

Groupe LC détecteurs :
Réunion de Physique
29 février 2012

Simulation des gerbes hadroniques
dans un calorimètre micromégas

Analyse des données Test-Beam
d'aout 2011

Damien Girard

Simulation des gerbes hadroniques dans un calorimètre micromégas

Particules = pions

Gamme d'énergie = 3 -> 200 GeV
(données simulées par Jan et Yannis)

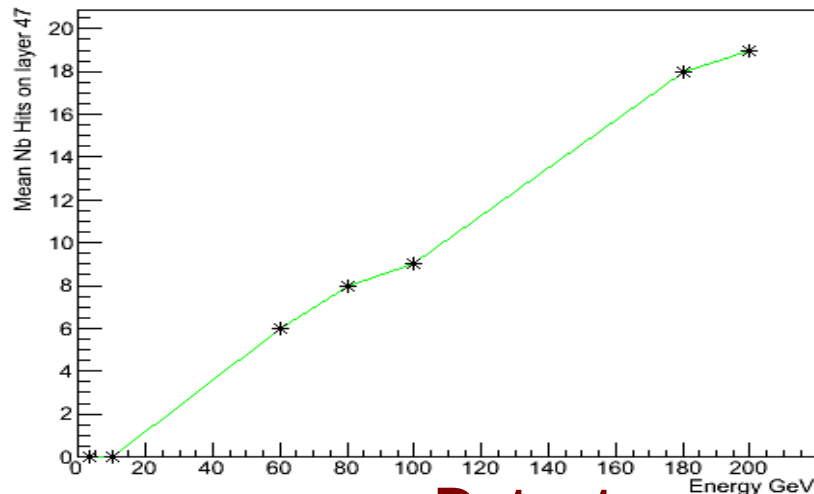
Calorimètre (simulé par Jan) :

- dimensions : 2m * 2m * 80plans
- absorbeurs = Fer
- détecteurs = micromégas

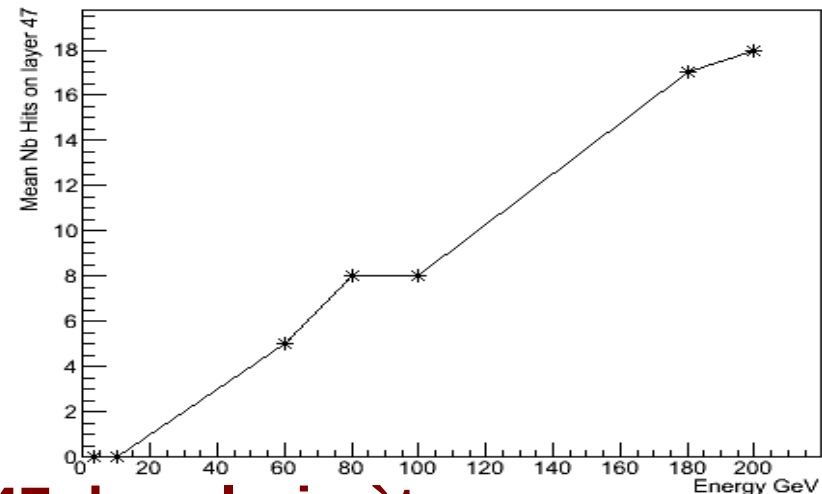
- * Nombre de hits moyen par plan
- * Méthodes de reconstruction du profile de gerbe
- * Statistique du départ de la gerbe hadronique
- * Qualité de la reconstruction en fct du nb d'evts

