A first design of the PEP-N Calorimeter

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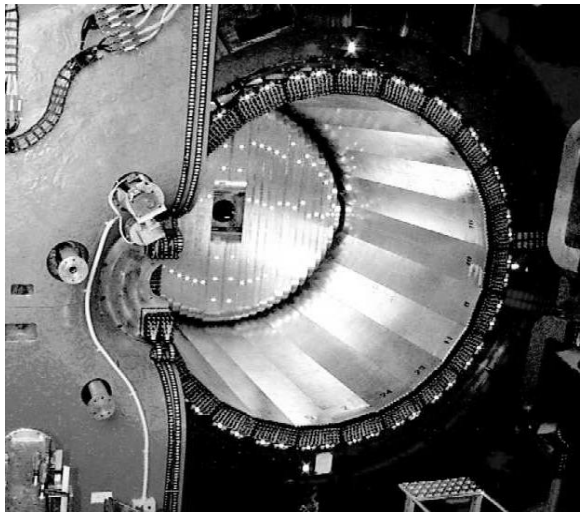
INFN

for PEP-N Calorimeter Group

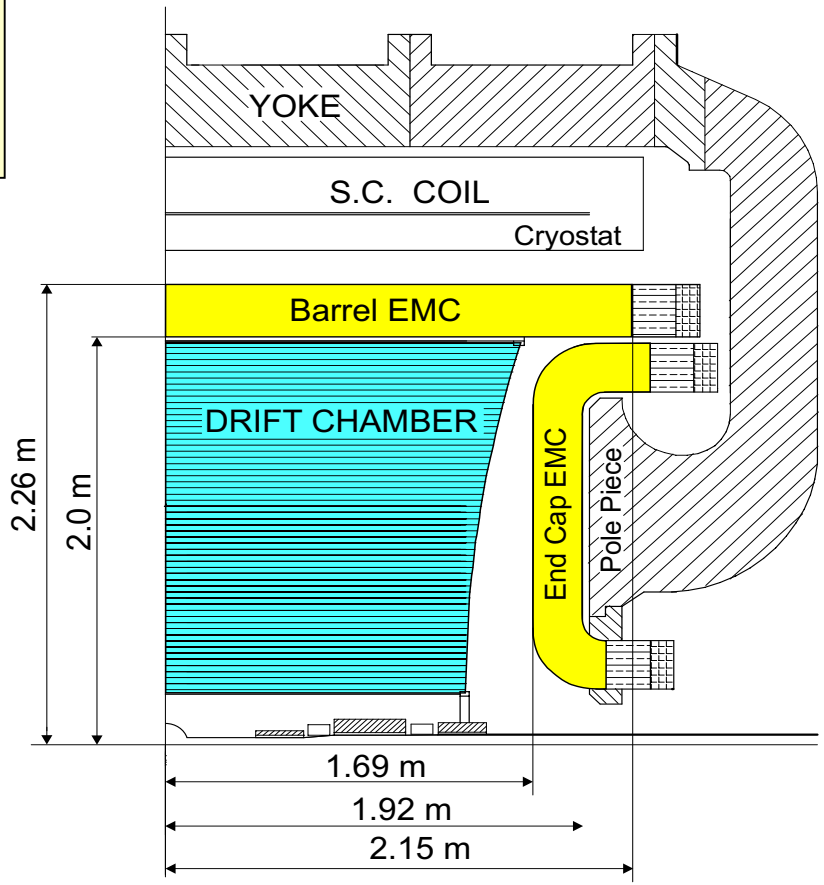
- Brief presentation of KLOE calorimeter
- Schematics of PEP-N calorimeter
- Simulations: reconstruction and TOF

KLOE CALORIMETER OVERVIEW

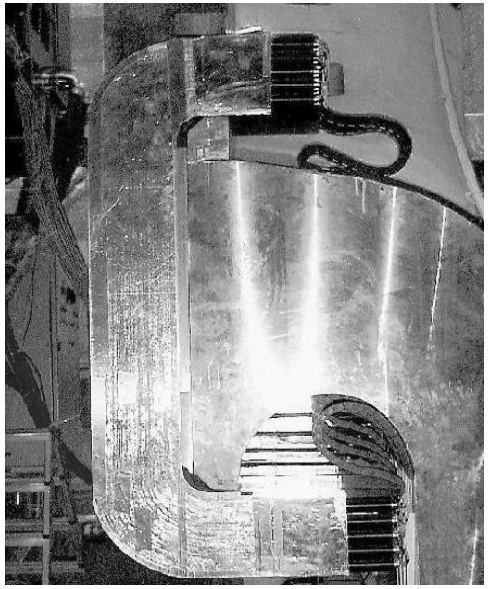
24 barrel modules
60 cells (5 layers)
4.3m length



