

Xmas Run Monitoring




Hendrik Meyer

Correction Procedure

Monitoring correction:

$$\text{SiPM}_{\text{sig,corr}} = \text{SiPM}_{\text{sig}} \frac{\text{SiPM}_{\text{LED},0}}{\text{SiPM}_{\text{LED}}} \frac{\text{PIN}_{\text{LED}}}{\text{PIN}_{\text{LED},0}}$$



Relative SiPM variation
Temperature, jumps

Relative LED variation
Temperature, jumps

Most data in christmas run is calibration mode data
from saturation curve runs.

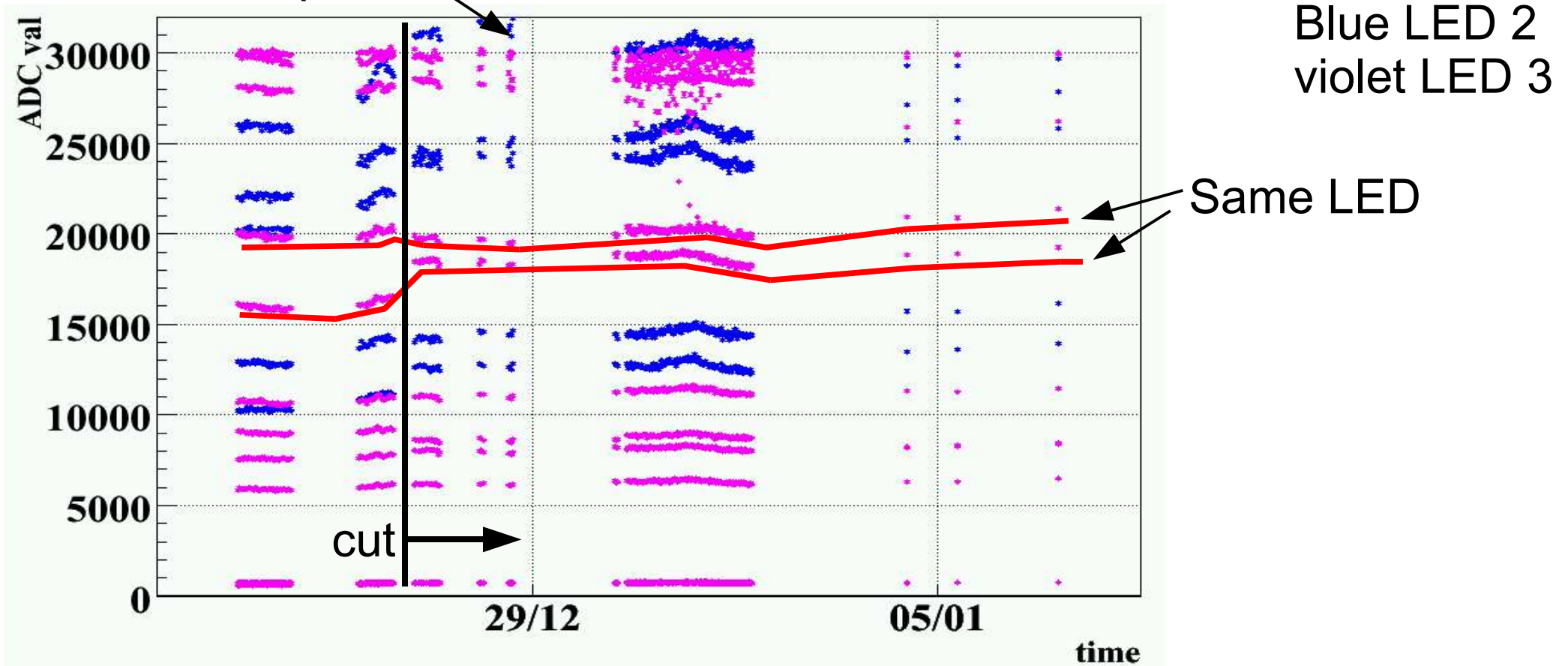
Data for ~ 3 weeks

3 LEDs going to 3*18 SiPMs monitored by 3 PIN diodes

Cosmics for ~1/3 of 3 modules.

