

Module 0 Build Progression

ArgonCube Engineering Meeting

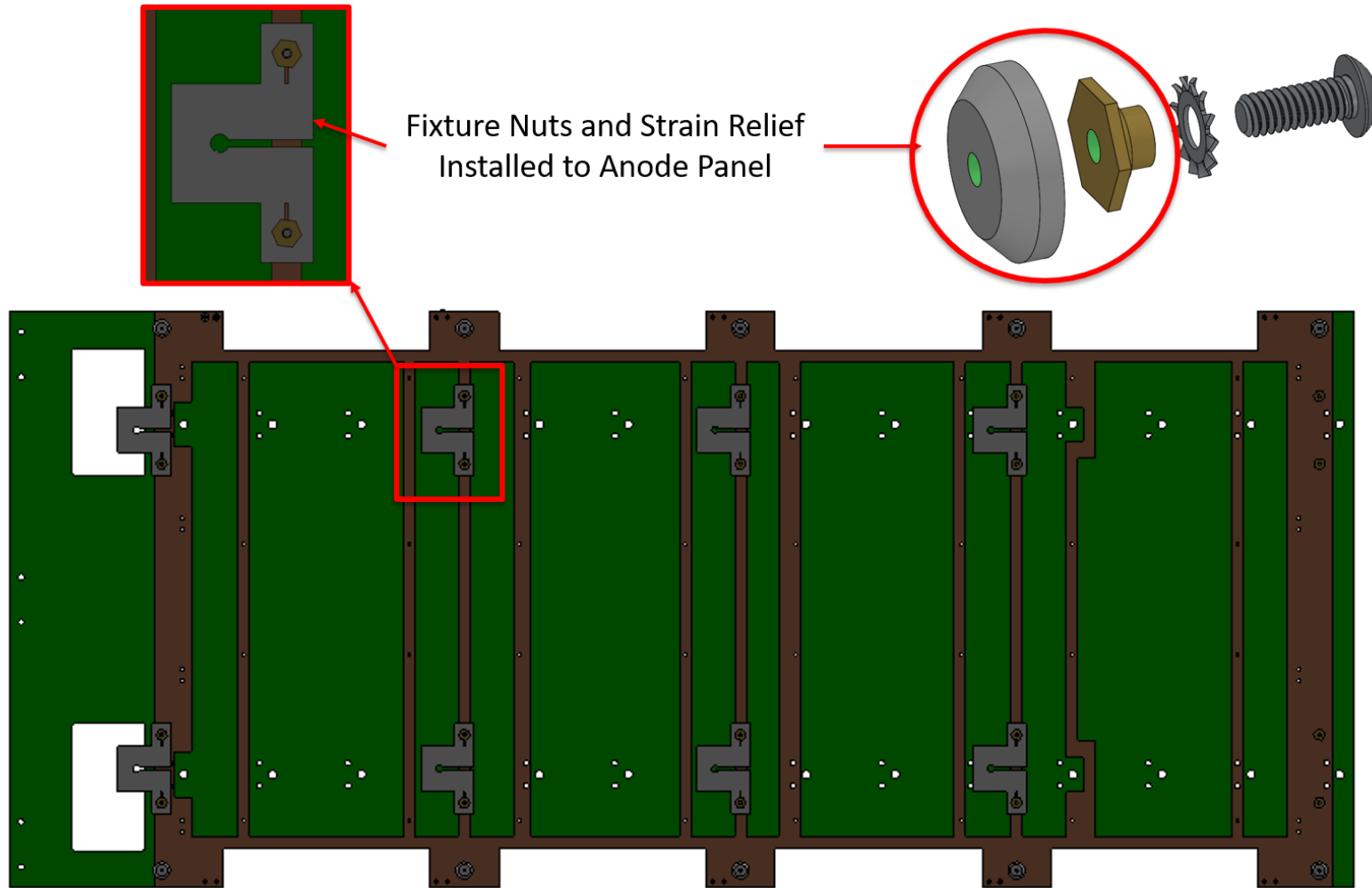
February 28th, 2020

Andrew Lambert

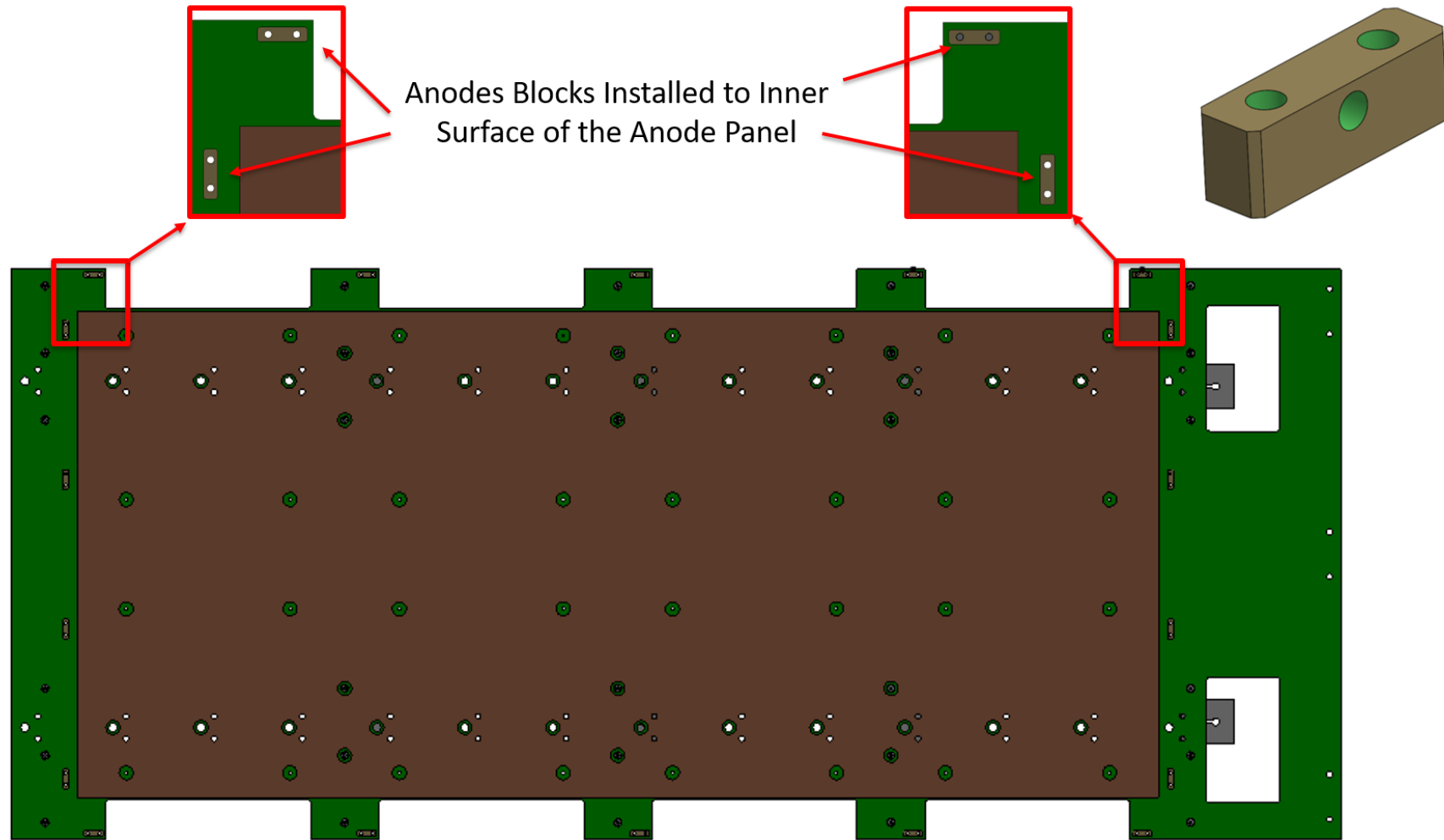
Agenda

- Anode Assembly
- Cathode Assembly
- Field Cage and HV Assembly
- Final Module Assembly
- Summary

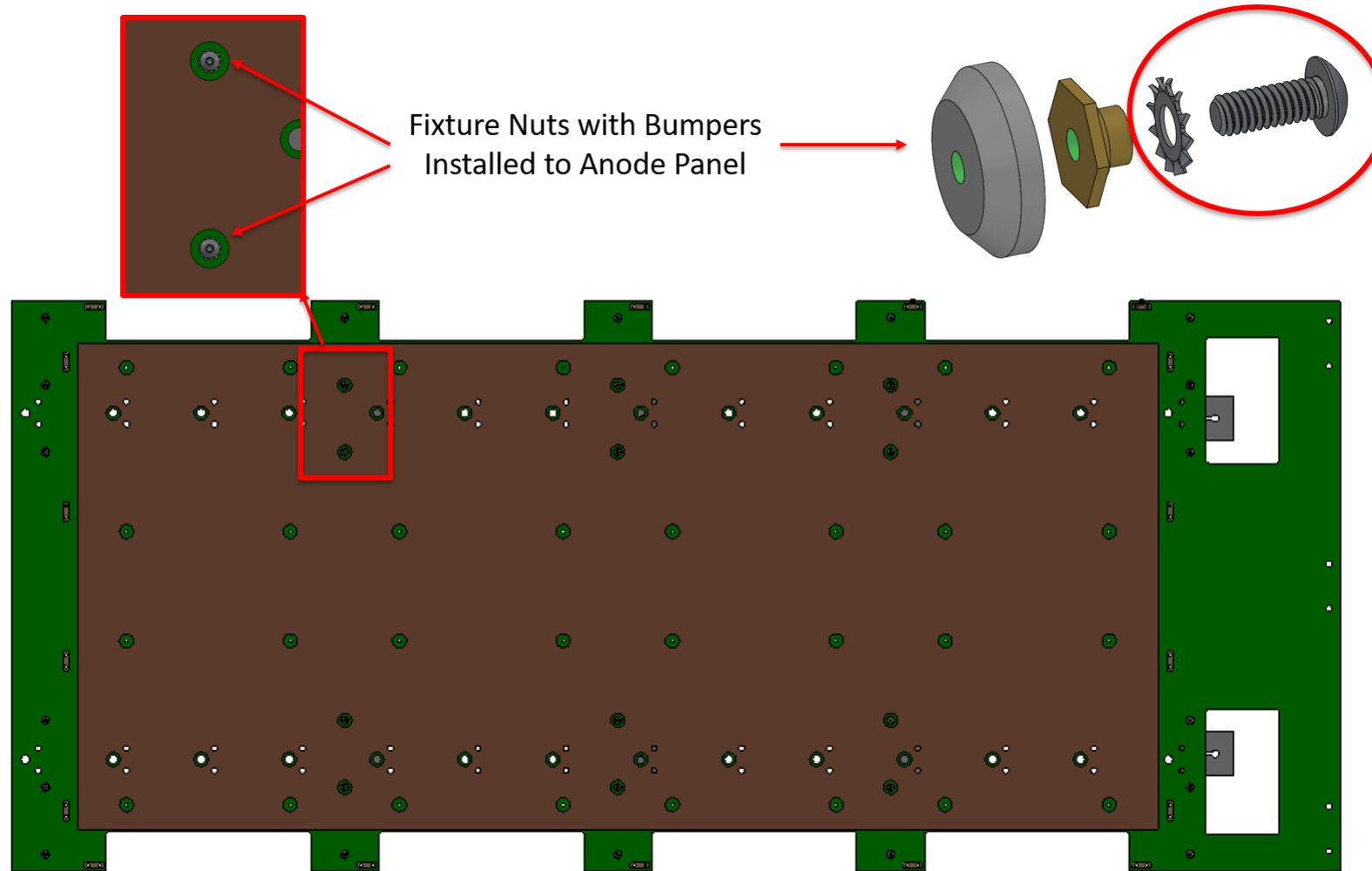
Anode Pre-Assembly



Anode Pre-Assembly

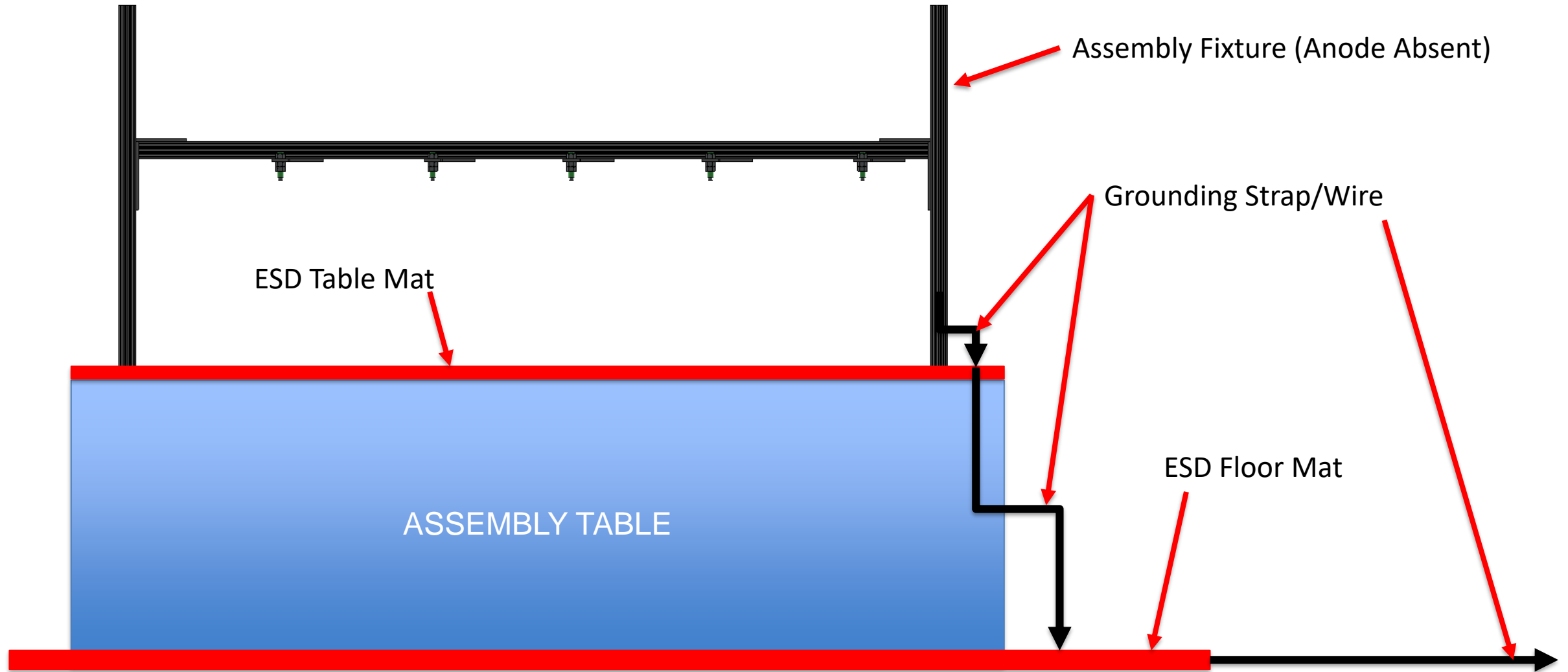


Anode Pre-Assembly

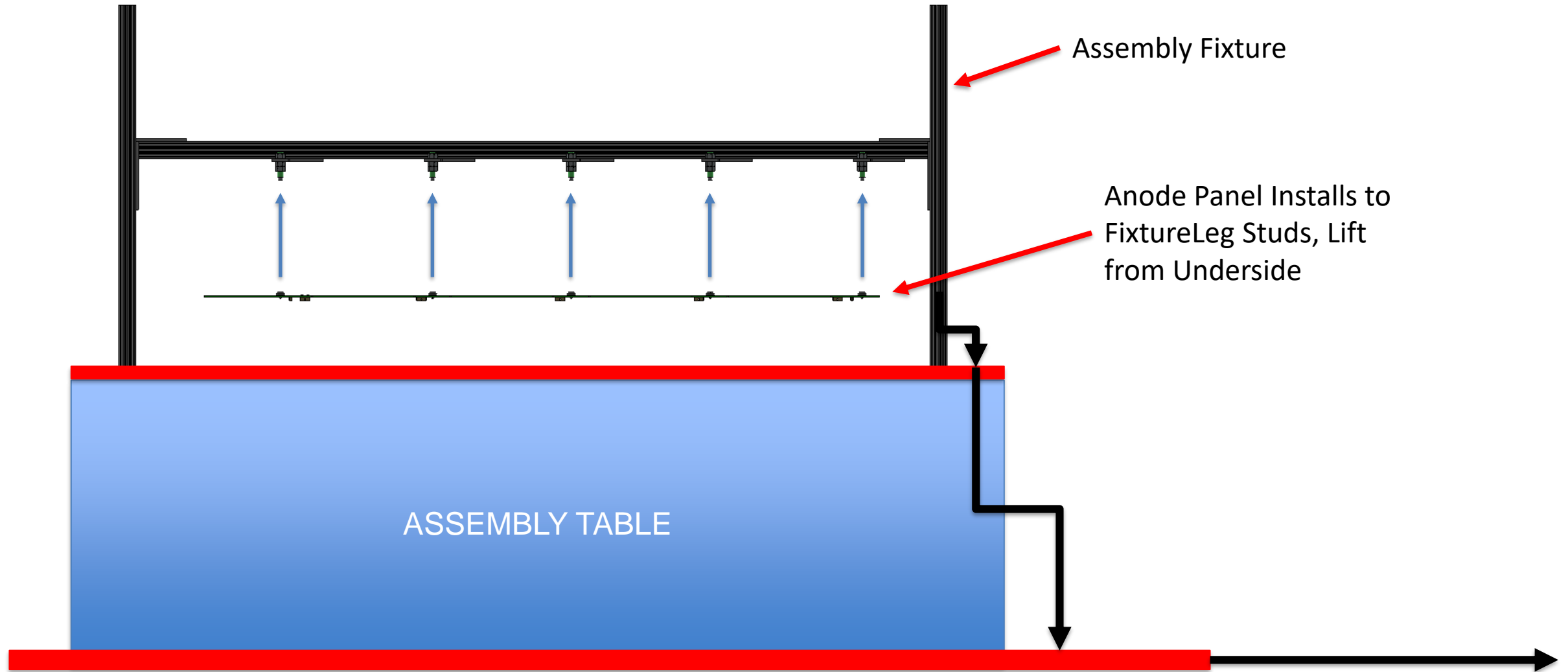


Would be possible to receive the anode panel from SLAC with this pre-assembly completed?

