MEBT MEETING AGENDA

December 6, 2001

Mechanical Systems Update

1. **Water system installation**
   - Raft Plumbing (photo)
   - Frame Plumbing (photo)

2. **Chopper Status**
   - LANL shipping assembled choppers today
   - Alum. leak check and testing beambox has been ordered

3. **Profile Monitor Status**
   - BNL has "promised" to ship first wire scanner this week

4. **X-Ray Shielding**
   - Measurements today (previous measurements)
   - Viewport cover (image)

2. **Design Status** (MEBT)
   - PM5 vacuum manifold out for bid (image)
   - Raft assembly drawings (Raft1 draft)
   - Quad Electrical Covers (image)

Electrical Systems Update

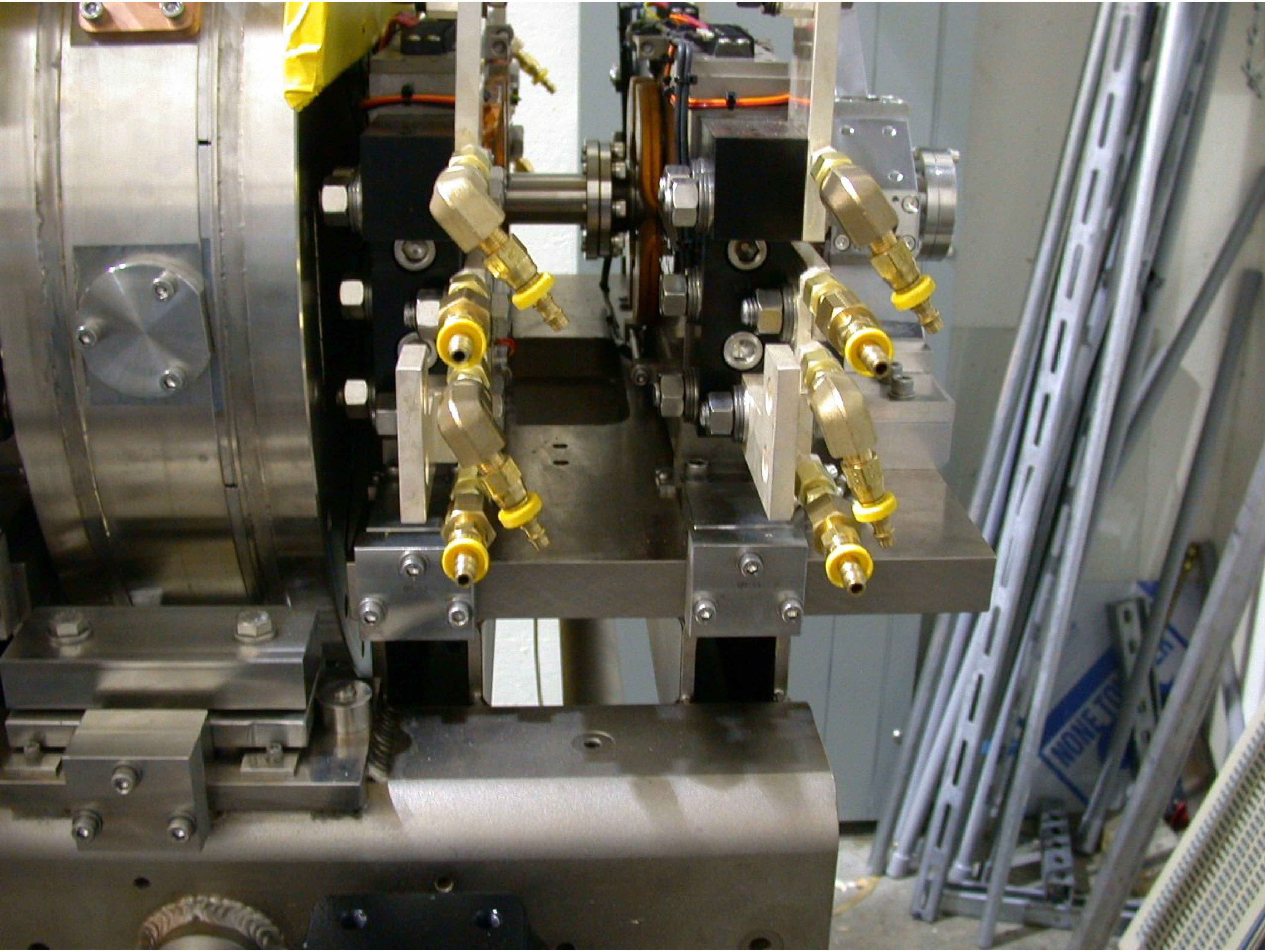
1. **Low Level RF**
2. **Rebuncher System** (photo)
   - Cavity #2 fiducialization complete, shims fabricated
3. **Beam Diagnostics**

