Spectrometer Solenoid Update

MICE CM37
Rutherford Appleton Laboratory

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Topics

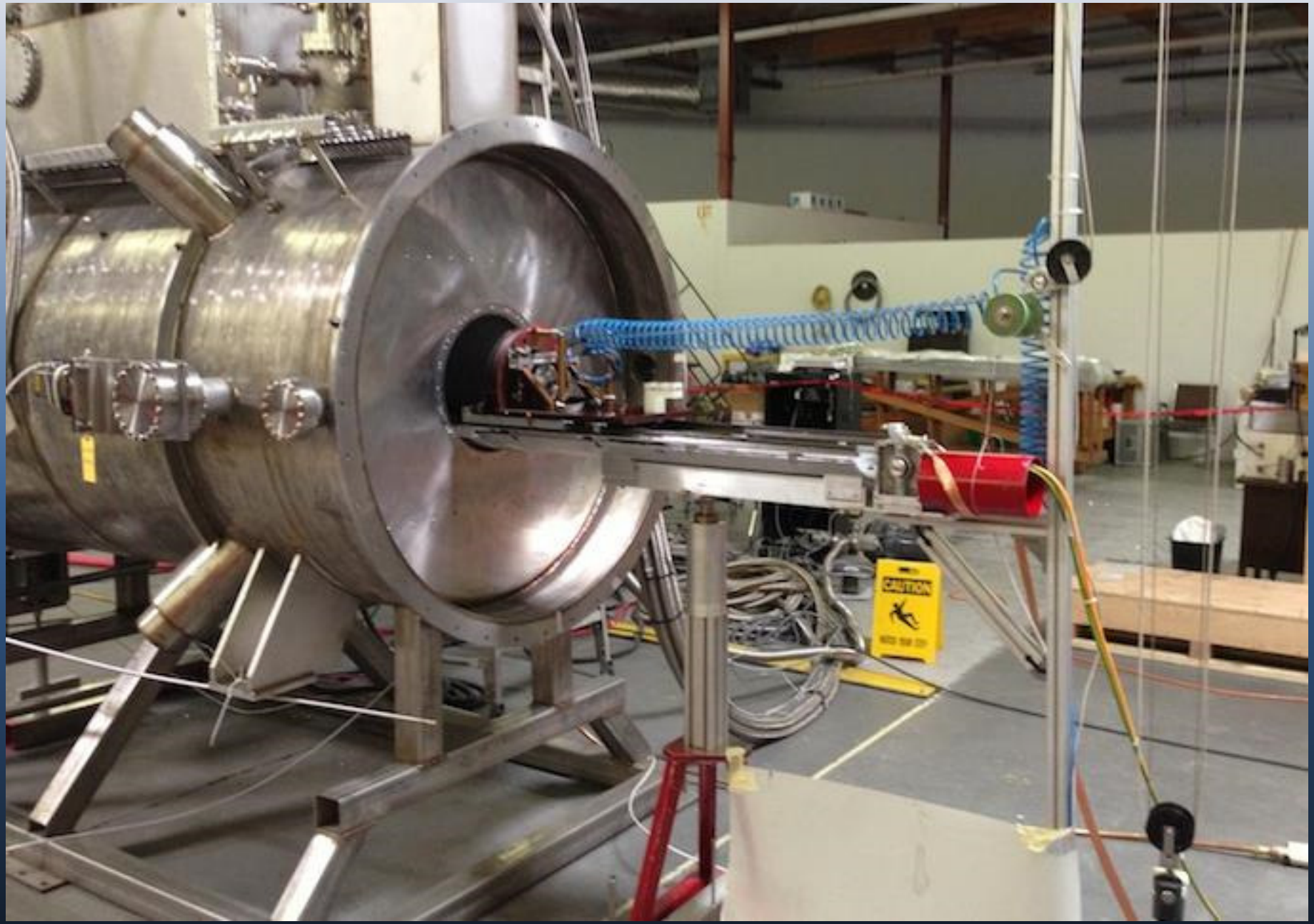
- SS2 field mapping completion
- SS2 shipping to RAL
- Control system update
- SS1 powered testing
- Schedule

Magnet Field Mapping

- Magnet training to full current completed at the end of February 2013
- CERN mapping equipment arrived at the end of May, installed by CERN crew and aligned to magnet by LBNL laser tracker group
- Runs completed with and without shield installed
- Iron shield successfully installed/removed without removing mapping system
- Minimal re-training w/iron shield addition (quench at ~98% full current on 1st try, no quench on 2nd try)

Magnet Field Mapping

- Full 3D mapping runs completed w/shield in place and at both flip and solenoid modes (full current)
- With iron shield removed, additional full current, full 3D mapping runs completed for both modes
- Additional mapping (80% current) and calibration runs (w/NMR probe) have been carried out
- Zero current mapping runs were generally carried out during every day of running
- All necessary mapping completed for SS2


CAUTION

SS2 Shipping to RAL

- Modifications of the first Spectrometer Solenoid related to shipping were completed in September
- SS2 was trucked to Houston, Texas (departed Wang NMR on Sept. 26th) for subsequent flight to London
- Magnet plus iron shield brackets arrived in the UK on October 7th, RAL on October 9th
- Magnet recently moved into R9 at RAL
- Vessel leak check and coil resistance measurements to be carried out soon

SS2 Lifting with Forklift

SS2 on Pallet at Wang NMR

Unloading at RAL

Temporary Storage at RAL

Control System Update

- Previous issues with the HTS lead voltage taps appeared to have resulted in power supply instability during ramping
- The instabilities apparently caused added heat load to the cold mass as well
- The voltage taps were reconfigured and carefully checked prior to the most recent powered tests
- The taps and the power supplies all worked well with no instability or dropped channels

