Calorimeter Intercalibration

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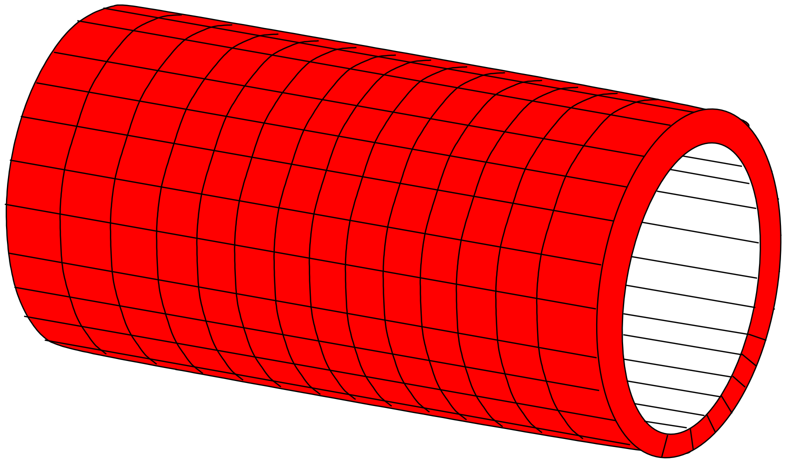
Calibration Meeting

- Final shape of intercalibration.
- Last tests and results.

Storage of the events



Following the calorimeter structure :

A layer $\longleftrightarrow$ ICLayer.

A cell $\longleftrightarrow$ ICVirtualCell

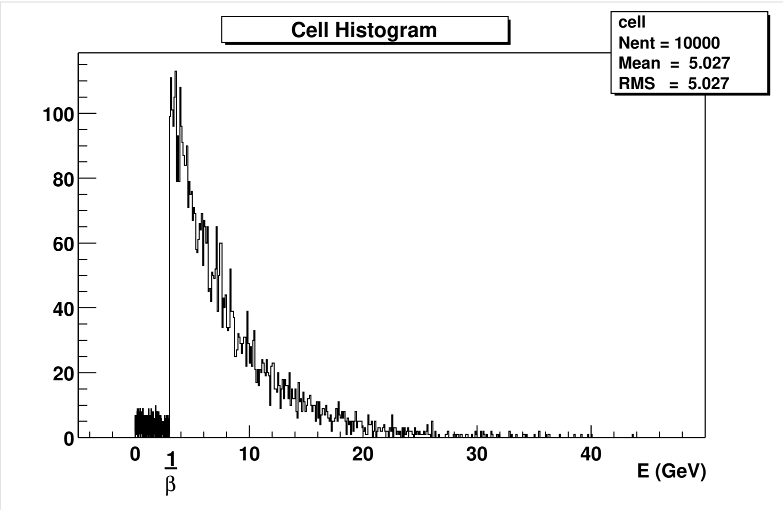
Our derived class from ICVirtualCell contains

- position of the cell (η, ϕ)
- A histogram which stores events' energy

Storage of the events

We can not store all recorded value one by one.

$\Longrightarrow$ Histograms.

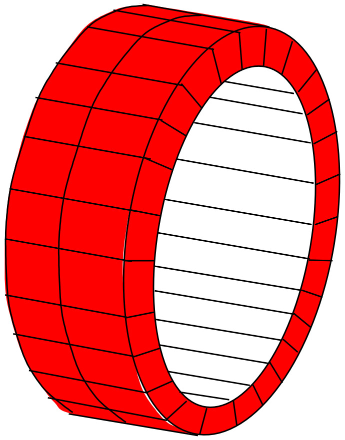


Histograms with variable bin size : small binning at low energy to have the most precise reconstruction.

For min. bias or inclusive QCD events we expect an exponential distribution : $\sim e^{\beta E}$

β (should be η-dependant) will be extracted from the datas.

Intercalibration tools



On each layer we define some rings (ICRing) which have ϕ symmetry.

ICRing (associated with a calibration method)

$\Downarrow$ (ϕ-subdivision)

ICUnit $\longleftrightarrow$ intercalibration constants.

$\Downarrow$

One or more ICVirtualCell.

Summary

With high statistic :

- A ICUnit contains only 1 cell
- Each cell has its own intercalibration constant
- Each cell is intercalibrated with other cells at same η, same layer.

