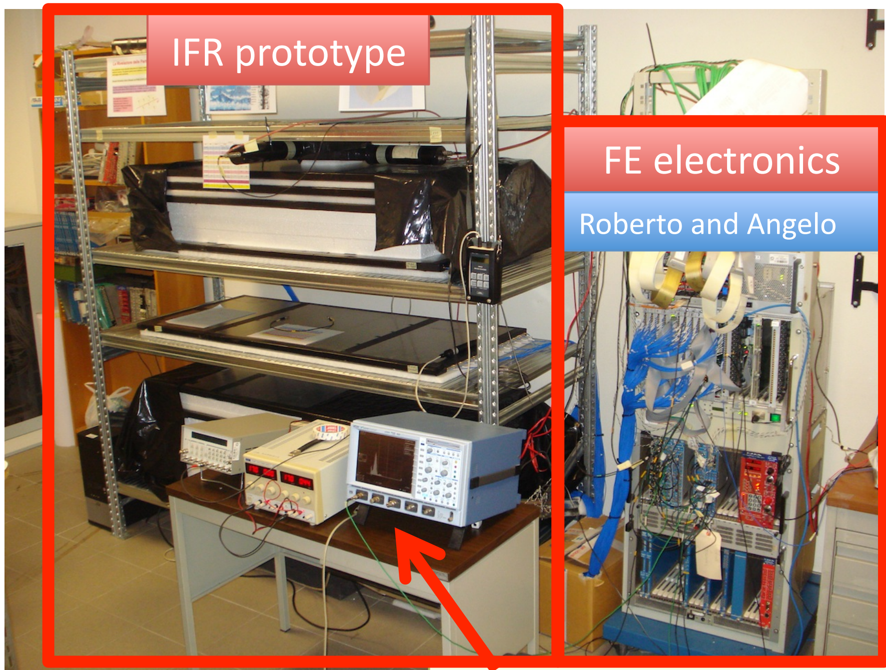
Something about the prototype

G. Cibinetto

Featuring



IFR prototype

FE electronics

Roberto and Angelo

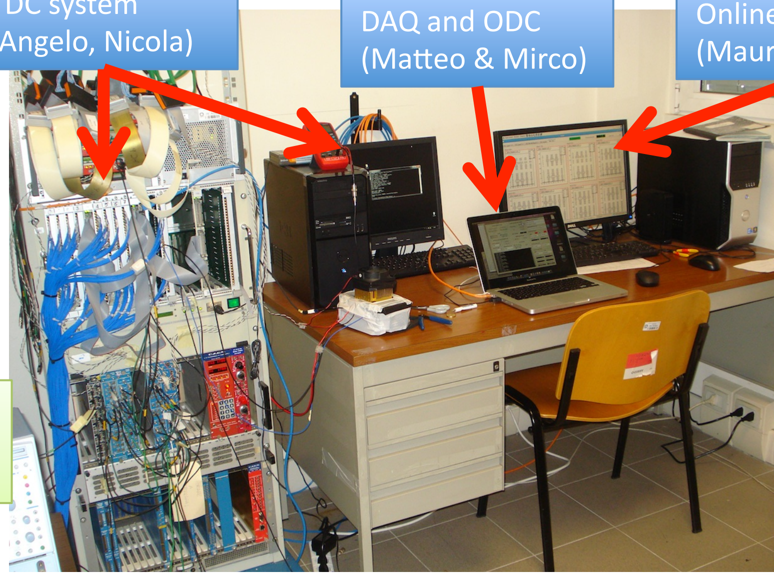
Scope for amplitude analysis (Wander, Vincenzo)

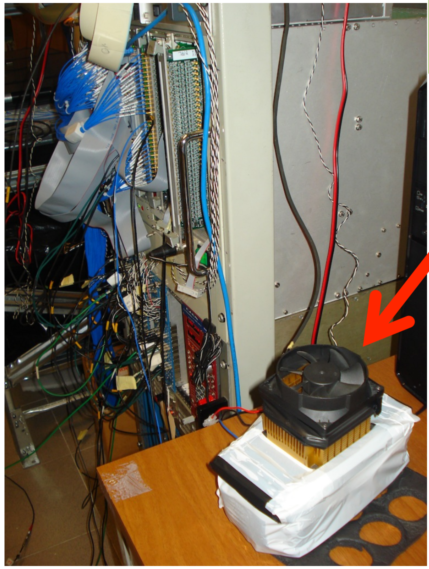
Online

TDC system (Angelo, Nicola)

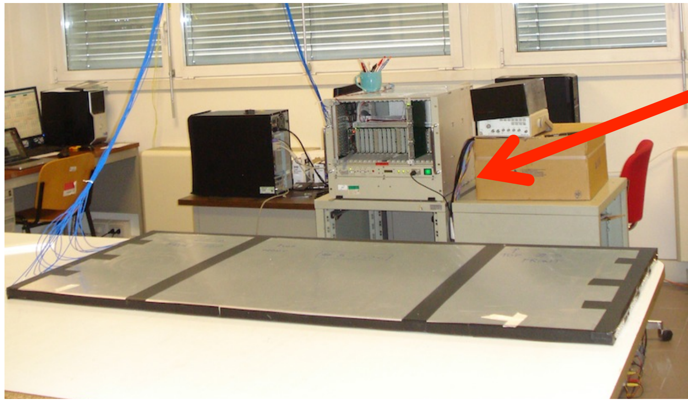
DAQ and ODC (Matteo & Mirco)

Online Monitor (Mauro)



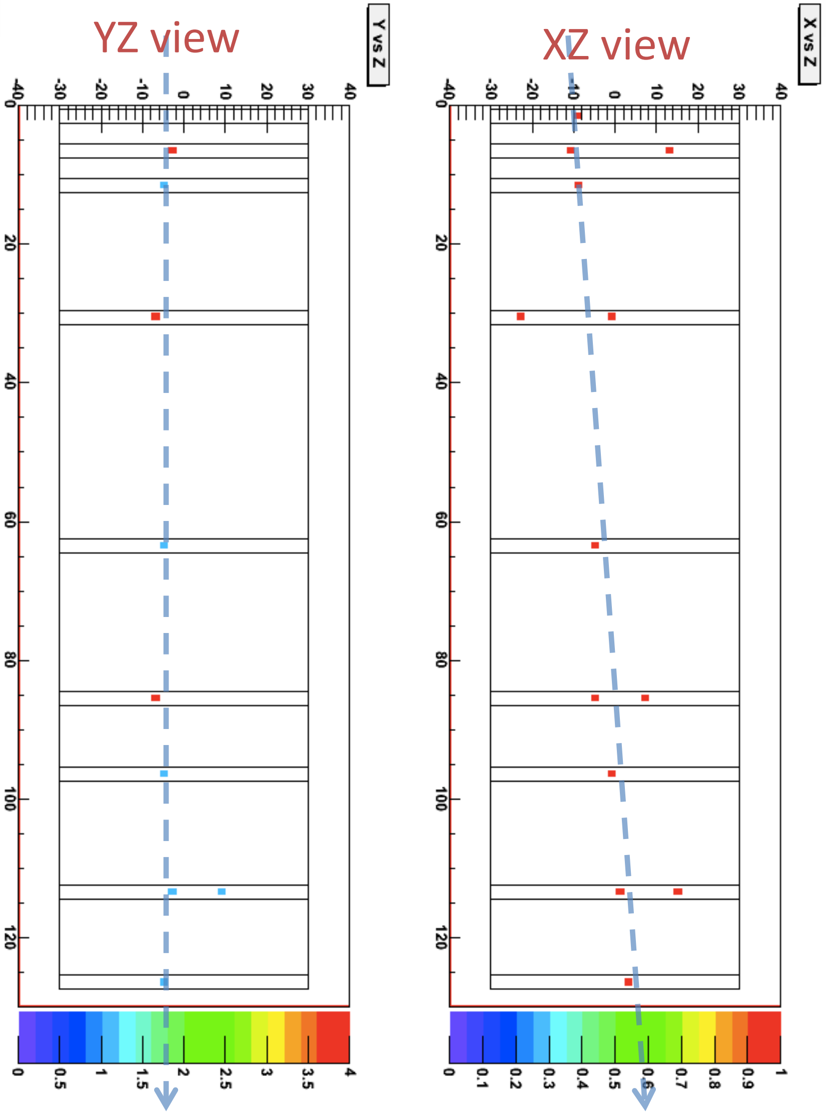


Peltier cell for controlled-temperature measurements (Roberto, Wander, Vincenzo)



