Quelques remarques et status de l'étude de mesure d'impulsion par MCS

•Situation actuelle: algorithme de base et vérification avec des données OPERA ('soft' muons)

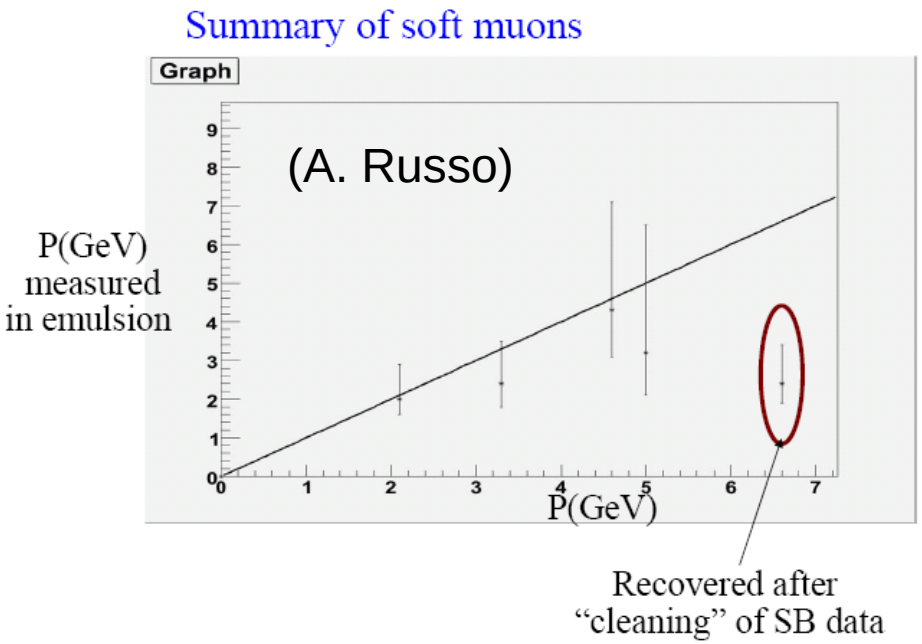
• Quelques pistes pour améliorer les performances de l'algo de base

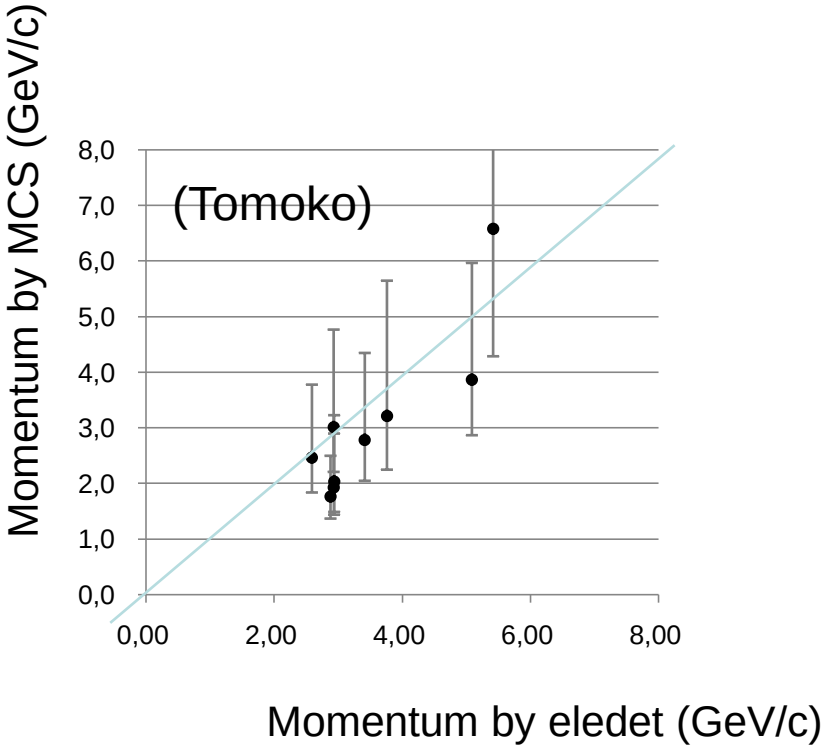
• 'framework' logiciel de développement au LAPP

D. Duchesneau

Réunion de groupe
21 septembre 2009

Comparison of reconstructed momentum in emulsions with electronic detector results for ‘soft’ muons



