Neutron Detector for LAMPS-H

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Lab. Meeting
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Waveform Data Analysis[1]

1.0: Terminal Objective

Reconstruction of a typical mean waveform by using a user defined function.

- The function will then be used for fitting the waveform data with some good precision compared to known functions because the shape of the waveform distribution is quite unknown.

1.1: Main Objectives

To achieve the above terminal objective:

- Firstly need to obtain a mean typical waveform by invoking FitSlicesY method.
- Then construct a function based on a TSpline3 and later use it to fit the the typical mean waveform data.

Waveform Data Analysis[2]

1. Using FitSlicesY Method

The reasons for invoking FitSlicesY method are two-fold:

1. To obtain the mean waveform from the typical 2-dimensional waveform data.
2. To reveal distortions in the waveform.

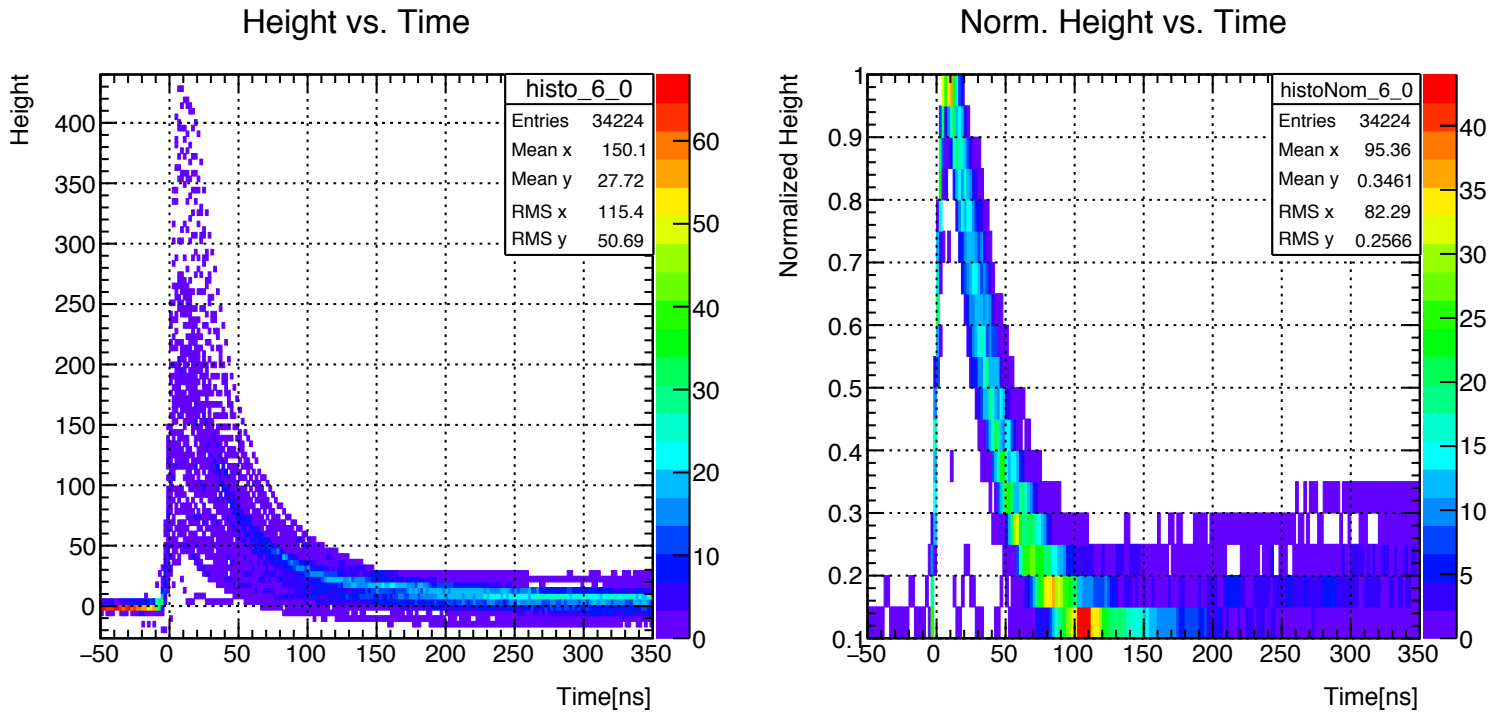


Fig.1: Total waveform (Left panel) and Normalized total waveform (Right panel)

