

$$\text{Analog signal} = A \cdot t \cdot e^{-\frac{t}{\tau}}$$

$$\text{threshold} = A \cdot \frac{\tau}{e}$$

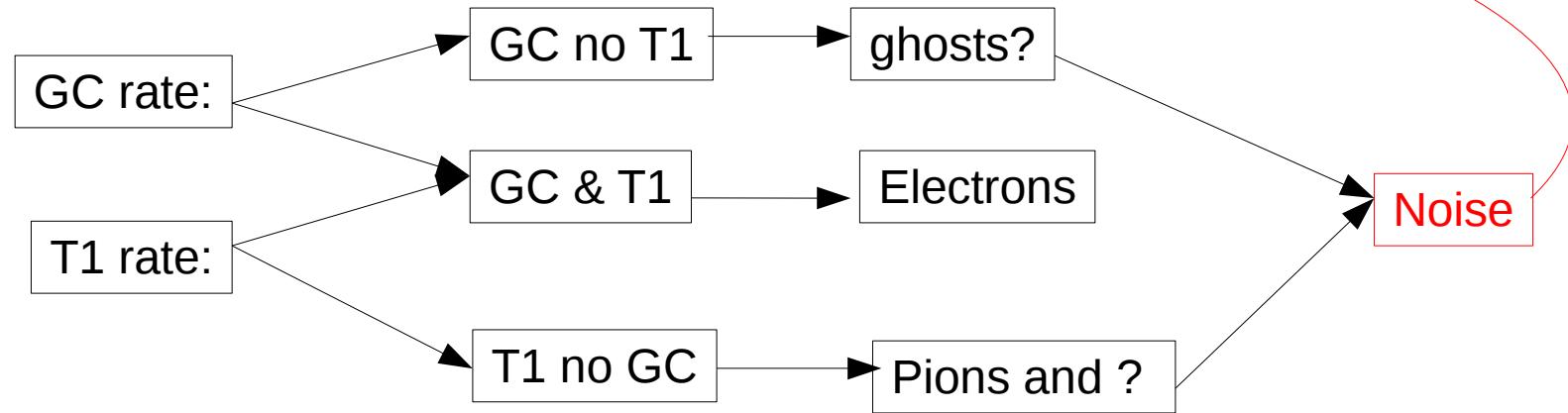
$$\text{cut on ADC} = k \int A \cdot t \cdot e^{-\frac{t}{\tau}} = k \cdot A \cdot \tau^2$$

$$\begin{aligned} A_{ps} \cdot t_{ps} + A_{sh} \cdot t_{sh} &> \text{const} \\ \text{ADC}_{ps} = k \cdot A_{ps} \cdot t_{ps}^2 \\ \text{ADC}_{sh} = k \cdot A_{sh} \cdot t_{sh}^2 \end{aligned}$$

$$\longrightarrow \text{ADC}_{ps} \cdot t_{sh} + \text{ADC}_{sh} \cdot t_{ps} > \text{const}$$

## The Theory

Assumption: Noises are random, i.e. independent of the real physics signal



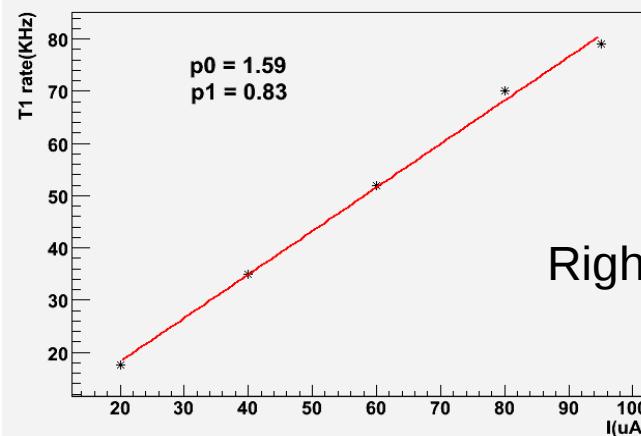
Theory:

$$\begin{aligned} \text{Deadtime(group)} = & R_{T1.no.GC} \times (W_{T1in} - W_{T1out}) \\ & + R_{GC.no.T1} \times (W_{GCin} - W_{GCout}) \\ & + R_{group} \times W_{path} \end{aligned}$$

