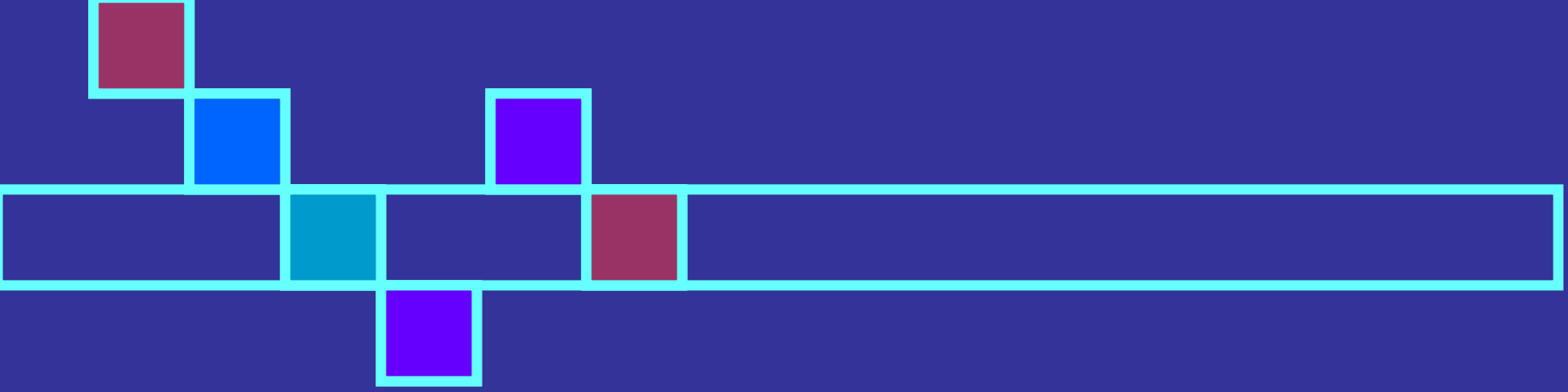


PMCS Performance for Jets

Ming Yan
Department of Physics University of Maryland

Outline

- 1: Introduction
- 2: PMCS Vs RECO Jets
- 3: Conclusions

1: Introduction:

- PMCS is intended to replace RECO for the fast simulation of events in D0 detector. In this talk we will compare the performance of PMCS Jets simulation with D0 RECO. We will compare jets Pt and the energy resolutions at three detector regions.

Introduction (2):

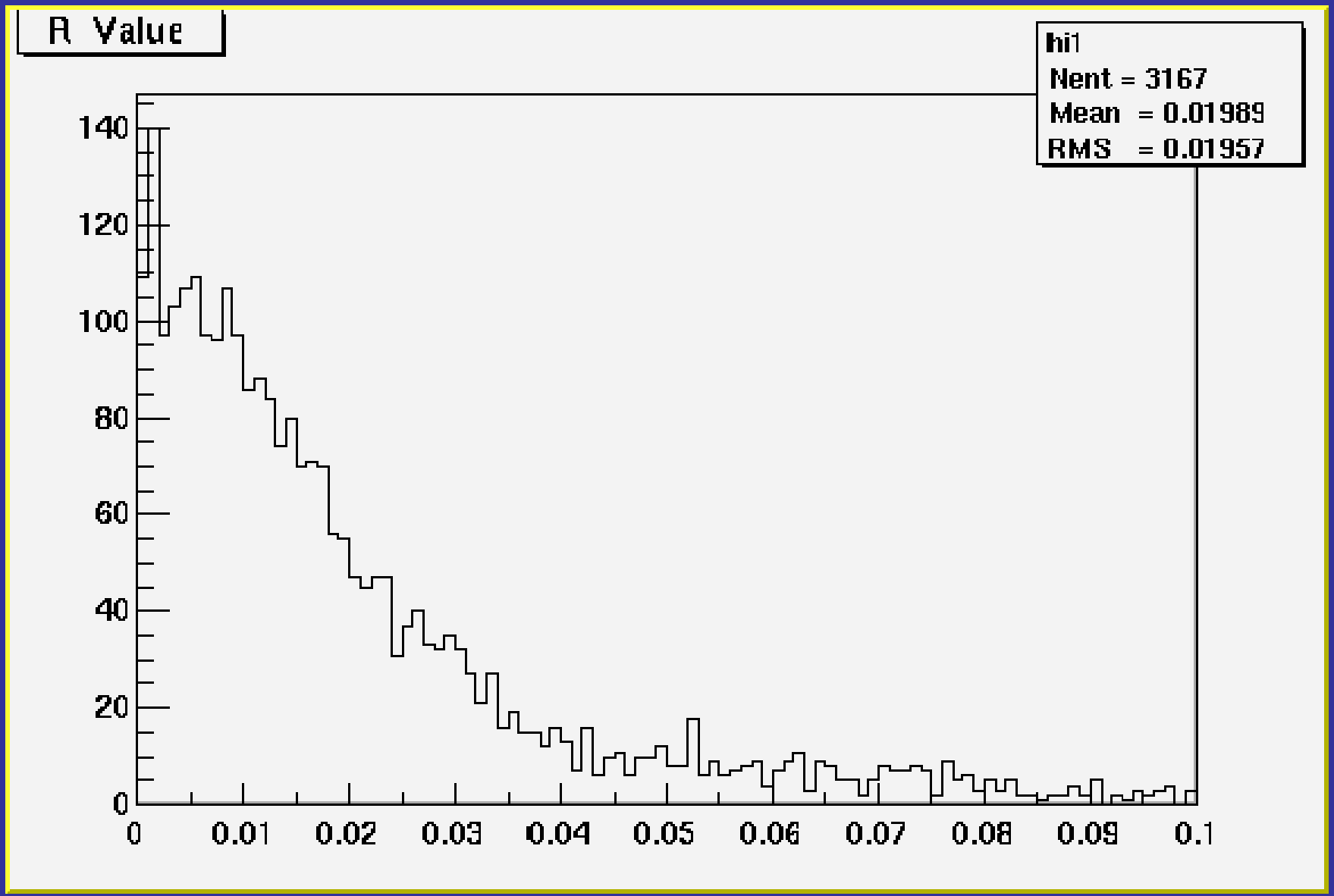
- PMCS package used: t01.73.00
- RECO algorism used: JCC7. Here JCC7 stands for Run I, cone, R=0.7, simple cone preclustering, calorimeter
- RECO version is p09.10.00
- We used three data sets in calculation:QCD 160, 80 and 40 Gev and up, generated by Pythia, overlay 0.5, inclusive dijets
- For 160 and up GeV data set, we generated 2000 events in simulation. 80 GeV and up and 40 GeV and up, both have 500 events of jet.