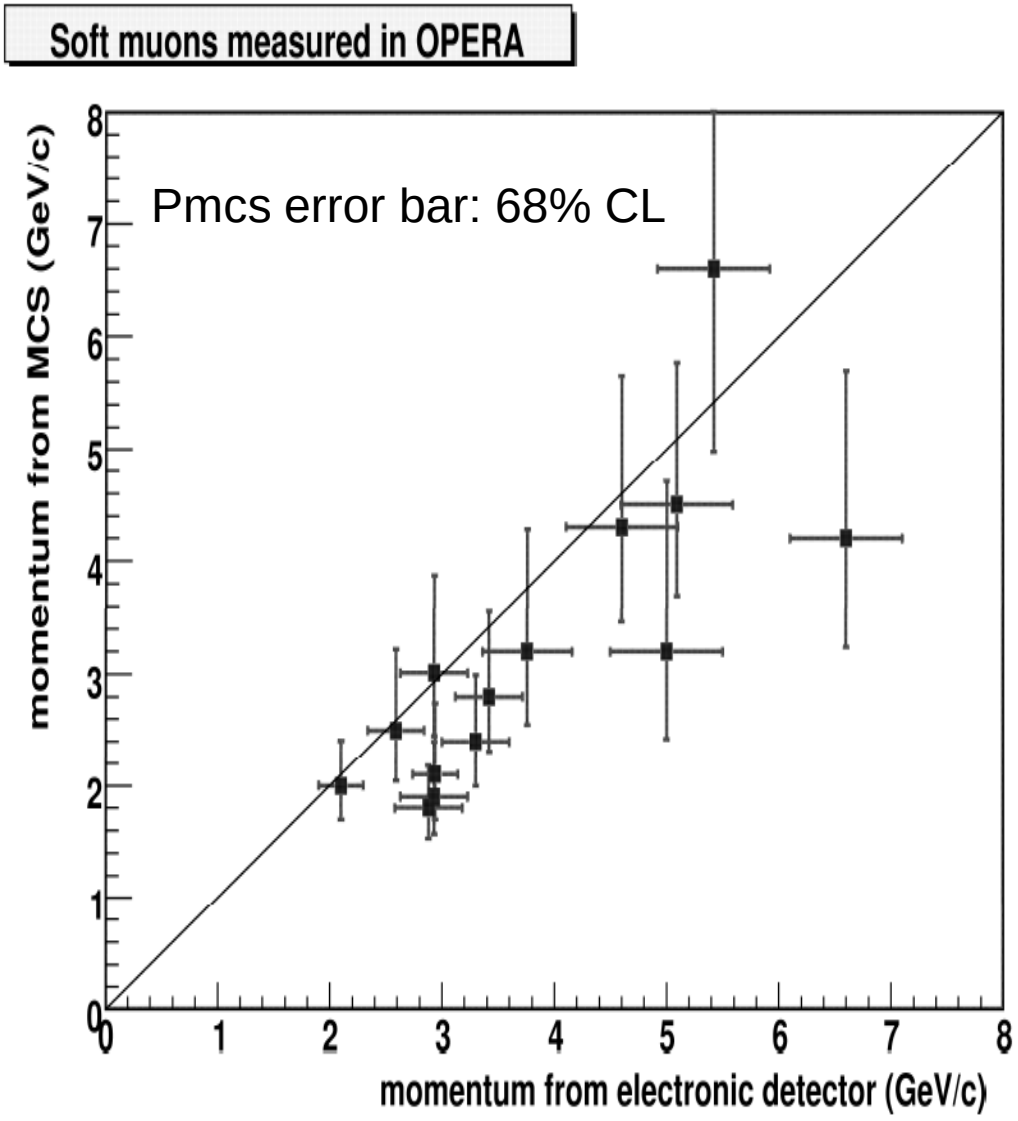


The algorithm seem to give good results compatible with the expected performance. It is a good confirmation of the pion test beam results.

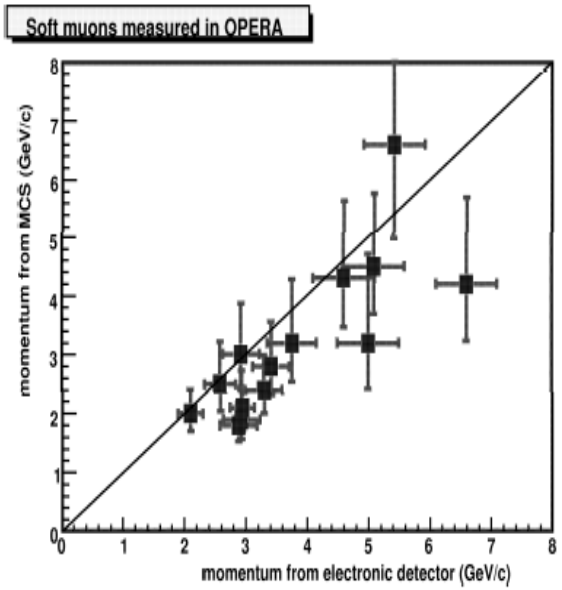
This study of reconstructed muons should be pursued continuously and developed coherently

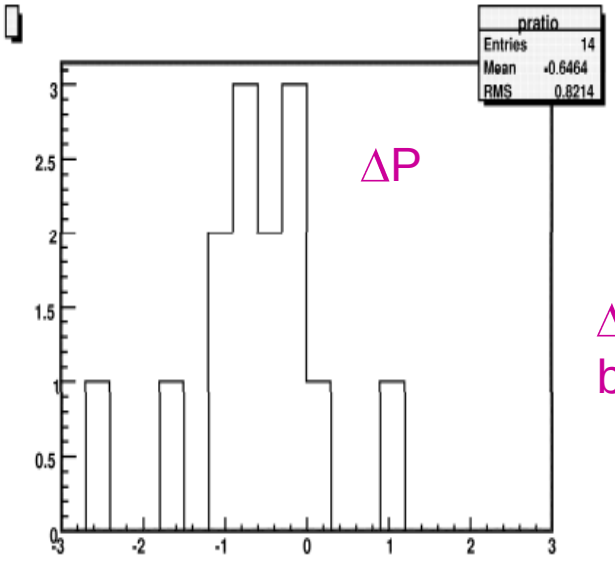
(cf: presentation at OPERA general meeting on 09/09/09)

