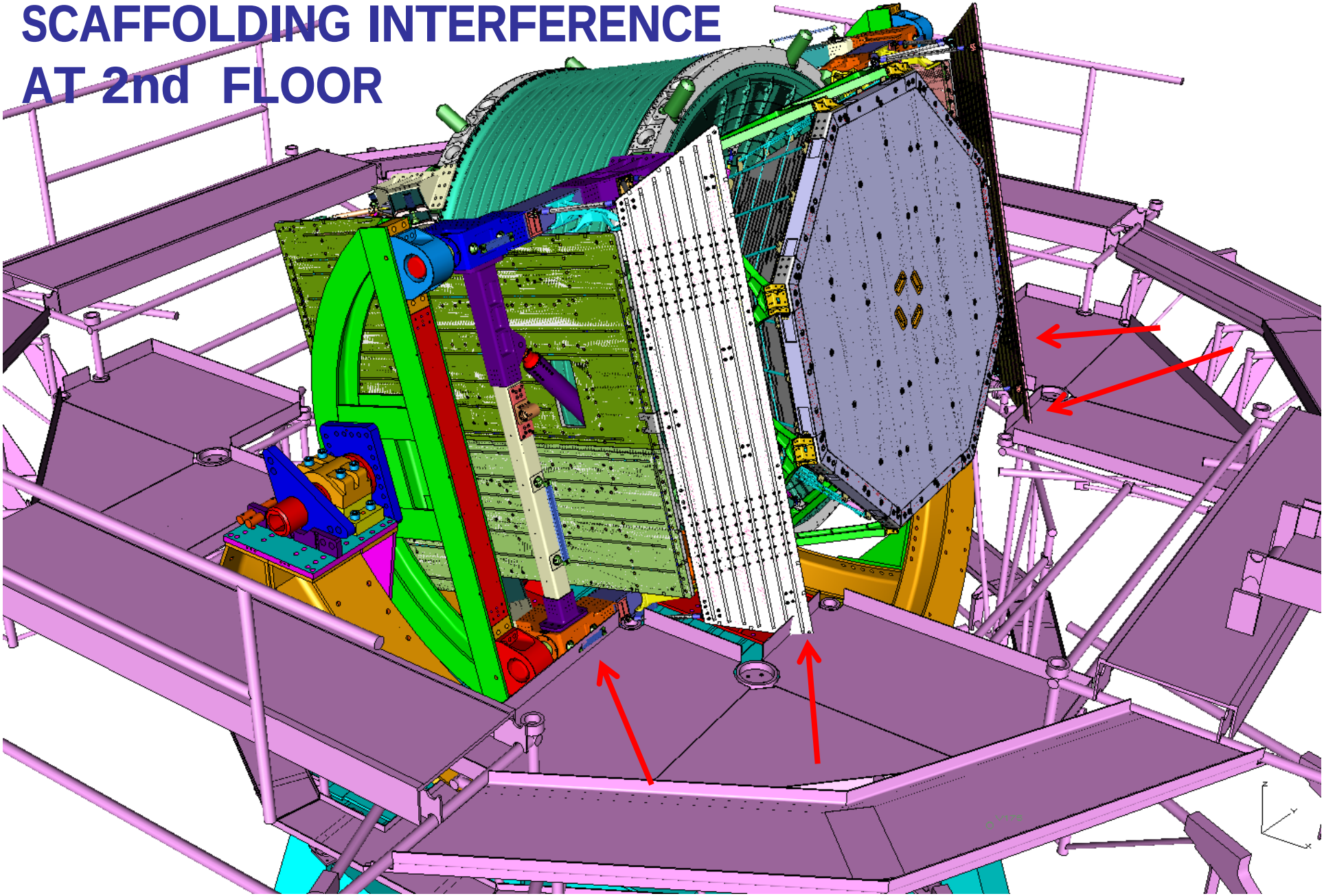
SCAFFOLDING INTERFERENCE AT 1ST FLOOR (four locations)



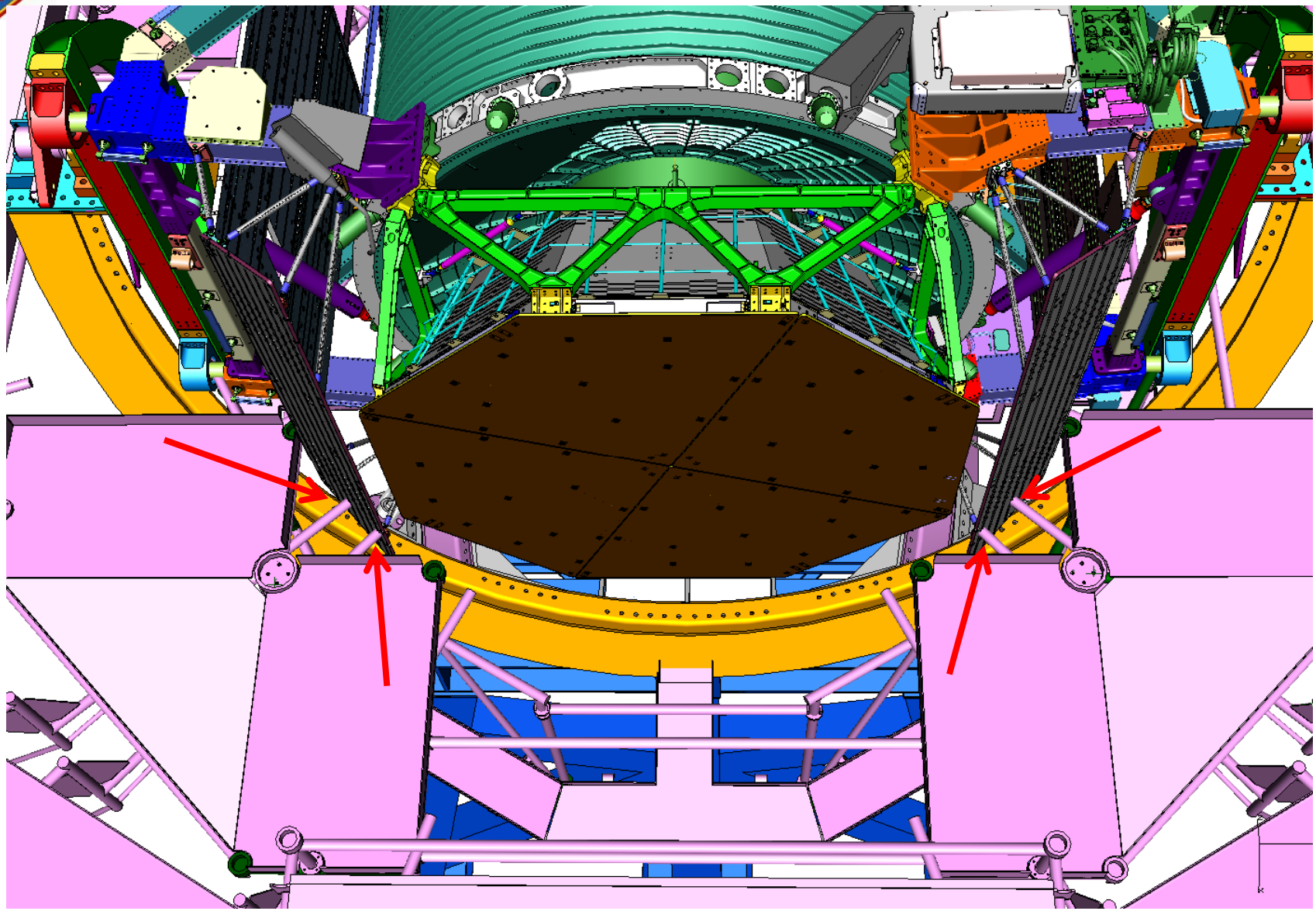
SCAFFOLDING INTERFERENCE AT 1ST FLOOR

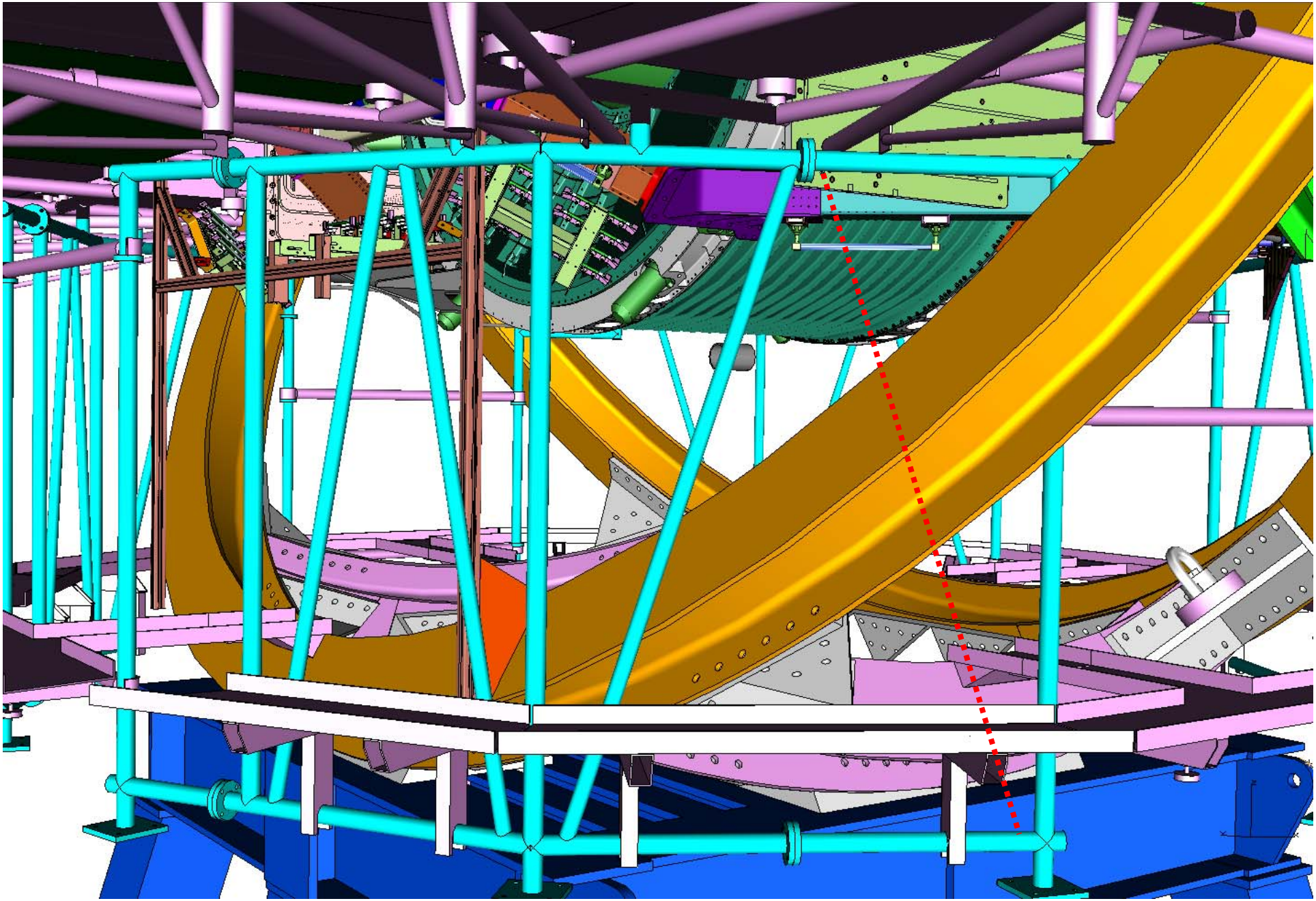


SCAFFOLDING INTERFERENCE AT 2nd FLOOR

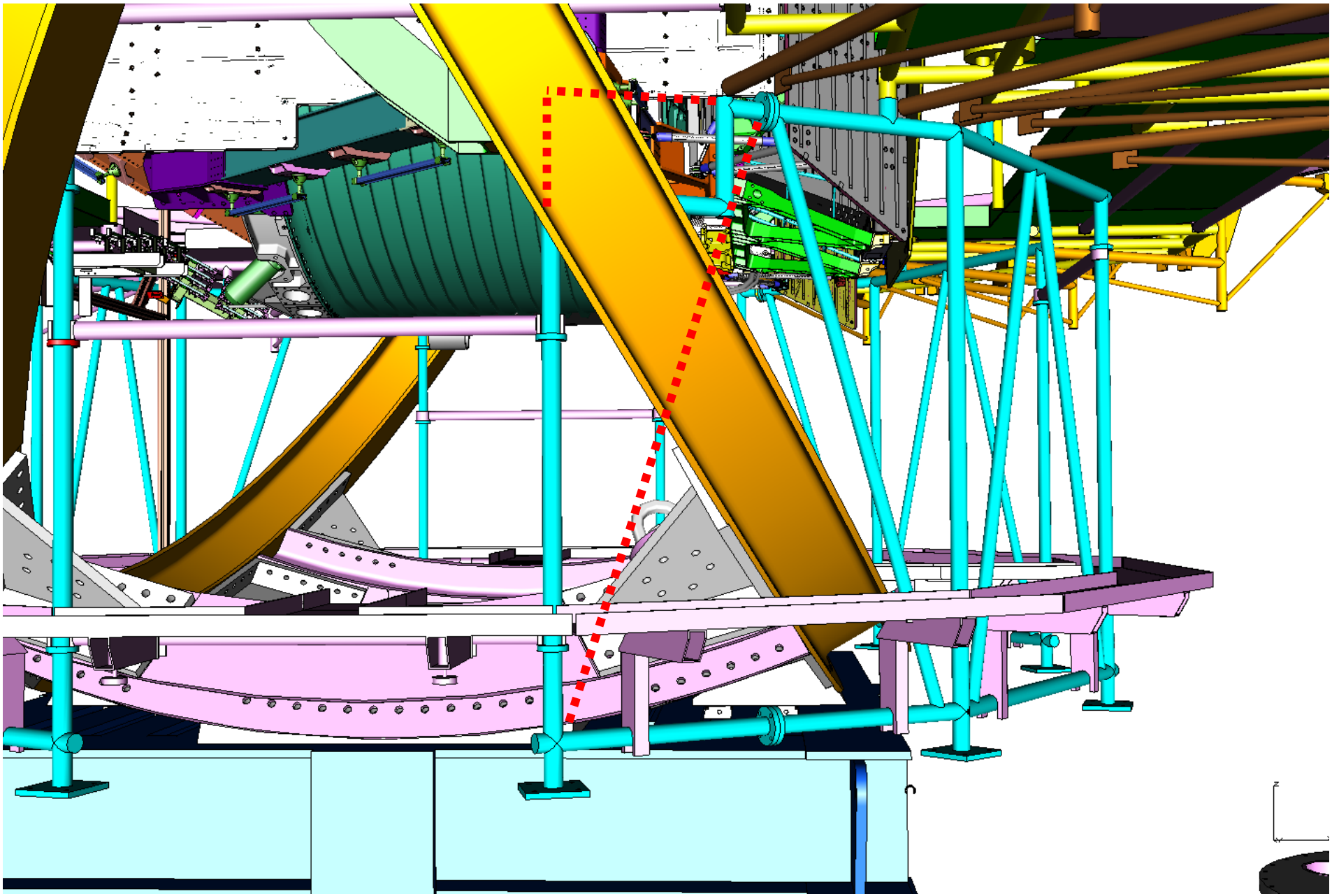


SCAFFOLDING INTERFERENCE AT 2nd FLOOR

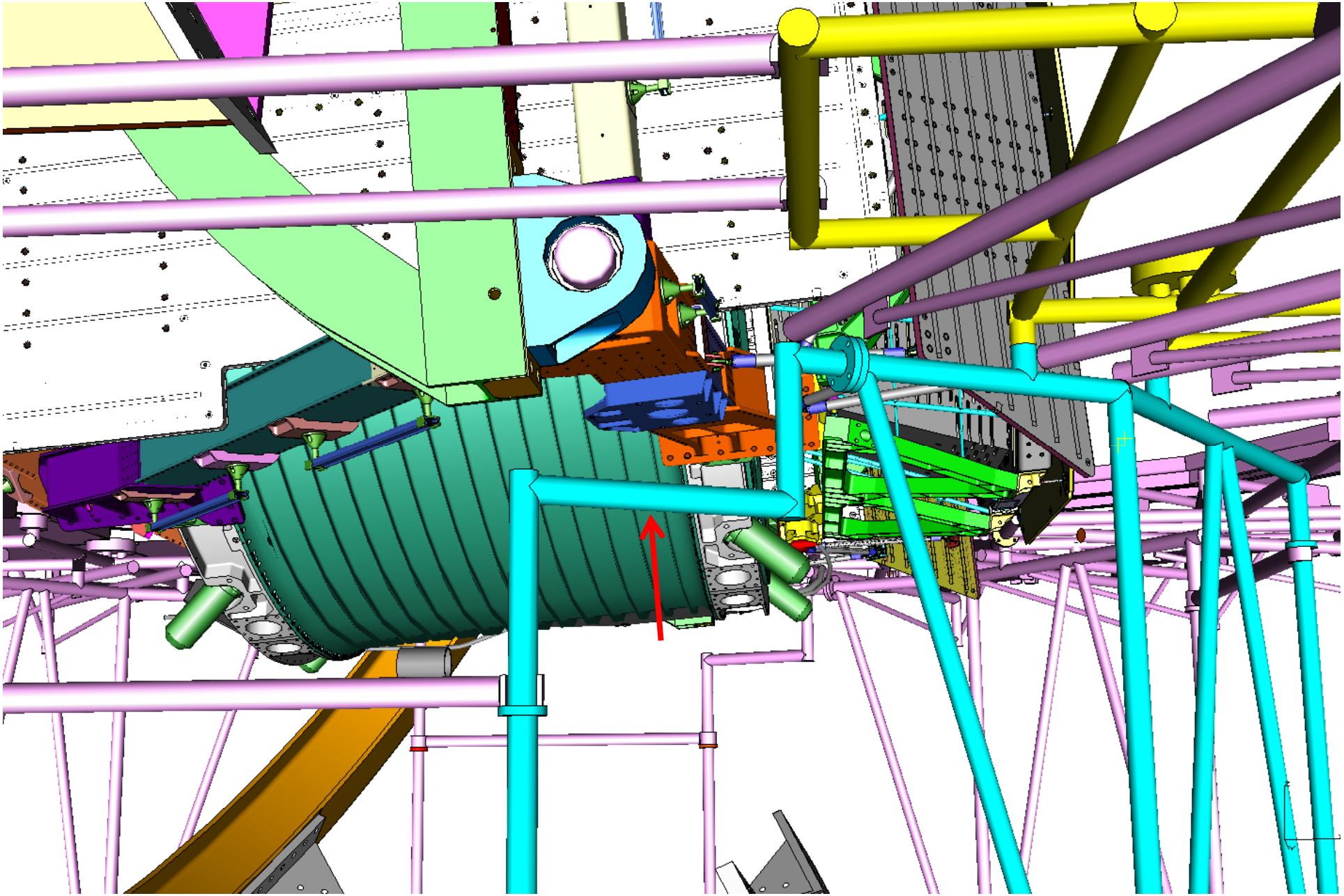




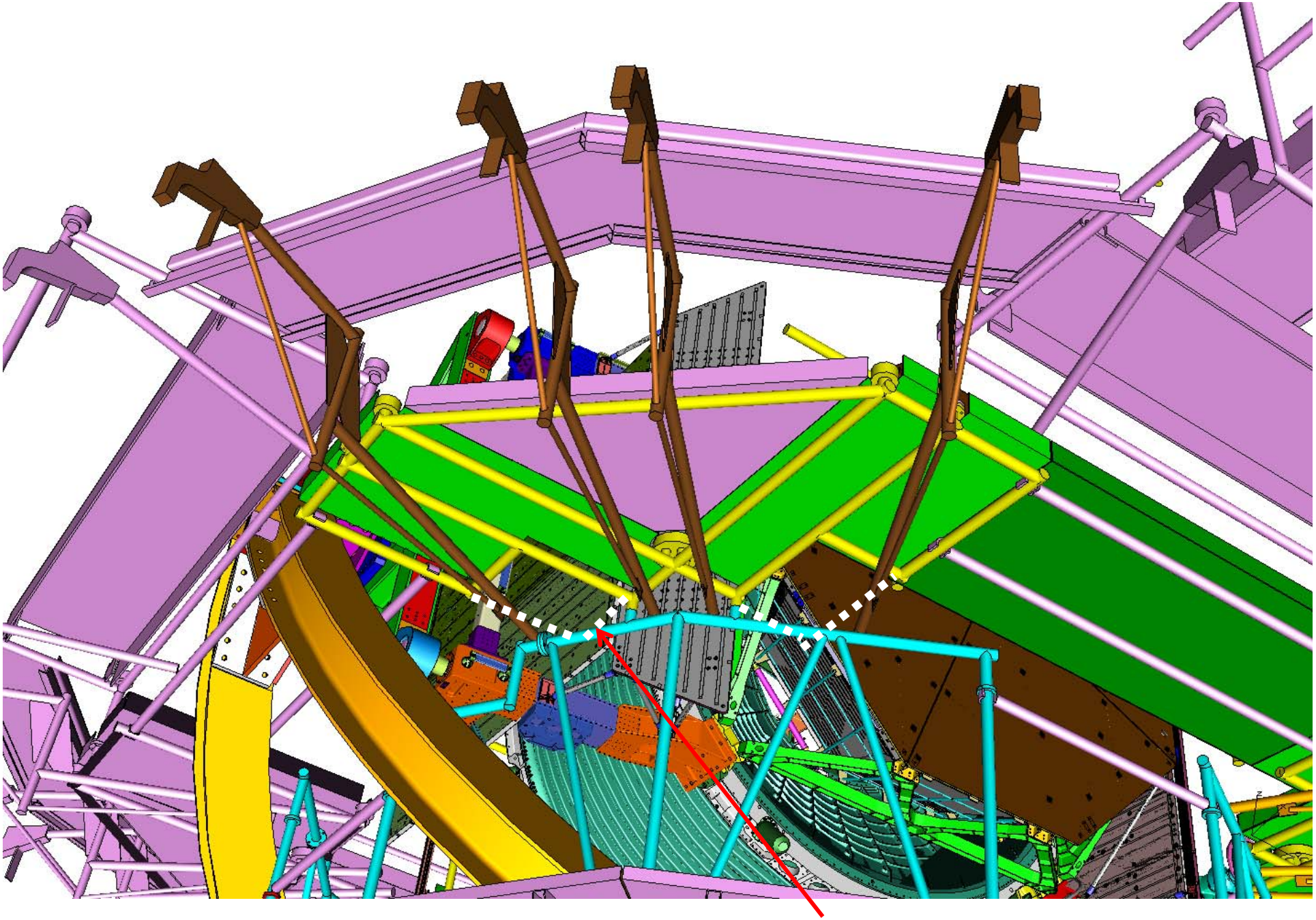
SCAFFOLDING MOD-1



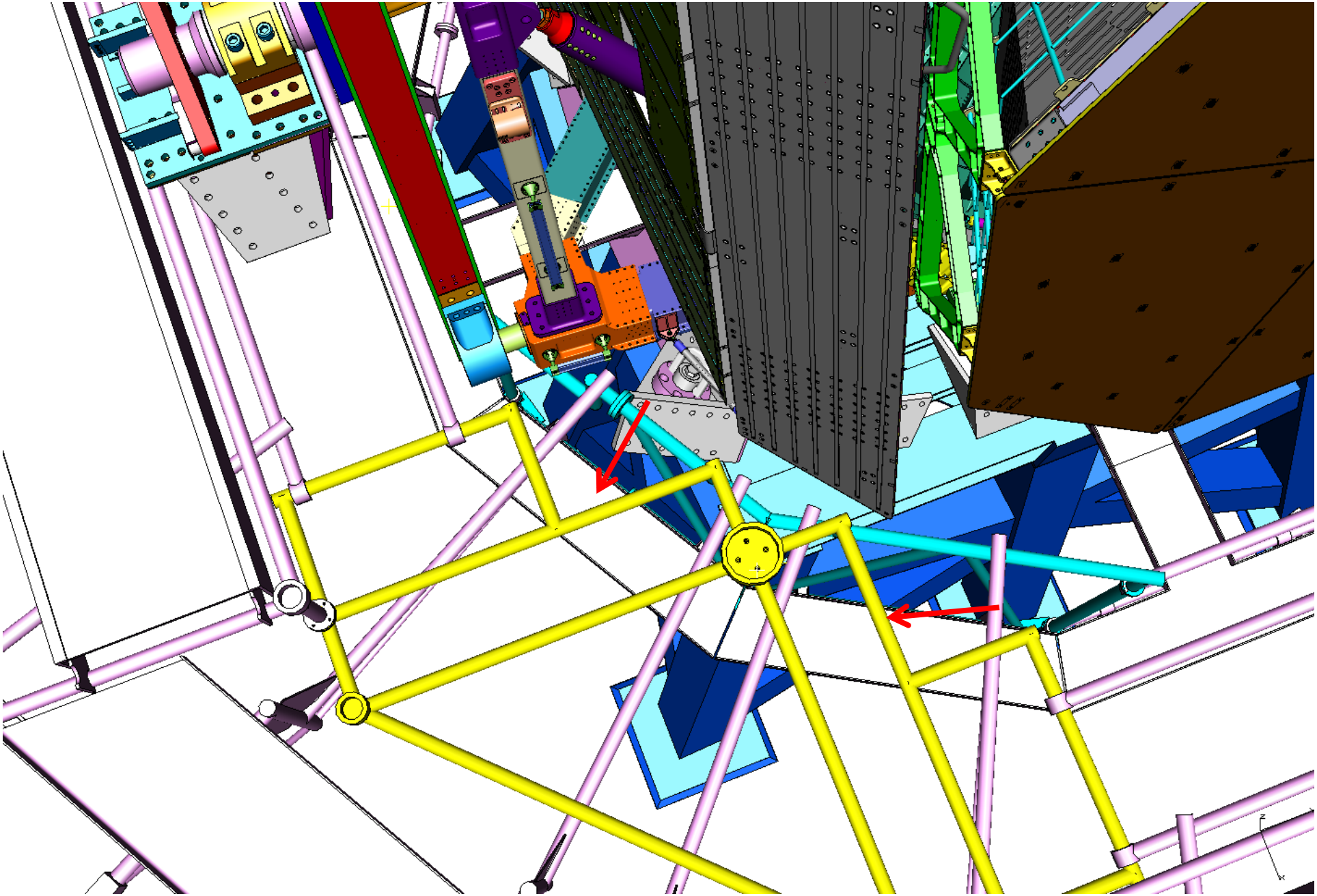
SCAFFOLDING MOD-2 & 3



SCAFFOLDING MOD-3

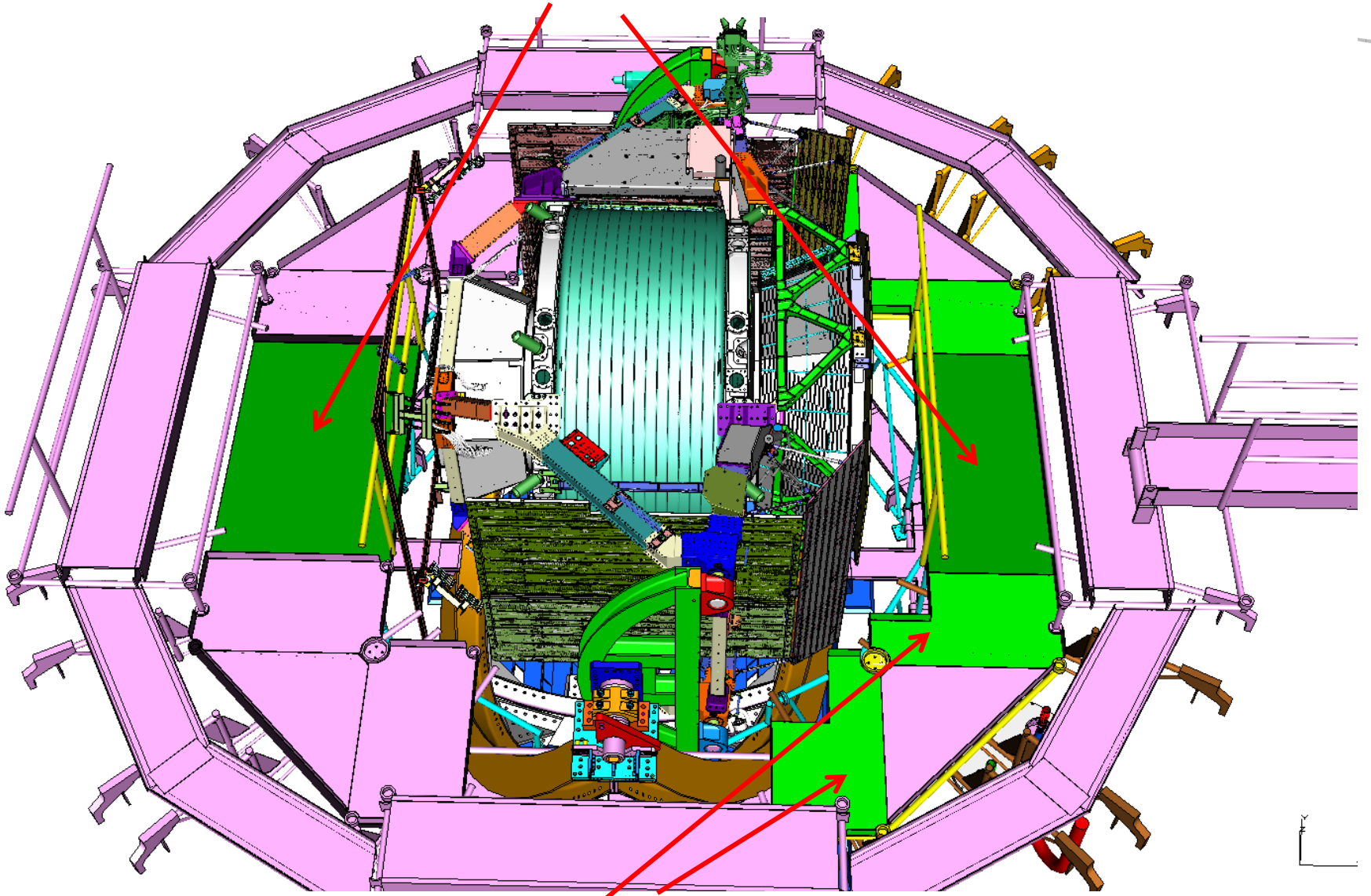


SCAFFOLDING MOD-4

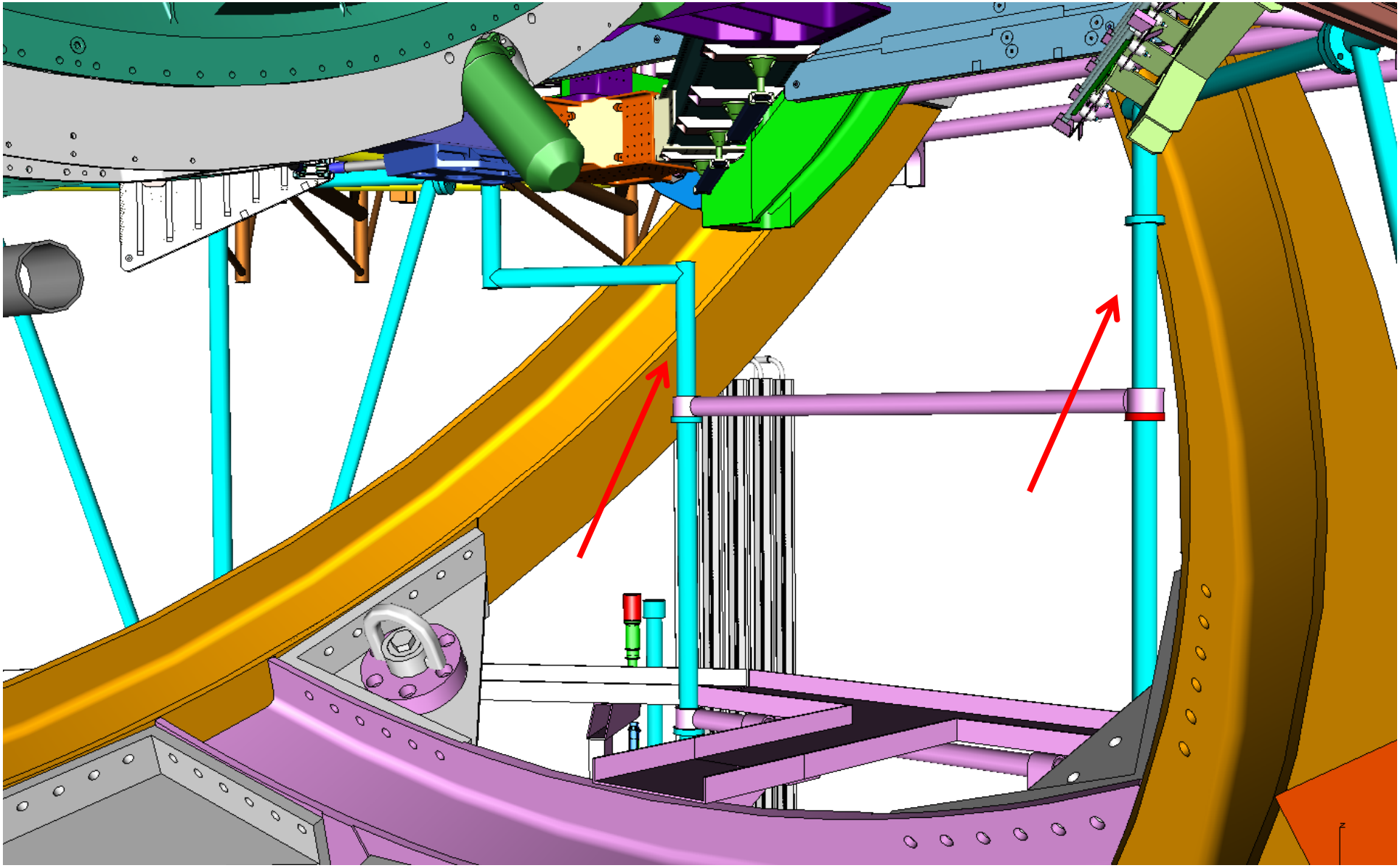


SCAFFOLDING MOD-4

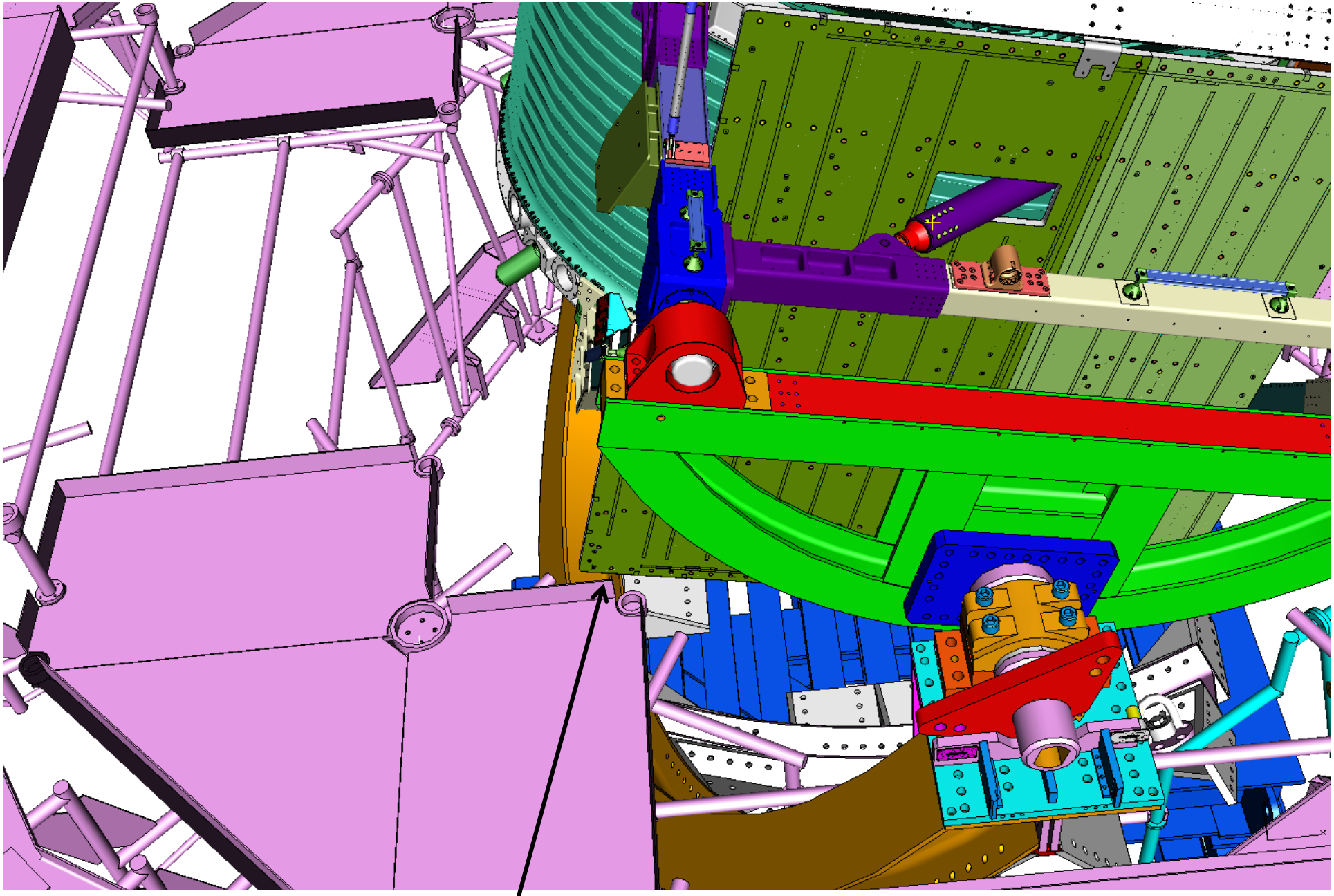
SCAFFOLDING NEW PLATFORM AND BARRIER



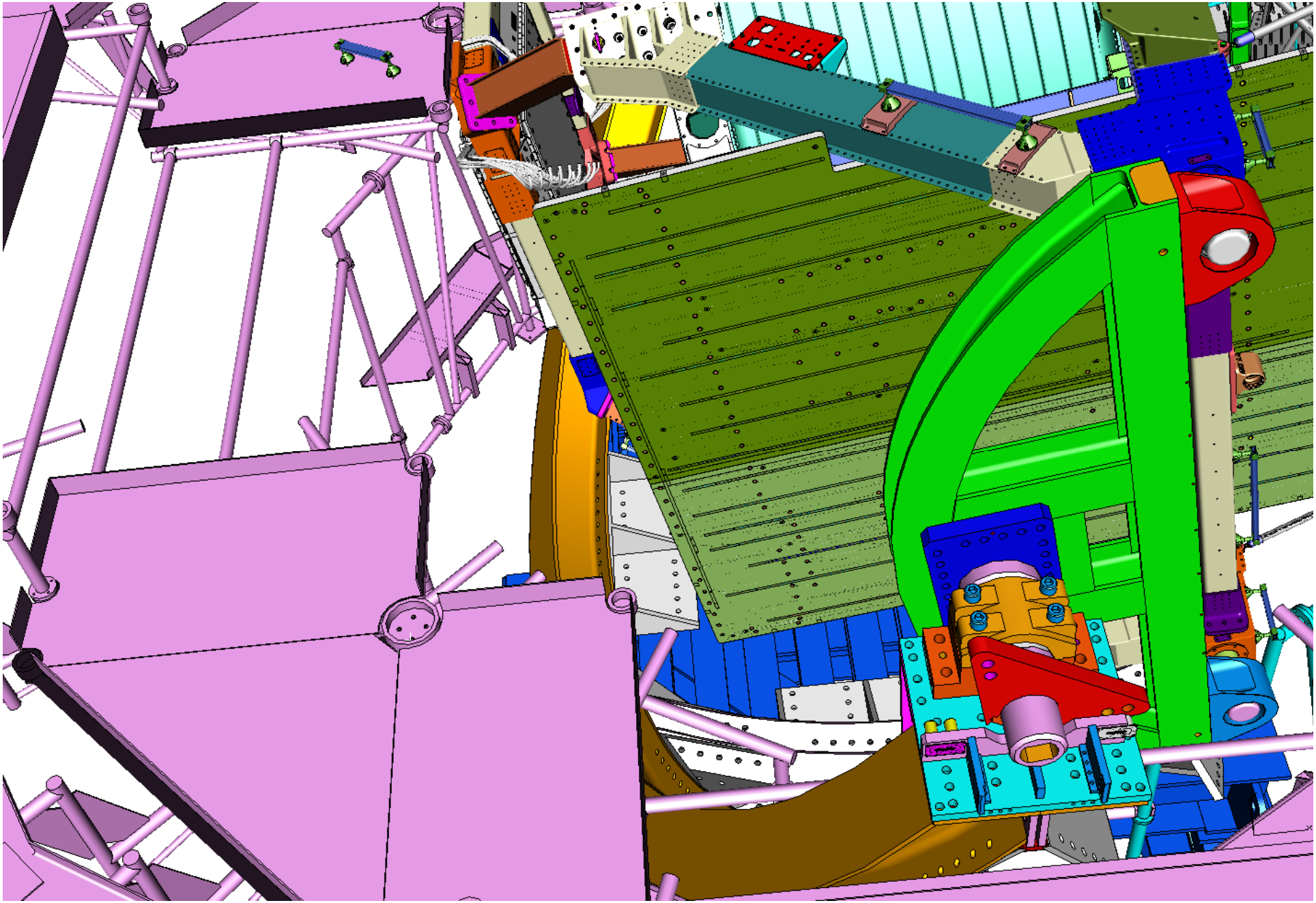
In these two locations there could be preserved the original platforms (pink) under the condition that they have to be dismounted during the rotation and installed back after.
If this is not possible a modification of these platforms is needed (light green)



MINIMUM CLERANCE. Install these section of the scaffolding before disconnecting the Gondola from the crane for a verifcation of the position of the gondola Vs the scaffolding

