DHCAL simulation

Gérald Grenier
IPN Lyon, Université Lyon 1

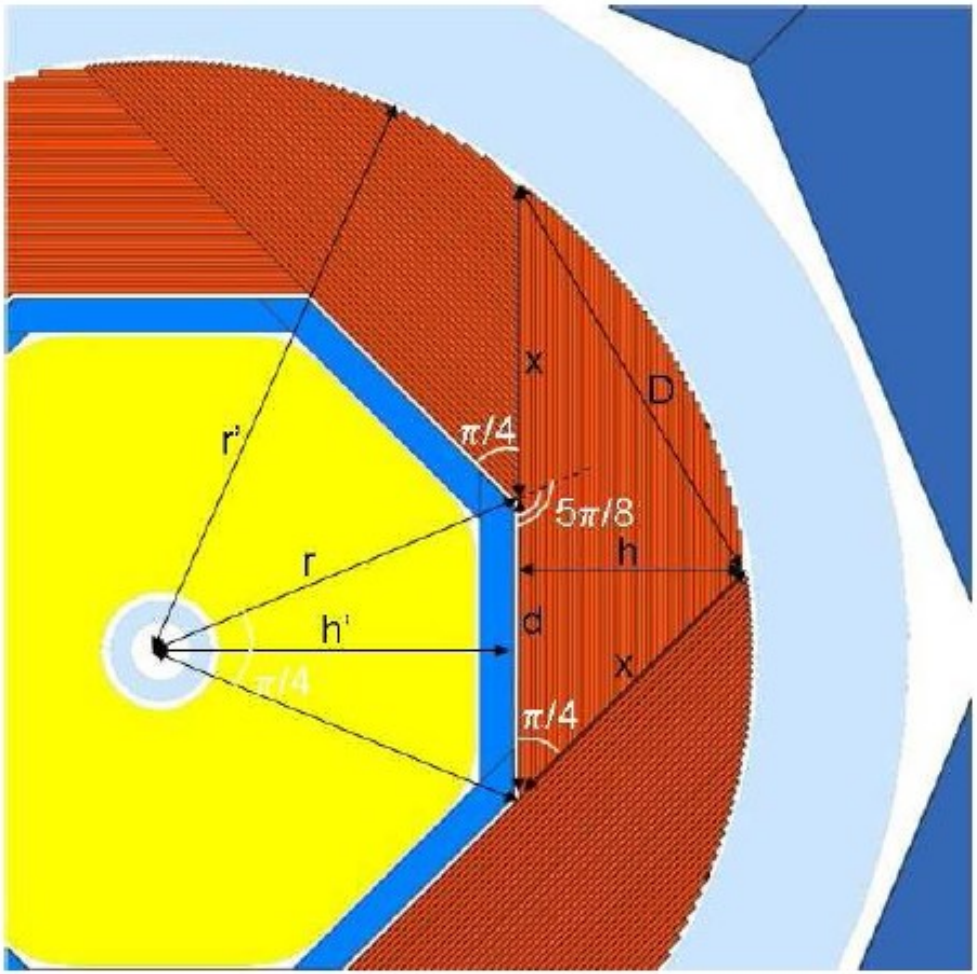
ILD software meeting, LLR, January 27th 2010

The DHCAL in MOKKA.

This has the geometry "à la Videau" and a realistic description of the RPC.

