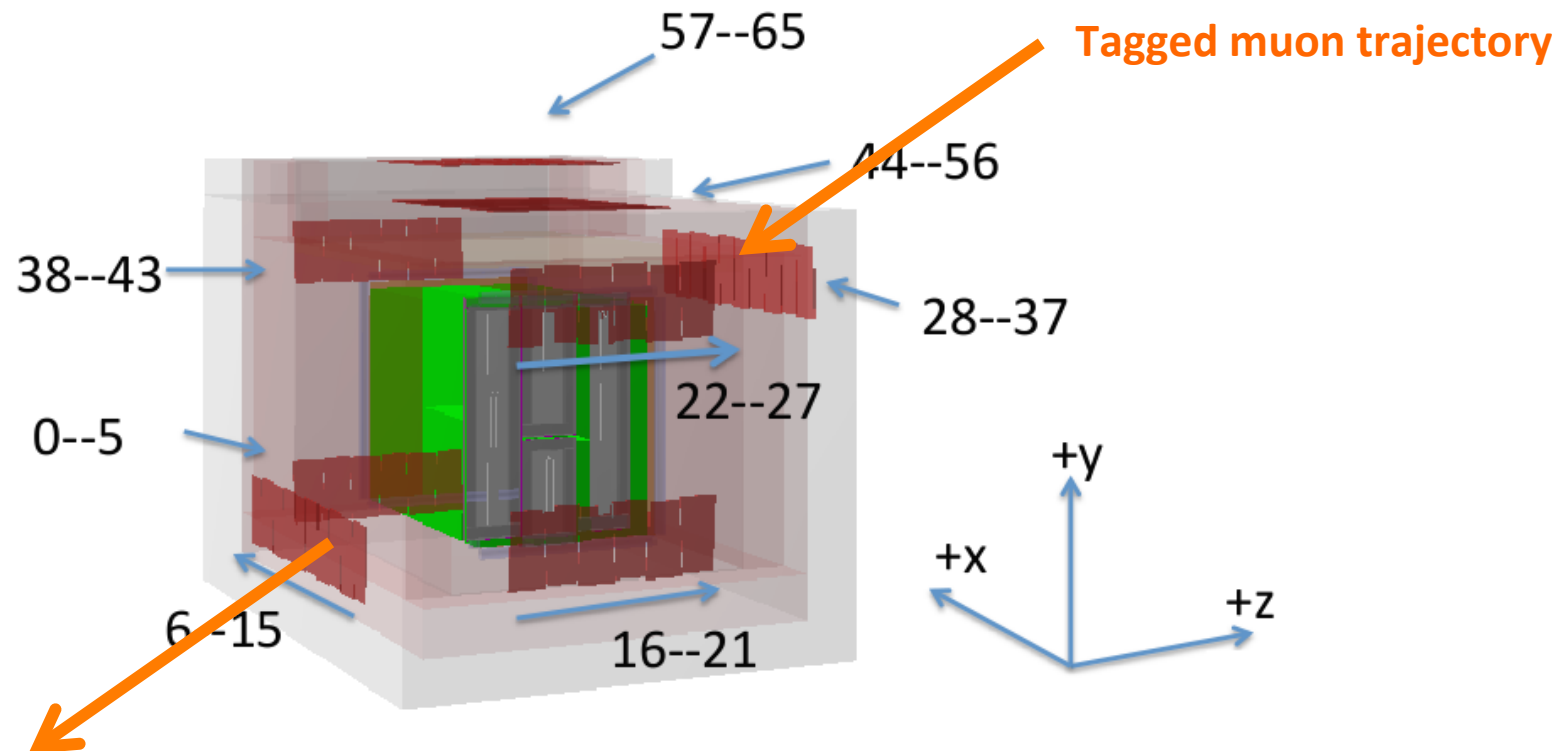


Online LAr Purity Monitoring in DUNE 35t prototype

Use external scintillator counters to tag sample of muons travelling parallel to APA

