First Look at UH Timing during Beam Test

Joe S, Jan 2008

Larry created set of filtered data files for slot 7 (see his presentation today)

→ ~1500 flat text files (~1.9M events) with event number, hit times and charges for 12 pads

I converted those into ROOT trees and created ROOT chains corresponding to time ranges of our beam test runs, rejecting PiLas data and times with bad beam.

Tried for a few weeks to find an algorithm that would match Hawaii event number with event number (lower 8 bits) they provided for CAMAC stream to combine our beam detector and prototype Philips pads with slot 7

→ had to give up due to asynchronous writing of events to CAMAC and Hawaii data streams. Further complicated by runs with missing event number, missing upper 8 bits in CAMAC stream, etc.

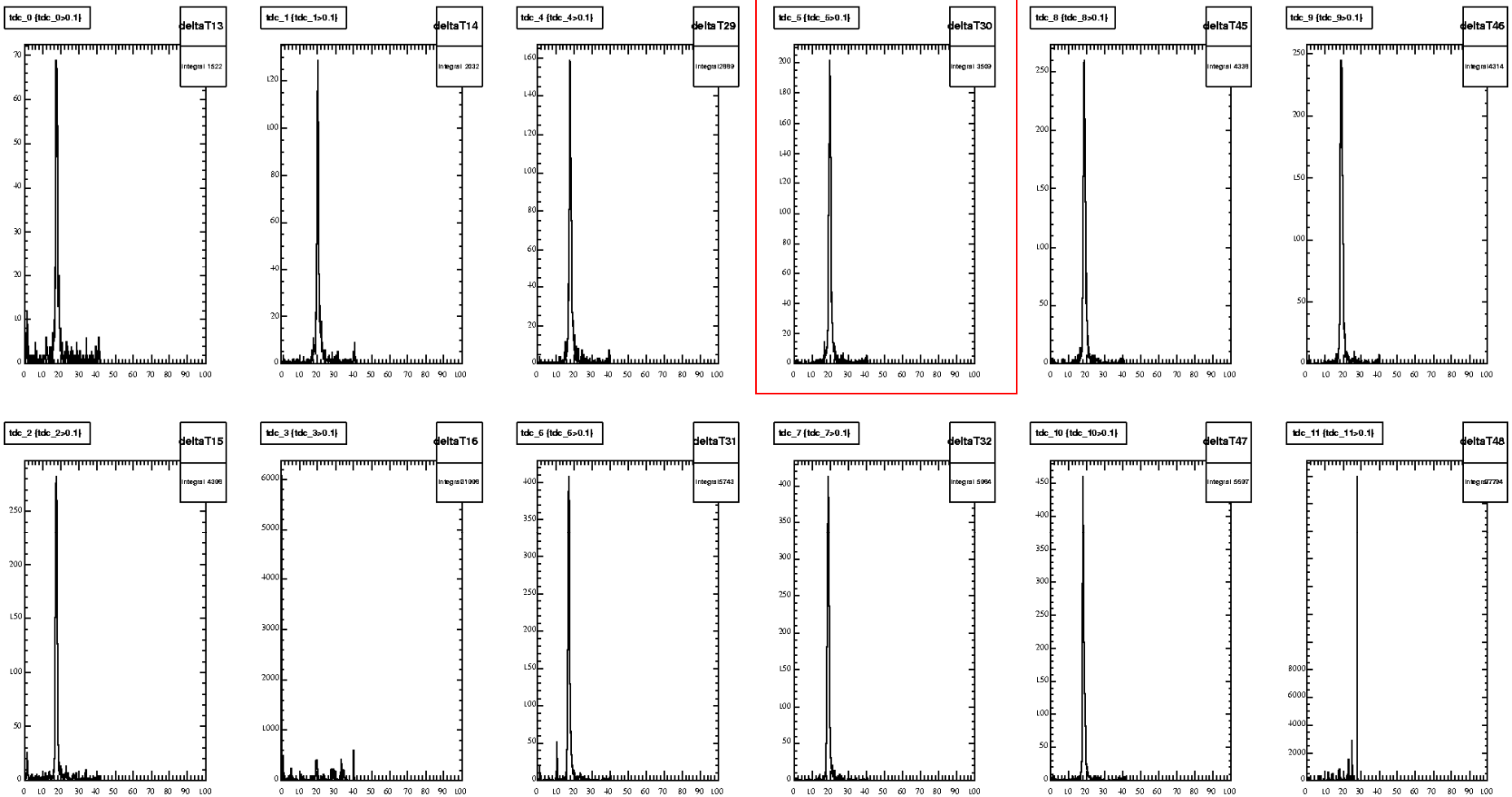
→ priority to synchronize CAMAC and UH streams in any future beam test

Today: Quick look at standalone Hawaii timing data from slot 7 (filtered and raw) and simple qualitative comparison to slots 1-6, read out via Philips/CAMAC.

Run 24, position 4, ~58k good single tracks in CAMAC stream

active range 0-40ns, only see direct photons (peak 2 expected at peak 1 + 25ns)

