Electromagnetic showers energy estimation

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Réunion de groupe OPERA 12/12/2011

MC Sample - OpRelease 4.0

Sample of 1000 taue DIS produced by Elisabetta
Sample of 1000 nue beam produced by Elisabetta
Sample of 1000 single monochromatic electron (Amina, Florian)
MC samples without background

• Processed through OpEmuIO
• Processed through OpEmuRec packages : CS, Scanback, Link, Alignment, Track & Shower by using all plates available in the brick
• All packages up to OpEmuRec Track are taken from the release $GROUP_DIR/soft/OpRelease4.0_emulsion_march2011/
• OpEmuRec Shower is released here : /sps/opera/scratch/flbrunet/analysis/OpRelease_2011-04-04_OKwithShower/4.0/OpEmuRec/

FEDRA RELEASE (1210) OPEMUREC(v3)/OPRELEASE(4.0)

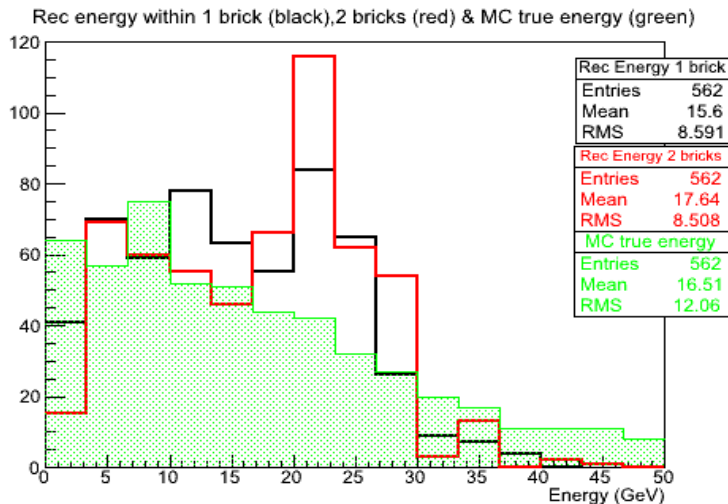# Energy reconstruction : Monochromatic electron 4.0 GeV

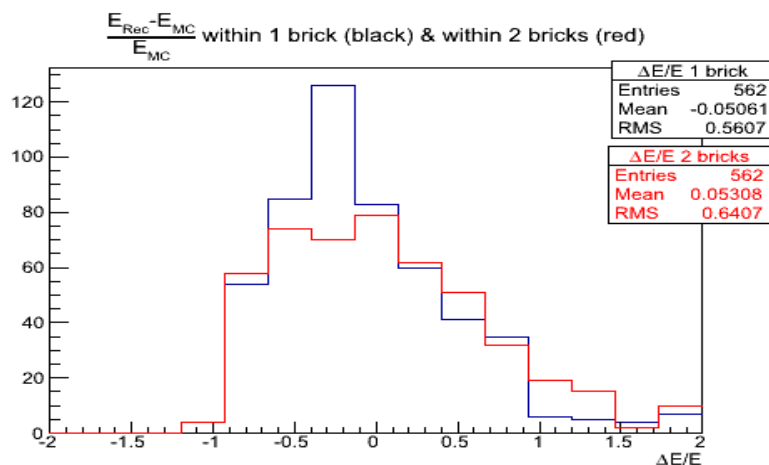Goal : check with all recent developments the performance of the shower algo
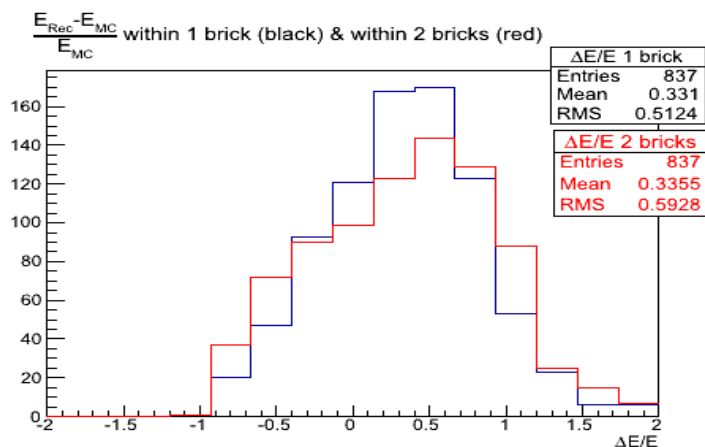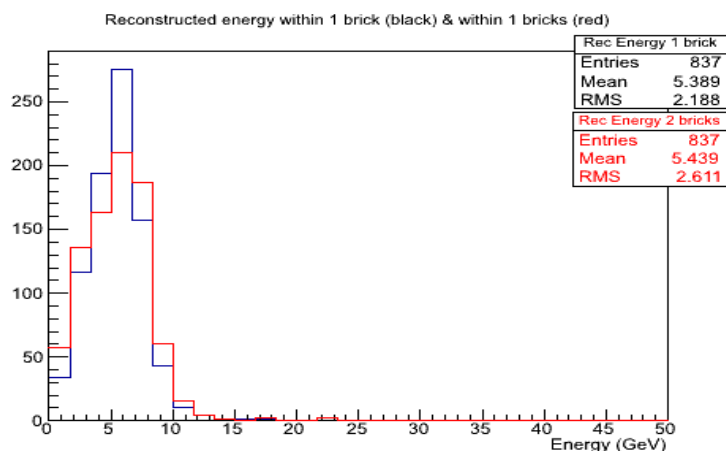
- Energy is overestimated for 4 GeV electron
- 2 bricks reconstruction get more overestimated energies since we collect more tracks (see next slides)
- Beside overestimation, energy resolution wrt MC true energy is about 50%