Waveform Data Analysis[3]

1. Using FitSlicesY Method

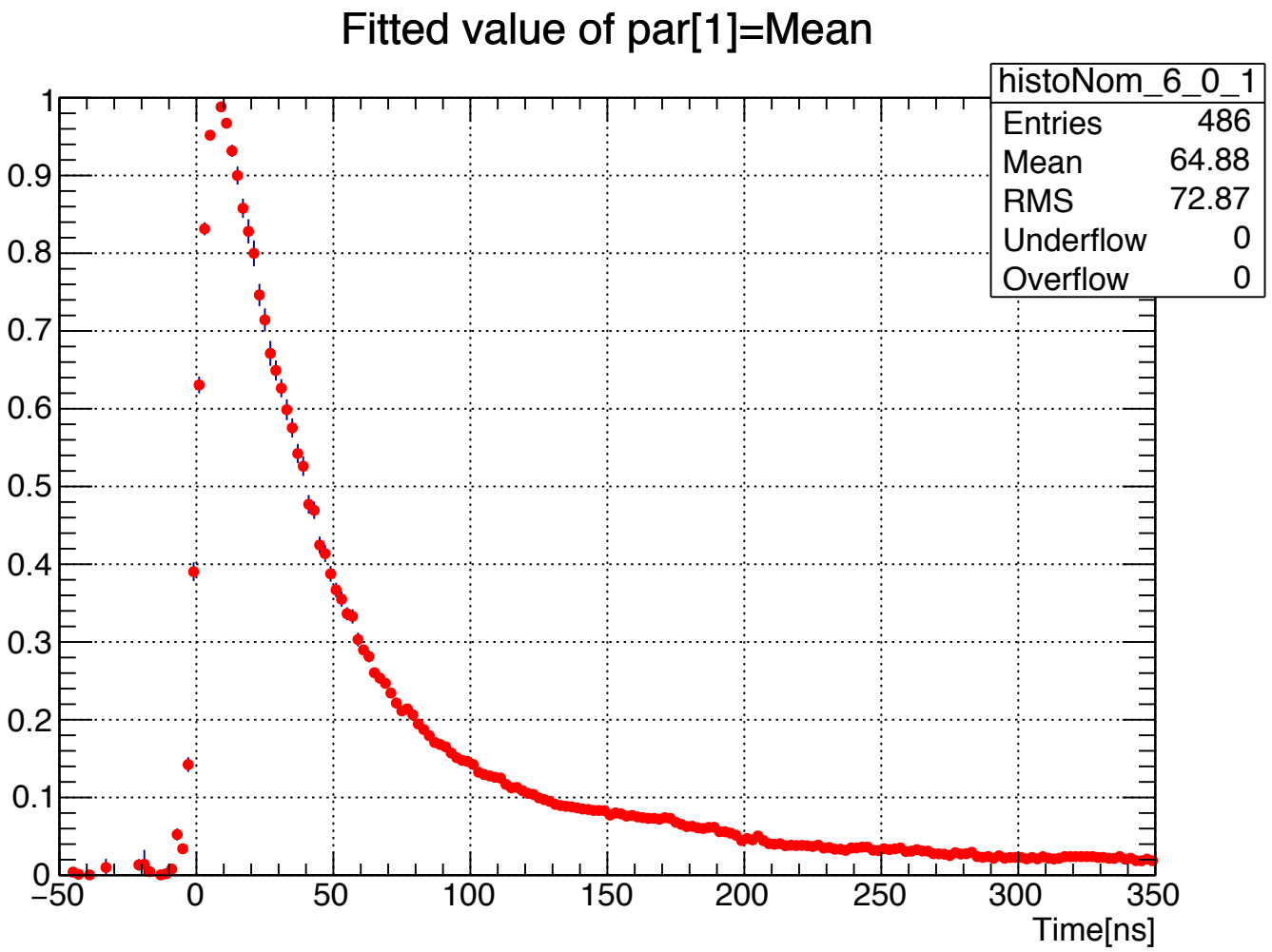


Fig.2: Typical mean waveform obtained from FitSlicesY Method

Waveform Data Analysis[4]

2. Applying TSpline3 Method

TSpline3 was then used to produce a fitting function by loading each value of time (x-axis) of the mean waveform obtained previously