

AHCAL Electronics.

The New Generation

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CALICE main meeting

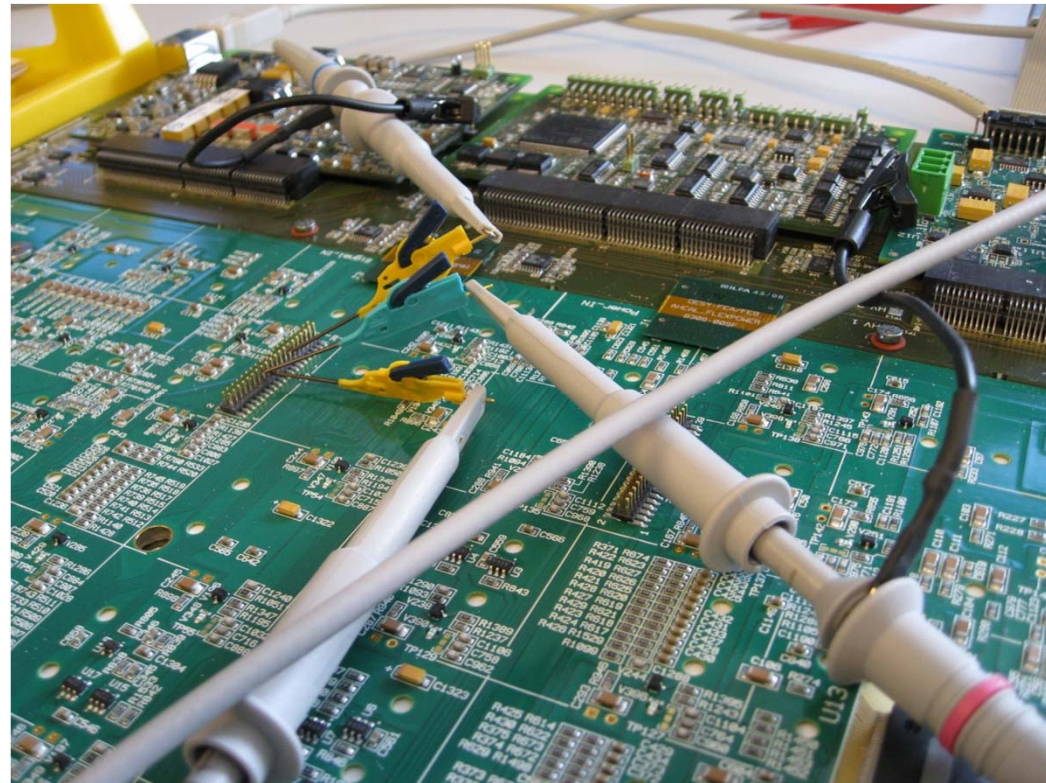
Univ. Heidelberg, Germany

Sept. 15th, 2011



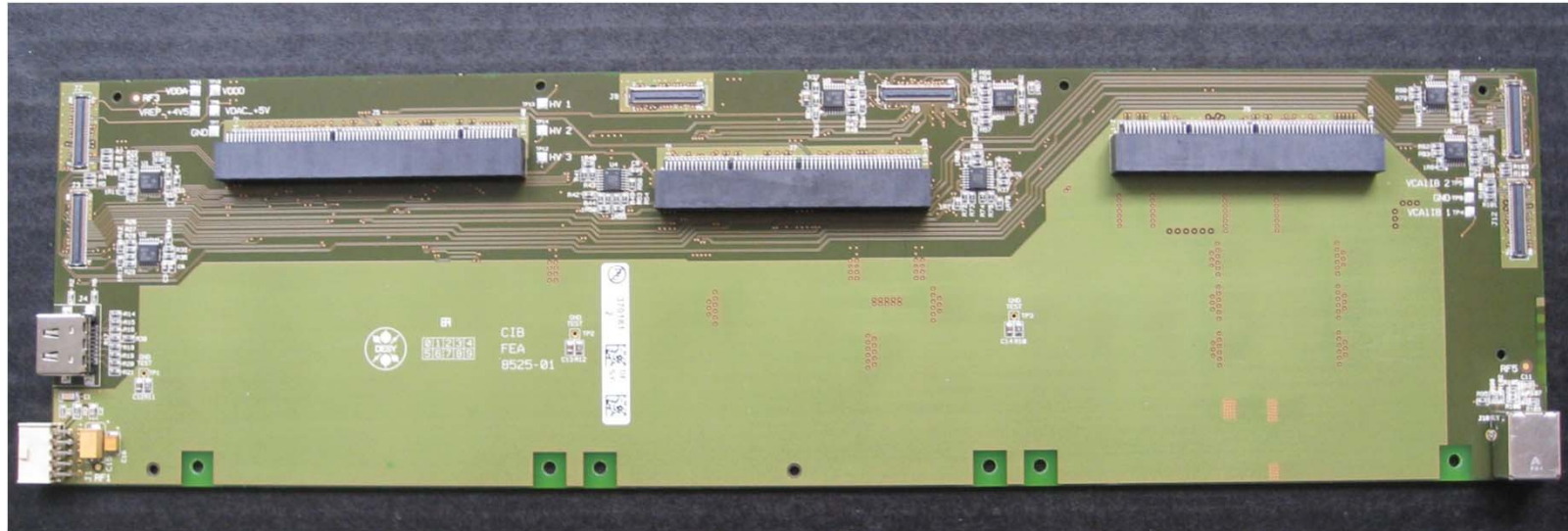
Outline

- > Status of the AHCAL New Generation's Electronics
- > CALICE DAQ
- > NIU_HBU and EBU
- > Conclusions



AHCAL - The New Generation

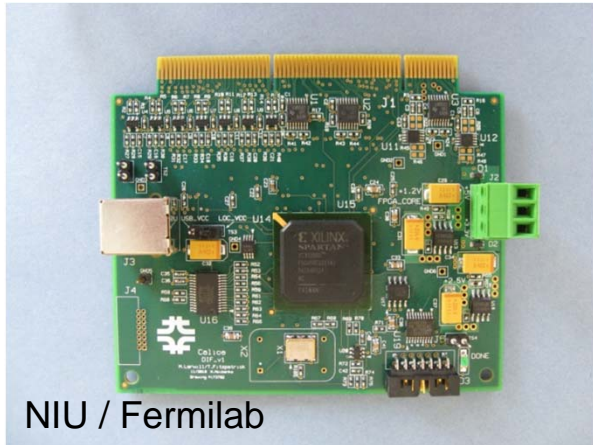
AHCAL CIB



- > Carrier Board for DIF2, CALIB2 and POWER2
- > 36 x 10 cm² (width as AHCAL middle slab)
- > DAQ interface via HDMI or USB, Detector's power input

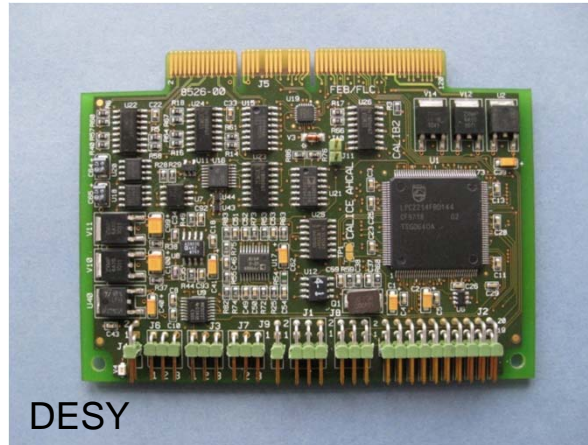
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AHCAL DIF2



