



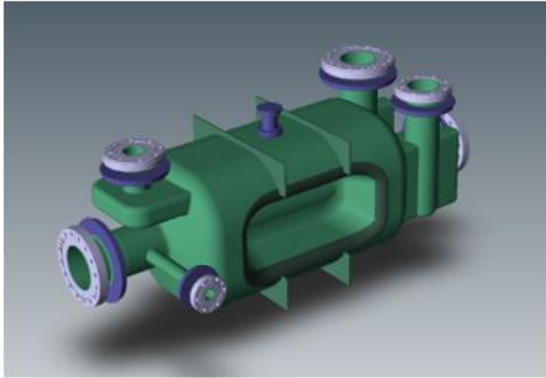
RFD Updates

Leonardo Ristori – Fermilab

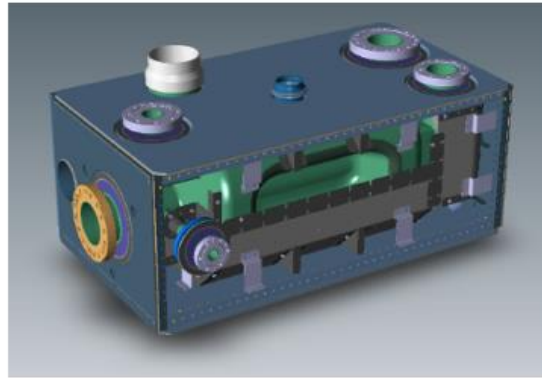
September 8 2017



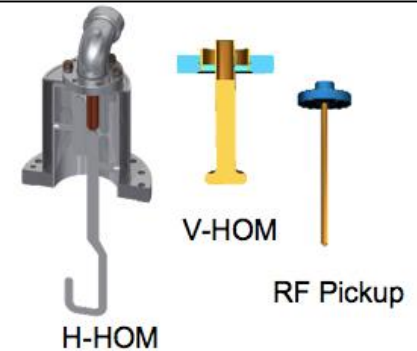
Introduction to Deliverables



Bare RFD Cavity



Dressed RFD Cavity
(front wall removed to show internal components)



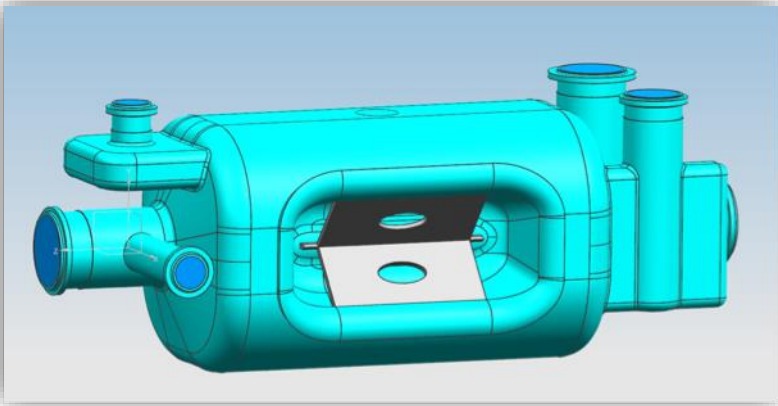
RF Ancillaries

- **Dressed RFD Crab Cavity:**
 - Bare Cavity
 - Magnetic Shields + Helium Tank
 - RF Ancillaries
 - Assembly
- Processing, Qualification at 2 K
- Shipment to CERN of 10 cavities ready for string assembly

Design

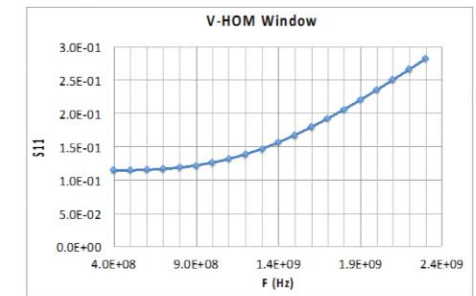
Cavity Design:

- HOM feed-through design (in progress, Z. Li, SLAC)
- 760 MHz mode shift, small tweak (in progress, S. de Silva, ODU)
- LFD reduction $\sim 3\text{kHz}$ @ 3.4 MV (in progress, P. Berrutti, M. Parise, FNAL)
- FINALIZE: Nov 2017 (HiLumi CM)
- Award Contract: \sim Jan 2018



