REDUCING THE MASS WITHOUT CHANGING THE VOLUME (geo. Acceptance)

Reduce Number of crystals
Increase the gaps

Reduce the size crystals (2.8*2.8)
Increase the gaps

Insert lighter scintillator cubes 1/N
NO GAP INCREASE

Or remove internal cubes

→ Non homogeneus calo

→ Reduction of depth (λ)

→ New hardware for different light output

REDUCING THE MASS WITHOUT CHANGING THE VOLUME (geo. Acceptance)

Reduce Number of crystals
Increase the gaps

Reduction of depth (λ)

Less interaction
Reduced effective acceptance

Less
sampling

less electron/proton discrimination

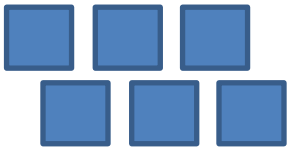
Less homogenus CALO
Less resolution

More leakage
Less resolution

Reduce the size crystals
Increase the gaps

Same problems except for the
decrease of sampling.

With large gaps the misallinemnt of the cubes increase resolution



Reduce Number of crystals
Increase the gaps

Mass reduction 20x20x20/(21x21x21) =0.86*1500kg
(-206kg)

Gaps + 1,5mm

5,5mm Z,Y 9,5mm in Z

Reduce the size crystals 2.8cm
Increase the gaps

Mass reduction = 0.81*1500kg (- 280Kg)
Gaps + 2mm

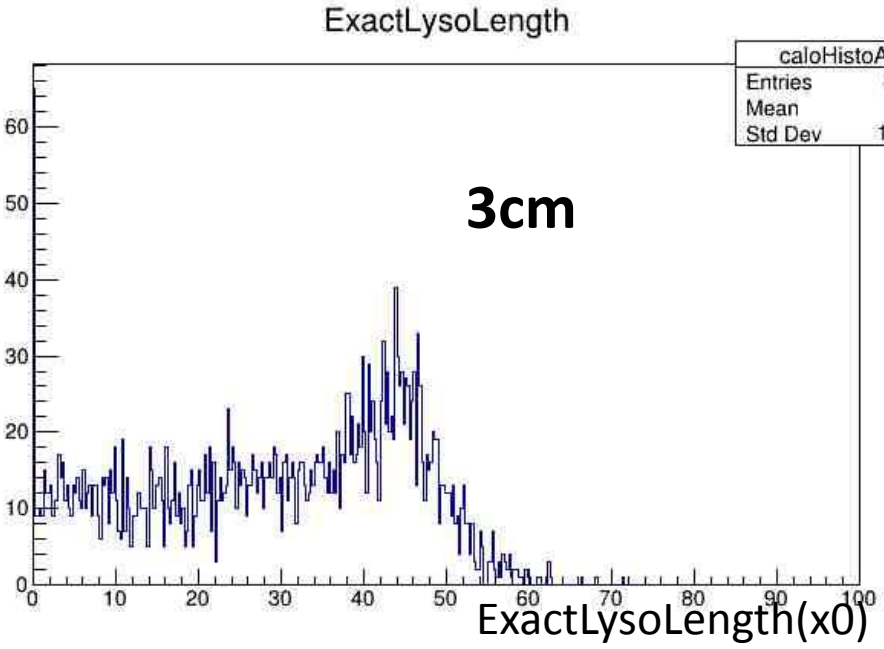
6mm Z,Y 10mm in Z

Less light in one cube (93% for the MIP)
Less space for fibers – no less than 2,8 cm ?

