

# Hall C Winter Meeting Upcoming Installations 2023 and beyond

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# Hall C Experimental setups

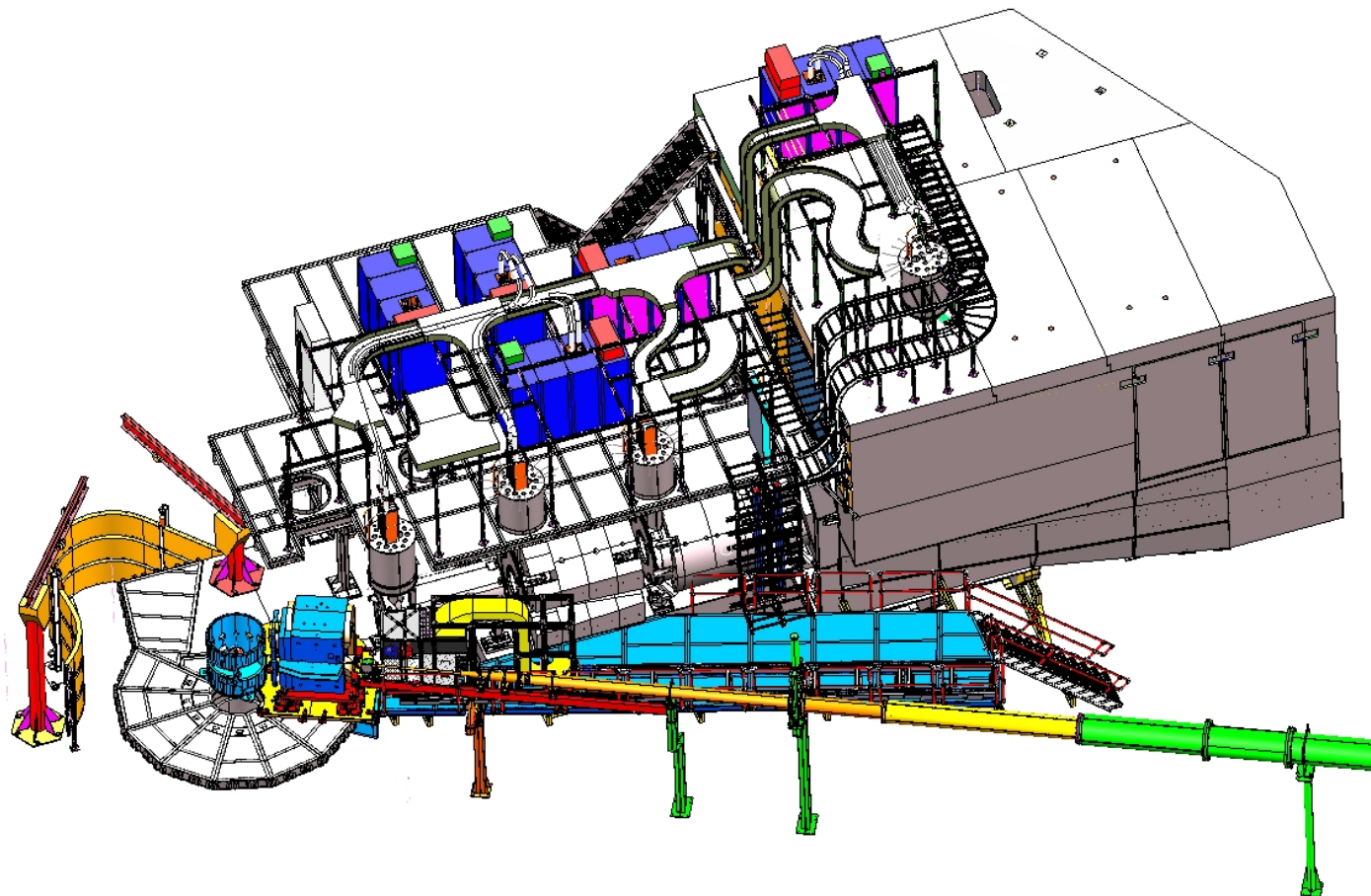
## Planned and under consideration

- NPS PIONS (SHMS right side and uses HMS) - 2023
- LAD and GEM (Uses SHMS and HMS) - 2024
- Standard SHMS/HMS configuration – 2024 thru 2025
- NPS WACS (SHMS right and left and uses HMS) –
- CPS with transversely polarized hydrogen target.
- HES/HKS – (design concept with no engineering)
- SBS/BigBite (needs to be investigated)
- Polarized deuteron target (uses SHMS/HMS)

# NPS SAD-23 Installation

## SAD-23 Activities:

- Target chamber removal
- Remove HB from SHMS.
- SHMS detector roof Block modification.
- Downstream beamline and Correction magnets
- Target platform re-enforcement.
- NPS platform installation.
- NPS cable tray installation.
- NPS magnet, detector, cable carrier, and cable installation



