Discussion for the LP endplate

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See also: http://w4.lns.cornell.edu/~dpp/linear_collider/LargePrototype.html

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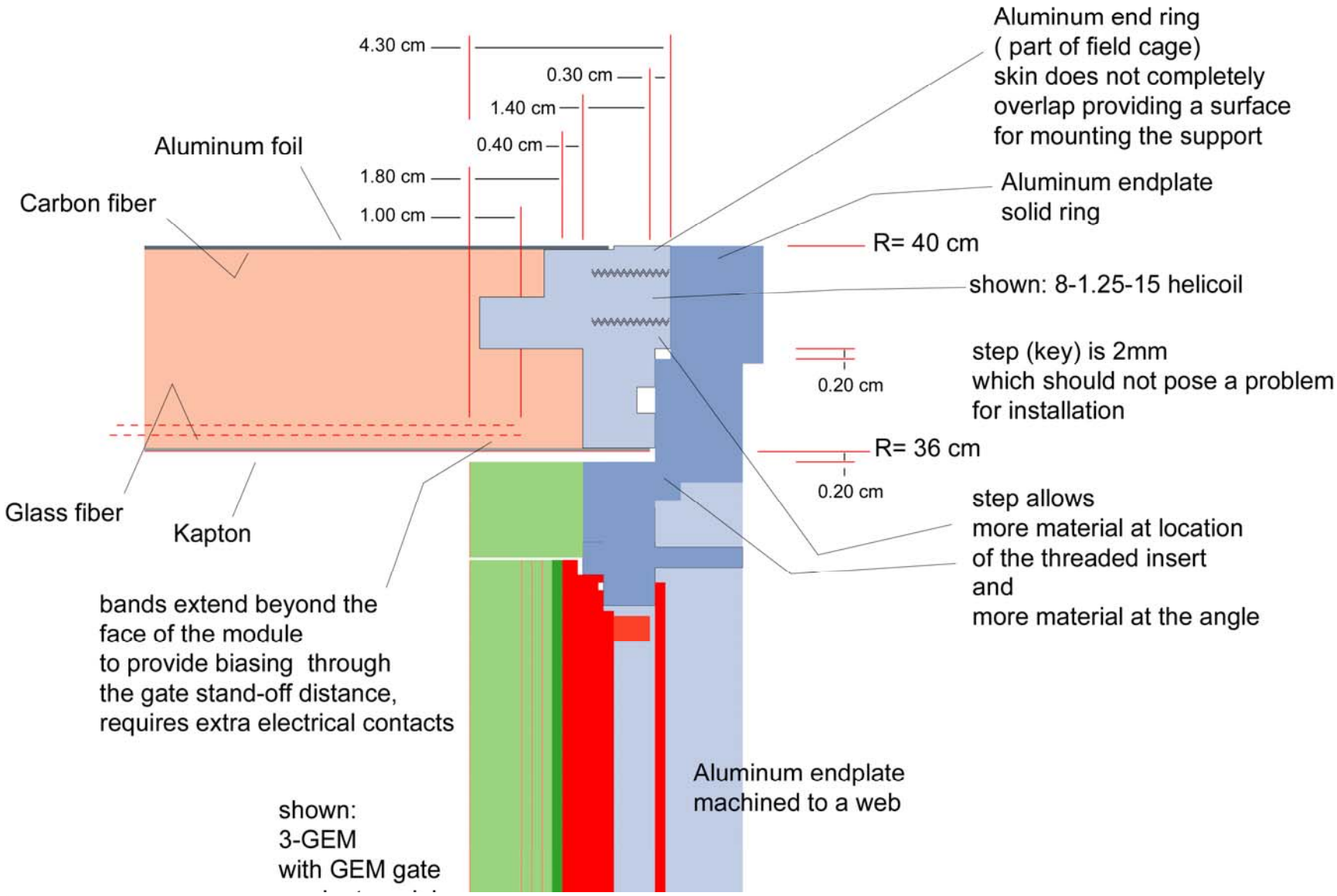
the US National Science Foundation (LEPP cooperative agreement)
and an LCDRD consortium grant

