



GLAST

The Gamma Ray Large Area Space Telescope

LAT Trigger Tests

Timing Results

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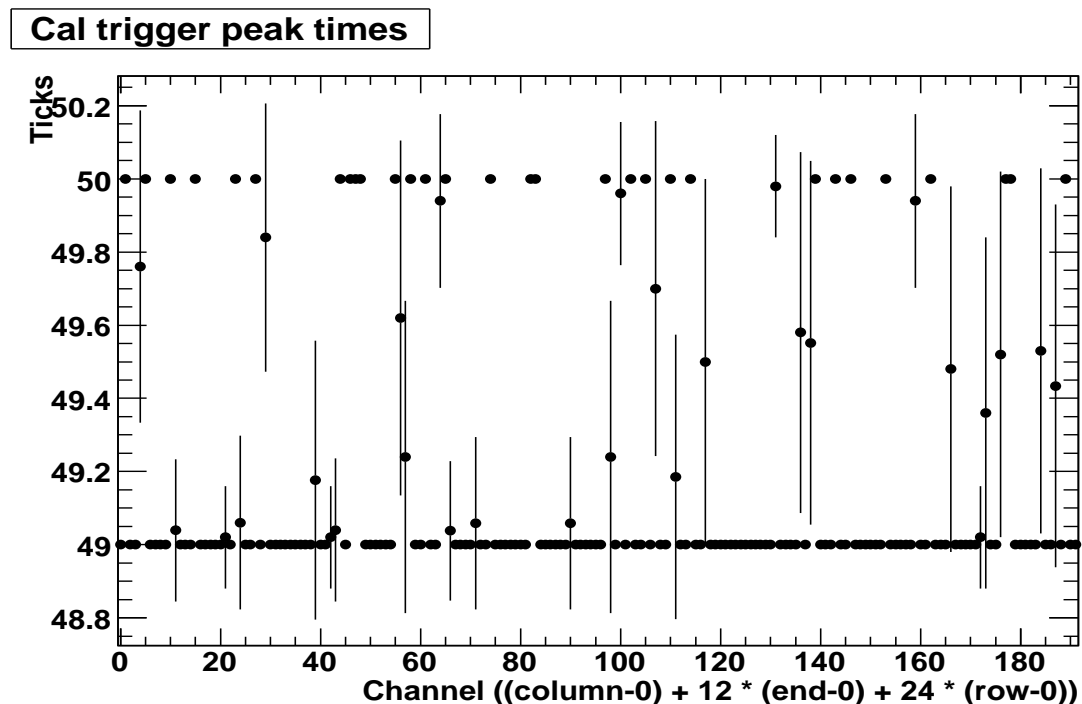
List of Tests

- CAL channel uniformity
- TREQ for CAL and TKR
- TACK for ACD, CAL, TKR

CAL Channel Uniformity

- Method: Inject charge into each channel separately. Measure time until a trigger arrives.
- Test was performed on all 16 towers.
- Uniformity was found to be very good for both FLE and FHE on all towers.

Example plot shows
FLE tower 2.