IN ANY CASE WE EXPECT VERY SIMILAR PERFORMANCE FOR GIVEN MASS REDUCTION

HERDSOFTWARE ALREADY ALLAO THE THE REDUCED SIZE OF CRYSTALS

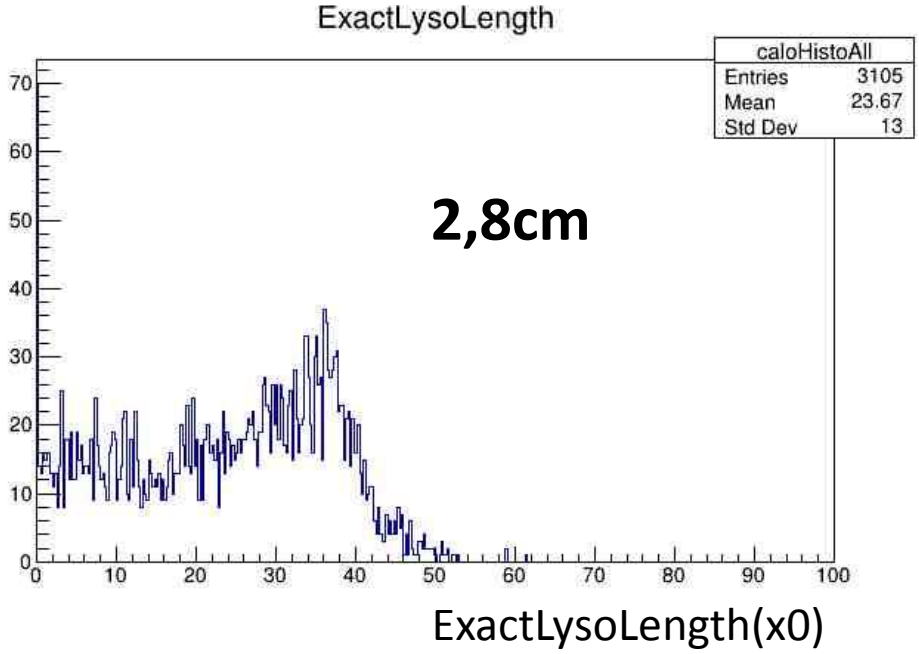
100 TeV protons - HerdSoftware



The average of ExactLysoLength(x0)

Is reduced from 29,3 to 23,67

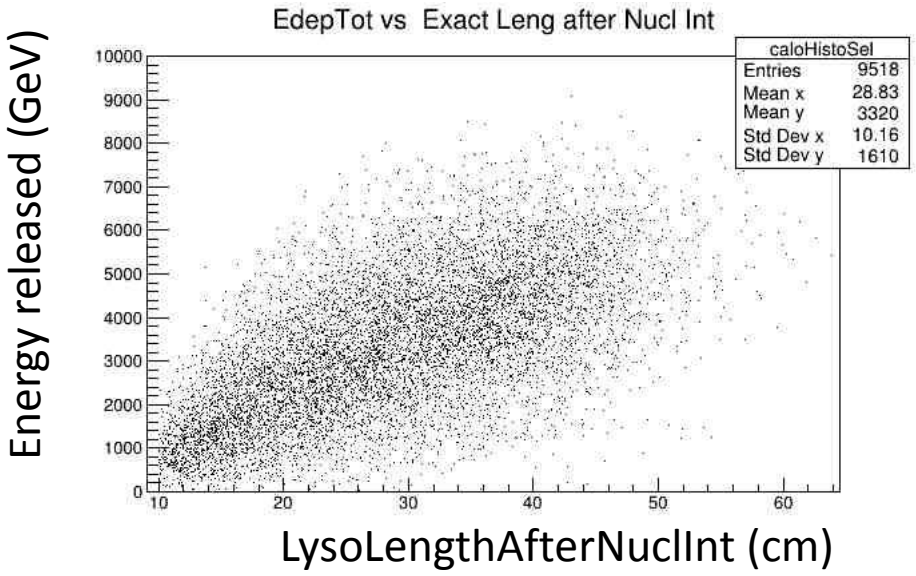
0.81 reduction factor , in accordance with reduced mass (and not by 2,8/3)

