

Analysis updates

Calibration (SHMS), HGC

Run Numbers:

7882

7883

7884

Experimental condition

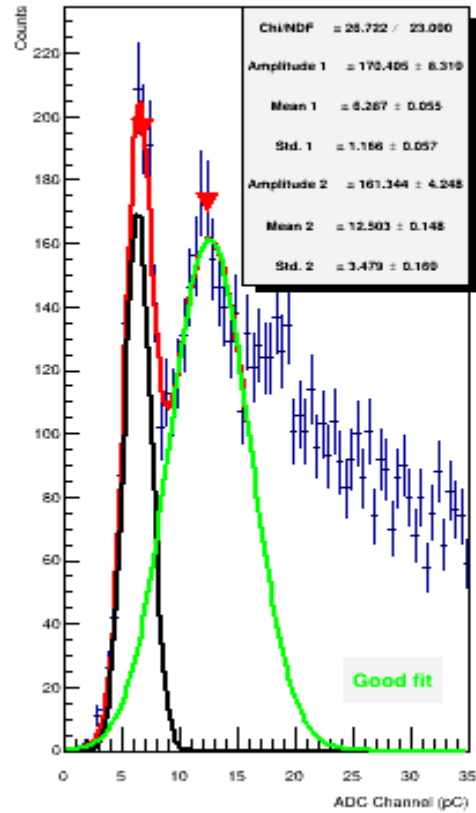
$E_{\text{beam}} = 6.19 \text{ GeV}$

$I_{\text{beam}} = 70 \text{ uA}$

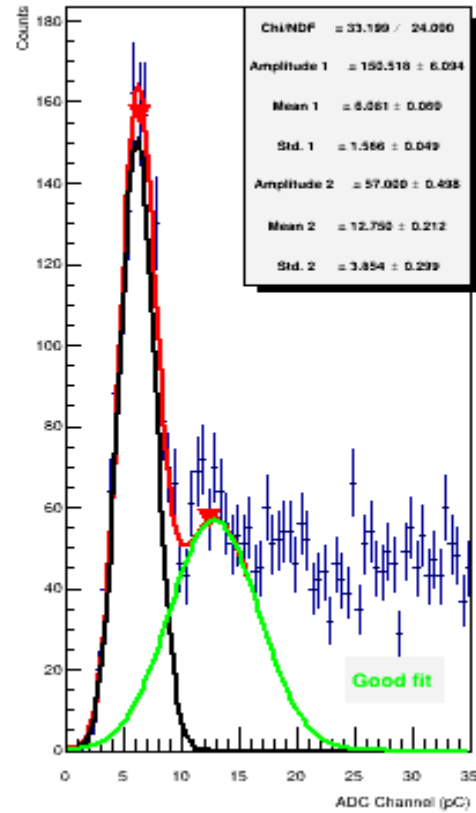
$P_{\text{shms}} = 3.48 \text{ GeV/c}$

Single and double photo electron peaks: PMT1

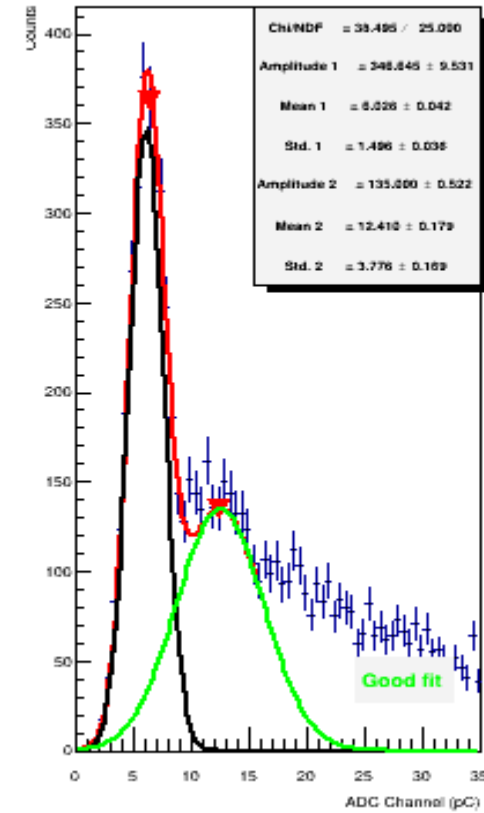
Pulse Integral PMT1 quad2



Pulse Integral PMT1 quad3

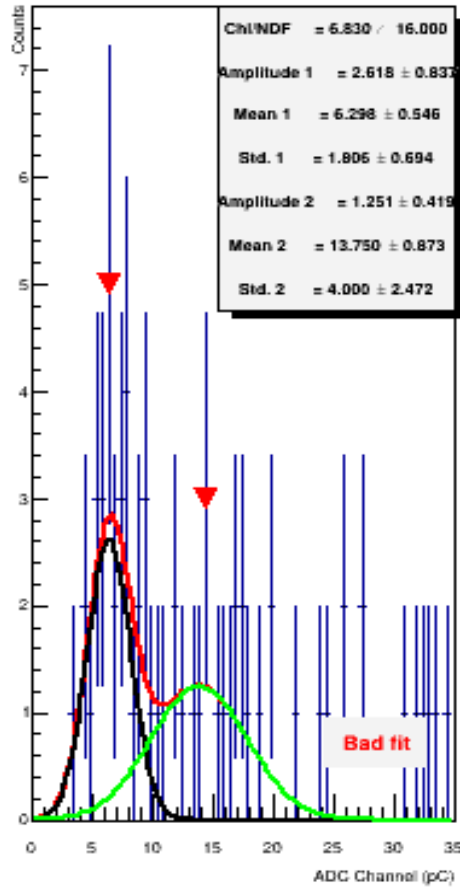


Pulse Integral PMT1 quad4

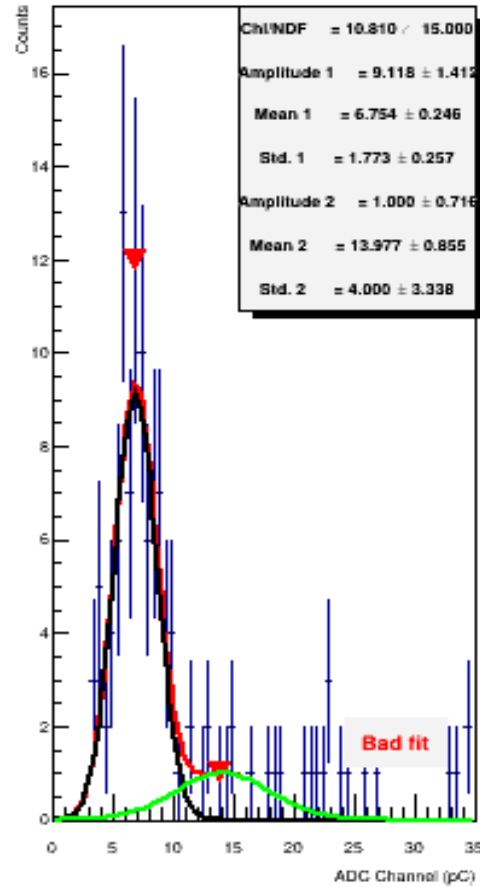


Single and double photo electron peaks: PMT2

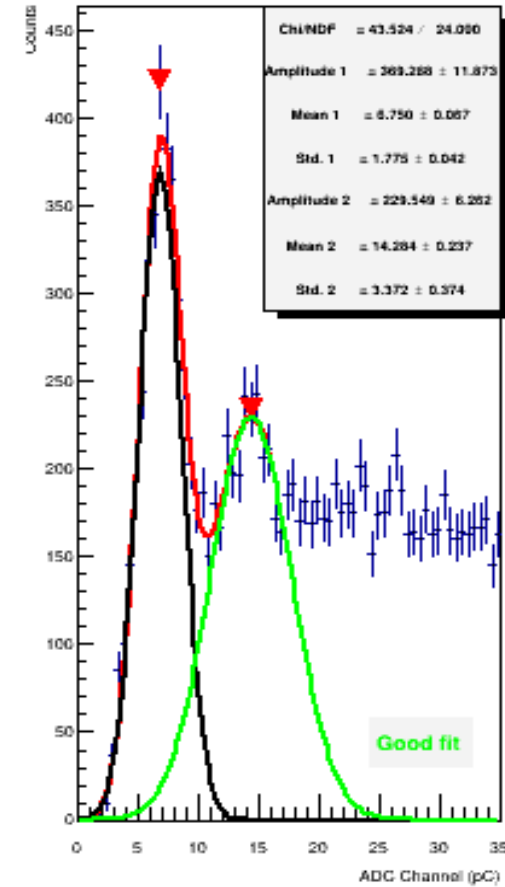
Pulse Integral PMT2 quad1



Pulse Integral PMT2 quad3