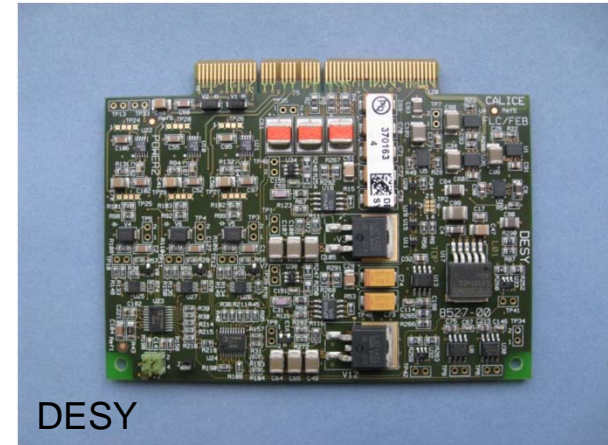
NIU / Fermilab

AHCAL CALIB2



DESY

AHCAL POWER2

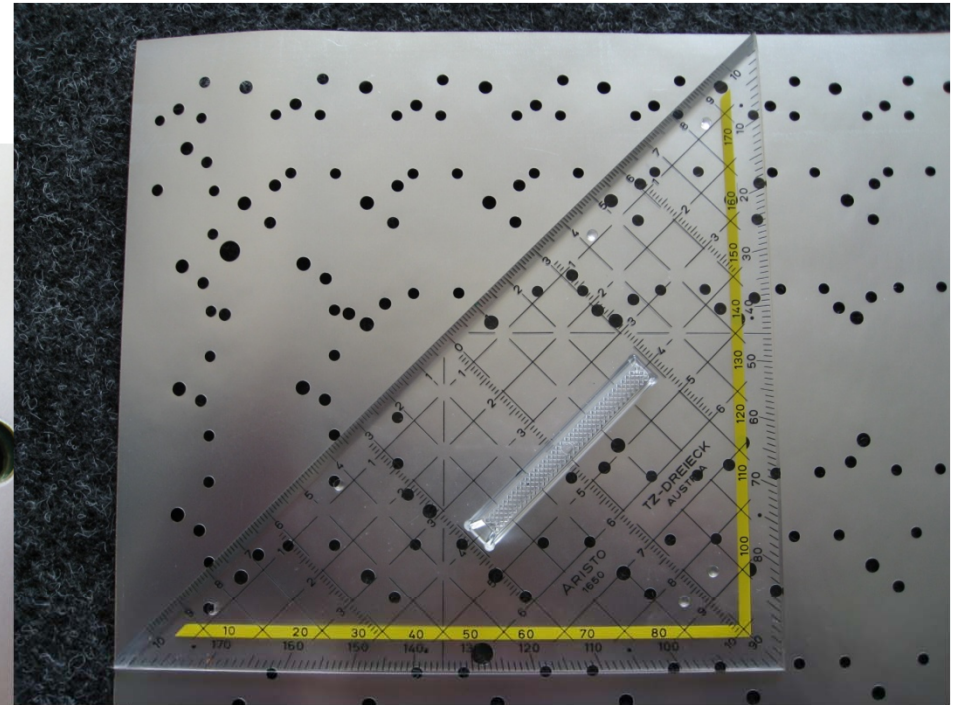
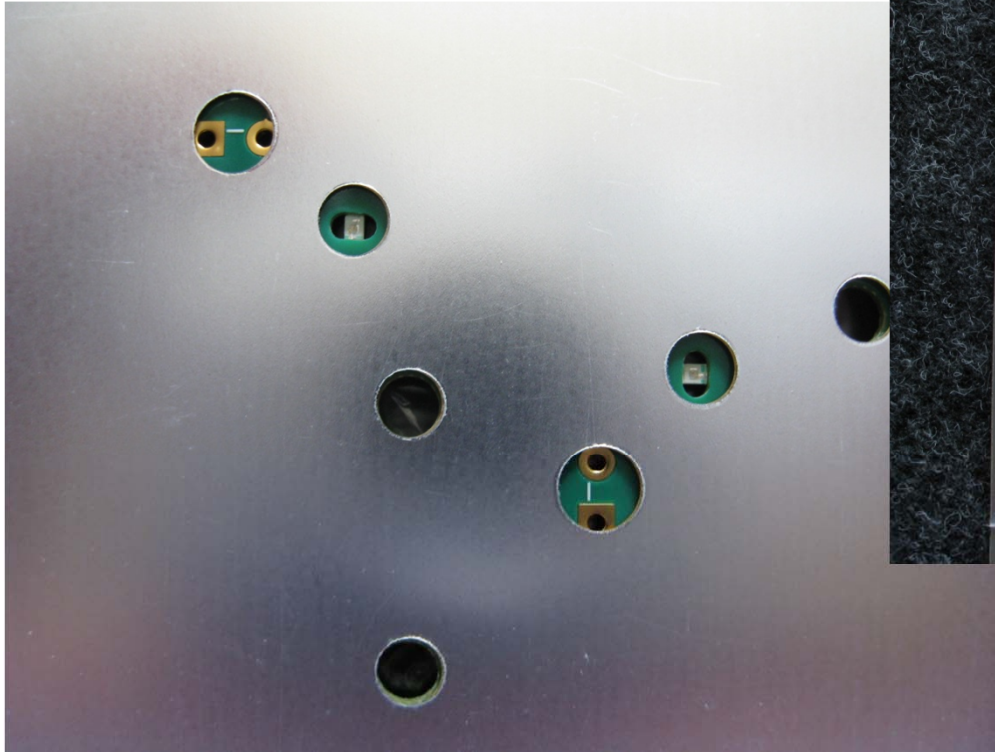


DESY

- > Detector-DAQ interface (DIF), LED calibration system (CALIB2) and power-supply (POWER2).
- > Realized as Mezzanine Modules

