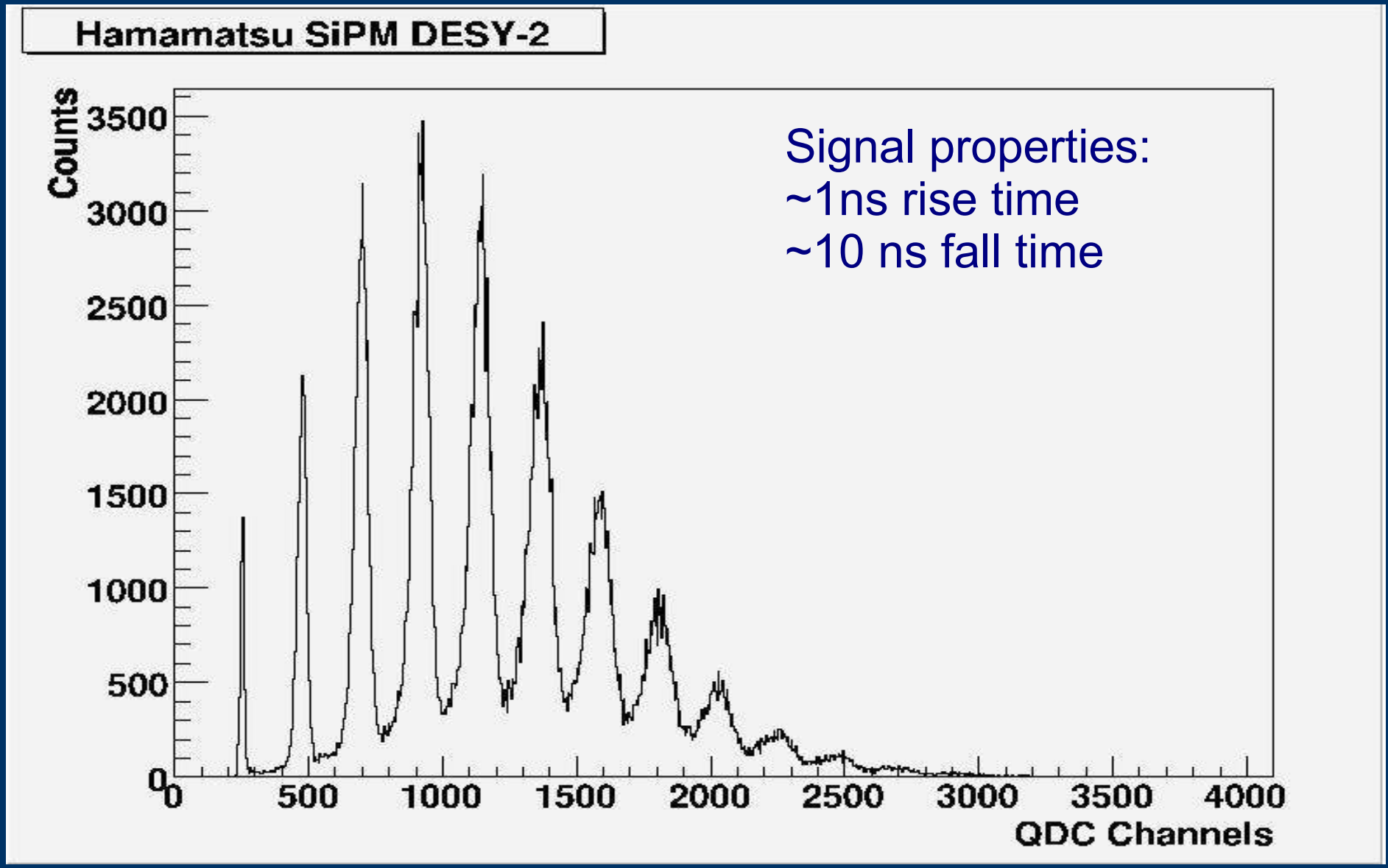
Recent study of the Hamamatsu Silicon PhotoMultiplier

