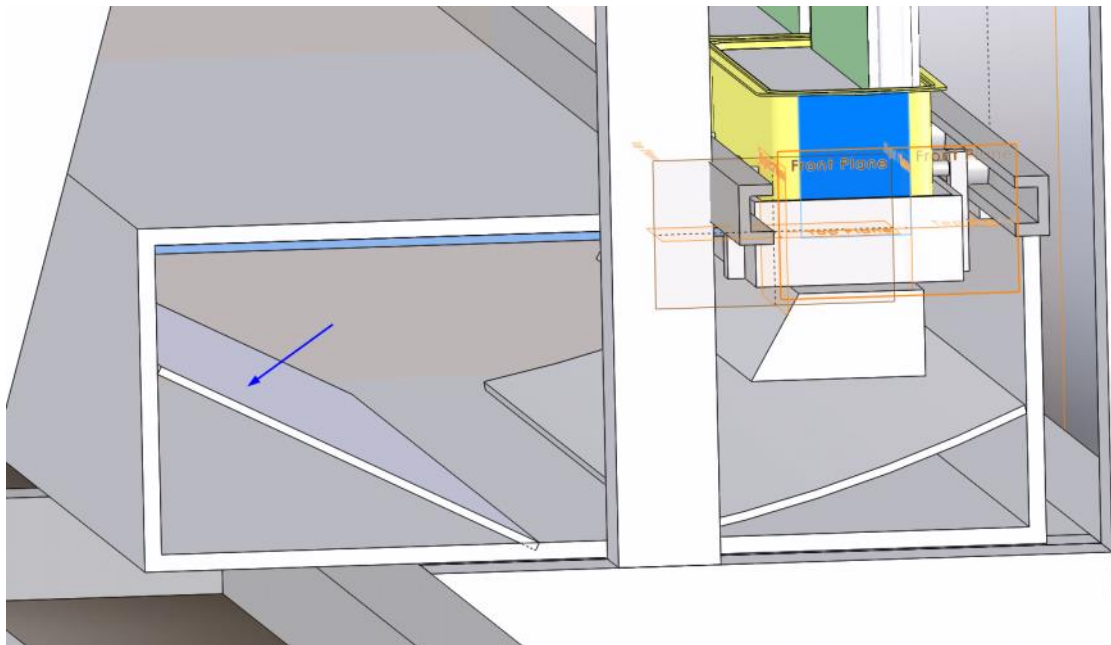


Questions / Issues

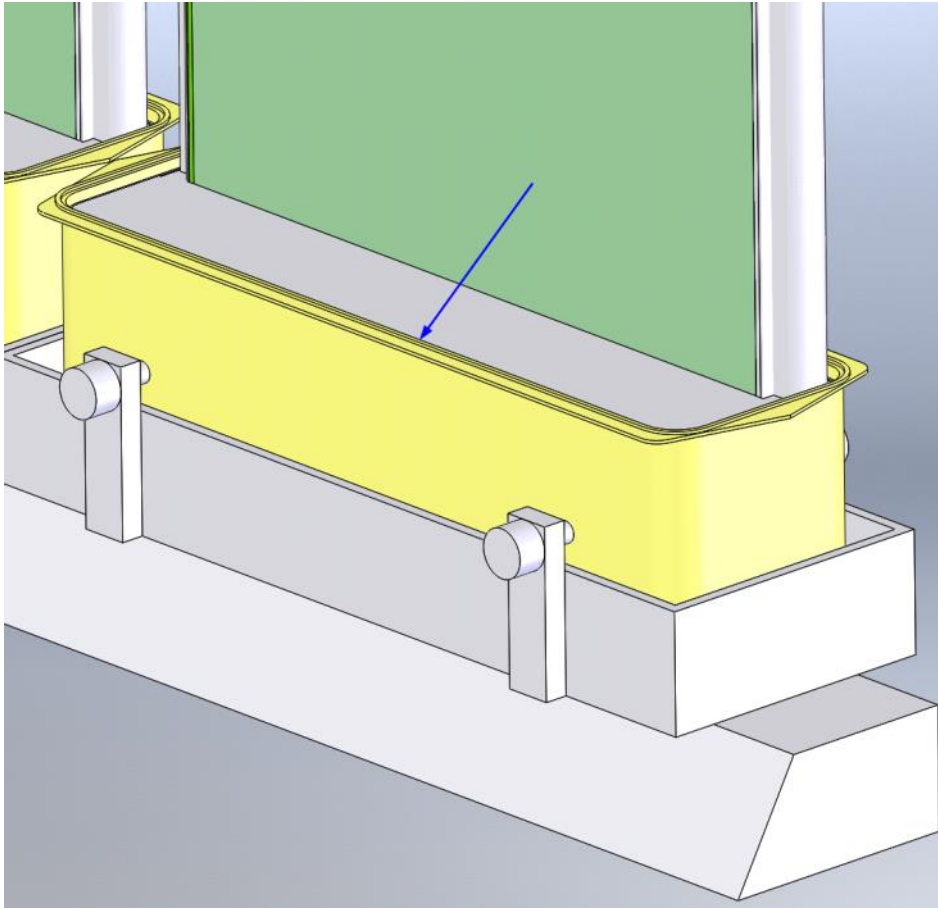
Friday, July 18, 2014 11:01

Questions:

1. Do we make one oil box for two pairs of boxes, or two separate oil boxes? Use single box for both pairs of Bar Boxes; strong physics / technical reason; need to hermetically seal top. For "prototype", box only holds single BB
2. Our meeting picture showed the prism exit surface coincident with the flat mirror, but the imported STEP files shows them offset . Does this matter? YES! Exit prism (#2) surface and planar mirror must be coplanar
3. In the STEP model, the surface called Tank Readout - is this where the PMT's must lie? If so, shall the tank be cut at this angle to allow PMTs to live in air? Yes, cut at angle, include window (quartz, plastic, etc., low xmission and absorbtion @ 300-600 nm) allow to replace single PMT but must remain optically coupled to window.
 - a. Whether or not to have a PMT window is still a question - need to determine likelihood or replacement, and practicality of having some sort of reservoir to move the oil - not having a window opens up many components to contamination (prisms, mirrors, other pmts, box surface - all of which would be impossible to clean in situ) --> 23July214 Meeting leaning strongly towards window)



4. Is the readout based on Hamamatsu H8500/H9500, or this large area picosecond photodetector? use Hamamatsu H12700 (per CLAS12 Cherenkov RICH)
5. Mirror Construction: Substrate can be anything; glass will be best for surface finish - consider for planar mirror. Aluminum probably for cyl mirror
 - a. Vendors: 3M, Nico Form - specialized in making mirror supports,
 - b. What kind of adjustment is required on the two mirrors? 6 dof? No real-time / in-place needed, expect to shim to high precision (O(10 um) as of 23JUL2014)
 - c. Planar mirror could be glass or plastic mounted to separate ground plate to allow shimming to box lid.
6. Is there a sleeve or something surrounding the PMT bars? YES, need to get BaBar CAD from IU



