protoDUNE-DP integration

Latest news

Information on meetings related to IG:
-Every Monday 3 pm CET discussion between DUNE management and SP+DP integration responsible.
-Every Tuesday 10:00 CET discussion in Prevessin (CERN,SP, DP) essentially latest updates and plans for the week.

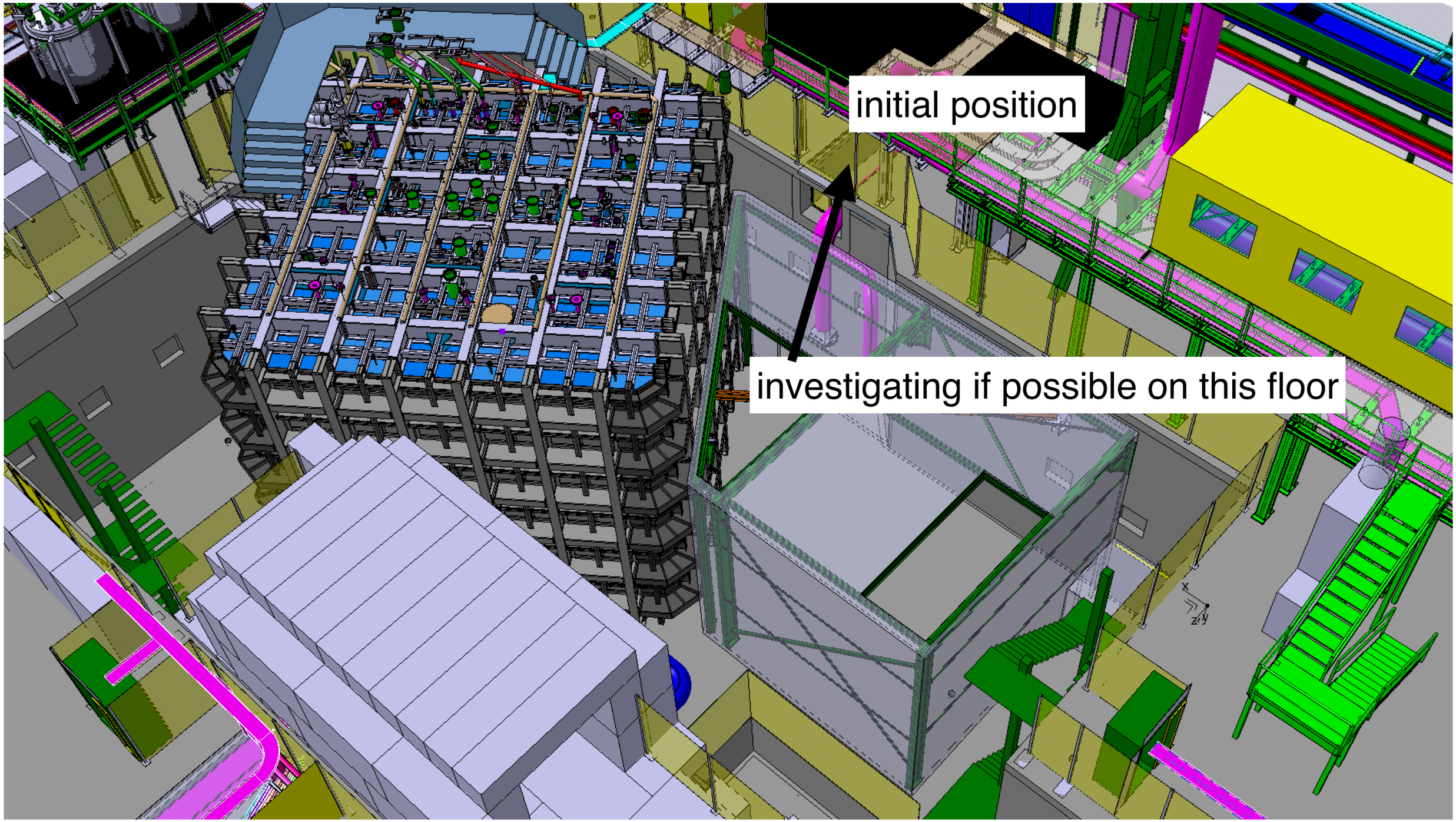
- Still pending decision on exact location of racks. CERN did not realise that the initially proposed location was causing trouble for passage. Discussions ongoing to see if the floor below is possible or if we can still use the initially planned one. -> needs to be decided asap

- 1.5 days meeting with Benjamin, Nicolas + Adamo at CERN to finalise the document for CERN safety (Installation sequence + load calculations).

- last week: T. Shaw, L. Bagby and Yann mounted the impedance monitor rack and made first checks (see next slides)

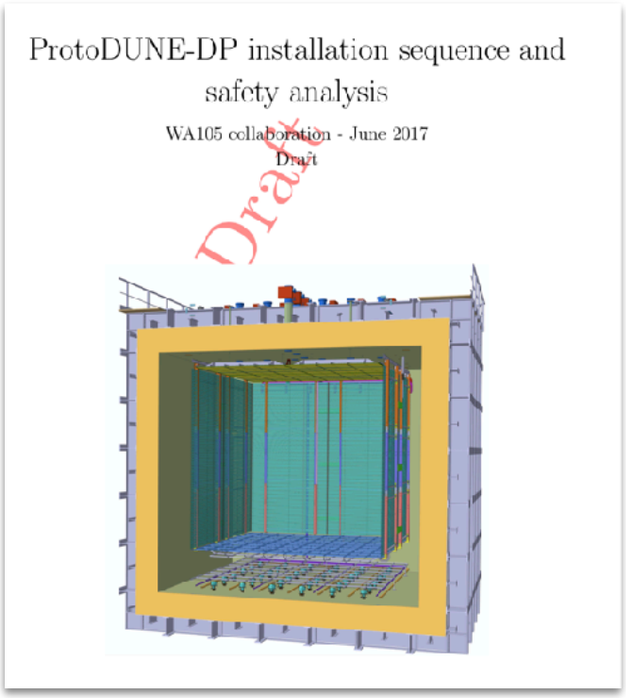
- Working on getting a V3 detailed schedule before Aug. 31st

Racks



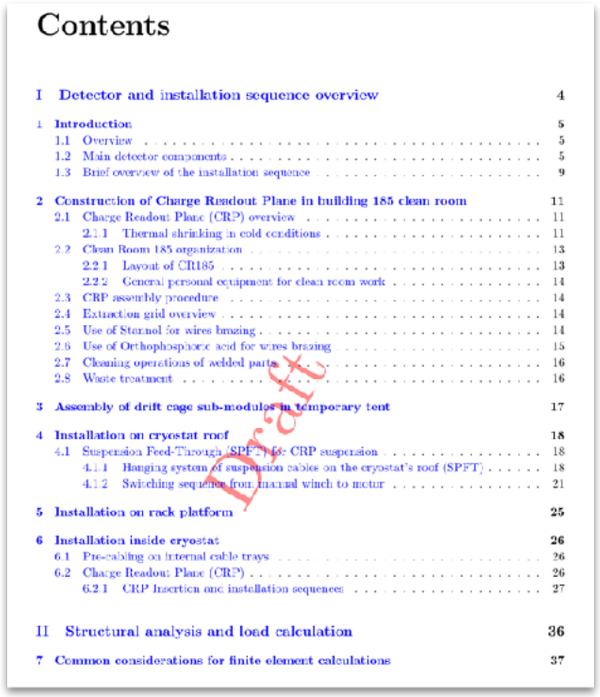
Safety

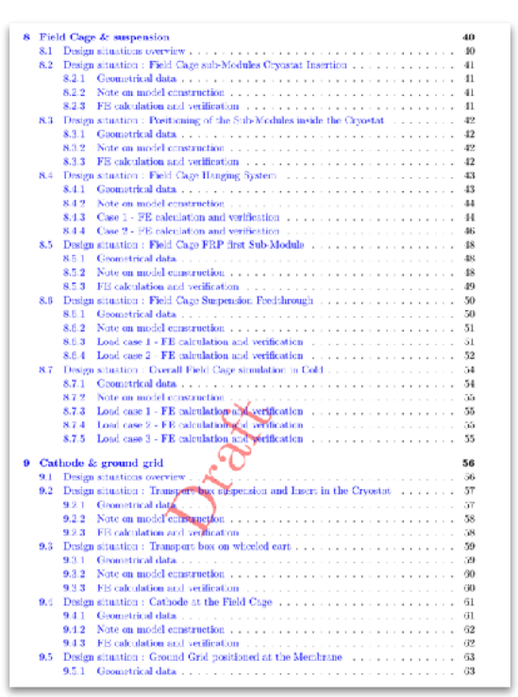
- progress on the document describing installation and load calculation.
- Keeping a centralised data-base (2D, specs,..) on CERNbox.

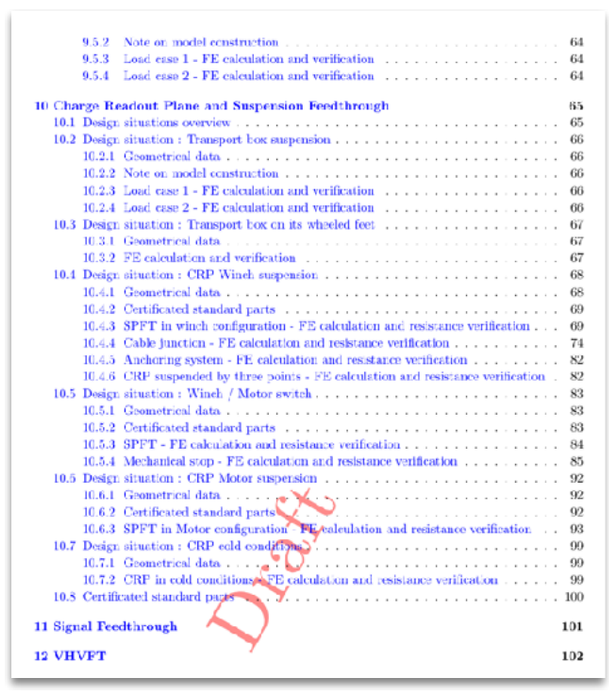

ProtoDUNE-DP installation sequence and safety analysis

WA105 collaboration - June 2017

Draft


Contents





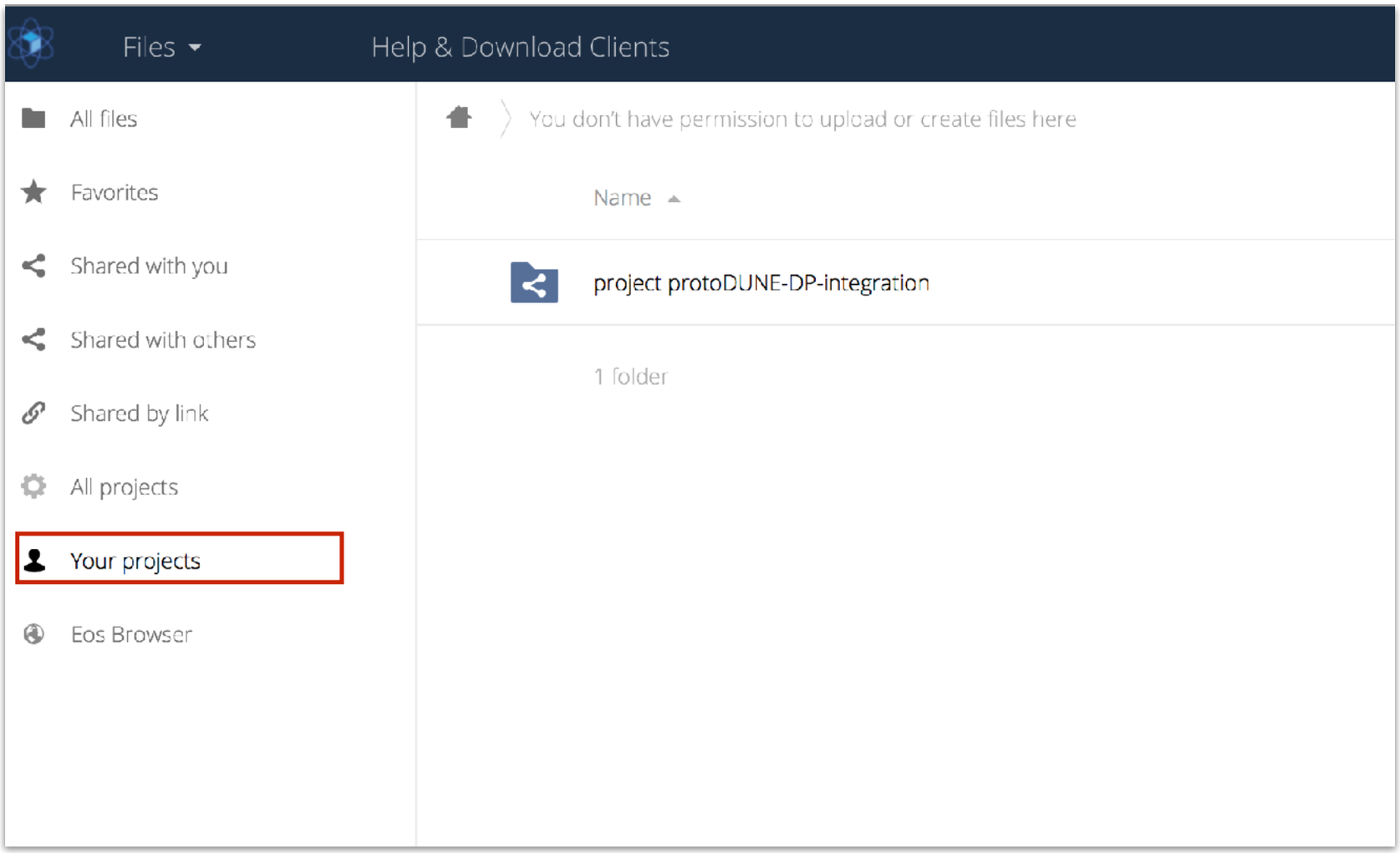
Safety trainings - list of trained people so far

