

Integration and FC and Cathode design

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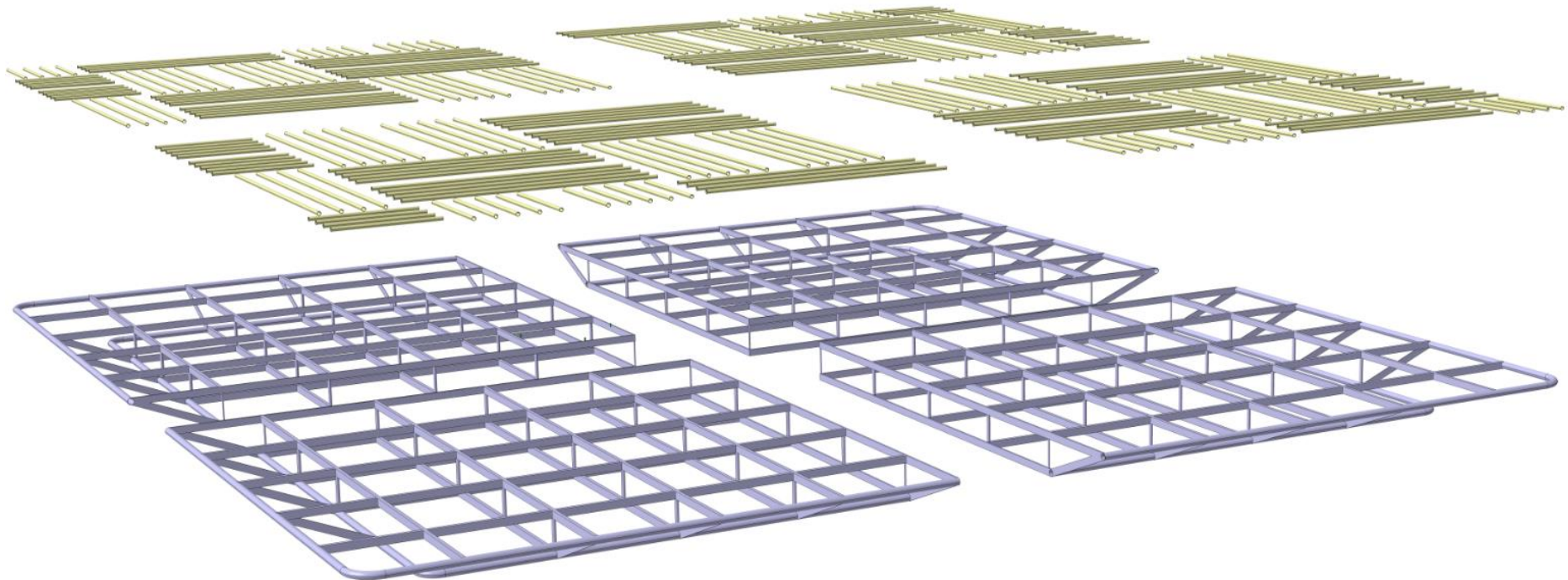
ETH zürich

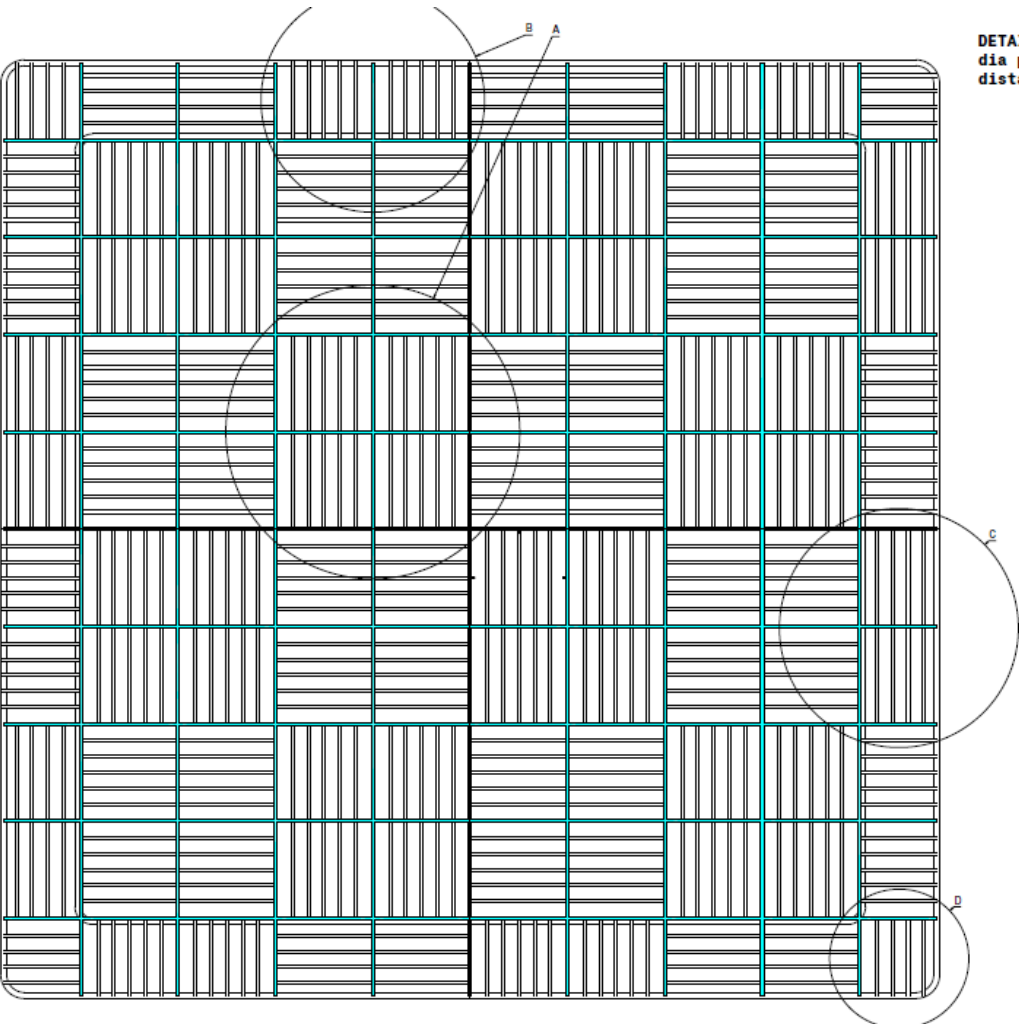
30.11.2016

- Integration
 - Received new CRP and SPFT model (not yet integrated)
- Cathode Design
 - 20 mm dia pipes
 - Mechanical structure not changed
- Field Cage
 - Design Update of the Field Cage (details)
 - 2D Drawing 1st «final» version
 - Hanging System → designed finalised (drawings not yet)
- CERN Alu Profiles:
 - New Proposal for the corner clip
- Field Cage Test Setup for the Alu Clips
 - Parts manufactured
 - Start assembly

