

Technology Development MAP Friday Meeting

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Outline

- Summary of TD Activities
- L2 Summary reports
- Topical Report
 - *Recent All Season Cavity Results at the MTA, Yagmur Torun, IIT*

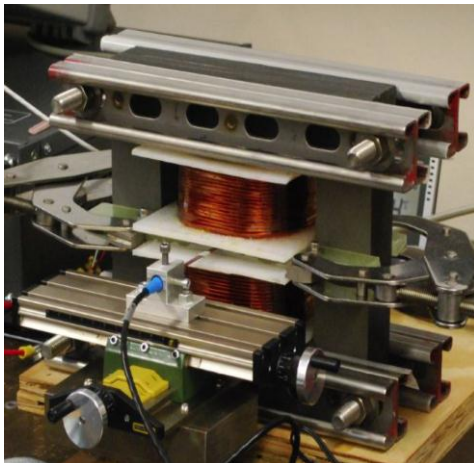
Technology Development Activities



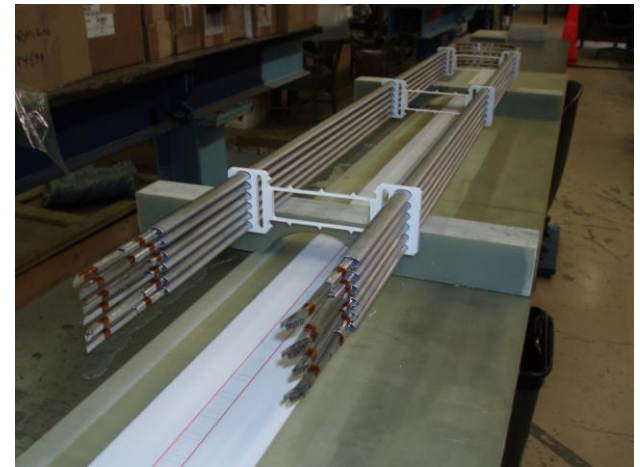
- RF Studies
 - Modular 805MHz Cavity (SLAC, LBNL)
 - 200MHz cavity development (LBNL, FNAL)
 - HPRF (Muons, Inc., FNAL)
 - SRF cavities (Cornell)
- HTS Studies
 - BISCO 2212 cable development (FNAL)
 - YBCO based high-field solenoids (BNL)
- Magnet Design (Next Slide)
- Prototyping rapid pulsing (400 Hz) dipoles for rapid cycling synchrotrons
- Conceptual design of a 4-MW target system

Magnet Design

- ± 1.8 -T, 400Hz RCS magnets (BNL, Mississippi)
- HTS rapid cycling magnets (FNAL)
- Collider ring magnets (FNAL, PBL)
- IR Quadrupoles (FNAL)
- HCC design and prototyping (FNAL, Muons, Inc.)



**Mississippi-
Test reached 1.8T
Design &
prototype work
in progress**



FNAL- HTS rapid cycling coils

Monthly L2 Status Report -

WBS: 03 01: Normal Conducting RF

12 April, 2013
Presenter: Derun Li

Milestone Status (Progress)

- Modular cavity (collaboration with SLAC)
 - Cavity fabrication started
 - Already have parts made
 - Halted due to budget at SLAC and should resume soon
- 201 MHz cavity
 - Preparation for testing at MTA using the single cavity vessel and accessory components:
 - RF coupler MP simulations with MICE B field map,
 - Tuners and actuators (in progress, but delayed)
 - MP simulation studies (collaboration with SLAC)

Summary of Previous Month

- Modular cavity
 - Fabrication drawings complete
 - Interface document between SLAC and LBNL signed
 - Fabrication started and parts are made
 - Ready for PO of the Be plates
 - Bi-weekly meetings at SLAC to monitor/oversee fabrication progress
- Fabrication drawings of the RF coupler for 201 MHz MICE cavity delivered to Fermilab and sent out for quotes
- Revisit RF coupler design, update and MP simulation studies
- Cryostat fabrication for MICE CC magnet started
 - Some parts are made

