Dead material correction status.

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- Problems with DM hits in PostRome data.

- Starting work with DM hits from the region 0.05<eta<0.55

- Questions:

where the DM energy is mainly deposited
dependence of DM energy in three zones on pion energy
EM, NonEM, Invisible and Escaped energy for dead material
DM correction simple try

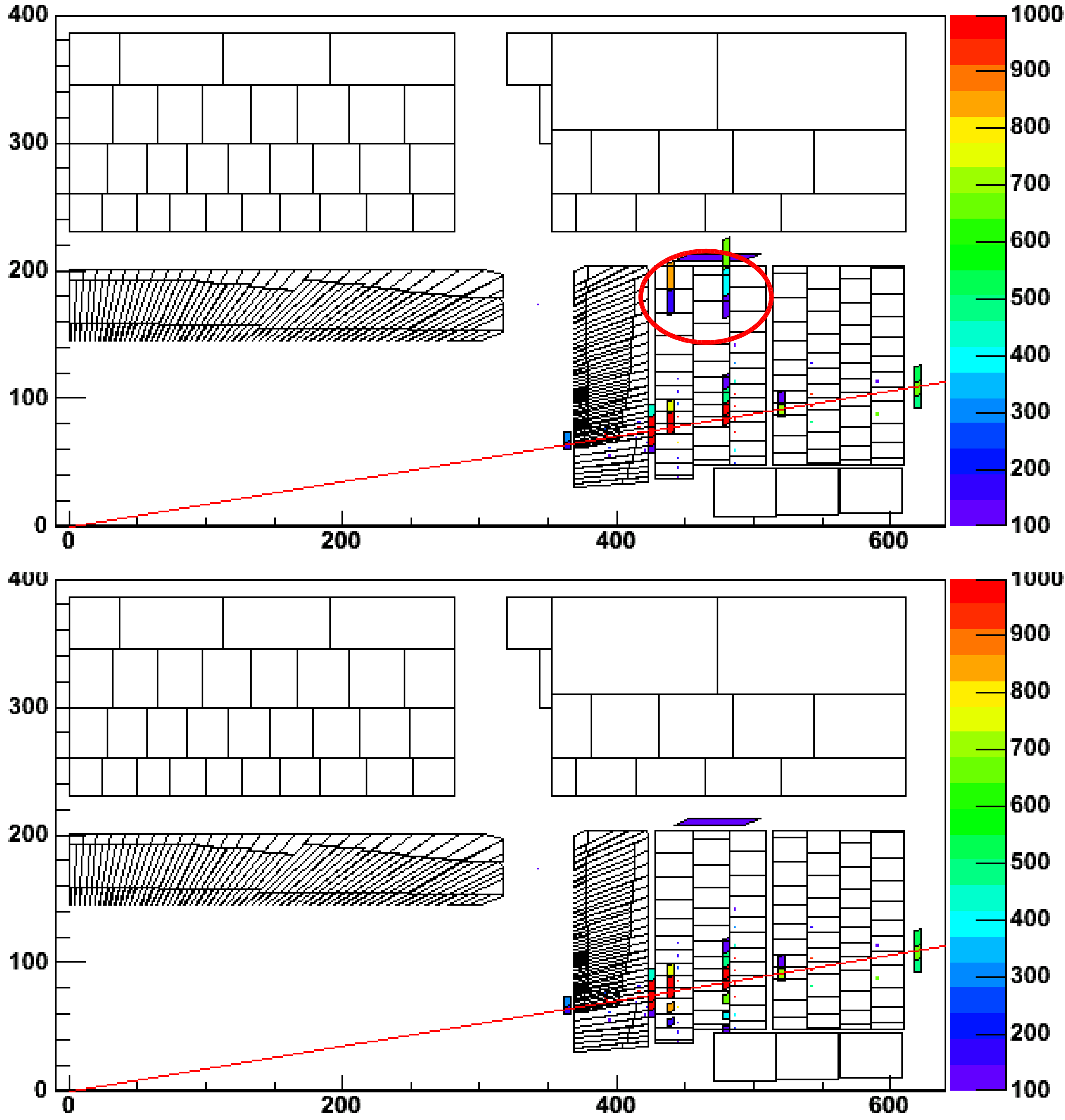
Problems with DM hits (1).

In the 'Event Display' are shown the DM hits (as colored boxes) and standard hits (as colored points), as well as initial particle direction (red line).

On the top plot (500 GeV pion, eta=2.432) one can see that some DM hits with ID=4,2,x,2 (azimuthal cracks between HEC modules) are wrongly displaced to the top of HEC (eta=1.5-1.7).

