

Signal integral

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Signal shape function

$$s(t)=V_{\text{out}}(t)=V_0 (t/\tau) \exp(-t/\tau)$$

In root: $p[0] + p[1] * (x - p[2]) / p[3] * \text{TMath} :: \text{Exp} (-(x - p[2]) / p[3])$

- $p[0]$: y-offset -> baseline
- $p[1]$: norm -> V_0 * amplification
- $x-p[2]$: relative time -> $p[2]$ = time when signal (fit) starts
- $p[3]$: time constant (τ), shaping time

Managed to introduce this function into the Eudaq software (not used as root script), this way I hope I will be able to extract CMN also

Extract the integral

Fitting parameters

– Maximum: $t = \tau$

– Amplitude:

$$A = s(t = \tau) = -V_0 \exp(-1) = (\text{Max_Signal} - \text{Mean_BL})/\exp(-1)$$

– Area under the curve:

$F(a) = V_0 (\exp(-a / \tau)(a + \tau) - \tau)$ (???) - I used the ROOT function
“Integral()”

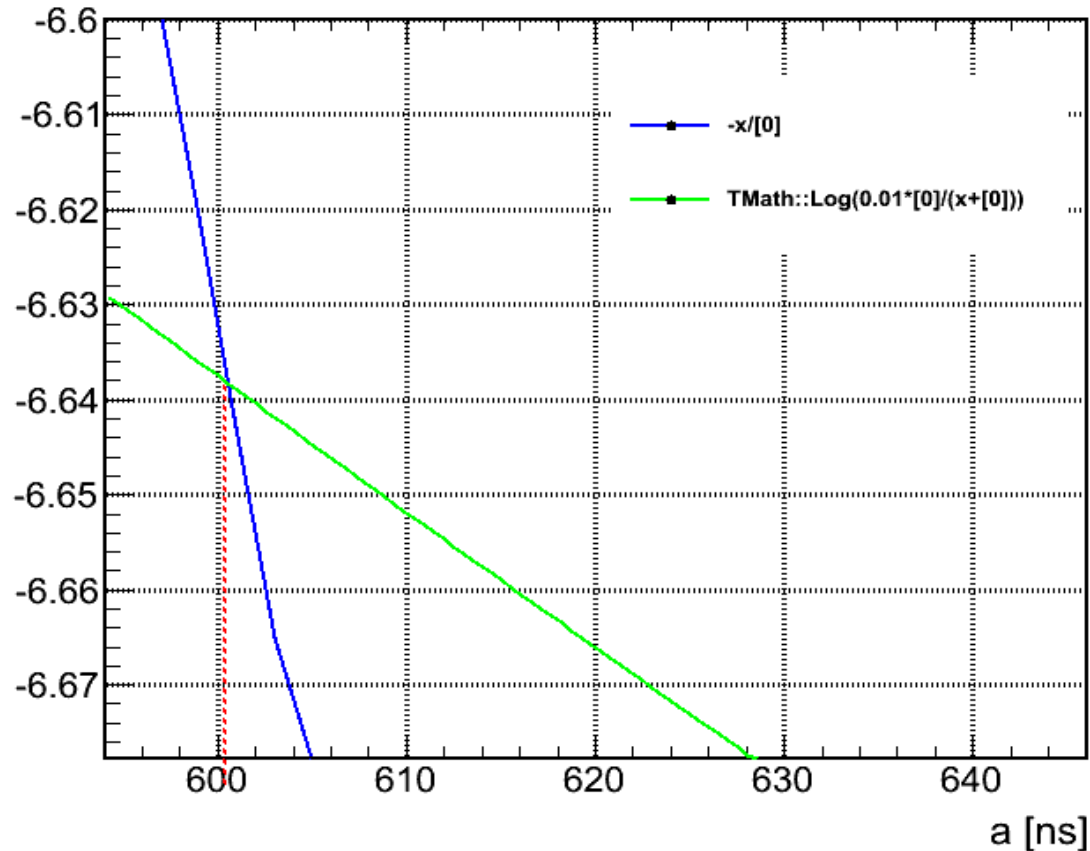
Range: (Start time (from the fit) ; Start time + a)

“a” = relative time: end of integration window: when area under the curve reaches 99% of it's (theoretical) maximum

Solve:

$$\ln\left(\frac{0.01 * \tau}{a + \tau}\right) = -\left(\frac{a}{\tau}\right)$$

Integration window end



Integration window: “a = 600 ns”

