Dose Profiler: electronics development and first measurements

Giacomo Traini, Marco Toppi, Adalberto Sciubba

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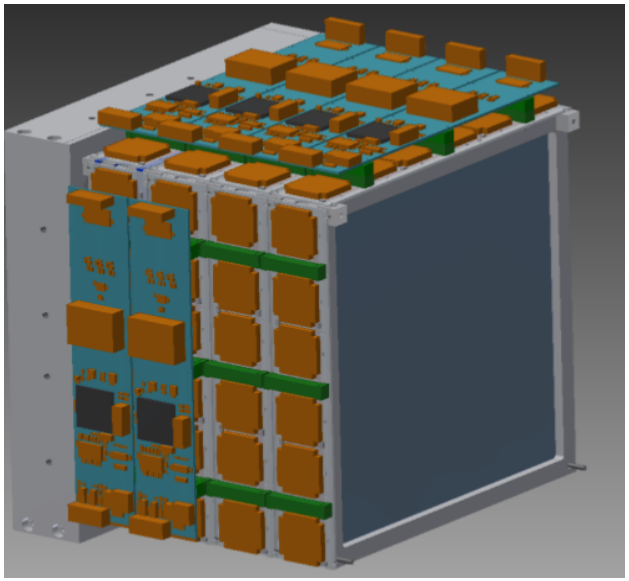
Roma

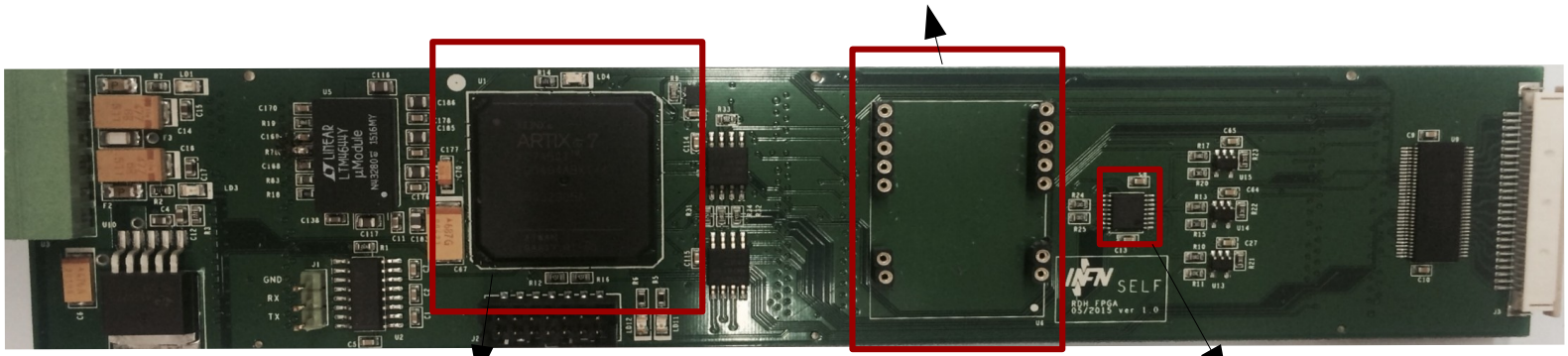
Read-out electronics and DAQ



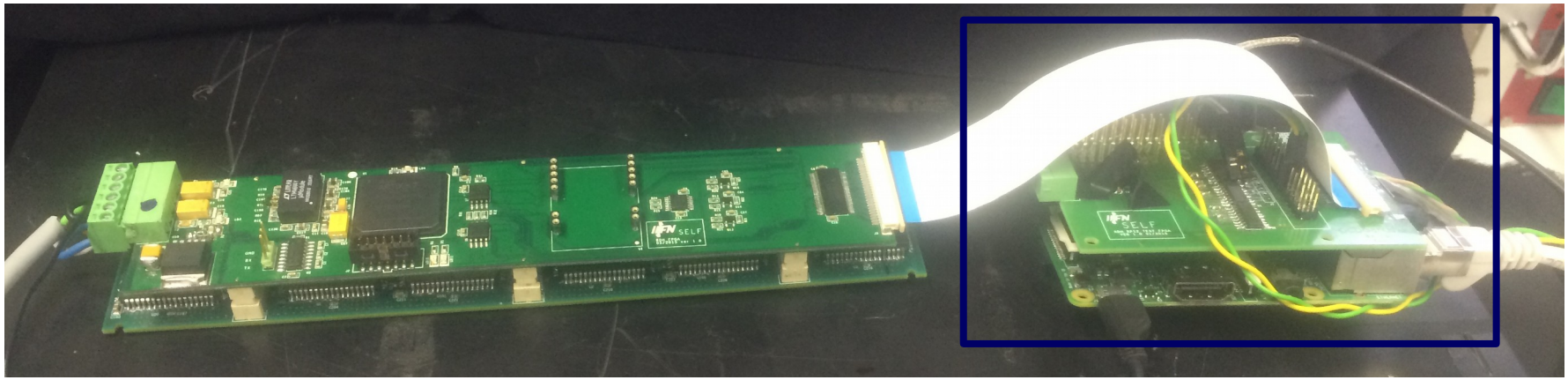
- The FPGA provides the configuration and the read-out of 6 BASIC

