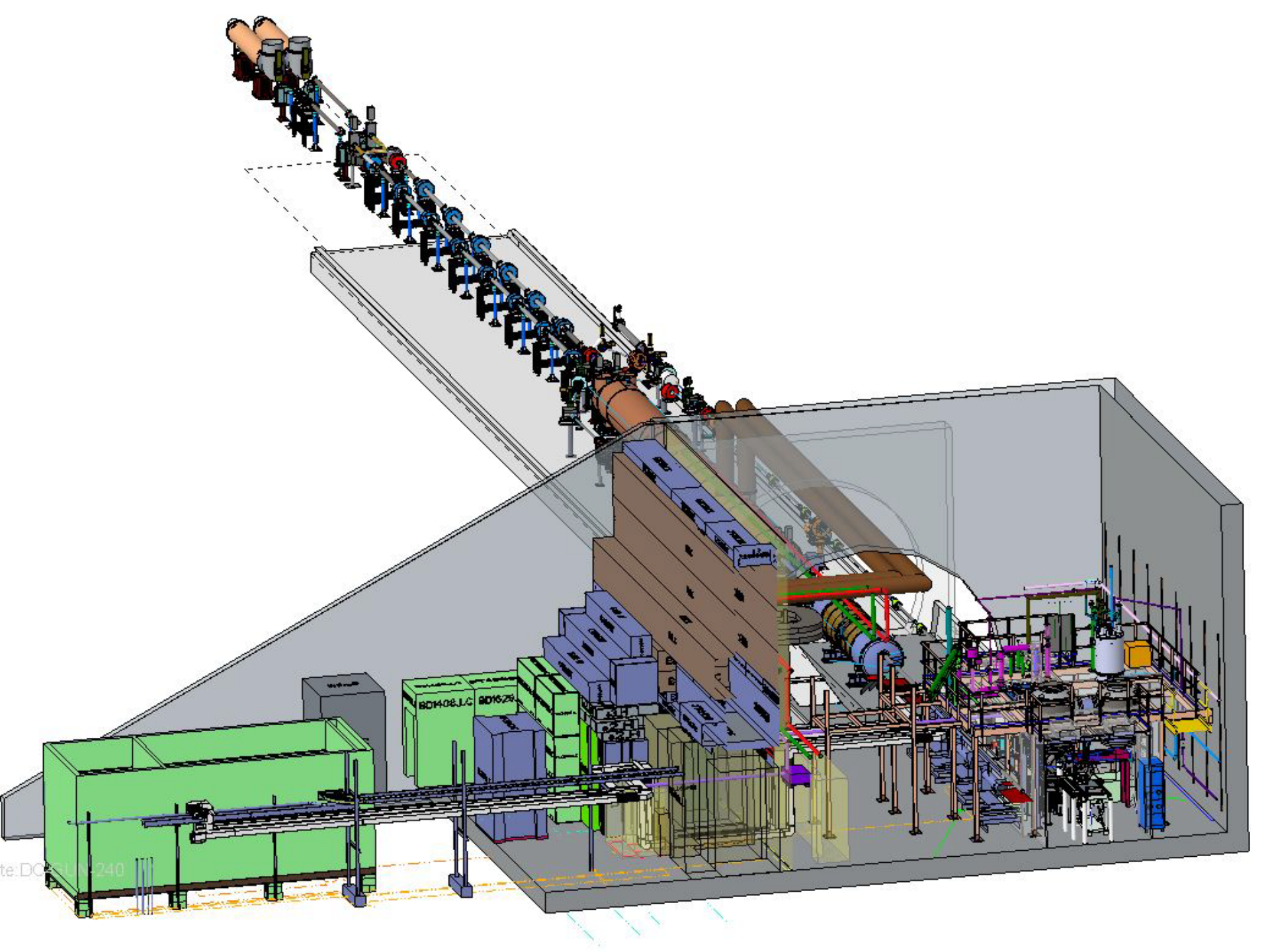
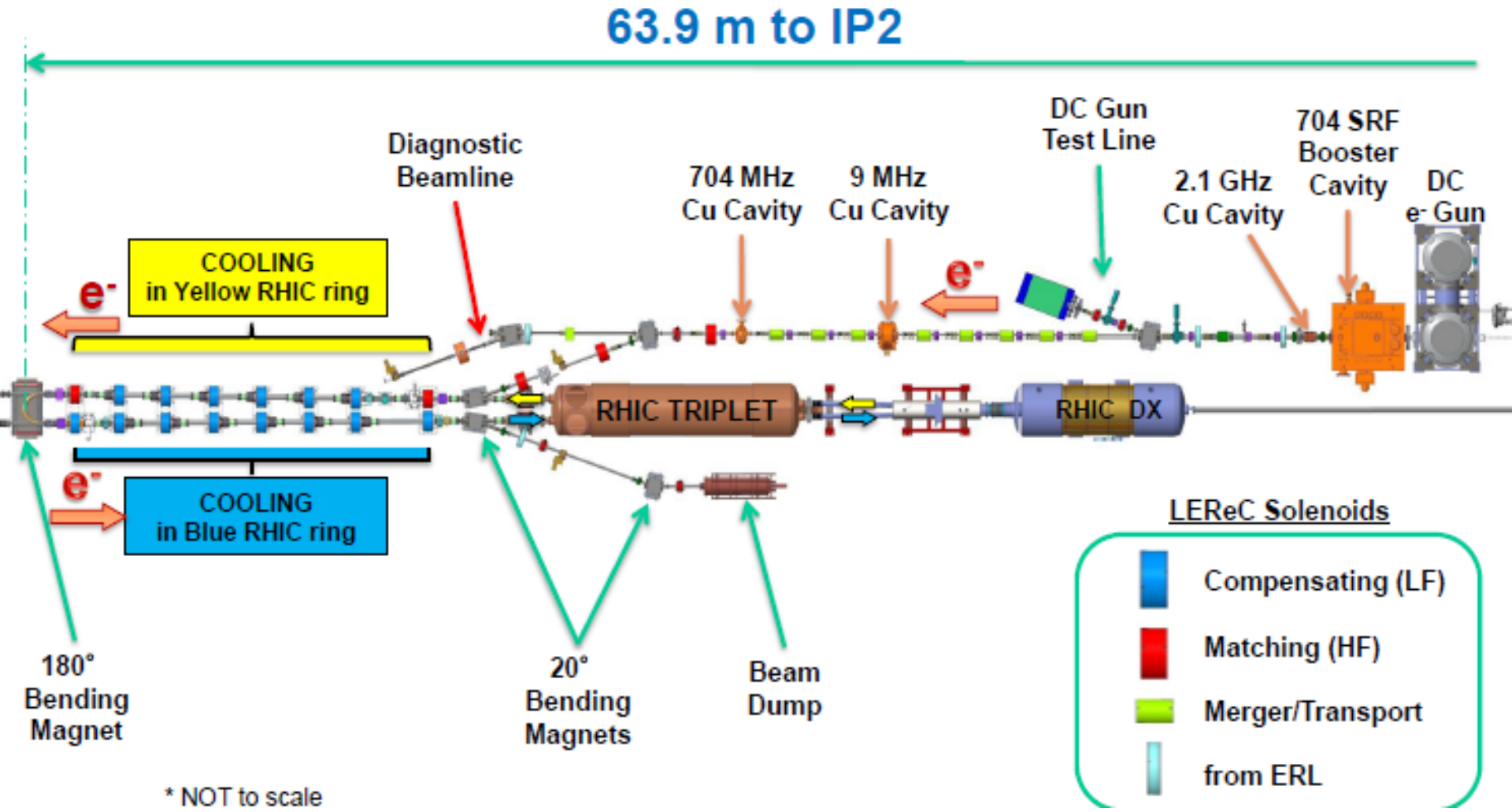
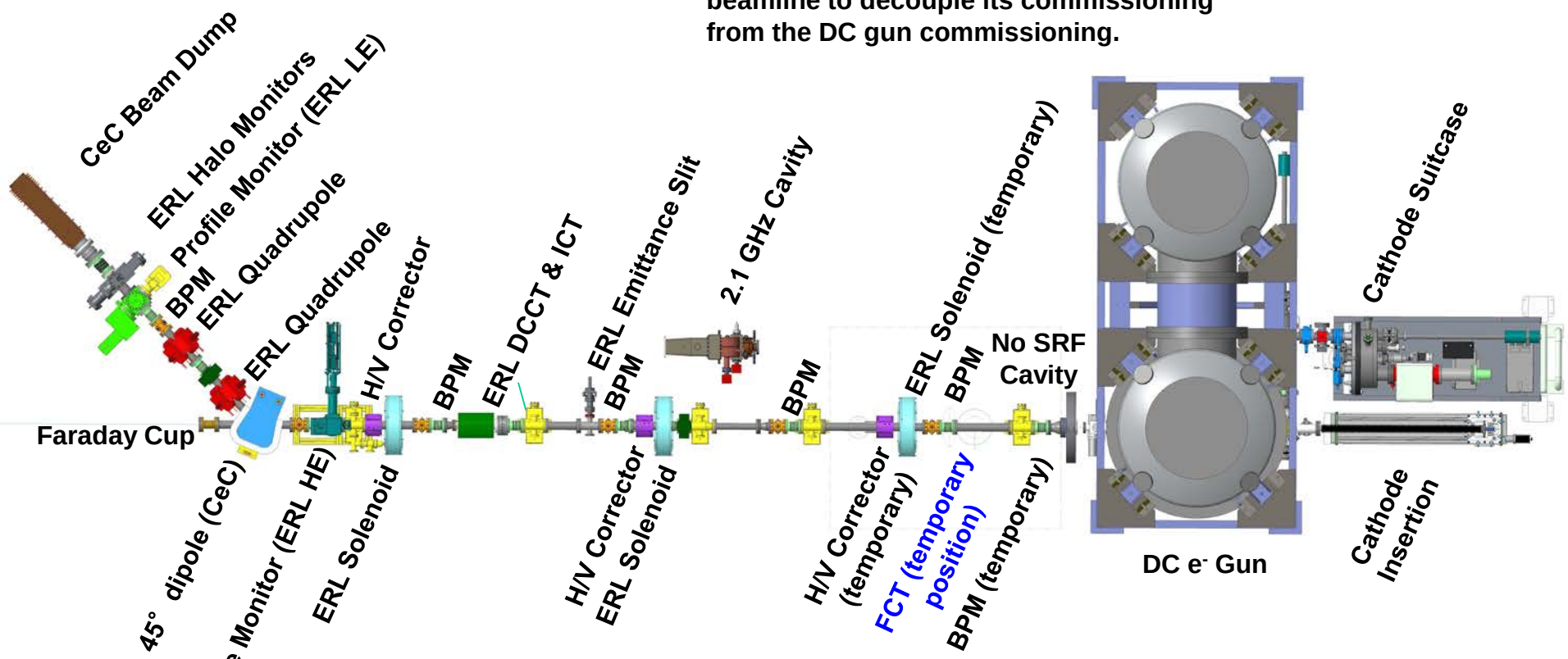

BD1408.LC
BD1629

LEReC System



LEReC Injection section 2016 (6/9/16)

2.1 GHz Cavity:
The cavity will be installed next to the beamline to decouple its commissioning from the DC gun commissioning.