Nicola D'Ascenzo (DESY)

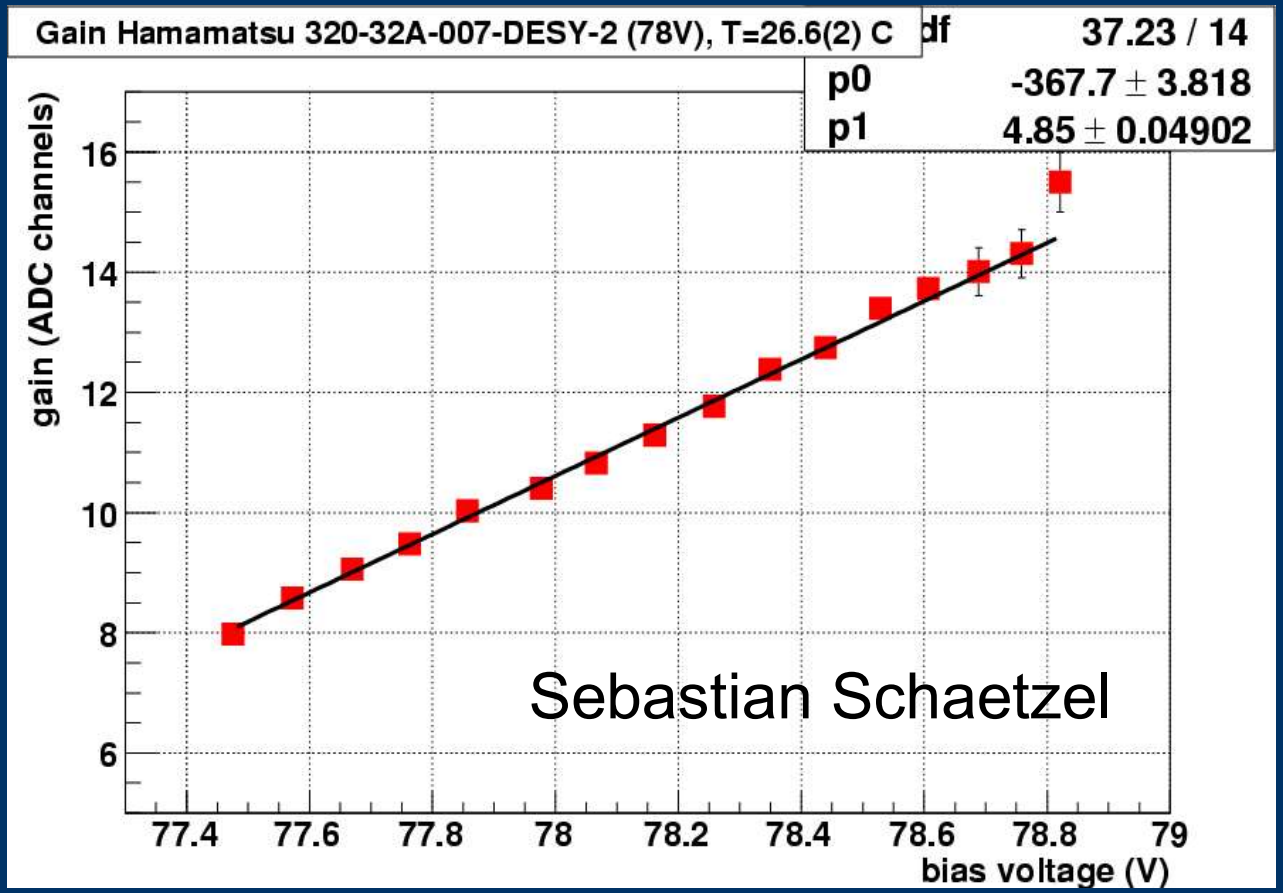
Devices and analysis description

- 3 (+1 broken) SiPM, with 69 V and 78 V
- 400 pixels
- Different basics measurements
  - “reccomended” operating voltage
  - Standard tests to extract parameters of common relevance (cross talk, dark rate, gain, timing)
  - Tile Tester test, in order to calculate the MIP efficiency with out tile configuration (scintillator+wavelength shifter fiber)
  - Direct coupling with the scintillator, without wavelength shifter fiber

