MICE Construction

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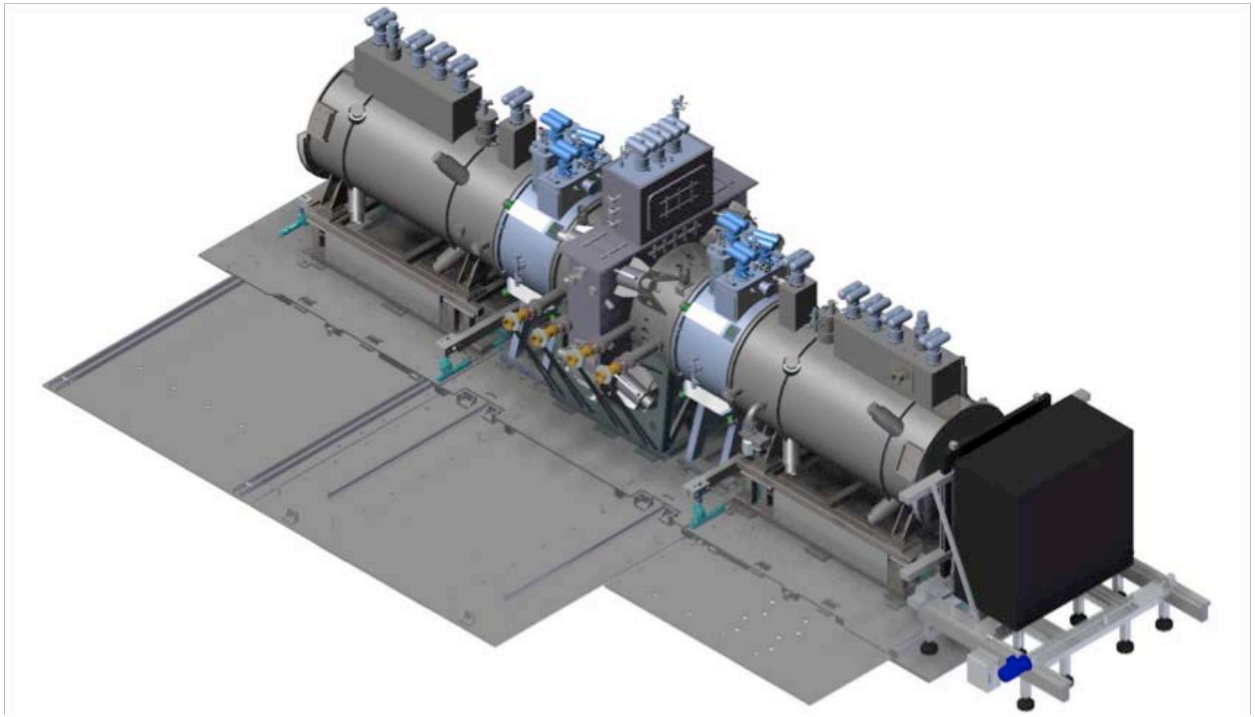
Outline

- High-level overview
- US-Construction
  - Detector systems
  - LiH absorbers
  - Spectrometer Solenoids
    - 2 needed for Step IV
  - RFCC (RF-Coupling Coil)
  - Magnetic mitigation
    - Partial Return Yoke

MICE Overview

- Purpose of MICE is to demonstrate μIC feasibility and validate its simulations
  - Engineering “proof-of-principal” in a number of areas
- Understand performance well enough to reliably extrapolate to cooling systems for MC or NF
  - Measure an ≈10% emittance reduction to 1% relative precision, i.e., 10^{-3} emittance resolution
  - Requires single-particle measurements in low-intensity beam



US Organization

- MICE Construction L1: AB

L2 structure:

– Detectors
  - AB

– RF
  - Derun Li, LBNL

– Magnets
  - Soren Prestemon, LBNL

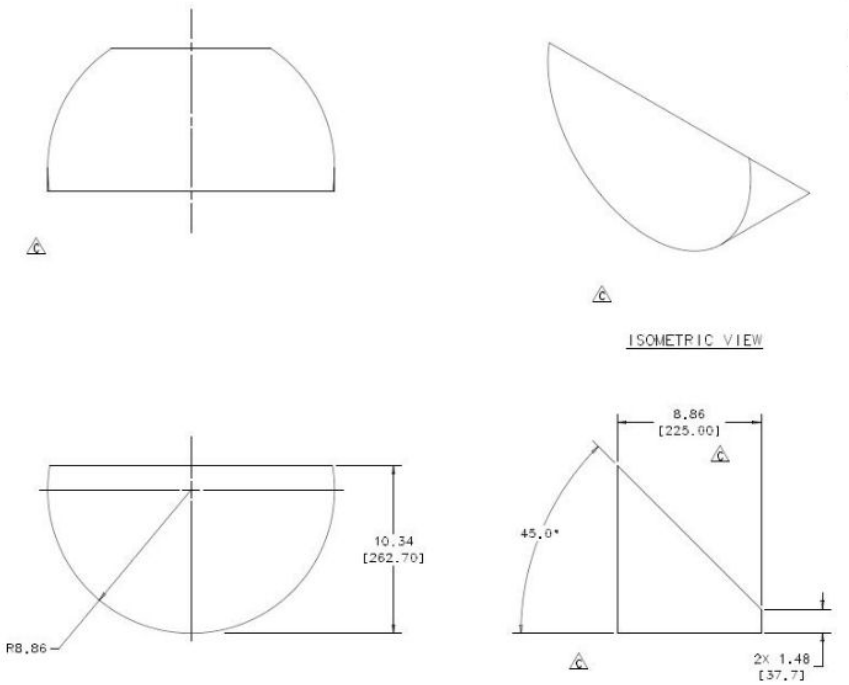
– Magnetic shielding
  - Holger Witte, BNL

