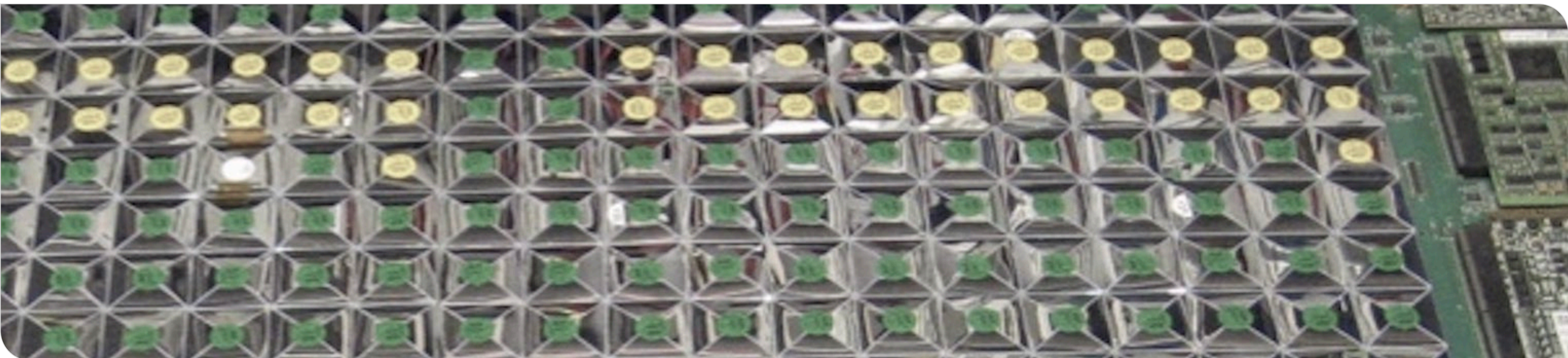


# AHCAL in DRD6

## *WP1.2.1*

**Frank Simon**

DRD6 Collaboration Meeting, April 2024





- Building on a mature technology:
  - SiPM-on-tile AHCAL prototype with 22k channels, 0.5 m<sup>3</sup> and 38 layers constructed 2017/18, operated in several beam tests
  - SiPM-on-tile section of CMS HGCal using this technology - significant synergies, profit from prototyping and construction experience.

Hope to connect to AHCAL studies of CALICE and CMS HGCal partners in the US

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- Plans for DRD6: Further develop the technology in the Higgs Factory context.  
Main focus: system aspects.
  - Address specifics of circular colliders - current prototype uses linear collider readout scheme
  - Develop alternative scintillator integration concepts and materials: Mass production, cost reduction

- The key next step for the AHCAL: Establish capability for running at circular collider (=FCC-ee) conditions on the system level.
  - The main aspect: Continuous readout, no power pulsing.
- *Main items to study:*
  - ⇒ Re-evaluate need for active cooling:
    - What would be the effect on energy resolution, PFA reconstruction, missing energy, tau ID, ...?
    - Can we avoid it by changing granularity, readout ASICs with lower power consumption?
  - ⇒ Evaluate consequences of higher data rates:
    - Do we need changes to data concentration strategy (trigger needed?)
    - Possible impact on powering, cooling, services, overall detector integration
  - ⇒ Evaluate / re-optimize detector geometry (sampling structure, granularity), also in view of overall detector layout (maximum expected particle energy, magnetic field, tracker radius)
  - ⇒ Consolidate and possibly improve cell-by-cell time resolution.
  - ⇒ Scintillator materials, geometry, photon sensors.



# DRD6 AHCAL Work Plan

## Activities & Task Sharing

- Build a small AHCAL prototype (“EM stack”) with continuous readout and with hit timing capability - starting with small reconfigurable prototype in first 3-year period.
- *Task sharing* between institutes working on CALICE AHCAL (DESY, U Göttingen, U Hamburg, U Heidelberg, KIT, U Mainz, Prague, Omega)
  - Front-End boards & ASIC (DESY, HD, Omega)
  - Data interface & concentration, Back-End / DAQ (KIT, Prague)
  - Photon sensors (Hamburg)
  - Scintillator materials, megatiles (Mainz)
  - Mechanical and thermal integration (Mainz, HD, DESY)
  - Common tasks for all: software, testbeams, analysis, ...

Basis of a grant application of German institutes to BMBF  
- results now coming in:

Funding granted, but at reduced level (~50%)

