LED notched fibre system

short HBU0 party with QMB6

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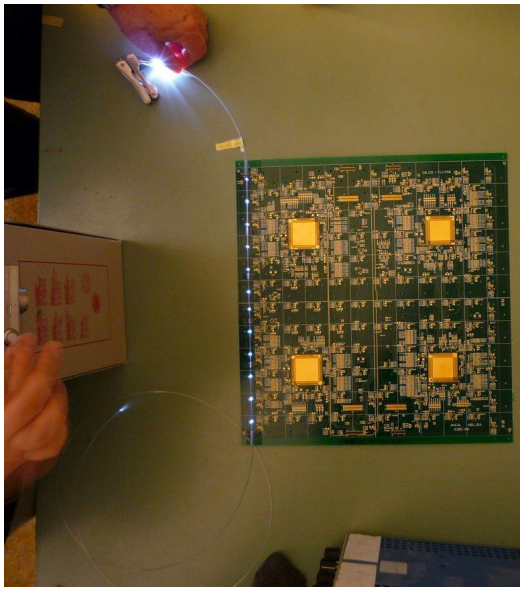
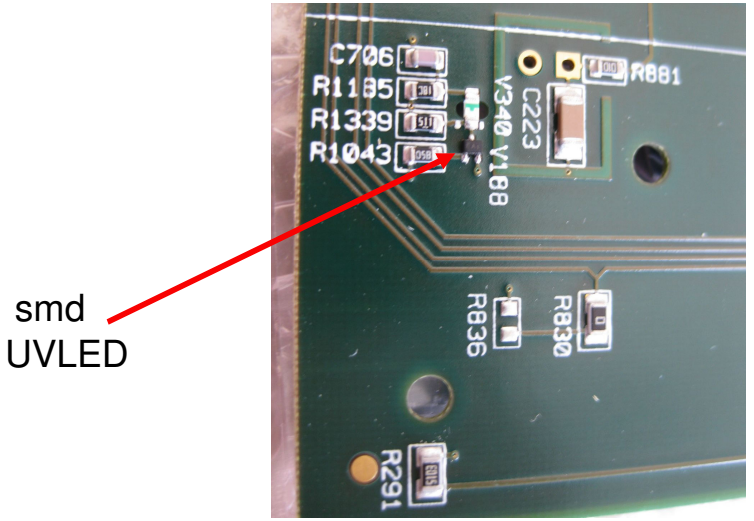
1. Notched fibre light distribution systems
2. A Set-up, with provisional fibre layout
3. QRLED driver generate single p.e. Spectra at HBU0
4. Saturation curve needs better light coupling
5. Conclusions

Flashing UVLED - 2 methods

- Light distributed by notched fibres



- Light distributed directly by microLED to the scintillator - distributed LEDs



Institute of Physics ASCR, Prague, (= FZU)
Kobe University

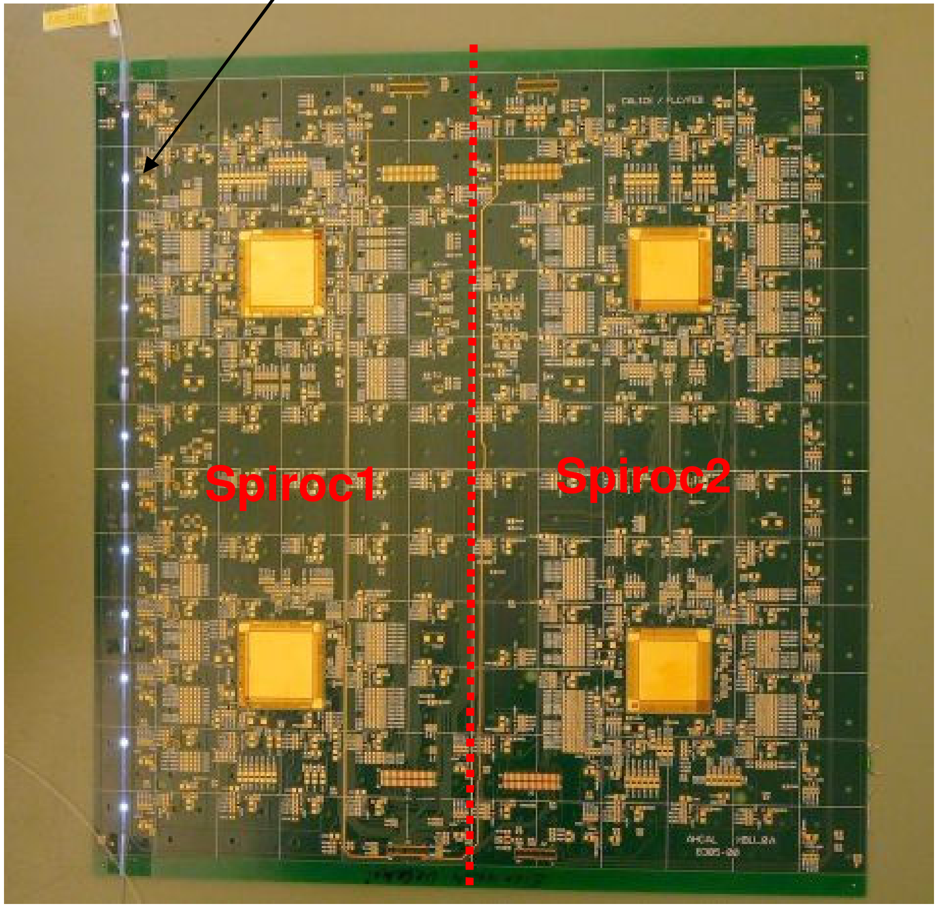
DESY Hamburg
UNI Wuppertal

Notched fiber system

Notched fibre routed at HBU0, taps illuminates the scintillators via special holes