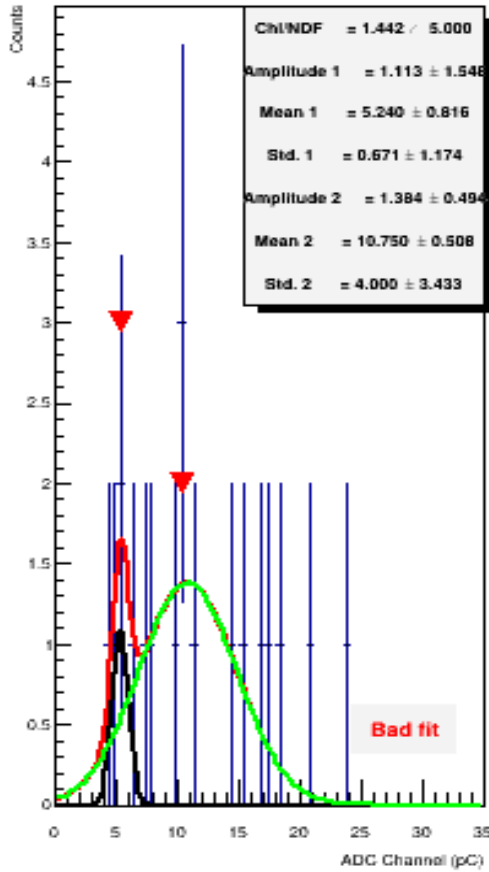


Pulse Integral PMT2 quad4

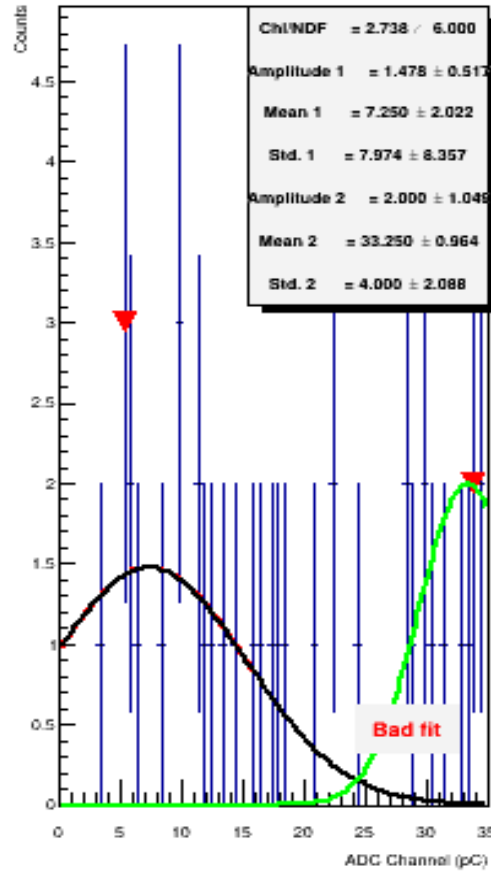


Single and double photo electron peaks: PMT3

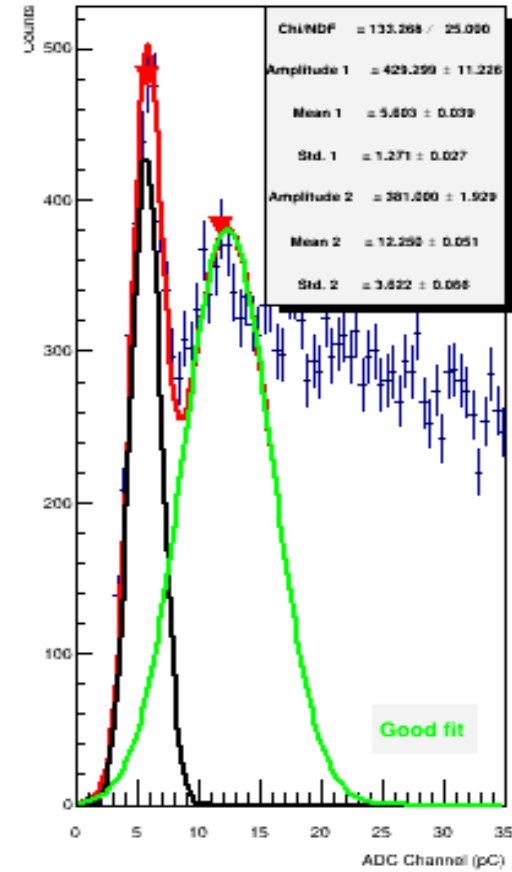
Pulse Integral PMT3 quad1



Pulse Integral PMT3 quad2

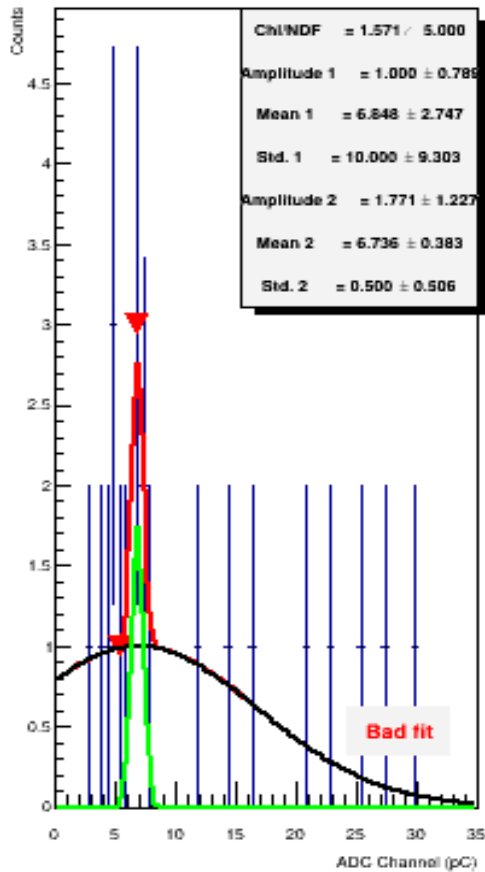


Pulse Integral PMT3 quad4

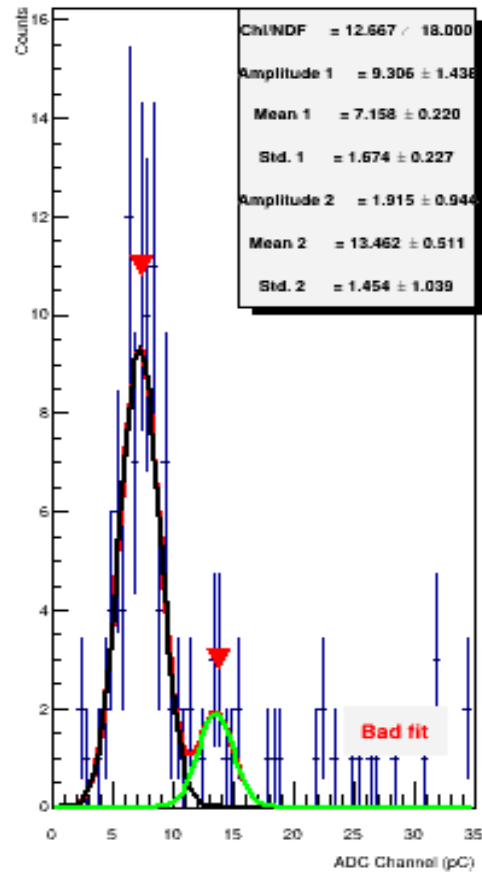


Single and double photo electron peaks: PMT4

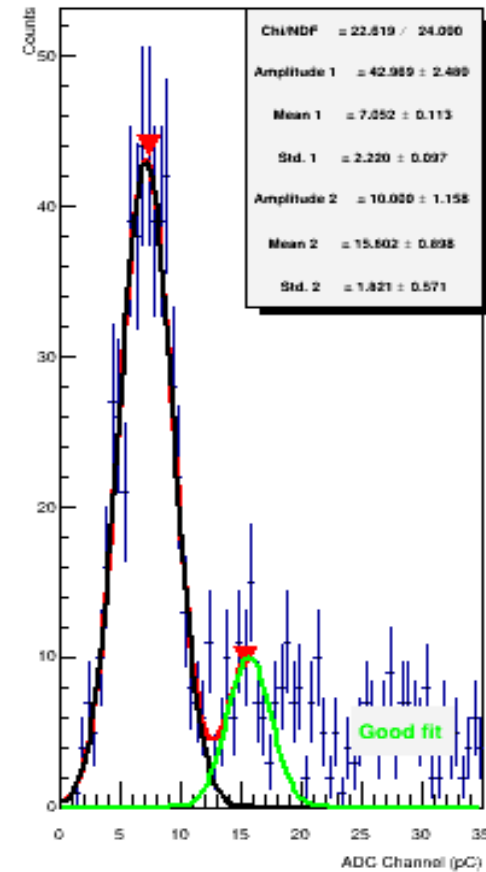
Pulse Integral PMT4 quad1



Pulse Integral PMT4 quad2



Pulse Integral PMT4 quad3



Quality control:

After fit the single and double photo electron peaks with Gauss2 function, we will have pretty good calibration parameters for the each PMT.