Nombre de hits moyen sur un plan détecteur

All

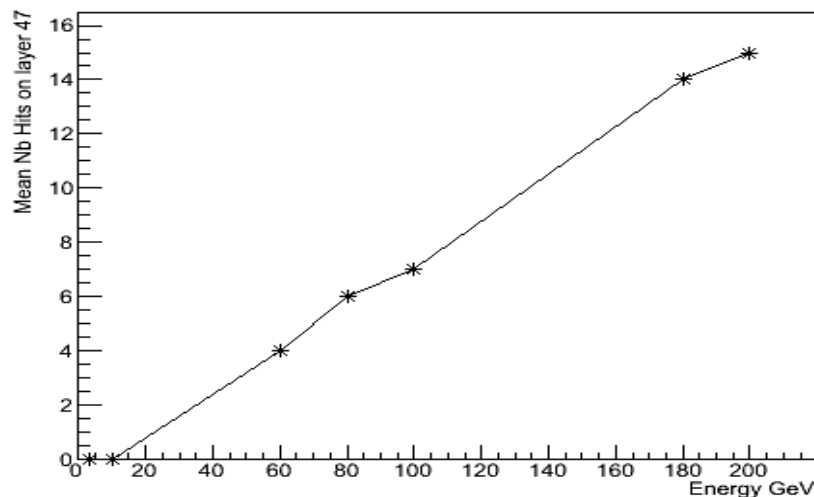


Threshold0 = 2.0835 fC

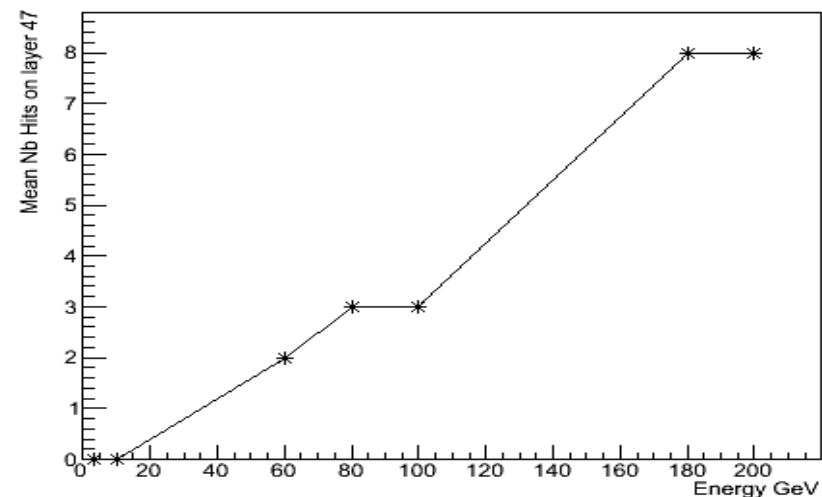


Détecteur au plan 47 du calorimètre

Threshold1 = 7.5 fC

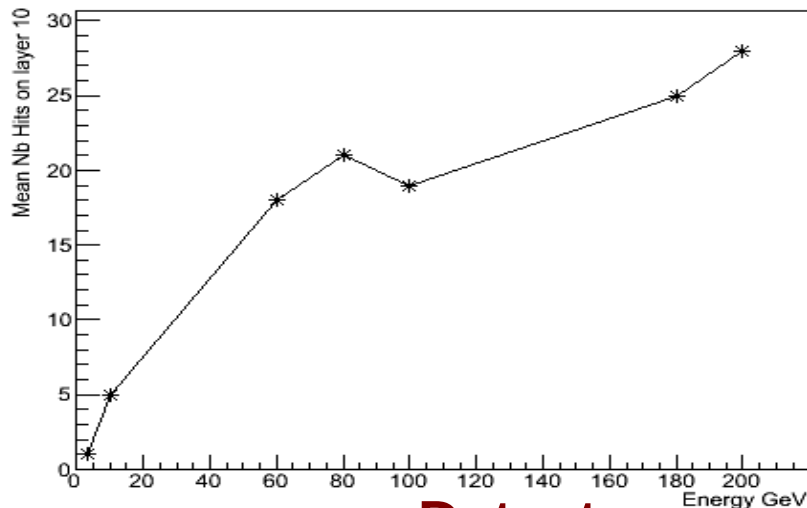


Threshold2 = 20. fC

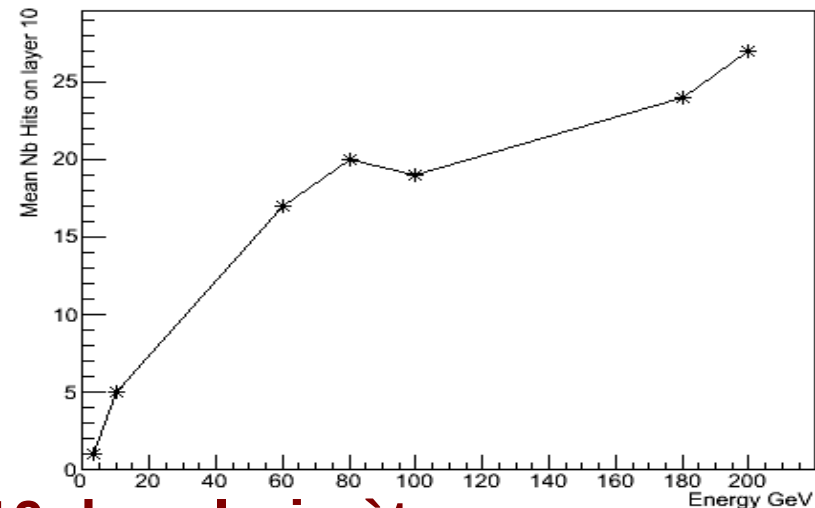


Nombre de hits moyen sur un plan détecteur

All

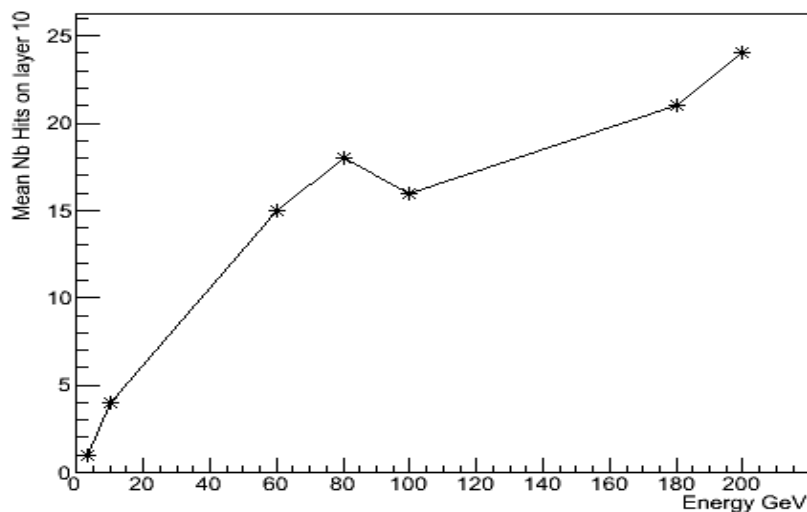


Threshold0 = 2.0835 fC

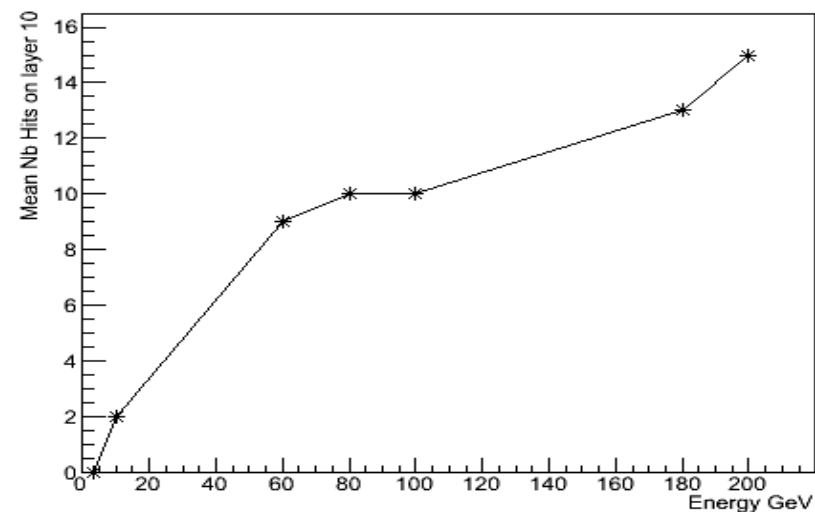


Détecteur au plan 10 du calorimètre

Threshold1 = 7.5 fC

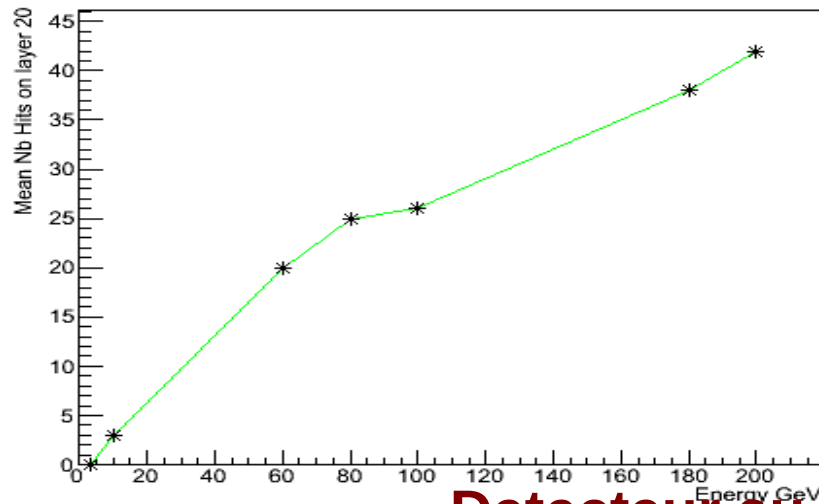


Threshold2 = 20. fC

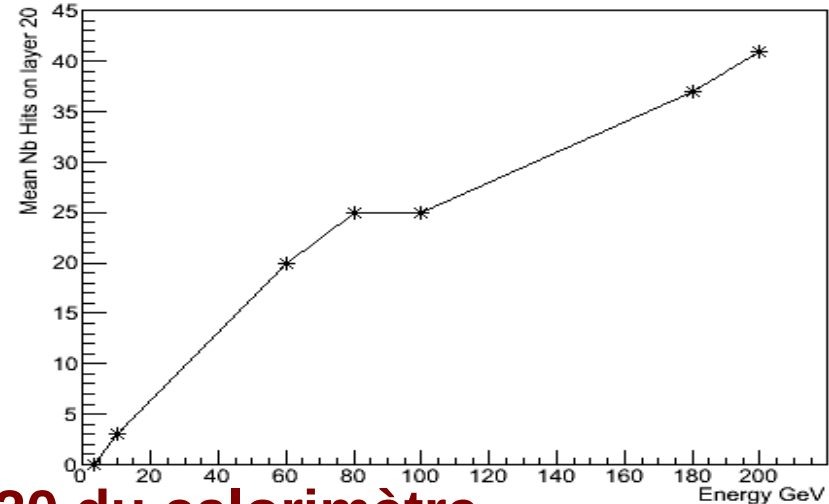


Nombre de hits moyen sur un plan détecteur

All

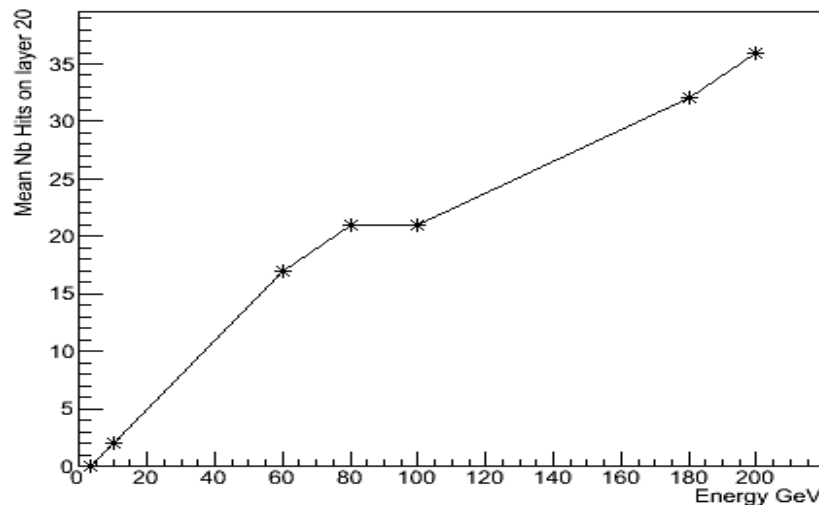


Threshold0 = 2.0835 fC

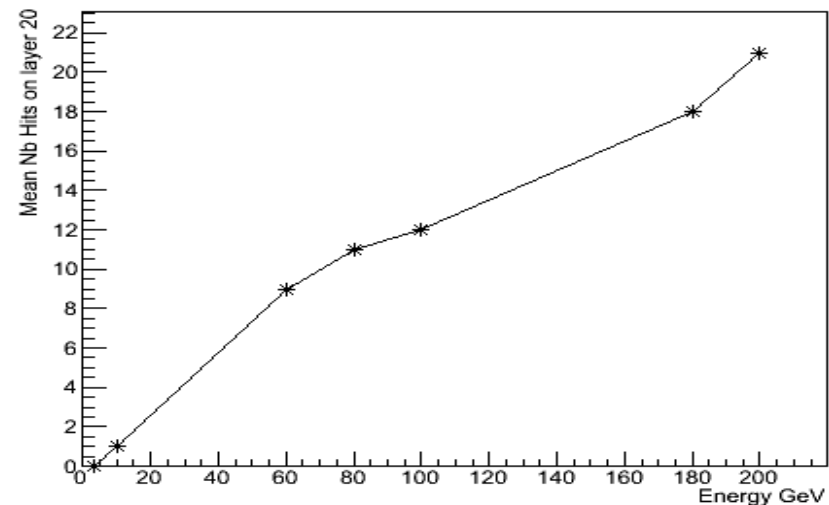


Détecteur au plan 20 du calorimètre

Threshold1 = 7.5 fC

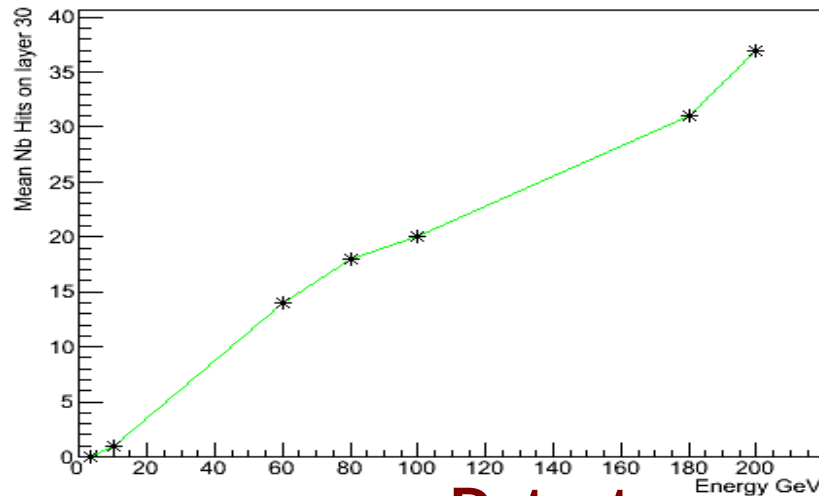


Threshold2 = 20. fC

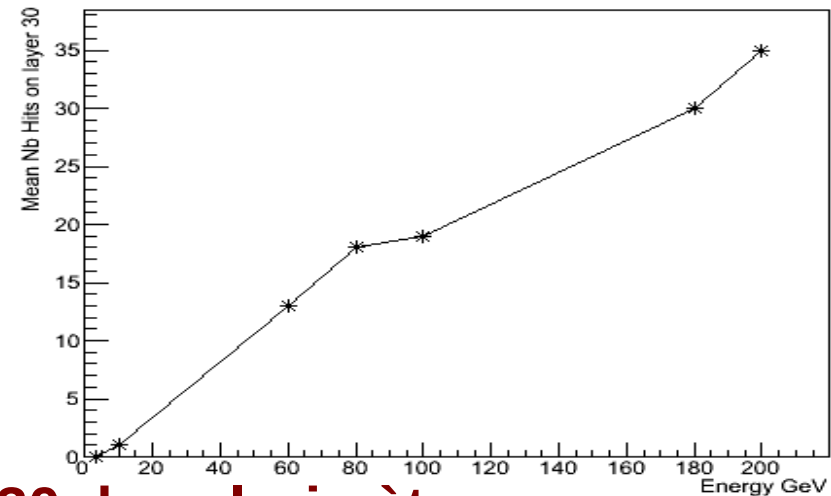


Nombre de hits moyen sur un plan détecteur

All

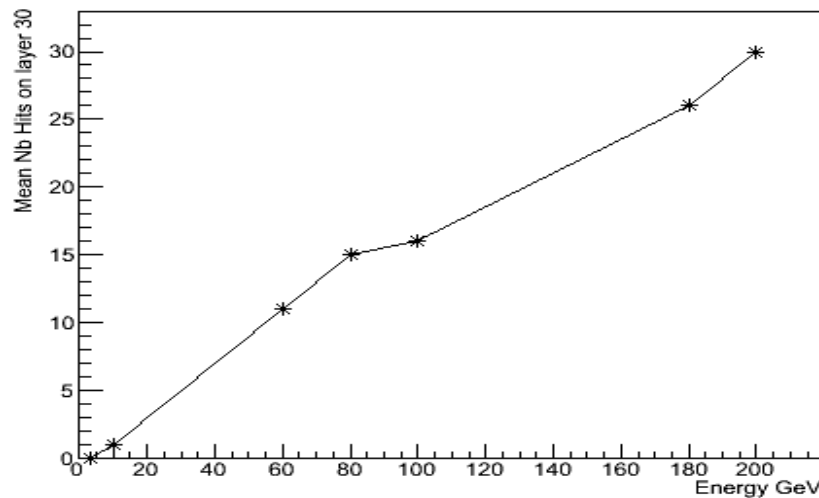


Threshold0 = 2.0835 fC

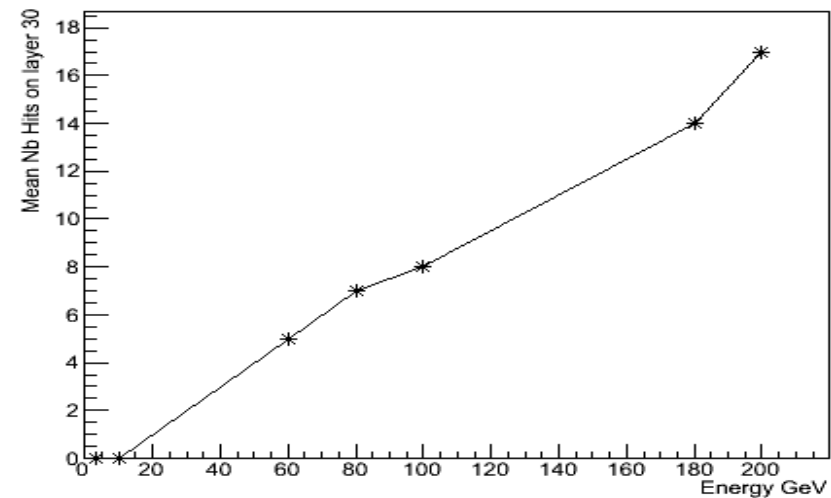


Détecteur au plan 30 du calorimètre

Threshold1 = 7.5 fC

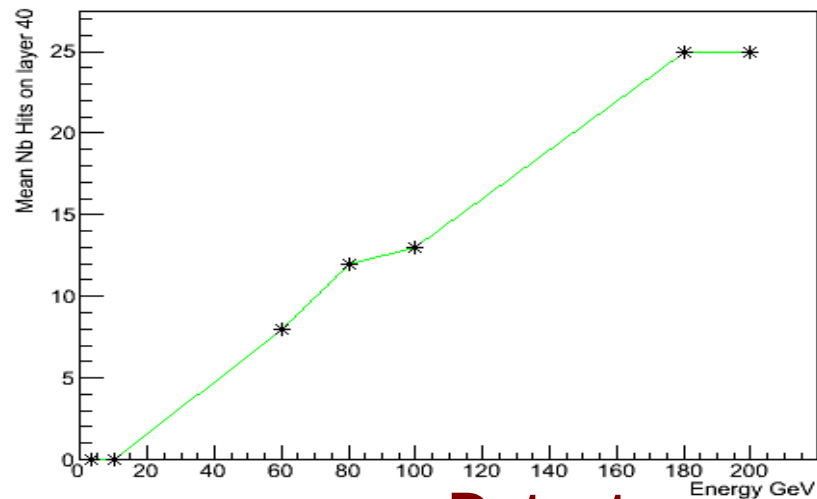


Threshold2 = 20. fC

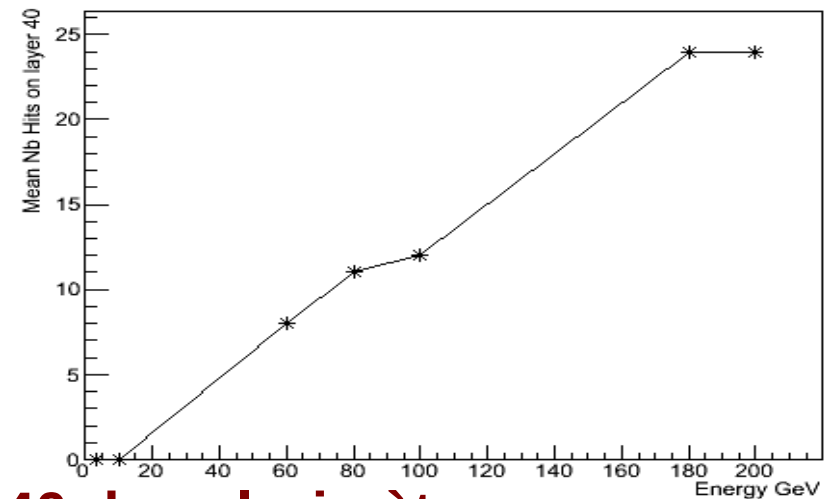


Nombre de hits moyen sur un plan détecteur

All

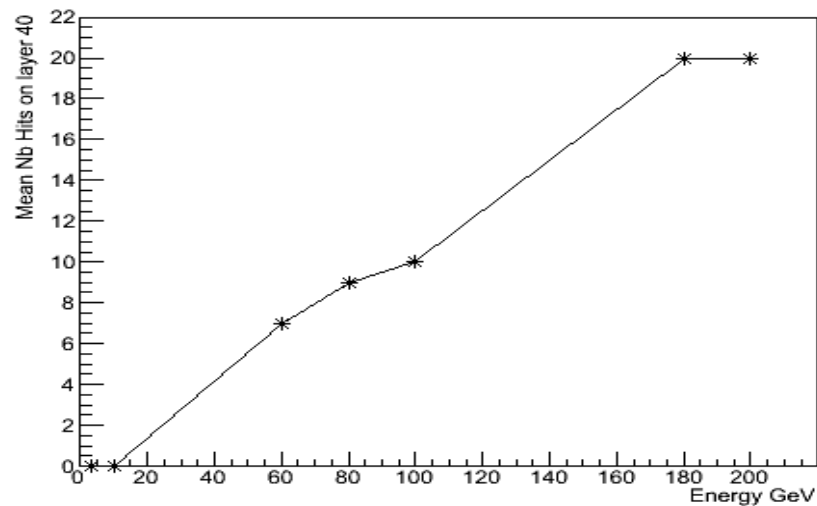


Threshold0 = 2.0835 fC

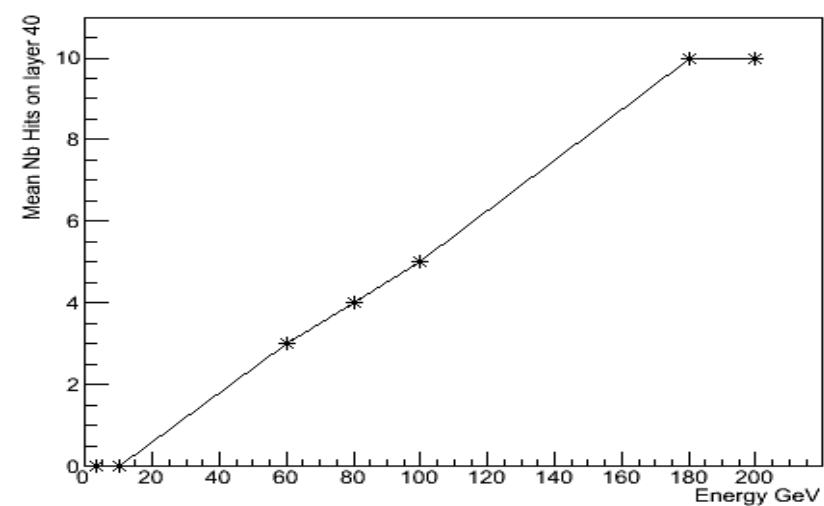


Détecteur au plan 40 du calorimètre

Threshold1 = 7.5 fC

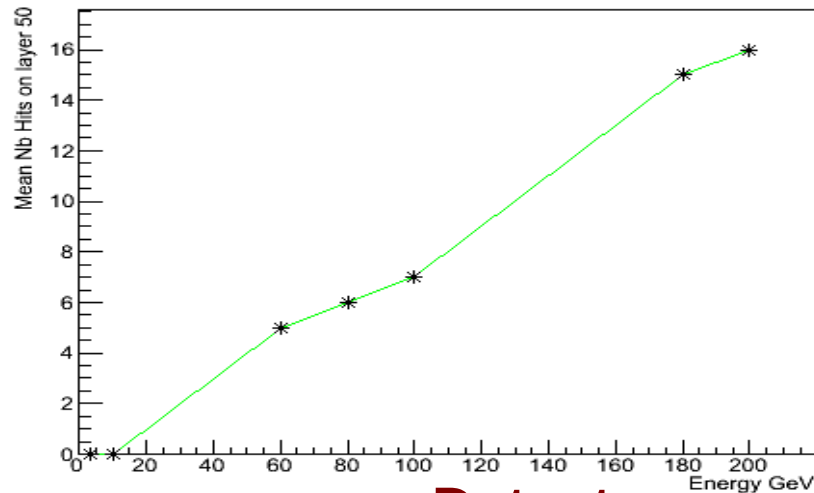


Threshold2 = 20. fC

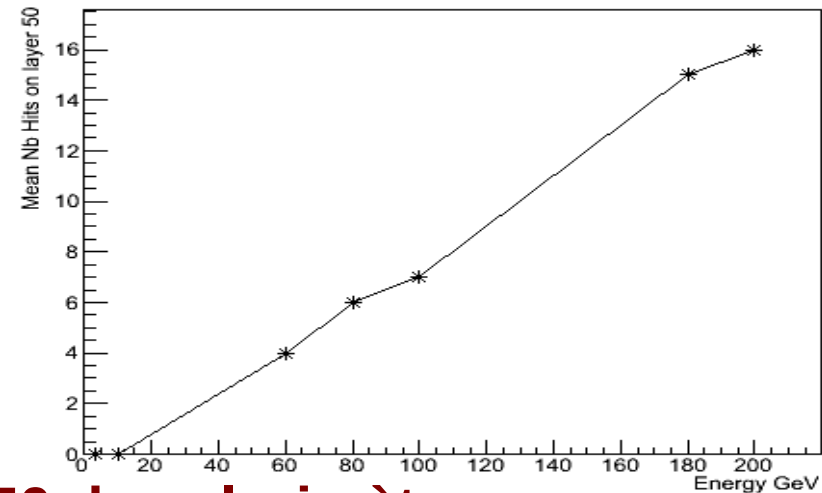


Nombre de hits moyen sur un plan détecteur

All

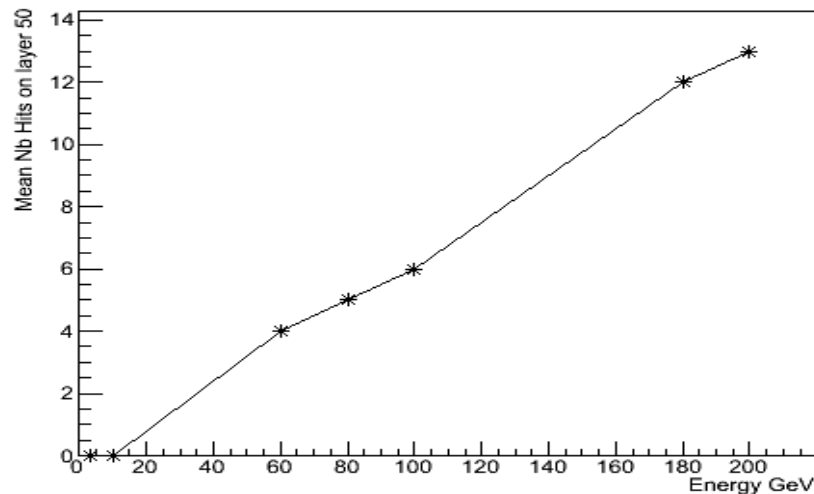


Threshold0 = 2.0835 fC

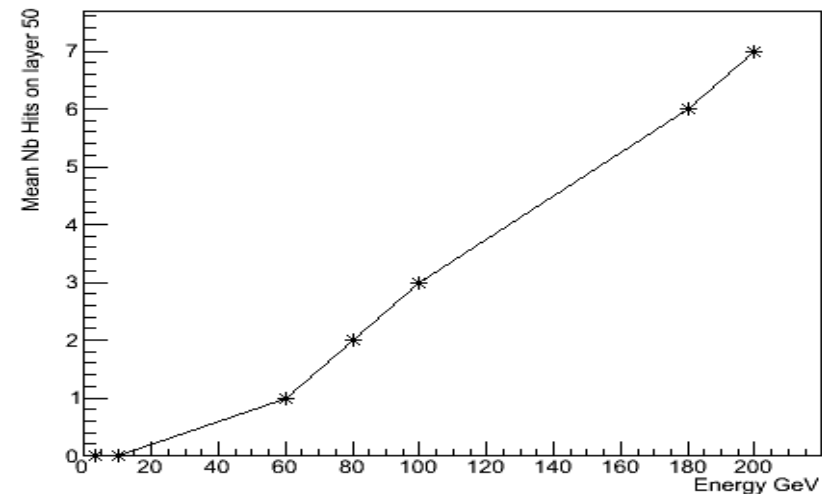


Détecteur au plan 50 du calorimètre

Threshold1 = 7.5 fC



Threshold2 = 20. fC



Méthodes de reconstruction du profile de gerbe en test faisceau

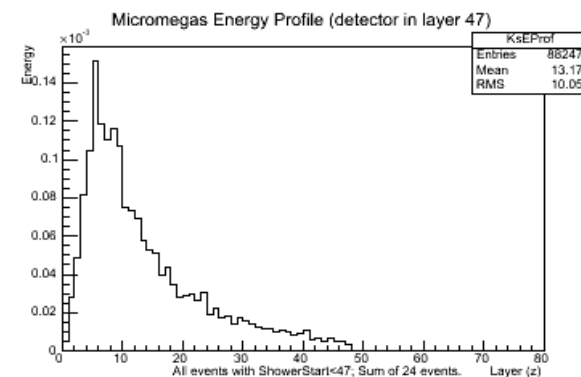
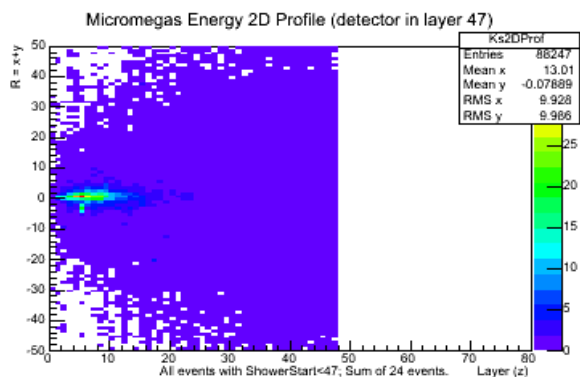
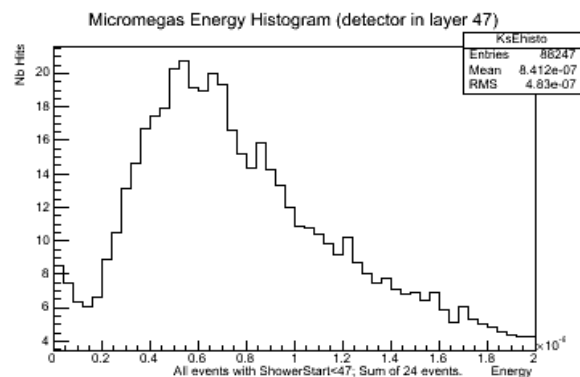
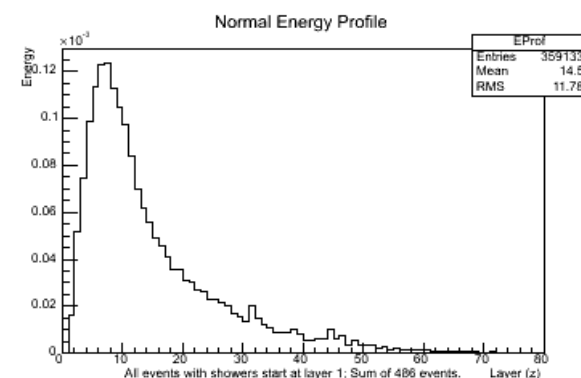
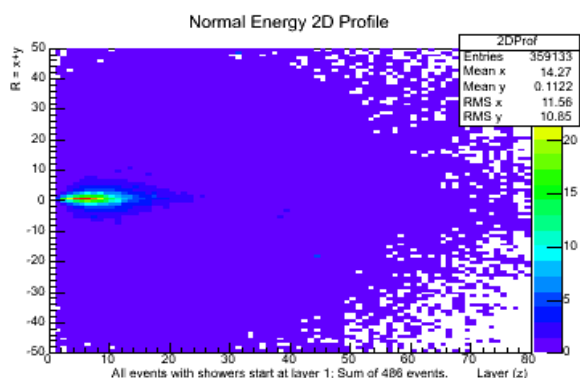
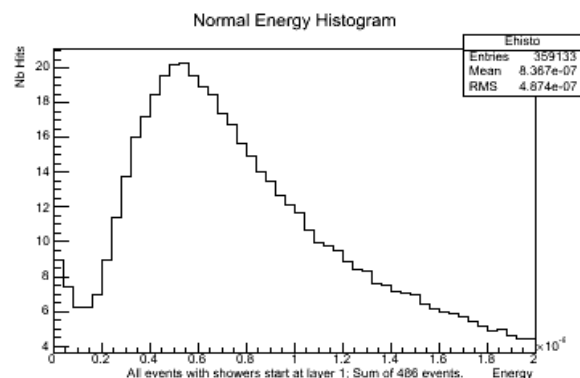
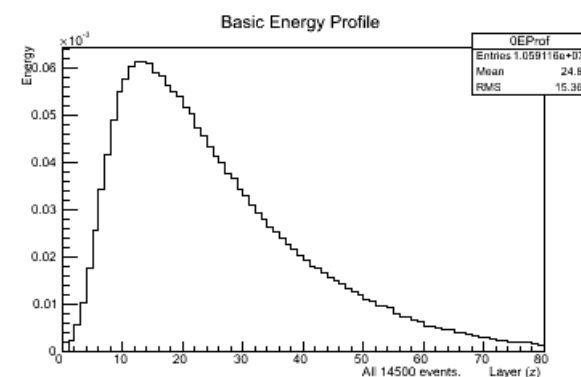
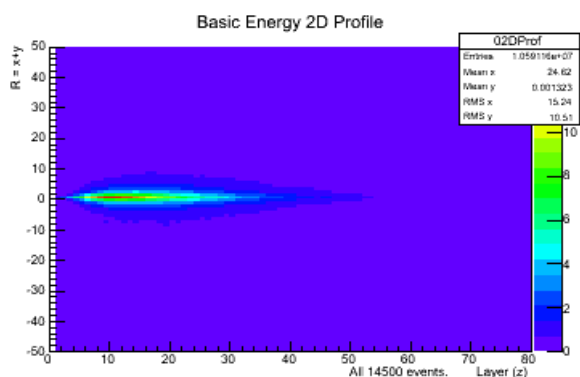
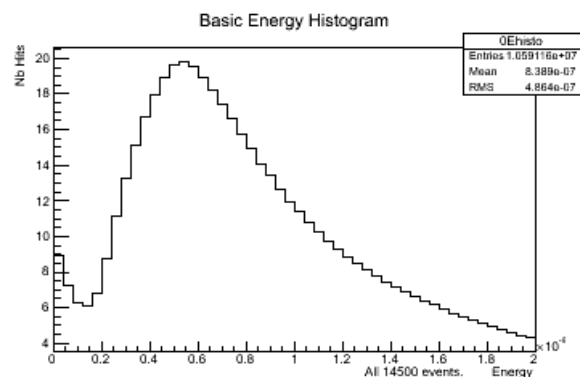
3 méthodes :

- * Basique : pour tous les événements, histogramme de l'énergie déposée en fonction du plan détecteur (nécessite de déplacer le détecteur à tous les plans ; ne tient pas compte du point de départ de la gerbe)
- * Simple : pour les événements dont la gerbe commence au plan 1 , histogramme de l'énergie déposée en fonction du plan détecteur (nécessite de déplacer le détecteur à tous les plans)
- * Nouveau : pour les événements, histogramme de l'énergie déposée en fonction de la distance entre le plan détecteur et le départ de la gerbe

