Profile fitting method: -works best at high energy
-only method

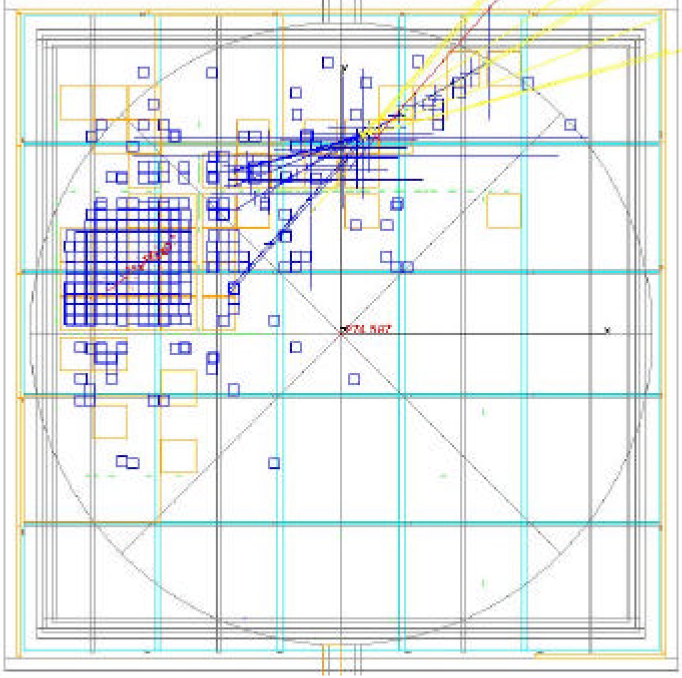
Allows one to use only part of the information: « sampling » of the shower profile.

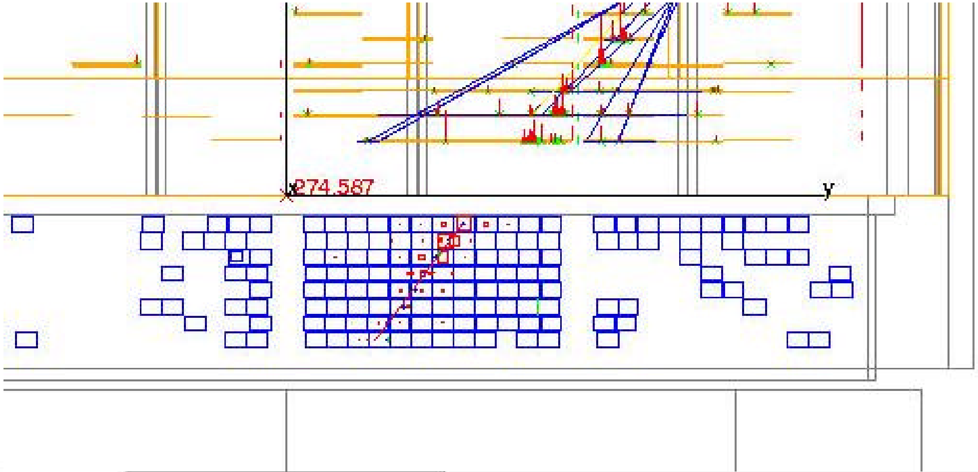
Incomplete gamma function: $$E(i) = \frac{E_0 b}{\Gamma(a)} \int_{x_i}^{x_{i+1}} (bx)^{a-1} \exp(-bx)\, dx$$

