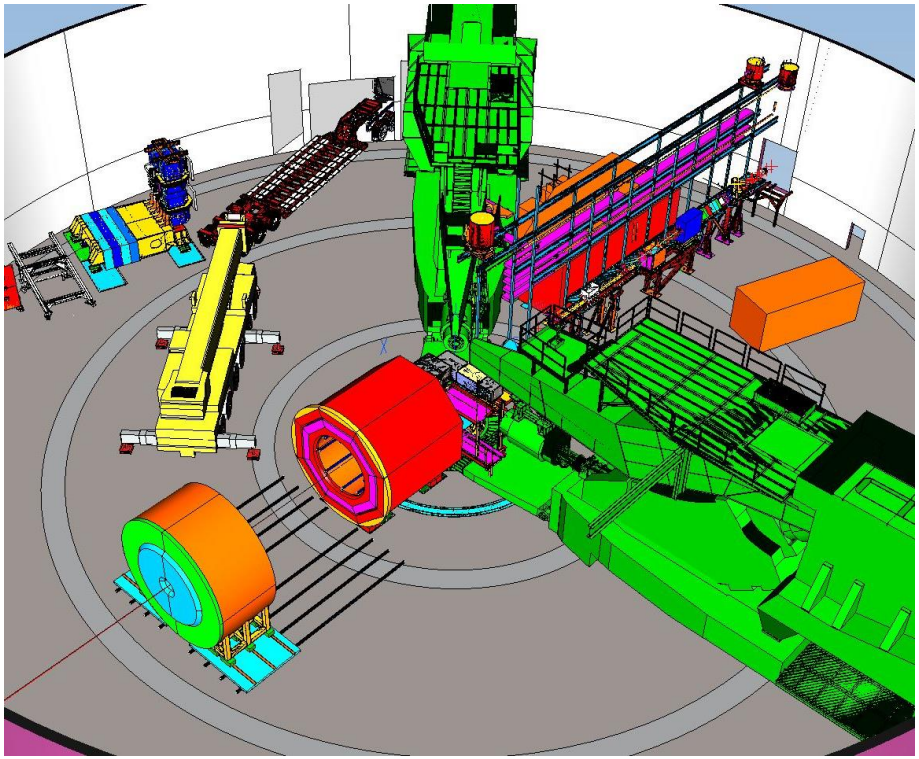
SoLID Collaboration Meeting

Magnet Test & Detector Support



Whit Seay

December 15, 2021

Presentation Outline

Latest updates – Cold Test

1) Cold test update
2) Detector support plan
3) Misc.

Merged CLEO Refurbishment and Cold Testing (Phase 1)*

1. New Instrumentation and Control System – FY18
   - Design the system – completed
   - Identify hardware and software requirements – completed
   - Procurement – completed
   - Assemble and test the new I&C – in progress – assembly started

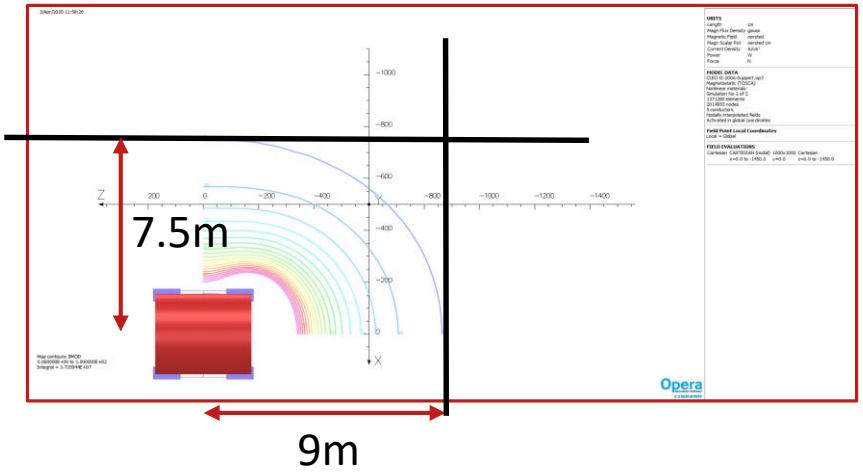
2. New Cryo Control Reservoir – FY 19-20
   - Design to interface w/ CLEO and JLAB ESR system – in progress
   - Procurement: – completed
   - **Acceptance testing upon arrival-leak & pressure** – completed

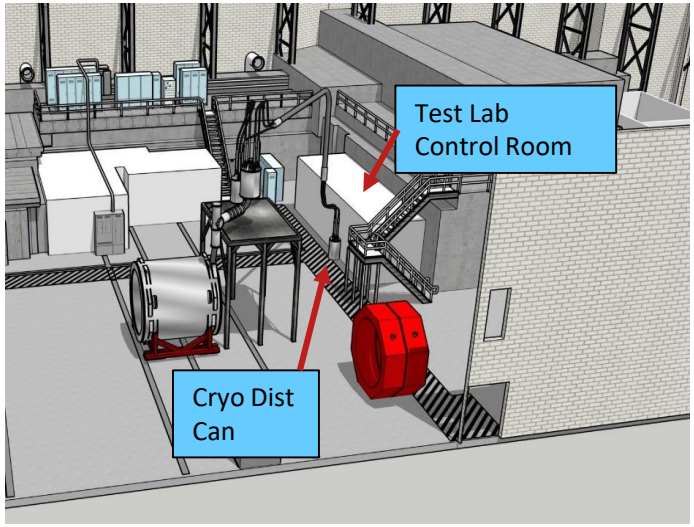
3. Static Testing of the CLEO Magnet – FY 18-20
   - Check out existing instrumentation in the cryostat – completed
   - HIPOT test the coil – completed
   - **Tested 50% of the radial loadcells** – completed Nov 2020

