# Technology Development
# MAP Friday Meeting

Harold Kirk

*Brookhaven National Laboratory*

*April 11, 2014*

# Outline

- **TD Highlights**
- **L2 Summary reports**
- **Brief update from Daniel Bowring on Modular Cavity Status**

# Technology Development Highlights for March, 2014

- **RF- Modular Cavity**
  - **Low-level rf testing at SLAC reveals lower $Q_o$ than expected**
  - **Shipping to FNAL delayed**
- **201 MHz RF couplers shipped to FNAL**
- **E-beam welding of Nb beam tubes onto two 500 MHz explosion bonded SRF cavities has resumed**

# Monthly L2 Status Report - April 11, 2014

## WBS: 03 01: Normal Conducting RF  Presenter: Derun Li

### Milestone Status (Progress)

- Modular cavity (collaboration among Fermilab, LBNL and SLAC )
  - Repair complete
  - Assembly and first cold test on Feb. 28, 2014
- Preparation of 201 MHz MICE prototype cavity testing
  - Progress at MTA (Yagmur ) and R. Pasquinelli's weekly report
  - Fabrication of two RF power couplers complete at LBNL
  - Delivery of the two couplers to Fermilab
  - Installation of the couplers scheduled for next week

### Resource Conflicts, Plan Changes and Issues

### Late Items

- PO of Be plates for the modular cavity
- Delay in modular cavity delivery
- Delay of the two power RF coupler delivery

### Summary of Previous Month

- Modular cavity
  - CMM measurements of the modular cavity
    - RF contact not satisfactory, measured Qo is too low and not acceptable
    - Measured $Q_{ext}$ is close to design
- Progress of the MICE prototype cavity installation at MTA, Fermilab
- Fabrication the two power RF couplers at LBNL complete
  - Delivered to Fermilab
  - Coupler installation next week (Allan DeMello will travel to Fermilab to assist with the assembly)

### Quarterly Plans

- The modular cavity fabrication, assembly and testing
- EP of the remaining MICE cavities at LBNL
- Development of the modular cavity testing plan
- Data analysis of previous 805 MHz testing results
- Support MTA RF testing programs
- Support of RF design studies for MAP D&S.

### Upcoming Work (Next Month)

- Finalize plan for RF/vacuum seals and improve RF contacts
- Assembly of the modular cavity and leak check
- Low power RF measurements at SLAC
- Packing and shipping to Fermilab
- Assembly of RF couplers
- Single cavity vacuum vessel to MTA

# MICE Couplers

# Monthly L2 Status Report - April 11, 2014

## WBS: 3.2 – Superconducting RF  Presenter: Don Hartill

### Milestone Status (Progress)

### Resource Conflicts, Plan Changes and Issues

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### Late Items

- **Research Instruments shipment of 500 MHz cavities**
- **Electroforming Cu on 1.3GHz Nb cavity**

### Summary of Previous Month

- **Work resumed on welding Nb beam tubes onto the two 500MHz explosion bonded cavities (Research Instruments). Initial welding on first cavity with thinnest Nb failed due to cracking.**
- **Nb coupons have been sent to Epner Technologies for developing and testing of Cu on Nb electroforming techniques**.

### Upcoming Work (Next Month)

- **Research Instruments will attempt welding on the second 500 MHz SRF cavity which has a thicker layer of Nb on the explosion bonded surface.**
- **Studies of techniques for electroforming Cu on Nb will proceed.**

### Quarterly Plans

- **Testing of 500 MHz explosion-bonded cavities expected in late summer.**
- **Cu on Nb electroformed 1.3GHz cavity by end of FY14**

# Monthly L2 Status Report - 11 April 2014

## WBS: Magnets – 03-03

## Presenter: J. Tompkins

## Milestone Status (Progress)

## Resource Conflicts, Plan Changes and Issues

- Conductor development needs funding for realistic scale test and development
- ReBCO magnet program support in absence of PBL grant