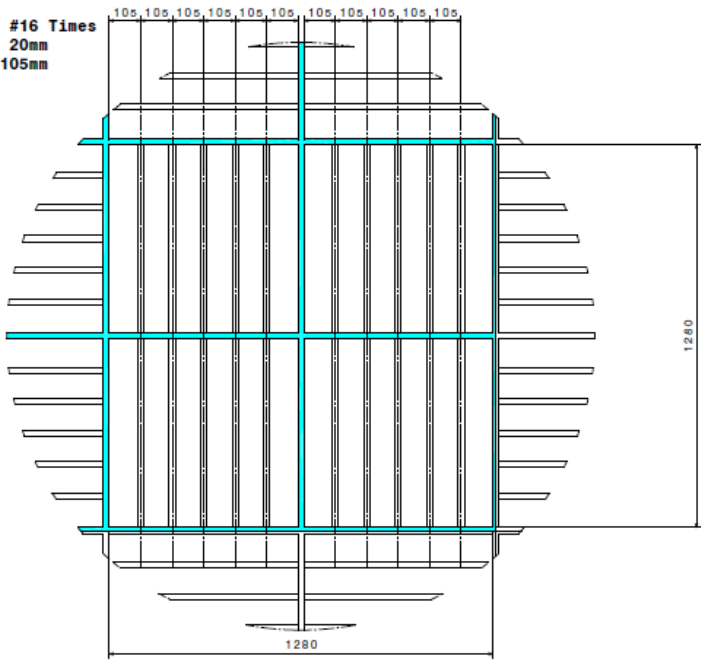
Cathode Design

- Mechanical Structure unchanged
- 20 mm dia SS pipes with 105mm pitch
- Pipes orientation according to the original design (F. Sergiampietri)
- Design with Layout sent to I.Debonis for Simulation (see next Slide)

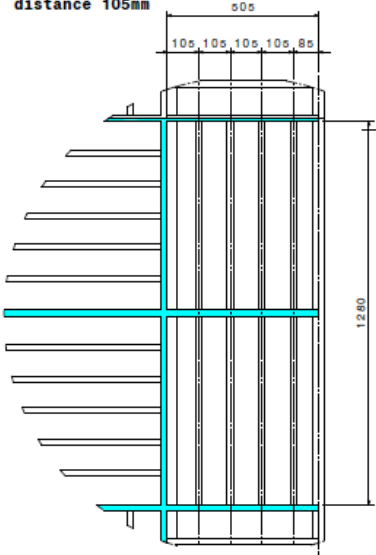




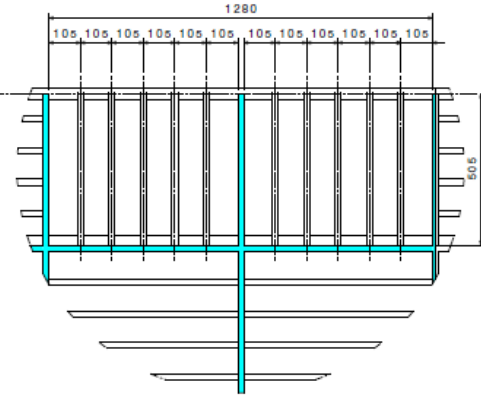
DETAIL A: #16 Times
dia pipes 20mm
distance 105mm



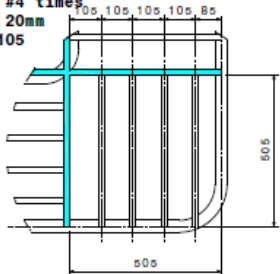
DETAIL C: # 8 Times
dia pipes 20mm
distance 105mm



