# Tab bonded module data

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Sinced we do not get the fast OR from the module the data was taken sending the DAQ sequence repeatedly to the chip and accepting only the events with at least one peak higher than a given value. The problem with this is that the data is not sampled at the proper time and one gets a blurred energy distribution. In the following I try to describe the method I used to unfold that effect and check that the data we took has any sense. The data corresponds to an $^{241}$Am source.

If no correction is made, one obtains the *energy* distribution shown in Fig. 1:

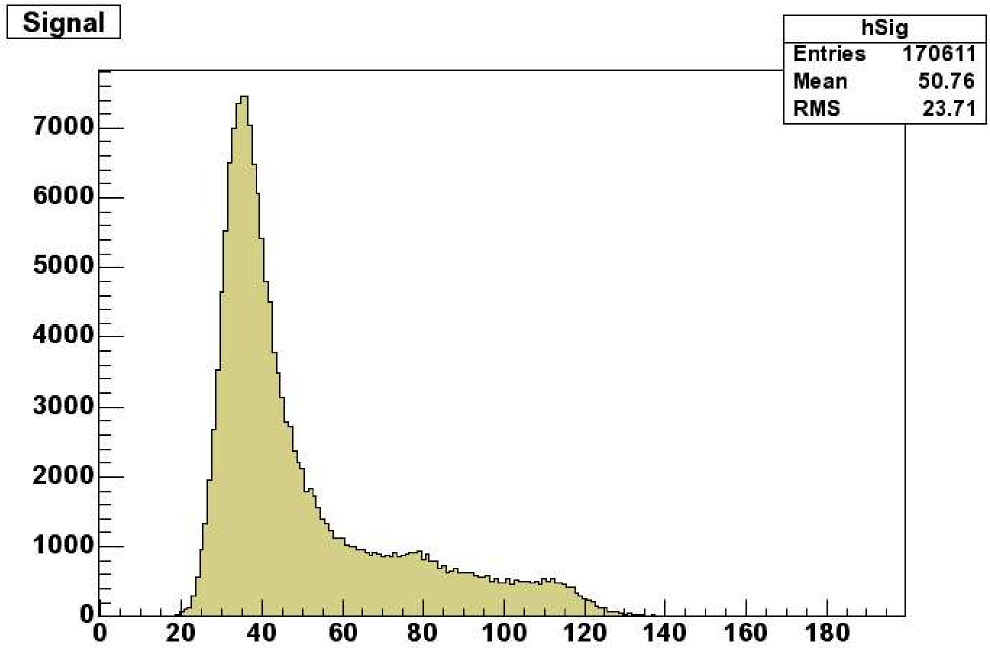


*Figure 1. Non corrected distribution.*

In order to unfold the timing effect I assume the signal is a CR-RC, with a peaking time of 1µs. This has a shape like shonw in Fig. 2 Where a pulse of amplitude 1 has been drawn. If we make an out-of-time sampling, the amplitude meassured will not be 1 in all the cases and it will depend upon the sampling time. A bit of algebra allows to obtain the probability distribution of meassuring a value V from a pulse of amplitude $V_0$ if we set the threshold to T: $P(V;.V_0,T)$. The function is shown in Fig. 3 for the previous pulse assuming our threshold is 0.1.

With that in hand, it is easy to see that the values in the uncorrected histogram are:

$$h(E_i)=\sum_{E_j>E_i} P(E_i;E_j,T)\,f(E_j)$$

where h is the histogram content in the bin corresponding to $E_i$ and *f* is the real distribution function. So, one sees that each bin will have its own contribution plus the contribution of the higher depositions on that particular bin. This is a linear system that with a good computer can be solved in a couple of minutes and should give us the real energy distribution.

