Clearance for the SSD Opto-Coupler and other Shroud issues

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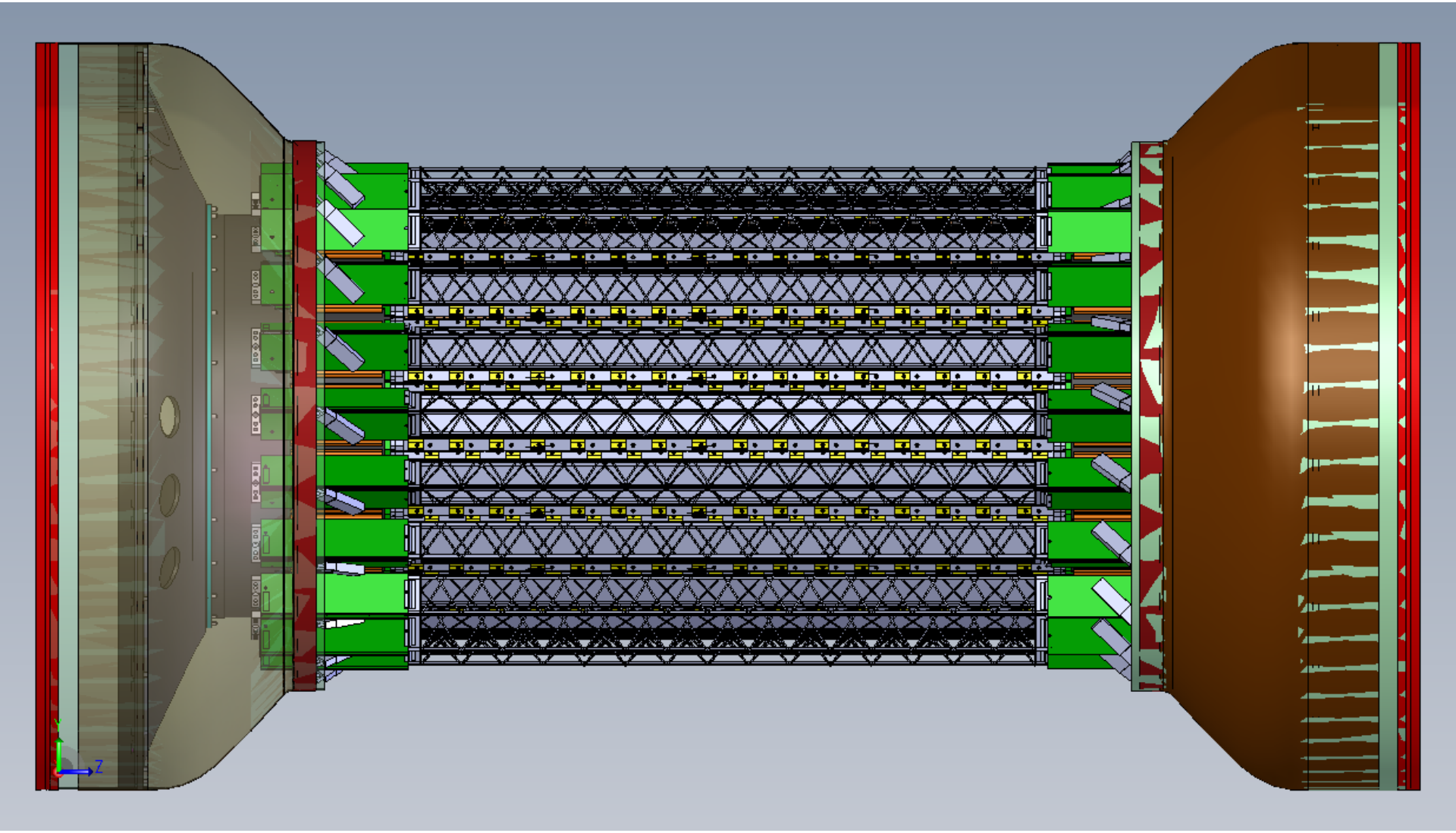
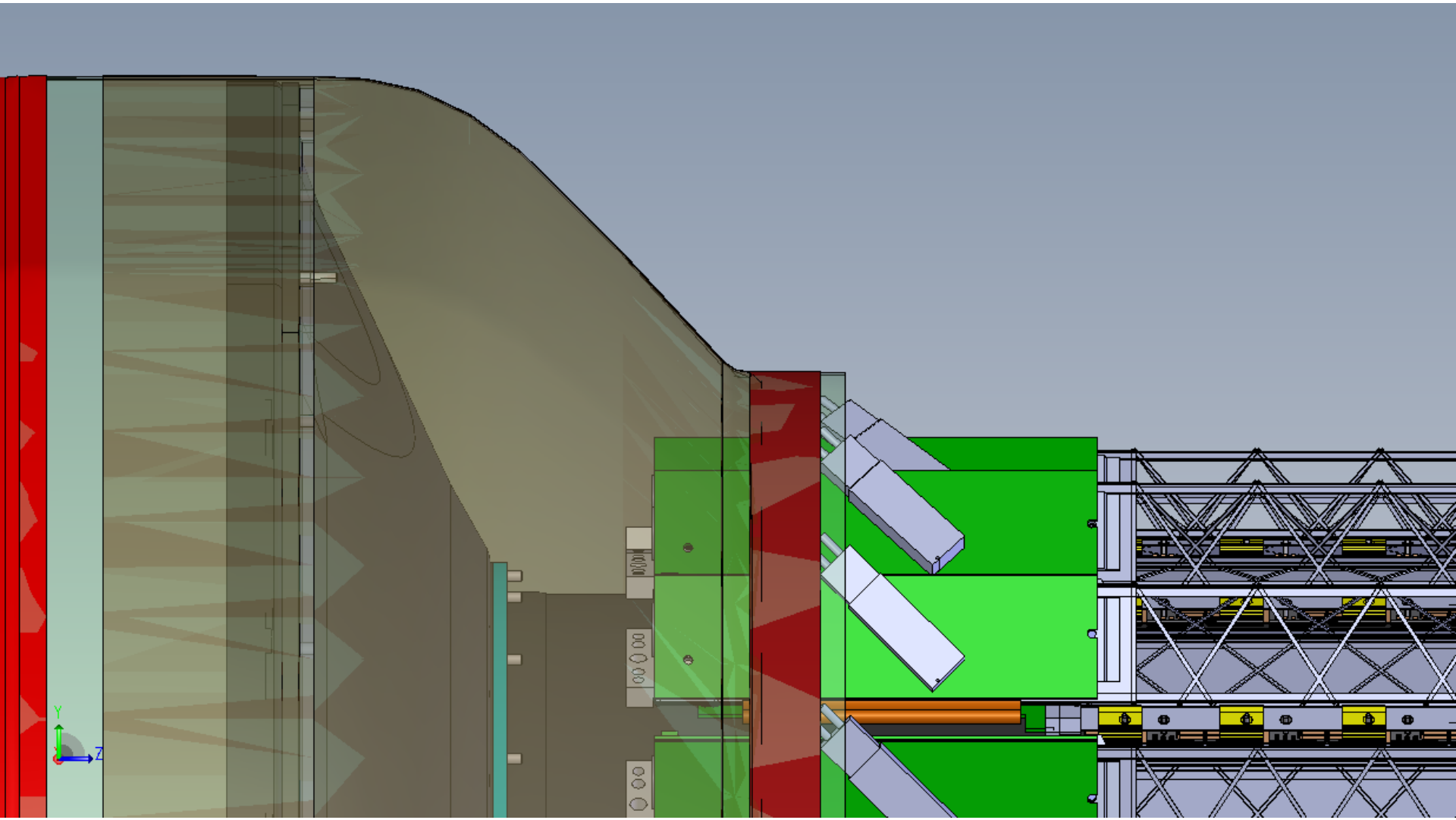
The SSD with ladder cards installed



