AHCAL report

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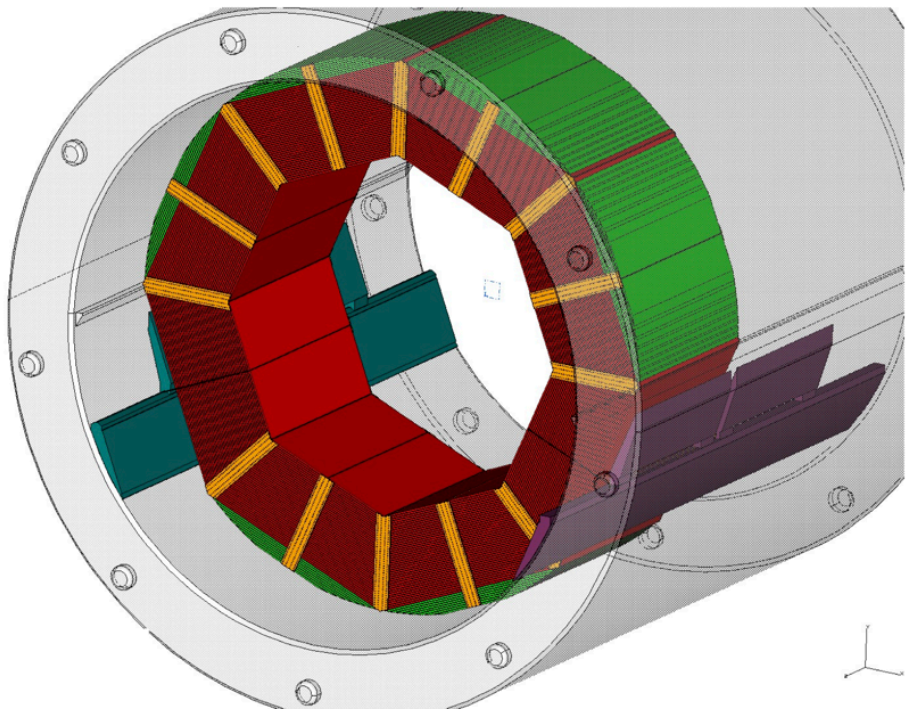
Outline