– Component integration
  - Sandor Feher, Fermilab

Detectors & LiH

- All detector systems are complete, installed and commissioned
- LiH disks are complete and ready to ship to RAL
- LiH wedges:
  - Partially completed. On hold at Y12 pending funding availability

LiH



- Will ship the LiH to RAL through Y12.
  - Since ^{6}Li enriched, considered nuclear material

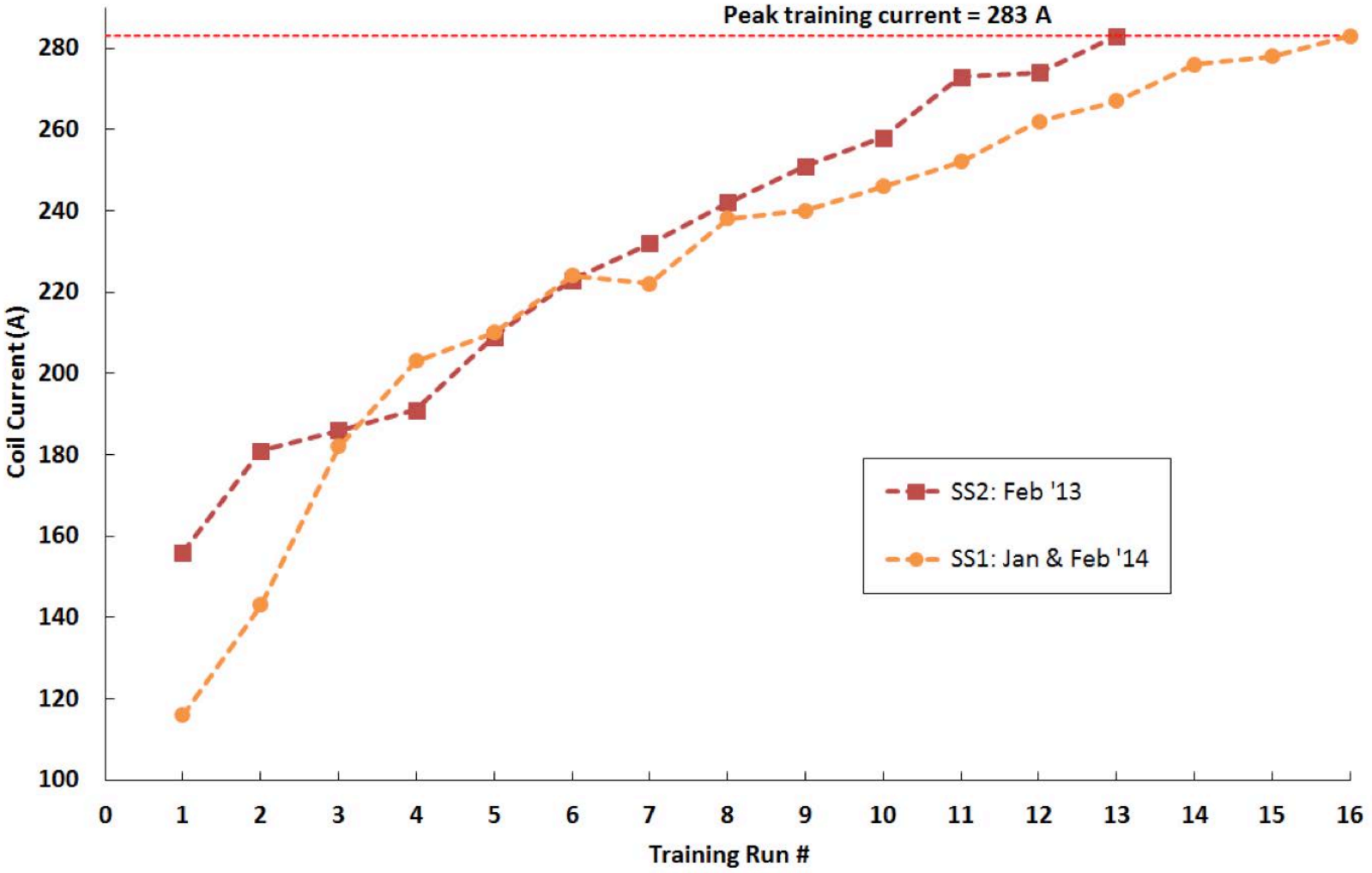
