

SDHCal Progress @Tesla

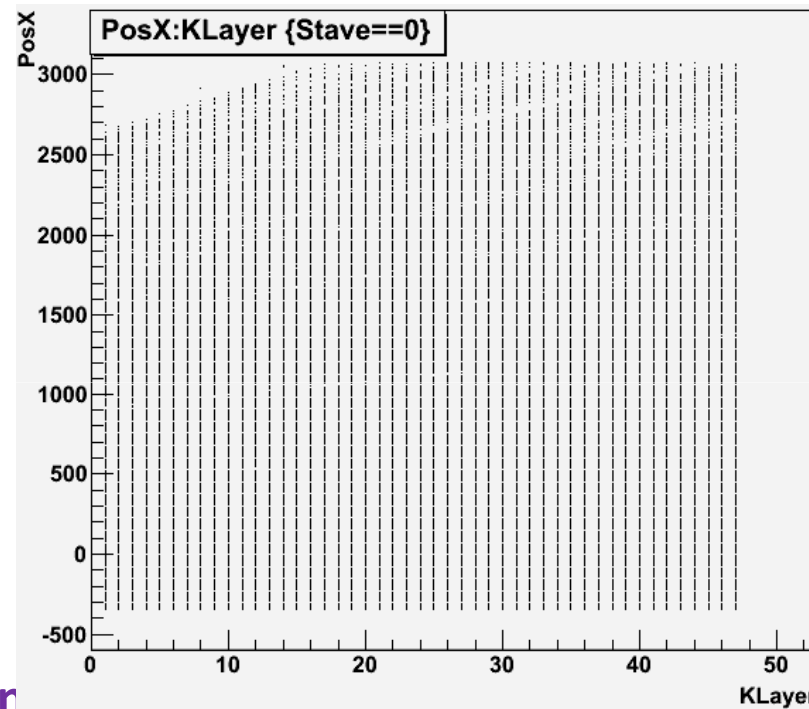
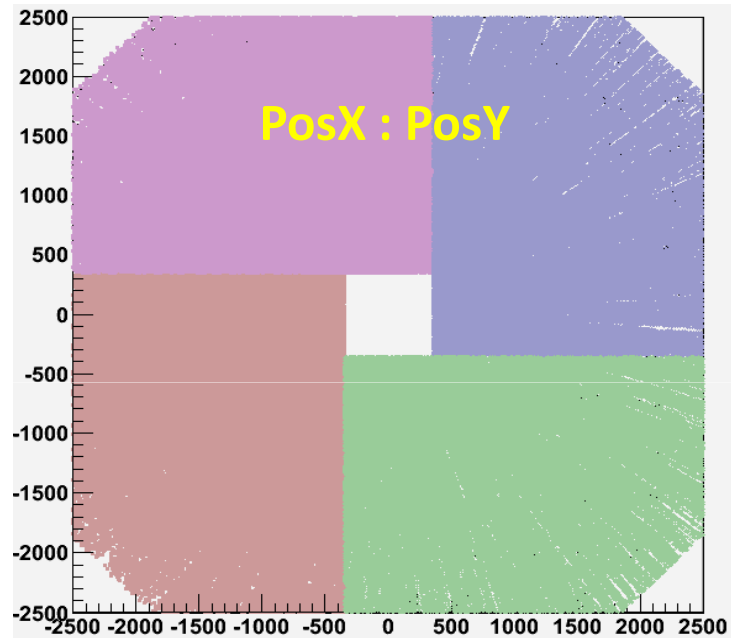


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IPNL 2011-07-20

	Before 2010 .11	2010.11— 2011.05	2011.05— 2011.07
Mokka	1- GRPC only @ Videau 2- Prototype simulation	1- Update Videau based on realistic 2- GRPC @Tesla Barrel Part	GRPC@ Tesla Endcap &Endcapping
Marlin	1- Rough Digitizer in Marlin 2- Digitization study based on cosmic data and prototype simulation	1- Digitizer in ILD without multiplicity 2- Check Digitizer by simulation some sample and PFO reconstruction	1- Digitizer in ILD with multiplicity 2- optimized constants roughly

GRPC @Endcap of Tesla

1- 10,000 -100GeV -muons events, shoot to Endcap (theta=0+-40deg)

