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# Embedded LED System on HBU2 + new method for gain extraction

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HCAL Meeting,  
December 13<sup>th</sup> 2011

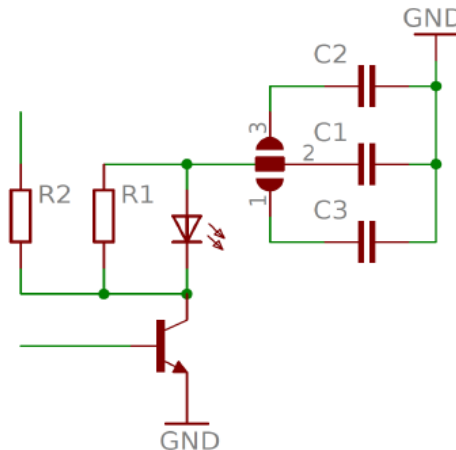
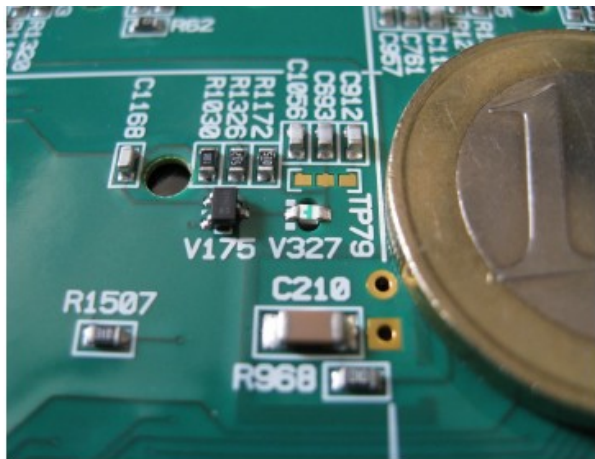
Content:

- ◆ Embedded LED System on HBU
- ◆ Wuppertal Test-setup progress
- ◆ FFT enhanced gain extraction

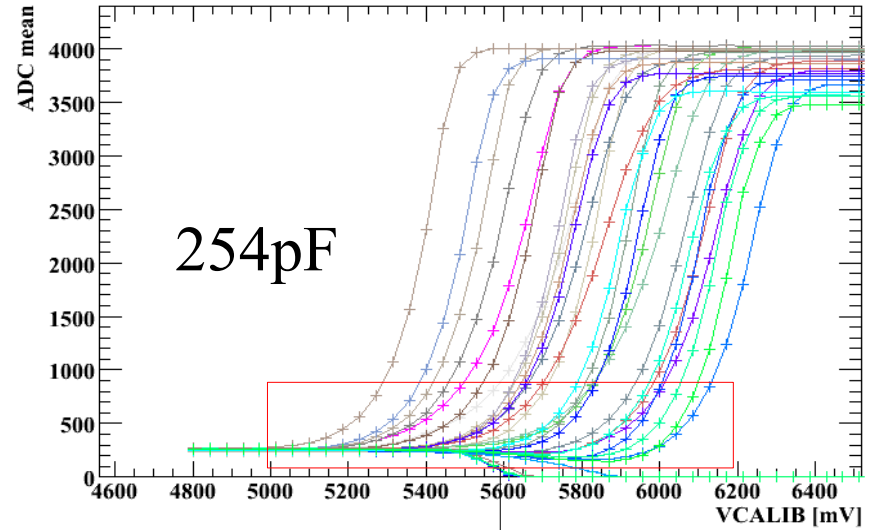
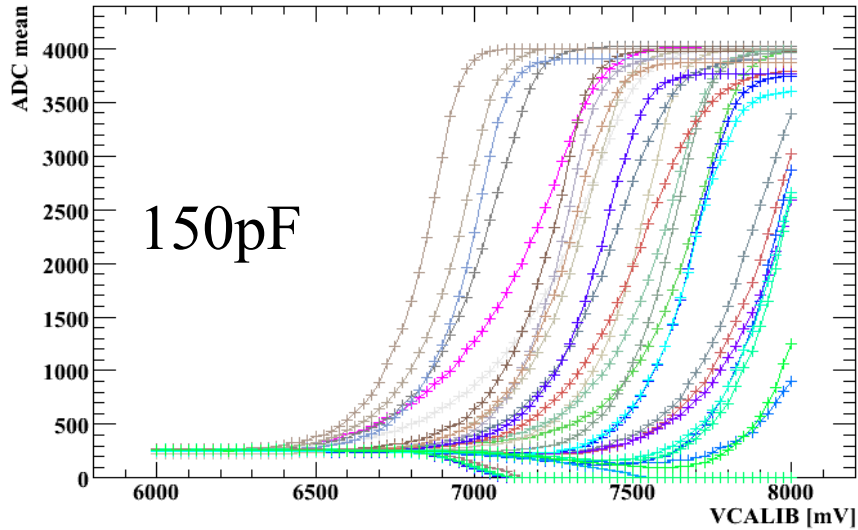
# LED System on HBU2



