

# SDHCAL simulation/reconstruction quick summary

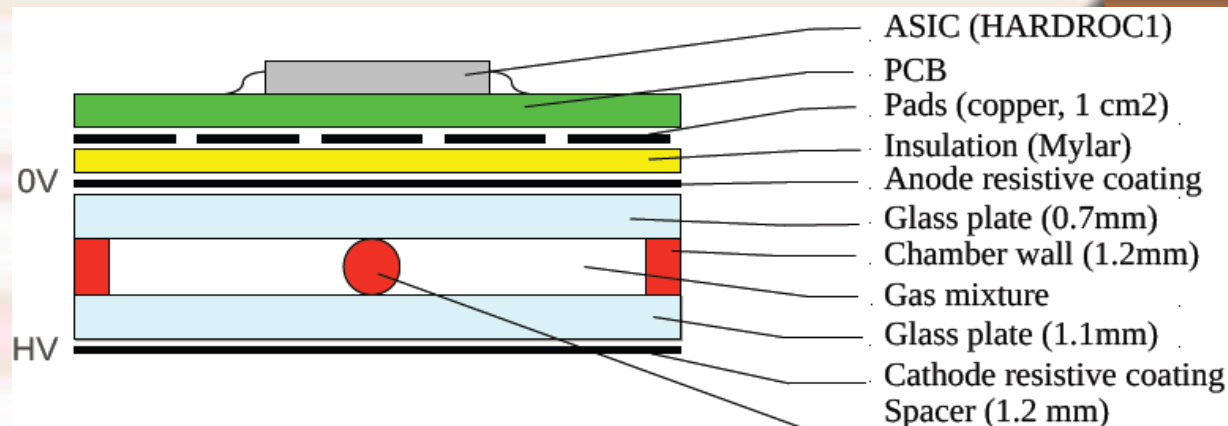
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IPN Lyon, Université Lyon 1

ILD Analysis meeting, May 3<sup>rd</sup> 2011

- Mokka
- Digitisation
- Algorithm

- GEANT4 description of GRPC is detailed.
- Mokka drivers available for GRPC with Videau or TESLA geometry in SHCalRPC02 (R. Han, G. Musat, P. De Freitas)



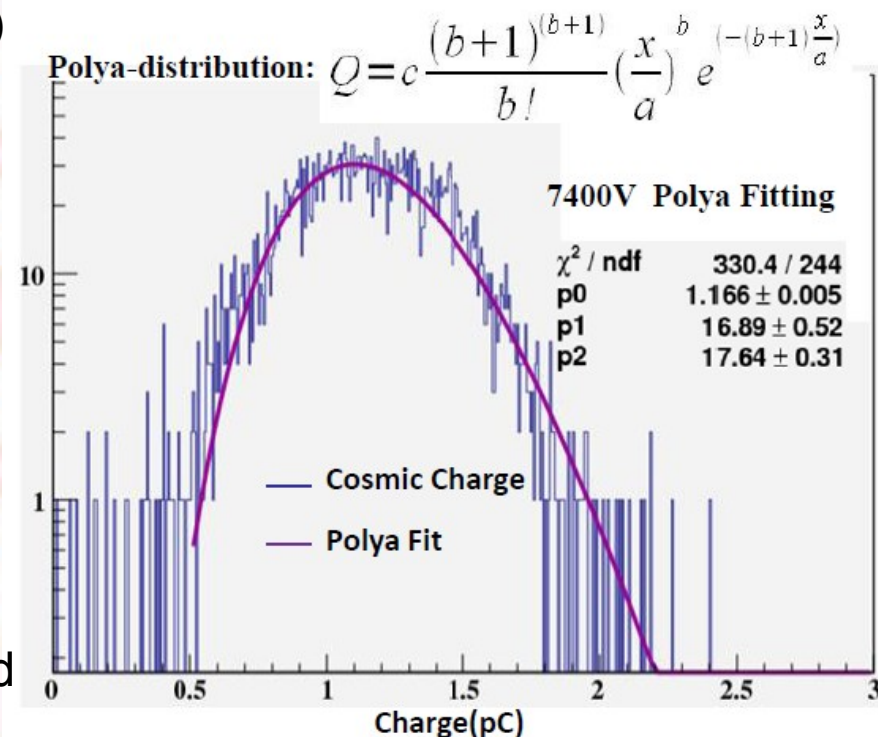
1	-844	-1.9e+03	365	4e+04	0	2.11e+03	2.11e+03	BarrelHcalModule	Transportation
2	-853	-1.92e+03	369	4e+04	0	21.8	2.13e+03	physiRPCFree	Transportation
3	-853	-1.92e+03	369	4e+04	0	0.402	2.13e+03	physiRPCmylarCathode	Transportation
4	-853	-1.92e+03	369	4e+04	0	0.196	2.13e+03	physiRPCGraphiteCathode	Transportation
5	-853	-1.92e+03	369	4e+04	0	0.0544	2.13e+03	physiRPCThickGlass	Transportation
6	-854	-1.92e+03	369	4e+04	0	1.2	2.13e+03	physiRPCGap	Transportation
7	-854	-1.92e+03	370	4e+04	0	1.31	2.14e+03	physiRPCThinGlass	Transportation
8	-855	-1.92e+03	370	4e+04	0	0.761	2.14e+03	physiRPCGraphiteAnode	Transportation
9	-855	-1.92e+03	370	4e+04	0	0.0544	2.14e+03	physiRPCmylar	Transportation
10	-855	-1.92e+03	370	4e+04	0	0.0544	2.14e+03	physiRPCPCB	Transportation
11	-855	-1.92e+03	370	4e+04	0	1.31	2.14e+03	physiRPCElectronics	Transportation
12	-856	-1.93e+03	370	4e+04	0	1.74	2.14e+03	BarrelHcalModule	Transportation

