CERN Testbeam 2010

Data Quality and Calibration

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The WHCAL

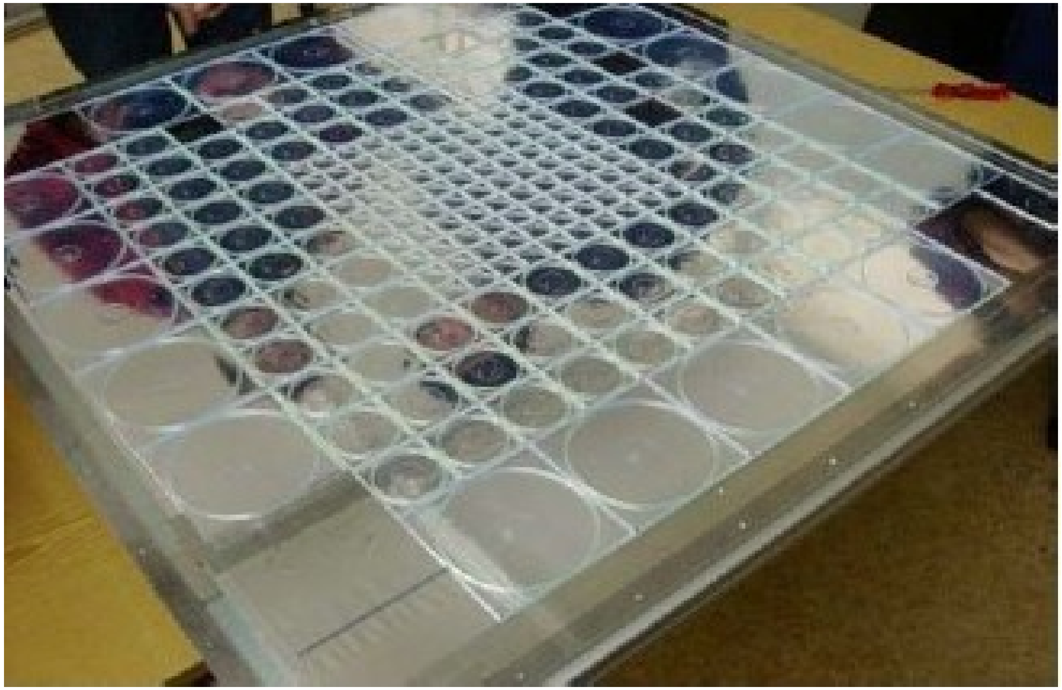
Absorber:

30 plates of 1cm thick tungsten alloy

$\lambda_{int}(W) = 10$ cm, $X_0(W) = 0.35$ cm

Compared to steel:

- Less visible energy (ionization)
- More neutrons (slow shower component)



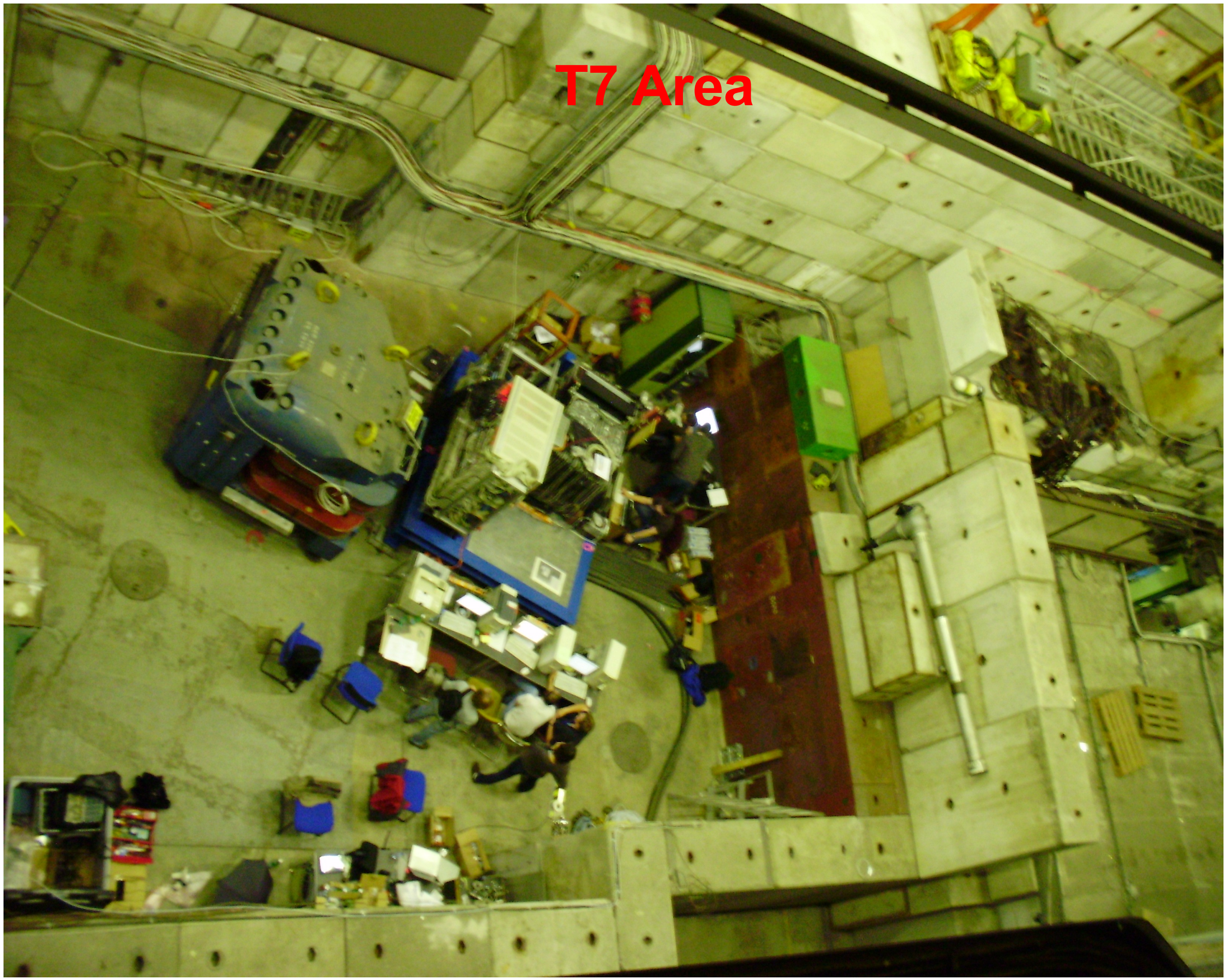
Active material:

Scintillator tiles with with WLS fibre,
Read out via multi-pixel SiPM

(same as for AHCAL Physics Prototype, but coarse modules not used)