Combination of the 19 soft muons => adding 10% error on P from spectrometer

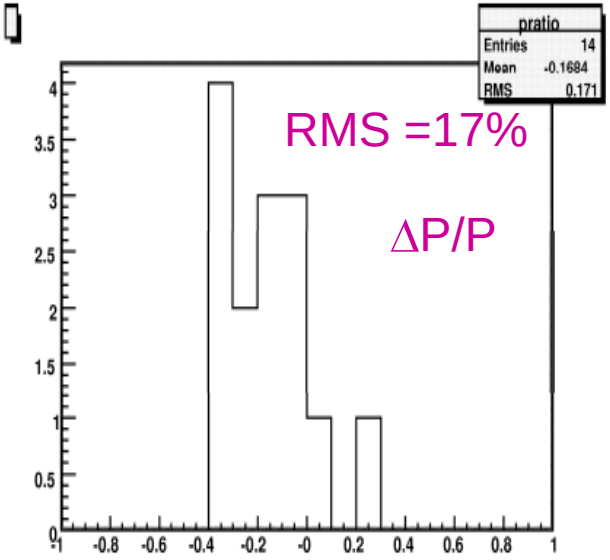


Plot privé non communiqué





ΔP=Pmcs-Pspectro: shifted by about -0.5 GeV



ΔP/P=(Pmcs-Pspectro)/Pspectro

1) Résolution comme prévue
2) Comprendre le décalage entre les 2 mesures
3) Analyser finement les traces utilise, notamment la résolution des bases traces

Ideas for possible upgrades of the Standard Algorithm:

• Study of local deformation: (cf: A. Russo)

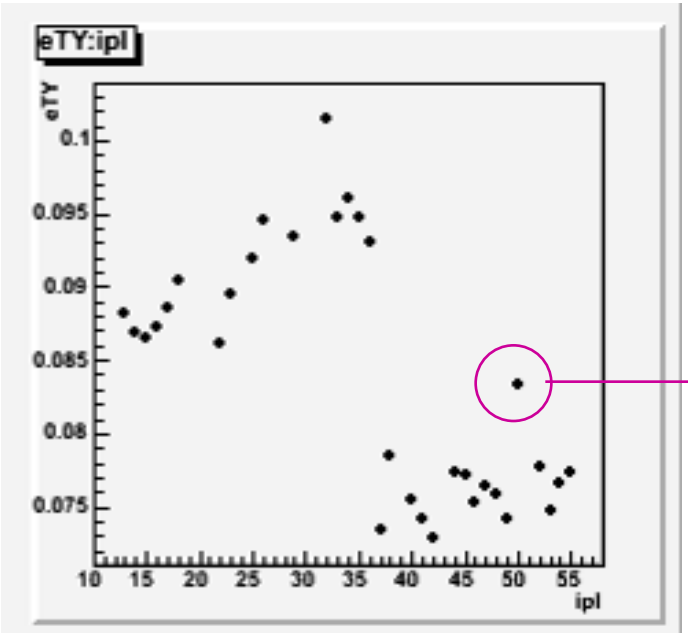
This work is interesting and has shown that the correction for local deformation for the moment doesn't change significantly the momentum resolution but add an offset on the measured momentum. More studies are needed to understand the possible feasibility with OPERA bricks.

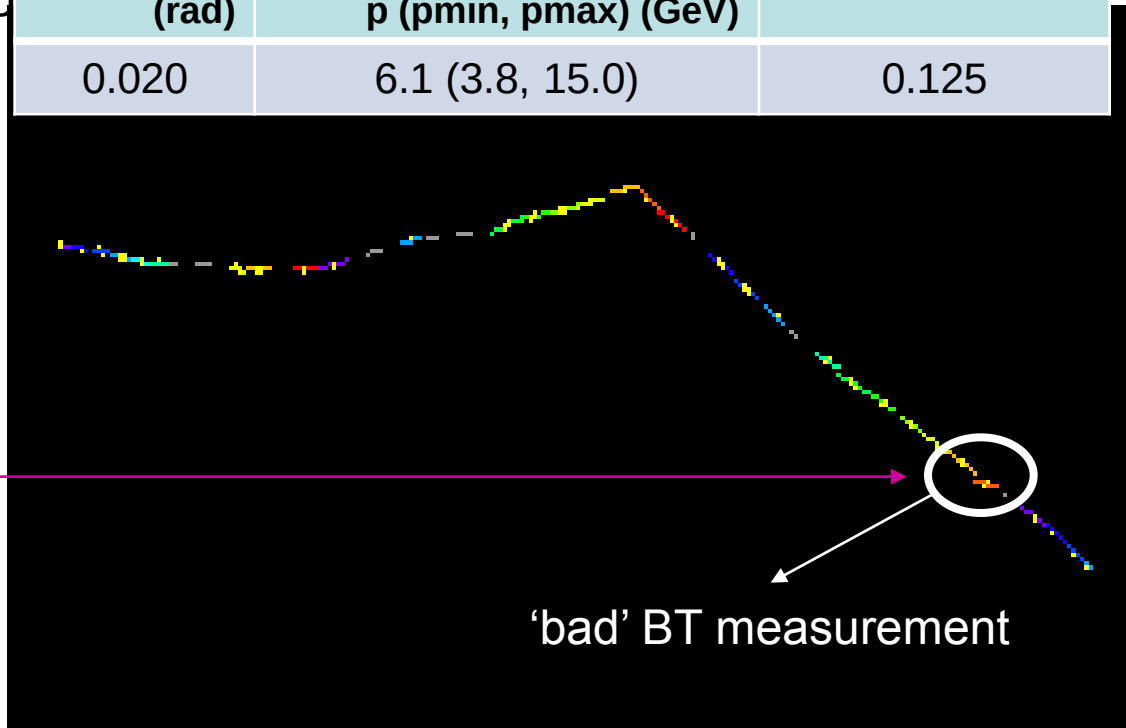
• Improved treatment of 'bad' base track which can be treated automatically in the algorithm

•Also manage possible deviatio

(Tomoko)

Kink angle (rad)	Daughter p (pmin, pmax) (GeV)	Pt (GeV/c)
0.020	6.1 (3.8, 15.0)	0.125

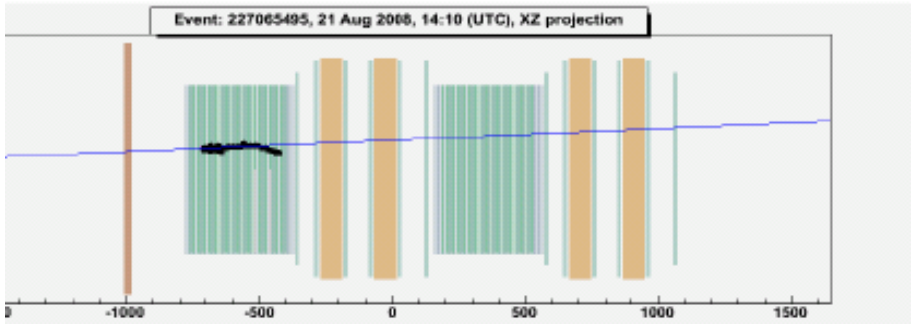




Ideas for possible upgrades of the Standard Algorithm:

• Constrain the momentum confidence level range in case of stopping particles in the brick where the track is measured

Event 227065495



Four tracks at primary vertex (μ included)

$p_{spec} = 2.1\ GeV/c$

$p_{\mu} = 2.0^{+0.9}_{-0.4}\ GeV/c$

$p_{h1} = 1.7^{+0.7}_{-0.4}\ GeV/c$

$p_{h2} = 1.0^{+2.1}_{-0.4}\ GeV/c$

$p_{h3} = 0.8^{+8.7}_{-0.4}\ GeV/c$

The upper limit could be bound by taking into account the particle range in lead.

• Develop a variant by extending the standard algorithm to very short tracks
In order to compute reliably enough first estimate of the momentum before more thorough kinematical analysis.

• Improve the precision of momentum determination for low energy tracks
By taking into account more precisely the loss of momentum along the track path

Méthode d'analyse locale:

- Développement sur LAPPSL4 sur mon compte

- Modification de Fedra localement sur une installation dans une zone de lapp_data

- Tests et mesures avec des fichiers root au niveau 'Linked tracks' de pions data et MC qui sont les références pour les développements futurs du Pmcs

- Vérification avec des données OPERA obtenus avec Berne ou autre groupe

- A terme: application des tests sur les données des fichiers root extraits de la DB par Elisabetta et son équipe

- Quand les tests et modifications sont concluants => 'commit' de la version modifiee de la function EdbMomentumEstimator.cxx (.h) de FEDRA sur SVN (j'ai les autorisations et accès donnés par V. Toukov)

