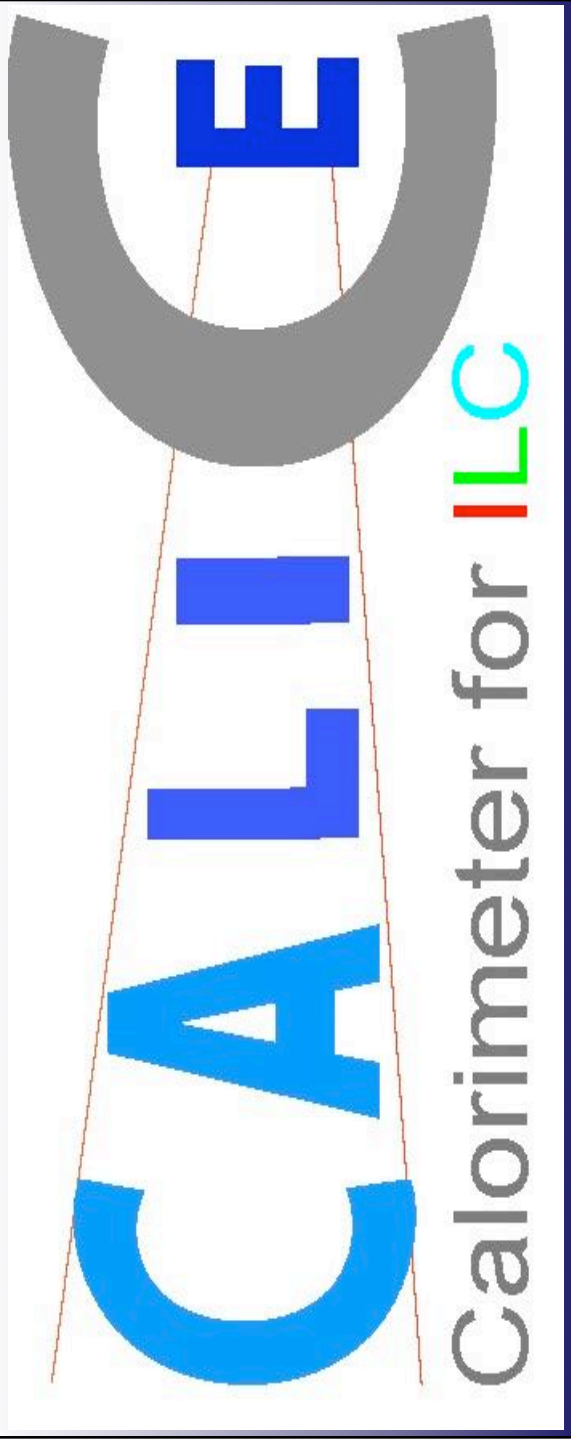

Close Look to Systematic Uncertainties for the Electron Analysis

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Clermont Ferrand

ECAL Paper Status - referee's complaints:

- no absolute uncertainty on the beam energy scale was taken into account

=> quote the discrepancy in offset between MC and data as uncertainty on the beam energy scale

- the stochastic term in the energy resolution is better for data than for MC

=> show that they are compatible within the systematic uncertainties (imposes that we quote an overall systematic uncertainty)

Several sources of systematic uncertainties were discussed in the paper:

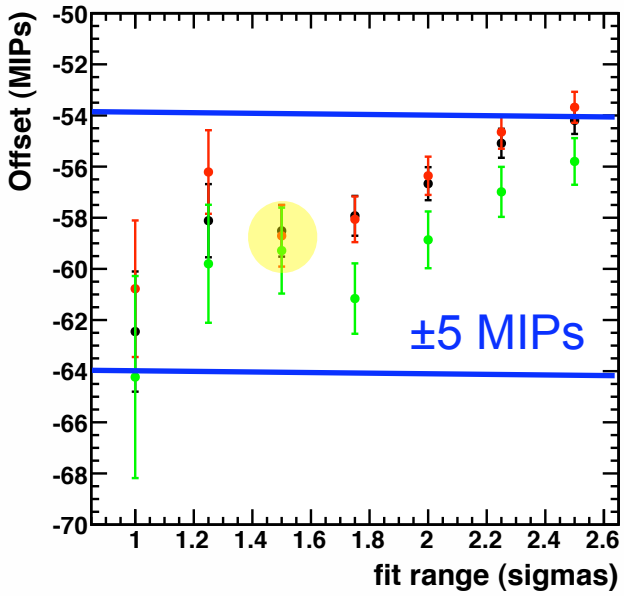
- minimal distance of the shower barycenter to a gap to accept the event (d_{gap})
- fitting range for the recorded energy in the ECAL
- rejection of the electrons radiating in front of ECAL (T_{max})
- imperfect knowledge of the beam energy
- threshold on the hit energy