2: PMCS Vs RECO Jets

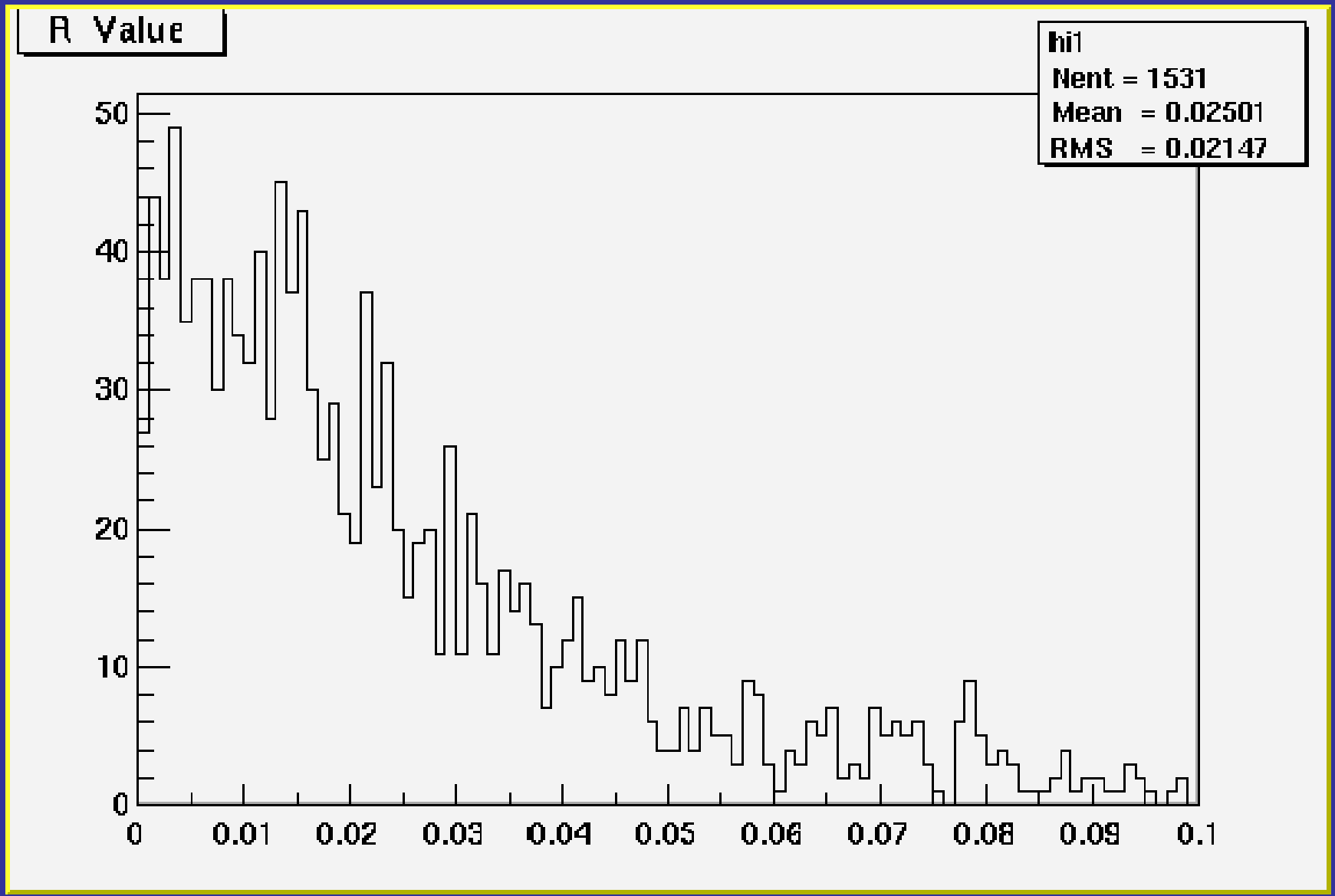
- In order to compare PMCS jets performance, we define the distance between PMCS jets and RECO jets $\Delta R=\mathrm{sqrt}(\Delta\eta^2+\Delta\varphi^2)$. Here $\Delta\eta$ or $\Delta\varphi$ stands for the difference between RECO and PMCS generated or smeared events. A cutoff value of ΔR is set to determine whether PMCS jets are within the prediction of RECO
- Now ΔR obtained from PMCS generated Vs RECO based on 160, 80, 40 GeV data sets are presented

ΔR: PMCS generated Vs RECO

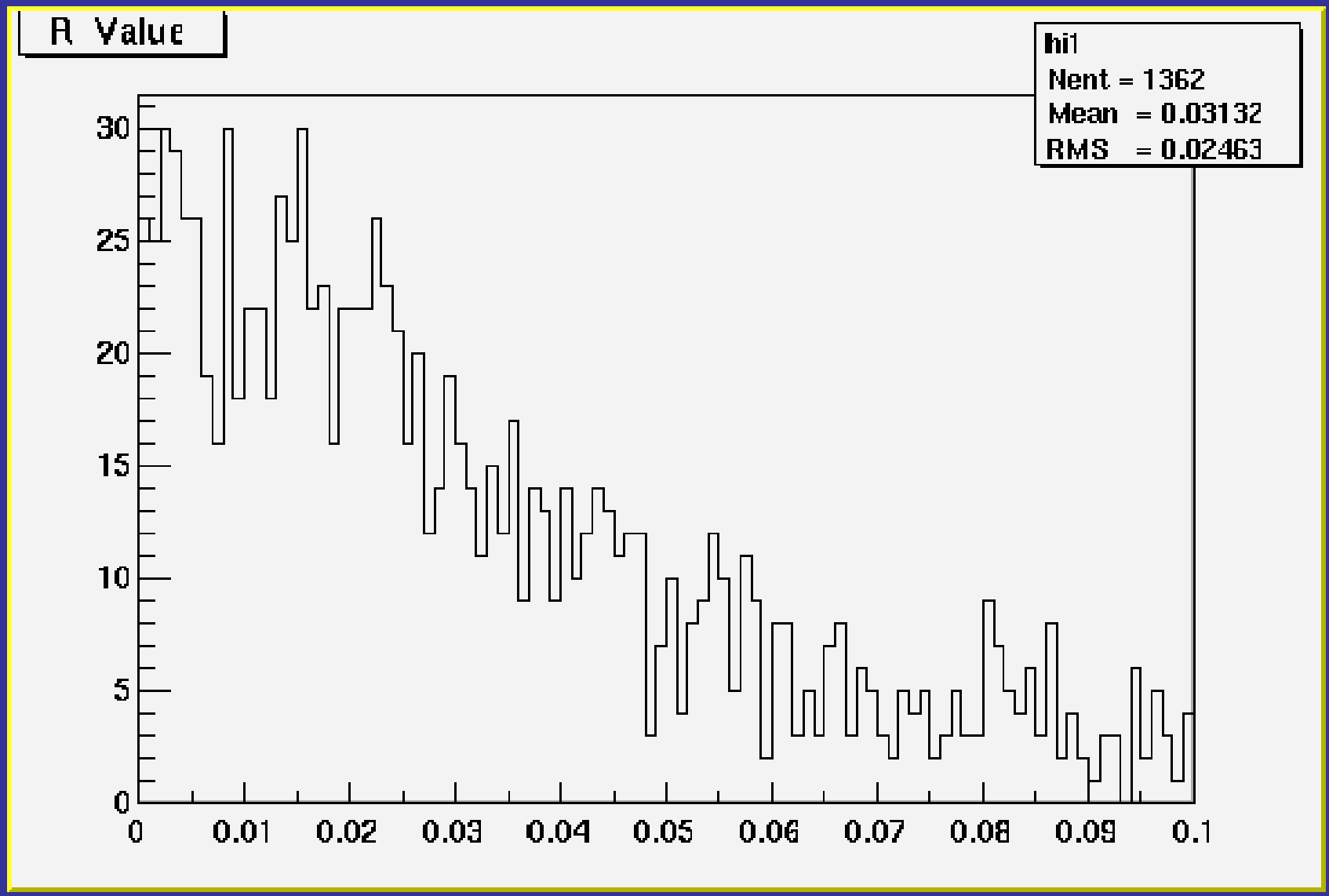
- X axis is ΔR , y axis is number of events