## Late Items

## Summary of Previous Month

- Helical Solenoid (HCC- Nb3Sn) – Initial practice winding using dummy (copper) cable; design mods underway; 3D parts being printed
- Rapid Cycling Magnets HTS Completed. fab. of cryostats & moved to leak checking; continued feasibility studies for MC app.
- Rapid Cycling Mag. Conv (UMiss) – Preparations for BH curves for ultralow carbon steel are in process; a Rogowski Profile for magnet end shapes has been calculated
- Rapid Cycling Mag. Conv(BNL) - Studied hysteresis effects
- General Magnet Design – Concept of the W liners & masks mech. & therm. integr w/ magnet cryostat developed. Anal. of W liner deform. as fnctn of xverse size and length performed
- HTS ReBCO Solenoid (BNL) – no activity
- HTS Bi2212 Solenoid (FNAL) – OP processing furnace system arrived and is being set-up; Critical current density and quench characteristics of a 6-layer Bi-2212 coil were tested to 14 T

## Upcoming Work (Next Month)

- HTS Bi2212 Solenoid (FNAL) - Test mechanical properties of the coil pack after epoxy impregnation; and, continue overpressure furnace commissioning.
- HTS ReBCO Solenoid (BNL) – No activity
- Helical Solenoid (HCC- Nb3Sn) – Practice winding; mod design ; cont. design studies
- Rapid Cycling Magnets – HTS Begin assembly of HTS magnet and its current leads; cont. design study of HTS rapid cycling magnets (30 – 500), (500 -1250),etc.
- Rapid Cycling Magnets Conv(UMiss). - Power supply design for a dipole with a 6mm gap.
- Rapid Cycling Mag. Conv(BNL) - Look into design with 3% SiFe poles
- Gen. Mag. Des./IR- Magnets – Continue development of W liners & masks - mech. & therm. integration w/ magnet cryostat

## Quarterly Plans

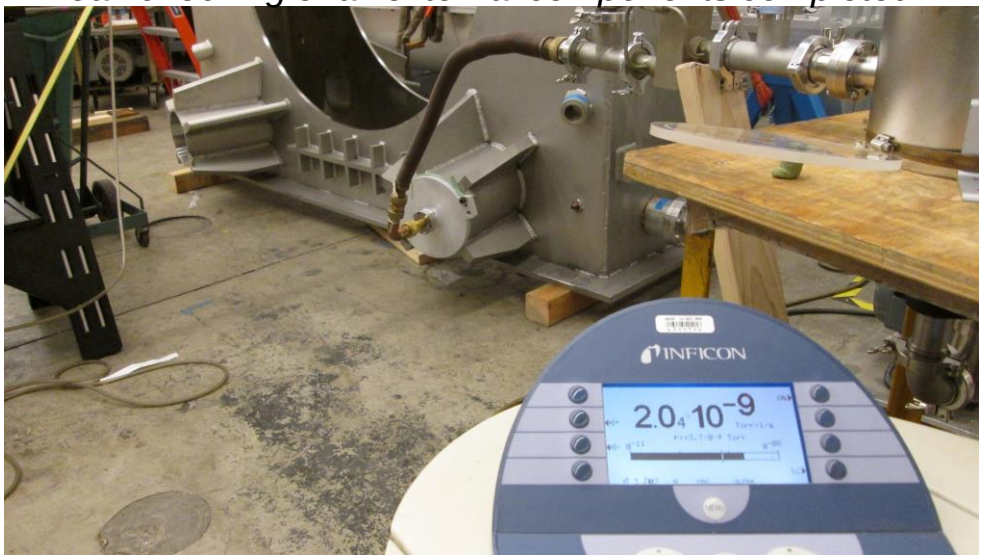
- 2212 Conductor –R&D work utilizing OP processing to define acceptable gas impurity levels for BISCO 2212 coils; develop tooling fabrication of Rutherford cable utilizing the improved conductor; wind, react, and test the resulting OP processed coils.
- Rapid Cycling Magnets HTS – continue fabrication of parts, assembly of components, etc.; preparations for test in E4R –
- Rapid Cycling Magnets Resistive– Continue design work incorporating various steels and develop designs for the required power supplies.

