



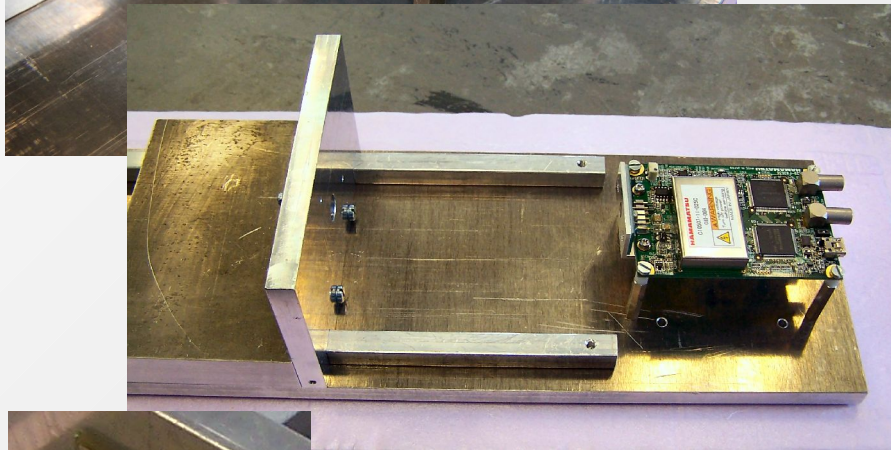
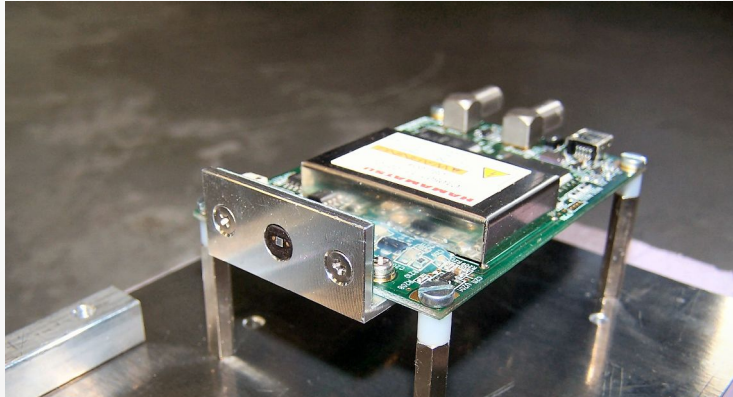
News on
Embedded LED calibration system

- Sebastian Weber -
University of Wuppertal

Overview

- Hamamatsu MPPC module
 - ◆ Optimizing LED pulsing circuit
 - ◆ Find suitable LED
- First surface scan of HCAL tiles with embedded LED pulsing circuit

