

muX analysis meeting

10.06.2020

HPGe Clustering and timing.

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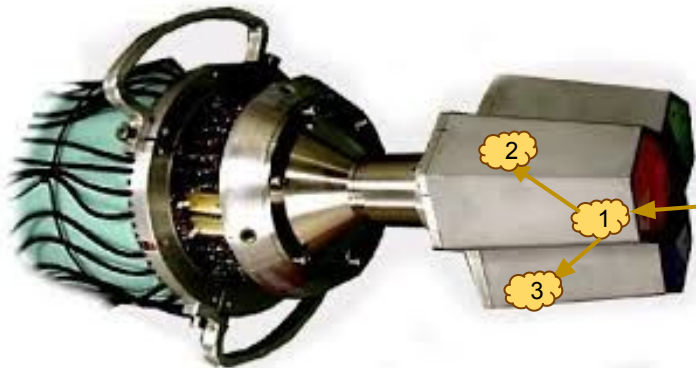
Clustering

Clustering, *adding*, of hits in neighboring crystals

- Increase if full energy peak
- Reduce continuous Bbackground



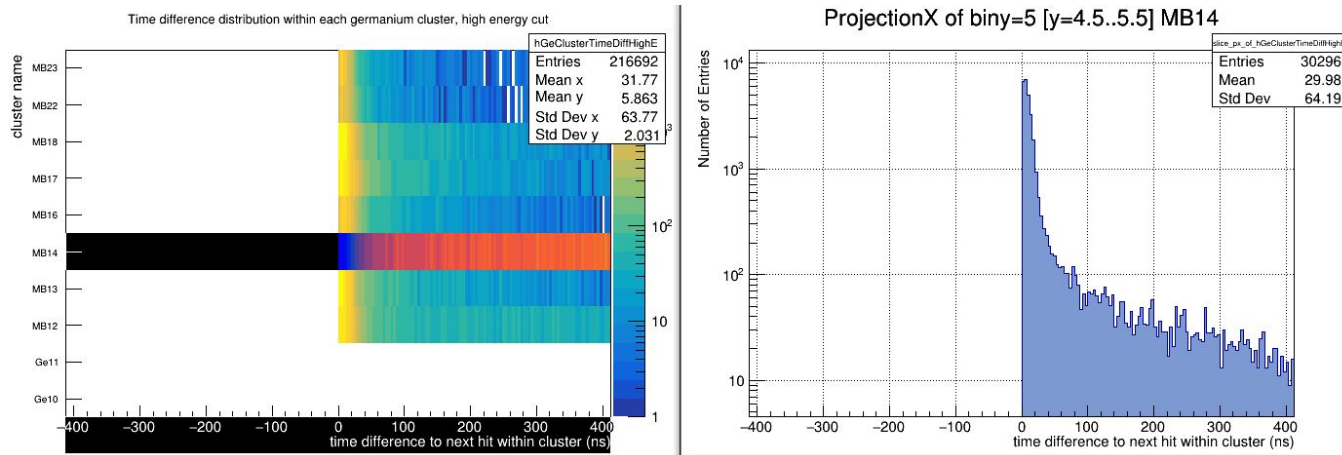
- 1) Compton scatter
- 2) Full absorption in neighboring crystal



- 1) Pair production
- 2) 511 keV absorption in same crystal
- 3) 511 keV absorption in neighboring crystal

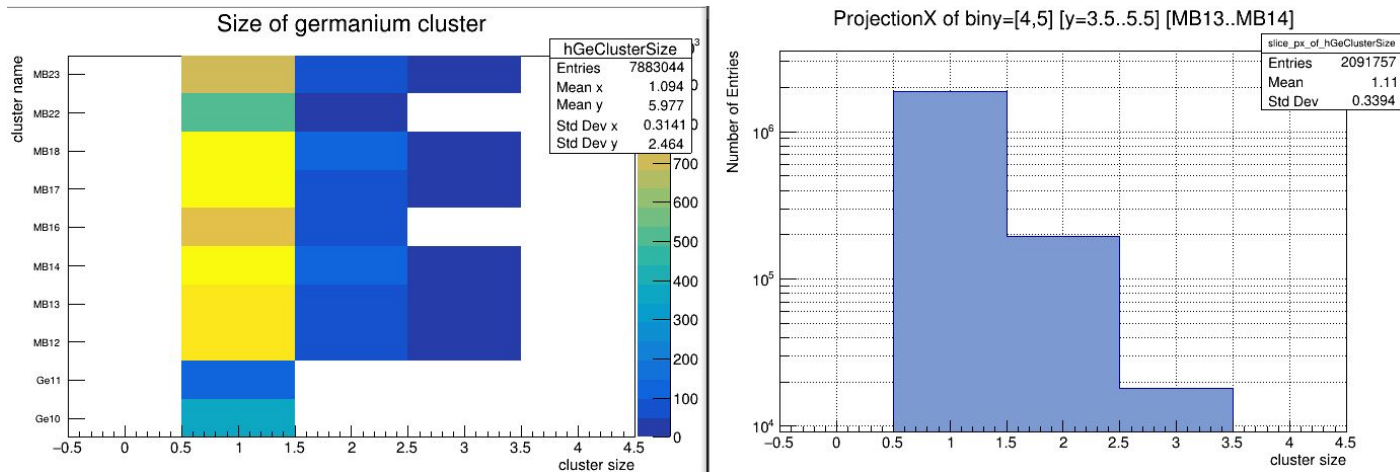
Clustering

- See <https://muon.npl.washington.edu/eelog/neutralcurrents/Analysis2019/2>
- On the ROOT *tree* level
- Code:
 - Add *ClusterHit_t*'s to *MuonEvent_t* (*MuonEventStruct.h*)
 - Utility functions in *Cluster.h*
 - Example ROOT macro: *tree_read_clustering.C*
- Cuts listed in *Cluster.h*, based on data (change for your needs)



