201 MHz Cavity Plans

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February 11, 2011
MAP Friday Video Conference Meeting

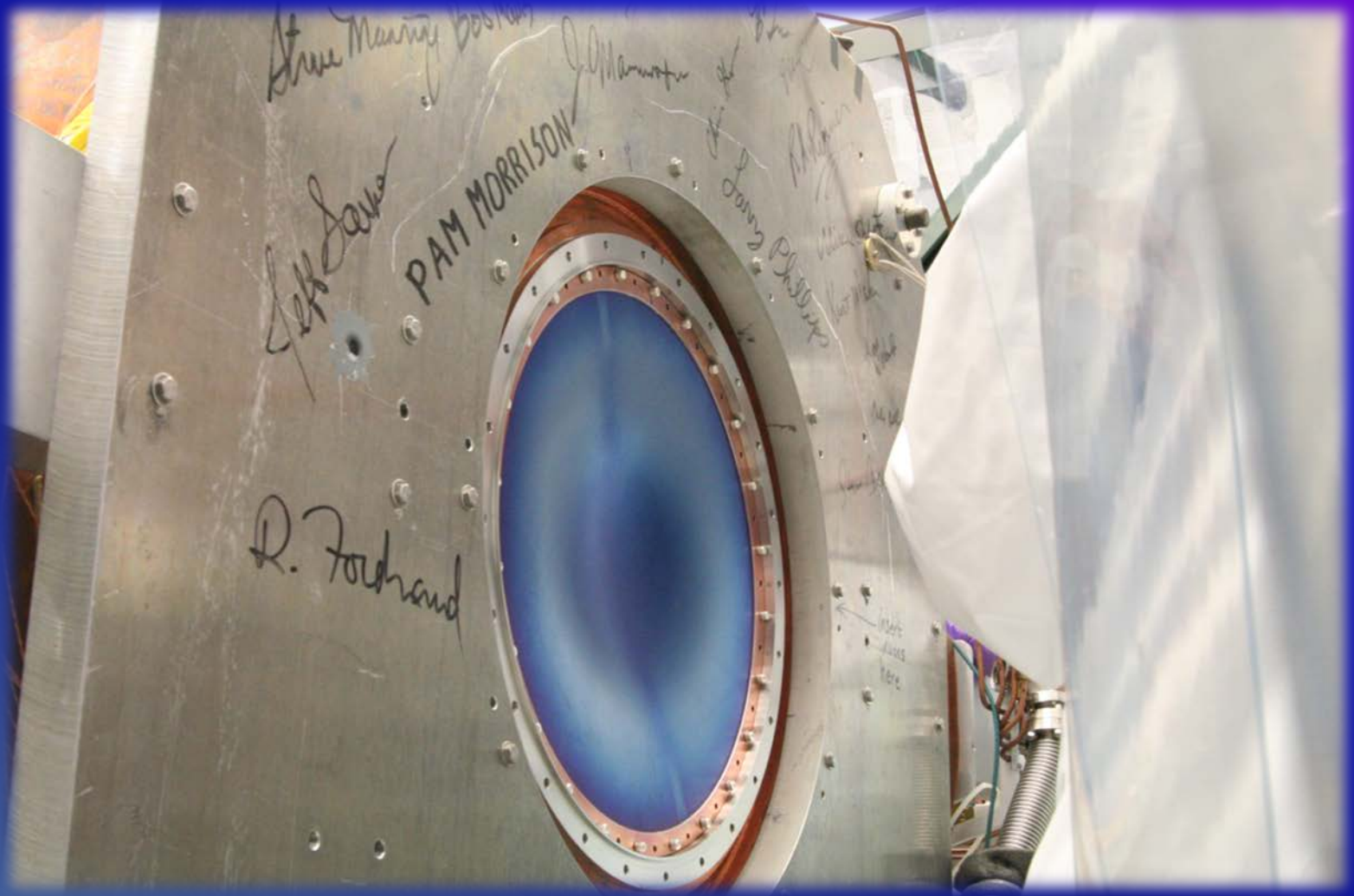
Summary of 201 MHz Cavity Activities

- **RF loop coupler damage (observation)**
  - Sparking at loop region due to a narrow gap between the loop and cavity body
  - Ceramic window damage: copper sputtered on the window with patterns
- **Understand/study and repair the damaged coupler**
  - A small section of the coaxial part of the coupler has been cut for measurement and analysis by J. Norem at ANL
  - The loop will be modified to increase the spacing between the loop and cavity body, including all couplers for MICE cavities
- **Field enhancement and RF heating power of the curved-in beryllium window**
  - Verify simulation results

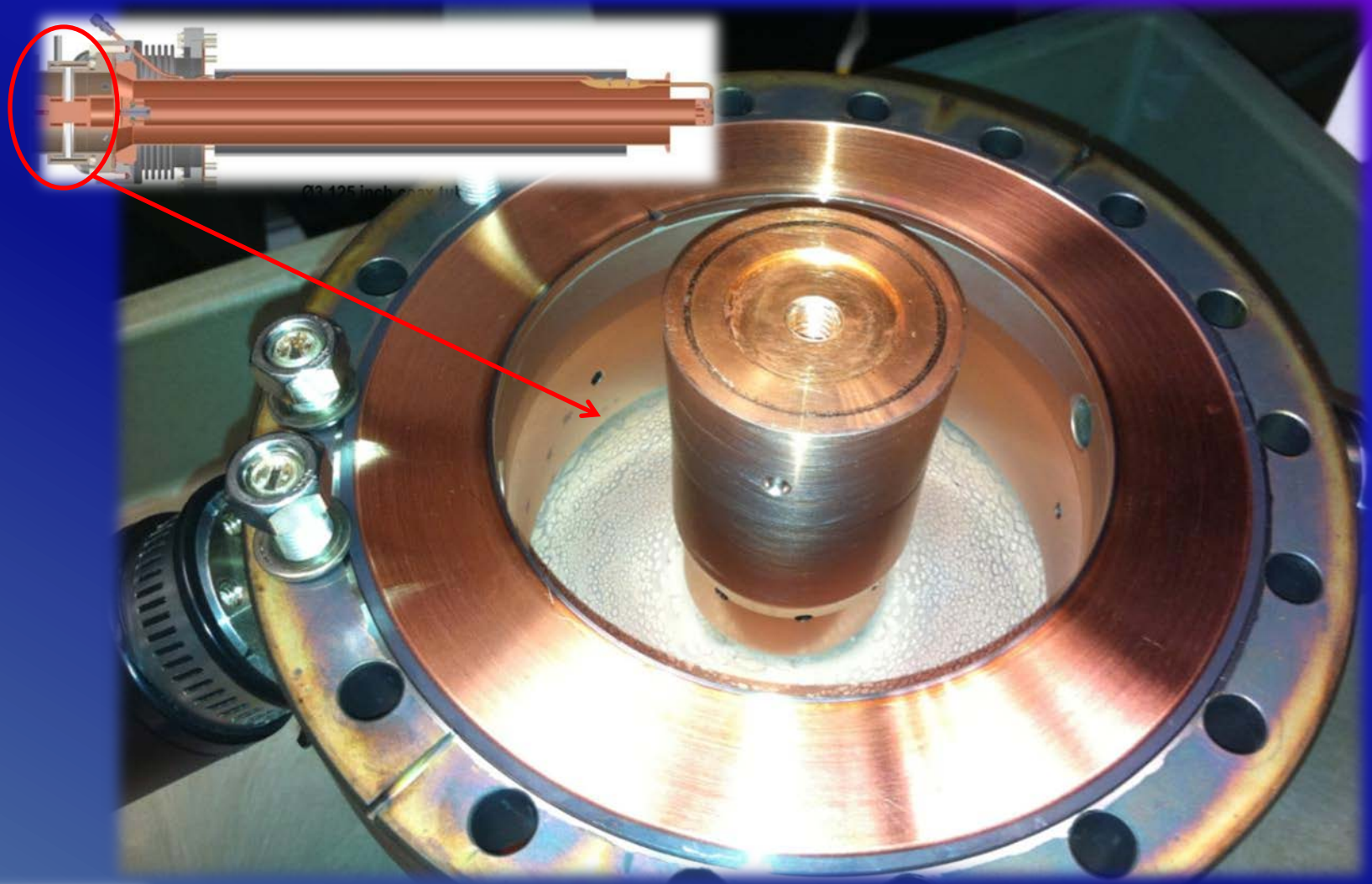
201 MHz Cavity for MICE

- **MICE cavity fabrication progressing well**
  - MICE RF cavities *in advance of scheduled date* (MICE CM28)*;* we have ten cavities with brazed water cooling pipes (two spares) at LBNL (Dec. 2010)
    - First five cavities measured with low RF power (frequency and *Q*)
    - Received nine beryllium windows (with TiN coatings)
    - Ten ceramic RF windows ordered; two could be used for MTA
    - Tuner design complete, one tuner prototype tested offline
    - Six prototype tuners in fabrication, and to be tested this year
    - Design of RF power (loop) coupler complete, ready for fabrication
    - Design of cavity support and vacuum vessel complete
    - Cavity post-processing (surface cleaning and preparation for EP) to start this year at LBNL