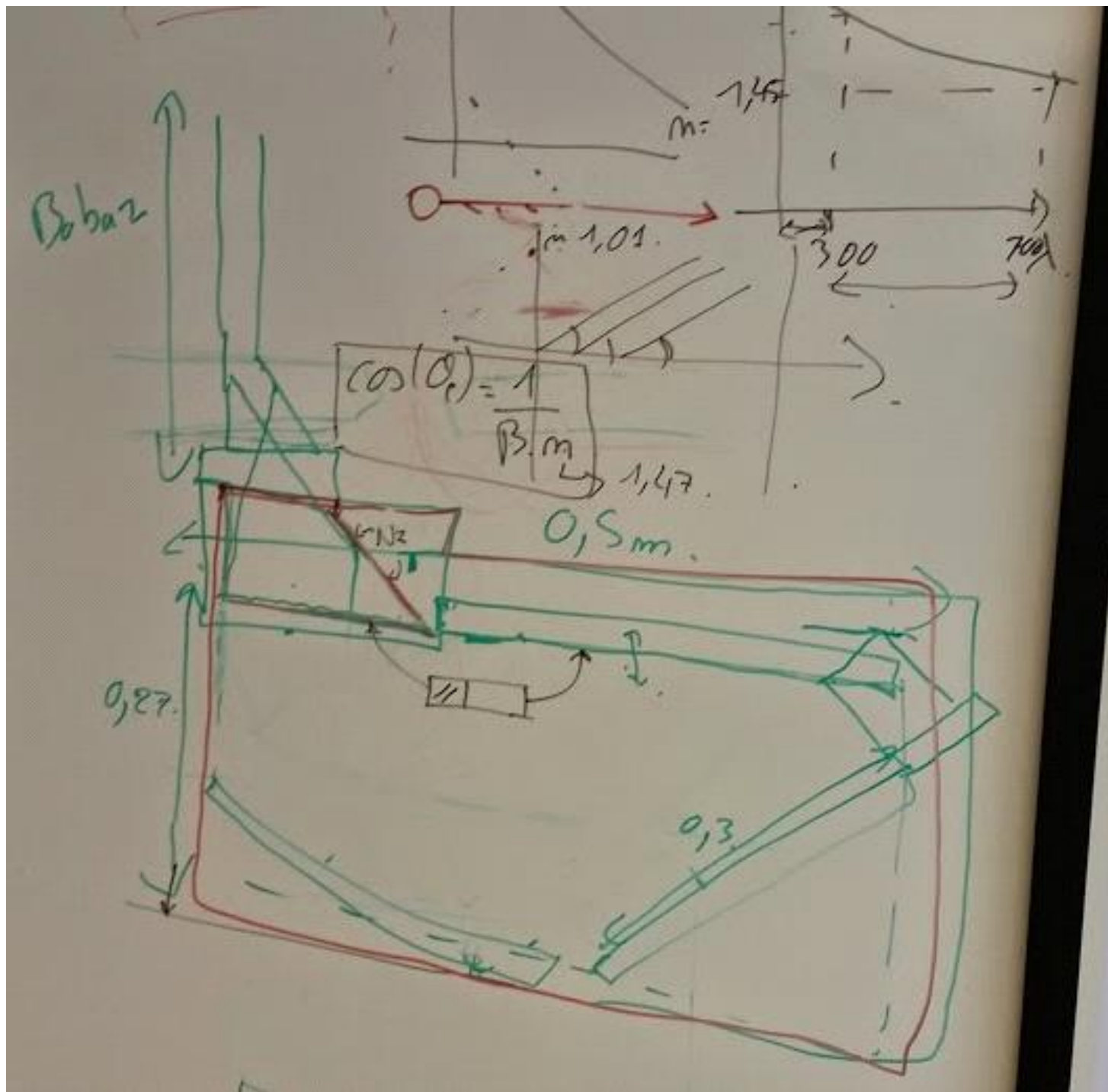
Meetings

Wednesday, July 23, 2014 9:49 AM

17 June 2014 @ Bates

Baptiste, Jim, Jason, Justin

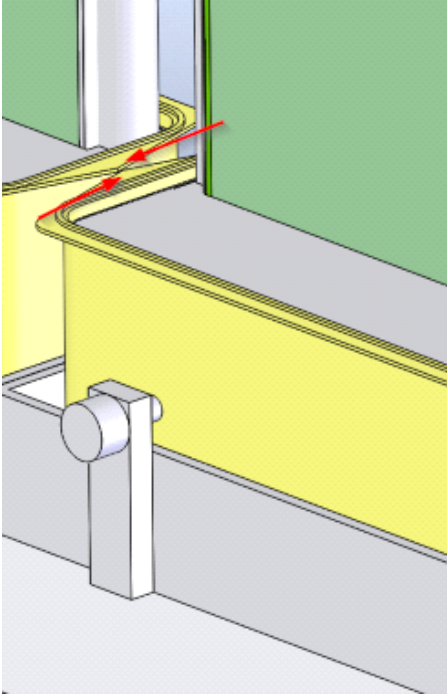
- 12 BaBar Boxes exist (12 scintillator bars each). We need 4. Cost is ~\$1M each
- Boxes are stored under flowing N₂, must eschew humidity and debris. Opening box is akin to destroying it.
- SLAC has test boxes (using glass) for mechanical testing
 - Further testing includes test shipment to work out vibration / shipping / handling issues.
Also using glass mockups
- BaBar and SLAC groups have lots of experience gluing these optical components
- IU performing mechanical design of carriage / frame



