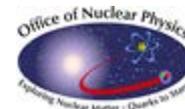


# Minutes 10/1/2015



Cooling Section Mock-up: George and Vito are working on the design of one section. Vito will look into increasing the inner magnetic shield diameter so the BPM fits with 90 degree connector and cable. There was brief discussion of method of surveying BPM with attached beam line that will continue 'off-line'. Joe suggested a meeting to work out the details of the magnetic shield design. Field inside the shield to be less than 2 mG per Alexei.

RF Design: RF Shielded Valves – These valves have a .080 groove (standard) that has not been checked out. Final locations and quantities for these needs to be decided so Mike M. can order. The beam dump line can use standard valve. Mike is waiting for quote on special RF conflat gaskets.

## Instrumentation:

- BPMs: MPF has delivered 18 housings and 8 buttons to BNL. Vito started measurements on a housing, and Matt and Survey will continue this effort in 905. Dave G. said they should have 80 housings delivered in a few months.
- Standard Profile Monitors: Drawings close to complete. Toby to order YAG screens for an early December delivery.
- Emittance Slit: Slit is in the shop for fabrication. The tungsten slit plate has just been modified to 150 micron thickness in slit area (2 mm thick elsewhere). Who will order?
- Hybrid BPM-PM-Energy Slit: Gary W. needs to know the slit width. Gary to order mirrors (copper).
- Per Mike M. ordering of bake-out blankets for all the instrumentation chambers is needed.

## Magnets

- 20 Dipole: Visited Everson Tesla on Tuesday. All 4 dipoles to be complete and shipped in mid-October. Two coils were seen potted.
- LF Solenoids: All have been delivered by Alpha.
- HF Solenoids: These are near shipment or have just been shipped from Buckley, NZ.
- Chamber for 180 dipole: Will not be installed this shutdown.
- Correctors: The transport line correctors need to be designed. Joe showed picture of CU design. Alexei said that JLAB has a very simple design.

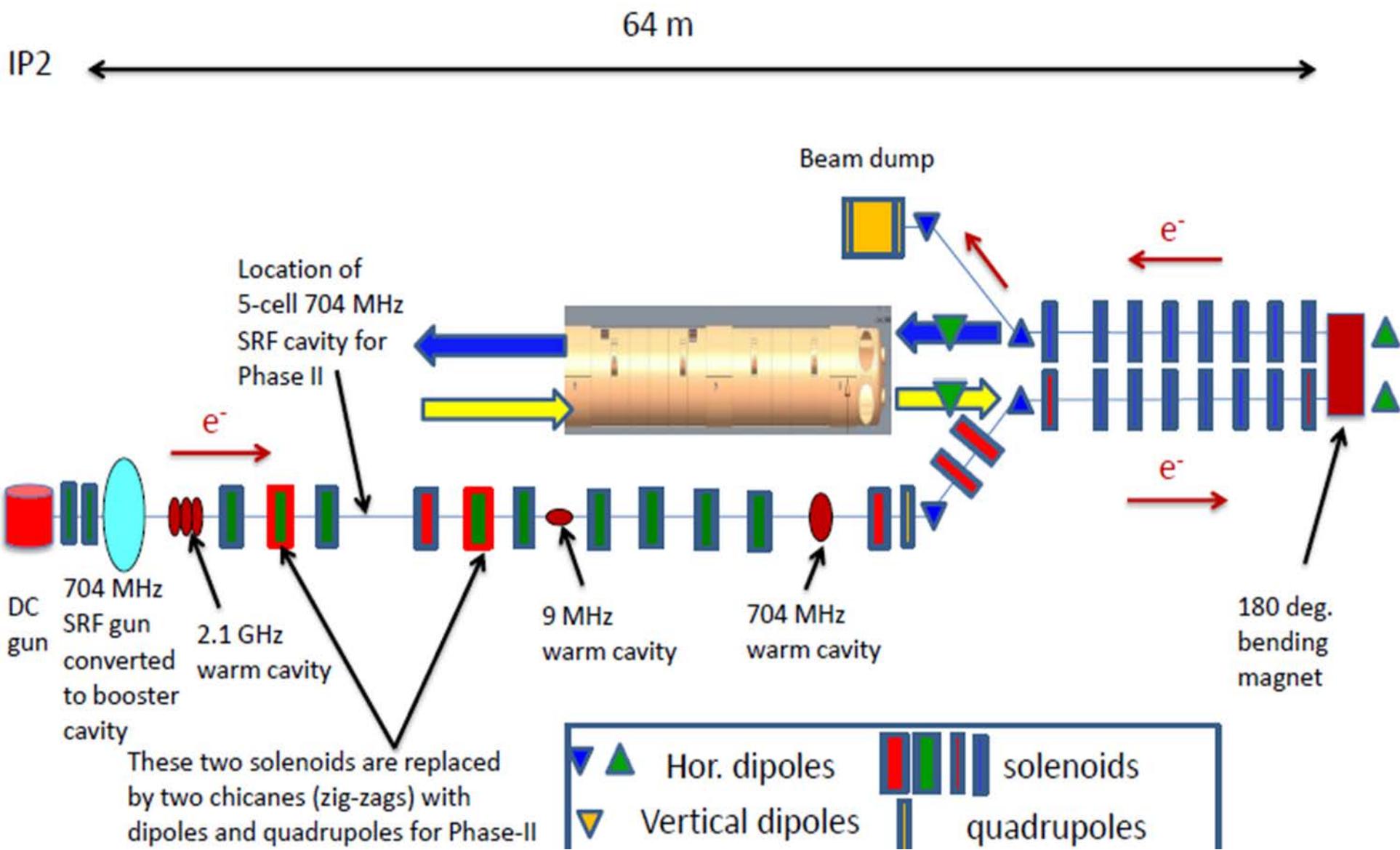
## eGun

- Meeting at CU yesterday. There has been good progress in manufacture of chambers.

