

HYPER-NUCLEAR DESIGN STATUS

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Hall C Mechanical Engineer

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HYPER-NUCLEAR

- **Charge 1A)** Status of the equipment required for this set experiments towards operation? What is the completion/commissioning schedule and tasks?
- **Charge 1B)** Status of the beam line and scattering chamber
- **Charge 1D)** Status of the HKS, HES, PCS, ENGE and the effect of the magnetic fields on the beam line. The status of the needed power supplies.
- **Charge 1E)** The integrated system, including the support structures for the magnets, as expected to be used during the experiment.
- **Charge 1F)** The Low Conductivity Water (LCW) requirements for the experimental equipment.
- **Charge 1G)** Final configuration of the Hall space.

HYPER-NUCLEAR

- **Drawing List**
 - Drawing Numbers for Experiment Assemblies
- **Nansemond Pre Cast Concrete – Concrete Rad Shielding**
 - P.O. 25-D1718-0 - Deliverables late Sept-Oct 2026
- **Power Supply Unit Procurements**
 - PR 451970 HKS Supplies
 - PR 452018 Enge Supplies
- **Experiment Design in Hall C**
 - Beam line layout
 - Common Vacuum
 - PCS Experiment Stand
 - PCS Transportation Stand
 - HKS, HES, Enge Stand
 - Cable and Hose Routing
 - Additional RAD Shielding
 - Radiation Analysis
- **LCW**
 - Pressure System Number PS-HALLC-26-001
 - Establish preliminary Bill of Materials
- **Schedules / Manpower Estimates**

HYPER NUCLEAR – DRAWING LIST

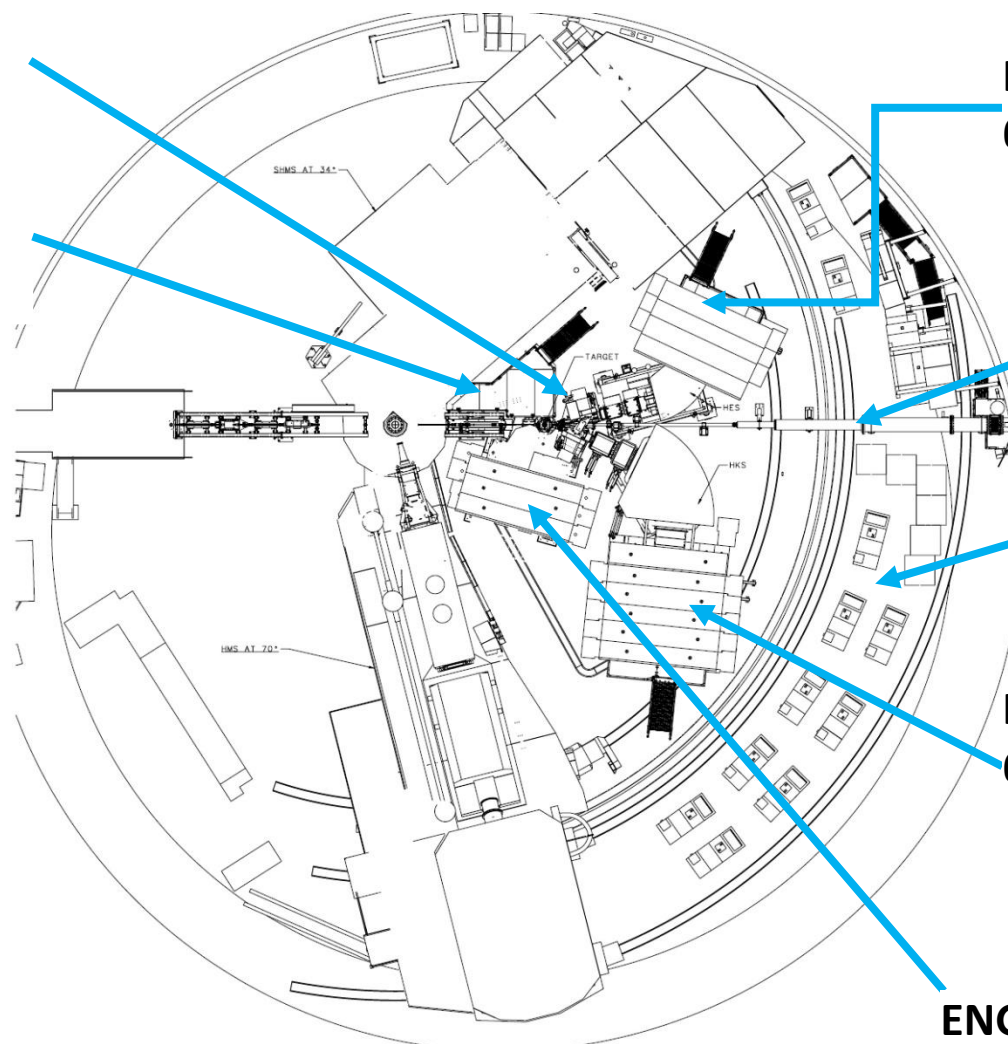
Charge 1F

PCS MAGNETS INSTALL
67510-00002

BEAM LINE/TARGET
PLATFORM
67510-00130

LCW INSTALLATION
67510-00005

CABLE TRAY
67510-00037



HES SPECTROMETER
67510-00010

BEAM LINE INSTALL
67510-00200

POWER SUPPLIES

HKS SPECTROMETER
67510-00011

ENGE SPECTROMETER
67510-00012

HYPER-NUCLEAR PURCHASE REQUESTS/ORDERS

- ***Nansemond Pre Cast Concrete*** – Concrete Rad Shielding
 - P.O. 25-D1718-0 - Deliverables late Sept-Oct 2026
 - Long Term Storage of Concrete Rad Shielding
 - Discussion/Agreement with Property Management
 - TENTATIVE PLANS ARE FOR SHIELD BLOCKS TO BE STORED INSIDE GATE ALONG CEBAF BLVD ROAD BEHIND HALL C.



HYPER-NUCLEAR PURCHASE REQUESTS/ORDERS

CHARGE 1D

- Power Supply Unit Procurements
 - PR 451970 HKS Supplies (Qty 3)
 - SENT OUT FOR RFQ EXPECTED BACK EARLY JUNE 2026
 - PR 452018 Enge Supplies (Qty 1)
 - Waiting for Budget office approvals.



HYPER-NUCLEAR PURCHASE REQUESTS/ORDERS

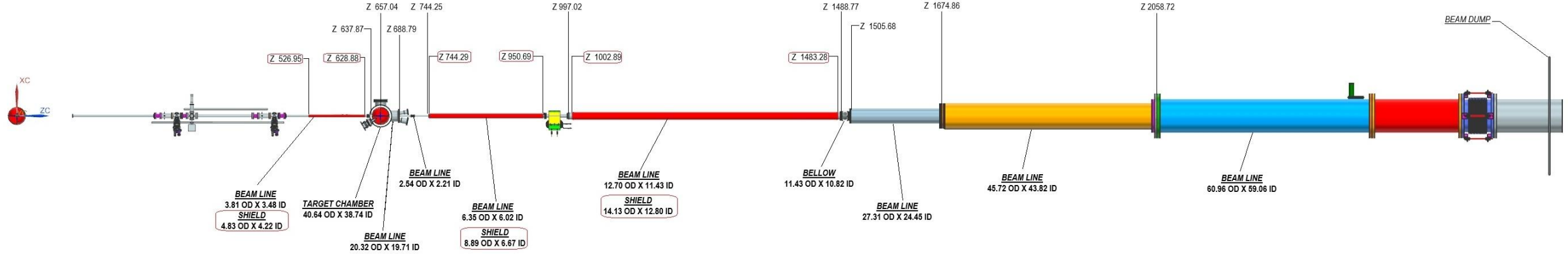
ITEM	DESIGN STATUS	PURCHASE STATUS	NEED BY DATE
HES DETECTOR STAND	DRAWINGS NEEDED	PR YET TO BE SUBMITTED	JAN 2028
ENGE MAGNET FEET	COMPLETE	PR SUBMITTED	SEPT 2027
HES /HKS MAGNET FEET	COMPLETE	PR SUBMITTED	APR 2028
SIEVE SLIT ASSY	COMPLETE	PR YET TO BE SUBMITTED	NOV 2027
TUNGSTEN	COMPLETE	PR SUBMITTED	MAR 2027
POWER SUPPLY CABLES	DRAWINGS NEEDED	PR YET TO BE SUBMITTED	JAN 2028
NMR COILS	COMPLETE	PR YET TO BE SUBMITTED	2028
PCS STAND	DRAWINGS NEEDED	PR YET TO BE SUBMITTED	2027