from FitSlicesY method and outputting a corresponding value of height (y-axis) according to:

$$h(t) = par[0] + par[1] * (sp3 -> Eval(t[0] - par[2]))$$

where the 3 parameters used were:

1. Par[0] = Pedestal
2. Par[1] = Height
3. Par[2] = Shift, t = 0

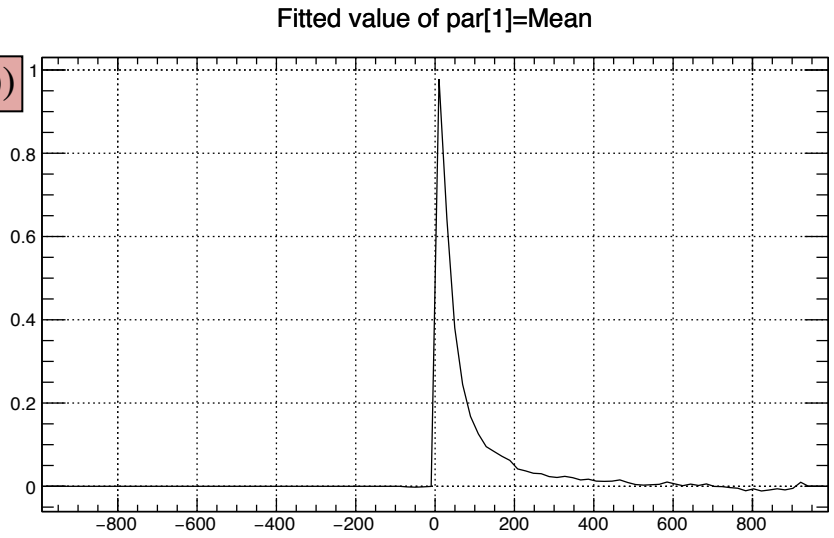


Fig.3: A cubic spline

Waveform Data Analysis[5]