Magnets

Spectrometer Solenoids

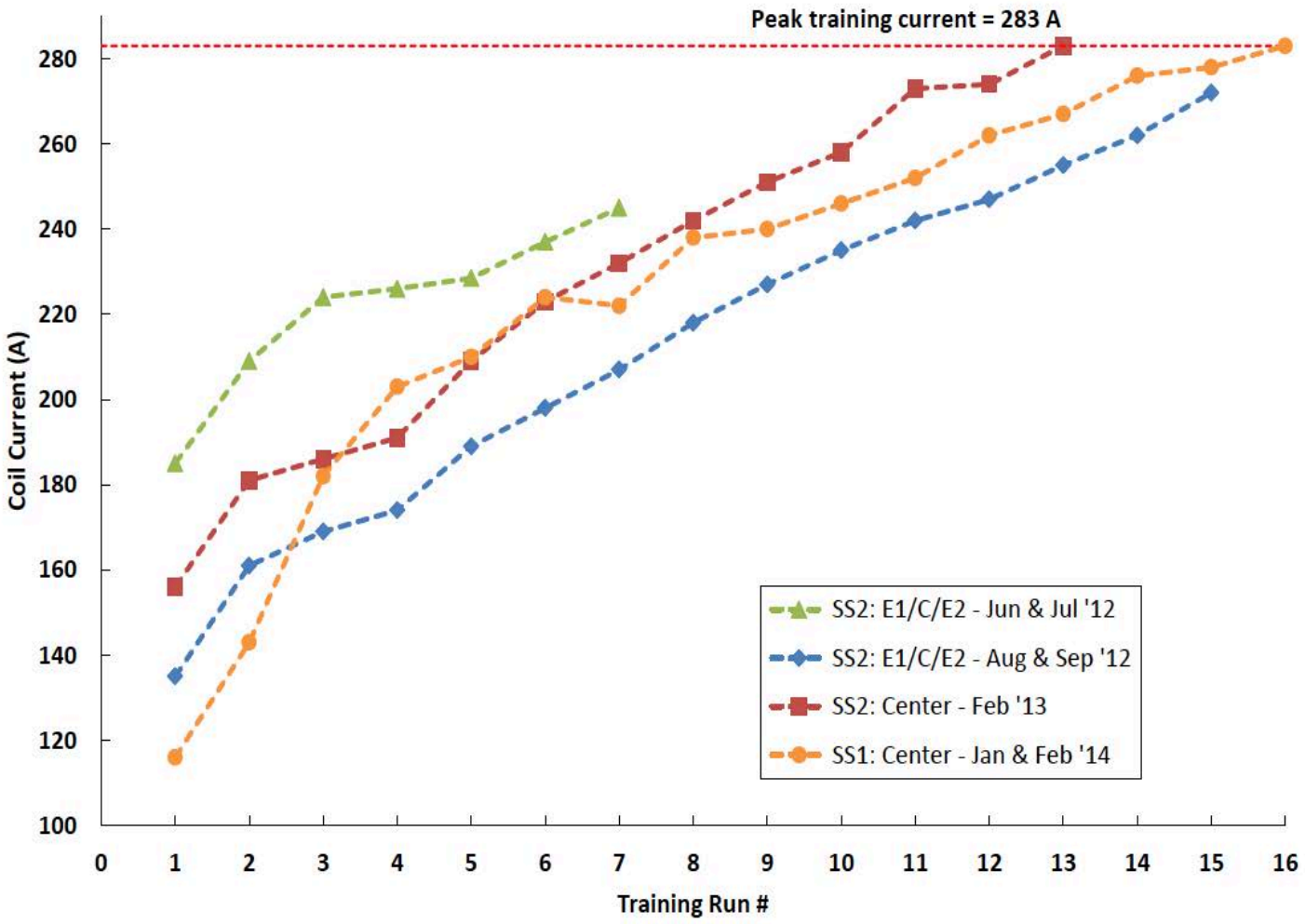
- Both have been completed and are at RAL
- Reached full operating current (+2%) in flip and solenoid modes
  - Soak test a full current performed
  - Tested with iron shield in place
    - Minimal re-training
  - Fully mapped with CERN mapper
    - With & with out shield
    - x-check calib. With NMR probe