# LEReC Phase-I (electron beam energies 1.6-2MeV):

## Gun-to-dump mode

July 8, 2015



# BPMs in Cooling Section

(14 Locations)



## Large Dia. BPM Housings (4.8 ID), 28mm buttons

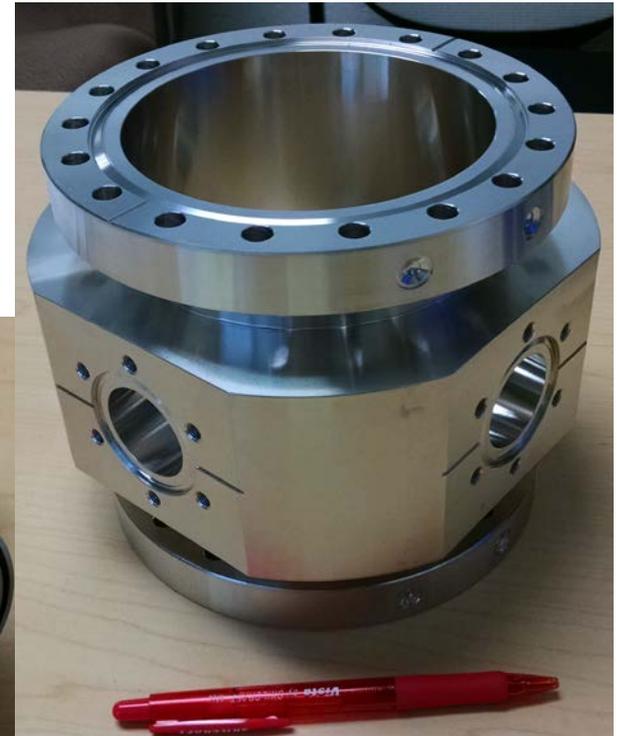
- Order Placed with MPF
- Final Design Review 6/23/2015, no issues
- Increased number of button first articles for 2 BPM's one standard, one 180 magnet special
- Agreed on vacuum bakeout for components

MPF will vacuum bake buttons @900C/1hr during brazing

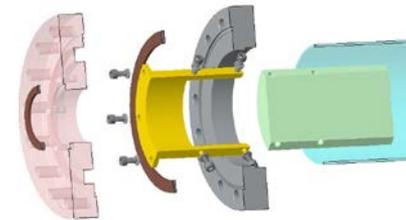
MPF will vacuum bake housing @450C/48hr

MPF will vacuum bake 1<sup>st</sup> article housing

- First Article delivery buttons 9/21/2015
- Housing deliveries
- Testing: leak check, dimensions, electrical



# Cooling Section *Standard* Profile Monitors



RF impedance design approved (Peter T.)

Ferrite ring mounting design complete. CMD5005 material.

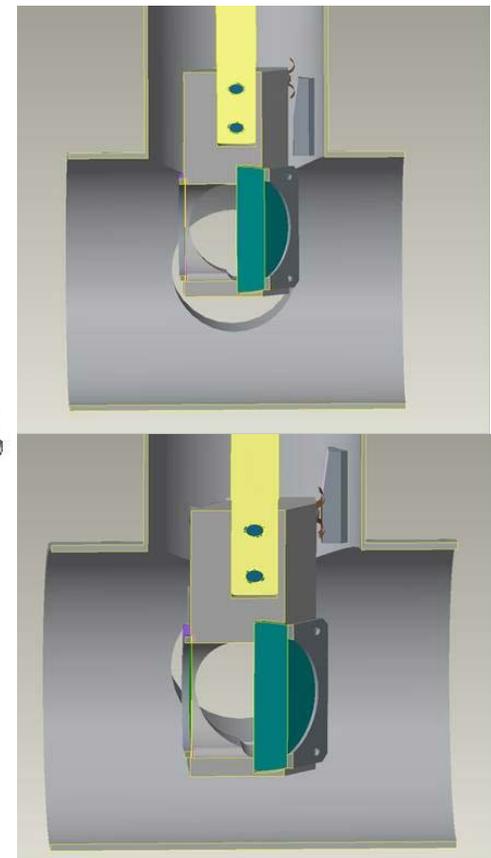
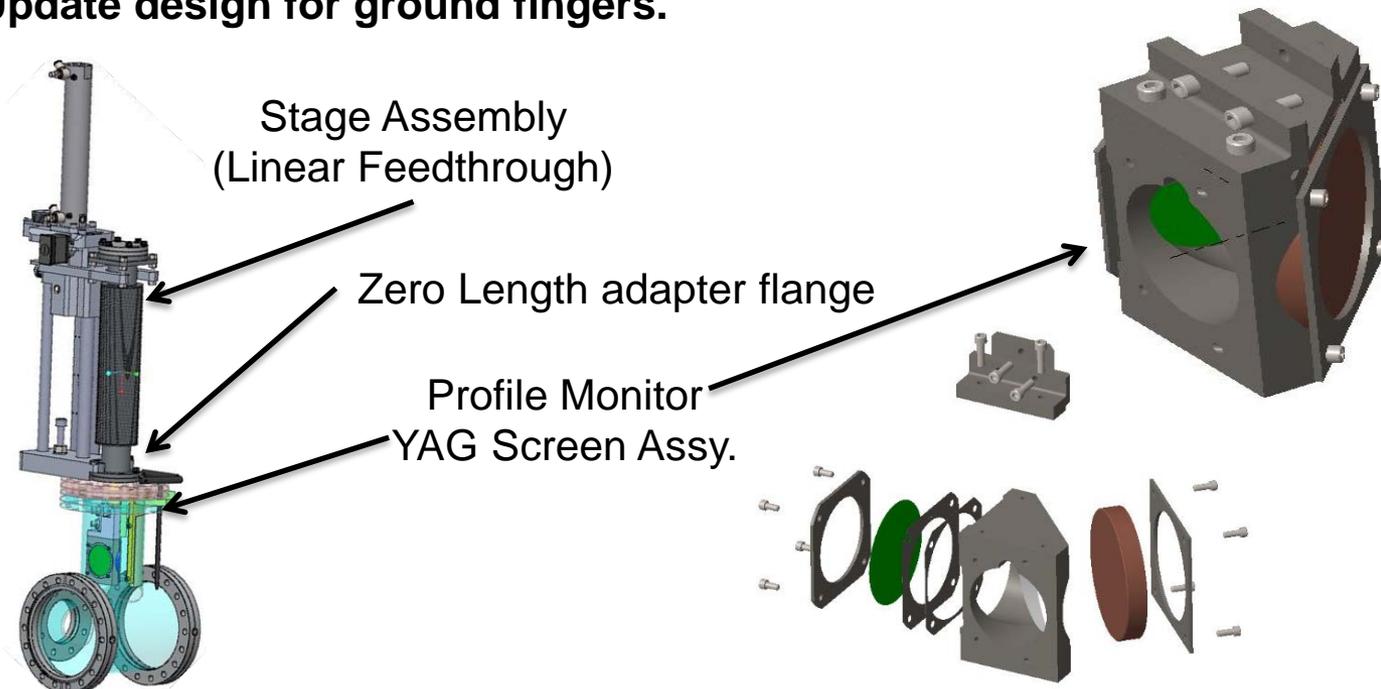
Requisition for commercial vacuum linear stage, requisition complete

Chamber fabrication drawing complete – CS order chamber

YAG screen/mirror holder design complete.