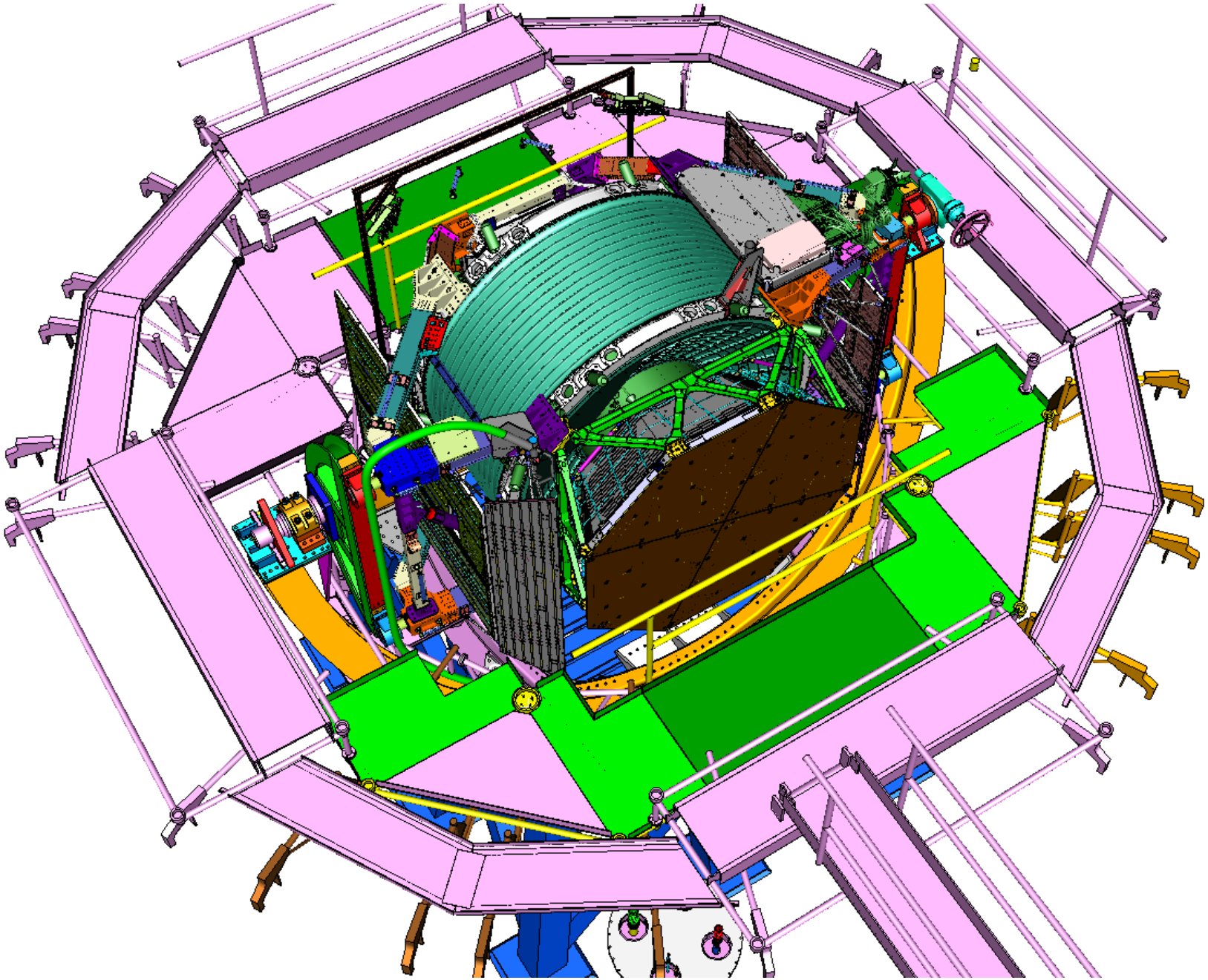


MINIMUM CLERANCE only during rotation

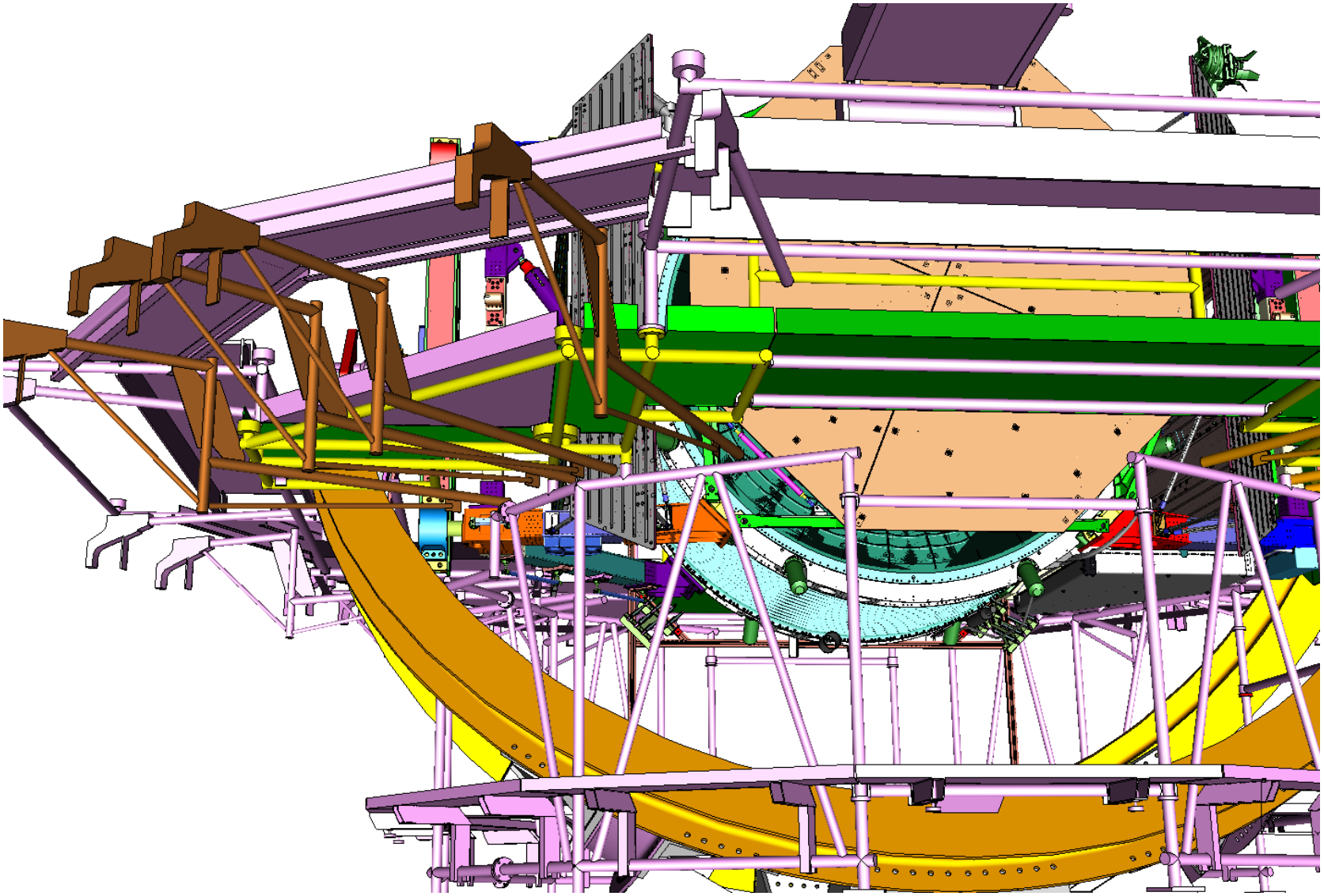


LARGER CLERANCE at rotation final phase

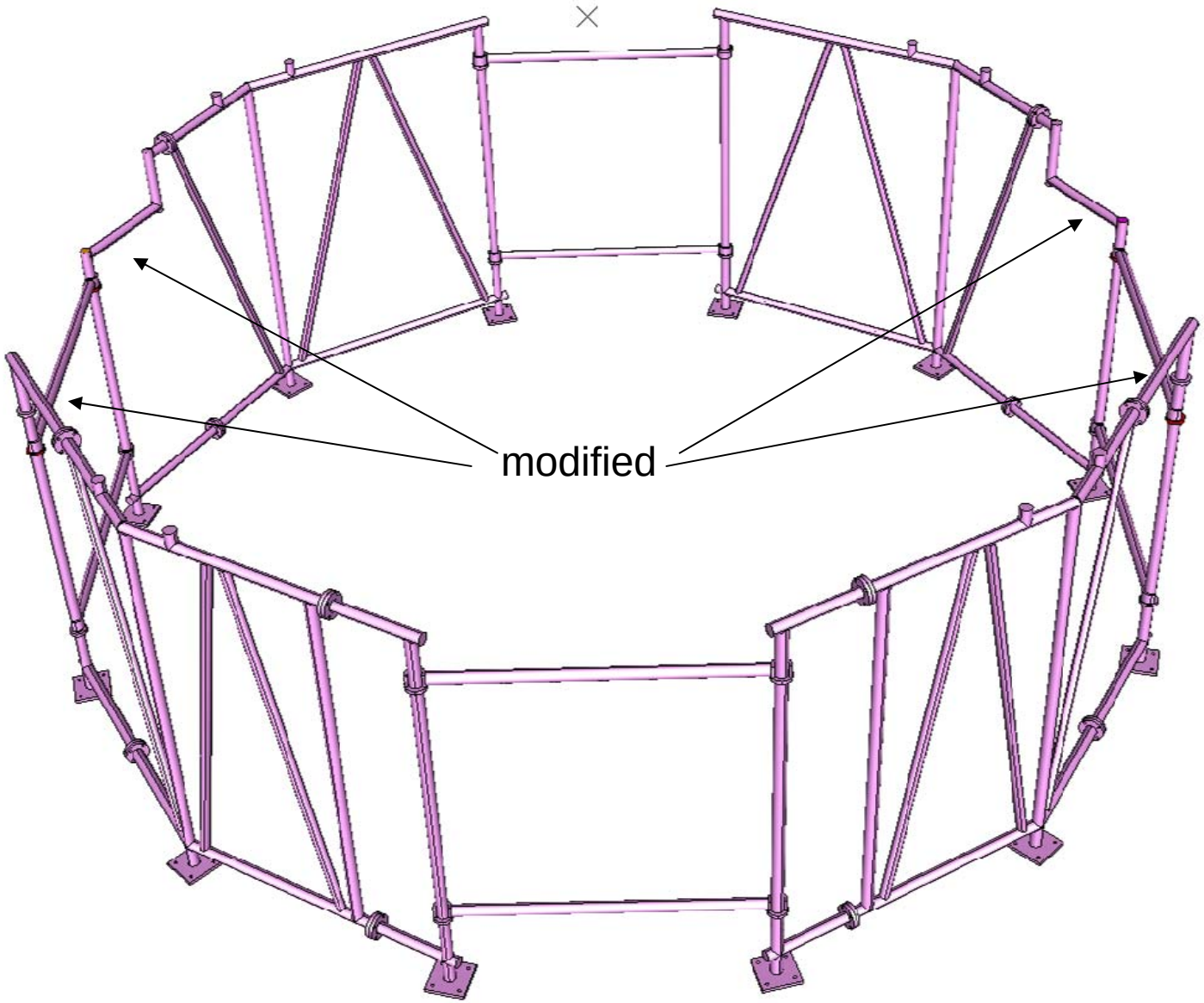
SCAFFOLDING MOD overall



SCAFFOLDING MOD overall



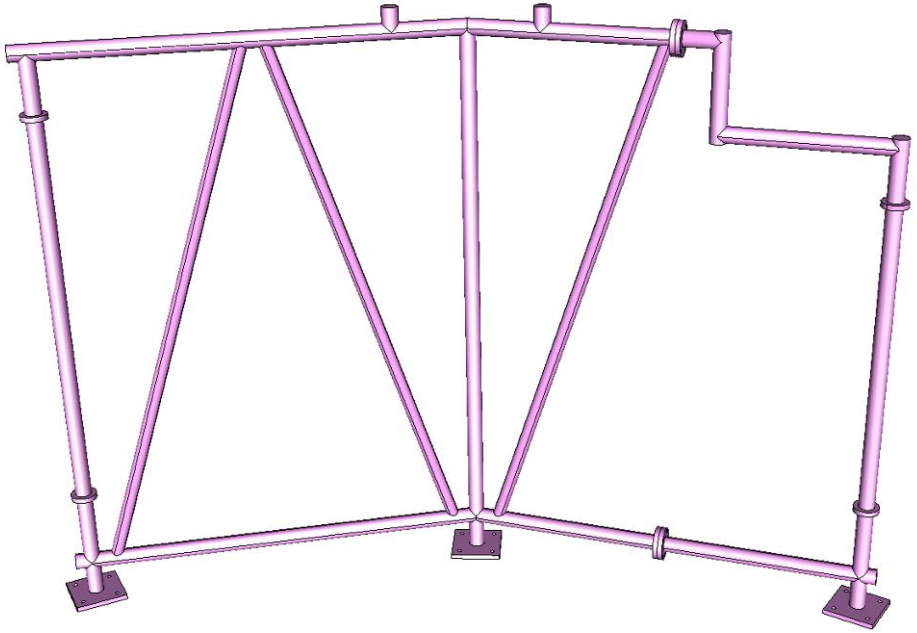
SCAFFOLDING MOD detail



SCAFFOLDING MOD detail

modified

N.2

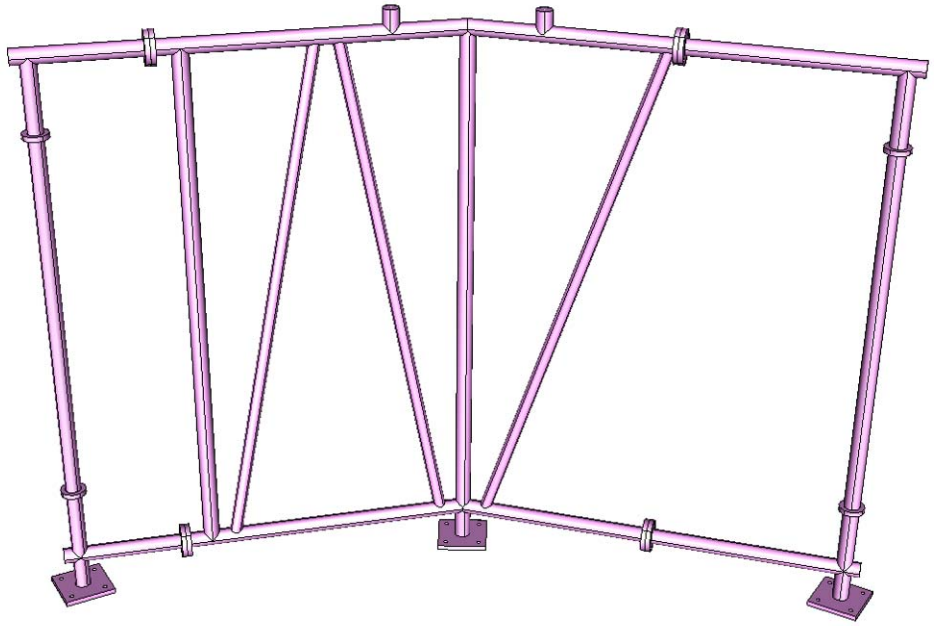


original

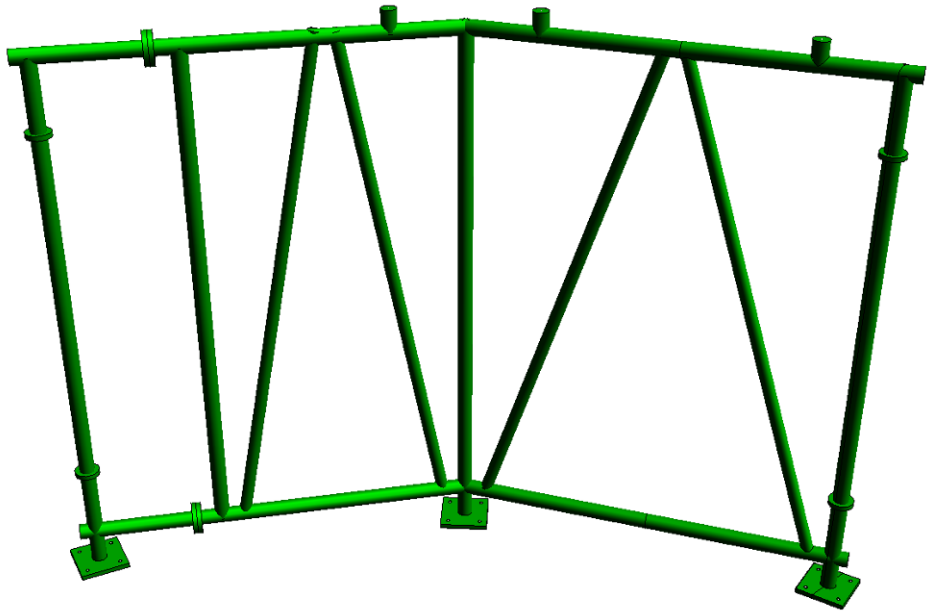
SCAFFOLDING MOD detail

modified

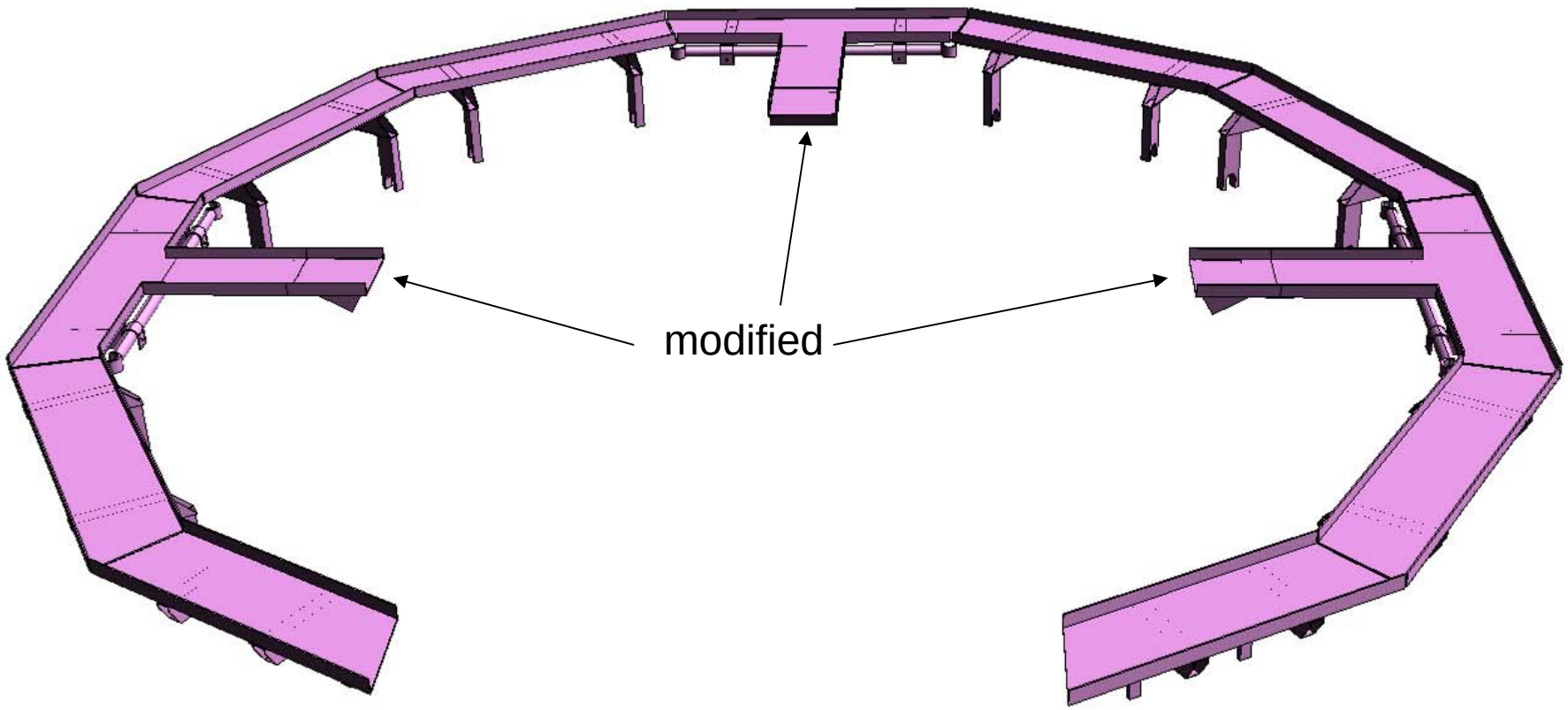
N.2



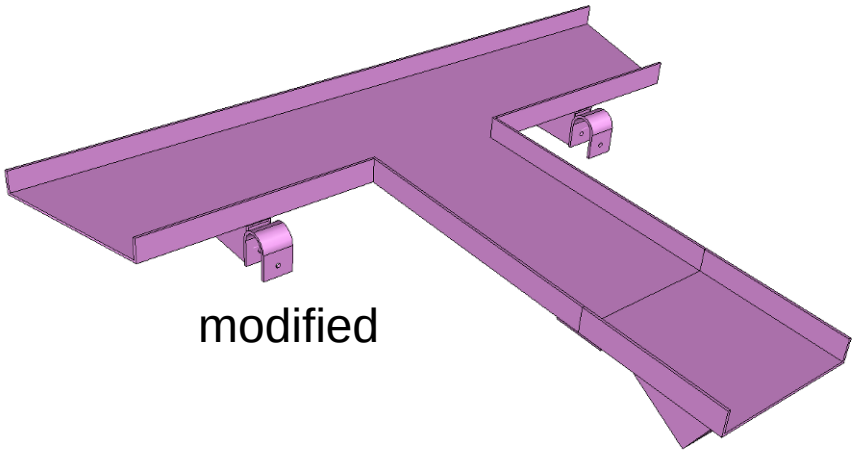
original



SCAFFOLDING MOD detail

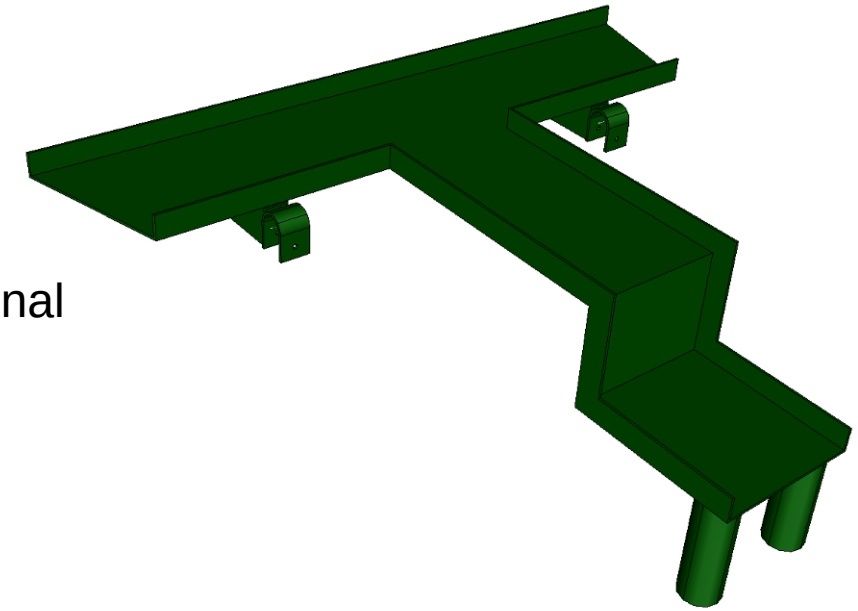


SCAFFOLDING MOD detail



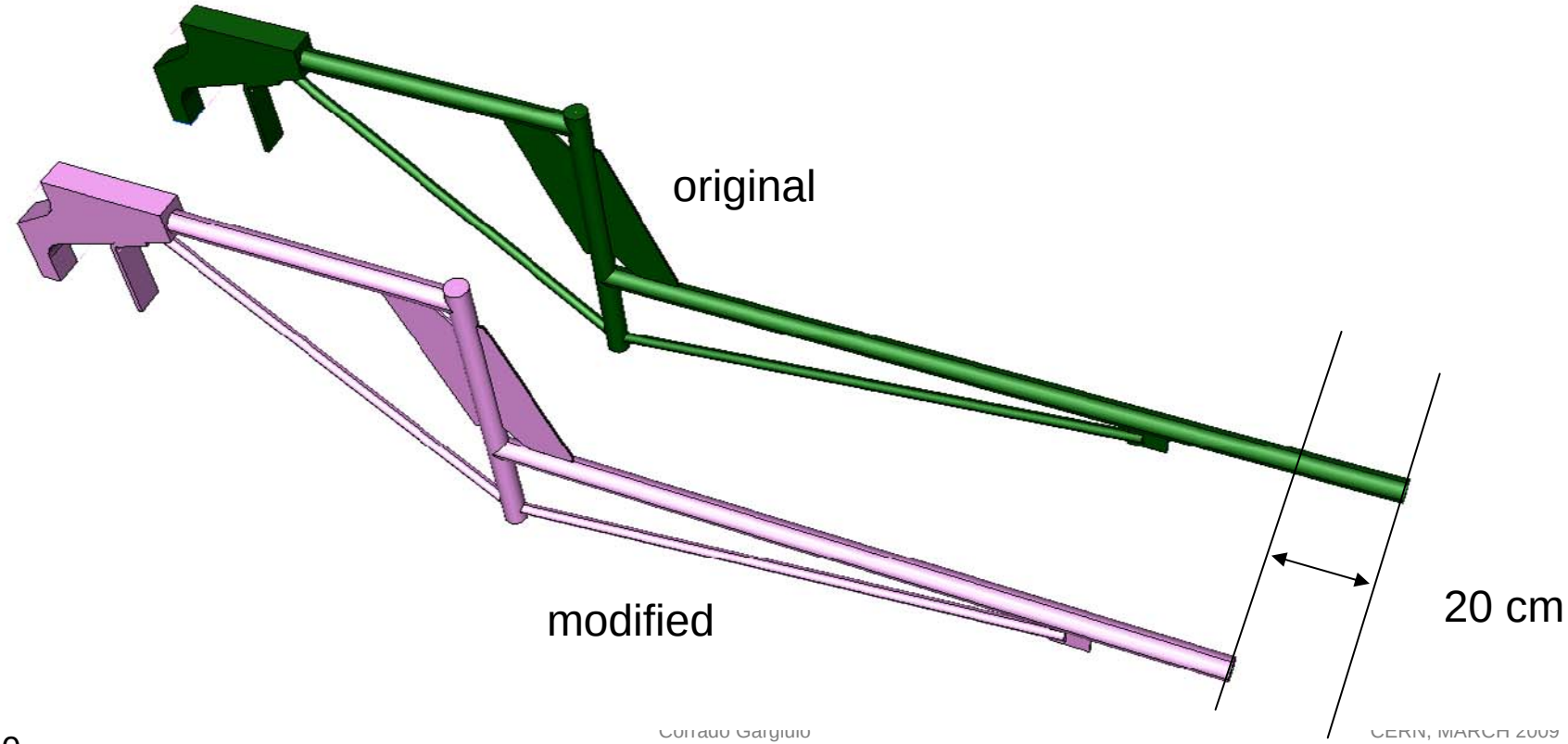
modified

N.4



original

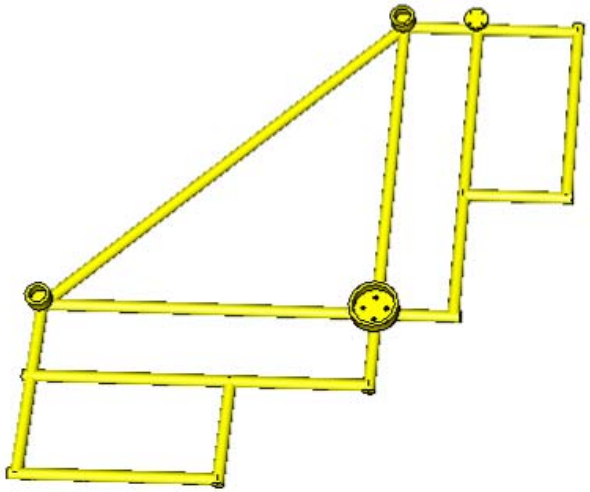
SCAFFOLDING MOD detail

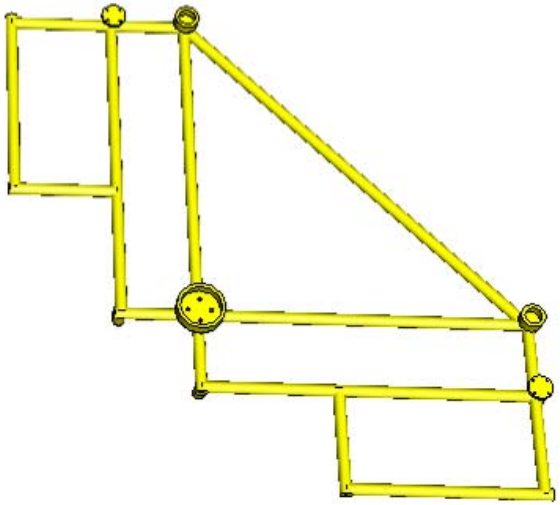


SCAFFOLDING MOD detail

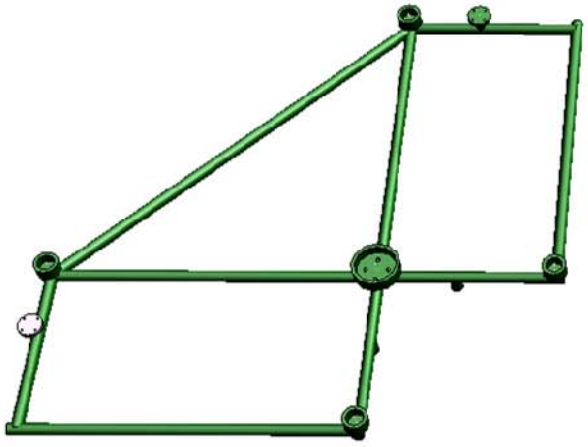
N.2

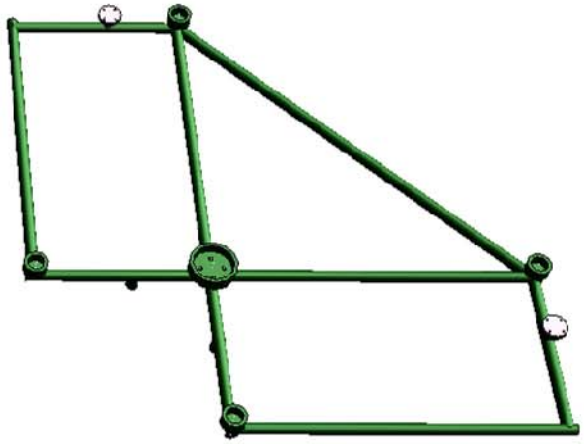
modified





original



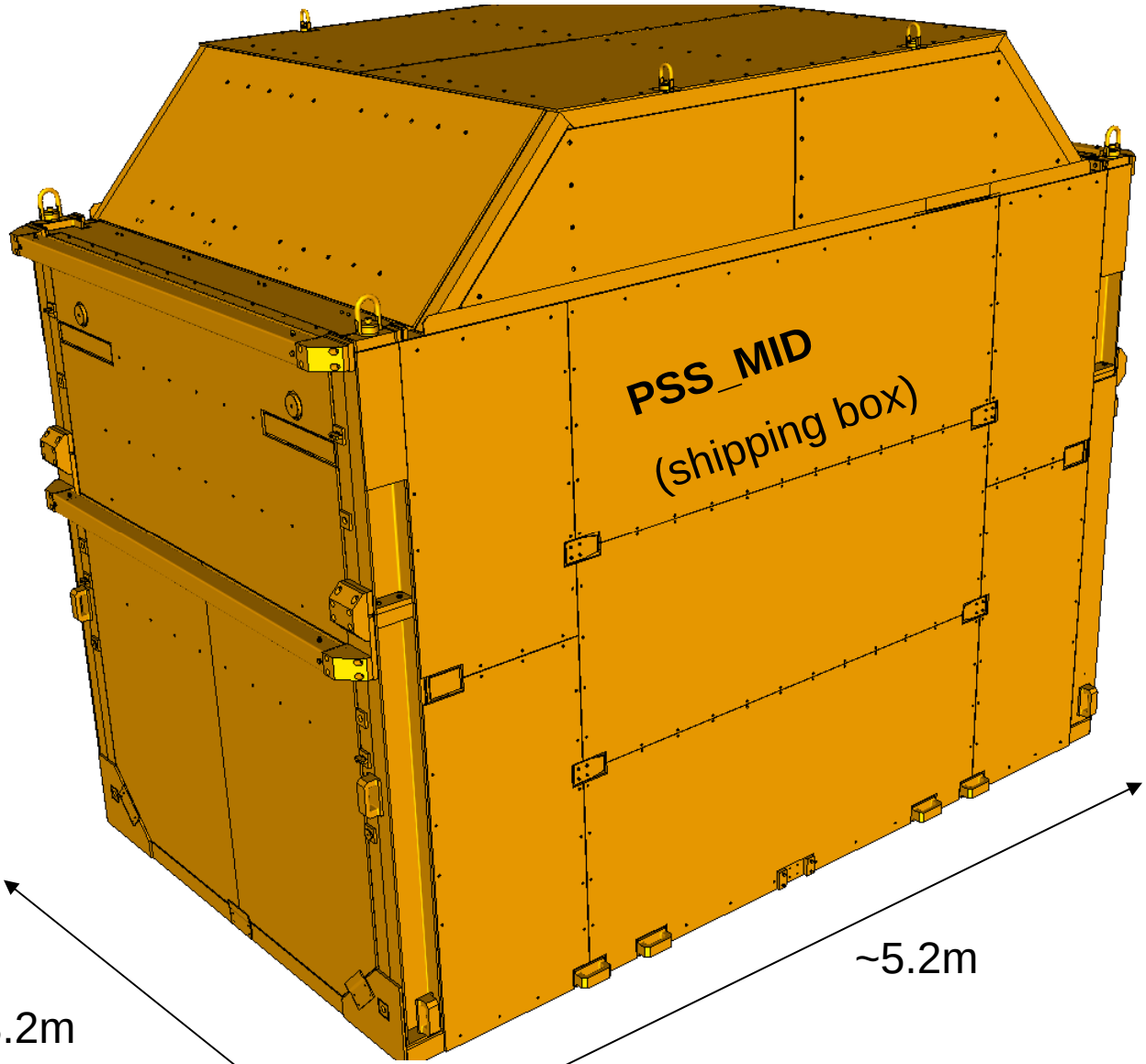


ACTION 3: AMS INSTALLATION IN LSS

STEP_1: AMS DOWNLOADING FROM TRUCK, CLEANING OF SHIPPING CONTAINER (PSS)
STEP_2: AMS MOVING TO ARTEMIS CLEAN ROOM BY ESTEC AIRPADS
STEP_3 DISASSAMBLE SHIPPING CONTAINER (PSS)
STEP_4: AMS PREPARATION IN ARTEMIS CLEAN ROOM
STEP_5: AMS MOVING INSIDE LSS BY CRANE
STEP_6: AMS FIXATION TO THE GONDOLA
STEP_7: AMS 90° ROTATION BY GONDOLA WARM GEAR
STEP_8: AMS 90° POSITION ADJUSTEMENT AND FIXATION
STEP_9: WARM GEAR REMOVAL

Access to the Test Area

To be moved around



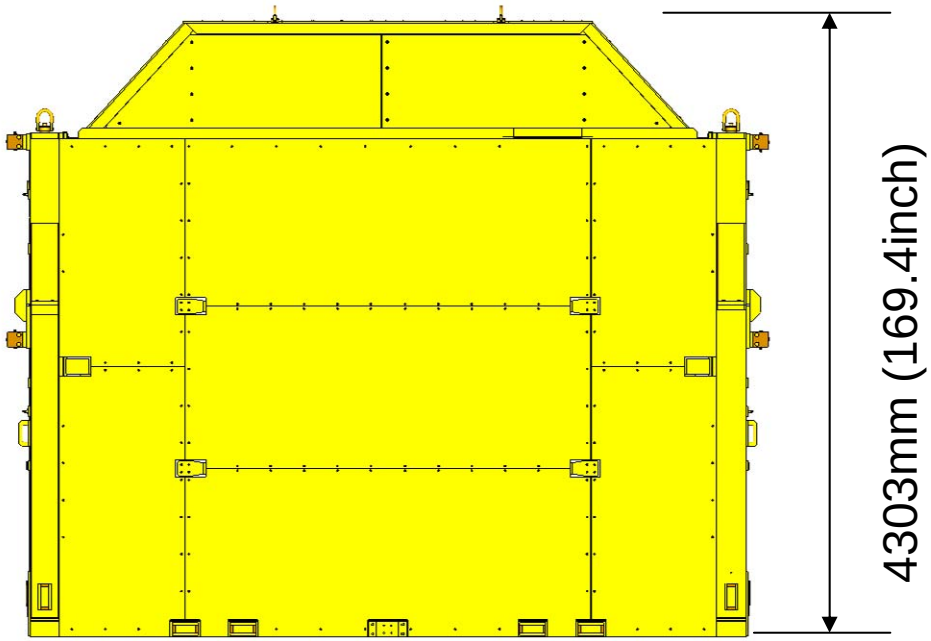
~4.3m

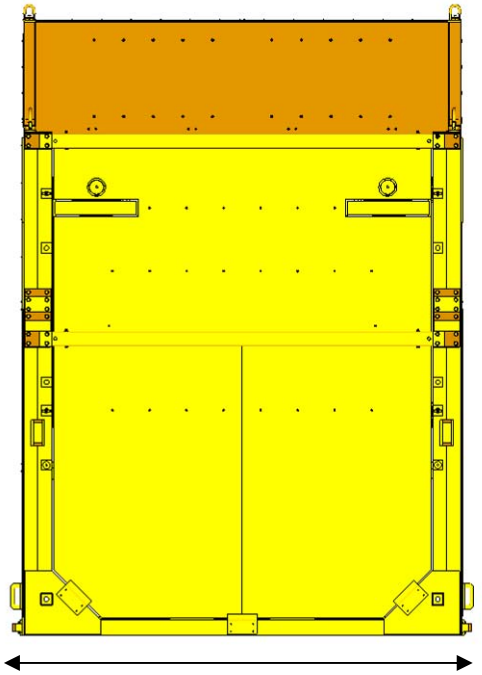
~3.2m

~5.2m

~9.5 Ton

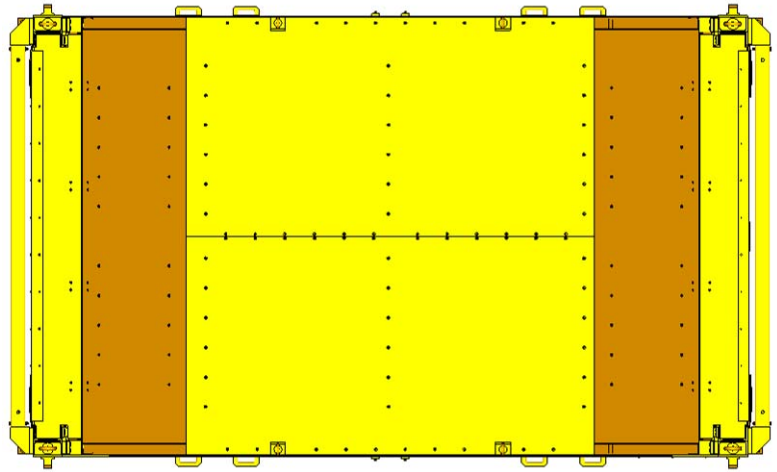
2.5(PSS)+7(AMS)

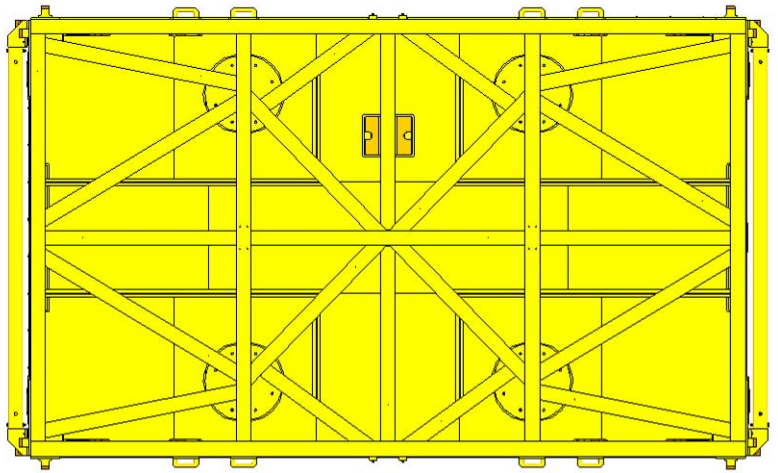




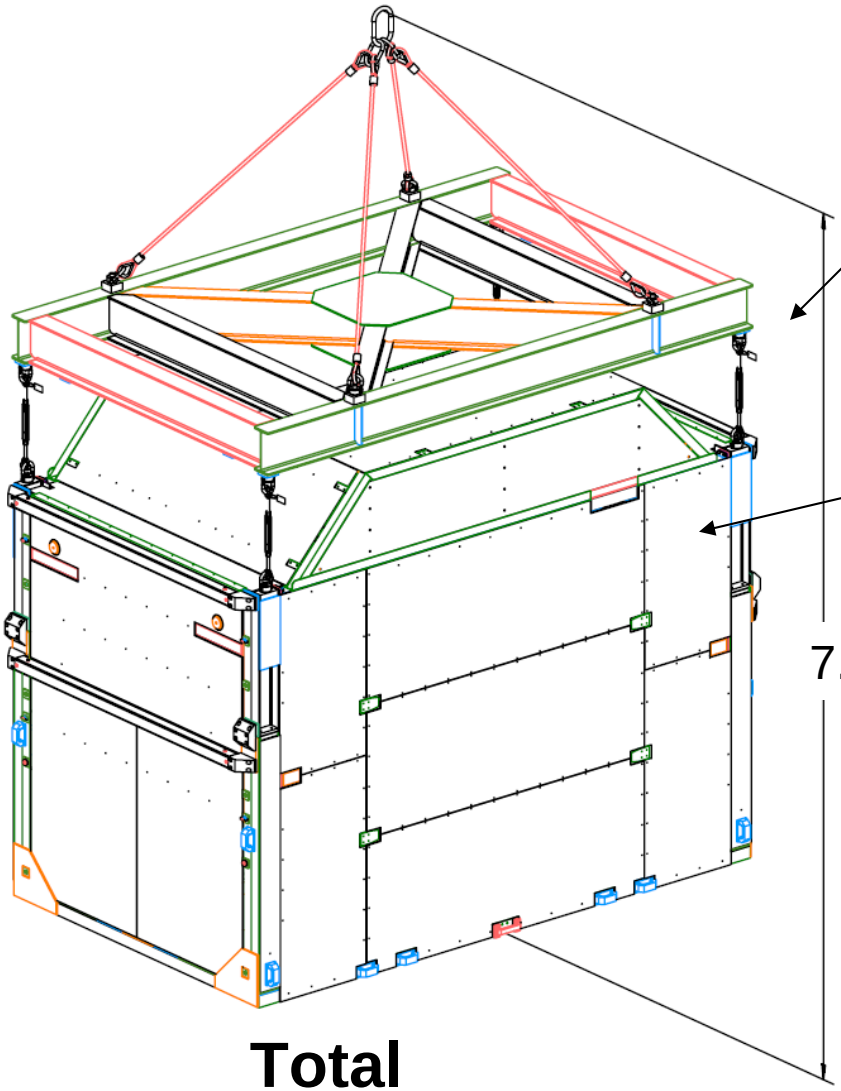
3175mm (125inch)

5207mm (205inch)





2226kg (4908 lbs) empty, no panel



PLF

~1.95 Tons

~9.5 Tons

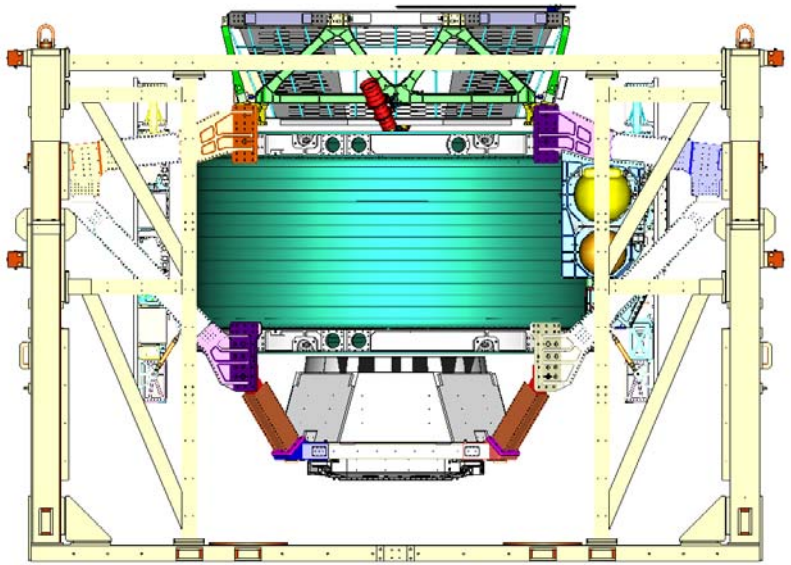
2.5(PSS)+7(AMS)

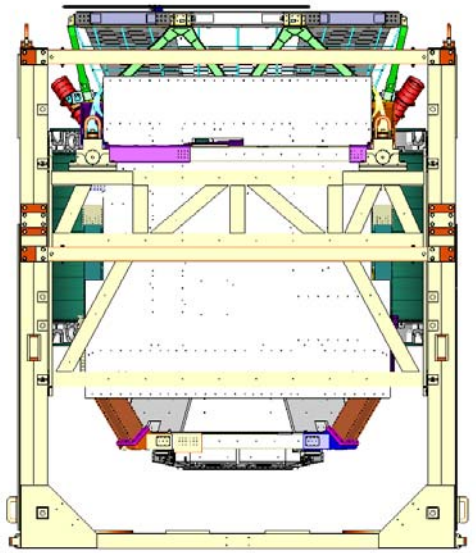
7.25m

Total

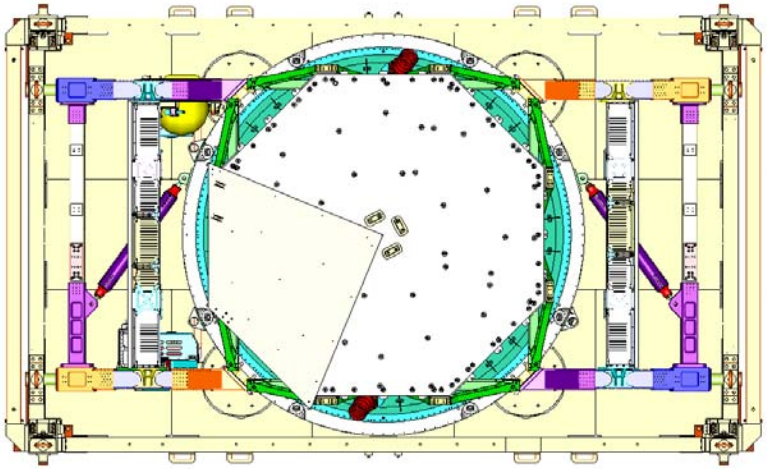
~11.5 Tons

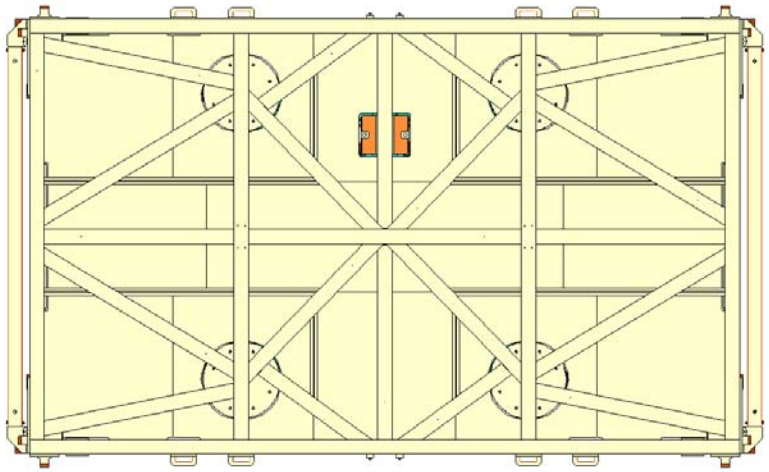
AMS in PSS-MID





AMS 6850kg (15070 lbs) based on helium tank full

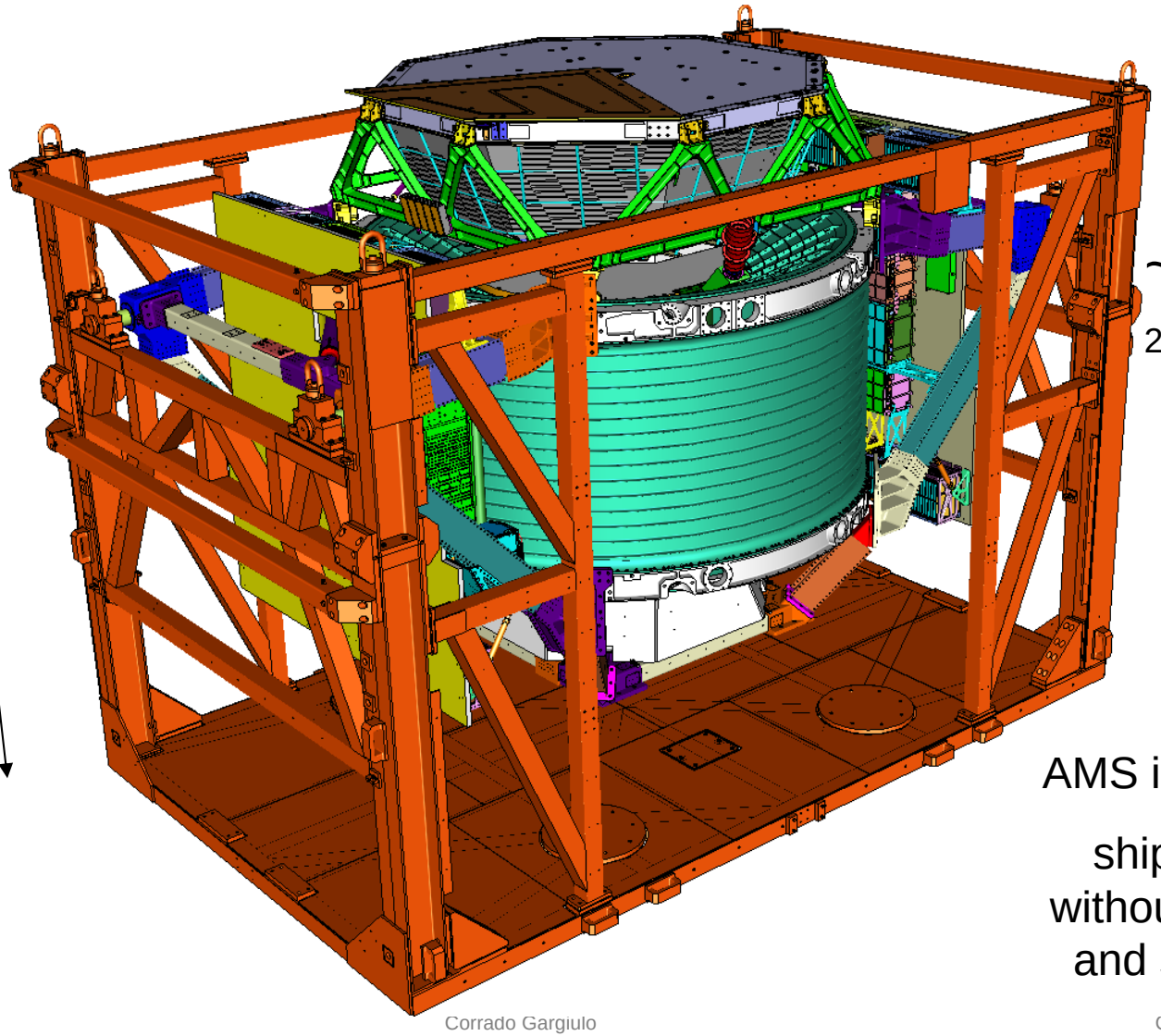




Bottom view

Access to the Test Area

To be moved around



~3.5m

~9.1 Ton

2.2(PSS)+6.9(AMS)

AMS in PSS_MID

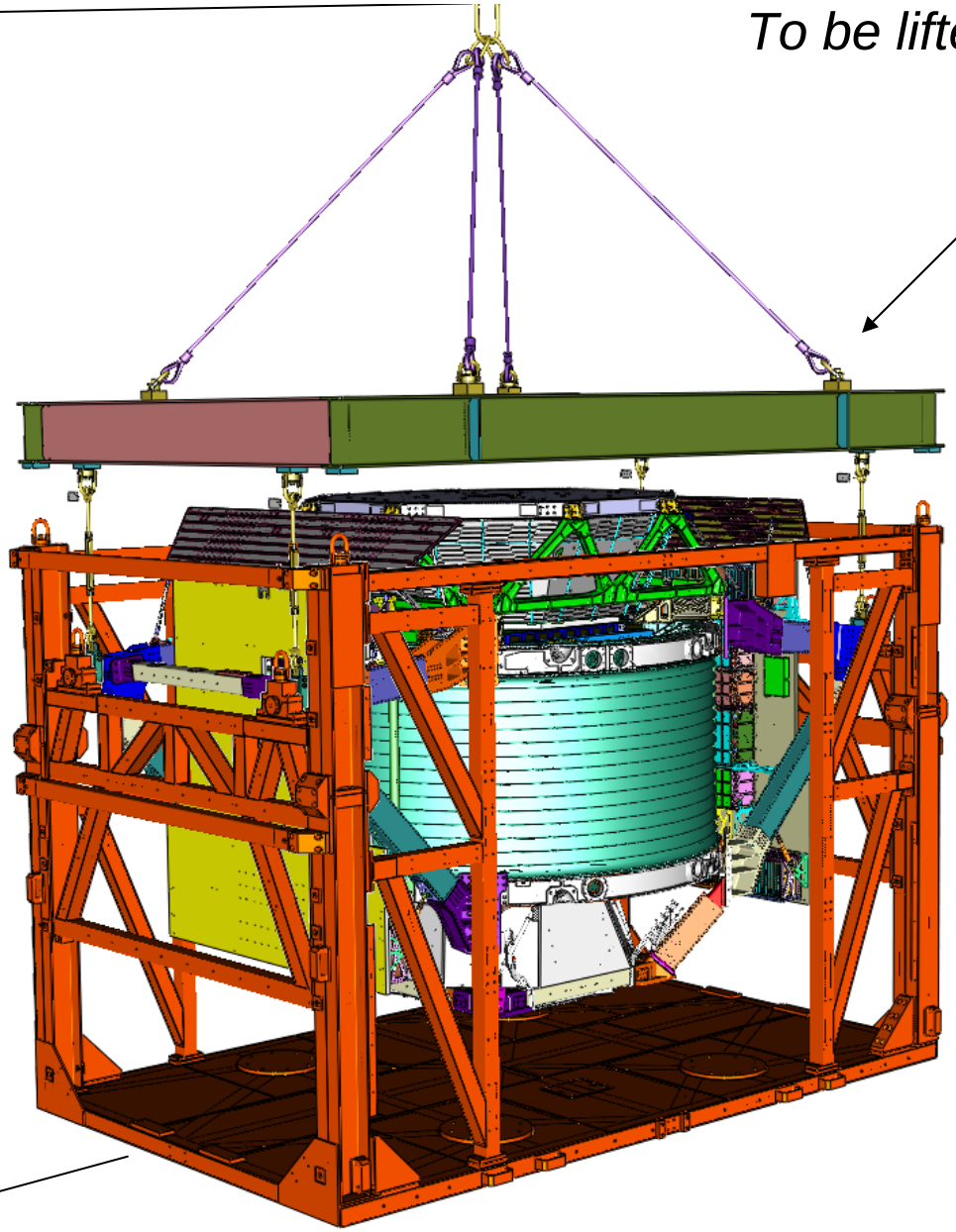
shipping box
without top cover
and side panel

AcceSS to the Test Area

To be lifted

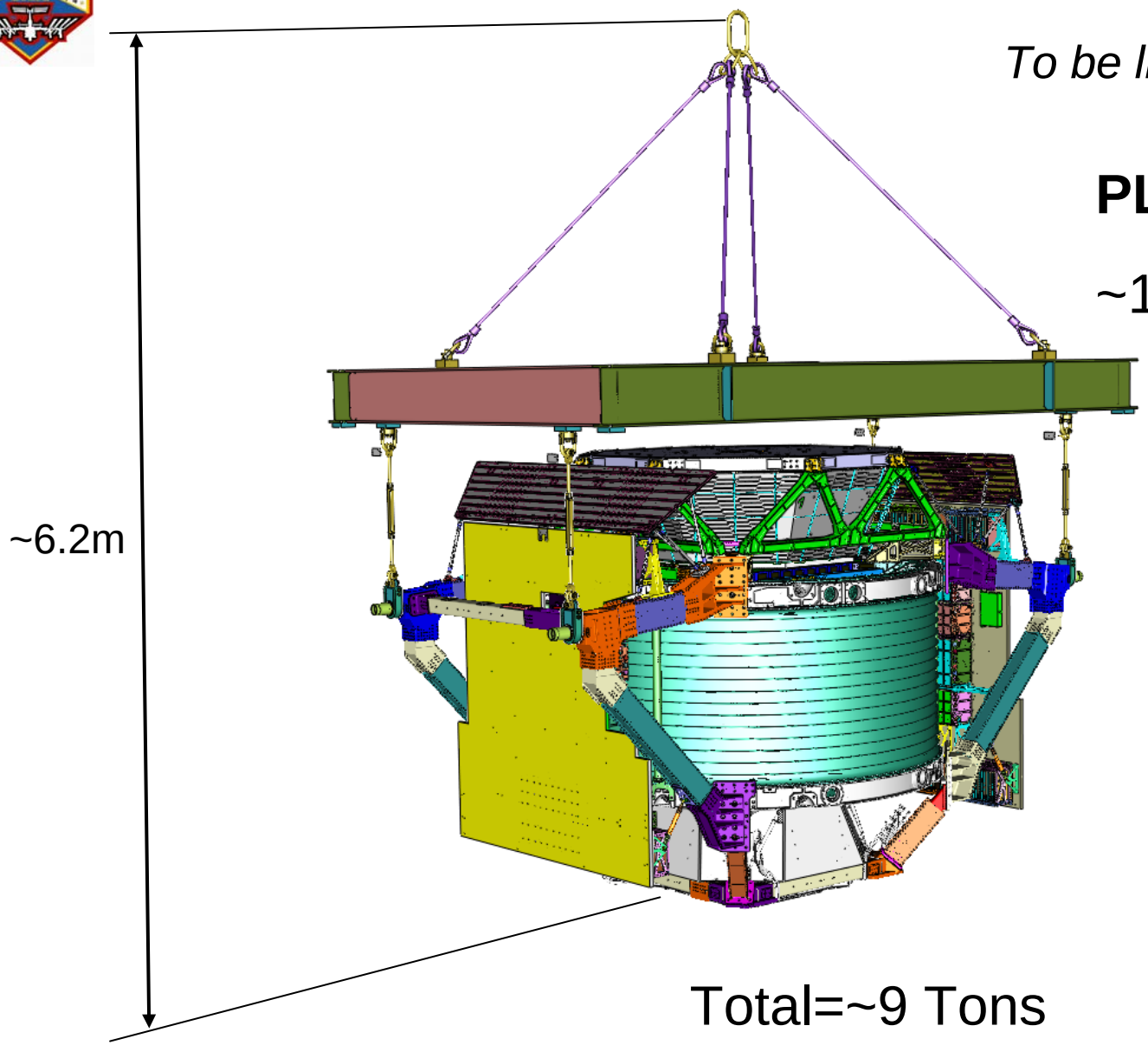
PLF

~1.95 Ton



~6.8m

AcceSS to the Test Area



To be lifted

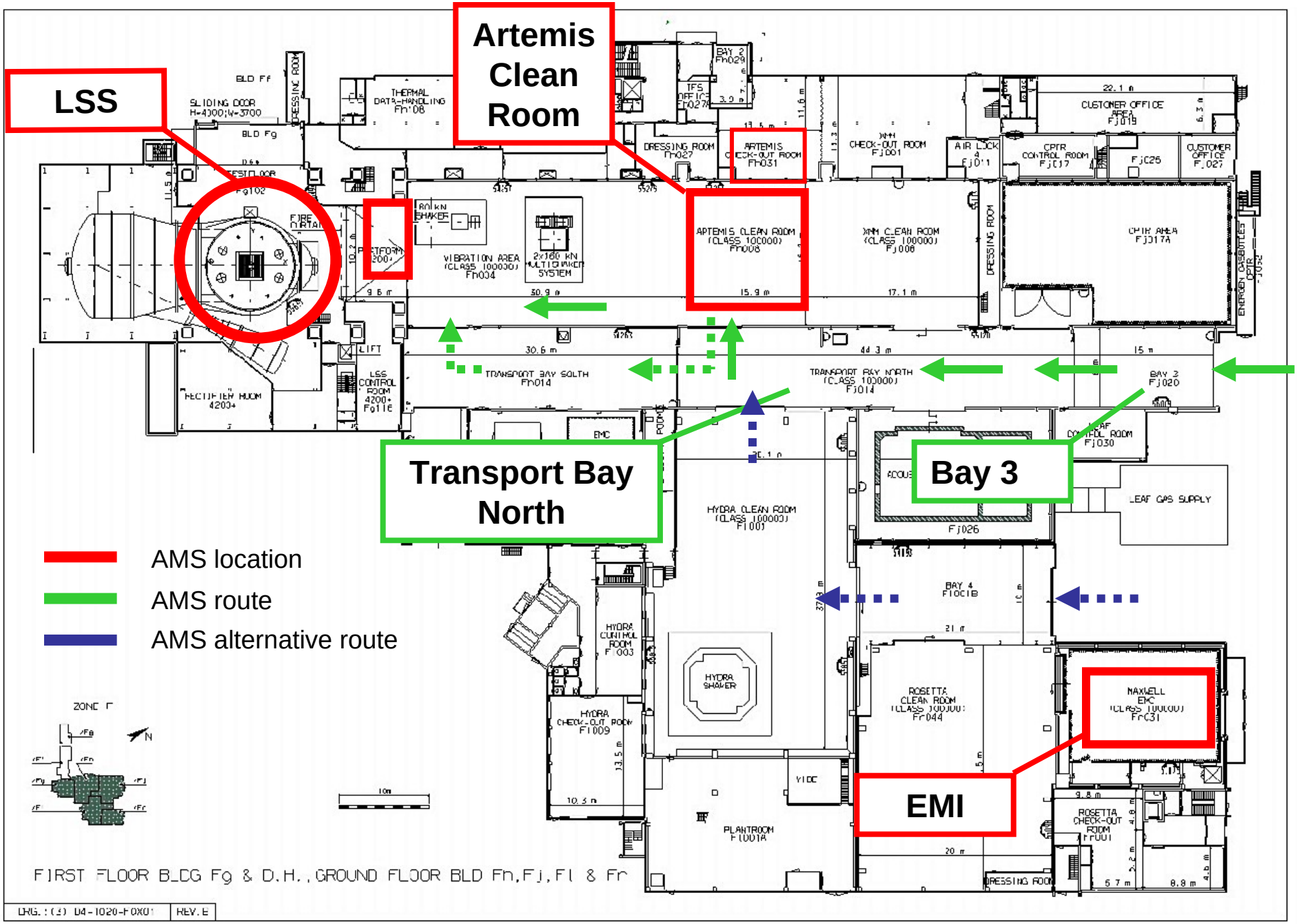
PLF

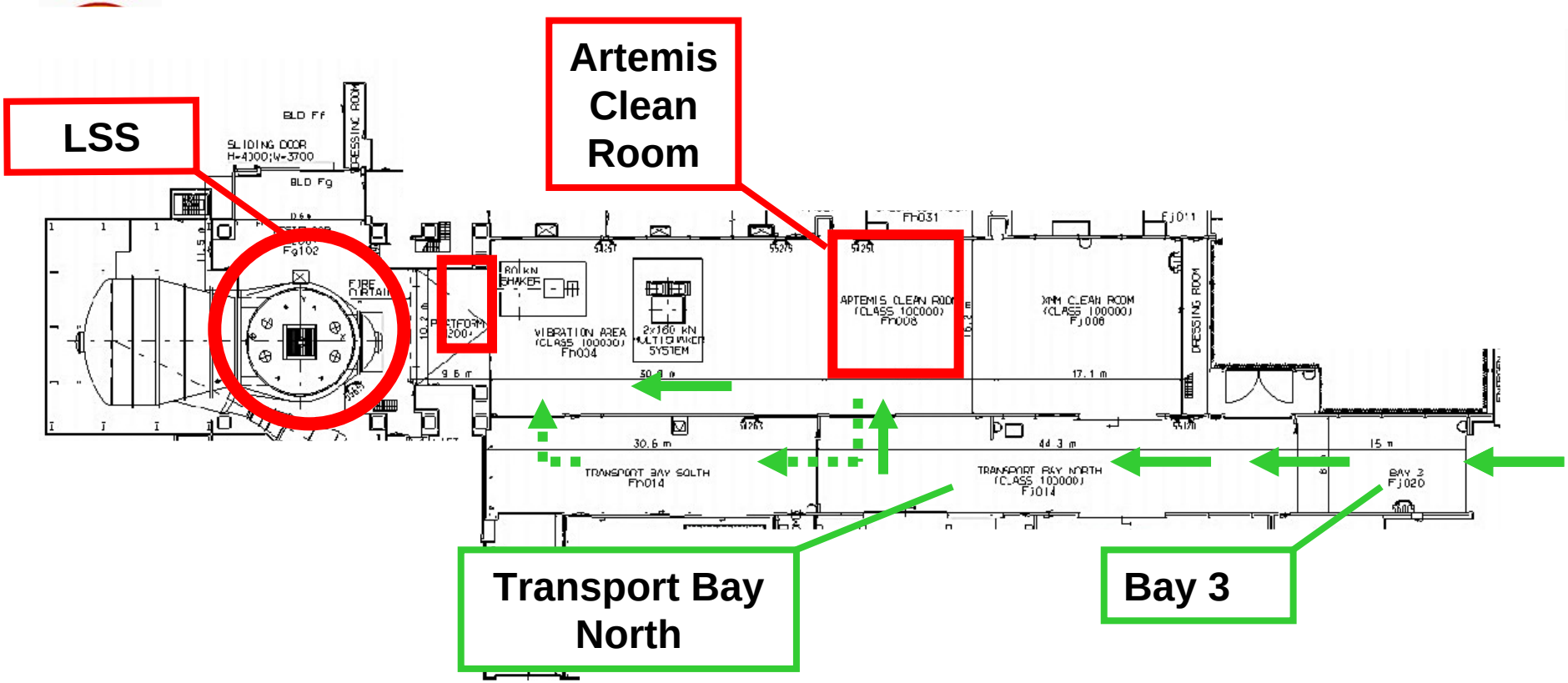
~1.95 Tons

AMS

~6.9 Tons

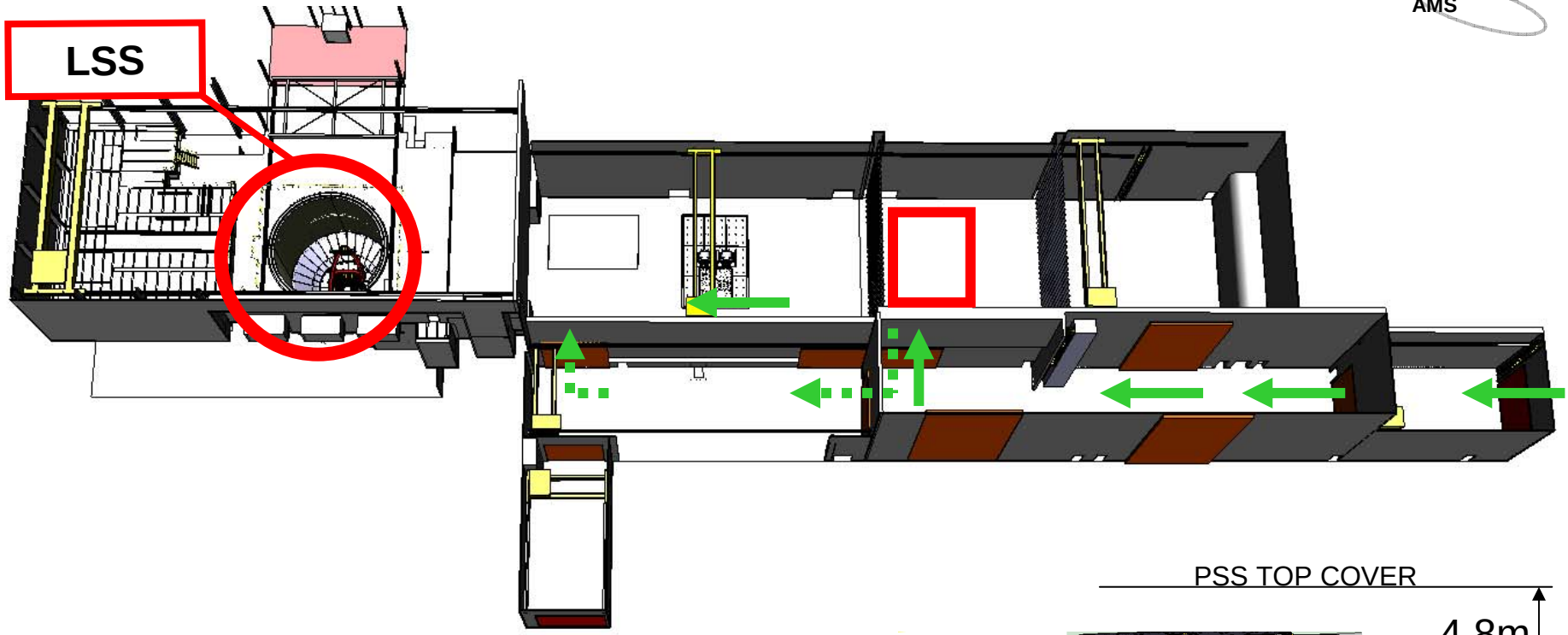
Total=~9 Tons

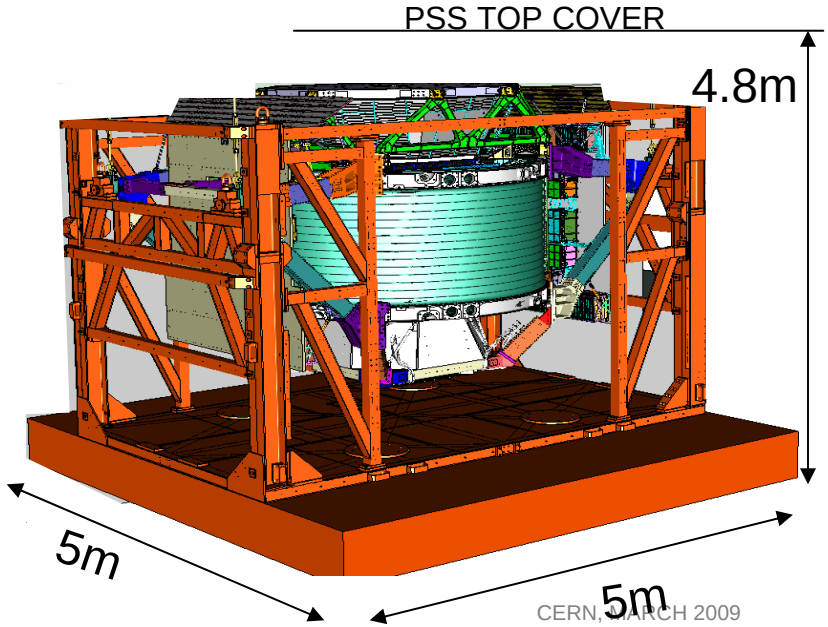

LSS
Artemis Clean Room
Transport Bay North
Bay 3
EMI
AMS location
AMS route
AMS alternative route
FIRST FLOOR BLDG Fg & D.H., GROUND FLOOR BLD Fh,Fj,Fl & Fr



FIRST FLOOR BLDG Fg & D.H., GROUND FLOOR BLD Fh, Fj, Fl & Fr

AMS MOVED AROUND ON AIR PALLET





NO CRANE CONTINUITY

AMS+PSS will be moved on AIR PADS

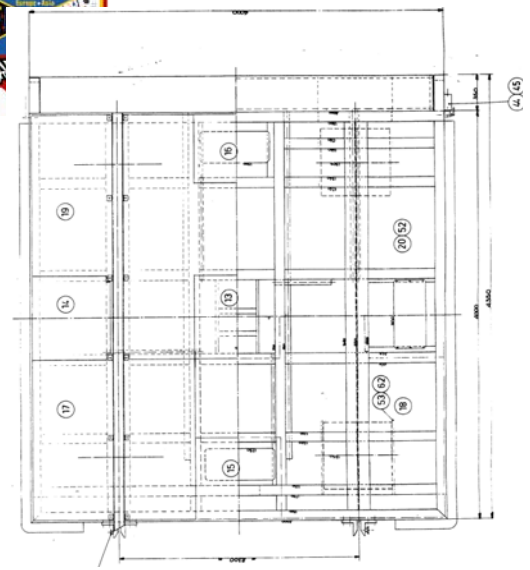
AIR_PADS

5x5x0.5m 15 ton

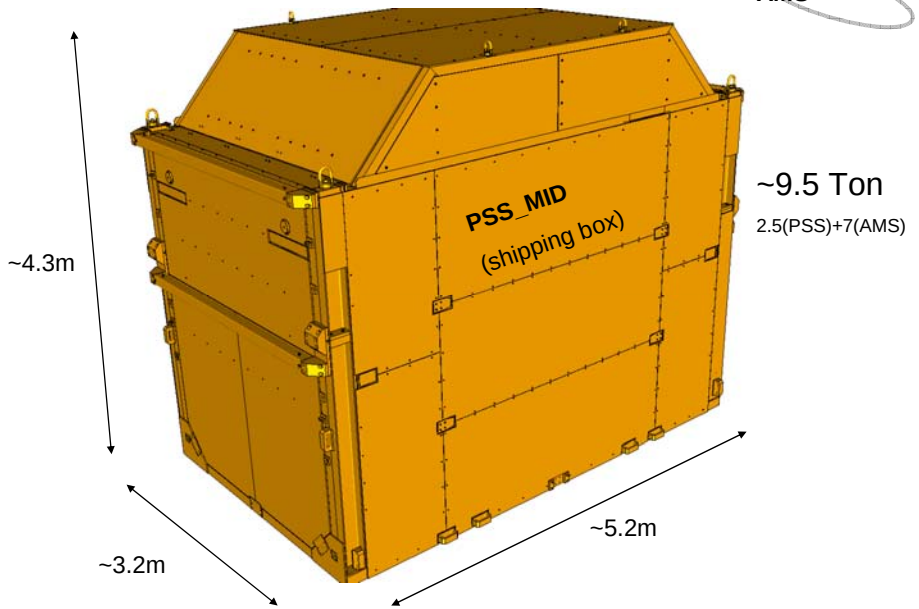
or

4x4x0.5m 20 ton

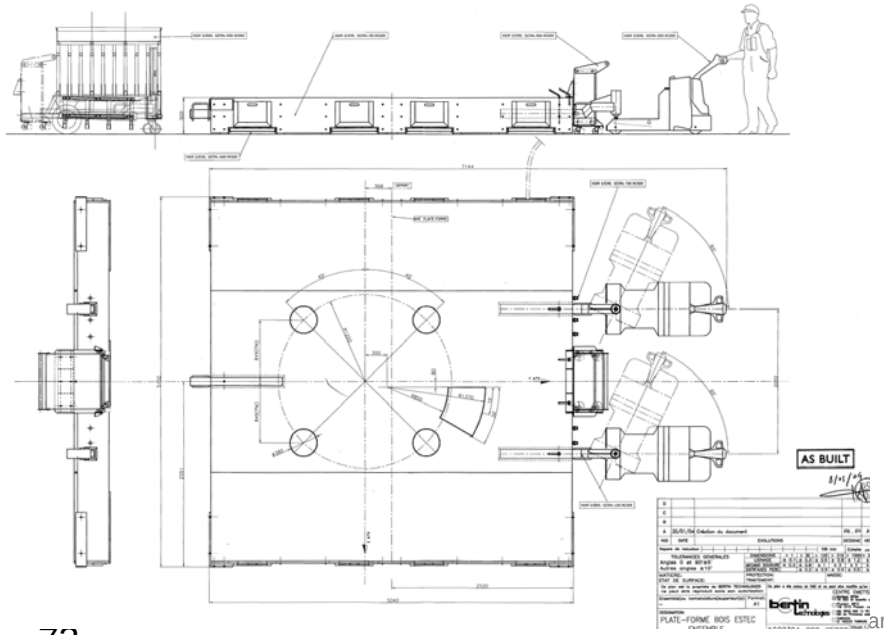
AIR PALLETS AVAILABLE AT ESTEC

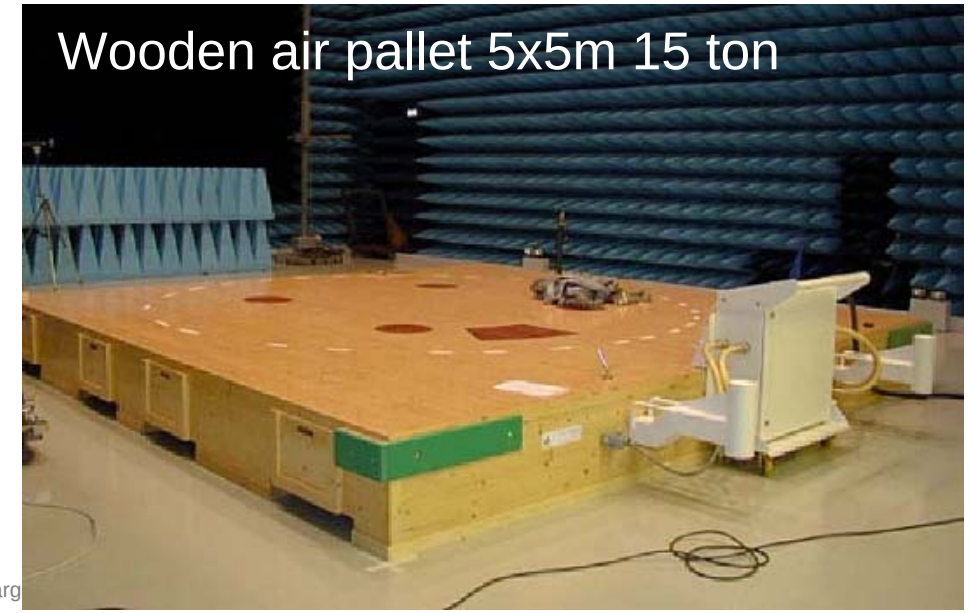


Steel air pallet 4x4m 20 ton

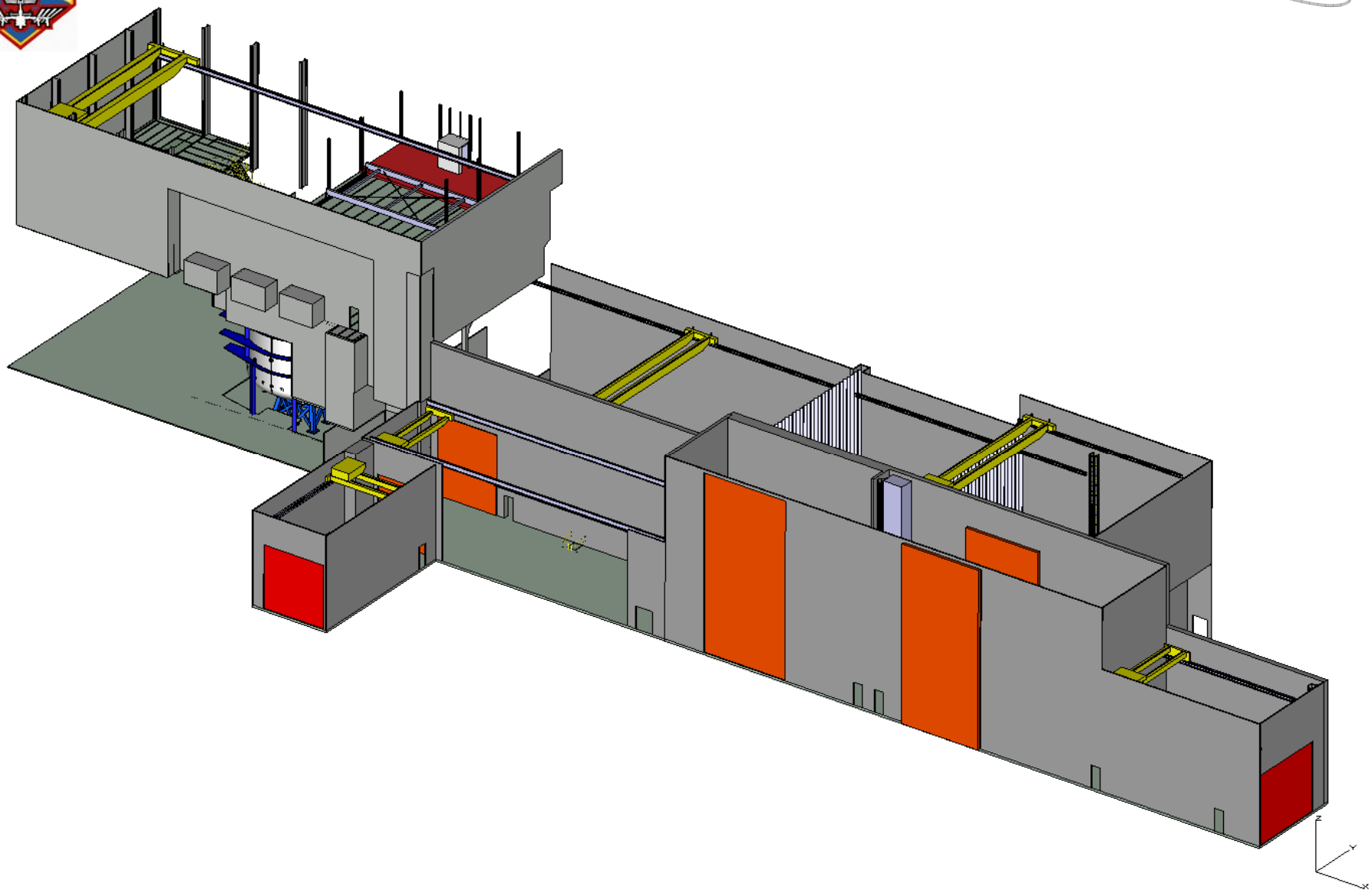


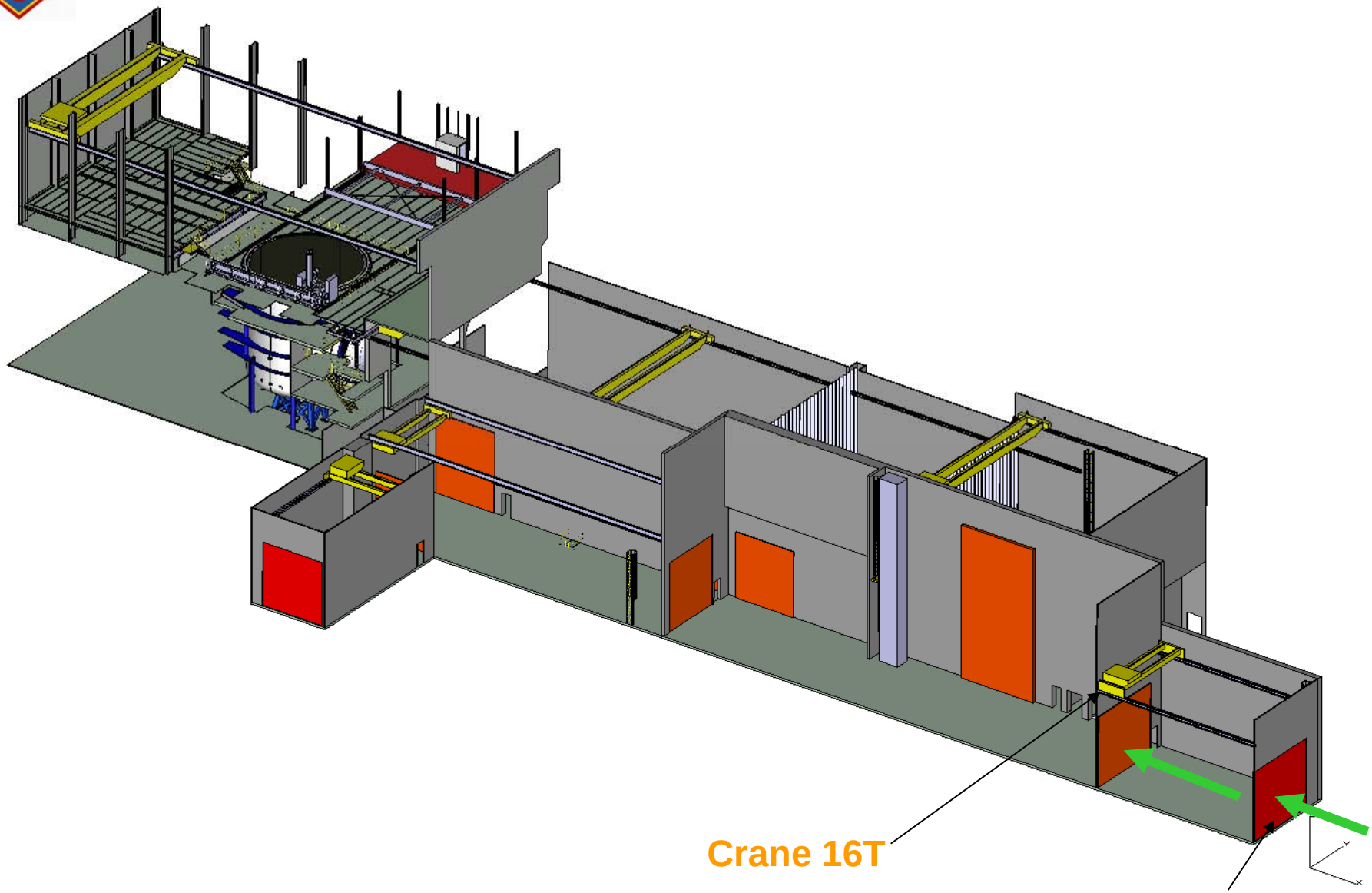
~9.5 Ton
2.5(PSS)+7(AMS)