DETAIL B: # 8 Times
dia pipes 20mm
distance 105mm

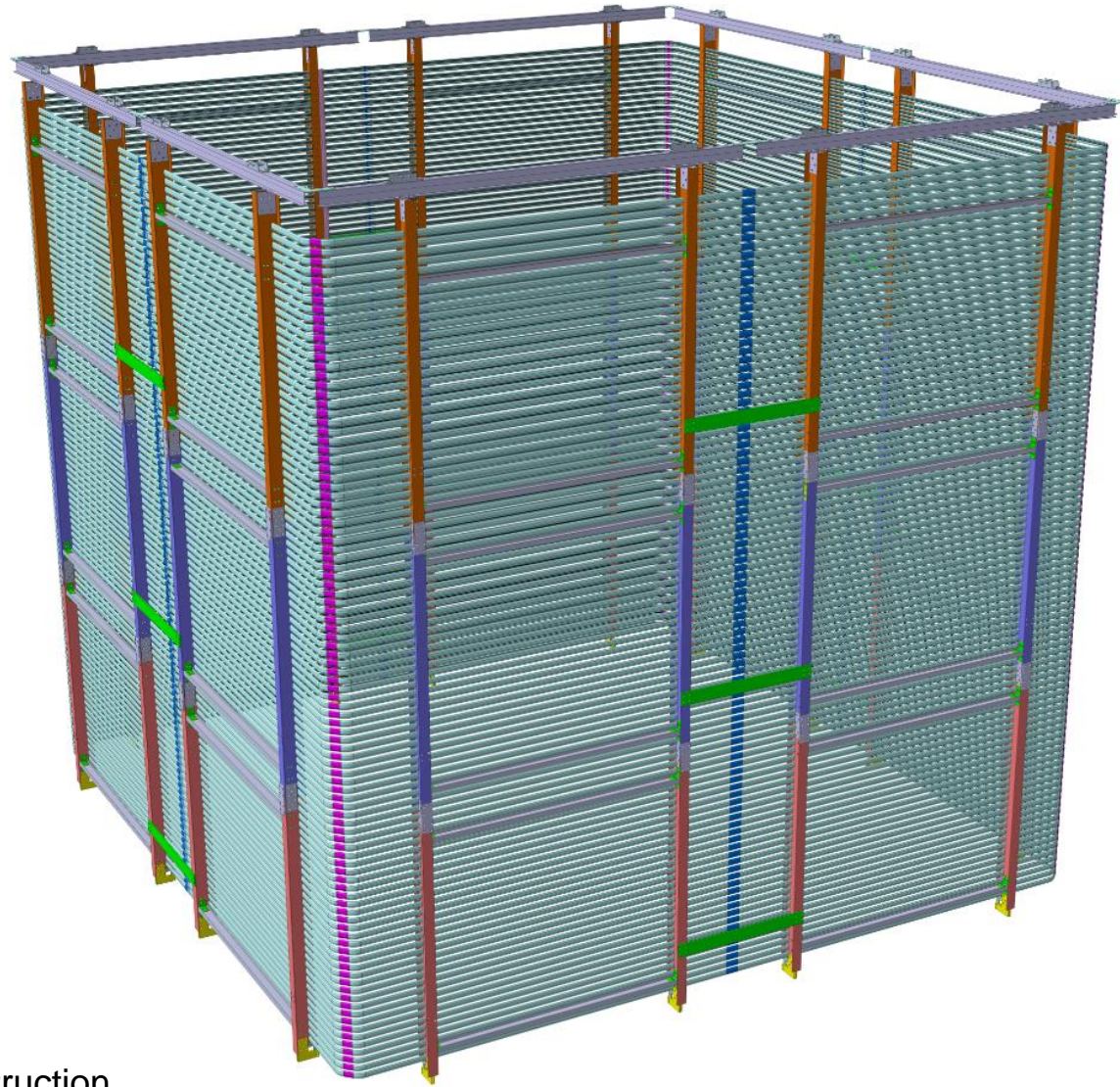


DETAIL D: #4 times
dia pipes 20mm
distance 105

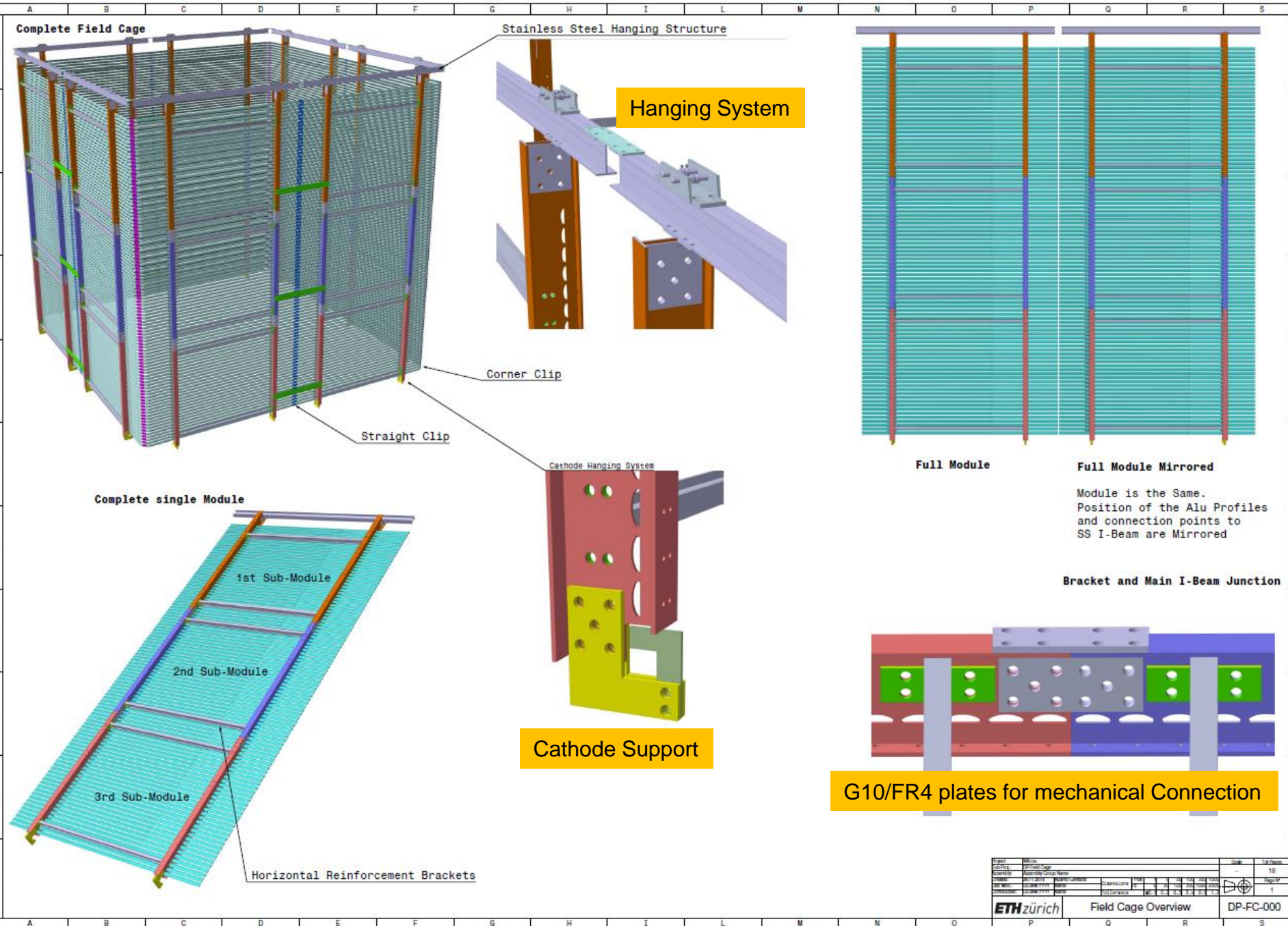


CATHODE PIPES POSITION

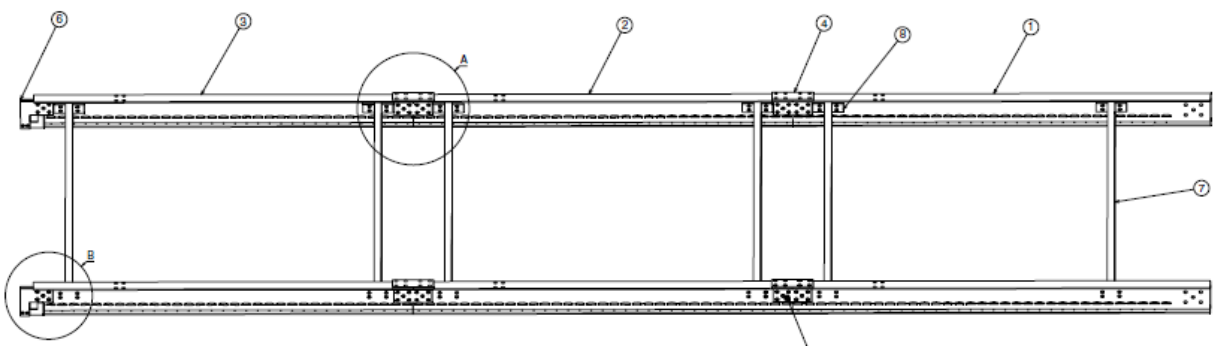
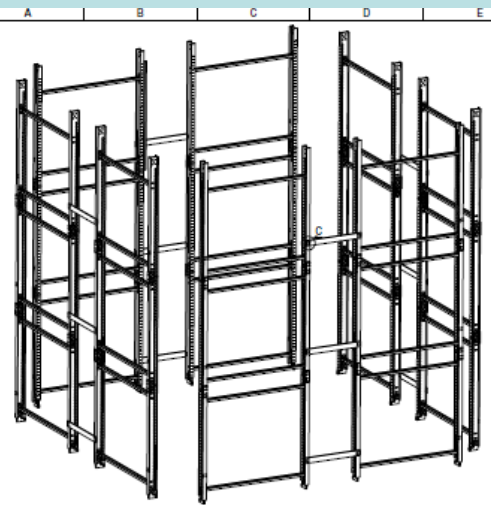
- Finalized detail
- SS Hanging system finalized
- Cross check with SP parts design
- Mechanical connection through G10/FR4 inserts
- Cathode hanging support
- New Profile Corner Clips
- 1st Version of the technical Drawings done.



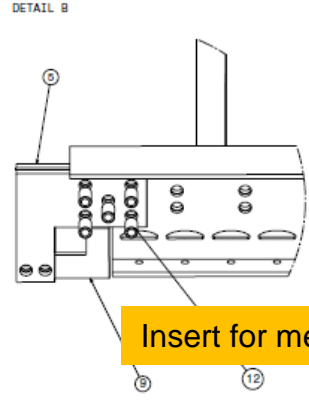
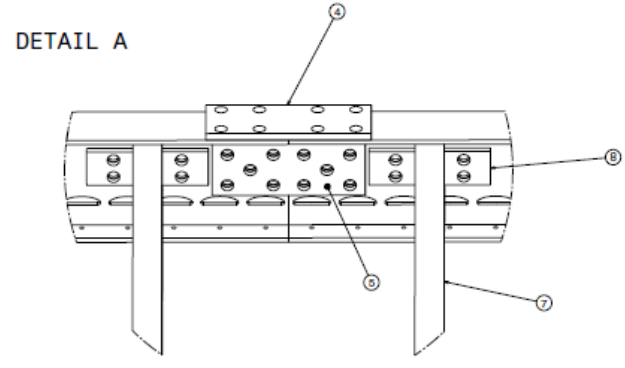
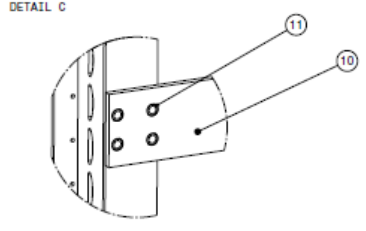
For the point of view of the Construction the Field Cage (Hanging System not included) consist in 8 identical modules



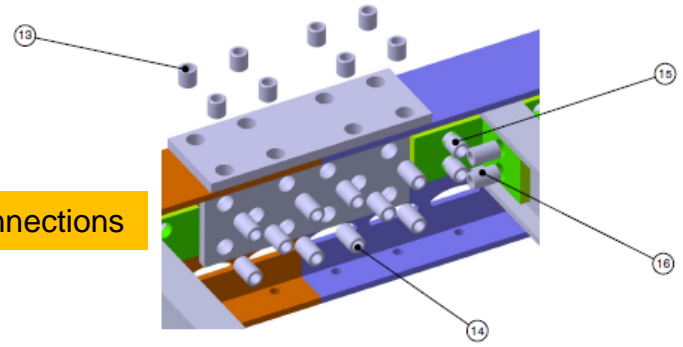
Project	FC-000	Scale	1:1
Client	ETH Zürich	Sheet	18
Design	ETH Zürich	Revision	1
Checked	ETH Zürich	Author	ETH Zürich
Approved	ETH Zürich	Date	2023-10-27
ETH zürich		Field Cage Overview	
		DP-FC-000	



3rd Sub Module 2nd Sub Module 1st Sub module



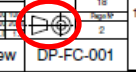
Insert for mechanical Connections



Complete Part List for 8 modules

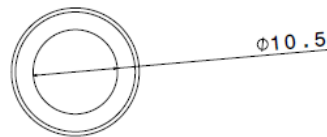
Pos	Part Name	Part Number	Material	Quantity	Description