HYPER-NUCLEAR PURCHASE REQUESTS/ORDERS

- Current Purchase Requisitions
 - ENGE MAGNET FEET--PR 447231-Waiting for Budget office approval.
 - HKS/HES MAGNET FEET--PR 451681- Waiting for Budge office approval.
 - SIV SLIT TUNGSTEN- PR 451270 -Waiting for Budget office approval.
- Future Procurements (Estimates)
 - HES DETECTOR STAND ~\$40k
 - ENGE Media Blast ~ \$10k
 - LCW Configuration Equipment ~ \$130k
 - SIV SLIT ASSEMBLIES ~ \$40k
 - PSU WIRING ~ \$50K (\$1500/100LF)
 - VACUUM EQUIPMENT ~\$50K
 - PCS STAND-----~\$60K

HYPER-NUCLEAR BEAMLINE

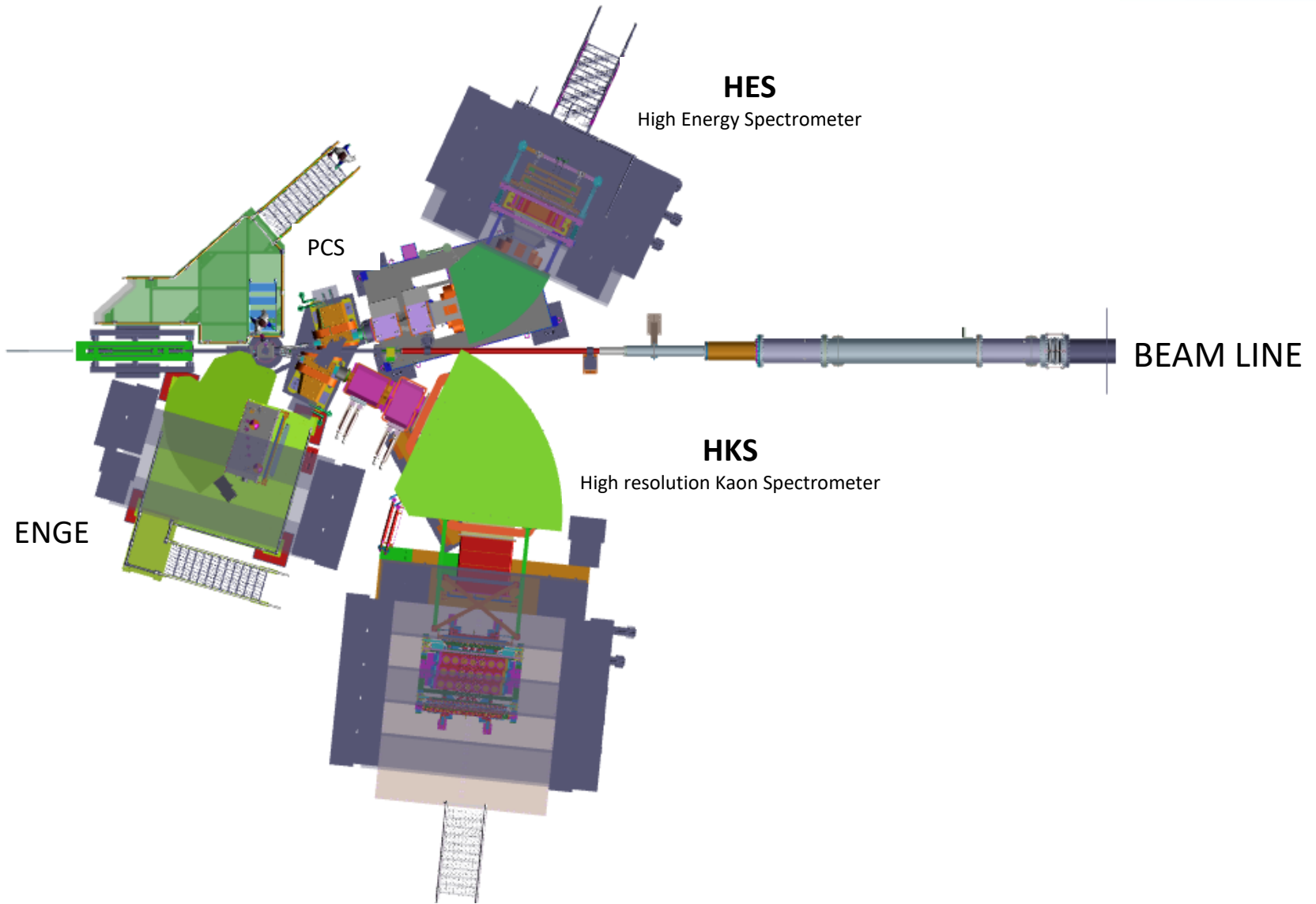
CHARGE 1B



HYPER NUCLEAR BEAM LINE SIZE INFORMATION

04/14/2026
Dimensions in Centimeters(cm)

HYPER NUCLEAR – LAYOUT(TOP VIEW)



HYPER NUCLEAR – COMMON VACUUM

ION PUMP WILL BE INSTALLED ON UPSTREAM GIRDER

Gamma Vacuum: TiTan Ion Pumps,
PN# 25S-DIX-2V-SC-N-N
RFQ : \$3k EACH

Pos	Product number Description	Qty	List Price	Discount (%)	Unit Price	Total
100	25SDX2VSCNN 25S TiTan Ion Pump 25S TiTan Ion Pump with: Element Style: TiTan DIX, XHV/SEM Port Options: Vertical, 2.75 CFR HV Feedthrough: SAFECONN Heater Voltage: No Heaters TSP/NEG: None Edwards Part Number: 25SDX2VSCNN Country of origin: US Typical Lead-time: 7-8 Weeks Current availability: Out of Stock	1	3,544.00	-15.00	3,012.40	3,012.40
					Net Price	3,012.40
					Grand Total	3,012.40

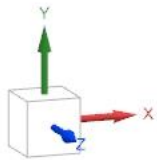
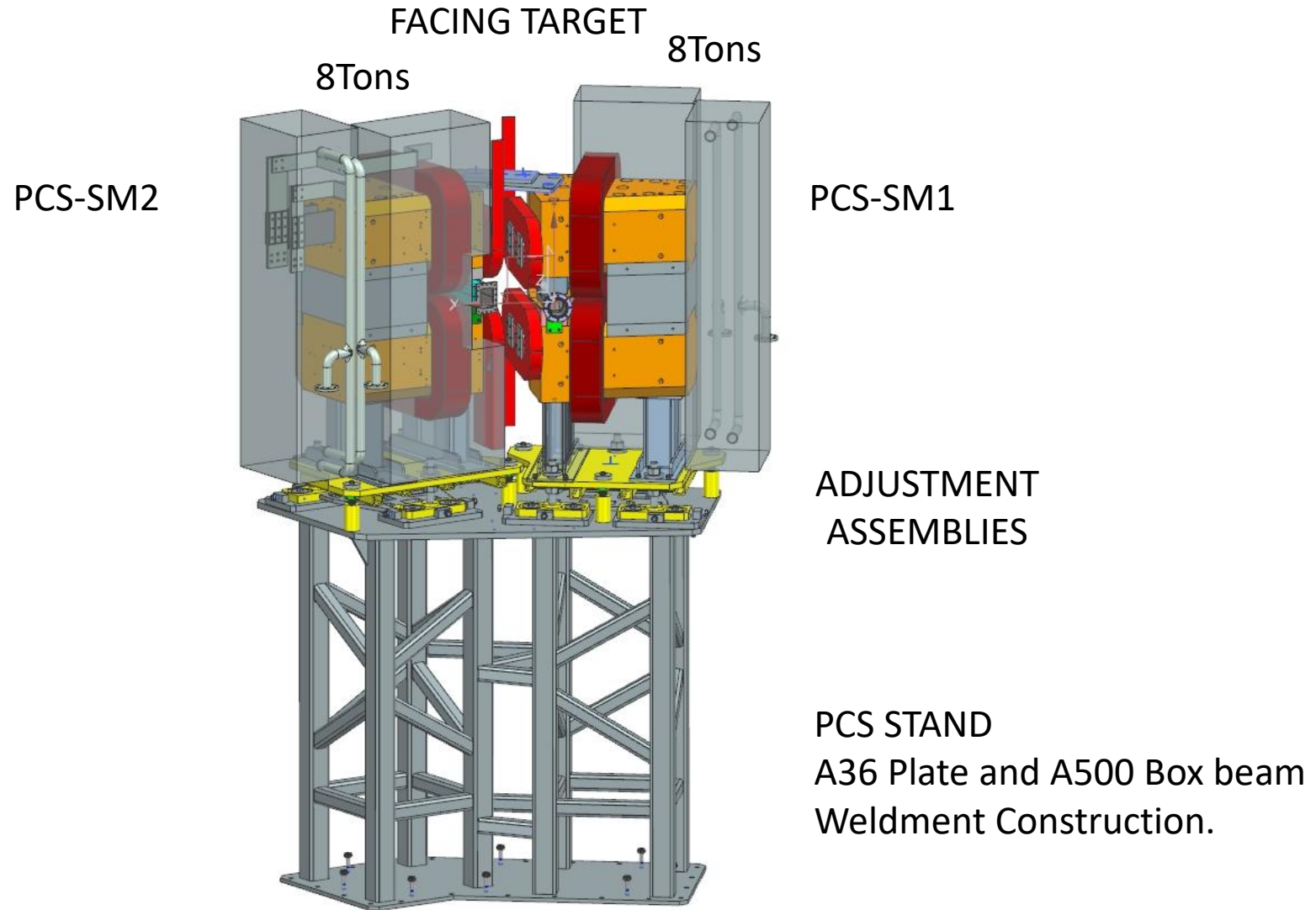
IN HOUSE AVAILABLE
ROUGHING PUMPS AND TURBOS ON EACH INDIVIDUAL MAGNET DETECTOR.