- Power supply for SiPM, adjustable bias voltage

- 12 bit DAC/ADC chip provides low voltages to set HV and drive the led on the SiPM board



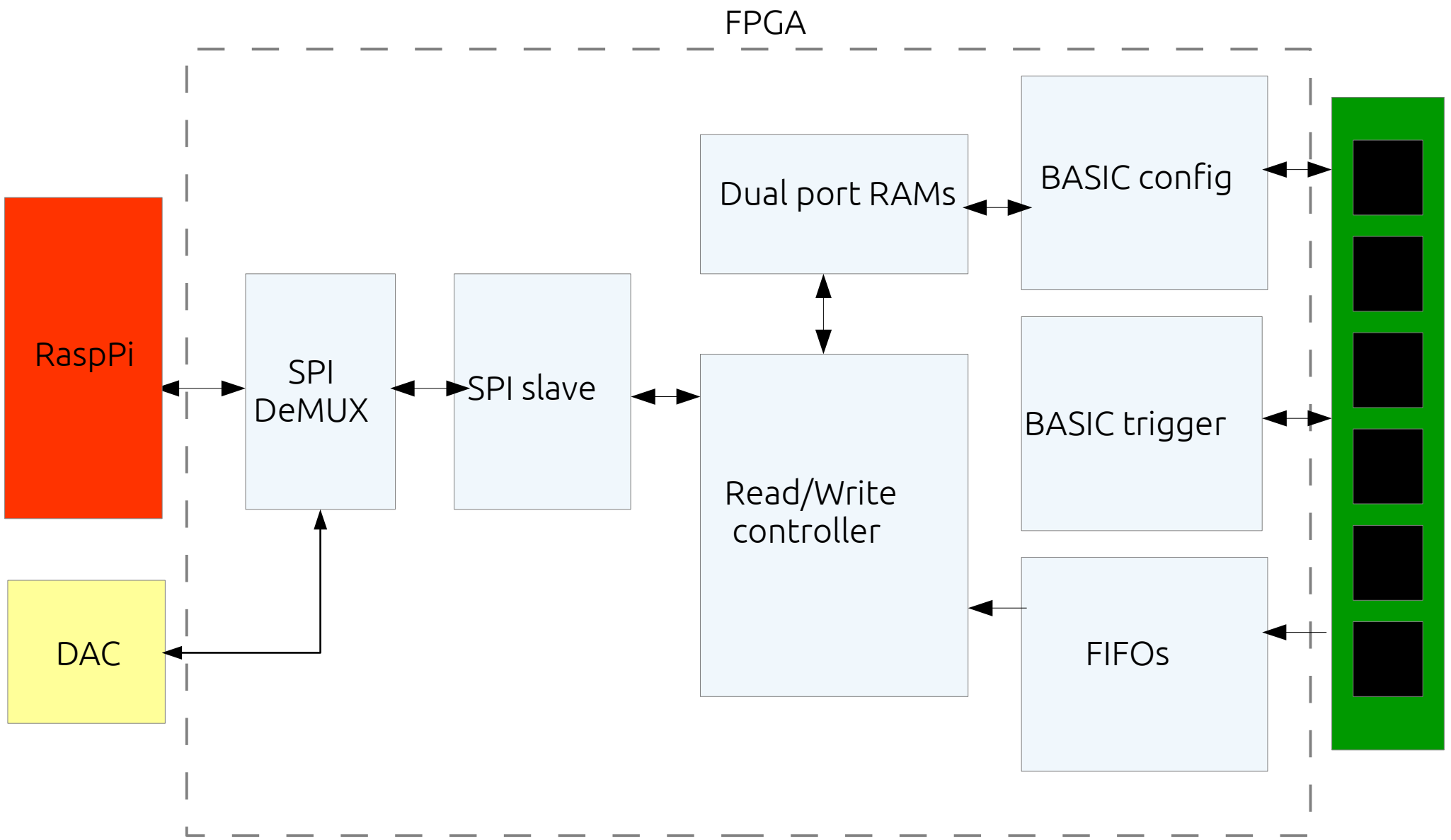
FPGA board test



Raspberry Pi used as a function of the concentrator. SPI protocol is used for communication