Estimate electron lifetime -> LAr purity from sample of these muons



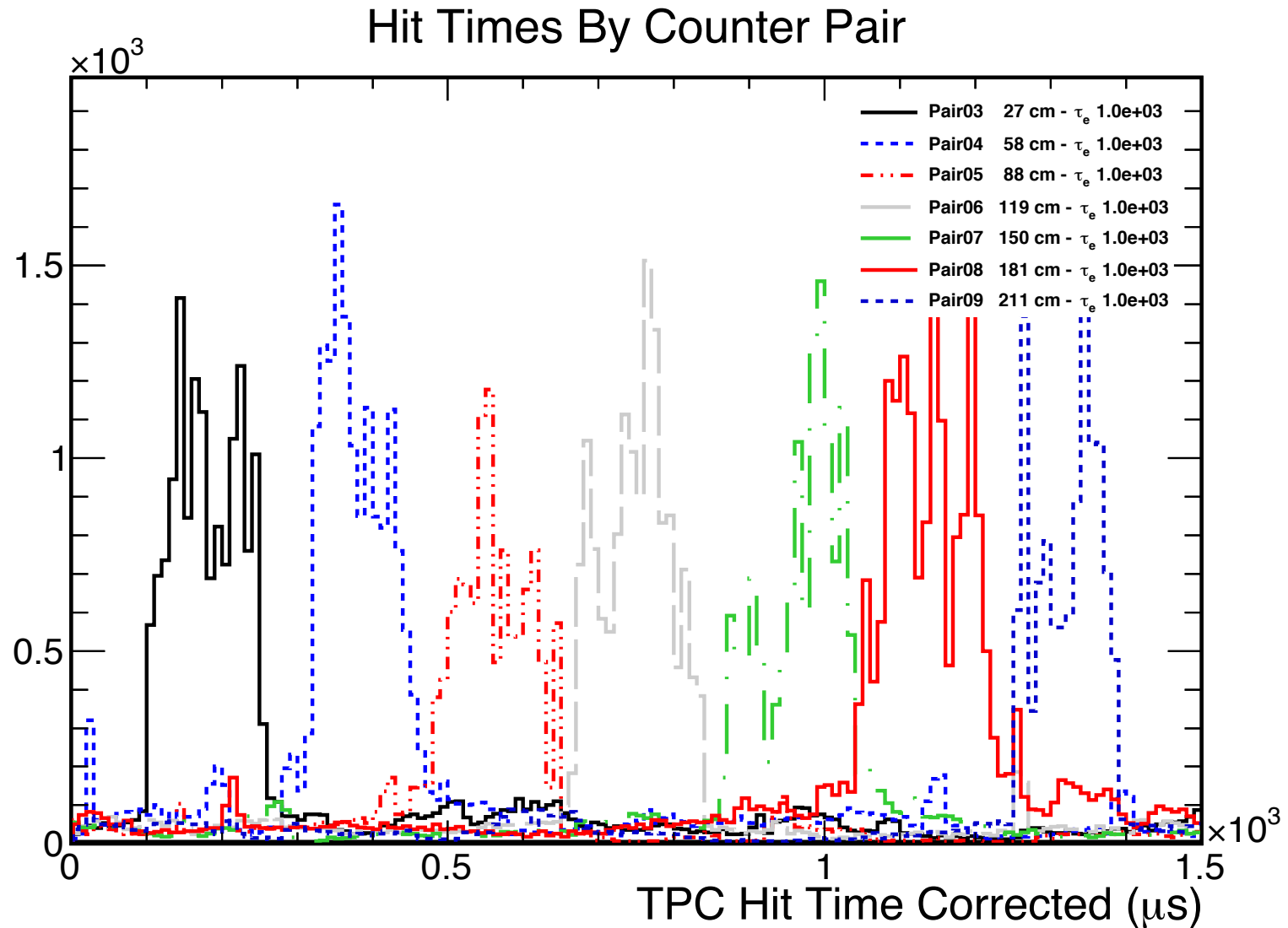
Trying to generate CRY cosmic ray samples