Handled by the SHCAL04 superDriver

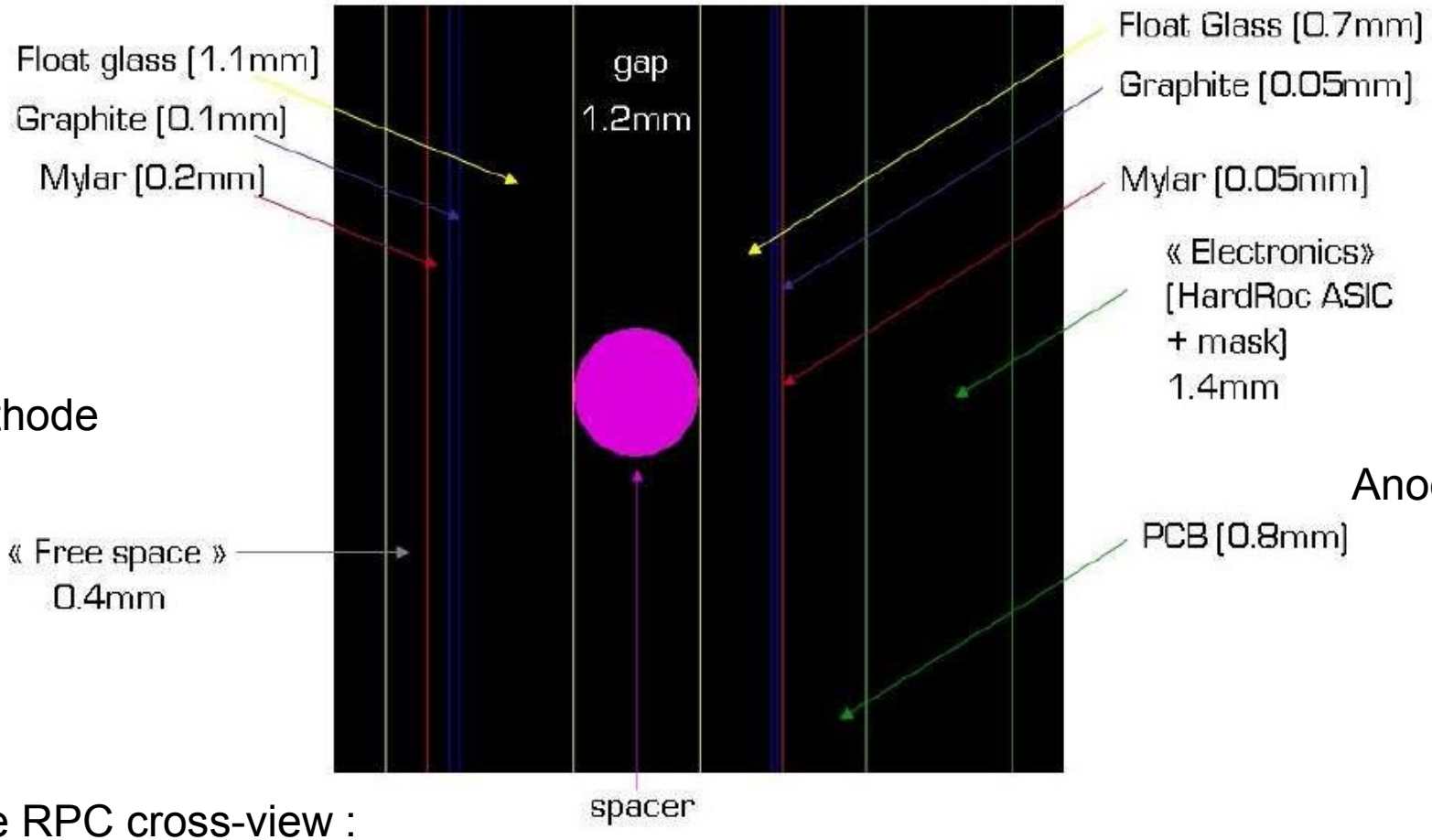
This can be used in detector model
ILD_00Dhcal (i.e. ILD_00 with DHCAL)
ILD_00fw_Dhcal (i.e. ILD_00fw with DHCAL)



The geometry is parametrized by 3 quantities :
- Number of layers
- Outer radius (r')
- Distance between center and first plate (h')

In Pandora, the DHCAL geometry is identified by the presence of the outer radius parameter in the GEAR file.