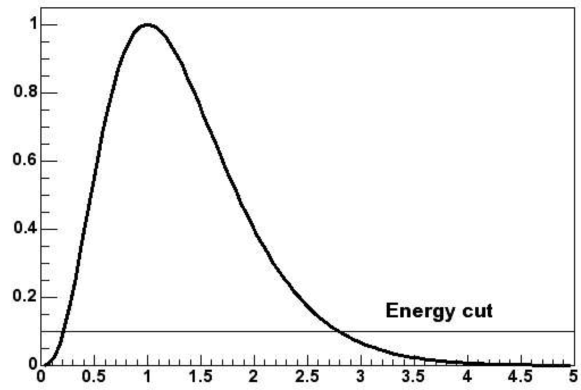


*Figure 2. Pulse shape*

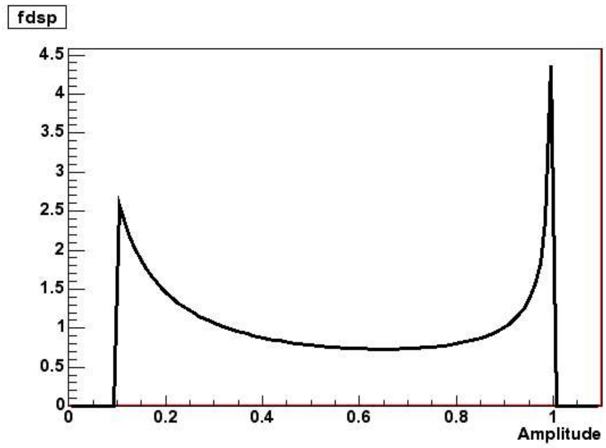


*Figure 3. Response function when sampling out of time.*

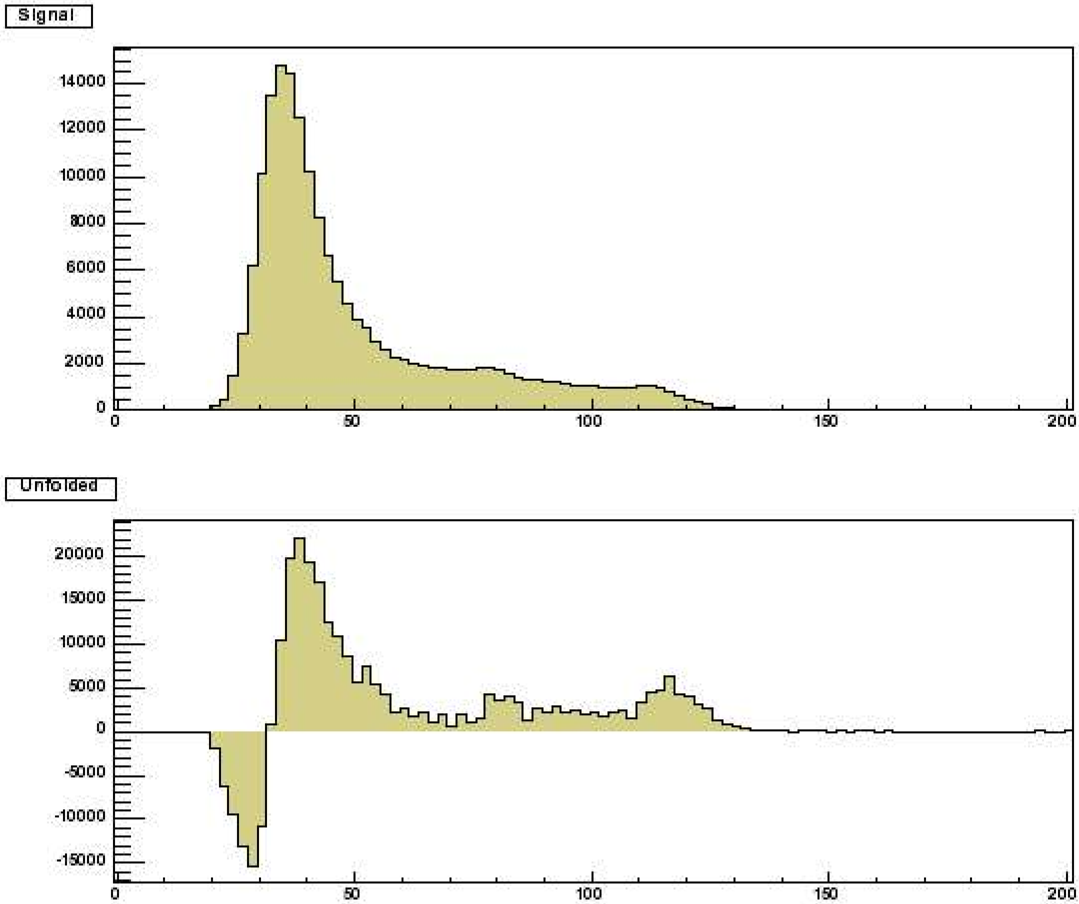


*Figure 4. Top: data uncorrected. Bottom: data corrected.*

Solving that equation for the histogram in Fig. 1 One gets the distribution shown in Fig. 4. The upper histogram shows the data uncorrected and the bottom plot shows the data with the timing effect unfolded. One can see a hint of a peak at the end of the distribution, together with one of the X-ray lines of