Summary of electron studies & τ → e MC study

LAPP – Annecy
Florian Brunet
Supervisor : Amina Zghiche

OPERA LAPP Meeting – 13/07/2011

Outline

Electron Working Group studies

Test Brick exposure to electron beam (Aki)

Electron energy estimation within 2 bricks : $\tau \to e$ (Flo)

Electron shower reconstruction nue data from EU (Flo)

Outlook

Problems in previous exposure in 2009

1,3,4 GeV/c electron enriched pion beam.

50-100 electrons / cm2 …

Too high density exposure

every electron shower overwrap with the other electron showers.

Module structure was different.

Z bricks were used. not standard brick, double lead or double emulsion.

Beam angle at (0,0)

high instrumental BG.

This time

2, 4 GeV/c electron enriched pion beam
Low exposure density ~ a few/cm2
1 electron / cm2 for 4 GeV
2 electron / cm2 for 2 GeV
Use Z bricks, but re-piled before exposure.
no double lead, no double emulsion
Angle (0.1, 0.0)
avoiding high BG angle.

Bricks after exposure

Bricks are transported from CERN to GS
most probably they will be developed today (23rd Aug)

Scanning and Analysis

Florian will analyze the data
Scanning will be performed in Bern.
Florian stay in Bern some time to start.
then scanning will be continued by Bern shifters.
using a microscope in night, ~2,3 month.

MC Sample - OpRelease 4.0

Samples of 1000 τ→e DIS & QE produced by Elisabetta
/sps/opera/operap/production/OpEmuIO/march2011/TAUE/DATA/taueforemu_tgt1000_OpR4.0_rec_11.root