Results from 160 GeV data



Results from 80 GeV data



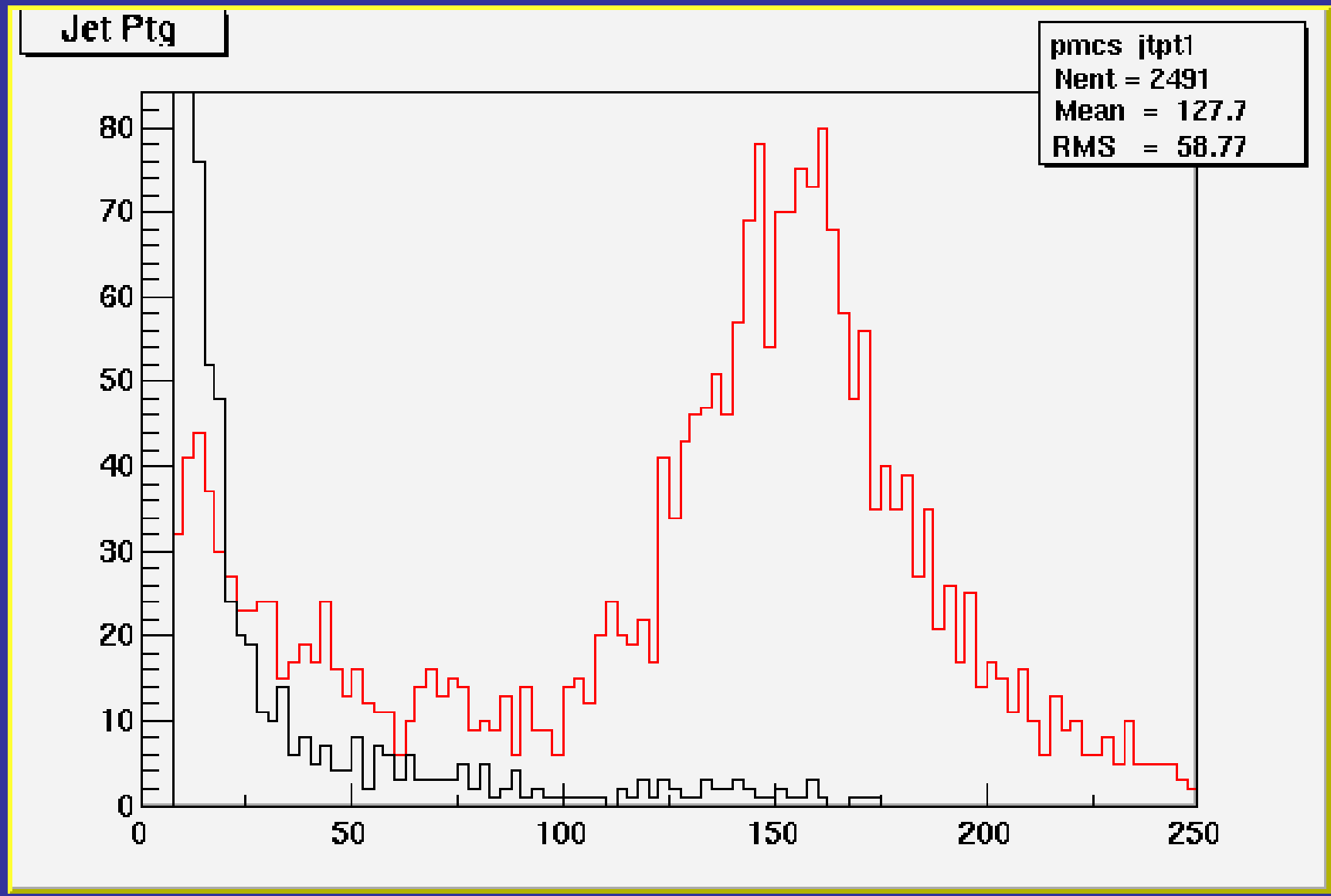
Results from 40 GeV data

Analysis of ΔR:

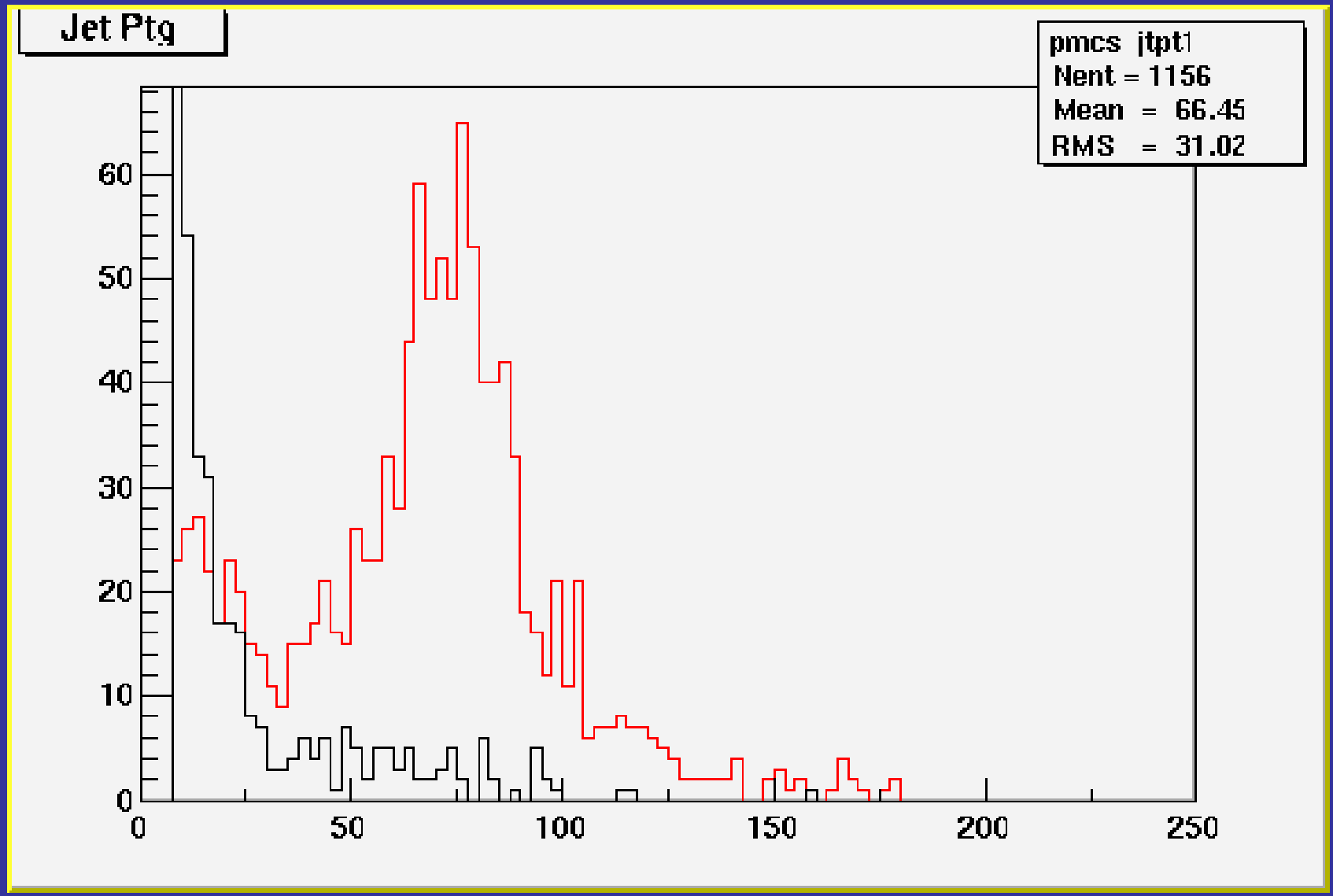
- All regions PMCS jets match RECO very well.
- ΔR curves become flat when energy of jets becomes lower, but most of events ΔR is smaller than 0.1. We select cutoff value 0.05 for ΔR in the following calculations.

Analysis of Et

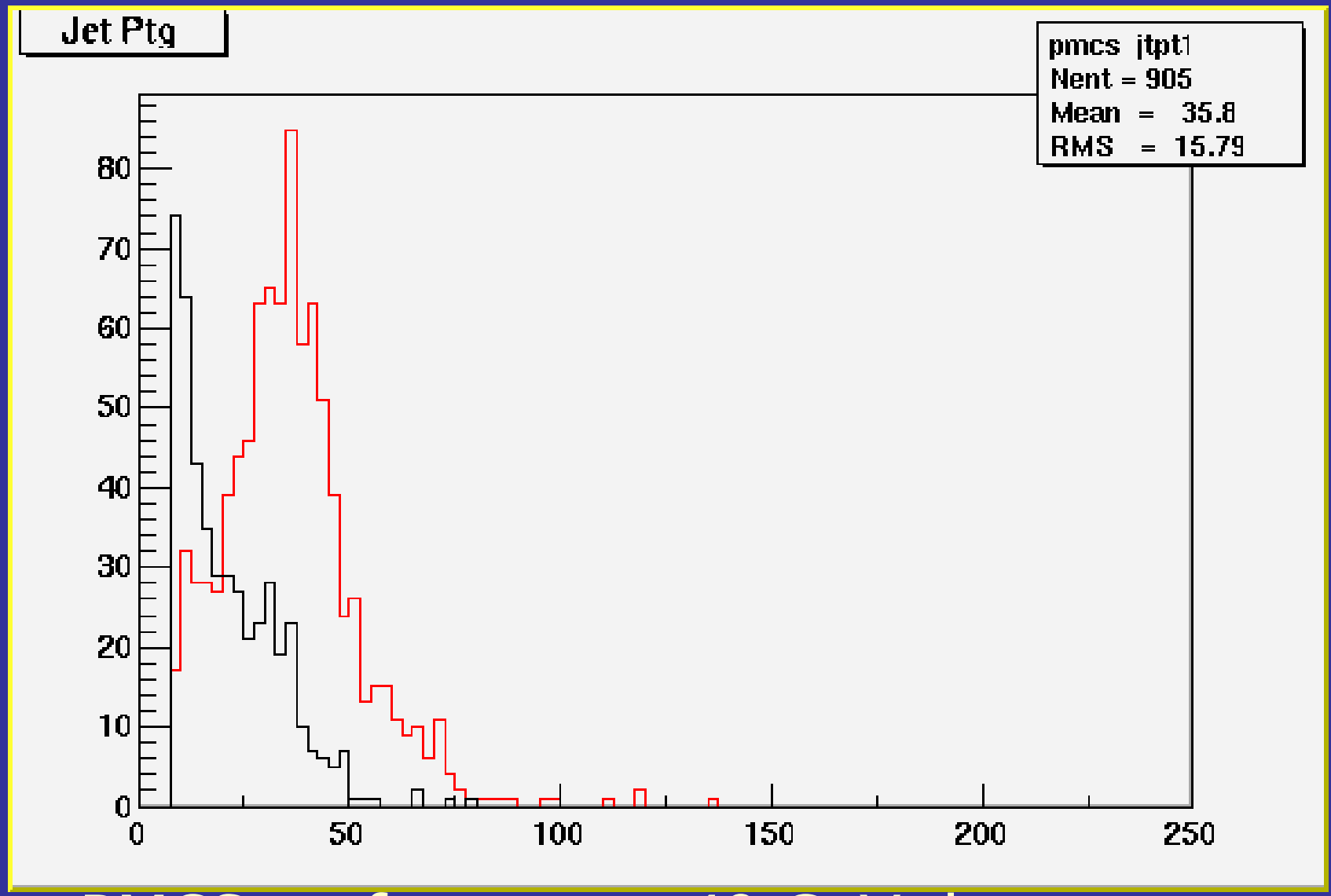
- In high energy level, we consider Pt is the same as Et
- We consider $\Delta R<0.05$ for matched events and vice versa
- 160, 80, 40 GeV data sets are analysised
- In the following plots, RED curves stand for matched events, BLACK for unmatched events. The x axis is Et in GeV, y axis is the number of events