Setup for characterization and gain equalization studies (Mirco and Silvia)

Cosmics at glance



Few weeks ago we turned on the prototype in Ferrara for cosmic data taking and other tests.

At a first look everything was fine, and we moved rapidly from debugging to data taking.

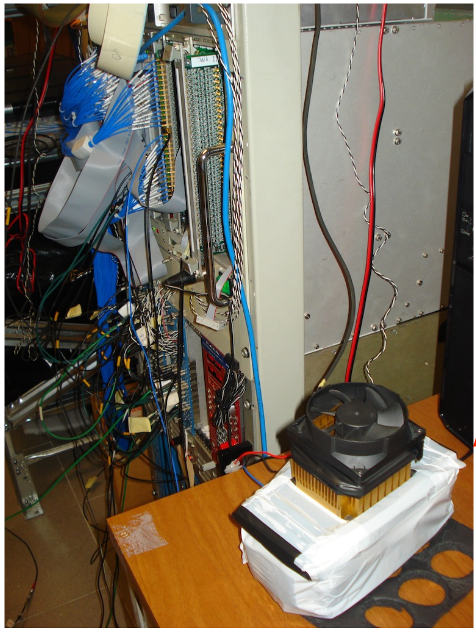
BTW, a lot of upgrades have been done so far to the online system to improve the reliability.

In this presentation I'll show some issues, results, considerations of the last 10 days of run.

THE WEATHER CHANNEL

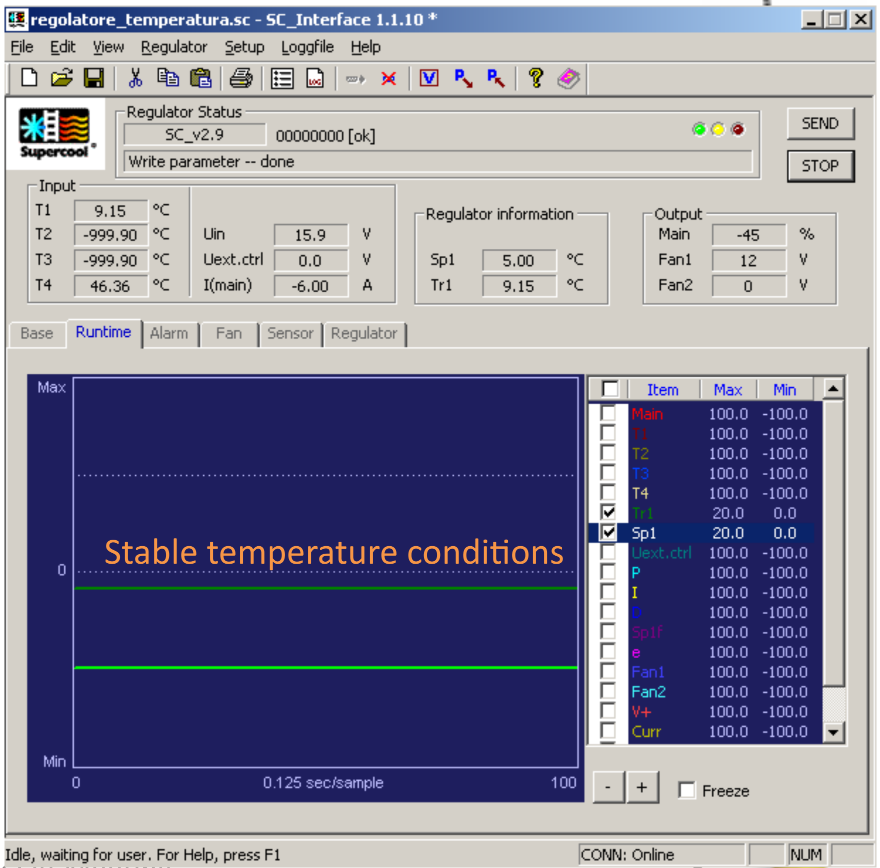
Spring may be hot in Ferrara

- When we first measured the efficiency of the prototype we found very low values.
- The temperature was above 30 Celsius!

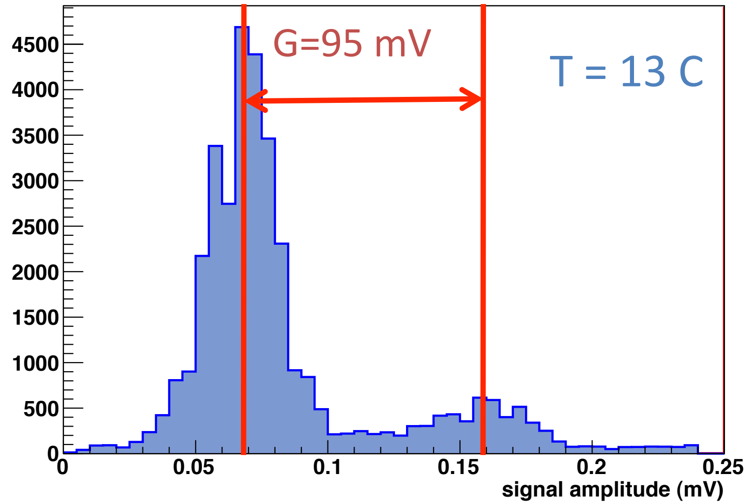


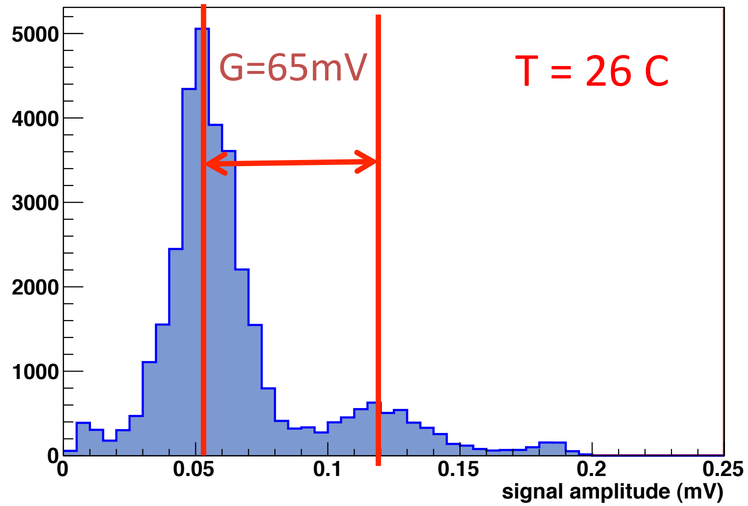
The Peltier cell for controlled-temperature measurements

