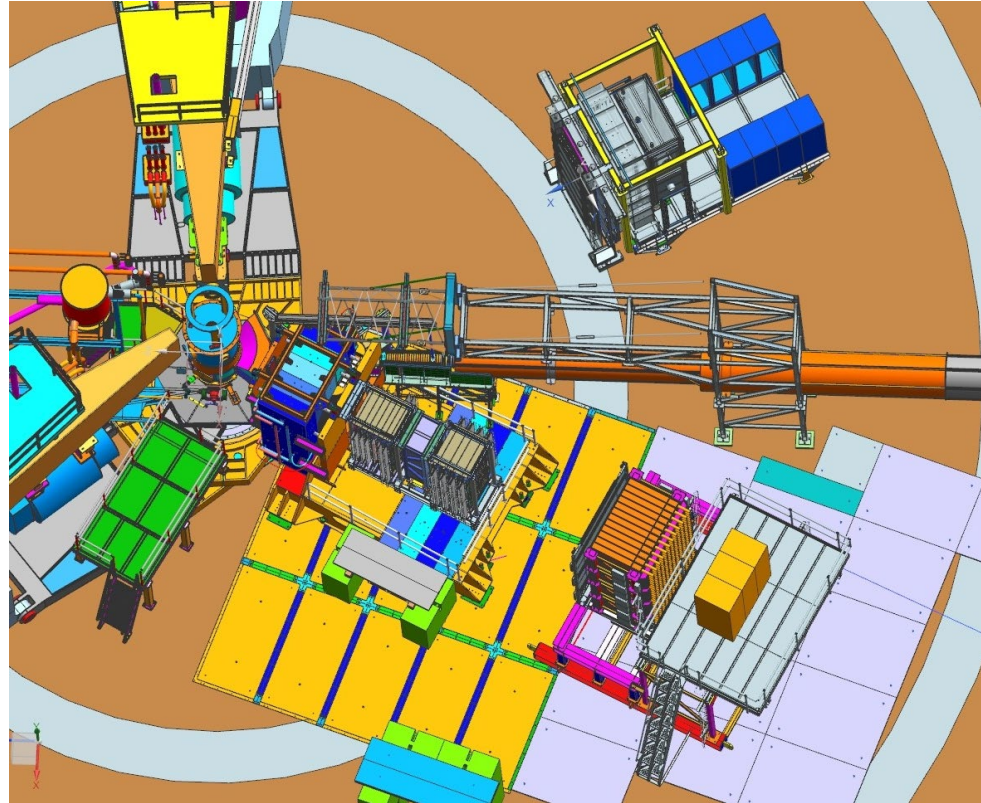


# Hall A E12-07-109 Experiment Readiness Review

## GEP Design Report (charge 1,4)

- modifications to beamline
- SBS
- detectors



Robin Wines

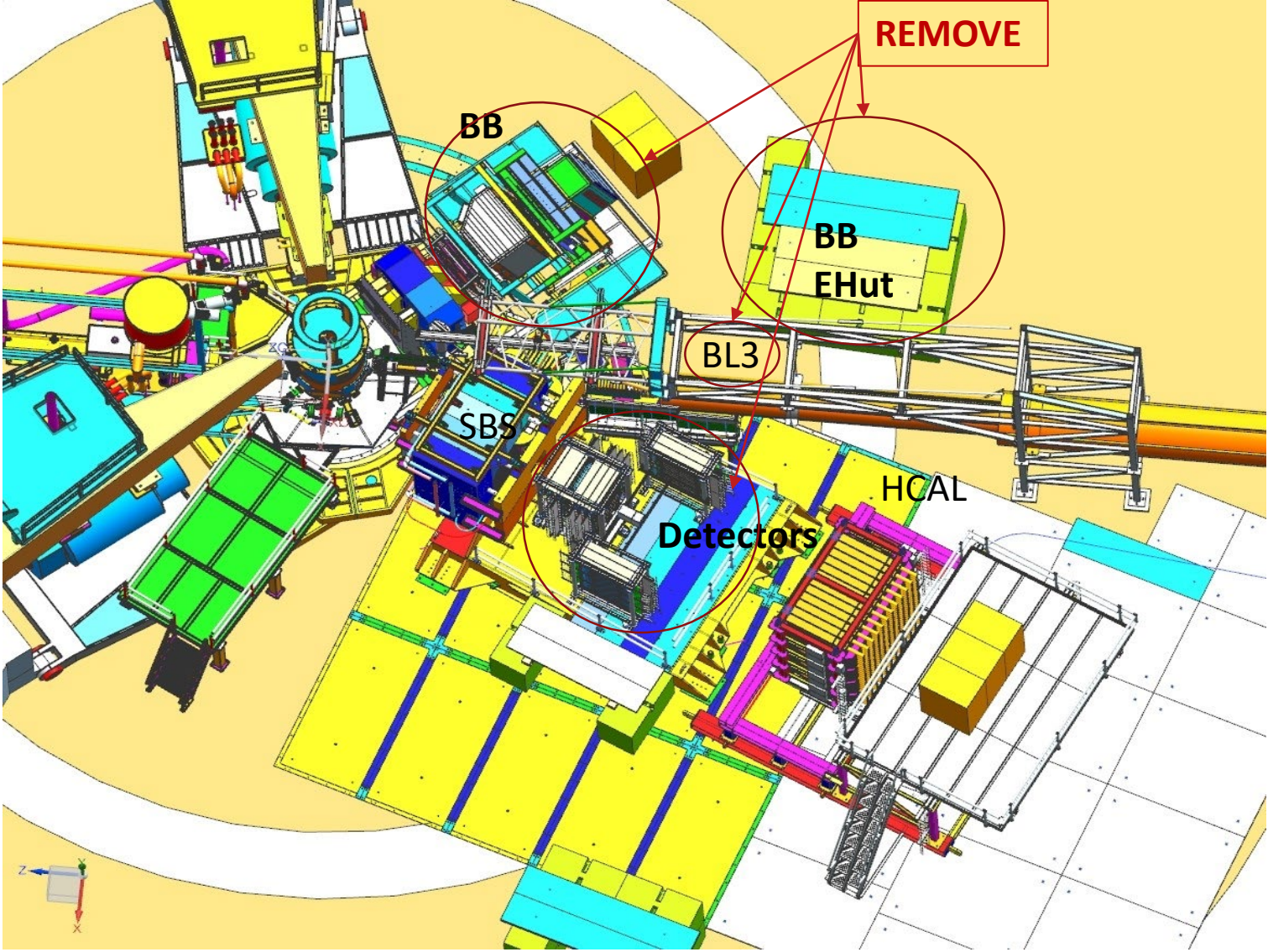
# GEP Kinematics

Name	Energy	Program	ECAL	ECAL	SBS	SBS	HCAL	HCAL	P_nucleon	P_elect.	PAC days	Time, days	SBS current	J_in/J_out
		Q2, GeV2	angle	dist., m	angle	dist., m	angle	distance	GeV/c	GeV/c	at full Lum.	calendar	% 2100 amp	
GEP-0	6.40	GEP Comm.	29.8	9.5	25.7	1.60	25.7	10	3.86	3.36	0	2	100%	
GEP-1	6.40	GEP 5.5	29.8	9.5	25.7	1.60	25.7	10	3.86	3.36	2	4	100%	0.79/0.87
GEP-2	8.50	GEP 7.8	27.5	6.5	22.1	1.60	22.1	10	5.15	4.20	11	22	100%	0.76/0.82
GEP-3	10.60	GEP 11.7	30.0	4.5	16.9	1.60	16.9	10	7.26	4.22	32	62	100%	0.56/0.58