SiPM LED signals

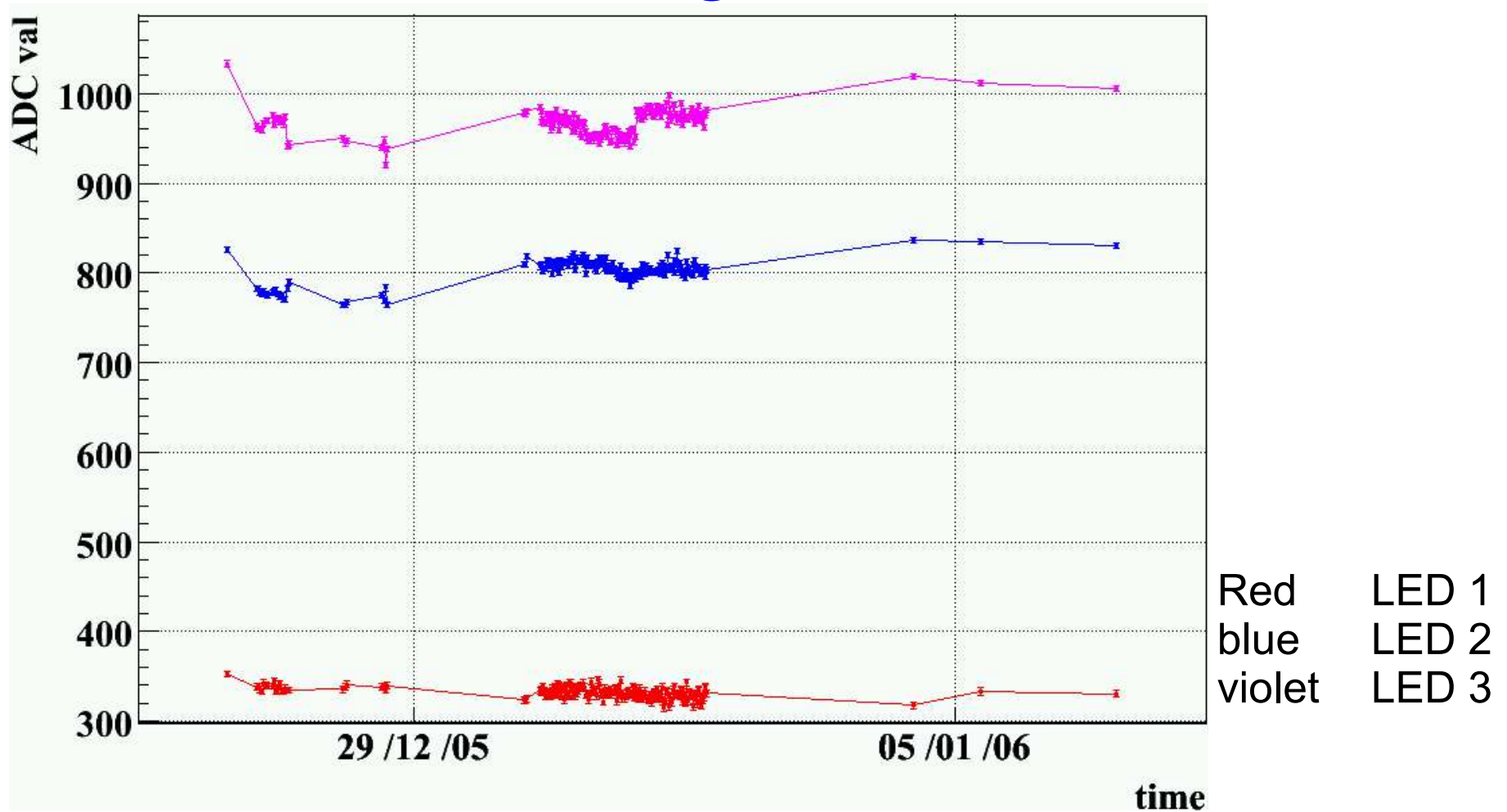
1024 events per run – mean is used.