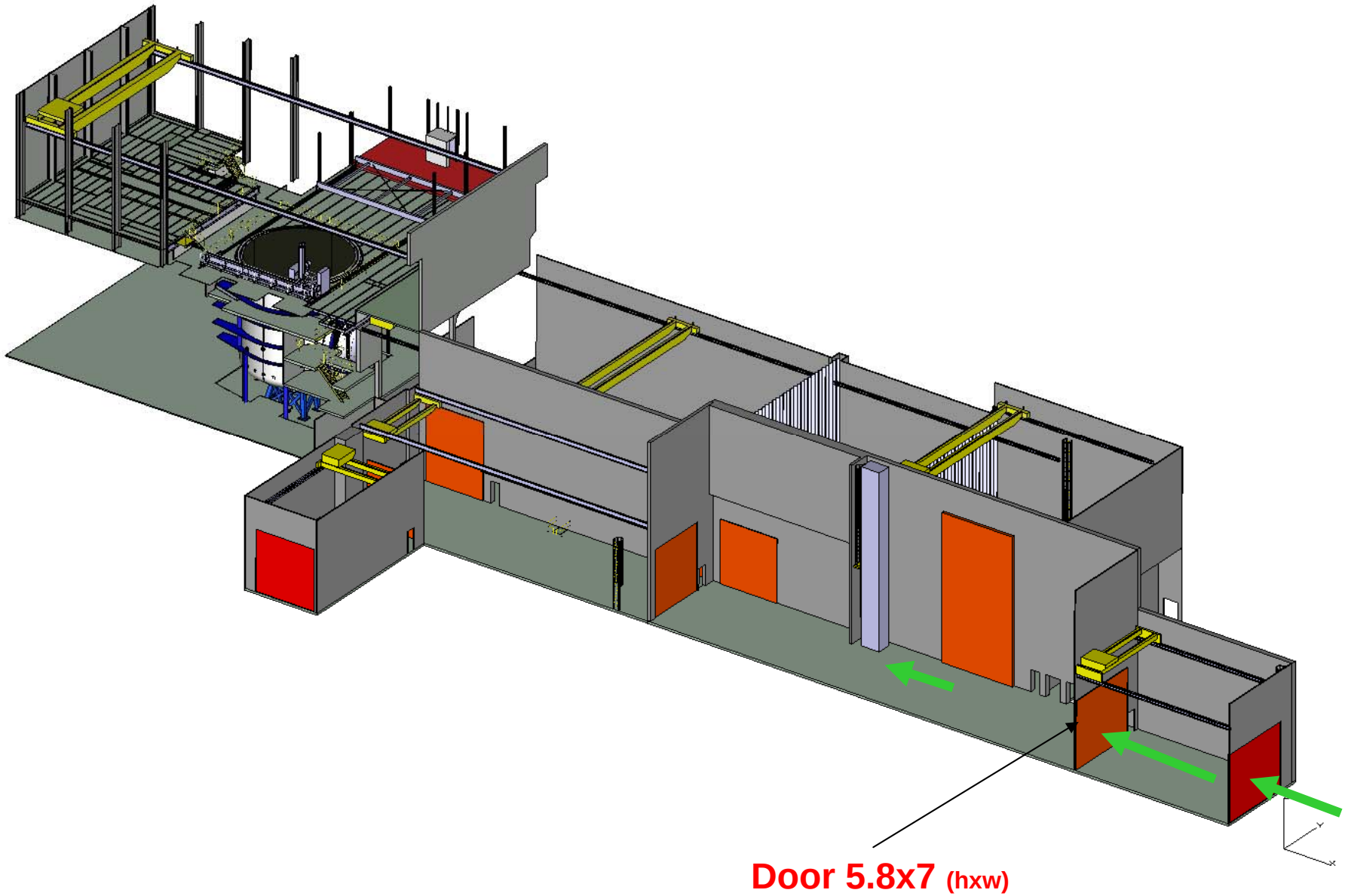


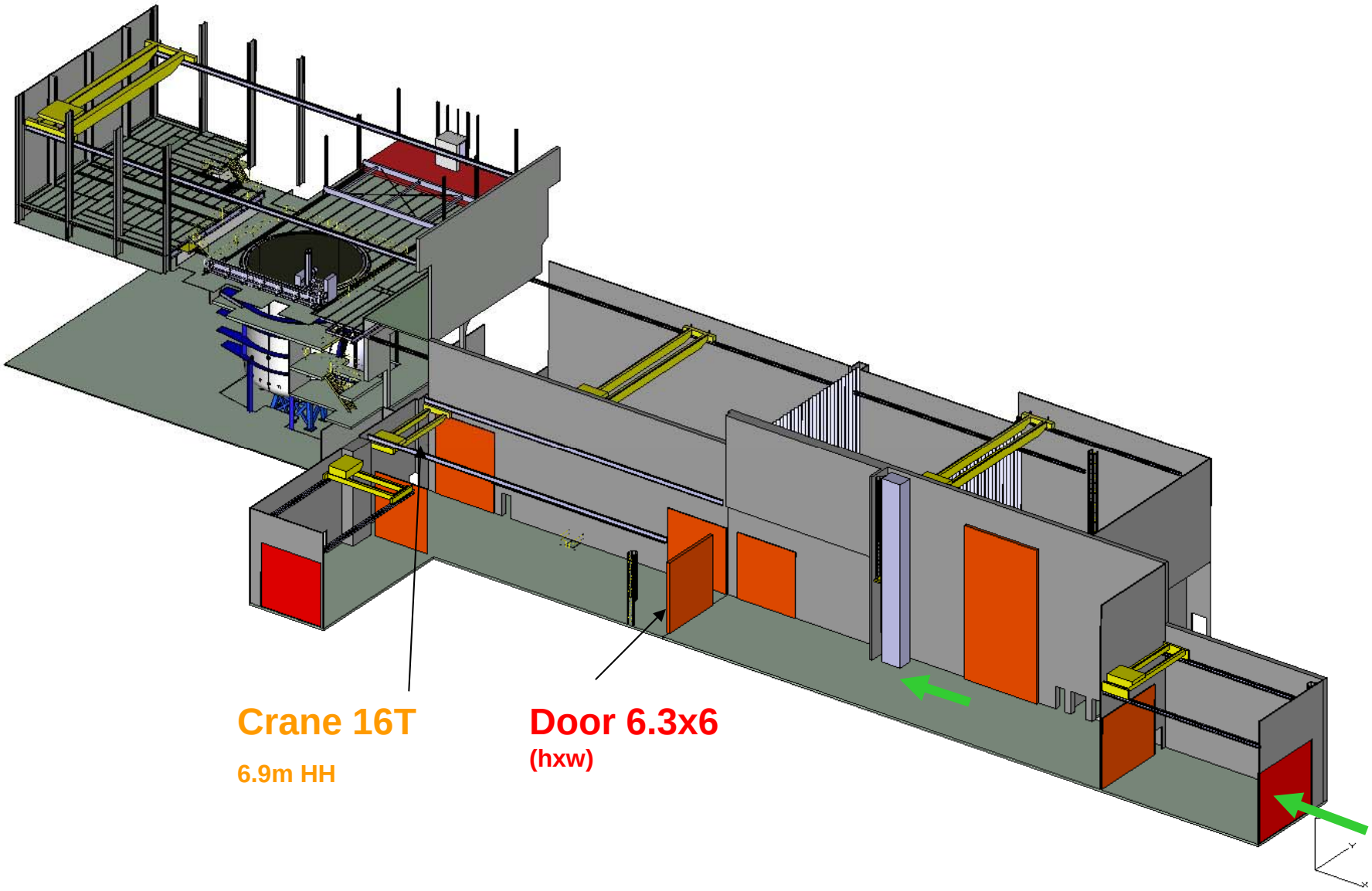


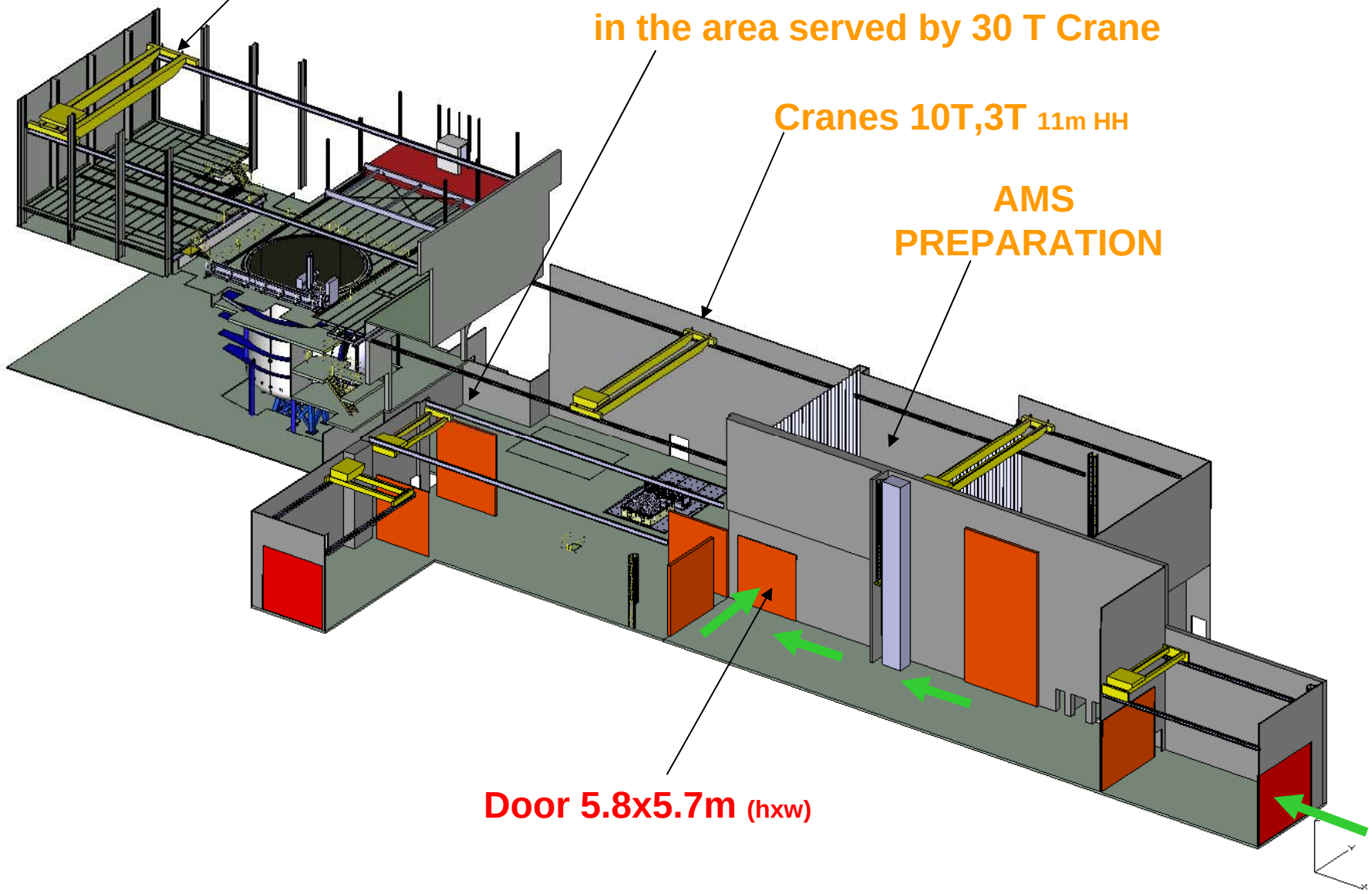
Wooden air pallet 5x5m 15 ton

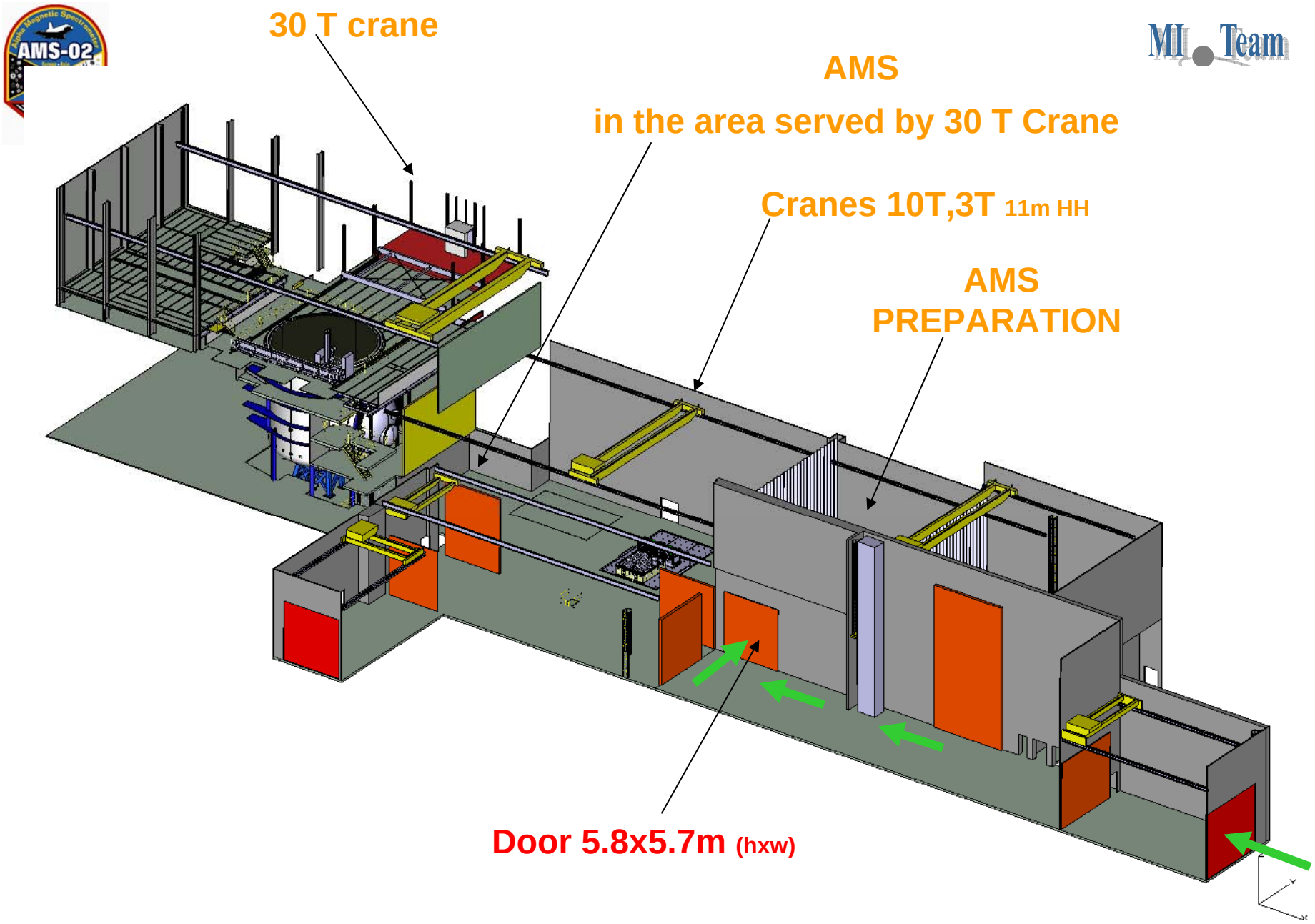



Crane 16T
8.8m Hook Height
Door 6x7m (hxw)

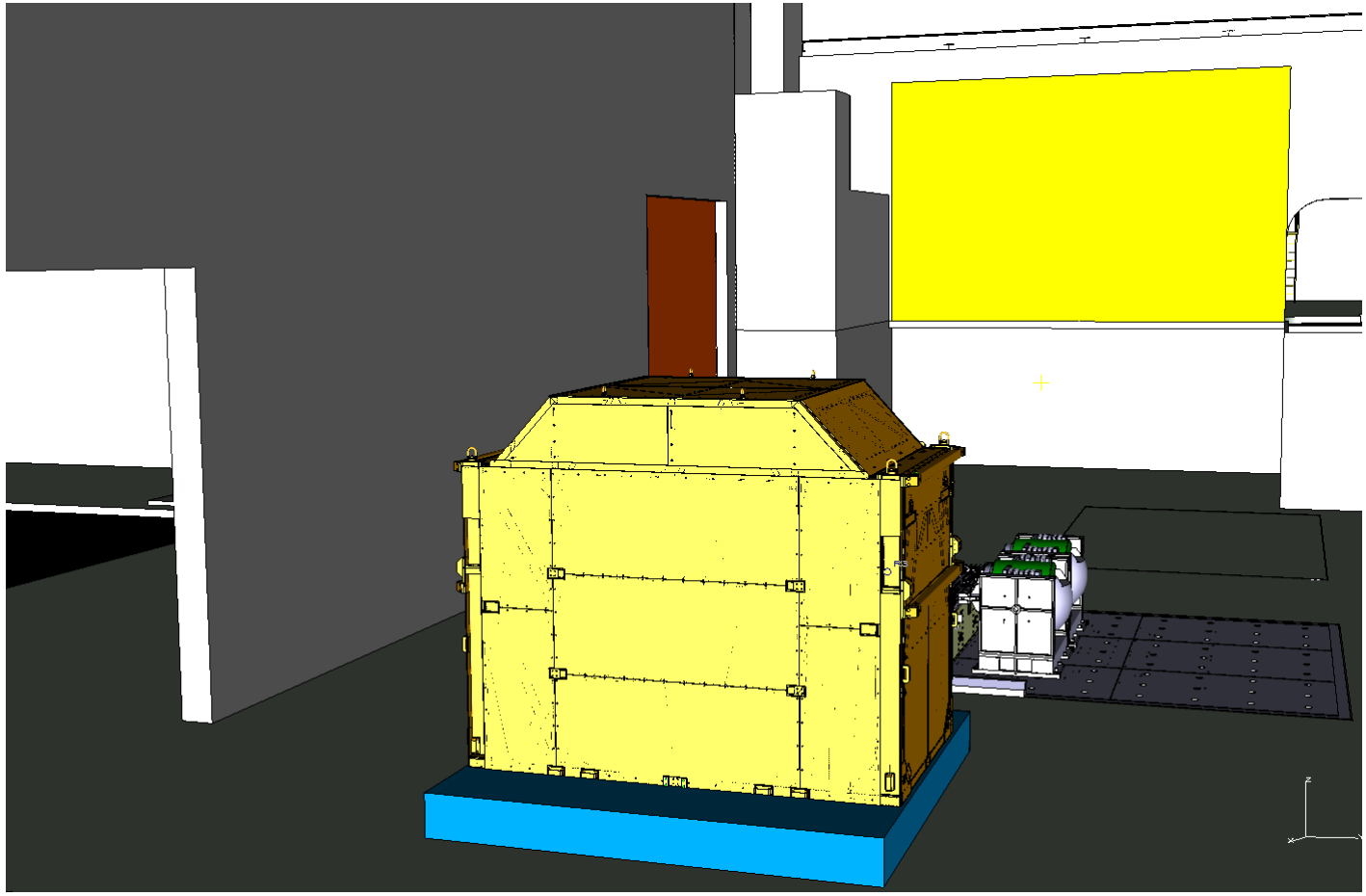

Door 5.8x7 (hxw)


Crane 16T
6.9m HH
Door 6.3x6
(hxw)

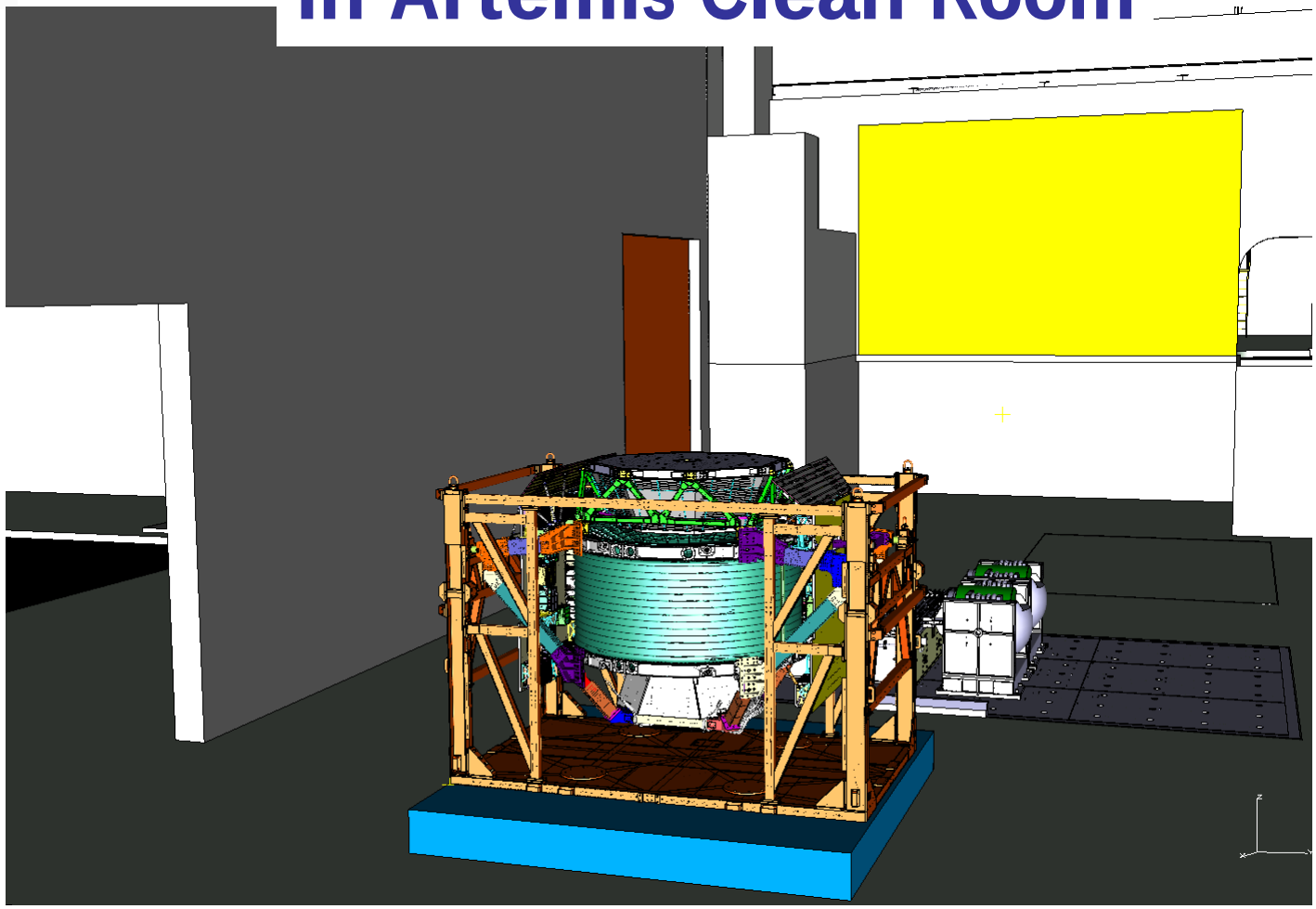

30 T,1T,2T
cranes
AMS
in the area served by 30 T Crane
Cranes 10T,3T 11m HH
AMS
PREPARATION
Door 5.8x5.7m (hxw)


30 T crane
AMS
in the area served by 30 T Crane
Cranes 10T,3T 11m HH
AMS
PREPARATION
Door 5.8x5.7m (hxw)

AMS preparation in Artemis Clean Room

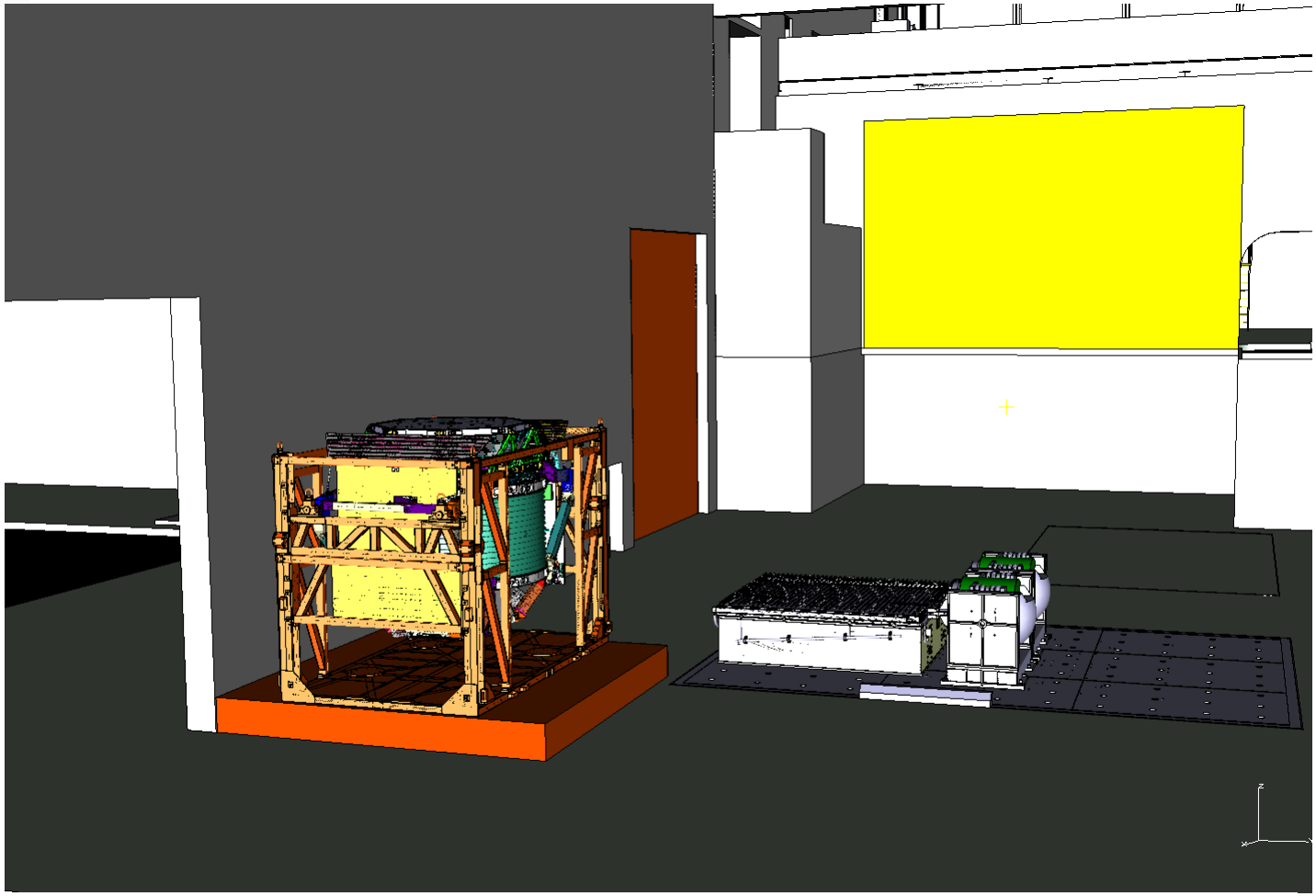


AMS preparation in Artemis Clean Room



DISASSEMBLE SHIPPING CONTAINER (PSS)

AMS going to LSS

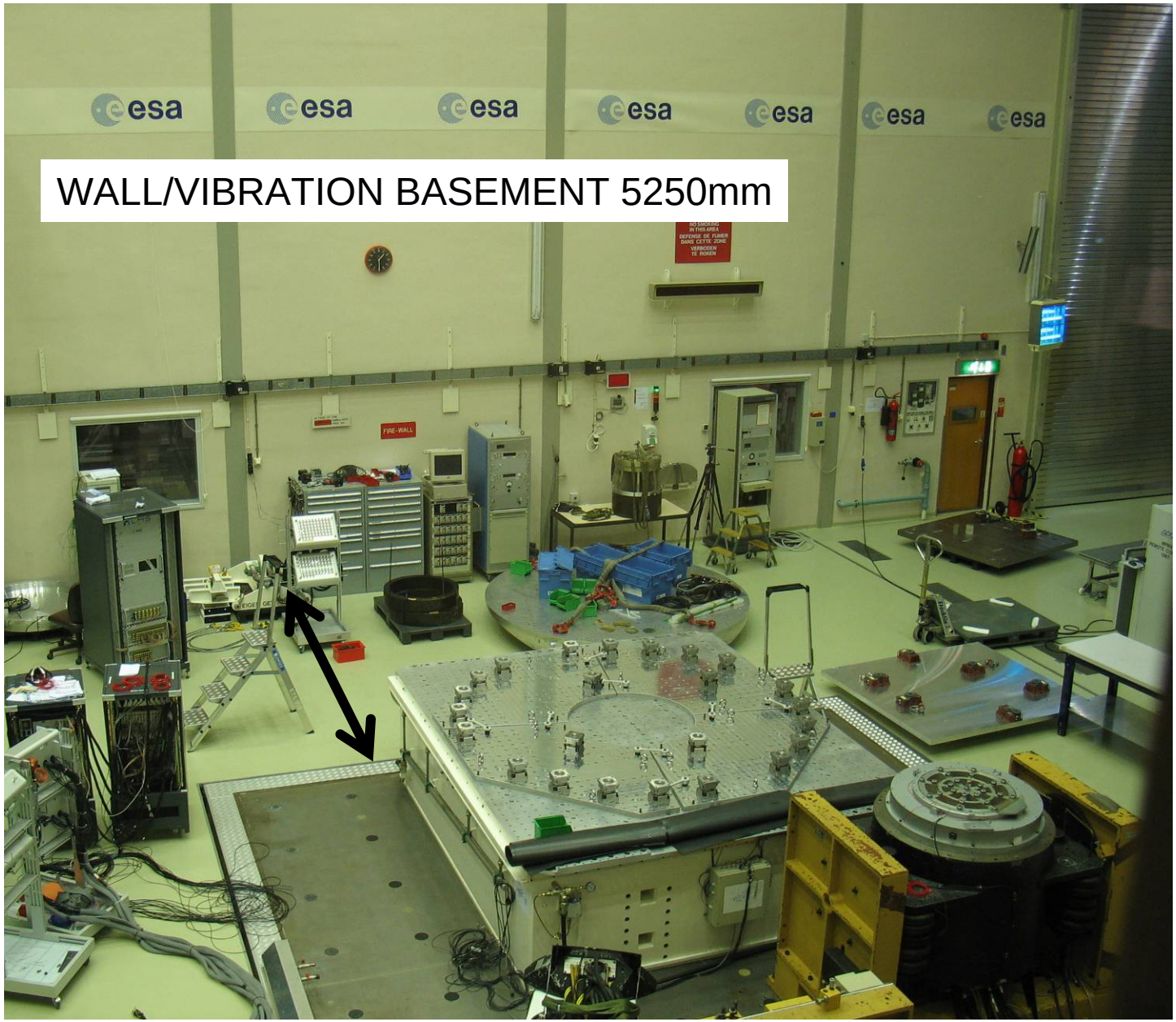


WALL/VIBRATION BASEMENT 5250mm

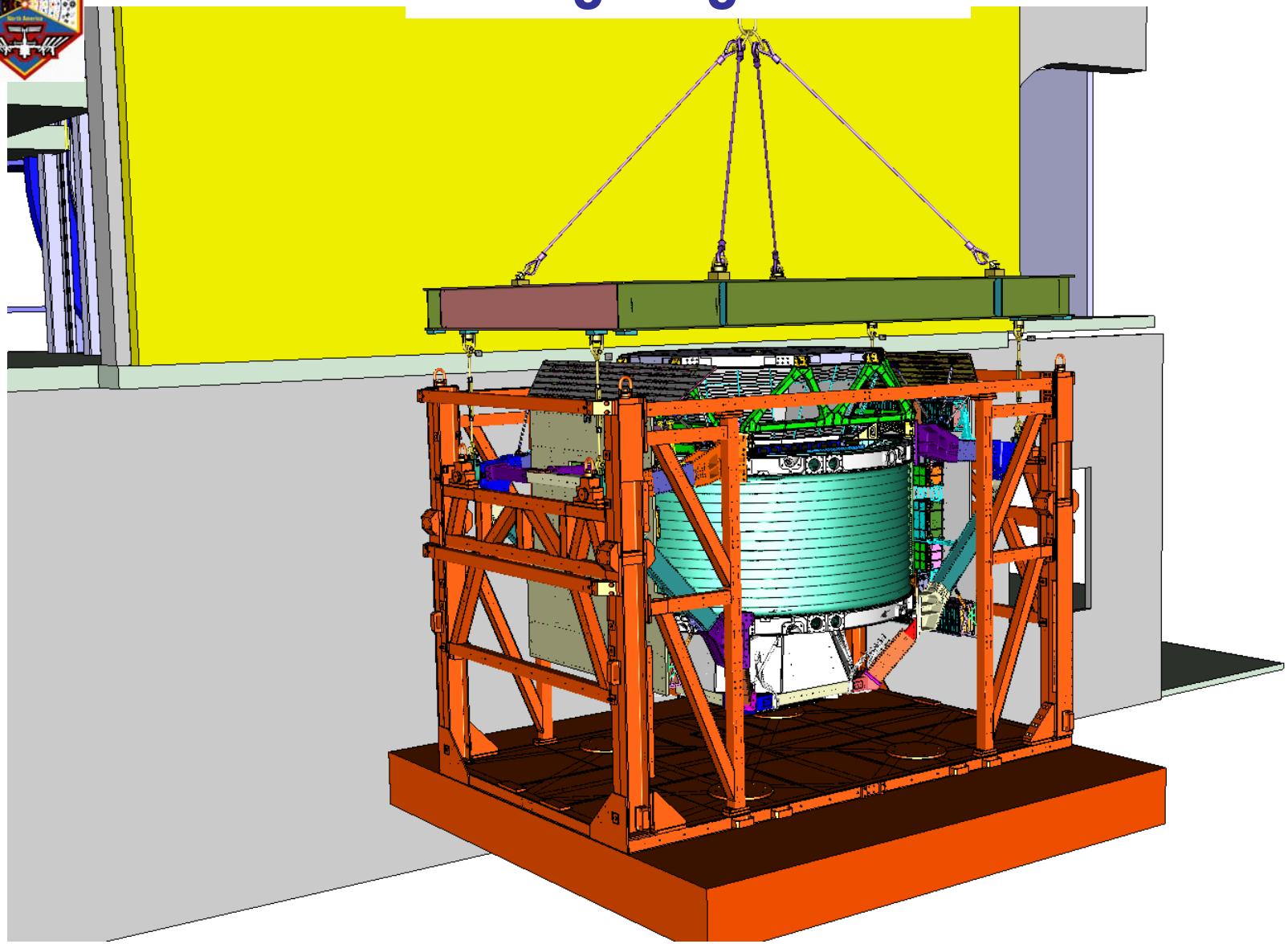
AIR PADS MAX OVERALL WIDTH 5102mm

In alternative it is possible to use the 4x4m air pallet (TBD)