The WHCAL II

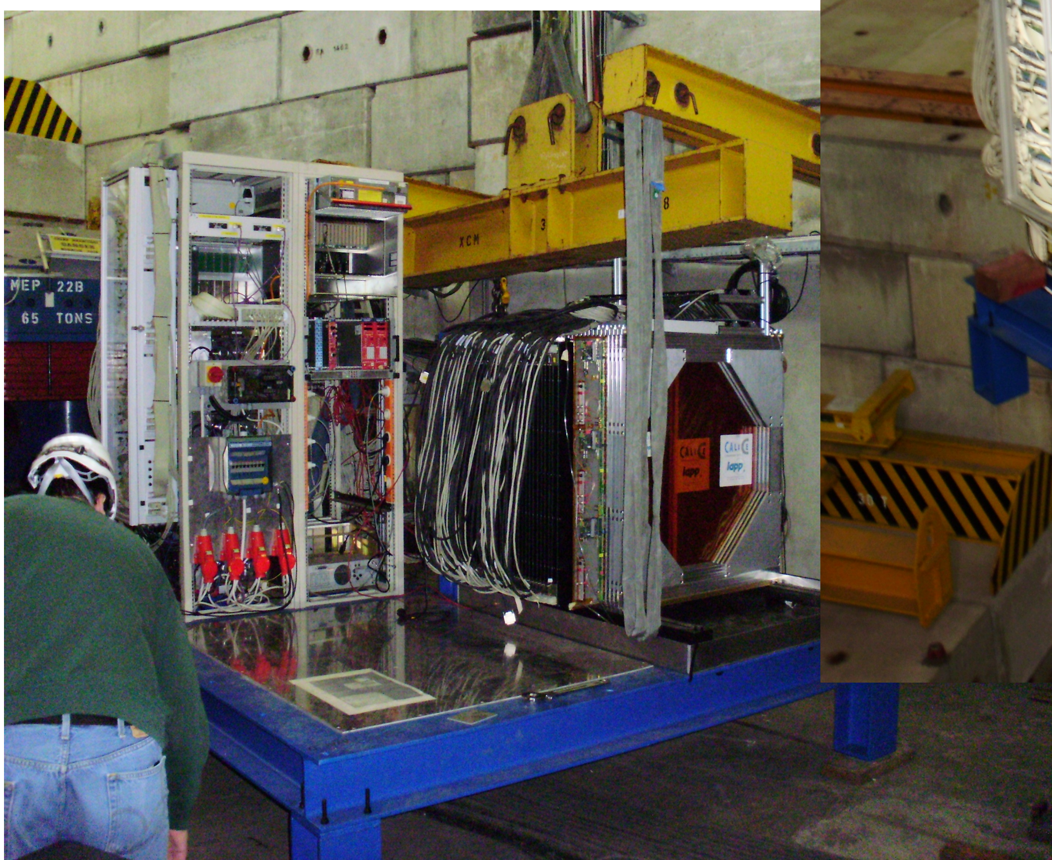
The whole testbeam at CERN PS 2010 was split into two periods:

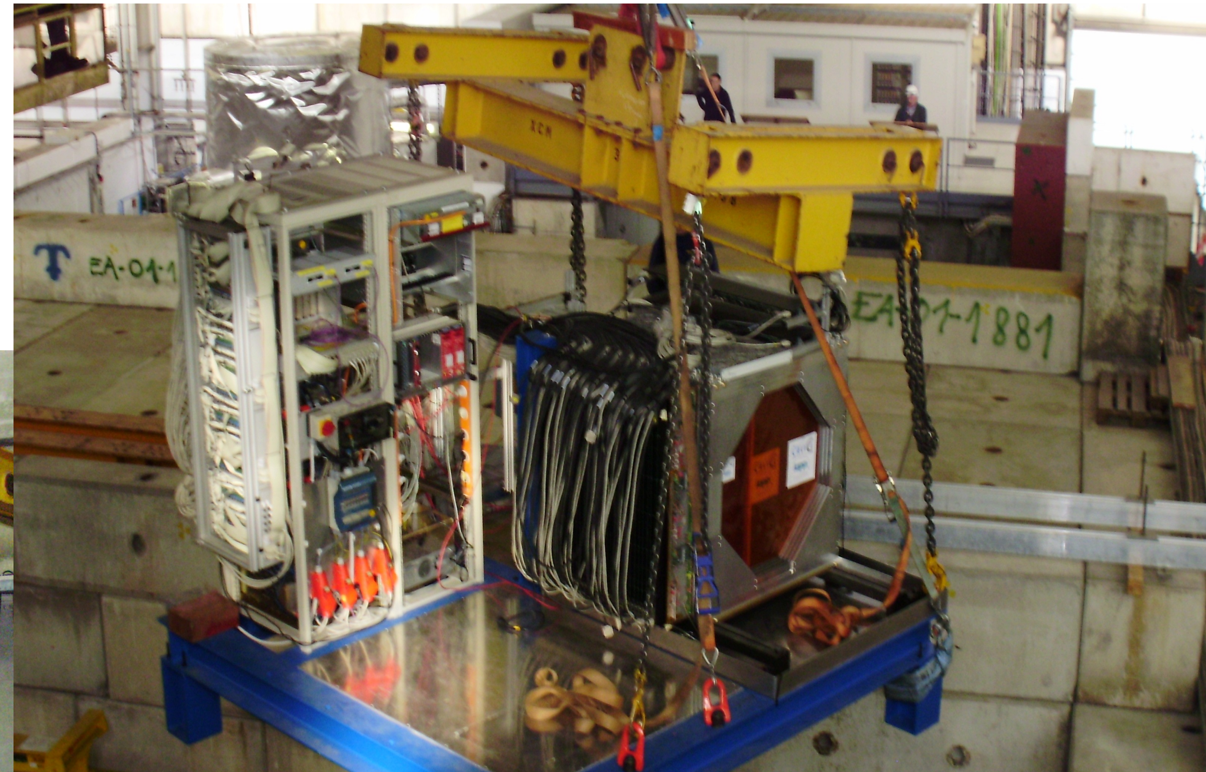


- T7 area with “muon beam” to establish a new muon calibration, do some repairs (e.g. resoldering of SiPMs), integrate the other experiments into the setup (T3B and Micromegas) and prepare the period in the T9 area (2.9. - 3.11.2010)
- T9 area with a beam to record particle showers at various energies (3.11. - 22.11.2010)