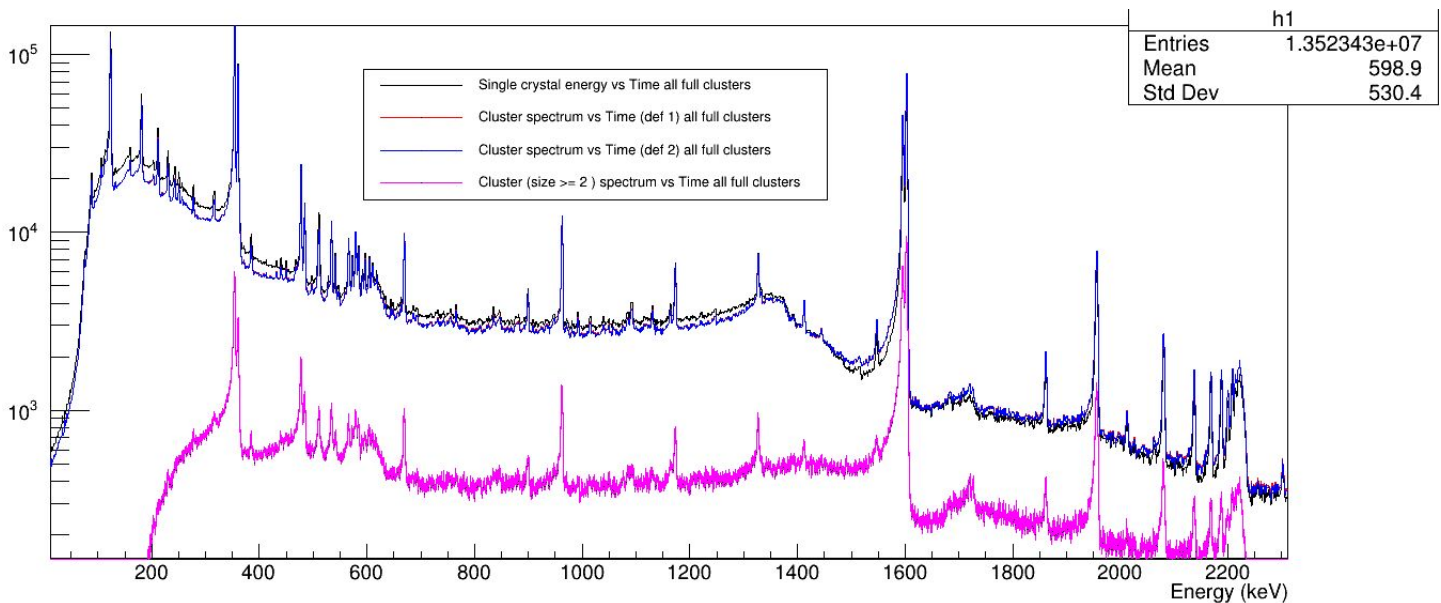
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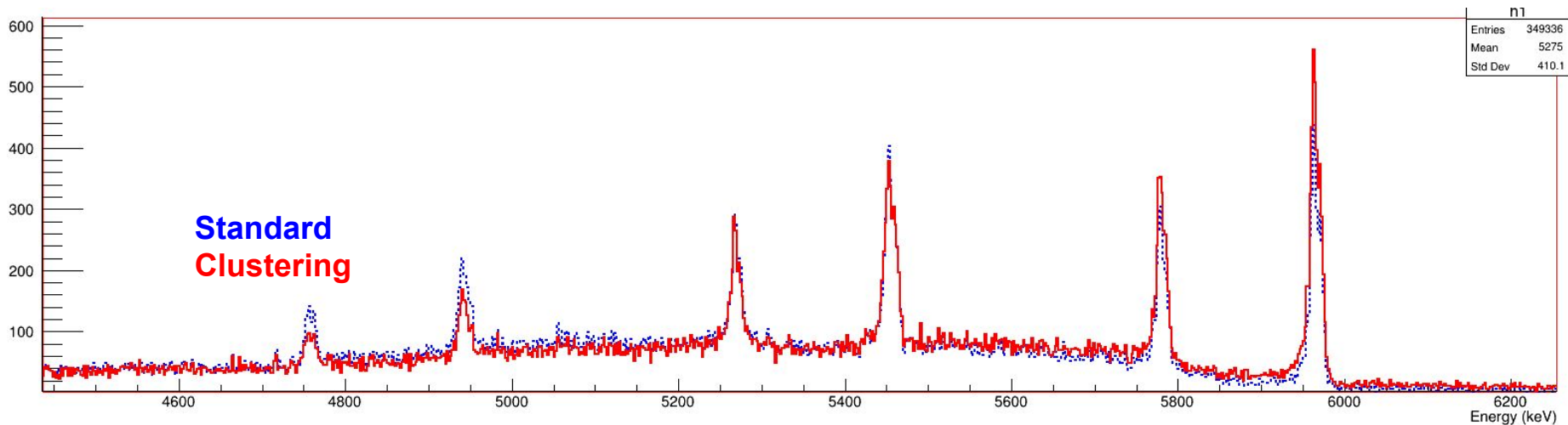
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- Code:
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 - Example ROOT macro: *tree_read_clustering.C*
- Less Compton BG



