SiPM properties study
by
INFN Roma-1
and
University “la Sapienza” of Rome
- first results

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SIPM customers and producers

AHCAL

HEP, astrophysics, medical apps...

SiPM produced by :

- ***MEPhI / PULSAR (Russia)***
- ***Obninsk Uni / CPTA (Russia)***
- ***HAMAMATSU (Japan)***
- ***IRST (Italy)***
- ***SensL (Ireland)***
- ***?..***

SIPM STUDIES at ROMA

First steps :

- *Development of the test setup and measurement procedure*
- *General measurements of the SiPM response to LED light (single photoelectron spectra)*
- *Comparison of SiPM produced by different manufacturers*

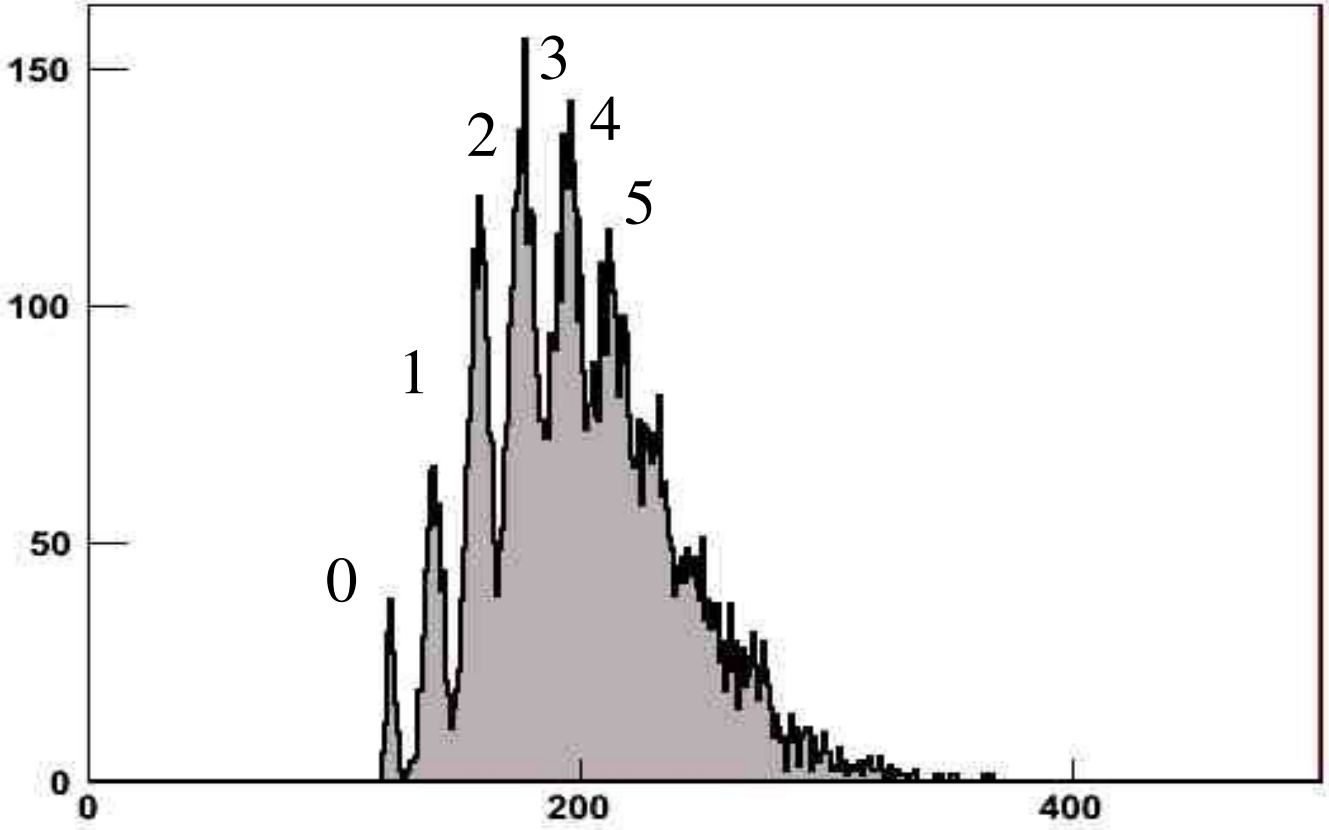
SiPM samples :

- *Obninsk Uni / CPTA*
- *HAMAMATSU*
- *FORIMTECH / CPTA*
- *IRST*
- *SensL*

Measurements :

- *Current-Voltage characteristics*
- *Response to low-intensity light (UV LED)*

SINGLE PHOTOELECTRON SPECTRUM



Parameters :

- *Gain*
- *Width of the pedestal and single pe peak*
- *Efficiency of light registration*
- *Crosstalk between pixels*

LED DRIVE

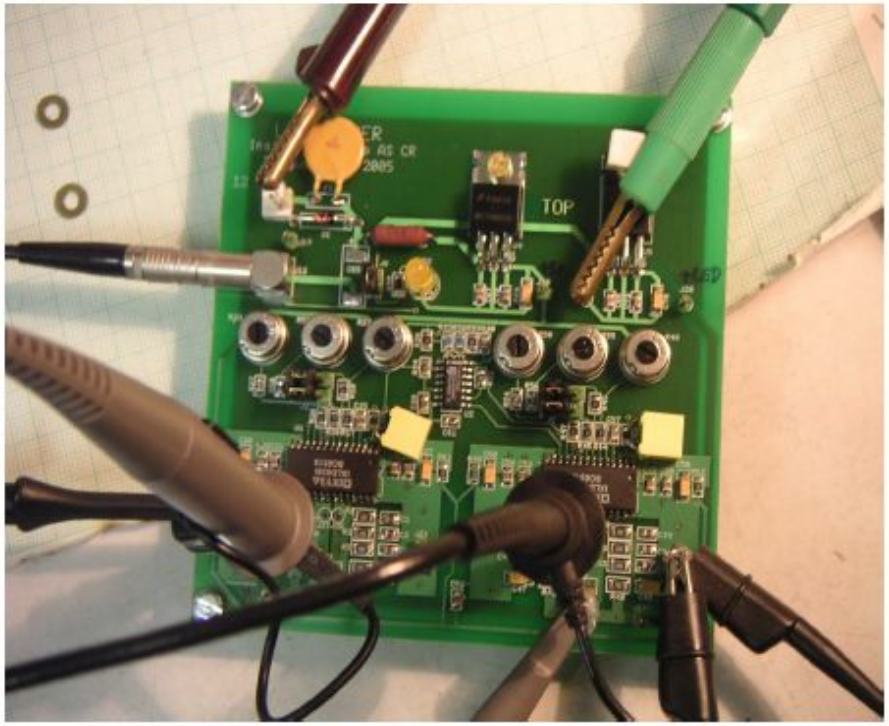
Low intensity fast light pulses :