Upcoming Work (Next Month)

- Sign-off of the interface document between LBNL and Fermilab
- Fabrication of the modular cavity
- Further development of the cavity test plan
- Support of the 201 MHz installation at MTA, Fermilab
- MP studies of 201-MHz cavities with B field
- Support the RF coupler fabrication at Fermilab
- Continue the fabrication of actuators at LBNL

Resource Conflicts, Plan Changes and Issues

- MICE magnets: SS and CC
- Available resources at SLAC for the modular cavity fabrication
- EP of the remaining MICE cavities at LBNL
- Development of the modular cavity fabrication plans and schedule

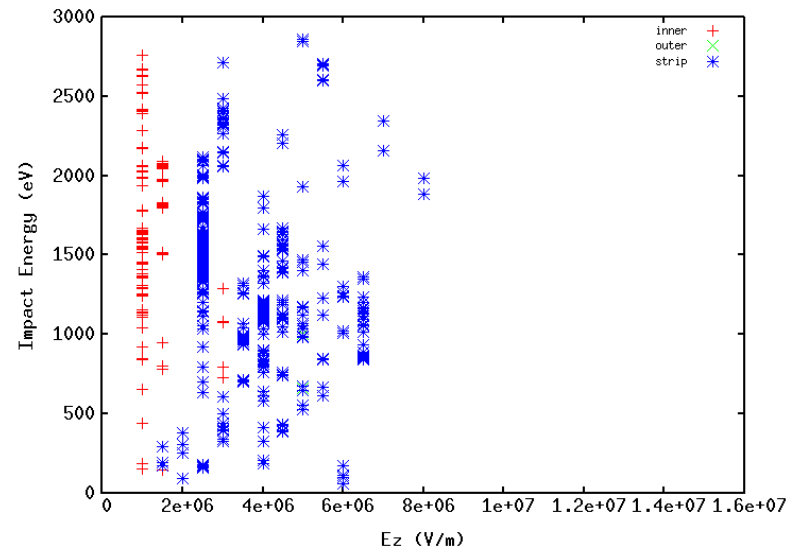
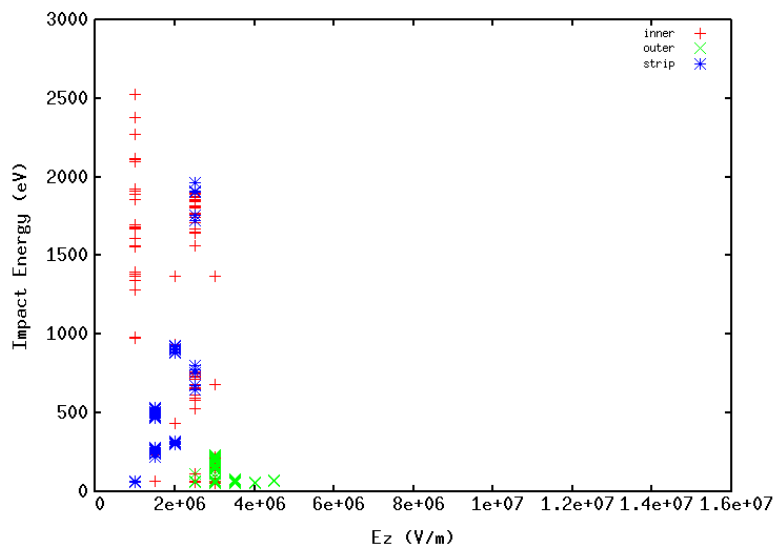
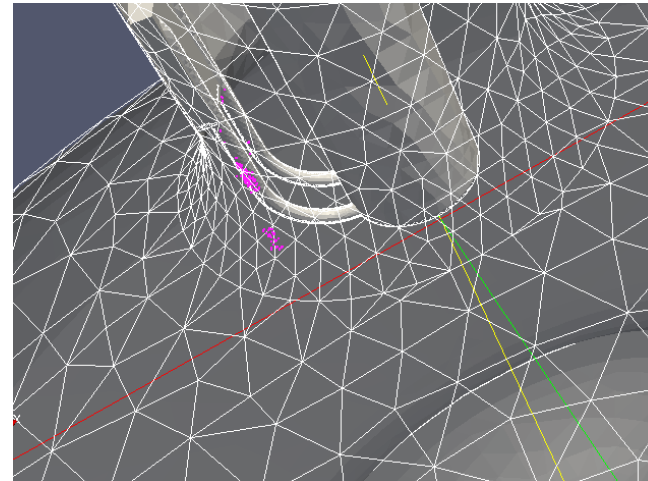
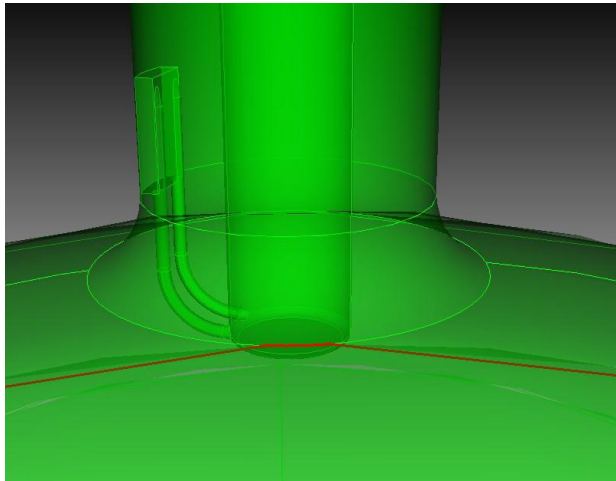
Late Items

