sPHENIX EMCal Review Mechanical Design

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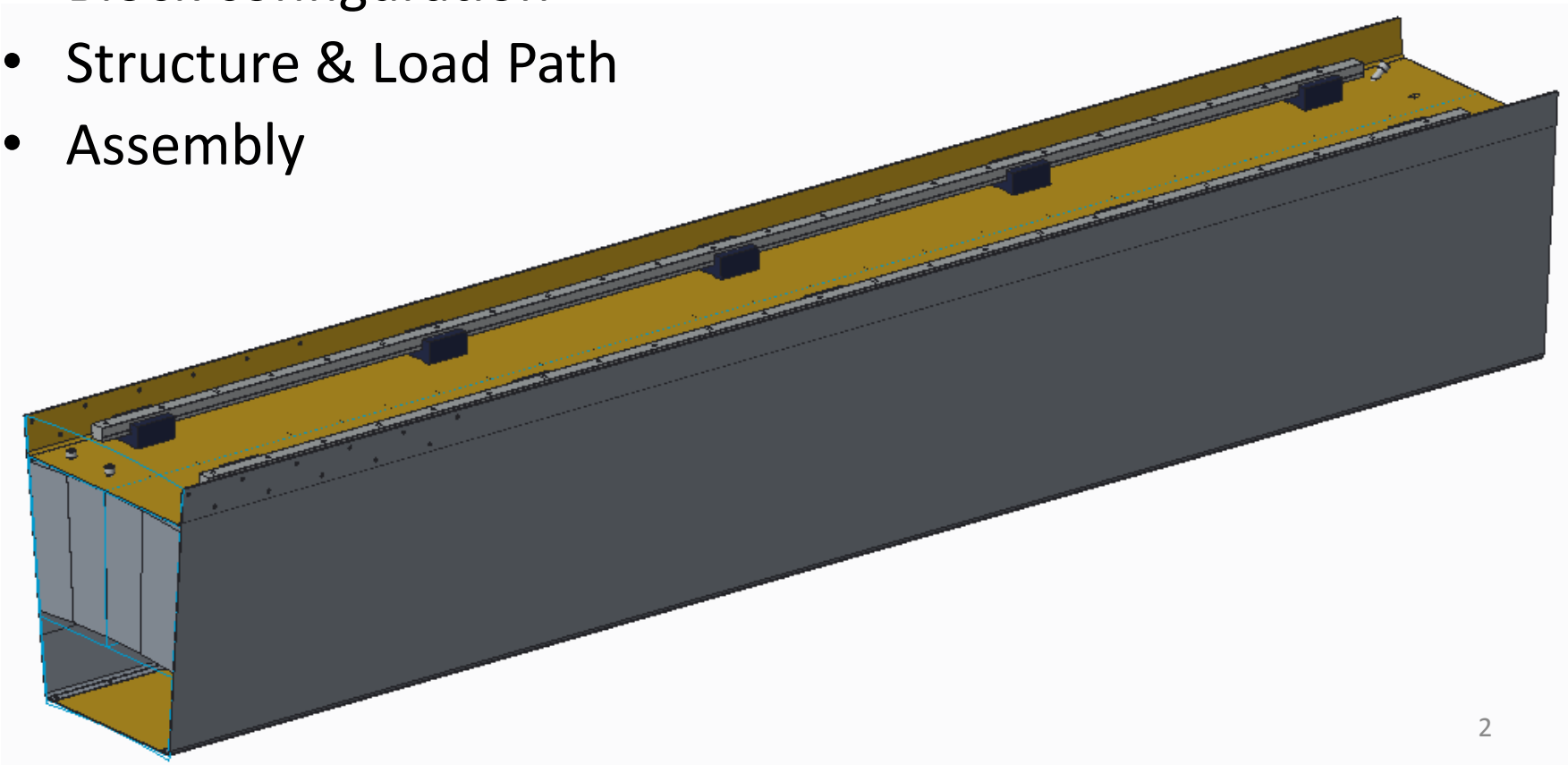
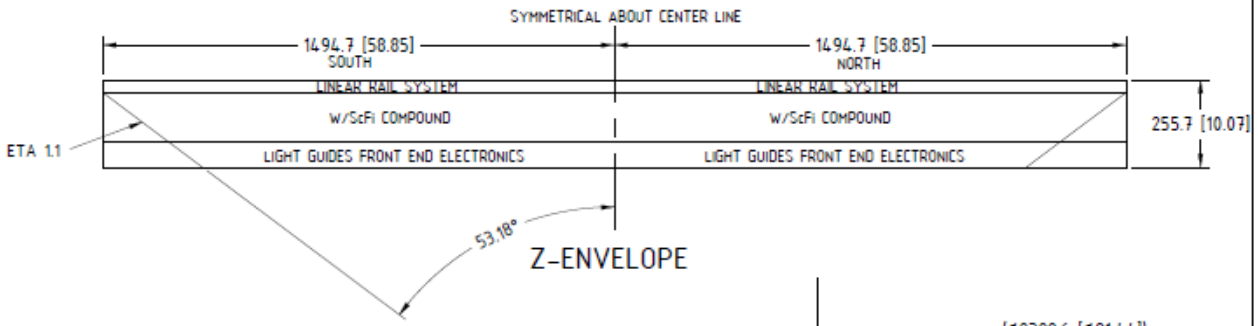
August 20, 2015