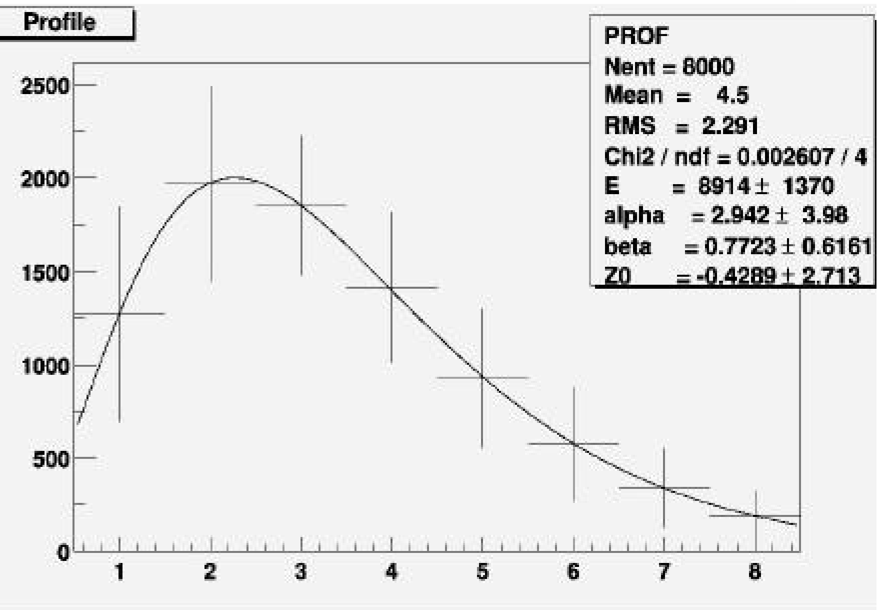
Régis fitted the shower profiles to determine the distributions for a and b as a function of E and angle, and then used the so-found distibution modes a(cos(θ),E), b(cos(θ),E) for the reconstruction.
The profiles were then fitted using these dependences, leaving only E_0 and x_0, the initial vertex location, as free parameters.

Purpose of the current work: just test ideas, no optimization.
The initial fitting (10 GeV) uses the nominal depences of a and b on the energy taken straight from the Particle Data Book, leaving E_0 and x_0, as free parameters. Only provision for angle: $b = b_{\theta=0}/\cos(\theta)$.
At 1 GeV: 1-fit parameter E (x0 taken from TKrRecon).