SS1 leaving Wang NMR

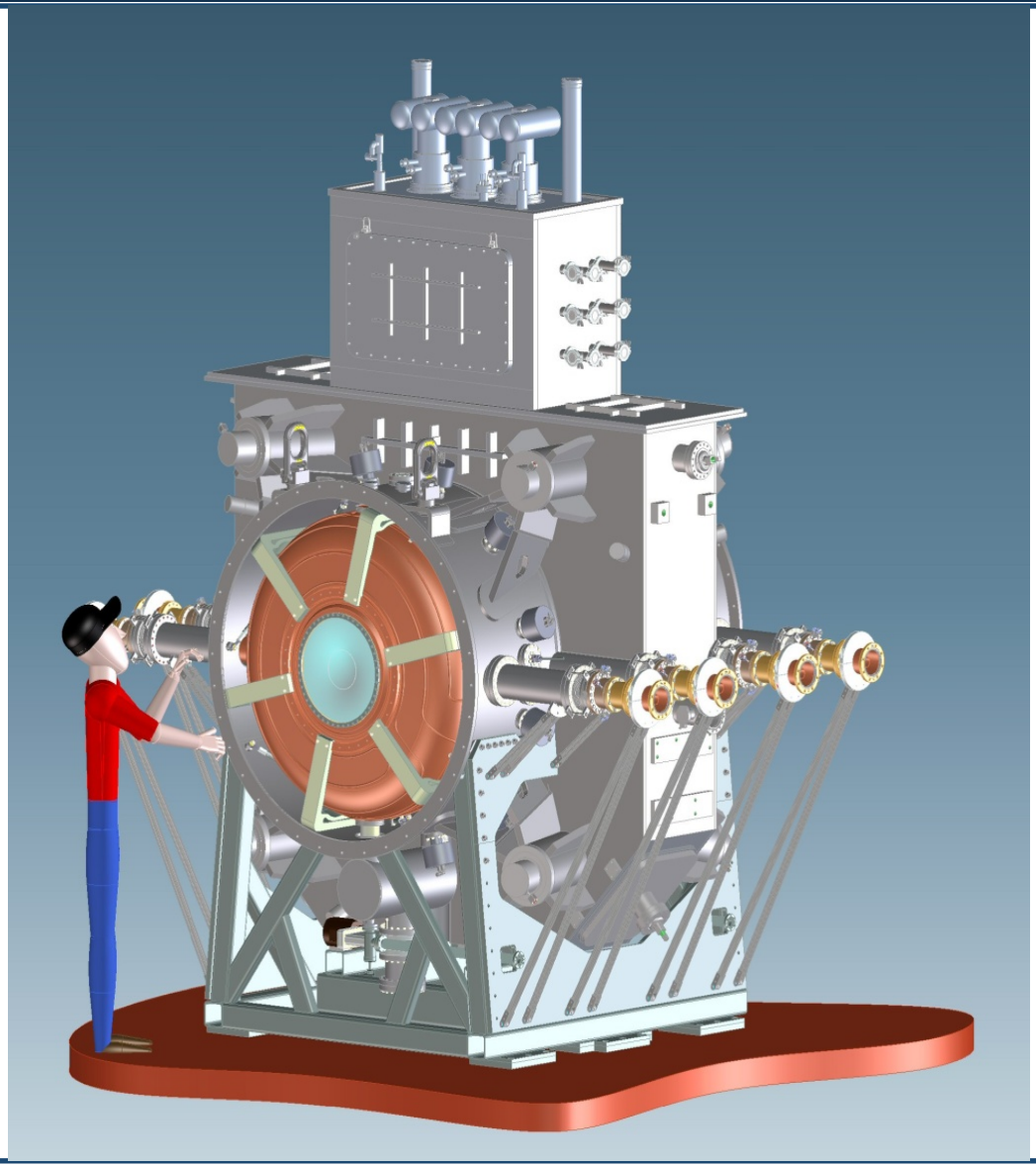
SS1 and SS2 Training



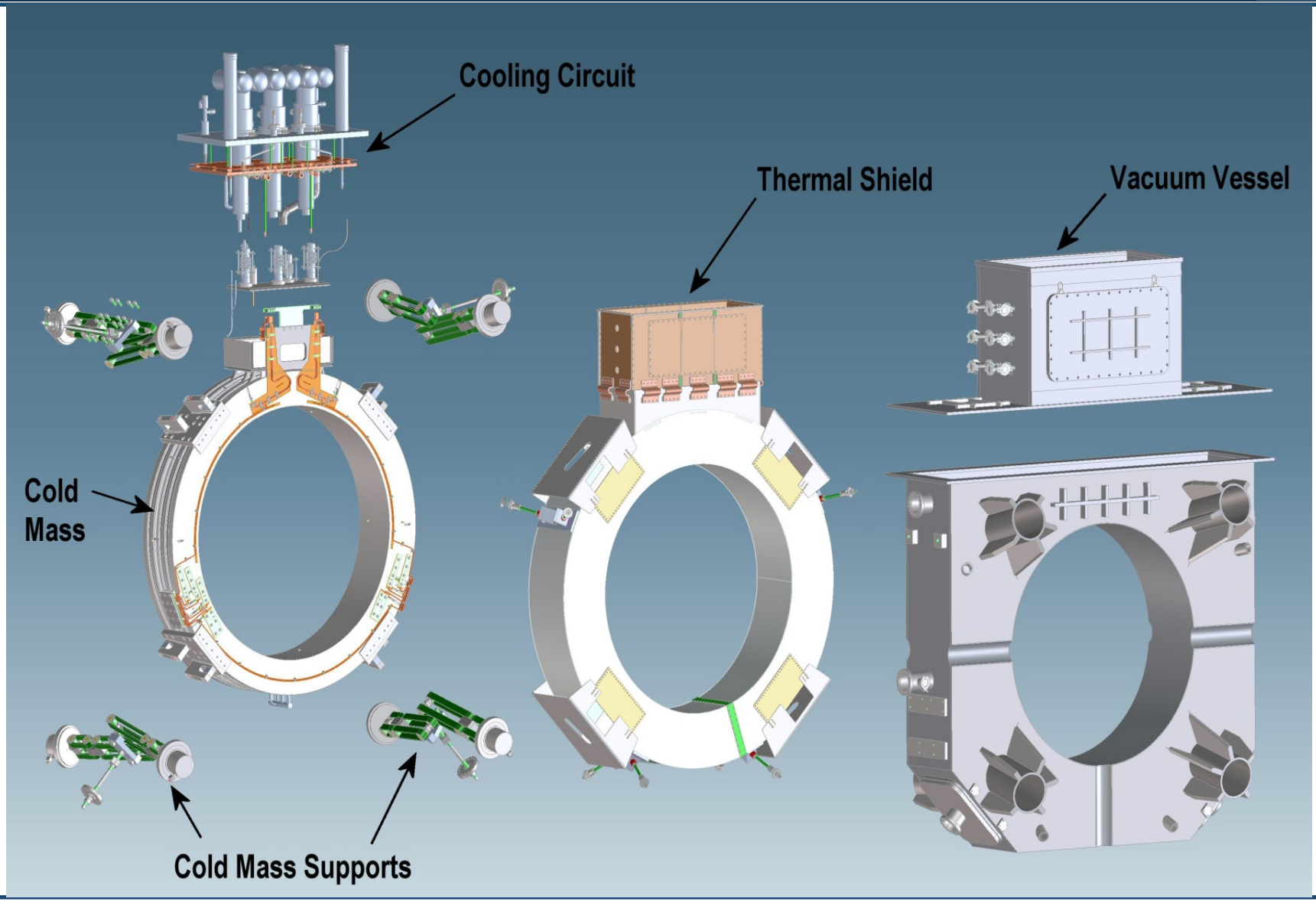
Training history



Coupling Coil Magnets (CCM)



