

Coupling Coil Plans

**MICE CM 32 @ RAL
February 8, 2012**

Steve Virostek - LBNL

Outline

- Progress since CM31
- Design topics
 - Drawing Modifications
 - Cooling circuit and cryostat
 - Quench protection
 - Lead stabilization
- Prep for testing of the 1st cold-mass
- Upcoming reviews
- Plans and schedule for FY12



Coupling Coil Test Prep

- First Coupling Coil cold mass:
 - Work continuing at LBNL to prepare the 1st CC cold mass for testing at FNAL



Cover plate welding at HIT in early August 2011

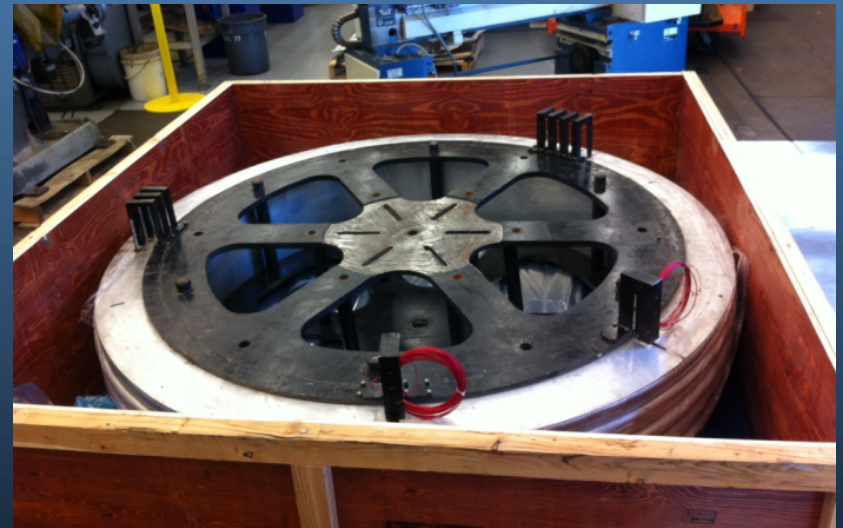


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Coupling Coil Test Prep

- External physical measurements completed
- Cooling pipes are ready for welding to cold mass
- Resistance measurement of each segment completed
- Epoxy for potting has been procured
- Cold mass support brackets being fabricated



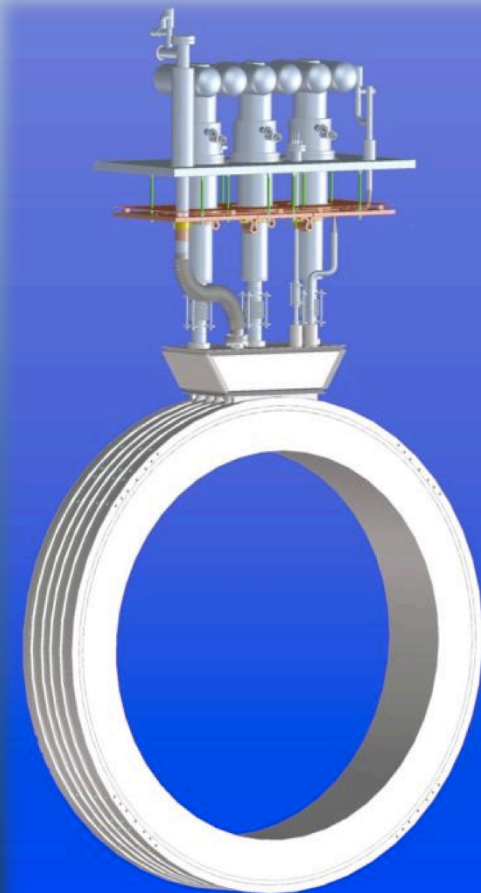
Design Work

- Work has continued to finalize the Coupling Coil detailed design on several fronts
- Allan DeMello and Nanyang Li nearing completion of drawing modifications and conversion to US standard
- Modifications to the cooling circuit design are being developed but still need final approval
- A tentative plan for forced cooling during the FNAL testing has been developed
- MIT has completed an initial quench system analysis and is designing the quench protection assembly
- Analysis of the coil leads has been completed by MIT; design of the lead stabilization scheme is under way