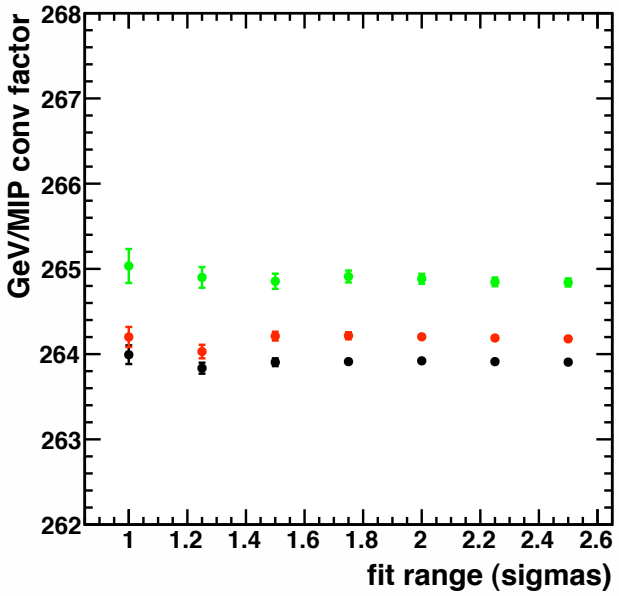
Some others were not ....

- ECAL calibration
- detector description in the Monte Carlo (material budget, electronics description, etc)