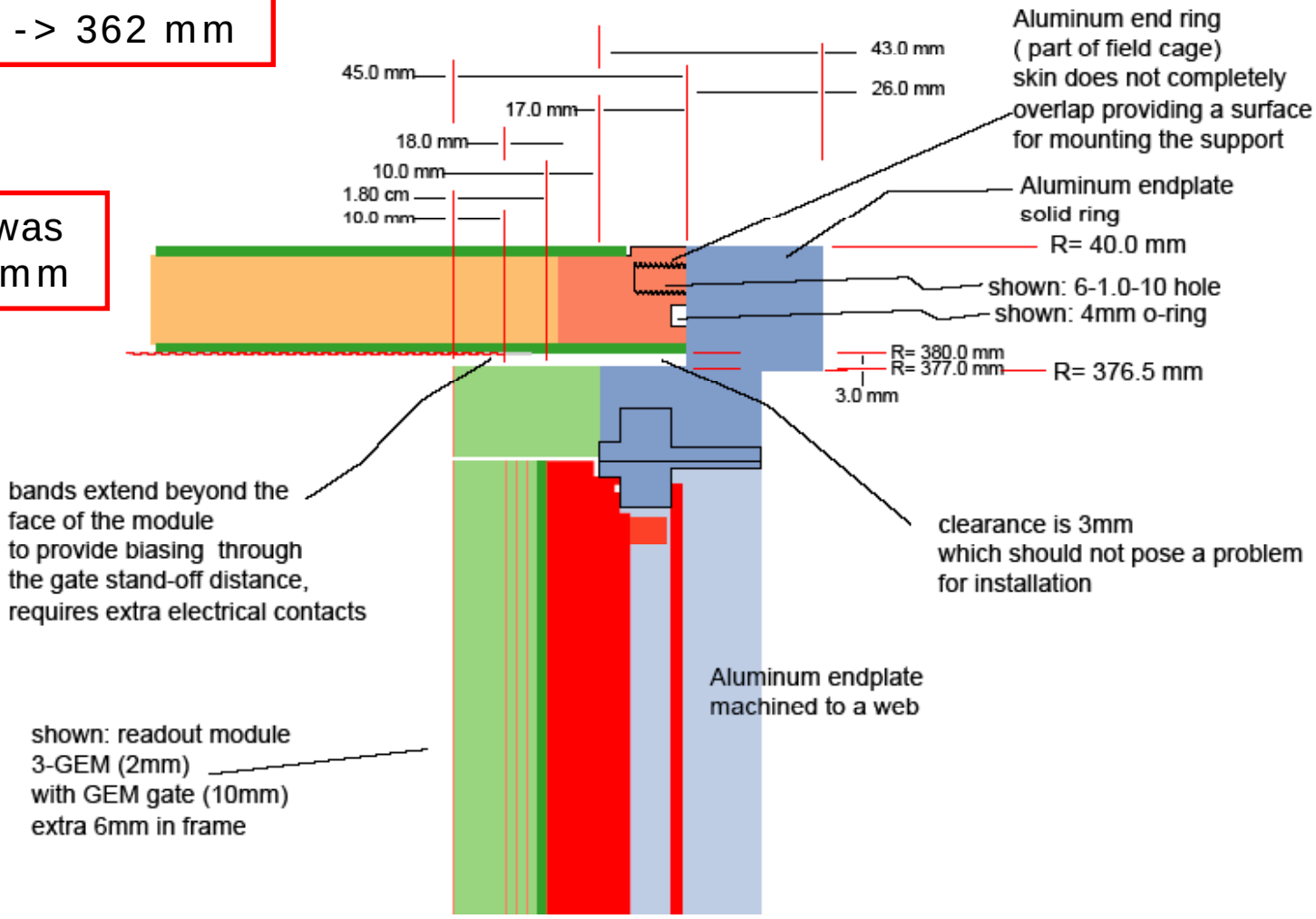
Endplate/band geometry, 2006-11-09



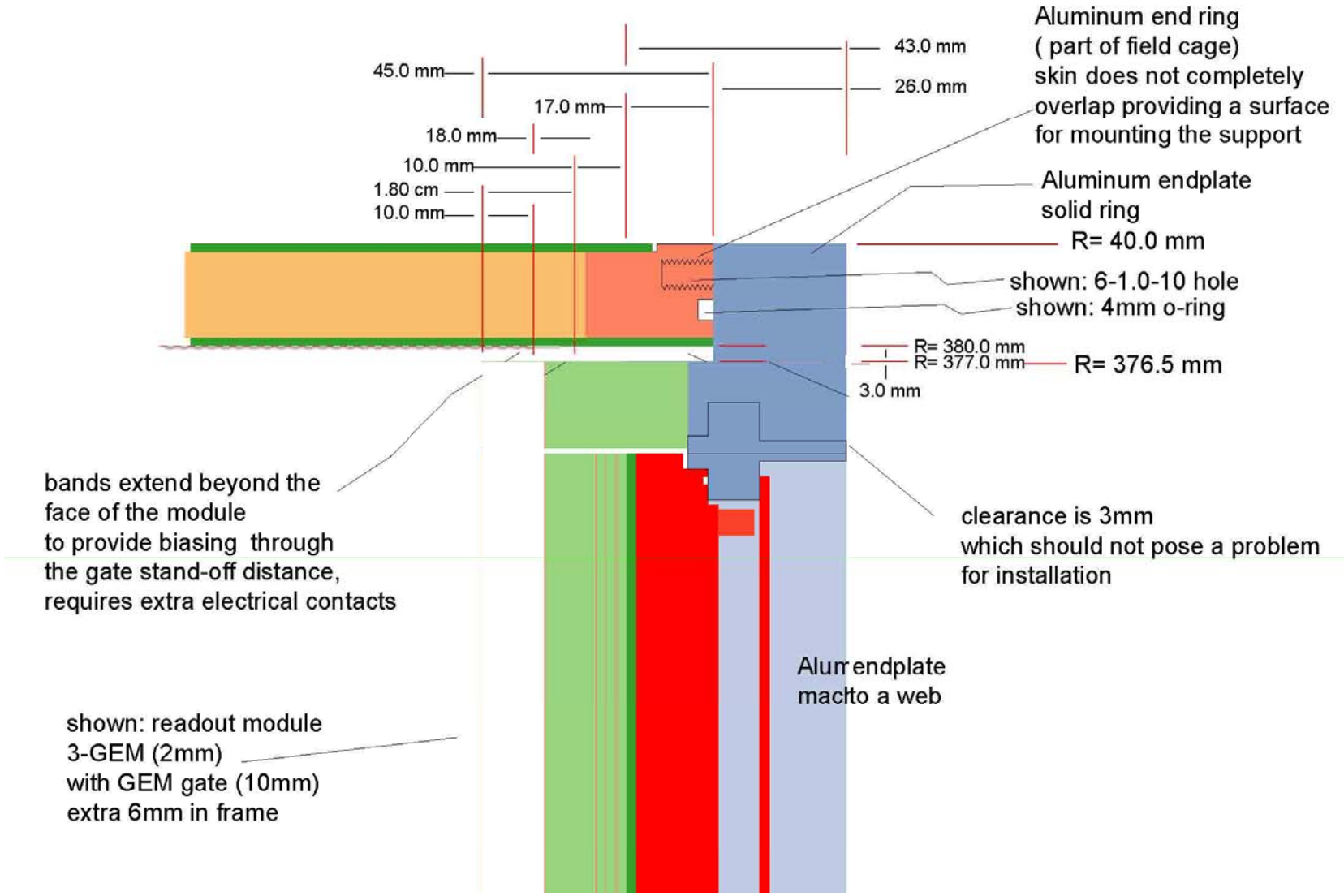
Endplate/band geometry, 2007-01-17

before decreasing radius,
outer 400mm -> 385mm
insert 377mm -> 362 mm

module height was
legislated at 28mm

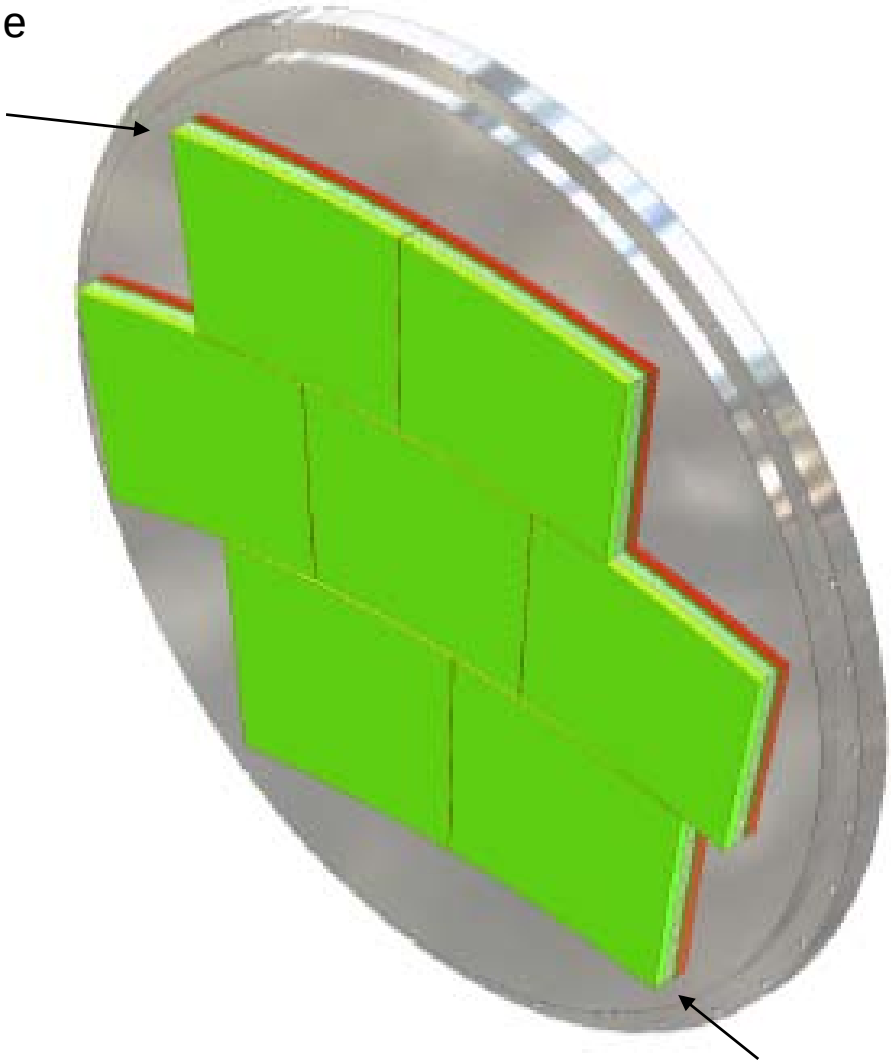


Endplate/band geometry, From Peter Schade 2007-05-23



Endplate/Module model 2007-03-19

This is with equal radius-of-curvature

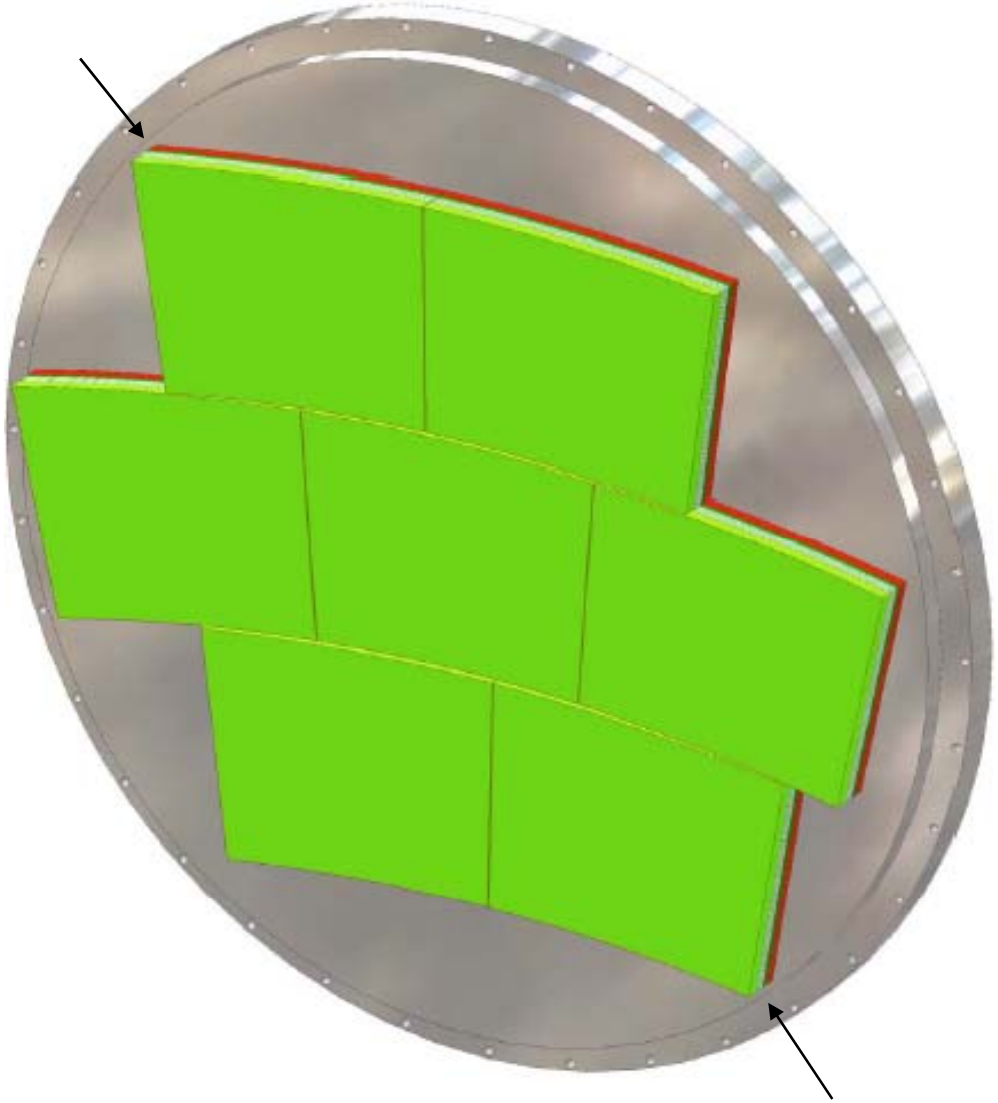


before decreasing radius,
outer 400mm -> 385 mm
insert 377mm -> 362 mm

“stay clear” = 357 mm

Endplate/Module model, 2007-05-24

This is with equal center-of-curvature



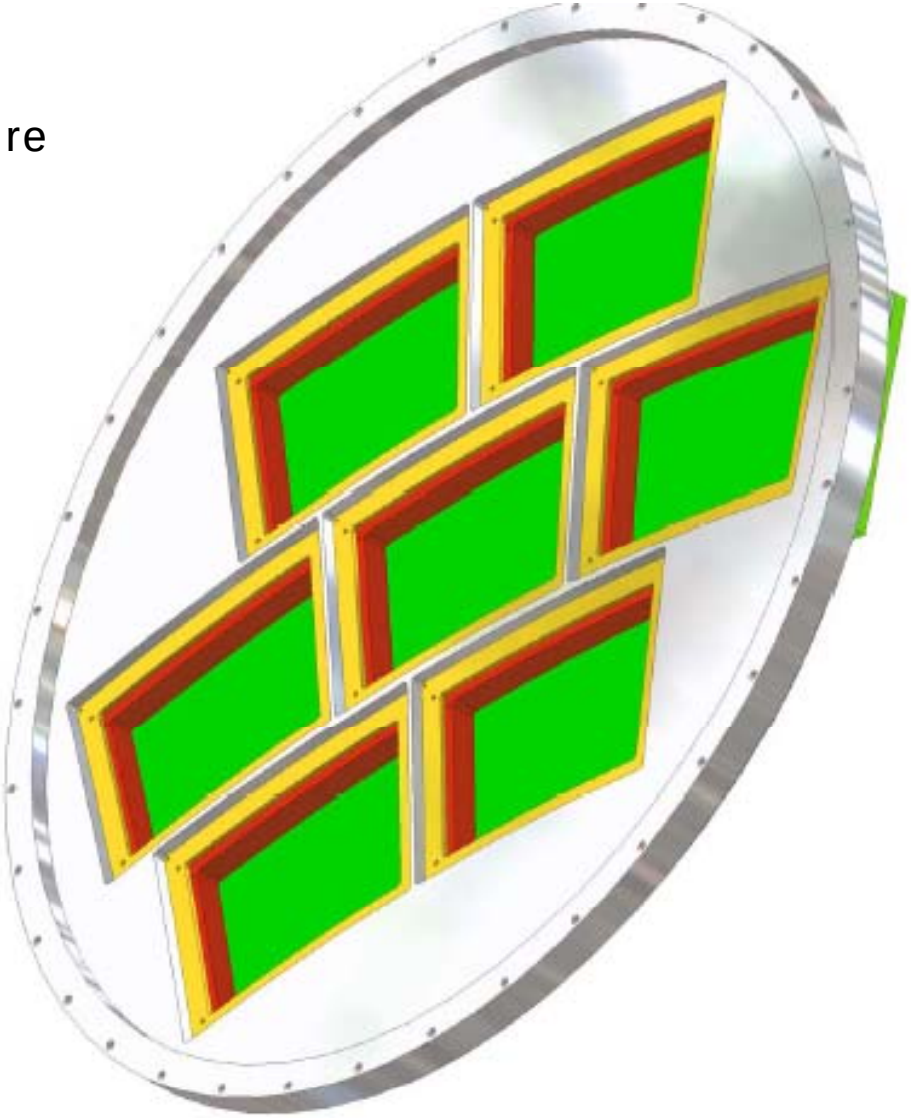