the Americium. The negative values correcpond to bins where part of their contents have move to the *real* bins. Figs. 5 and 6 show the common mode and the noise across the channels, respectively.

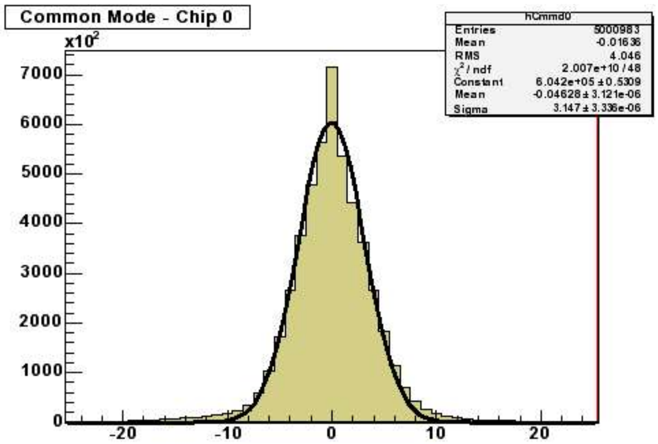


*Figure 5Common mode*

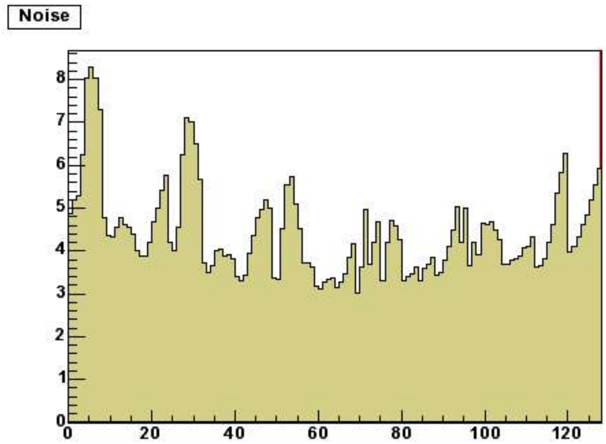


*Figure 6. Noise across channels*

The next figure shows another set of data where I put an Al foil, 100 µm thick, in front of the source in order to kill the X-ray line. There the Am peak is even more evident. The width of the peak is slightly smaller than 5 ADC counts.