PMCS efficiency: 160 GeV data set



PMCS performance: 80 GeV data set



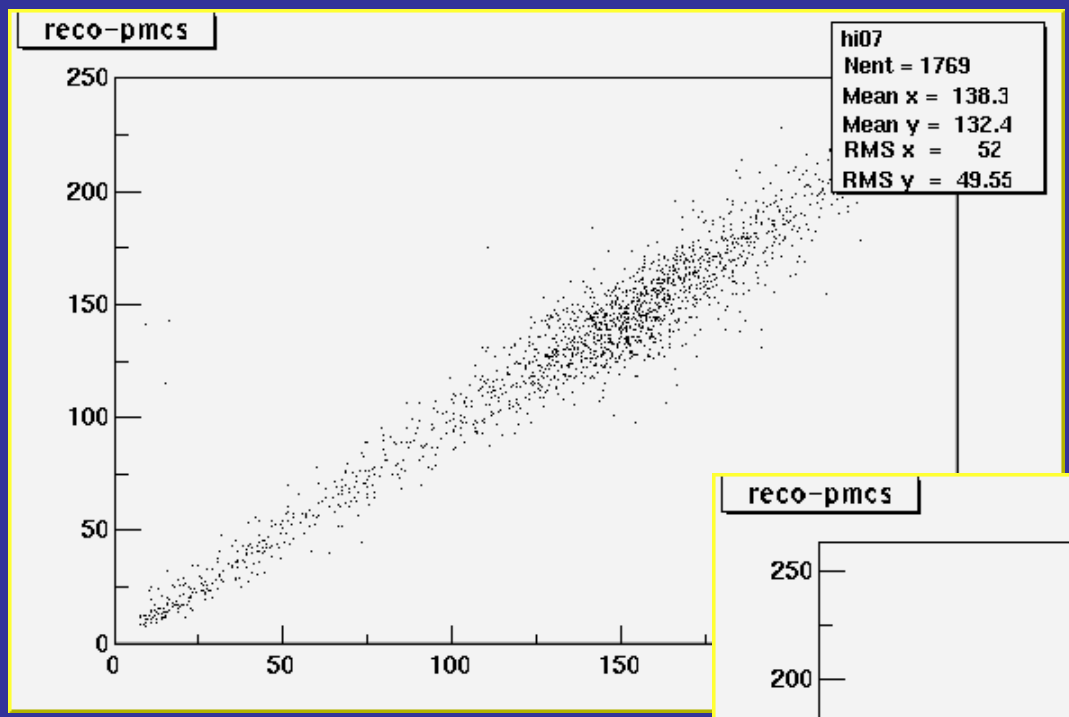
PMCS performance: 40 GeV data set

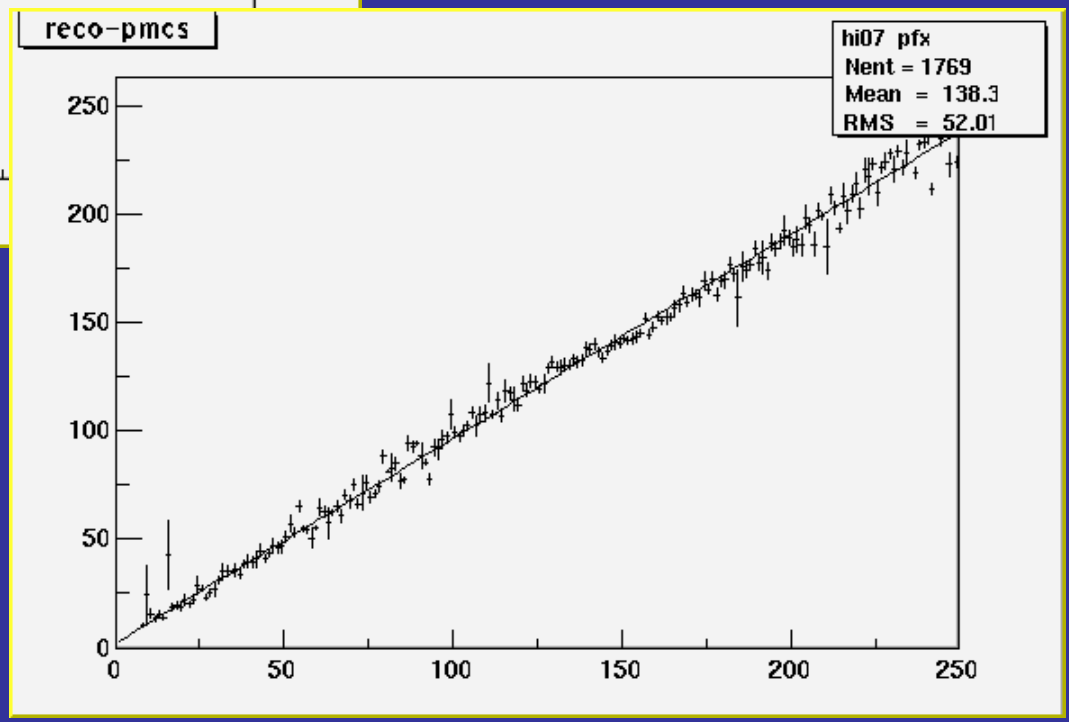
Analysis of PMCS performance

- We can find from the plots, the number of matched events is larger at high Et range, smaller at lower Et range. This consists with the PMCS smearing method
- PMCS smeared Et but not the direction of the jets. To analysis the jets Et, we compare RECO and PMCS jets Et in the following plots. We only analysis 160 GeV data set for simplicity