1	1st Sub Module Main Beam	DP-FC-002	FRP	16	6 Inch I-Beam
2	2nd Sub Module Main Beam	DP-FC-003	FRP	16	6 Inch I-Beam
3	3rd Sub Module Main Beam	DP-FC-004	FRP	16	6 Inch I-Beam
4	Fixing Plate Sub Modules 1	DP-FC-005	G10/FR4	32	
5	Fixing Plate Sub Modules 2	DP-FC-006	G10/FR4	64	
6	Cathode Fixing Plate	DP-FC-007	G10/FR4	32	
7	Horizontal Beam	DP-FC-008	FRP	48	3 Inch I-Beam
8	Horizontal Beam L-Profile	DP-FC-009	FRP	192	3x3x1/4 Inch L
9	Cathode Blocking Plate	DP-FC-010	G10/FR4	16	
10	Plate Between Modules	DP-FC-011	G10/FR4	12	
11	Insert for Modules Plate	DP-FC-012	G10/FR4	96	
12	Insert for Cathode Connection	DP-FC-013	G10/FR4	112	
13	Insert Sub Modules 1	DP-FC-014	G10/FR4	256	
14	Insert Sub Modules 2	DP-FC-015	G10/FR4	320	
15	Insert for L Short	DP-FC-016	G10/FR4	384	
16	Insert for L Long	DP-FC-017	G10/FR4	192	

ASME Standard projection

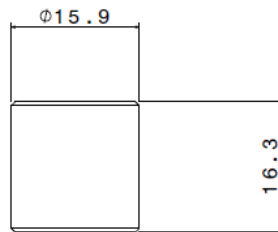


- Main FRP I-Beam, FRP Horizontal I-Beam and FRP L-Profile are exactly the same as for the SP field Cage

- Concerning the Inserts there is one things that need to be defined:



- All the inserts have outer diameter 15.9mm [.625 Inch]
- Internal hole needs to be defined according to the Bolts size
 - Now is 10.5mm → for M10
 - At Cern there are G10 M10 Rods,Nuts and Washers
 - SP as 10mm dia → 3/8 inch Bolts??