For the two functions I need $\tau \Rightarrow$ fit 10 000 events and make the τ distribution
Then run again the code to extract the integral with fixed integration window
Not efficient but didn't find another way

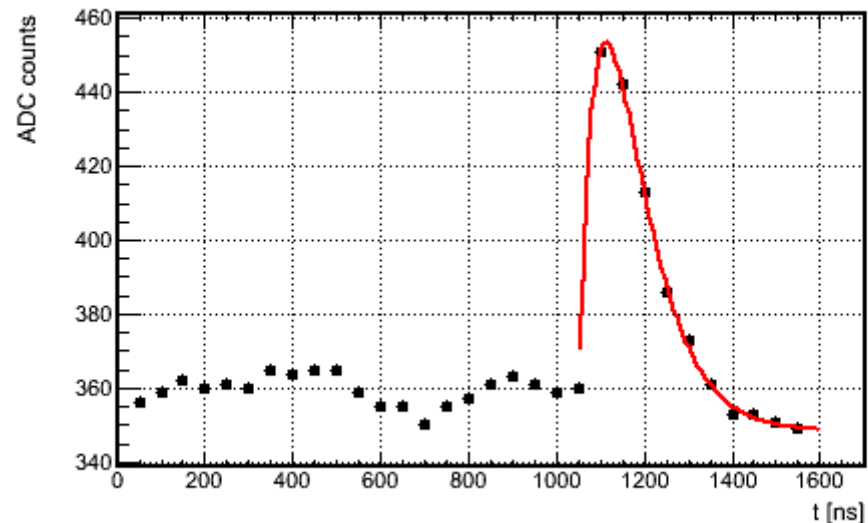
Cracow ADC data fitting

Run: 248

- scan of all pads measurements: Pad 1 run 1, Channel 0, Event 10000
- Baseline: mean over first 20 samples
- No CMN subtraction yet
- Fit if:

(Signal > baseline+tresh) where threshold=10 (ch 0-4) or 5 (ch 4-8)
&& Signal>10

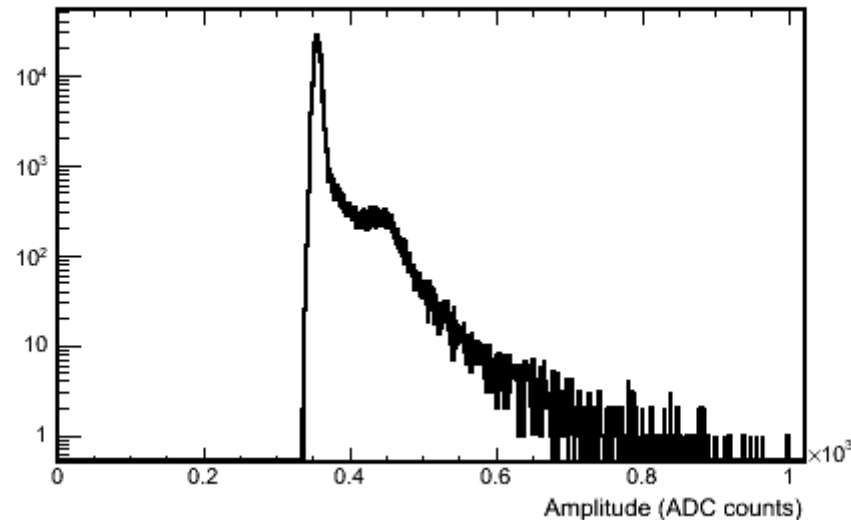
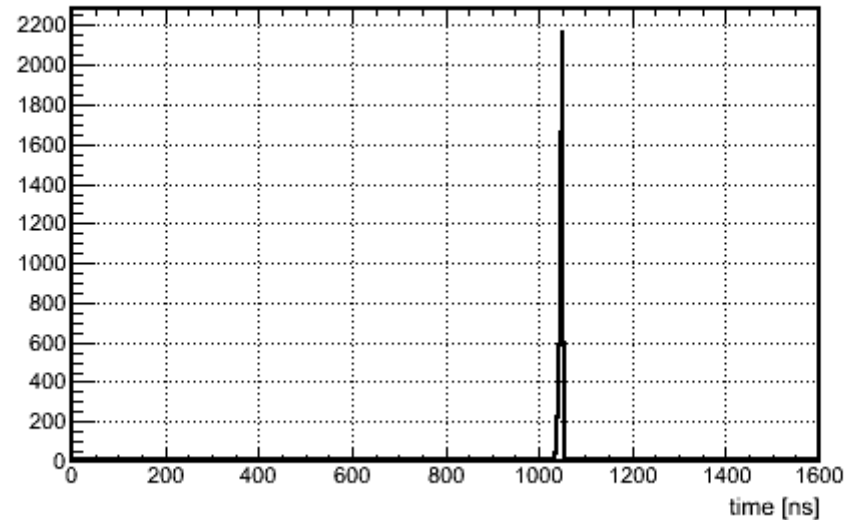
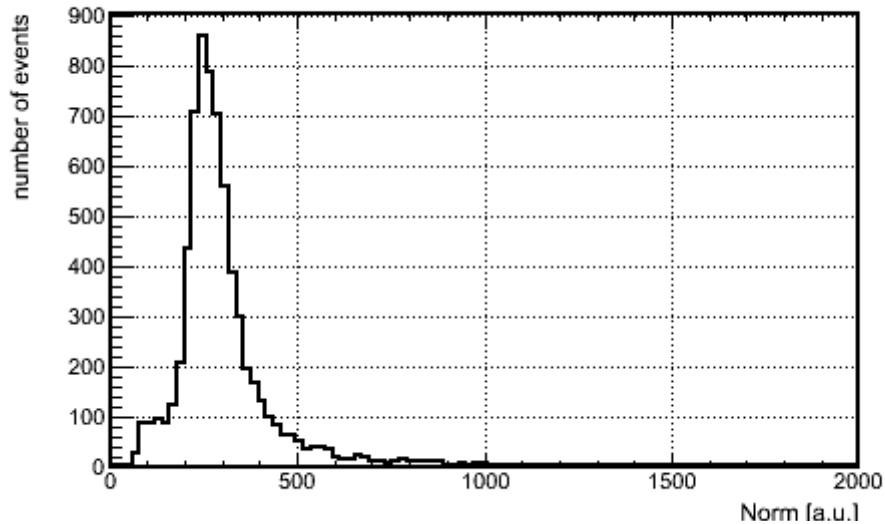
Had to save the data into Graphs
(otherwise the histogram is not
re-written, it adds up the
amplitudes of all events => no
good fit)