... and I would prefer not to discuss them

D_{gap} & fitting range

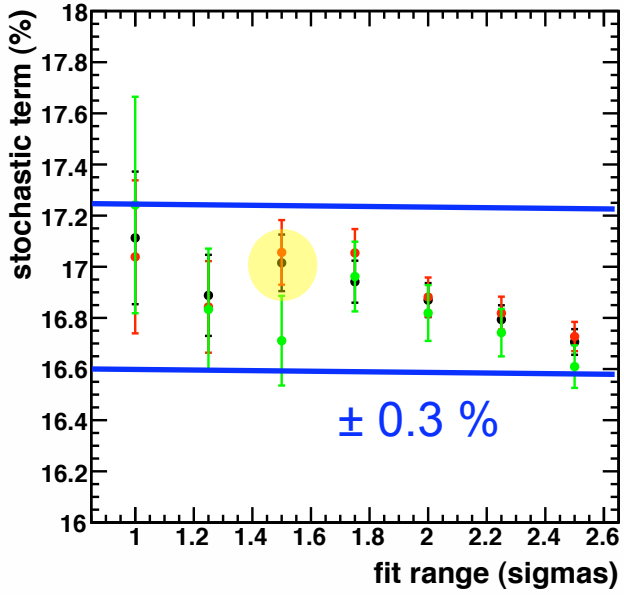


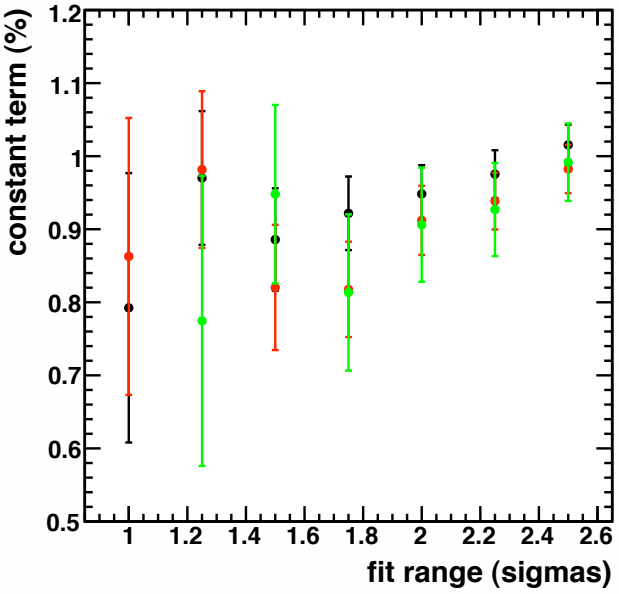


$d_{gap}>3.5\sigma_{gap}$

$d_{gap}>4\sigma_{gap}$

$d_{gap}>5\sigma_{gap}$

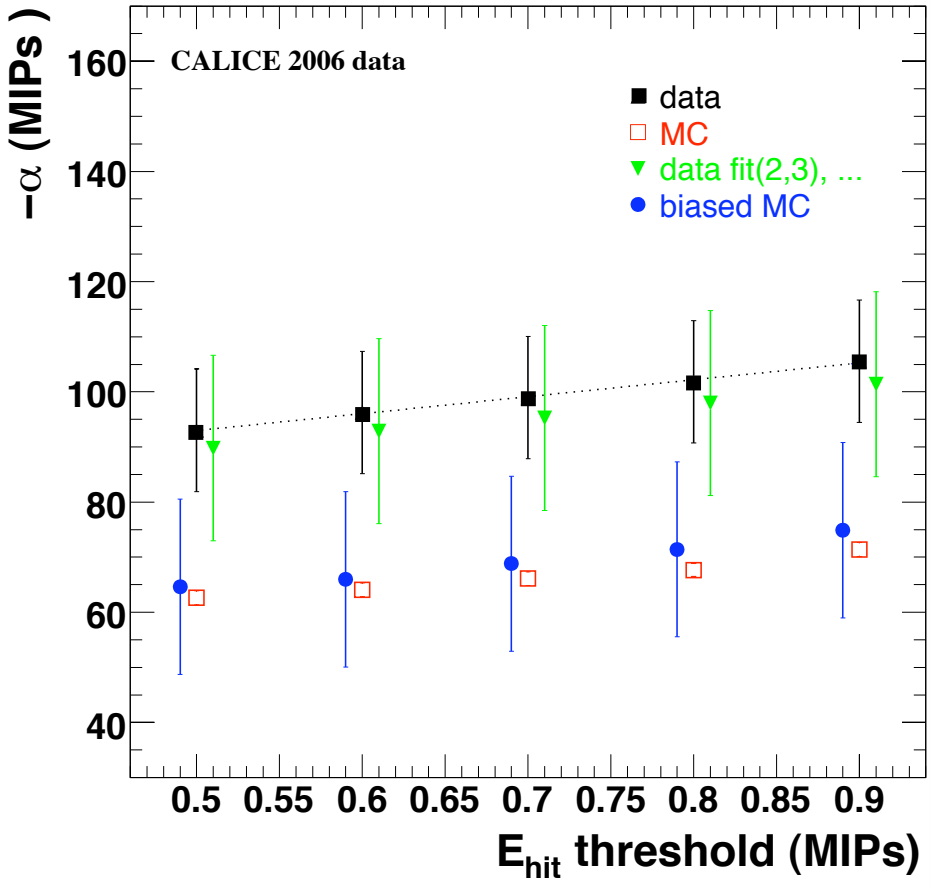


