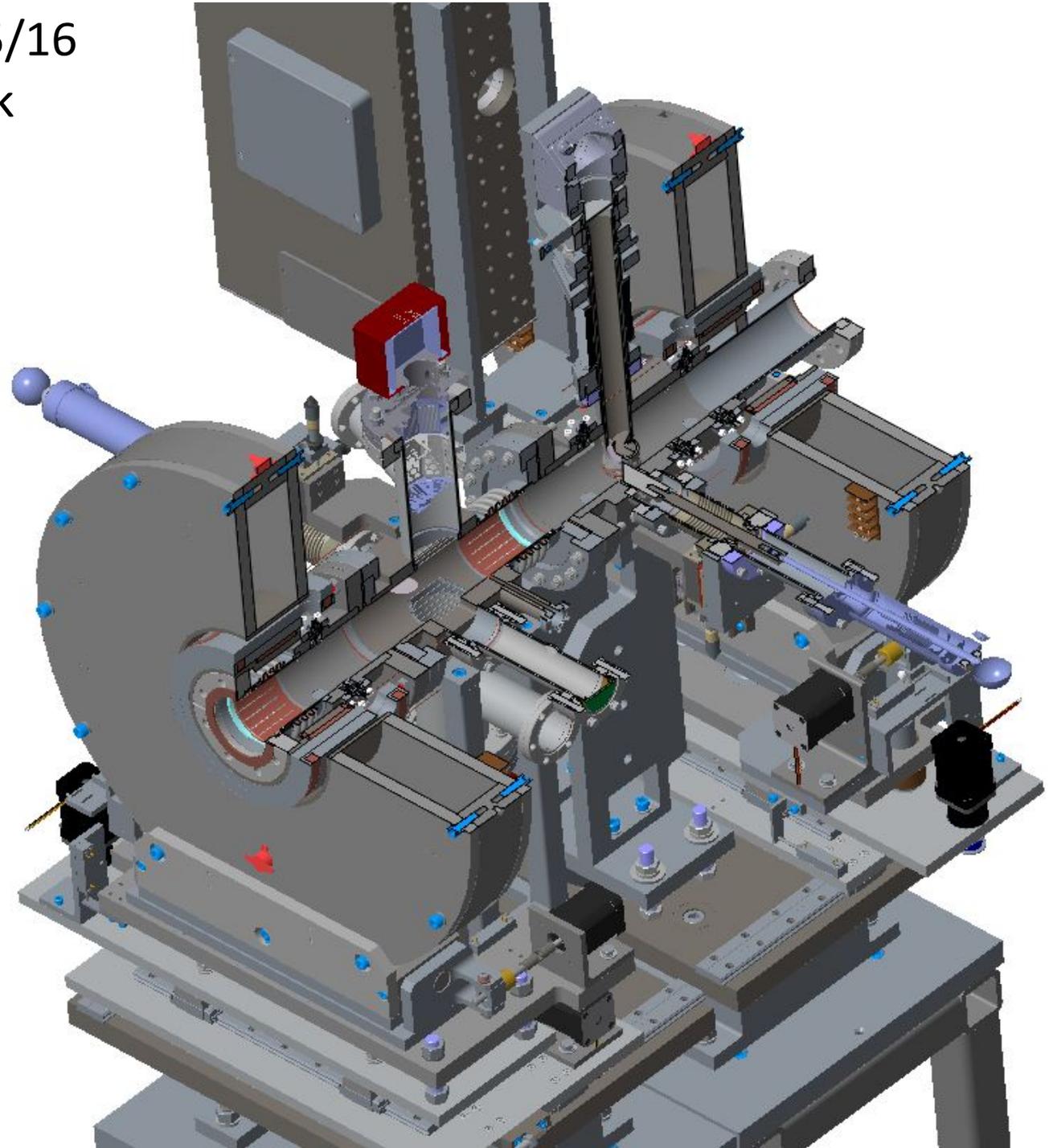


# Meeting Minutes 8 16 16

S. Nayak, J. Halinski, L. DeSanto, D. Gassner, C.J. Liaw, Z. Zhao, P. Inacker, M. Minty, J. Tuozzolo

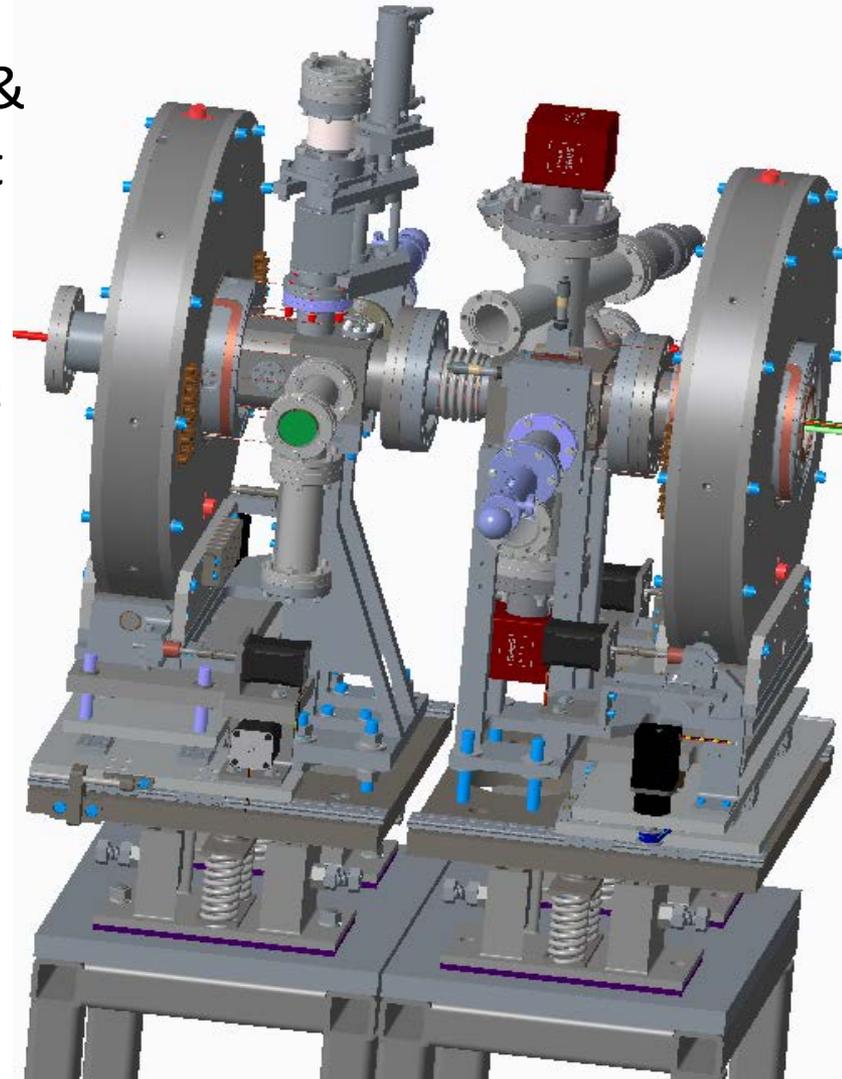
- All three custom chambers ordered from Kurt Lesker. Delivery 11/1/16
- Solenoid magnets ordered Alpha magnetics. Delivery 10/1/16 then magnetic measurement
- Corrector magnets: 1<sup>st</sup> dipole & multipoles in magnetic measurement
- Solenoid magnet positioning: Len has some of the motor drives in hand, one motor drive is long lead so another similar one is in hand and Len will be testing reliability.
- Solenoid magnet positioning: Len will investigate availability of copper plated flexible insulator material to give the controls the ground signal to stop magnet motion.
- Solenoid magnet positioning: Some discussion on the magnet motion GUI. Dave will talk to controls about system screen. General agreement it will give translating and rotating positioning; but, not provide a running position since rotating motion will affect translating position. Agreement that the control system should provide a “home” button that will bring the magnet back to no skew/rotation and on beam line center. System must rotate magnets to perpendicular to beamline first and then center in X and Y.
- Remove Vibration Isolator from transport line stands.
- Beam line internal laser mirrors: the stainless steel mirror has been ordered and may be good enough for commissioning. The plated copper mirror is preferred. German supply company has still not signed from required by purchasing. Patrick volunteered to call the company (S. Nayak has contact info).
- Laser windows ordered, will stay with parallel glass surfaces for commissioning.
- Profile monitor-camera assembly drawings in checking. Sumanta working with Kurt Lesker on vacuum positioning drive.
- Laser mirror positioning assembly drawings in checking.
- Vacuum pumps ordered, vacuum controllers being ordered this week.