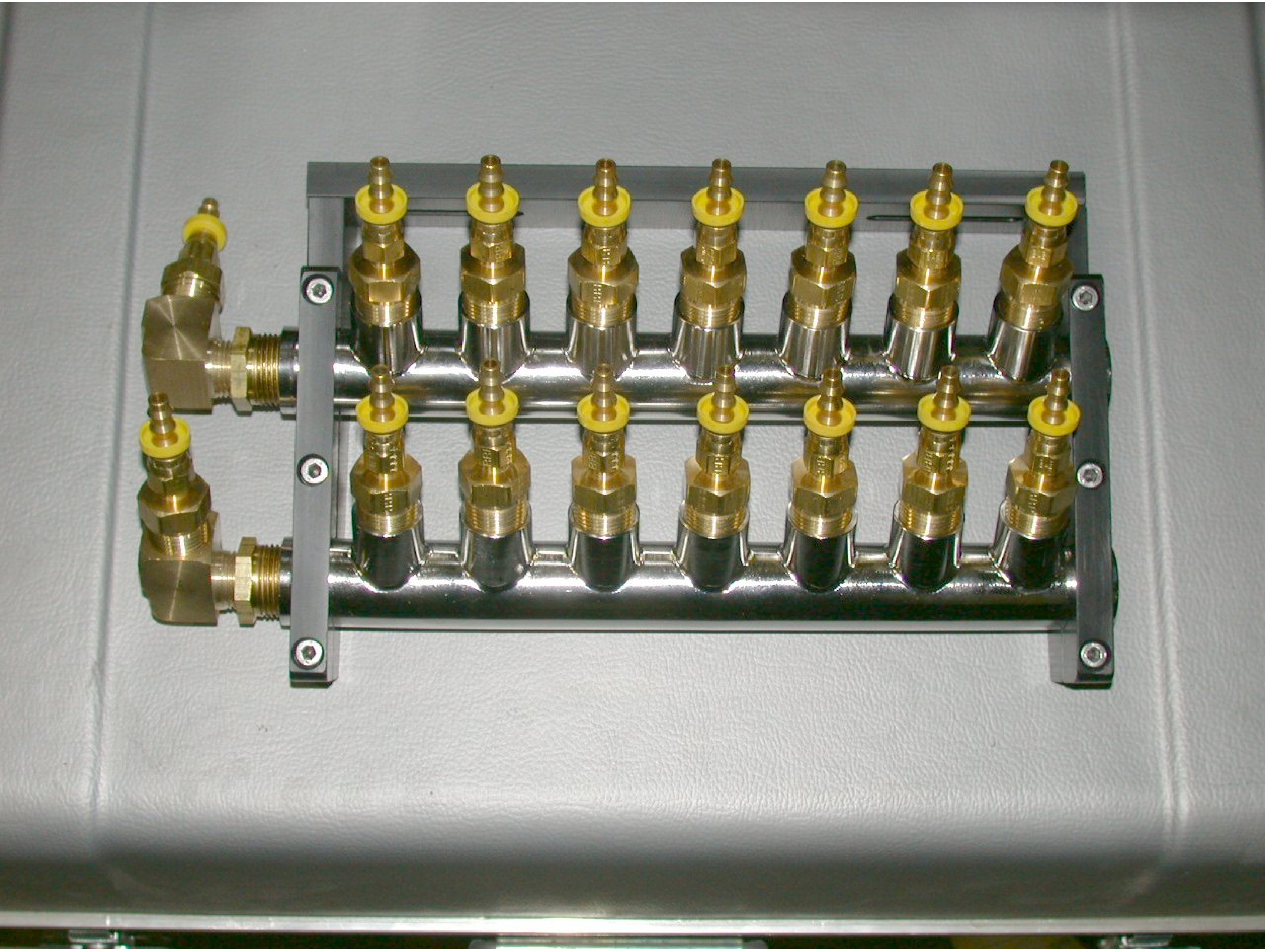
System Integration / Installation

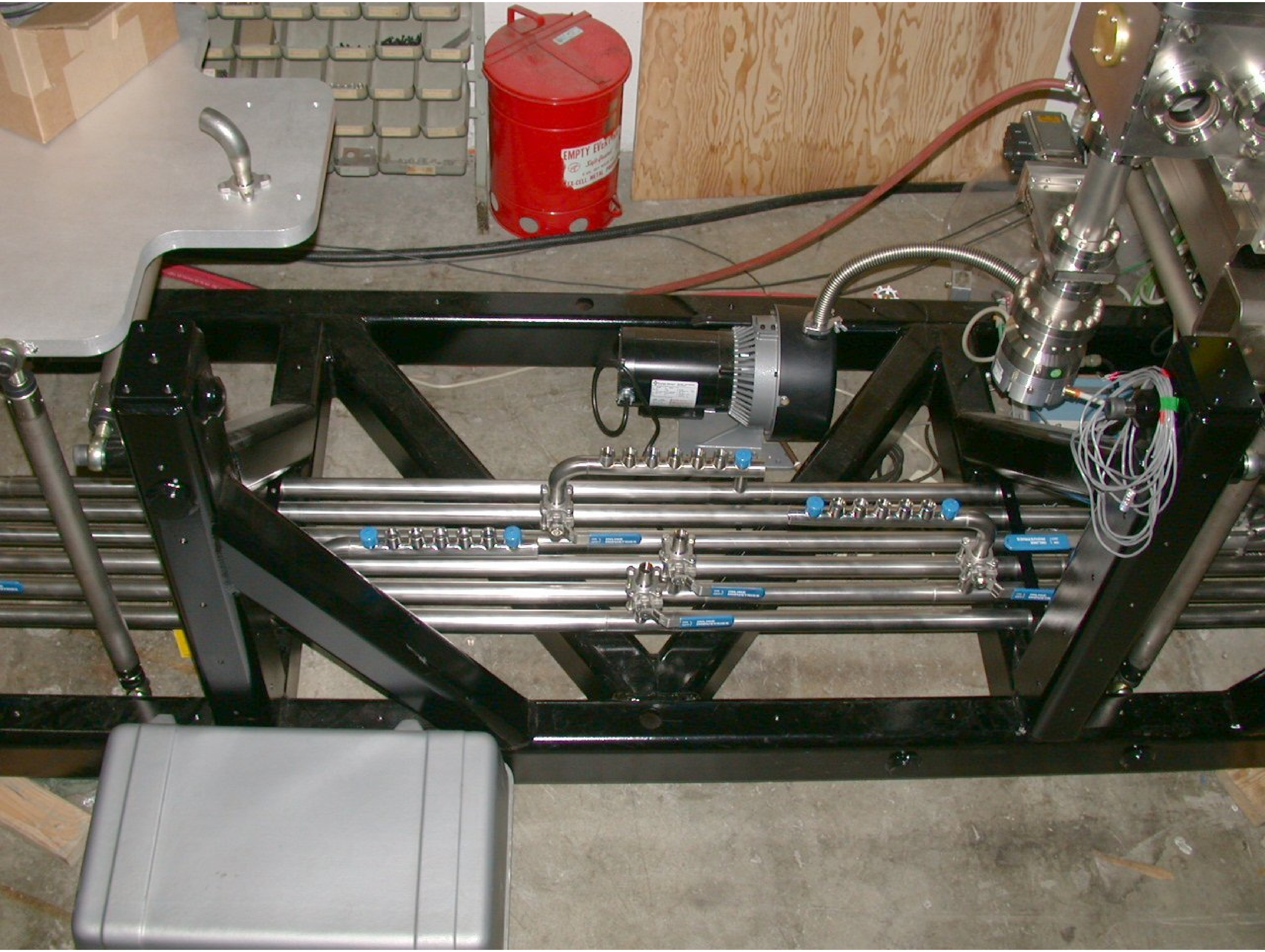
1. **Installation of MEBT frame**
2. **Electrical system installation**

