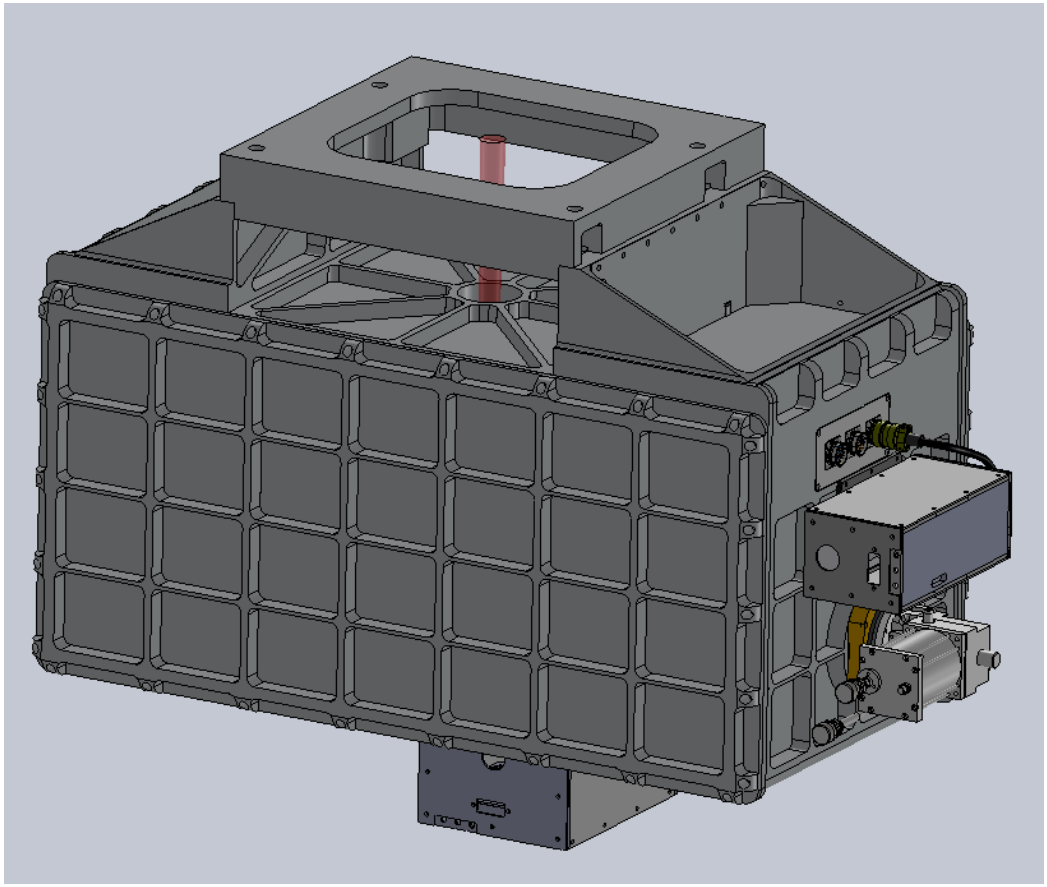
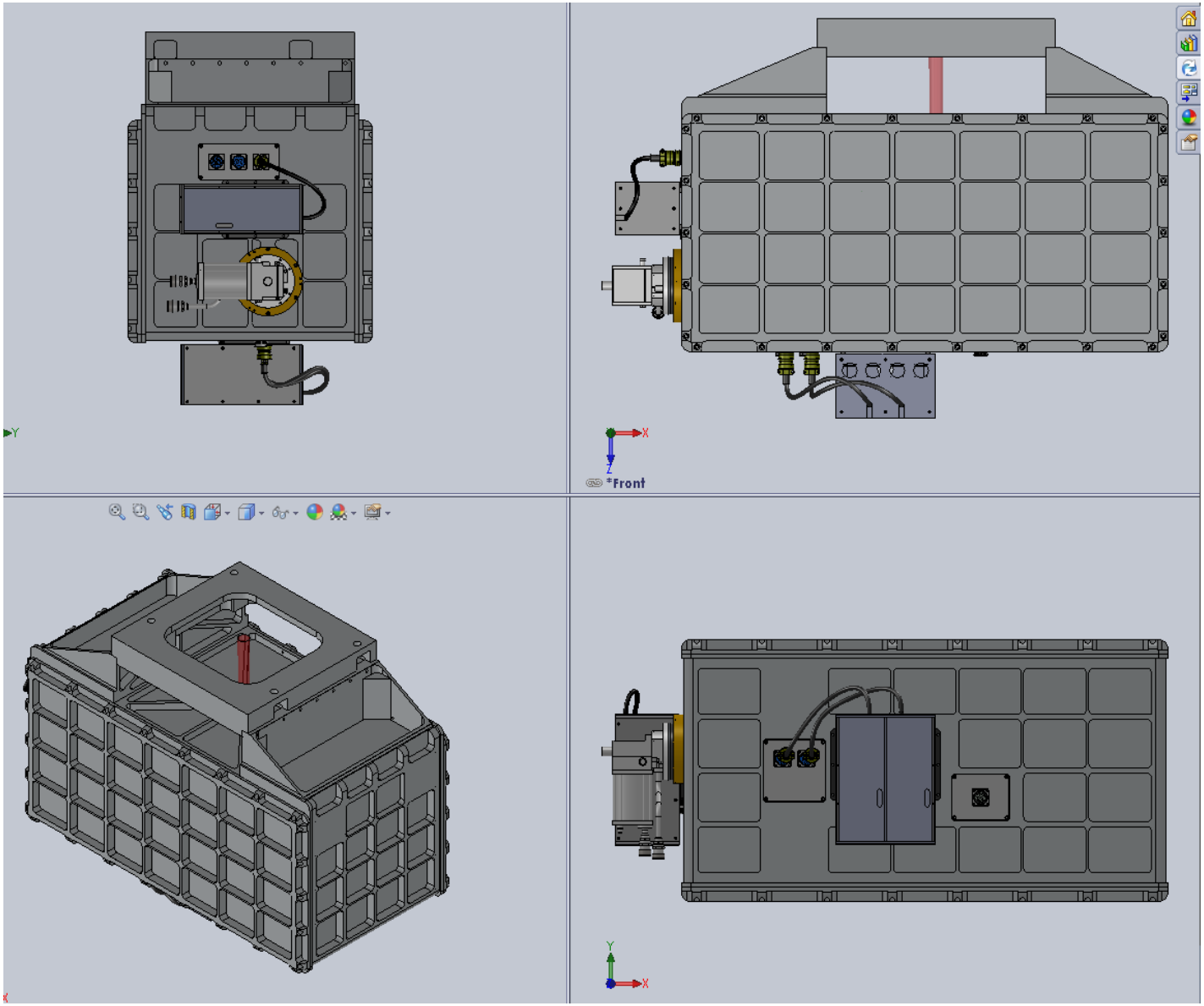
iSHELL Design Review
Cryostat & Optics Bench