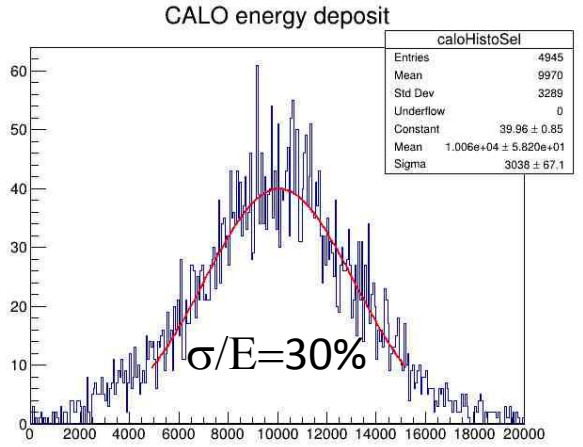


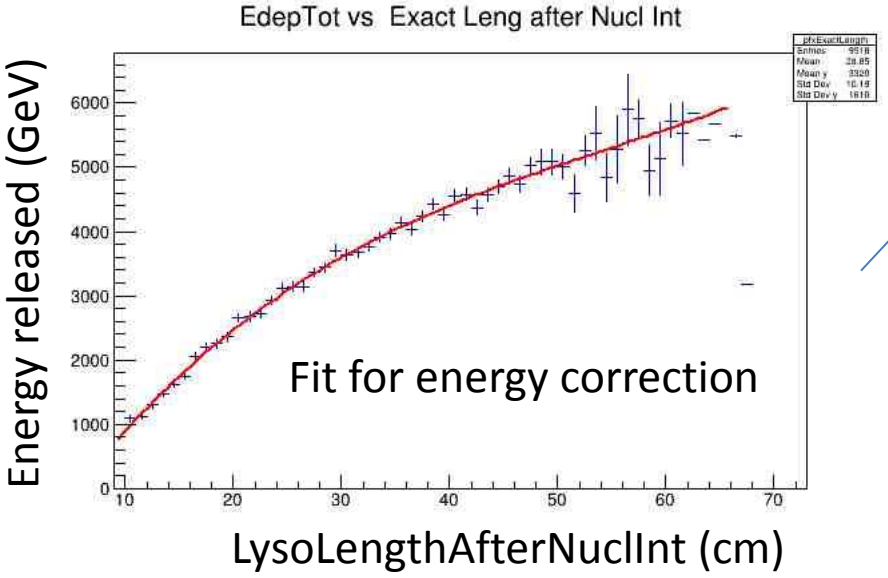
The fraction of INTERACTING PROTONS is reduced from 73% to 67%

This reduce ‘directly’ the effective acceptance by ≈10%

10 TeV protons - HerdSoftware **Standard 3cm configuration**







After correction, with
L*=LysoLengthAfterNuclInt>30cm

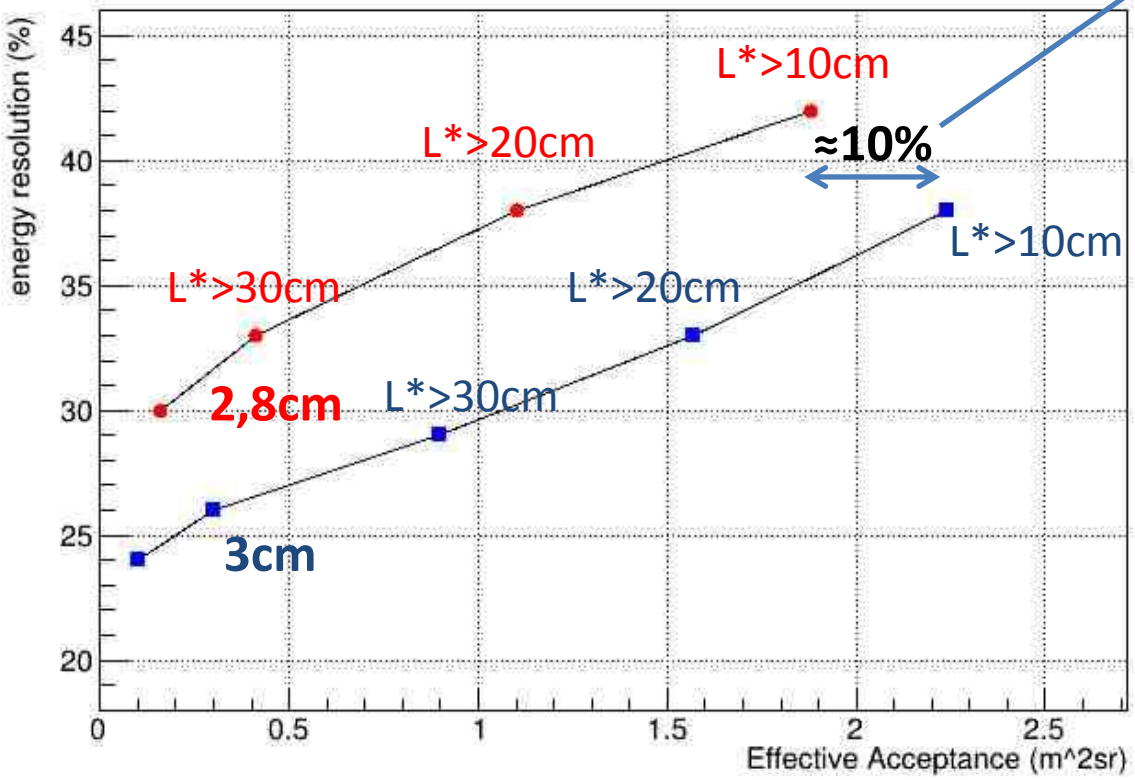
But with acceptance ≈1 m^sr
Only downward going particles