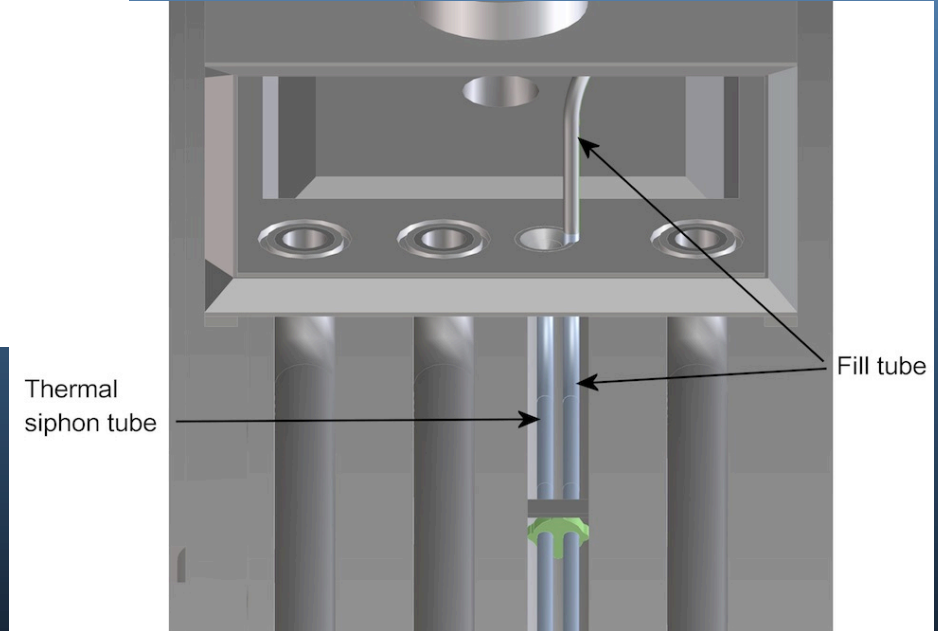
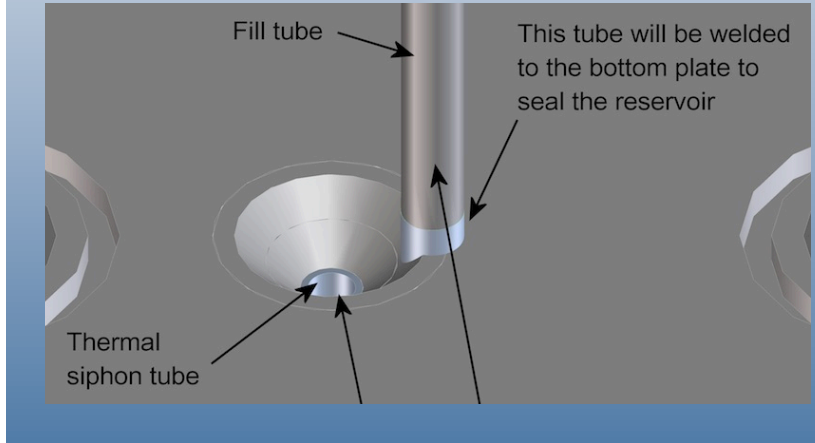