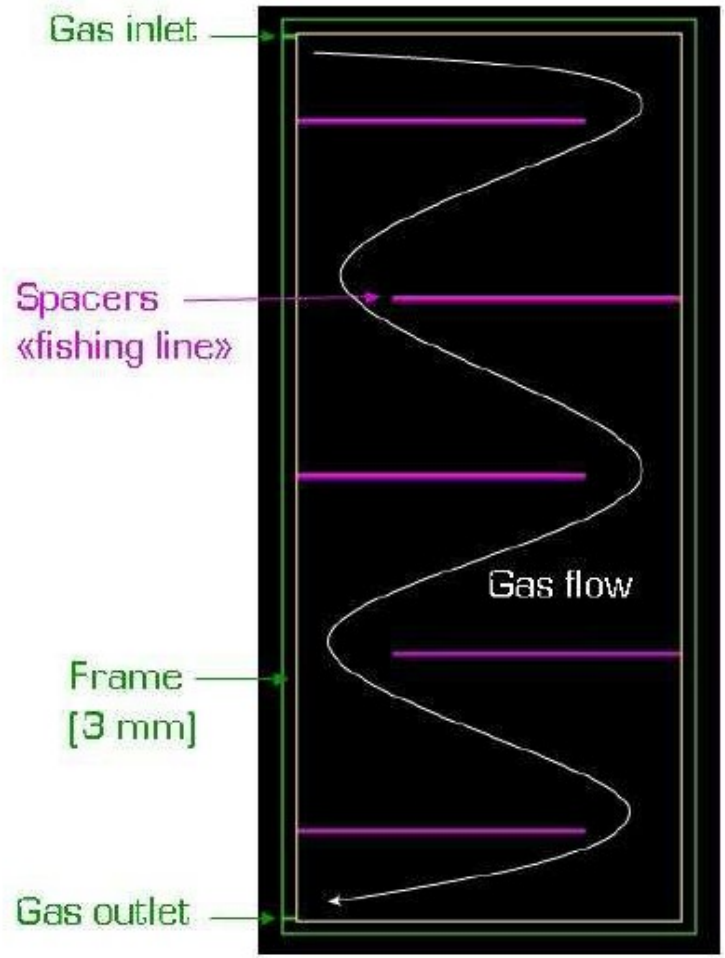
The RPC (cross-view).



The RPC cross-view :
Recent needed changes are : Graphite thickness (cathode) = 0.05 mm
Mylar thickness (cathode) = 0.0175 mm

For the EndCaps and EndCapRings, there is a mixed material used for the Mylar, the Graphite, the electronics, the PCB and the “free space”.

The RPC (upper view).



Upper view of the RPC as it is now in MOKKA.

In the current design, the spacer aren't any more “fishing lines” in nylon but ceramic balls.
(One ball every 10 cm).

Currently 2 material for balls : ZrO_2 and Si_3N_4

This would need to be changed in the simulation.

2 steps simulation.

MOKKA simulation outputs contain simulated calorimeter hits
with the GEANT4 deposited energy in the gas.

Hence, **MOKKA simulates the DHCAL analogically**.

The "D" part of the DHCAL simulation is done by MARLIN processors.

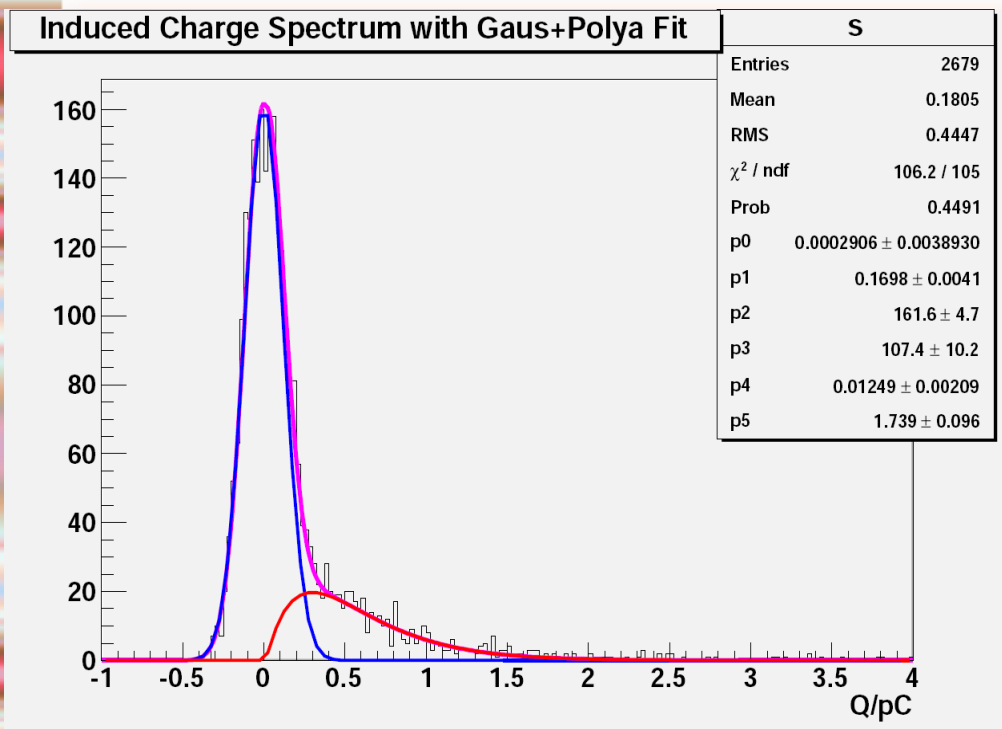
A processor to translate the GEANT 4 hit energy into the GRPC charge response
(see next slide)

