AHCAL Electronics.

Status Commissioning

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for the AHCAL developers
EUDET electronics and DAQ meeting
Paris Palaiseau, Jan. 14th, 2010

HELMHOLTZ GEMEINSCHAFT

CALICE Calorimeter for ILC

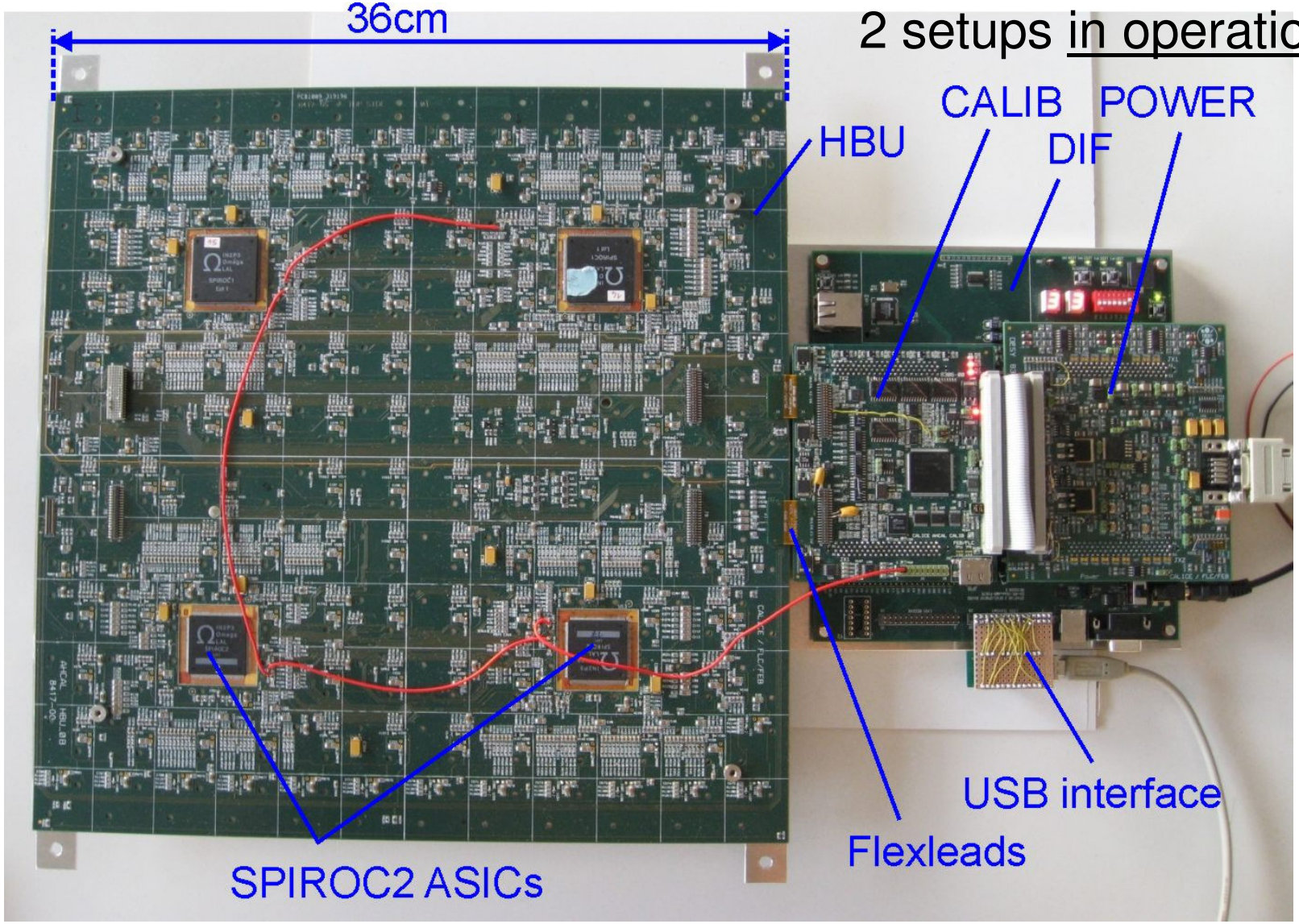
EUDET

DESY

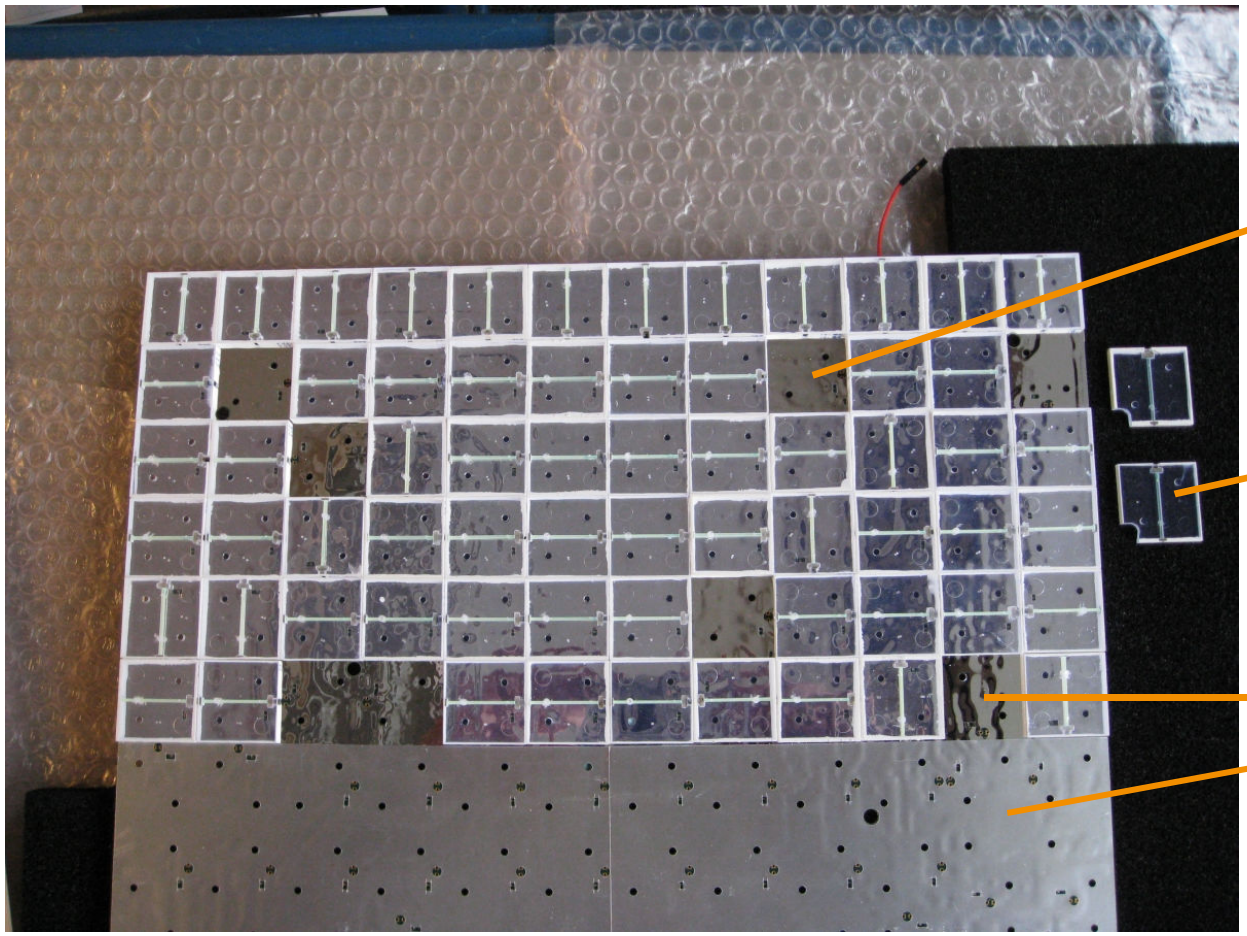
Outline

- System Commissioning
  - Labview DAQ operation
  - First SPIROC2/system results
- SPIROC redesign
- Conclusions and Outlook