Look at pad 30 more closely

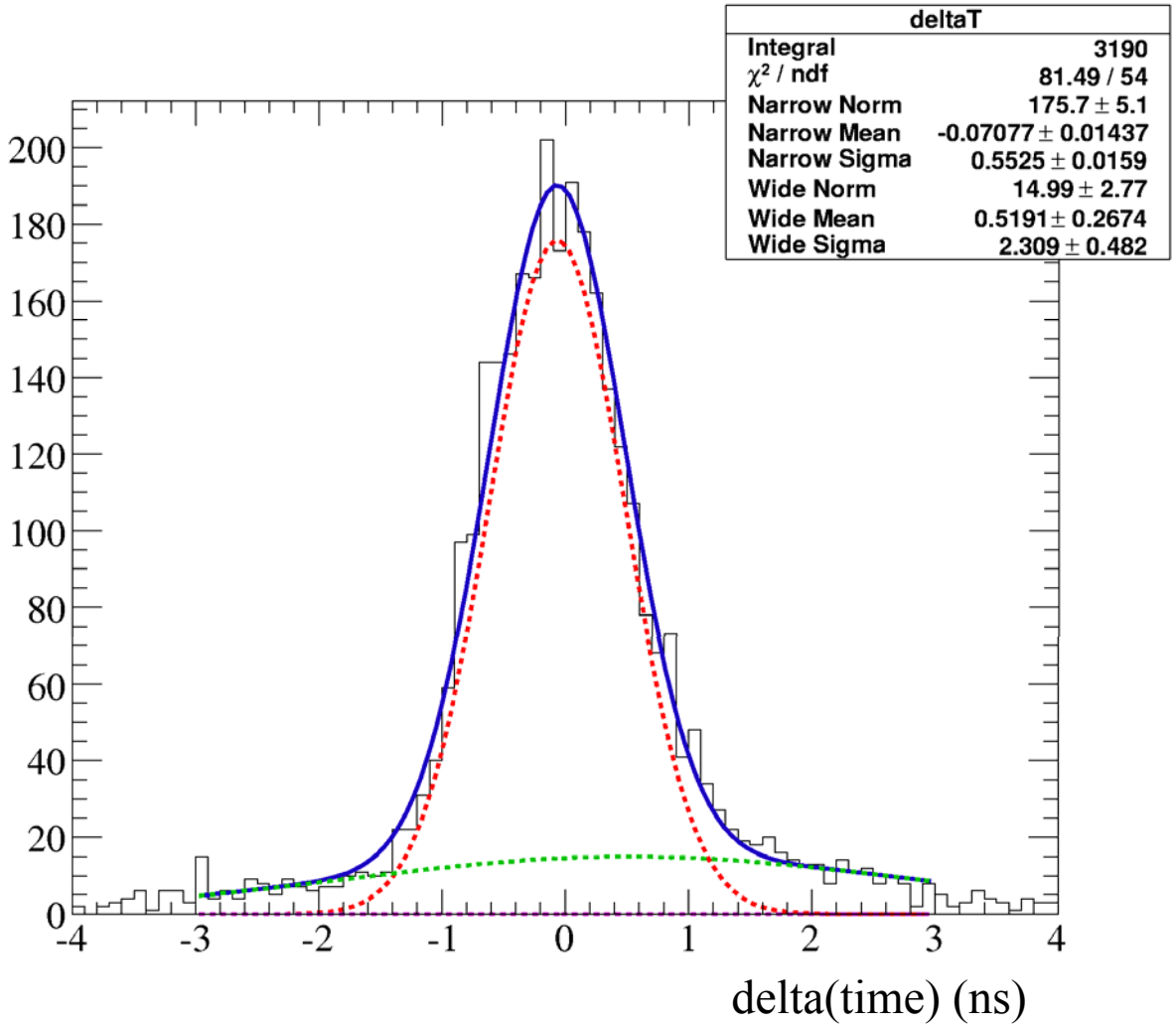


Run 24, position 4, ~58k good single tracks in CAMAC stream

good pad (30) without noise peaks in this run

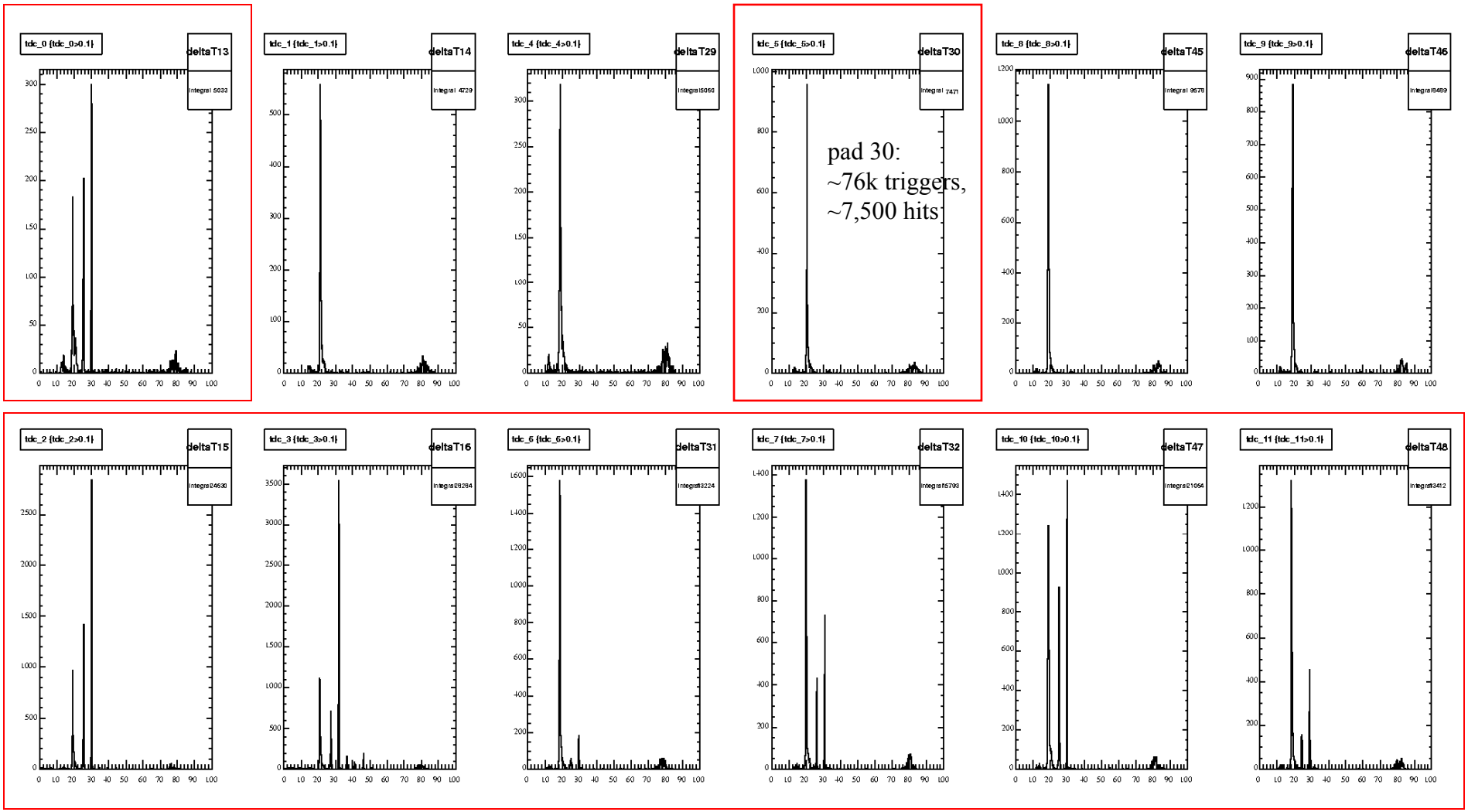
center peak 1 (direct photons) at zero (arbitrary offset) and fit with G+G