AMS going to LSS

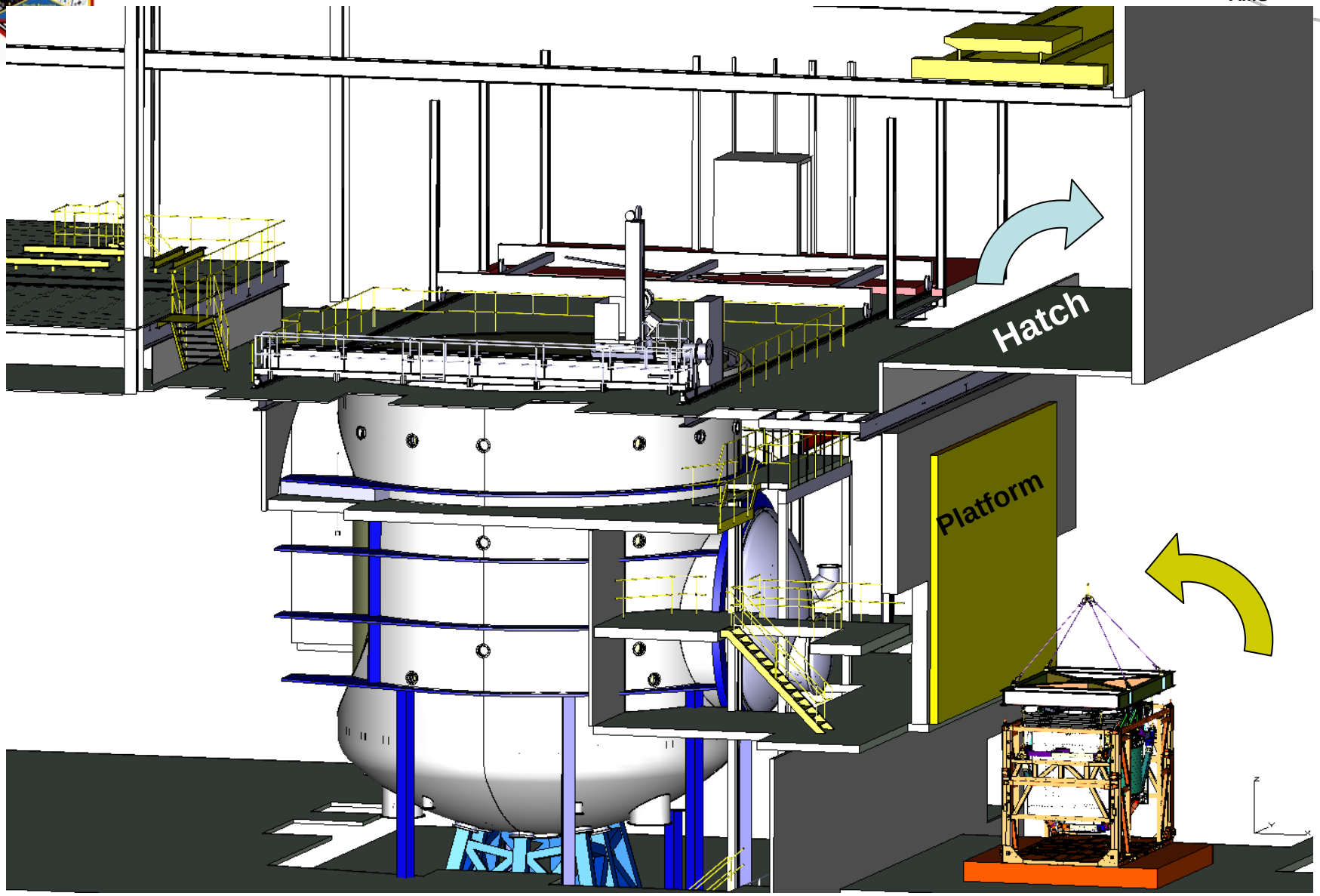

WALL/VIBRATION BASEMENT 5250mm

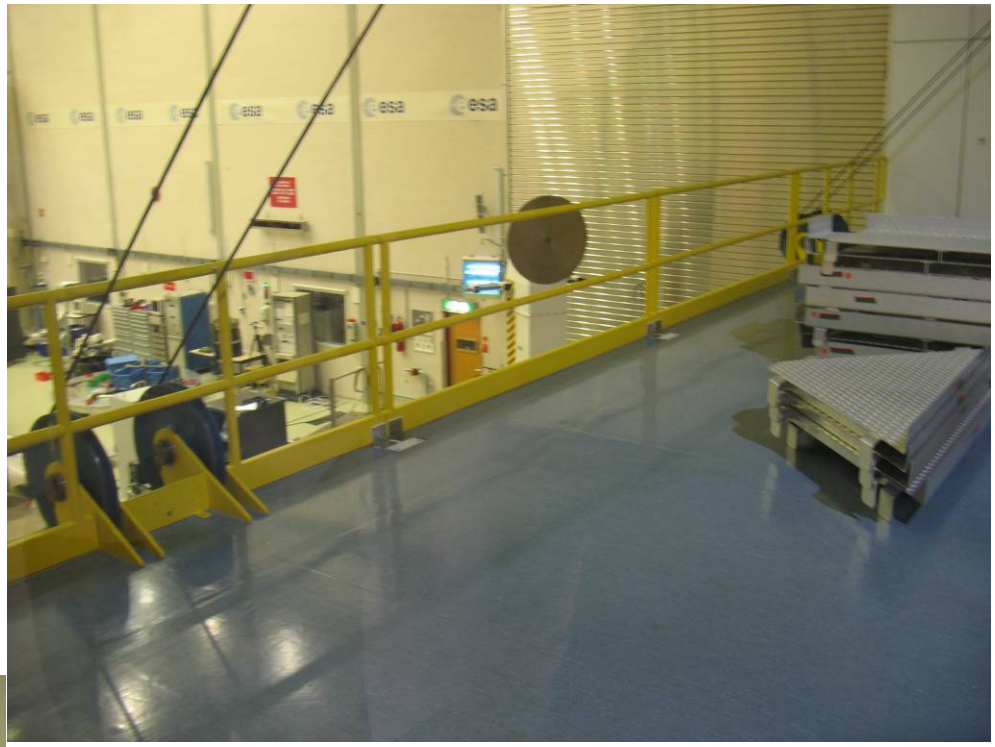
AMS going to LSS



AMS in the 30T crane served area

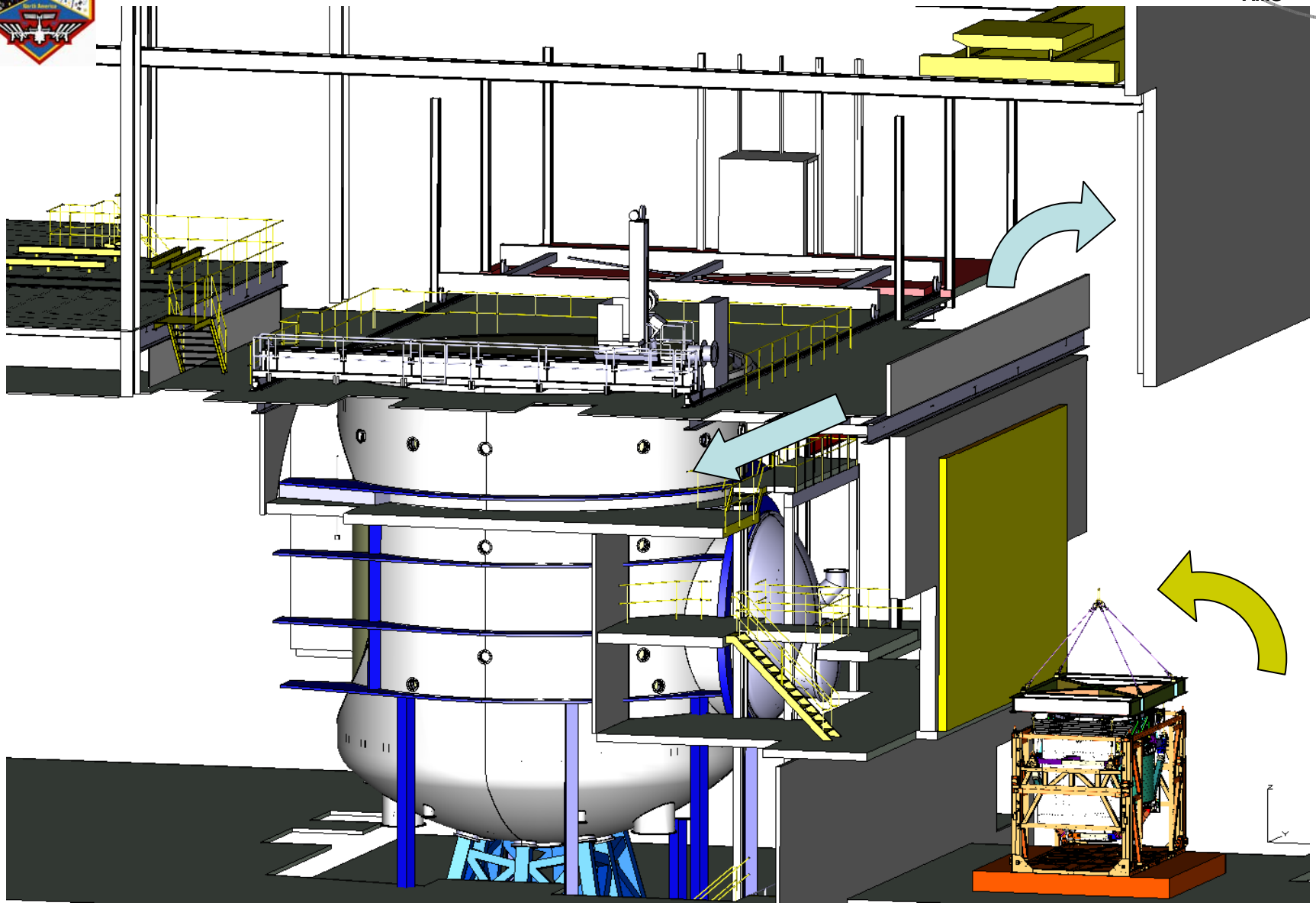
AMS LIFTING



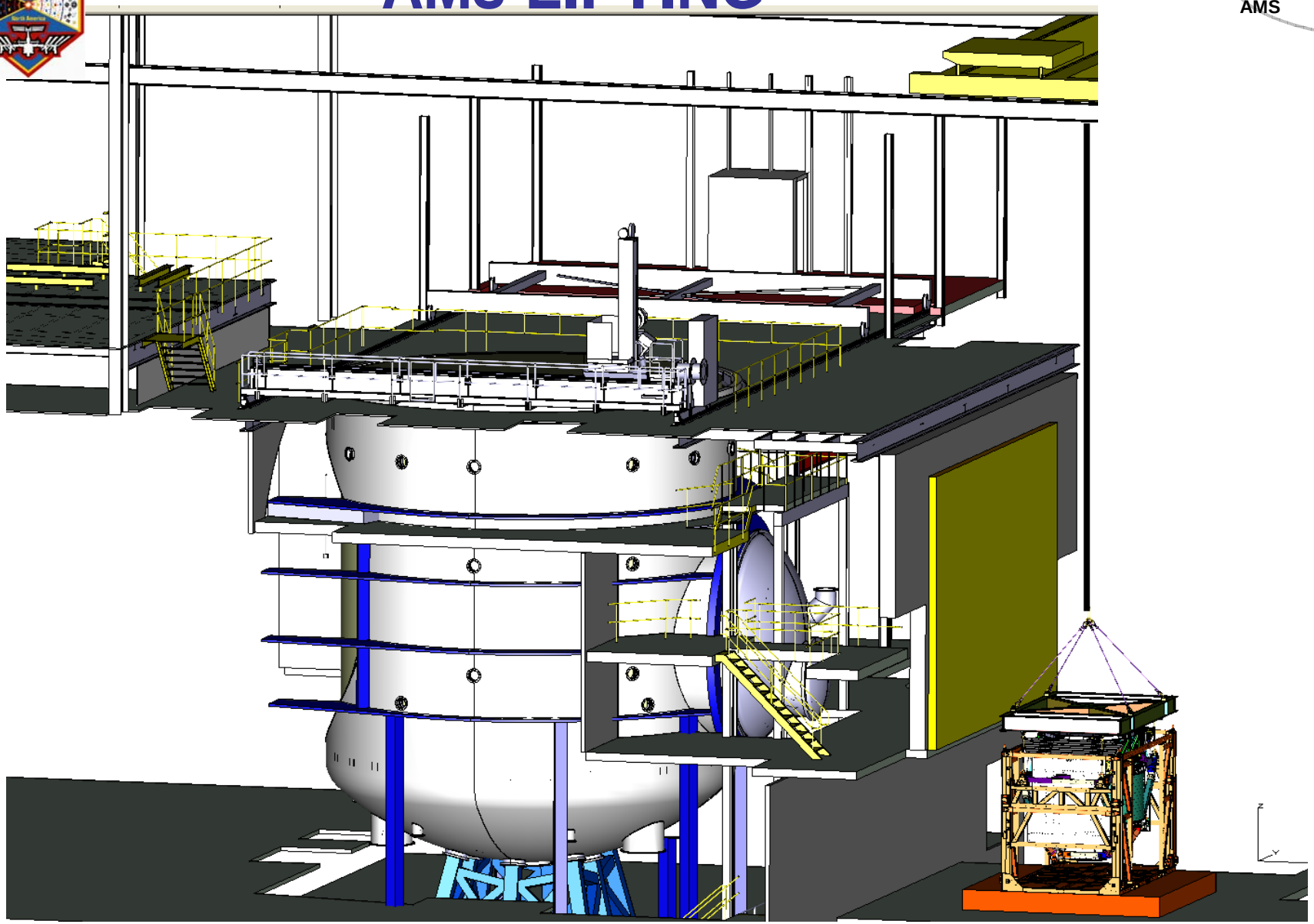

esa

ESTEC
APCO

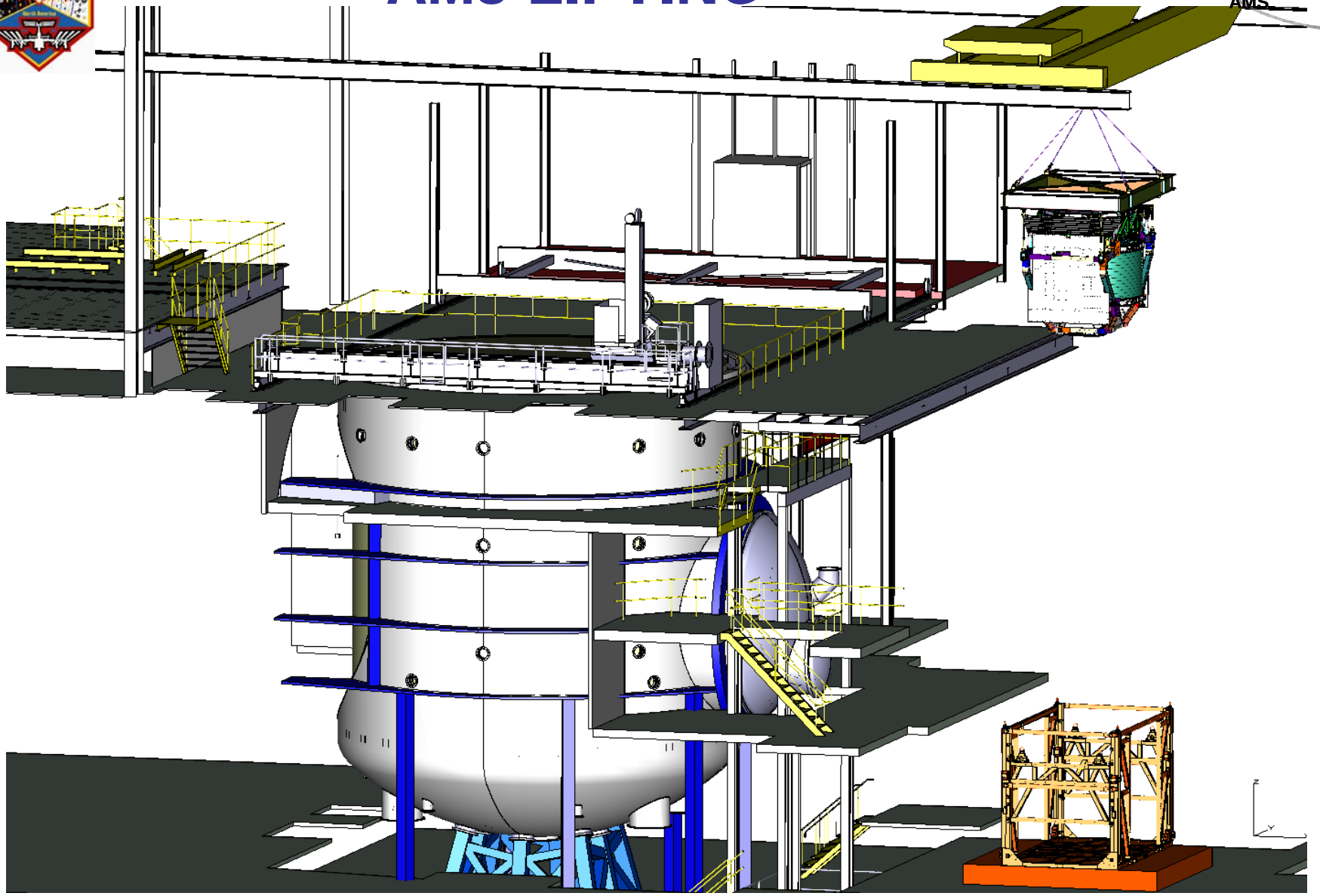
AMS LIFTING



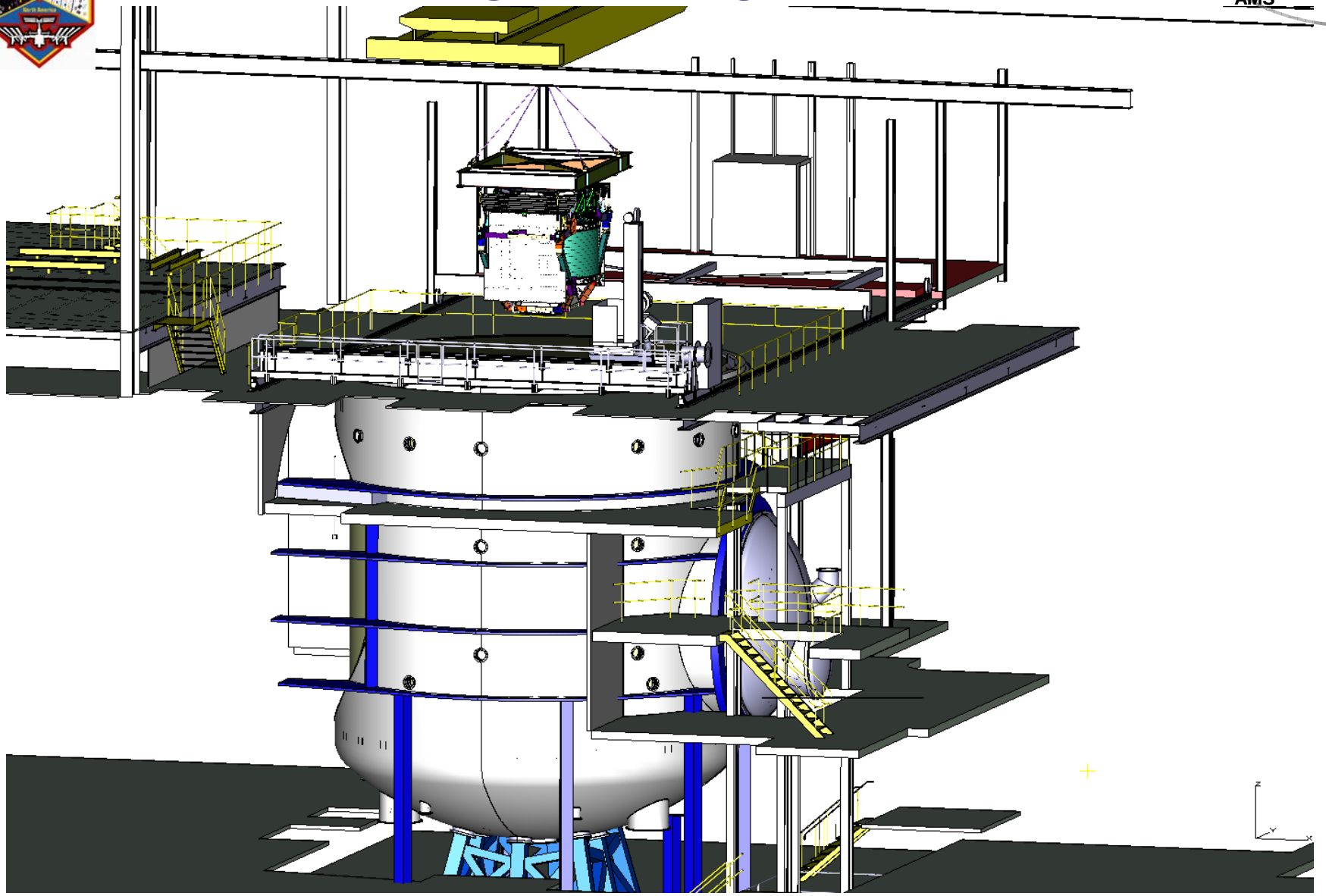
AMS LIFTING



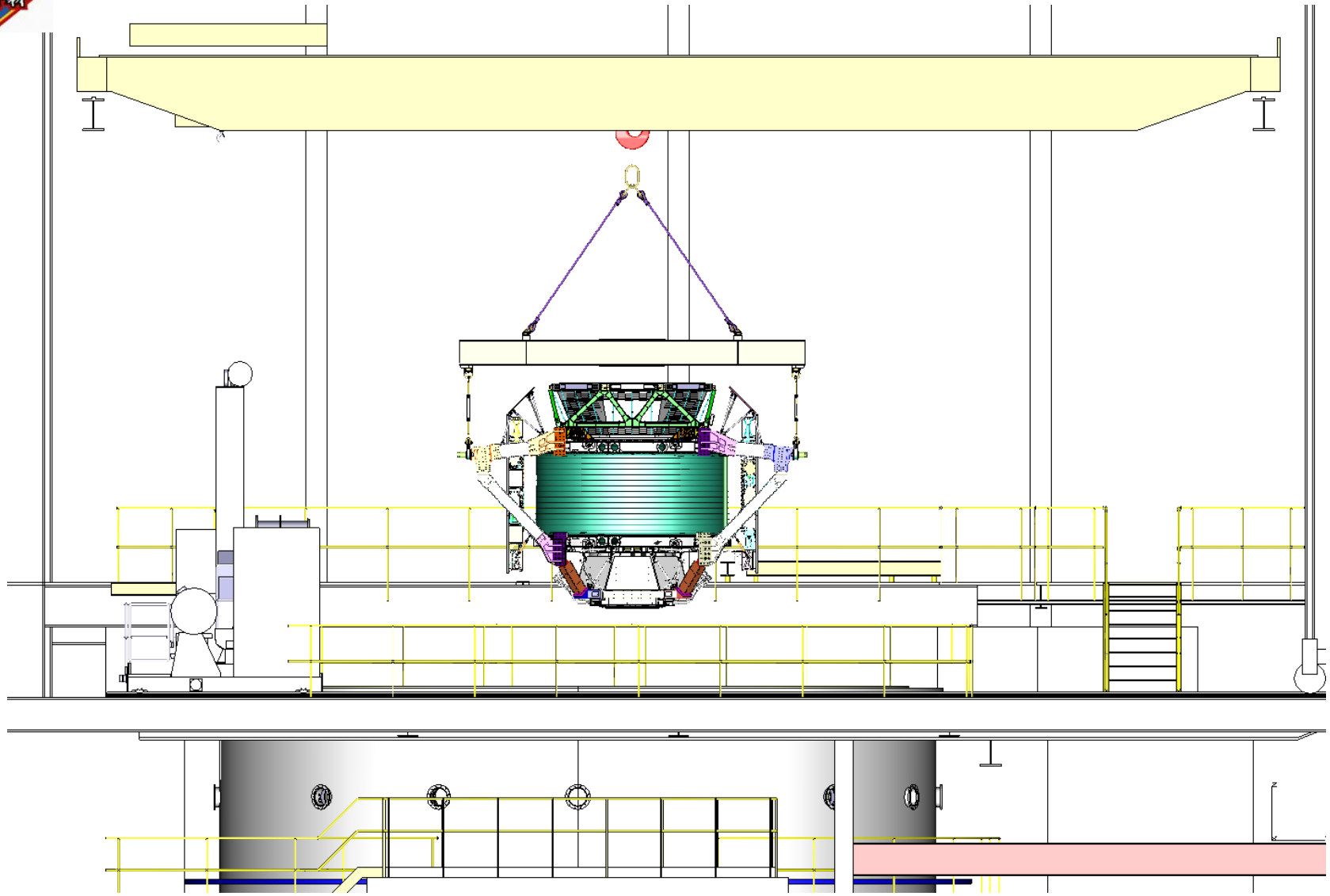
AMS LIFTING



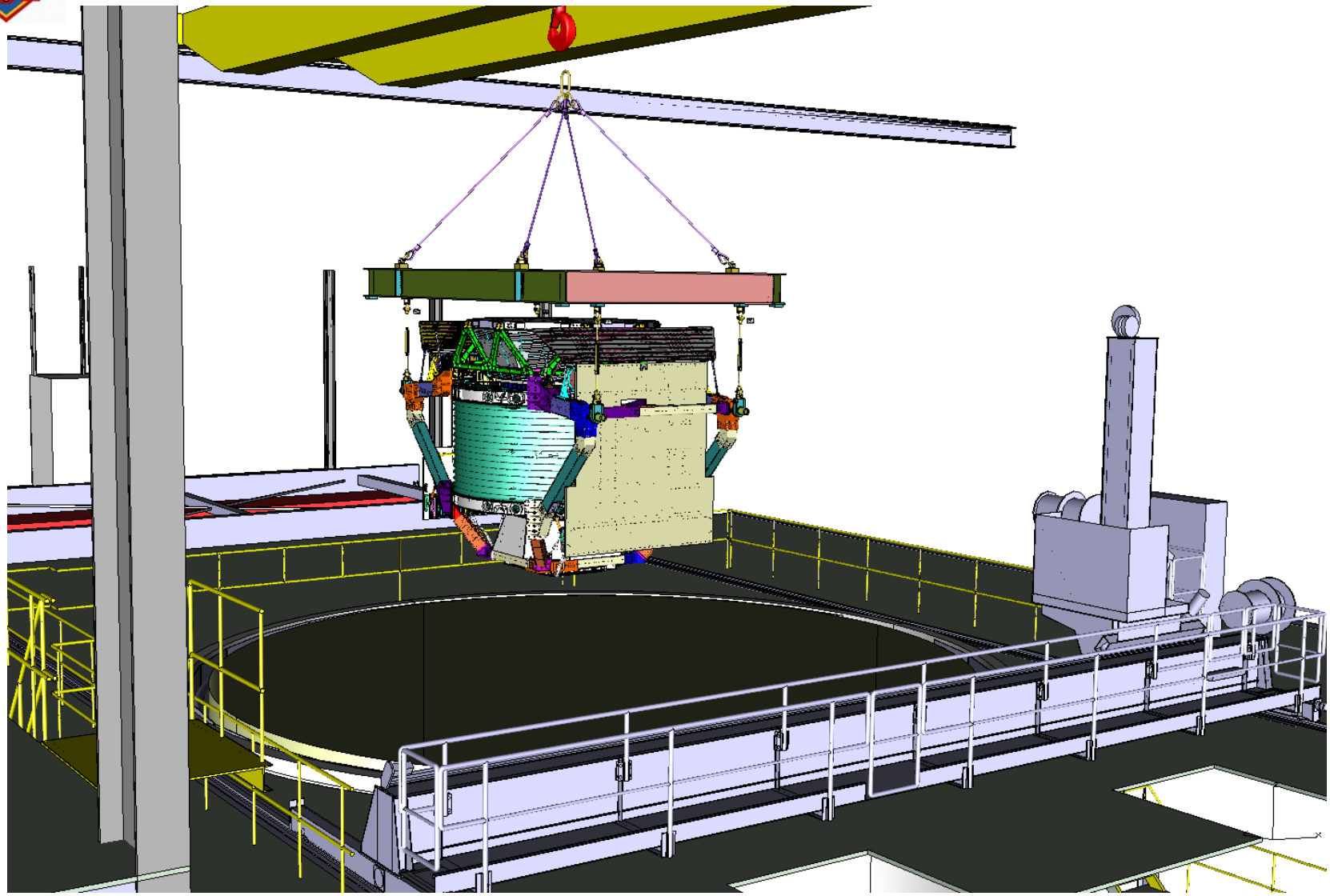
AMS LIFTING



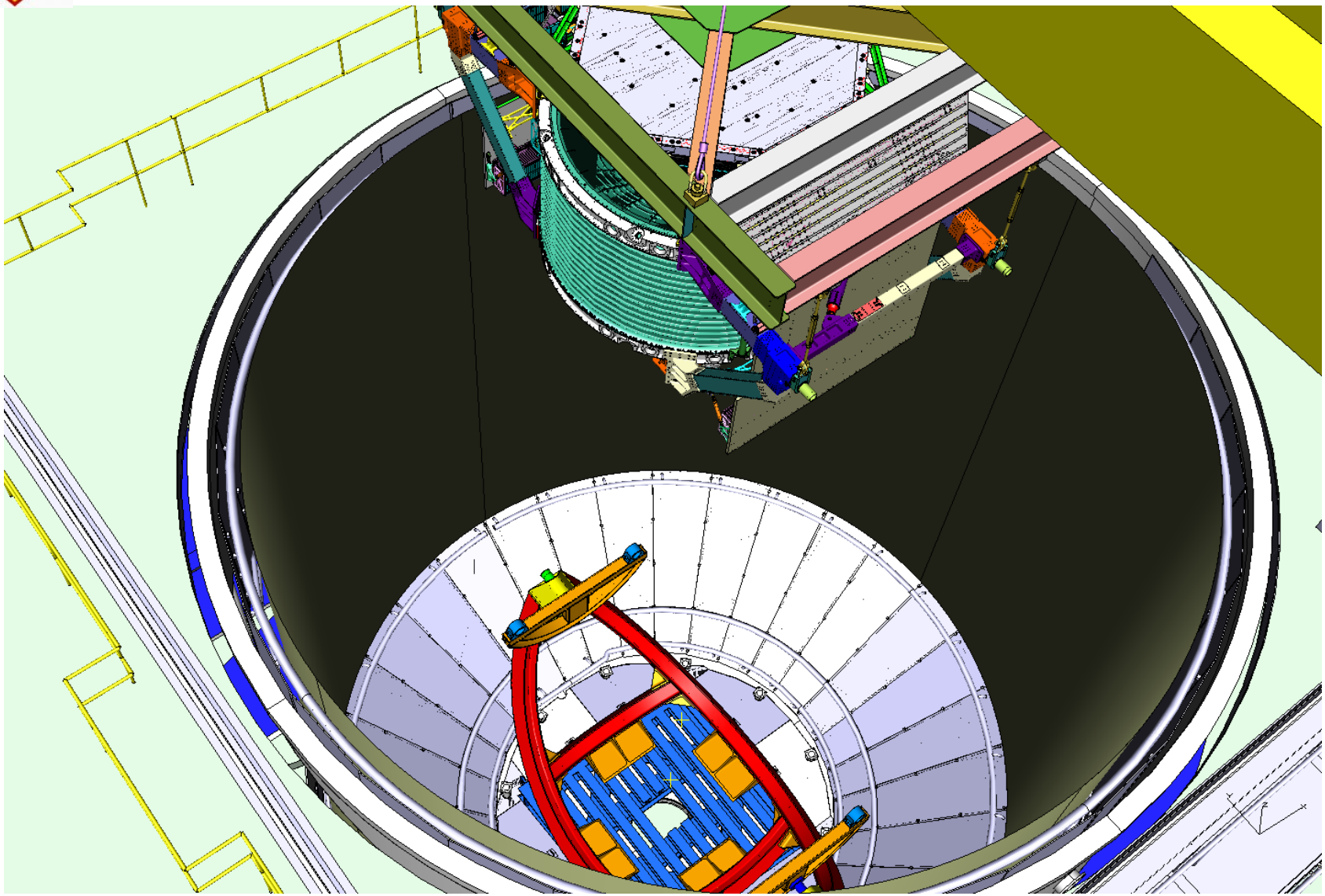
AMS LIFTING



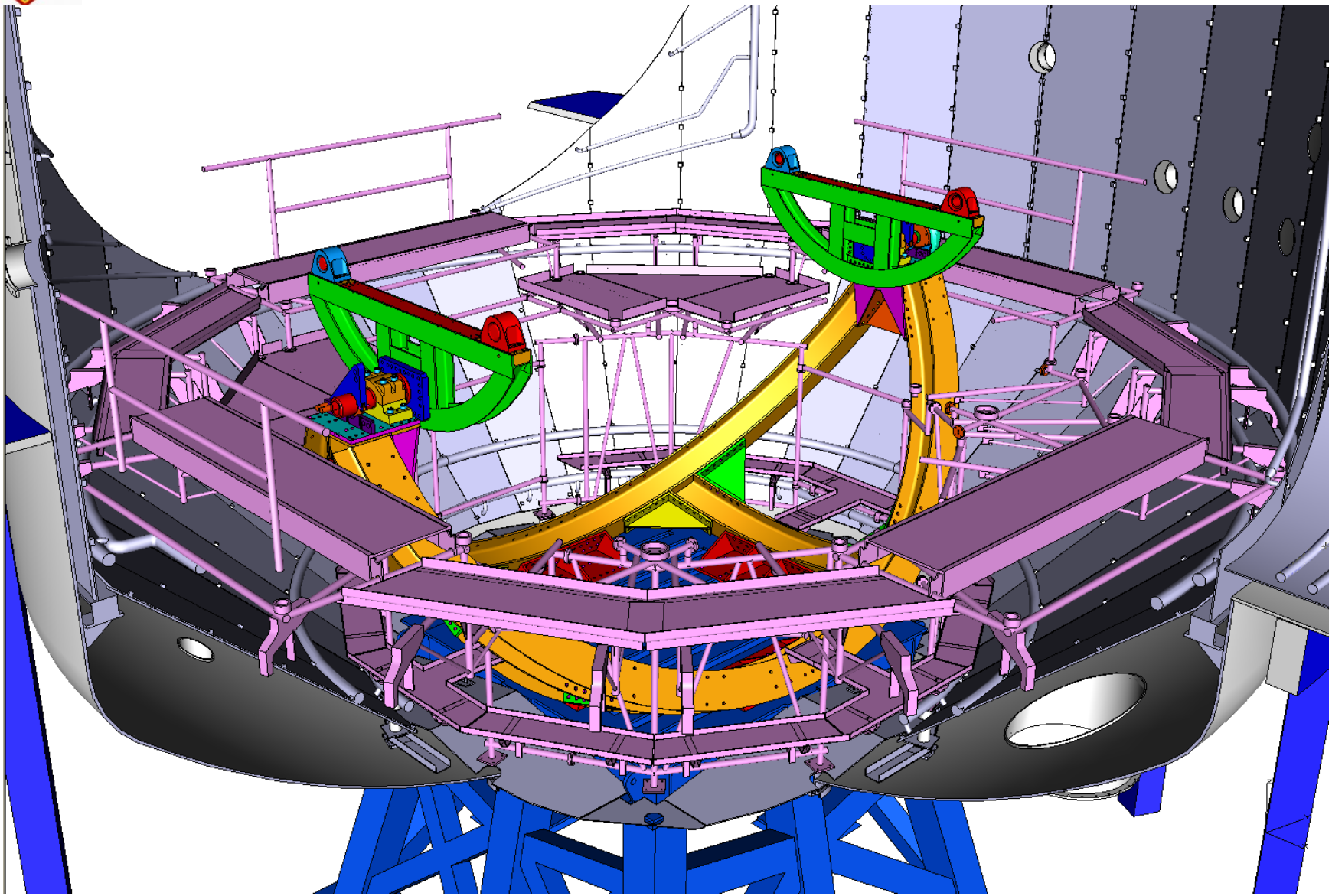
AMS LIFTING



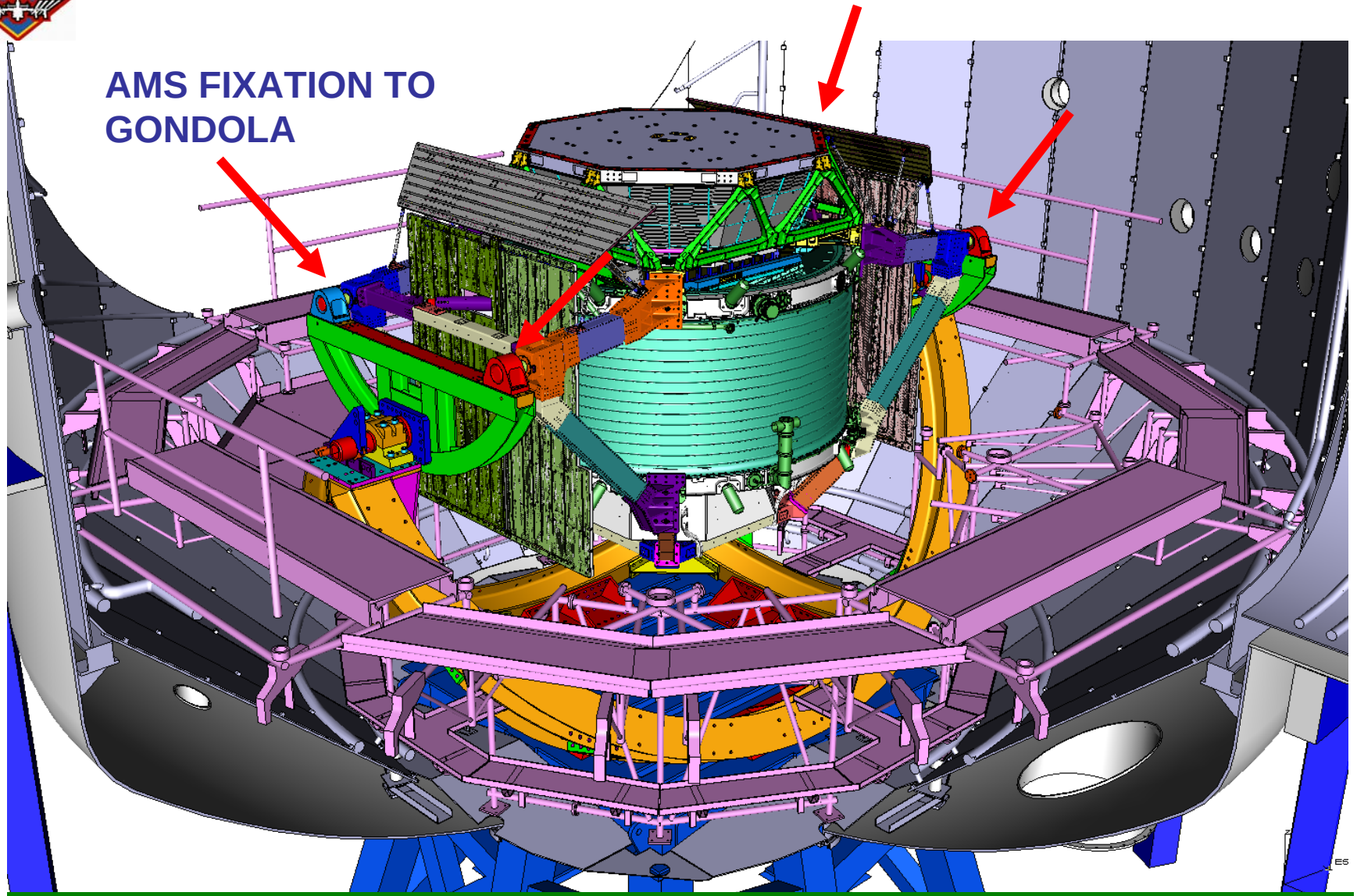
AMS LOWERING in LSS



AMS MOUNTING ON THE GONDOLA



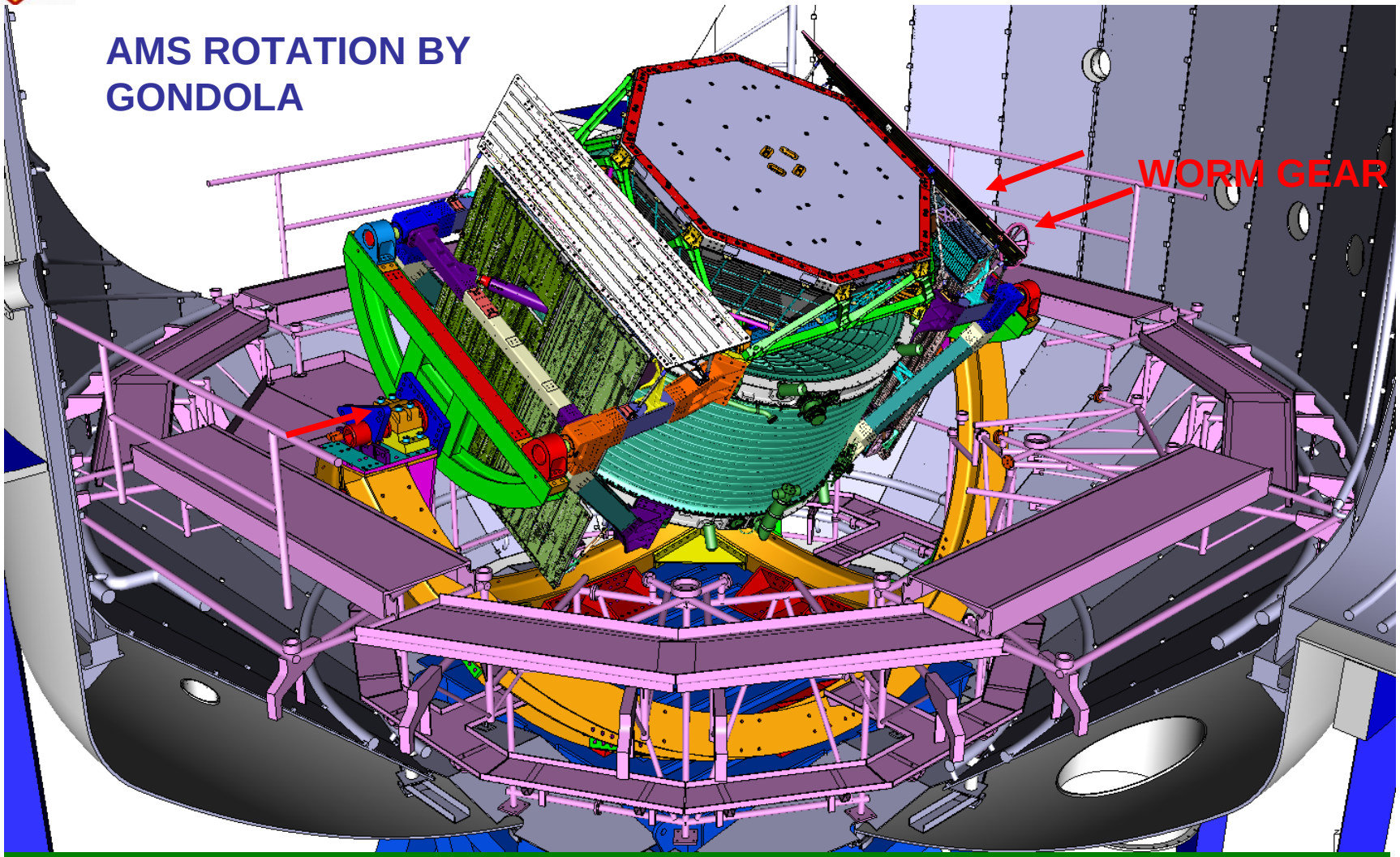
AMS MOUNTING ON THE GONDOLA



ACCESS NEEDED AT THE FOUR BRACKETS: *SCAFFOLDING L2-9C, L2-10C, L2-11C, L2-12C*

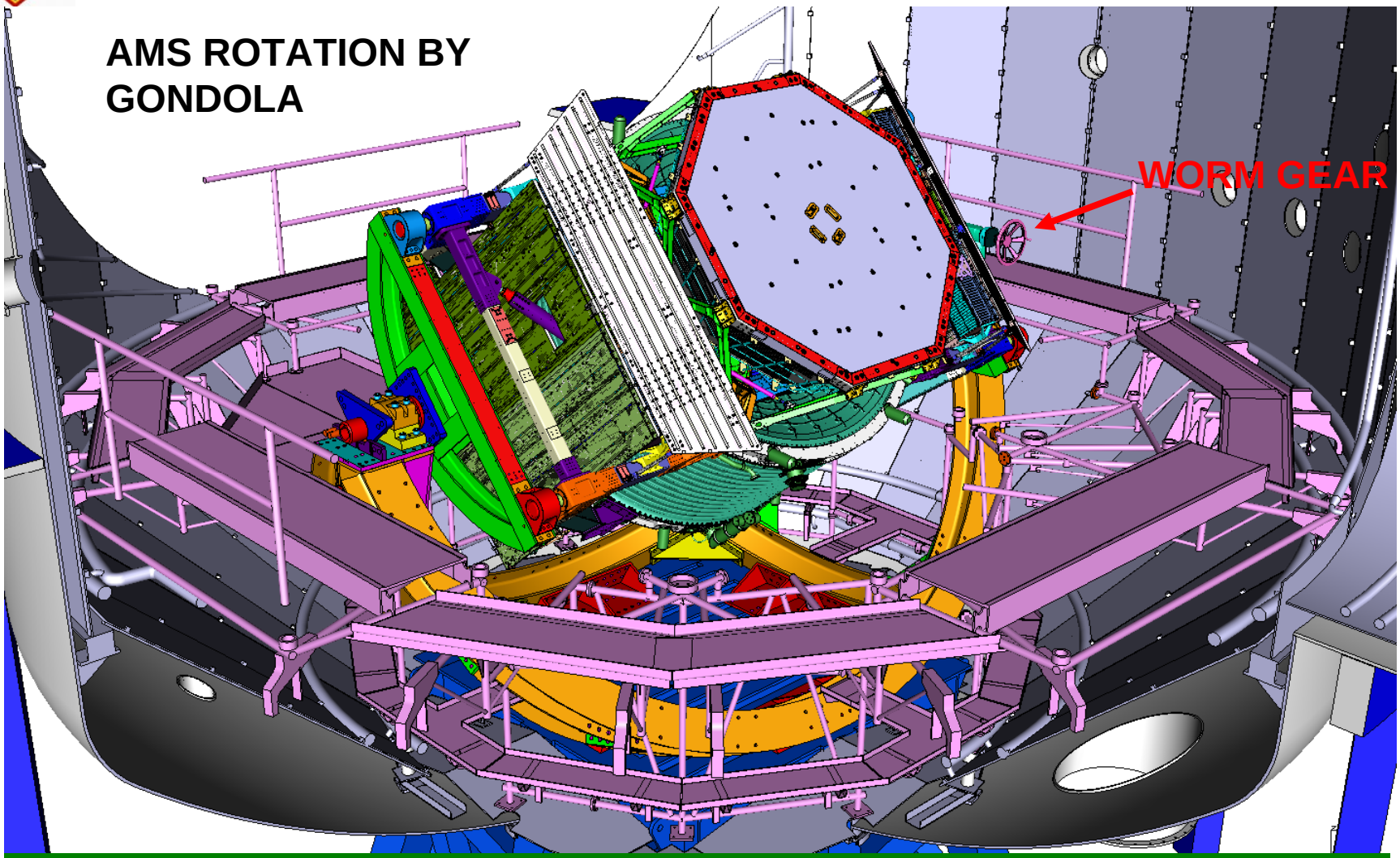
AMS ROTATION

AMS ROTATION BY GONDOLA



ACCESS AT THE GONDOLA BLOCKING PINS (BOTH SIDES) AND AT THE WORM GEAR (ONE SIDE): SCAFFOLDING L2-1, L2-5

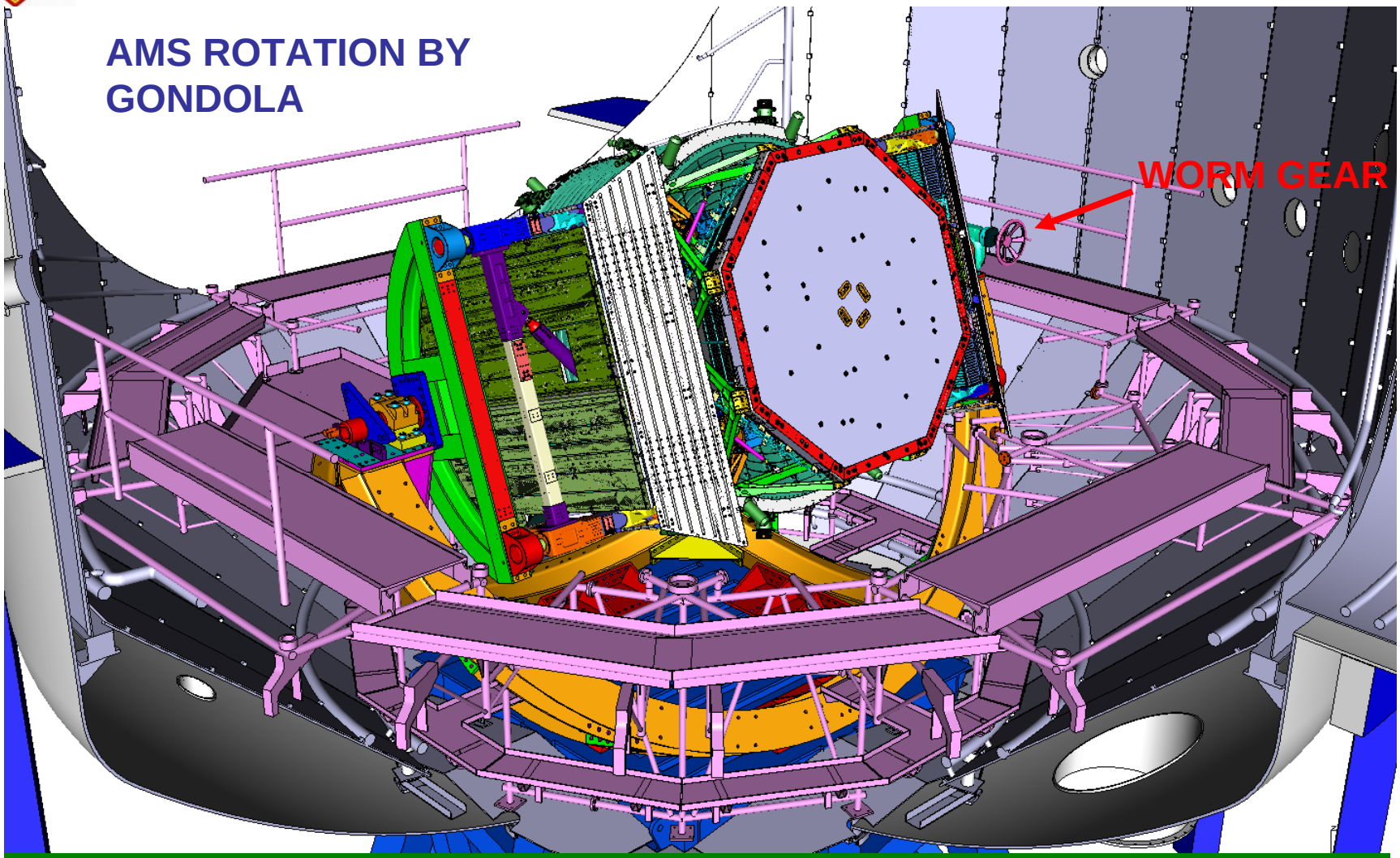
AMS ROTATION



ACCESS AT THE WORM GEAR (ONE SIDE). SCAFFOLDING L2-1 OR L2-5 (WORM GEAR CAN BE MOUNTED ON EITHER SIDE OF THE GONDOLA)

AMS ROTATION

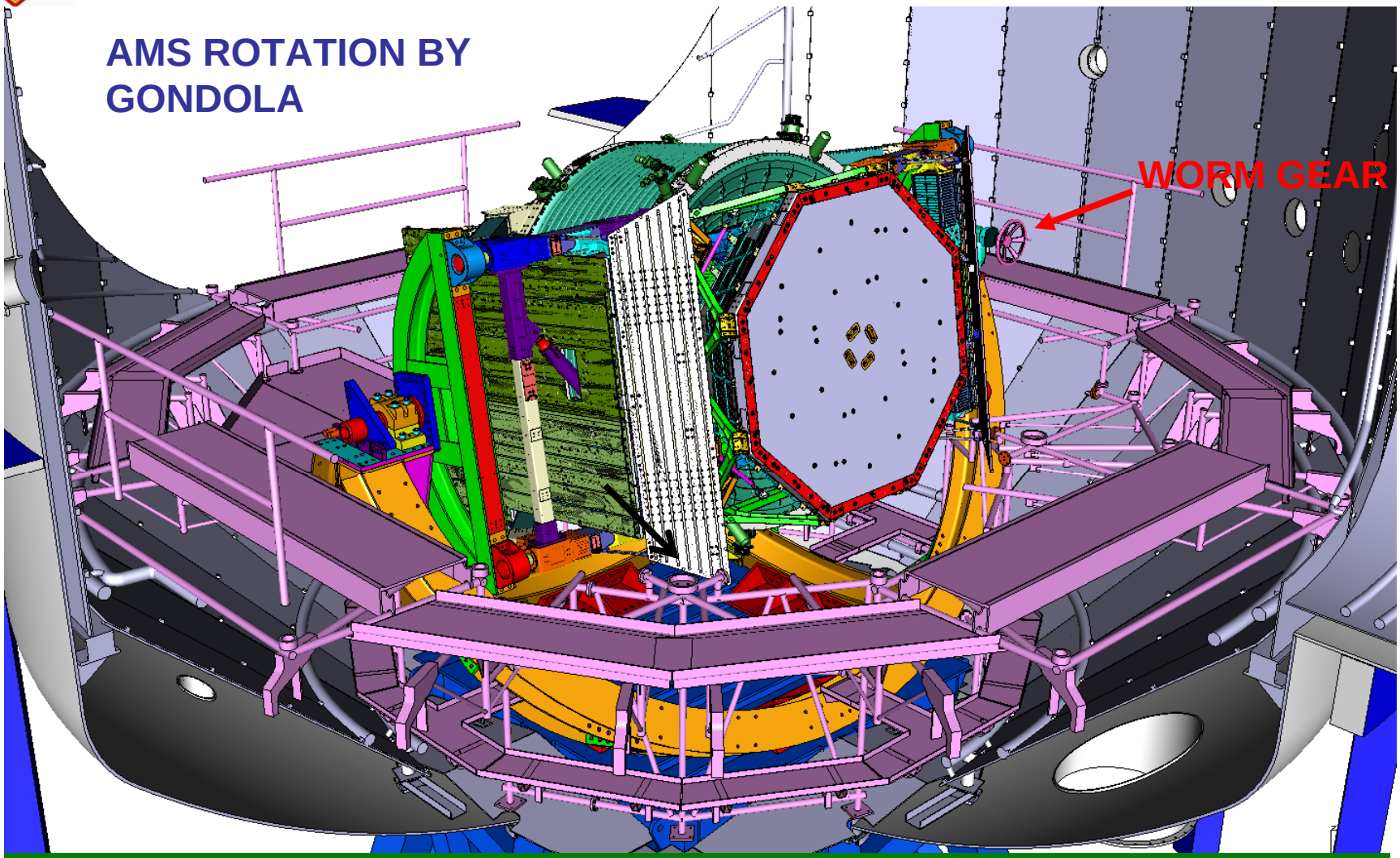
AMS ROTATION BY GONDOLA



ACCESS AT THE WORM GEAR (ONE SIDE). SCAFFOLDING L2-1 OR L2-5 (WORM GEAR CAN BE MOUNTED ON EITHER SIDE OF THE GONDOLA)

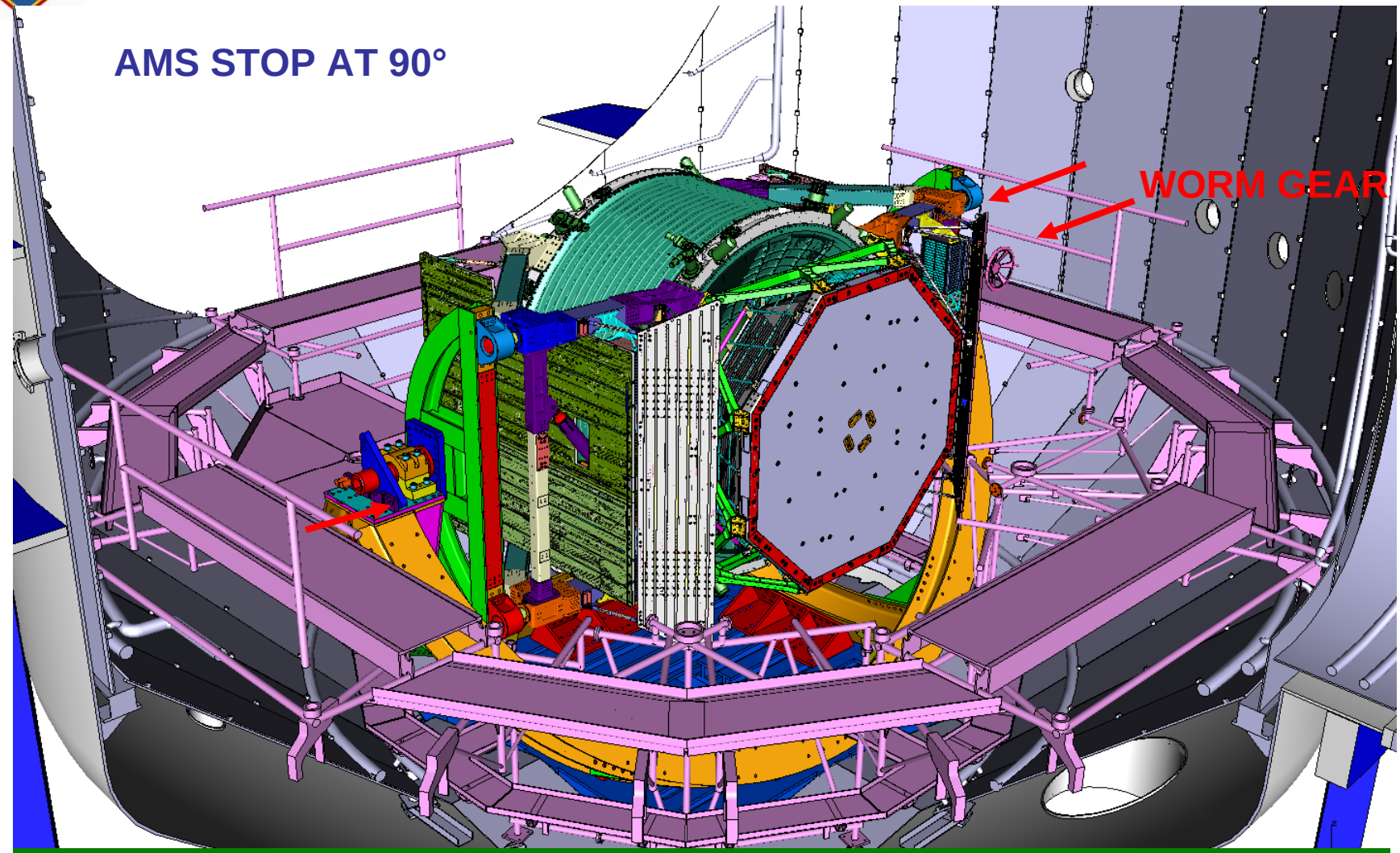
AMS ROTATION

AMS ROTATION BY GONDOLA

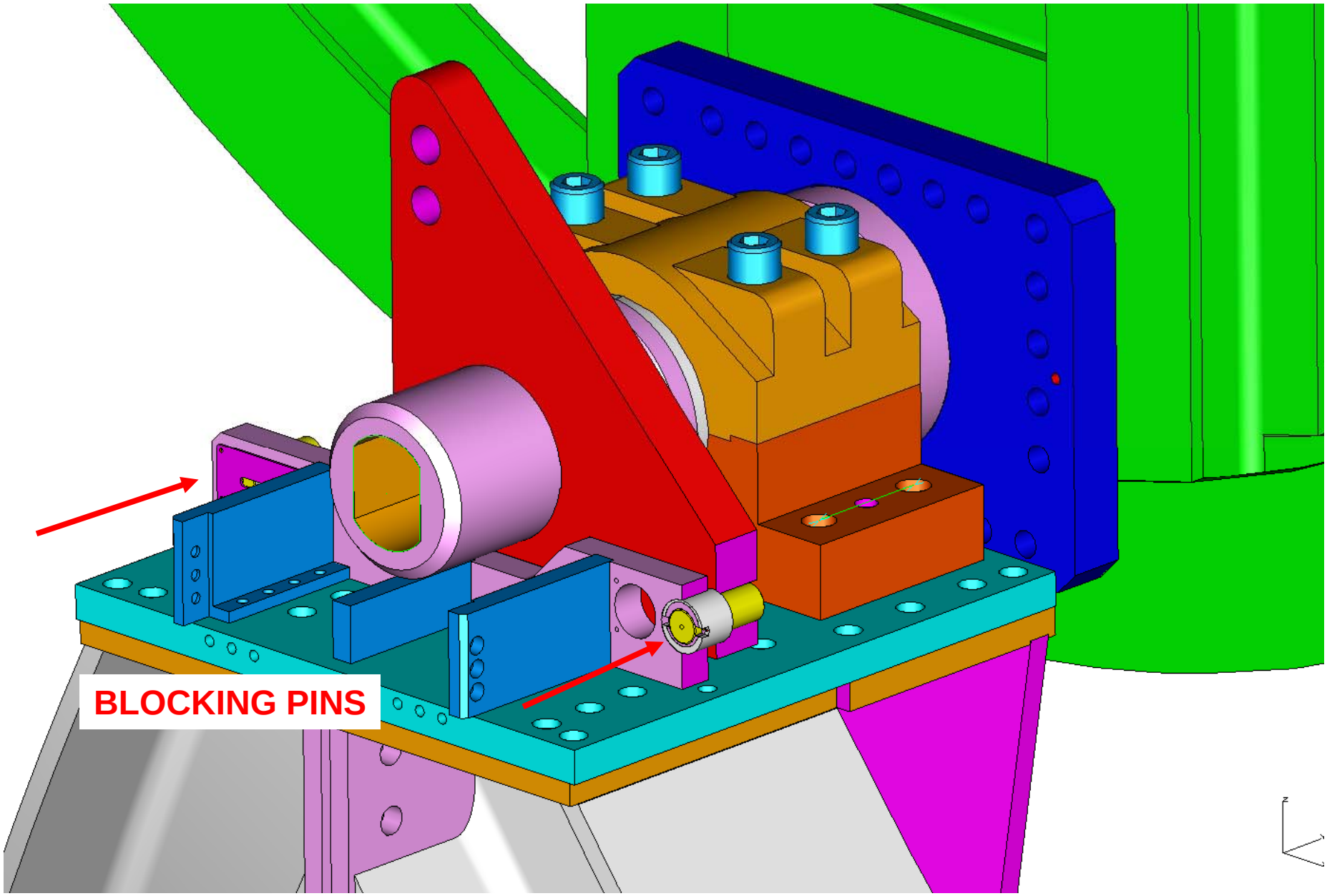


ACCESS AT THE WORM GEAR (ONE SIDE): SCAFFOLDING L2-1 OR L2-5 (WORM GEAR CAN BE MOUNTED ON EITHER SIDE OF THE GONDOLA)

AMS TEST ORIENTATION



ACCESS AT THE GONDOLA BLOCKING PINS (BOTH SIDES) AND AT THE WORM GEAR (ONE SIDE): SCAFFOLDING L2-1, L2-5



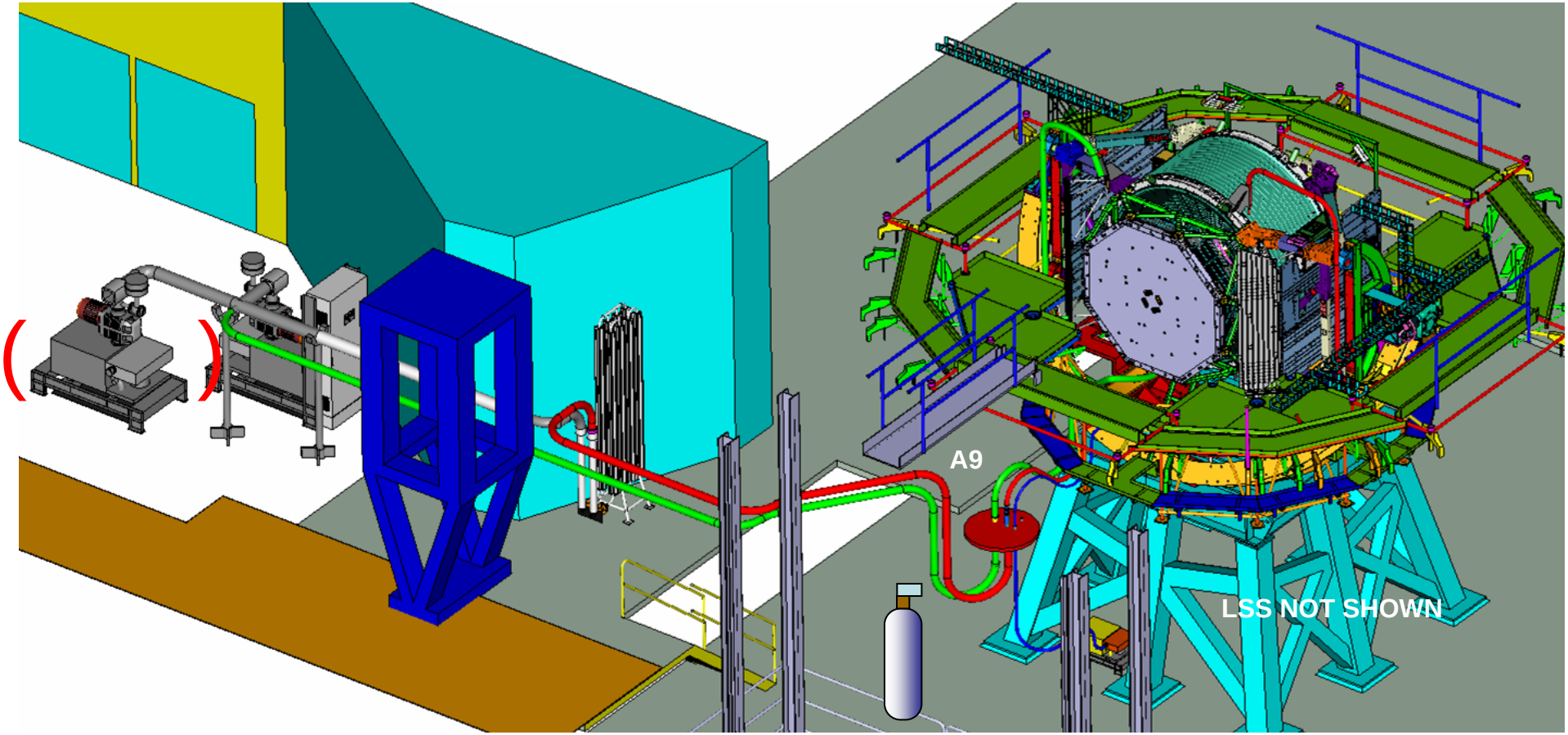
AMS FINAL POSITION WITH REFERENCE TO MAIN RADIATORS INCLINATION (INCLINOMETER)

ACTION 4: Cryo Ground Support Equipment INSTALLATION

STEP_1: *CGSE_LSS-OUT* INSTALLATION
STEP_2: CGSE FEEDTHROUGH AT A9 FLANGE
STEP_3: *CGSE_LSS-IN* PARTIAL INSTALLATION
STEP_4: *CGSE_LSS-IN* INSTALLATION COMPLETION AND CONNECTION TO AMS (after AMS istallation and 90° rotation)
STEP_5: CGSE lines test

NOTE: CGSE installation shall start before AMS arrival at ESTEC based on CGSE components availability

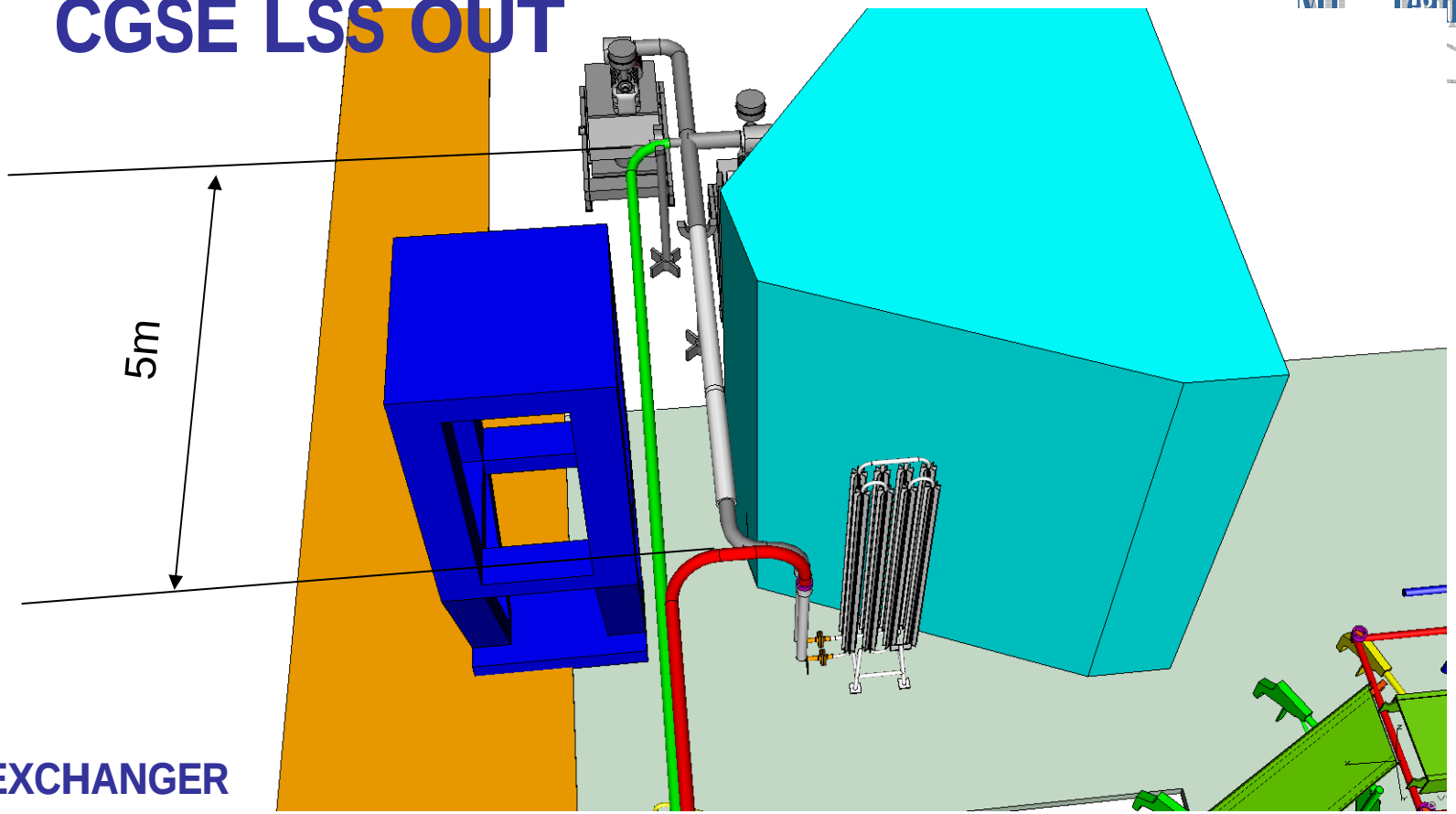
CGSE LSS OUT



PL13= SS Vacuum Jacketed line 10m available at CERN (SJTU)

PL7B= SS corrugated line16m (4x4m) available at CERN (MIT)

CGSE LSS OUT

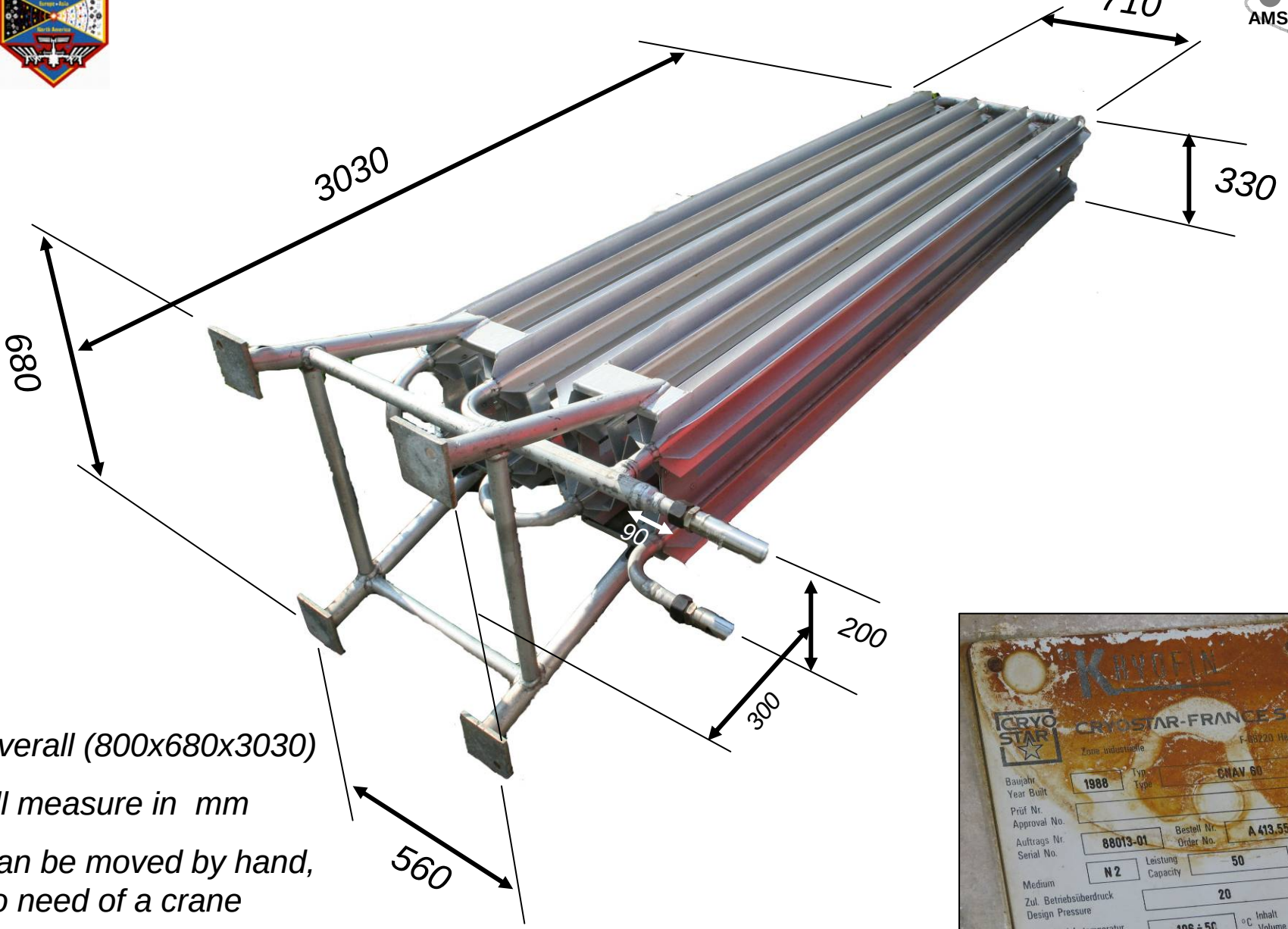


HEAT EXCHANGER

Line from HX to pump length~5m.