Merged CLEO Refurbishment and Cold Testing (Phase 1)*

4. Test Lab Layout – FY20
   - Run a careful magnetic analysis of coil in test lab* – completed
   - Identify 50 gauss and 5 gauss boundaries* – completed
   - Identify existing transfer lines that can be used in test– completed
   - Lock down final magnet position for test – completed

5. Support Structures for Cold Test – FY 20-21
   - Design platform to support CCR/personnel access – in fabrication
   - Design cryo line supports – in progress



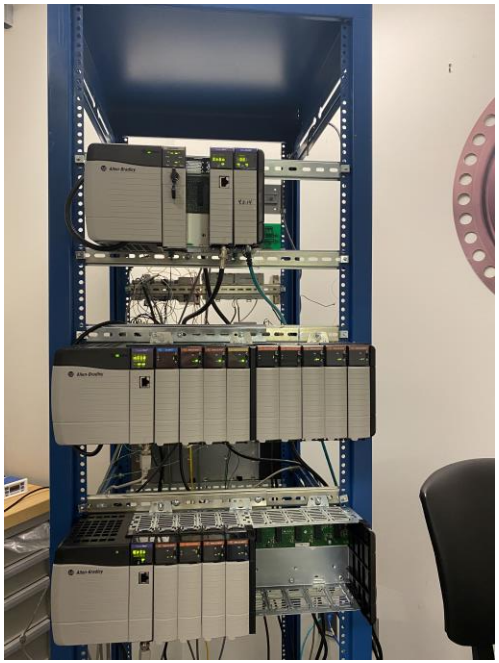


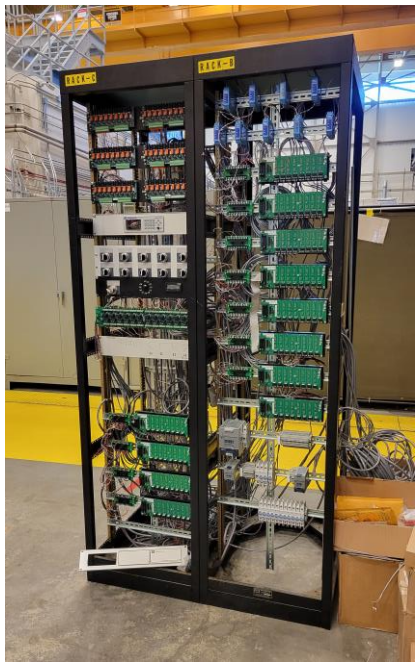
*Addresses technical suggestion from Director's Review

Jefferson Lab

Magnet – Cold Test Update

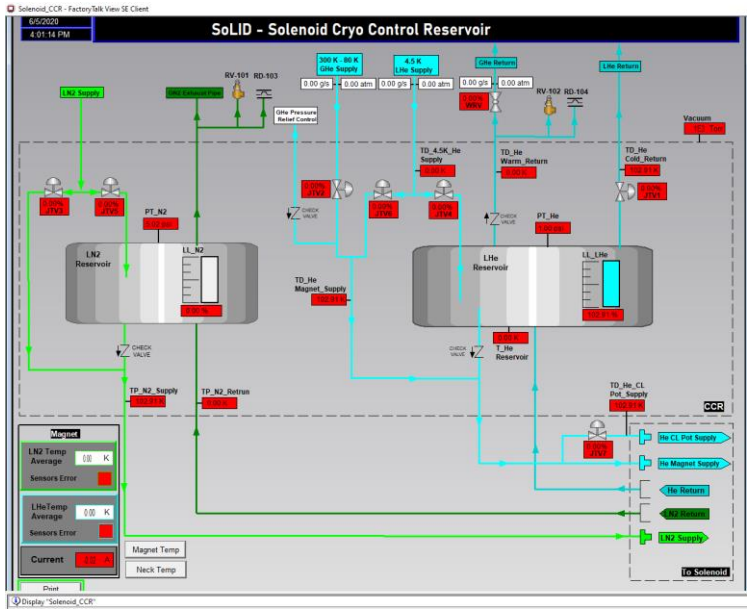
- **Majority of our effort remains focused on the cold test**
- Merged the CLEO refurbishment/static test and cold testing into Phase 1
- **Detector Support Group (DSG) is making steady progress on SoLID control system**
- Hall C has provided engineering and design support for the CCR and interface with the current lead stack (turret). Performed an analysis of the coils in the test lab to identify magnetic field boundaries.
- Personnel access platform designed – working on support for CCR, heat exchanger, turret





Magnet - Cold Test Update - Controls

- Detector Support Group (DSG) are assembling the control racks
- **PLC code & HMI screen development are complete**
- Modifying a Hall C superconducting magnet controls program for use with SoLID
- Interface with cryo group and MCC ongoing (CSS)
- **Motor controller boards for JT valve control delivered**
- **Checking/reviewing the PLC code – 50+ pages to date**
- Neck temperatures, radial and axial supports and radial and axial support expert CSS-BOY screens created
- Latest version of CCR control HMI updated
- **Electrical drawings are being reviewed**
- **Cables for the control system being procured**
- **Assembly of control system nearing completion**
- **Estimated completion Jan 2022**