Variable Distribution

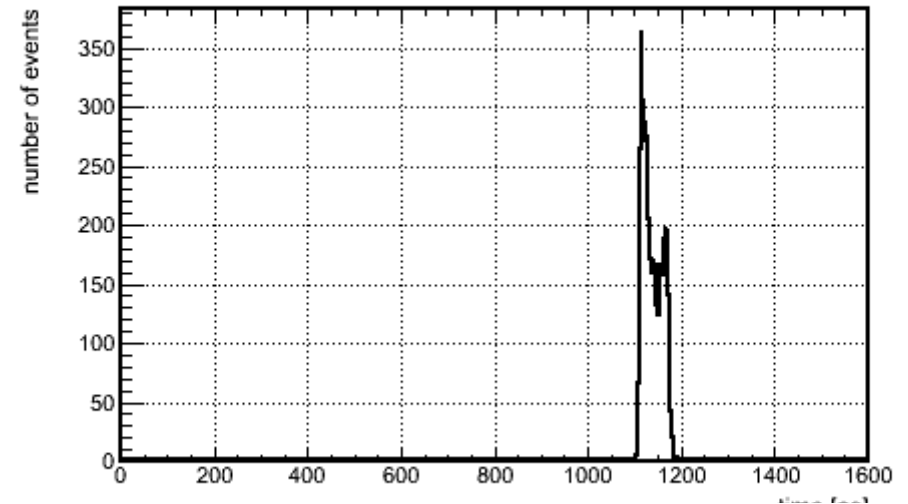
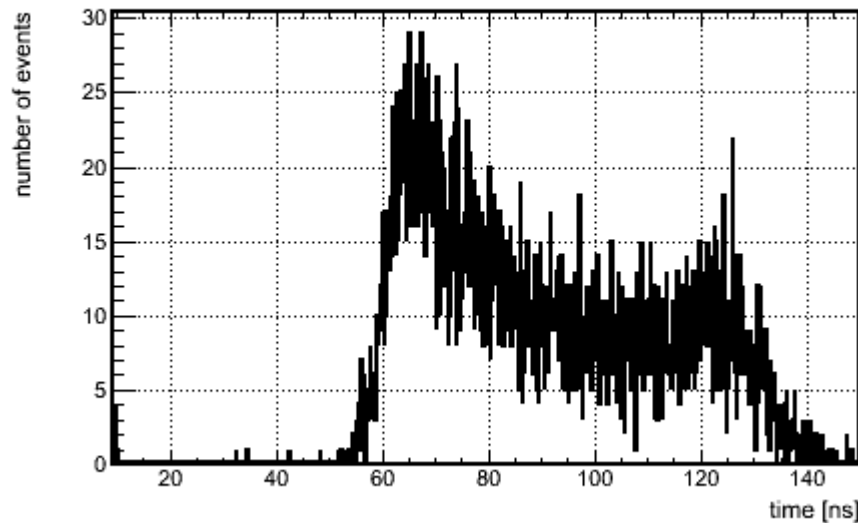
$$A = s(t = \tau) = -V_0 \exp(-1) = (\text{Max_Signal} - \text{Mean_BL}) / \exp(-1)$$

