MICE RFCC Module Update

MICE CM33 at University of Glasgow, Scotland

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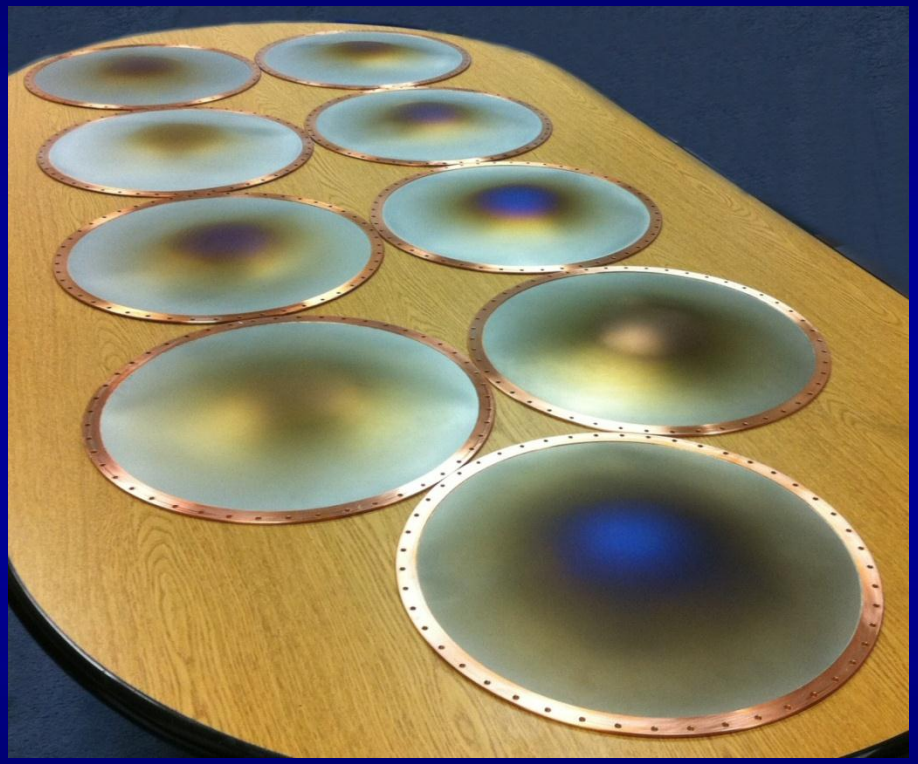
Current Status of RFCC Module

- **RF Cavities and single cavity vessel:**
  - All 11 beryllium windows received at LBNL (1st RFCC module)
  - Ten ceramic RF windows received
  - Six tuner flexures have been fabricated at Fermilab
  - Components for 6 actuators have been fabricated
  - RF coupler design has been modified to eliminate the gap between the outer coax and the RF loop
  - Electropolishing of the first cavity is complete
  - Measurements of the remaining six cavities to start in next fiscal year
  - Cavity inside surface mechanical smoothing and subsequent electropolishing to start in next fiscal year at LBNL
  - Single cavity vacuum vessel, fabricated at Keller Technology in Buffalo New York, is complete and is at Fermilab now.