VENDOR:

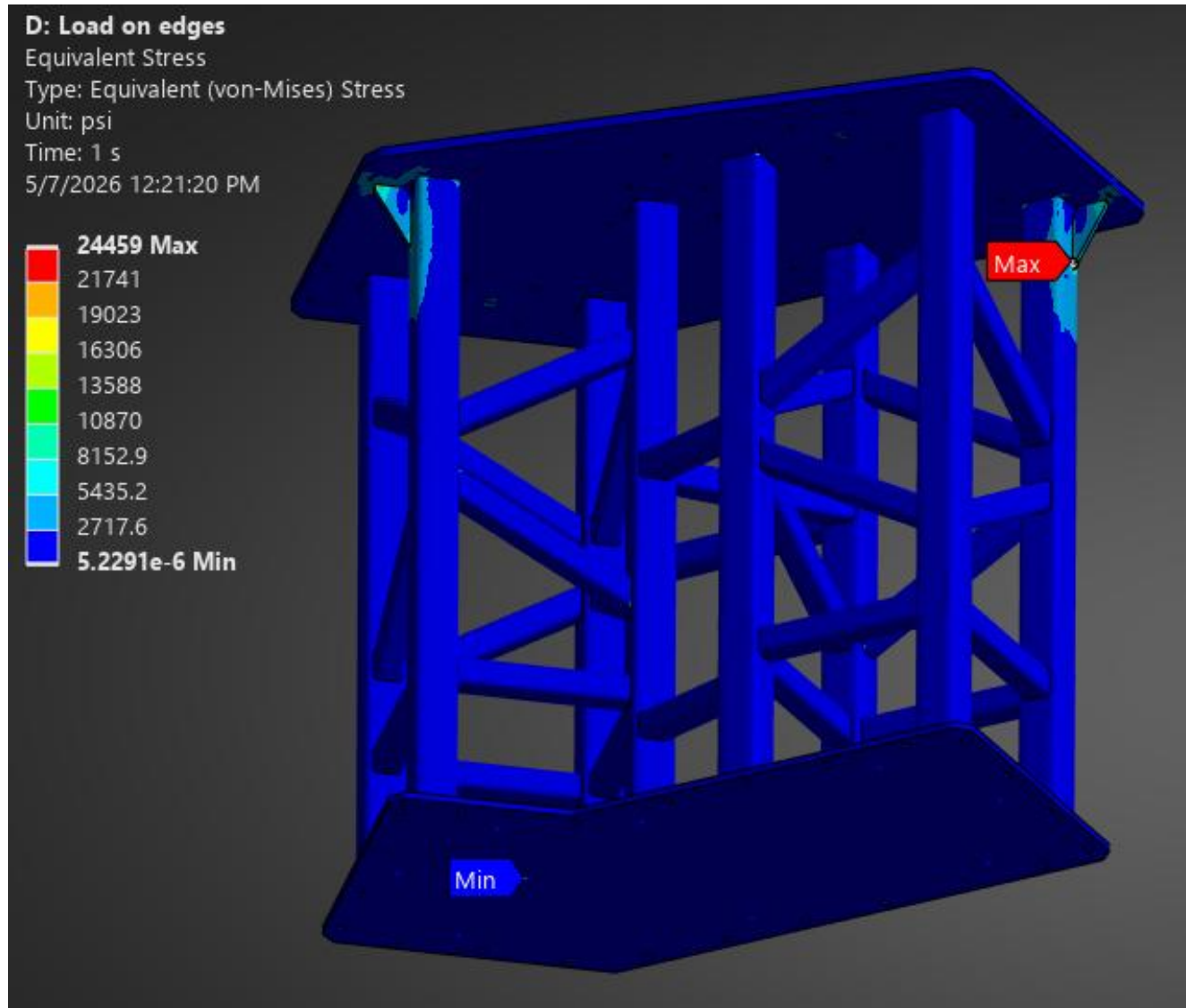


HYPER NUCLEAR – PCS

CHARGE 1E



HYPER NUCLEAR – PCS Von Mises Stress



Static Load Analysis

*AMERICAN INSTITUTE OF STEEL CONSTRUCTION:
Steel Construction Manual
AISC 2005
Chap C: Stability Analysis and Design.*

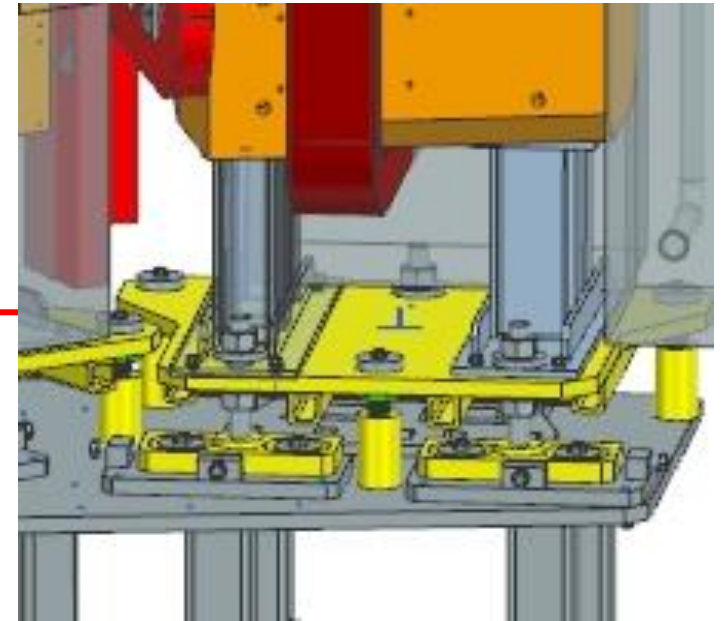
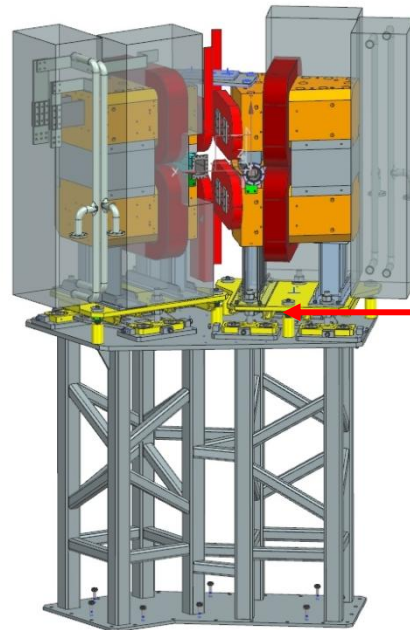
Factor of Safety : 1.67
Allowable Safety Design (ASD)

Peak Stress is an artifact of Stress Concentration
Majority of stress in FEA meets or exceeds factor of
Safety needed for construction approval.