We want to check whether these parameters are reasonable or not.

I have filled another histogram with full range of data distribution and scaled it with the calibration constant for the each PMT.

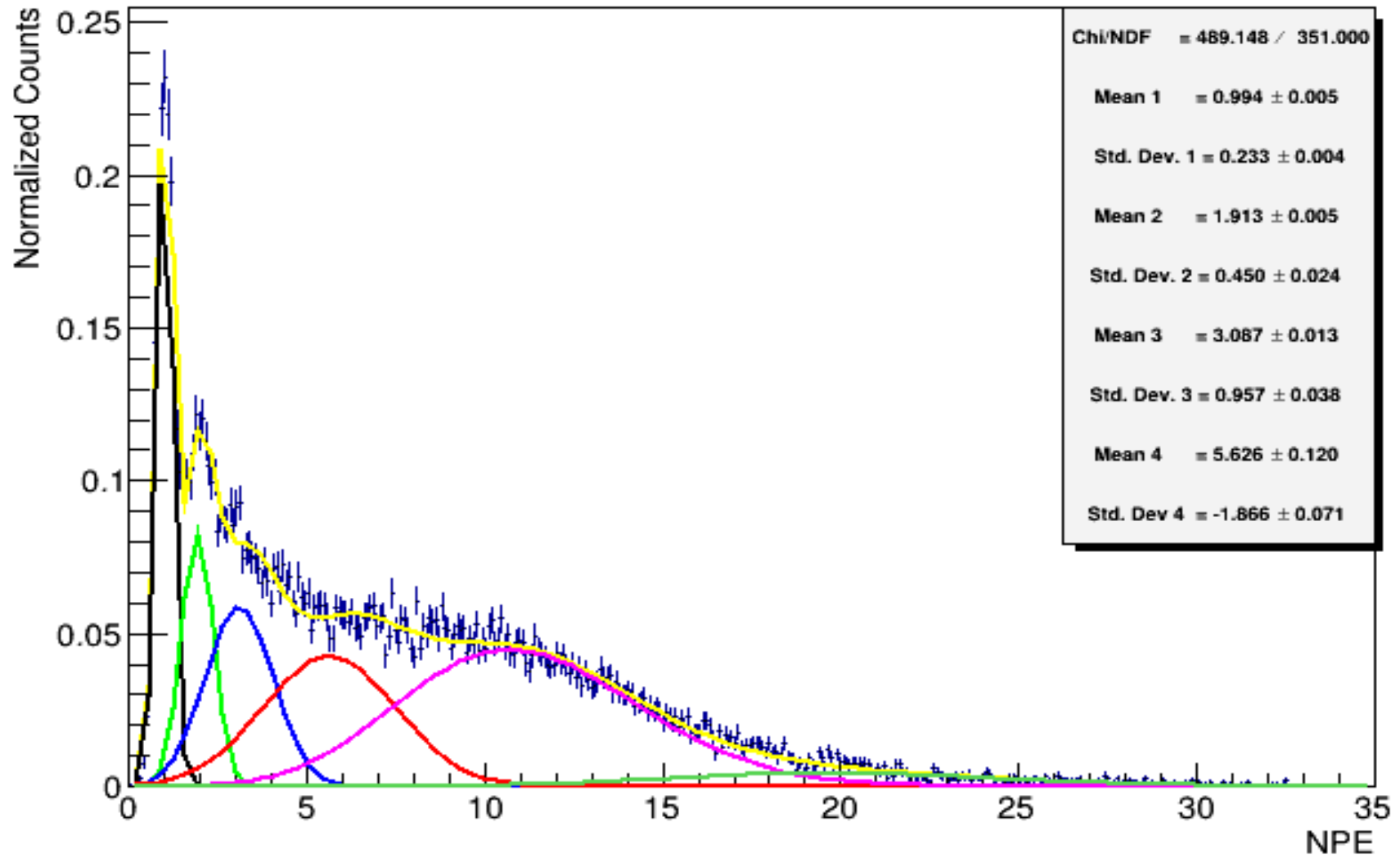
I made a function (Gauss4 +Poisson2) to fit the distribution and then draw the individual functions to see how it is looking.

For the Gauss mean in the function (Gauss4 + Poisson2), I set the limits of the parameter which is third times of the error in the scale parameter ($pm\ 3 \times xscale_err$).

Finally, I have zoomed the histogram (region of interest) and draw it for the each PMT again.

