

# Technology Development MAP Friday Meeting

Harold Kirk

*Brookhaven National Laboratory*

*June 14, 2013*

# Outline

- TD Highlights
- L2 Summary reports
- Topical Report - Progress of dielectric loaded gas-filled RF test at the MTA , K. Yonehara, FNAL

# Technology Development Highlights for May, 2013



- RF Studies
  - Modular 805MHz Cavity on track for delivery by end of FY13 (SLAC, LBNL)
  - Lab G Magnet re-trained to 5T (FNAL)
- Targets
  - Studies for 1MW, 3GeV proton target initiated
- Magnets
  - New Biscoco 2212 wire tested to  $J_c$  of 160A/mm<sup>2</sup> at 5T
- 12 IPAC13 TD related papers presented

# Monthly L2 Status Report -

## WBS: 03 01: Normal Conducting RF

June 14, 2013  
 Presenter: Derun Li

### Milestone Status (Progress)

- Modular cavity (collaboration with SLAC)
  - Cavity fabrication in progress and will be delivered to Fermilab by end of FY13
  - Test plan is being developed
- 201 MHz cavity
  - Preparation for testing at MTA using the single cavity vessel and accessory components:
    - RF coupler fabrication
  - MP simulation studies in a B field

### Summary of Previous Month

- Modular cavity
  - Fabrication at SLAC continues
  - Ready for PO of the Be plates
  - Bi-weekly meetings at SLAC to monitor/oversee fabrication progress
- Support the single cavity installation at MTA, Fermilab
- Updated and completed the fabrication drawings of the RF coupler for 201 MHz MICE cavity, quotation from LBNL received.
- Actuators fabrication complete and delivered to Fermilab
- Cryostat (vacuum vessel) fabrication for MICE CC magnet continued at LBNL, very good progress

### Upcoming Work (Next Month)

- Sign-off of the interface document between LBNL and Fermilab
- Continue the fabrication of the modular cavity at SLAC
- Continue development of the modular cavity test plan
- Support of the 201 MHz installation at MTA, Fermilab
- MP studies of 201-MHz cavities in B field
- Oversee 201-MHz cavity coupler fabrication
- TiN-coating of the coupler
- Oversee the CC cryostat fabrication at LBNL

### Resource Conflicts, Plan Changes and Issues

- MICE magnets: SS and CC
- EP of the remaining MICE cavities at LBNL
- Update of cryostat drawings for the first CC cold-mass

### Late Items

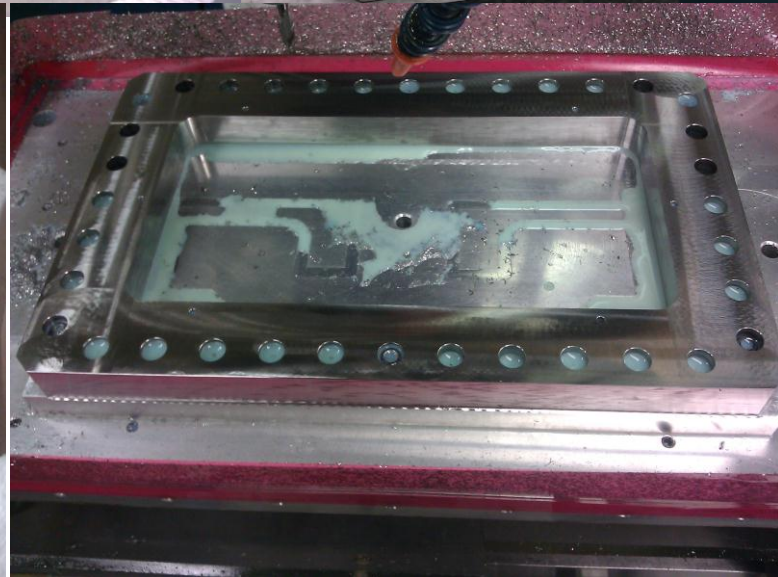
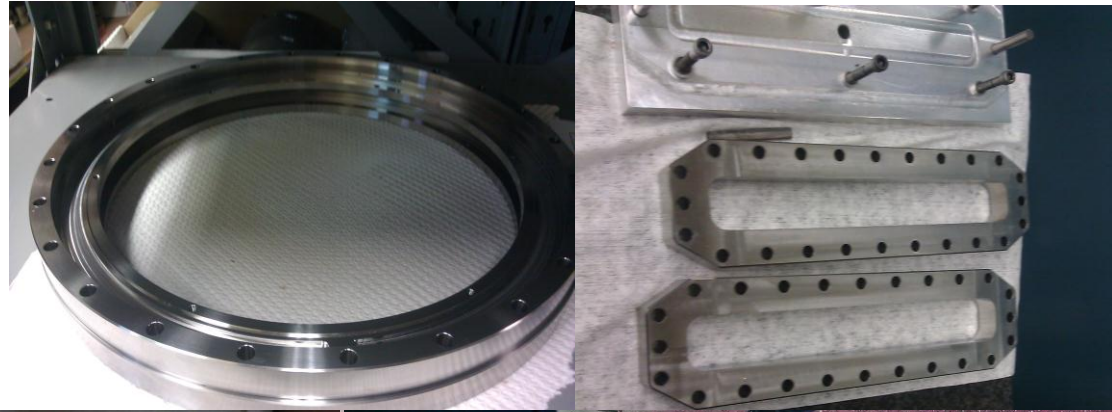
- Sign off of the interface document between LBNL and FNAL
- Fabrication of the modular cavity
- PO of Be plates for the modular cavity
- RF coupler fabrication for the 201 MHz cavity

