

Technology Development MAP Friday Meeting

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May 10, 2013

Outline

- TD Highlights
- L2 Summary reports
- Topical Report - *Update on the NHMFL HTS Program* , David Larbalestier, NHMFL

Technology Development Highlights April, 2013



- RF Studies
 - Modular 805MHz Cavity Fabrication Resumed (SLAC, LBNL)
 - 200MHz Cavity Prep for Testing(LBNL, FNAL)
 - Dielectric Cavity Tested (Muons, Inc., FNAL)
- HTS Studies
 - Damaged outer layer of some YBCO pancakes removed. Pancakes now in working order. (BNL)
- Magnet Design
 - Progress in pulsed HTS dipoles for rapid cycling synchrotrons
- 12 IPAC13 TD related papers submitted

Monthly L2 Status Report -

WBS: 03 01: Normal Conducting RF

May 10, 2013
Presenter: Derun Li

Milestone Status (Progress)

- Modular cavity (collaboration with SLAC)
 - Cavity fabrication resumed at SLAC
 - IPAC-2013 paper submitted
- 201 MHz cavity
 - RF coupler MP simulations with MICE B field map, IPAC-13 paper
 - Tuner actuators fabrication complete at LBNL, packed and shipped to Fermilab this week
 - RF coupler design updated, seven updated fabrication drawings delivered to Fermilab

Summary of Previous Month

- Modular cavity
 - Budget issue got resolved and fabrication resumed at SLAC
- 201 MHz Cavity
 - RF coupler fabrication quotes received
 - RF coupler design updated, fabrication drawings sent to Fermilab
 - Fabrication of six actuators for the prototype cavity complete
- Cryostat fabrication for MICE CC magnet started
 - Many parts have been made, fixtures and assembly for welding complete

Upcoming Work (Next Month)

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

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, waiting for funding from University of Mississippi

Late Items

- Sign off of the interface document between LBNL and FNAL

Quarterly Plans

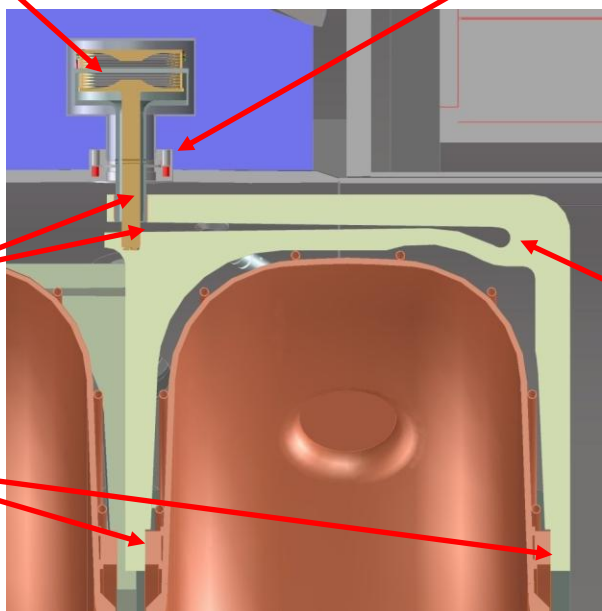
- Continue the modular cavity fabrication
- EP of the remaining MICE cavities at LBNL
- Development of the modular cavity testing plan
- Data analysis of previous 805 MHz testing results
- MP simulation studies of the MICE cavity and coupler with external magnetic fields and explore other possible solutions
- 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

Progress Update

- Fabrication of six actuators complete at LBNL
- Packed and shipped to Fermilab this week

- Dual - action actuator

- Tuner/actuators are thermally independent of the vacuum vessel



- Actuator is screwed into the tuner arm

Fixed connection to cavity

- Flexure tuner arm



Monthly L2 Status Report -

WBS: 3.2 – Superconducting RF

10 May, 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>Late Items</u></p>
<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>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) 	

Monthly L2 Status Report -

May 10, 2013

WBS: Magnets – 03-03

Presenter: J. Tompkins

Milestone Status (Progress)

A review and update of milestones for the 03-03 tasks for FY13 thru FY15 has been completed. A new set of milestones has been agreed upon.

Summary of Previous Month

- [HTS \(2212\) Program](#) - with Oxford Instr., des. & fab 0.8 mm Bi-2212 conductor w/ low gas impurities for imprv long-length perf. ; with new 19x36 archit for smaller d_{eff} , imprv mag. field quality /reducing AC losses. Instrum. of the Bi- 2212 coil is well along: v-taps, film httrs, thermometers, strain gauges, and acoustic emission sensors
- [HTS Magnets / ReBCO](#) - The damaged coil has been inspected and some Cu delamination was found on last turn of 1 pancake; removing first turn (both pancakes) resulted in coil performing normally. Further investigation continues.
- [Helical Solenoid \(HCC\)](#) – Bi-weekly meetings begun; prelim design concepts for first model coils explored.
- [General Magnet Design](#) – Conceptual design of 500 mm IR dipole B1 was dev. and analyzed; x-section optimized for field quality in the beam area. 2 T dipole coils optimized and added to Q2 and Q4 to provide detector protection from the mu decay. “*Preliminary Design of a Higgs Factory $\mu\mu$ Storage Ring*,” Y.I. Alexahin, et al. – submitted to IPAC2013.
- [Rapid Cycling Magnets / Conv](#) - working on how to transpose the stands in the coils to reduce losses from eddy currents
- [Rapid Cycling Magnets / HTS](#) - Setup for simultaneous splicing of 120 HTS tapes (6 sub-cables) to a conventional power lead complete; procurement of materials for magnet and lead cryostats 30% complete