The reason is a bug in LArG4HEC/geometry.cc.

In the bottom plot this bug is corrected and the hits from top of HEC are moved to the region eta > 2.5 (where granularity deta=0.2 is twice that of region eta <2.5).

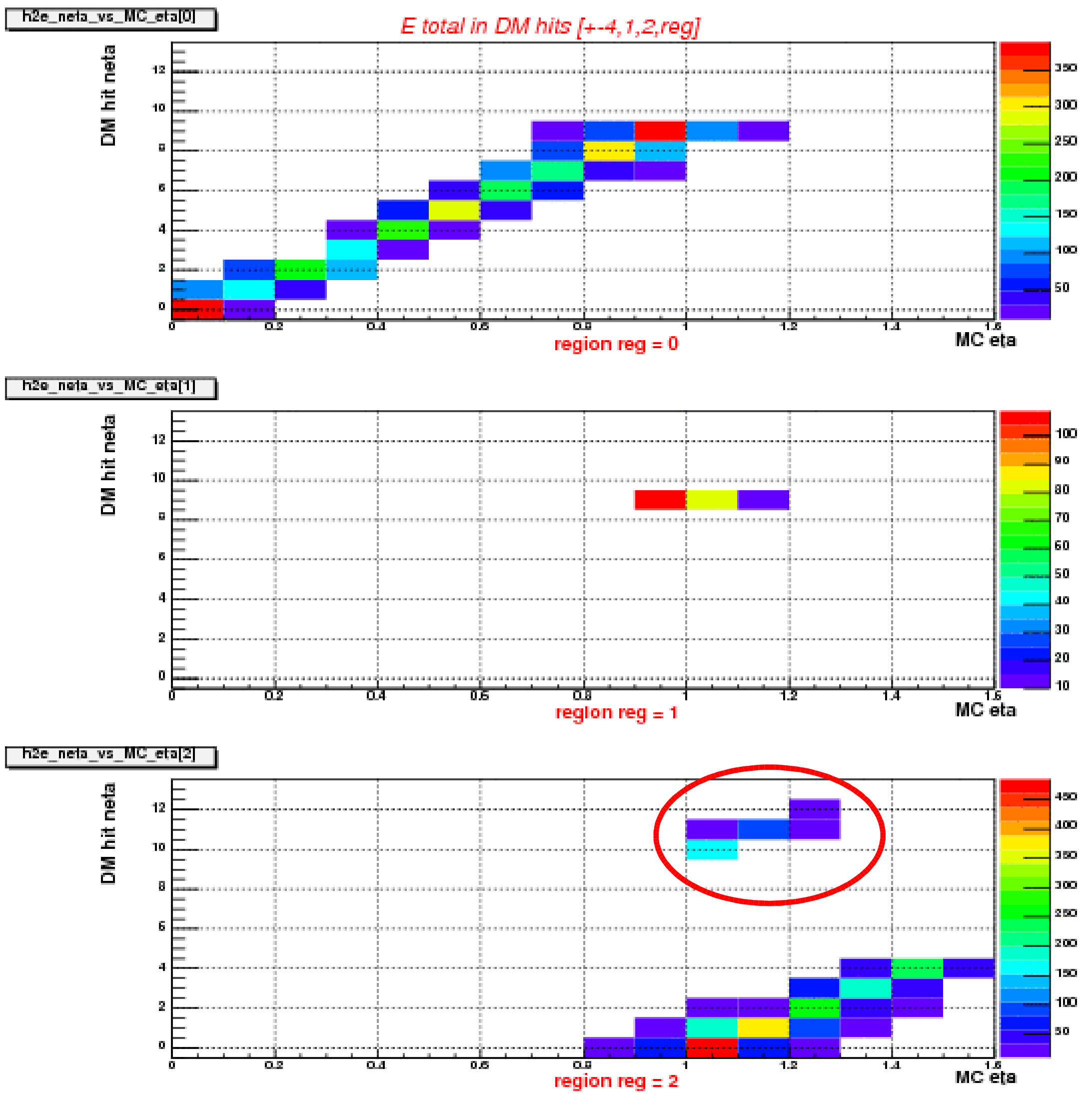


Problems with DM hits (2).

This picture traces the origin of wrong "neta" values for part of DM hits with ID = [4,1,2,2] (materials behind the active layer of accordion and in front of the scintillator, eta=1.0-1.5), shown on the bottom plot.