GtB beamline 7/25/16  
J. Halinski, S. Nayak



## DC Gun to Booster Transport Line Status

- All three chambers ordered KL 11/1/16
- Solenoid magnets ordered 11/1/16
- Corrector magnets: 1<sup>st</sup> article dipole & multipoles in magnetic measurement
- Remove Vibration Isolators
- Laser mirrors ordered? SS yes, Cu no
- Laser windows ordered, parallel glass
- profile monitor-camera assembly drawings in checking
- Laser mirror positioning assembly drawings in checking
- Solenoid positioning drives
- Vacuum pumps ordered
- Vacuum controllers



## DC Gun to Booster Transport Line Status

### Laser Viewports

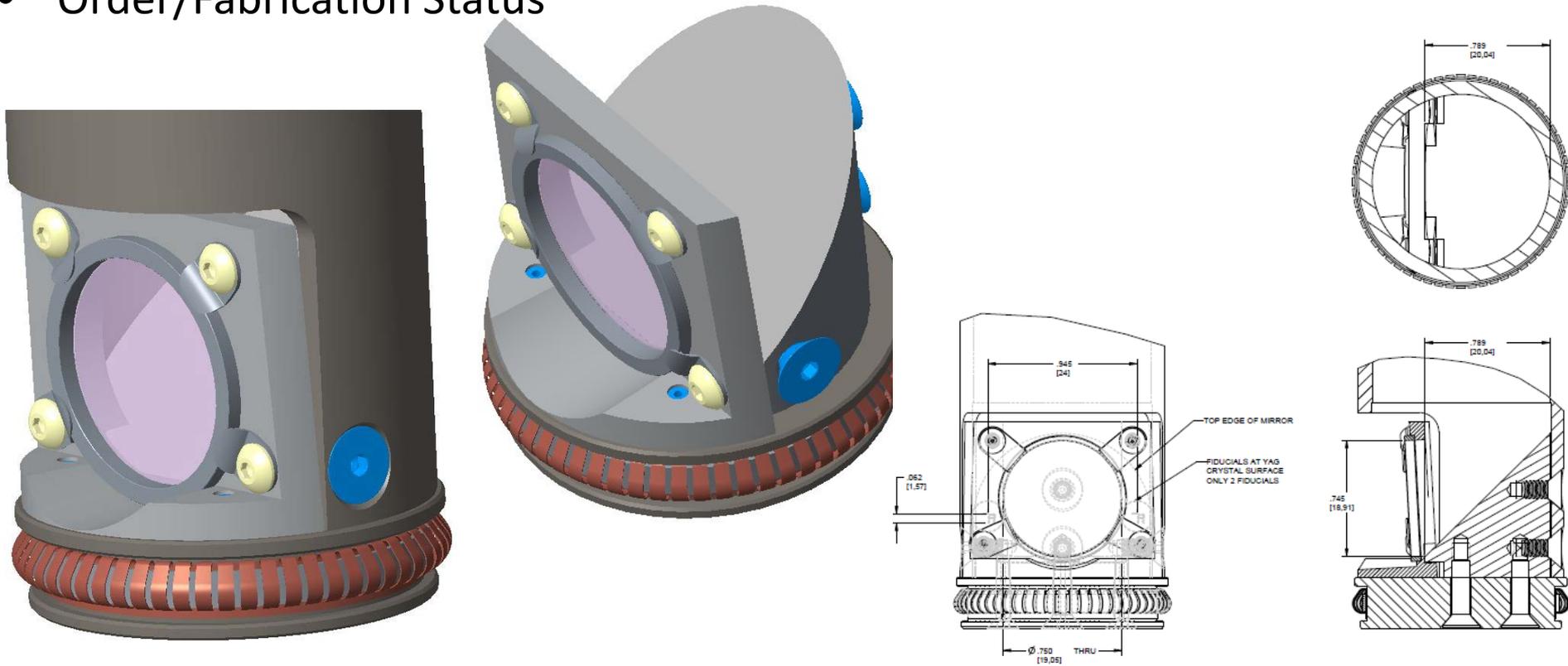
- 2.75" CF has view port diameter 1.13", after AR hard coating by Optosigma, the clear aperture (CA) will be 0.56" which is not acceptable to us.
- Spectrum Thin Films, can provide 90% CA of viewing diameter, I have asked for a plot %R vs wavelength.
- I will try another vendor, Laseroptex.com