Signal and Spectrum

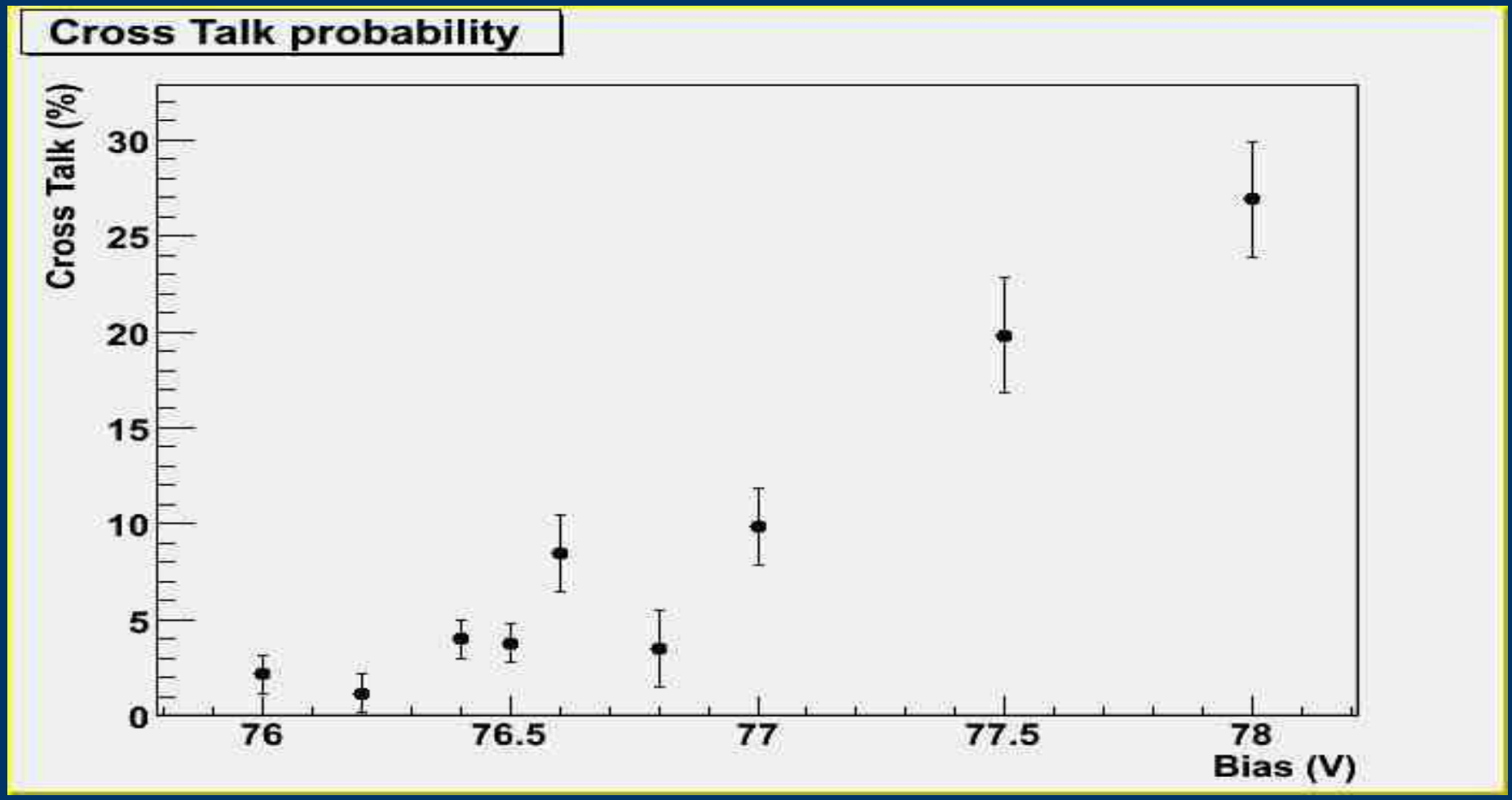


Linearity and gain properties



