LED signal injection

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Outline

PURPOSE Test the dependence of the output signal as a function of the CASIS Time injecting a signal thought a LED

METHOD Inject signal using a two different LEDs (**old red** and **new blue**), changing *amplitude and duration of the pulse*.

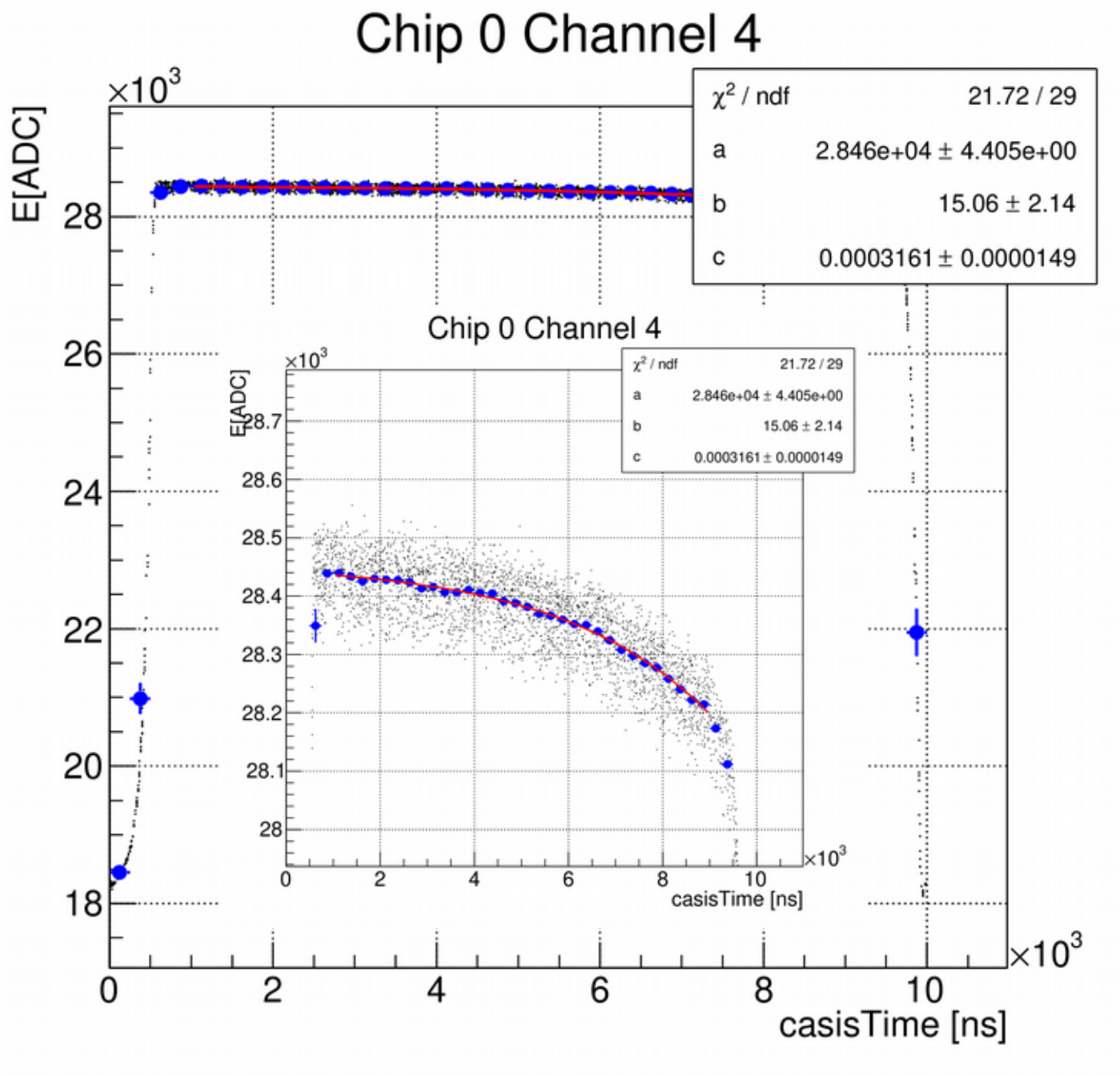
SETUP Typical pulse amplitudes are **1.5-2 V** and **3.5-4.5 V**, whereas typical pulse durations are **150-300 ns**.