# NPS Platform Pre-installation test fit

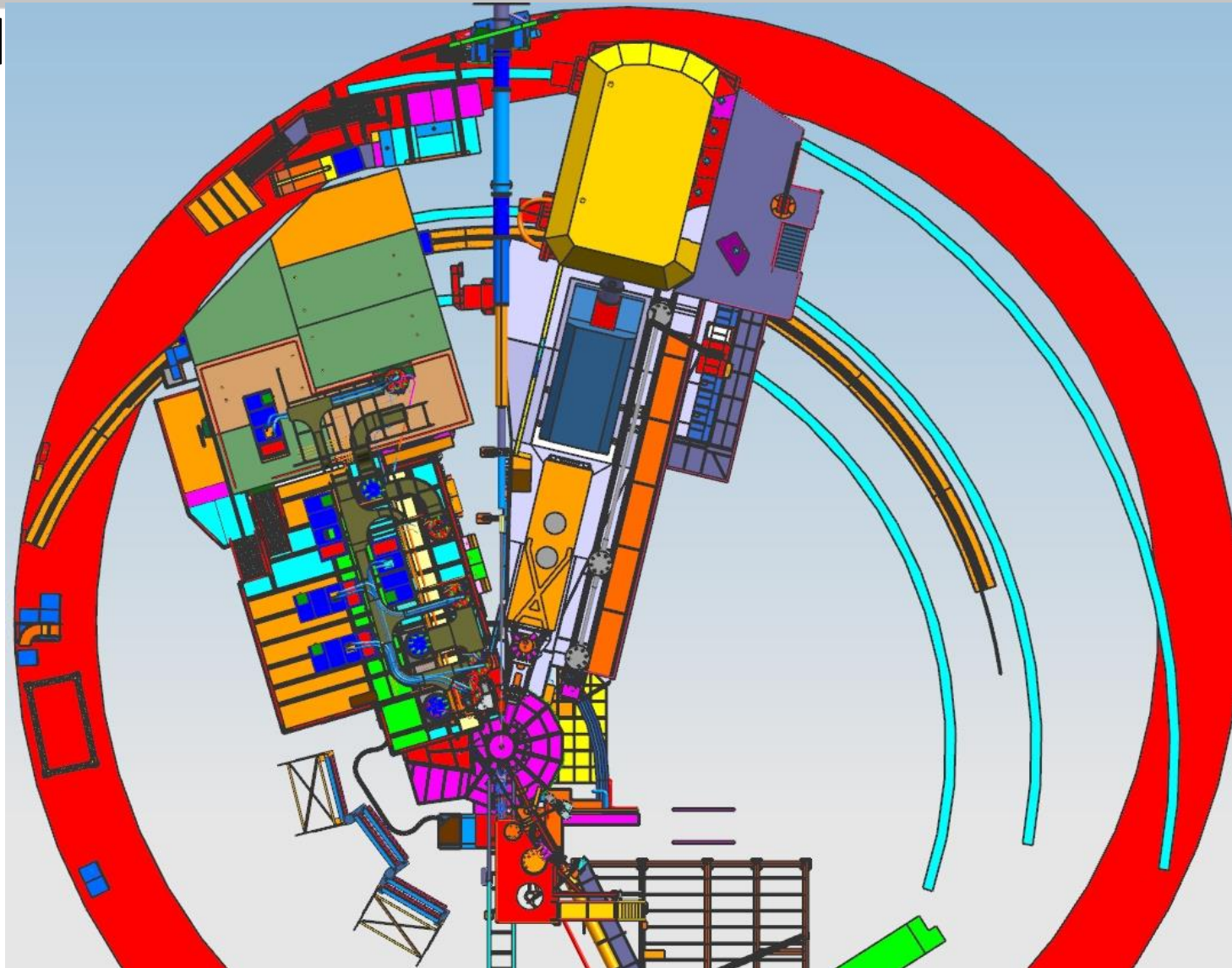




# LADS & GEMS - 2024

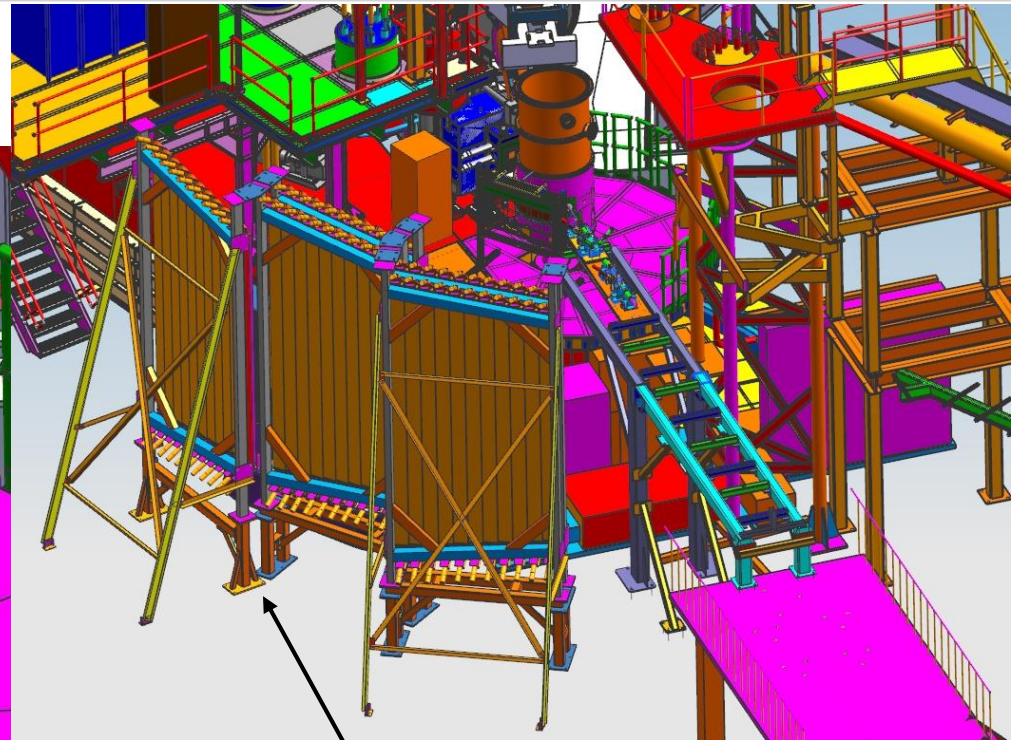
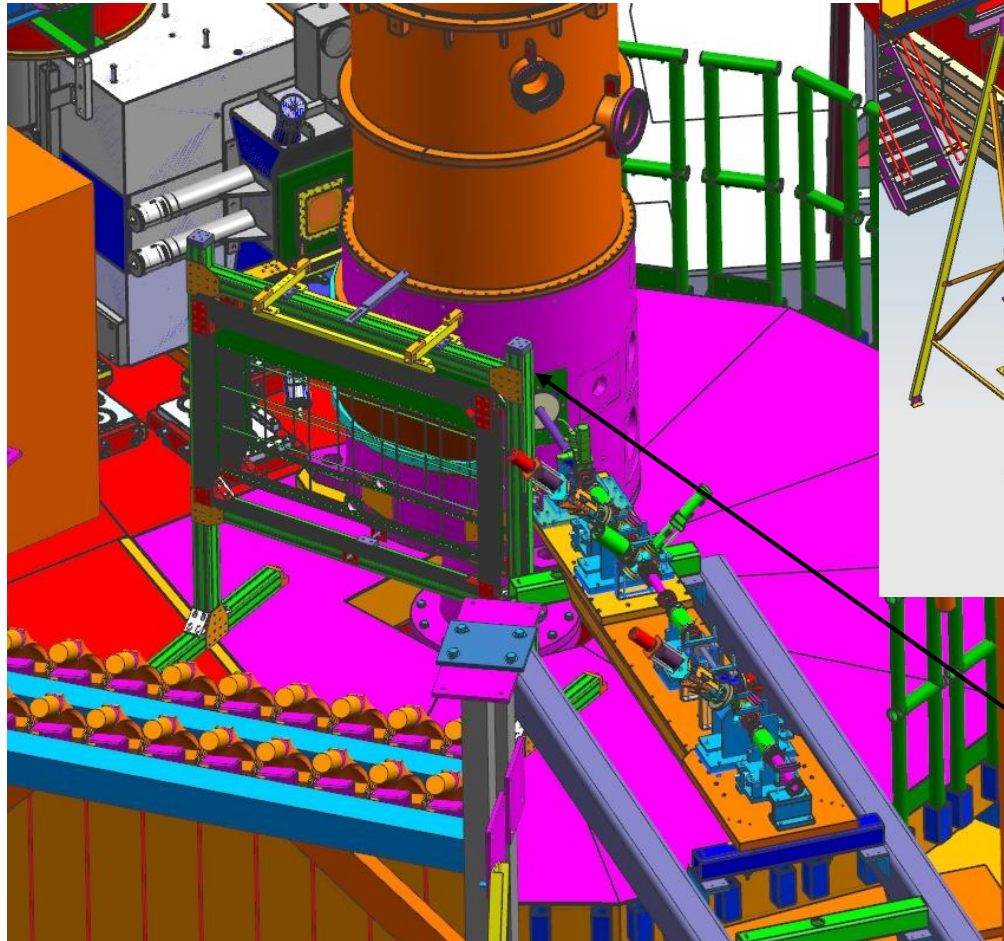
SHMS and HMS shown at 13.5°

SHMS HB will need to be re-install on SHMS and cooled down



# Close up view of LADS and GEM in Hall C

LAD Detectors and upper frames in ESB Building



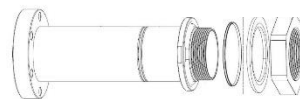
GEM and LAD Detector Frames Currently Being Built by Hall C