### Quarterly Plans

- Continue the modular cavity fabrication
- EP of the remaining MICE cavities at LBNL
- Development of the modular cavity testing plan
- Data analysis of previous 805 MHz testing results
- MP simulation studies of the MICE cavity and coupler with external magnetic fields and explore other possible solutions
- Fabrication of two 201 MHz RF couplers for the first MICE cavity in preparation for the testing at MTA
- Support MTA RF testing programs

# The Modular Cavity Fabrication

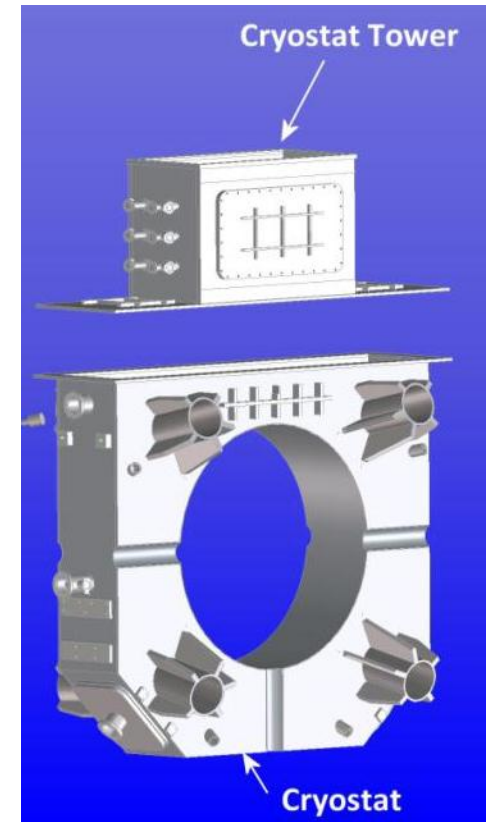
Parts are being fabricated, and the cavity will be brazed, low power measured at SLAC  
The cavity will be delivered to MTA, Fermilab for high power test by end of FY2013





# Cryostat Vessel Fabrication

Large vessel with tight tolerance  
New Water Jet cuts the parts  
Fixture developed to minimize distortion due to welding and handling



CC Cryostat Vessel Fabrication at LBNL

Design

# Monthly L2 Status Report -

14 June, 2013

WBS: 3.2 – Superconducting RF

Presenter: Don Hartill

<p><b><u>Milestone Status (Progress)</u></b></p>	<p><b><u>Resource Conflicts, Plan Changes and Issues</u></b></p> <ul style="list-style-type: none"> <li>.</li> </ul>
<p><b><u>Summary of Previous Month</u></b></p> <ul style="list-style-type: none"> <li>• Begun examining stored energy issues for both 325MHz and 650MHz SRF cavities</li> <li>• Research Instruments continues work for completion of the two 500 MHz cavities</li> </ul>	<p><b><u>Late Items</u></b></p>
<p><b><u>Upcoming Work (Next Month)</u></b></p> <ul style="list-style-type: none"> <li>• 500MHz cavity preparations by Research Instruments</li> <li>• Progress for the SRF program will be reported at the MAP Collaboration meeting at FNAL</li> </ul>	<p><b><u>Quarterly Plans</u></b></p> <ul style="list-style-type: none"> <li>• Research Instruments shipment of 500 MHz cavities expected by end of FY13</li> <li>• Testing of 500 MHz explosion-bonded cavities expected in late spring and early summer. Testing to be completed by mid-summer</li> <li>• Preparation of 3GHz electroformed cavity by summer</li> </ul>

# Monthly L2 Status Report -

June 13, 2013

WBS: Magnets – 03-03

Presenter: J. Tompkins

## Milestone Status (Progress)

**Rapid Cycling Magnets /HTS** : Completed engineering design of Rapid Cycling HTS Magnet test system to be assembled at E4R enclosure

