Light Tighting the Box

L. Bartoszek

BARTOSZEK ENGINEERING

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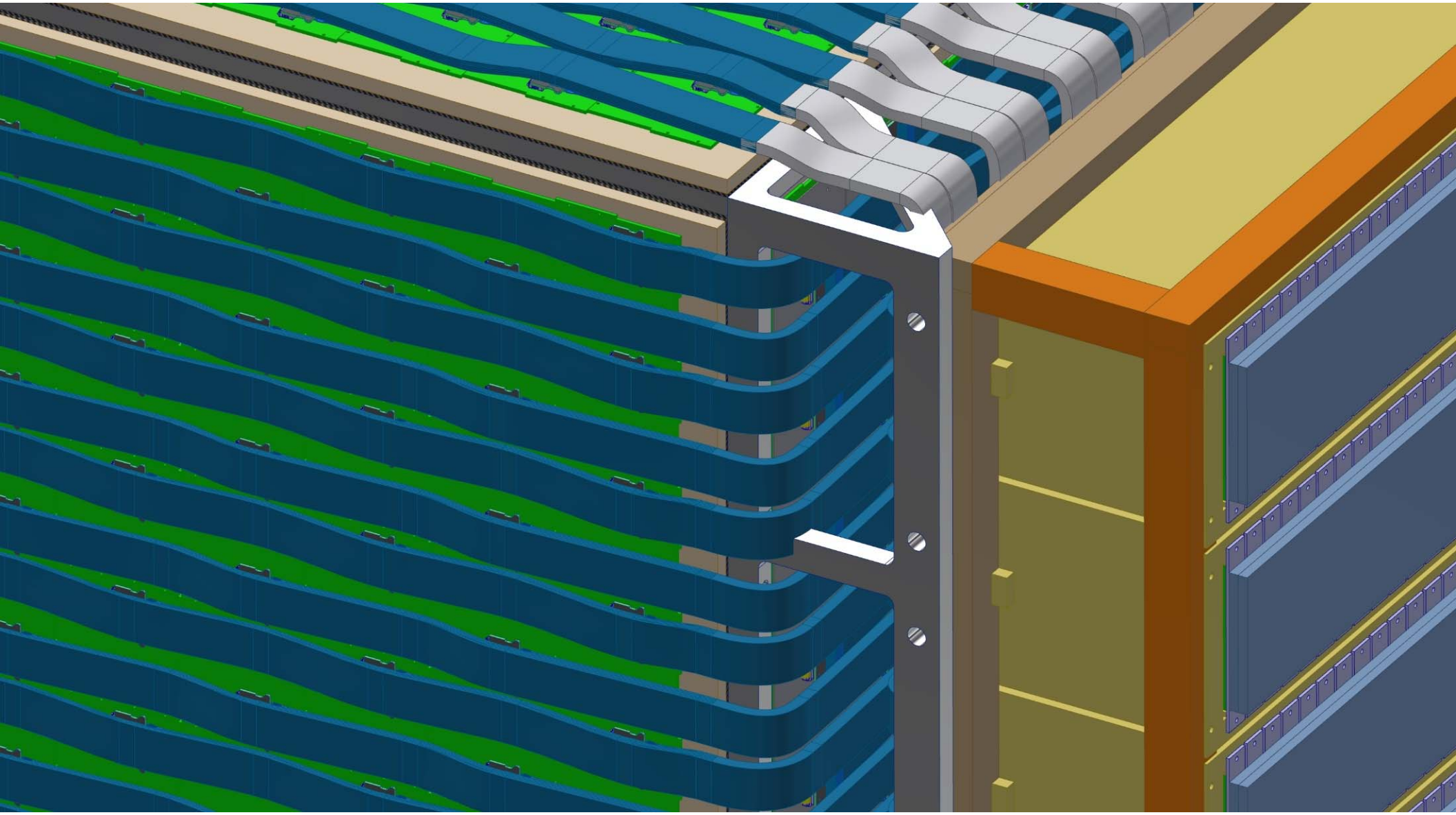
Two basic concepts

1. Make each component fastened to the box light tight and its connection to the box light tight
2. Wrap a light barrier all the way around the box enclosing everything
   - Where is the interface? We can't enclose the electronics or they would get no cooling air
   - That means each cable would have to be light-tight where it exits the barrier