ANALYSIS Analysis is divided into three steps:

- we create a graph of Signal vs casisTime
- we extract the profile of Signal vs casisTime
- we fit it using $y = a-b*e^{cx}$ in the range [1, 9] μs

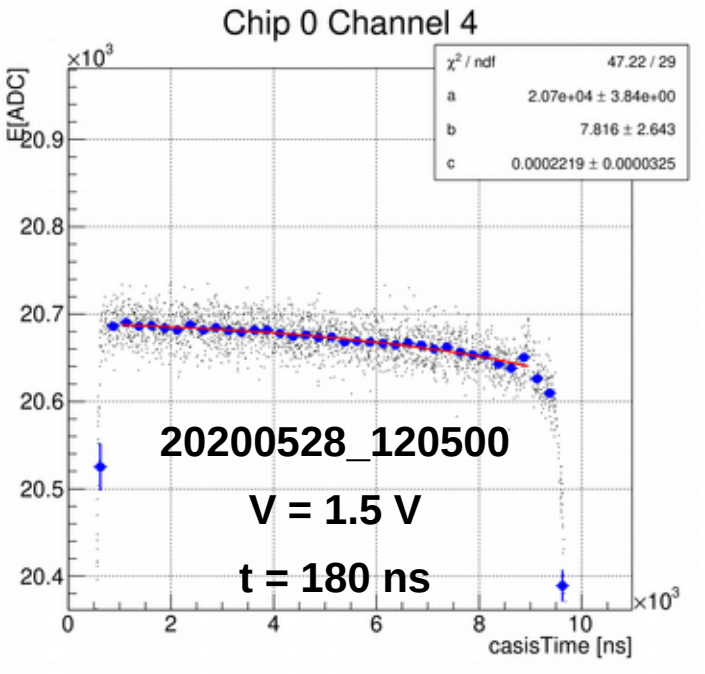
$y = a - b * e^{cx}$