Clustering

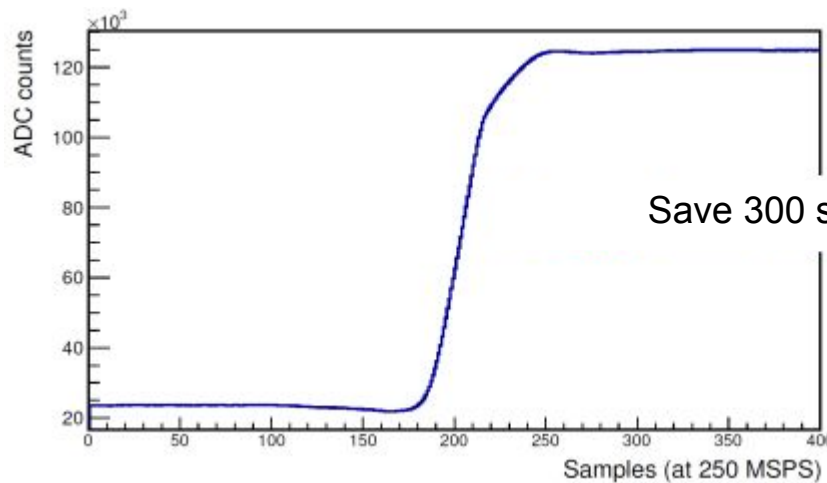
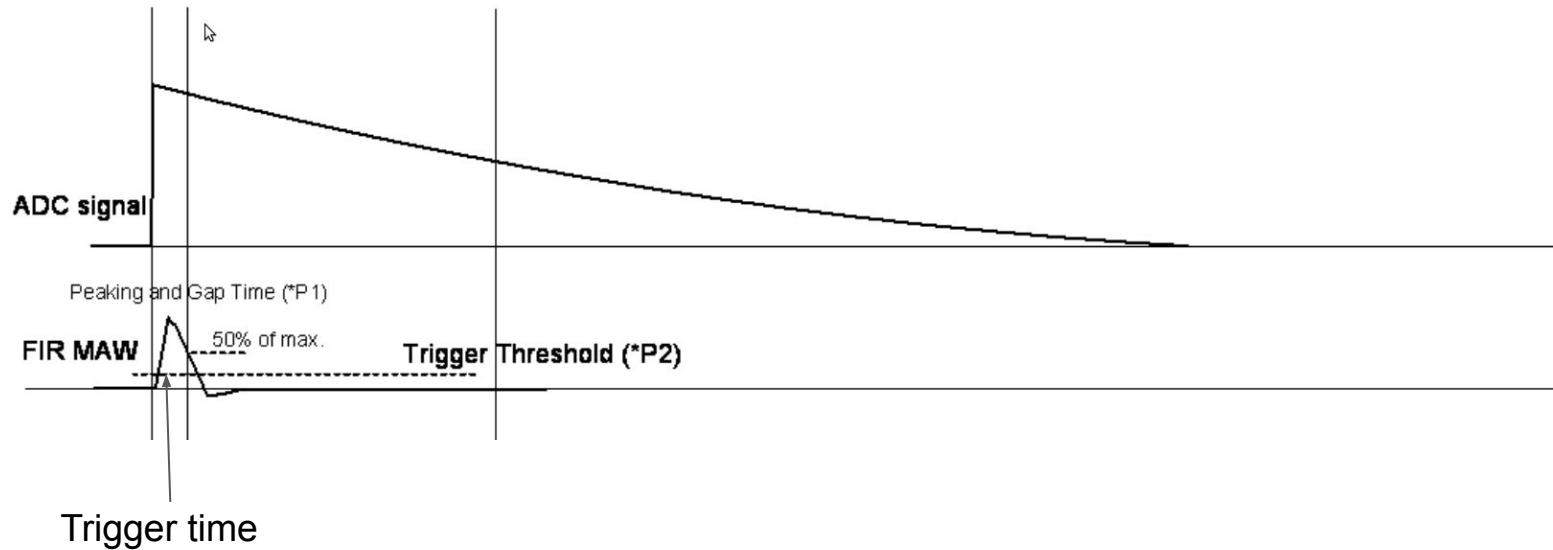
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- Push back SE & DE



Clustering

- See <https://muon.npl.washington.edu/eelog/neutralcurrents/Analysis2019/2>
- On the ROOT *tree* level
- Code:
 - Add *ClusterHit_t*'s to *MuonEvent_t* (*MuonEventStruct.h*)
 - Utility functions in *Cluster.h*
 - Example ROOT macro: *tree_read_clustering.C*
- Push back SE & DE + Less Compton
- User code with some utilities/examples provided
- Cuts:
 - Time window (not too sensitive)
 - Time definition (e.g. time of largest hit)
 - Which detectors to cluster (Miniball clusters by default)
 - Energy cut on clustering (Nigel)