The SiPM is inside here and it's biased and read by the ABC board

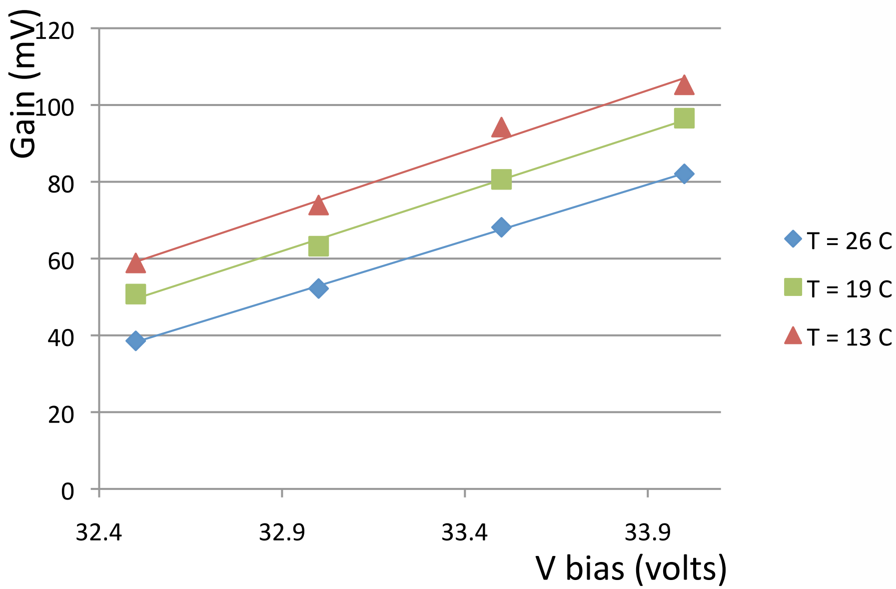


Amplitude spectra

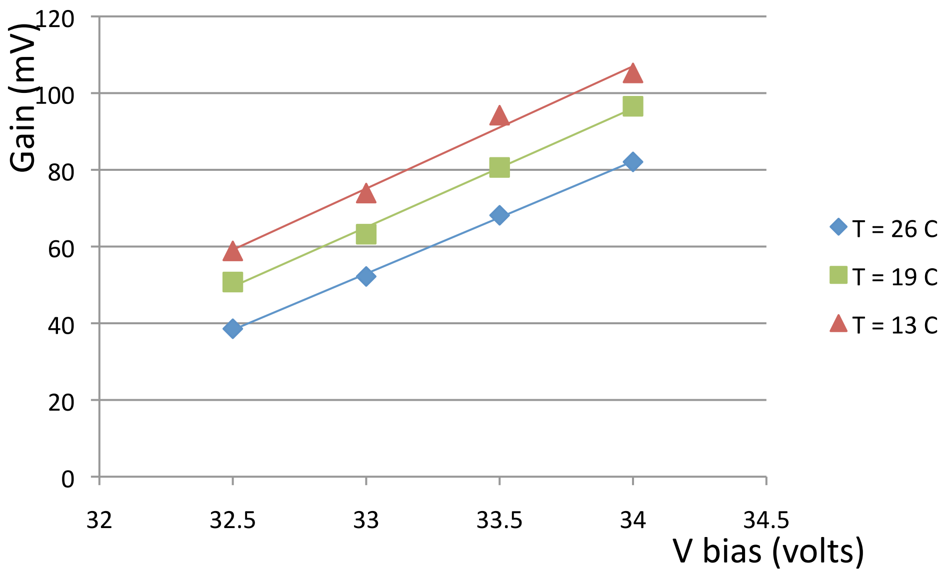


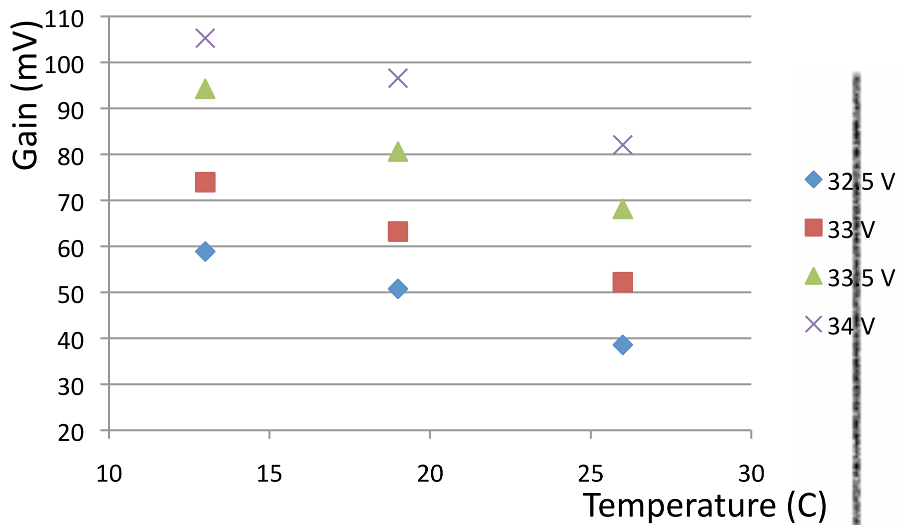


- The difference of the signal amplitude changes about 50% in 13 degrees.