Fabrication drawings for YAG screen/mirror holder - checking

Update design for ground fingers.



# Cooling Section “hybrid” BPM, PM, Slit

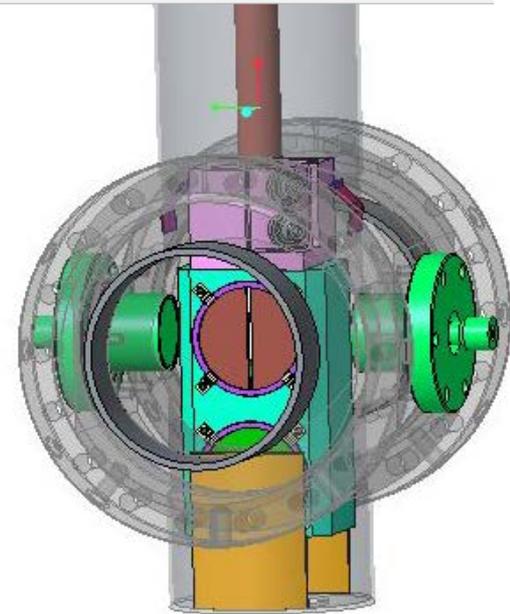
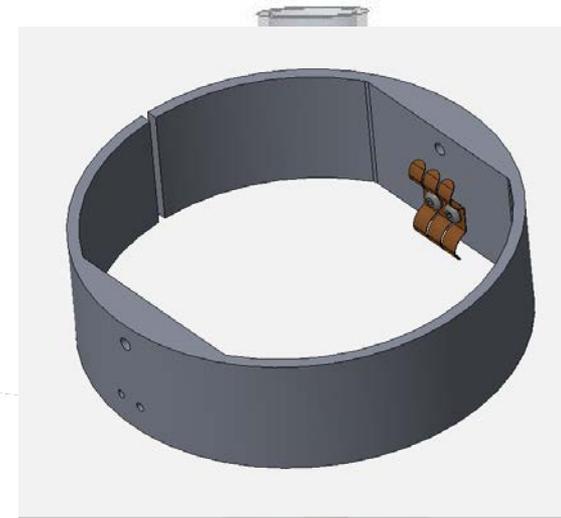
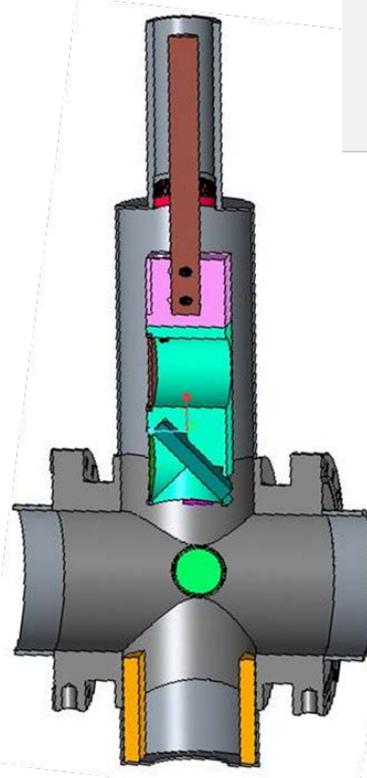
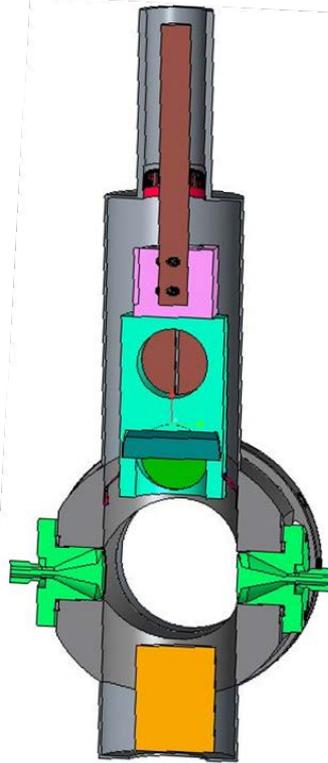
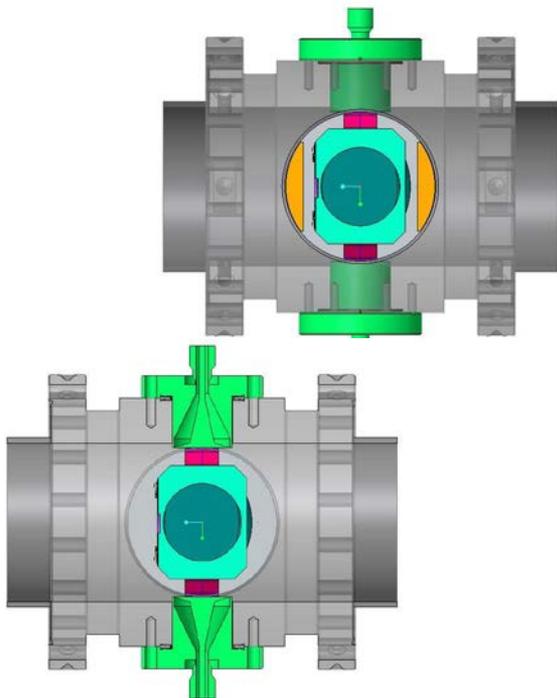
RF impedance analysis complete