	Institute	contact	Habilitation Electrique - Person making Tests in Labs or on Test Bench - Initial	Working at Heights - Using a Harness	Mobile elevating platform	Confined spaces
Sebastien Murphy	ETHZ		X	X		X
Dominique Duchesneau	LAPP				*X (planned)*	
Laura Molina Bueno	ETHZ		X	X	X	X
Caspar Schloesser	ETHZ				X	
Thierry Viant	ETHZ		X			X
Adamo Gendotti	ETHZ				X	
Cosimo Cantini	ETHZ		X	X	X	
Yann-axel Rigaut	ETHZ		X	X	X	
Benjamin Aimard	LAPP				*X (planned)*	
Nicolas Geffroy	LAPP				*X (planned)*	
Fabrice Pelletier	LAPP				*X (planned)*	

note: cryostat not considered as confined space when TCO opened

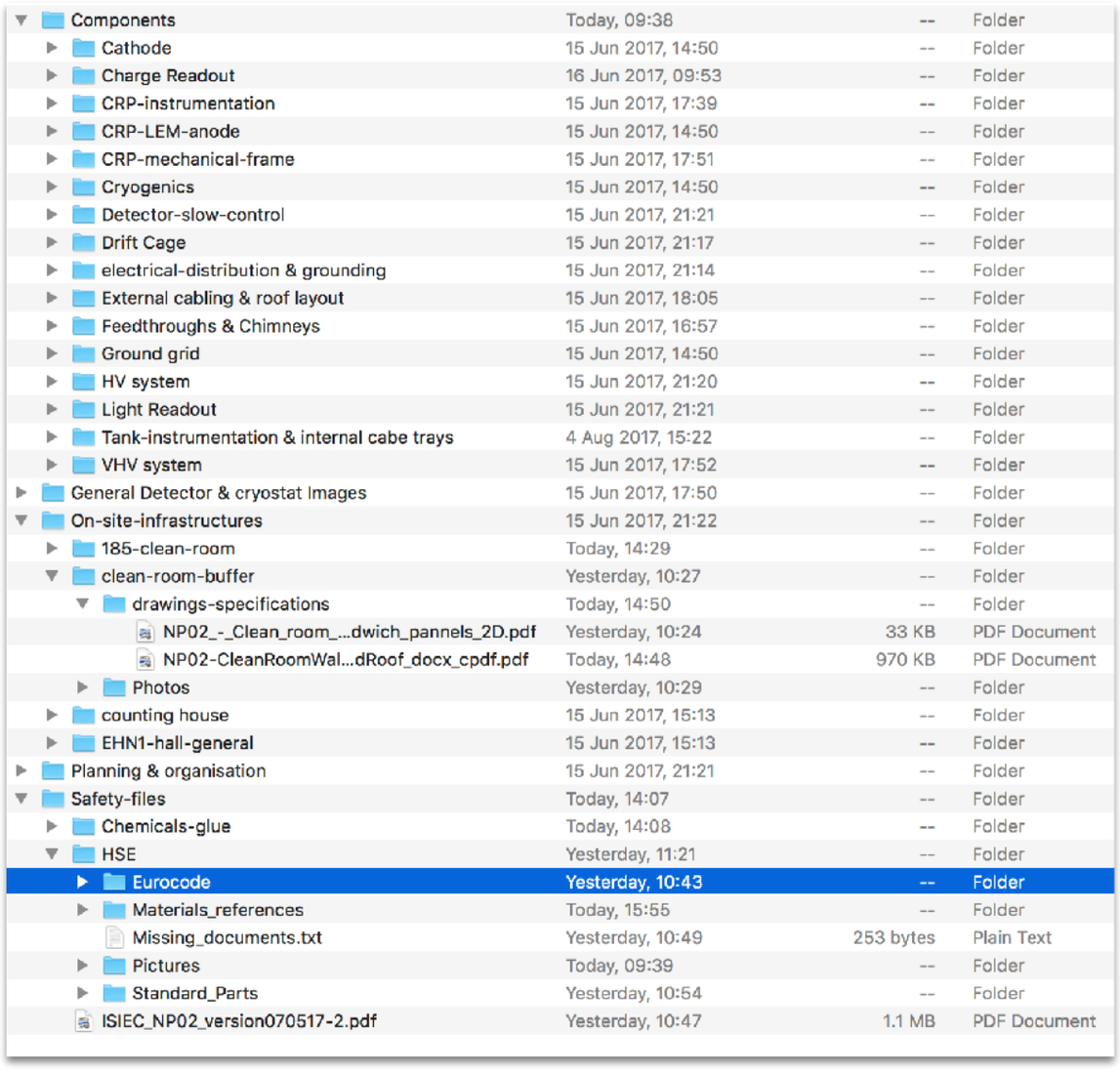
CERNbox

- Used extensively! Quotes, 2D drawings, specs, photos, safety data-sheets, infrastructure information,… are regularly uploaded there.
- I setup a project called protoDUNE-DP-integration. If you go to cernbox.cern.ch all collaborators on the group CENF-WA105-integration will see it in “Your projects” tab.
- “Unlimited” space and very easy to sync with your local folder to drag and drop files (use like dropbox). Follow this tutorial http://cernbox.web.cern.ch/cernbox/en/synchronisation/add_a_folder_sync_connection.html use path /eos/project/p/protoDUNE-DP-integration

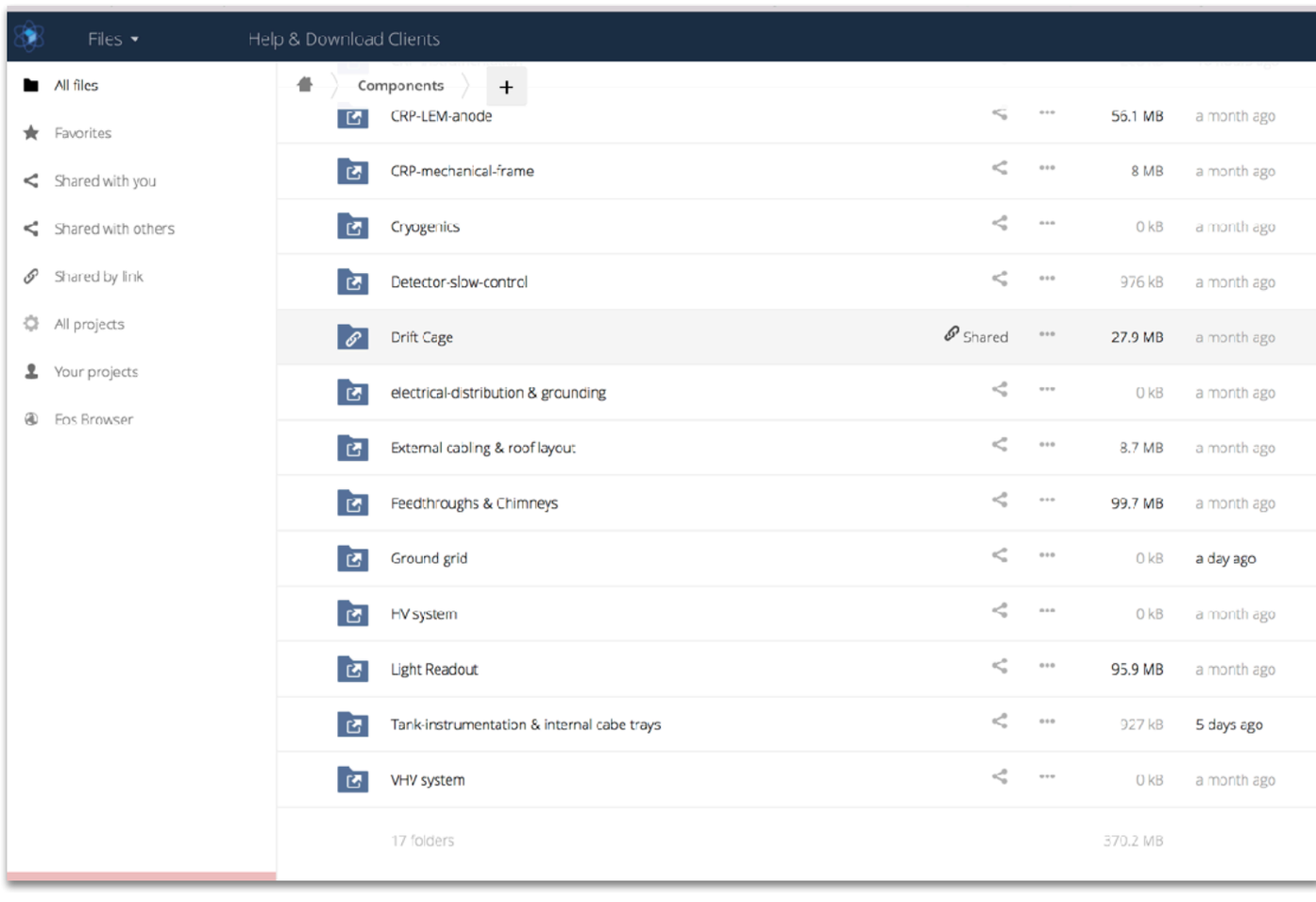


CERNbox

view in local folder (3 GB of files for now)



view in browser



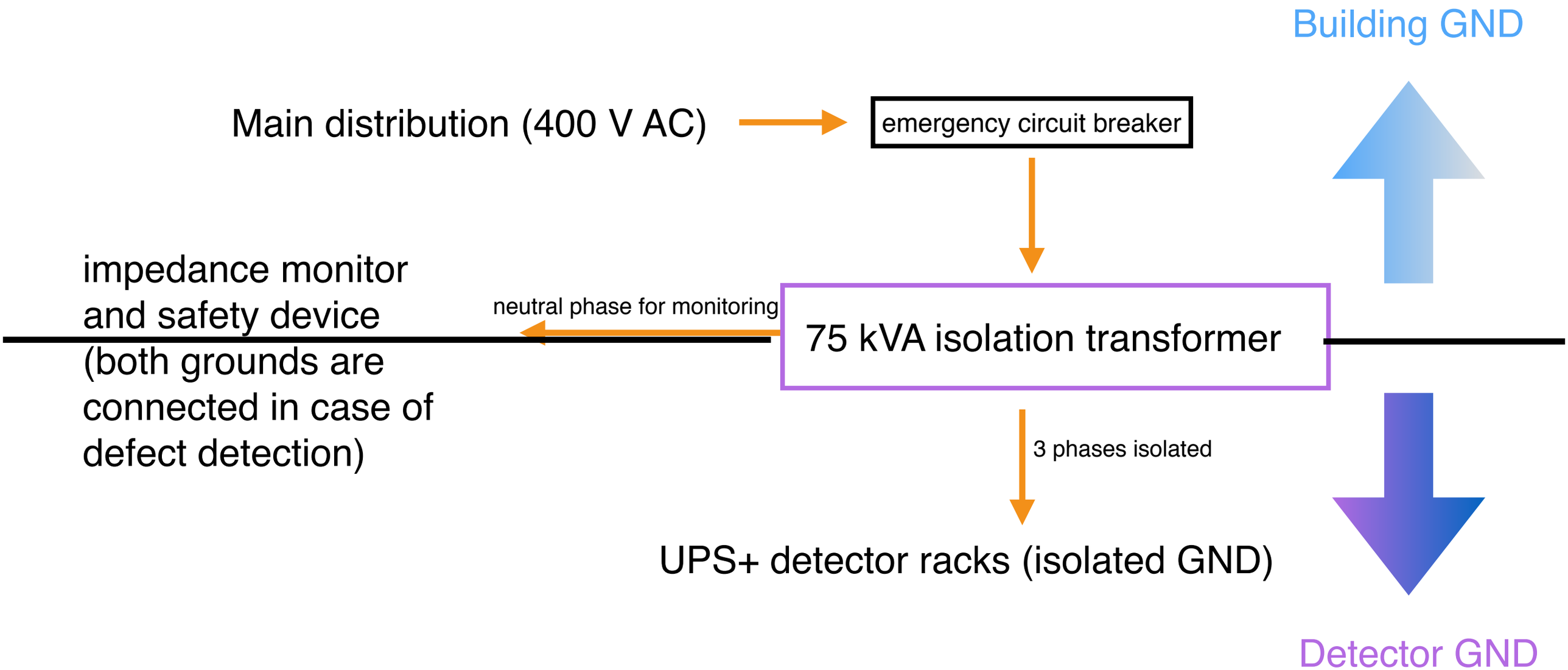
Remove heaters

Decided to remove top and bottom heaters. They proved to be of limited use in the 3x1x1 (low heating power compared to tank heat input)

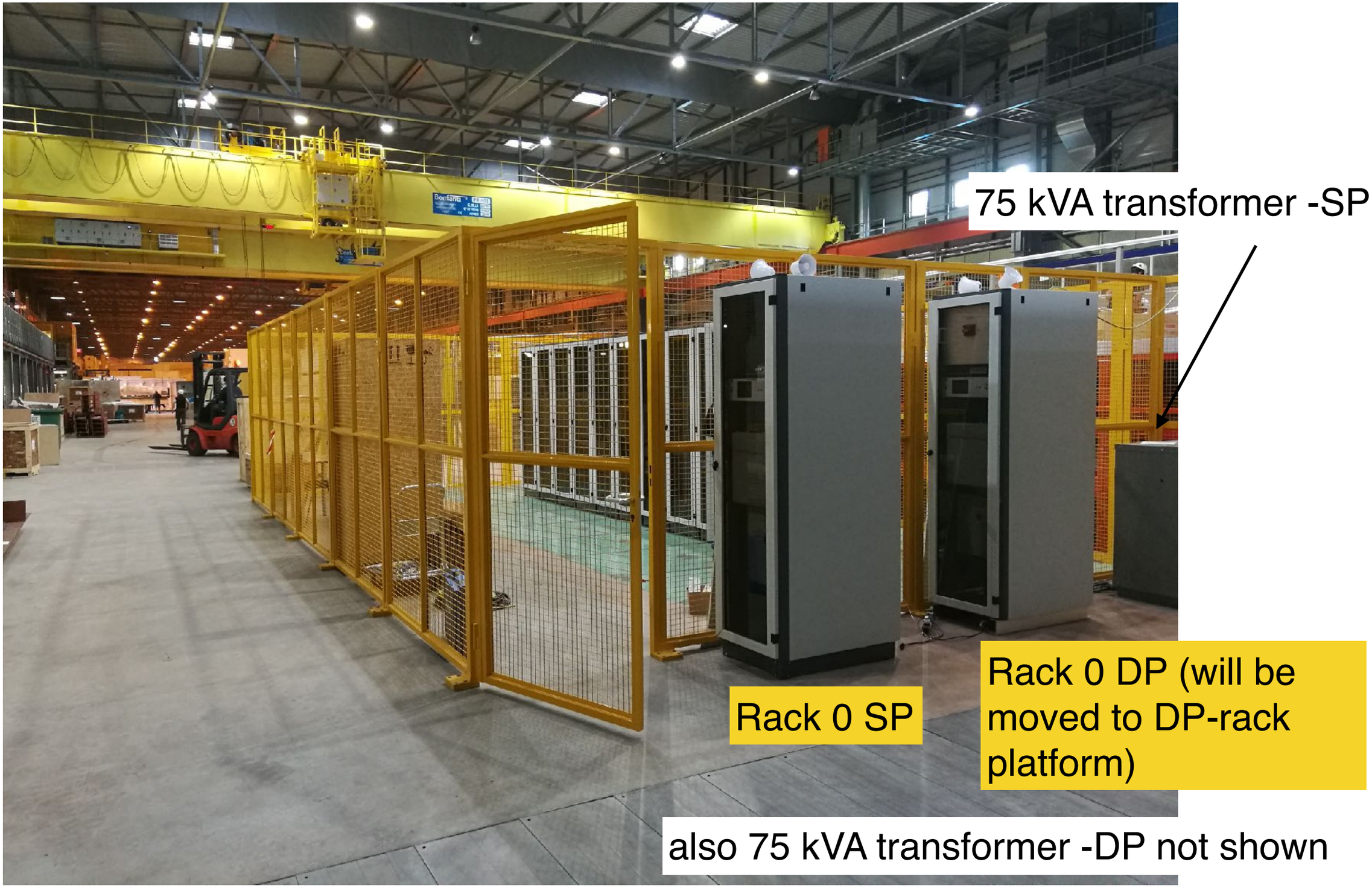
			SENSOR -> PATCH PANEL						PATCH PANEL -> FLANGE			
	Sensors/Items	**No. Items per CRP module**	**Cables**	**CODE**	**No. of cables**	**Diameter**	**Connector on patch panel IN**	**Patch Panel**	**Connector on patch panel OUT**	**Cables**	**CODE**	**Weldable connector on flange**
x4	Thermometers (6 Pts each)	4 Thermometers	3M 50 way Twisted Ribbon Cable, 1.27 mm pitch, AWG 28	RS 111-8900	2	63.5mm	SUBD 50 pins		SUBD 50 pins	3M 50 way Twisted Ribbon Cable, 1.27 mm pitch, AWG 28	RS 111-8900	2x SUBD 50 pins
	Temperature for heaters	4	3M 50 way Twisted Ribbon Cable, 1.27 mm pitch, AWG 28	RS 111-8900	<1				SUBD 50 pins	3M 50 way Twisted Ribbon Cable, 1.27 mm pitch, AWG 28	RS 111-8900	1x SUBD 50 pins
	Capacitive level meters	4	CABLE COAXIAL 50 OHM - RG316U	RS 260-5607	8	4.2mm	8x SMA	Patch Panel 1	8x SMA	CABLE COAXIAL 50 OHM - RG316U	RS 260-5607	8x SMA
	Distance meters	4	CABLE COAXIAL 50 OHM - RG316U	RS 260-5607	8	4.2mm	8x SMA		8x SMA	CABLE COAXIAL 50 OHM - RG316U	RS 260-5607	8x SMA
	Calibration KEL connectors	3	Hitachi twisted pair 40c	---	3		8930E-040-178MS-F KEL		8930E-040-178MS-F KEL	Hitachi twisted pair 40c	---	PCB multilayer (each with 3 KEL connector)
	Heaters	4	KAPTON INSULATED WIRE	311-KAP Allectra	8	2.1mm	AMPHENOL MDC 10 pins	Power connector assembly, hold on SS	AMPHENOL MDC 10 pins	KAPTON INSULATED WIRE	311-KAP Allectra	1x AMPHENOL MDC 10 pins
	HV LEM	72	kapton insulated KAPW50ohm or micro coax	LewWac KAPW50	72	2.1mm	MACOR own Design	Patch Panel 2	MACOR own Design	kapton insulated KAPW50ohm or other	LewWac KAPW50 or other	---
	Extraction Grid/FFS	4	kapton insulated ZKAPW 50ohm	Lewvac ZKAPWC	4	3.2mm	MACOR own Design		MACOR own Design	kapton insulated ZKAPW 50ohm	Lewvac ZKAPWC or other	---

