

# AHCAL overview

- Ongoing Hardware Developments
- SiW-ECAL + AHCAL Testbeam
- Synergies AHCAL and HGCAL

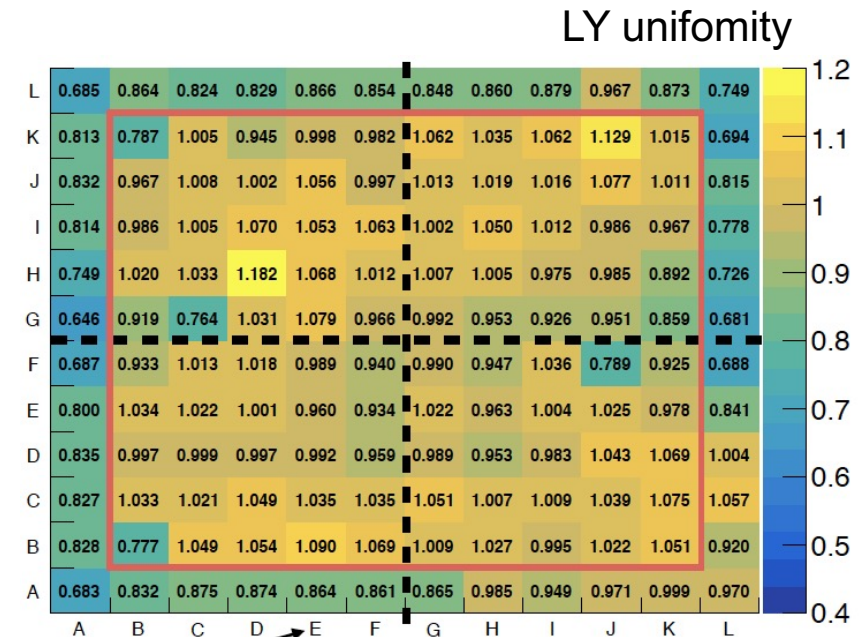
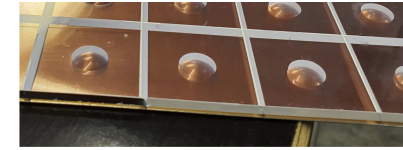
CALICE meeting, Valencia, 21. April 2022

Katja Krüger

# Hardware developments: Megatile

## Alternative tile geometry: Megatile

- Pro: Would allow larger mechanical units, easier logistics
- Con: need to limit optical cross talk between (sub-)tiles, uniformity is a challenge
- Several generations with improvements
  - Reduced cross talk
  - Better uniformity (edge cells)
- Testbeam in 2021: good cross talk ( $\sim 3\%$ ), reasonable uniformity



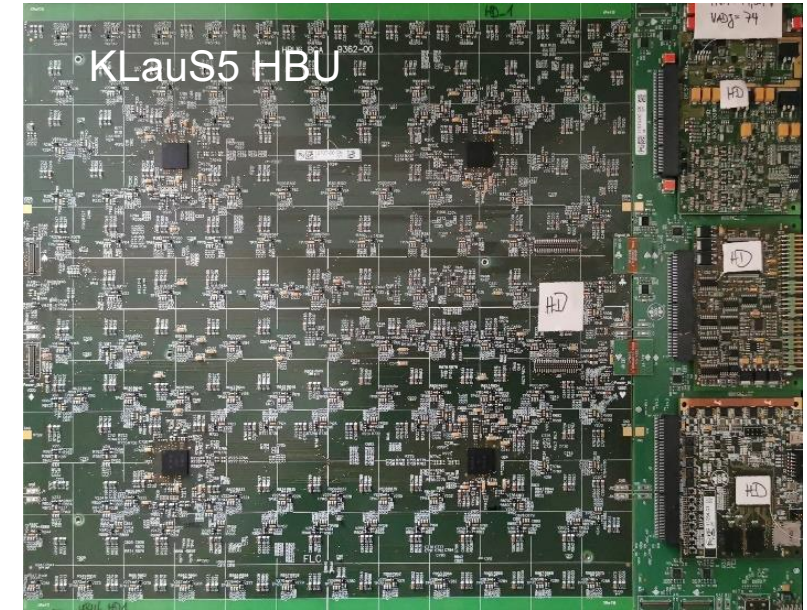
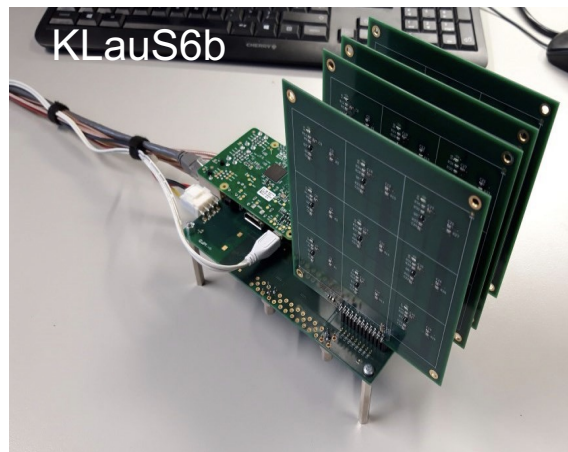
More details in Antoine's talk