Chamber design complete

Chamber fabrication drawing complete

Complete component fabrication drawings

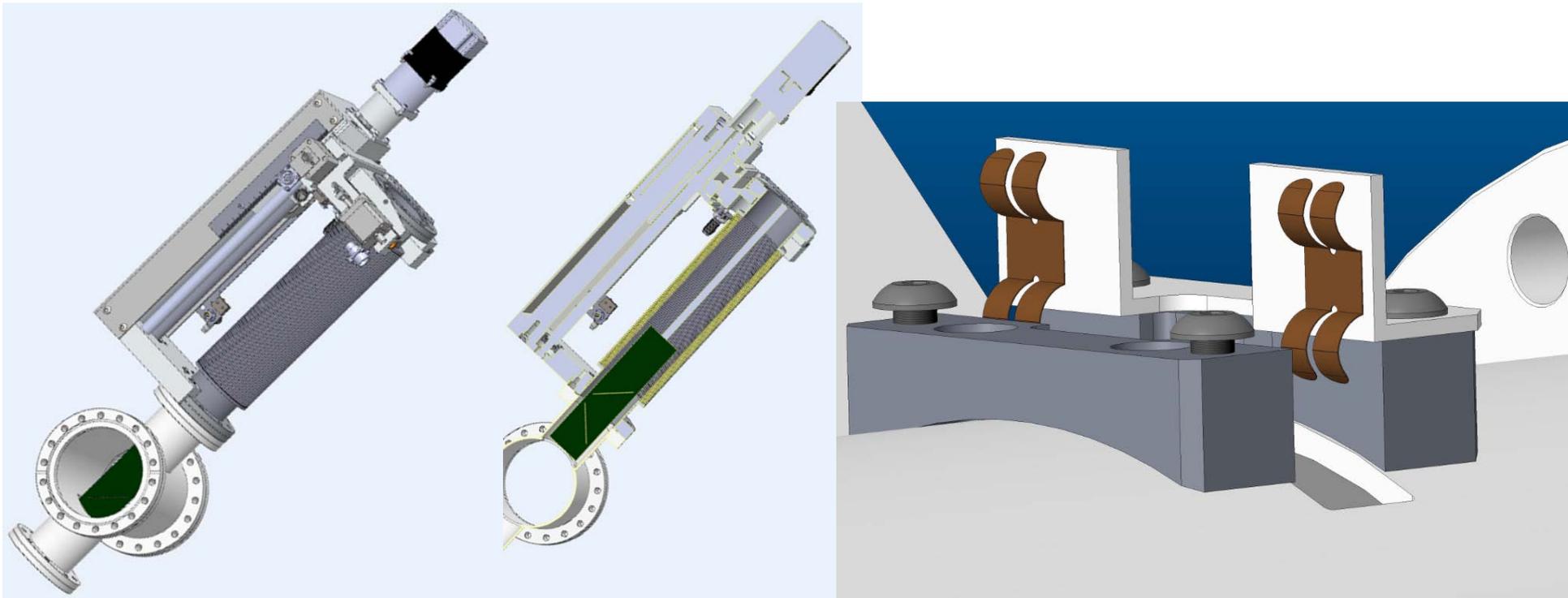
Complete ferrite drawing – order ferrite



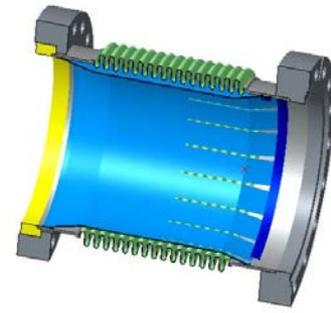
Low Energy RHIC electron Cooling

# Cooling Section Emittance Slits

- Requisition for commercial vacuum linear stage.
- Fabrication drawings complete and approved.
- Central Shops requisition approved for vacuum chamber and W slit.
- The slit needs to be grounded at the vacuum chamber when scanning.
- Delivery dates: shifter, vacuum chamber, W slit, mounting hardware.



# Vacuum Hardware



**Beam line bellows & 180 accordion bellows purchase orders.**

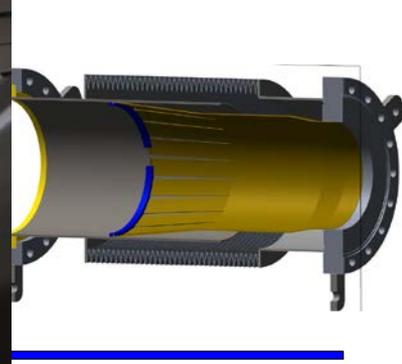
**“Standard Chamber Length” defined – NEG coating underway 50% complete. Need beamline chamber drawing (define lengths).**

**180 chamber in shops, 20 chamber in shops**

**Shielded valves in house.**

**RF shielded gaskets – 3 sizes:**

- 4.92 ID (beam flange ID 4.78 to 4.92)
- 4.64 ID
- 3.65 ID (beam flange ID 3.62 to 3.65)
- 2.44 ID