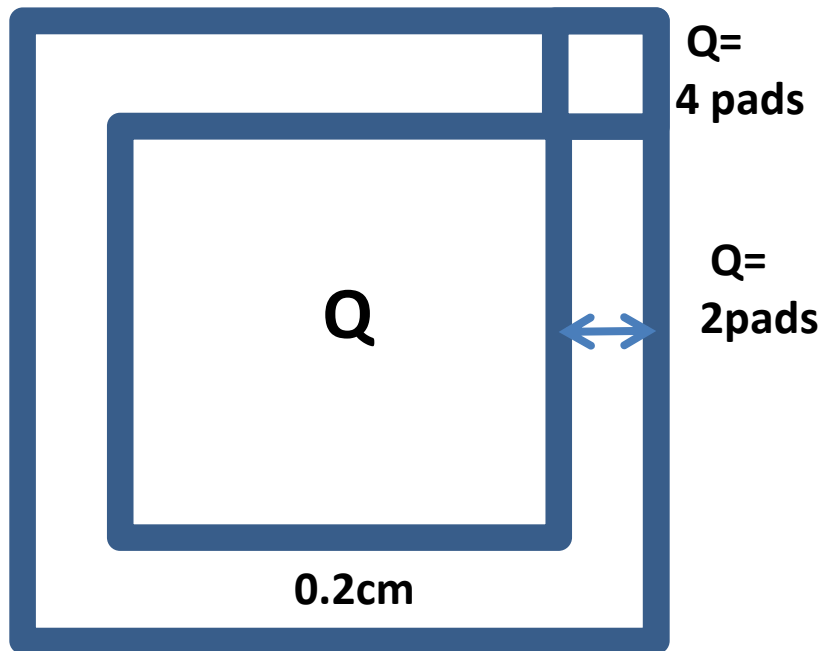


2- Geantino particle to see what is in

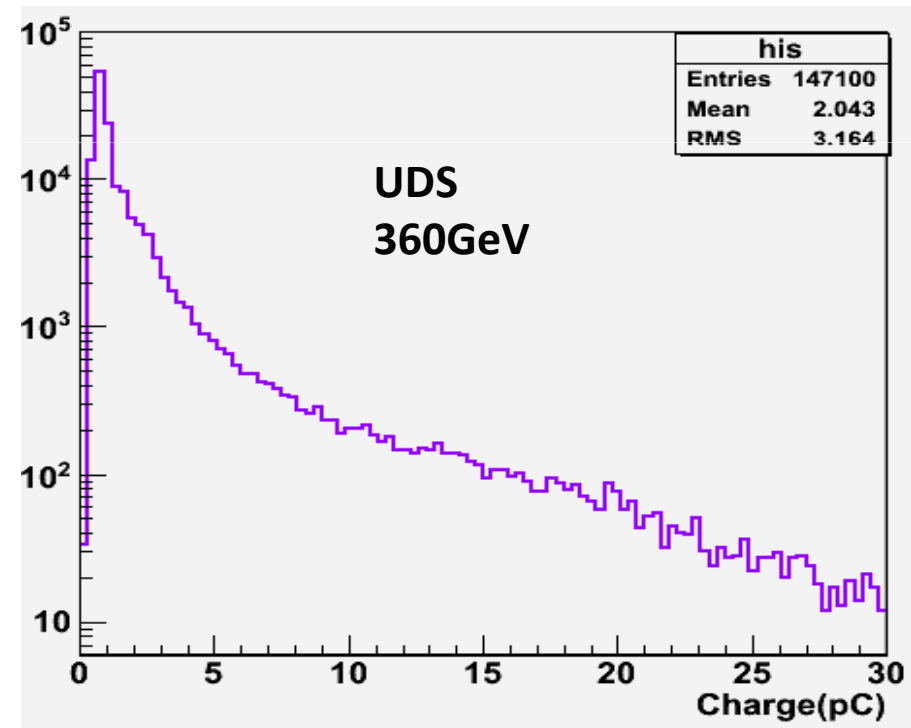
1	-188	-423	2.51e+03	EndCapPhys Transportation
2	-190	-427	2.54e+03	EndcapRPC_ThickGlass Transportation
3	-190	-427	2.54e+03	EndcapRPC2GasPhysical Transportation
4	-190	-427	2.54e+03	EndcapRPC_ThinGlassPhysical Transportation
5	-190	-427	2.54e+03	EndcapRPC_MixPhysical Transportation
6	-190	-428	2.54e+03	EndCapPhys Transportation