Dan Kokubun

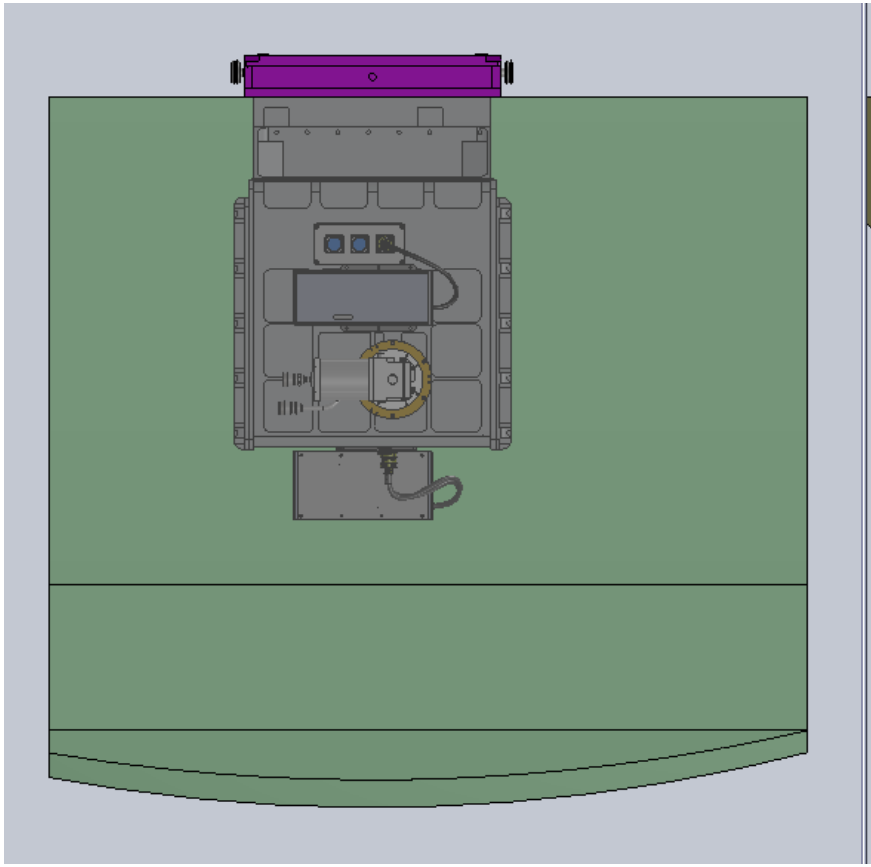
9/11/2013

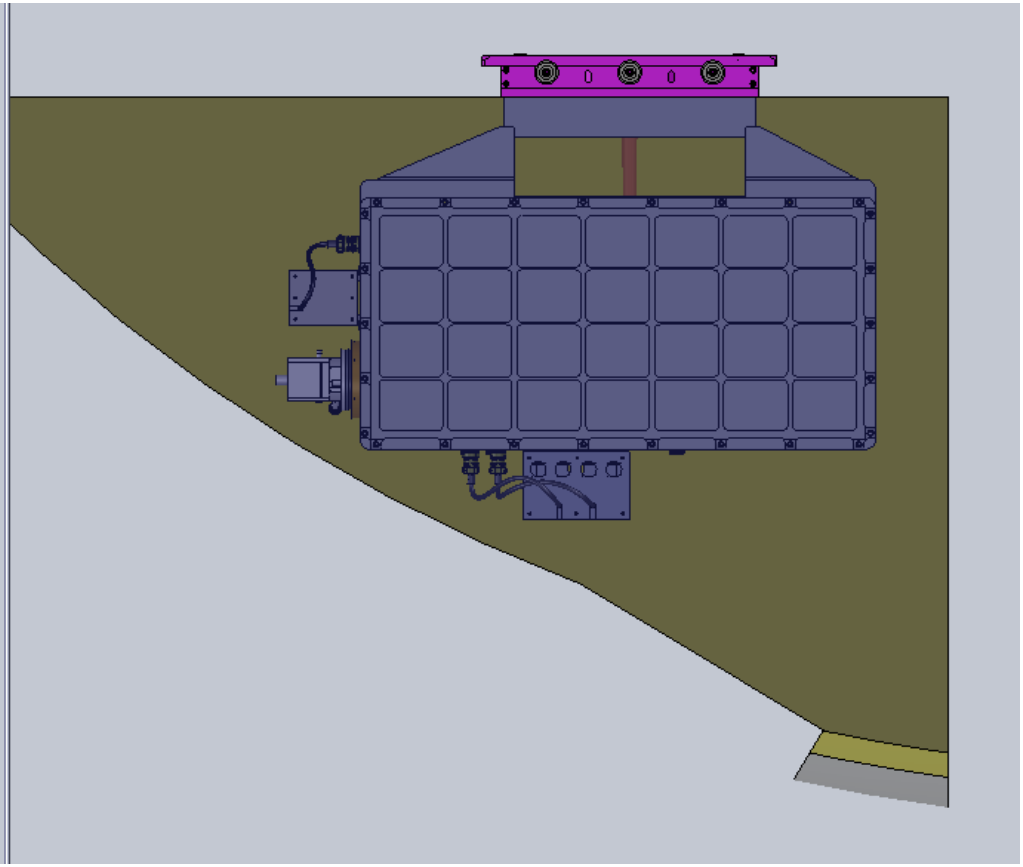
Overview



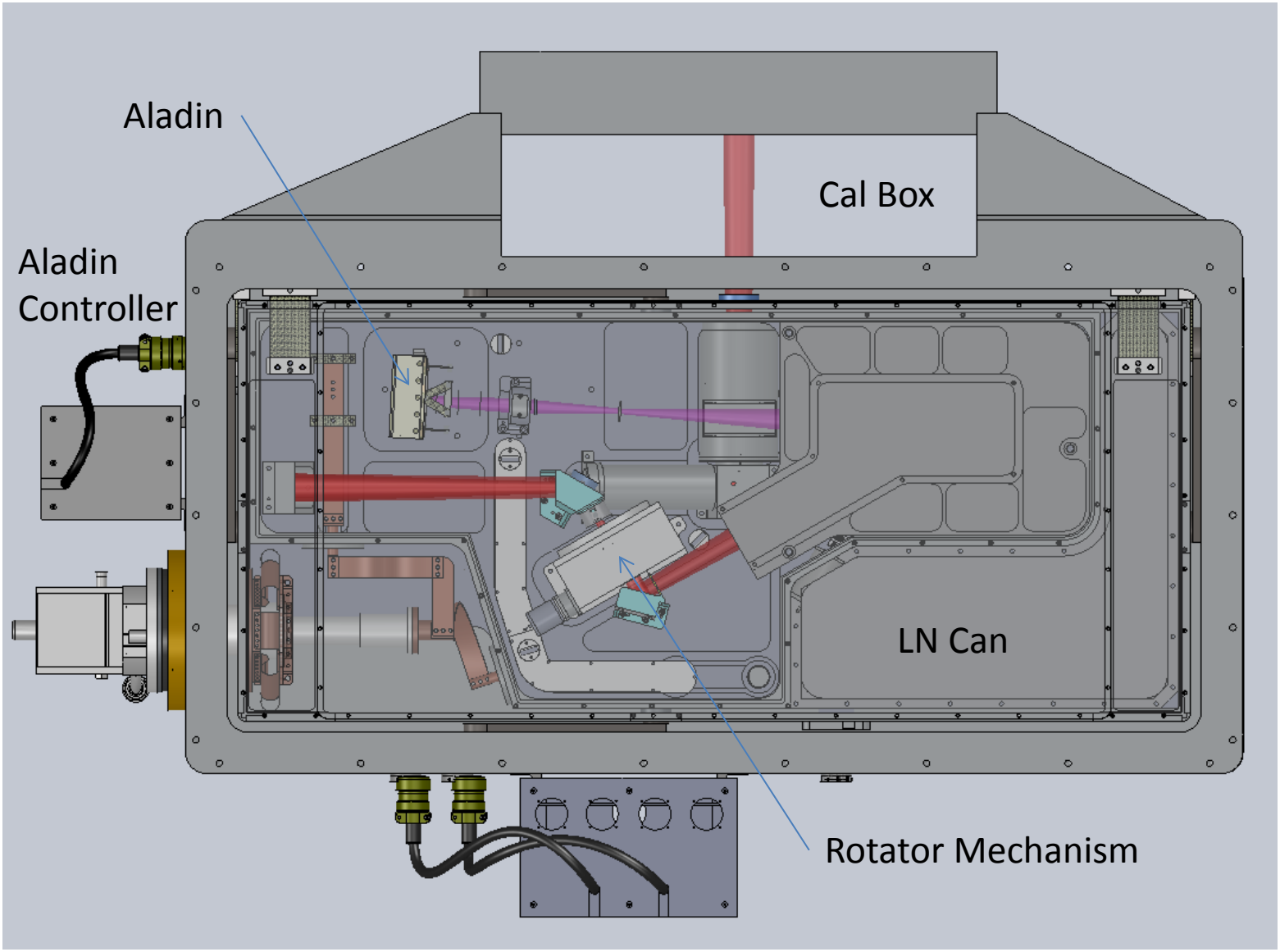
Overview

- Estimated Weight: 1040 lbs
- CG: within 2” of optical axis
- Helium lines run eastward
- Hall Effect box placement TBD