SiPM signals are in a brought

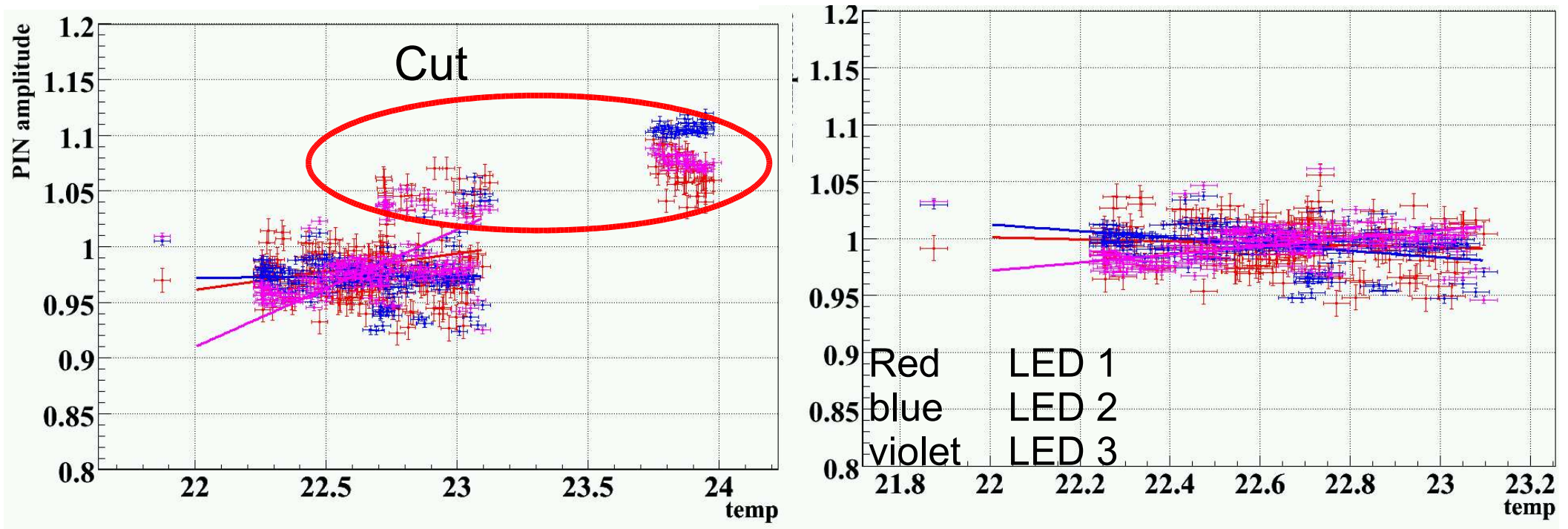
First jumps not correctable (maybe due to instable set up)