HX available at CERN

HEAT EXCHANGER



Overall (800x680x3030)

All measure in mm

Can be moved by hand, no need of a crane

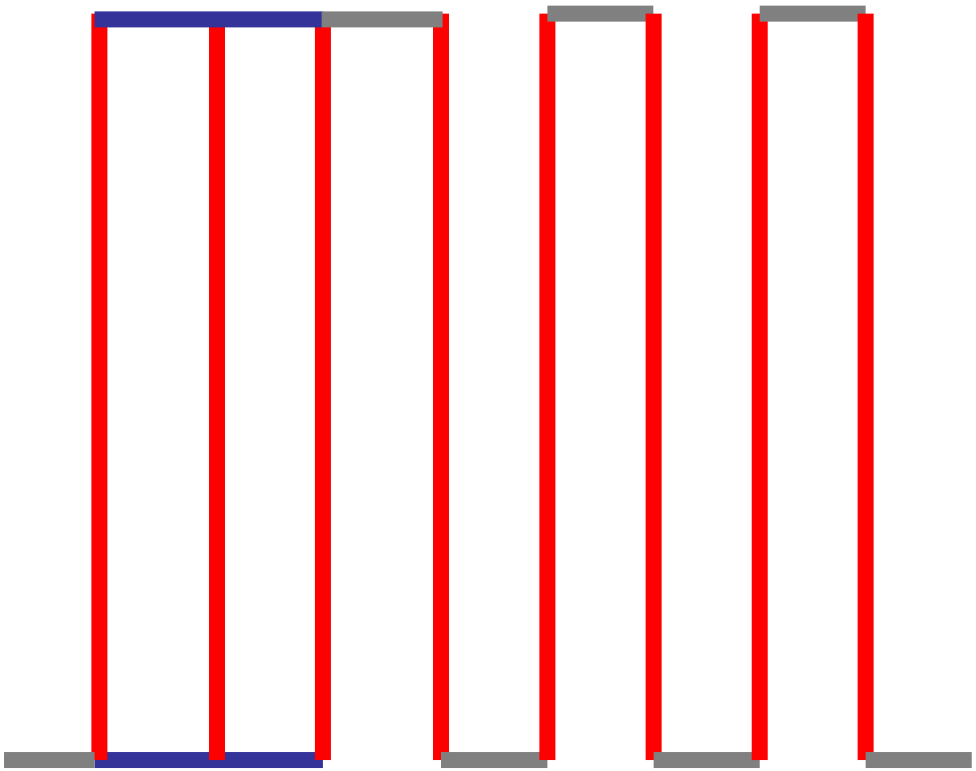
HEAT EXCHANGER

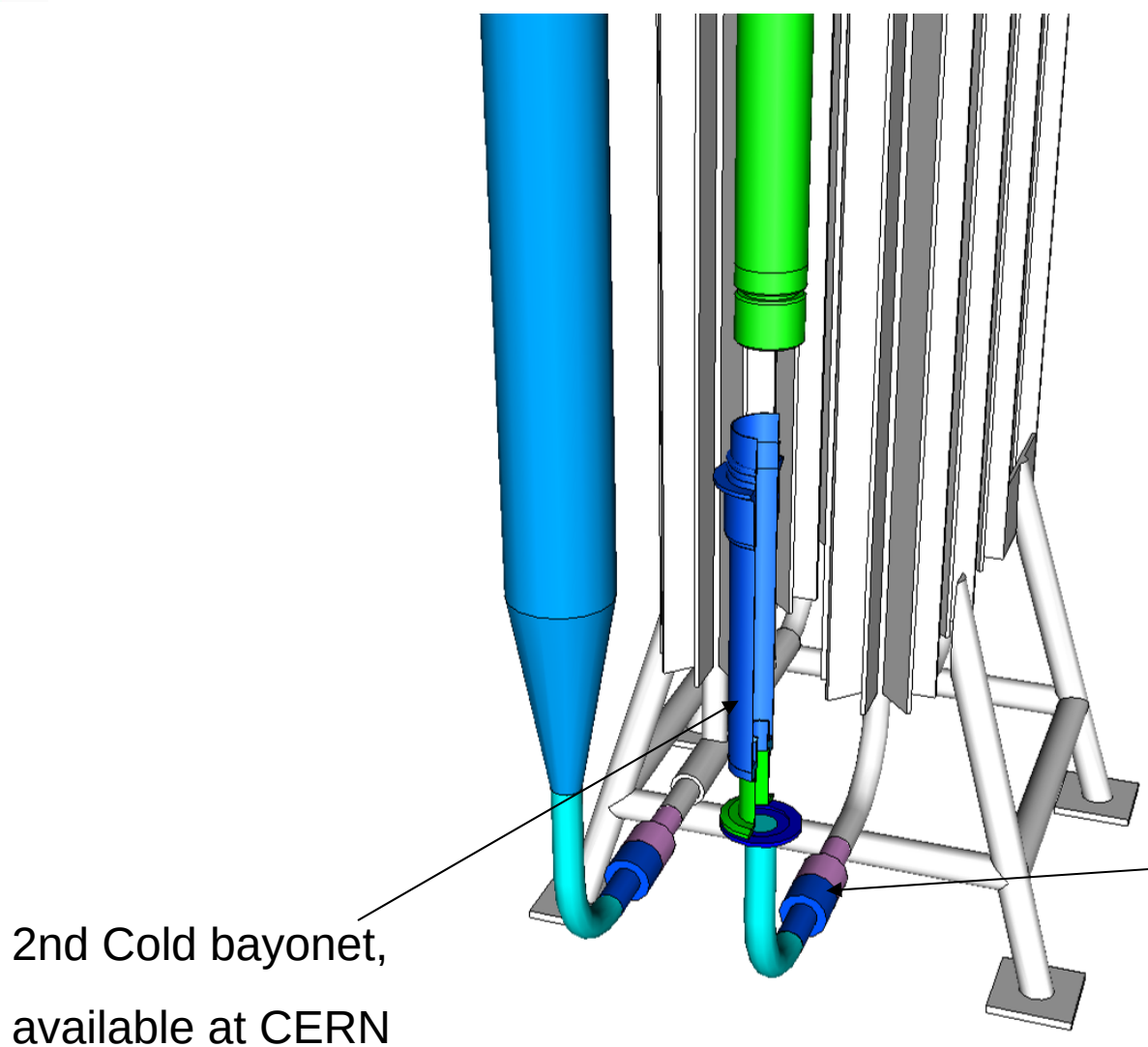
HX

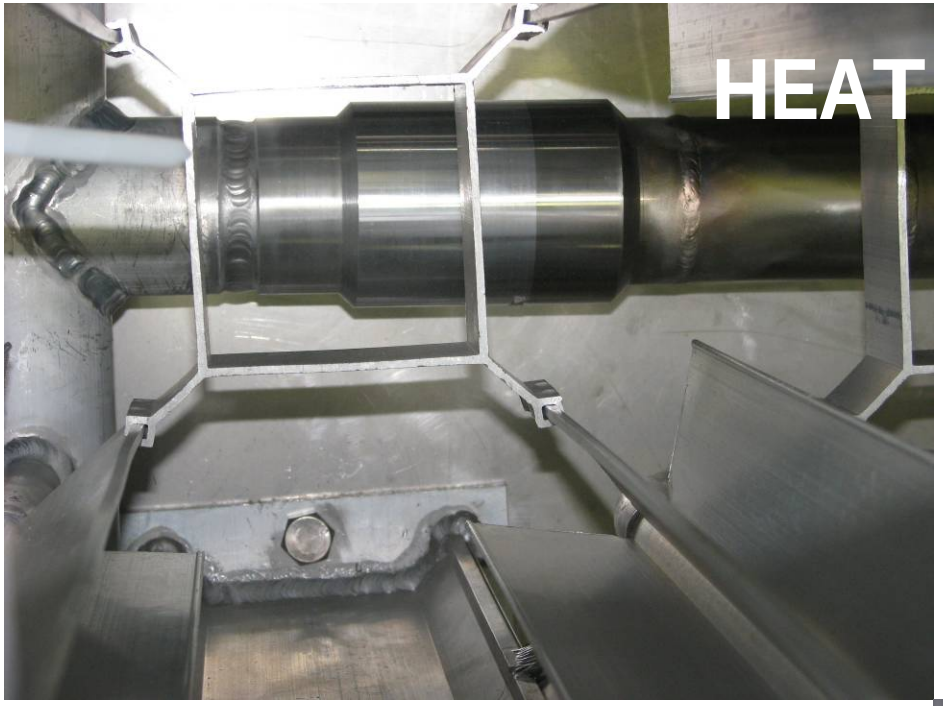
OD=30mm/ OD=30mm/ OD=40mm

TOTAL LENGTH=22000mm= (2500X8+2000)

HALF SERIAL HALF PARALLEL

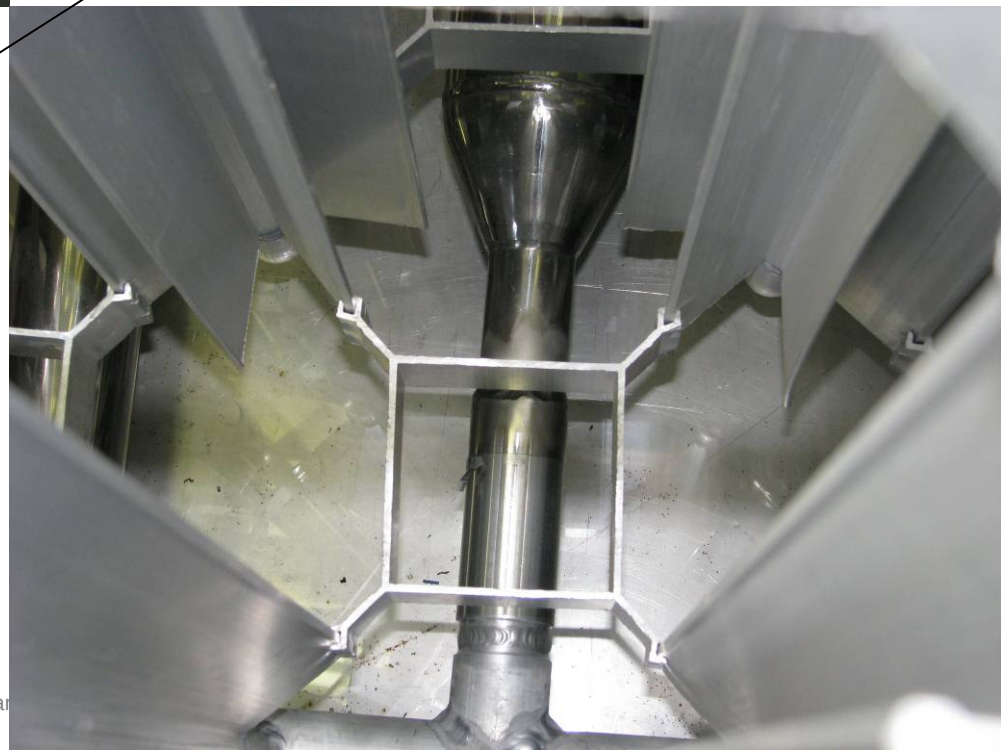



To Pump
From Magnet
2nd Cold bayonet, available at CERN
Bimetal Al/SSteel



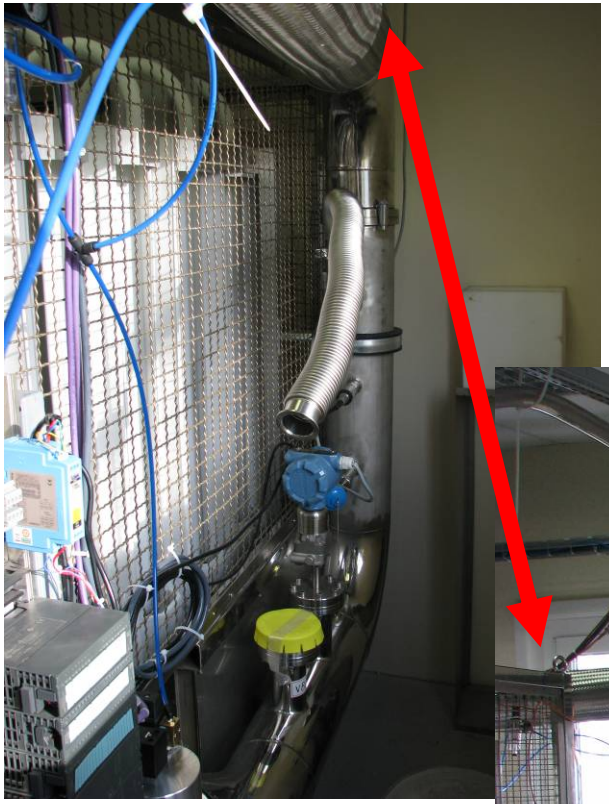
HEAT EXCHANGER

Lay-out at CERN with the large Heat Exchanger



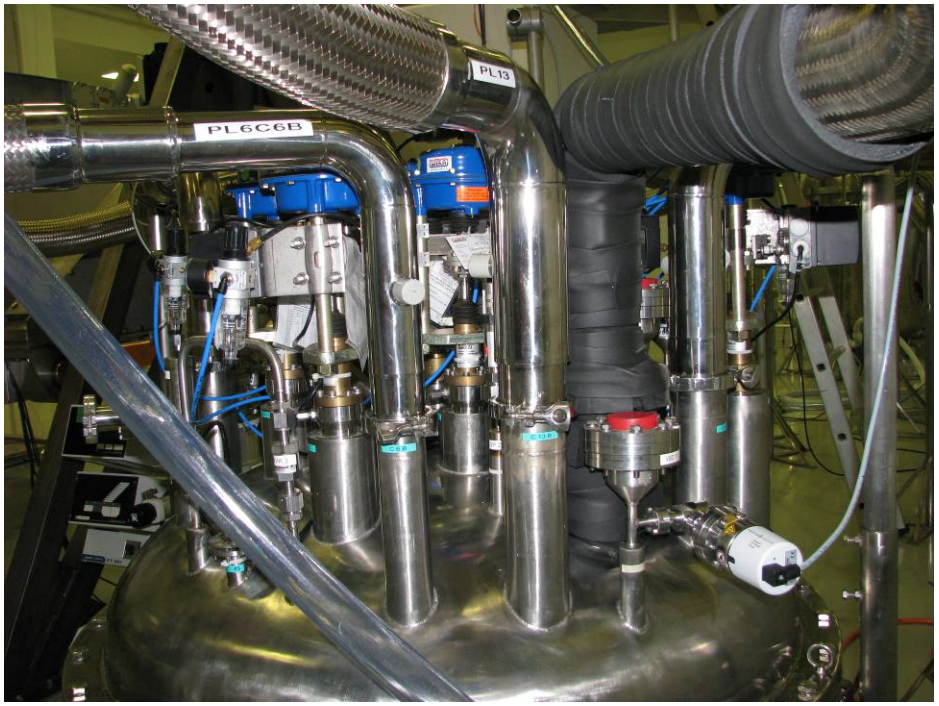
HEAT EXCHANGER

Lay-out at CERN with the large Heat Exchanger

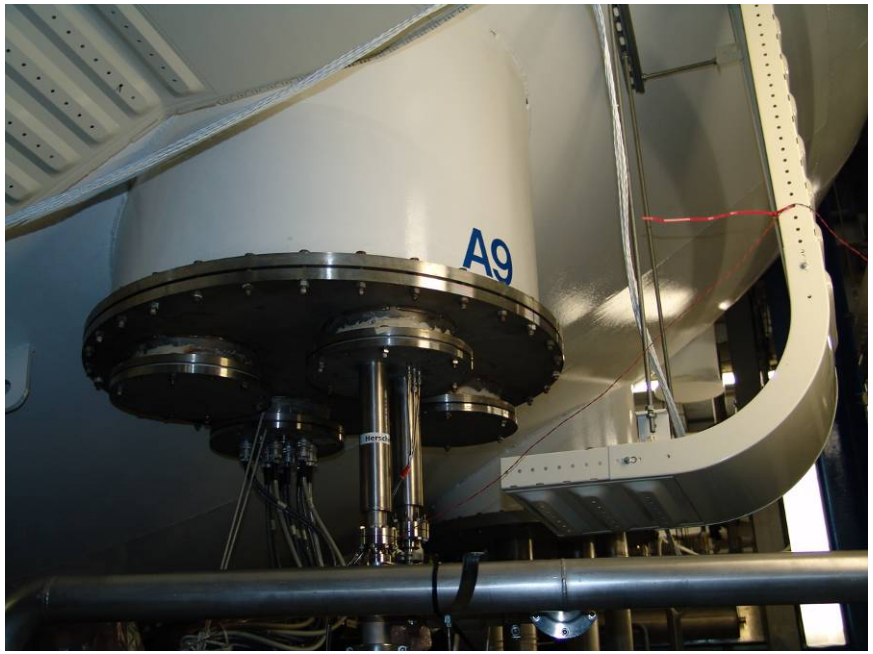


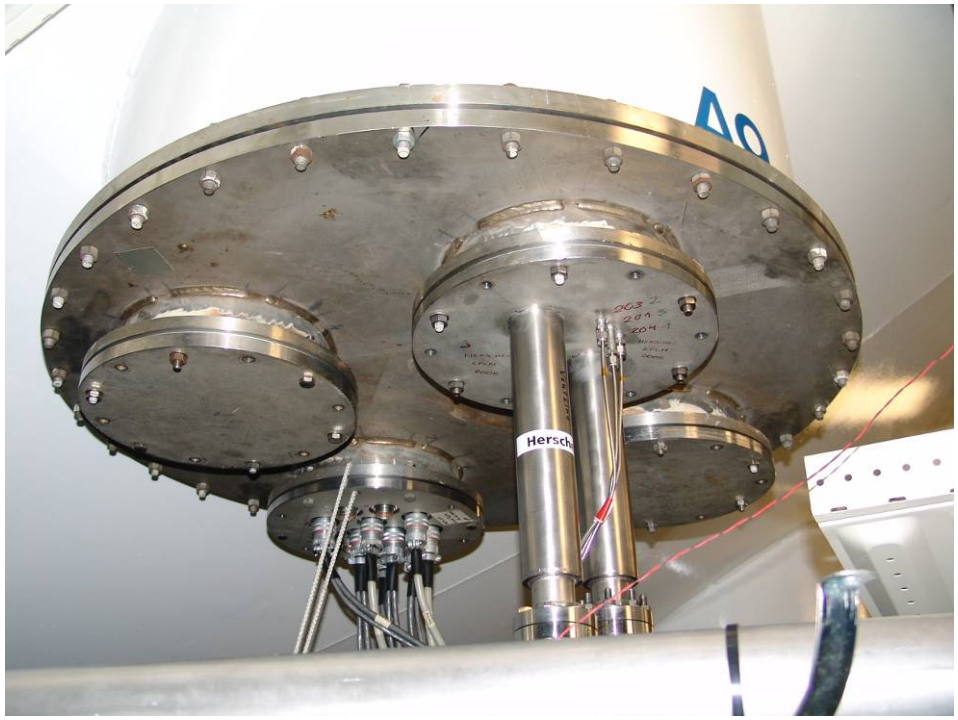
PL13

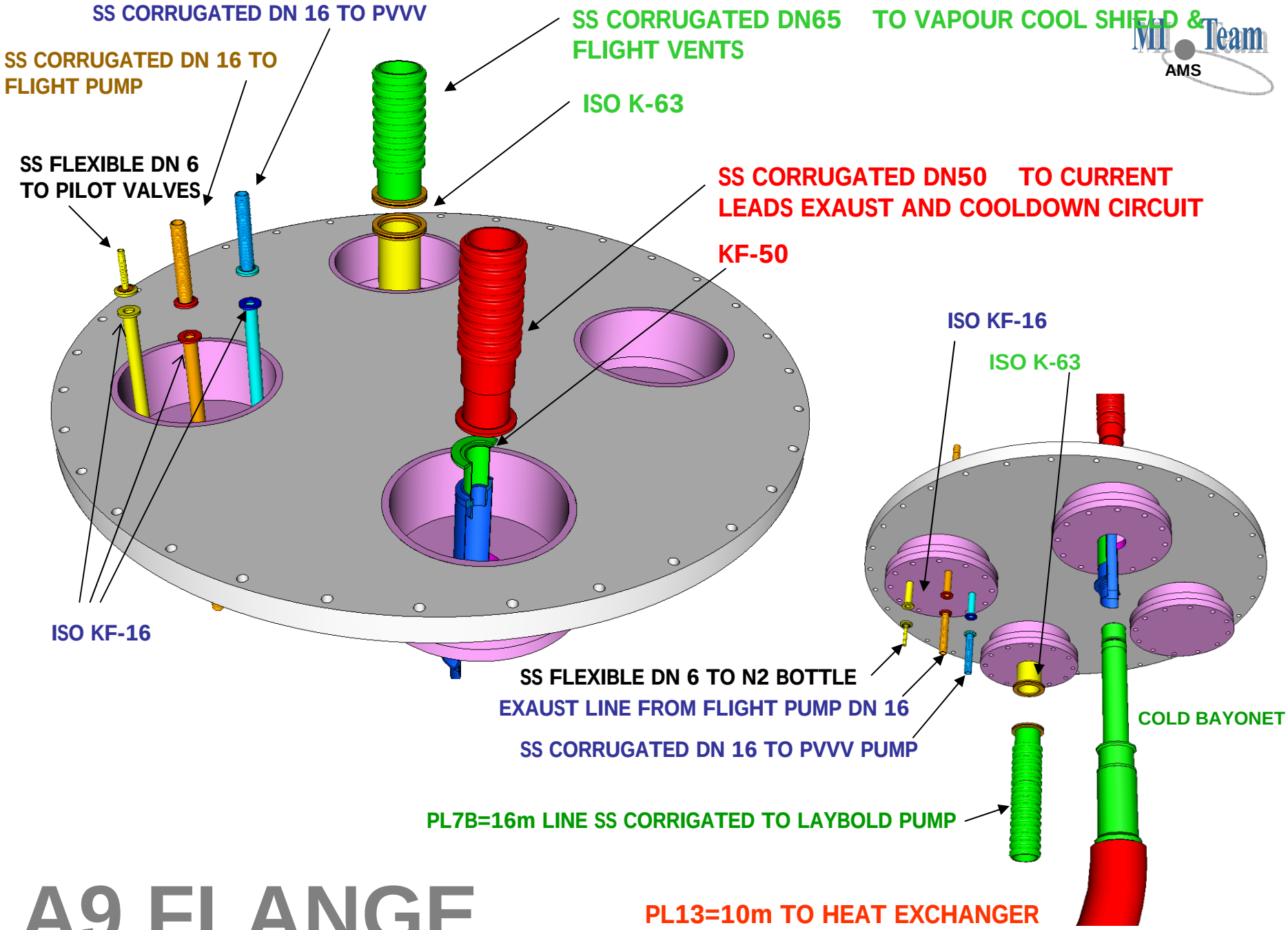
Lay-out at CERN with the large Heat Exchanger



A9 FLANGE

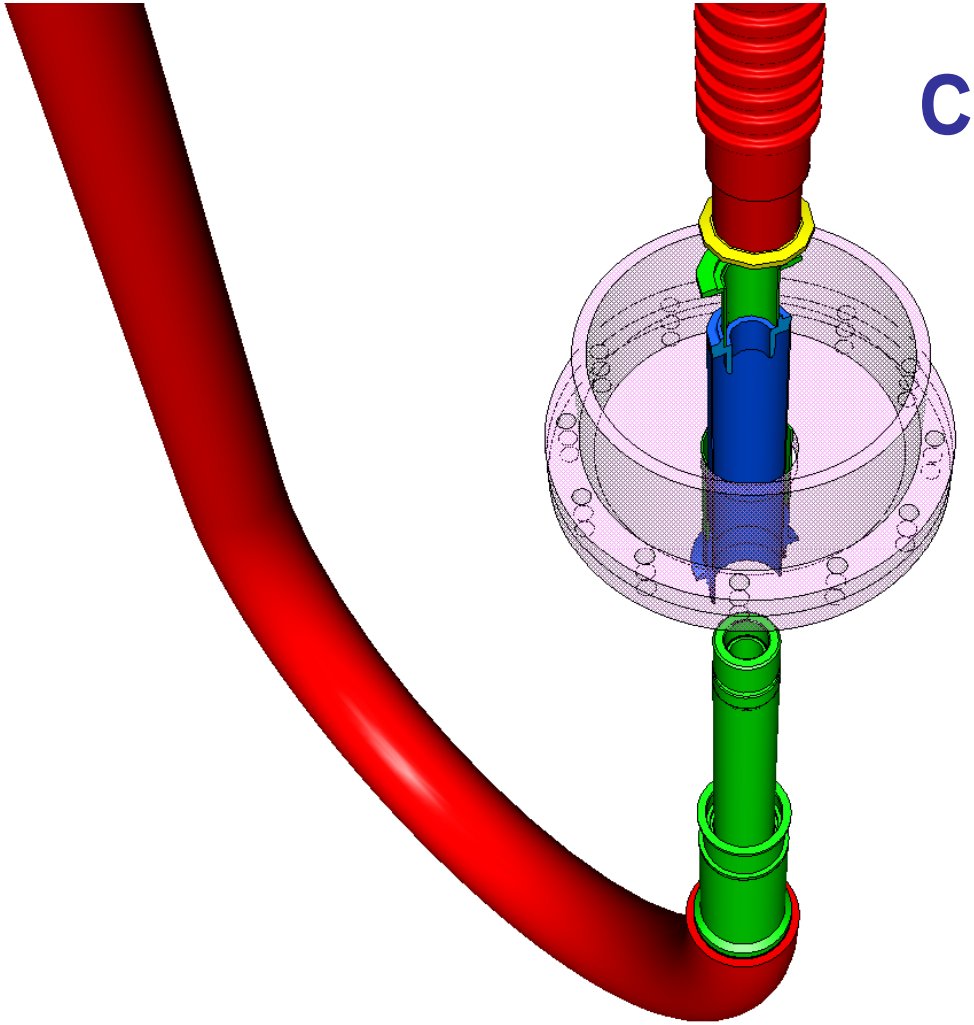




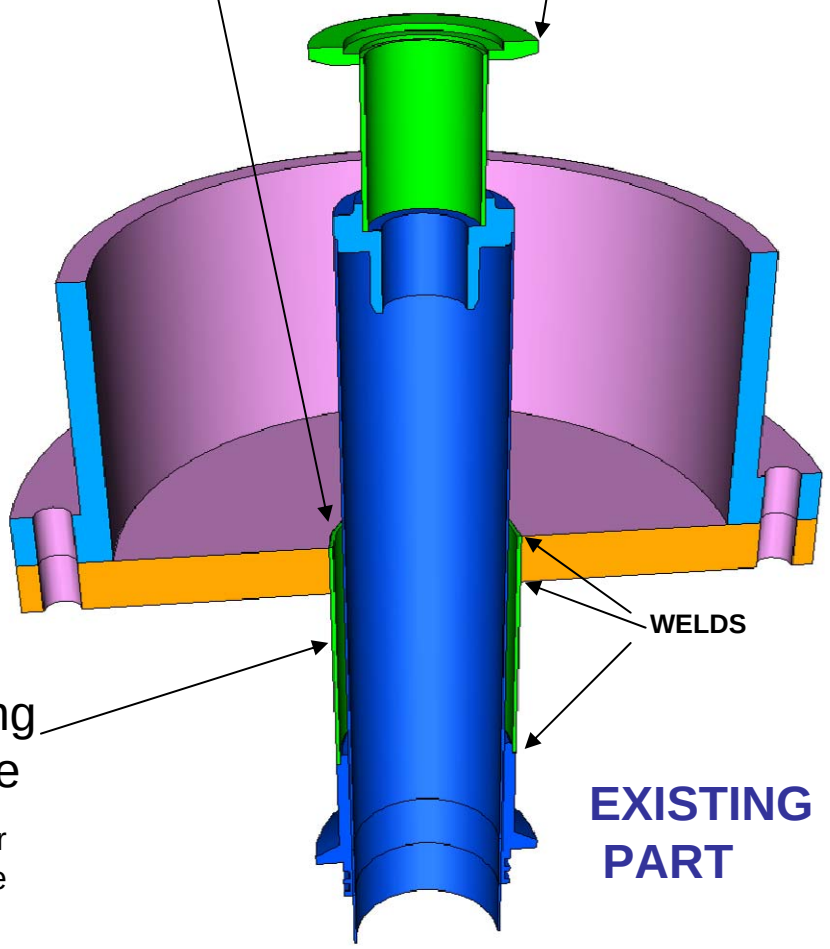

SS CORRUGATED DN 16 TO PVVV
SS CORRUGATED DN 16 TO FLIGHT PUMP
SS CORRUGATED DN65 TO VAPOUR COOL SHIELD & FLIGHT VENTS
ISO K-63
SS FLEXIBLE DN 6 TO PILOT VALVES
SS CORRUGATED DN50 TO CURRENT LEADS EXAUST AND COOLDOWN CIRCUIT
KF-50
ISO KF-16
ISO KF-16
ISO K-63
SS FLEXIBLE DN 6 TO N2 BOTTLE
EXAUST LINE FROM FLIGHT PUMP DN 16
SS CORRUGATED DN 16 TO PVVV PUMP
COLD BAYONET
PL7B=16m LINE SS CORRIGATED TO LAYBOLD PUMP
PL13=10m TO HEAT EXCHANGER

A9 FLANGE

COLD BAYONET



NEW PARTS
TO BE PRE-ASSEMBLED
TO THE COLD BAYONET



Collar for thermal decoupling the bayonet from the A9 flange

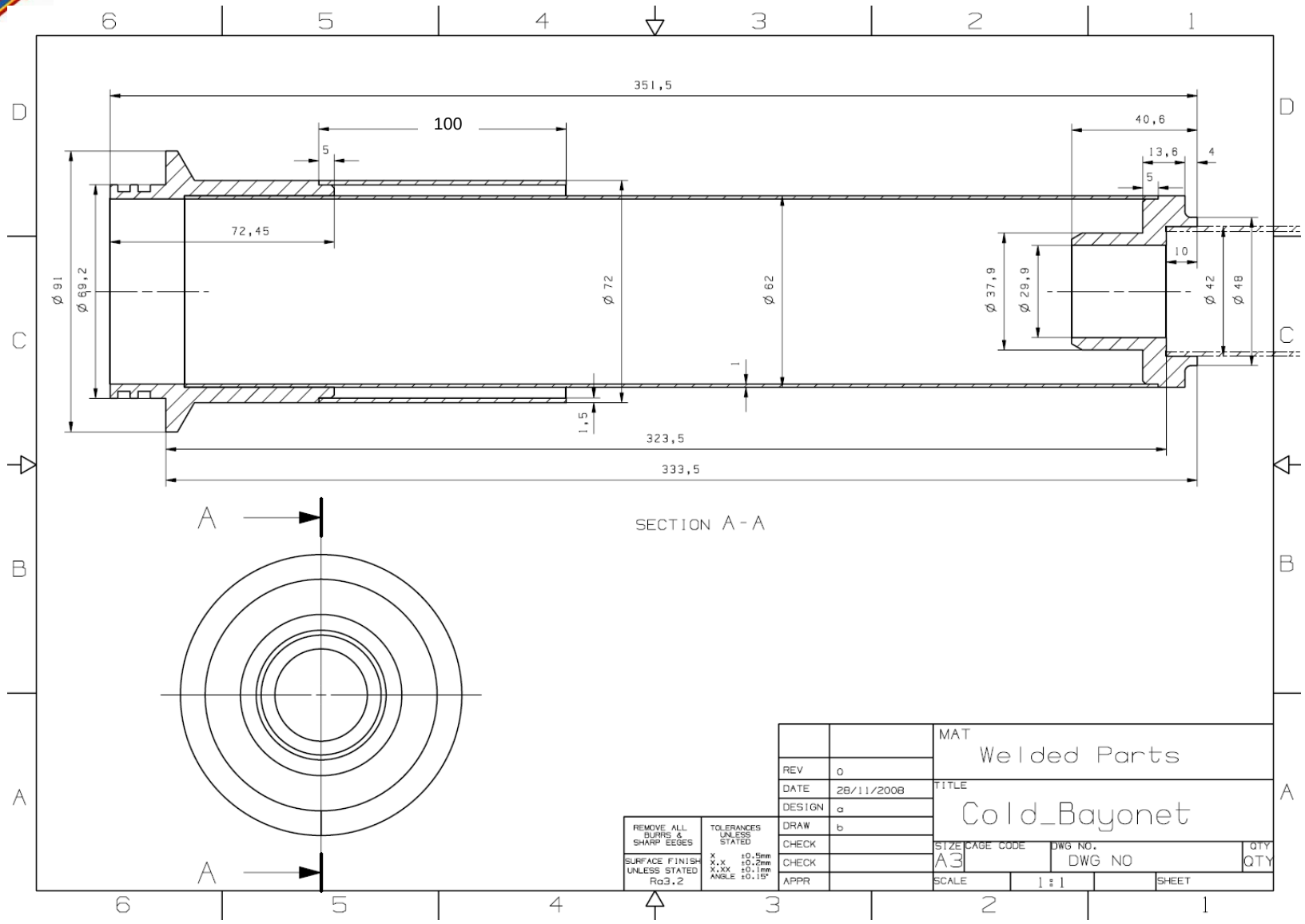
We shall place a thermocouple and heater (and maybe MLI) at the flange or at the external surface of the green collar

EXISTING PART

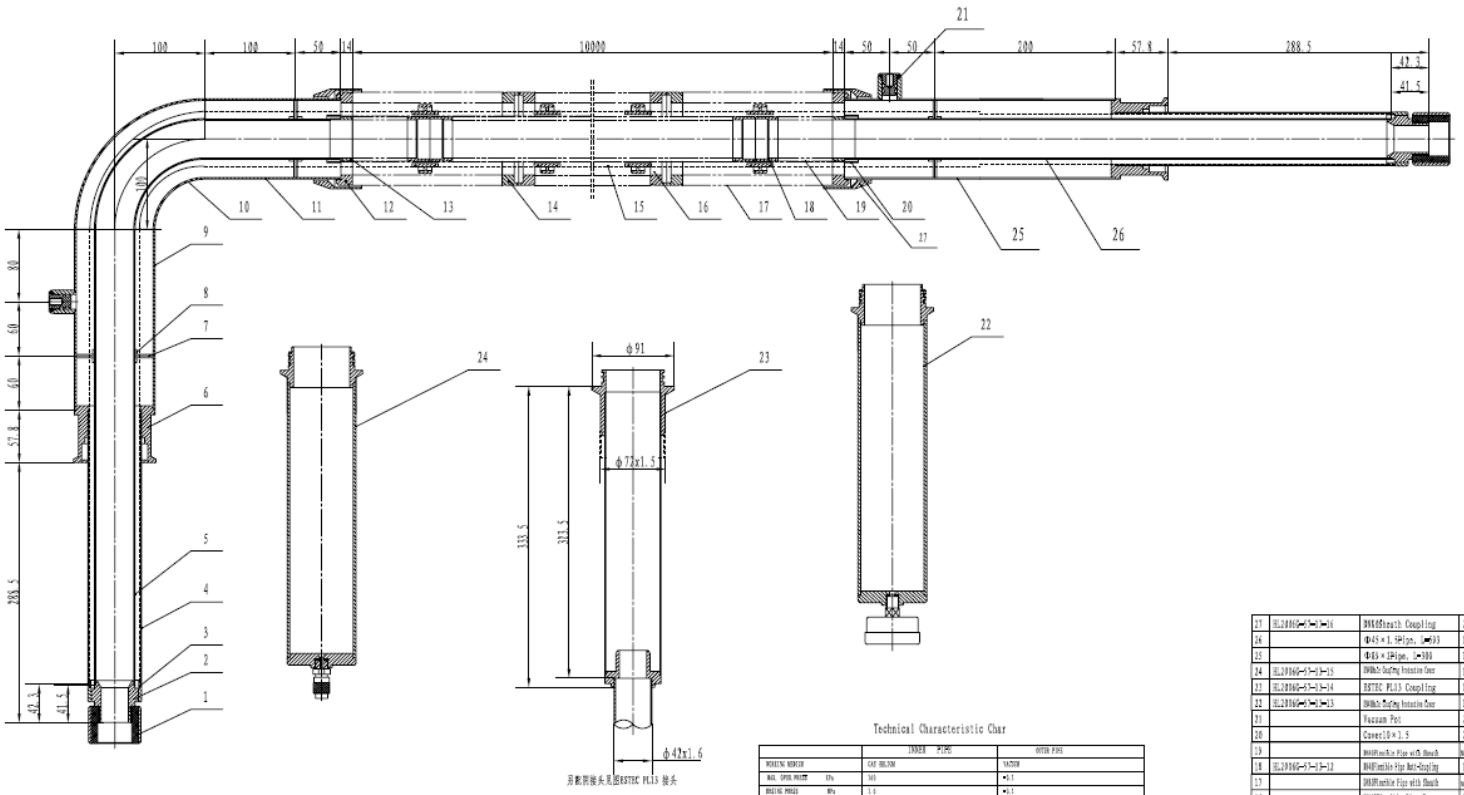
COLD BAYONET

PL13

COLD BAYONET



PL13



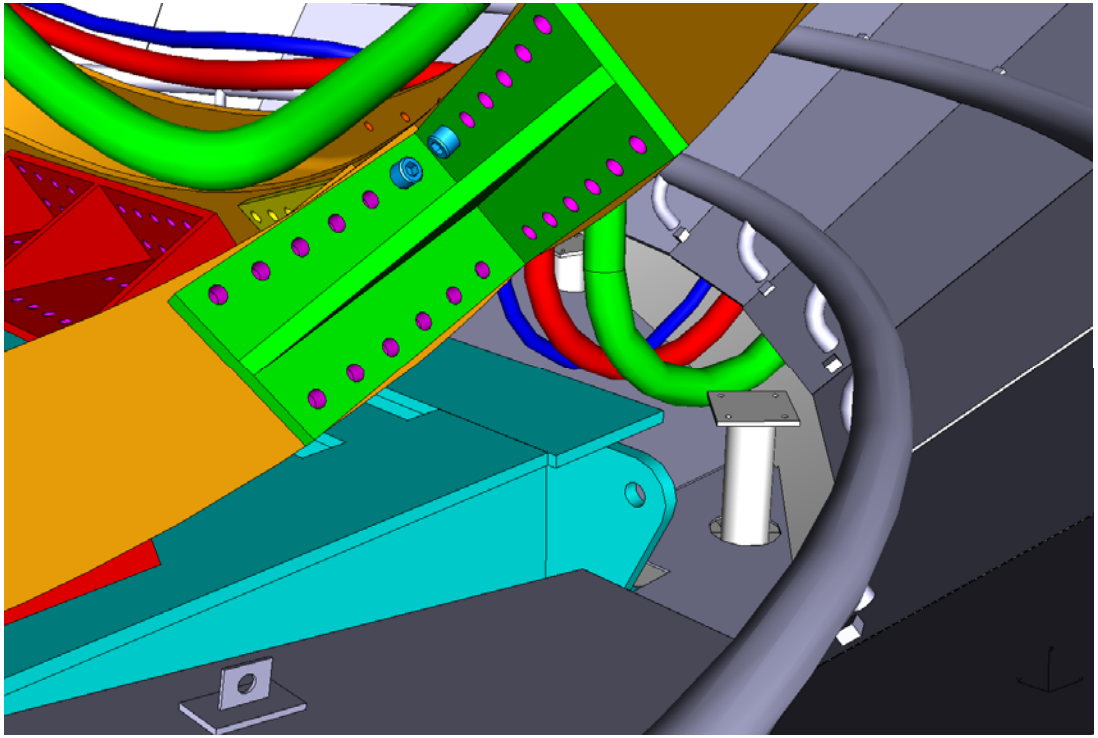
Technical Characteristic Char

	INNER PIPE	OUTER PIPE
WORKING MEDIUM	CAT HELIUM	VACUUM
MAX. OPER PRESS MPa	3.0	≤0.1
TEST PRESS MPa	3.6	≤0.1
WORKING TEMPERATURE K	4.1~300	280~313
TEST TEMPERATURE K	4.1~400	280~400
CORRUGATED RADIUS mm	6	6
WORKING WALL THICKNESS mm	PIPE: 1.5mm, FLEX: 0.2mm	PIPE: 2mm, FLEX: 0.2mm
LEAKAGE RATE Pa.m³/s	<1×10⁻⁹	<1×10⁻⁸
TEST GAS MEDIUM / TIGHTNESS PRESSURE MPa	GAS METHANIUM / 2.4	
INSULATION MODE / INSULATION PERFORMANCE	High vacuum multilayer insulation. Heat leakage: between 77~300k ≤1W/m² Axial coupling ≤1.2W	
VACUUM LIFE		Pressure≤1×10⁻³Pa, evacuation time≤24hours, ultimate≤1×10⁻⁴Pa, after 5 temperature cycles.
AXIAL VACUUM LEVEL/VACUUM LEVELL UNDER LOW TEMPERATURE		3×10⁻³ / 1×10⁻⁴
LEAKAGE VELOCITY Pa.m³/s		<1×10⁻⁹
MAIN MATERIAL	SUS316TP304L(ASTM)	SUS304(ASTM)

WELDING	
STANDARD	JB4730-2004
TESTING METHOD	GRADUATE TEST
TESTING PROPORTION	100%
QUALITIES LEVEL	Ⅰ

No.	Code	Name	Qty	Material	Unit Weight	Total Weight	Rmark
27	HL20060-91-13-16	304Hfsheath Coupling	2	304			
26		Φ45×1.5Pipe, L=603	1	316L			
25		Φ83×2Pipe, L=388	1	304			
24	HL20060-91-13-15	304Hc-SnCfq Intensive Cone	1	Discrete			
23	HL20060-91-13-14	BETEC PL13 Coupling	1	Discrete			
22	HL20060-91-13-13	304Hc-SnCfq Intensive Cone	1	Discrete			
21		Vacuum Pot	2	Discrete			Borrowed
20		Cover10×1.5	2	304			
19		304HFlexible Pipe with Sheath	1.7 Meter	316L			Including Bellow Flexible
18	HL20060-91-13-12	304HFlexible Pipe Anti-Coupling	14	316L			
17		304HFlexible Pipe with Sheath	Meter	304			Including Bellow Flexible
16		304HFlexible Pipe Space	73	Glass Fiber Reinforced Plastic			Glass of Fill Between each Layer
15		Insulation Layer	Sheet	Compound Material			20 Layer
14	HL20060-91-13-11	304HFlexible Pipe Anti-Coupling	6	304			
13	HL20060-91-13-10	304HFlexible Pipe Coupling	2	316L			
12	HL20060-91-13-09	304HFlexible Pipe Coupling	2	304			
11		Φ89×2Pipe, L=150	2	304			
10		Φ89Elbow	2	304			
9	HL20060-91-13-08	Φ83×2Pipe, L=280	2	304			
8	HL20060-91-13-07	304HSpacer Fixed Ring	6	304			
7	HL20060-91-13-06	304HSpacer	4	Glass Fiber Reinforced Plastic			
6	HL20060-91-13-05	Male Flange	1	304			
5	HL20060-91-13-04	Inner Bend Connector	2	316L			
4		Pipe Φ59×1, L=804	2	304			
3	HL20060-91-13-03	Transitional Ring	2	316L			
2	HL20060-91-13-02	Inner Male Flange	2	316L			
1	HL20060-91-13-01	Sealing Ring	2	Discrete			

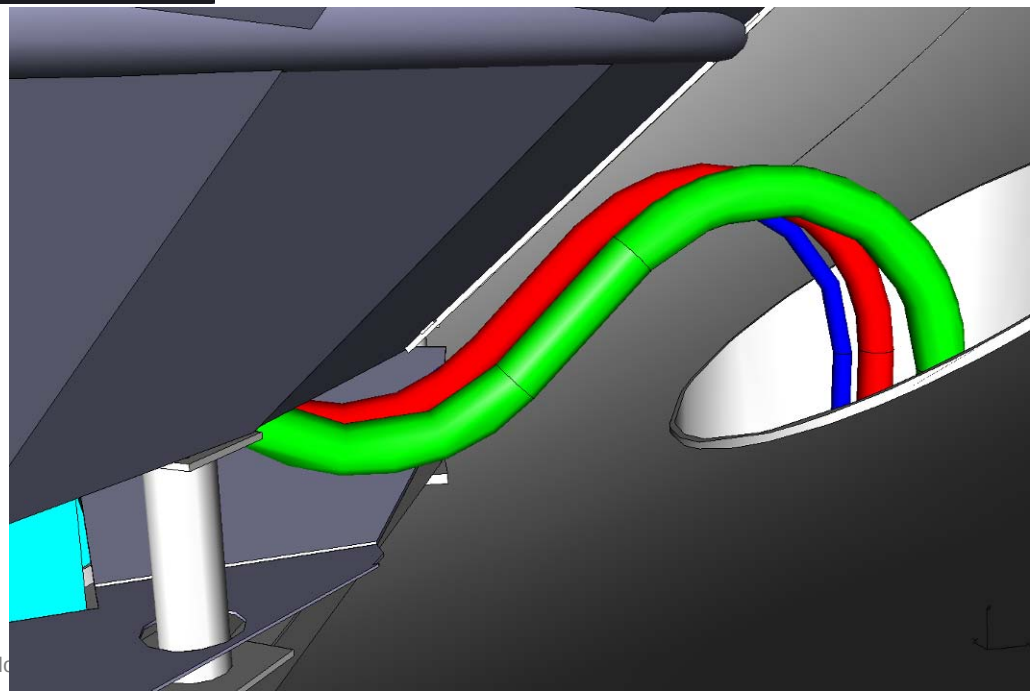
Design			2006. chengdu	HL20060-91
Author			Design Project	AMS-02
Checker			Design stage	
Approver			PL13	HL20060-57-13-00
			Scale	1:2.5



CGSE LSS IN

MI Team
AMS

ON THE WAY IN
FROM A9 FLANGE



CGSE LSS IN

CGSE LINES CONNECTED INSIDE THE LSS

1 EMERGENCY VENT LINE [BD06]

2 EXTERNAL VALVES AIR/N2

3 FLIGHT VENT PUMP LINE

4 CURRENT LEADS EXHAUST [DV11]

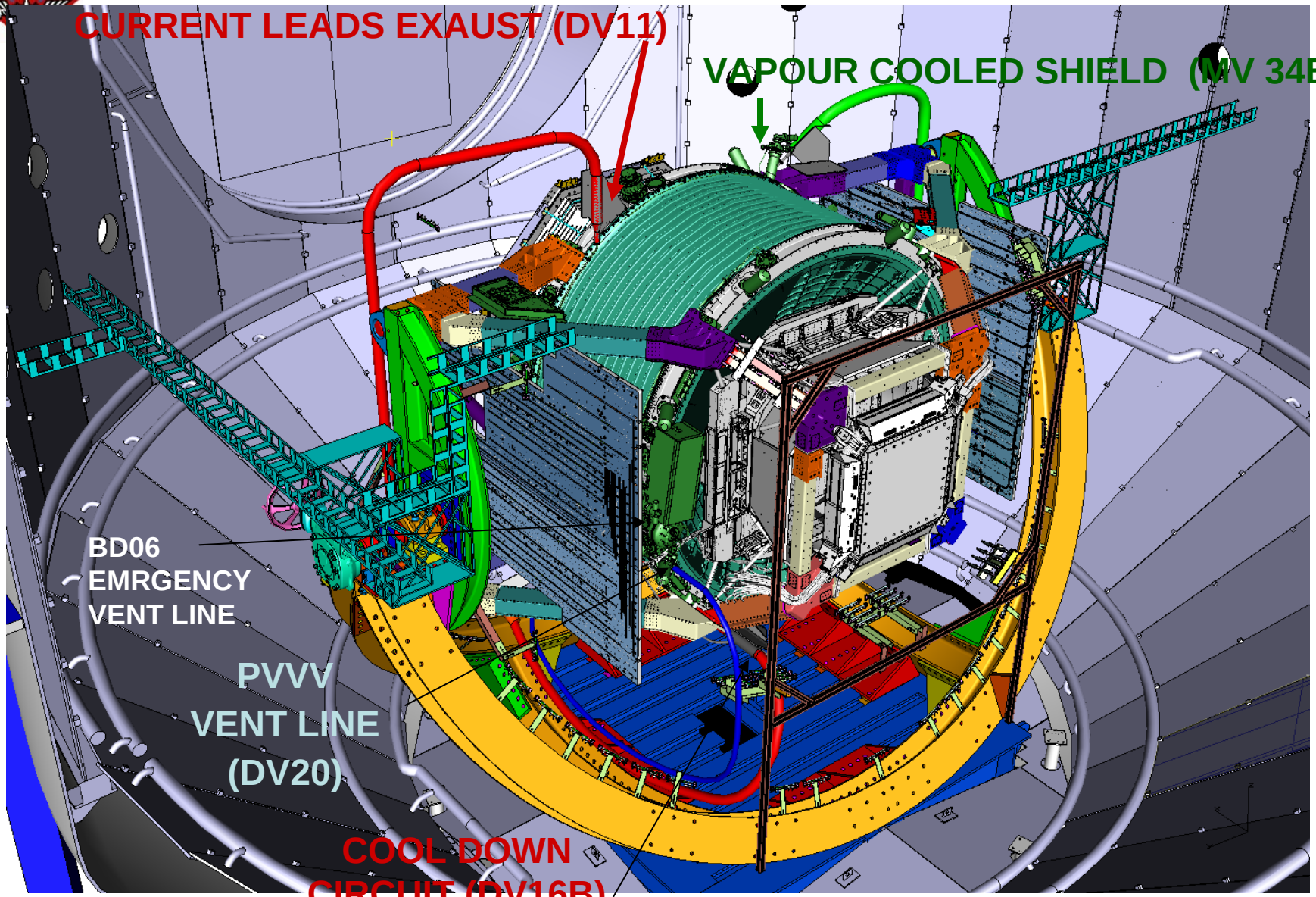
5 COOL DOWN CIRCUIT [DV16B]

6 VAPOUR COOLED SHIELD [MV 34B]

7 FLIGHT VENT [DV15]

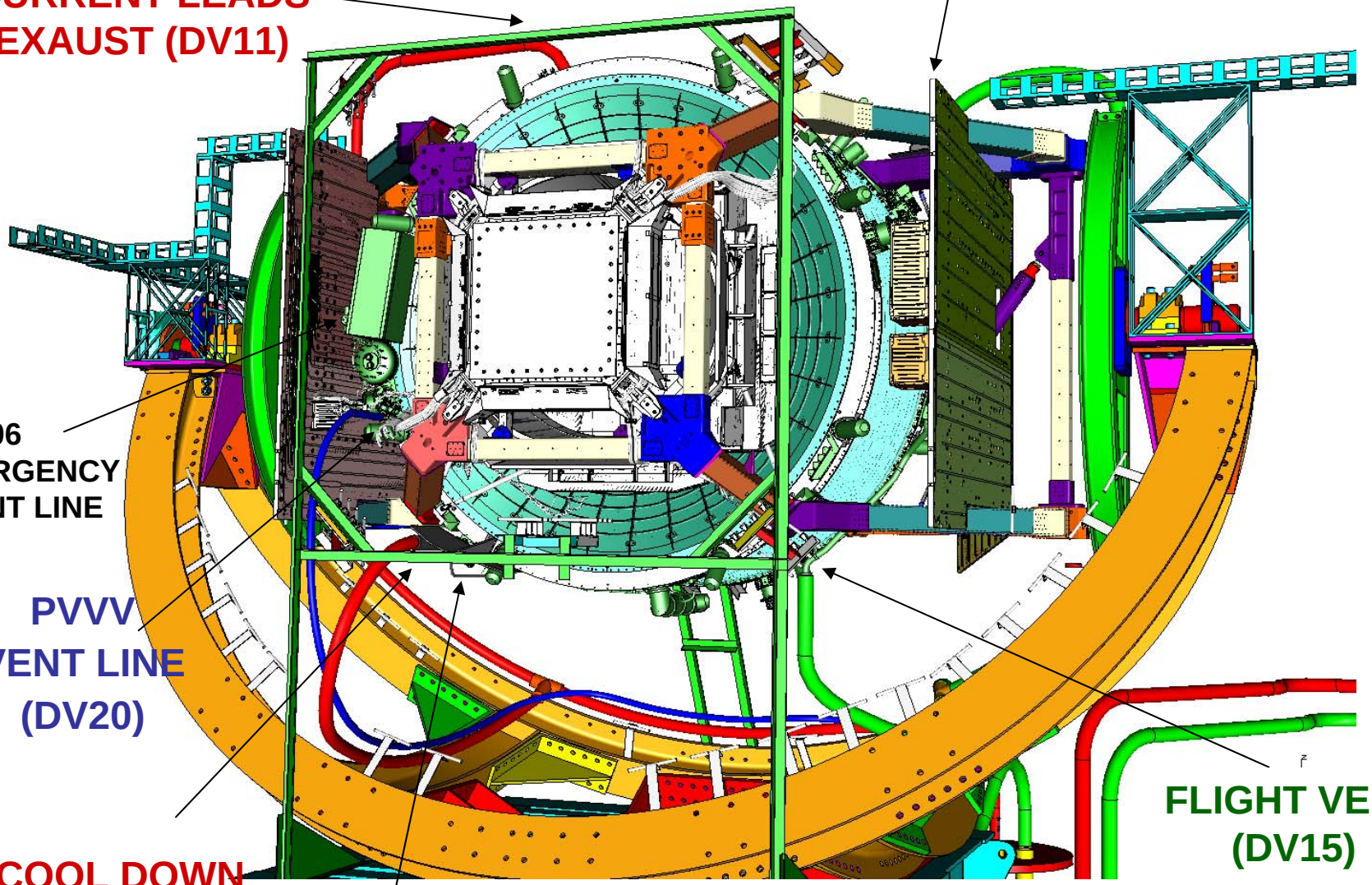
8 PVVV VENT LINE [DV20]

CGSE LSS IN


CURRENT LEADS EXAUST (DV11)
VAPOUR COOLED SHIELD (MV 34B)
BD06
EMRGENCY
VENT LINE
PVVV
VENT LINE
(DV20)
COOL DOWN
CIRCUIT (DV16B)

Cryo-Lines NOT SHOWN

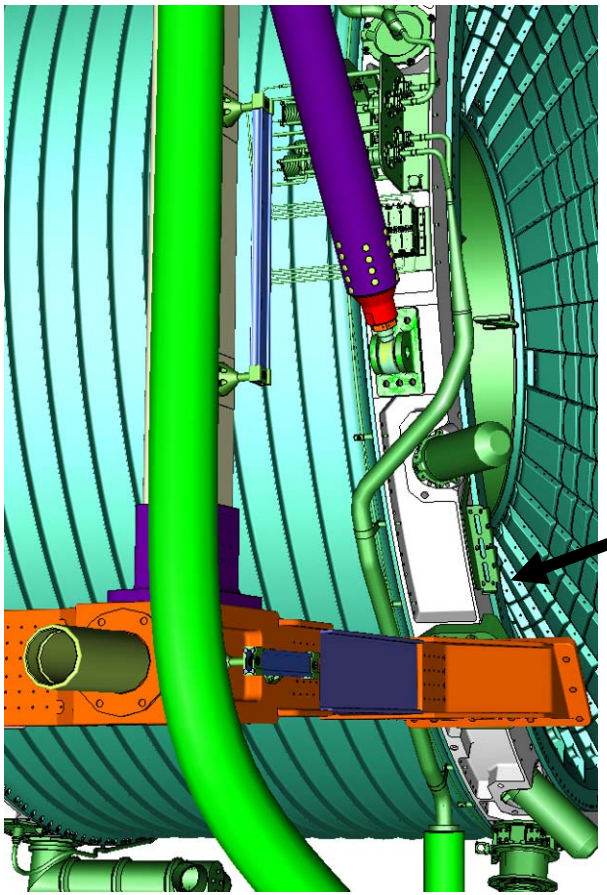
1) EMRGENCY VENT LINE [BD06] (CHIMMY)
2) EXTERNAL VALVES AIR/N2
3) FLIGHT VENT PUMP LINE

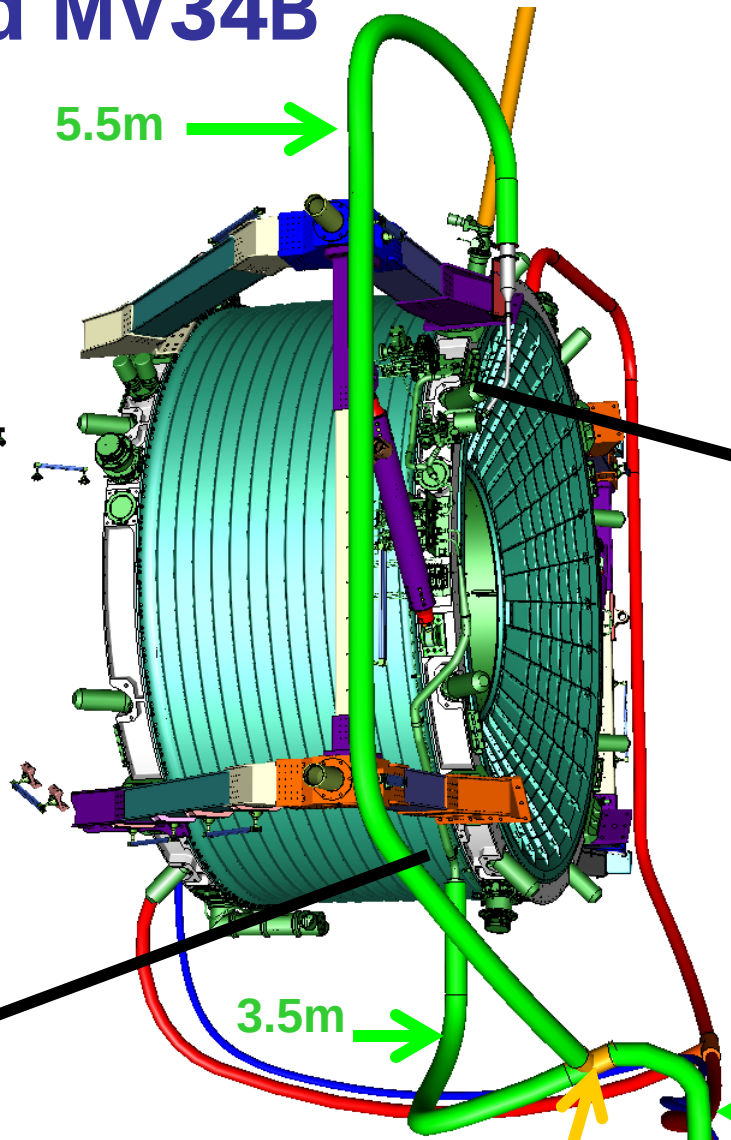


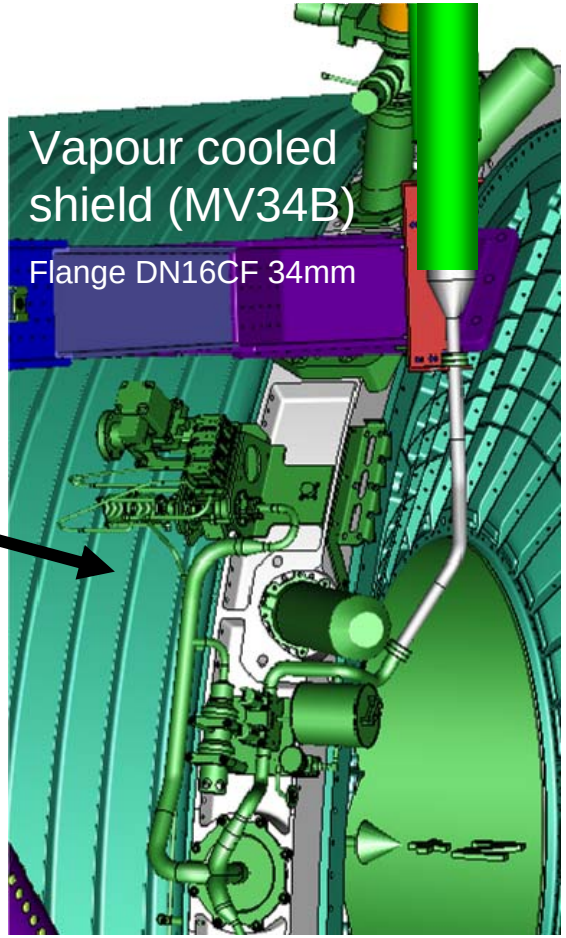
DV15 and MV34B

Flight Vent
(DV15)

Flange DN38CF 70mm







Vapour cooled shield (MV34B)

SS 65 mm corrugated line

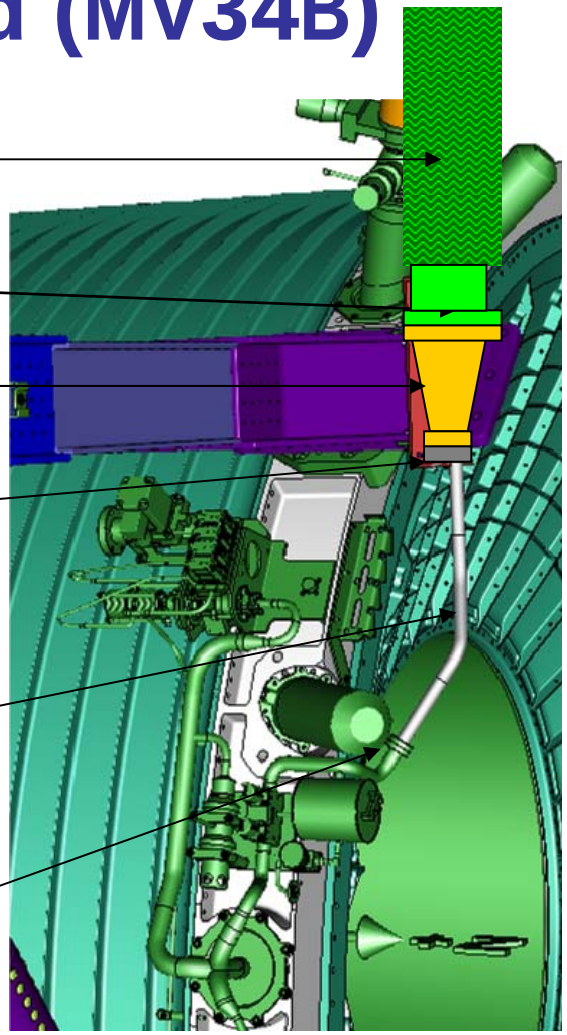
ISO K 63 at SS corrugated line

Adaptor CF-16 (34mm-OD flange) VS ISO K 63

CF-16 (34mm-OD flange) tapped M4

Installed in CERN clean-room

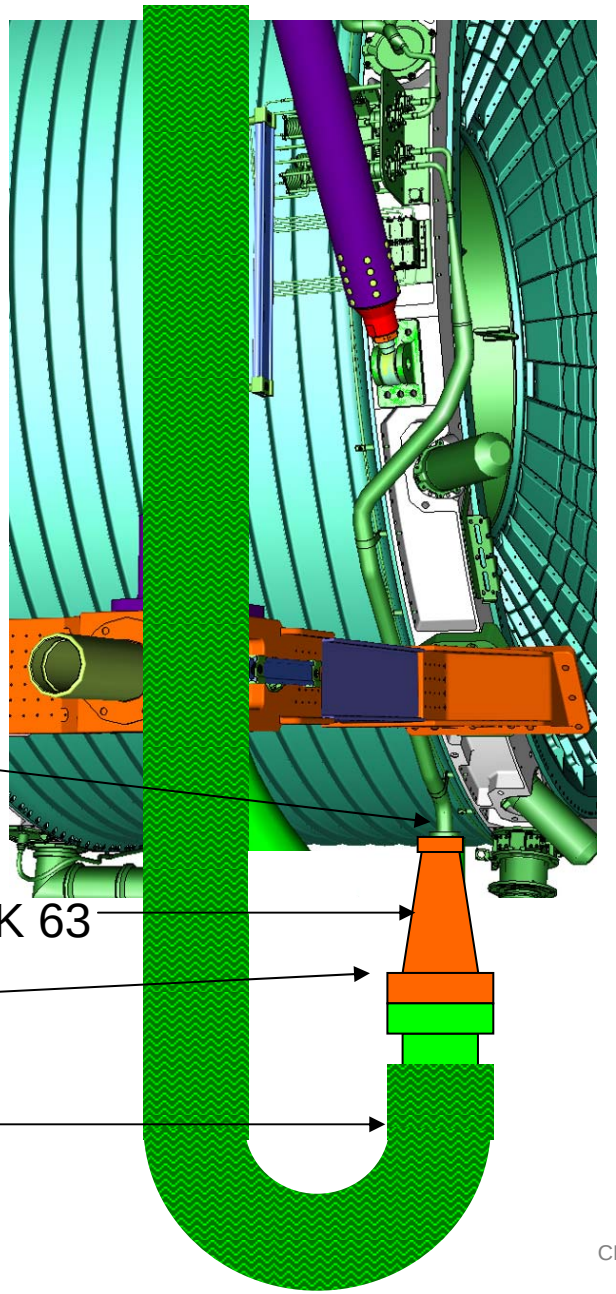
CF-16 (34mm-OD flange) w/ thru holes and a tapped M4 flange (6mm thick) behind it; needs longer M4 screws 0.75"OD x 0.036"W tubing