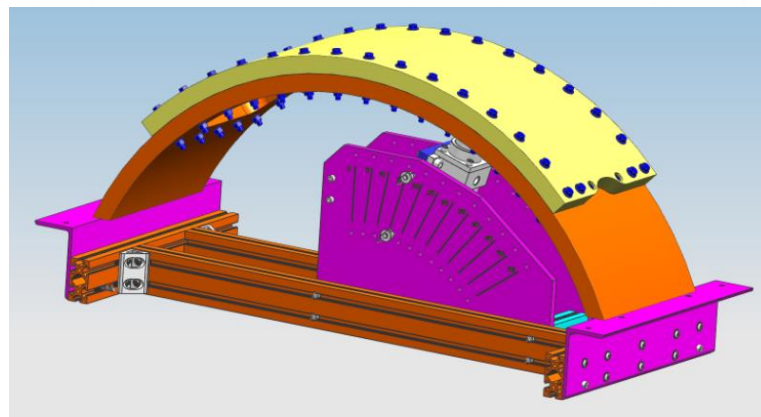
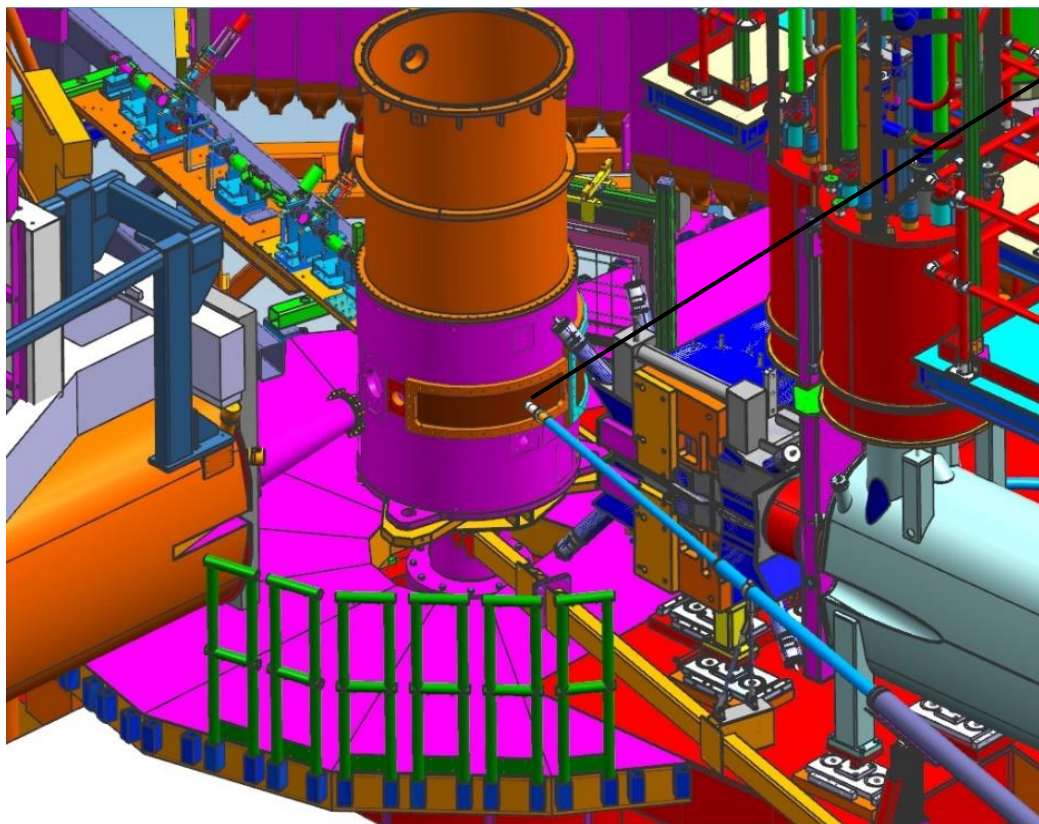
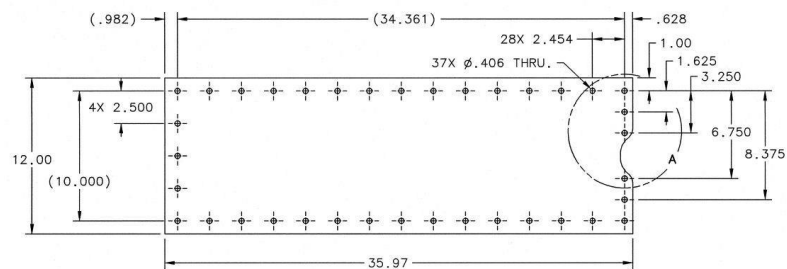
# LAD & GEM Target Chamber Window

- New Design using the HMS Window with Window Connection Assy

Window Connection Assy 67153-56033



HMS Window 67153-56017-02



The existing Window Forming Fixture, 67153-56033, will have to be modified



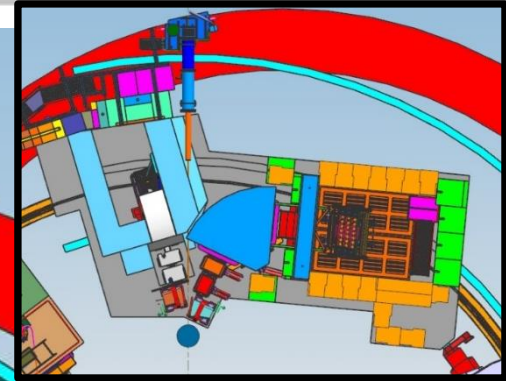
# HES/HKS in Hall C

SHMS @ 34°  
HMS @ 70°

HES

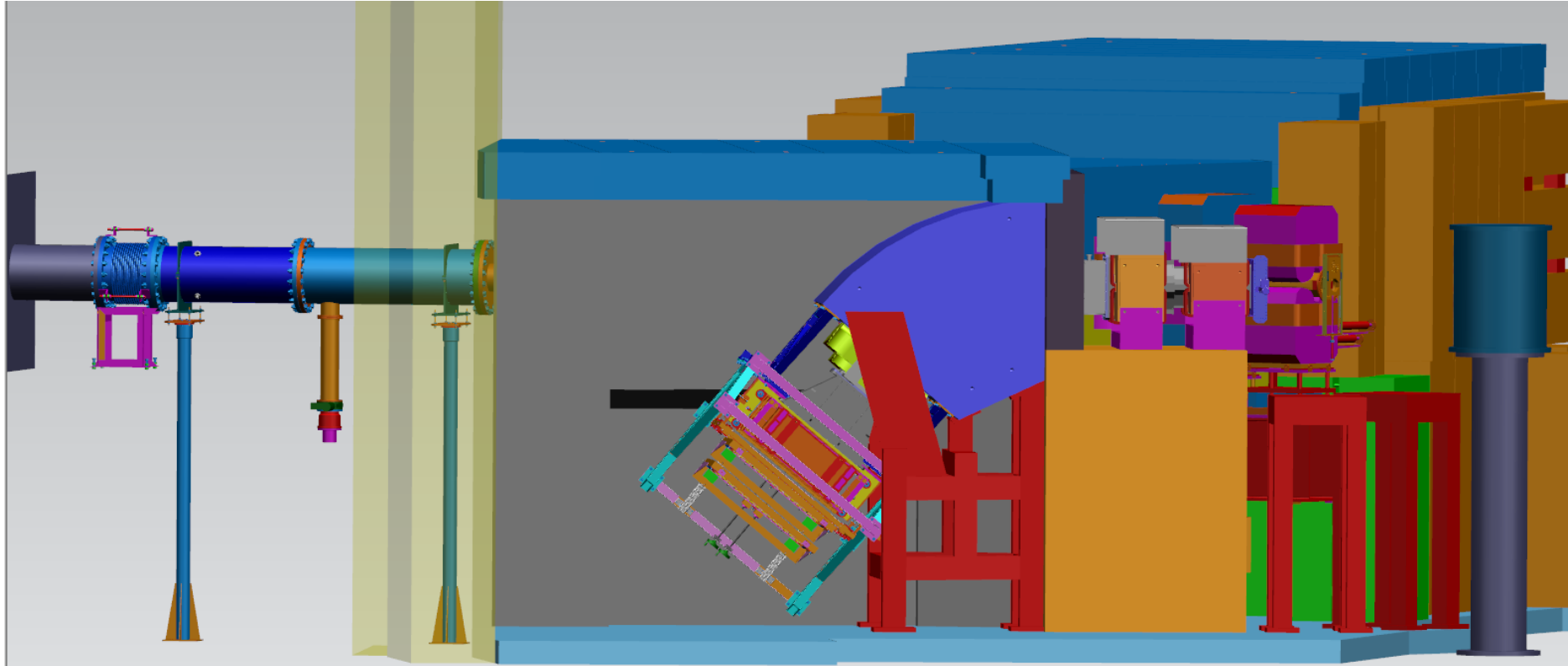
HKS

Distance from Pivot to Target Center  
11.24m (442.7in)