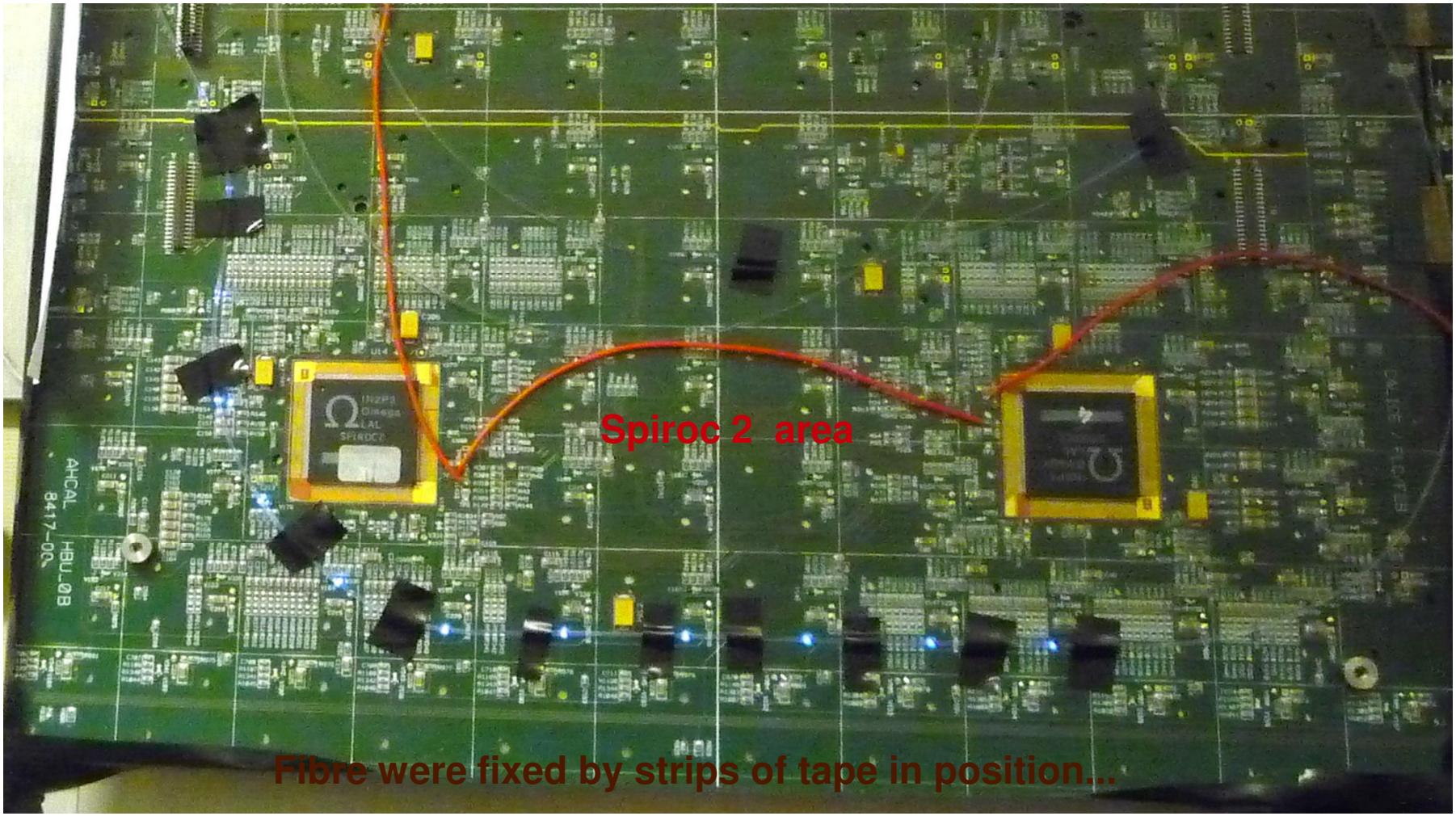
- advantage – tuneable amplitude of LED light from 0 to 50 mips
- Variation of LED amplitude does not affect the SiPM response readout
- LED circuit and LEDs enable optical pulses with around 5ns width
- Spread of light intensity from notches can be kept under 20%
- disadvantage LED with control unit outside the detector volume
- Notched fibre production is not trivial