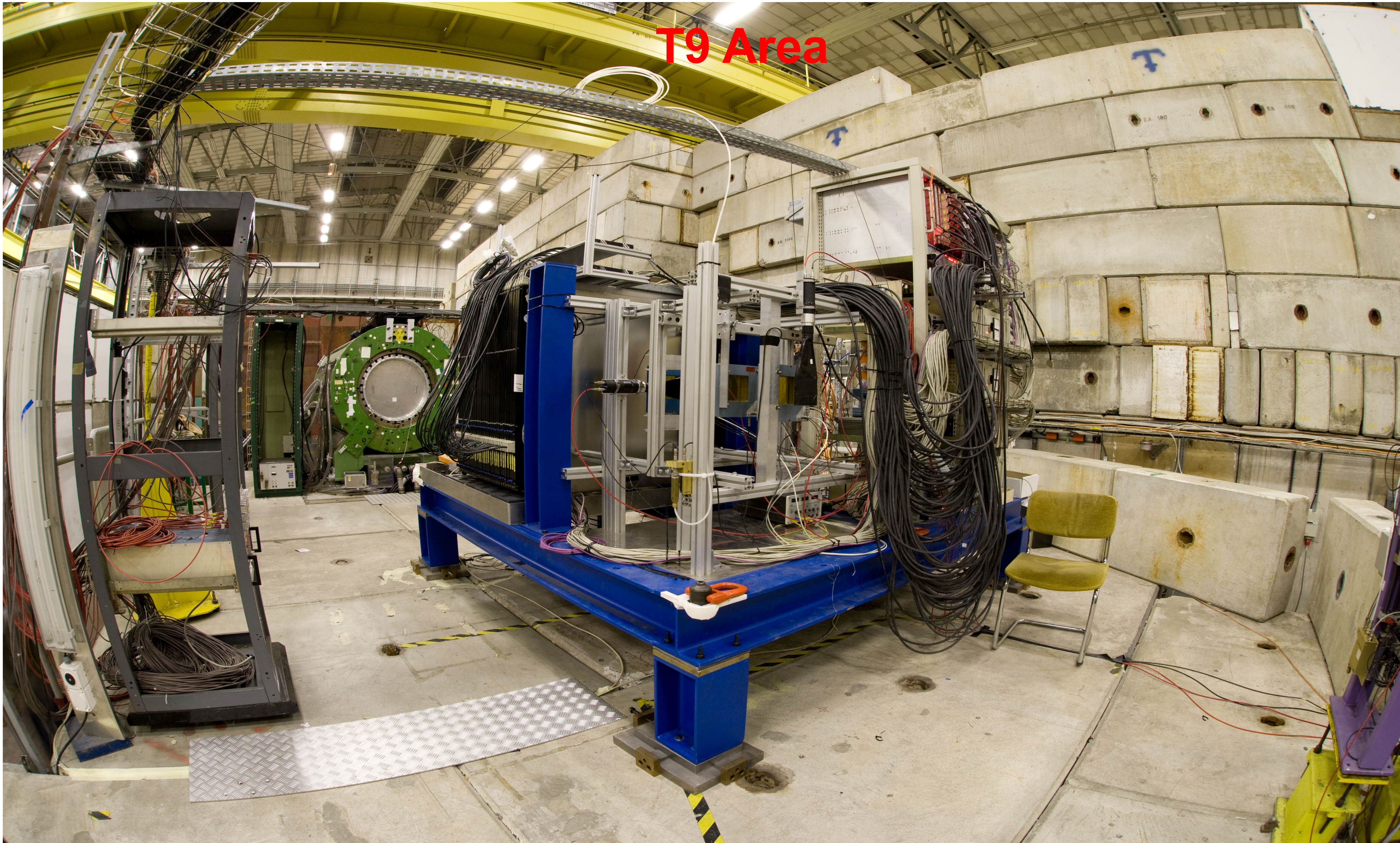
WHCAL III

The moving from T7 to T9 was done via crane

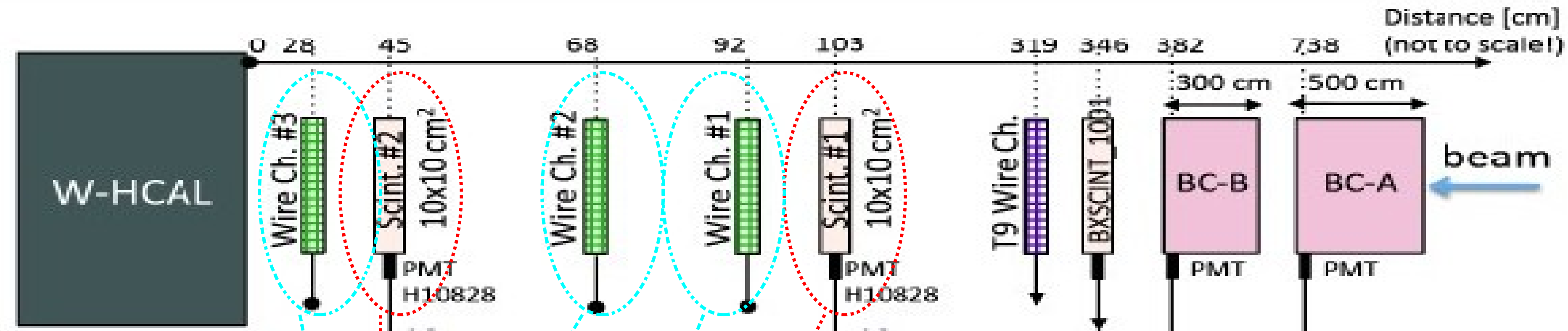


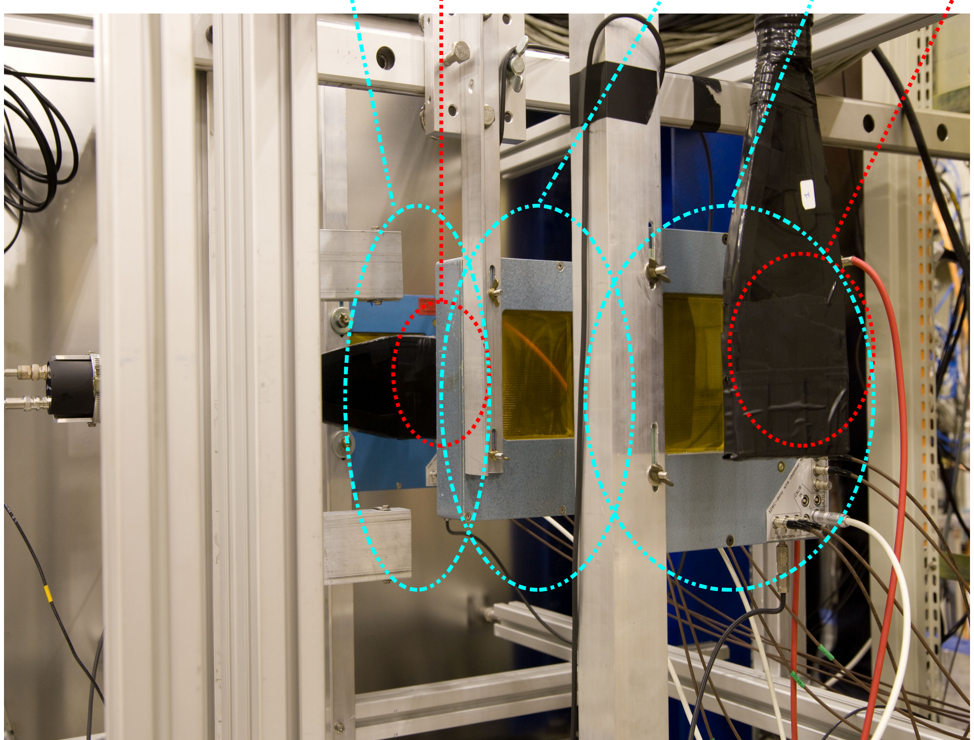


The WHCAL IV



T9 Beamline



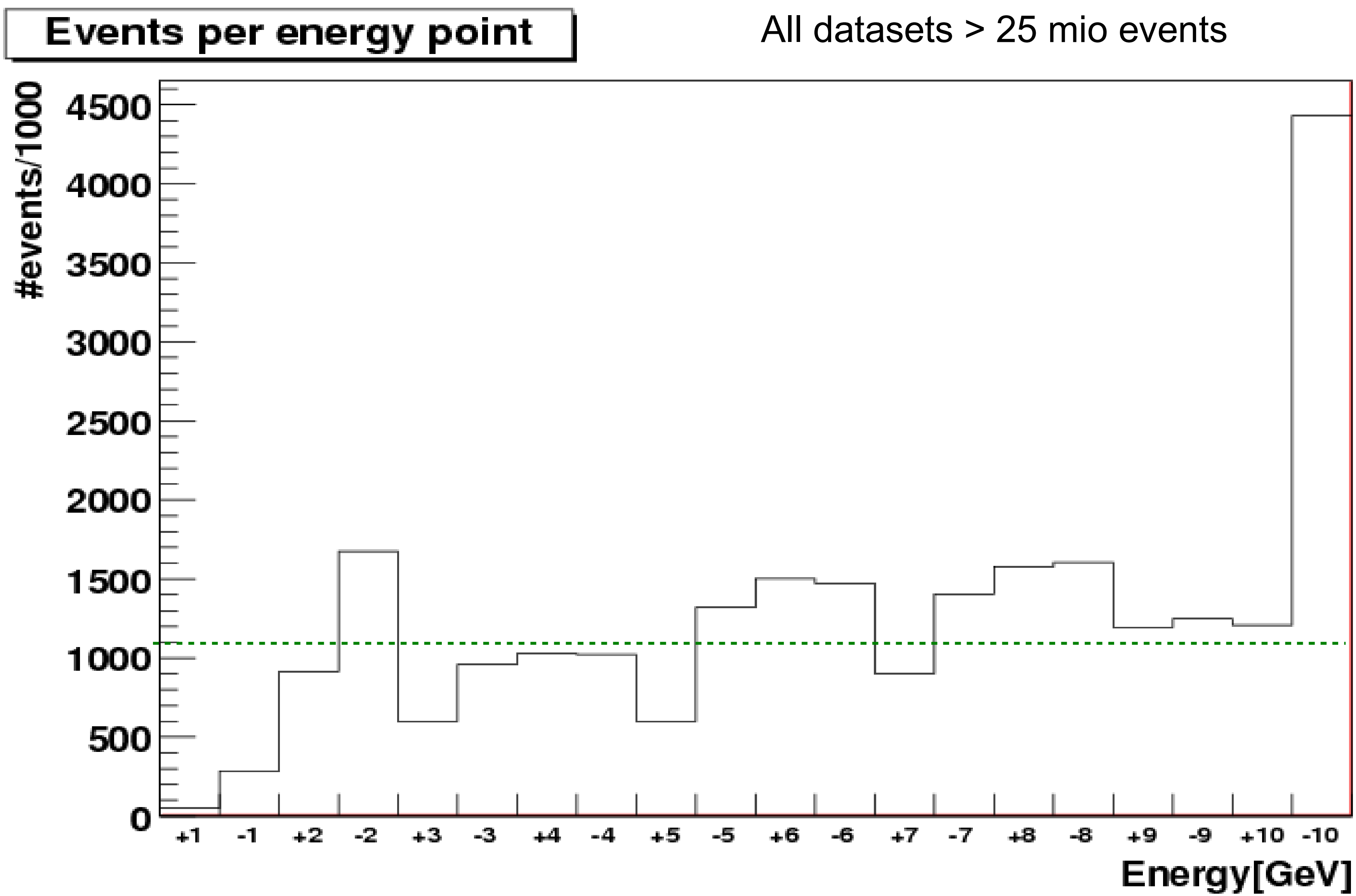


- 2 10x10 cm^2 scintillators (coincidence is main trigger)
- 3 wire chambers for tracking
- Additional wire chamber and scintillator counter at the beampipe