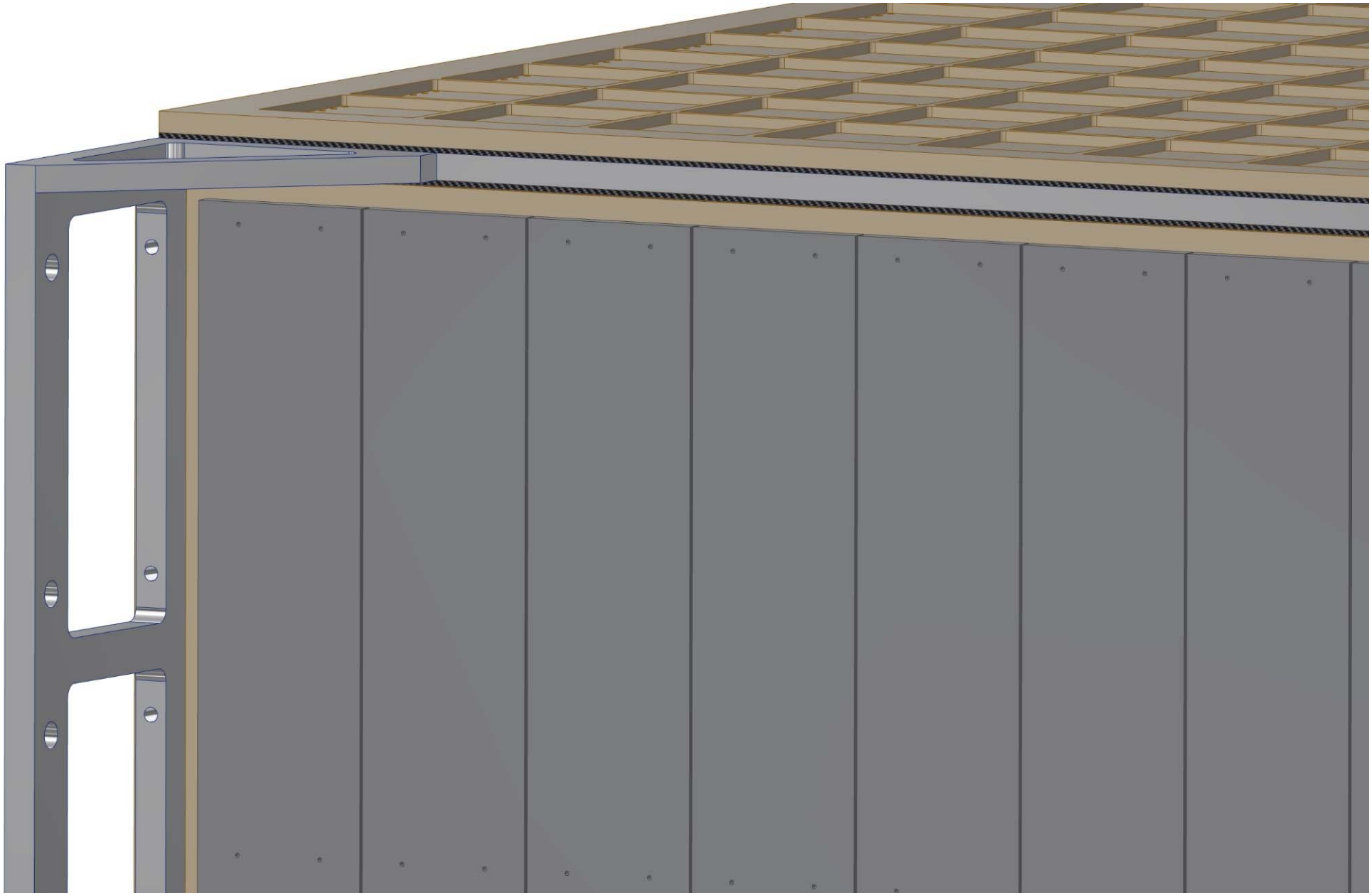
- I am going to talk about #1 because I do not believe we have room for #2

Out-of-date view of MPPC boards, cables and electronics



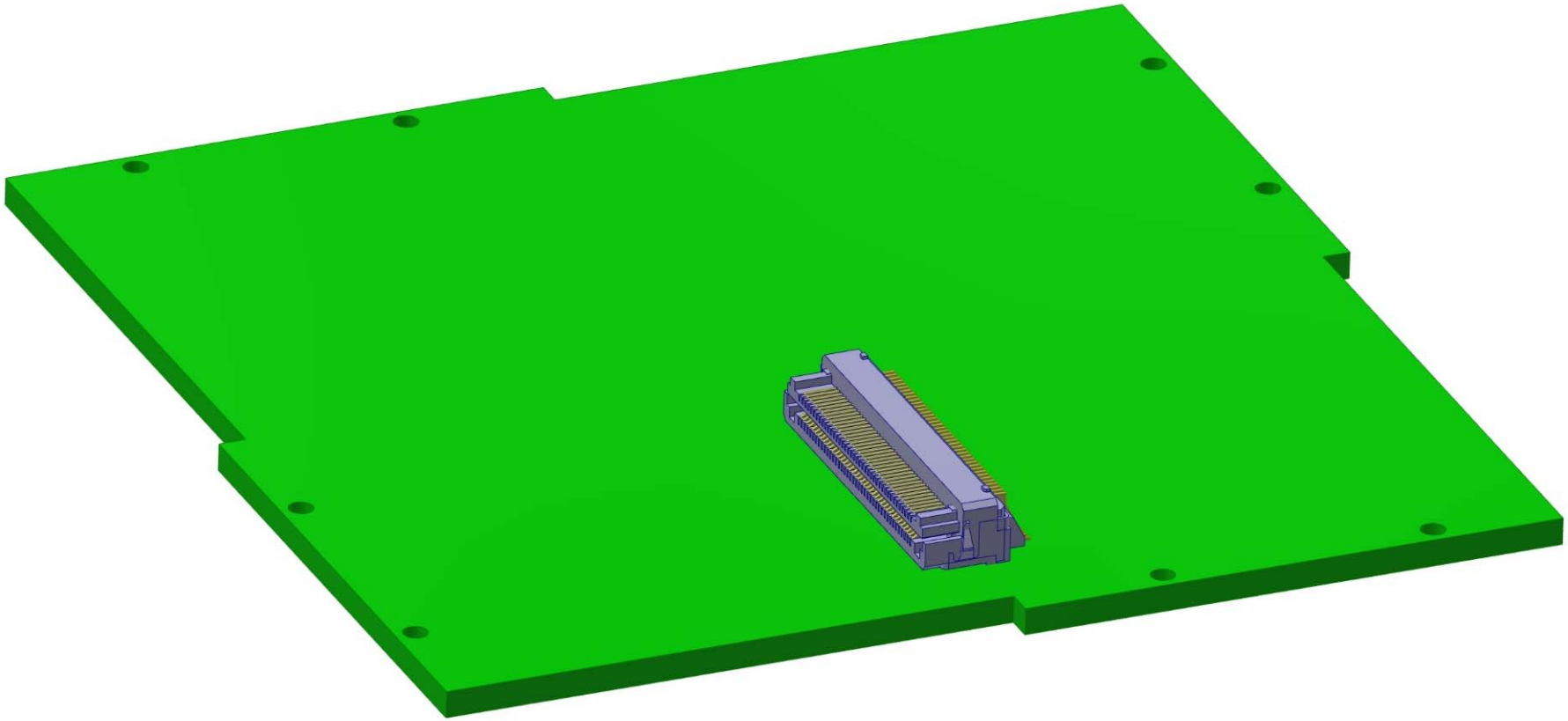
Don’t focus on the interferences in this picture. Look at the complexity of the cables.