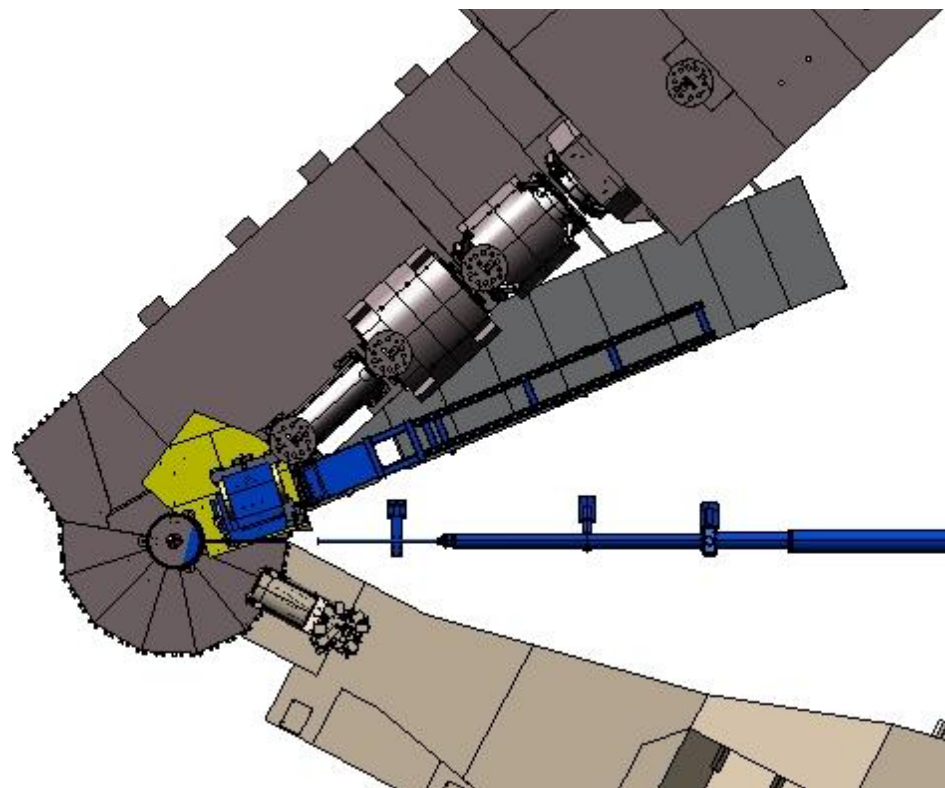


# HES Rotated 90°

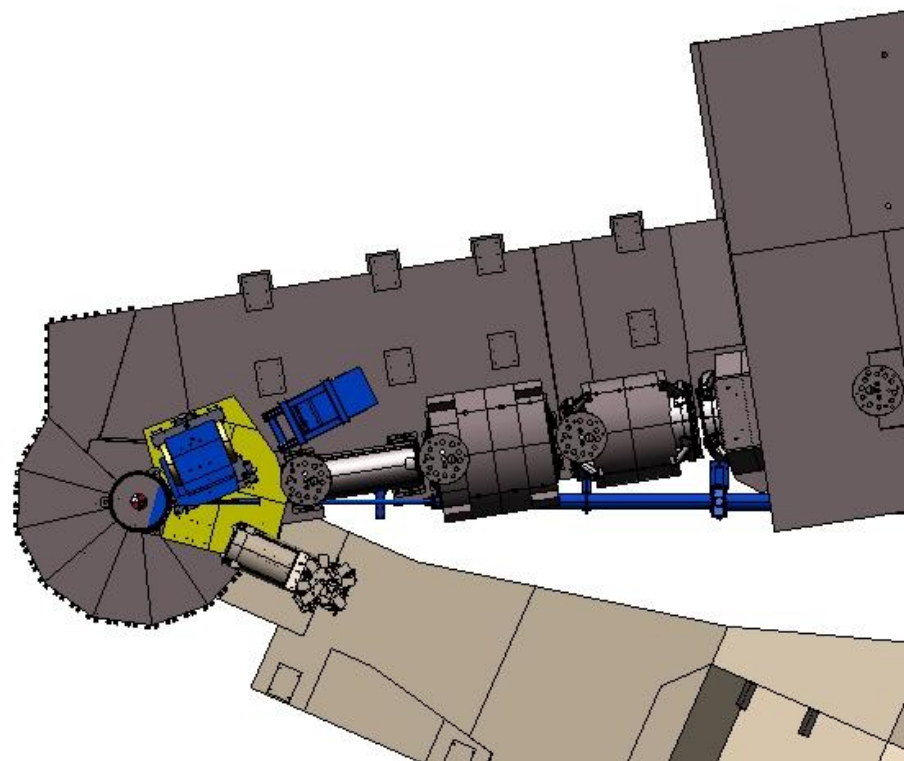


# NPS SHMS right vs Left

- WACS #4C

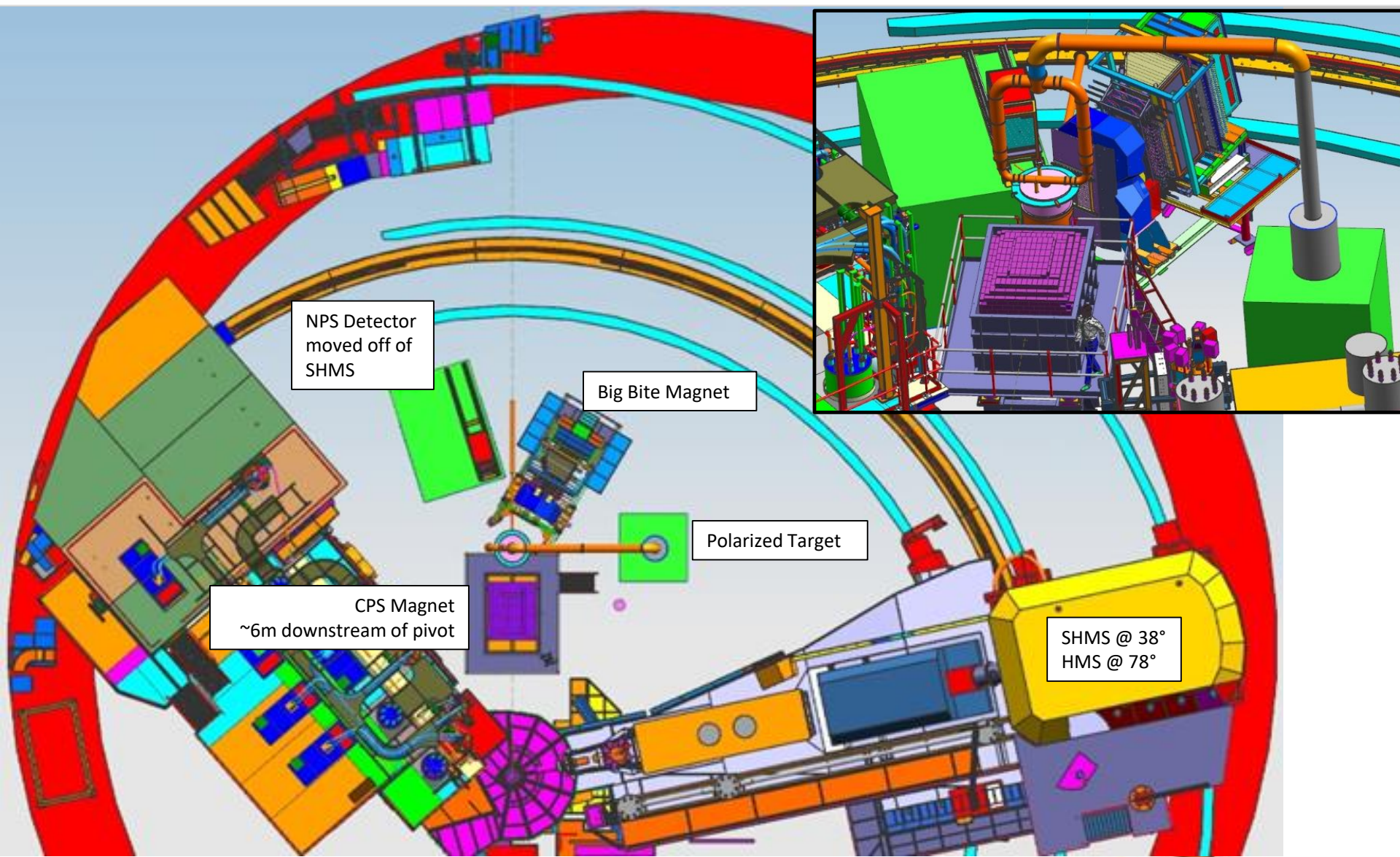