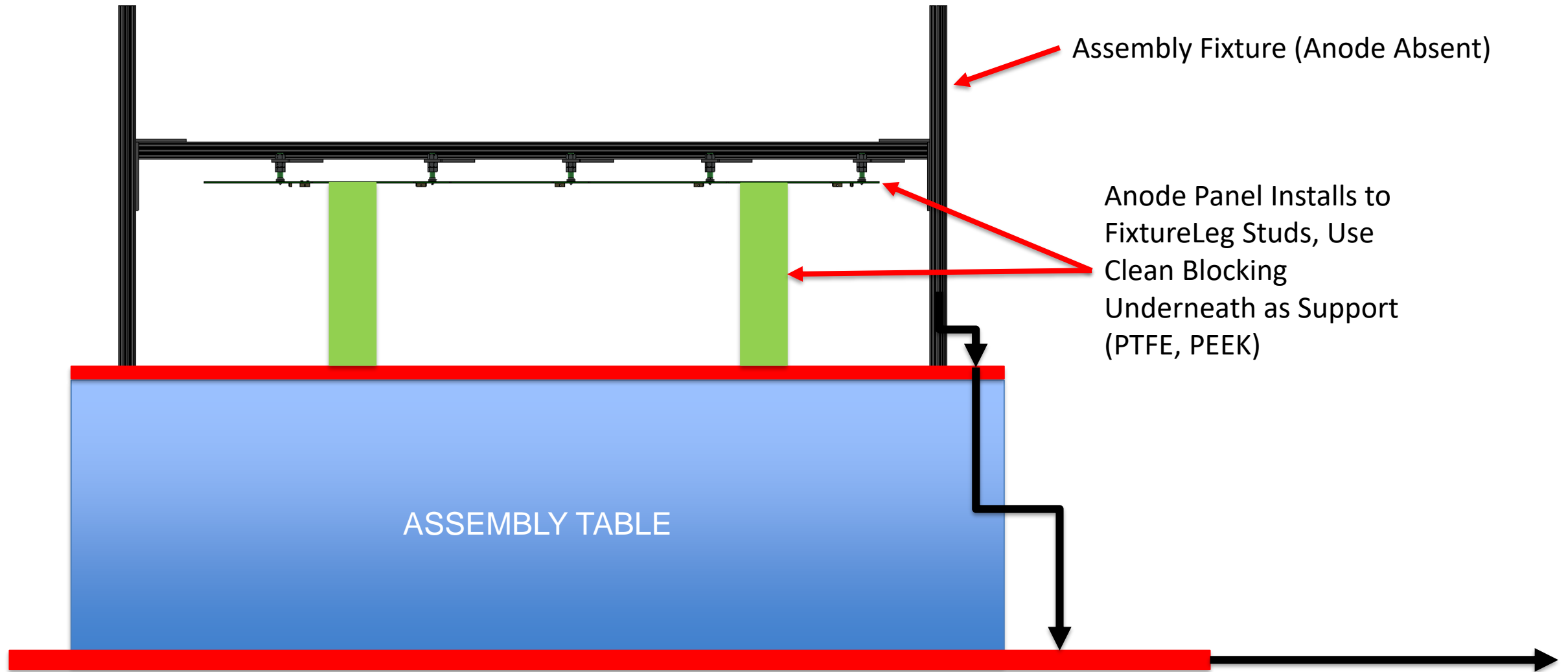
Anode Assembly Area Setup



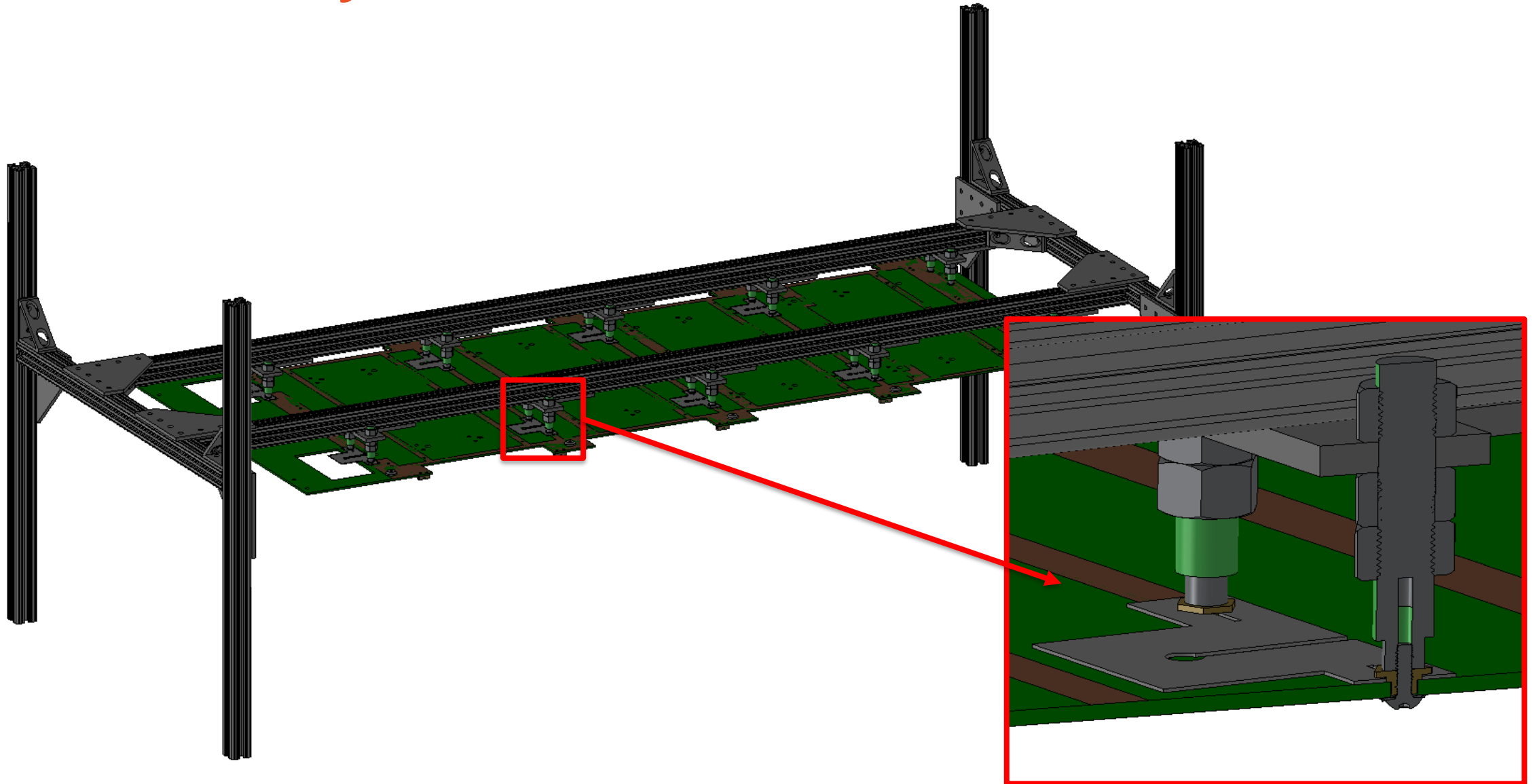
Anode Assembly



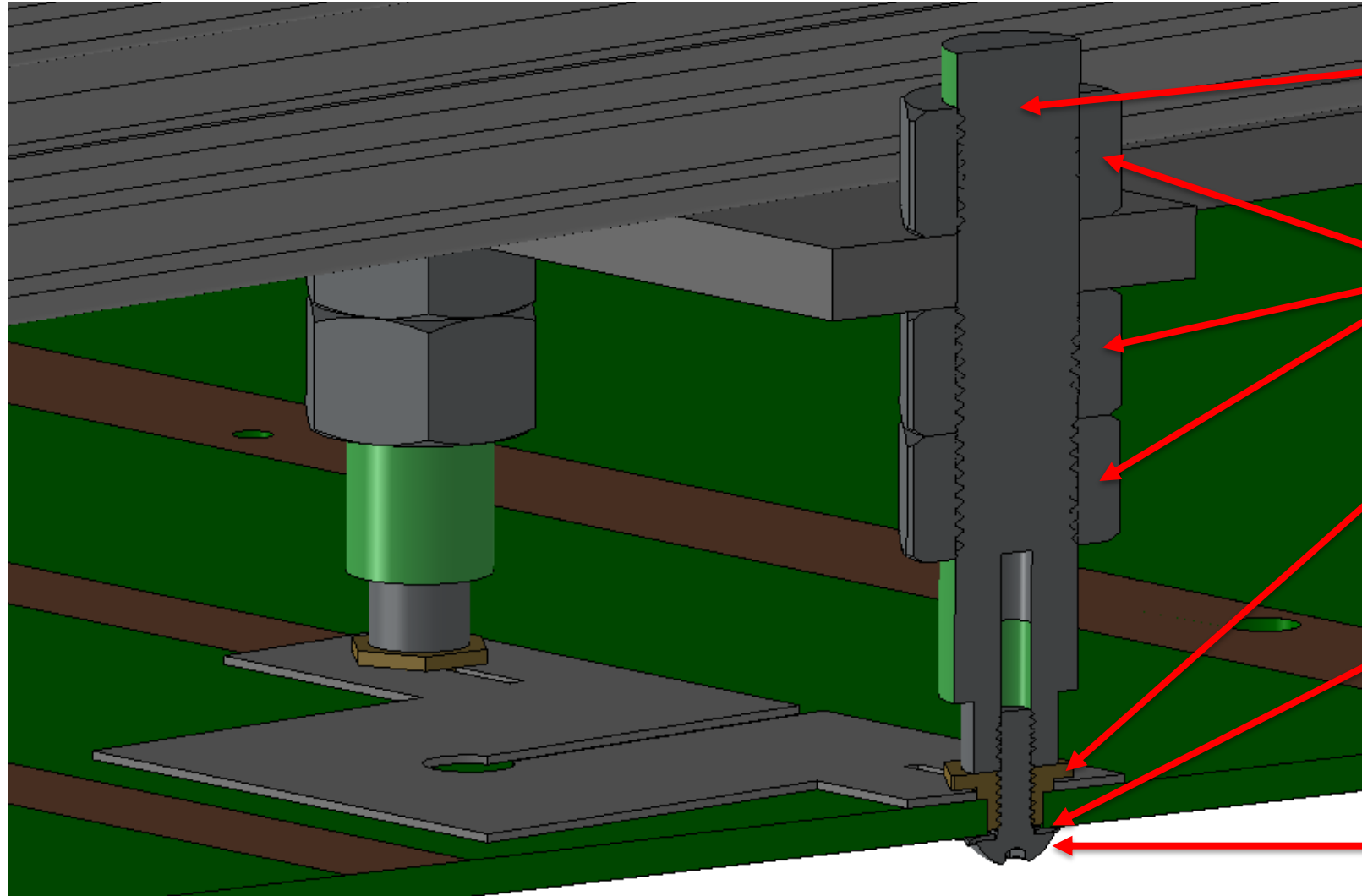
Anode Assembly



Anode Assembly



Anode Assembly



FixtureLeg Stud

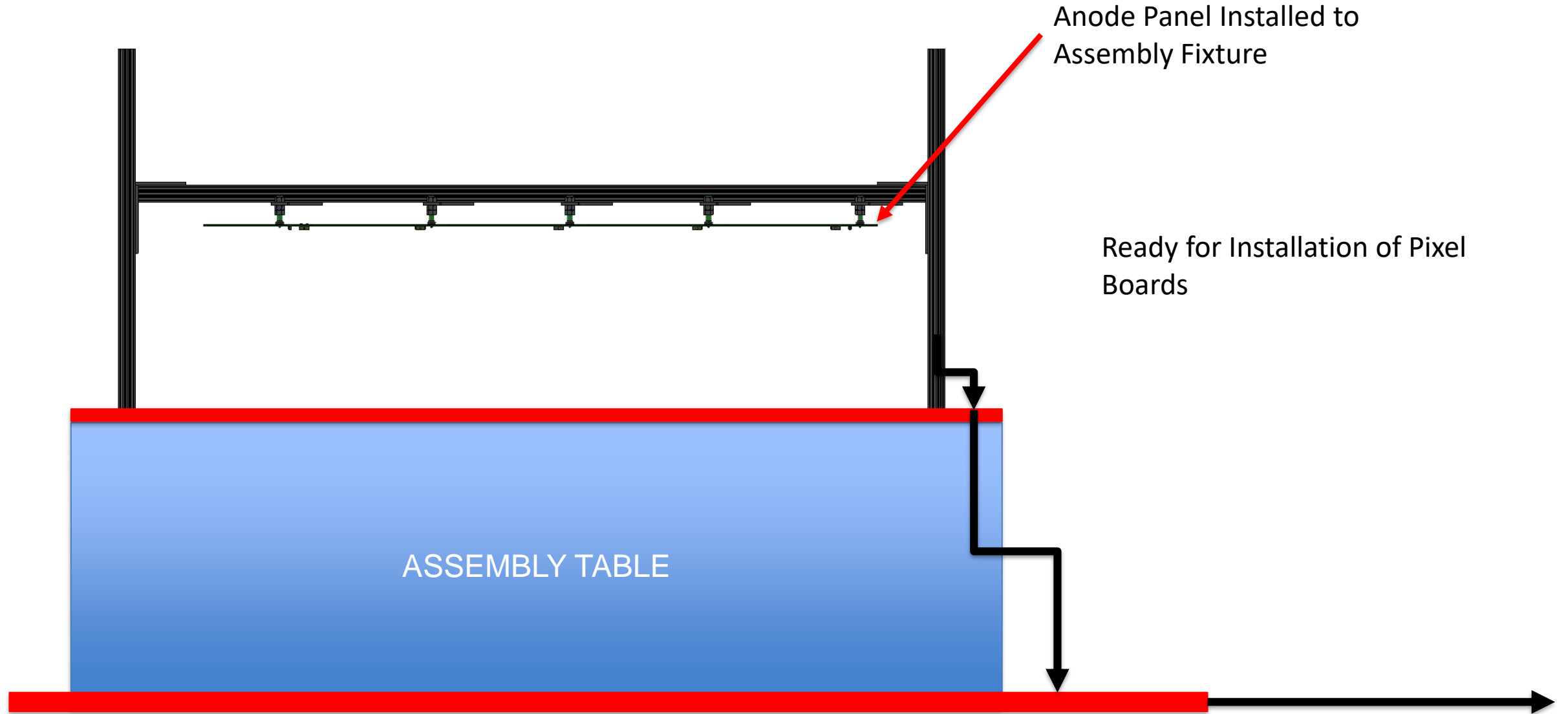
18-8 Stainless Steel Hex
Nut, 1/2"-20 Thread Size
McMaster 91845A145

Fixture Nut

Mil. Spec. External-Tooth Lock
Washer for Number 8 Screw Size
McMaster 97775A220

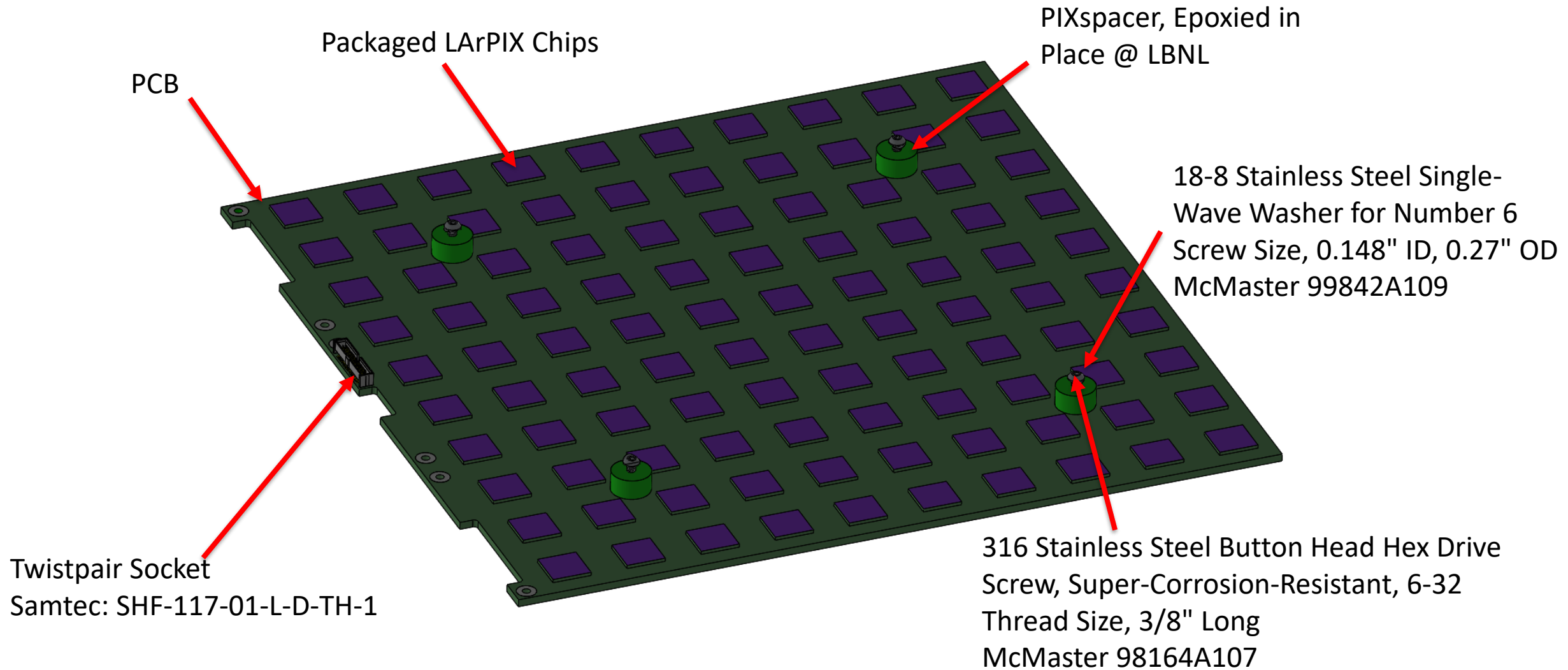
18-8 Stainless Steel Button
Head Hex Drive Screw, 8-32
Thread Size, 7/16" Long
McMaster 92949A193

Anode Assembly

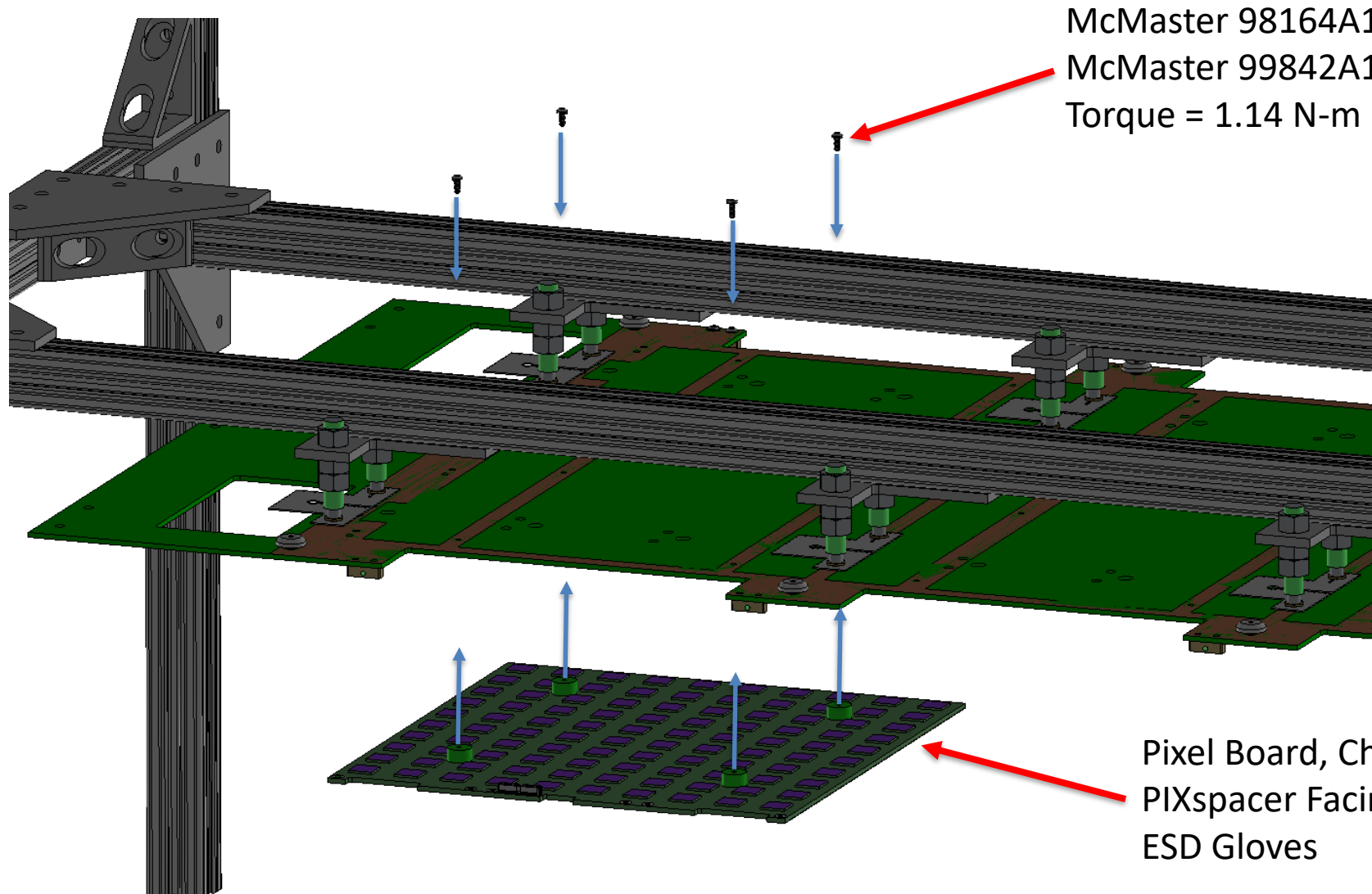


Pixel Board Assembly – As Received from LBNL/UTA

QA Tested @ UTA



Pixel Board Installation to Anode Panel

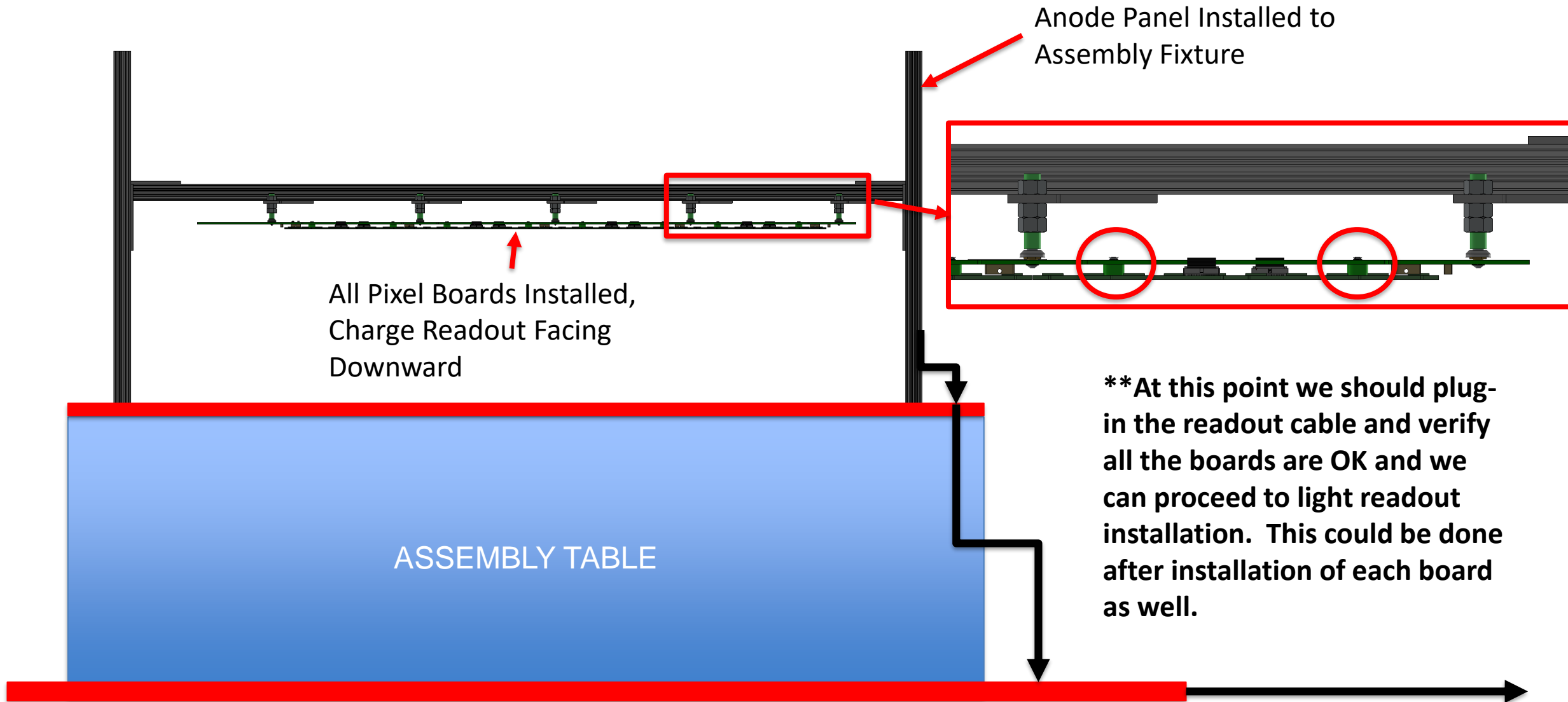


McMaster 98164A107 (4X) &
McMaster 99842A109 (4X)
Torque = 1.14 N-m (10.1 in-lbs)