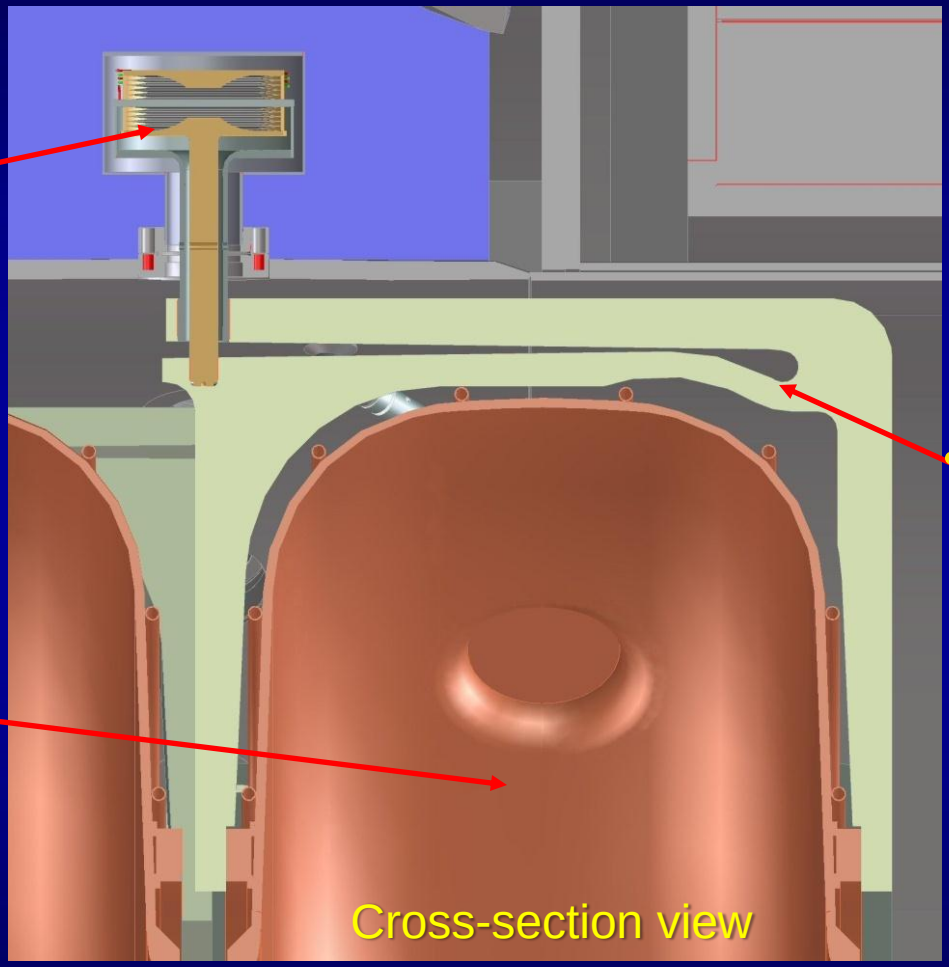
Beryllium Windows

- Eleven beryllium windows have been fabricated (1st RFCC module)