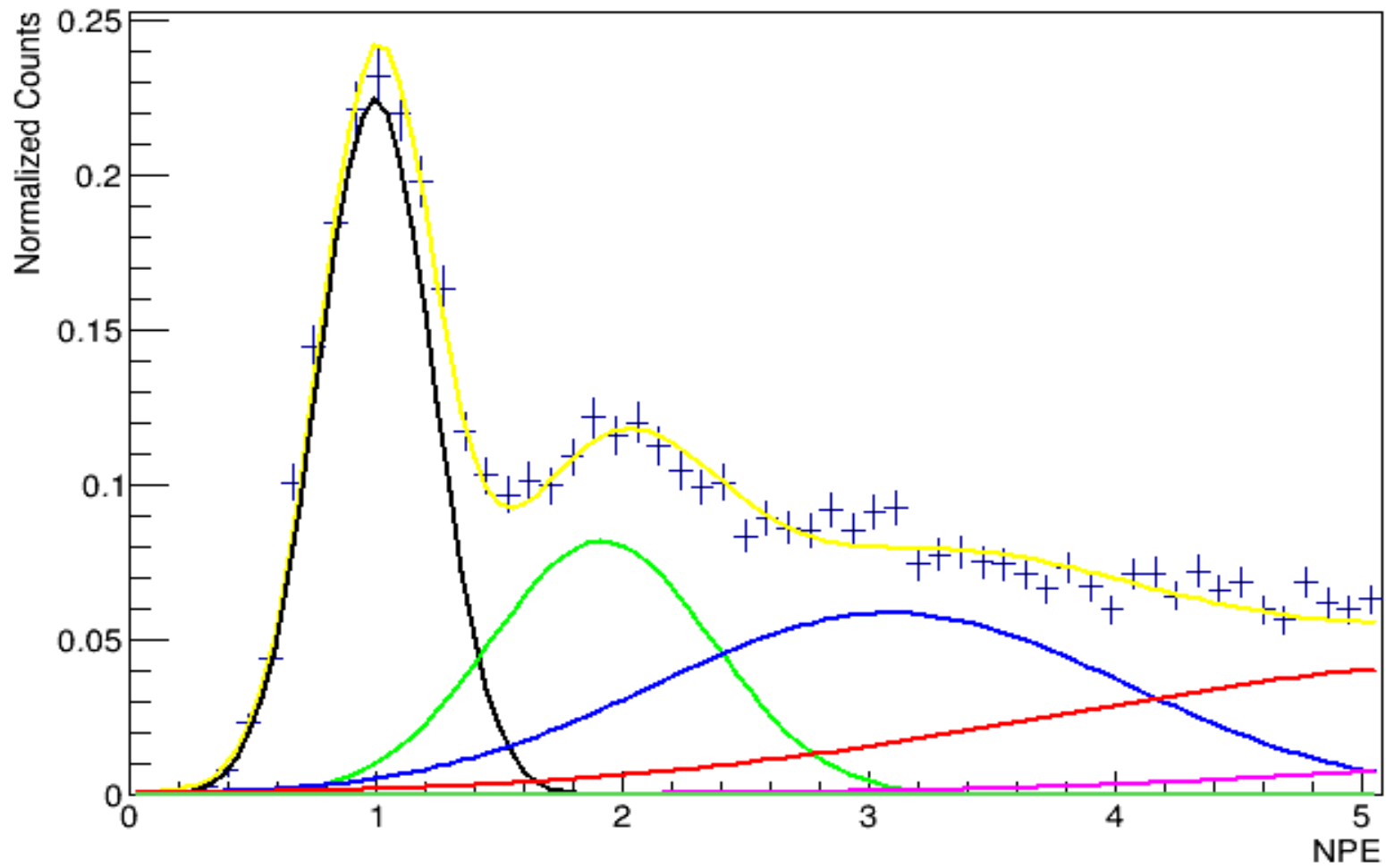
Full Distribution: PMT1

Scaled ADC spectra for PMT1



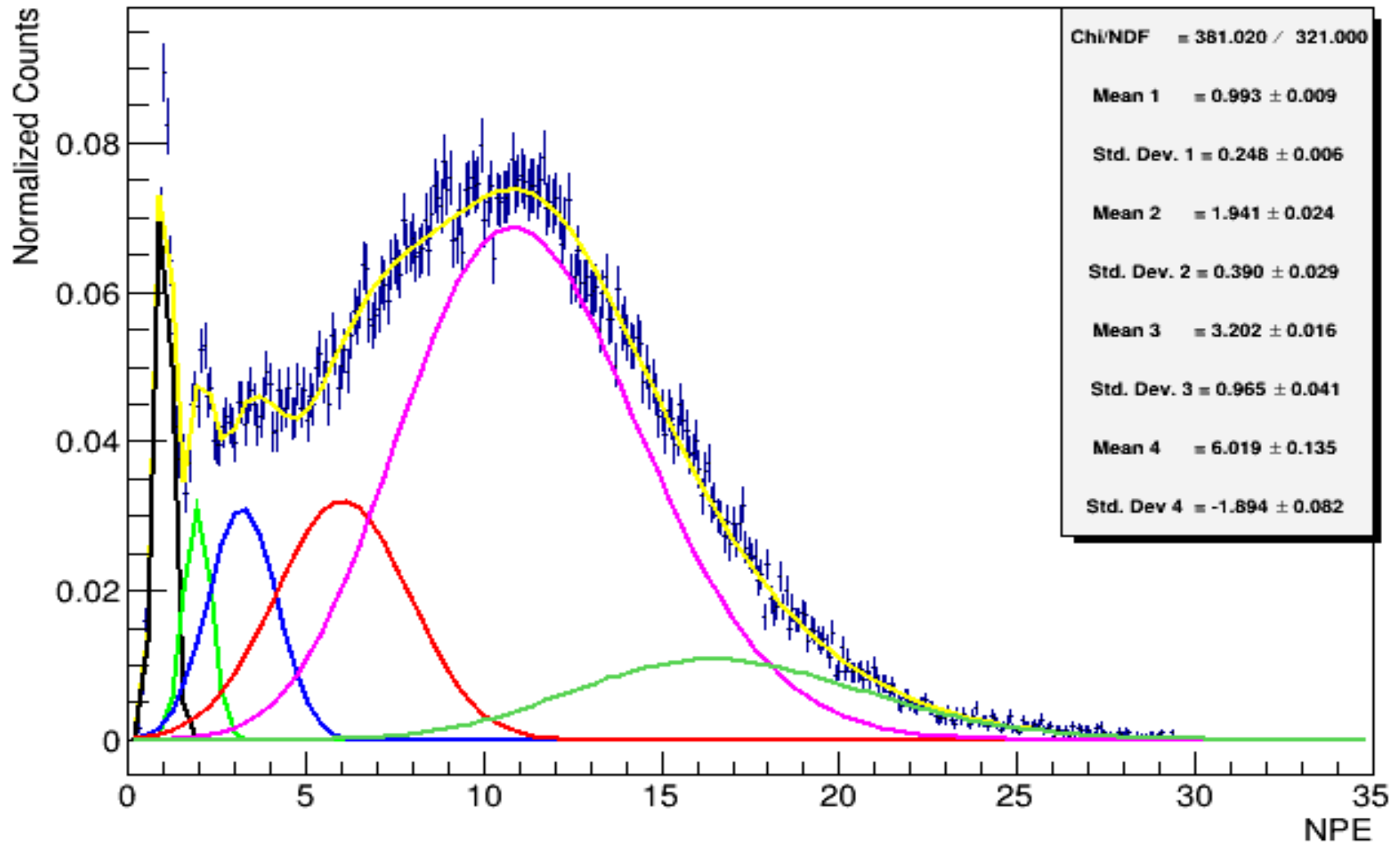
Zoomed Distribution: PMT1

Scaled ADC spectra for PMT1



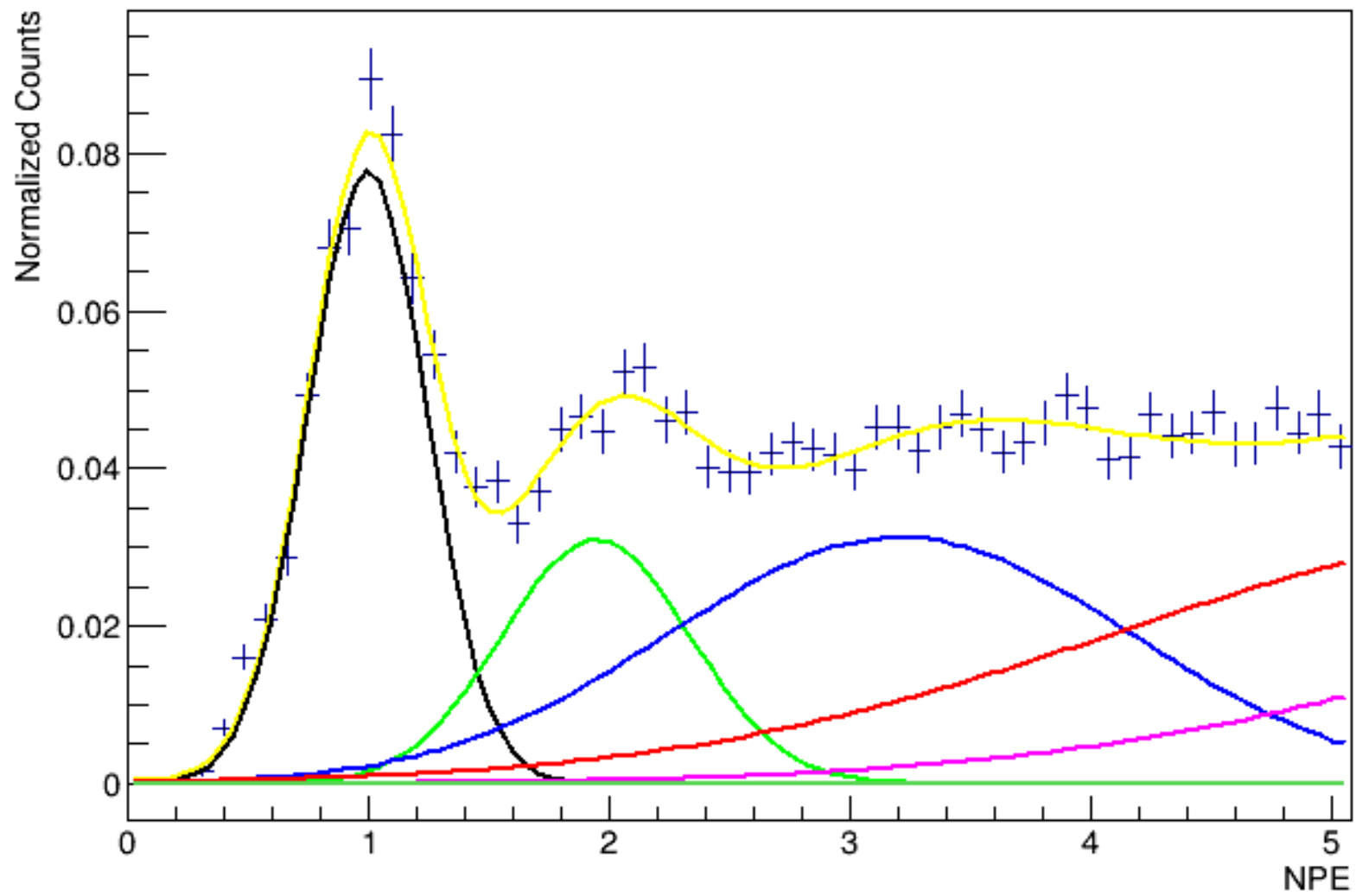
Full Distribution: PMT2