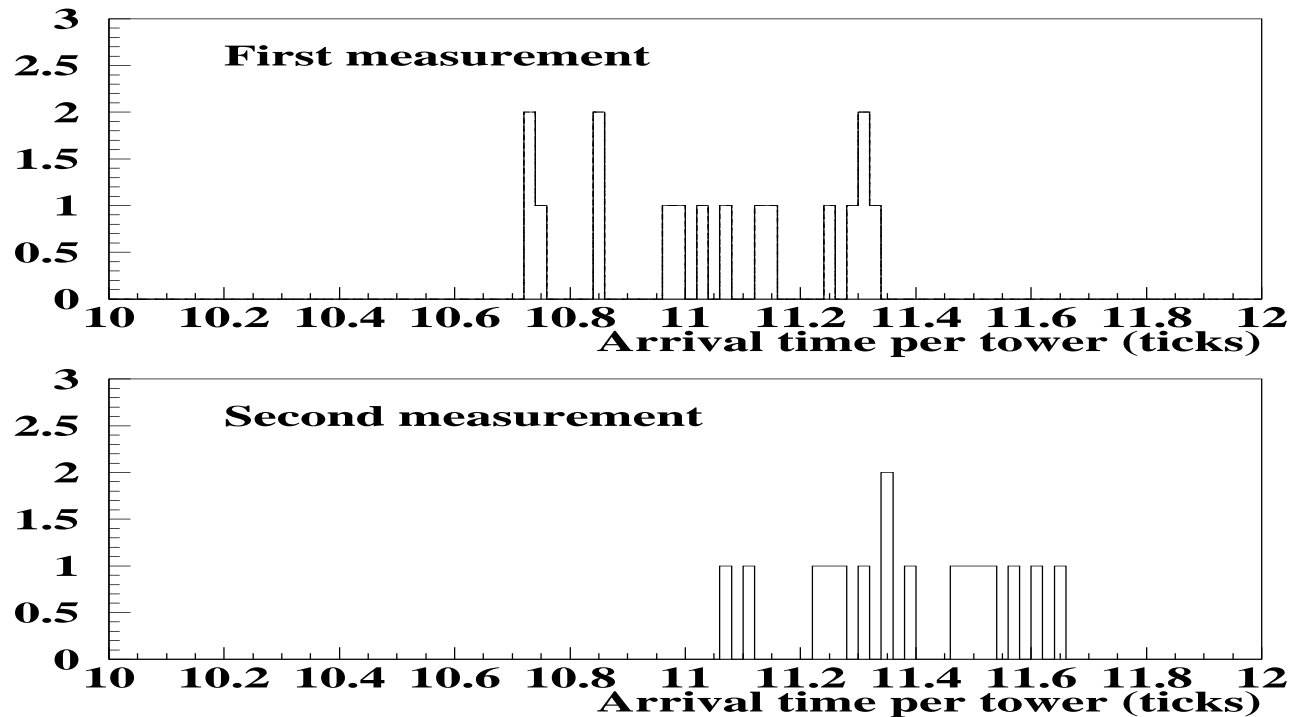


TREQ delays

- New script times in all towers at the same time.
- Test had to be repeated after a bug was found that had the effect that all FLE thresholds had been set to 20.
- Between the first and the second attempt on some towers the TKR timing moved back by about 0.5 ticks. Is this understood?
- The reference for the measurement of arrival times was the ACD.