RF Cavity Frequency Tuner Components

- Dual – action actuator
- RF cavity



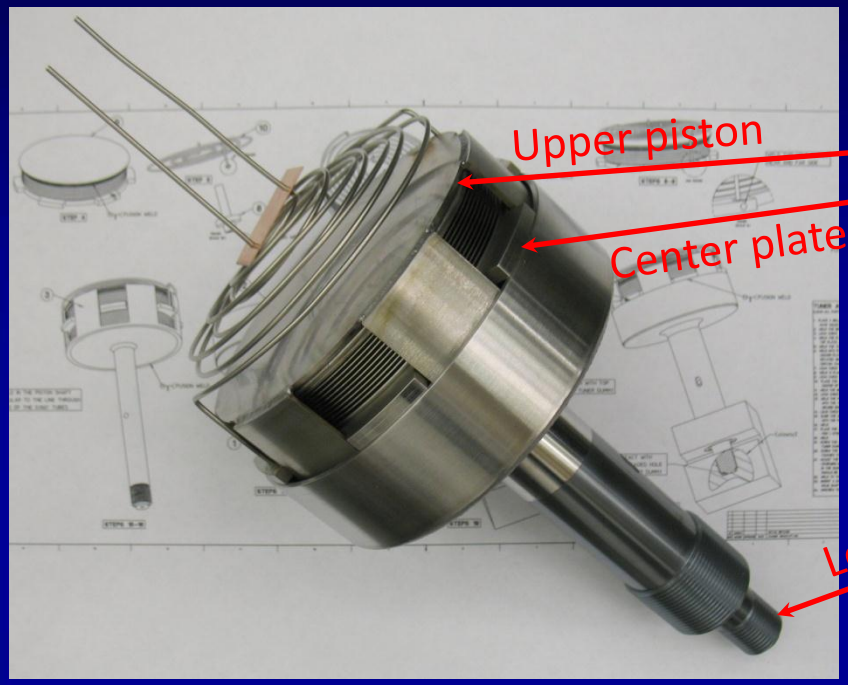
- Flexure tuner arm

Tuning range:
± 230 kHz

Cavity Frequency Tuner Flexure

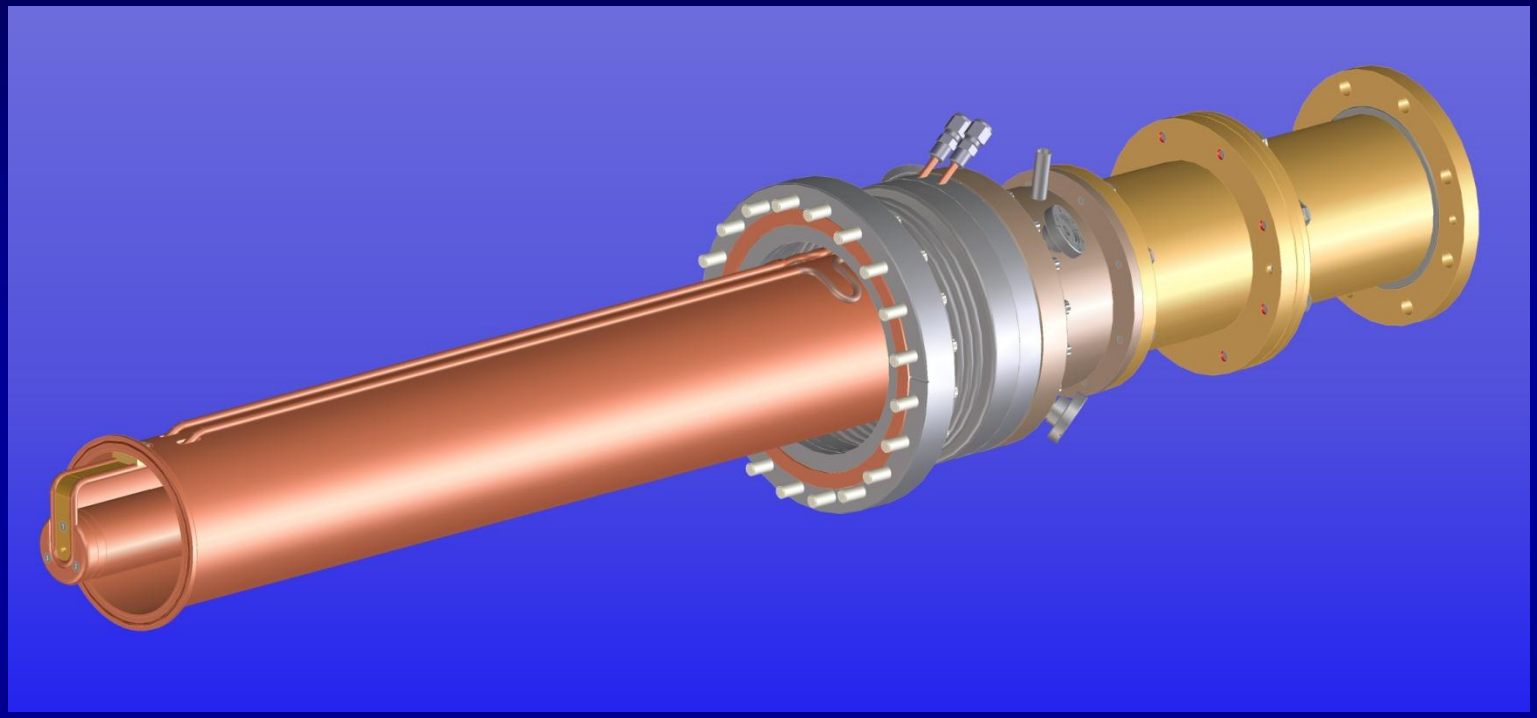
Six tuner flexures have been fabricated at Fermilab

Actuator Component Fabrication



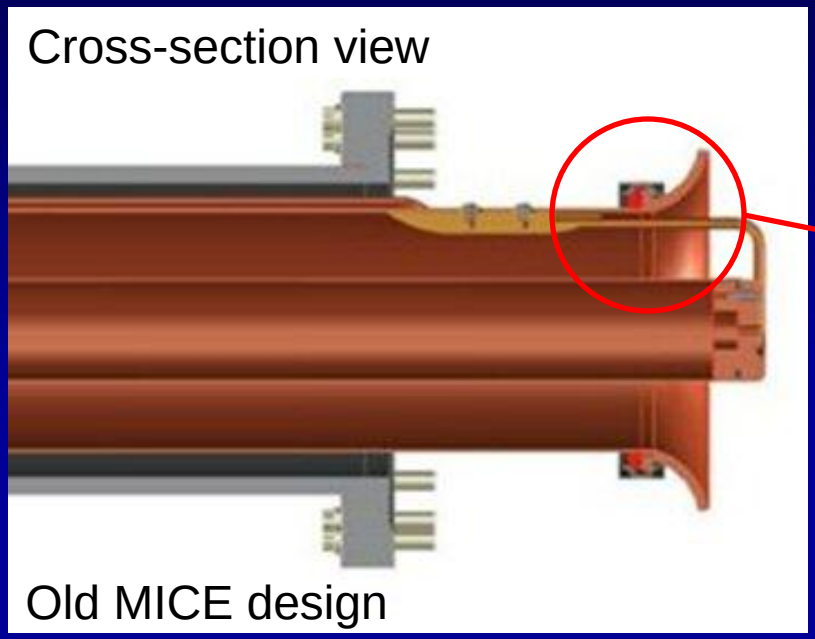
- Component for six actuators have been fabricated
- A second prototype actuator (photo above) has been assembled and tested for bellows performance of a new vendor
- 12 additional bellows will be ordered
- Six actuators will be assembled at LBNL for the single cavity test at Fermilab