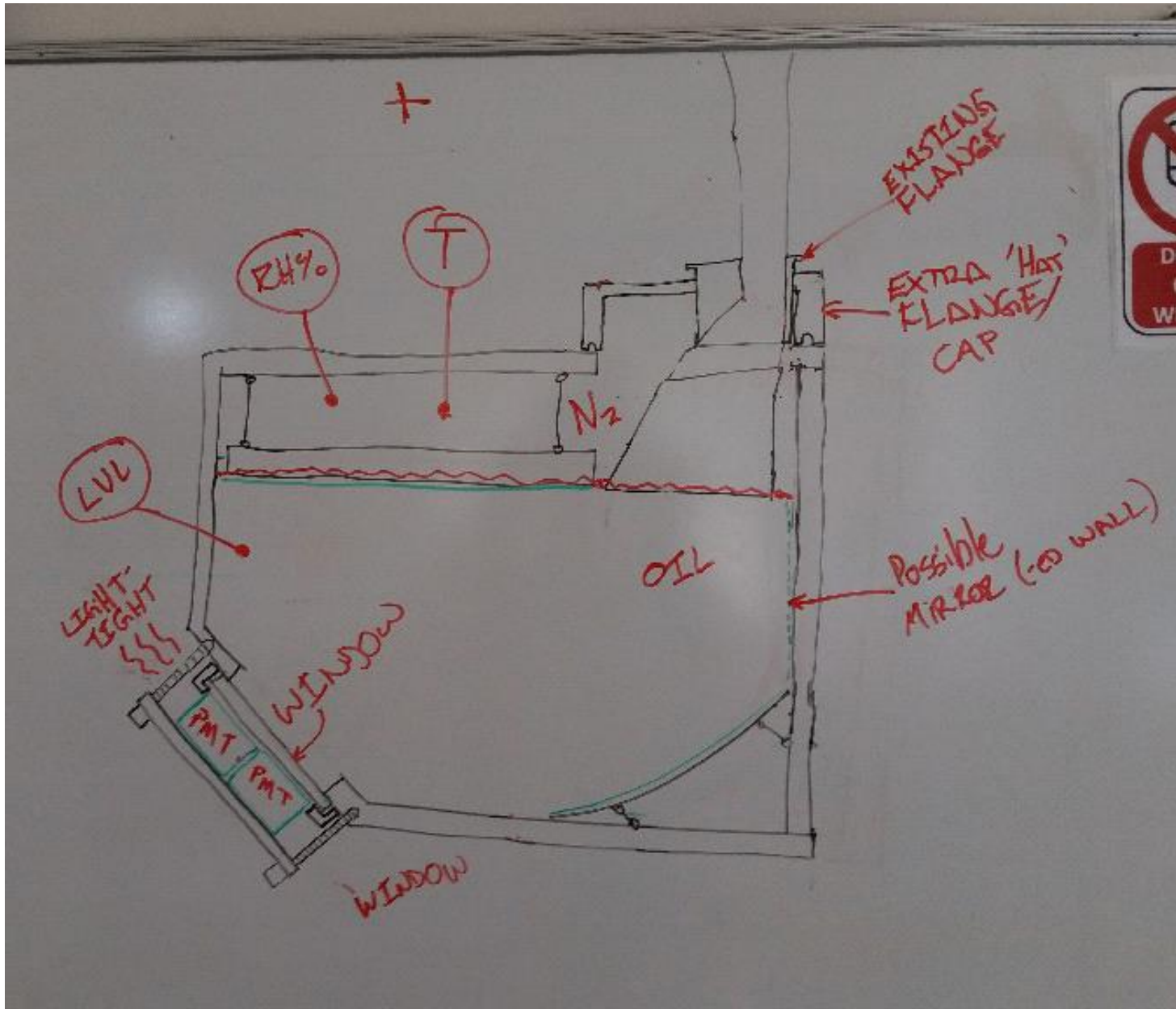
23 July 2014 @ Bates

Baptiste, Jim, Jason, John.