2440 cells



2 × 32 endcap modules
10/15/30 cells



4880 channels

Fiber choice: Kuraray SCSF-81 and Pol.Hi.Tech 0046

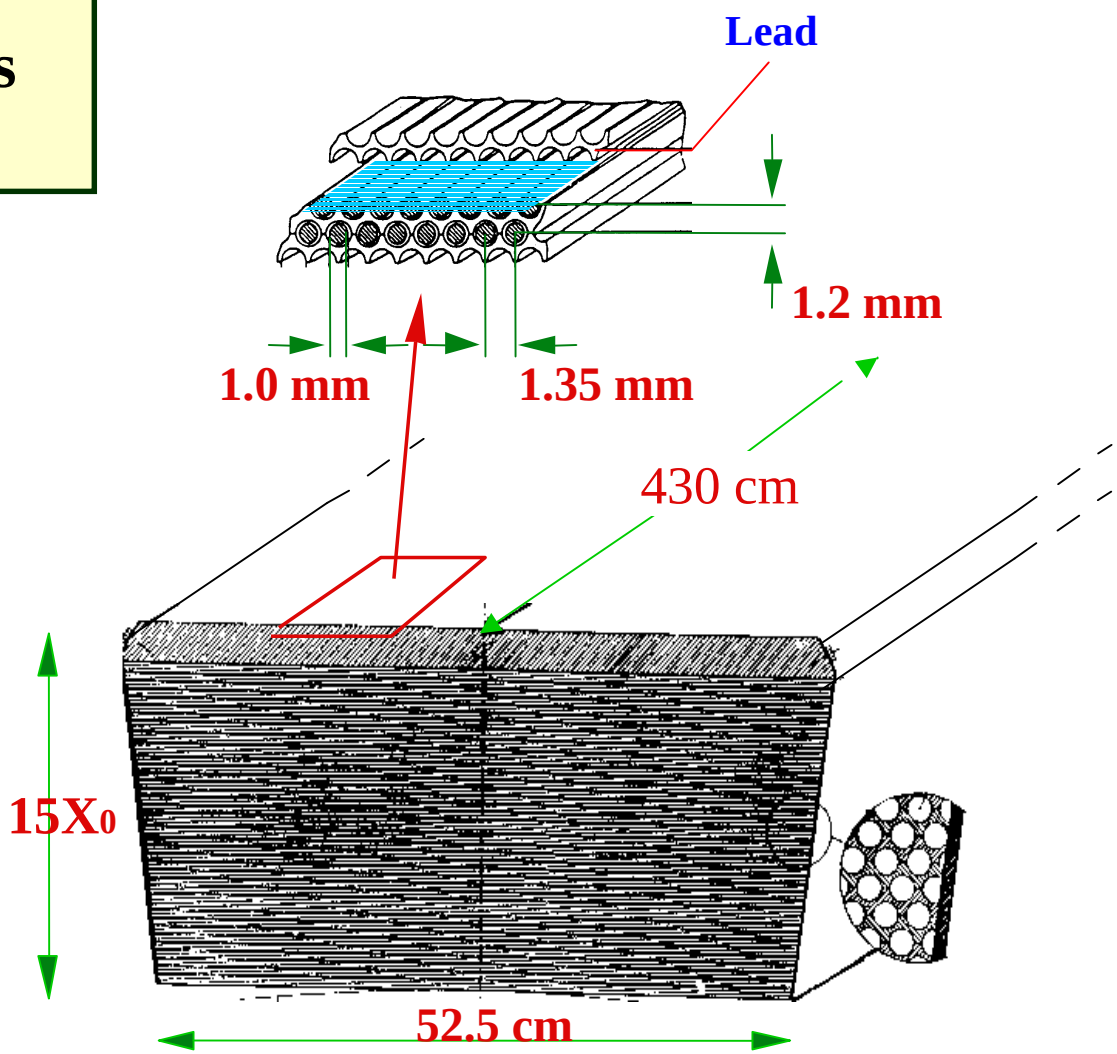
PM choice: Mesh Hamamatsu R5946

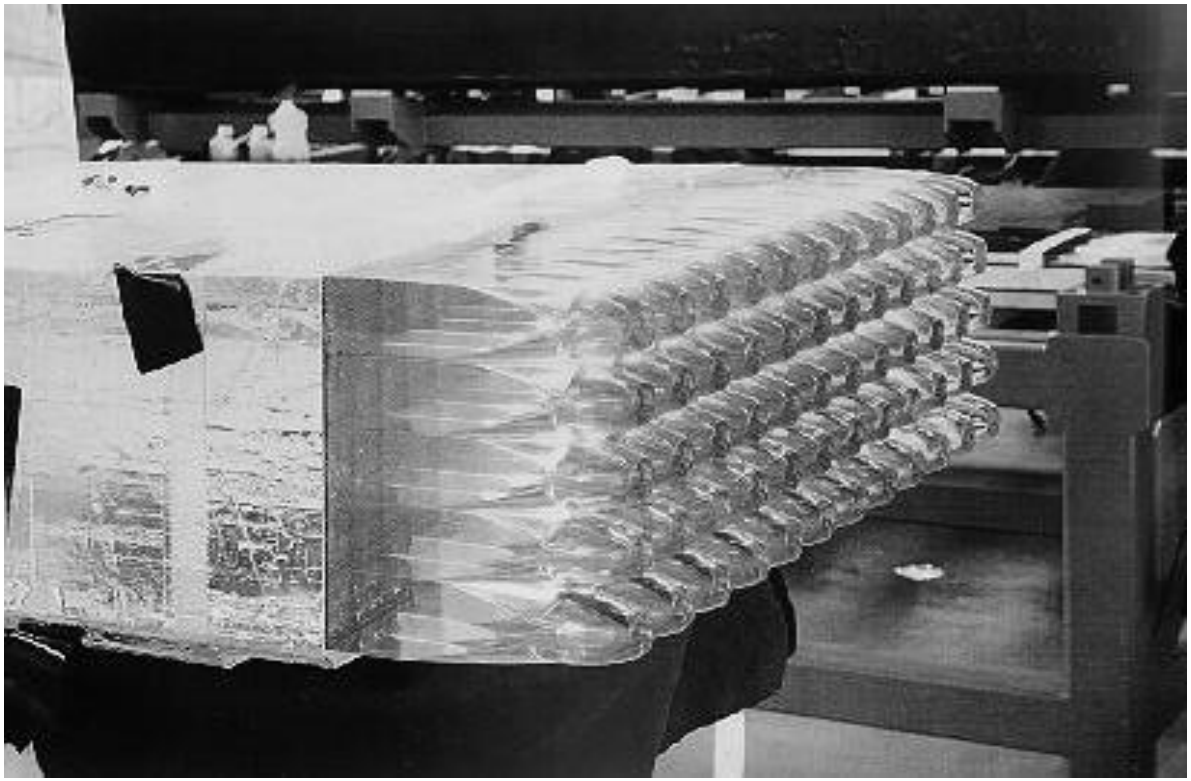
THE CALORIMETER STRUCTURE

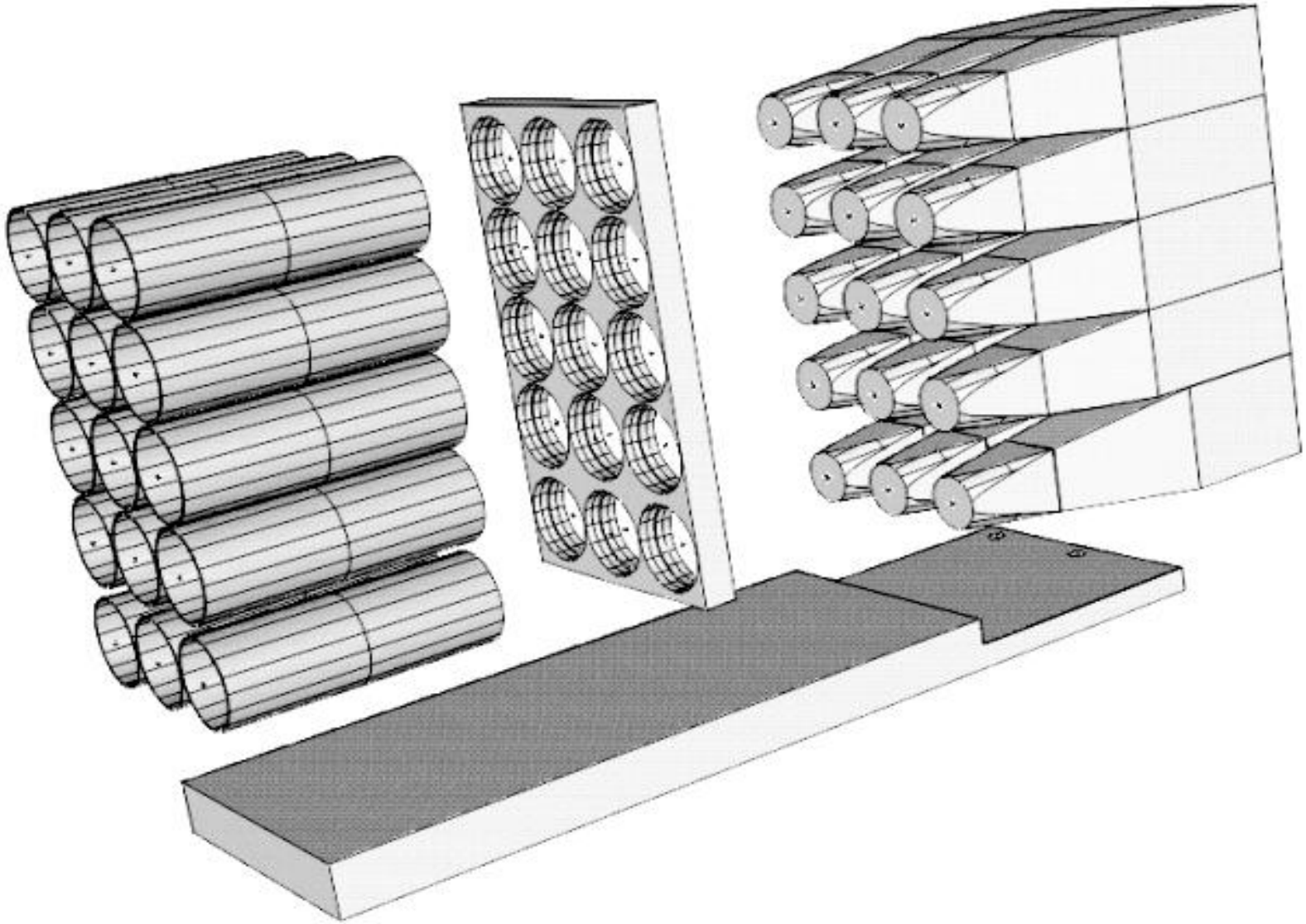
The KLOE EMC is a fine sampling lead/scintillating fibers calorimeter

- **Volume Ratio Fiber:Lead 50:50**
- **Energy sampling fraction 13 %**
- **$\langle X_0 \rangle = 1.6$ cm $\langle \rho \rangle = 5.3$ g/cm^3**

- Pure "em" calorimeter … no compensation
- High light yield and good energy resolution due to fibers' choice
- Excellent time resolution driven by fast time emission in the fibers and small light path dispersion along the fibers' length