With low statistic :

- A ICUnit contains several cells.
- The Calorimeter is divided into blocks (the ICUnits) which are intercalibrated with other blocks in the same η range.

Calibration Methods

N method:

Equalizing a number of events above a threshold.

E method:

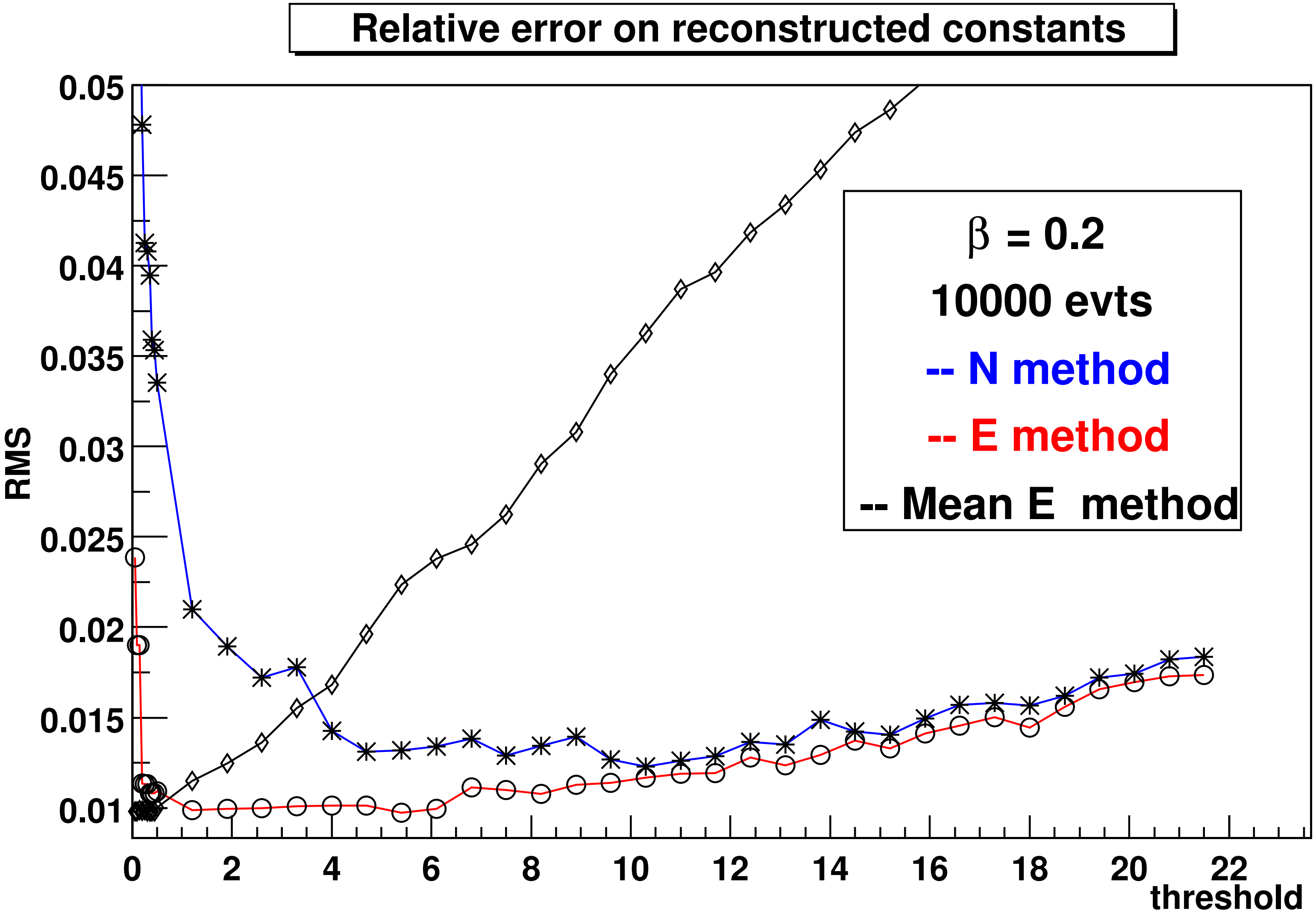
Comparing total amounts of energy above a threshold.