after decreasing radius,
outer 400mm -> 385 mm
insert 377mm -> 362 mm

"stay clear" = 357 mm

discuss the "bounding box"

Endplate/Module model, 2007-05-24

This is with the equal center-of-curvature (outside)



Endplate/Module model, 2007-05-25 (variation)

This is with
not-equal center-of-curvature,
not-equal radius-of-curvature.

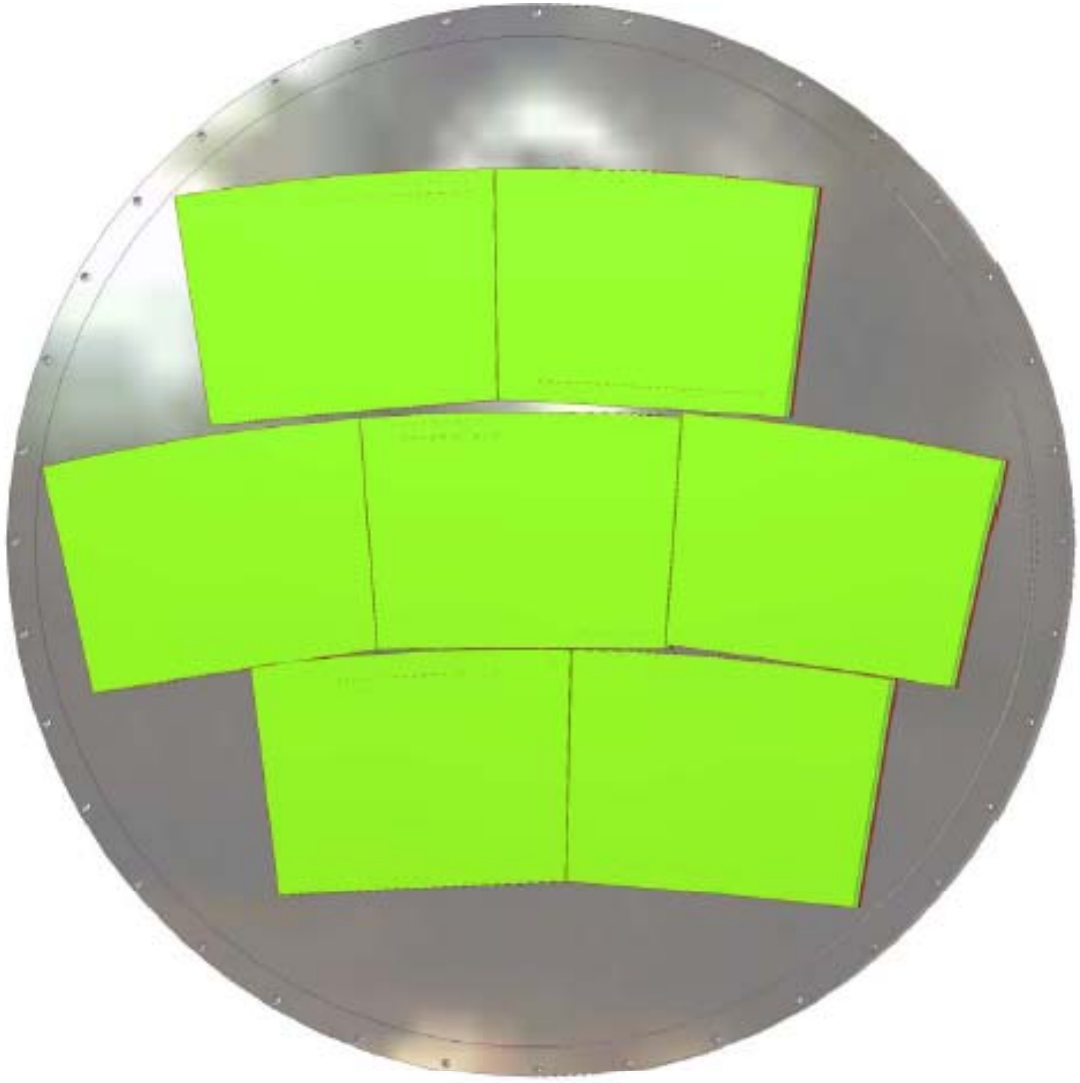
The lower radius of curvature
is set to be almost flat,
9144 cm (100 yards).

The spread-sheet-driven model
works. However, the extreme
change in radius uncovers an
error in the model.

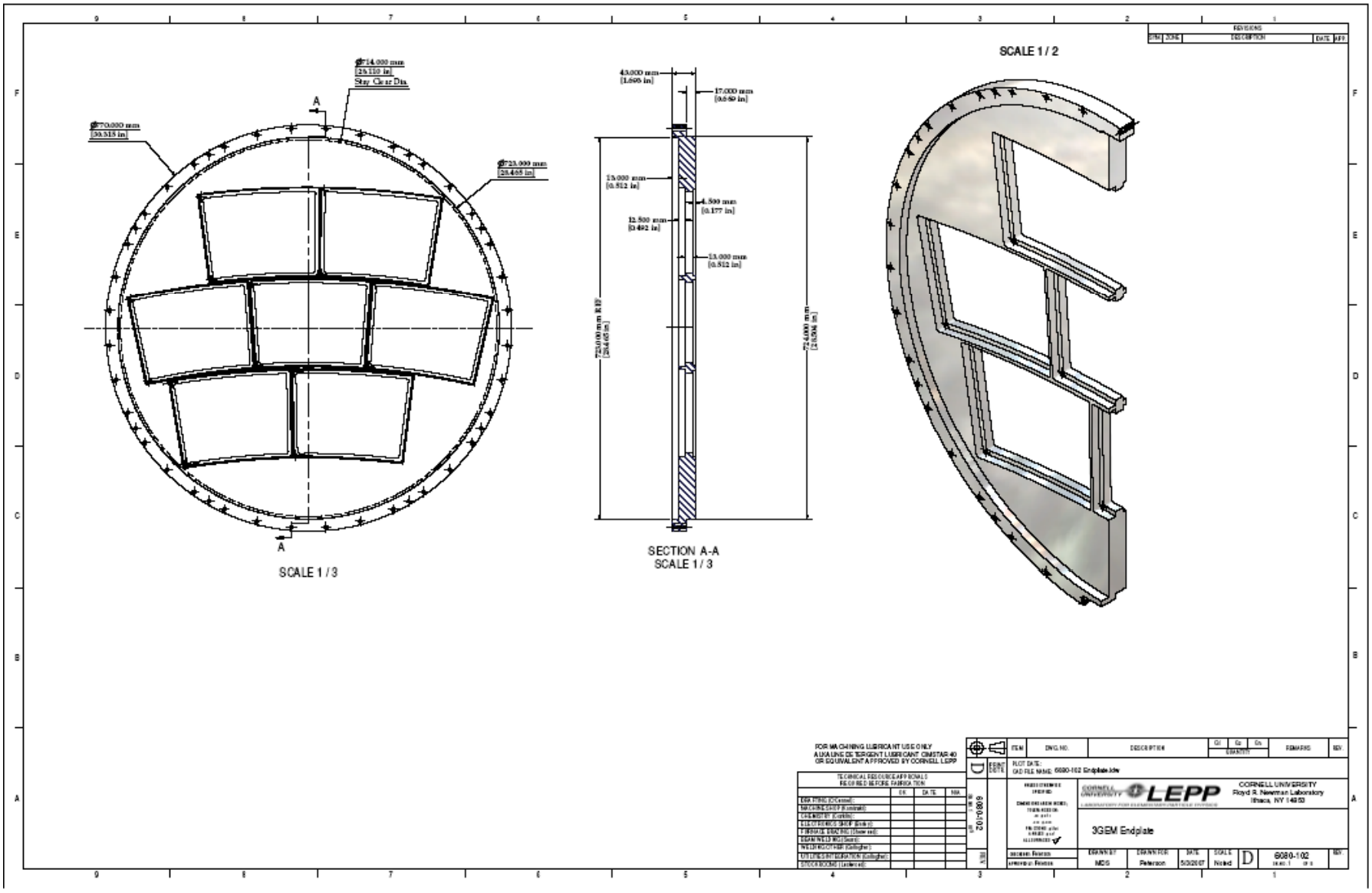
This is an error in the way that
the constraints are applied to
the module positions.