Nice idea, but… Spiroc1 area is not working

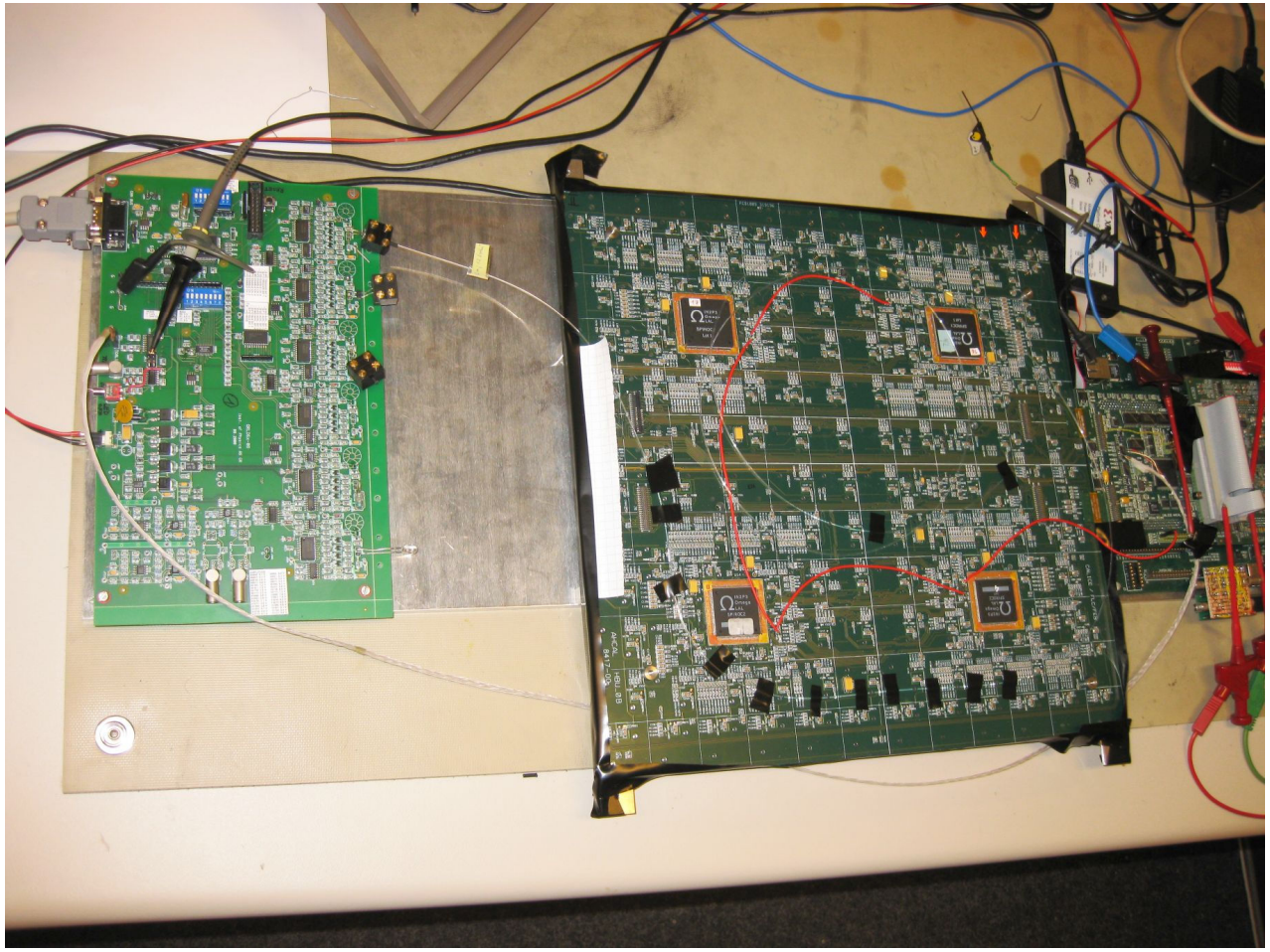


Notched fibre layout

nice blue taps shins to alignement pins



Setup QMB6 + HBU0

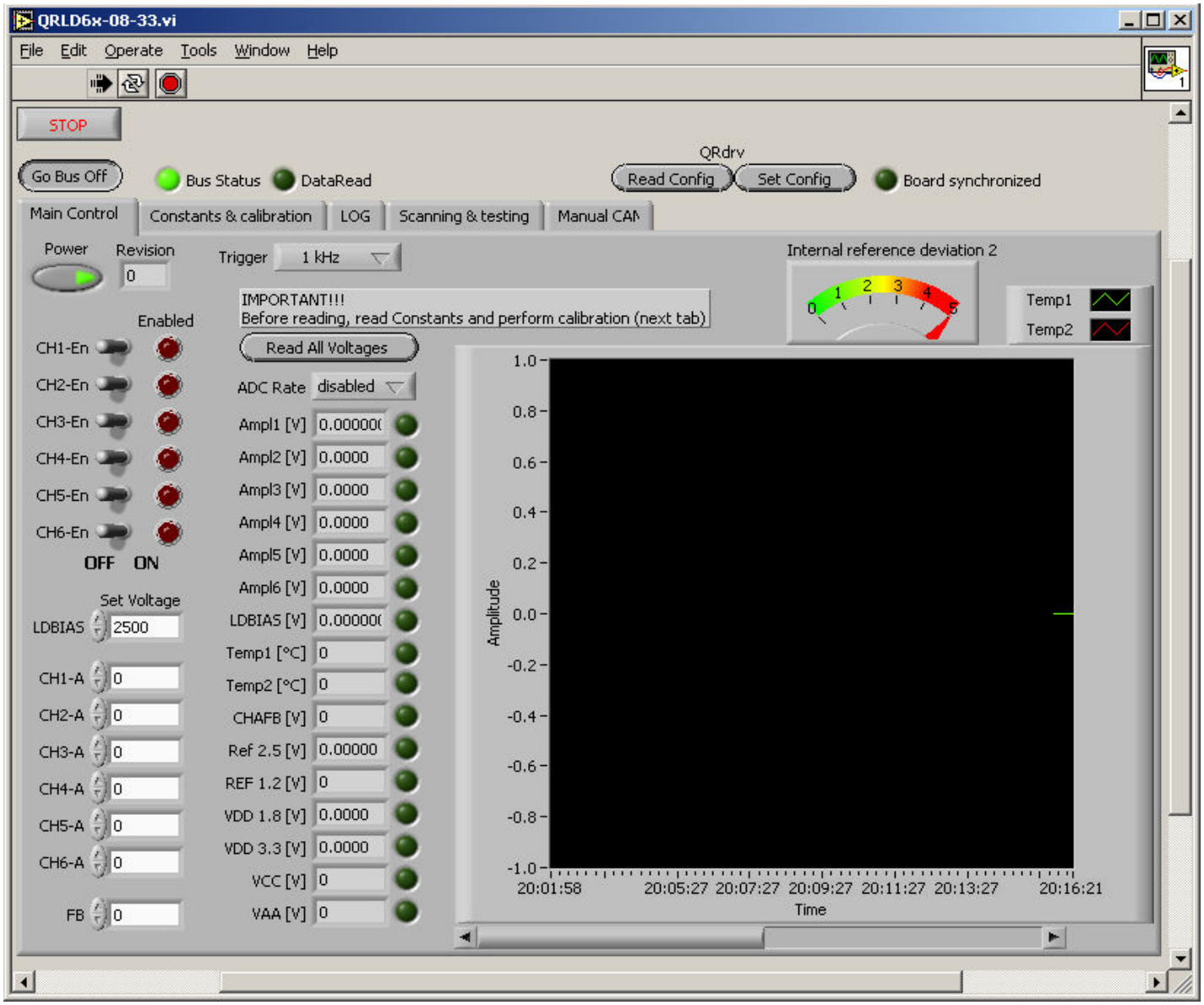


- From HBU0 (calib board):
  - signal T-calib LVDS only
  - 60ns Delay
  - power +15V/0.16A
  - CANbus slow-control
  - One UVLED 5mm
  - One Notched fibre

Control: LabView 8.2 exe-file, One PC with DAQ, USB --> CAN

Almost **plug and play**

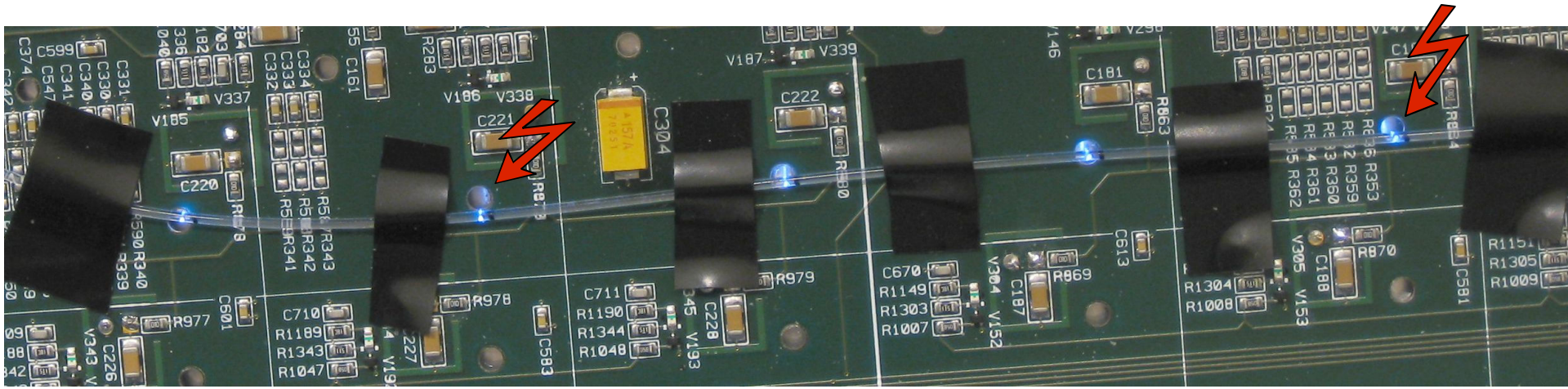
Control panel of QMB6 in LabView 8.2



- Controls individual LED amplitude
- LED Enables
- Trigger mode ext/internal
- Measure temperature
- CANbus control
- It can work as Exe file