Coupling Coils



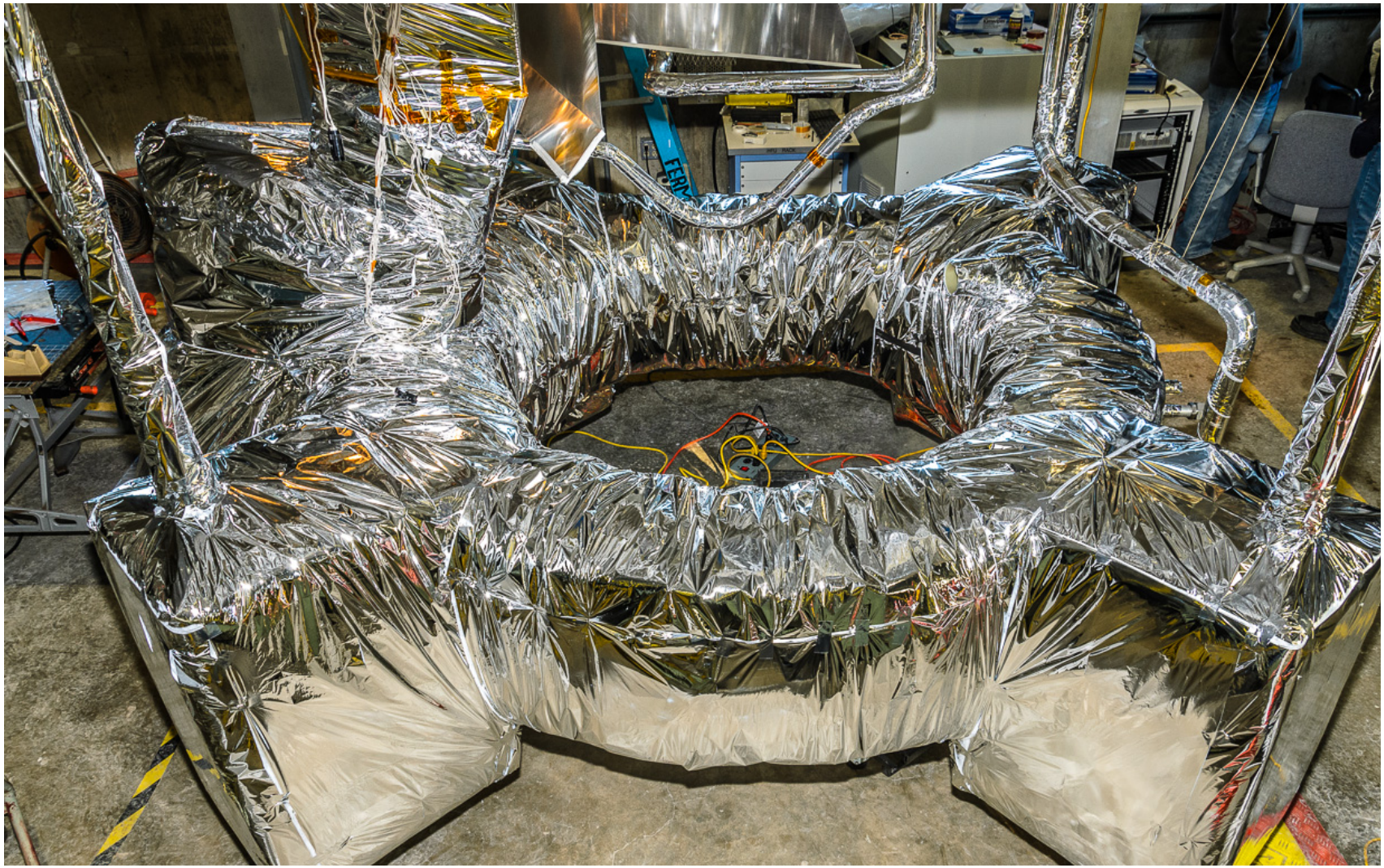
Solenoid Test Facility (STF)

- Designed/built to test MICE Coupling Coil Magnet windings
  - Will also be used to test coils for μ2e
- Obtained a large SMES cryostat from the NHMFL/FSU
- Evaluated several Fermilab locations for this facility (IB1, CDF, CHL). Recommended CHL
- Plan approved by Directorate in January 2012
- Obtained ORC April 17, 2013
  - Test of first MICE CCM cold mass started in May 2013