EFFECTIVE ACCEPTANCE CALCULATED FOR ONLY DOWGOING PARTICLES 5 FACES

GEOMETRIC ACCEPTANCE = 4,4 (m^2sr) (X **1,65**=7,28(m^2sr) for **every directions**)

10 TeV protons

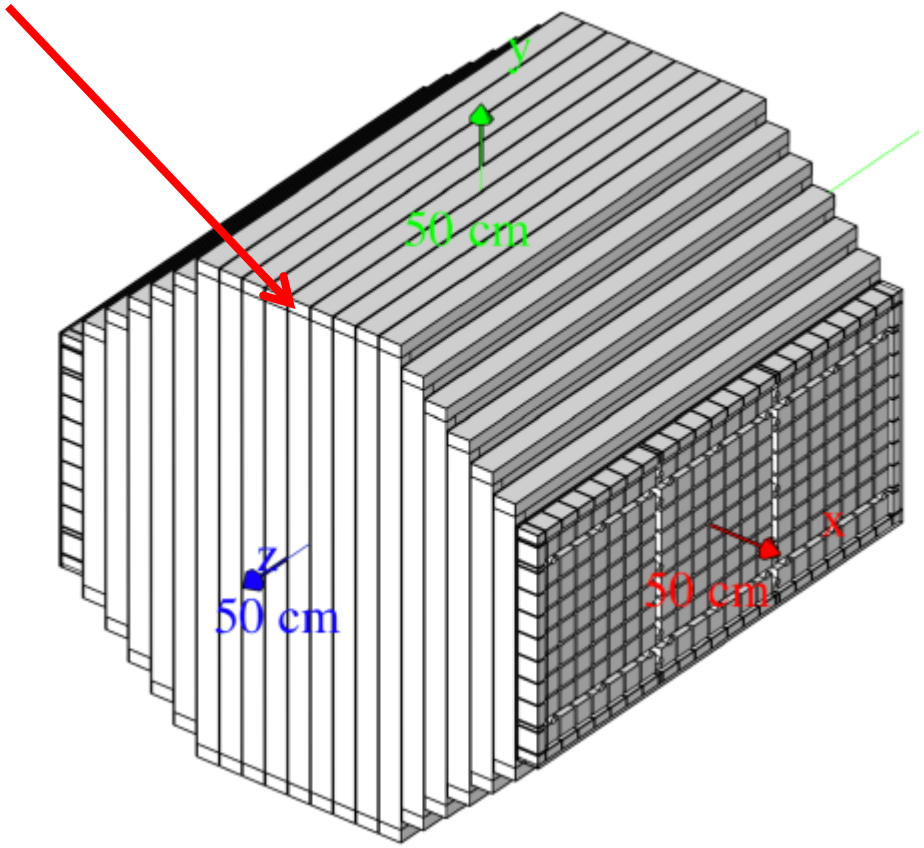
Almost given by different fraction of interacting protons