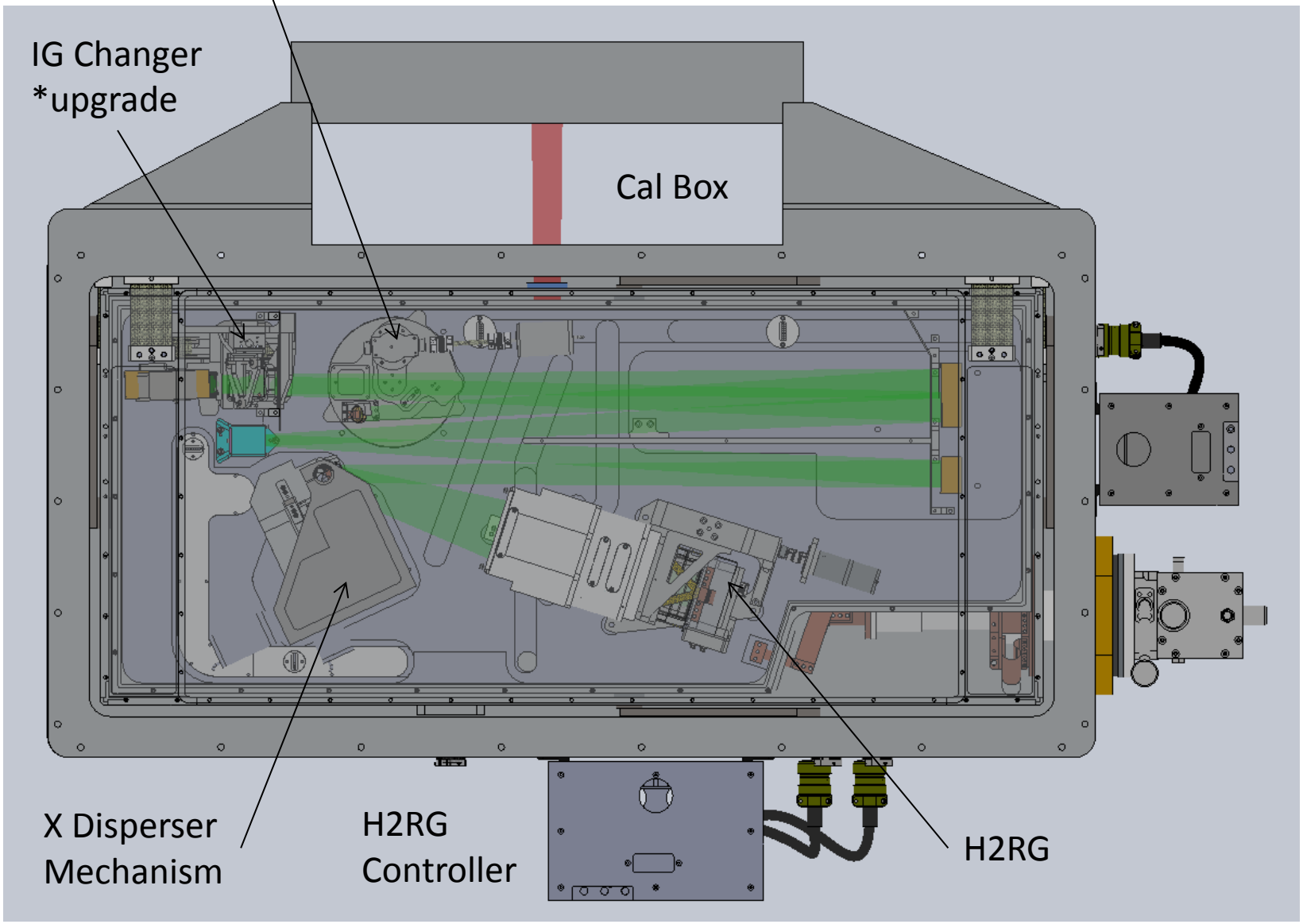




Overview

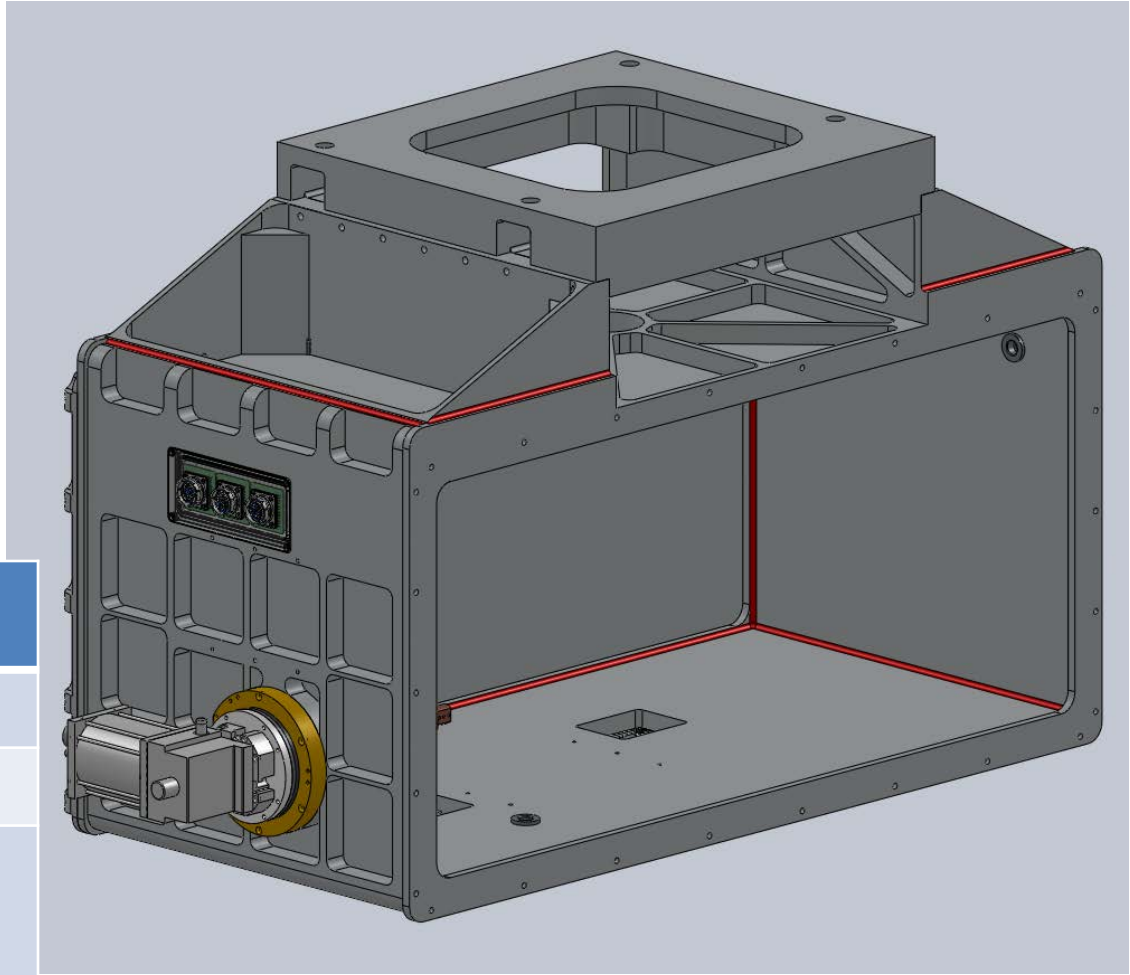


Overview


Order Sorting Mechanism
IG Changer *upgrade
Cal Box
X Disperser Mechanism