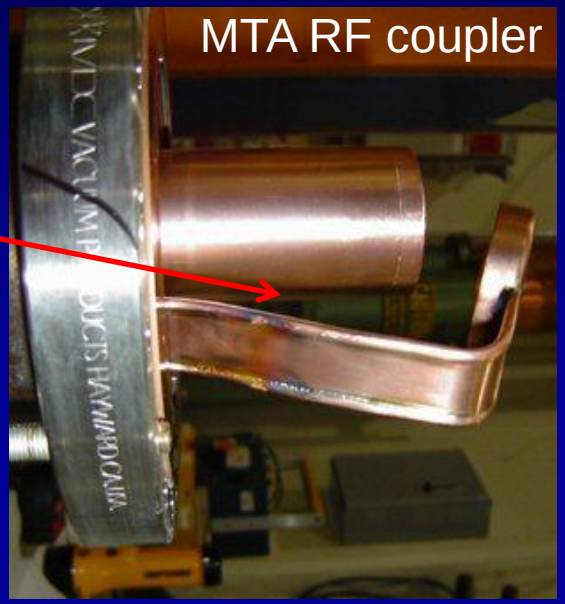
RF Power (loop) Coupler



- RF power (loop) coupler design has been modified to eliminate the gap between the loop and the outer coax tube

