Tests of a Preprototype ILC Muon Detector Module

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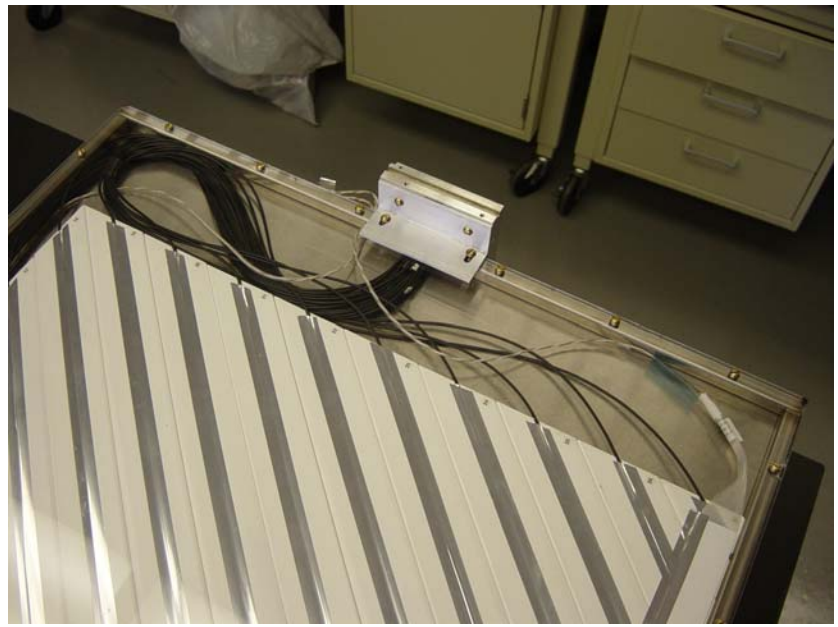
Progress/Status Report

- Test Module Description
- Pulser Calibration of PMT
- Cosmic Ray Tests
- Source Tests
- Conclusions/Next Steps

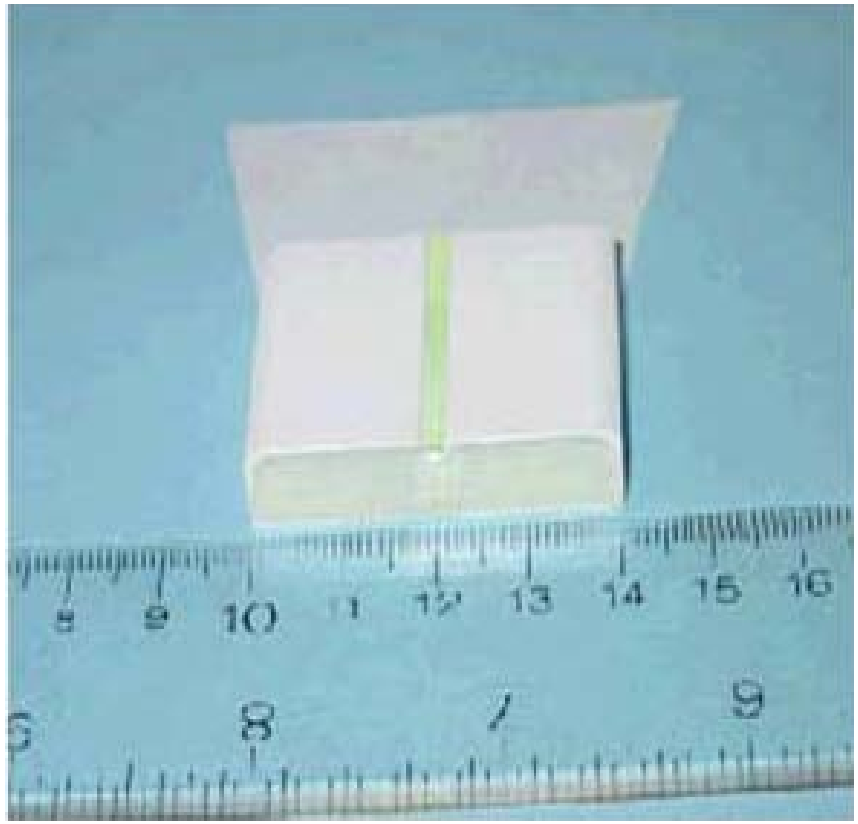
Test Module

- Built as Reduced Size Mechanical Preprototype for ¼ Scale Module
- Built by Notre Dame U.
- Test PMT not the MAPMT planned for the next version
- Tested in Light-Tight Box