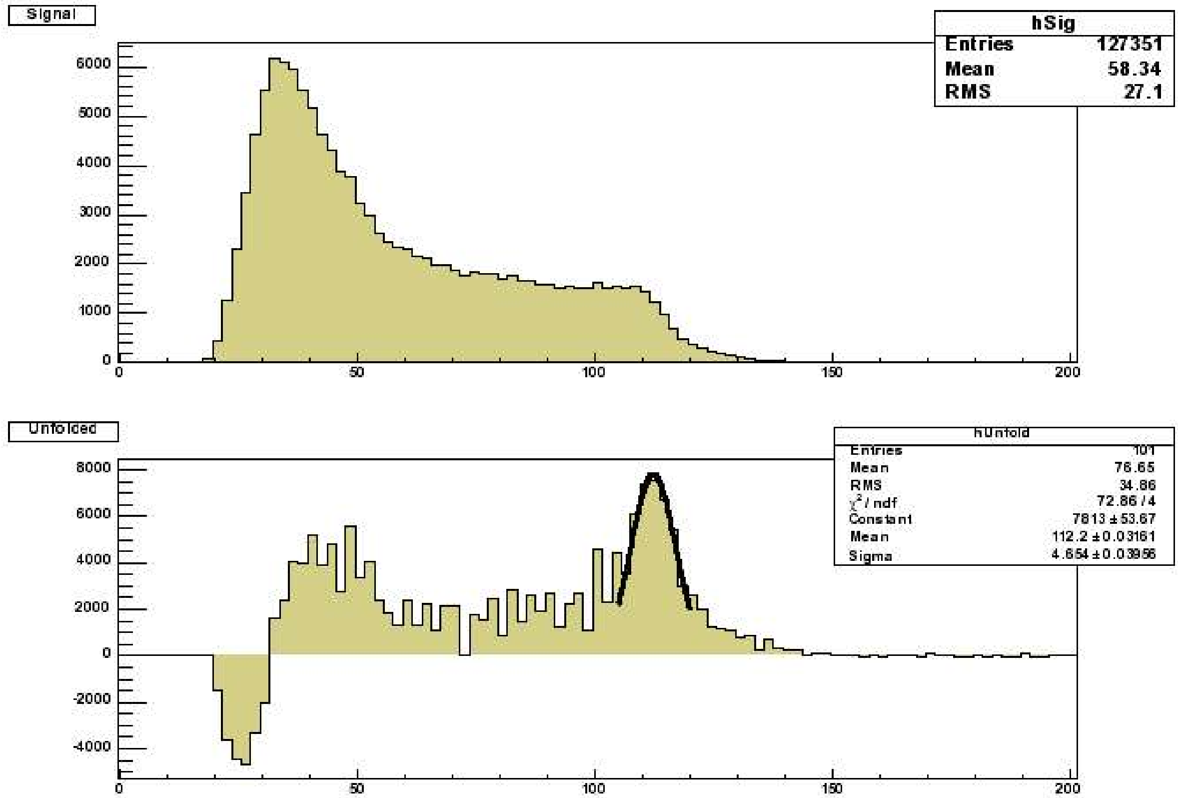


*Figure 7. Top: data uncorrected. Bottom: data corrected. The data corresponds to an $^{241}$Am source plus a 100 µm Al foil.*

Figs. 8 and 9 show the common mode and the noise across the channels, respectively.

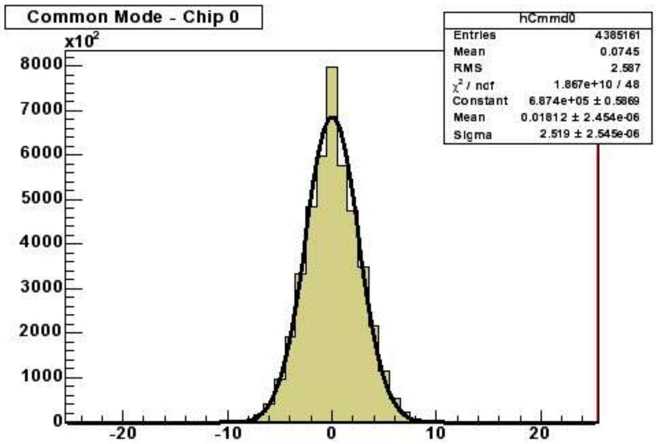


*Figure 8. Common mode*

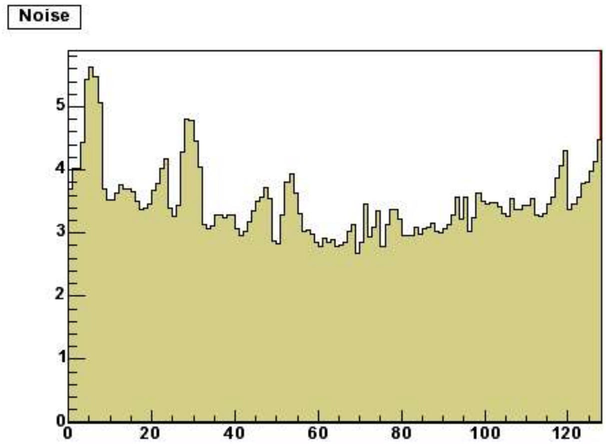


*Figure 9. Noise across the channels*