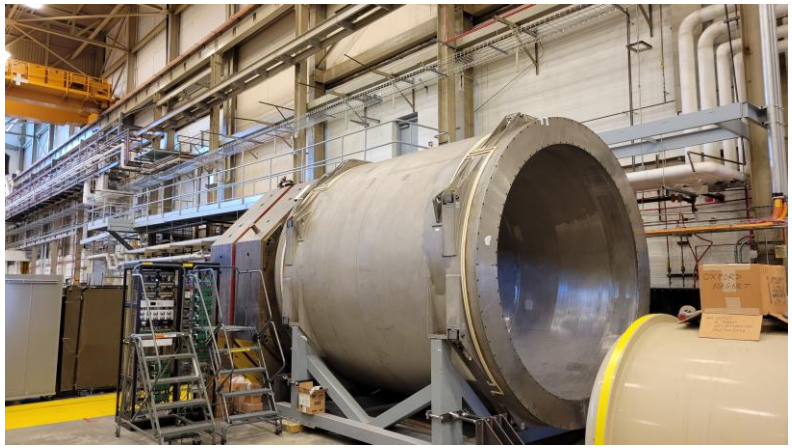
Magnet – Access Platform Update

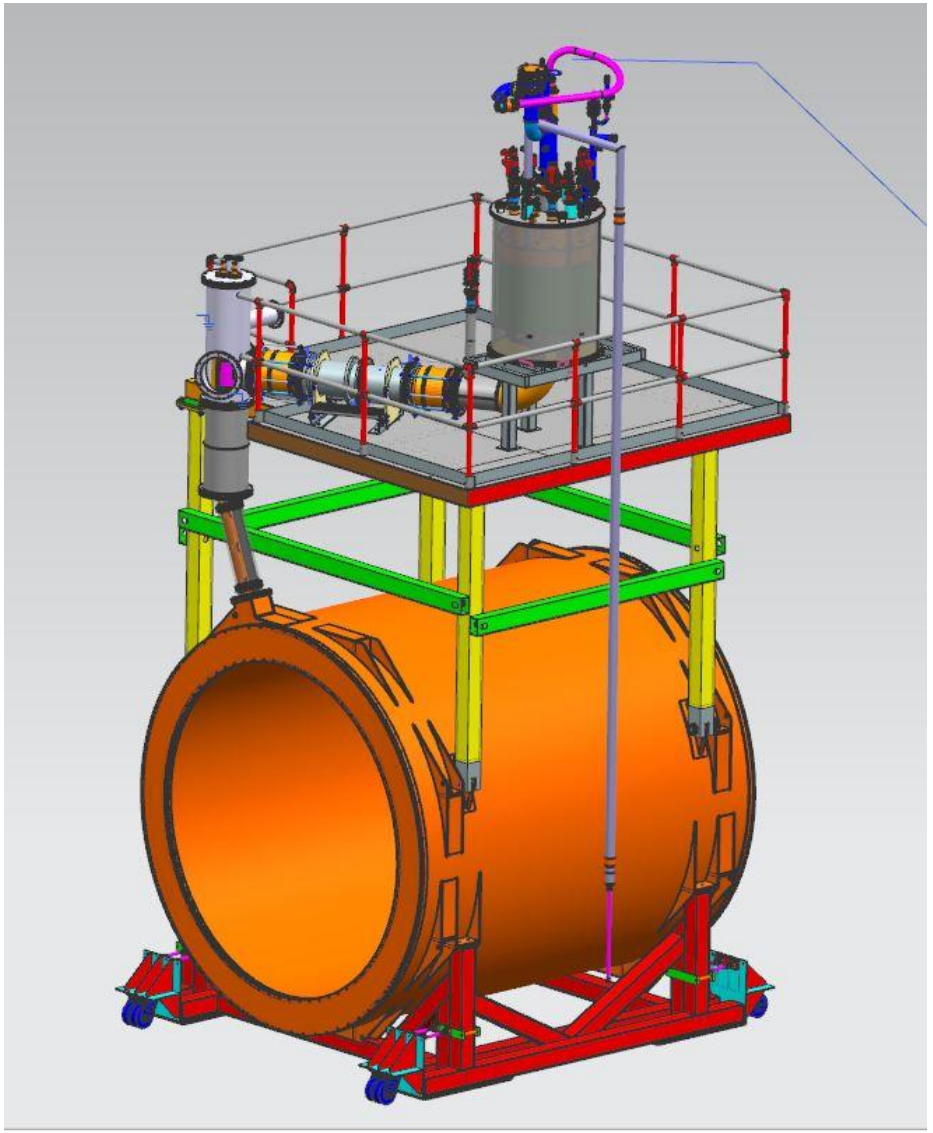
Platform design completed

Fabrication has started - material ordered last week

Design for CCR support and service turret support in progress.

Connection between CCR and service turret along with its support stand has been designed. Drawings in progress.





Cold Test Update – CCR – Testing Complete

CCR delivered early March 2021

Final acceptance tests completed end of March 2021

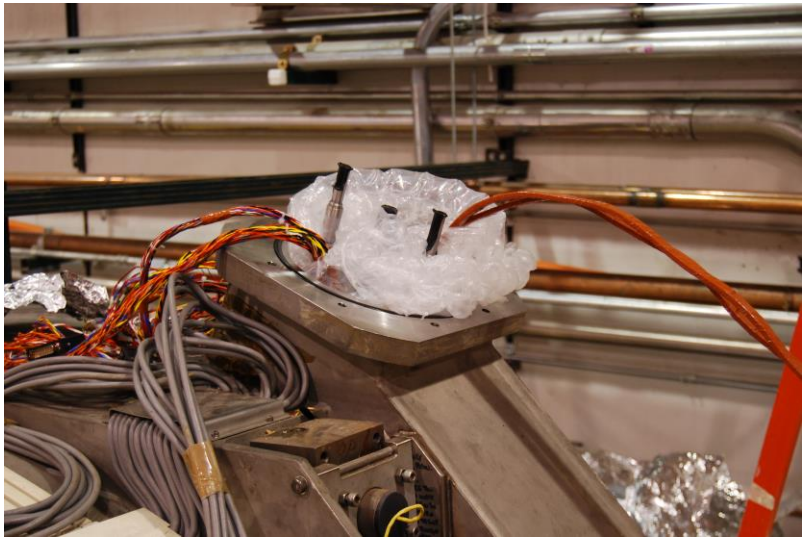
Ready for instrumentation and JT valve installation

Cold Test Update – Service Turret Removal - Complete

Service turret housing SC leads removed from 700L CLEO dewar.