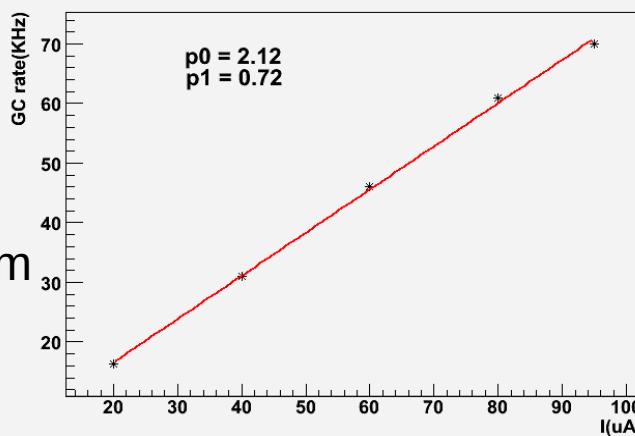
$$\text{Deadtime(global)} \approx R_{T1.no.GC} \times (W_{T1in} - W_{T1out})$$

$$+ R_{GC.no.T1} \times (W_{GCin} - W_{GCout})$$

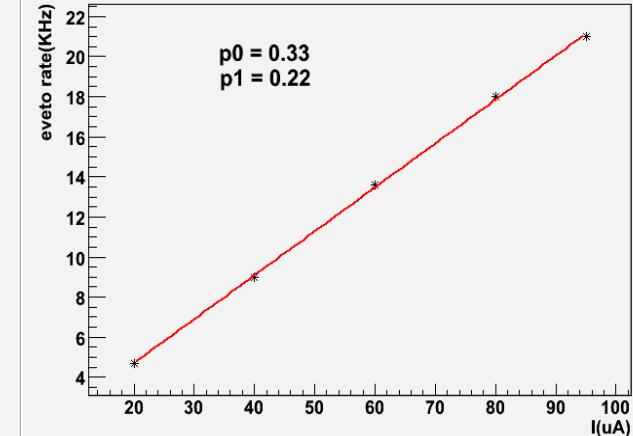
T1 rate vs I



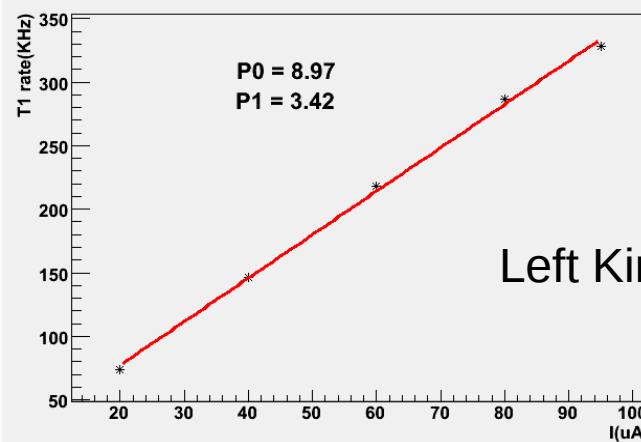