View of a side with the calibration modules (LED cables not shown)



There are only two different things to attach to the box, MPPC boards and calibration modules

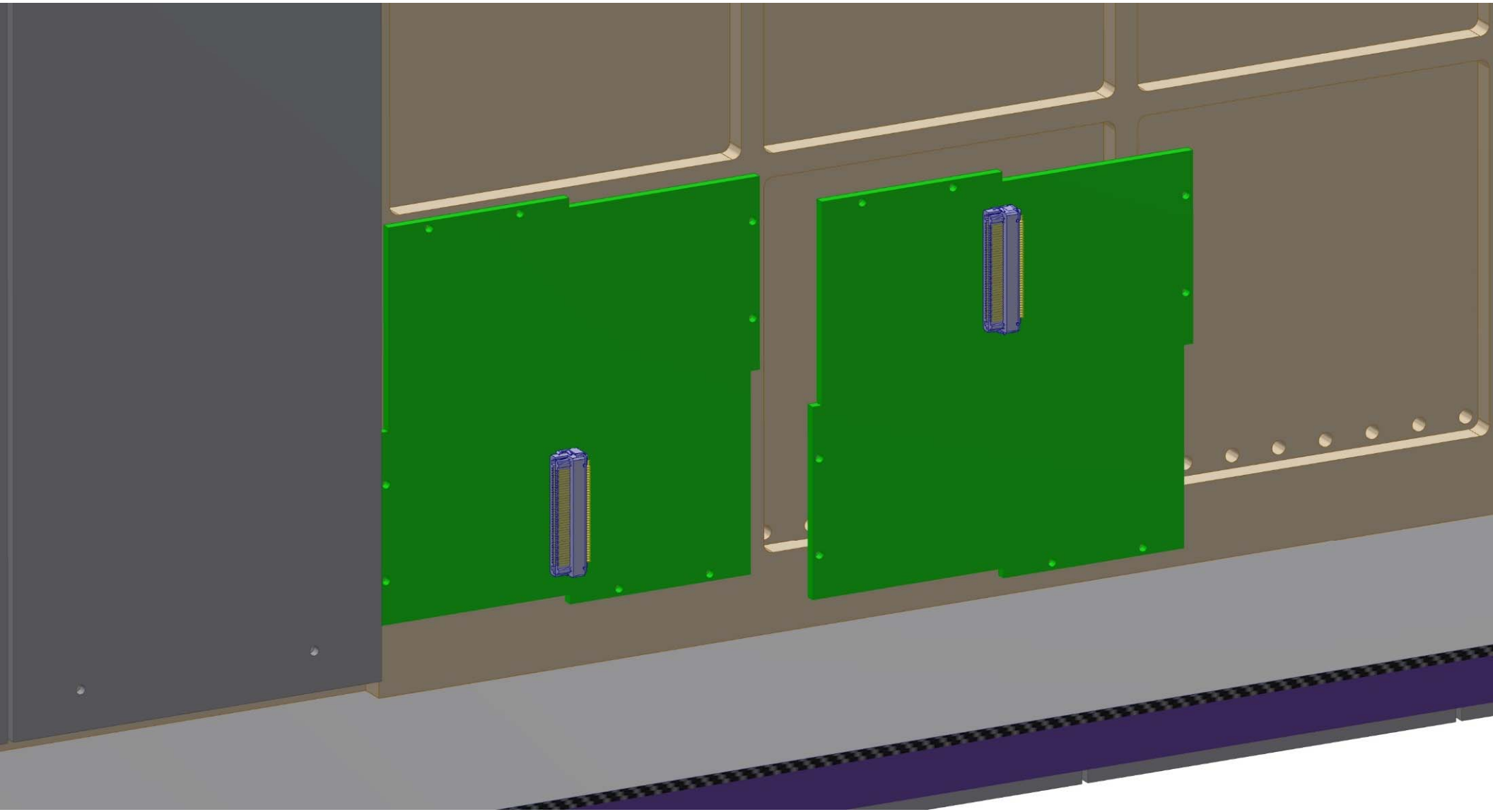
View of what is in the model for the MPPC board



You can see, this is all I have to represent the board and the connector on the backside. The main question is, **can this board be made light-tight**? If the boundary of the board where it fastens to the box is light-tight, would then the whole thing then be light-tight?

