Quarknet: Box and Large Scintillating Panels

Participants

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Purpose

The construction of the light-tight box was to provide an appropriate environment in which to use the large scintillating panels for data collection. The large scintillating panels were then equipped with PVC pipes and 3D-printed pieces to house the necessary PMTs to collect data.

Equipment

- 3D printer
- Black fabric
- Adhesive glue
- Plywood (⅝ inch)
- PMTs (currently two) and respective wiring
- High voltage power supply

Procedure

First we built our new light-tight box. We built it using mostly ⅝ inch plywood (we ran out and used ½ inch plywood for the smallest sides of the box). The inside of the box is covered with black fabric which has been adhered to the wood with spray-on adhesive glue. The box has 4 latches: one pair on the front of the box to latch down the lid, and one on either side to hold up a bottom “lip” piece on the front. The lid has two handles and a chain to ease the lid down. The lid sits back with the chains on the sides holding it up, and it is steadiest when some weight is in the box (like the panels).

The panels are stacked in the box with pieces of leftover plywood spacing them out. The plywood is necessary to make sure there is enough room for the PMTs. We equipped each panel with a piece of two inch PVC pipe to hold the PMTs. There are also 3D printed cylinders designed to hold the PMT inside the PVC comfortably. The high voltage and signal cables for the PMTs can be connected into a panel filled with connector pieces so that high voltage can get into the box and signal can get out. The outside of the panel is protected with a small hinged cover to keep it light tight.

The PMTs get high voltage from two orange high power supplies sitting in the rack next to the box. Their dials are relatively accurate, but we recommend double checking voltages with a multimeter. The PMTs should receive 1500 volts from the high voltage power supply.

Further Research

While our oscilloscope does flash when cosmic rays enter the panels, we don’t have a way to store events or waves. It could be improved by either setting up the oscilloscope to store such data or by designing a data acquisition board for our setup. Once capable of recording data, this setup could be used like an ordinary quarknet paddle setup. However, since the panels are only capable of being in a stacked

orientation in the box, they cannot be used for shower studies or other studies that require different orientations.