Energy reconstruction : nue beam

Goal : check with all recent developments the performance of the shower algo

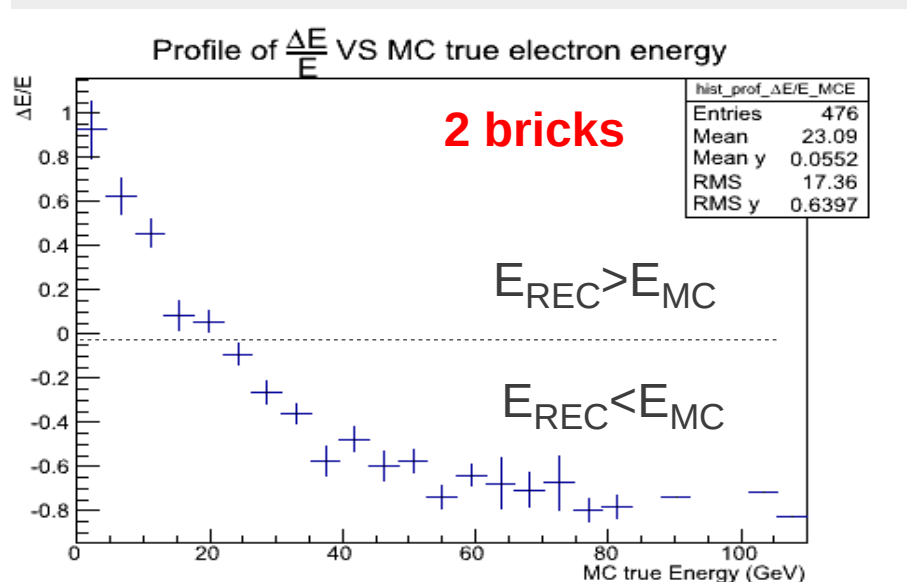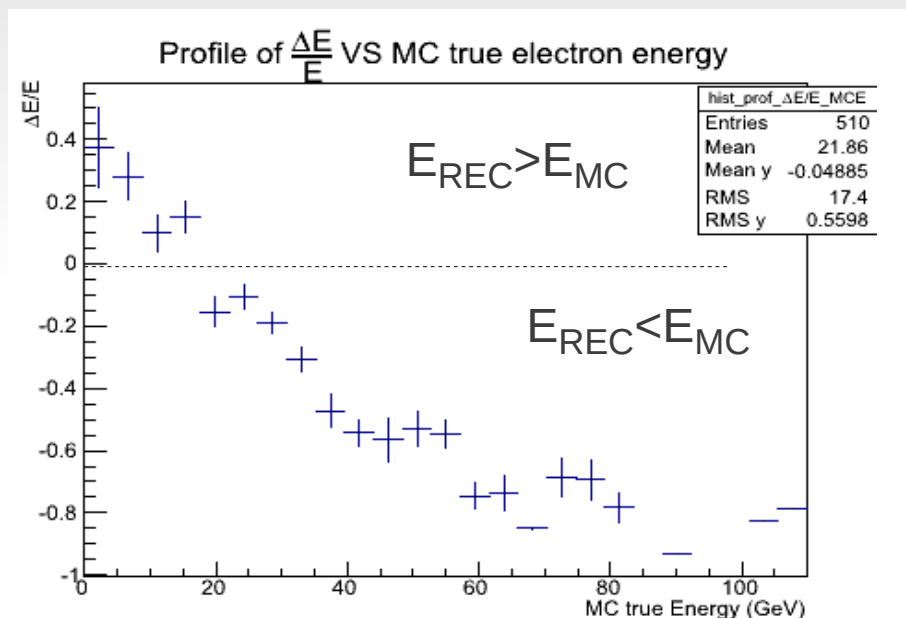Rec energy within 1 brick (black),2 bricks (red) & MC true energy (green)