- Sign off of the interface document between LBNL and FNAL
- Fabrication of the modular cavity
- Fabrication of actuators at LBNL

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
- Complete the fabrication of actuators at LBNL
- Support MTA RF testing programs

201 MHz RF Coupler Update



Monthly L2 Status Report -

WBS: 3.2 – Superconducting RF

12 April, 2013
 Presenter: Don Hartill

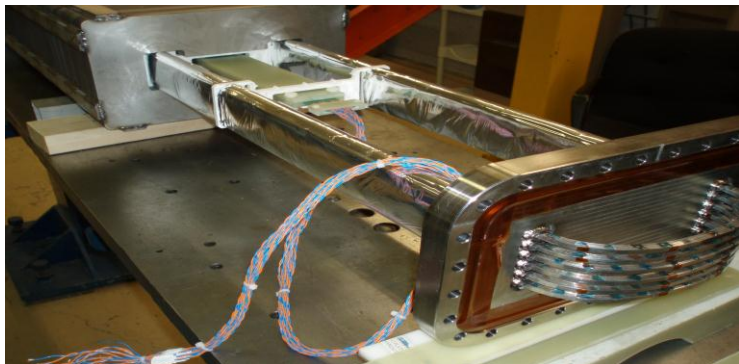
<p><u>Milestone Status (Progress)</u></p>	<p><u>Resource Conflicts, Plan Changes and Issues</u></p> <ul style="list-style-type: none"> .
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none"> • Completed plan for e-beam welding of cavity with reduced thickness of Nb on one end • Research Instruments has started adding beam tubes to two 500 MHz cavities 	<p><u>Late Items</u></p> <p><u>Quarterly Plans</u></p> <ul style="list-style-type: none"> • Research Instruments shipment of 500 MHz cavities expected in ~6 weeks • Testing of 500 MHz explosion-bonded cavities expected in late spring and early summer. Testing to be completed by mid-summer • Preparation of 3GHz electroformed cavity by summer
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none"> • 500MHz cavity preparations by Research Instruments • First e-beam weld by Research Instruments of the adapter ring on the 500MHz prototype (key weld to finish the cavities) 	

MAP Magnets [03-03]

