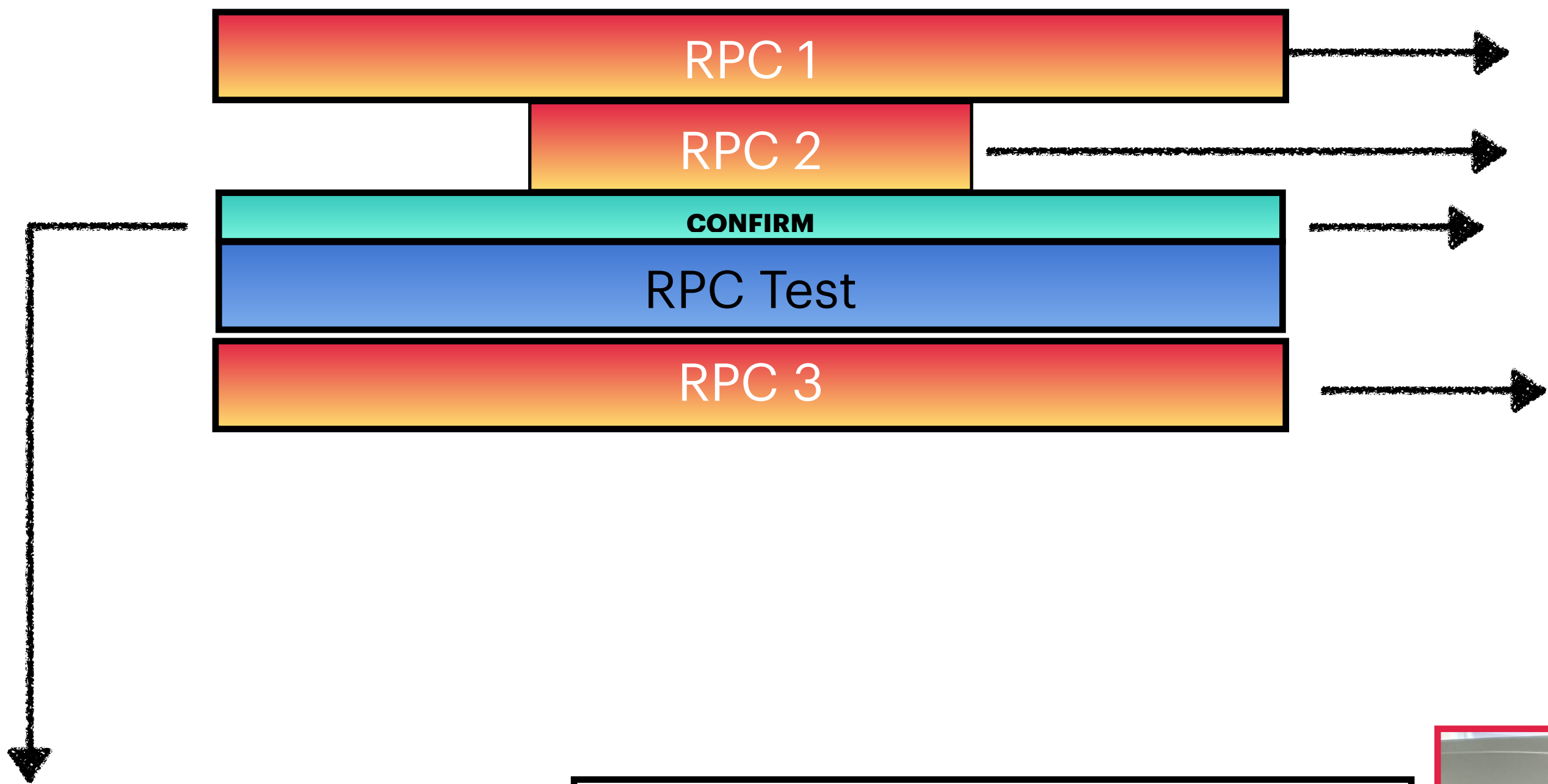
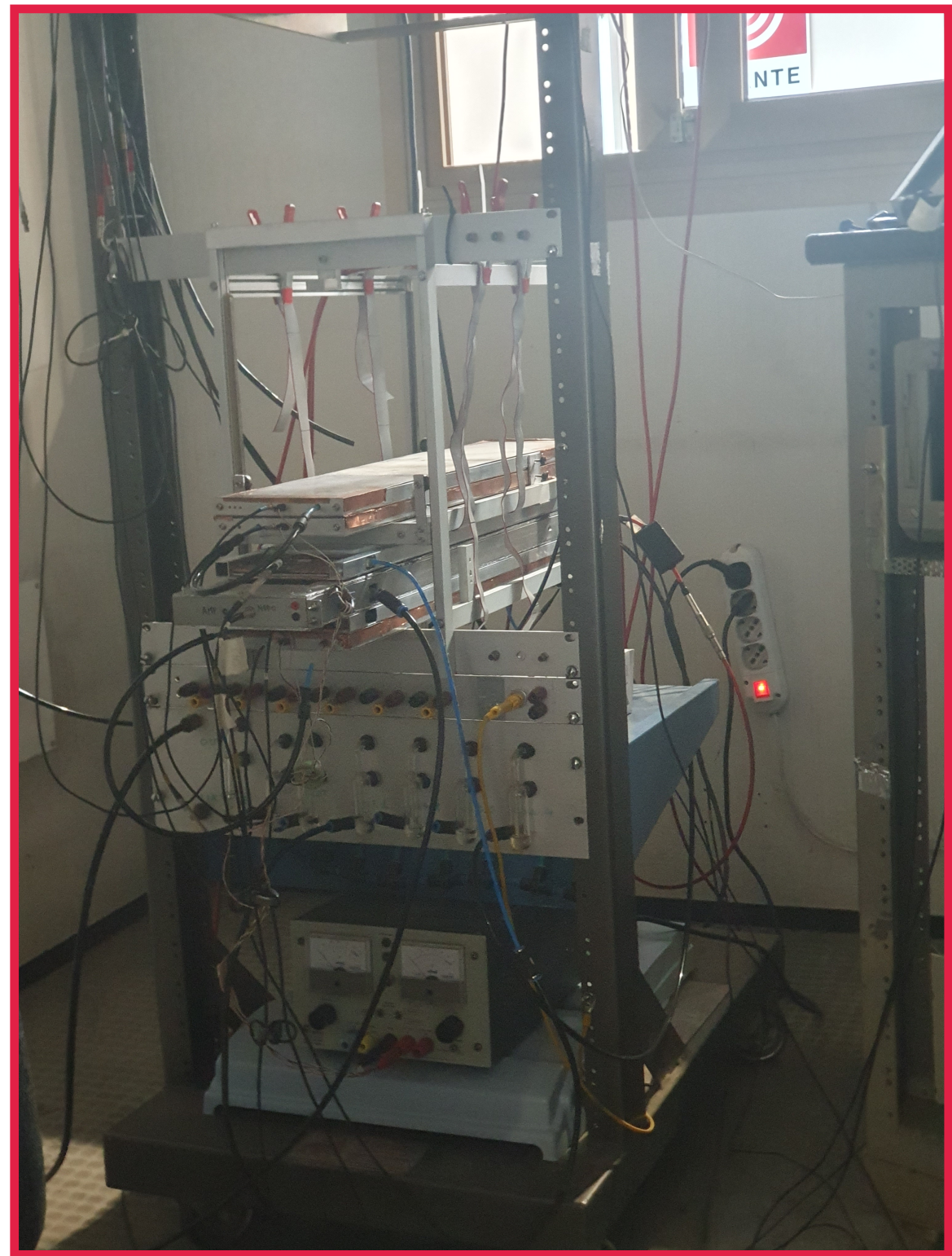