Realistic Digitization

- 1- Charge distribution from cosmic ray (Polya distribution)
- 2- Accumulate charge when multiply particles go through in one pad
- 3- Dispatching charge to more than one pad when track on the pad border



Dispatching Charge



Charge Distribution

How to Use SDHCal

Mokka

- 1- Simulate by yourself after ilcsoft V01-11
- 2- Use files already generated @Calice grid

Marlin

GRPC:SimRPCDigitization, DigitalHcal==1

Threshold : 0.4pC, 4.8pC, 15pC ;

CalibrHCAL : 0.07, 0.40, 0.56 (constants need to be further optima)

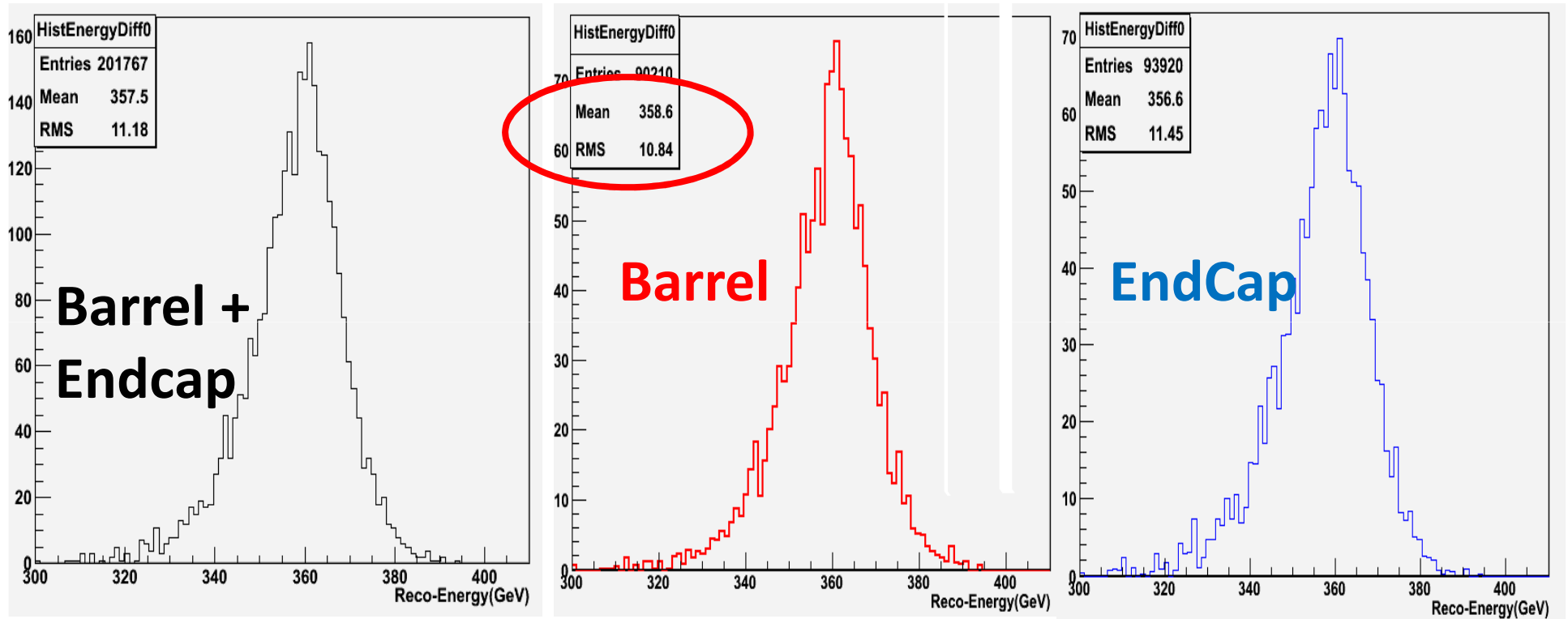
Digitizer in <https://svn.in2p3.fr/calice/analyse/trunk/SDHCAL-offline-tools/>