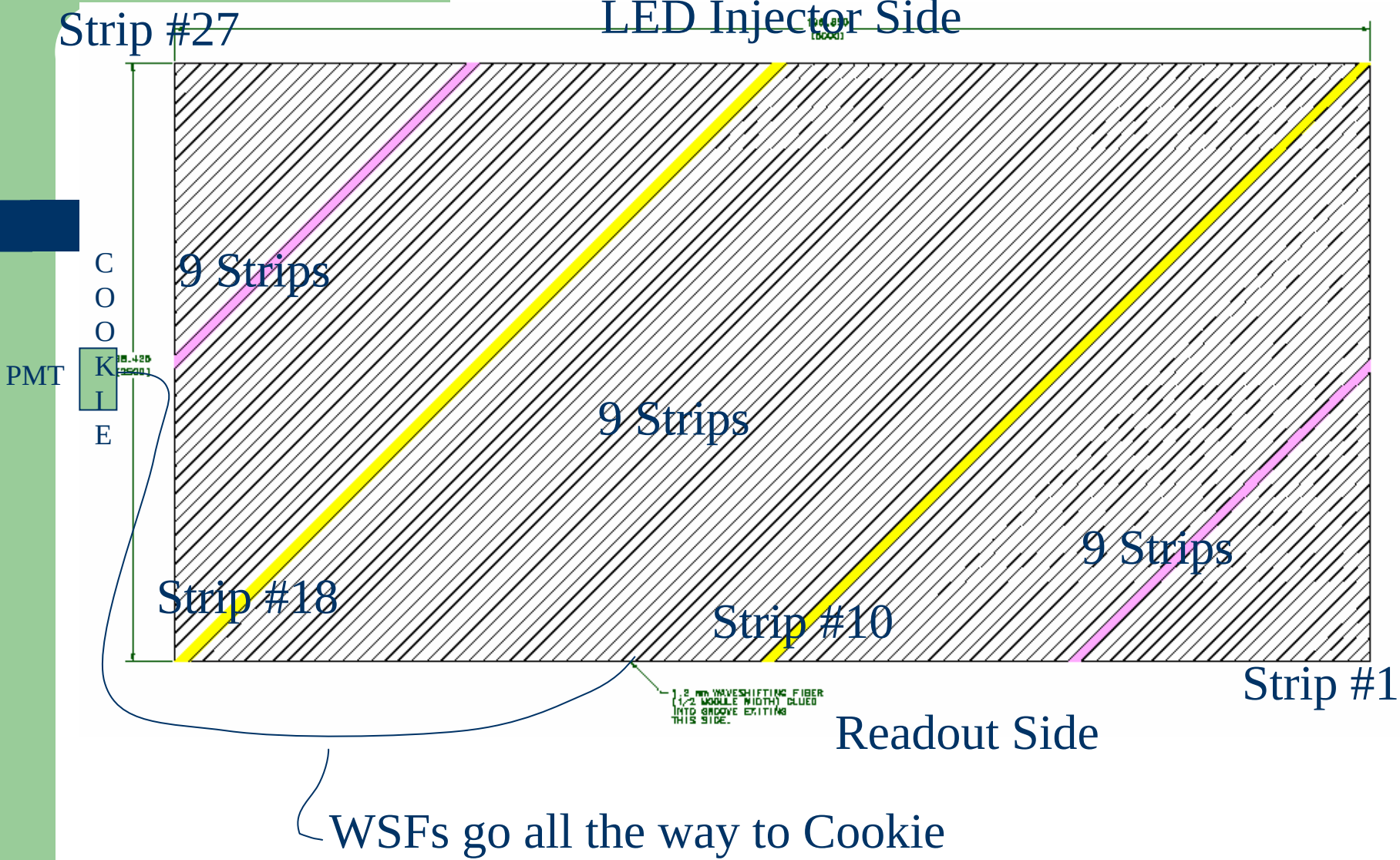


Scintillator Strip Cross Section

- Strips 10mm x 41mm Popop
- Coated with TiO_2
- 1.2mm Wavelength Shifter Fiber in Slot