CRP instrumentation list (Cosimo)

Electrical distribution

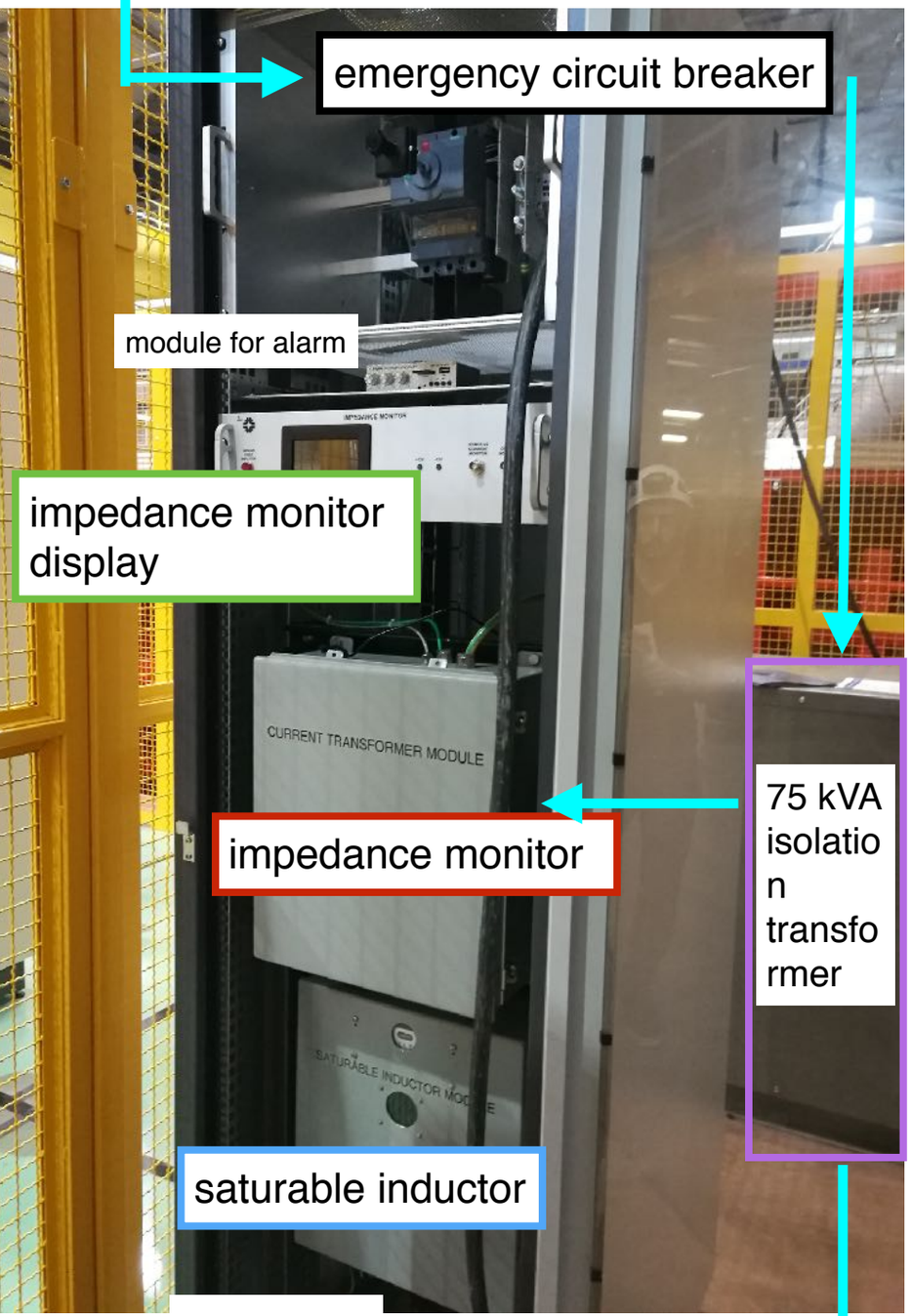


Impedance monitoring racks

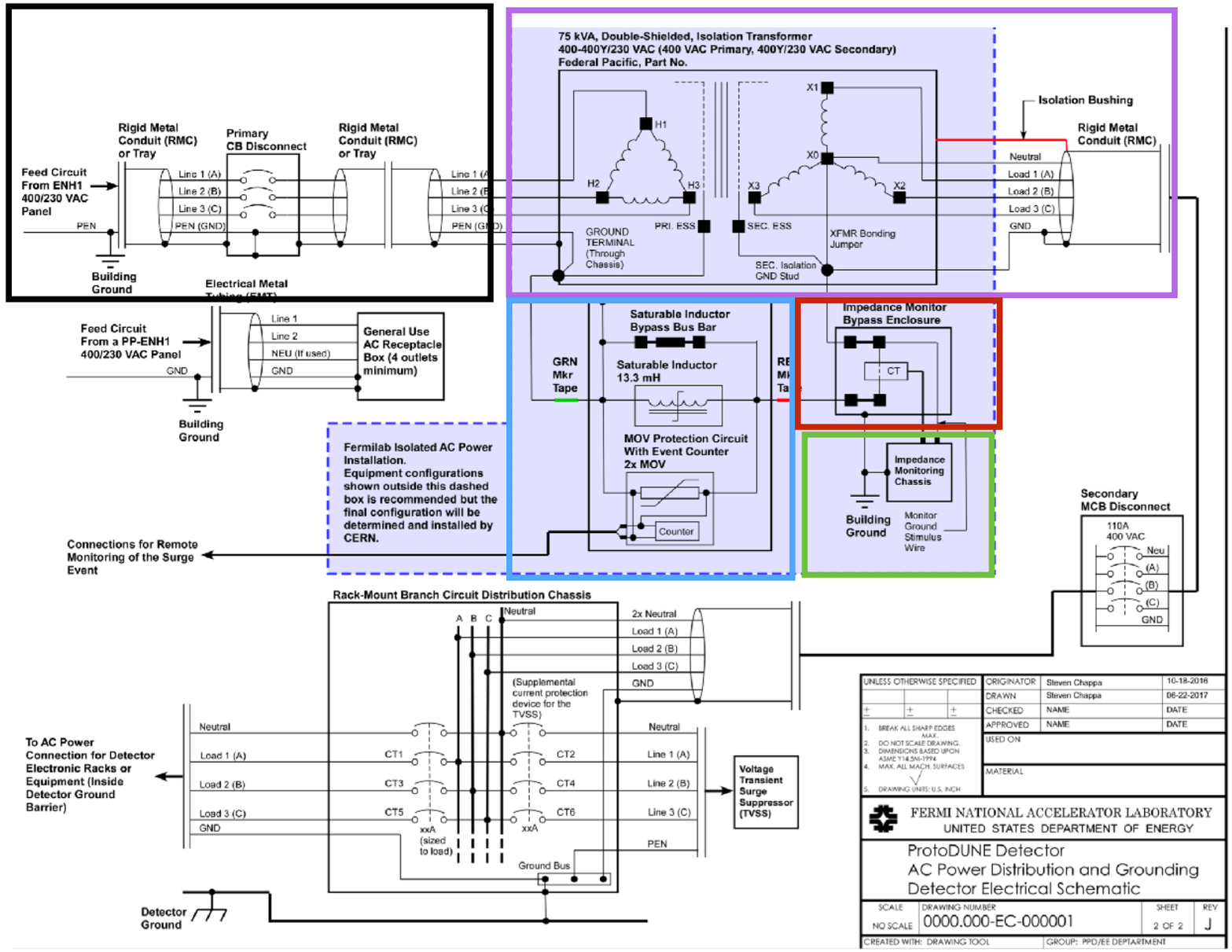


Impedance monitor (rack 0)

from main distribution (400 V AC)



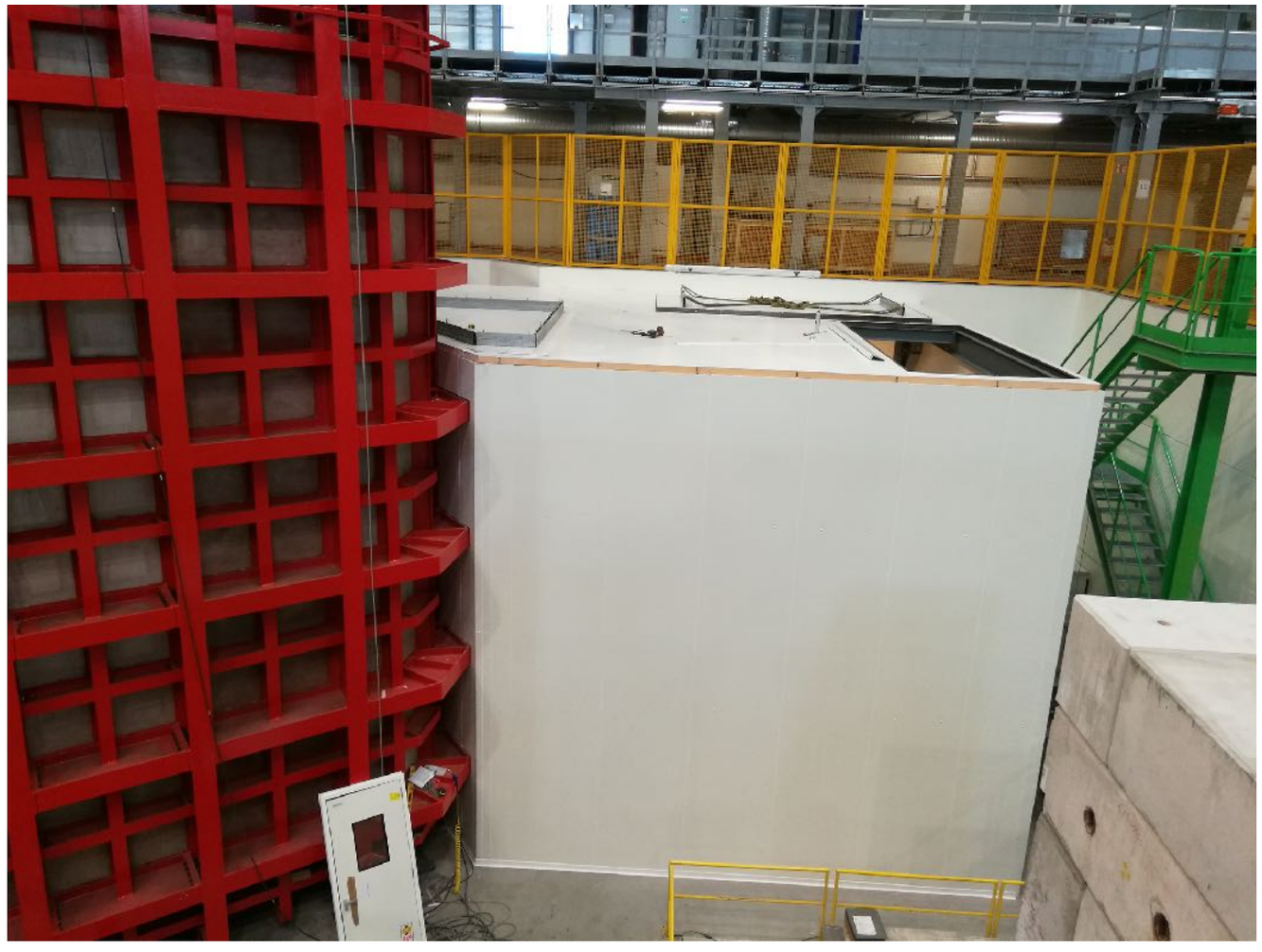
Everything installed and tested.
Terri, Linda, Yann last weeks (see talk at DUNE meeting)



detector racks

EHN1-latest pictures

- CRB structure done
- Started to install membrane inside cryostat.