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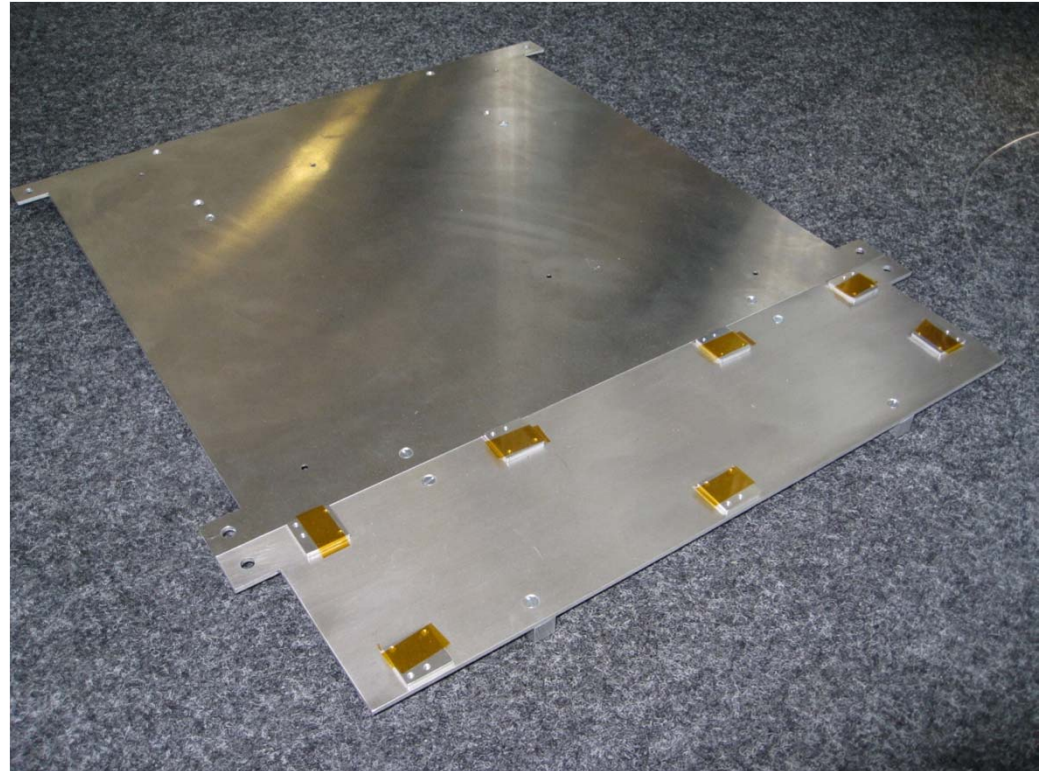
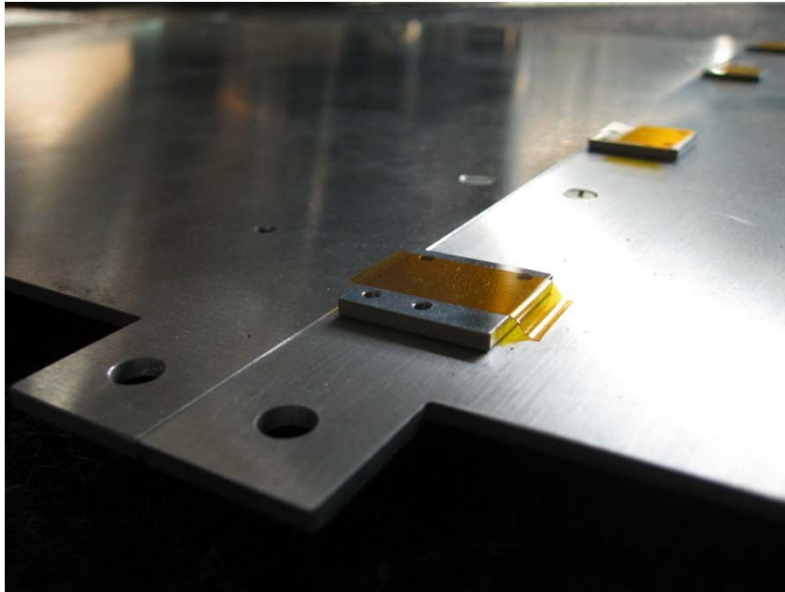
Reflector Foils II



- > New Reflector foils realized (laser-cutting), 4x top- and bottom-types
- > Both types look promising (quality, fit to HBU2), size $\sim 36 \times 36 \text{ cm}^2$

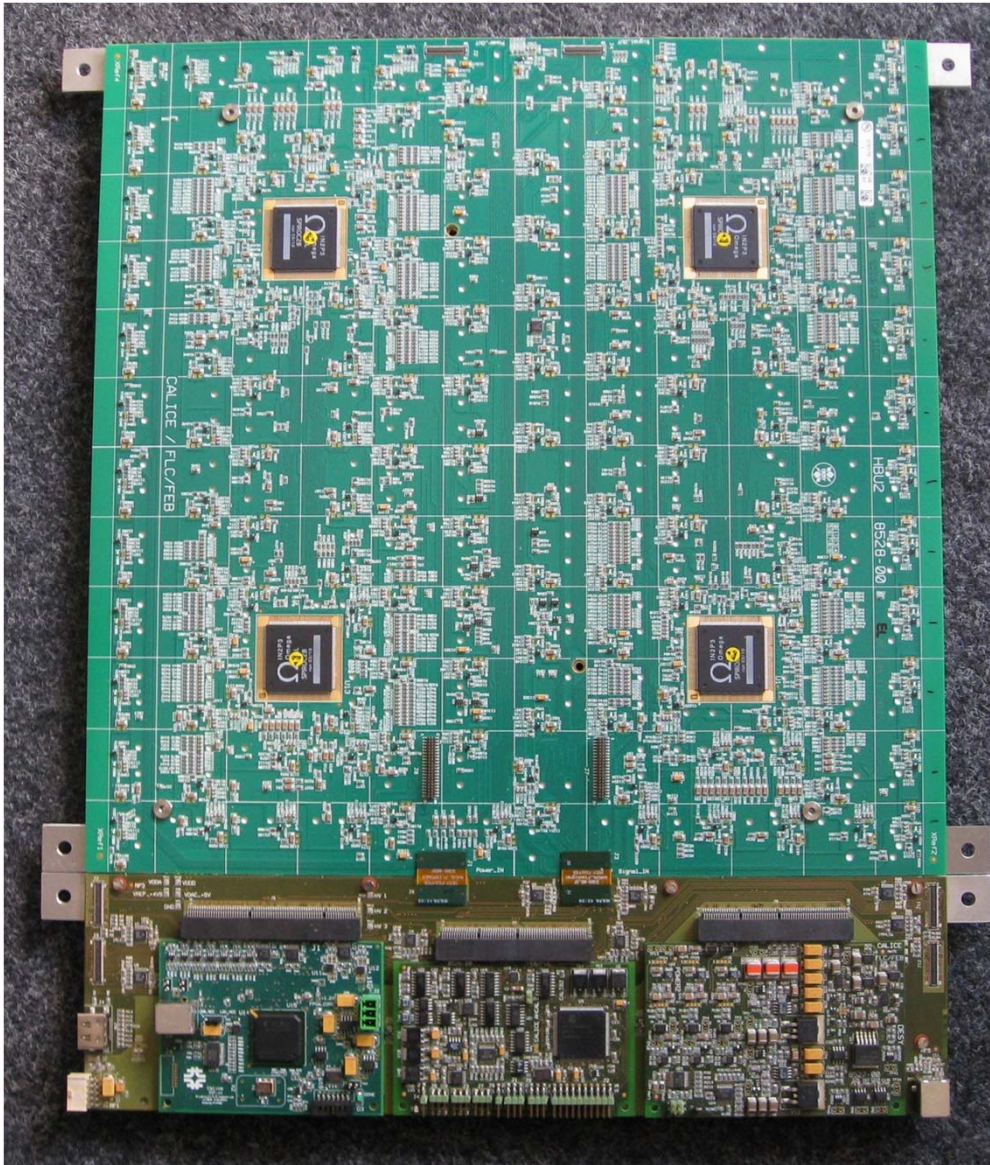
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Mechanics (laboratory and DESY testbeam setup)



- > New Mechanical Support structure, 4 sets have been realized
- > Enables stitching of up to 6 HBU2s to a full slab, Cover not shown