- More realistic spectrum of muons (energy, momentum, position)
- Estimate live time needed to get purity measure

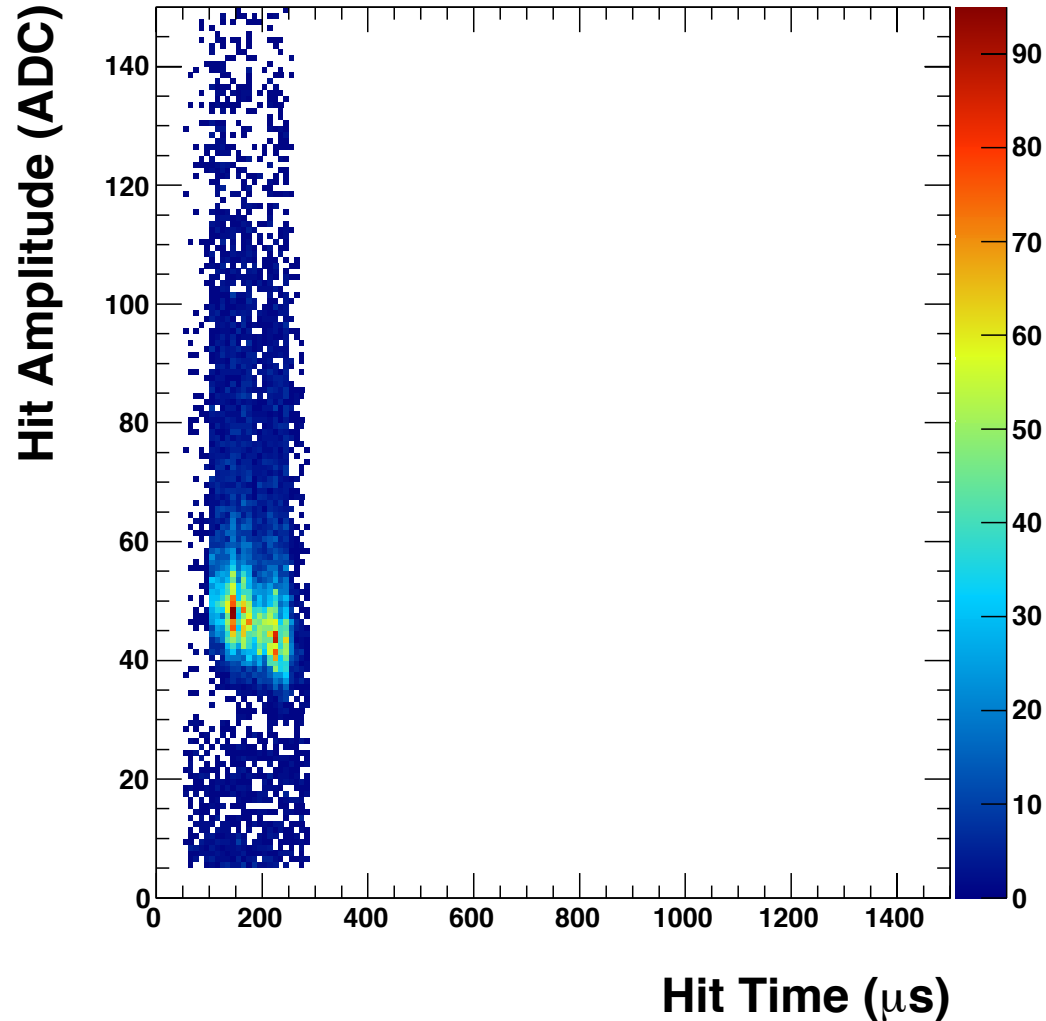
Generated samples using standard fcls (i.e. MC challenge) with Dom Brailsford's external counter filters in place

Generated 250,000 events:

- ~3,500 pass filters
- GEANT stage performed with three electron lifetimes $1e3$, $1e4$ and $1e5$ us