- **HTS Magnets / ReBCO – Ramesh Gupta**
 - 100 mm ReBCO solenoid containing 24 pancakes was removed from test stand. Outer fiberglass epoxy support was removed. No physical damage or abnormality was found on the outer surface of pancakes.
 - Next month: The structure will be completely disassembled and all 12 double-pancakes will be individually inspected. Detailed testing of individual double pancake at 77K is expected to start.
- **HTS Magnets /2212 – Tengming Shen**
 - Wound and reacted a Bi-2212 coil (Six layer, 244.5 turns, ID=2a₁=33.40 mm, OD=2a₂=48.1 mm; Length=2b=57.80 mm; insulation: alumina-silicate)
 - Next month: The coil will be instrumented with voltage taps, film heaters, thermometers, strain gauges, and acoustic emission sensors and then epoxy impregnated with CTD-101k. It will be tested 4.2 K, 14 T together with its quench characteristics.
- **Helical Solenoid (HCC) – Mauricio Lopes w/ Muons, Inc.**
 - Planning and conceptual design activities for development of Nb₃Sn coils for next stage of HCC; design & engineering effort in early stages
 - Next month: continue with design and engineering work
- **Rapid Cycling Magnets / HTS – Henryk Piekarz**
 - Welding of 12 sub-cable cryogenic pipes to all magnet cable flanges is complete; fabrication of support fixture to splice 6 x 20 HTS strands to and connect to power lead;
 - Engineering design of magnet & leads cryostats is complete; procurement & fabrication of components for all cryogenic transfer lines and cryo-boxes is complete
 - Next month: Assemble splicing setup for HTS to power leads; test splicing setup and develop procedure; Procure for magnet & lead cryostats and submit for fabrication at VMS
- **Rapid Cycling Magnets / Conv – Don Summers**
 - Dipole has been operated at 1.8T and 1410Hz
 - Next month: work is underway to transpose strands in the coils to reduce eddy current losses.
- **General Magnet Design – Sasha Zlobin**
 - No new magnet design studies this month
 - Next month: depends on disc/needs of Mokhov & group; e.g., changes in ring design => magnet requirements, parameters

Rapid Cycling SC Magnet Assembly Work

H. Piekarz



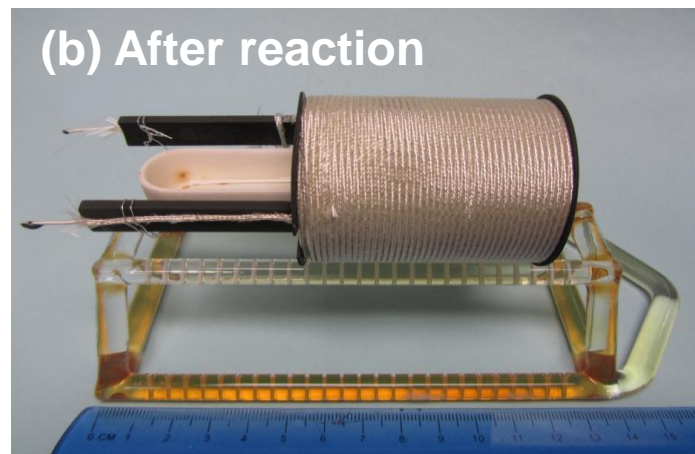
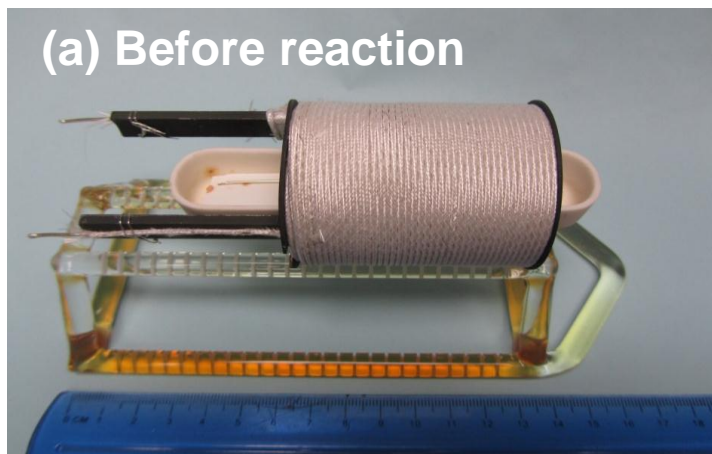
Inserting coil into the magnet gap. The 8-cell, 520 mm long flat coil probe is in the center.



