HCAL Description in Mokka
– Status –

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Overview

1. Barrel
2. Endcaps
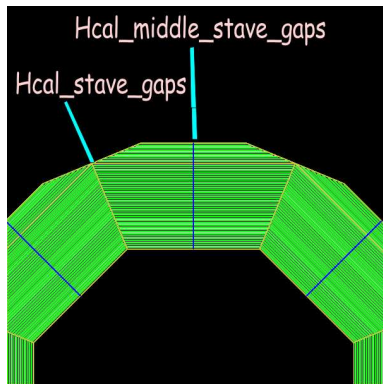3. Endcap Rings

HCAL Barrel

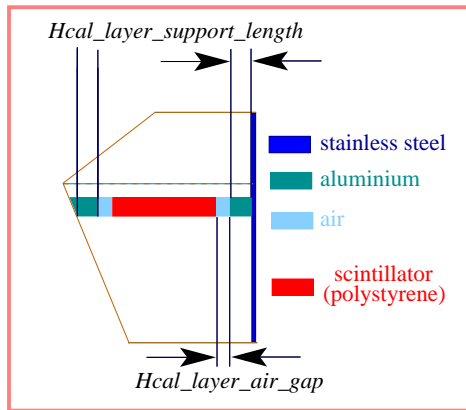- Stave divided by a gap filled with steel:

$Hcal\_stave\_gaps = 3\,\mathrm{mm}$

$Hcal\_middle\_stave\_gaps = 3\,\mathrm{mm}$
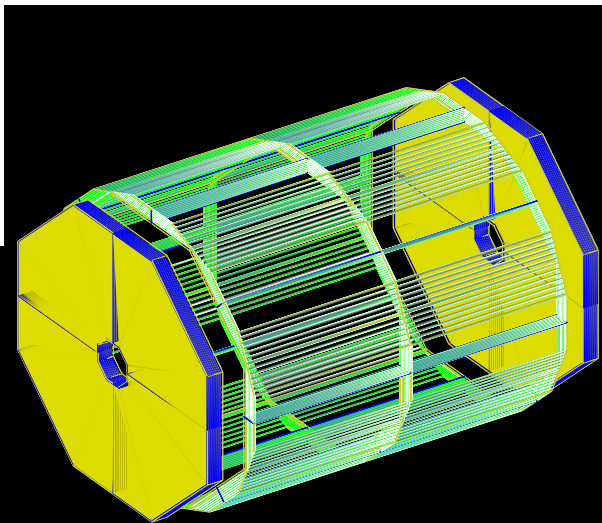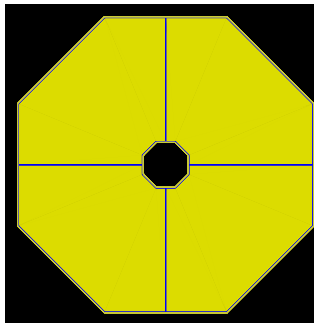
- Layer support:

$Hcal\_layer\_support\_length = 5\,\mathrm{mm}$ (Al)
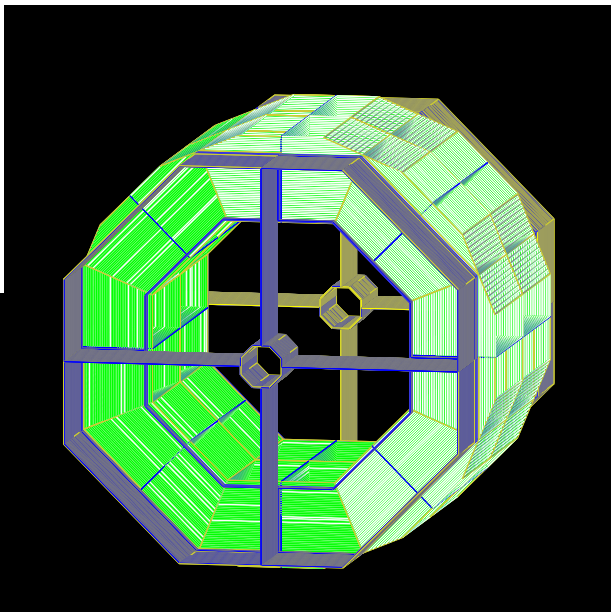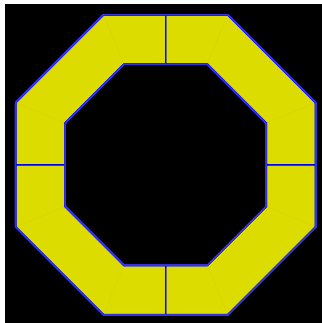
$Hcal\_layer\_air\_gap = 2\,\mathrm{mm}$ (air)