This will be fixed.

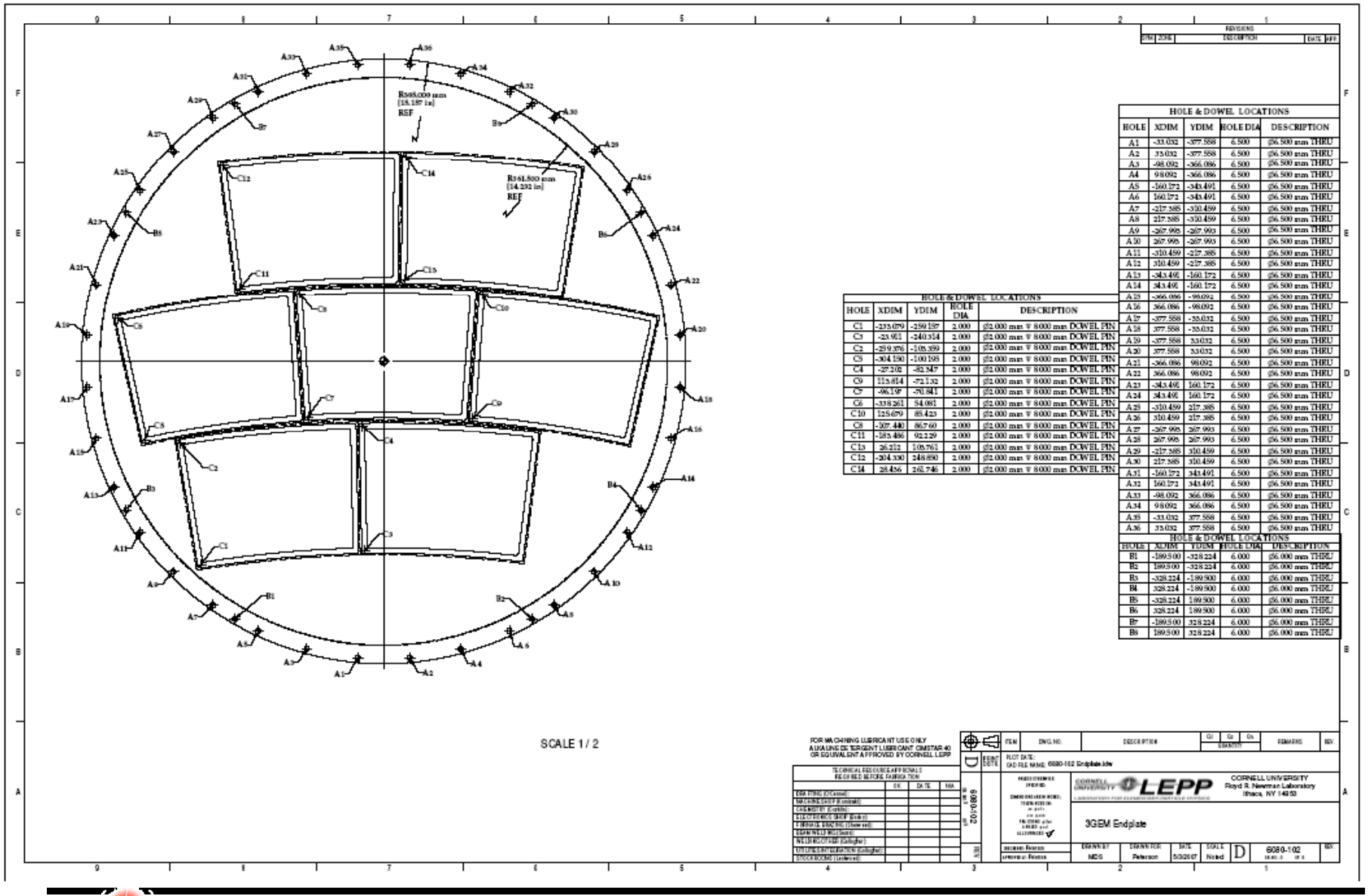
This does not affect the bounding
specifications.



Endplate Drawings, 2007-05-25



Endplate Drawings, 2007-05-25



HOLE & DOWEL LOCATIONS

HOLE	XDIM	YDIM	HOLE DIA	DESCRIPTION
C1	-235.079	-259.197	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C3	-23.981	-240.314	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C2	-259.376	-105.359	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C5	-304.150	-100.195	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C4	-27.202	-82.347	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C9	113.814	-72.132	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C7	-66.159	-70.841	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C6	-338.261	54.081	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C10	125.679	85.423	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C8	-307.440	86.760	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C11	-185.486	92.229	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C13	26.212	105.761	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C12	-204.330	248.890	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN
C14	28.456	261.746	2.000	ø2.000 mm Ø 8.000 mm DOWEL PIN

HOLE & DOWEL LOCATIONS

HOLE	XDIM	YDIM	HOLE DIA	DESCRIPTION
A1	-33.032	-377.588	6.500	ø6.500 mm THRU
A2	33.032	-377.588	6.500	ø6.500 mm THRU
A3	-98.092	-366.086	6.500	ø6.500 mm THRU
A4	98.092	-366.086	6.500	ø6.500 mm THRU
A5	-160.172	-343.491	6.500	ø6.500 mm THRU
A6	160.172	-343.491	6.500	ø6.500 mm THRU
A7	-217.388	-310.459	6.500	ø6.500 mm THRU
A8	217.388	-310.459	6.500	ø6.500 mm THRU
A9	-267.995	-267.993	6.500	ø6.500 mm THRU
A10	267.995	-267.993	6.500	ø6.500 mm THRU
A11	-310.459	-217.388	6.500	ø6.500 mm THRU
A12	310.459	-217.388	6.500	ø6.500 mm THRU
A13	-343.491	-160.172	6.500	ø6.500 mm THRU
A14	343.491	-160.172	6.500	ø6.500 mm THRU
A15	-366.086	-98.092	6.500	ø6.500 mm THRU
A16	366.086	-98.092	6.500	ø6.500 mm THRU
A17	-377.588	-33.032	6.500	ø6.500 mm THRU
A18	377.588	-33.032	6.500	ø6.500 mm THRU
A19	-377.588	33.032	6.500	ø6.500 mm THRU
A20	377.588	33.032	6.500	ø6.500 mm THRU
A21	-366.086	98.092	6.500	ø6.500 mm THRU
A22	366.086	98.092	6.500	ø6.500 mm THRU
A23	-343.491	160.172	6.500	ø6.500 mm THRU
A24	343.491	160.172	6.500	ø6.500 mm THRU
A25	-310.459	217.388	6.500	ø6.500 mm THRU
A26	310.459	217.388	6.500	ø6.500 mm THRU
A27	-267.995	267.993	6.500	ø6.500 mm THRU
A28	267.995	267.993	6.500	ø6.500 mm THRU
A29	-217.388	310.459	6.500	ø6.500 mm THRU
A30	217.388	310.459	6.500	ø6.500 mm THRU
A31	-160.172	343.491	6.500	ø6.500 mm THRU
A32	160.172	343.491	6.500	ø6.500 mm THRU
A33	-98.092	366.086	6.500	ø6.500 mm THRU
A34	98.092	366.086	6.500	ø6.500 mm THRU
A35	-33.032	377.588	6.500	ø6.500 mm THRU
A36	33.032	377.588	6.500	ø6.500 mm THRU