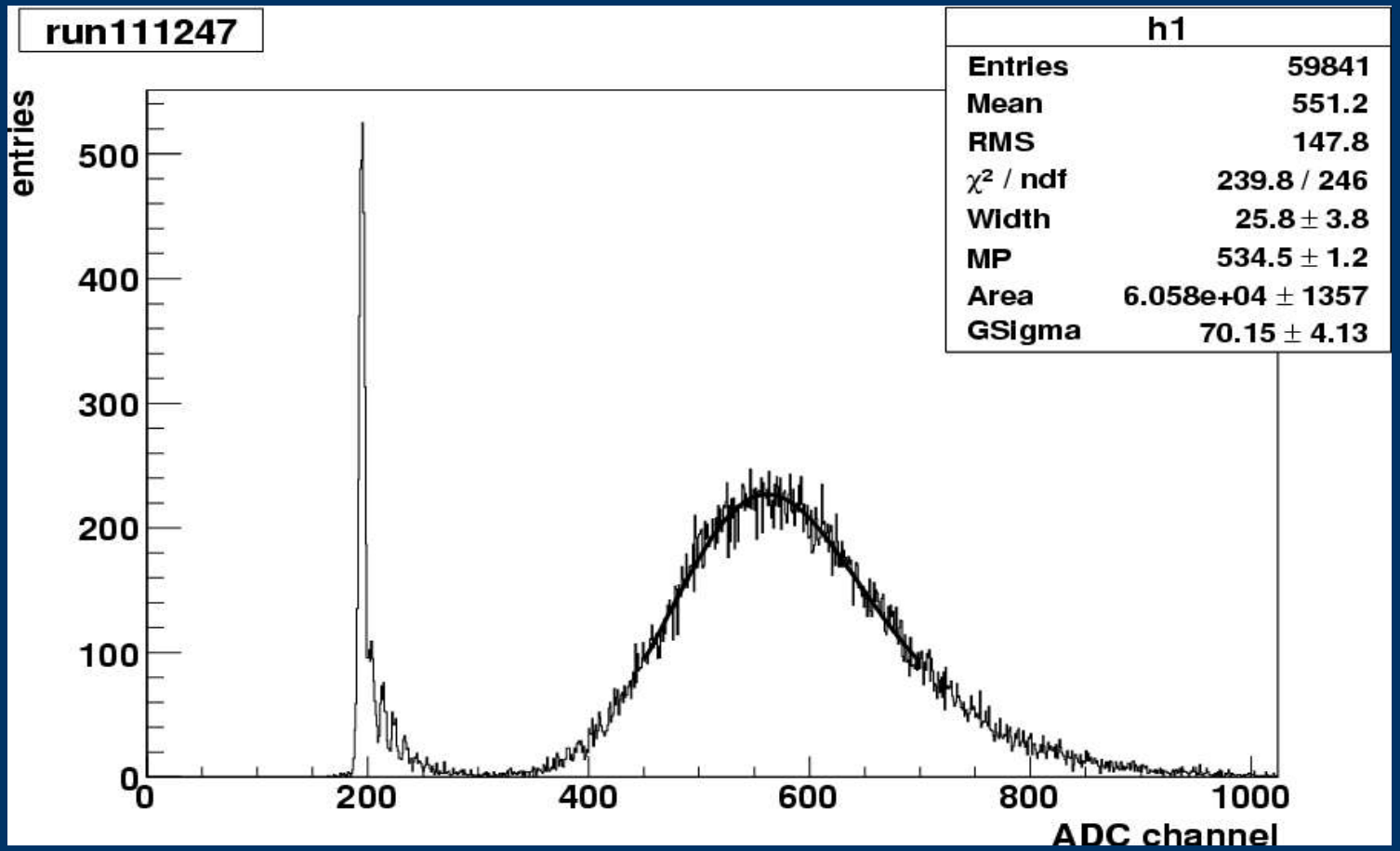
- Gain @76.8V = (196 fC +- 12) Ch.