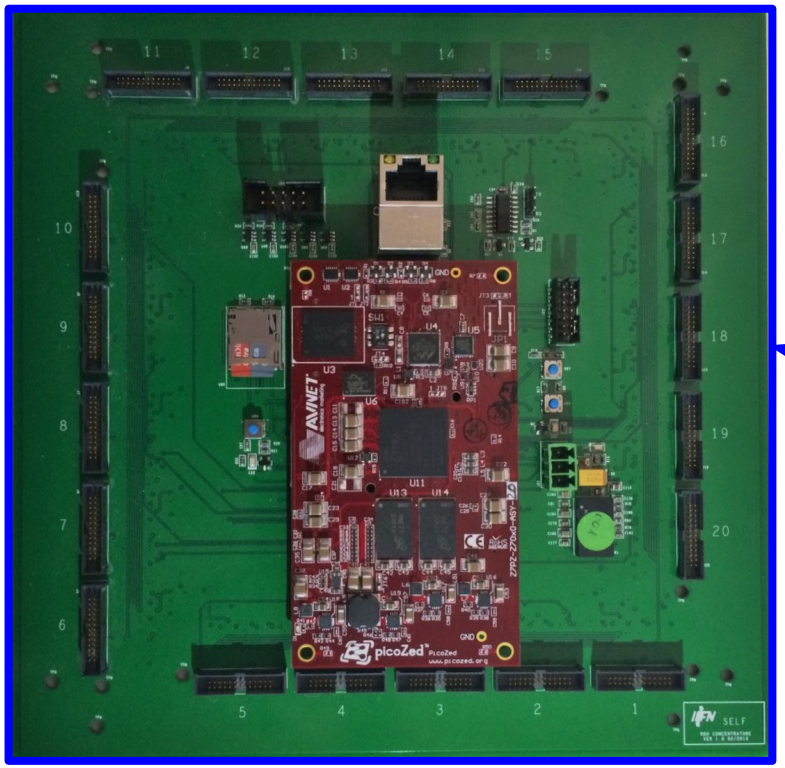
- Write/read configuration
- Read-out: pedestal with external trigger, SiPM fired by led with internal trigger
- DAC/ADC operation check
- HV module