Design of connection between turret and new CCR finalized. Welded bellows is in procurement.

Planning and writing of procedures for service neck installation on the cryostat in progress.

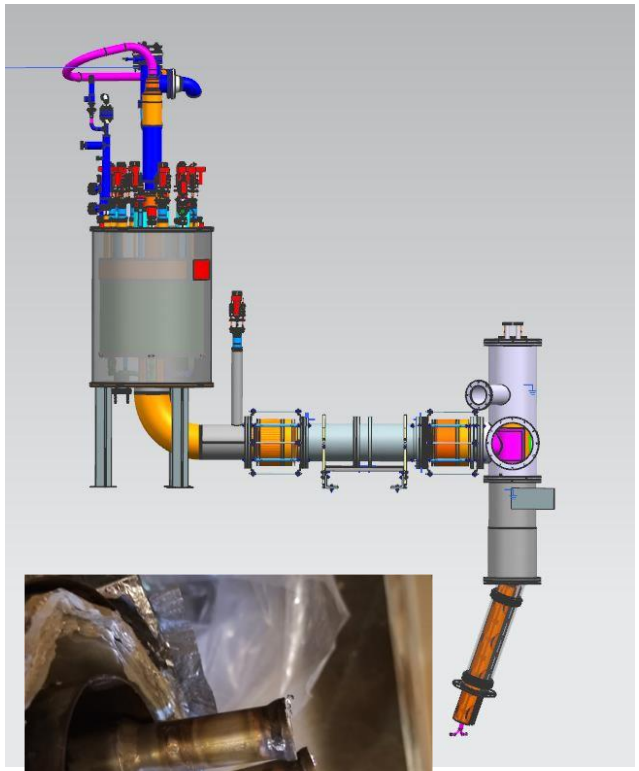


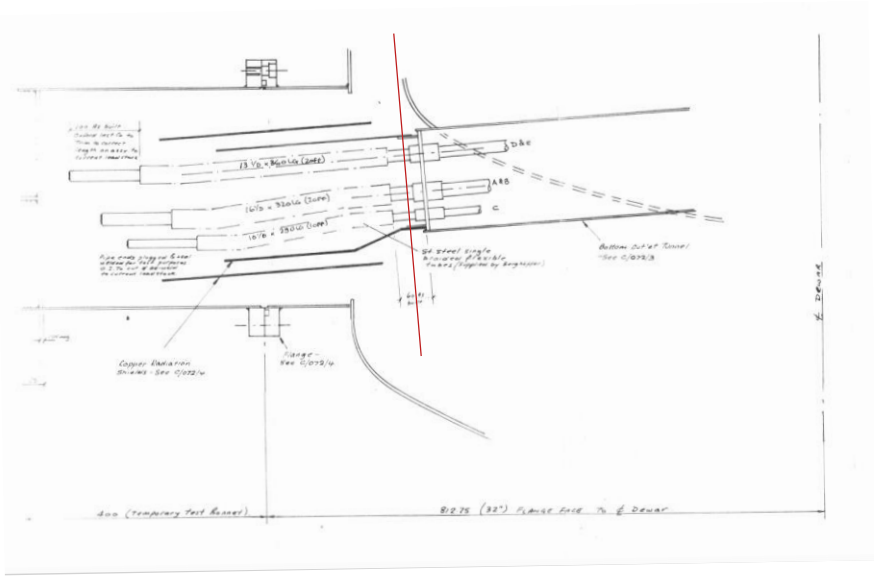
Cold Test Update - Section cut through CCR and Current Lead Pot

Connection between CCR and current lead stack turret finalized Oct 2022.

Cryo piping updated – revision to piping made based on cut location

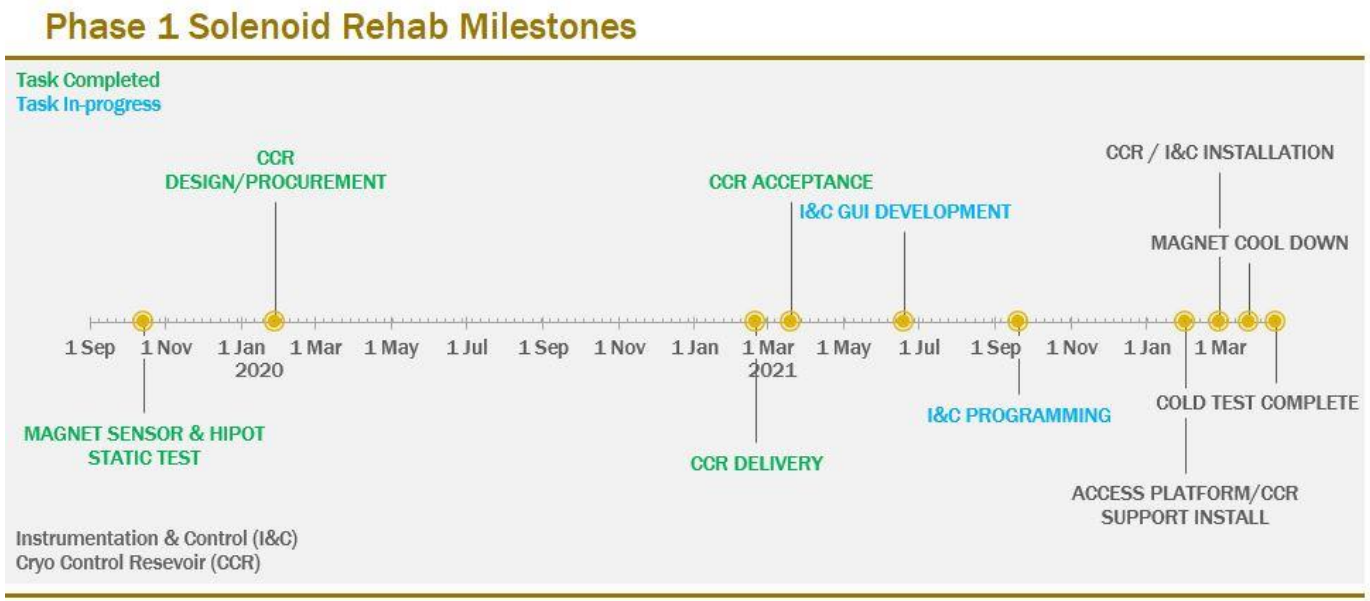
Vacuum jacket and radiation shielding design updated after turret removal and piping update