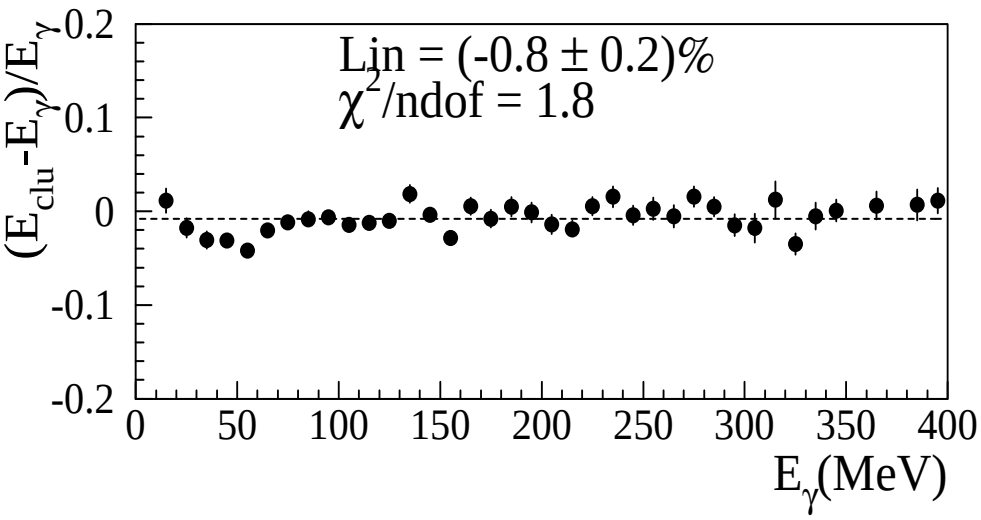


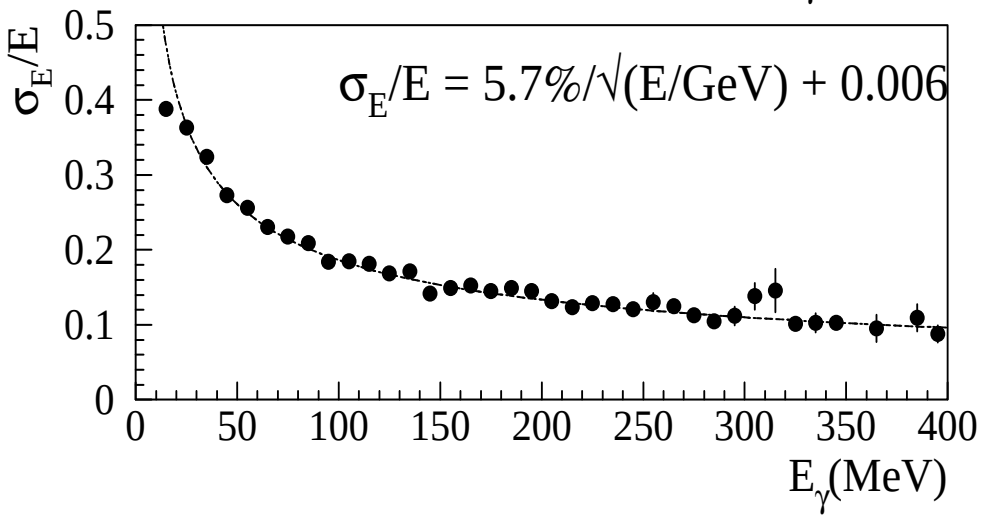
LINEARITY IN ENERGY RESPONSE AND ENERGY RESOLUTION

- Average energy scale:
  - → 40 MeV/MIP
- Using the number of pe/MIP measured at CRS: light yield of
  - → 1000 pe/GEV/side
    @ calorimeter center
- A factor 2 more light at the calorimeter boundaries

- Energy resolution dominated by sampling fluctuactions
- No cuts have been made on “holes” or specific detector regions

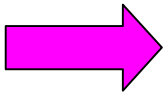
$e^+e^- \rightarrow e^+e^-\gamma$

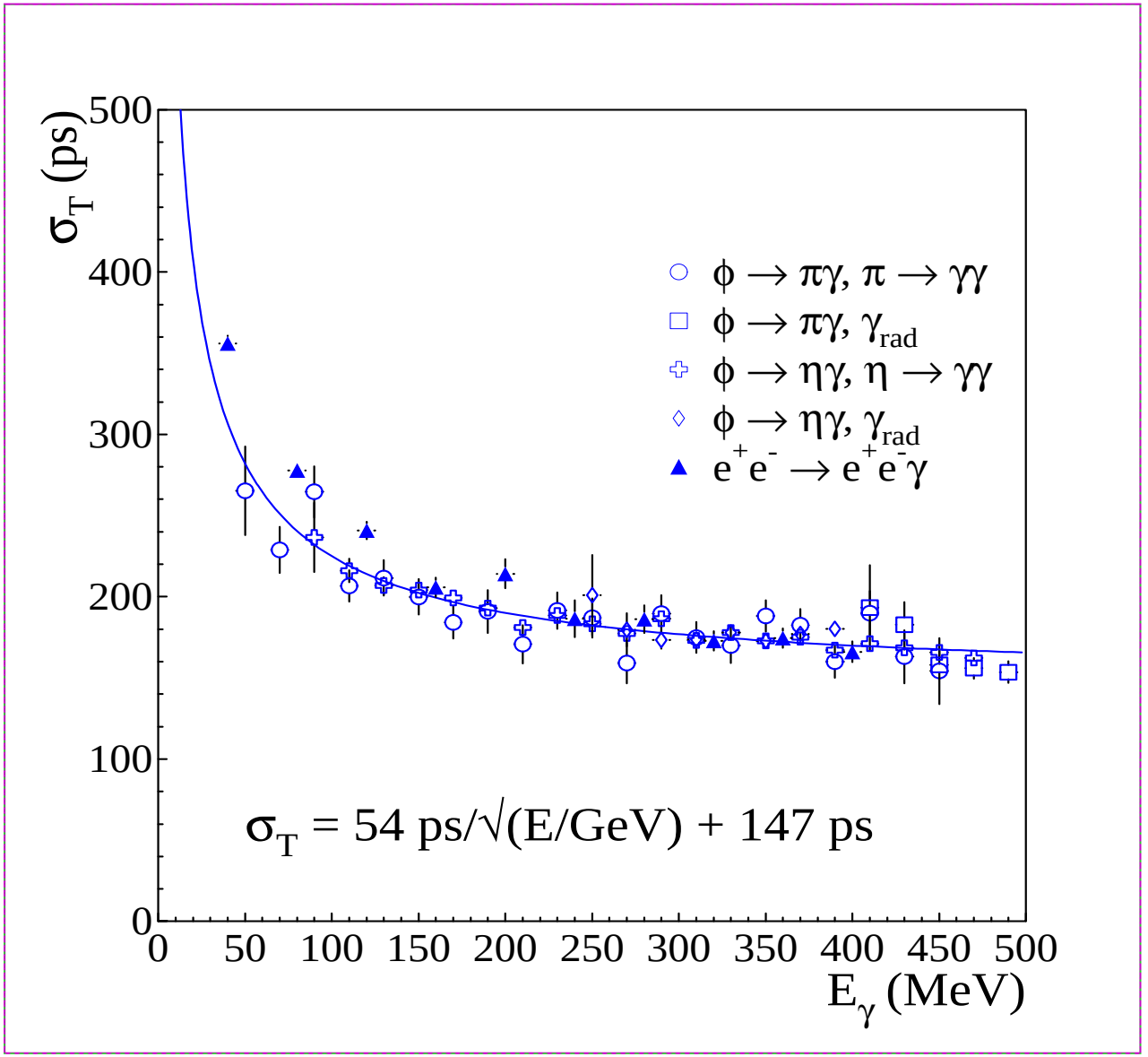




TIMING RESOLUTION

Behaviour of σ_t as a function of the γ energy is reported using all relevant γ's samples