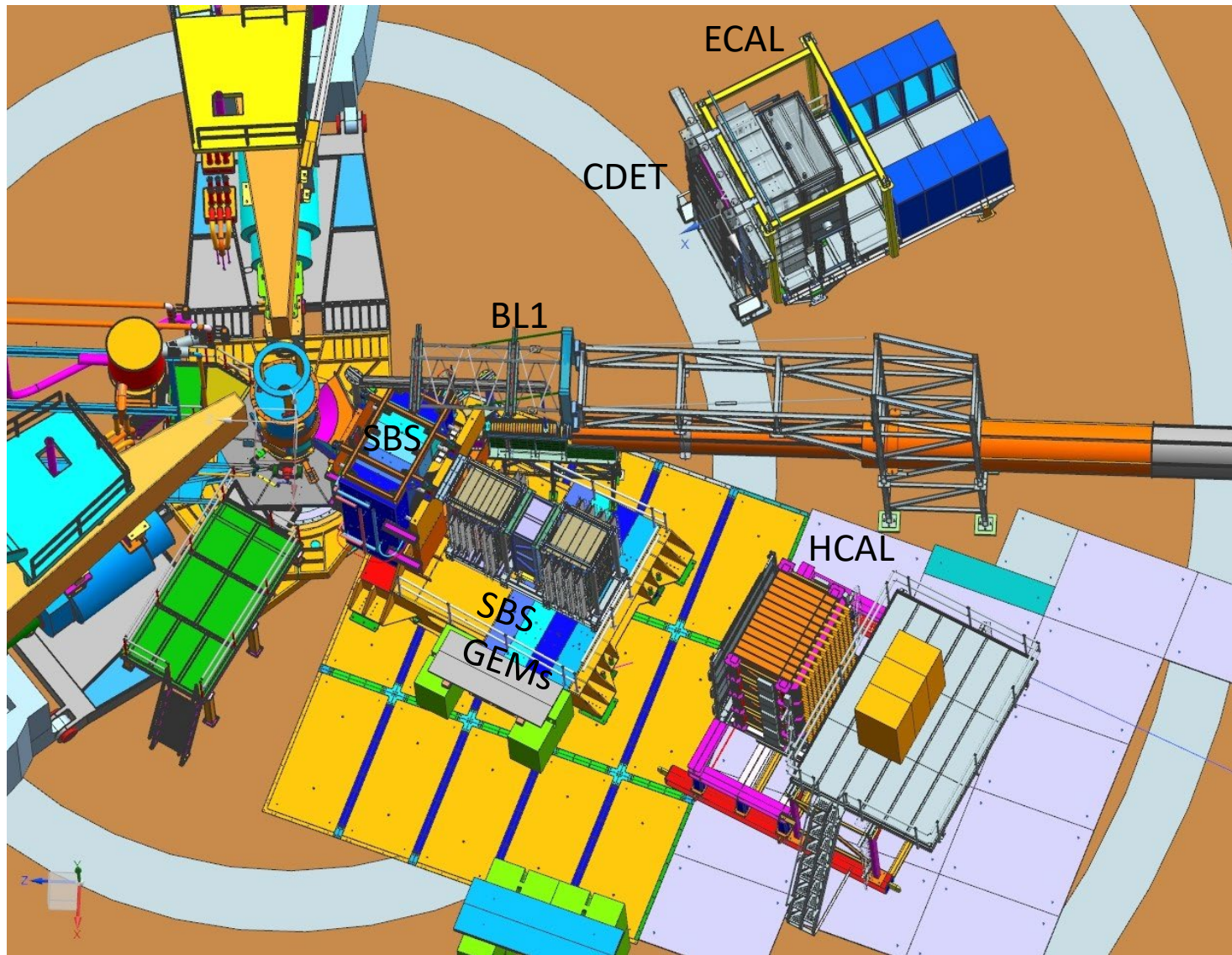
GEP requires

- SBS magnet with pole shims and coils configured for full current
- SBS field clamps
- Beamline 1 with corrector magnets braced
- SBS GEM detectors
- ECAL
- CDET
- HCAL
- Lead shielding
- Gate valve and differential pumping window
- Target scattering chamber with snout

# GEn-RP Experiment prior to GEp









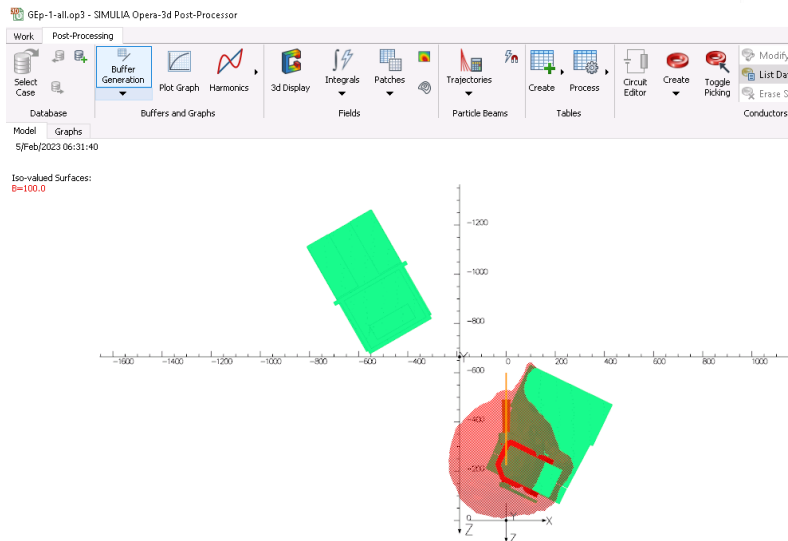
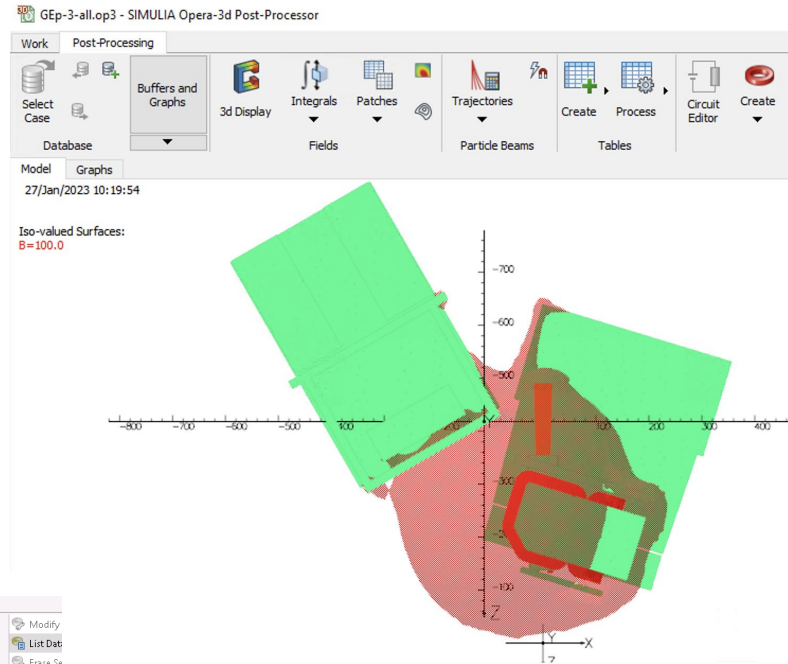
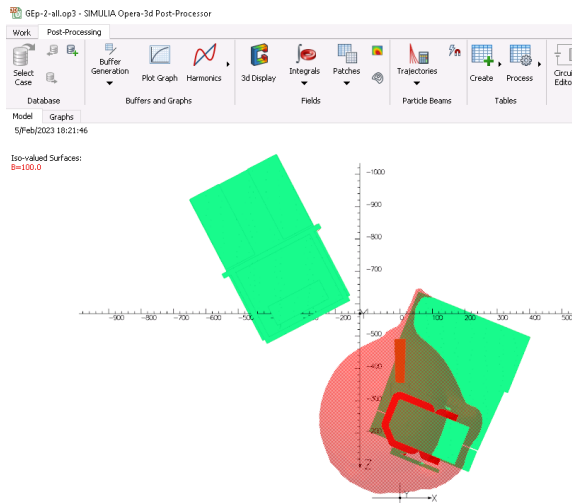
# SBS Magnet, Pole Shims and Field Clamps