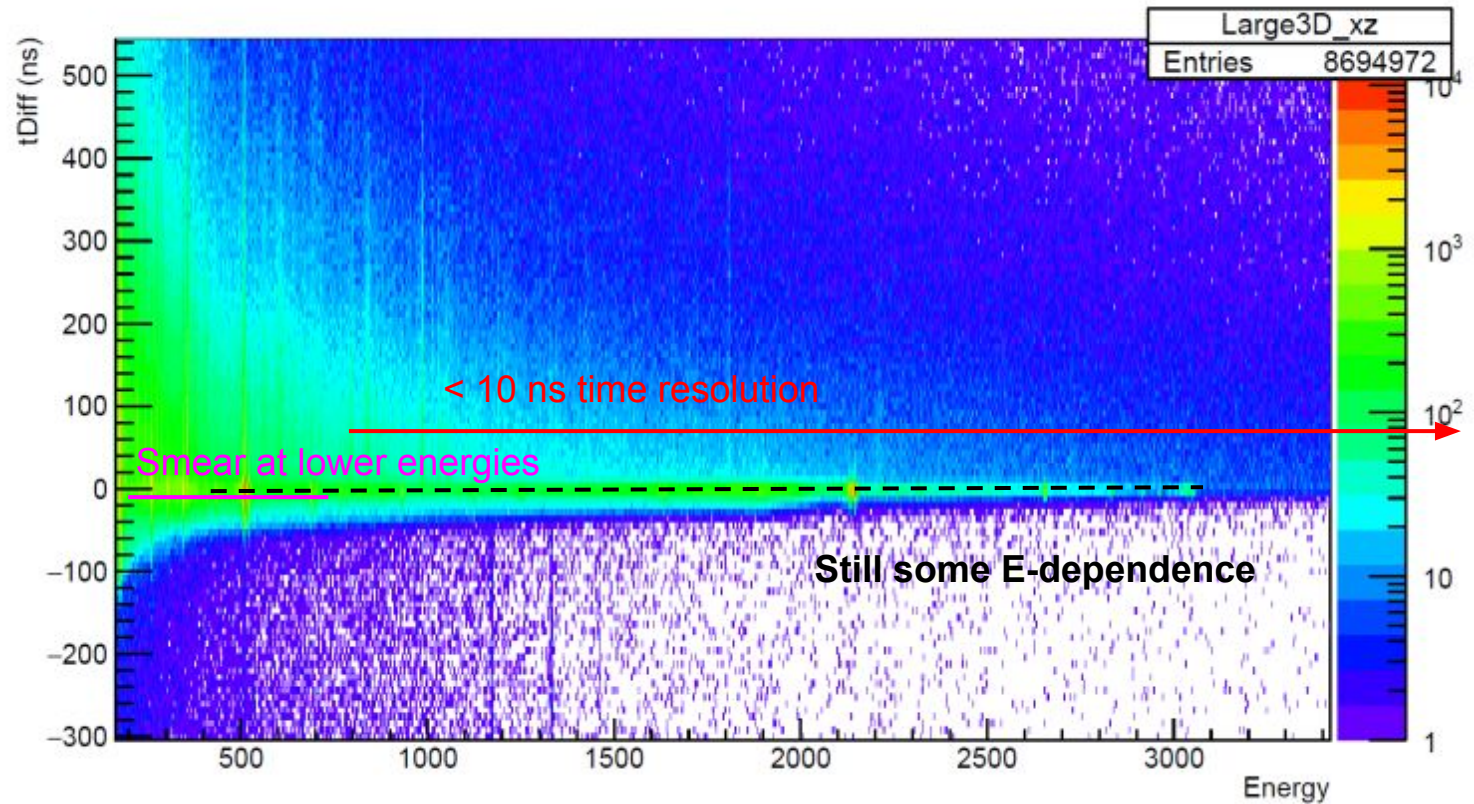
ELET timing



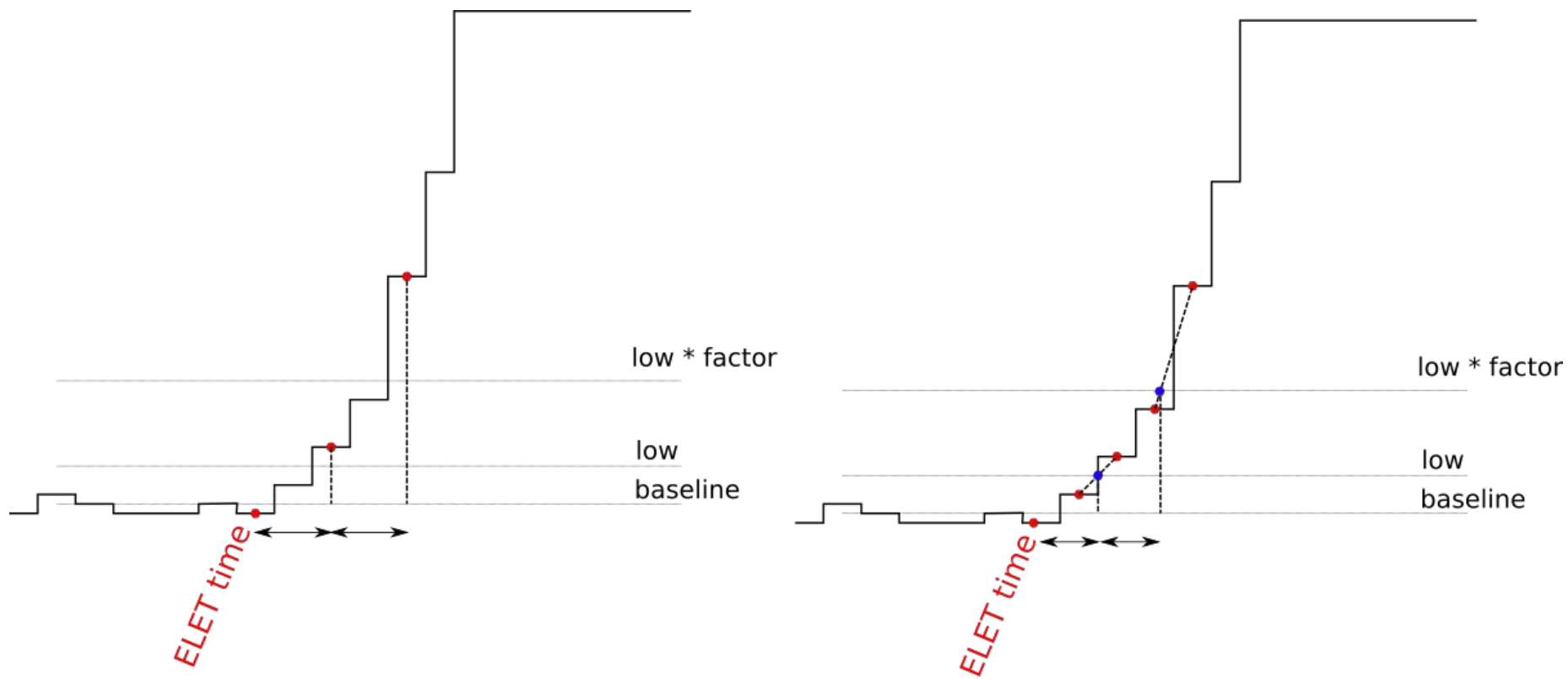
Save 300 samples of the waveform

ELET timing