HCAL Base Unit (HBU) and system setup



Tile Assembly – HBUII SPIROC2 area

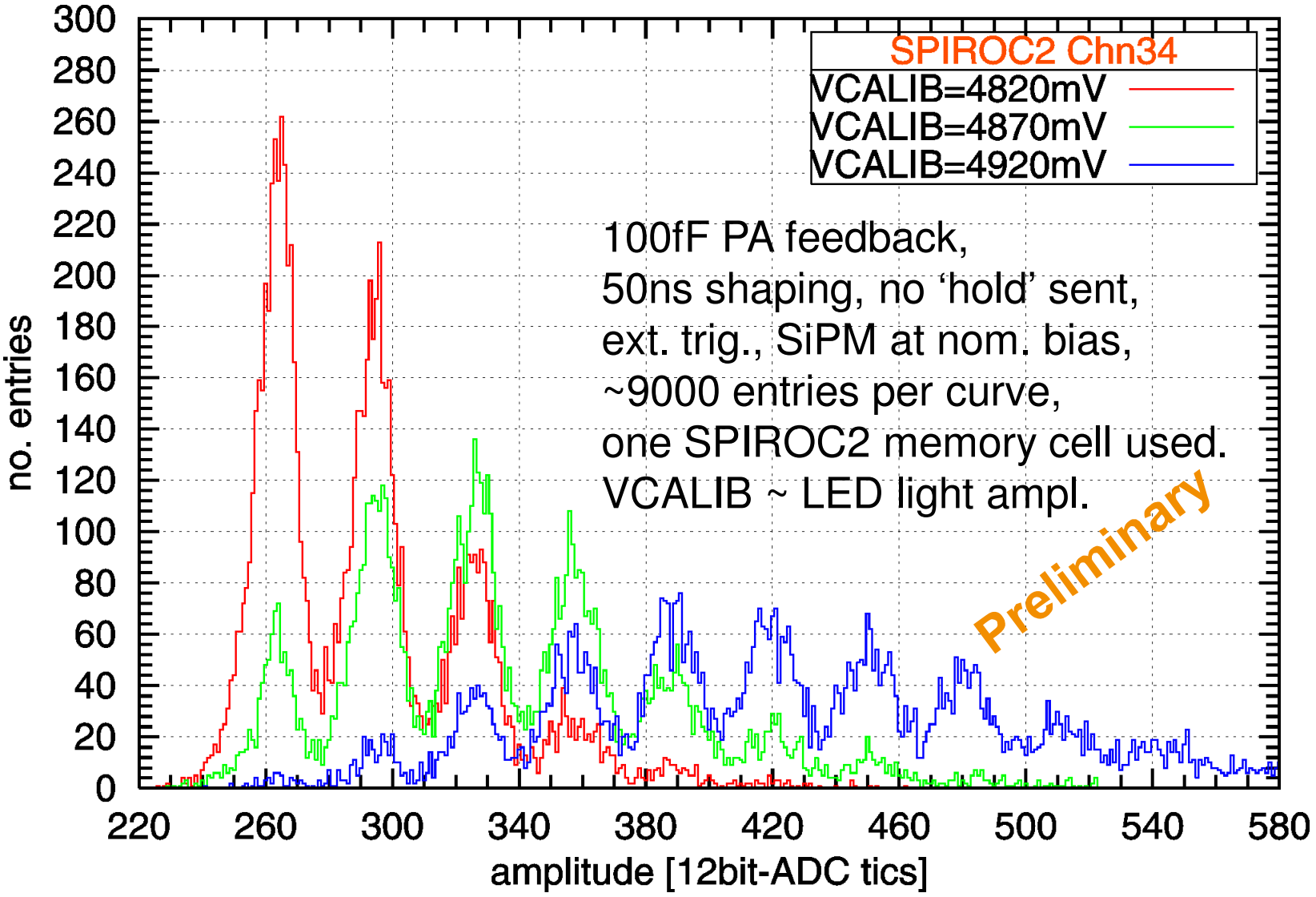


Some positions cannot be assembled (tiles do not fit in)

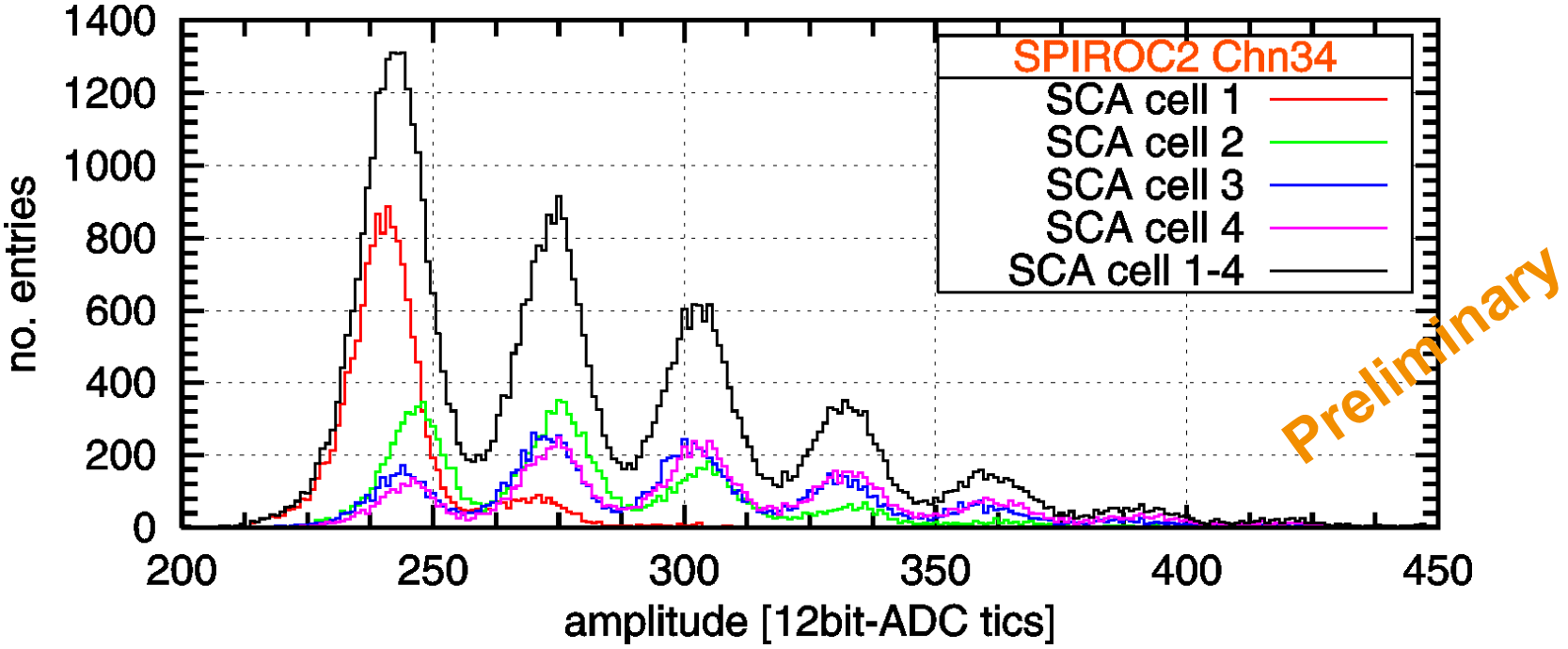
“mechanics tiles” (cassette construction)

