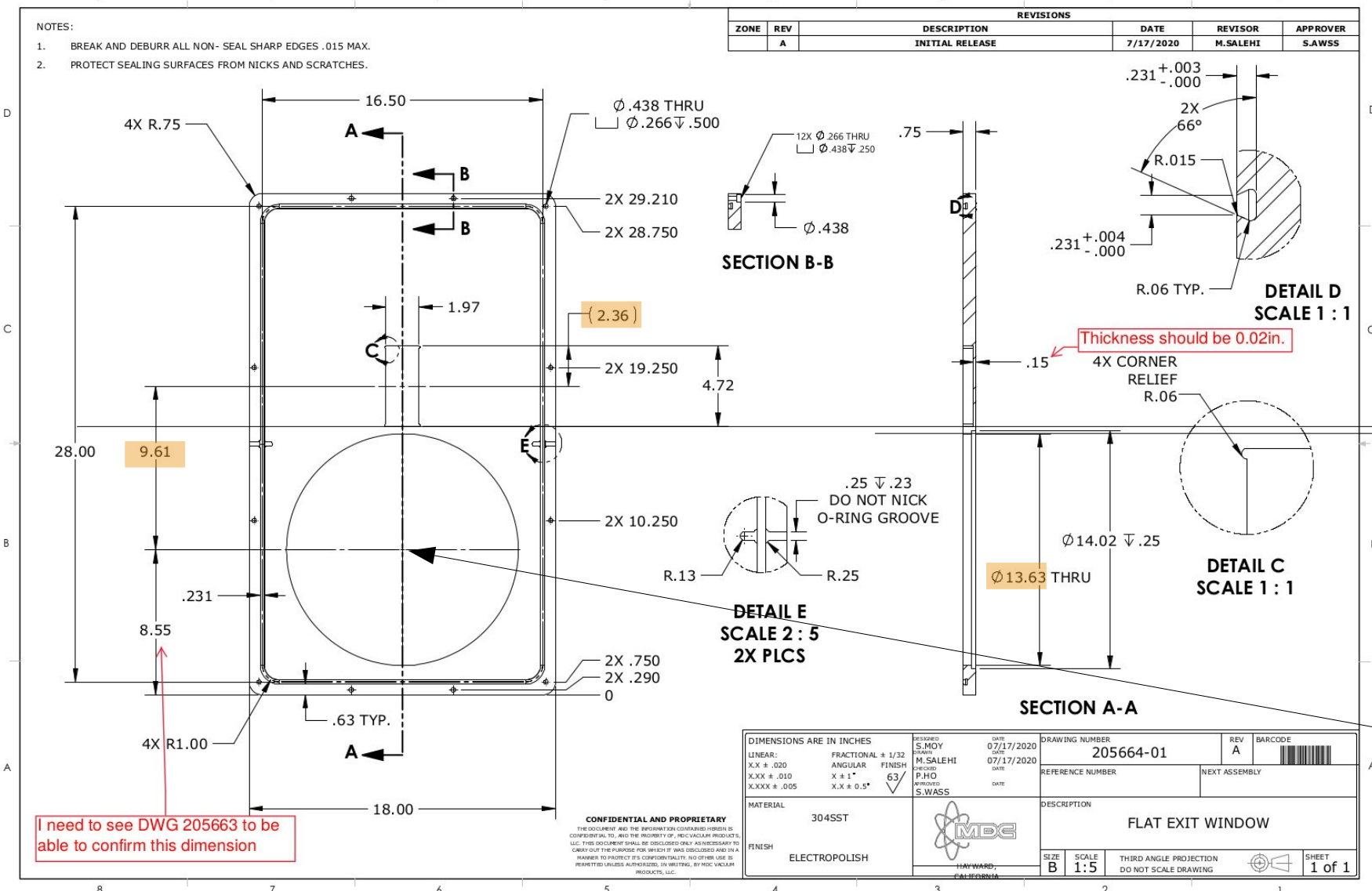
MDC
first version
July 27, 2020



I interpret these two lines as the limit

9.61-(13.63/2) – 2.36 = 0.435 = 11.05 mm

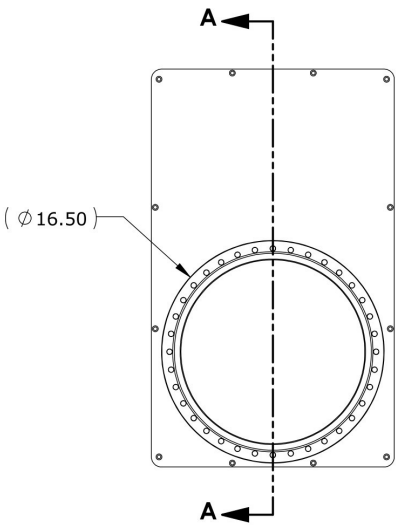
Offset by 1.44 cm w.r.t the electron beam before the dipole
(see next slides)

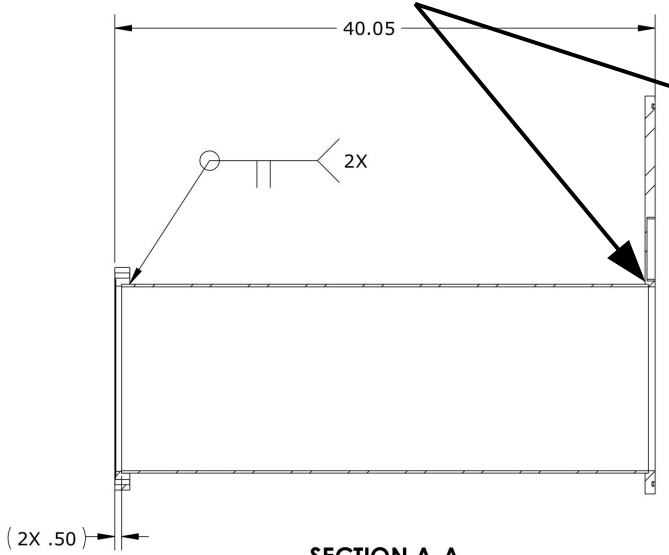
NOTES:

1. LEAK CHECK TO 2 X 10 -¹⁰ SCC/SEC OF He.
2. FACE OFF ALL TUBING 4.00 OD OR GREATER TO LENGTH AFTER WELDED TO MAIN BODY.