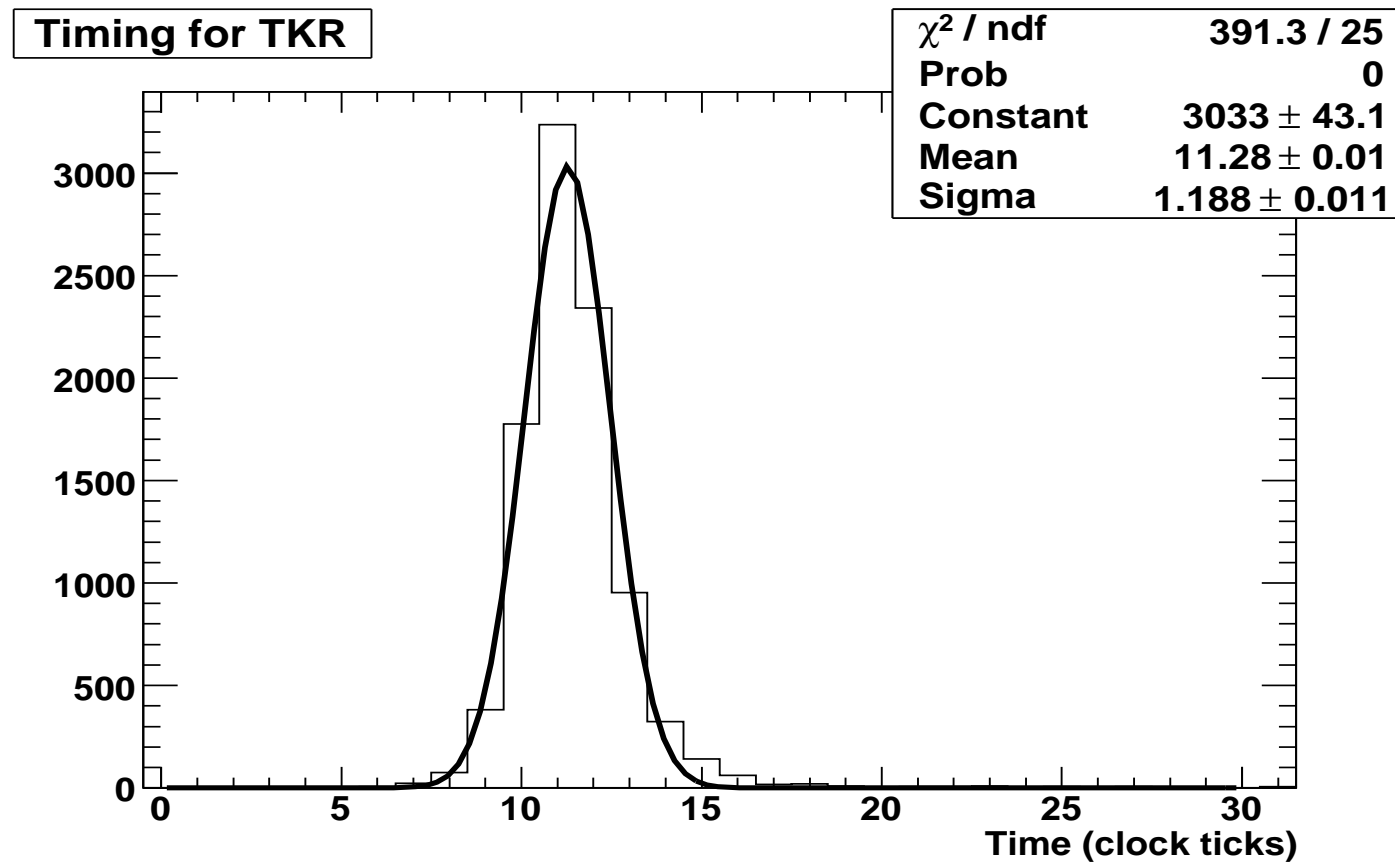
Tracker TREQ

- The same test was done twice with a week in between. Some towers had the same timing in the second test, others shifted.
- Overall, the timing distribution is narrow (ca. $\frac{1}{2}$ clock tick).



