Test beam drift chamber prototype

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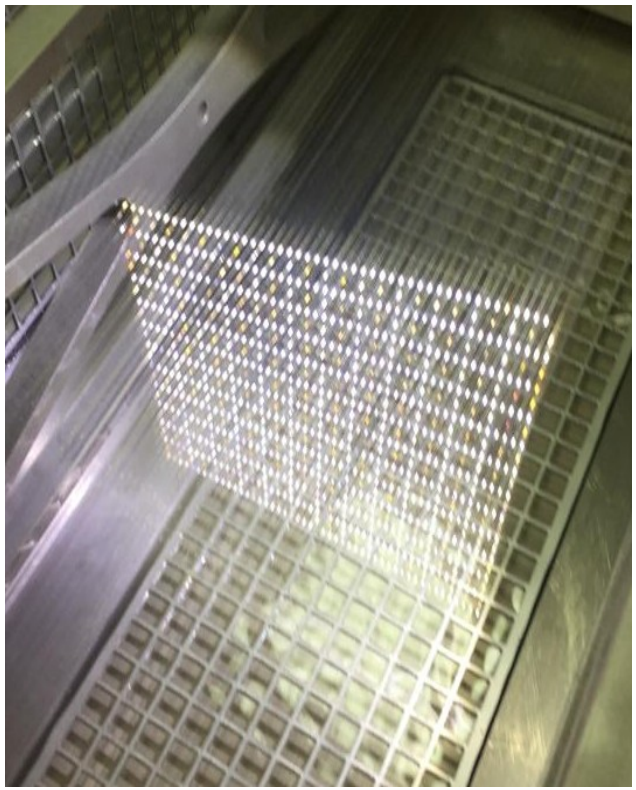
Introduction

- The chamber consists of 12 x 12 squared cell, with a side of 1 cm.
- The gas used is 90%He 10%iC_4H_{10}.
- The voltage applied to each wire is about 1475 V (depends by the runs).



During the test beam (2018), just 20 cells in the central core were read.
All data present some distortions due to different noise sources that make difficult subsequent analisys.
We are developing a filter algorithm to reduce the distortions.

Filter procedure:

1. Filter for baseline restoring
2. Analisys of the frequency spectrum
3. Search of noise peaks
4. Notch filter
5. Different treatments for "difficult" noise distortions

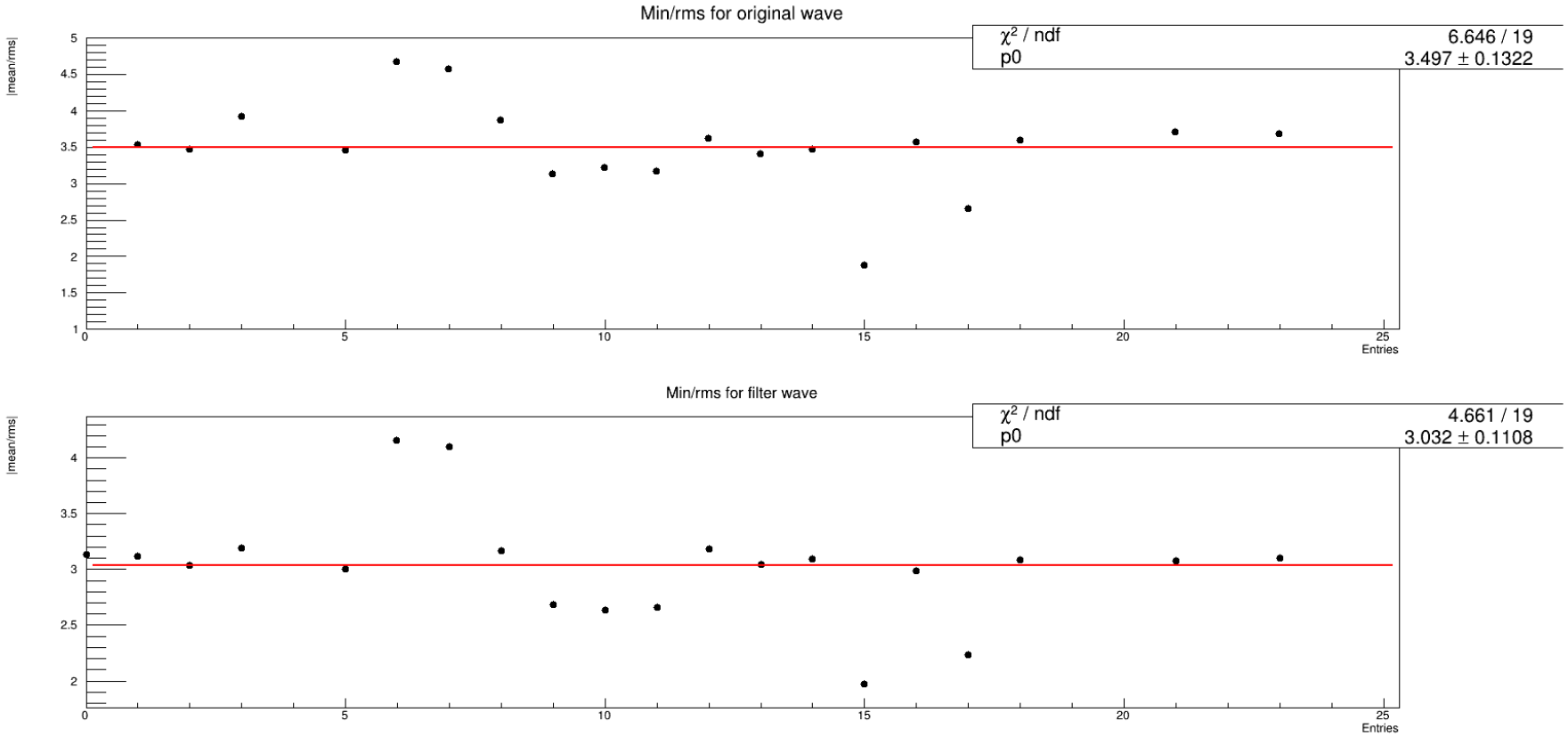


Figure: Noise evaluation.