Standard ELET algorithm



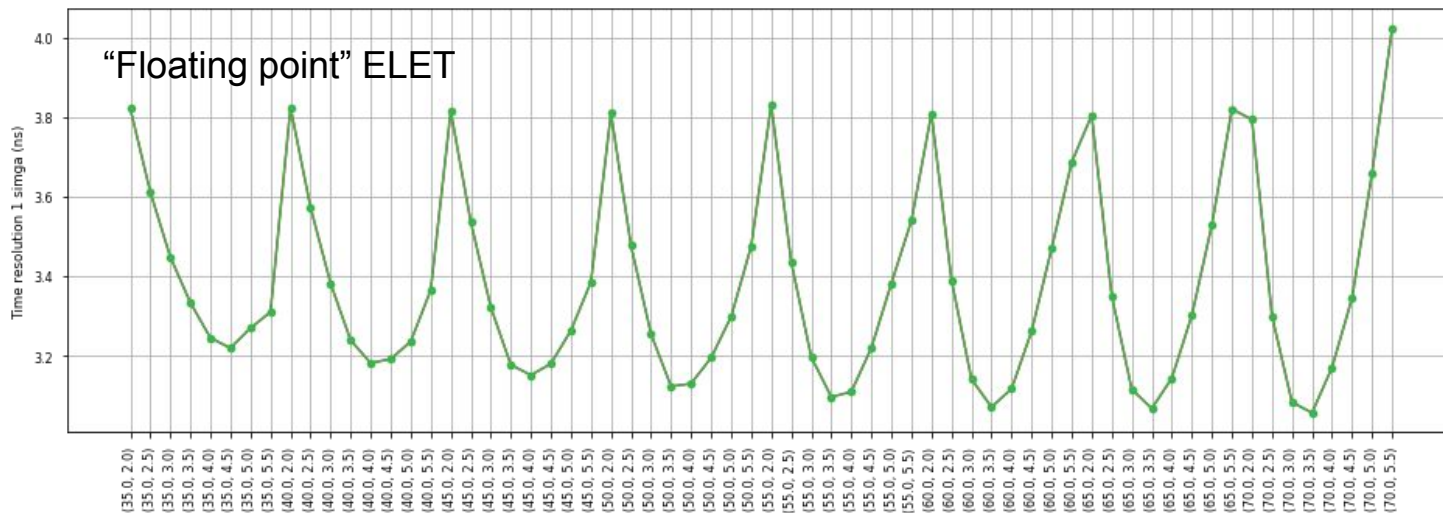
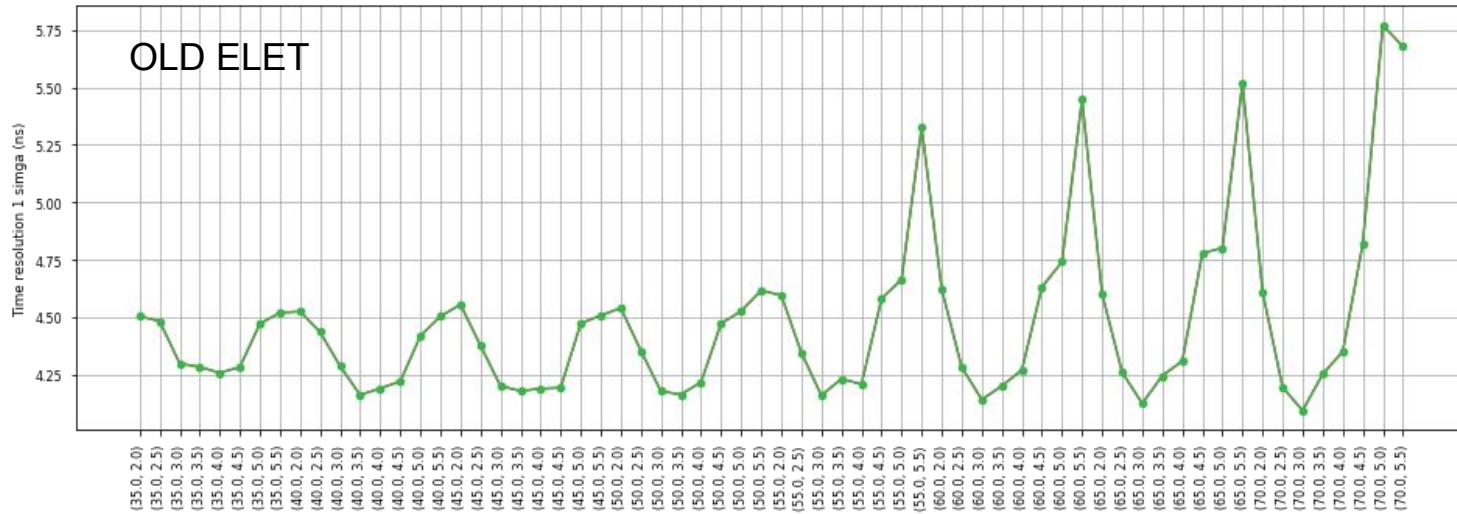
Improved ELET timing



Get rid of the 4ns granularity!