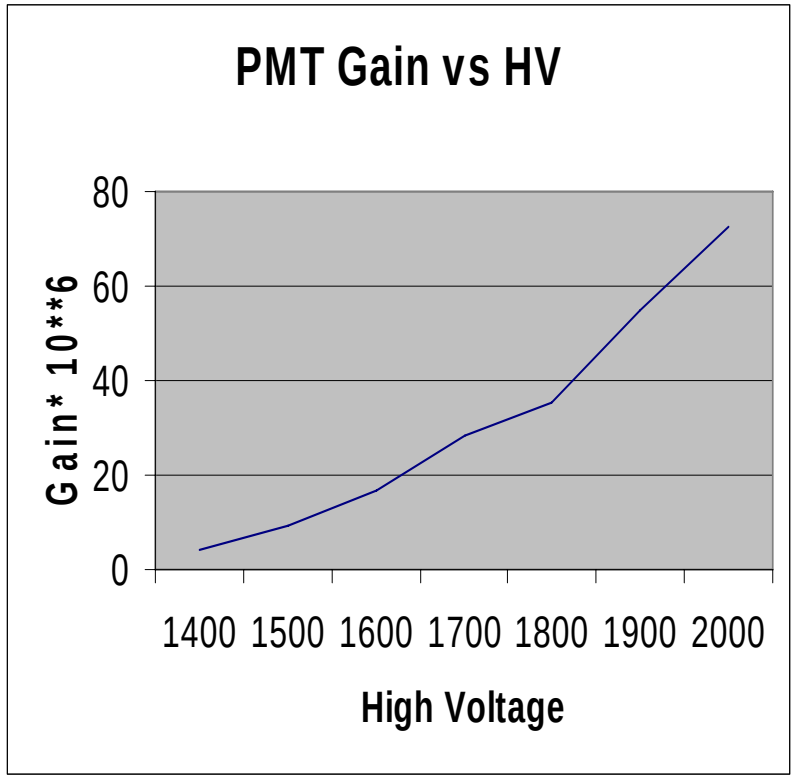


Muon Test Module (0.52m x 1.25m)

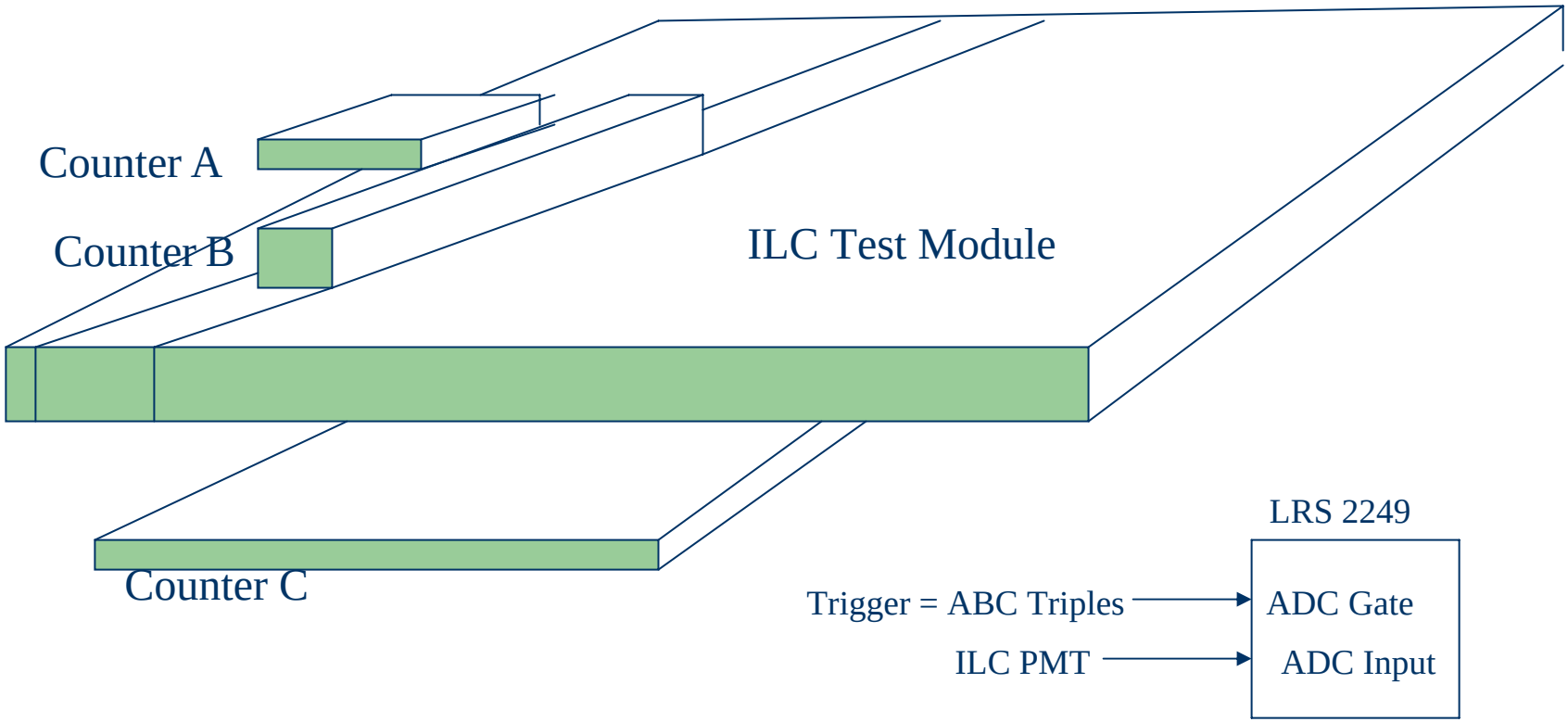


Gain vs HV for Hamamatsu E934 PMT

- Derived from rms**2/mean response to single photon Laser light source
- Gain of 34 x 10**6 at 1800V
- At 1800V mean~18pC

