B0 Test Stand Status

.....and a few other stray observations

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- B0 Test Stand
- B-Field PMT Tests (Penn)
- Bar Tests
- Cookie Tests
- Test Program

B0 Test Stand

Infrastructure:

- PMT Counter inventory:
  - 3 counters (PMT+Sci) inherited from ???
  - 6 PMT's from Run I TOF test system
  - Miscellaneous scintillator pieces

    PMTs...we need the real thing
- PC Controlled CAMAC readout using LabView
- Setup to take Pulse-Height Spectra with ADC
- In progress of setting up TDC measurements
- Cosmic coincidences set up
- Basic LED pulsing of PMT's
- Yet to understand LED stability and reproducibility
- Magnet operational, but LCW has been finicky
- Have N_2 Laser, need to set it up
- Radioactive Sources?
  ^{137}Cs (X-ray, β), ^{90}Sr (β),...?

To Polish, or NOT to Polish...
...that is the question...

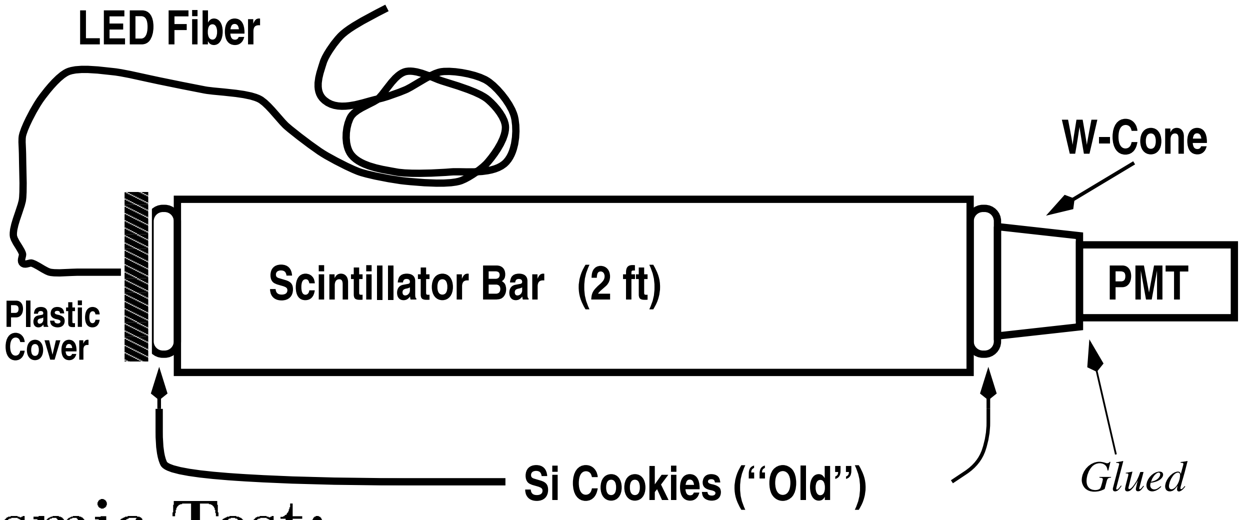
- 2 ft bars with nominal 4×4 cm^2 cross section cut (old TOF bar stock)
  - 1 bar UNPOLISHED
  - 1 bar polished.....but seen to be fairly heavily scratched
  - 1 bar POLISHED....this time pretty clean
    $\rightarrow$ call it "NEW POLISHED"
- Wrapped bars: 1 Layer white + 1 Layer black paper + tape
- Pick old TOF tube from Penn as a "standard PMT"
- Compare response of UNPOLISHED to NEW POLISHED bar

Stray Observations:

$\triangleright$ Wrapping bars smoothly/tightly is NOT so easy*!*

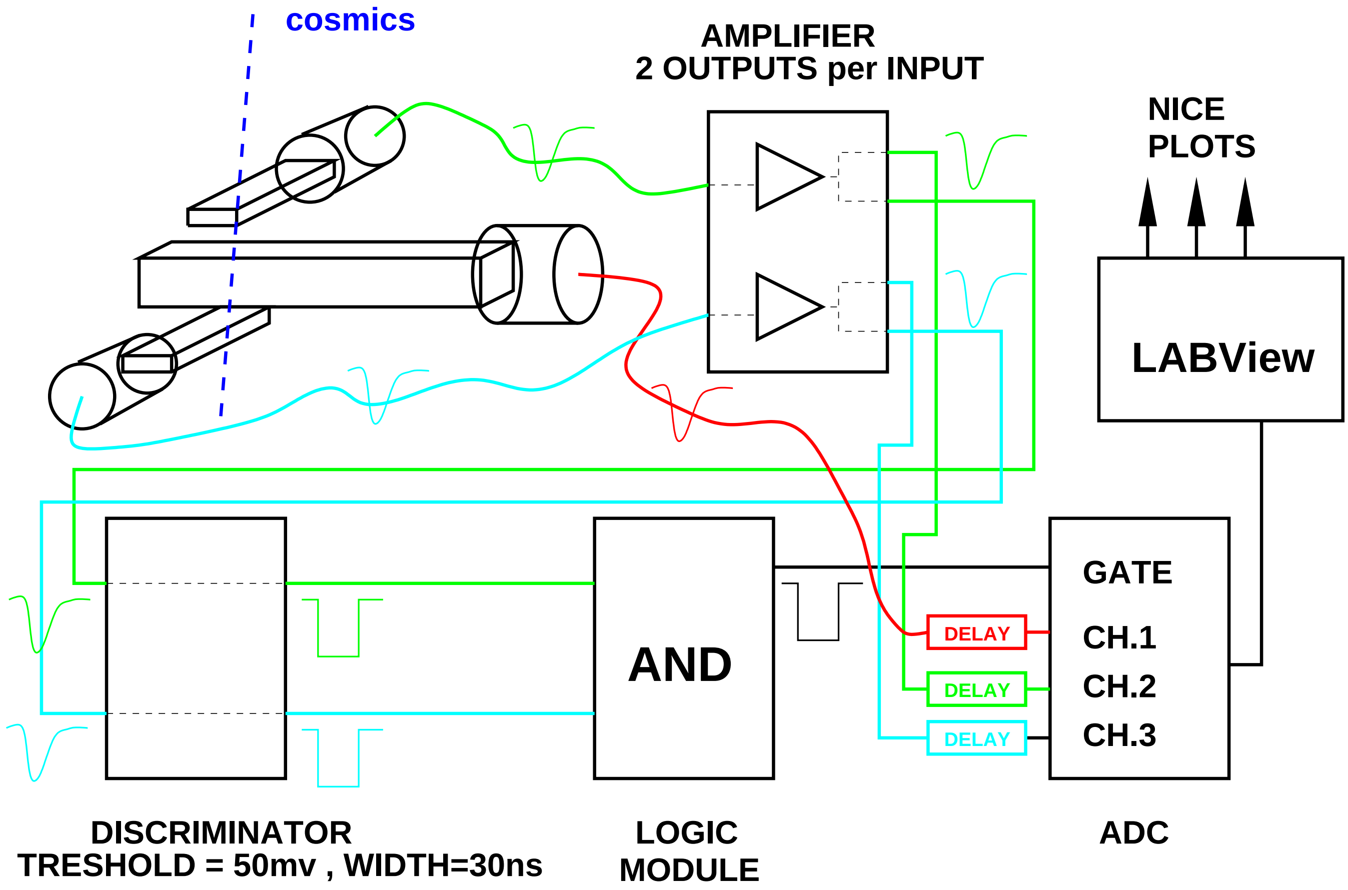
$\triangleright$ Black paper *SEEMS* not to tear very easily, BUT, we did so several times in handling (light leaks)
$\Longrightarrow$ Tightly creased bar edges may be vulnerable*!*