FPGA firmware



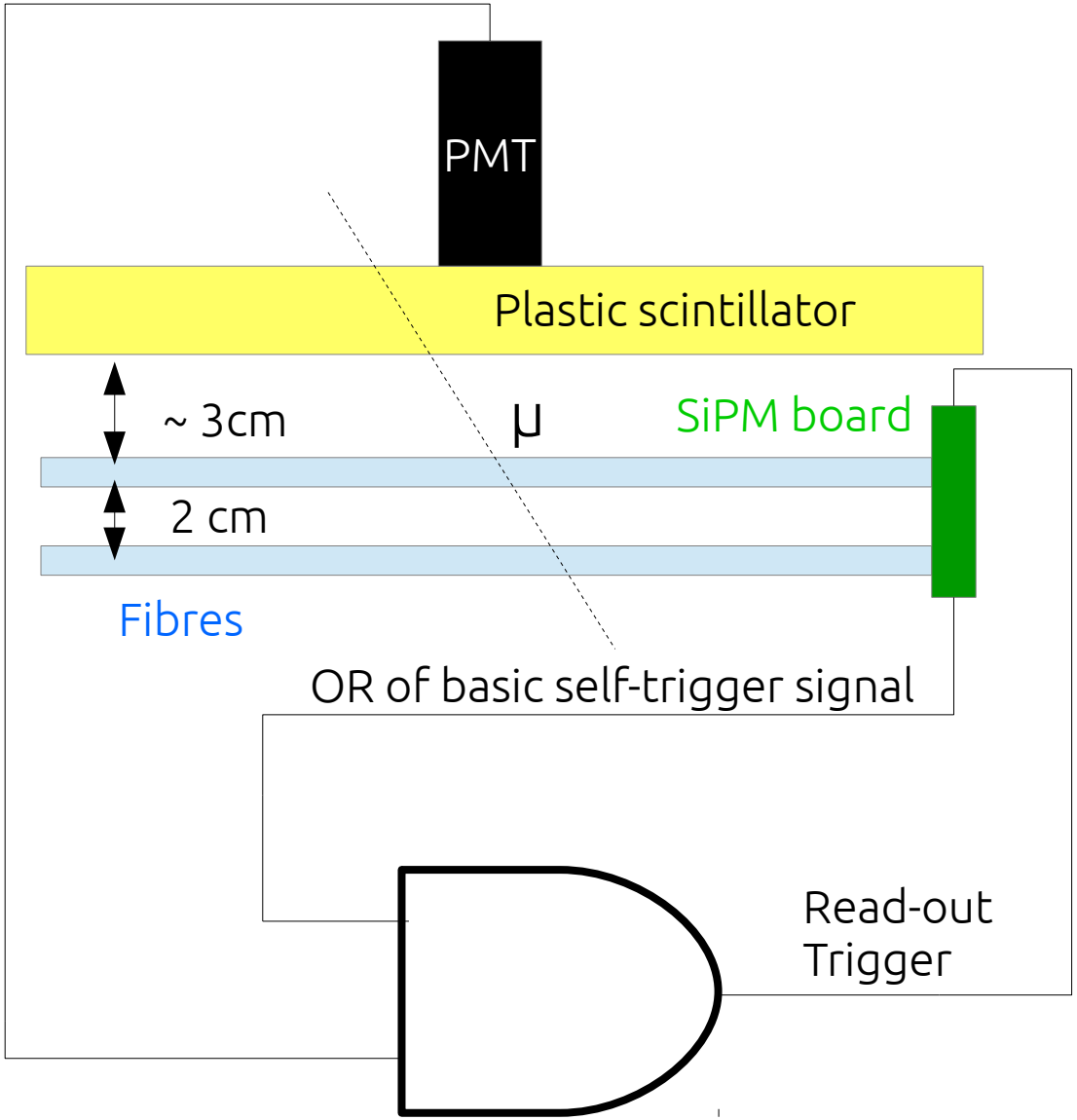
Results and next steps

- The first prototype of the board works properly
- HV power supply is noisy, a new version is currently under development at LNF.



- The SiPMs boards (18) has been assembled. They have to be tested.
- The first prototype of the concentrator board has been produced. Firmware coding and board test ara the following steps.