H2RG Controller
H2RG

Cryostat - *Housing*

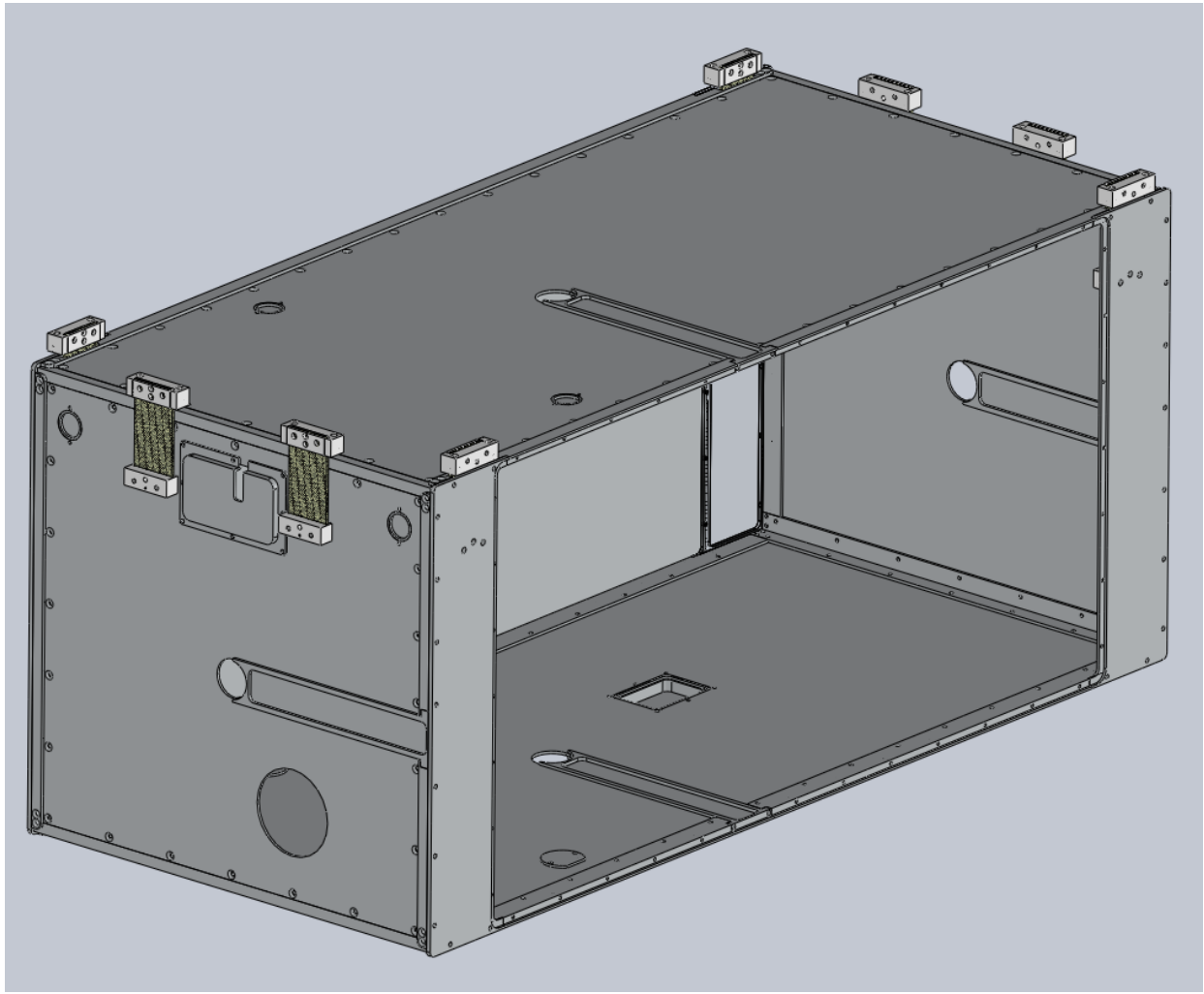
- Welded Structure
- Parts milled from billet
- Inserts for Truss mounts pressed in place