## Summary of Previous Month

- **HTS (2212) Program** - The new 19x36 wire PMM130411 was heat treated and its  $I_c$  was measured up to 14 T. At 5 T, its  $I_c$  reached 160 A. Test fixtures were designed and being machined for the coil .
- **HTS Magnets / ReBCO** - Repairs have been made to one double pancake; a new diagonal splice has been used; the splice and one pancake have been repaired. The same repair has then been applied to 9 of the 12 double pancakes
- **Helical Solenoid (HCC)** – Progress in the investigation of using 3d printing to create parts for the coil former and shell; conceptual designs are in development – parametrized cable added to the model, which follows the actual winding path
- **General Magnet Design** - No activities in May-June except paper writing and presentation at IPAC2013 and slide preparation to the CM.
- **Rapid Cycling Magnets / Conv** – We are working on twisting bunches of conductors to make Roebel cables to ensure that the amount of flux going through current loops is the same.
- **Rapid Cycling Magnets / HTS** - Procurement of materials for magnet and lead cryostats complete; components of magnet and leads cryostat submitted for fabrication at VMS; study of scaling the HTS rapid cycling magnet for the Muon Accelerator

## Upcoming Work (Next Month)

- **HTS (2212) Program** - The critical current facility has been shut down for safety review. Once it is back to operation, the coil will be tested at 4.2 K and in fields up to 14 T. Its quench characteristics will be tested and analyzed.
- **HTS Magnets / ReBCO** – cont. with repair and apply to all coils (damaged or not); assembly at 24 pancakes into 12 double pancakes; test each double pancake.
- **Helical Solenoid (HCC)** - Continue with initial design and engineering studies; magnetic and mechanical analysis (FEA) to set dimensions. With base dimensions set, designs for coil winding tooling will be developed
- **General Magnet Design** – No plans for July (preparation to MT-23) work will be resumed in Aug-September focusing on HF SR magnet concepts.
- **Rapid Cycling Magnets / Conv** – we plan to run OPERA 2D simulations of eddy currents in the iron laminations near the pole faces to find the magnitude of the second order derivative. Higher order moments can affect the lattice.
- **Rapid Cycling Magnets /HTS** - Proceed with splicing of HTS strands to power lead; complete fabrication of magnet and leads cryostat components at VMS; continue study of applying HTS rapid cycling magnet technology for the Muon Accelerator

## Resource Conflicts, Plan Changes and Issues

- [....]

## Late Items

## Quarterly Plans

- **HTS (2212 ) Program** – Continue work to develop tooling and Rutherford cable from the improved conductor; wind, react, and test coil using 1.2 mm single strand using overpressure processing.
- **HTS Magnets/ReBCO** – Disassembly and examination of midsert coil and inspection of individual pancake coils; identify source of degradation; development of formal test procedure; failure analysis report
- **Helical Solenoid (HCC)** - Development of magnet specifications; development of preliminary magnetic, mechanical, & cryogenic designs
- **General Magnet Design** – continued collaboration on development of CR/IR magnets: cross-sections, field characteristics, heat loads, etc. with CR Group (Mokhov) on requirements, as needed
- **Rapid Cycling Magnets – HTS** Continue with fabrication of system components; begin assembly of test system
- **Rapid Cycling Magnets – Conv** Develop procedure for transposed Cu strands; test and compare to calculations



# Monthly L2 Status Report -

# 14 June 2013

WBS: 03.04 Targets and Absorbers

Presenter: Kirk McDonald

# Monthly L2 Status Report -

# 14 June 2013

## WBS: 3.5 – MuCool Test Area

Presenter: Yağmur Torun

### Milestone Status (Progress)

- 201-MHz vacuum RF: assembly work about to start
- Infrastructure – on track but late: beamline upgrade, RF switch re-commissioning, station-2 vacuum system
- Data analysis: HPRF beam test PRL draft under revision (B. Freemire, K. Yonehara, A. Tollestrup, M. Chung); beam spot analysis RSI published (M. Jana); all-season cavity data review in progress

### Summary of Previous Month

- Solenoid: training complete (J. Volk, M. Leonova, J. Makara)
- Dielectric loaded HPRF: cavity reassembled/tested without rod (K. Yonehara, G. Flanagan, A. Moretti)
- 201-MHz Single-Cavity Module: much progress at installation workshop (May 28-29), tuner response tested, instrumentation plan formed (L. Somaschini, D. Peterson, R. Pasquinelli, A. Moretti); safety documentation prepared (J. Volk)

### Upcoming Work (Next Month)

- 805-MHz all-season cavity: operation in  $B > 3T$
- DL-HPRF cavity: retesting with dielectric rod
- Old pillbox cavity: install grid windows
- 201-MHz Single-Cavity module: RF control system upgrade, tuner instrumentation tests, mount/dress cavity in Lab-6, start LLRF measurements
- Modular cavity: instrumentation

### Resource Conflicts, Plan Changes and Issues

- Mechanical support for RF program
- Electrical support for beamline upgrade

### Late Items

- Single-Cavity Module assembly, installation
- Pillbox with grid windows, all-season cavity high-B run
- Beamline commissioning

### Quarterly Plans

- Data analysis/publication
  - magnetic insulation
  - Be-Cu buttons
  - HPRF beam test
- Current program
  - All-season cavity in magnetic field
    - $B > 3T$
  - Dielectric-loaded HPRF
- Next on the list
  - Grid windows on pillbox cavity
  - 201-MHz Single-Cavity Module
  - New 805-MHz modular cavity
- Other
  - Beamline commissioning