

Checking Prototype Detector for Light Leaks

After confirming that the LED was functioning and sealing the prototype detector with silicon and a layer of black tape around the cover's edges we began testing the box for light leaks. To do this we read out the signal from a single PMT through an amplifier and a discriminator and sent the resultant signal to a scaler. We adjusted the discriminator such that we had a reasonable rate of hits (around a few hundred Hz) seen by the scaler. We then covered the entire detector in black felt and allowed the scaler to run for 60 seconds. We then read off the result of the scaler and took this result to be approximately the dark signal rate of the PMT with no light leaks.

Then we uncovered one side of the detector at a time and took another 60 second scaler measurement. If we see more counts than we did with the detector covered there is a light leak on the uncovered side. Table 1 shows the result of these tests. These results made it quite clear that the light leaks were originating on the side of the detector to the left of the side with the PMT array. Black tape was then applied to areas of this side that may allow light to leak. In particular the base of the LED case seemed likely to let light in the detector. Once this side had been taped the scaler measured the same rate of hits whether the detector was covered or uncovered indicating that there are no more significant sources of light leaks.

Table 1: Results Testing Prototype Detctor for Light Leaks

Area of Detector Covered	Scaler Counts After 60 Seconds
Entirety of Prototype Covered	3560
PMT Side Uncovered	3660
Side to the Left of PMT Side Uncovered	52800
Side Opposite of PMT Side Uncovered	3720
Side to the Right of PMT Side Uncovered	3630
Entire Prototype Uncovered	59800
Black tape applied to base of LED where light leaks are suspected.	
Entire Prototype Uncovered After Tape Applied	3400
Entire Prototype Covered After Tape Applied	3200