LED drive from Institute of Physics ASCR Prague

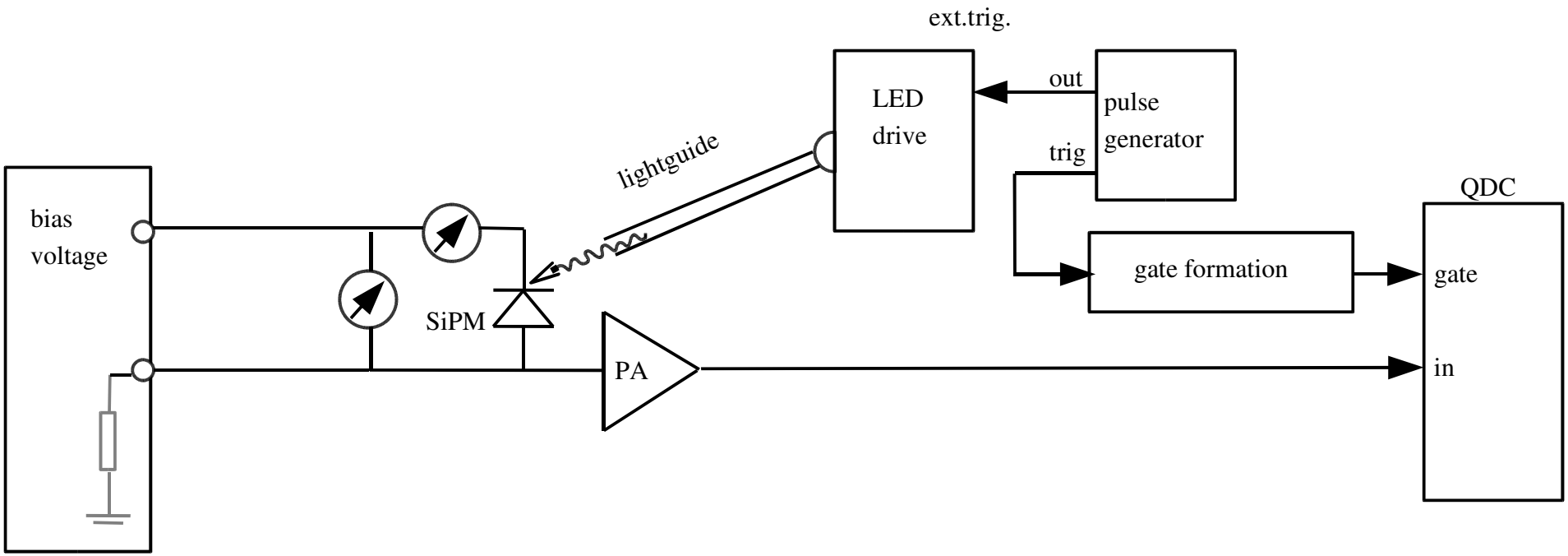
- ***developed for Calibration and Monitoring Board***
- ***external trigger***
- ***variable current pulse width***
- ***variable current pulse amplitude***

- Common input for signal LED-trigger, lemo, 50Ω
- One 12V (60mA) supply, protection
- Rise time 2ns,