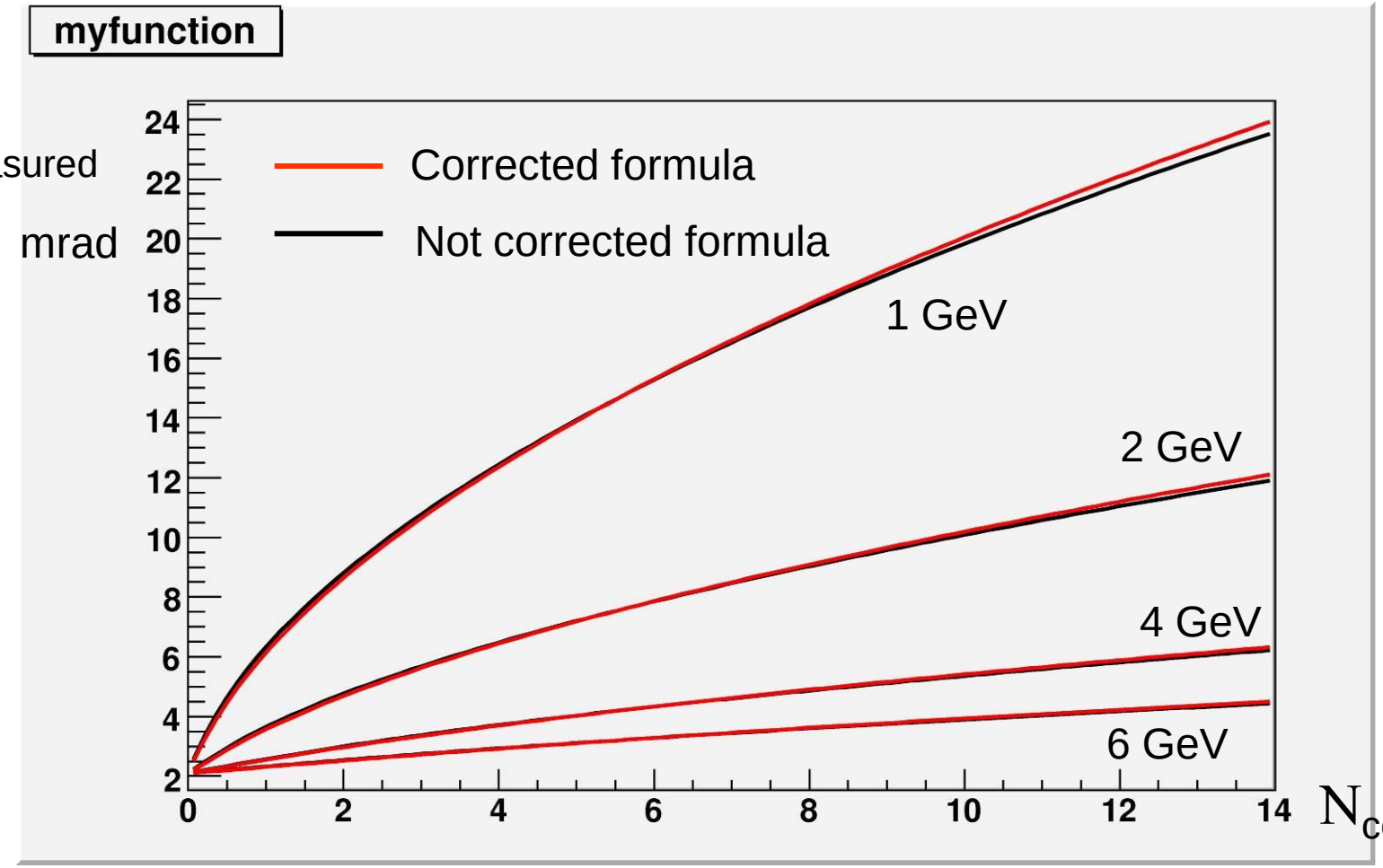
The END

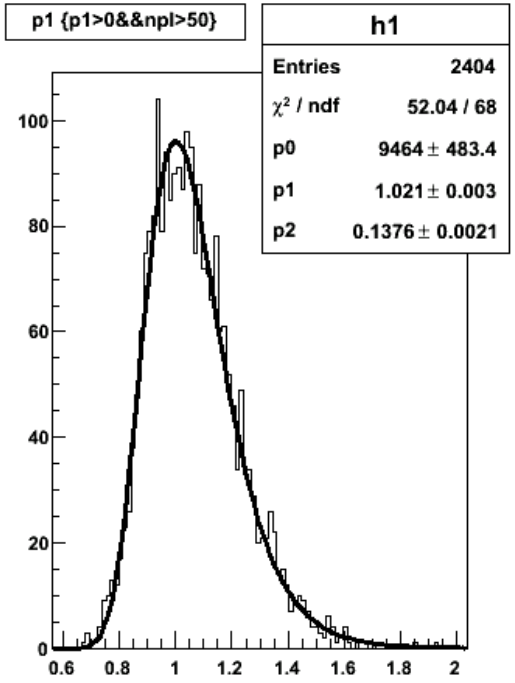
Second order “bug” found:

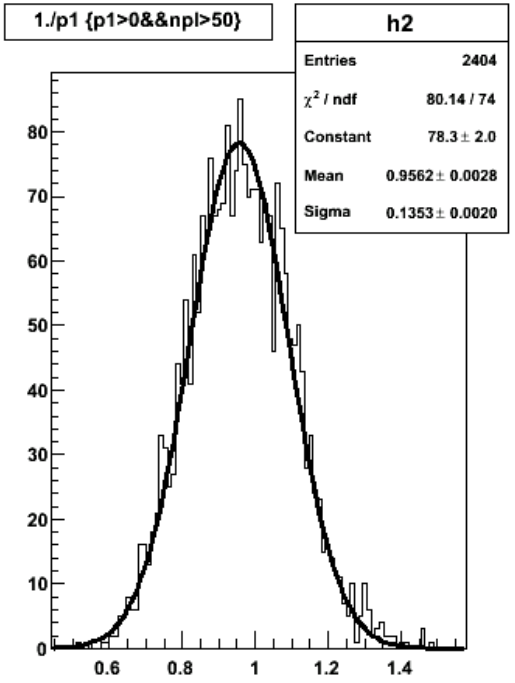
Effect of wrong power on (1+0.038ln(x/x0)) term in the function:
EdbMomentumEstimator::MCSErrorFunction and MCSErrorFunction_base

True: TF1(name,Form("sqrt(214.3296*x/%f*((1+0.038*log(x/(%f)))**2)/([0])**2+%f)",x0,x0,dtx));