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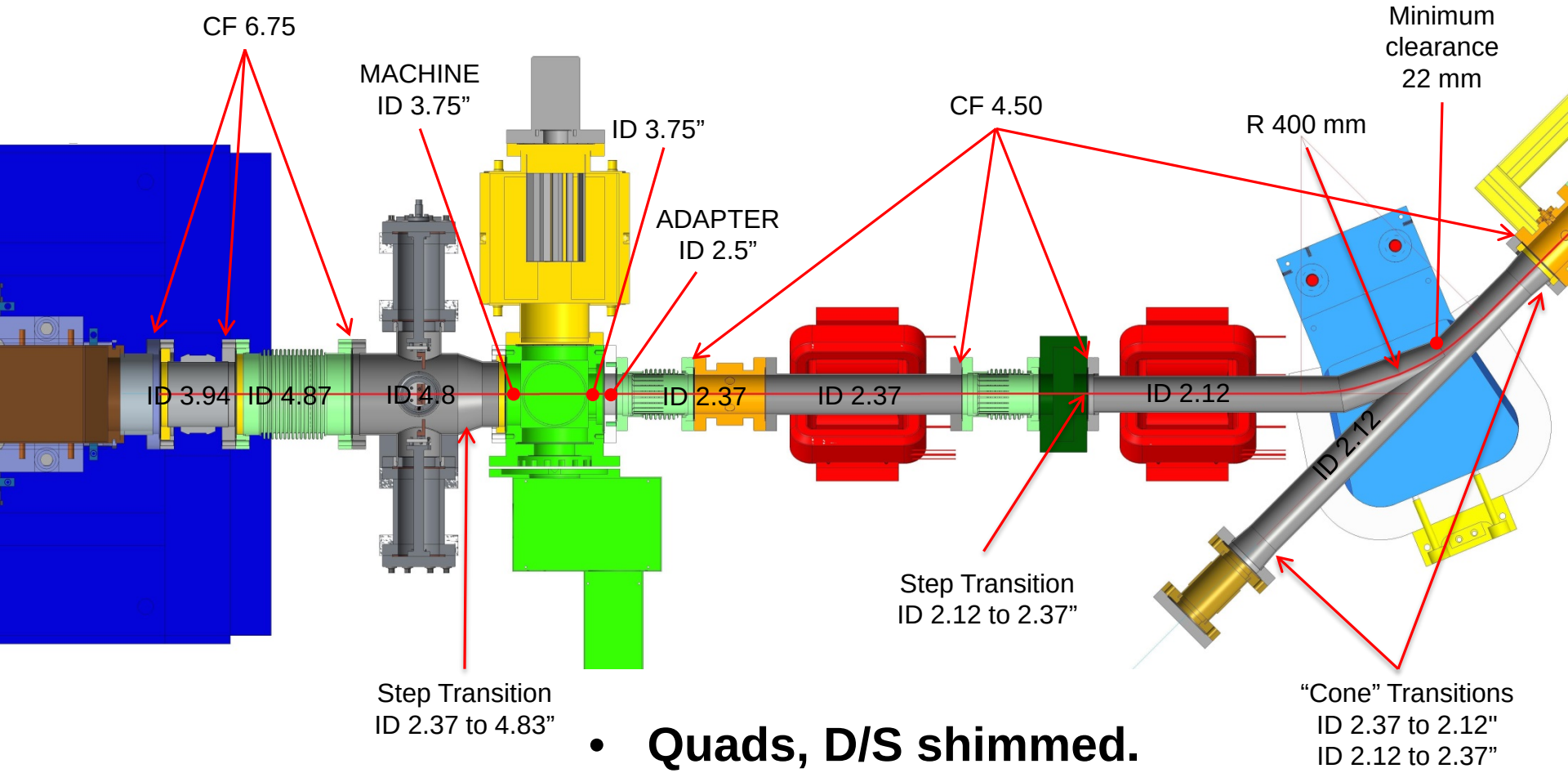

- **Quads, D/S shimmed.**
- **Dipole is not shimmed.**
- **Note beam tube apertures.**

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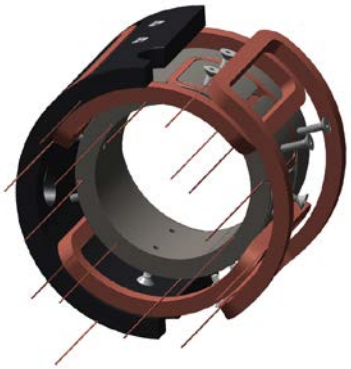
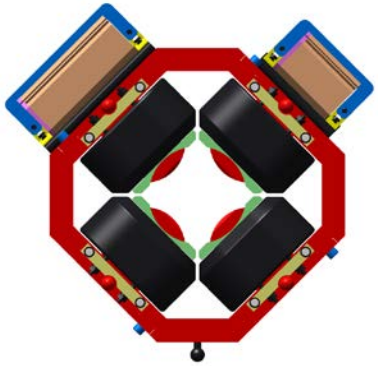
Component Status

Magnets:

- (2ea) GtB solenoids – preparing bid package.
- (6ea) ERL solenoids – magnet measurement complete
- (6ea) H/V corrector magnets – New GtB aircooled design, fabricate in house.
- (2ea) ERL quadrupoles – remove, shim one, magnet measurement
- (1) CeC 45º dipole magnet – magnet measurement?, new vacuum chamber (next slide)
- Magnet base, survey adjustment hardware, and stands for above.
- (2ea) Hi-field transport solenoids, out for bid.





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Component Status

Diagnostics:

- DCCT and ICT from ERL (internal RF shielding analyzed) any further modifications – no, shield drawing to be completed.
- (1) ERL HE Profile Monitors (new internal RF shield for vacuum chamber, ferrites, new larger YAG screen) model complete, fabrication drawings continue.
- (1) ERL LE Profile Monitors – modified and assembled (D. Weiss), needs pre-survey.
- (1) Emittance slit drive (new vacuum chamber and slit shape)
- (1) ERL Halo Monitor (new vacuum chamber, insertion limit defined)
- (1) Faraday cup (ceramic insulated vacuum flange?) 1 watt limit?
- (1) Fast Current Transformer (FCT) for MPS

6/07/16 Work Platform Meeting

- Eliminate 2 posts near the tuner access ports on the Booster Cavity. (Dave, Bob)
- Laser transport configuration – more layouts and modeling:

  (Zhi, Steve, Bob, Laura)

  a) Move the building to wall laser transport slightly north

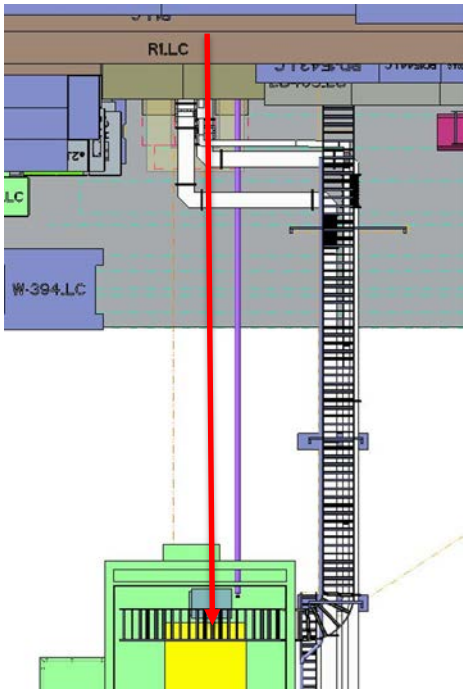
  b) Use a single 90^{o} vertical up bend out of tunnel wall laser tuning box and then move with a small angle across the IP to the vertical down bend to the laser table.

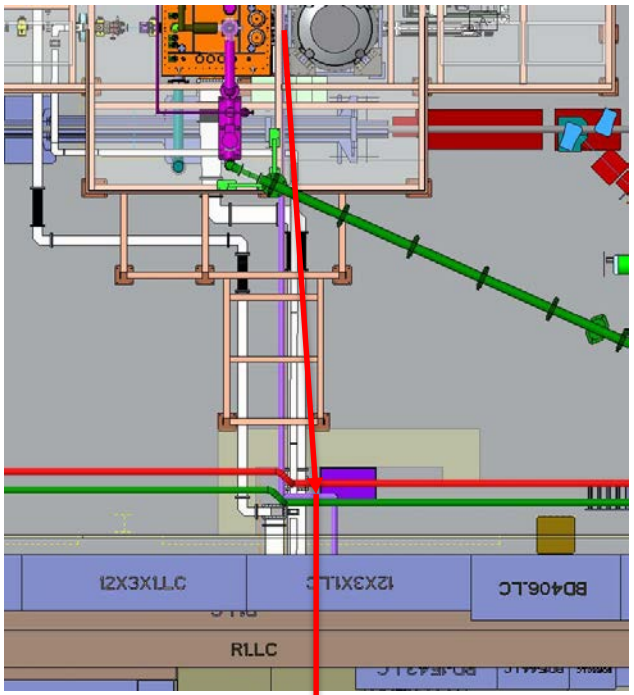
  c) Populate components on the in tunnel laser table.
- Awaiting reply from clean room equipment vendor on existing layout.
- Can a ducted port be built over the GtB section? (Dave, Charlie, Bob)
- Add a “gowning” entrance on the north side. (Bob)
- Add raised walkway space. (Dave, Bob)
- Reduce the number of flex joints in the Booster Cavity waveguide. (Cliff)

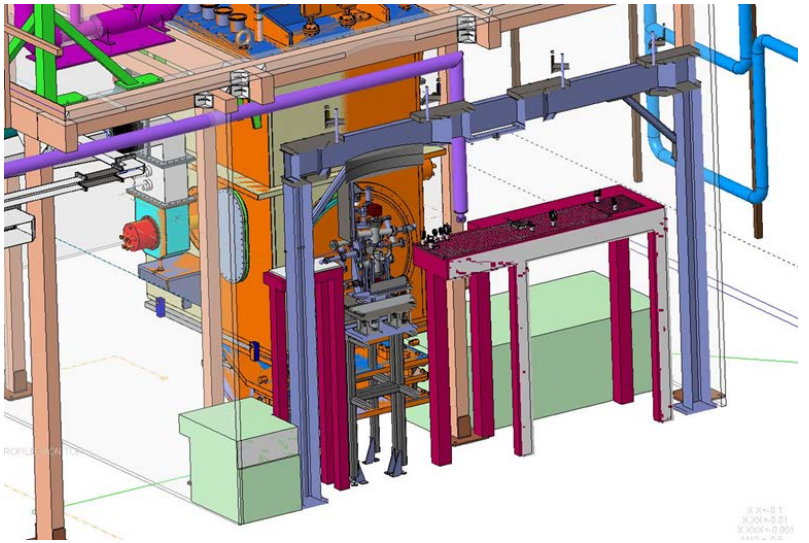
Component Status

Laser Systems: (From Tuesdays meeting)

- Laser building modifications (AC unit change, vibration)
- Transport line (work platform meeting): considering changing height and location out of laser building, change location in tunnel area/reduce number of 90^{o} bends.
- In tunnel optics tables (3 tables, detailed layout underway)