Mean E method:

Comparing Mean energies above a threshold.

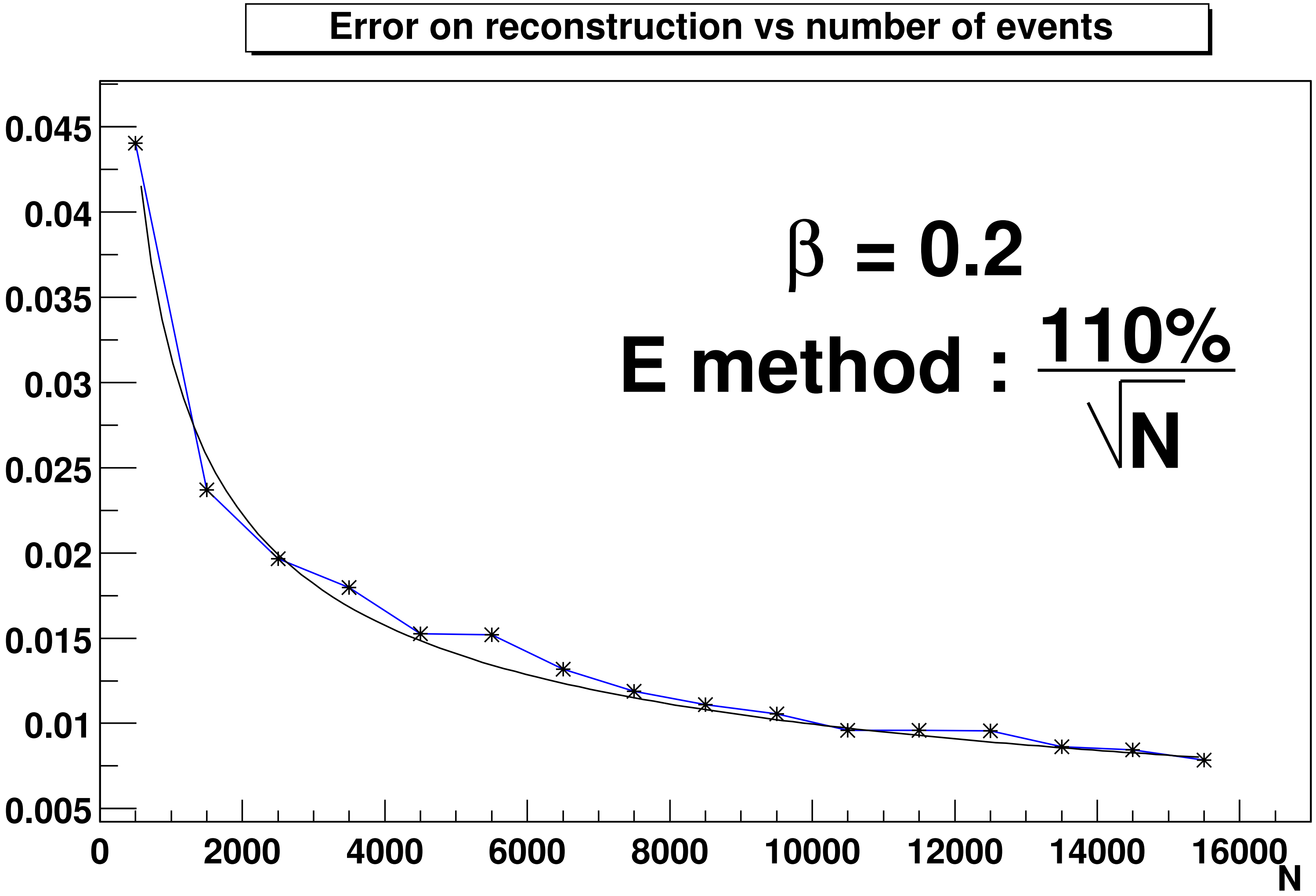
Methods were tested and compared on inclusive-QCD-like events (*i.e.* on a random exponential distribution)

Results


Relative error on reconstructed constants
RMS
threshold
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0
2
4
6
8
10
12
14
16
18
20
22
β = 0.2
10000 evts
-- N method
-- E method
-- Mean E method