Quotation from Spectrum Thin films:

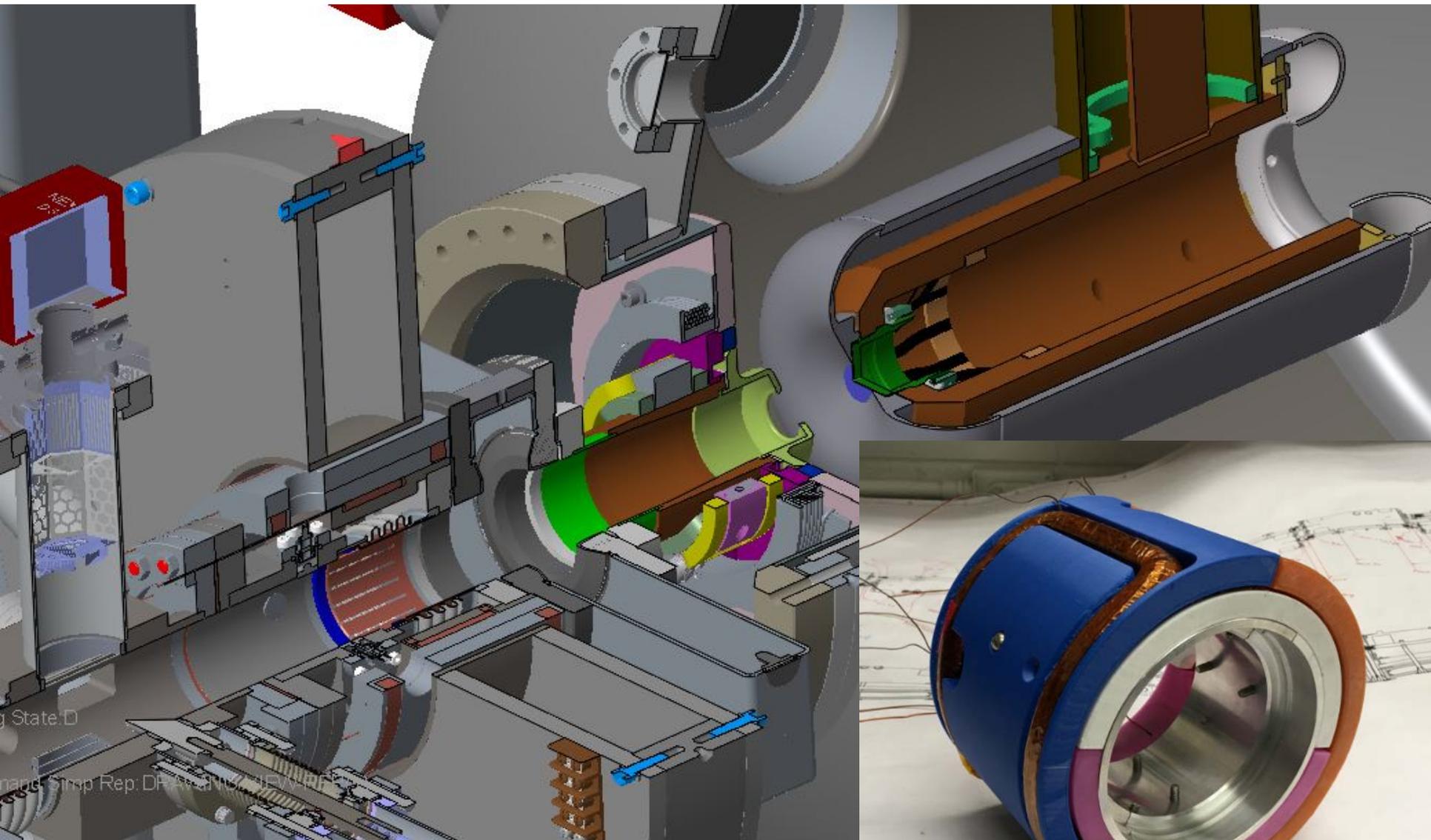
Coating Description	Delivery	Qty	Price Each	# Per Run	Total
CFM: FS Viewport Dimensions: 2.720" dia  CA: 90%  Coating Both Surfaces: R<0.25% @ 520nm  AOI: 0°  High Power Coating  Lot Charge Qty: 3 pieces	1 week ARM	1	1,000.00		1,000.00