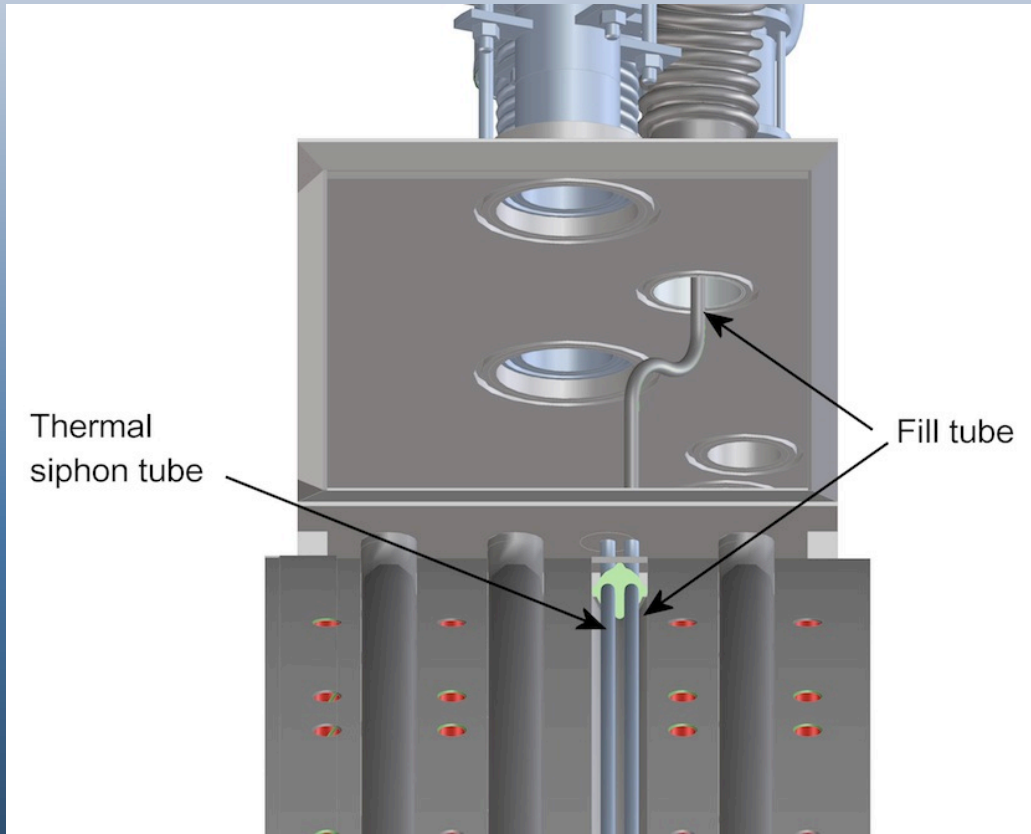