  tested with P5050 scope probe (8pF, 500MHz)
  C=8pF, L=30nH
  f_{res}=290MHz

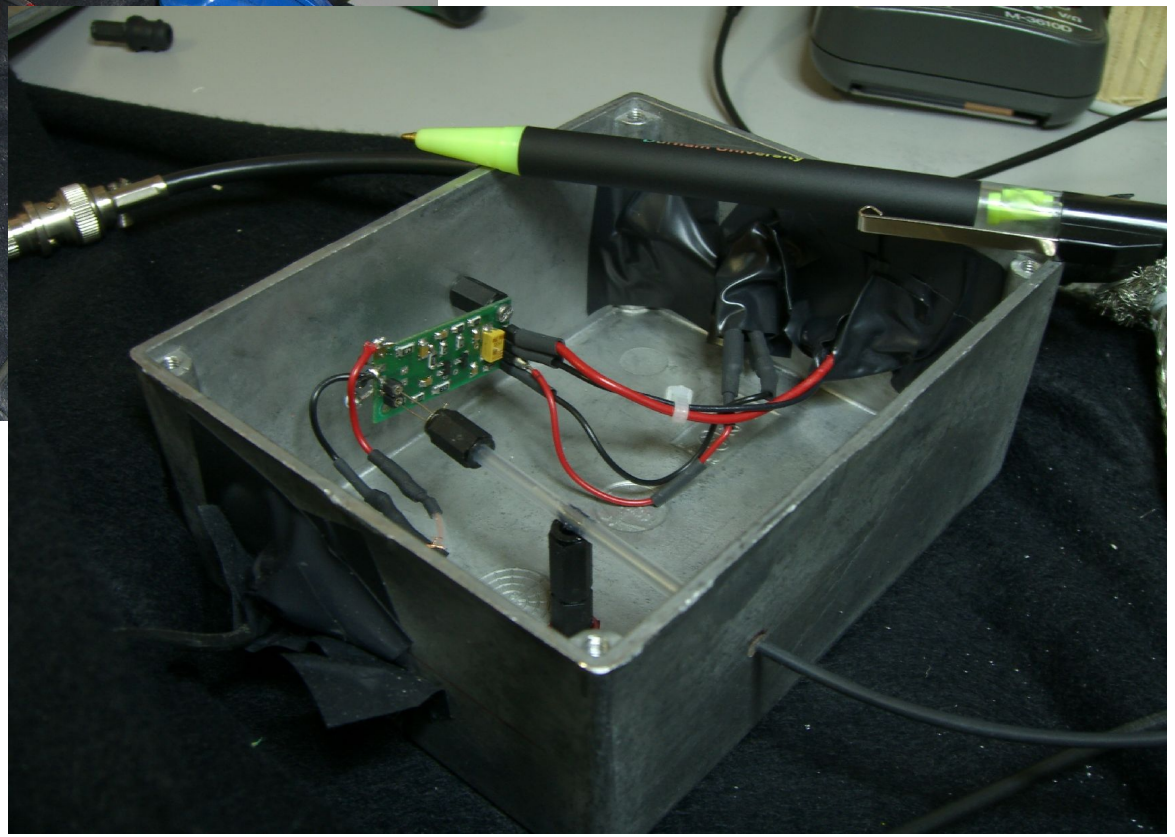


SETUP @ ROMA1

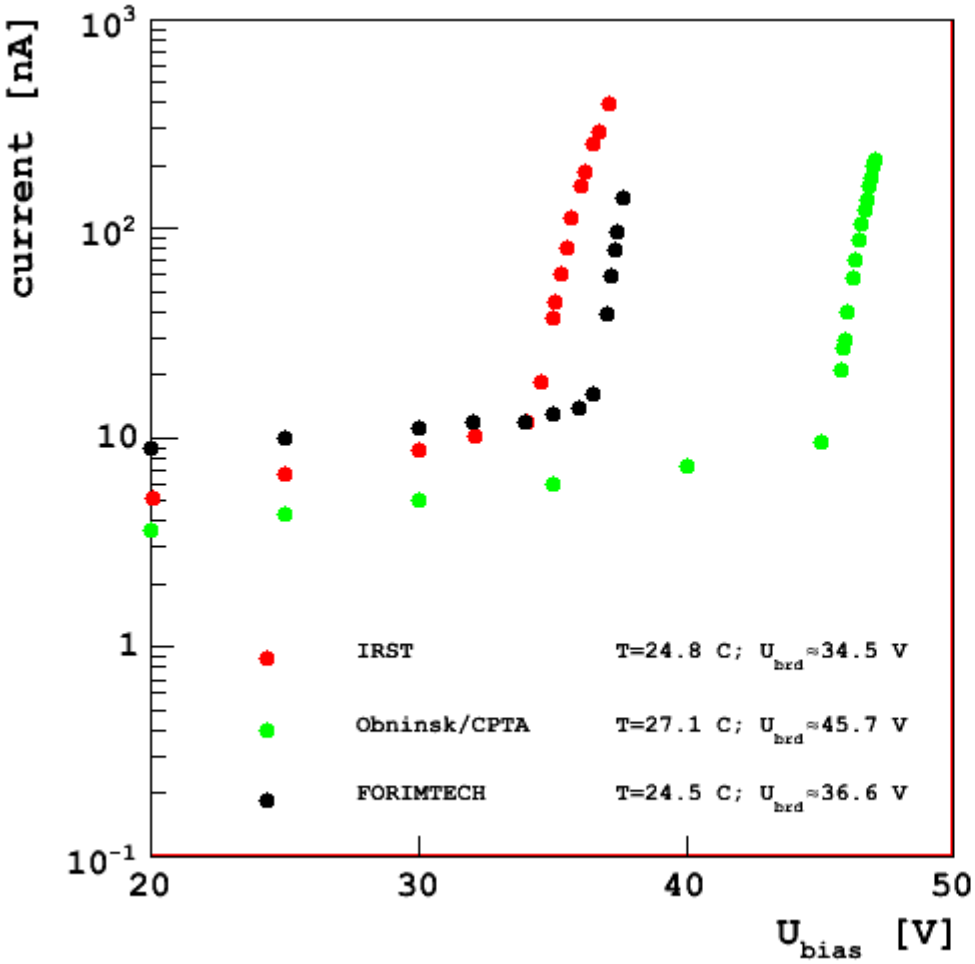

ext.trig.
LED
drive
out
pulse
generator
trig
lightguide
QDC
bias
voltage
gate formation
gate
SiPM
PA
in