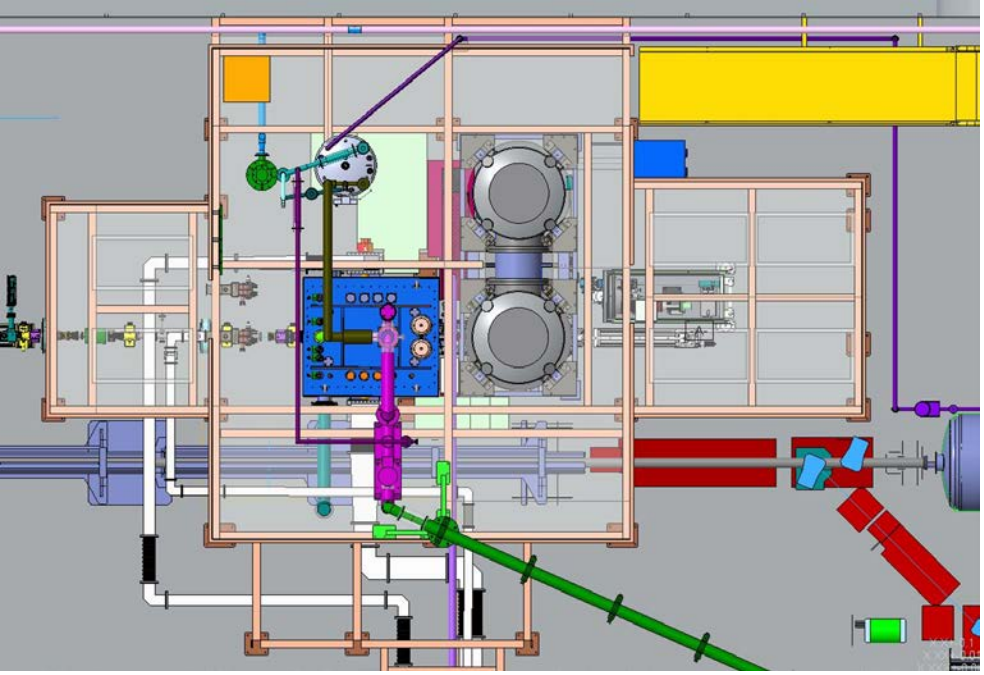


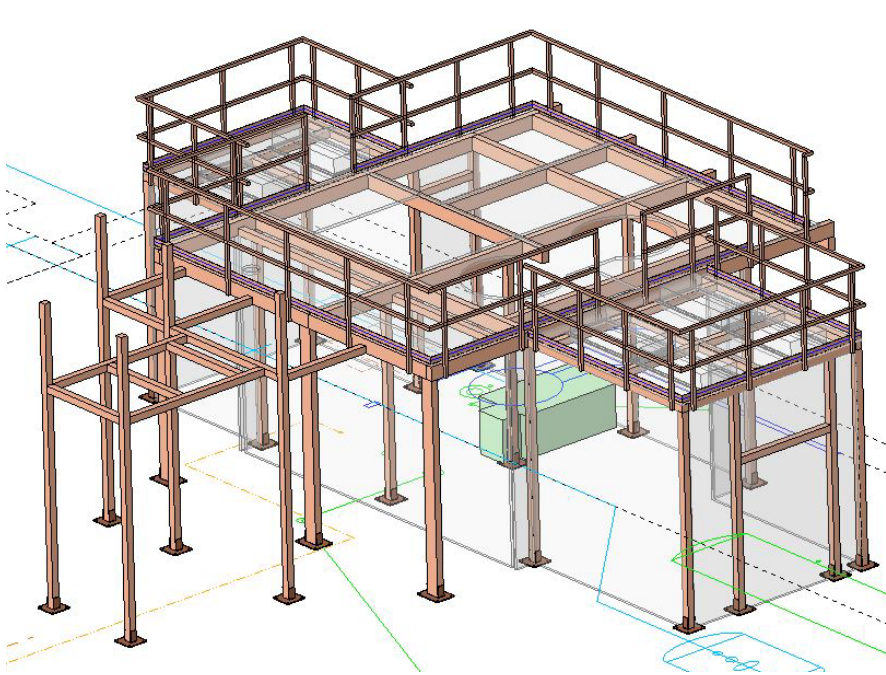


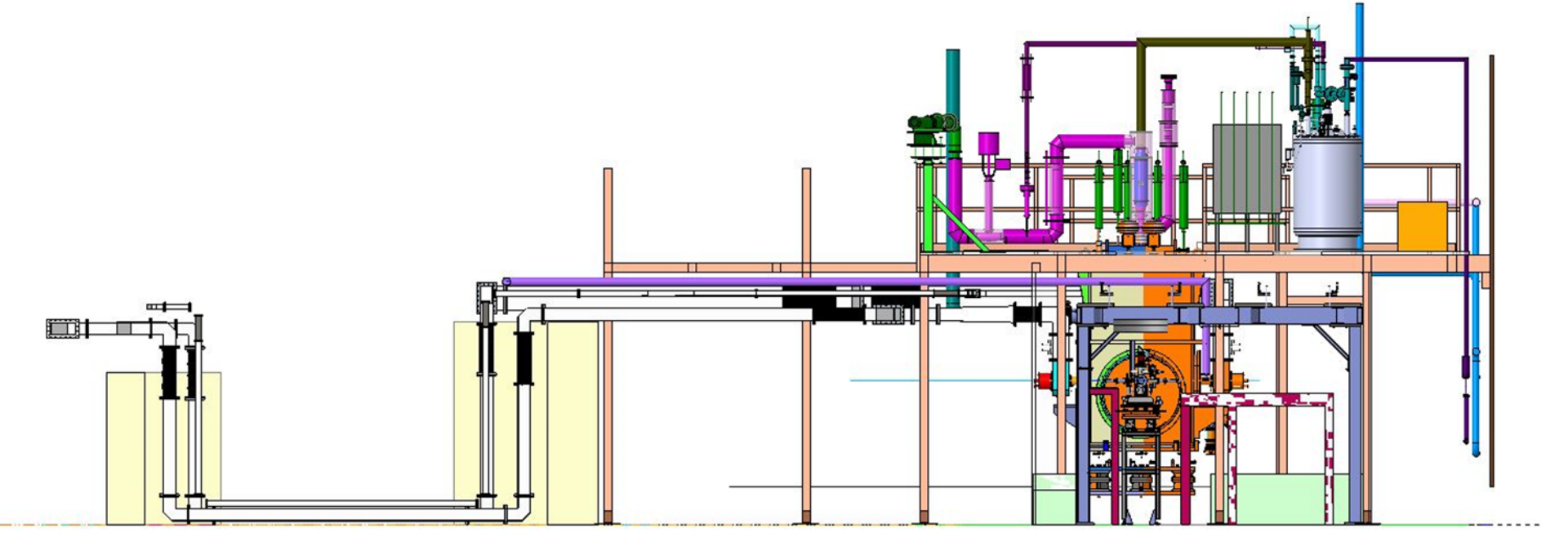


Laser Update

- Measurements of laser synchronization, time jitter, laser power stability, and beam position instability are under way:
- Locking to a new low phase noise signal generator, the RMS time jitter is varying from 650 fs to 850 fs [10 Hz to 1 MHz], meeting the design specification.
- Stability of IR laser power around 100 W is measured behind the main amplifier. Within 30 minutes, the std. deviation is about 0.25%.
- Work on laser stability at different amplifier stages is in progress.







EP&S Support

- Work Platform, Cleanroom design proceeding (Dave, Bob)
- Work Platform, order Rexroth (Dave)
- Tunnel power for DC Gun PS and Cleanroom fans and lights (Don, Mike, PK)
- 1002D power and cable tray requirements, Finalize magnet/power supply specifications (Don, PK, Dave)
- Tunnel cable tray layout (Dave, Bob)
- Tunnel penetration for laser transport (Dave, Bob, Zhi, Steve)

Vibration Measurements

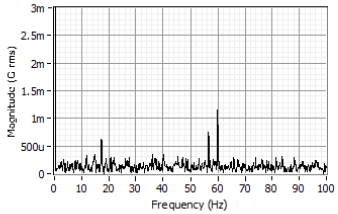
Measurements taken in laser trailer, 2:00, and 4:00 (56 MHz).

Run is coming to an end send requests to T. Tallerico/V. Badea

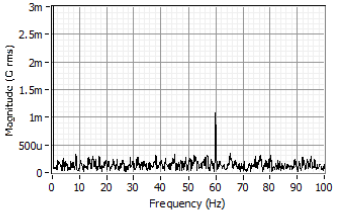
Request T. Tallerico/V. Badea set up a meeting to present results

RUN NUMBER 2 WITH LARGE CHILLER ONLY 4/25/2016

X-direction (A1=A)



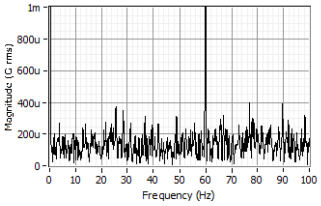
Y-direction (A1=A)



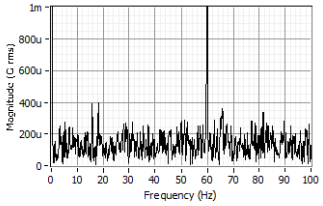
Z-direction (A1=A)

112 MHZ RUN 3 A1 FLANGE AND A3 ON FPC BLOWER OFF 5 27 16

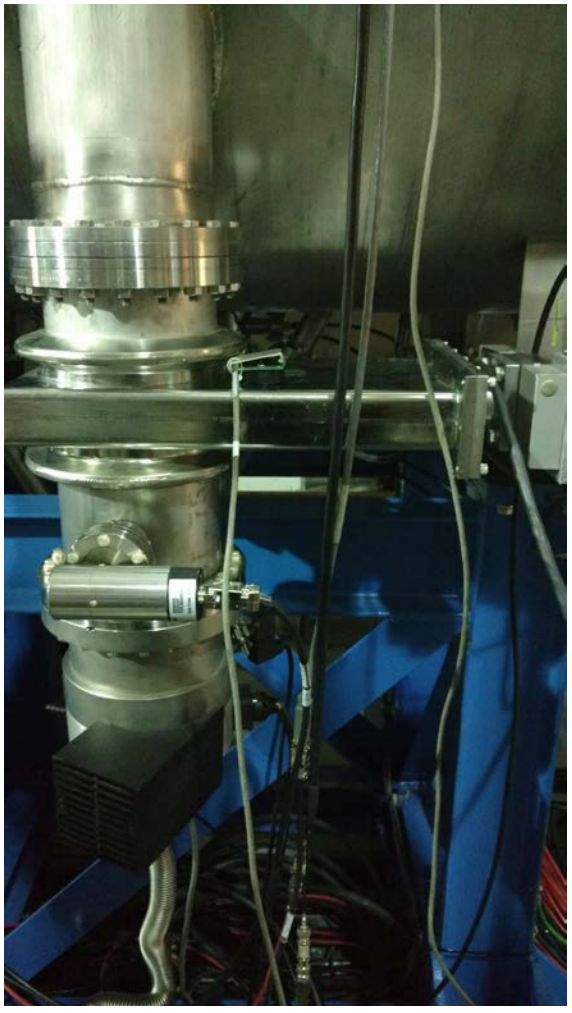
X-direction (A1=A)



Y-direction (A1=A)