# Hardware developments: KLauS

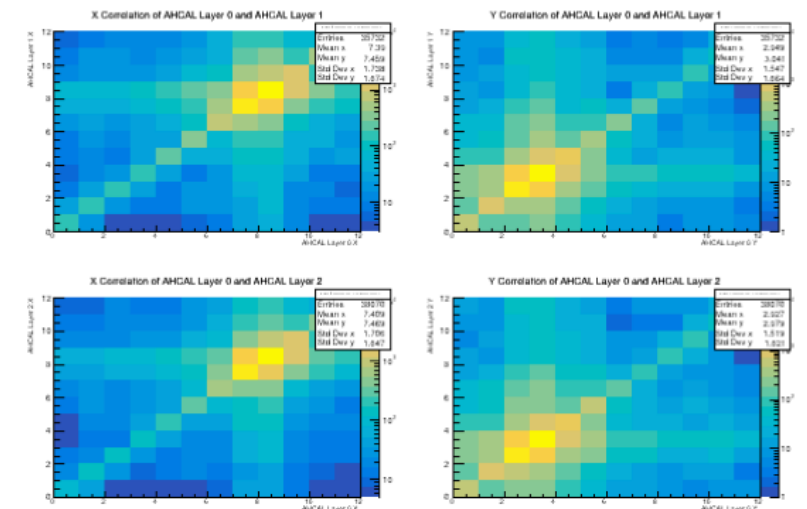
**Alternative Readout ASIC: KLauS ASIC** targeting low gain SiPMs (e.g. with 10  $\mu\text{m}$  pixels)

- Allows power pulsing as well as continuous readout
- Testbeams in 2021
  - Full HBU with KLauS5 (first 36-channel version)
  - Test setup with KLauS6b (improved TDC for better time resolution)
  - Performance as expected

Plan to construct one layer (4 HBUs) with KLauS HBUs with Megatiles for large technological prototype



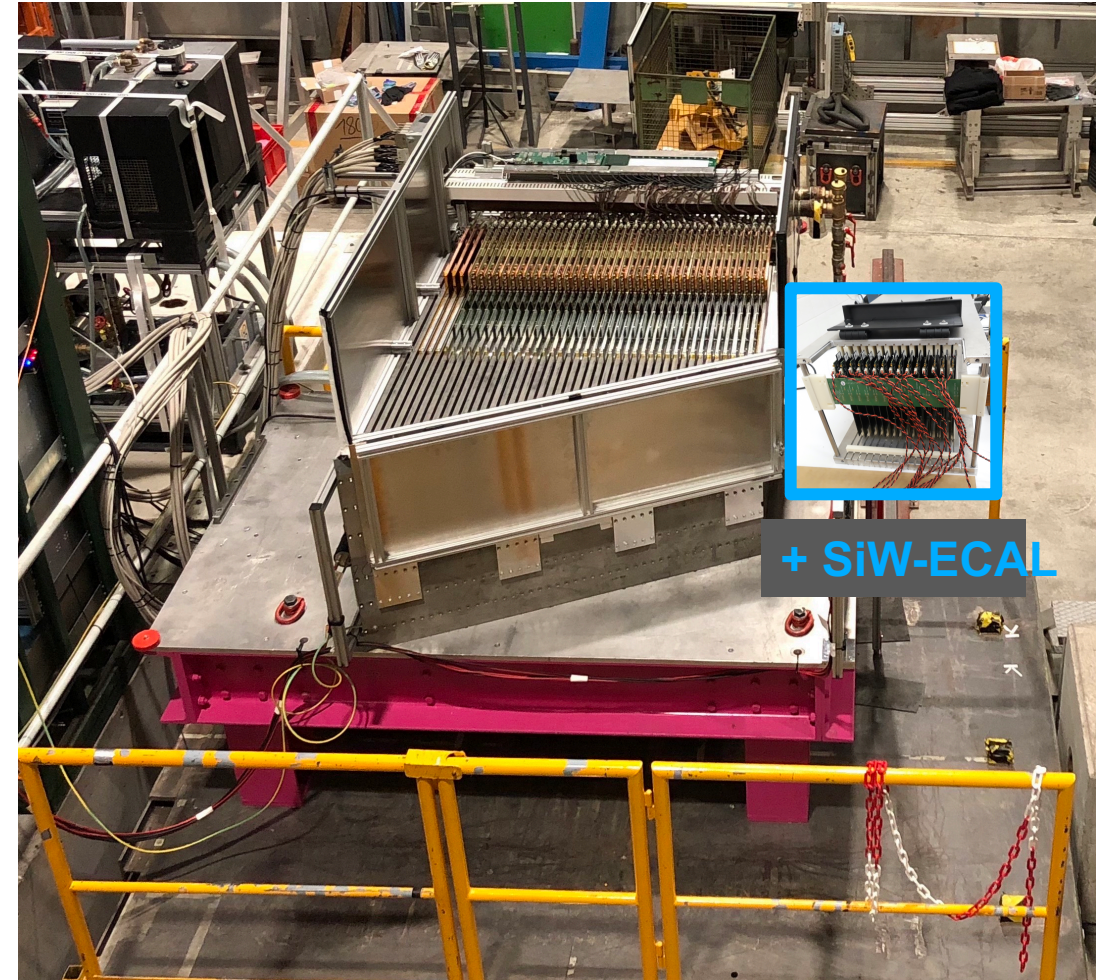
Spatial correlations KLauS HBU  $\leftrightarrow$  SPIROC HBU