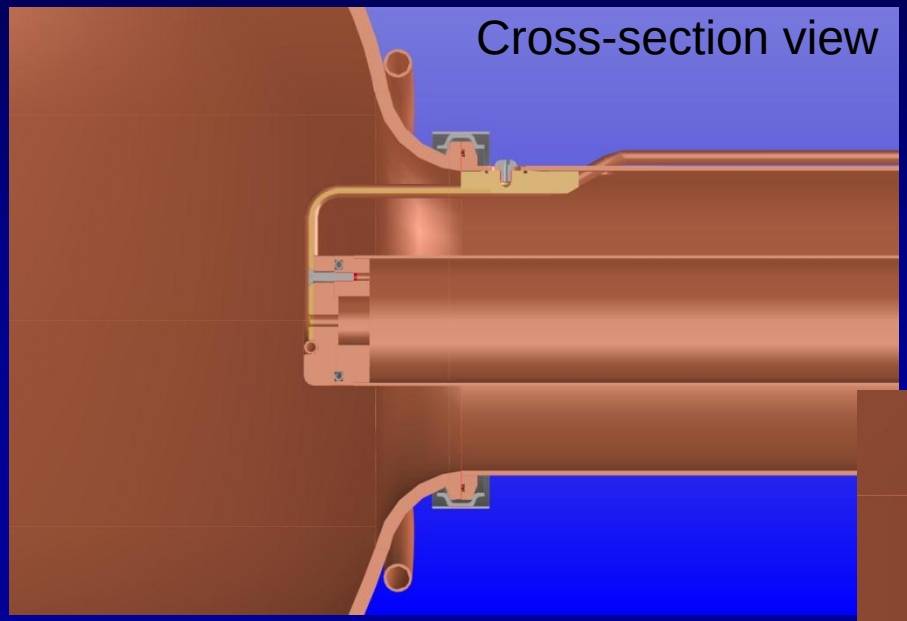
RF Power (loop) Coupler

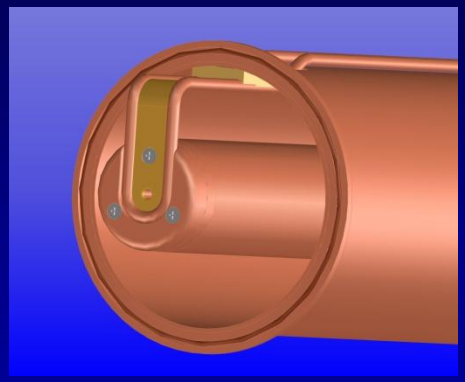


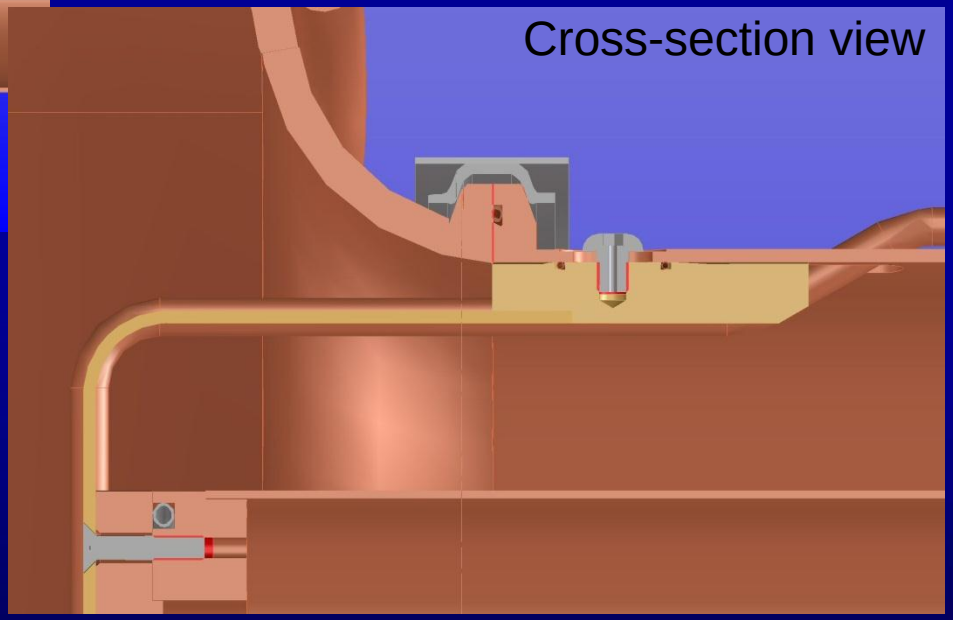


- Testing/experience of the prototype cavity at MTA: sparking at the coupler
- The coupler design has been changed slightly to increase the gap spacing
- The sparking region can be Ti-N coated if necessary (will be tested at MTA using the prototype cavity)
- Adding diagnostics: arc detector at the coupler region

RF Power (loop) Coupler

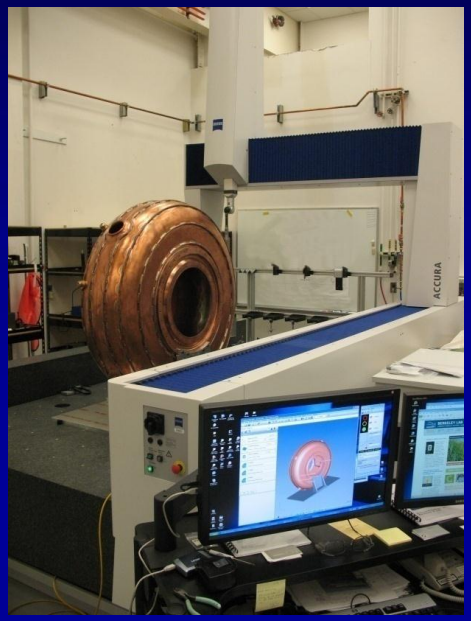






- Modified MICE RF power coupler design is complete and nearly ready for fabrication
- Fabrication of the couplers will start soon at Fermilab

Cavity Measurements



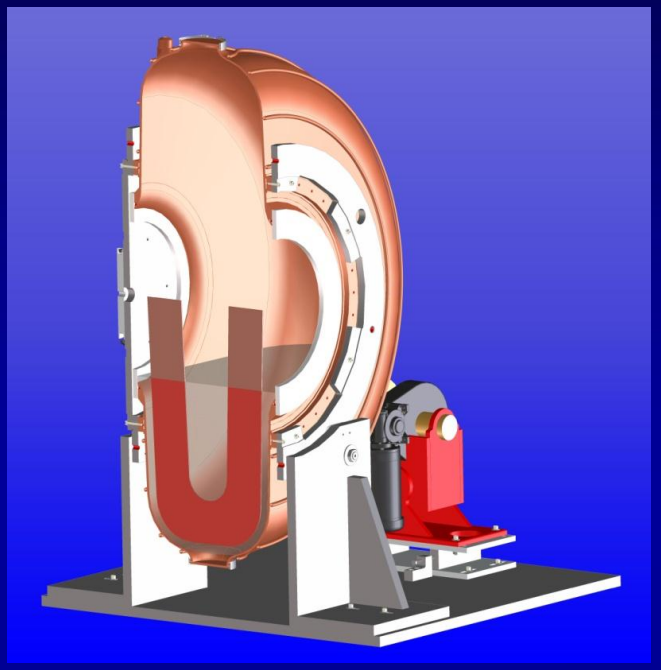
Cavity physical measurement

Cavity frequency measurement

- Physical measurements for the six remaining cavities expected to take approximately 1-1/2 weeks (60 hours)
- RF measurements and tuning to a center frequency after the EP of all ten cavities (two spares) at LBNL.
- This activity will begin in the next fiscal year