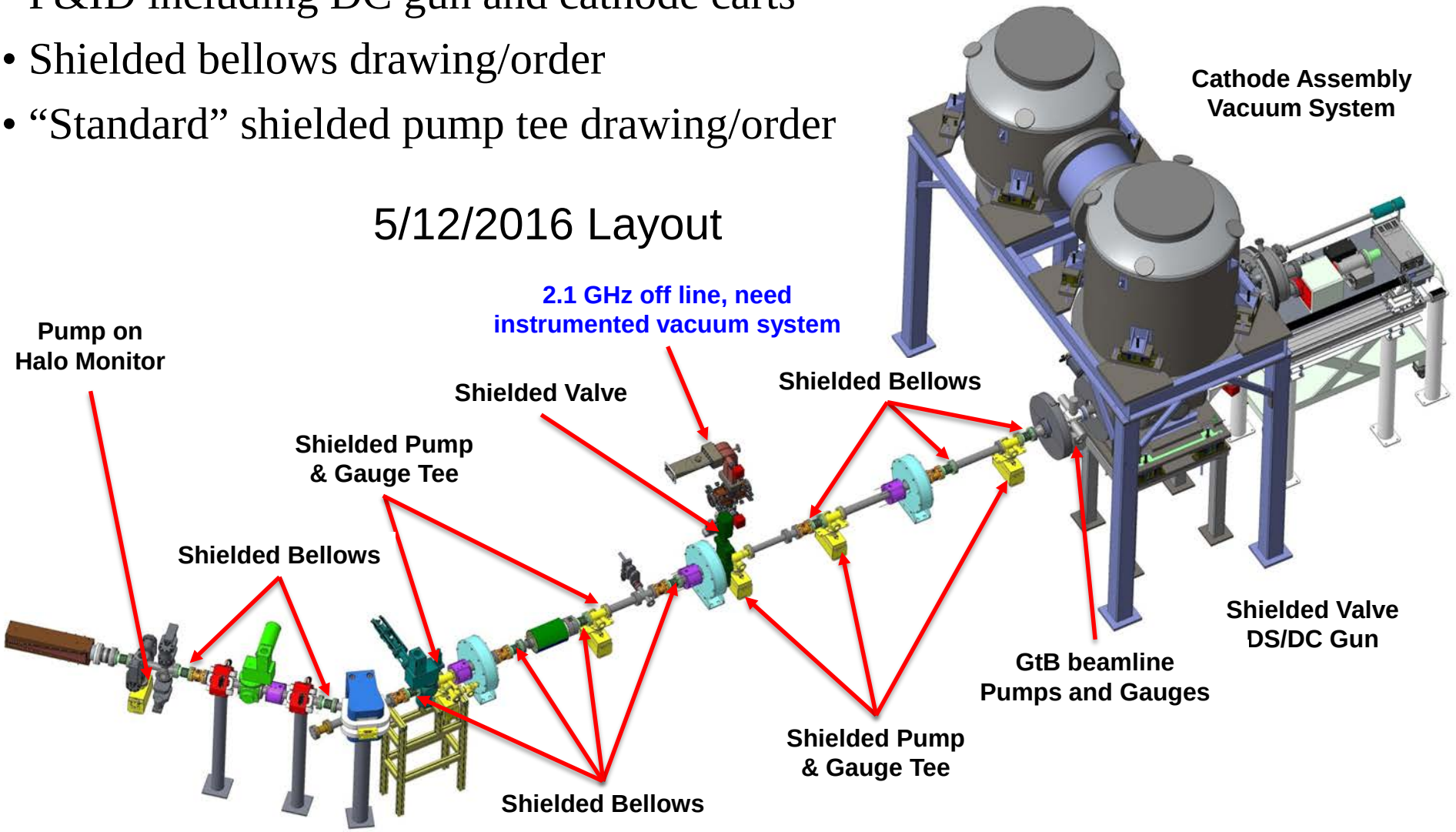
Z-direction (A1=A)



Vacuum Components

- P&ID including DC gun and cathode carts
- Shielded bellows drawing/order
- “Standard” shielded pump tee drawing/order

5/12/2016 Layout



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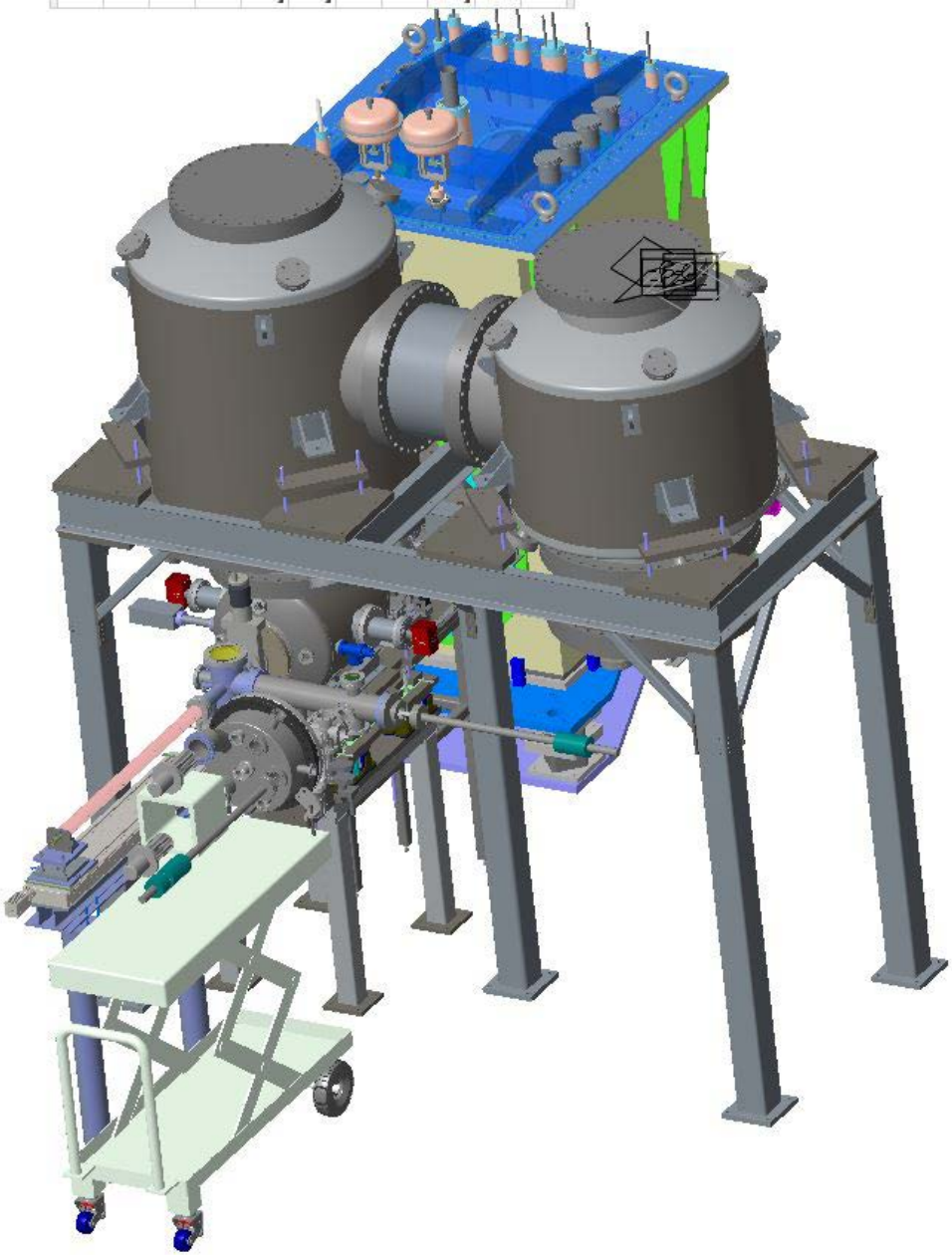
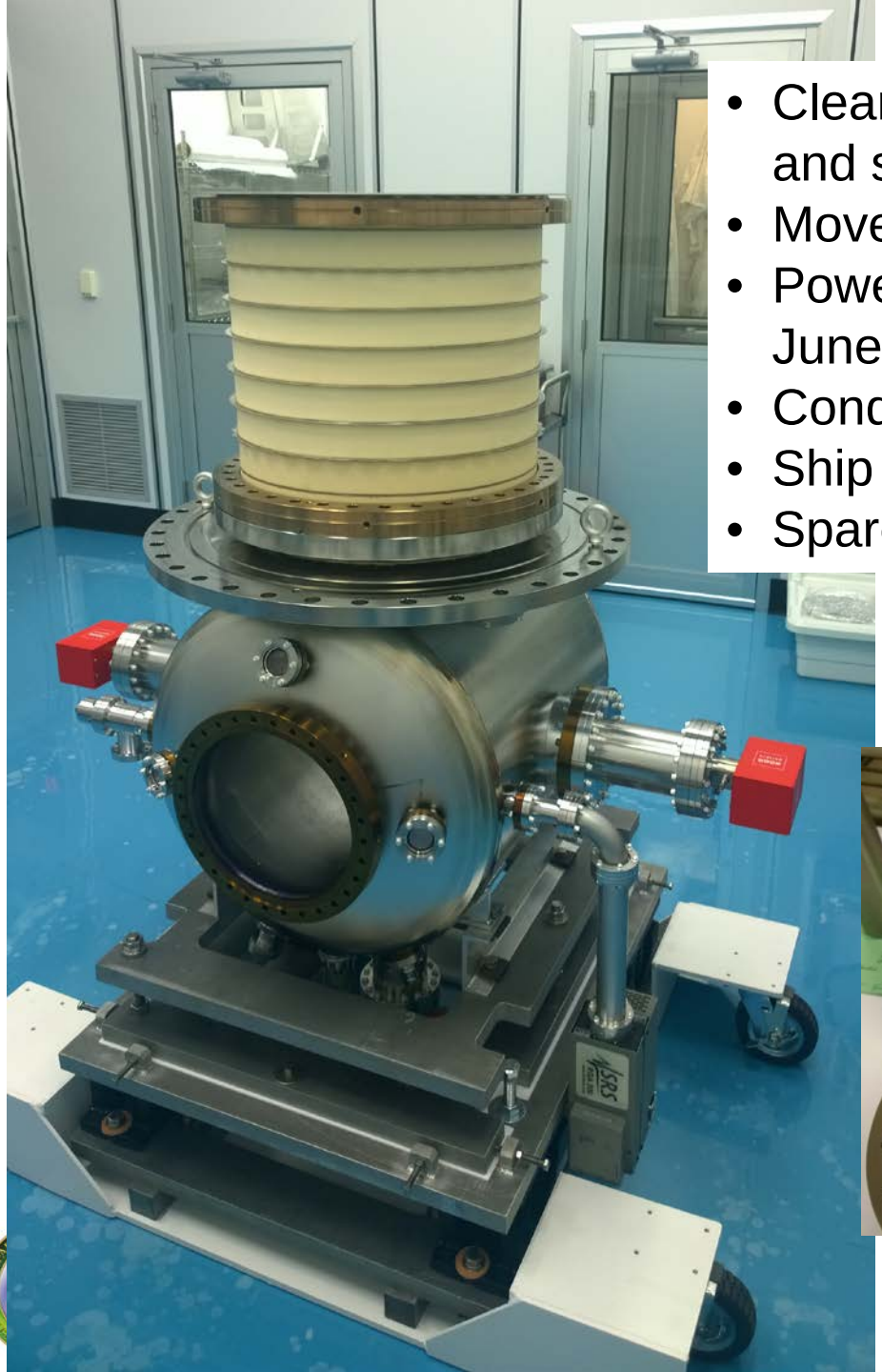


DC Gun Vacuum

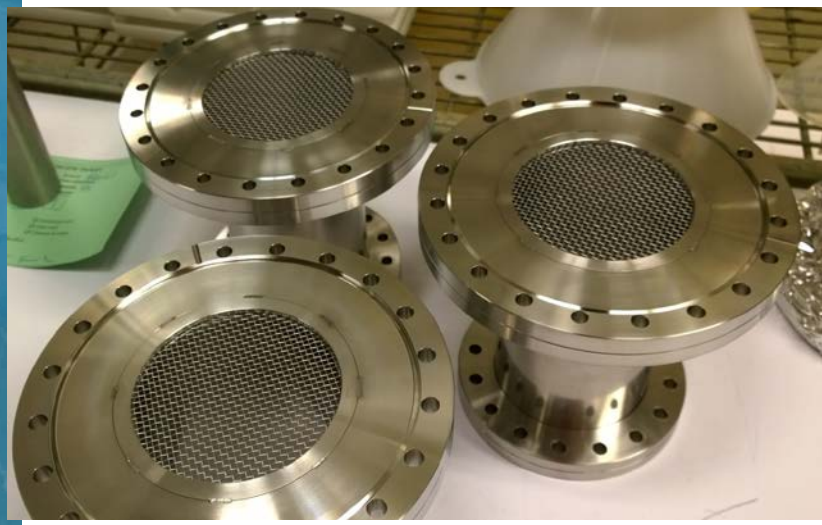
- Ion pump and NEG
- Bake-out 150-200C
- Extractor vacuum gauge
- Remote bleed valve for HV conditioning
- 1 shielded, 1 non-shielded valve

Cathode Systems Vacuum

- Bake-out 150-200C
- Vacuum gauges and pumps
- Plug in cables for transport cart pumps and gauges – remote monitoring
- Bake-able Vacuum “load lock” with remote monitoring and remote temperature control
- Valves w/interlocked controls (local MPS)
- Tunnel switches for interlocked “load lock” valves



- Cleanroom assembly of cathode stalk and survey next week.
- Move to cBeta Floor for conditioning.
- Power supply assembly week of June 20 or 27.
- Conditioning July 5 – 15.
- Ship to BNL ~July 18.
- Spare HV ceramic stacks delivered.



