

How To Construct a Muon Scintillator?

In order to construct a Successful Muon scintillator there are 2 key parts

- *Geometric Shape*
- *Surface Area*

These parts are important because you want to get the Max amount of counts for your Experiment. To Prevent Loosing counts it is best to have a guidance for the pulses to go through when heading to the bases from the scintillator.

The **geometric shape** is probably the most important part in building a scintillator. You want to prevent any way that pulses can be lost during the travel to the base inside the Scintillator. There are Many Prefabricated “Light Guides” to do so but when building a Scintillator from scratch those might not be the best idea because “Light Guides” are a waste of Weight and Surface area in a Design. So the best thing to do would be to Get a piece scintillator Acrylic and Make it into a diamond like shape. No matter where the Muon hits it will be detected compared to the light Guide which only guides Pulses form the Scintillator and does not detect.

In order to get the Maximum amount of counts for your Experiment it is best to have the largest amount of **surface area** as possible. During Many experiments it is always best to have as many accurate counts as possible Per-Minute. In order to do so we maximized the surface area of our scintillator.

Building the Scintillator

- **Cutting the Scintillator**
- **Polishing the Scintillator**
- **Mounting the Tubes**
- **Wrapping the Scintillator**

When **cutting the scintillator** we found it best to use a Milling Machine found in The Santa Cruz Institute For Particle Physics (SCIPP). We would then Cut off the un needed material slowly and very Accurately.

In order to **Polish the Scintillator** correctly we used Sand paper a Dremel tool and a bottle of “Plastic Scratch Remover/ Anti Fog/ Anti Static” We would first submerge the scintillator under water and Sand the edges with a 300 G sand paper. We would then sand the edges with 500 G sand paper. Then 600 G. Then 800 G. After we have sanded the edges with all of these sandpapers while the scintillator was submersed we should be able to start seeing through the scintillator. If you cant see through then you probably changed sandpapers to much and should take more time on each G of sandpaper. After you can sort of see through the edges it is time to move on to the Dremel Polishing. We used a simple scratch removal/ polish made for plastic. We would first apply the polish then buff it in using the dremel with a buffing bit. We would keep doing this on each of the edges until all of the edges can be clearly seen through.

When **mounting the tubes** it is best to used a clear epoxy glue. First apply glue to the edge then take the clip and mount it on the wanted spot. Hold it there firmly until glue has completely dried.

The most important part is **wrapping the scintillator** if it is not wrapped correctly you will have in accurate data and could potentially break your P.M. Tube. So first start with a light weight foil and cover every part including the tube. Try and have the least amount of wrinkles to have more accurate data. Then secure the foil using black electrical tape. Then after the foil is secured cover the whole Scintillator in black electrical tape to prevent future light leaks and to insulate your scintillator for potential damage.