# ECO2 Results

**Giorgia Proto, Barbara Liberti**



# Experimental setup: Trigger and DAQ



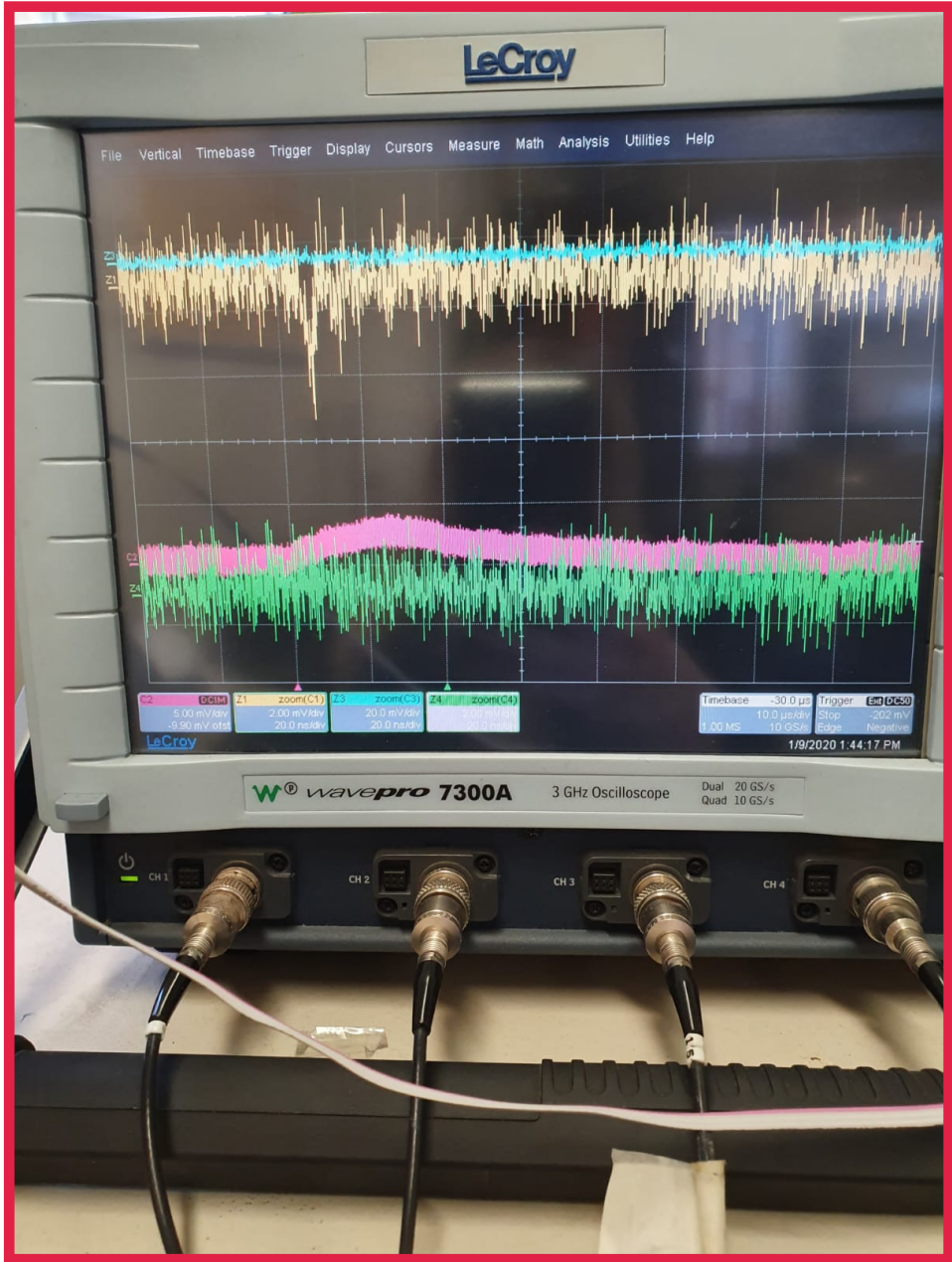
Amplified signals are discriminated and sent to the logic unit, which produces the logic AND

## Confirm chamber

- RPC (0.5 mm gas gap)
- Prompt amplified signal for the trigger
- Naked prompt signal for the time reference in the offline analysis

## Oscilloscope

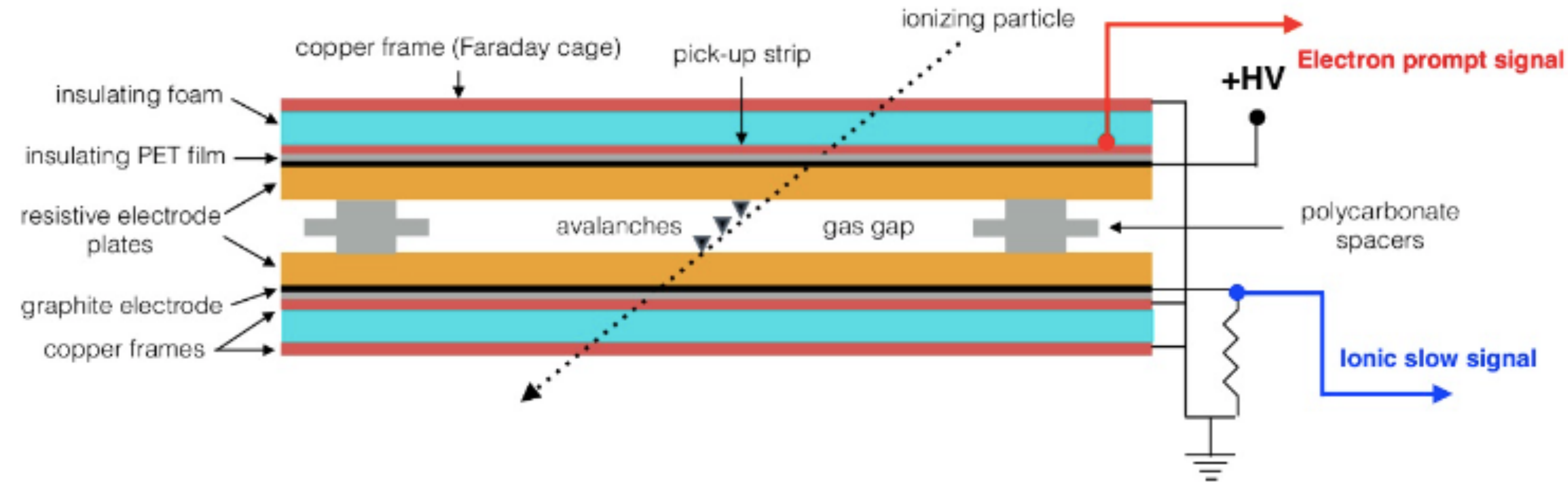
- Bandwidth: 3 GHz
- Sampling velocity : 20 Gs/s
- Acquired time window for the *prompt* signal = 200 ns
- Acquired time window for the ionic signal = 100  $\mu$ s