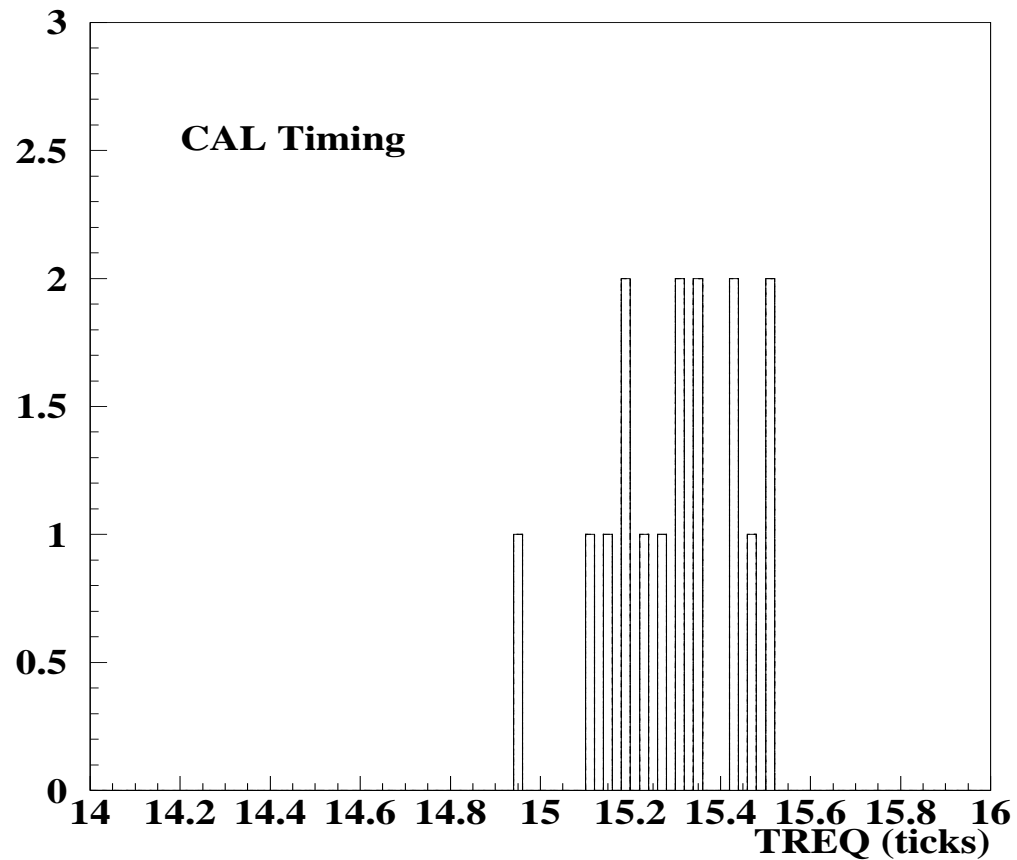
TKR Jitter

- The jitter per tower is around 1.2 ticks.
- Example plot shows tower 0.



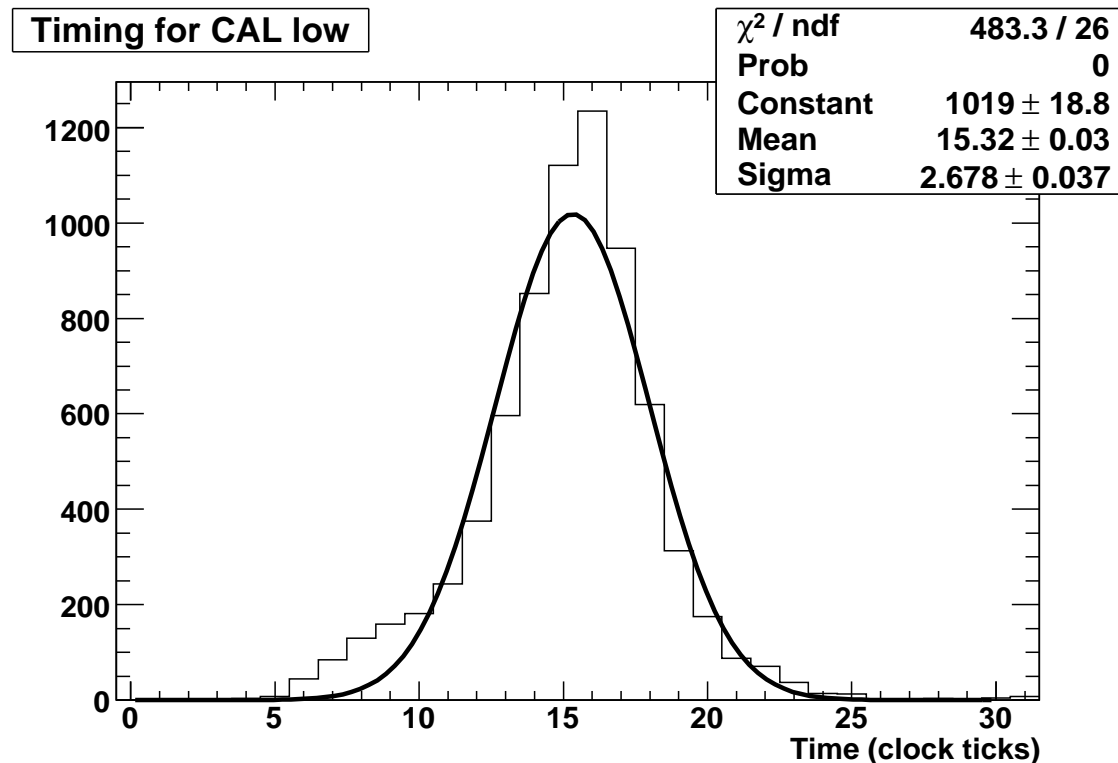
Calorimeter TREQ

- Timing distribution is narrow (about $\frac{1}{2}$ clock tick).



CAL Jitter

- The calorimeter jitter is about 2.5 clock ticks (sigma).
- The early peak which is due to direct diode hits is enhanced because unlike the muon telescope the ACD does not select vertical tracks only.



Plot shows tower 0.

TREQ Summary

- Both TKR and CAL show a spread of about $\frac{1}{2}$ tick in timing between towers.
- The CAL distributions have an enhanced early peak. The fit does not take this into account so the actual CAL timing is slightly later than the fit result (ca. 0.2 ticks).
- Because of rounding to full clock ticks some there is a spread of 1 tick in between CAL towers and TKR towers.
- The best delays for ACD/TKR/CAL would be between 15/4/0 and 16/5/0.
- For the SVAC runs 16/5/0 was used.