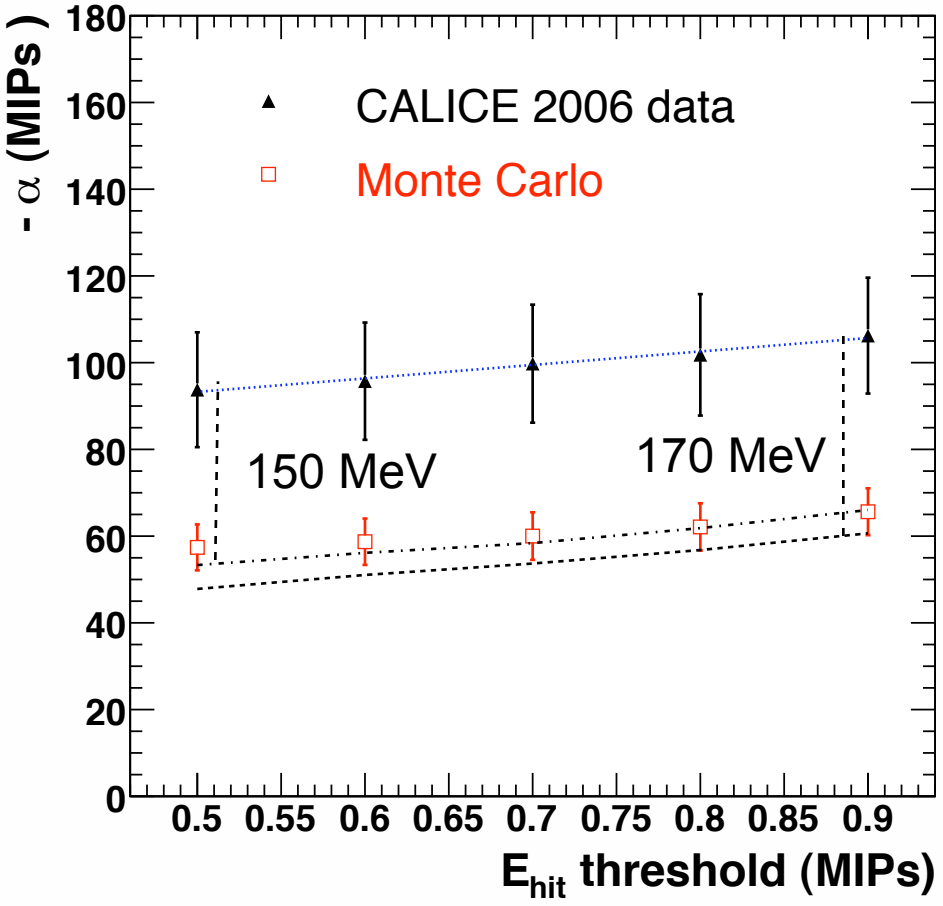


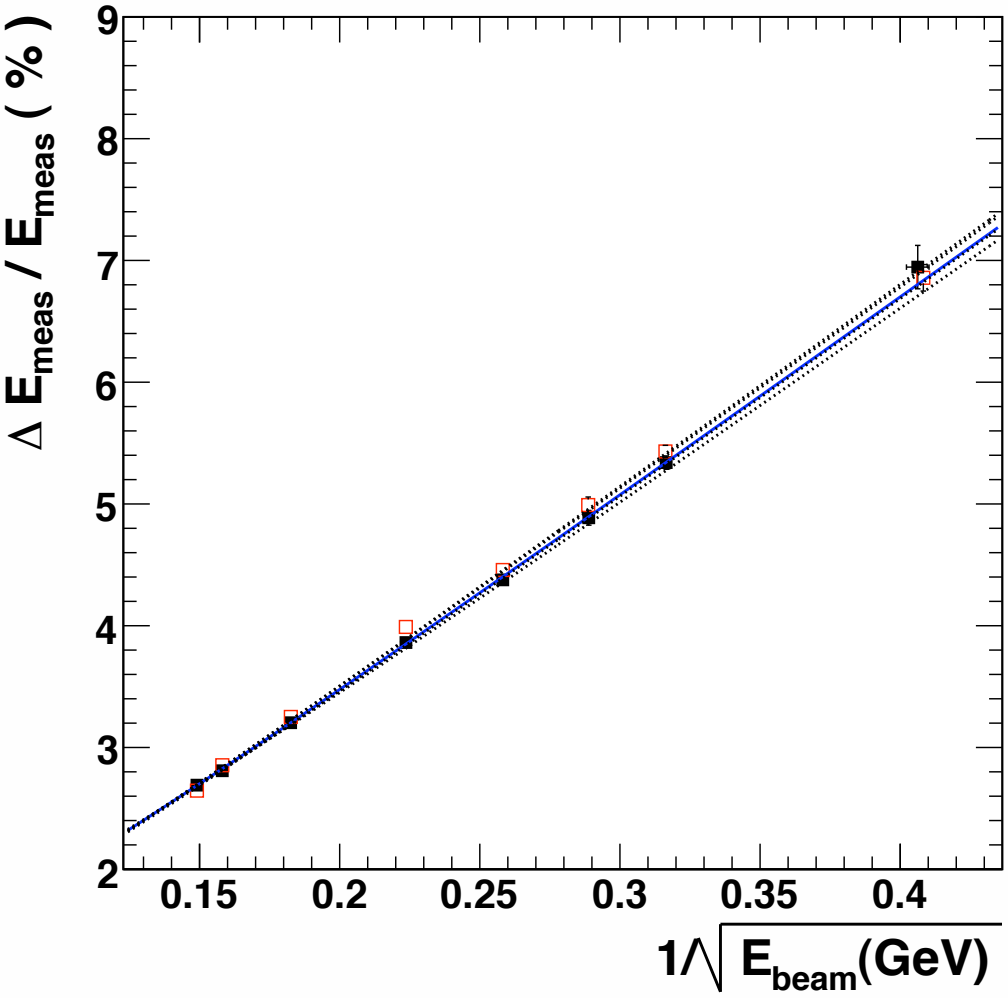
Summary of the systematic uncertainties (data & MC)

syst	beam en (rel)	Tmax	d_{gap}&range	thresh E_{hit}	
offset	1.9	5.55	5	3	
		1.46	5	1.3	
stochastic	?	0.24	0.3	0.04	0.38
		0.26	0.3	0.02	
ct	?	0.01	0.1	0.01	
		0.2	0.1	0.02	