Cross Talk



The cross talk probability is the deviation from the poissonian distribution

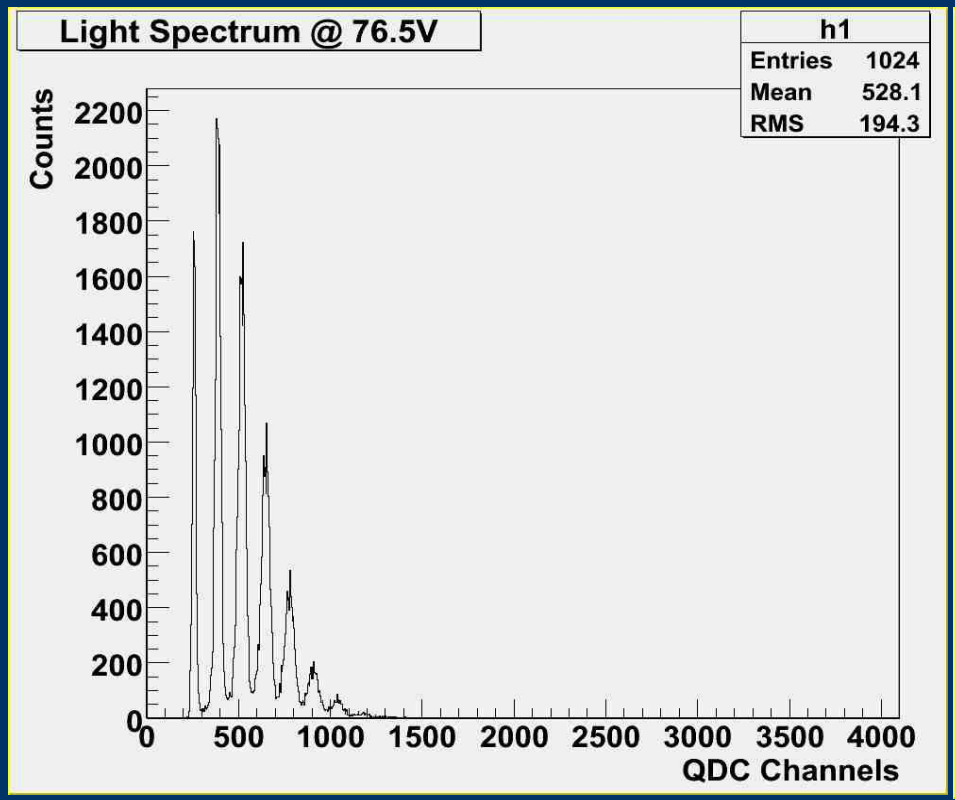
MIP efficiency: standard tile

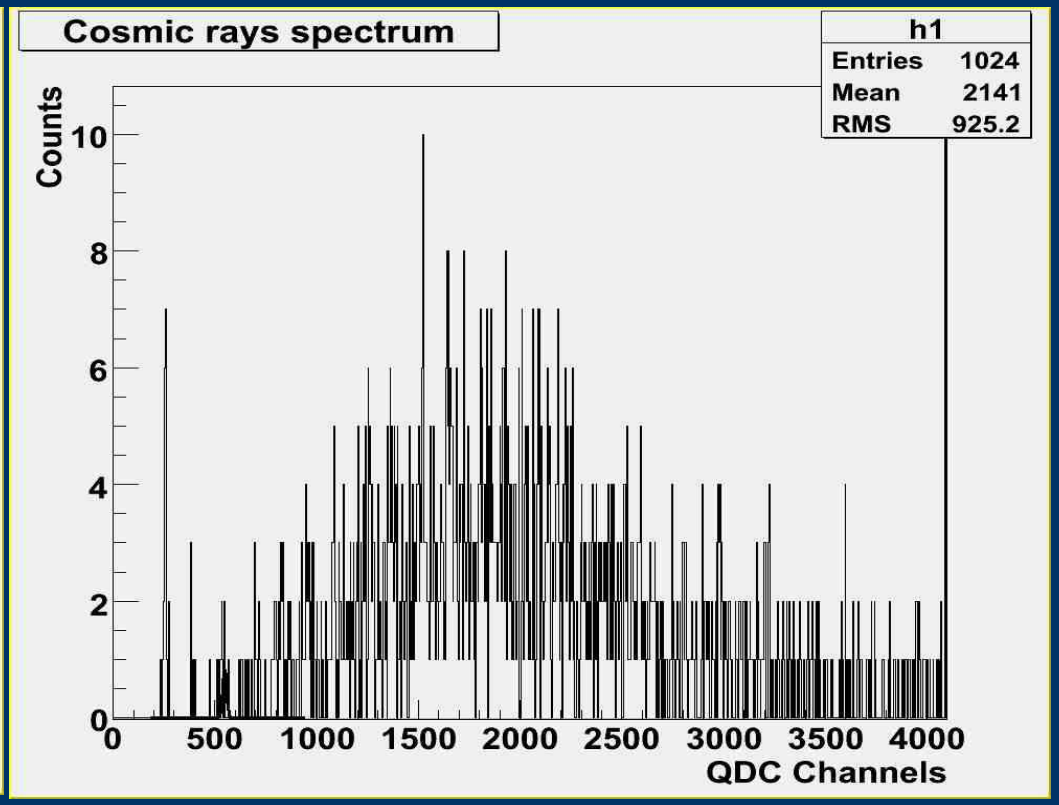


Sebastian Schaetzel

35 pixels/MIP @ 78V ; 23.2 pixels/MIP@69V

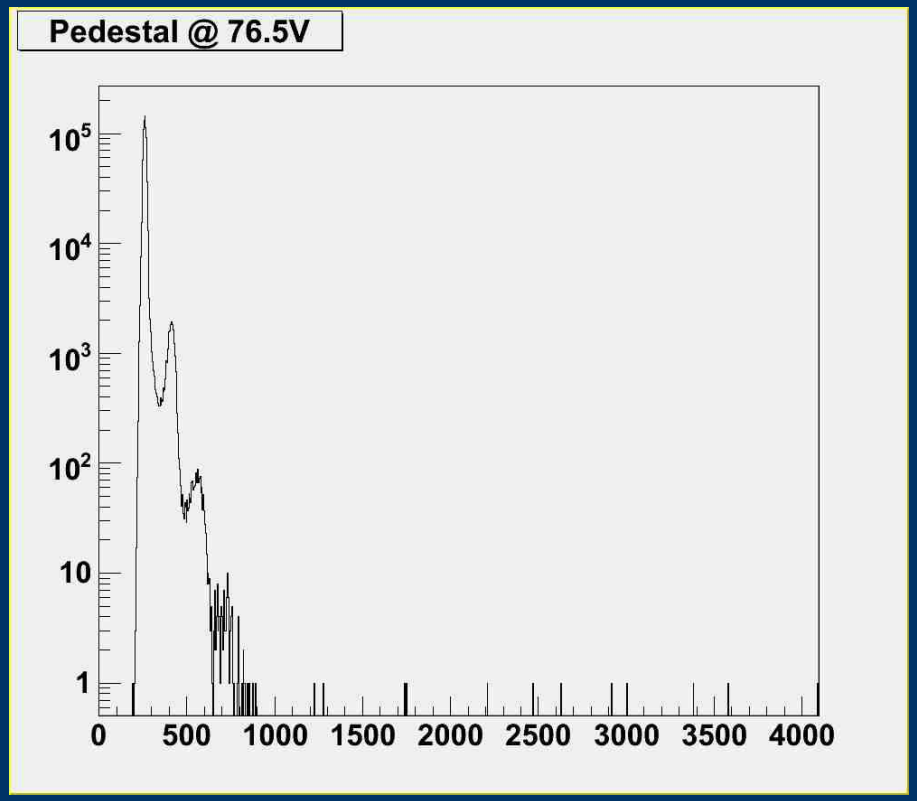