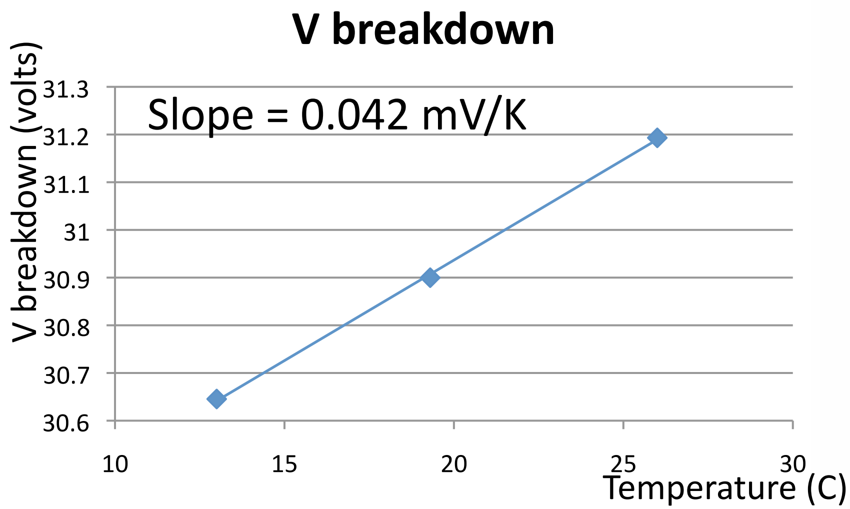


Breakdown voltage vs temperature



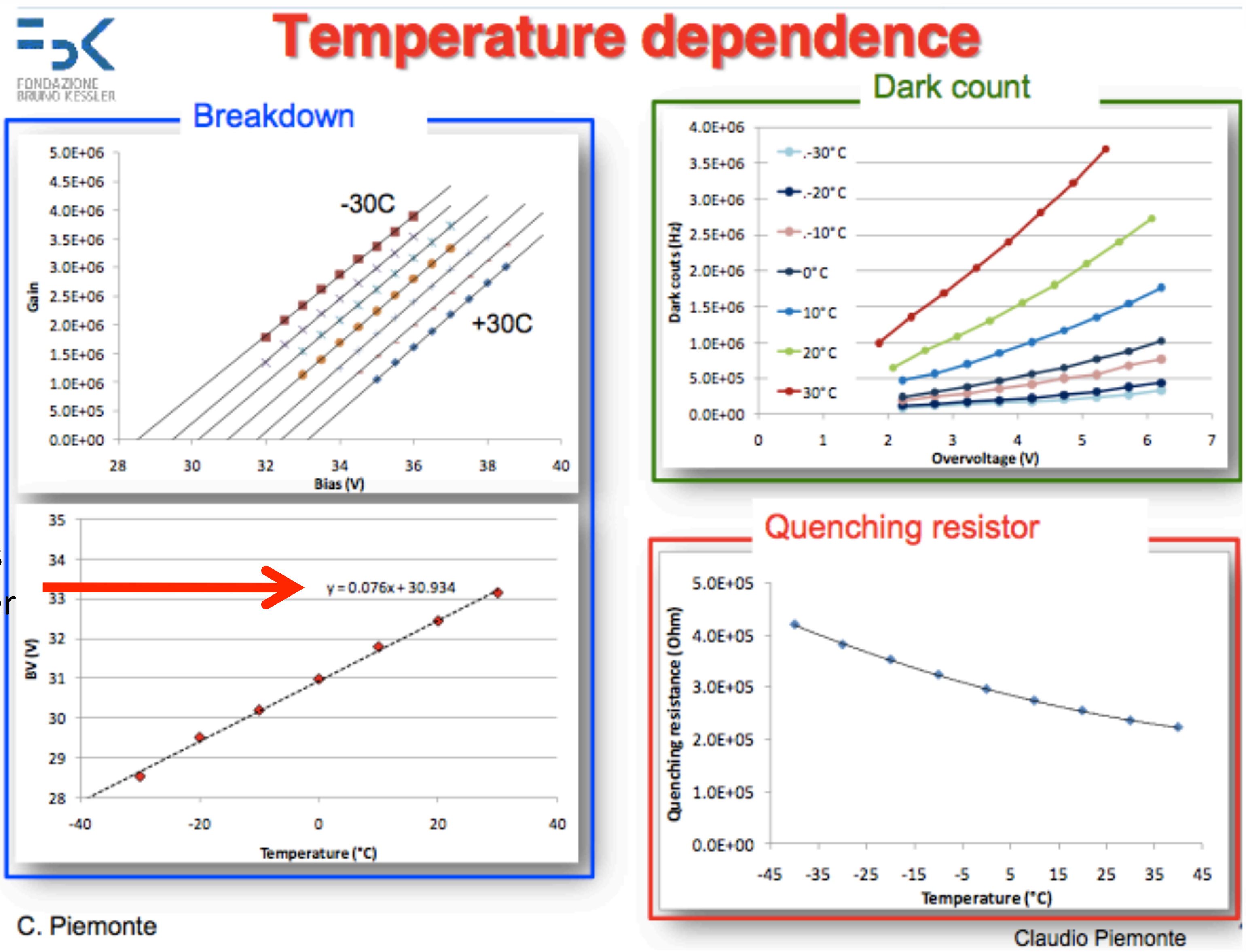


T	Vbkd
13	30.64545455
19.3	30.89981273
26	31.19306931

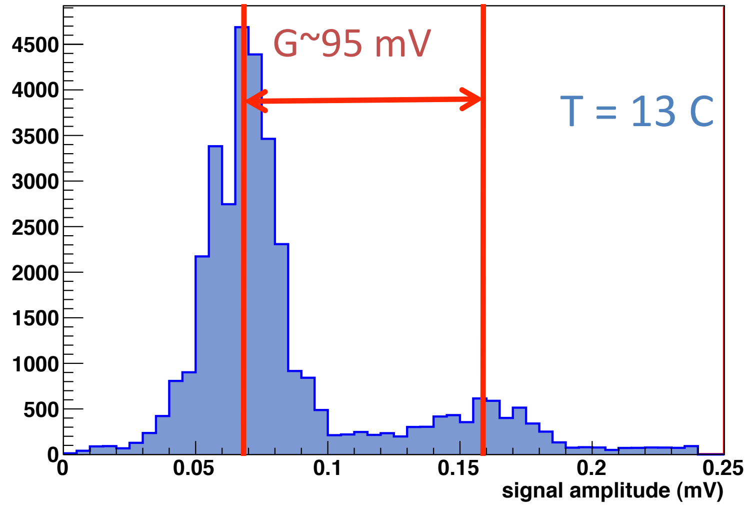


What's in Literature

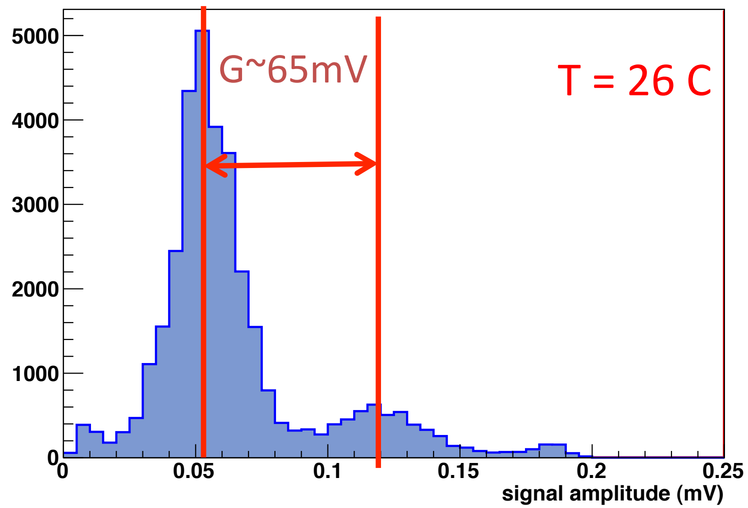
The slope is much higher

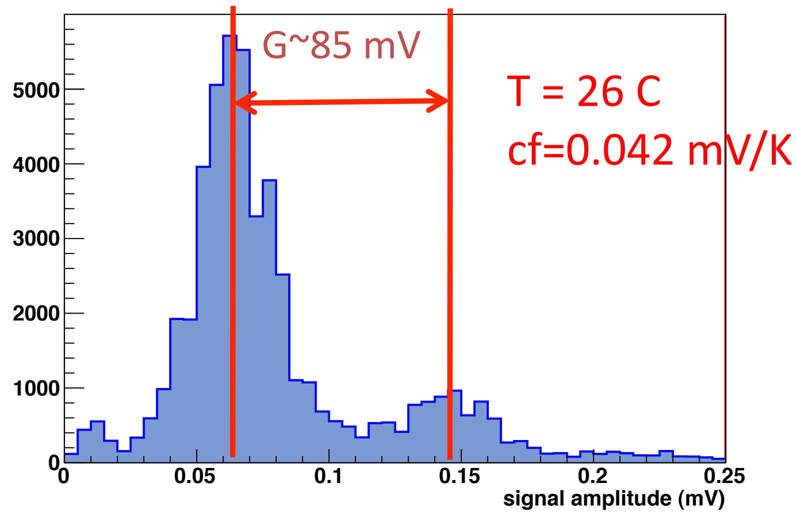


Applying the correction (I)

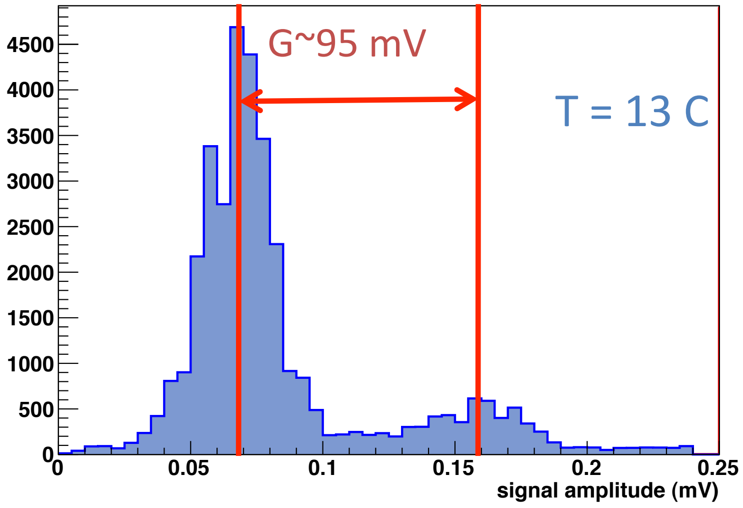


- We correct the bias voltage to take into account the temperature effect.
- Using our correction factor (0.042 mV/K) the gain is still lower than expected.