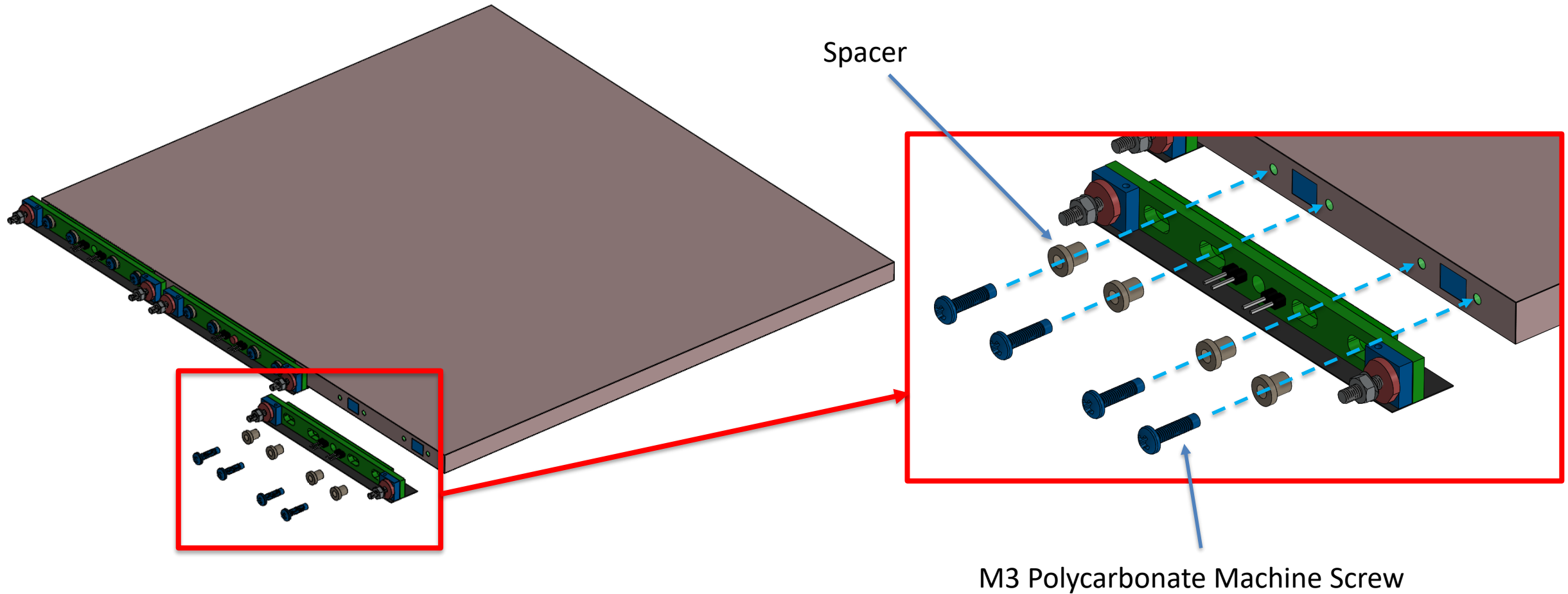
- 8 Pixel Boards per Anode
- Repeat Installation Process for Each Pixel Board
- Watch for Interference with Adjacent Boards

Pixel Board, Charge Readout Facing Down,
PIXspacer Facing Anode Panel, Handle with
ESD Gloves

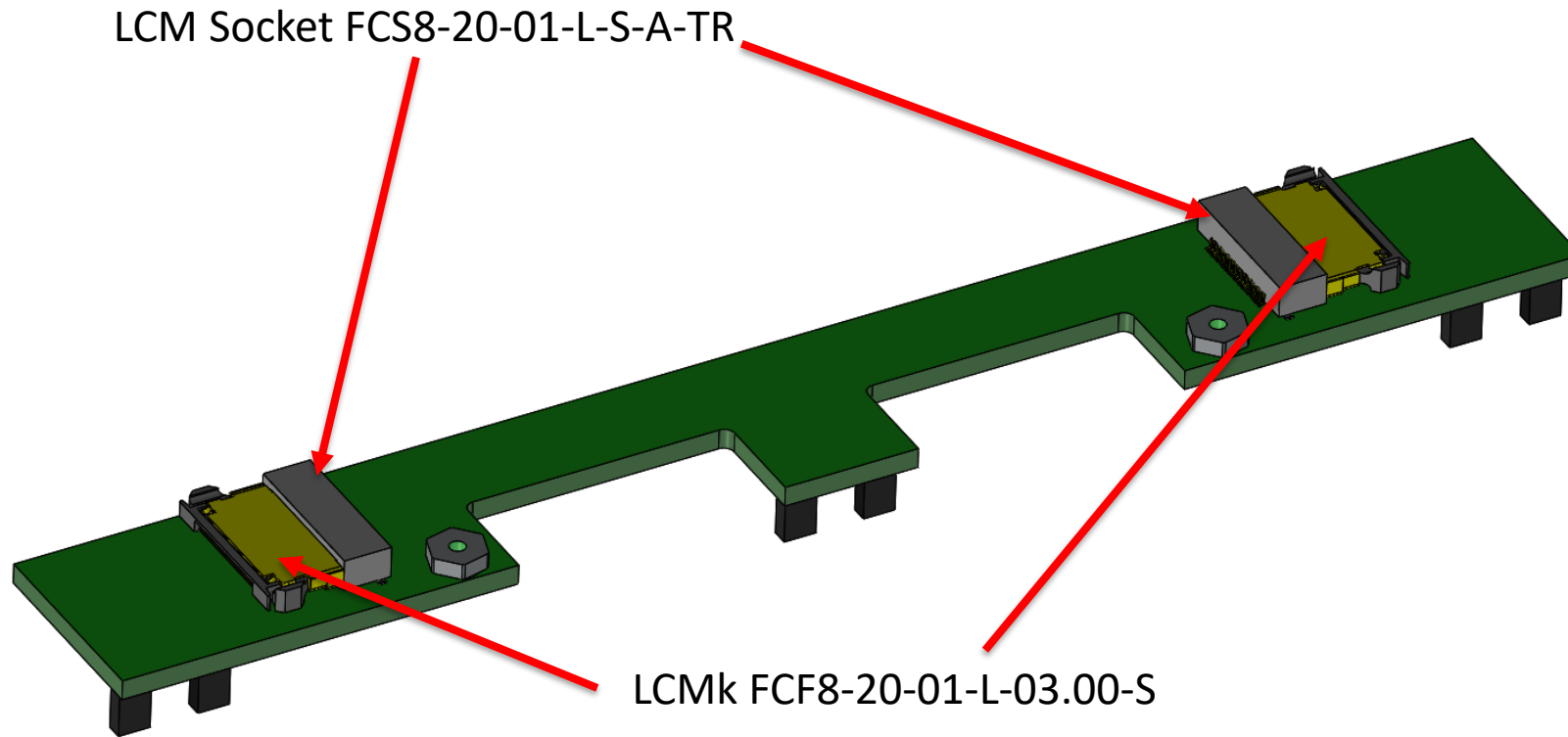
Pixel Board Installation to Anode Panel



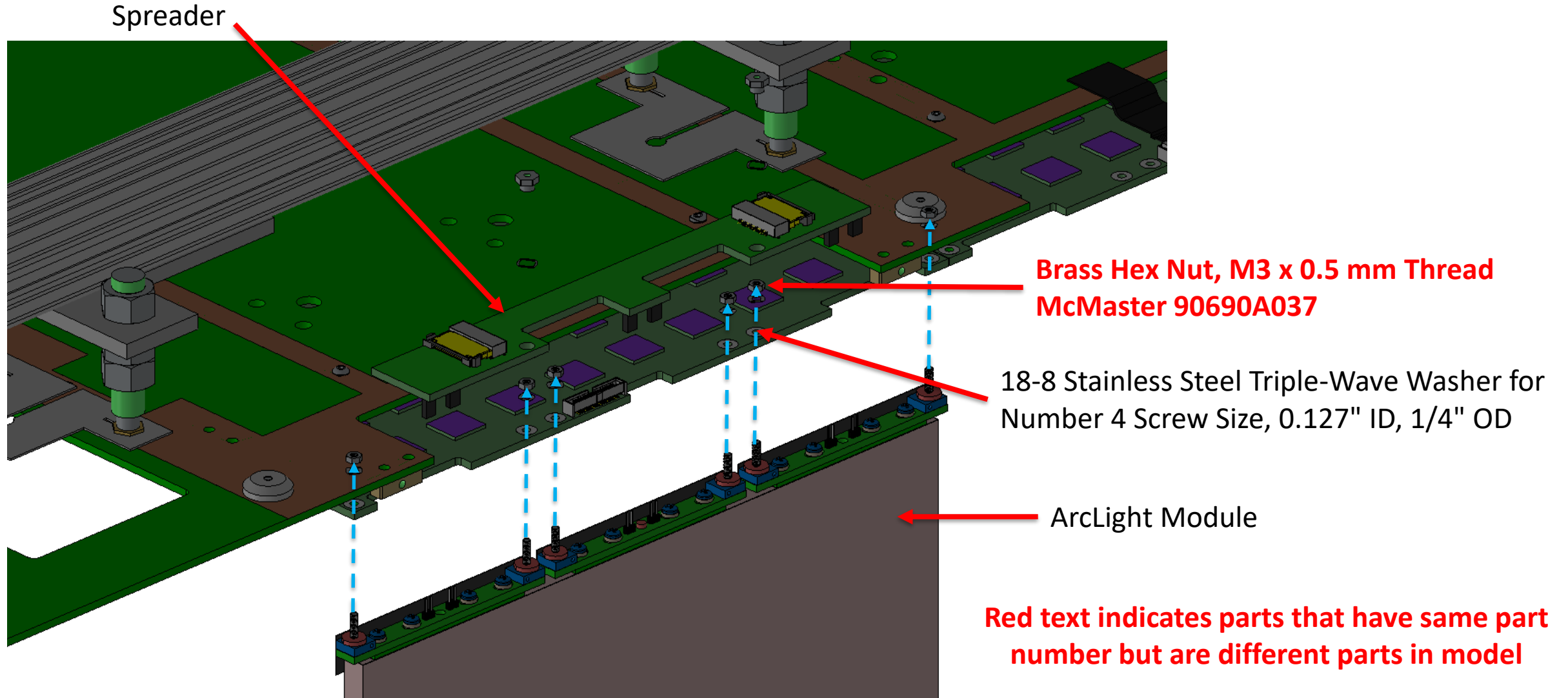
Light Readout Installation to Anode Panel - ArcLight



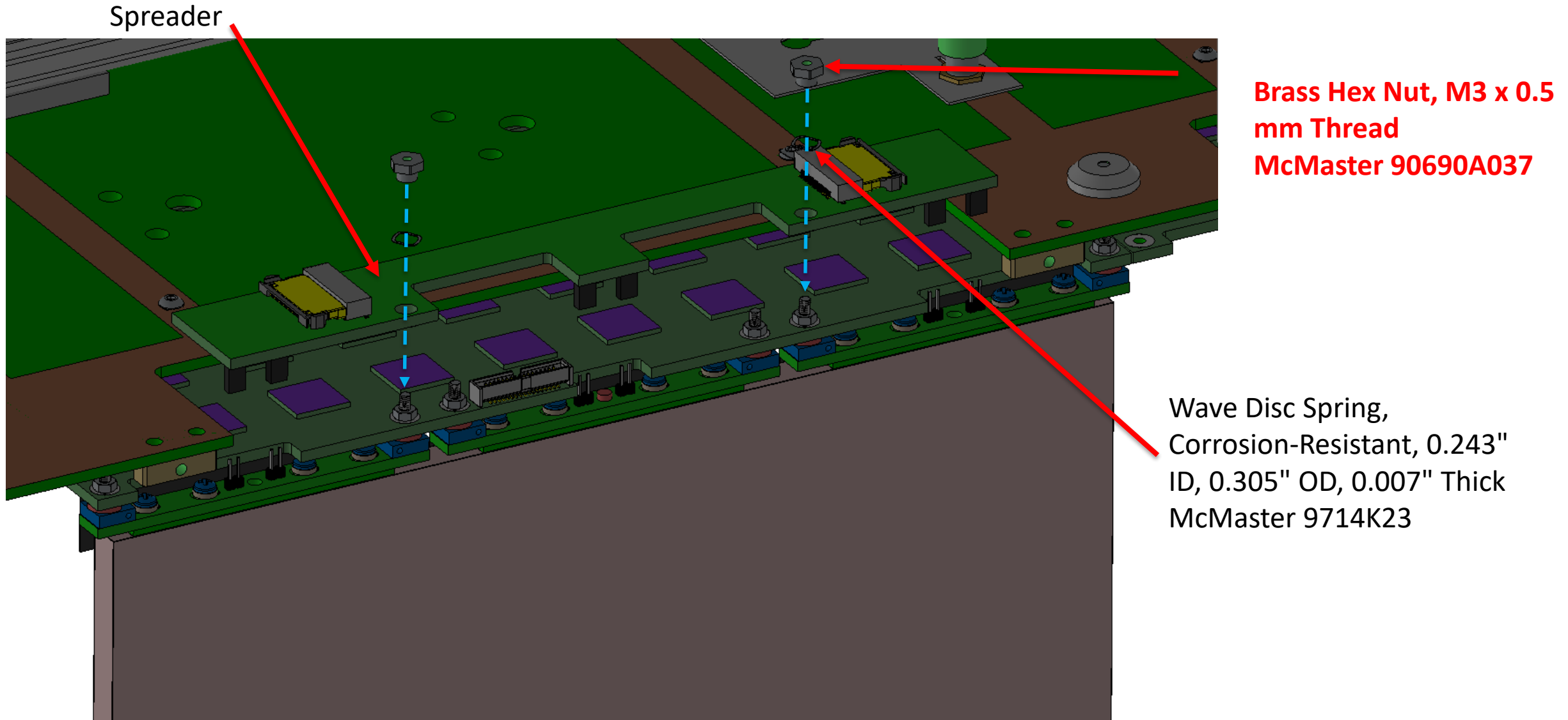
Spreader



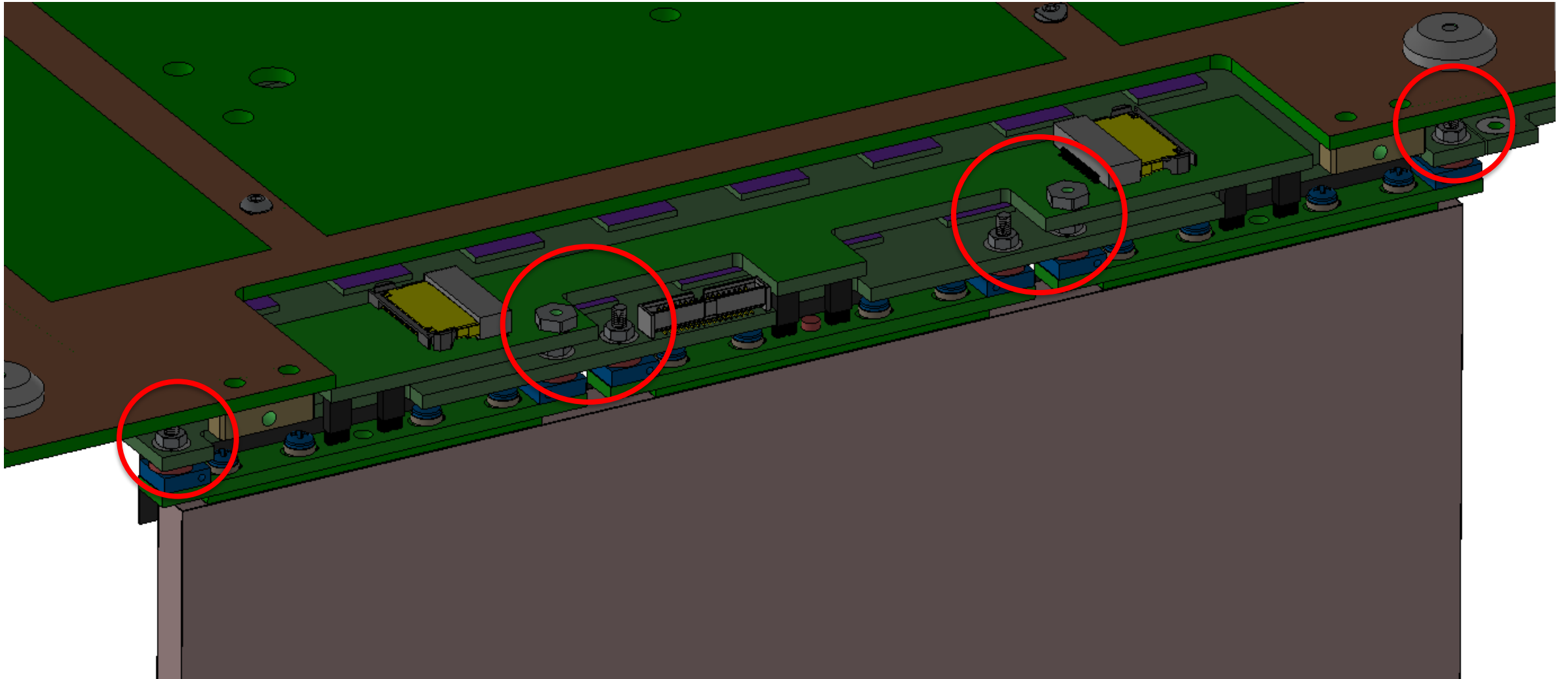
Light Readout Installation to Anode Panel - ArcLight



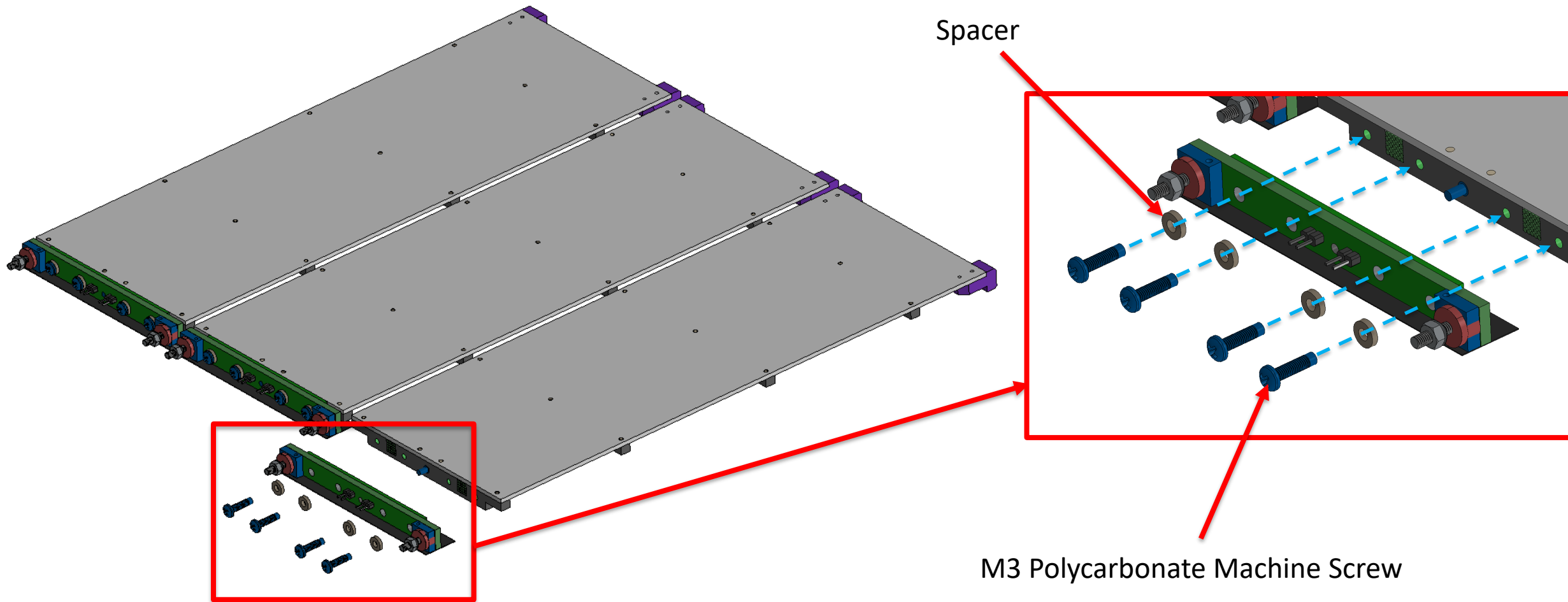
Light Readout Installation to Anode Panel - ArcLight