- Energy is roughly well estimated
- 2 bricks reconstruction estimate higher energy for low energy events
- Energy resolution wrt MC true energy is about 60%

$\frac{E_{Rec}-E_{MC}}{E_{MC}}$ within 1 brick (black) & within 2 bricks (red)

Energy reconstruction : nue beam

Goal : check with all recent developments the performance of the shower algo

Strong energy dependance → optimal work in the range [10-30] GeV

Energy reconstruction meeting

Details of the training of NN shower algo :
Frederic algo and what I used for now
    Cone : 0,020mrad opening angle - 800 µm radius at max
    Displacement between 2 basetracks : 150 µm
    Angle between 2 basetracks : 150mrad

Frank NN sample used for training :
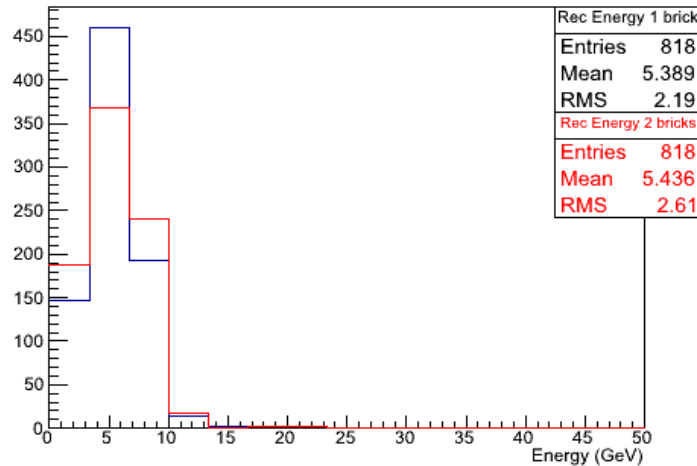   Cone : 0,025mrad opening angle – 700 µm radius at max
    Displacement between 2 basetracks : 150 µm
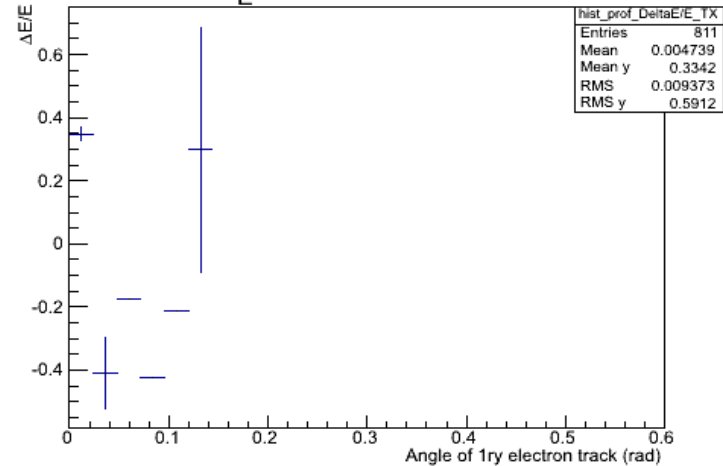   Angle between 2 basetracks : 130mrad