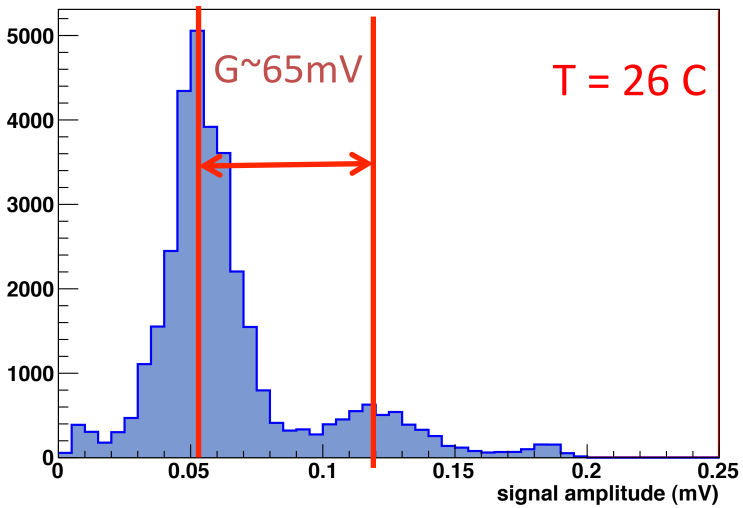


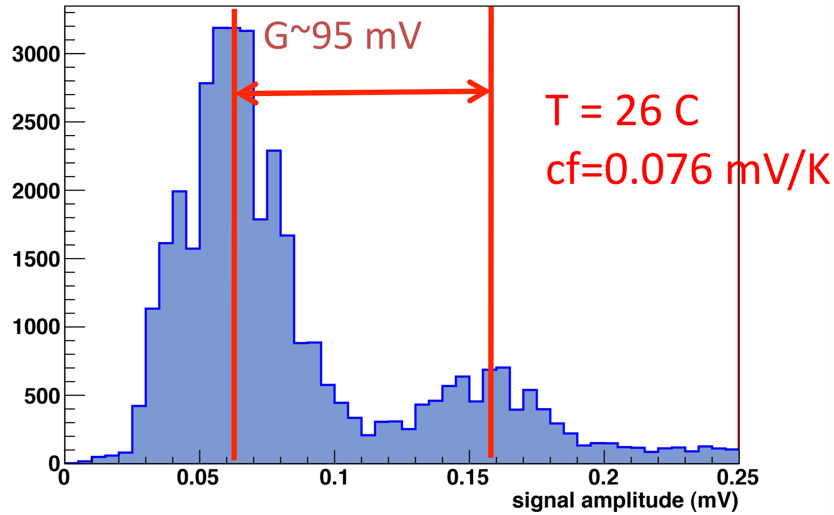


Applying the correction (II)



- Using the correction factor (0.076 mV/K) found in literature the temperature gain loss is completely taken into account.
- What's wrong with our measurement?





Therefore

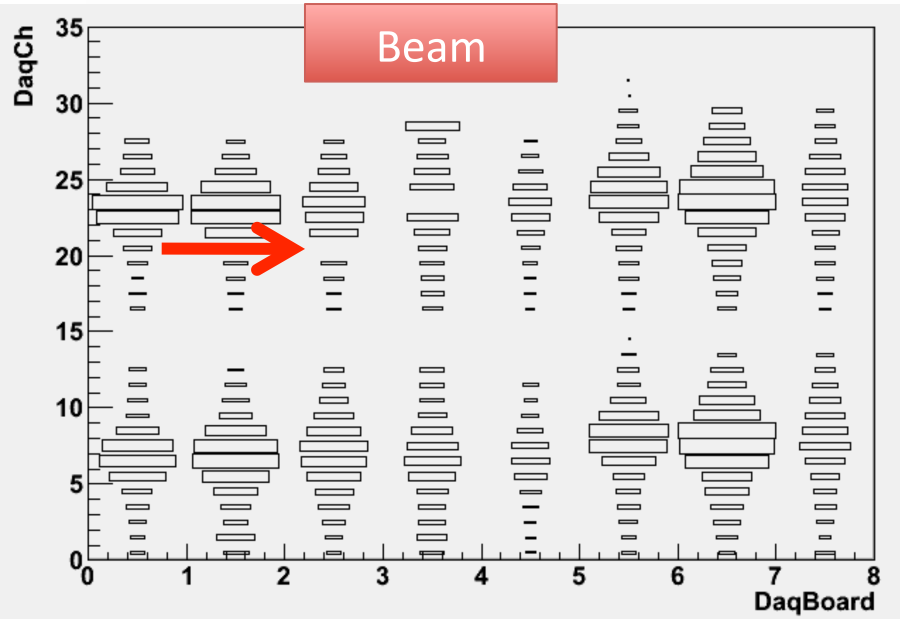
- The SiPM have been characterized at ~24 Celsius.
- The Beam Test has been done in December at Fermilab and the temperature was certainly below 20 C. We didn't apply any temperature correction.
- Now we are running at ~23±2 C with a static temperature correction

➡ Any comparison between cosmics and beam data is hard and must be interpreted very carefully

➡ We need a dynamic temperature control (ASAP).

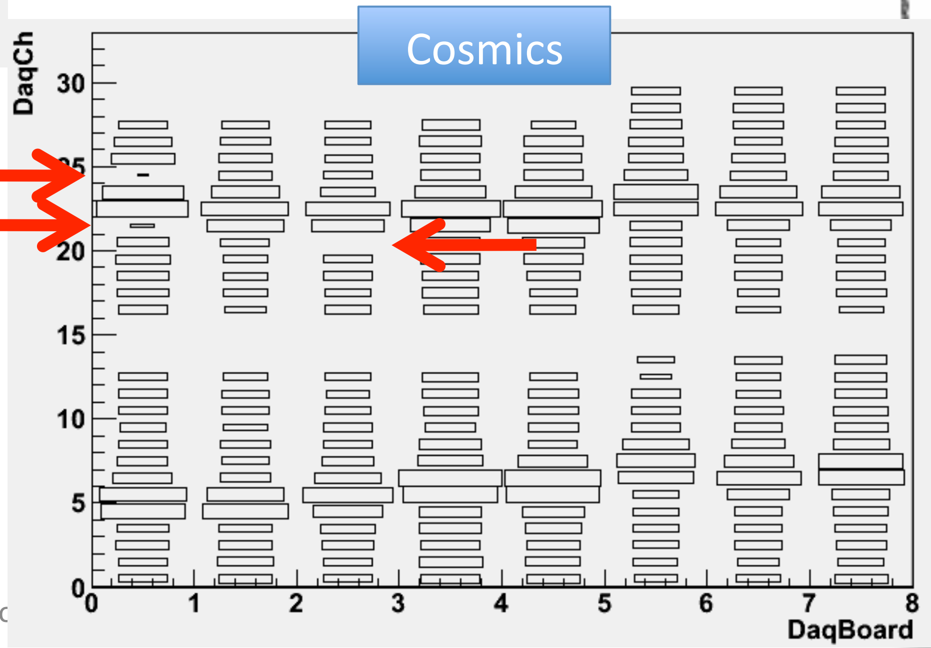
BEAM VS COSMICS

Dead channels



1 dead channel during the beam test

3 dead channels now.