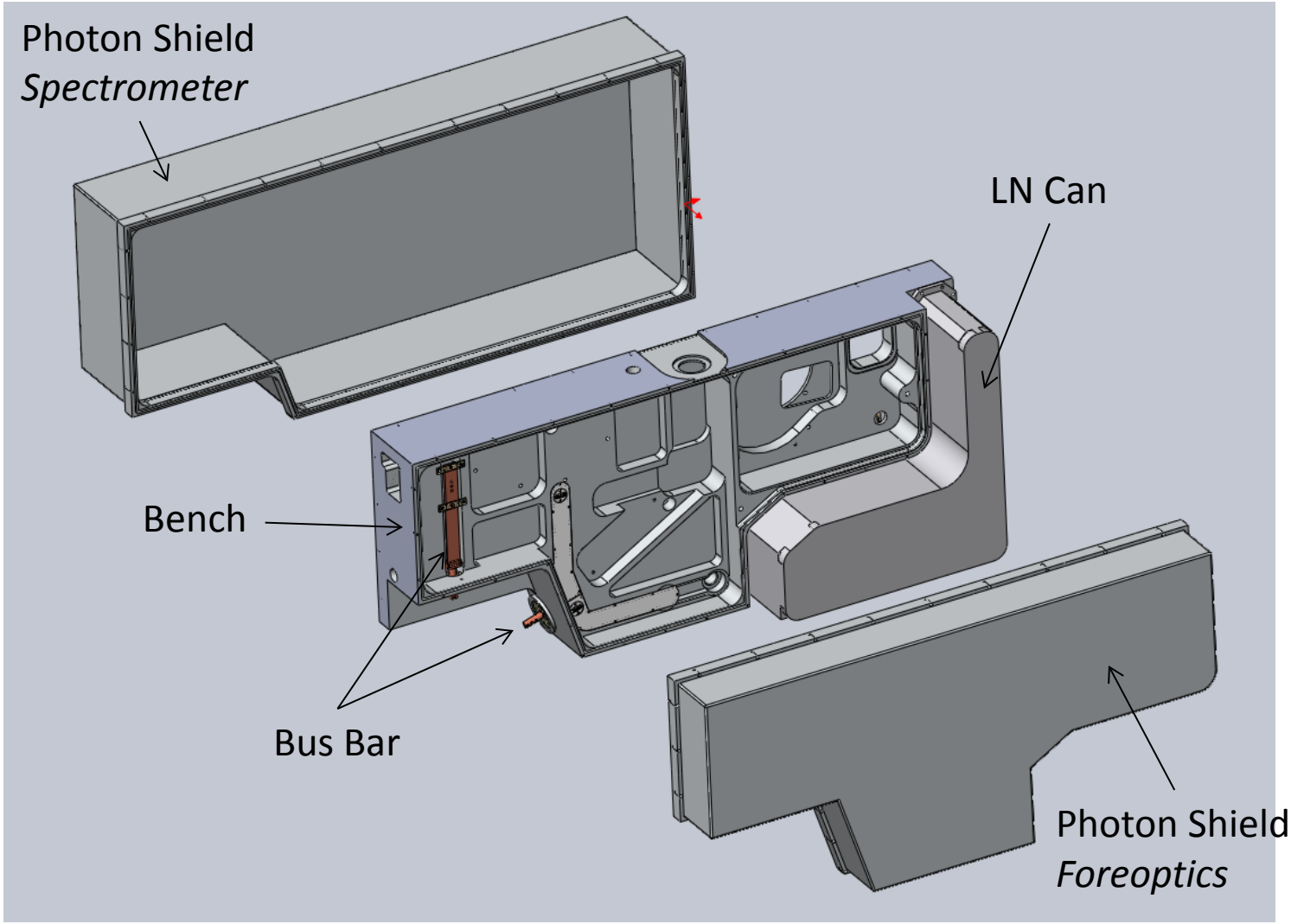
	Tensile Yield	Notes
AL 5083-T0	21 kpsi	No heat treat
AL 5056-T0	22 kpsi	No heat treat
AL 6061-T6	40 kpsi	Heat treat required post welding. Severe warping expected

Cryostat – *Radiation Shield*

- Eight G-10 Mount tabs (1.9W heat load)
- Pre-polished panels
- Access panels for wire harness installation
- Slots for truss clearance during installation
- Covers for access to truss mount bolts