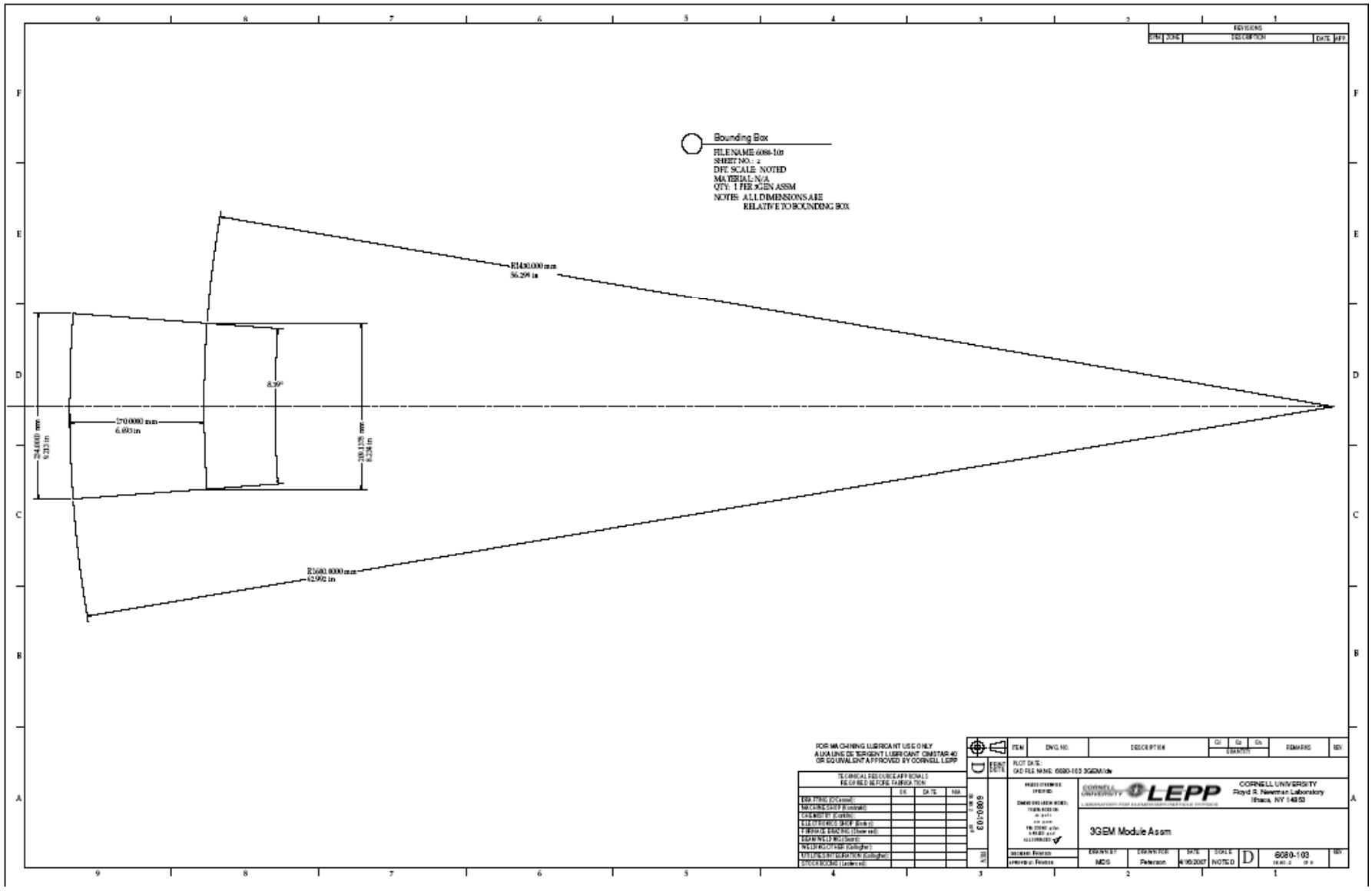
HOLE & DOWEL LOCATIONS

HOLE	XDIM	YDIM	HOLE DIA	DESCRIPTION
B1	-189.500	-328.224	6.000	ø6.000 mm THRU
B2	189.500	-328.224	6.000	ø6.000 mm THRU
B3	-328.224	-189.500	6.000	ø6.000 mm THRU
B4	328.224	-189.500	6.000	ø6.000 mm THRU
B5	-328.224	189.500	6.000	ø6.000 mm THRU
B6	328.224	189.500	6.000	ø6.000 mm THRU
B7	-189.500	328.224	6.000	ø6.000 mm THRU
B8	189.500	328.224	6.000	ø6.000 mm THRU