Light Readout Installation to Anode Panel - ArcLight

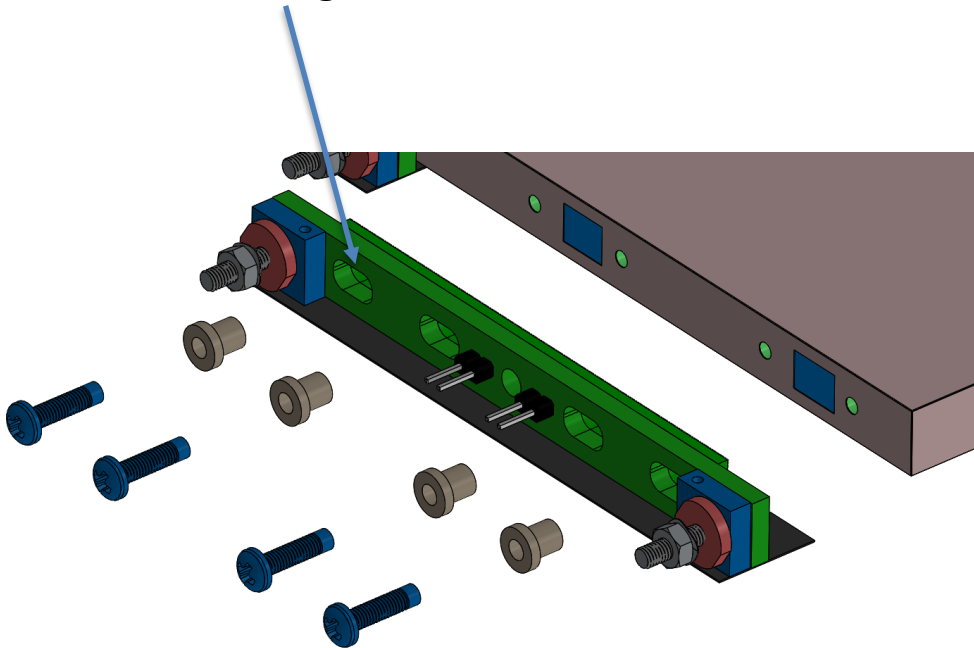


Light Readout Installation to Anode Panel - LCM

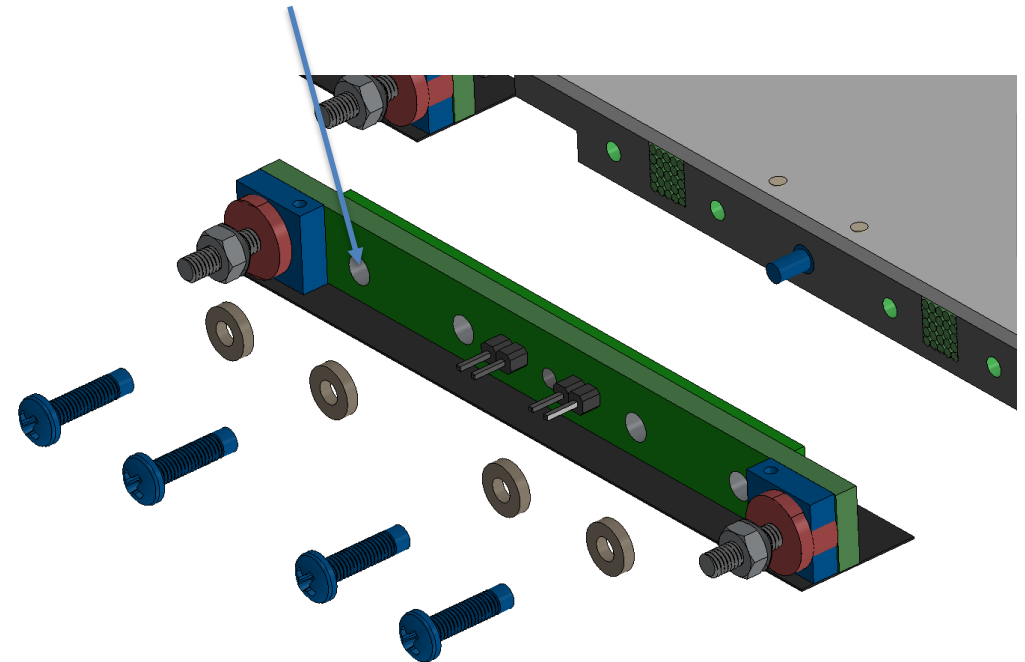


ArcLight vs LCM – Design Question

Slotted in ArcLight

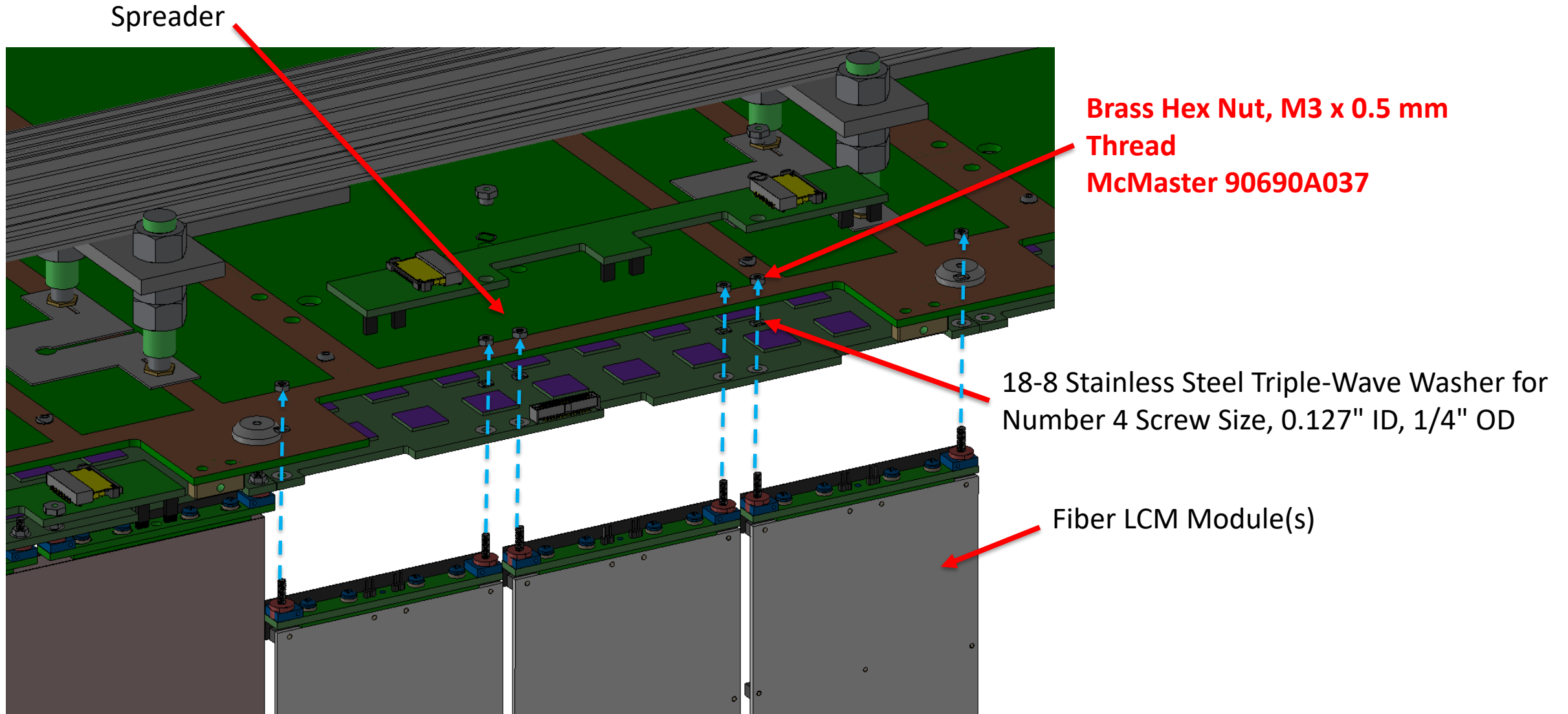


Not Slotted in Fiber LCM – does this need slots?

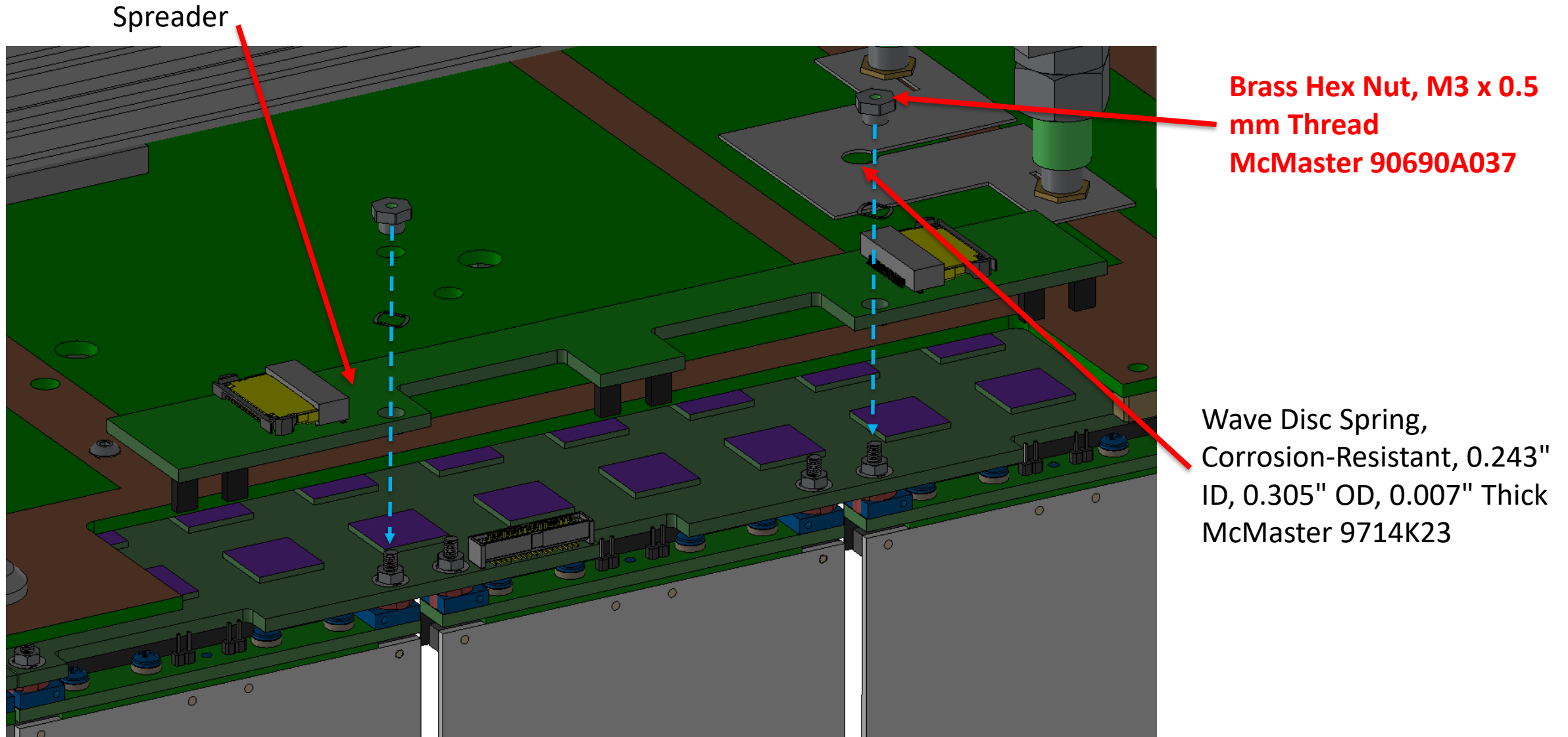


Assume this is due to material differences between the ArcLight and Fiber LCM, but want to verify that this is the case. Cost-wise it would be nice if this could be the same part but maybe not possible?

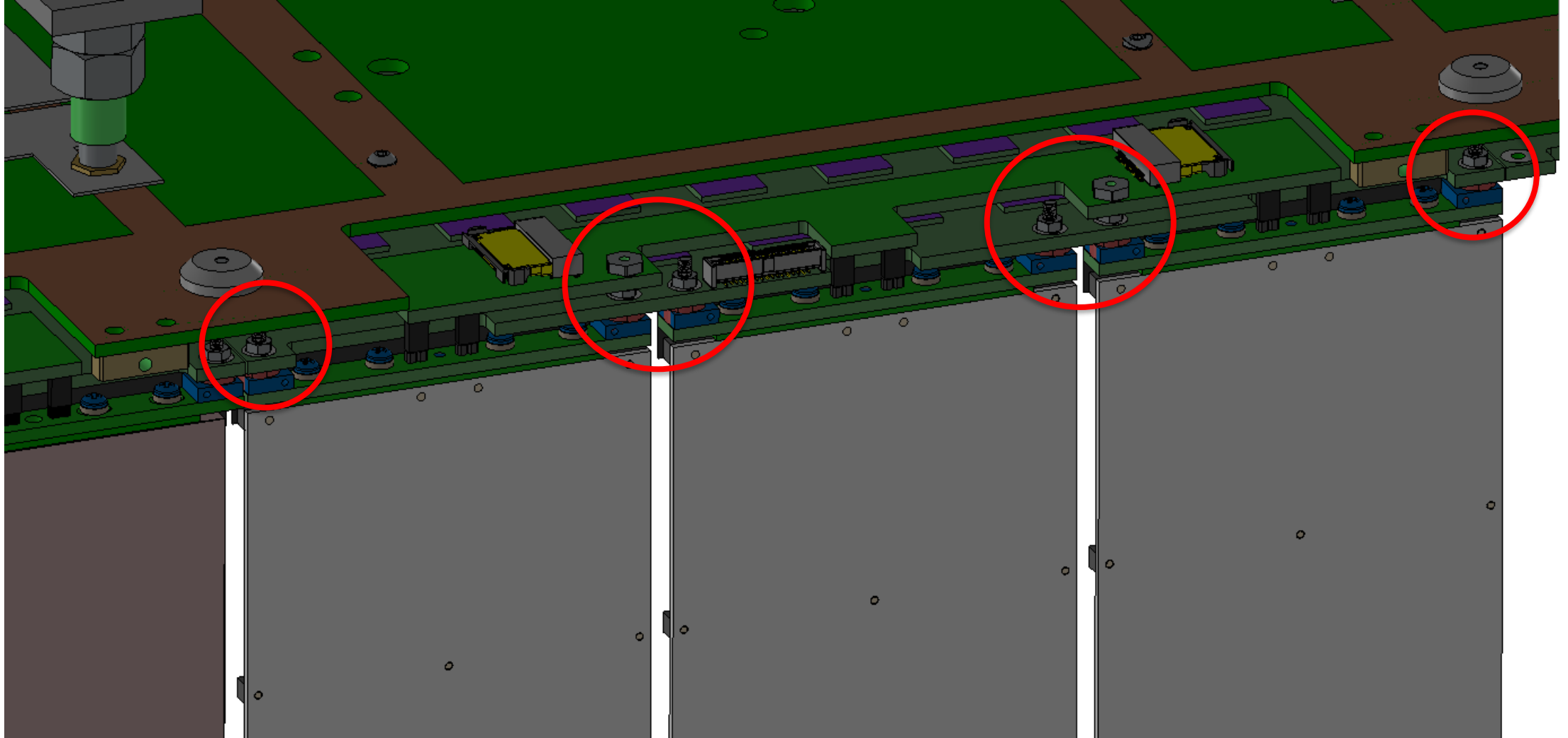
Light Readout Installation to Anode Panel - LCM



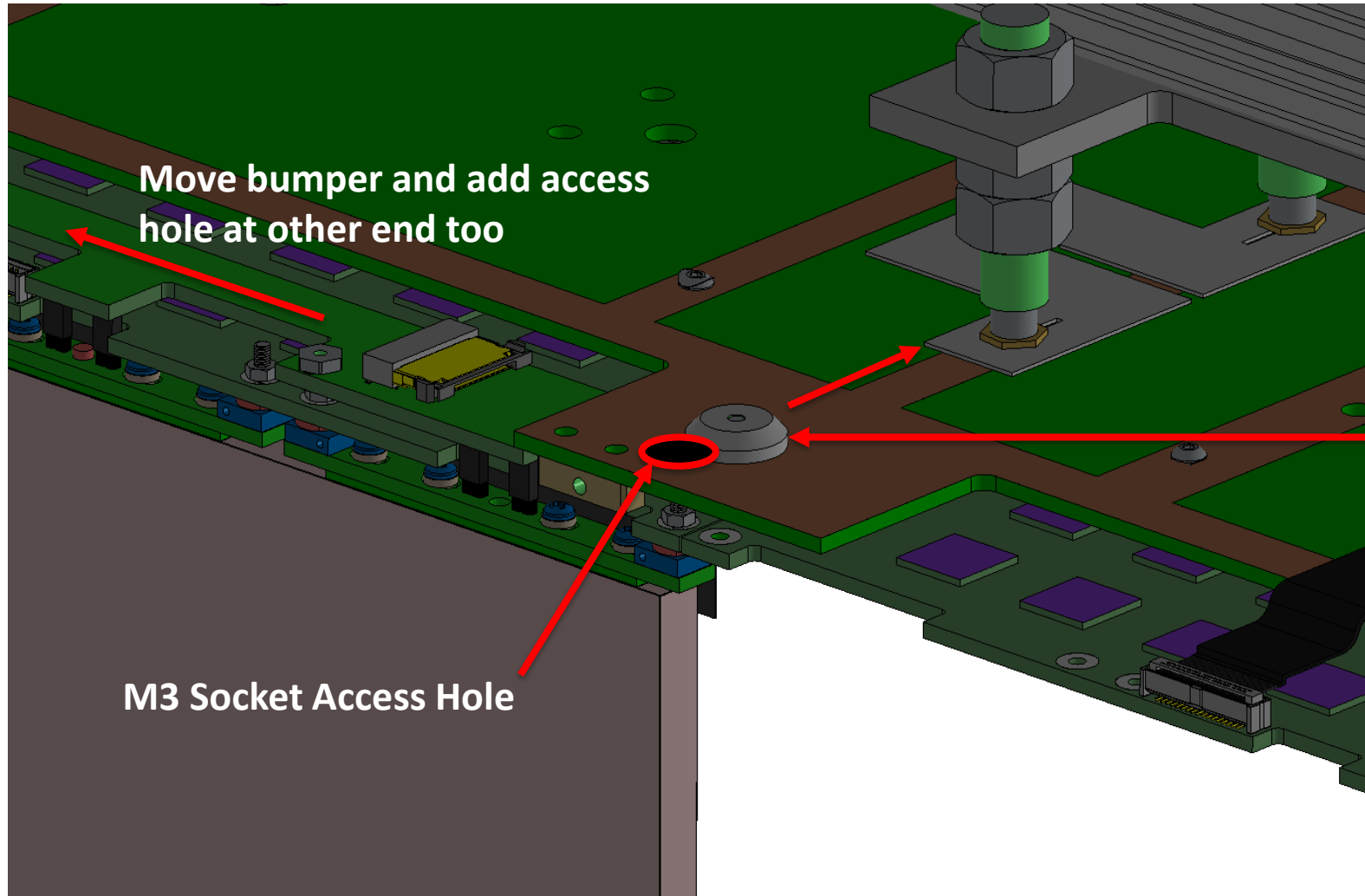
Light Readout Installation to Anode Panel - LCM



Light Readout Installation to Anode Panel - LCM

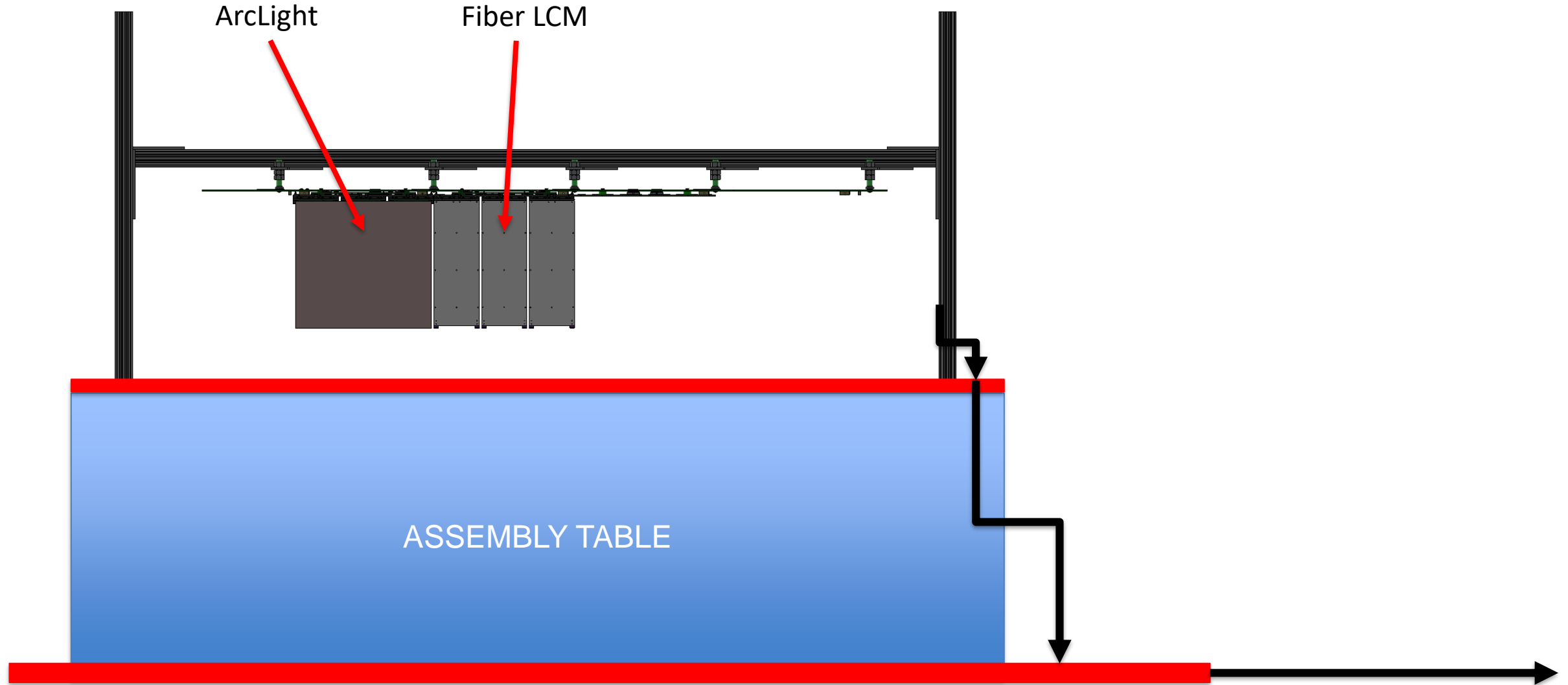


Light Readout Installation to Anode Panel – ArcLight & Fiber LCM

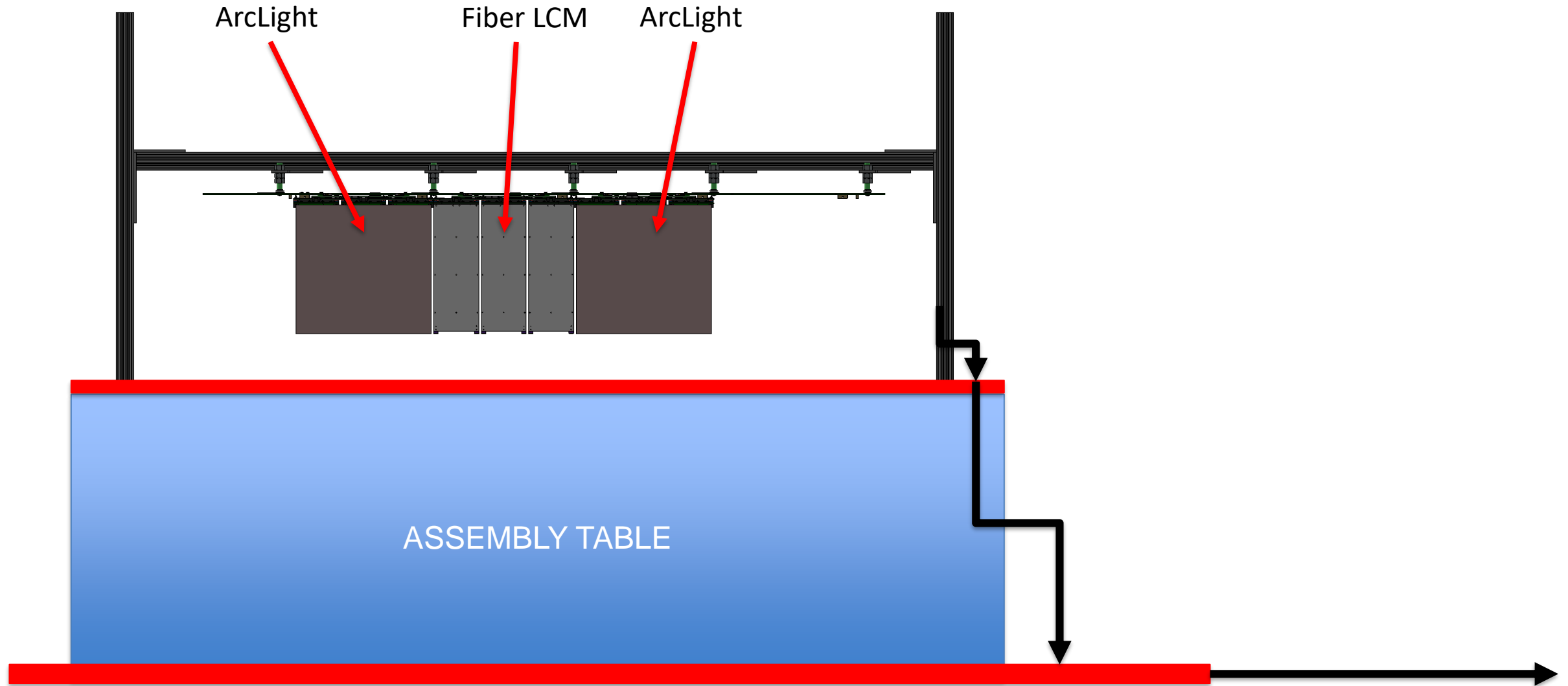


Can this bumper be moved in the direction indicated and a socket access hole put in the anode panel for easier access to the this nut? We should be able to swap out a light readout without removing the pixel board as well. This should be done at all bumpers at this outside location, and M3 socket access ports machined into panel at all locations