Hit Amplitude vs Time - Pair03 27 cm τ_e 1e+03

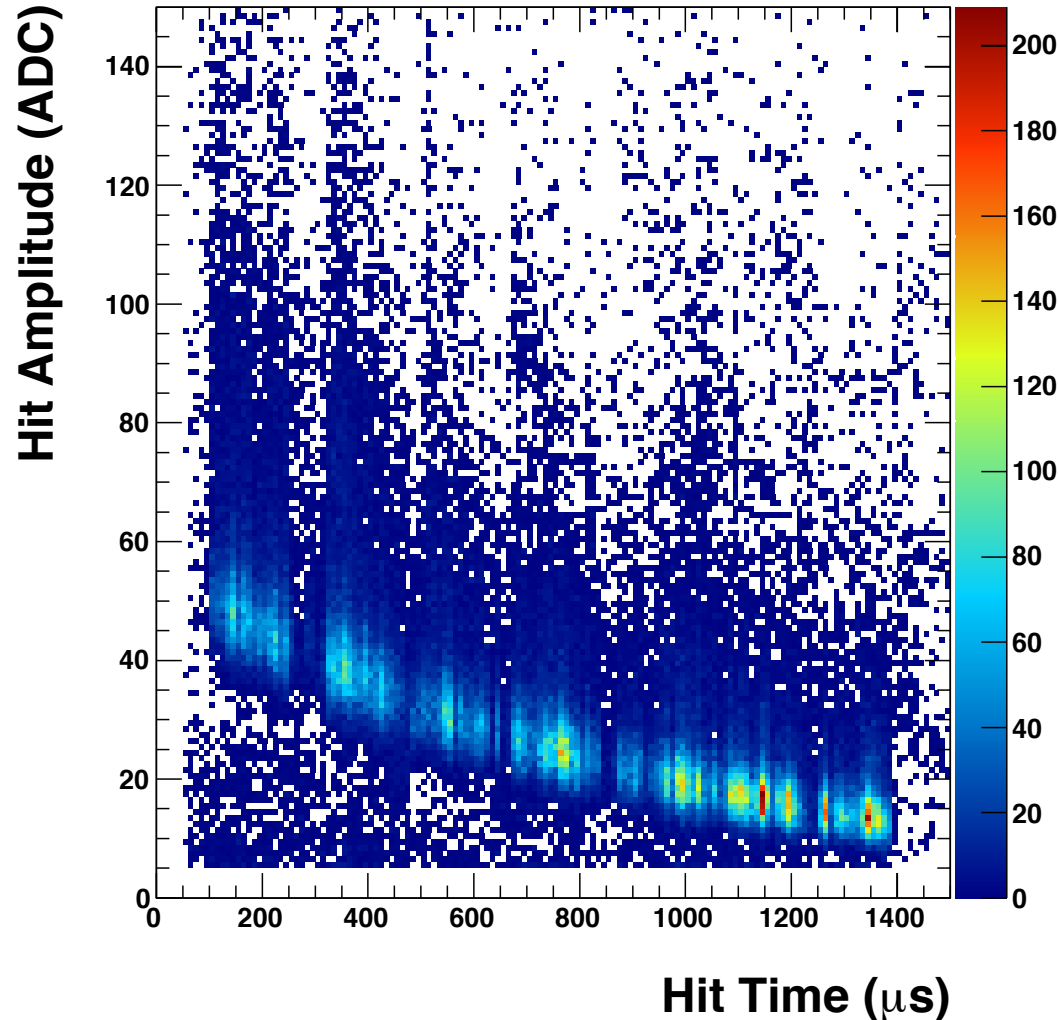


Pair 03 – ~27cm from APA

Select only events hitting a pair of opposing counters

