

Figure 54: Top panel: the PMT rate as a function of the light wave length for the PMT with the quartz window (in blue) and with the UV-window (in red). Bottom panel: the ratio of these rates

## 5 Mechanical Design

The basic shape of the HTCC is naturally generated by a combination of the dimensions and positions of surrounding equipment, certain required acceptance angles, and the planned focal points of the mirror within. The body will serve primarily as a gas volume container, and should have as little material as possible within to obstruct either the Cherenkov light, or particles to other detectors. An overall view of the appearance of the HTCC, including its mechanical housing is shown in Fig. 5

### 5.1 Outer body

The mirror's design (six radial segments of two rows of eight mirrors) dictates a hexagonal shell centered around the beamline, with a place on each segment to mount two rows of eight PMT's. The shape is simple, and can easily be constructed of flat, machined and welded plates of Aluminum.

### 5.2 PMT Mount

Design analysis of the mirror geometry reveals that the focal points of the mirror combined with their average angles of incidence with their respective PMTs result in a complex surface for mounting the Winston cones, which would involve more expensive material, and a very complex machining sequence. A more simplified surface could be used by repositioning the PMTs along the original light path, up to 2 beyond the planned focal point. This simplification allows the PMT mount surface to be constructed of one plate, bent to each of

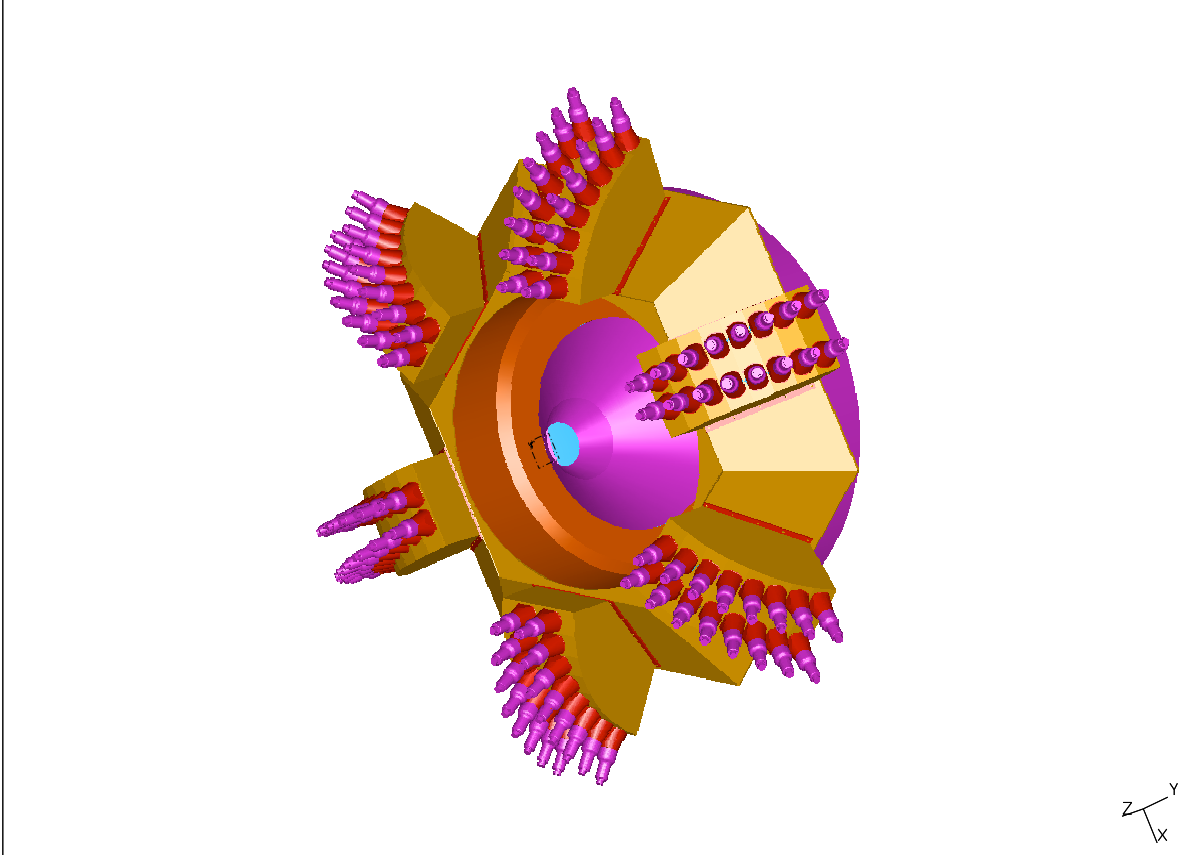
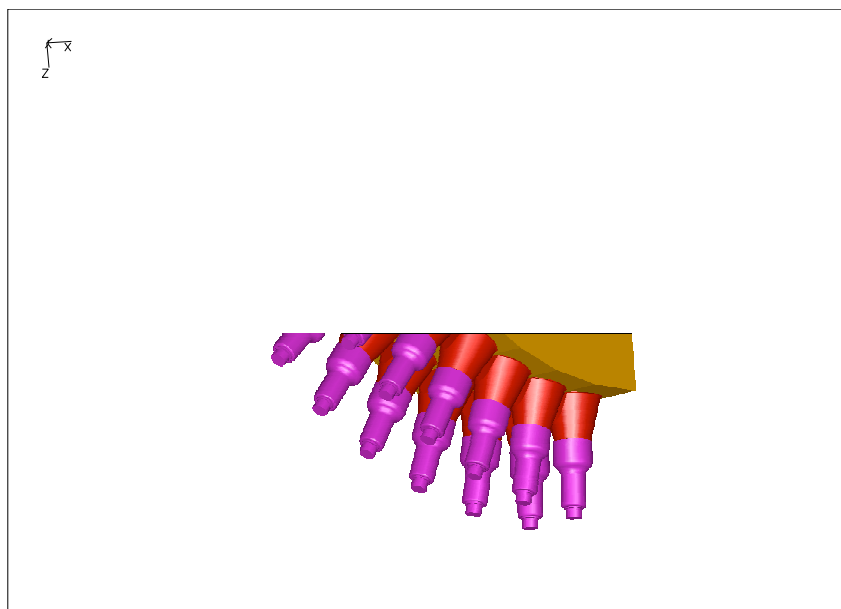