Cooling Circuit Design

- Original lower LHe reservoir removed from the bottom of the magnet
- Liquid supply and vapor return through same cooling tubes deemed high risk
- Implemented a dedicated, insulated liquid supply line from the upper reservoir to the bottom of the magnet
- New scheme is a traditional thermal siphon cooling circuit
- A second parallel line to the bottom of the coil to be used for cool down



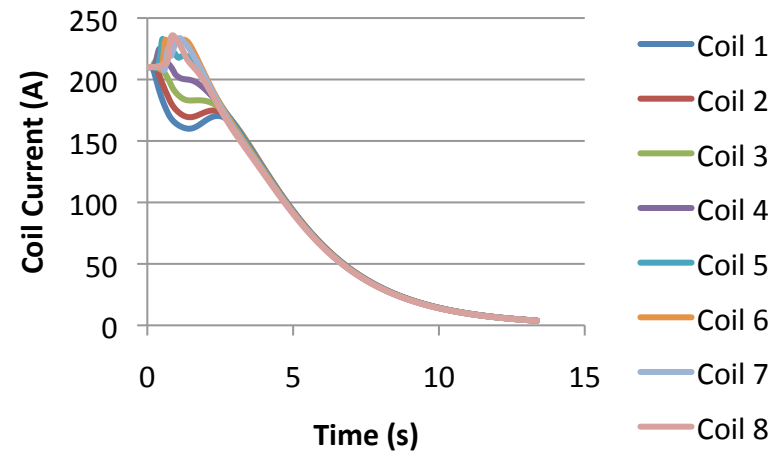
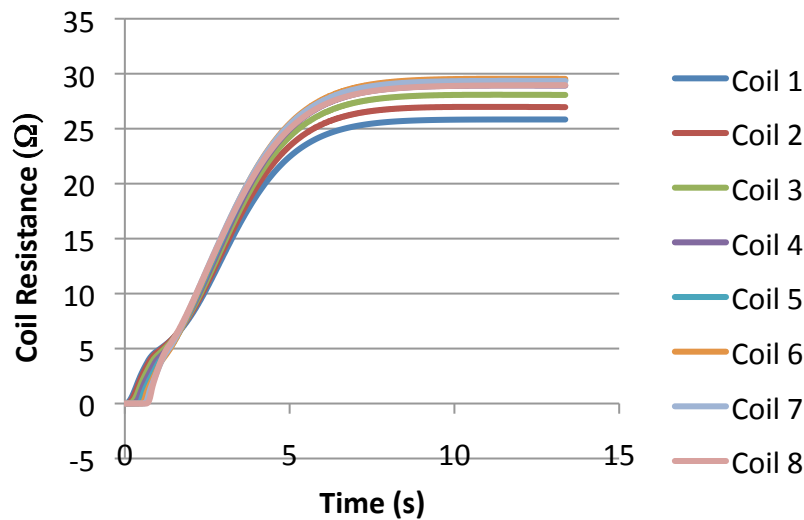
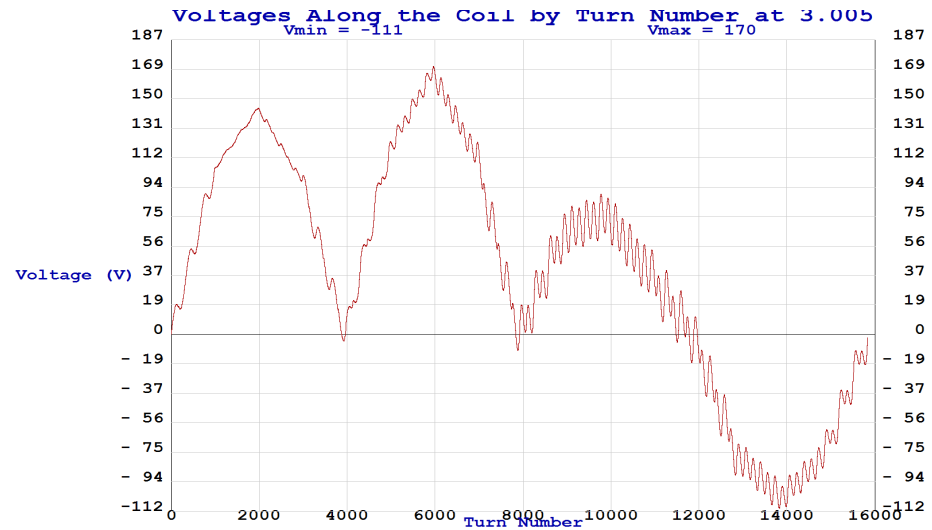
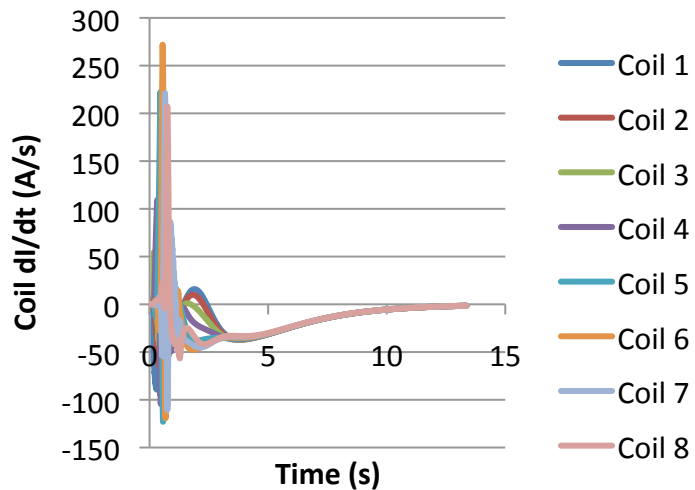
Magnet Cooling Scheme