# Experimental setup: RPC chamber under test

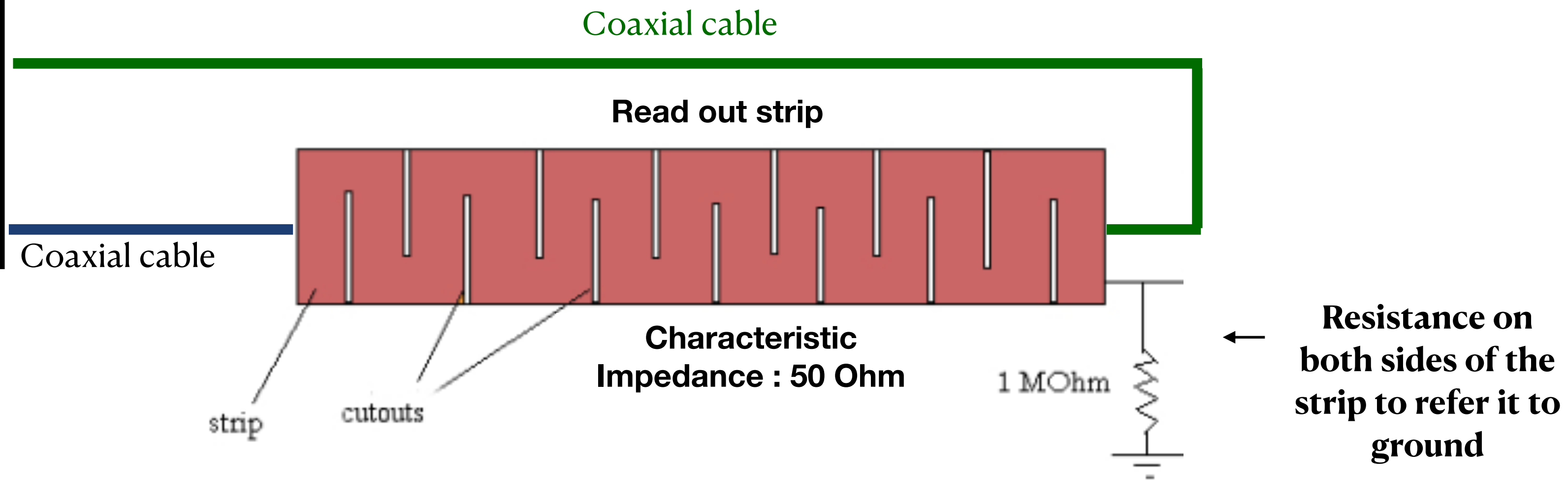
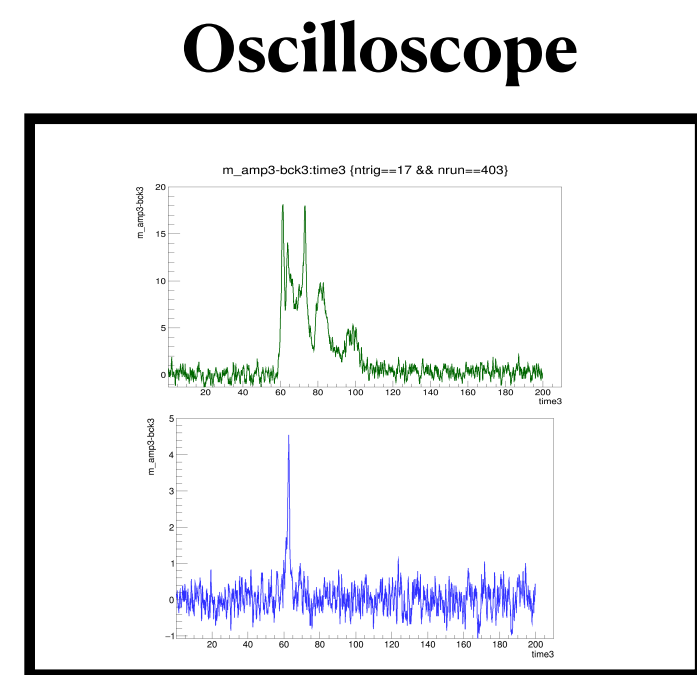
- Dimensions : 57 X 10 cm<sup>2</sup>
- Gas gap width = 2 mm
- Electrode thickness = 1.8 mm



Ionic signal : read out on a resistance on the ground graphite electrode equal to 10 kOhm