- Processed through OpEmuIO
- Processed through OpEmuRec packages : CS, Scanback, Link, Alignment, Track & Shower by using all plates available in the brick
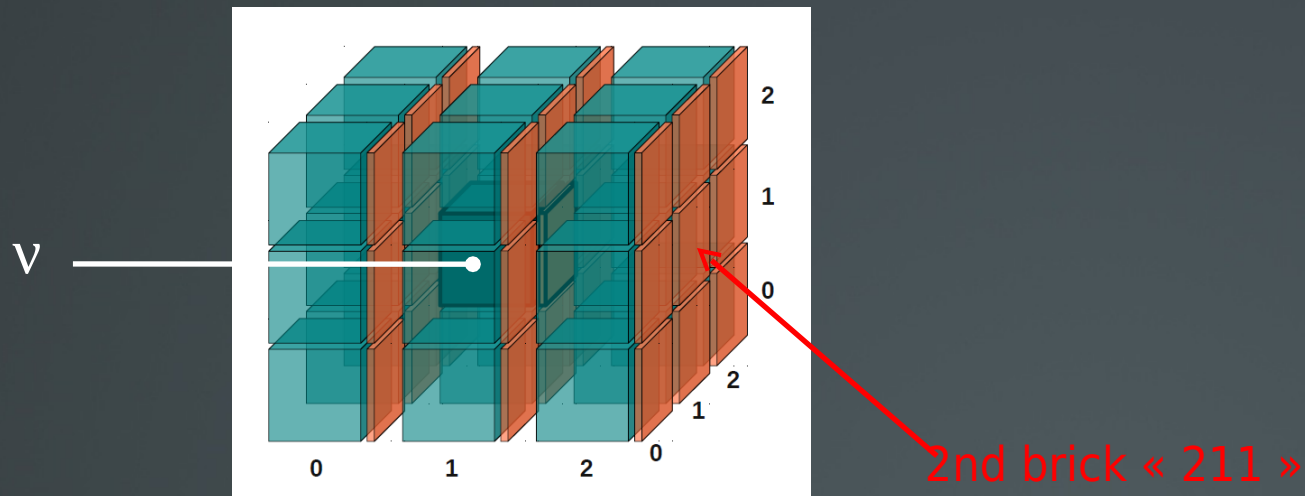
- All packages up to OpEmuRec Track are taken from the release $GROUP_DIR/soft/OpRelease4.0_emulsion_march2011/
- OpEmuRec Shower is released here : /sps/opera/scratch/flbrunet/analysis/OpRelease_2011-04-04_OKwithShower/4.0/OpEmuRec/
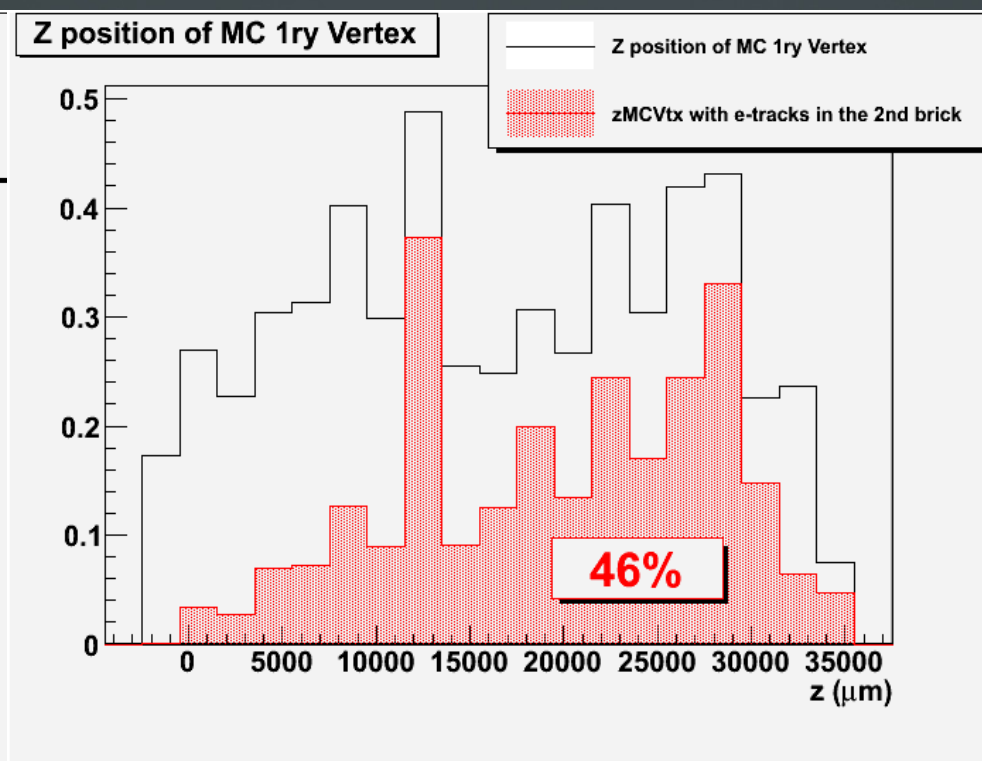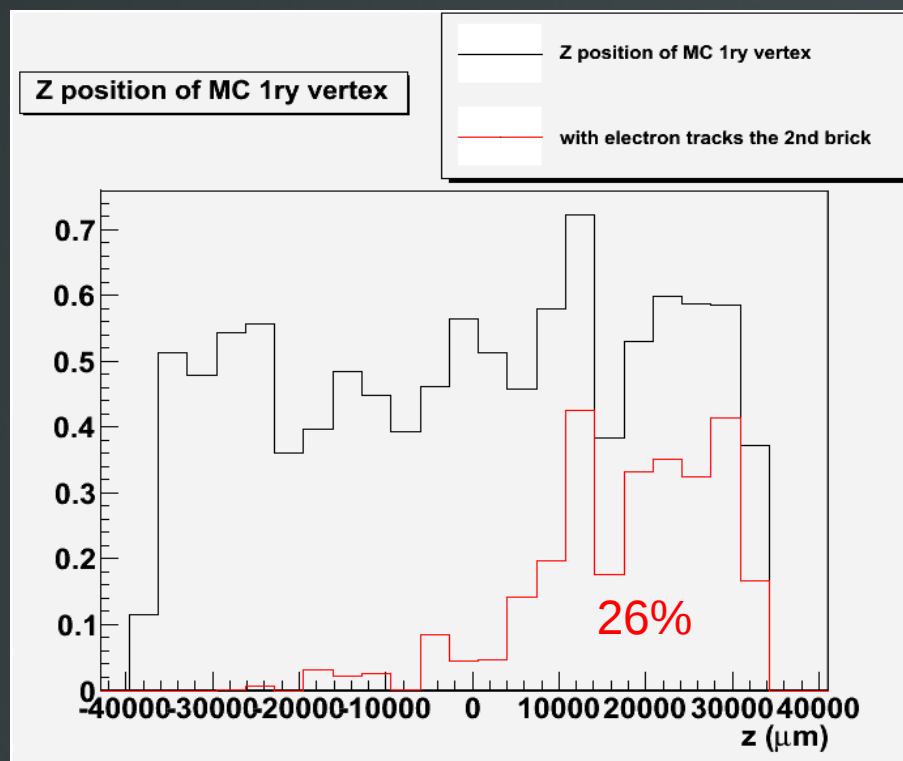
LAST FEDRA RELEASE (1173) LAST OPEMUREC(v3)/OPRELEASE(4.0)