Scaled ADC spectra for PMT2



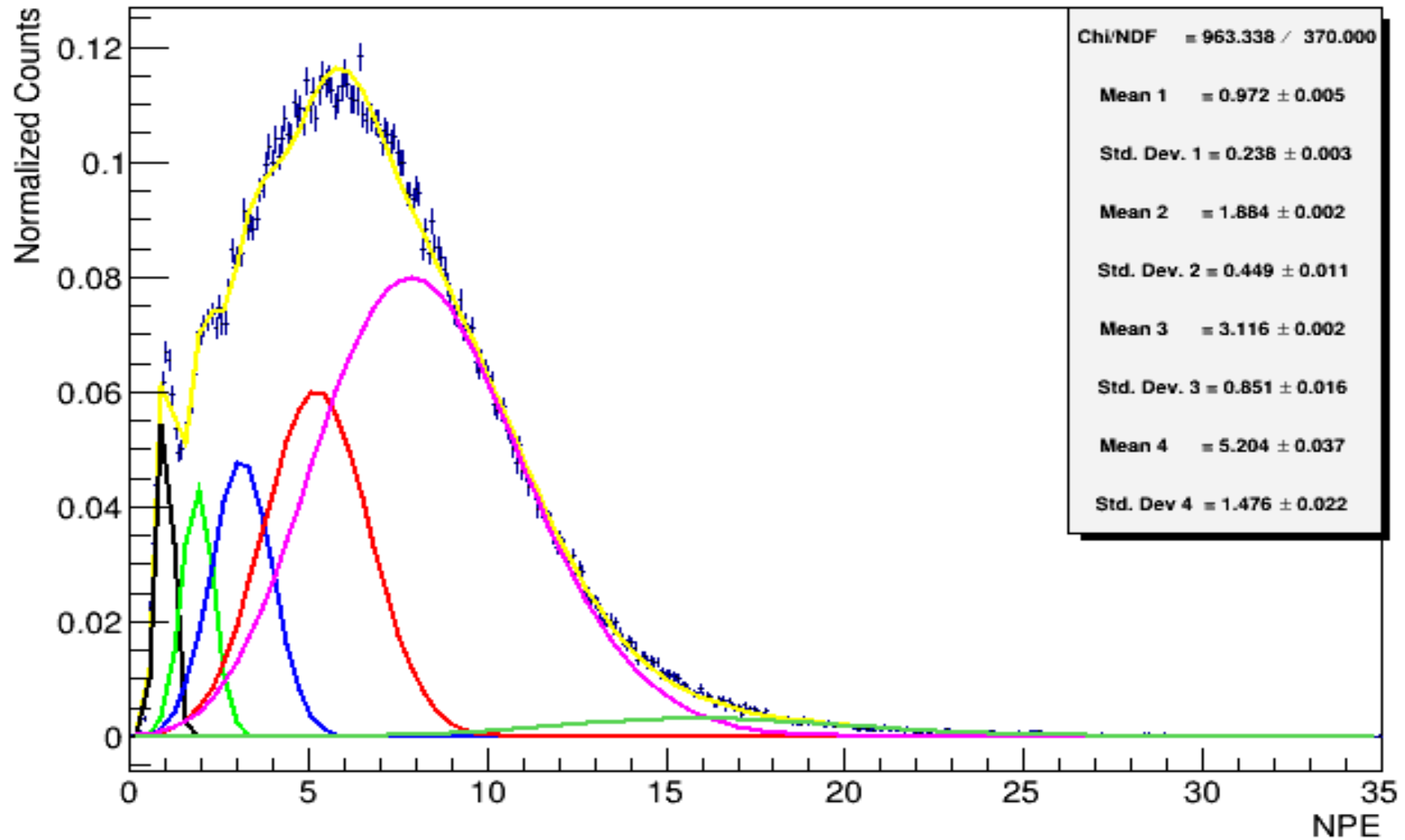
Zoomed Distribution: PMT2

Scaled ADC spectra for PMT2



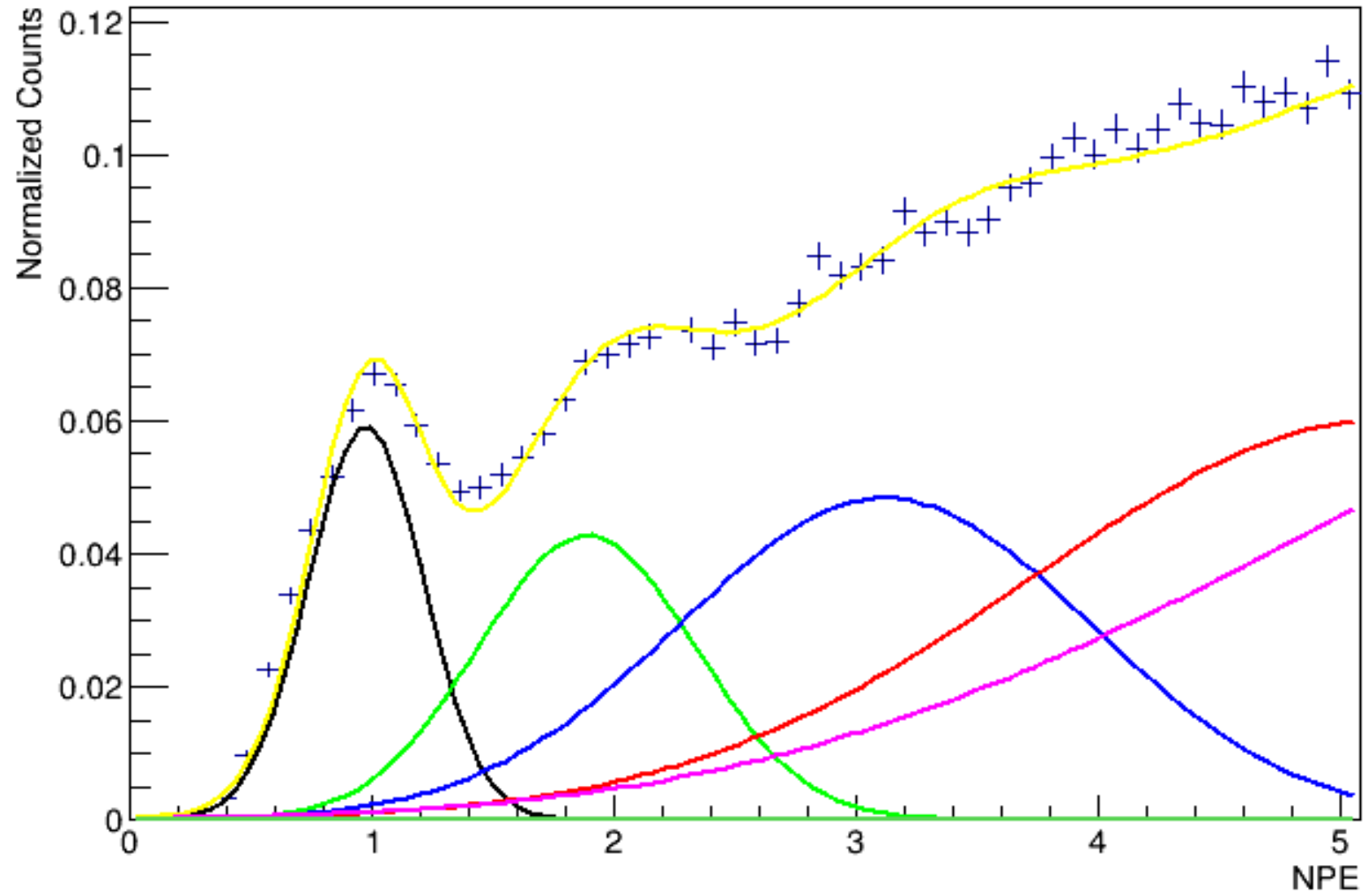
Full Distribution: PMT3

Scaled ADC spectra for PMT3



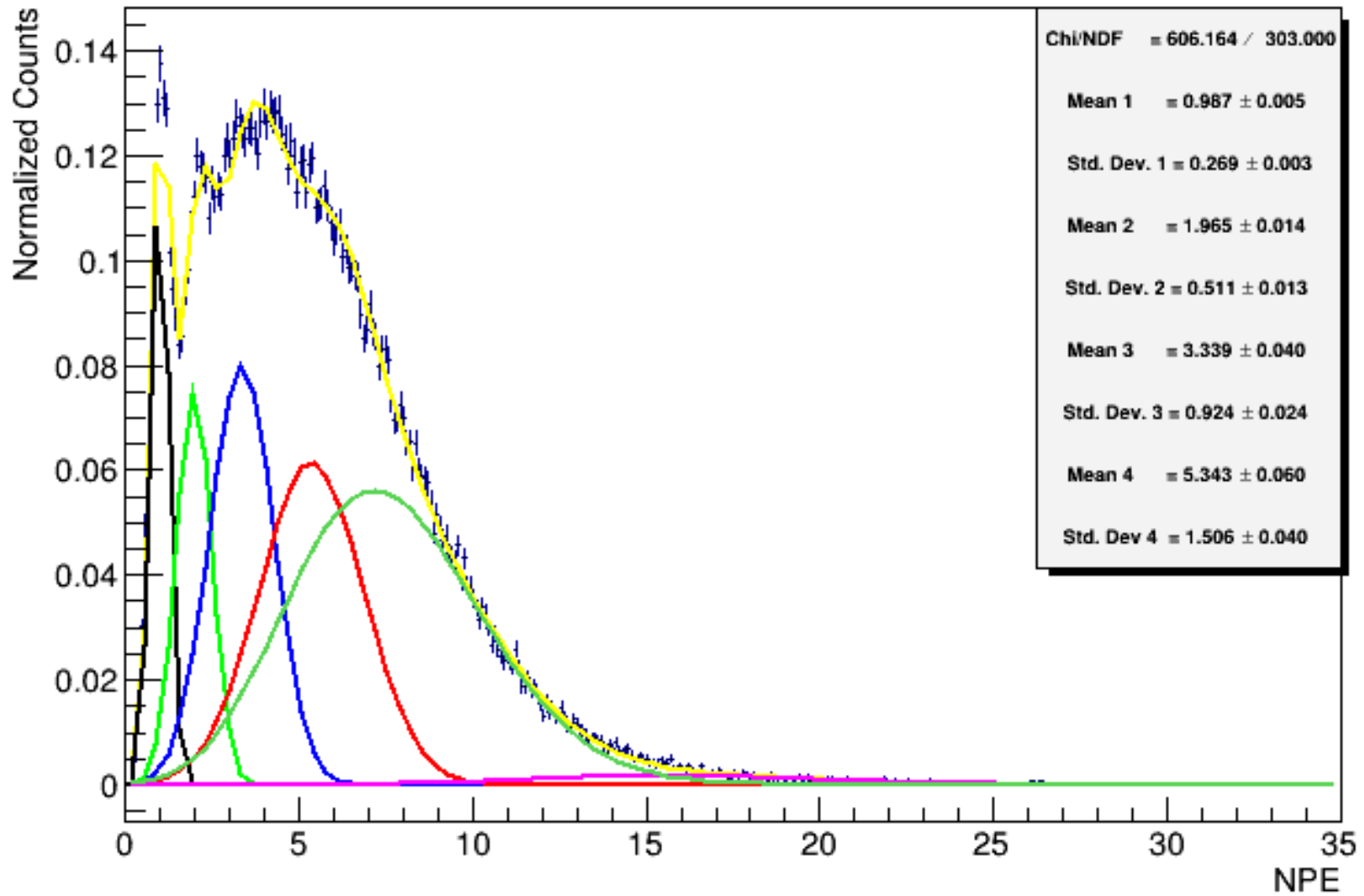
Zoomed Distribution: PMT3