Figure 55: Overall appearance of the appearance of the HTCC, including its mechanical housing



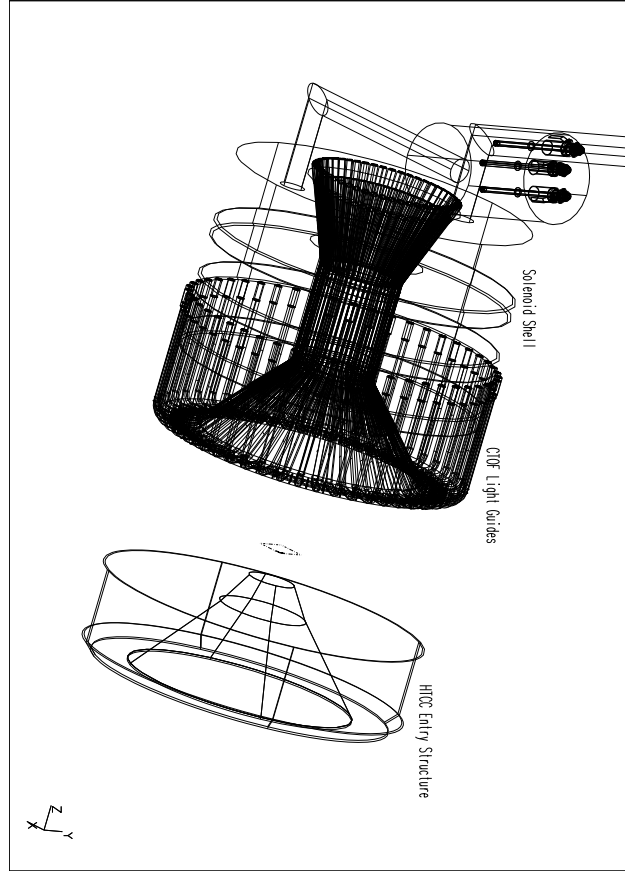


Figure 57: Mechanical entry structure.

planned solenoid shape, and position of the CTOF lightguides. This angle is only achievable using equipment clearances as low as 1/2cm, and a cone thickness of .040". At this thickness, the cone could be made of aluminum or a carbon composite; it is not a structural member, and only needs to be strong enough to support itself and the entry window. A view of the presently planned entry structure is shown in Fig. 5.4.