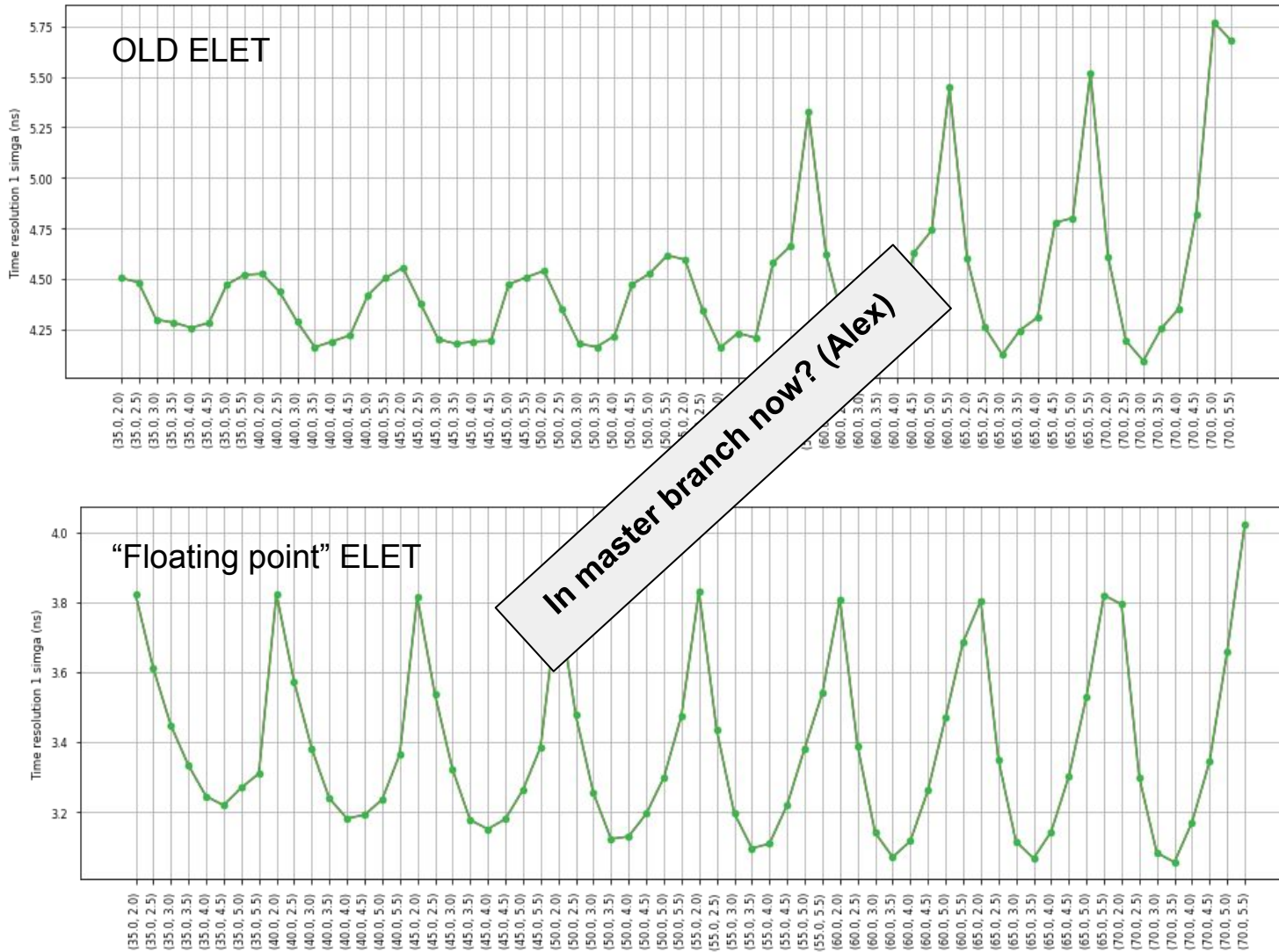
Improved ELET timing

Tune parameters + get rid of clock ticks



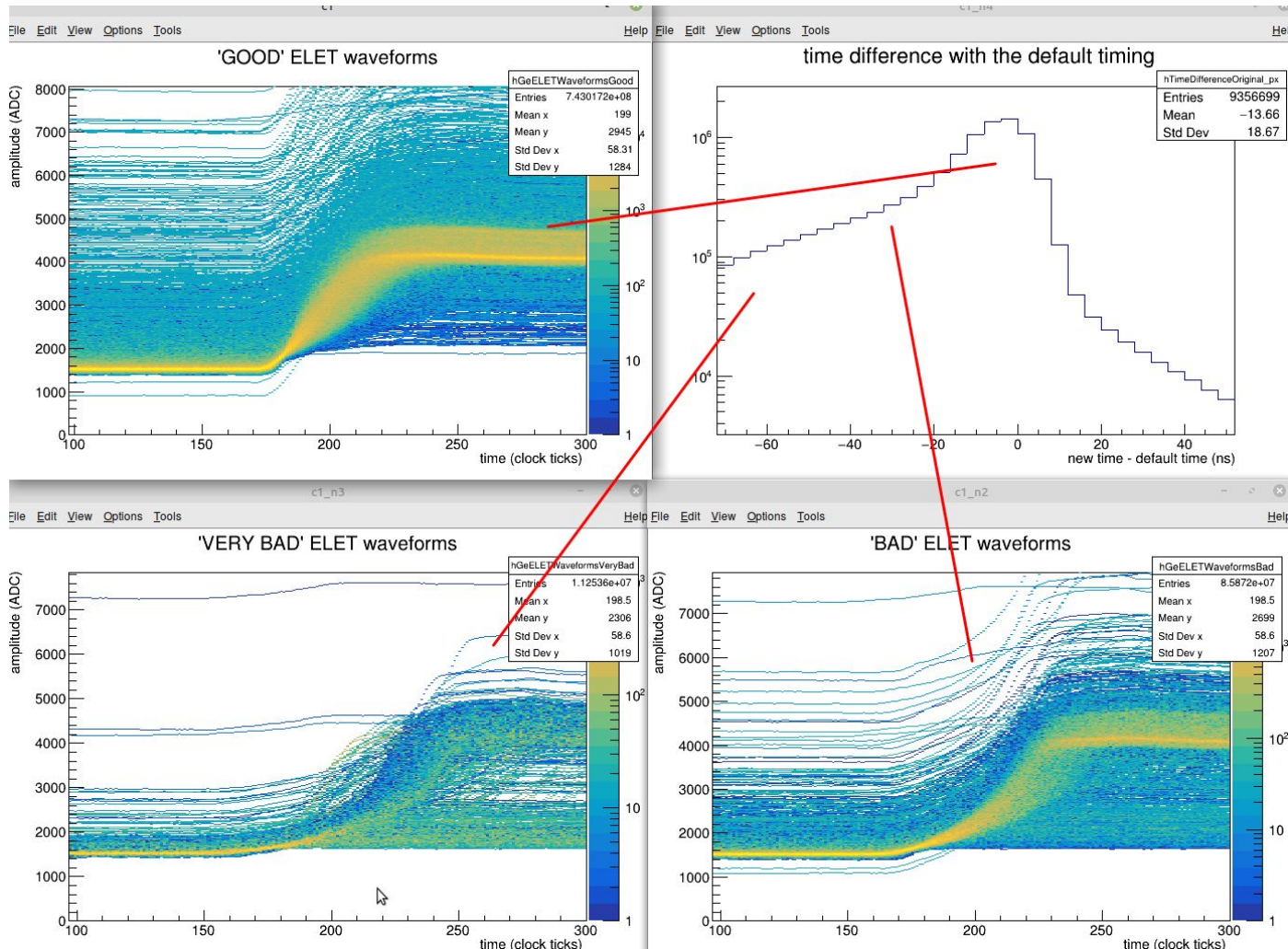
Improved ELET timing

Tune parameters + get rid of clock ticks



Template fitting?

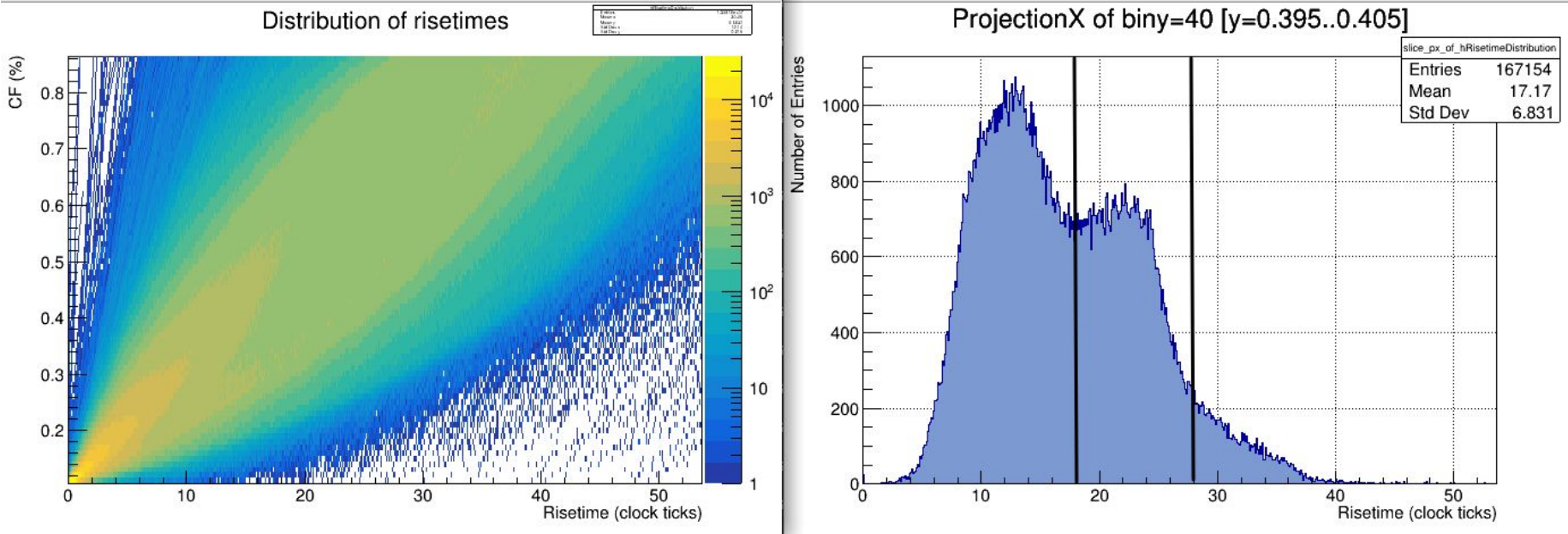
- All waveforms for the same energy
- HPGe detectors do not have 1 template waveform