Cavity Electropolish at LBNL

EP rotation fixture



Cavity section view

- The inner surface of each cavity will be mechanically smoothed and then electropolished at LBNL using the techniques developed at JLab for the prototype cavity
- Electropolishing process will take approximately 1- 2 days for each cavity or 4 weeks to complete all 10 cavities

Cavity Electropolish at LBNL

EP setup in plating shop at LBNL

EP finished

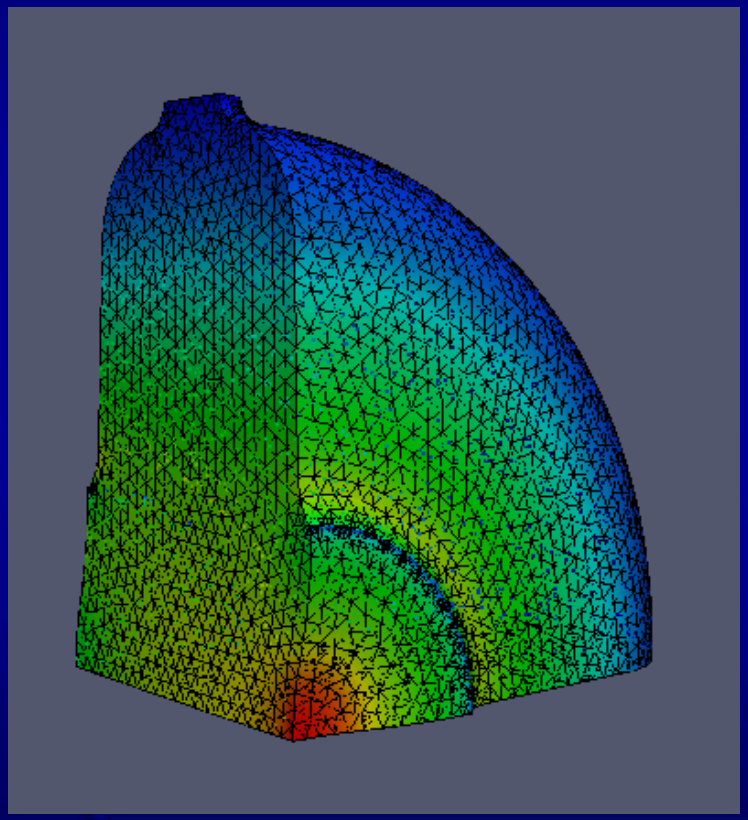
View inside of finished cavity

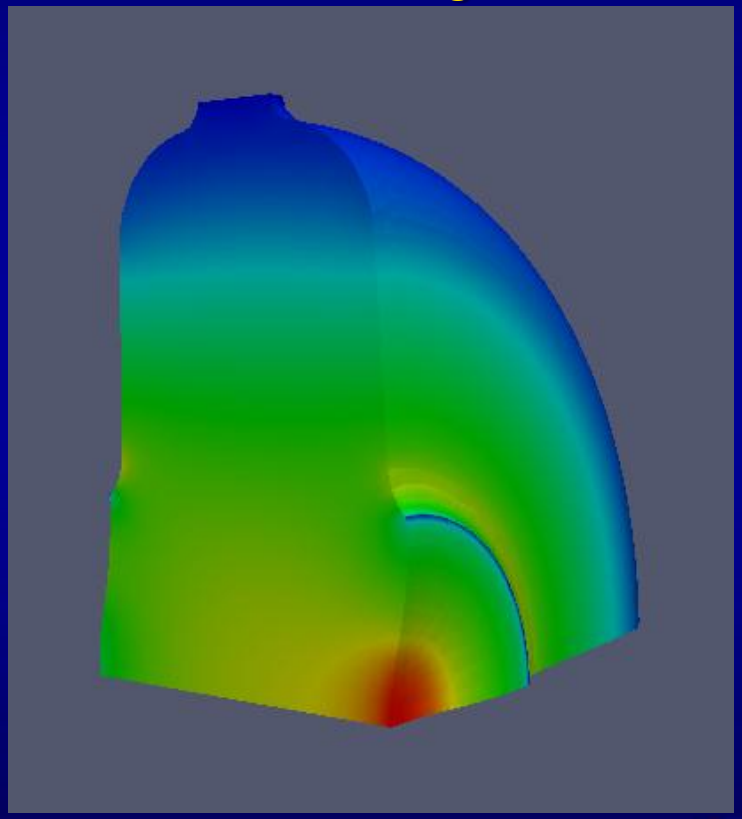
- Fabrication of EP fixturing is complete and approved for use by EH&S
- Electropolishing has been done on one cavity
- Electropolishing of the remaining nine cavities will resume in the next fiscal year at LBNL