Quench Protection

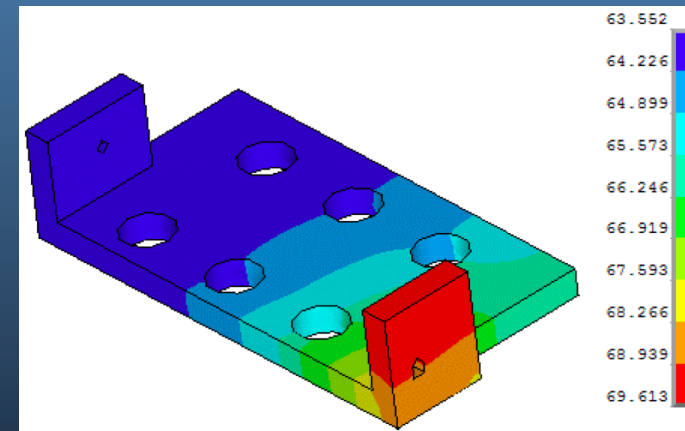
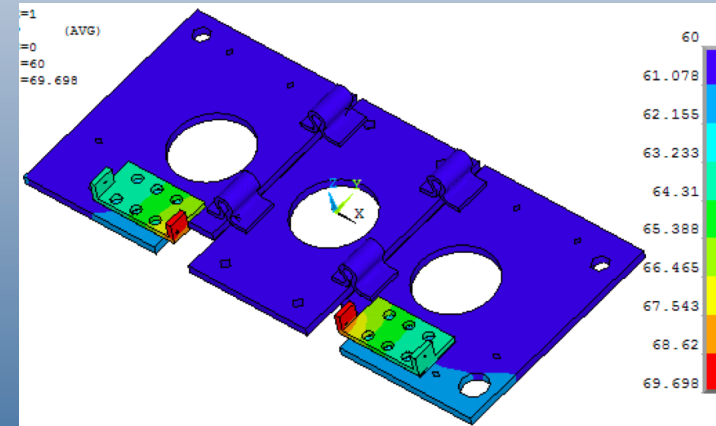
- MIT has completed a series of magnet quench analyses, including the effects of coil segmentation (1, 2, 4, 8 segments)
- Results indicate no more than 4 segments needed
- Design of the actual quench system components is now under way
- LBNL will assist with detailed design/fabrication
- Characterization of the quench diodes likely needed
- Same quench system to be used for tests at FNAL

Quench Analysis Plots



Lead Stabilization Analyses

- Results of lead analyses recently distributed by MIT group
- Design to include: optimization of warm leads, heat sinking of warm lead lower end and HTS lead upper end to cooler first stage, stabilization of cold leads
- Cold lead stabilization scheme to be implemented at LBNL and used for testing at Fermilab



Coil Testing at FNAL

- FNAL and LBNL participated in a meeting two weeks ago (at Fermilab) to discuss interfaces and project planning
- Forced-flow cooling scheme developed by FNAL
- A new cover for the FSU cryostat has been designed
- Facility location for testing identified (CHL)
- Test requirements and test plan is currently under development
- A test plan review is being held at FNAL on February 22nd
- Project has strong support of FNAL management



Pre-production Review

- Review to be held at LBNL on February 29 and March 1
- Fabrication drawings to be assessed for readiness to start cryostat parts fabrication at QiHuan Co. (China)
- The overall cooling circuit design will be assessed including: re-condensing power vs. heat leaks, coil temperature margin, radiation shield design
- The instrumentation plan will be presented/reviewed
- The MIT group will present their designs for the quench protection system and lead stabilization
- Other topics will include coil testing at FNAL and plans for assembling the cryostats and installing the coils



Plan Going Forward

- All three cold masses to be tested and trained to full current at Fermilab prior to magnet assembly
- All parts for the magnet cryostats will be fabricated in China by the QiHuan Company and shipped to the US
- QiHuan is to wind the 2nd and 3rd coupling coils using conductor currently being procured by Fermilab
- Plans call for the cryostats to be assembled by an outside vendor (preliminary quote from Meyer Tool)
- Assembly of the first unit likely to occur at FNAL
- Different options being explored for assembly of 2nd and 3rd coupling coils



Schedule Milestones

- Delivery of 1st coil to FNAL from LBNL with cooling tubes, potting, QP system, support brackets, and instrumentation: **end April '12**
- Perform testing and training of first coil at Fermilab: **July '12**
- Complete assembly of 1st cryostat: **Sept. '12**
- Delivery of 2nd and 3rd coils from QiHuan Company to LBNL: **Aug., Dec. '12**



Summary

- LBNL review and modification of the cryostat fabrication drawings is complete
- Details of the of the cooling circuit, quench protection system and lead design being completed
- Plans for coil testing at FNAL continuing to be developed
- Much activity in the coming months: cryostat parts fabrication, 2nd and 3rd coil winding, 1st coil testing, vendor bidding for cryostat assembly