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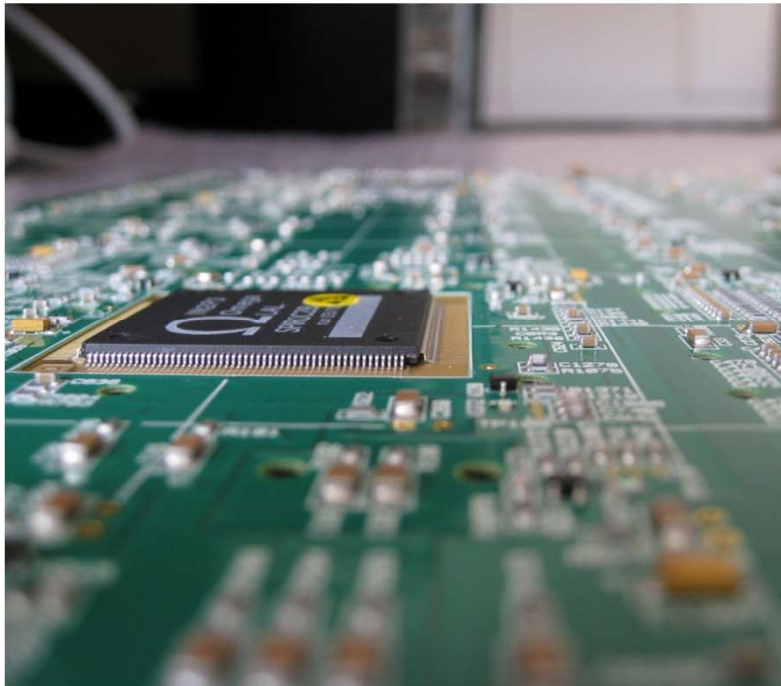


AHCAL HBU2

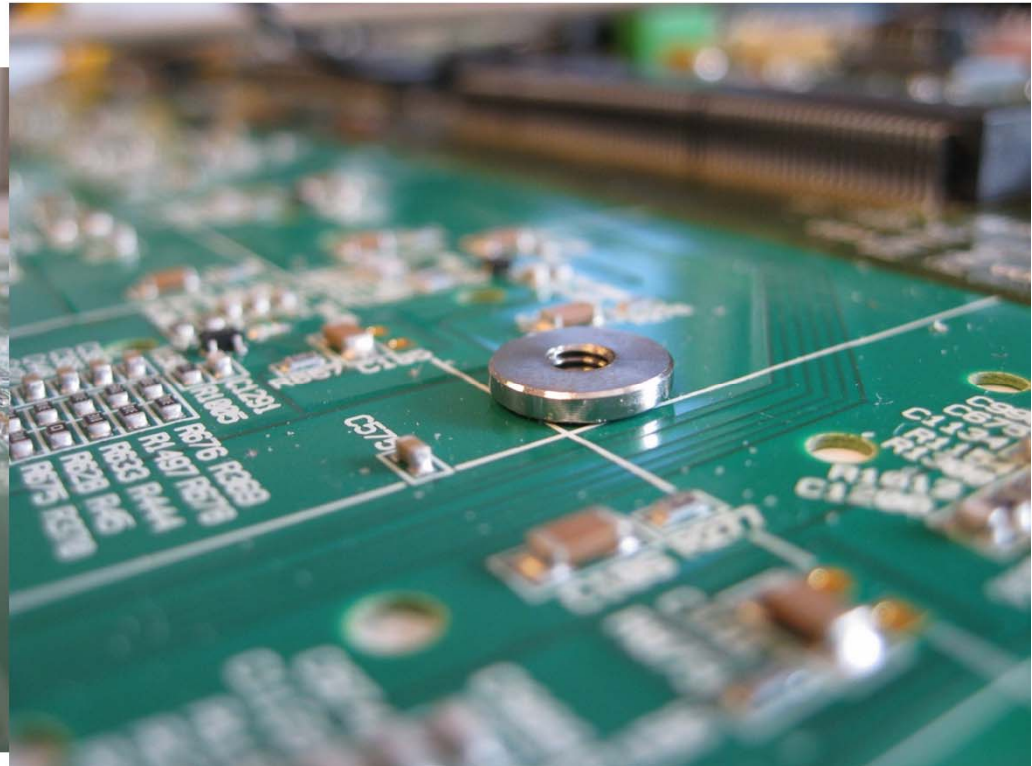
- > Inner Detector Module
- > 144 channels
- > ~36 x 36 cm²
- > 4 x SPIROC2b
(can carry SPIROC2a)
- > 2 x LED system:
integrated solution,
fiber-based solution

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HBU2 Photo Gallery I



3mm assembly corridor
for assembly in cutout



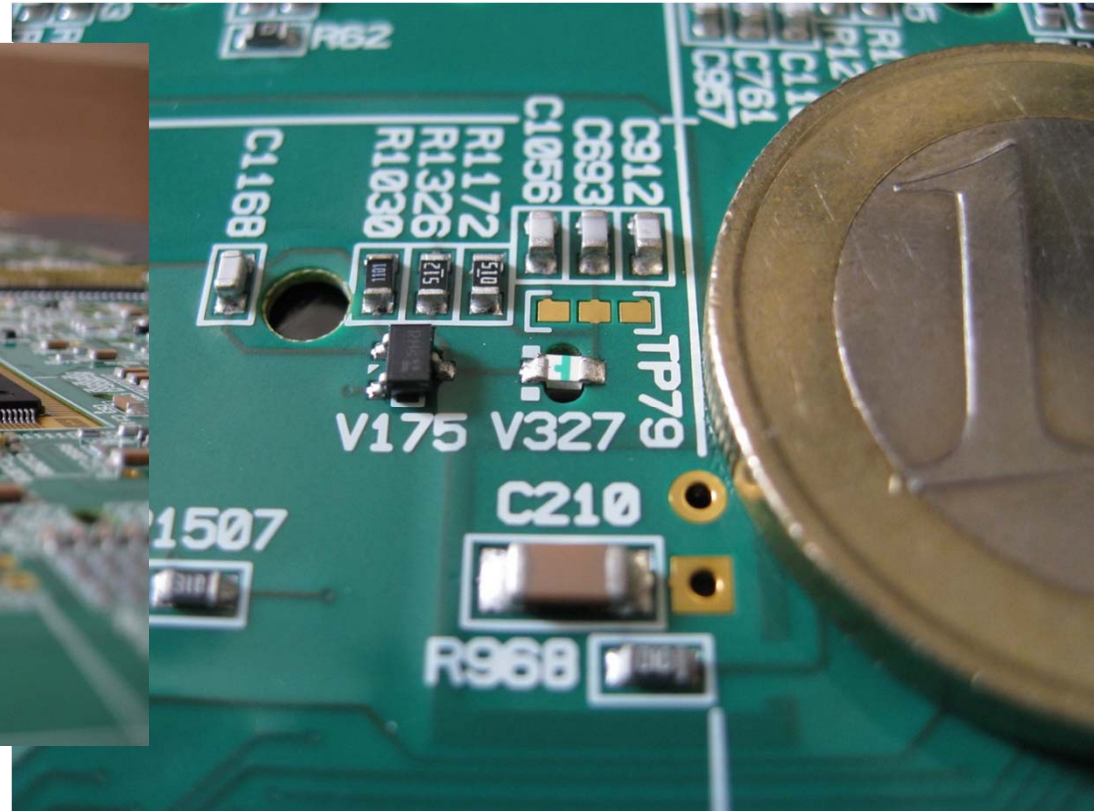
1.6mm high base for the top plate,
defining the component height