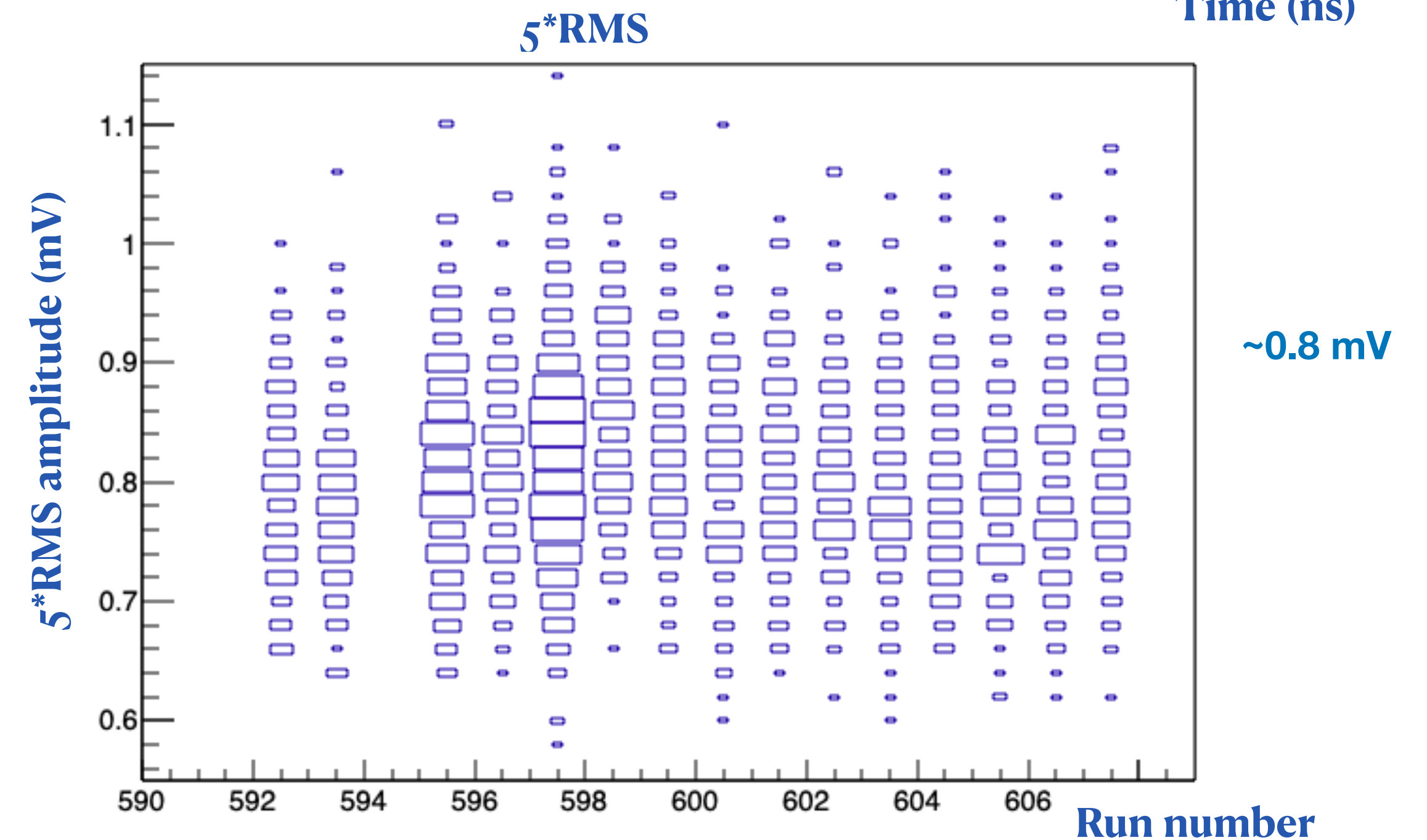
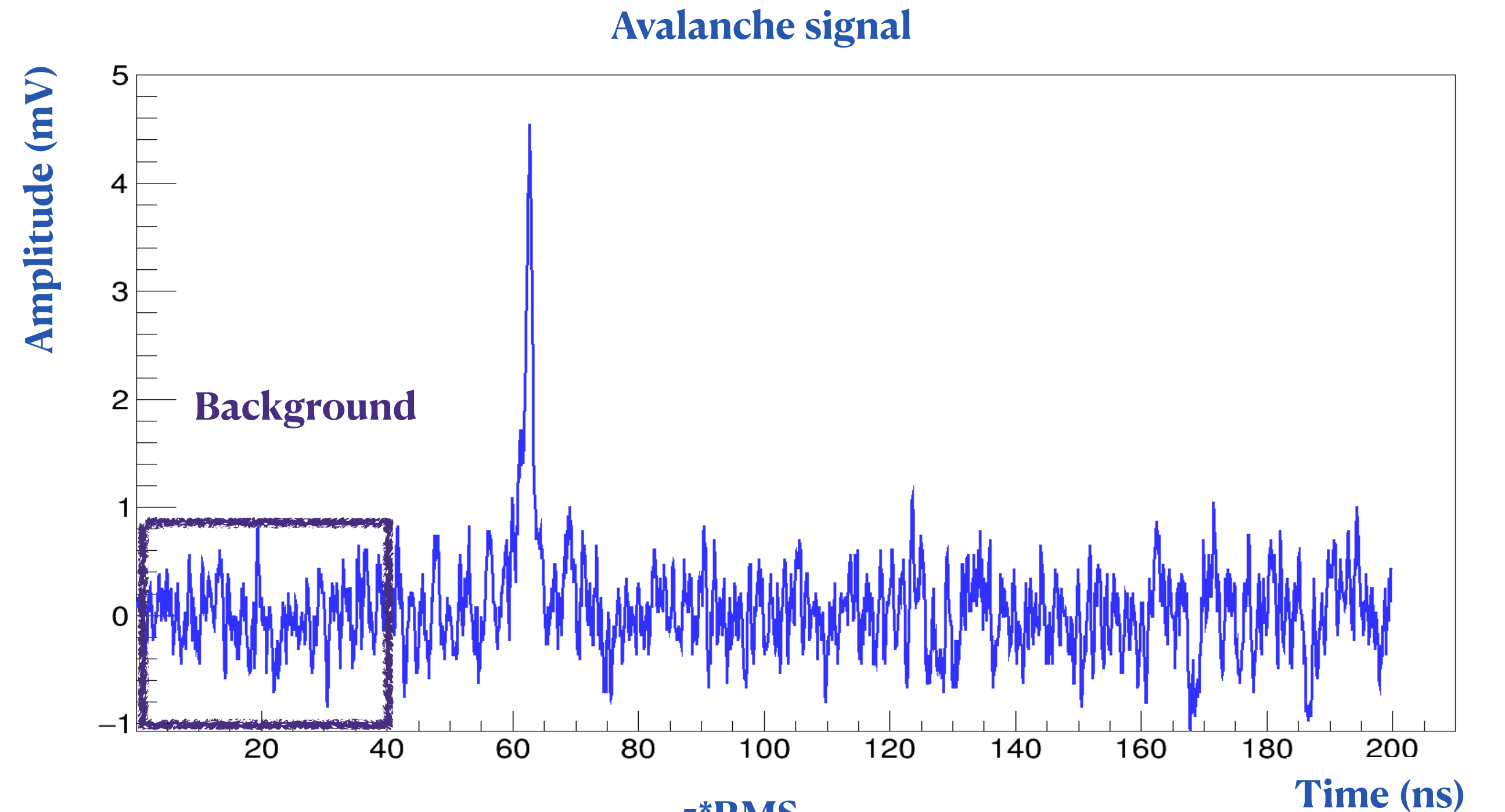
- Prompt signal **without amplification** for the streamer analysis
- Oscilloscope scale variable

- Prompt signal **without amplification** for the efficiency measurement
- Maximum oscilloscope sensitivity