?EU or US Bolts?



Pos	Part Name	Part Number	Material	Quantity	Description
11	Insert for Modules Plate	DP-FC-012	G10/FR4	96	NOTES: .625 INCH ROD

UNLESS OTHERWISE SPECIFIED:
 UNTOLERANCED DIMENSION ARE BASIC
 VALUES QUERIED FROM 3-D DIGITAL
 DATE FILE
 [0.3] [A] [C]






ETH zürich Insert for Modules Plate DP-FC-012

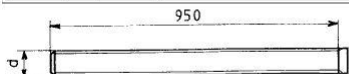
Field Cage update: Technical Drawings

47.63.62 - THREADED RODS - GLASS FIBRE WITH EPOXY RESIN

[For any further technical information additional - click here](#)

STANDARD : EN-EPR S5

Buy	SCEM Code	Unit	Unit Price	Stock	Expected Delivery	Direct Delivery	d
	47.63.62.060.8	PC	37,0	14	29.11.2016	>=14 i	M6
	47.63.62.080.4	PC	36,5	1	29.11.2016	>=16 i	M8
	47.63.62.100.7	PC	41,0	5	29.11.2016	>=15 i	M10
	47.63.62.120.3	PC	43,0	3	29.11.2016	>=12 i	M12
	47.63.62.160.5	PC	67,5	5	29.11.2016	>=11 i	M16

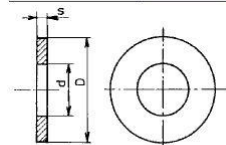


47.78.82 - PLAIN WASHERS - GLASS FIBRE WITH EPOXY RESIN







[For any further technical information additional - click here](#)

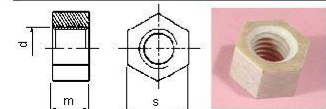
STANDARD : EN-EPGC203

Buy	SCEM Code	Unit	Unit Price	Stock	Expected Delivery	Direct Delivery	FOR SCREW	D mm	d mm	s mm
	47.78.82.060.1	PC	3,29	250	29.11.2016	>=329 i	M6	14	7	1,3
	47.78.82.080.7	PC	2,95	100	29.11.2016	>=366 i	M8	14	9	1,3
	47.78.82.105.5	PC	2,95	297	29.11.2016	>=366 i	M10	30	11	4
	47.78.82.125.1	PC	7,62 i	0 i	19.12.2016	>=99999999 i	M12	40	14	4
	47.78.82.160.8	PC	3,69 i	0 i	19.12.2016	>=99999999 i	M16	40	18	4

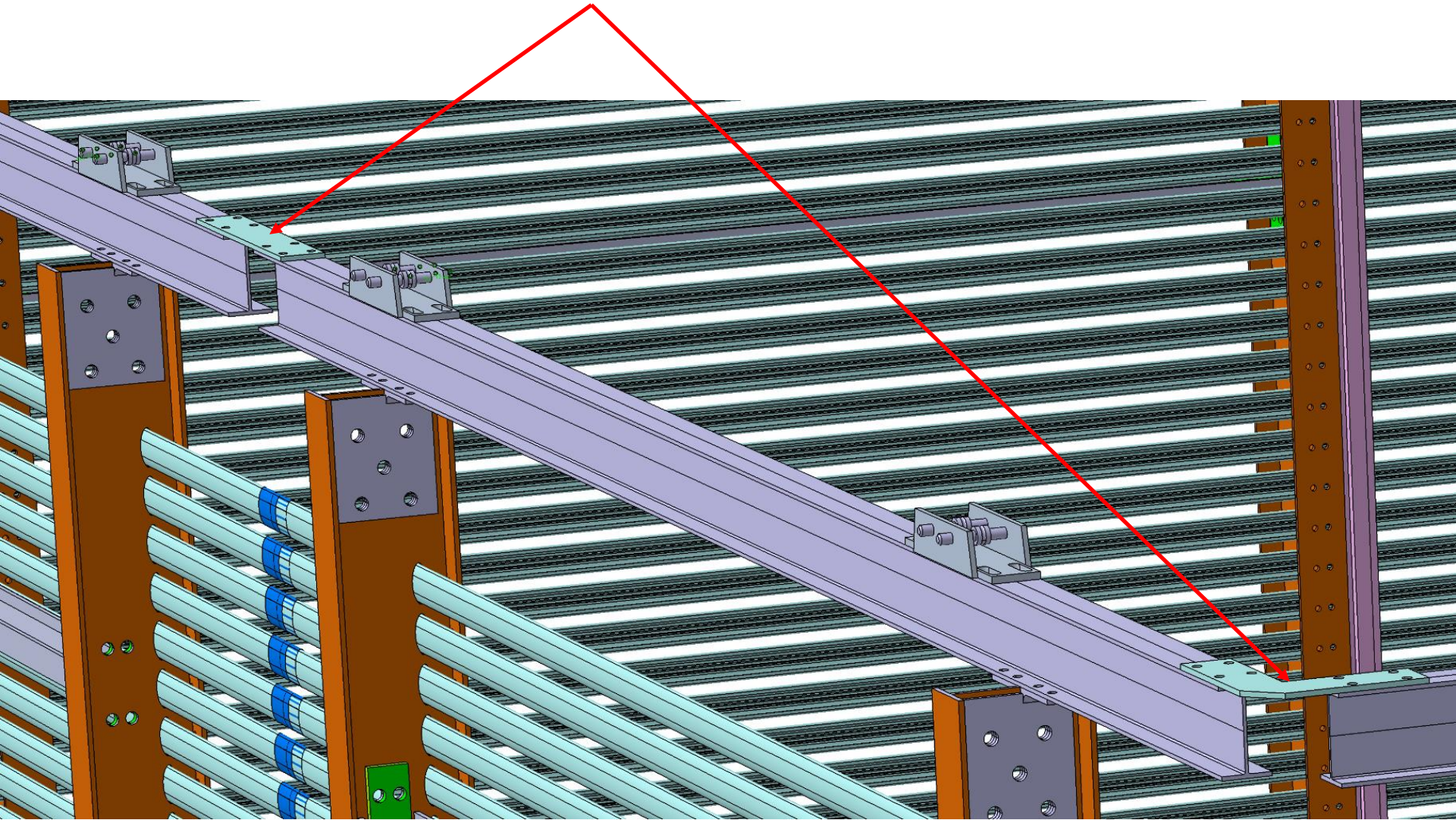


COMPRESSION RESISTANCE : 550 M Pa
 IMPACT RESISTANCE : 200 KJ/m²
 TRACTION RESISTANCE : 250 M Pa
 THERMAL CONDUCTIVITY : 0,3 W/mK
 TEMPERATURE : -270 to +155°C