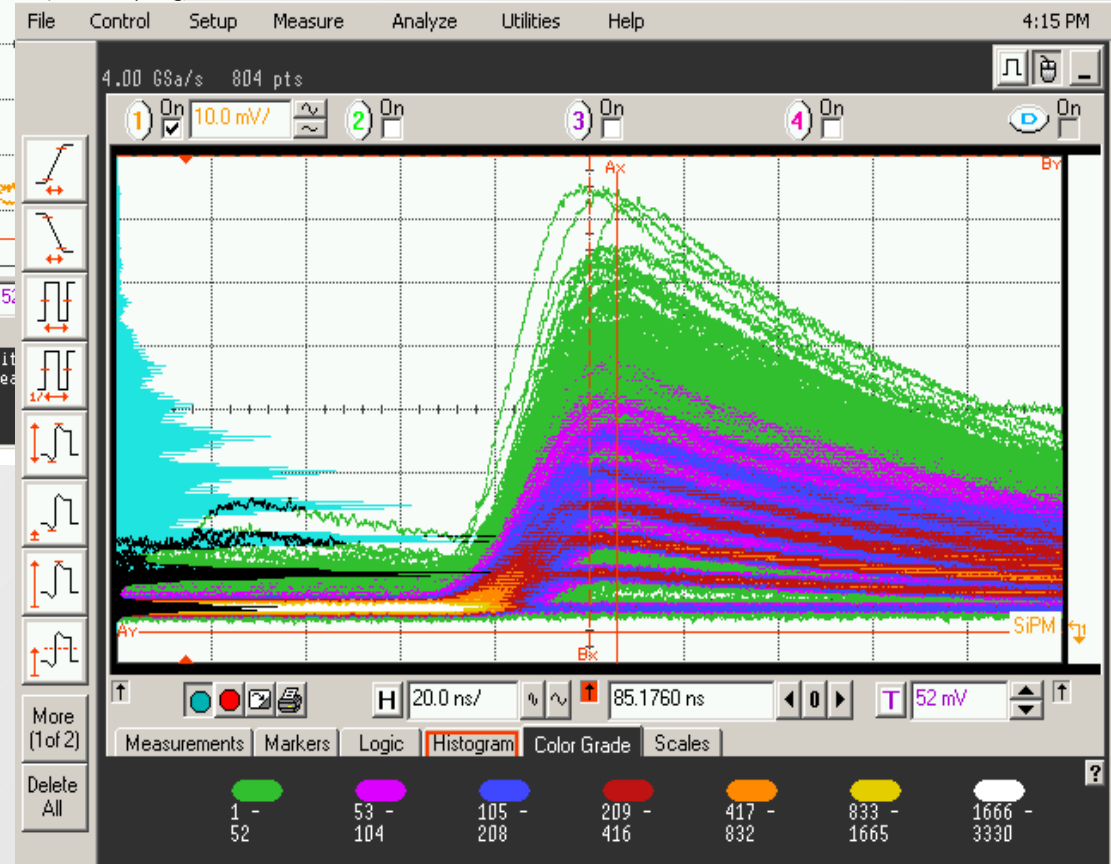
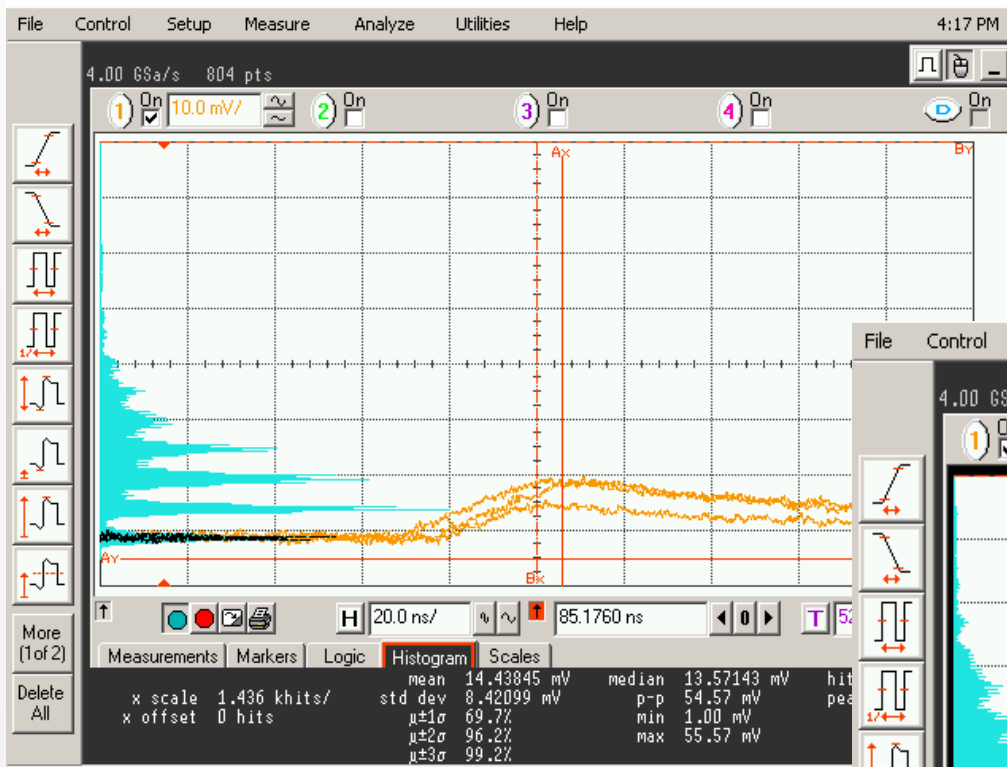
Hamamatsu setup



- MPPC-Module from Hamamatsu
- 1600 pix SiPM (blue sens.)
- Analog out
- Comparator TTL out (0.5 – 3.5 single photon signals)
- USB
 - ◊ Power
 - ◊ Comparator config
 - ◊ „high performance“ software
- Slide with small LED PCB
 - ◊ Change intensity w/o changing el. characteristics