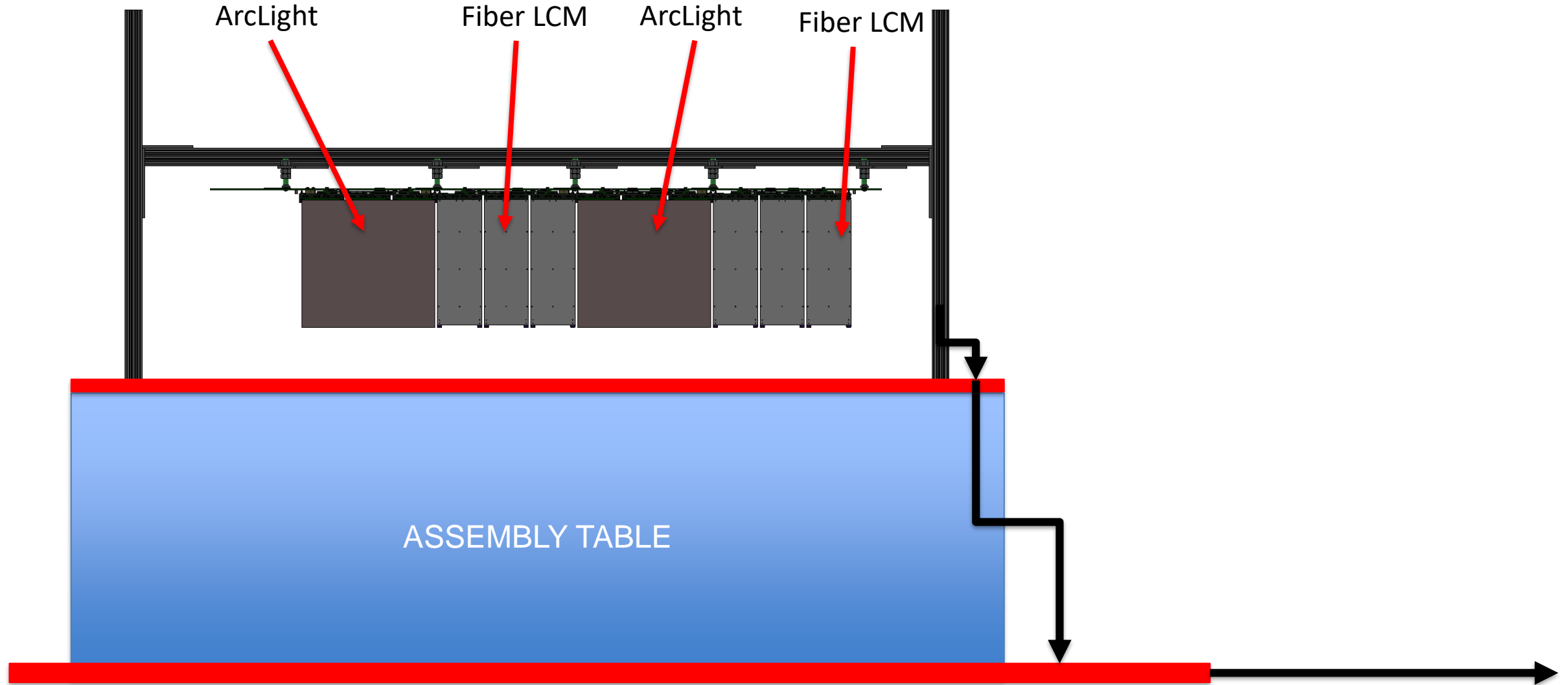
Light Readout Installation to Anode



Light Readout Installation to Anode



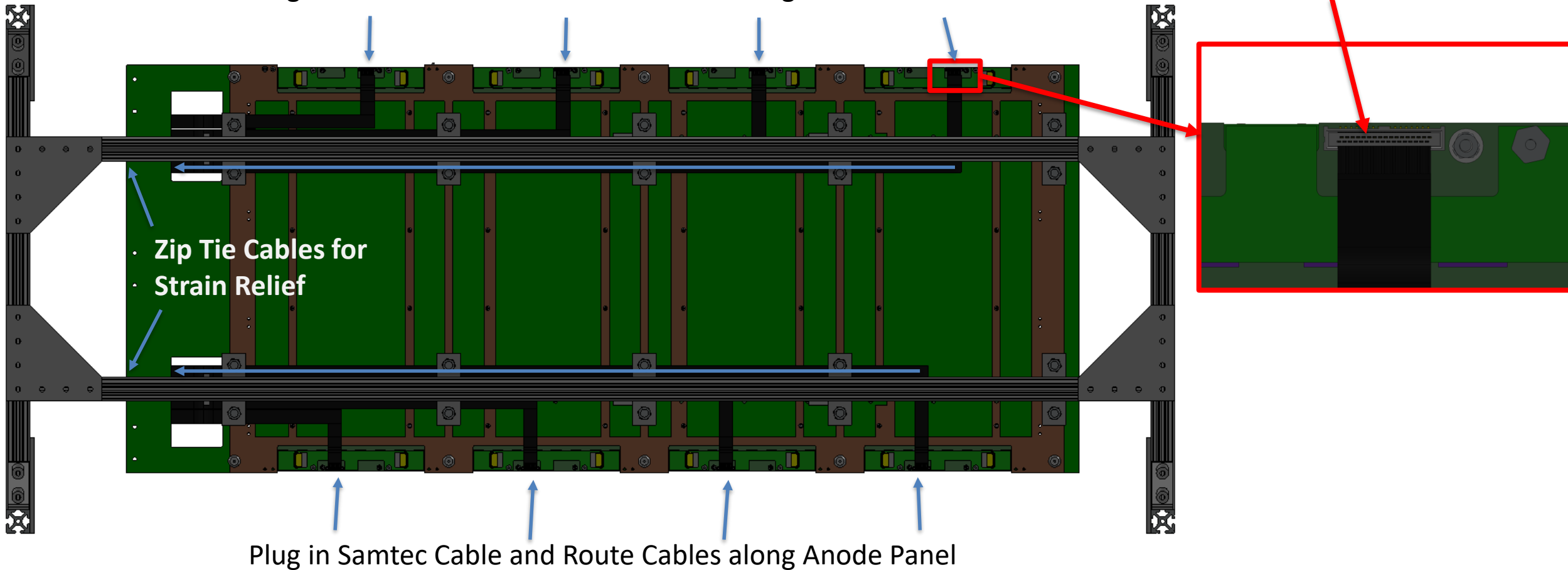
Light Readout Installation to Anode



Pixel Board Cable Installation to Anode Panel

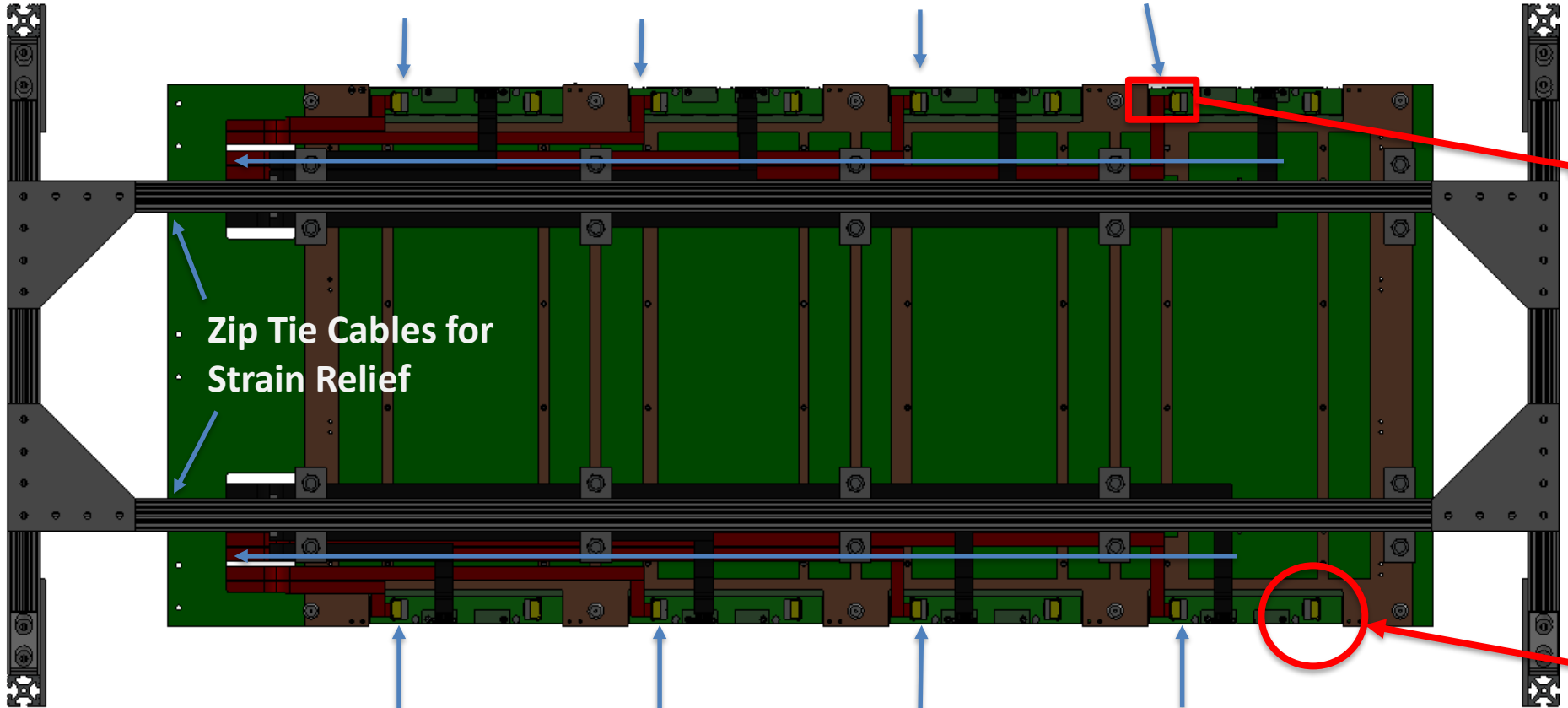
Plug in Samtec Cable and Route Cables along Anode Panel

Twistpair Cable
Samtec FFTP-17-D-08.77-01-N-1



Light Readout Cable Installation to Anode Panel

Plug in Samtec Cable and Route Cables along Anode Panel

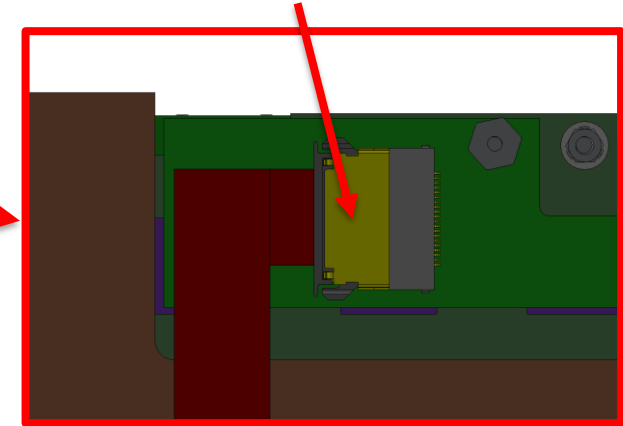


· Zip Tie Cables for Strain Relief

Plug in Samtec Cable and Route Cables along Anode Panel

LCMk

Samtec FCF8-20-01-L-03.00-S



Is this socket not used or are we missing cable in CAD model?

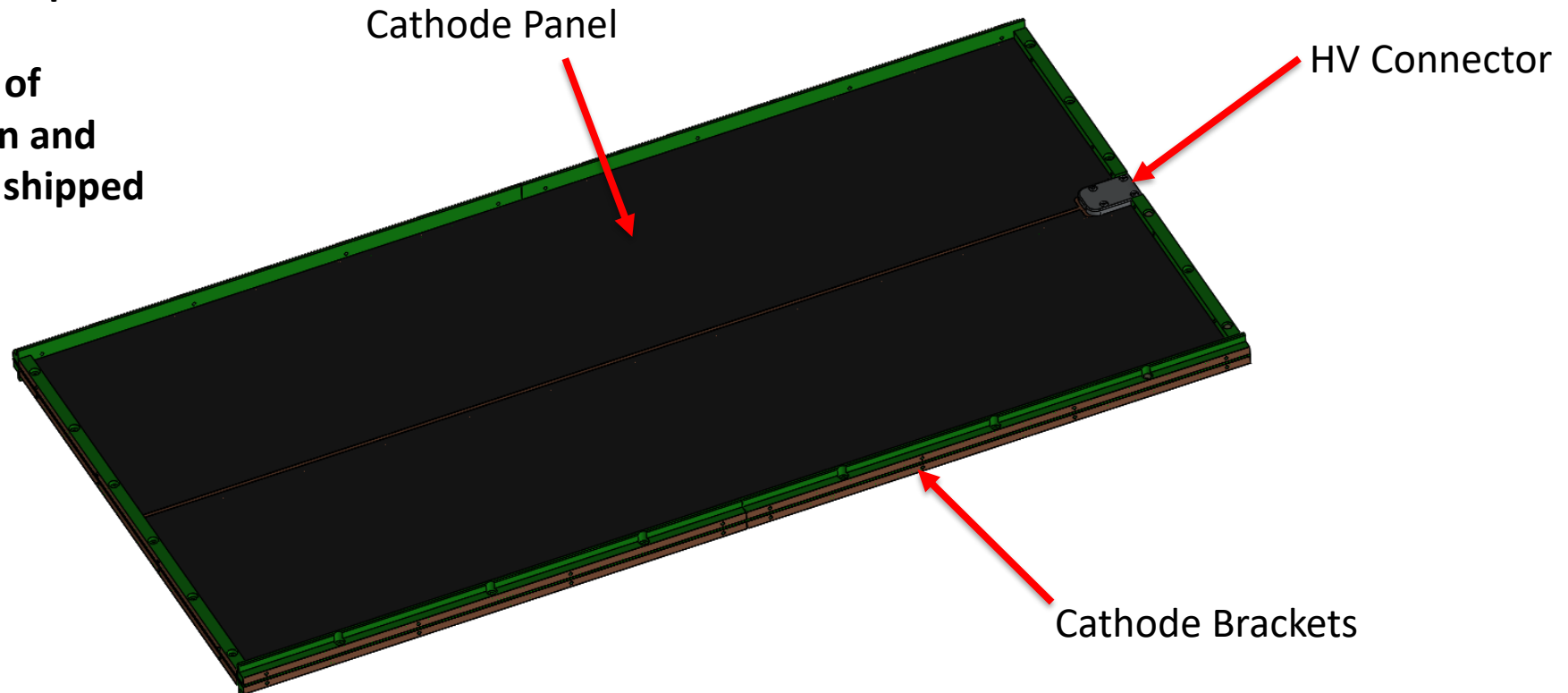
Anode Assembly Notes

- Two person operation per Anode Assembly
 - One person holds Pixel Board/Light Readout
 - One person inserts and torques fasteners/nuts
- Installation location – Univ. of Bern electronics shop, upstairs from 2x2 test facility
 - Toured this briefly on my first visit, I would like to get a better look on my next visit
 - Ample counter space to setup assembly
 - Can setup some portable ionized air blowers, ESD floor mats
 - Possible to do two Anode Assemblies in parallel?
- PPE required
 - ESD wrist-strap connected to grounded table mat
 - ESD shoe straps
 - ESD cleanroom gloves
 - Headcover
 - Safety glasses
- Post-Installation
 - Use readout cables to bring up entire Anode Assembly and verify functionality
 - Is there other warm testing that could be done at this point that would help with testing in the cryostat?
 - Need to find an ESD foam or bag that can be wrapped around the Anode Assembly when all warm testing complete

Cathode Assembly

If there is a test-fit up @SLAC, can the cathode assembly be shipped with these components installed?

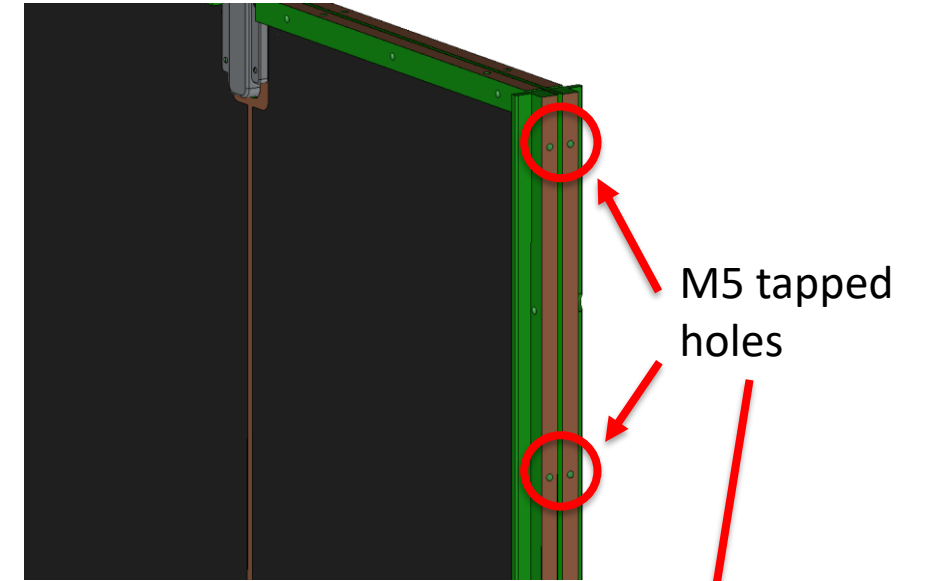
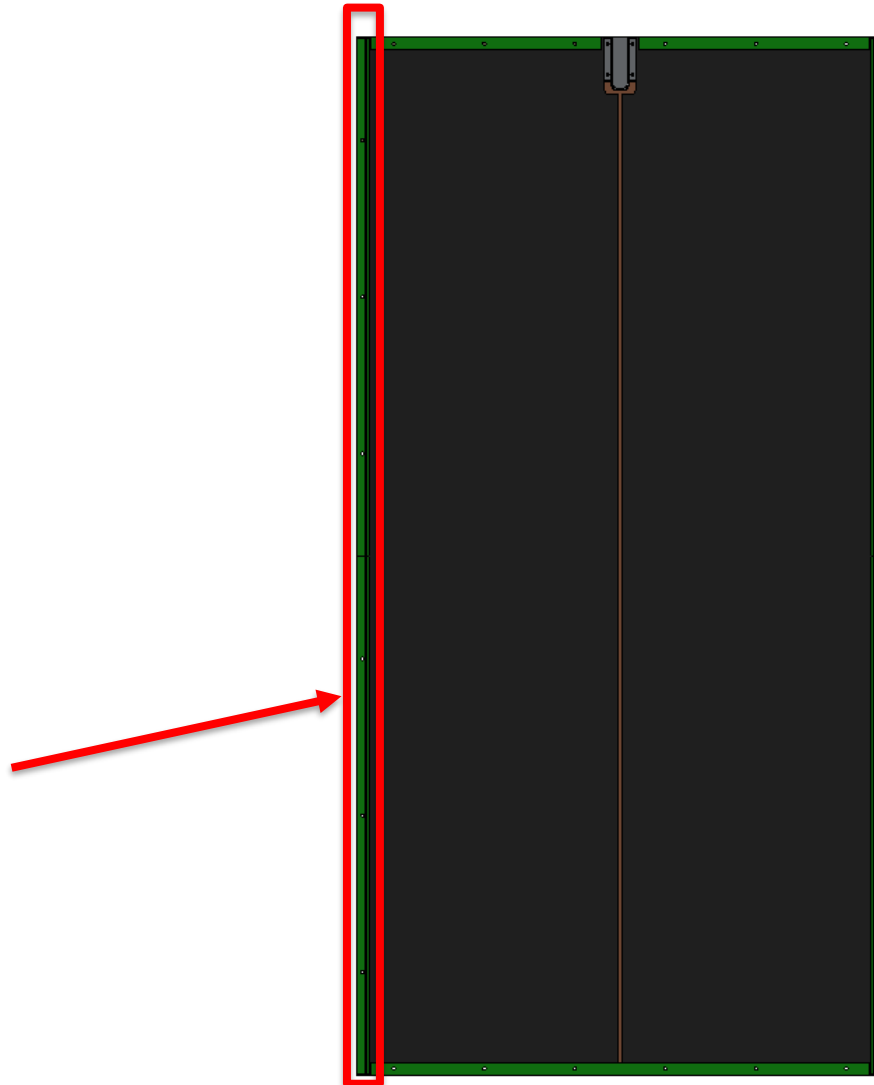
This would save a lot of assembly time at Bern and reduce the # of parts shipped and tracked.