GC rate vs I



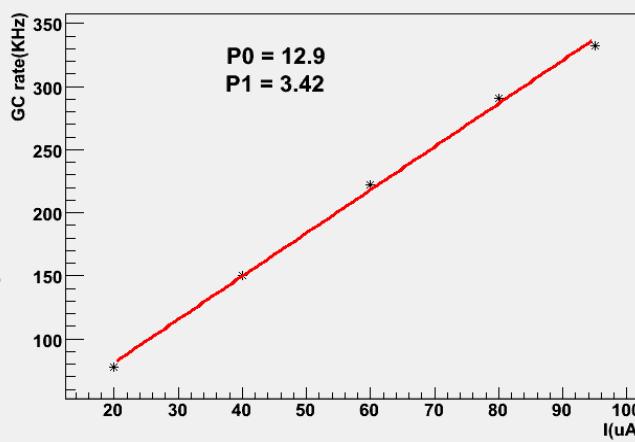
eveto rate vs I



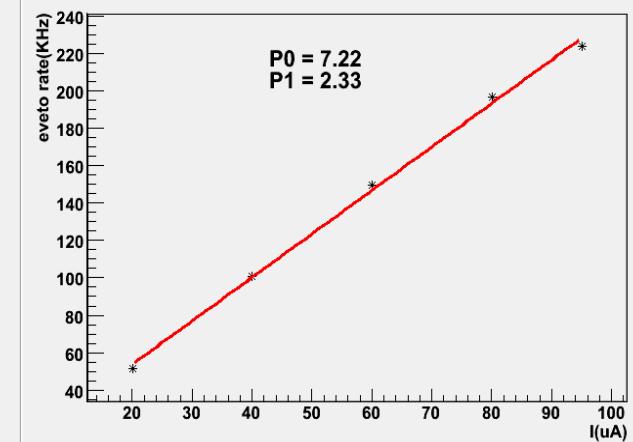
T1 rate vs I



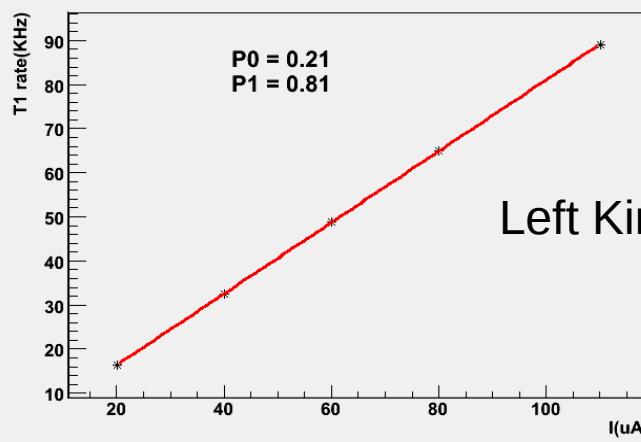
GC rate vs I



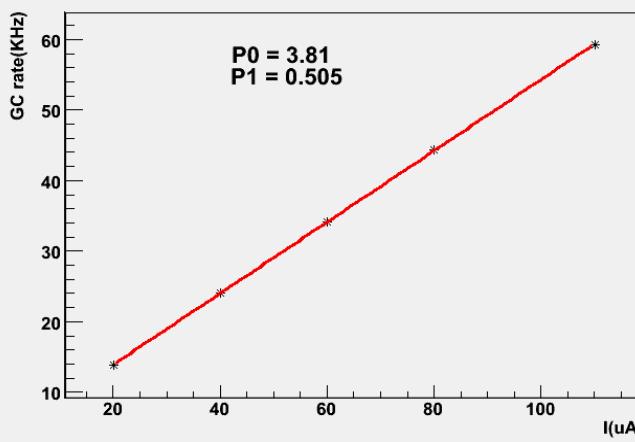
