Stripline PMT Test @ Hawaii Nov. 24, 2010

• First testing of stripline PMT in Hawaii.
• Two laser spots directed to PMT via fibers.
  – Spot size of each ~mm.
• PMT operated at 2.4 kV, no further amplification.
• Data collected with scope:
  – 8 GHz analog bandwidth
  – 20 GSa/s (last week used wrong time base in analysis code... 2.5 GSa/s instead of 20).
• Timing extracted with 30% constant fraction method.
Pulse Height Distributions

*No interpolation is done to get peak height... so only a few bins are occupied.*
Calculated as $Q = \sum_i V_i \frac{dT}{R}$ with $(dT = 50 \text{ ps}, R = 50 \Omega)$

If we were to use $\mu_{\text{p.e.}} \sim (\mu / \sigma)^2$, we would get $\mu_{\text{p.e.}} \sim 1500$ (?)

- Suggests a very low gain ($\sim 0.5 - 1 \times 10^4$).
- Bad approximation? Bad integration procedure?
Sample Scope Traces

**Strip 1 - Left**

**Strip 1 - Right**

**Strip 2 - Left**

**Strip 2 - Right**

**Black Points** – sample event (#99)

**Red line** – averaged profile of all events

**Rise times** $\sim< 500$ ps
Timing by Channel

$\sigma \sim 18-22$ ps, depending on channel
Differences / Averages within Strips

Averages: $\sigma = 19, 18$ ps

Differences: $\sigma = 23, 16$ ps

* Differences are still likely more amenable to cross-correlations rather than CFD.
Difference between Strip Averages

Strip 1 Average - Strip 2 Average

<table>
<thead>
<tr>
<th>diff_ave</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Entries</td>
<td>5000</td>
</tr>
<tr>
<td>Mean</td>
<td>0.5199</td>
</tr>
<tr>
<td>RMS</td>
<td>0.01455</td>
</tr>
<tr>
<td>$\chi^2$/ndf</td>
<td>42.94/41</td>
</tr>
<tr>
<td>Constant</td>
<td>330.8 ± 5.7</td>
</tr>
<tr>
<td>Mean</td>
<td>0.5198 ± 0.0002</td>
</tr>
<tr>
<td>Sigma</td>
<td>0.01435 ± 0.00014</td>
</tr>
</tbody>
</table>

$\sigma \sim 14$ ps
Summary

• Results are much closer to those expected.
  – Still a little unclear on how many p.e. we have...

• Other plans remain the same...
  – With existing data:
    • Try pre-processing / filtering of data
    • Different algorithms for extracting timing
  – Future data:
    • More p.e. points, match ranges previously studied: ~1-200
    • Varying MCP gain
    • Comparisons with/without external amplification