Status of the HCAL Description in Mokka

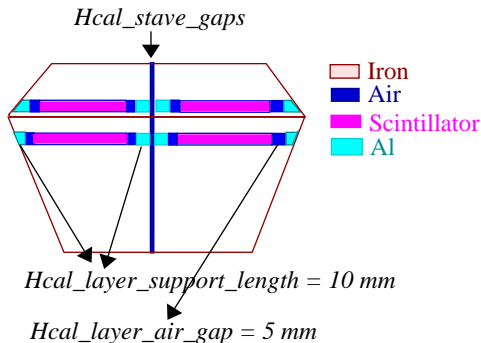**Angela Lucaci-Timoce**

Overview

1. Barrel
2. Endcaps

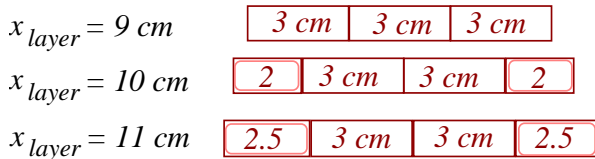# HCAL Barrel Geometry

- new air gap in the middle of every stave;
  Consequences:
  a) 16 pointing cracks
  b) double the stave id to uniquely identify the position of the hit (even stave id: left side, odd stave id: right side)
  c) new encoder (**Encoder32Hcal**) adds 1 bit for stave id, and 1 bit for layer id (for later studies)

- new layer support structure closer to engineering design (5 mm air + 10 mm Al)

Hcal_stave_gaps

☐ Iron
■ Air
■ Scintillator
■ Al

Hcal_layer_support_length = 10 mm

Hcal_layer_air_gap = 5 mm

Cells with Fractional Size

- Want to get rid of cells ganging $\Rightarrow$ simulate integer cells ($3 \times 3 \ \mathrm{cm}^2$), with 2 fractional cells at the edges
- Algorithm is such that $x_{fractional\ cell} \in (1.5 \ \mathrm{cm}, \ 3 \ \mathrm{cm})$

$$x_{layer} = 9 \ cm \quad \boxed{3\ cm \quad 3\ cm \quad 3\ cm}$$

$$x_{layer} = 10 \ cm \quad \boxed{2} \ \boxed{3\ cm \quad 3\ cm} \ \boxed{2}$$

$$x_{layer} = 11 \ cm \quad \boxed{2.5} \ \boxed{3\ cm \quad 3\ cm} \ \boxed{2.5}$$

- new sensitive detector class (**SDHcal**) implements fractional cells
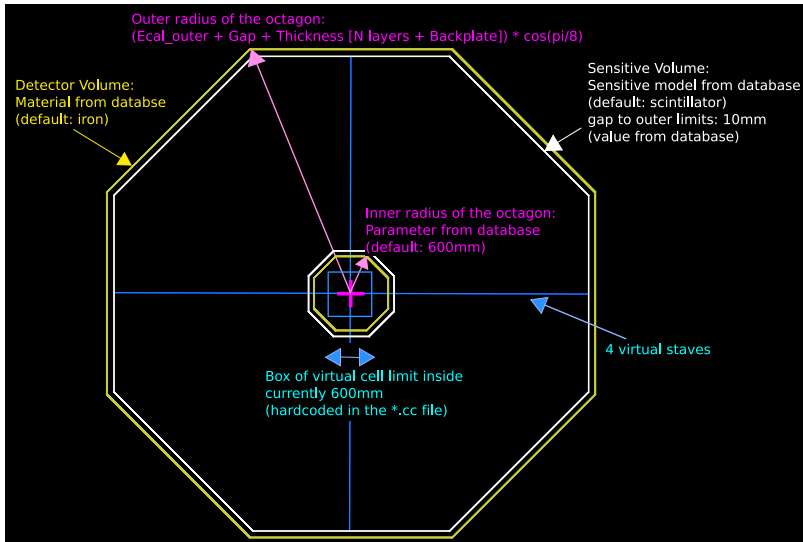- first numerical checks indicate the algorithm is working

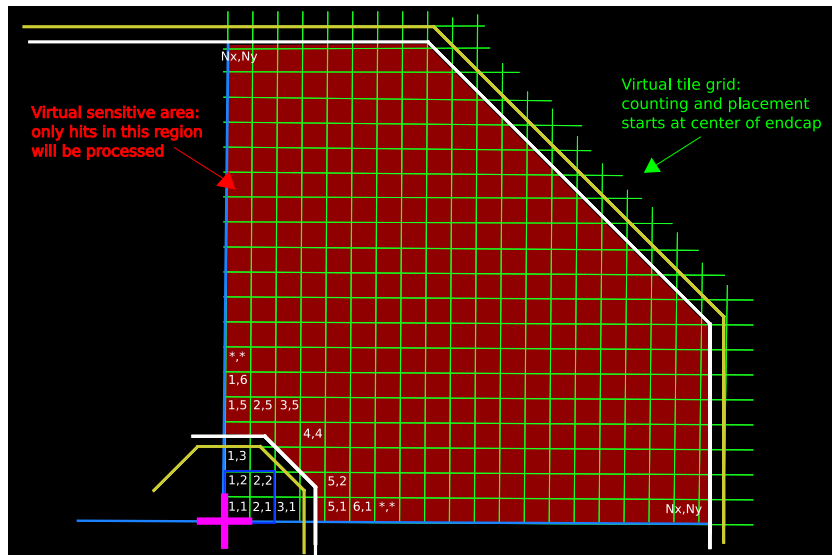# HCAL Endcaps in the Tesla Design

- 4 cracks
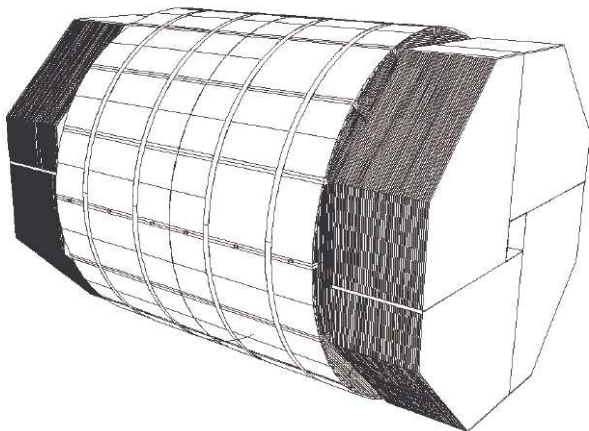
- pictures provided by **Ralf Diener**

Missing Items

Barrel

- **Birks law**:
  - got new implementation from Vladimir Ivantchenko (CERN), with special treatment of gammas, neutrons and ion energy losses
  - need to be implemented in the sensitive detector class
- Provide a list of geometric parameters to GEAR for calculating I, J and K indexes of a hit
- New parameters to be written to the Mokka data base: *Hcal_chamber_thickness*, *Hcal_layer_support_length*, *Hcal_layer_air_gap*
- Proper testing of the sensitive detector class
- Implementation and check of the digitization function provided by Niels Meyer

Endcaps

- introduce the 4 cracks
- more realistic treatment of the cells at the endcap edges

Conclusion

- we have a realistic description of the barrel
  - 16 pointing cracks
  - layer support structure
  - fractional tiles

- ideally, we want to work on the missing items for the barrel
  (request 1 more week to finalize)

- Endcaps and HCAL ring will be left for a later production

- Other long term projects: build an HCAL model with non-pointing cracks