- WACS #4D





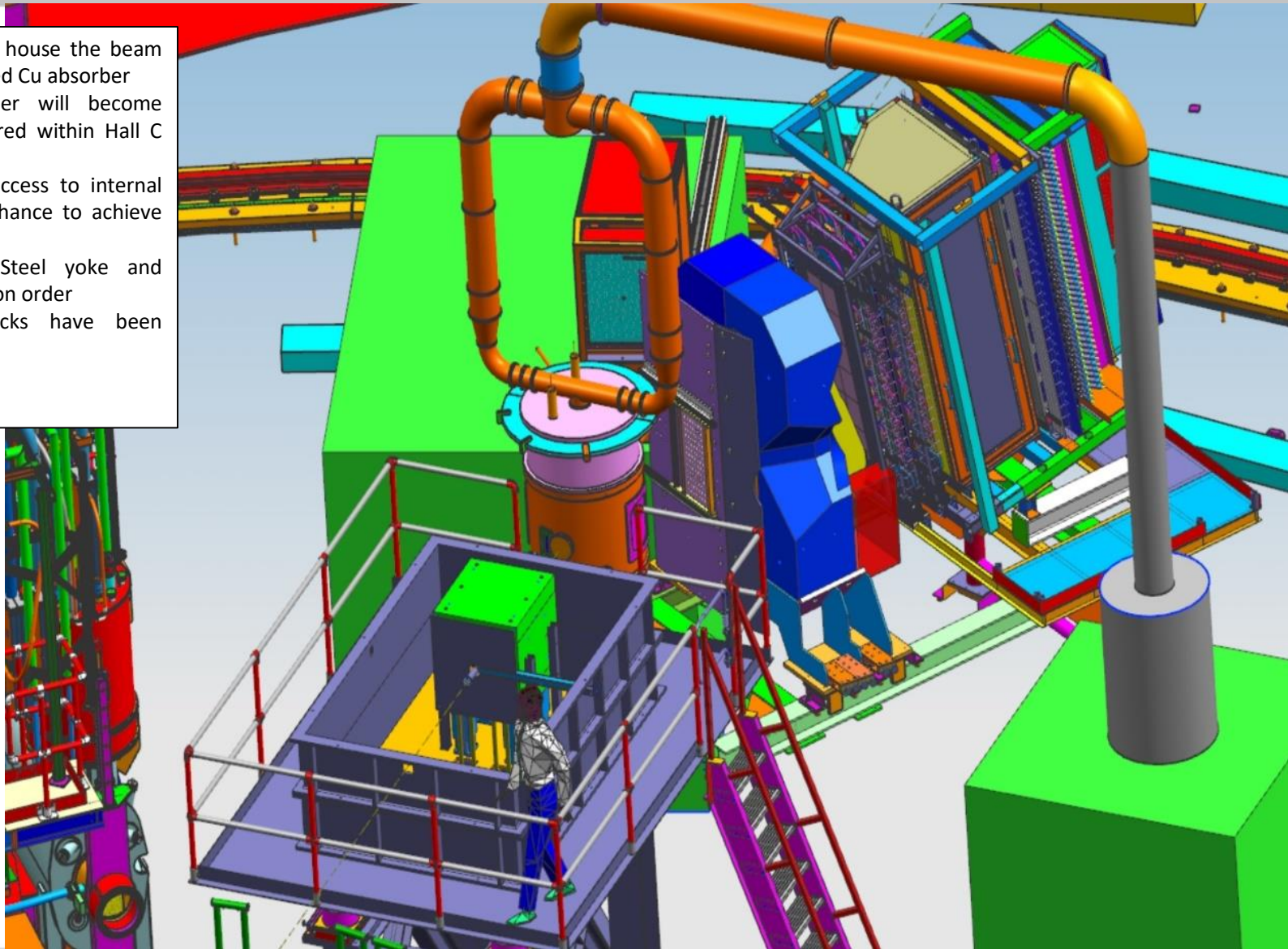
# CPS Layout Hall C





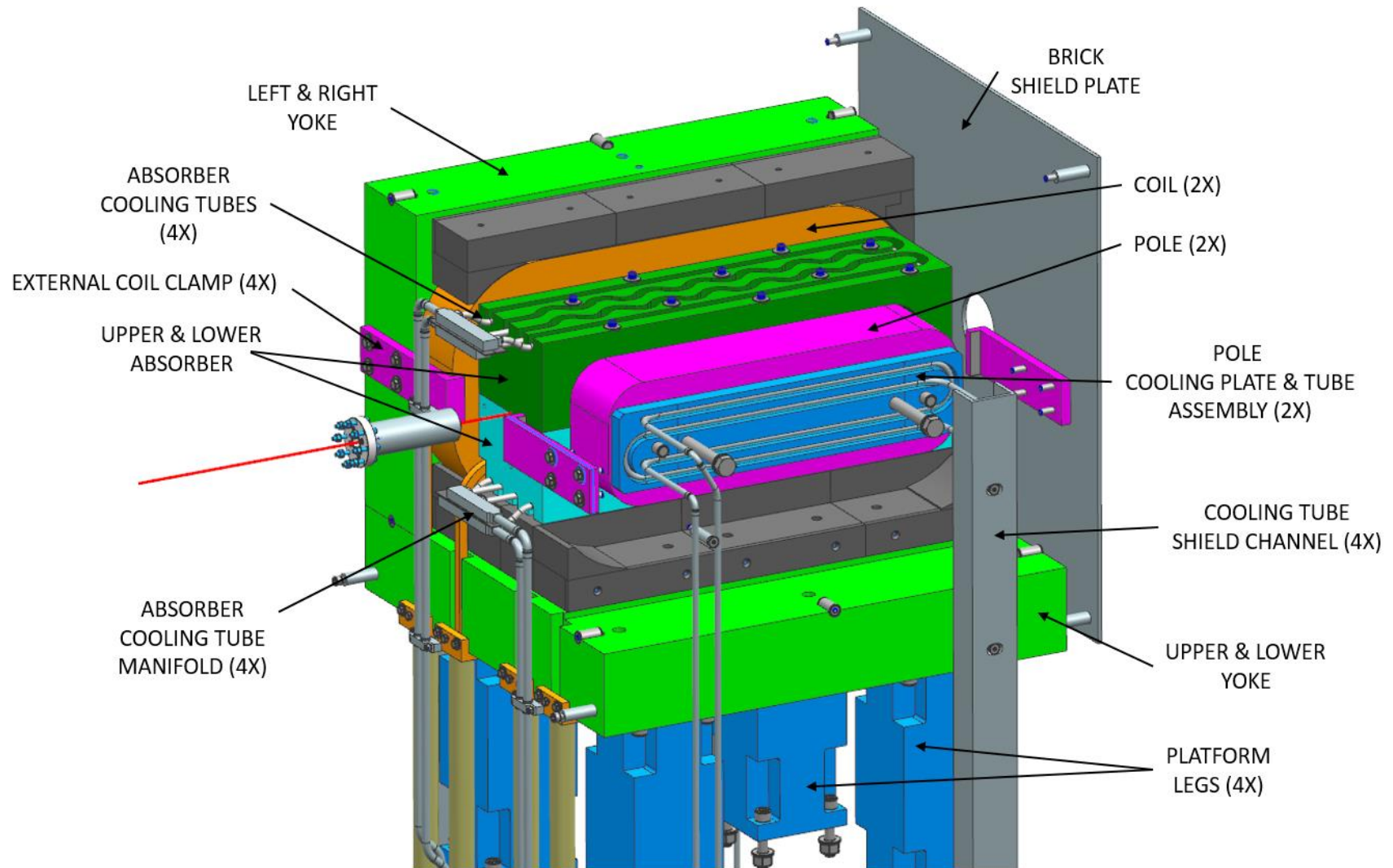
# CPS (shielding removed)