- Existing SBS magnet will be needed with all coils powered and pole shims inserted.
- Pole shims exist.
- Connections for coils exist.
- Field clamps exist.
- Field and force studies have been completed.



# GEp field maps including ECAL, beamline and correctors

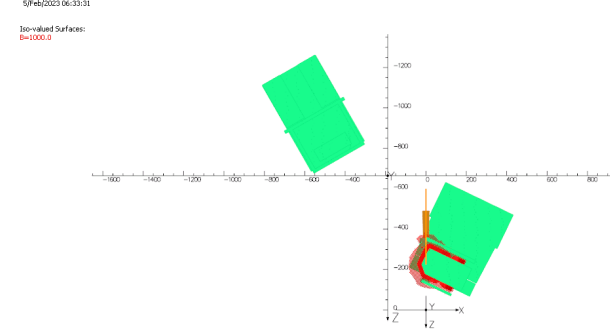
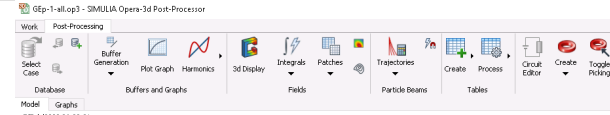
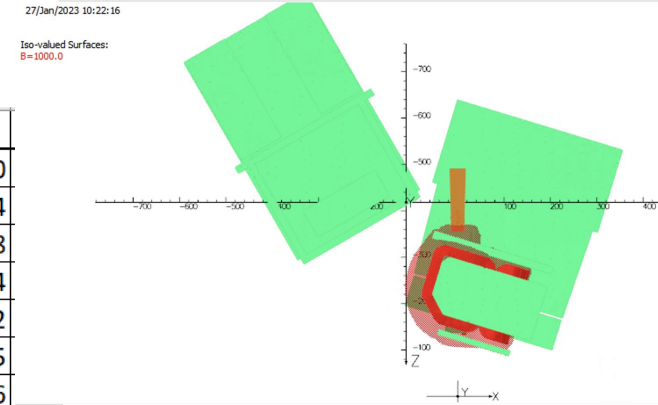
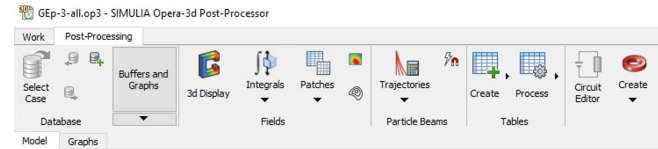


100 Gauss  
regions for  
Gep 1, 2 and 3.

# GEP field maps

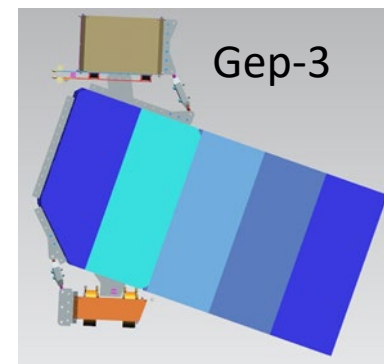
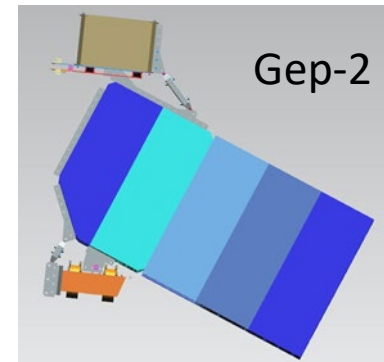
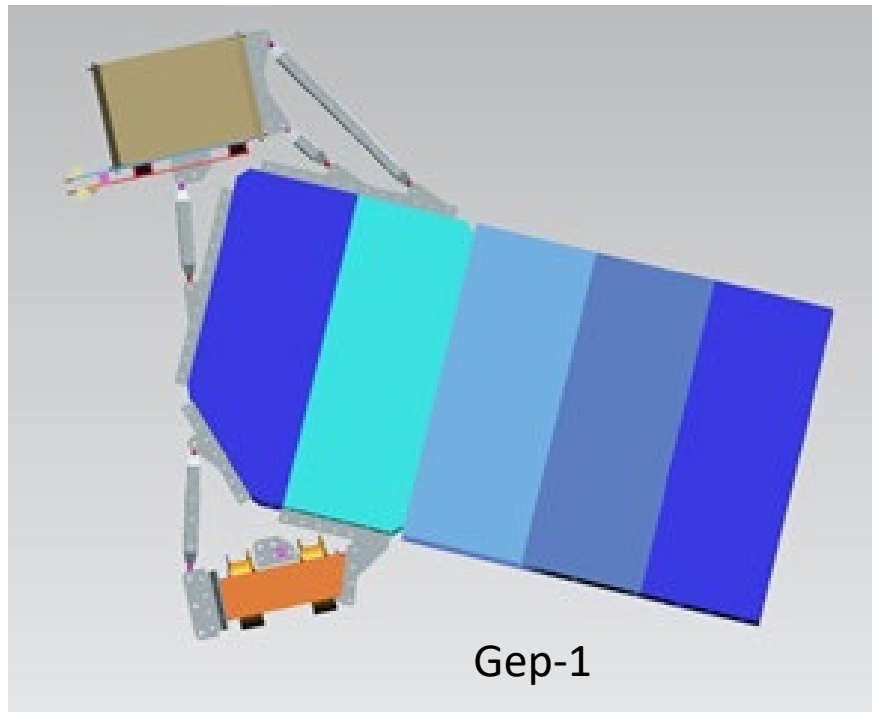
- SBS magnet at 2100 A, all coils energized used for determining corrector, beamline and detector bracing.

