

Cosmic Ray Detector Lab 1 – Plateau the Detector Paddles

Name _____ Period _____ Date _____

Objective: Plateau the Detector Paddles - Adjust the voltage to each Photo Multiplier Tube to maximize sensitivity and minimize noise.

Equipment: FermiLab Cosmic Ray Detector with four paddles

Computer with Hyper Terminal software or equivalent

Purdue Cosmic Ray Detector Program (for Hyper Terminal)

Auto-ranging Voltmeter

Procedure: If you haven't already labeled the channels on your Power Distribution Box, we recommend labeling them with colored tape. We use red, white, yellow and blue tape, from left to right. You will also want to label the cables and connectors on the paddles and Data Acquisition Board.

Set the angle of the Detector Stand at 45 degrees and leave it there throughout this lab.

With the Cosmic Ray Detector assembled and the power turned on, turn all voltage potentiometers in a counterclockwise direction (down). Now, attach a Digital Voltmeter to the Power Distribution Box by inserting the ground probe into the black, female connector and inserting the red probe into the corresponding yellow, plastic circle of the channel you want to plateau.

Set the Voltmeter to read in Volts DC. Be sure that auto-ranging is turned on.

Adjust the potentiometer so that the Voltmeter reads 0.92 Volts. Set the Purdue Cosmic Ray Detector Program to count the channel you are testing for 30 seconds. After 30 seconds, record your count in the data table below.

Increase voltage to the next level and take another 30 second count. Record the data in the table below.

Repeat until you have a count for all the voltage levels in the table.

Plot the count for each voltage on graph paper and draw a line between the points. (or use Microsoft Excel.) Be sure to title your graph, number and label both axes.

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The data should be an S-curve with an elongated, horizontal plateau. Select the voltage from the middle of the plateau for your paddle that maximizes response and minimizes noise.

Use the voltmeter to set your potentiometer to the voltage that you have selected.

Repeat for each paddle detector.

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Data Table – Paddle 1

Voltage	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02
Count											

Data Table – Paddle 2

Voltage	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02
Count											

Data Table – Paddle 3

Voltage	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02
Count											

Data Table – Paddle 4

Voltage	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.02
Count											