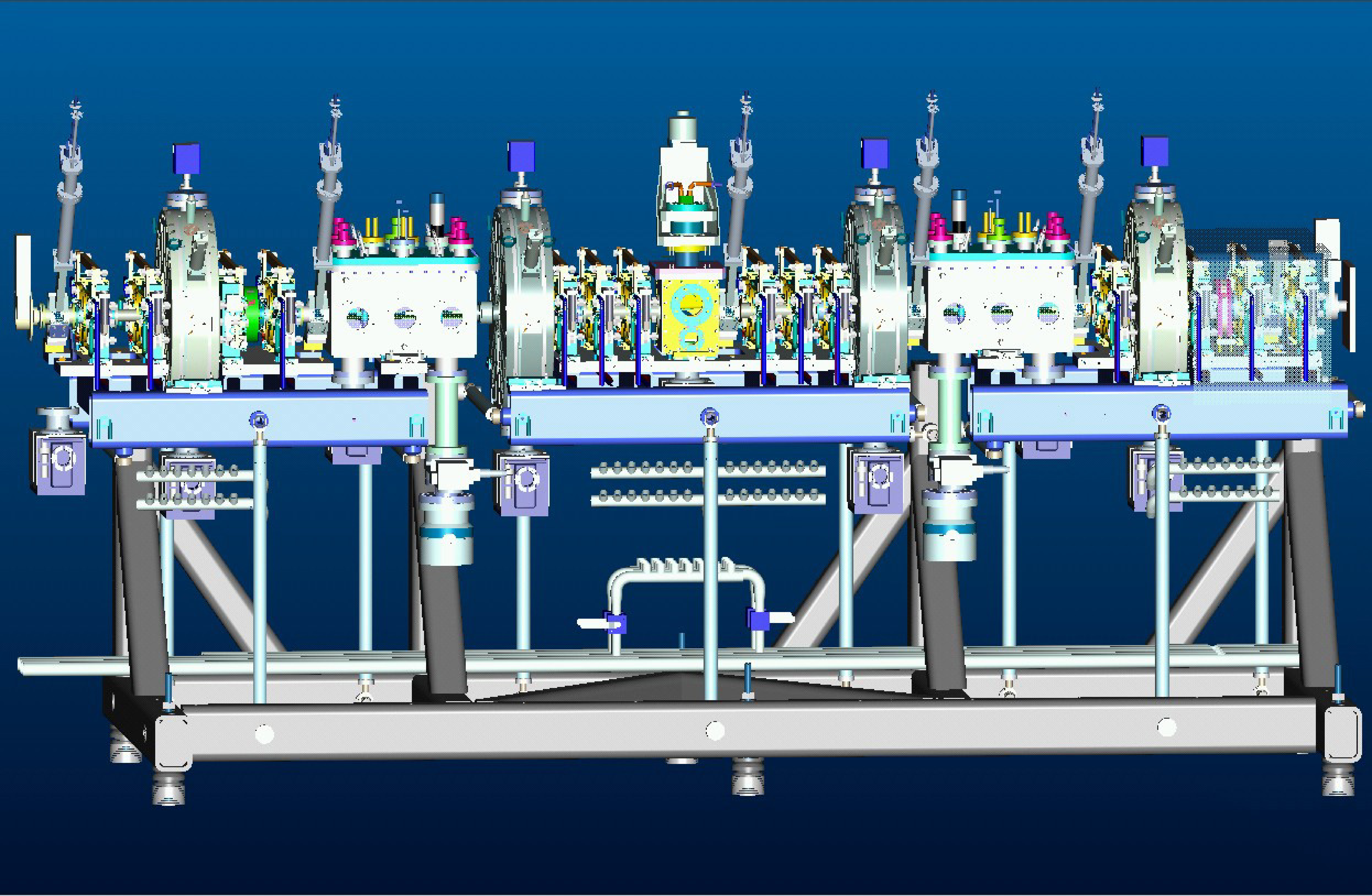
Next Meeting: Thursday, 12/20/01, 10 AM

MA_12-6-01.doc
D. Oshatz










DWG. NO. 25B6154 SIZE REV. 3 SH. 1
SUPPLY TO RFQ WALL CIRCUIT
SUPPLY FROM 100 GPM CHILLER
REBUNCHER SUPPLY MANIFOLD
SUPPLY FROM BUILDING CHILLED WATER
FILTER
30 MICRON
RFQ BYPASS LINE
RAFT #1 QUAD SUPPLY MANIFOLD
RAFT #2 QUAD SUPPLY MANIFOLD
RAFT #3 QUAD SUPPLY MANIFOLD
CHOPPER SYSTEMS SUPPLY MANIFOLD
PRES
TEMP
QM1
QM2
QM3
RC1
QM4
RC2
QM5
QM6
QM7
QM8
QM9
QM10
RC3
QM11
QM12
RC4
QM13
QM14
TURBO
CHOPPER
CHOPPER TARGET
ANTI-CHOPPER
BEAM DIRECTION
FLOW SWITCH
FLOW CONTROL VALVE
FLOW
CHOPPER SYSTEMS RETURN MANIFOLD
RAFT #1 QUAD RETURN MANIFOLD
RAFT #2 QUAD RETURN MANIFOLD
RAFT #3 QUAD RETURN MANIFOLD
RETURN TO BUILDING CHILLER WATER
AUTO FLOW
REBUNCHER RETURN MANIFOLD
RETURN FROM RFQ WALL CIRCUIT
RETURN TO 100 GPM CHILLER
100 GPM CHILLER SUPPLY
100 GPM CHILLER RETURN
CHILLED WATER SUPPLY
CHILLED WATER RETURN
TEMP THERMOCOUPLE
PRES PRESSURE TRANSDUCER
FLOW FLOW METER
MANUAL VALVE
FLEXIBLE HOSE
RIGID TUBING
NOTE: ALL MAGNET HOSES TO BE NON-CONDUCTIVE
REV DWG CHK ZONE DATE CHANGES
UNLESS OTHERWISE SPECIFIED
DO NOT SCALE PRINT
SHOP ORDERS
ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA - BERKELEY
SNS - FES MEBT
MECHANICAL SUBSYSTEMS
WATER SYSTEM ASSEMBLY
DWG. D. OSHATZ DATE 22-May-01
APR D. OSHATZ
DWG. TYPE ASSEM
SHOWN ON 25B603
SCALE: 13/100
SHEET 1 OF 3
CATEGORY CODE FE3313
DWG. NO. 25B6154 REV. 3