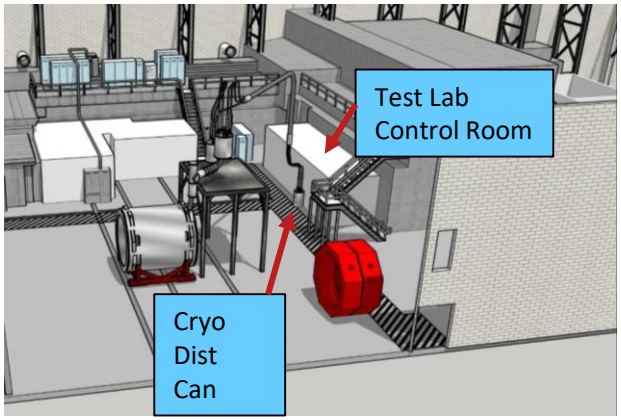




Jefferson Lab

Cold Test Update – Cold Test Milestones





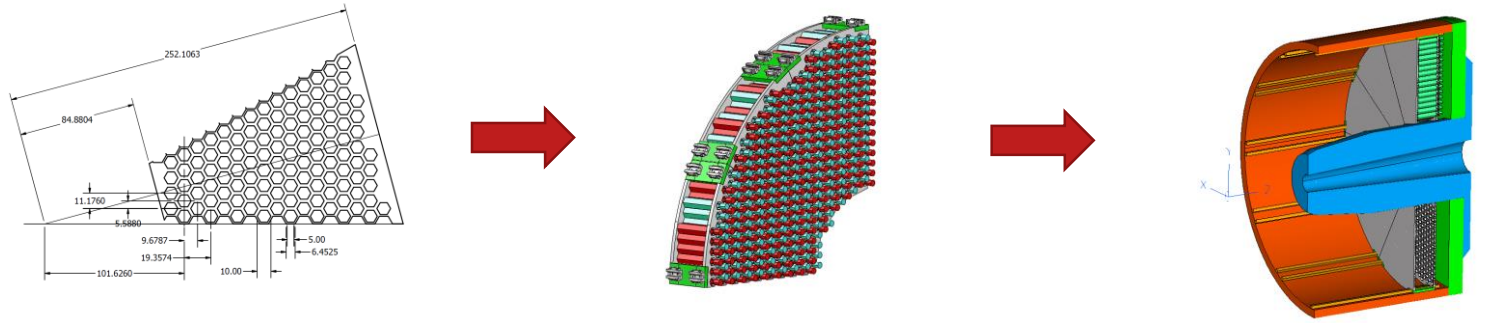
- Solenoid rehab will confirm condition of the magnet
- Provide risk reduction to the project
- Improve magnet cost estimate
- Estimated completion April 2022

Infrastructure – Detector Support Plan

Looking forward….preparing for CD0 → CD1 design work on detector supports

- Provide updated detector design details to engineering/design – CAD models, space requirements and weight
- Provide preliminary assembly plan – include any assembly fixture design or concepts
- Develop initial detector delivery → assembly → testing → installation plan for each detector group
- All high level discussions at this point

This will define the requirements of each detector and lead us into installation fixture design. Ideally each detector group would have the same or very similar installation fixture

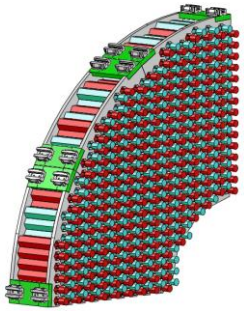


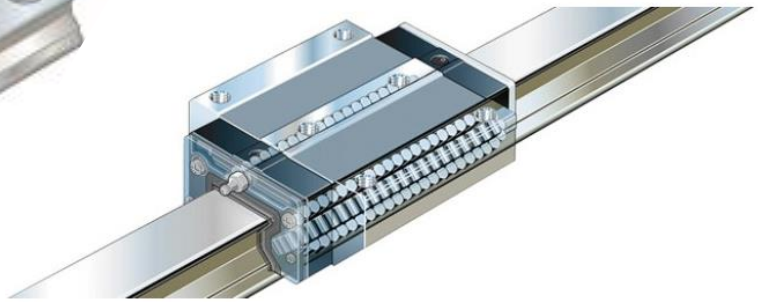
Infrastructure – Detector Support Plan

Requesting updated detector design information from detector groups

- Number of sectors of your detector
- Final installed configuration – one piece or two? Remember detectors support by rails in endcap must be assembled into two halves split vertically. LGC is the exception since it doesn't mount to rails.
- Weight of each sector
- Robust lift points – used for lifting, rotating into proper orientation and installation

This allows us to lock in quantity and size of the rails – likely governed by heaviest detector