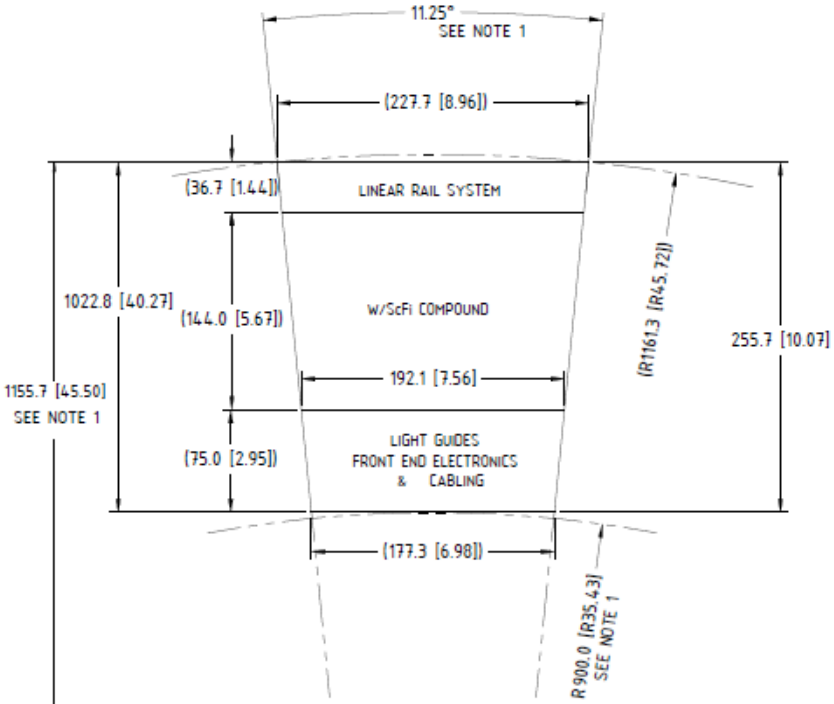
Topics

- EMCal overview
- Mounting Layout
- Block configuration
- Structure & Load Path
- Assembly