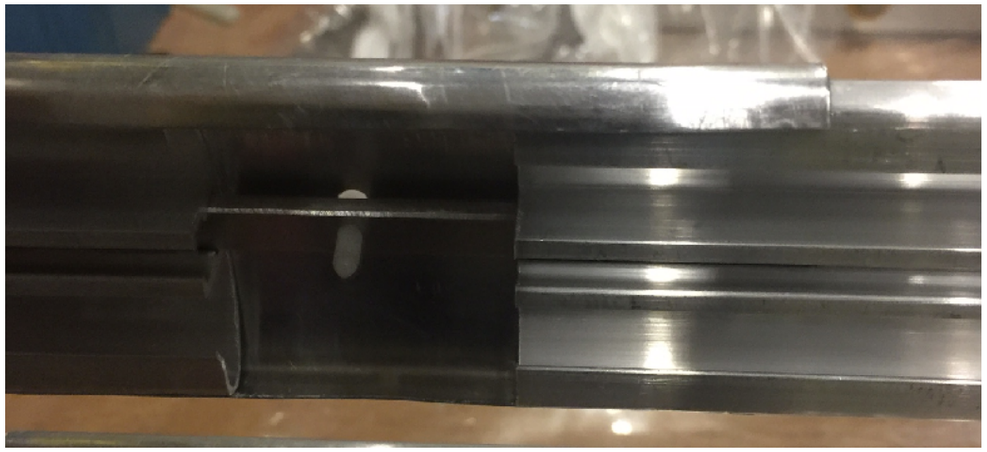


level of planning advancement

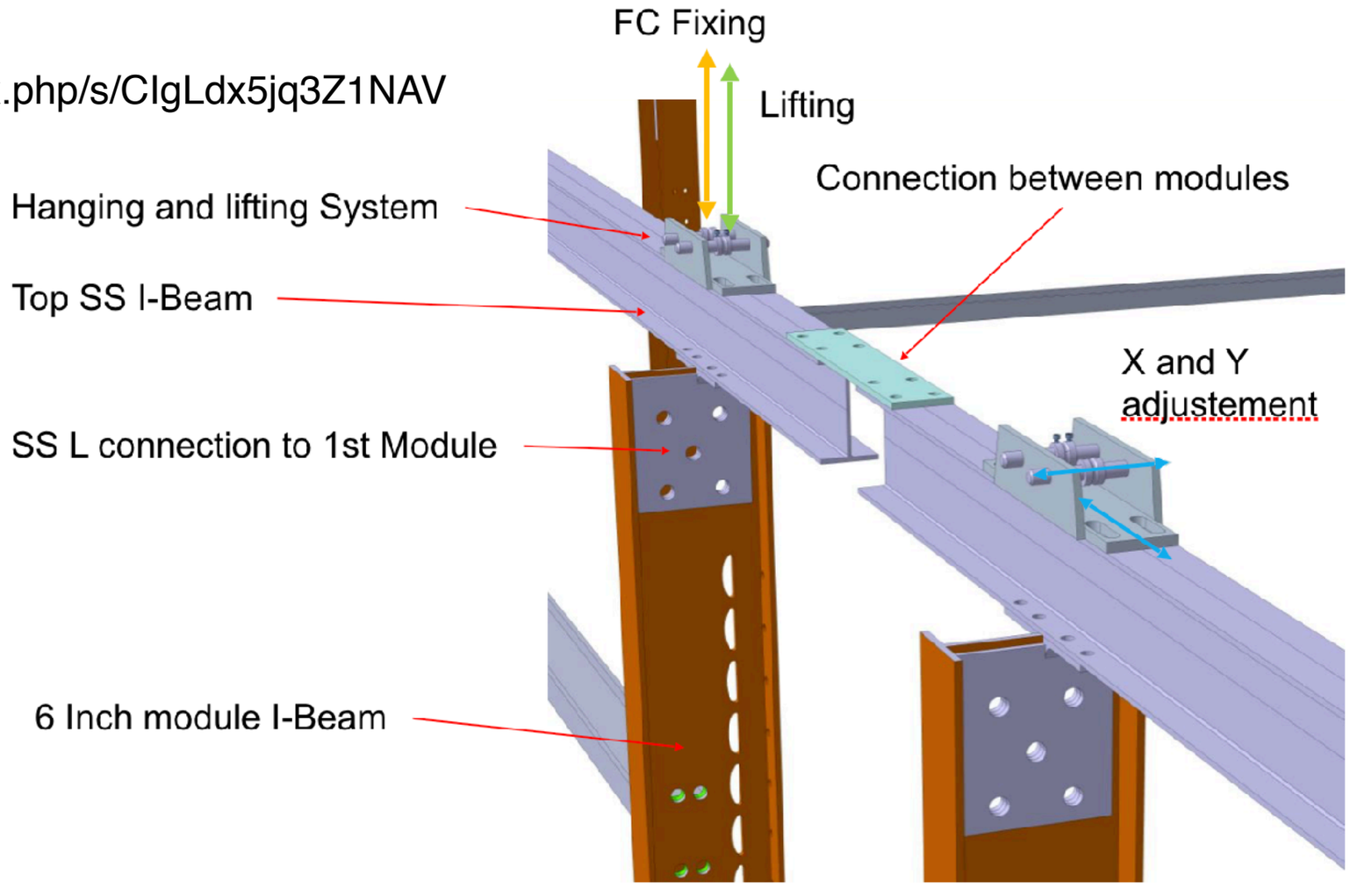
- Infrastructures (EHN1 cryostat, CRB, CR185) ✓
- CRP mechanical frame ✓
- CRP instrumentation/internal cabling ✓ => next slides
- CRP LEM-Anodes ✓
- Drift cage ✓ => next slides
- Cathode and ground grid ✓
- Light Readout ✓
- Charge Readout ✓
- Feedthroughs and Chimneys
  - TANK-INST ✓ => design work almost final (this meeting Roger)
  - CRP-INST ×
  - SGFT ×
  - CRP-SPFT
  - FC-SPFT ×
  - HV systems ×
  - VHV × => this meeting
- Beam-plug ×
- Detector slow control ×
- Tank instrumentation/internal cabling × => this meeting (Sebastien)
- Electrical distribution and grounding ×
- External cabling and roof layout × => this meeting (2 talks, Yann & Adamo)
- CRT ×

- × = not yet fully detailed in planning
- ✓ = incorporated in planning

Drift cage components



CERNBOX: https://cernbox.cern.ch/index.php/s/CIgLdx5jq3Z1NAV



Drift cage - main components

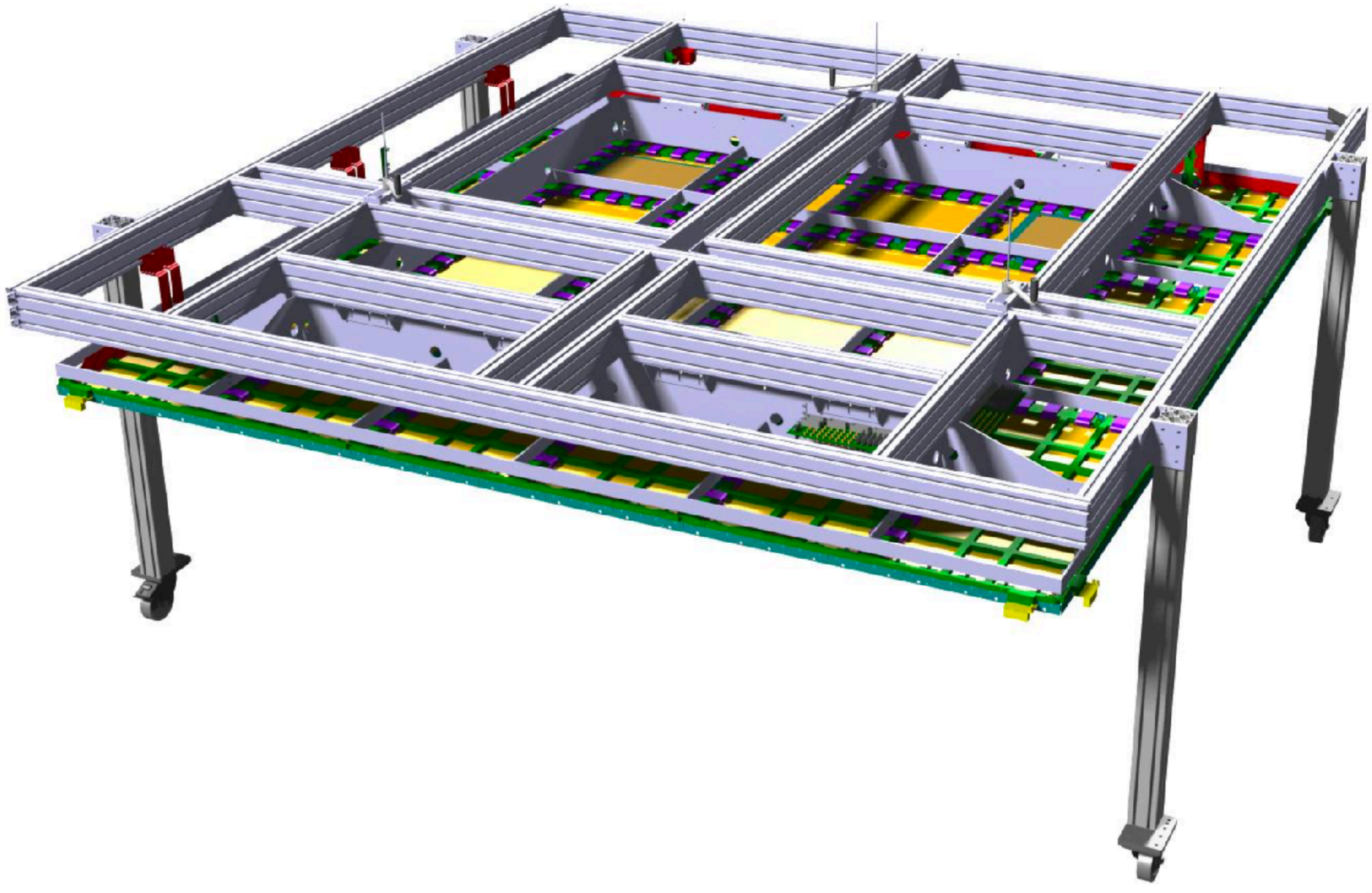
		Resp. design	Resp. Purchase	Status	Remark
DC modules	bent coated Al profiles	ETHZ/CERN	CERN	ordered	ordered 1000 (20% spare). First 33 being shipped to CERN for
	Al clips	ETHZ/CERN	CERN	ordered	ordered 600 of 85 mm + 600 of 70 mm
	small Al sliding bars between profiles	ETHZ	CERN	design tested needs final	proto Ok.
	FRP I beams	UTA	UTA	delivered at UTA	
	FRP/G10 connection between FRP I beams	UTA	UTA	delivered at UTA	
	Slip nuts (fix profiles to FRP I-beam)	UTA	UTA	delivered at UTA	
DC hanging system	Top SS I beams	ETHZ	?	designed	2D production drawings ready
	SS L connection	ETHZ	?	designed	2D production drawings ready
	hanging and lifting anchoring point	ETHZ	?	designed	2D production drawings ready
	hanging cable	ETHZ	?	designed	2D production drawings ready
	SS connection plate between modules	ETHZ	?	designed	2D production drawings ready
	field cage suspension FT	ETHZ	?	designed	2D production drawings ready
DC electronics	PCB boards	UTA	UTA	ordered	prototype under revision. Full production within on month
	electrical components for divider	UTA	UTA	75% arrived	under test

Update by Jae at the DUNE CM

Towards 1st CRP assembly in b.185

Priority now is to start CRP #1 assembly in b. 185 this fall.

Next slides summarise the plans and status of orders



KEL connectors

KEK is taking care of orders, regular discussions.
So far we have been delivered the connectors for bridge + the SMT anode connectors

table from KEN, regularly updated

https://cernbox.cern.ch/index.php/s/JEJdaS1s93ArkId

cable	Necessary quantity	Plan to purchase	Status	Ordered	Reamining	Comment
KEL 8925E-068-179F-095T-GG	240	270	waiting	0	270	Waiting to fix the cable length from anode to cold-FT
KEL 8925-068-179F-220T-GG	120	150	waiting	0	150	Waiting to fix the cable length in the signal chimney
KEL 8925-080-179F-220T-GG	120	150	waiting	0	150	Waiting to fix the cable length in the signal chimney
connector						
KEL 8930E-068-178MS-F	3360	3700	partially ordered	2250	1450	800 already arrived at CERN (2017/July/28). Reamining parts will be ordered after checking the initial anode producition
KEL 8925-068-179-F	2400	2700	partially ordered	1700	1000	700 already arrived at CERN (2017/July/28). Reamining parts will be ordered after checking the initial anode producition
KEL 8913-068-178MS-A-F	360	400 custom	ordered	400	0	Expected delivery period is the end of September
KEL 8901-068-177L-F	240	270 custom	ordered	270	0	Expected delivery period is the end of September
KEL 8931E-068-178L-F	120	150	waiting	0	150	Waiting to fix the design of signal chimney
KEL 8931E-080-178L-F	120	150	waiting	0	150	Waiting to fix the design of signal chimney
KEL 8930E-080-178MS-F	240	270	waiting	0	270	Waiting to fix the design of warm-FT
KEL 8913-080-178MS-A-F	120	160	waiting	0	160	Waiting to fix the design of warm-FT
KEL 8930E-040-178MS-F	60	70	waiting	0	70	Waiting to fix the design of pulsing system
KEL 8925-040-179-F	60	70	waiting	0	70	Waiting to fix the design of pulsing system
KEL 8903-068-177S-A-F	240	270 custom	ordered	270	0	Expected delivery period is the end of September

1st CRP -mechanics

- only parts that need to be fabricated are shown and only parts which are critical to begin assembly of 1st CRP.
- Complete list with all details available on CERNbox (and regularly updated)
- https://cernbox.cern.ch/index.php/s/H05MjmSuEL7QHsF
- All 2D drawings also available there

	Resp	Status	Remark
INVAR frame	LAPP	Arrives end of September	
G10 frames + G10 parts	LAPP	Arrives beg. of September	
100 micron wire	LAPP	delivered	
wire tensioning system	LAPP	under test at LAPP- delivered to 185 in October	
wire combs	LAPP	delivered	
Anode centering pins	CEA	to be ordered	
Anode fixation screws	CEA	Arrives beg. of September	
LEM-anode spacers	CEA	Arrives beg. of September	
G10/INVAR decoupling screws	LAPP	needs to be ordered	
PCB wire holders	LAPP	delivered - needs HV testing	
not detailed all small screws and bolts			
CRP supporting structure	LAPP	design finished needs to complete FEA calculations	
CRP transport box	LAPP	under design	

all material halogen free

1st CRP- sensors and electronics

	Resp. design	Resp. purchase	Status	Remark
40 certified LEMs with HV connectors + insulator	CEA	CEA	Arrives end of September	
40 anodes with connectors soldered	ETHZ	ETHZ	Arrives beg. of October	
patch panel PCB	ETHZ	ETHZ	First proto September?	
patch panel connectors + Macor insulating contacts	ETHZ	ETHZ	First proto September?	
PCB thermometers	ETHZ	ETHZ	ordered	
temperatrue probes	ETHZ	ETHZ	ordered	
cable temperature probes (sensor->panel->flange)	ETHZ	ETHZ	identified cable needs ordering	
level meter sensors	ETHZ	ETHZ	design ok needs ordering	
level meters cables (sensor->patch-panel->flange)	ETHZ	ETHZ	identified cable needs ordering	
Distance meters sensors	LAPP	LAPP	delivered	**General comment: technicians needed for cables and sensors assembly**
distance meters cables (sensor->patch-panel->flange)	LAPP	LAPP	identified cable needs ordering	
KEL SMT connectors for anode	KEK	KEK	first batch for 36 anodes delivered	
bridge between anodes (KEL connectors+ flat cable)	KEK/ETHZ	KEK/ETHZ	identified cables, ordered connectors, needs manufacturing	
calibration PCBs + components (R,C)	ETHZ	ETHZ	design ok, needs ordering	
KEL connectors fo calibration	KEK	KEK	ordered	
KEL cables+ connectors anode->SGFT	KEK	KEK	waiting to define exact length	
HV cables LEM (sensor->patch-panel)	ETHZ	ETHZ	ordered	
HV cables LEM (patch-panel->flange)	ETHZ	ETHZ	design pending	
HV cables GRID (sensor->patch-panel)	ETHZ	ETHZ	ordered	
HV cables GRID (patch-panel->flange)	ETHZ	ETHZ	design pending	
Macor insulating contact HV grid	ETHZ	ETHZ	ordered?	