Incorrect: TF1(name,Form("sqrt(214.3296*x/%f*(1+0.038*log(x/(%f)))/([0])**2+%f)",x0,x0,dtx))







Wrong

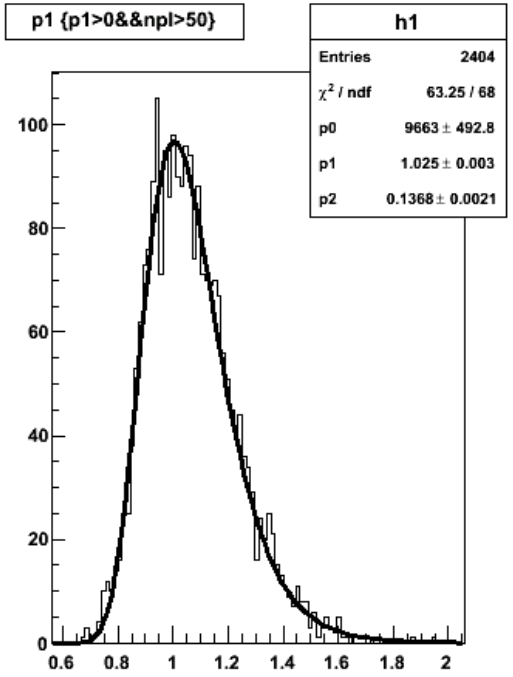
Base track resolution = 2.3 mrad

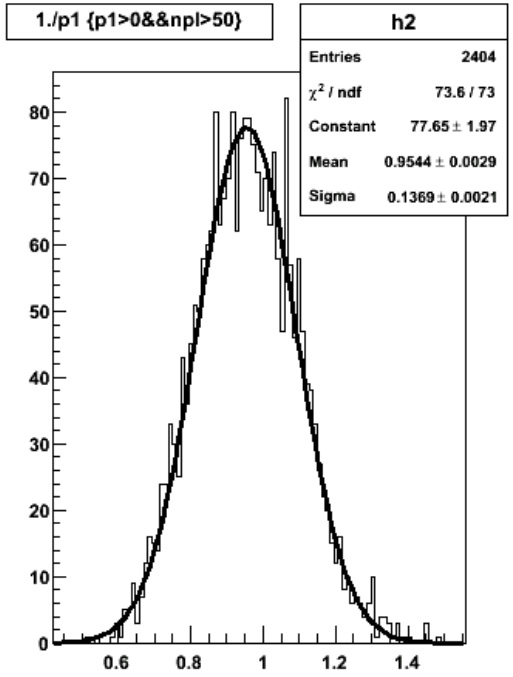
1 GeV

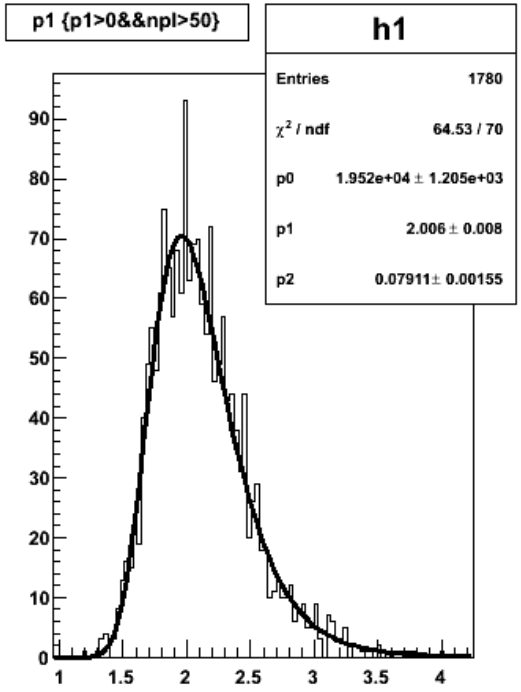
Corrected

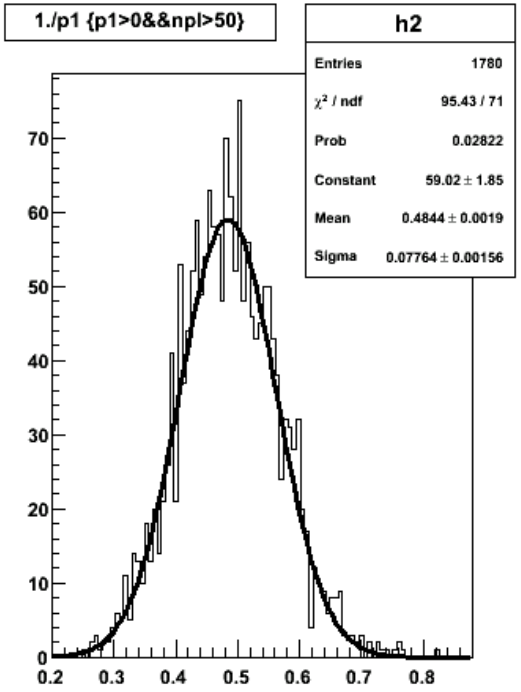
With bug :
1gev -> p=1.03+-0.01
2gev -> p=2.03 +-0.03
4gev -> p=3.96 +-0.08
6gev -> p=6.0 +- 0.2

corrected :
1gev -> p= 1.04 +- 0.01
2gev -> p=2.04 +- 0.04
4gev -> p=4.0 +- 0.1
6gev -> p=6.1 +- 0.2