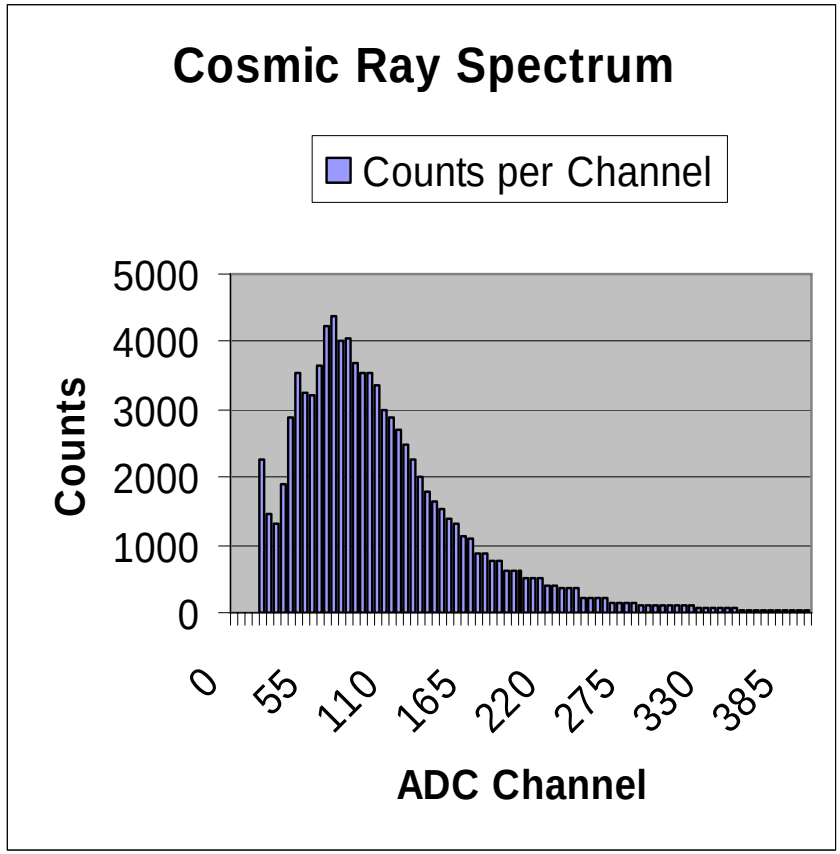


Cosmic Ray Test Setup



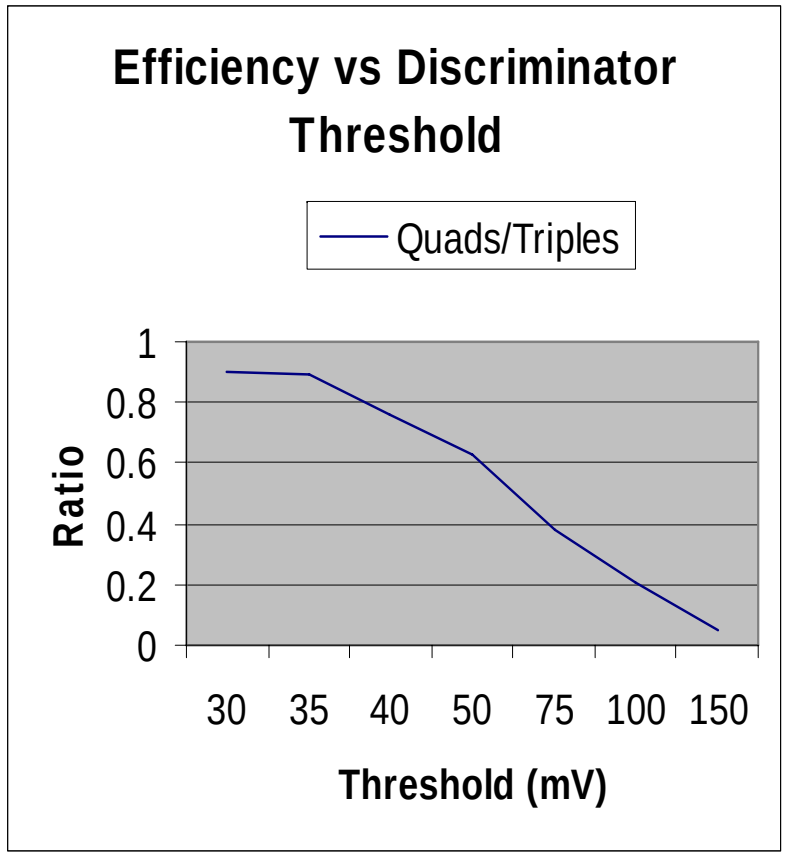
Cosmic Ray Spectrum ILC Counter

- Strip #18 near the center; 1800V
- 92000 Triggers, 2250 Pedestals (Chan 20)
- LRS 2249 ADC 0.25 pC/Chan)
- Peaks at ~ Chan 45, 70, 95
- Identify 1, 2, 3 PE's (6.25 pC per PE)
- Mean # of PE's is 3.8 for Cosmics
- Ln(Prob(0) gives 3.7 PE's
- Corresponds to ~18 mV for 5 ns pulse into 50 Ohm