3. TOLERANCE FOR ALL FOCAL LENGTHS, TARGET POINTS AND OAL DIMENSIONS ± .030, ANGLES ± 1°.
4. BREAK AND DEBURR ALL NON- SEAL SHARP EDGES .015 MAX.
5. WELD PER ASME SECTION IX. COSMETIC APPEARANCE PER ES0013, CF-3 VALUE.

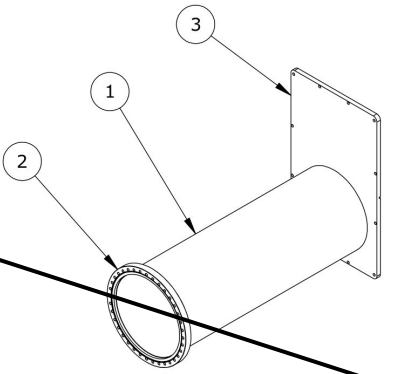
REVISIONS					
ZONE	REV	DESCRIPTION	DATE	REVISOR	APPROVER
	A	INITIAL RELEASE	7/17/2020	M.SALEHI	S.WASS

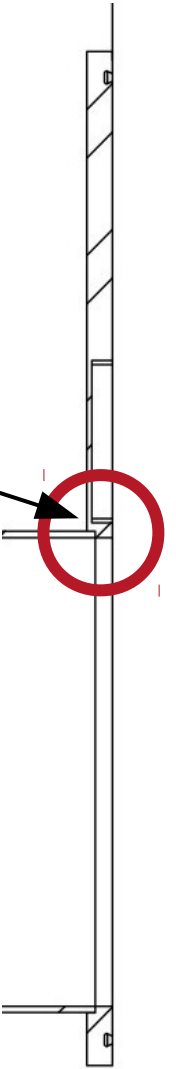
Question:
should we push for less material here?