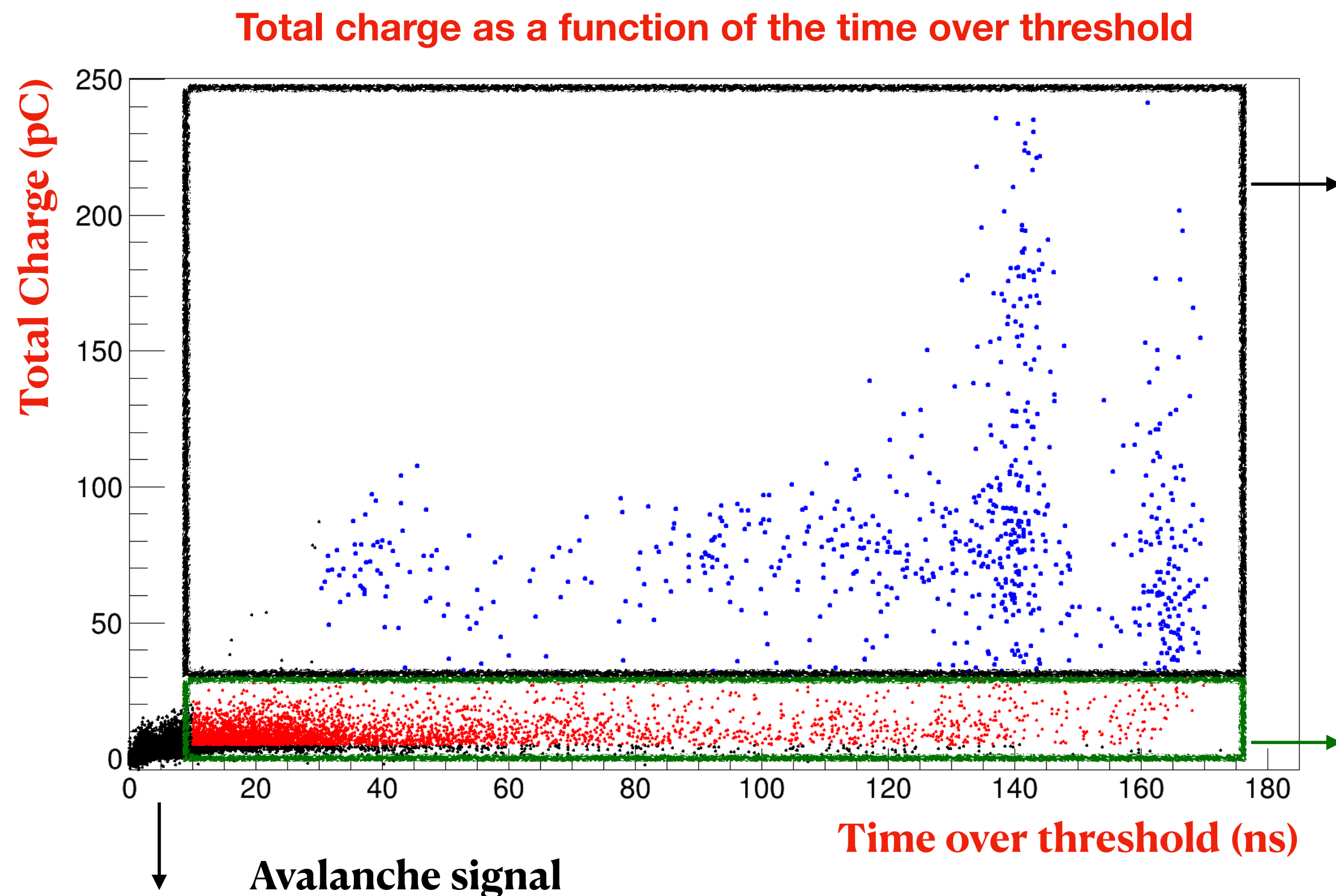
# Efficiency criteria

- signals which cross an amplitude threshold equal to the 5 Root Mean Square of the background window;
- The background is calculated in a time window of 40 ns which anticipates the avalanche signal;
- The average value of the RMS over all the HV scans is  $\sim 0.8$  mV
- Fixed threshold: 1.5 mV