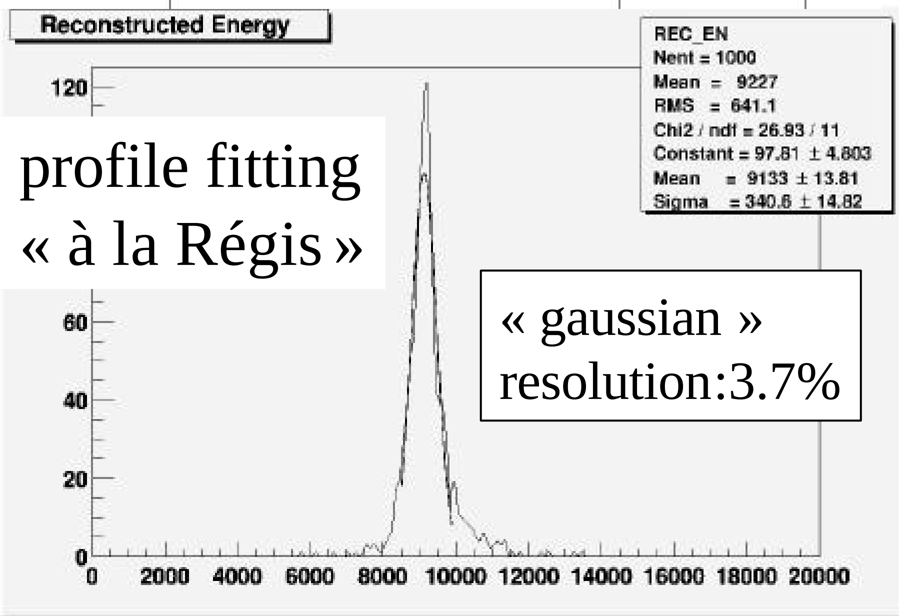
10 GeV gamma θ=60° ϕ=30° no crack



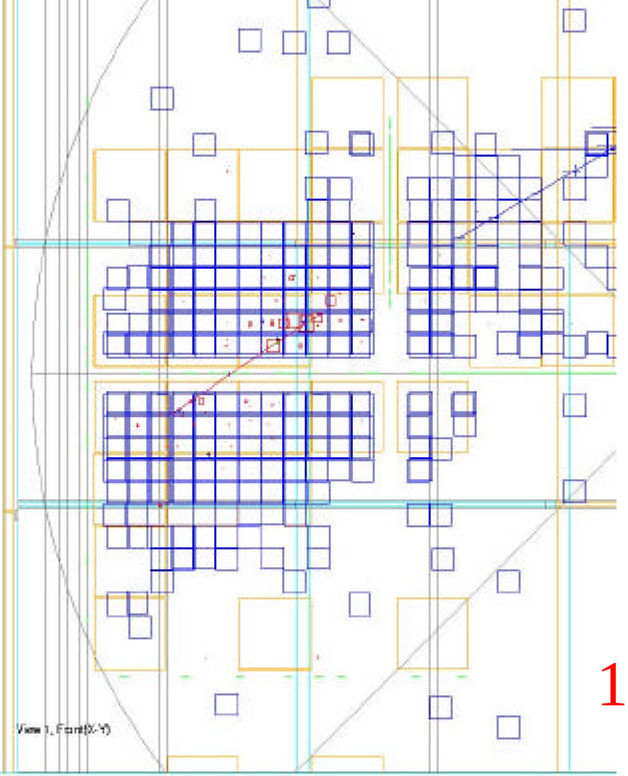


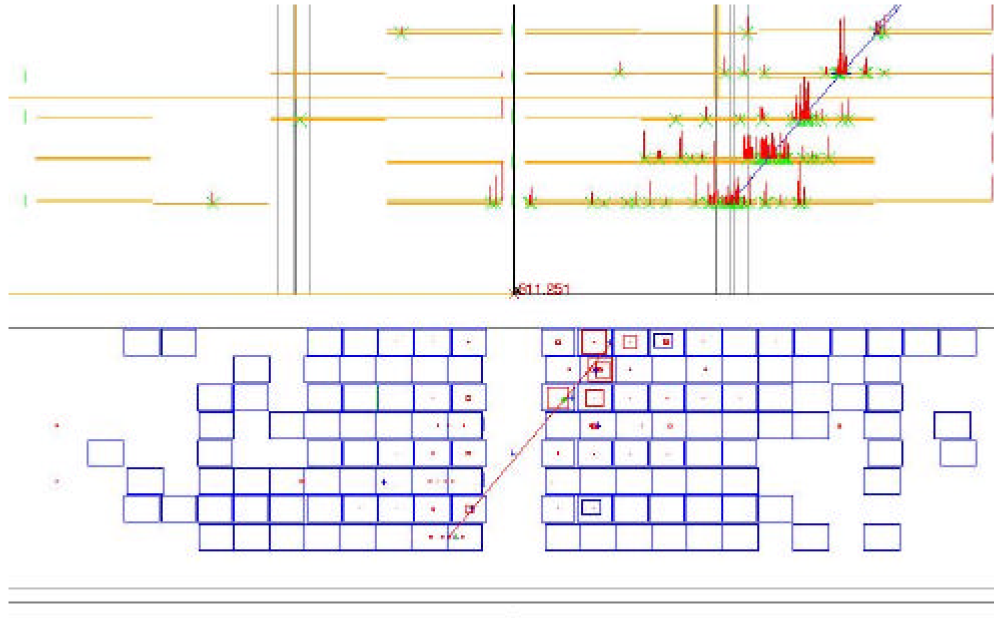


profile fitting
« à la Régis »