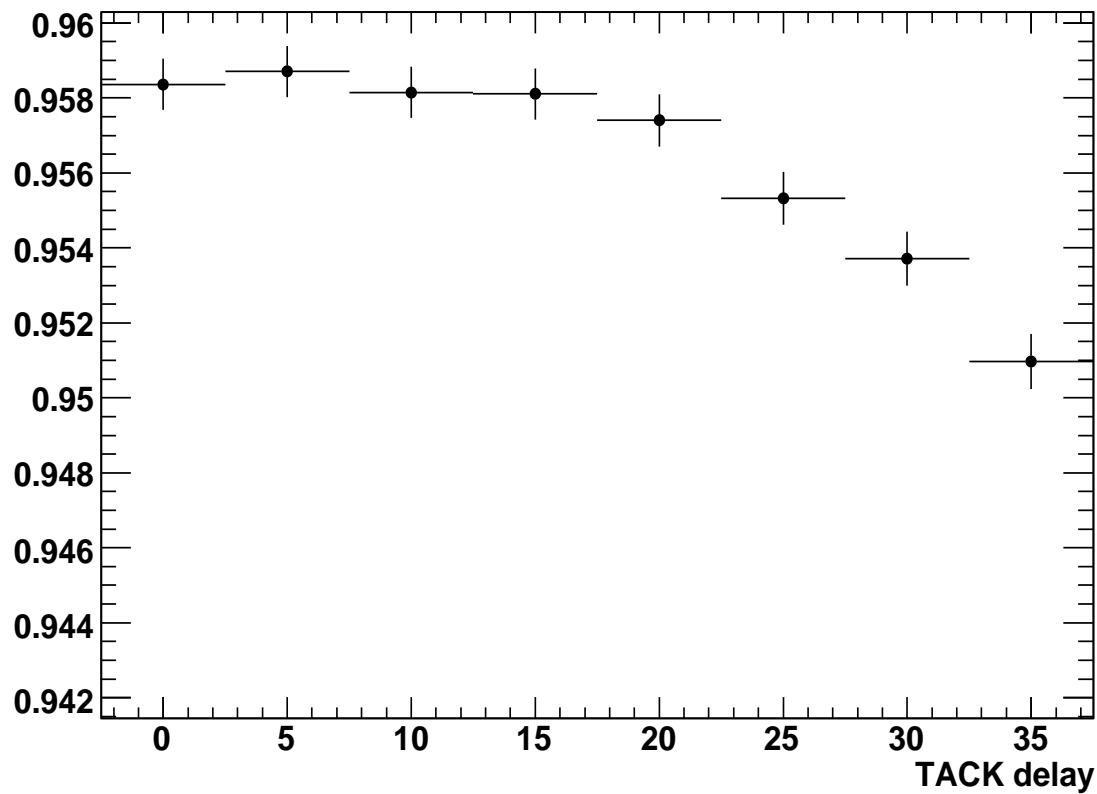
TACK scan

- 8 cosmic runs were taken with different TACK delays for each point.
- For TKR, the tracking efficiency is recorded for each point
- For CAL and ACD, the ADC spectra are recorded for each channel. Fits are performed, and waveforms are assembled from the 8 runs. The peak of the waveform is the optimal TACK delay.