Scaled ADC spectra for PMT3



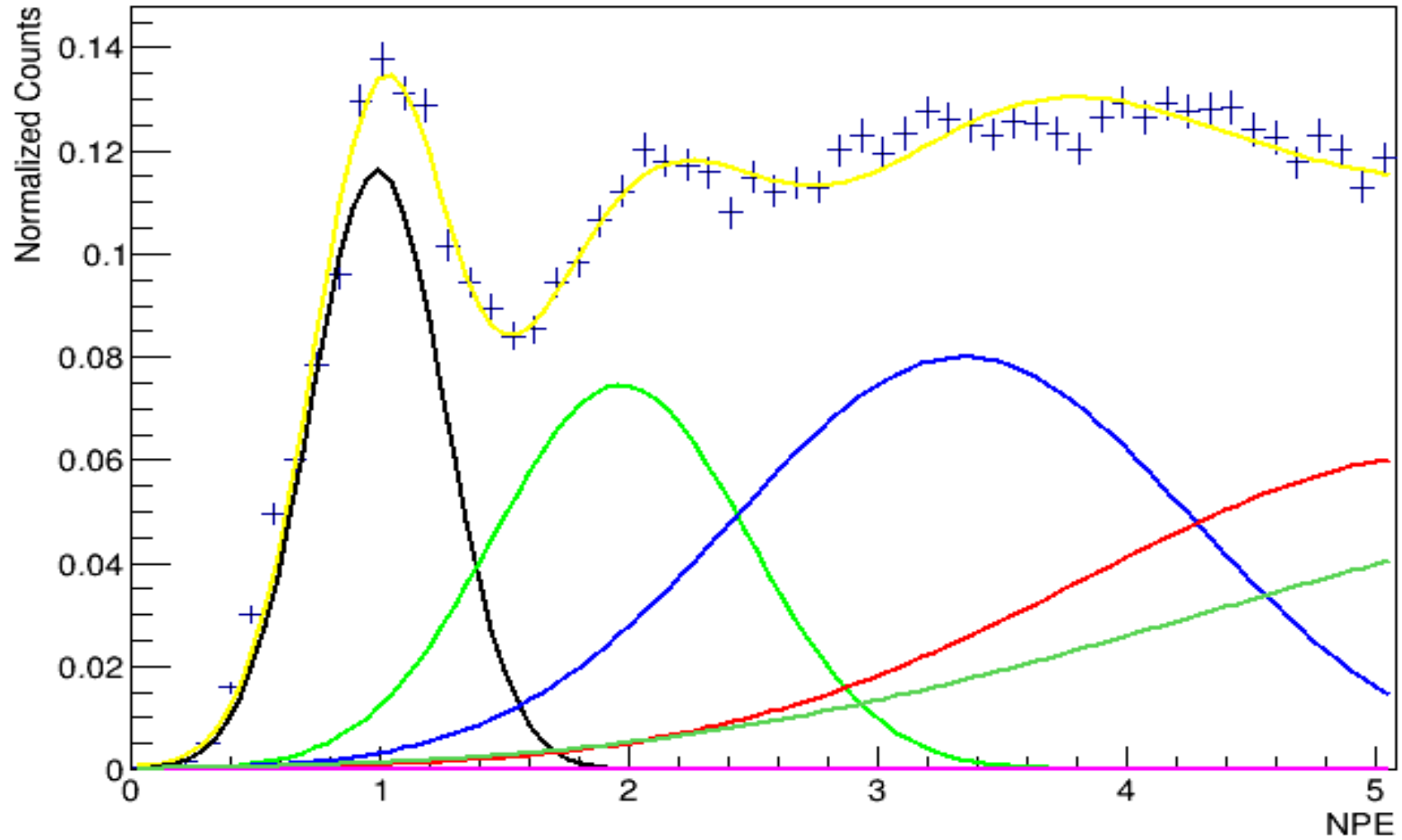
Full Distribution: PMT4

Scaled ADC spectra for PMT4



Zoomed Distribution: PMT4

Scaled ADC spectra for PMT4

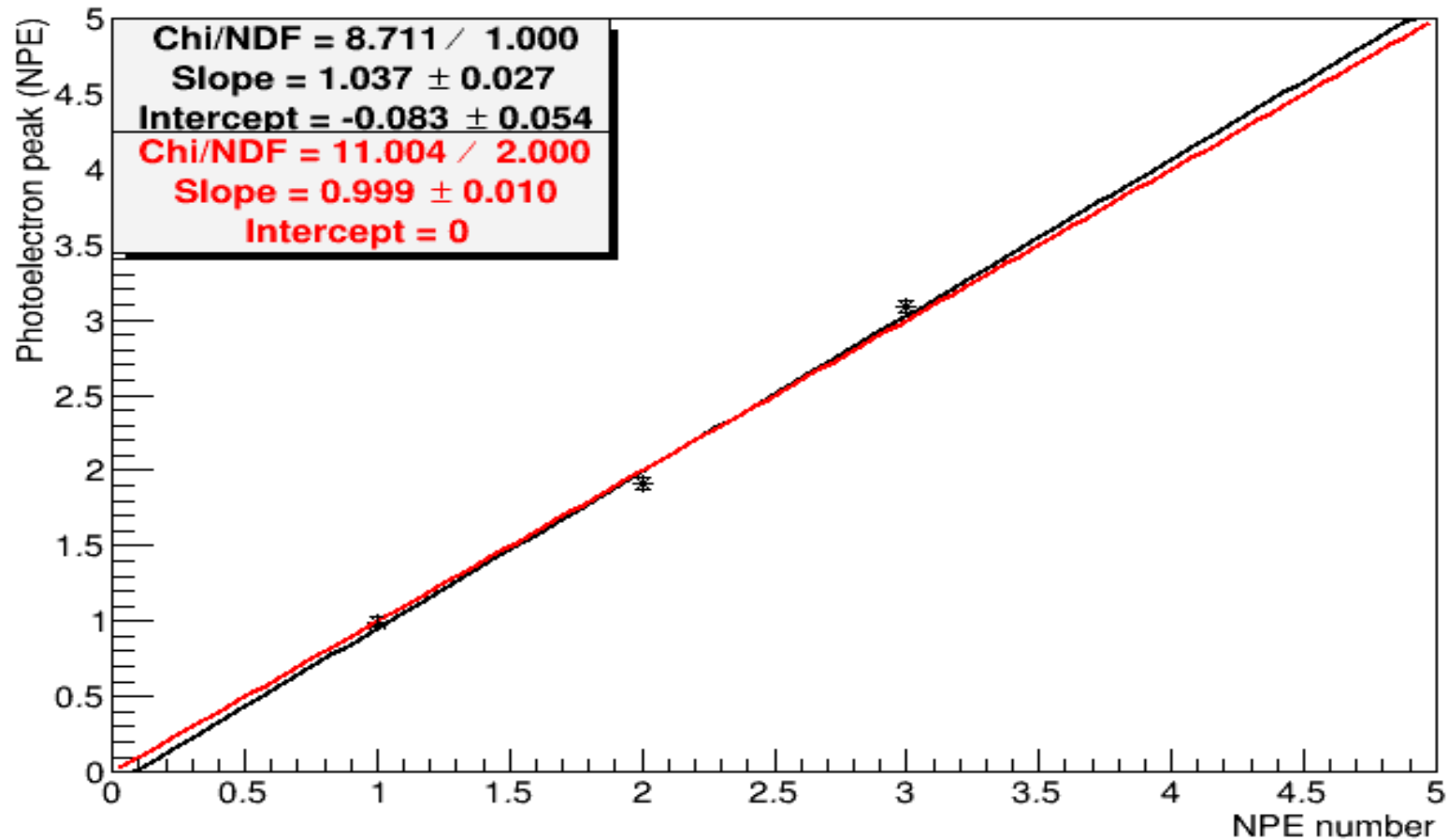


Continue.....Quality control work