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HBU2 Photo Gallery II



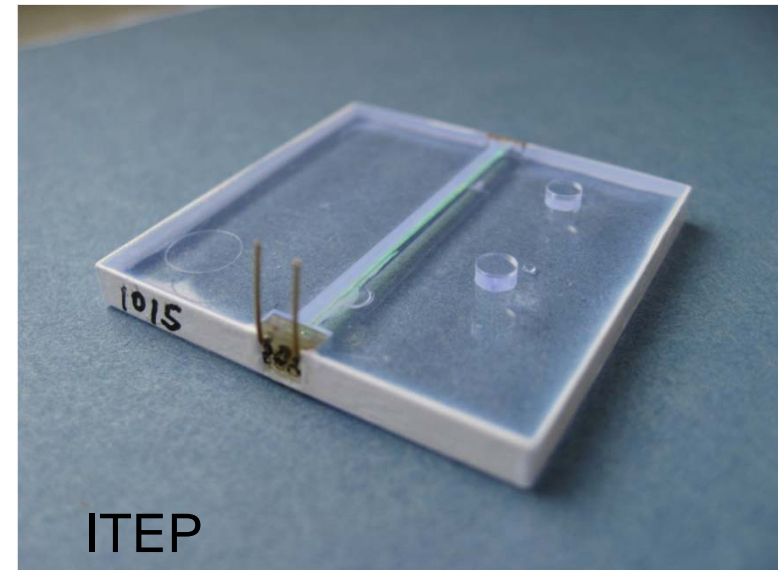
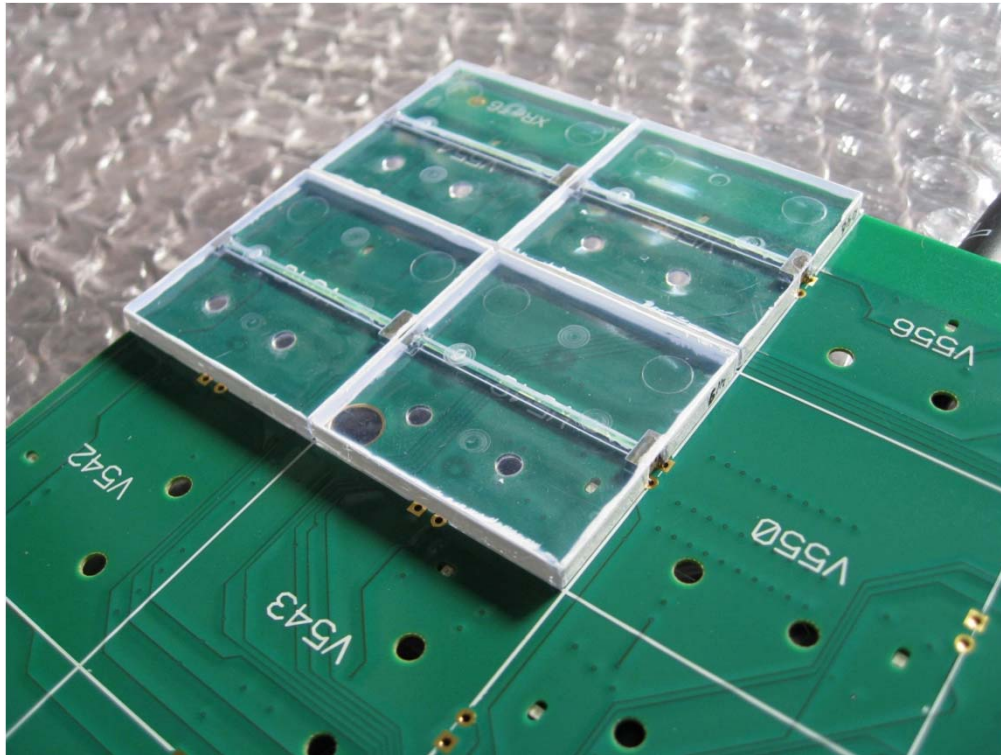
SPIROC2b in cutout,
flat components



Integrated LED system with
LED (V327) and RF transistor (V175)

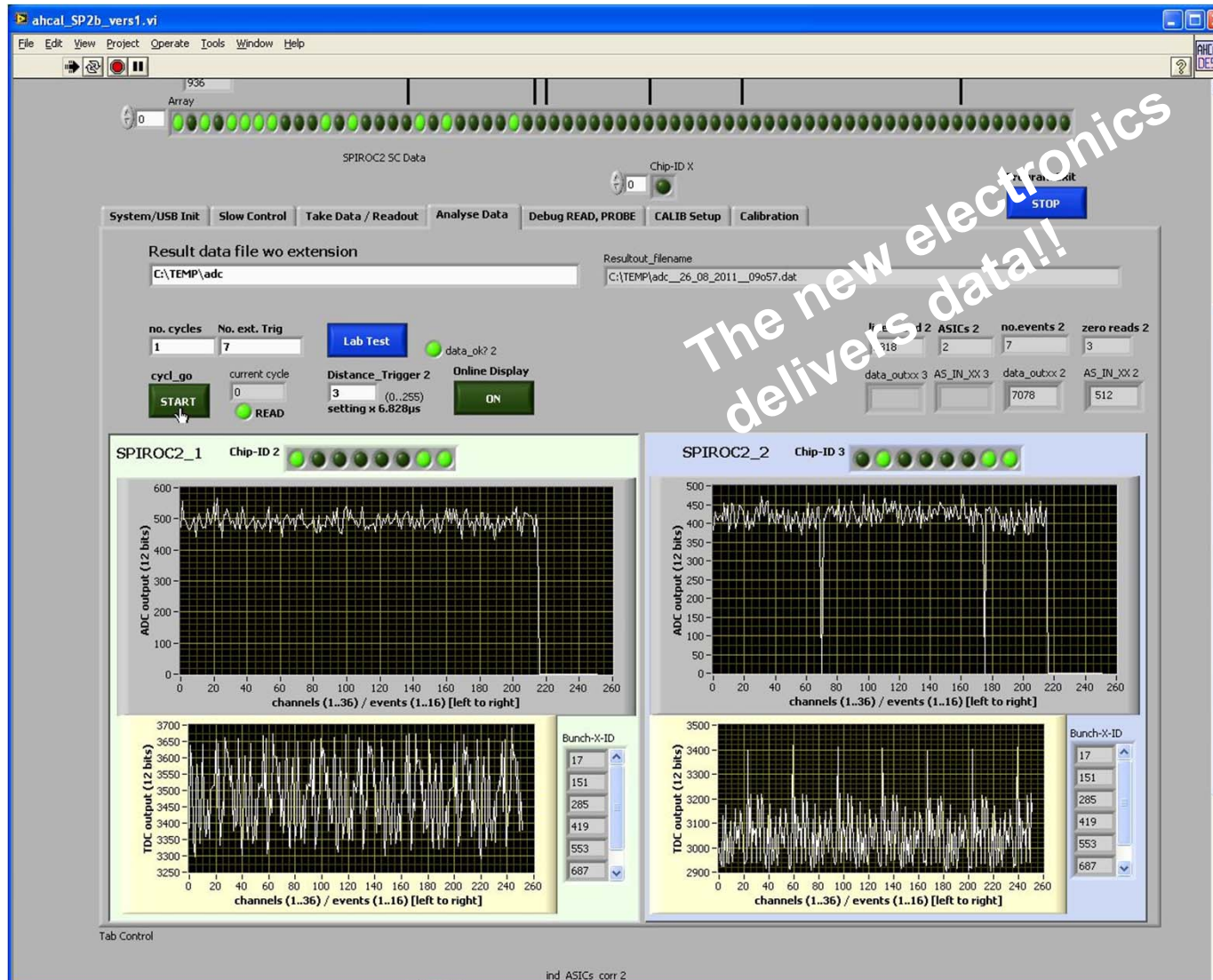
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Tiles



- > Assembly test with 4 of the new 20 tiles below HBU2 – fit perfectly!!
- > Tiles for several HBUs expected end Sept.

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Screenshot !!