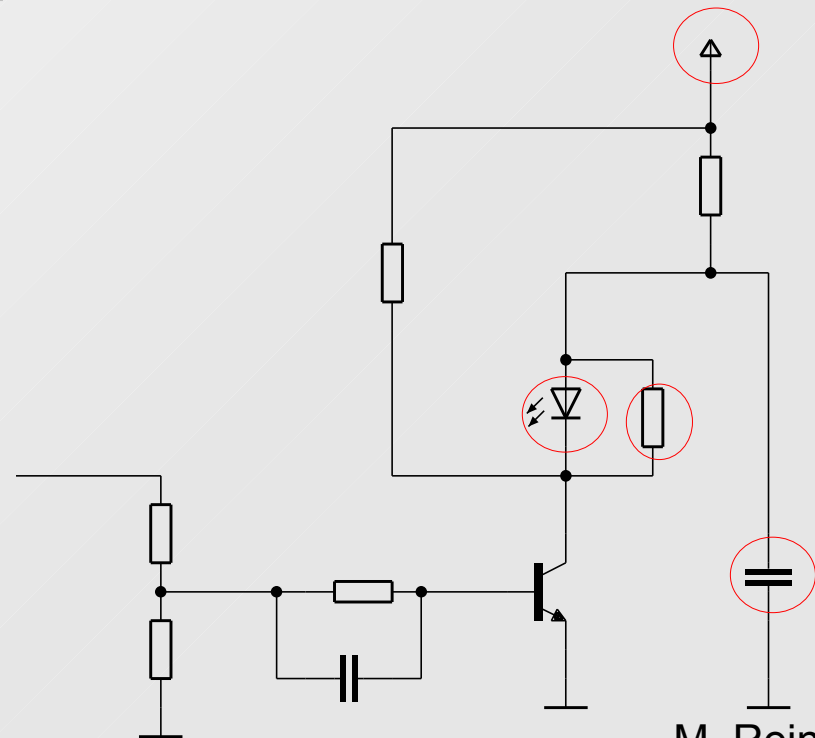
Readout

- 6MHz low-pass as shaper
- Histogram signal on oscilloscope



Test program

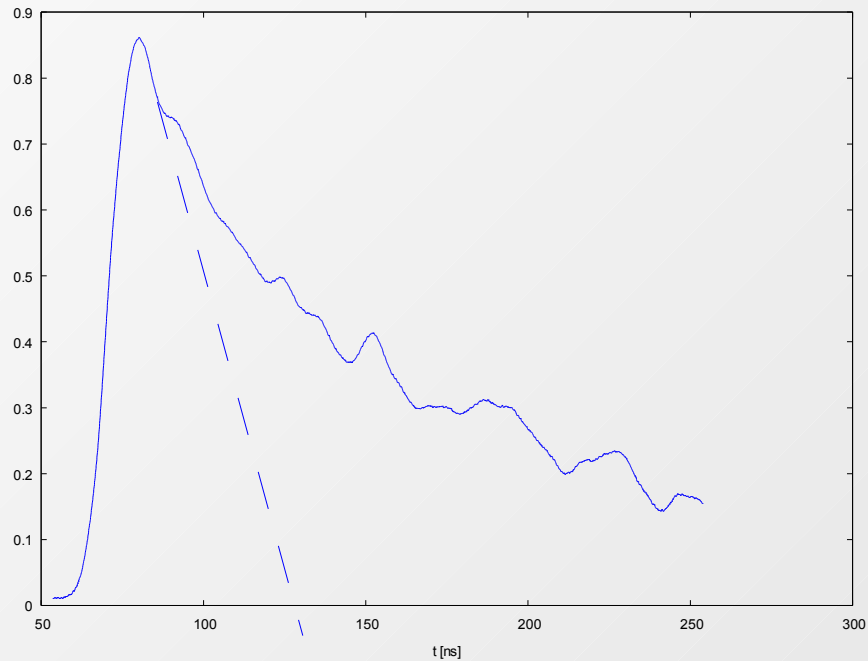
- Try different LEDs (UV, **blue**, green)
 - Blue would be better than UV
- Optimize Histogram and signal shape via
 - loading capacitor (100p-1n)
 - Resistor (100-1k)
 - Vcalib (up to 15V)
- Goal:
 - Short pulse
 - Good histogram
 - *for wide range of Vcalib & parts*