eveto rate vs I



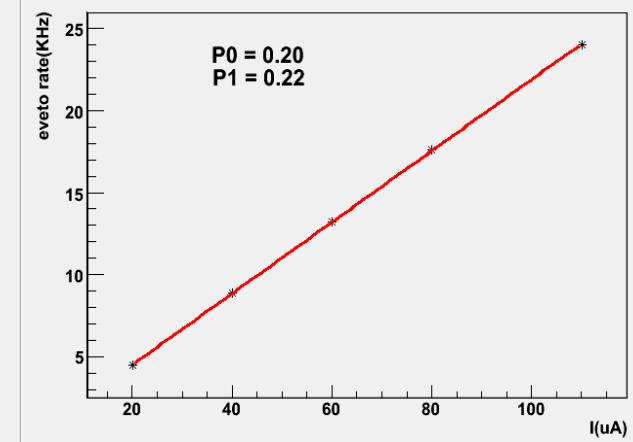
T1 rate vs I

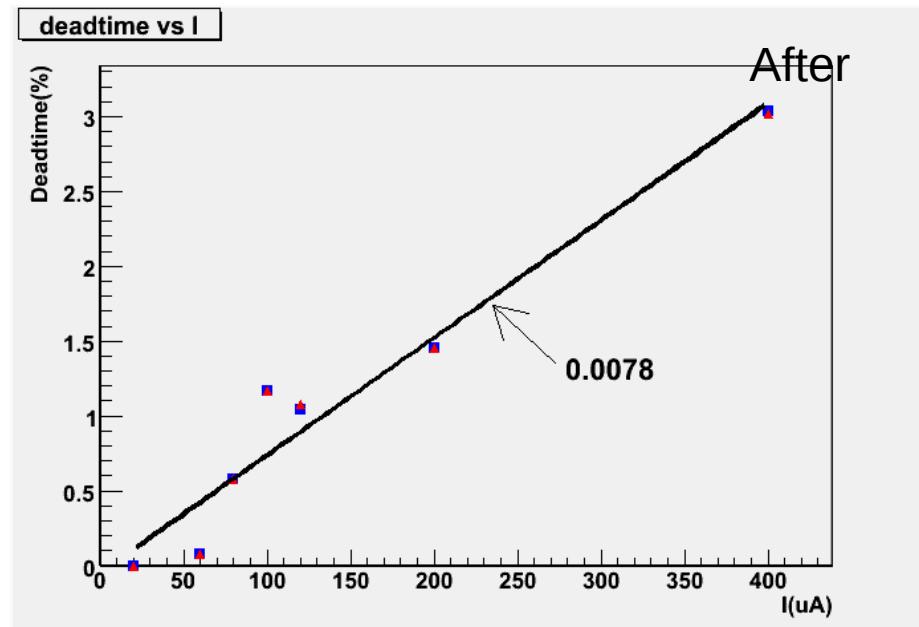
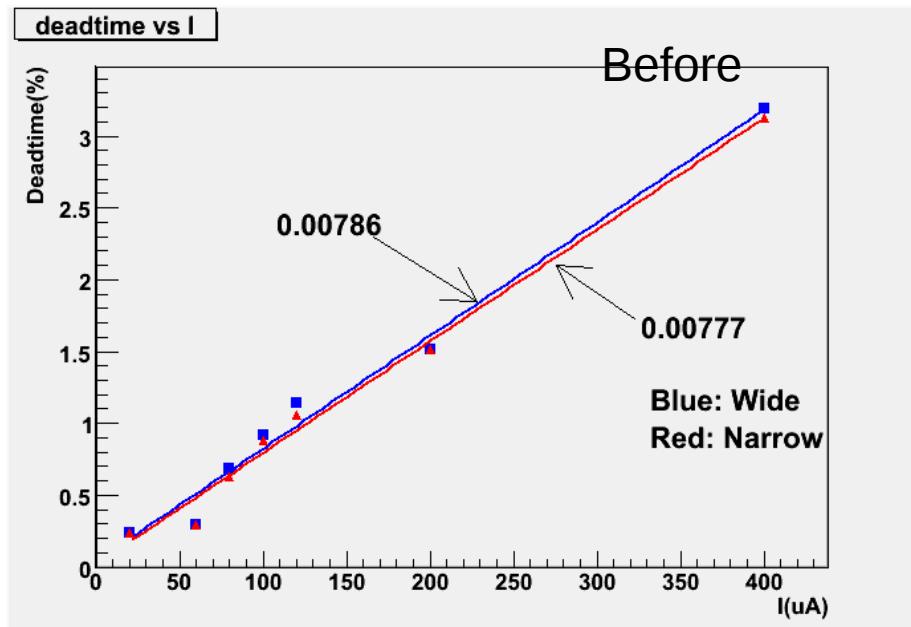


GC rate vs I



eveto rate vs I





$$(0.61 * (100 - 20) + 0.5 * (100 - 55)) * 1e-4 = 0.00713$$