# Streamer and extra charge definition

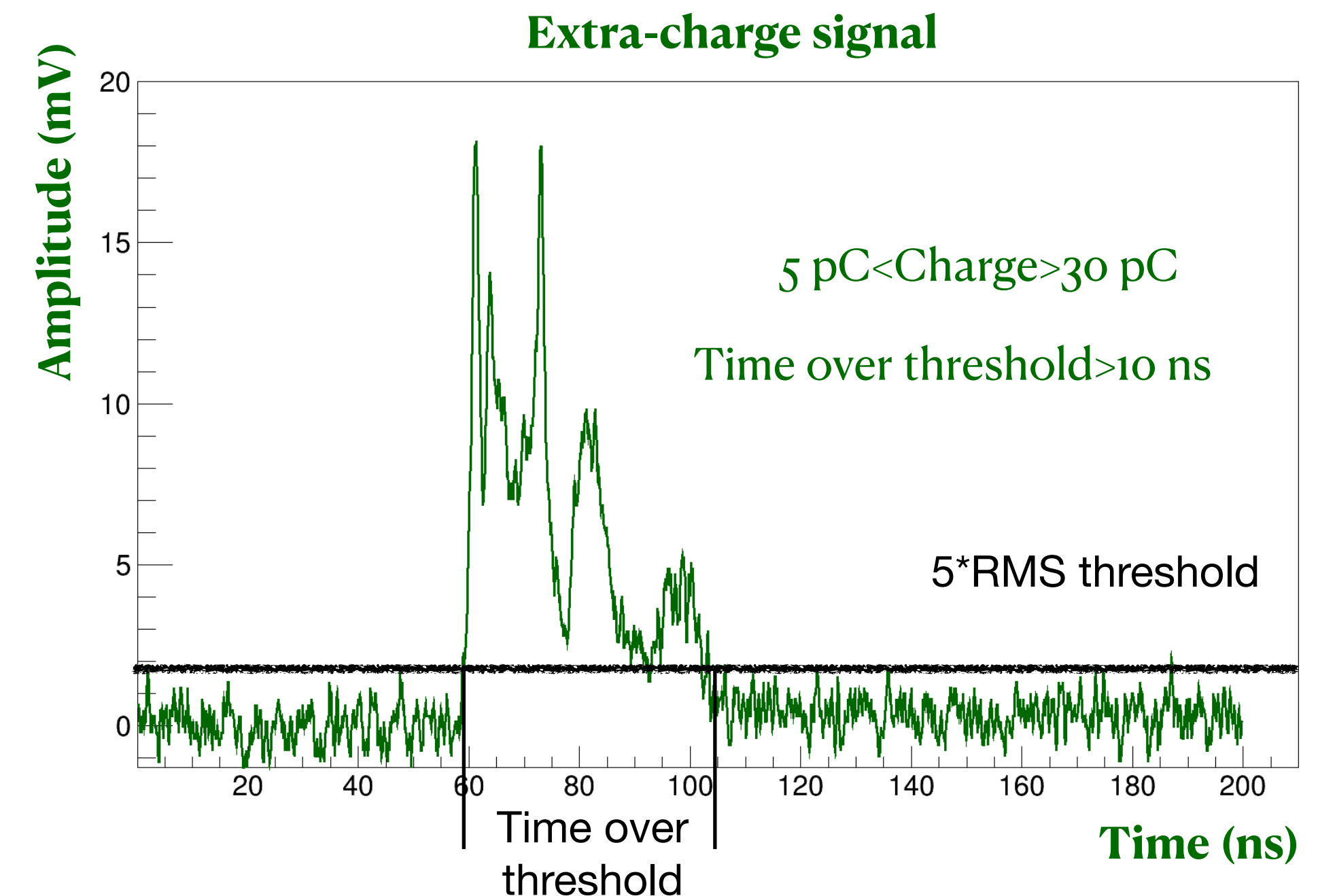
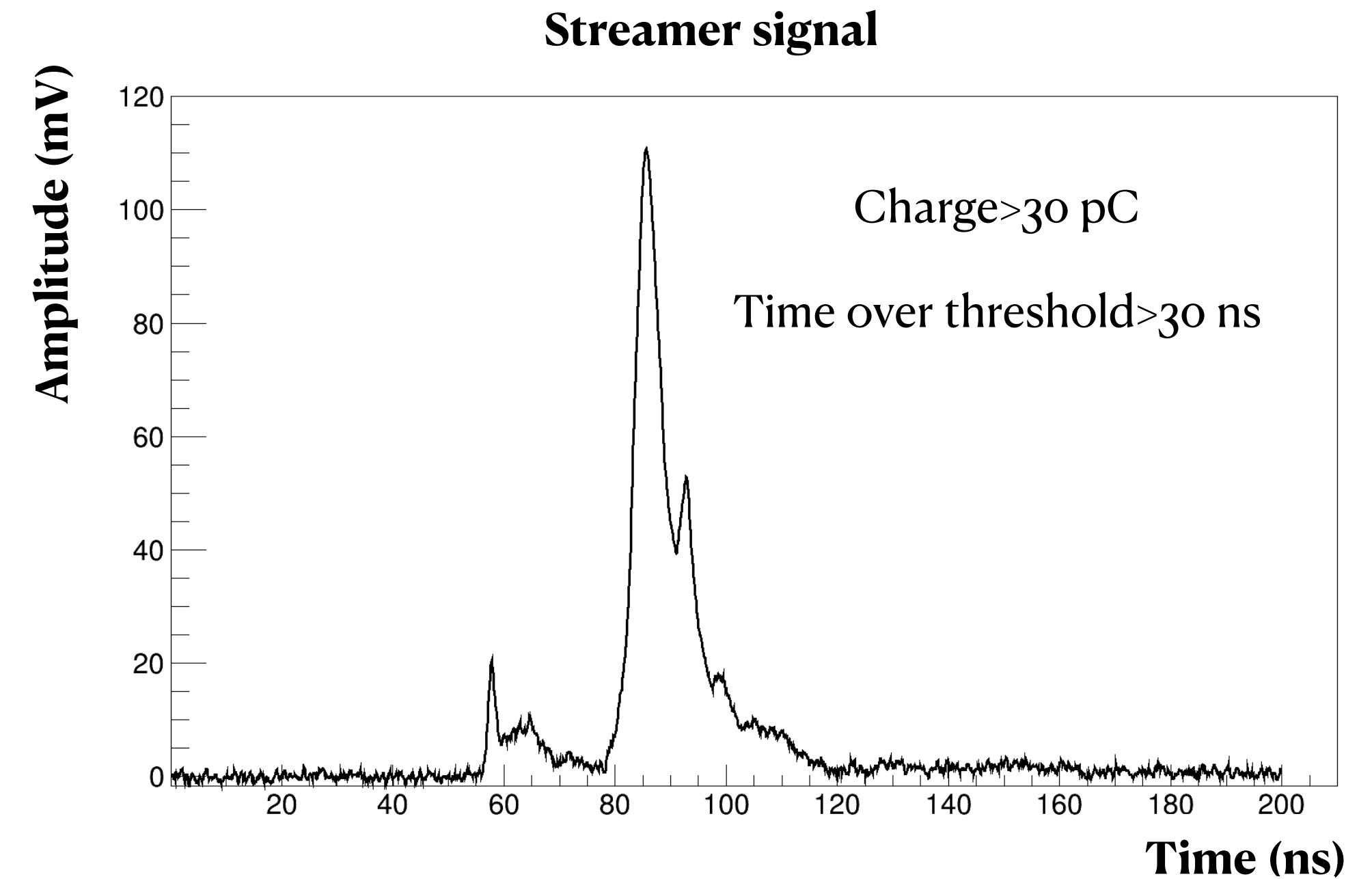