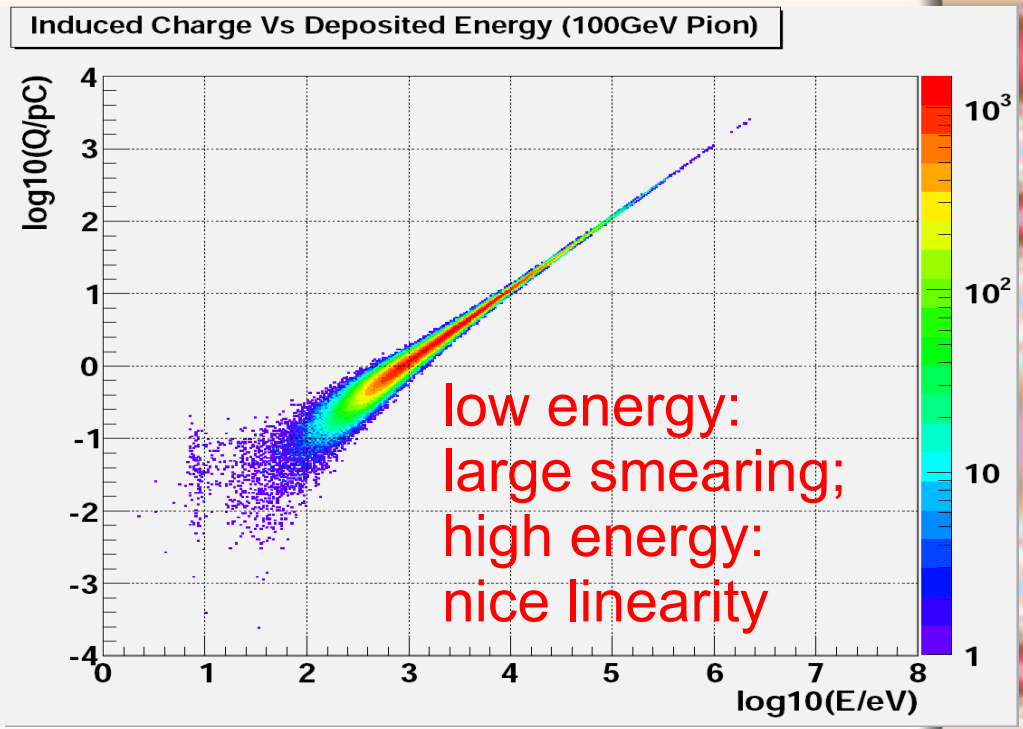
A processor to simulate the effect of the threshold(s) on the hit energy.
Up to now, the NewLDCCaloDigi processor has been used.

Digitisation.

From hits with GEANT4 deposited energy to hit with induced charge value.

The induced charge is simulated.





Processor parameters determined from cosmic ray data.
Processor can be used for other gaseous detectors.

Final remarks and wishes.

The last step of the DHCAL simulation can be seen as the first step of the analysis.

DHCAL thresholds studies needs running MARLIN in loops.
Need to think on ways to speed up running MARLIN.

Wish list :

– It would be more convenient if the geometry information could be stored in the LCIO file or retrieved from it.
Still looking for an efficient way of storing multi-Gb LCIO file-few bytes GEAR file pairs.

– To disentangle effects of the geometry and effects of the GRPC/scintillator choice, it would be good to be able to change the sensitive detector (GRPC, scint) independently of the geometry (octogon AHCAL or “à la Videau” DHCAL)