Multiple Low P_T Jets

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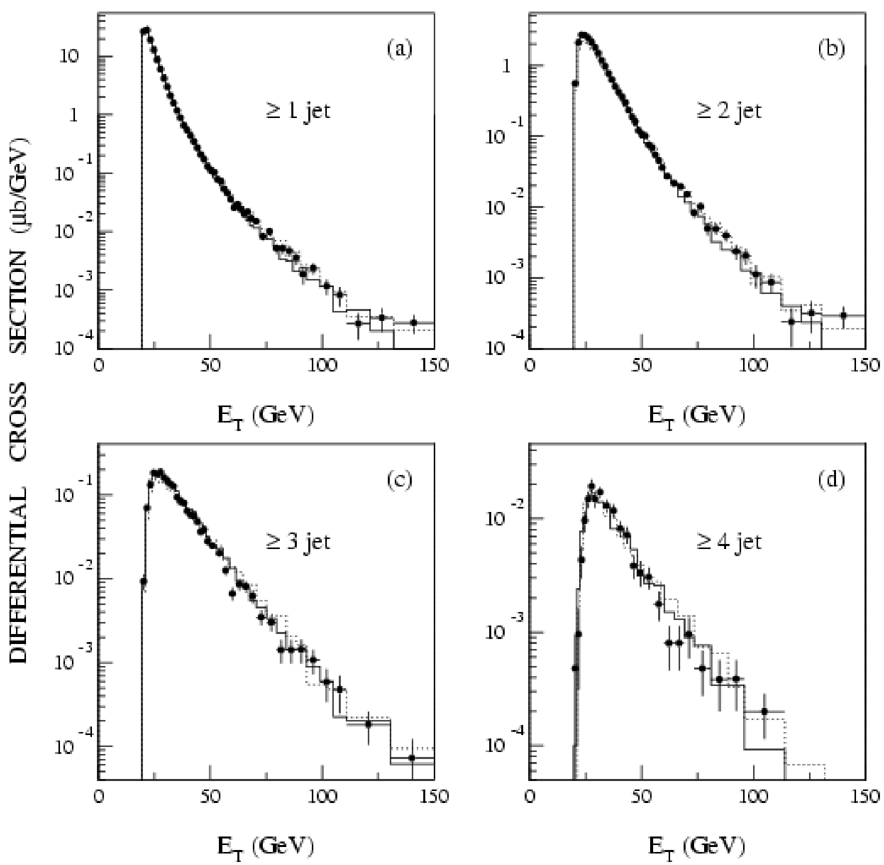
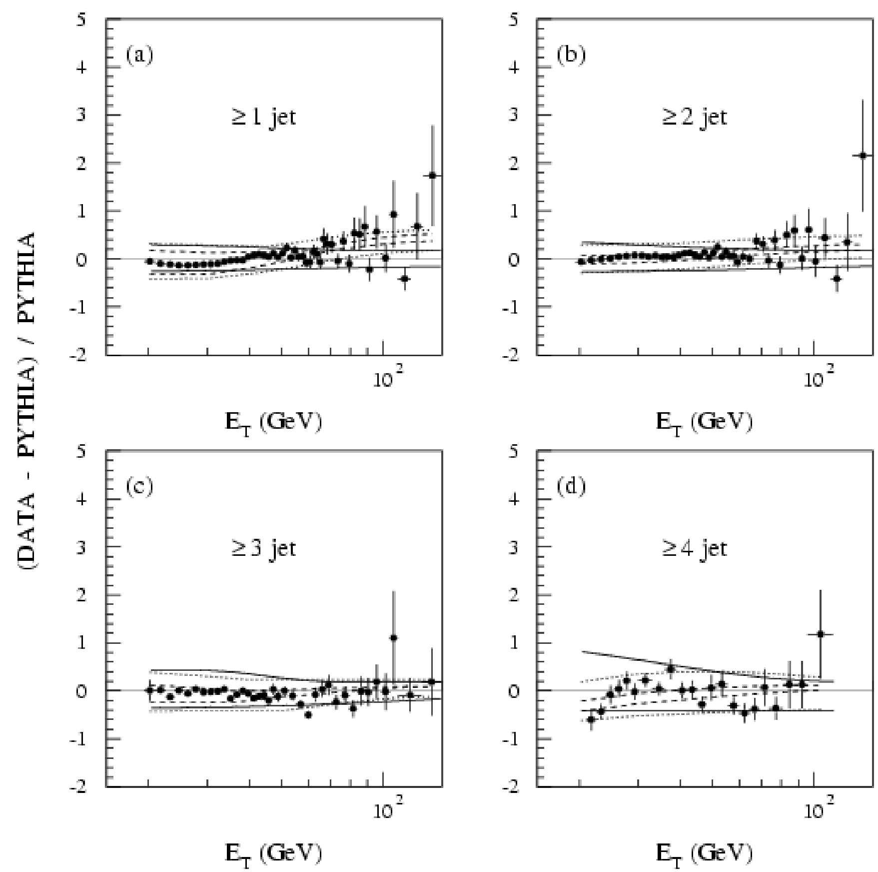
Analysis goals