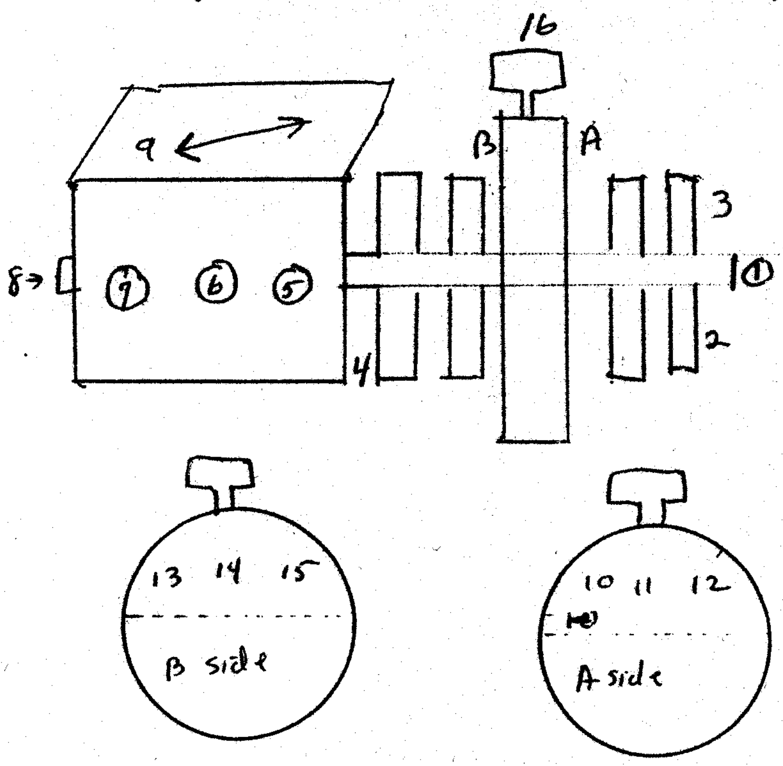
Radiation Survey, performed 11/20/01

Victoreen 450P unit.

Background 8-12 μR/h

performed by Ken Barat.

6% Duty Factor



10-15 have existing Pb shielding in place

All Readings in mR/hr, at contact.

Power	location								
KW	1	2	3	4	5	6	7	8	9
20	250	40	30	12.5	9	9	70	145	.7-2.0
					*[2	.5	.7]		

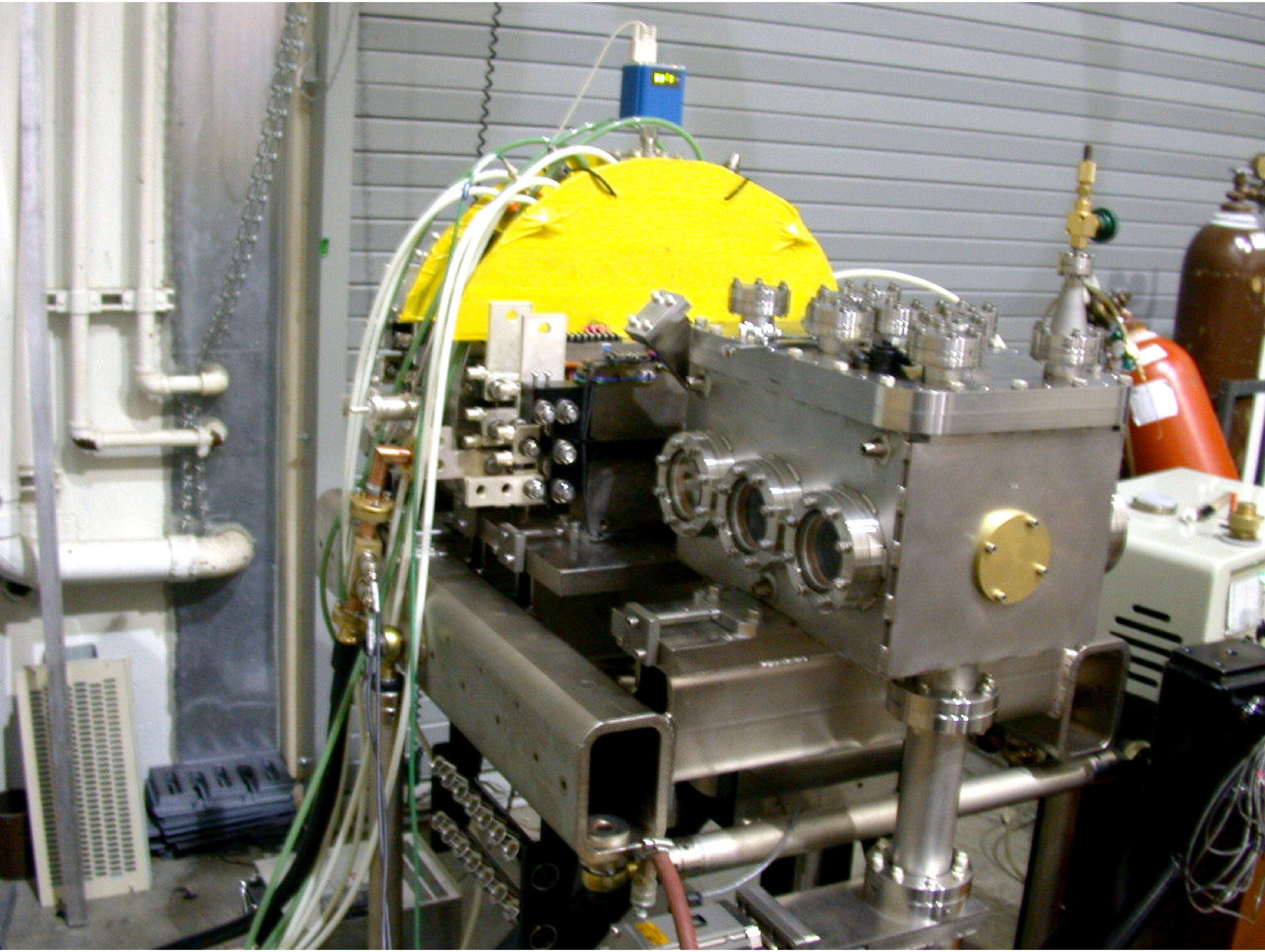
20 KW	10	11	12	13	14	15
Readings →	30	40	23	13	20	9