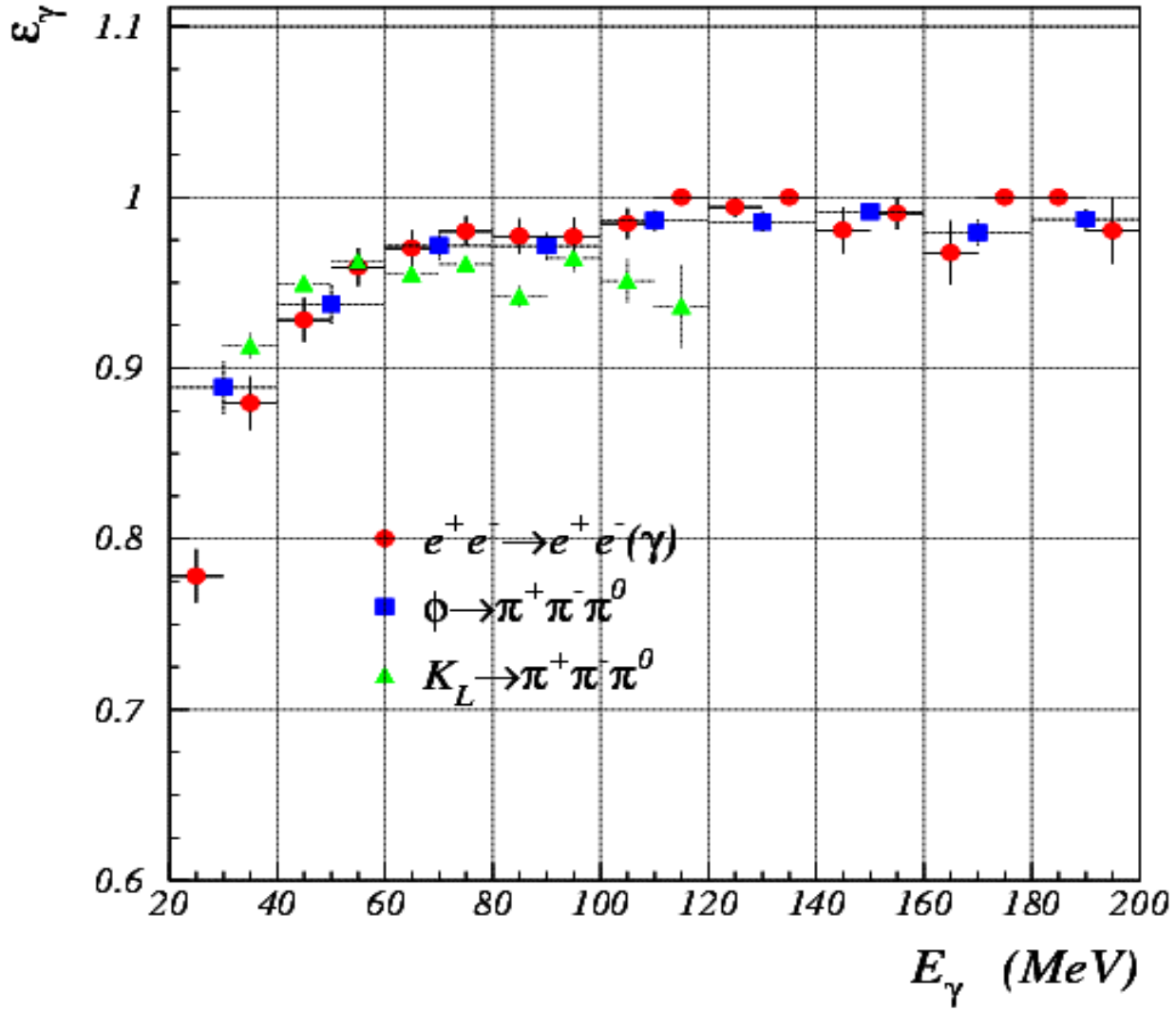




Comparing the difference of timing between two clusters at small and large angle we estimate that of the 147 ps of constant term:

- 50 ps mis-calibration
- 55 ps bunch spread
- 125 ps machine time spread

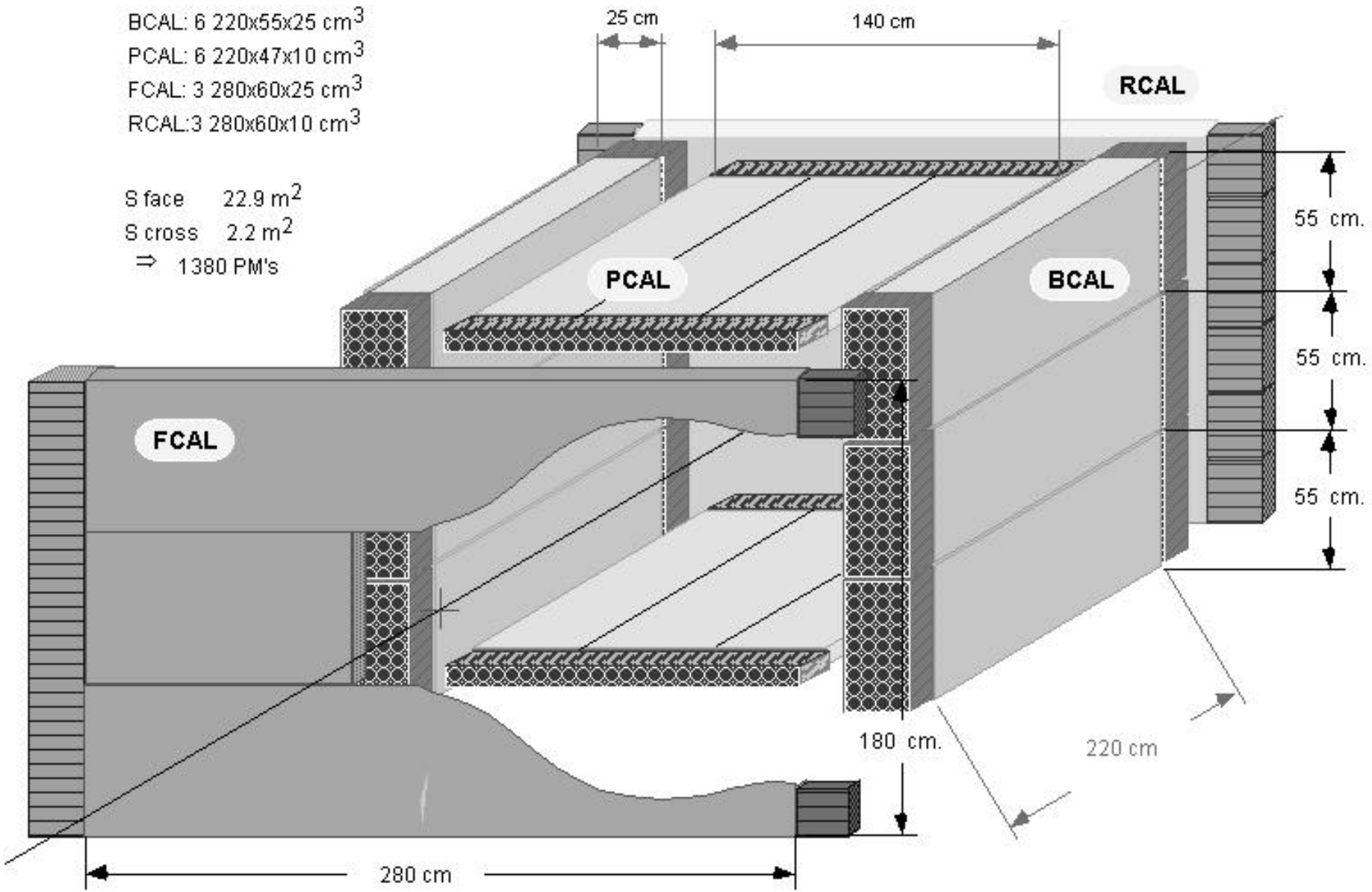
Measured efficiency in Kloe calorimeter



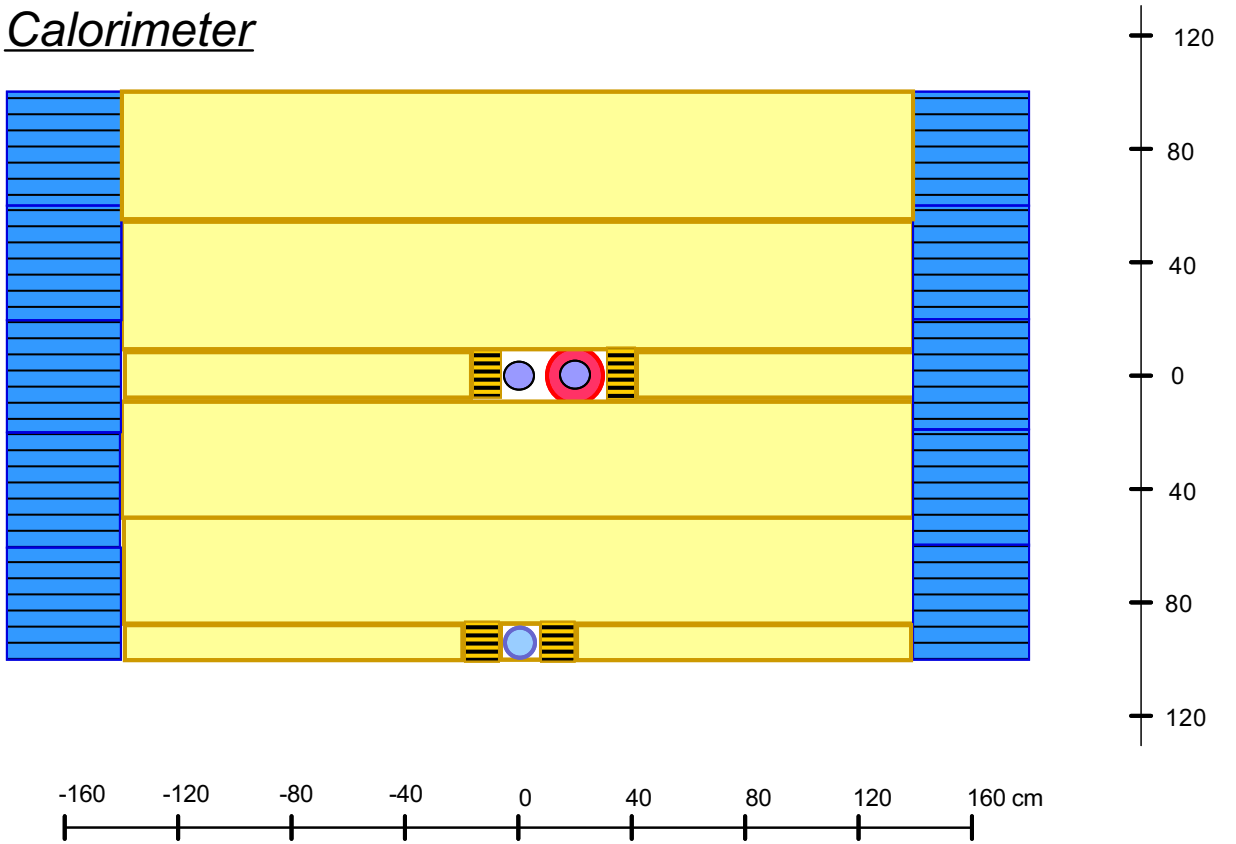
Summary of KLOE-type SciFi calorimeter

Spatial resolution	**transverse**	**~1.5**	**cm**
	longitudinal	**1.2/√E**	**cm/√GeV**
Energy resolution		**0.06/√E**	**1/√GeV**
Time resolution		**54/√E[GeV]+ 147**	**ps**
Radiation length		**1.5**	**cm**
Energy sampling frac.		**13**	**%**

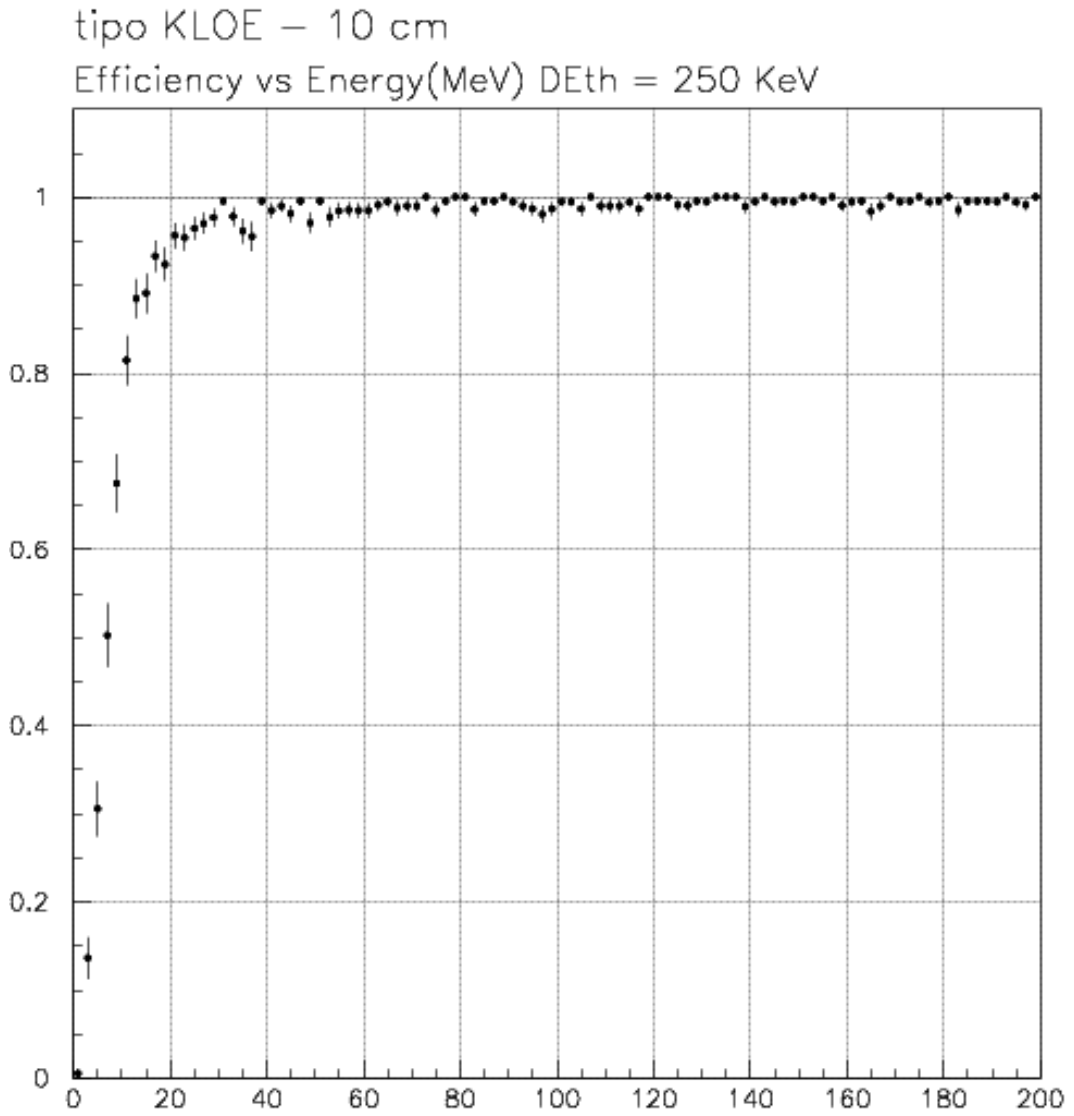
Perspective view of the PEP-N calorimeter