- Earlier meas give ~15 PE's for scint + fiber (scint QA meas'mts).



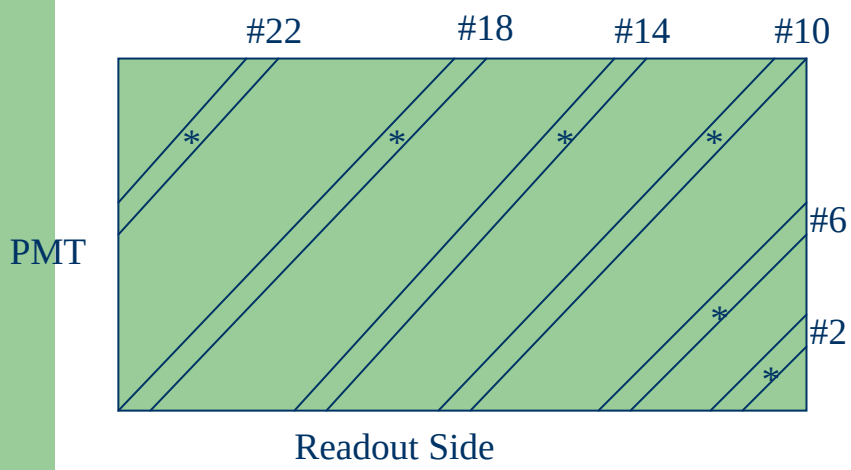
Discriminator Curve – Cosmic Rays

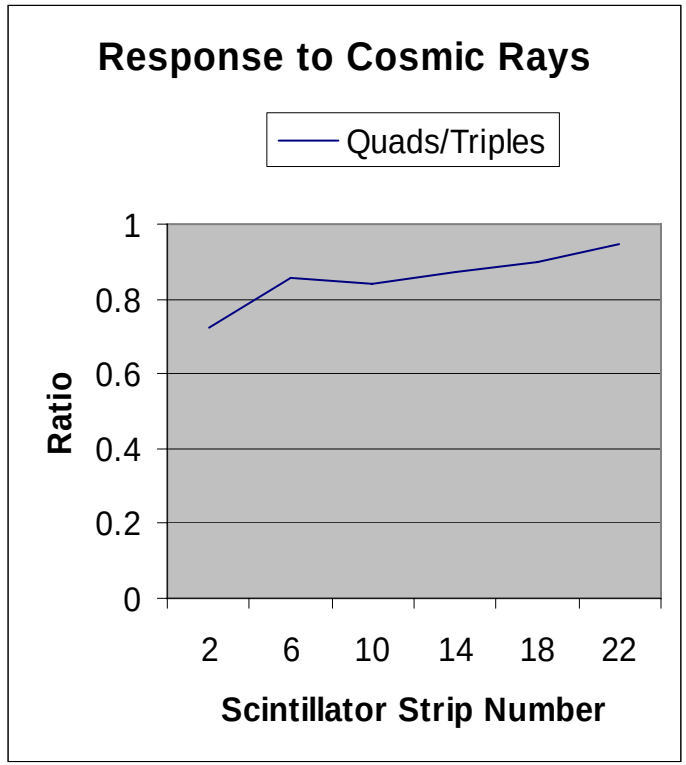
- 20” from readout end of Strip #18
- Triples are 2 Scint Ctrs on top of ILC Ctr, 1.5”x7” and 4”x4”and a 10” x 10” beneath.
- Quads are ILC Counter + Triples
- ILC Ctr Efficiency ~90% at 30-35 mV