Template fitting?

First attempt for template fitting:

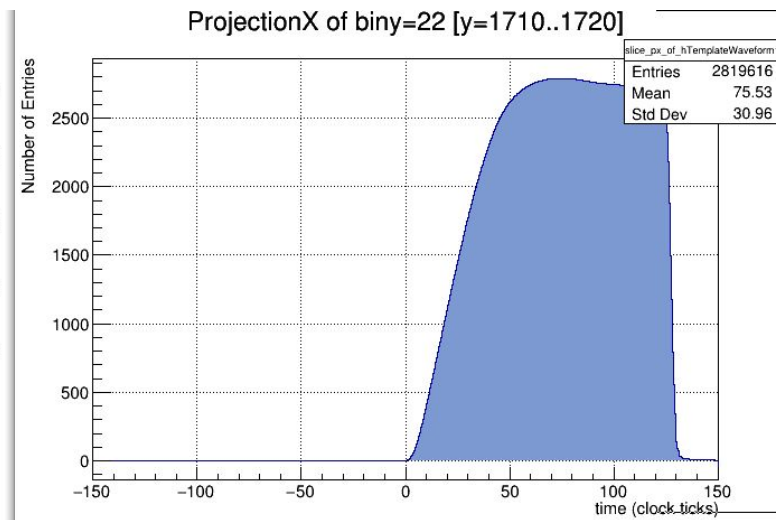
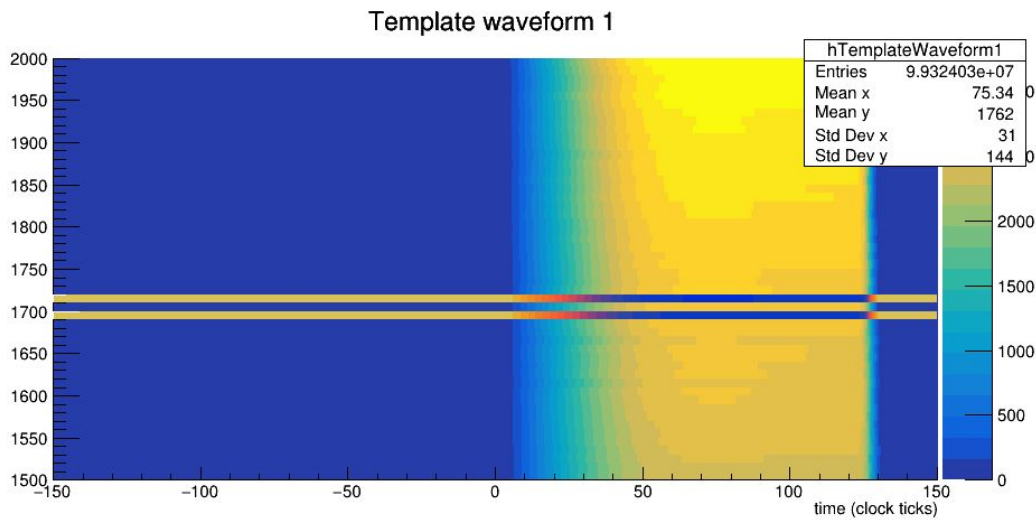
- Classify waveforms



Template fitting?

First attempt for template fitting:

- Classify waveforms
- One template for one risetime and one energy

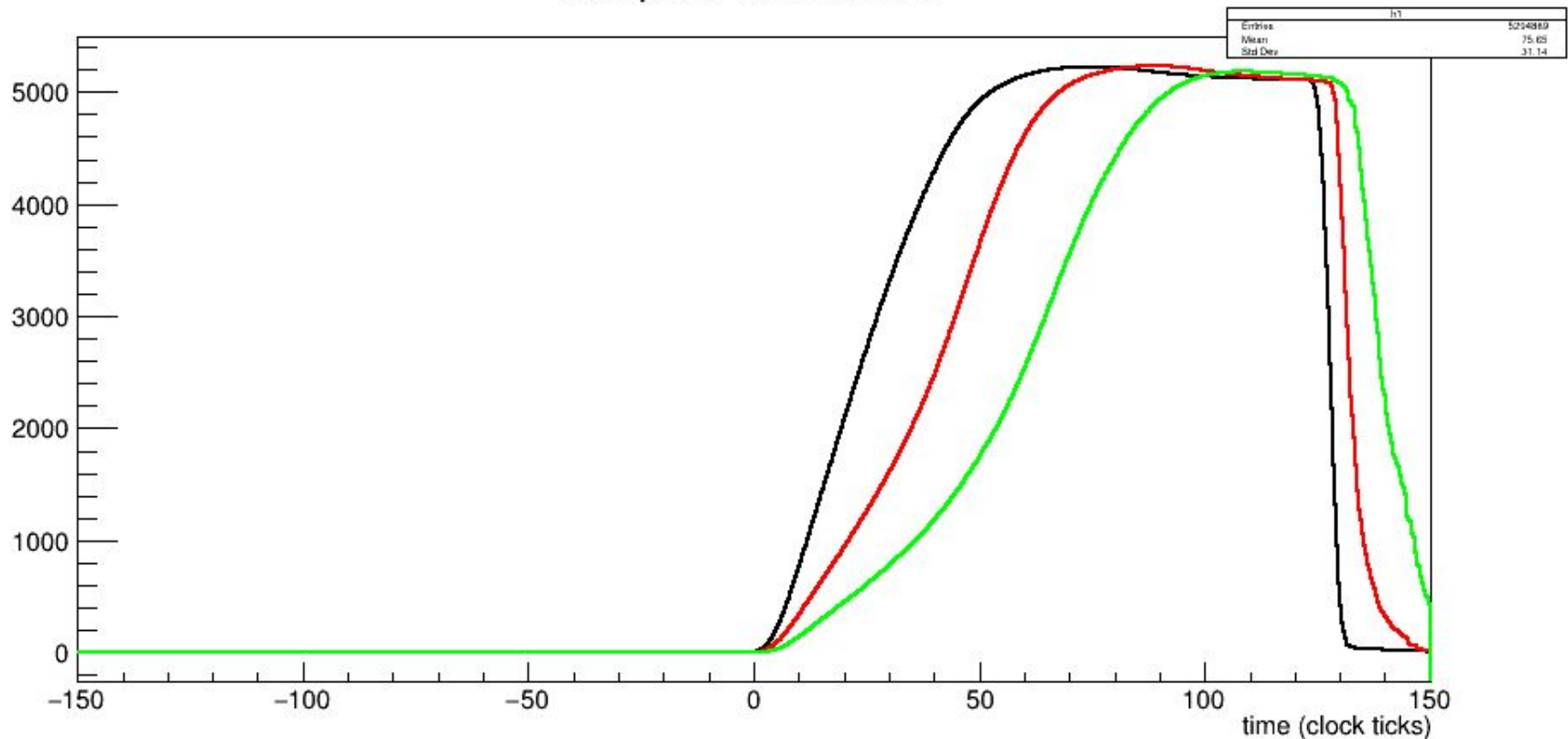


Template fitting?

First attempt for template fitting:

- Classify waveforms
- One template for one risetime and one energy
- Not perfect

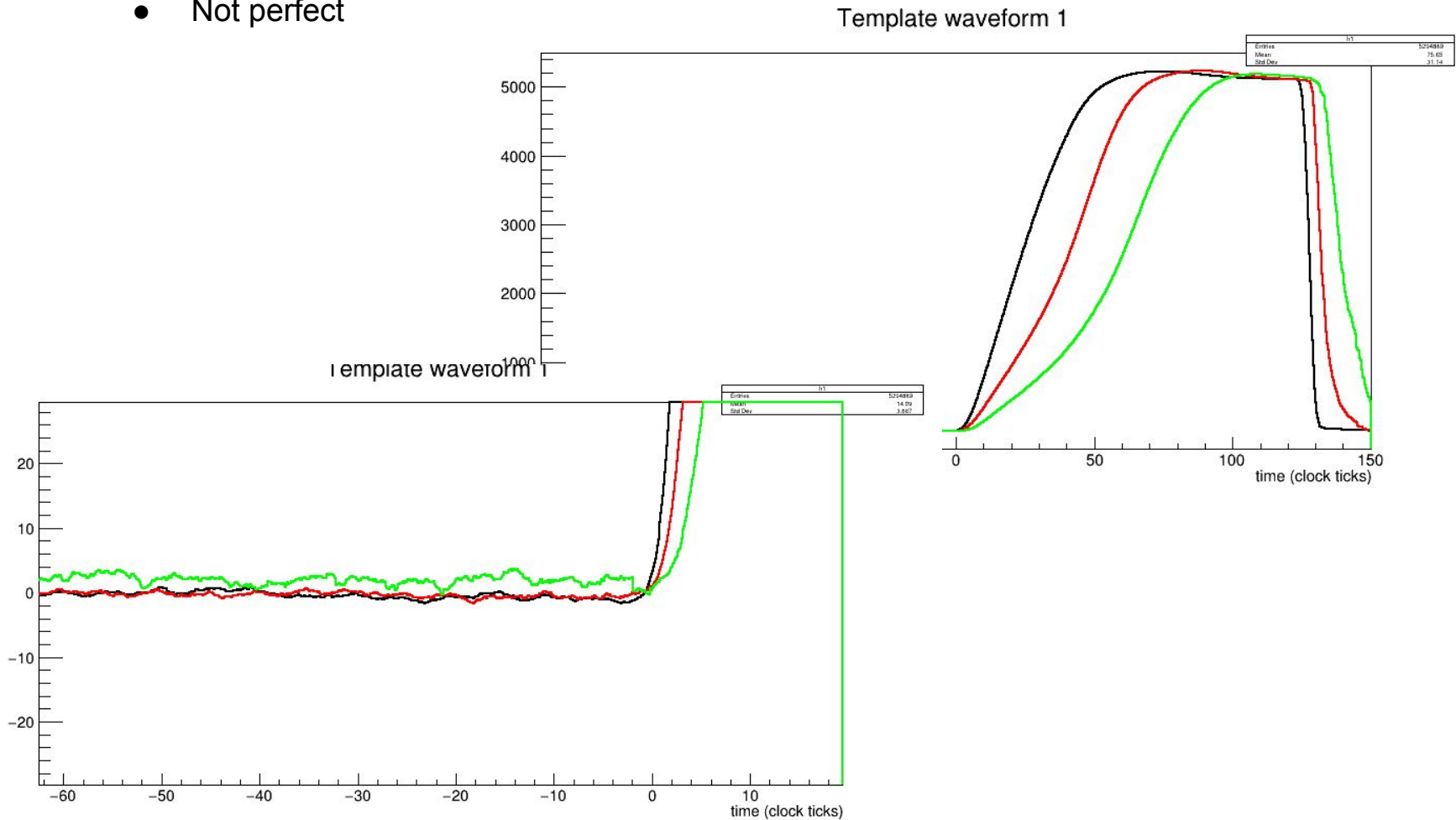
Template waveform 1



Template fitting?

First attempt for template fitting:

- Classify waveforms
- One template for one risetime and one energy
- Not perfect



Template fitting?

First attempt for template fitting:

- Classify waveforms
- One template for one risetime and one energy
- Not perfect
- For “perfect” waveforms, improved timing, but ...