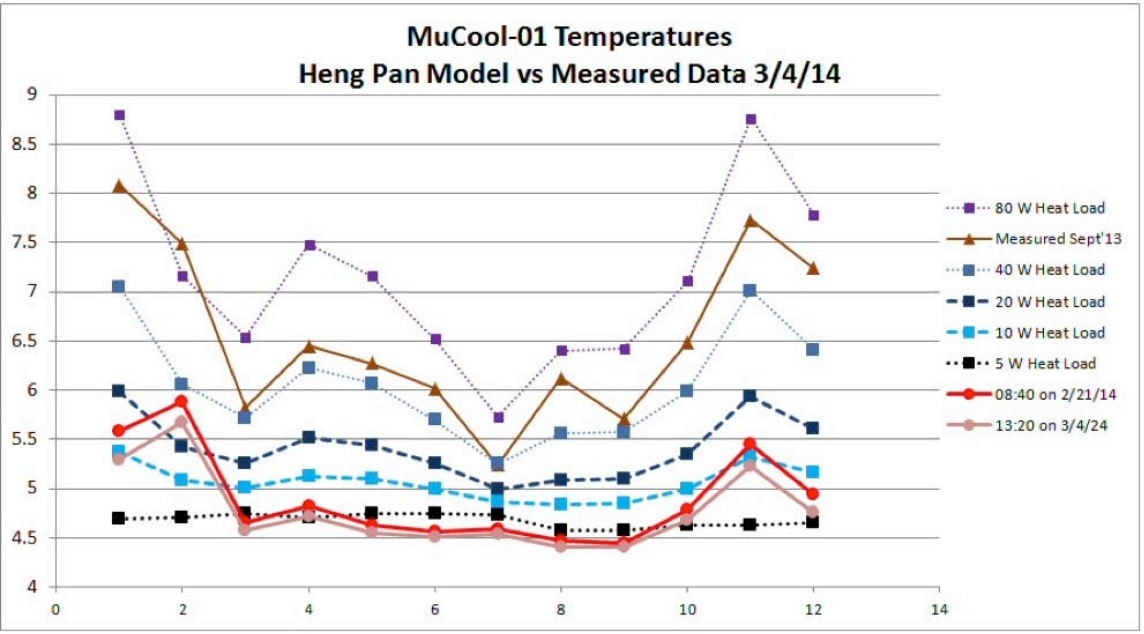
SMES Cryostat

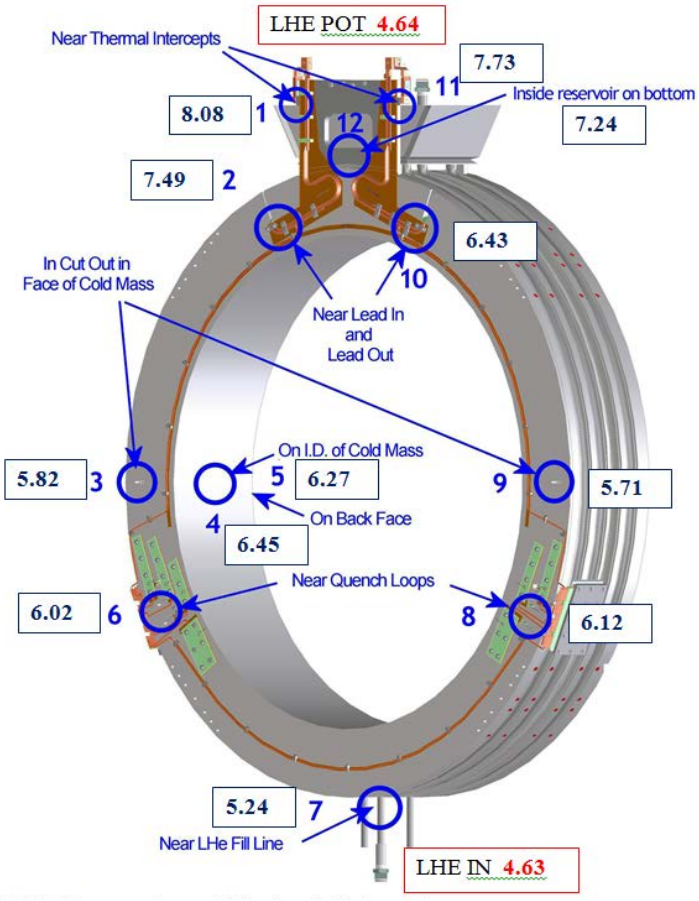
Then and now

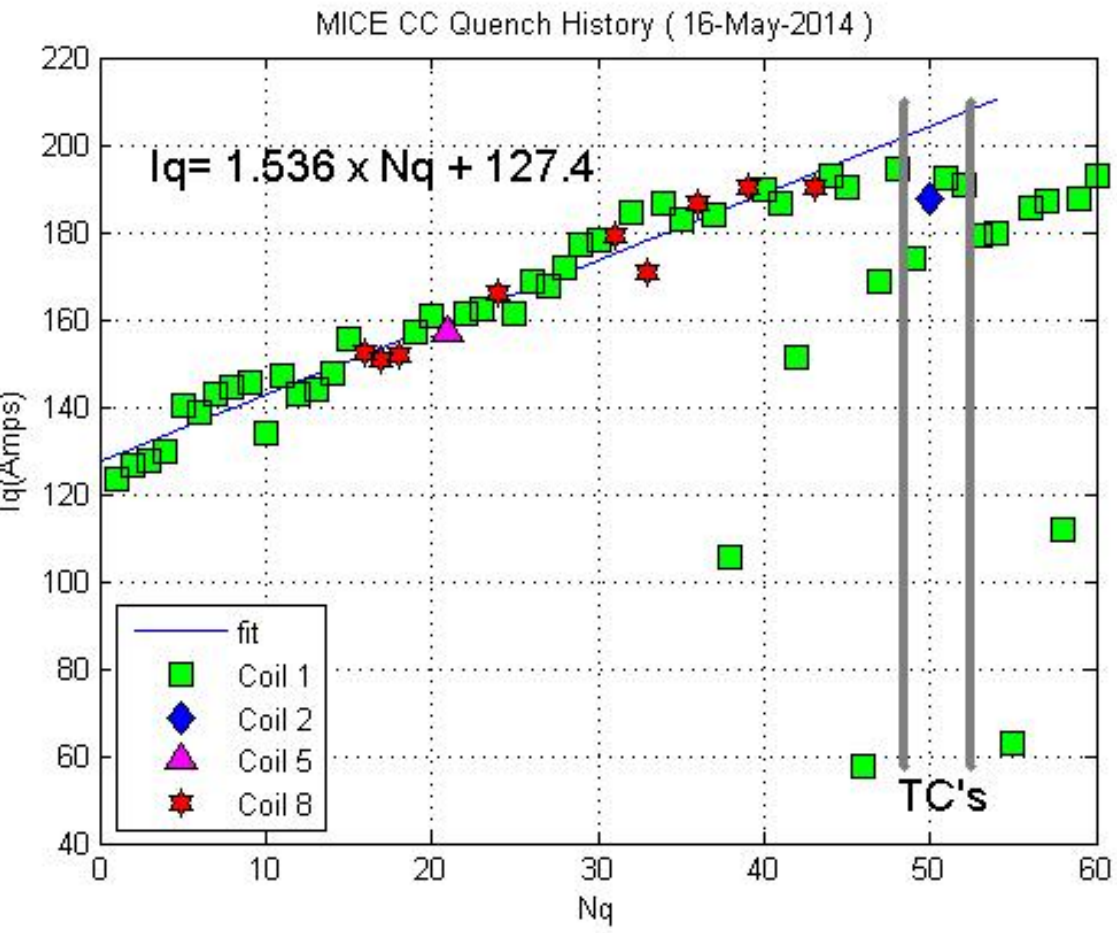
Final MLI installation



CC cryo performance







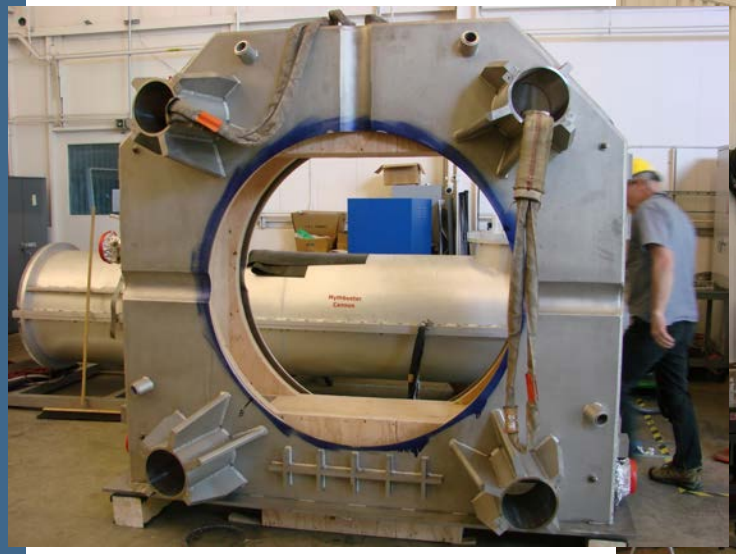
- Training in CHL complete
- Cold mass warm and removed from STF
- Will be moved to ICB

CCM Cryostat #1

- Being fabricated at LBNL
  - Ready to ship to Fermilab this week
- Thermal shields and cooling circuit
  - Shield drawings nearing completion
  - Cooling circuit drawings still in process
    - Design review in June
  - Both will be fabricated at LBNL

Cold Mass / Thermal Shield Mock-up