60 GeV

Profile de gerbe

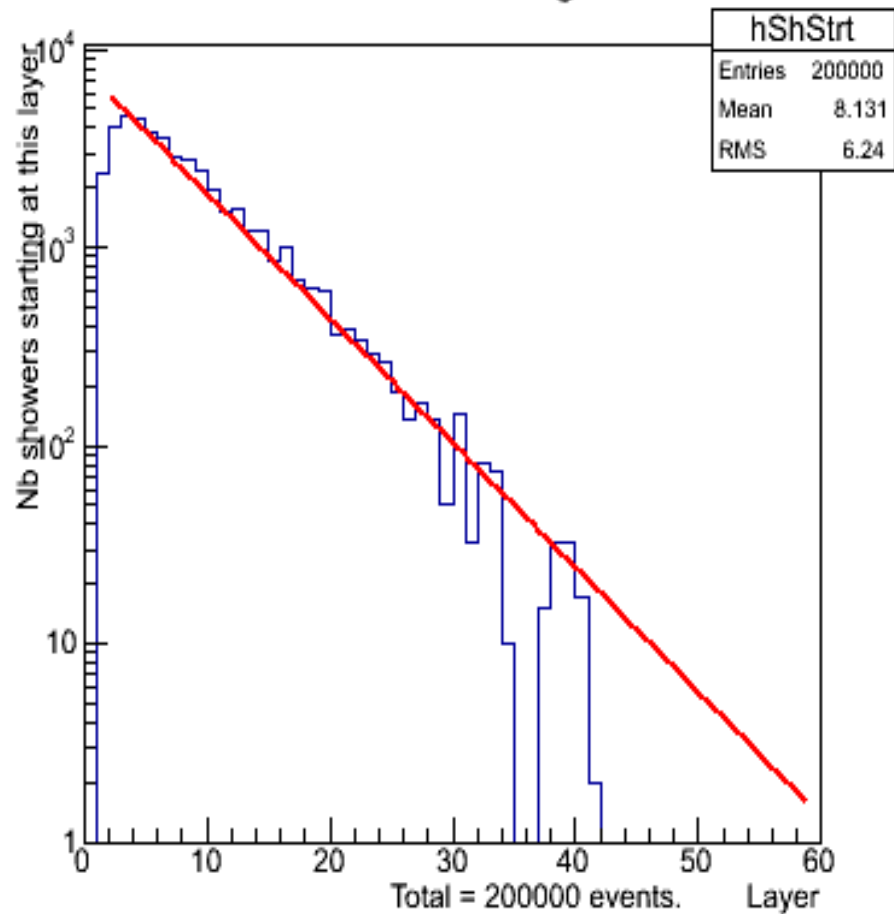
Det au Plan 47



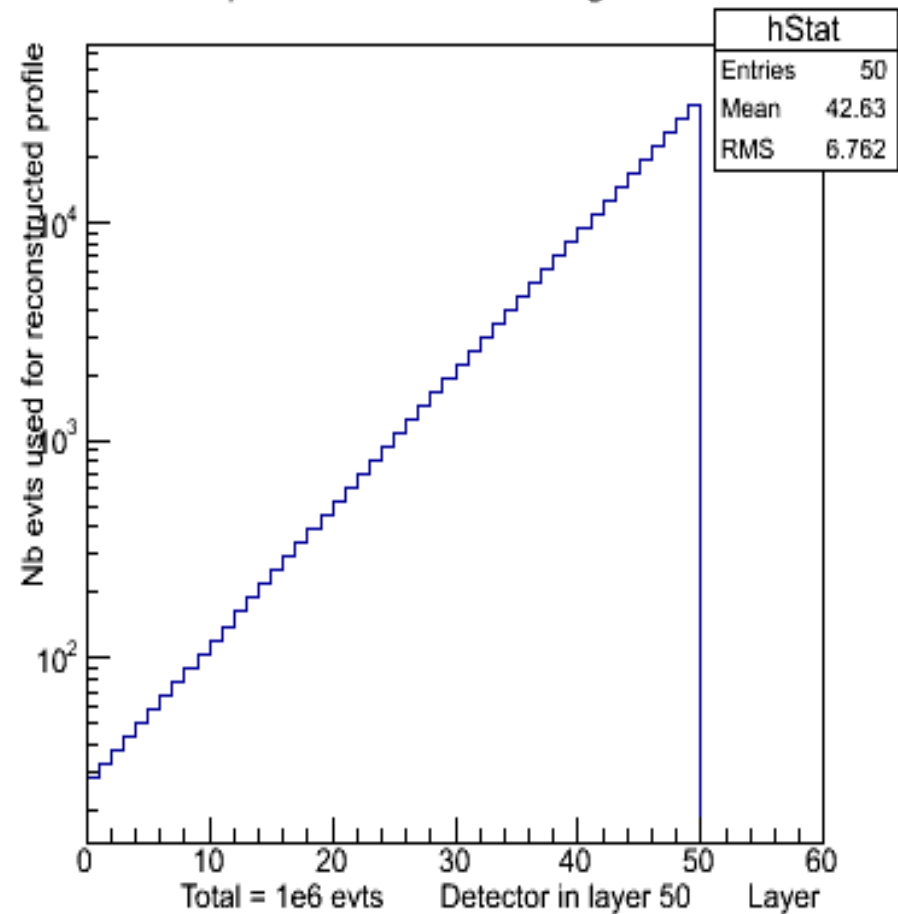
Départ de gerbe hadronique

3 GeV

Shower start histogramm



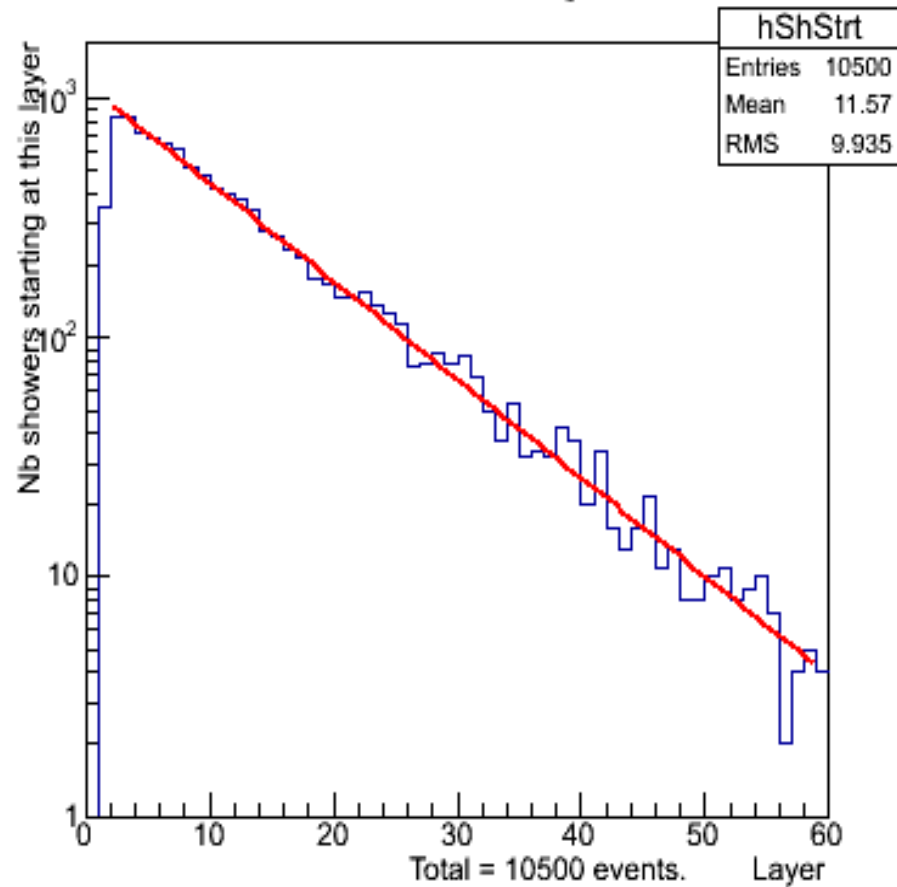
Eprofile statistic histogramm



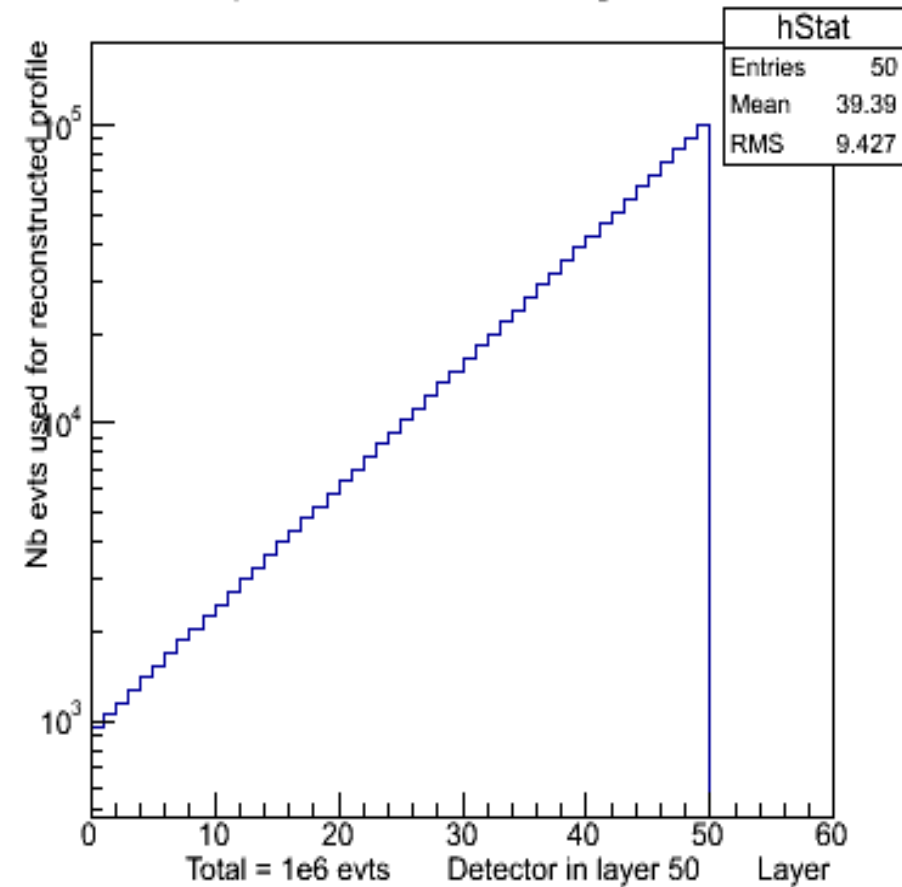
Départ de gerbe hadronique

80 GeV

Shower start histogramm



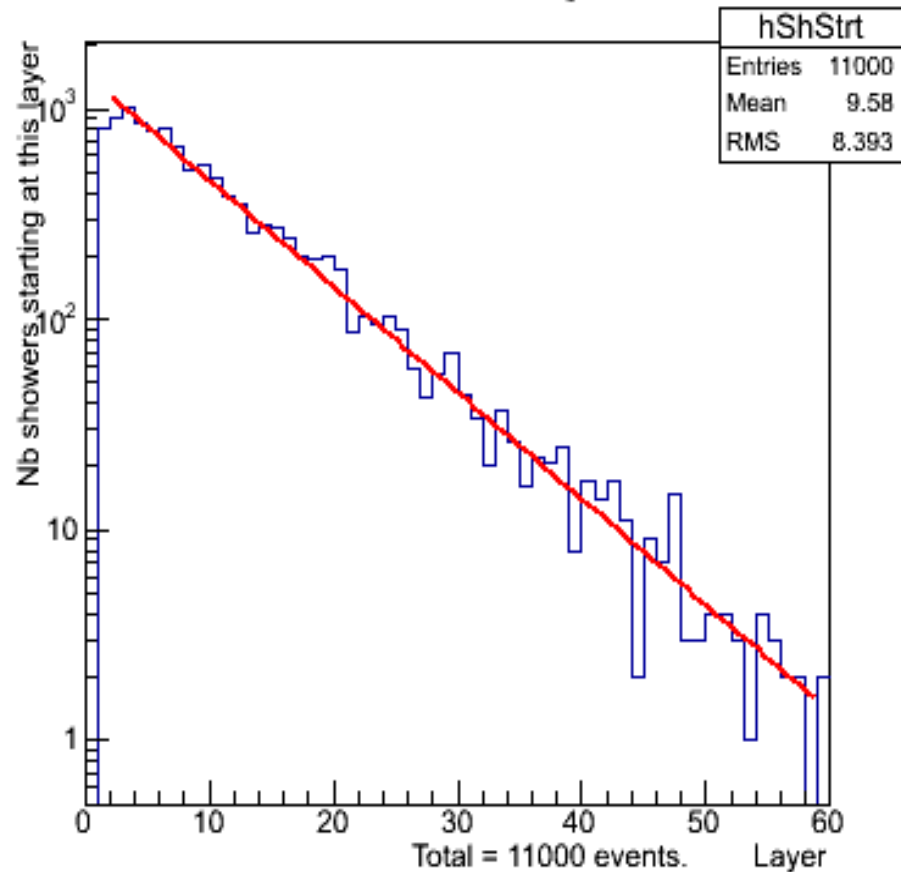
Eprofile statistic histogramm



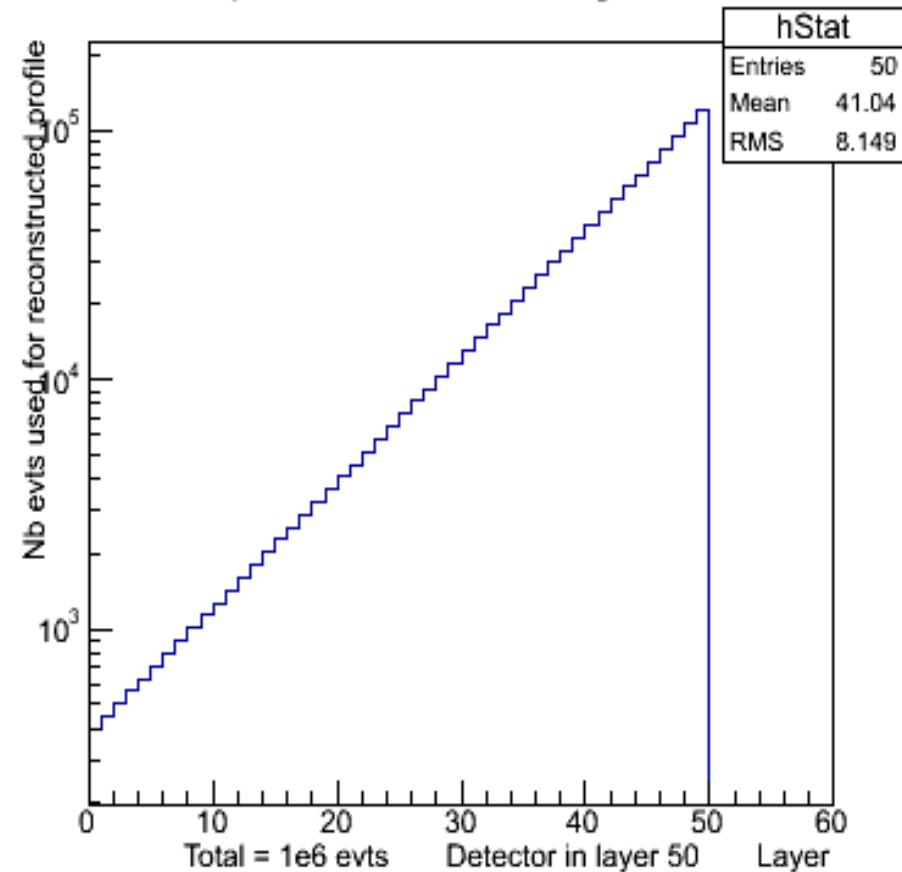
Départ de gerbe hadronique

200 GeV

Shower start histogramm



Eprofile statistic histogramm



Profile de gerbe en fonction du plan détecteur

60 GeV

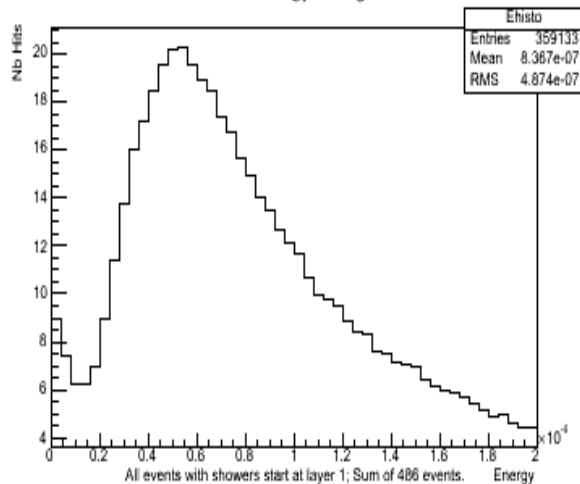
Det au Plan 10

All 14500 events. Energy

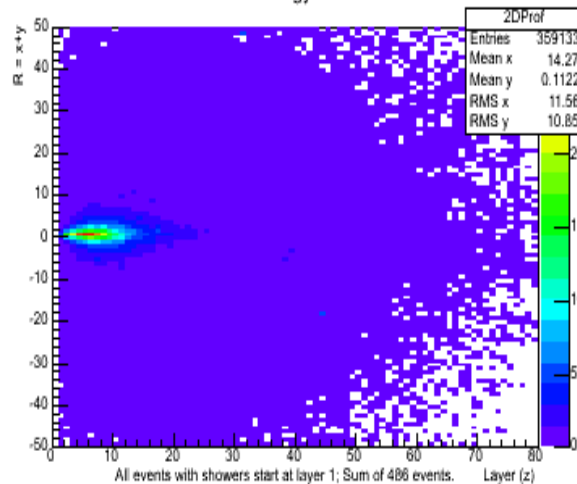
All 14500 events. Layer (z)

All 14500 events. Layer (z)

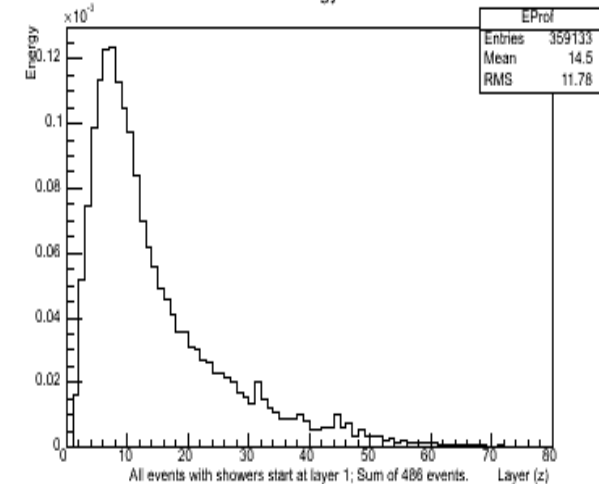
Normal Energy Histogram



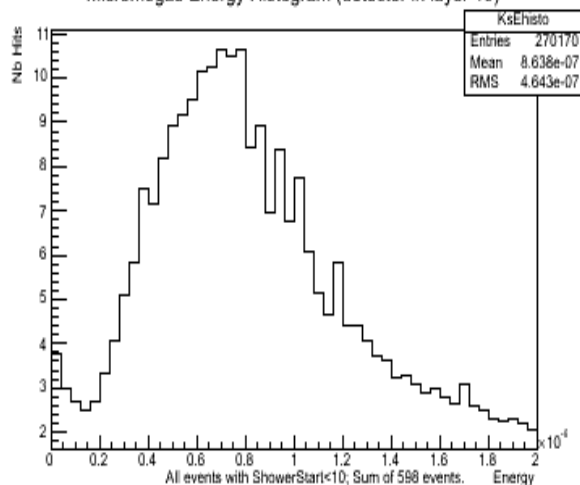
Normal Energy 2D Profile



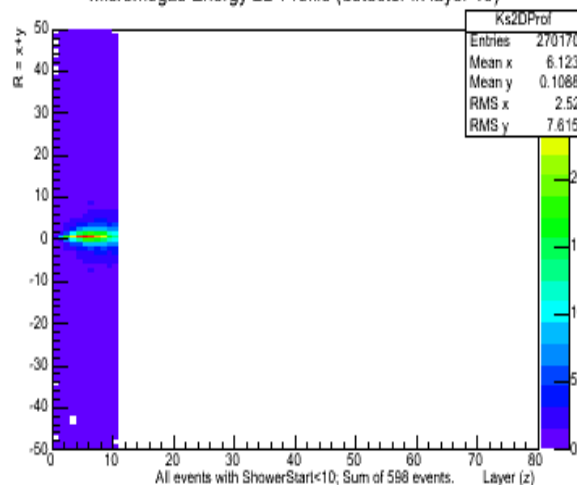
Normal Energy Profile



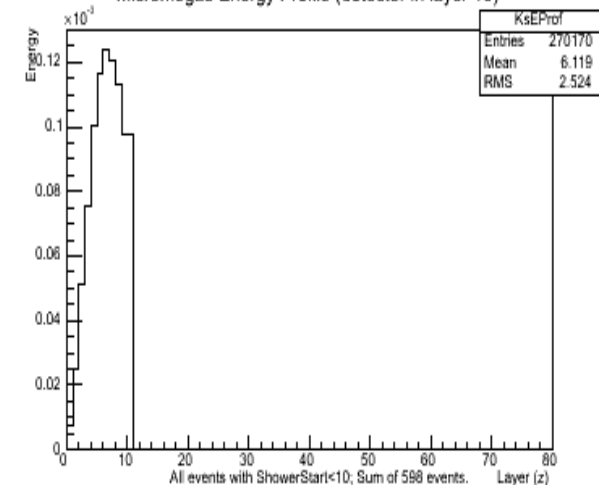
Micromegas Energy Histogram (detector in layer 10)



Micromegas Energy 2D Profile (detector in layer 10)



Micromegas Energy Profile (detector in layer 10)



Profile de gerbe en fonction du plan détecteur

60 GeV

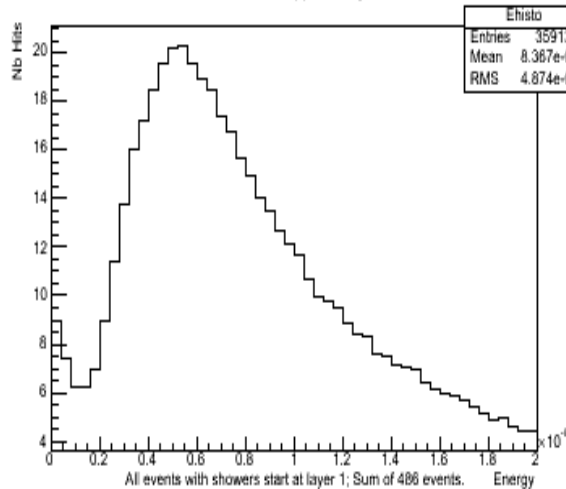
Det au Plan 20

All 14500 events. Energy

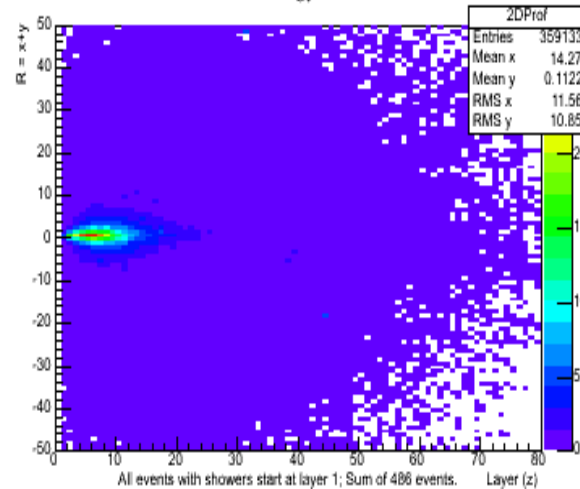
All 14500 events. Layer (z)

All 14500 events. Layer (z)

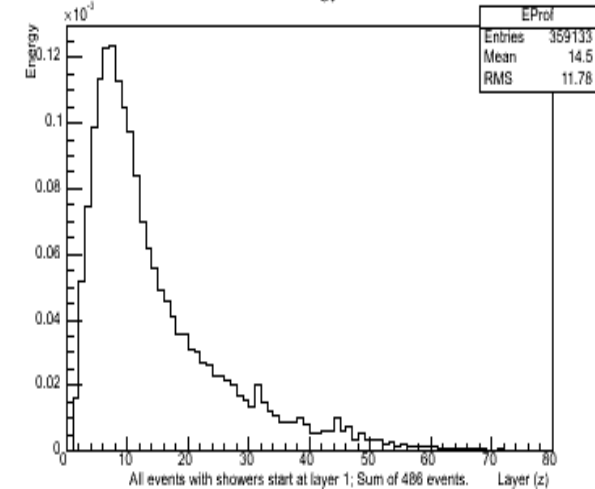
Normal Energy Histogram



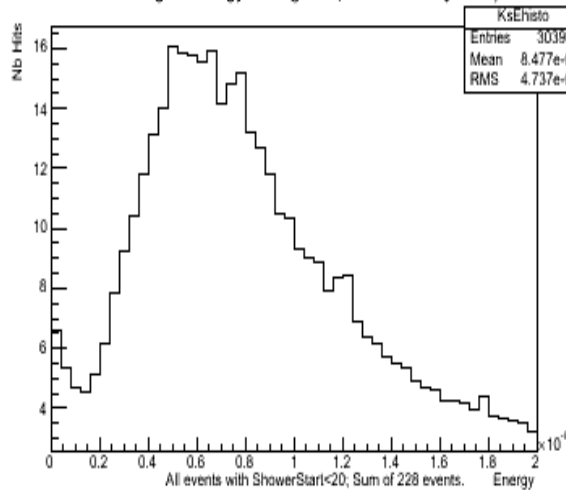
Normal Energy 2D Profile



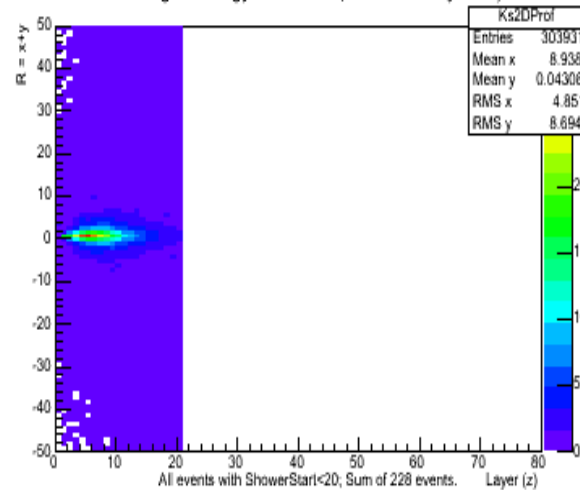
Normal Energy Profile



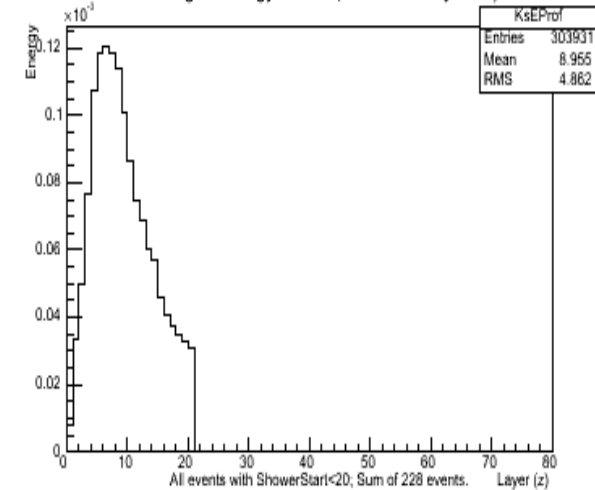
Micromegas Energy Histogram (detector in layer 20)



Micromegas Energy 2D Profile (detector in layer 20)



Micromegas Energy Profile (detector in layer 20)



Profile de gerbe en fonction du plan détecteur

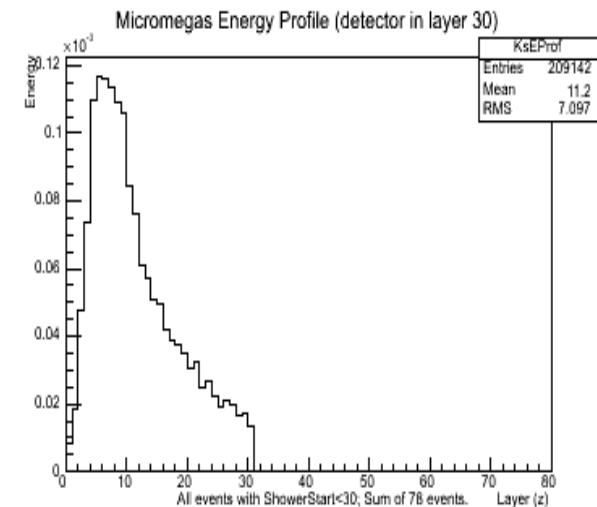
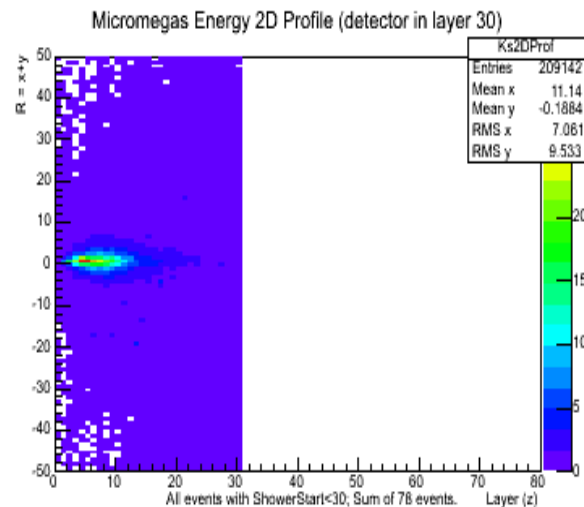
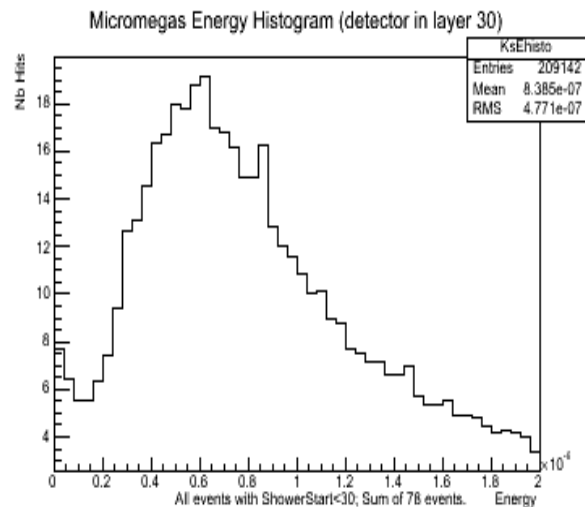
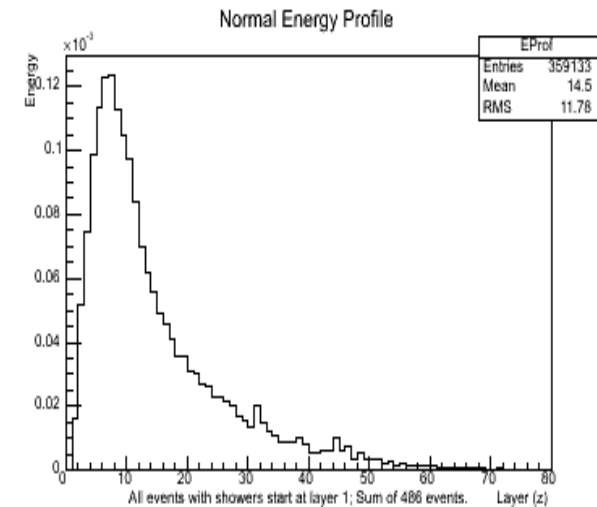
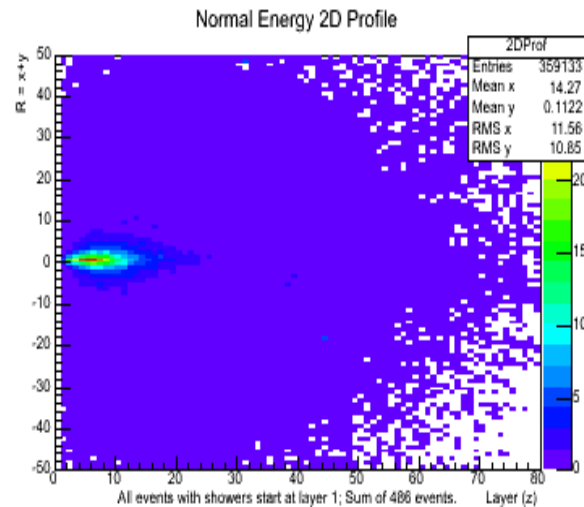
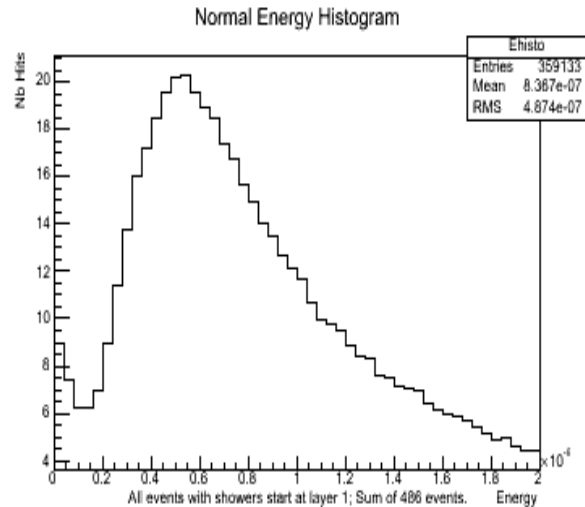
60 GeV

Det au Plan 30

All 14500 events. Energy

All 14500 events. Layer (z)

All 14500 events. Layer (z)



Profile de gerbe en fonction du plan détecteur

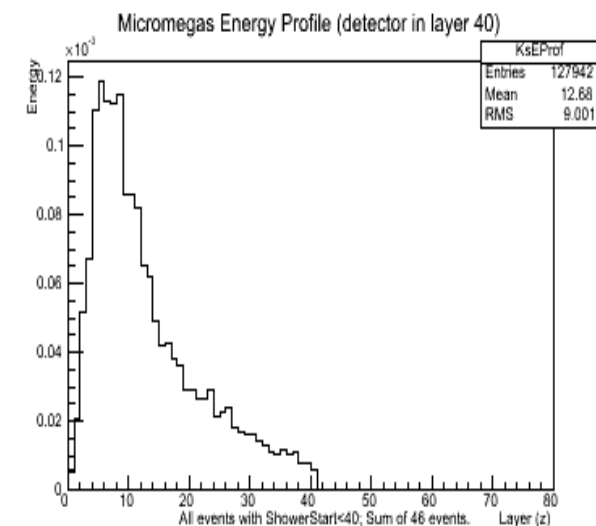
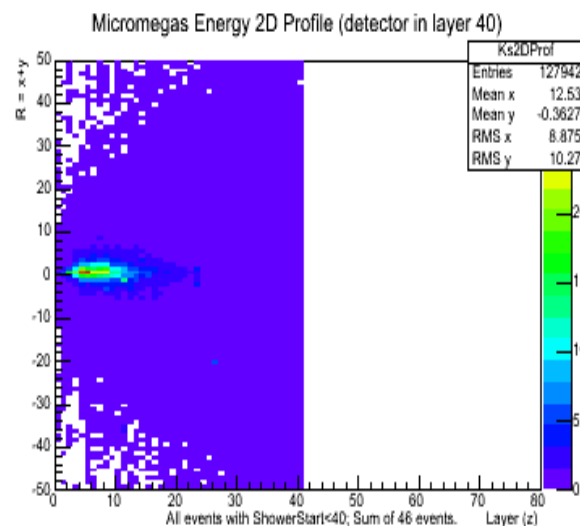
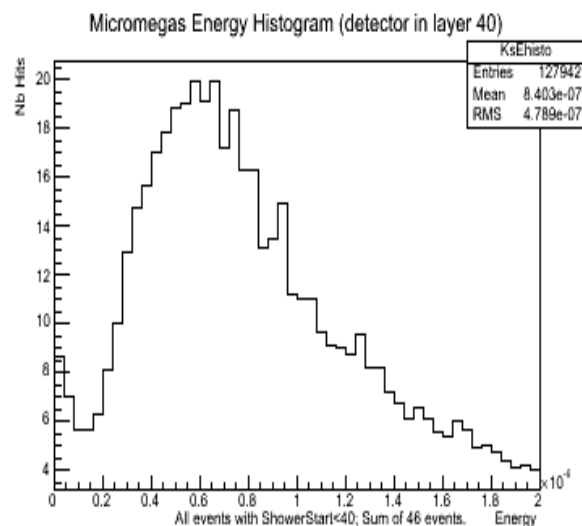
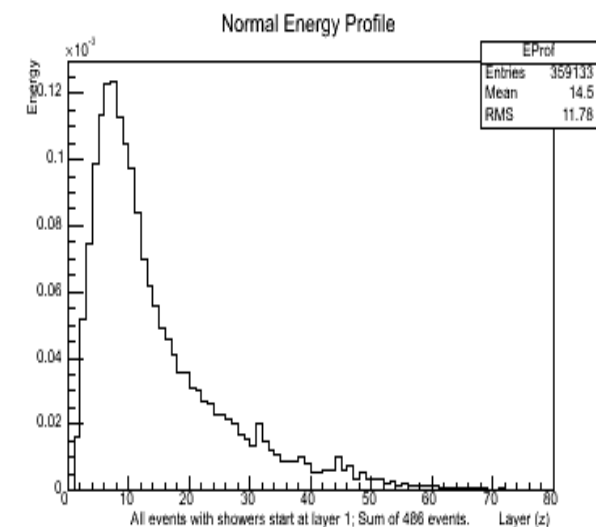
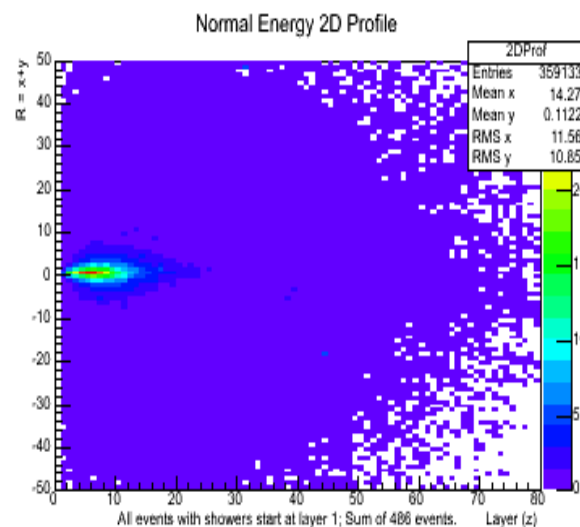
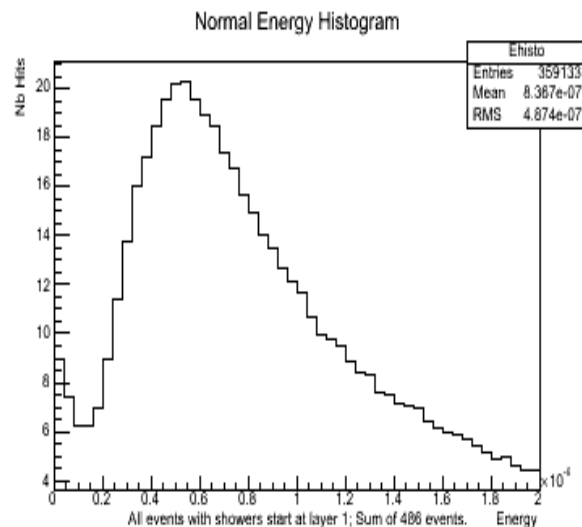
60 GeV