After the correction of noise distortion, we focused on:

- the occupancy of single channel
- the number of full events over the analyzed events.

A method of selection : full waveform/empty waveform

- Separate the waveforms that contain signal (**full waveform**) from which ones that do not contain anyone (**empty waveform**).
- Study distribution of maximum for all waveforms minus the baseline to choose a threshold.
- The baseline is evaluated as a mean of the first 100 bins.

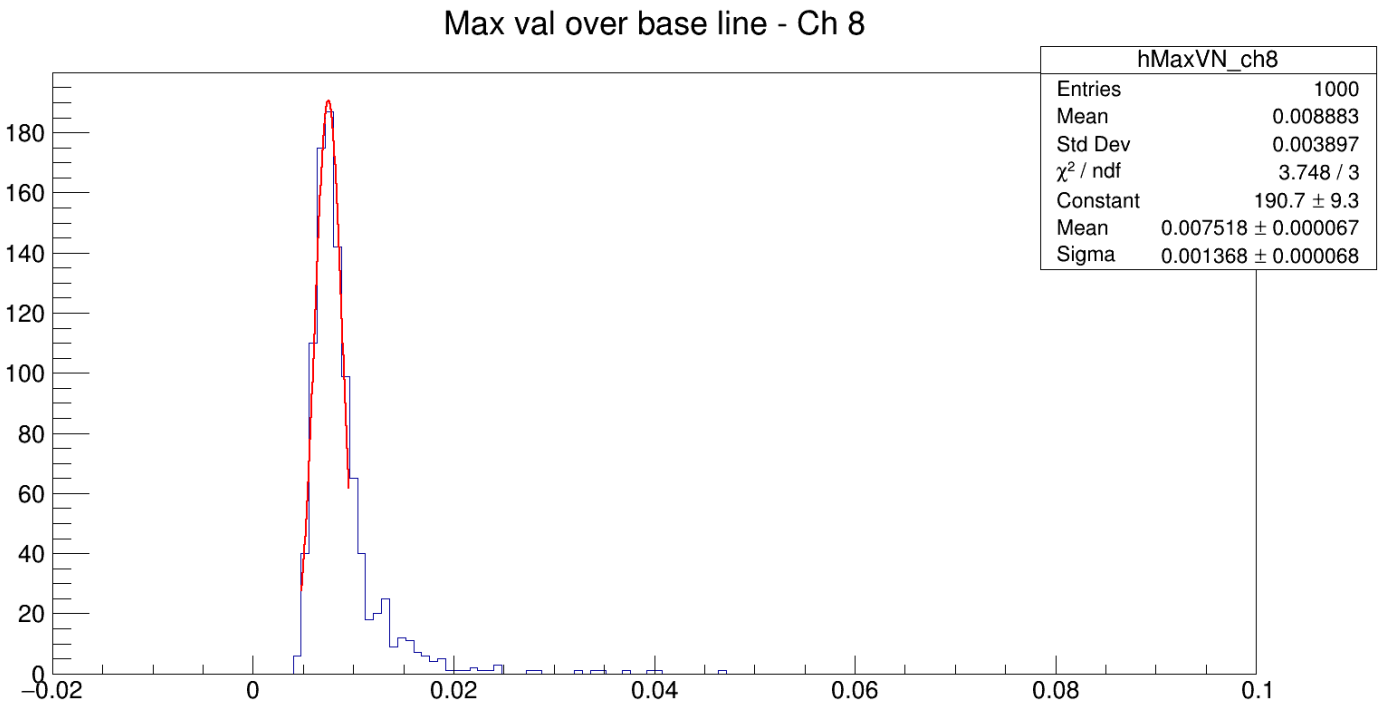


Figure: Max distribution for channel 8.

The threshold is: $\mu + 3\sigma$

The threeshold is chosen channel by channel 0,1,2,3,5,8,9,10,11,12,13,14,16,18,21,13.
We studied the channel occupancy.