Record all hit time / amplitude pairs

Counter Pair Hits - τ_e 1e3 μs



All Pairs

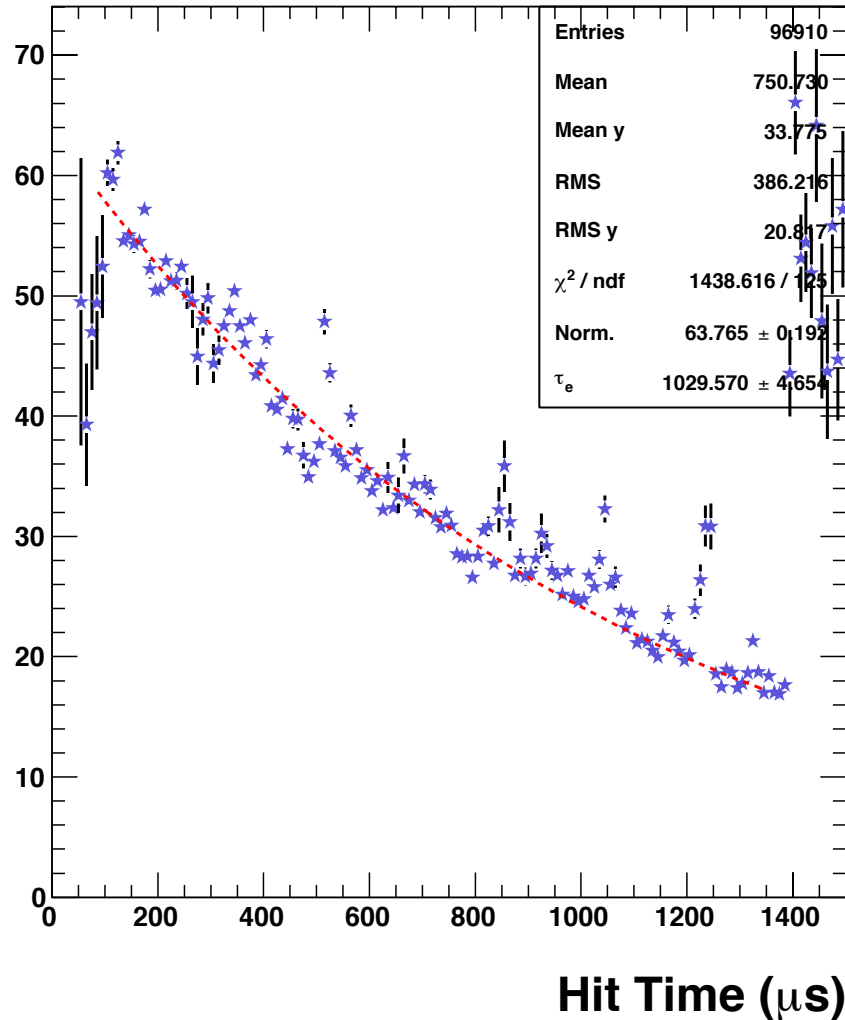
Select only events hitting a pair of opposing counters