M. Reinecke

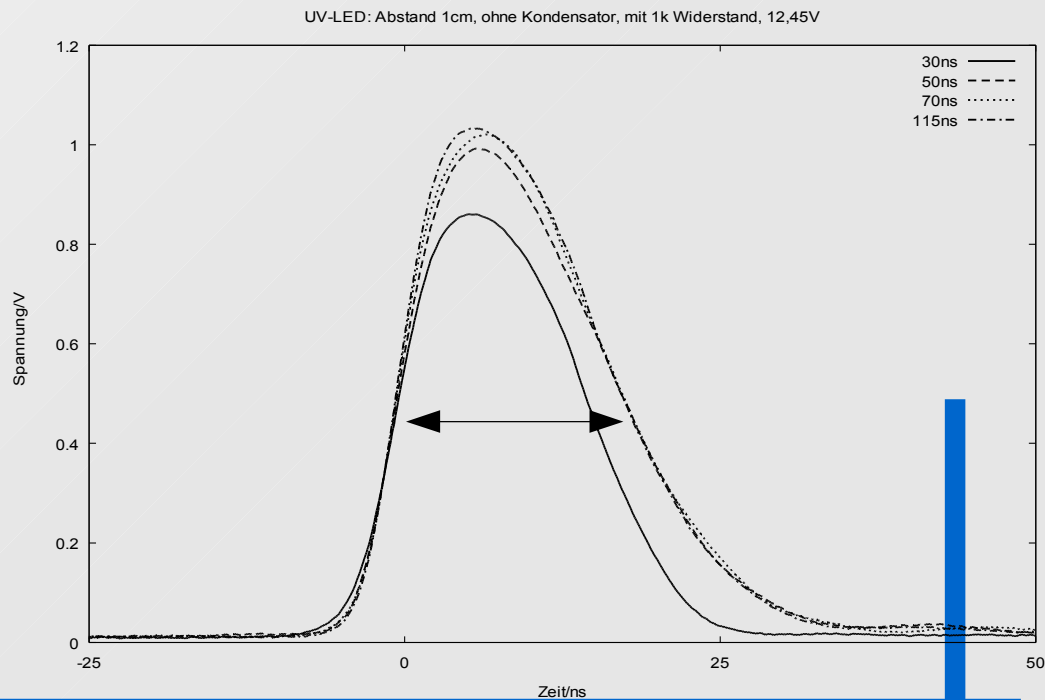
Resistor parallel to LED

- LEDs often show some afterglow
 - Slow discharge



16x averaged pulse signal

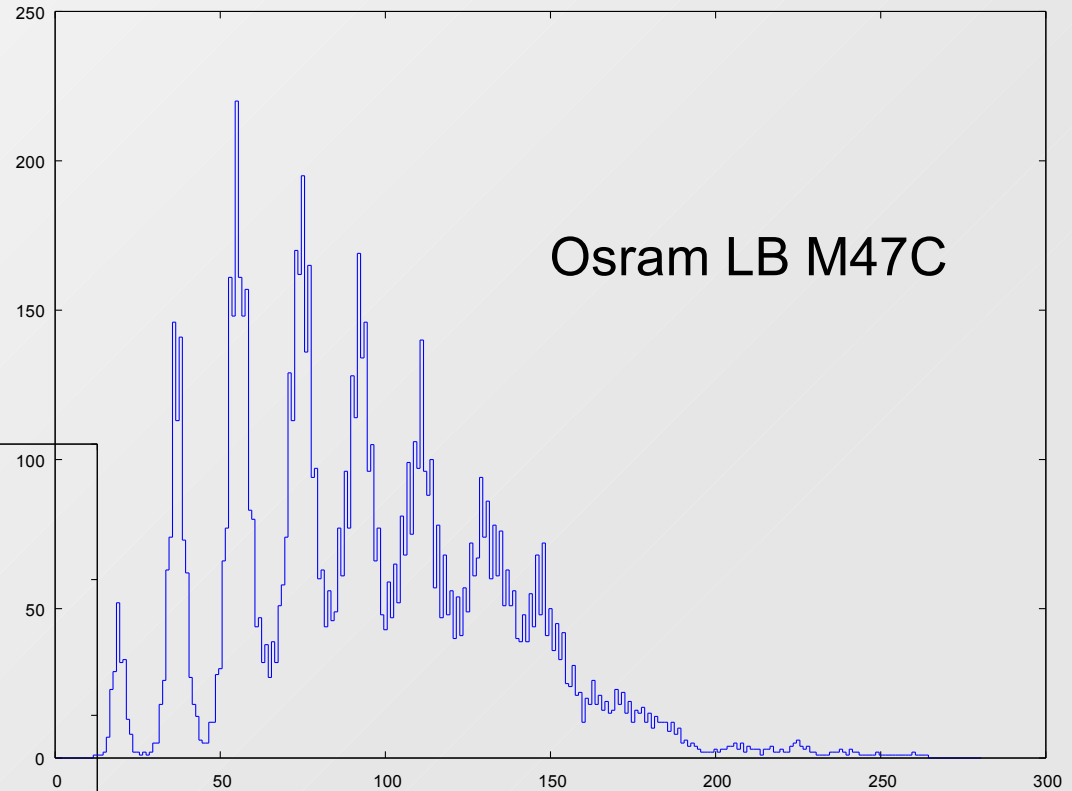
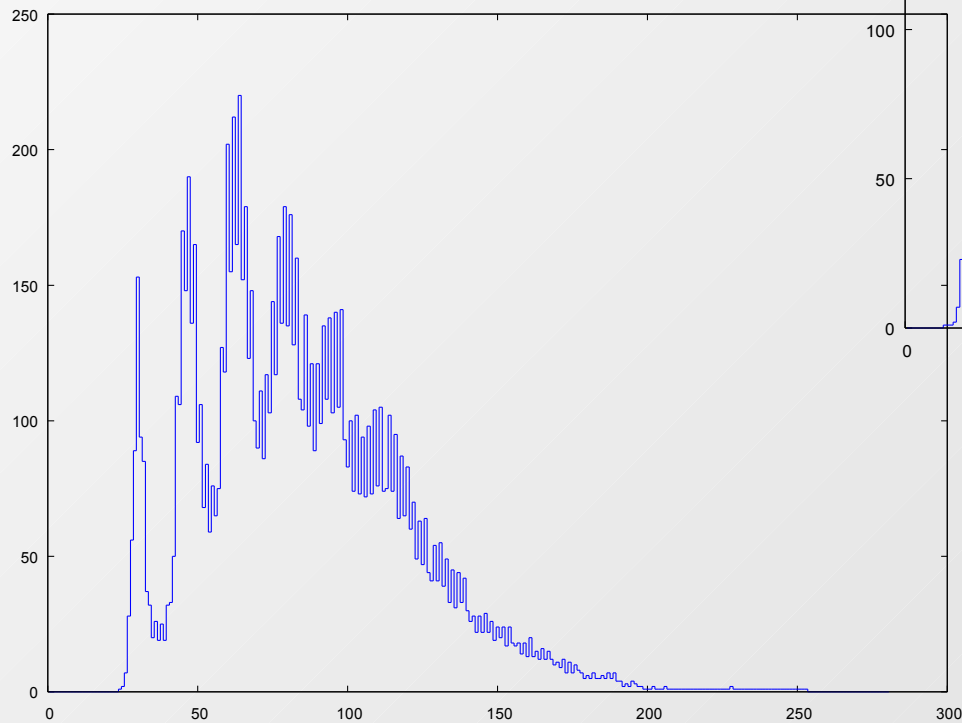
- 100-1k in parallel:
 - Shorter
 - Cleaner
 - Better time response
 - *Independent from input pulse!*
- But higher Vcalib needed
 - Sometimes too high for parts