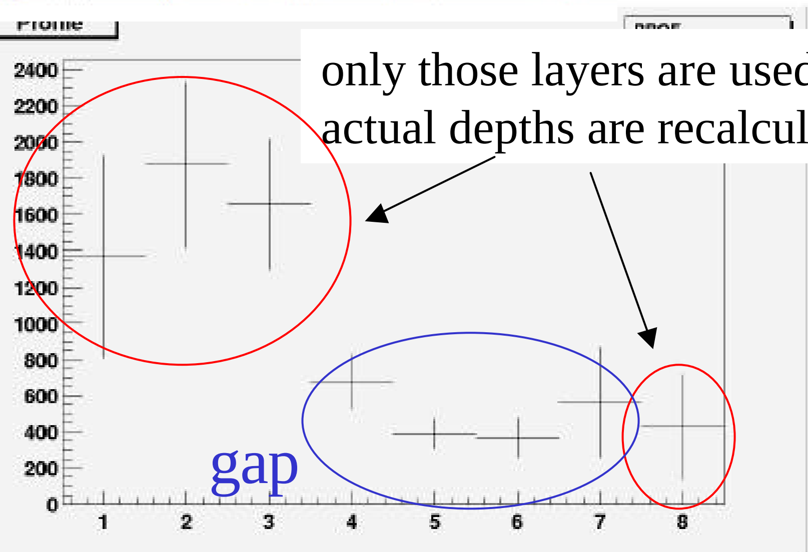


« gaussian »
resolution:3.7%



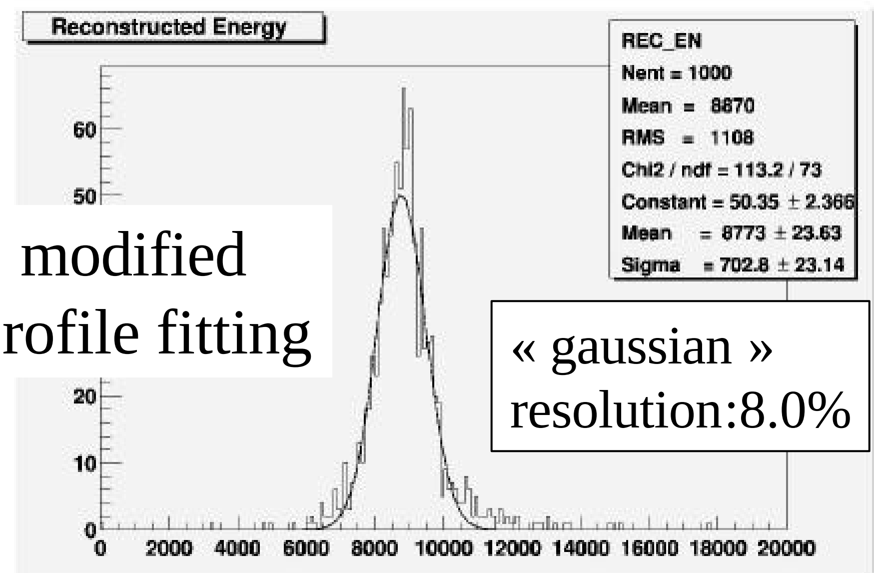


10 GeV gamma θ=60° ϕ=30° crossing a crack!



only those layers are used + actual depths are recalculated

gap



modified profile fitting

« gaussian » resolution:8.0%

At great distances beyond the gap,the deposited energy should be the same with or without gap, at a given depth: the particles that escaped through the gap have large angles, i.e. low energy and won’ t contribut to the shower development: all the truer for high energy showers.

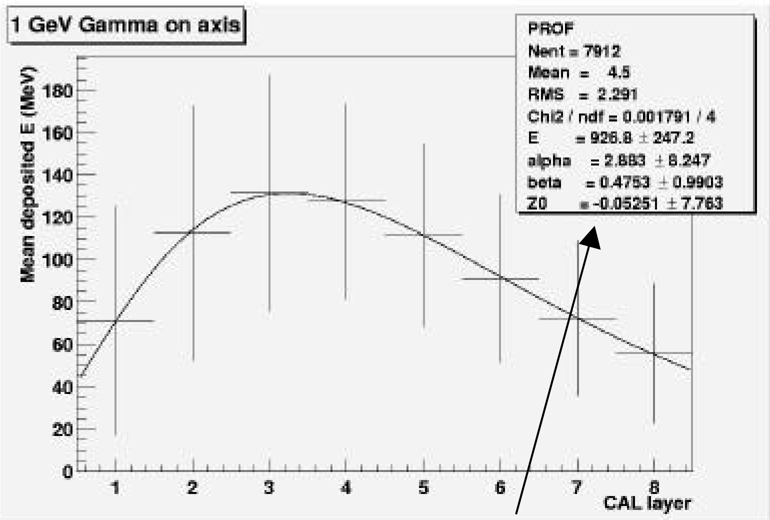
Recent development:

- calculate the distances between the shower core to the gaps for each layer
-calculate the effective depth of the shower within the calorimeter akin to « propagator ».
-look at lower energies: 1 GeV gamma-rays.