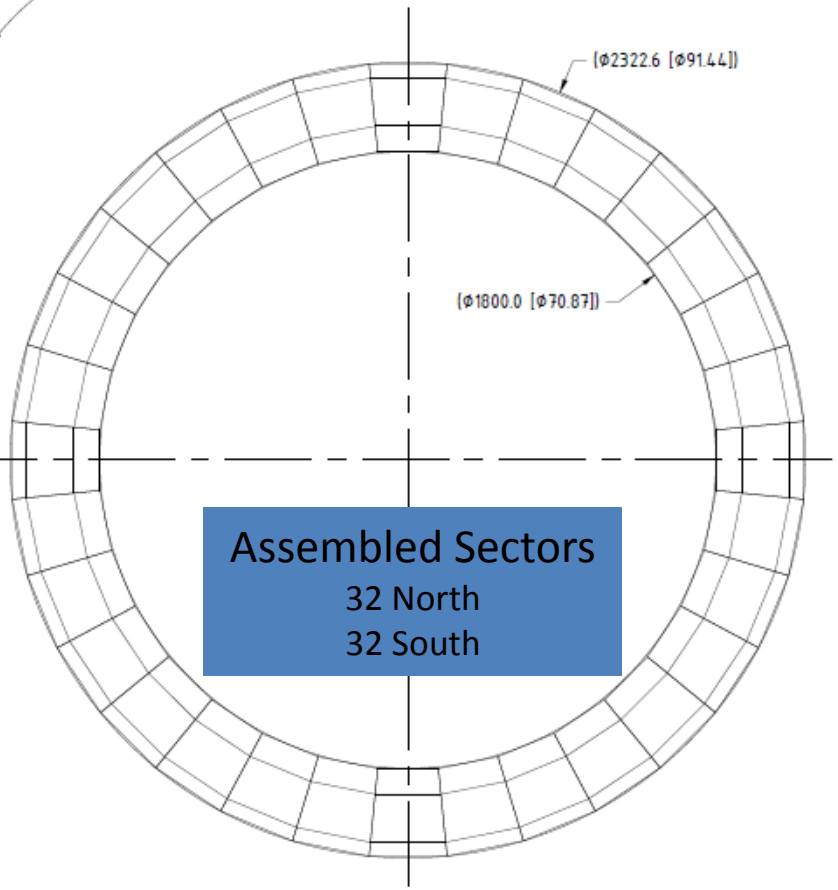


NOTES:
1. NOTED DIMENSIONS ARE MAXIMUM SIZE.
   ALL SERVICES, NUTS, BOLTS & OTHER DETECTOR
   COMPONENTS SHALL NOT EXCEED THESE DIMENSIONS.
2. ALL DIMENSIONS ARE IN mm[inch].





Sector Dimensions



Assembled Sectors
32 North
32 South

PRELIMINARY
3/26/2015

			REV	
			SHEET	
REVISION STATUS OF SHEETS				

THIRD ANGLE PROJECTION

NEXT ASSEMBLY

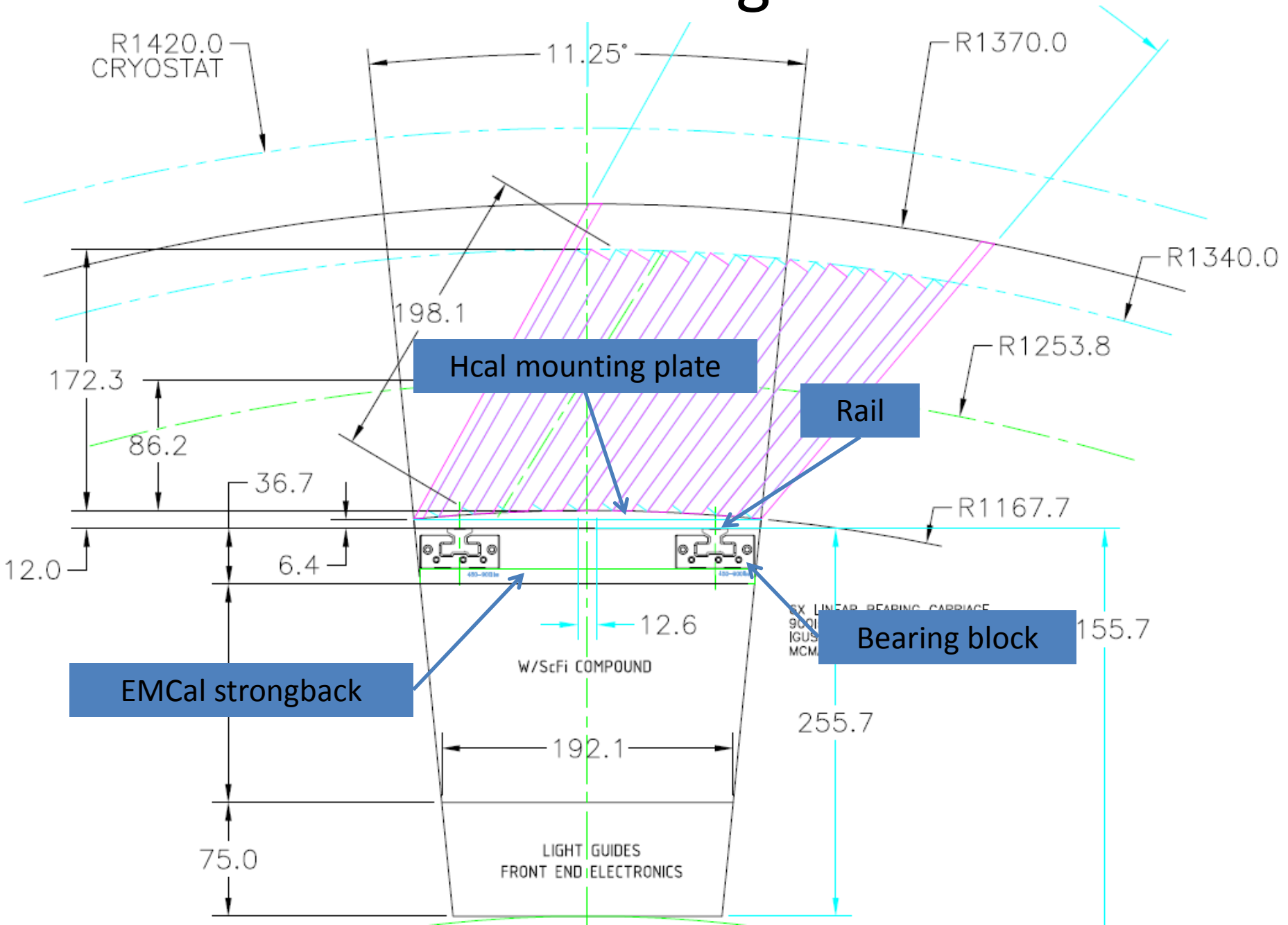
BROOKHAVEN NATIONAL LABORATORY
Upton, NY 11973