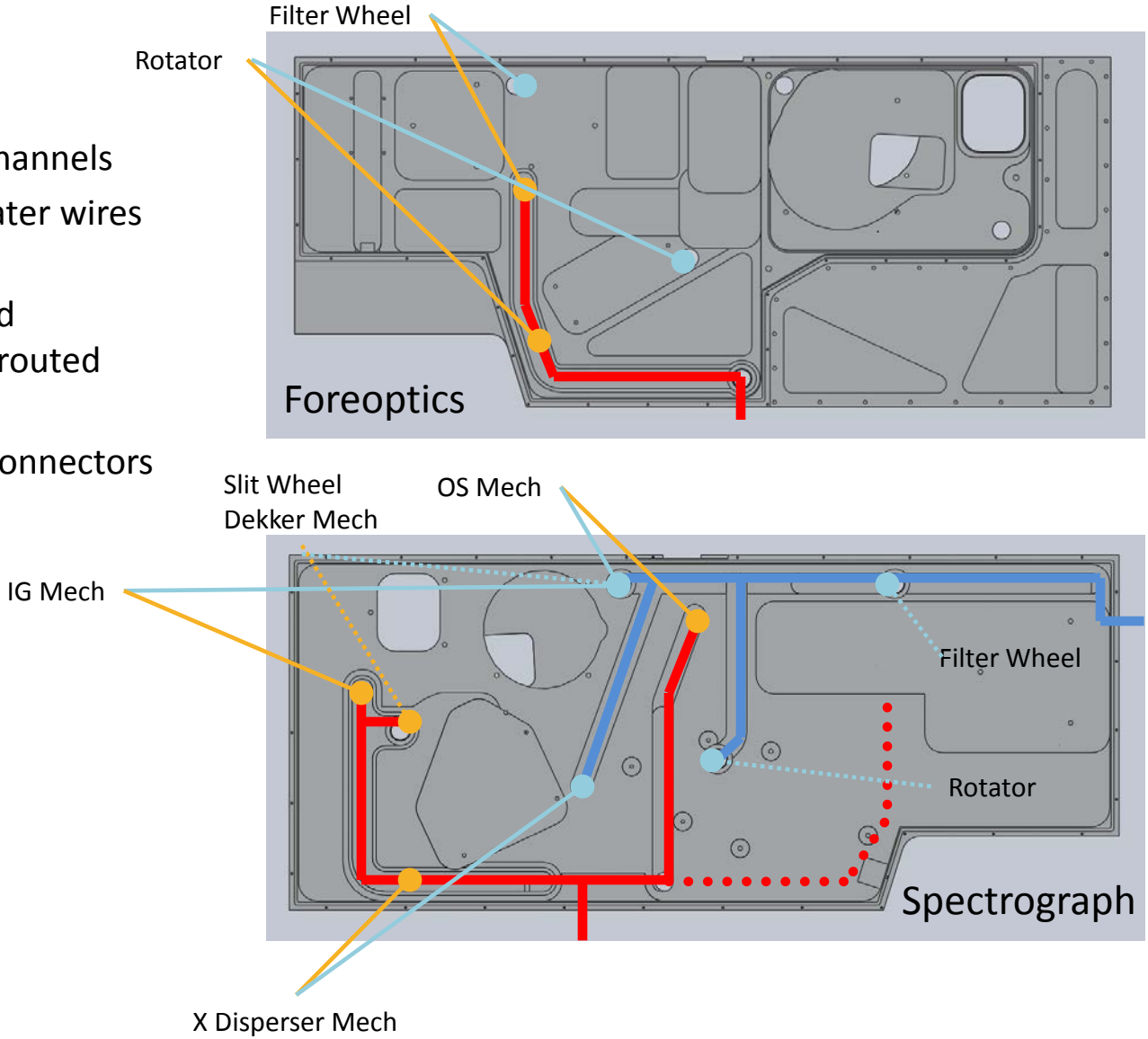


Optics Bench



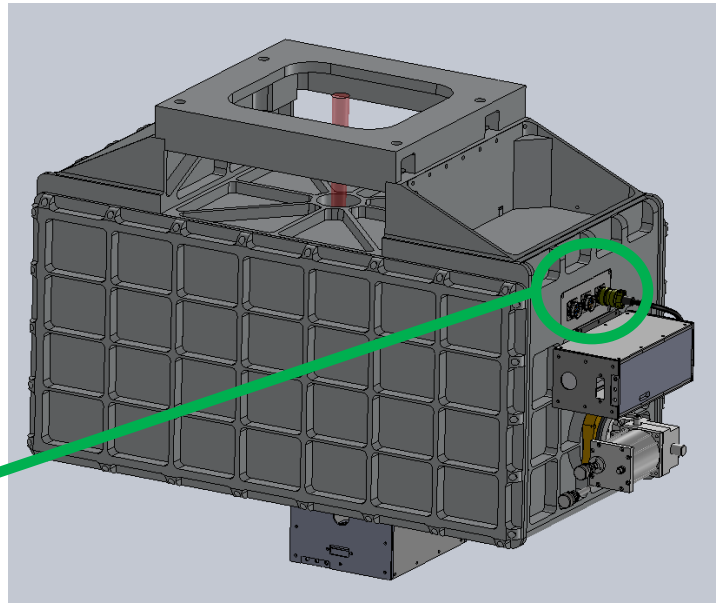
Optics Bench – *Wire Routing*

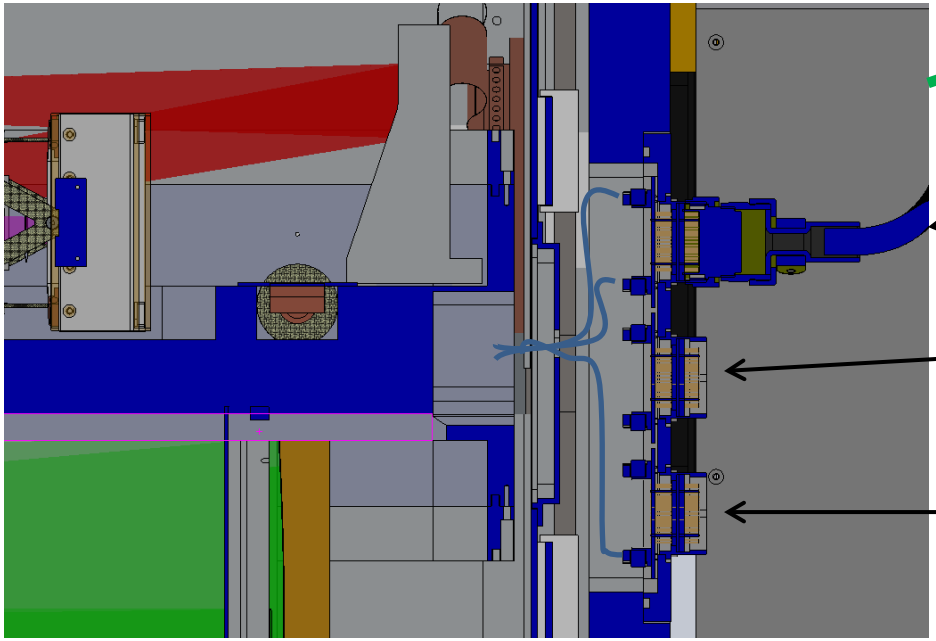
- All wires in covered channels
- Motor power and heater wires routed together
- Hall effect sensors and temperature sensors routed together
- Light tight bulkhead connectors



Optics Bench – *Connectors*

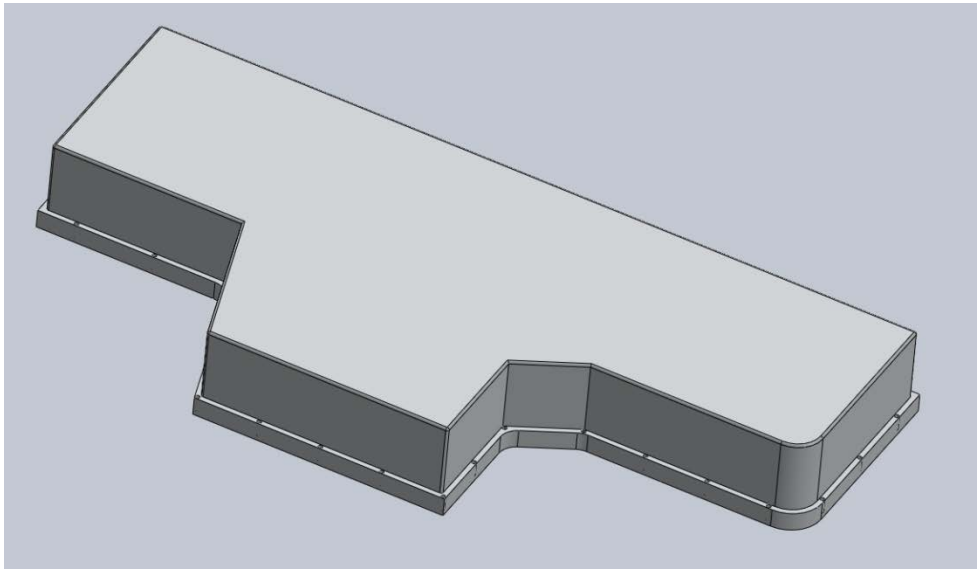
- External access to wire harnesses
- Hermetic connectors epoxied to a single plate
- Radiation shield access panel