Wrong

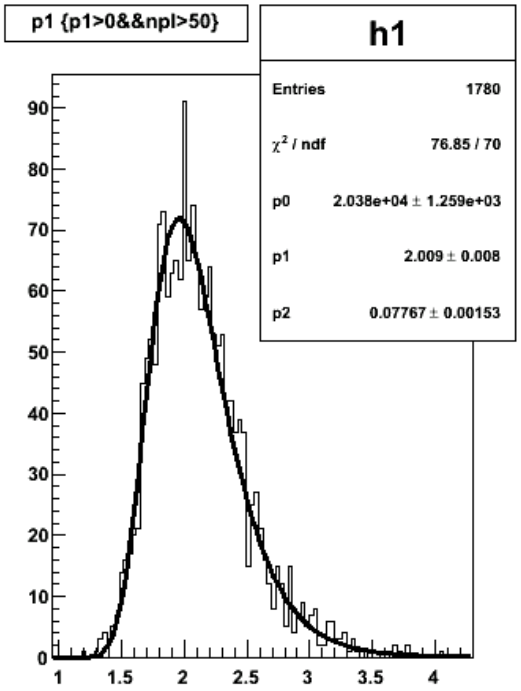
Base track resolution = 2.3 mrad

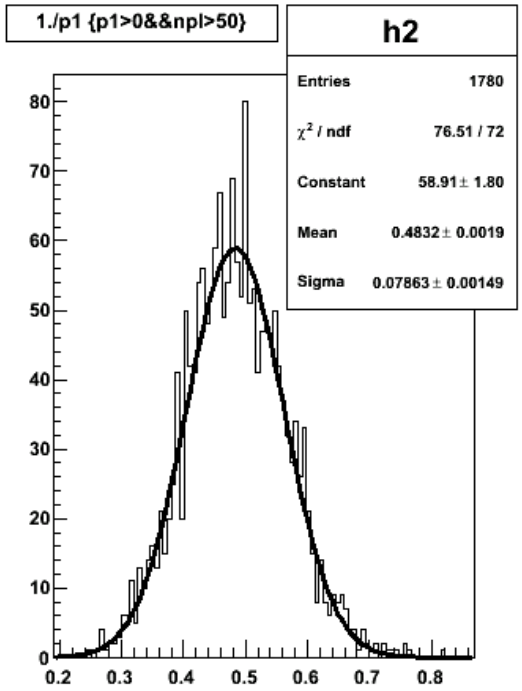
2 GeV

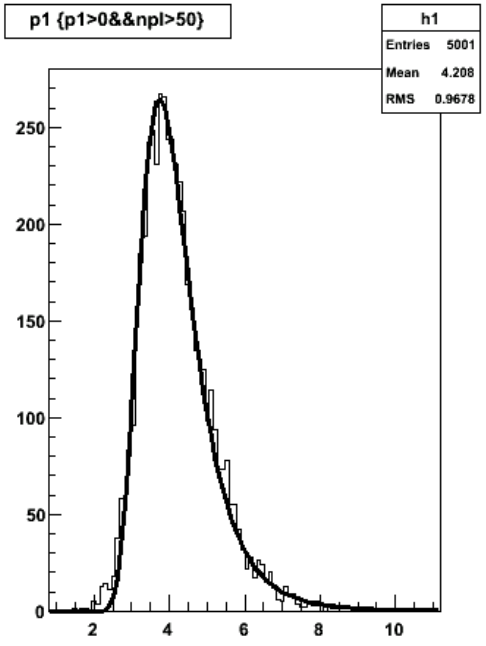
Corrected

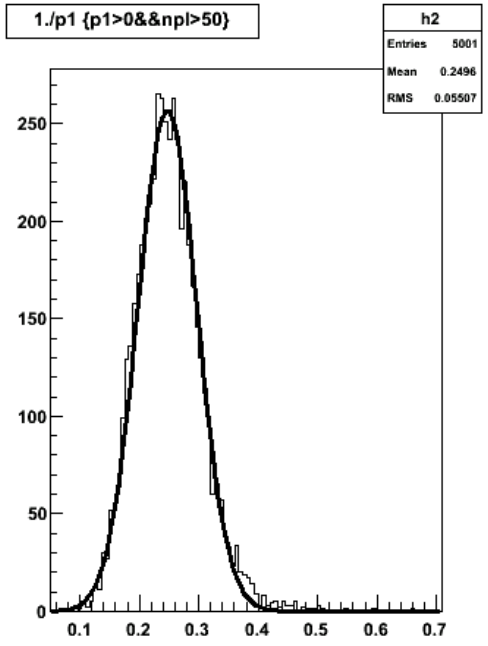
bad :
1gev -> p=1.03+-0.01
2gev -> p=2.03 +-0.03
4gev -> p=3.96 +-0.08
6gev -> p=6.0 +- 0.2

good :
1gev -> p= 1.04 +- 0.01
2gev -> p=2.04 +- 0.04
4gev -> p=4.0 +- 0.1
6gev -> p=6.1 +- 0.2