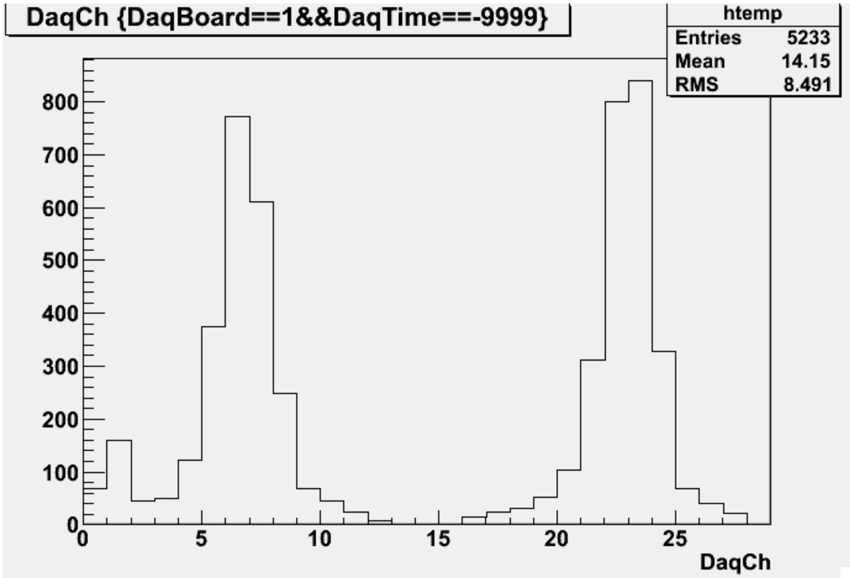


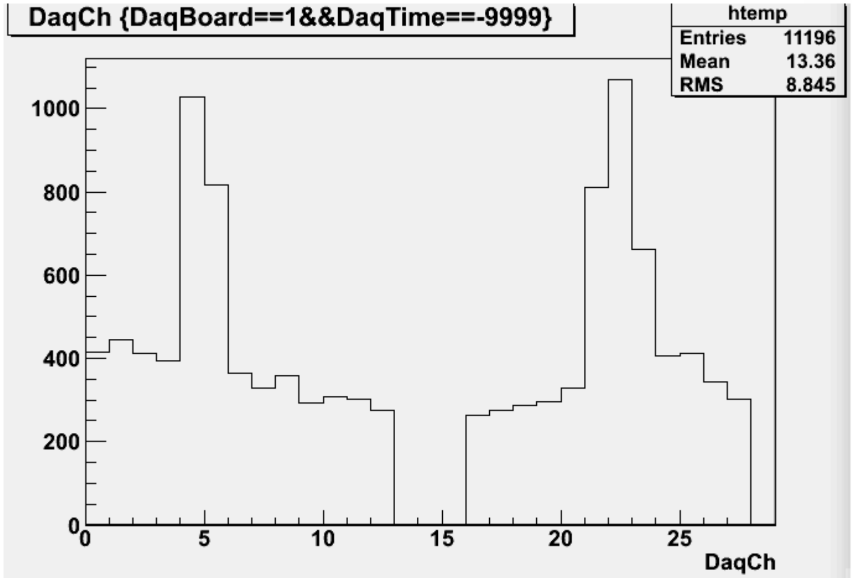
Noise level (BiRO)

Beam

Cosmics

after correction (maybe overcorrected)



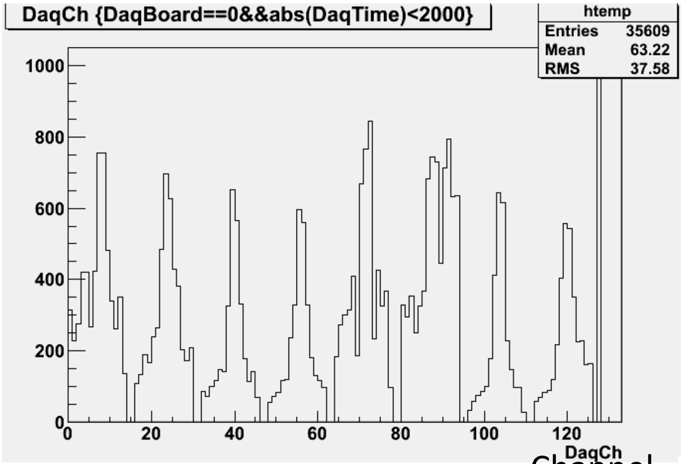


This is the hit map for 1000 beam/cosmic events; noise level is about 40% for cosmics!

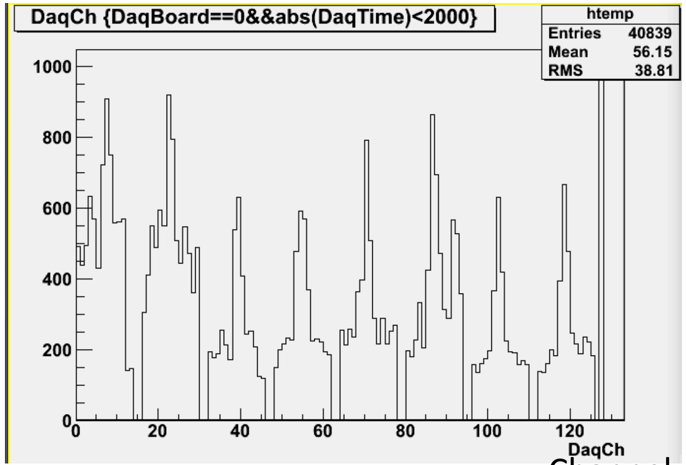
Noise level (TDC)

