Aim: To determine the working voltage and a appropriate threshold for the output signal of the given Scintillator detector.

Theory:

Scintillator are the materials that emits a small flash of light i.e. scintillation, when struck by a charge particle or radiation. The scintillation produced by these materials is converted into electrical pulses using a amplifying device named as Photomultiplier (PM). The scintillator detector basically consist of scintillating material which is optically coupled to a photomultiplier via a light guide. In case of photomultiplier the voltage applied to the PM determines its overall gain and pulse height of the output signal . However PM's have a wide range of possible working voltages in which a user can work. In view of this it is vary important to find a working voltage where we get maximum gain, low noise, and a region in which the counting rate is least sensitive to the change in the applied voltage . In order to this a so called plateau measurement is done.

Apparatus:

1. Connectors and wires: Safe high voltage (SHV) connector for high voltage connections, Lemo 00 connector for carrying signals, high voltage wires (0-8 kV range) and RG 174 co-axial lemo wires
2. Scintillator paddles
3. High voltage power supply
4. Discriminator and Scalar modules

Experimental Set up and Procedure:

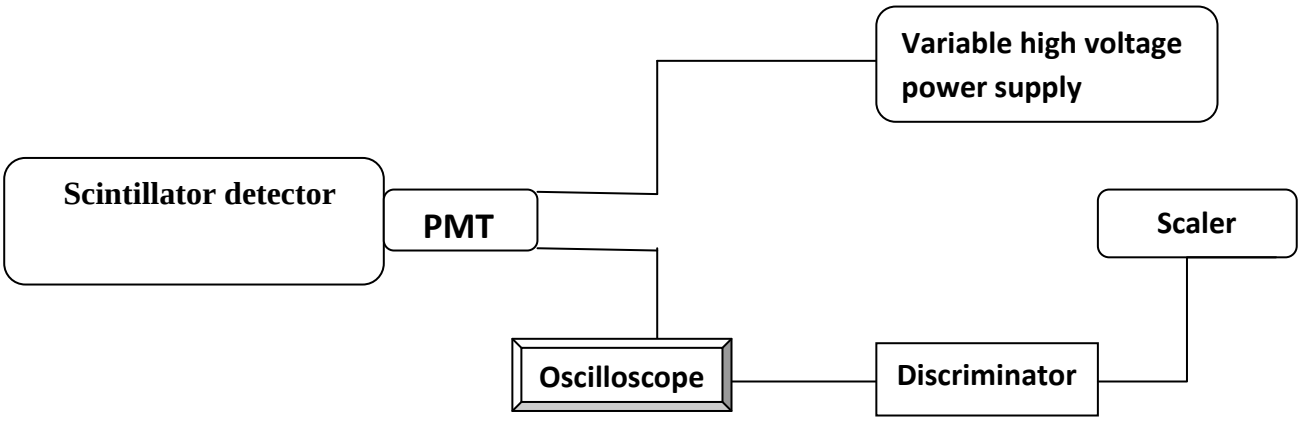

Figure: Experimental Set up for the working voltage and threshold setting measurement.

Procedure:_

1. Ramp up the voltage of the detector upto specified by the manufacturer.

Precaution: Don't go beyond the voltage specified by the manufacturer in any condition and also limit the max current value to protect PMT.

2. Check the analog output of the detector in one of the channel of Oscilloscope and estimate the noise level in the output signal.

3. Now set the threshold in the discriminator, according to the noise level contained in the signal.

4. Record the number of counts using scalar for the specific time interval and plot them as a function of applied voltage range.

5. Find the plateau region from the above mentioned plot and select the new voltage from the plot.

6. Again observe the noise level of the signal at the above determined voltage.

7. Set the new threshold depending upon noise contained in the signal and record the counts for the voltage range.

8.Do this iteration until you get the minimum noise and the appropriated plateau working voltage.

Output of the Experiment: