Testbeam analysis – integral method

Eliza Teodorescu, IFIN-HH
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Integral method - reminder

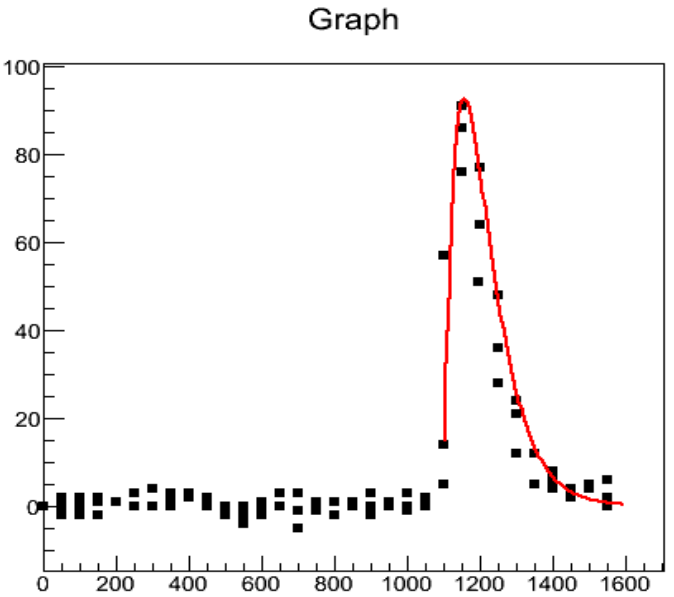
Estimate the SNR using the integral method
Use signal shape function to fit signals:

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

Use 7 samples to estimate the Baseline (the same as for signal integration)

In root: p[0] + p[1] * (x − p[2]) / p[3] * TMath :: Exp (−(x − p[2]) / p[3])

- p[0] : y-offset -> baseline
- p[1] : norm -> V0 * amplification
- x-p[2]: relative time -> p[2] = time when signal (fit) starts
- p[3] : -> time constant (τ), shaping time

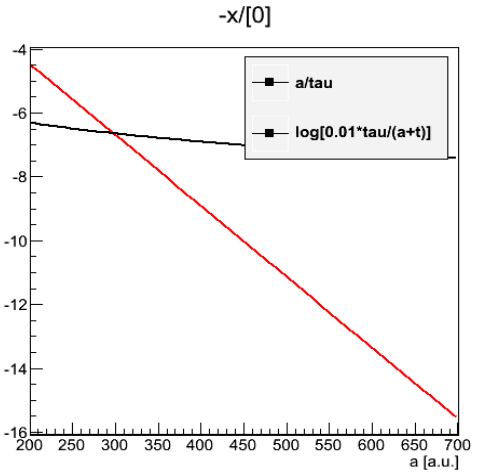


Area under the curve:

$F(a) = V_0\,(\exp(-a/\tau)(a+\tau) - \tau)$

a = integration window:

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

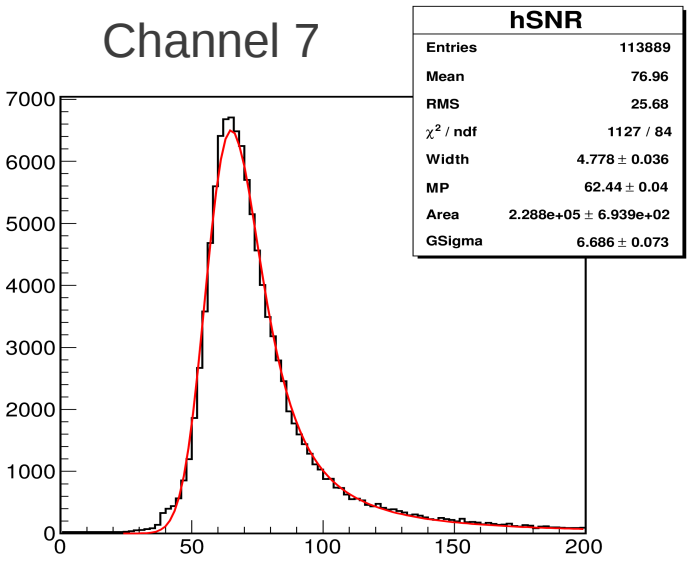


SNR distributions for all channels

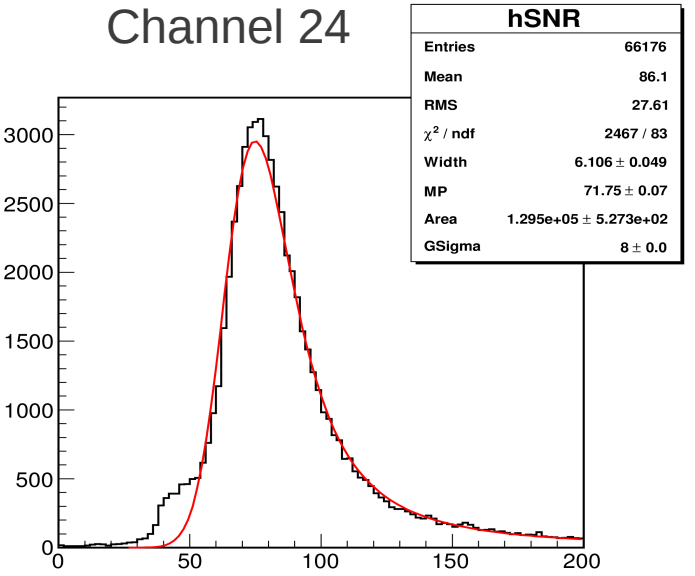
Use all available statistics:
- for each channel – collected 4 runs (~50.000 events)

For each event, the integral is calculated and SNR is estimated
The distribution of SNR is plotted for all events in the 4 runs of each channel and fitted with Landau+Gauss
The most probable value of SNR for each channel is extracted