Efficiency for Cosmic Rays

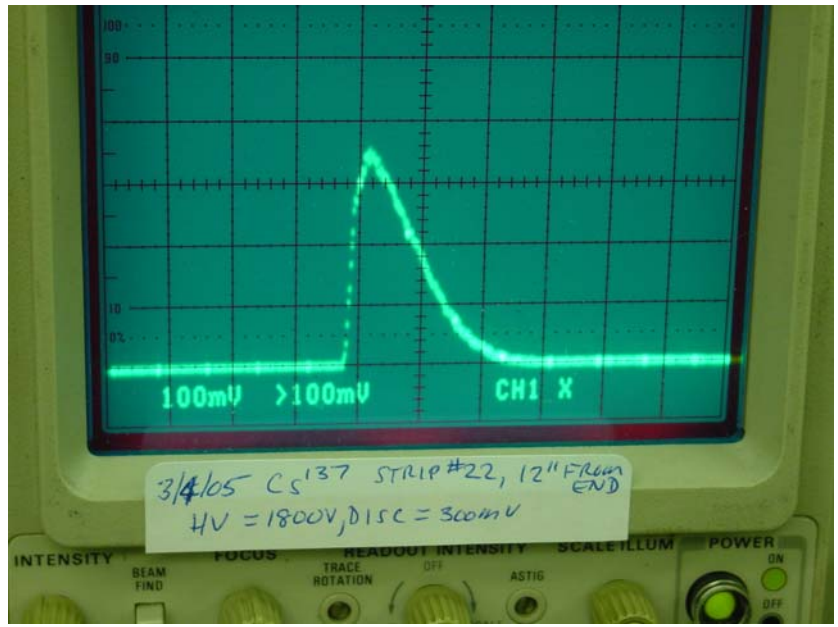
- Discriminator at 30 mV
- Sampling of Strips
- Efficiency better near PMT end