PROJECT: PHENIX
SYSTEM: sPhenix
MODEL/DRAWING NAME: EMcal Module Envelope

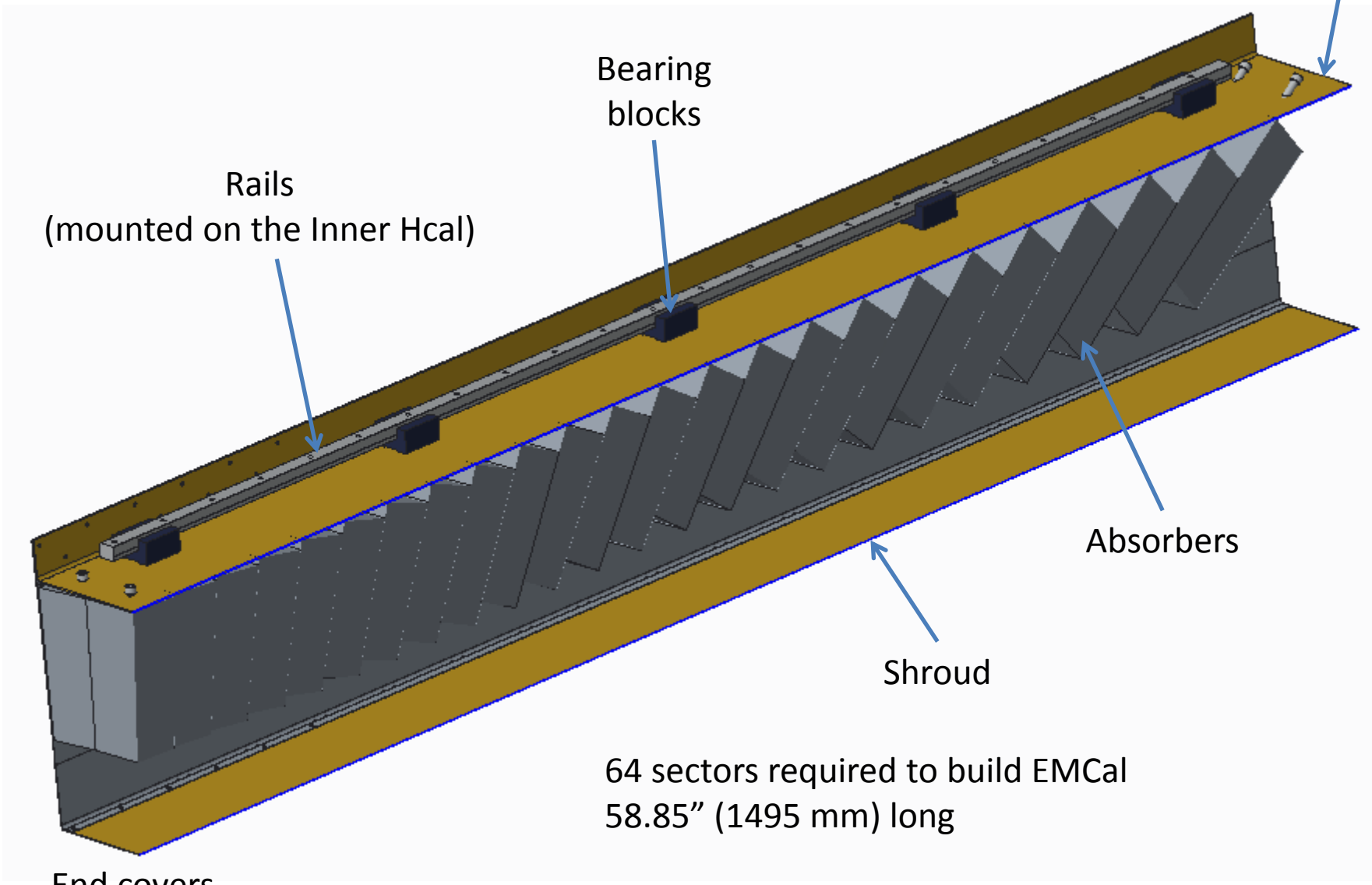
SIZE	DRAWING NUMBER	REV
C	SP00-000-004	A