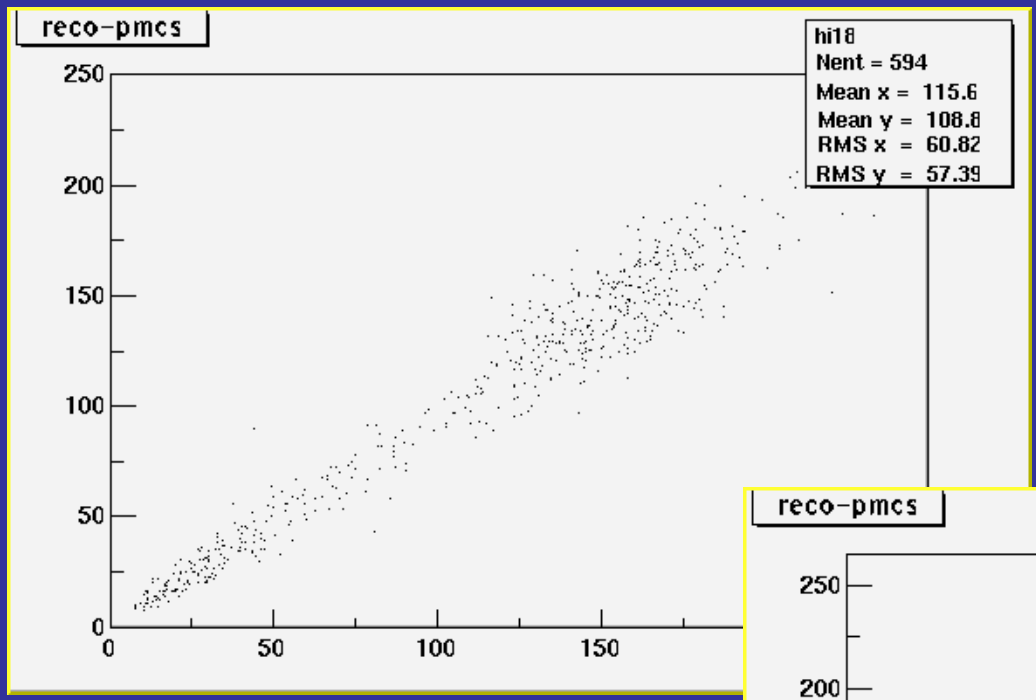
Legends of the plots

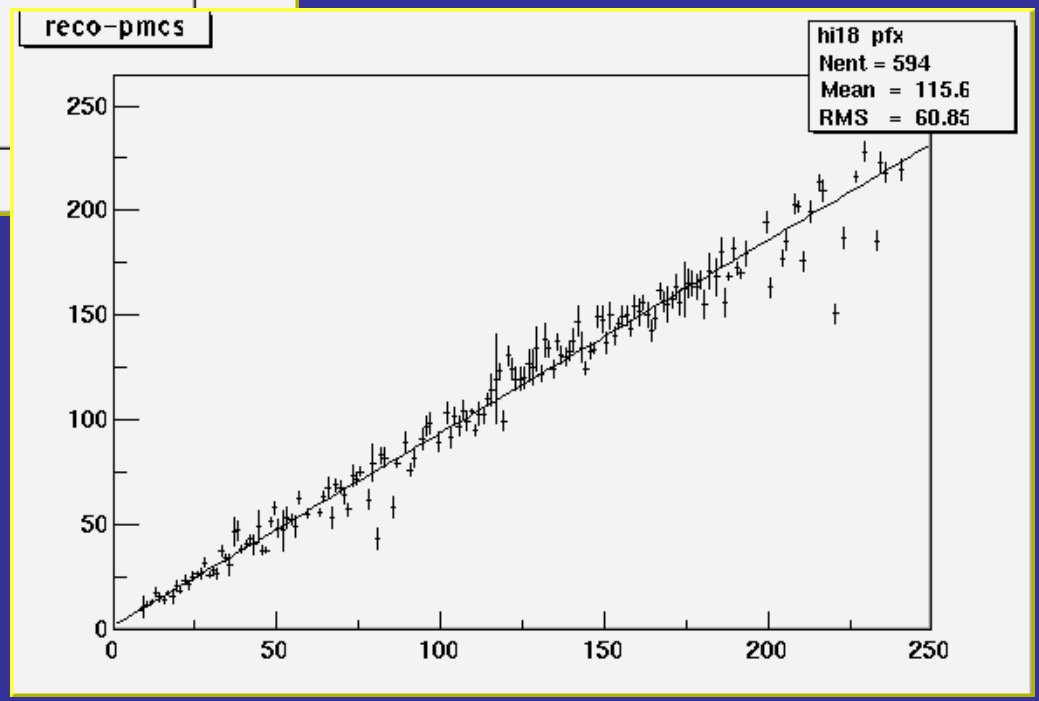
- X axis is PMCS generated Et, y axis is RECO Et
- Data are plotted at different $|\eta|$ value for CC, IC and EC detector regions
- The data are fitted linearly and fitted results are presented