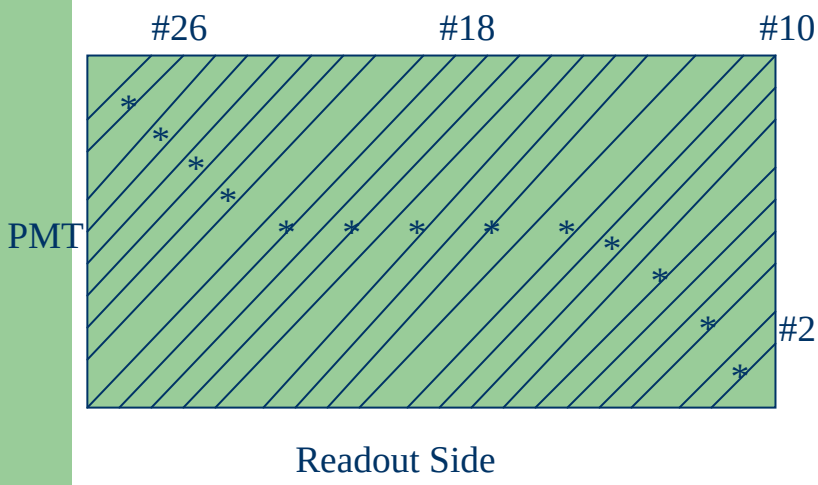


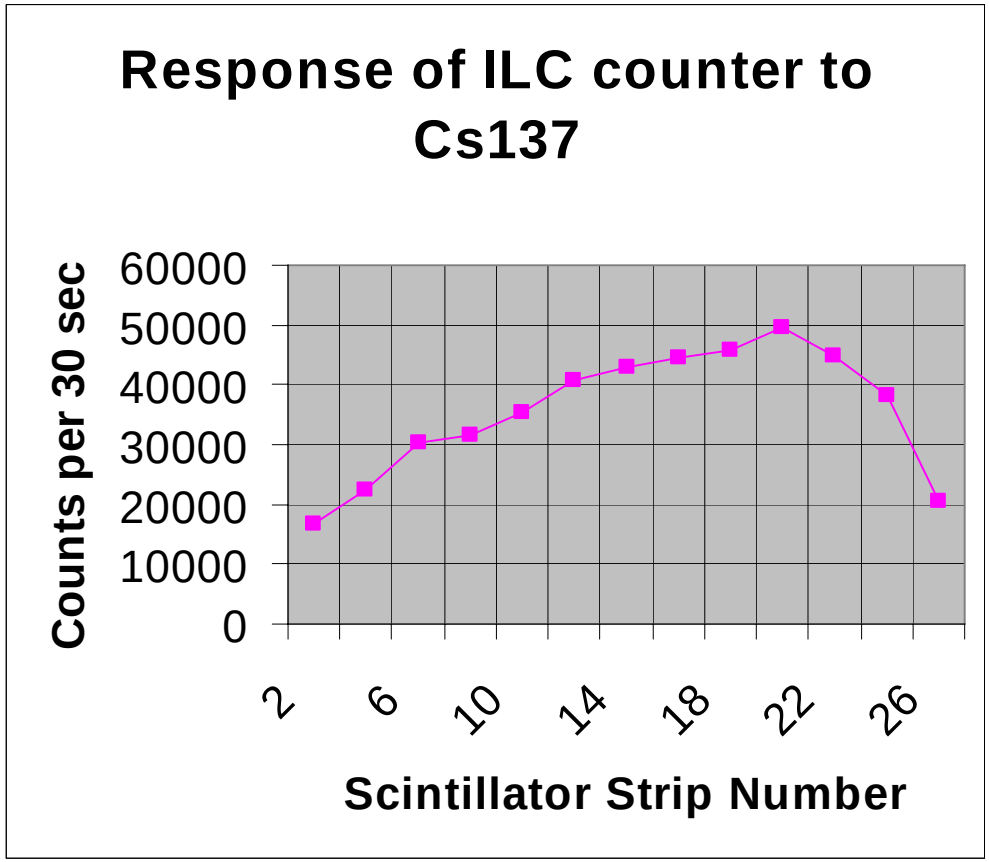
Cs137 Source Spectrum on LRS qVt

- 1 mCi source 2” above lLC counter
- Self Trigger, Disc Threshold at 300mV, PMT at 1800V
- Center of Strip #22
- Peak ~ Channel 300 LRS qVt (75 pC). Ranges to 125 pC.