# MICE Coupling Coil

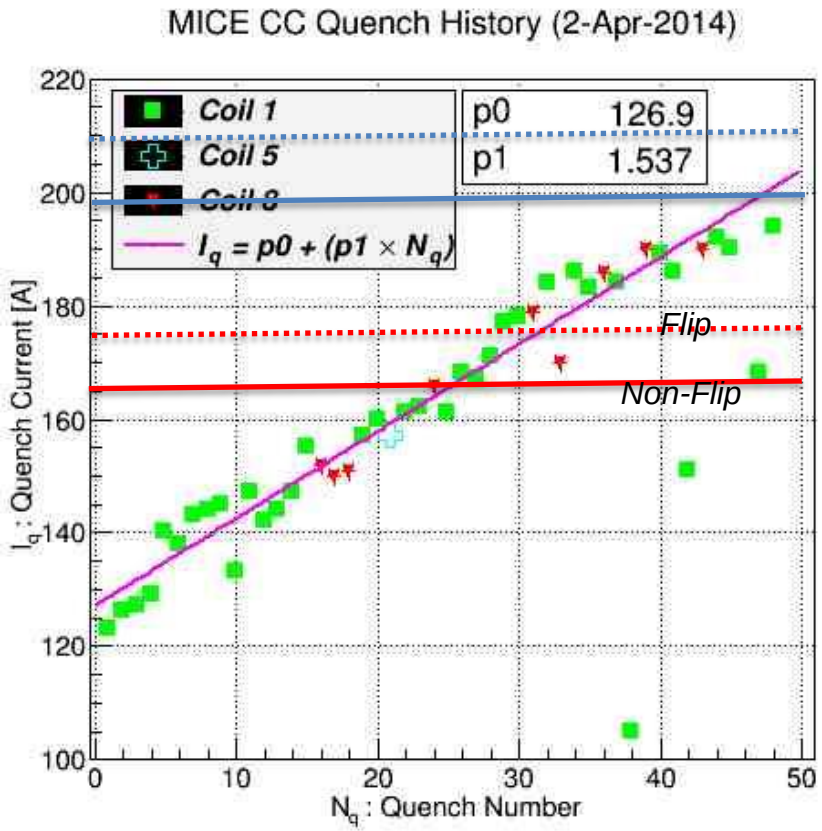
Status:

- First cold test cycle at FNAL completed
- Thermal cycle nearly complete:
  - 4.5K=>300K=>Almost back to 4.5K
- ***Second thermal cycle test starts 4/14/2014***
- Cryostat work ongoing:
  - Cryostat vacuum vessel being leak-checked
  - Cooling circuit design being consolidated