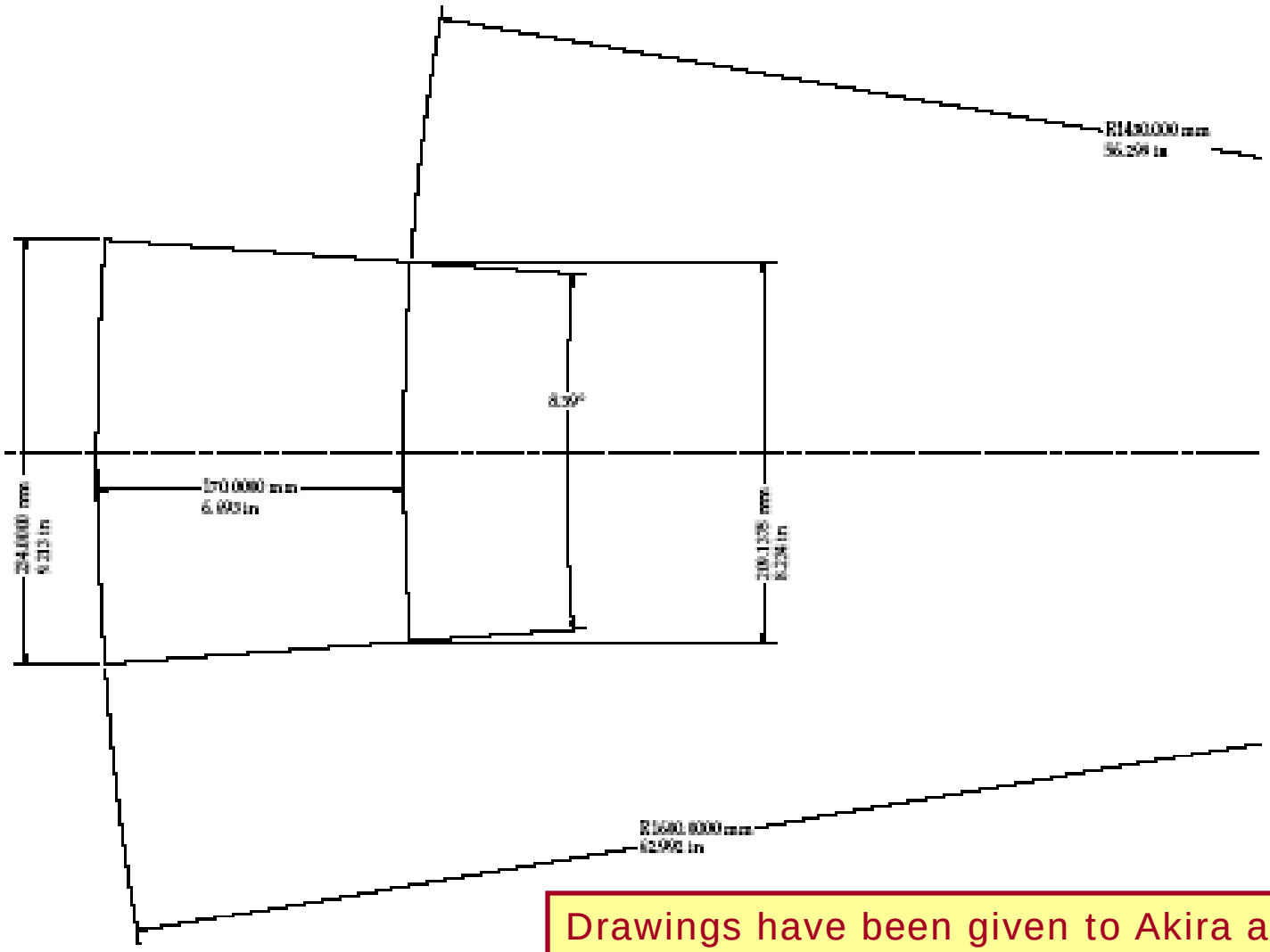
CORNELL UNIVERSITY LEPP
LABORATORY FOR ELEMENTARY-PARTICLE PHYSICS

D. Peterson, "LC-TPC LP endplate", LC-TPC group meeting at LCWS07, 04-June-2007

The Bounding Box, 2007-05-25

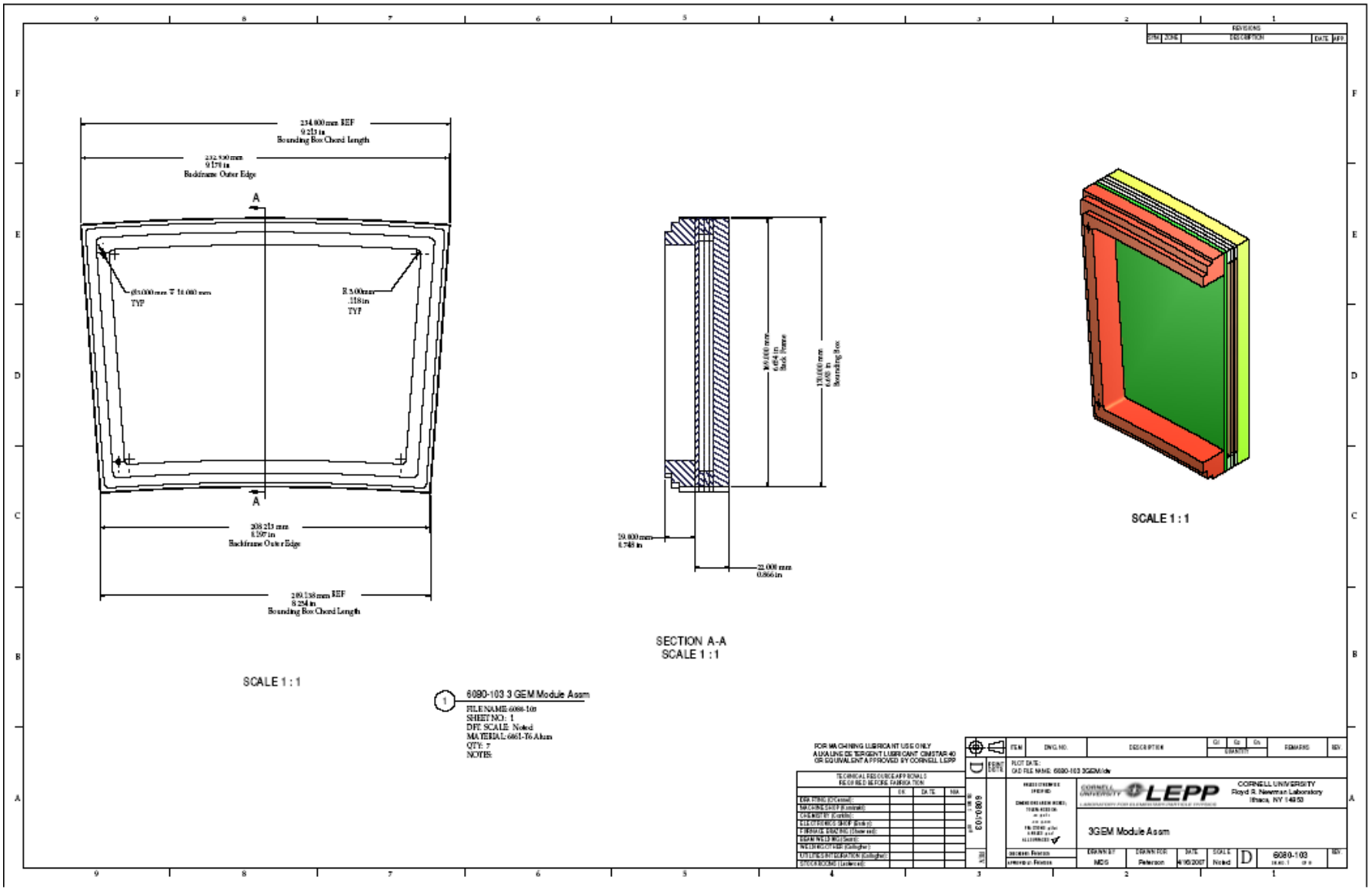


The Bounding Box, 2007-05-25

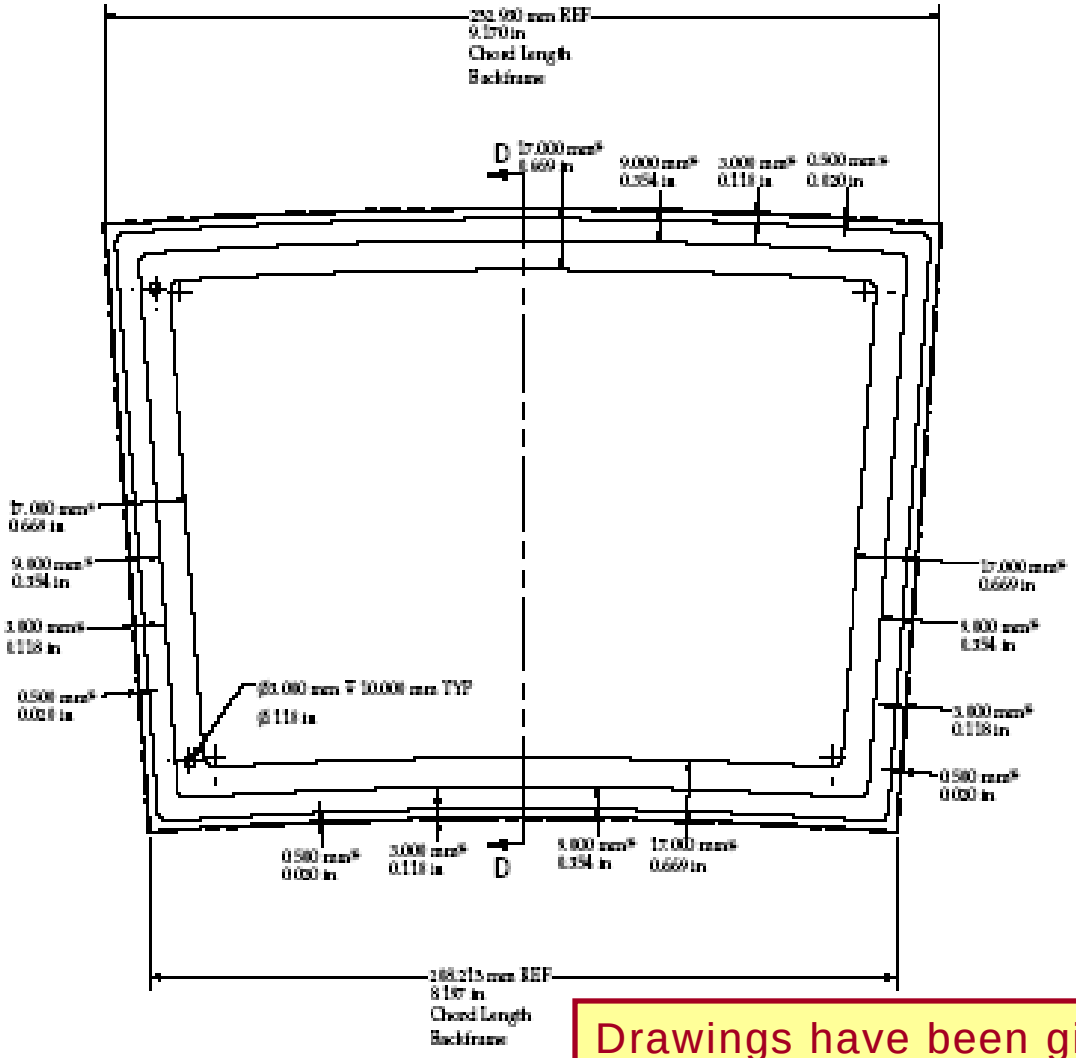


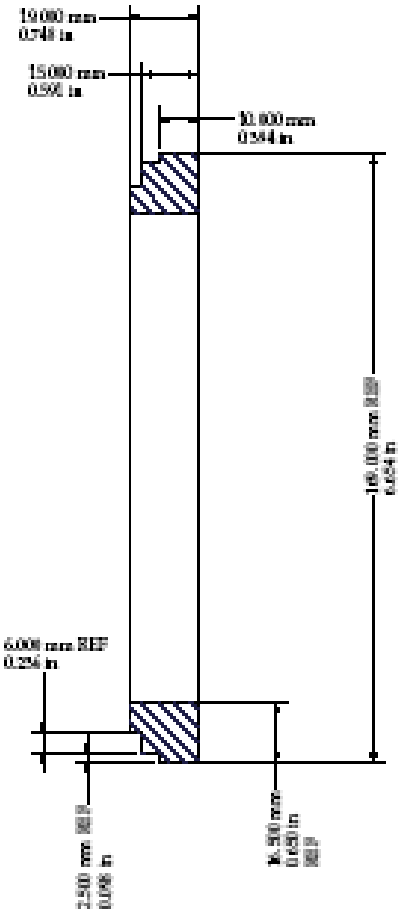
Drawings have been given to Akira and Paul in pdf.

Module Drawings, 2007-05-25



Module Drawings, 2007-05-25





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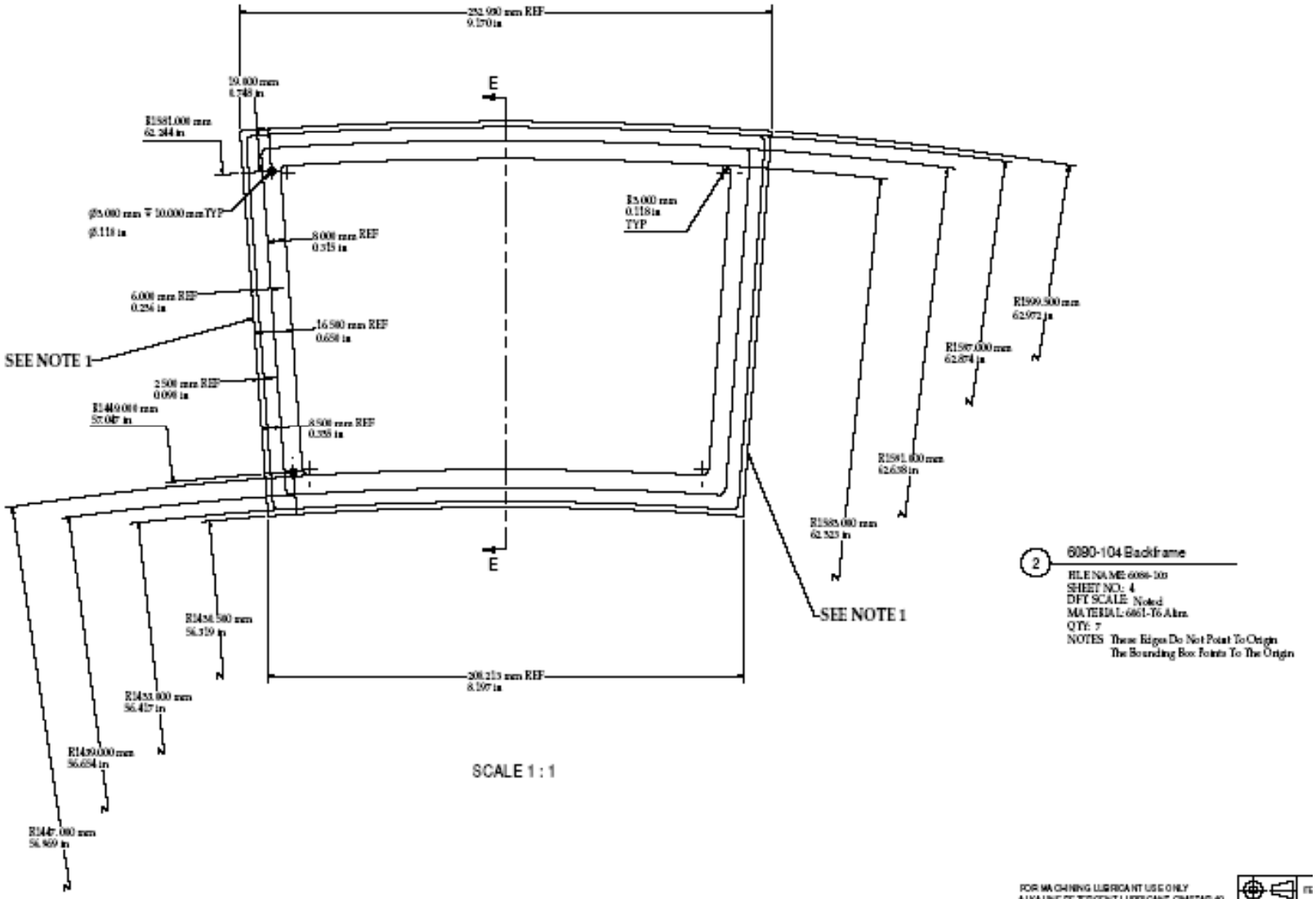
Module Drawings, 2007-05-25



Stress relief test piece

This shows the first in a series of “stress relief test pieces”.

This has been cut with a center opening of 30cm wide. The “mullions” are the same size as proposed in the endplate drawing: 18mm at the widest width, 14mm in depth.

This is the first baseline part, with no stress relief.

It has been fully measured on a CMM. The mullion position is distorted upward by 500µm (0.020inch).

The drawing was modified to have the strengthening section as shown in the current endplate.

Stress relief test piece

A close-up of the part shown in the previous slide.

Machining a Stress Relief Test Piece, 2007-05-25

Motivation:

A position tolerance of <25μm is needed for the modules to decouple the calibration of the magnetic field from the position calibration of the modules.

I am trying to provide, at delivery, <25μm position tolerance of the mullions. The endplate will then be evaluated after some service time to determine the ability to maintain this tolerance.

The program:

6 plates are being made to the revised drawing.
A multi-step production is used:

1) machine to 1000 μm oversize
2) machine to 750 μm oversize,
3) stress relief
4) machine to 250 μm oversize,
5) stress relief
6) machine to drawing dimensions

Stress relief processes:
2 plates - (3)heat to 325F, (5)heat to 650F
2 plates - rapid cooling to liquid N_2
2 plates - ultrasonic cleaner, 6 hours

Coordinate Measuring machine (CMM), 2007-05-25

CMM, 2007-05-25, Z measurements

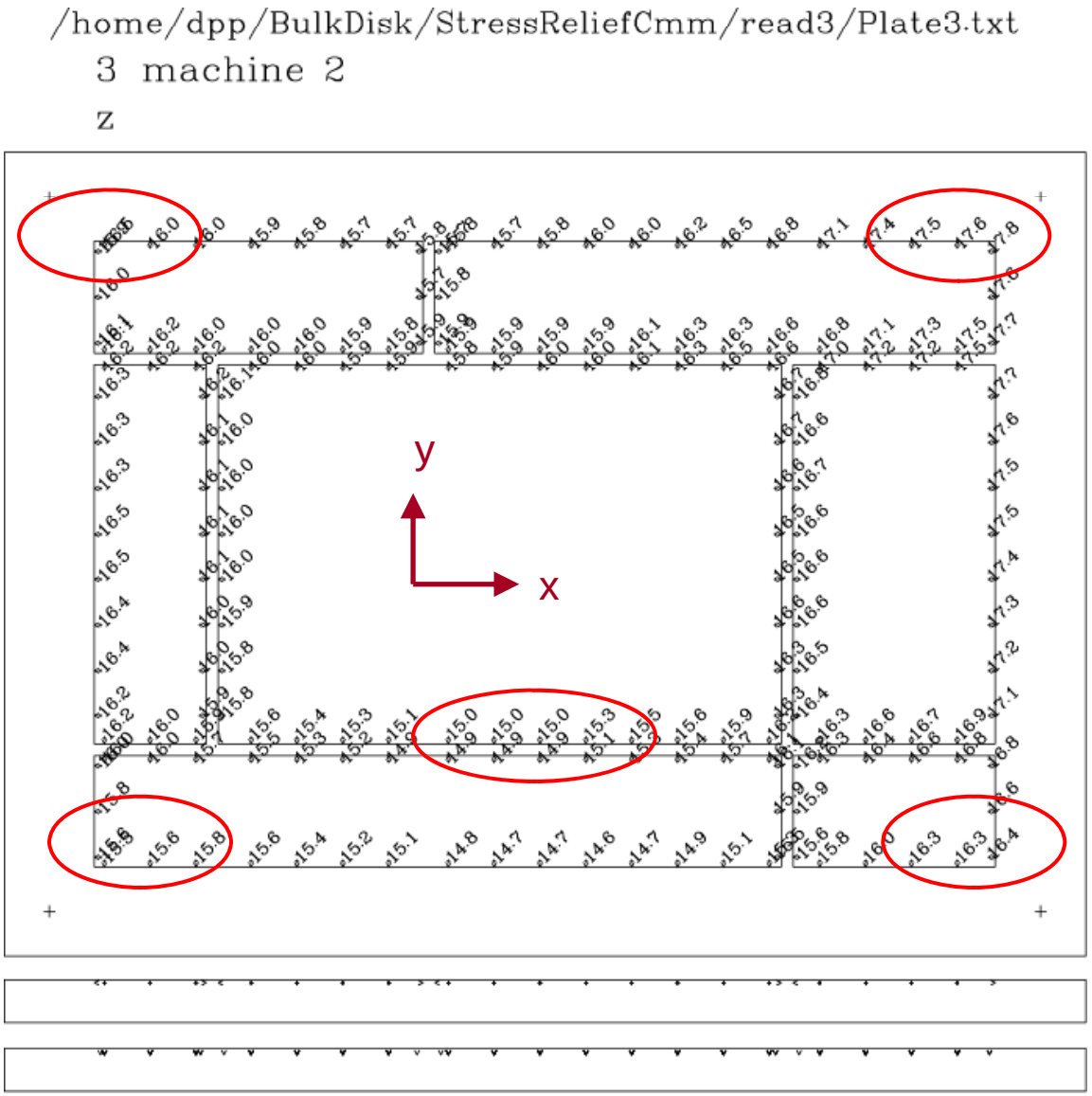
Example of measurement after the 2nd machining.

Units are milli-inch.
0.001 inch = 25.5 µm

This is the Z view.

There is a 30 µm bowing in z-x .

There is a twist about x from left to right of 25 µm.



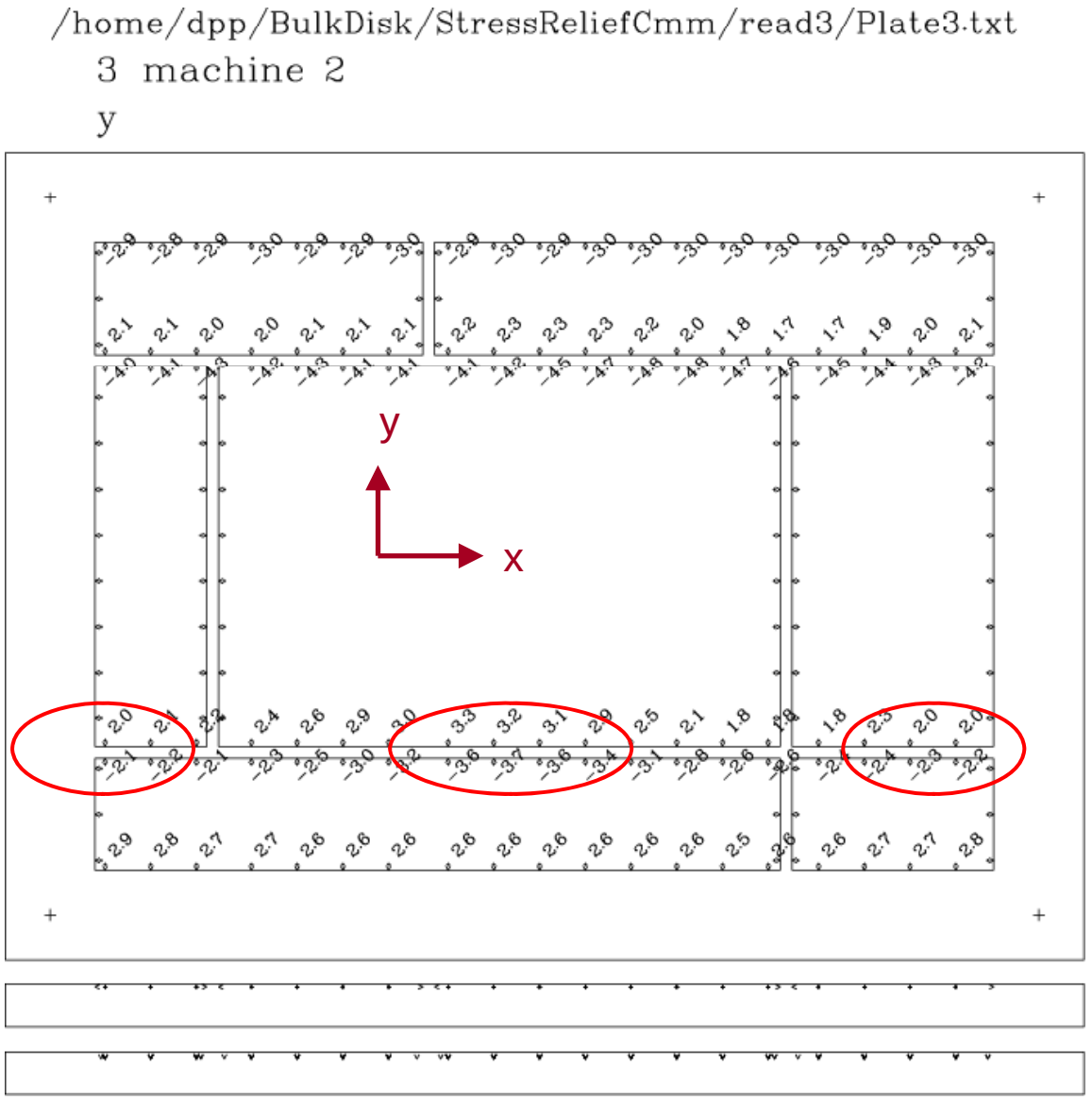
CMM, 2007-05-25, y measurements

Example of measurement after the 2nd machining.