PIN signals



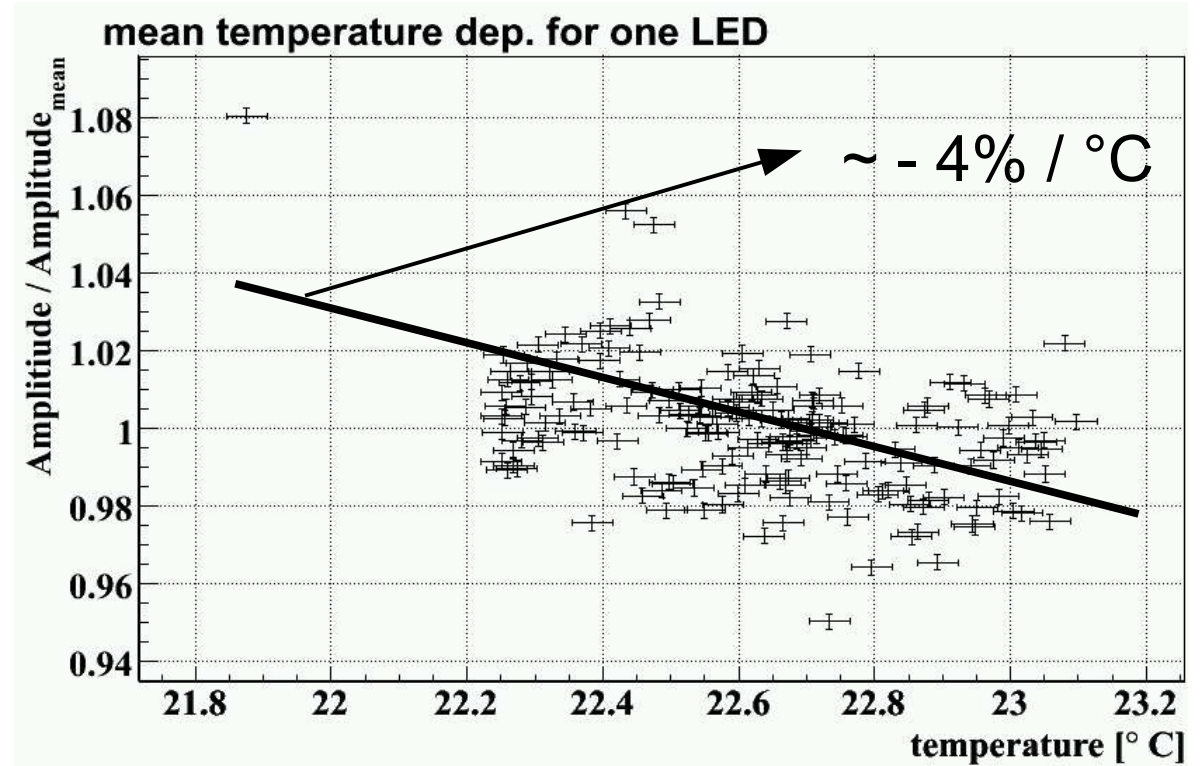
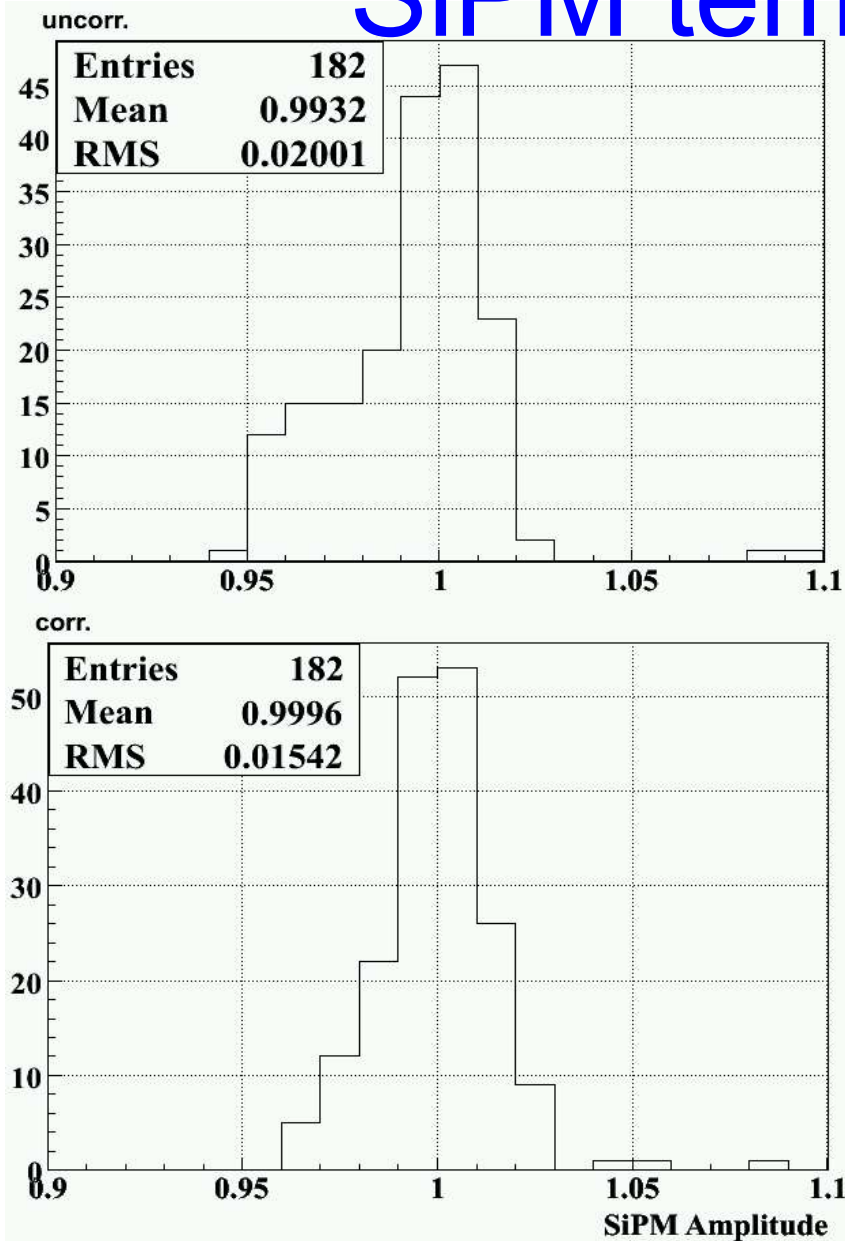
Very different amplitudes ,different sensitivities to light changes