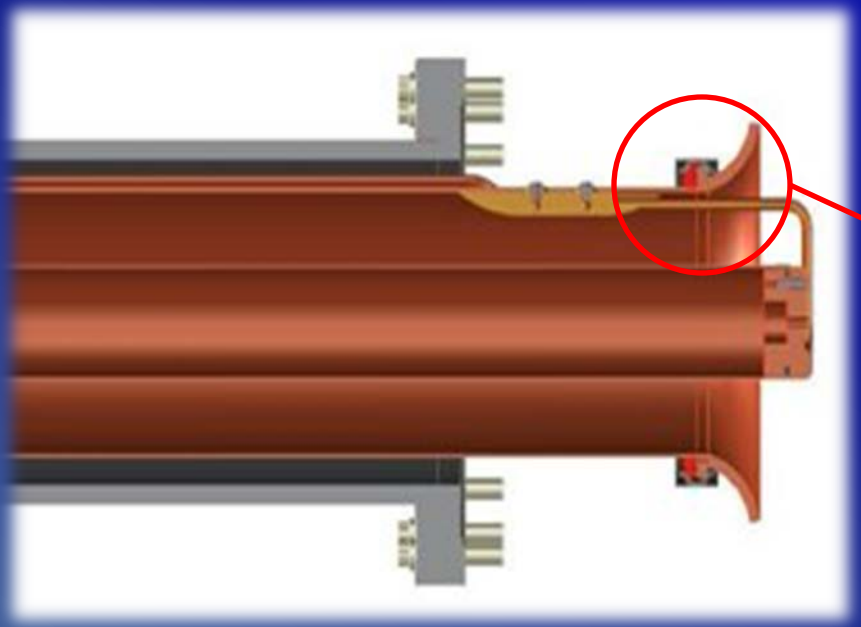
Cavity Inspection



Damage on Ceramic Window

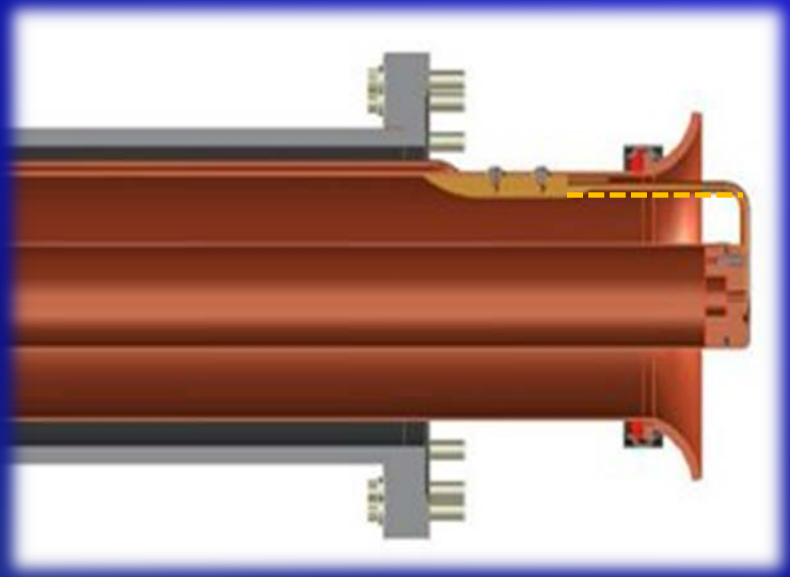


Sparking Marks of RF Coupler



Coupler Repair

- Borrow two MICE ceramic windows for high power tests (ten of them have been ordered)
- Refurbish the couplers
  - Modify the loop design to increase spacing of the gap between the coupler and cavity body
  - TiN coating on the loop region
  - Clean surface exposed to RF
- Retune RF coupling
- Add more diagnostics
  - Arc detectors
  - Temperature sensors