**Streamer:**  
signal with a charge content more than 30 pC and a time over threshold more than 30 ns

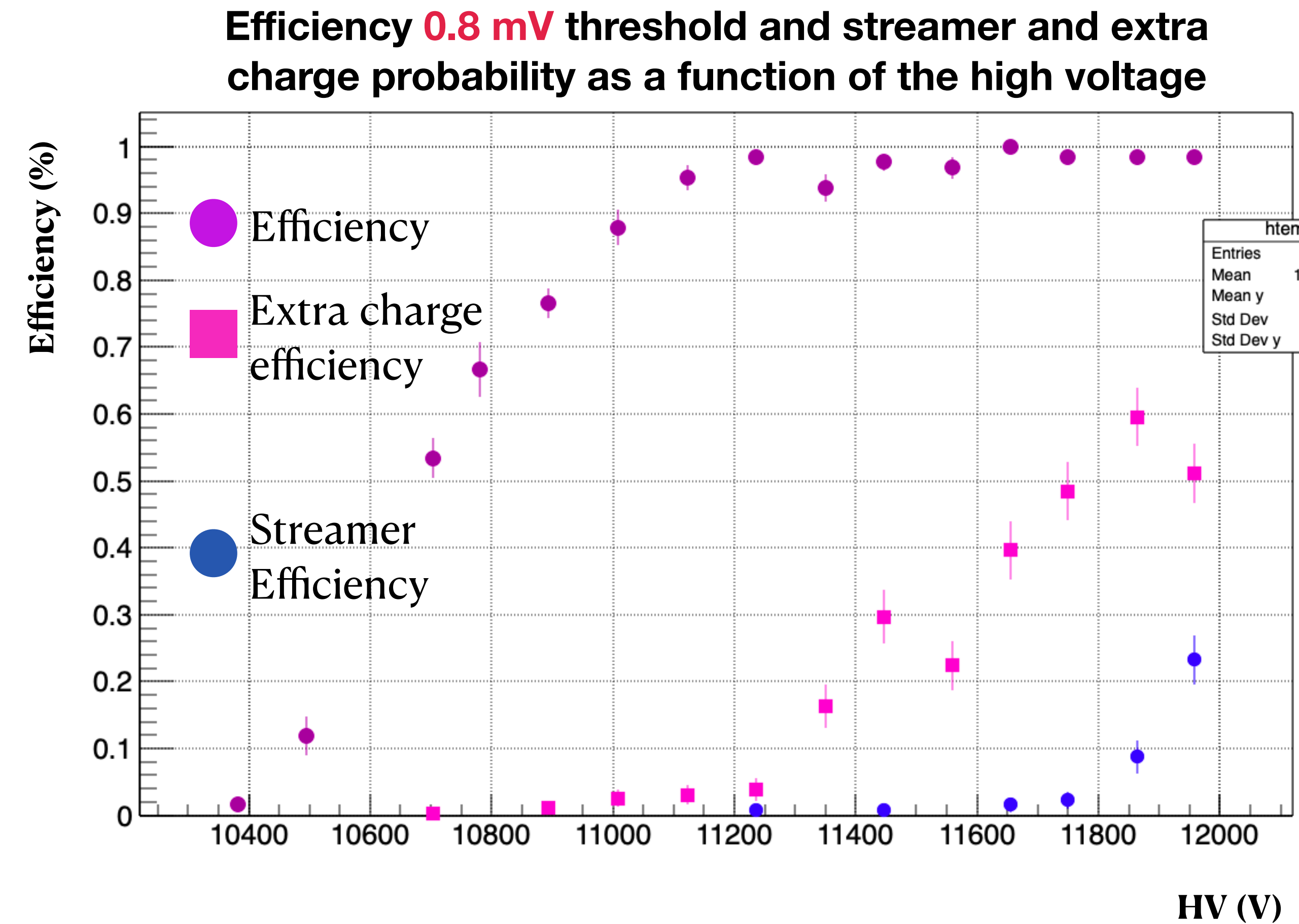
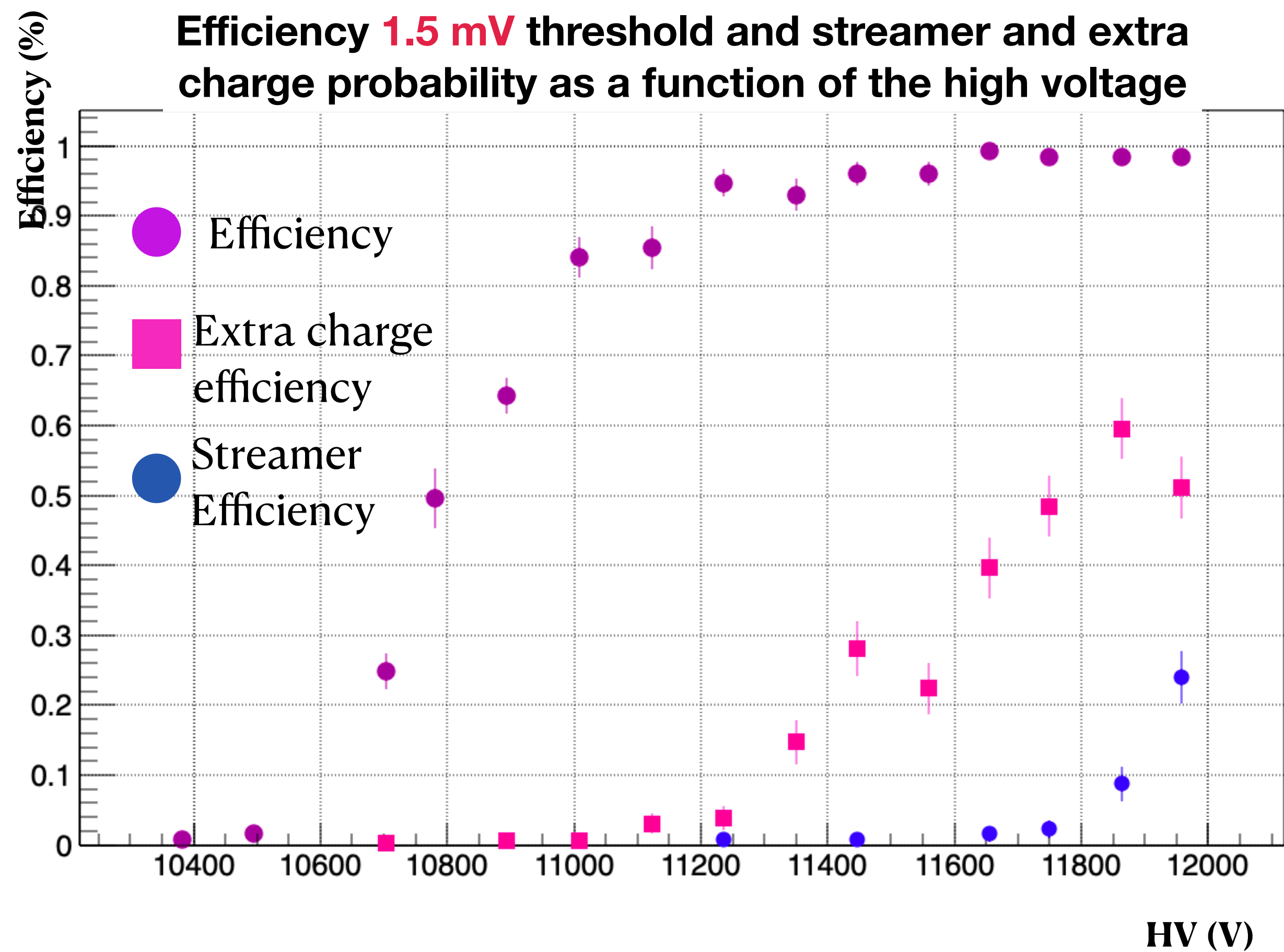
**Extra-charge signal:**  
signal with a charge content more than 5 pC and less than 30 pC with a time over threshold more than 10 ns

Three band :

- Low charge and low time over threshold signals have been considered as **avalanche signals**
- Medium charge and high time over threshold signals have been considered as **extra-charge signals**
- High charge and high time over threshold signals have been considered as **streamer signals**