N : total number of events

N_c : number of events above an energy cut E_c. $\Rightarrow N = N_c\, e^{+\beta E_c}$



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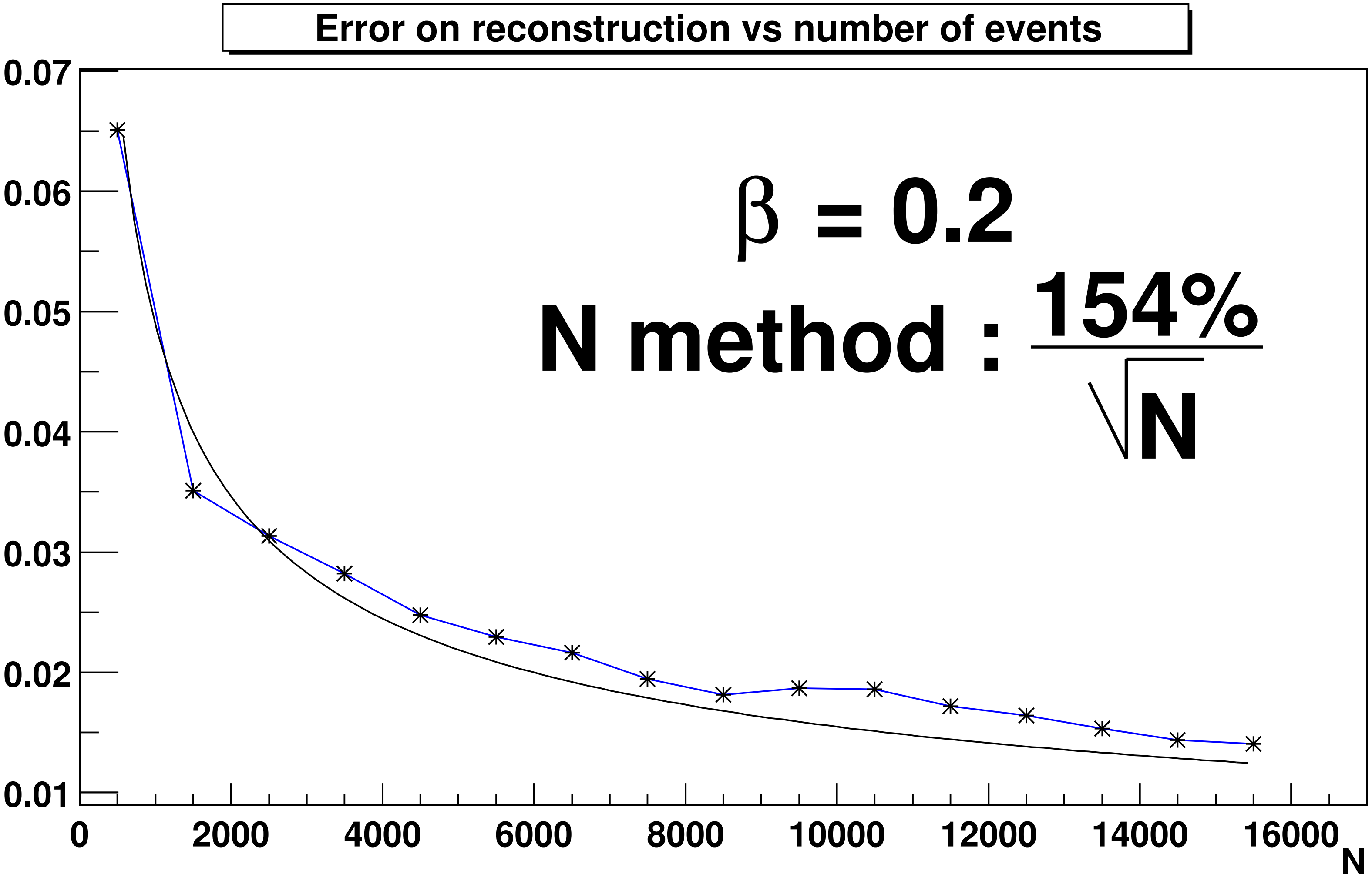
$$\Rightarrow N = N_c\, e^{+\beta E_c}$$