Several LEDs tested

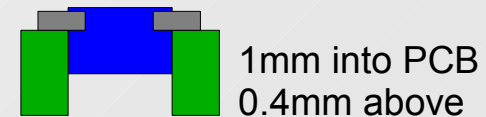
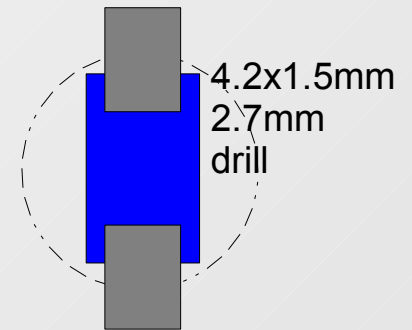
- All LEDs show spectra
- Not all suitable

- 2 types of blue LEDs:



Some words about the blue LED

- Osram LB M47C
- Huger than 0603
- Made for low profile through-PCB mounting
- Only 0.4mm profile above PCB
- Good narrow preselection
 - wavelength
 - Brightness
- Specified for 300mA pulses
- **May be good candidate**

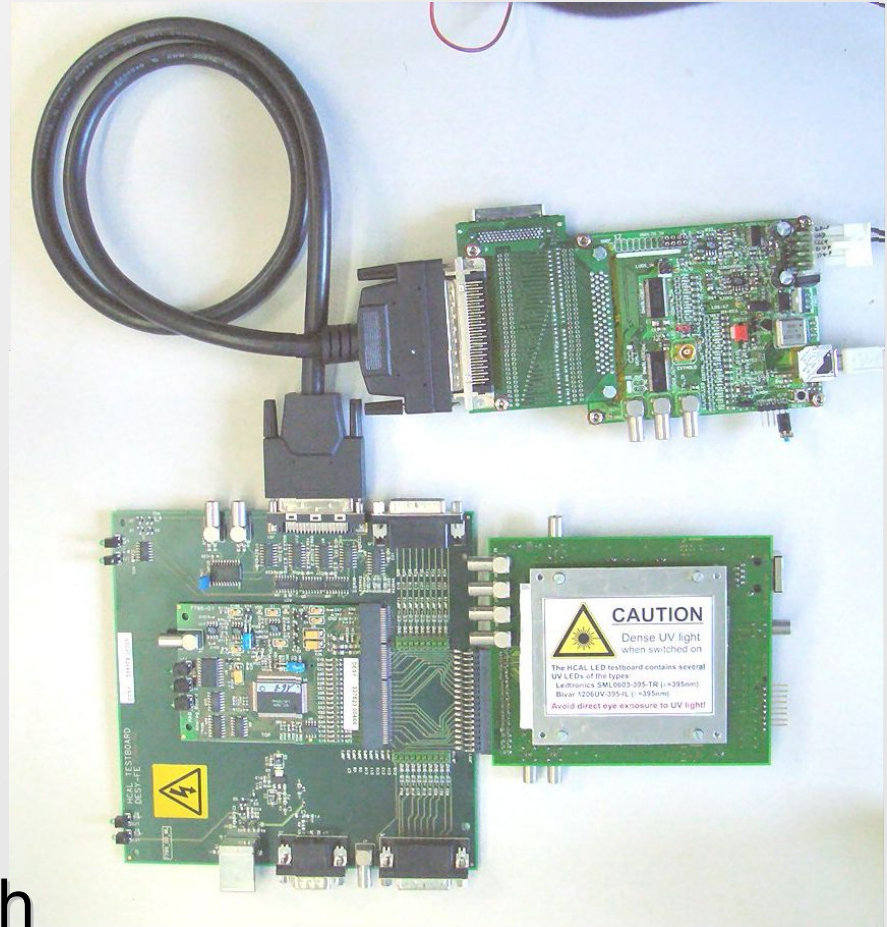


Summary so far

- Several LEDs show spectra
 - ♦ Have to adjust all components for LED types
 - ♦ e.g. Capacitor: 1p up to 1n
 - ♦ Not all show good spectra
- One suitable blue LED found for Hamamatsu SiPM
- But what about HCAL?