Upcoming Work (Next Month)

- [HTS \(2212\) Program](#) - The new 19x36 architecture wire will be characterized. Its critical current density will be determined in 10 cm short pieces and 1.4 m ITER-type barrels; 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. investigation and tests performed in the previous month and determine if removing one or more turn from the inner side of 2nd pancake will result in removing the bad section completely
- [Helical Solenoid \(HCC\)](#) - Continue with initial design and engineering studies; explore design concepts w/ 3D printer models
- [General Magnet Design](#) – determ. by needs of Acel. Physics & Mokhov groups; e.g., changes in ring design => magnet requirements, parameters
- [Rapid Cycling Magnets / Conv](#) – continue work underway to transpose strands in coils to reduce eddy current losses; options include twisting bunches of conductors to Roebel cables
- [Rapid Cycling Magnets / HTS](#) - Test splicing arrangement and proceed with splicing of HTS strands to power lead; complete procurement of materials for magnet and leads cryostats, submit for fabrication at VMS

Resource Conflicts, Plan Changes and Issues

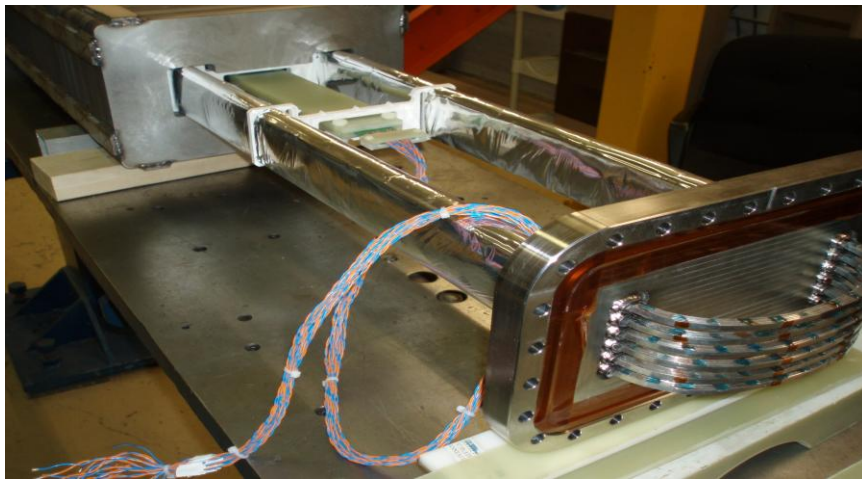
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Late Items