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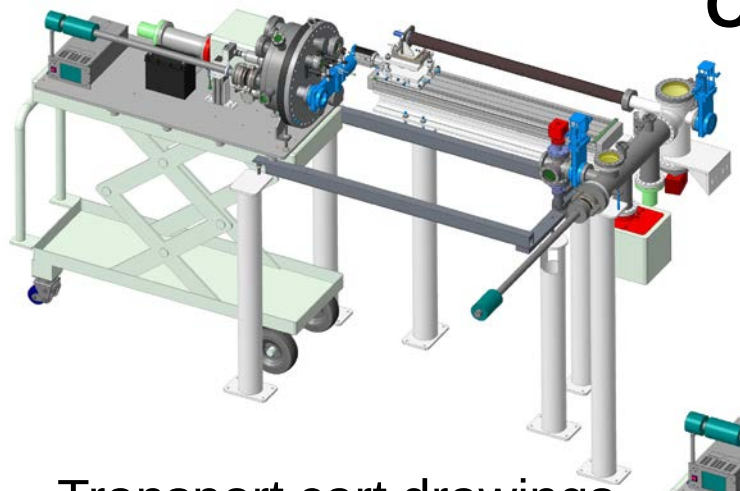
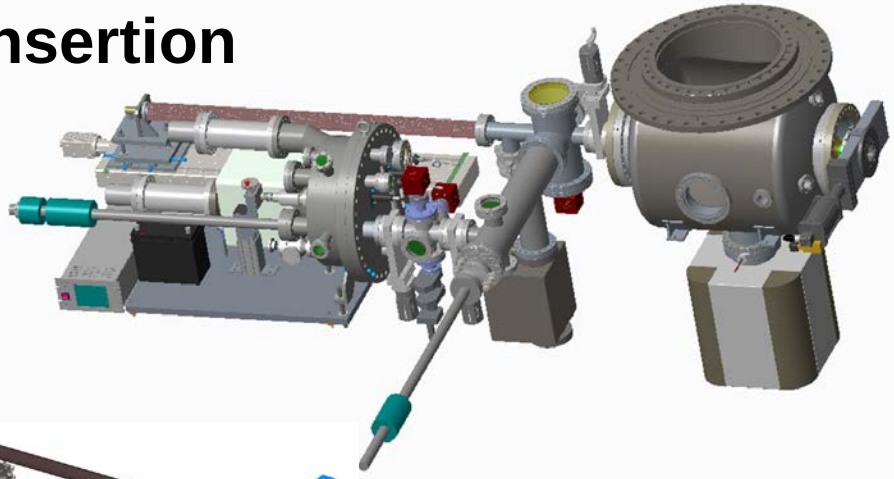
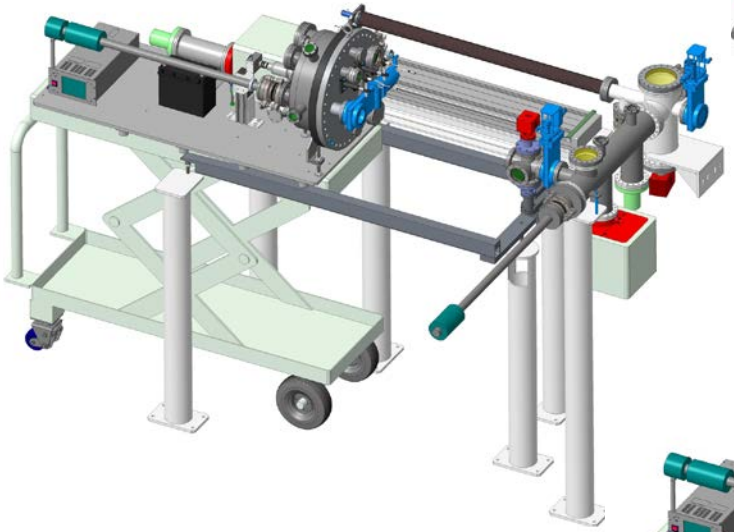
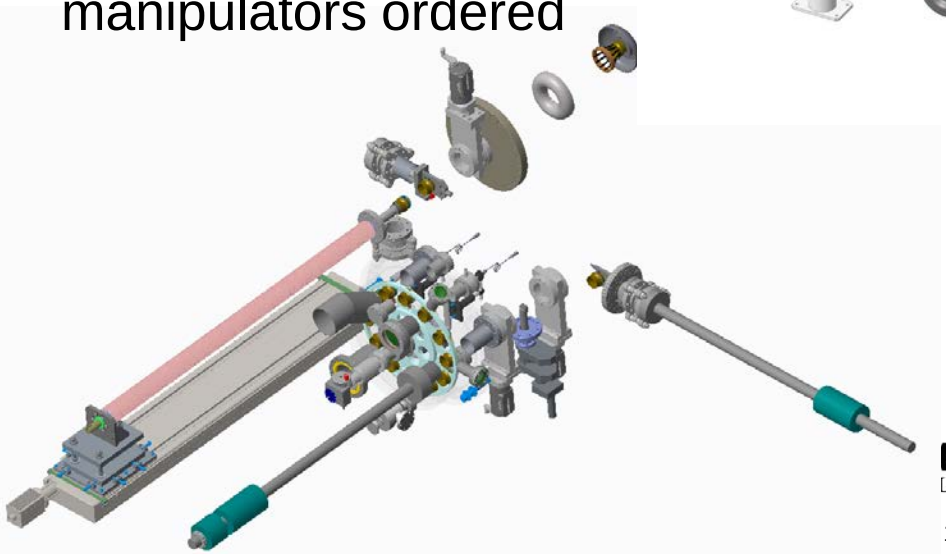
Cathode Insertion

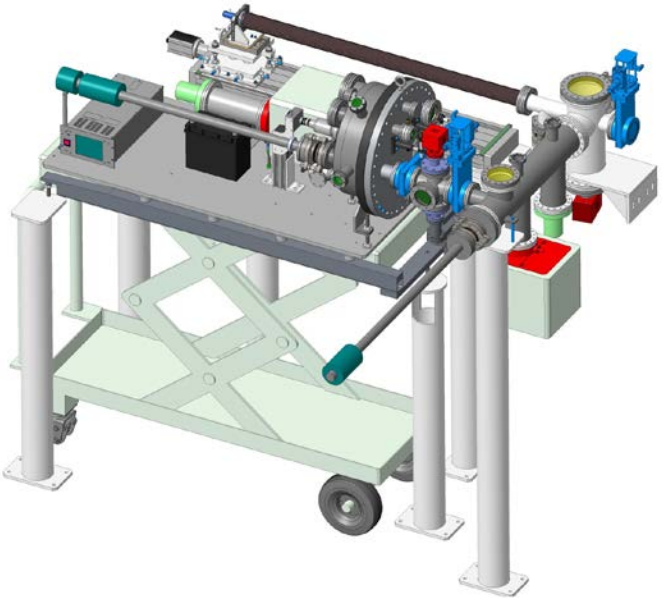






- Transport cart drawings in checking
- Insertion system drawings in checking
- Transfer engineering manipulators ordered





Cathode R&D Tasks and Status

Build and Test effusion Cells for Large Scale Production (up to 9/week)

Production: Three effusion cells have been fabricated and tested.

Develop Recipe for Na_2KSb cathode: Based on existing literature, a baseline recipe is ready, Multiple K-Cs-Sb cathodes with a few % QE have been fabricated in a similar system. Bulk alkai metal has been procured.

Design, Fabricate and Test R&D Vacuum Chamber: Design complete, Components have been ordered, fabrication underway

Effusion Cell: Has been designed, fabricated, and tested.

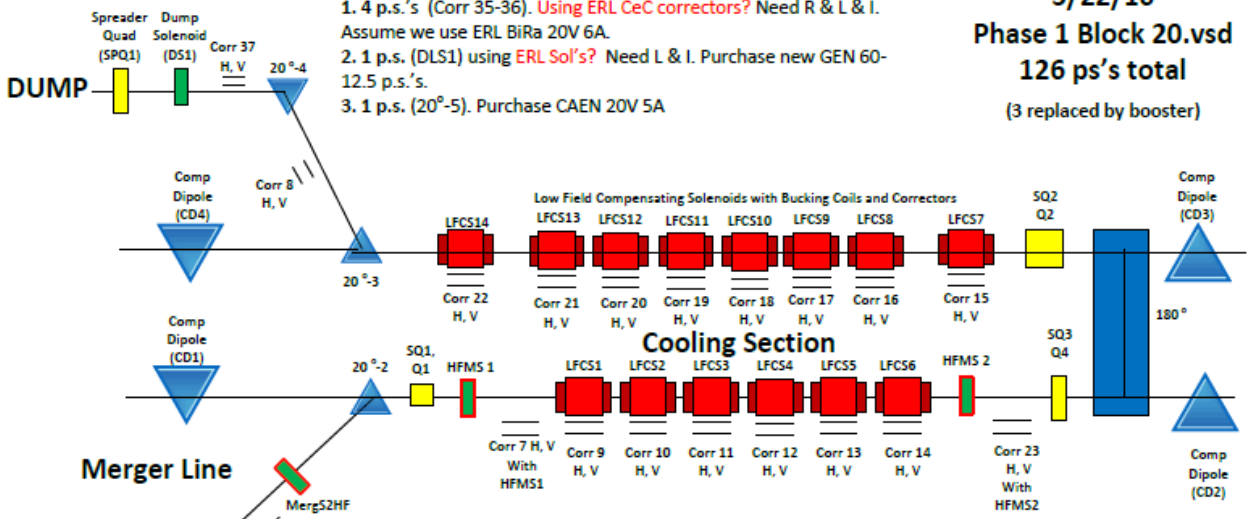
Gun Injection Section

1. **1 p.s.** Kaiser High Voltage ps for gun
2. **1 p.s.** High Voltage Anode Bias ps. Does this go into the tunnel? Cornell specs ~1kV and 30uA. Purchase Stanford 1.25kV, 20mA with GPIB.
3. **1 p.s.** (BC1). I op=4.2A. I max = 6A 1000ppm. Using ERL BiRa 20V, 6A p.s.
4. **2 p.s.'s** (Corr 24), I op=0.6A 100ppm Purchase new CAEN 20V 1A 100ppm p.s. bipolar.
5. **2 p.s.'s** (GIS1-GIS2) using New GM Sol's. Iop=8.4A, I max=10A @ 100ppm. Purchase New CAEN EZ 20V 10A 100ppm ps's
6. **3 p.s.'s** (GIS3-GIS5) ERL Sol. I op=8.4A, I max=10A @1000ppm Purchase New CAEN FAST-PS 40V 10A 100ppm ps's
7. **8 p.s.'s** (Corr 25H, V, Q, SQ & Corr 26H, V, Q, SQ). New GM Correctors. Purchase CAEN 20V 1A 100ppm ps's for 25H,V & 26H,V. Use ERL BiRa 20V 2A 1000ppm for 25Q,SQ and 26 Q,SQ
8. **10 p.s.'s** (Corr 27-30). Using GM new correctors. Use ERL 20V 2A 1000ppm or CAEN 20V 1A 100ppm ps's??
9. **1 p.s.** ComD1. CeC 45° dipole. I op=20A 1000ppm required. Use kepco 50V 20A 100ppm. 20A is ps limit, buy another ps?
10. **2 p.s.'s**. Q5 & Q6. ERL Quads. Waiting on Dmitry for magnet specs.