Homework: are dimensions up-to-date? This is an old model.

The region near the shroud

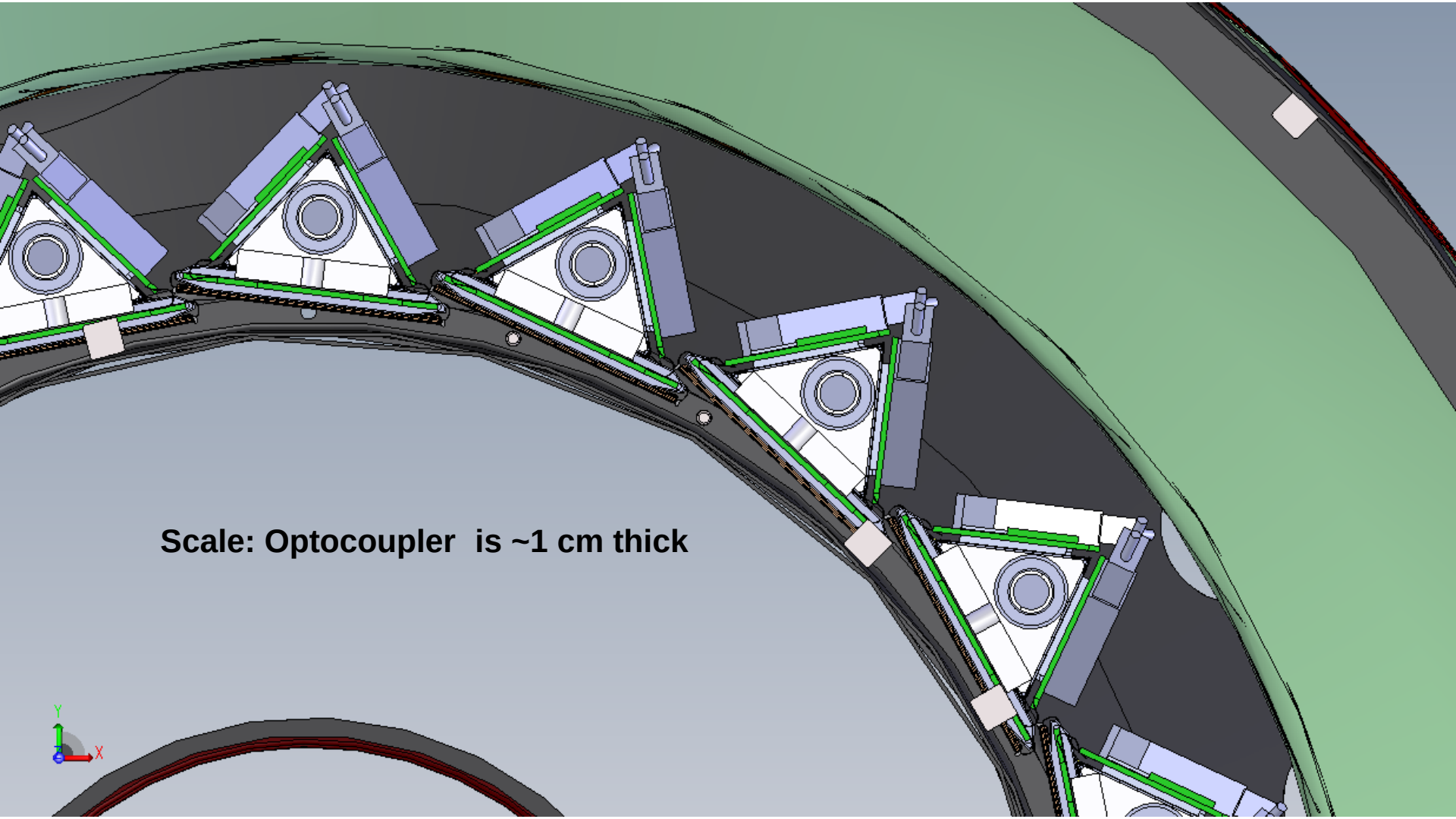


Possible interference between the opto-coupler and the shroud

Issues

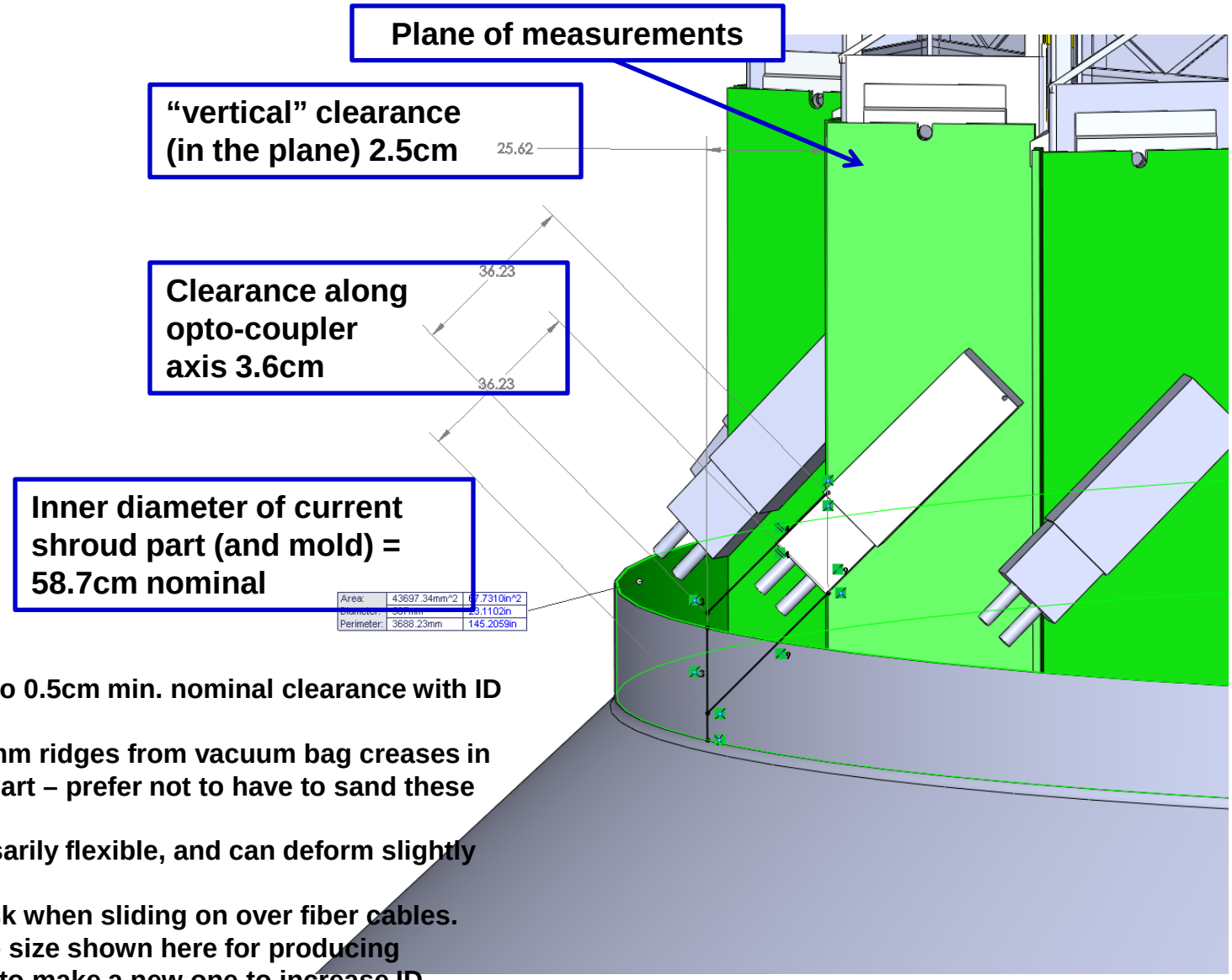
- Is the smaller radius of the shroud a critical dimension
  - Can it be changed to give more room for the otpo-coupler?
  - See next page for additional issues and concerns about space
- How will the shroud be installed when the ladders are in place?
  - For the most recent installation, hands had to go under the shroud to install the nuts and bolts to fasten the shroud to the OSC
  - Can the shround ‘clamshell’? Issue with breakdown near joint?
- How do we connect wires and cooling lines to the ladders
  - Will the shroud be slid to the mid-line?
  - How will it be held in place for this rather delicate operation?
- How do we service the SSD?
  - We probably do not want to disassemble the OSC etc etc etc in order to replace a ladder (or a ladder card on a ladder)
  - Clam shelling the shroud seems like the only option … but that takes us back to the previous bullets. Issues with breakdown?