Cathode Assembly

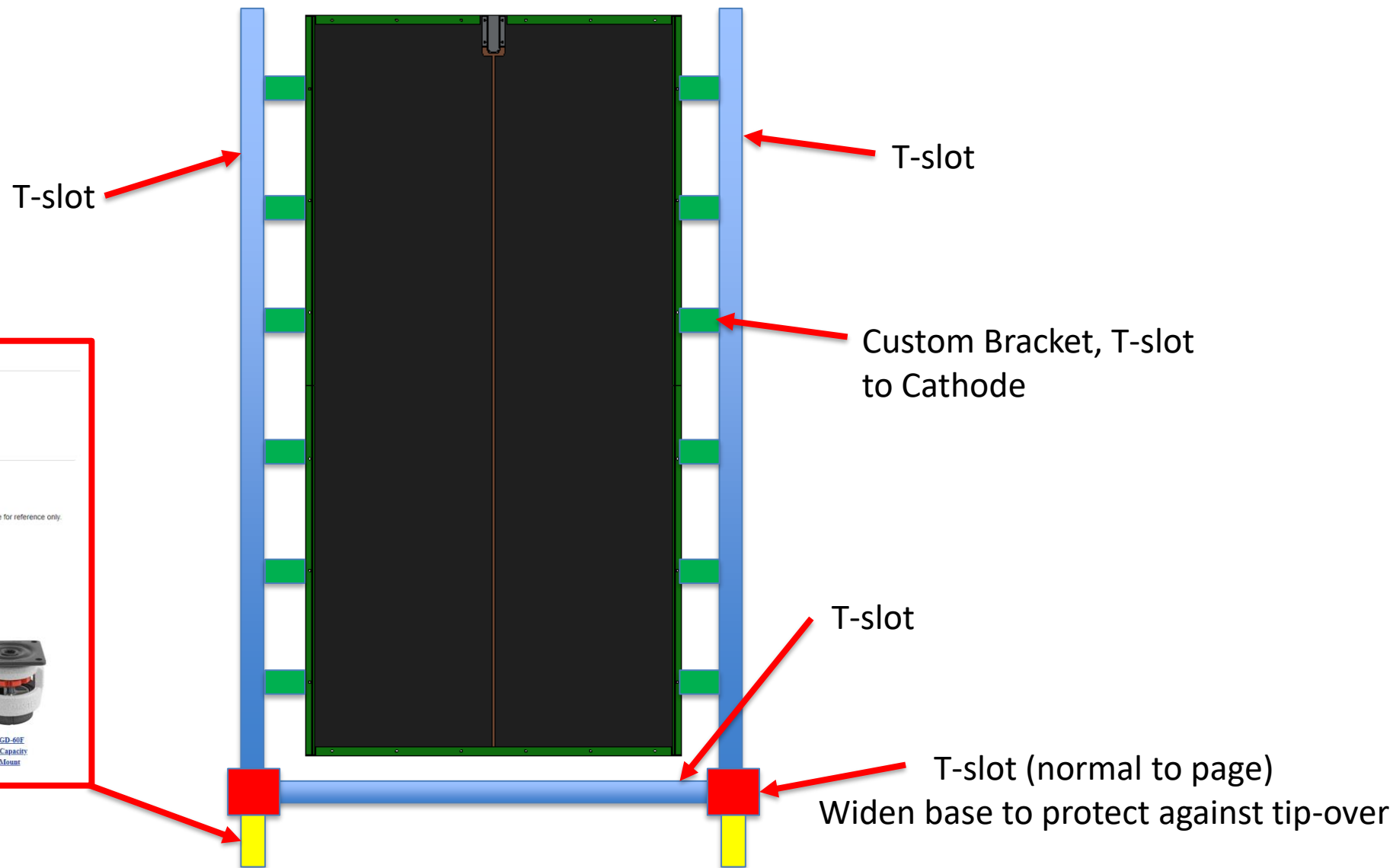
How is cathode held for assembly of other components?

- Possible to stand it up on a clean surface on the floor, but would require someone to constantly hold it from tipping over – not ideal
- Could design a T-slot structure that engages with tapped holes on the cathode brackets




Do these holes have a threaded insert?

Cathode Assembly



Shop Options: [0 Cart Item\(s\) \\$0.00](#) | [Customer Account](#) | [Continue Shopping](#)







Leveling Plate Caster
Price: \$21.00
Quantity:
[Add to Cart](#) [Go to Cart](#) [Continue Shopping](#)

Model Number: GD-40F
Dimensions: 2-13/16" OAH
Side Access
*Images may or may not be your exact model. Images are for reference only.

[CLICK HERE to view other models](#)

GD SERIES LEVELING CASTERS

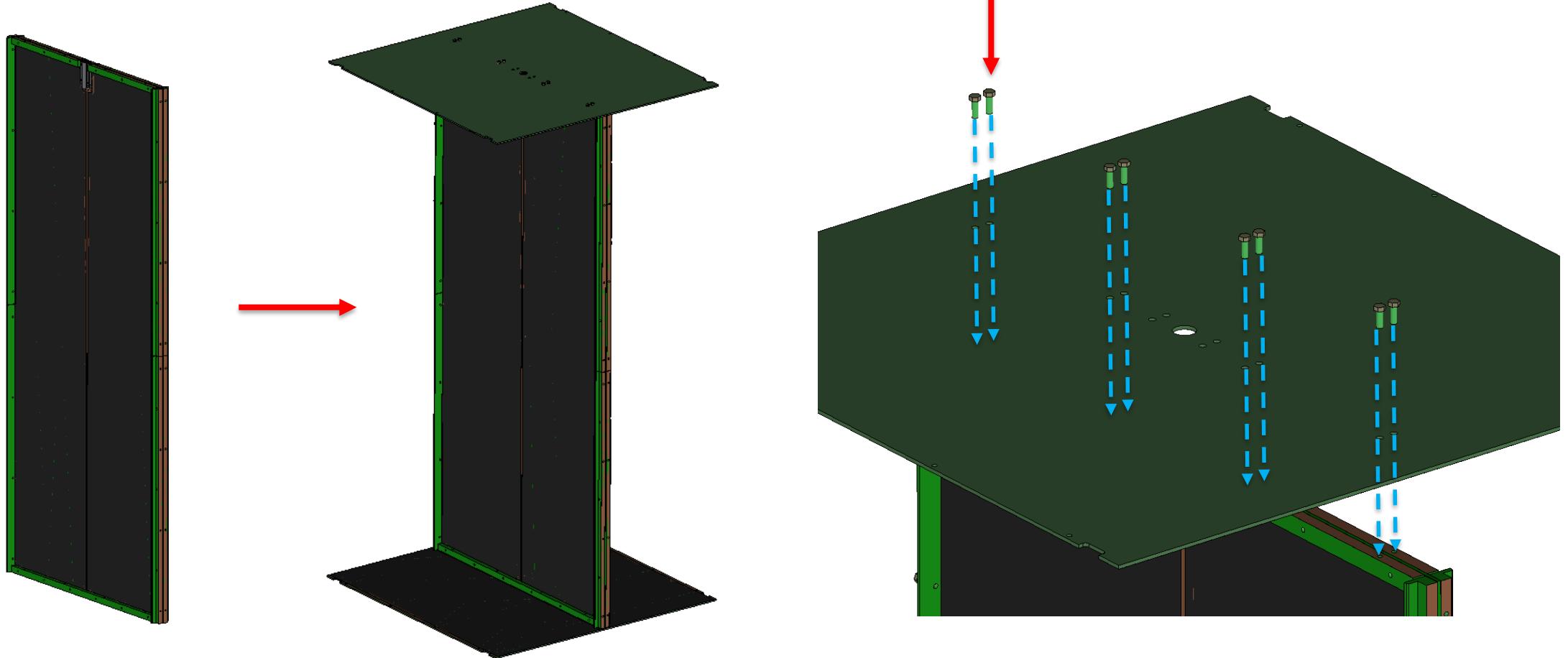
[Click any picture or title for pricing and complete specifications.](#)

 Model GD-40S 110 lbs. Capacity Stem Mount	 Model GD-40F 110 lbs. Capacity Plate Mount	 Model GD-60S 550 lbs. Capacity Stem Mount	 Model GD-60F 550 lbs. Capacity Plate Mount
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Height Adjustable
Caster

Install Top and Bottom Field Panels

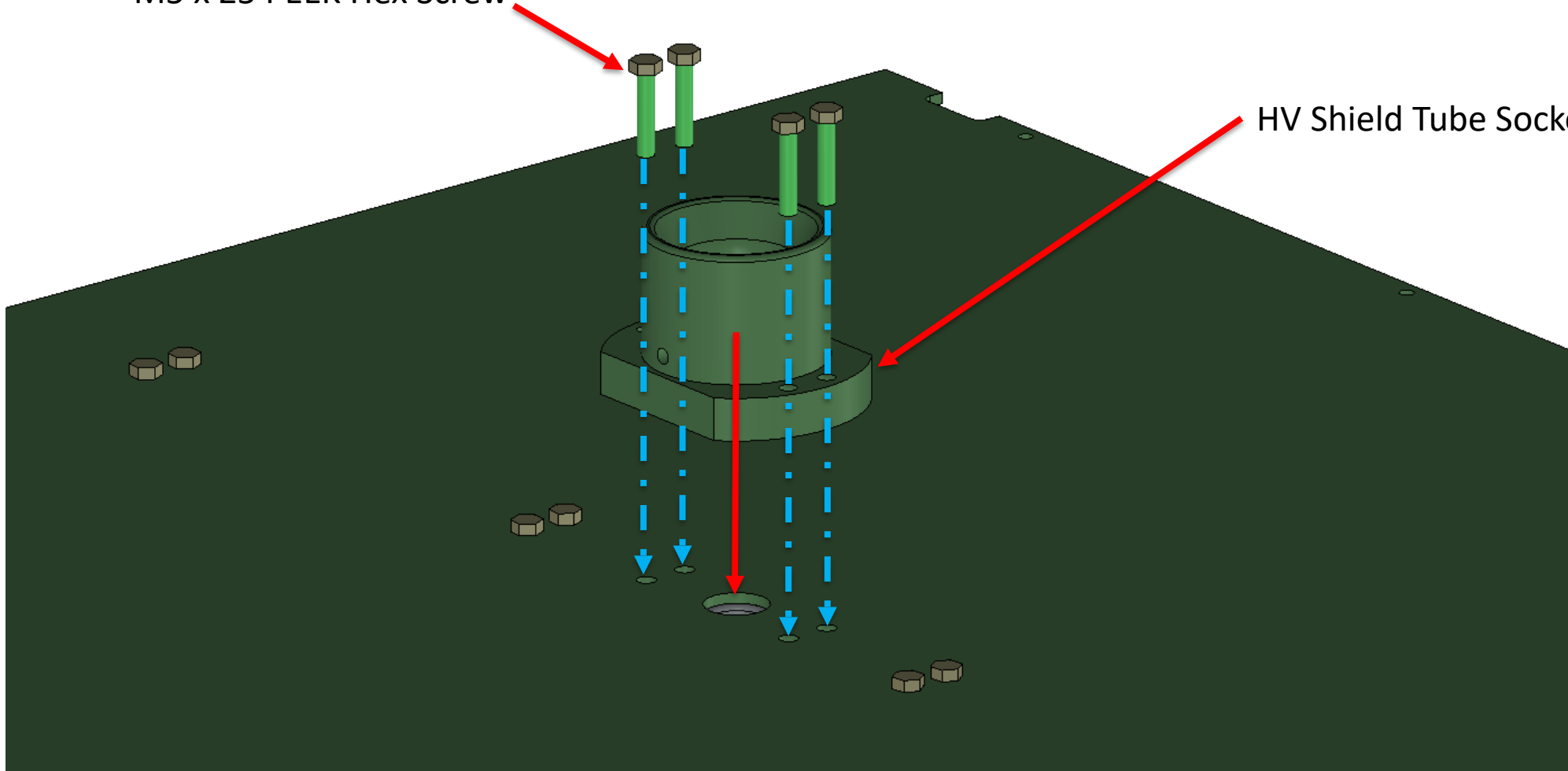
Imagine Assembly
Fixture is here



Install HV Shield Tube Socket

M5 x 25 PEEK Hex Screw

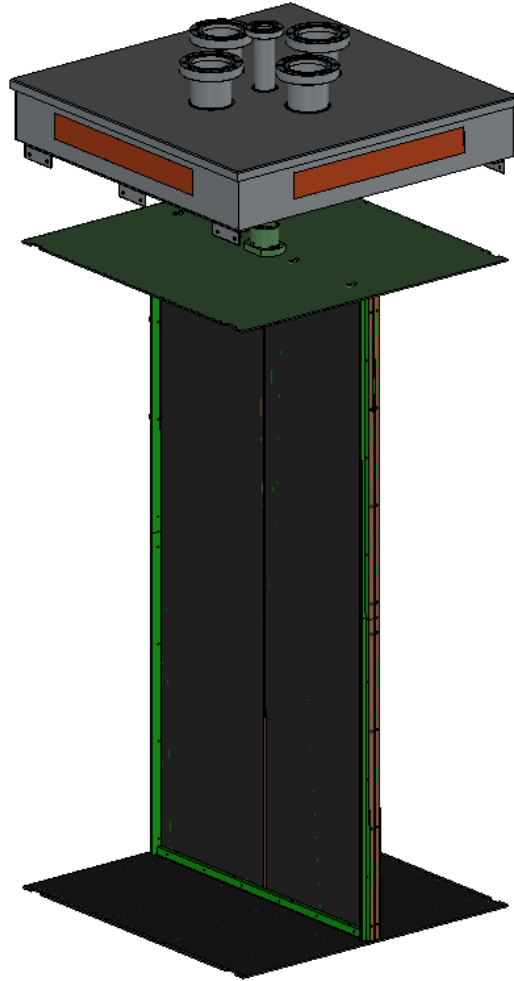
HV Shield Tube Socket



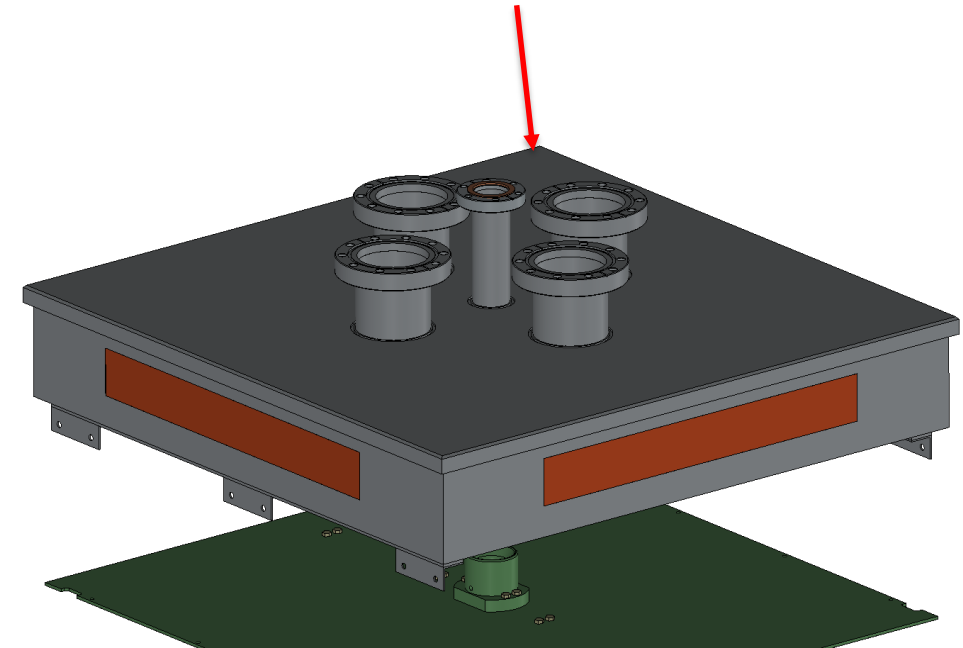
Bring in Module Top Flange

How is the Module Top Flange held during assembly?

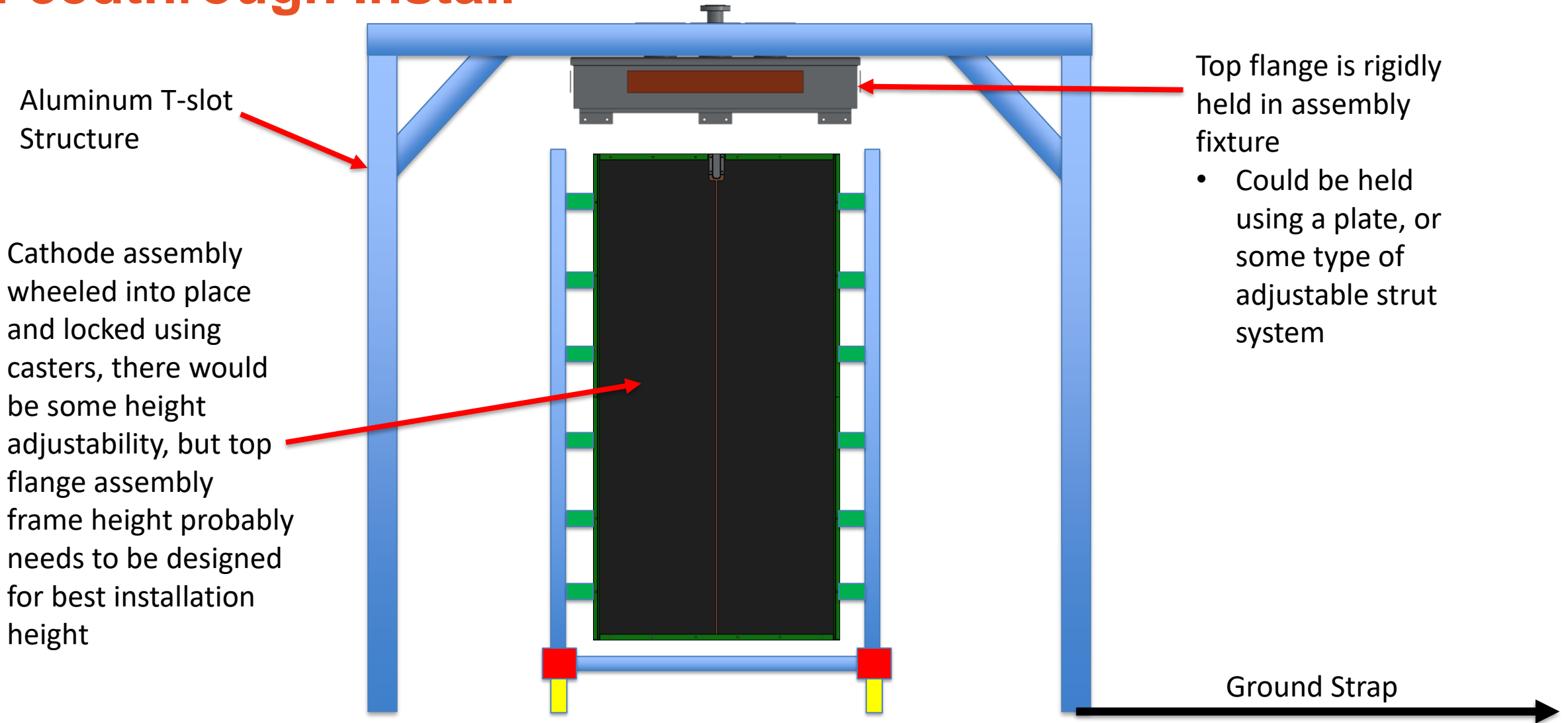
- We want to avoid suspending it from a ceiling crane – unsteady, suspended load, not ideal for end of day
- A rigid assembly fixture would be the best solution – designed to hold the full weight of the Module with margin
- This could be a T-slot structure again with some custom parts that interface to the bolt pattern on the top of the module flange