- AHCAL engineering and integration
- AHCAL simulation
- AHCAL R&D

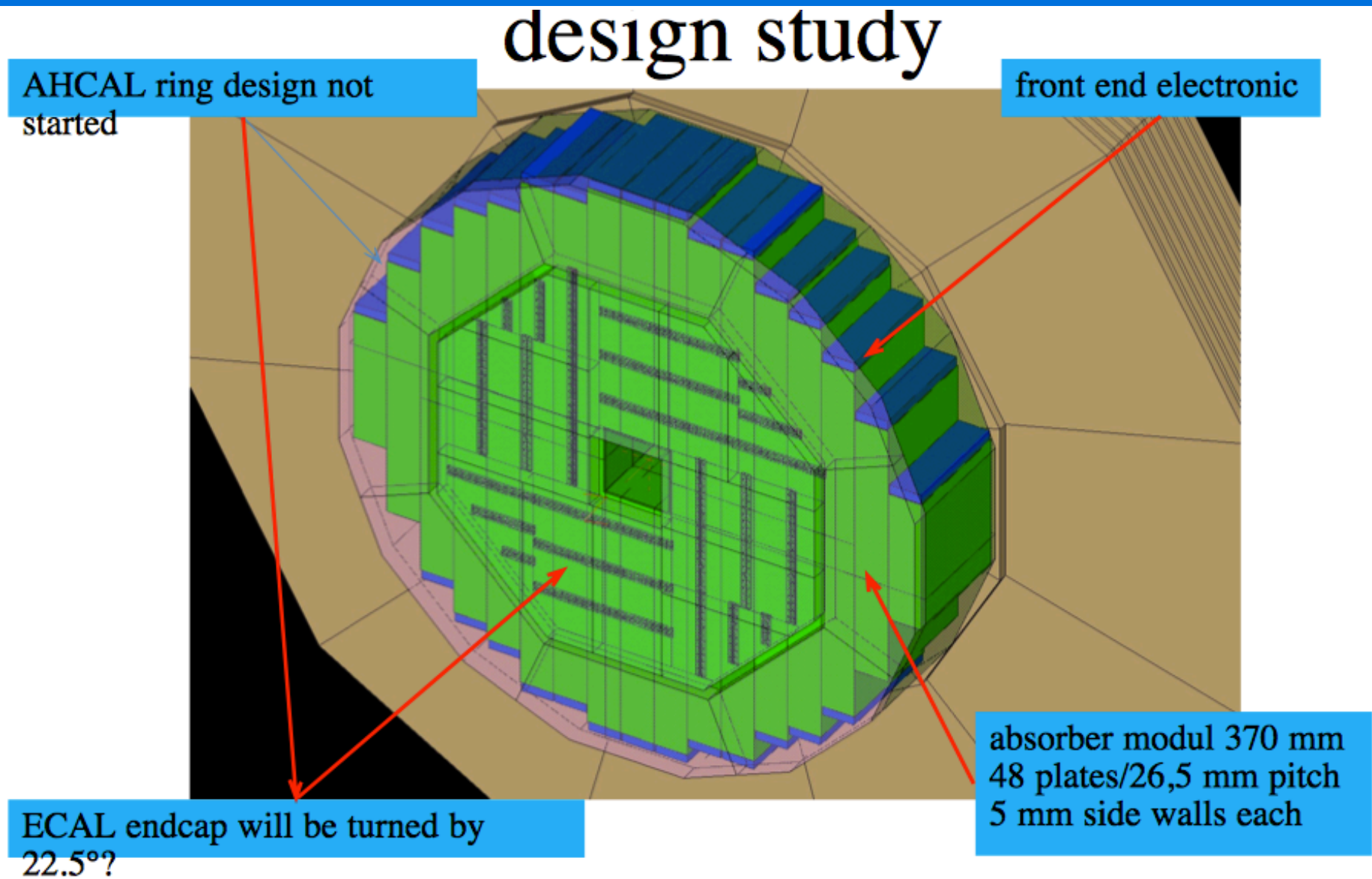
AHCAL engineering and integration



- Barrel updated by K. Gadow in May
  - adapt to LOI overall dimensions
  - placeholder verified by M.Jore
  - rotation by 22.5 deg for optimal support in cryostat

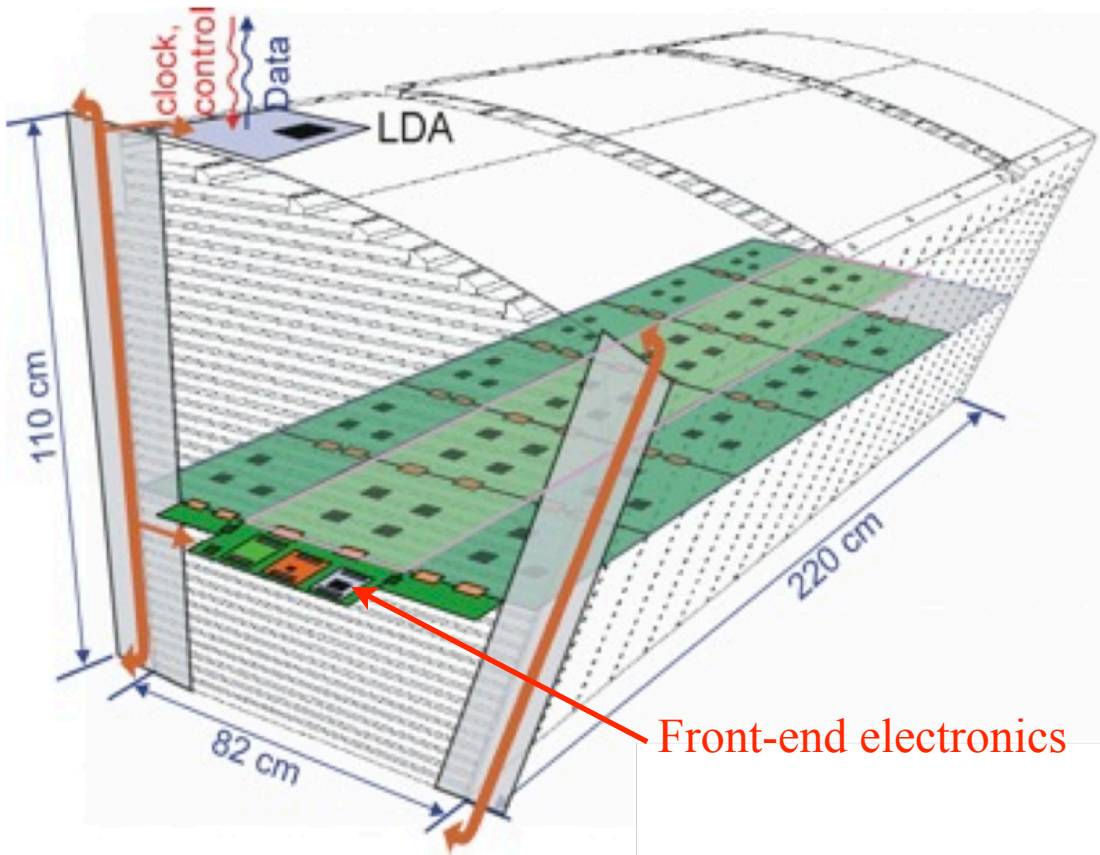
- To come (in 2011): Endcap update
  - incorporate structural constraints from support by yoke endcap
  - consequences for endcap yoke plate thickness
  - use barrel cassette design for active layers
  - HCAL ring design

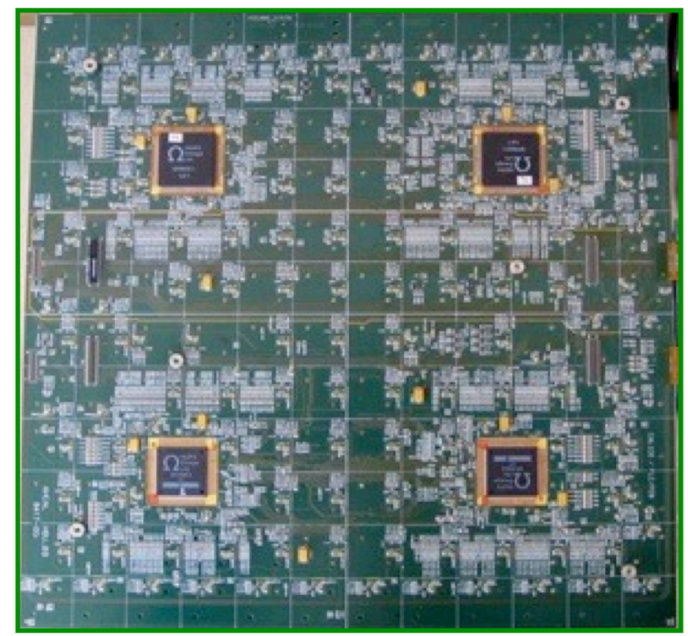
Outlook: Endcap design



- by K. Gadow

2nd Generation Prototype: Module

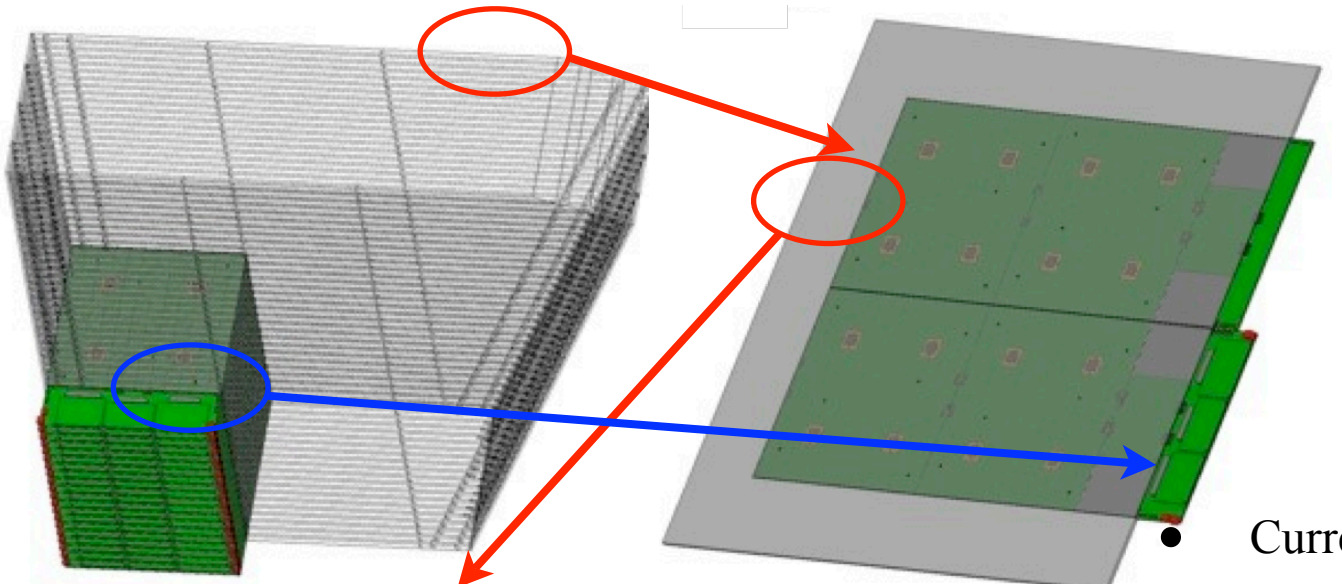


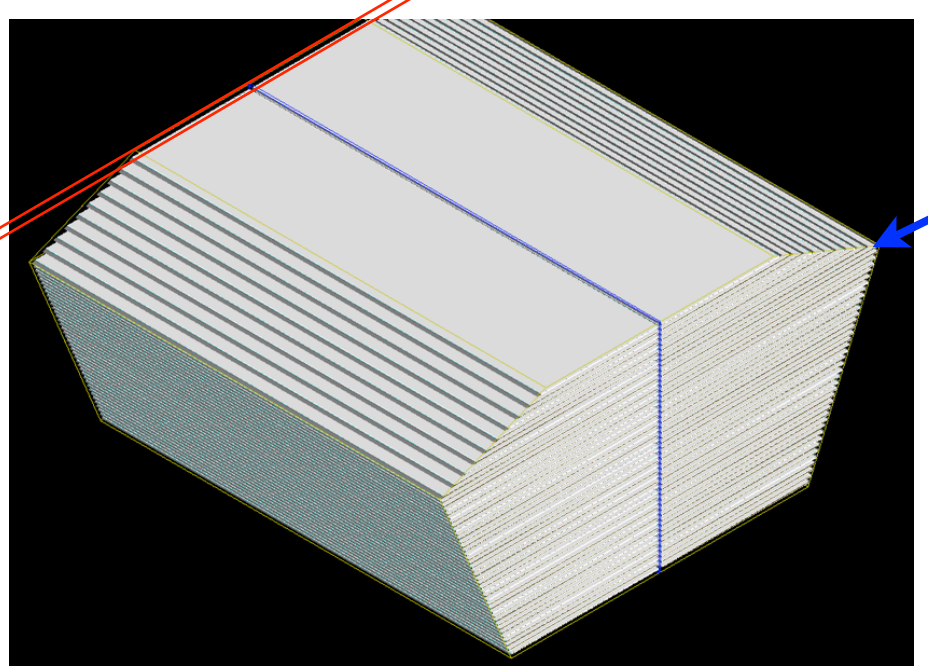


HBU

- Realistic design with fully integrated electronics
- Compact construction minimized gaps, ASICs embedded in PCB
- No active cooling needed with power pulsing
- Interconnected electronics boards (HBUs)
- Front-end electronics at one end of the module

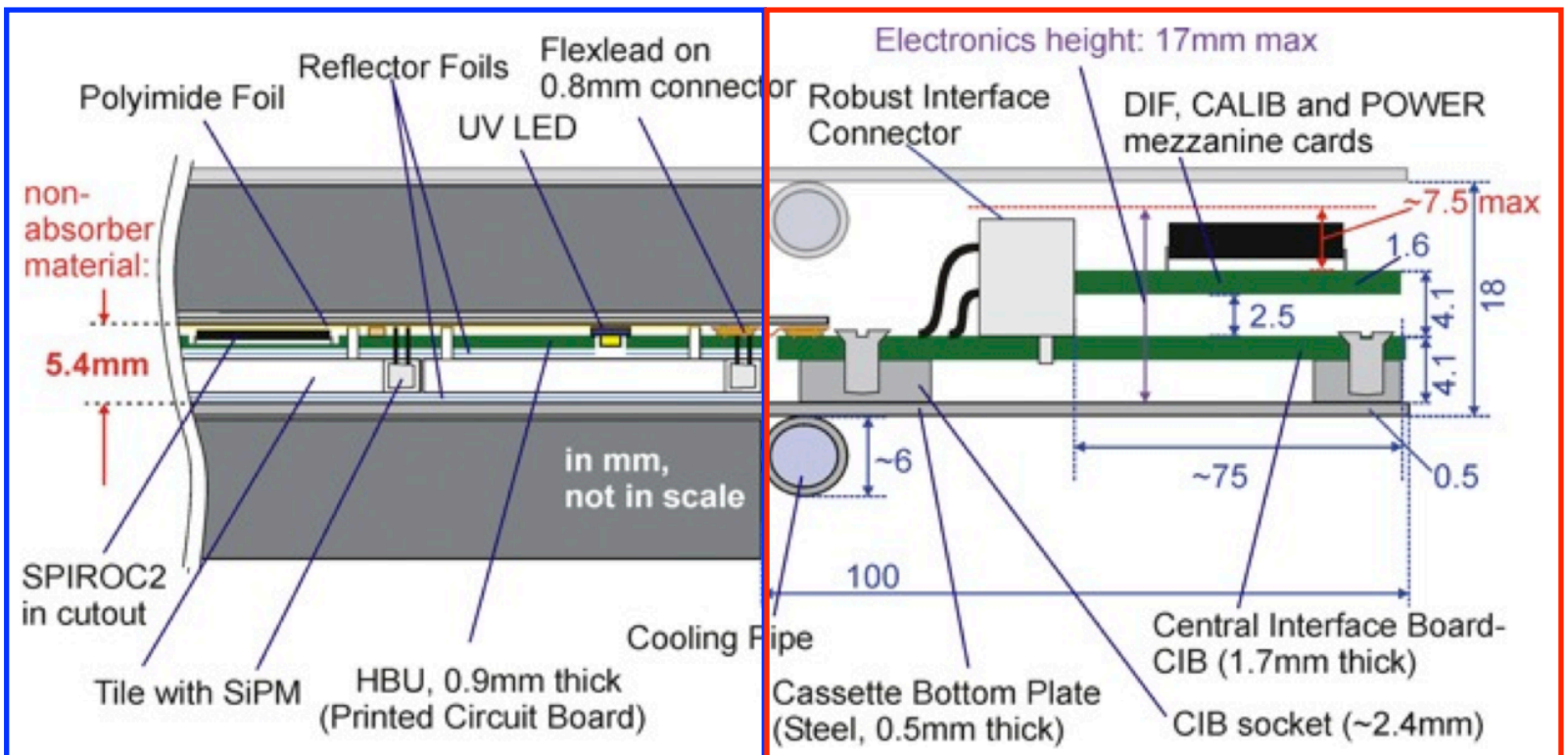
Current Implementation of Simulation Geometry (1)