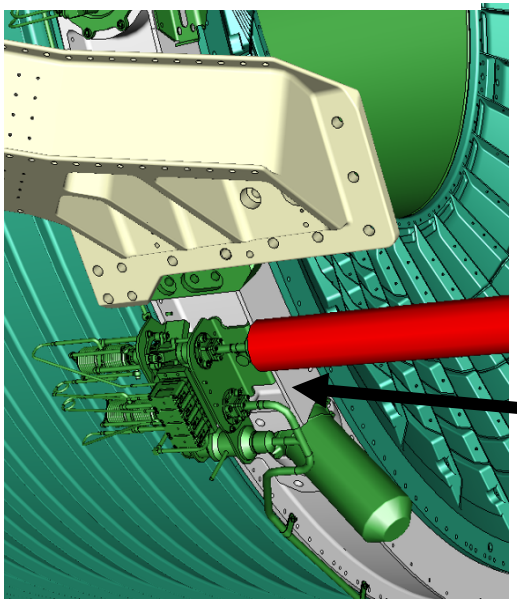
Vapour cooled shield (MV34B)

Flange DN16CF 34mm

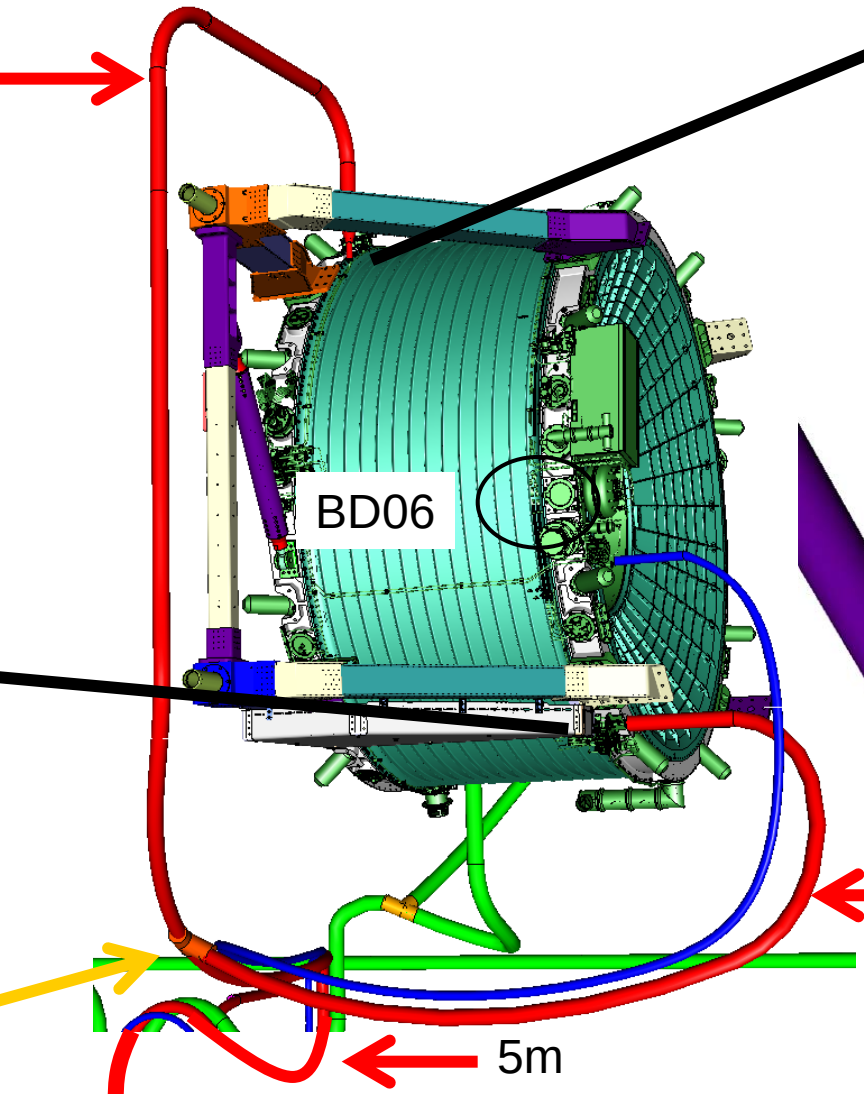
Flight Vent (DV15)

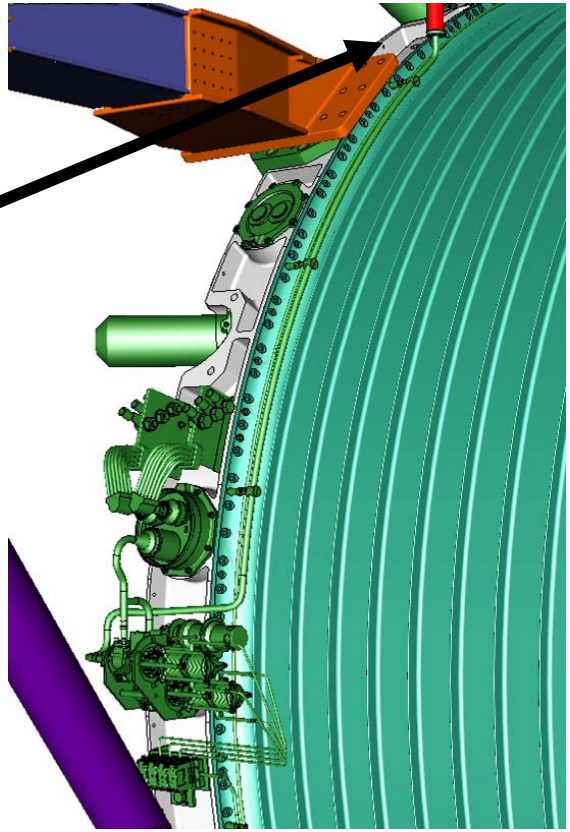


DV16B and DV11



Cool Down Circuit
(DV16B)





Current Leads
Exaust (DV11)

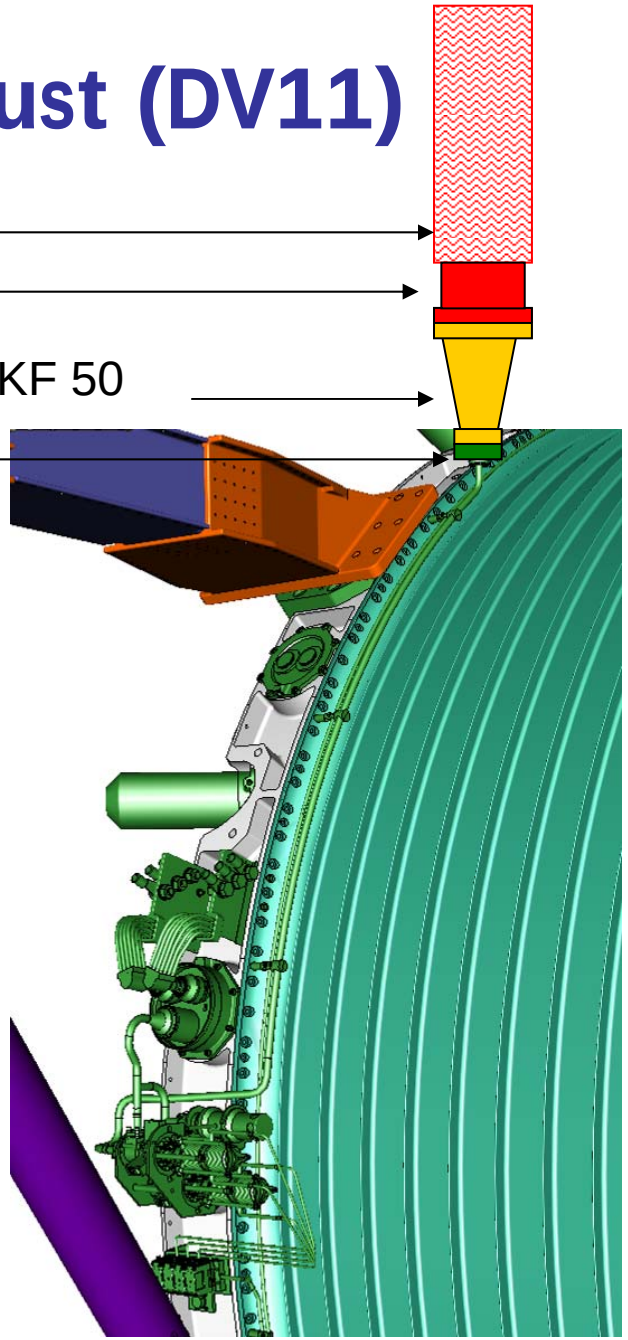
Current Leads Exaust (DV11)

SS corrugated line DN50mm

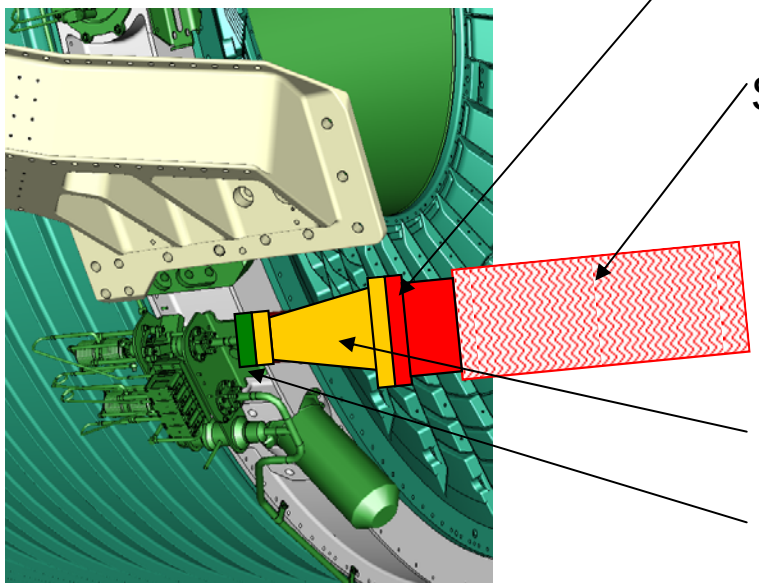
Flange ISO KF 50

Adaptor CF-16 (34mm-OD flange) Vs ISO KF 50

CF-16 (34mm-OD flange)



Cool Down Circuit (DV16B)



Flange ISO KF 50

SS corrugated line DN50mm

Adaptor CF-16 (34mm-OD flange) Vs ISO KF 50

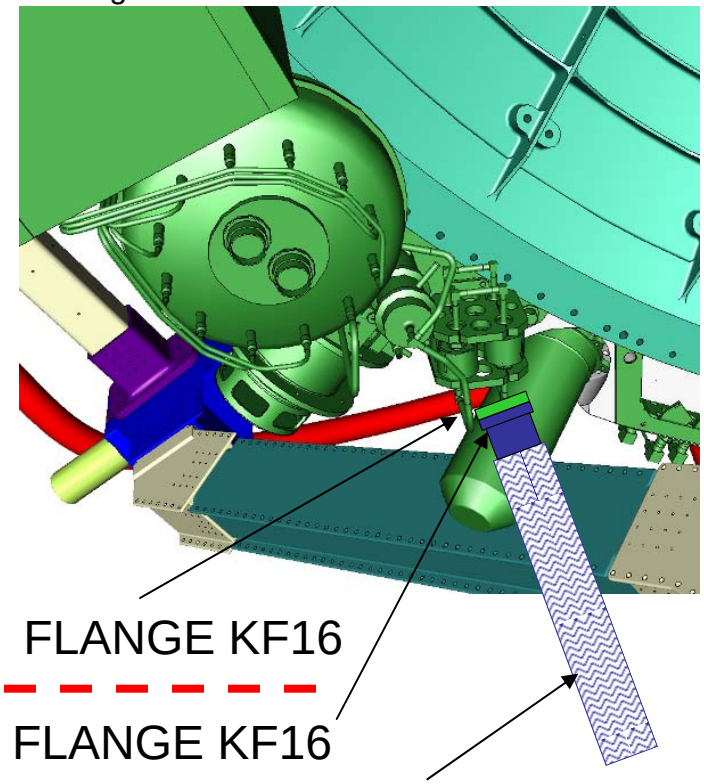
CF-16 (34mm-OD flange)

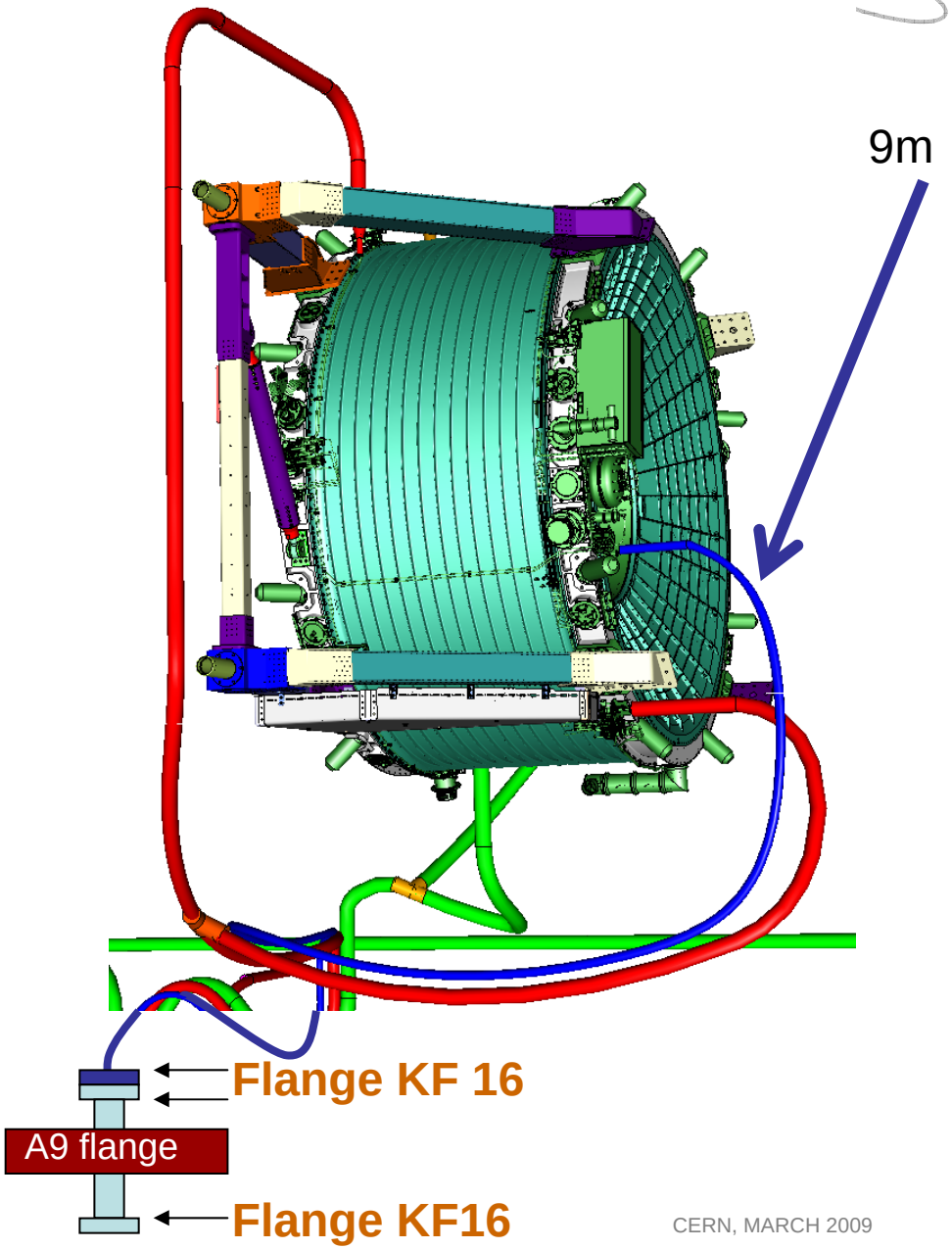
DV20

PVVV VENT LINE

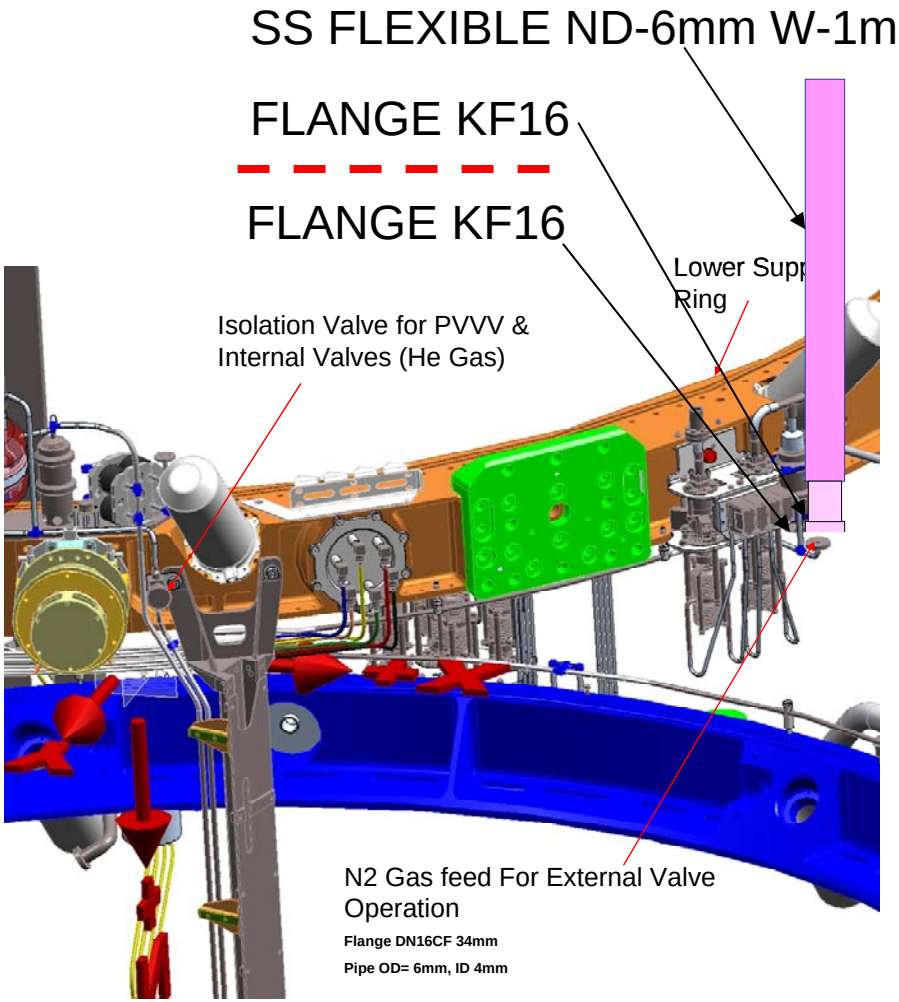
(DV20)

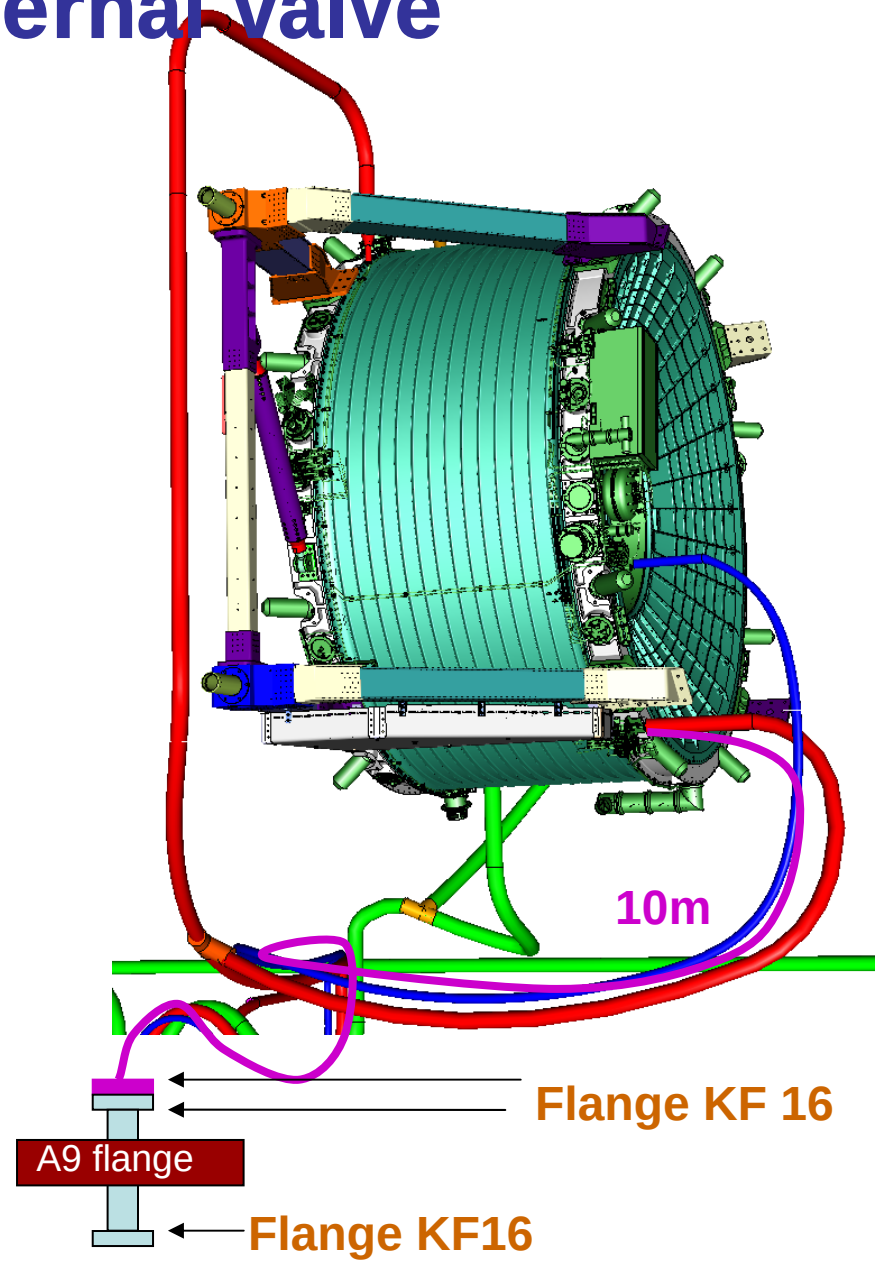
Flange DN16KF



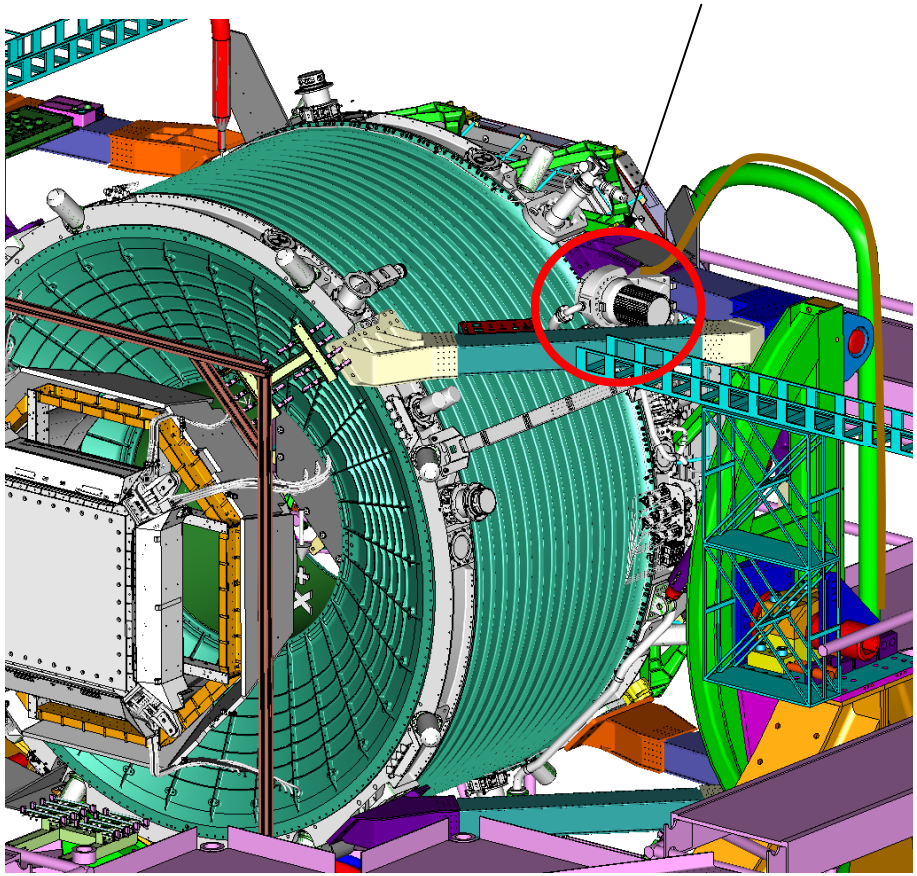


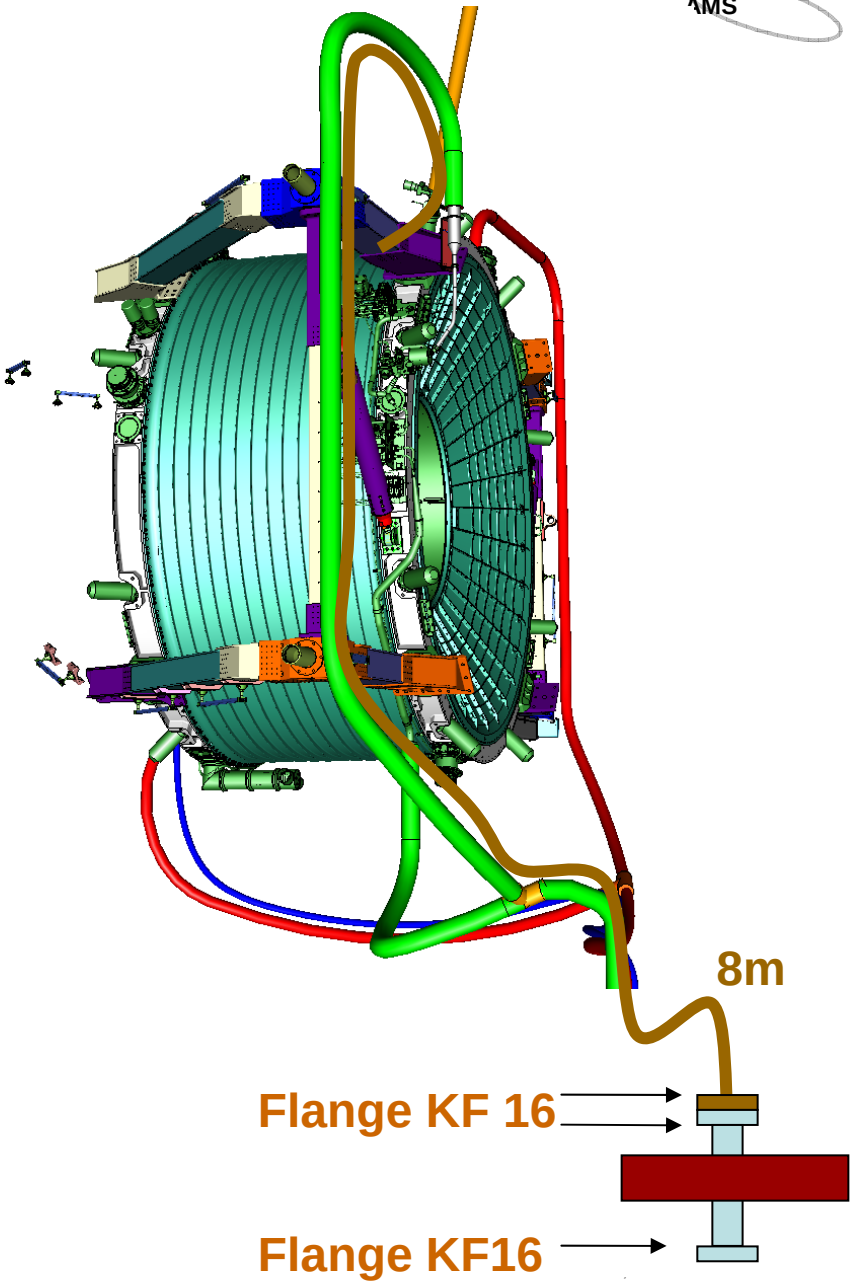
N2 gas feed for external valve





FLIGHT VENT PUMP EXAUST

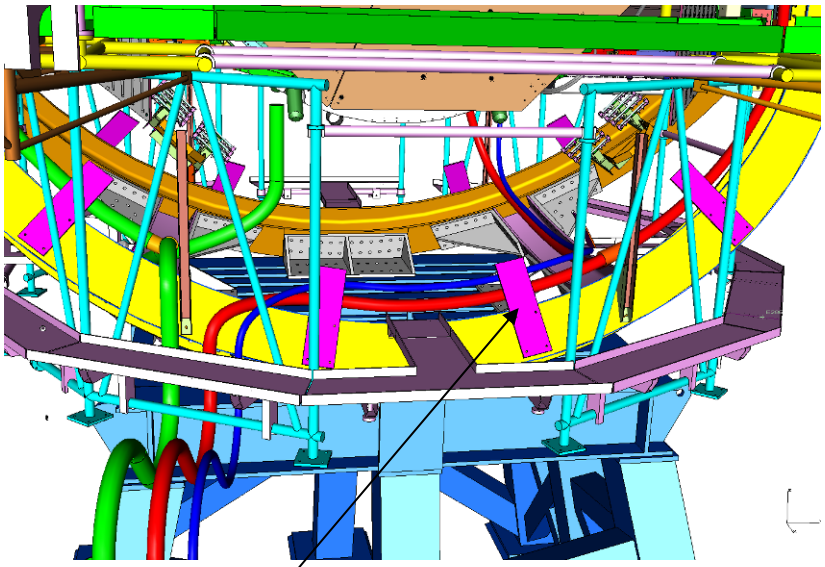




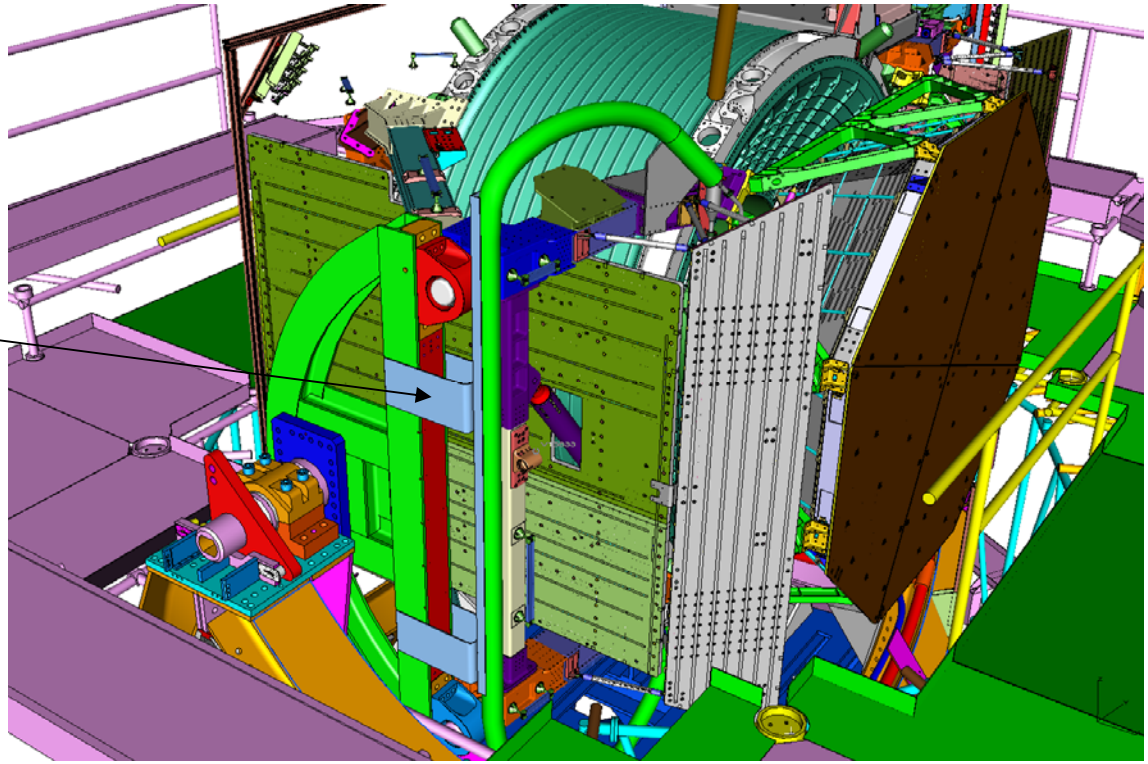
FLANGE KF16

FLANGE KF16

SS CORRUGATED DN-16



CGSE SUPPORTS AT GONDOLA



CGSE LINES INSTALLATION INSIDE LSS AND ACCESS POINTS

1 EMERGENCY VENT LINE [BD06]

Chimney inside LSS for safety; temporary line 1m above work access, reuse flexible line from CERN clean room, attached to LUSS/ECAL lamps support. Line installation will be after AMS installation and 90° rotation and after LUSS/ECAL lamps support installation.

ACCESS needed for installation: Scaffolding L2-10A,B,C

2 EXTERNAL VALVES AIR/N2

Pipe OD 6mm x 1mm W; routed through A9 flange. The line can be preinstalled in the LSS before AMS installation and the connection to AMS finalized after AMS installation and 90° rotation.

ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange

3 FLIGHT VENT PUMP LINE

Exhaust line from the flight vent pump, routed outside through A9 flange, purpose is to avoid helium contamination inside the chamber. Pump will only be used in atmospheric pressure conditions from the time the MV34 is closed (physical access required) to the time the LSS door is closed before pumping down starts.

This line will be installed in the LSS:

a) after AMS installation and 90 degree rotation providing there will be access by the LSS movable platform

b) will be connected to AMS in advance (the full length or a portion of it), outside the LSS, and lifted together with AMS in the LSS providing will be well secured (TBD).

ACCESS needed for installation:

a) LSS movable platform (TBD), Scaffolding L2-12C, LSS seismic table, A9 flange

b) LSS seismic table, Scaffolding L1-11, A9 flange

CGSE LINES INSTALLATION INSIDE LSS AND ACCESS POINTS

4 CURRENT LEADS EXHAUST [DV11 A/B]

SS corrugated line DN 50mm, routed outside through A9 flange.
The line is in two sections jointed by a “T” that also connects to the *cool down circuit* line.
Sections length are 6.5m and 5m.
The section that goes to the A9 flange (5m) will be preinstalled before AMS installation.
ACCESS needed for installation: LSS seismic platform, Scaffolding L1-11, A9 flange
The section that goes to AMS port DV11 (6.5m) will be installed
a) after AMS installation and 90 degree rotation providing there will be access by the LSS movable platform
b) will be connected to AMS in advance, outside the LSS, and lifted together with AMS in the LSS providing will be well secured (TBD). This section is supported by devoted brackets to the Gondola rotating frame, close to the brackets used for AMS fixation to the Gondola (line-brackets design under definition).
ACCESS needed for installation:
a) LSS movable platform (TBD), LSS seismic table, Scaffolding L2-9C
b) LSS seismic table, Scaffolding L2-9C

5 COOL DOWN CIRCUIT [DV16B]

SS corrugated line DN 50mm. The line is in two sections jointed by a “T” that also connects to the current leads exhaust line. Sections length 6.5m and 5m. Both the sections will be preinstalled before AMS installation and the connection to AMS will be finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange

CGSE LINES INSTALLATION INSIDE LSS AND ACCESS POINTS

6 VAPOUR COOLED SHIELD [MV 34B]

SS corrugated line DN 65mm, routed outside through A9 flange. The line is in two sections jointed by a "T" that also connects to the *flight vent* line. Section length 5.5m and 3.5m.
The section that goes to the A9 flange (3.5m) will be preinstalled before AMS installation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange.
The section that goes to AMS port DV11 (5.5m) will be installed
a) after AMS installation and 90 degree rotation providing there will be access by the LSS movable platform
b) will be connected to AMS in advance, outside the LSS, and lifted together with AMS in the LSS providing will be well secured (TBD). This section is supported by devoted brackets to the Gondola rotating frame, close to the brackets used for AMS fixation to the Gondola (line-bracket design under definition).
ACCESS needed for installation:
a) LSS movable platform (TBD), LSS seismic table, Scaffolding L2-12C
b) LSS seismic table, Scaffolding L2-12C

7 FLIGHT VENT [DV15]

SS corrugated line DN 65mm, routed outside through A9 flange. The line is in two sections jointed by a "T" that also connects to the *vapour cooled shield* line. Sections length 2.5m and 3.5m. Both the sections will be preinstalled before AMS installation and the connection to AMS will be finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange

8 PVVV VENT LINE [DV20]

SS corrugated line DN16? (9m)routed outside through A9 flange. The line will be preinstalled before AMS installation and the connection to AMS will be finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange

ACTION 5: TRD-GAS-Ground-Support-Equipment INSTALLATION

STEP_1: *TRD-GAS_GSE_LSS-OUT* INSTALLATION
STEP_2: FEEDTHROUGH AT C2 FLANGE
STEP_3:*TRD-GAS_GSE_LSS-IN* INSTALLATION AND CONNECTION TO AMS (after AMS installation and 90° rotation)
STEP_4: *test*

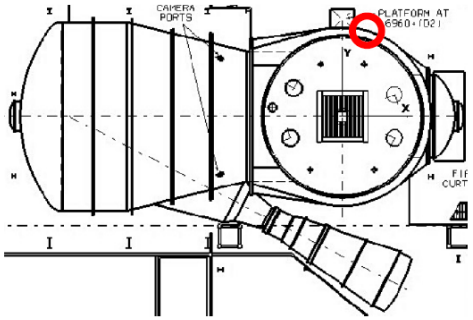
ESTEC TRD-GAS GSE

GSE for TRD Pressure Control in Emergency (TRD-GAS Failure)

To assure P_{TRD} stays above P_{ATM} when LSS is repressurized

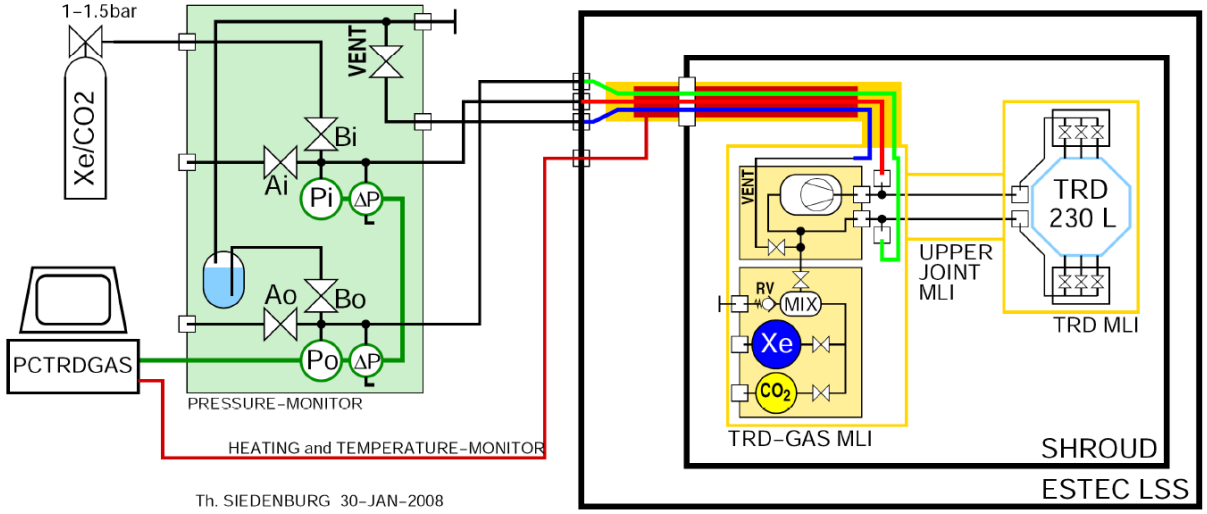
3 x 1/8" Lines for Gas In / Out / Vent
Fix routing from TRD to C2-Flange

Lines insulated in copper tube&MLI
Test of bending and heating



C2 Flange for TRD 3x1/8"VCR 1x25SubD

Flange specs sent to ESTEC



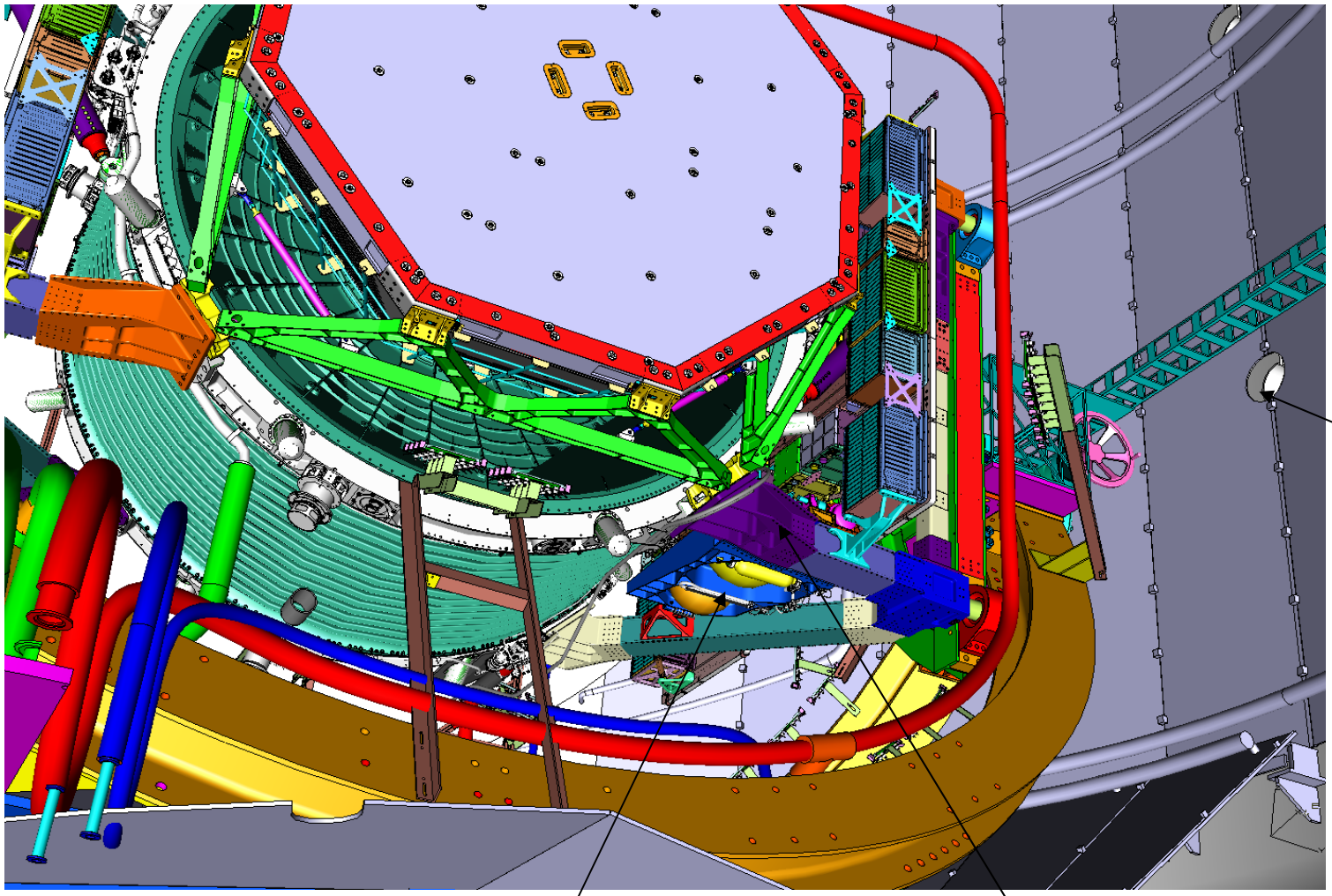
Th. SIEDENBURG 30-JAN-2008

AMS TIM 29-OCT-2008 Siedenburg / MIT Status TRD & TRD-GAS 9

by T.SIEDENBURG

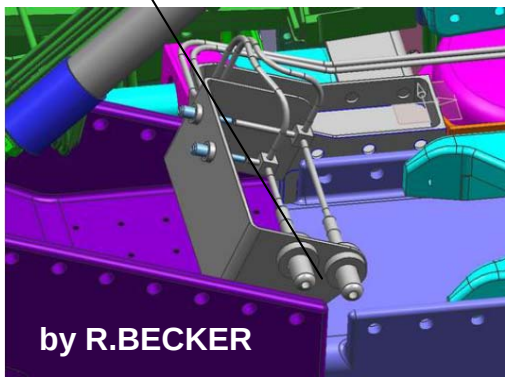
Three 1/8" stainless steel lines from TRD-GAS to C2 flange will be routed inside a copper tube with 8mm inner diameter. The copper tube will get some heater resistors and DALLAS temperature sensors to keep it above -30 degC. The copper tube will finally be wrapped in MLI.

ACCESS NEEDED INSIDE LSS: LSS seismic table, Scaffolding L2-3,L2-9A, C2 Flange, trd-gas_GSE pipe clamping points (TBD)

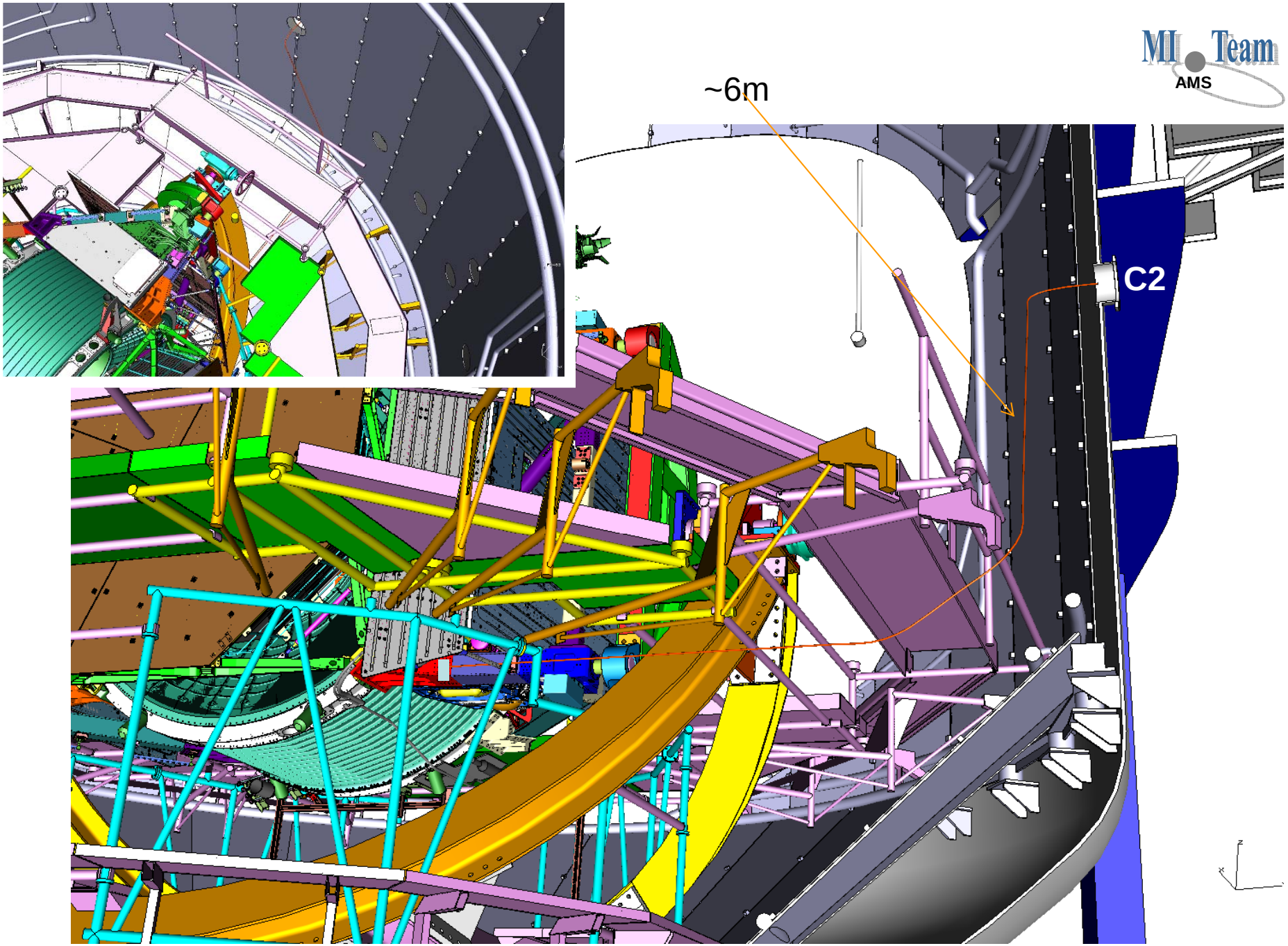


C2 FLANGE

TRD-gas system



TRD-Gas-GSE interface


~6m
C2

ACTION 6: INFRARED LAMPS INSTALLATION

STEP_1: Install lamps supports and lamps
(STEP_2: Route the infrared lamp power supplies cables to B3 & B4 flanges) *
(STEP_3: test)*

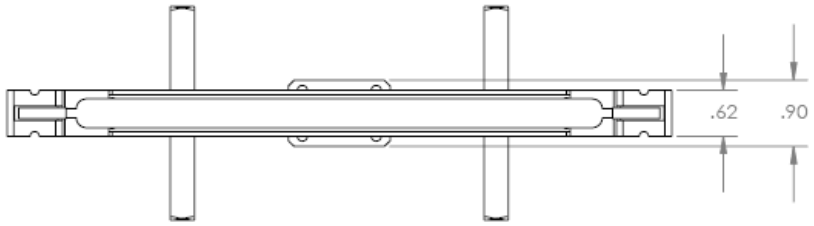
* **covered in the next action**

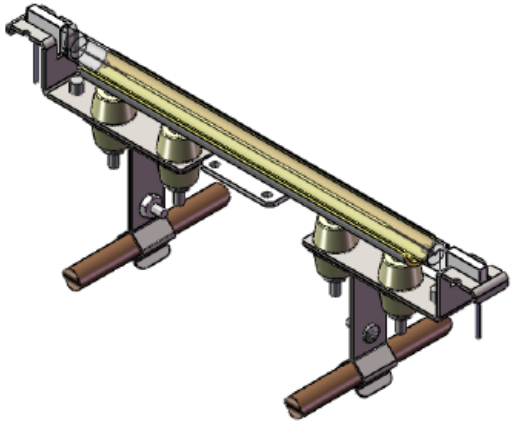
ACCESS NEEDED:

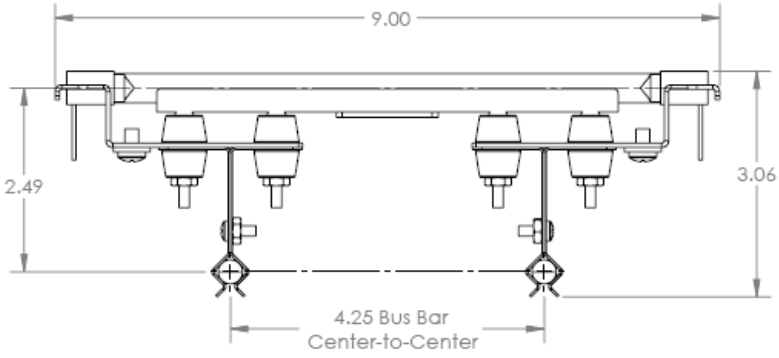
NOTE: as base line the lamps will be installed as late as possible in order to avoid to damage them during the installation of other hardware but, due to the number of lamps and the complexity of the overall lay-out, the installation will be in different steps

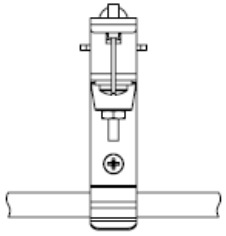
IR LAMPS

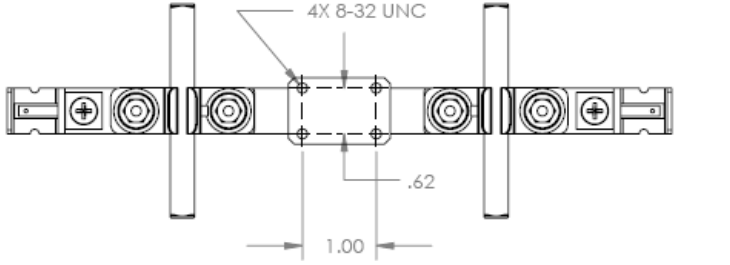
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	Initial release.	8/4/2008	PDR