- CPS sweeper magnet house the beam dump – A Water cooled Cu absorber
- Magnet and absorber will become activated and be stored within Hall C after experiment
- Once activated, no access to internal components – One chance to achieve success.
- Magnet Coils and Steel yoke and Permendur Poles are on order
- W-Cu shielding blocks have been procured

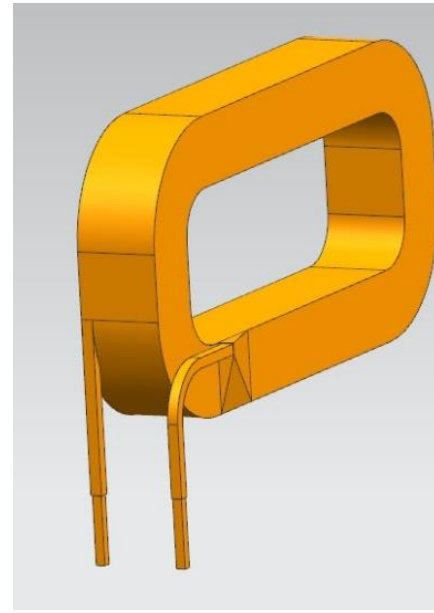
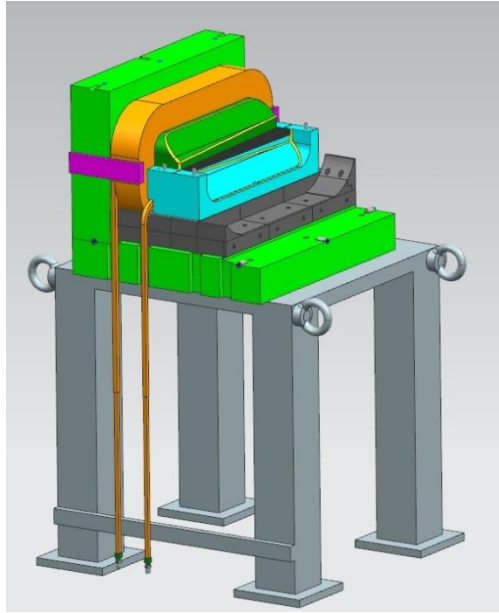
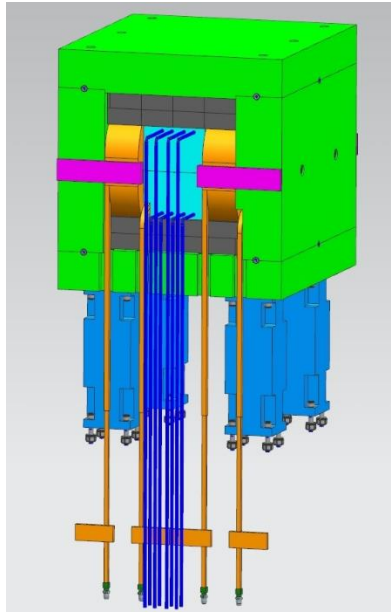




# CPS: magnet and cooling details

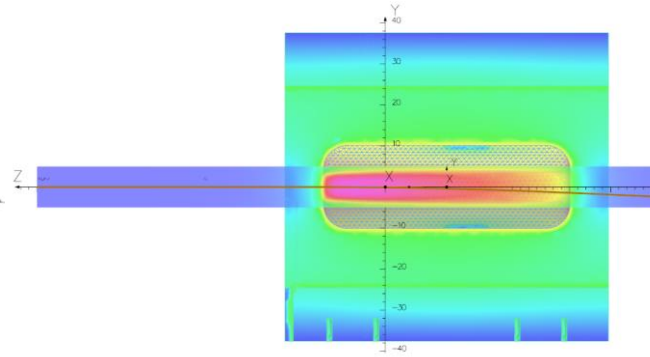
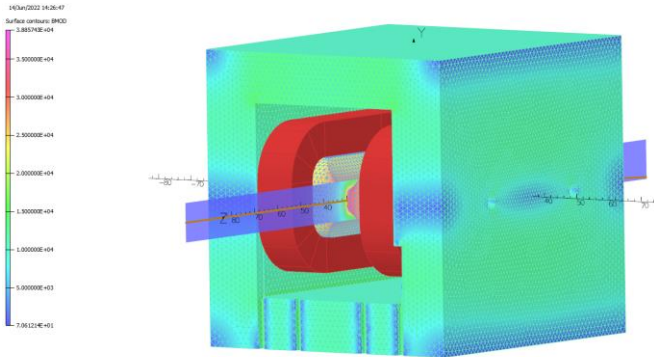