HCAL Endcaps

- 4 gaps filled with radiator material (iron)
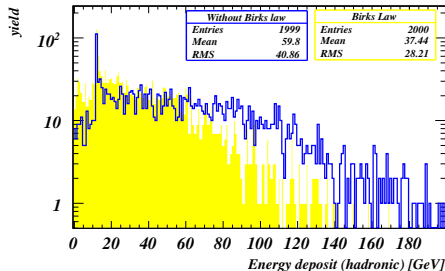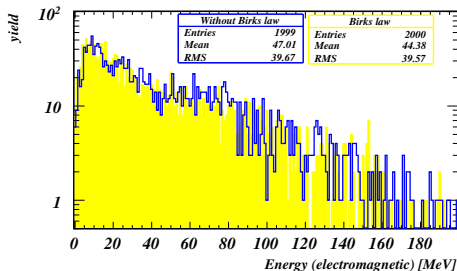- implementation: **Ralf Diener**

HCAL Endcap Rings

- 4 gaps filled with radiator material (iron)
- implementation: **Ralf Diener**

Birks Law

- Studied by **Nicola D'Ascenzo**
- Events with 60 GeV π, no cut
- Energy deposited in 1 m^3 test beam HCAL detector

Without Birks law		With Birks law	
Entries	1999	Entries	2000
Mean	108.3	Mean	82
RMS	71.12	RMS	57.86

Without Birks law		Birks law	
Entries	1999	Entries	2000
Mean	47.01	Mean	44.38
RMS	39.67	RMS	39.57

Without Birks law		Birks Law	
Entries	1999	Entries	2000
Mean	59.8	Mean	37.44
RMS	40.86	RMS	28.21
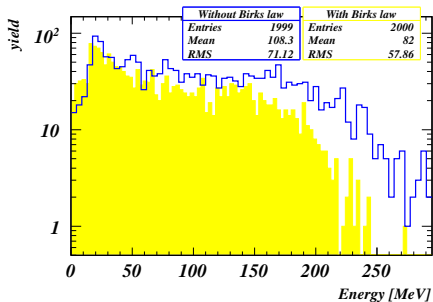
Summary and Conclusions

Barrel

- 2×8 pointing cracks
- updated layer structure, with support at the edges
- virtual cell size $= 3 \times 3 \; \mathrm{cm}^2$, with **fractional cells** at the layers ends
- new sensitive detector class, with fractional cells
- **Birks law** for attenuated scintillator response implemented

Endcaps and Endcaps Rings

- 4 pointing cracks
- virtual cell size $= 3 \times 3 \; \mathrm{cm}^2$

Conclusions

- More realistic description of the HCAL barrel, endcaps and endcap rings
- Code in CVS, ready for testing ☺
- If tests OK, start optimization studies (adjust scintillator and absorber thickness to see the sampling effects, etc...)

HCAL related code in CVS

- G4EmSaturation - GEANT4 class from Vladimir Ivantchenko (CERN), used to implement Birks law (will be removed once there is a new GEANT4 release)
- Encoder32Hcal - new 32 bits encoder (1 additional bit for the layer id, and 1 additional bit for the stave id)
- SDHcalEndCaps - new sensitive detector class for the HCAL endcaps (additional gap)
- SDHcalBarrel - new sensitive detector class for the HCAL barrel (additional gap + fractional tiles)
- SHcalSc01 - new HCAL superdriver, containing only the scintillator option