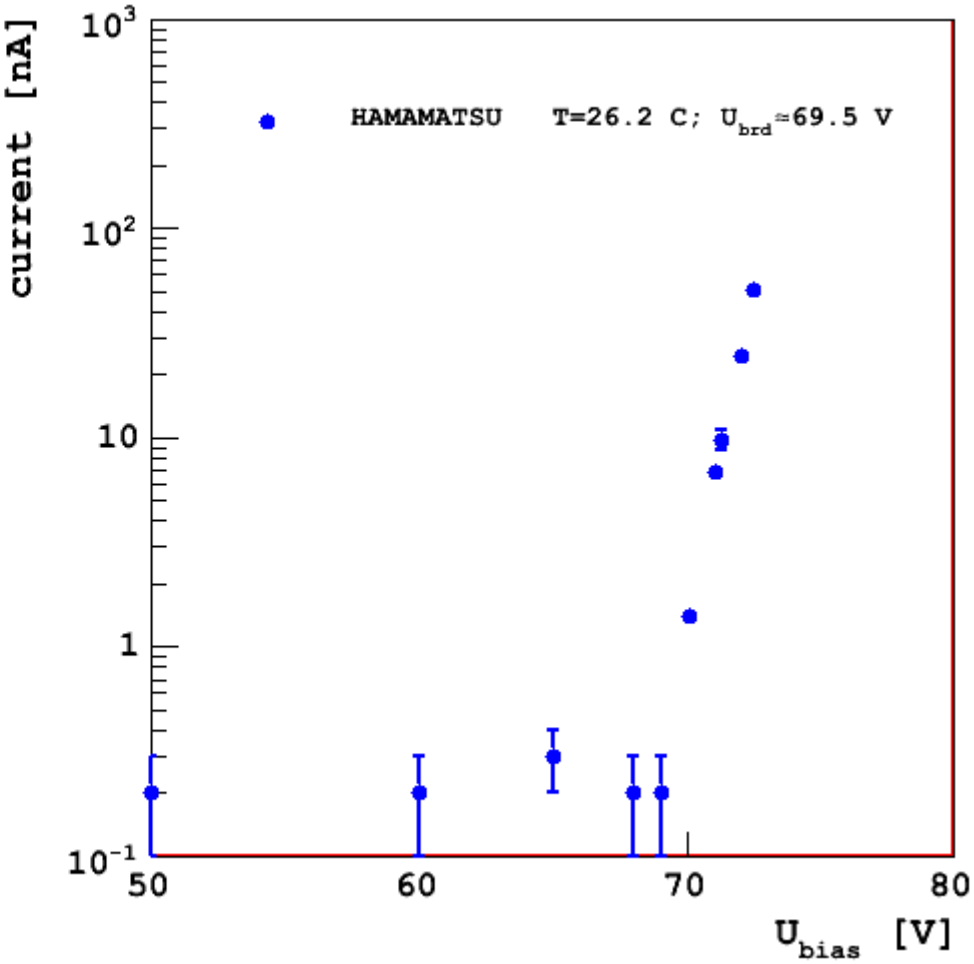
SETUP @ ROMA1


KEITHLEY 486 AUTORANGING PICOAMMETER
VOLT - AMPERE
197 AUTORANGING MICROVOLT DMM
EUTRON

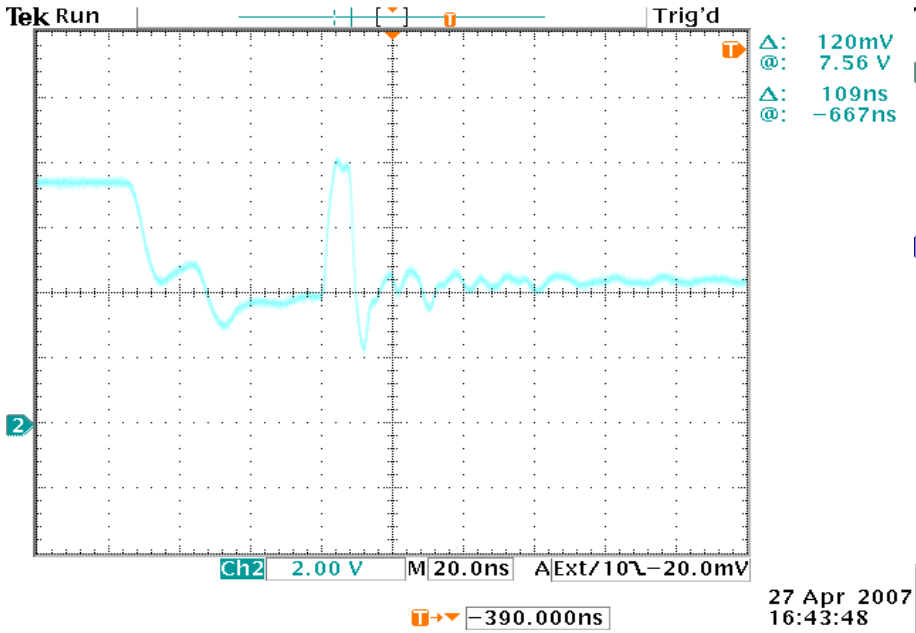


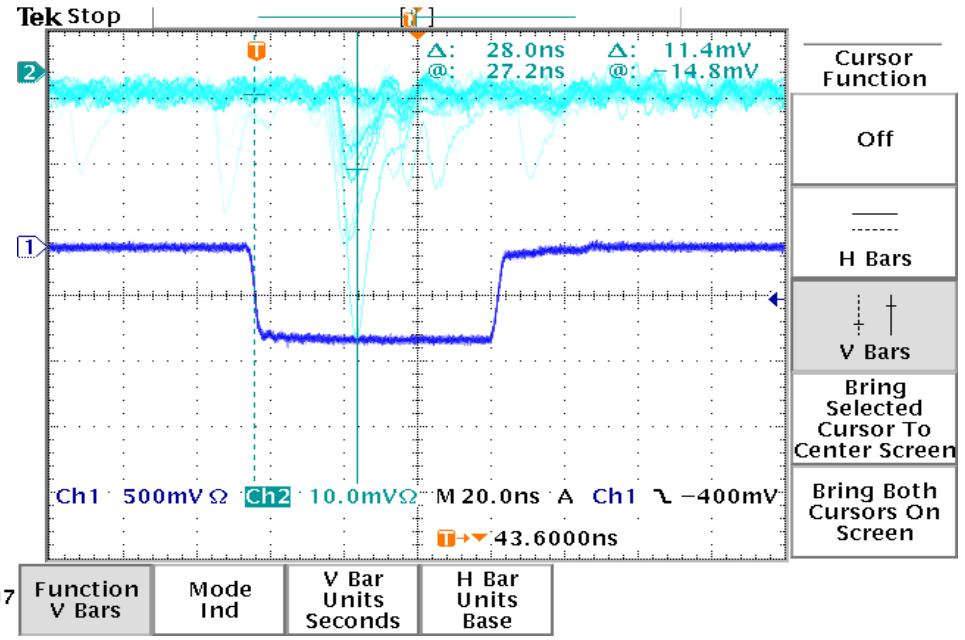
FIRST RESULTS - IV

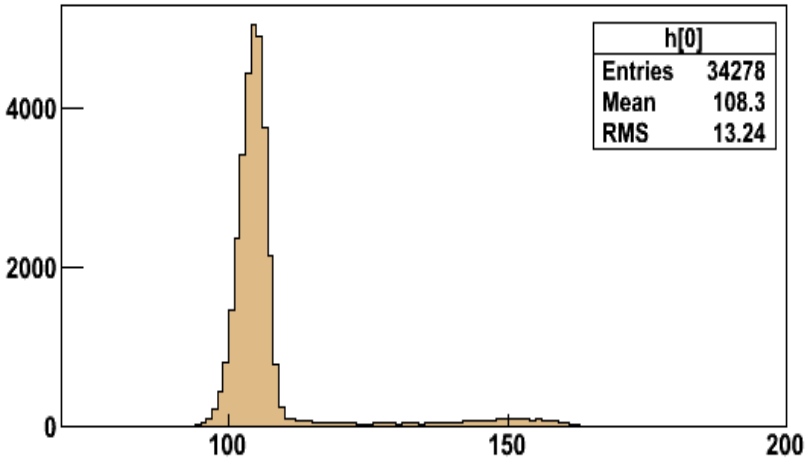


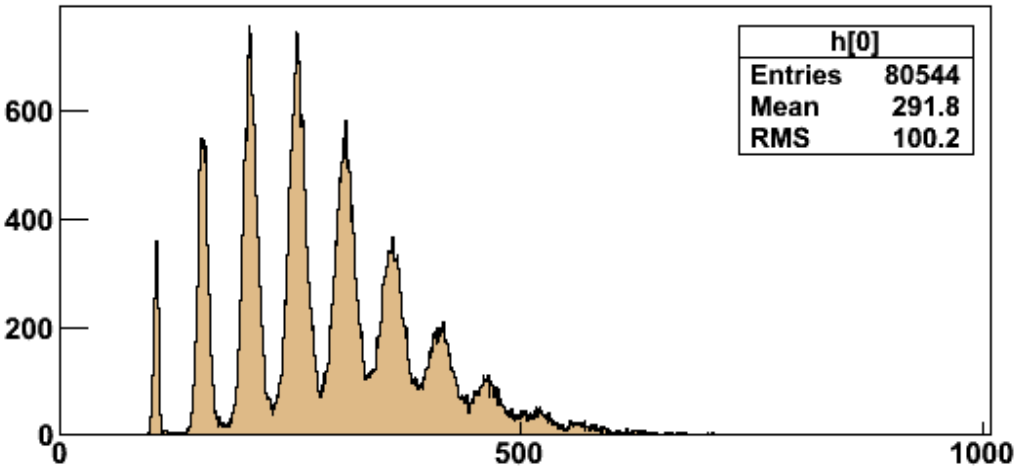


FIRST RESULTS - light response







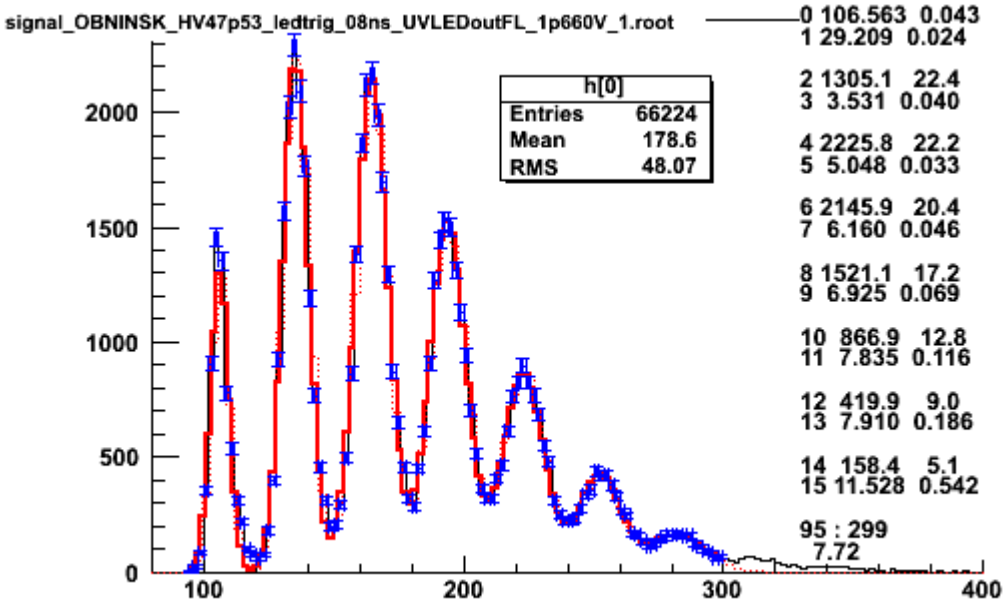


SPECTRA TREATMENT : INITIAL PROCEDURE

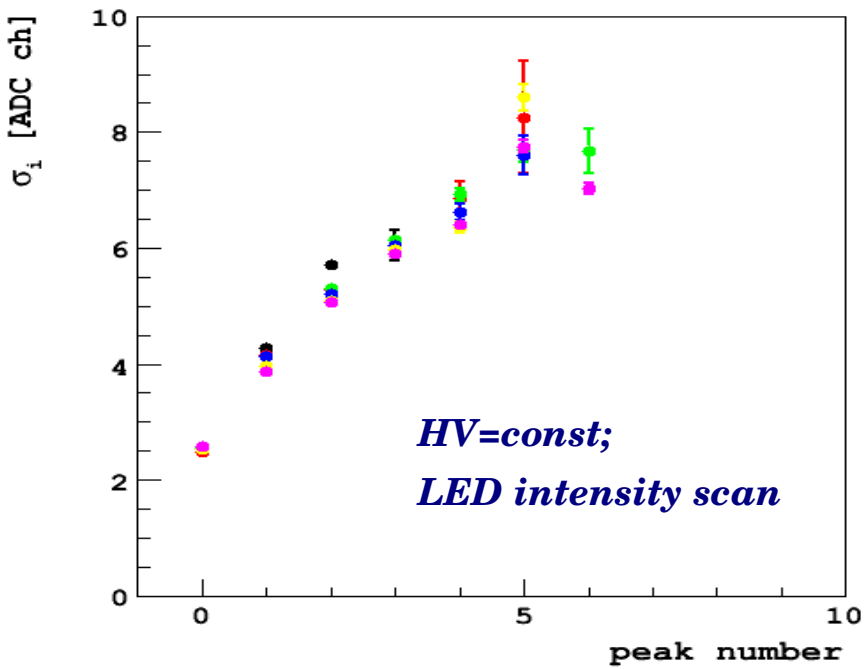
Fit parameters :