# CPS Magnet



Dimensions:  
0.75x0.82x0.81m  
Central Opening:  
3mm x 3mm

Coils : 55turns/pole @  
764A and 16.4V/coil  
Power= 12.5kW/coil

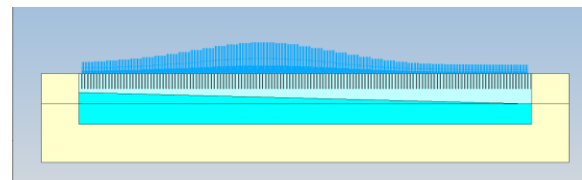
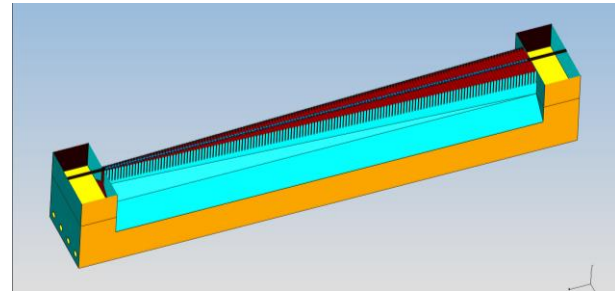
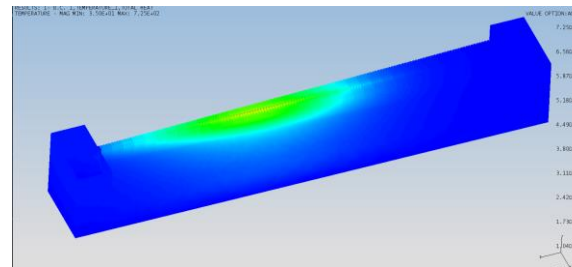
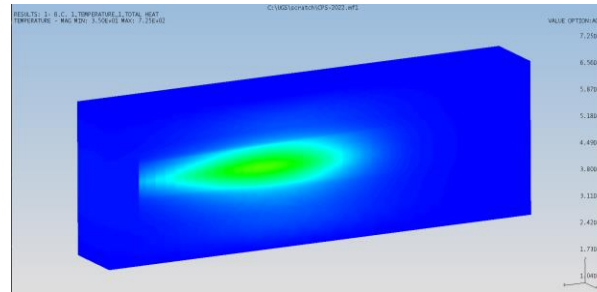
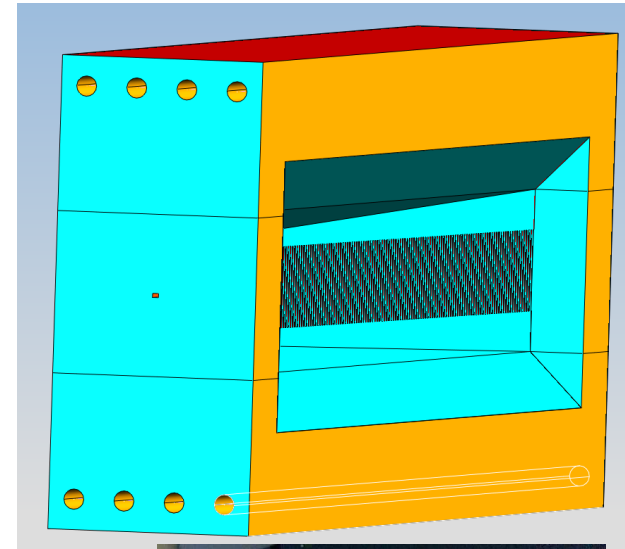


$J=500\text{A}/\text{cm}^2$ , Yoke = 1006,  
Pole= Permendur  
Max Pole field 3.89T,  
tracks: electrons 11 GeV @  
2.7uA

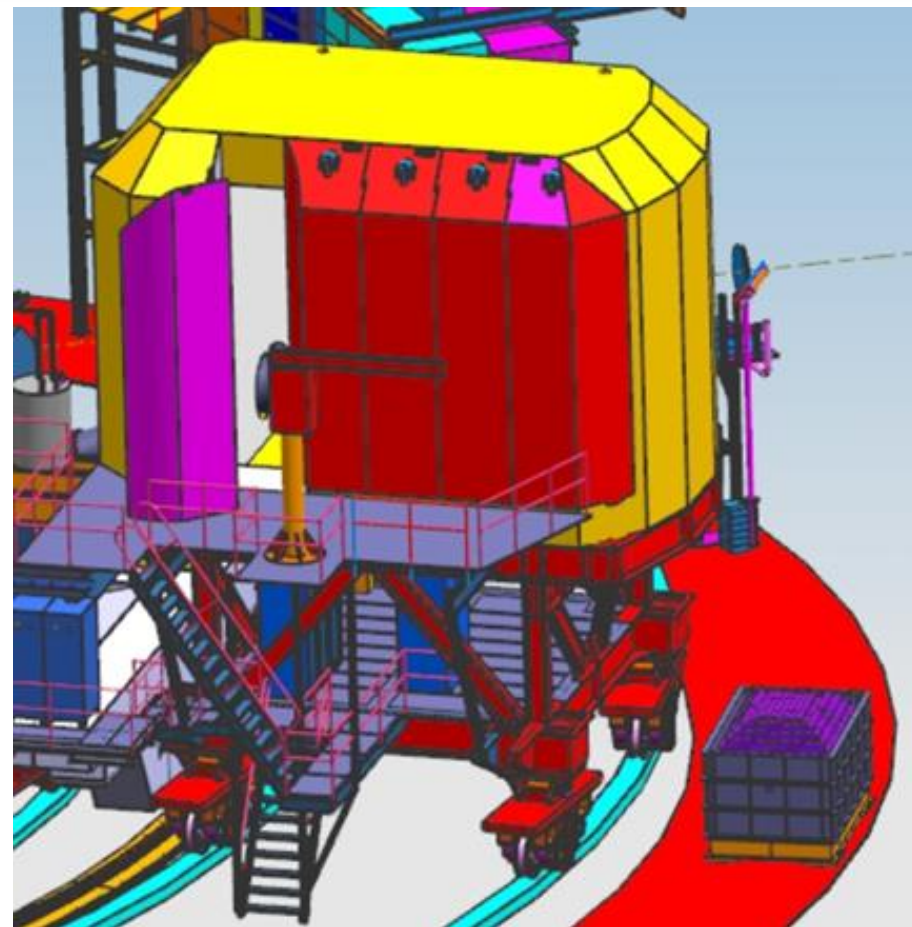
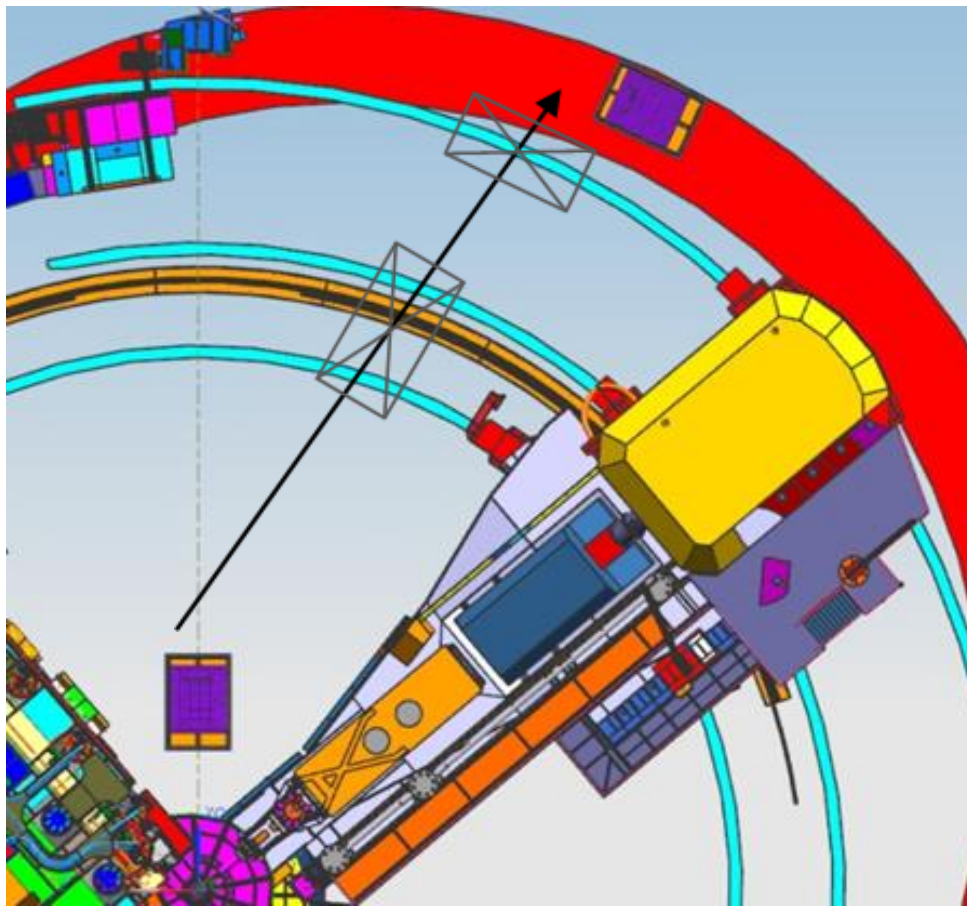


# CPS Cu Absorber

- 30kW heat load deposited.
- Absorber: slotted to reduce thermal expansion stresses
- Prototype developed and waiting on testing



# Storing CPS in Hall C ~30° behind HMS



CPS weight of ~50 tons requires external crane and lifting towers to reposition within hall



# Conclusion

- Many years of running  $> \frac{1}{2}$  dozen different experimental setups in Hall C.
- Engineering/design team will be heavily tasked.