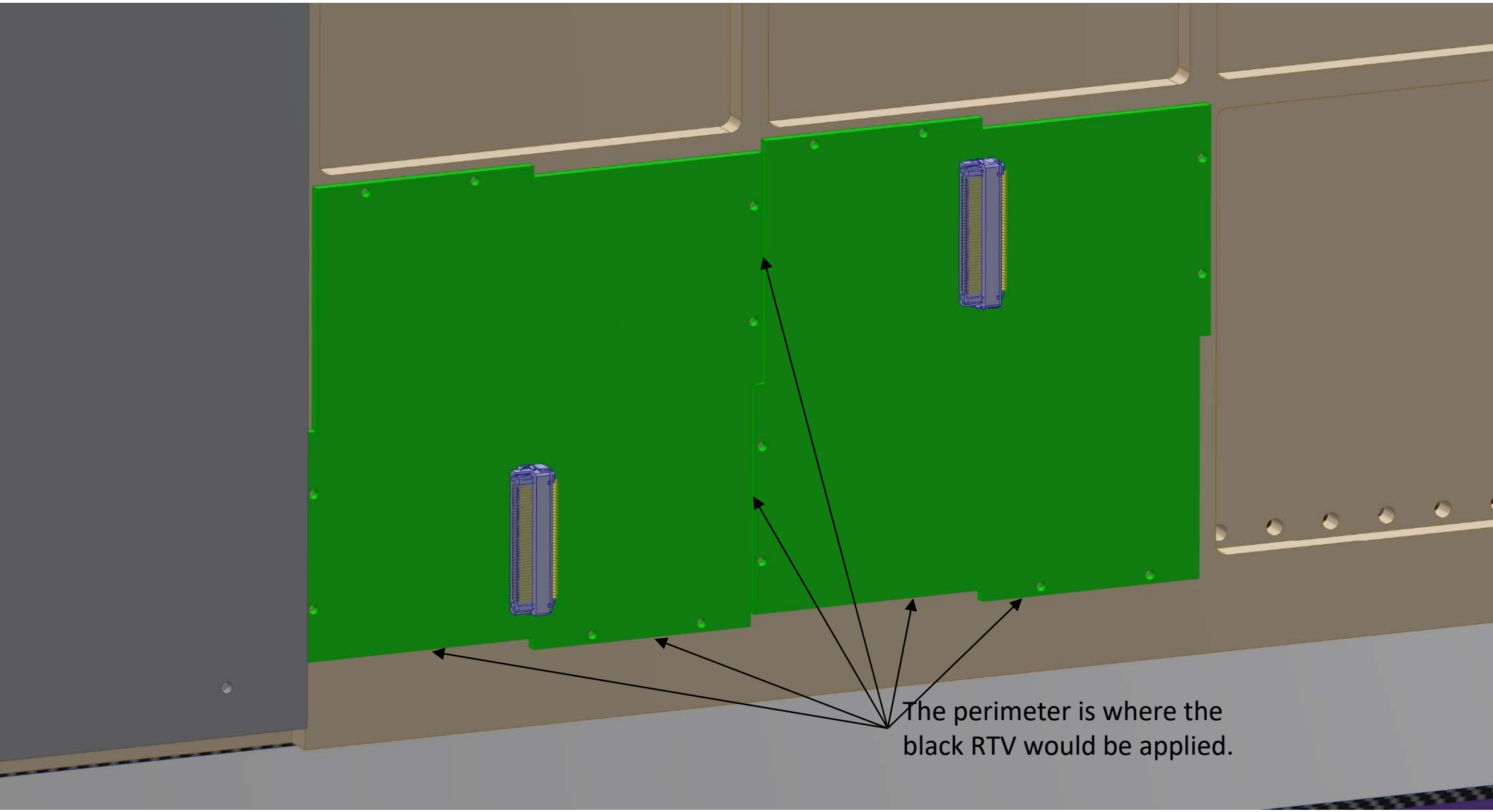
I would use black RTV around the edge of the board to make it light-tight to the box. I have worked on experiments with lots of holes in the detector where black RTV was used to make the detector light-tight.

Fastening the MPPC boards to the box



This is a vertical wall on beam right.