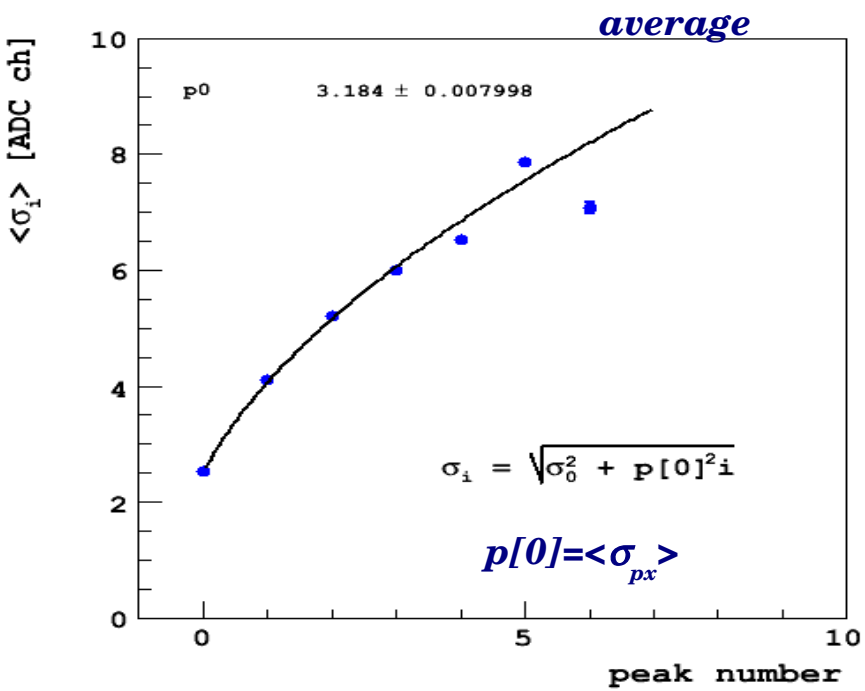
- *pedestal*
- *peak distance*
- *gauss N_i*
- *gauss σ_i*

(no eff. nor x-talk consideration)