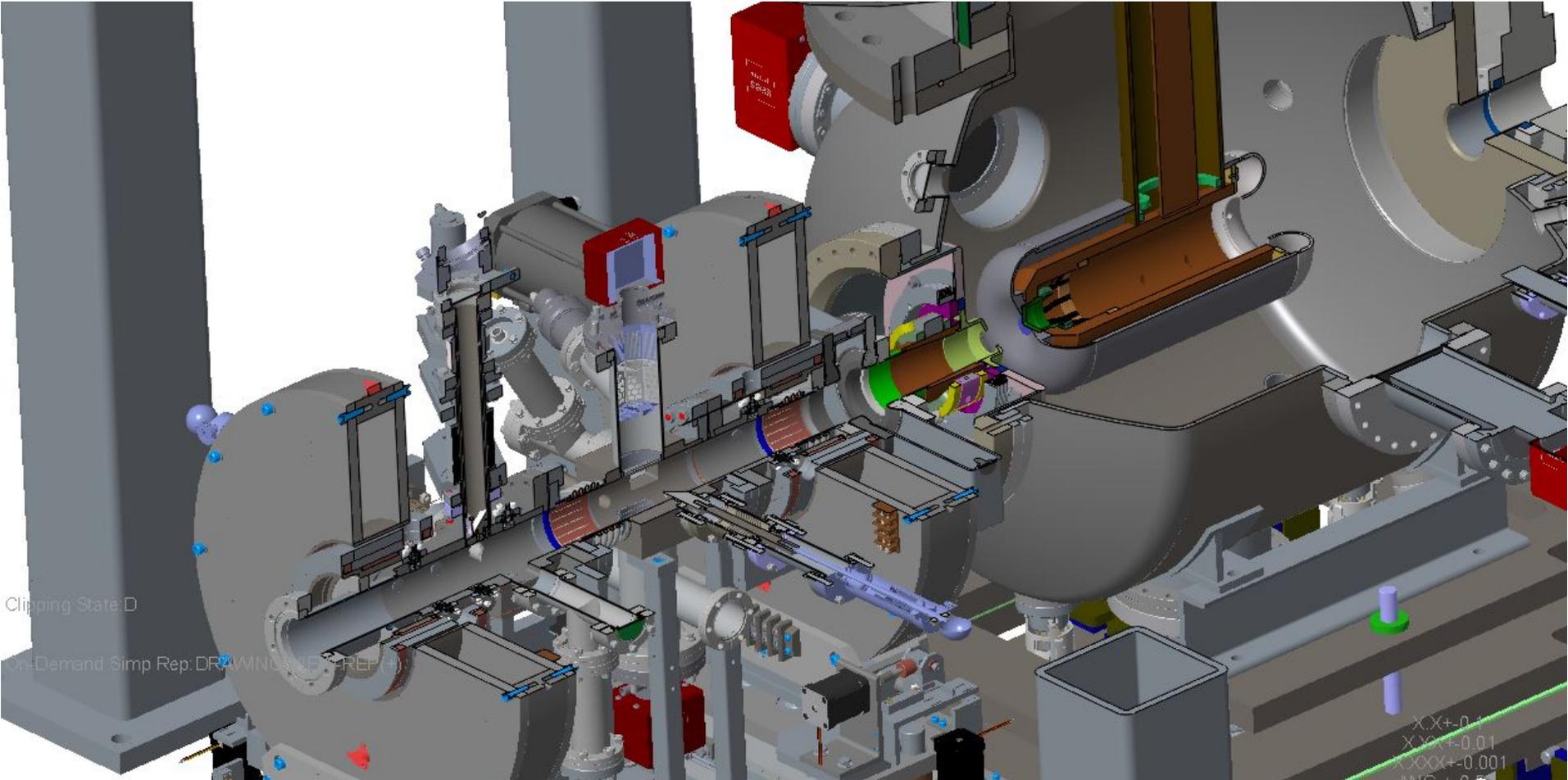
# Profile Monitor

- YAg holder, mtg. tabs were moved forward, this opened up room on the inside. Mtg of holder is from below
- Mirror was simplified and made the be held in place with 4 #4-40 screw, 2 in the back then one on each side.
- YAg is .75 round: YAG clips from front similar to cooling design.
- 3<sup>rd</sup> fiducial was added to inside of holder and the word "TOP" added.
- Order/Fabrication Status