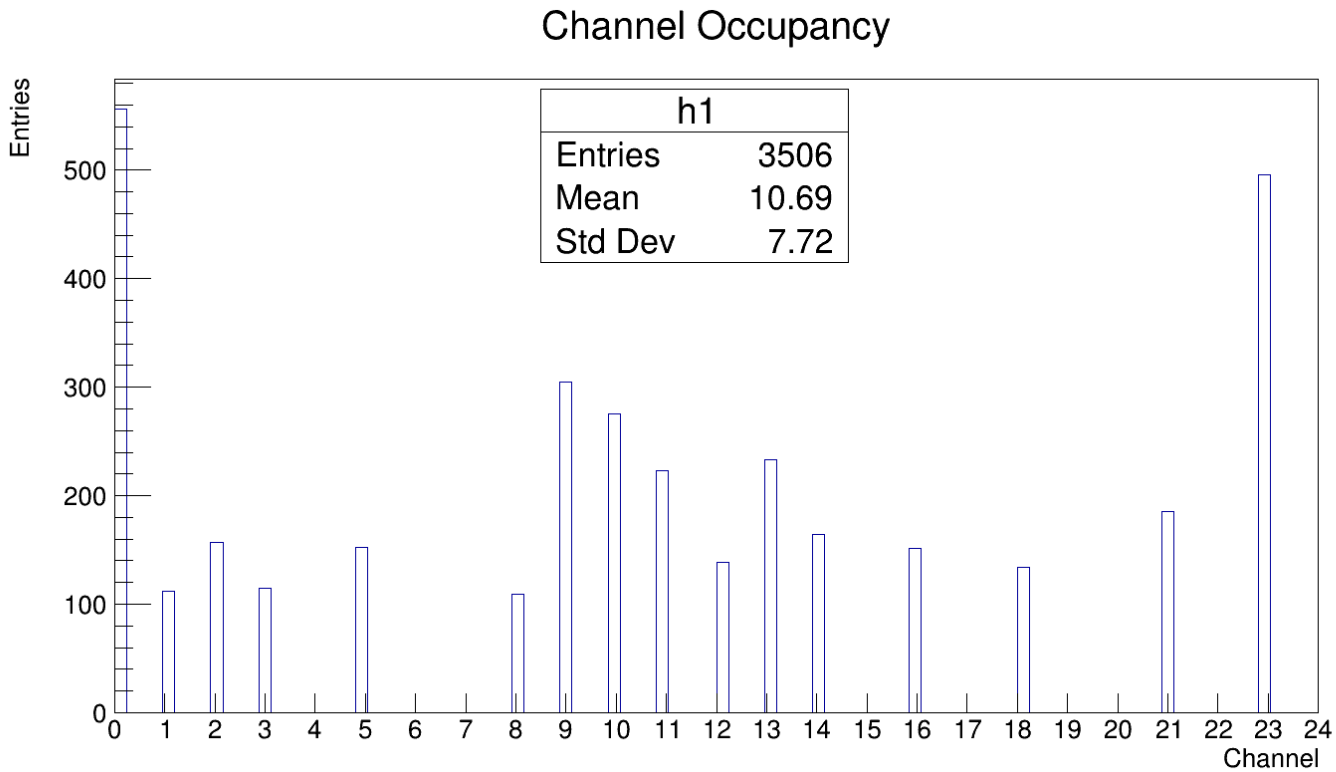


Figure: Channel occupancy.

We studied the distribution of events channel per channel.

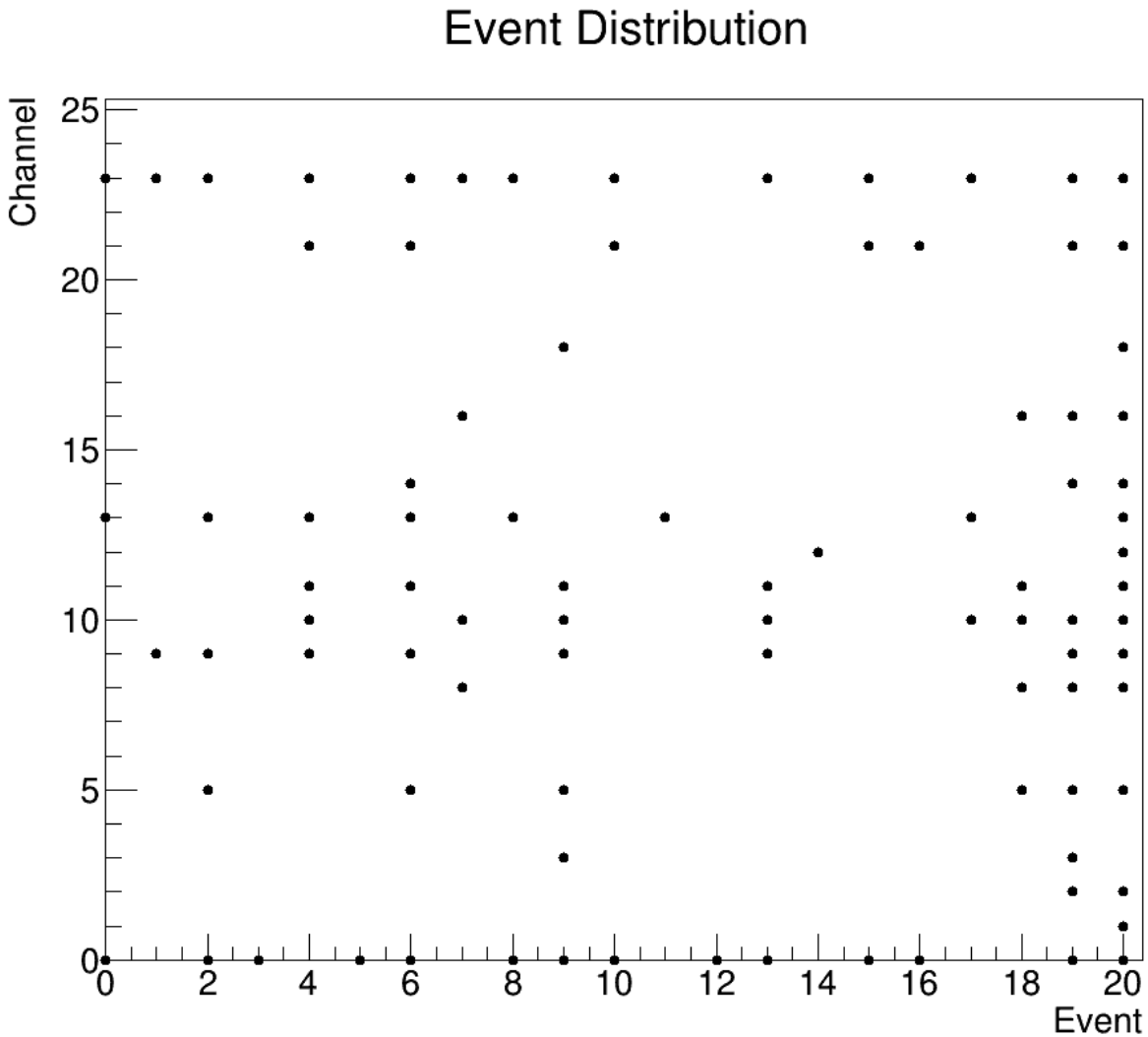


Figure: Event distribution of the first 20 full events.