An Example



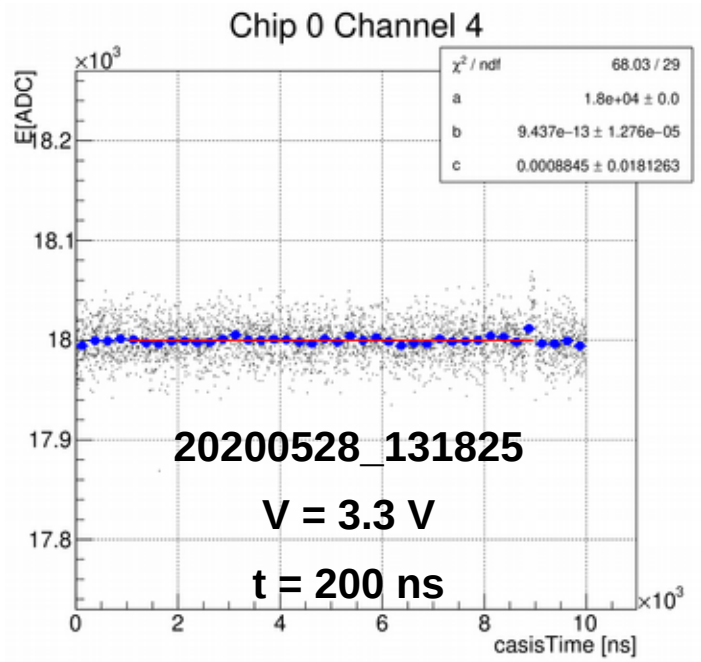
Red LED

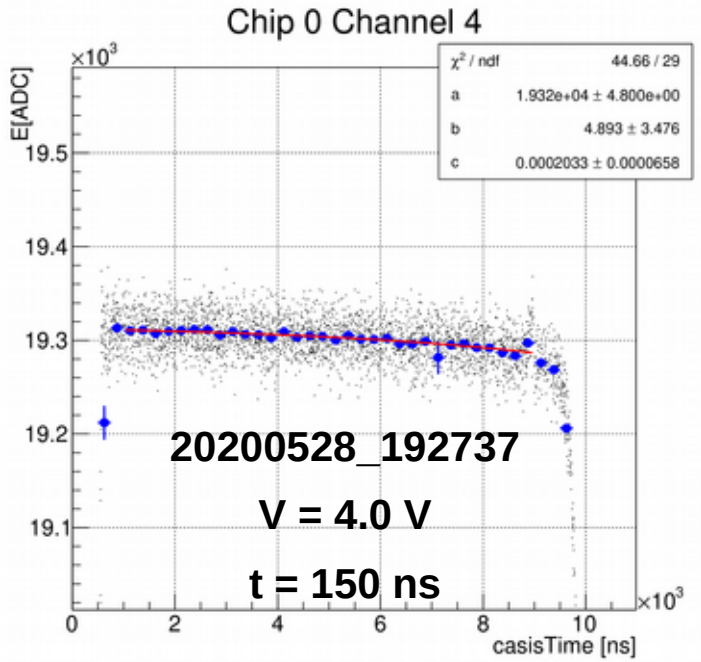
$y = a - b * e^{cx}$

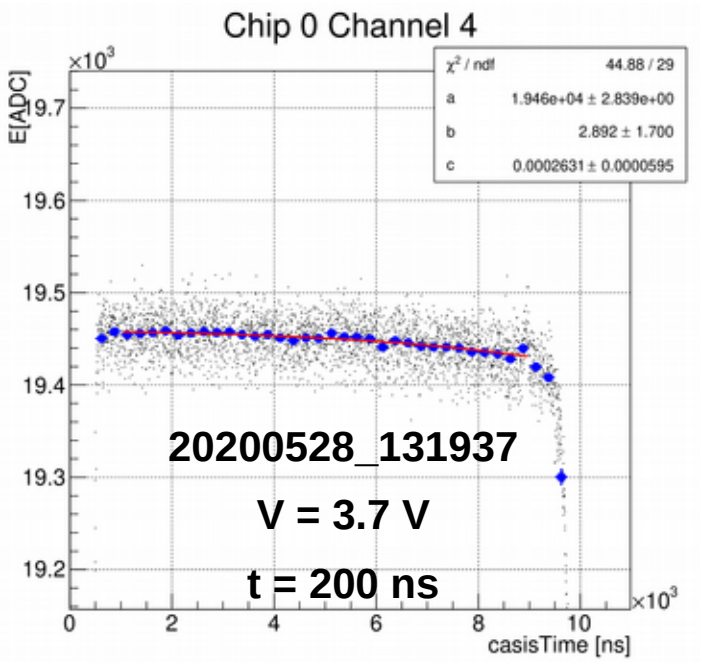


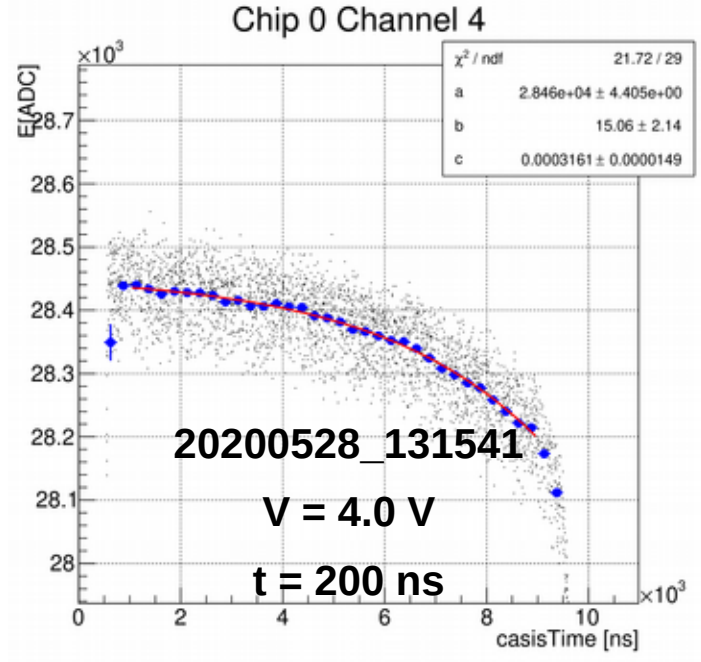
Blue LED

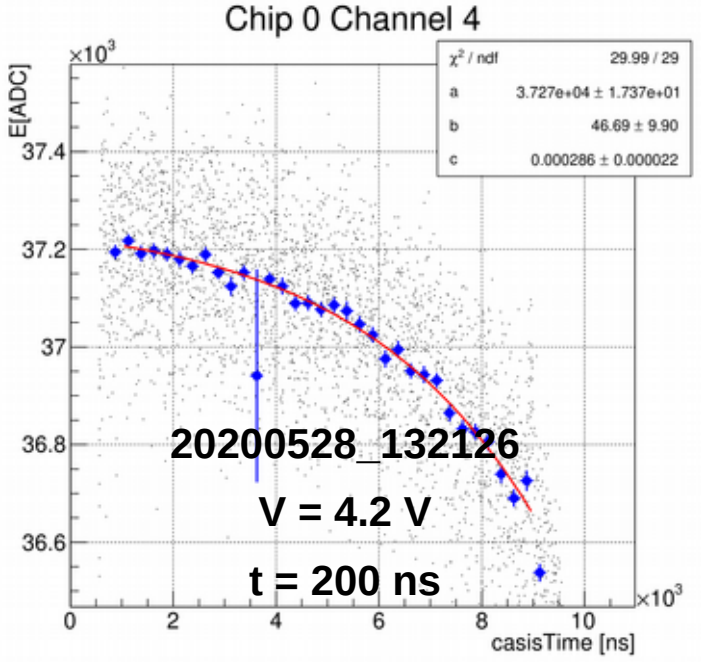