Ongoing Simulations of MICE RF Cavity

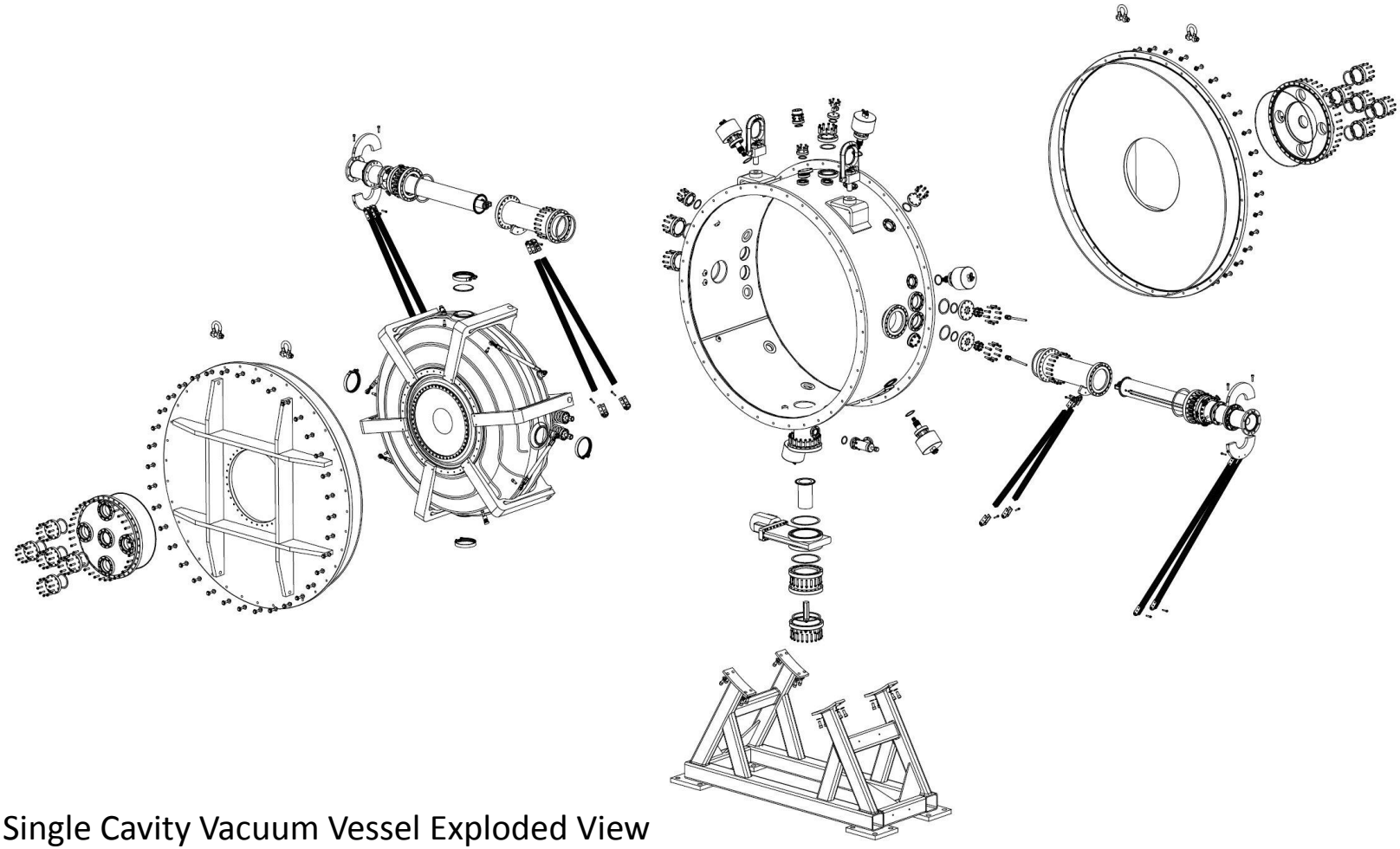
Study of external magnetic field on MICE RF cavity and coupler (Dr. Tianhuan Luo)

- 3D simulations (from CAD model) using SLAC's Omega-3P code: f = 201.866 MHz
- MP simulations, and RF breakdown studies with an external magnetic field