2. Applying TSpline3 Method

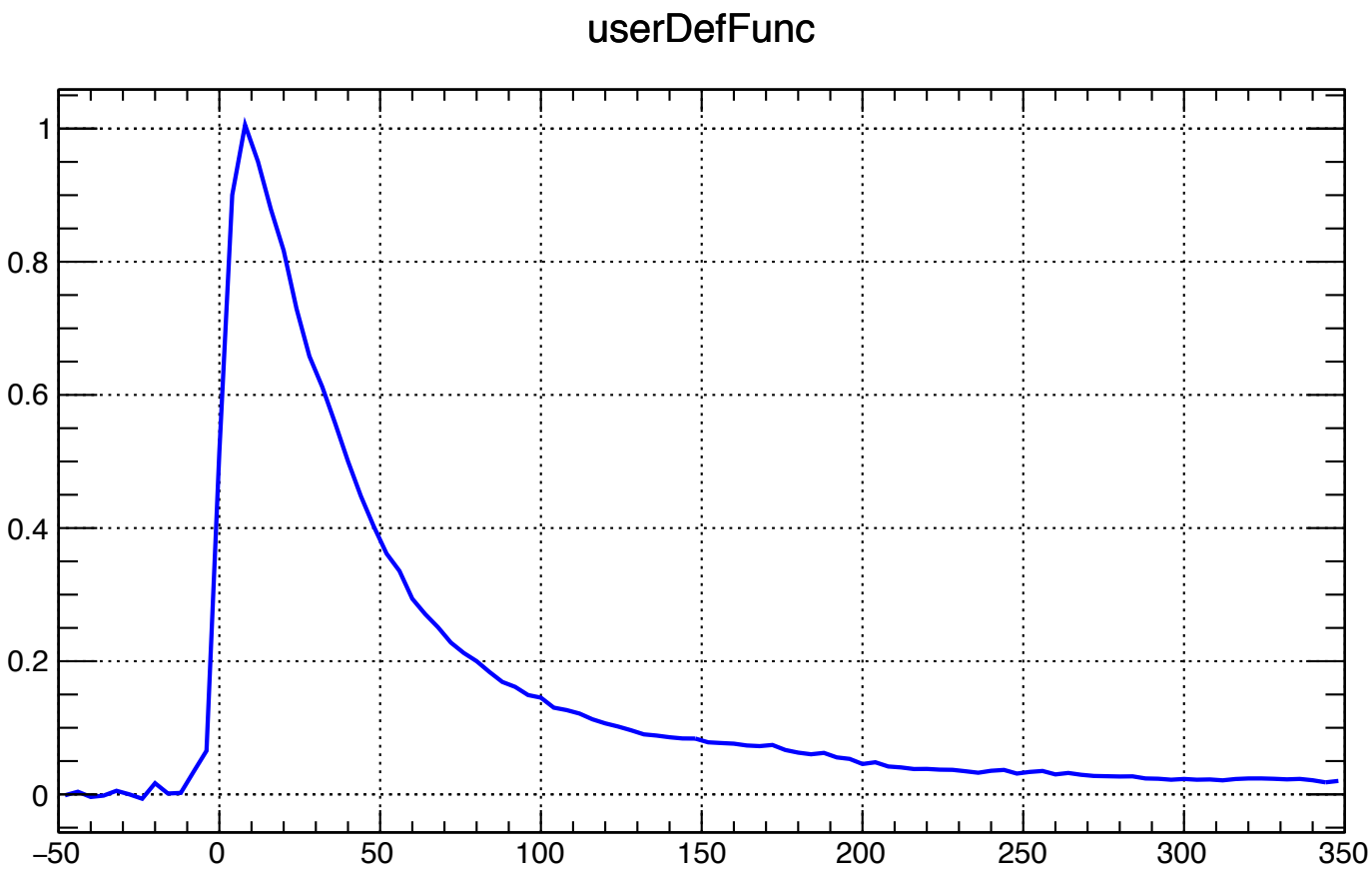


Fig.4: Function reproduced from the average waveform by applying a cubic spline

Waveform Data Analysis[6]