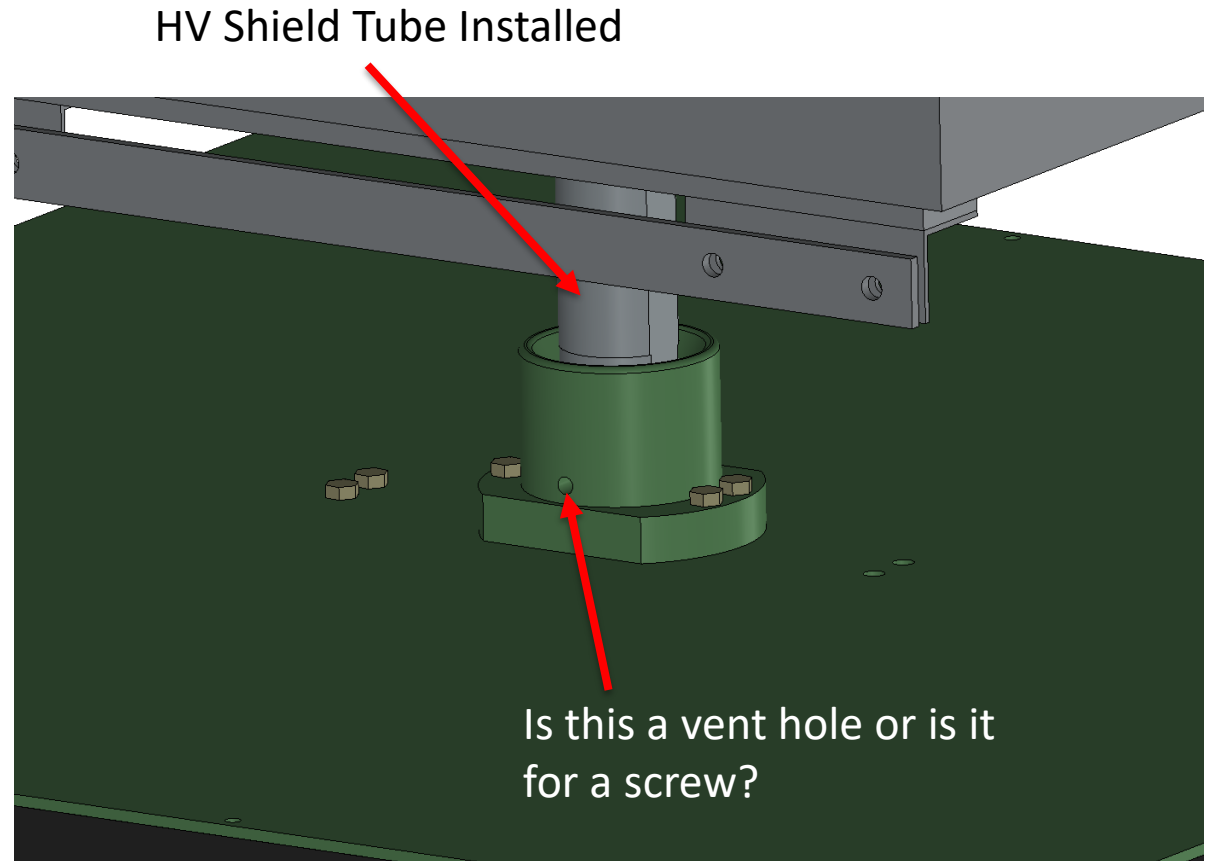
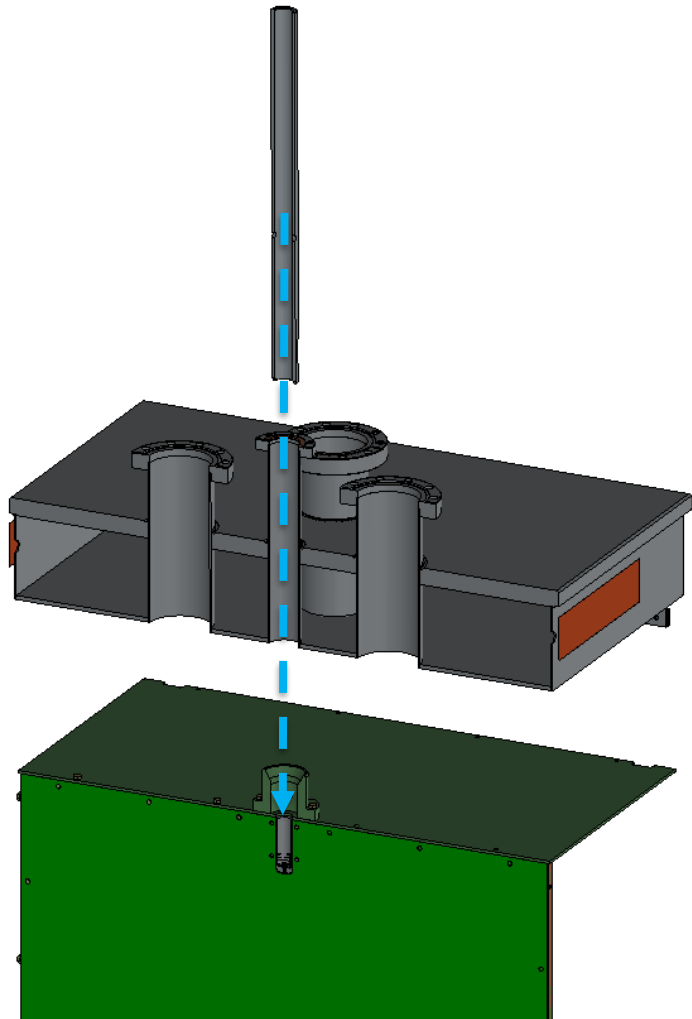
Pick up bolt pattern on top of flange with assembly fixture – combination of T-slot and stainless plate



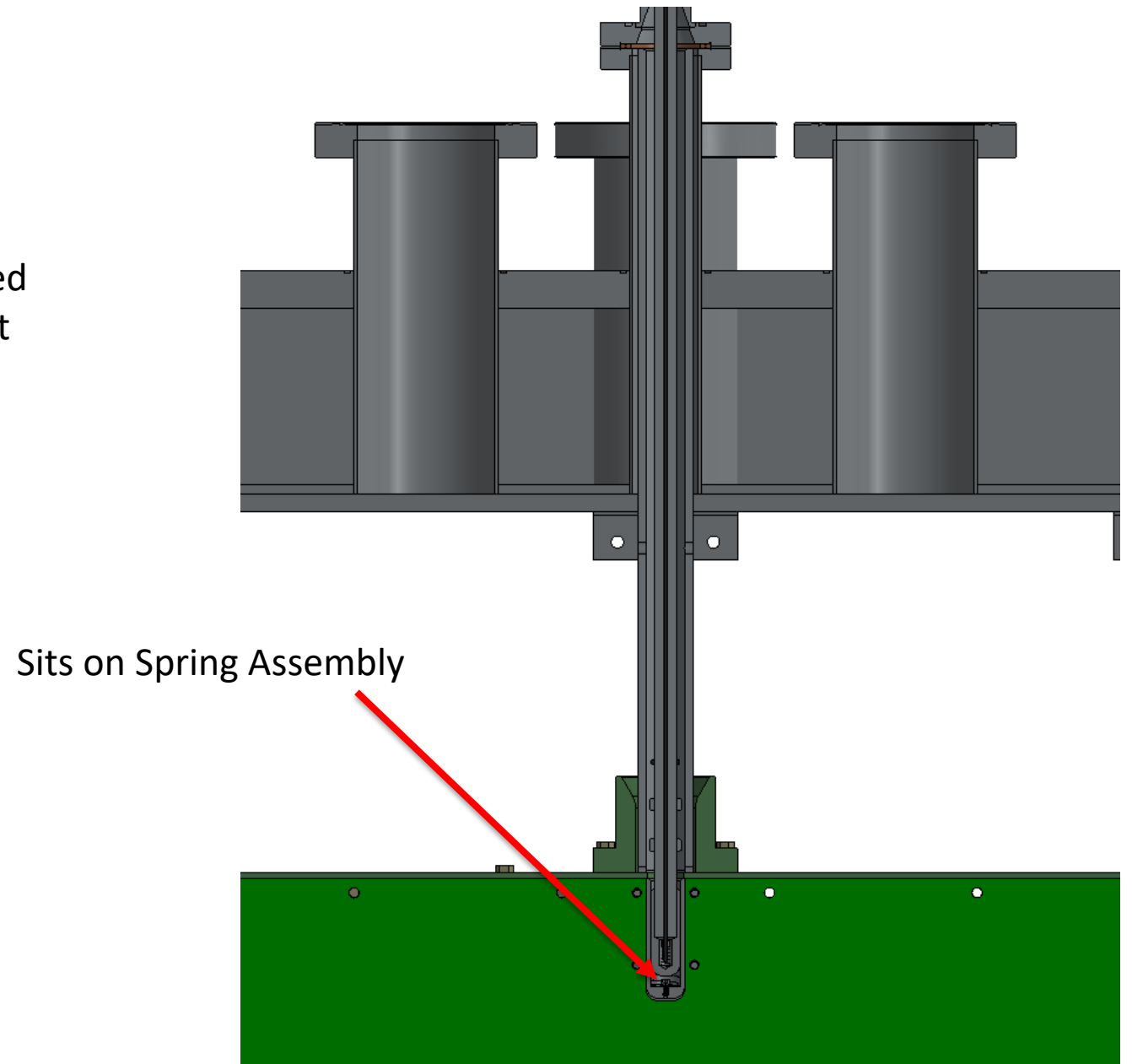
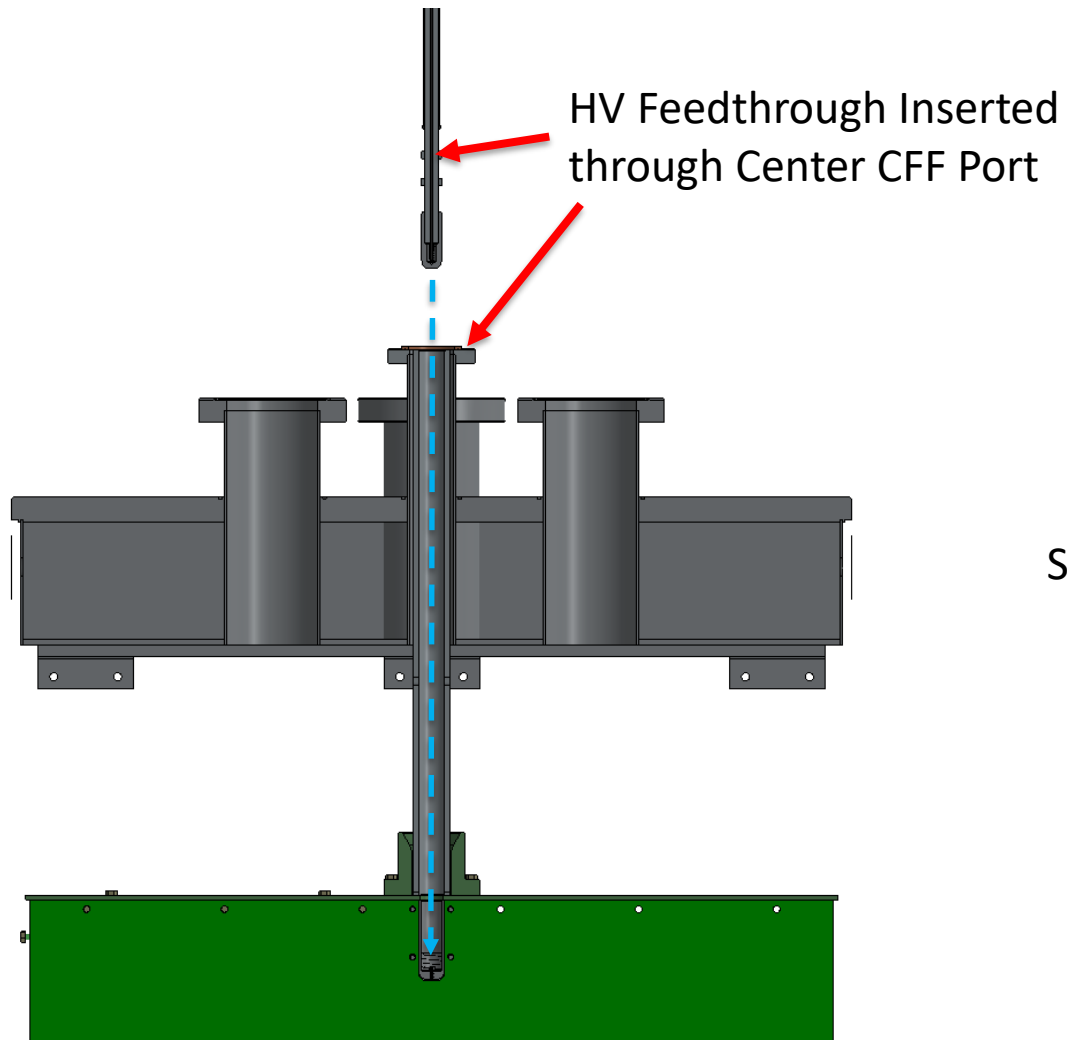
Module Top Flange and Cathode Integration for HV Feedthrough Install



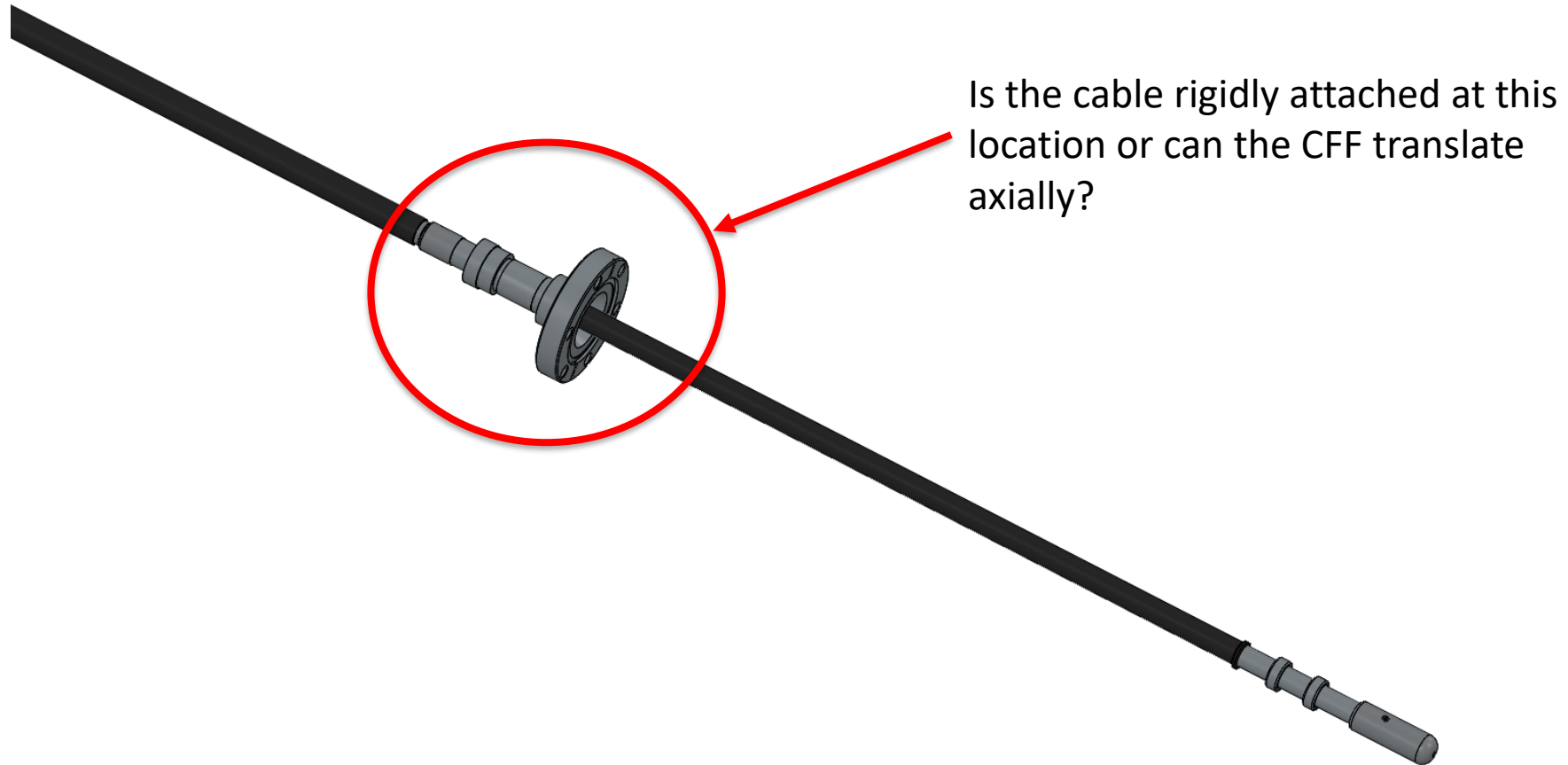
HV Shield Tube Installed



HV Feedthrough Install



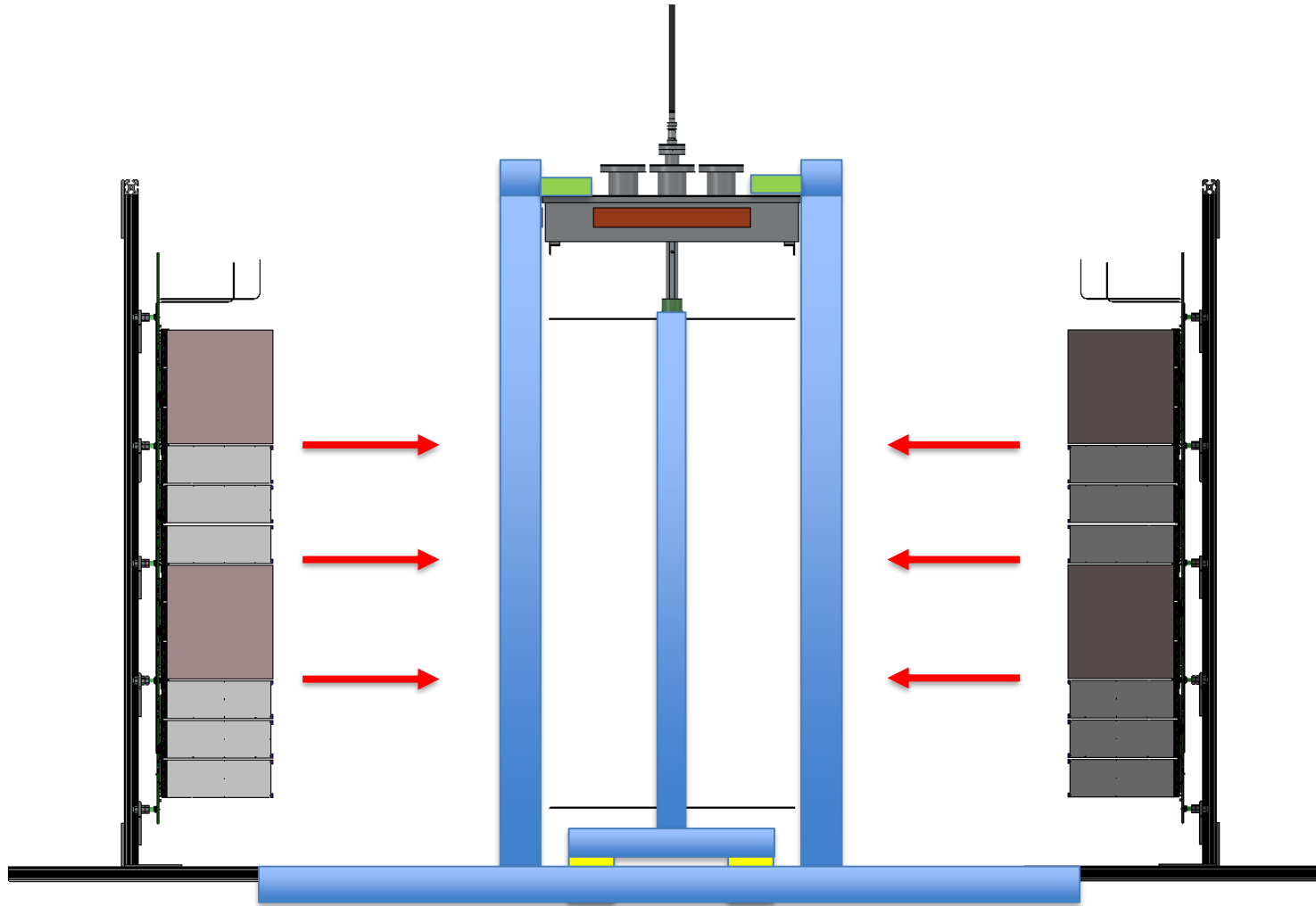
HV Feedthrough Question



Module Structure, HV and Field Structure Assembly Notes

- Two or three person task
 - Could involve some crane work for module Top Flange
- Unlike the Anode Assembly, it is unclear with these assemblies how they are held and manipulated
 - It would be my preference to have dedicated assembly fixtures
 - Cathode Assembly Fixture
 - Module Top Flange Fixture – capable of supporting full module weight as well
- Installation location – Univ. of Bern 2x2 test facility
 - Carve out floor space and clear area for required assembly fixtures/components
 - Try to establish an ESD safe area to store completed Anode Assemblies?
 - Portable clean tent?
- PPE required
 - ESD wrist-strap connected to grounded assembly fixture
 - ESD cleanroom gloves
 - Safety glasses
 - Hard hats during crane use
- Post-Installation
 - Is there any warm testing that could be done at this point that would help with testing in the cryostat?