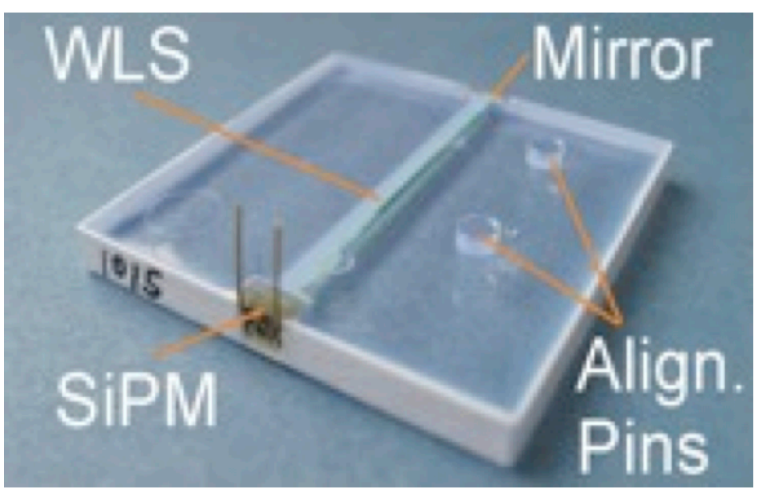
- Current implementation of module:
  - 15 mm thick lateral support plate is in one end of module
  - The modules placed in the HCAL barrel, which lateral support is in the middle of the barrel
  - No lateral support plate in another end of the module, which Frond-end electronics will be connected to the HBUs in the module
- Cracks updated following engineering design (detail list table in next slide)