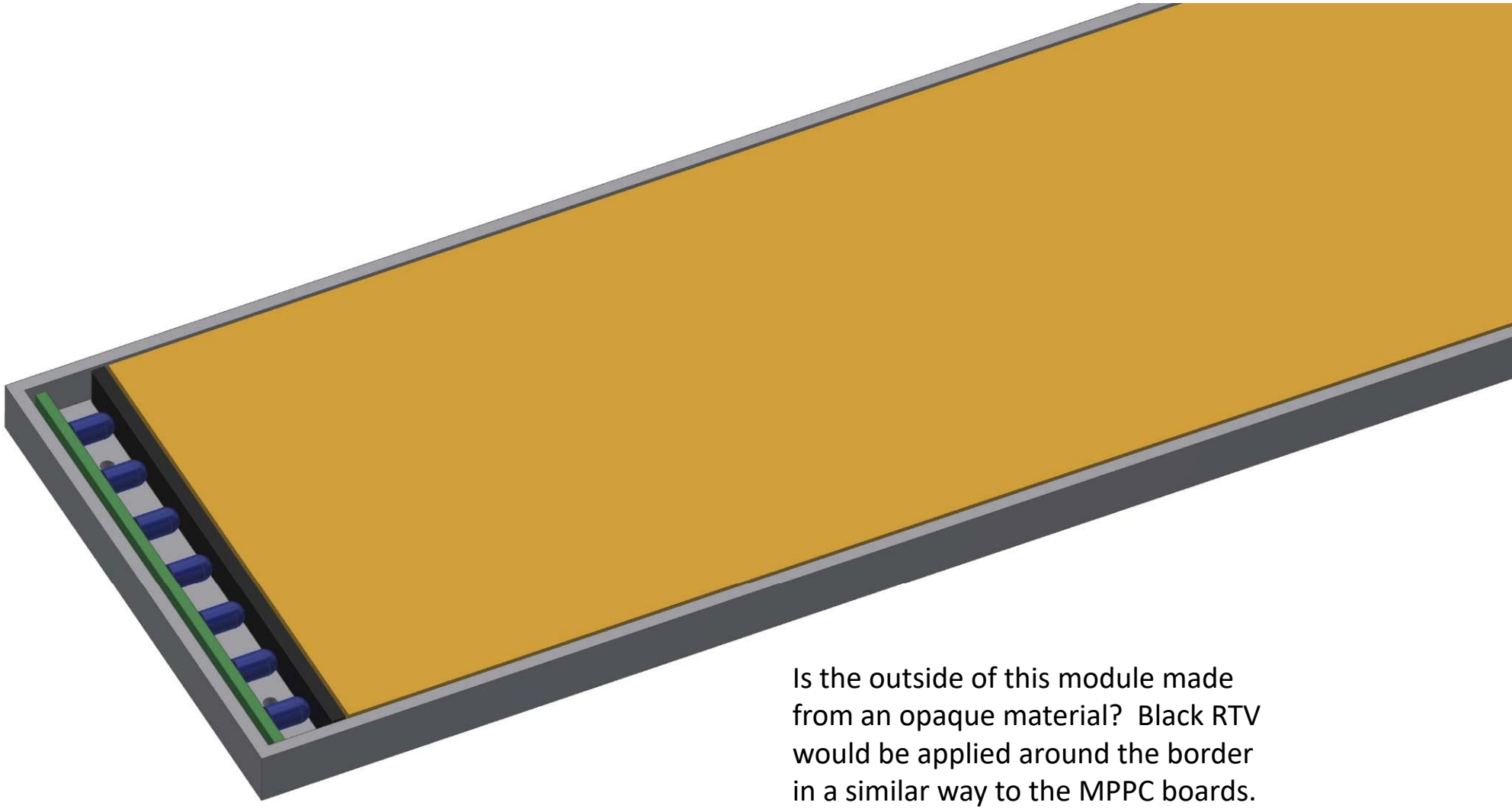
Two boards adjacent to each other



We can’t put the RTV between the board and the box because that would change the distance between SiPMs and the light fiber connectors.

I think we could apply the RTV all around the boards after they have all been assembled.

View of the side of the calibration module that goes against the box



Is the outside of this module made from an opaque material? Black RTV would be applied around the border in a similar way to the MPPC boards.

This is the kind of product I’m talking about:

It’s $4.97 USD per tube at Home Depot.

There are lots of choices of manufacturer and detailed formulations.