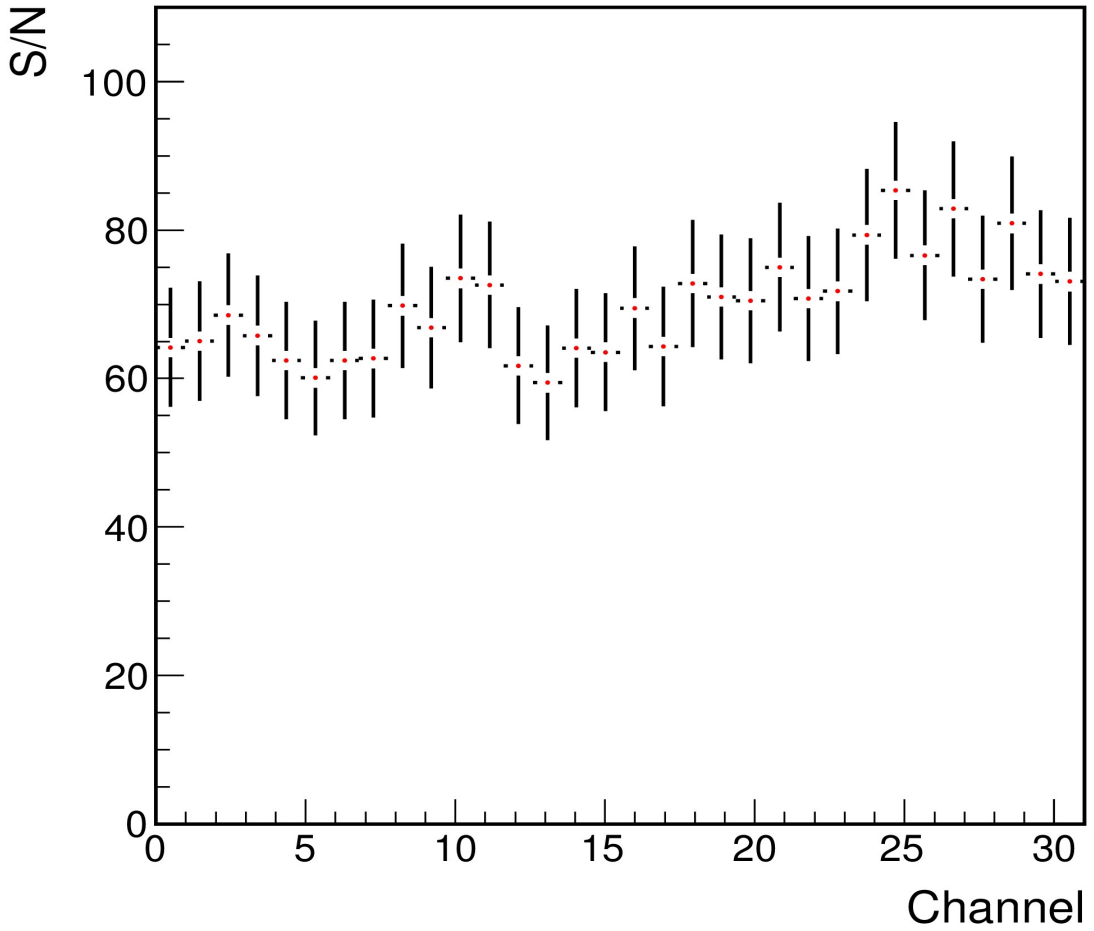
Channel 7



Channel 24



SNR distributions for all channels

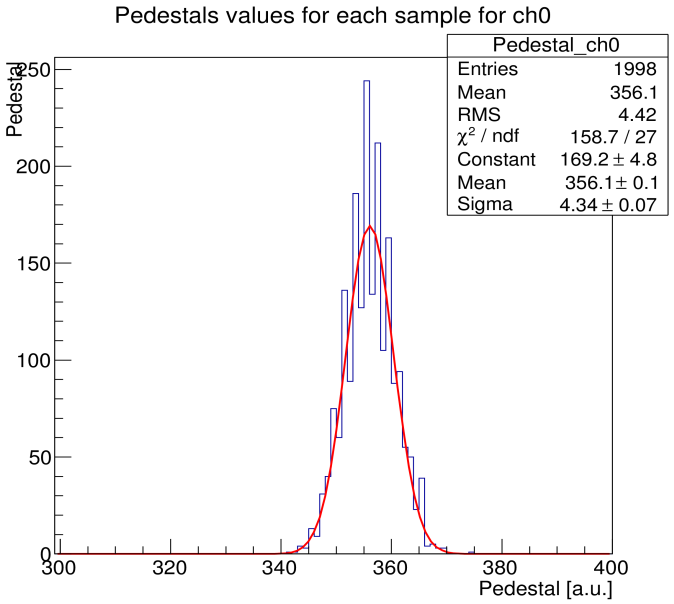


Pedestal Sigma vs. Integration Window

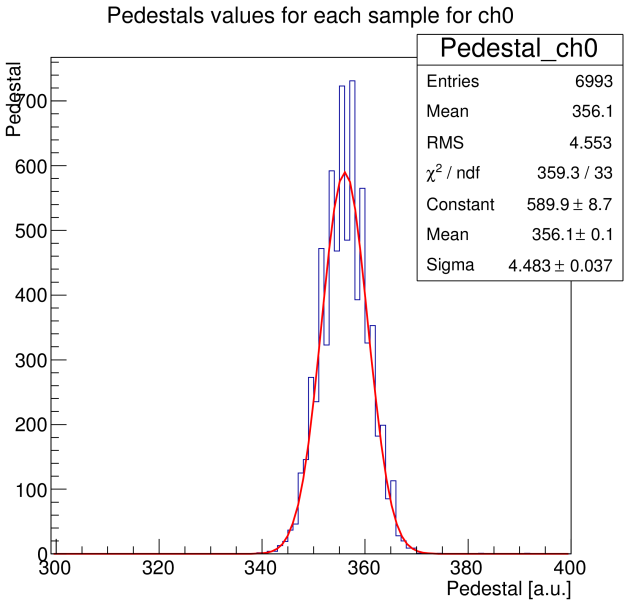
Use different number of samples to extract the baseline

- 2 samples (100 ns)
- 7 samples (350 ns = 100% of the signal)
- 20 samples (1000 ns)