Problems at low energy: - significant loss in the tracker
- lateral extension larger
- « squeezed »longitudinal profile

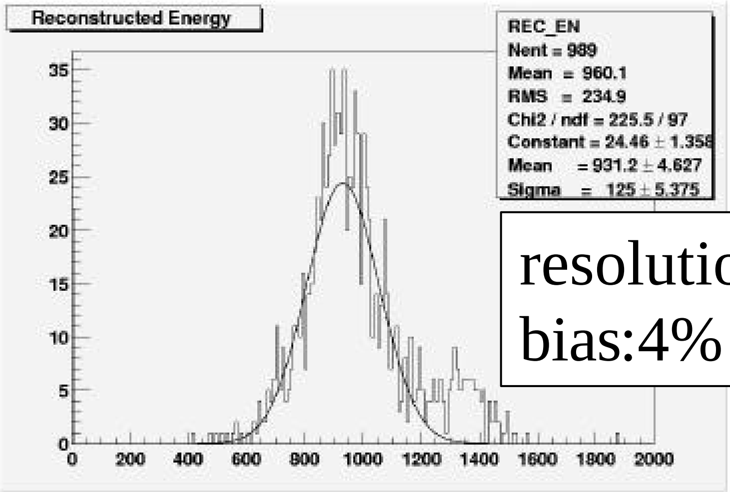
At large angles, the profile is not well fitted by a gamma function.

1 GeV Gamma on axis

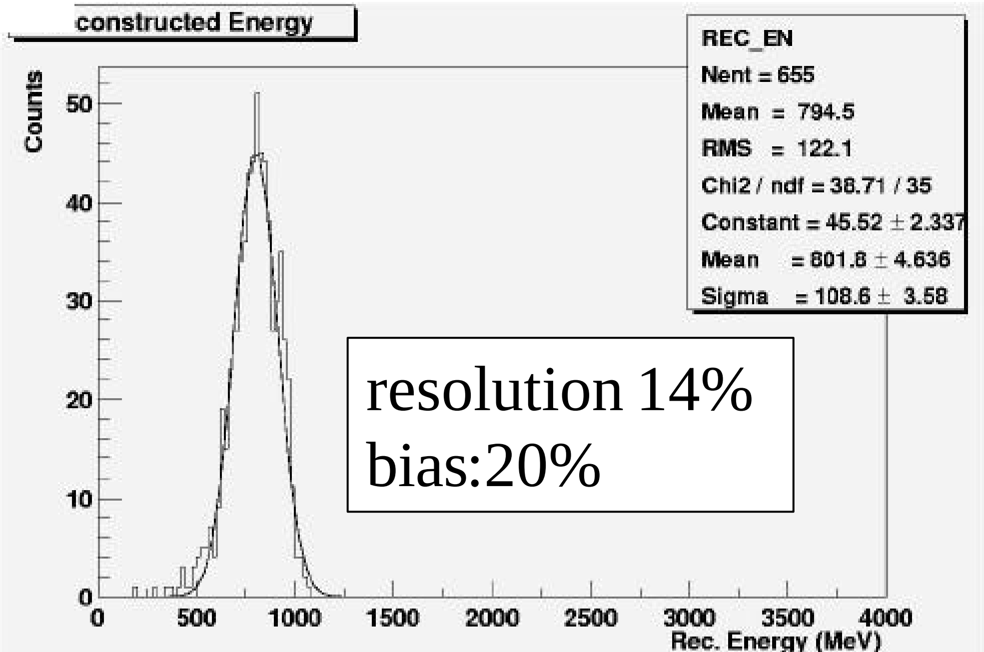


Fitted coefficients similar to those actually used a=3.5, b=0.5 at 1GeV

E reconstructed using a 2-parameter fit: E, x_0
In some cases, x_0 unphysical



1-parameter fit: E
a(E), b(E) as before
x0 taken from TkrRecon



1 GeV Gamma θ=60° φ=30° 1-parameter fit