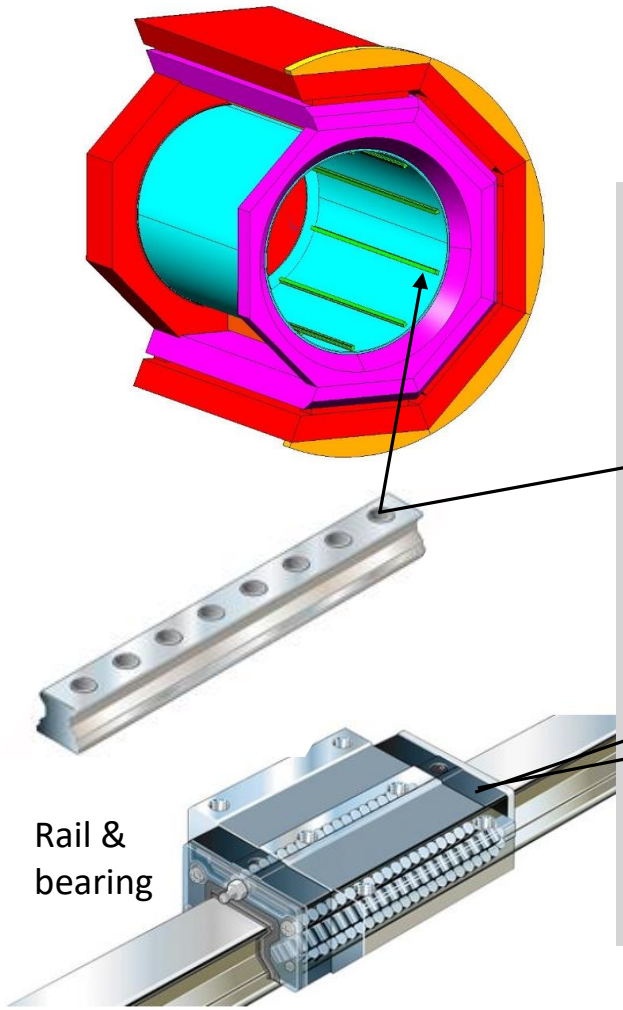


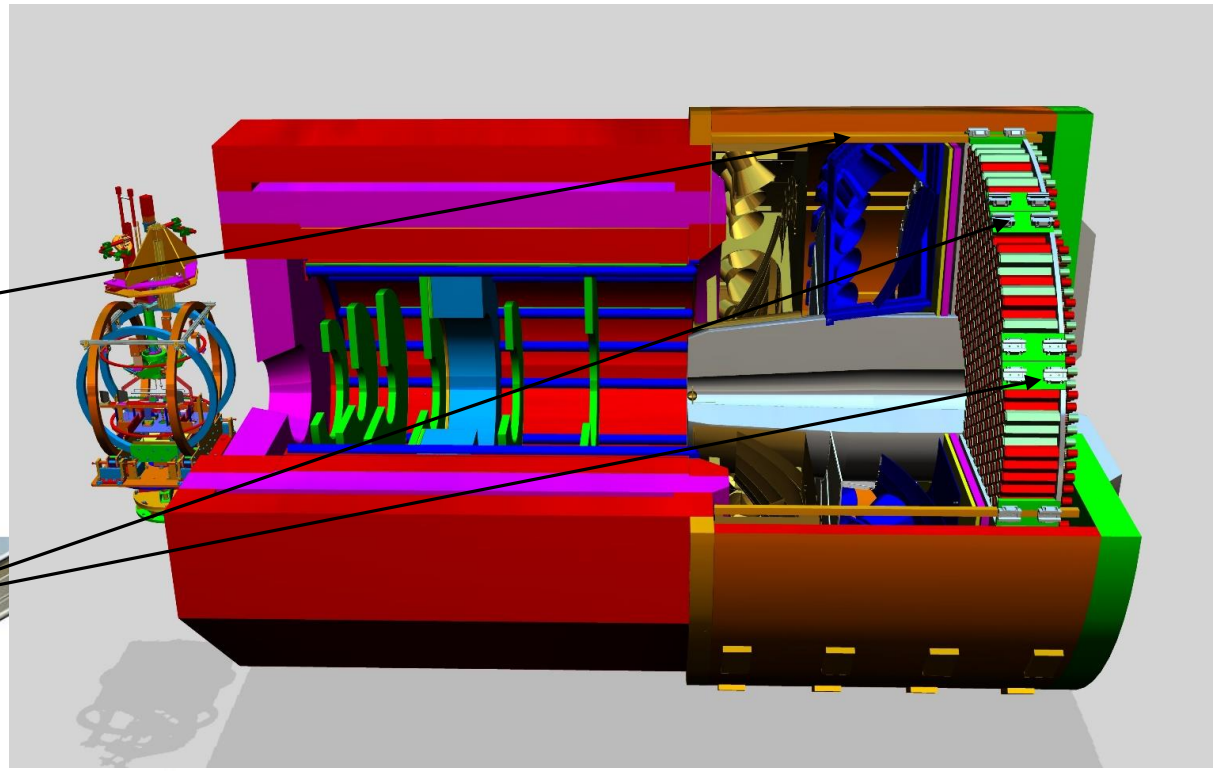


Infrastructure – Detector Support Structure

Provide a universal mounting system that is utilized by each detector group.
Use the same concept for internal magnet and endcap locations.