All 14500 events. Energy

All 14500 events. Layer (z)

Det au Plan 40

All 14500 events. Layer (z)



Profile de gerbe en fonction du plan détecteur

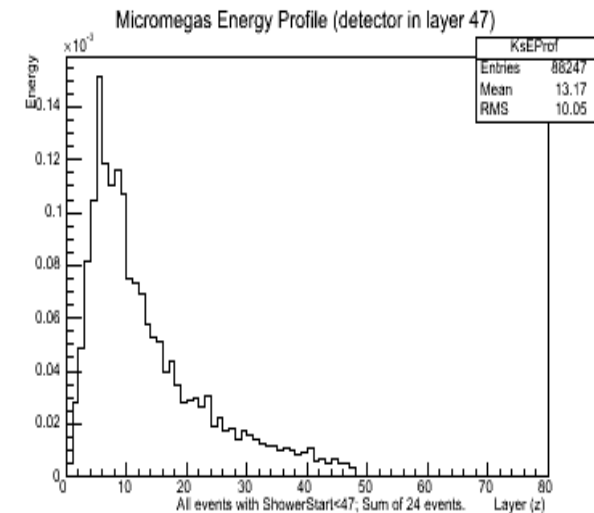
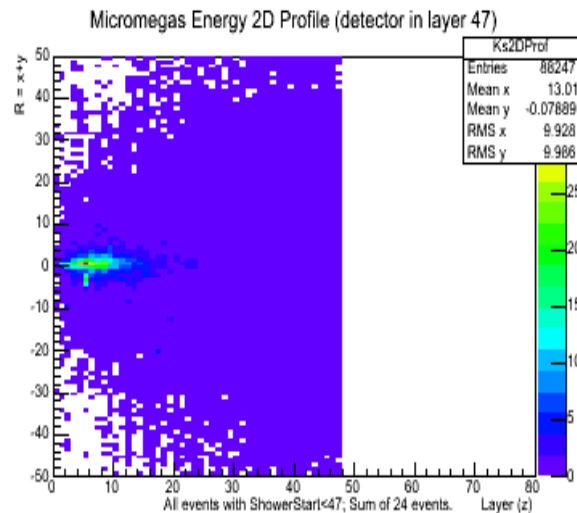
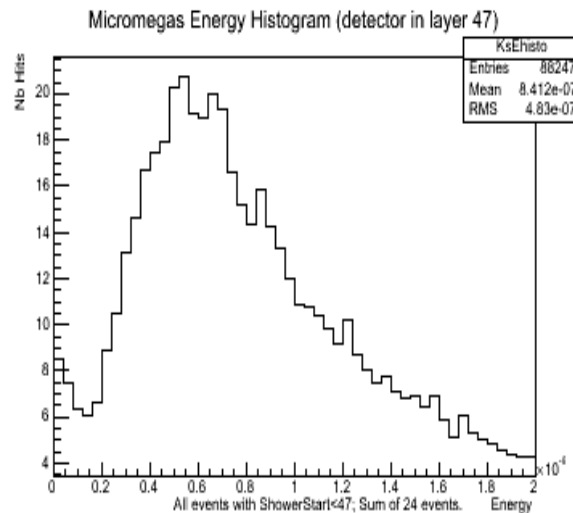
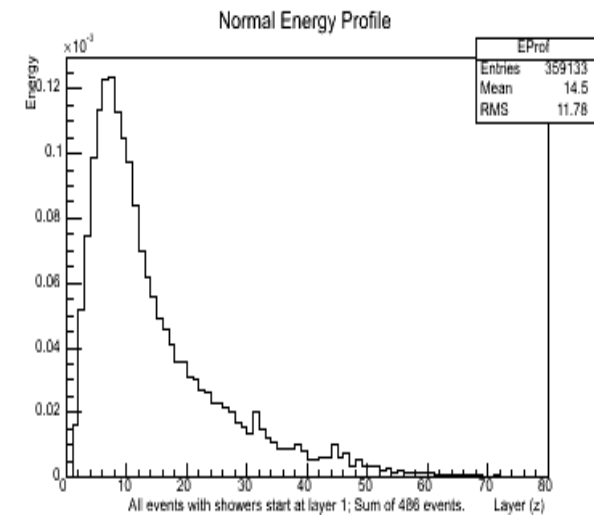
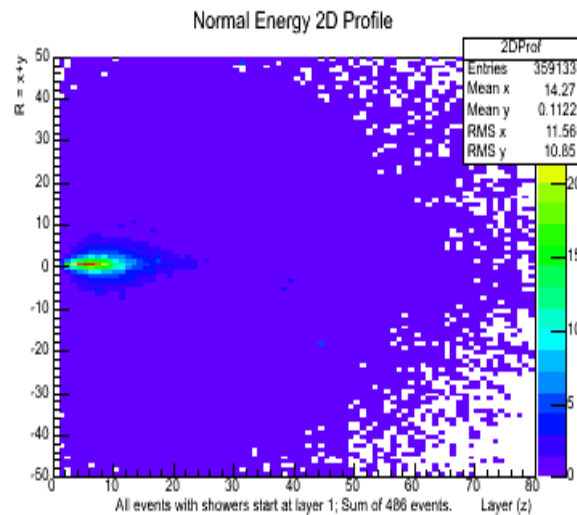
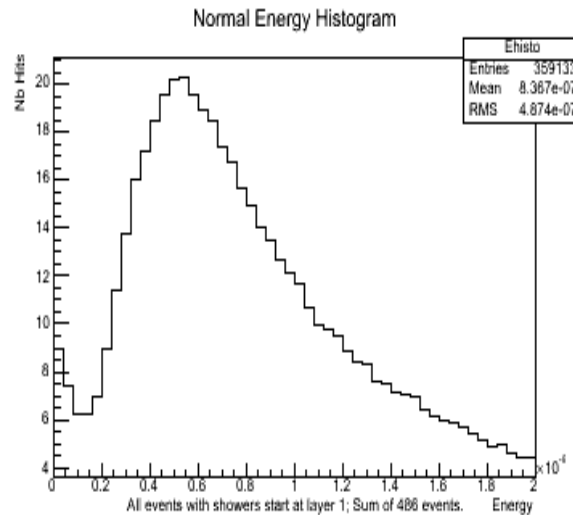
60 GeV

Det au Plan 47

All 14500 events. Energy

All 14500 events. Layer (z)

All 14500 events. Layer (z)



Profile de gerbe en fonction du plan détecteur

60 GeV

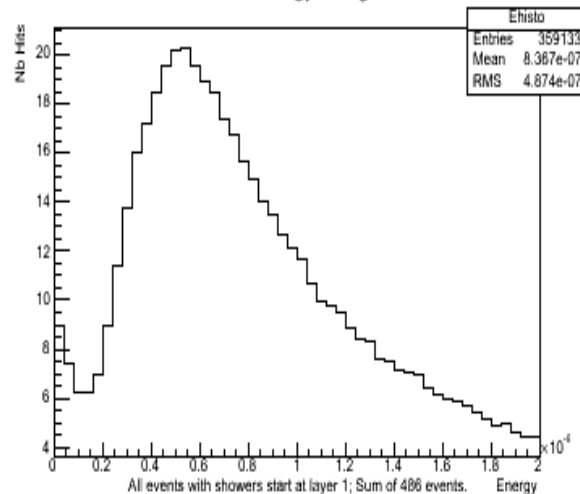
Det au Plan 50

All 14500 events. Energy

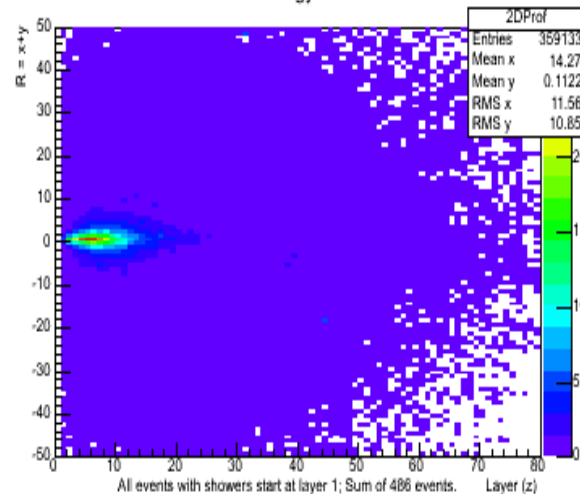
All 14500 events. Layer (z)

All 14500 events. Layer (z)

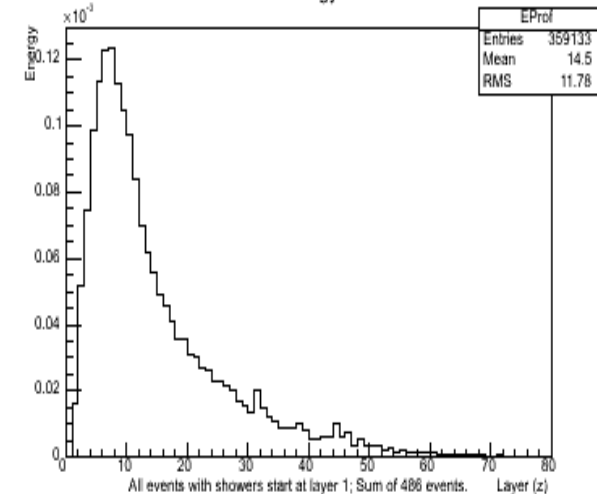
Normal Energy Histogram



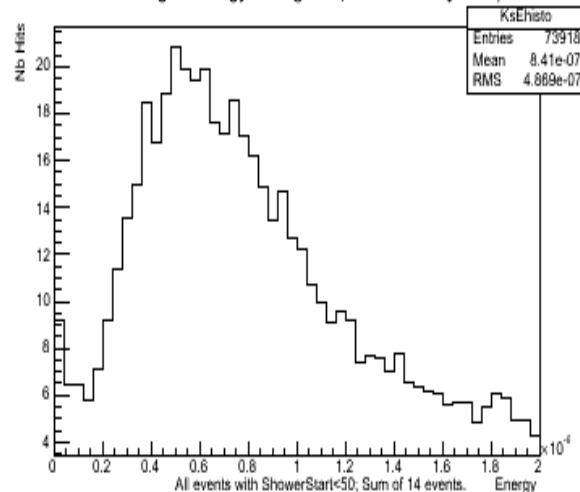
Normal Energy 2D Profile



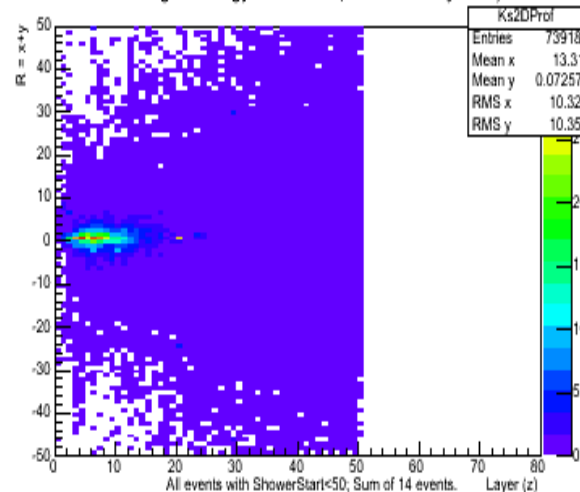
Normal Energy Profile



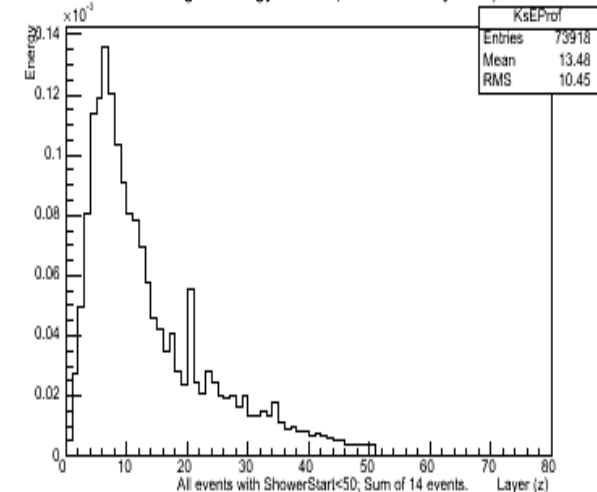
Micromegas Energy Histogram (detector in layer 50)



Micromegas Energy 2D Profile (detector in layer 50)



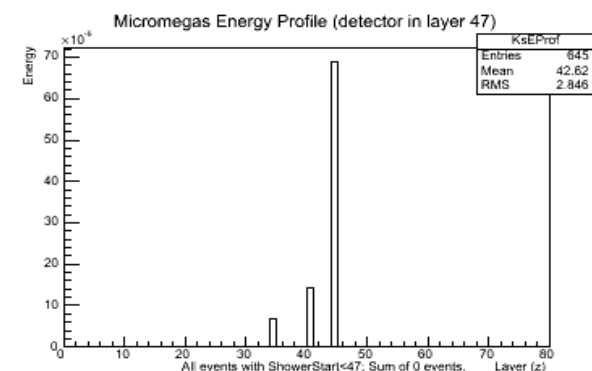
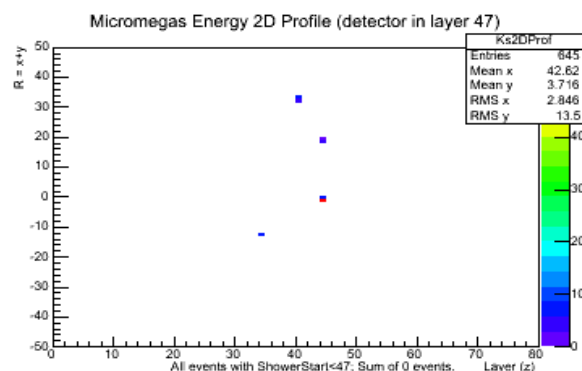
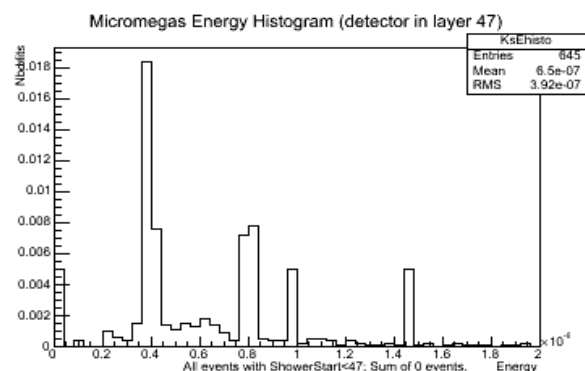
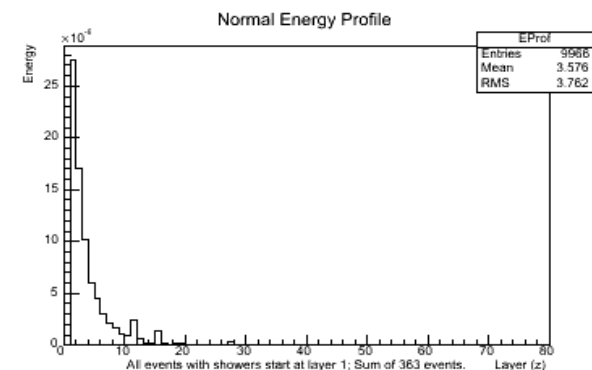
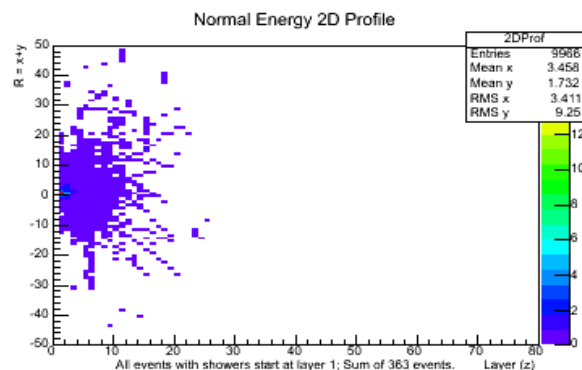
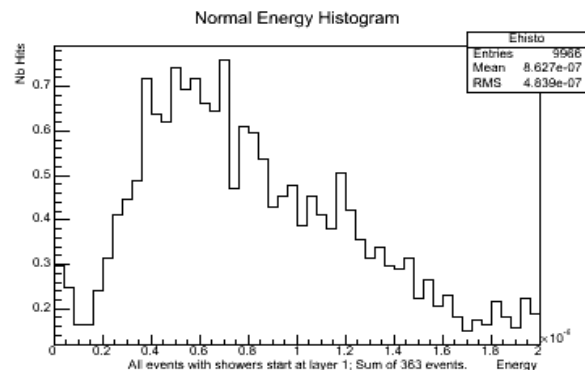
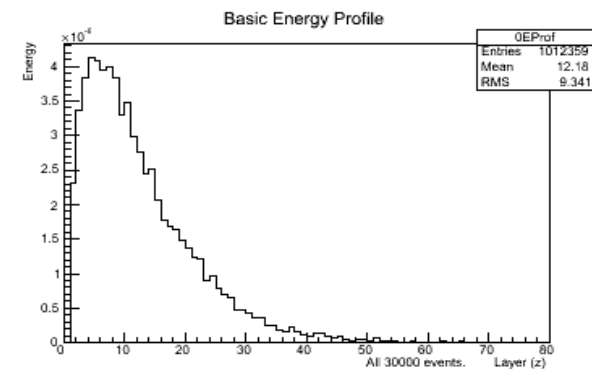
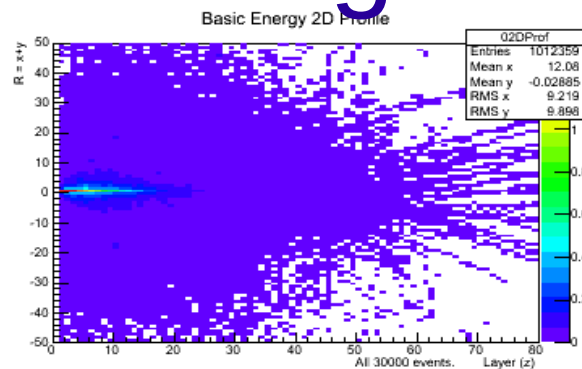
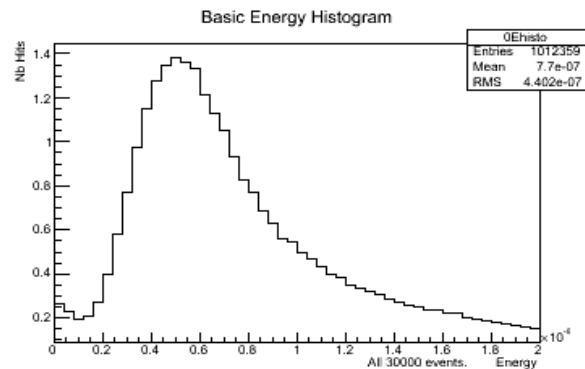
Micromegas Energy Profile (detector in layer 50)



Profile de gerbe en fonction de l'énergie

3 GeV

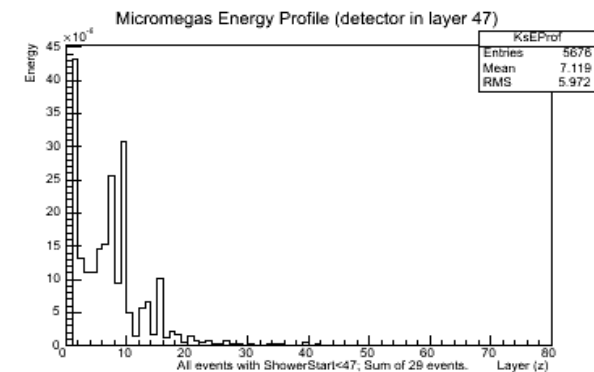
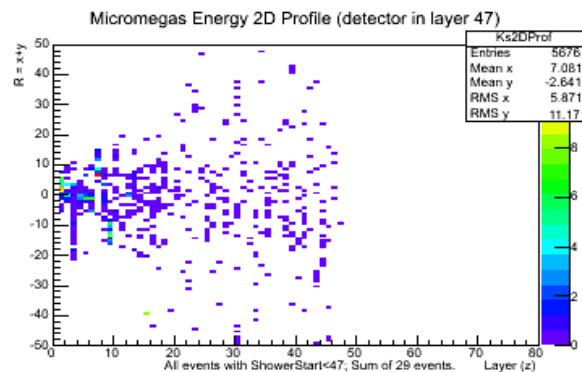
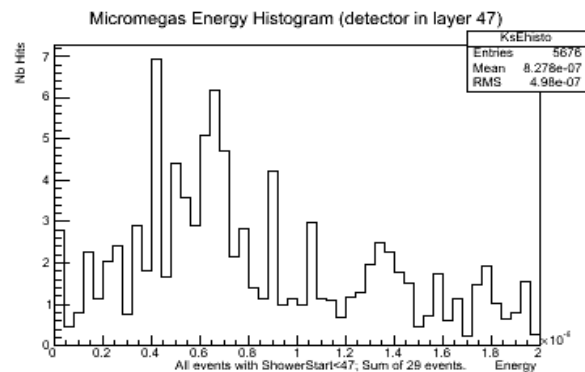
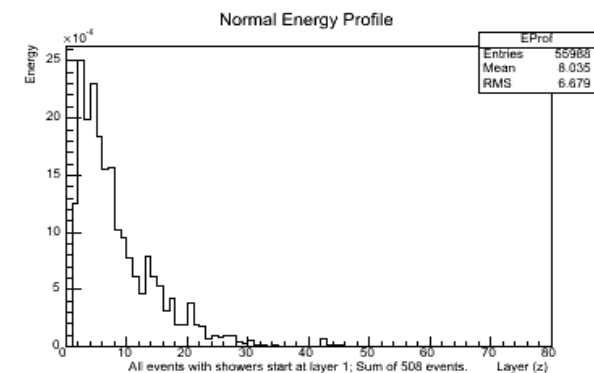
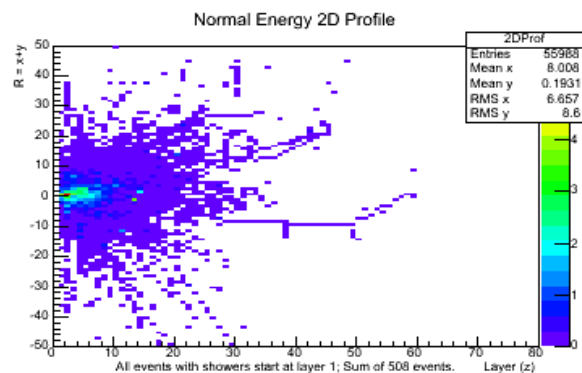
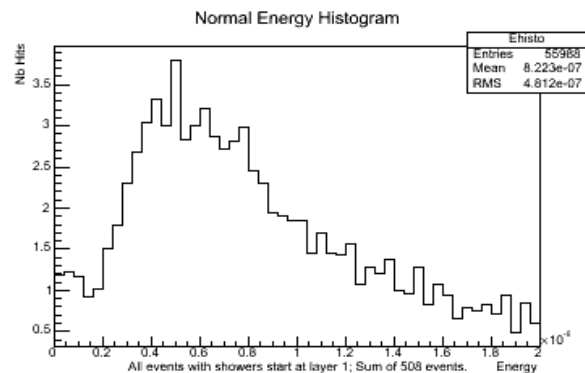
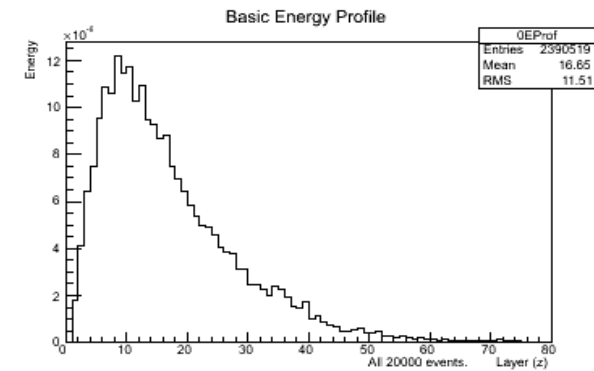
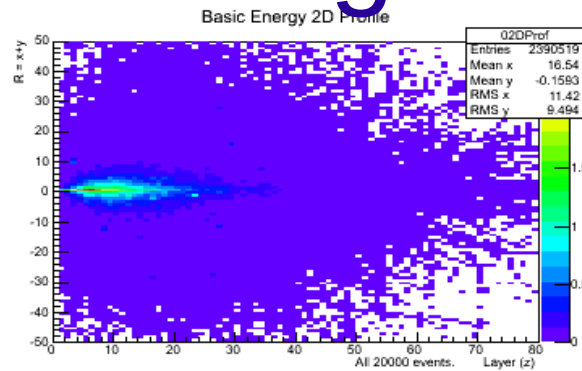
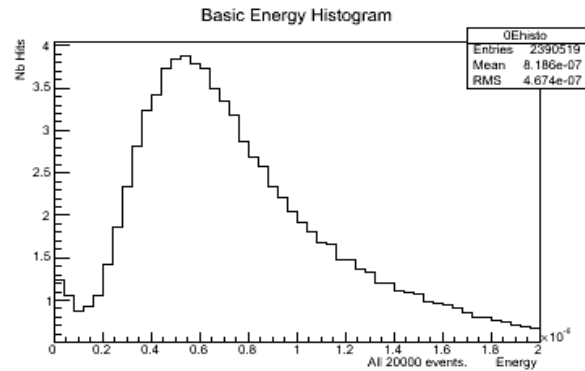
Det au Plan 47



Profile de gerbe en fonction de l'énergie

10 GeV

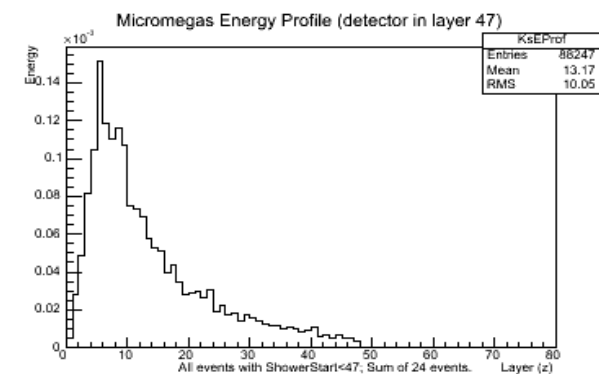
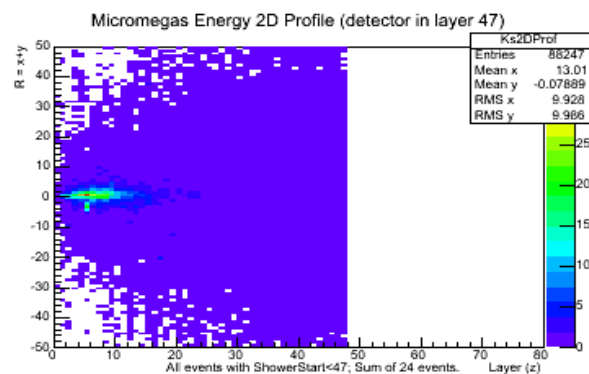
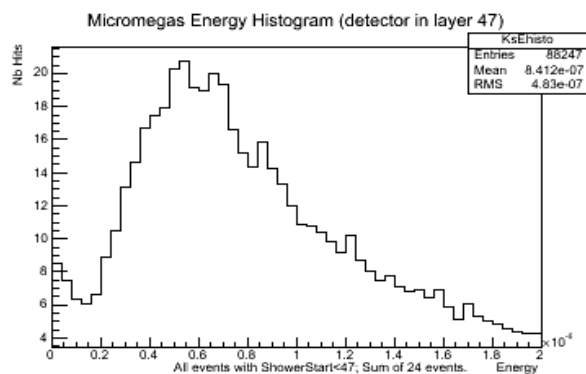
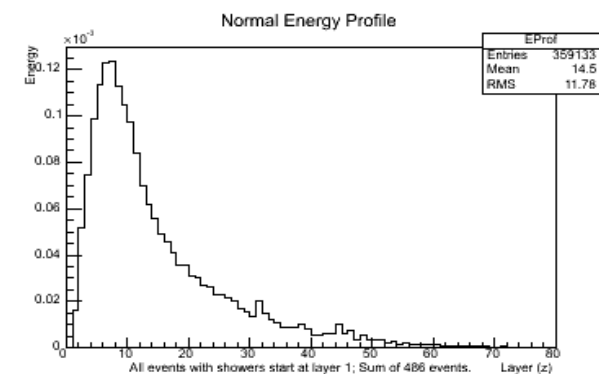
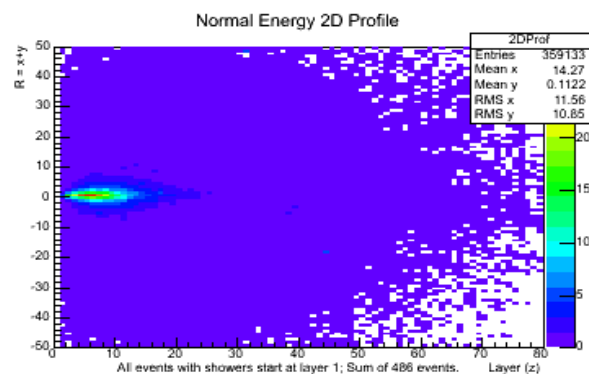
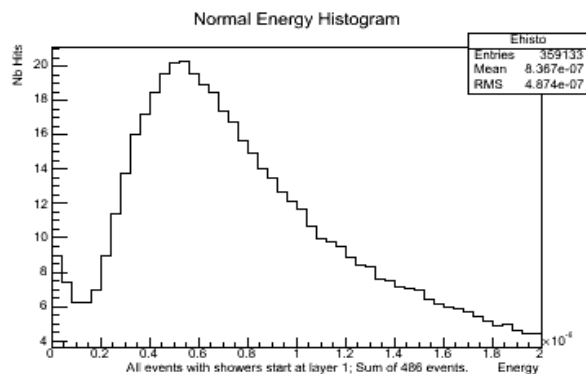
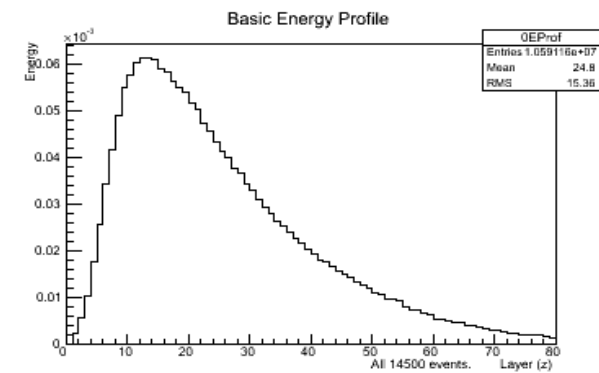
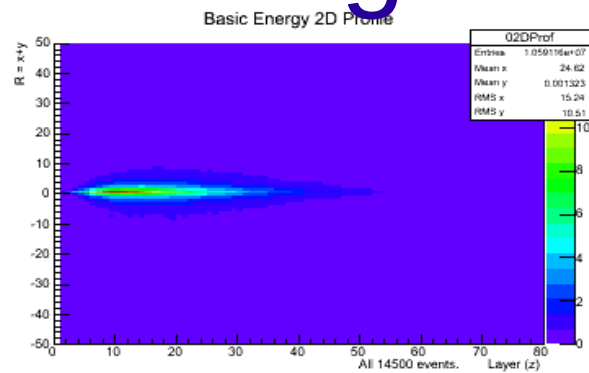
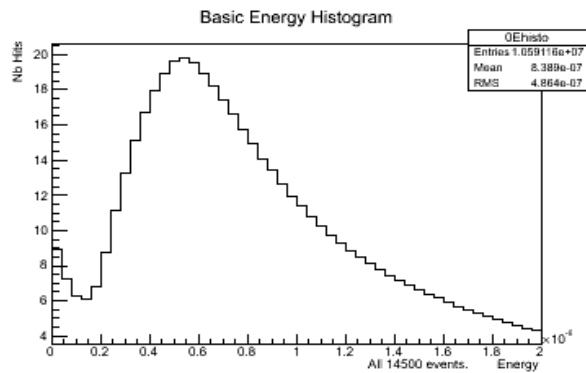
Det au Plan 47



Profile de gerbe en fonction de l'énergie

60 GeV

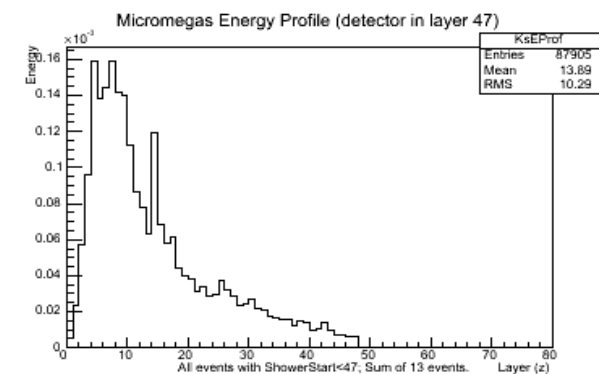
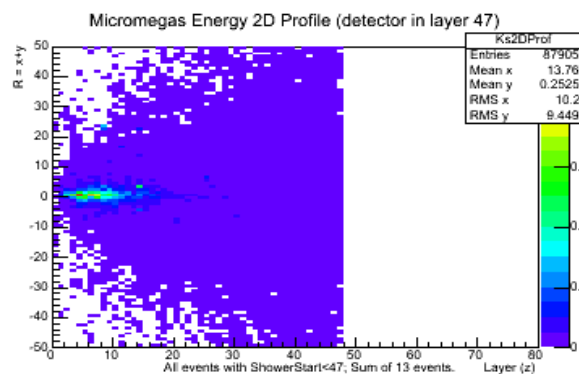
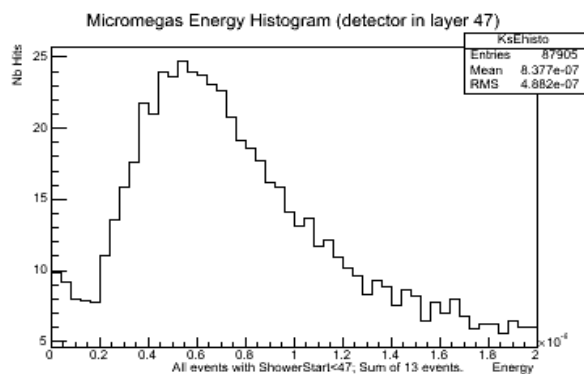
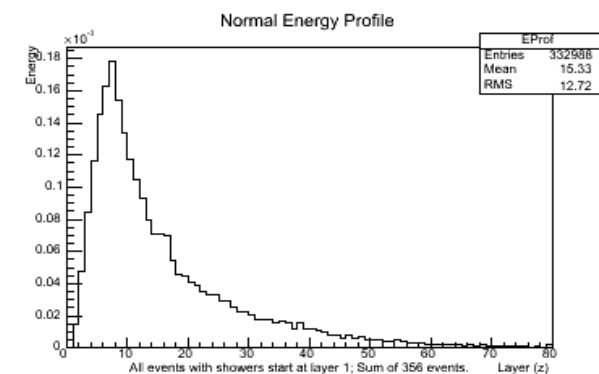
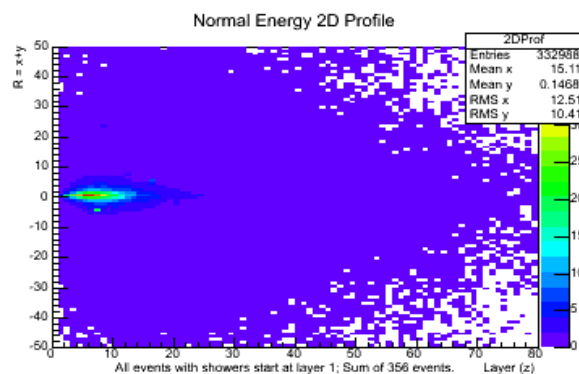
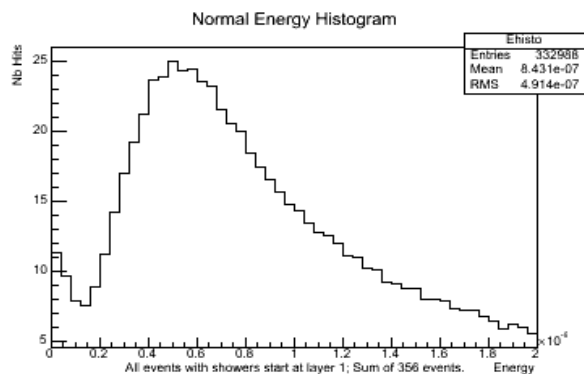
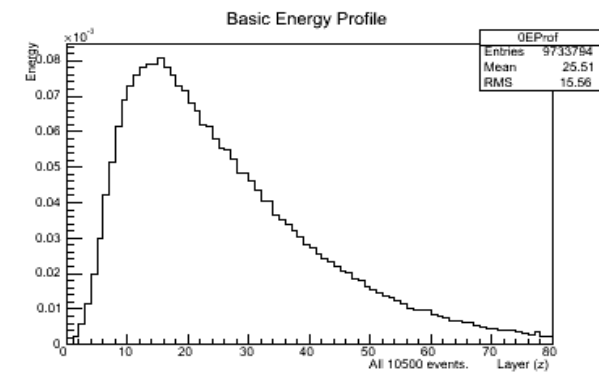
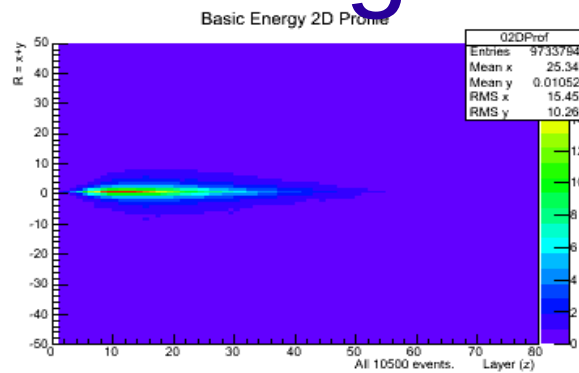
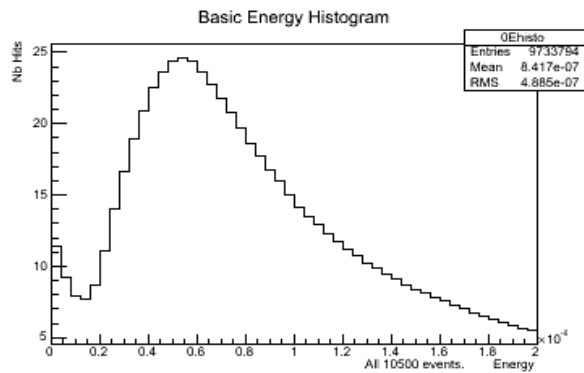
Det au Plan 47



Profile de gerbe en fonction de l'énergie

80 GeV

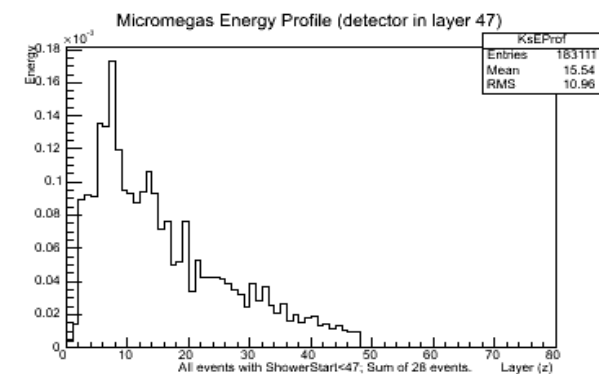
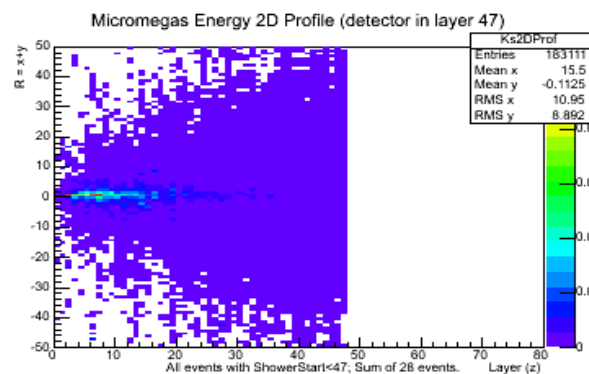
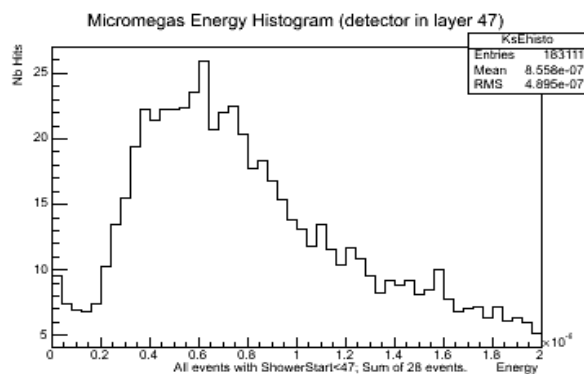
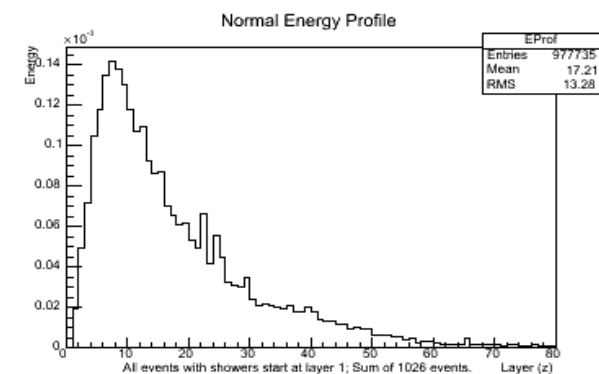
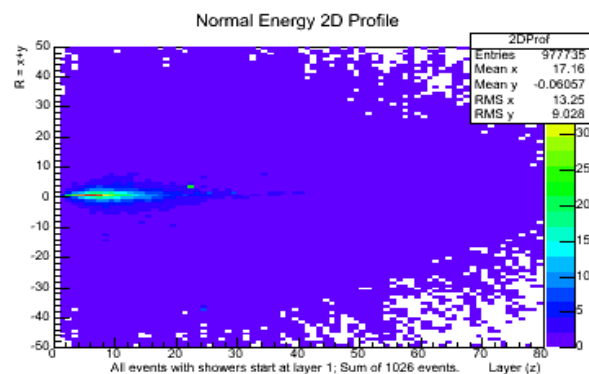
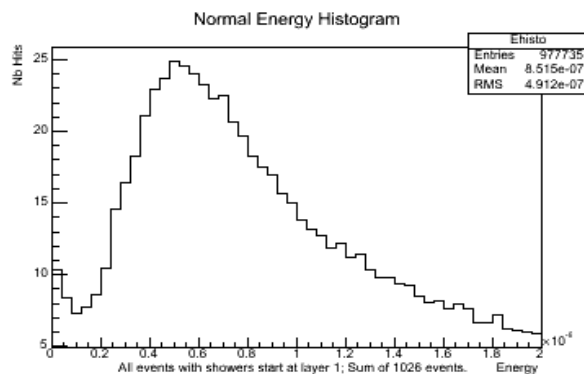
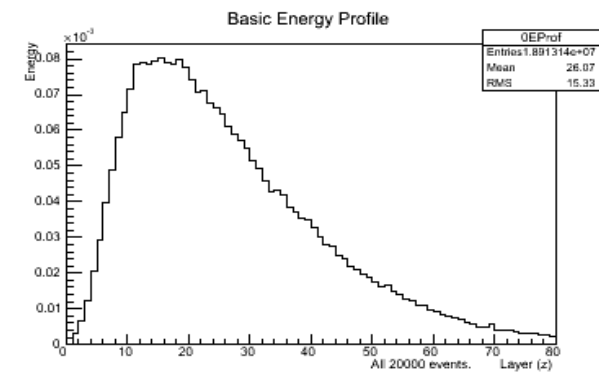
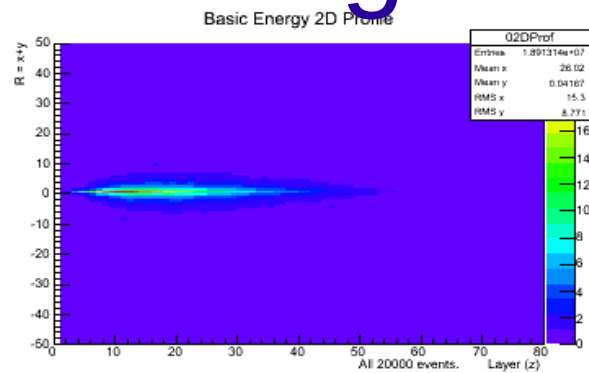
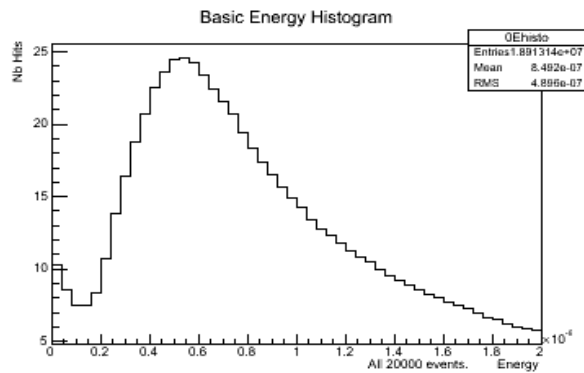
Det au Plan 47



Profile de gerbe en fonction de l'énergie

100 GeV

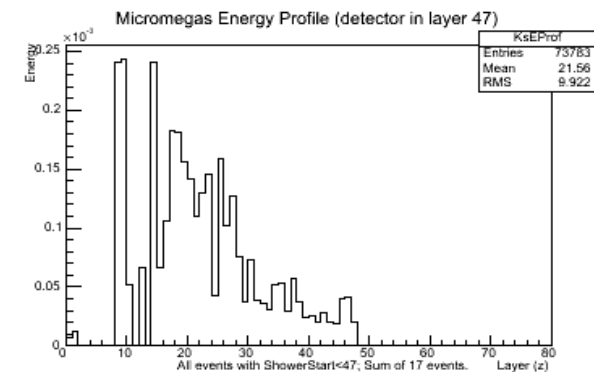
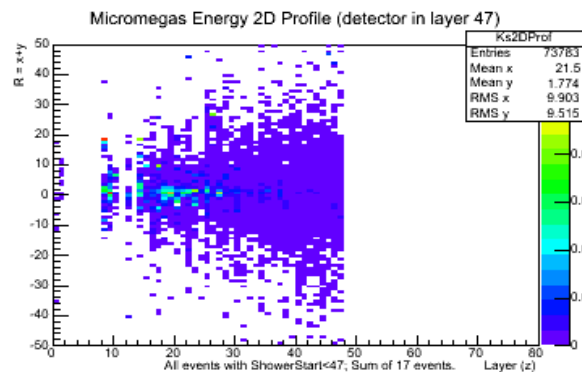
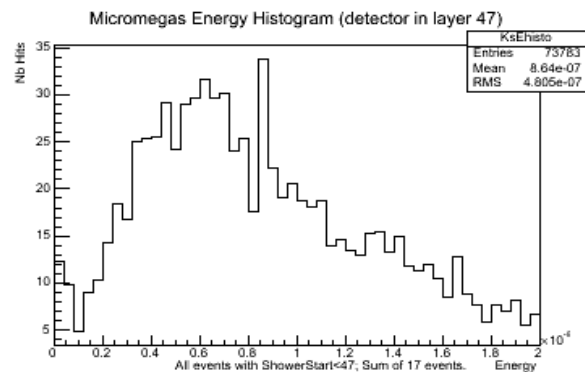
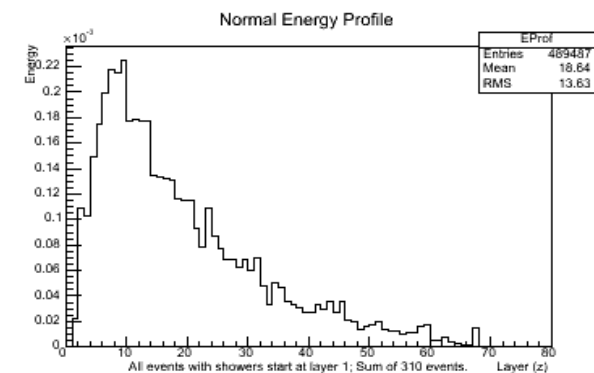
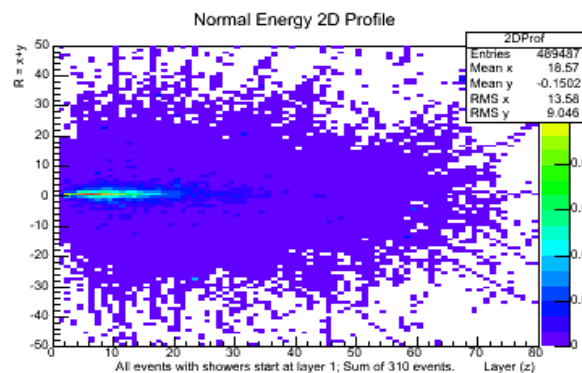
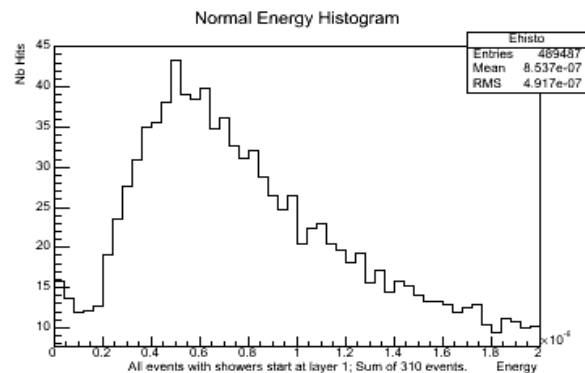
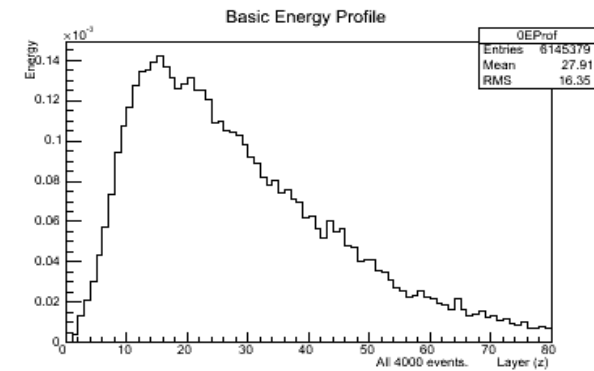
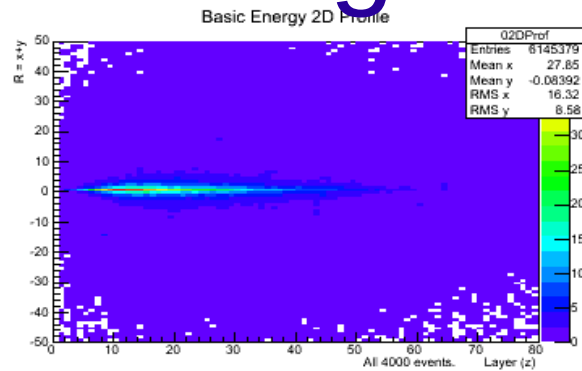
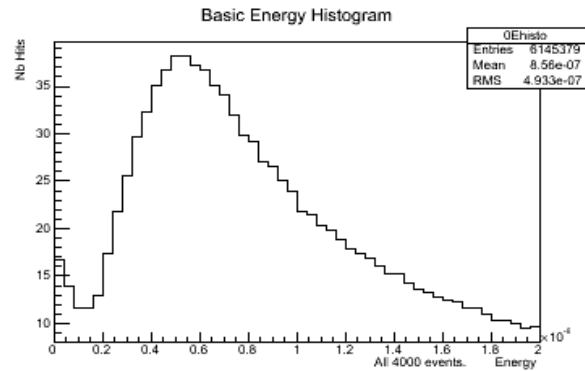
Det au Plan 47



Profile de gerbe en fonction de l'énergie

180 GeV

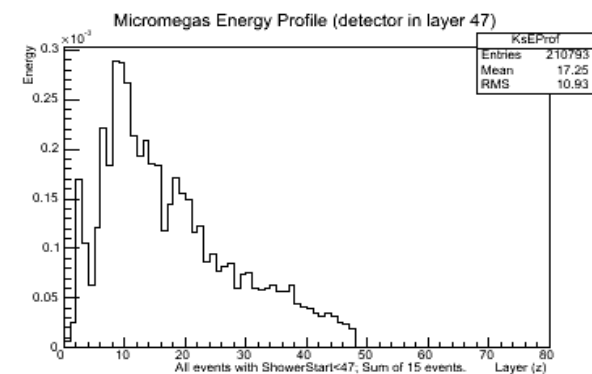
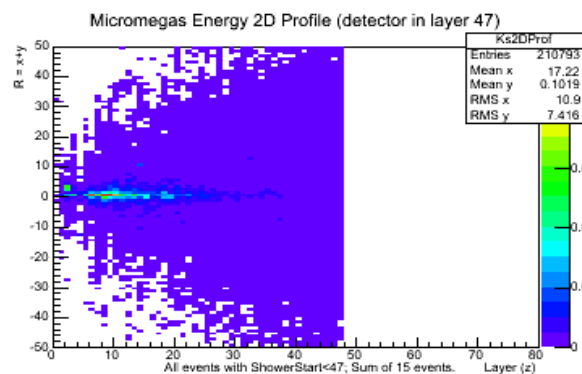
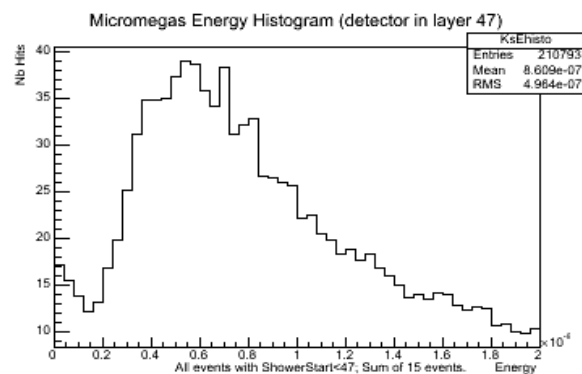
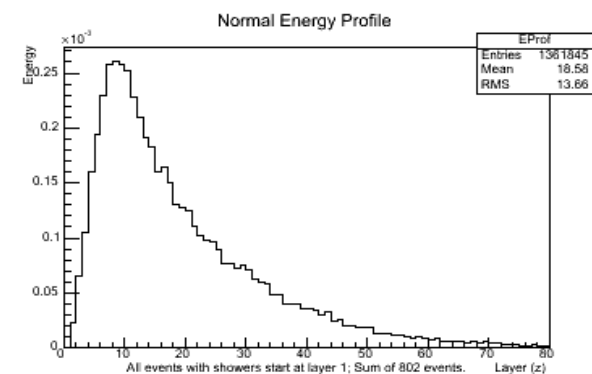
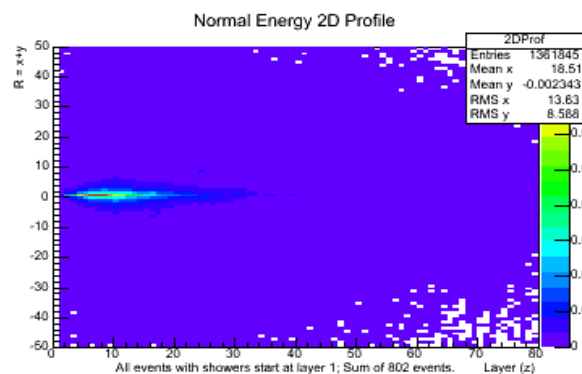
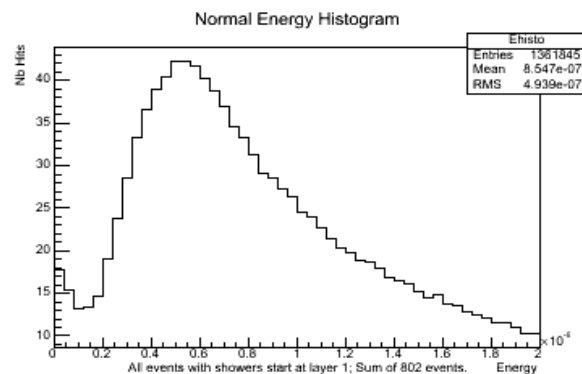
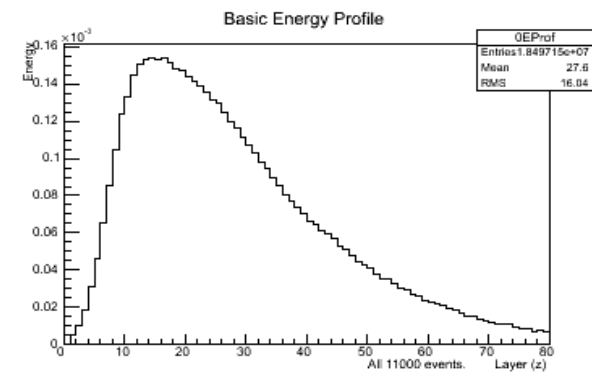
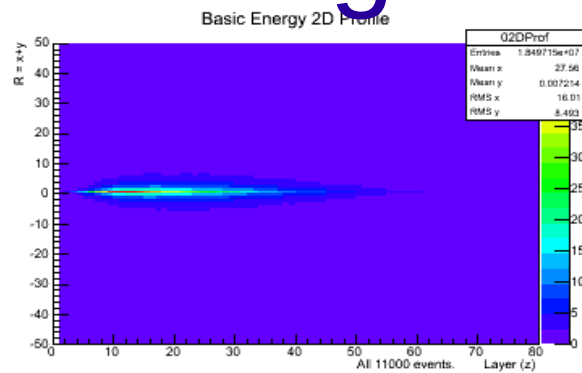
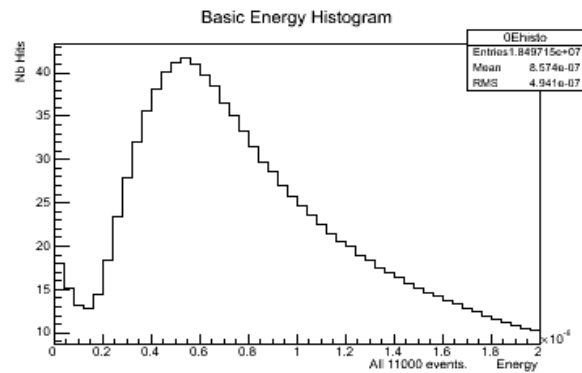
Det au Plan 47



Profile de gerbe en fonction de l'énergie

200 GeV

Det au Plan 47

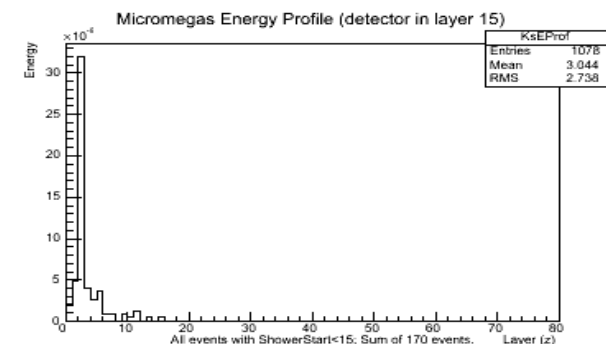
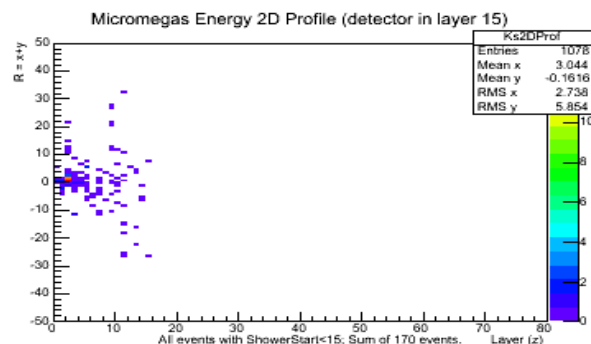
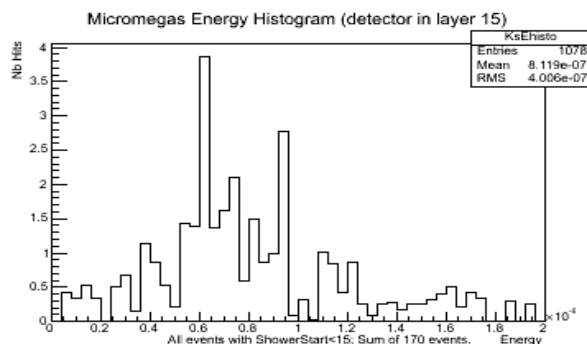
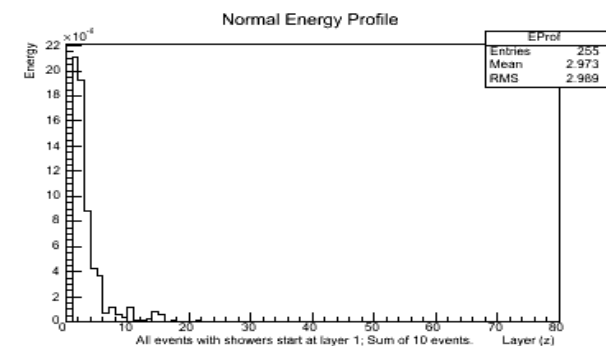
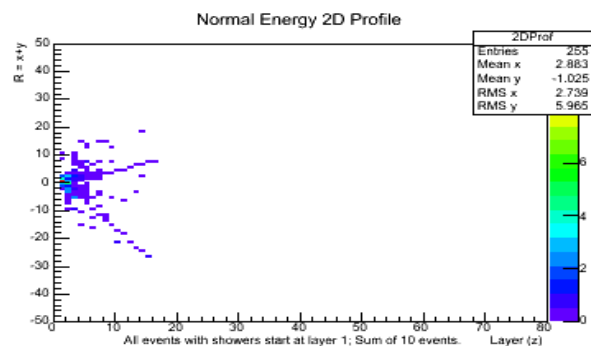
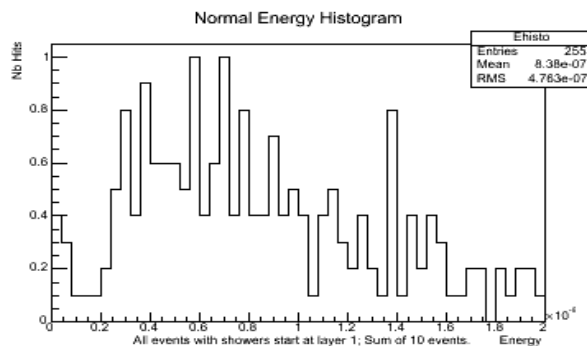
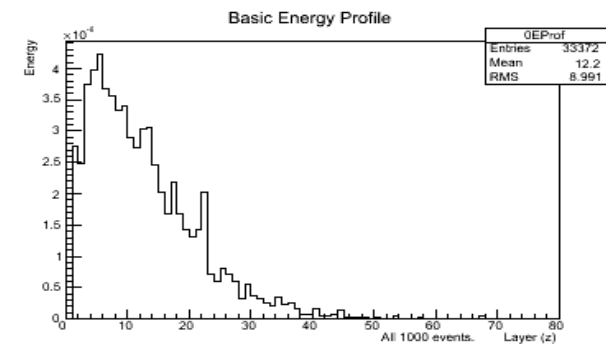
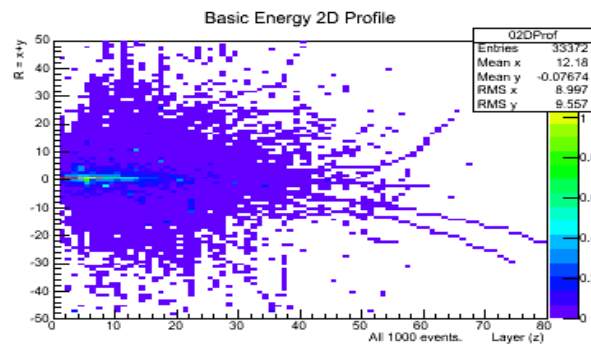
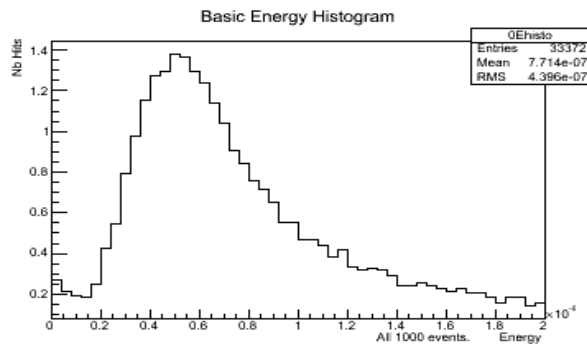


Qualité de la reconstruction en fonction du nombre d'événements

3 GeV

1 000 evts

Det au Plan 15

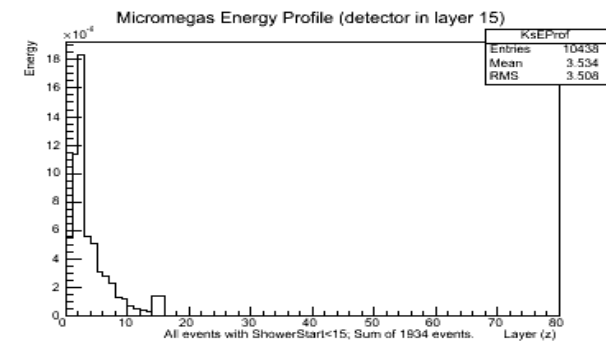
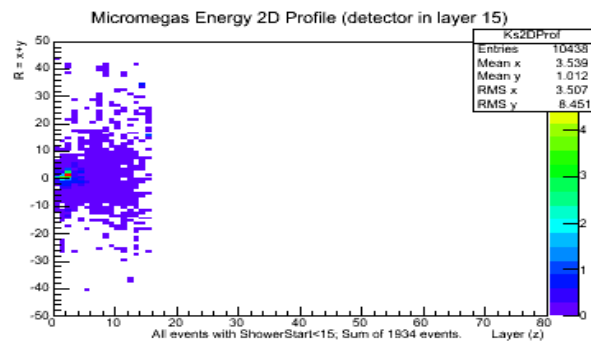
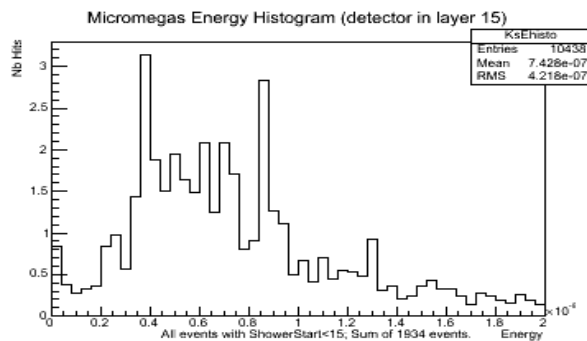
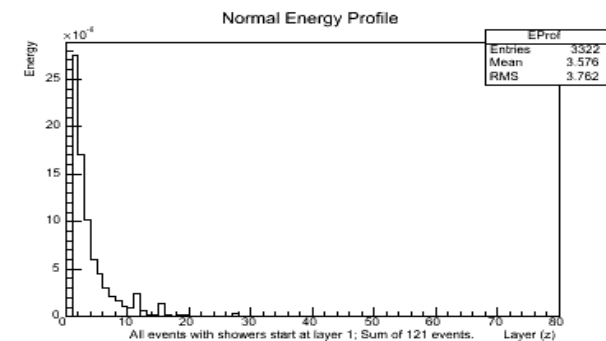
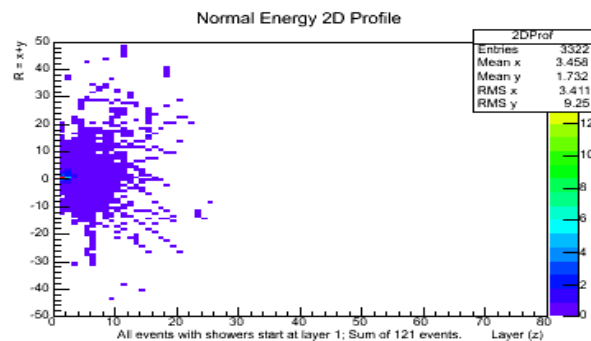
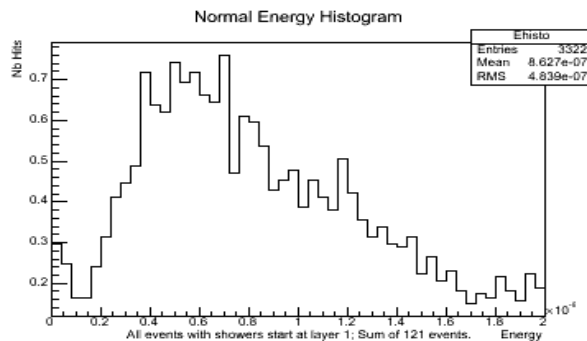
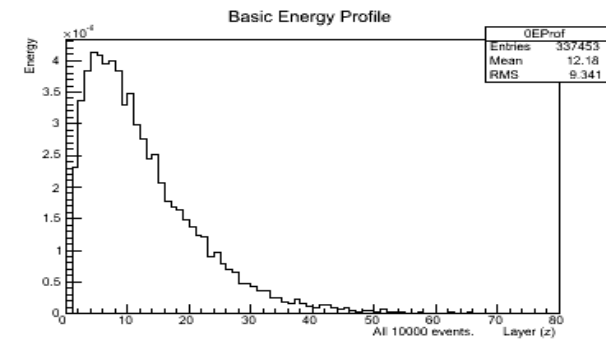
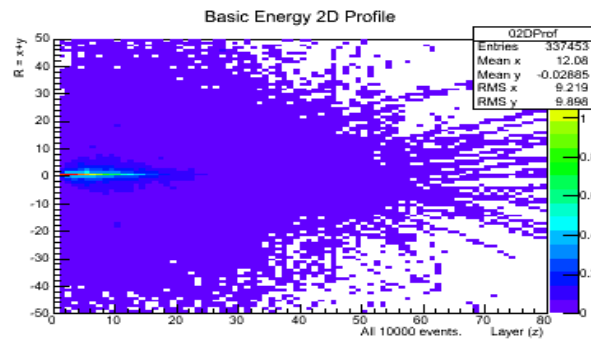
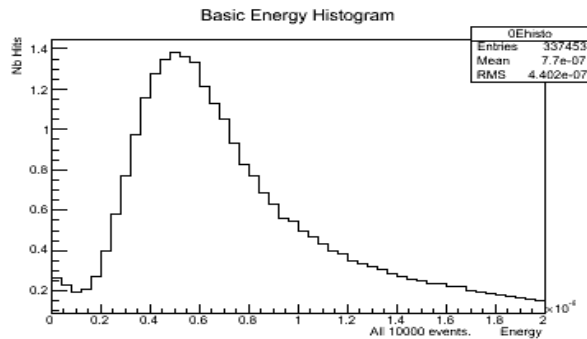


Qualité de la reconstruction en fonction du nombre d'événements

3 GeV

10 000 evts

Det au Plan 15

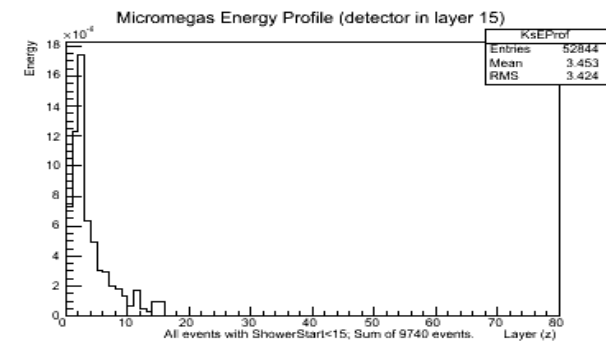
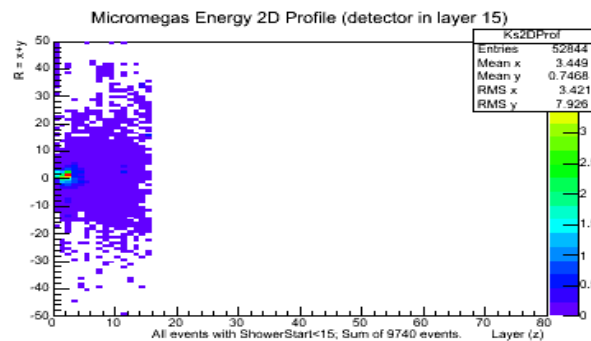
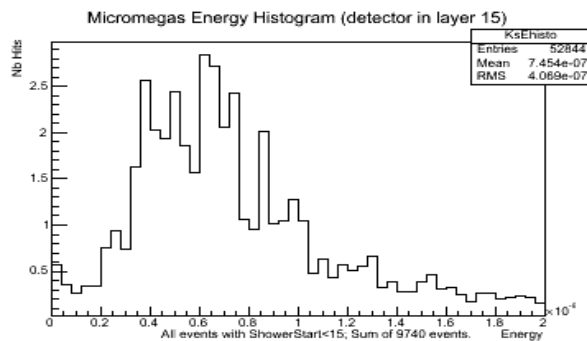
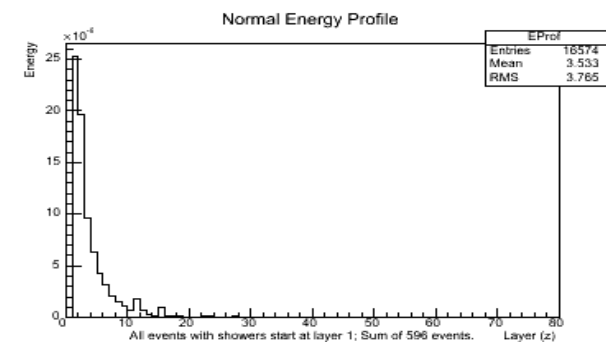
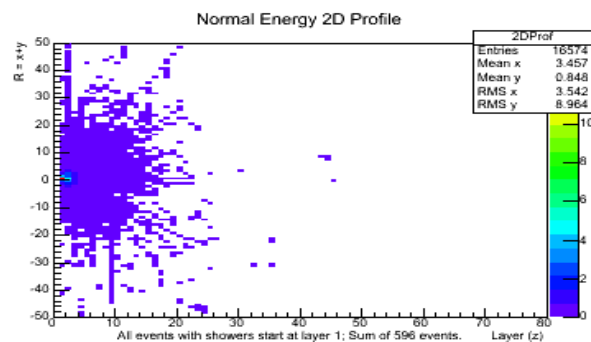
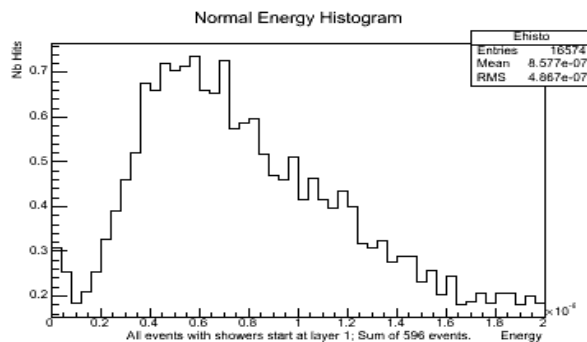
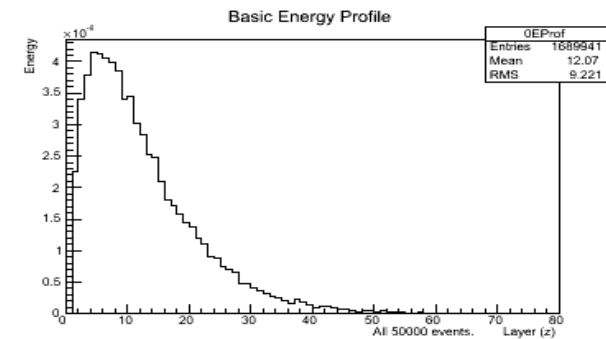
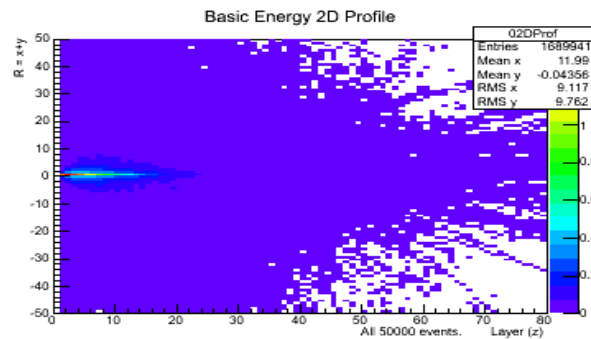
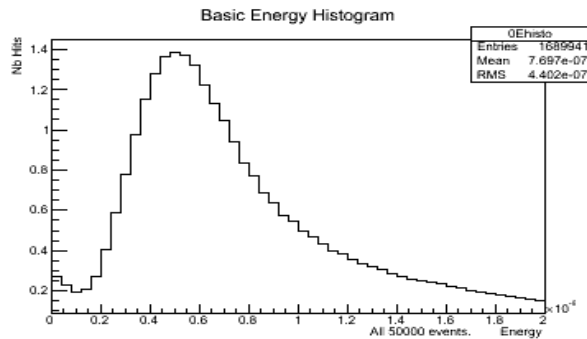