We studied the multiplicity.

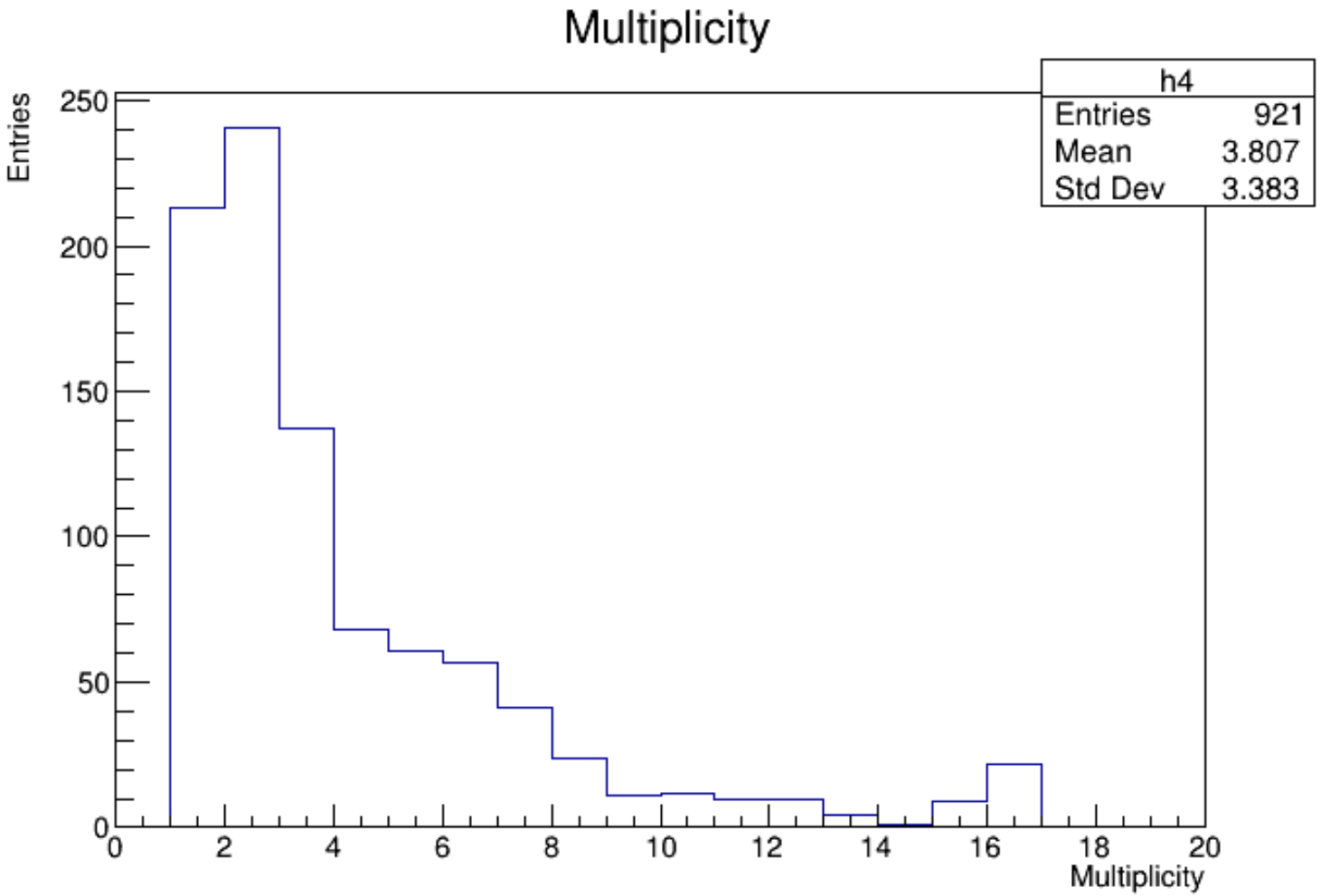


Figure: Multiplicity

Some waveforms have spikes that the algorithm could see as "signal".
We chose the Savitsky-Golay filter with k=2, m=23 (blue curve).