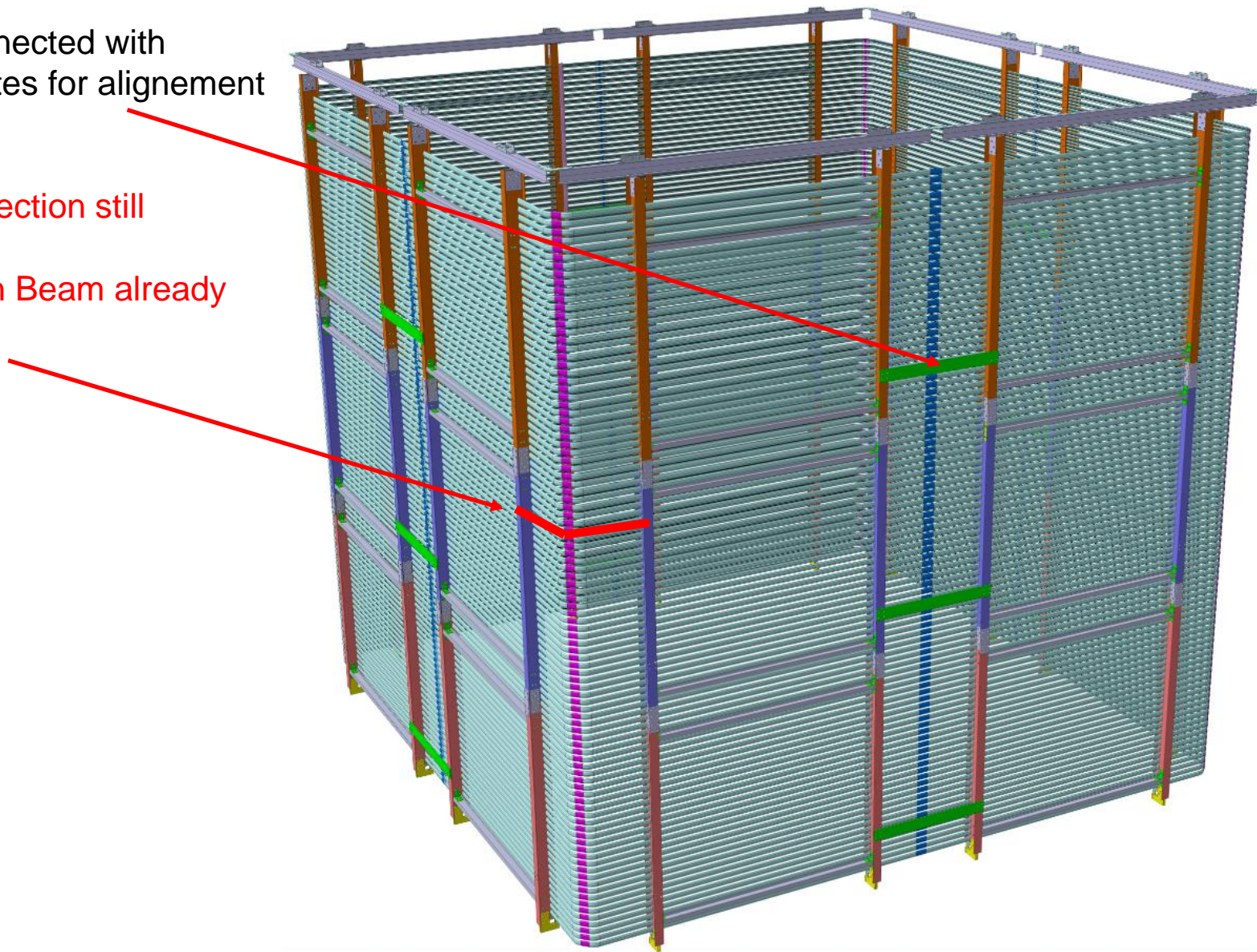
Buy	SCEM Code	Unit	Unit Price	Stock	Expected Delivery	Direct Delivery	d	s mm	m mm
	47.44.92.050.3	PC	7,5	20	29.11.2016	>=103 i	M5	8	4
	47.44.92.060.1	PC	7,9	33	29.11.2016	>=141 i	M6	10	6
	47.44.92.080.7	PC	7,5	85	29.11.2016	>=117 i	M8	13	8
	47.44.92.100.0	PC	8,6	90	29.11.2016	>=117 i	M10	17	10
	47.44.92.120.6	PC	8,4	5	29.11.2016	>=72 i	M12	19	12
	47.44.92.160.8	PC	12,0 i	0 i	16.12.2016	>=99999999 i	M16	24	16