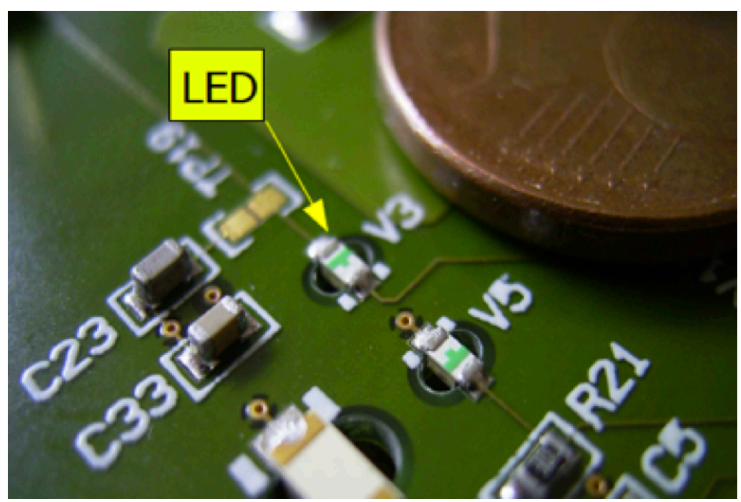
2nd Generation Prototype: Layer



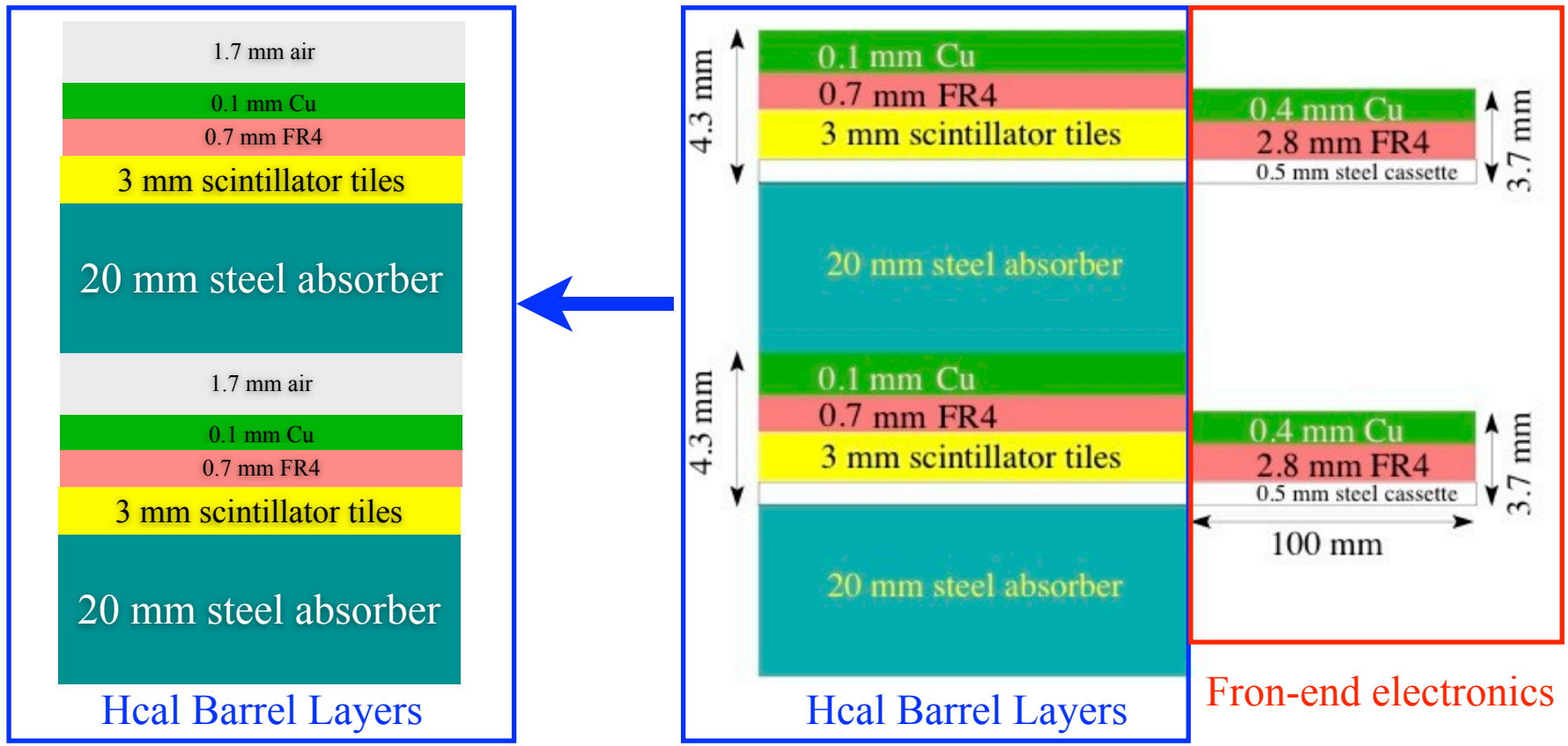
Hcal Barrel Layers

Front-end electronics





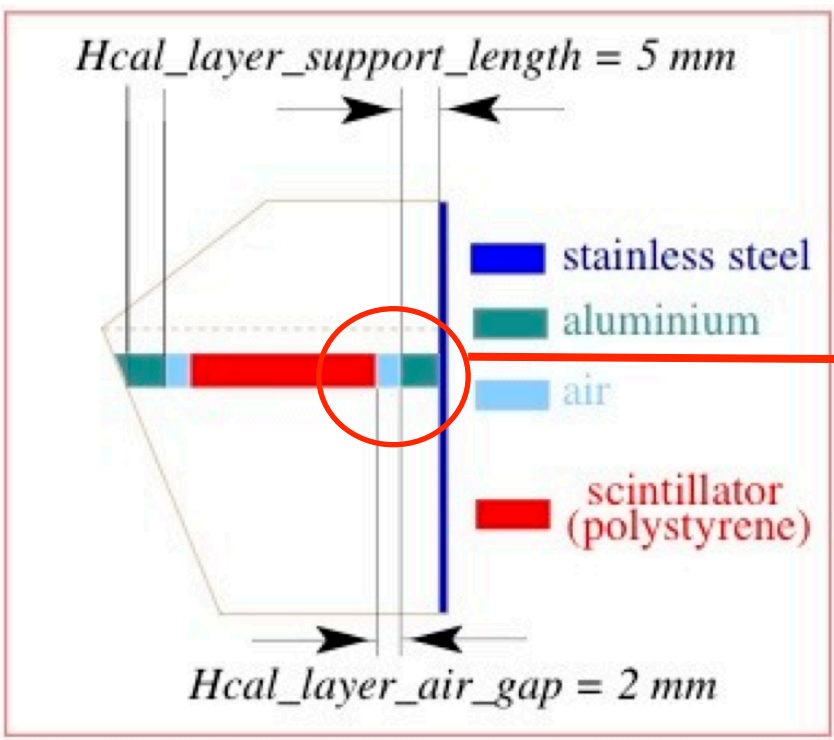
Current Implementation of Simulation Geometry (2)

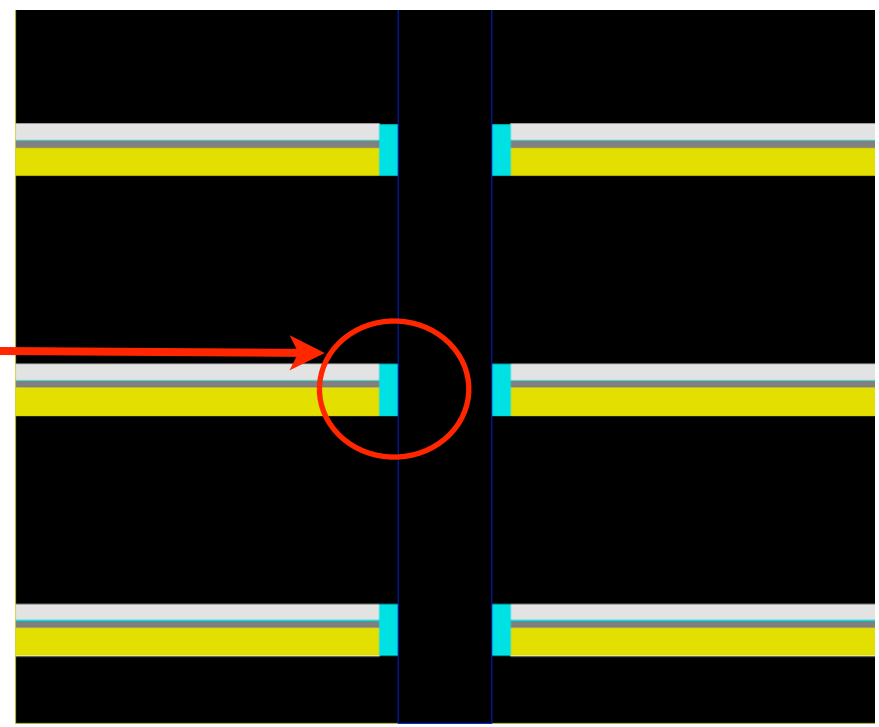


- Current implementation of detector layers:
  - 20 mm thick steel absorber: include 19 mm absorber and 2*0.5 steel cassettes
  - 3 mm thick scintillator tiles
  - readout board with integrated ASICS simulated by 0.7 mm FR4 and 0.1 mm Cu
  - 1.7 mm air gap for connectors, solder pins ...
- Front-end electronics at module ends were implemented