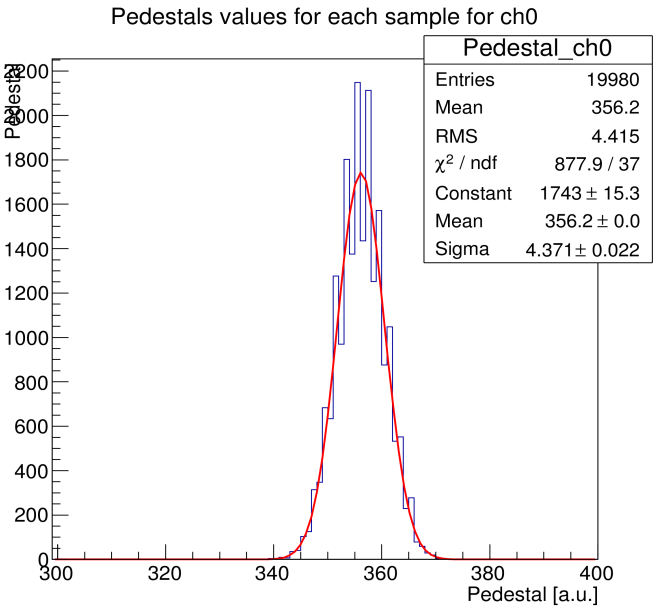
Fit with Gauss and extract mean and sigma