- 1. CAD of Boxes @IU: John Frye jomfrye@indiana.edu, also in charge of test for moving the bar from horizontal to vertical.
- 2. PMTs: Current plan to use Hamamatsu PMTs, see CLAS12 experience
- ? 3. Cleanliness of prisms and box - what particle size limits?
- 4. Bar Box flanges may possibly be cut down to reduce the gap between Bar Box pairs



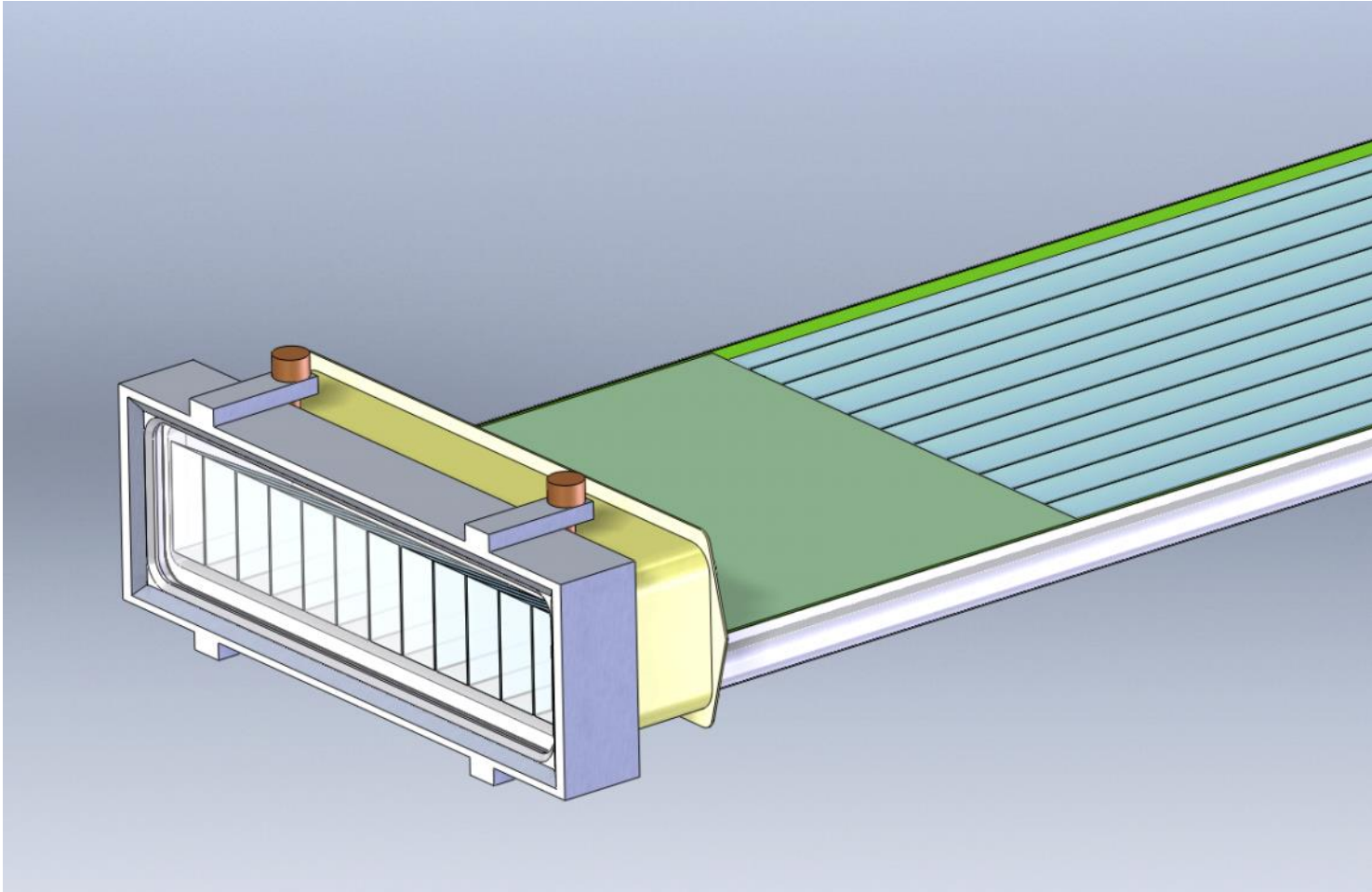
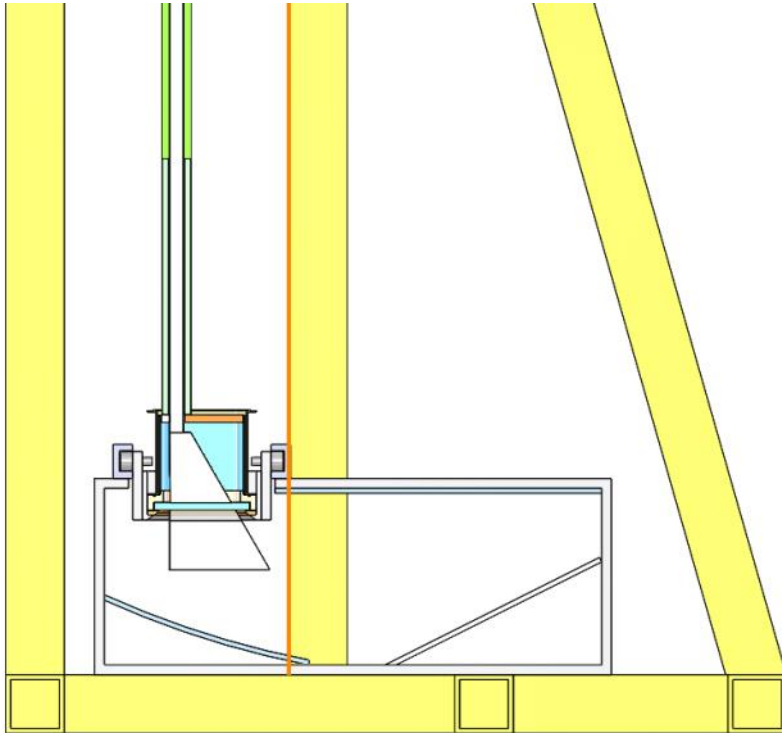
- 5. We can add lots of material for the bar supports, say 15-20 % X0. This would be useful to avoid the kinematically over-constrained current configuration of the Bar Support rollers.
- ★ 6. NEED to also build ptype box ~1/4 length (for single bar box) - this needs to be cost estimated ASAP for MW.