Pandora

HCalToMipCalibration= 1.0; HCalMipThreshol=0.0

optimaztion in pandora need to do more

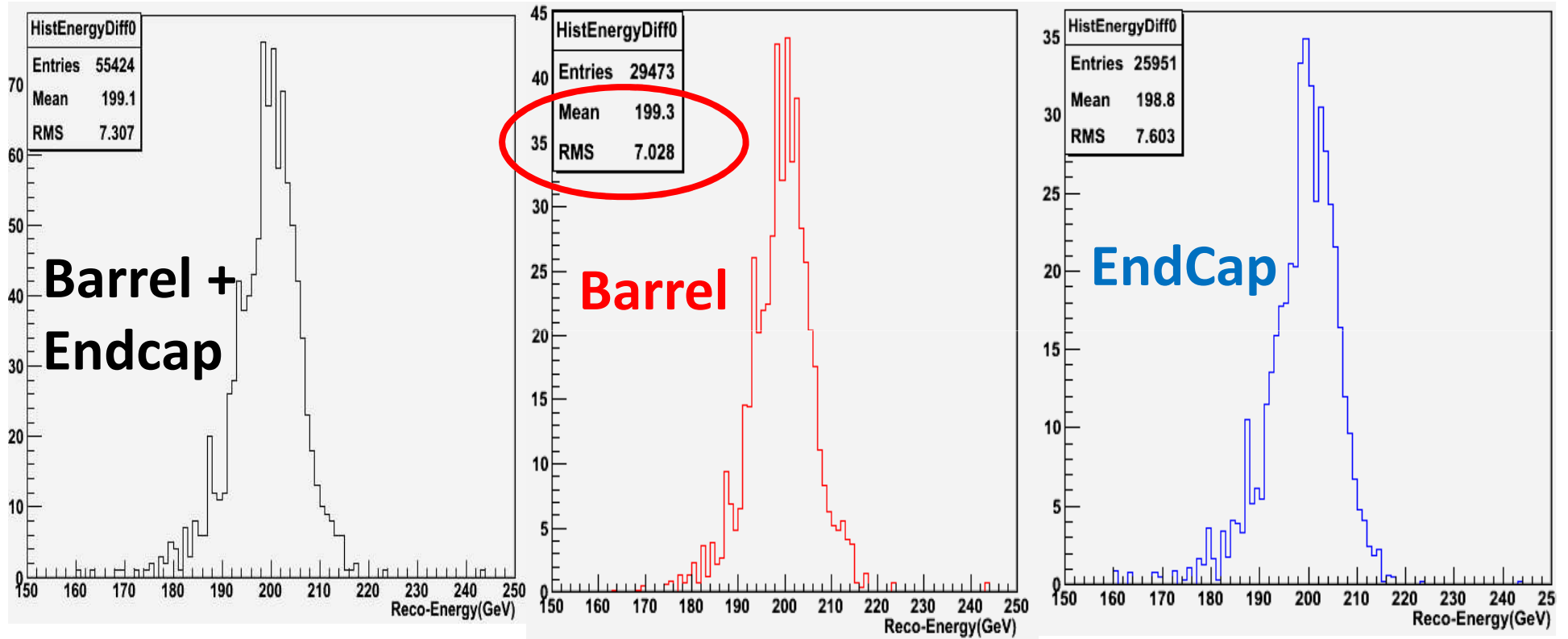
360GeV_uds_3000evts



Total PFO reconstructed energy

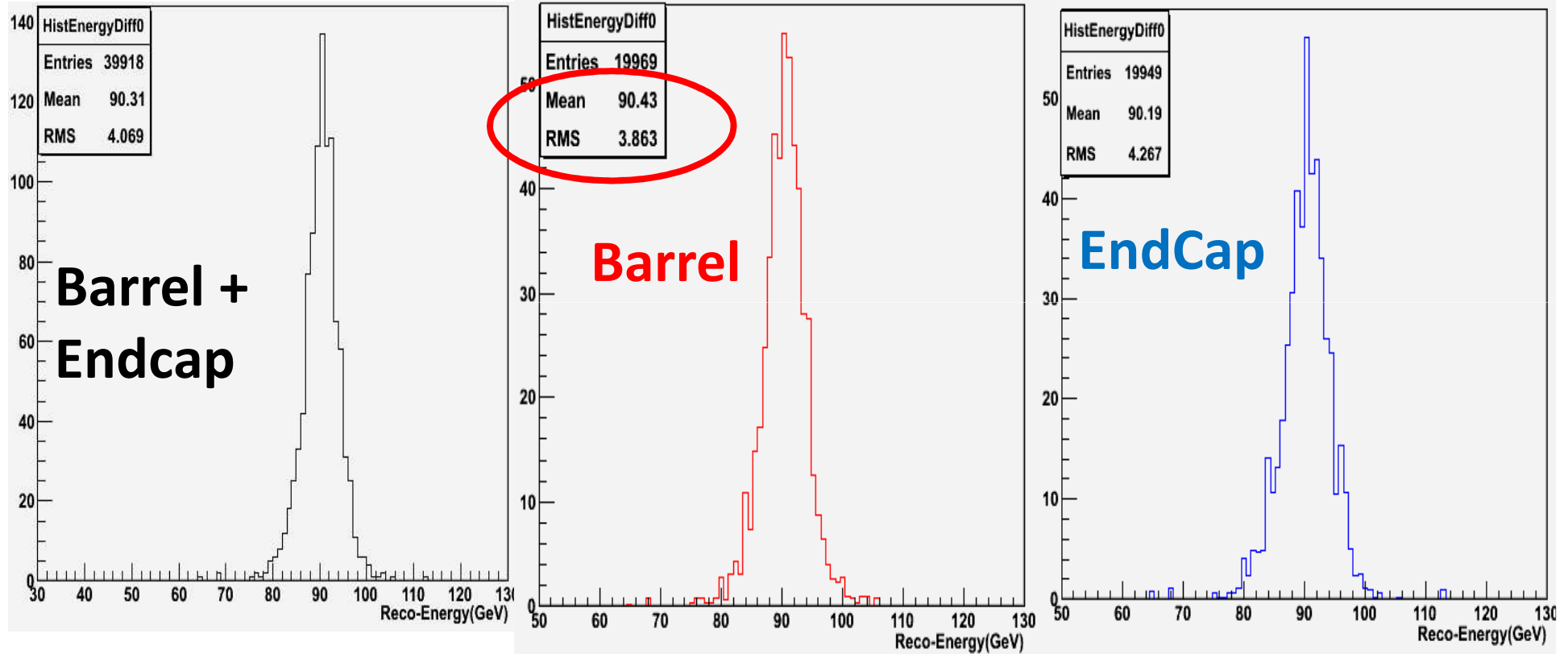
ILD Letter of Intent
Page 36, raw rms=11.2@ costheta<0.7

200GeV_uds_1000evts



Total PFO reconstructed energy

91GeV_uds_1000evts



Total PFO reconstructed energy

Summary & Outlook

- The RPC @ Videau & Tesla totally
- The realistic digitizer in Marlin process now
- A fast look to UDS PFO reconstruction

- Increase statistic to do optimization with Mark Thomson and John Marshall
- Try some physics analysis (advise?)

backup

Energy reconstruction

Semi-digital solution: 3 thresholds \longleftrightarrow NS1, NS2, NS3

Where: NS1 = number of hits exceeds the threshold 1 (0.2 MIP)
NS2 = number of hits exceeds the threshold 2 (5 MIP)
NS3 = number of hits exceeds the threshold 3 (10 MIP)

Reconstructed Energy: $E_{rec} = (a \times N_{S1} + b \times N_{S2} + c \times N_{S3})$