2. Applying TSpline3 Method

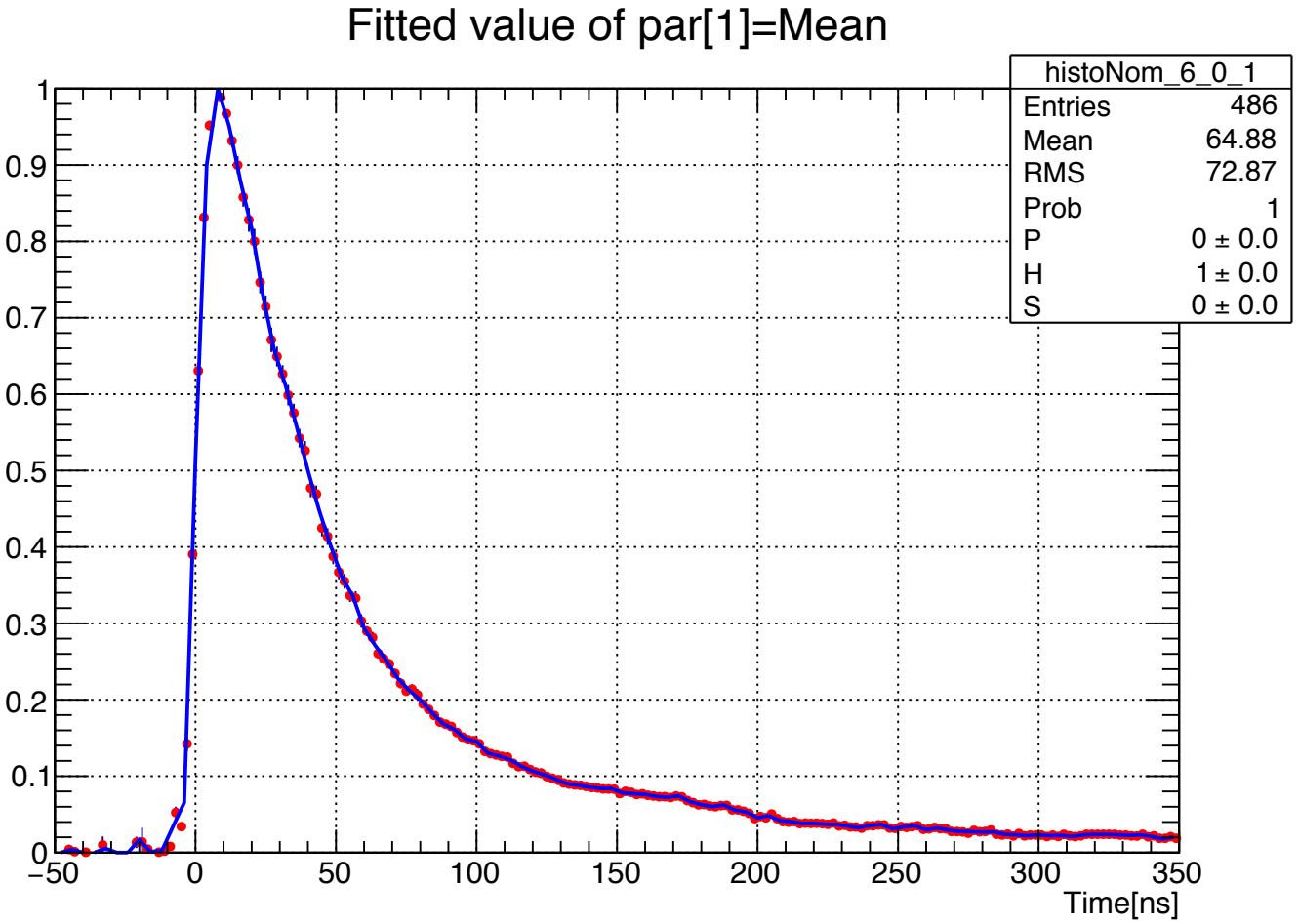


Fig.5: Average waveform fitted with a user defined function obtained from a spline3.