MIP efficiency: direct coupling

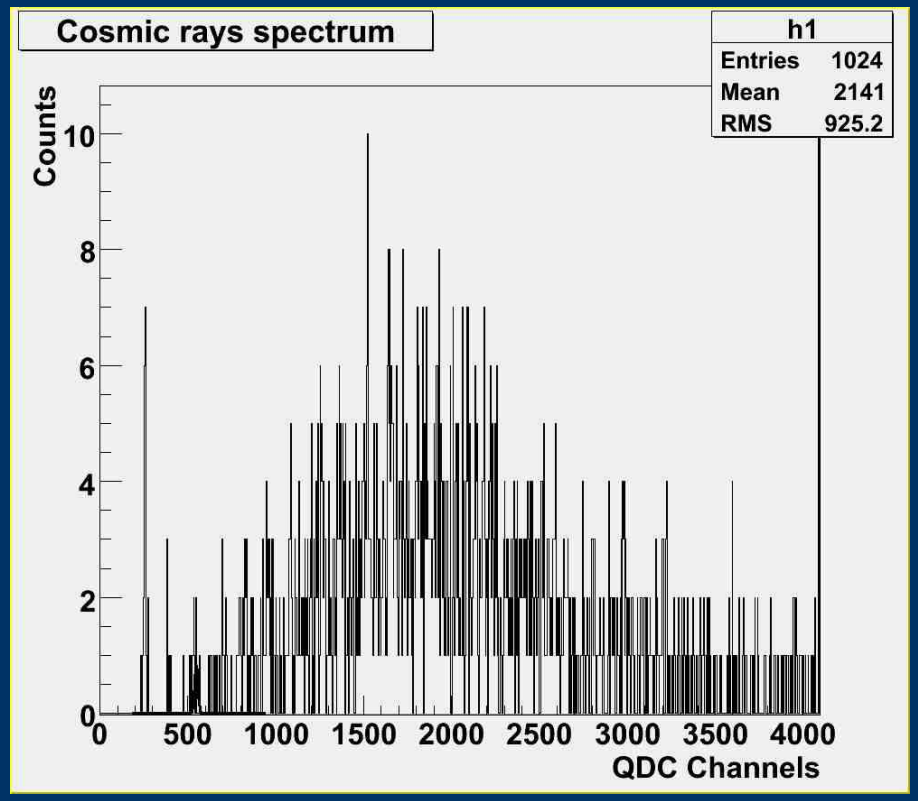




(13.28+-0.01) Pixels/MIP@76.5 V
The SiPM was coupled directly at the corner of the tile.

MIP efficiency: direct coupling





95% MIP Efficiency @ 1.5-2 pixels threshold

Conclusions

- The new SiPMs produced by Hamamatsu have a new and up to now unique feature: very good sensitivity in blue region:
  - Direct coupling with the scintillator: earning in costs, time and large scale production of the calorimeter
- Good cross talk and dark rate properties @ operating voltage
  - A low threshold can be choosen.
- These SiPMs seems to be promising for the future R&D of the calorimeter