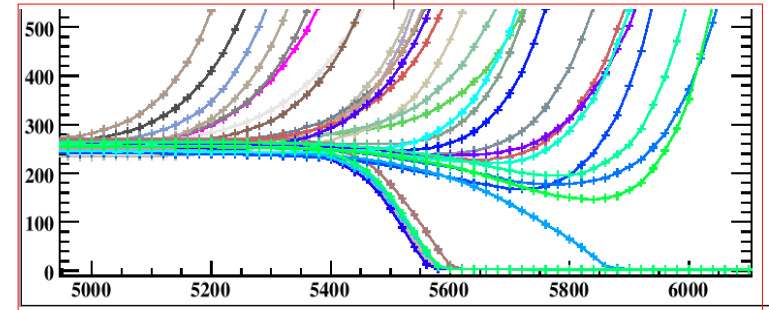
- ◆ Latest iteration of Wuppertal UV-LED system implemented on HBU2
  - ◆ 1 LED circuit per Tile; 1 global control voltage
- ◆ Adjustable light output per channel:
  - ◆ 2 tuning capacitors, set up via soldering jumper
- ◆ First test of full calibration chain  
LED -> SiPM -> SPIROC2b -> DAQ



# VCALIB Scan - highgain



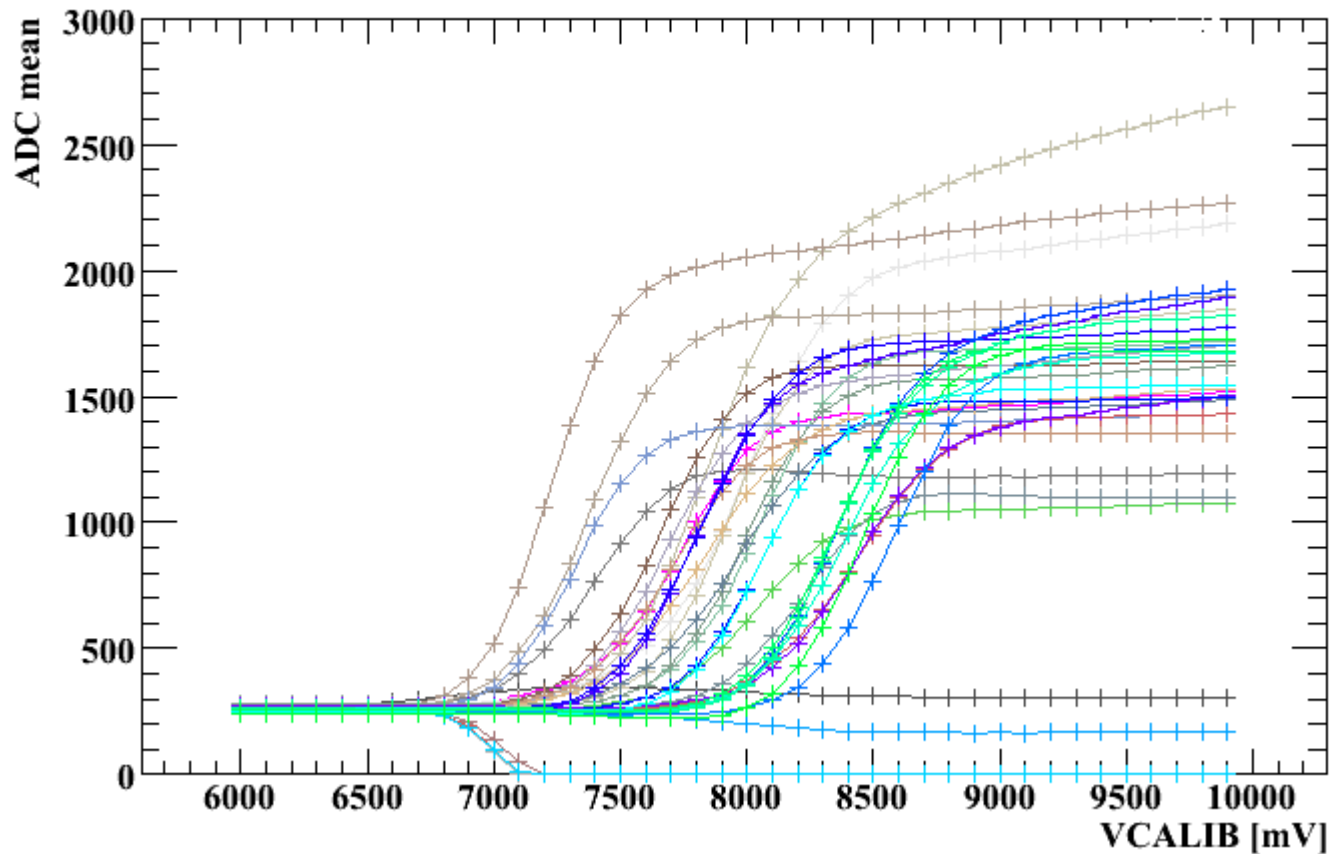
- ◆ Tuning capacitors shift LED output
- ◆ Pedestal shift is an issue
  - ◆ Loaded channels influence pedestal level of other channels
- ◆ Challenge: normalize SiPM response