Next day we found a misalignment of the fibre

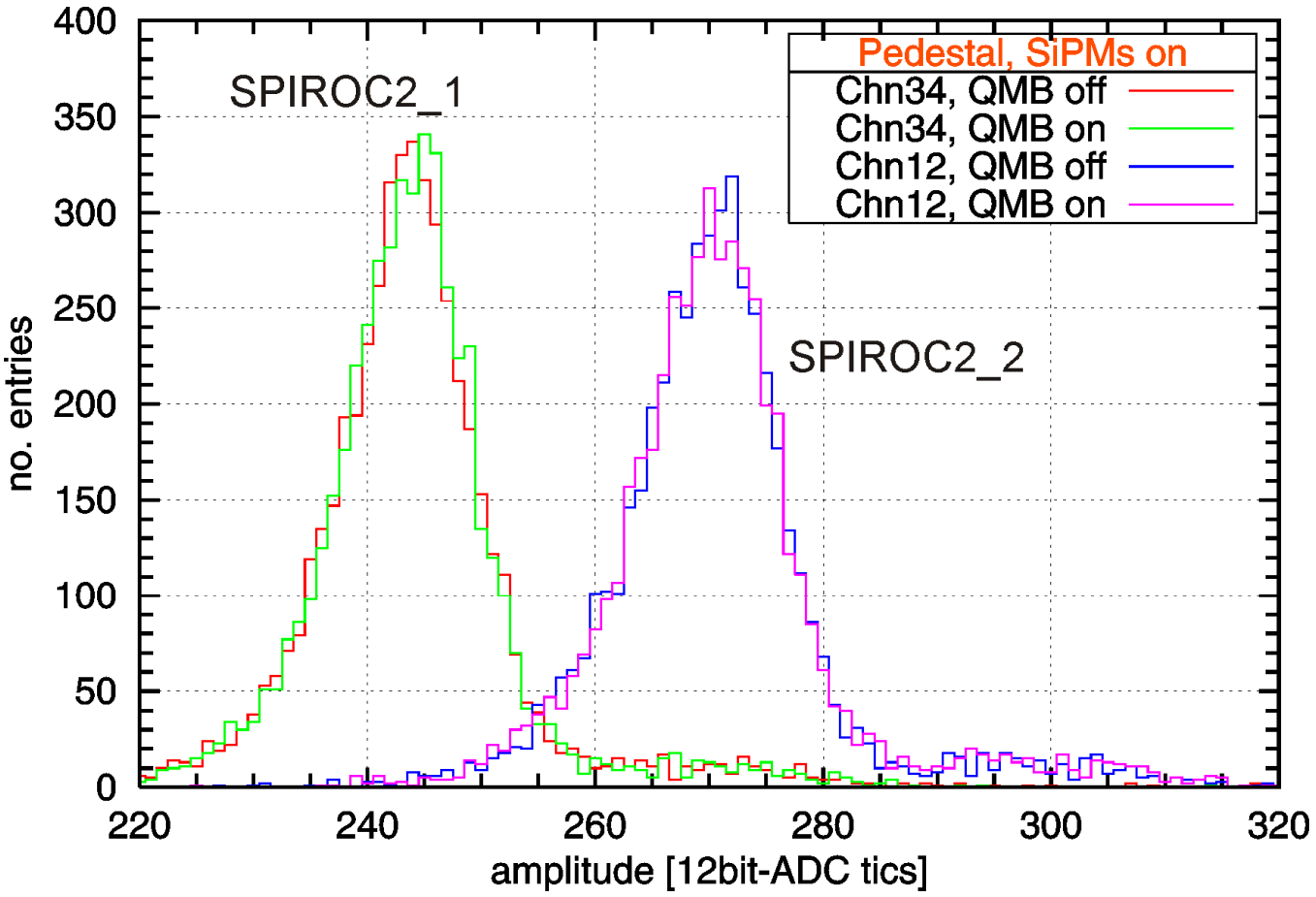
Electrical tape and bended fibre is not the right combination!



QMB6 **ON**/**OFF** test

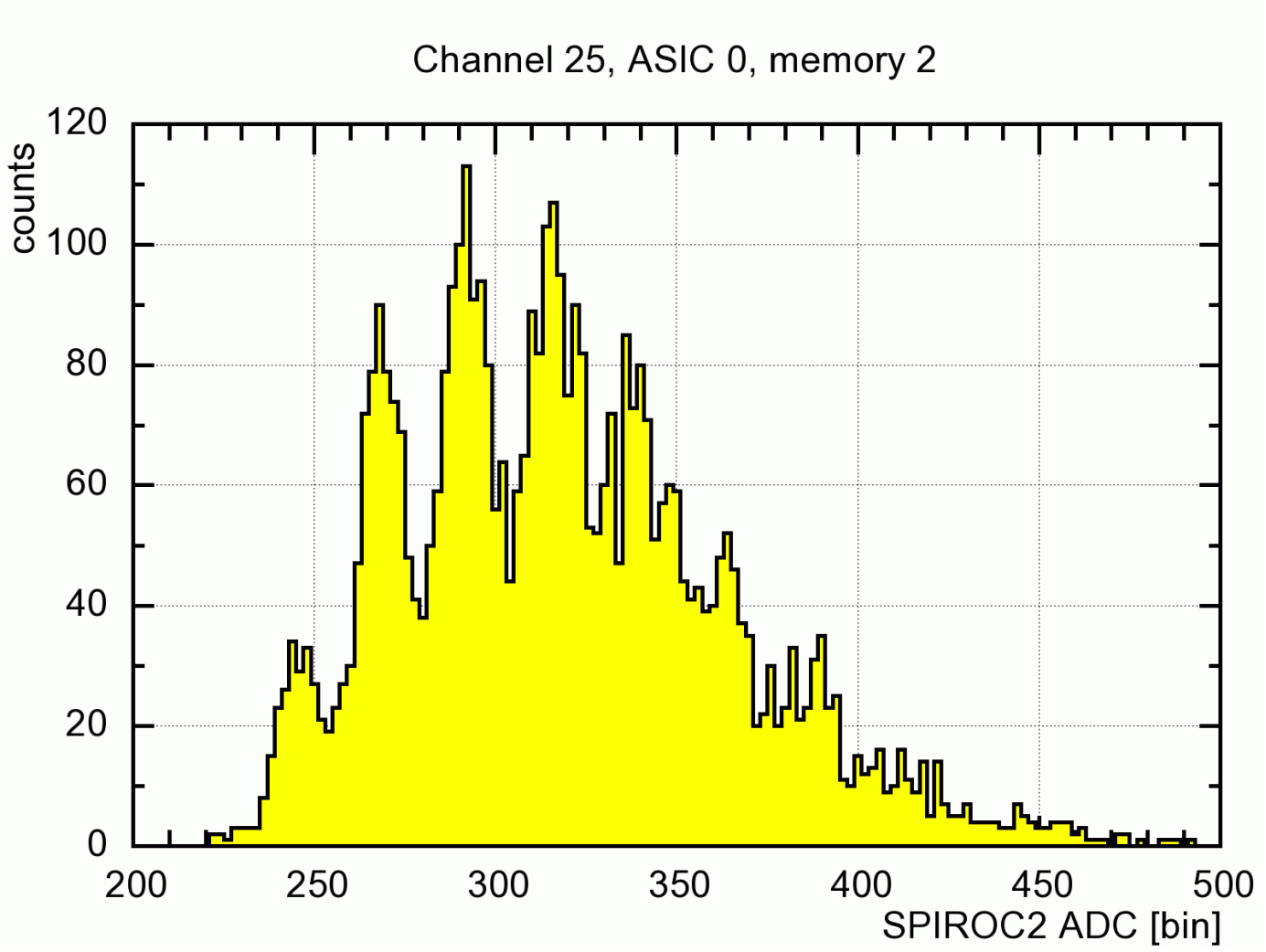
ON means T-calib on, LED off

OFF means +15V power off



NO pedestal shift!
NO unwanted ground coupling!