	Force(lbf)	Gep-1 @ 25.7deg	Gep-2 @ 22.1 deg	Gep-3 @ 16.9 deg	
BL-A	x		-309	-265	110
	y		-132	-132	-154
	z		22	44	-88
US Corrector	x		1940	1477	1654
	y		66	-110	22
	z		-1962	-2205	-3065
DS Corrector	x		992	353	706
	y		-88	-22	44
	z		5160	6527	8004
BL-C	x		22	0	0
	y		0	-22	-22
	z		44	66	66
ECAL	x		22	0	44
	y		-66	0	0
	z		44	0	44



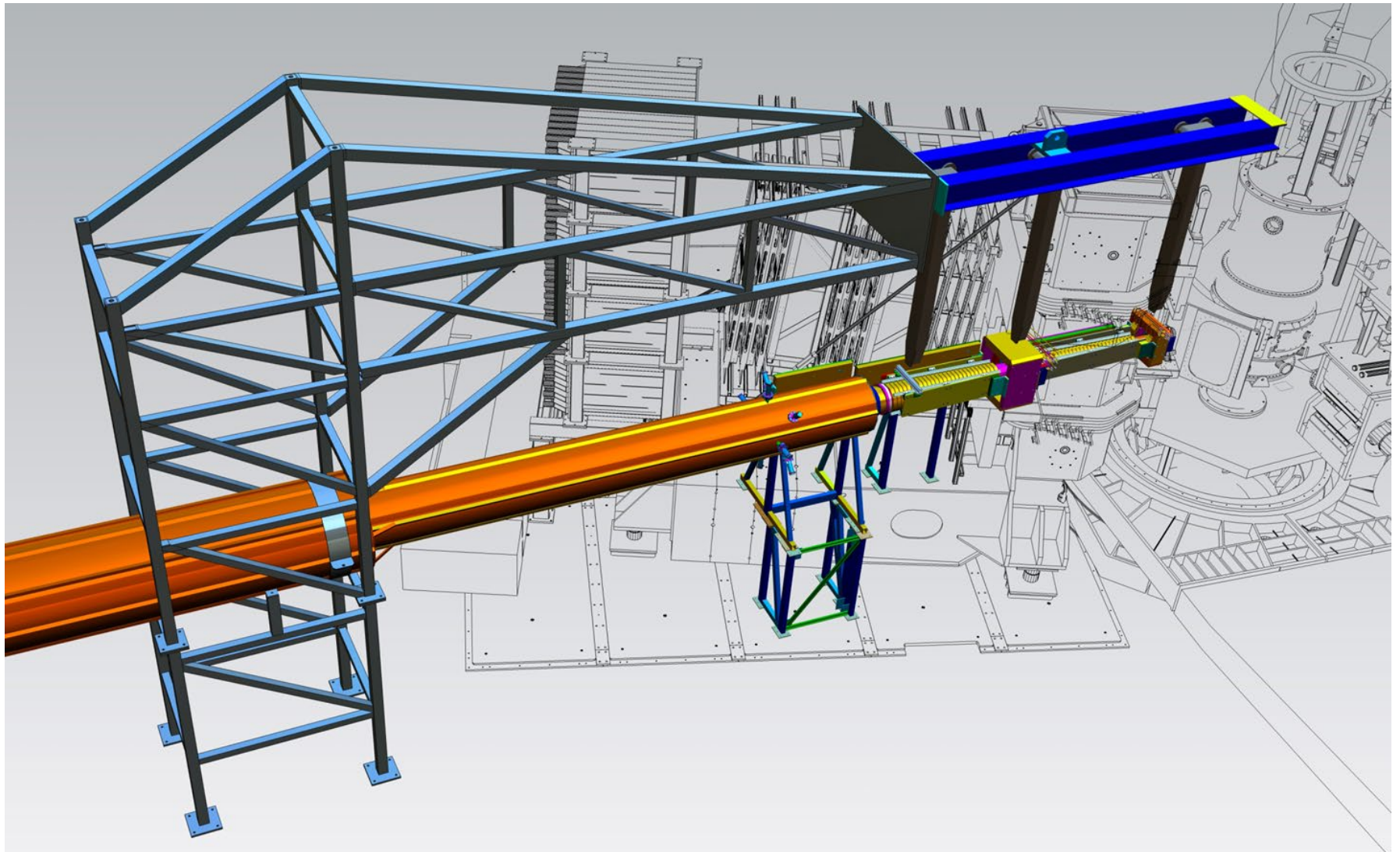
# Correctors

- Existing correctors to be used with existing Beamline-1(BL1) configuration
- Corrector braces have been designed and analyzed. Previously fabricated braces to be used with additional bracing plates to be fabricated.