- > Pedestals from new System!!
- > ADC and TDC data
- > DC points have to be corrected (assembly mistake DESY)



AHCAL - The new Generation

People involved in the very basic development

- > Mourad Zeribi CALIB2 board, Microcontroller software
- > Frantisek Krivan DIF firmware (DIF and DIF2)
- > Hans Wentzlaff POWER2 board, power-pulsing tests
- > Angela Schröder Lab & DESY testbeam setup, reflector foils
- > Werner Baatz,
Klaus Diekmann Layout
- > Lothar Steffen POWER2 test adapter
- > Mathias Reinecke HBU2, CIB2, Flexfoils, Labview SW
- > Tom Fitzpatrick,
Marcus Larwill (both NIU) DIF2

Thanks a lot to everybody!!



AHCAL - The new Generation

Status and Next Steps

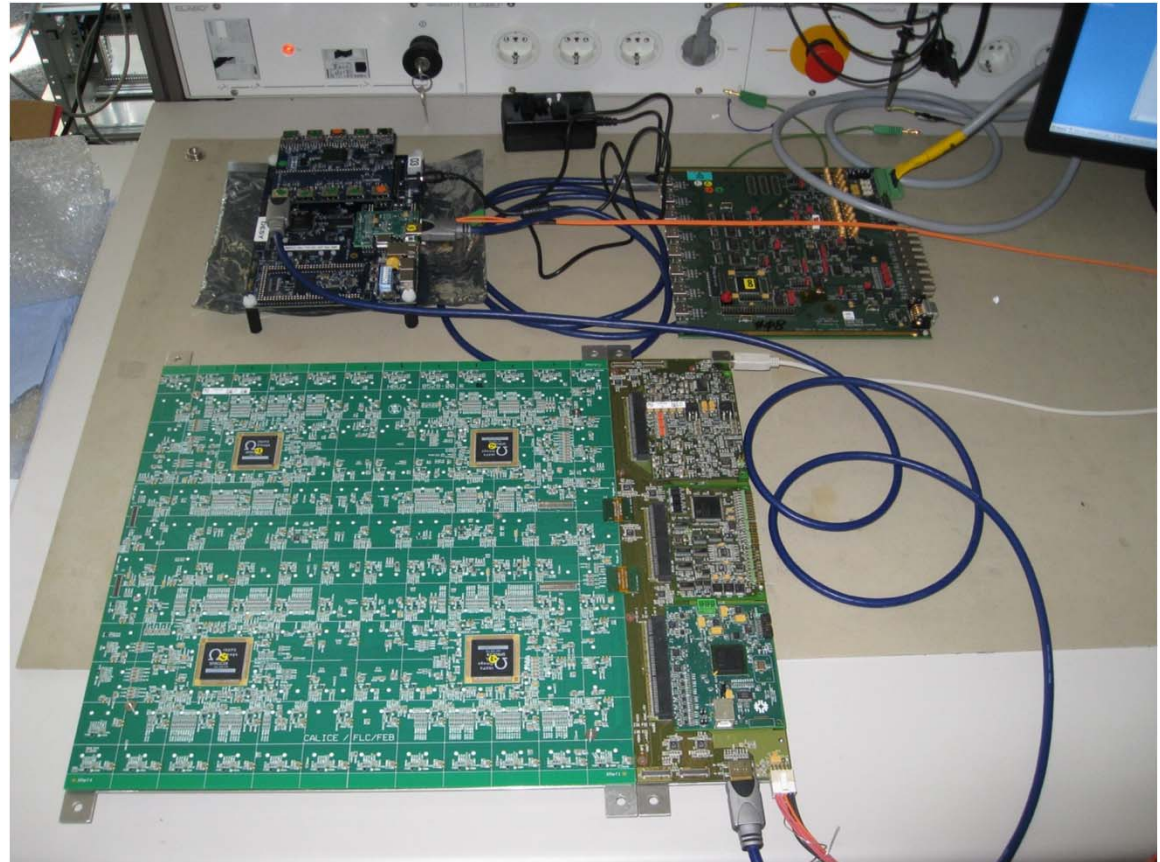
- > Current setup includes all new modules and the Labview/USB DAQ.
- > Pedestals from the first 2 SPIROC2bs can be read out (old DAQ is written for 2 SPIROC ASICs). => **Promising start of tests!**
- > Next: Test of Calibration system and LEDs (few days)
- > End of Sept.: Tile Installation
- > Mid October.: Order for more modules for a AHCAL layer?
- > 4 sets of all modules available, except for DIF2 (expected soon).
- > From now on: 2 branches of development with the new electronics:
 - With old Labview/DIF for basic and SPIROC2b tests. Several setups possible.
 - With final DIF firmware and new Labview/USB for multi-HBU setup.



AHCAL - CALICE DAQ

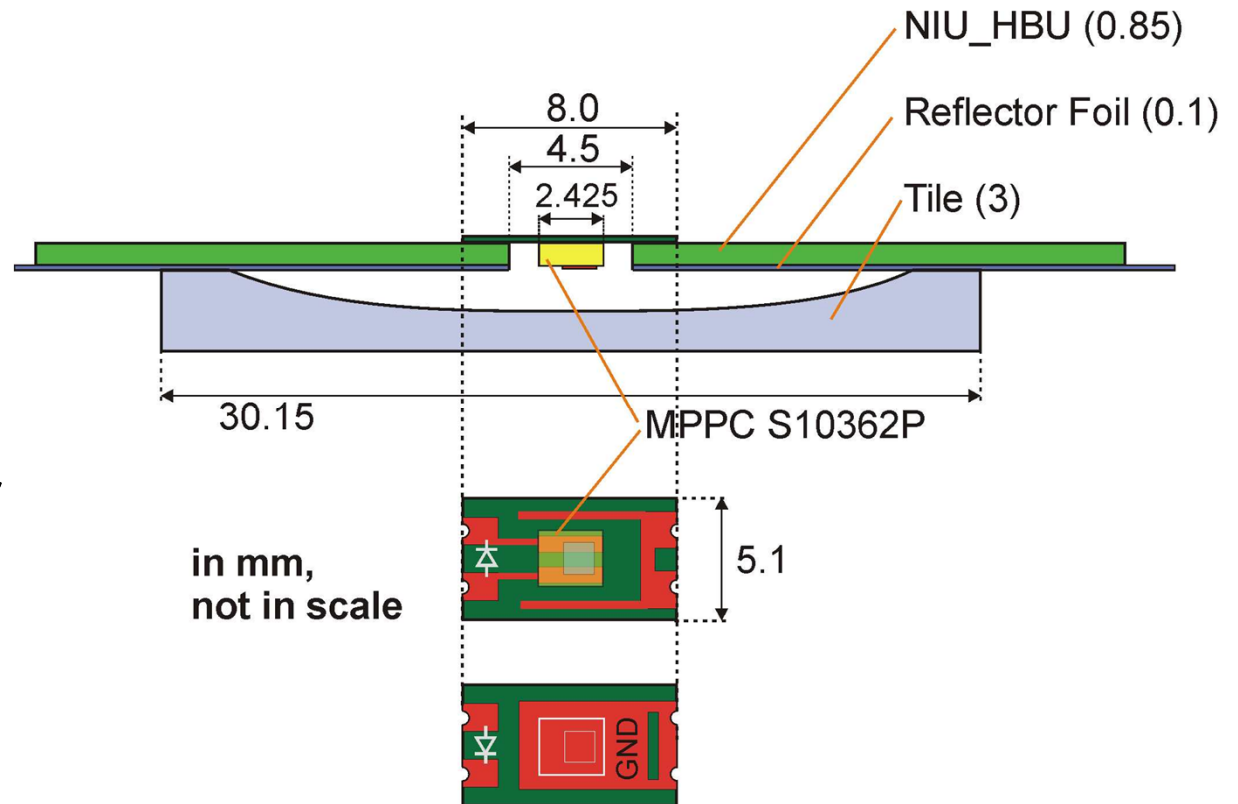
Status at DESY

- > Setup from LLR has been copied, including Linux PC with Python, C&C, LDA, AHCAL DIF.
- > Access to repository from LLR established (DIF firmware, Python)
- > Communication with LDA works (thanks to Mark!!)
- > Next: Load final firmware to AHCAL DIF and establish link from PC.
- > XDAQ establishment at DESY unclear (not started, to be discussed).