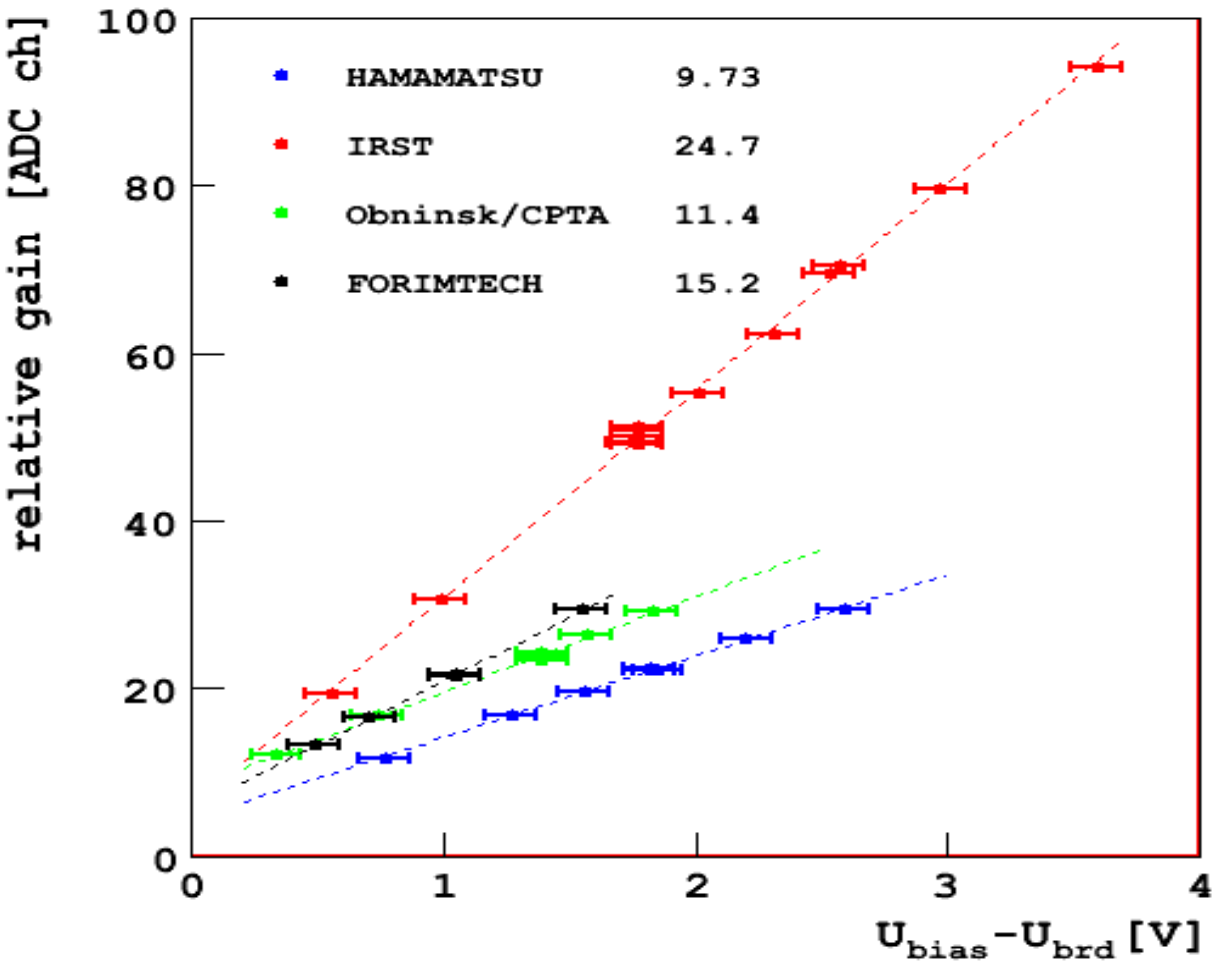


Intensity scan @ bias_U=const : x-check





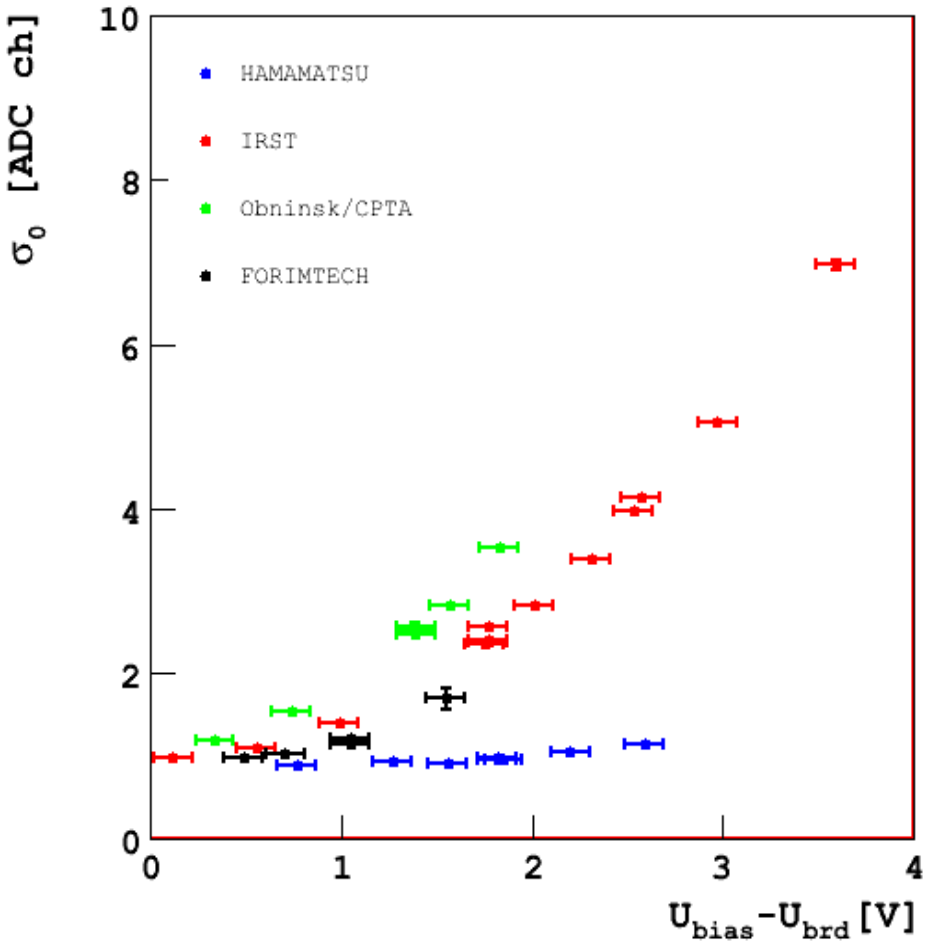
SPECTRA TREATMENT : PRELIMINARY RESULTS

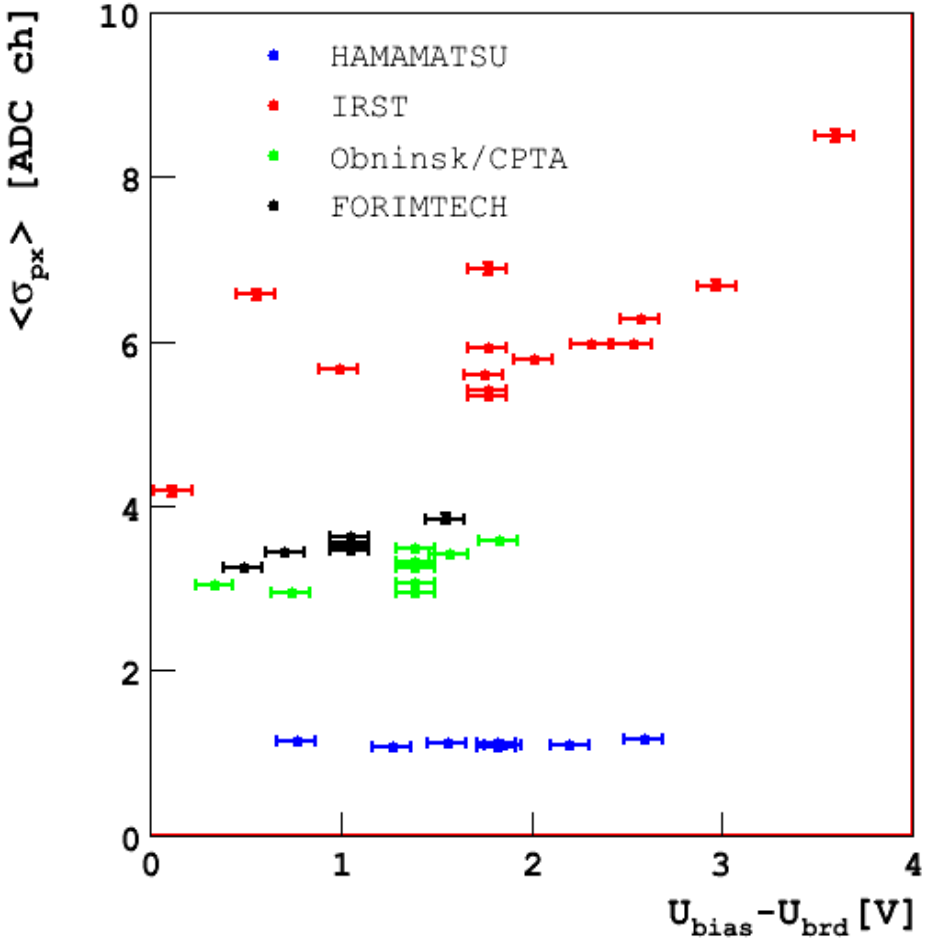


No temperature control yet :