a, b et c optimum \longrightarrow Minimisation : χ^2

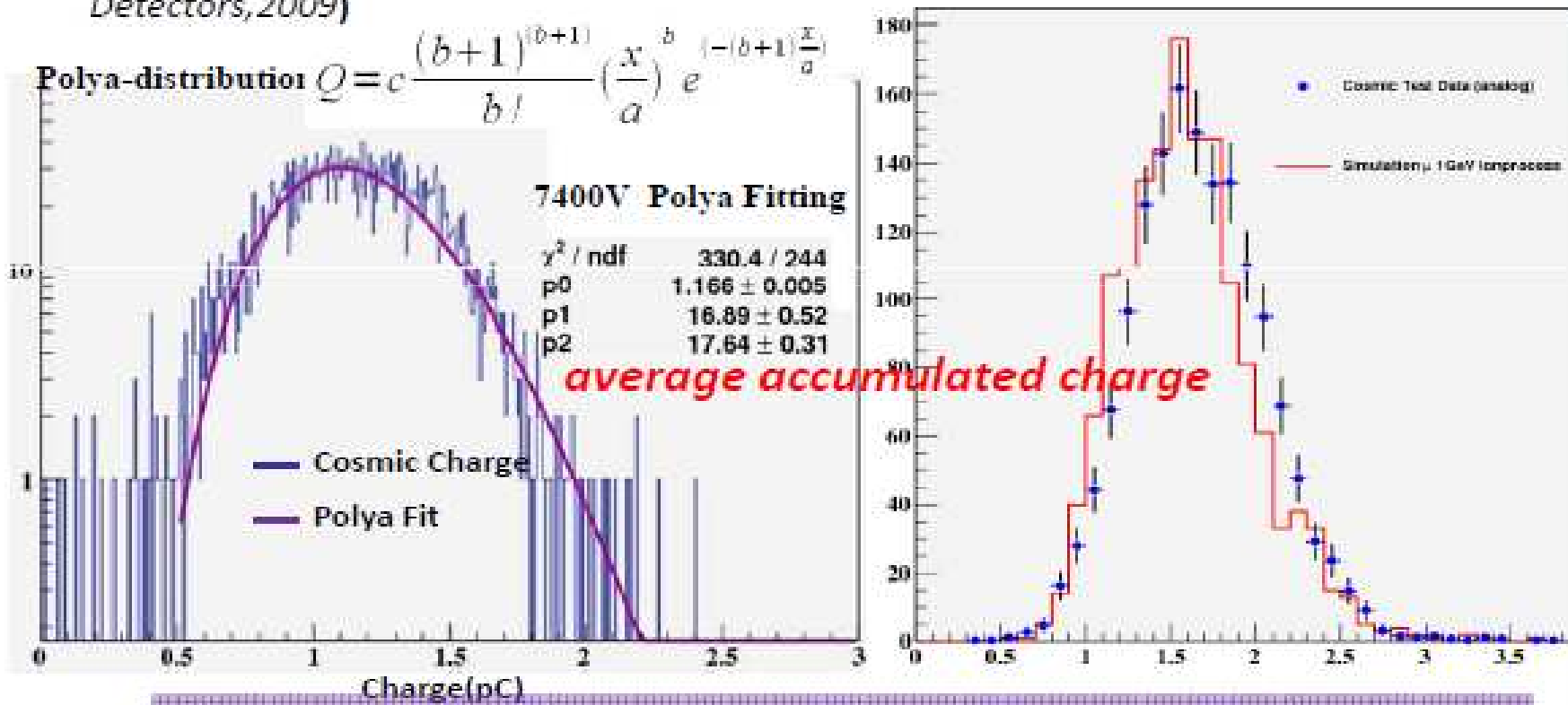
$$\chi^2 = \frac{1}{N} \times \sum_{i=1}^N \frac{(E_{beam} - (a \times N_{S1} + b \times N_{S2} + c \times N_{S3}))^2}{\sigma^2} + \frac{1}{N} \times \sum_{i=1}^N \frac{\sigma_k^2}{\sigma'^2}$$

Where :

$$\sigma_k^2 = \overline{(E_{rec} - \overline{E_{rec}})^2} \quad \overline{E_{rec}} = \sqrt{\frac{\sum_{i=1}^N E_{rec}}{N}}$$

Total Q Distribution

- 1: Simulate RPC physics process (first principle)
- 2: Get from data , **extract parameters in Polya function from Data** (F.Sulia, Gas Detectors, 2009)



Next : pad multiplicity— number of hit pads for one track going through
 Charge in each pad ----The charge density distribution

- The file in init.macro like
 - /Mokka/init/detectorModel ILD_01pre00
 - /Mokka/init/EditGeometry/rmSubDetector SHcalSc03
 - /Mokka/init/EditGeometry/addSubDetector SHcalRpc02 110 (TESLA)
 - #/Mokka/init/EditGeometry/addSubDetector SHcalRpc01 110 (VIDEAU)
- #/Mokka/init/globalModelParameter Hcal_sensitive_model scintillator
- /Mokka/init/globalModelParameter Hcal_sensitive_model SDRPC
- /Mokka/init/globalModelParameter Hcal_cells_size 10
- /Mokka/init/initialMacroFile mac.mac
- /Mokka/init/lcioFilename pion.slcio
- /Mokka/init/MokkaGearFileName pion.xml

Single muon Check: Geometry Correct