$y = a - b * e^{cx}$

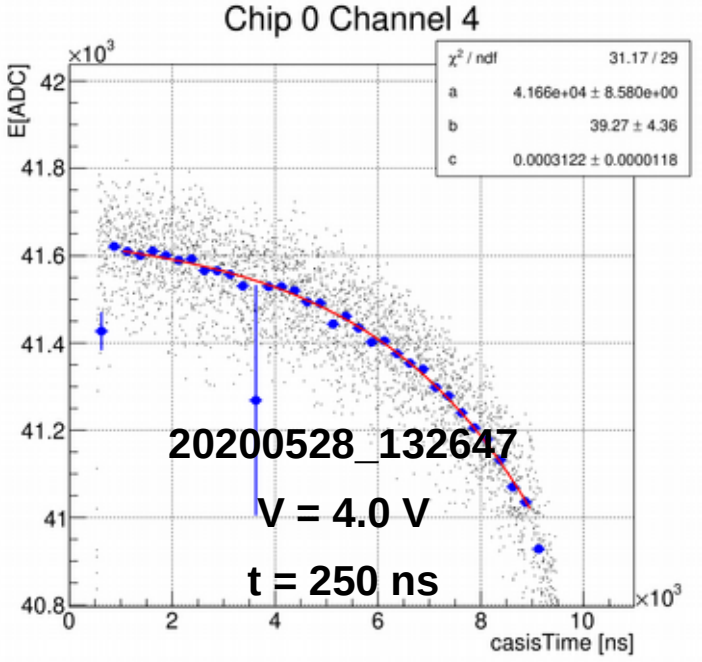








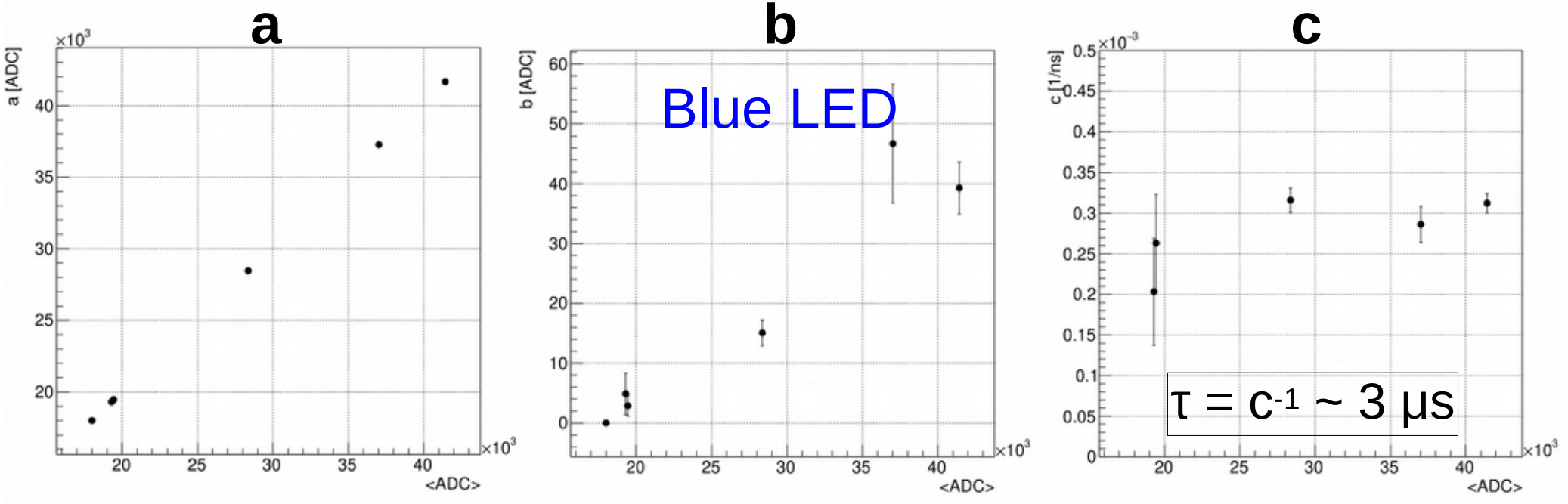




Parameters

$y = a - b \cdot e^{cx}$

The effect seems to be dependent not only on V or only on t, but on the total light signal injected in the system.