Start time of the signal – appears to be a narrow distribution around ~1050 ns

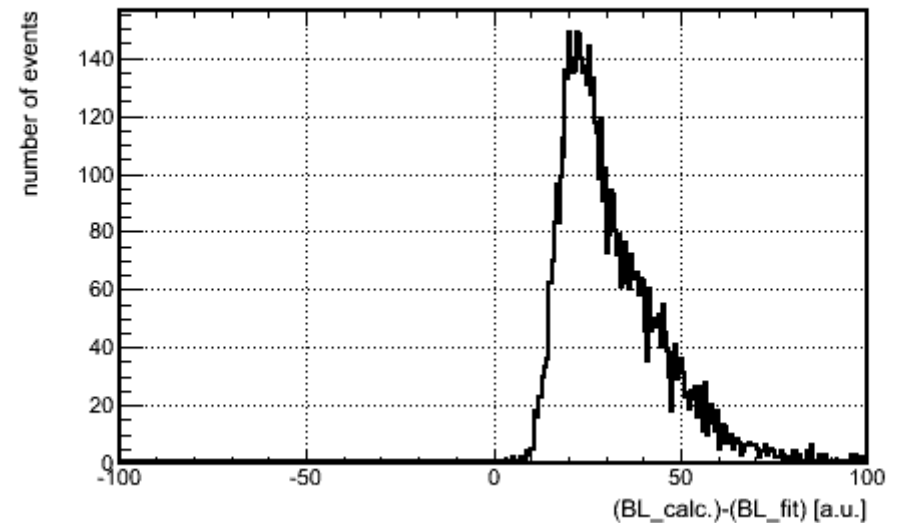


Variable distribution

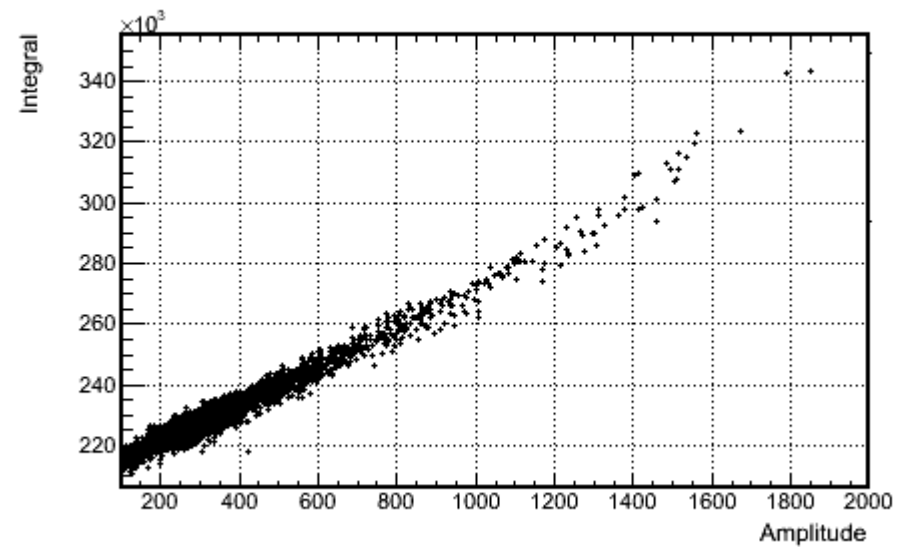
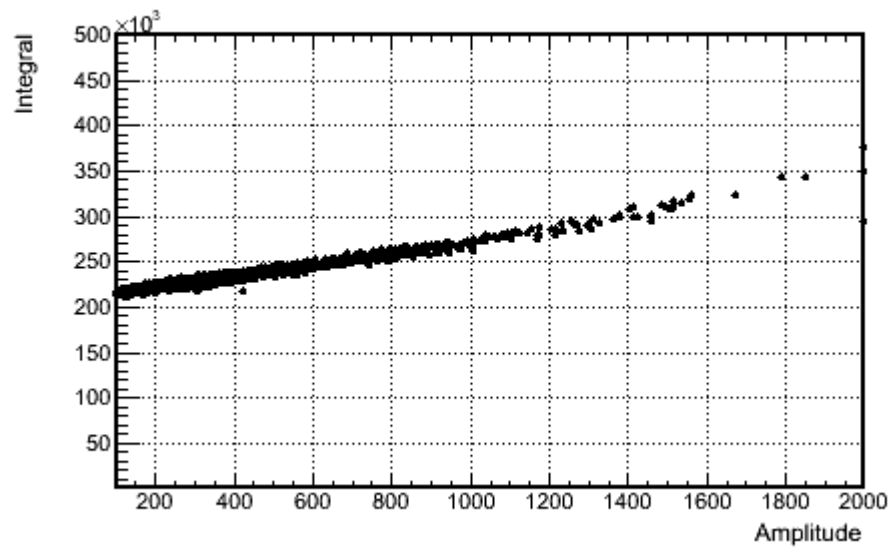
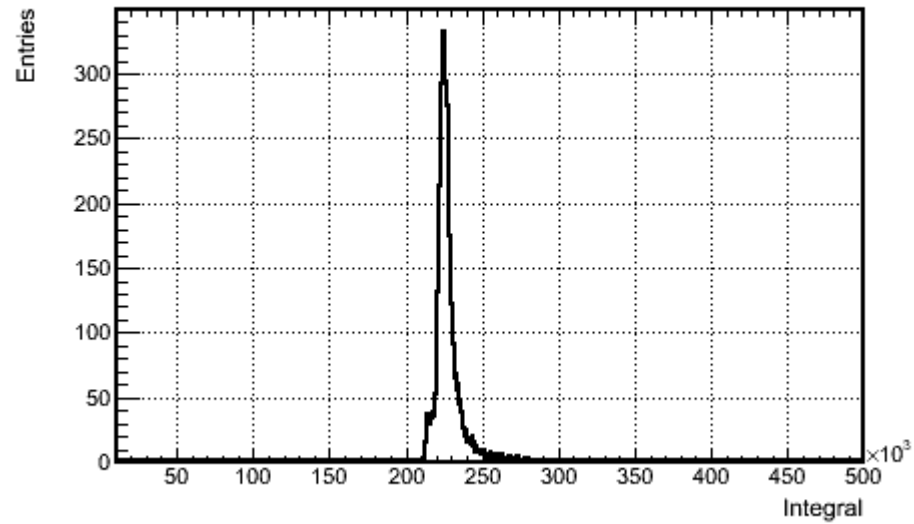