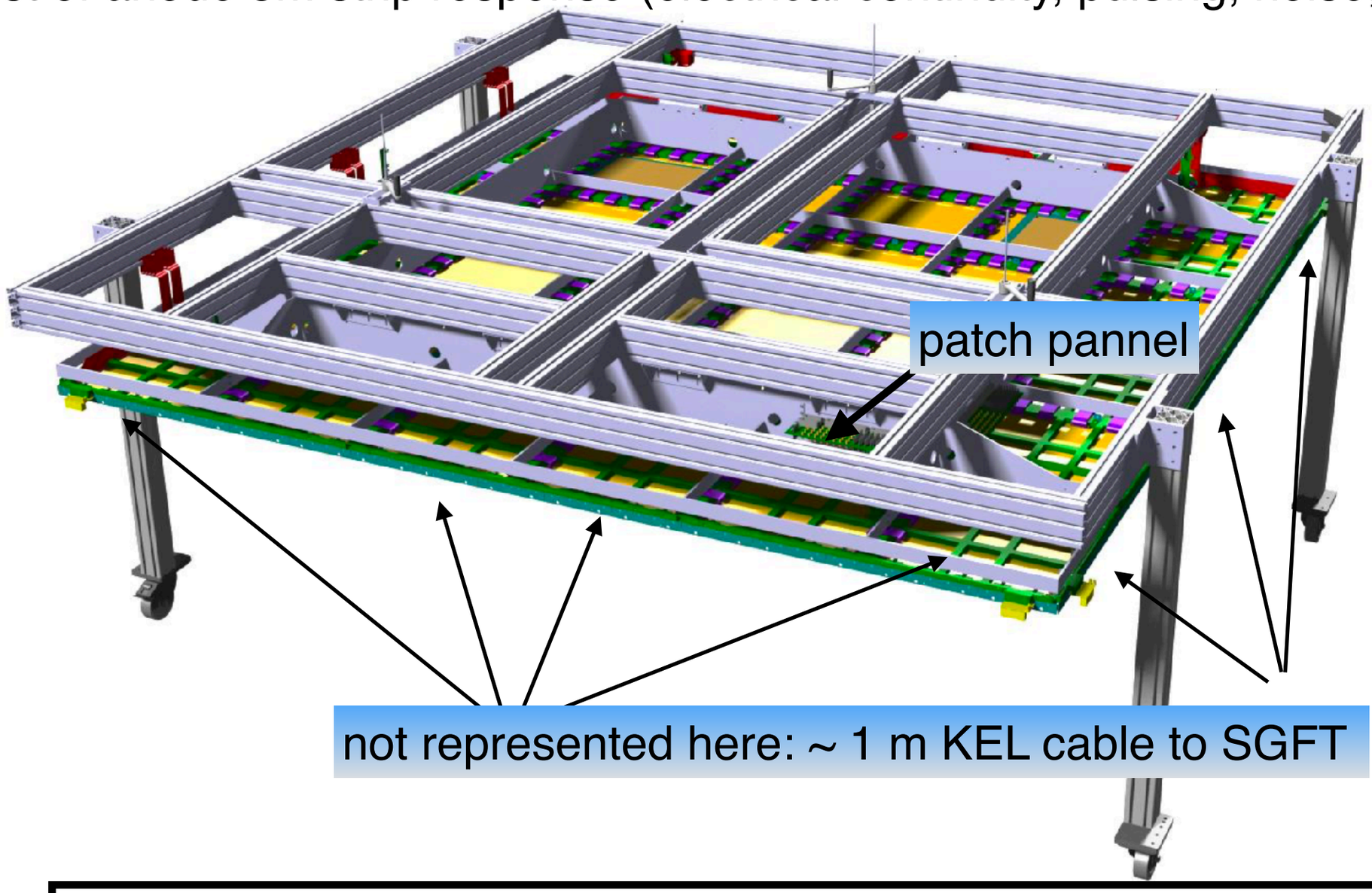
1st CRP-infrastructure and tooling

	Resp	Status	Remark
Storage for 40 Anodes	ETHZ	re-use a storage cabinet from 182	
Transport of clean LEMs CEA->CERN	CEA	not defined	
Storage for 40 LEMs	ETHZ	b 185 space not defined	
optical table	ETHZ	in 185	
furniture (table, chairs,..)	ETHZ/CERN	available (3 tables, 3 storage shelves,4 chairs,..)	
cupboard rated for chemical storage	ETHZ/CERN	need to check	
basic tooling	ETHZ/LAPP/CEA	need to make a list	
soldering fume extractors	LAPP	2 mobile units being ordered	
soldering irons	ETHZ/LAPP	at least 2 available from 182	
tin, brazing acid,..	LAPP	availble at LAPP	
appropriate wire stripping tools + spares	ETHZ	to be oredered	

1st CRP - QA/QC

The CRP is its own detector. Needs to be extensively tested in b. 185 before packing and shipping to EHN1. **Test should foresee at least**

1. Alignement, survey.
2. Test of HV contacts + instrumentation.
3. Test of anode 3m strip response (electrical continuity, pulsing, noise,…)



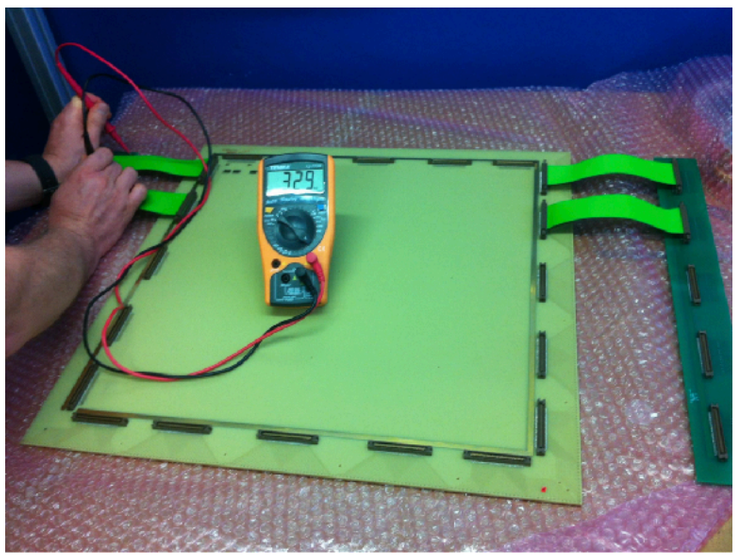
Setting up a first discussion on this end of August. Next slides first proposal

1st CRP - QA/QC

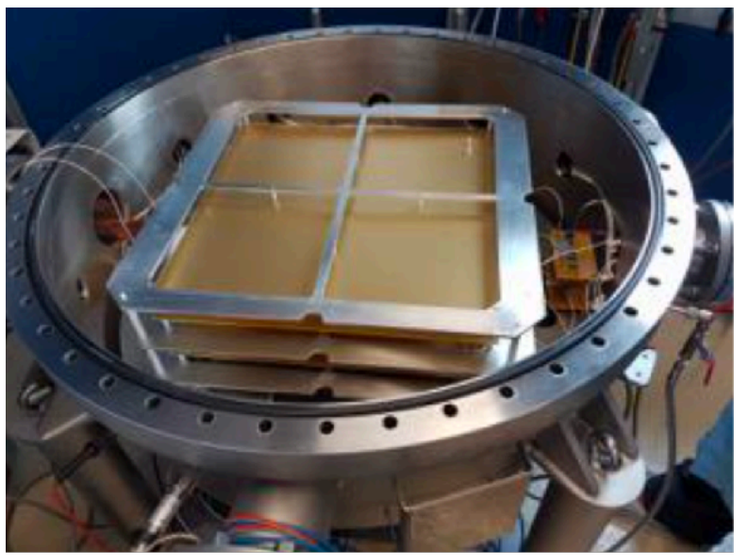
Before construction:

1. LEMs (QA/QC in Saclay + visual inspection in 185 after transport)
2. Anodes test of electrical continuity (soldering of connectors is checked optically by company but not electronically)
3. Mechanical frame: (INVAR+ G10) verification of planarity
4. Patch panel: test of contacts
5. GRID: test of HV contact up to 10 kV (air + GAr)

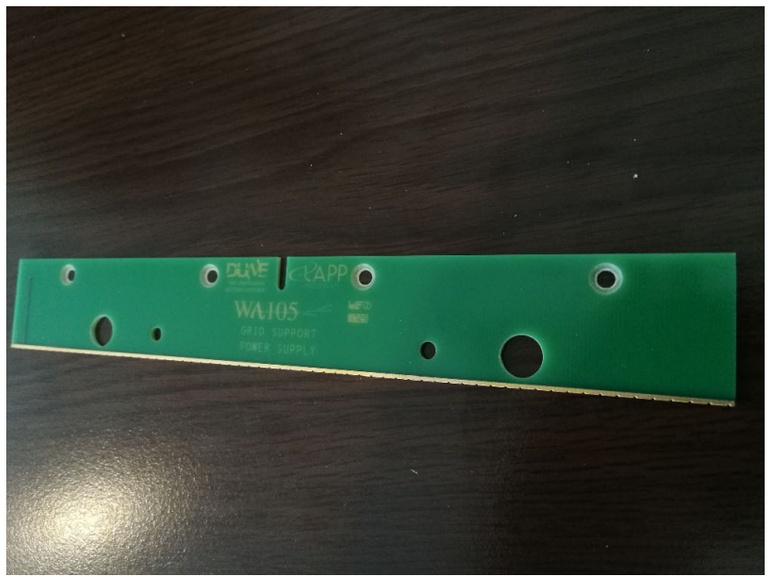
CEA: system for checking the electrical continuity of the anode tracks (~5-10 mins per anode)



CEA: LEM cleaning + testing



LAPP: PCB wire holder



1st CRP - QA/QC

Once CRP constructed in b. 185:

- Visual check of the grid wires
- measure sagging and alignement of the frame (with survey team)
- test of LEM HV connections Patch-panel->LEM :

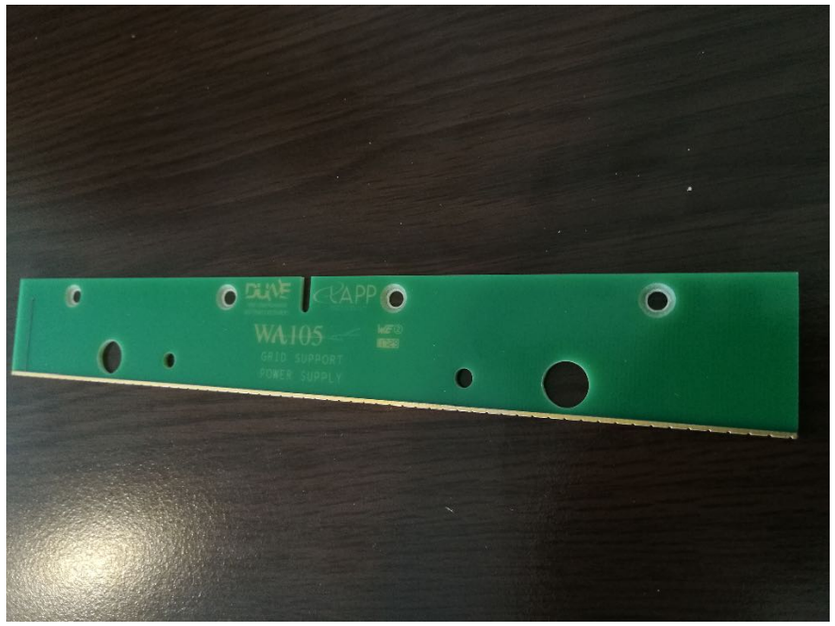
  -measure capacitance between LEM-up and LEM-down to make sure the contact is there (should measure around 8 nF + cable)

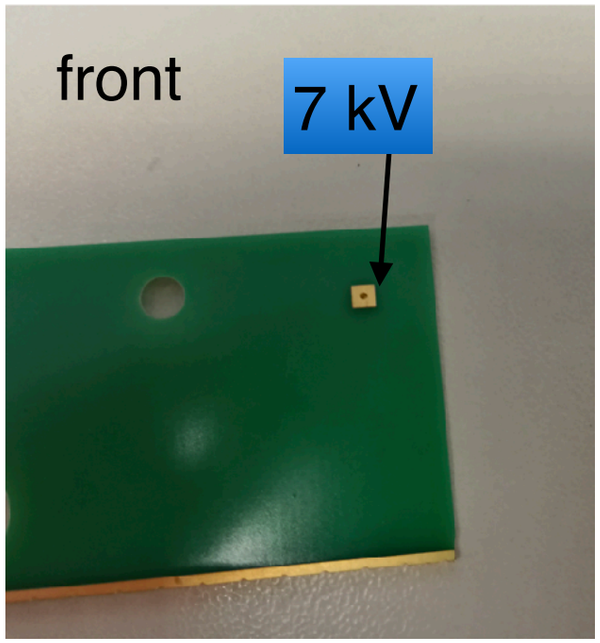
  -ramp up to a defined voltage and check leakage current