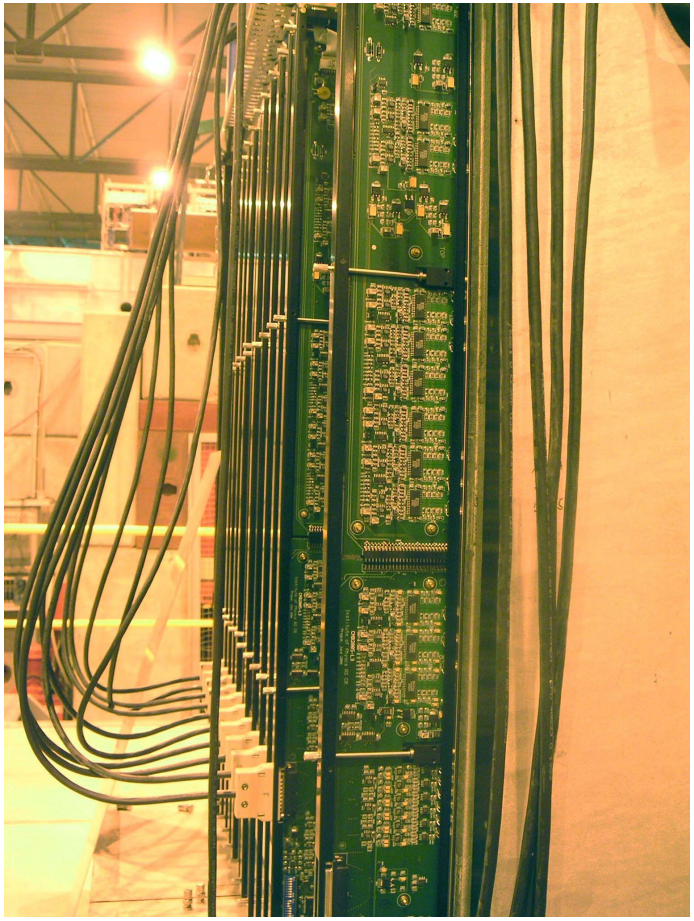
Single p.e. spectrum

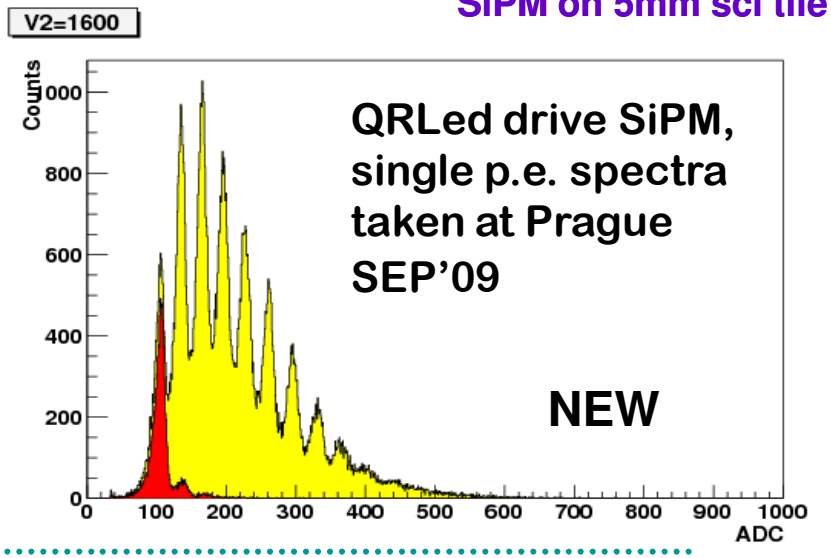


Calibration mode,
High Gain

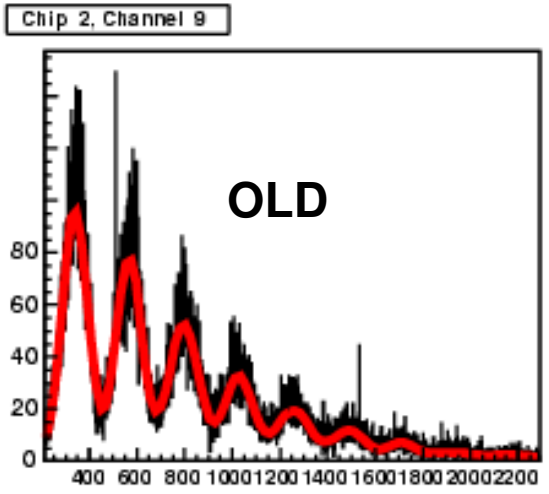
Single photoelectron spectra with CMB and QRLED