SECTION A-A





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ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	056151	ROLLUP, Ø14.00 X .187W X 39.07LG	1
2	110040	FLANGE, DEL SEAL CF, 16.5" OD, 14" OD TUBE NON- ROT THRU	1
3	205664-01	FLAT EXIT WINDOW	1

DIMENSIONS ARE IN INCHES
LINEAR: FRACTIONAL ± 1/32
X.X ± .020 ANGULAR
X.XX ± .010 X ± 1°
X.XXX ± .005 X.X ± 0.5°
FINISH 63

DESIGNED M.SALEHI 07/17/2020
DRAWN M.SALEHI 07/17/2020
CHECKED P.HO
APPROVED S.WASS

DRAWING NUMBER 205664
REV A
BARCODE
REFERENCE NUMBER
NEXT ASSEMBLY

MATERIAL SEE BOM
FINISH ELECTROPOLISH

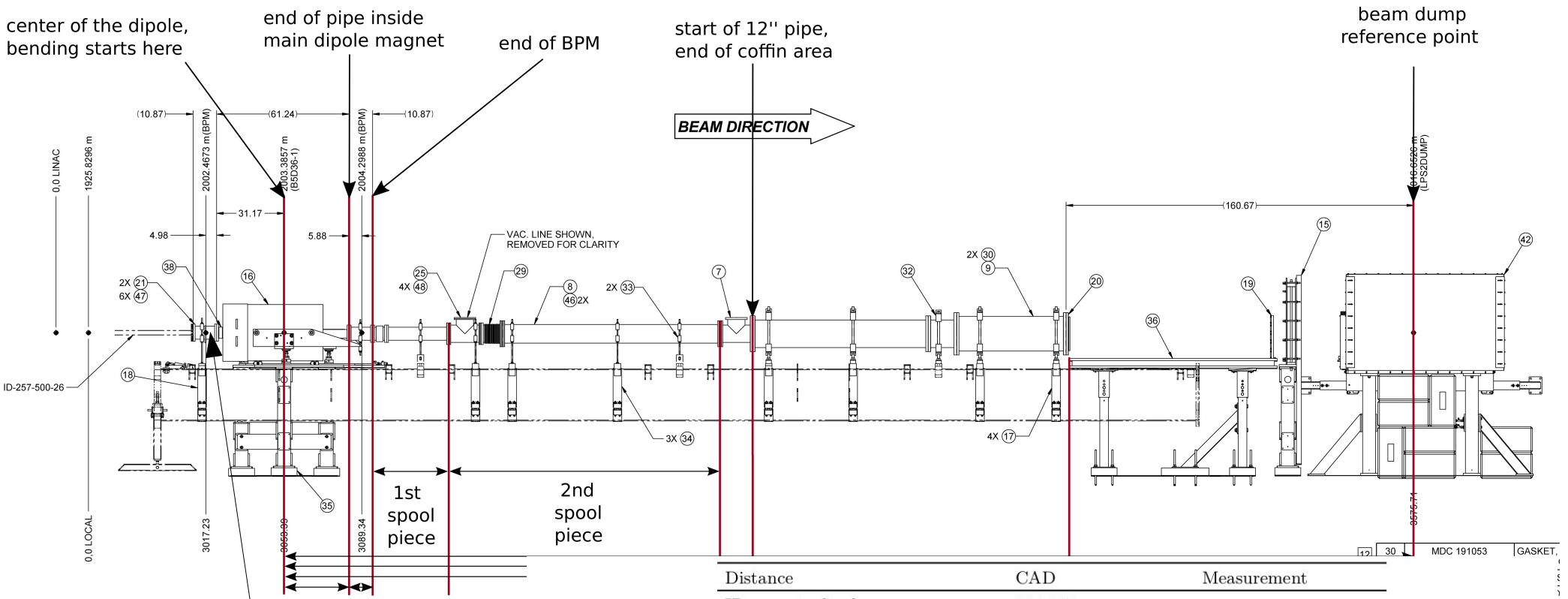
DESCRIPTION SPEC# POSITRON EXIT WINDOW

SIZE B | SCALE 1:8 | THIRD ANGLE PROJECTION DO NOT SCALE DRAWING | SHEET 1 of 1

HAYWARD, CALIFORNIA

UNCONTROLLED DRAFT

FILE NAME: 205664



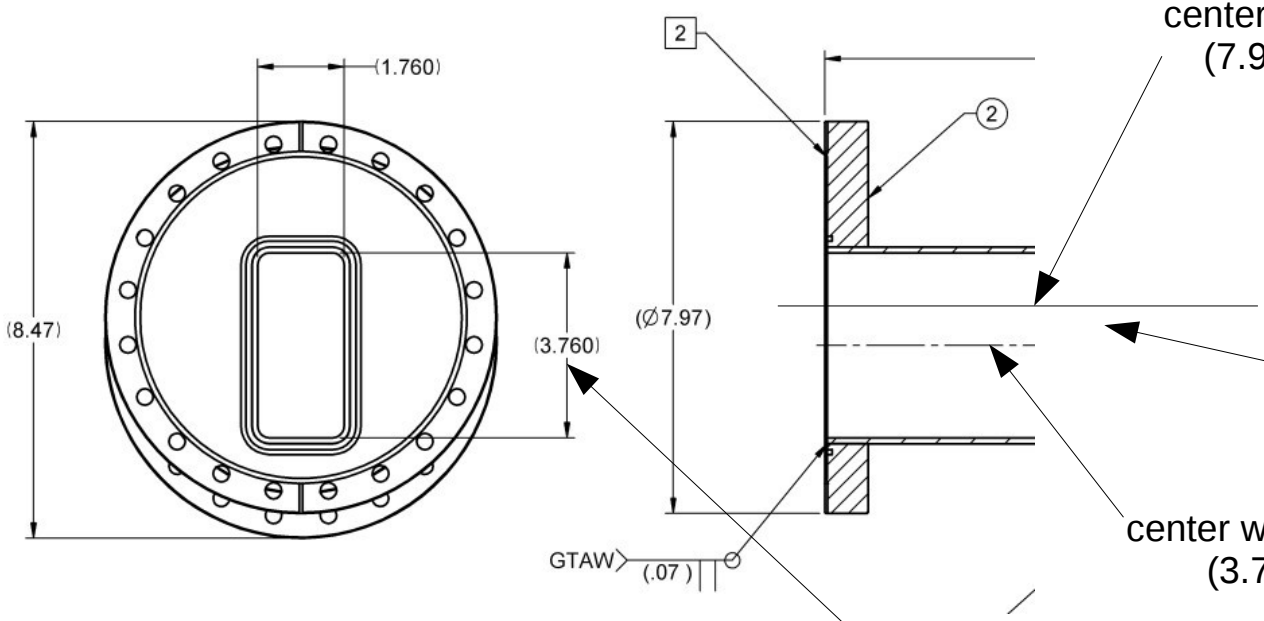
FACET-II beamline dimensions
(old sketch)

vertical offset of 1.44 cm here (see next slide)

Distance	CAD		Measurement	
IP to main dipole	13.1247 m			
BPM (possibly removed)	27.61 cm	(10.87″)	22.86 cm	(9″)
1st spool piece after BPM	89.4 cm	(35.2″)	93.98 cm	(37″)
2nd spool piece after BPM	318.9 cm	(125.6″)	322.58 cm	(127″)
length of T-piece before 12” pipe	38.2 cm	(15″)		(15″)
main dipole to first flange	76.33 cm	(30.05″)	72.39 cm	(28.5″)
main dipole to 12” pipe	5.50 m		5.50 m	
main dipole to dump table	9.22 m			
main dipole to dump	13.27 m			

TABLE I. We quote both distances which have been extracted from the CAD drawing (see Fig. 1) and those measured by Lauren/Carsten. Distance from center of magnet to 12” pipe (measured) is given by 28.5” (magnet) + 9” (BPM) + 37” + 127” (two spool pieces) + 15” (T-piece, only CAD value known so far).