Q.A. CATEGORY:	SCALE:	WEIGHT:	SHEET 1 OF 1

EMCal Mounting Detail



Sector Section



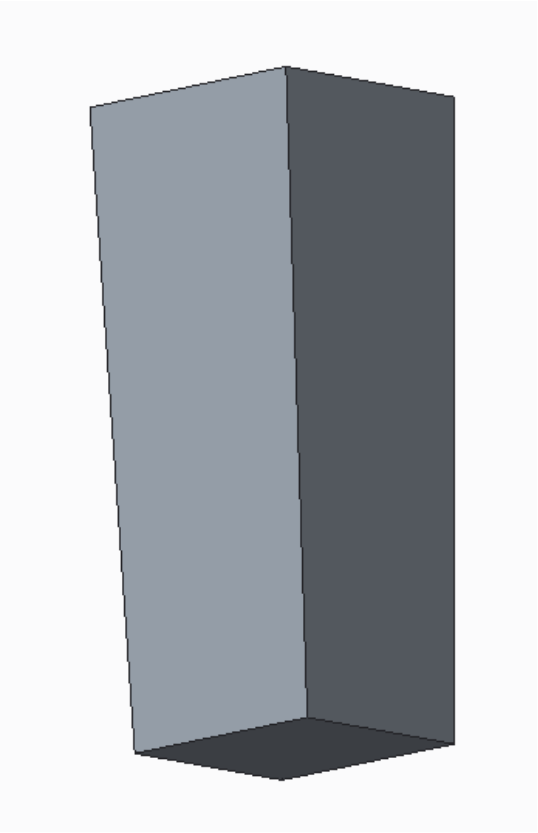
64 sectors required to build EMCal
58.85” (1495 mm) long

End covers not shown

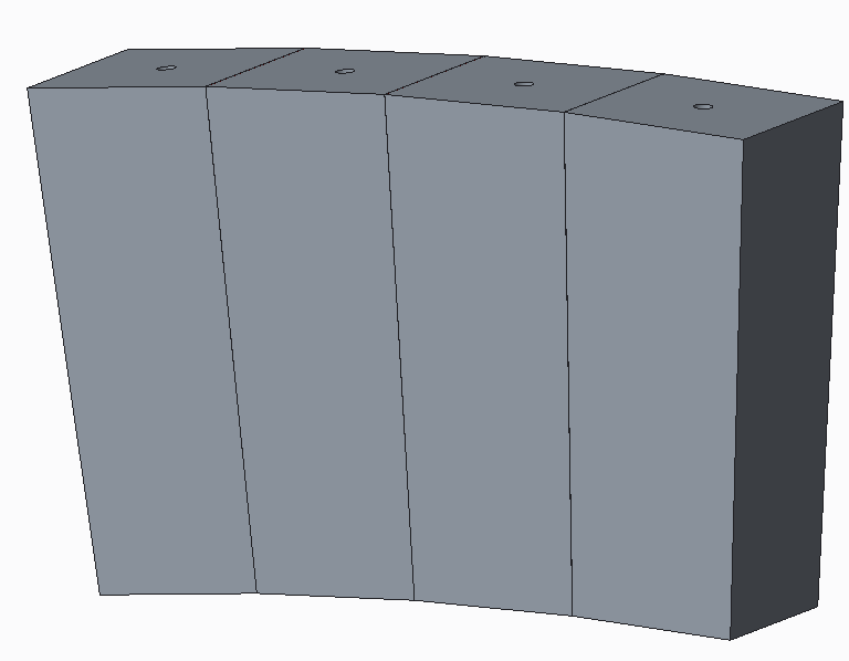
Block Layout

- 4 towers (2x2) = 1 block
- 4 blocks (2x8) = 1 module (row)
- 24 modules (48x8) = 1 sector
- 2x 32 sectors = 1 EMCal
- 24,576 towers = 1 EMCal