Electron energy estimation within 2 bricks : $\tau \rightarrow$ e DIS 1000 events

By taking into account MT efficiency

ν

2nd brick « 211 »

Electron energy estimation within 2 bricks

By considering only secondary electron tracks

Electron energy estimation within 2 bricks
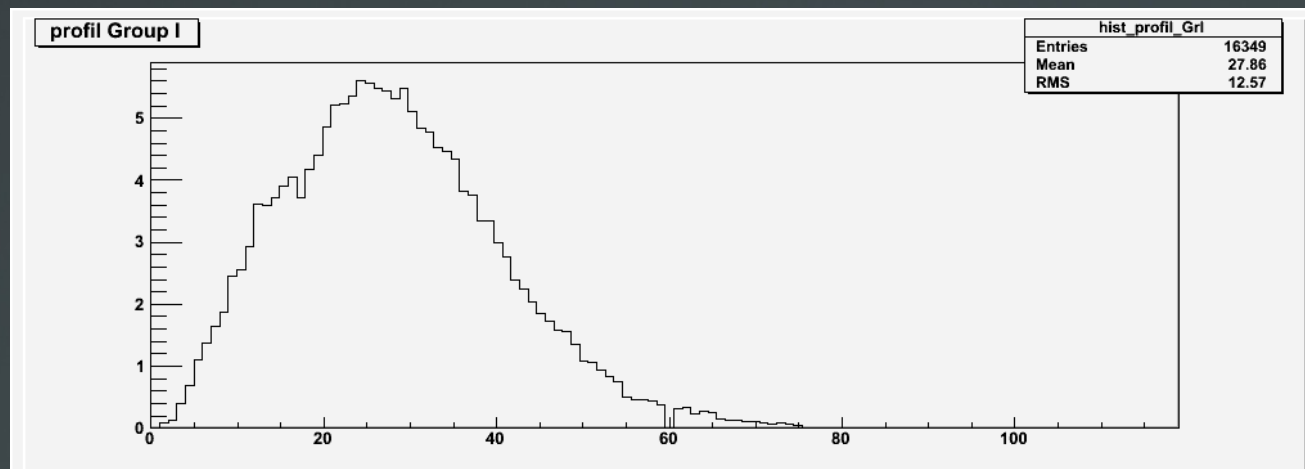
By considering ALL electron tracks

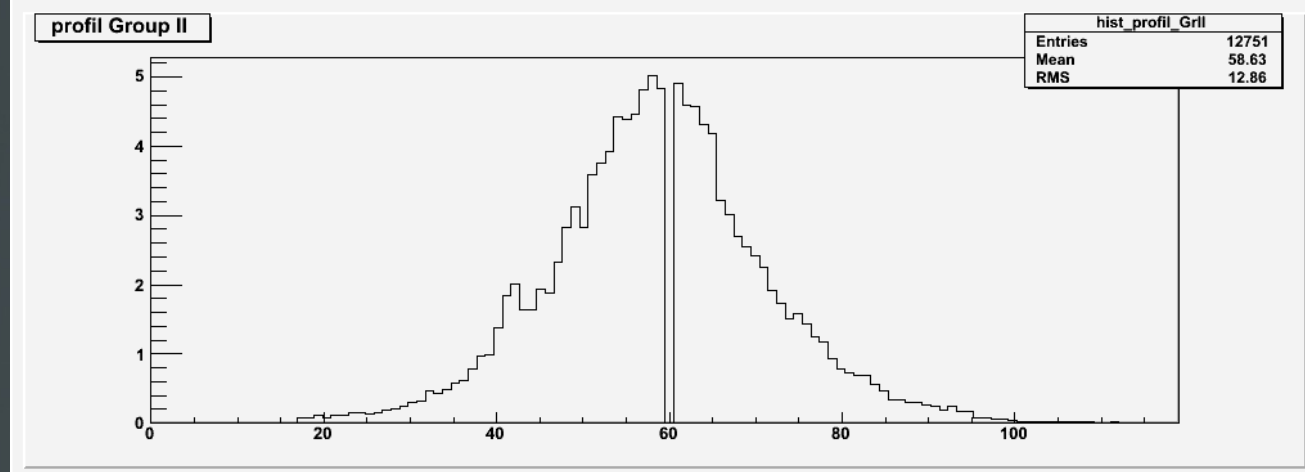75% of events have electron tracks in the second brick downstream : Groupe II