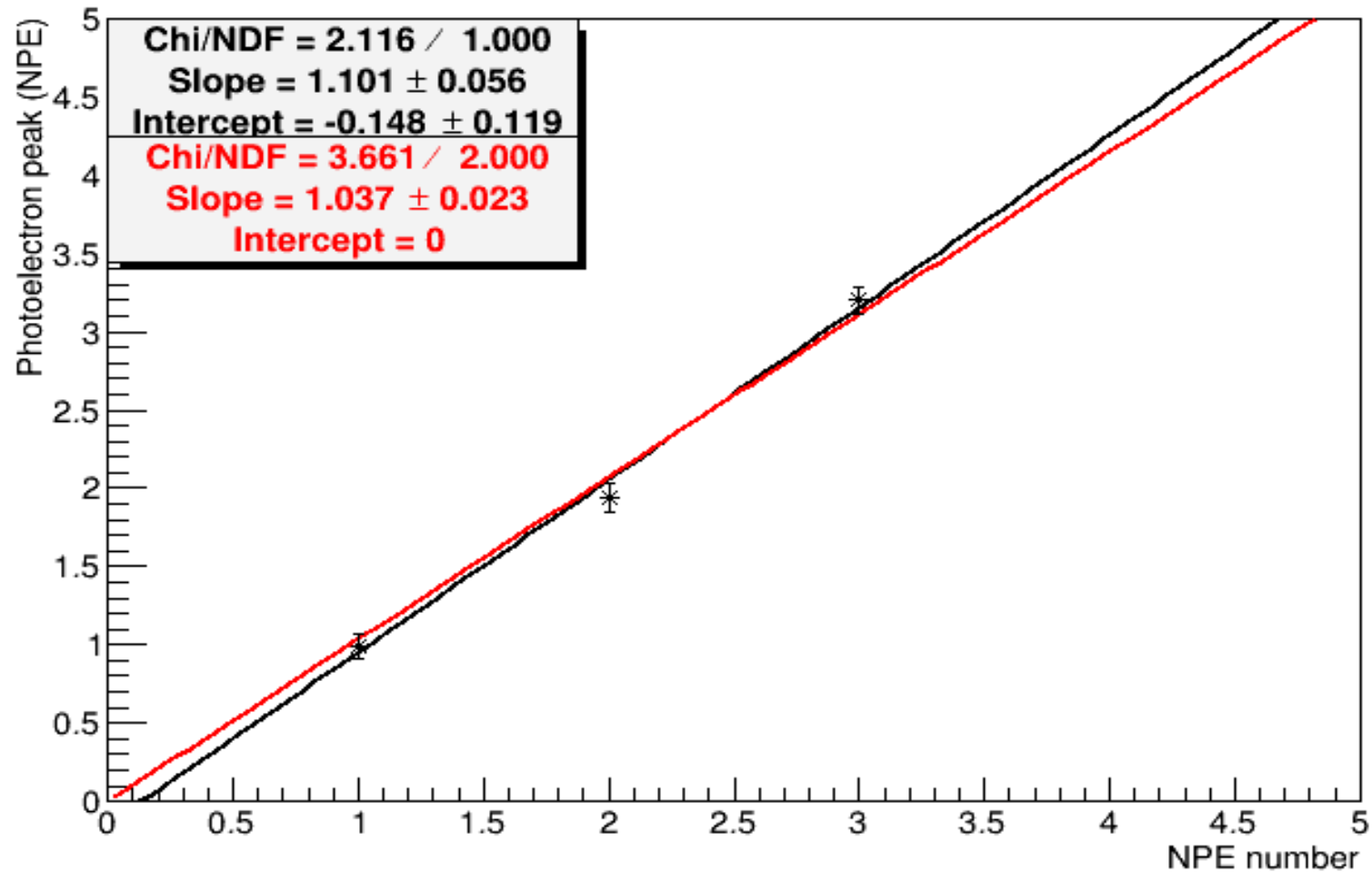
Linear spacing of photo electron for the each PMT.

Crucial part is error in the linear spacing plot because above yellow fit is constraint. The error in linear spacing is the sum of the error in scale parameter and error from yellow fit.