1 Block



1 Module



Building Blocks

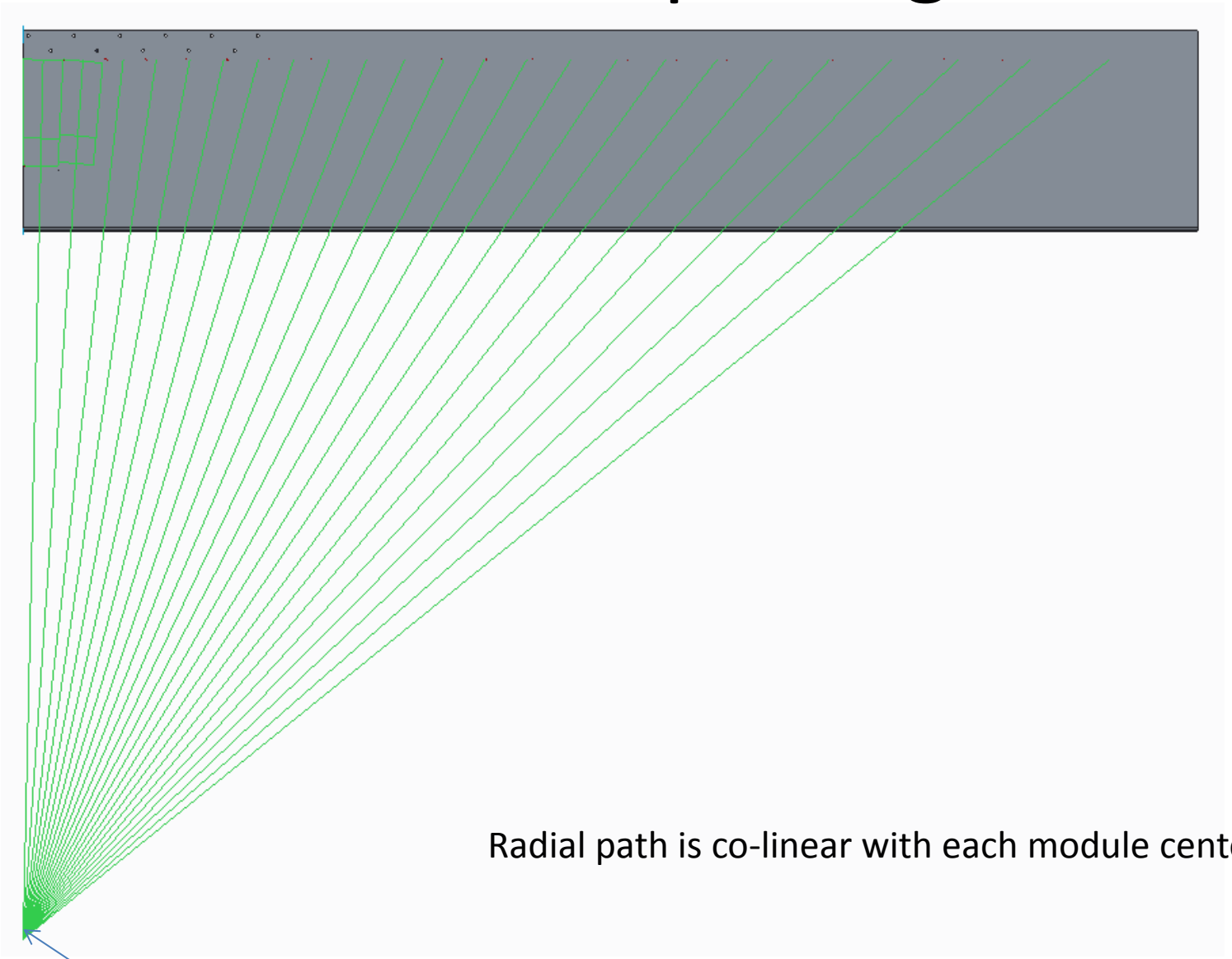
Sector Construction

- Each block is molded and machined
- 1 mold shape per row
- 4 blocks are epoxied together and machined to form a module
- 24 modules are mechanically fastened to the EMCal strongback

Block Shape

- Geometrically driven from EMCal shape & radial particle path from center
- Minimize gaps
- 135 mm minimum length