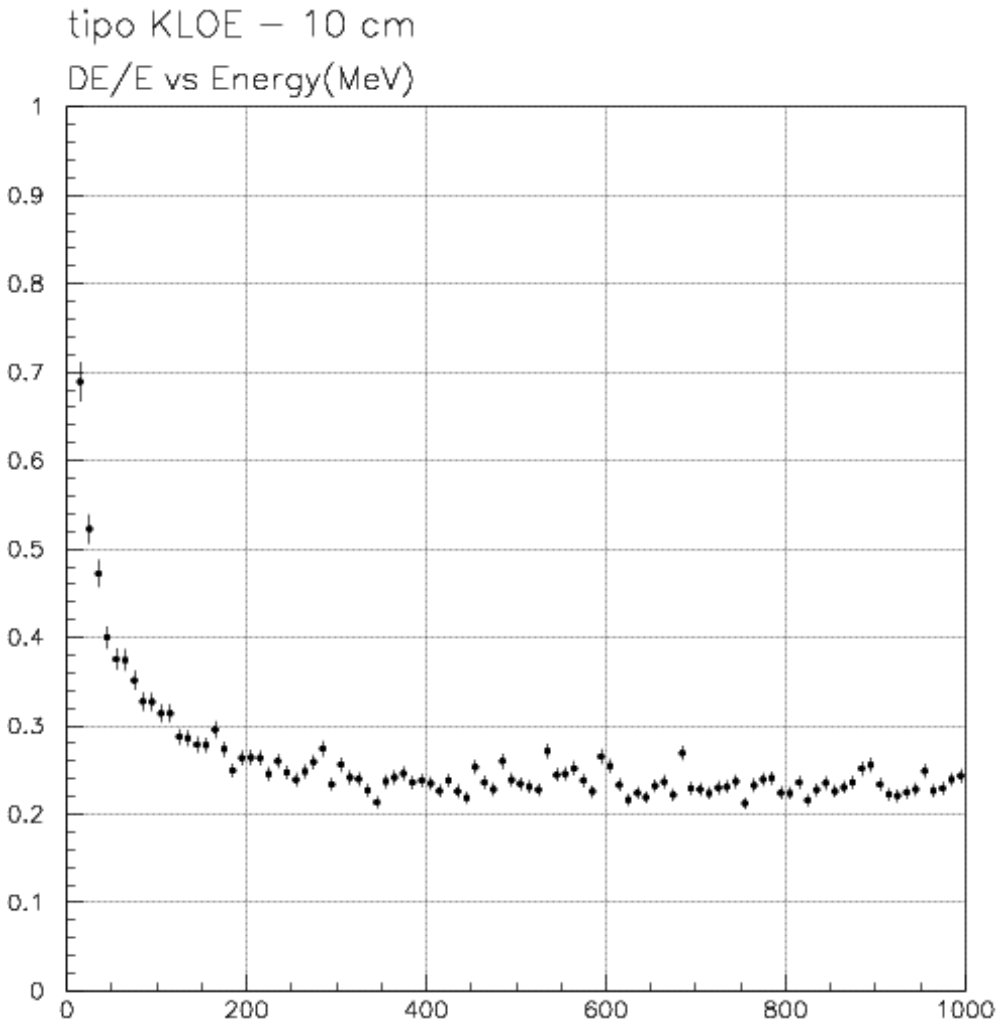
Forward Calorimeter



Montecarlo efficiency of 10 cm thick Kloe-type calorimeter

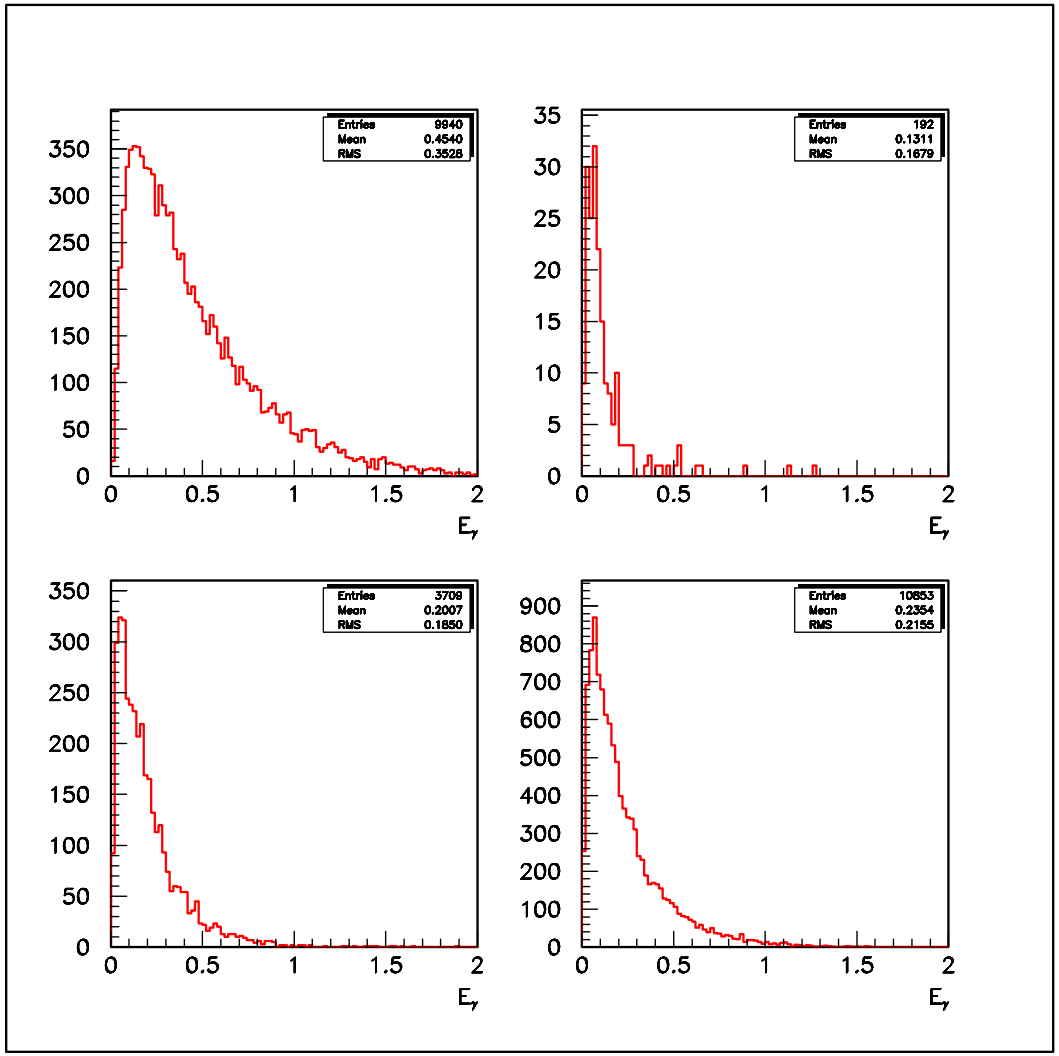