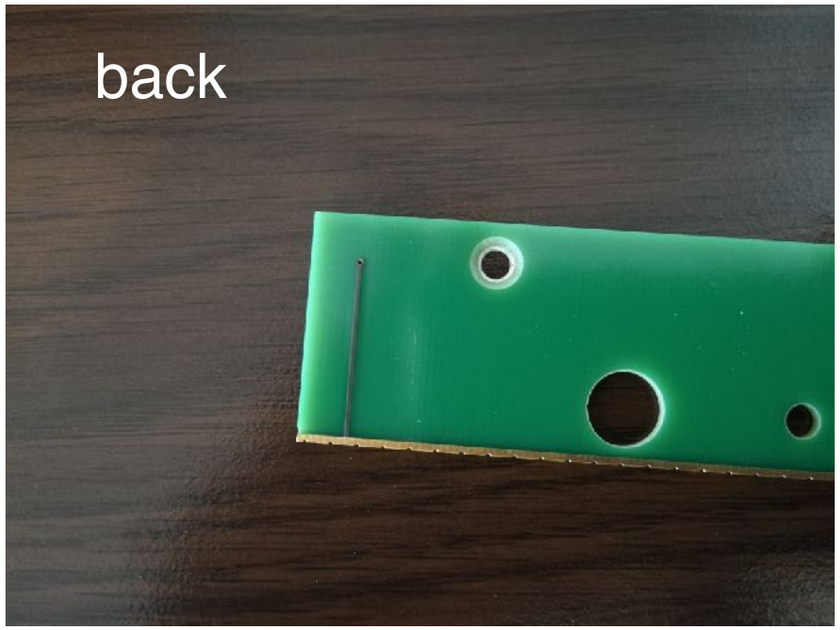
- test of GRID HV connection + leakage current.
- test 3m strip response (electrical continuity, noise,…) and pulsing system:
  - need pulsing system (multiplexer,..)
  - need charge readout test system (FE, LV, DAQ,…)
- test instrumentation (temperatures + level meters)

1st CRP - QA/QC

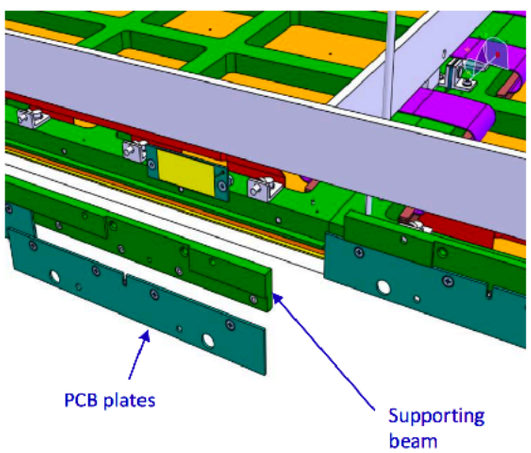
Received PCB wire holders (LAPP). Need to make a test in air+ Ar of the 7 kV HV contact. Waiting for cable + connectors (ordered).



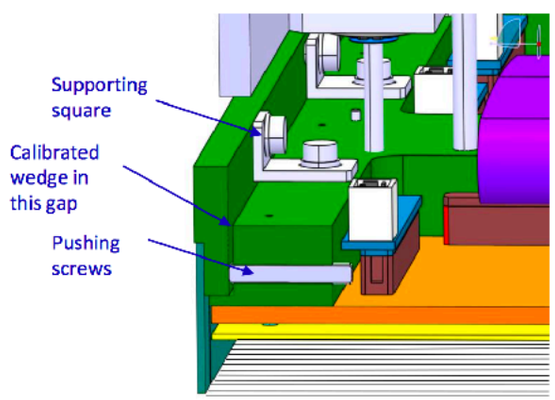


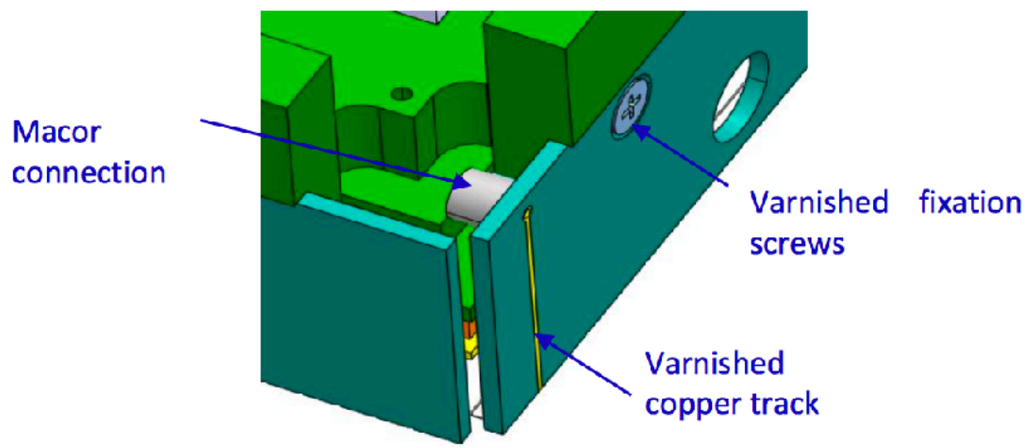


- Extraction grid's wires are soldered on supporting PCB plates, assembled on a supporting beam



- Grid tensionning is performed by tightening « pushing screws », adding a calibrated wedge, and locking the supporting square





DUNE collaboration meeting- integration talks

-Plenary status of protoDUNE-DP integration (Sebastien)

-DP: CRP construction in b. 185 (Benjamin A. , Nicolas G.)

-DP: Status of light readout system (inc. DAQ/calibration/electronics) (Clara C.)

-DP: Status of drift cage production and assembly (Jae)

-SP+DP: very high voltage system test and installation (Laura M.B, Sarah L)

-SP+DP: grounding and electronic distribution (Linda, Terri, Yann)

-DP: Status of charge readout DAQ (TBD)

-DP: status of slow control racks and PVSS (Yann)

-DP: status of beam design (Nikos)

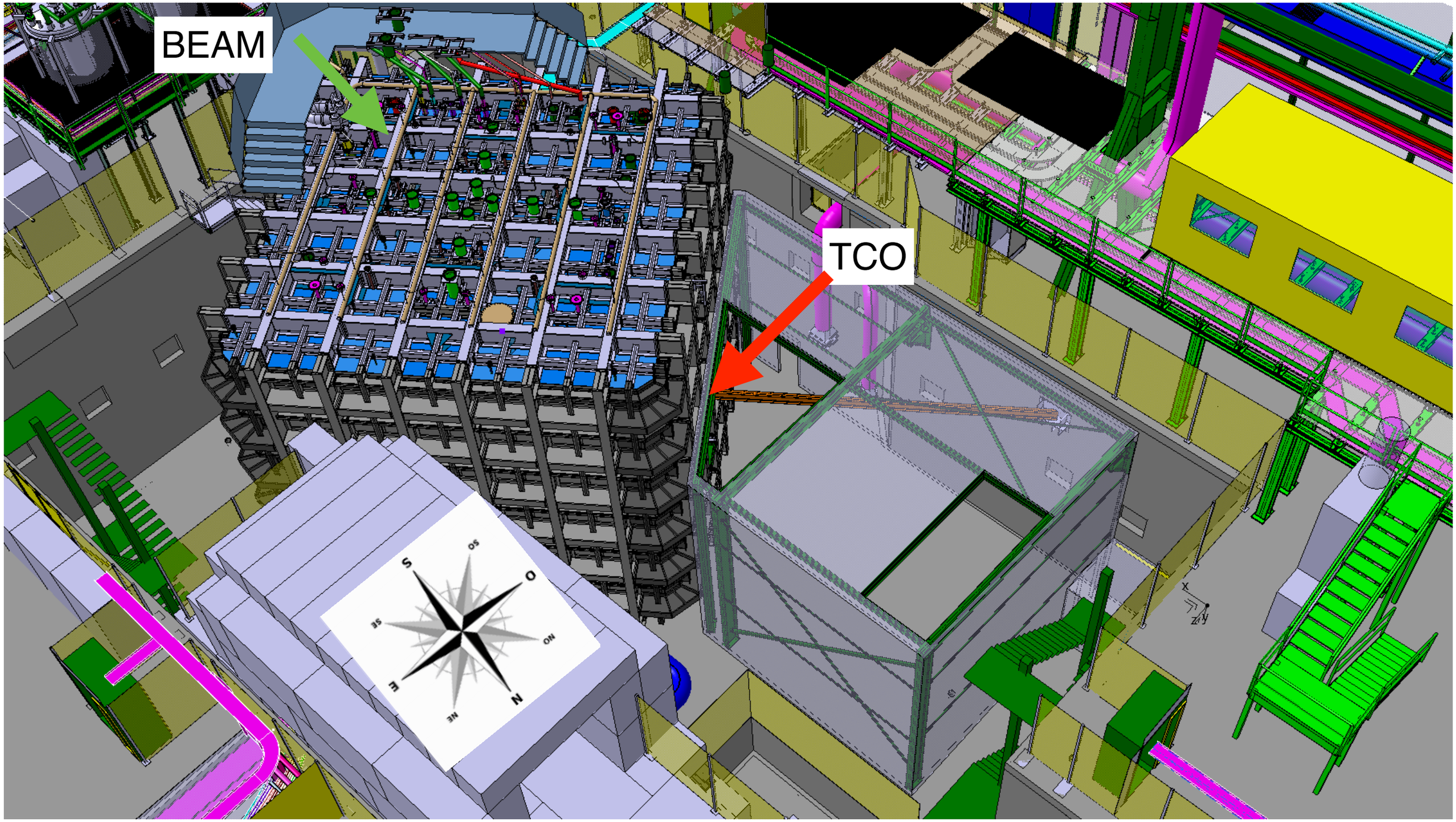
Next meeting

Next meeting August 25th, we foresee presentation on

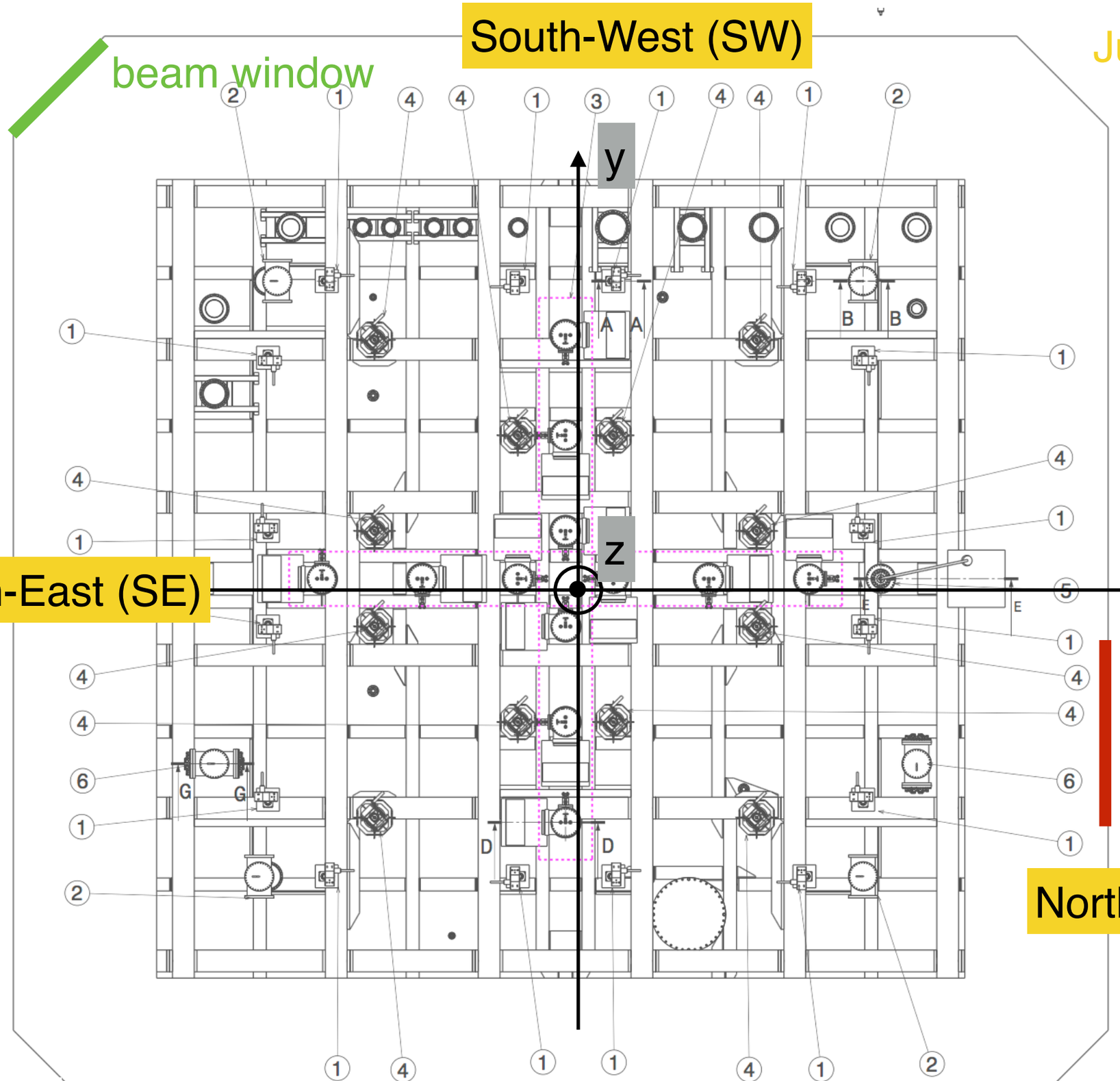
- CRP- instrumentation flange
- CRP- electrical components and QA/QC plan
- CRP- status of mechanical components
- Status of LEMs
- Status of SGFTs
- document with load calculations for HSE
- Purity monitors
- Cameras update