# SiPM saturation



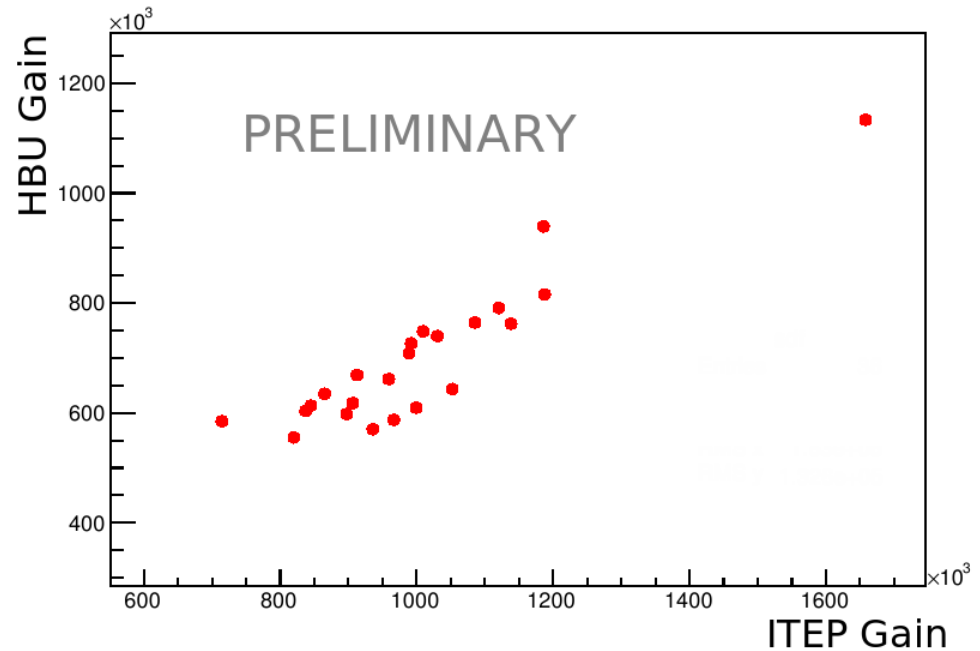
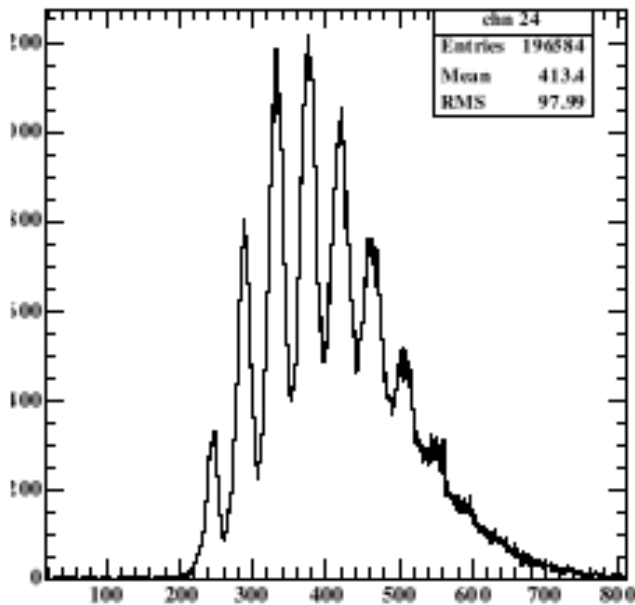
- ◆ In lowgain mode: SiPM saturation studies possible
- ◆ LED system covers full range from SPS to SiPM saturation