???? The rising time of the signal appears to have two peaks!!
This reflects in the distribution of PeakTime



BL_calc -BL_fit not centered around 0!!

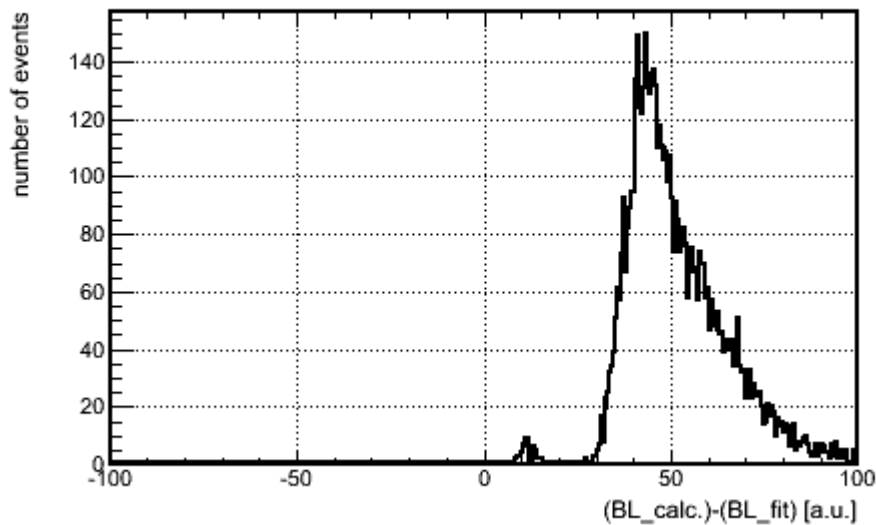


Integral



Baseline calculation

If I use only 10 samples to average the baseline



20 samples