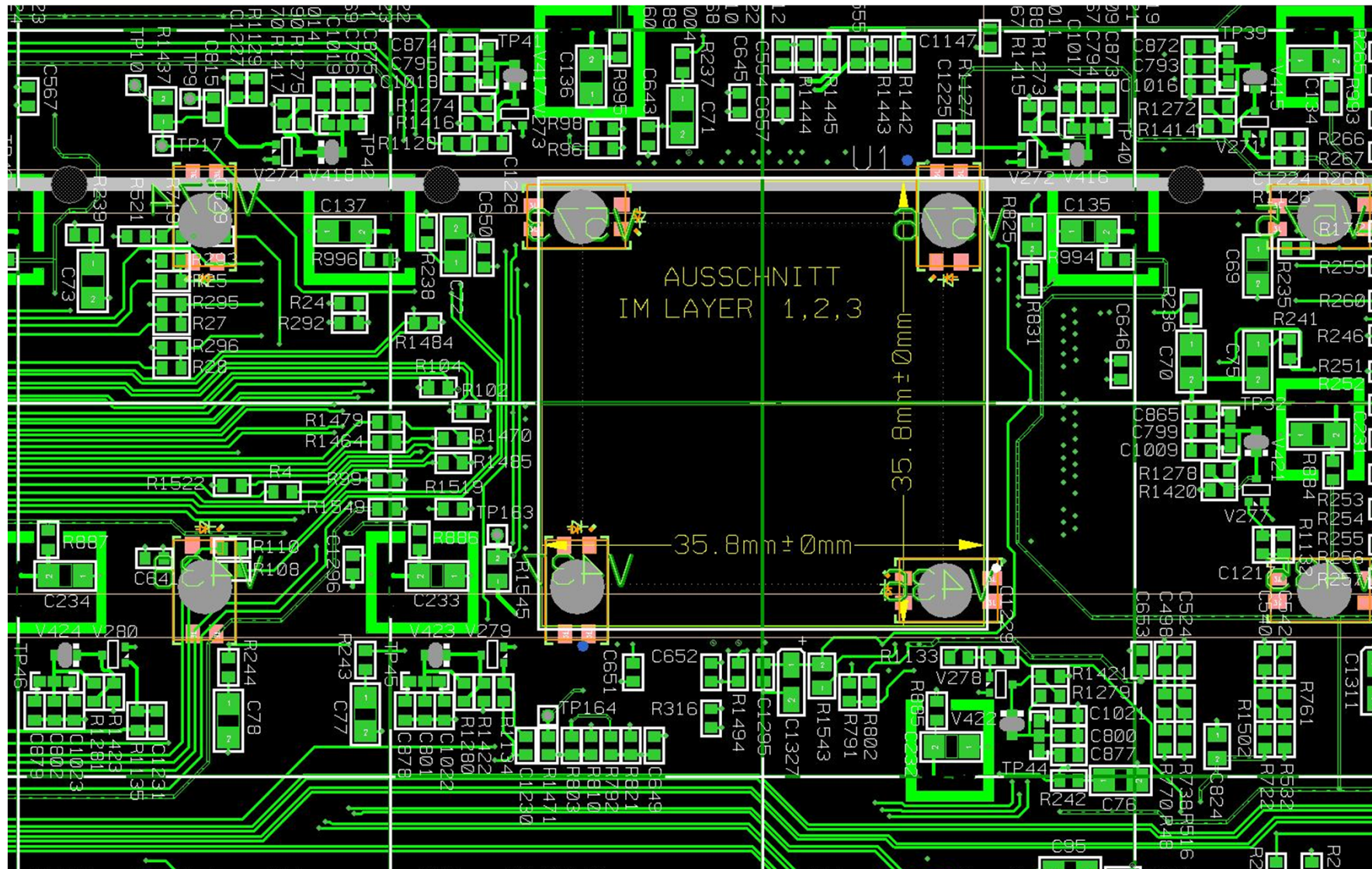
NIU_HBU

- > Tiles have special shape to optimize light collection efficiency
- > MPPCs are part of NIU_HBU
- > NIU_HBU is except for tiles a copy of HBU2
- > MPPC adapter (NIU) and NIU_HBU (DESY) are in design/product.



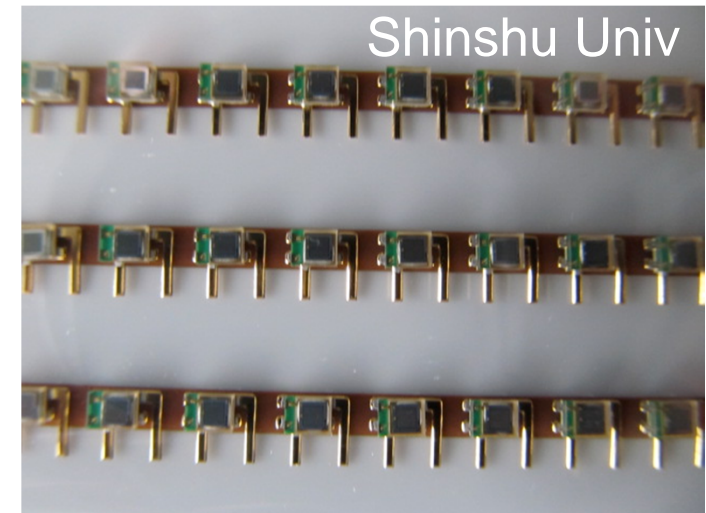
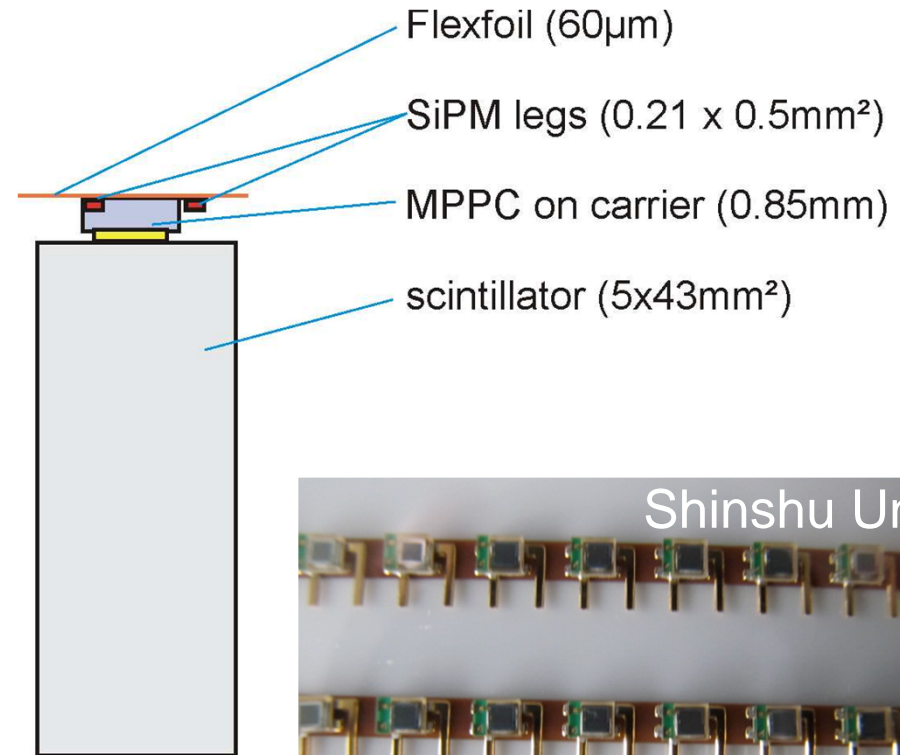
- > Problem: MPPC has to be in the middle of tile, which is not possible for all tiles (see next slide). Some channels cannot be assembled.
- > Fixation of NIU MegaTile to HBU has to be defined.