# Gain calibration



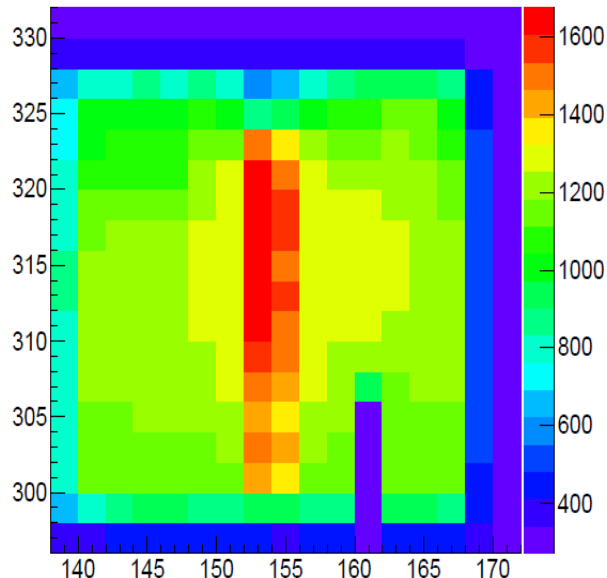
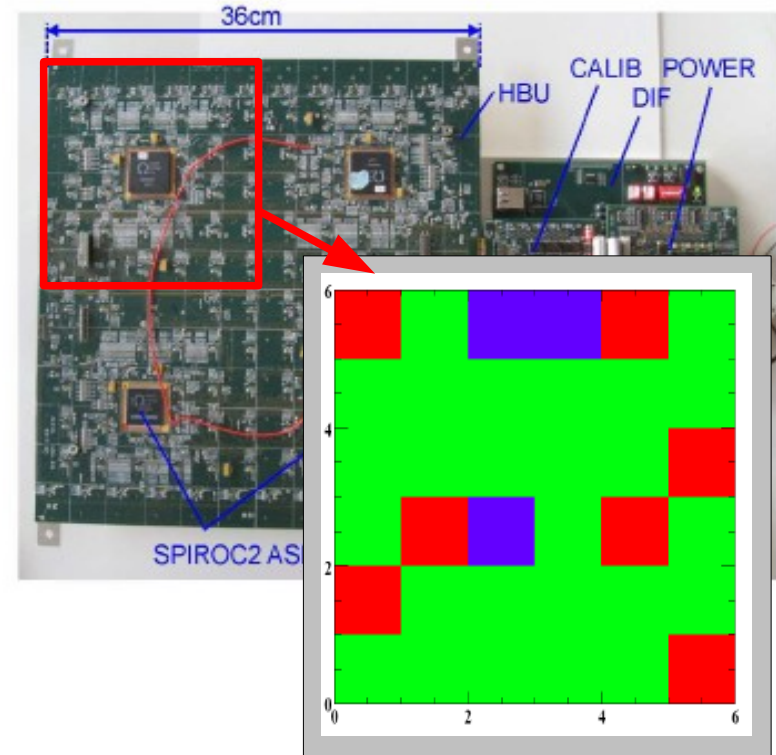
- ◆ All channels show SPS in the right VCALIB range
- ◆ Calibration readout chain established on HBU2!
- ◆ Preliminary gain cross-checks look promising