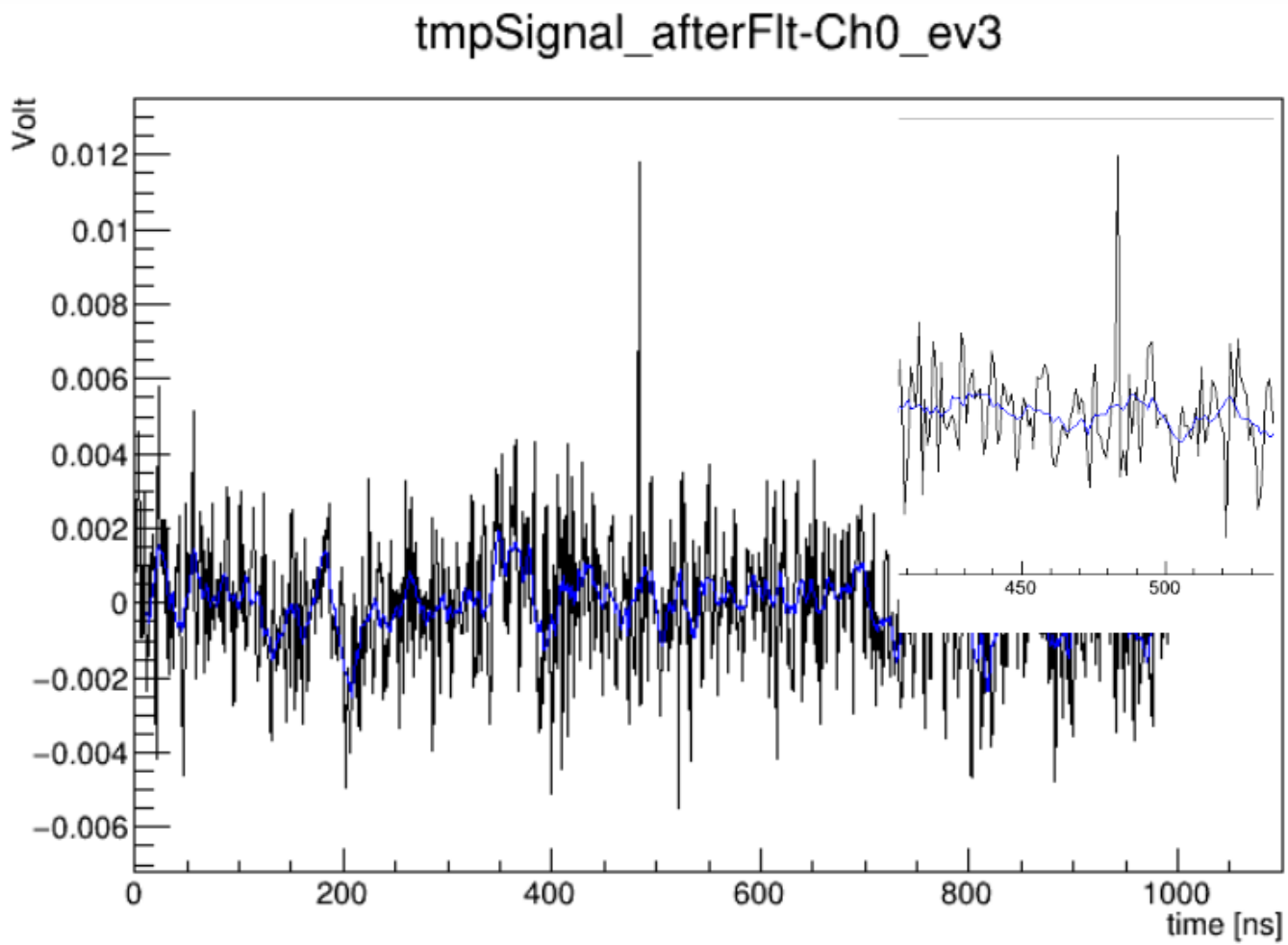


Figure: Example of a spike.

We performed the same analysis for smoothed waveforms.