Beam | **Cosmics**

TDC hit Map

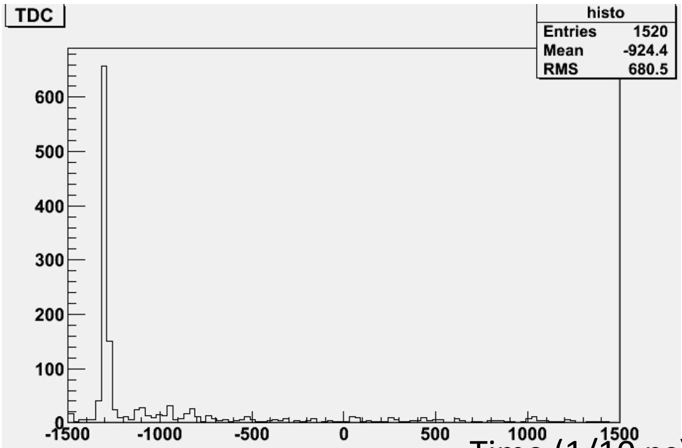


Channel

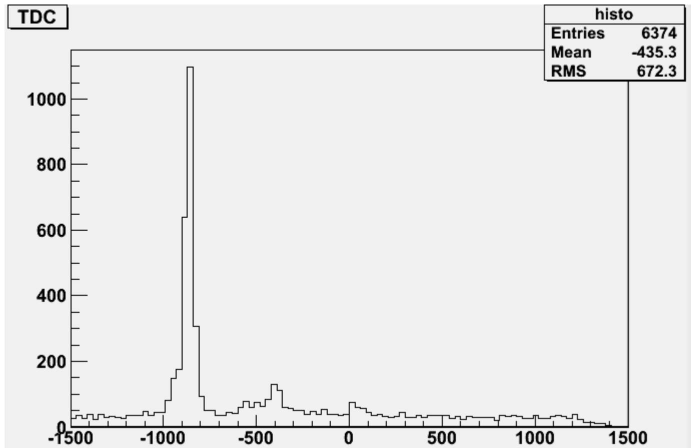


Channel

Time distribution for one half layer

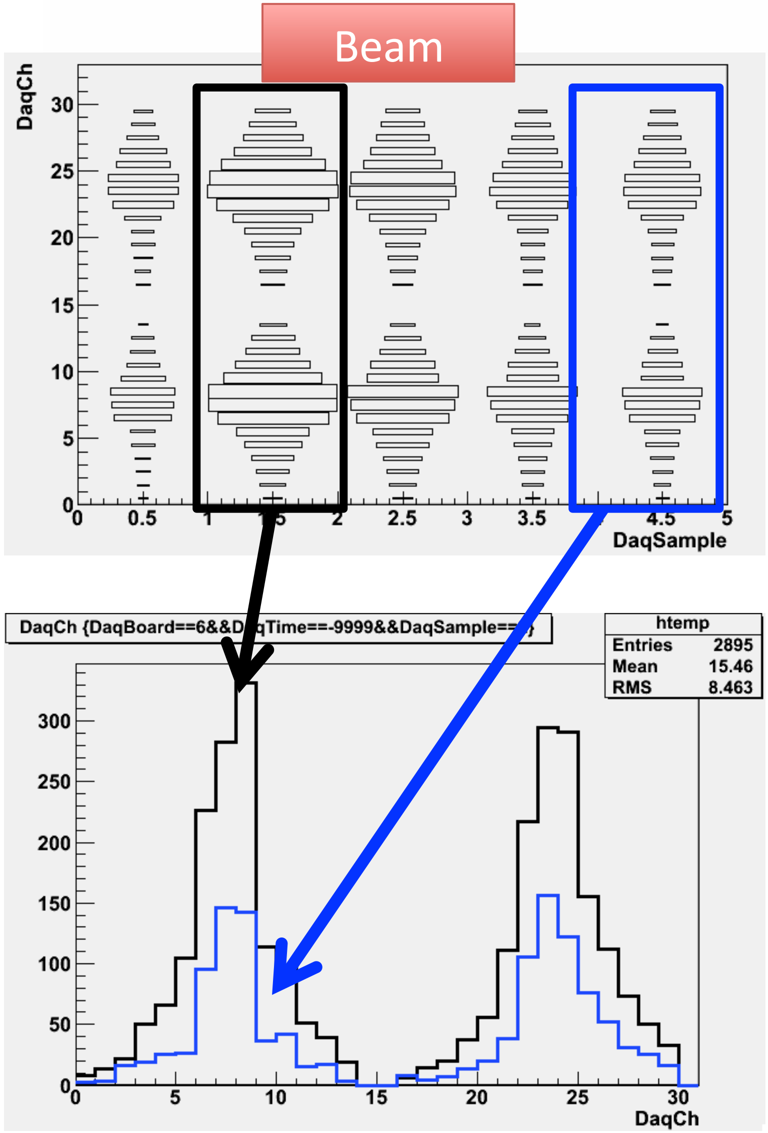


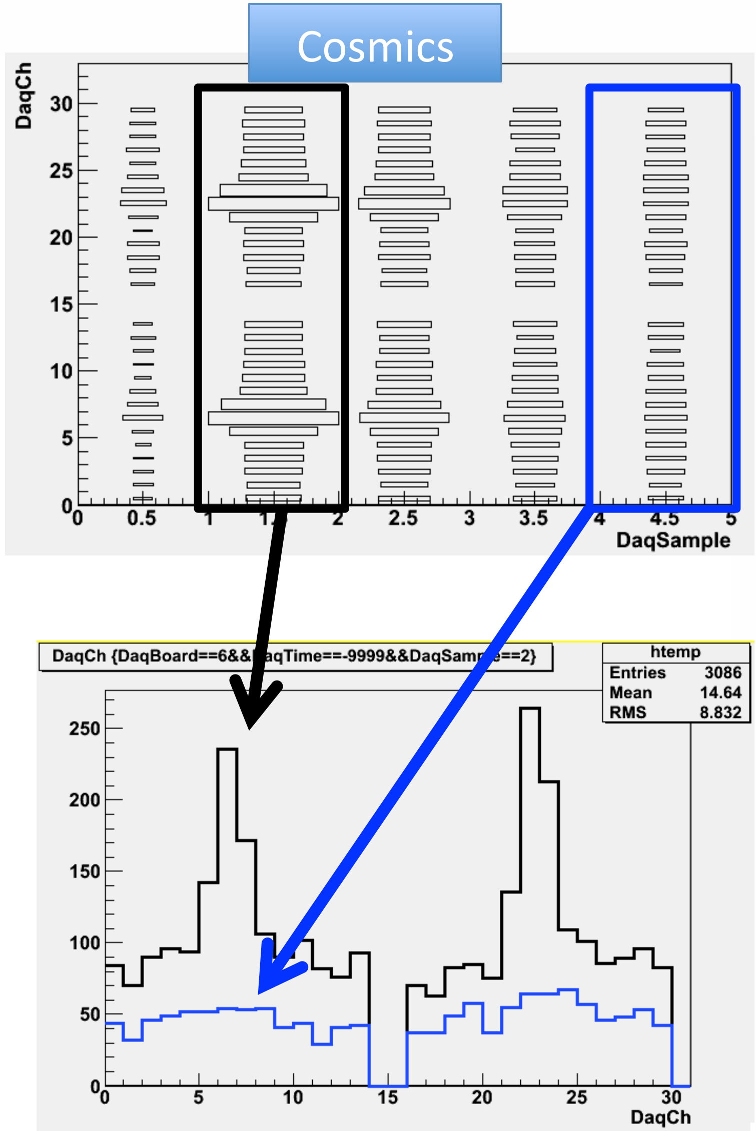
Time (1/10 ns)



Time (1/10 ns)