V-HOM Window

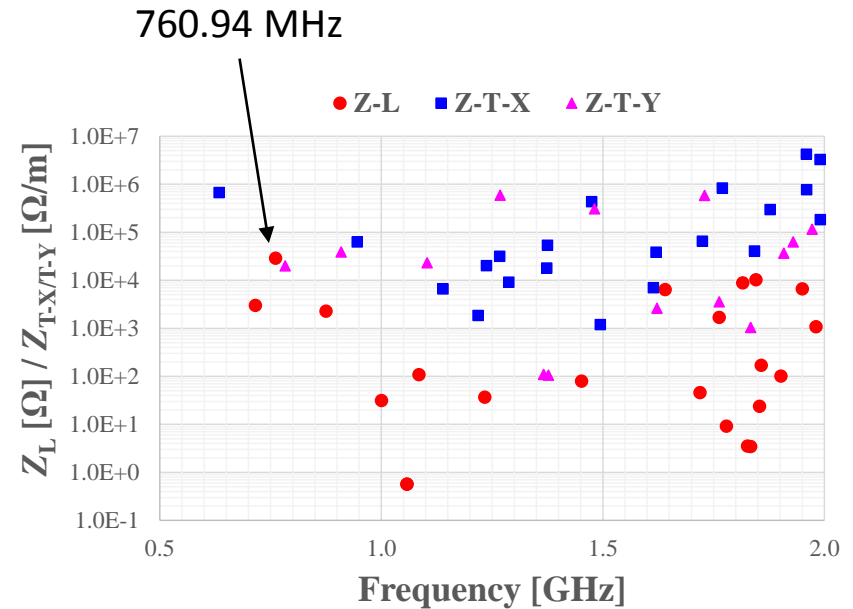
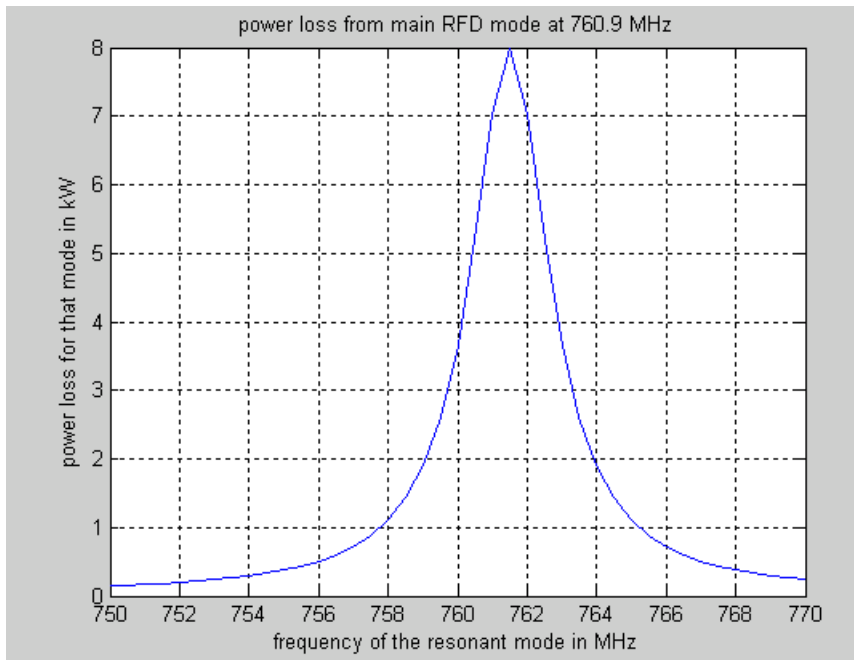
- 10-mm ceramics



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Z.Li HOM feedthrough

760 MHz Mode Study

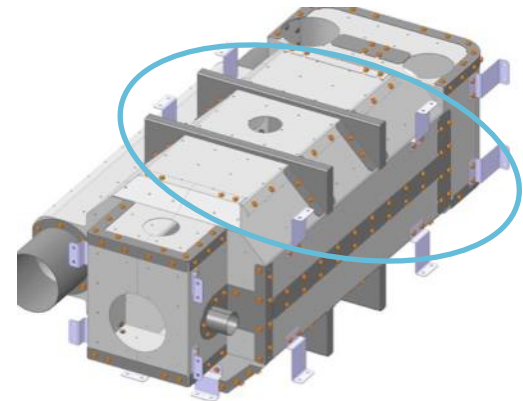


Outline:

- Investigate frequency shifts of 760 MHz mode - **Ongoing**
 - Due to cavity trimming
 - Room temperature to cryo temperature
 - Due to tuning
- Study effect of shifting 760 MHz higher or lower
- Reevaluate Hom impedances
- Check and validate multipole and multipacting for the updated RFD cavity

Design

- Magnetic Shields Design:
 - Need design iteration to simplify shields (Daresbury)
 - Use of 4 circumferential ribs on cavity was abandoned
 - No benefit found for performance or safety
 - Award Contract: ~ Aug 2018
- Helium Tank Design:
 - No urgent need, just concept for completeness
 - With non-negotiable interfaces in mind, design to be streamlined based on CERN experience
 - Ideal: weld joints to allow TIG welding outside glove box
 - Award Contract: ~ Feb 2019