HYPER NUCLEAR – PCS TRANSPORTATION STAND



- Preliminary Design
A36 1" THK Steel Plate
A500 12" x 6" Rectangular beam .50" wall thickness
- Transportation stand will also be used to drill
2.25" diameter holes in the legs of each PCS magnet (qty 4)



HYPER NUCLEAR – HES/HKS/ENG DETECTOR STAND

ENGE PLATFORM (pictured in Longterm storage)

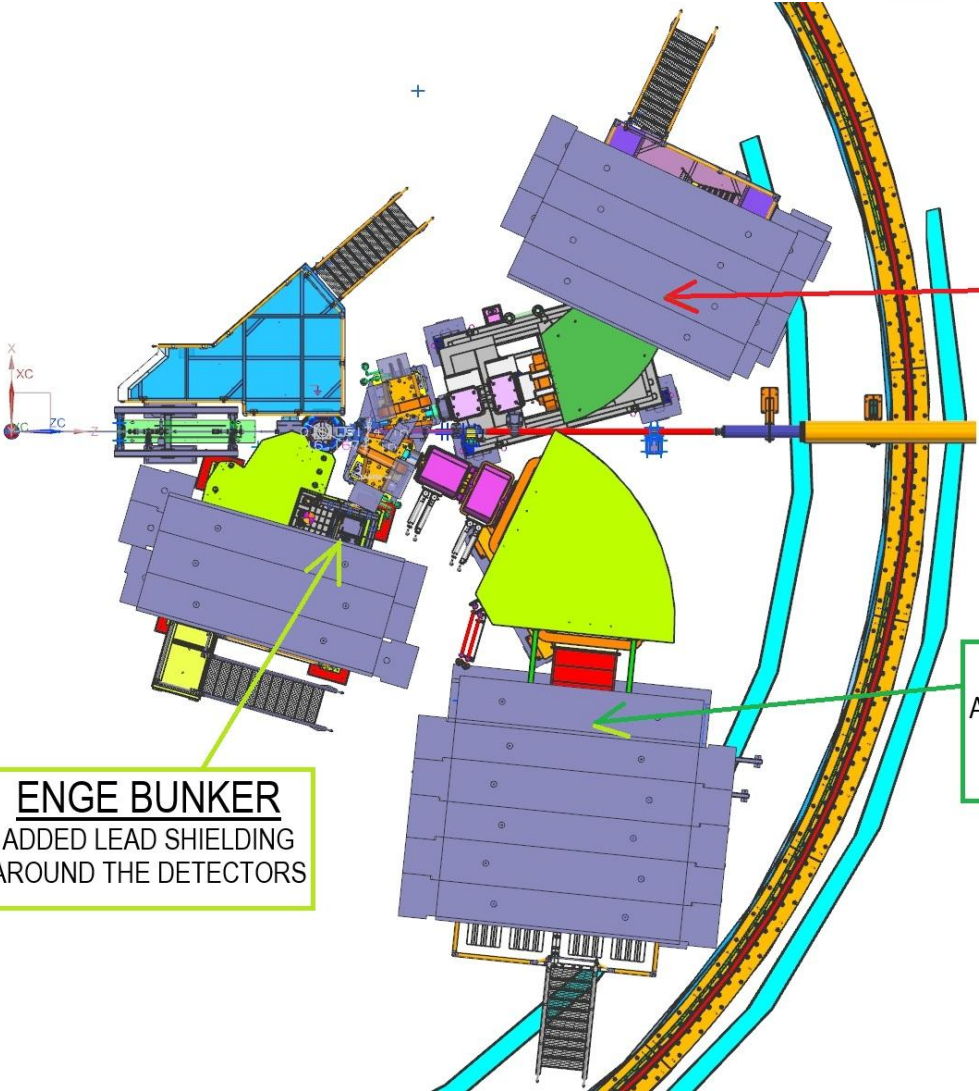


Media blast and Paint

HES PLATFORM is in Preliminary Design Stage

HKS PLATFORM is located inside Hall C

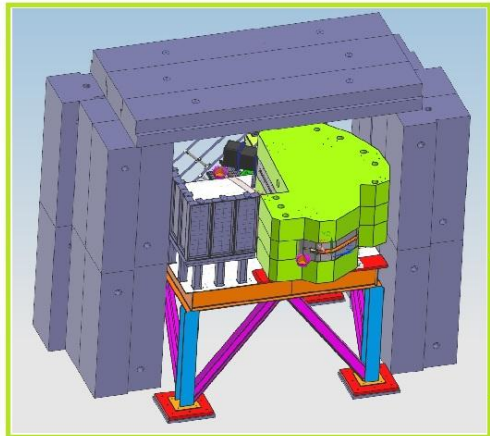
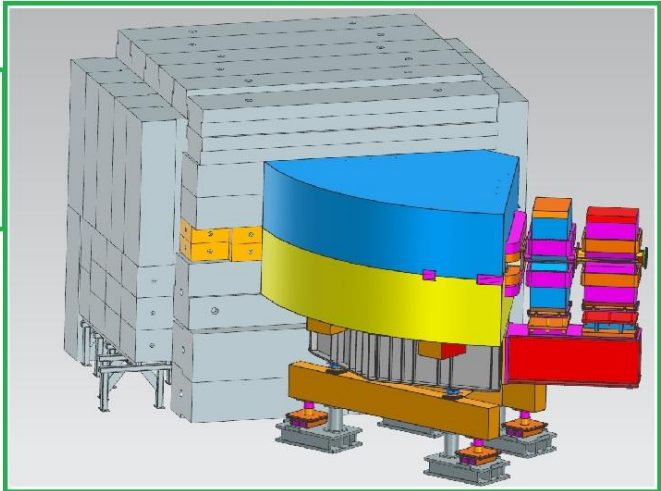
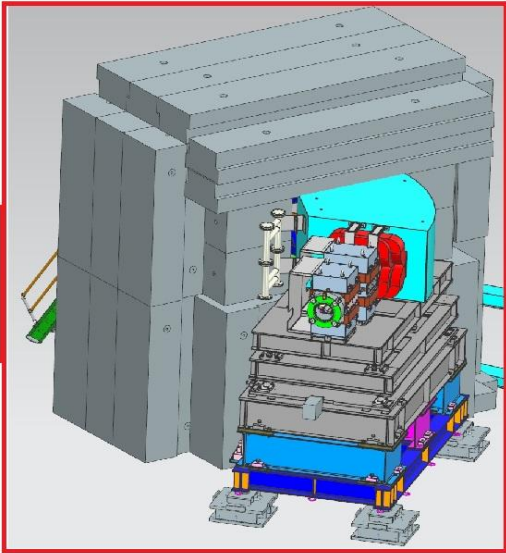
HYPER NUCLEAR – ADDITIONAL RAD SHIELDING