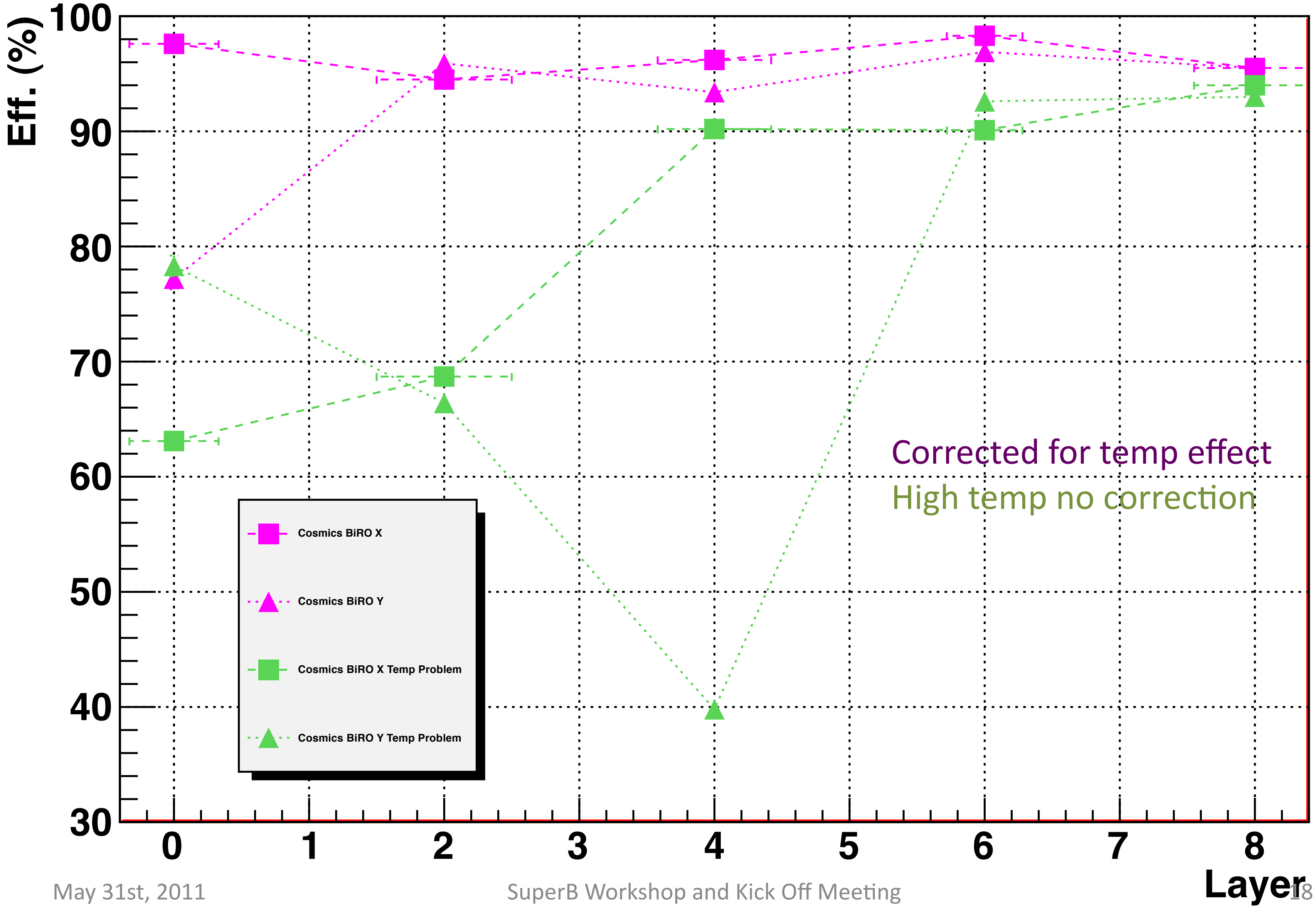
BiRO time evolution



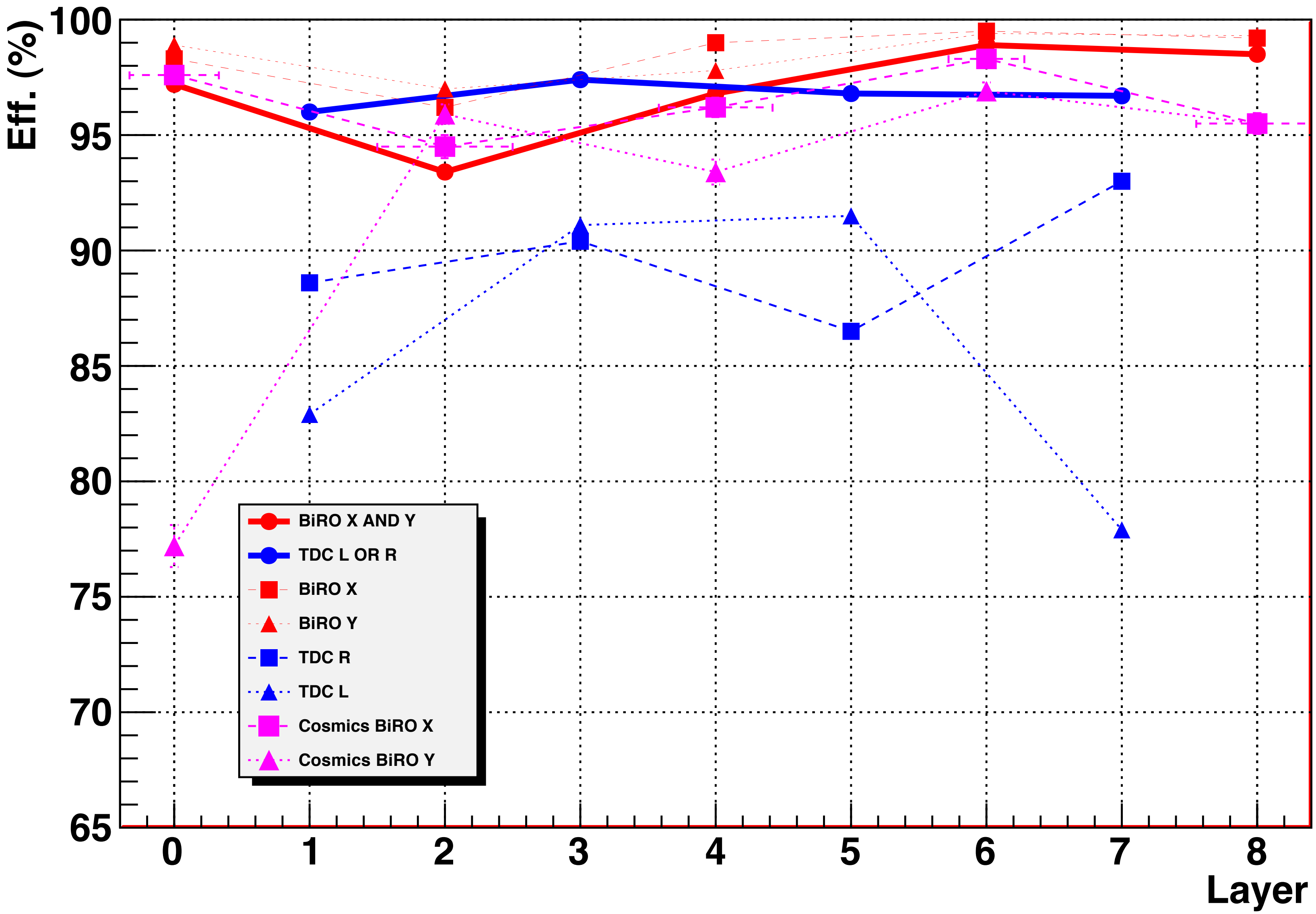


EFFICIENCIES

Cosmics data efficiency (BiRO only)



Prototype efficiency (beam and cosmics)



Conclusions

- The temperature issue has been underestimated and need to be addressed before the next beam test (Chicago is very hot during the summer)
  - More measurements
  - Implement dynamic correction
  - Cooling (?)

- Preliminary results on cosmic runs are difficult to be interpreted due to the temperature effect.
  - Efficiency for BiRO about the same as during the beam test
  - Noise much higher (but can be not only the temperature but also a nosier environment).
  - Before analyzing the TDC data (efficiency and time resolution) we need to lower the noise.