- To get low P_T jets Run II data and compare with the Run I D0 results: PRD D 67, 052001 (2003). Study Multiple Parton Interaction.
- Study a BFKL physics, i.e. a nature of Pomeron.
- Study Double Parton Interaction.

MPI estimation in Run I





Multiple Parton Interactions (MPI)

The first estimation of the MPI was in the D0 paper 2003.

1. Different pairwise interactions are independent, Poisson distribution for the number of interactions.
2. The probability of MPI for each impact parameter depends on the matter distribution.

Double Gaussian with the core parameters: $a_2/a_1=0.4$, $\beta = 0.32$.

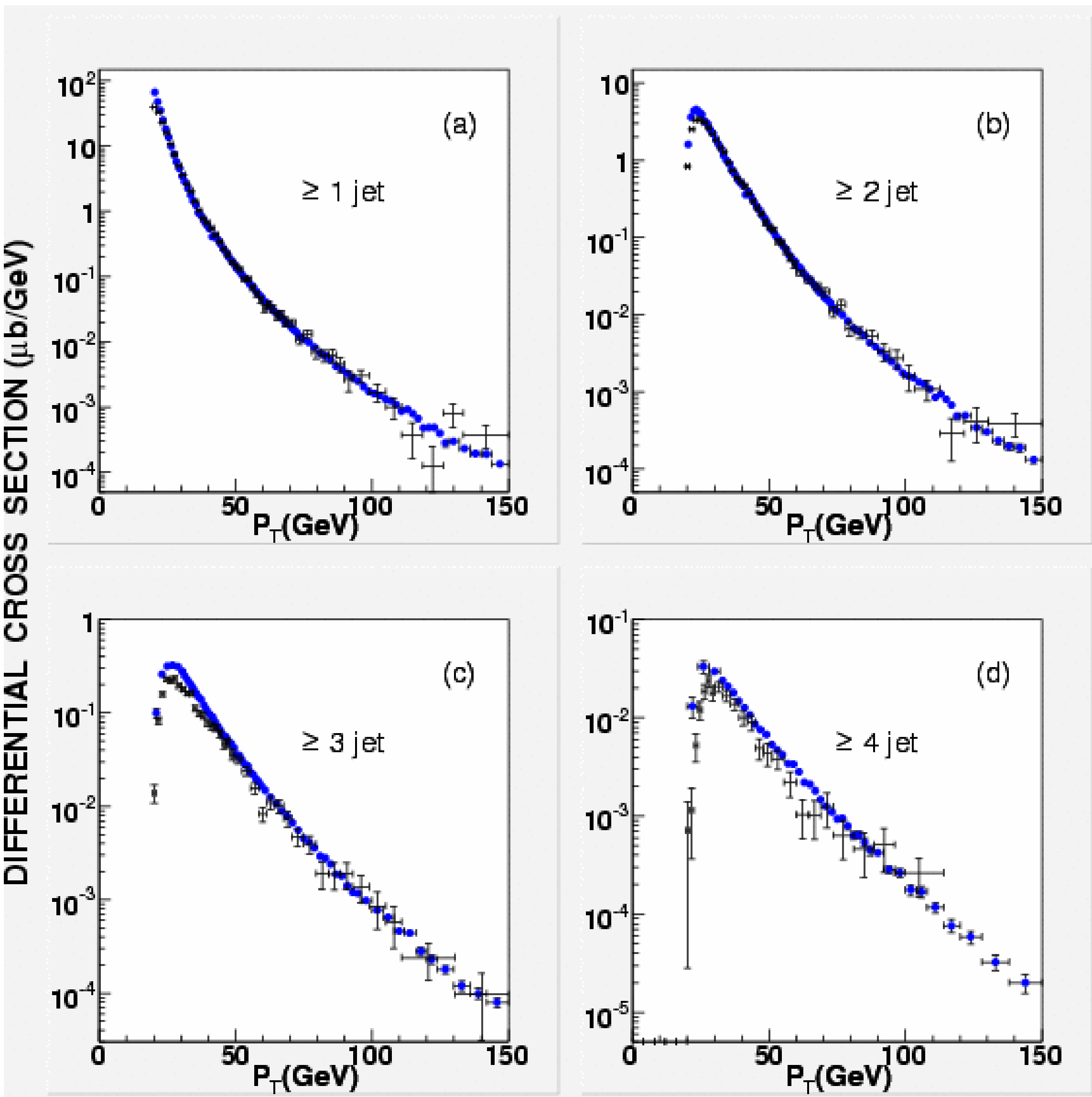
Studied Issues

- Multiple Interactions (MI) suppression
- Trigger efficiency
- p_T,η,φ,M resolution
- MC description
- Unfolding the leading jet p_T
- Physics: MPI and core of the hadronic matter distribution