Procurements

- Raw Materials for 2 prototypes:
 - RRR Nb and NbTi (Ningxia) cleared incoming inspection
 - Next: Ultrasonic inspection of all RRR sheets per Cern requirement
 - Discuss need of UT inspection for RRR Rods and Tubes and for NbTi blanks
- Braze Joints for 2 prototypes:
 - Contract with ANL imminent to produce total of 44 brazements
 - Beam Axis 3 prototypes, 4 for use, 4 spares 1 sectioning
 - FPC, 3 prototypes, 2 for use, 2 spares, 1 sectioning
 - V-HOM, 3 prototypes, 2 for use, 2 spares, 1 sectioning
 - H-HOM, 3 prototypes, 2 for use, 2 spares, 1 sectioning
 - Antenna transitions, 3 prototypes, 2 for use, 2 spares, 1 sectioning

RF Ancillaries at JLab

- 2 Proof-of-Principle sets (H-HOM, V-HOM, RF pickup, RF input)
 - Weld trial pieces machined
 - On schedule for completion at the end of CY2017

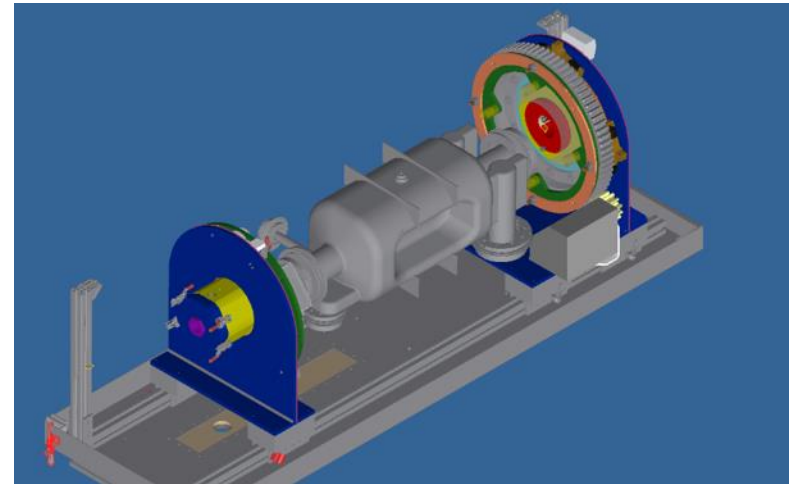
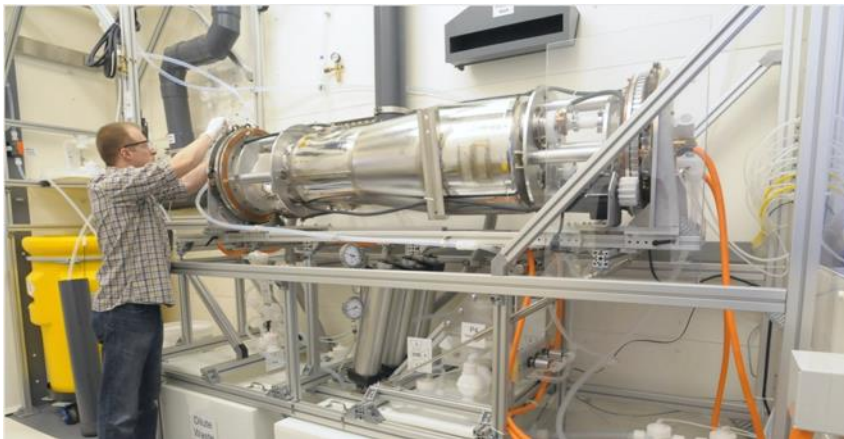
RFD HOM Damper Update

- Hook and Tee for Weld Tests Completed. Inspection Underway.
- Fabrication Drawings Being Finalized
 - Currently working with input from HyeYoung, Suba and Zenghai
- Practice Weld and Brazed Pieces Being Fabricated



Processing & Testing

- LARP RFD #1 Testing estimated end of September
 - New burst disc needed for compliance with FNAL cryo-safety
 - VTS support frame ready and dry-fitted
 - 500W Amplifier purchased and installed
- Rotational BCP at ANL
 - Design effort started
 - Tool to be upgraded to accept RFD
 - Perform chemistry on RFD #1 to qualify process prior to CD-2 (~ Fall 2018)



Outstanding Issues

- Tensile testing of Nb batch per CERN requirement (confirm details)
- Location of flanges and Nb-Ti transitions (based on lessons learned from DQW assemblies)
- Location of non-negotiable interfaces with other cryomodule components (support system, 2 phase piping, others?)
- Pressure Code analysis:
 - Von Mises (what pressure, what acceptance criteria?)
 - What other analysis per CERN need?