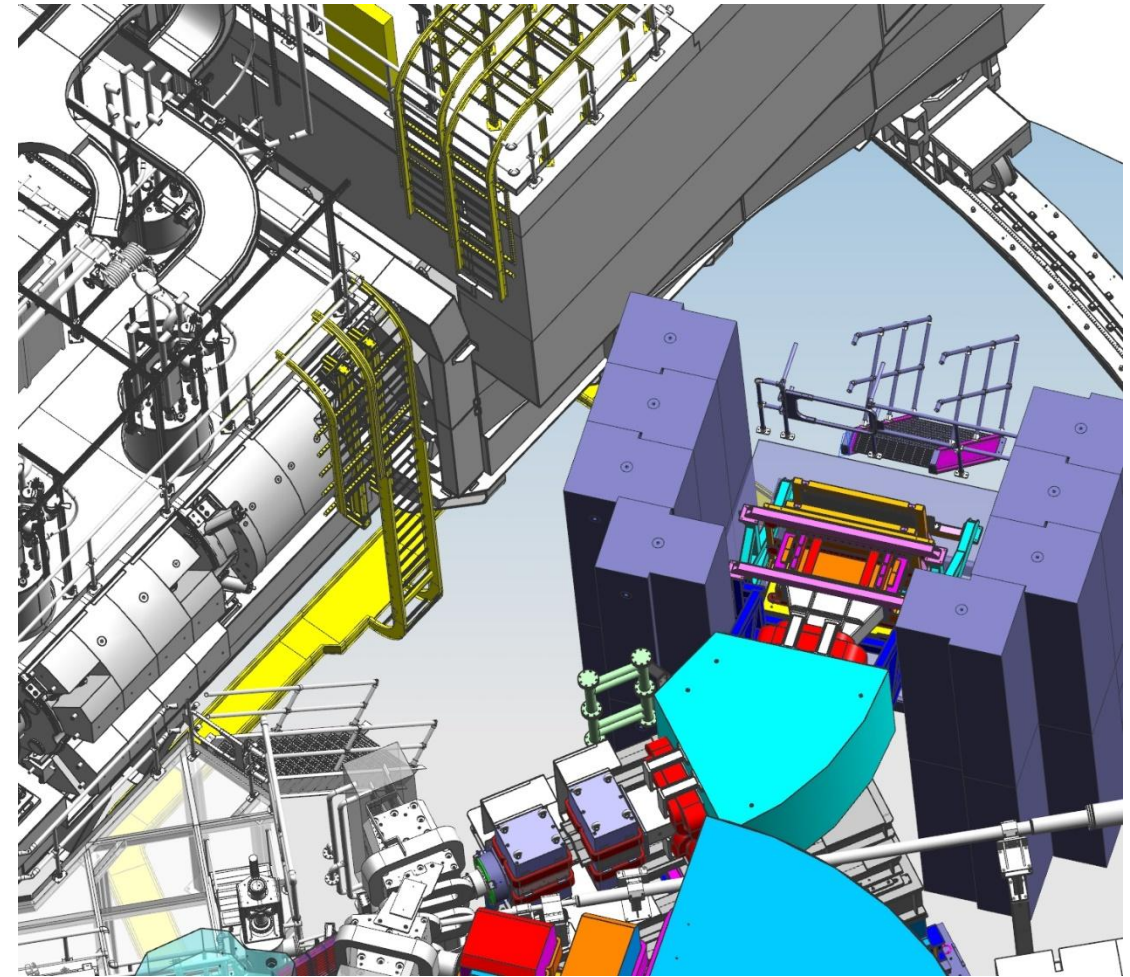
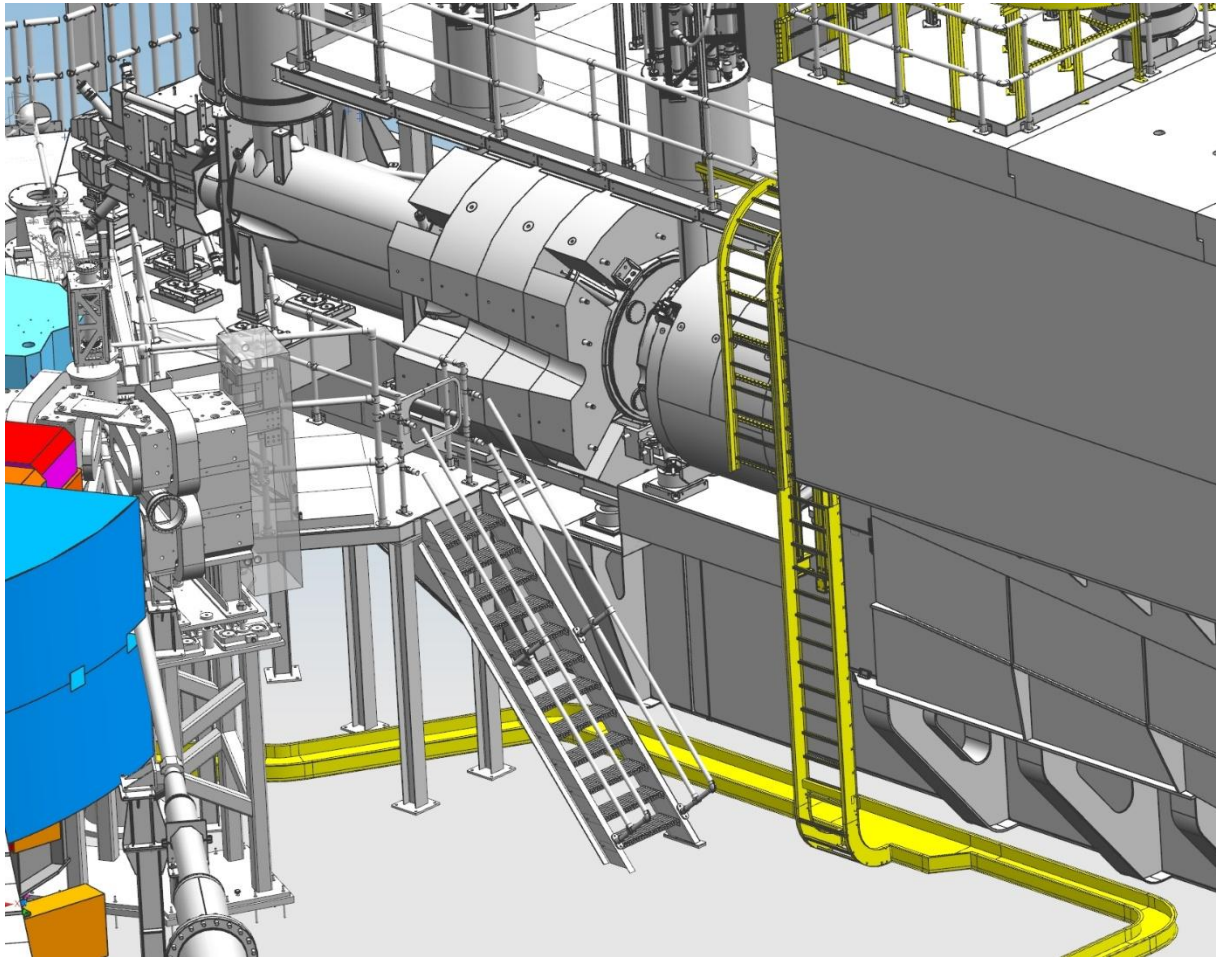
ENGE BUNKER
ADDED LEAD SHIELDING
AROUND THE DETECTORS