* = 1/8" Pb covering windows

XY - with 2" Pb Brick - without 1400 mR/hr.

location →	1	2	3	4	5	6	7	8	9
.33 KW	(XY 1.5)	380	310	63	1.6	1.6	3	.3	1
					Pb in place 1/8"			3/4"	

location →	10	11	12	13	14	15	16
Reading mR/hr. →	250	310	200	140	190	120	40



High Frequency
Circuit Materials

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The Effect of Nuclear Radiation Exposure to RT/duroid® PTFE-Based Composites

The radiation resistance of RT/duroid materials is of concern in space applications where microwave devices or antennas will be exposed to nuclear radiation.

RT/duroid materials are based on polytetrafluoroethylene (PTFE) combined with glass microfiber or ceramic filler. In either case, the component most susceptible to nuclear radiation damage is the PTFE. Because of the low cohesive forces between PTFE molecular chains, a polymer must be of very high molecular weight in order to realize the desired mechanical properties.

The primary effect of radiation on PTFE is the reduction of molecular weight by breaking the large polymer molecule into smaller parts. Oxygen is essential to some of the possible radiation induced reactions. Thus the damage due to radiation is minimized in an oxygen-free environment such as space.

The effect of molecular weight reduction is primarily on mechanical properties. There will be an increase in brittleness. Tensile strength, modulus and elongation are all reduced.

It has been reported that the mechanical changes in PTFE appear to depend on the total radiation dose and to be independent of dose rate. The dielectric properties are affected by electrical charge distributions in the resin which decay with time, and thus the dose rate is important.

During irradiation the dielectric constant and loss factor will be temporarily increased. The effect of radiation on these properties is less at elevated frequencies such as would be encountered in microwave applications.

The degree to which PTFE is affected is essentially a function of the amount of energy absorbed regardless of the identity of the radiation. That is, beta, gamma, X-ray, etc. have about equivalent effect. The radiation dose unit usually employed in radiation studies is the rad. One rad equals 100 ergs/grams.

The following is a summary of radiation doses in rads related to damage levels.

	In Air	In Vacuum
Threshold	$2\text{-}7x10^4$	$2\text{-}7x10^5$ or more
50% tensile strength	10^6	10^7 or more
40% tensile strength	10^7 or more	$8X10^8$ or more
Retain 100% elongation	$2\text{-}5x10^5$	$2\text{-}5x10^6$

Frequently the dose rate of 10 rads/hour is quoted for the Van Allen Radiation Belt. At this rate PTFE could operate for 5 to 50 years before a thresholds level of damage would be detectable mechanically.

(continued)

Since the primary function of RT/duroid® microwave laminates is electrical, with mechanical support usually provided by metallic components, the exposures cited above can be expected to be well below the point where electrical performance would be impaired. The resistance of PTFE to radiation damage is generally better than that of solid state electronic devices such as transistors.

REFERENCES:

1. Morris, P.O. Jr., "The Effects of Combined Environments on PTFE", AIEE CP62-1284 (1962)

2. Florin, R.E. and Wall, L.A., Journal Applied Polymer Science, Vol. 2, No. 5 (1959) p. 251

3. Bopp, C.D. and Sisman, O., "Physical Properties of Irradiated Plastics", ORNL-928, (1951)

4. "Radiation Resistance of 'Teflon' in a Simulated Space Environment", Hughes Aircraft Company, Components and Materials Laboratory. TM-687l (August 1961)

5. Linnenbom, V.J., "The Radiation Challenge", Insulation, (Feb. 1962), p. 80

6. Frisco, L.J. "Dielectrics for Satellites and Space Vehicles", final report 311159 to 2128162 Johns Hopkins University—Dielectrics Lab., ASTIA No. AD 276-867

7. "Radiation Tolerance of 'Teflon' Resins", The Journal of Teflon, Vol. 10, No. 1, (Jan-Feb 1969), DuPont Company, Wilmington, Delaware