Parameters are ordered according to the average signal value in the range [1, 9] μs.

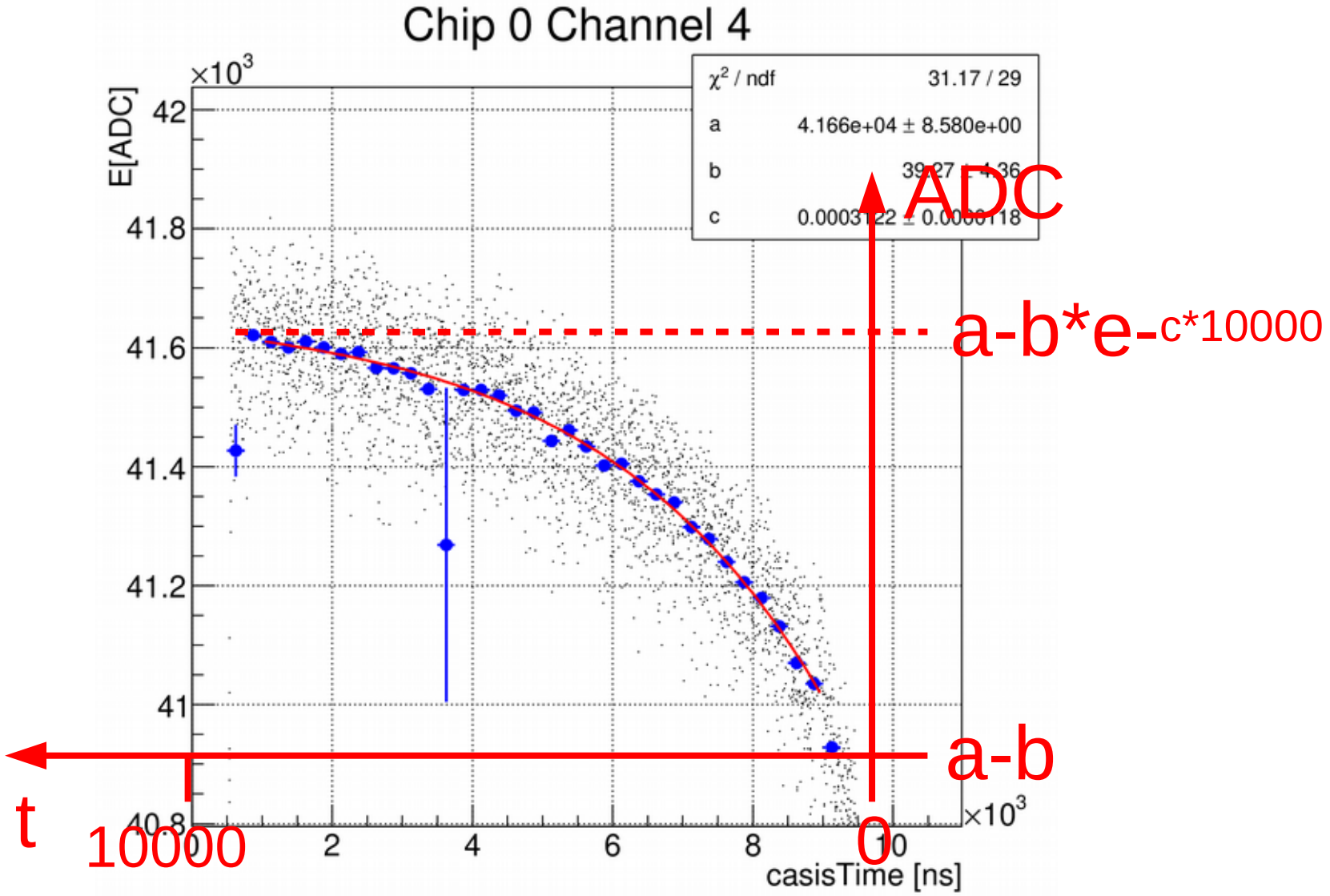
What we see in our plot is the integral of the signal

High casisTime means low integration time

This is equivalent to inverting the time scale

Interpretation

$y = a - b*e^{cx}$ → $ADC = a - b*e^{c*(t-10000)}$



Summary

Using a LED to inject signal in the PD, we found a dependence of Signal as a function of casisTime.

This dependence is particularly evident for high values of the amplitudes/times of the LED signal.

A general behavior of the output *Signal **ADC*** as a function of *casisTime **t*** was found as follows:

$$ADC = a - b * e^{c*t}$$

$$\tau = c^{-1} \sim 3\ \mu s$$