Reflector foil:
without cover (blank)
still with cover

Single-Photon Peaks I

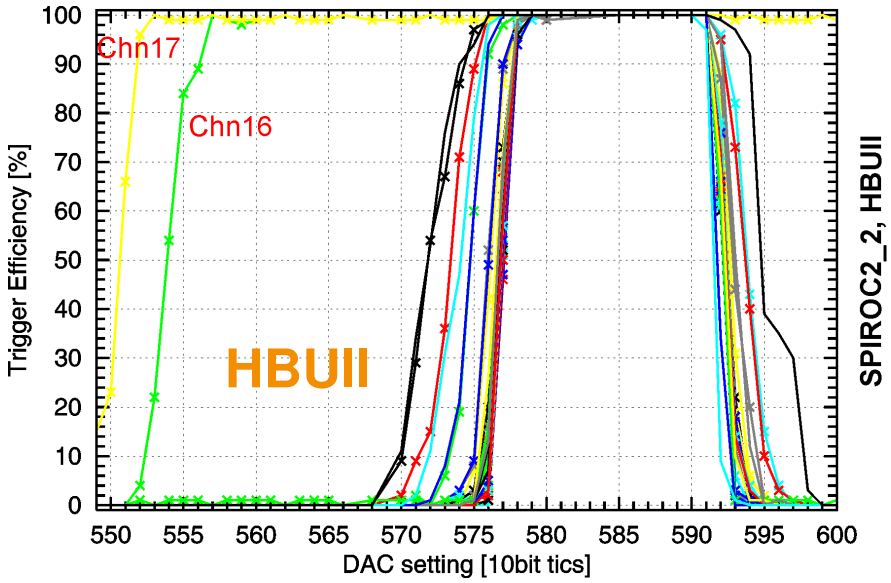


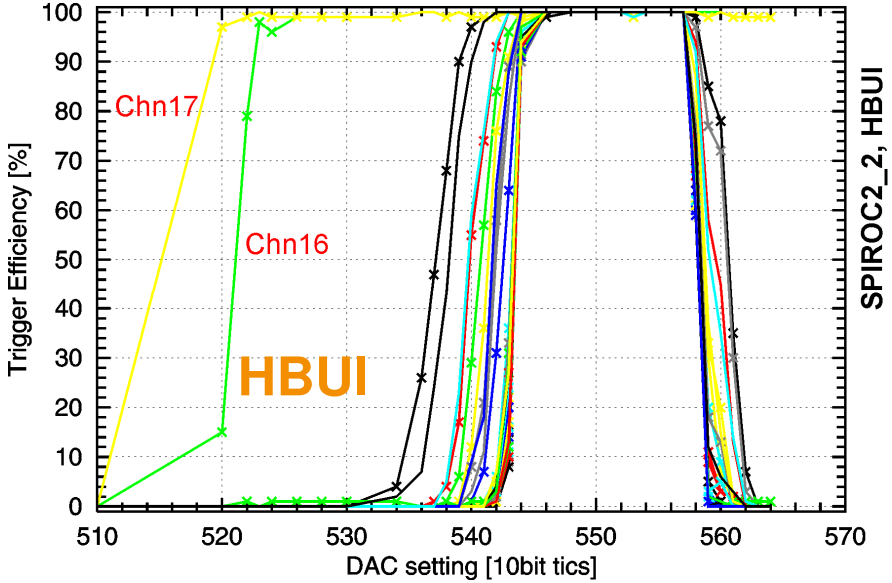
Single-Photon Peaks III (SPIROC2 SCA test)



- Different light amplitudes due to integrated LED system, but reason unknown (no level shifts of GND or VCALIB observed).
- Offset may be due to SCA cells, or due to GND level shifts.
- Without correction, sum of SCA cell results (black curve) should not be used.