NIU_HBU (Layout generation, in progress)

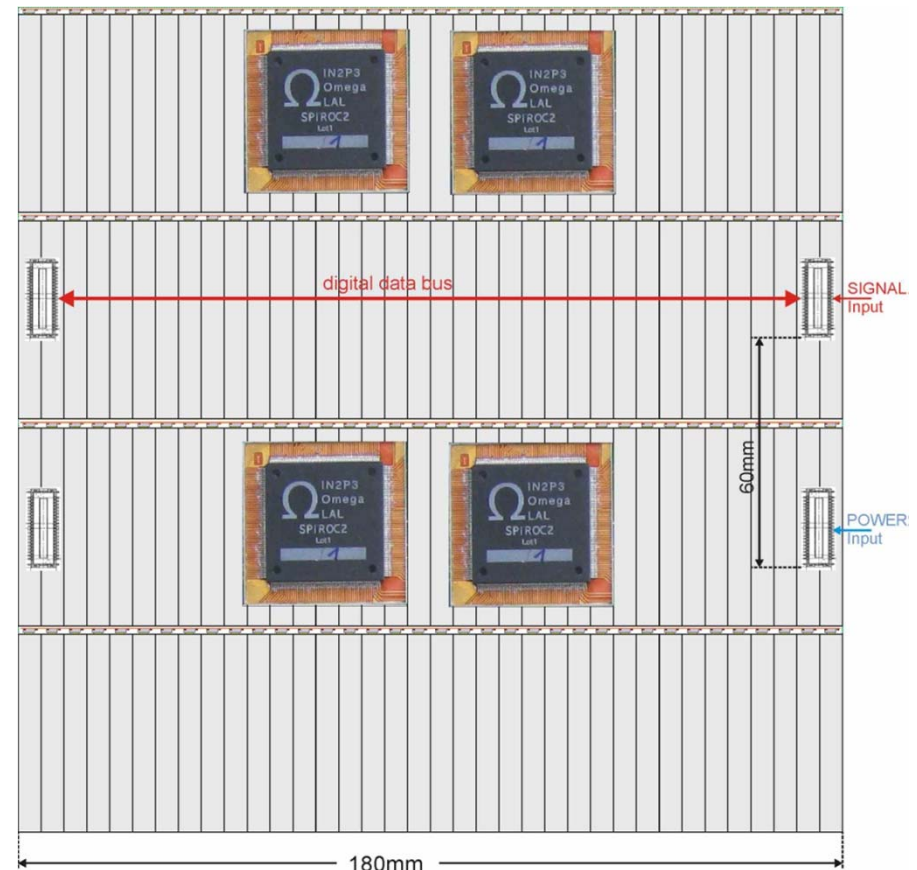
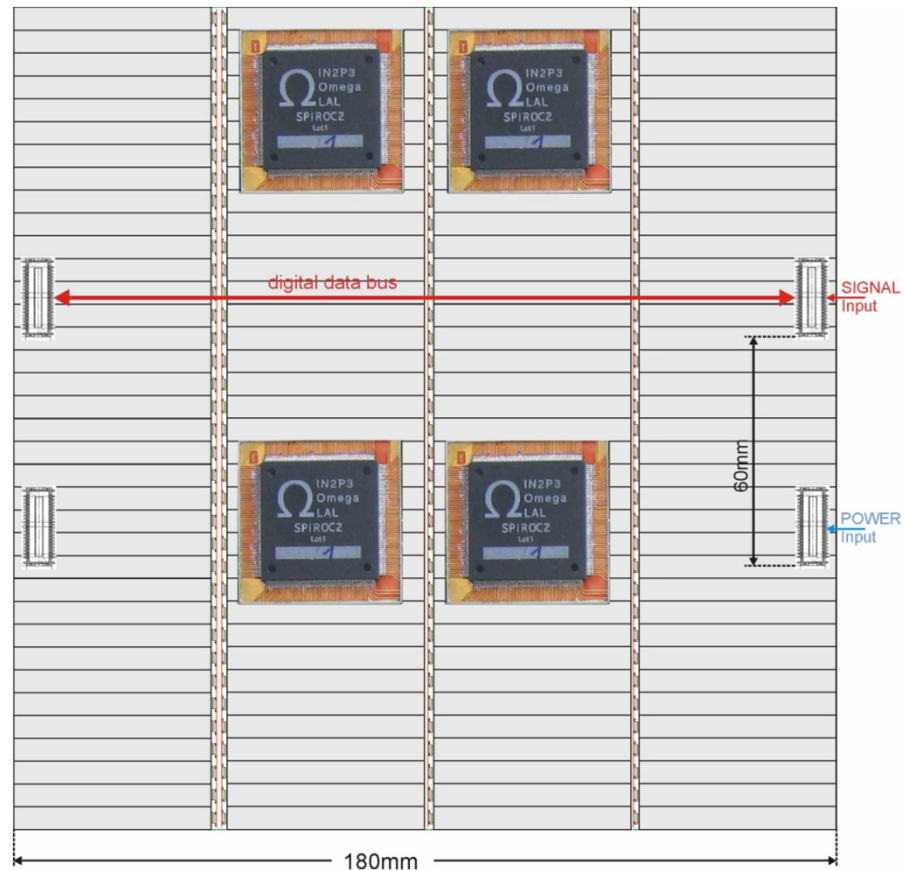


EBU (ScECAL HBU)

- > Idea: Use HBU concept for a Scintillator ECAL option.
- > Cooperation: Shinshu Univ. – DESY – LLR
- > Scintillator bars wrapped with reflector foils, MPPCs on long flexfoils
- > Two board types necessary (see next slide)



EBU types ,Horizontal' and ,Vertical'



- > Keep SPIROC ASICs at the same position in order to keep top-layer layout!?
- > Design and Dimensions (especially distances) not fixed.

EBU – Points to clarify

- > MPPCs cannot be placed directly to EBU edge. Distance?
- > MPPCs cannot be placed back-to-back directly. Distance?
- > Connection Strips-EBU (cassette-like solution)? Interconnection to DAQ (DIF)? Detector Insertion?
- > Coupling (distance) MPPC to scintillator? Tolerance?
- > Distance from one row to next, tolerances?
- > Tolerances of reflector-foil wraps? Strip Pitch?
- > Position of ASICs ok?



Conclusions and Outlook

- > The new generation of AHCAL electronics sends first signs of life!!
- > Few tests are still needed to exclude major bugs in new concept (2-3 weeks).
- > NIU_HBU in layout design phase. Not all channels can be assembled.
- > EBU concept still needs clarifications
- > NIU_HBU and EBU: wait for HBU2 experiences?