Record all hit time / amplitude pairs

Looks like an encouraging shape

Try fitting profile

Counter Pair Hits - τ_e 1e3 μs



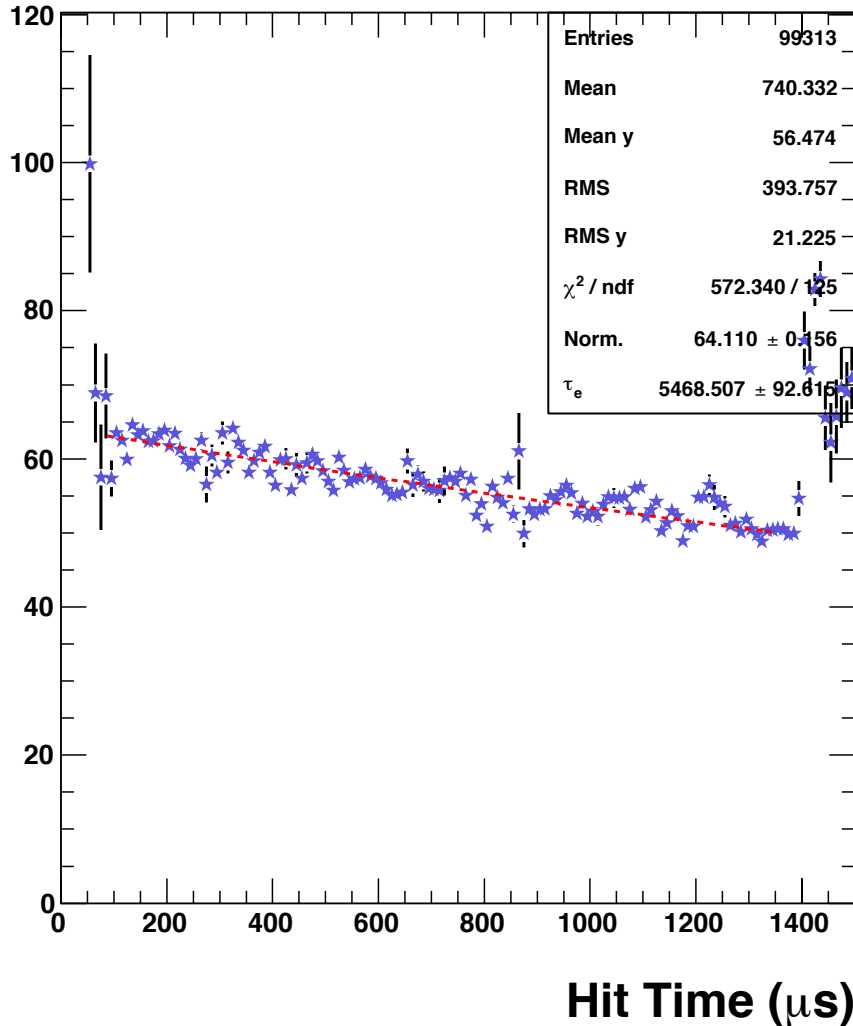
Fitted profile

Poor quality fit

Lifetime is not within errors of fit result

Tau_e 1029.6 +/- 4.7 us

Counter Pair Hits - τ_e $1e4$ μs



Actual

Tau_e 1,000 us

Fitted

Tau_e 1029.6 +/- 4.7 us

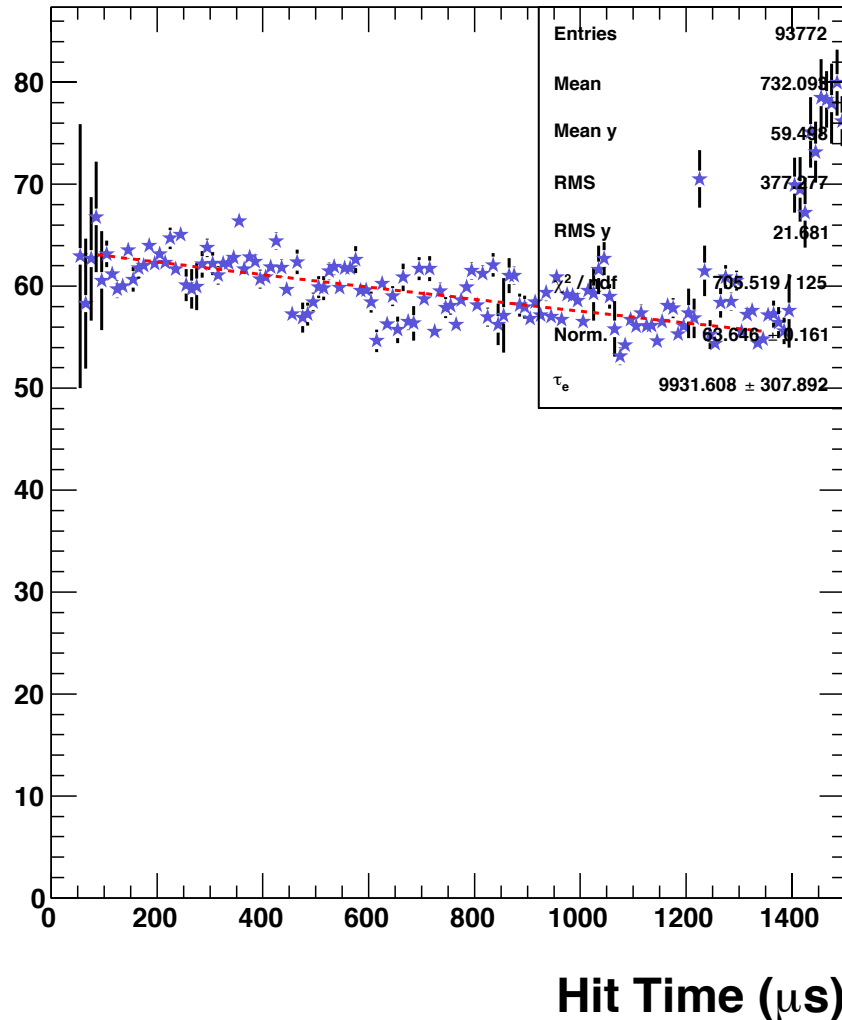
Actual

Tau_e 10,000 us

Fitted

Tau_e 5468.5 +/- 92.6 us

Counter Pair Hits - τ_e 1e5 μ s



Actual

Tau_e 1,000 us

Fitted

Tau_e 1029.6 +/- 4.7 us

Actual

Tau_e 10,000 us

Fitted