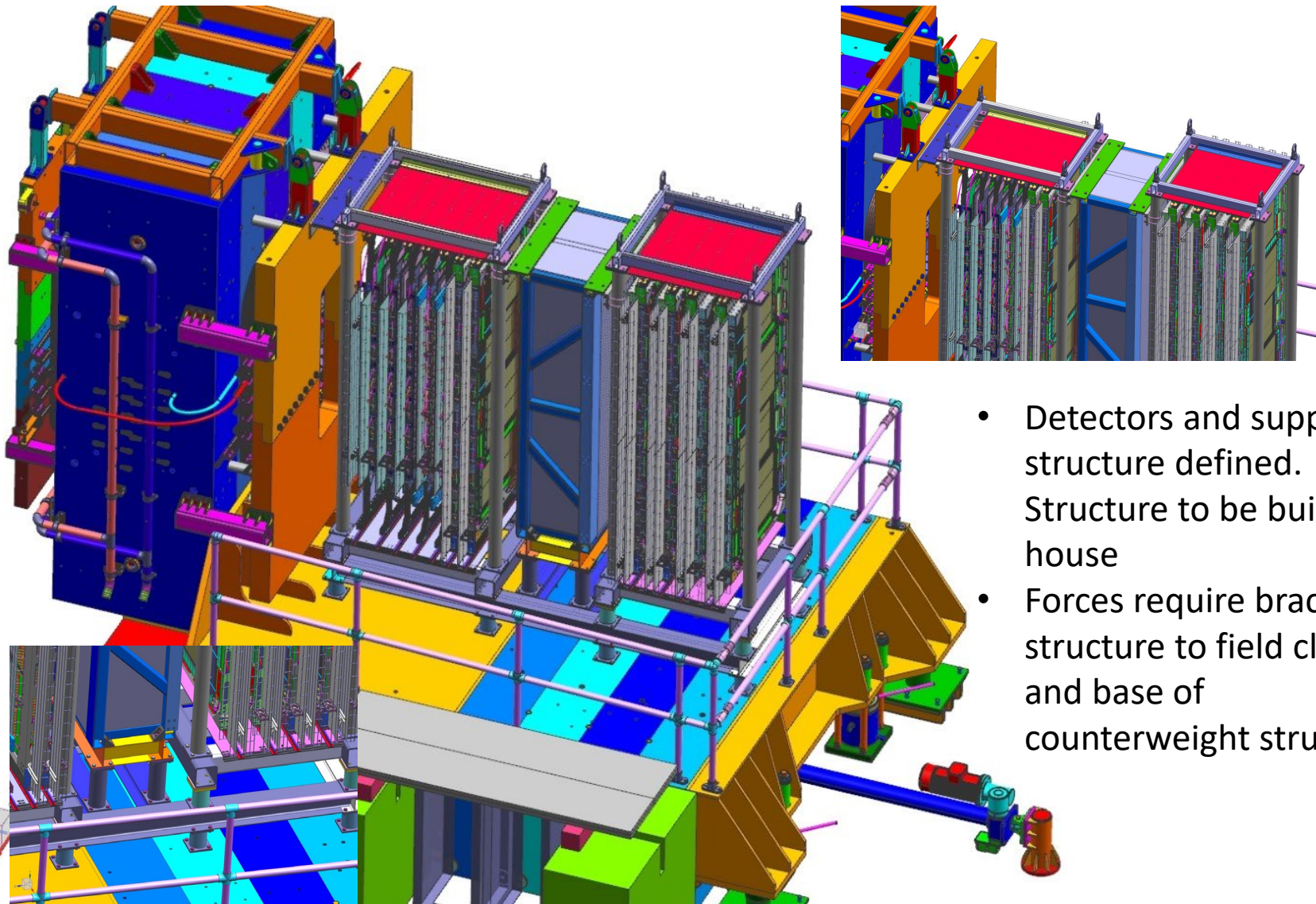




# Beamline BL1 Configuration



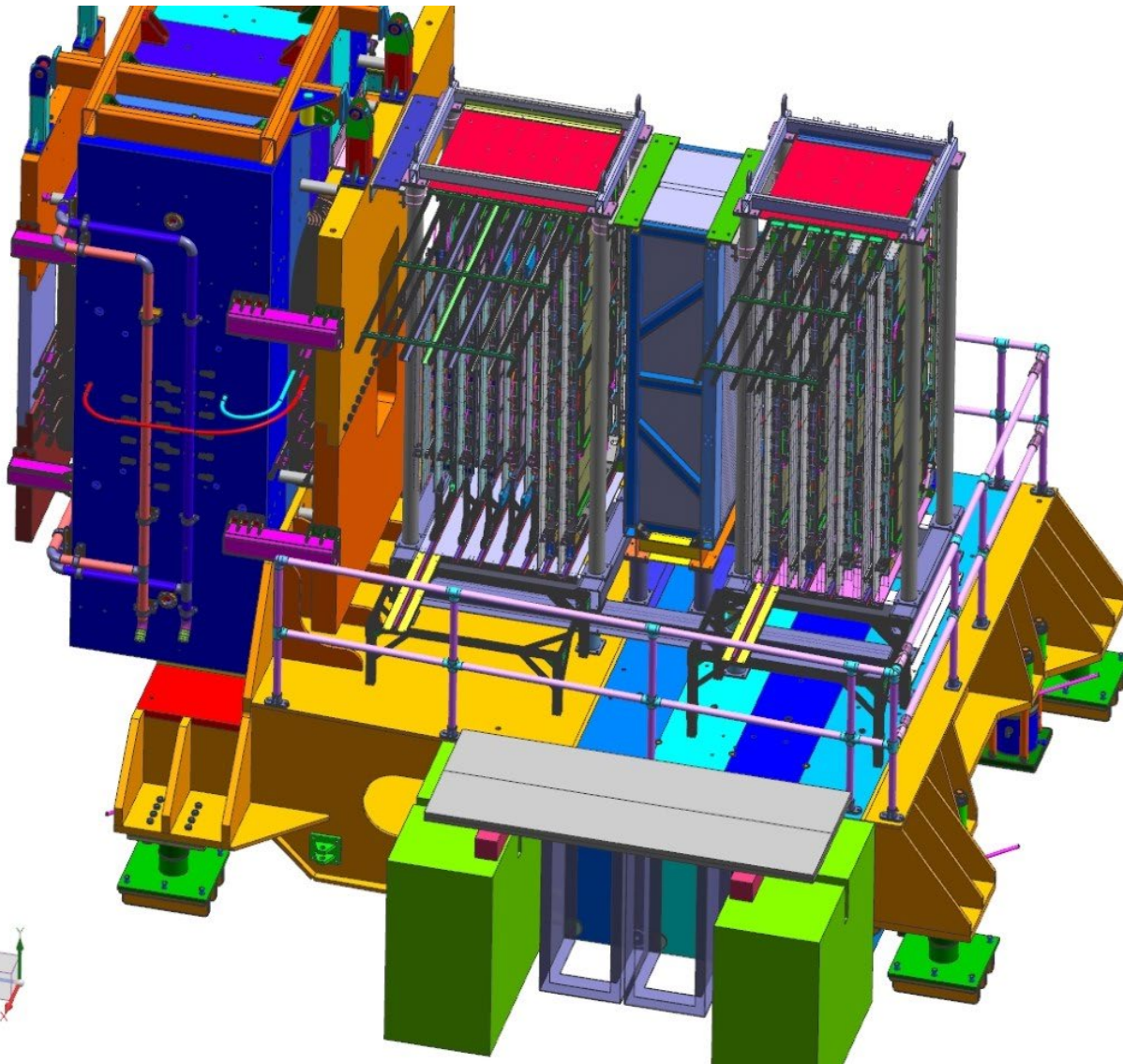
# SBS Detector/GEMs



- Detectors and support structure defined. Structure to be built in-house
- Forces require bracing of structure to field clamp and base of counterweight structure.