HES BUNKER
ADDED SHIELDING
ON TOP AND TUCKED
IN THE SIDE BLOCKS

HKS BUNKER
ADDED SHIELDING
ON TOP AND TUCKED
IN THE SIDE BLOCKS



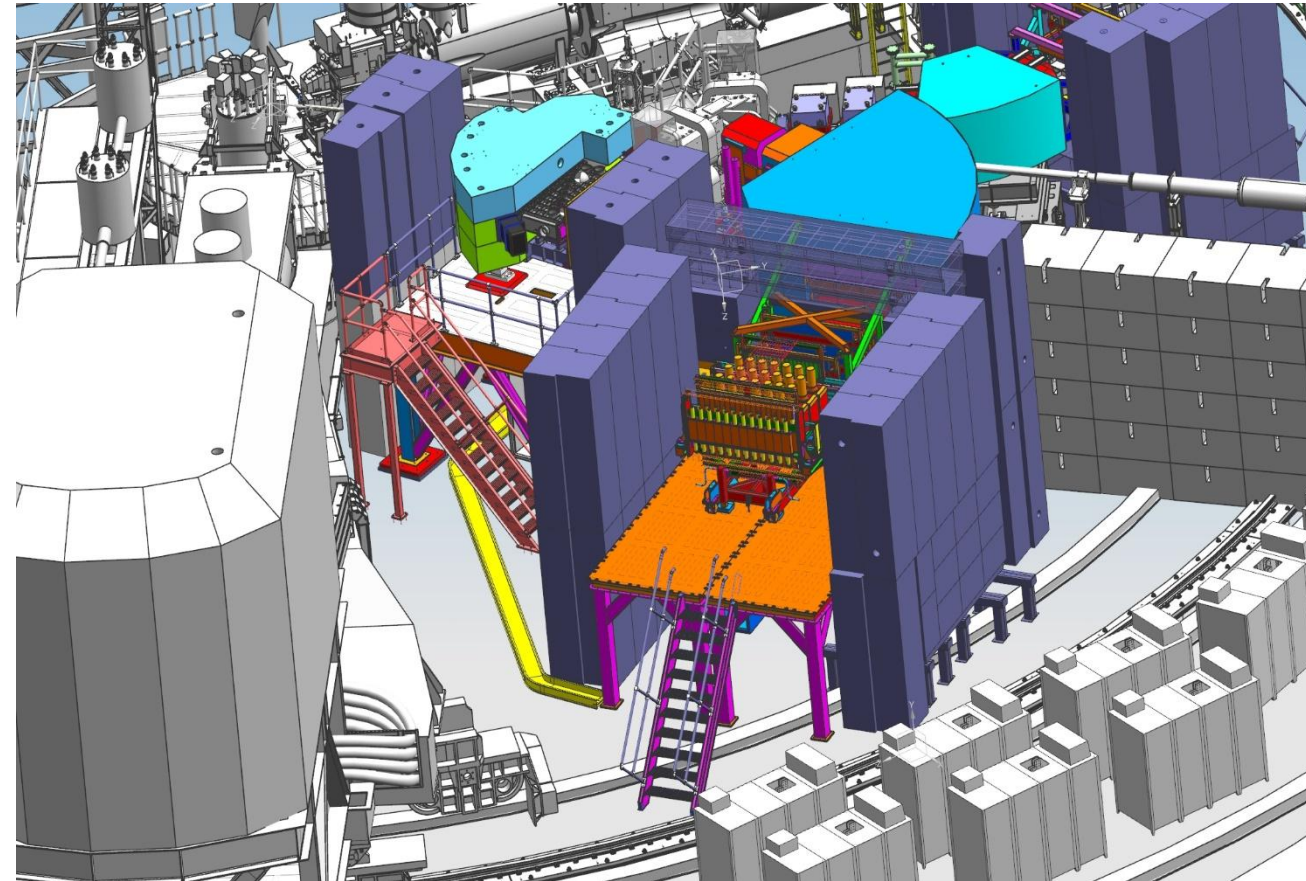
HYPER NUCLEAR – DATA CABLE ROUTING



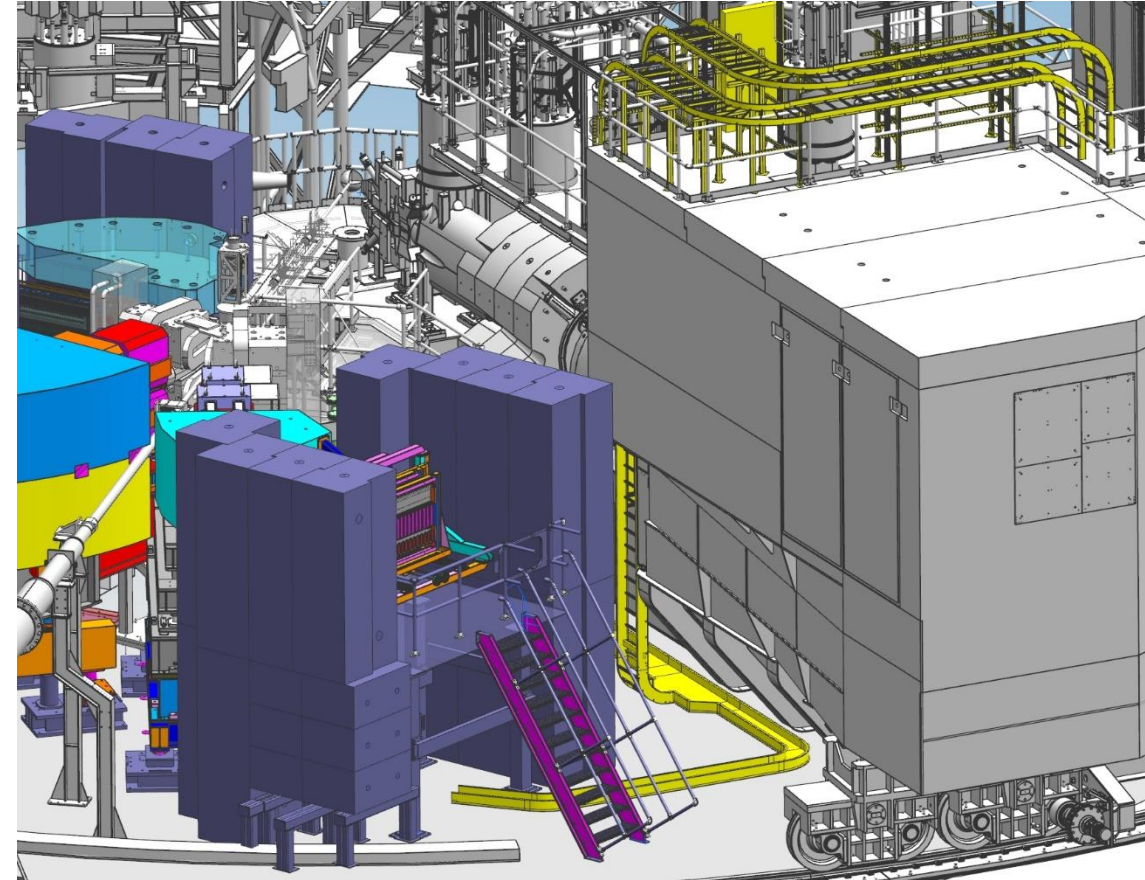
CABLE TRAY LAYOUT FROM SUPER HMS(YELLOW)

HYPER NUCLEAR – DATA CABLE ROUTING

HKS

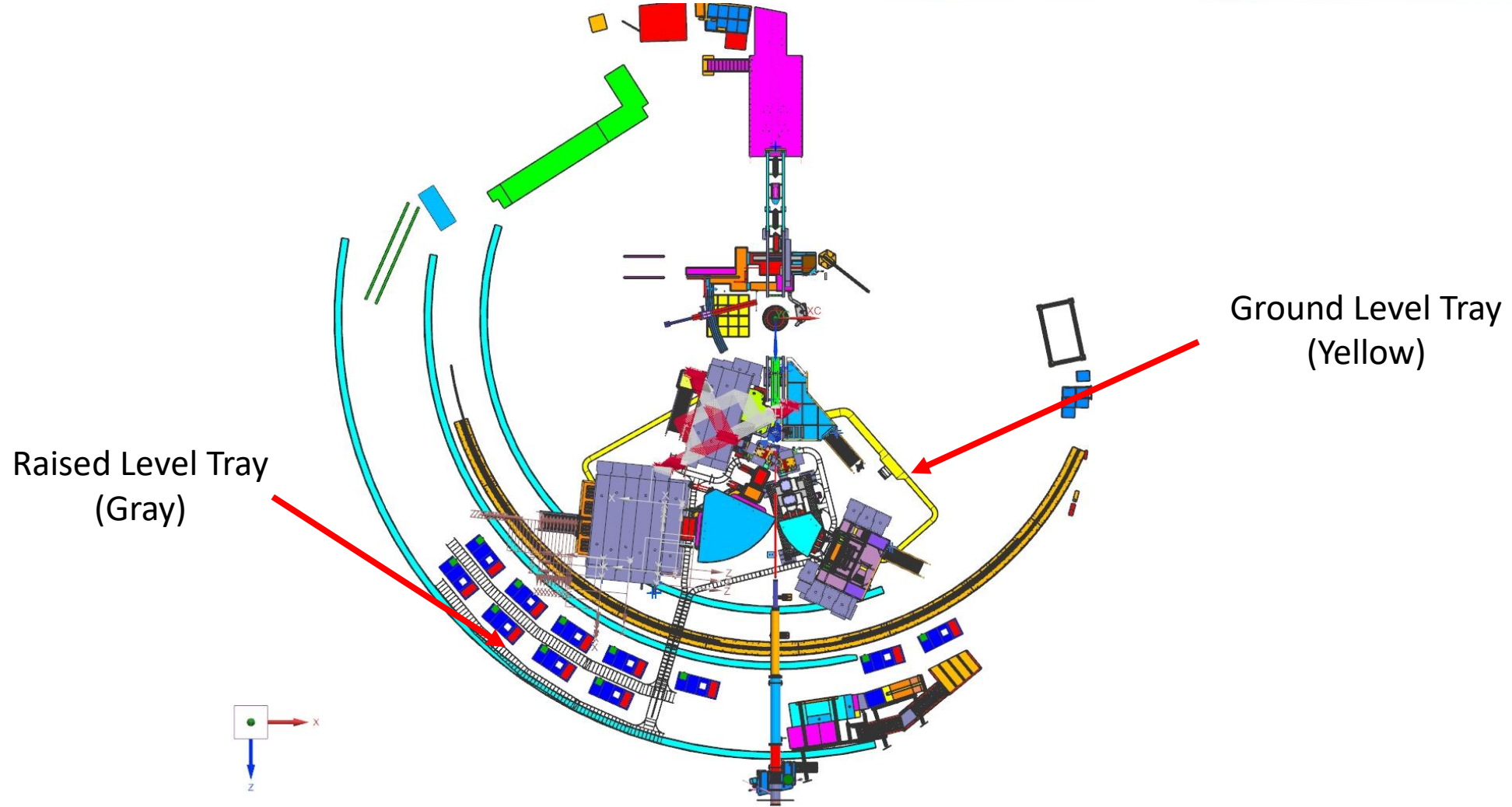


HES



CABLE TRAY LAYOUT FROM SUPER HMS(YELLOW)