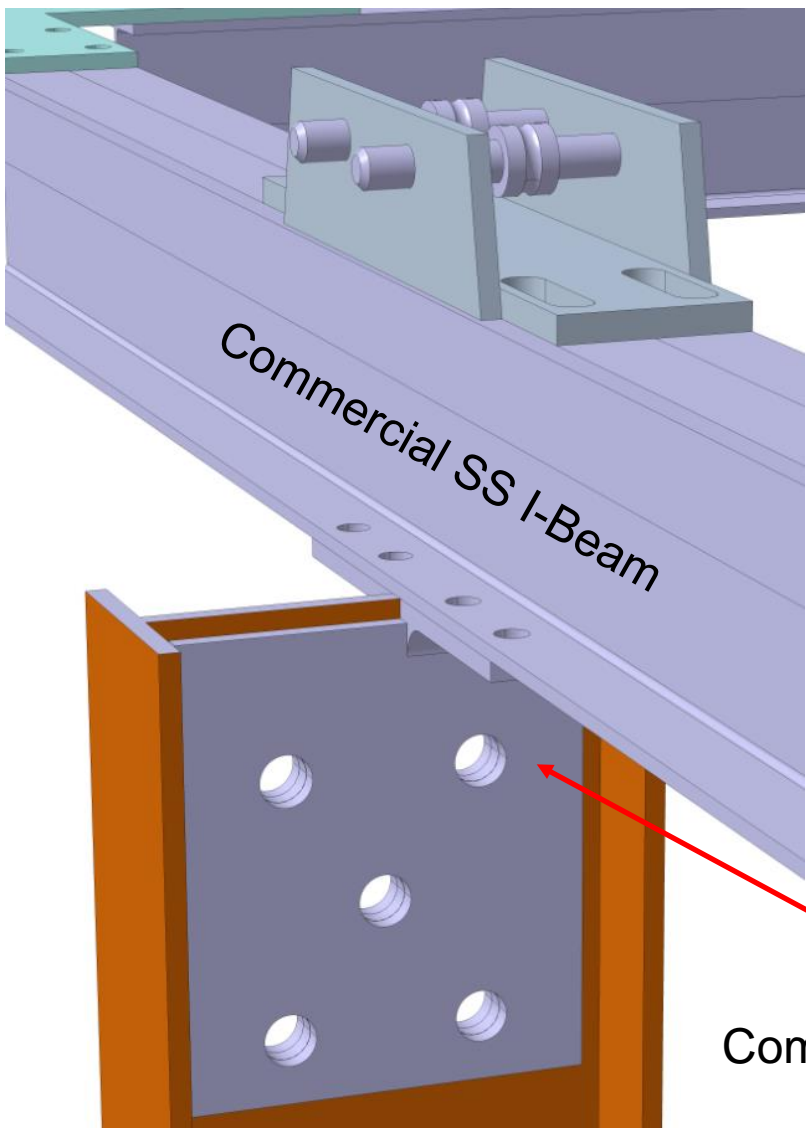


- Field Cage connected with SS Plates for better alignment and stability

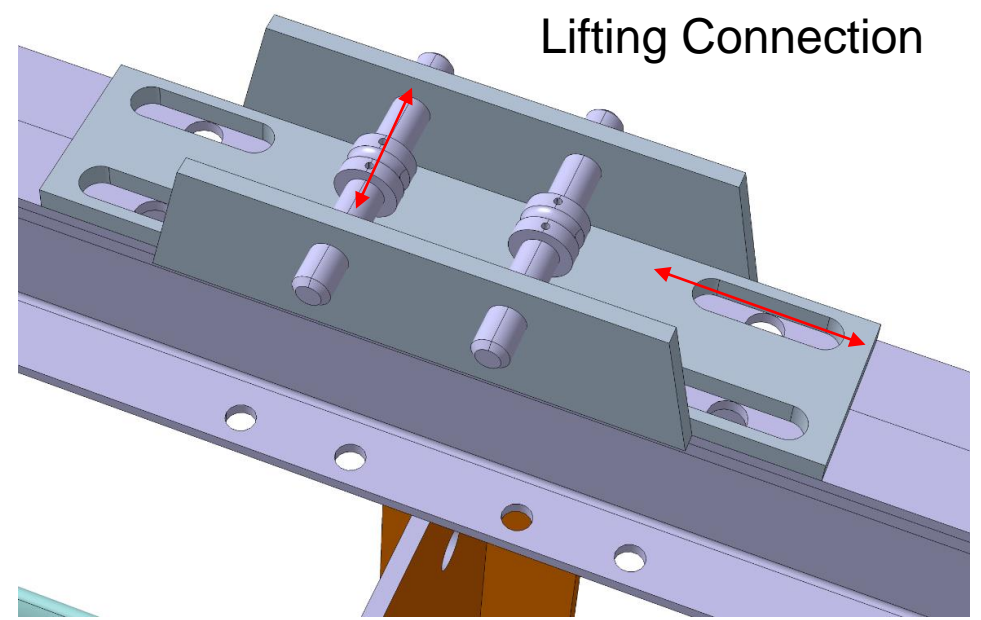


- Modules connected with G10/FR4 plates for alignment and stability
- Corner Connection still missing. Holes in main Beam already foreseen