# Plans for the large prototype

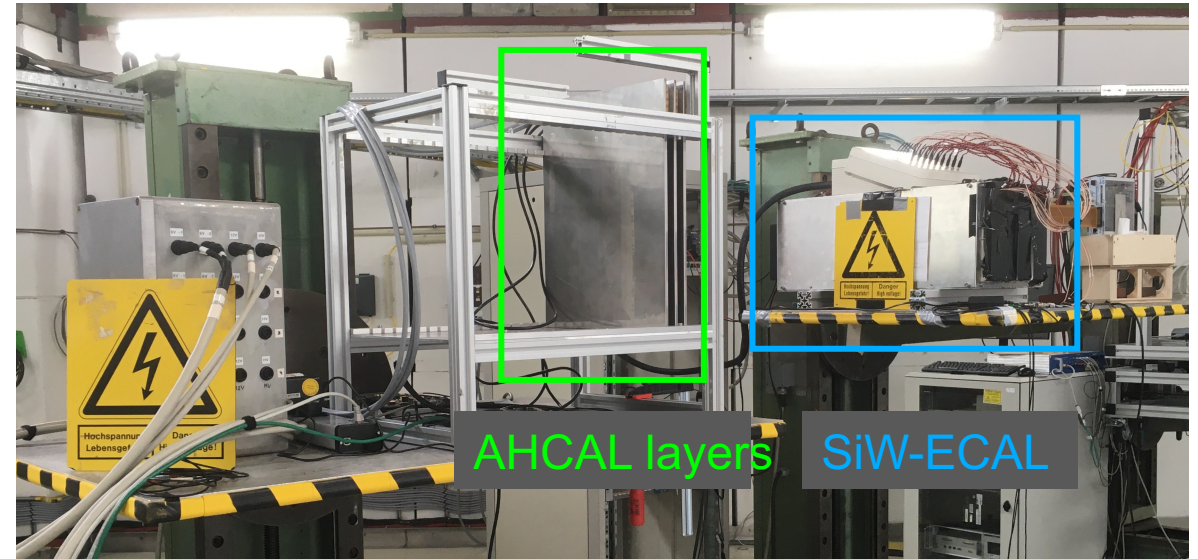
- Was tested in beam at DESY and CERN SPS in 2018
- Measurements still planned
  - **With “ultimate” time resolution (ILC bunch clock)**
  - With tungsten absorber
  - **Running with ECAL:**
    - **2 weeks of beam time 8-22 June 2022 at SPS for SiW ECAL + AHCAL**
- Preparation
  - ILC mode: well tested already with smaller setups
  - Common running: tested in March 2022 at DESY testbeam
  - Test large prototype hardware before travelling to CERN
  - Probably too early for KLauS + Megatile layer





# Preparation: common running of SiW-ECAL + AHCAL

- Status of (large) technological prototypes
  - AHCAL: last time in beam in 2018
  - SiW-ECAL: 15-layer stack for the first time in DESY beam in March 2022
- First combined beam test of SiW-ECAL + (3 small layers of) AHCAL prototype at DESY testbeam in March 2022
  - Proof-of-principle of synchronised running of the 2 prototypes
  - ILC mode
  - Common clock
  - Common busy signal
  - Identified monitoring tools to be improved



# Preparations: Dress rehearsal & transport

- As in 2018, plan full dress rehearsal of the complete detector with cosmics
  - Planned for first week of May
- Preparations for packing and transport also started



new test and approval of road-worthiness of our transport containers





# Synergies CALICE AHCAL and CMS HGCAL

- DESY has taken over responsibilities in the SiPM-on-Tile part of the CMS HGCAL
  - Development and test of tileboards (equivalent to AHCAL HBUs)
  - Lead Tile Module Assembly Centre: demonstration of the assembly of tilemodules = tileboards + tiles
    - Including quality control
  - Beam test and analysis
- Considerable effort, but a lot of synergies
  - HGCAL profits from AHCAL experience
    - Tileboard design
    - Assembly procedures and quality control
  - AHCAL will profit from HGCAL experience
    - Next step in scaling up: ~20k channels AHCAL prototype -> ~200k SiPM-on-Tile channels HGCAL (-> 8M ILD)
    - Improved procedures
    - Experience with radiation hardness and electronics for LHC data rates
- See Malinda's and Timo's talks