Units are milli-inch.
0.001 inch = 25.5 µm

This is the y view.

There is a 30 µm bowing in y of the indicated mullion.

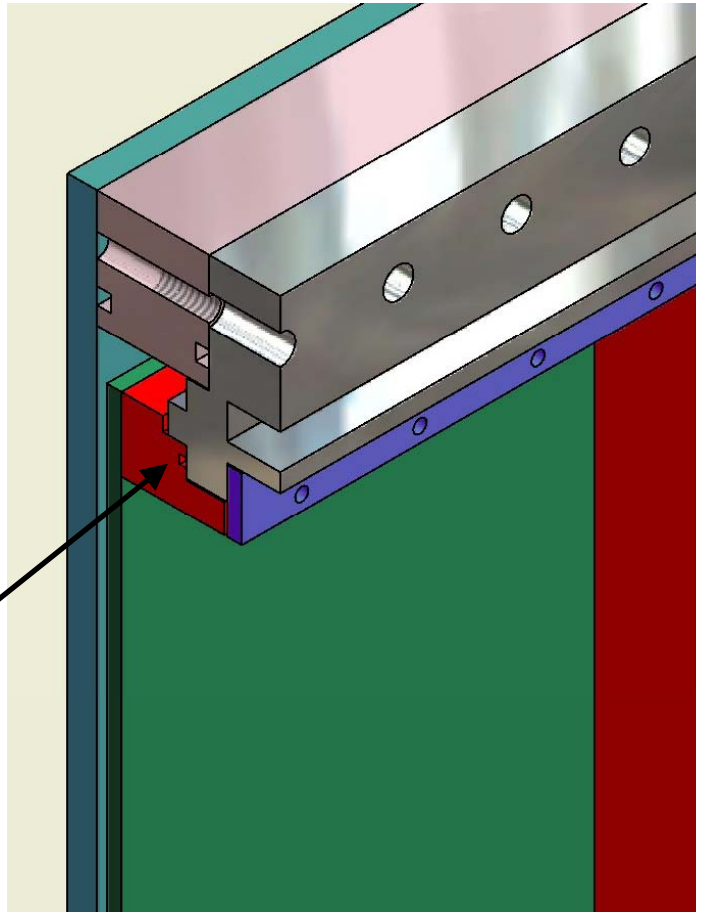


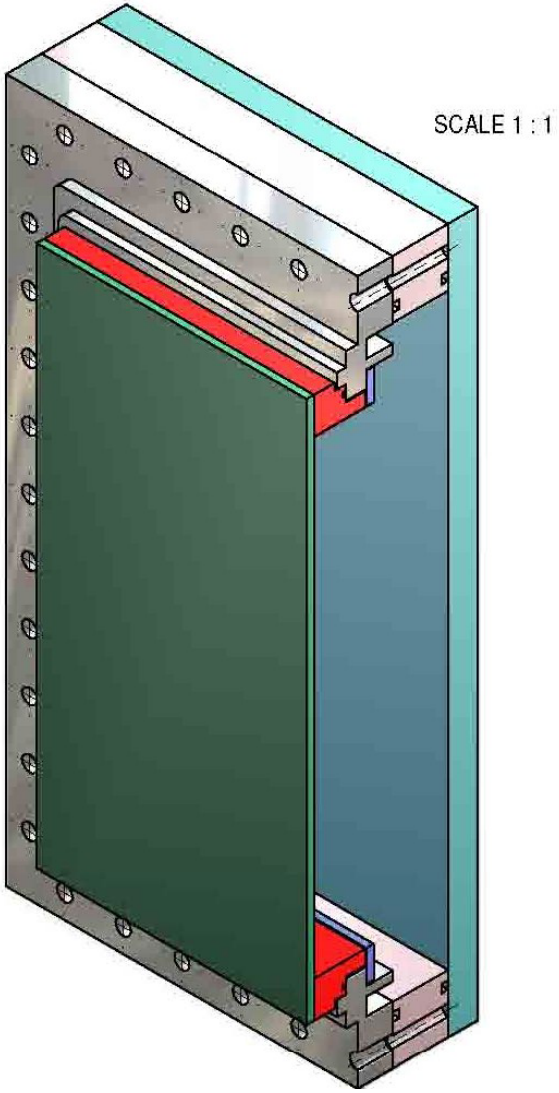
Gas Seal test, 2007-05-25

Test of the o-ring seal.

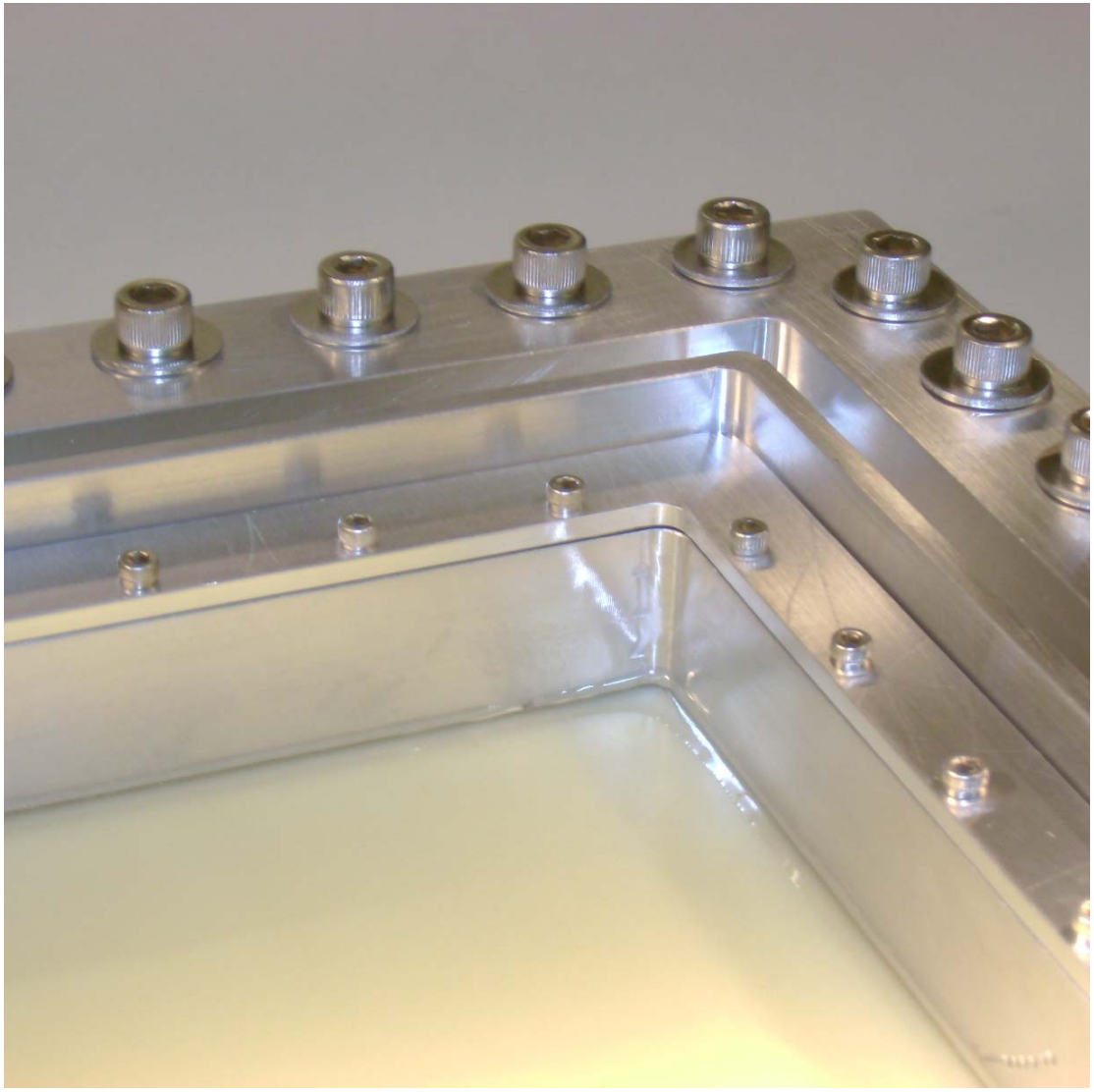
It can be mounted either way.

- model of mullion
- clamping bracket





Gas Seal test



First test, at
oxygen overpressure,
~ 4 cc/hour/panel.

Second test (new back frame with improved o-ring slot)
~ 2 cc/hour/panel

Other improvements to make…

decisions

Interface of endplate to field cage

Bolt locations