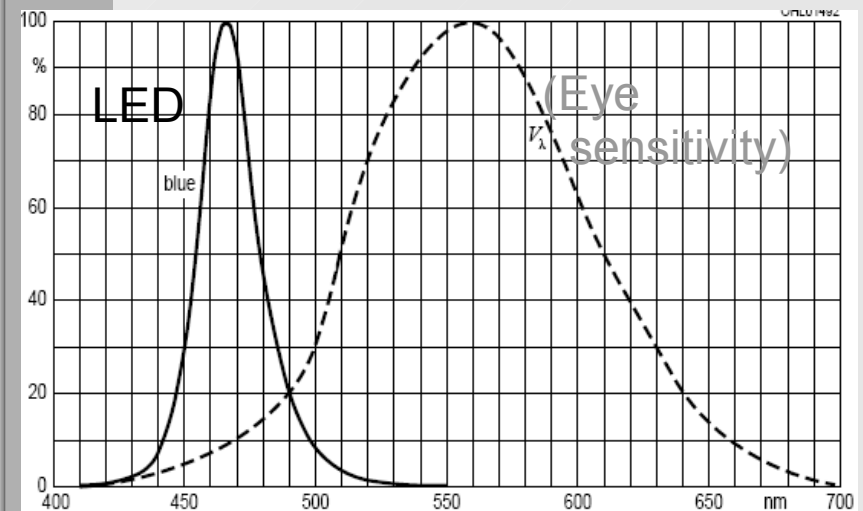
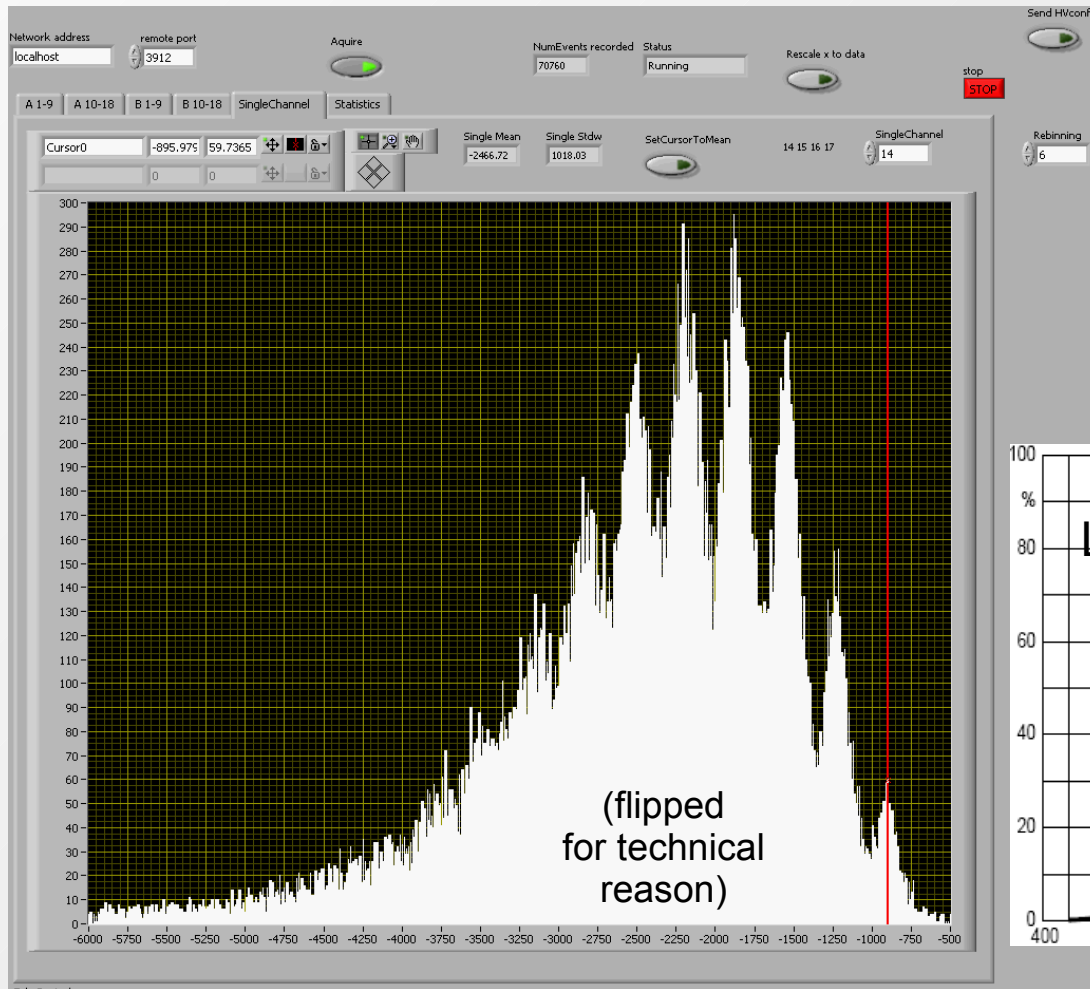
„HCAL“ electronics setup

- 4 tiles connected to HAB
 - 2 defect SiPMs
- Read out by μ DAQ
- No suitable spectra seen with UV-LED circuits embedded on testboard
- → Single tile together with LED PCB in a Box...