Tau_e 5468.5 +/- 92.6 us

Actual

Tau_e 100,000 us

Fitted

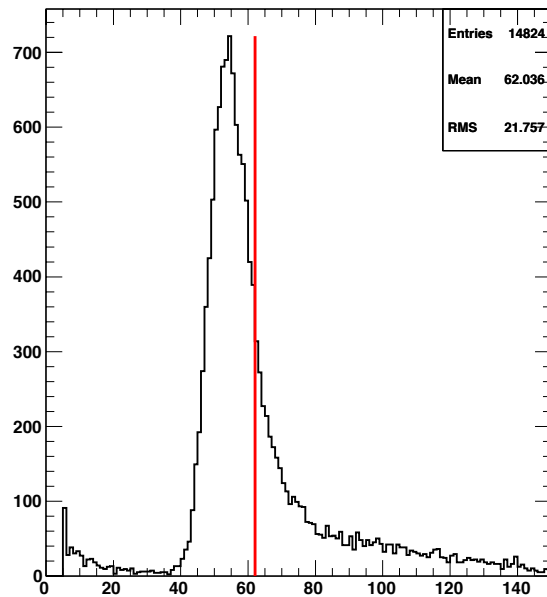
Tau_e 9931.6 +/- 307.8 us

What's going wrong?

Ideas – ADC distribution fit?

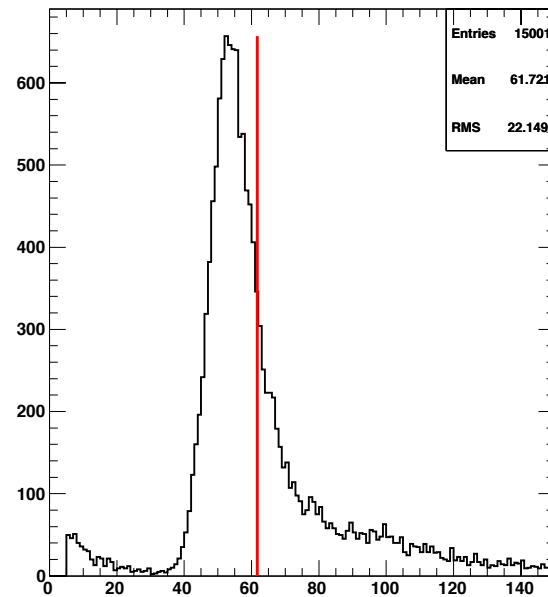
- Profile histogram doesn't do a good job at representing actual ADC distributions
- Actual distributions are Landau-Gaussian
- Could fit the distributions individually?

Hit Amplitude - Pair03 27 cm τ_e 1e+05



Hit Amplitude (ADC)

Hit Amplitude - Pair04 58 cm τ_e 1e+05



Hit Amplitude (ADC)

- Some other effect causing a drop off in ADC counts as a function of distance?
- Diffusion?