

Spectrometer Solenoid Plans

MICE Collaboration Meeting #29
Rutherford Appleton Laboratory

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Topics

- Review and recommendations
- Magnet analyses
- Design modification plan
- Preliminary modifications
- Current Status



MICE Cooling Channel Layout

Spectrometer Solenoid #1



Spectrometer Solenoid #2

Technical Review and Recommendations

- MICE technical review held on 10/27/10
- Final report w/recommendations issued 12/14/10
- LBNL has reviewed the recommendations and prepared preliminary responses
- The committee recommended implementation of an active quench and lead protection system
- LBNL is conducting analyses to determine if an active system is necessary
- Other recommendations are related to the heat load calculations



Heat Load Analysis

- The heat leaks due to the dominant static sources have been re-evaluated
- Calculations focused on heat leaks into the 4.2K cold mass (re. LHe boil-off during operation)
- Heat loads on the shield and vacuum insulation have also been considered
- The dynamic heat loads during cooldown or current ramp-up have been ignored (negligible during normal operation)



Electromagnetic Calculations

- The design of the passive magnet protection system is being reviewed and analyzed under the various operational regimes
- The areas covered include: calculation of peak voltages, coupling between coils during quench, estimate of current decay, suitability of quench resistors, the role of quenchback in the mandrel
- The suitability of the existing passive system and the possible need for an active system is being assessed
- Details of the analyses are presented in Soren Prestemon's following talk