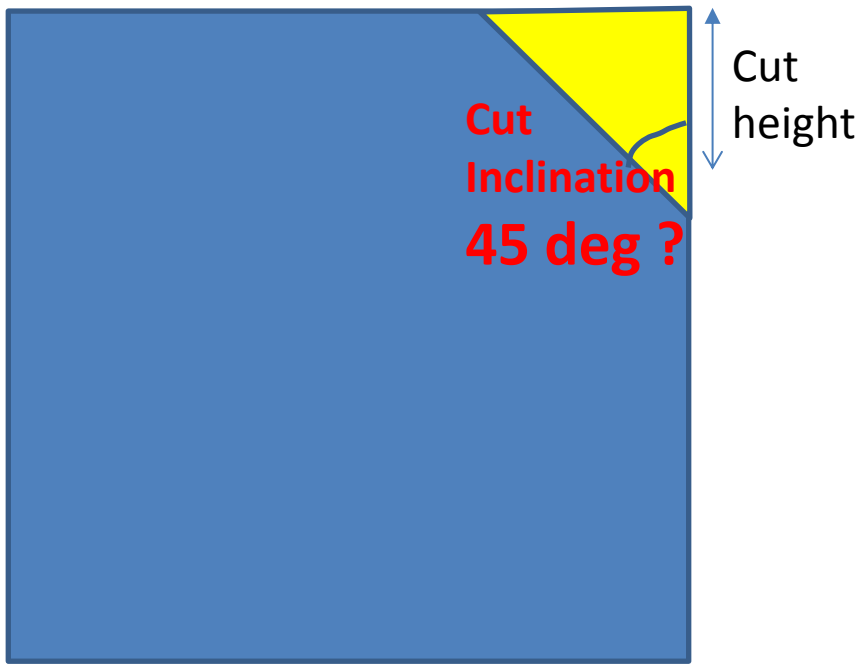


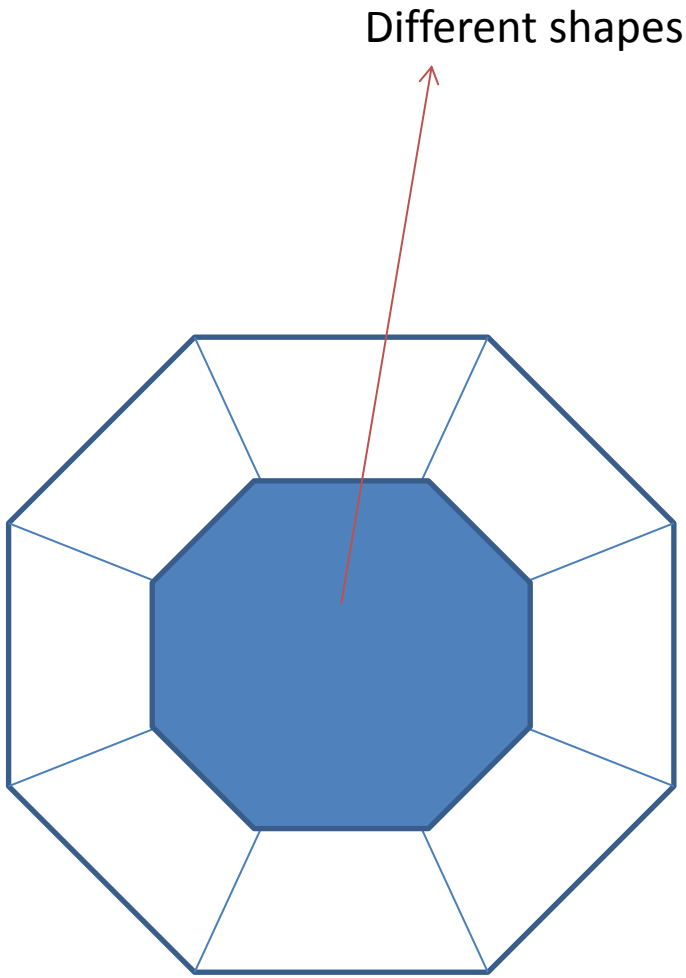
FOR CONSTANT ACCEPTANCE $\sigma/E(2{,}8\text{cm}) \approx \sigma/E(3\text{cm}) + 7\%$

REDUCING THE MASS <u>CHANGING</u> THE OVERALL VOLUME

CUT ALSO THESE EDGES ! → APPROACH A SPHERE ?