Offset & absolute beam-energy scale





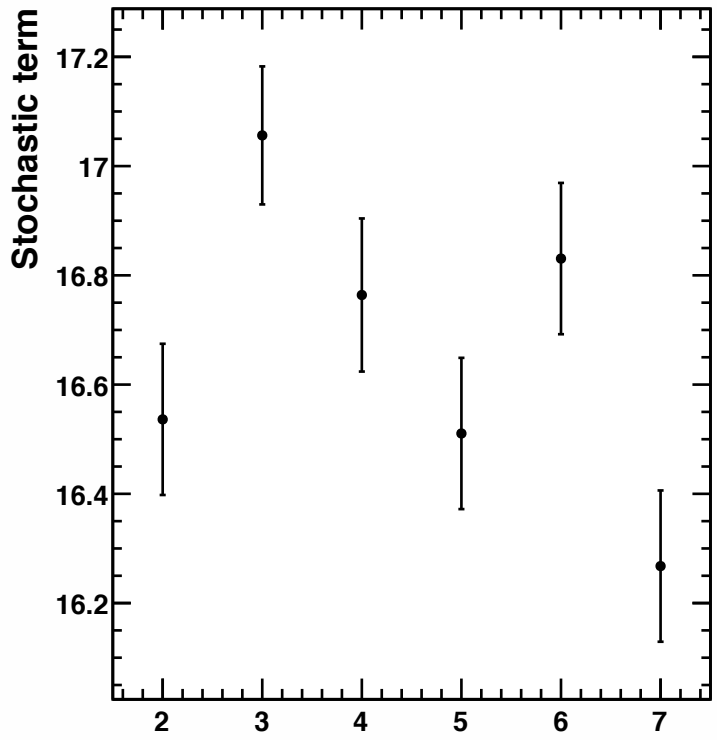


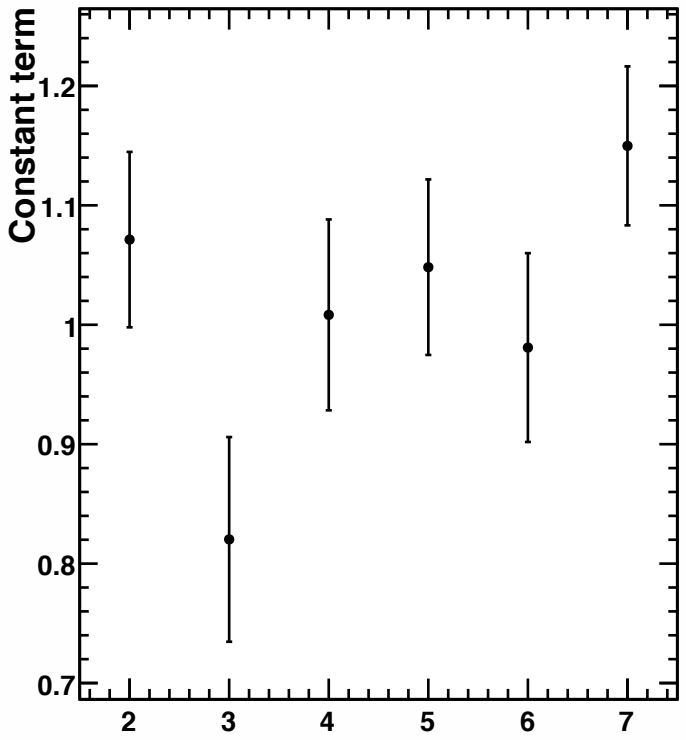
blue line: resolution fit for data

black (dotted) lines: resolution fit when changing the beam energy scale by +/- 300 MeV

$$\frac{\Delta E}{E}\,(\%) = \frac{16.53 \pm 0.14}{\sqrt{E\ (\mathrm{GeV})}} \oplus (1.07 \pm 0.07)$$

$$\frac{\Delta E}{E}\,(\%) = \frac{17.06 \pm 0.13}{\sqrt{E\ (\mathrm{GeV})}} \oplus (0.82 \pm 0.09)$$





1: data
2: MC
3, 4: beam energy scale +/- 150 MeV
5, 6 : beam energy scale +/- 300 MeV