**Energy RHIC electron Cooling**



# Special RF gasket dimensions

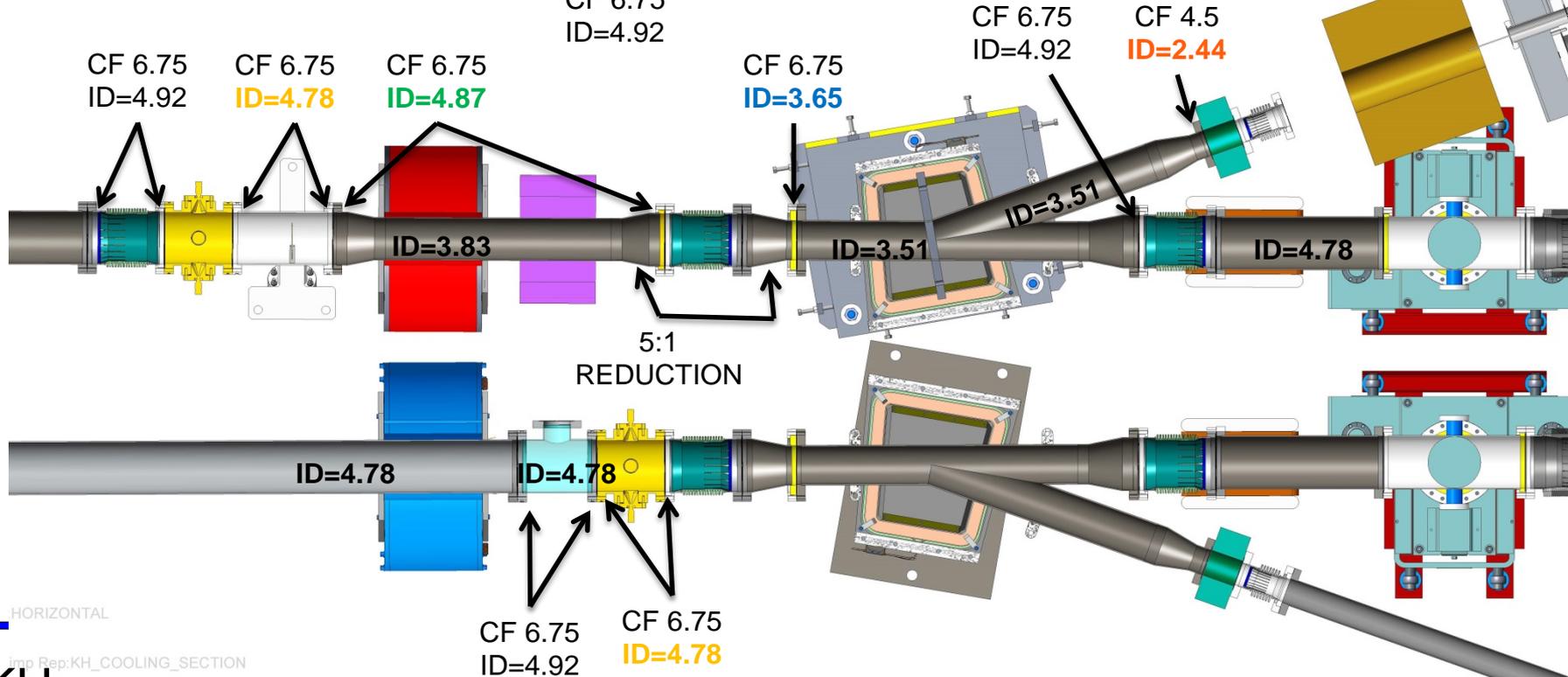
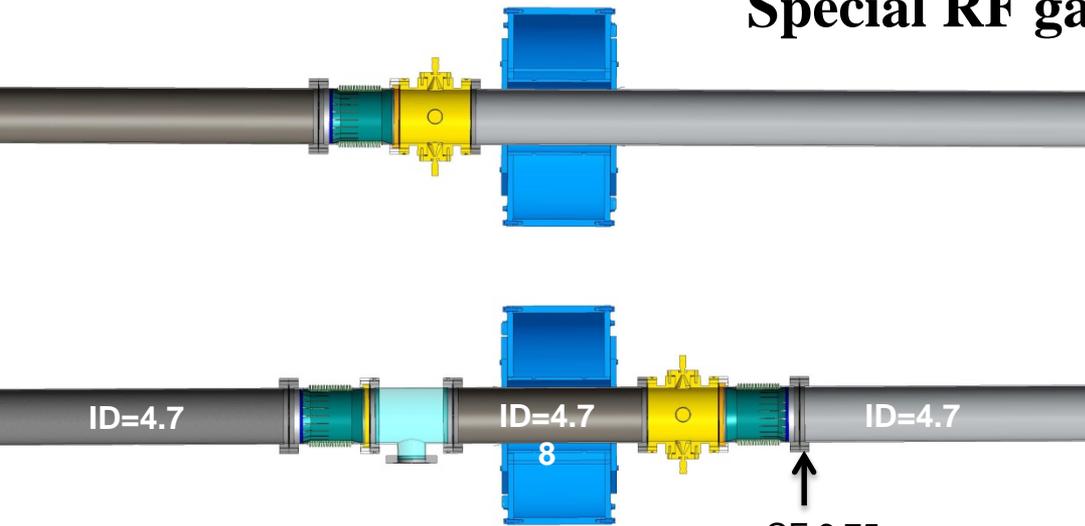
RF shielded gaskets – 3 sizes:

4.92 ID (beam flange ID 4.78 to 4.92)

4.64 ID

3.65 ID (beam flange ID 3.62 to 3.65)

2.44 ID



HORIZONTAL

Imp Rep:KH\_COOLING\_SECTION

KH

# 20° Dipole Magnet

*Requisition approved SOW – 2 magnets by 10/1/2015.*

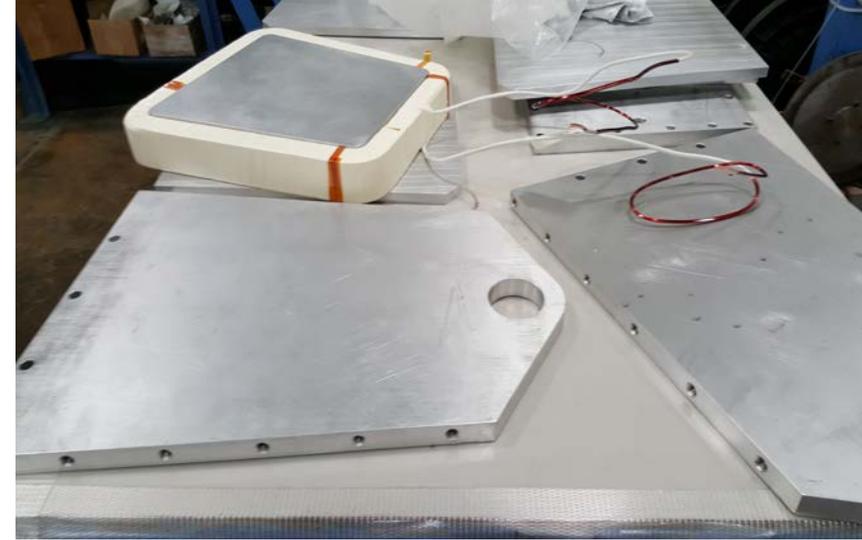
**Order Placed 5/6/2015 Everson Tesla**

**Estimated Delivery four magnets 10/15/2015**

Distance Between Pole Faces = 10.4 cm (4.1 in.)

Magnet Vertical Gap = 10 cm

Vacuum Chamber V Aperture = 9.5 cm (3.74 in.)



Electron tracking results and field qualities along trajectory on R=1 cm curved cylinder:

	Ek = 5 MeV	Ek = 1.6 MeV
Current per coil (Amp-turn)	1053.288	393.192
Overall current density (A/mm <sup>2</sup> ) (overall coil cross-section 3.0x4.8 cm)	0.73145	0.27305
Central Gap Field (Gauss)	251.20	93.73
Half b1-integral(dipole) (G-cm)	3.1982E3	1.1930E3
Half b3-integral(6-pole) (G-cm) [Ratio to dipole integral]	1.803E-2 [5.64E-6]	7.019E-3 [5.88E-6]
Half bending angle from tracking tests (required 10°)	10.013°	10.006°