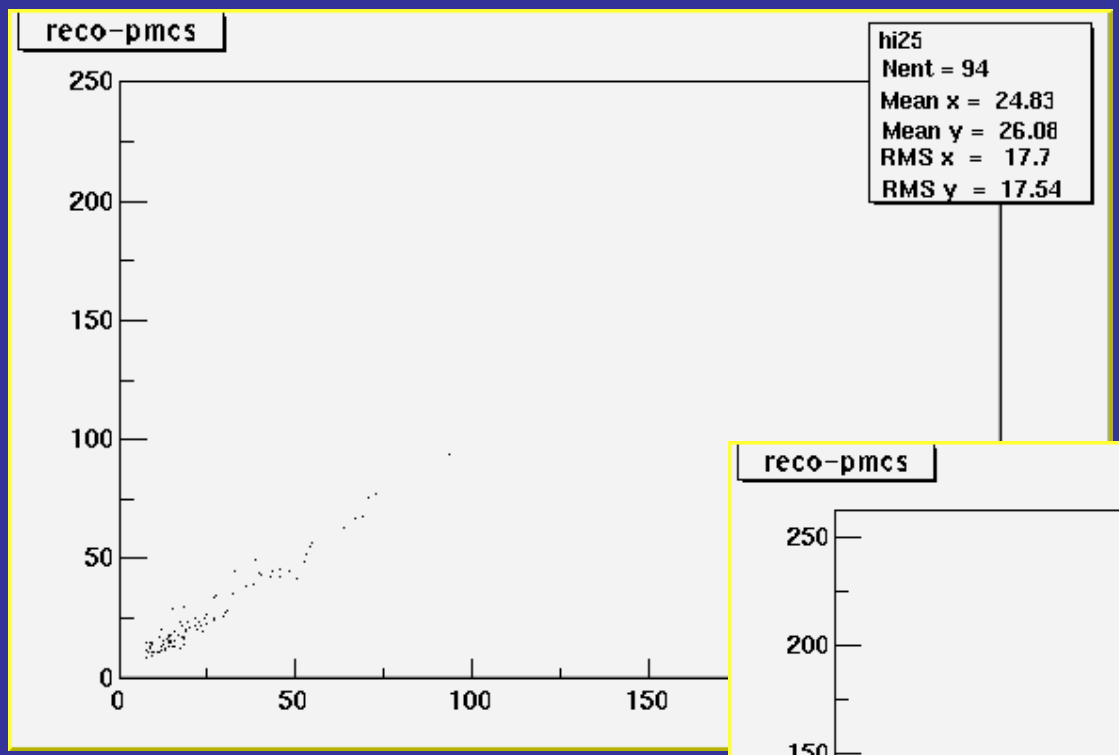


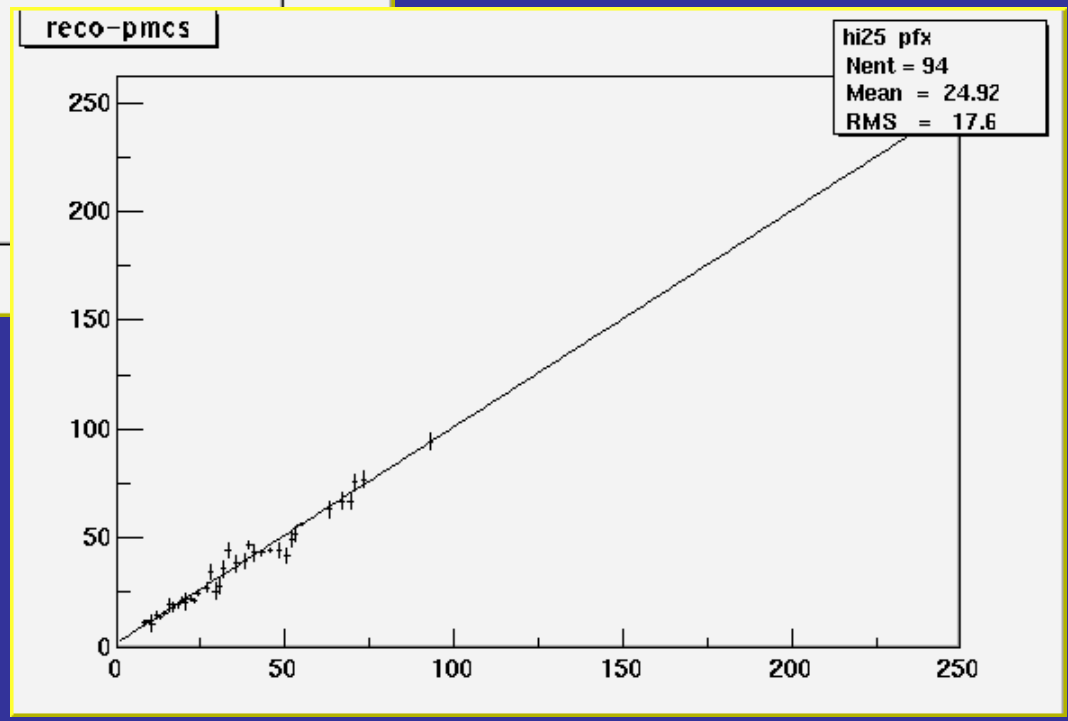
CC region ($|\eta|<0.7$), right bottom is fitted profile





IC region ($0.7<|\eta|<1.8$), right bottom is fitted profile





EC region(1.8<|η|<2.5), right bottom is fitted profile

Fitted Data

- CC: $Et^{RECO}=2.123(0.259)+0.945(0.002)Et^{PMCS-G}$
- IC: $Et^{RECO}=1.429(0.238)+0.922(0.003)Et^{PMCS-G}$
- EC: $Et^{RECO}=1.299(0.390)+0.995(0.011)Et^{PMCS-G}$

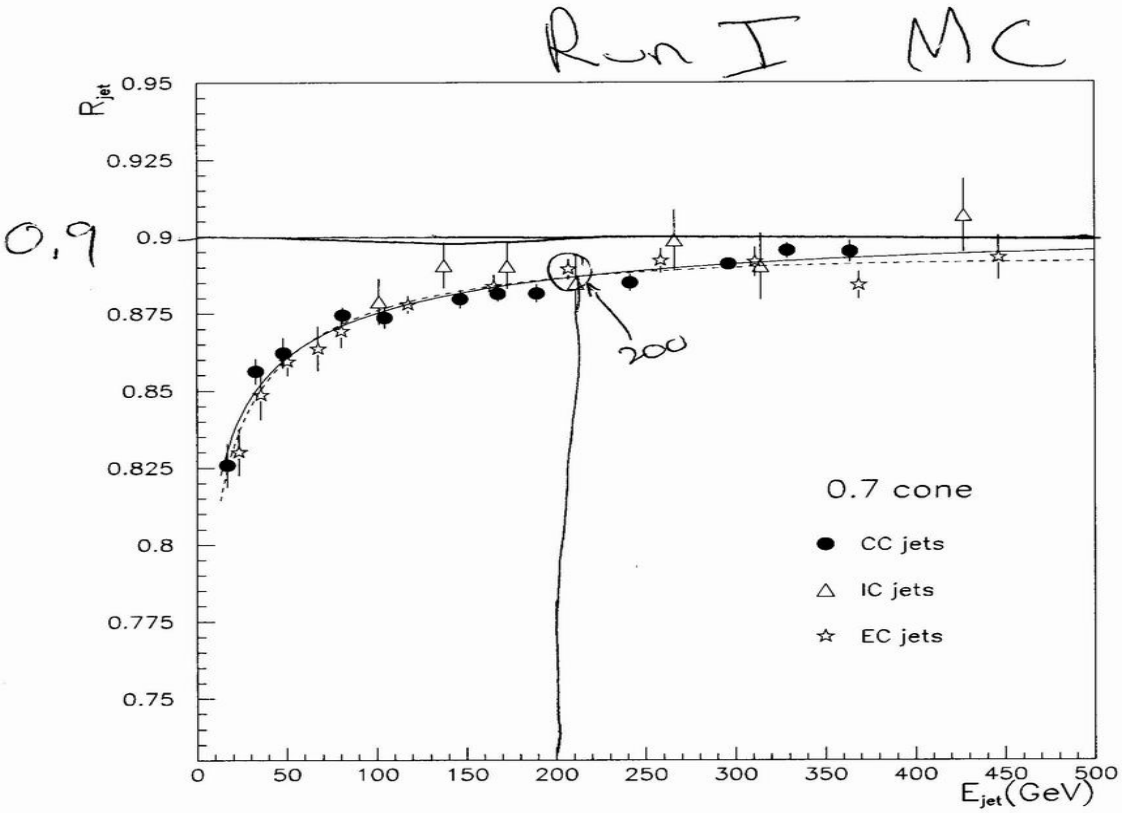


Fig. 29. Jet energy response determined using the $\not\!\!E_T$ projection fraction method from SHOWERLIB Monte Carlo (circles, triangles and stars) compared to the response obtained with the single particle convolution approach (dashed line). The solid line shows a fit to the points.