The value along X axis represents true eta, the value along Y – DM hit neta and the box color – energy accumulated over 500 events for sample of 500 GeV pions uniformly distributed in eta (-5.0 < eta < 5.0).

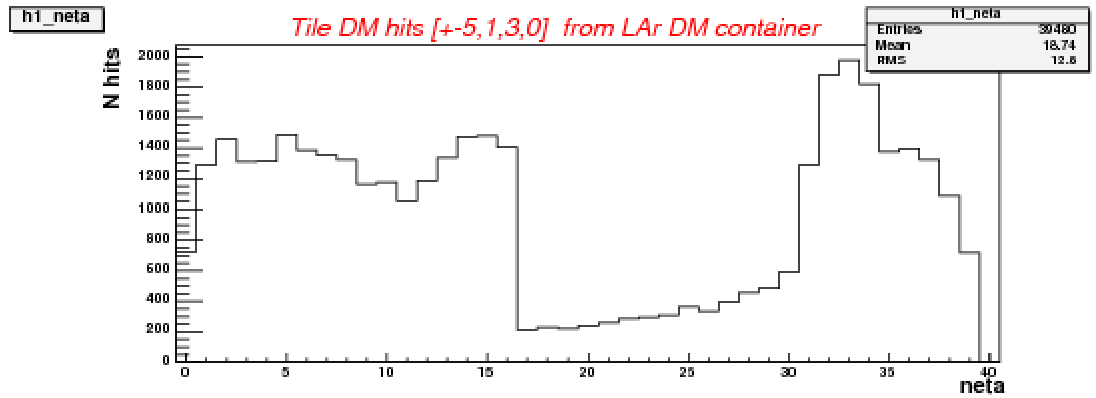
The pattern with wrong neta=10 12 on bottom plot should be moved to middle plot (region 1, the crack Tile barrel – extended barrel).

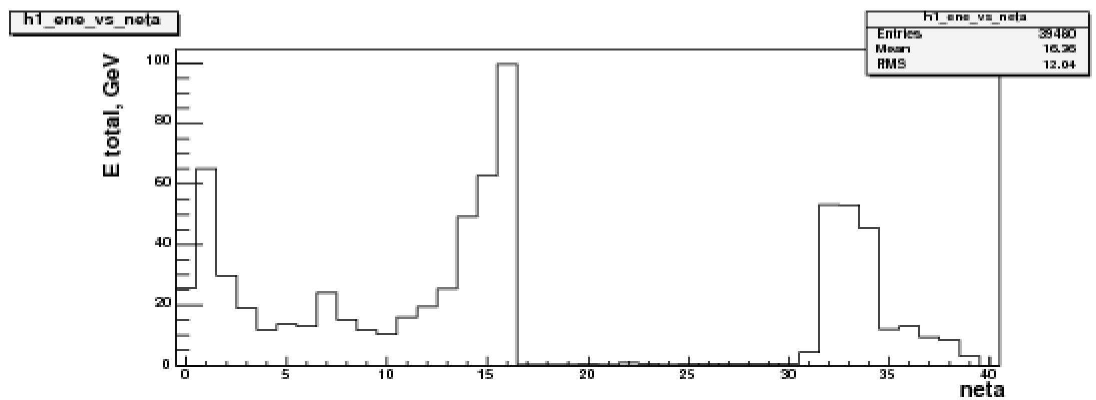


Problems with DM hits (3).

There are also problems with Tile DM hits. they were not included into GeoCaloCalibHit adaptor (we have done it). The same DM pattern [5,1,3,0] is presented in LAr and Tile DM hits containers. Moreover, it corresponds to both “leakage behind tile” and “Tile default Calculator” – we propose to disentangle them.

The picture shows number of hits (top) and accumulated energy (bottom) as a function of “neta” index for the same sample of 500 500-GeV pions. The hits with neta > 16 (eta>1.7) are due to the bug in LArG4EC/CryostatCalibrationLArCalculator (corrected in recent nightlies).