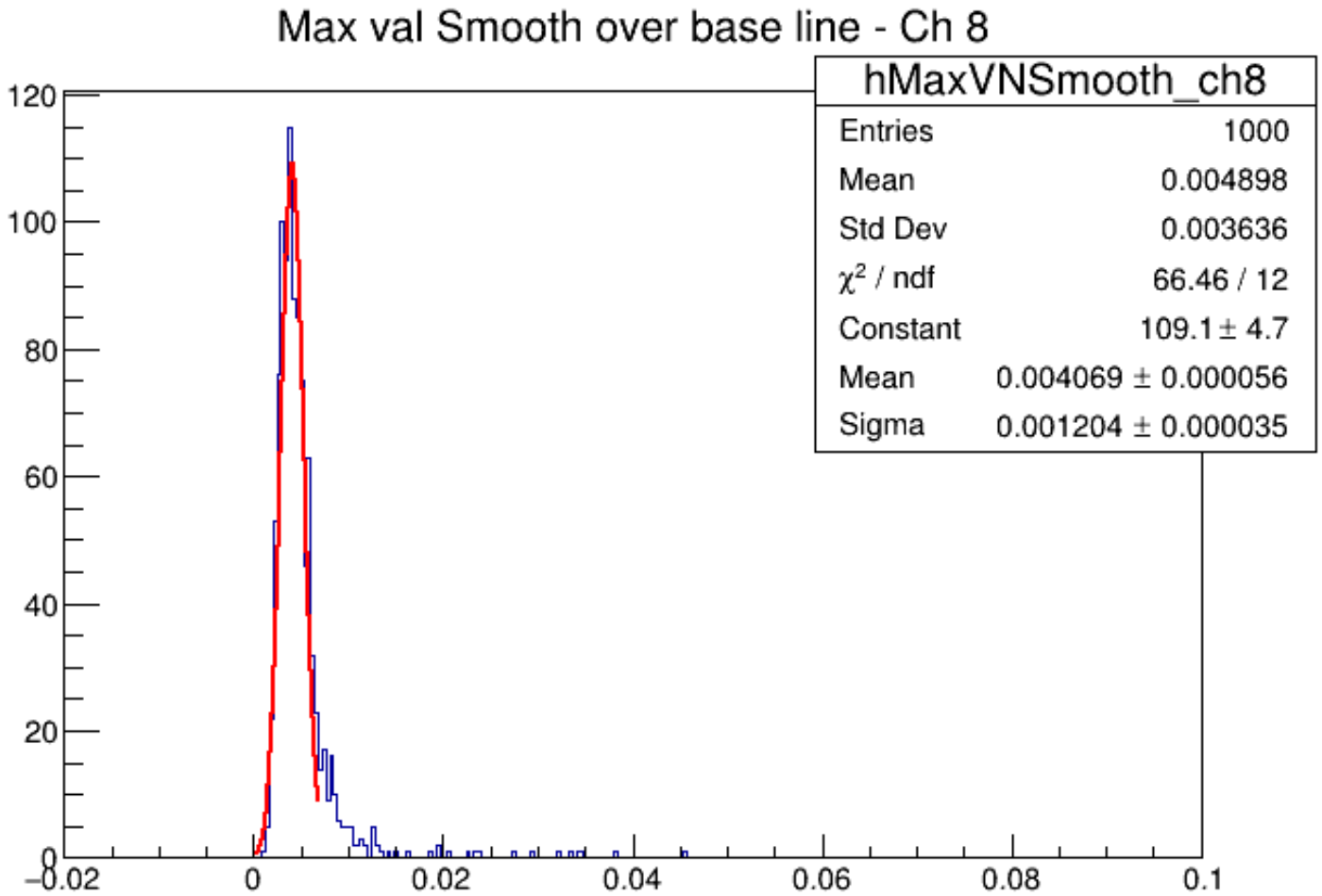


Figure: Maximum distribution over the baseline

Channel occupancy

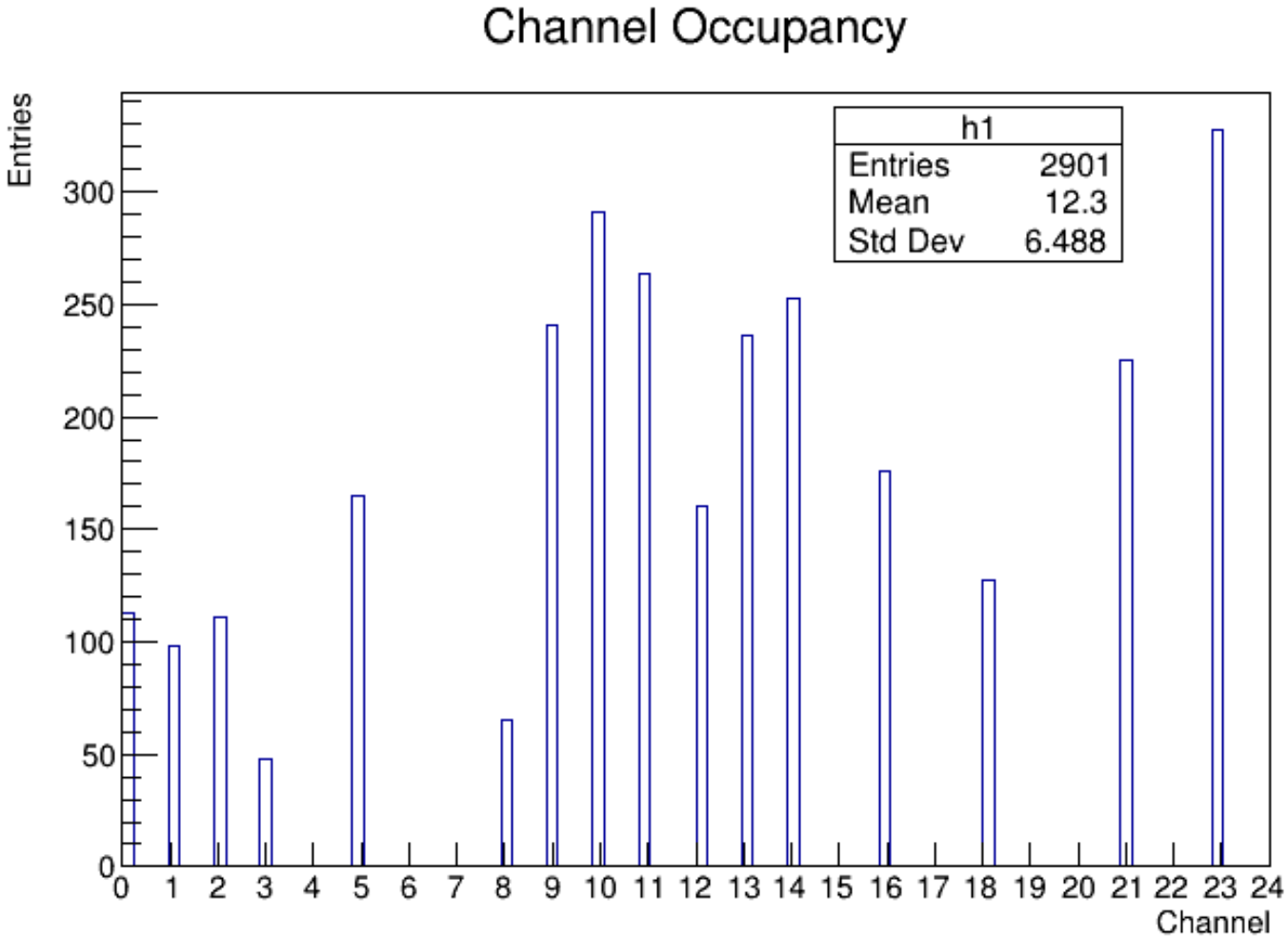


Figure: Channel occupancy