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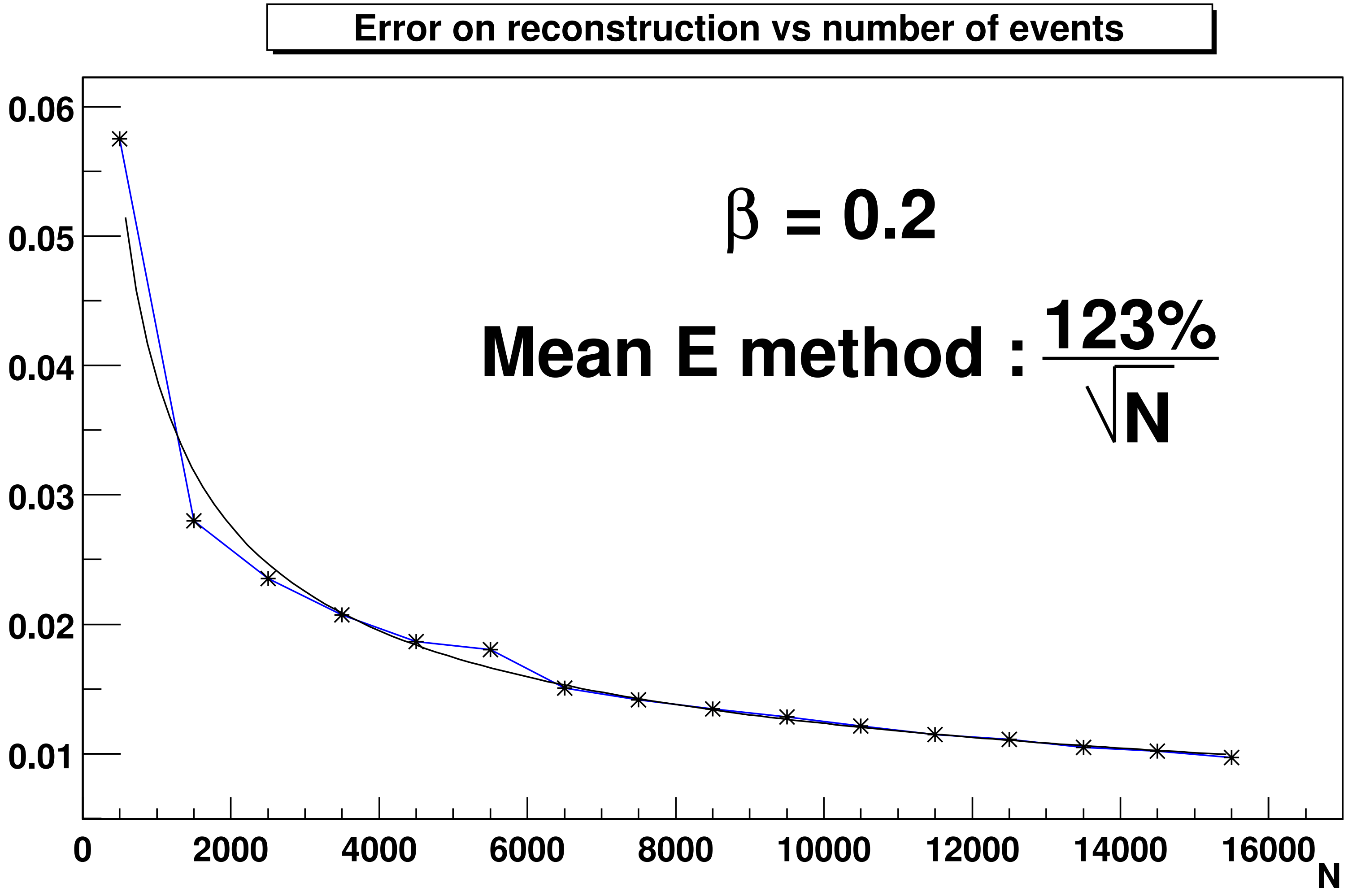
$$\Rightarrow N = N_c\, e^{+\beta E_c}$$



Conclusion

Intercalibration is almost ready, we need to:

- Implement the code in D0 framework. 2 possibilities :
  - Get the ICLayer from rootuples with calorimeter blocks (method is already working but needs huge amounts of disk space).
  - Get the ICLayer from reco files : need to write a special package.
- Test on MC events.
- Intercalibrate...(august 2001)