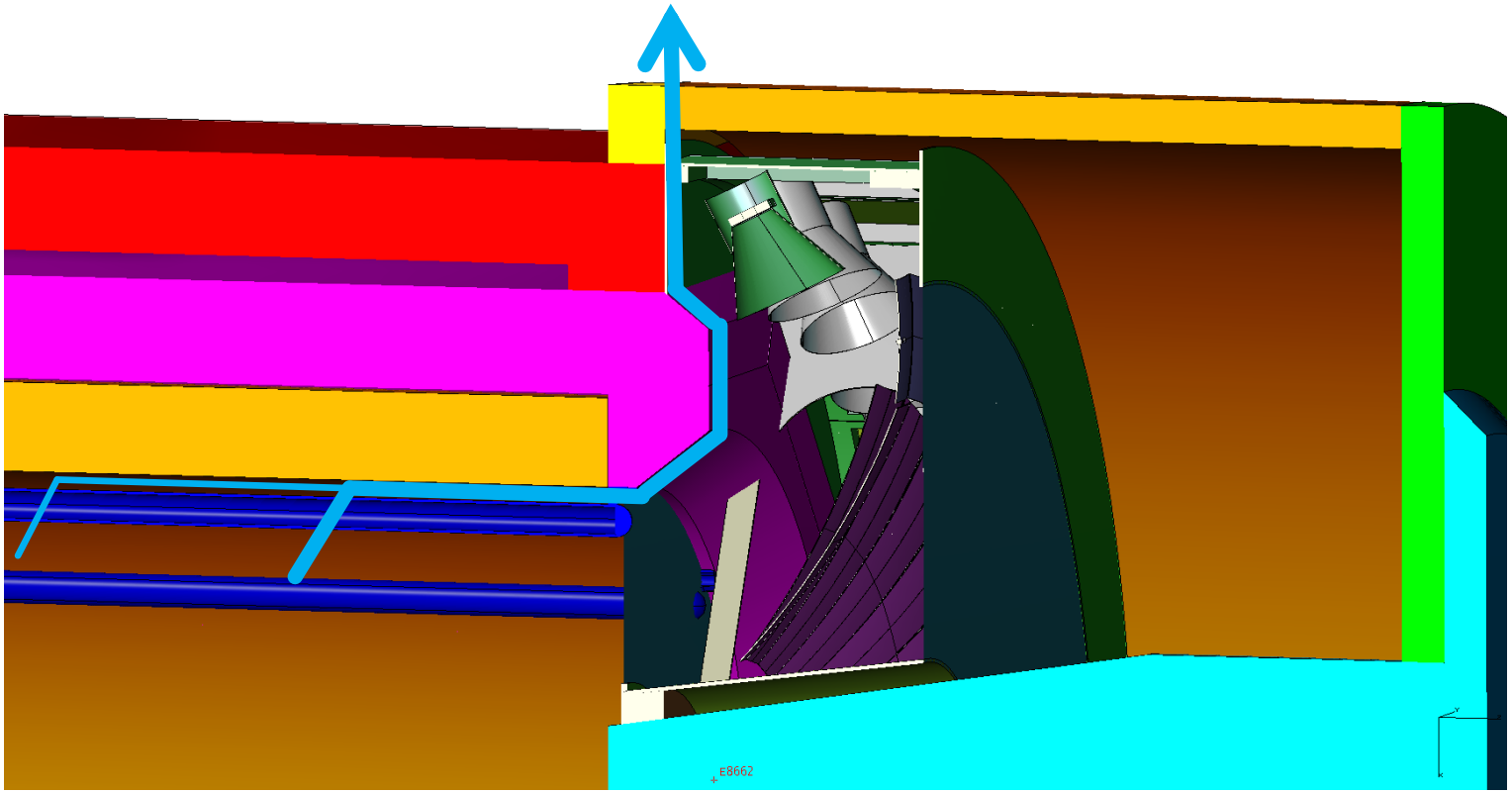
Conceptual design uses off the shelf rails and bearings. Bearings will be integrated into individual detector design.





Infrastructure – Magnet Bore Cable Routing – LGC

Below demonstrates the possibility of running cables from inside the bore downstream and out radially along the perimeter of the coil collar, layers of return iron and out through openings in the front of the endcap. This could create channels for bundles to weave their way out. This impacts the LGC space and the design of their tank. **Defining these requirements needs to be a priority.**