- 2 threshold cherenkov counters

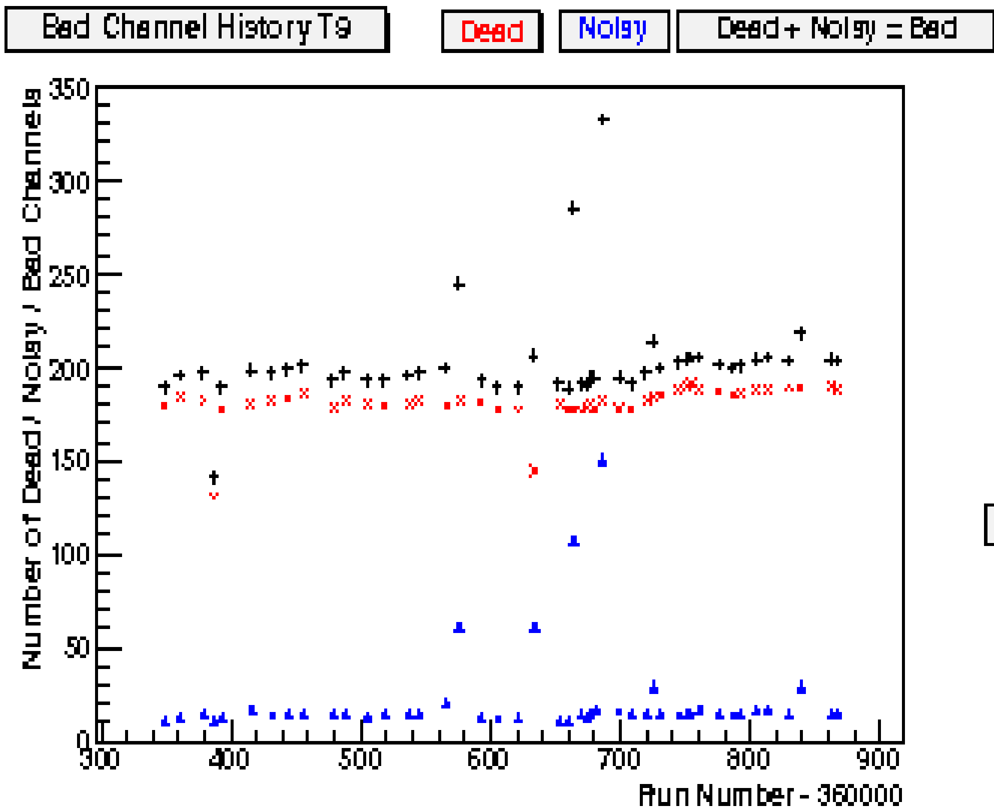
(Details in Angelas talk)

Data recorded

All datasets > 25 mio events



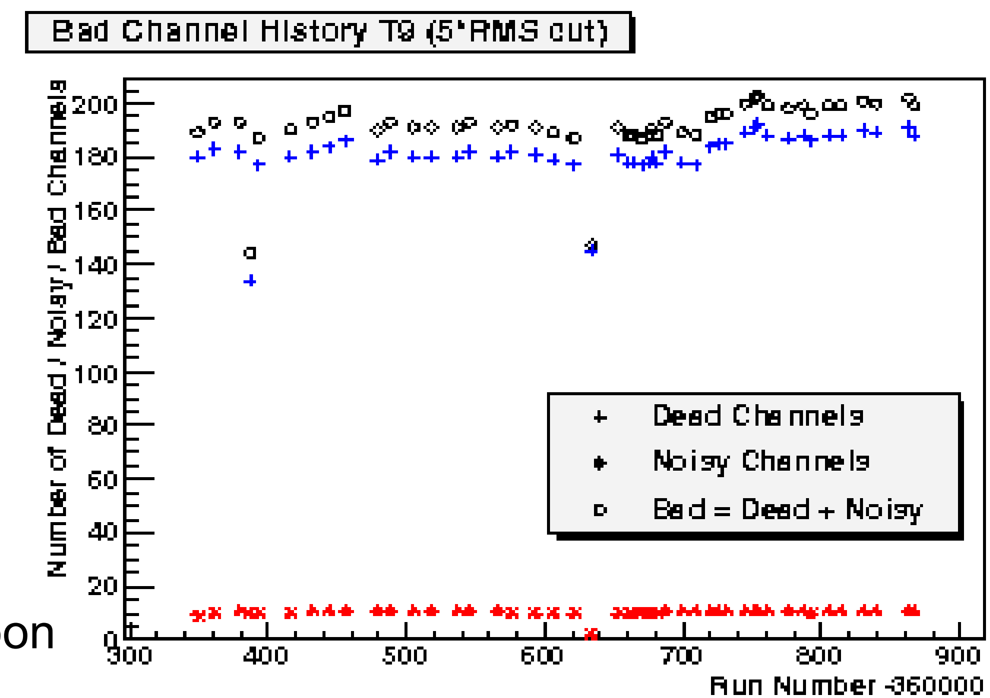
Dead and noisy channels



Number of dead channels almost constant
=> only few loses during CERN 2010

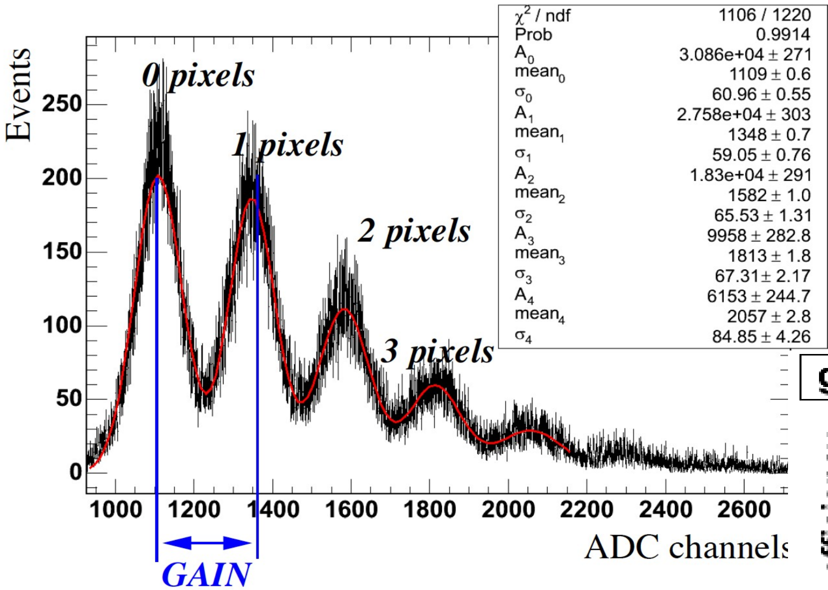
Noisy channels increase at certain point (most likely due to random LED pulses), but go back to normal level