Polishing Test #1: Cosmics

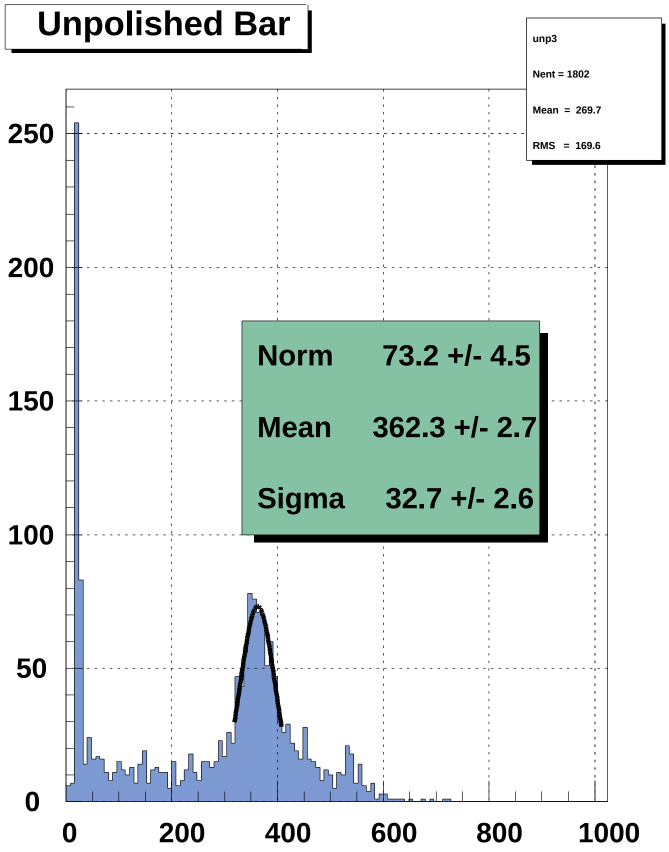


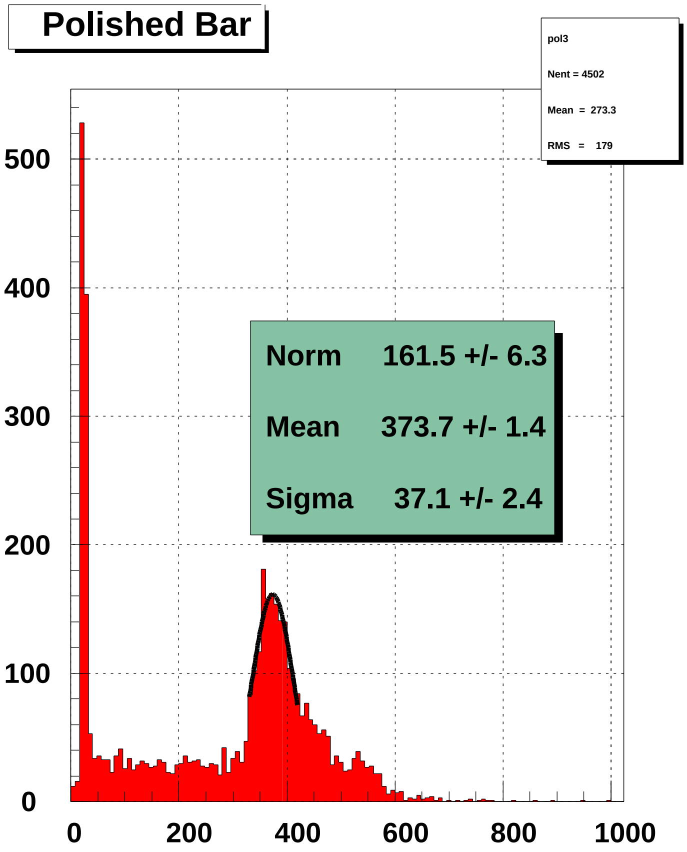
Cosmic Test:

- Collect Cosmics with coincidence at far end of bar
- Compare Pulse Height between (new) POLISHED & UNPOLISHED bars



<u>Cosmics Cnt'd:</u>





...do simple Gaussian fit to peaks...