timing resolution σ≈550ps



Run 27, position 1, 3M triggers/119k good single tracks in CAMAC stream

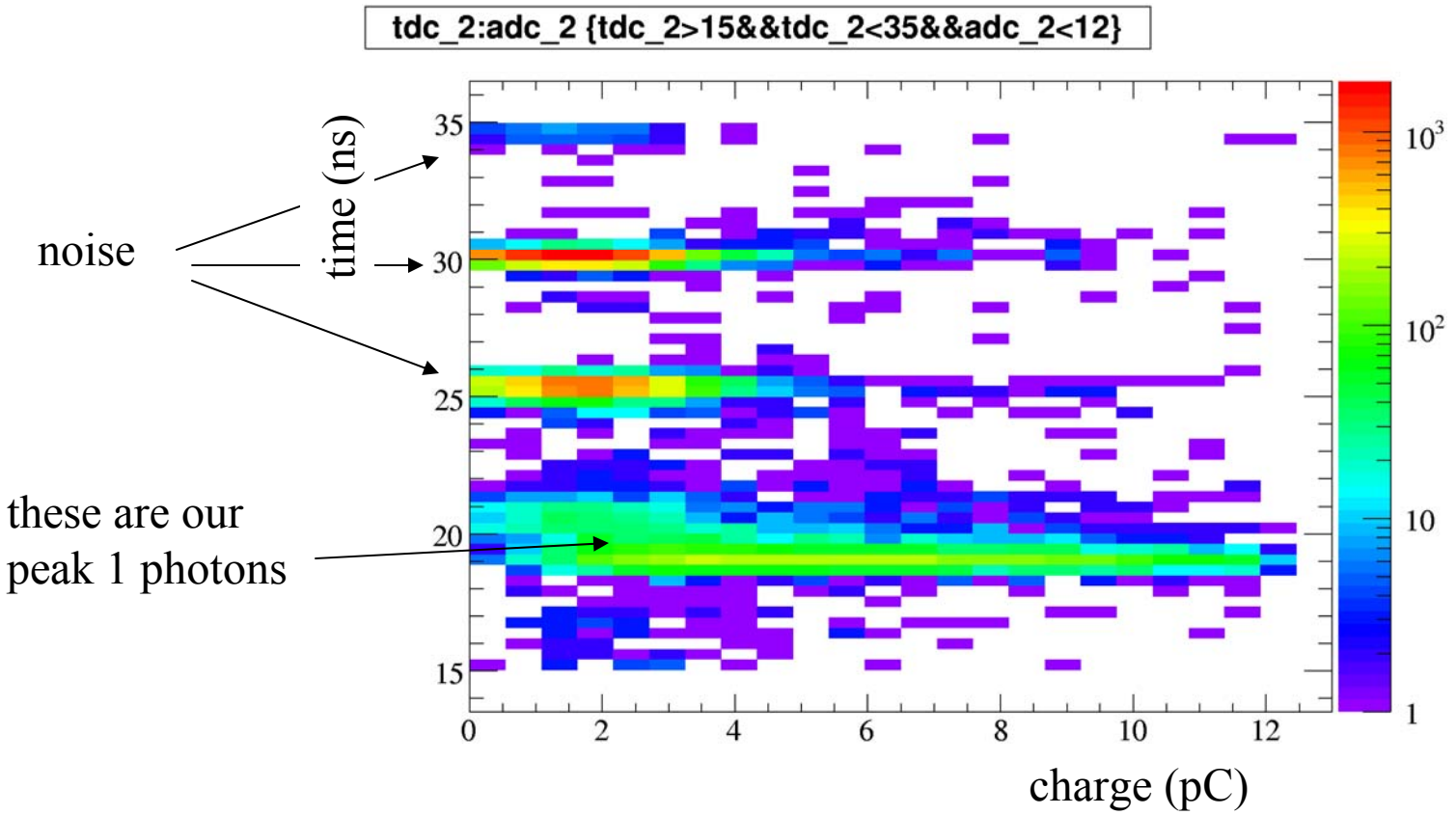
active range ~0-90ns, see both peak 1 and peak 2
some big noise peaks in addition to our signal peaks
– the "usual" noise on MCP edge pads



Run 27, position 1, ~119k good single tracks in CAMAC stream

Look at one pad (15) with noise peaks

noise peaks have small charge



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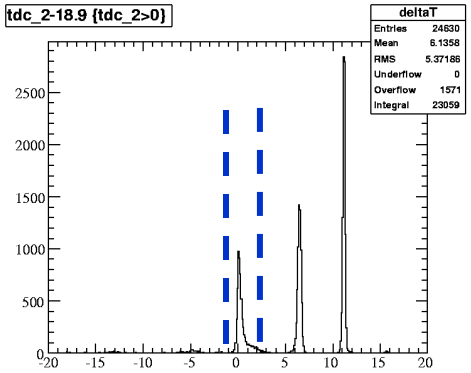
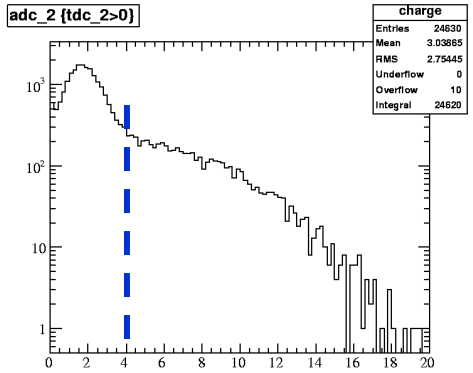
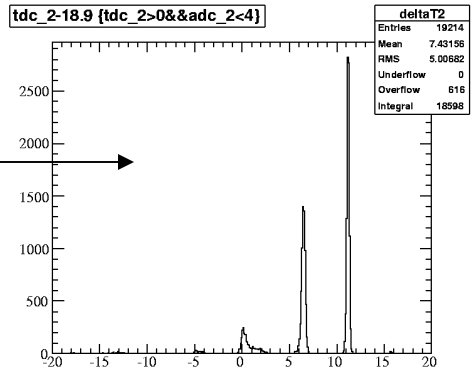
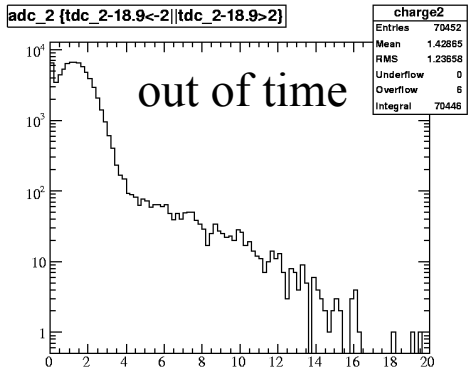




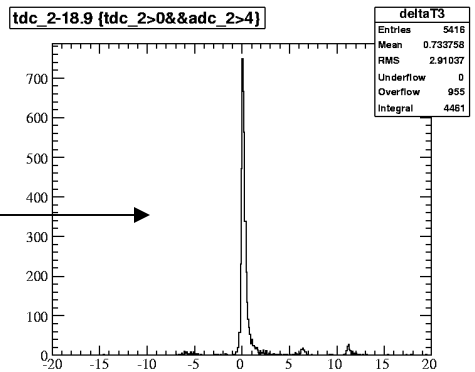
smaller charge
(adc<4pC)