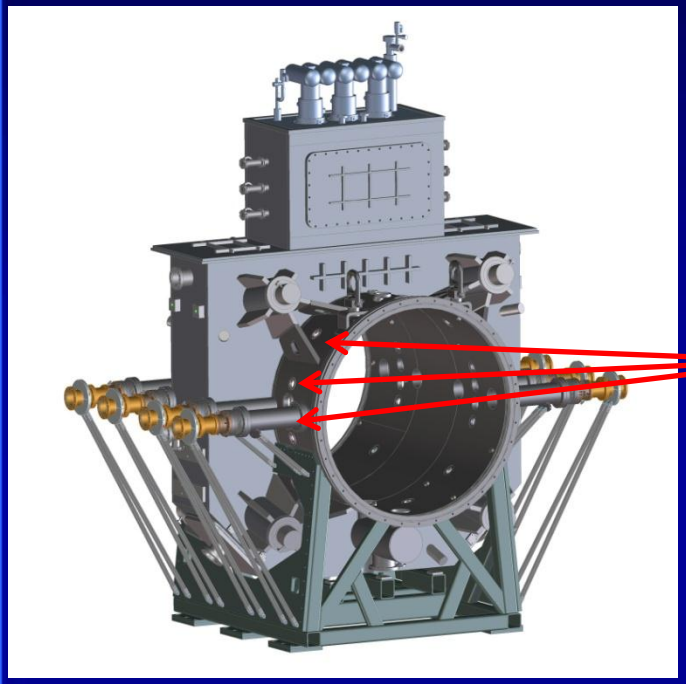


Single RF Cavity Vacuum Vessel



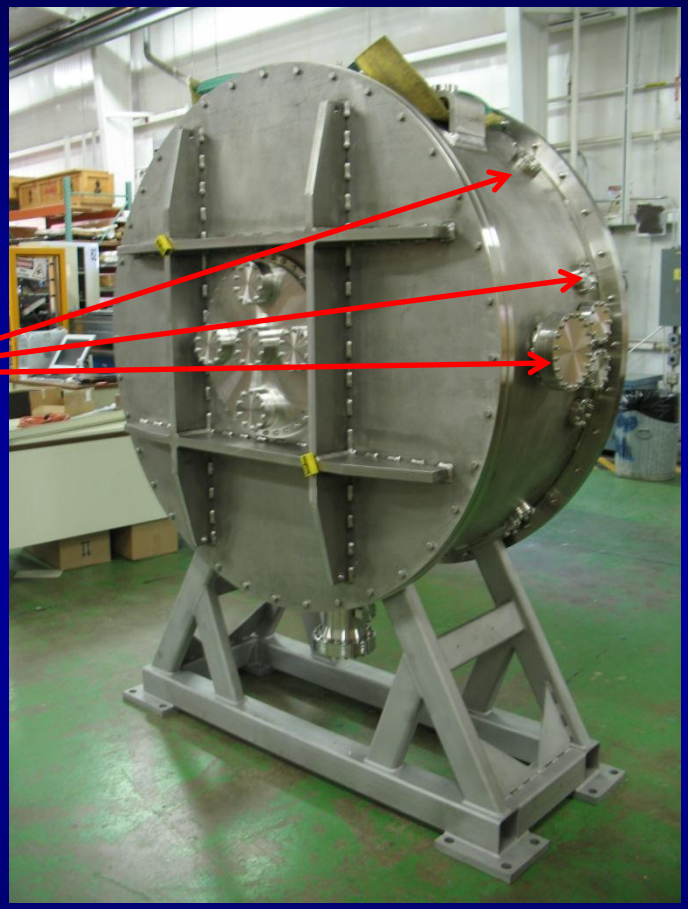
Single Cavity Vacuum Vessel Exploded View

Single Cavity Vacuum Vessel



MICE Vacuum Vessel (cavities removed)

Single cavity vacuum vessel is designed with all of the same ports that the MICE RFCC vacuum vessel will have



The single cavity vacuum vessel is complete and at Fermilab

RFCC Future Work

- **Vacuum Vessel:**

- Vessel design is complete but needs to be updated to incorporate changes to the interface with the new coupling coil cryostat design
- Fixturing for the assembly process of the vacuum vessel to the coupling coil needs to be finalized and drawings for fabrication generated

- **RFCC Module:**

- Finalize fixturing for module assembly and shipping
  - for aligning the frequency tuners onto cavities
  - for inserting the cavities into vacuum vessel
  - shipping skid/tilt fixturing for shipping RFCC to RAL

Plan and Schedule

- RFCC module schedule is mainly determined by the schedule of CC magnets
- Schedule of RFCC fabrication is being developed, testing of the 1st CC cold mass dominates the current schedule