POLISHED: Mean $= 373.7 \pm 1.4$ rms $= 37.1 \pm 2.4$

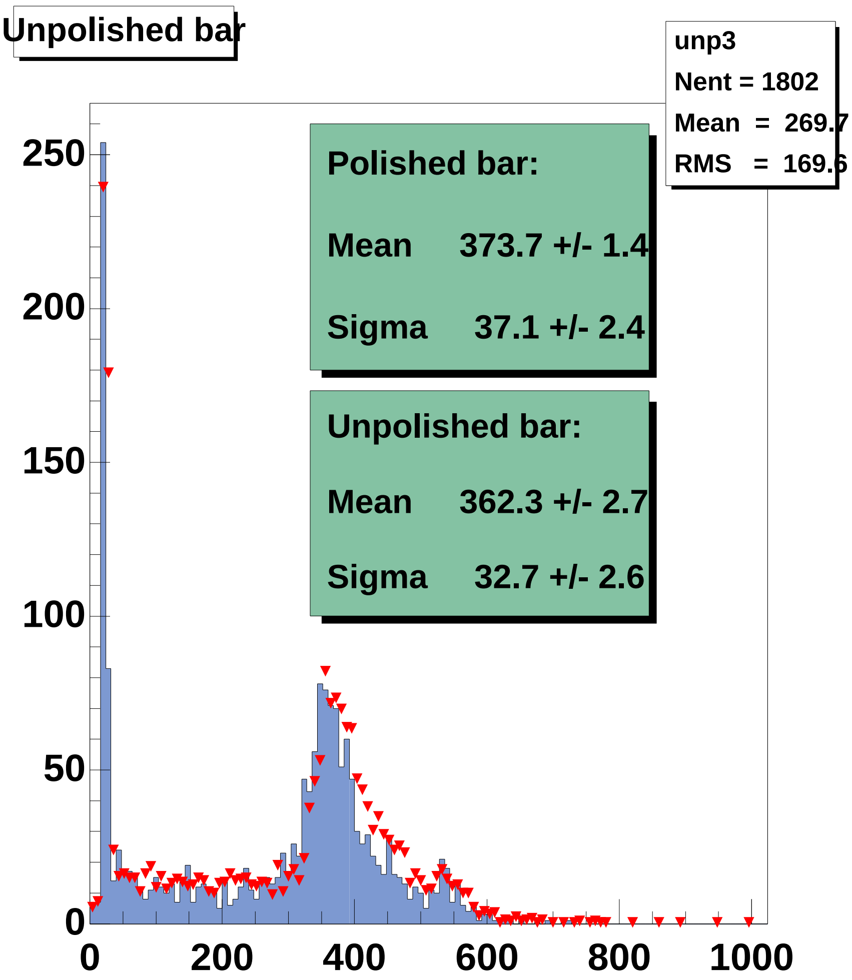
UNPOLISHED: Mean $= 362.3 \pm 4.5$ rms $= 32.5 \pm 2.6$

ADC Counts

$$\Delta\mathrm{Peak} = +11.4 \pm 3.0$$

$+3.1 \pm 0.9$ % Nominal Improvement

Compare Shapes:



However:

▷ Need to keep same PMT

$\Longrightarrow$ Had to mechanically change tube

$\Longrightarrow$ Risk IR-Reproducibility

but since POLISHED ≈ UNPOLISHED

$\Longrightarrow$ Looks Possible to Reproduce Results

$\boxed{\Longrightarrow \textbf{ POLISHING does NOT look significant}}$

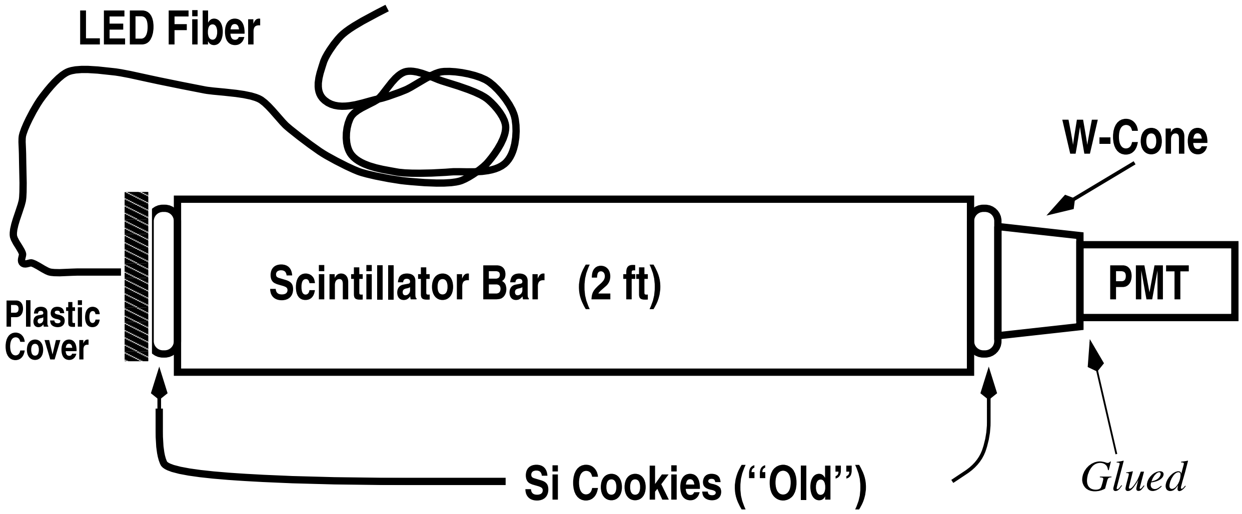
...Further check by repeating PMT swap AGAIN

...Like to confirm with LED...