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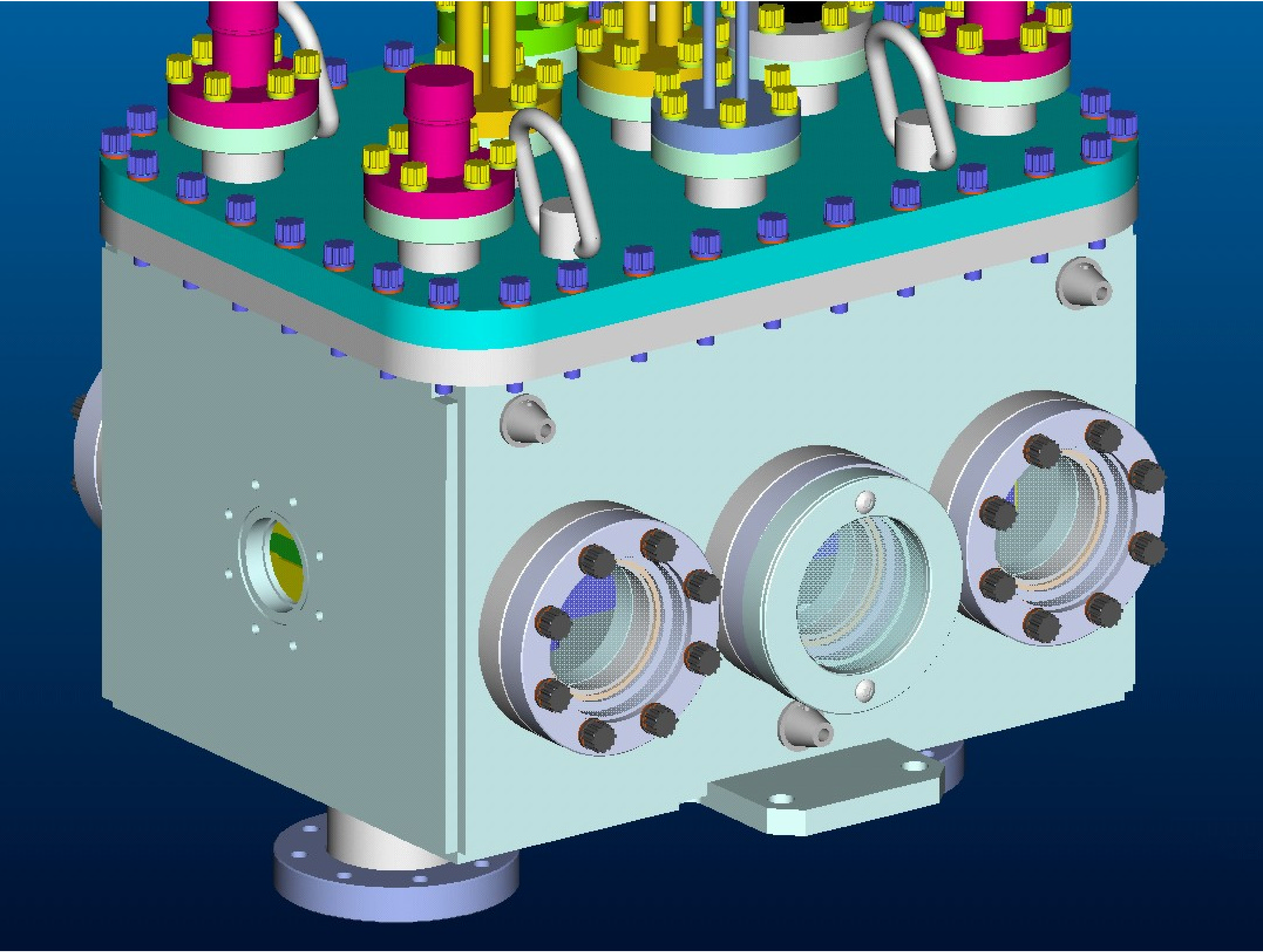
Leaded Glass

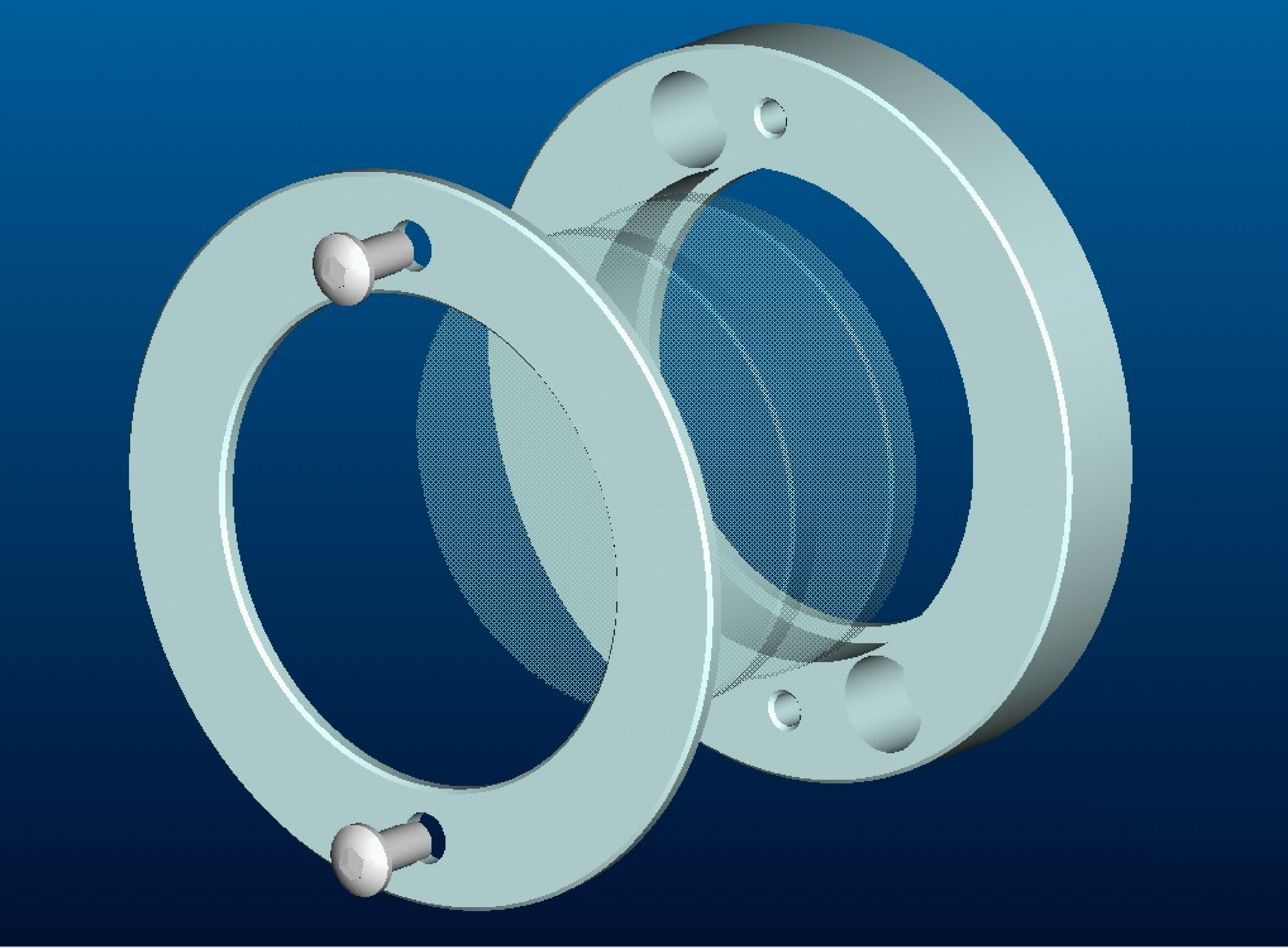
Lead glass is available in many sizes and thicknesses.