## 5.5 Exit Scheme.

The exit window of the HTTC assembly sets approximately ? past the most downstream point of the mirror. As a flat window, it is only possible to achieve 37 acceptance without interfering with region 1 of the torus assembly. To allow the electrons at angles of  $40^\circ$  to pass through the exit window, it must make a bend (near the outer radius of the mirror) and follow the 25 midplane angle of the region 1 assembly. This forms a beveled window, which if made from laminated foam, would be rigid enough to support itself, and still allow particles to pass through, unobscured. From the Hexagonal portion of the shell where the PMTs are mounted, a cylindrical tube reaches downstream, to house and support the mirror and adjustment fixtures, and finally interfaces with the exit window. The mechanical design of the exit window is shown in Fig. 5.5

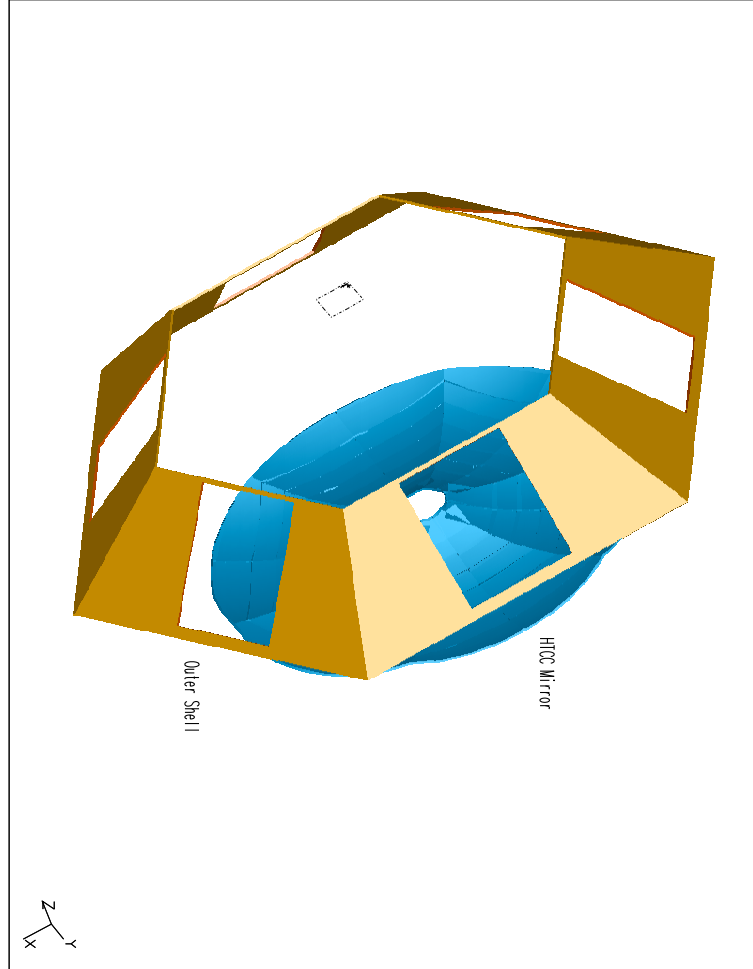


Figure 58: View of the mechanical components of the outer shell.

## 6 Cost estimates

Details and discussion will be provided later

Table 2: Cost (Procurement and Expenses) for HTCC Construction

	Item	Un	Amn	Price, \$/unit	Source of Estimate	Cost, k\$	Date	Comments
1	Winston Cone	EA	96	325.00	Vendor	38.70	02.07.07	Set-up fee 7.5k is added
2	PMTs, XP4508, concave – convex quartz window	EA	96	3256.00	Vendor	312.58	10.23.06	Options available
3	Dividers, VD105K negative, passive	EA	96	169.00	Vendor	16.22	10.23.06	
4	Magnetic Shield, MS175	EA	96	408.00	Vendor	39.17	10.23.06	
5	Deposition of re- flector and protec- tion coating onto the substrates	EA	96	177.08	Vendor	17.00	03.09.07	
6	HV Cables	km	3.0	656.17	Catalog	1.97		To be updated
7	HV Connectors	EA	288	11.30	Catalog	3.35		To be updated
8	Signal Cables	km	7.68	1706.04	Catalog	13.1		To be updated
9	BNC Connectors	EA	288	6.90	Catalog	1.99		To be updated
<b>Subtotal (procurement of components):</b>						<b>444.08k</b>		
1	Mechanical Struc- ture	HR	900	50.00	Engineering Judgment	45.00		<b>preliminary</b>
2	Manufacturing of auxiliary equip- ment for mirror construction	HR	1500	50.00	Prototyping Document	75.00	30.09.06 - 13.14.07	<b>preliminary</b>
3	Construction of 96pc of substrates	HR	2400	50.00		96.00	30.09.06- 13.14.07	<b>preliminary</b>
4	Aluminum Angles (3033031/20)	FT	300	6.32	Vendor	1.90	03.14.07	
5	Polyurethane Foam FR-6710, Sheet (1034803960)	EA	22	155.00	Previous Procure- ment	3.41		
<b>Subtotal (machine shop expenses):</b>						<b>221.31k</b>		
<b>Total:</b>						<b>665.39k</b>		