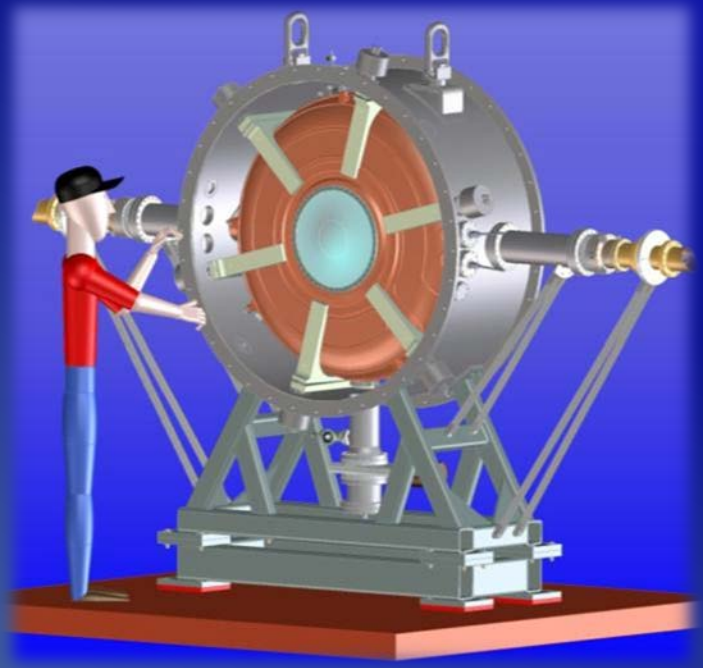


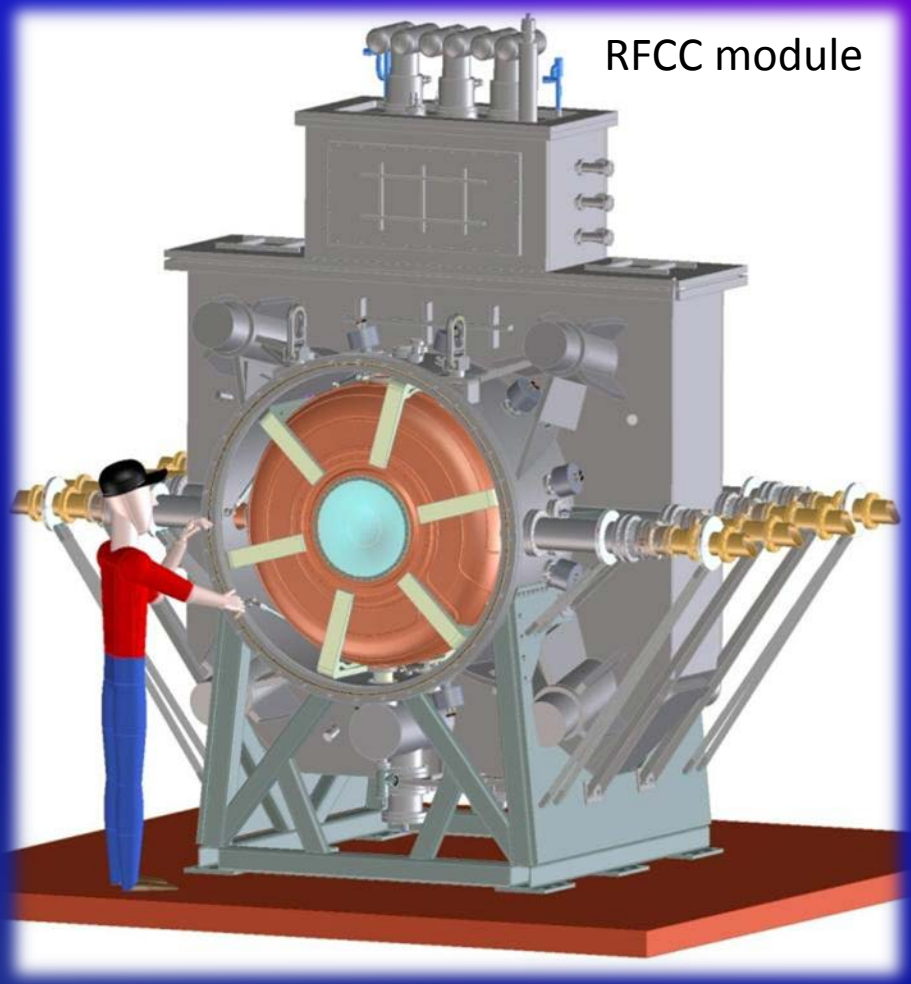
Measurement Plan Using MICE Cavities

- Measurement of engineering and mechanical designs
  - Prototypes: MuCool prototype cavity, tuners, tuning mechanism, support structure
  - Vacuum, water cooling and integration
- RF measurement
  - RF parameters: frequency, Q, coupling (couplers)
  - Low power RF measurements of tuning range, sensitivity, mechanism and control circuit
  - W/O and with beryllium windows
- Single cavity vessel

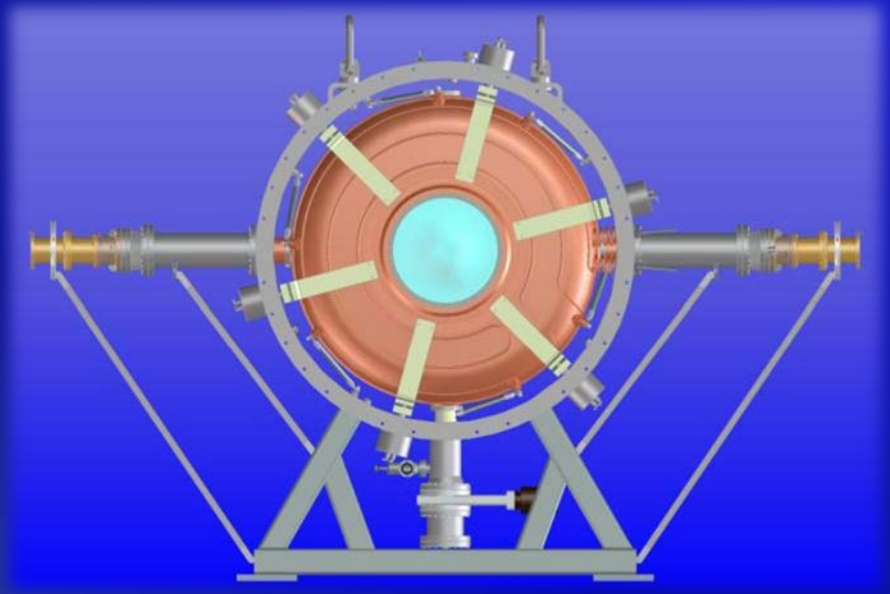
Design of Single Cavity Vessel

- Keep as much as possible of the same dimensions and features of RFCC
- One vessel to accommodate two types of MICE cavities (left and right)
- Future LN operation





Design of Single Cavity Vessel



- The single cavity vessel design is complete (LBNL)
- Drawings will be generated for review soon
- Design review soon:
  - Biding and identification of vendors
  - Fabrication of vessel and accessory components
- Six prototype tuners in fabrication at Mississippi University

What Can We Learn?

Prior to having MICE RFCC module, the single cavity vessel allows us to:

- **Check engineering and mechanical design**
- **Obtain hands-on experience on assembly and develop assembly procedures and fixture**
  - Cavity installation
    - Beryllium windows
    - RF couplers and connections
    - Water cooling pipe connections
    - Vacuum port and connections
    - Tuners and circuit
  - Cavity support structures
  - Vacuum vessel support and handling

What Do We Plan to Measure?

Low power RF measurements:

- Cavity frequency in air and vacuum
- Tuning sensitivity in air or vacuum

High power RF measurements:

- Cavity conditioning
- Frequency variation due to RF heating on beryllium windows and cavity body (can be done using the MTA prototype cavity)
- Frequency shift as a function of average RF power and time

- Repeat above measurement with active tuners on the cavity and measure tuning range and sensitivity (tuner control circuits, etc.)

- Measurements with magnetic fields?

Summary

- Damage of RF couplers and ceramic windows observed, more RF tests will be resumed with new ceramic windows and repaired and modified couplers
- RF cavity measurement plan (using MICE cavity) developed
- Many MICE related issues can be explored and learned from the measurements of single cavity vessel
- In addition, we will continue
  - RF measurements of the second batch of the five MICE cavities
  - Cavity surface finish and EP
  - Corse tuning (by deforming the cavity body) of all MICE cavities to a center frequency
  - Fabrication of accessory components
- Coupling coil magnet for MuCool