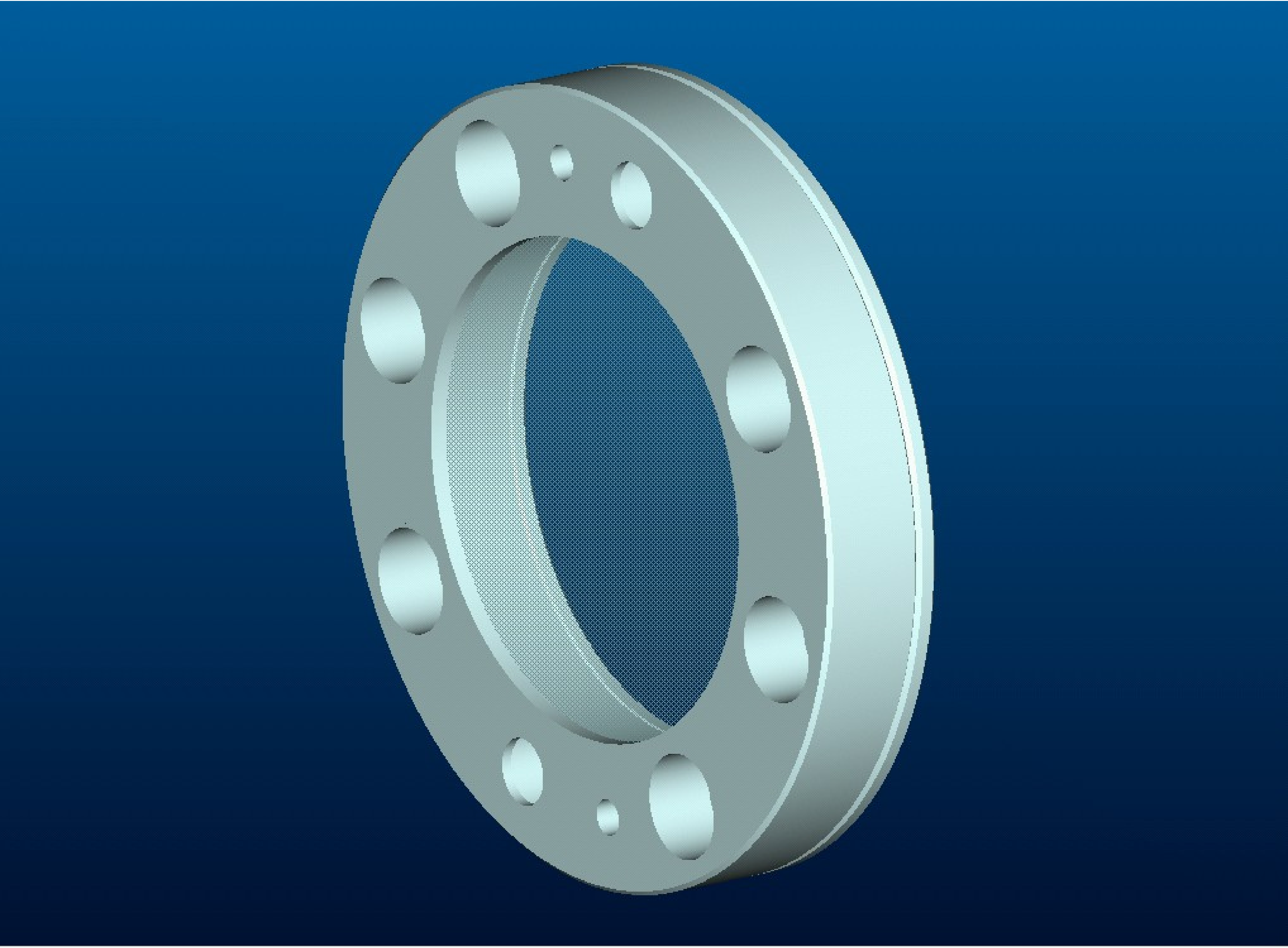
Standard Thickness values			
Lead equivalence (mm)	1.8 - 2.0	2.5-2.7	3.0-3.2
Lead equivalence (in)	(1/16)	(3/32)	(1/8)
Thickness (mm)	7.5-8.5	10.5-11.5	13.5-14.5
X-ray peak voltage (Kv)	150	150	200
Cost ($US / ft^2)	140	180	210