HYPER NUCLEAR – CABLE/HOSE ROUTING



HYPER NUCLEAR – POWER SUPPLY UNITS

Magnet	Current (with overhead for MOL) (A)	Voltage (V)	Magnet DC Power kW	Magnet LCW (L/min)	Inductance (H)	Magnet LCW pressure (MPa)	Magnet resistance (not including leads)	PSU – New or existing	PSU Water Flow (L/min) 0.6LPM/kW	PSU DC Power (kW)	Regulation (PPM)
HES E Dipole	1,000	220	220	95	0.820	0.5	0.181/pole	Existing HES PSU	48	220	
HES E Q1	800	110	88	41	0.054	0.5	0.111	Existing BB	48	90	
HES E Q2	800	110	88	41.4	0.056	0.5	0.109	Left Q1 Hall A	48	90	
HKS Dipole	1,140	165	188	135.1	1.95	0.67	0.145	Existing HKS PSU	135	190	
HKS Q1	875	160	140	49.6	No data Use HKS Q2	0.36	0.181	Existing Compton PSU	43	140	
PCS (k)	1,700	106	180	100	2.0 (from vendor report)	0.16	0.06	Existing SBB	100	186	10
PCS (k) corr	1,000	97	97	NA	2.0 (from vendor report)	0.16	0.01	Existing NPS PSU	32	97	10
Corrector magnet	150A			Air cooled		NA		Existing (NPS)	NA		

HYPHER NUCLEAR – POWER SUPPLY UNITS

Magnet	Current (with overhead for MOL) (A)	Voltage (V)	Magnet DC Power kW	Magnet LCW (L/min)	Inductance (H)	Magnet LCW pressure (MPa)	Magnet resistance (not including leads)	PSU – New or existing	PSU Water Flow (L/min) 0.6LPM/kW	PSU DC Power (kW)	Regulation (PPM)
PCS (e')	1,800	130	180	100	2.0 (from vendor report)	100	0.06	PR 451970	112	186	10
PCS(e') corr	1,100	120	97	NA	2.0 (from vendor report)	100	0.1	PR 451970	58	97	10
HKS Q2	500	60	28	17.3	0.36	0.38	0.119	PR 451970	15	25	10
ENGE	331	50	100	50	1.59	1.0		PR 452018	11	17	10
Sub Totals (both sheets)			1,406	629.4					650	1,338	

500+GPM are allotted for Hall C. Preliminary design is ~ 350 GPM

HYPER NUCLEAR – LCW (PS-HALLC-26-001)

CHARGE 1F

Submitted PS-1 Form:

Pressure System Code
ASME 31.9

Liquid under 300 psi

Temp braided trunk line and hose for each
Individual feed.



Gorilla®

Application: A premium-quality, multipurpose industrial hose with a wide range of applications in factories, construction, agriculture, quarries, mines, railroads, the oil and gas industry and shipbuilding. All sizes are crush-resistant and rated at 500 psi (3.4 MPa) maximum working pressure. The premium Carbryn™ cover offers the most superior abrasion resistance of air and multipurpose hose. Non-conductive, minimum electrical resistance greater than 1 megohm per inch of hose length at 1000 Volts DC.

- › Carbryn™ cover for superior abrasion resistance
- › Highest oil resistance in both tube and cover for long life span
- › Crush-resistant with aramid reinforcement for durability

Tube: Nitrile synthetic rubber, ARPM Class A (High Oil Resistance)

Cover: Yellow Carbryn™ synthetic rubber, ARPM Class A (High Oil Resistance), MSHA approved

Reinforcement: Spiral aramid yarn, 2" is braided synthetic yarn

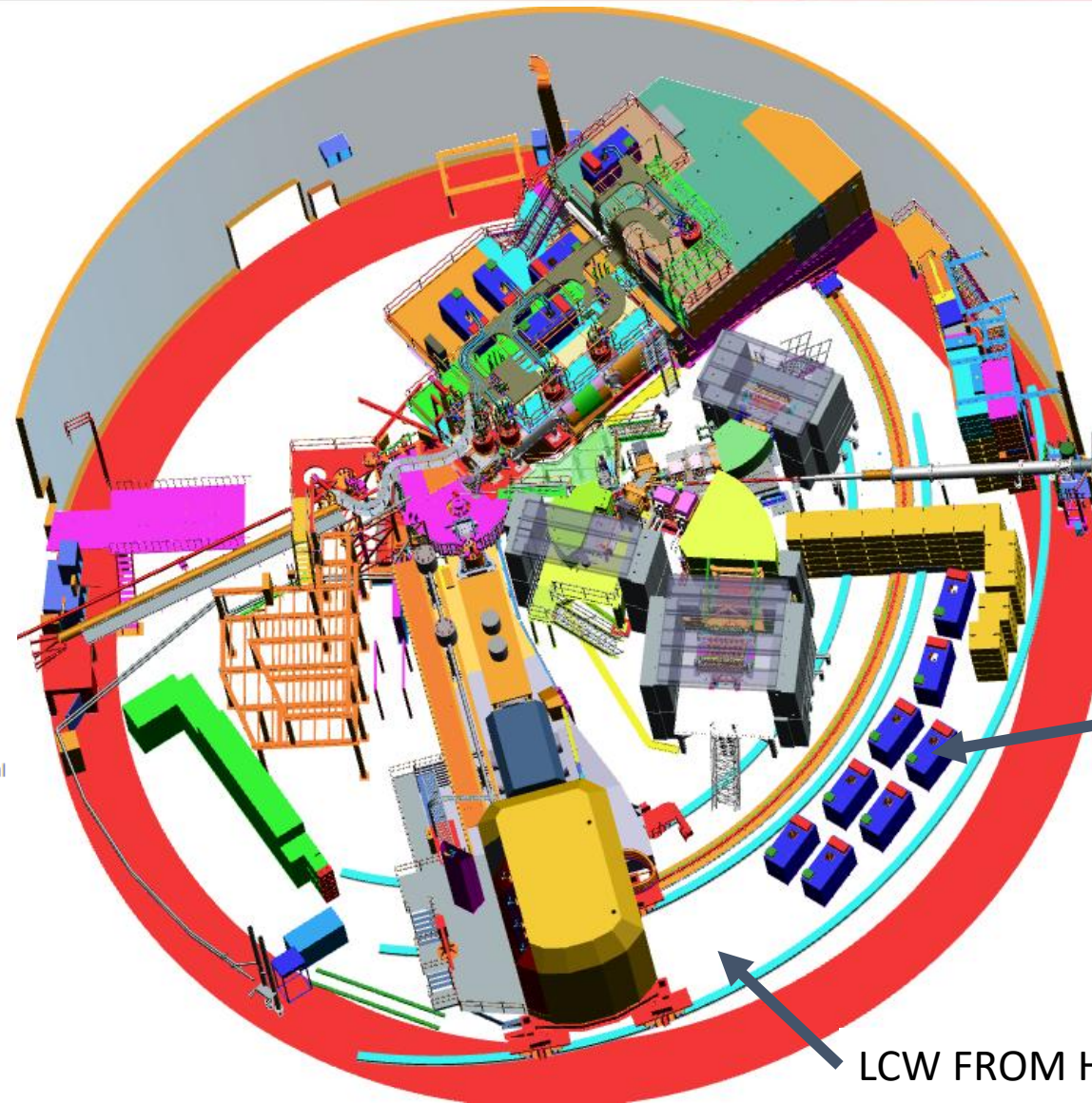
Temperature: -20°F to 210°F (-29°C to 99°C)

Couplings: Continental UC Male NPTF

Order Codes:

569-035

536-446 (2")



PSU LOCATION
(BLUE)