LED light 400nm to SiPM on 5mm sci tile





←CMB in tuning position at AHCAL TB 2007 CERN

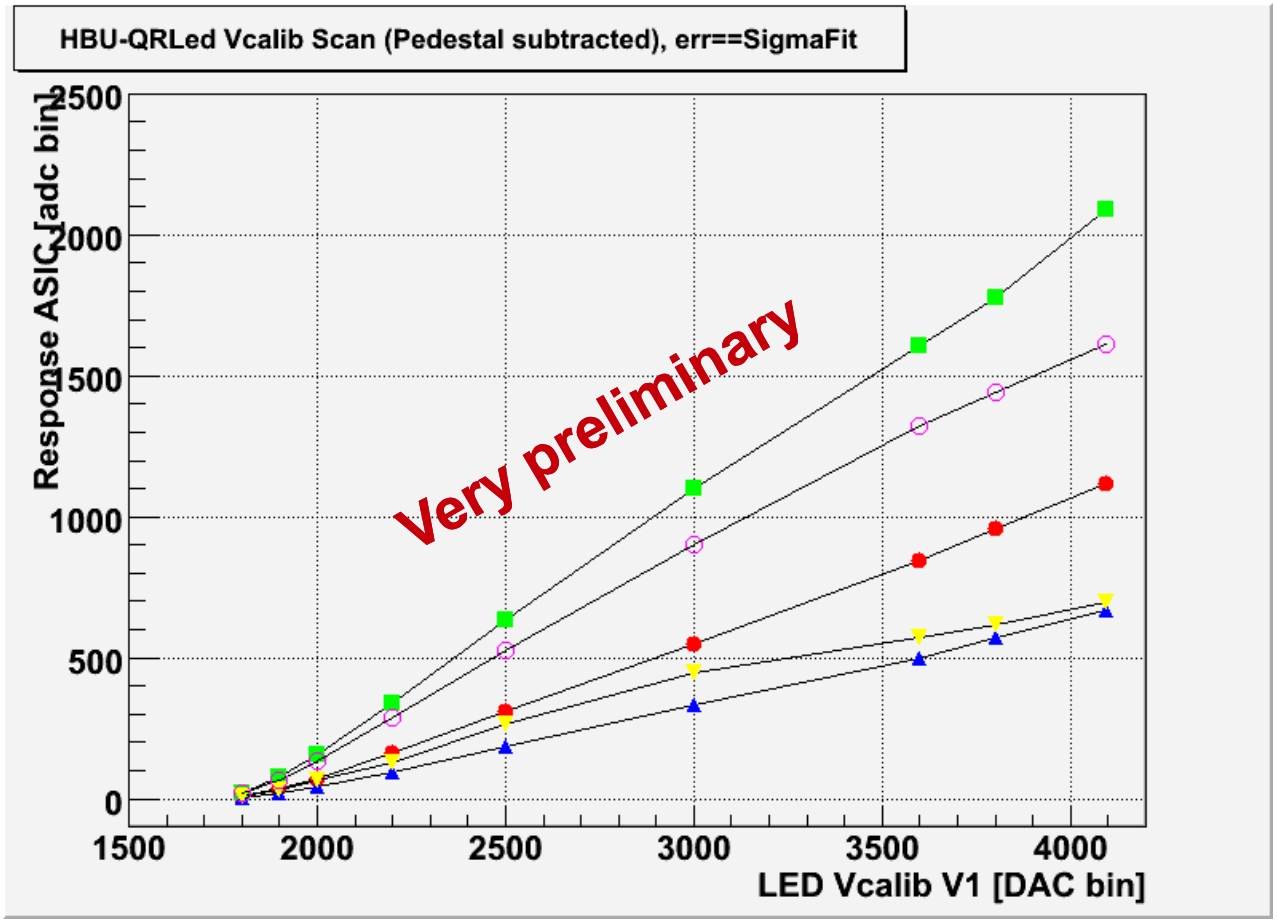


one of the single p.e. spectra →

More info about CMB can be found at:

http://www-hep2.fzu.cz/calice/files/ECFA_Valencia.Ivo_CMB_Devel_nov06.pdf

Linearity test (it means a saturation curve)



Settings:

Cf = 400fF
Low gain mode

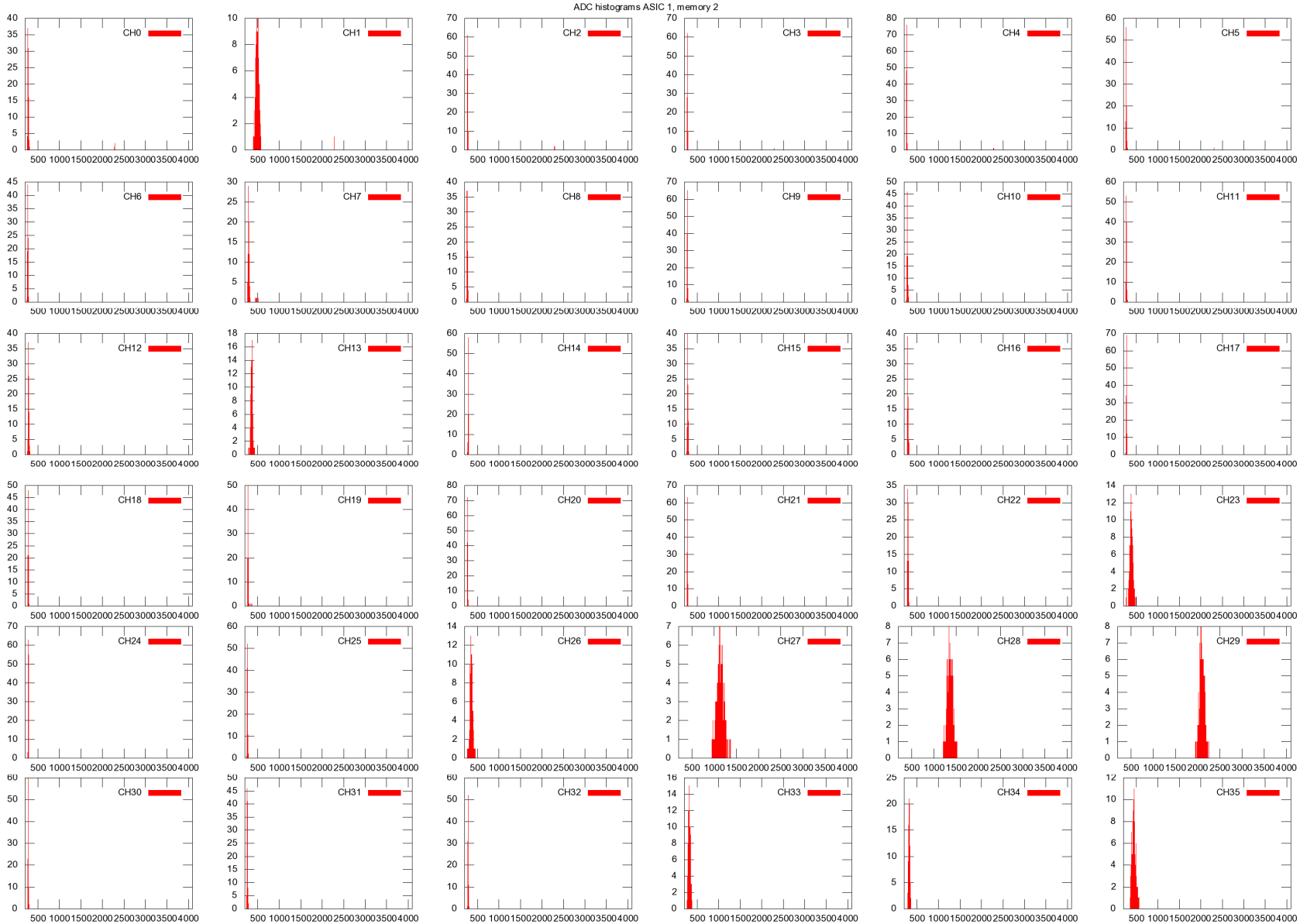
- We do not see saturation effect, yet.
- Better optical coupling alignement is a must.
- Higher LED pulse can be made with larger pulse-width (3.7 → 7ns)