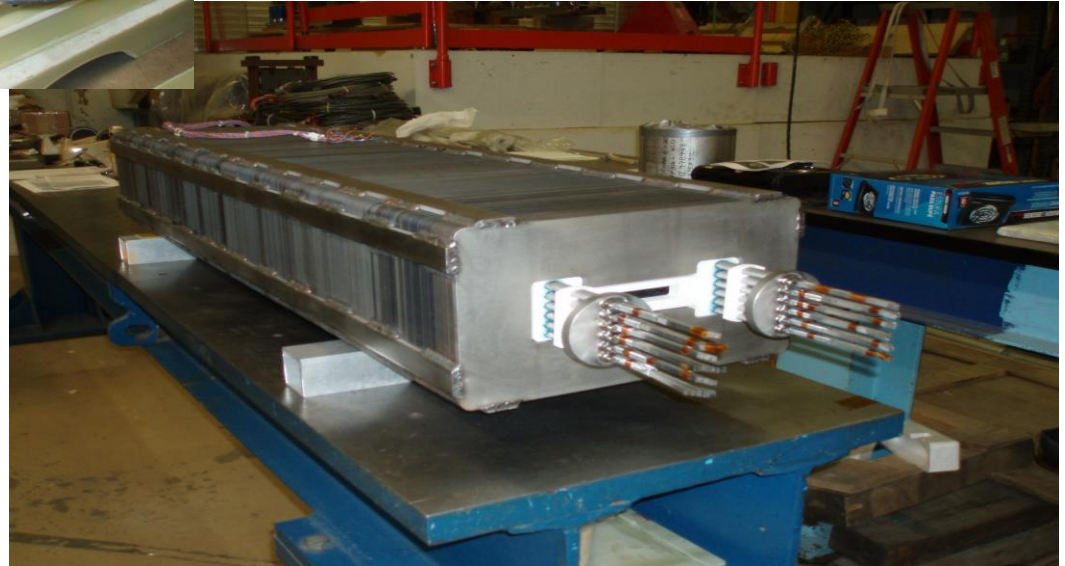
Quarterly Plans

- [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

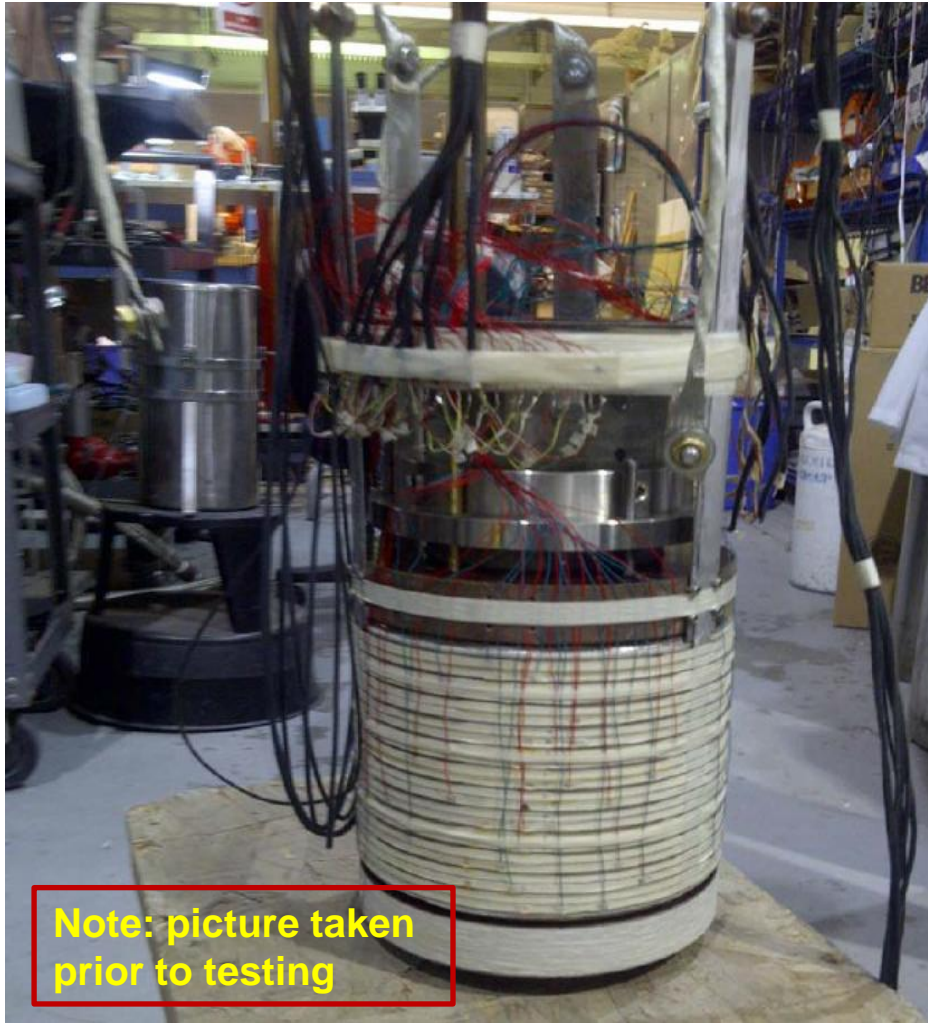
Rapid Cycling Magnets / HTS - H. Piekarz



- Installation of the HTS coil assembly into the magnetic core: complete



Midsert Coil Inspection



Note: picture taken prior to testing

“The solenoid (24 pancakes) structure was disassembled for inspection. The most degraded double pancake was inspected: copper delamination was found on the last turn of one pancake. That turn was removed. The first turn from the inside was also removed from both pancakes. The double pancake was then assembled with the new splice joint and tested again at 77 K. One pancake and the joint performed completely normally (i.e., the bad segment had been removed) and the second coil became significantly better. It is possible that most damage may be only at the i.d. and o.d. of the coils. If so, we may be able to use many of those coils by removing only a few turns.” - Ramesh

Monthly L2 Status Report -

10 May 2013

WBS: 03.04 Targets and Absorbers

Presenter: Kirk McDonald

Milestone Status (Progress)

Resource Conflicts, Plan Changes and Issues

Late Items

Summary of Previous Month

- Ding, Souchlas: Continued preparations for running multiple MARS1512 jobs on clusters.
- Weggel: Several more magnet designs for “tapers” that end at $z = 5-7$ m, including 1.5-T modules for the Decay Channel
- Sayer: ICOOL simulation to show that new Decay-Channel lattice from Weggel has no stop bands.
- Graves: Preliminary drawings of short-taper magnet systems.
- McDonald: Edited 5 Target System papers for IPAC13; presented the Target System at a BNL/Snowmass Workshop, at PASI2 and IDS-NF10 at RAL.

Quarterly Plans

- Extend target system conceptual design up to start of buncher (including chicane in decay/drift region).
- A big new effort, to continue over several quarters, is to evaluate Target-System options for staging scenarios, with initial emphasis on 3-GeV proton energy, 1-MW power. Reconsider a toroidal-horn option, as well as the (baseline) solenoid- capture option.

Upcoming Work (Next Month)

- Begin studies of Target Systems for 3-GeV, 1-MW staging option.