Current Implementation of Simulation Geometry (3)

- The aluminum layer support has been removed following the updated engineering design





Linear Collider note LC-TOOL-2008-001

- The crack at Z=0, filled with steel too, no air gap

Status of simulation

- Current update of Mokka driver in the barrel has be reported in detail here.
- Endcap will follow after engineering design
- Current status of simulation
  - overall dimensions were already OK
  - service in barrel endcap region were already in
  - updated details of active layer structure
  - updated cracks, to follow engineering design

AHCAL R&D

- Finalize and publish test beam results
- Still to come (selection)
  - low energy hadrons
  - scint ECAL plus AHCAL combined resolution and PFlow performance (hopefully)
  - tungsten absorber

AHCAL R&D

- Technical prototype with embedded electronics
  - hardware for demonstrator layer in hand
    tiles for first 3 HBUs have been shipped
  - commissioning ongoing, results in 2012
  - multi-layer test difficult before mid 2012

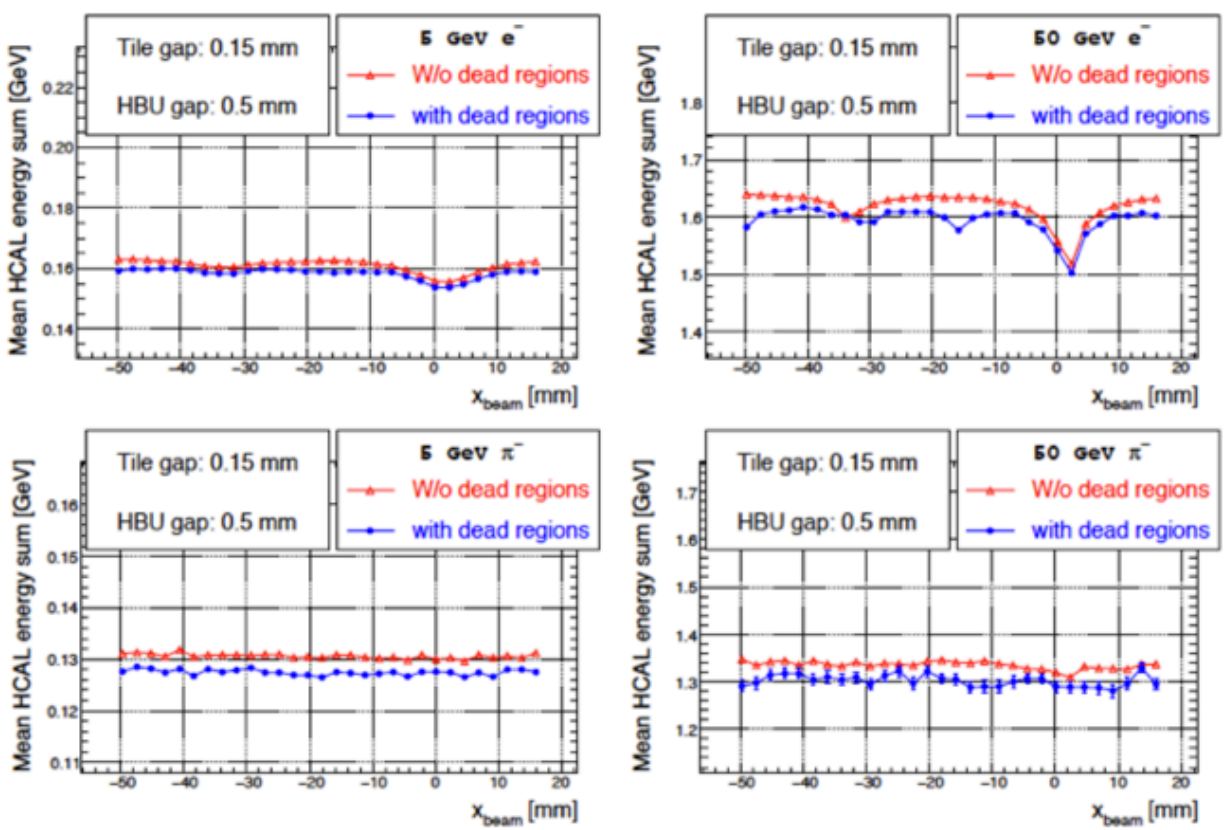
Summary

- AHCAL is in track, but must keep the momentum

backup

Cell and Module Boundaries

- In a realistic detector, there is a very small gap, and corresponding local loss of efficiency for ionizing particles, between tiles and at module boundaries:
  Do these effects need to be simulated, or is 3 x 3 cm^2 simulation granularity sufficient?