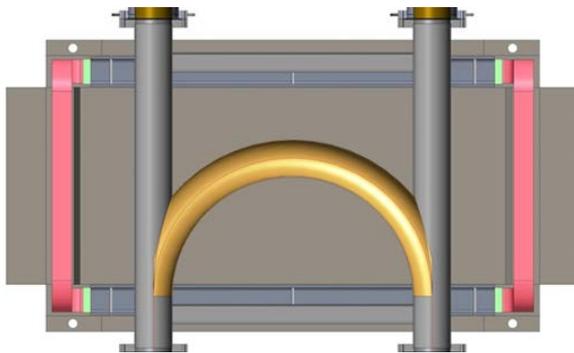


# 180° Dipole Magnet Revised

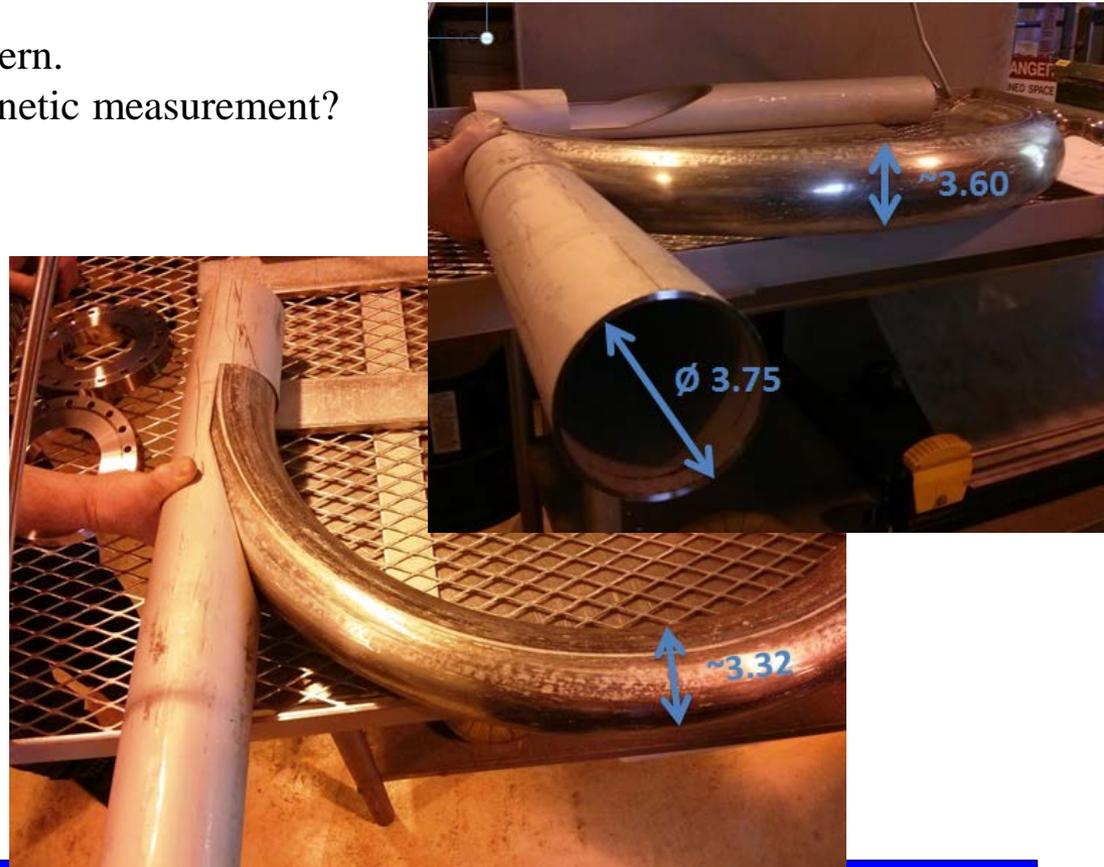
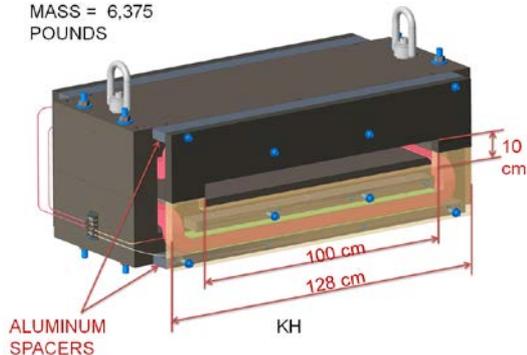
Need information on NMR probe in order to design 180 vacuum chamber mounting point.

180 vacuum chamber will not be installed this shutdown.

- NMR probe can be installed and tested with chamber during magnetic measurement.
- 180 dipole power supply stability could be evaluated during magnetic measurement with NMR probe read backs.
- Fabrication lead time for the PS is a concern.
- Can chamber welds be tested during magnetic measurement?



MASS = 6,375  
POUNDS



# Compensating and Matching Solenoids

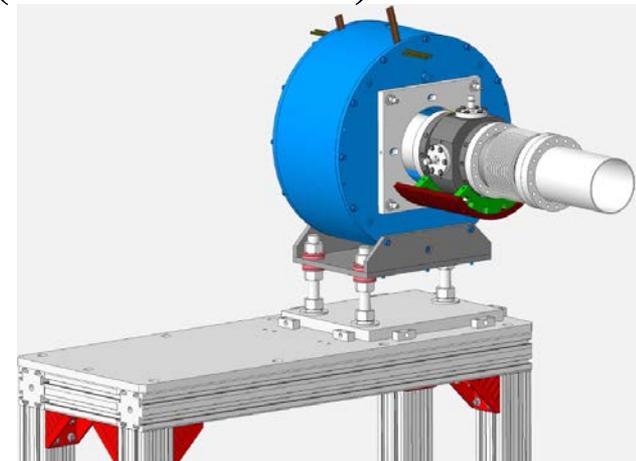
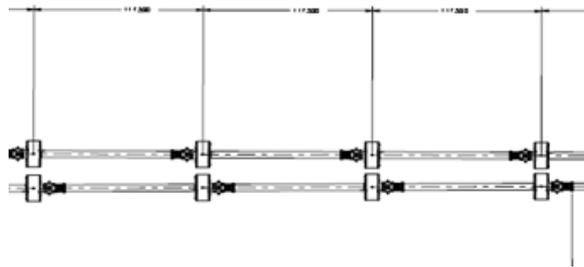
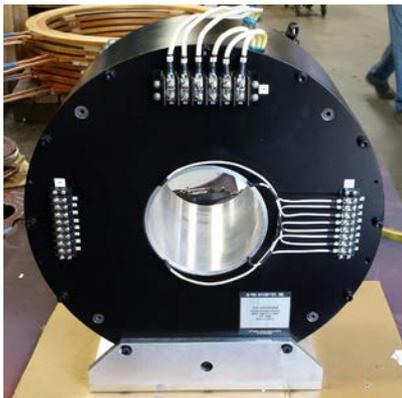
Buckley magnets complete **9/18/15** + **airfreight** + customs.