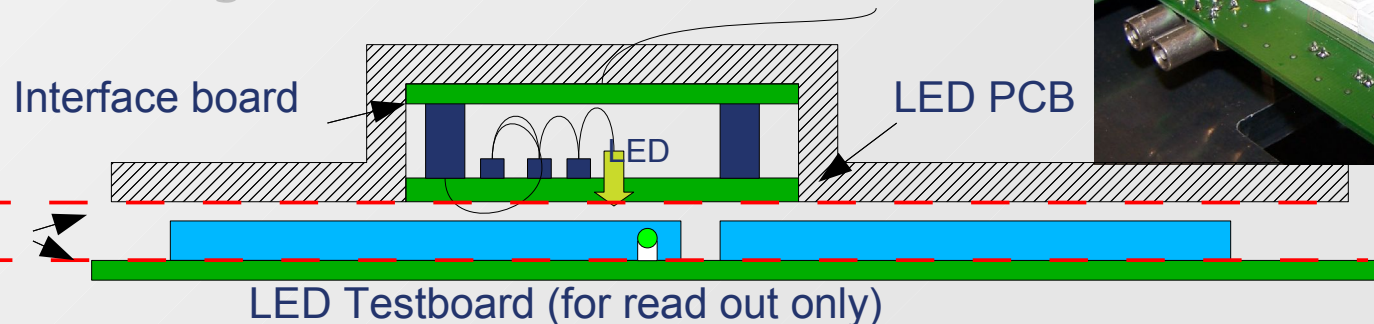
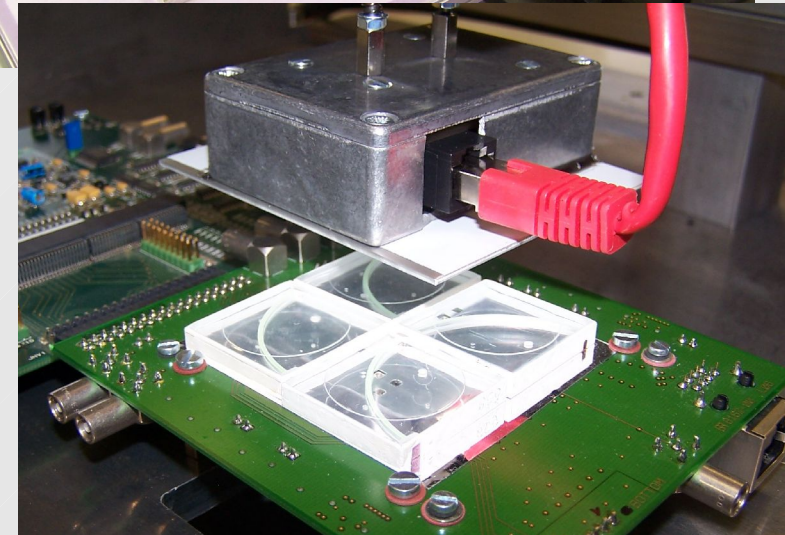
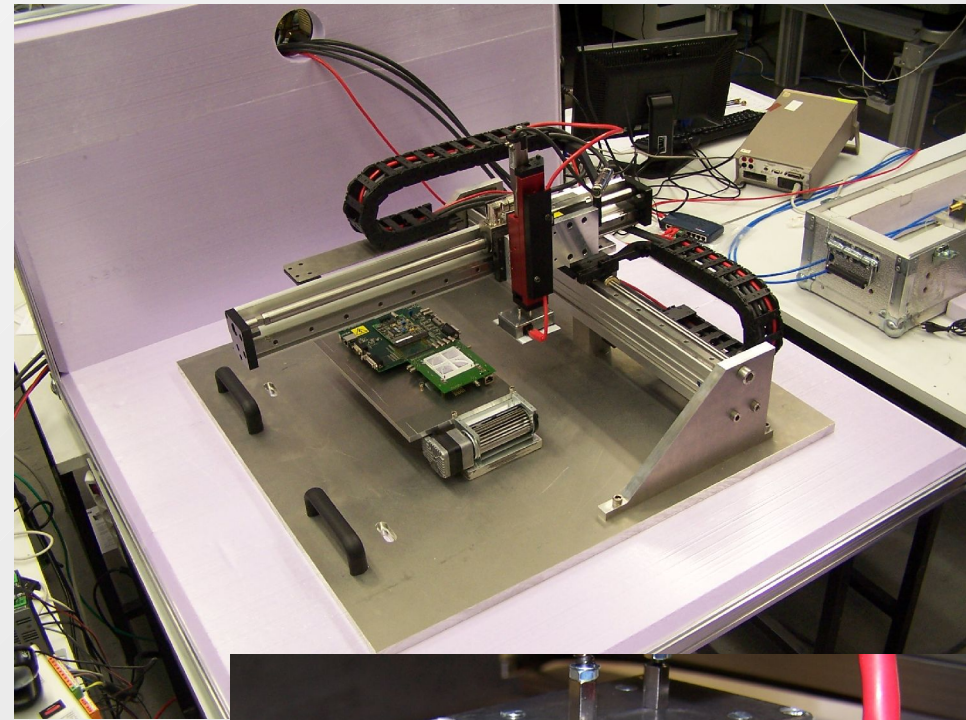
First single photon spectrum from HCAL SiPM