2nd Magnet Progress

- All assembly work on SS1 was completed back in late July, including iron shield installation
- Instrumentation and control system was fully debugged along with several enhancements
- Vacuum vessel was pumped out and cold mass cooled down at the end of July in preparation for the initial powered testing
- Several issues have prevented the magnet training from being completed as of this date

SS1 ready to Test

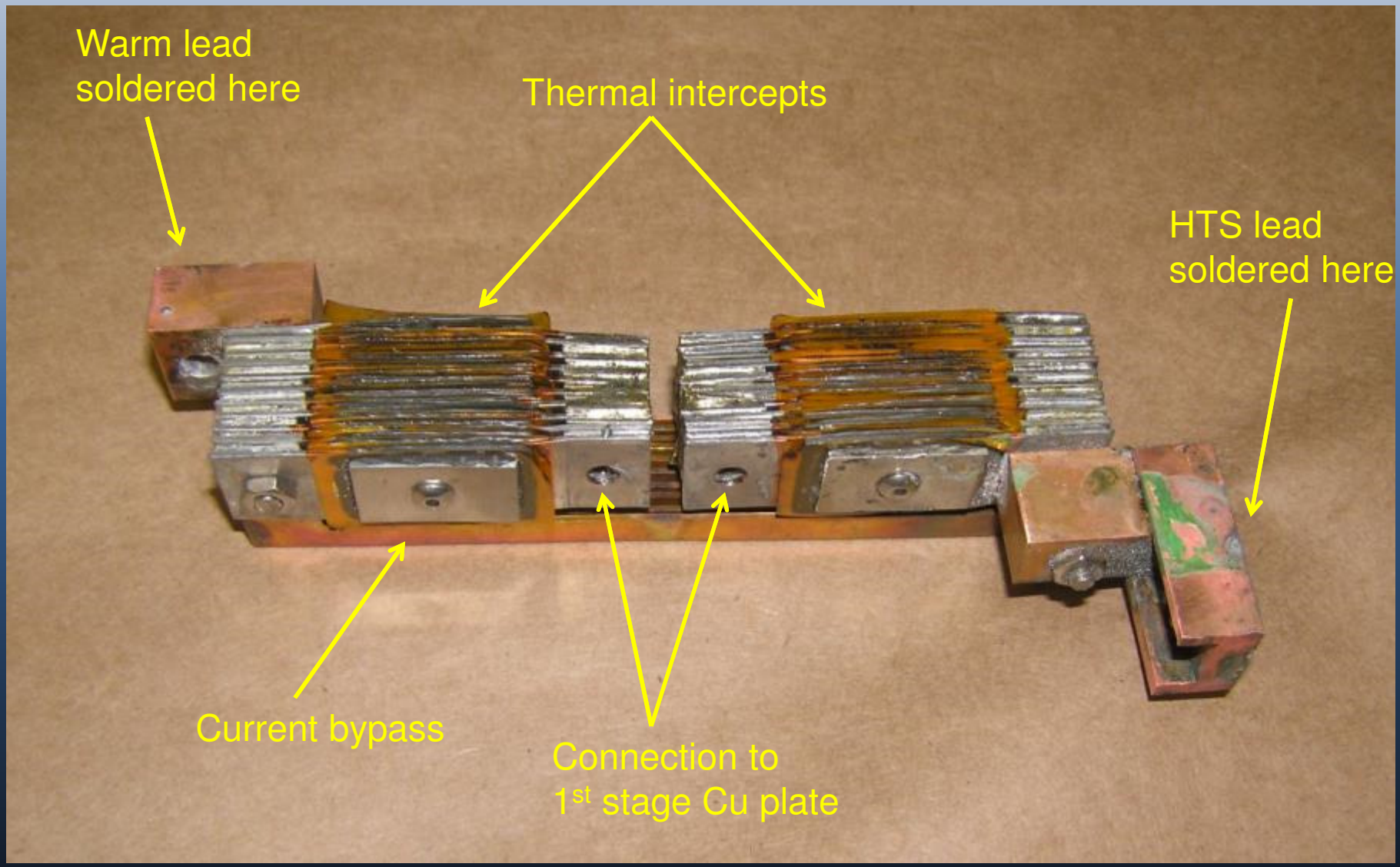
Testing Summary

- The magnet has been cooled down three times with several issues arising that required warm up and repair
- The initial issue was vacuum leaks in the power lead vacuum feedthroughs, caused by inadequate support of the external warm leads
- During subsequent powered testing, an HTS lead burned out at ~135 A
- After replacing the lead and cooling down again, another HTS lead was found to exhibit resistive behavior at low current, necessitating warm up

Testing Summary (cont'd)

- After opening the tower access port, close examination of the HTS lead area found several loose connections between the thermal intercepts and the 1st stage plate
- Intercept connected to the HTS lead showing resistive behavior was found to be the most loose
- Original solder joints lacked the structural strength to resist loads from coiled warm leads
- Repair consisted of a bolted connection with indium foil in the joints – all 8 intercept joints repaired
- All 8 HTS leads replaced with new units from HTS-110

Thermal Intercept Features



Testing Summary (cont'd)

- Temperature sensors have been added to the top end of the HTS leads (and a sensor on the bottom of one lead)
- Most likely scenario is inadequate cooling of the HTS leads causing resistive behavior and previous burnouts
- Several previously suspect leads have been sent to HTS-110 for analysis and testing
- Additional leads are now being tested at LBNL as well
- Repaired magnet to be leak checked tomorrow in preparation for cool down next week

Schedule

- Training of SS1 expected to start ~Nov. 18th after cooldown and system checkout
- Magnetic mapping system to be installed during the second week of December
- SS1 expected to be prepared for shipping during January and shipped ~early February
- Cryocooler testing to take place at LBNL in parallel with training