LCW FROM HMS SIDE OF HALL

HYPER NUCLEAR – SCHEDULE

▸ SHMS Moved to Beam right	78 days	Wed 9/1/27	Fri 12/17/27
▸ Anaconda Support Fixture	78 days	Wed 9/1/27	Fri 12/17/27
Design	30 days	Wed 9/1/27	Tue 10/12/27
Fabricate	30 days	Wed 10/13/27	Tue 11/23/27
Install	5 days	Wed 11/24/27	Tue 11/30/27
Disconnect Anaconda from existing support	2 days	Wed 12/1/27	Thu 12/2/27
Attach to new support	2 days	Fri 12/3/27	Mon 12/6/27
Rotate HMS to largest Angle	1 day	Tue 12/7/27	Tue 12/7/27
Remove Target Chamber	2 days	Wed 12/8/27	Thu 12/9/27
Remove Downstream Beamline	3 days	Fri 12/10/27	Tue 12/14/27
Remove equipment/detectors around pivot	2 days	Wed 12/15/27	Thu 12/16/27
Rotate SHMS to largest Angle BR	1 day	Fri 12/17/27	Fri 12/17/27

HYPER NUCLEAR – SCHEDULE

• ENGE Installation	49 days	Fri 12/17/27	Wed 2/23/28
Prep Hall for ENGE magnet	6 days	Fri 12/17/27	Fri 12/24/27
Stage HyperNuclear items in ESB	2 days	Mon 12/27/27	Tue 12/28/27
Move ENGE out of ESB	4 days	Wed 12/29/27	Mon 1/3/28
Transfer ENGE to Hall C	3 days	Tue 1/4/28	Thu 1/6/28
Move ENGE around SHMS	6 days	Fri 1/7/28	Fri 1/14/28
Move SHMS to largest Angle	4 days	Mon 1/17/28	Thu 1/20/28
ENGE Shield blocks 13x26x26 (15x) Install (under platform shielding)	4 days	Fri 1/21/28	Wed 1/26/28
Crane in ENGE support frame	3 days	Thu 1/27/28	Mon 1/31/28
Position/Survey/Align/Grout ENGE Support Frame	3 days	Tue 2/1/28	Thu 2/3/28
Bring in Lifting tower	3 days	Fri 2/4/28	Tue 2/8/28
Position ENGE onto Support Frame	3 days	Wed 2/9/28	Fri 2/11/28
Remove lift towers from hall	3 days	Mon 2/14/28	Wed 2/16/28
ENGE detector platform (mounts to magnet)	3 days	Thu 1/27/28	Mon 1/31/28
ENGE detector package	6 days	Tue 2/1/28	Tue 2/8/28
ENGE roof blocks (3x)	3 days	Wed 2/9/28	Fri 2/11/28
ENGE wall blocks (12x)	4 days	Mon 2/14/28	Thu 2/17/28
Enge Detector package	4 days	Fri 2/18/28	Wed 2/23/28
Target support post installation	3 days	Thu 1/13/28	Mon 1/17/28
Target platform installation	3 days	Tue 1/18/28	Thu 1/20/28
Upstream Girder Suport stand installation	25 days	Fri 1/21/28	Thu 2/24/28

HYPER NUCLEAR – SCHEDULE

PCS Magnets Installation	43 days	Thu 2/24/28	Mon 4/24/28
Target chamber installation	10 days	Thu 2/24/28	Wed 3/8/28
Sieve Slits (2x) Installation	5 days	Thu 3/9/28	Mon 3/20/28
First Section of Beamline installation	3 days	Tue 3/21/28	Thu 3/23/28
NPS correction magnet Installation	3 days	Fri 3/24/28	Wed 3/29/28
Install PCS Stand	4 days	Tue 2/8/28	Mon 2/14/28
Install Magnet PCS 1	8 days	Tue 2/15/28	Fri 2/25/28
Install Magnets PCS 2	3 days	Mon 2/28/28	Wed 3/1/28
Install LCW and Electrical connection	5 days	Mon 3/6/28	Fri 3/17/28
Survey and Alignment	2 days	Mon 3/20/28	Tue 3/21/28

HYPER NUCLEAR – SCHEDULE

▴ HES Arm	60 days	Fri 4/21/28	Thu 7/13/28
HES support frame installation	2 days	Fri 4/21/28	Mon 4/24/28
HES Quad(2x) installation	4 days	Tue 4/25/28	Fri 4/28/28
HES Bellows	2 days	Mon 5/1/28	Tue 5/2/28
HES Dipole	10 days	Wed 5/3/28	Tue 5/16/28
HES Shield blocks 13x26x26 (24x)	4 days	Wed 5/17/28	Mon 5/22/28
HES Detector frame / platform	2 days	Tue 5/23/28	Wed 5/24/28
HES Detector	3 days	Thu 5/25/28	Mon 5/29/28
HES Rail Bridge	2 days	Tue 5/30/28	Wed 5/31/28
HES wall Blocks (14x)	3 days	Thu 6/1/28	Mon 6/5/28
HES Large Shield Blocks (6x)	3 days	Tue 6/6/28	Thu 6/8/28
HES roof blocks (4x)	2 days	Fri 6/9/28	Mon 6/12/28
Survey and Alignment	2 days	Tue 5/30/28	Wed 5/31/28

HYPER NUCLEAR – SCHEDULE

▴ HKS Arm	74 days	Thu 7/13/28	Tue 10/24/28
HKS support frame installation	3 days	Thu 7/13/28	Mon 7/17/28
HKS Quad (2x) installation	4 days	Tue 7/18/28	Fri 7/21/28
HKS Bellows	2 days	Mon 7/24/28	Tue 7/25/28
Shield Block 13x26x26 (28x)	5 days	Wed 7/26/28	Tue 8/1/28
Shield Block 52x52x26 (15)	3 days	Wed 8/2/28	Fri 8/4/28
HK Dipole	12 days	Mon 8/7/28	Tue 8/22/28
HKS Detector	3 days	Wed 8/23/28	Fri 8/25/28
HKS Rail Bridge	2 days	Mon 8/28/28	Tue 8/29/28
HKS Detector frame / platform (2x)	2 days	Wed 8/30/28	Thu 8/31/28
Large Shield Block (15x)	3 days	Fri 9/1/28	Tue 9/5/28
HKS wall blocks (28x)	5 days	Wed 9/6/28	Tue 9/12/28
HKS roof blocks (7x)	4 days	Wed 9/13/28	Mon 9/18/28
Survey and Alignment	2 days	Tue 8/8/28	Wed 8/9/28
Vacuum pumps installation	3 days	Tue 9/19/28	Thu 9/21/28
Downstream beam line installation	3 days	Fri 9/22/28	Tue 9/26/28
Cable trays	10 days	Wed 9/27/28	Tue 10/10/28
DC power cables	10 days	Wed 10/11/28	Tue 10/24/28

HYPER NUCLEAR – SCHEDULE

LCW lines (around magnets)	40 days	Tue 10/24/28	Mon 12/18/28
LCW lines to pivot	5 days	Tue 10/24/28	Mon 10/30/28
DC power supplies (12x)	10 days	Tue 10/31/28	Mon 11/13/28
480 Vac power lines	10 days	Tue 11/14/28	Mon 11/27/28
Power on Power Supplies	14 days	Mon 11/27/28	Thu 12/14/28
Tune and Calibration	21 days	Wed 1/3/29	Wed 1/31/29

HYPER NUCLEAR – MANPOWER

Mechanical Installation

Title	Employee	Allocation
Engineers:	Jamie Shiflett	100%
	Engineer I (TBD)	100%
Designers:	Paulo Medeiros	100%
	Hunter Garrett	100%
	Designer II (TBD)	100%
	Designer I (TBD)	100%
Tech:	Jerry Nines	100%
	Larry Carraway	100%
	Mike Bowman	100%
	Phillip Ullman	100%
	Tech II (TBD)	100%
	Hall A Tech	50%
	Hall A Tech	50%

ELECTRICAL INSTALLATION

Title	Employee	Allocation
Engineers:	Ellen Becker	100%
	Engineer I (TBD)	100%
Designers:	Paulo Medeiros	100%
Tech:	Electrical Tech (TBD)	100%
	Accelerator Electrician	60%
	Accelerator Electrician	60%

FUTURE TASKS

- TIMELINE TO CHECKOUT EXISTING POWER SUPPLIES
- TESTING OF PCS MAGNETS AND FIELD MAPPING
- ASSEMBLY INSTALLATION PROCEDURES

RECOGNITIONS

LEGUANG TANG, BILL HENRY, PAULO MEDIEROS, MARK GARRET, JASON CLARK, JERRY NINES, LARRY CARRAWAY, PHILLIP ULLMAN, MICHAEL BOWMAN, ELLEN BECKER,