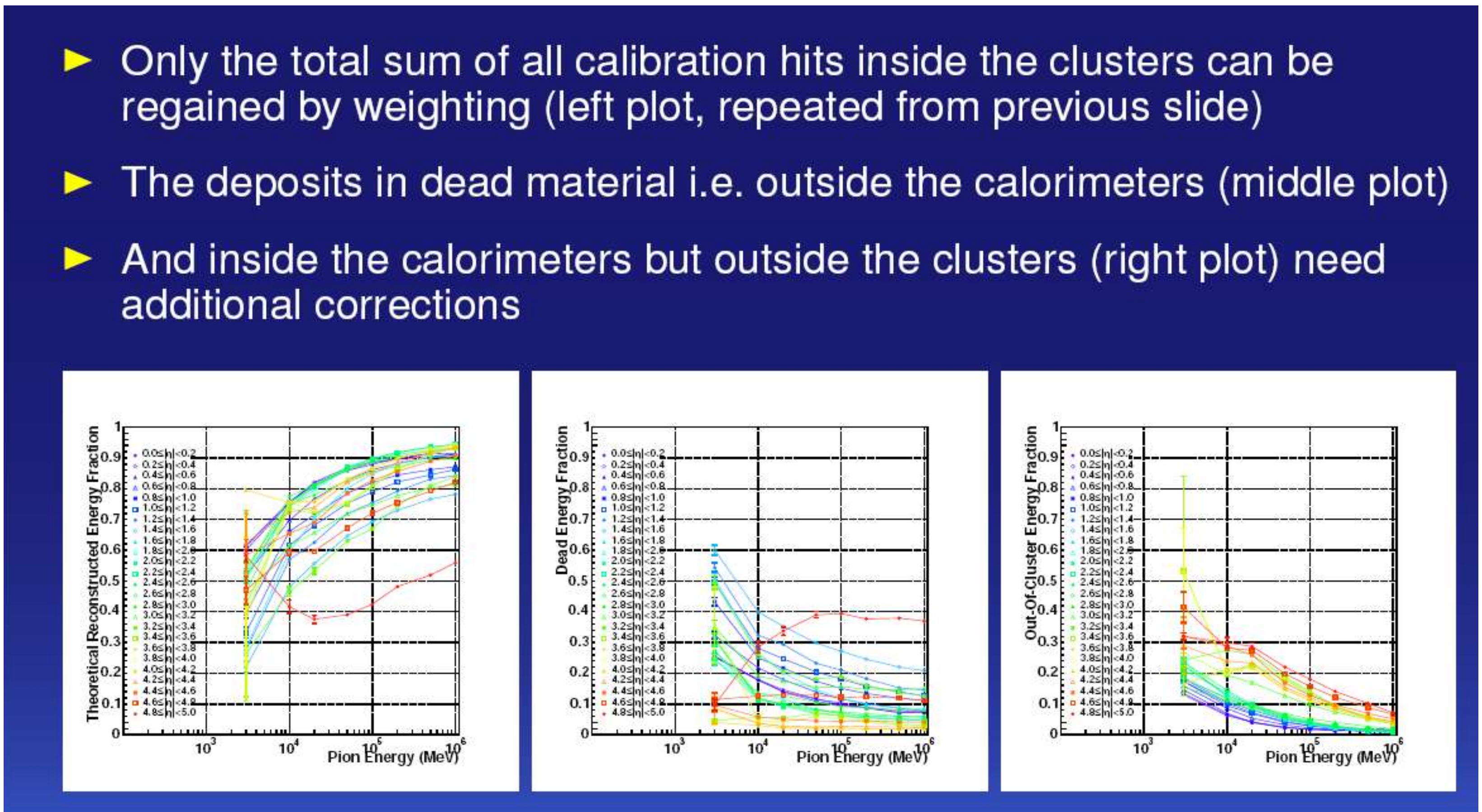




Study of DM hits for region: 0.05< eta < 0.55

This fragment from Sven's presentation at last LAr week (16.11.05) shows that dead material effect become large for low pion energies. It also heavily depends on eta.

So we have decided to start from eta region 0.05<eta<0.55, it shouldn't be very hard…



Study of DM hits for region: 0.05< eta < 0.55 (1)