12 stacks of 20 HTS strands at magnet end to be connected with power leads.

Bi-2212 conductor and coil development

T. Shen



Wind and react a Bi-2212 coil (Six layer, 244.5 turns, $ID=2a_1=33.40$ mm, $OD=2a_2=48.1$ mm; Length= $2b=57.80$ mm; insulation: alumina-silicate)

Monthly L2 Status Report -

WBS: 03.04 Targets and Absorbers

12 April, 2013
 Presenter: Kirk McDonald

<p><u>Milestone Status (Progress)</u></p>	<p><u>Resource Conflicts, Plan Changes and Issues</u></p>
<p><u>Summary of Previous Month</u></p> <ul style="list-style-type: none"> • Ding, Souchlas: Preparations for running multiple MARS1512 jobs on clusters. • Sayed: ICOOL simulation of relation between proton beam time and rapidity of magnet taper • Zhan: Thesis proposal defense at SUNY Stony Brook. • Weggel: First look at magnet design for the chicane; high heat loads in magnets may favor use of HTS conductor. Magnet design for “taper” that ends at $z = 7$ m. • Snopok: Use of MARS capability to import geometry from ROOT (G4beamline) for first look at energy deposition in the chicane. • McDonald: Participation in IDS-NF Plenary Meeting 10 to prepare for writing of the RDR. 	<p><u>Late Items</u></p>
<p><u>Upcoming Work (Next Month)</u></p> <ul style="list-style-type: none"> • Continuation of all projects of previous month 	<p><u>Quarterly Plans</u></p> <ul style="list-style-type: none"> • The basic target system concept is well-defined. • Clarify whether we can drop the capture solenoid field from 20 T to 15 T. • Optimize target & decay magnetic configuration for best performance of beam delivered to accelerator (a step towards a global optimization of the entire MC/NF). • Extend target system conceptual design up to start of buncher (including chicane in decay/drift region). • Begin technical design of mercury handling system, and of magnet cryostats and shielding modules from target to buncher.

Monthly L2 Status Report -

12 April 2013

WBS: 3.5 – MuCool Test Area

Presenter: Yağmur Torun

Milestone Status (Progress)

- 805-MHz vacuum RF: all-season cavity run at B=0-3T done
- 201-MHz vacuum RF: Single-Cavity Module transport stand built; tuner test fixture redesigned (R. Schultz, J. Gaynier, A. DeMello); vacuum vessel surveyed (J. Volk)
- Infrastructure – on track: beamline upgrade, RF switch re-commissioning, station-2 vacuum system
- Data analysis: HPRF beam test PRL draft ready (B. Freemire, K. Yonehara, A. Tollestrup, M. Chung); beam spot analysis RSI submitted (M. Jana)

Summary of Previous Month

- Operations: LabView control/conditioning program for 805-MHz system updated (D. Peterson) enabling 24/7 running
- RF source: modulator up(?)graded (A. Moretti)
- Solenoid: quench training instrumentation installed (J. Volk)
- Dielectric loaded HPRF: parts test fit (K. Yonehara, A. Moretti)
- Surface inspection: button microscopy fixture built (R. Schultz, J. Sobolewski); pillbox window analysis in progress (M. Jana)

Upcoming Work (Next Month)

- 805-MHz all-season cavity operation in B>3T
- Complete button microscopy, analysis
- Build 201-MHz RF control system upgrade

Resource Conflicts, Plan Changes and Issues

- Mechanical help for single-cavity module assy
- Access to machine shop
- Help for beamline upgrade commissioning

Late Items

- Single-Cavity Module assembly
- Pillbox with grid windows

Quarterly Plans

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