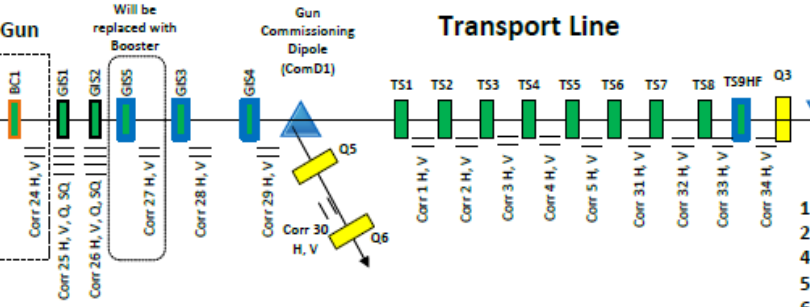
Diagnostic Line

1. **4 p.s.'s** (Corr 35-36). Using ERL CeC correctors? Need R & L & I. Assume we use ERL BiRa 20V 6A.
2. **1 p.s.** (DLS1) using ERL Sol's? Need L & I. Purchase new GEN 60-12.5 p.s.'s.
3. **1 p.s.** (20°-5). Purchase CAEN 20V 5A

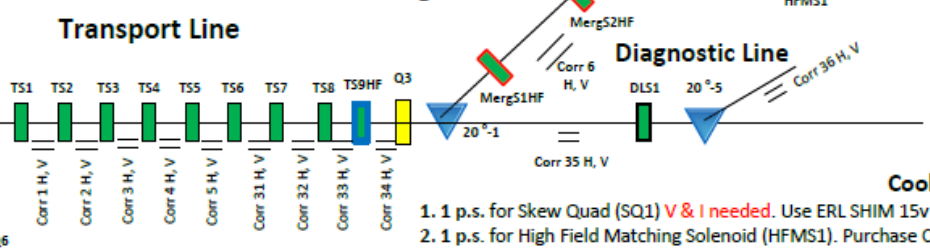
5/22/16
Phase 1 Block 20.vsd
126 ps's total
(3 replaced by booster)



Gun Injection



Transport Line



Transport Section

1. **8 p.s's** ERL SHIM 15V 10A 100ppm (limit 100W each) for 8 New design Sol magnets (TS1-8) . These magnets are 200G @ 6.8A.
2. **18 p.s.'s** for 9 New GM Correctors (Corr1-5 & 31-34) magnets. Purchase new CAEN 20V 1A 100ppm ps's or use ERL 20V 1A 1000ppm
3. **1 p.s.** for TS9HF. Use ERL Sol. I op=8.4A, I max=10A @100ppm Cannot use SHIM, may need CAEN FAST-PS 40V 10A
4. **1 p.s.** for one ERL Quad, Q3, Waiting on magnet Specs. Use ERL 15V 10A SHIM ps (limit 100W)?

Merger Section

1. **2 p.s.'s** 100G Solenoid Magnets (MergS1HF & MergS2HF). I op=11.3A Purchase new CAEN FAST-PS 20V 20A ps's?
2. **2 p.s.'s** needed for one Corrector magnet (Corr 6). Use new GM corr, Purchase new CAEN 20v 1A p.s.?
3. **2 p.s.'s**, ERL Kepco BOP GL 50V 20A or new CAEN 20V 5A for 20° magnets. Merger Section has 20°-1 on its own p.s. and 20°-2 on its own p.s. 20°-1 will also have a new laminated magnet. There is a possibility of using a shunt p.s. on 20°-1 but this is not included in count now.

Cooling Section

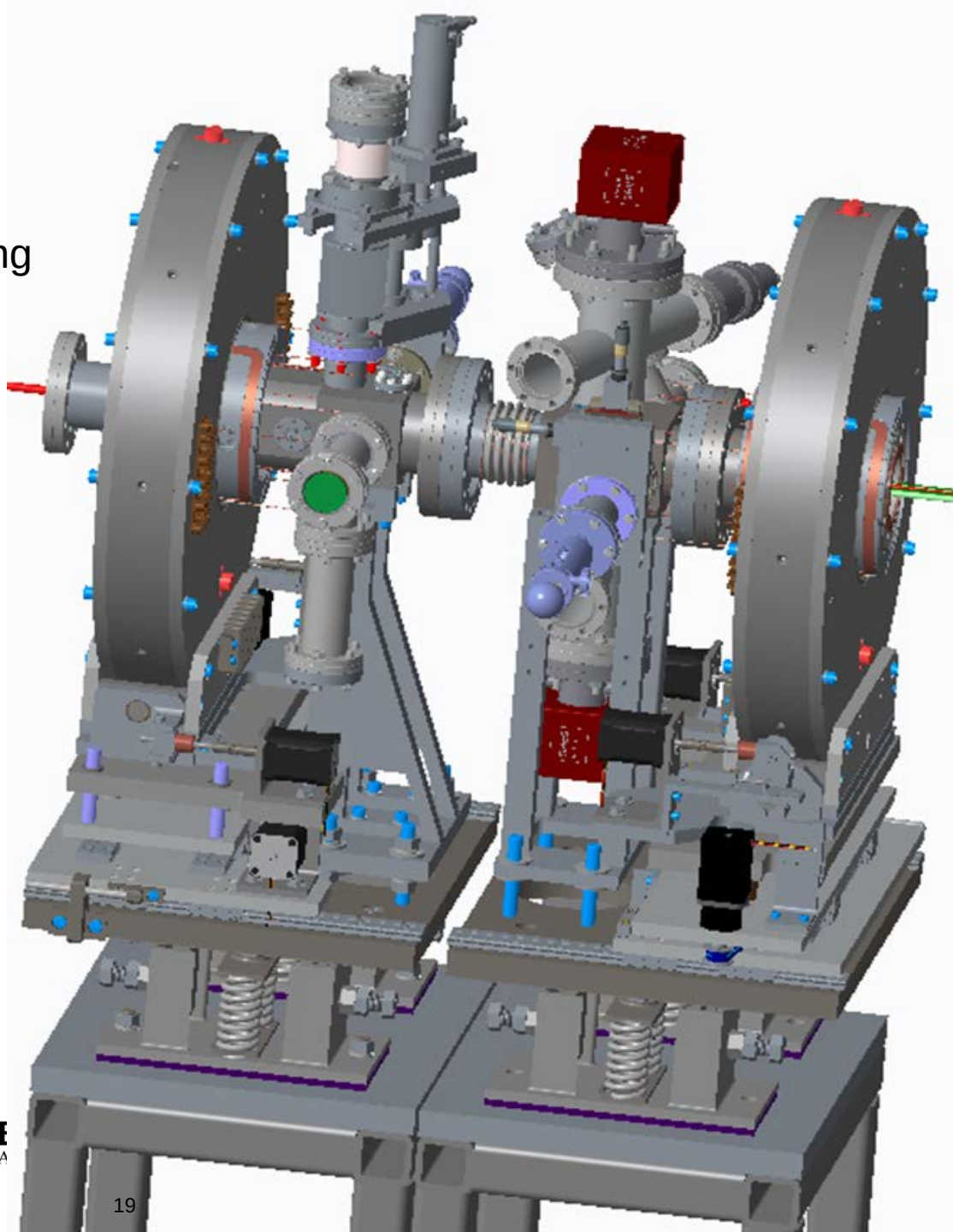
1. **1 p.s.** for Skew Quad (SQ1) V & I needed. Use ERL SHIM 15v 10A (limit 100W)
2. **1 p.s.** for High Field Matching Solenoid (HFMS1). Purchase CAEN EZ 20V 10A.
4. **1 p.s.'s** 30V 25A for High Field Matching Solenoid (HFMS2). Received
5. **4 p.s.'s** for HFMS Correctors (Corr 7 & 23), need real Mag V & I. For now using ERL 15V 10A SHIMS
6. **1 p.s.** 150V 22A for LFCSc1-6 cores 6 in series. Received.
7. **1 p.s.** 150V 22A for LFCSbc1-6 buck coils (2x) 6 in series. Received.
8. **28p.s.'s** 20V 2A BIRA MCOR for Correctors (Corr 9-22) with LFCS magnets.
9. **1 p.s.** for SQ3 V & I needed. Use ERL SHIM 15v 10A (limit 100W)
10. **1 p.s.** for Q4 V & I needed. Use ERL SHIM 15v 10A (limit 100W)
11. **1 p.s.** for 180° magnet. Have LSII p.s. in house. Assembling it. Add FWD to COTS ps?
12. **1 p.s.** for SQ2 V & I needed. Use ERL SHIM 15v 10A (limit 100W)
13. **1 p.s.** for Q2 V & I needed. Use ERL SHIM 15v 10A (limit 100W)
14. **1 p.s.** for Compensating Dipoles (CD1-4). All 4 in series. Use one kepco 50V 20A p.s.
15. **1 p.s.** 30V 25A for LFCSc7 core single. Purchase new GEN 30-25
16. **1 p.s.** 30V 25A for LFCSbc7 buck coils 2 in series from one magnet. Purchase new GEN 30-25.
17. **1 p.s.** 150V 22A for LFCSc8-13 cores 7 in series. Received.
18. **1 p.s.** 150V 22A for LFCSbc8-13 buck coils (2x) 7 in series. Received.
19. **1 p.s.** 30V 25A for LFCSc14 core single. Received.
20. **1 p.s.** 30V 25A for LFCSbc14 buck coils 2 in series from one magnet. Received