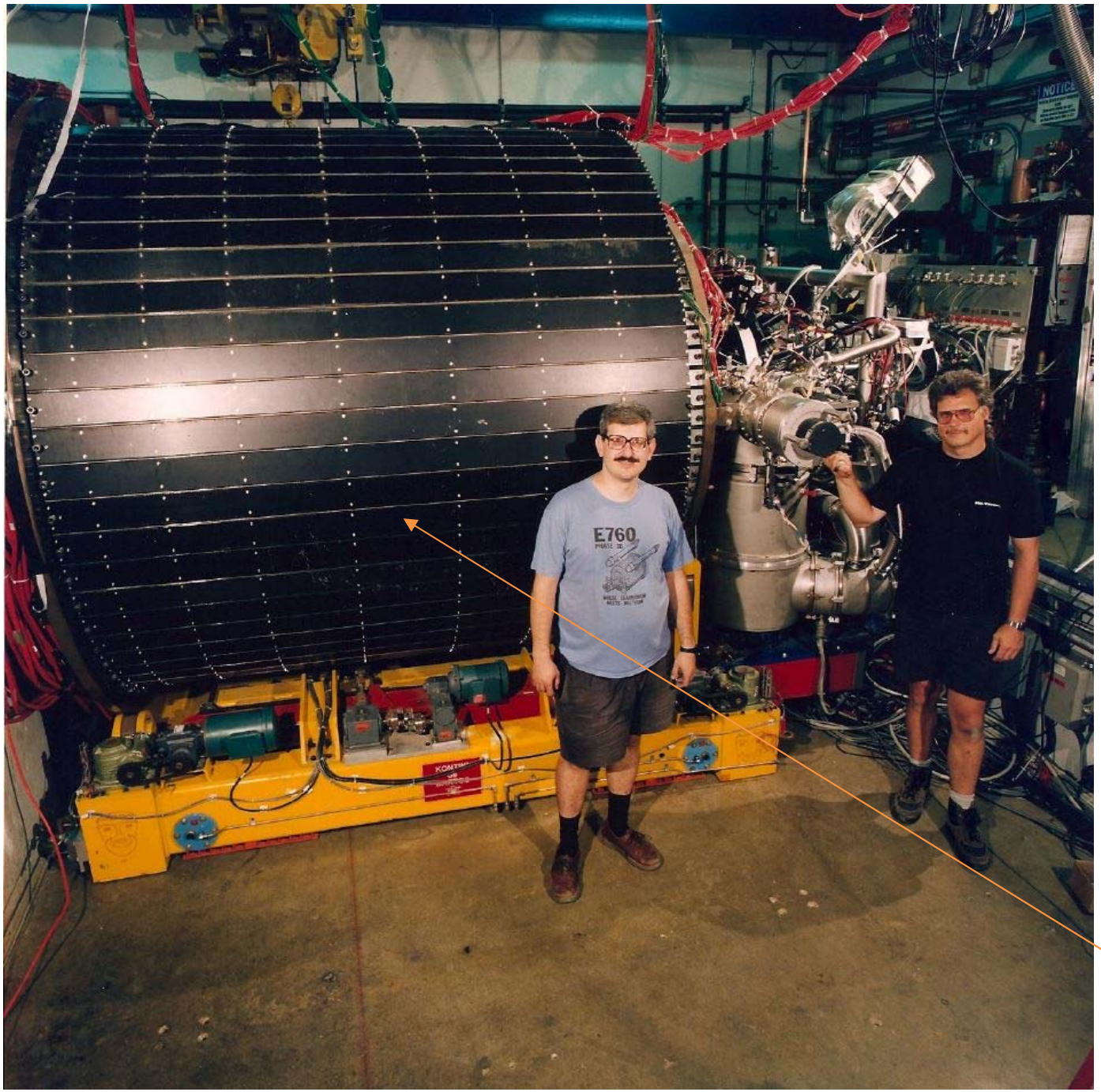
Some versions may peel away for easier repairs and replacement of parts. We should test this.

Product Overview

Permatex Ultra Black Maximum Oil Resistance RTV Silicone Gasket Maker is a fast-curing, sensor safe, low odor, non-corrosive formula. It retains high flexibility and oil resistance properties through use of a patented adhesion system. This gasket maker meets performance specs of OE silicone gaskets and is OEM specified.

- Sensor-safe, non-corrosive formula designed for superior adhesion to oily surfaces and long term durability
- Superior resistance to powertrain fluids including engine oil, transmission fluid, gear lube and coolants
- Retains high flexibility and eliminates the need for pre-formed, pre-cut, paper, rubber or cork gaskets
- Suggested applications: valve covers, oil pans, intake manifold end seals, timing covers and differential covers