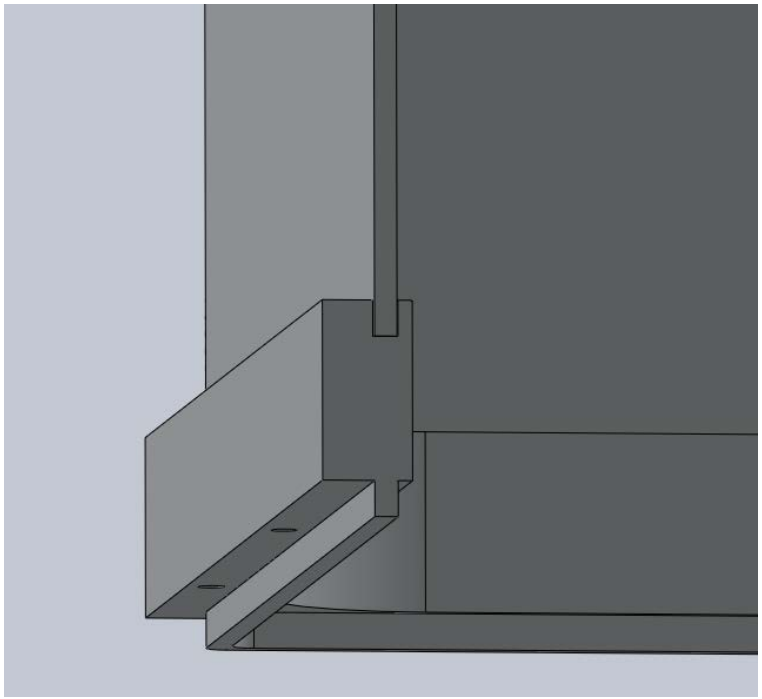




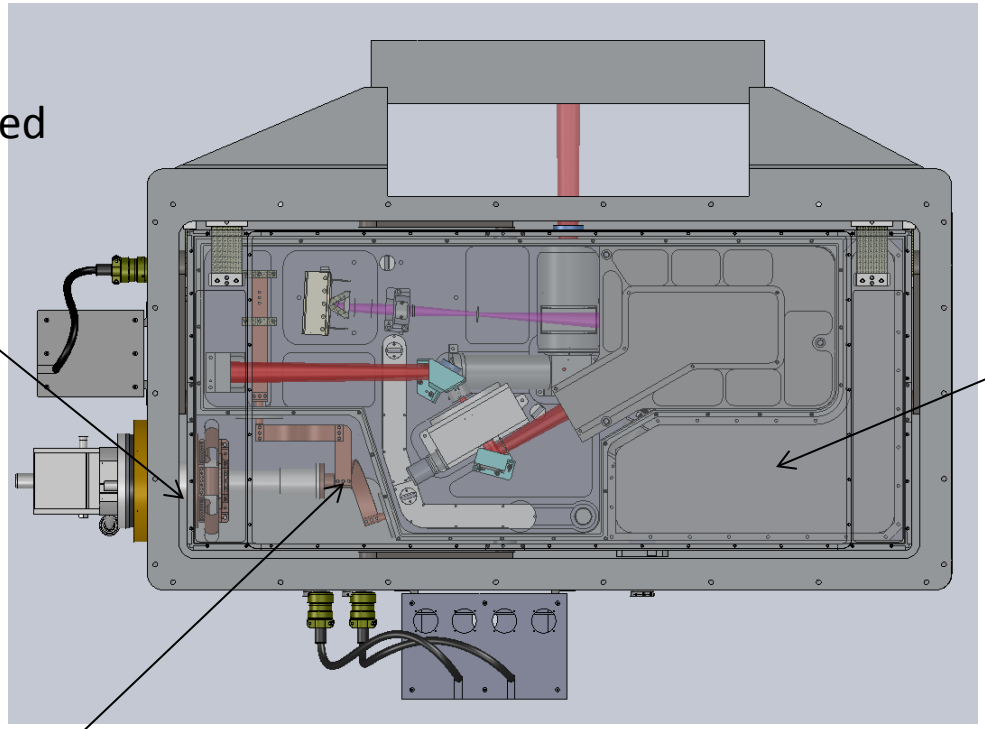
Optics Bench – *Photon Shield*

- Welded Pan (3mm thk)
- Machined Flange
- Epoxied joint
- Painted inside, polished outside
- Qty 32 of #6 screws (4” spacing)



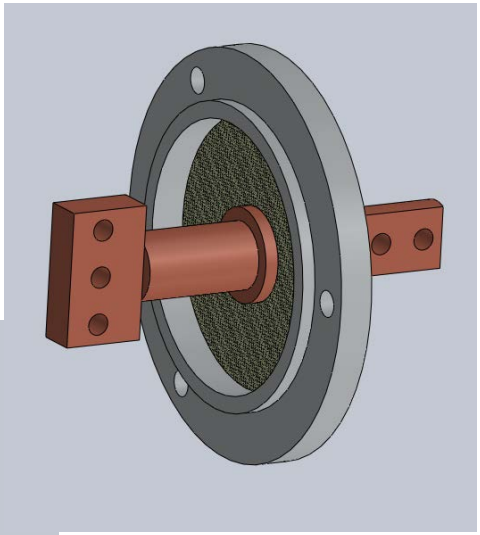


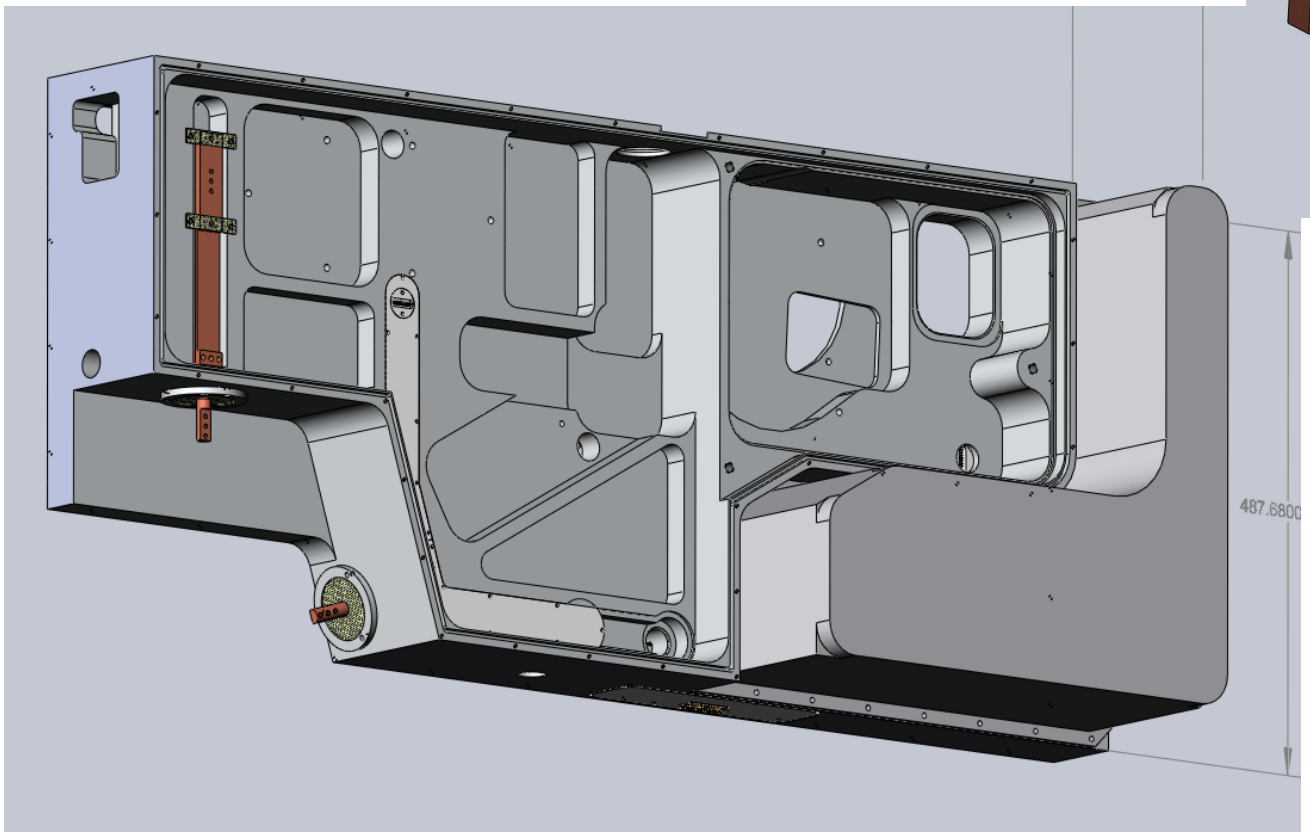
Thermal Design – *Hybrid Overview*



Thermal Design – *LN Can*

- LN Can – milled from billet and welded
- Cooling Bus Bar mouned with G-10 tabs
- Bus Bar Feedthru epoxied to G-10 disk