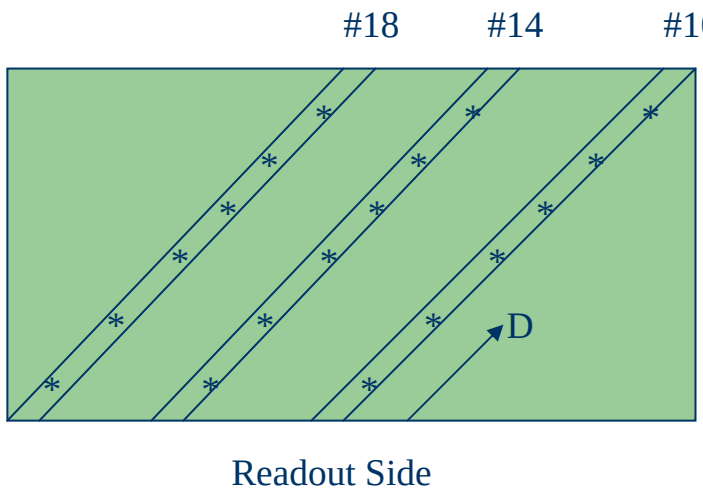
Response to Source at Centers of Strips

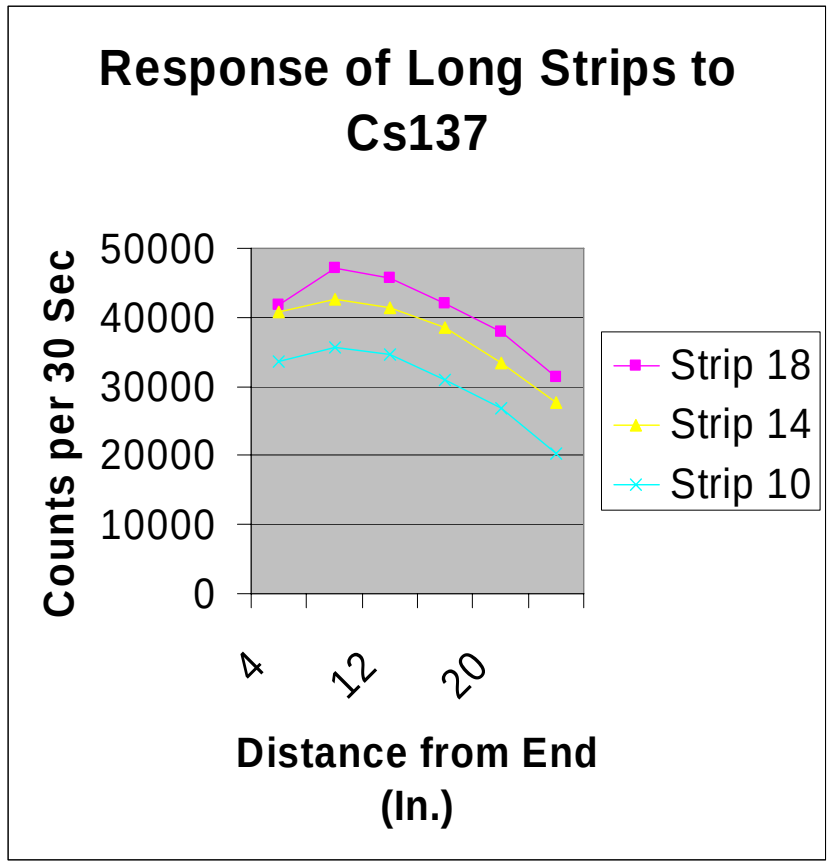




ILC Counter Response Along Strips

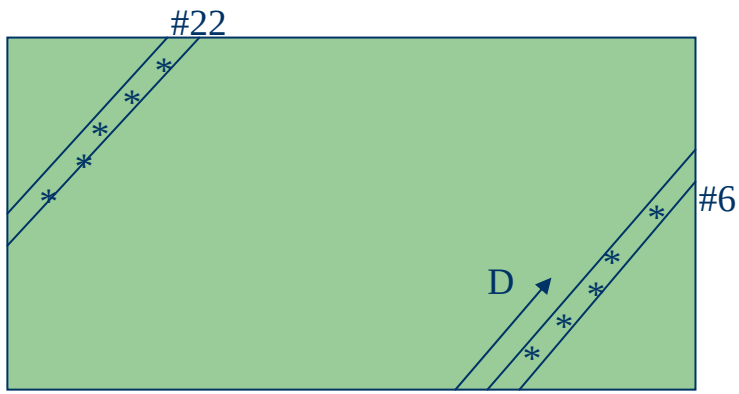
- Distance from Readout Side (4” Intervals)
- Attn length of 5m gives 15% reduction along strip
- Full-Length Diagonal Strips

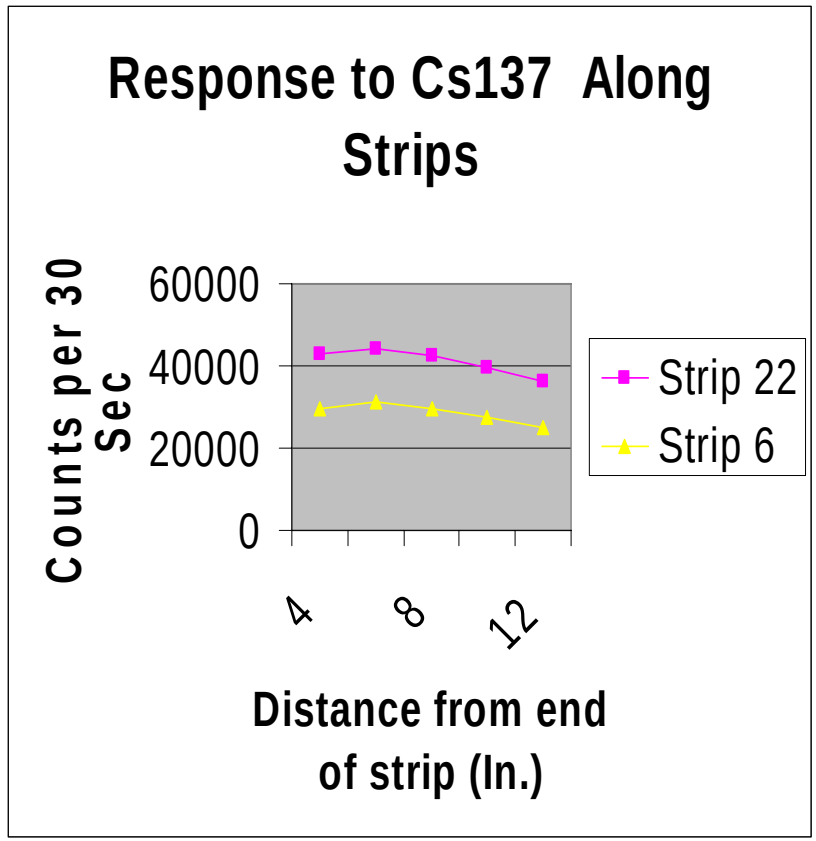




Response Along Medium Strips

- Response vs Distance from Readout side of Counter (2” Intervals)





Conclusions and Next Steps

- PE yield is lower than expected, but optics not optimal
- Response Variation Observed with Source and with Cosmic Rays
- Use Spliced Clear fibers from shifters to PMT
- Look at separate fiber groups and try with MAPMT
- Test with LED built into Counter