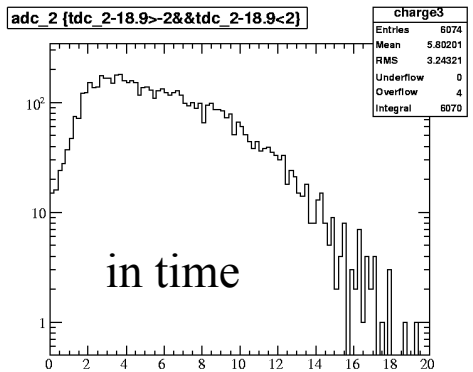




(arbitrary) cut at 4pC removes almost all noise and retains 65% of signal

larger charge
(adc>4pC)





delta(time) (ns)

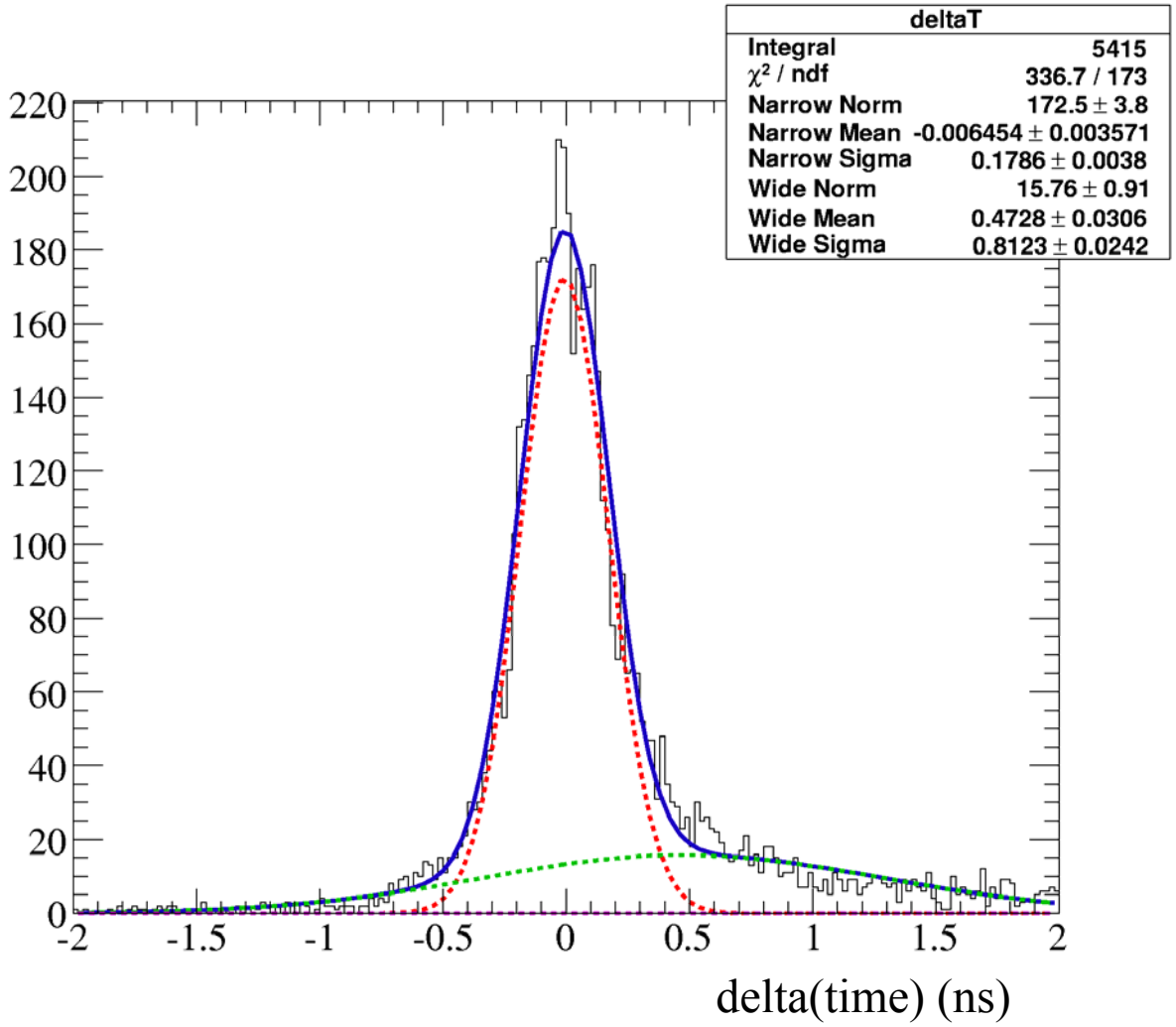
charge (pC)