# SBS Detector Access

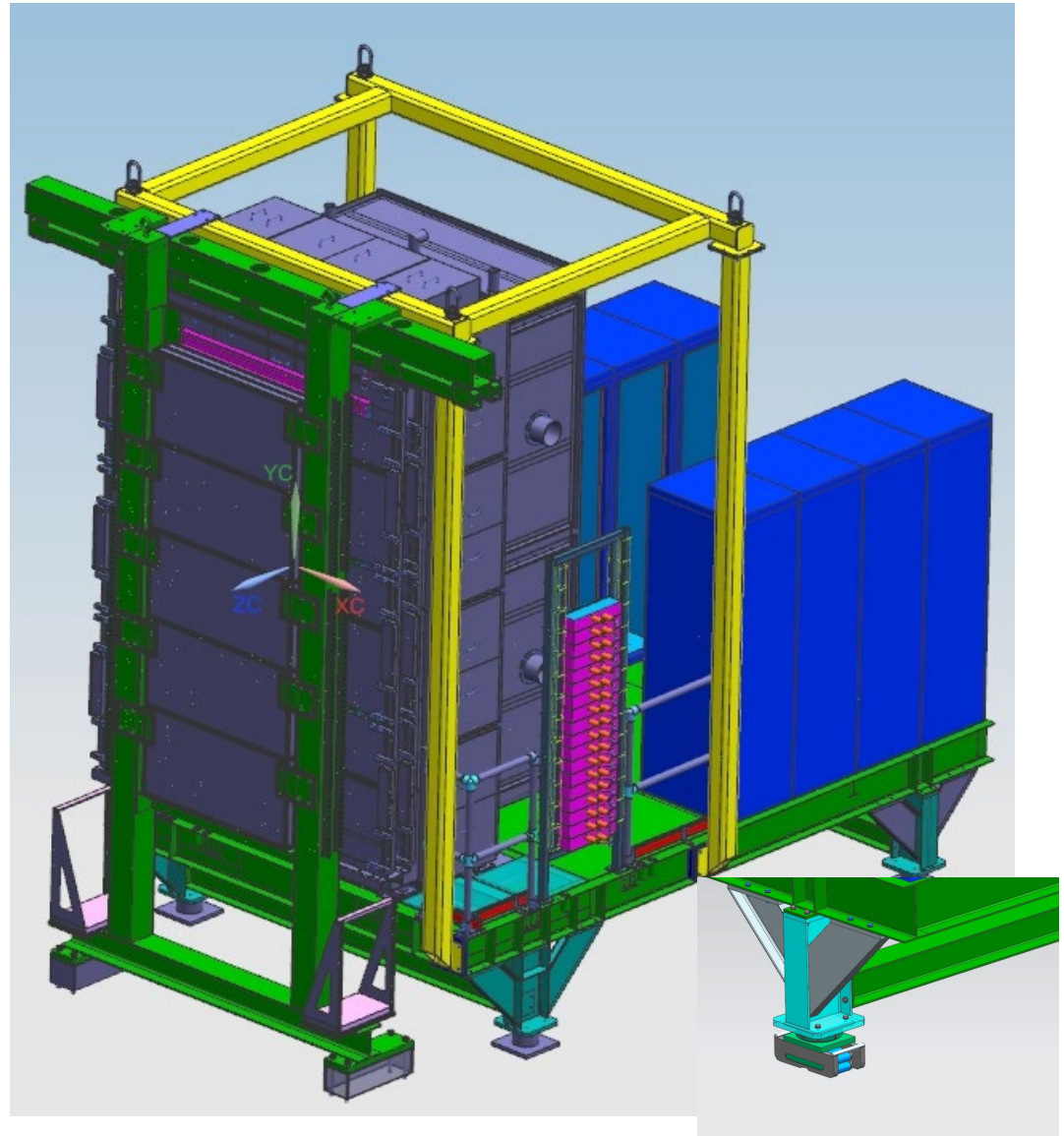


- Detectors to be pre-assembled in support frame and installed as assembly
- Maintenance platforms to be used for counterweight base height maintenance.
- Maintenance at higher reach will require access from manlift or removal to Hall floor.



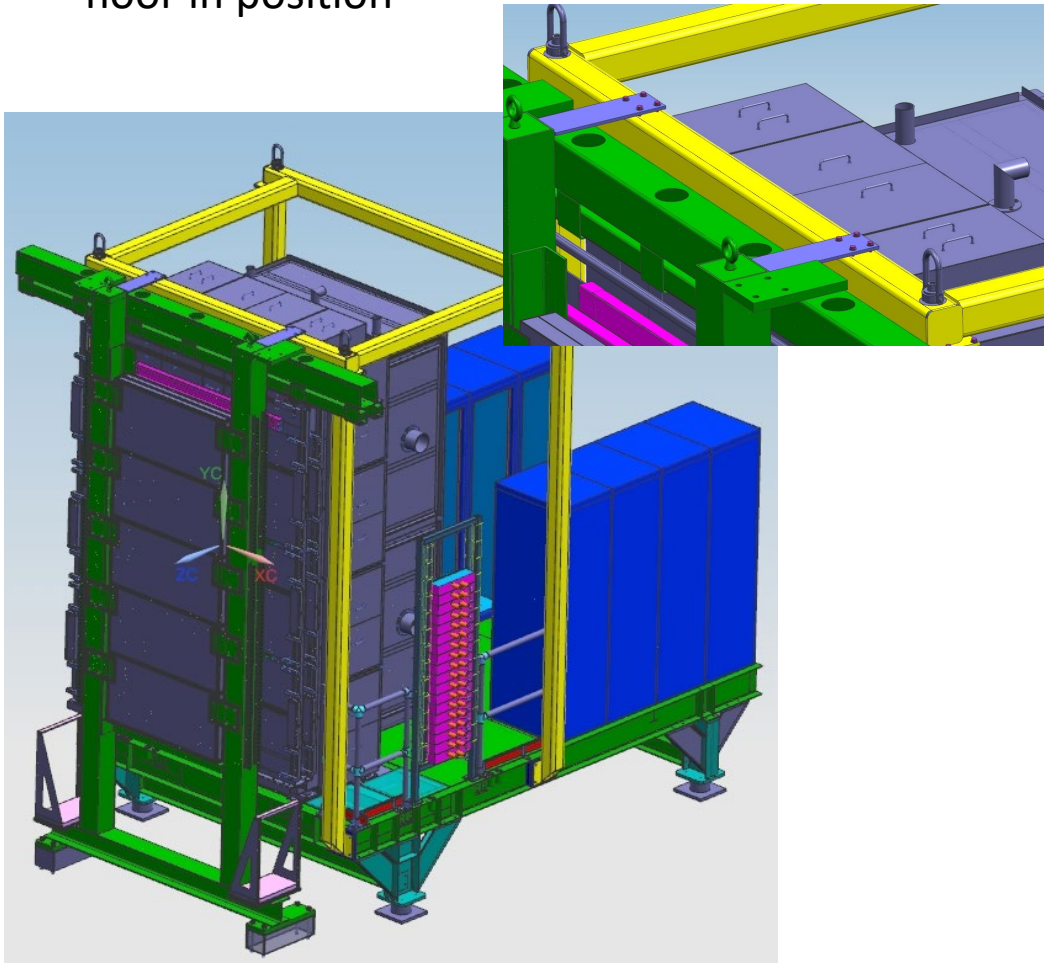
# ECAL

- Assembled Weight=31600 lbs
- ECAL to be assembled in Hall.
- Modules to be inserted with temporary hoisting mechanism attached to (yellow) frame. Personnel access from manlift and ladder
- ECAL is rotated into position on Hilman poly rollers
- In position the Hilman rollers are elevated from floor and replaced by support feet.
- Base and support legs are existing
- Frame in-house fabrication

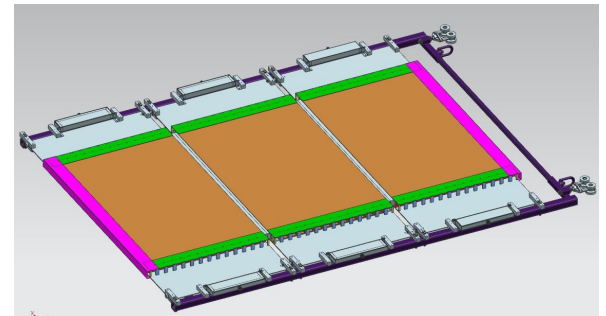


# CDET

- Assembled Weight = 7900 lbs
- CDET braced to ECAL frame and floor in position



- In assemble and during motion of ECAL frame has temporary bracing to stand alone
- CDET frame and supports exist. Stand alone bracing to be built in-house
- CDET panels are assembled horizontally and inserted vertically onto frame rails with stops for maintaining position.