A more detailed look at the 3D model



Note: not necessarily the same scale as previous diagrams

Shroud/SSD models as of 2011-10-25 (j. silber)

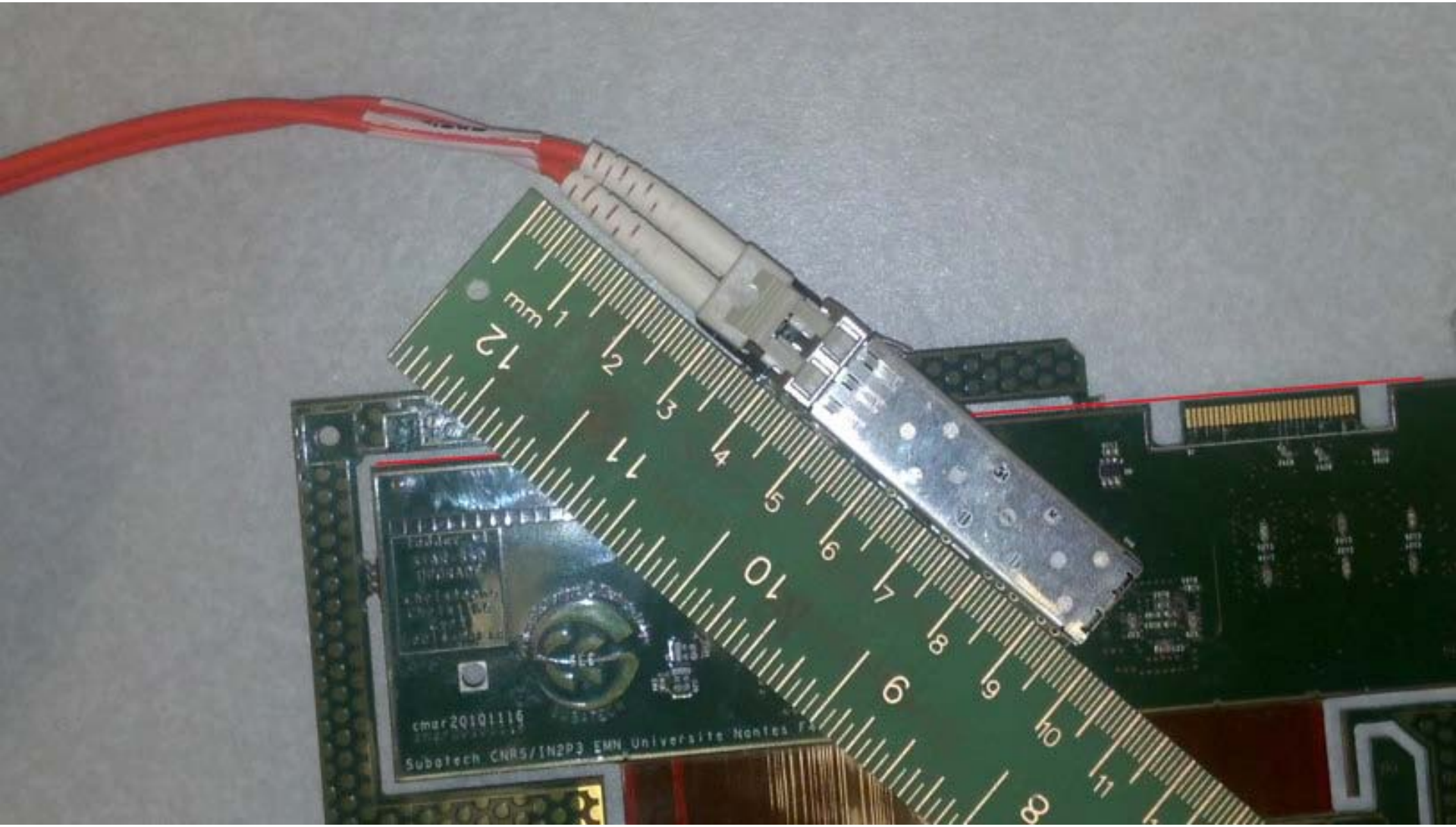


Ideally would design to 0.5cm min. nominal clearance with ID of shroud:

1) **There can be ~2mm ridges from vacuum bag creases in the wet-molded part – prefer not to have to sand these off.**
2) **Shroud is necessarily flexible, and can deform slightly when bolted in.**
3) **Less handling risk when sliding on over fiber cables.**

We have a mold at the size shown here for producing shrouds. Would have to make a new one to increase ID.

The prototype ladder card with opto-coupler

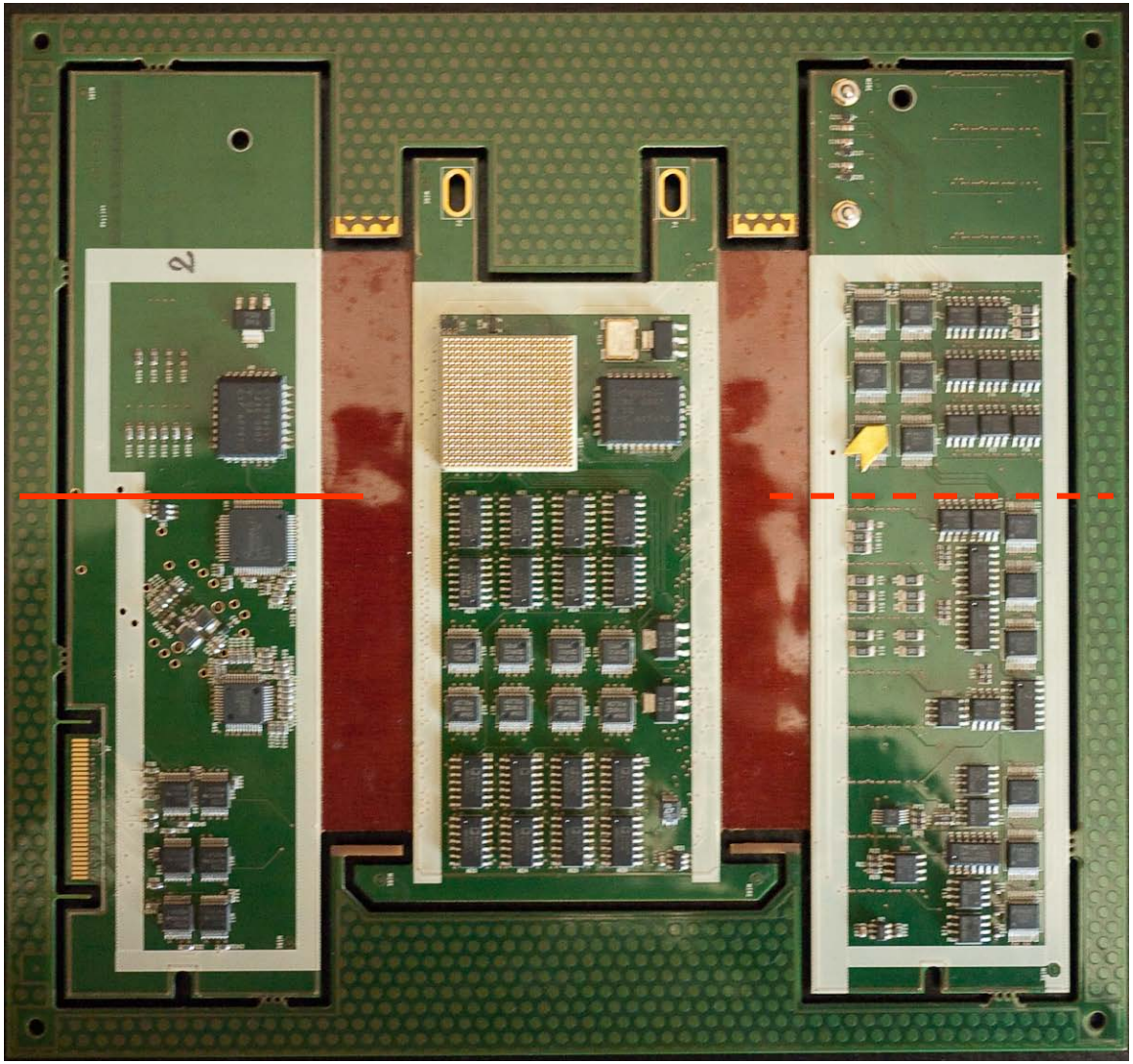


We need 5 cm beyond the top of the opto-coupler for fiber strain relief. Note: The red line is the top of the ladder card.

More Issues

- **We need 5 cm (along long dimension of metal cage for the opto-coupler)**
  - **Including angles at 45 degrees on card, and 60 degrees tilt, this means we need at least 3 cm of vertical clearance to the shroud**
  - **The CAD model suggest we have ~2 cm**
  - **Obviously need to check these numbers, very carefully, but this is not a region where we want close tolerances.**
    - **Service will be a nightmare if we have to shoehorn the ladders in place**
- **The proto-type ladder card is not the same as the card shown on the 3D drawings.**
  - **At least one difference is that Christophe moved the optocoupler further out away from the board by ~1 cm (along the long dimension of the metal cage) in order to make room for the locking device to hold the fibers into the metal cage (lock is on the bottom)**
  - **We were in trouble with the previous design. Now we are really in trouble.**
  - **Christophe is investigating putting the optocoupler back into its original position. This requires cutting the board to make room to access the lock.**
    - **This would gain about 7 mm in the vertical direction … not enough**
    - **Not sure why, but he is reluctant to make this change**
    - **Also, apparently not an option to rotate the connector to a different angle**

More details (opto-coupler on the other side)



- There exist some limits to the motion of the opto-coupler
- Opto-coupler must overhand an edge