Alpha Magnetics update: **1st production magnet** + **9 more in house**.

**Magnetic Measurement ordered and received 1% and 0.1% 3D probes**  
**3D Probes being calibrated.**

**Production measurement schedule.**

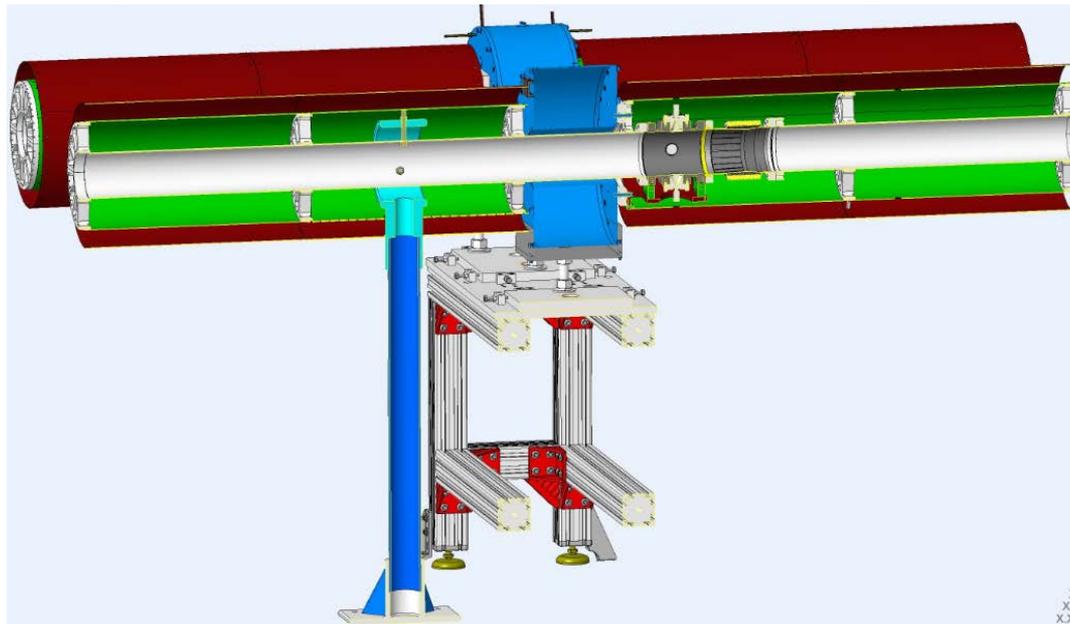
- **Design support stand assembly** – provide space for mu metal shields, separate beam pipe stand support. **Fabricate Stands** – requisition started
- Magnetic shielding analysis (Wuzheng).
- **Design mu metal shields/supports** – magnet measurement. (Spring 2016)
- **In tunnel magnetic measurement system of shields.** (2016 shutdown)



# Compensating and Matching Solenoids

Discussion on the magnetic shielding:

- The magnetic shielding will not be installed until the 2016 shutdown.
- The magnetic shielding test fixture will be used to develop and verify the design of the magnetic shielding assembly.
- A measurement probe system needs to be designed that can transit down the test fixture.
- After installation, measurements must be made in the tunnel to confirm that the installed shielding reduces the magnetic field in the beam tube to  $< 1$  mG.
- **From Magnet Measurement Meeting: Test section should be built solenoid to solenoid rather than either side of a single solenoid. This will require keeping one solenoid out of the tunnel this year.**



# LEReC Cooling Section Design Room



- LF & HF solenoid and 20° dipole magnets fabrication drawings (KH)
- Beam Diagnostics: BPM chamber and buttons (VDM)
- Beam Line 5” bellows with shields fabrication drawings (GW)
- 20° dipole vacuum chamber for impedance review (KH)
- 180° dipole fabrication drawings (KH) Spectrometer magnet (180° dipole) revisions (KH)
- 180° vacuum chamber + large sliding bellows fabrication drawing (KH)
- Beam Diagnostics ES W slit & chamber fabrication drawings (VDM)
- 20° dipole vacuum chamber fabrication drawings (KH)
- Cable tray and penetration drawings and excel sheet (AF)
- Beam Diagnostics: PM vacuum chamber fabrication drawings (GW)
- Beam Diagnostics: standard PM fabrication drawings (GW)
- Beam Diagnostics: special “hybrid” ES/PM/BPM fabrication drawings (GW)
- Beam line solenoid/BPM stands & vacuum chamber stand (VDM)
- 20° magnet stand drawing (KH)
- 180° magnet w/hybrid BPM stand drawings (KH) on hold*
- Magnetic shielding drawing and solenoid magnetic measurement test station (VDM)
- In tunnel, magnetic measurement “mole” for stray field studies
- HF dipole, quadrupole, and skew quadrupole corrector drawings

# LEReC Design Room Source Design Work



*DC Gun Vacuum Chamber Fabrication Drawings (JH)*

*DC Gun SF6 Pressure chamber specification control drawings (JH)*

*DC Gun cathode cooling design for Karl S. Cornell (JH)*

*DC Gun stands (JH)*

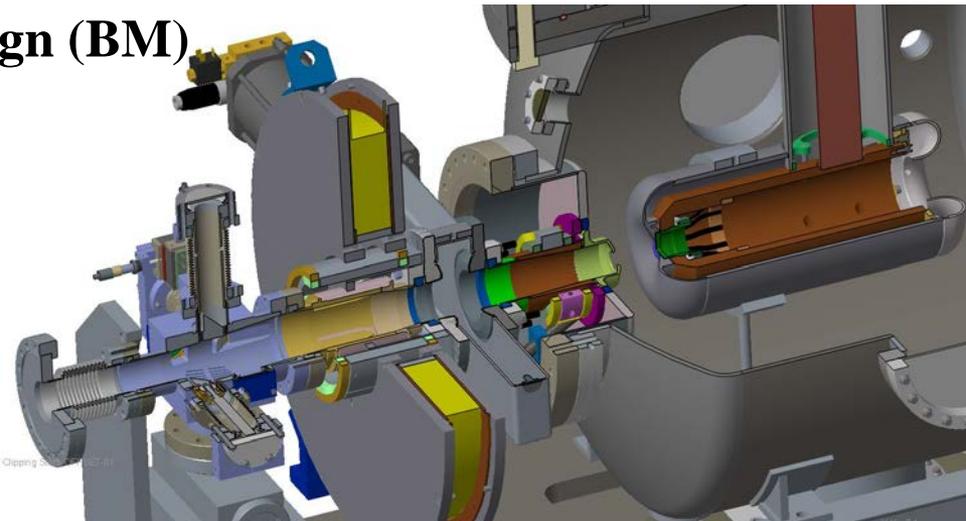
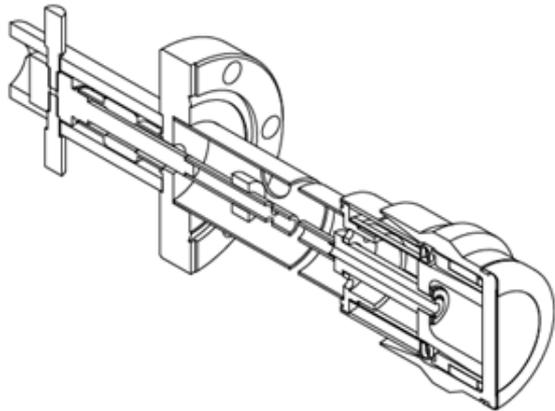
**DC Gun to Booster SRF booster cavity beam line (JH)**