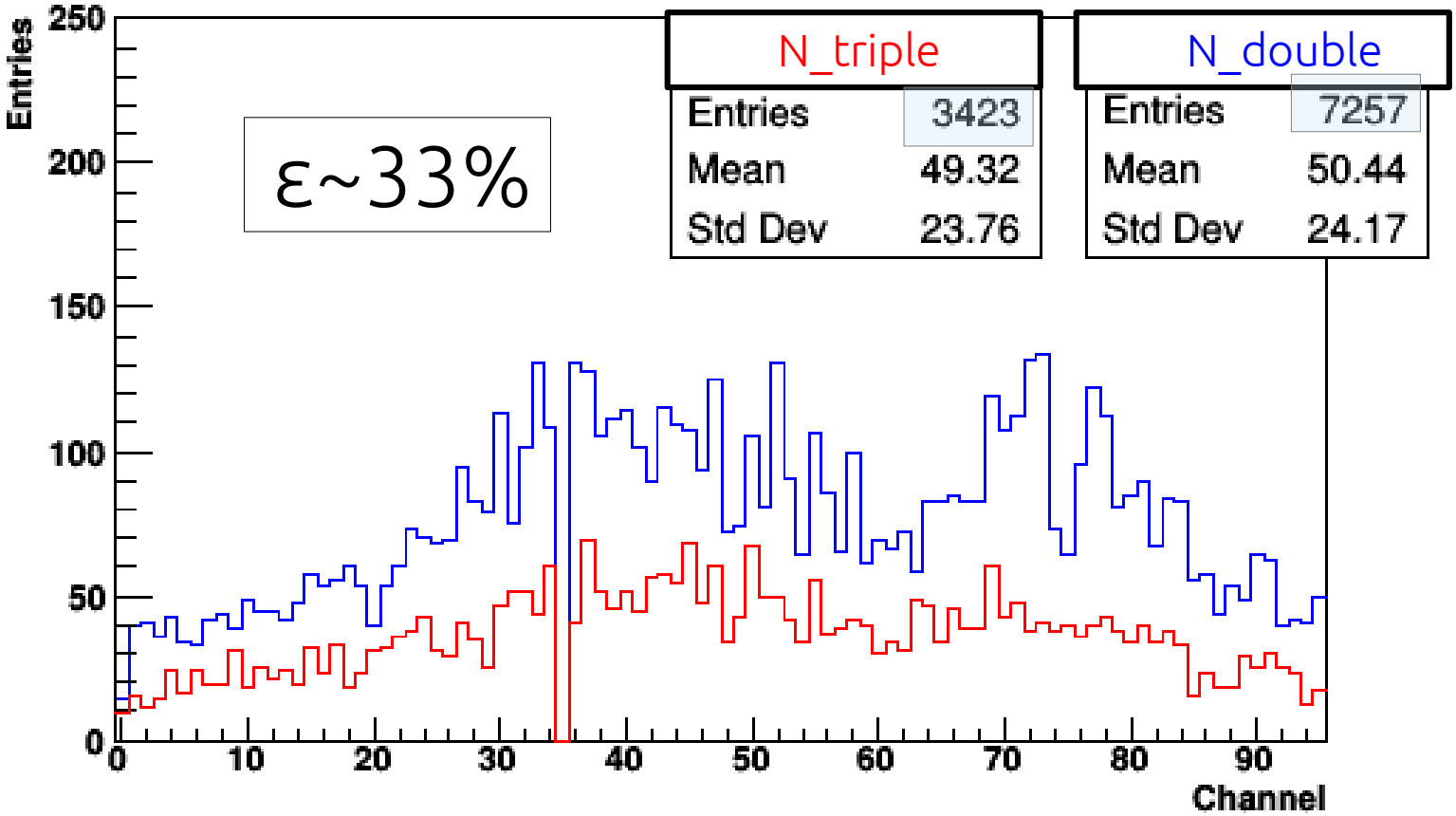
Dose Profiler cosmics measurements



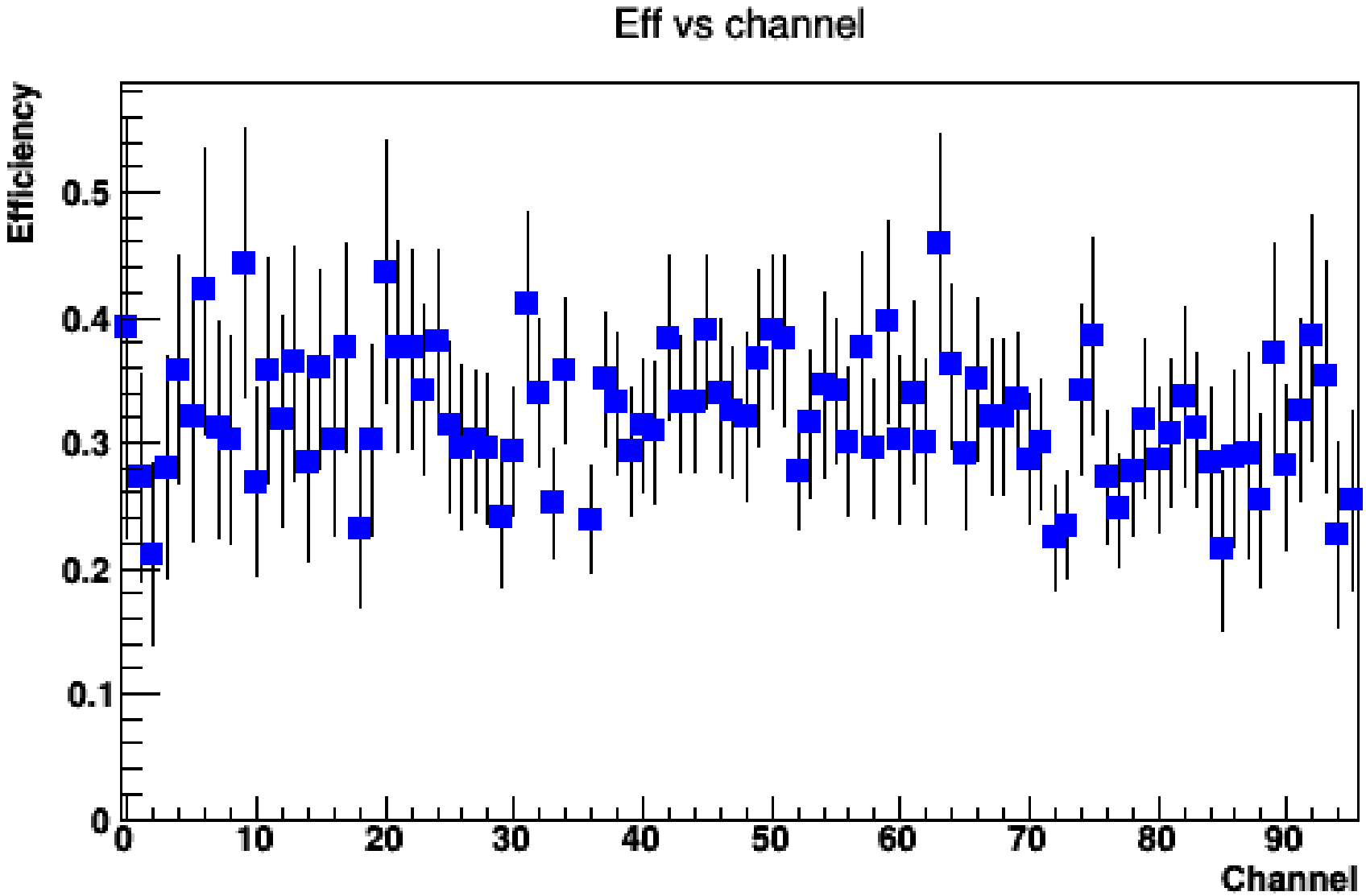
Efficiency

- **N_double**: scintillator + at least one channel fired in the down layer
- **N_triple**: scintillator + at least one channel fired in both layer