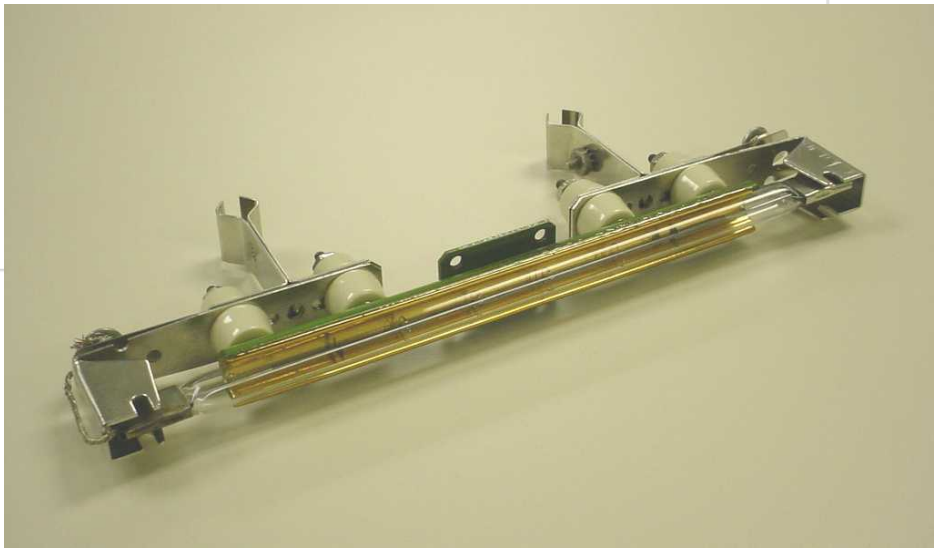






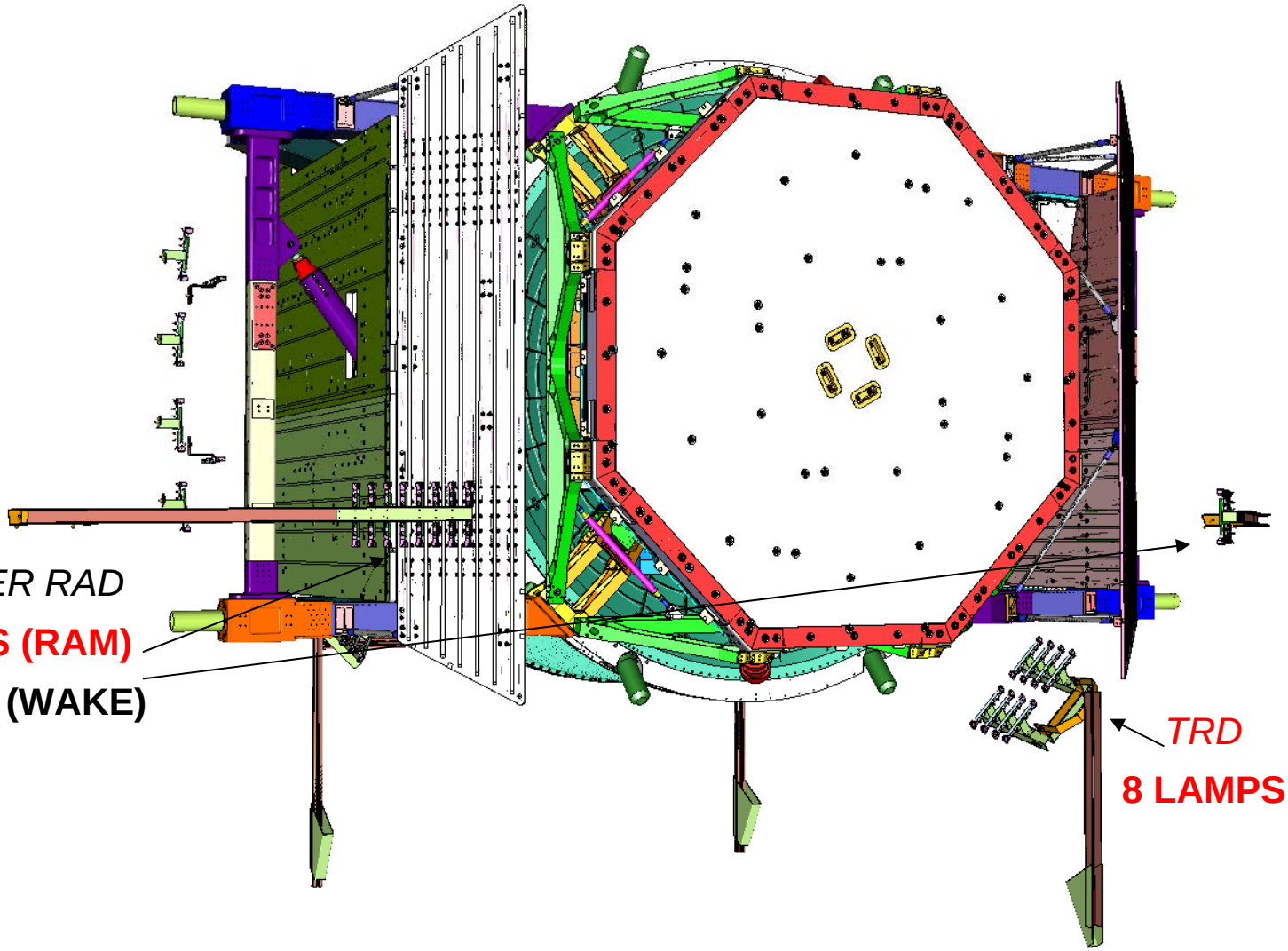


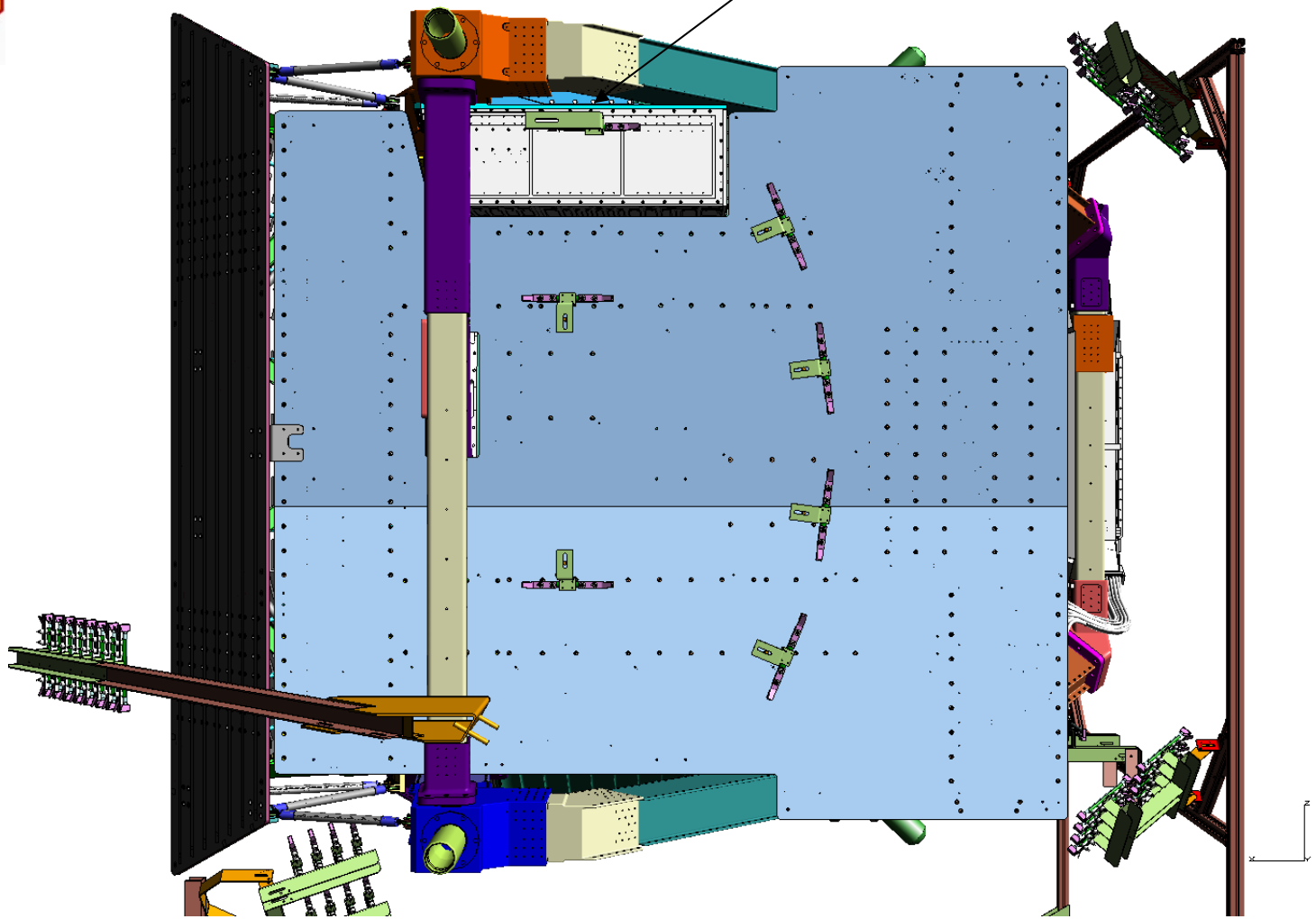




Corrado Gargiulo

77 LAMPS

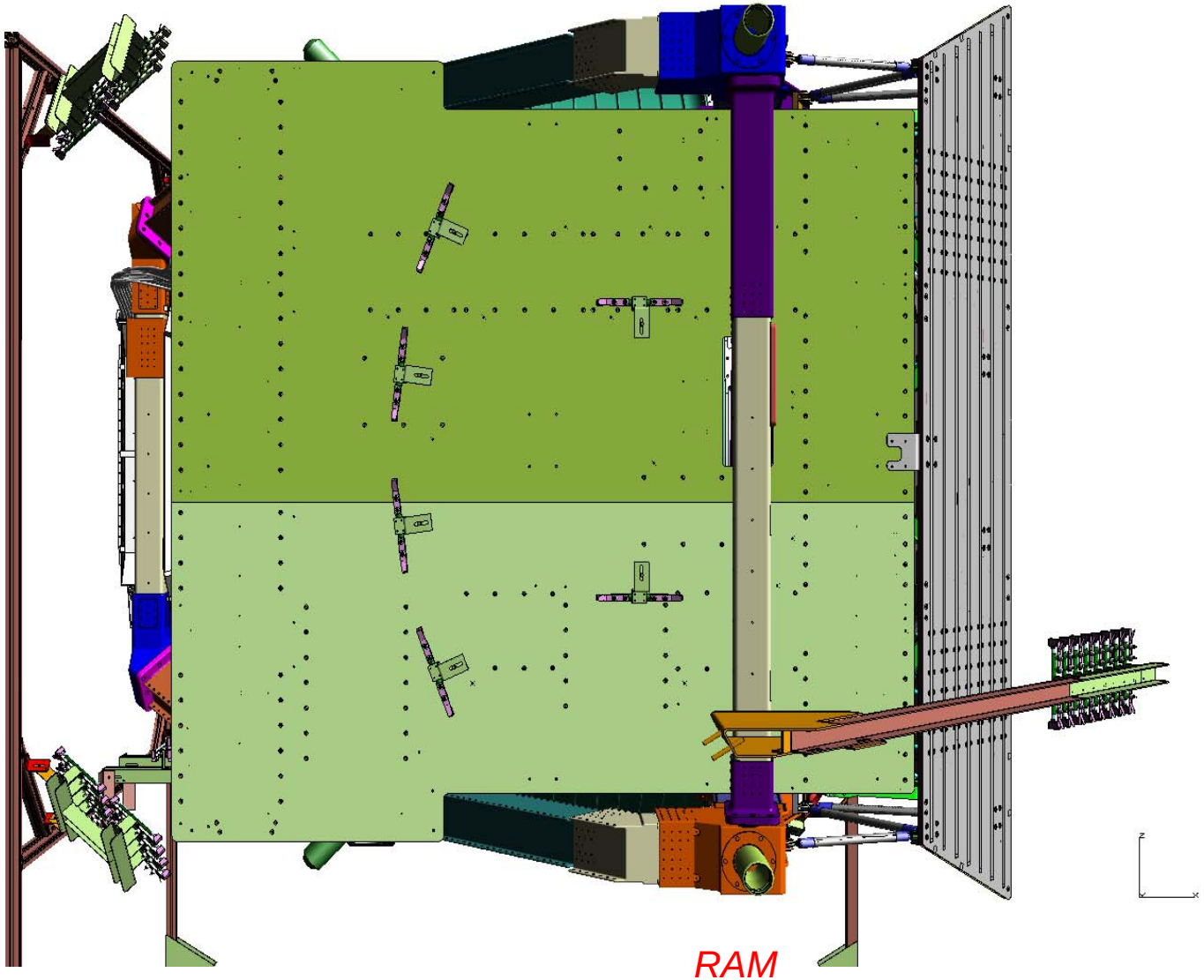




WAKE

MAIN RADIATOR

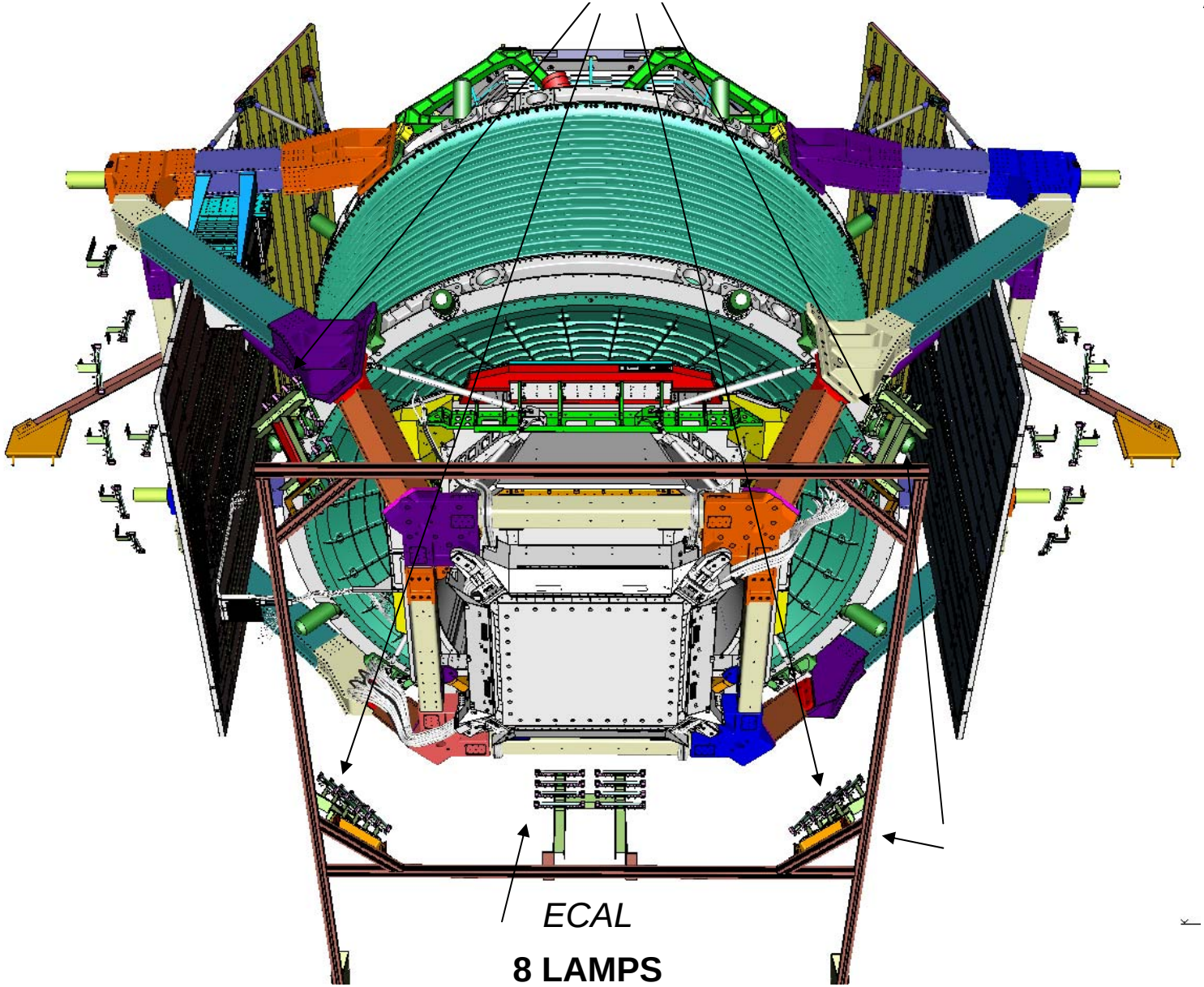
6 LAMPS



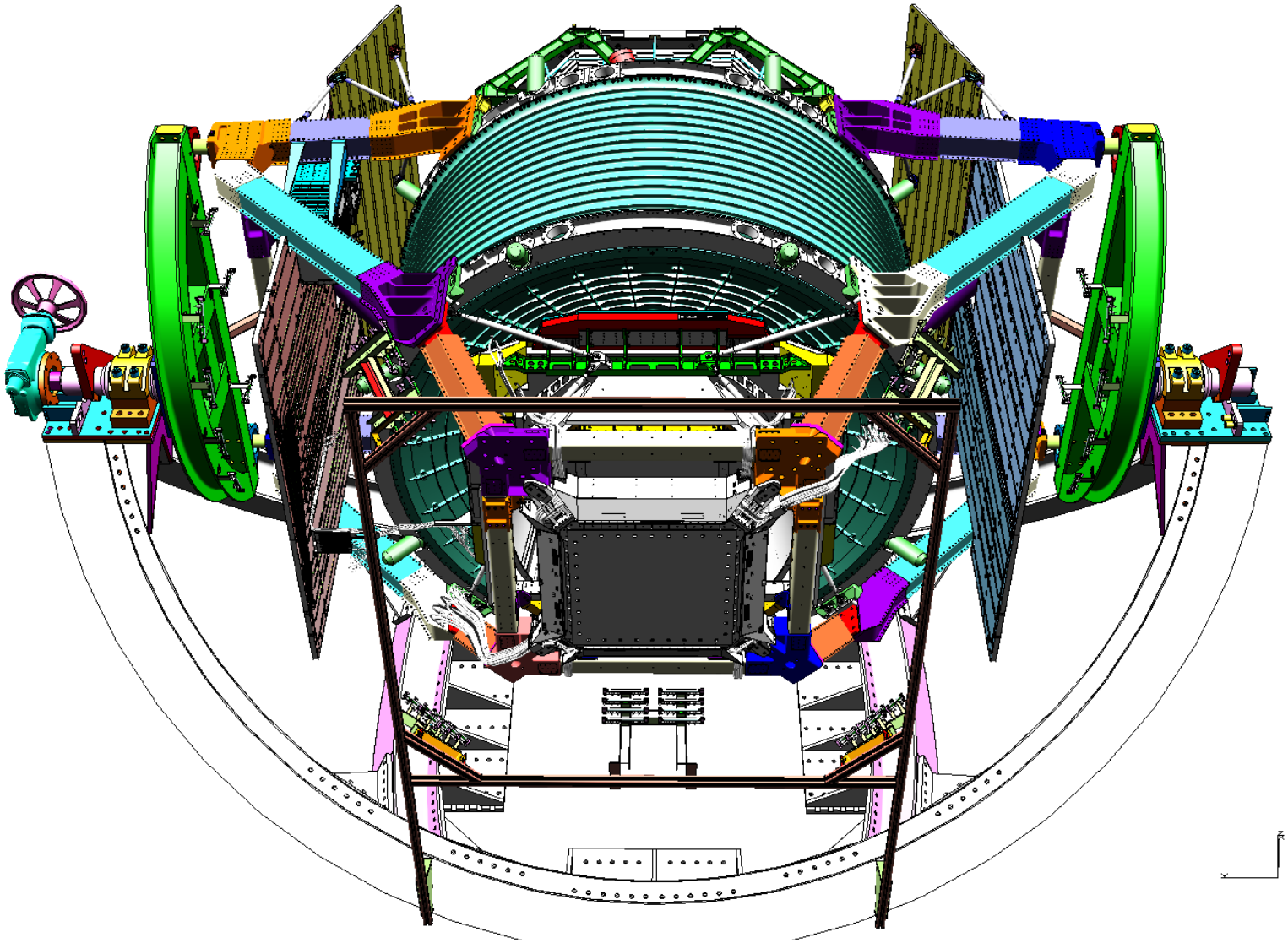
RAM

MAIN RADIATOR

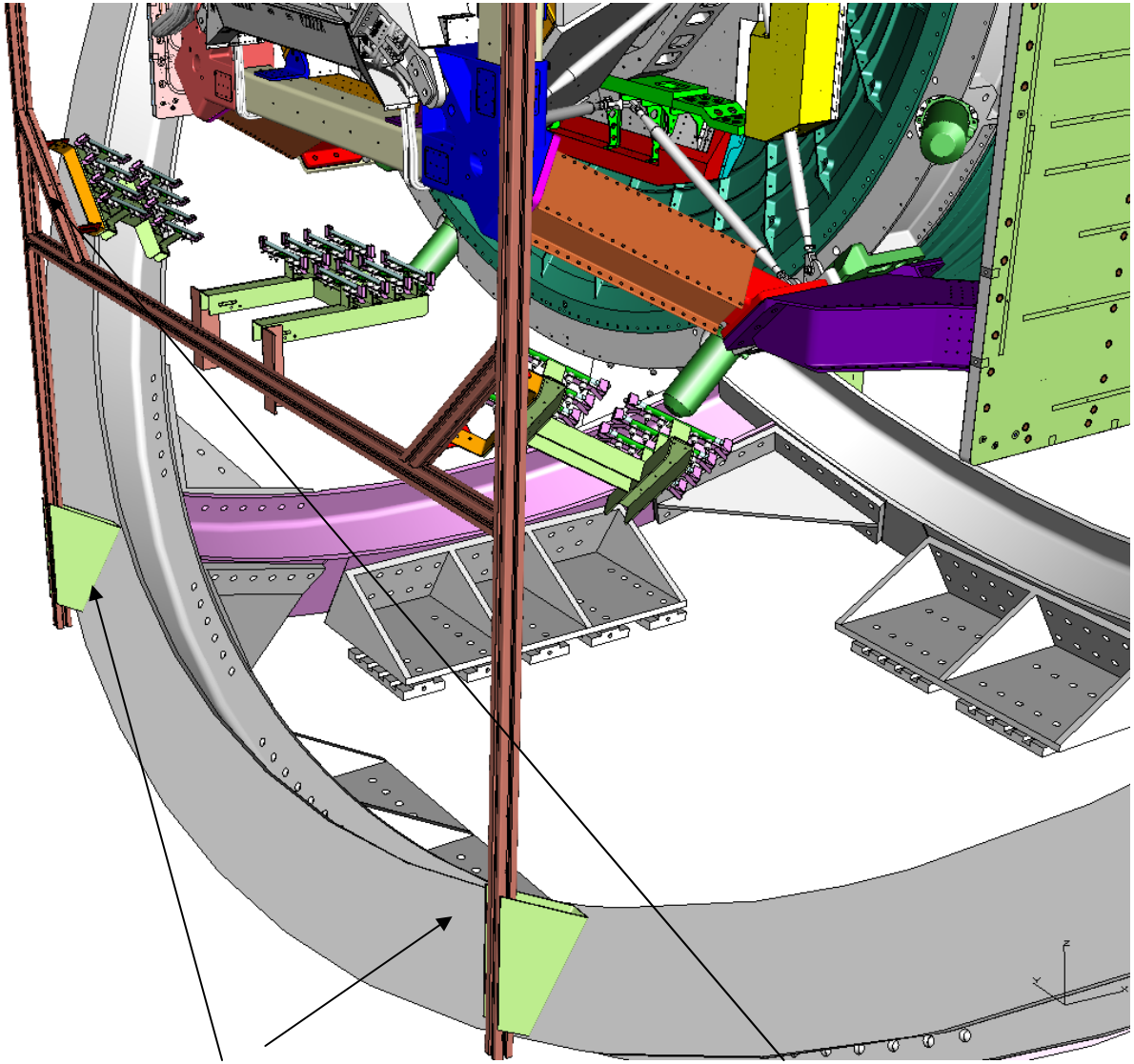
6 LAMPS


LUSS 8X4 LAMPS
ECAL
8 LAMPS

LAMPS FRAME for ECAL &LUSS

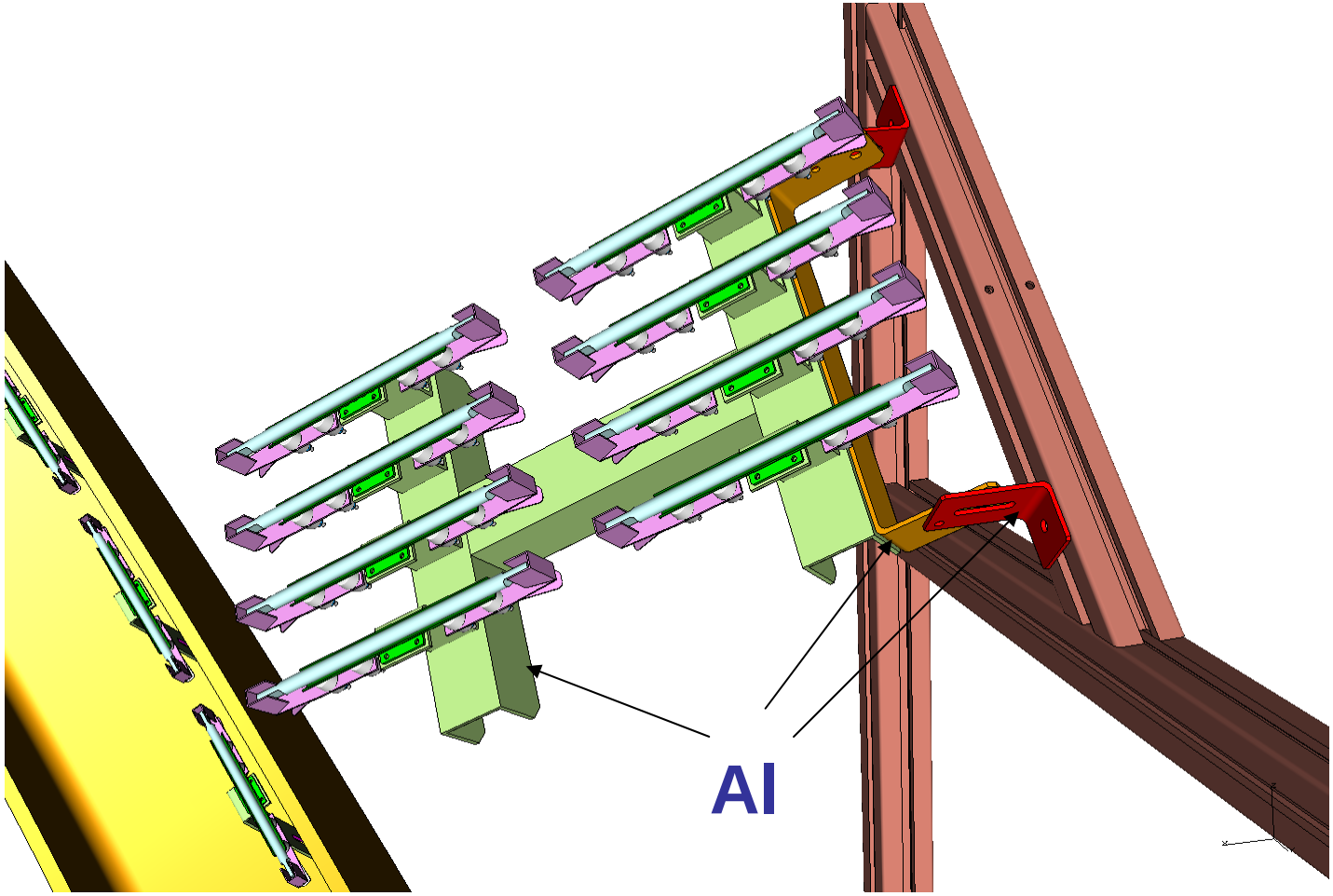


LAMPS FRAME for ECAL &LUSS



…fixed to the Gondola, drilled for venting…

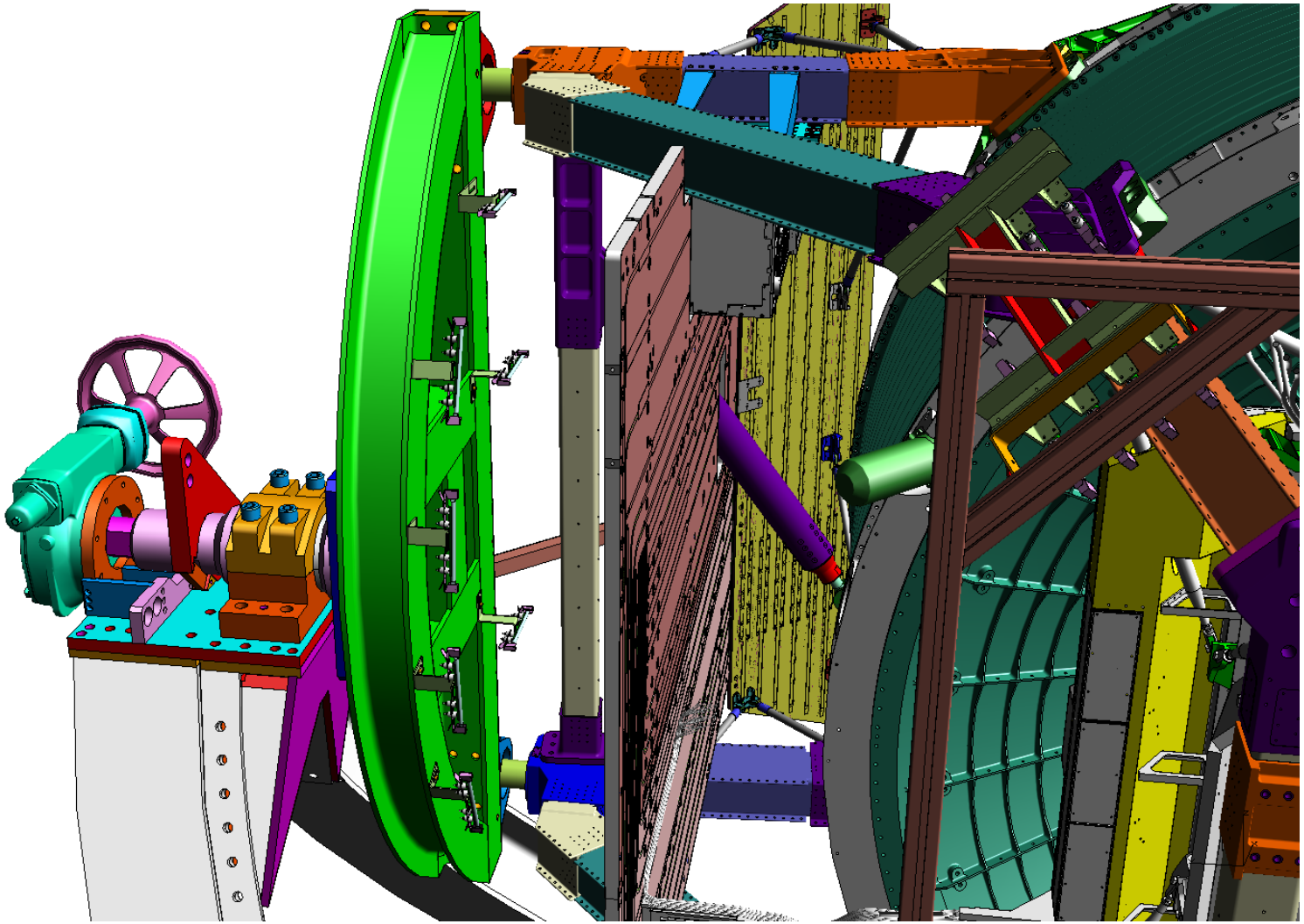
LAMPS FRAME for ECAL &LUSS



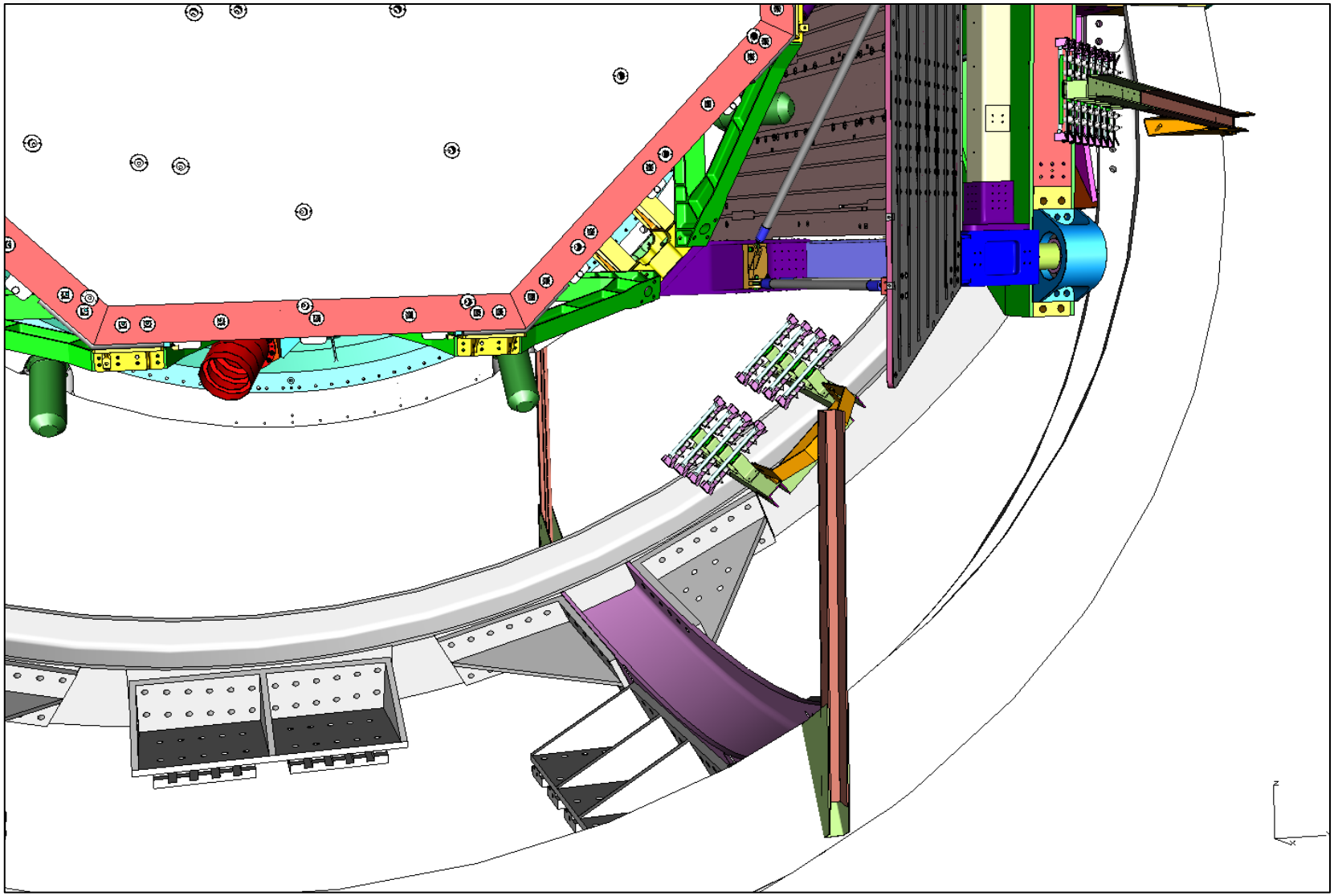
…lamps assembly adjustable for both installation and final position adjustment…

LAMPS for MAIN RADIATIORS,

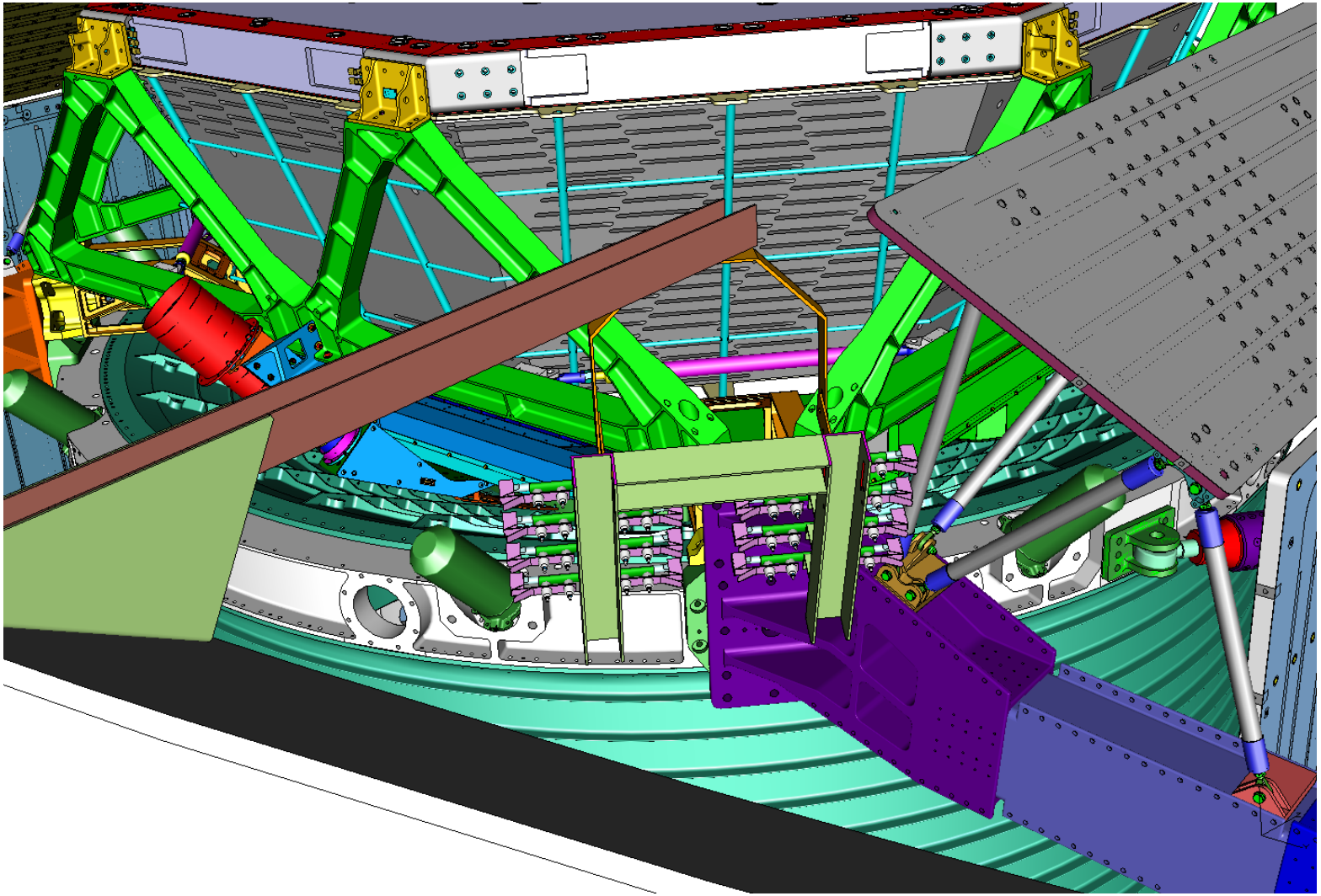
fixation to the GONDOLA



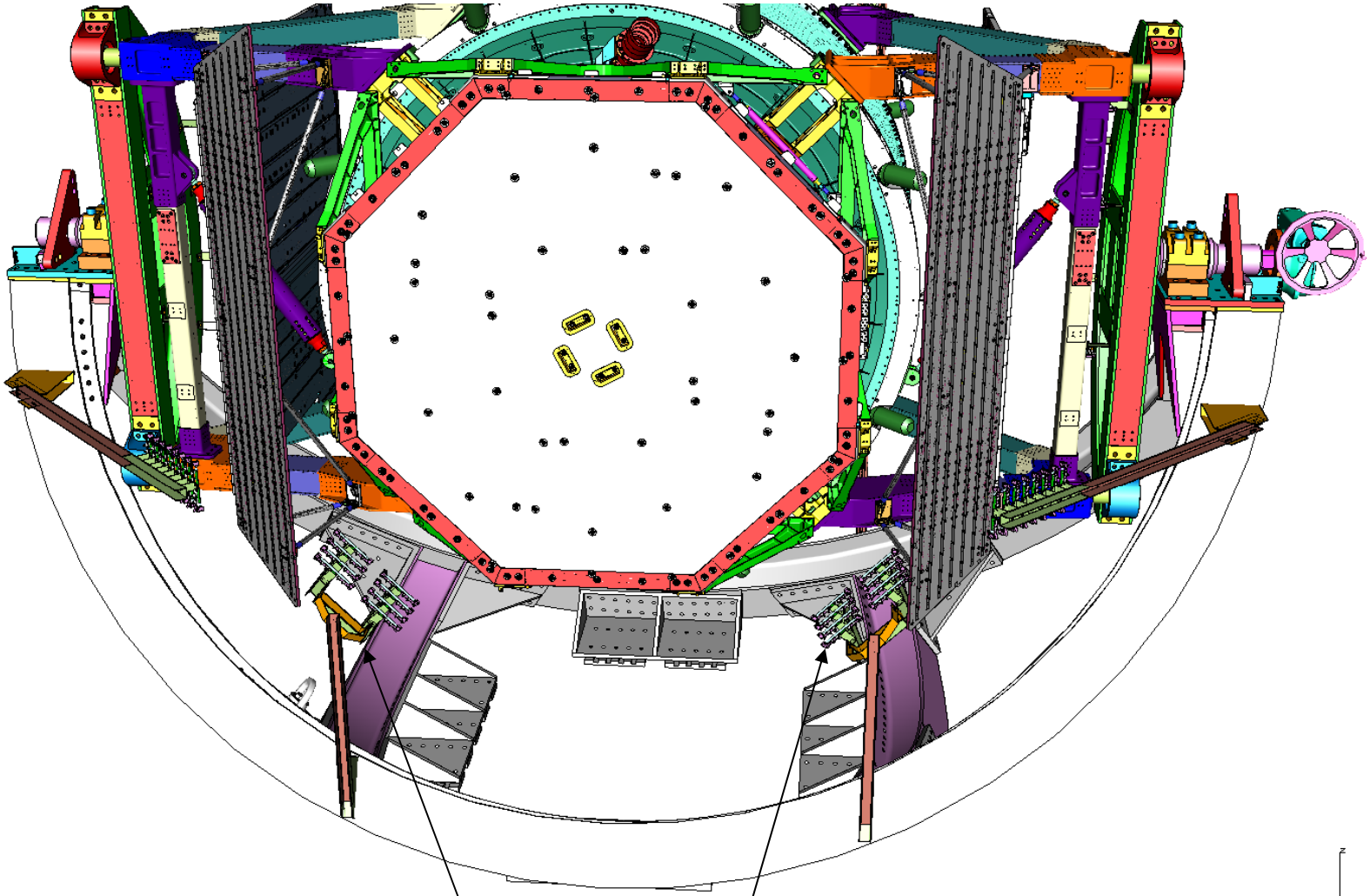
LAMPS SUPPORT FOR TRD



LAMPS SUPPORT FOR TRD

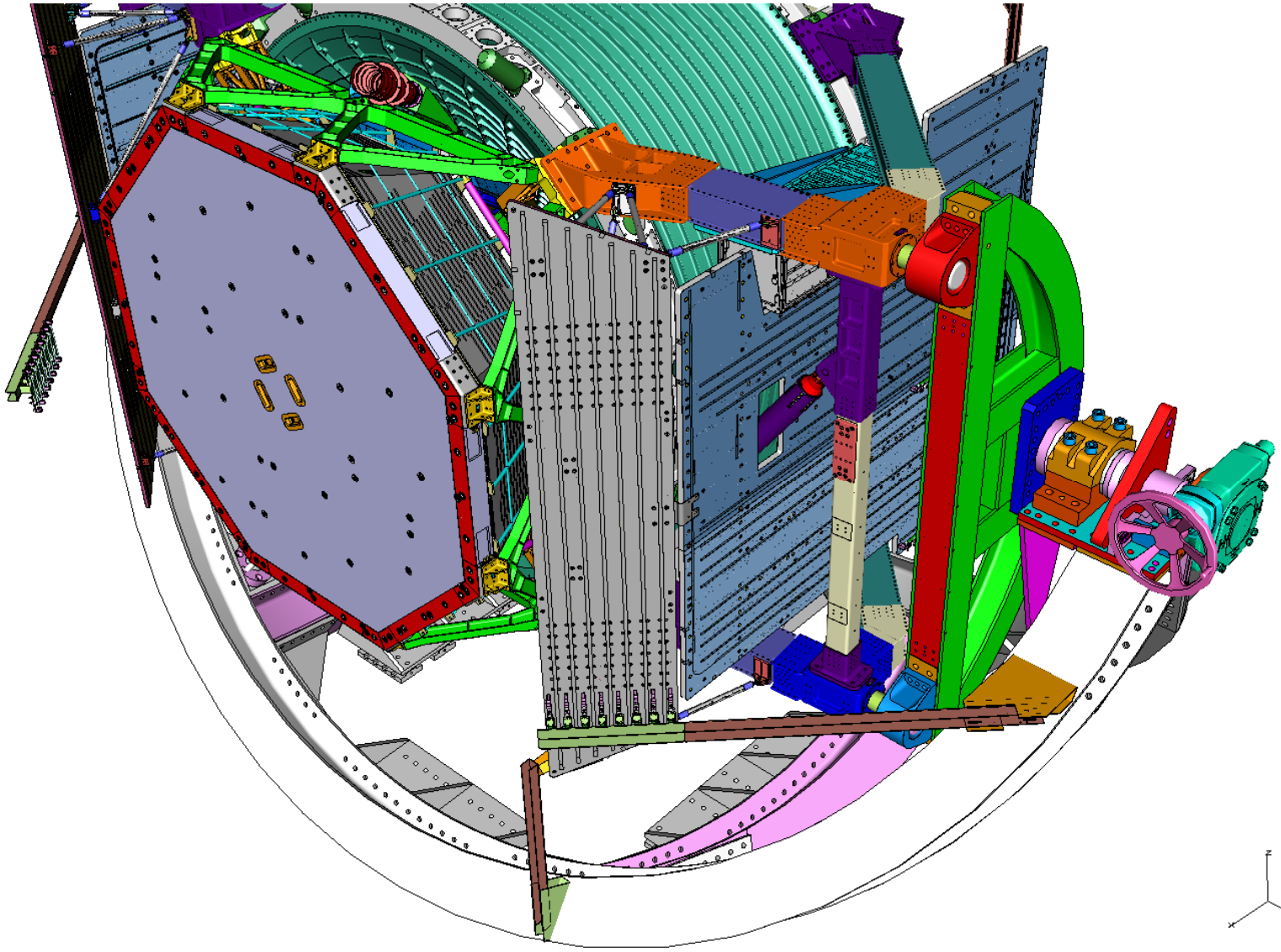


LAMPS SUPPORT FOR TRD

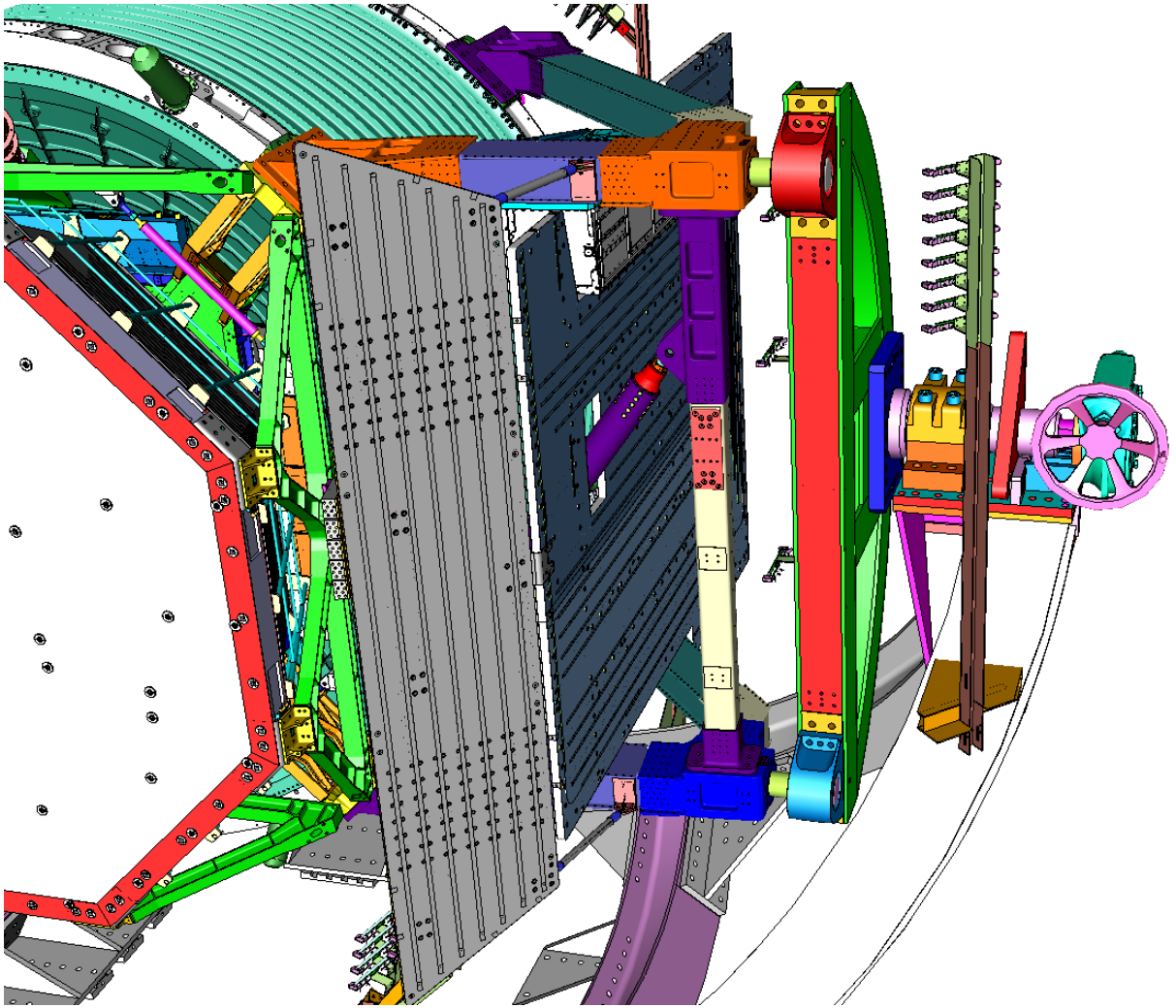


…possibility to mount the TRD lamps either at RAM or WAKE side …

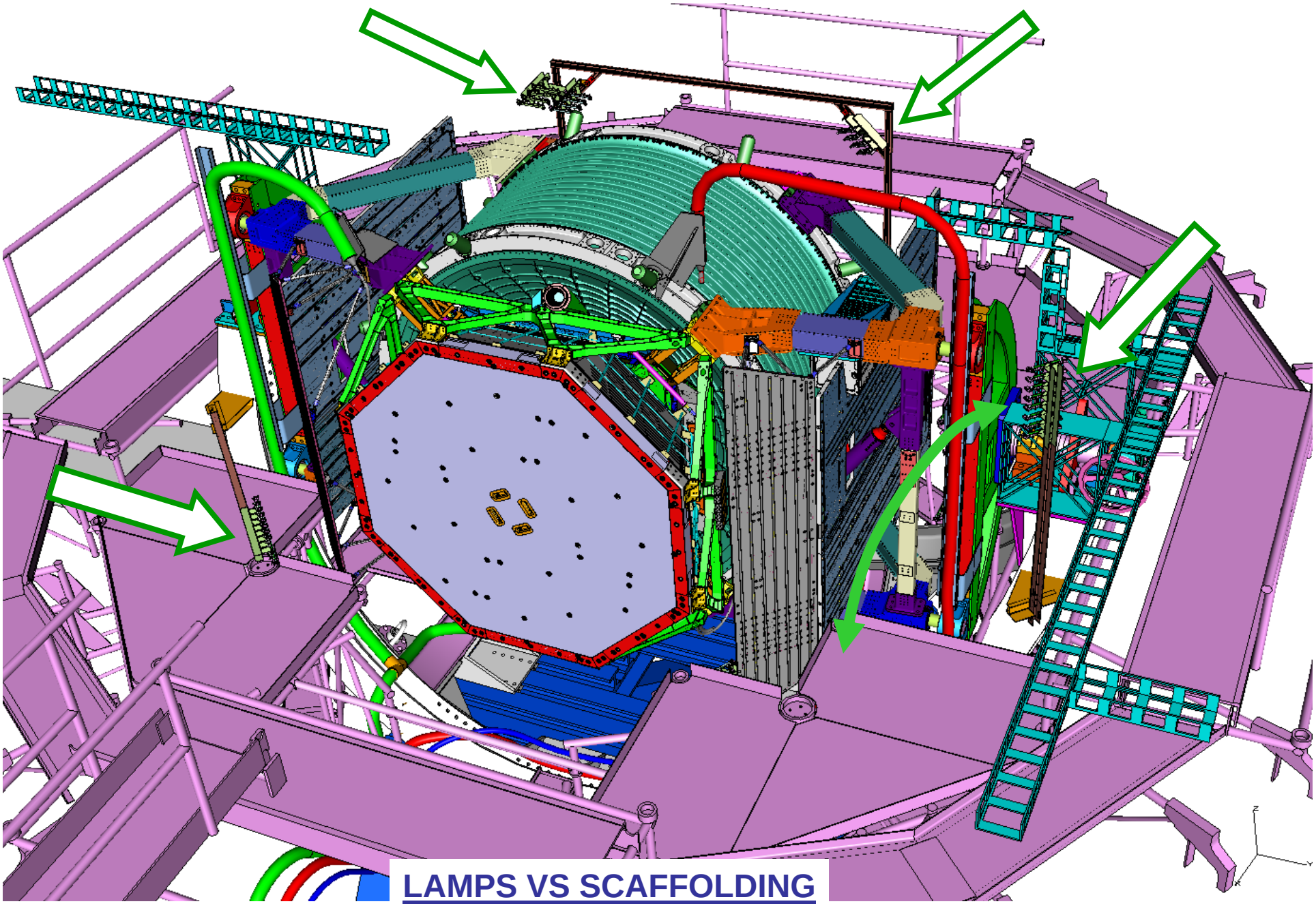
LAMPS SUPPORT FOR TRACKER RADIATORS



LAMPS SUPPORT FOR TRACKER RADIATORS

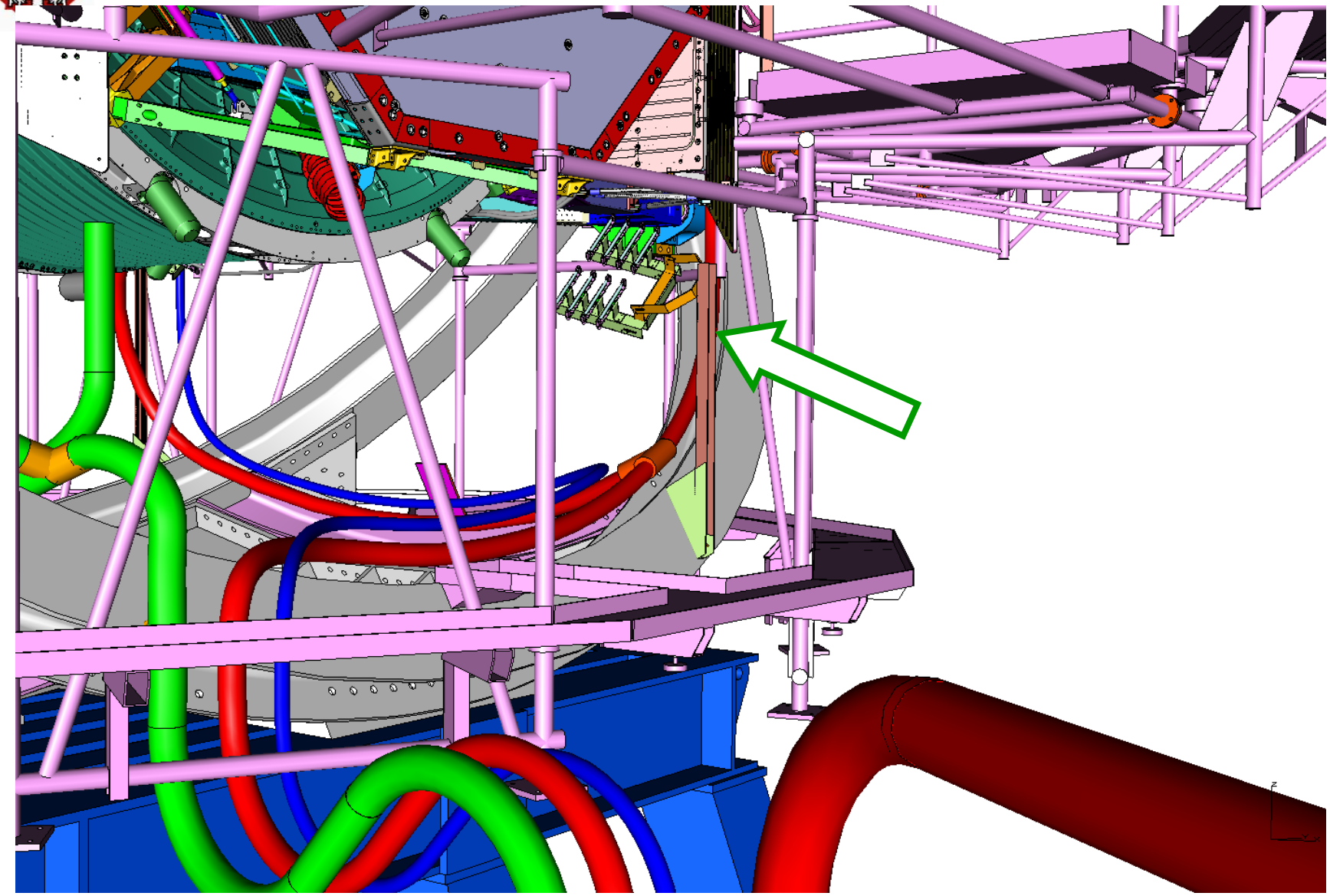


…possibility to rotate the support to allow for scaffolding removal …

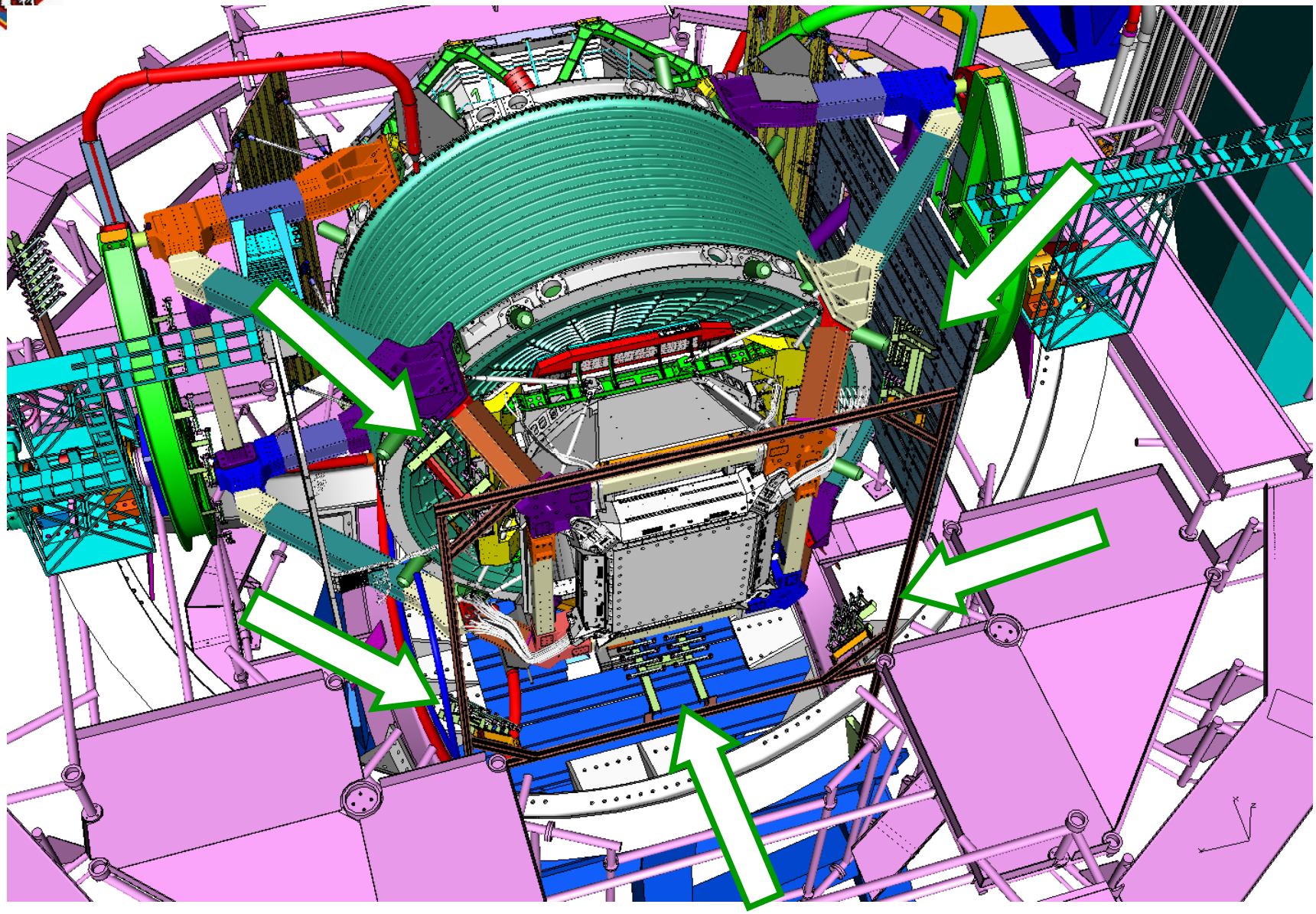


LAMPS VS SCAFFOLDING

LAMPS VS SCAFFOLDING

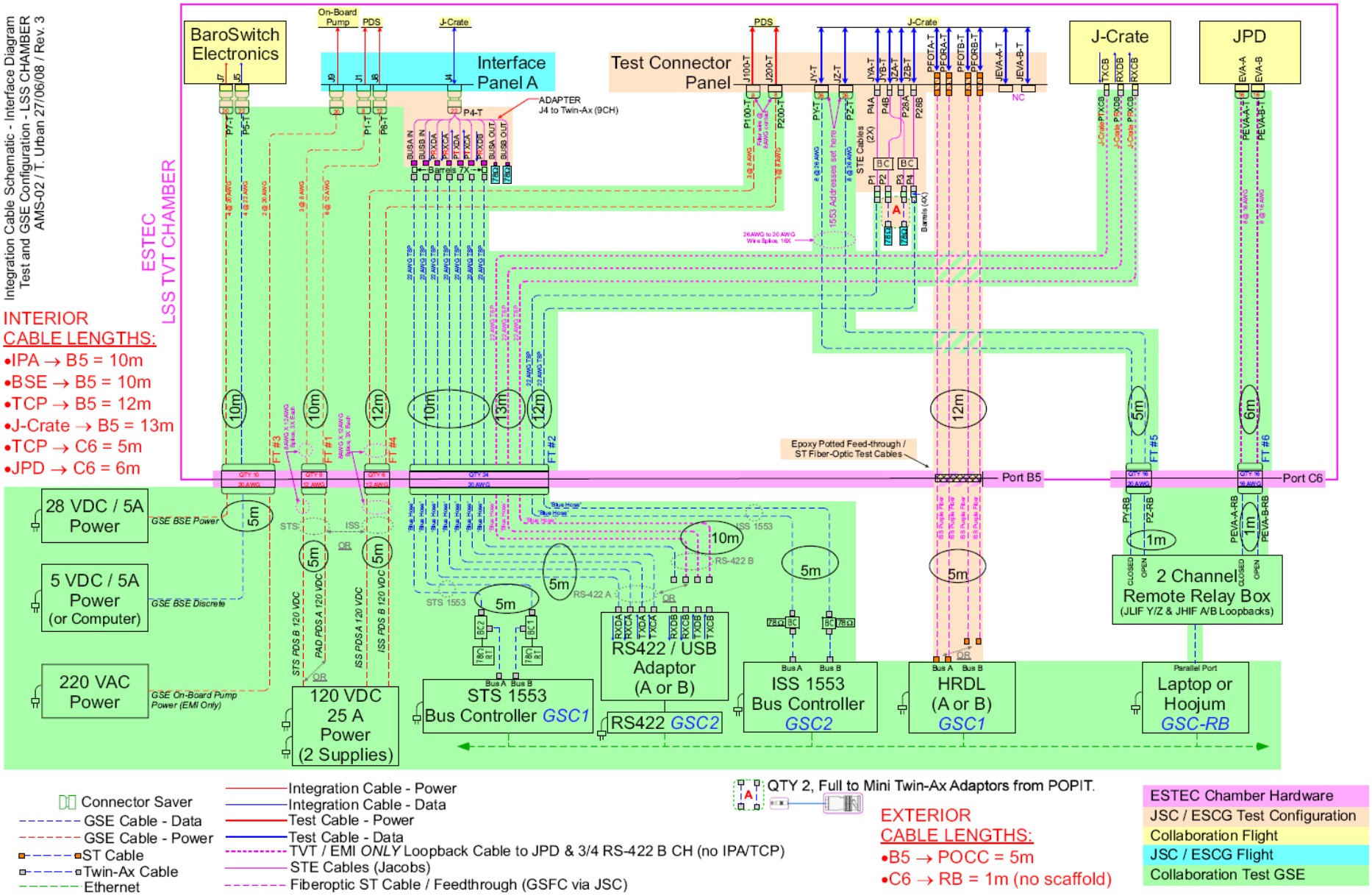


LAMPS VS SCAFFOLDING



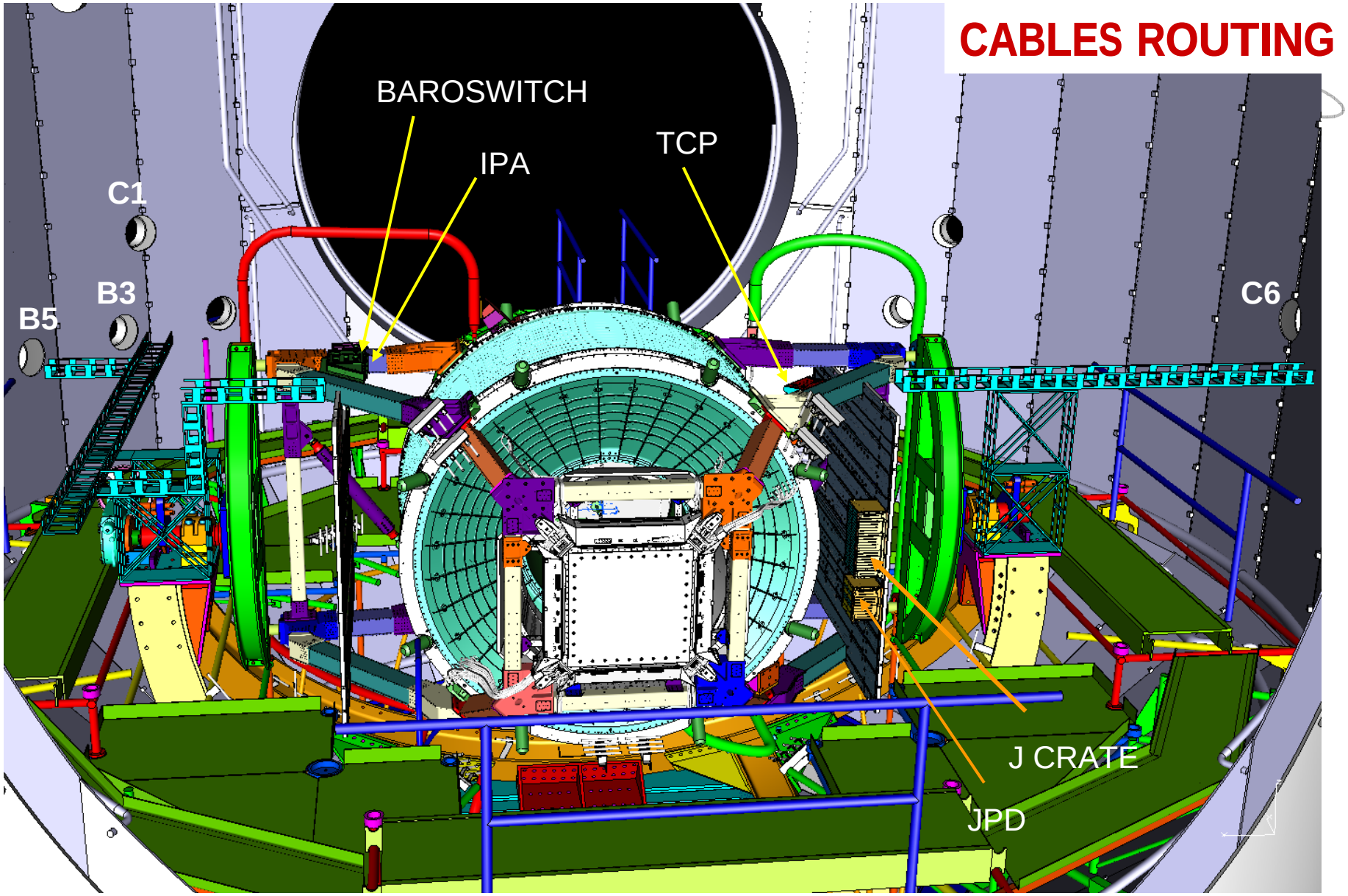
ACTION 7 CABLES ROUTING

STEP_1: Install cable trays
STEP_2: Route AMS power and data cables to B5 and C6 flange
STEP_3: Route AMS thermocouples cables to C1 flange
STEP_4: Route the infrared lamps power supplies cables to B3 & B4 flanges
STEP_5: test