The E760 Central Calorimeter

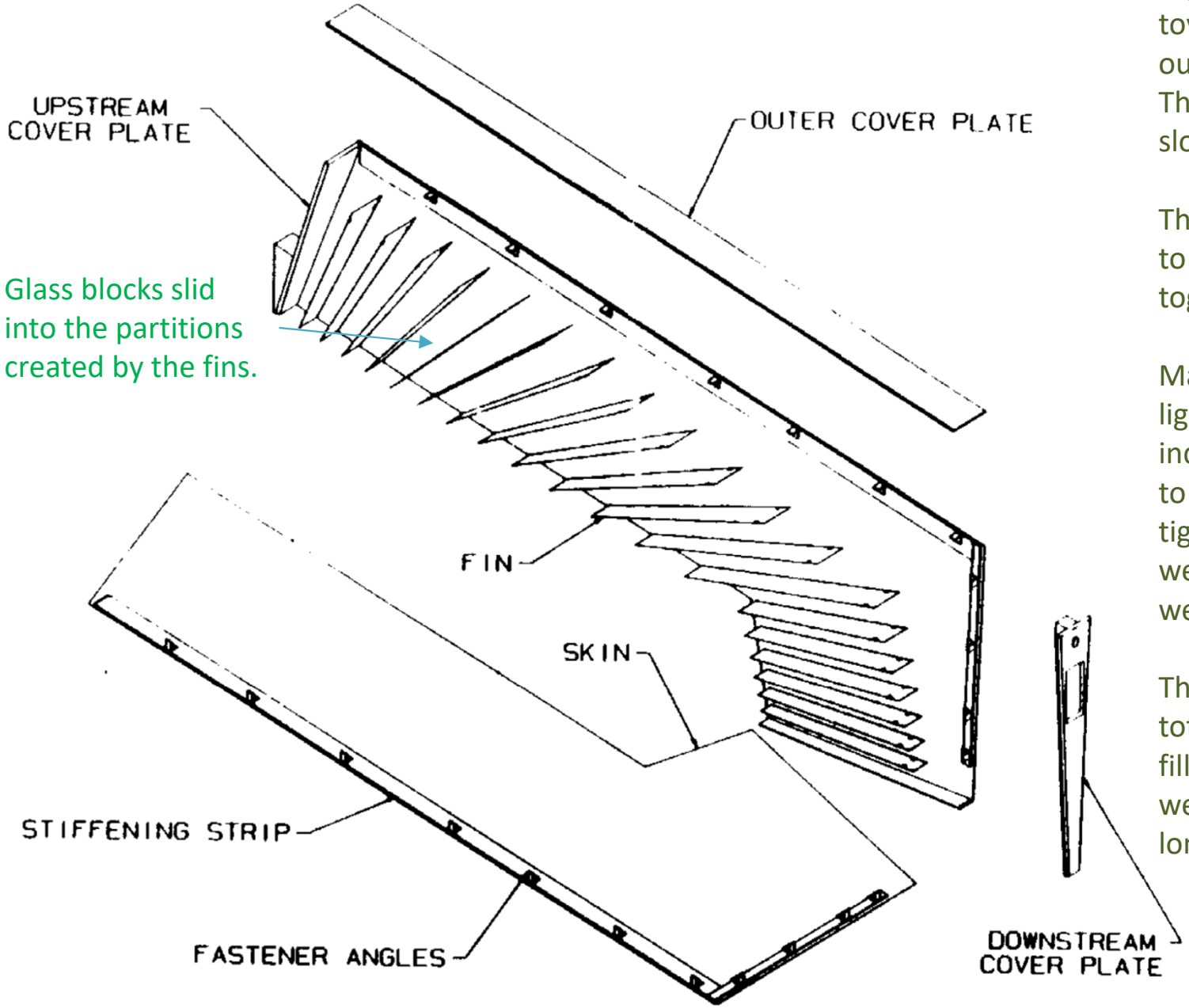


E760 was assembled from 64 wedges, each containing 20 lead glass blocks that were tapered to point at the collision point of the experiment.

Wedges were made from .76 mm thick outer sheets of stainless steel and .25 mm thick stainless partitions between the glass blocks (see next slide.)

Each wedge was a light-tight unit. Light-tightness was achieved with black RTV.

The E760 Wedges, Bartoszek et al., NIM a 301 (1991) 47



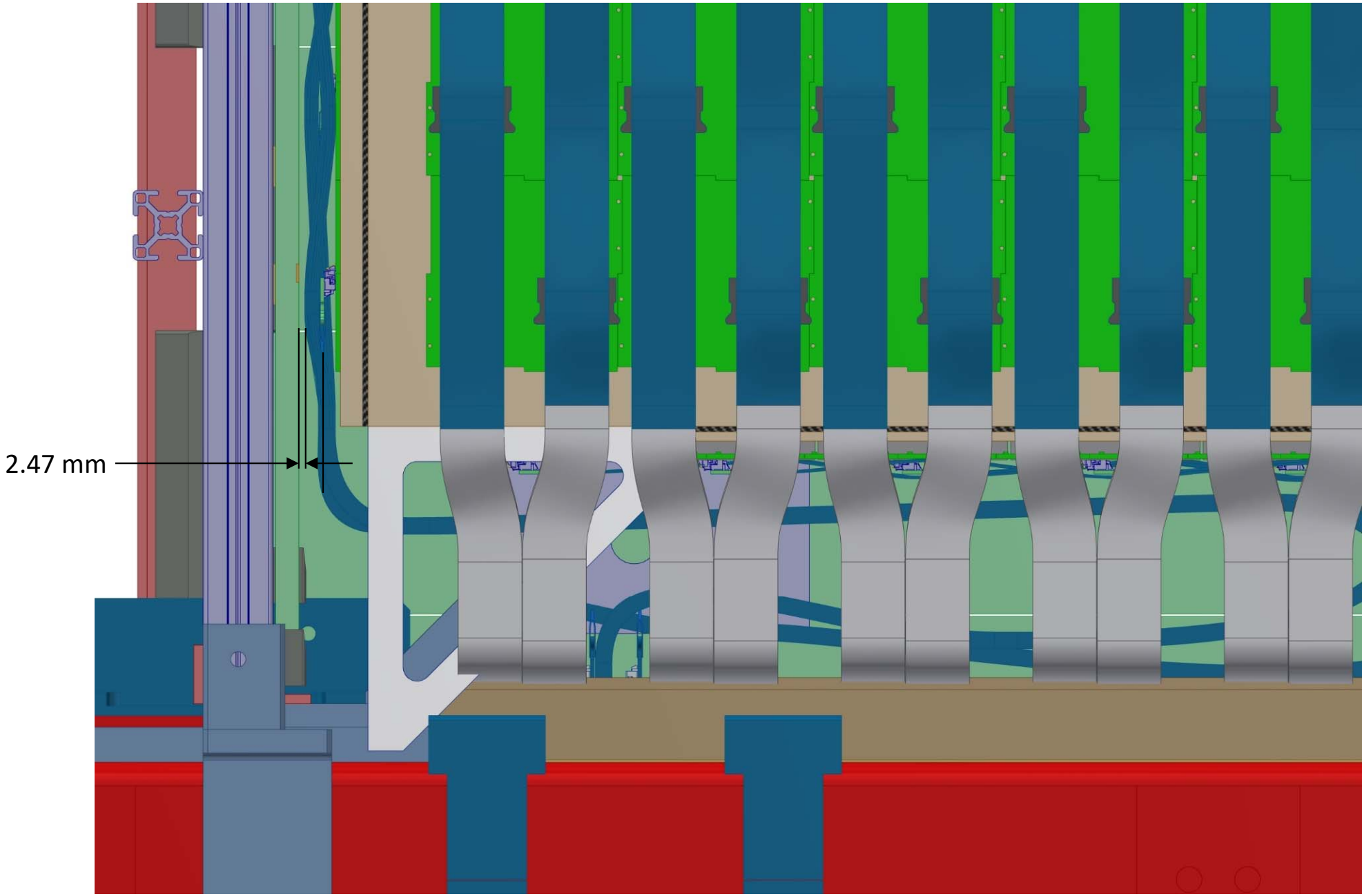
The wedges were put together the way sheet metal toys are, cutting slots in the outer thicker skins by laser. The fins had tabs to match the slots in the skins.