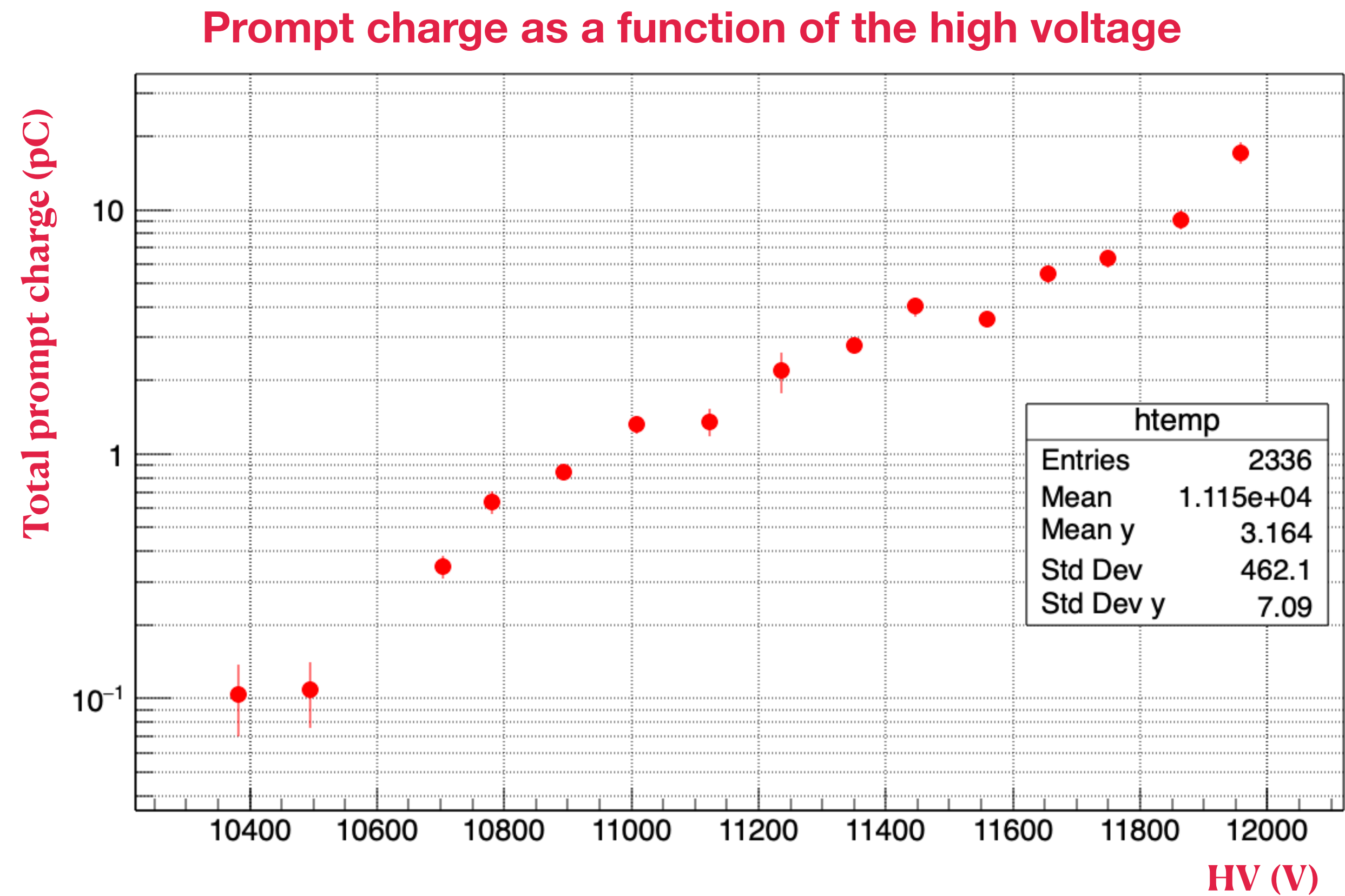
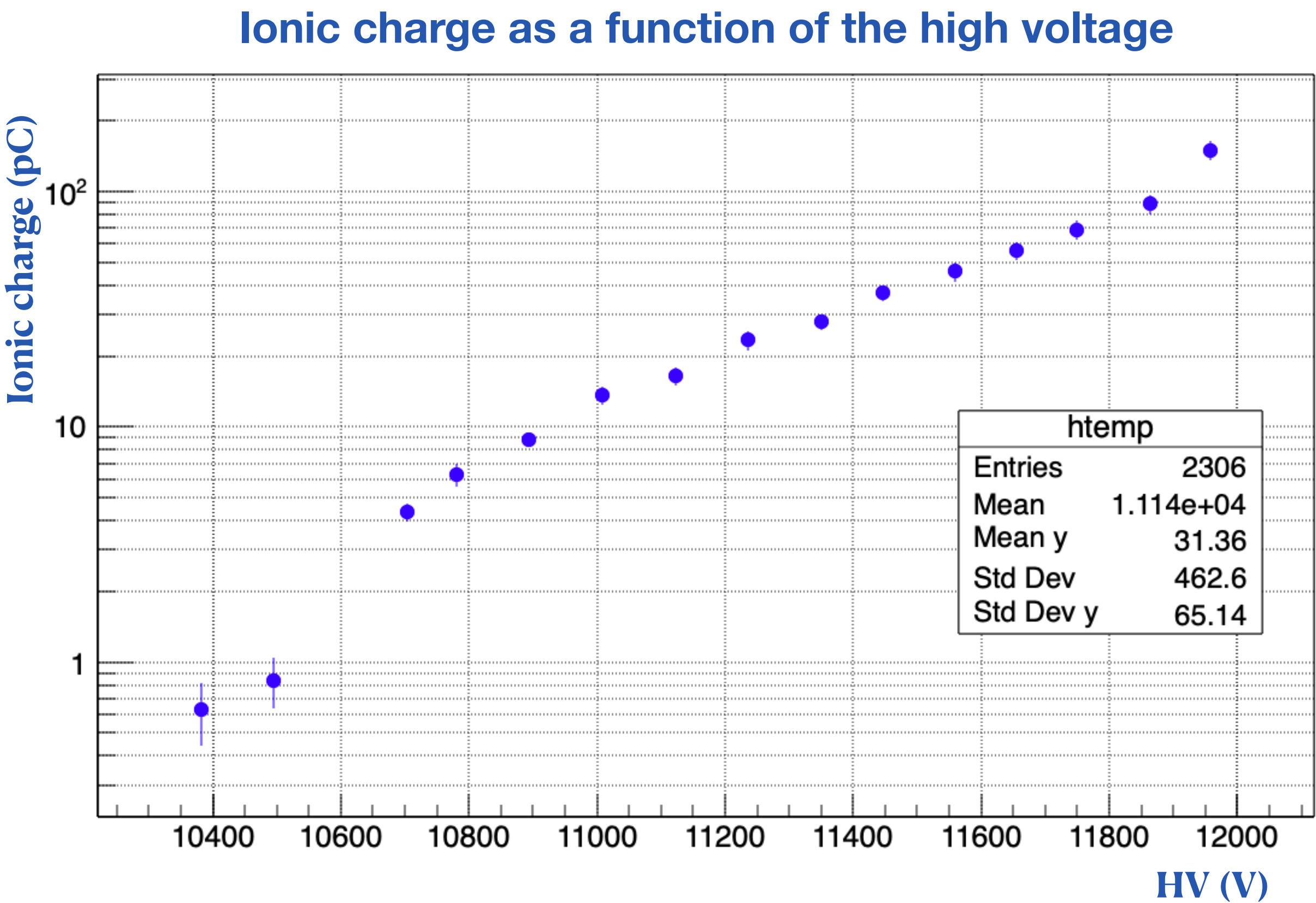
# ECO2= 35% HFO, 60% CO2, 4% iC4H10, 1% SF6 :Efficiency Study



Efficiency @ plateau	Vknee (1.5 mv/ <b>0.8 mV</b> )	%streamer #Vknee +200V (1.5 mv/ <b>0.8 mV</b> )	%extra charge@Vknee +200V (1.5 mv/ <b>0.8 mV</b> )
98%	11200 V / <b>11000 V</b>	0%/ <b>0%</b>	30%/ <b>5%</b>



ECO2= 35% HFO, 60% CO2, 4% iC4H10, 1% SF6 : Charge study



Vknee	Ionic charge @Vknee +200V	Prompt charge @ Vknee +200V
11200 V/ <del>11000 V</del>	40 pC/ <del>25 pC</del>	4 pC/ <del>2 pC</del>

THANK YOU