PIN signals normalized



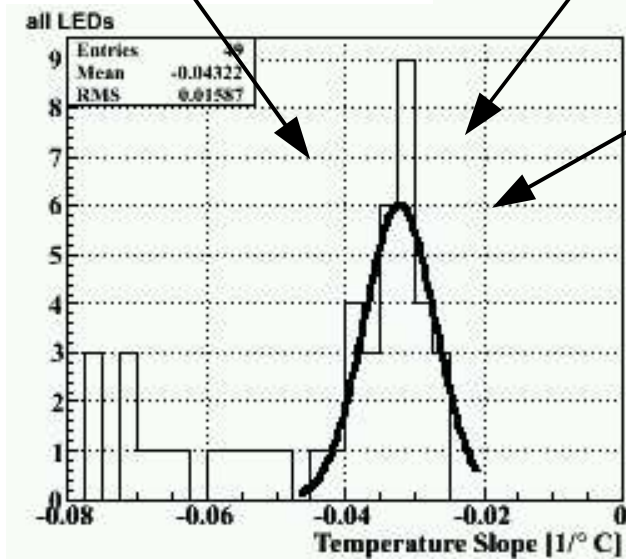
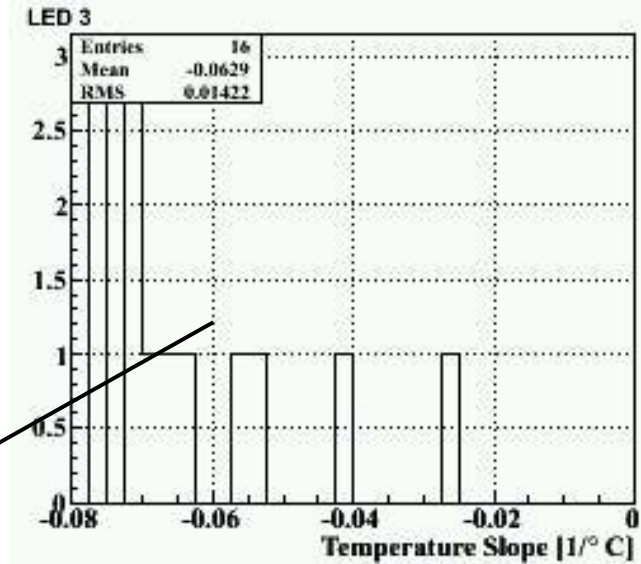
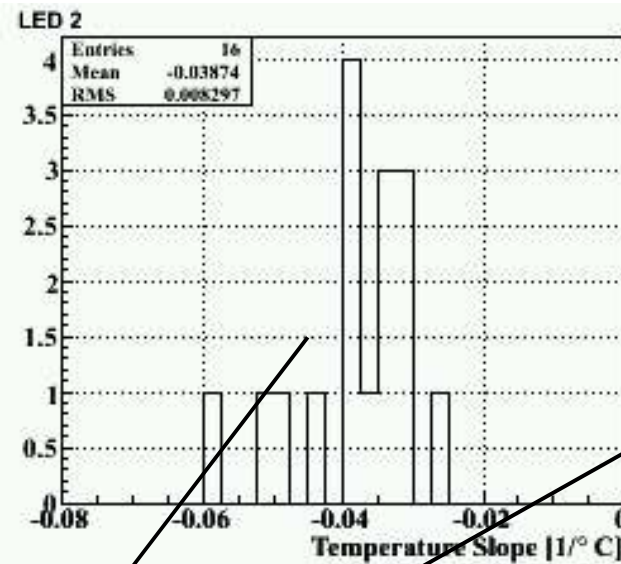
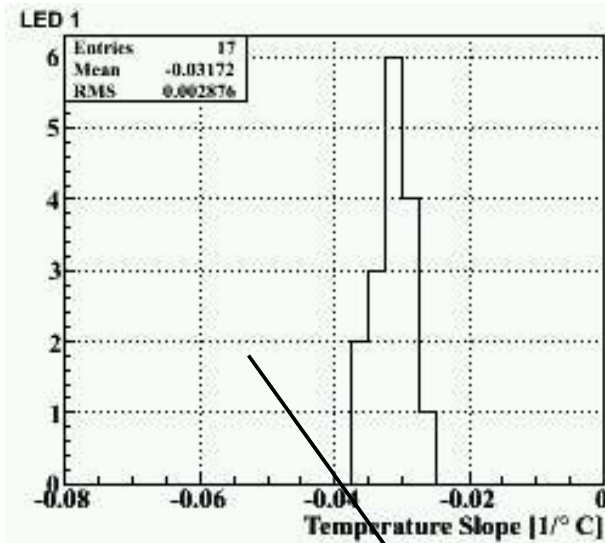
Signals normalized to mean
PIN signals show slight temperature dep. In LEDs (~2%)

SiPM temperature dep. (calibration mode)