*Leak checking of all external components completed*

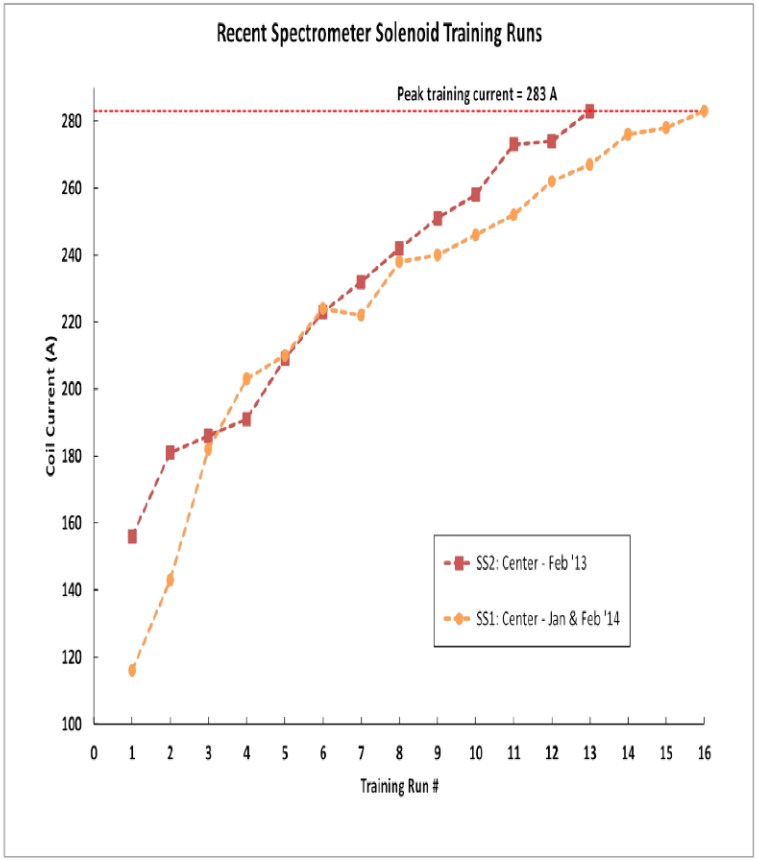



P=200MeV/c P=240MeV/c



# MICE Spectrometer Solenoid

- Training of SS1 (second device) is completed.
- Magnetic measurements completed.
- Preparations for shipping to RAL ongoing.



# Monthly L2 Status Report - 11 April 2014

## WBS: 03.04 Targets and Absorbers

## Presenter: Kirk McDonald

### Milestone Status (Progress)

- The major Milestone is the delivery of a preconceptual design of a Target System for a 6.75 GeV proton beam of 1 MW power, with an upgrade path to 4 MW, for the IBS.

### Resource Conflicts, Plan Changes and Issues

- FY14 funding for Weggel is exhausted, => No further updates of magnetic configuration until FY15.

### Late Items

### Summary of Previous Month

- Ding: Optimization of a graphite target for 6.75 GeV, 1 MW.
- Progress is slow, but it is tempting to conclude that we could run a graphite target with no "dump" near the target, and instead use the chicane as the beam dump. [This is not an option for a liquid-jet target.]
- New comparisons of C, Ga and Hg continue to indicate that the yield is higher with the higher Z targets.

### Upcoming Work (Next Month)

- Continuation of projects of previous month. If the target optimization converges well enough, we can begin energy deposition studies (Souchlas).

### Quarterly Plans

- Continue effort on Target System.
- Could expand effort to coil design + shielding for chicane and rest of Decay Channel, but funding limited.
- Could interact with Proton Driver group on Final Focus issues.

# Monthly L2 Status Report - 11 Apr 2014

## WBS: 3.5 – MuCool Test Area

## Presenter: Yağmur Torun

### Milestone Status (Progress)

- 201-MHz vacuum RF: about to start coupler installation
- 805-MHz vacuum RF: gridded window run in progress
- Infrastructure: 805-MHz RF switch commissioned
- Physics:
  - HPRF beam test analysis continuing
  - all-season cavity data under review

### Resource Conflicts, Plan Changes and Issues

- Lots of activity in parallel
- Design/drafting backlog

### Late Items

- Single-Cavity Module installation, commissioning
- Modular cavity installation, commissioning

### Summary of Previous Month

- Experimental program resumed after overhead crane installation
- 201-MHz Single-Cavity Module: progress on instrumentation (D. Peterson, R. Pasquinelli, M. Chung, A. Moretti, P. Lane, YT); cover plates machined (R. Schultz, J. Gaynier)
- Modular cavity: repair plan under discussion (D. Bowring)
- DL-HPRF: dielectric samples procured (B. Freemire), beam test cavity measured with new gaskets (B. Freemire, M. Chung, A. Moretti)
- Infrastructure: crane installation complete (R. Schultz, R. Pasquinelli, M. Backfish), clean room cleaned (YT), klystron replaced and RF switch commissioned (A. Moretti, D. Peterson)

### Upcoming Work (Next Month)

- Old pillbox cavity: complete run with gridded windows
- DL-HPRF cavity: re-assemble old cavity, start sample testing
- 201-MHz Single-Cavity Module: build/install/test more instrumentation, finish vacuum system, install/align couplers
- Modular cavity: instrumentation and inspection setup
- Infrastructure:

### Quarterly Plans

- Data analysis/publication
  - all-season cavity
  - HPRF beam test
  - magnetic insulation
  - Be-Cu buttons
- Current program
  - Grid window test
  - DL-HPRF
- Next on the list
  - 201-MHz Single-Cavity Module
  - New 805-MHz modular cavity
- Other
  - External user beam run

# MuCool Test Area – Mar-Apr 2014