# Backups slides

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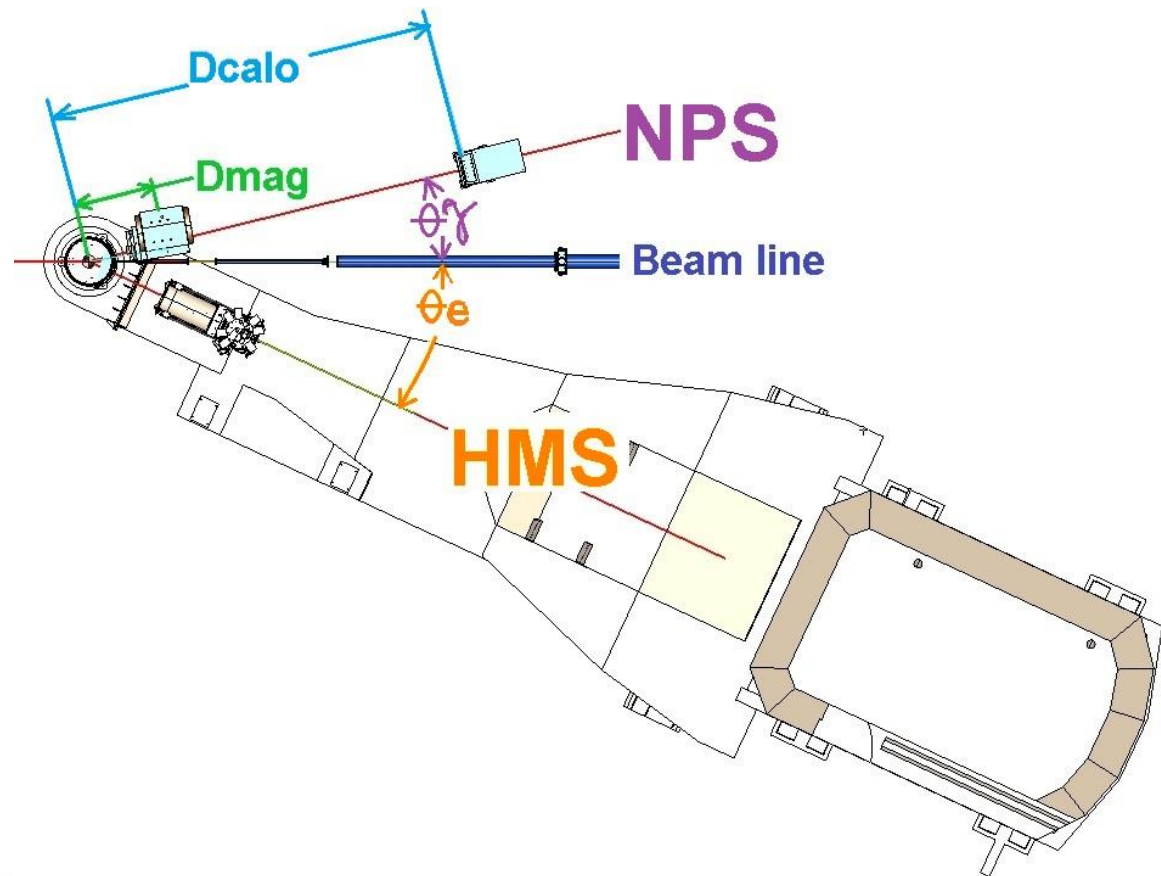
# NPS Layout definitions

$\Theta\gamma$  = angle between beam and NPS

$\Theta e$  = angle between beam and HMS

$D_{mag}$  = distance between target center and sweeper center

$D_{calo}$  = distance between target center and detector face





# NPS Layout Setups

SETTING	NPS location	NPS angle (deg)	HMS angle (deg)	D magnet (m)	D calorimeter (m)	Magnet angle (deg)	Beam energy (GeV)	Beam current (uA)	Time (hours)
7	SHMS right	21.7	11.7	1.6	3.0	5.5	11	28.0	48
11	SHMS right	19.8		1.6	3.0	5.5	11	28.0	120
12F	SHMS right	17.2	17.84	1.6	6.0	4.0 or 5.5	11	28.0	240
8E	SHMS right	16.6	15.65	1.6	3.0	5.5	11	28.0	120
3B	SHMS right	16.2	11.7	1.6	3.0	5.5	11	28.0	96
5C	SHMS right	12.4	15.30	1.6	3.0	5.5	11	28.0	72
15A	SHMS right	10.6		1.6	4.0	4.0 or 5.5	11	50.0	24
17D	SHMS right	7.9	24.15	1.6	3.0	5.5	11	50.0	120
13	SHMS right	6.3	27.90	1.6	6.0	4.0	11	11.0	24
16	SHMS right	6.3	17.30	1.6	6.0	4.0	11	11.0	24
6	SHMS right	20.2		1.6	3.0	5.5	8.8	28.0	72
10	SHMS right	17.8		1.6	3.0	5.5	8.8	28.0	24
2	SHMS right	14.7		1.6	3.0	5.5	8.8	28.0	96
4	SHMS right	10.3		1.6	4.0	4.0 or 5.5	8.8	50.0	24
14	SHMS right	9.2		1.6	4.0	4.0 or 5.5	8.8	5.0	24
9	SHMS right	13.8		1.6	3.0	5.5	6.6	28.0	120
1	SHMS right	11.7		1.6	3.0	5.5	6.6	28.0	24

# NPS Layout Setups

SETTING	NPS location	NPS angle (deg)	HMS angle (deg)	D magnet (m)	D calorimeter (m)	Magnet angle (deg)	Beam energy (GeV)	Beam current (uA)	Time (hours)
4A	SHMS right	14.2	40.1	1.6	9.0	4.0 or 5.5	8.8	5	20
4B	SHMS right	17.9	33.7	1.6	7.0	4.0 or 5.5	8.8	15	20
4C	SHMS right	22.5	27.8	1.6	5.0	4.0 or 5.5	8.8	30	20
5A	SHMS right	11.0	41.7	1.6	11.0	4.0 or 5.5	11	20	15
5B	SHMS right	13.8	35.3	1.6	8.0 (9.0?)	4.0 or 5.5	11	30	20
5C	SHMS right	16.9	30.0	1.6	7.5	4.0 or 5.5	11	60	20
5D	SHMS right	19.7	26.3	1.6	6.0	4.0 or 5.5	11	60	40
4E	SHMS left	34.0	18.9	1.6	4.0	5.5	8.8	60	50
5E	SHMS left	29.9	17.8	1.6	4.0	5.5	11	60	120
4D	SHMS left	26.9	23.7	1.6	4.0	5.5	8.8	60	30
	E12-06-114	Larger @ 2.2GeV/pass	Smaller @ 2.2GeV/pass				2.1 GeV/pass		
48_J1	SHMS right	13.79	18.83	1.6	3.0	?	10.617	30	70
60_J1	SHMS right	11.76	33.17	1.6	3.0	?	8.517	30	200
60_J2	SHMS right	14.76	21.64	1.6	3.0	?	10.617	30	170
60_J3	SHMS right	6.41	57.77	1.6	4.0	?	8.517	50	300