Montecarlo energy resolution of 10 cm thick Kloe-type calorimeter

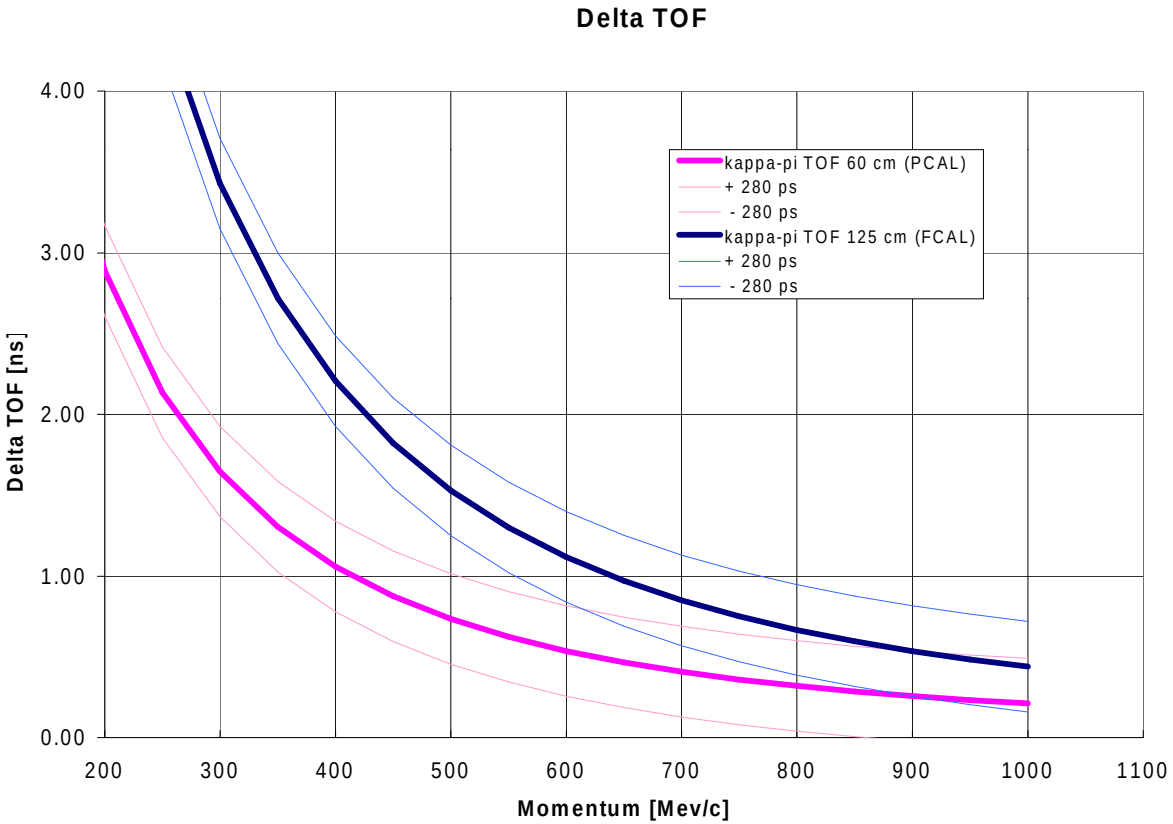


γ energy distribution

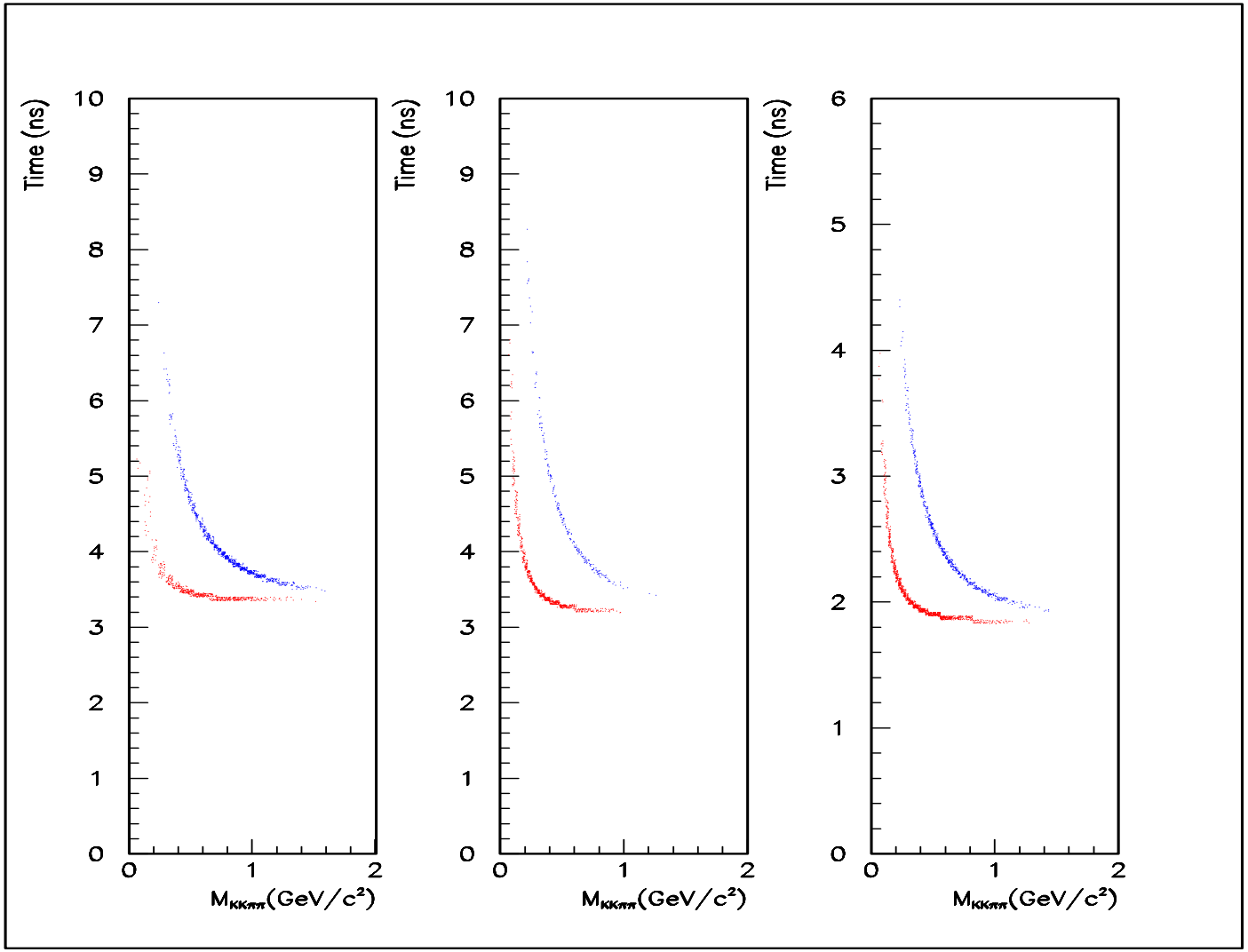
FCAL, RCAL (top) BCAL, PCAL (bottom)