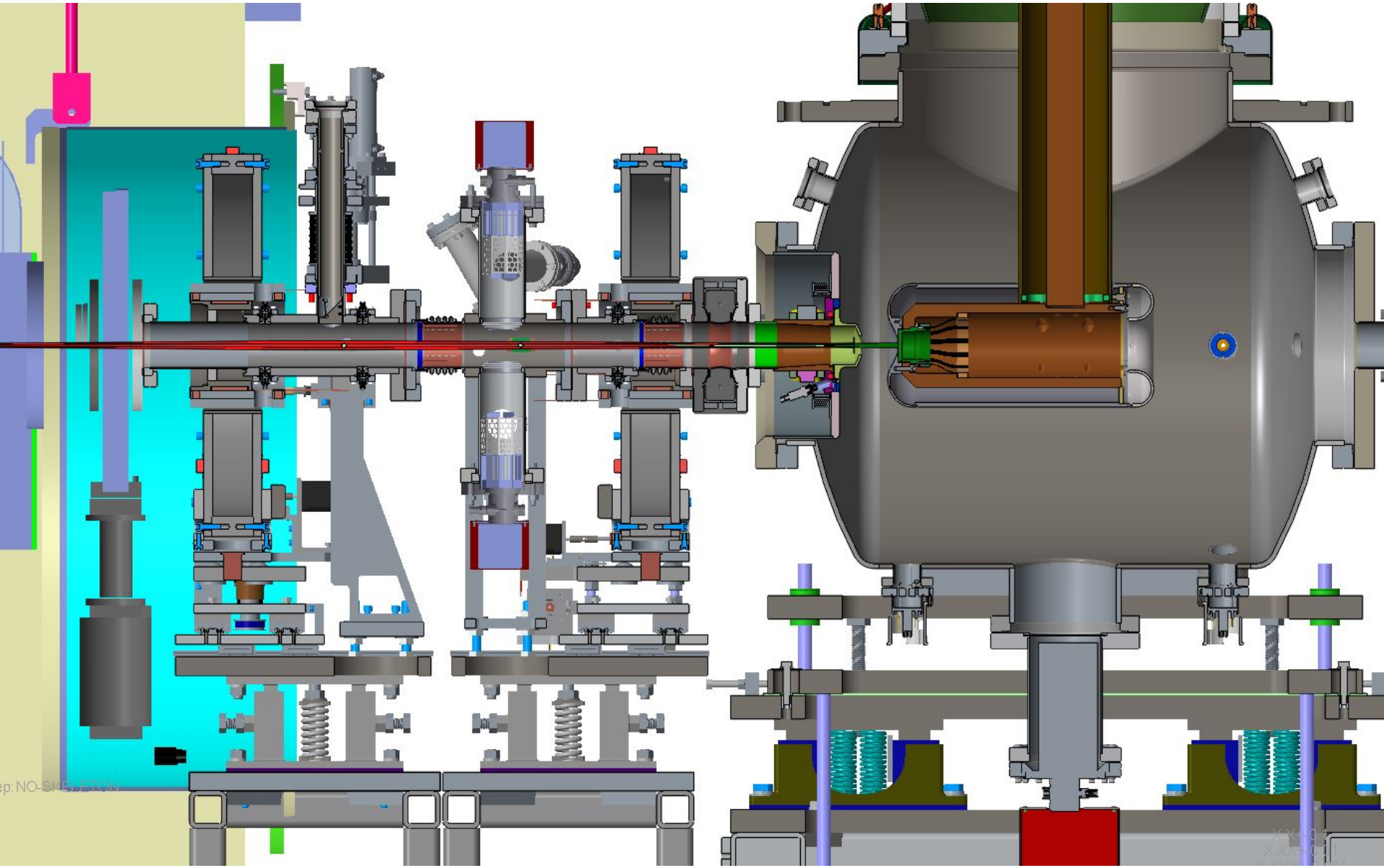
Dump

1. **1 p.s.** needed for one Spreader Quad Magnet (SPQ1), No V & I, told to use ERL 15V 10A SHIM p.s.
2. **1 p.s.** 60V 12.5A needed for Dump Solenoid (DS1). Use ERL Solenoid
3. **1 p.s.** Dump Section has 20°-3&4 in series on one 50V 20A kepco or one 20V 5A CAEN p.s.
4. **2 ps's** for Corr 8 (V&I needed). Use ERL SHIM 15v 10A (limit 100W)??
5. **2 p.s.'s** for Corr 37. Using ERL CeC correctors? Need V & I. Assume we use ERL BiRa 20V 6A.

Changes from Block 11
1. Removed TS10 & TS11
2. Moved Corr D1 after GIS4
3. MergS1-S2 are the same type of Sol's as TS1-TS9
4. Added GS4 and GS5
5. Added GCS1
6. GS1-GS5 and GCS1 are all ERL type Sol's
7. Added Corr 27 - 38
8. Added Q, SQ only to Corr 25 and Corr 26
9. Added BC1
10. TS1-TS9 and MergS1-S2 are new Sol's. Use Karim's design
11. Include High Voltage Anode Bias ps for gun, need info from Karl Smolenski
12. Include Kaiser HI V p.s. for Gun

1. Solenoid drawings complete, checked, requisition
2. Corrector drawings complete, checked, (Bakeout)
3. Mirror assembly complete, checking
4. Vacuum chambers (3), checking
5. Profile monitor design complete
6. Order ion pumps, gauges, NEG pumps
7. Profile Monitor near complete, checking
8. Support Stands modeled





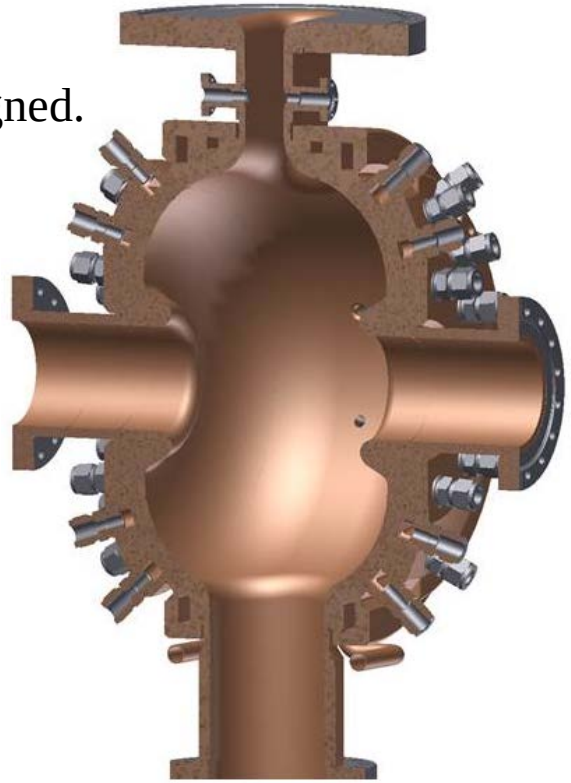
RF Component Status

2.1 GHz Cavity (offset on beamline): Cavity and wave guide transition ordered.

- 1002B new PA: delivery July 2016
- Tuner system w/drive, design complete, components being ordered
- Wave guide design near complete – being ordered, stand design underway

704 MHz Cavity (D/S DC gun beamline, in final position): Cavity ordered

- 1002B use Booster Cavity PA for commissioning (2017 ops - retune CeC 500 MHz)
- tuner system w/drive – design/model complete
- wave guide (Booster Cavity at wall to coax transition) to be designed.
- RF window transition, stand to be designed



9 MHz RHIC Cavity (D/S DC gun beamline, in final position)

ACS interlocks, MPS, water, cables

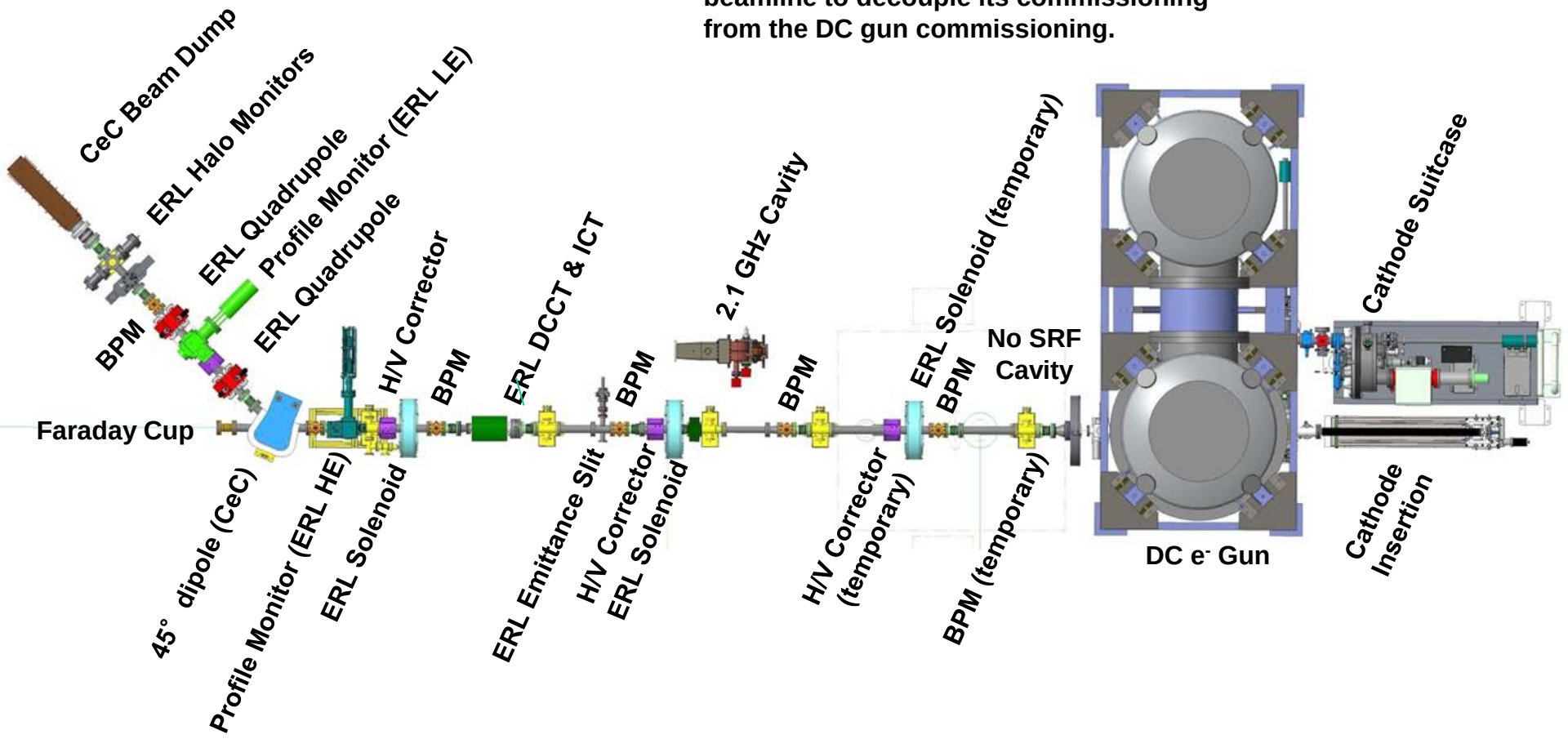
Cognizant Engineers

1. Cathodes: Rao, Walsh, Liaw, Hamdi
2. Cathode system: Liaw, Tuozzolo, Hamdi
3. Laser System: Zhao, Sheehy, Bellavia
4. DC Gun: Liaw, Halinski Cornell – Karl Smolenski
5. DC Gun HV power supply: Bruno, Sandberg, Costanzo
6. Magnet Power Supplies: Bruno
7. GtB Transport Line: Nayak, Halinski
8. Magnets: Mahler
9. Beam Diagnostics: Miller, Gassner, Michnoff, Minty, Weiss
10. Vacuum: Mapes, Steszyn, Weiss, Nayak
11. Beam Dump: Fite, Corbin
12. Warm RF Cavities: Zaltsman, Smith, Brutus, DeSanto
13. Controls: Theisen, Jamilkowski, Costanzo MPS: Selenski, Altinbas
14. Civil construction: Phillips, Folz
15. Commissioning: Kayran, Hammons

Old slides, previous meetings

LEReC Injection section 2016 (5/12/16)

2.1 GHz Cavity:
The cavity will be installed next to the beamline to decouple its commissioning from the DC gun commissioning.