A cut has been introduced, which removes events, where the signal exceeds mean + 5 RMS. This effects only very few noise events and improves the noise level

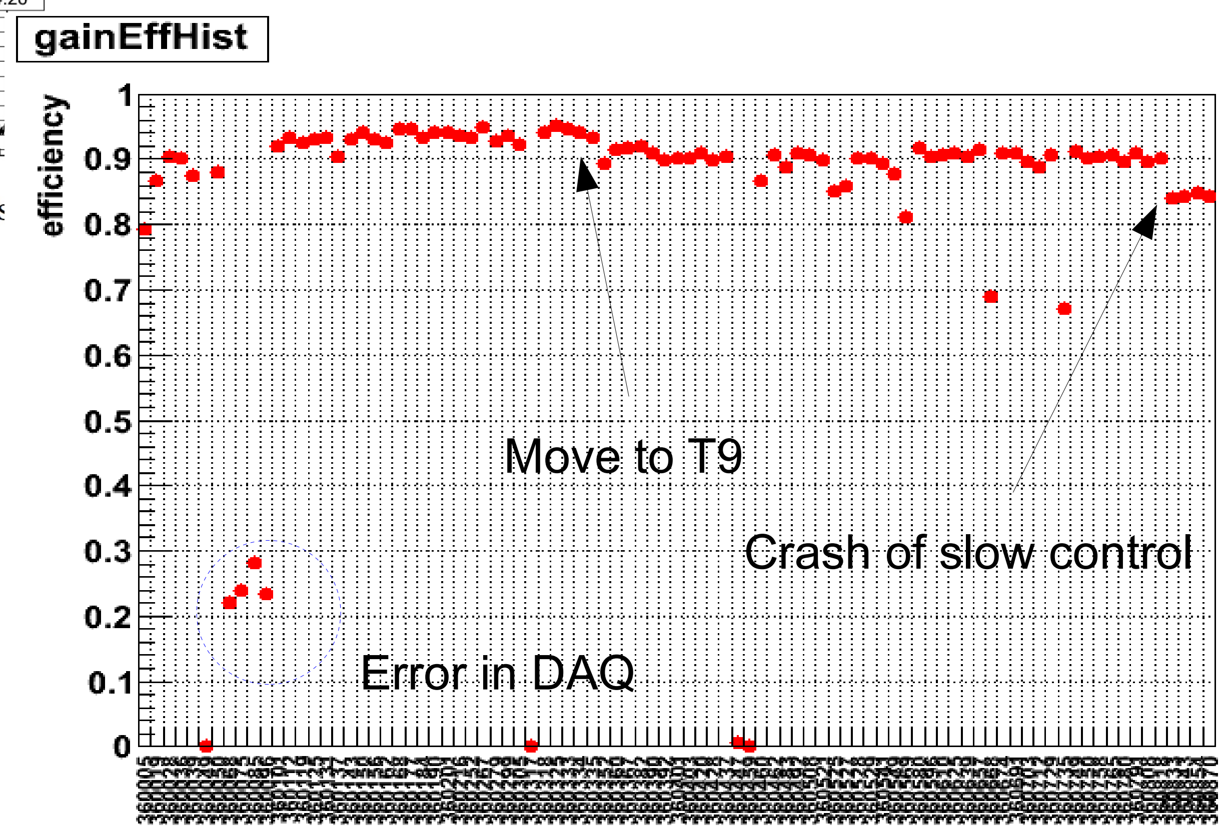


Software package for noise will be released soon (with M. Killenberg, CERN)

Calibration - Gains



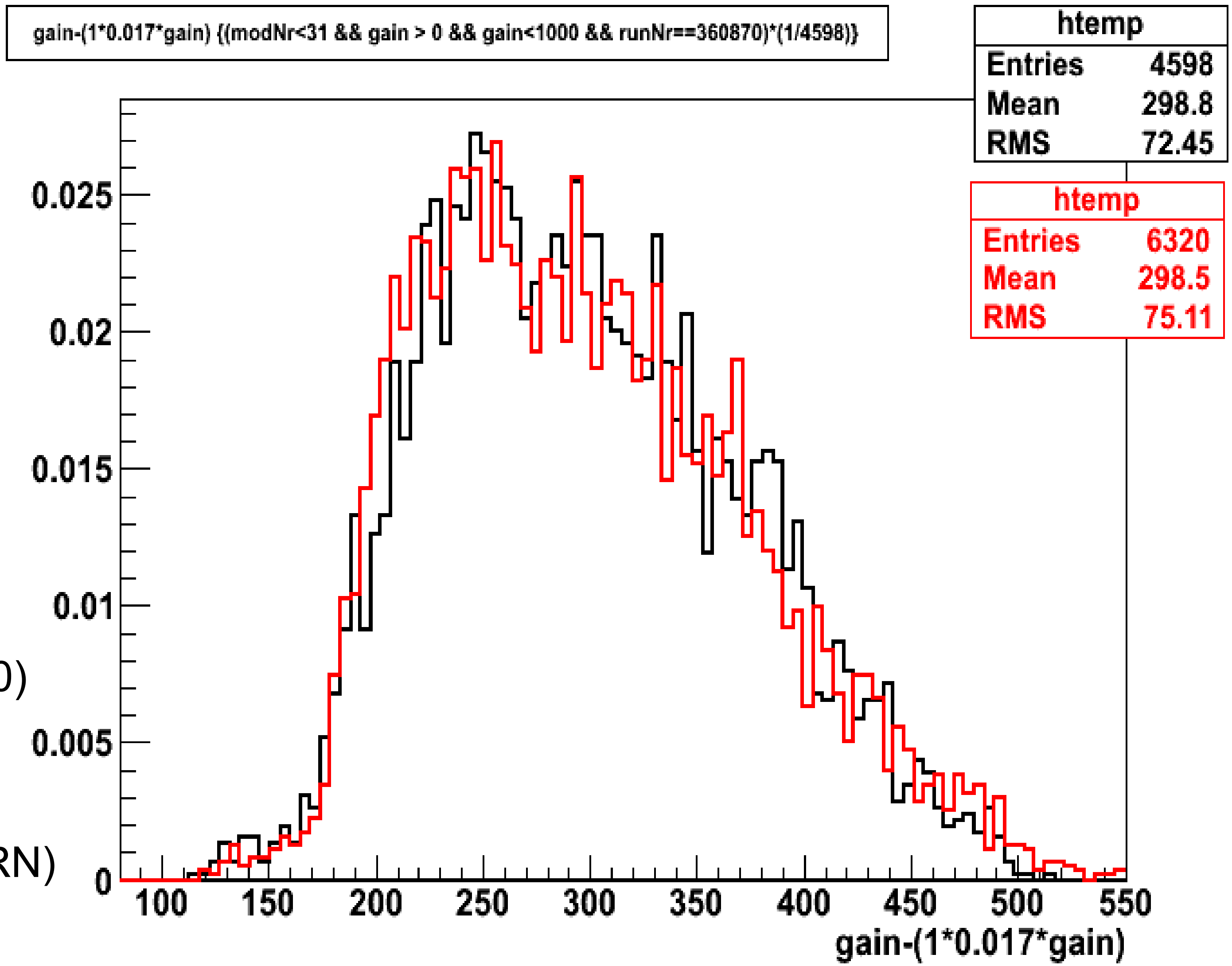
Reminder:
Gain is the ADC counts per pixel, obtained at low light intensity with high amplification.
Resulting spectrum is fitted with a multi gauss