Run 1 Data

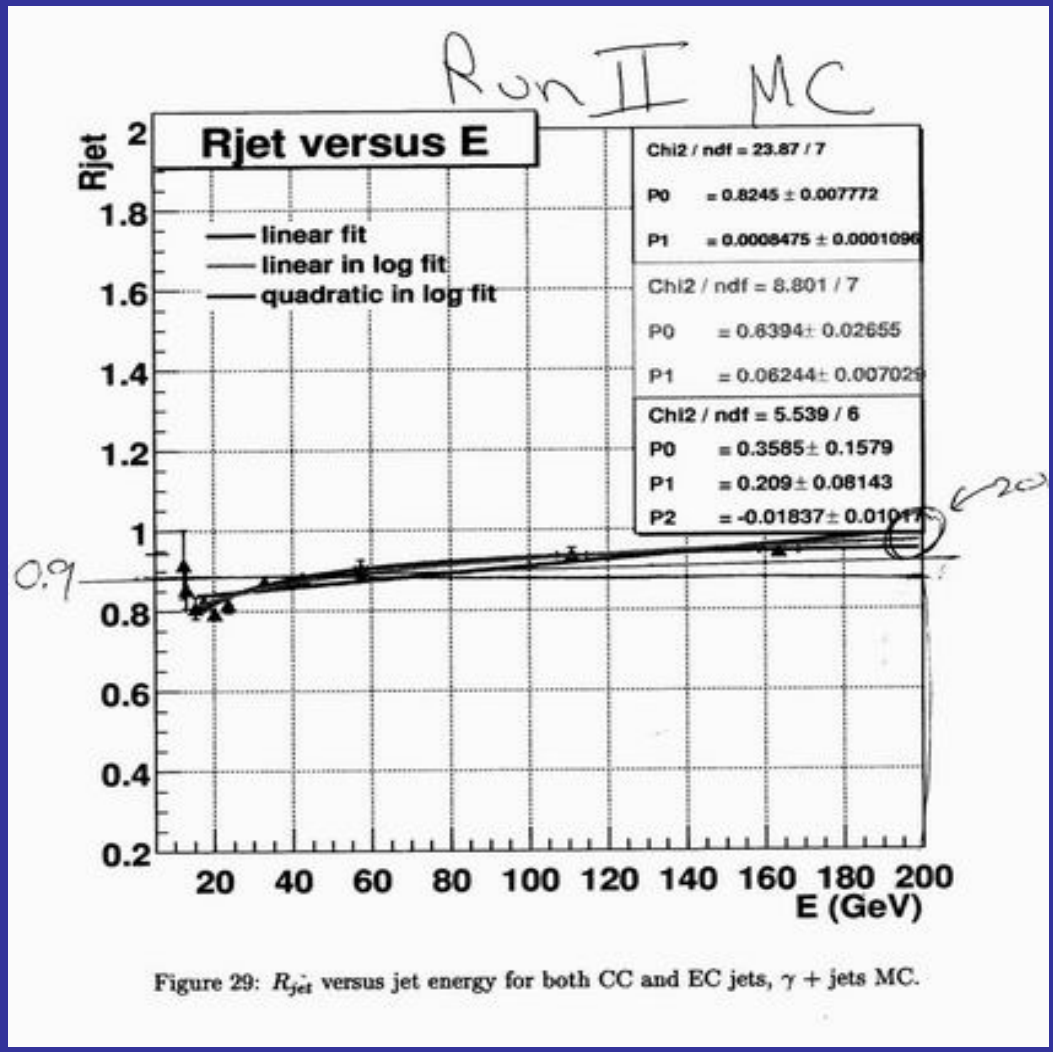


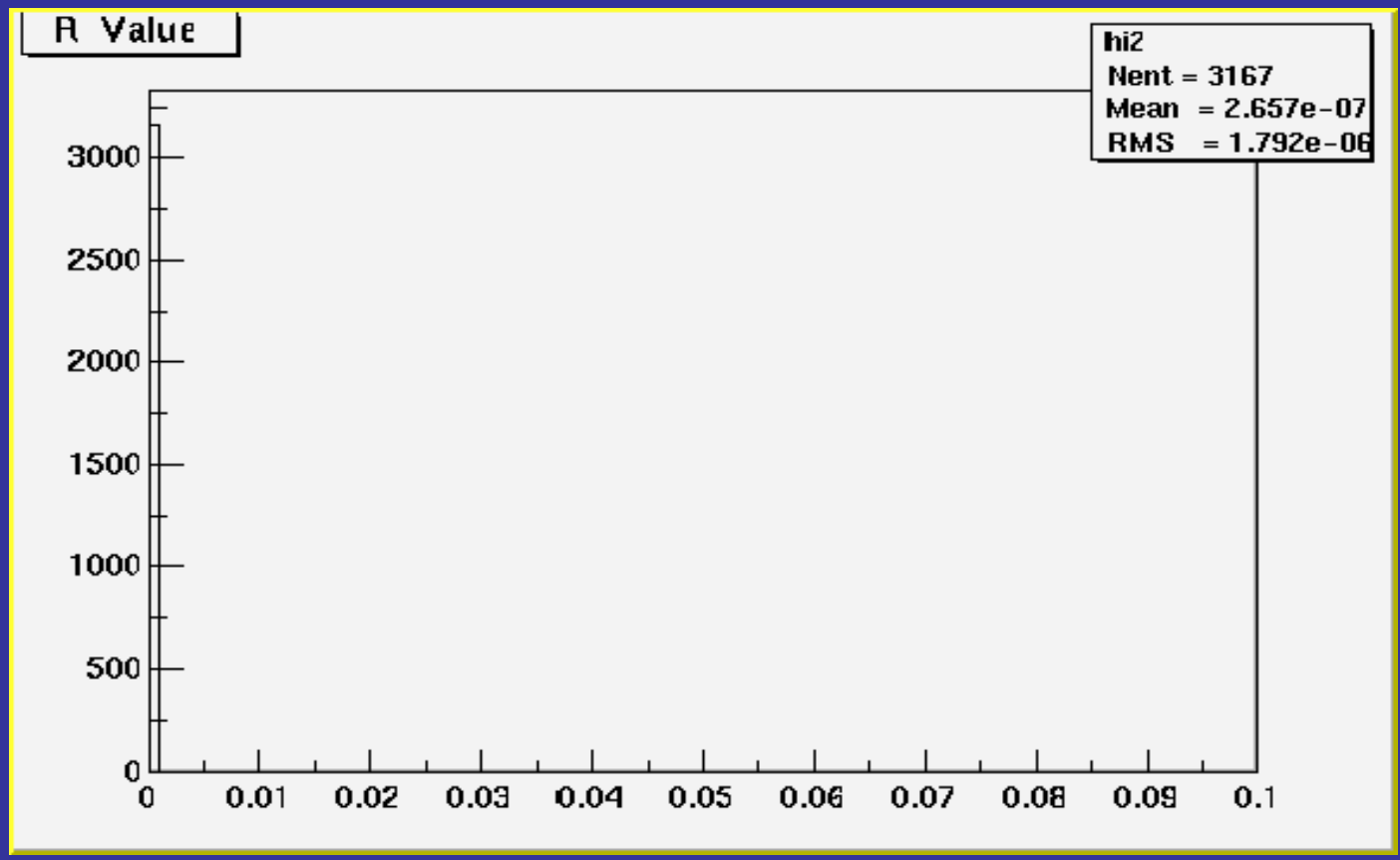
Figure 29: R_{jet} versus jet energy for both CC and EC jets, γ + jets MC.

Run 2 data

Analysis of fitted data

- Run 1 data is below 0.9
- Run 2 data is shifted. For 160 GeV data set, these fitted number is higher than 0.9

PMCS smeared:



- Because PMCS does not smear direction, so the ΔR between PMCS generated and PMCS smeared will be a delta function

3: Conclusions

- Using QCD data, the results from PMCS and RECO are very close matched
- Need test additional data sets, such as Z→ee