50 GeV, pi-, 0.05< eta < 0.55

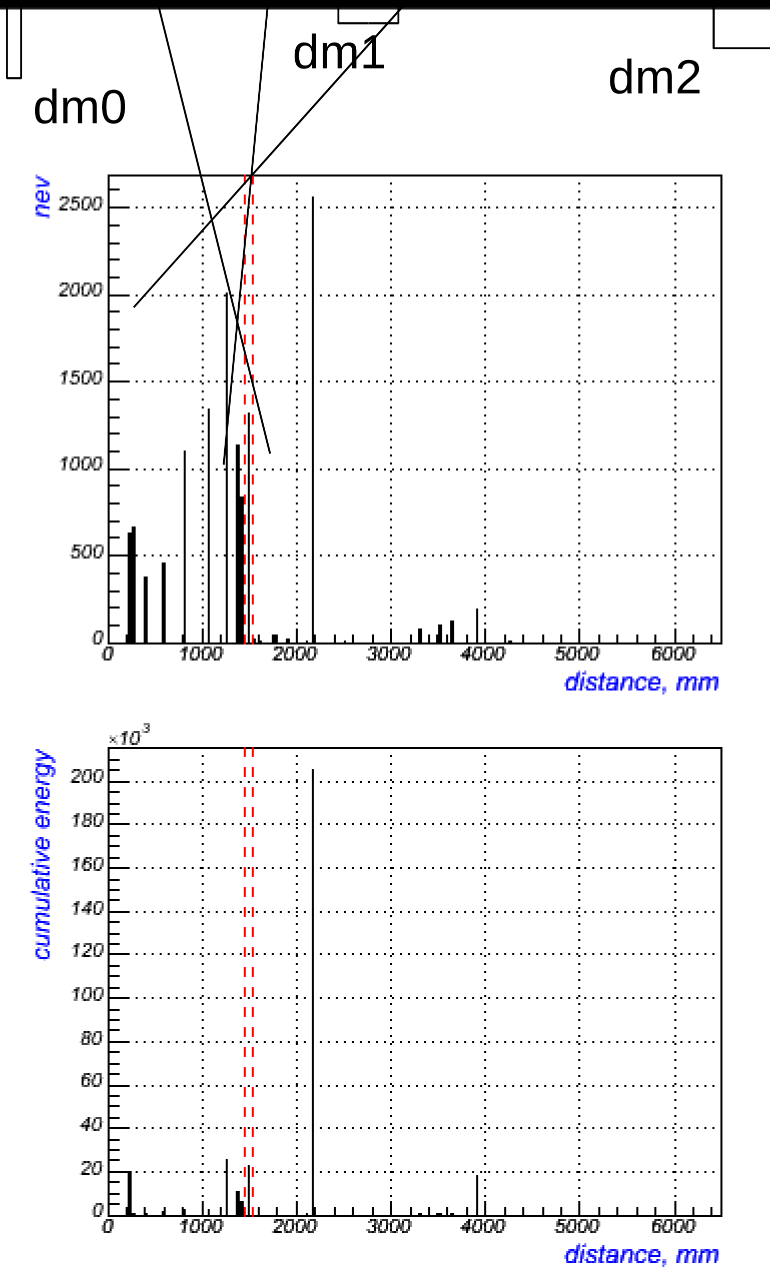
Upper plot shows the distribution over DM hits radius (distance from central axis).

Bottom plot shows cumulated energy as a function of DM hits radius.

We will distinguish three DM zones:
Dm0 – zone before the barrel presampler (i.e. inner detector, cryostats)

Dm1- zone between the barrel presampler (EMB0) and barrel strips (EMB1).

Dm2 – zone between the EM and tile barrels (EMB3 and TileBar0).