# HCAL

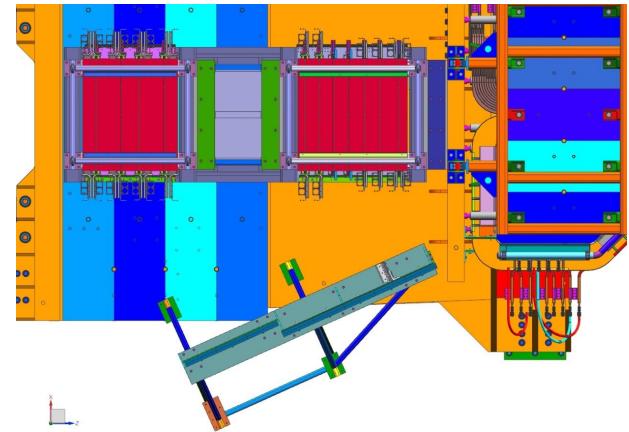
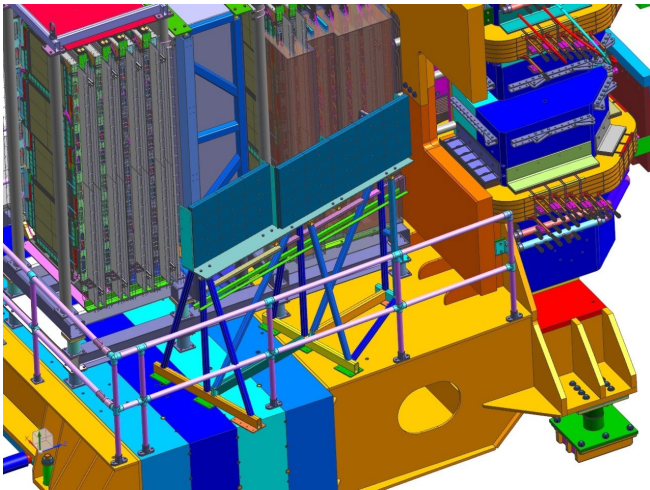
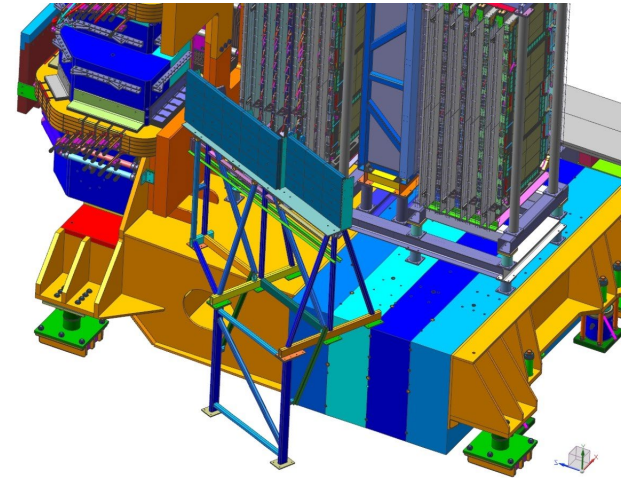


Existing HCAL to continue use in Hall for GEp

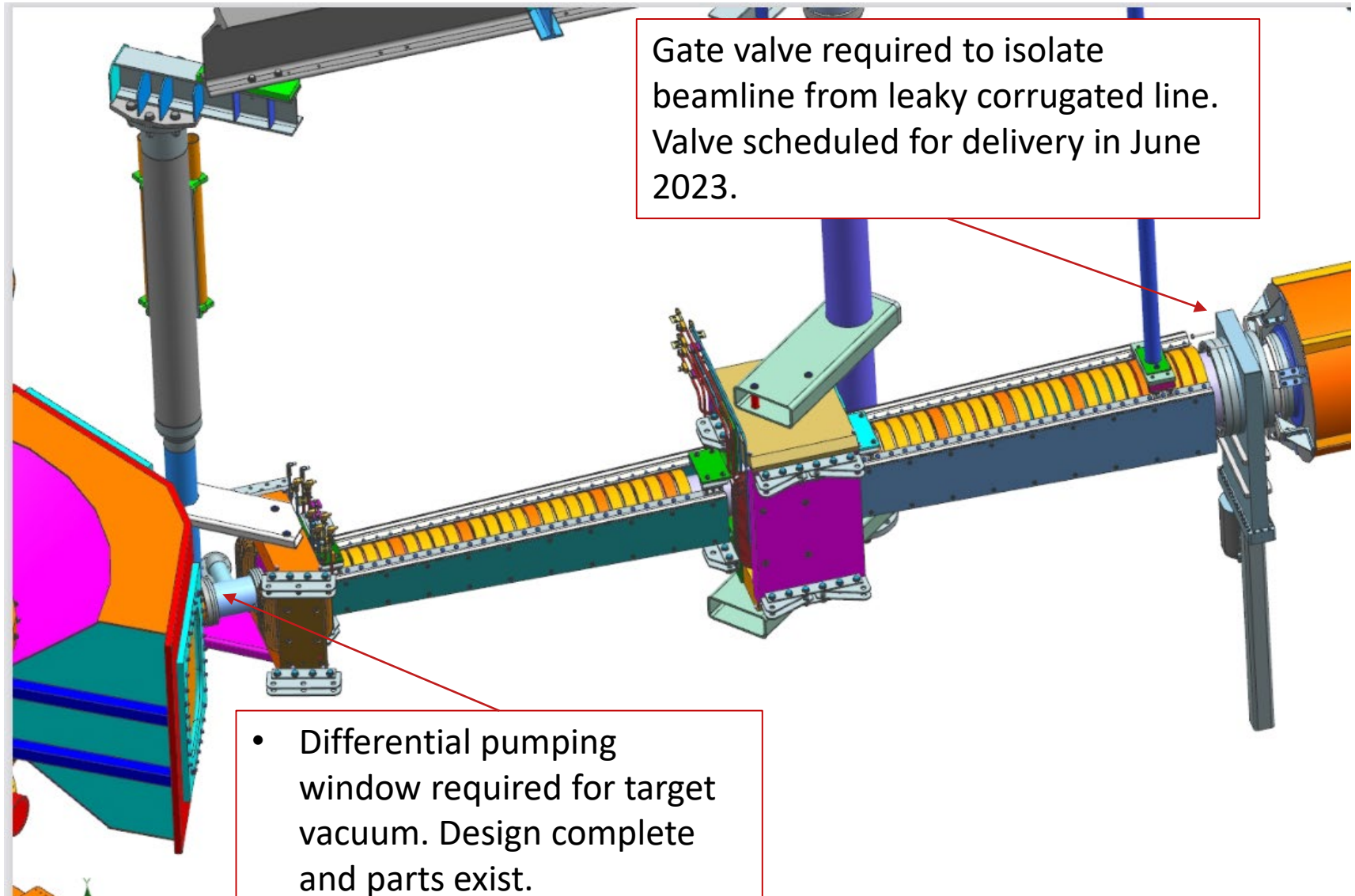


# Lead Shielding

- Lead shielding wall required between beamline and SBS GEMs
- Lead shielding wall exists
- Installation requires securing support frame to the counterweight support floor and to the Hall floor