S-Curves – Noise on two channels?

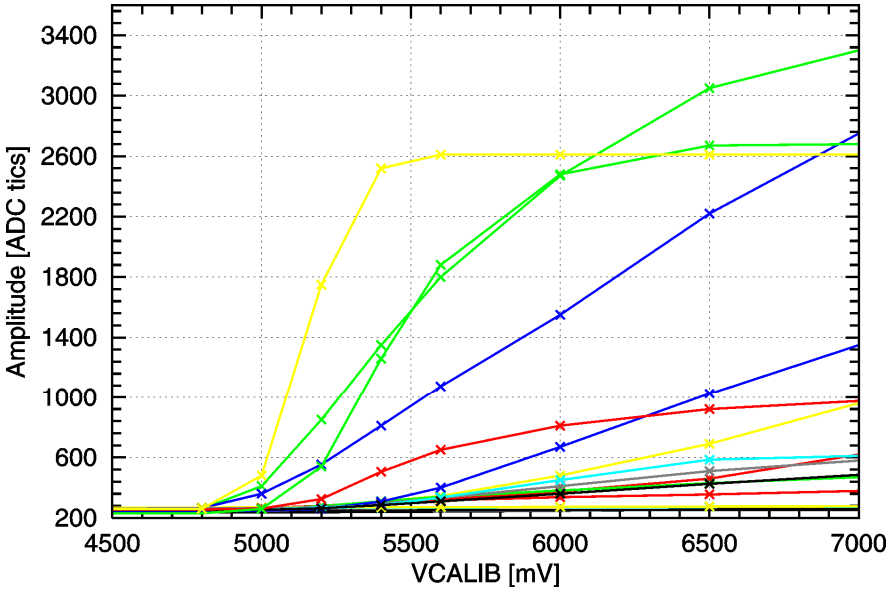




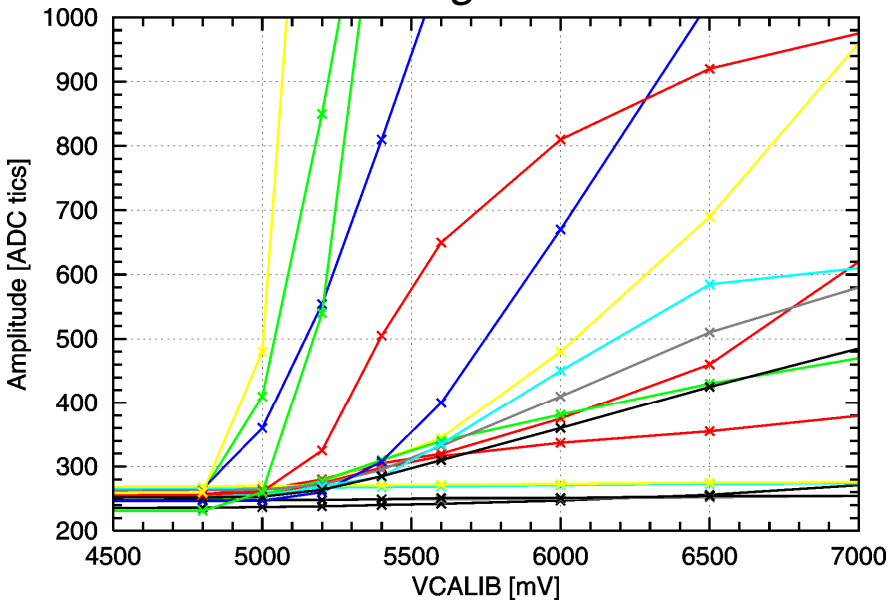
- Same two channels stick out for both HBUs…
- No special layout feature recognizable … lines run below ASIC, but with GND plane in between AND there is a third running there as well.

integrated LED system – dynamic range

SPIROC2: 400fF PA feedback, 50ns shaping, results for 18 assembled channels shown