Wrong

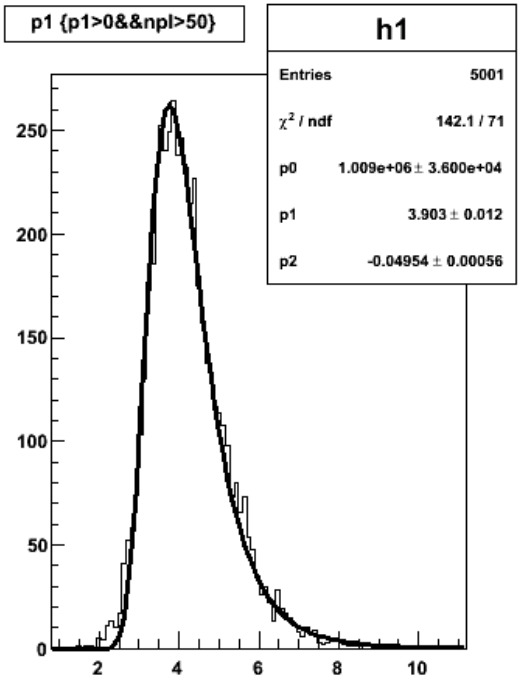
Base track resolution = 2.3 mrad

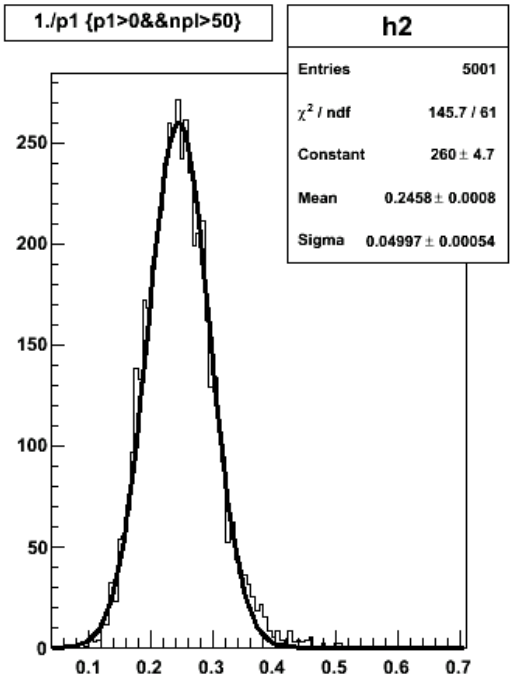
4 GeV

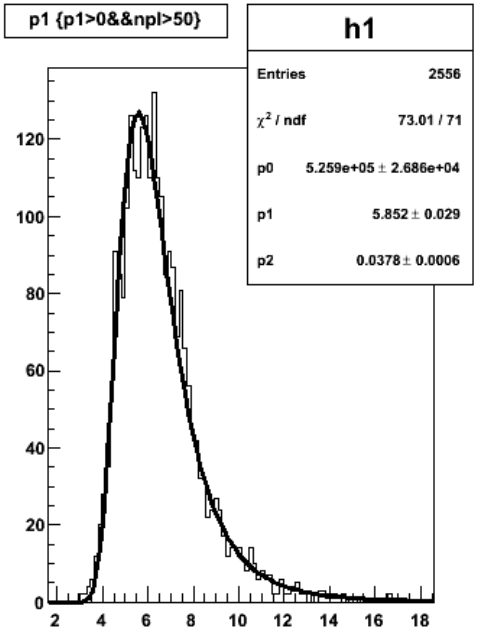
Corrected

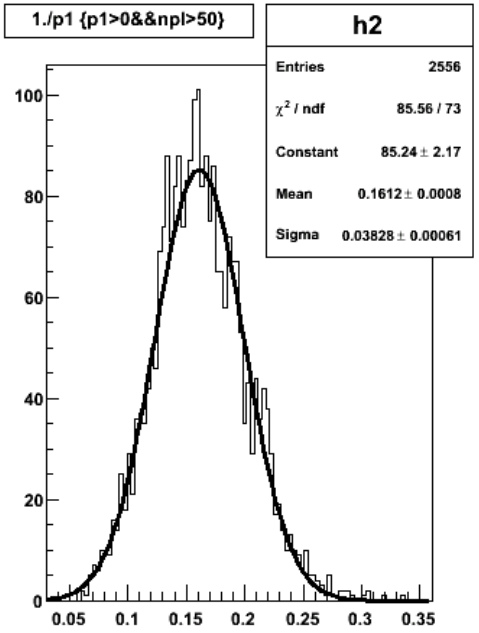
bad :
1gev -> p=1.03+-0.01
2gev -> p=2.03 +-0.03
4gev -> p=3.96 +-0.08
6gev -> p=6.0 +- 0.2

good :
1gev -> p= 1.04 +- 0.01
2gev -> p=2.04 +- 0.04
4gev -> p=4.0 +- 0.1
6gev -> p=6.1 +- 0.2









Wrong

Base track resolution = 2.3 mrad

6 GeV

Corrected

bad :
1gev -> p=1.03+-0.01
2gev -> p=2.03 +-0.03
4gev -> p=3.96 +-0.08
6gev -> p=6.0 +- 0.2

good :
1gev -> p= 1.04 +- 0.01
2gev -> p=2.04 +- 0.04
4gev -> p=4.0 +- 0.1
6gev -> p=6.1 +- 0.2