Run 27, position 1, ~119k good single tracks in CAMAC stream

good pad (30) without noise peaks in this run

center peak 1 (direct photons) at zero (arbitrary offset) and fit with G+G

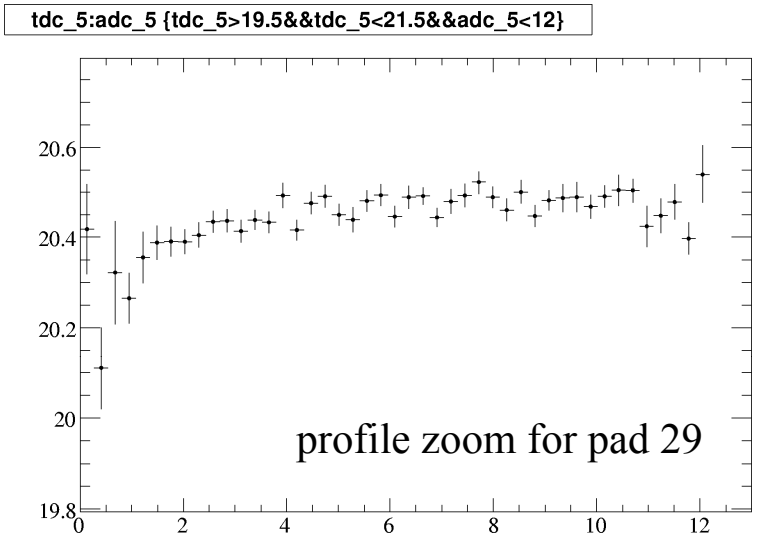
timing resolution σ≈180ps

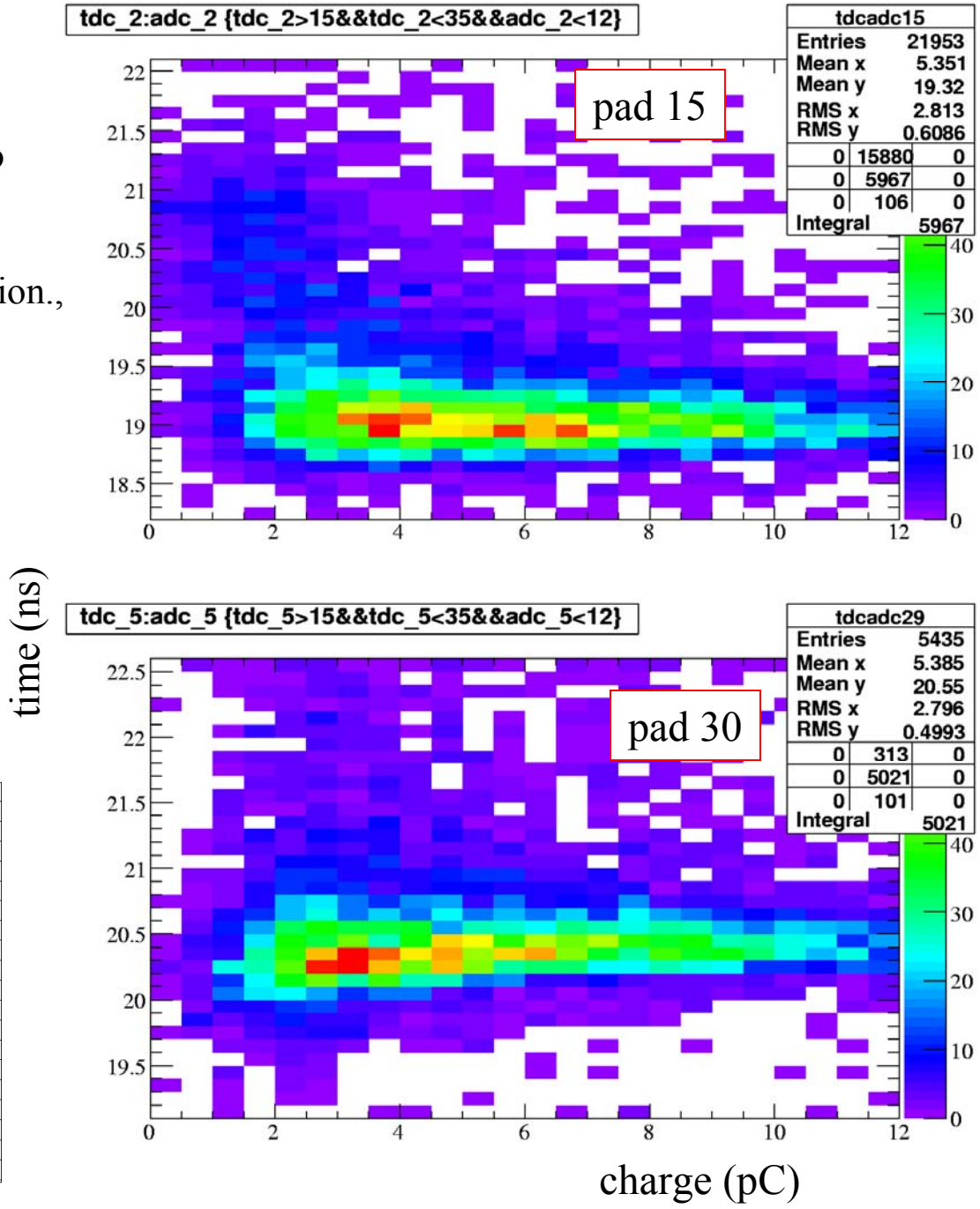


TDC vs. ADC for signal in run 27

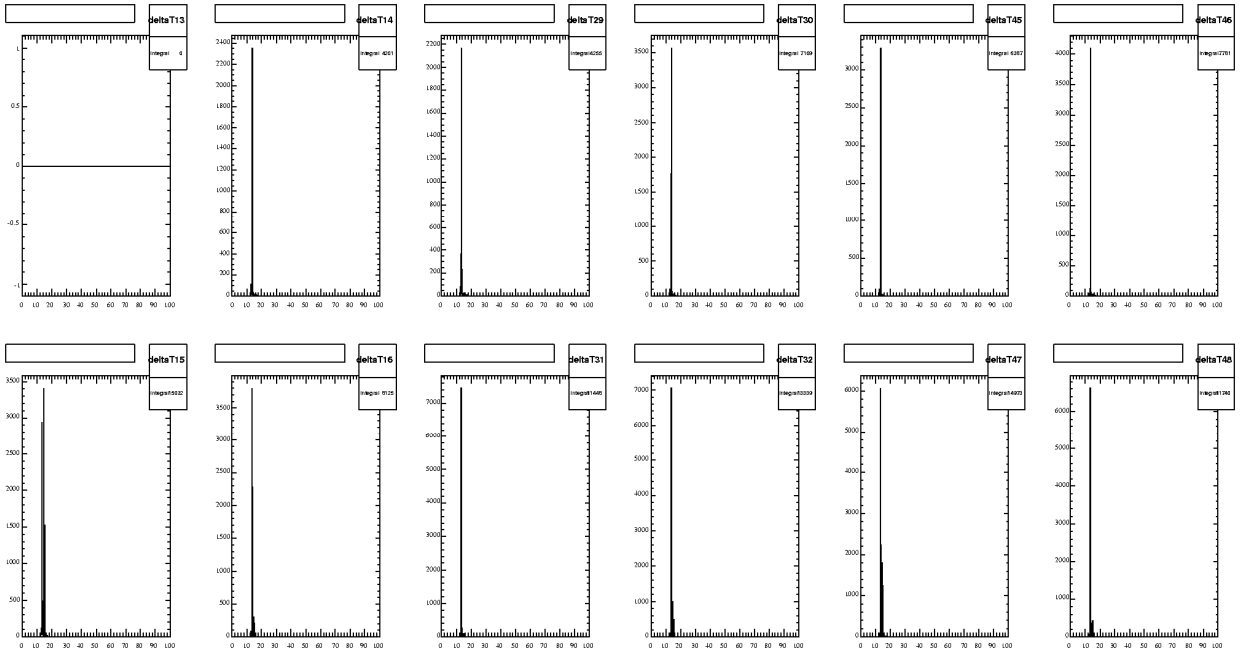
Larry's offline correction method seems to come close to correcting time walk.

Some over-correction, some under-correction., more can be done offline with charge info.