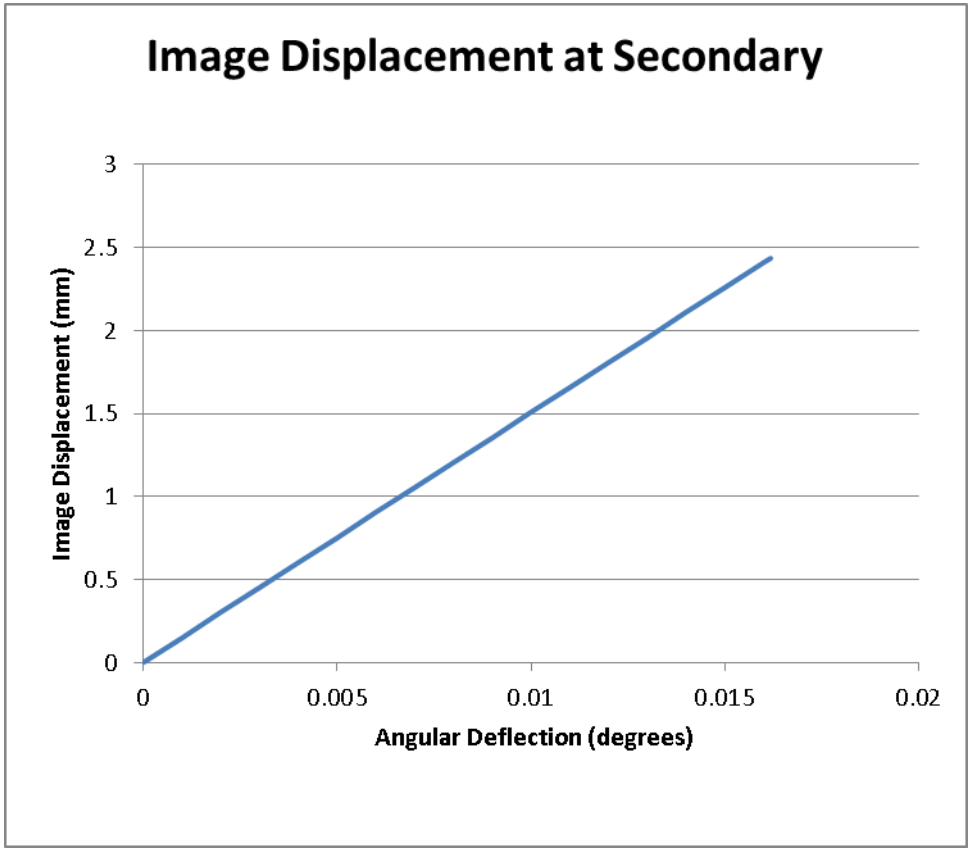
Cold Stop Alignment Requirement

Requirement:

To achieve an absolute flux calibration of 1%, the cold stop and telescope exit pupil need to remain co-aligned to within 1% of their diameters both while observing the object, and while performing the flux standard star observations. – *Instrument Top Level Specification*

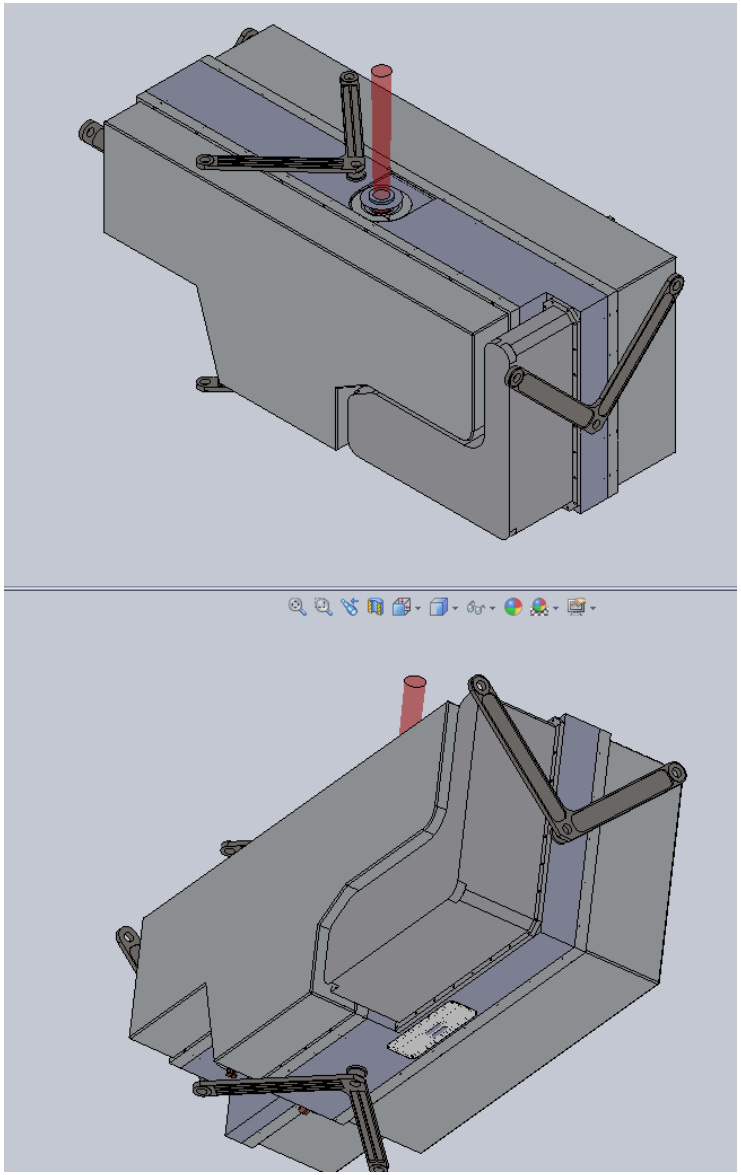
Flow Down:

- +/- 2.4 mm image movement at the secondary
  - 1% of Secondary Diameter
  - Secondary Diameter is 243.84mm
  - Secondary vertex to Instrument mounting face distance is 8632.84mm
- +/-0.016 deg max angular deflection (total budget)



FEA – *Displacements*

- Approximate Results
  - Three Truss: .015 deg
  - Four Truss: .005 deg
    - 4W thermal load



Assembly

- Install radiation shield in cryostat
- Install bench with trusses
- Install RS truss covers
- Install wire harnesses and RS access panels
- Install photon shields
- Install remainder of radiation shield mount tabs (2 per side)
- Install radiation shield panels
- Install cryostat covers

Notes from Reviewers

- WS: Use 1/32 tabs with G10 washers for the bus bar mounts
- WS: Use Bellville washers under the cold strap screws
- WS: Use t&g on the bus bar feed thru flanges
- Weight Issue:
  - SpeX is 1100 lbs
  - Cshell is 300 lbs
  - Consider weight reduction possibilities for iSHELL\
- WS: Reuse SpeX handling equipment if possible
- RC: Find out if the cryostat vendor will do post weld stress relief
- WS: Make sure the truss mounts are correctly positioned post welding
- DW: The radiation shield has over constrained tabs.
- ??: Add captive screws on the photon shields
- JR: Add a key on the wiring slide (what is blue and what is red)
- WS: Epoxy needs to be painted where light leaks are an issue
- EW: Use separate holes in the radiation shield for the Aladdin and the other wiring
- Multiple: provide more space for wire harness service loops under the connector plates. Suggest making a top hat out of the connector plate.
- RC: Use #6-40 screws on the photon shield if larger screws cannot be used.
- Don't forget to include temperature sensors for engineering evaluation
- Need to resolve epoxy vs. welding approach for the photon shields
- JR: Need a getter on the cold finger
- JR: Need to fine tune the A/L for the bus bars and flexible straps
- AT: Review the FEA with Vern and Morgan
- AT: Need to develop an assembly plan and handling equipment
- Need to make the cryostat bigger. Allow for ½" clearance between the radiation shield and the cryostat/bench. DK: Will also consider making the photon shield flanges wider to accommodate larger screws.
- AT: have followup detailed design reviews in two parts
  - 1. Discussion of assembly and optical alignment
  - 2. Final review at the 100% completion mark
- JR: Add the Slit viewer assembly in the applicable slides