Cut
Inclination
45 deg ?
Cut
height


Different shapes ?

Old fluka simulation for cubic homogeneus calorimeter

Gap scaling WITH CONSTANT TOTAL MASS (lyso+mec)

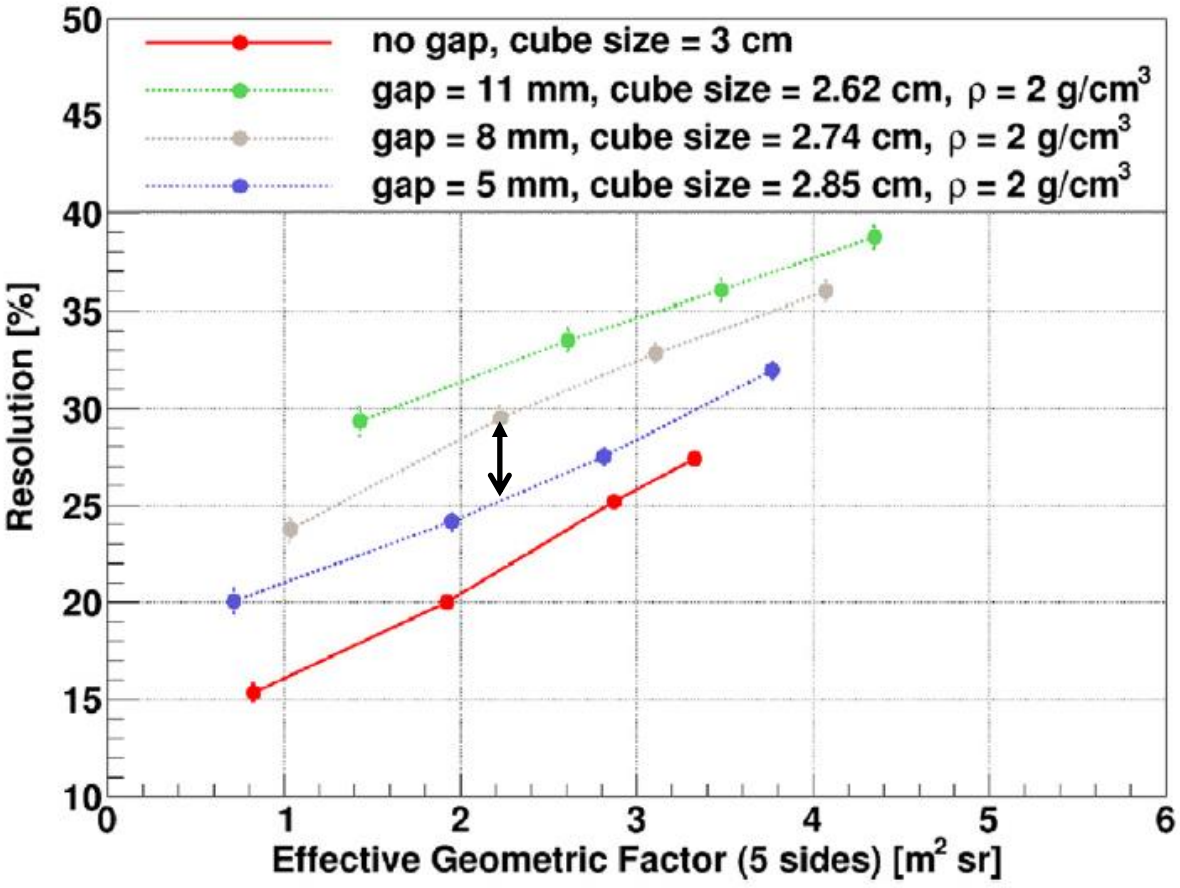


Fig. 8. Performance for 1 TeV protons in the case of 21 × 21 × 21 cubic calorimeter using LYSO cubes as scintillating material. Various configurations with different gap dimensions and crystal sizes, but constant total mass, are shown.

In herd , much of the gaps are 'empty'

So here we see more the effect of enlarged gaps

In our case the Situation degrade more