Integration Cable Schematic - Interface Diagram
Test and GSE Configuration - LSS CHAMBER
AMS-02 / T. Urban 27/06/08 / Rev. 3
ESTEC
LSS TVT CHAMBER
INTERIOR
CABLE LENGTHS:
•IPA → B5 = 10m
•BSE → B5 = 10m
•TCP → B5 = 12m
•J-Crate → B5 = 13m
•TCP → C6 = 5m
•JPD → C6 = 6m
BaroSwitch Electronics
On-Board Pump
PDS
J-Crate
Interface Panel A
Test Connector Panel
ADAPTER J4 to Twin-Ax (9CH)
J-Crate
JPD
Epoxy Potted Feed-through / ST Fiber-Optic Test Cables
Port B5
Port C6
28 VDC / 5A Power
GSE BSE Power
5 VDC / 5A Power (or Computer)
GSE BSE Discrete
220 VAC Power
GSE On-Board Pump Power (EMI Only)
120 VDC 25 A Power (2 Supplies)
STS 1553 Bus Controller GSC1
RS422 / USB Adaptor (A or B)
RS422 GSC2
ISS 1553 Bus Controller GSC2
HRDL (A or B) GSC1
2 Channel Remote Relay Box (JLIF Y/Z & JHIF A/B Loopbacks)
Laptop or Hoojum GSC-RB
Connector Saver
GSE Cable - Data
GSE Cable - Power
ST Cable
Twin-Ax Cable
Ethernet
Integration Cable - Power
Integration Cable - Data
Test Cable - Power
Test Cable - Data
TVT / EMI ONLY Loopback Cable to JPD & 3/4 RS-422 B CH (no IPA/TCP)
STE Cables (Jacobs)
Fiberoptic ST Cable / Feedthrough (GSFC via JSC)
QTY 2, Full to Mini Twin-Ax Adaptors from POPIT.
EXTERIOR
CABLE LENGTHS:
•B5 → POCC = 5m
•C6 → RB = 1m (no scaffold)
ESTEC Chamber Hardware
JSC / ESCG Test Configuration
Collaboration Flight
JSC / ESCG Flight
Collaboration Test GSE

by TIM URBAN

CABLES ROUTING



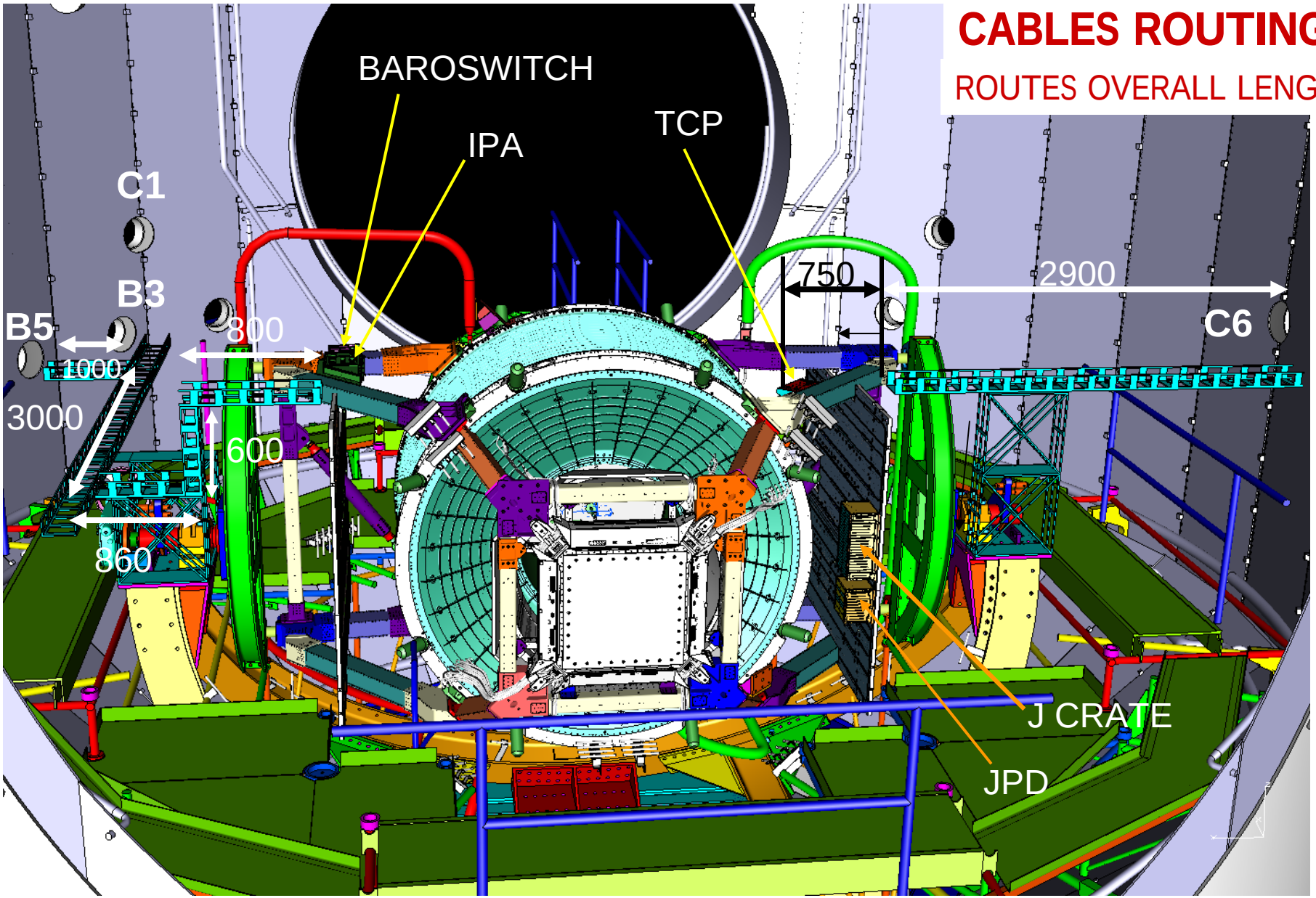
B3 & B4 flanges will be reserved for the infrared lamp power supplies

C1 flange is for AMS thermocouples

B5, C6 flange is for AMS power and data

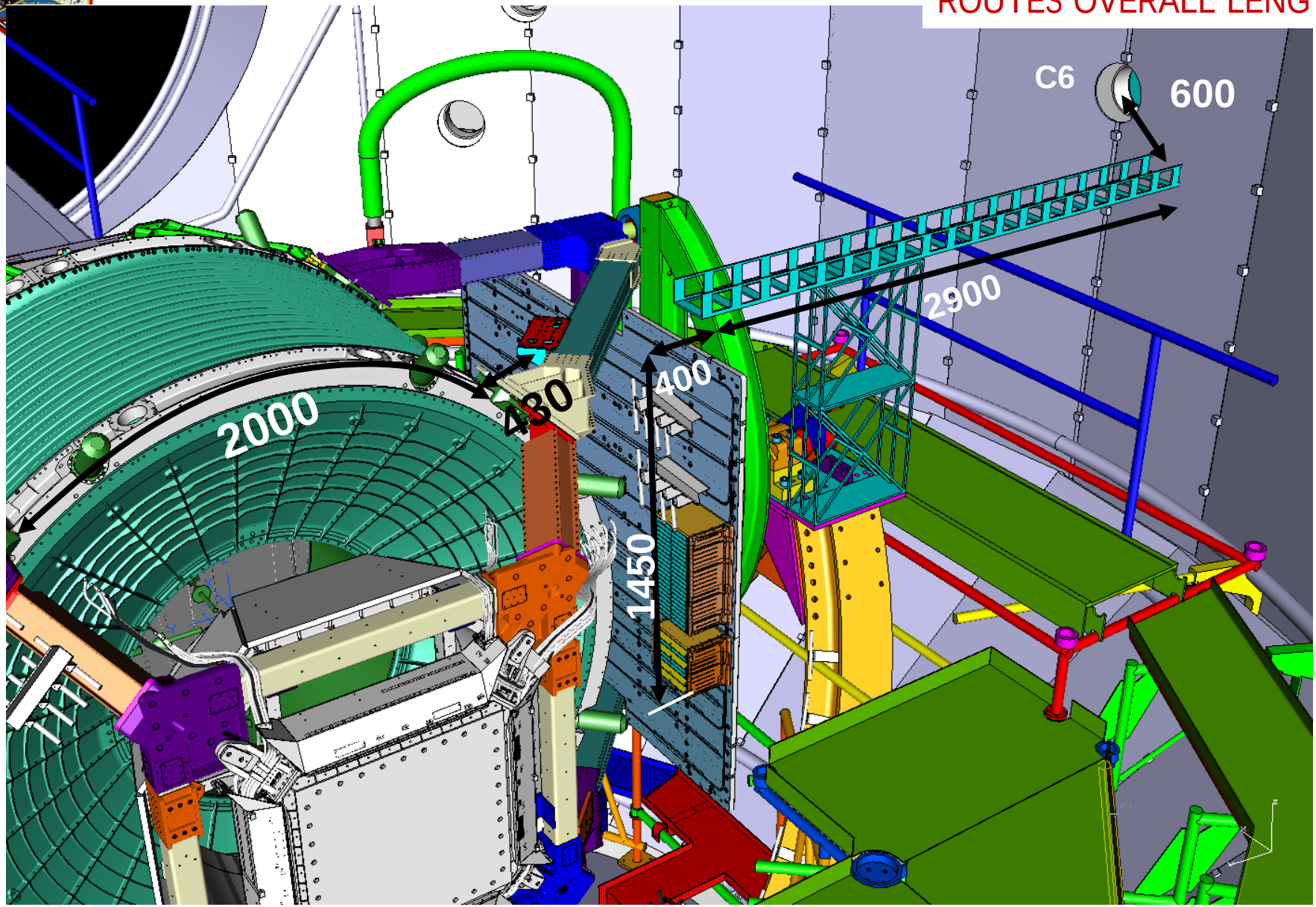
CABLES ROUTING

ROUTES OVERALL LENGTH



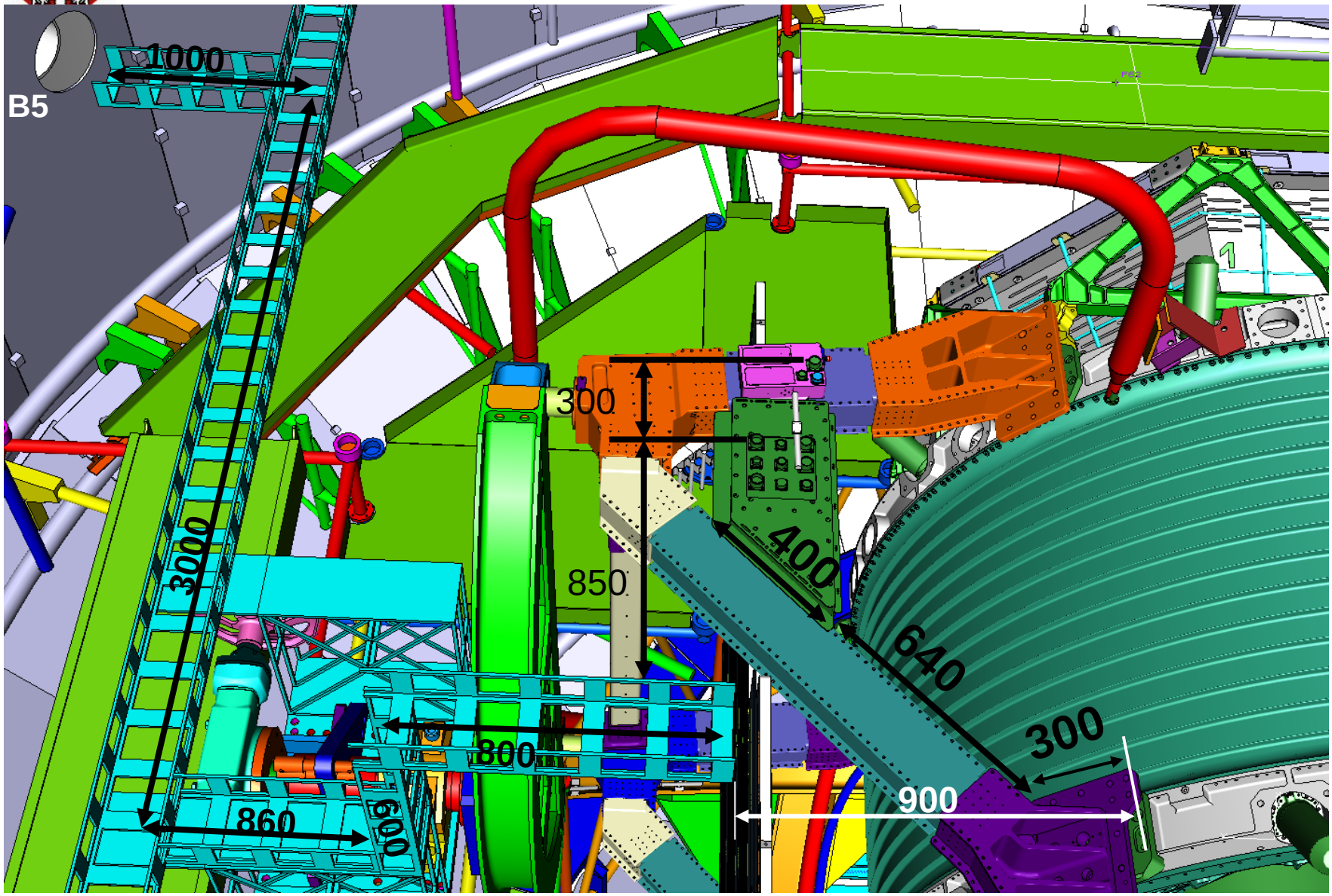
CABLES ROUTING

ROUTES OVERALL LENGTH



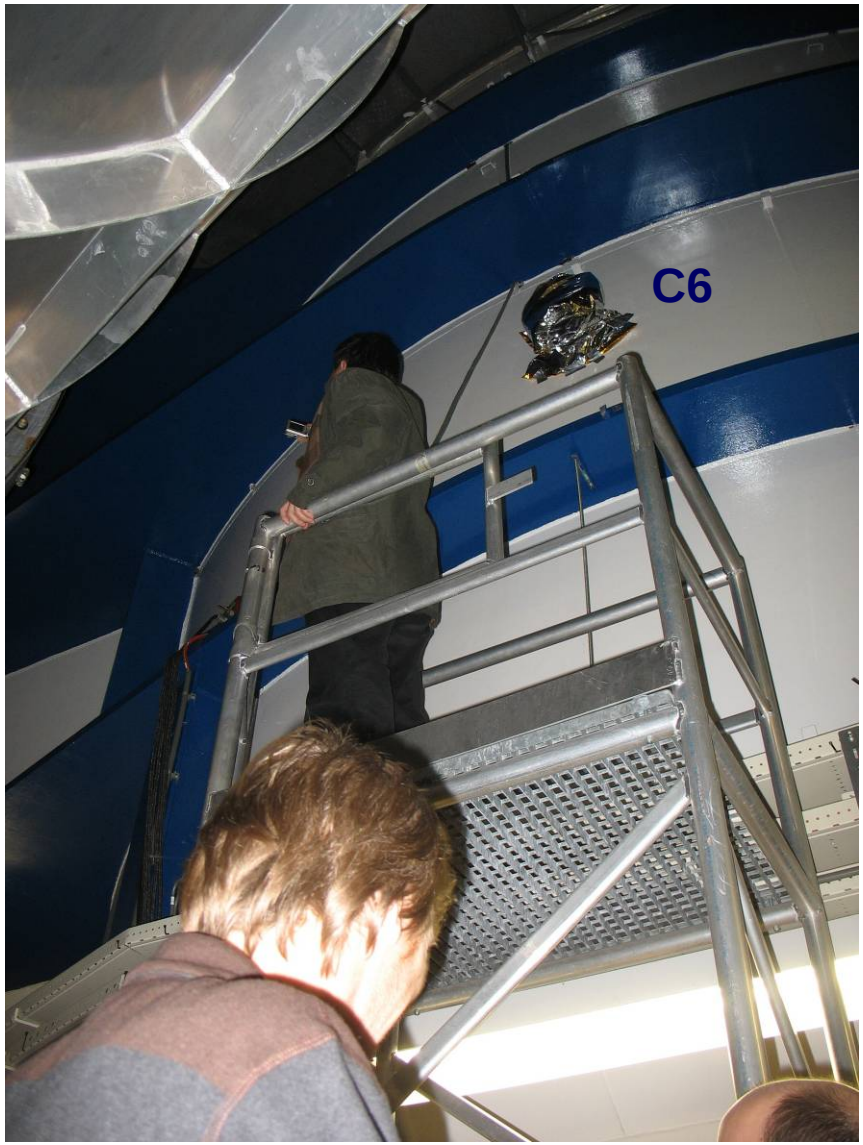
CABLES ROUTING

ROUTES OVERALL LENGHT



CABLES ROUTING

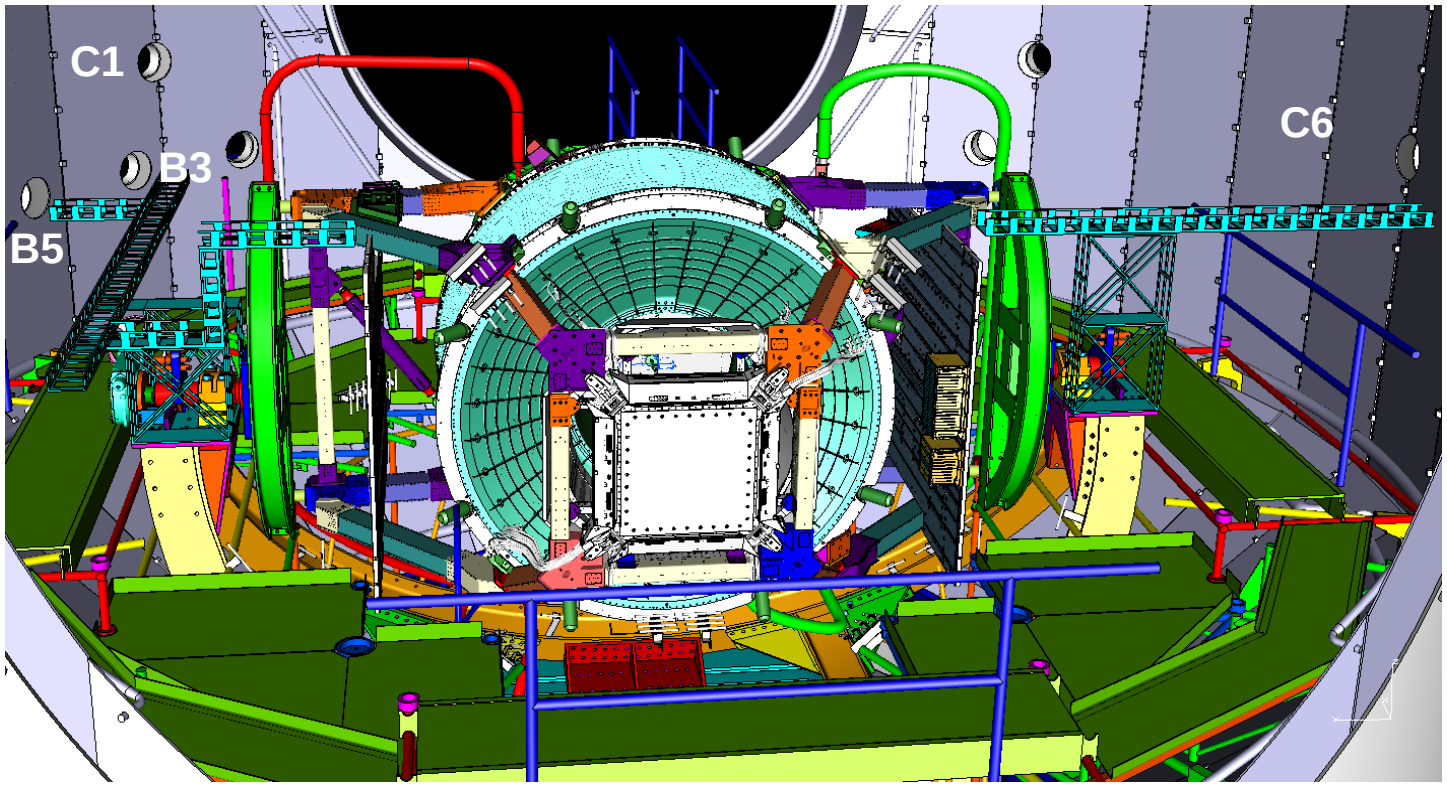
WAY-OUT: LSS FLANGES



CABLES ROUTING INSIDE LSS AND ACCESS POINTS

1 INSTALL CABLE TRAYS

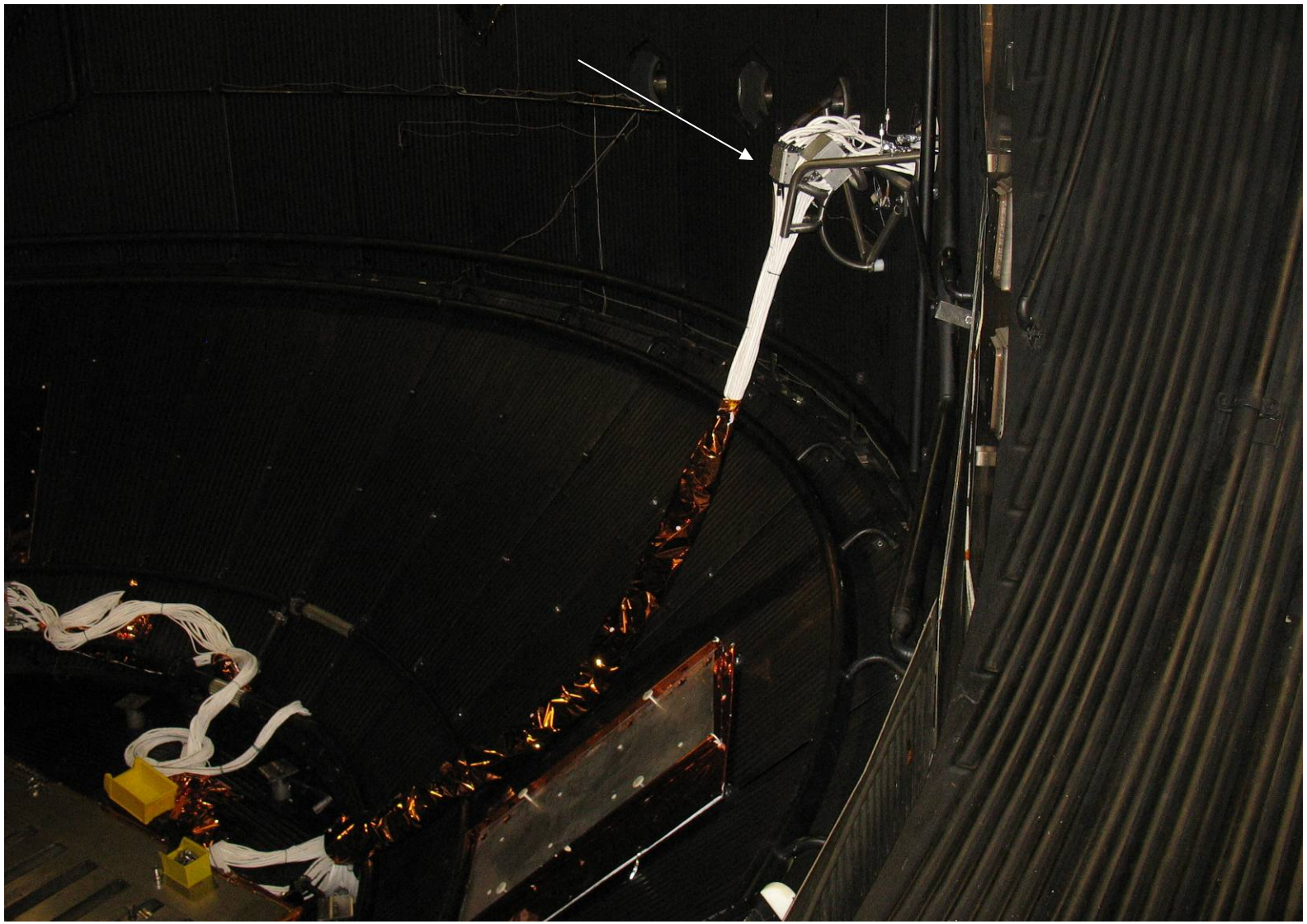
ACCESS needed for installation: Scaffolding L2-2,L2-3,L2-7, B3, B5, C6 flanges



CABLES TRAYS SUPPROT AT LSS WALL

FIX BY CABLE FROM TOP?

OR USE ANY AVAILABLE SUPPORT AS IN THE PICTURE?

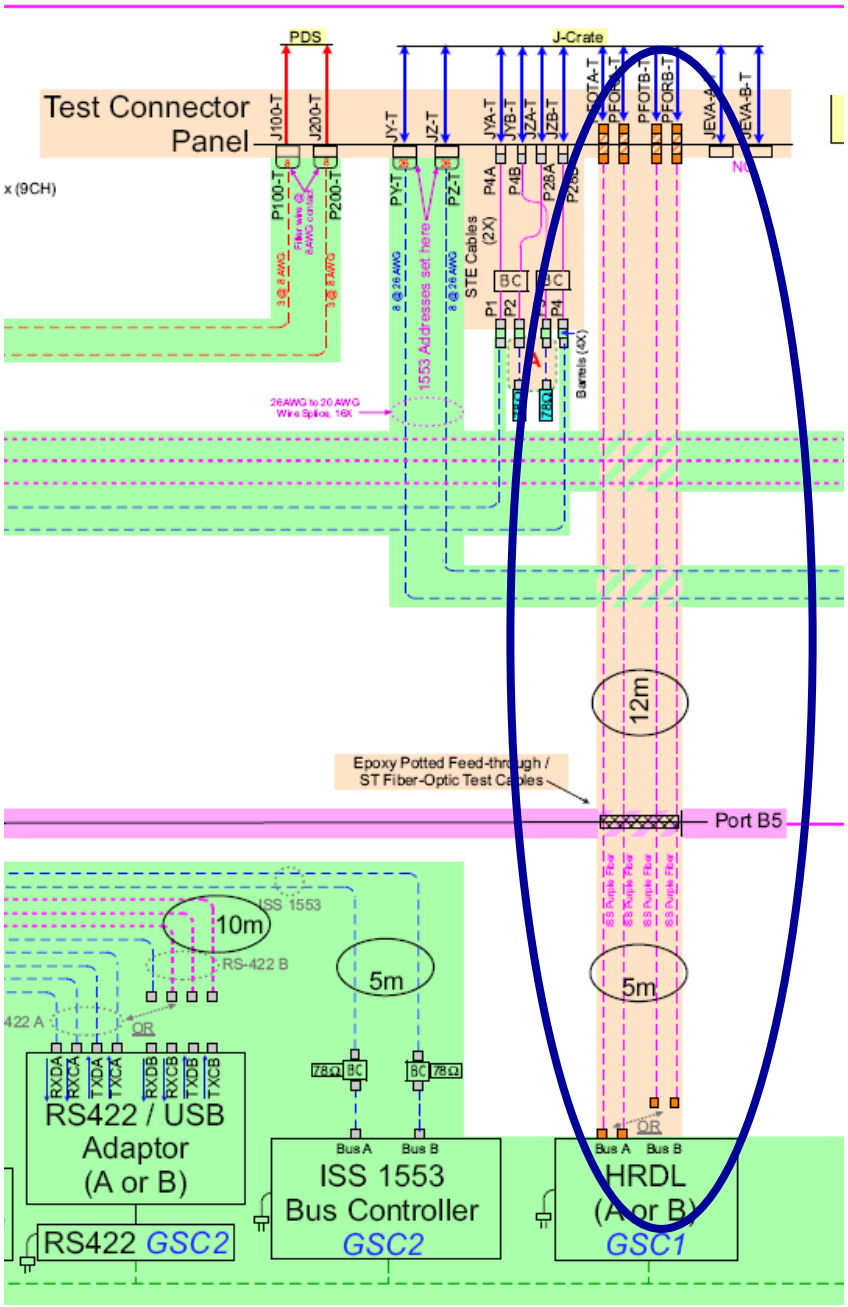


CABLES ROUTING INSIDE LSS AND ACCESS POINTS

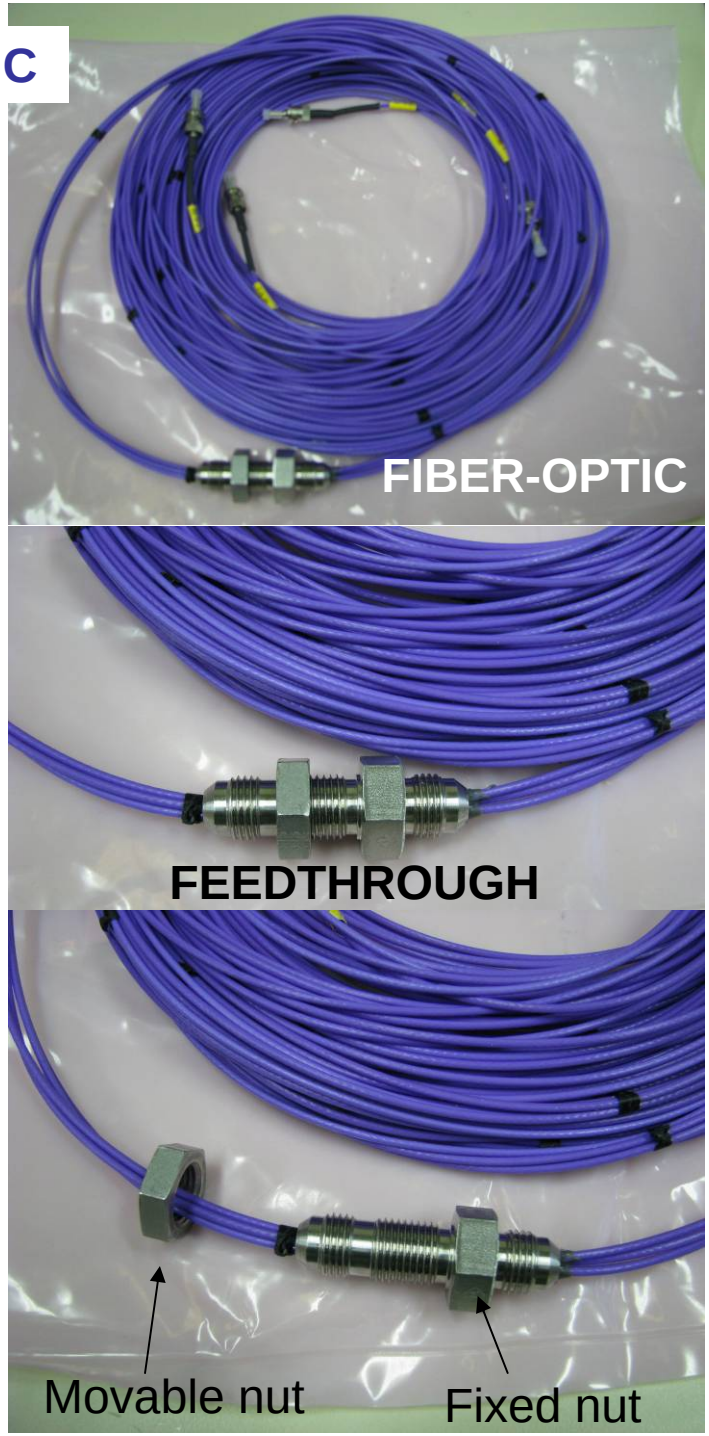
2 POWER AND DATA CABLES TO B5 AND C6 FLANGES

Power and data cables shall be connected at AMS side before AMS is installed in the LSS (connected already from test beam at CERN, or connected and checked at ESTEC in Artemis clean room)
Fiber-optic_ST_cables, from TCP to B5 flange, will have a feed-through provided by ESTEC that will house (glued inside) the fiber original connector (see next slide)
All the cables will be grouped in two bundles secured to the USS in an accessible area at AMS-X,+Y and AMS-X,-Y
When in the LSS the bundles will be unrolled and routed on the cable trays to the port B5 and C6.
Fiber-optics cables will be installed once in the LSS (not easy access to TCP)

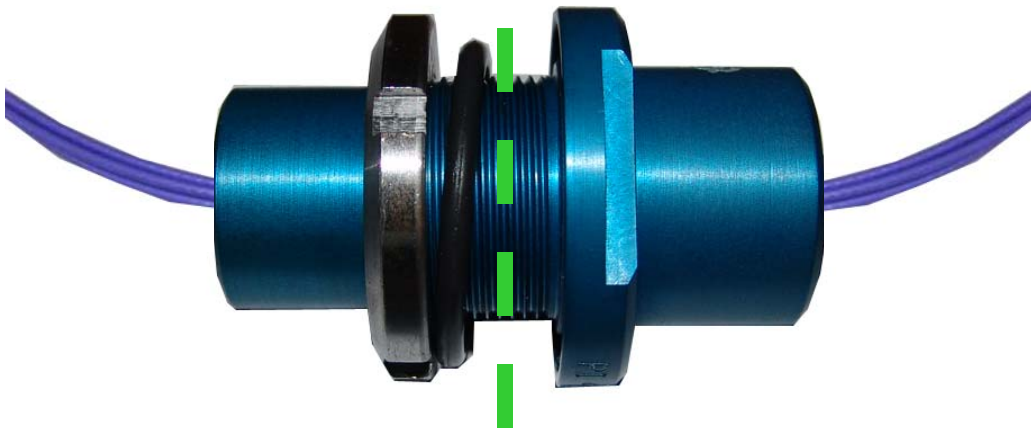
ACCESS needed for installation: Scaffolding L2-11C, L2-10C, L2-2, L2-3, L2-7, B5 and C6 flanges.
Note: in case of problem during cable testing IPA, TCP, J and JPD, Baroswitch need to be reached


PDS
J-Crate
Test Connector Panel
J100-T
J200-T
JY-T
JZ-T
JYA-T
JYB-T
JZA-T
JZB-T
PFOTA-T
PFORA-T
PFOTB-T
PFORB-T
JEVA-T
JEVA-B-T
x (9CH)
P100-T
P200-T
PYT
PZ-T
P4A
P4B
P28A
P28B
STE Cables (2X)
BC
P1
P2
P3
P4
Barrels (4X)
78Ω
26AWG to 20 AWG Wire Splice, 16X
1553 Addresses set here
12m
Epoxy Potted Feed-through / ST Fiber-Optic Test Cables
Port B5
5m
5m
10m
ISS 1553
RS-422 B
422 A
OR
RXDA
RXCA
TXDA
TXCA
RXDB
RXCB
TXDB
TXCB
RS422 / USB Adaptor (A or B)
RS422 GSC2
Bus A
Bus B
ISS 1553 Bus Controller
GSC2
HRDL (A or B)
GSC1

FIBER-OPTIC


FIBER-OPTIC
FEEDTHROUGH
Movable nut
Fixed nut

LSS IN | LSS OUT



Glued inside the blue feed-through

3 THERMOCOUPLE CABLES

AMS will be equipped with a maximum of about 432 thermocouples whose cables will be grouped in a large bundle secured to the USS in an accessible area at AMS –X,+Y, close to the cable tray that goes to C1 flange.

The large bundle will consist in 24 small bundles (bundles diameter about 7mm), where each bundle is constituted of 18 twisted pairs

When in the LSS the large bundle will be unrolled and routed on the cable tray to the port C1. The connection to a DCU (Data Collection Unit housing) and to the flange is being clarified by J.Burger with ESTEC

ACCESS needed for installation: LSS seismic platform, Scaffolding L2-10C, L2-2, L2-3, C1 flange

THERMOCOUPLE TWISTED PAIRS AND CONNECTOR

3 IR LAMPS CABLES

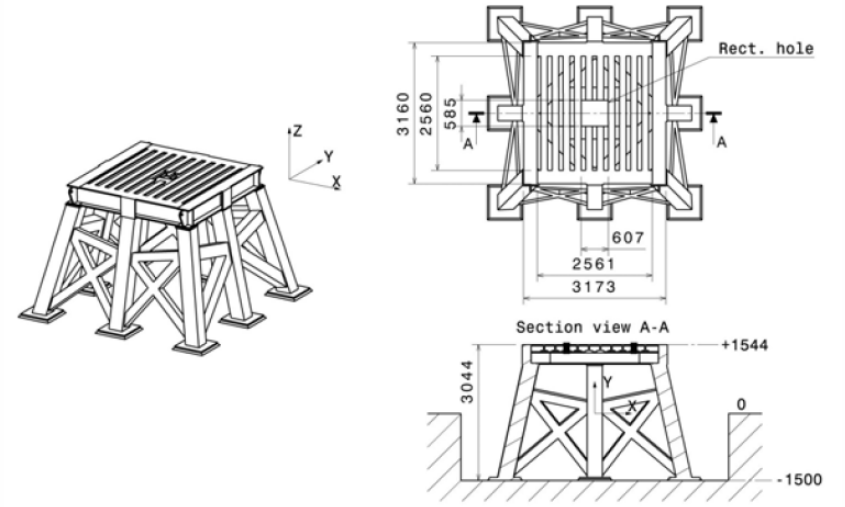
AMS TV test will be equipped with IR lamps whose cables will be grouped in a maximum number of 9 bundles each bundle consisting in 12 twisted pair
Wires will come from different locations and grouped in the cable tray to flange B3 and B4

ACCESS needed for installation: Different locations based on lamp final lay-out (under definition),LSS seismic platform, Scaffolding L2-2, L2-3, B3 and B4 flange,….

ACTION 8: INSTALL MLI ON LSS SEISMIC TABLE

STEP_1: Install MLI on LSS seismic table

The Seismic Table



ACCESS needed for installation: LSS Seismic table

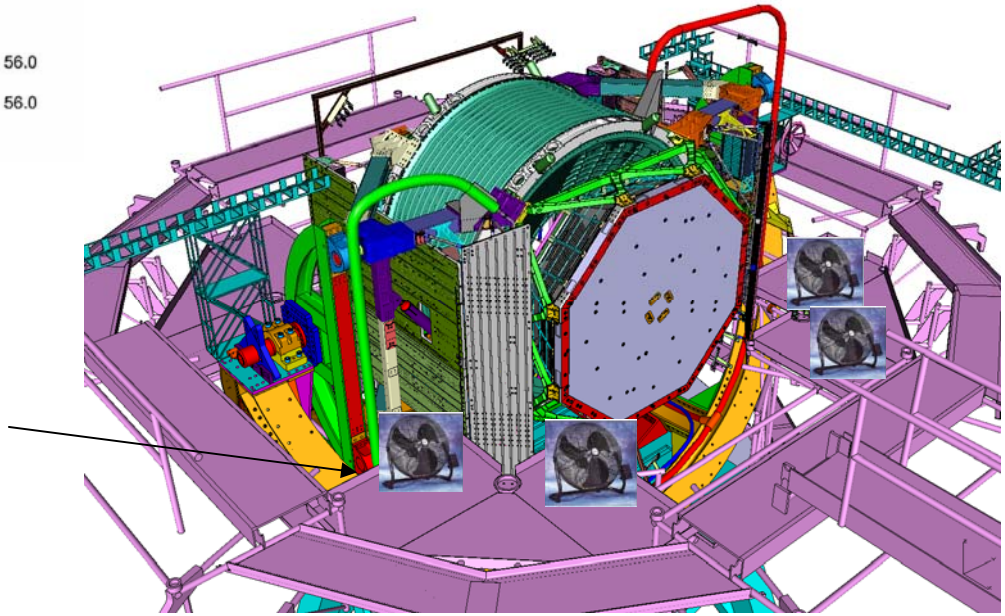
ACTION 9: FUNCTIONAL CHECK OUT (magnet ON)

STEP_1: install TEST-GSE
STEP_2: functional check-out
STEP_3: remove TEST-GSE

1-3 Install and after functional check-out remove GSE

GSE COOLING DURING PRE-TEST

Technical information		HV-180E
Article-no.		6.518.001
EAN-no.		40 22167 518 019
Diameter blade	cm	45
Capacity	m³/h	5200
Power	Watt	135
Voltage/frequency	V~/Hz	230/50
Power settings		4
Colour		black
Dimensions retail package	LxWxH (cm)	59.0 x 22.0 x 56.0
Weight retail package	kg	8.9
Dimensions master carton	LxWxH (cm)	59.0 x 22.0 x 56.0
Weight master carton	kg	8.9
Number of packaging units	pieces	1



ACCESS needed for installation: Scaffolding L2-10AB,C and L2-11A,B,C…

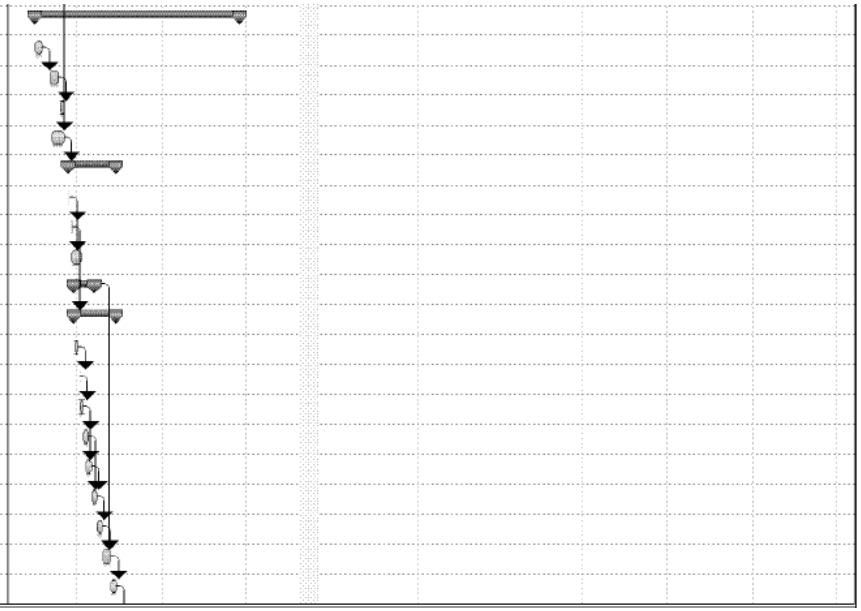
2 functional check-out

ACCESS needed: LSS seismic table, Scaffolding, LSS movable platform

TIME SCHEDULE

AMS ESTEC-KSC Flight Schedule - 1A 10/31/08

ID	Task Name	Duration	Start	Finish
28	**TVT/EMI Testing at ESTEC**	**74 days**	**9/16/09**	**11/28/09**
29	Test Stand at ESTEC	3 days	9/16/09	9/18/09
30	Install Test stand in LSS	4 days	9/21/09	9/24/09
31	Scaffolding install	2 days	9/25/09	9/26/09
32	Ship to ESTEC	5 days	9/22/09	9/26/09
36	**Setup TVT Mechanical**	**17.25 days**	**9/28/09**	**10/15/09**
37	Cleaning of shipping containers	1 day	9/28/09	9/28/09
38	Move to Assy area / Disassemble PSS	1 day	9/29/09	9/29/09
39	Install EGSE	4 days	9/29/09	10/2/09
40	**Setup of CGSE**	**8 days**	**9/30/09**	**10/7/09**
48	**Set up AMS in LSS**	**14.25 days**	**9/30/09**	**10/15/09**
49	Install AMS in LSS	2 days	9/30/09	10/1/09
51	Scaffolding install	0.25 days	10/2/09	10/2/09
52	Connect vent lines and cable / TRD Gas setup	1 day	10/2/09	10/3/09
53	Test cables and lines	2 days	10/3/09	10/5/09
54	Thermocouple Connection and Verification	2 days	10/4/09	10/6/09
55	Lamps and Heaters install	2 days	10/6/09	10/8/09
56	Lamps and Heaters checkout	2 days	10/8/09	10/10/09
57	1- Functional checkout before vacuum / Charge Ma	2 days	10/10/09	10/13/09
58	Scaffolding removal	2 days	10/13/09	10/15/09



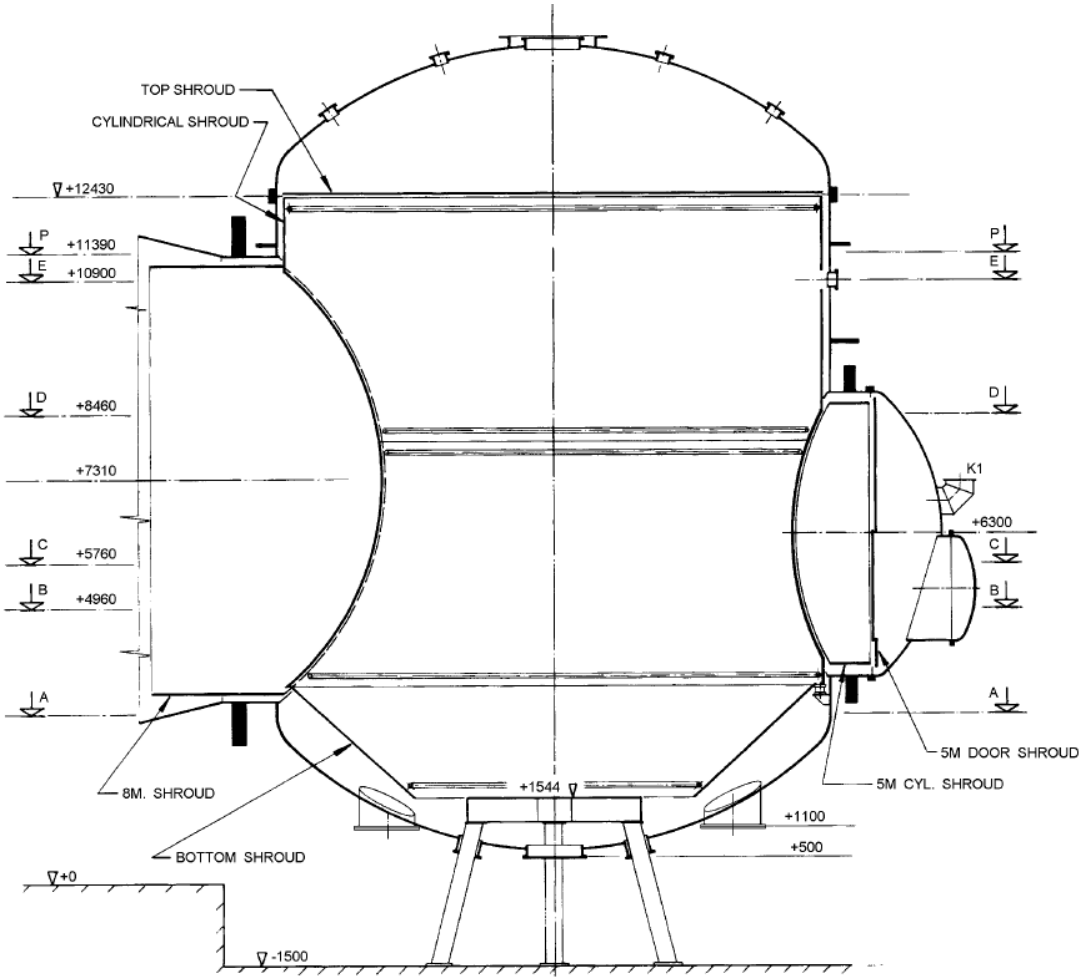
by J.HEILIG

ACTION 12: TEST RUNNING
ACTION 13: LSS DOOR OPEN
ACTION 14: SCAFFOLDING INSTALLATION IN LSS
ACTION 15: FUNCTIONAL TEST, TEST-GSE INSTALL AND REMOVE
ACTION 16: IR LAMPS, CGSE, AMS_02, GONDOLA,… REMOVAL FROM LSS

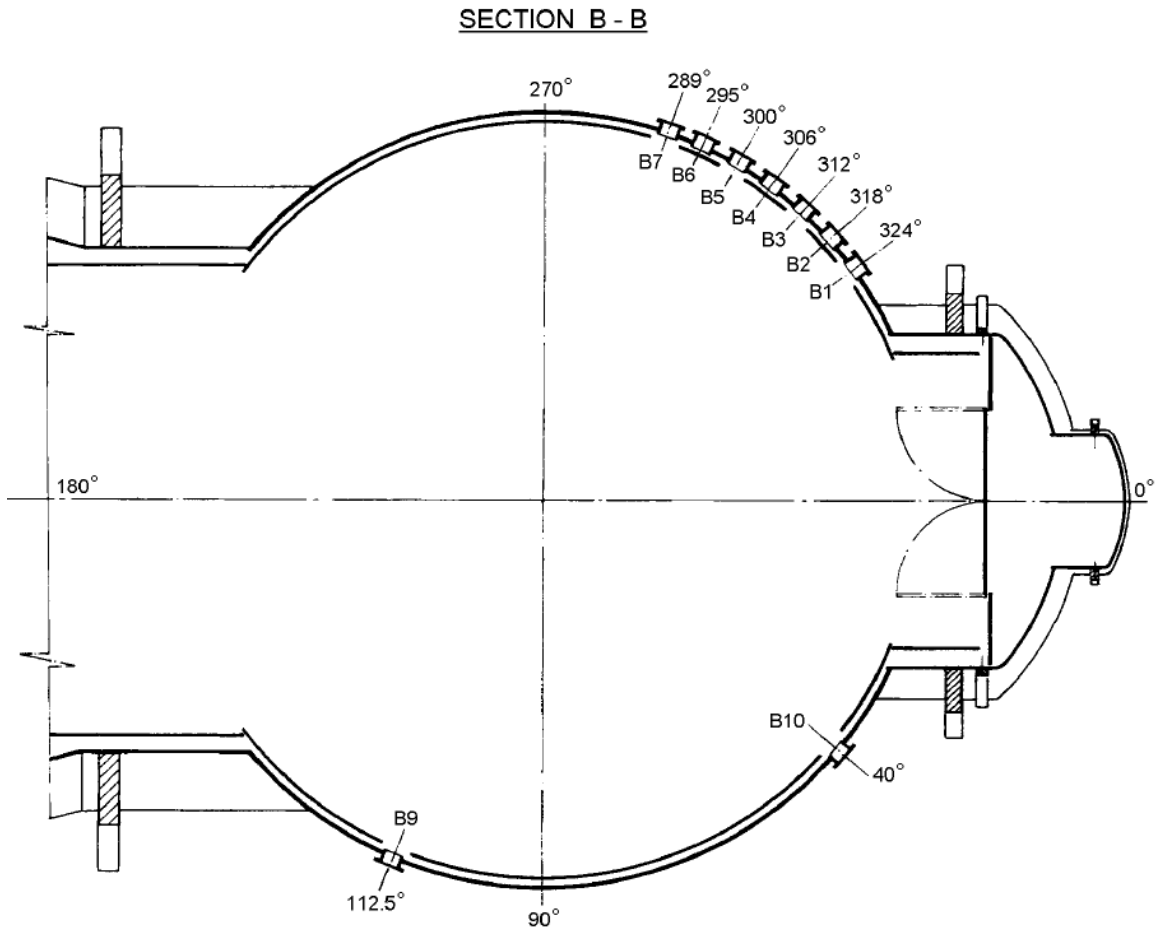
NON AMS (FLIGHT) MATERIALS INSIDE LSS DURING TVT

NON AMS (flight) MATERIALS inside LSS	ITEM	COMPONENT
Steel 316L	GONDOLA	structure
Steel 316 (A4)	GONDOLA	fasteners
Steel 304 (A2)	GONDOLA/ IR lamps/ CABLE TRAYS	fasteners
Ultem 1000	GONDOLA	4 bearings at AMS trunnions I/F
Teflon coating	GONDOLA	bushing and shaft at gondola main axis
Al alloy	IR LAMPS	support
Al alloy	CGSE	bracketery
Al alloy	CABLE	cable trays
Copper	TRD-Gas-GSE	tube to C1 flange

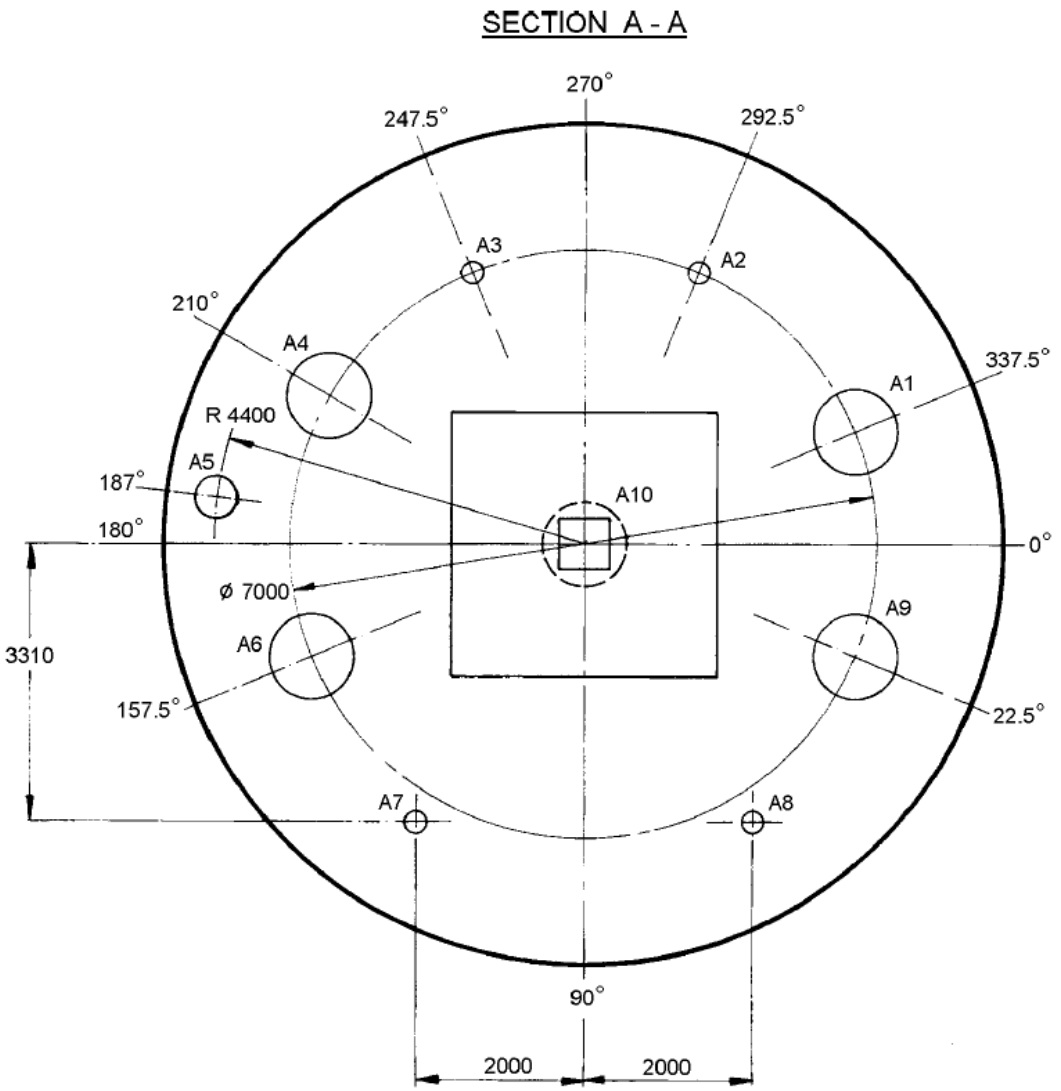
in work



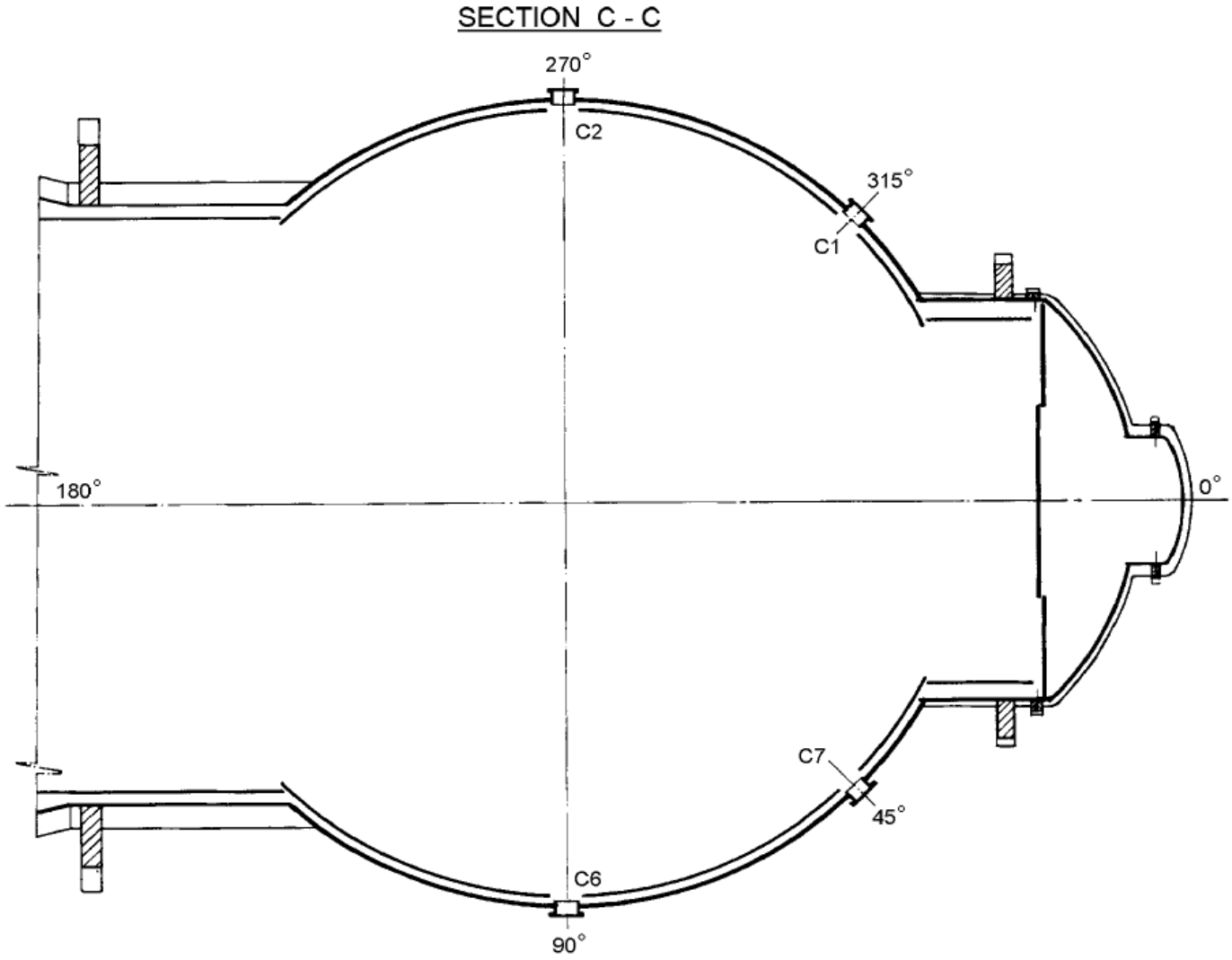
LSS PORT LEVELS


SECTION B - B
270°
289°
295°
300°
306°
312°
318°
324°
B7
B6
B5
B4
B3
B2
B1
180°
0°
B10
40°
B9
112.5°
90°

B PORTS


SECTION A - A
270°
247.5°
292.5°
A3
A2
210°
A4
337.5°
A1
R 4400
A5
187°
A10
180°
0°
Ø 7000
A9
A6
3310
157.5°
22.5°
A7
A8
90°
2000
2000

A PORTS



C PORTS

Alpha Magnetic Spectrometer
AMS-02

MI Team
AMS