# News from Wuppertal test setup

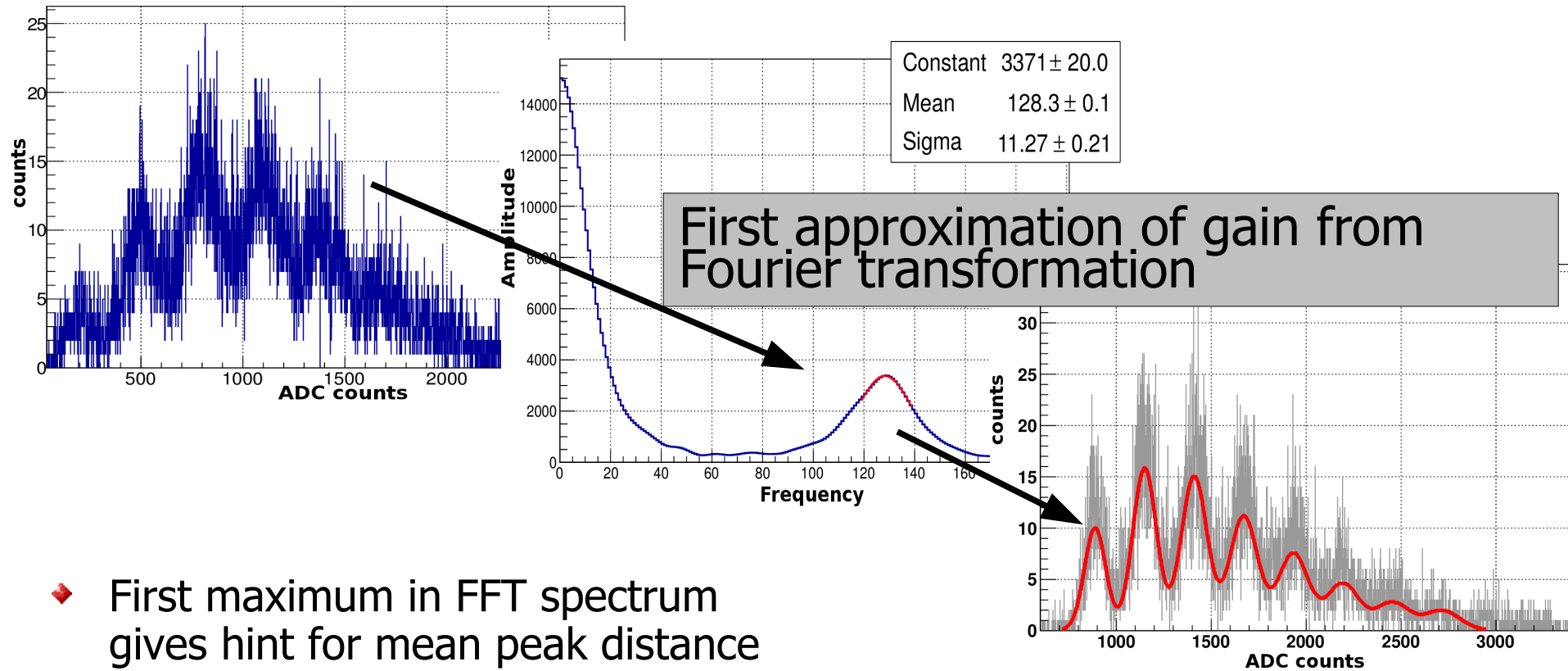


- ◆ HBU1 with SPIROC2a and 3mm tiles
- ◆ Measuring Head of XYZ table houses well defined LED circuit
- ◆ Repeat "Calib-Map" measurement from '10 with known pulser
- ◆ First area scan with xy-table and HBU readout: tile homogeneity