Block Shape Origin



Structure and load Path

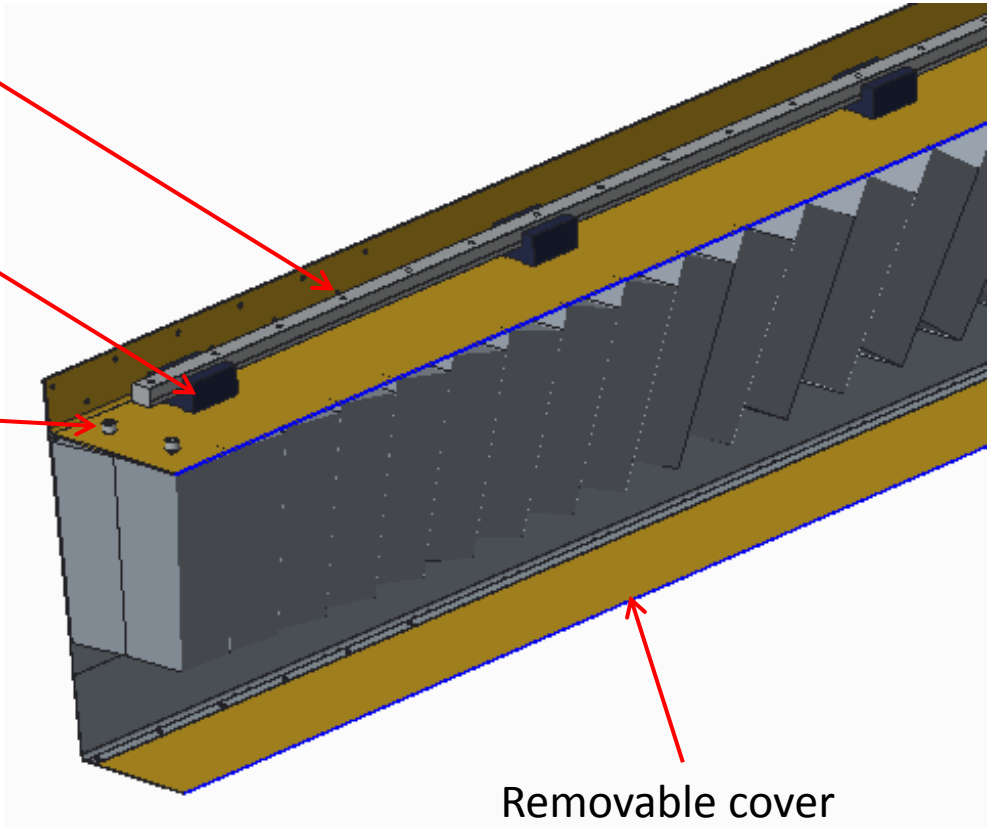
- Stiffness is key!
- Each sector weighs 950 lbf
- 3 & 9 o'clock positions have the most deflection
- EMCal sectors are attached to the inner HCal
  - Ideally Rigid
- HCal interface precision contributes to gap size
- Sectors need the ability to be removed from any position from the ring for maintenance