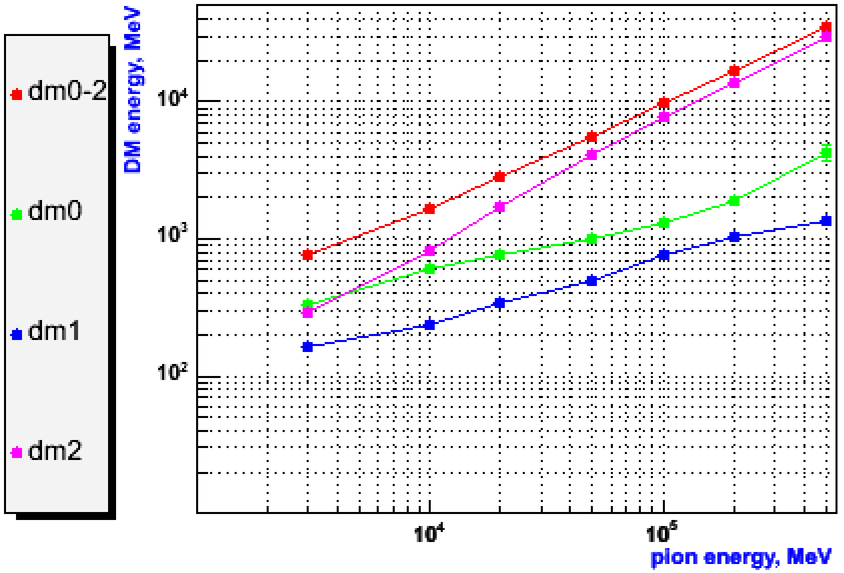


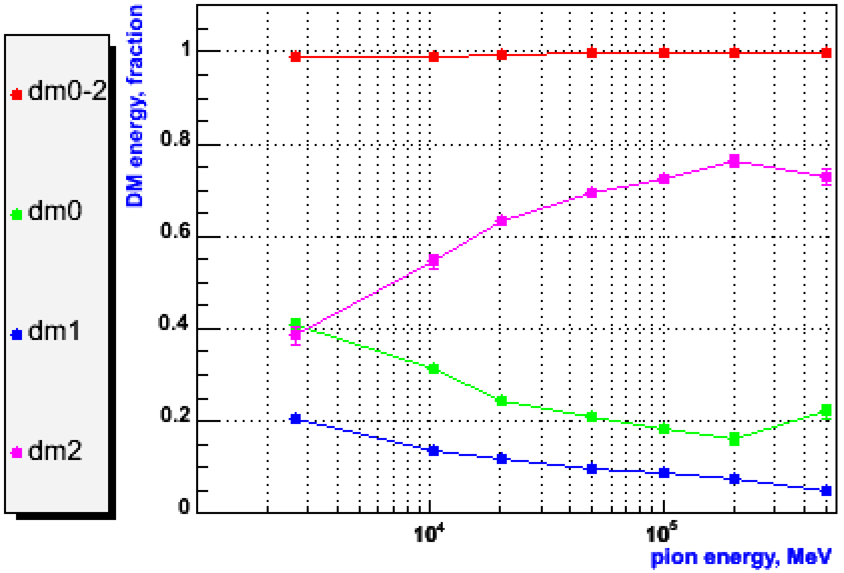
Study of DM hits for region: 0.05< eta < 0.55 (2)

Upper plot shows total DM energy in four DM zones as a function of pion energy.

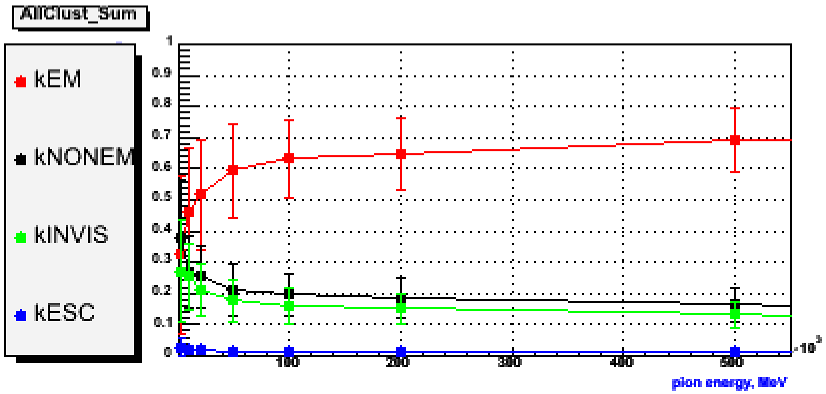
Dm0 – energy before barrel presampler.
Dm1 – energy between presampler and strips.
Dm2 – energy between EM barrel and tile.
Dm0-2 – sum of 3 energies above.

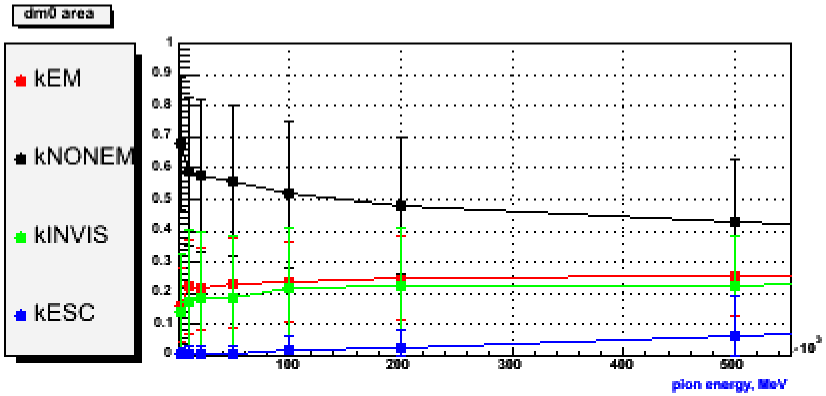
Bottom plot shows the ratio of DM energy released in particular zone to full DM energy accumulated in containers.