# Vacuum Beamline

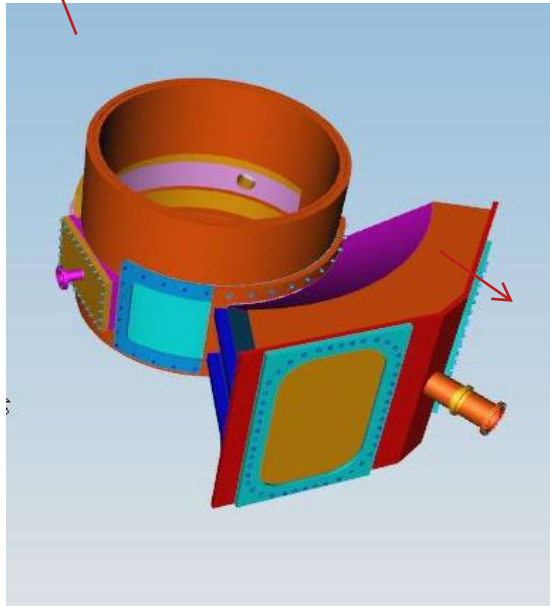


# Vacuum Chamber



- Utilizing existing scattering chamber.
- Vacuum snout has been delivered.
- Vacuum windows delivered.

Chamber

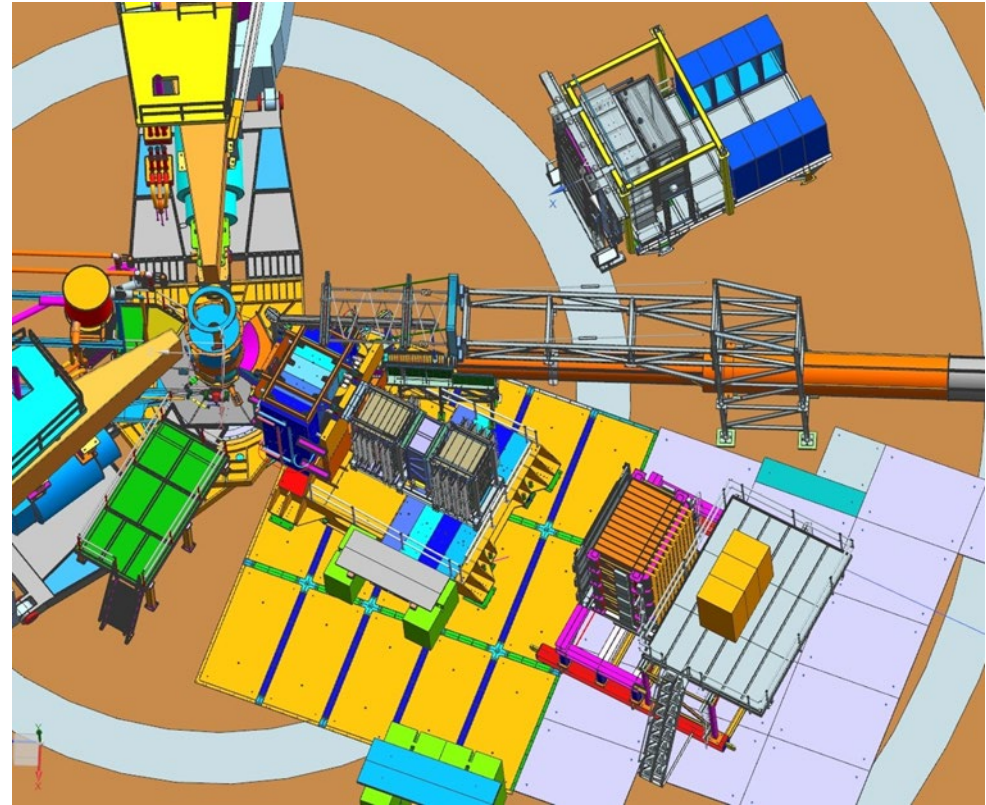


Snout



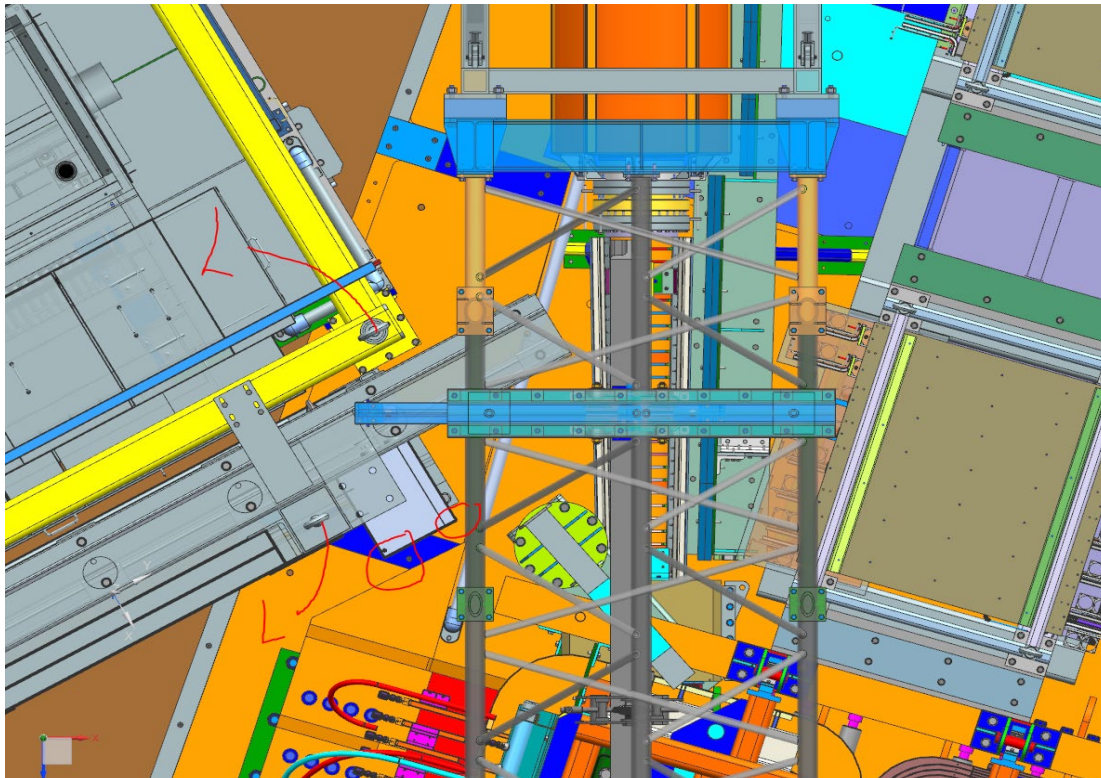


- All GEp experiment equipment has been defined.
- Equipment ready for installation by Fall 2023.



# Alternate GEp configuration

- GEp-3 kinematics configured for beam energy of 10.6 GeV. If 10.8 GeV achieved, equipment can be reconfigured by reducing ECAL angle by 0.5 degree and keeping SBS angle fixed.
- Installation tolerances are challenging but achievable.



Top view in area of beamline and ECAL at 29.5 degrees

# Correctors- bracing force analysis