- Missing item : only barrel with GRPC, EndCap still with scintillator. Implementation of GRPC in EndCaps should be done shortly.

- Digitization is done in a Marlin processor (Ran Han)
- Based on measurements in cosmic data.

Principle :

- for each GEANT4 tracks generating a hit, convert the GEANT4 deposited energy into an induced charge in the input of the read-out electronics
- The conversion is done by a random draw of a Polya function distribution (from measurement)
- If more than one track is contributing to the hit, the induced charges simulated for each tracks are summed (reasonable hypothesis)
- The 3 thresholds are then applied on the hit induced charge to form Semi-digital hits.

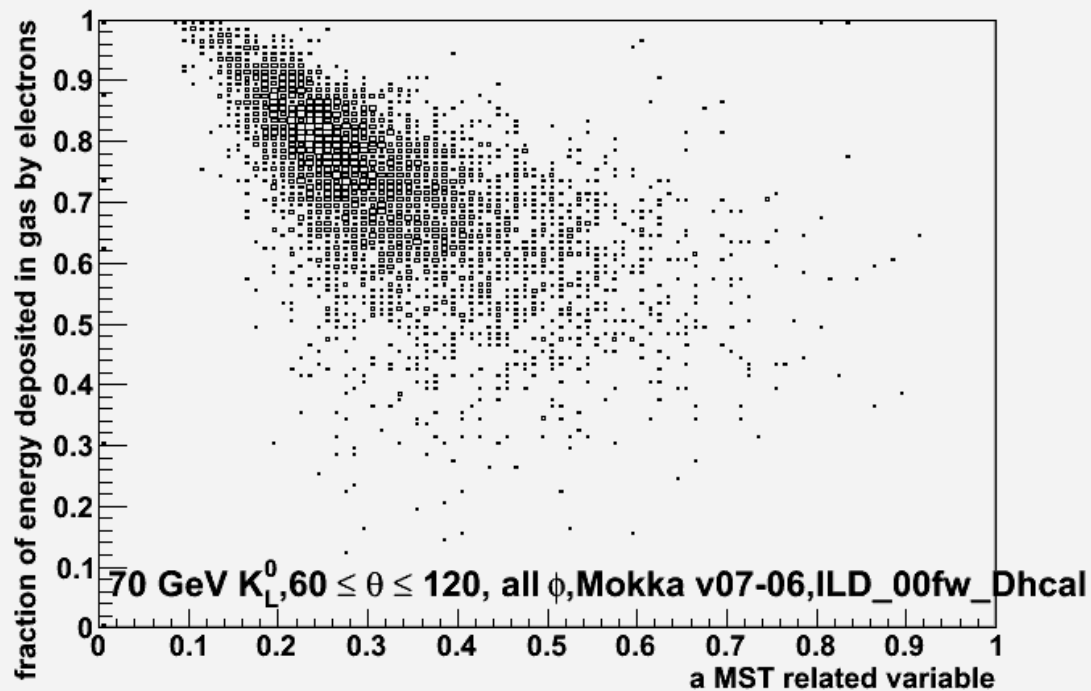


Missing item : hit multiplicity (induction of signal in neighbour cells).

- Will need LCIO v2 for proper implementation.
- Few options to simulate it with in LCIO v1 Marlin processor considered.
- Some options to be implemented shortly.

- Have started to use Pandora PFA with SDHCAL simulation (R. Han, M. Ruan, GG).
  - The Pandora configuration files need to be optimized
  - Few modification foreseen for Pandora to cope with semi-digital.
  
- Other reconstruction techniques based on the fine granularity
  - Use Minimum Spanning Tree (MST) linking calorimeter hits to find energy dependant variables
    - Hadron/EM energy fraction in shower (L. Cousin, GG)
    - Particle identification
    - A Marlin Processor can compute MST for various ways of linking and store the MST weights distribution result in a LCIO genericObject collection
  - Tracking MIPs in DHCAL : Hough transform, Kalman filter (medium term projects)

fracEMenergy:aboveFraction6[150]



- SDHCAL simulation is committed into Mokka
- Marlin processors for digitization and reconstruction are usually in local svn.
  - It is time to find them a place in the ILD software packages.