FACET-II Dipole magnet (B5D36)



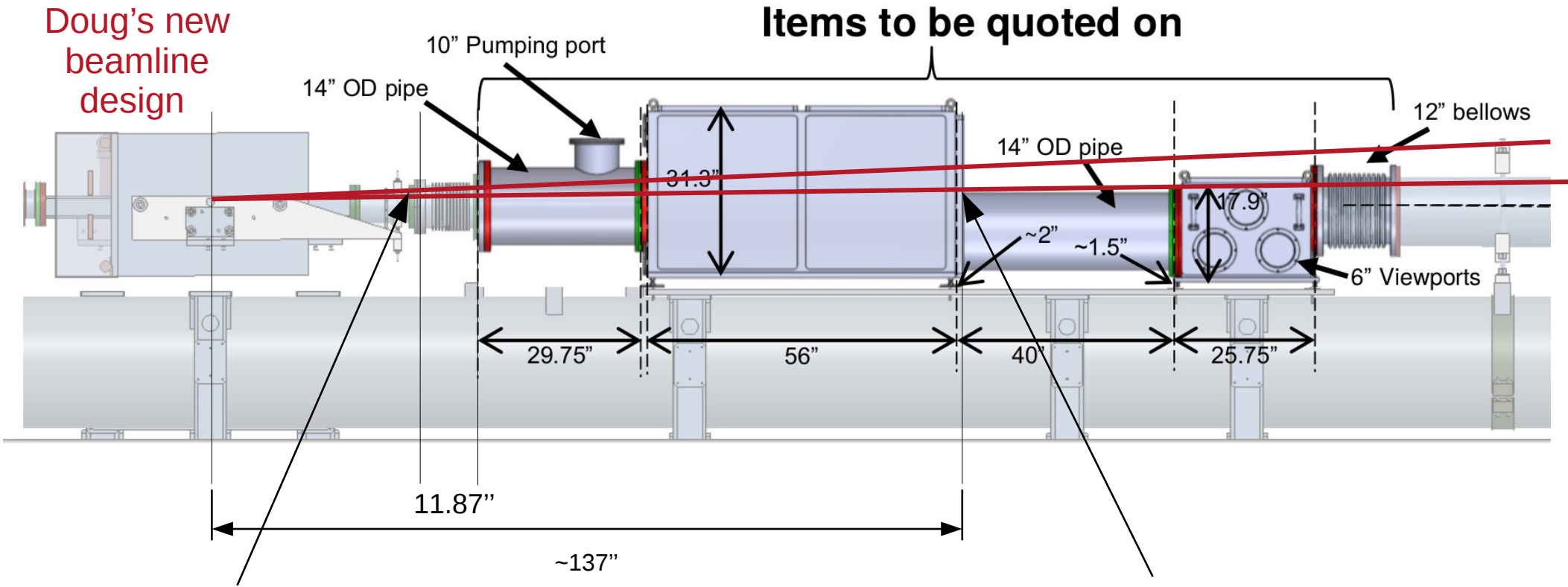
center w.r.t. big pipe
(7.97 diameter)

Offset is 1.44 cm
(confirmed with
pixel counting)

center w.r.t. small pipe
(3.76 length)

for some reason all “old” documents assume 3.75 here instead.