- Up to 8 peaks visible
- This is the best result ever seen with embedded LED system!
- **And it's a BLUE LED**

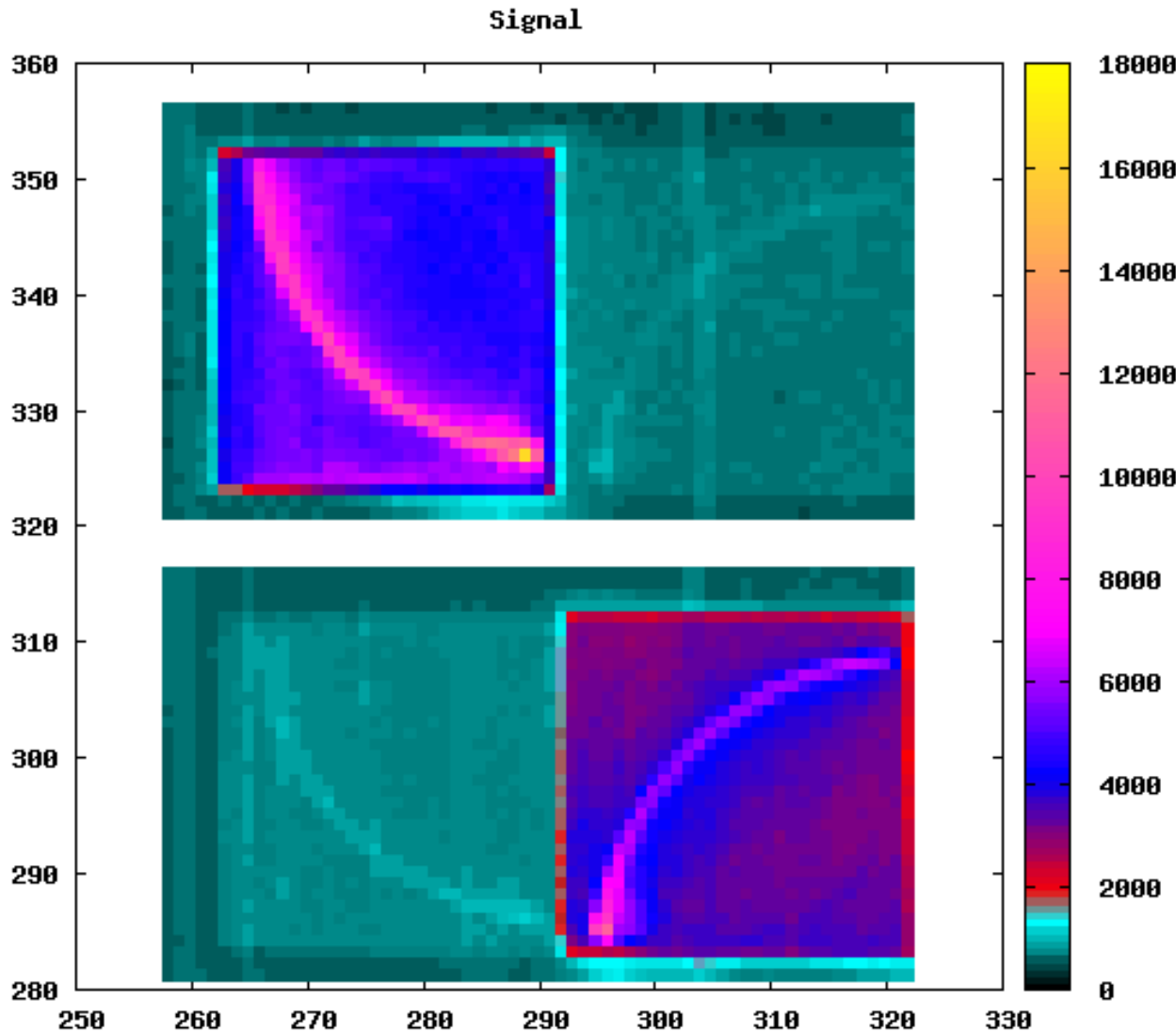
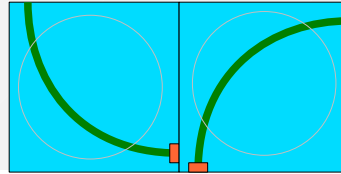


Mechanical setup

- xyz-stage build of linear axes
- Contained in light tight temperature controlled box
- Scanning head with support for LED PCB
- LED PCB easy to exchange



First surface scan with blue LED over 2 tiles



- 1mm scan with blue LED
- Much higher gain when shining into fiber
- Electrical(?) crosstalk seen on both tiles
 - ♦ More homogenous than expected for opt. crosstalk
 - ♦ Fiber
- You may notice the circle imprinted on the tiles!

Summary

- First scans taken just this week
- Irradiating fiber increases signal gain by ~ 2
- Still some noise problems
 - ♦ No deeper look into data

- First spectra from within setup seen this week
 - ♦ Detailed look into behavior of LED at different positions soon

- But in principle blue LED works on HCAL tiles