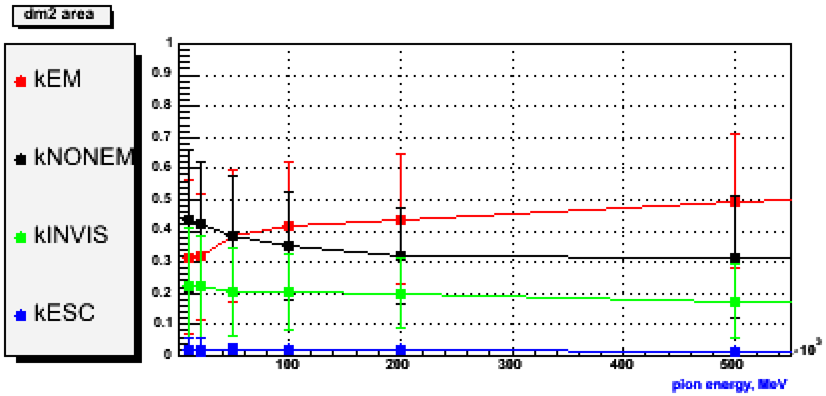




Study of DM hits for region: 0.05< eta < 0.55 (3)







Energy fractions:

e.m.
Visible non e.m.
Invisible
And escaped

Top plot:

Energy fractions for the sum of active and inactive hits corresponding to calo cluster.

Middle plot:

Energy fractions for DM energy deposited in front of the barrel presampler (dm0 zone).

Bottom plot:

Energy fractions for DM energy deposited between the EM barrel and tile (dm2 zone).

Each fraction is normalized to full DM energy in corresponding zone.

Study of DM hits for region: 0.05< eta < 0.55 (4)

Proper algorithm for DM energy correction should account for electromagnetic /hadronic fraction of cluster and geometrical shower quantities.

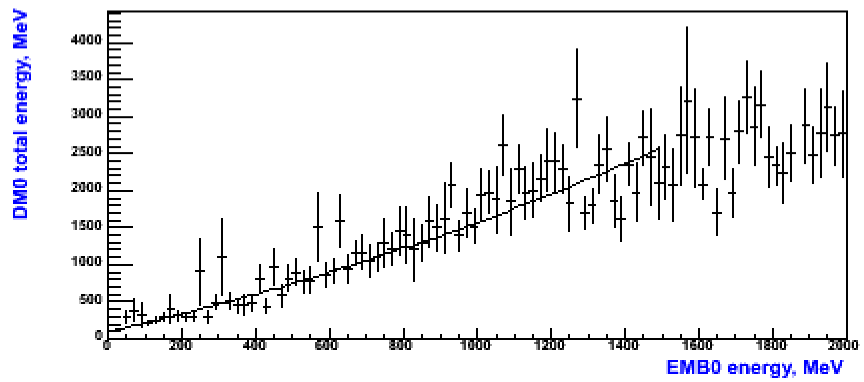
Leaving its development for next weeks here we try to compare two contrary cases:

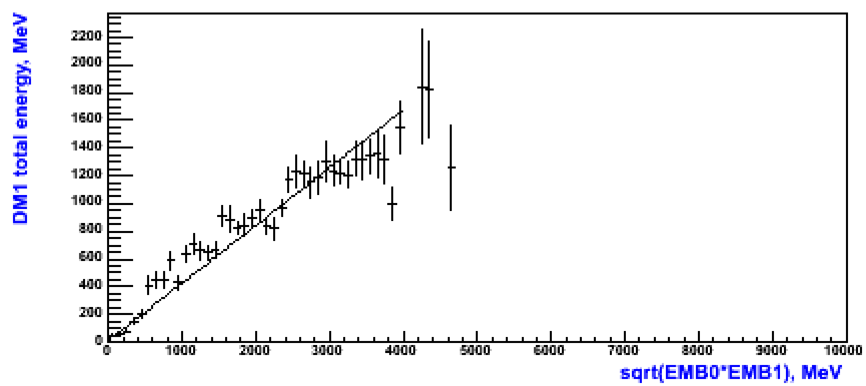
ideal one (DM energy is taken from calib. hits) and most simple (where DM energy in zones dm0-2 is approximated from reconstructed (unweighted) energy).

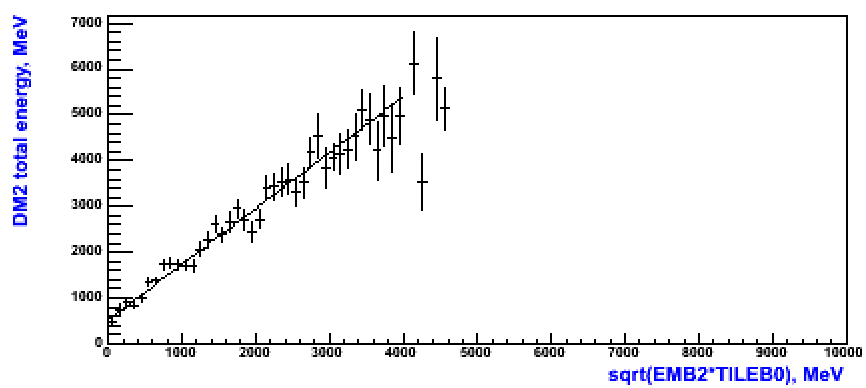
Top plot: DM energy before EMB0 as a function of EMB0 energy.