Tracker TACK

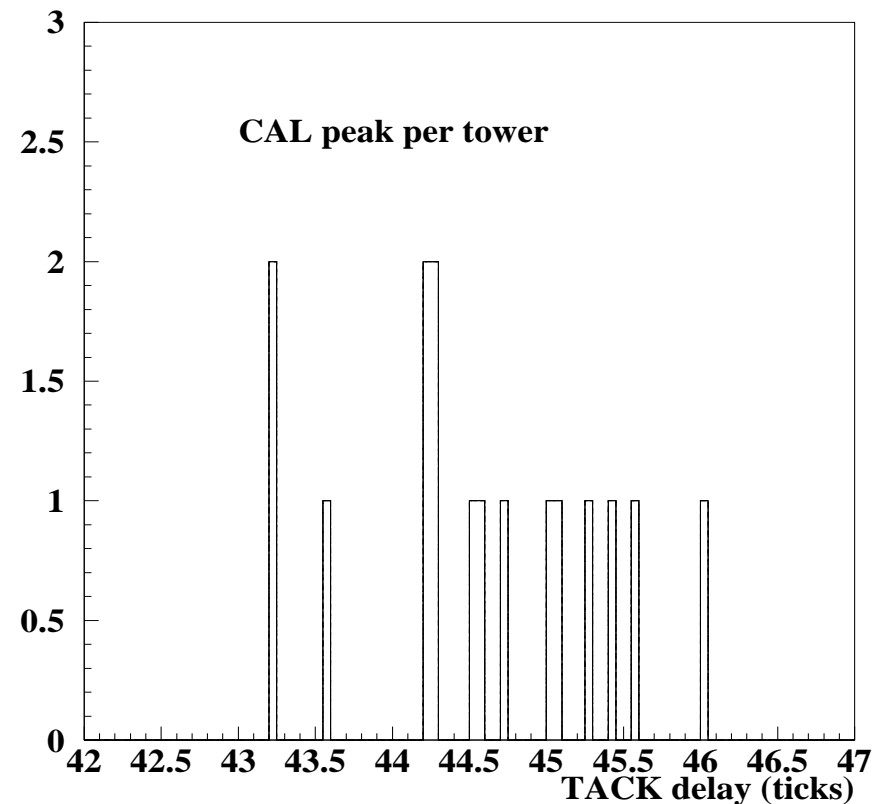
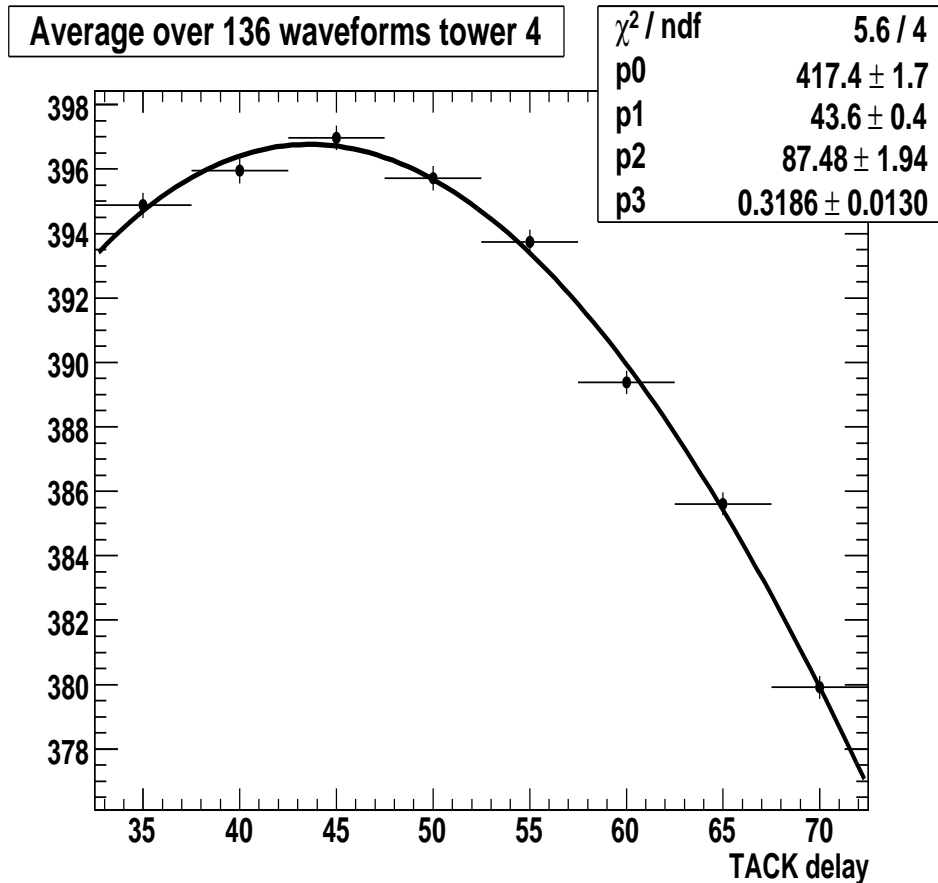
- The optimal point for all towers is a delay of 0.
- Efficiency starts dropping off at a delay of around 20.