Conclusions to common test HBU0 with QMB6

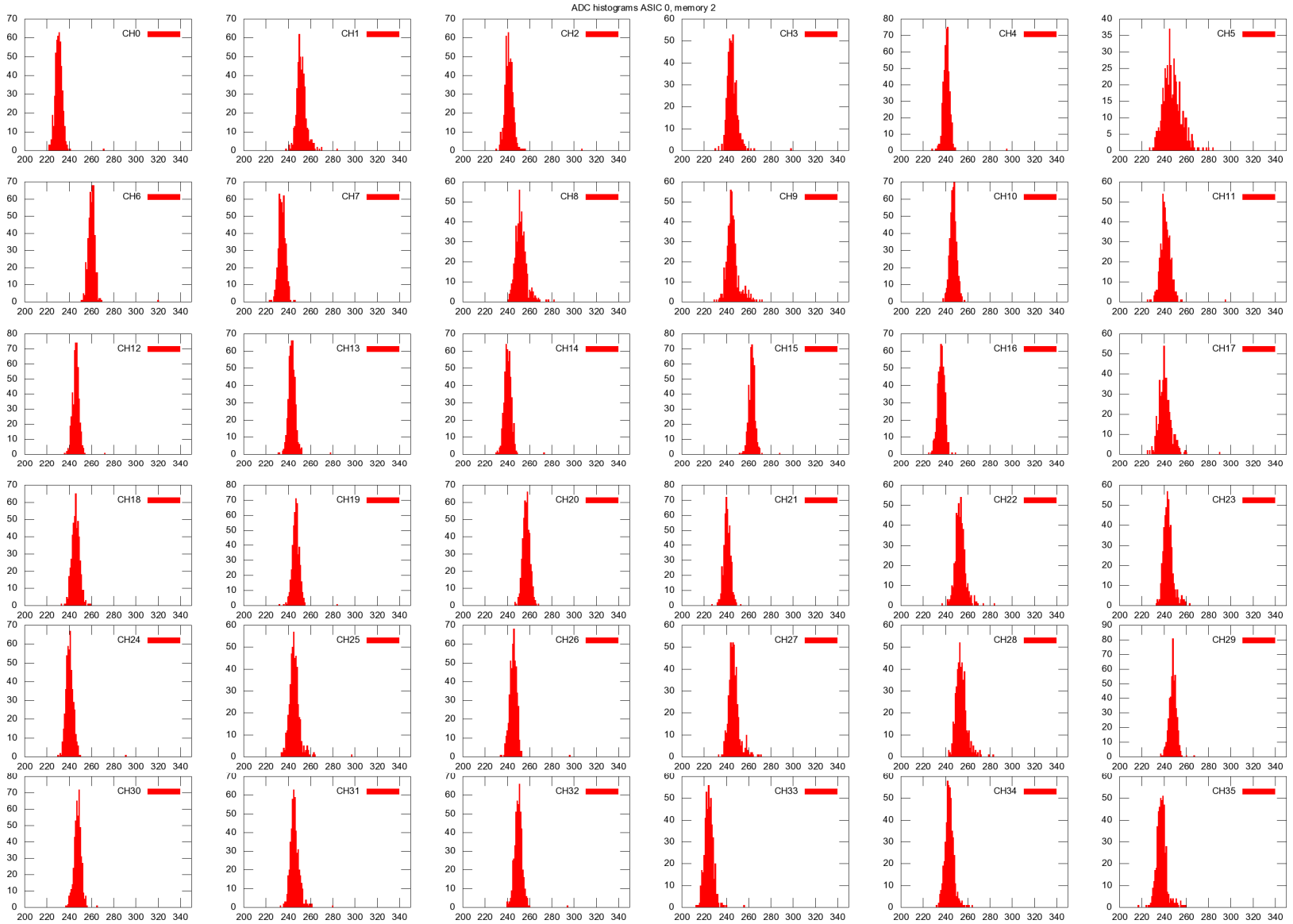
- Easy implementation, almost **plug and play** instalation
- QRLED driver has tunable light amplitude
- Both methods of light distribution are tested in HBU0 EUDET prototype
- With QMB6 we can see a nice single p.e. spectra, similar to distributed LEDs
- We do not see saturation of SiPM yet, better optical coupling is a must. We have to focuse on this detail.
- We would like to make more tests in the future, focusing on the optical coupling
- Special thanks to Mathias Reinecke and FLC group.