- ◆ Important information for LED calib. Systems and HBU layout

# FFT based gain fitting concept

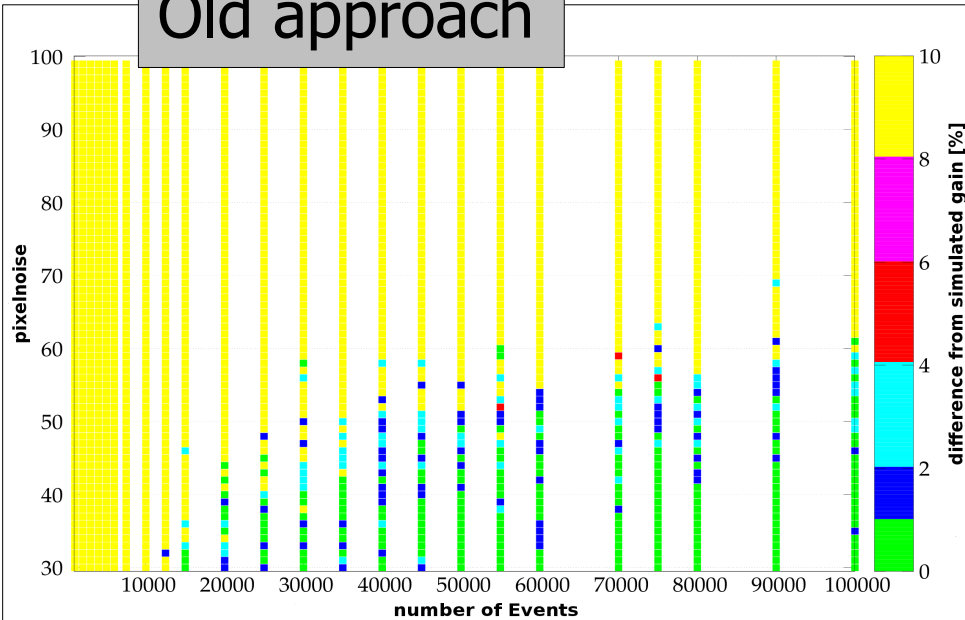


- ◆ First maximum in FFT spectrum gives hint for mean peak distance
- ◆ Pure FFT approach does not work, FFT peak is too sensitive to noise  
→ Multi-Gaussian Fit uses the FFT value as starting parameter

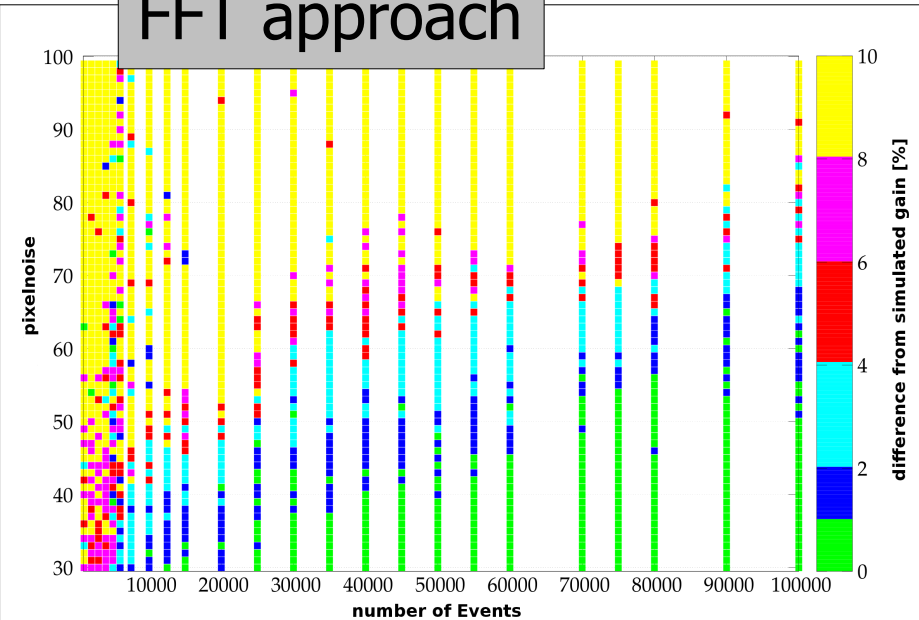
# Fit comparison



Old approach



FFT approach



- ◆ Y-axis: noise of simulated sample
- ◆ X-axis: statistics of simulated sample
- ◆ Colorgrade: fit gain deviation from simulation [%]
- ◆ FFT reconstruction covers wider range of simulated SPS
- ◆ Consistency check with real data



# Summary / Outlook



- ◆ Embedded LED System is now a part of the HBU
  - ◆ First tests running, first gain extraction shown
    - full HBU calibration measurement not yet analysed
- ◆ Pulse circuit study at xyz test setup:
  - ◆ Tile homogeneity scan shows strong non-homogeneity to UV light
    - comparison of old HBU full calibration with new pulser at xyz measurement setup
- ◆ FFT based gain extraction method:
  - ◆ Allows fits of more noisy / lower statistics single peak spectra (simulation)
    - reduce data-taking time of calibration runs