Sector Load Path

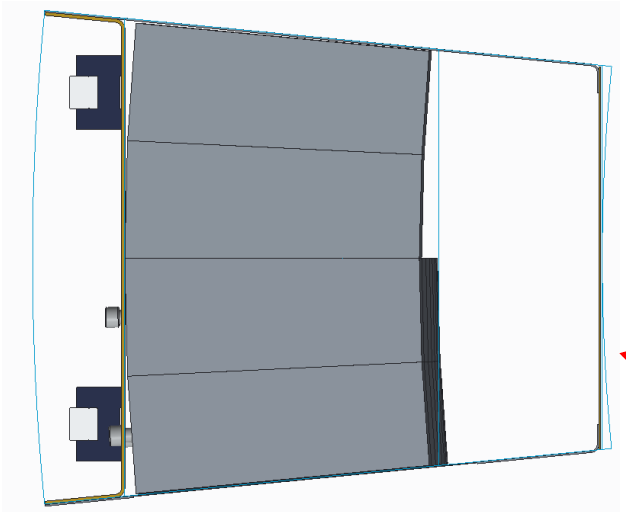
Rails are bolted to inner HCal

Multiple bearing blocks are bolted to the strongback

Each module is bolted to the stainless steel strongback



Removable cover for in-situ access

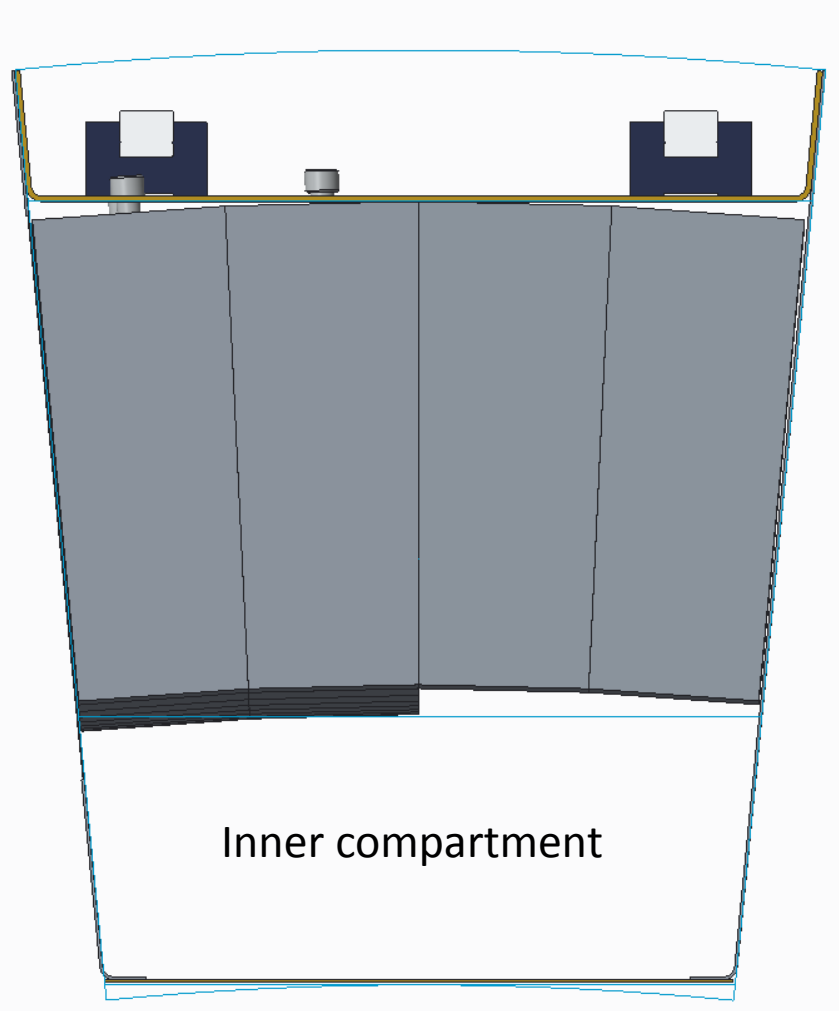


Sheet metal shroud & end covers (not shown) are not part of the structural load path

Load path from modules to HCal is direct!

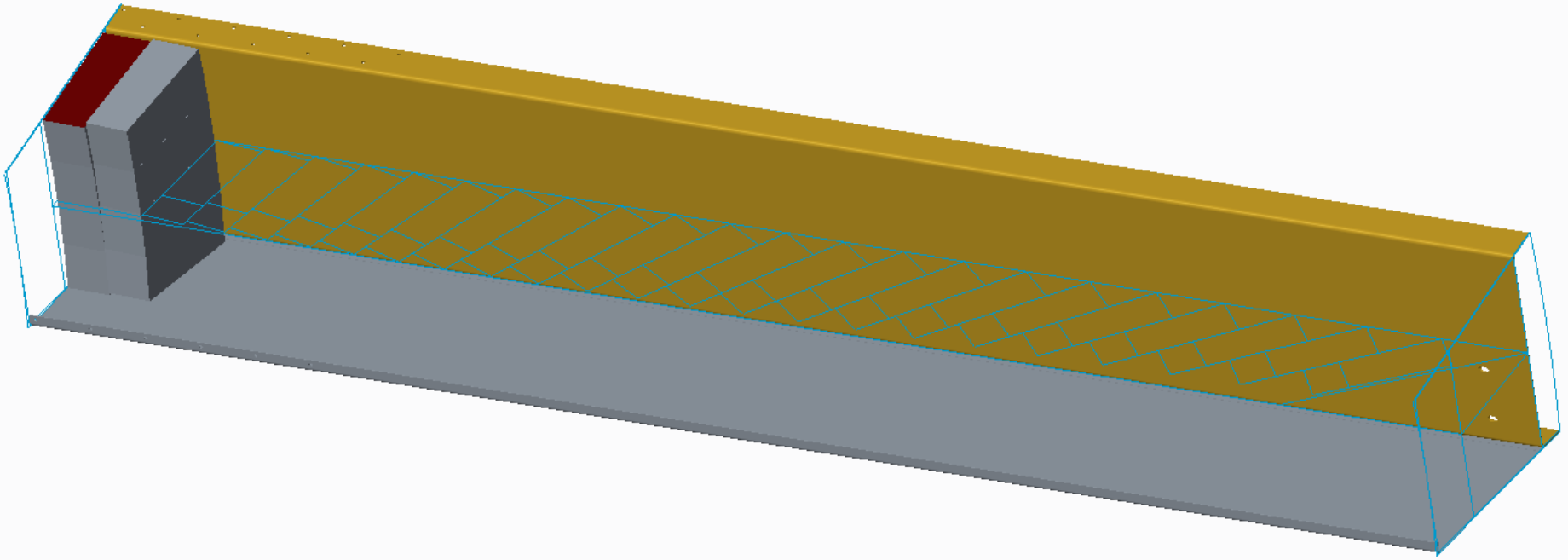
Inner Compartment

- Houses light guides, front end electronics & cables
- Cooling is required for the light guides and electronics
- All penetrations are from external end of EMCal



Assembly

- Assemble on side
- Stress free state
- Minimize gaps
- Add support aft of last module
- Attach remaining shroud skins



Issues & Concerns

- The packaging of the cables, cooling system & electronics in the inner compartment has not been performed
- The cooling scheme has not been incorporated.
- Deflection analysis has not been performed