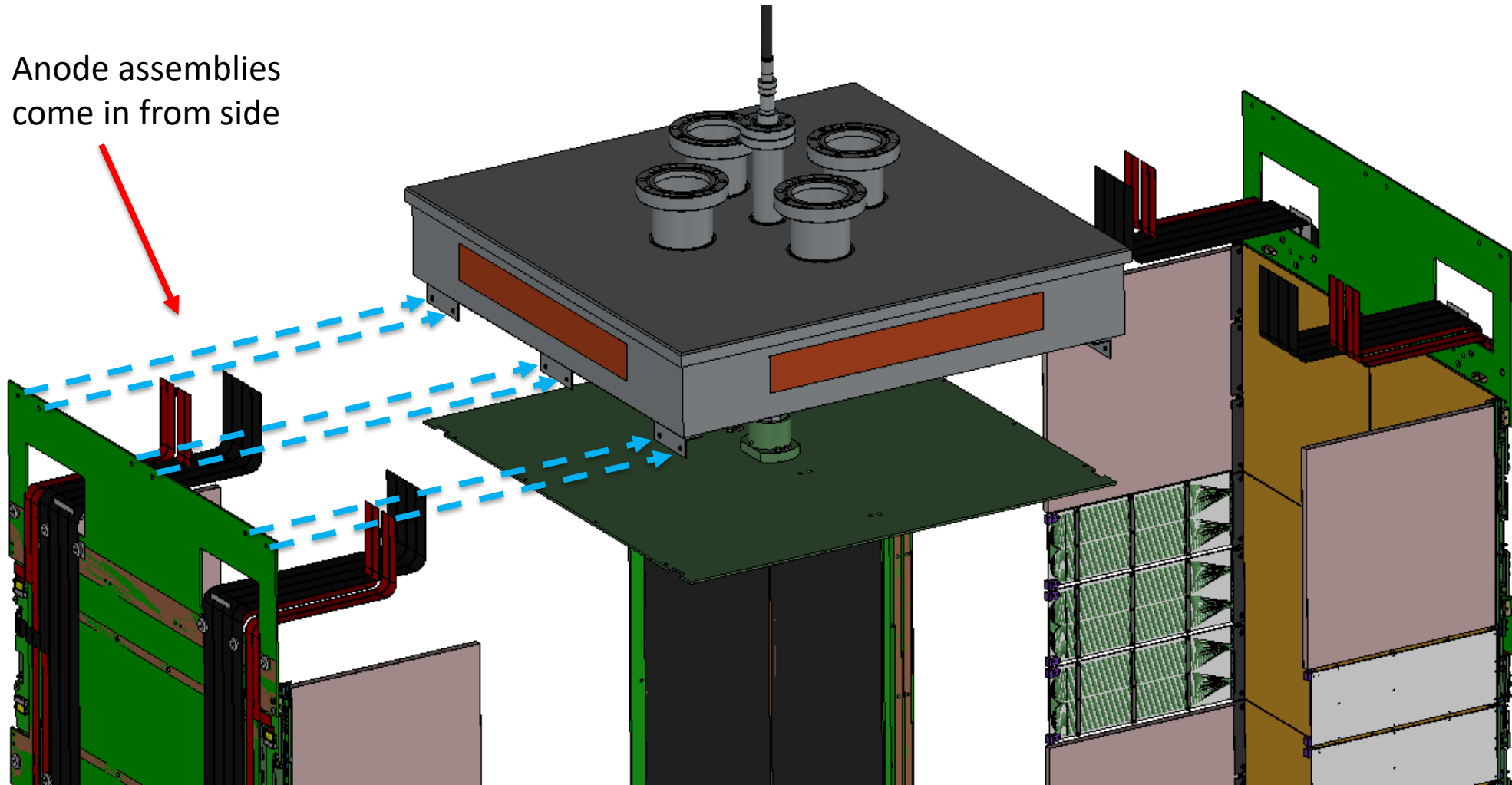
Final Assembly – Anode Installation



- Bring Anode Assemblies in from side
- Could put similar height adjustable casters on Anode Assembly Fixtures, can then wheel Anodes in place and adjust to correct height
- Some part of the assembly has to be height adjustable or need to get heights close enough in design that casters can accommodate misalignments
- I am glossing over **two** big tasks here:
 - Transport of the anode assemblies from electronics shop to 2x2 shop
 - Rotation of anode assemblies from horizontal to vertical
 - Need to think how these are done

Anode Installation

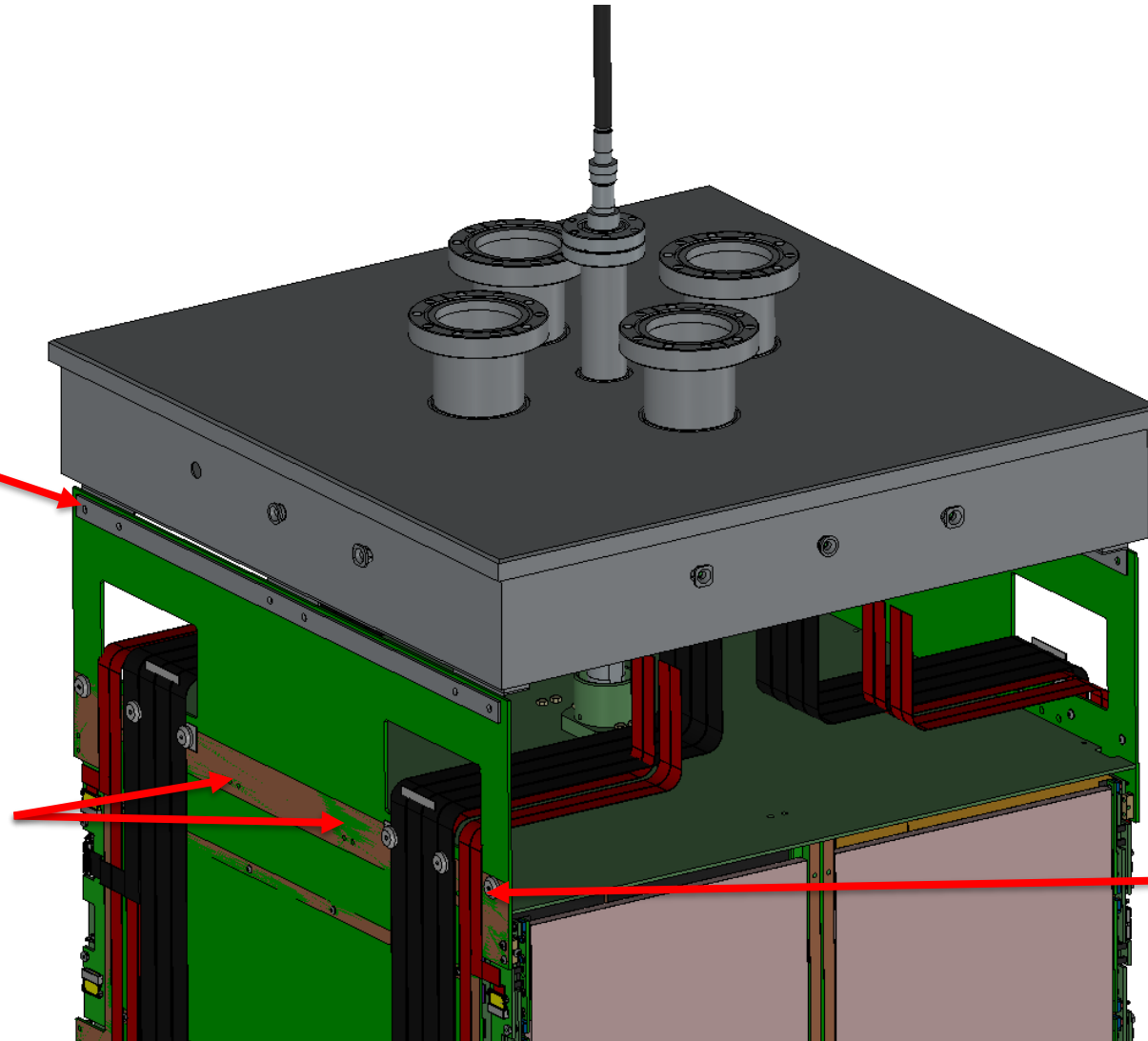
Anode assemblies
come in from side



Anode Installation

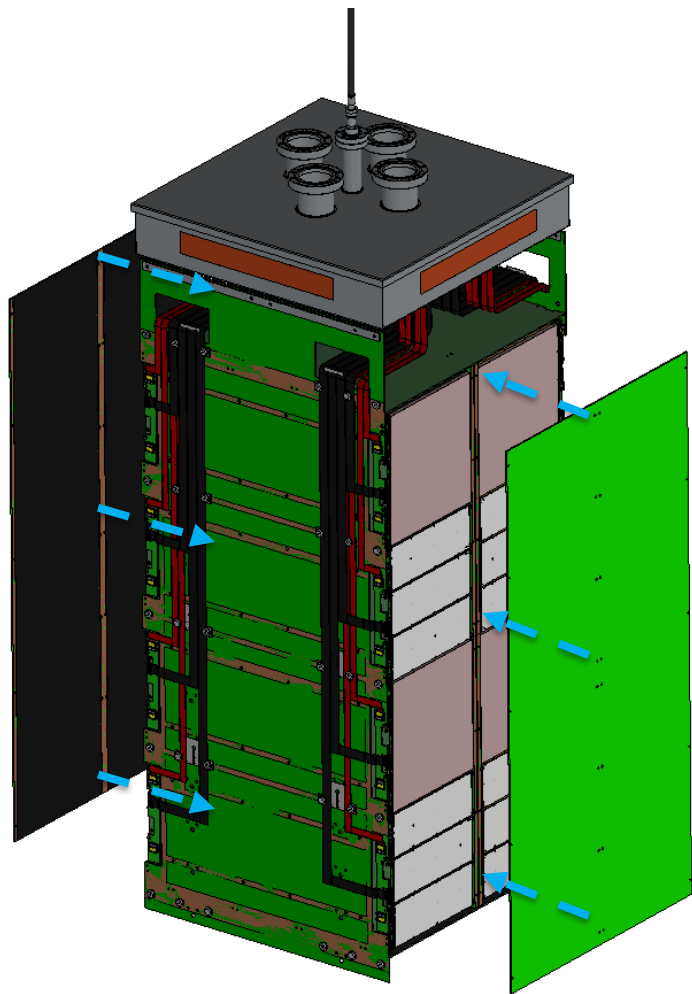
Install bracket plates and fasteners

Affix Anode Assembly to Top and Bottom Field Cage Panels using M4 SS BHCS and anode blocks

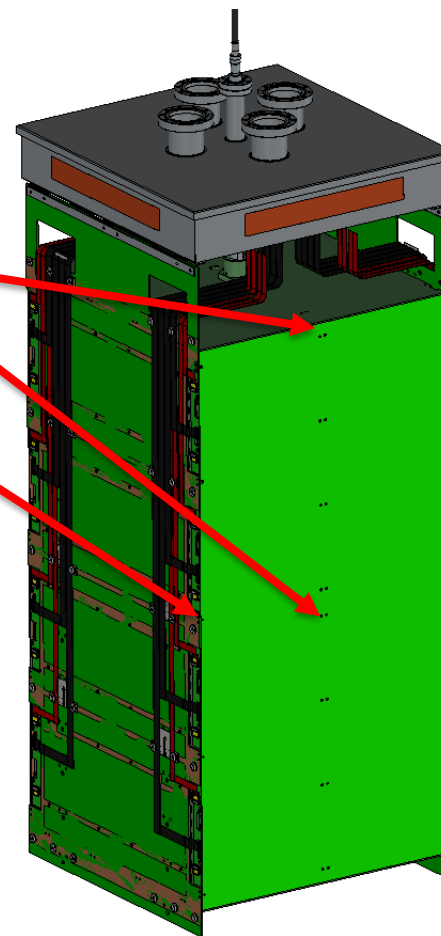


Re-install plastic bumpers

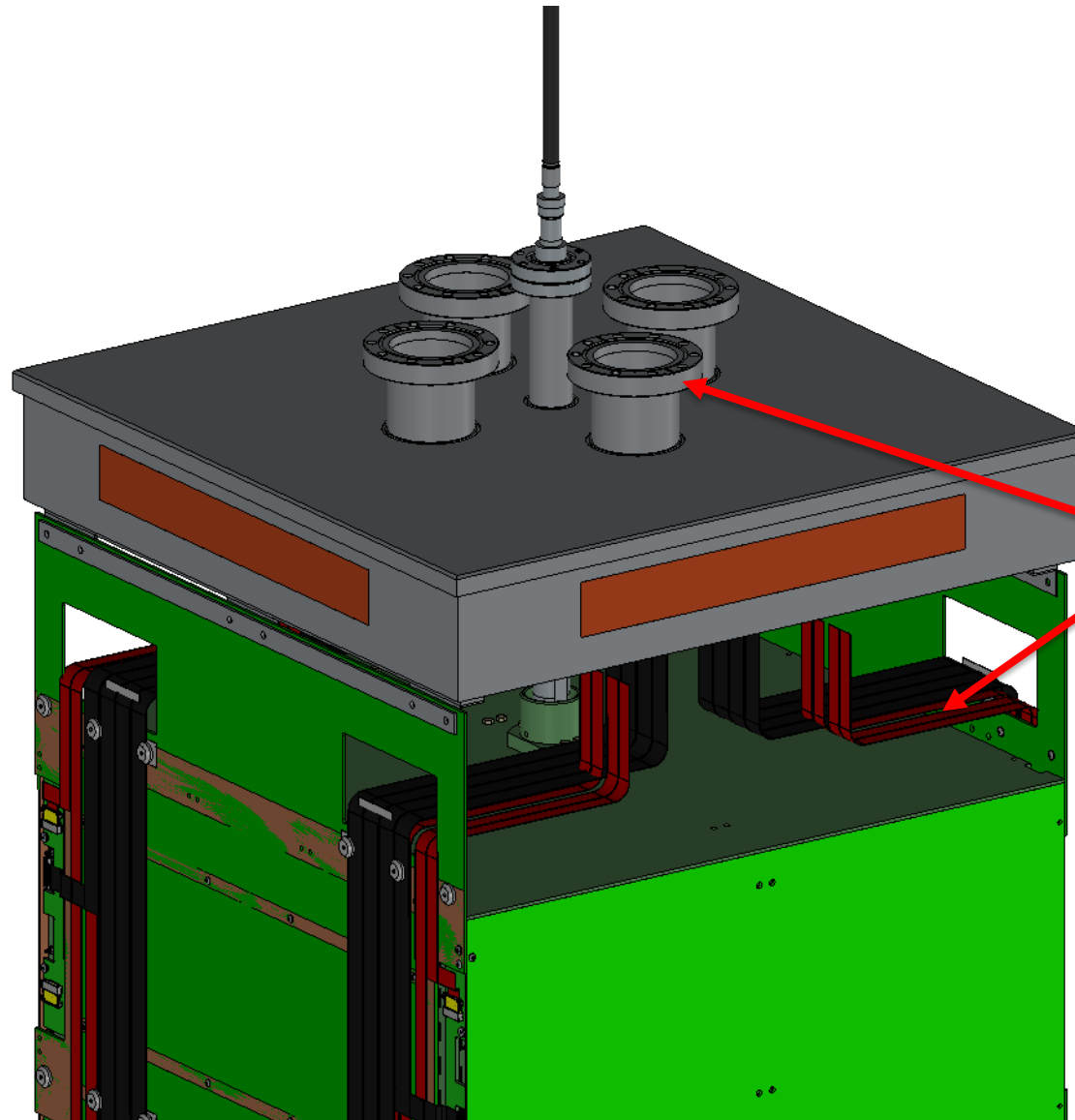
Field Cage Side Panel Installation



M5 PEEK Hex Screws
to fix side panels to
cathode and M4 SS
BHCS to fix side
panels to anode
blocks



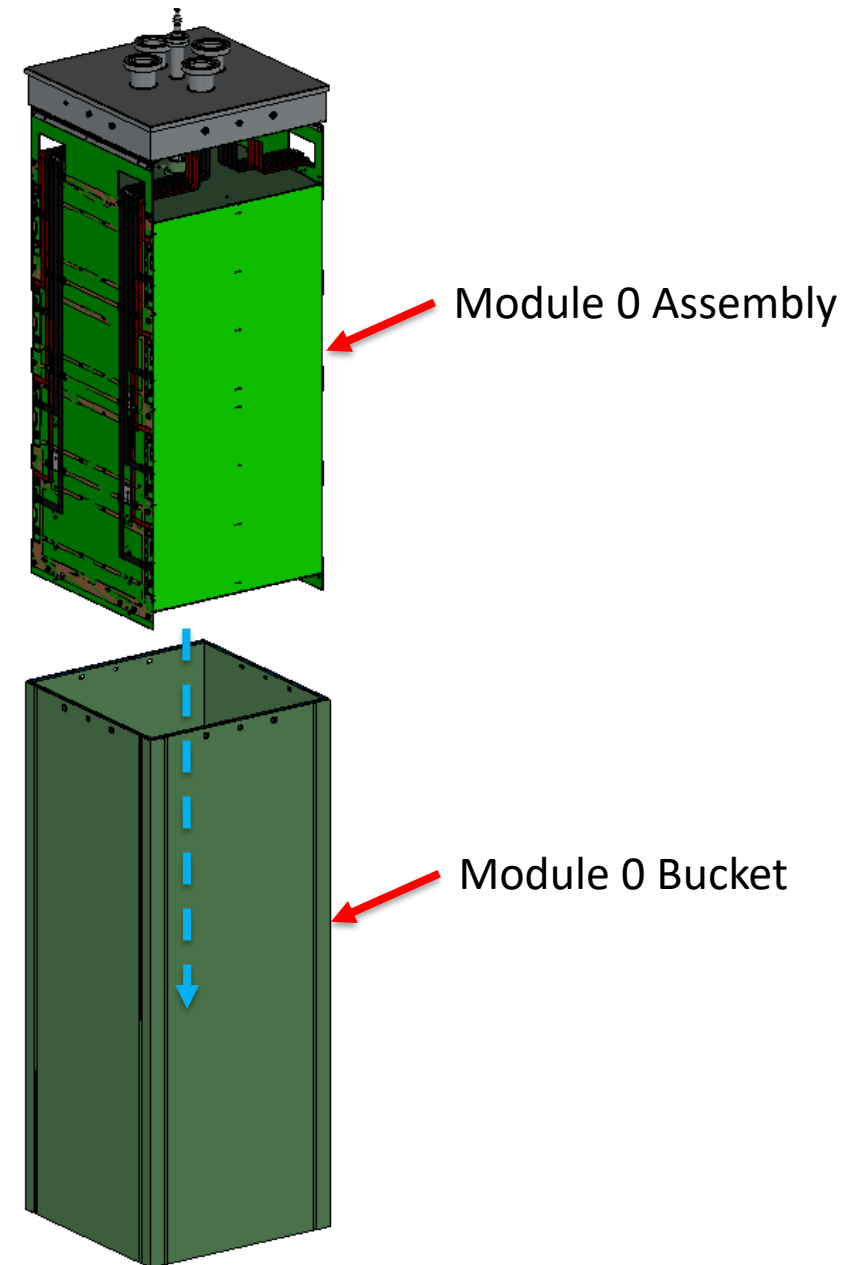
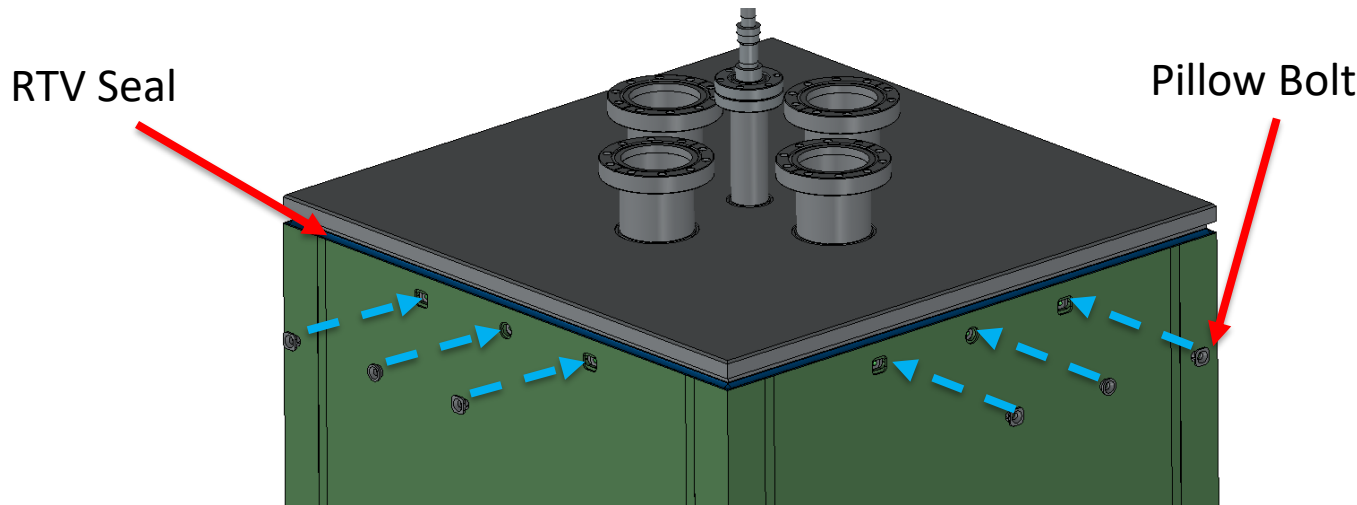
Cable Routing



Route all charge and light readout cables, power supply cables grounding cables and cryogenic lines through feedthrough flanges

Module Bucket Insertion

- This is definitely a crane operation so will require some additional thought, but overall should be a straight forward lift
- The Module 0 Bucket has pillars and a plate on the underside (not shown here), so the Bucket can easily rest on a clean surface on the floor
- Module 0 is lowered into the bucket, the plastic bumpers should guide the assembly into the bucket and protect the anode wall
 - Do we want some bumpers on the field cage side walls?
- Once the Module 0 Assembly is lowered into the Bucket, it is attached to the Top Flange via bolt/screw inserts and RTV seal



Module 0 Assembly Near Complete!

- Final cable routing and feedthrough installation
- Install blank off flanges
- Final wipe down of exterior surfaces
- Store for insertion into single module cryostat
 - Not covered here, story for another day

Final Assembly Notes

- Three person task
 - Could involve some crane work for Anode Assembly Rotation and Module insertion into the Bucket
- Installation location – Univ. of Bern 2x2 test facility
 - Same floor space as previous assembly
 - Overhead cranes can drip oil so we will want to devise a covering for the Anode Assemblies when lifting + rotating
- PPE required
 - ESD wrist-strap connected to grounded assembly fixture
 - ESD cleanroom gloves
 - Safety glasses
 - Hard hats during crane use
- Post-Installation
 - Is there any warm testing that could be done at this point that would help with testing in the cryostat?

Summary

- Non-exhaustive summary of the Module 0 assembly up to the point of insertion into the Bucket
- At first glance it looks like we have a couple of assembly fixtures to design – volunteers?
- Another item we need is a Master Parts List, which I can organize but I would ask to receive Bills of Materials from each Institution that covers their subsystem(s). I can incorporate these into Master BOM to track every part – the idea is to be able to say with confidence pre-assembly (June) that everything we need to begin has been delivered to Univ. of Bern
- Assembly procedures can be written as slide shows, we will not be providing these procedures as CD-2 documentation so their format can be less formal
- Interfaces need to be reviewed, this can be done in meeting format with slides that can serve as an ICD
- Hopefully this engineering meeting can serve as a forum to address technical issues and assembly planning
- Comments and suggestions?