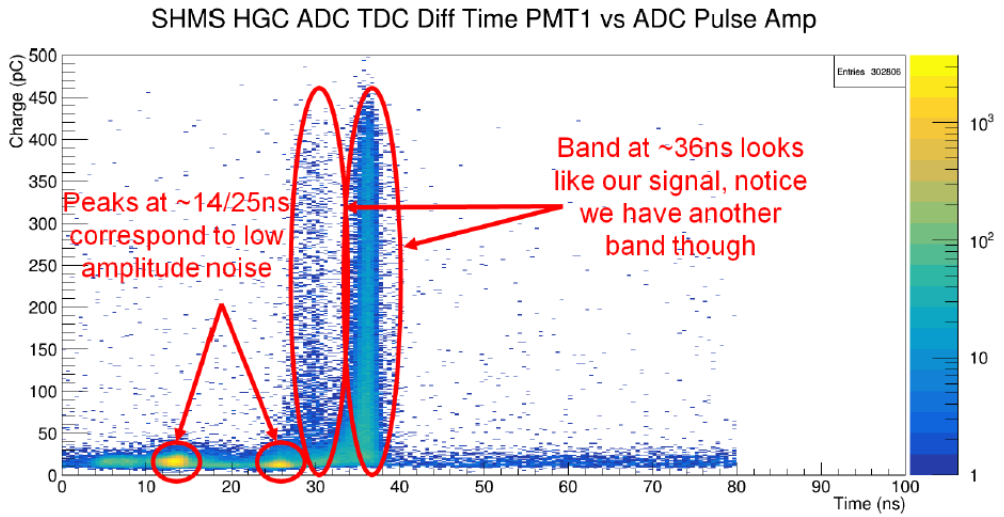
SHMS HGC Timing Example 2/3



SHMS HGC PMT1 ADCTDC Time Difference vs ADC Pulse Amp spectrum.

Comments

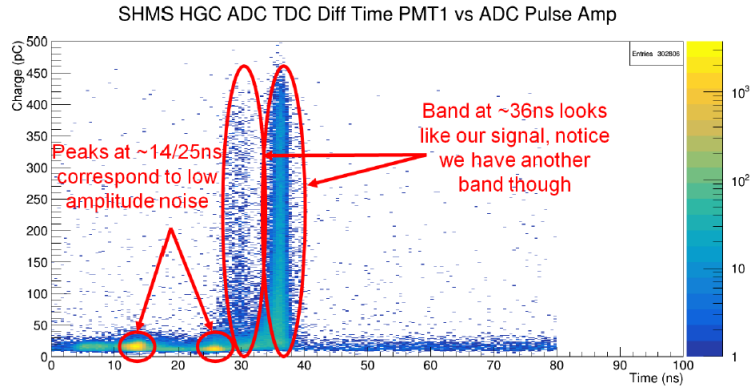
"Ghost" peak around 30 ns (so ~6 ns shift relative to the good signals): potentially good e-. Note that the timing resolution for this peak is significantly worse than the main signal peak though. Any working hypothesis has to explain this.

I've seen similar ghost peaks in plots that Hem showed me last year. I would treat them as good e- signals until proven otherwise.

A comment from the meeting was to try to verify these are good e- by checking the calorimeter like Simona/Abishek presumably did. (I couldn't follow their nice slides in real time, and they didn't post them. Sigh.)

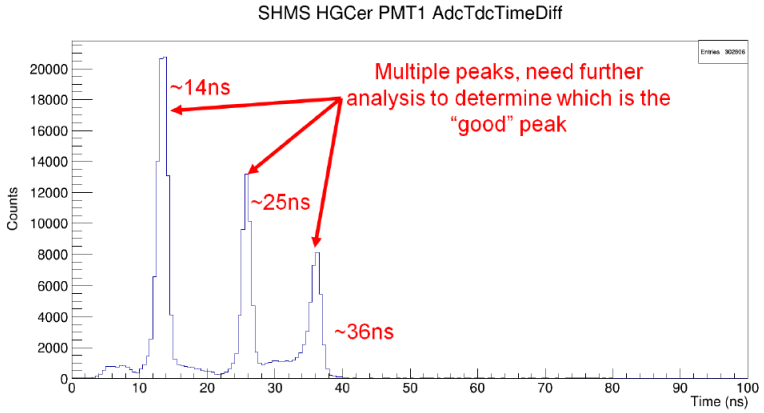
My only working hypothesis is that it's a non-obvious result of the FADC timing algorithm when there's random spe noise too near the signal of interest. Since you're plotting a time difference here, we can't tell from this plot whether the HGC or the reference time shifted by 6 nsec. With 20/20 hindsight, Simona/Abishek may have flashed plots of TDC vs TDC to disentangle this, but again I wasn't able to follow the discussion in real time.

SHMS HGC Timing Example 2/3



SHMS HGC PMT1 ADCTDC Time Difference vs ADC Pulse Amp spectrum.

SHMS HGC Timing Example 1/3



SHMS HGC PMT1 ADCTDC Time Difference spectrum.

Comments

The two small amplitude peaks near 14ns and 25ns:

I think the consensus is these aren't the droids we're looking for, but I feel uncomfortable that I really don't understand these two peaks.

The peak near 25 nsec: has more counts than the main e- signal peak, and the signal amplitude is consistent with electronic noise barely above flash threshold of ~10 mV. It is a reasonable hypothesis that we're somehow seeing the tip of the iceberg of electronic cross-talk from the very largest pion showers in the calorimeters.

The peak near 14 nsec: has even more counts, and the signal amplitude is pretty clearly 1 spe or ~ 15 mV. This peak is therefore "real" in some sense. I floated the suggestion of splash-back from the calorimeter, but I can't make sense of the deltaT of ~25 nsec which would imply a path length several meters too long. Hence I have no reasonable working hypothesis.

Finally, I can't make sense of the 11 nsec intervals between these peaks. If the sources of the two small amplitude peaks are completely different as I propose, then this 11 nsec separation would have to be an unlikely coincidence.

In conclusion, I really don't understand these two small amplitude peaks.