  - due to “lock”
- White tape is a gasket material for sealing the air flow within the ladders
- Components on board are arranged to avoid structural elements for the ladders
  - Example is shown by Red line
  - jt not sure about dashed red line

Electrical solutions are possible … but are mechanical (shroud) solutions easier to implement?

Summary

- **Assembly, service, and space for cables is an issue for the SSD with respect to the shroud**
- **Over the next couple of weeks, we need to look at the various options and think about the best way to make installation and service of the SSD an easy thing to do**
- **Homework:**
  - **verify dimensions**
  - **verify CAD model, update if necessary**
  - **discuss shroud design**
  - **discuss board layout**
  - **(ditto for cable paths and cooling lines, too)**

Hot Air … A totally different topic

- **In my spare time, I've been looking at various bits of instrumentation for the SSD air cooling system**
  - **This is the only SSD system that is on schedule ☺**
  - **probably because nothing is due for 6 to 12 months**
- **Diagnostic equipment is expensive, hard to interface to SlowC, doesn't really deliver the information we want, and often the diagnostic tool blocks the path of the air flow**
- **Taking a lesson from Howard Wieman (or Russ Wells?), we can use inexpensive Auto Parts to measure the air flow**
  - **see next page for idea … hope to explore this in detail, soon.**
- **Does anyone know how to measure pressure in a cheap and easy way?**

Air Mass Flow Sensor

- **1996 Volvo 850 – 2.4 liter displacement, 0 to 3500 RPM**
  - **140 liters per second**
  - **0 to 5 volt output**
- **I happen to own one of these … and it has a 3 inch inlet pipe**
  - **Good match to SSD cooling system requirements**
  - **20 ladders at 1.5 liters per second (total = 30 liters per second)**
  - **Design goal is to have 3 inch diameter plumbing between the vacuum source and the face of the TPC**
- **Can I use Government funds to purchase car parts? ($38.00)**