The fins were hand assembled to the skins, then laser welded together from the outside.

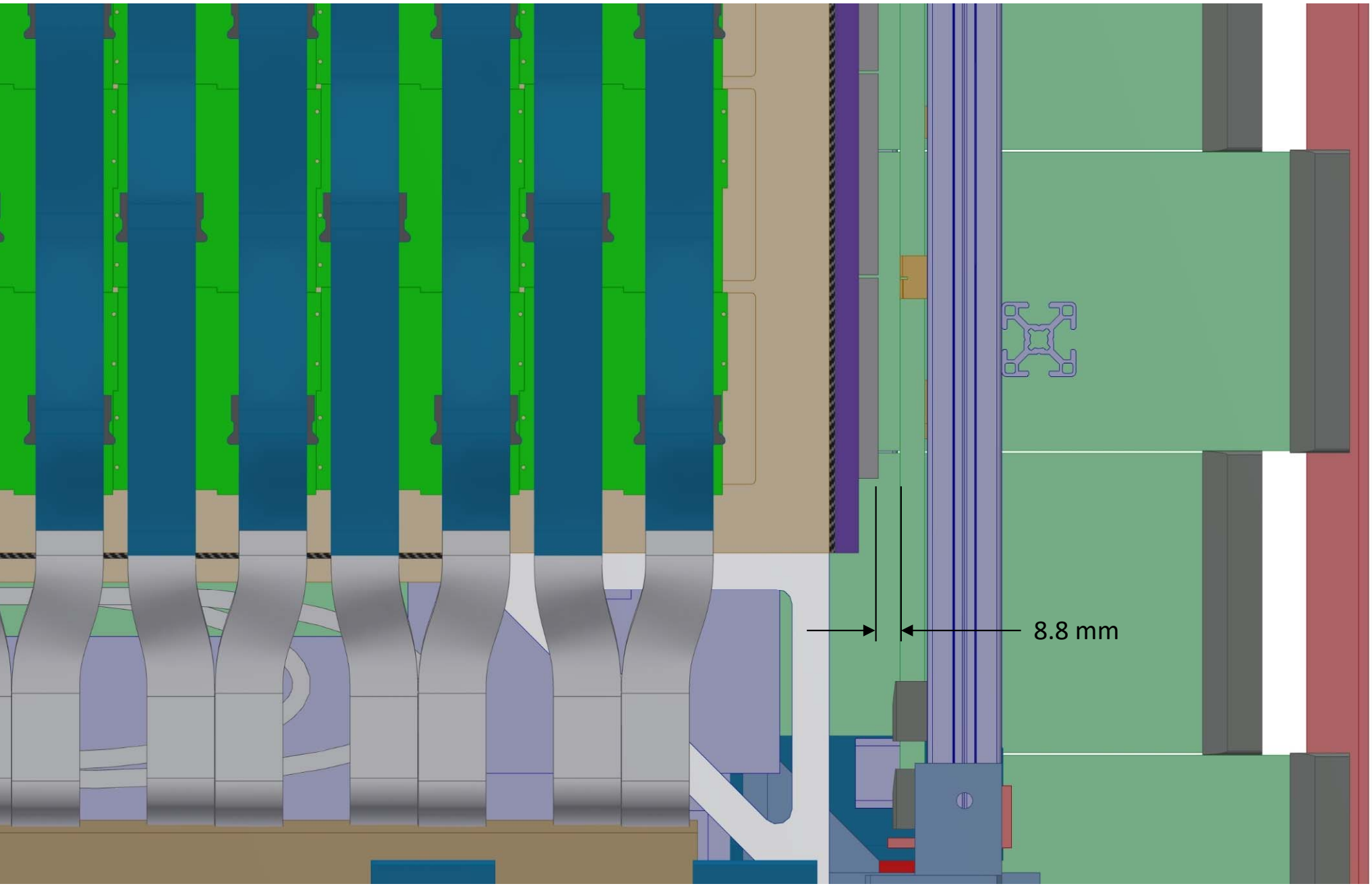
Many of the welds were not light-tight and had to be individually coated with RTV to make each wedge a light-tight unit. The cover plates were also RTV'd onto the laser welded wedges.

There were 24,320 welds total. Thousands had to be filled with RTV. (The welds were .25 mm wide by 6.4 mm long.)

Why I don’t think we have room for an external light barrier—US plan view



Plan view of the DS end showing clearance to TOF



Space conclusions

- The total gap between the SFGD box and the US and DS TOF is 11.27 mm (5.64 mm evenly distributed between US and DS.)
  - It took a lot of nipping and tucking to even get that much without losing a plane of cubes
- Any additional external light barrier is going to eat up some of this space making installation even more problematic

Conclusions

- If we can get the MPPC boards and calibration modules to be opaque, we can connect them to the box with a light-tight connection
  - Cables become irrelevant then, they are outside the light box
- Trying to come up with a secondary light barrier is full of trouble with boundaries
  - And it eats up valuable, scarce space
- Can the light level in the ND280 hall be reduced during running?