Back up

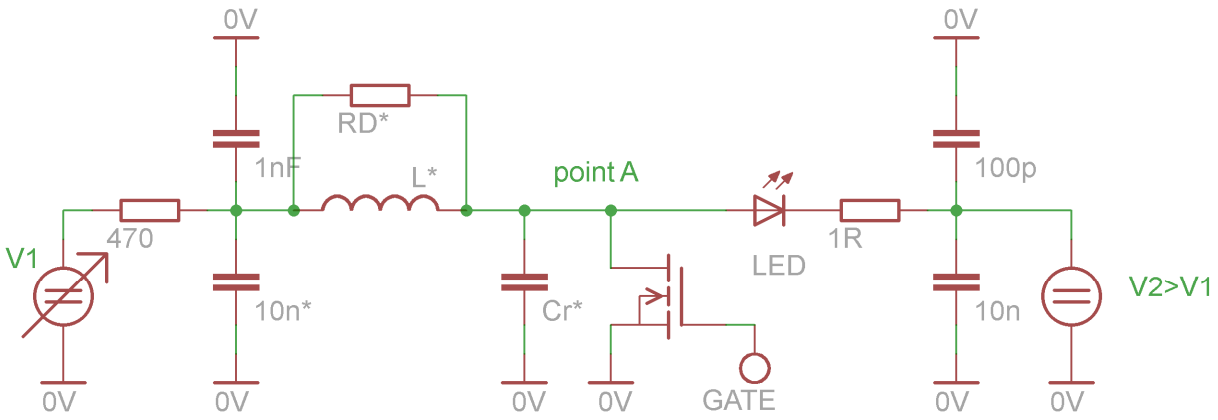
Max. Optical power, ASIC 0 histograms

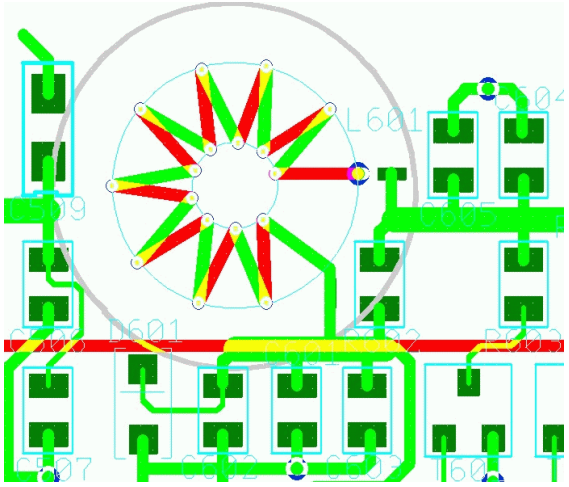


Pedestal ASIC 0, channel 1..36

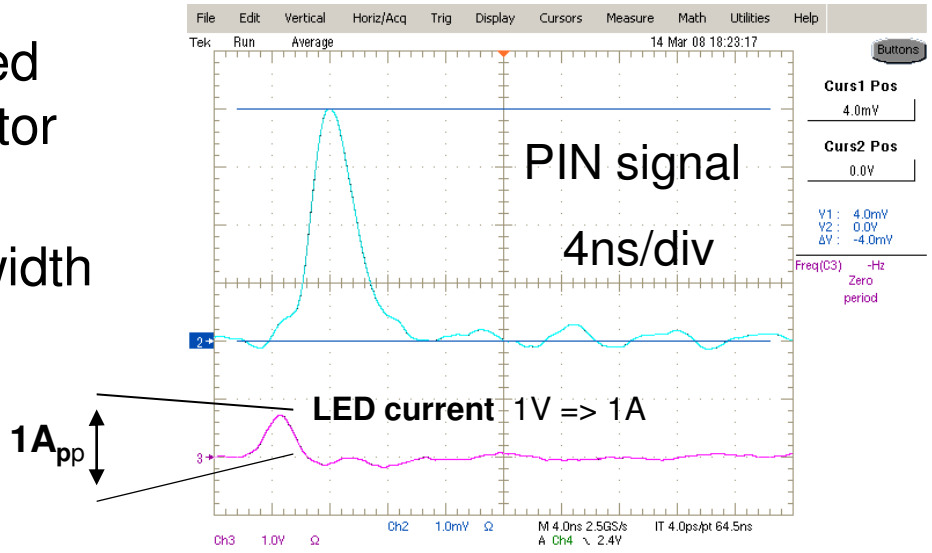


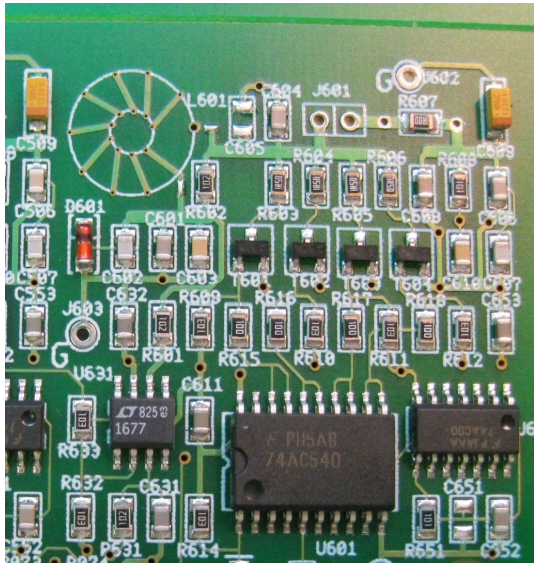
Quasi-Resonant LED driver



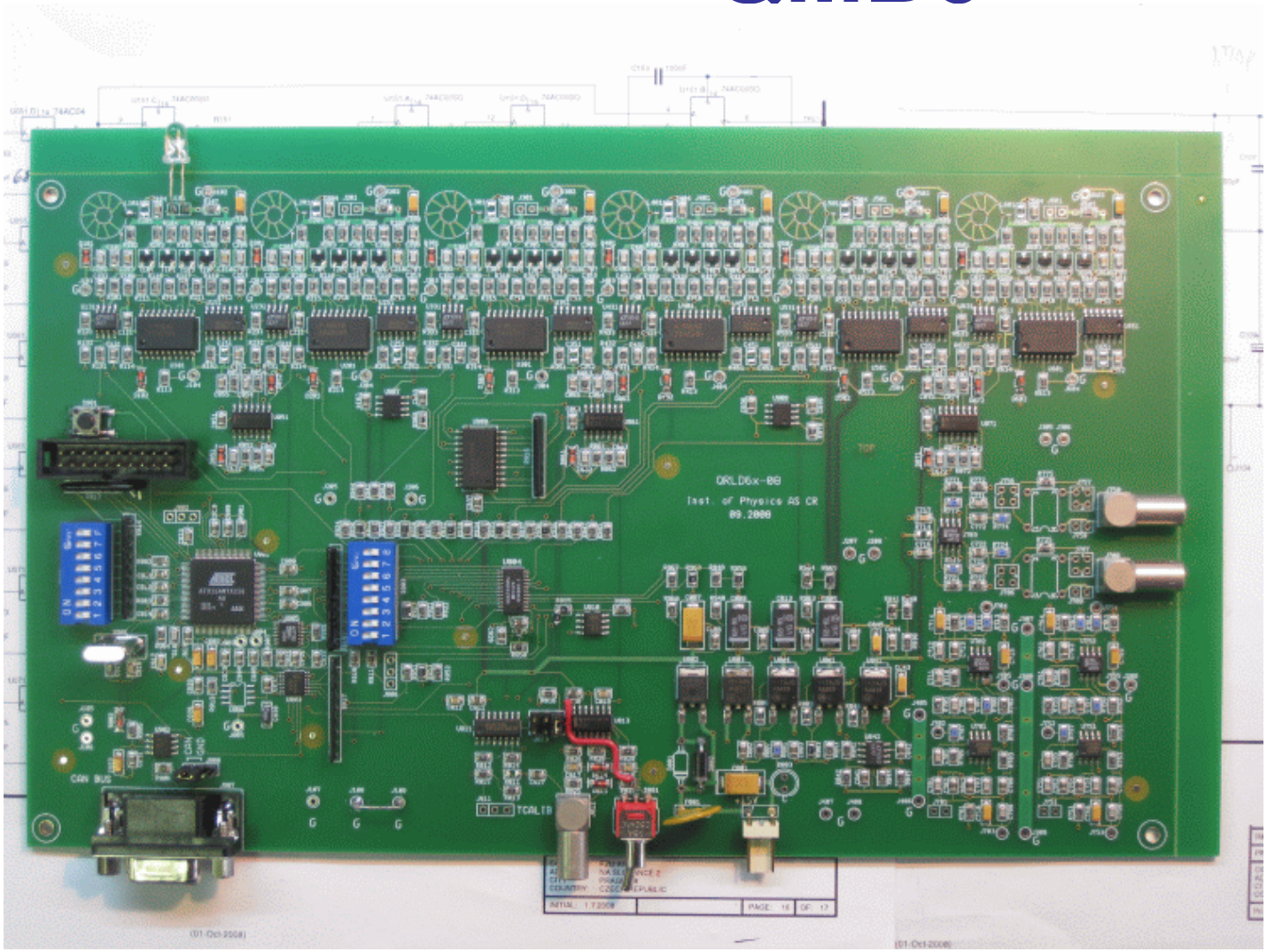


- Less RFI
- PCB integrated toroidal inductor (~35nH)
- Fixed pulse-width (~4ns)





6-LED QR driver Main Board = QMB6



Consists:

- 6 QR LED drivers
- 2 PIN PD preamps
- CPU + communication module, CANbus
- Voltage regulators
- temperature and voltage monitoring

Details of distributed LEDs

Small UV LED, smd size 1206 and 0603