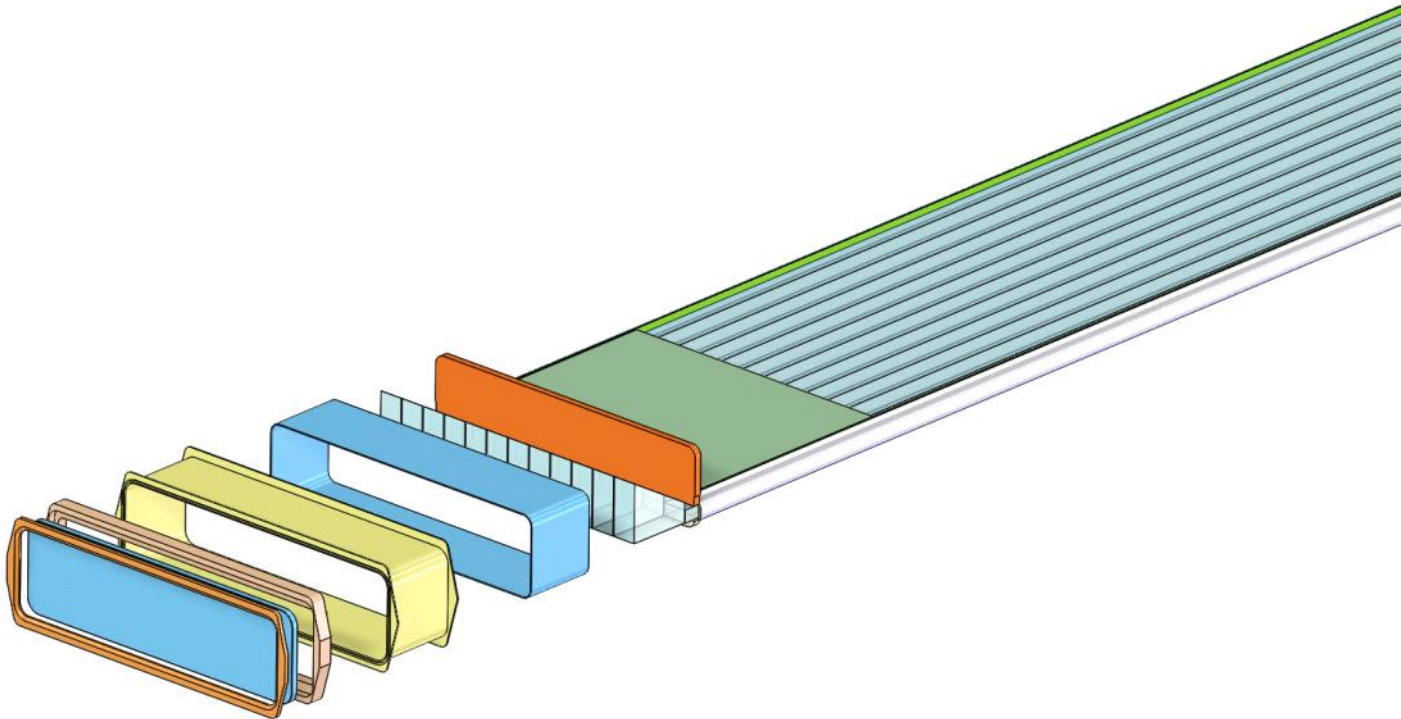


30 July 2014

Tuesday, July 29, 2014 09:35

Current SWX Model @ Bates:





Specifications

Wednesday, July 23, 2014 10:38 AM

Tolerances

Planar mirror to prism offset (perpendicular translation and 2x angles)	Xxx	Micron	
Axial position of cyl mirror (GD&T envelope)			
Angular deviation of vertical radiator bar (2x angle)			
Angular resolution at detector	10	Micron	Per 2014-6-17 meeting

Ancillary Constraints

Rad Length allowance	~10-15%	X0	Meeting 23Jul14
Magnetic Materials	No major (?) constraints		
PMTs	Must be serviceable in-situ		

Environmental

Hall temperature	Xx +/-	Deg C	
Hall RH%			
Radiation dosage		Mrad/a	
Vibration?			

Major Components

Wednesday, July 23, 2014 10:54 AM

1. Planar Mirror

Specification	Value	Tolerance	Notes / Source
Spectral reflectivity	>95%		
Spectral range	300-650 nm		

Notes: Possible to coat machined piece to form mirror

2. Cylindrical Mirror

Specification	Value	Tolerance	Notes / Source
Spectral reflectivity	>95%		
Spectral range	300-650 nm		

- Possible to coat machined piece to form mirror
- Must be accurately positioned

3. Exit Window + PMT Mounting

Specification	Value	Tolerance	Notes / Source

- From TDR:
Some deterioration of the PMT front glass windows (made of B53 Borosilicate glass) that are immersed in the ultra-pure water of the standoff box has been observed. For most of the tubes, the observable effect is typically a slight cloudiness, but for about 50 tubes, it is much more pronounced. Extensive R&D has demonstrated that the effect is associated with a loss of sodium and boron from the surface of the glass [69]. For most tubes, the leaching rate is a few microns per year, and is expected to be acceptable for the full projected ten year lifetime of the experiment. However, for the ~50 tubes, the incorrect glass was used by the manufacturer. That glass does not contain zinc, making it much more susceptible to rapid leaching. This leaching may eventually lead to either a loss of performance, or some risk of mechanical failure of the face plates for these tubes. Direct measurements of the number of Cherenkov photons observed in di-muon events as a function of time suggest that the total loss of photons from all sources is less than 2%/year.

4. Box Structure

Includes mirrored ends / extra surfaces, bar seal, monitoring, mirror mounting and shimming

Specification	Value	Tolerance	Notes / Source

5. Oil

- Very expensive; seek to minimize volume and waste
- Index can be made equal to that of quartz
- Possible formulations:
 - Glycerol (for optics applications), cheaper
 - Mineral oil (i.e. Bicon)
- Effect of temp and RH% unknown
 - Temp and RH% must be measured

To Do

Wednesday, July 30, 2014 9:17 AM

CAD

- Get PMT Models - use Hamamatsu H12700 (per CLAS12 RICH detector)
- Get remainder of Box structure (hermetic envelope)
 - Honeycomb
 - Aluminum Skins
 - Nylon support buttons (every 600 mm)