Florian

Electron energy estimation within 2 bricks

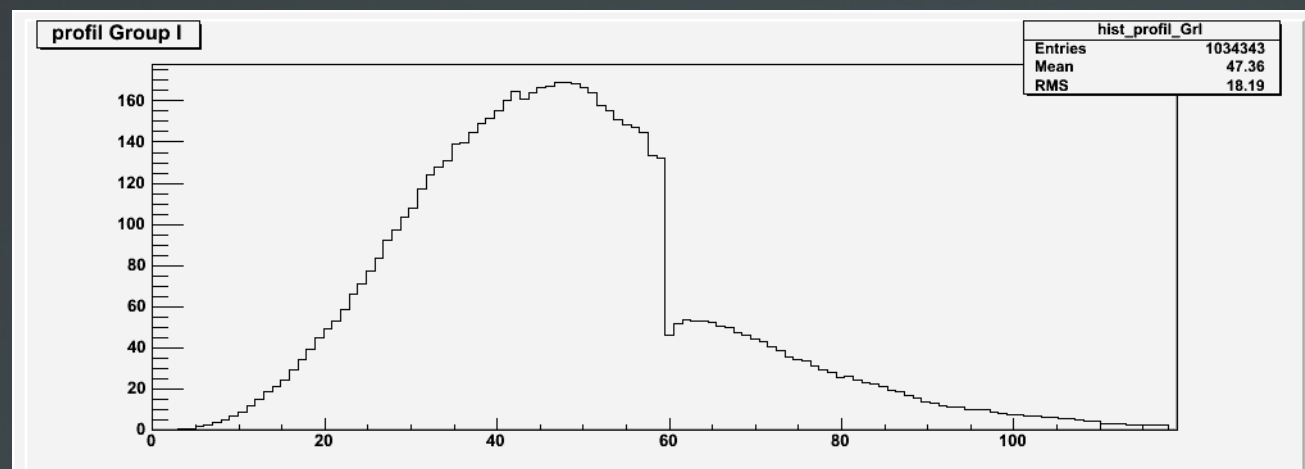Groupe I : events with the primary vertex in the first half-brick z < 0

Groupe II : events with the secondary electron tracks in the second brick dowstream
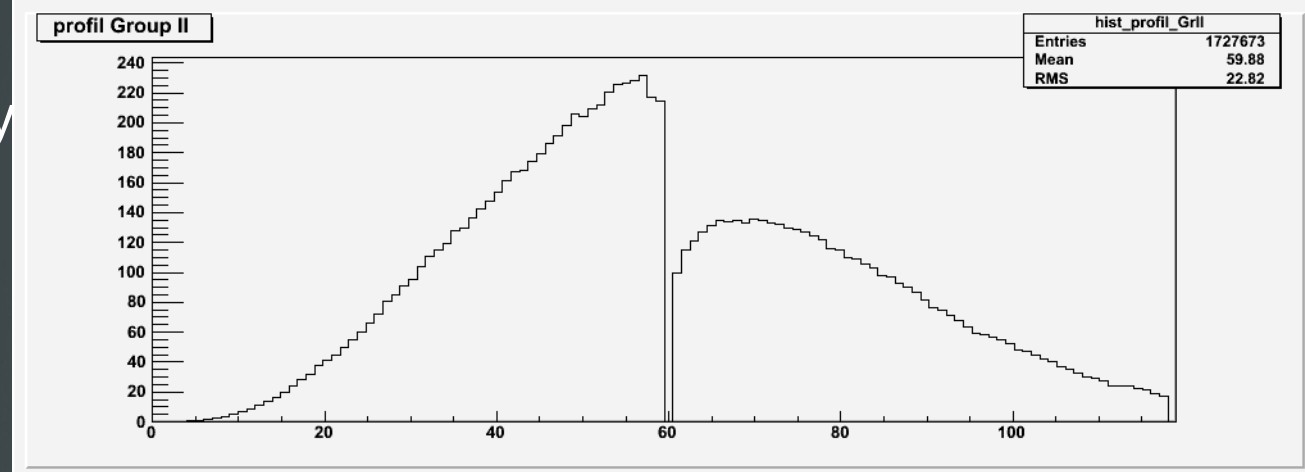(at least one microtrack)