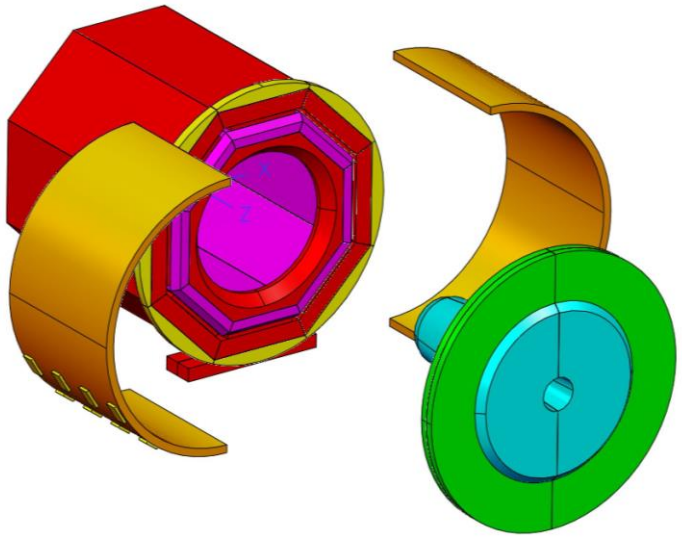


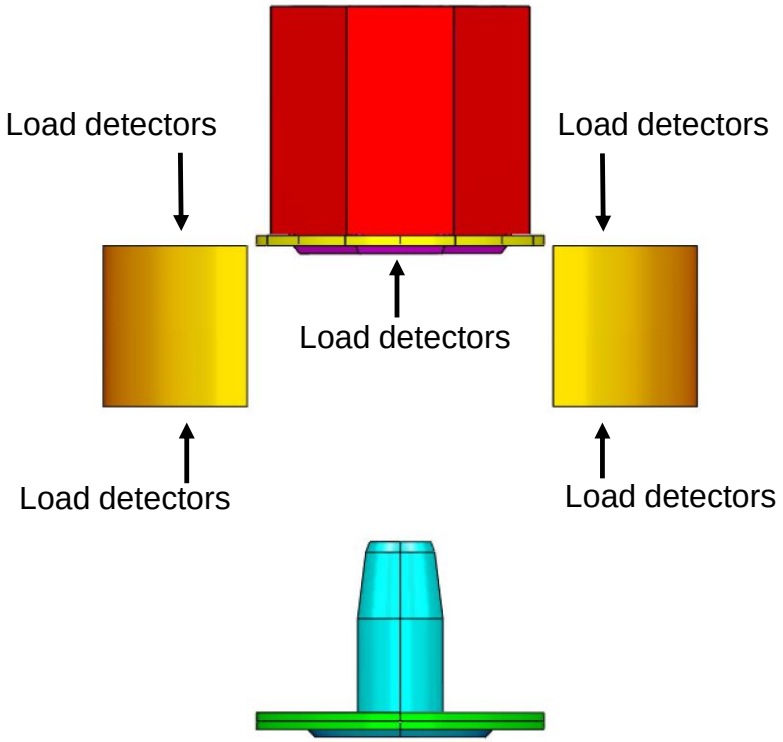
Magnet – Endcap Motion Concept

Decouples the nose and backplates from the half cylinders

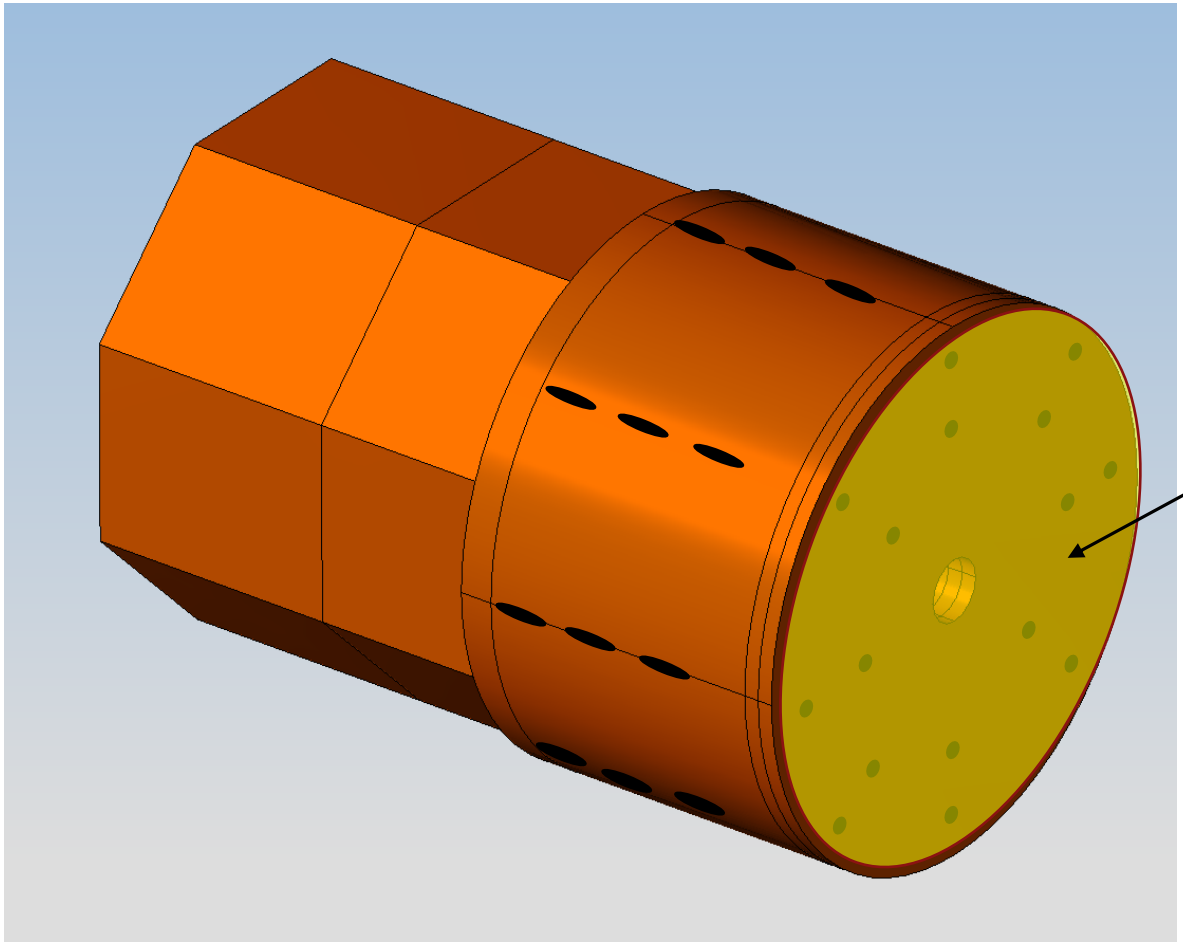
Provides additional access points for installing and servicing detectors

Simplifies motion system and tracks mounted to the floor





Magnet – Access Holes for Cabling



With new endcap motion concept the rear backplates are no longer available to route cables out of endcap

Magnet – Detector Cables – Update Total Area Needed

	Total area(cm2)	Location to go out	comment
FAEC (PVDIS)	1800	Endcap Back plate	1800 1.1cmD fiber bundle, 1800 0.3cmD fiber bundle
LAEC (SIDIS)	500	near downstream collar?	500 1.1cmD fiber bundle, 500 0.3cmD fiber bundle
FASPD	tiny	endcap side	240 1mmD fiber
LASPD	40	near downstream collar or solenoid front?	60 HV, 60 BNC
LGC	170	Near downstream collar or endcap side?	270 5mmD HV, 270 3mmD BNC
HGC	300	Endcap side	480 HV, 480 BNC 2 gas line at top, 2 gas line at bottom
GEM (PVDIS)	650	Near downstream collar or endcap side?	1,2,3 GEM planes, total cable 540 HDMI, 90 SHV, 180 Gas, 6mmD each, use 10mmD for safety, 3.1416*(10/2)^2/100*(540+90+180)=636cm2
	730	endcap side	4,5 GEM planes, total cable 720 HDMI, 60 SHV 120 Gas, 6mmD each, use 10mmD for safety, 3.1416*(10/2)^2/100*(720+60+120)=707cm2
GEM (SIDIS)	1380	Near downstream collar or solenoid front?	Assume same like PVDIS
MRPC	1650	endcap side	3300 channels, assume 0.5cm2 each

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Questions/Comments?