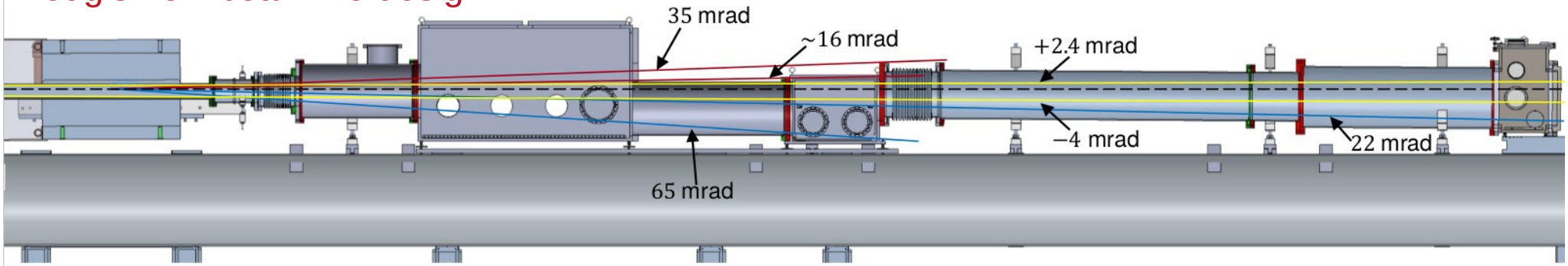
Doug's new beamline design



Dimensions here determine **maximum angle** (lowest energies), window should be long enough to support removing the BPM

Distance between window (lower edge) and pipe (inner edge) determine the **minimum angle** (highest energies)

Doug's new beamline design

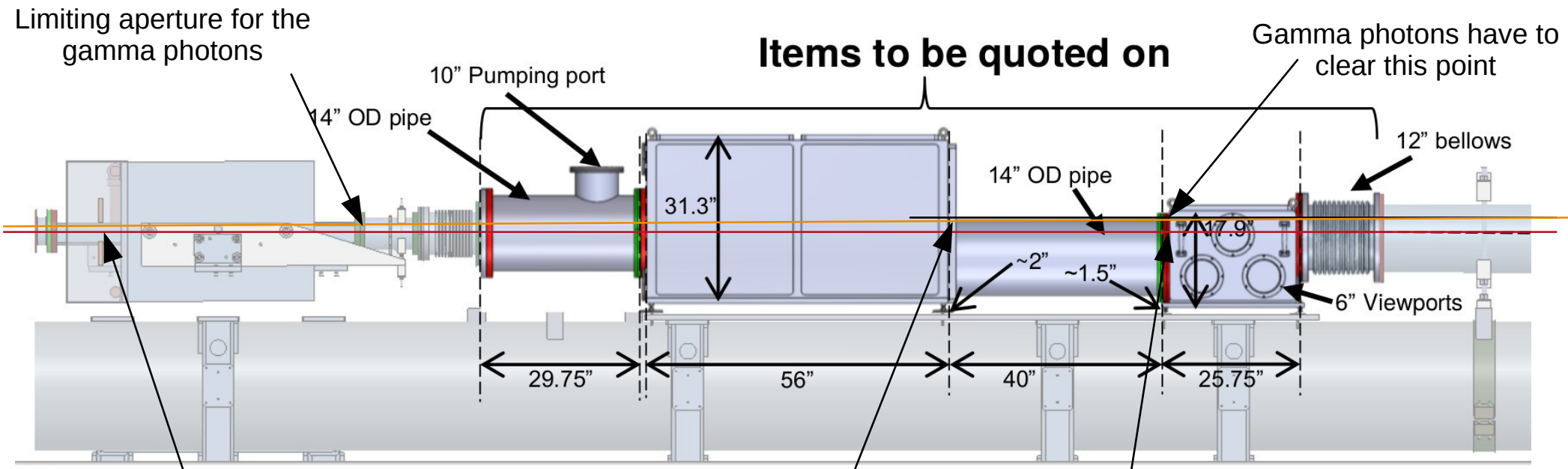


Clearances to be aware of:

1. +2.4/-4 mrad clearance from picnic basket/IP – Gammas (yellow)
   - Defined by dipole aperture and maintained by chamber apertures
2. **+35 mrad** maximum positron deflection that makes it **through dipole BPM** (red)
3. **+16 mrad** minimum positron deflection that **passes through positron exit window**
4. **–65 mrad** maximum electron deflection that makes it **through dipole BPM** (blue)
5. **–22 mrad** maximum electron deflection that makes it to **dump table**

Calculation of the gamma photon angle (upper):

Distance: IP to dipole: 13.1247m, dipole to end of pipe: 28.5'', total: 1385 cm; **Height**: 3.76''/2 - 1.44 cm = 3.34 cm
Angle: (3.76*2.54/2-1.44) /(13.1247*100 + 28.5*2.54) = **2.41 mrad**



Alignment of the assembly:

Distance: IP to dipole: 13.1247m, dipole to end of 14’’ pipe: ~180’’, total: 1770 cm;
Height: (2.4mrad gamma photon clearance): **4.26 cm = 1.68”** (distance from nominal e-beam to inner edge of the pipe)
(13.1247*100 + 180*2.54)*(3.76*2.54/2-1.44) /(13.1247*100 + 28.5*2.54)

Distance to lower edge of the positron window: 4.26 cm + 11.05 mm = 5.37 cm = 2.11’’

Details left to fine alignment in the tunnel

		angle	displacement after 3.5 m	34.9 MeV 2.68 mrad 6.07 GeV 2.7 cm	69.8 MeV 5.37 mrad 12.1 GeV 5.4 cm	87.2 MeV 6.71 mrad 15.2 GeV 6.7 cm	105.0 MeV 8.05 mrad 18.2 GeV 8.0 cm
positrons	(smallest energy)	0.0349	12.0 cm	1.0 GeV	2.0 GeV	2.5 GeV	3.0 GeV
at window	(largest energy)	0.0154	5.4 cm	2.3 GeV	4.5 GeV	5.7 GeV	6.8 GeV

We can measure the bulk of the spectrum with one magnet setting
(Table is with BPM *not* removed)

Magnet kick

13 GeV electron angle

FACET-I notation (magnet setting)

13 GeV electron displacement at dump (10 m after dipole)

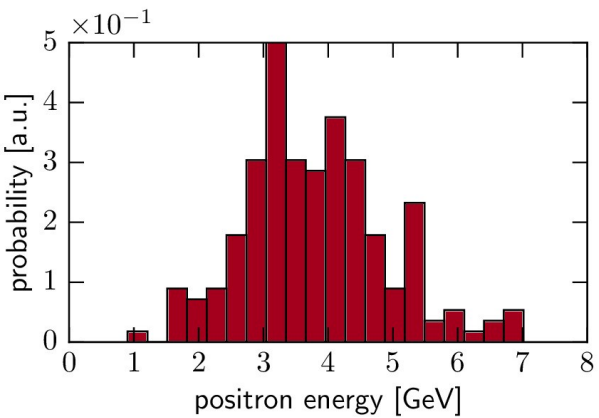
```
pipe_length = 28.5 * 2.54   #cm
pipe_height = 3.75 * 2.54   #cm
pipe_offset = 1.44          #cm
bpm_length  = 9 * 2.54      #cm

dipole_to_window                =  137 * 2.54   #cm
window_distance_from_center     =  5.37 # cm


maxangle_positron               = (pipe_height/2.0-pipe_offset)/pipe_length
maxangle_positron_bpm           = (pipe_height/2.0-pipe_offset)/(pipe_length+bpm_length)

maxangle_electron               = (pipe_height/2.0+pipe_offset)/pipe_length
maxangle_electron_bpm           = (pipe_height/2.0+pipe_offset)/(pipe_length+bpm_length)

minangle_positron               = window_distance_from_center/dipole_to_window
maxangle_positron_window        = (window_distance_from_center + 4.72*2.54)/dipole_to_window
```



Simulation: M. Tamburini