By considering only secondary electron tracks

Electron energy estimation within 2 bricks

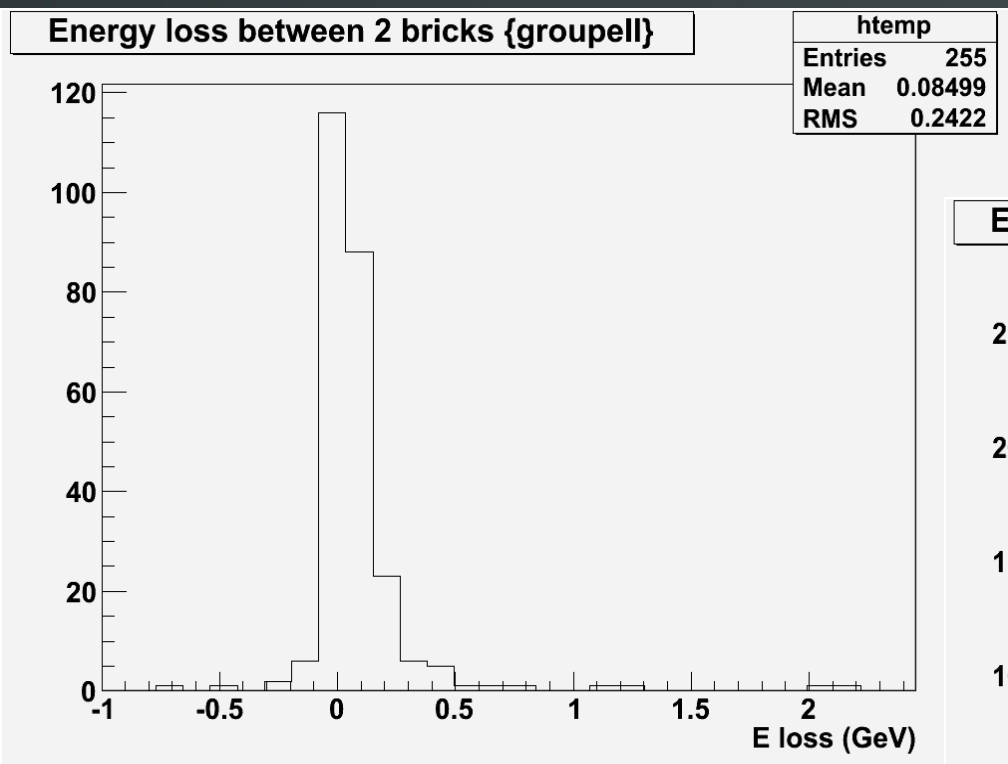Groupe I : events with the primary vertex in the first half-brick z < 0