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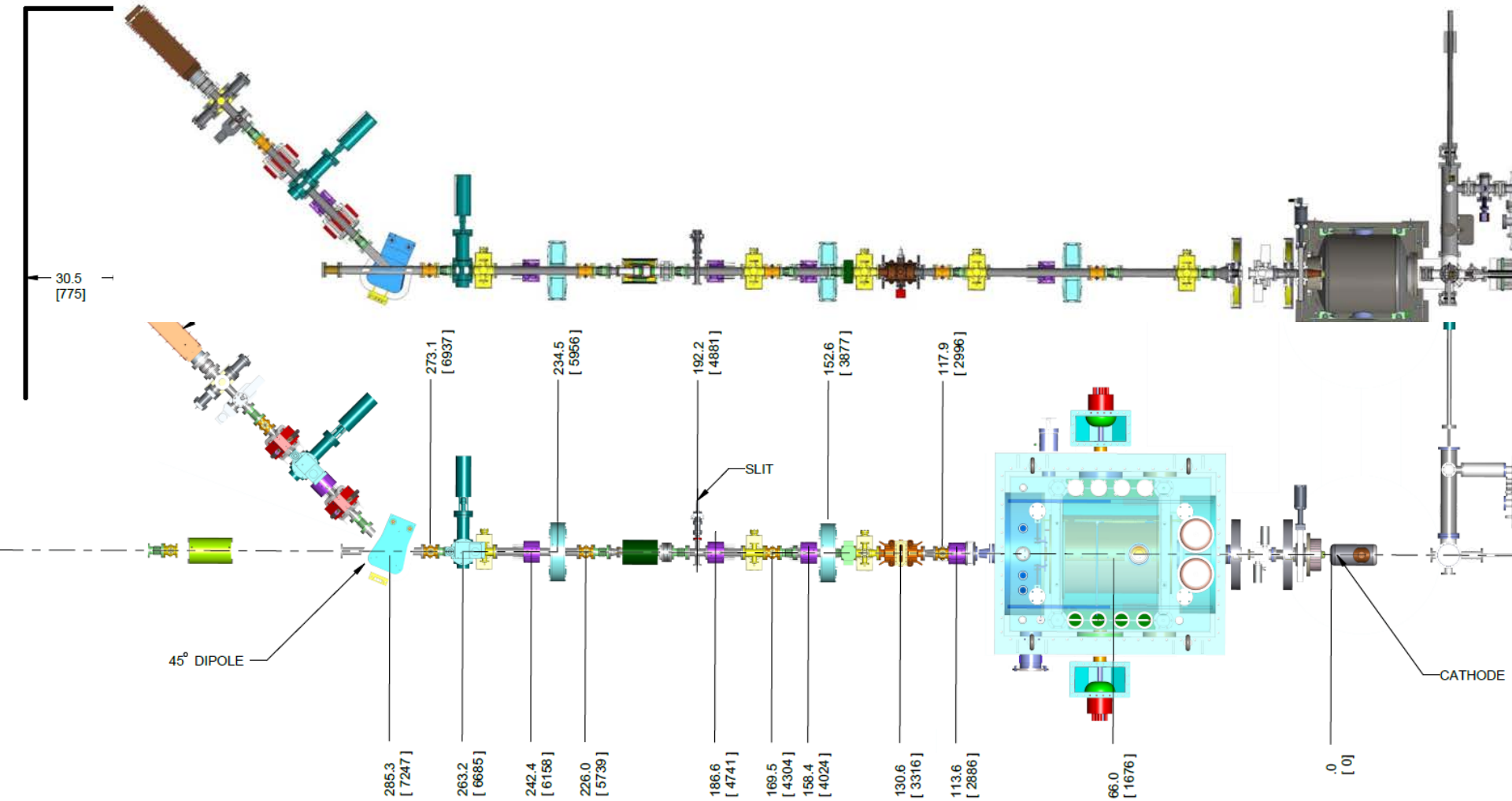

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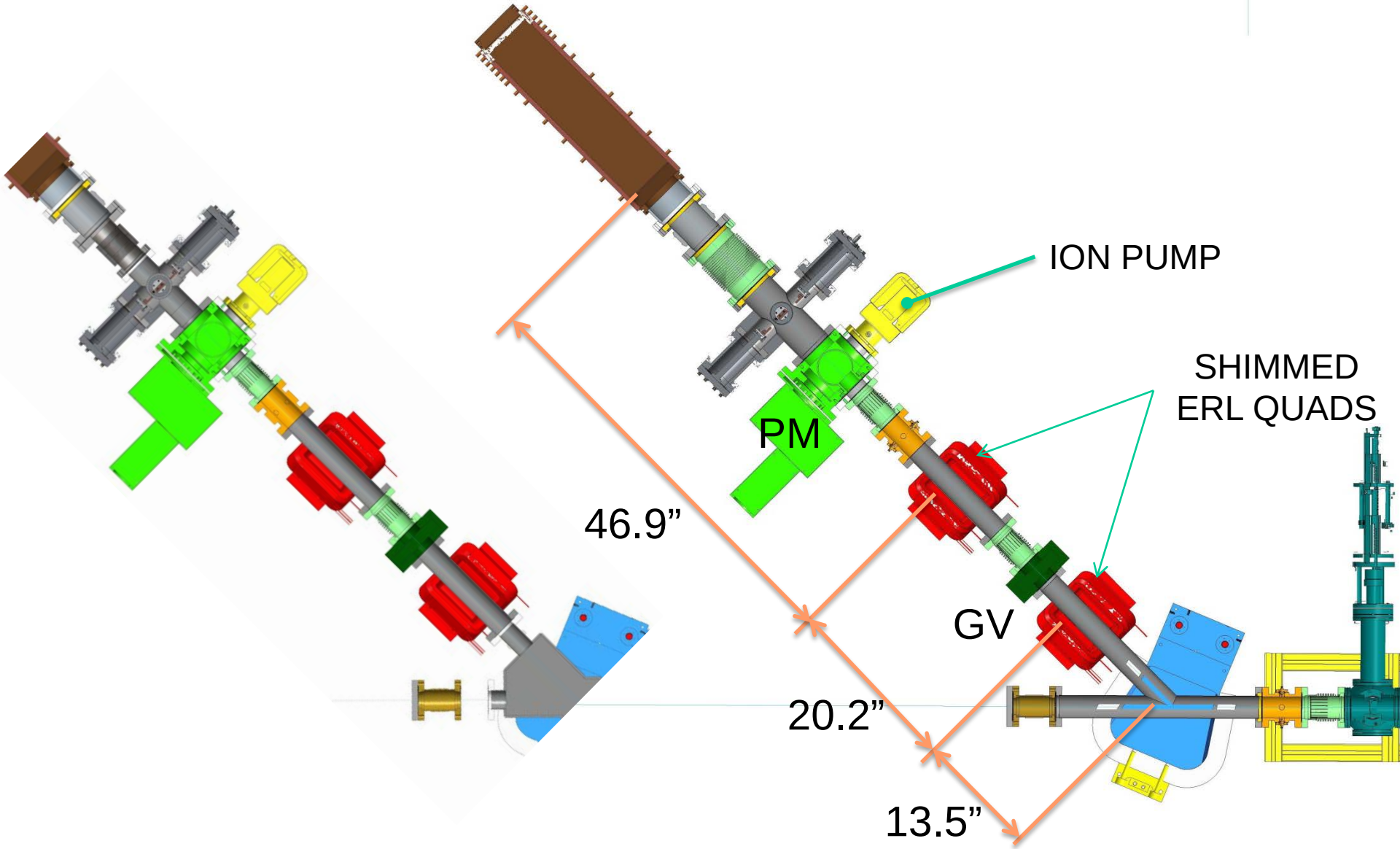

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Minutes 5 12 16 meeting

Mapes, Miller, Kayran, Fedotov, Gassner, Hamdi, Bruno, Mahler, Weiss, Hammons, Arno, Nayak, Fite, Bellavia

- The layout shown in the meeting was updated earlier today. The following slide shows the latest which provides a litte more clearance between the dump and the wall. Some discussion on moving the gun and beam line assembly further upstream – drawings are finalized and checked on cryogenics and being checked on waveguide and cable tray position – don't move the gun. (Tuozzolo)
- Also noted that the "safety" 36" clearance walk through will be by going under the beam dump line. The stands will be bridged in the area under the quads and PM to provide clear ground level clearance similar to the RHIC beamline for CeC – photo below.
- Some changes for the beam dump line. The quadrupole will be moved as close to the 45^{o} dipole as possible and will share the chamber weldment with the dipole. This will make the 2.5" OD beam tube okay for use in this line. (Kayran)
- George and Karem will make sure the ERL quad works in this dump line.
- Toby noted that the ERL LE PM has a large aperture with 6" conflat flanges, an adapter will be needed. Beam impedance (with nice transitions) will not be a concern in the dump line.
- Mike recommended adding a non-shielded gate valve at the beginning of the line. Therefore, after the dipole comes the quadrupole, then gate valve, then bellows, then corrector (over bellows?) then LE Profile monitor.
- The ion pump will be moved to the PM chamber.
- The halo monitor specifications will be discussed in the afternoon LEReC beam instrumentation meeting.
- The solenoid magnets drawings for GtB will be approved this week and the requisition will start.
- 6 H/V correctors are needed – 2 for the GtB with quad and skew quad correctors underneath and 4 more of the same for the rest of the transfer line without the quad and skew quad correctors. The support bracket for the correctors without quad and skew quad still needs to be designed.
- The standard shielded bellows drawing has been forwarded to vendors for estimates.

Minutes, 5 19 2016 Platform meeting:

(Mapes, Zhao, Soria, Meier, Bellavia, Aron, Smith, Tuozzolo, Zaltsman)

- Victor is near done on **cryogenic drawings, no changes**. Needs a specification control drawings for the return heater.
- Bob has **updated the cleanroom layout** so it can be transmitted to a cleanroom equipment vendor. It was agreed to move the curtain wall so that the cleanroom boundary will be on the CeC undulators so that the undulators will be just outside the cleanroom.
- **Doors** were added on both ends of the cleanroom including a double door for the cathode transport cart. Larger filter element sections were added
- **Bob has looked at straighter runs for the laser.** Still needs 3/90^{o} bends near wall, not a problem per Zhi. Also clarified that the final laser position to the tunnel optics table does not need to align with laser port on the beamline. Bob, Dave, Steve, and Zhi will meet in the laser room to update the table location and laser start to tunnel location.
- Zhi will provide some dimensions for the in line **laser alignment box** near the wall..
- Bob and Dave Phillips are considering a **raised floor design** that will use more Rexroth and the aluminum plate to be used for the upper platform.

5/25/16 Gun to Booster Transport Line Meeting Minutes: A. Fedotov, D. Kayran, S. Bellavia, M. Mapes, T. Rao, B. Sheehy, J. Tuozzolo, Z. Zhao, B. Sheehy, J. Halinski, T. Arno, J.C. Brutus, K. Hamdi, J. Fite, D. Gassner

Status of component drawings was reviewed:

- All the chamber drawings have been checked by Sumanta. John and Sumanta will work on getting them appoved. They have been given to KJL for quotation.
- Solenoid magnets drawings complete and approved.
- Corrector magnets complete. Being checked (Tony)
- Mirror system drawings complete. Being checked (Sumanta)
- Vibration Isolators are incorporated to the beam line brackets including the solenoid magnets.
- Design of the positioning mounts are complete (x and y positioning transverse to beam and skew on both x and y axis)
- Layout for profile monitor-camera assembly has started.

It was agreed to proceed with YAG crystal mounting design shown in the slide with 3^{o} angle.

Extended discussion on laser mirrors stainless steel and copper. The following was agreed to:

- Fabricate 3 stainless steel 440C mirrors that will be polished by Cabot Microelectronics. Sumanta is checking where protective silver coating would be done, Cabot/LT-ULTRA.
- Fabricate 3 copper mirrors that will be polished and silver coated by LT-ULTRA

Cabot Microelectronics is also making profile monitor mirror with the specification same as the laser mirror w/o any coating. There was agreement in the meeting that if the bakeout is done without incident that the copper mirror should not be damaged. There is time in the schedule to do some bakeout testing.

Discussion on the view ports. Zhi stated that the vendor needs to be aware of the laser intensity and Zhi will provide specifications for that will transit through the window. As far as clear aperture is concerned, Spectrum Thin Films quotation works fine. Zhi wants to check the following with the vendor.

1. what's the highest bake temperature?
2. what could be the best tolerance of vacuum level?
3. what's the average and peak power damage threshold?
4. AR coating specification for s- and p- light?

Additional discussion on the windows and mirrors for the laser transport (under rough vacuum) from the laser building to the tunnel optics table. Zhi stated that the requirements for those windows are less stringent. Steve noted that the commercially available vacuum mirror mounts were designed for 1" mirrors. It was agreed that 2" mirrors provide easier alignment and they should be used for the transport system. Steve will contact the vendor to find out the cost for mounting the larger mirrors in larger chambers.

a) Room to house R&D fabrication system is getting ready
    a. Electrical system ready
    b. Air handling system ready
    c. Pathway for cathode transport has been cleared
b) R&D Fabrication chamber
    a. Platform to house the chamber has been machined, assembled and wired
    b. Chamber has been designed
    c. Most of the components have been purchased
    d. Components are being machined prior to welding
c) Effusion cell:
    a. Has been designed, fabricated and tested successfully in a different chamber
    b. Bulk alkali metal has been procured
d) Cathode fabrication recipe
    a. Based on existing literature, a baseline recipe is ready
    b. Alkali sources for NaK2Sb has been procured