$$\epsilon = \frac{N_{triple}}{N_{double} + N_{triple}}$$

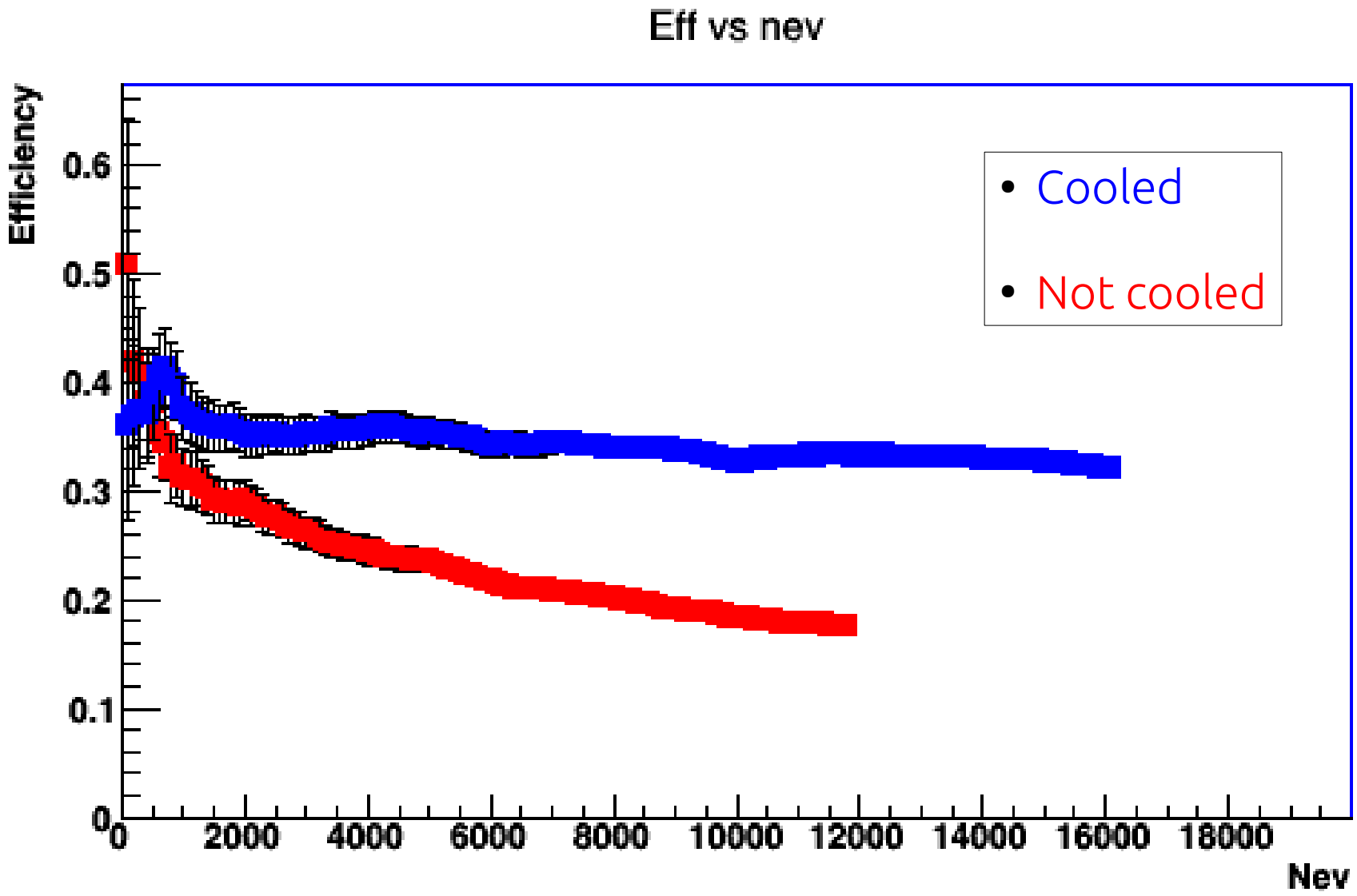


Efficiency

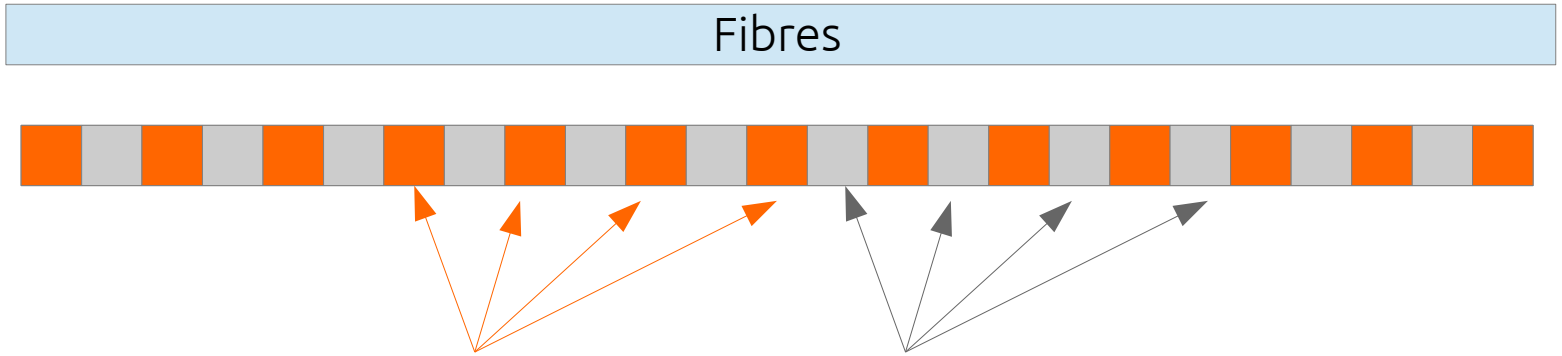


Low statistic… but it seems that there are not strange structures

Temperature dependence



Efficiency: dead space contribution

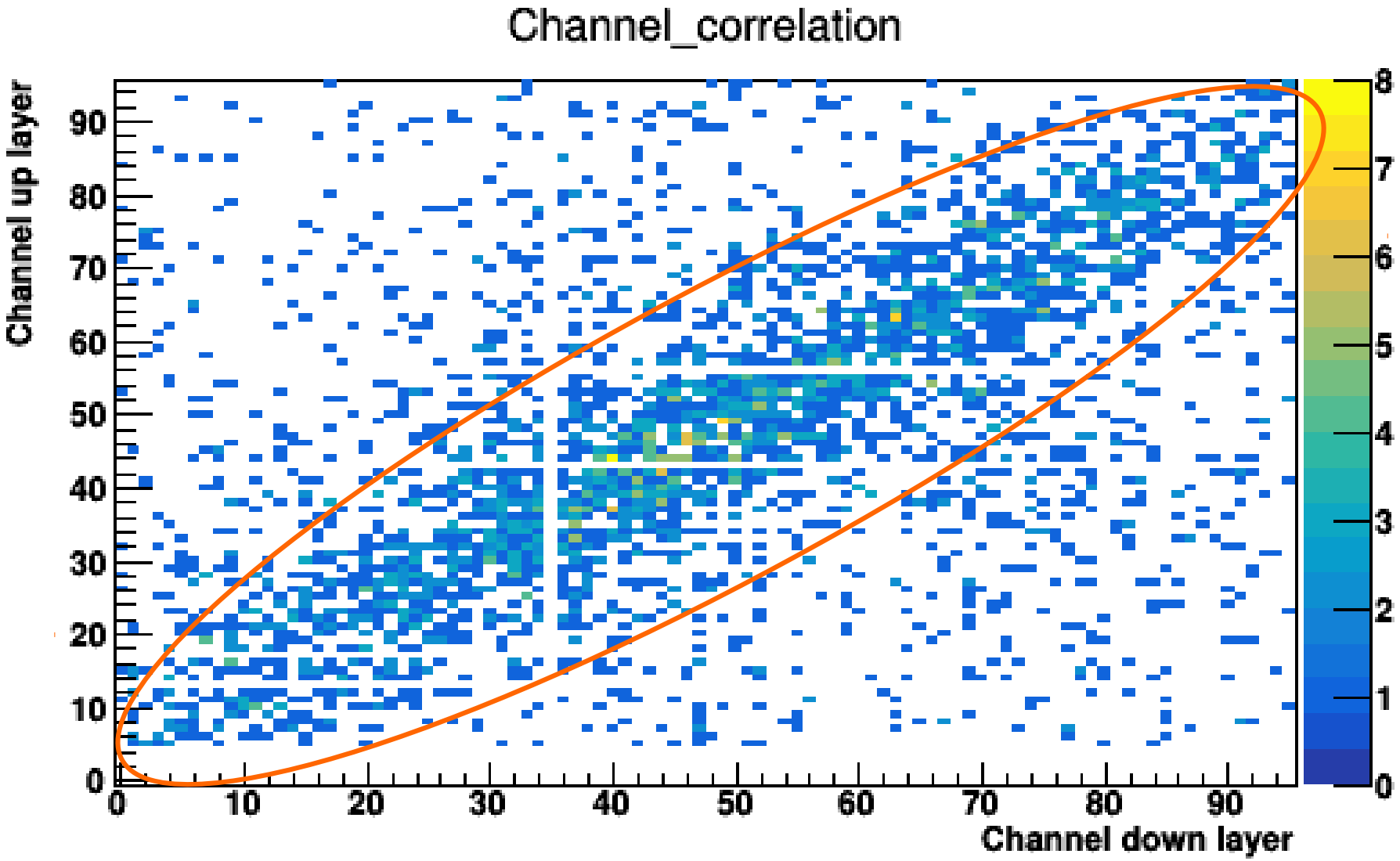