–> To do : check of the reconstruction with these parameters
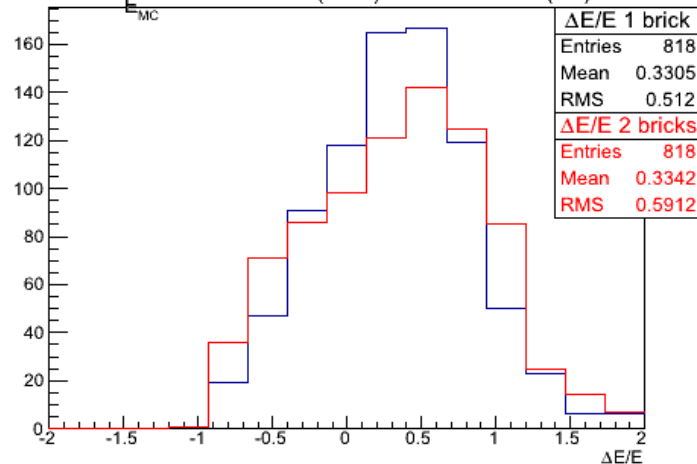
Energy reconstruction check

Backup slides

Nue shower profiles study

Surface : disc area with radius = 1σ of position distribution
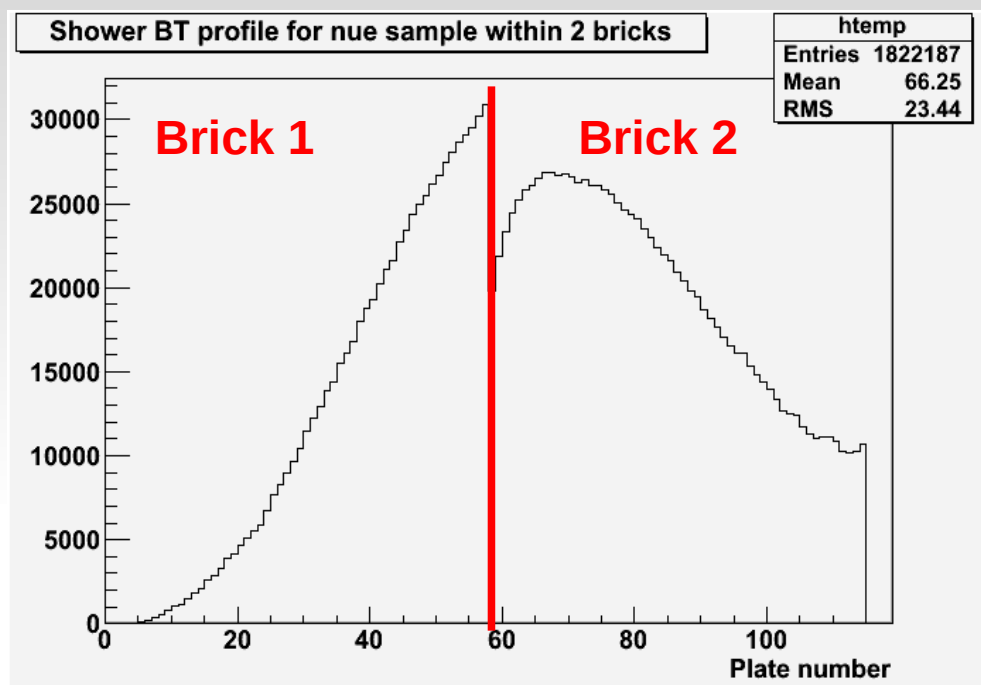
Small drop in the BT multiplicity between the two bricks