Middle plot: DM energy between EMB0 and EMB1 as a function of Sqrt(EMB0*EMB1).

Bottom plot: DM energy between barrel and tile as a function of Sqrt(EMB2*TILEB0).



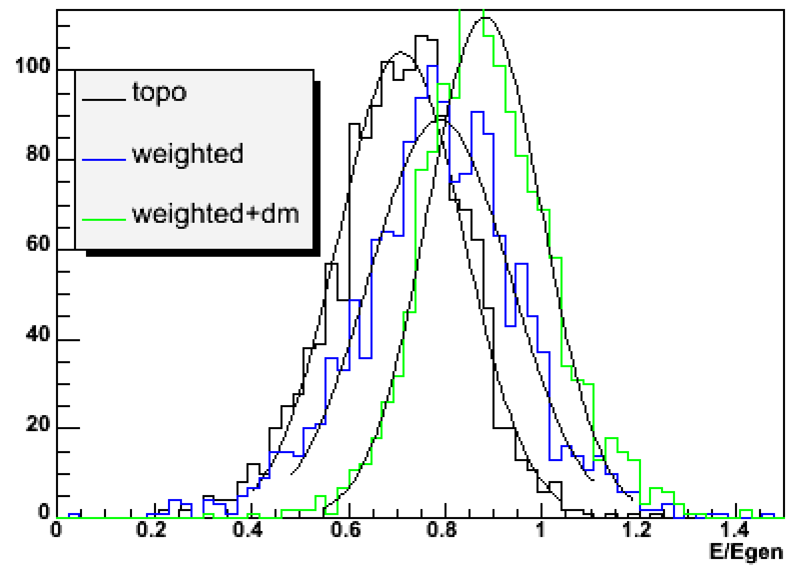




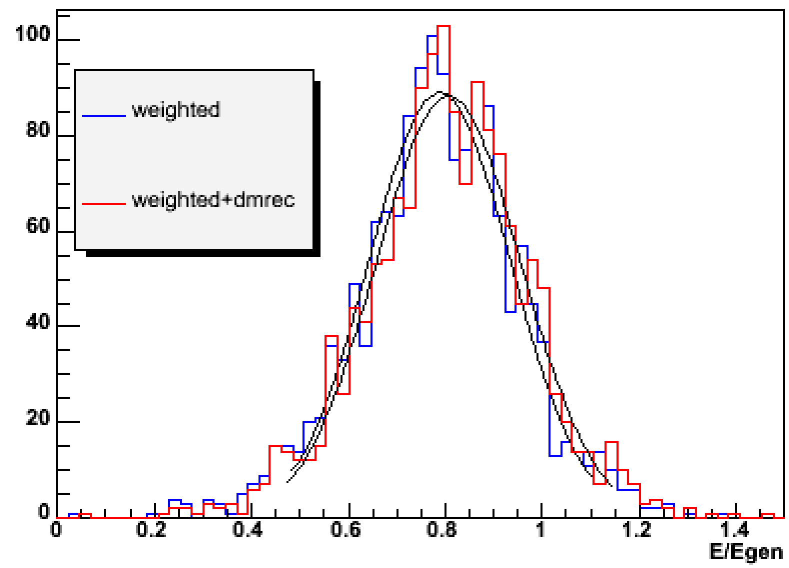
Study of DM hits for region: 0.05< eta < 0.55 (5)

Top plot shows the energy distribution for 20 GeV single pions for three cases:

Black – sum of energy in topo clusters (i.e. unweighted cell energies),
Blue – after applying weights in accordance with Sven's procedure.
Green – same as blue + DM total energy from calibration hits.



Bottom plot:
Blue – the same as on upper plot.
Red – same as blue + DM energy approximated from unweighted sampling energies as described on previous slide.



Mean value and resolution:
Topo: 0.71, 18.4%
Weighted Topo: 0.79, 19.6%
Weighted Topo + Approx. DM: 0.81, 18.8%

Weighted Topo + Ideal DM: 0.88, 14.0%