A wood mock-up of the cold mass/ thermal to assist in defining the coupling coil magnet assembly procedure



Vessel and shield mock-up being readied for shipment to FNAL

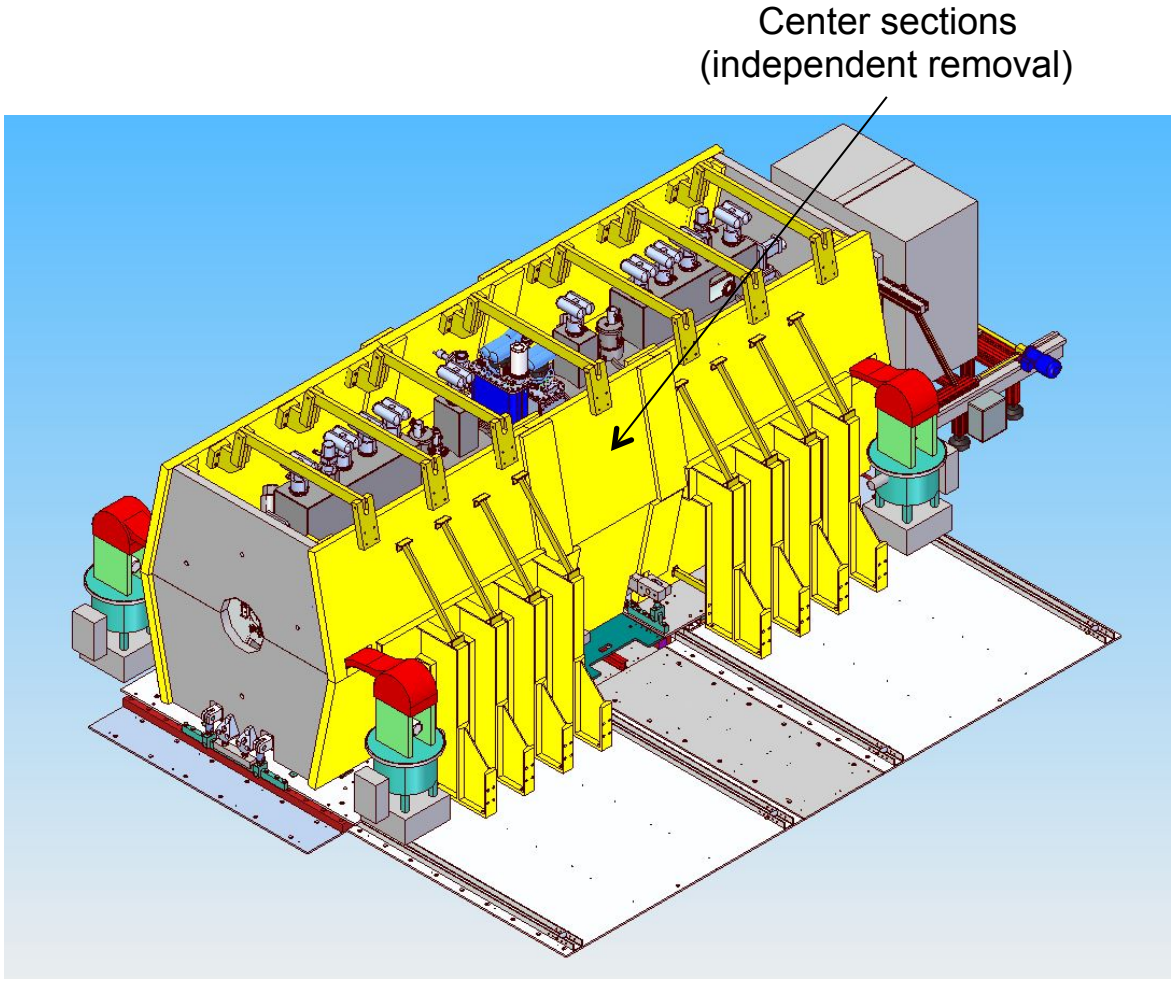
Magnetic Shielding/Mitigation

Magnetic shielding

- About 18 months ago, it was realized that the stray field from the MICE magnets would affect the operation of numerous electrical components in the MICE hall
- After extensive simulation studies and an external review, it was decided to utilize a partial return yoke (PRY) to reduce the stray fields to a level where all components in the MICE hall could operate
  - PRY also protects ISIS control room unequivocally