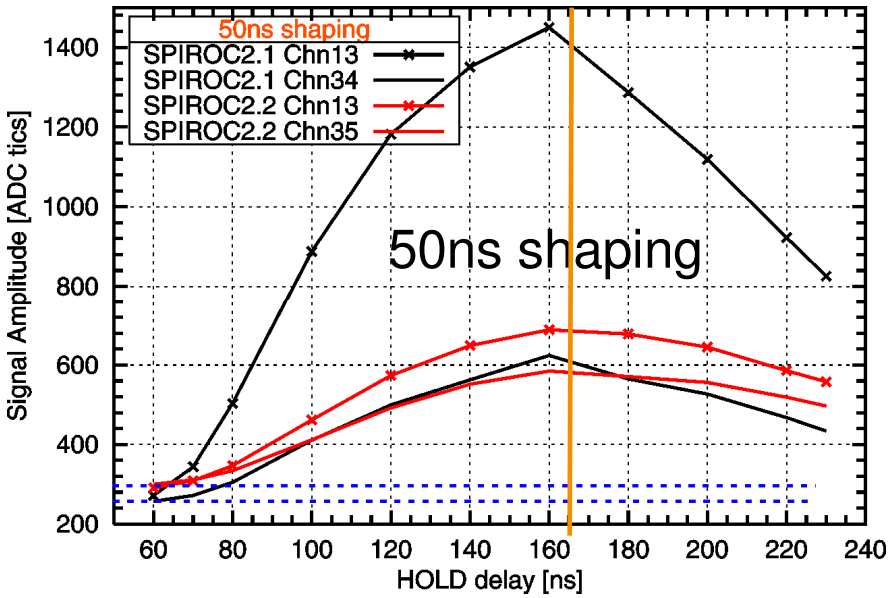


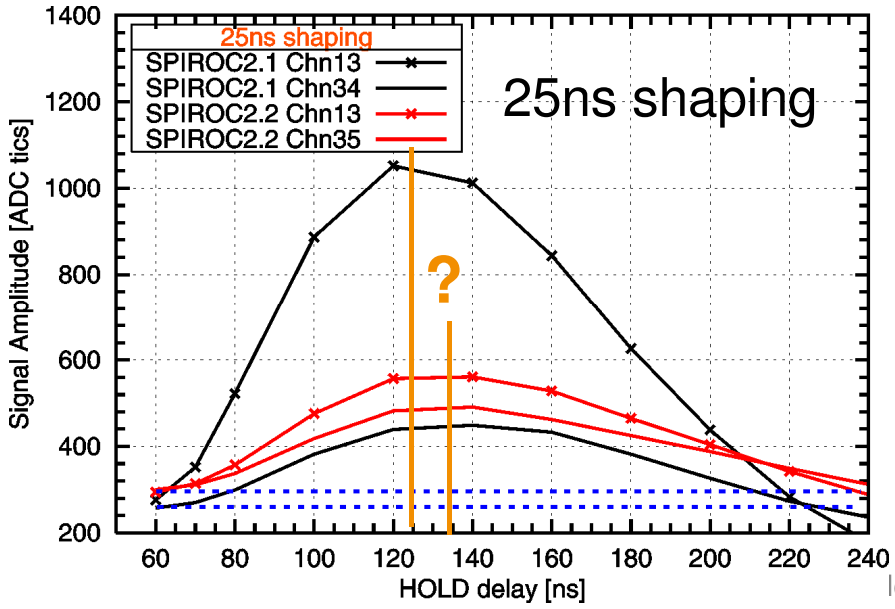
Zoom of Fig. on the left



- LED comp-to-comp spread is large => preselection necessary.
- Dynamic range: Change LED capacitor? VCALIB max = 10V.

HBU hold scan (preliminary)