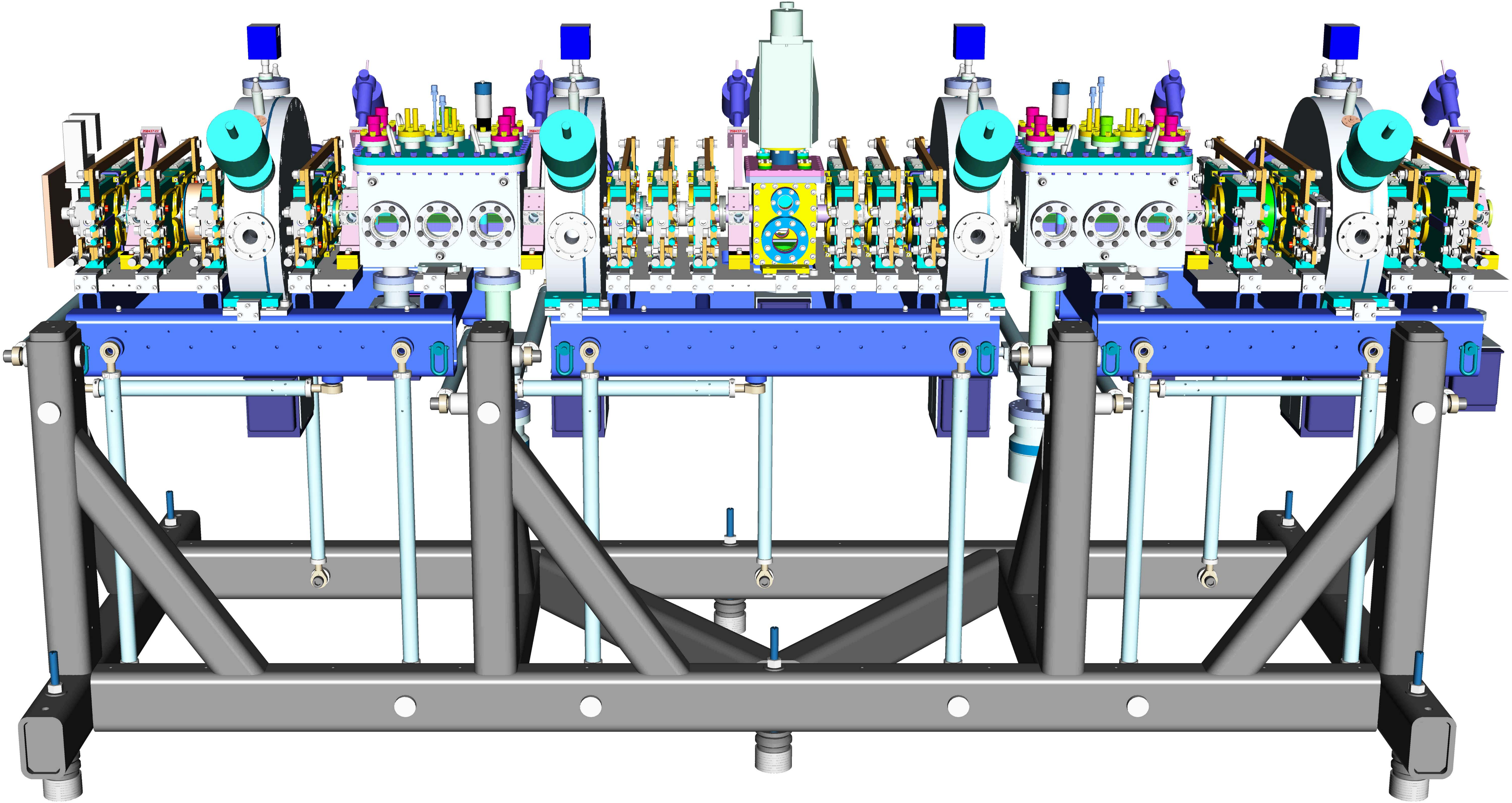
Standard Sizes (inches)	
8 x 10	24 x 36
10 x 10	24 x 48
10 x 12	30 x 30
12 x 12	30 x 36
12 x 16	32 x 40
12 x 18	36 x 36
12 x 20	36 x 48
12 x 24	36 x 60
14 x 18	36 x 72
16 x 20	36 x 84
16 x 24	36 x 96
18 x 24	48 x 48
18 x 26	48 x 60
20 x 24	48 x 72
24 x 24	48 x 84
24 x 30	48 x 96

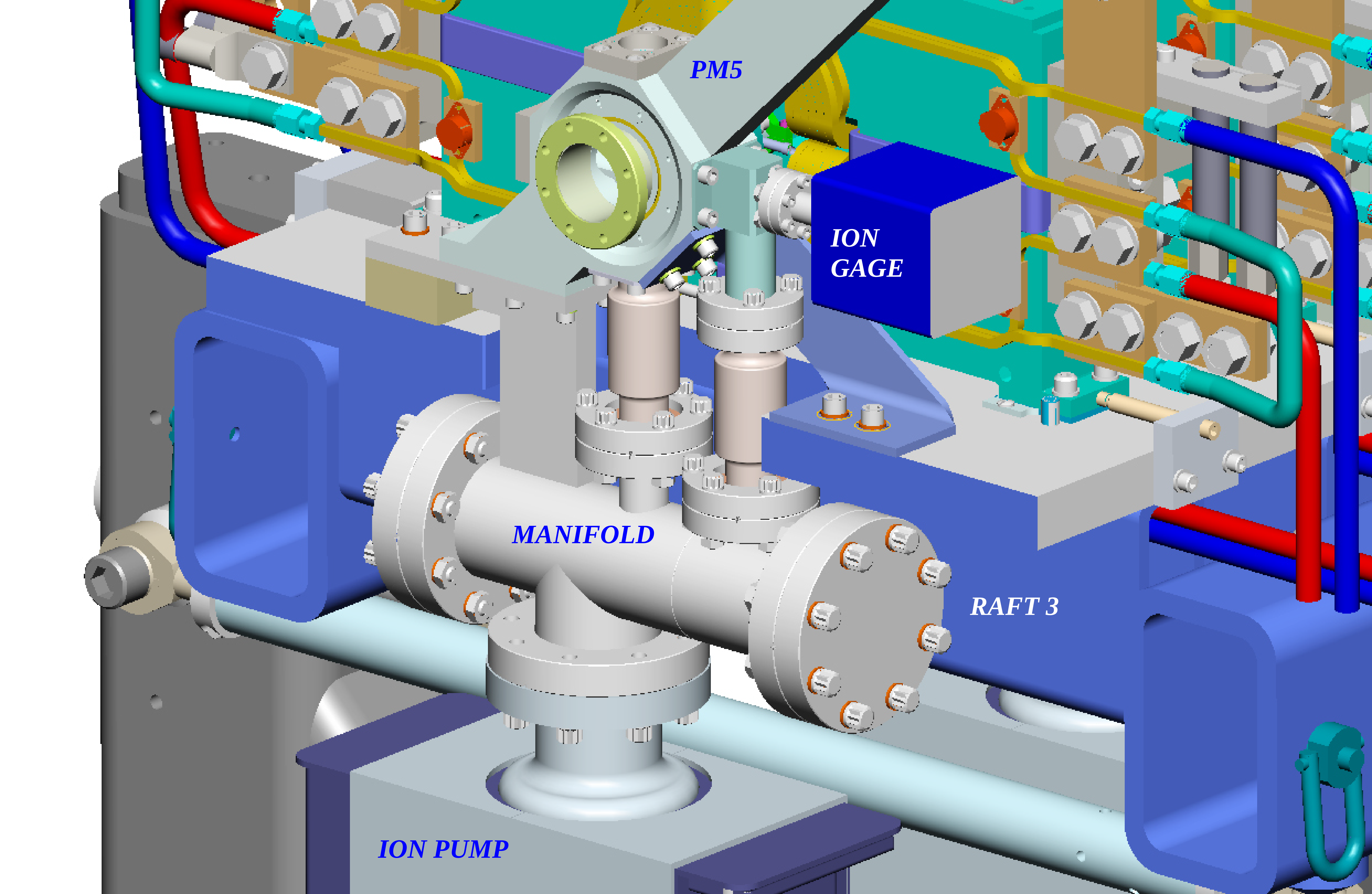
Custom sizes available, please call for your special price










PM5
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