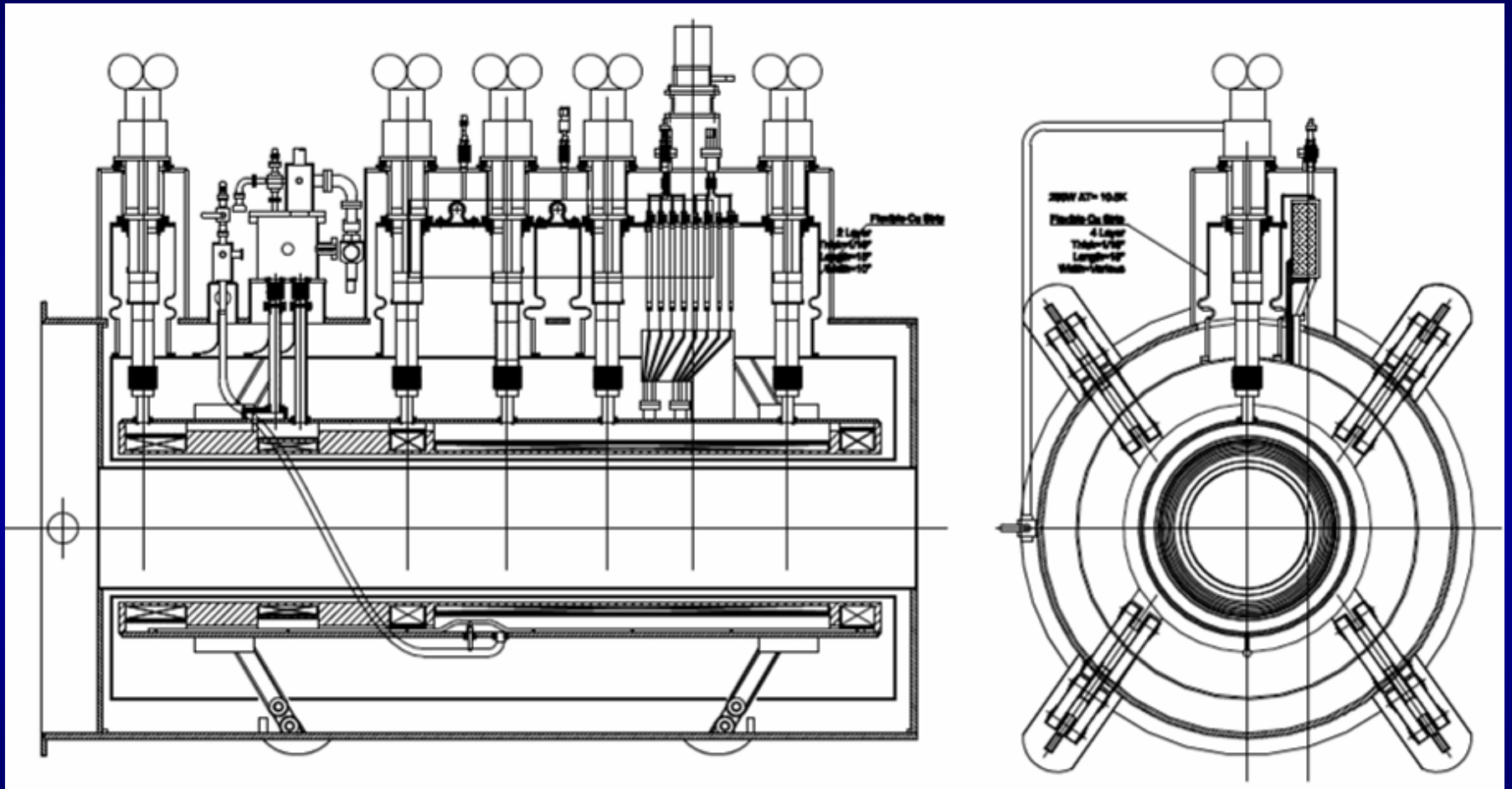


Design Modification Plan

- A preliminary design modification plan has been developed by LBNL. The plan includes the following:
 - reduction of heat leaks to the cold mass
 - the addition of more cryo cooling power
 - assessment of the suitability of the passive quench protection system
 - modification of the LTS leads to prevent burn-out
- The plan has been detailed in a separate document
- The plan will be finalized once the quench analysis and design modification (if necessary) are complete

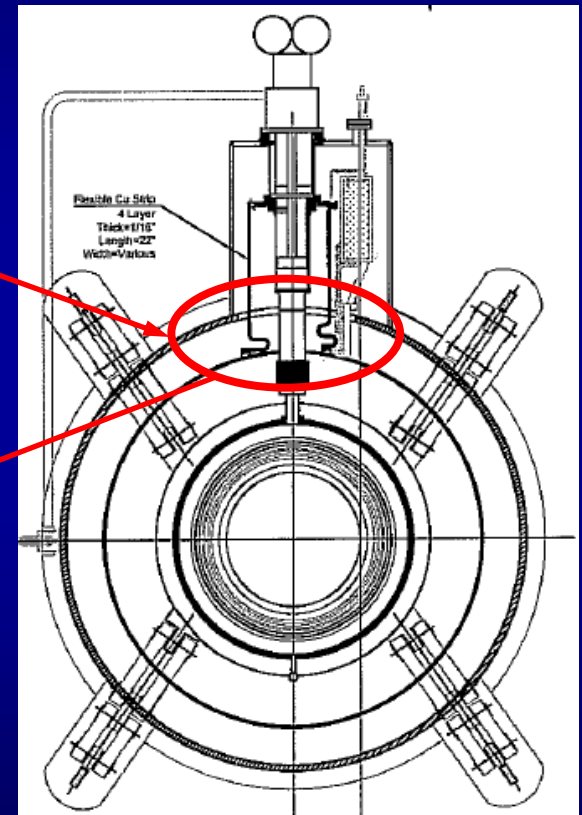


Proposed 5 + 1 Cryocooler Layout



Radiation Shield Improvements

- The modification plan includes improvement of the connection between the 1st stage of the coolers and the shield as well as enhanced conduction to the cold mass support intercepts
 - Pure aluminum bands welded at either end of the shield reduce intercept temperature
 - Copper transition plates welded to the top of the shield increase the thermal conductivity from the coolers



Other Modifications

- Improved isolating vacuum pumping system and instrumentation
- Modification to the fill and vent lines to prevent direct shine to 4.2K
- Monitoring for the presence of thermo-acoustic oscillations in vent and fill lines
- More direct connection of cryocooler condenser pipes to the cold mass
- Removal of the liquid nitrogen reservoir



Preliminary Work

- A series of tasks to start immediately were proposed and have been approved by MICE management:
- Modify Shield 1 to match previous mods to Shield 2
- Generate design layout of the 5 + 1 cooler arrangement and provide a spec to Wang NMR
- Develop a procedure for improved MLI bore wrapping
- Install a new 4" vacuum port on the cryostats
- After the 5+1 design layout is complete: modify the vacuum vessels and tower plates for the 5 + 1 design, add cryocooler holes in cold mass #2



Current Status

- The electromagnetic and heat load analyses are under way and expected to be completed in the coming days
- The quench and lead protection issue presents a major uncertainty in the completion of the plan
- Upon finalizing the modification plan, the Spectrometer Solenoid team will present the plan to MAP and subsequently the MICE tech board
- LBNL has been meeting with the vendor to begin preliminary work (approved by MICE) and to ensure the project restarts promptly when the plan is complete