- *<T> ~ 24 °C*
- *ΔT(one sample) ≈ 2 °C*
- *ΔT(all) ≈ 4 °C*

SPECTRA TREATMENT : PRELIMINARY RESULTS





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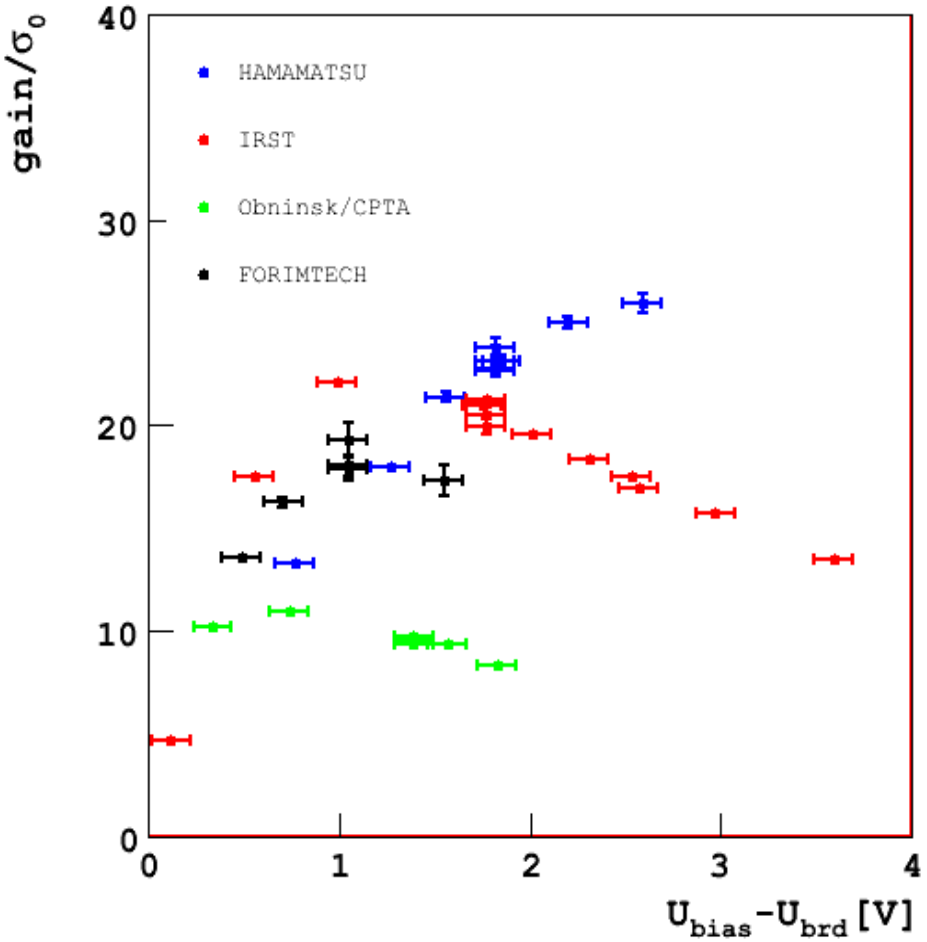

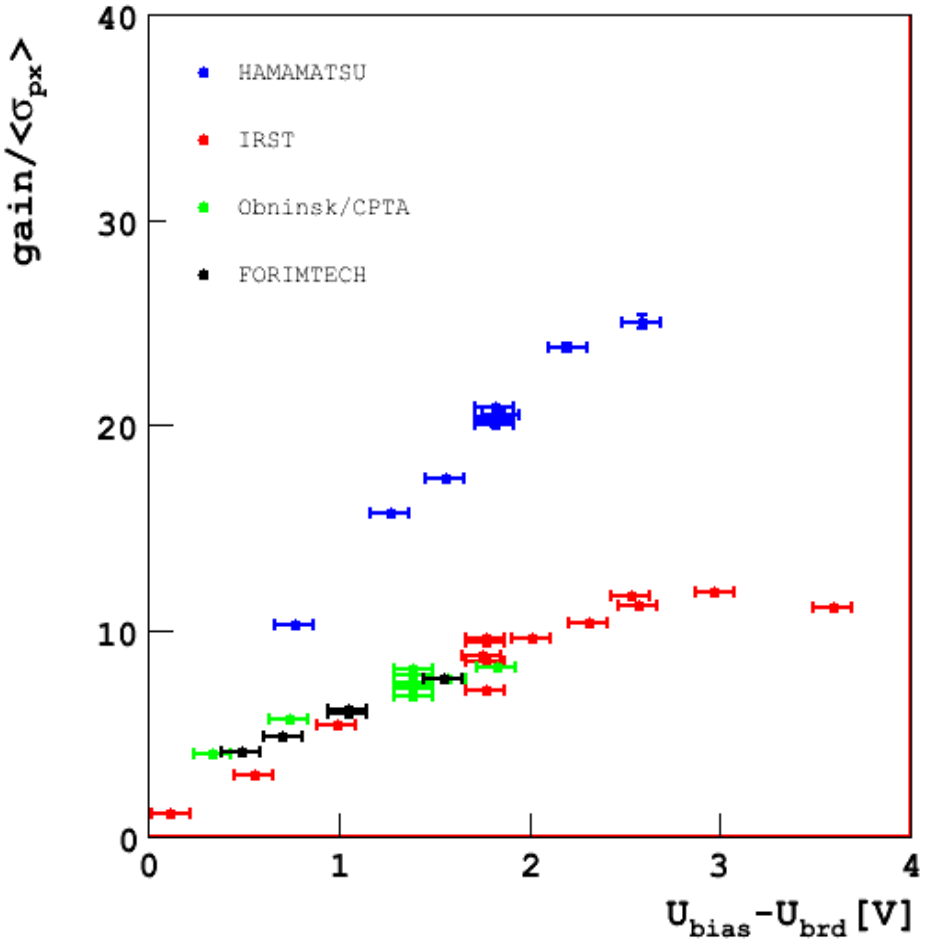

NEXT STEPS

Highest priority :

- *setup improvement (noise reduction, temperature control...)*
- *further development of the spectra treatment procedure (efficiency, x-talk)*
- *measurement program extension*
- *repeat the measurements for more samples*

After establishment of the full measurement procedure:

- *measurements of PDE as a function of light wavelength*

THANKS!

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