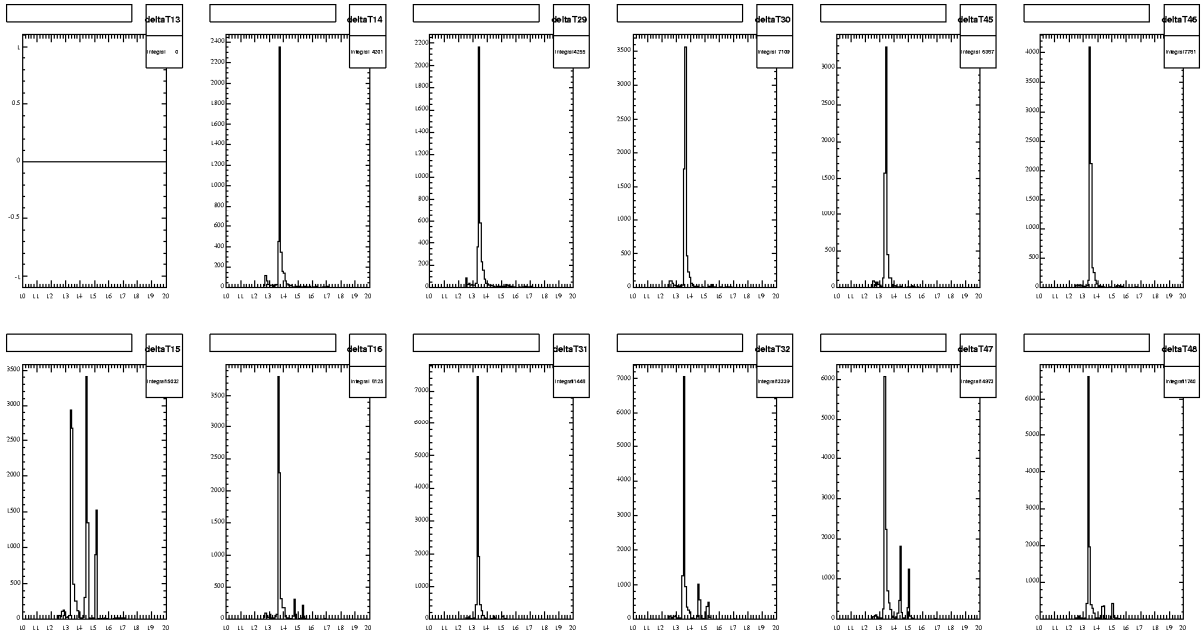


For completeness:
Camac stream of
UH readout in slot 7
for run 27, position 1



time (ns)

Zoom in to 10...20ns

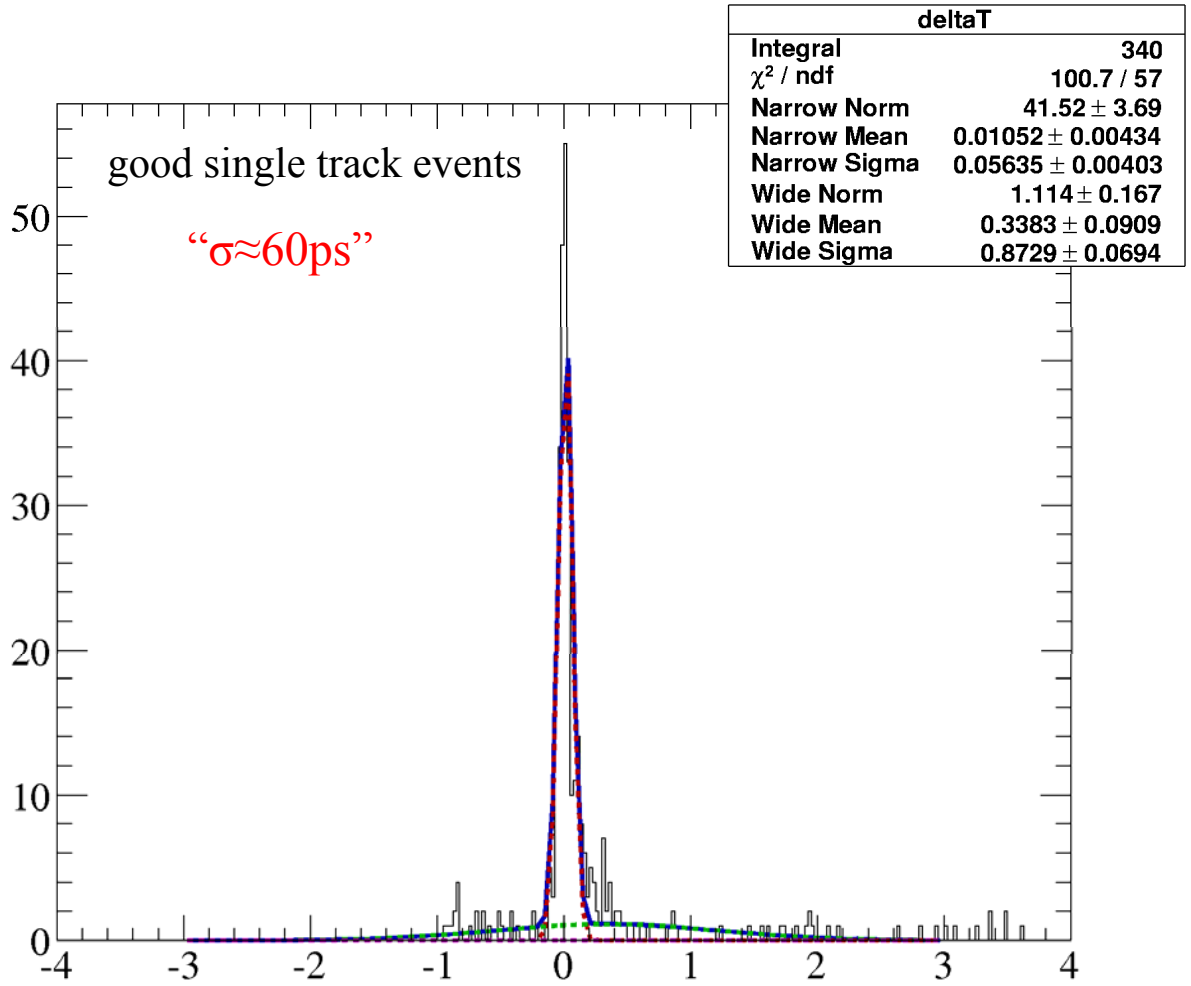


time (ns)

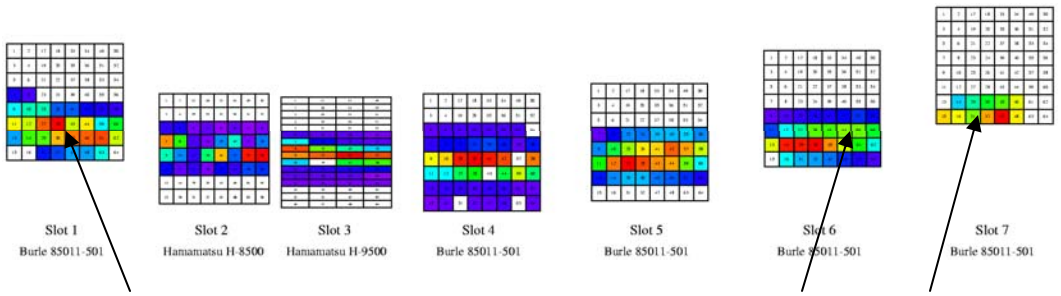
→ maybe we only see noise?
or is there Cherenkov data?