Groupe II : events with the secondary electron tracks in the second brick dowstream
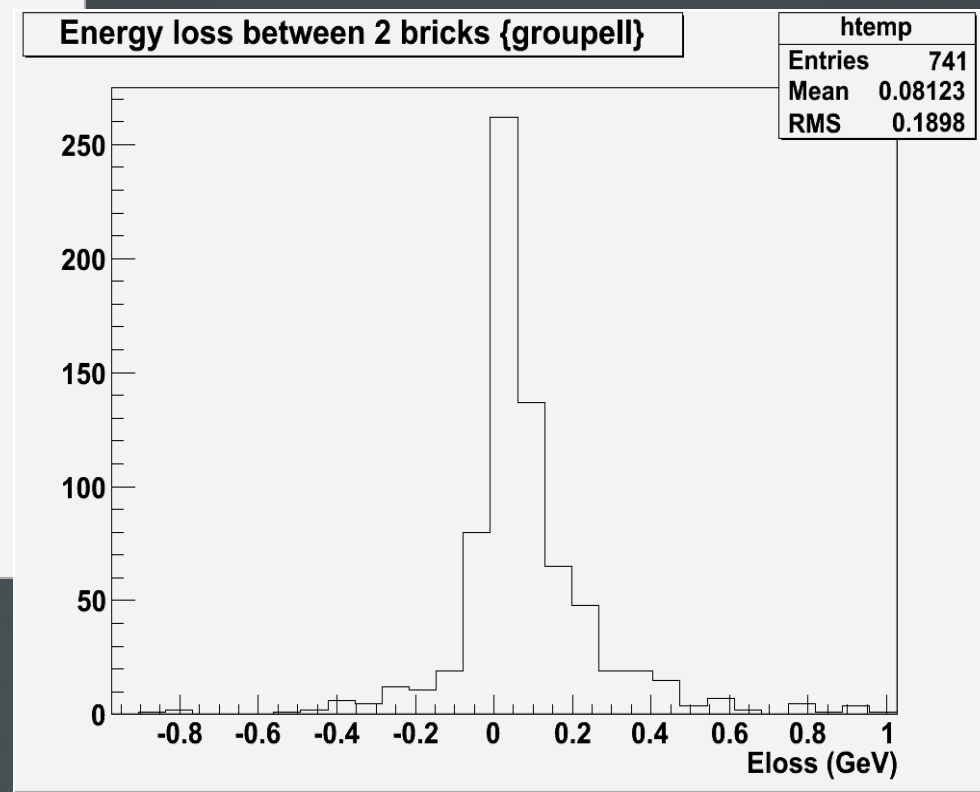(at least one microtrack)