**DC Gun cathode insertion drive (WJ/VDM)**

**DC Gun cathode coating system vacuum chamber (PC)**

**DC Gun cathode transfer load lock and vacuum chamber (WJ)**

**Cathode production coating system design (BM)**



# LEReC Design Room Other Work



**RHIC 1:00 move real estate drawings (V.DM.)**

**Phase 2: 5 cell cavity positioning (RM) – Revised Position on hold**

**Phase 1 cryogenic system layout (RM)**

**2.1 GHz warm cavity spec. control drawings (MG)**

**2.1 GHz warm cavity tuner and wave guide (MG)**

**704 MHz warm cavity spec. control drawings (SP)**

**Transport & Merger line layout (RM)**

**Locate booster cavity, solenoids, BPM's,  
RF Cavities, PM's, Diagnostic Lines**

**Transport & Merger Line Solenoids**

**Transport & Merger Line Correctors**

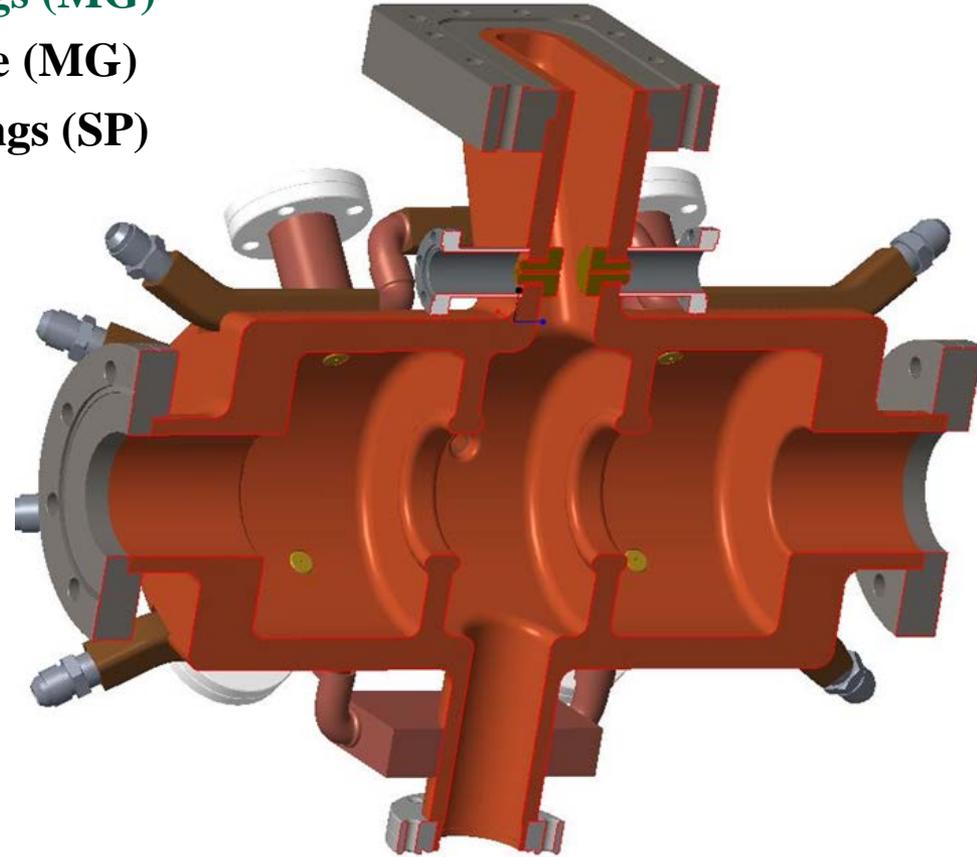
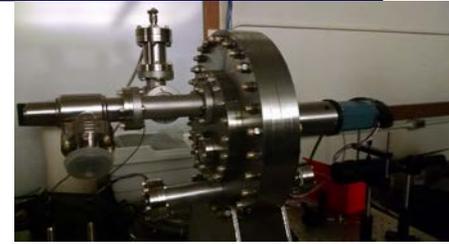
**Transport & Merger Line BPM's** ✓

**Transport & Merger Line Profile Monitors**

**Merger Line Flying Wire**

**Diagnostic Beam Lines and Components**

**Kickers, RF cavity, beam dump,**



**Low Energy RHIC electron Cooling**

# Installation Step – 2015 Shutdown

## Cooling Section Purchase Orders in Place

HF and LF solenoid magnets

20° merger magnets

Beam tubes being coated

BPM chambers and buttons ordered FDR approved

Beamline shielded bellow and 180° magnet sliding bellows

Beamline solenoid stands and plates

20° magnet vacuum chamber (2)

Profile monitor and emittance slit vacuum linear drives, windows

Standard Profile Monitor vacuum chamber

Emittance slit chamber and slit+mounting hardware

## Cooling Section Critical Items (not ordered yet)

Special RF vacuum gaskets

Standard PM mounting hardware

Hybrid PM/ES/BPM chamber (awaiting cost estimate) & mounting hardware

PM, Hybrid PM/ES/BPM, 20° magnet stand assemblies

180° magnet (spectrometer magnet, stand, NMR, PS – moved to 2016)



# Installation Step – 2015 Shutdown Punchlist

## Cooling Section Parts in Hand

10 of 15 LF solenoid magnets

2 HF solenoid magnets shipped

5" beam tubes and flanges

Shielded vacuum valves

1<sup>st</sup> article BPM buttons

BPM chambers