~ 50% dead space + 5 channels turned off for the noise

$\varepsilon \sim 70\%$

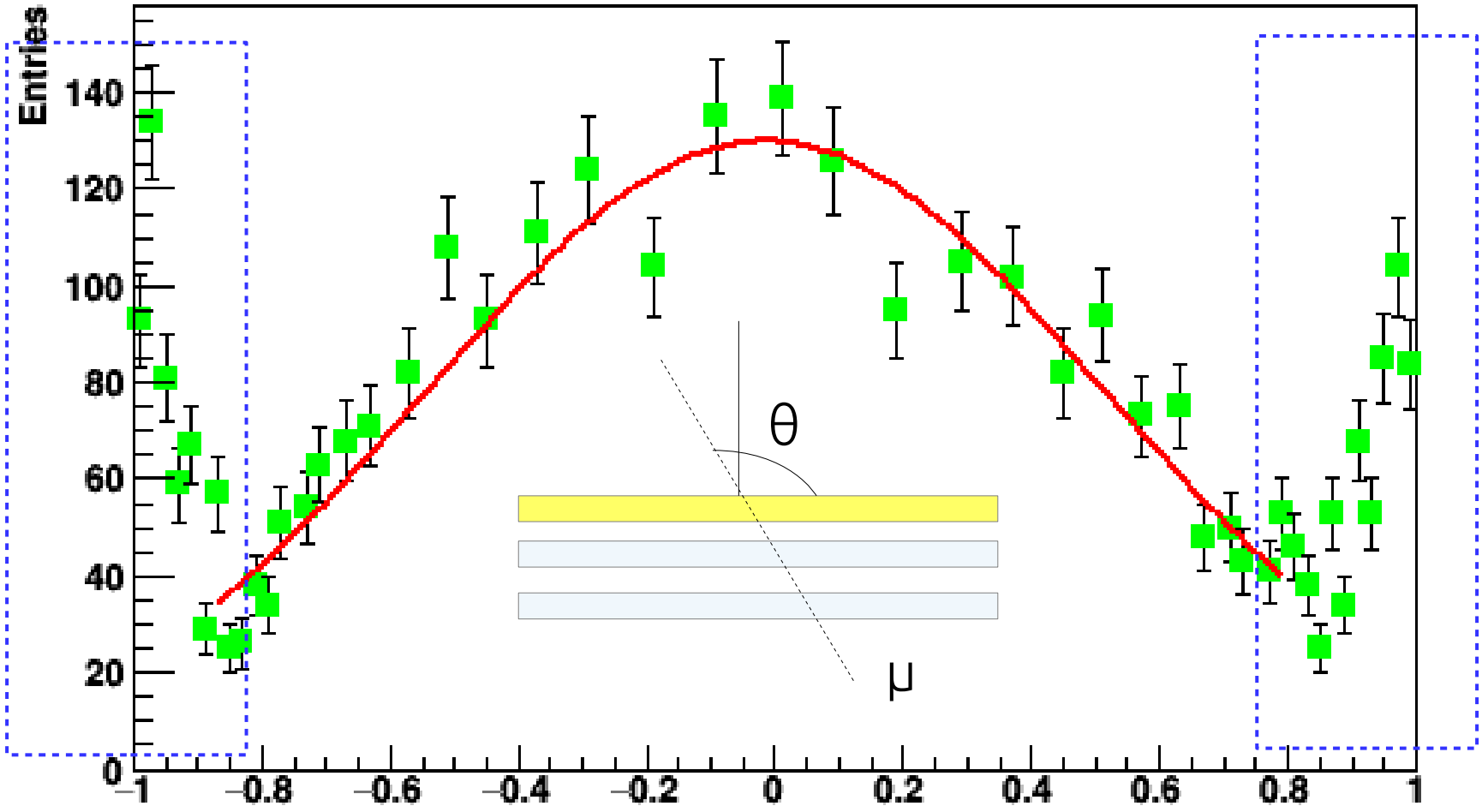
We expect an higer efficiency… –> We have to optimize the measurement adjusting theshold, SiPM gain (temperature) and minimizing the noise

Channel correlation



Angular distribution

$$I(\theta) = I_0 + A\cos^2(\theta)$$



Tails not yet understood...

Summary

- First cosmic rays measurement with Dose Profiler: detection efficiency ~ 70%
- We expect higher efficiency: optimize parameters (threshold, gain, temperature, noise)
- Further analisys on acquired data in order to get more solid result