# Corrector Magnet





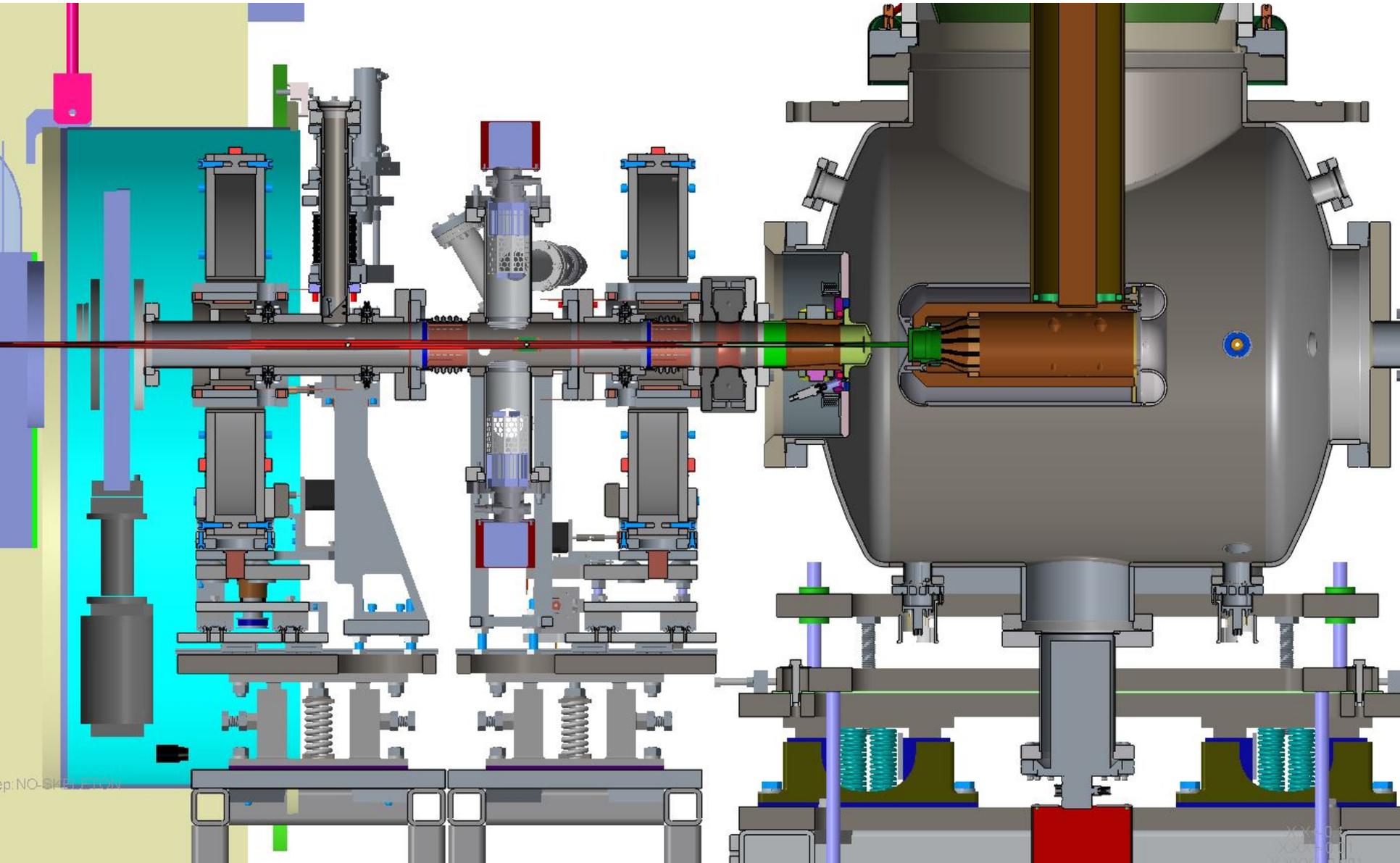
Clipping State: D

On-Demand Simp Rep: DRAWING STATE REF: 1

XXX+0.1  
XXX+0.01  
XXX+0.001  
ANG -0.5

# Interfaces to Gun and SRF Cavity Defined

(old layout of interfaces upstream and downstream)



## DC Gun to Booster Transport Line Status

### Profile monitor mirrors (Vendor: Cabot Microelectronics Polishing Corp)

Material: SS 440C 55-60 RC

Flatness:  $\frac{1}{3}$  wave @ 532 nm (0.000007")

Average Roughness (Ra): 2 nm (20 angstroms)

Scratch/Dig: 10/5 (per mil spec MIL-O-13830)

### Laser Mirrors

Original Specification:

Material: Cross forged SS 304L

Optical Finish: 1/8 Wavelength @ 500nm

- SS 304L is the first choice of material, but the recommended vendor LT-ULTRA declined to make so.

*“Unfortunately we cannot machine steel like 304L with our diamond tools. One possibility would be to cover the mirror with a 100 micron Nickel layer. On this Nickel layer a diamond machining would be possible” – LT-ULTRA*

## DC Gun to Booster Transport Line Status

### Laser Mirrors

LT-ULTRA quoted for copper mirrors as follows:

Pos	Item Description	Qty	Unit	Price EUR	Value EUR
1	<b>120343</b> Tilted Flat Mirror ø 19,05mm, Ch = 47,44mm , 92° OFHC-Copper coated with Protected Silver surface accuracy <0,3µm roughness <5nm Ra Drawing No. 3070M0086 Index A <b>Delivery time:</b> 7-8 working weeks after receipt of order	<b>3</b>	<b>PCS</b>	445,00 (*)	1.335,00

The SS mirror made by Cabot Microelectronics is better than the copper made by LT-ULTRA