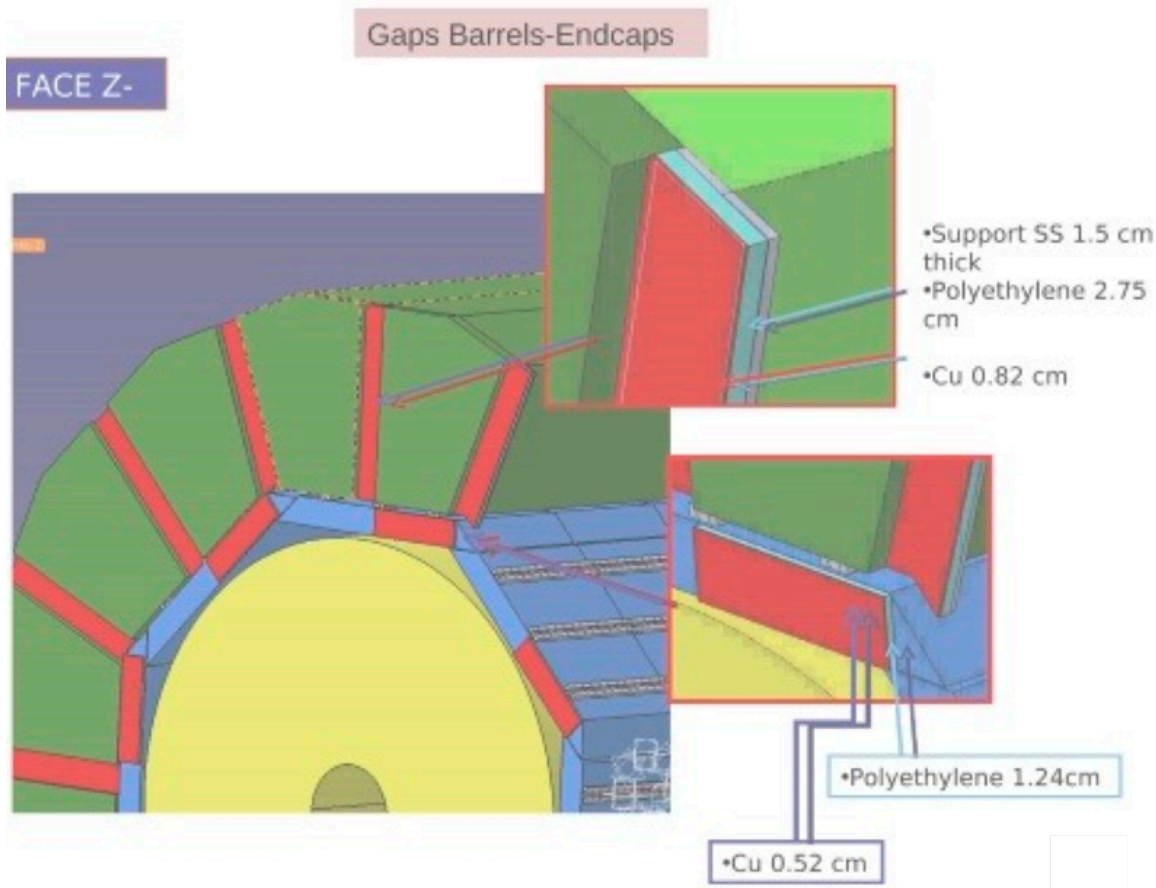
Clear answer:

No simulation necessary!

Detailed studies show some effect at HBU gaps for electrons (almost no effect at tile gaps)
No effect (beyond overall scale) for hadrons

Documented in arXiv:1006.3662

Current Implementation of Simulation Services



- Modeling of the gap between barrel and endcap
- ECAL and HCAL services:
- Support structures
- modeling of cables for HCAL and ECAL

Developed by Catherine Clerc, Mokka developers (Gabriel and Paulo) and Angela

Mokka database update list

No.	Parameter name	Meaning	value
1	Hcal_fiber_gap	gap between scintillator and next absorber	1.7 mm
2	Hcal_lateral_structure_thickness	lateral support plate thickness, only in middle	15 mm
3	Hcal_modules_gap	gap between HCAL modules in a stave	0 mm
4	Hcal_layer_support_length	x-length of the layer support in HCAL barrel	0 mm
5	Hcal_middle_stave_gaps	gap thickness in the middle of HCAL barrel staves	10 mm
6	Hcal_stave_gaps	gap thickness bwtween the HCAL staves	10 mm

The update only happen in Mokka driver SHcalSc03

Calculated parameters update list

No.	Parameter name	value
1	Ecal_outer_radius	2028 mm
2	Hcal_Ecal_gap	30 mm
3	Hcal_inner_radius	2058 mm
4	Hcal_R_max	3361.59 mm

The HCAL calculated parameters in Mokka

TPC_Ecal_Hcal_barrel_halfZ	2350 mm