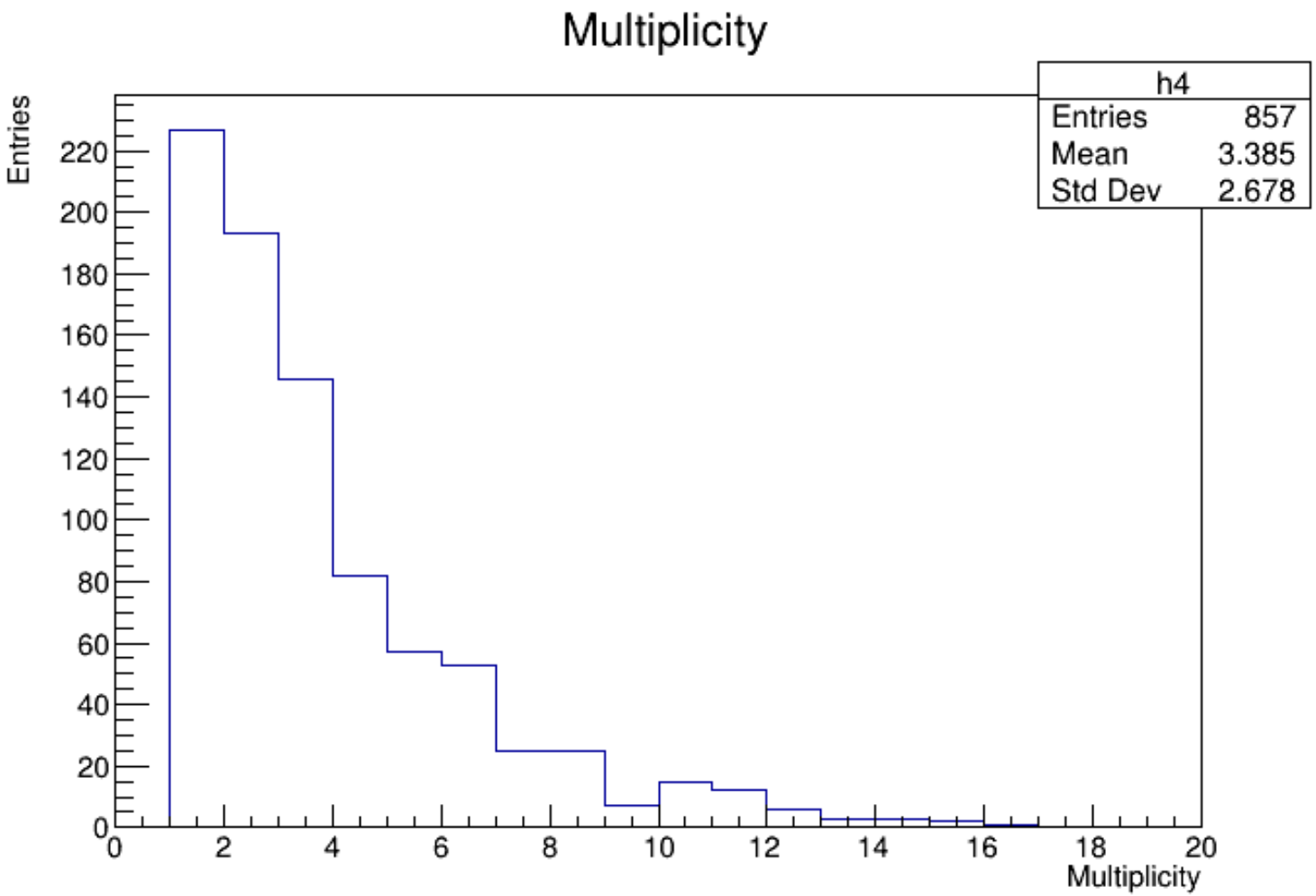


Figure: Multiplicity

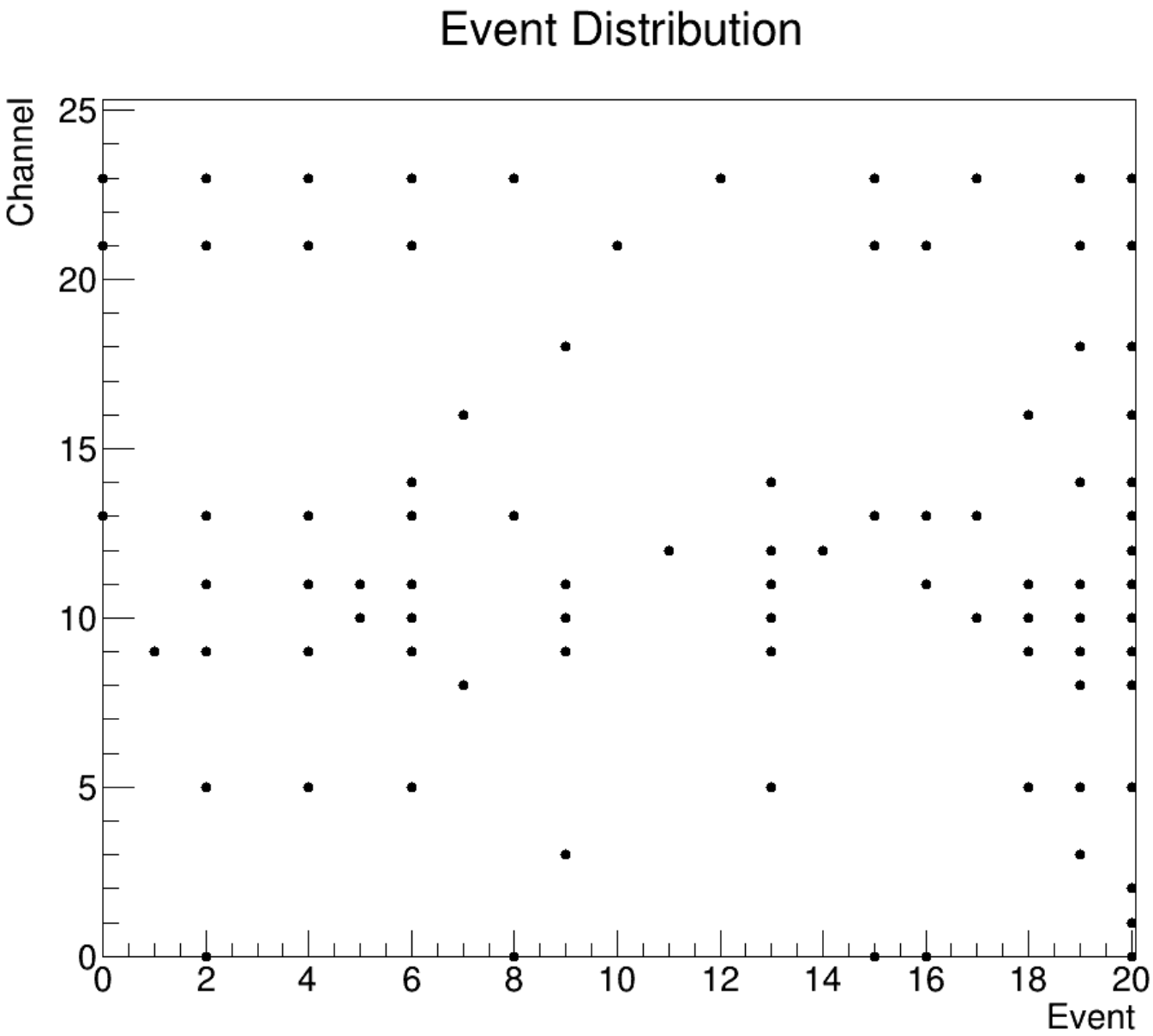


Figure: Event distribution.

Conclusion

We analyzed 1000 events from run1000.