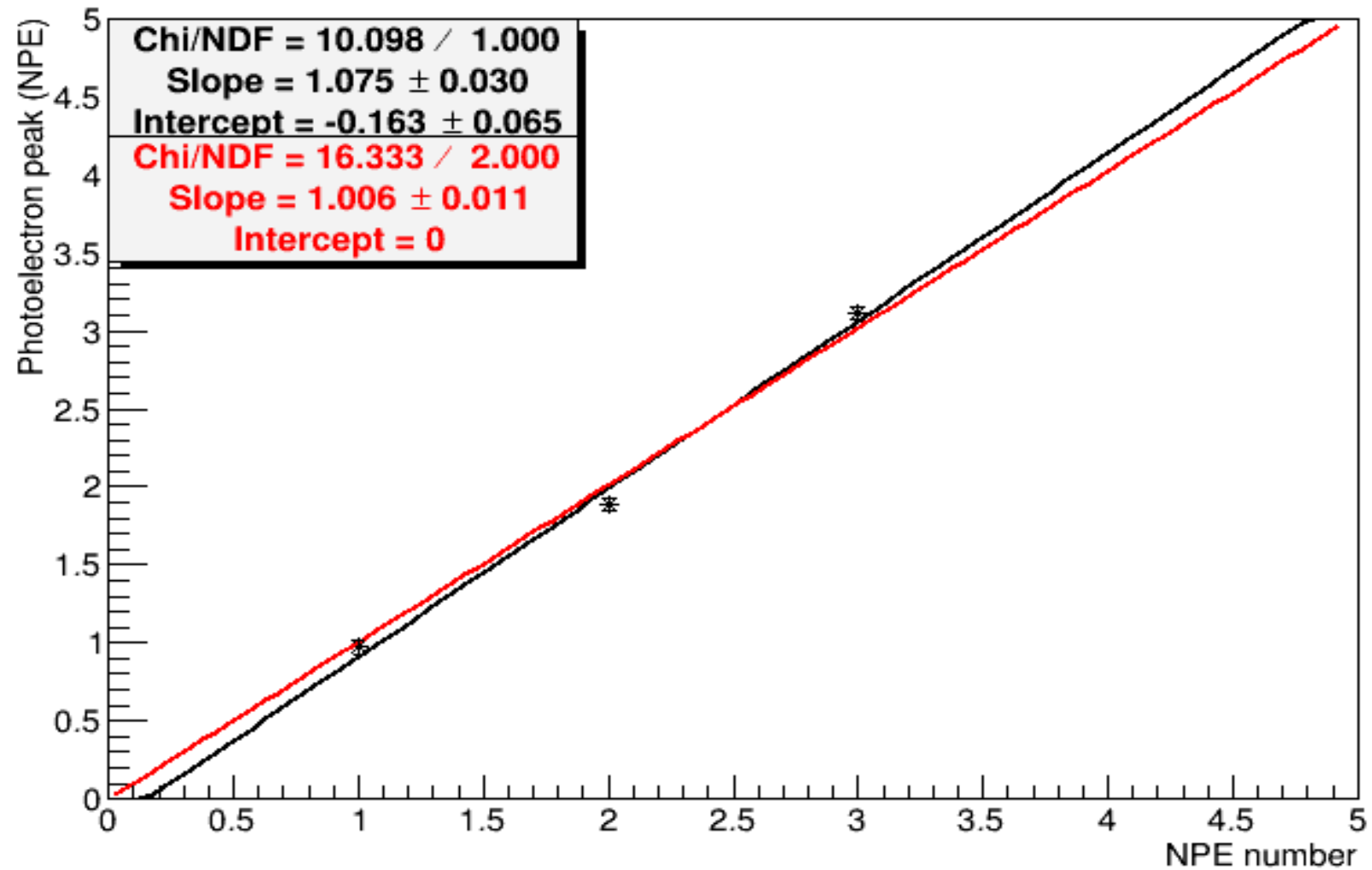
Linear Spacing of PE for PMT1



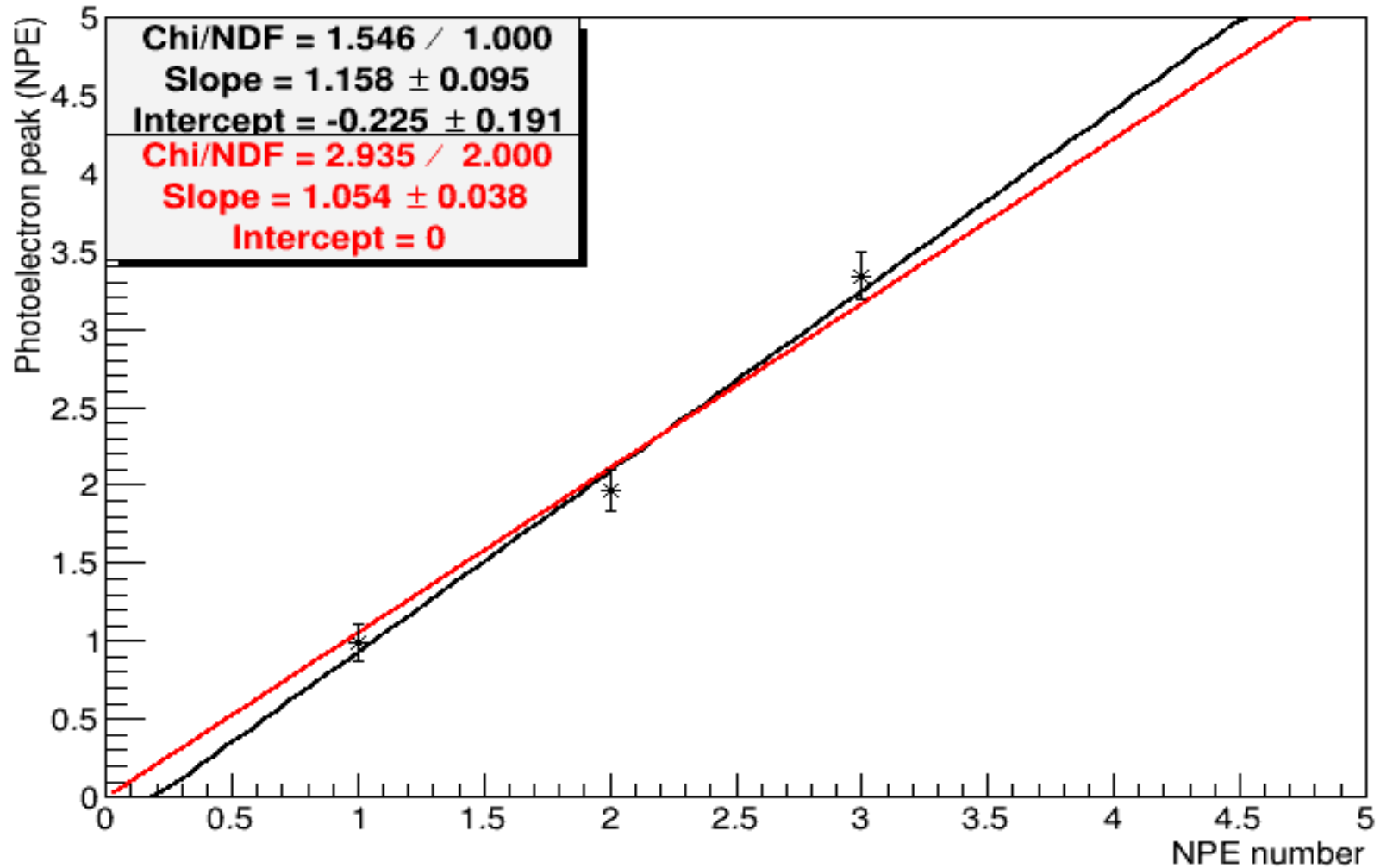
Linear Spacing of PE for PMT2



Linear Spacing of PE for PMT3



Linear Spacing of PE for PMT4



Calibration constants

Online calibration constants: Garth H. gain calibration from 4721, Sept 27 2018

PMT	Old Cal.constant for (reference)	First Cali. constant	Second Cali. constant
1	6.26	6.112 +/- 0.029	6.075 +/- 0.042
2	7.30	6.750 +/- 0.067	6.700 +/- 0.088
3	5.85	5.603 +/- 0.039	5.446 +/- 0.046
4	6.98	7.052 +/- 0.113	6.962 +/- 0.117

Second Calibration constants are calculated as, first calibration constant * mean from of the first peak in the yellow fit.

Outlook

Now, next task is to select run numbers from the whole experiment and do calibration for them and make plot between calibration constants and run numbers to check the consistency of the calibration.

Here, I have selected some run numbers from the second and third parts (3.8, 4.9 GeV) of the experiment.

These runs are after the rearrangement of the mirrors, I am also want to select some run numbers from before the rearrangement (part 1).

First two columns are from second part of the experiment

$E_{\text{beam}} = 3.8 \text{ GeV}$
 $P_{\text{shms}} = + 2.5 \text{ GeV/c}$

Last two columns are from third part of the experiment

$E_{\text{beam}} = 4.9 \text{ GeV}$
 $P_{\text{shms}} = + 2.5 \text{ GeV/c}$

6639	6854	6885	7042
6640	6855	6887	7043
6641	6856	6888	7044
6642	6857	6889	7045

Calibration constants

phgcer_adc_to_npe for Run Number: = 7882 + 7883 + 7884

phgcer_adc_to_npe: PMT1 = 6.112 +/- 0.029

phgcer_adc_to_npe: PMT2 = 6.750 +/- 0.067

phgcer_adc_to_npe: PMT3 = 5.603 +/- 0.039

phgcer_adc_to_npe: PMT4 = 7.052 +/- 0.113

From quality control, phgcer_adc_to_npe: PMT1 = 6.075 +/- 0.042

From quality control, phgcer_adc_to_npe: PMT2 = 6.700 +/- 0.088

From quality control, phgcer_adc_to_npe: PMT3 = 5.446 +/- 0.046

From quality control, phgcer_adc_to_npe: PMT4 = 6.962 +/- 0.117

Online calibration constants: Garth H. gain calibration from 4721, Sept 27 2018

PMT1: 6.26

PMT2: 7.30

PMT3: 5.85

PMT4: 6.98