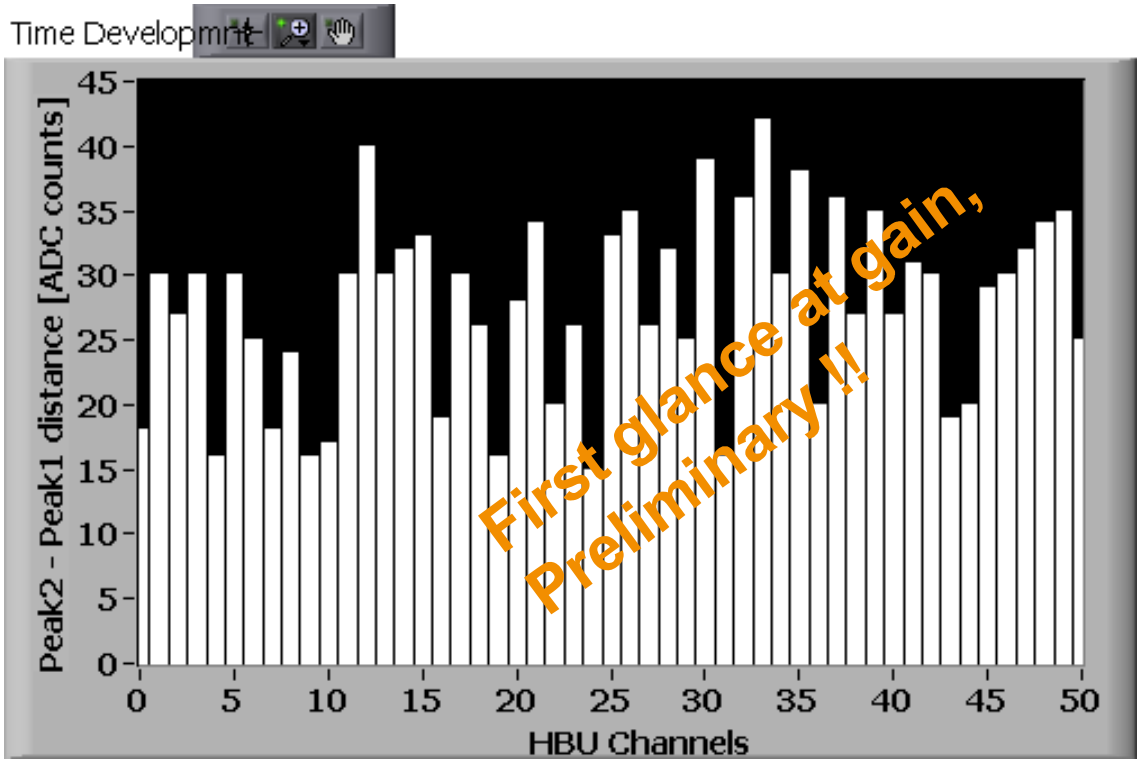
Parameters of this measurement:

- External Hold implemented, LED system as signal source.
- SPIROC2 preampl: 100fF feedback. All channel triggers enabled.
- **amplitude-dependent maximum? Has to be checked with more channels.** 160ns is large …

Result fits quite well to a measurement in SPIROC2 manual

Gain Calibration with Single Pixel characteristics

- Integrated LED system used with 5 different light amplitudes in order to have single-pixel peak structure for all channels.
- 72 channels: 51 show ‘single pixels’, 7 not assembled, 6 don’t show any signal, 7 respond to LED light but without single-pixel stucture.