By considering ALL electron tracks

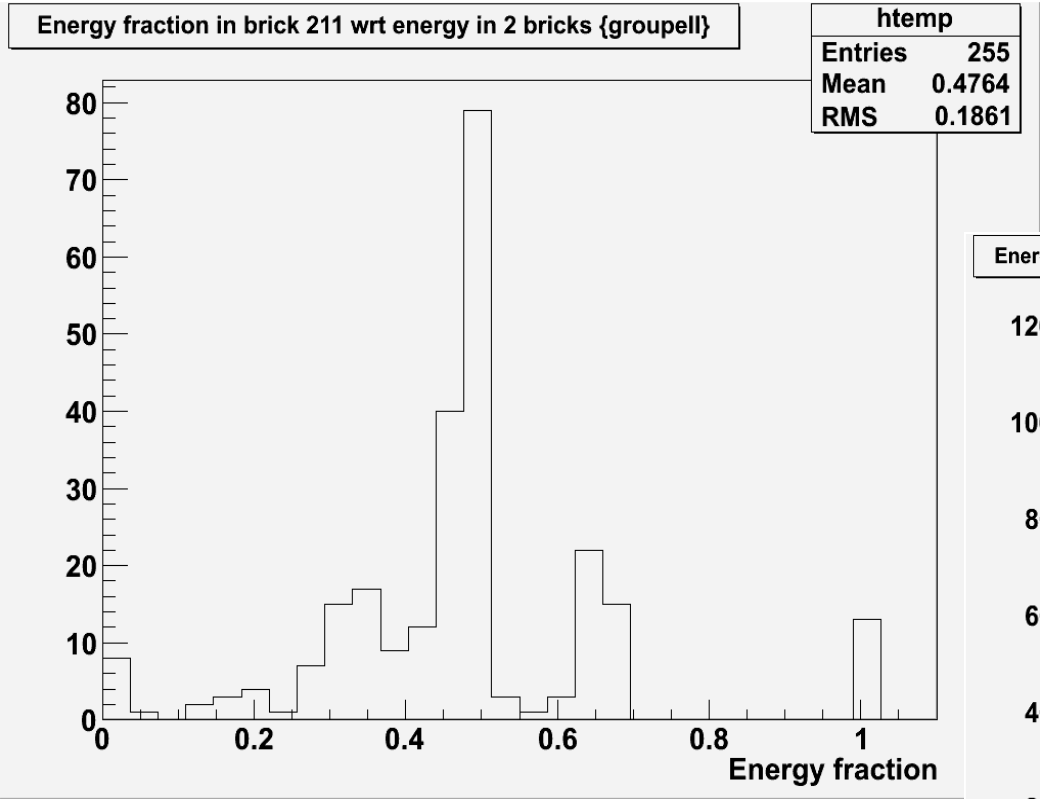# Electron energy estimation within 2 bricks
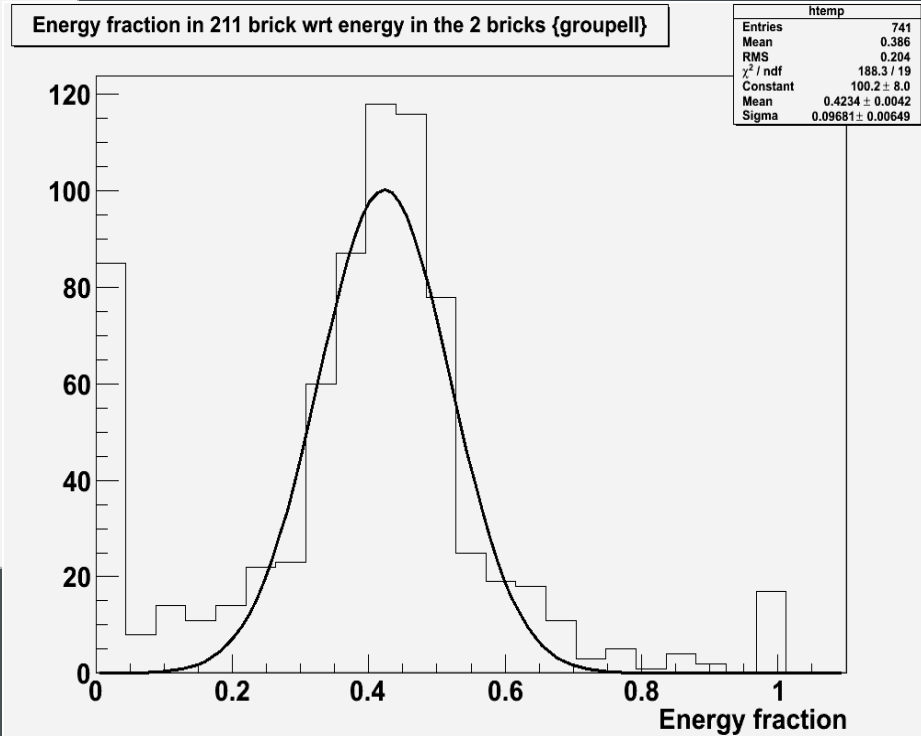

Only secondary electron tracks

All electron tracks

Electron energy estimation within 2 bricks

Only secondary electron tracks

All electron tracks

Electron shower energy estimation in nue data (EU)

- « Standard » strategy to estimate energy of these showers :

    - Reconstruct tracks and vertices (already done by Elisabetta & Andrea)

    - Select the primary vertex

    - Reconstruct showers on all primary tracks

- Code under development

Outlook

2-Brick analysis : estimation of error by using only one brick
Using shower tool by « simulating » the TT between two bricks

Data analysis : comparison of my result with the one already produced by scanning labs

Calibration of shower tool : beamtest brick analysis in Bern

Electron exposure

Same coordinate system as OPERA. -100 mrad rotated for X.
Brick 17006
4GeV/c standard magnet setting except final focusing magnet (Q6 -20A, Q7 -10A) and last bending (BHZ3 -97A), flat position distribution all over the surface. collimaters +-2mm.
Electron/trigger = 5.2%
3 spills, 3415 triggers -> **3200 pions and 170 electrons / 120cm2**.
= 1.4 electron/cm2
Brick 16743
2GeV/c standard magnet setting except final focusing magnet (Q6 -4A, Q7 0A). flat position distribution all over the surface. collimaters +-2mm.
Electron/trigger = 23%. (with Al target 17%).
1419 triggers -> **1100 pions and 300 electrons / 120cm2.**
= 2.5 electron/cm2