EXTRA SLIDES

3D EHN1

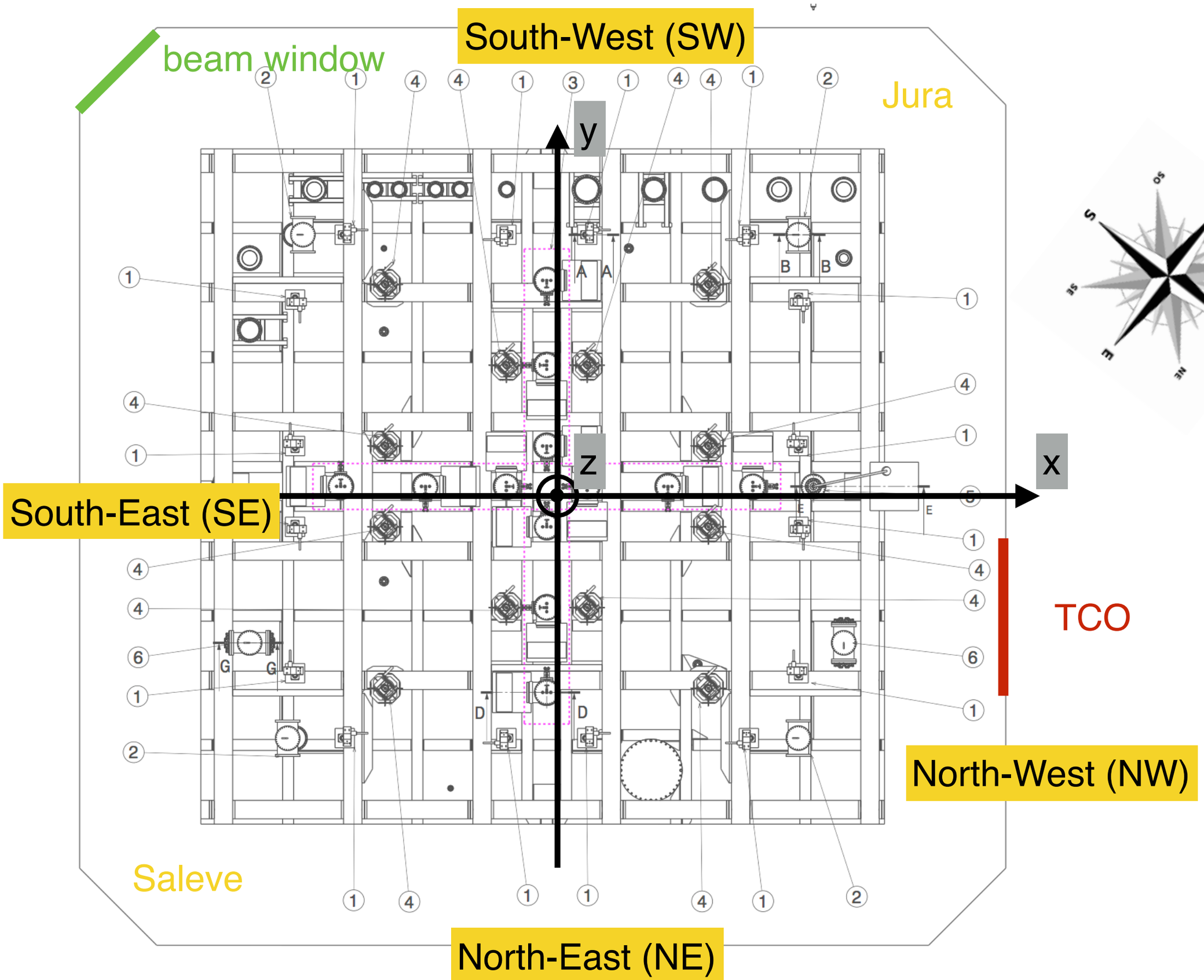


coordinate system

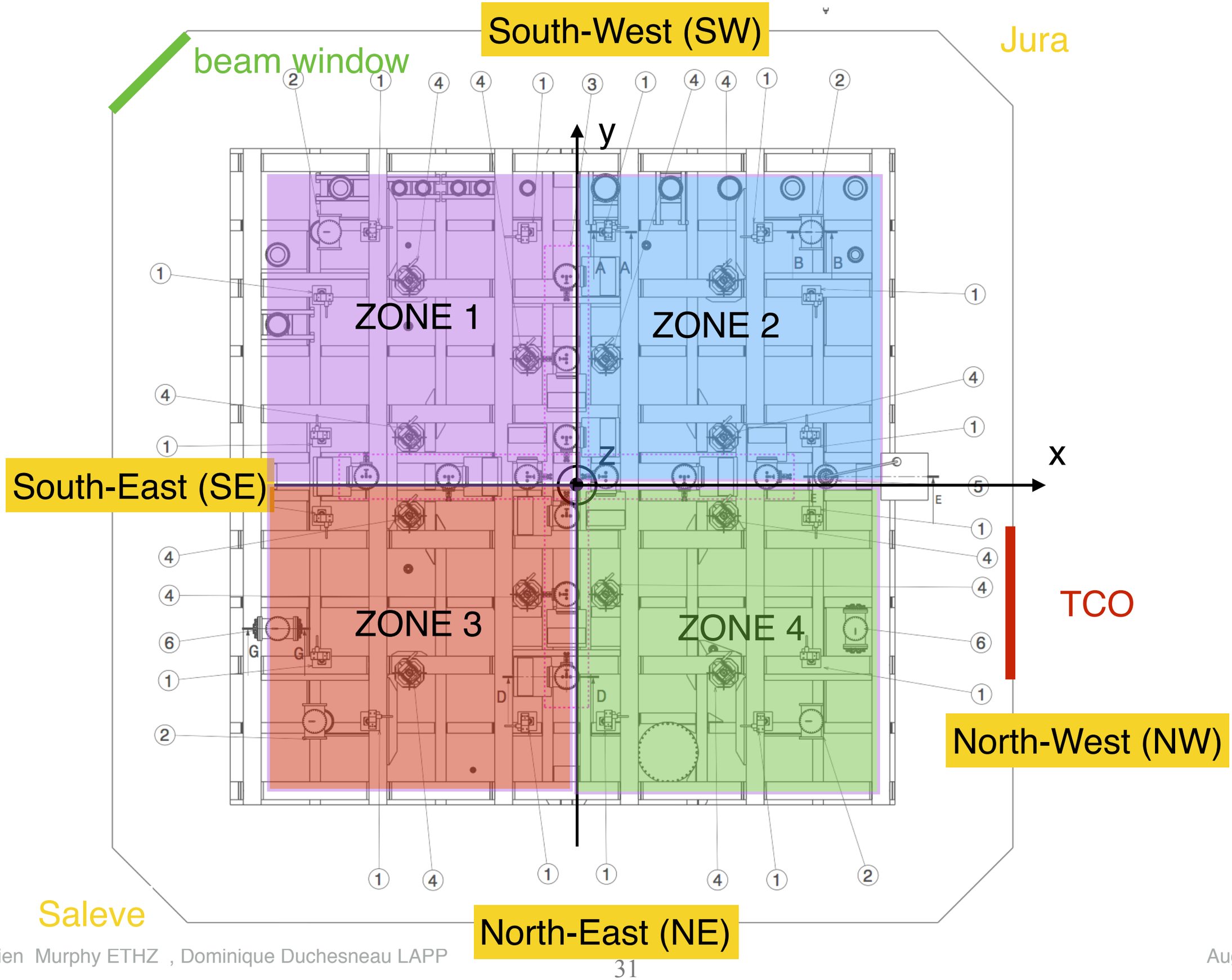


proposal of coordinate system for integration/installation purposes.

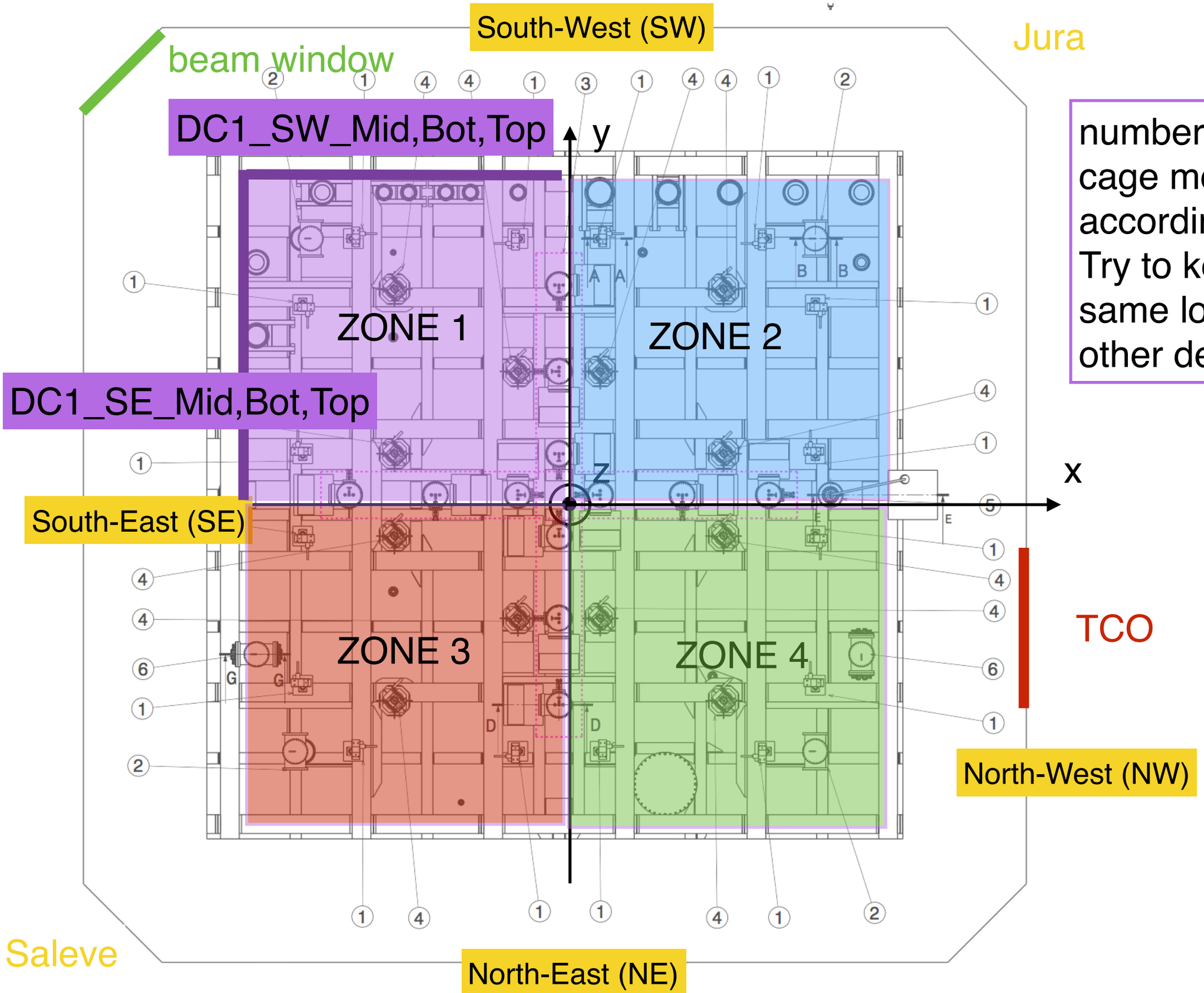
coordinate system



Nomenclature

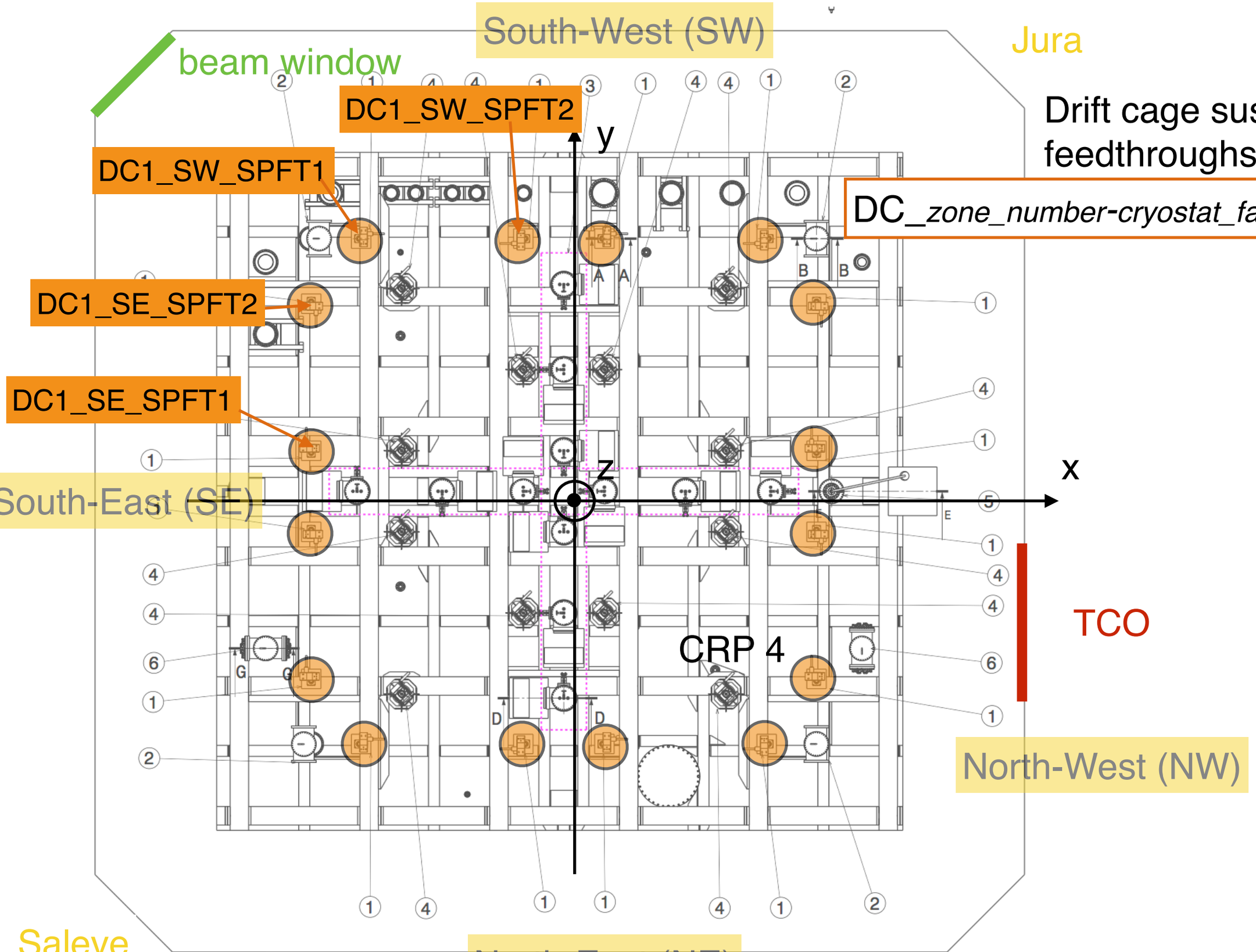


Nomenclature- example Drift cage modules



numbering of drift cage modules accordingly.
Try to keep to the same logic for all other detector parts