PIN correction reduces spread in SiPM fluctuations

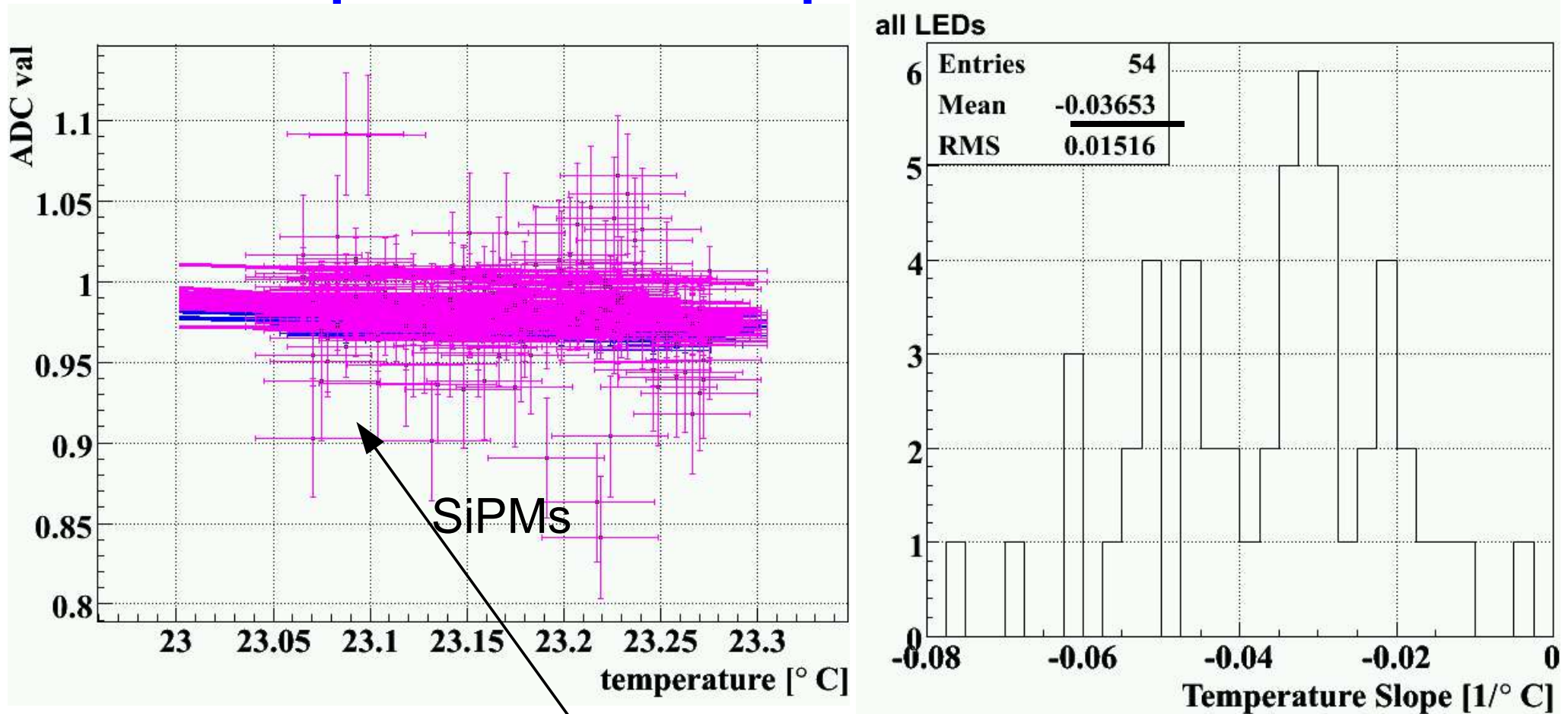
Temperature slope of SiPMs (calibration mode)



-3.5 %/ $^\circ\text{C}$
 ± 0.5 %/ $^\circ\text{C}$

Single SiPM temperature slopes sorted by LEDs. Mean slope is -3.5 %/K

Temperature slope of SiPMs (physics mode)



Similar result as calibration mode data
but smaller temperature range

Summary and Outlook

- Temperature slope can be extracted from various measurements in Xmas run. Gives consistent value of $\sim -4\% / ^\circ\text{C}$
- Cosmics data have now be corrected for temperature changes.
- To test: Can new CMB correct some strange behaviour of SIPM/LED.
- Now signal correction only in intersection of LED chan. and MIP chan.

Future Cosmics test with real CMB prototype needed:

- **mechanically more stable light coupling of LEDs and PINs**
- Final PIN preamp and LED driver
- Improved electrical contact of LEDs (soldered vs. connector)
- Improved electrical signal to LED (adjustable)
- 12 LEDs and PINs instead of 3
- New trigger plates of 1m^2 (more channels with MIP)