First procedure gives as result 921 full waveforms.
Second procedure gives as resul 857 full waveforms.

Smooth on signal.

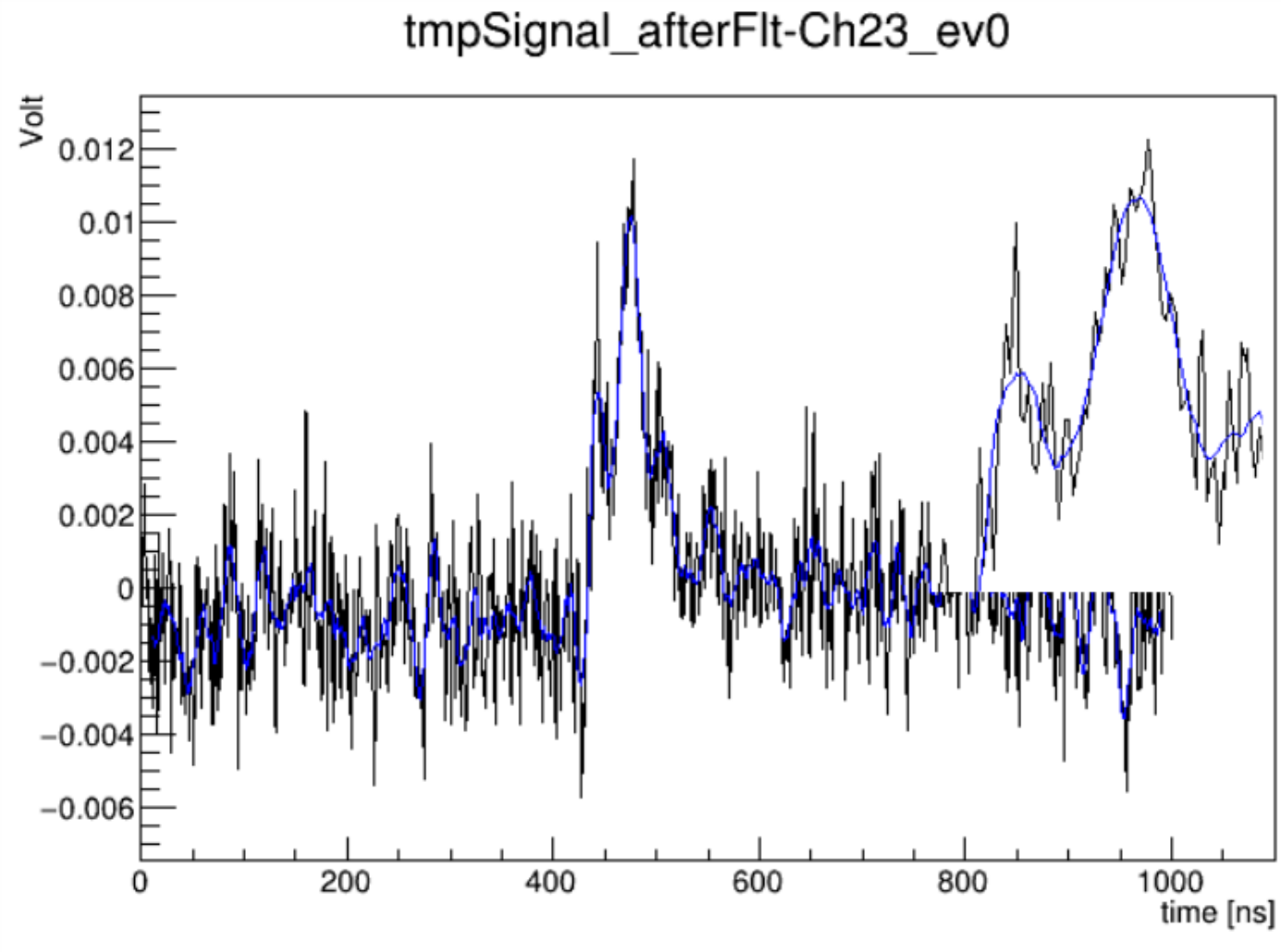


Figure: Smooth on signal .