2 samples

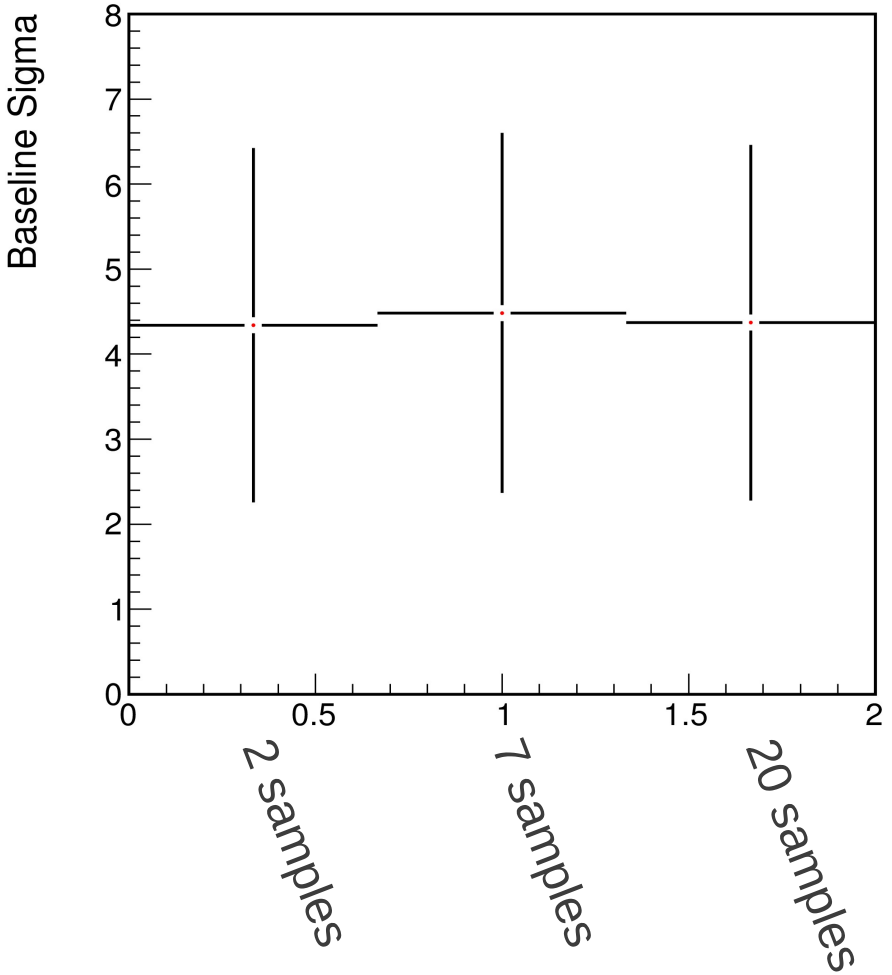


7 samples



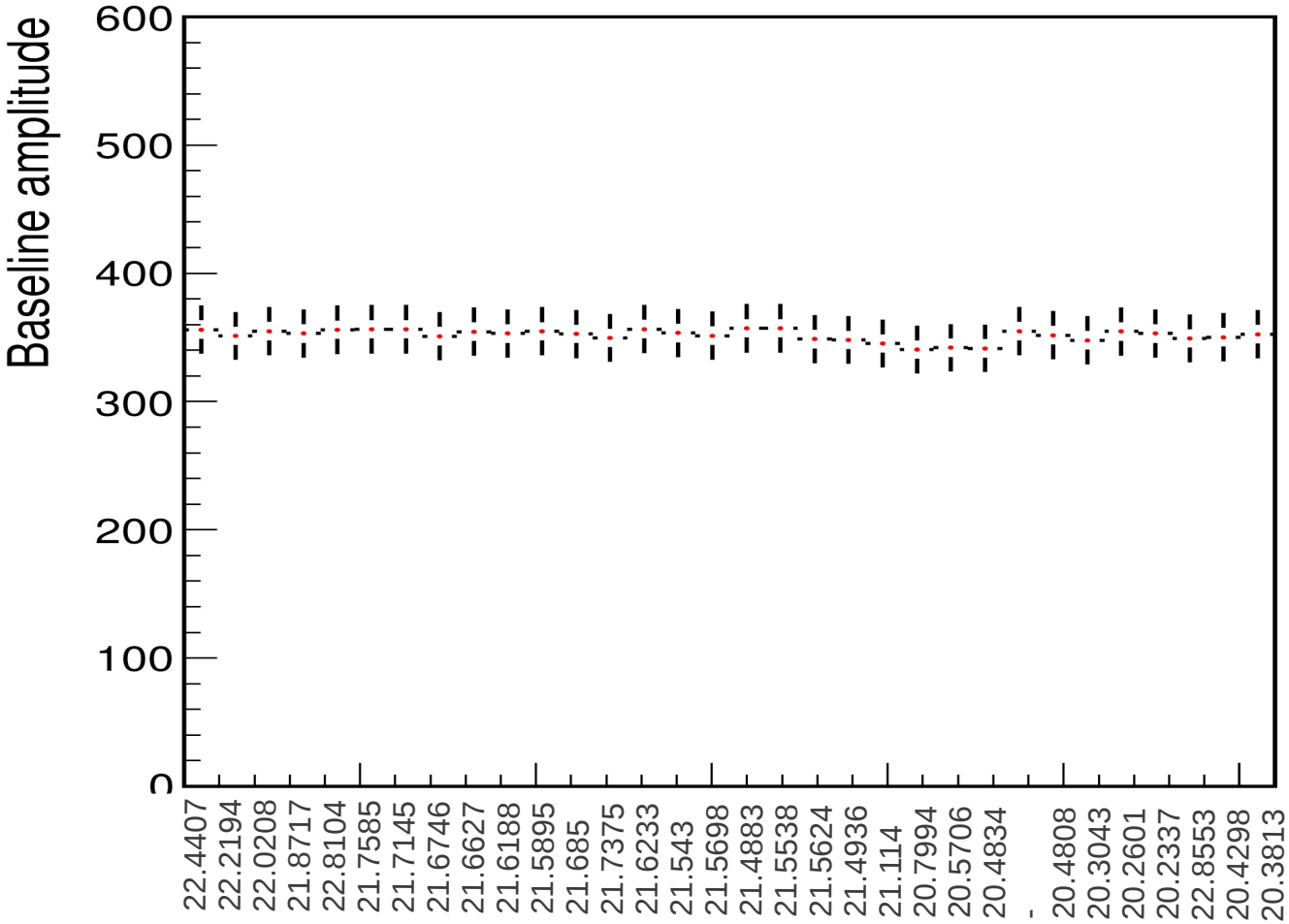
20 samples

Pedestal Sigma vs. Integration Window



Baseline variation with respect to temperature

From Gauss fit – extracted the baseline mean (took into account all 4 runs for each ch)
From temperature files – calculated the mean temperature for all 4 runs of each channel
On x axis → each bin represents one channel and the mean temperature is listed



Thank you for your attention!