Polishing Test #1: LED

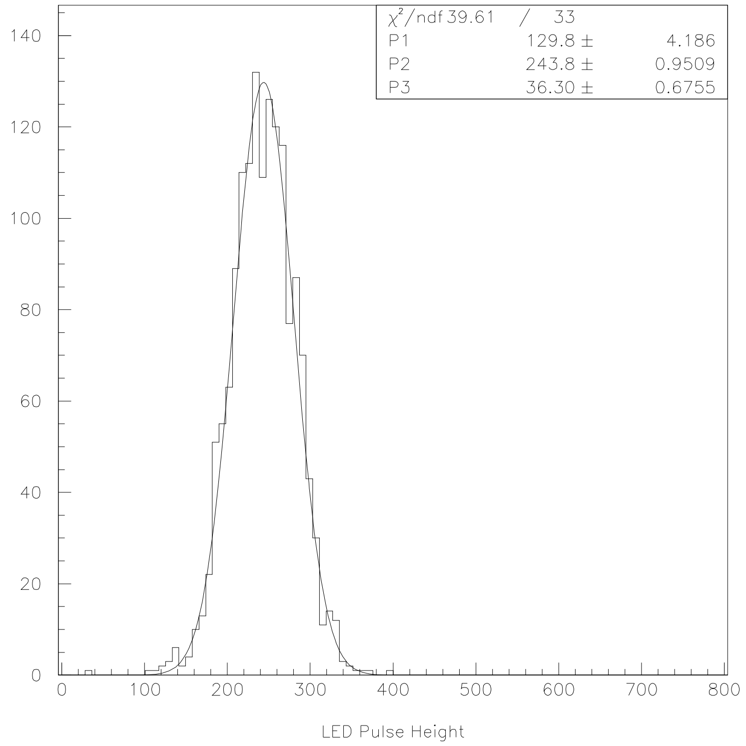
LED Pulsing System:

- Pulse Generator: Square Wave 10 ns long
- LED: 470 nm
- Again:



- Get fairly fast/short PMT pulses (at 1500 V)
  - Rise time ~ 10 ns
  - Decay time ~ 15 ns
  - Pulse Height ~ 100 mV driving LED at ~ 3 V

Sample LED pulse spectrum:



RMS $= 36.3 \pm 0.7$ ADC Counts

...OR 15.9 % width

(vs $\sim 10\%$ for Cosmic Runs)

- Looks Reasonably Good...
- However, NOT, so far, able to reproduce results when mechanically changing setup

Needs Work:

- Learn how to reproduce results
- Preparing fixture for fiber to point at different angles (more severe test of surface reflection)

Cookie Test

- Optical Coupling of Si-Cookies not tested
- Have obtained some Cookies cut from some ancient material
- Have obtained some freshly poured samples

Stray Observations:

- ▷ Matthew has expressed concern for yellowing
- ▷ "old cookies" do look a bit worse than new ones
- ▷ Si likes to collect lots of crap (glove fibers?)

  $\Longrightarrow$ Care to Keep Clean*!*

- Have played with cookies and Winston Cone $\Longrightarrow$ not always so easy to get complete contact
- Wrapped 3rd 2 ft bar with loose PMT + W-cone
- Will try to study LED response with varying amounts of pressure on PMT...

  ...Can any difference be seen??

Define Test Program

- Need to define what tests we want to do
- Remaining "Prototyping Tests"
  - B-Field of PMT + electronics
  - Polishing of Bars
  - Si-Cookies
  - Full 3-Pack Prototype
  - Laser Calibration System Design *(Mechanics, Fiber connection,...)*
  - ...??
- Production Testing: PMT's, Scintillator, Full Counters
  - Some discussion started for PMT's (Matthew, Fumi,...)
- What further tools needed?
- Time available in schedule for what tests?
- What facilities? $\Longrightarrow$ Some tests compete for same resources
- Where? Minimize counter movement $\Longrightarrow$ Additional test facilities at production site?

Summary

- Have Basic Tools:
  - Handful of PMT's & Scintillator
  - DAQ System for Pule Height Spectrum
  - Cosmic Coincidence
  - LED Pulsing System
- More Tools Needed:
  - Impliment timing (TDC's)
  - Reliable/Reproducible LED System
  - Laser
  - Radioactive Sources
  - . . . ?
- Ongoing Tests:
  - B-Field PMT Measurements
  - Bar Polishing $\Rightarrow$ Looks NOT too significant
  - Si-Cookies
- Future Tests:
  - 3-Pack Prototype
  - Other Prototype Tests $\Leftarrow$ Need to Define
  - Production Testing $\Leftarrow$ Need to Define