- High gain extraction efficiency
- Dropped slightly after move to T9
- Bad for the last few runs (<90%) most likely to non working LEDs (problem in principle known, but reinitialization of LEDs was most likely forgotten after slow control crash)

Calibration Gains II

After temperature correction, there is good agreement between the gain distributions

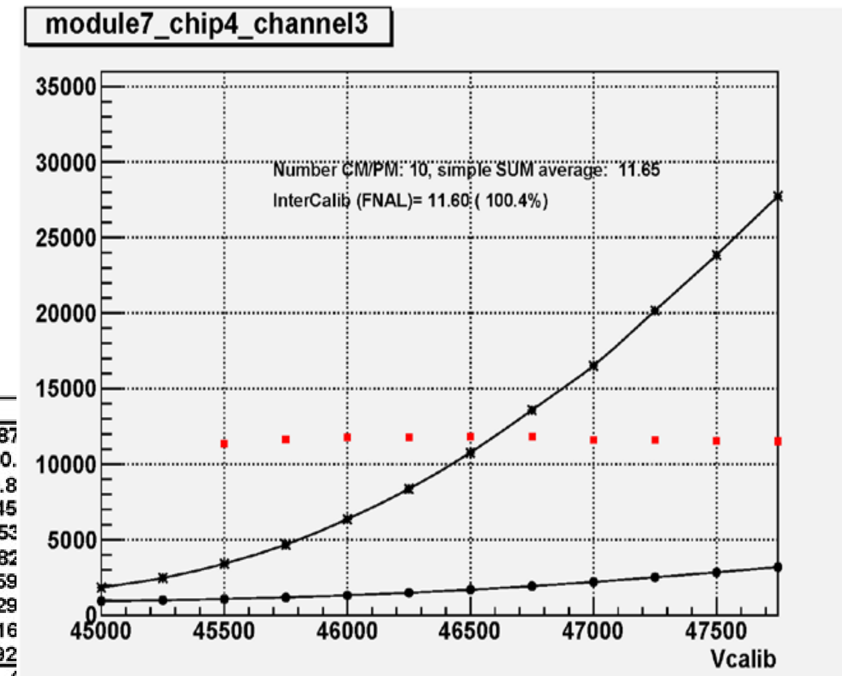


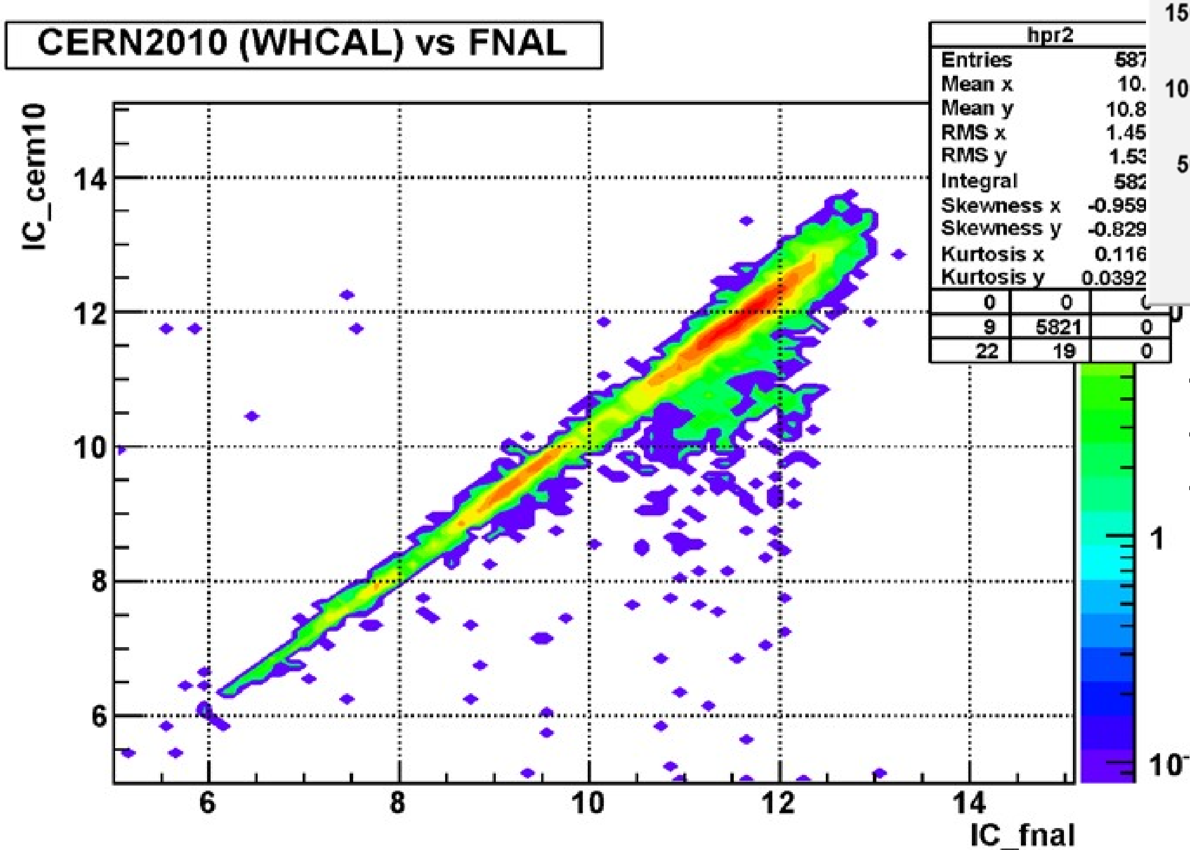
Red: run 500482 (FNAL)
Black: run 360870 (CERN 2010)

Results by E. vD Kraaij (CERN)

Calibration - Intercalibration

The ASIC chip has 2 read out modes
(calibration and physics mode)
The ratio of the response in both modes
of the asic to a fixed light intensity
is the IC (intercalibration) factor.





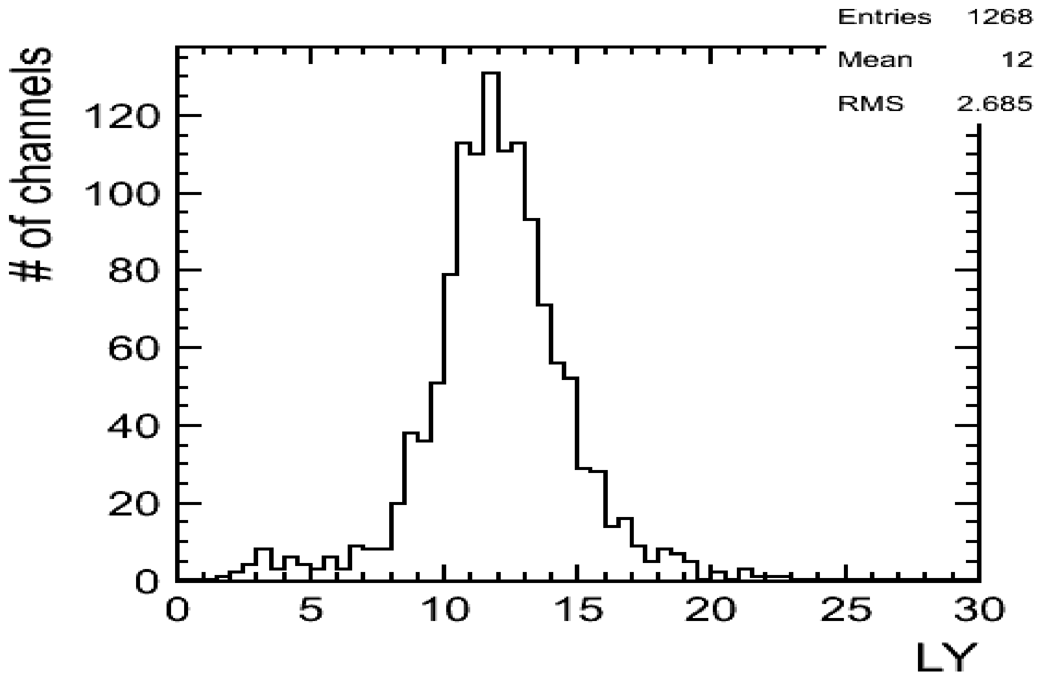
The comparision of T9 2010 data
To FNAL data shows good agreement
The differences are most likely due to
exchanged ASIC chips.