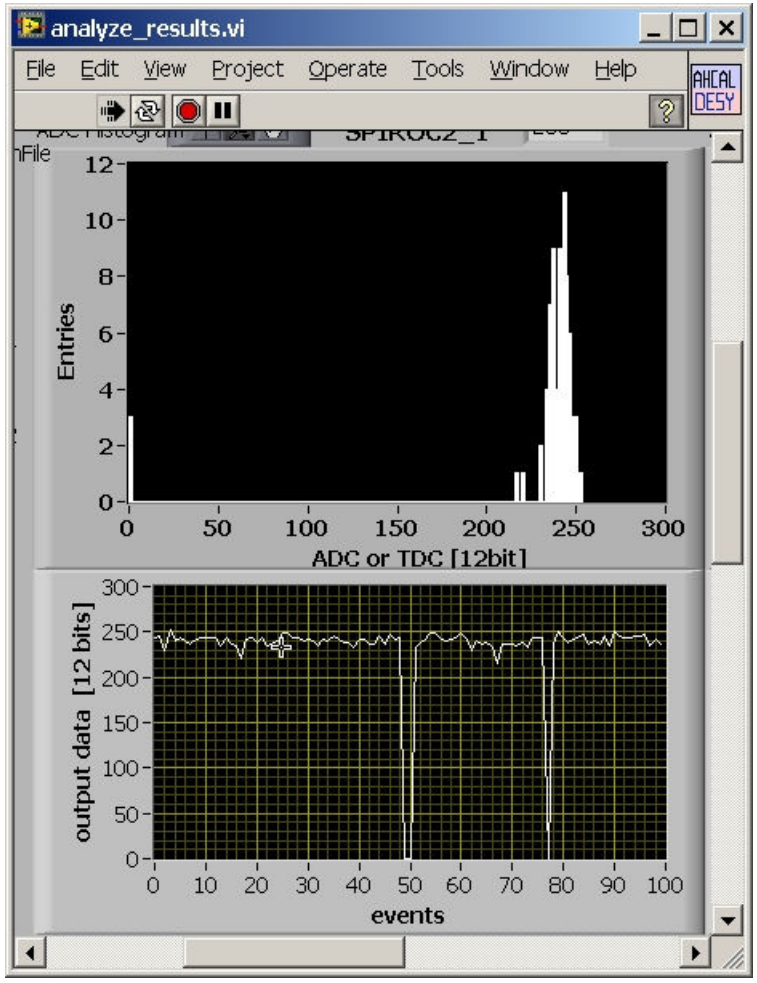


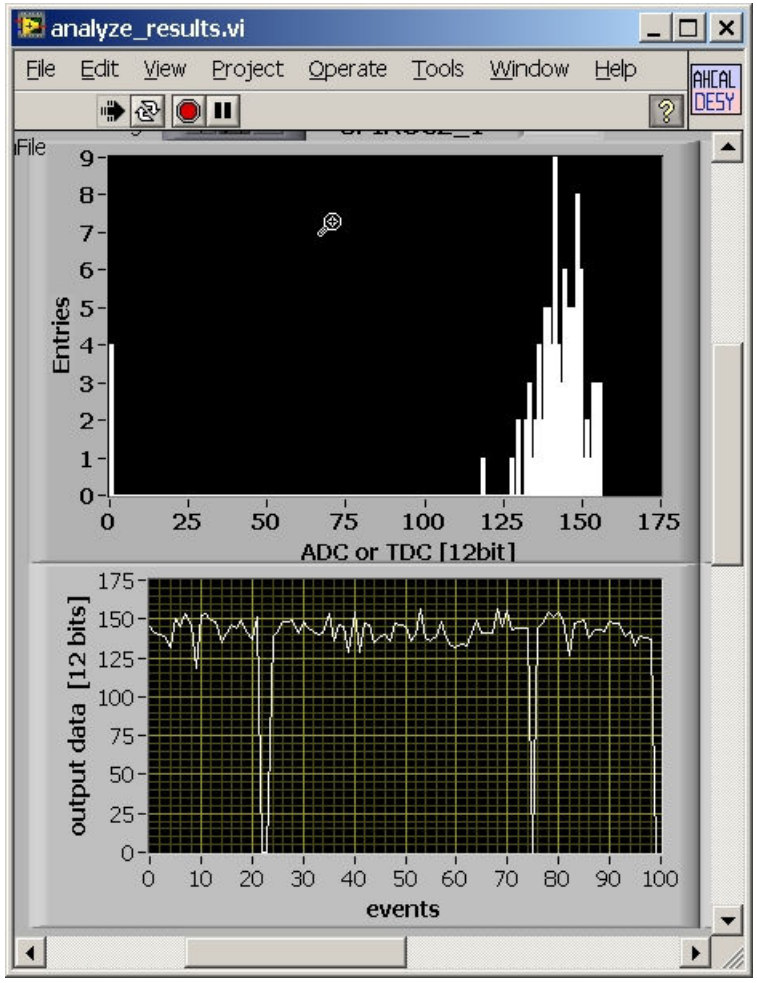
Large spread …
⇒check SiPM bias
(DAC setting)
⇒check ITEP data

Bugs and Features

- HBU: Baseline Shift with LED Bias: 20 ADC chns (Pixel dist: 28chns)
- HBU LED system: rising amplitude from 1st to 4th trigger @50kHz rate.
- HBU layout (redesign): all clock lines need higher routing priority
- detailed noise analysis (pedestals, S-curves) will show if all channels have low noise and low coupling to digital lines.
- Internal triggering not managed yet: Single-pixel spectra for auto-triggering, but not for the triggered channels.
  Tests so far without hold-delay adjustment.

Bugs and Features II





pedestal shift due to signal in neighbour. channels.

ASIC?
HBU gnd?

To be investigated!

no LED light

huge LED signal in neighbouring channels

Points for SPIROC redesign (see Ludovic's talk)

SPIROC2a (submission 'now')

- Slow Control programming / Probe reg. correction.
- data of first frame/trigger is always '0' ('zero_frame').
- improved input DAC.
- keep 1.4mm package/pinout.
- unclear: new trigger scheme (validation concept without no_trig/RazChn).

This list does not include analogue part change requests (Wei, Riccardo, Beni).

SPIROC3 (mid 2010?)

- Bandgap Reference offset (impact on DACs and ADCs dynamic range).
- Single channels show '0' quite often.
- ext_hold + ext_trig => one LVDS signal (SP2a?).
- I2C slow-control (7 ext. address inputs necessary) (**?**)
- Remove as many ext. bias points as possible (SP2a?).
- channel-wise threshold and gain adjustment (both?).
- trigger not only OR36.

DESY

Conclusions and Outlook

- AHCAL prototype in full operation! 2 setups realized!
- USB/Labview DAQ used so far. CALICE DAQ integration, when ..?
- DESY electron-testbeam preparation ongoing. Sandra Christen (responsible for testbeam setup) took over the testbeam system.
- Only SPIROC2 will get tiles, no tiles below SPIROC1. OK? (=> Remove SPIROC1 chips from HBU for power-pulsing tests).
- LED system works in principal. LED spread can be compensated by doing calibration runs at 5 different VCALIBs.
- A lot of system's and SPIROC analogue and digital tests ahead.
  - all shown analysis have not been completed.
  - status only demonstrates readiness of the system and system's tools.

New Labview App - Multichannel Display