Step IV Partial Return Yoke

- Design complete
- Steel order placed
  - Using JFE-EFE steel.
- Fab order out for bid
  - Close: 6/5

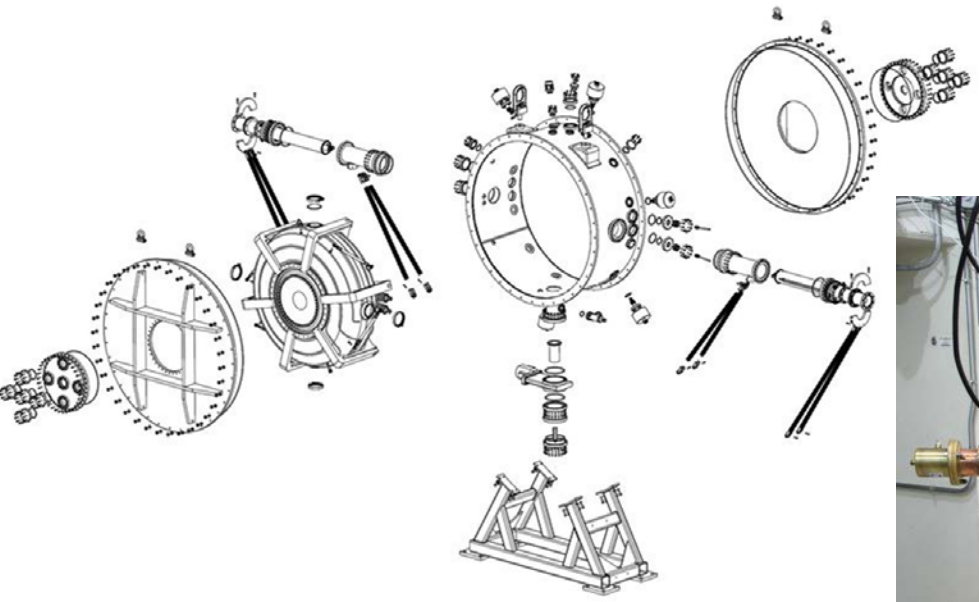


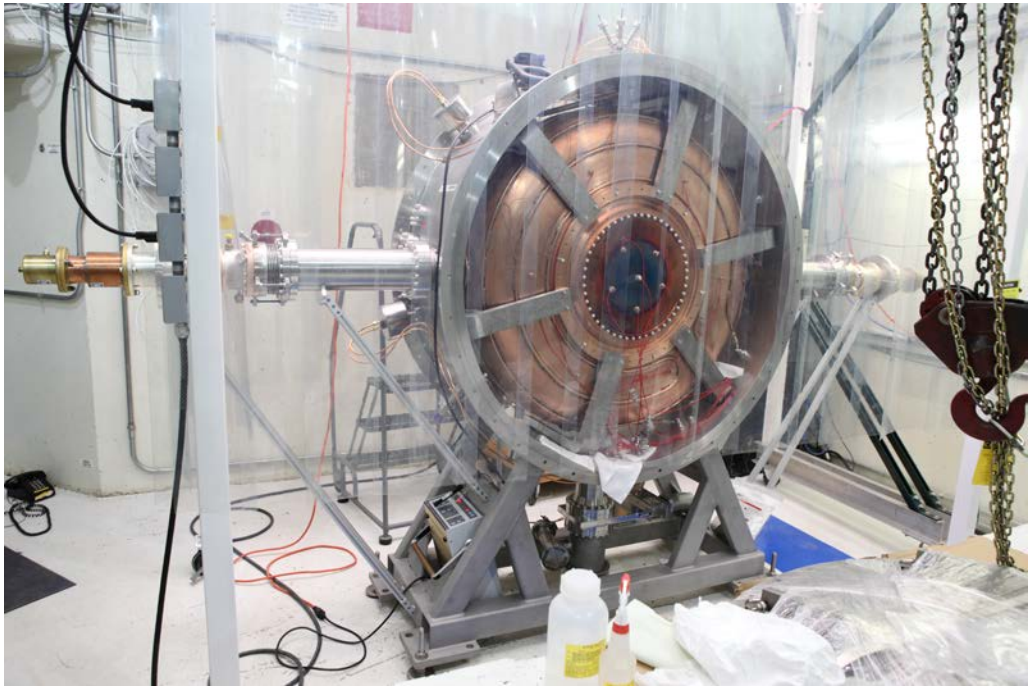
RF

RF

- The primary responsibility for MICE RF lies with LBNL
  - Cavity bodies complete except for final EP
  - Tuners for one RF module complete
    - NSF MRI (Mississippi)
  - Actuator design complete
    - First set delivered
  - New RF power coupler design complete
    - First 2 should be delivered to Fermilab this month
- At Fermilab we are setting up a Single-Cavity Test-System to conduct a full test in the MTA of the first production MICE 201 MHz cavity
  - First full system test

MICE 201 MHz Production Cavity Test





Installed in the MTA and being readied for test
Tests starting 2nd week of June
See Yagmur's talk on Friday for details

US MICE Construction project Critical Dates

- SS #1 arrives at RAL 5/1/14
- Step IV PRY at RAL (complete) 12/15/14
- CCM Assembly Complete 3/21/16
- CCM Testing Complete 8/31/16
- RFCC integration complete 12/28/16
- RFCC delivered to RAL 5/15/17
- Step V PRY complete 5/15/17
- Notes:
  - Expedited installation and commissioning schedule presently under review by UK team
  - Delivery schedule of Step V hardware could be expedited by having a suitable budget profile

Conclusions

- Detector systems complete and all have been commissioned.
- Spectrometer solenoids are complete and at RAL
- First coupling coil winding looks good
  - Chinese company (Qi Huan) has started winding the next CC coil
- CMM cryostat nearing completion
- CCM assembly area identified
  - Setup starting
- Component fabrication for first RFCC is well along