Qualité de la reconstruction en fonction du nombre d'événements

3 GeV

50 000 evts

Det au Plan 15

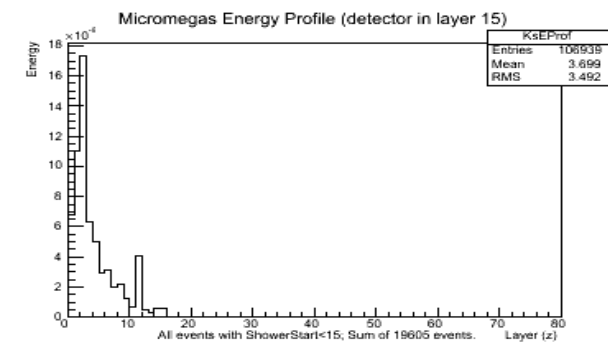
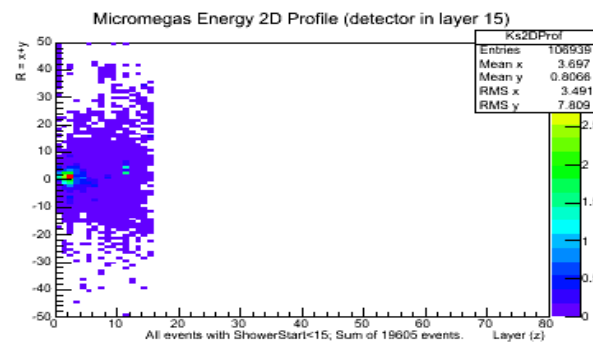
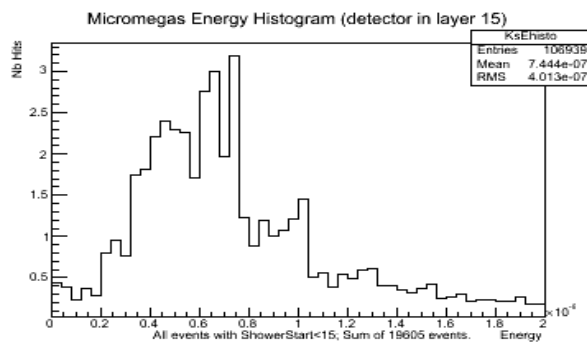
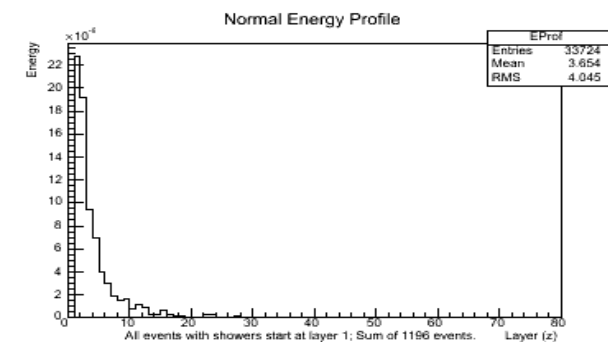
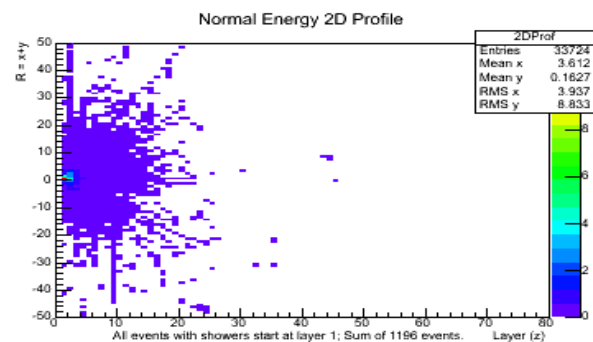
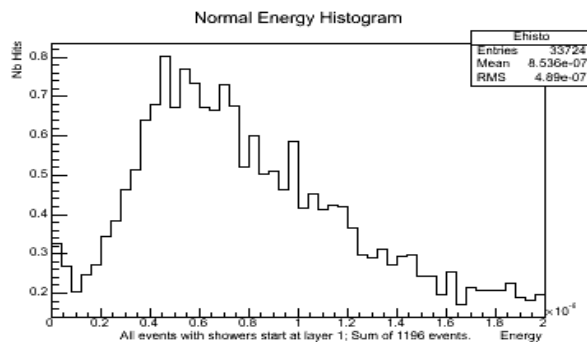
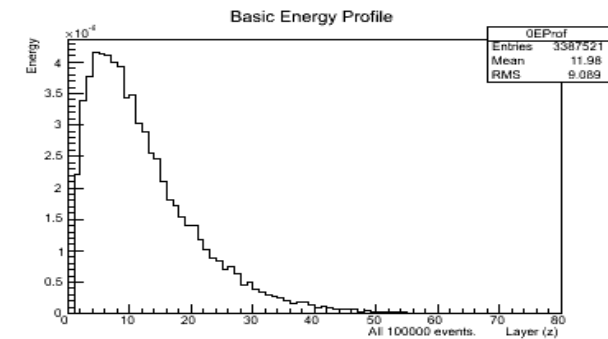
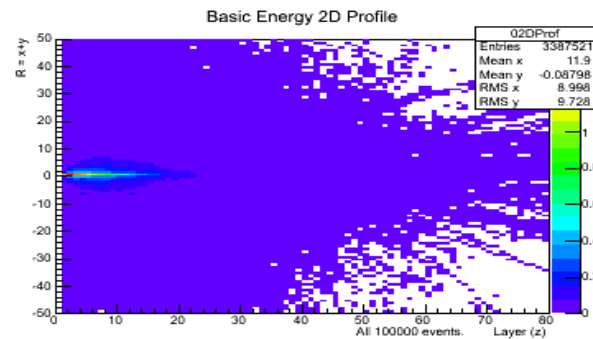
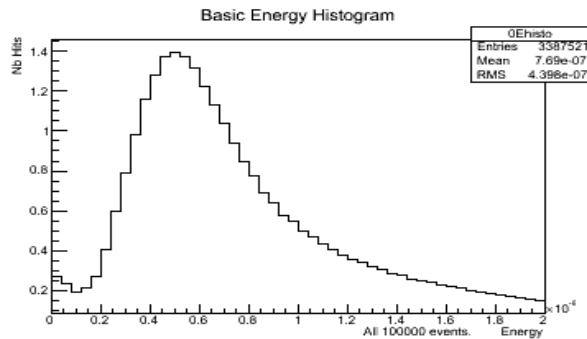


Qualité de la reconstruction en fonction du nombre d'événements

3 GeV

100 000 evts

Det au Plan 15

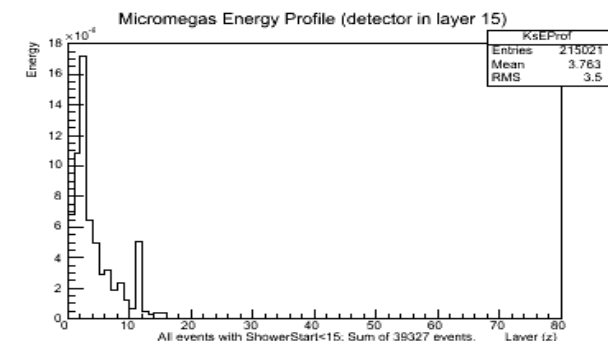
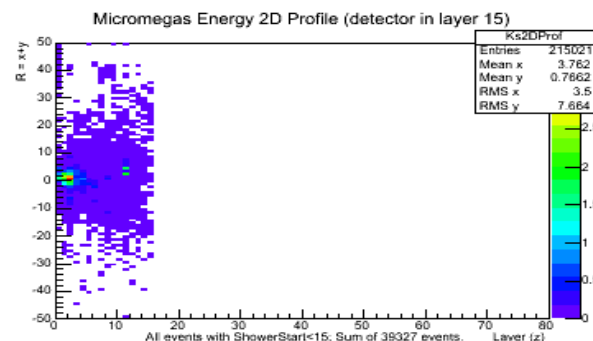
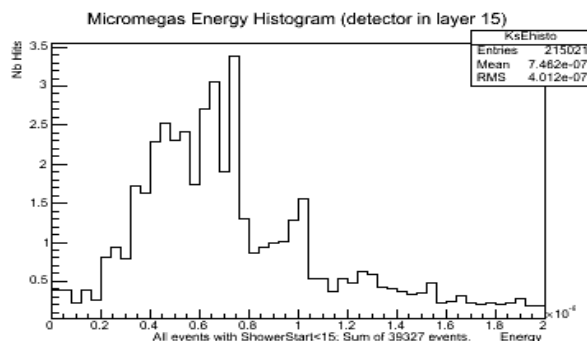
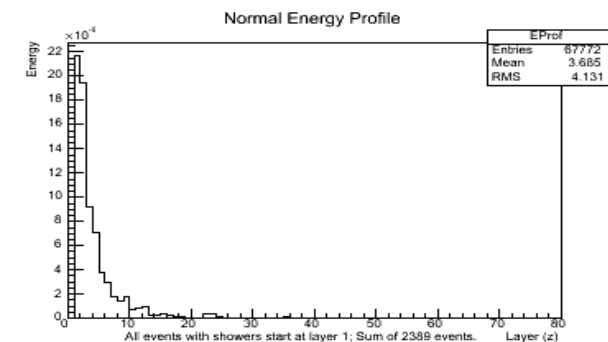
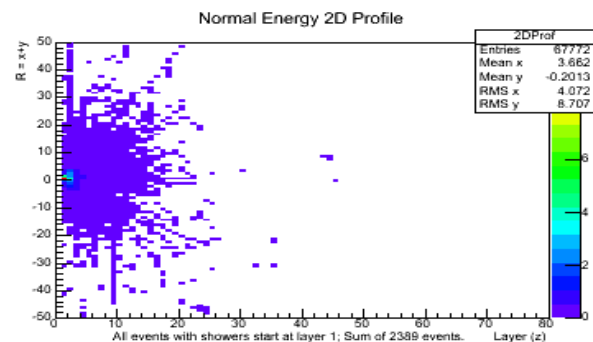
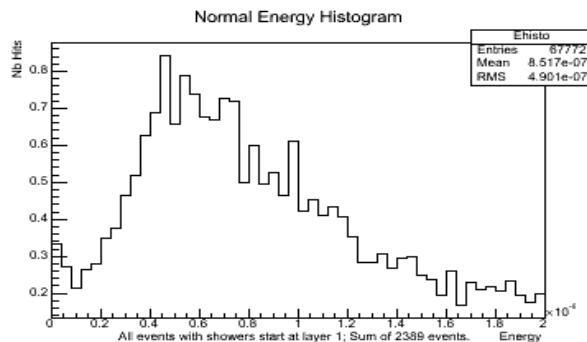
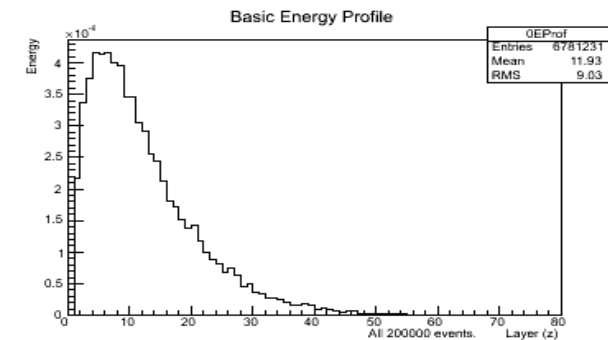
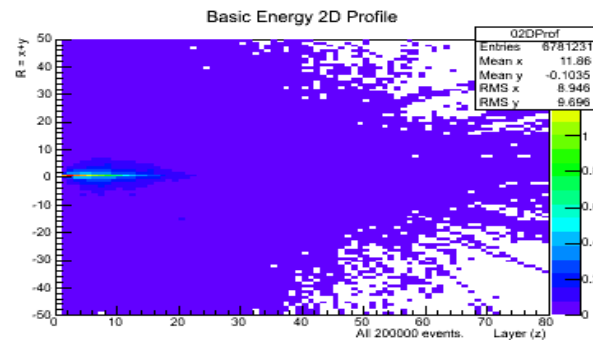
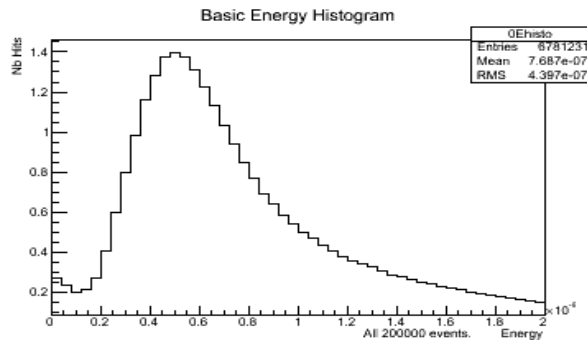


Qualité de la reconstruction en fonction du nombre d'événements

3 GeV

200 000 evts

Det au Plan 15



Conclusions

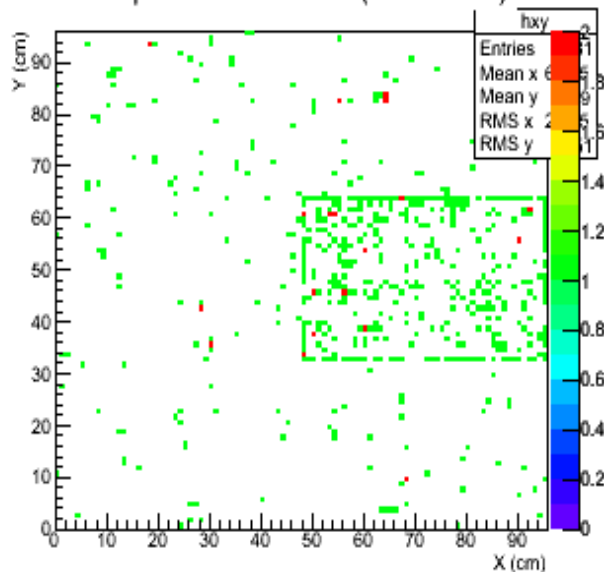
- * Le nombre moyen de hits fonction de l'énergie est quasi-linéaire quel que soit le plan de détection.
- * Il est possible de reconstruire le profile de gerbe sans déplacer le détecteur (en fonction du point de départ de la gerbe), à condition d'avoir suffisamment d'événements (plusieurs dizaines de milliers)
- * Plus on est loin dans le calorimètre plus on reconstruit une grande partie de la gerbe, mais moins on a de statistique sur le début de gerbe (=> il faut beaucoup d'événements)
- * Plus on est à haute énergie plus on a de hits par événement et meilleure est la reconstruction
- * Pour la simulation la liste QGSP (utilisée à 60 et 80 GeV) est meilleure que la liste LHEP (utilisée aux autres énergies)

Analyse des données Test-Beam d'aout 2011

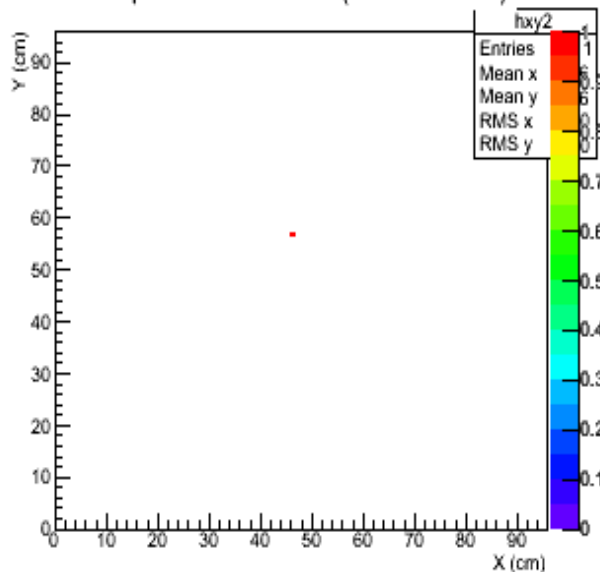
- * Identification et caractérisation d'événements :
 - > événements « carrés » (square)
 - identification ok, méthode dans le Framework
 - caractérisation à poursuivre (différents seuils, ramfull, quantifier le taux en fct du nb pad touchés)
 - > événements « cadre » (border)
 - identification ok, méthode prête à être implémentée dans le framework
 - caractérisation à poursuivre

Quelques événements « cadre »

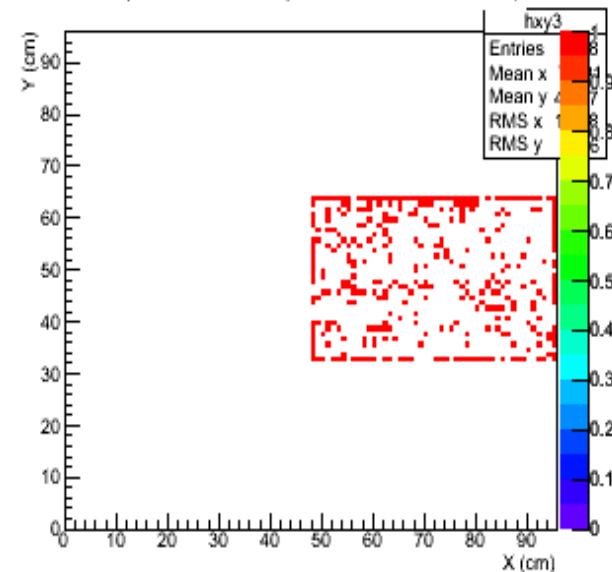
Hit position distribution (No time cut)



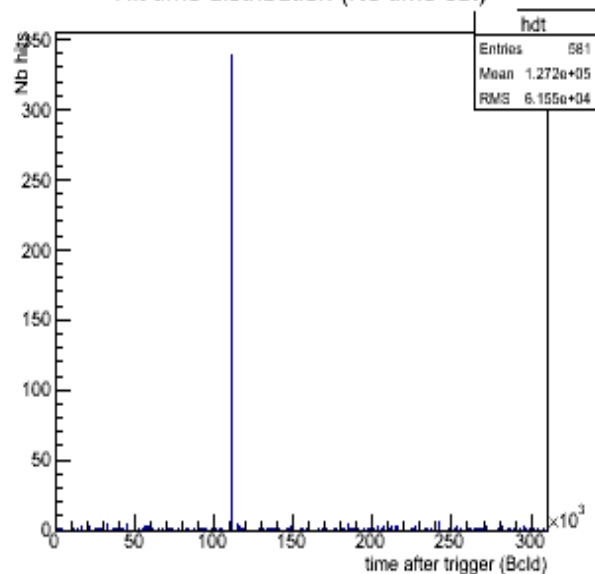
Hit position distribution (within time cut)



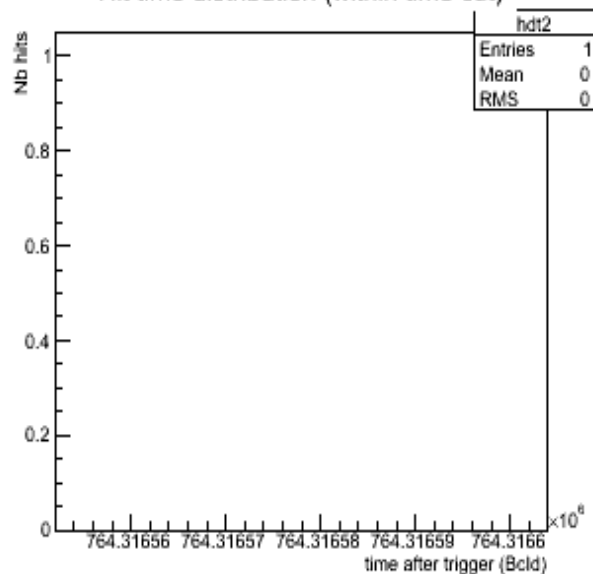
Hit position distribution (at the time where it is border)



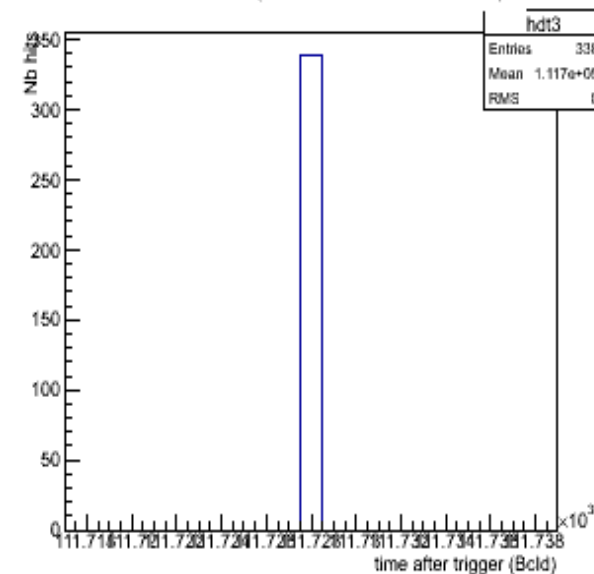
Hit time distribution (No time cut)



Hit time distribution (within time cut)

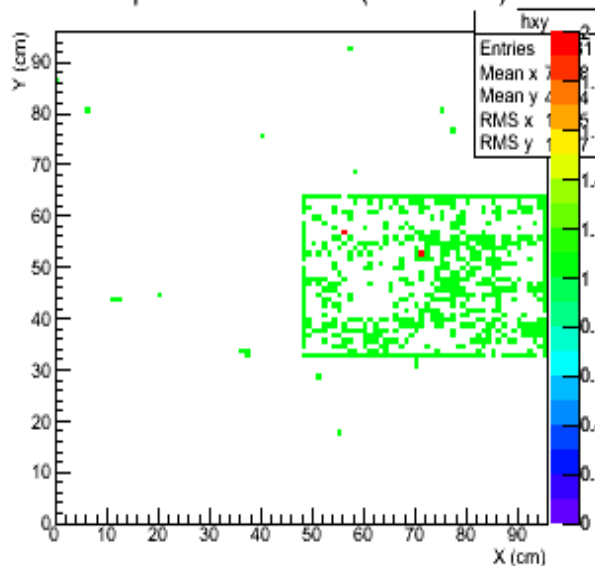


Hit time distribution (around the time where it is border)

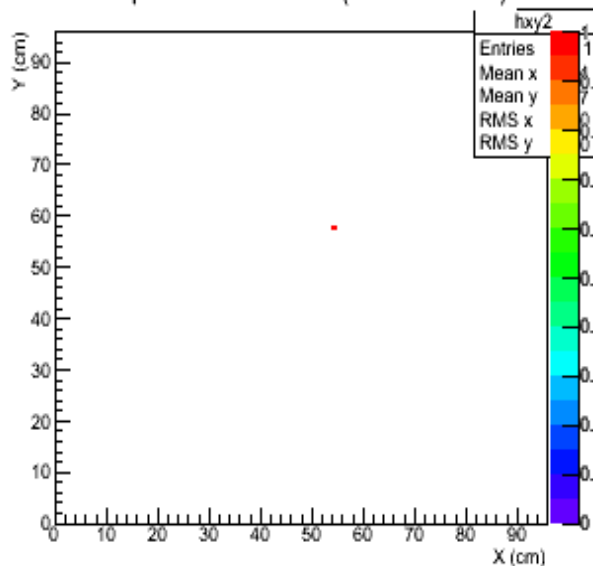


Quelques événements « cadre »

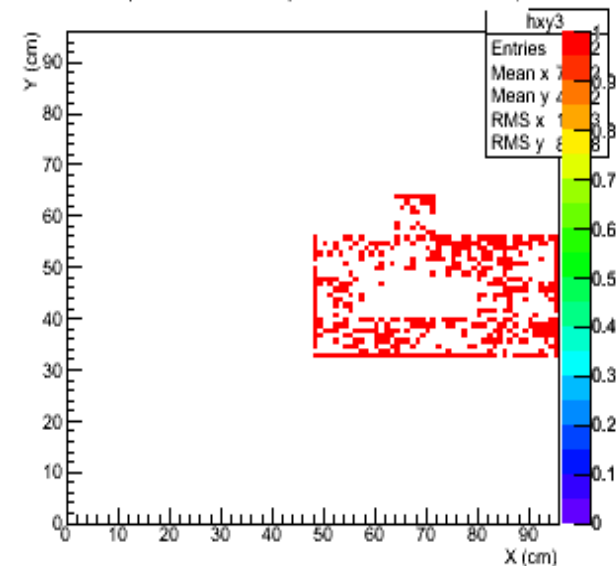
Hit position distribution (No time cut)



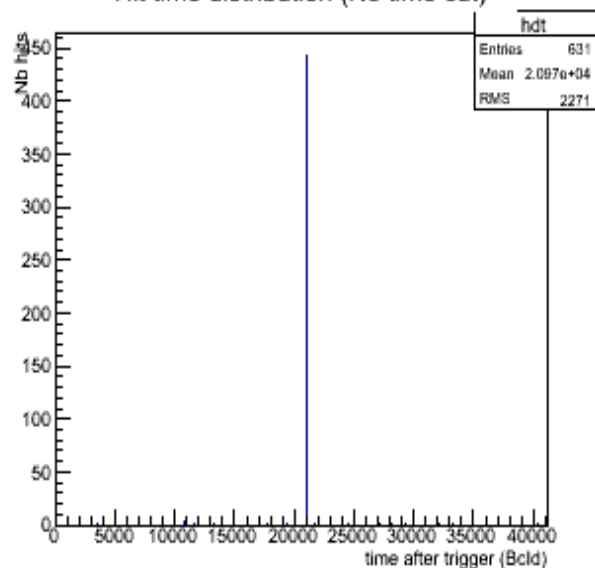
Hit position distribution (within time cut)



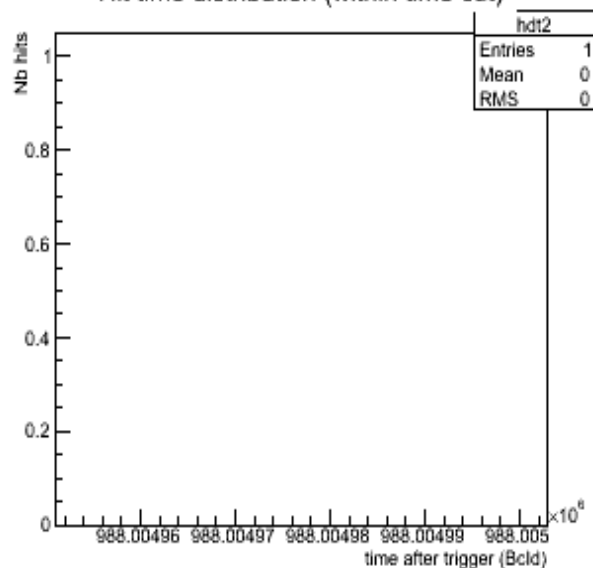
Hit position distribution (at the time where it is border)



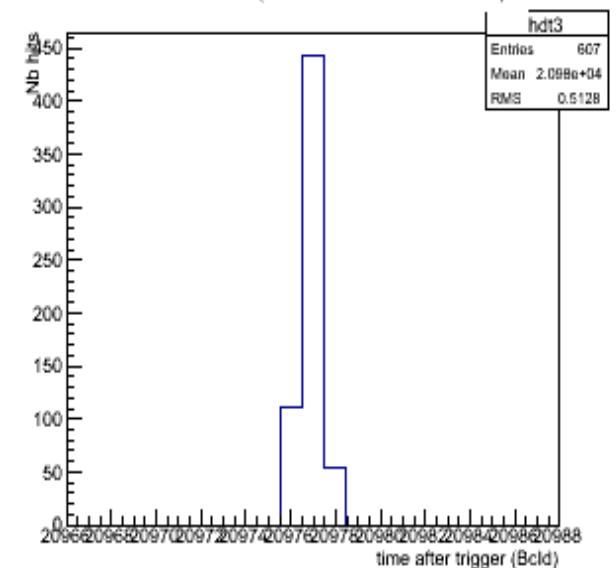
Hit time distribution (No time cut)



Hit time distribution (within time cut)