Tracker hit efficiency fit tower 4



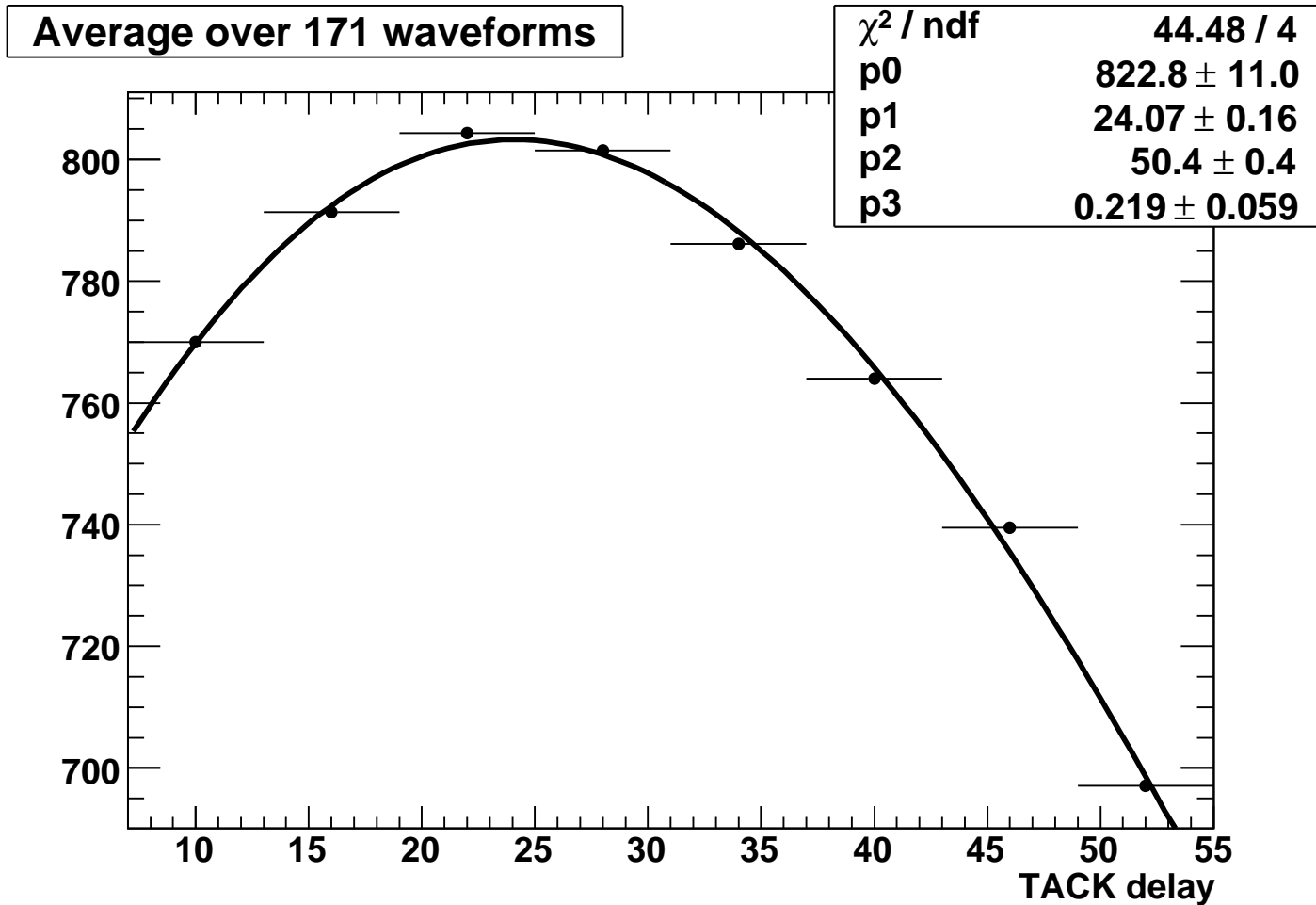
Calorimeter TACK

- There is a bit of variation in peak times as the waveforms are rather flat.



ACD TACK

- ACD peaks at a TACK delay of 24.



Summary