# DC Gun to Booster Transport Line Status

## Laser Mirrors

LT-ULTRA quoted for Cornell:

<u>Item</u>	<u>Qty.</u>	<u>Article</u>	<u>US\$/pc.</u>
01	2	<b>Tilted Flat Mirror out of OFHC-copper (complete manufacturing)</b> <ul style="list-style-type: none"><li>- 0.75" x 0.6" x 1.325" / 47°</li><li>- flatness <math>\leq 0,3\mu\text{m}</math></li><li>- roughness <math>\leq 5\text{nm Ra}</math></li><li>- coated with protected silver *)</li><li>- according drawing 7108-104</li></ul>	752,--
02	2	<b>Tilted Flat Mirror out of steel (1.4429) (only polishing)</b> <ul style="list-style-type: none"><li>- 0.75" x 0.6" x 1.325" / 47°</li><li>- flatness <math>\leq 0,3\mu\text{m}</math> over a elliptical aperture and a border of about 0,5mm</li><li>- roughness <math>\leq 3\text{nm Ra}</math></li><li>- coated with protected silver *)</li><li>- raw blanks provided by you</li><li>- according drawing 7108-104</li></ul>	595,--
*) Protected Silver			
• $R \geq 96\% @ \lambda = 520\text{nm} / \text{AOI}=43^\circ$			

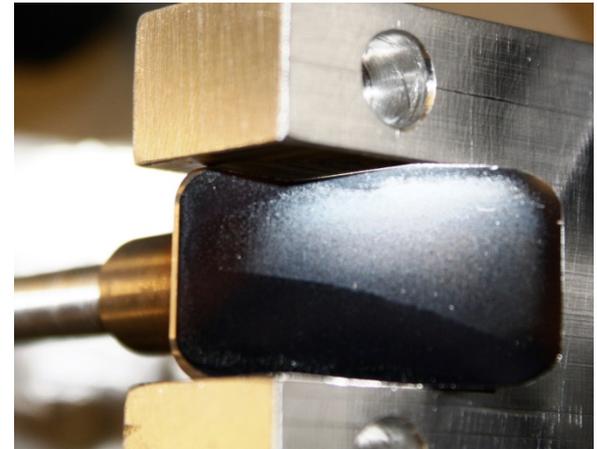
## DC Gun to Booster Transport Line Status

### Laser Mirrors

*“Importantly, though, the copper mirrors that we purchased were damaged by a 200C bake (see attached photo), and we had to send them back to be re-polished. The stainless steel ones that we purchased were fine after the same bake, so if you have a choice of material, I would choose that. On the other hand, after re-polishing, I believe the copper ones were fine after a lower temperature bake, but I don't remember the details”- Adam*

Summary from other emails from Adam:

- Cornell is using all SS mirrors, it seems copper mirrors are kept as spares.
- Cornell stopped using copper mirrors as it could not withstand 200C bake out.
- No beam testing is done on copper mirrors, but the expectation is that mirror would be fine if they survive the bake-out.



## DC Gun to Booster Transport Line Status

### Laser Mirrors

*“If you do find another company to machine the steel mirror substrates, **I would still recommend having LT Ultra polish and coat the mirrors.** A collaborator at DESY had many mirrors made by many different companies, and found that LT Ultra was the best choice.*

*See the slide 2 on the attached Power Point for what happened when we originally used another vendor to polish the SS mirrors. Laser is totally wrecked! But, after LT Ultra re-polished that mirror, it was indistinguishable from the standard dielectric mirror. So, we trust that company!”- Adam*

#### Conclusion:

- SS mirror is the best choice, but unfortunately LT-ULTRA, who makes most reliable mirrors, declined to make those mirrors.
- As Toby suggested, lets have both SS mirrors made by Cabot Micro Electronics and the Copper mirrors made by LT-ULTRA.
- May be, Copper mirrors would withstand 150<sup>0</sup> bake out, if it doesn't work then we can use SS mirrors