... time peak not very meaningful, much too narrow

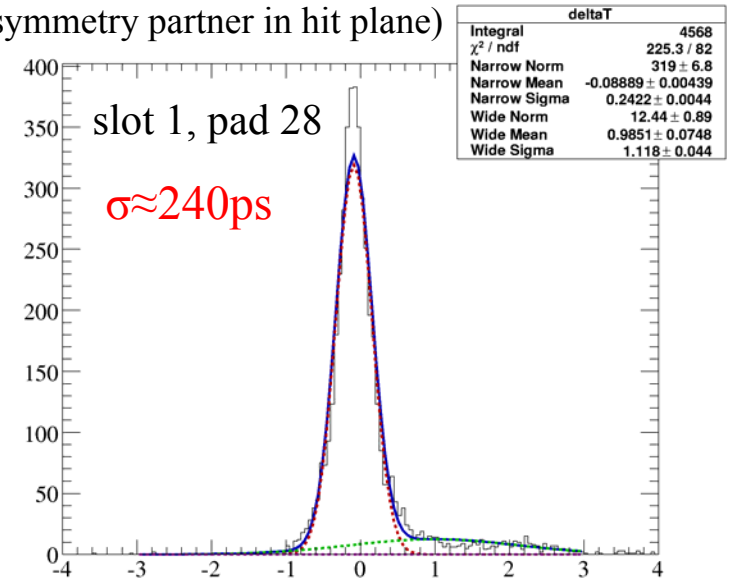
also, similar “hit” probability and time in events without any beam in lead glass...

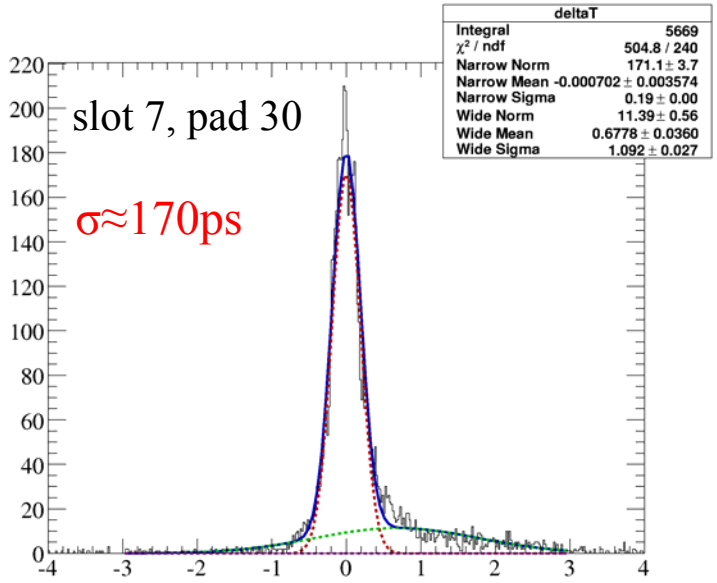


Comparison of UH timing slot 7, pad 15
to Philips slot 1&6
for run 27, pos 1, direct photons

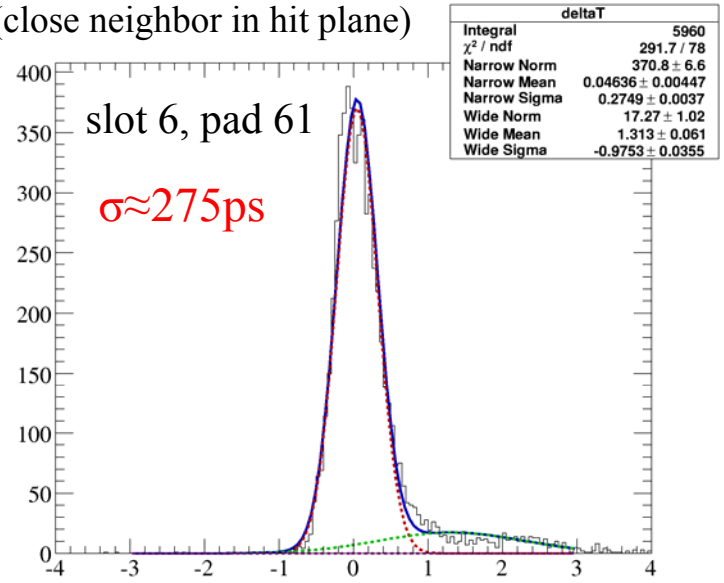


(symmetry partner in hit plane)





(close neighbor in hit plane)



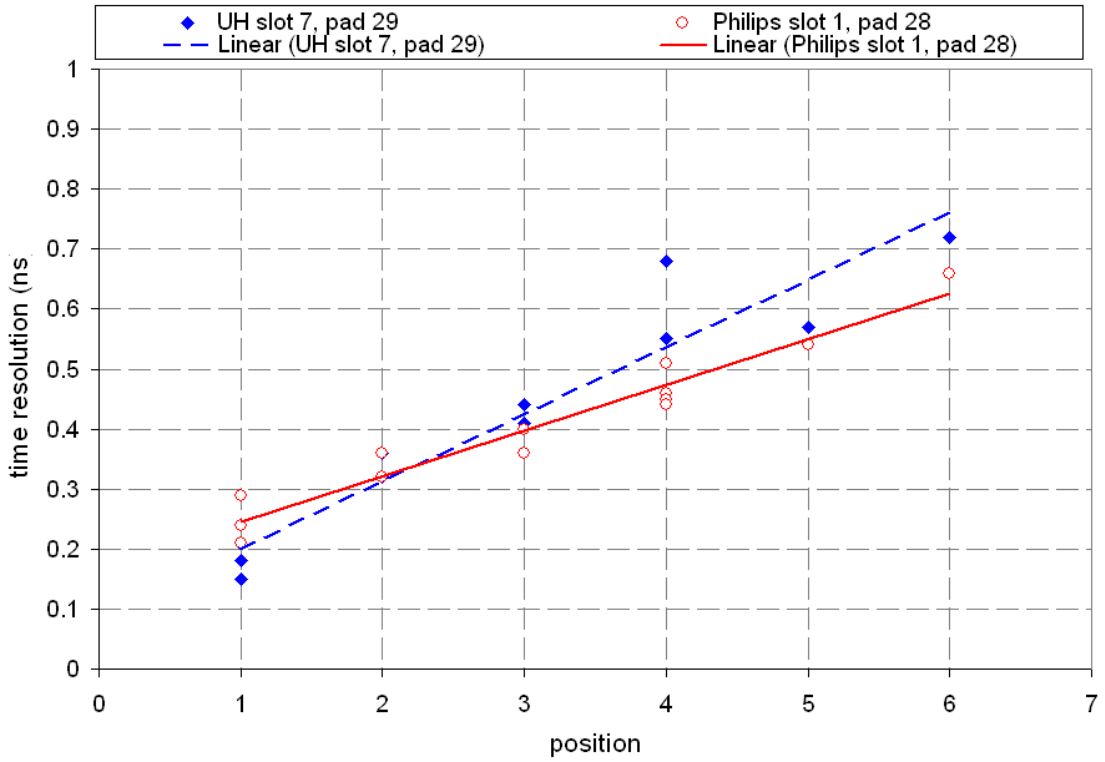
delta(time) (ns)