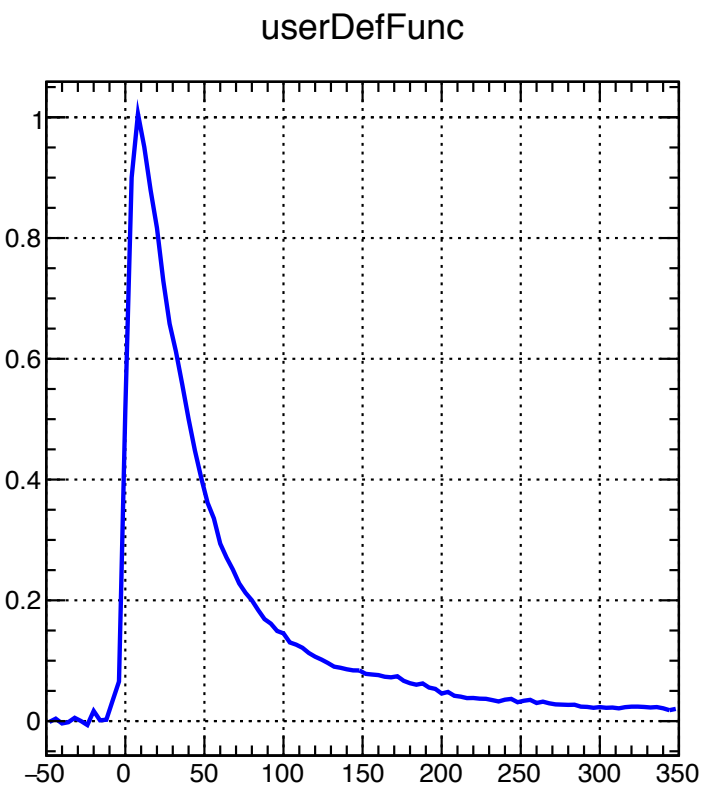
Waveform Data Analysis[7]

3. Next Tasks

1. Construct event by event waveforms; apply the derived waveform function and compare the quality of the fit parameters.

2. Examine waveforms at different positions in the scintillator. Previously it was shown that there is some dependence of waveform on the interaction point in the scintillator.

BACKUP[8]



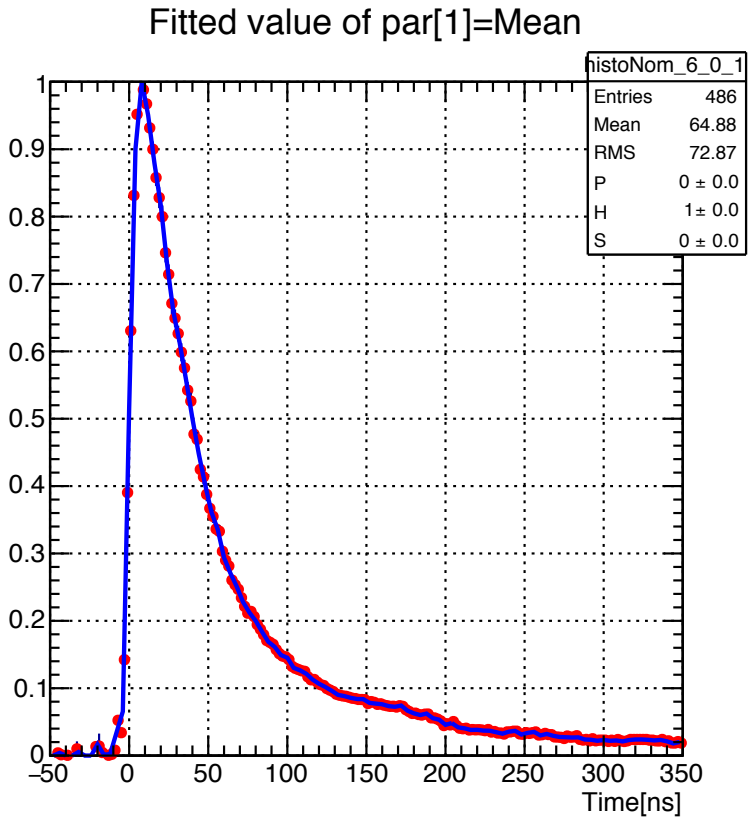


Fig.6: Average waveform fitted with a user defined function obtained from a spline3.

EXT NO.	PARAMETER NAME	VALUE	ERROR	STEP SIZE	FIRST DERIVATIVE
1	P	0.00000e+00	3.95680e-04	-0.00000e+00	9.21840e-13
2	H	1.00000e+00	2.47606e-03	0.00000e+00	2.62450e-11
3	S	0.00000e+00	4.03981e-02	0.00000e+00	-2.17754e-10