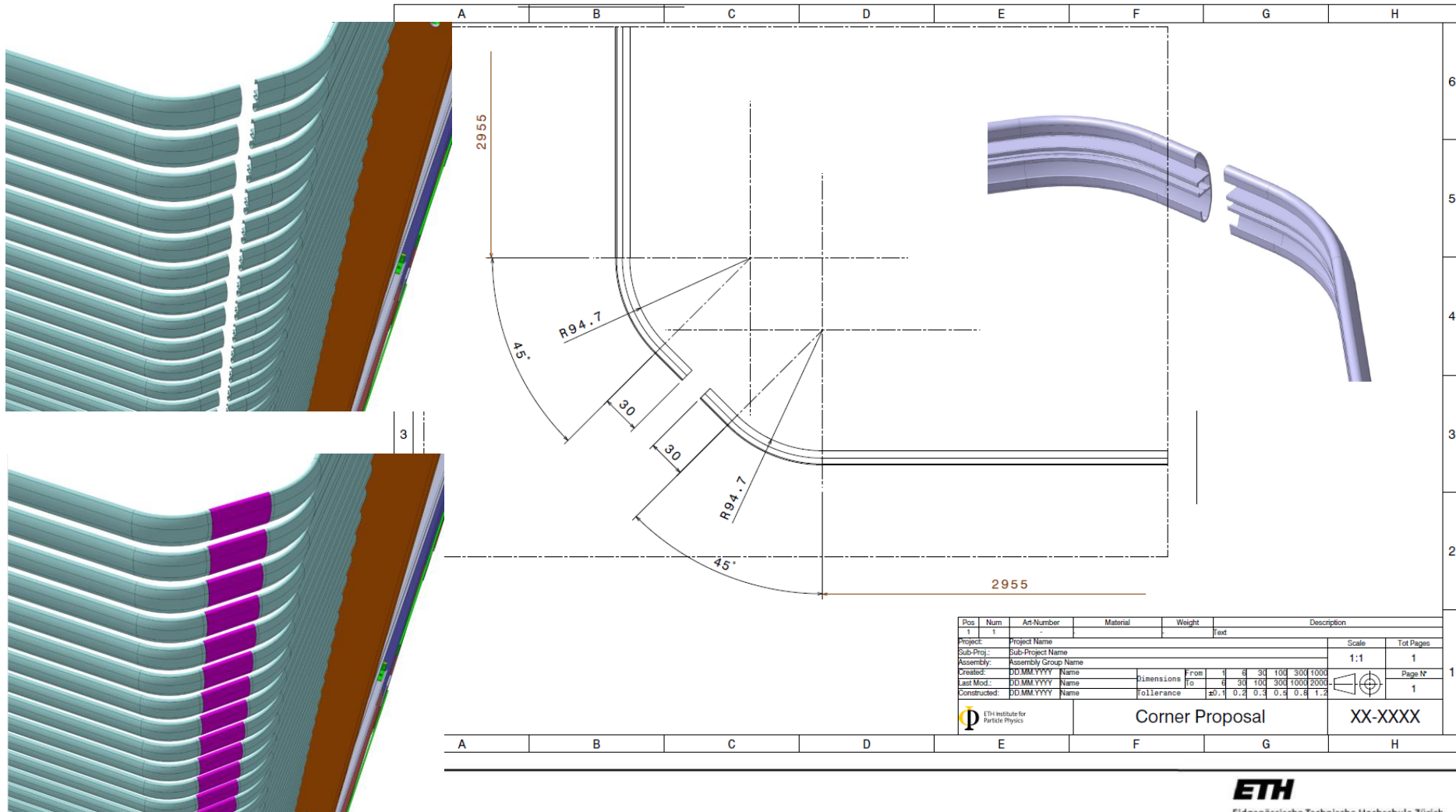
Hanging Connection



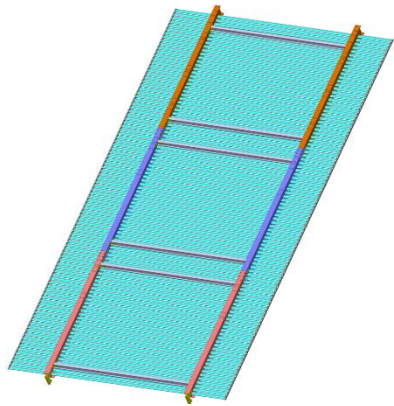
Commercial SS L-profile

CERN Alu Profiles and Clips:

- New proposal for the corner in order to have only straight clips
- Company confirmed that they could bend the Profile 45 deg (90 deg is too much)
 - Idea is to have full length profile bended 45 deg in one end)
- Received offer (yesterday evening) from MIFA for having ~30 prototypes profiles bended (need to discuss with F.Pietropaolo)
- Adding a bar to the clip in order to give better fixation, better alignment and stability (on discussion with F.P.)

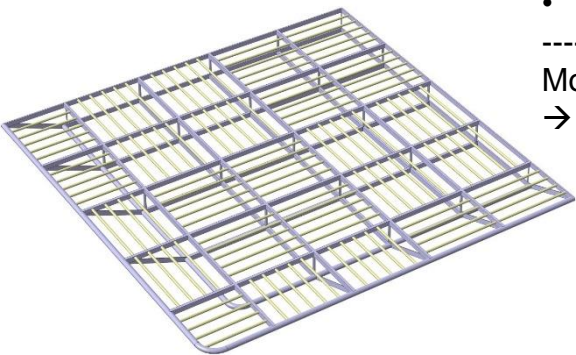


Preliminary weight Calculation of the Detector:



- 98 Alu Profiles: $0,821 \text{ Kg} \times 98 = 80.5 \text{ Kg}$
- FR-4 Beams and Reinforcements 68.3 kg

 FC Module $148.8 \text{ Kg} \times 8 \text{ Modules} = 1190.4 \text{ Kg}$



- Cathode Module: 110.5 Kg
- 20mm pipes $\sim 35 \text{ Kg}$

 Module weight $145.5 \text{ kg} \times 4 \text{ Modules} = 582 \text{ Kg}$
 $\rightarrow \sim 600 \text{ kg}$ (with bolts, nuts, etc...)

- Additional FC reinforcement $\sim 50 \text{ Kg}$
- Hanging System for 1 module $27\text{kg} \rightarrow \text{Total} \sim 220 \text{ Kg}$
- Details (HV divider, small connection, bolts etc..) $\sim 100 \text{ Kg}$

Total FC weight estimation $\sim 2,2 \text{ Tons}$

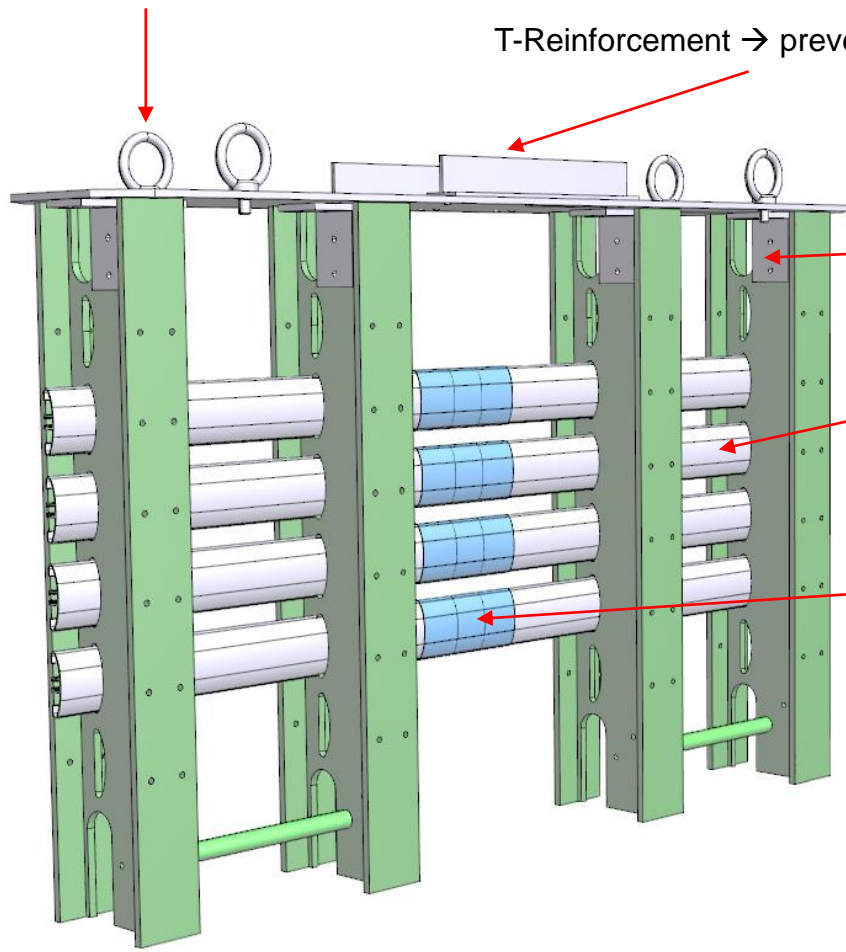
Hanging points for Crane

T-Reinforcement → prevent bending of the plate

L-Profile fixing FRP I-Beam to Plate

725mm CERN ALU Profile

CERN Prototipe CLIP



- Proceed with the Clip Test Setup Assembly and define final design for Alu Profiles and Clips
- Re-check the FC 2D Drawings and send them to V. Guarino for final check
- Prepare 2D Drawings for the Hanging System
- Finalize Cathode design and prepare manufacturing drawings
- Please send to me step files any time you have a reasonable drawing update.

Thank you.....