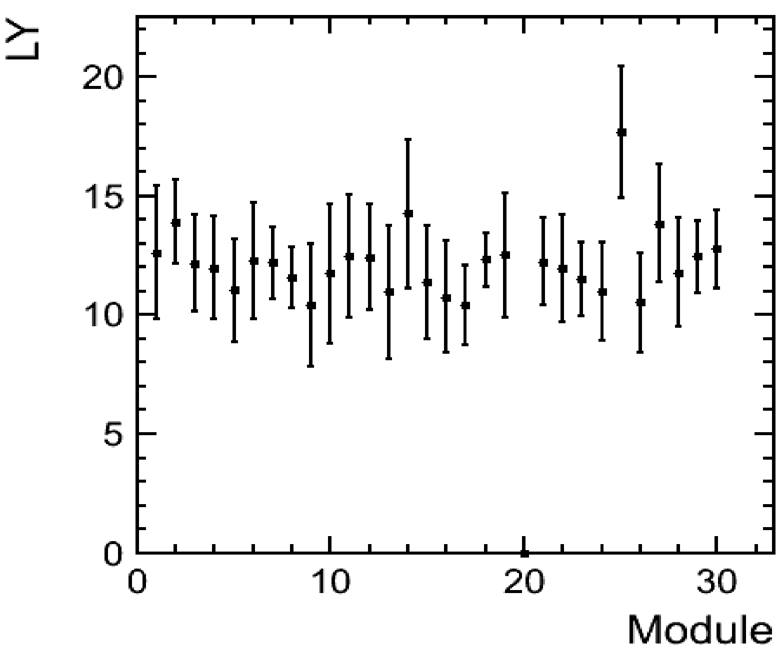
(Results by J. Zalesak)

Calibration – MIP & lightyield

After some technical problems in the beginning, first few runs have been analysed with Andreas MIP finder (by C. Grefe, CERN).
So far we use the old CERN MIP calibration from the database.

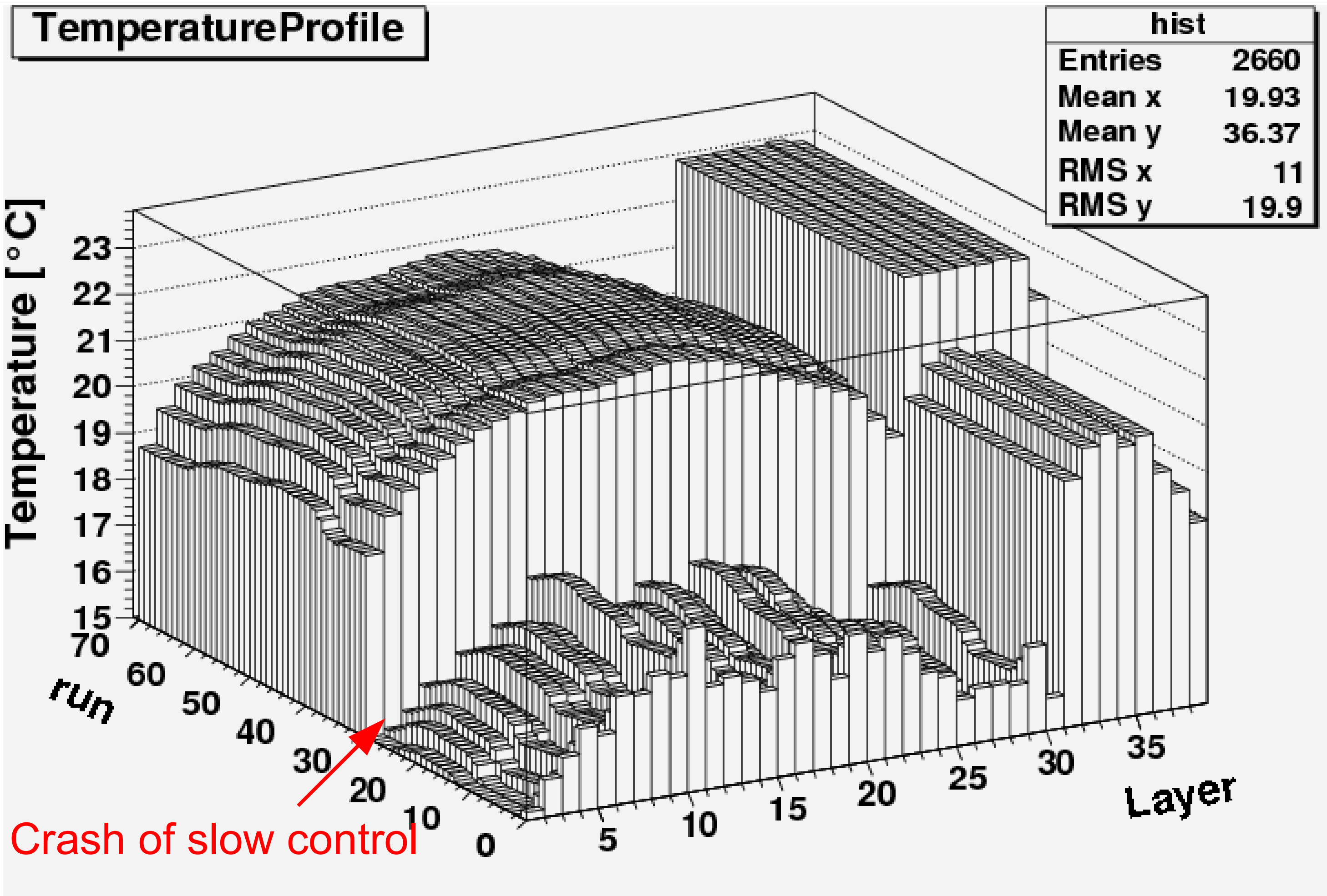
First lightyield analysis by A. Vargas Trevino:
- was done for just one gain and one muon run
- temperature corrected
- average over all channels: 12 p.e./MIP, $\sigma = 2{,}7\ \%$





Temperature measurement

After the crash, the temperature profile looks reasonable, the ones before not!