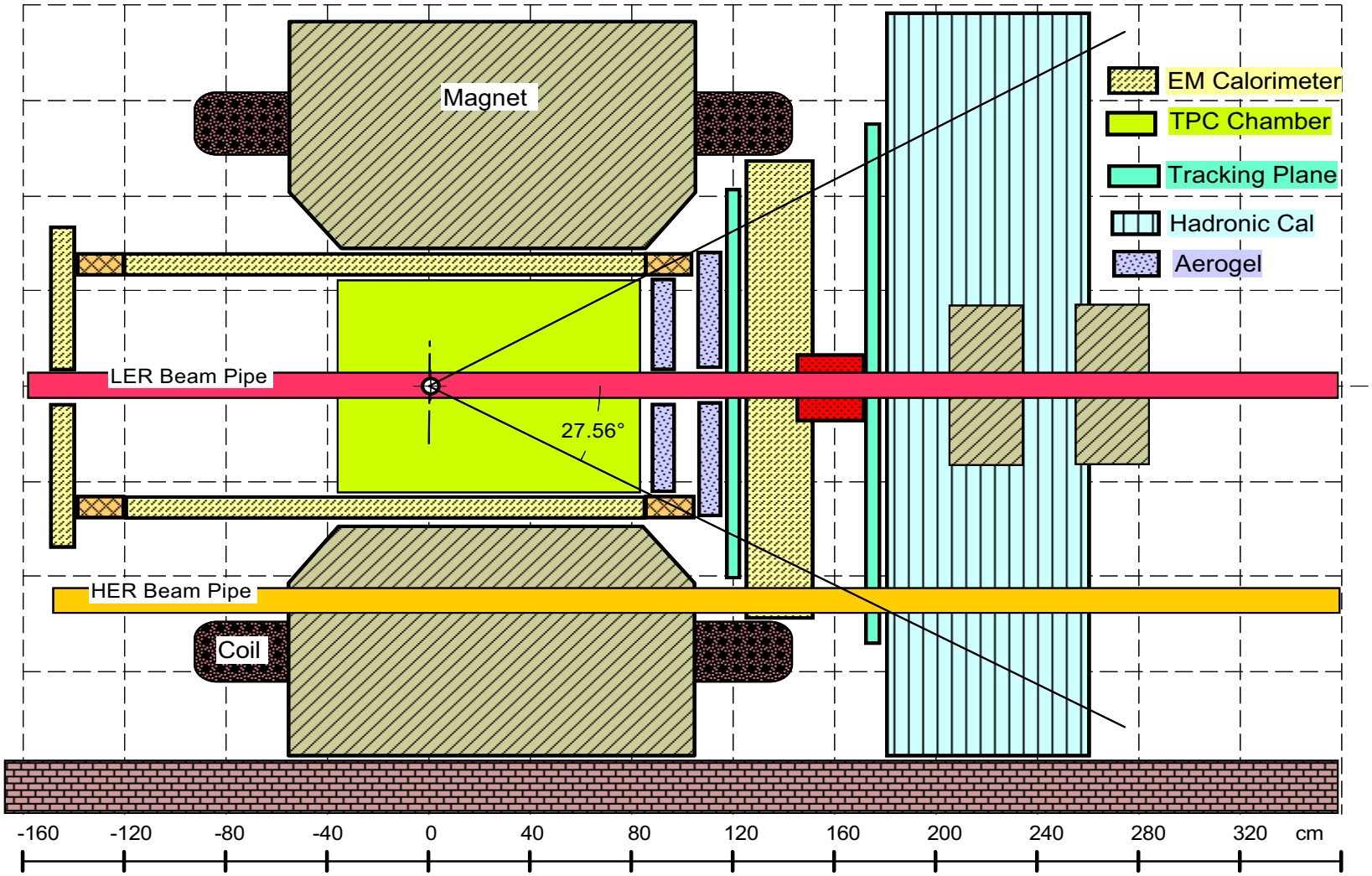
K- π time-of-flight difference

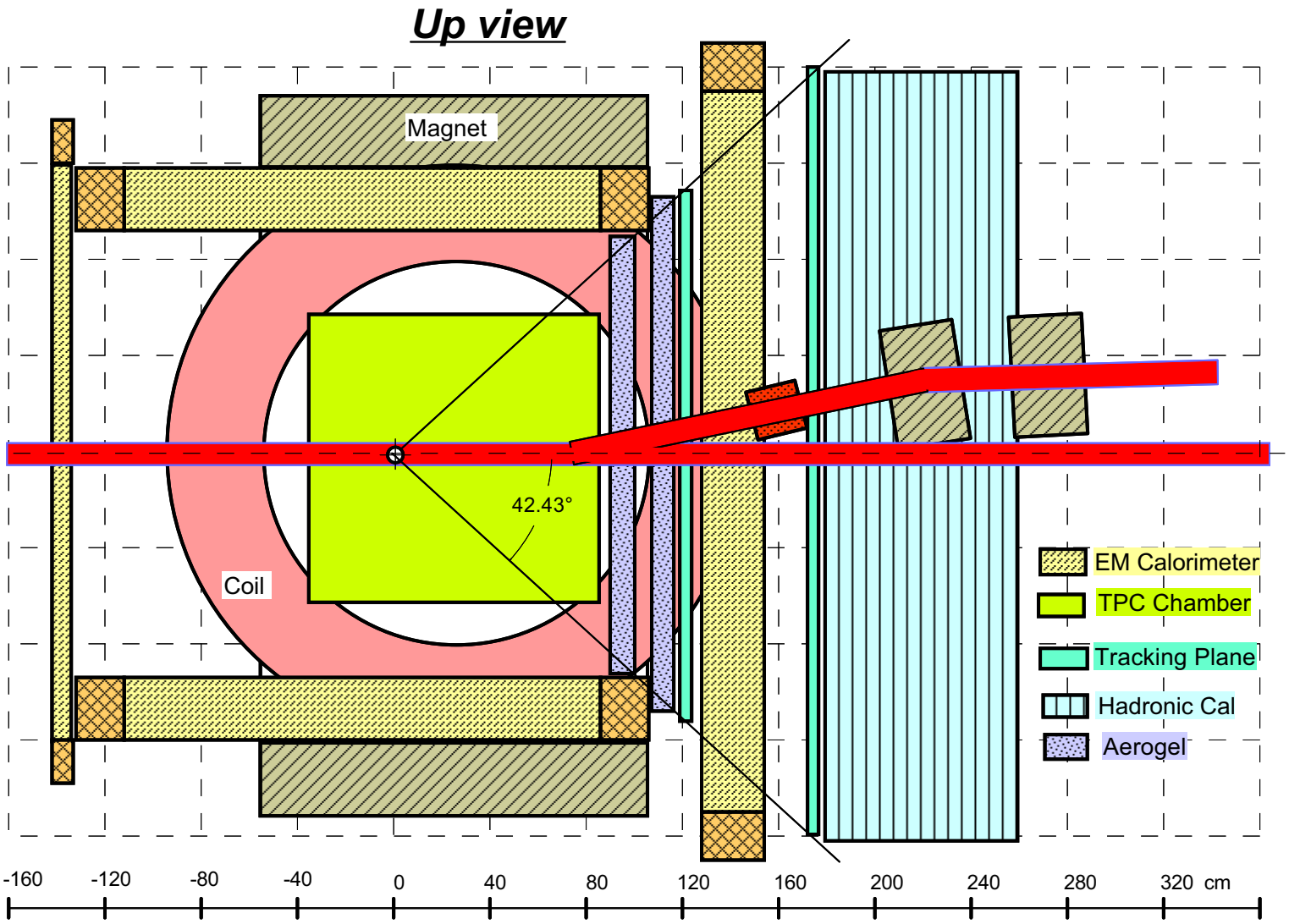


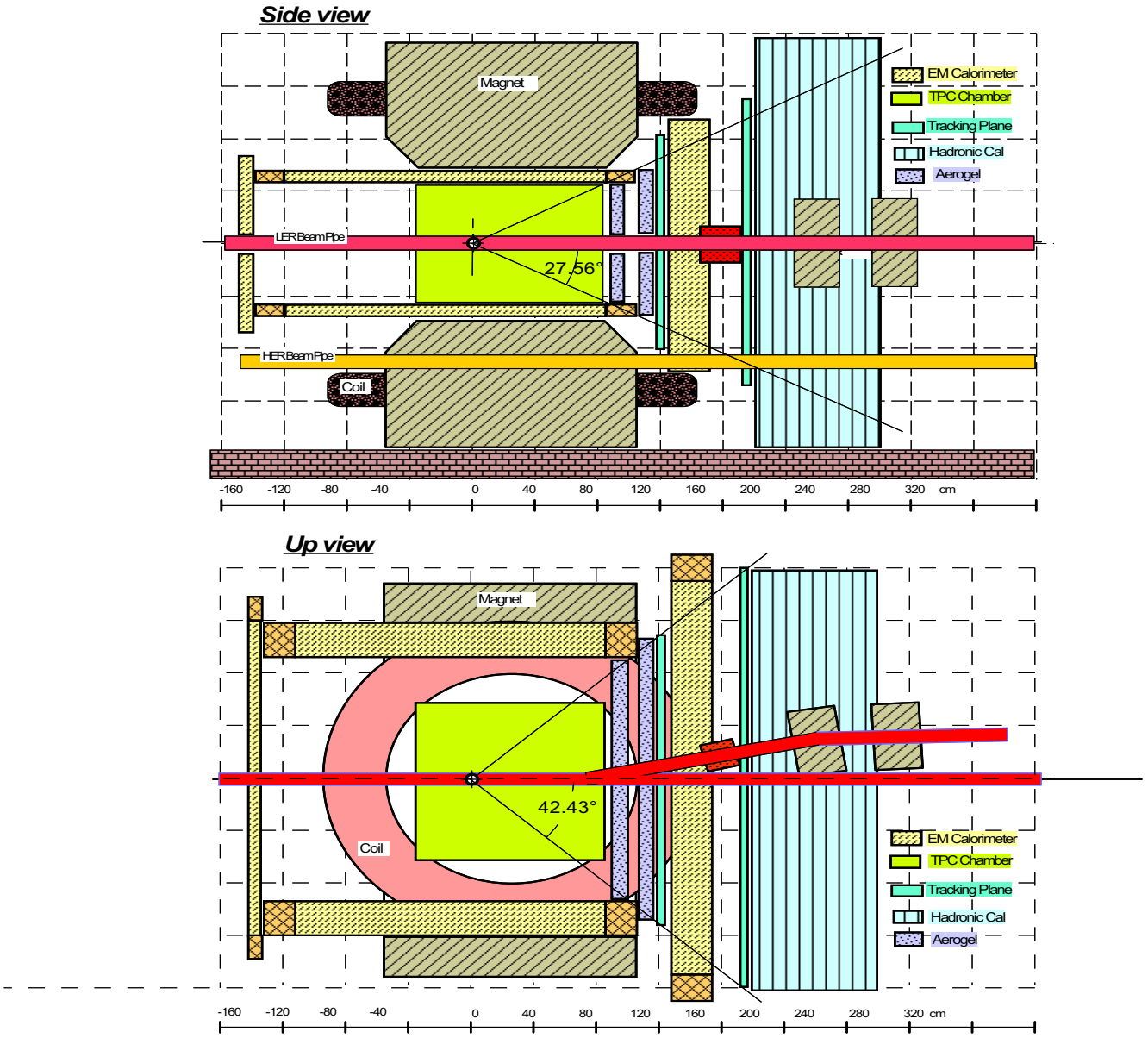
TOF distribution in FCAL, BCAL and PCAL



Side view


Magnet
EM Calorimeter
TPC Chamber
Tracking Plane
Hadronic Cal
Aerogel
LER Beam Pipe
27.56°
HER Beam Pipe
Coil
-160
-120
-80
-40
0
40
80
120
160
200
240
280
320
cm


Up view
Magnet
Coil
42.43°
EM Calorimeter
TPC Chamber
Tracking Plane
Hadronic Cal
Aerogel
-160
-120
-80
-40
0
40
80
120
160
200
240
280
320
cm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