→ **basetrack density decrease drastically between the 2 bricks**
→ **any electron tracks are absorbed in the TT**
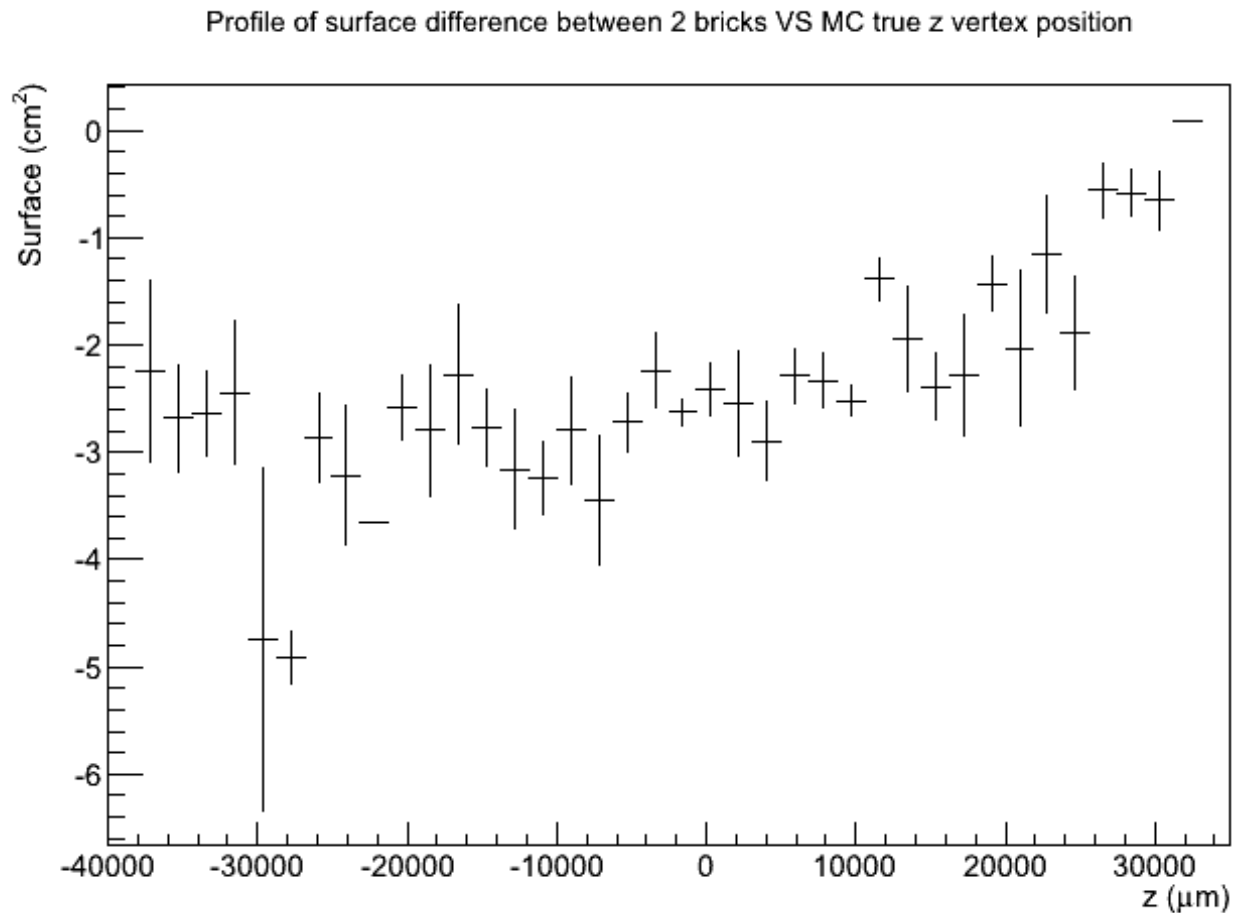→ **taue with same behaviour**
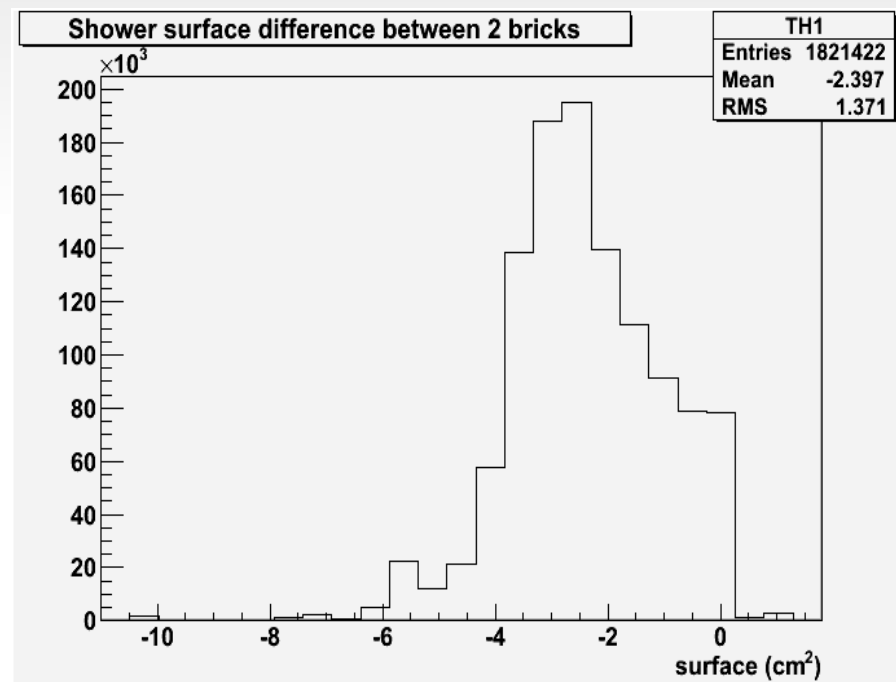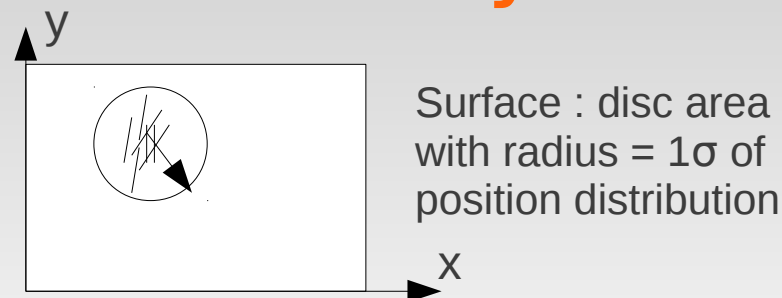
Shower Surface increase by 2.4cm^2 between the last plate of the located brick and the frirst plate of the next downstream brick

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Nue & taue shower profiles study

Goal : determine surface and number of plates to scan in the second brick downstream

- Surface increases between the 2 bricks by a mean value of 2.4 cm^2
- geometric acceptance of the showering : BT inside a cone of 0.02 cm^2 transverse area at maximum

→ area to scan should not be increased in the second brick

- Number of plate has to be 30 in total (brick 1+2) to have a optimal performance of the showering

- We have a tool which gives us a zone to scan in the second brick in function of z vertex position
- Increase the size of this acceptance cone is under study to improve the 2 bricks shower energy estimation

Nue shower profiles study

Profile of surface difference between 2 bricks VS MC true z vertex position

Nue shower profiles study

Shower surface in the plate 57 of the 1st brick

th3	
Entries	679
Mean	0.0979
RMS	0.1732