Don’t currently have full G4 path prediction for slot 7

(would have to revive my code and run variable lambda analysis for 7 slots)

Compare slots as function of position number instead

selecting slot 1 pad which is expected to have very similar path length



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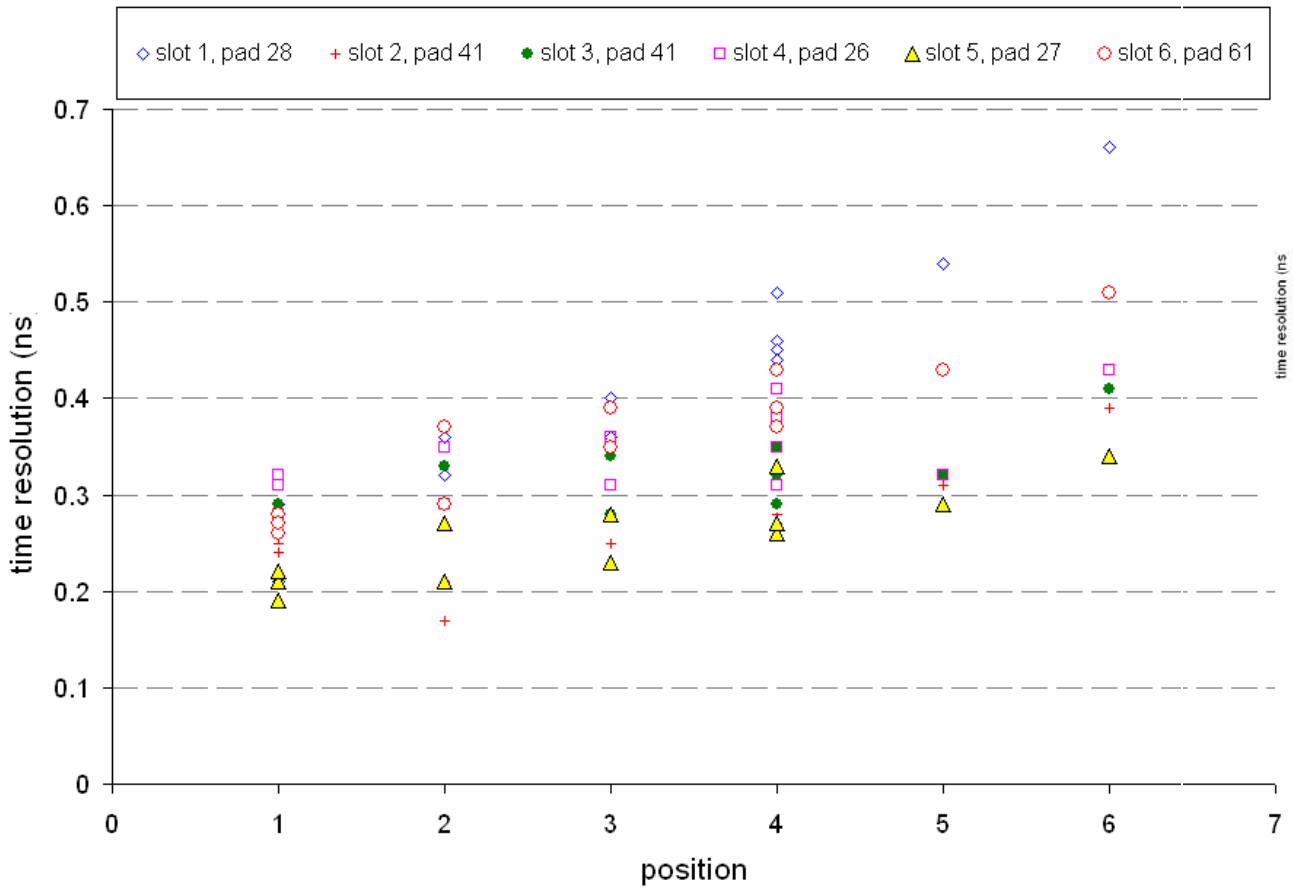

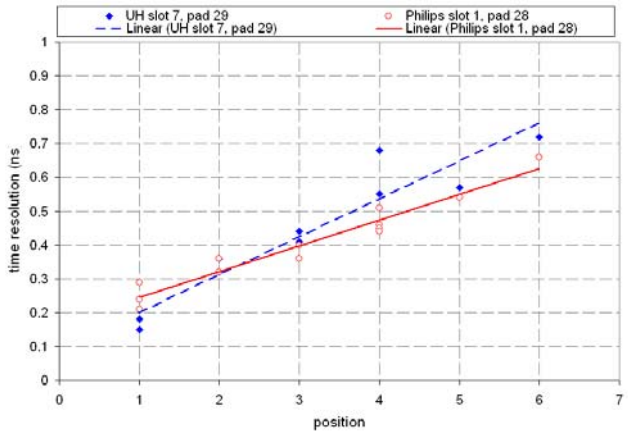

slopes get steeper as

you move toward wings

Still need to get my analysis code for 2007 beam test camac data fully configured.

2007 camac data has more problems than 2006 data:
some CFD issues, one run double-peak in time (both prototype and start counter),
lead glass ADC spectrum underwent many changes during beam test, etc

But – Jerry's analysis shows that 2007 data is useful after careful data selection.

Including slot 7 with UH timing does not seem feasible for 2007 data.
UH data written to CAMAC stream does not appear to be very meaningful.
Best we can do is show standalone analysis of slot 7 pads with UH timing.

First look at the data shows good timing resolution.

Timing correction in Larry's offline analysis appears to be doing good job of
correcting for time walk.

For any future beam test the UH electronics will provide corrected time and charge
to CAMC stream in synch with rest of beam and prototype detectors.