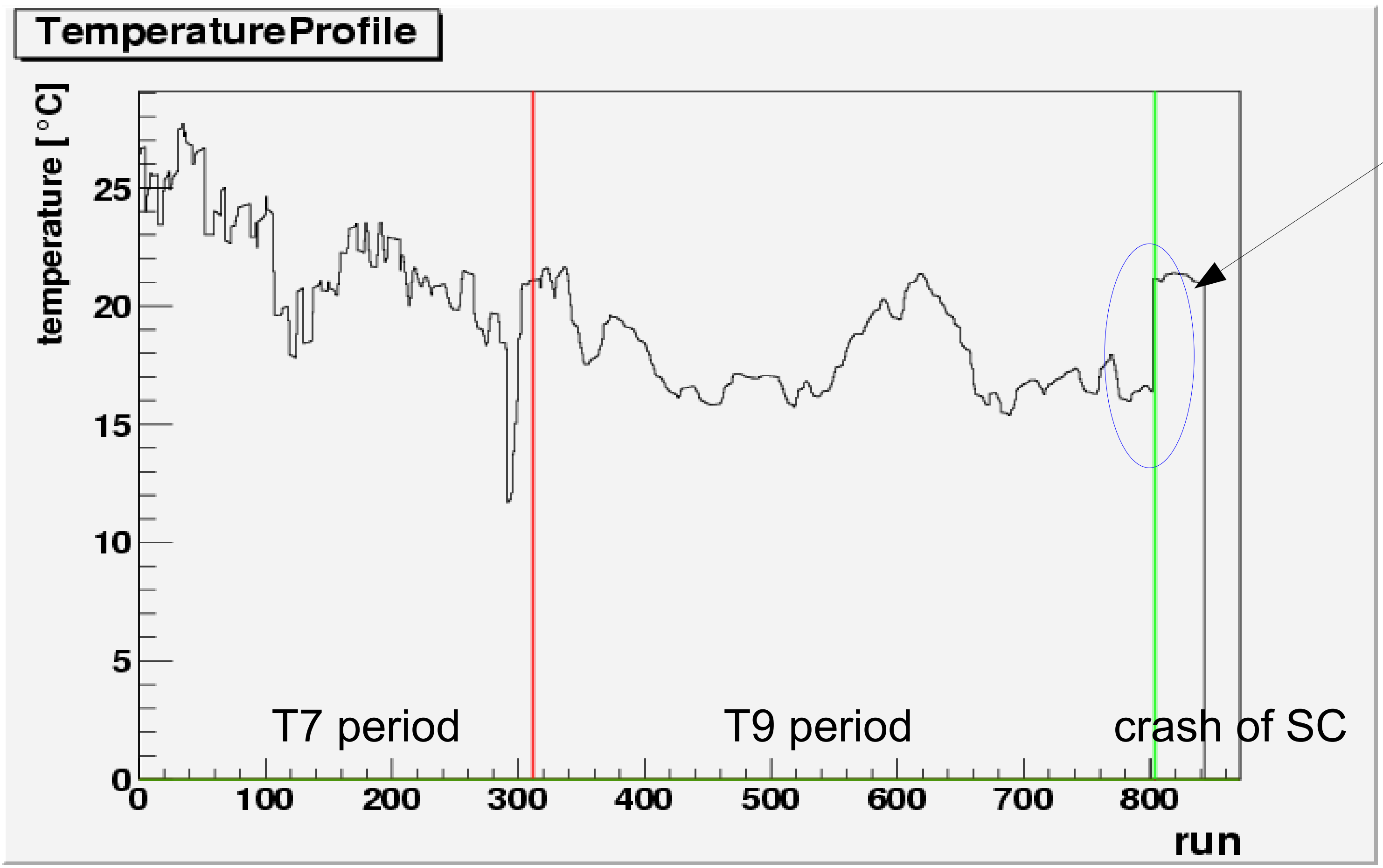
Therefore coefficients have been calculated, which will be applied to all runs before the crash.

Fourth order polynom has been fitted to first run after the crash. =>

factor = polynom(x) / value(x)

(layer > 30 are not connected!)

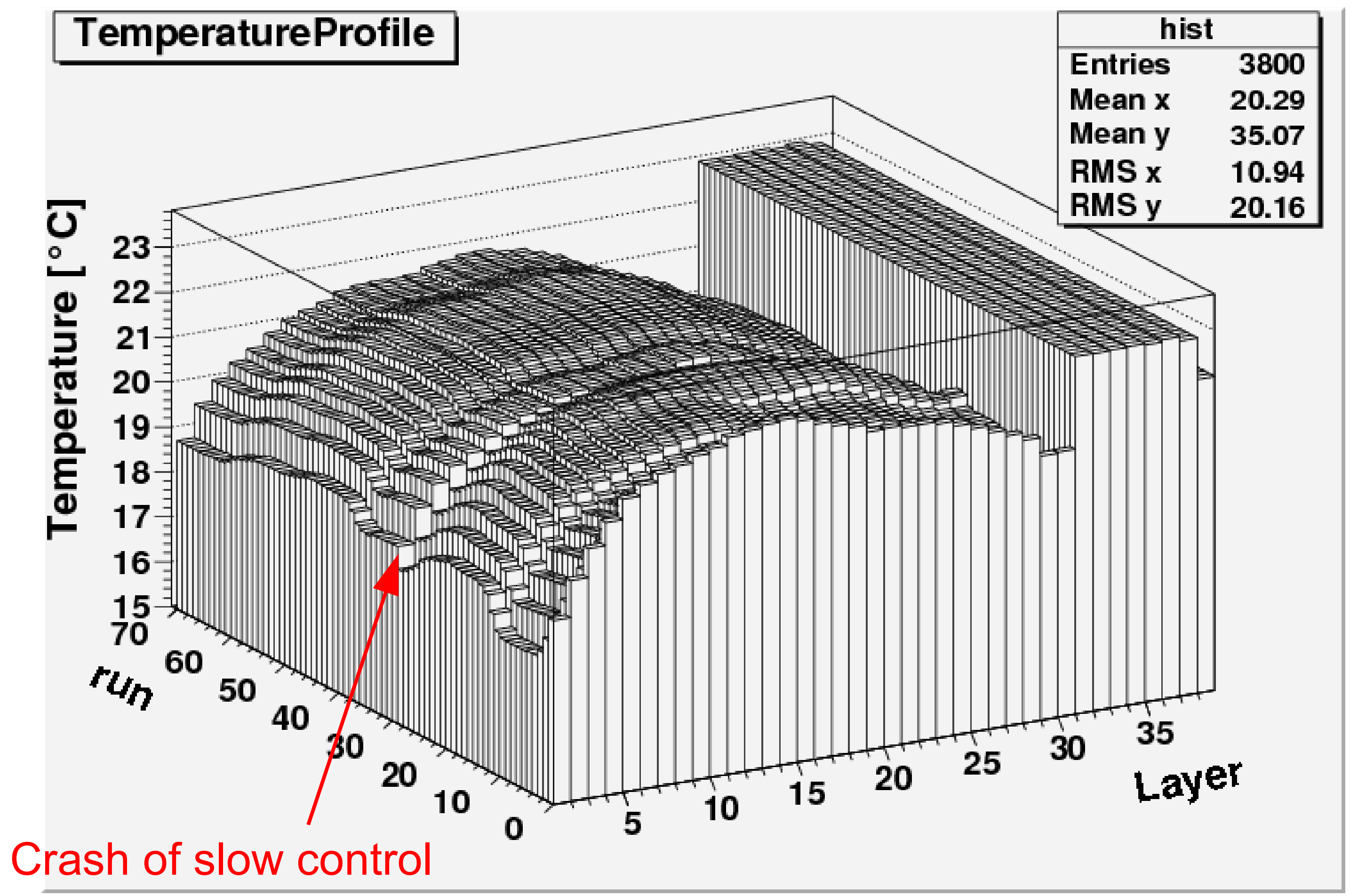
Mean temperature history



- There is just one jump in temperature in the T9 period
- Cannot judge for T7 period, needs real runtimes (due to breaks in datataking)

Temperature measurement II

Now all the temperature profiles looks more reasonable



Still not perfect, but at least physical. But absolute still to be crosschecked with temperature measurement from T3B

(layer > 30 are not connected!)

Summary

- 25 million events have been recorded in the CERN 2010 testbeam
- The gain and IC calibrations are in agreement with the old constants and have been written to database
- The MIP calibration is in progress
- We found a problem in the temperature measurements (jump), but it seems that we can correct for this.
- But before we put the newly calculated temperatures into the database, we need more crosschecks (work ongoing)
- If we decide to use the new temperatures, we have to recalculate the calibration constants