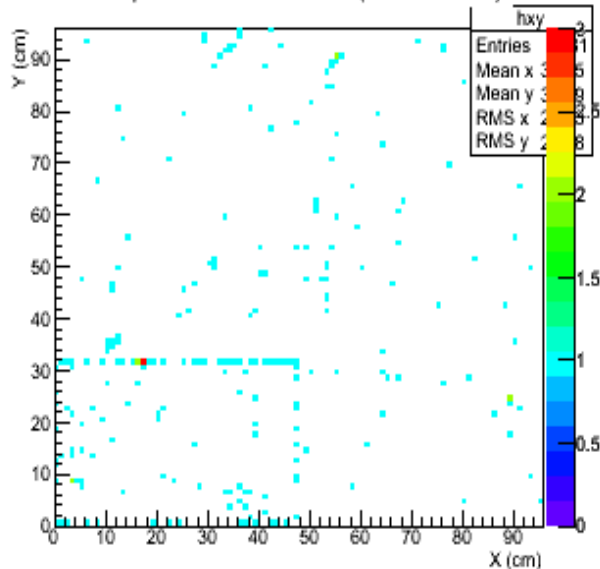


Hit time distribution (around the time where it is border)

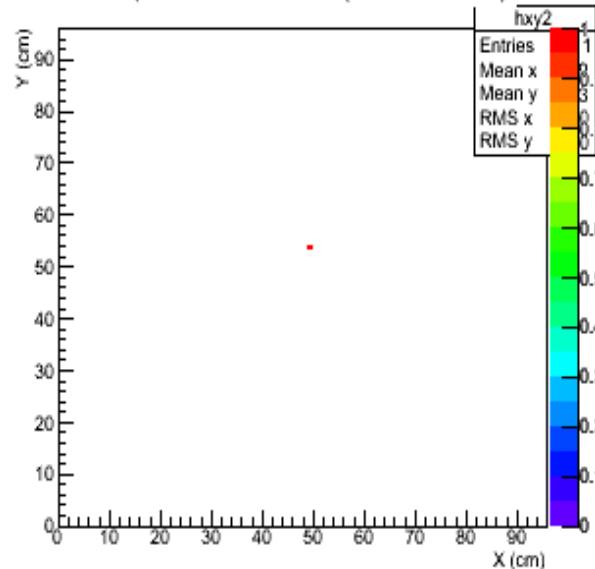


Quelques événements « cadre »

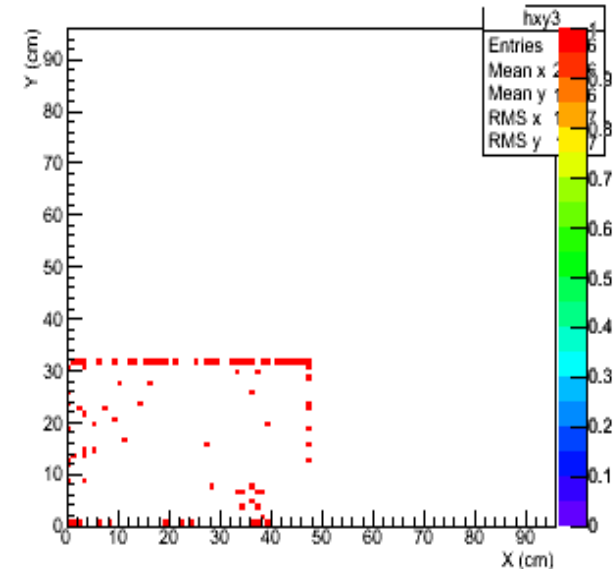
Hit position distribution (No time cut)



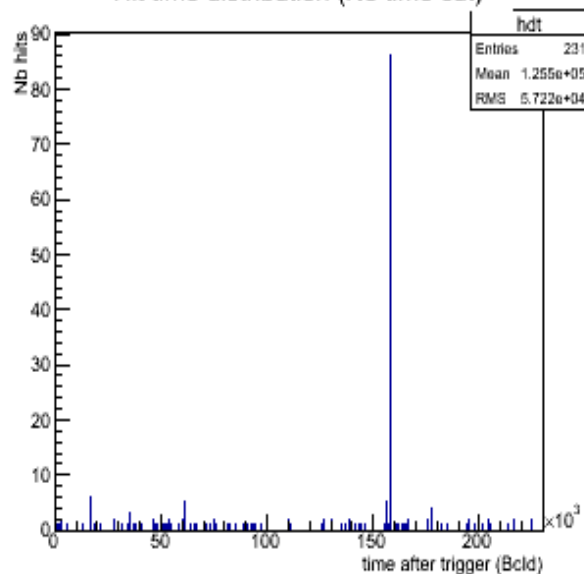
Hit position distribution (within time cut)



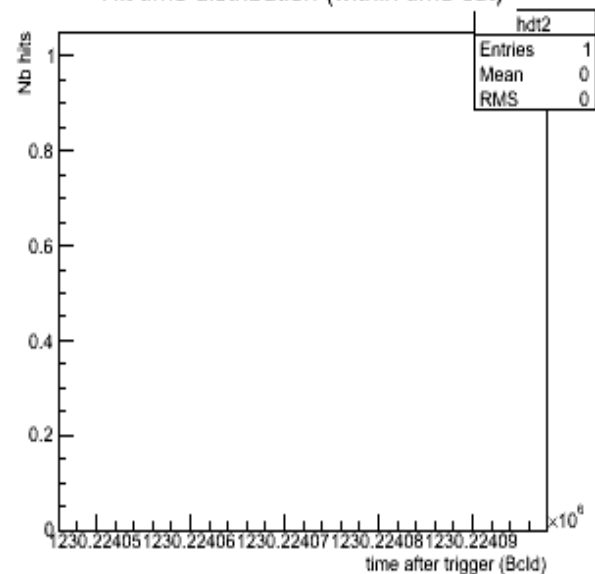
Hit position distribution (at the time where it is border)



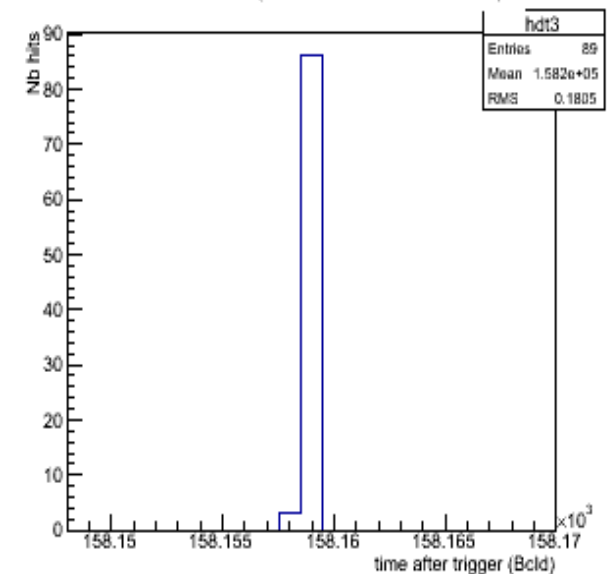
Hit time distribution (No time cut)



Hit time distribution (within time cut)

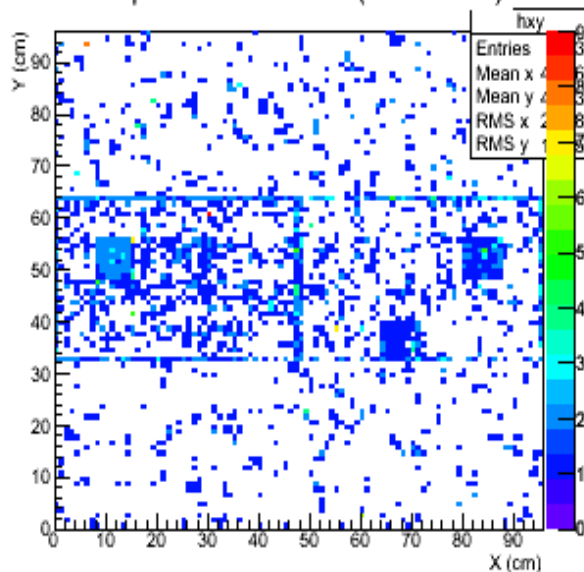


Hit time distribution (around the time where it is border)

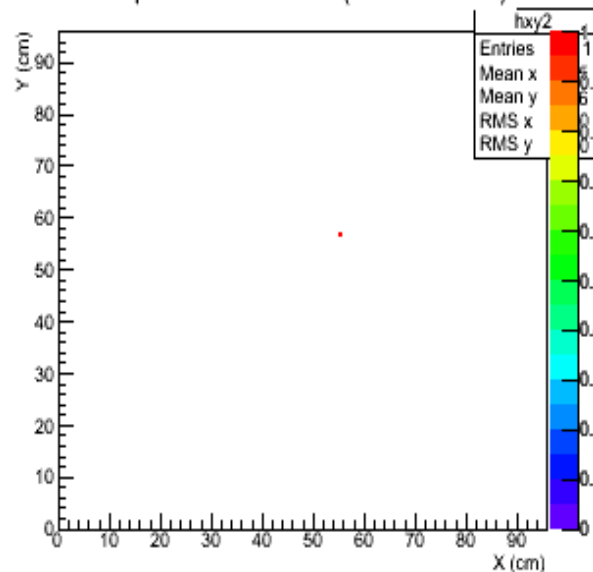


Quelques événements « cadre »

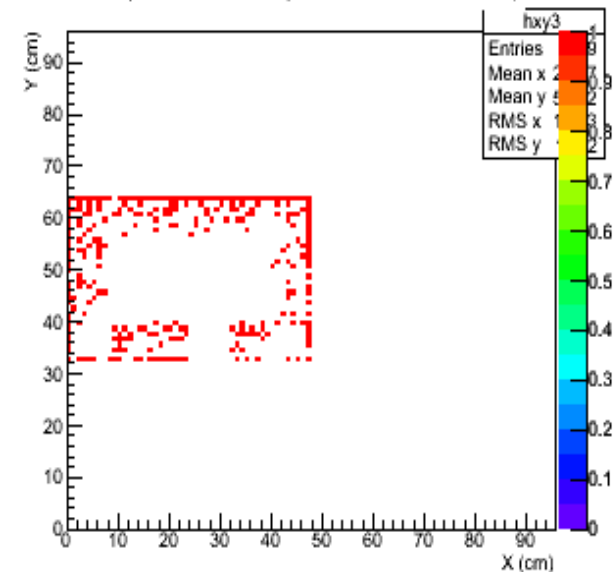
Hit position distribution (No time cut)



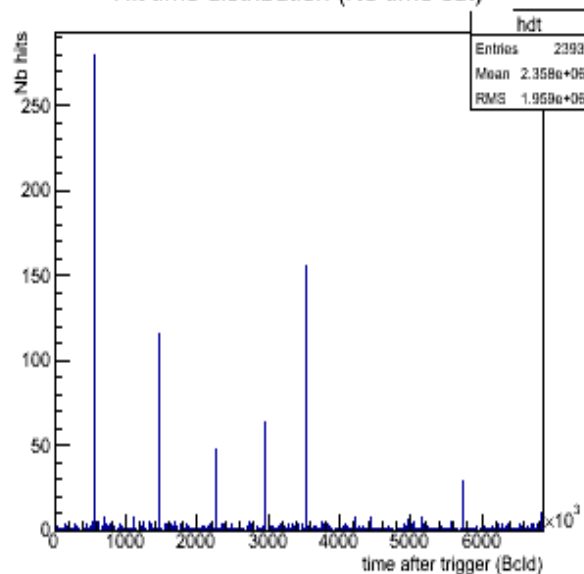
Hit position distribution (within time cut)



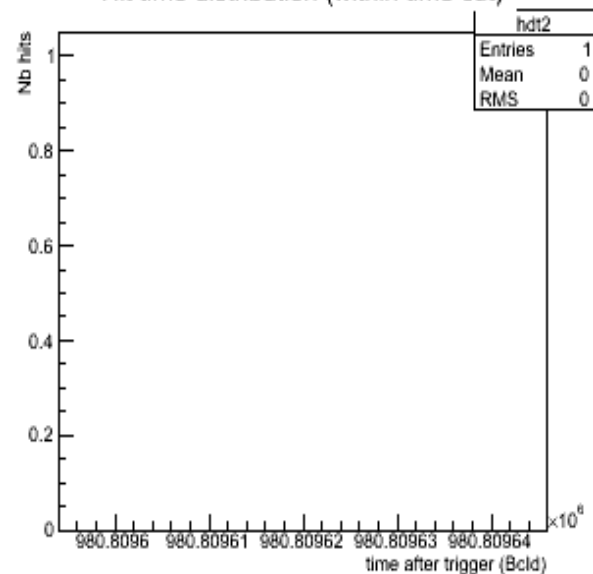
Hit position distribution (at the time where it is border)



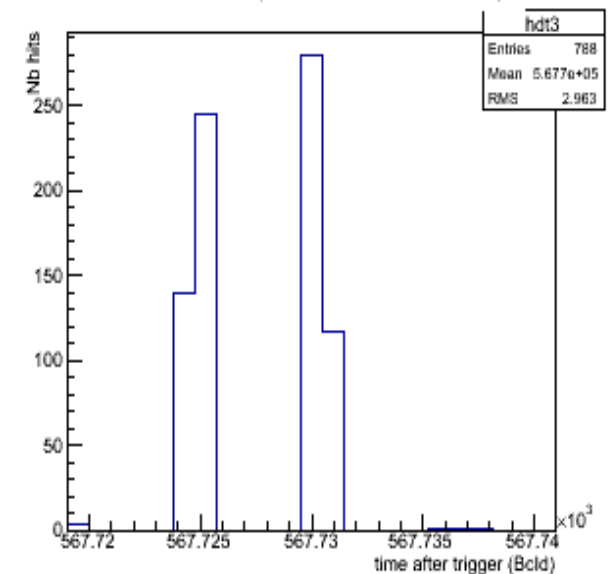
Hit time distribution (No time cut)



Hit time distribution (within time cut)

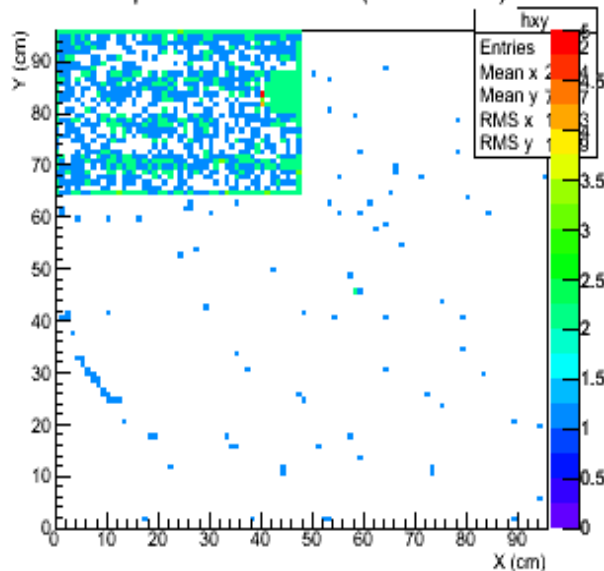


Hit time distribution (around the time where it is border)

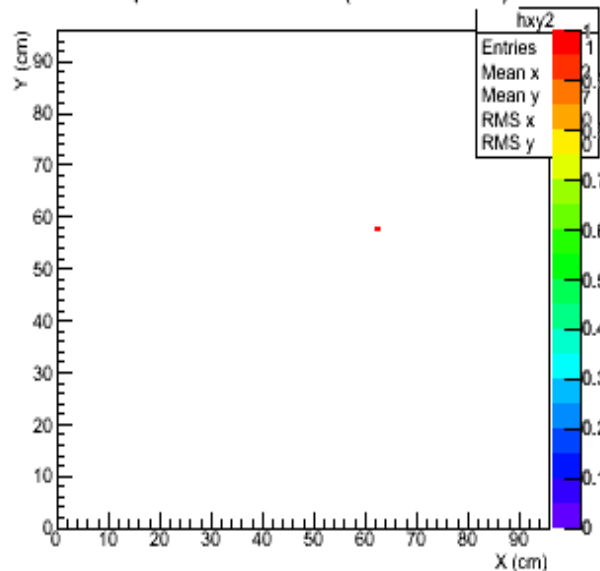


Quelques événements « cadre »

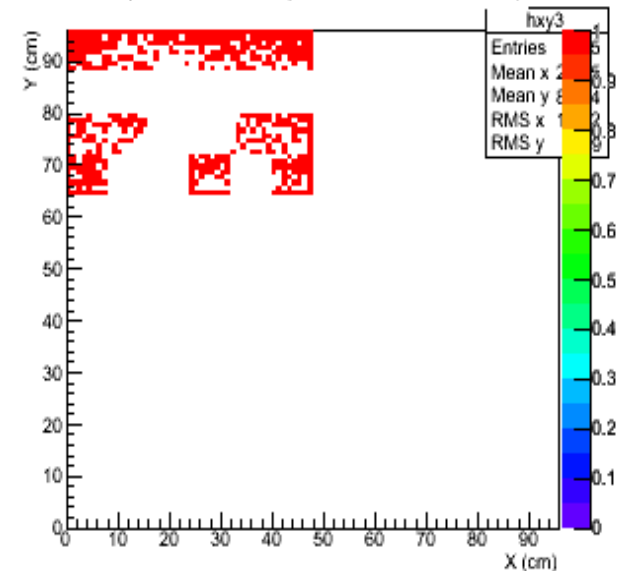
Hit position distribution (No time cut)



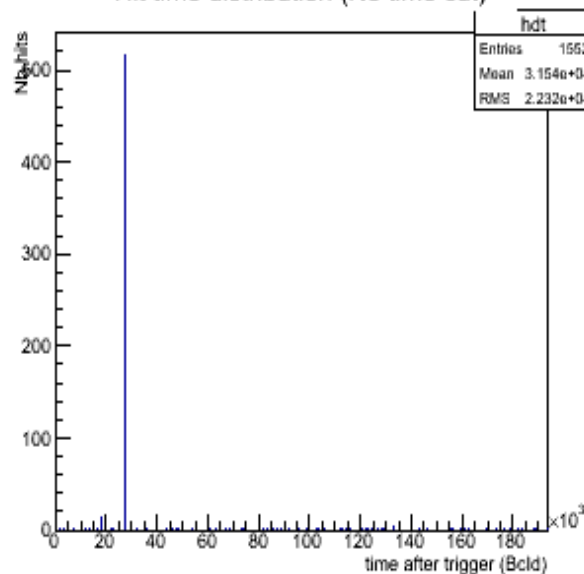
Hit position distribution (within time cut)



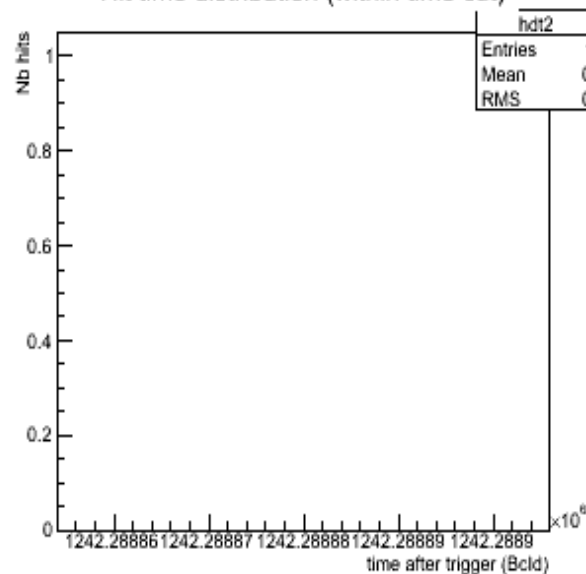
Hit position distribution (at the time where it is border)



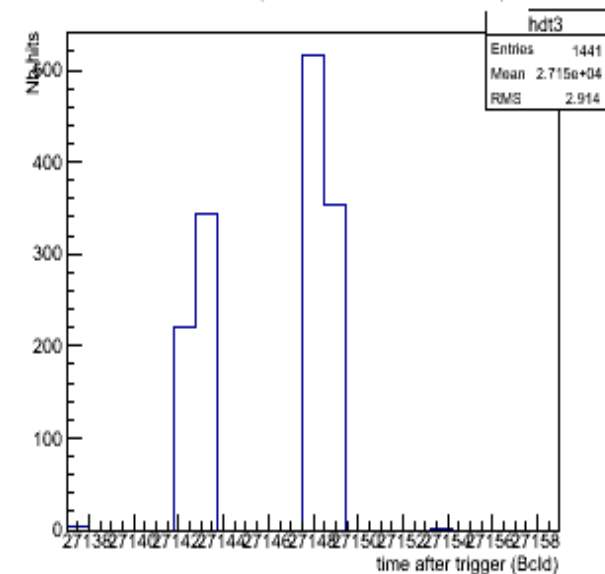
Hit time distribution (No time cut)



Hit time distribution (within time cut)

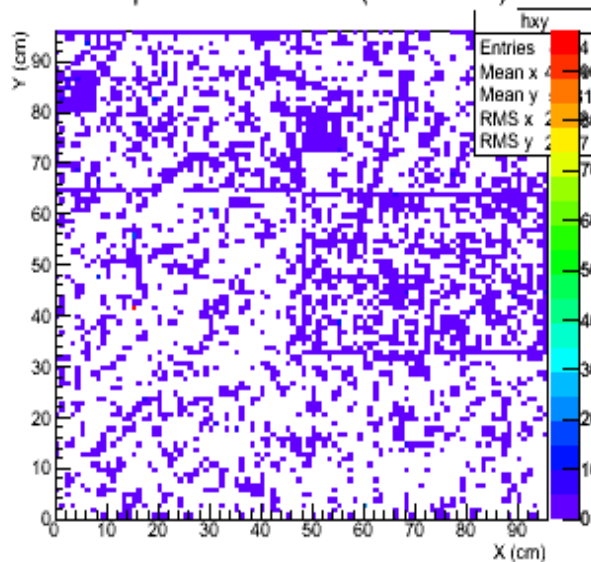


Hit time distribution (around the time where it is border)

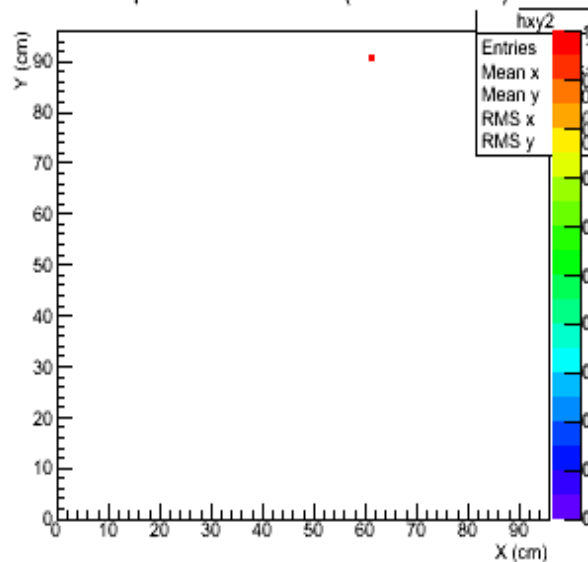


Quelques événements « cadre »

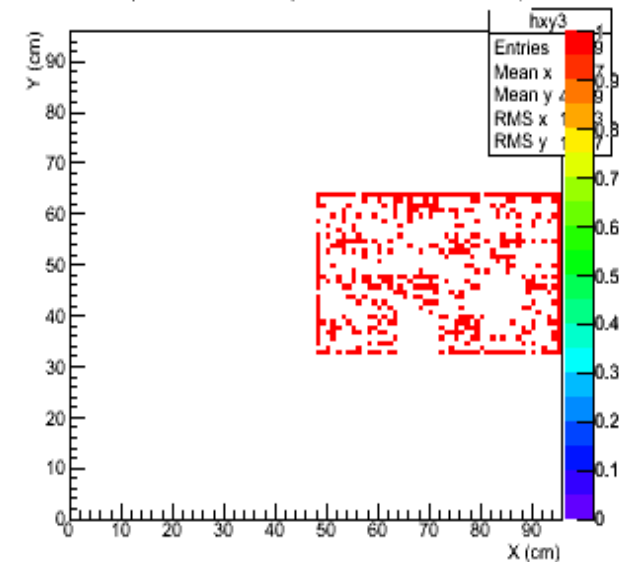
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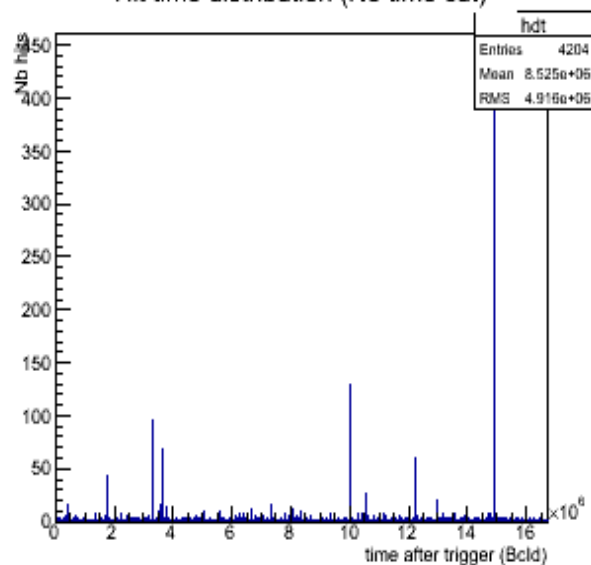
Hit position distribution (within time cut)



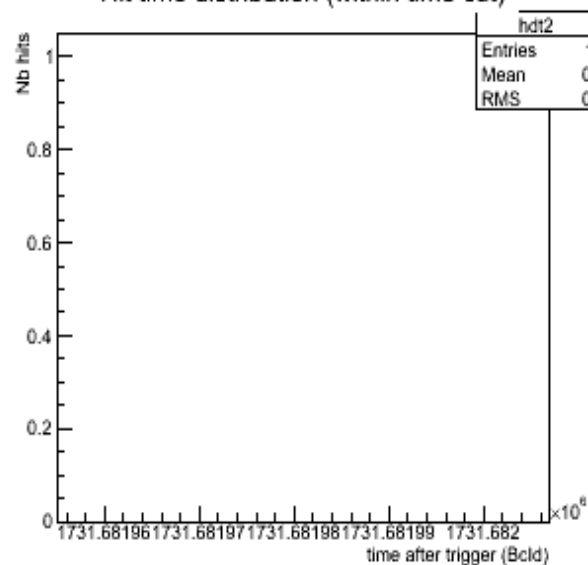
Hit position distribution (at the time where it is border)



Hit time distribution (No time cut)



Hit time distribution (within time cut)



Hit time distribution (around the time where it is border)