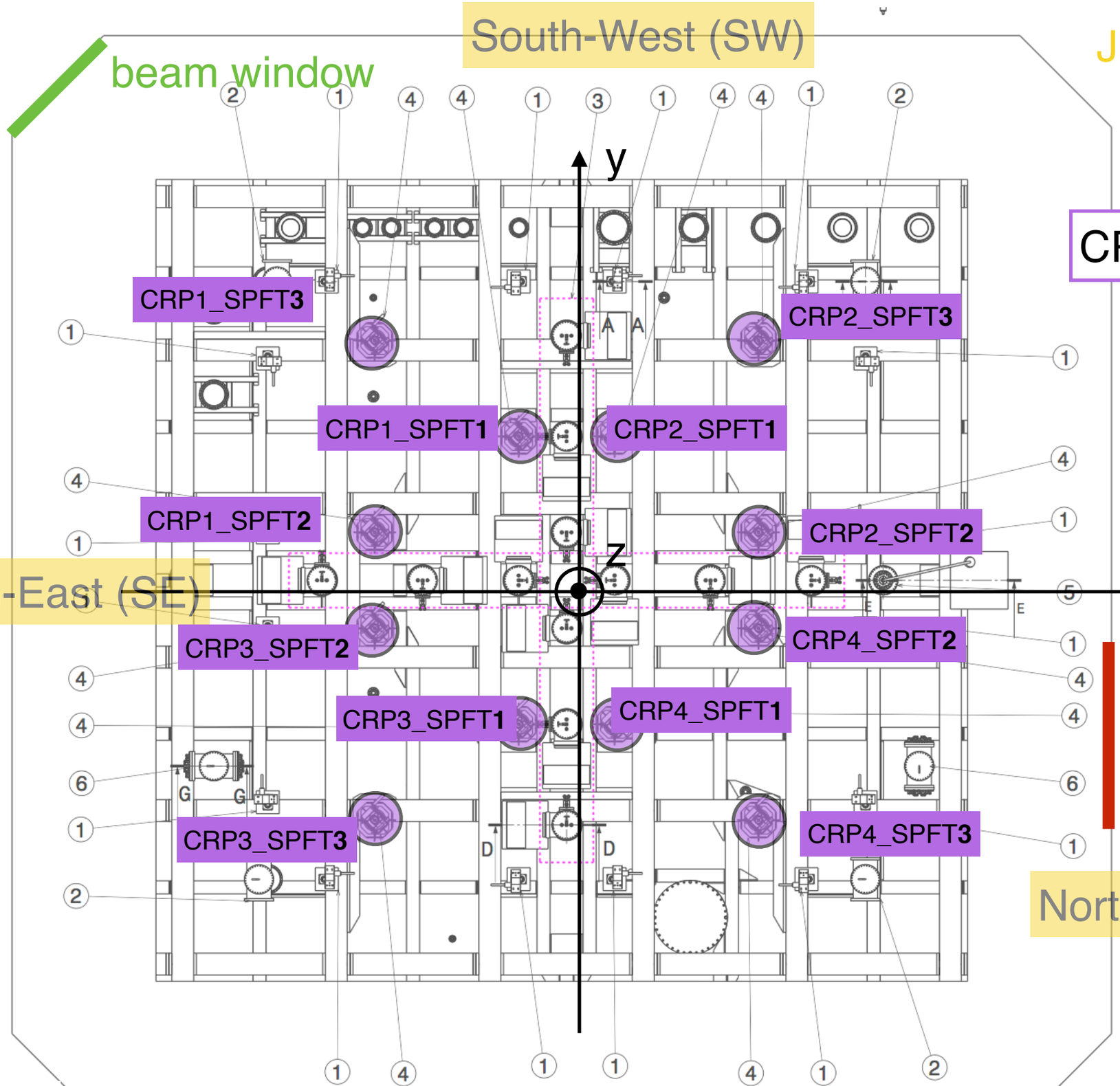
Feedthrough naming



Drift cage suspension feedthroughs

DC_*zone_number*-*cryostat_face*_*SPFTx*

Feedthrough naming



CRP suspension feedthroughs

CRP_*zone_number*-*SPFTx*

SPFT 1 always to lowest x (center) and SPFT 3 always the outermost

Feedthrough naming

South-West (SW)

beam window

Jura

SGFT

SGFT_zone1_zone2_A,B,C

A,B,C from the center

South-East (SE)

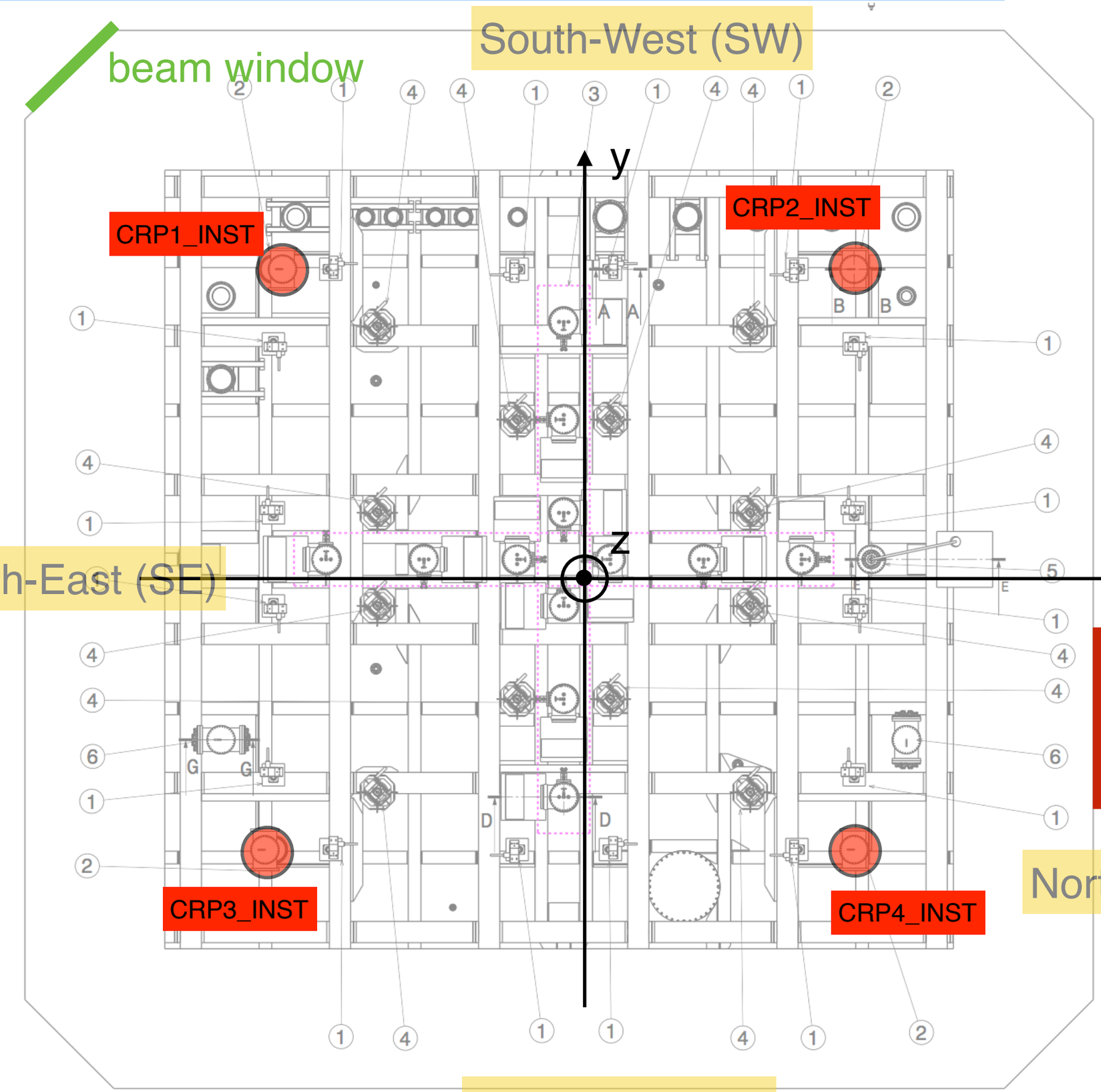
TCO

North-West (NW)

Saleve

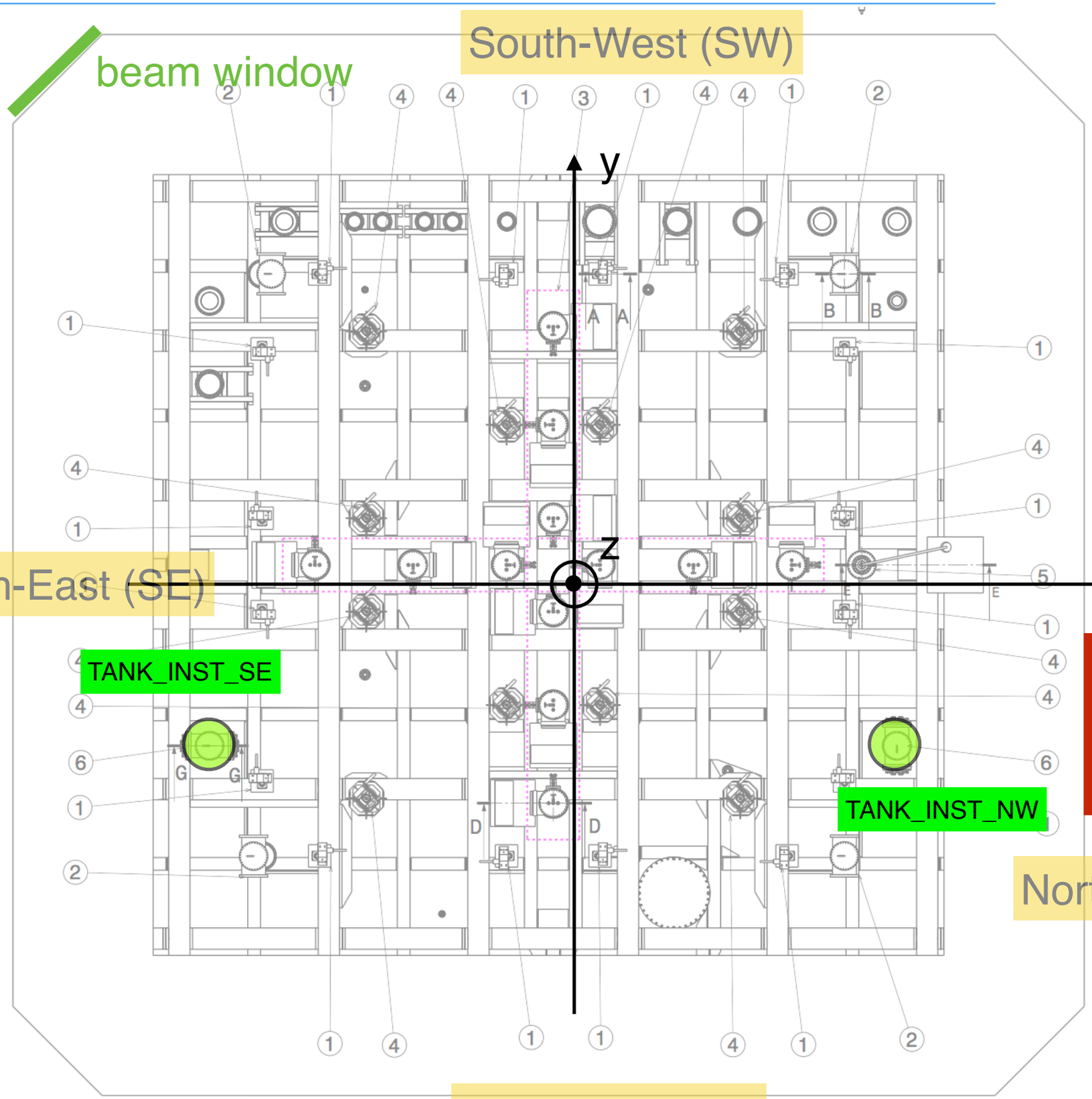
North-East (NE)

Feedthrough naming



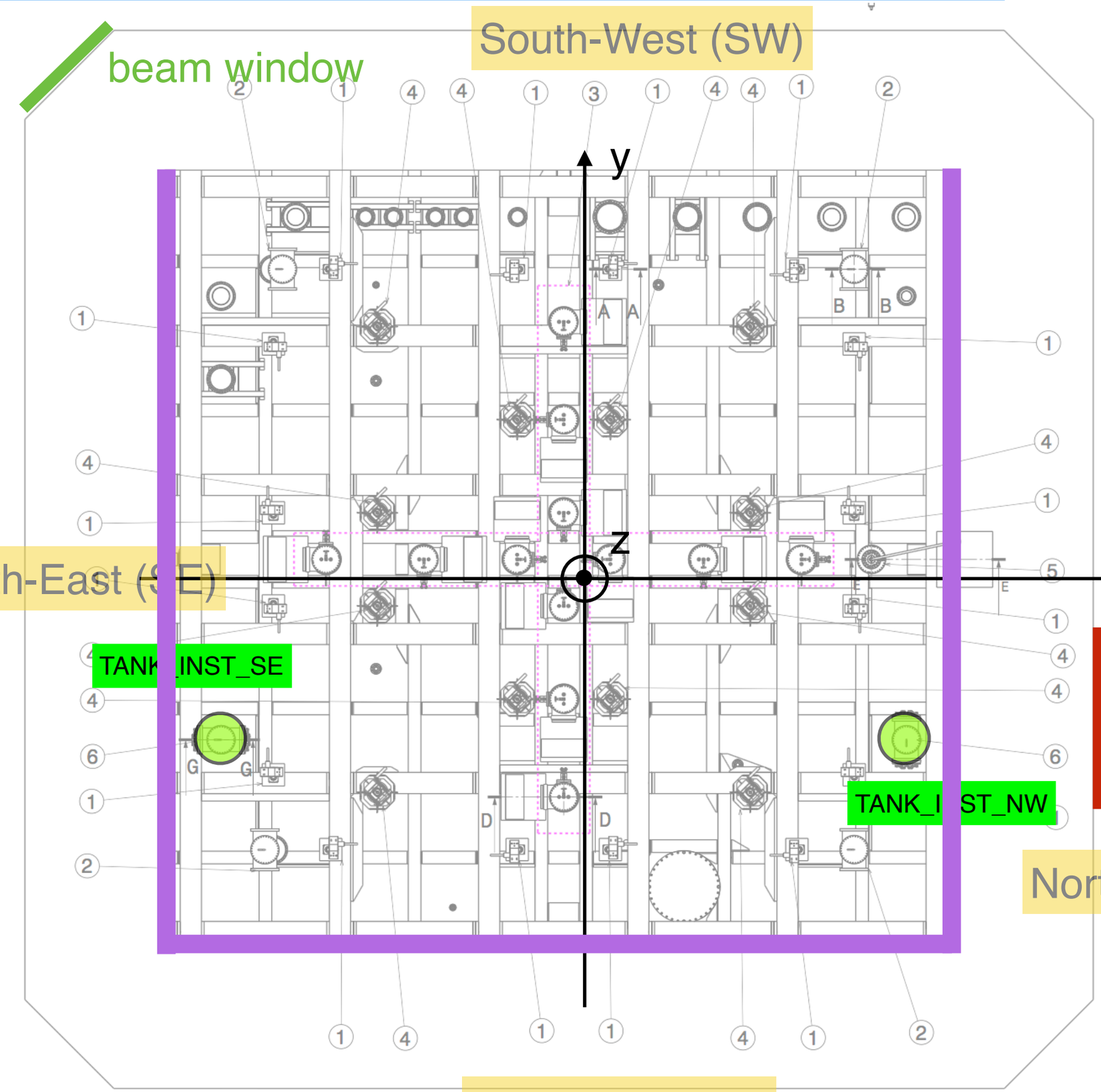
CRP_*zone_number*_INST

Feedthrough naming



TANK_INST_*SE,NW*

Feedthrough naming



TANK_INST_*SE,NW*