Analysis (qcd_jet_caf)

- Run II (a) data: Skim QCD p17.09.03, p17.09.06, p17.09.06b
- Data quality file: 2006-11-30.CALO.CFT.MUON.SMT.dq.def
- QCD triggers: JT_8TT, JT_15TT, JT_125TT
- MB triggers: min_bias, min_bias_NCU, min_bias_nim_NCU
- QCD ~100M events, MB ~ 60M events, integrated luminosity ~100 nb^{-1}

All triggers combined

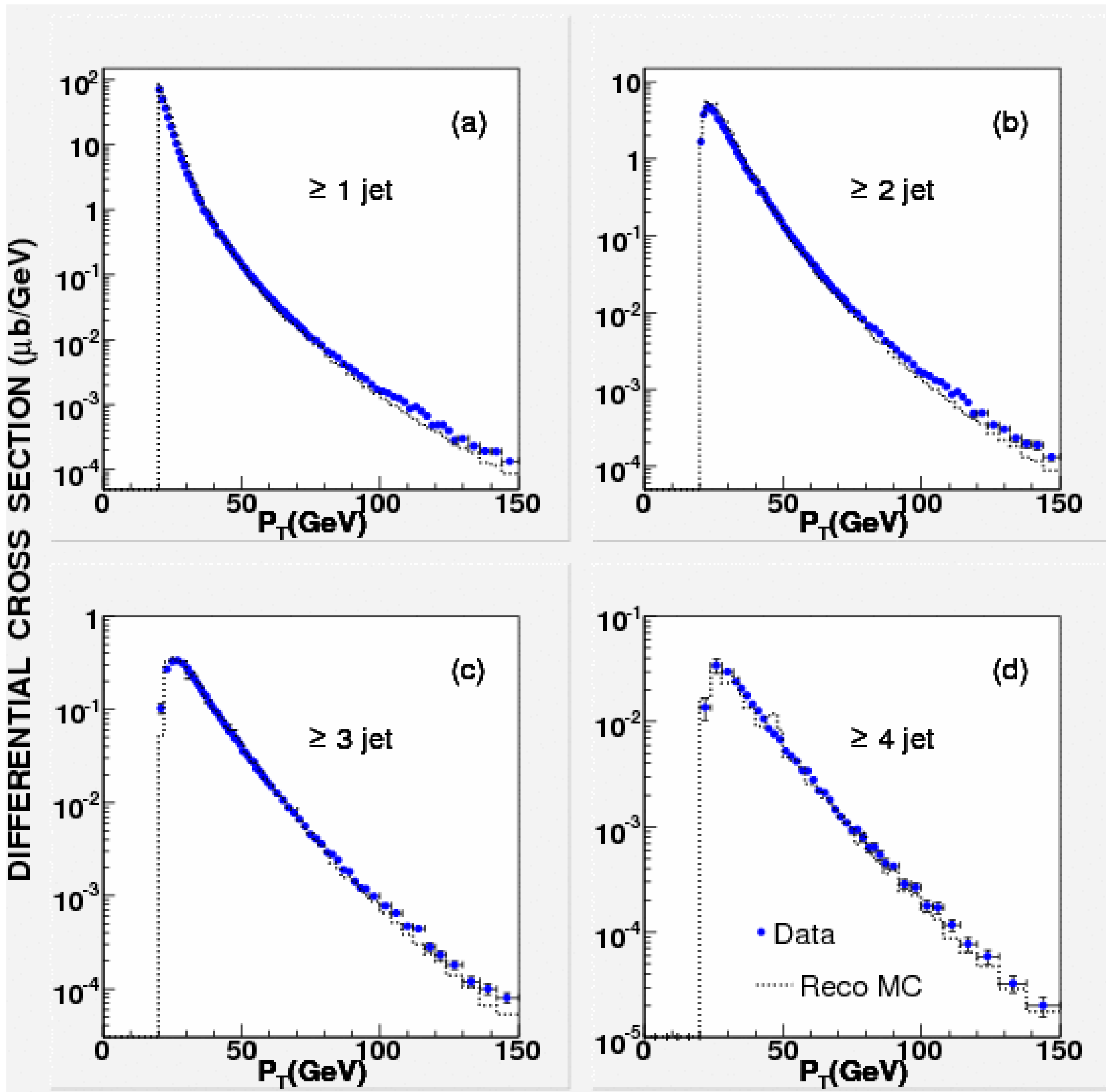


MB-QCD boundary:
(a) 42 GeV
(b) 42 GeV
(c) 28 GeV
(d) 28 GeV

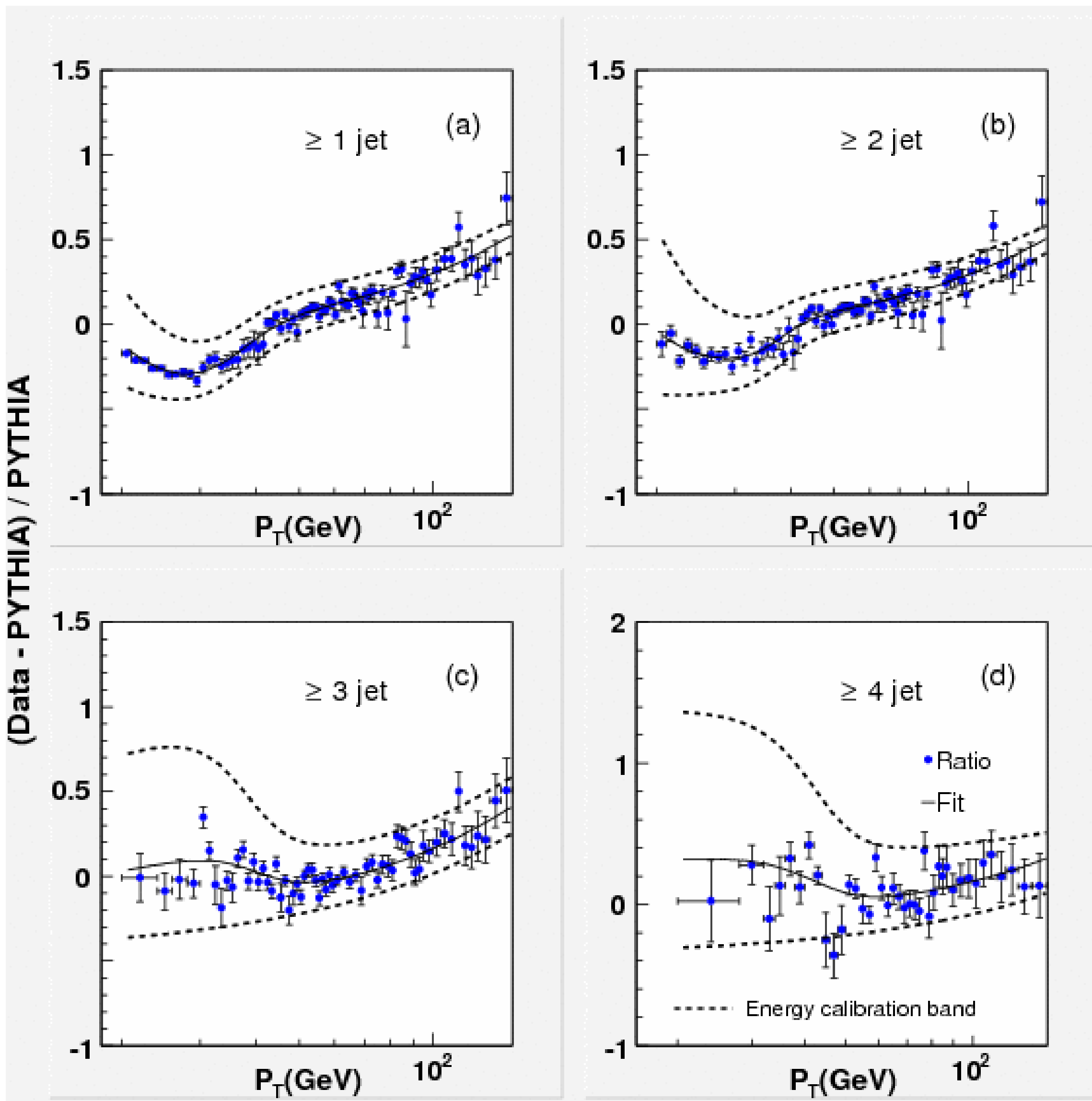
Run I data are corrected to an energy difference 1800 GeV and 1960 GeV by PYTHIA8108.

Some difference at low P_T could be due to a difference of jet thresholds, jet masses, and jet finding algorithms.

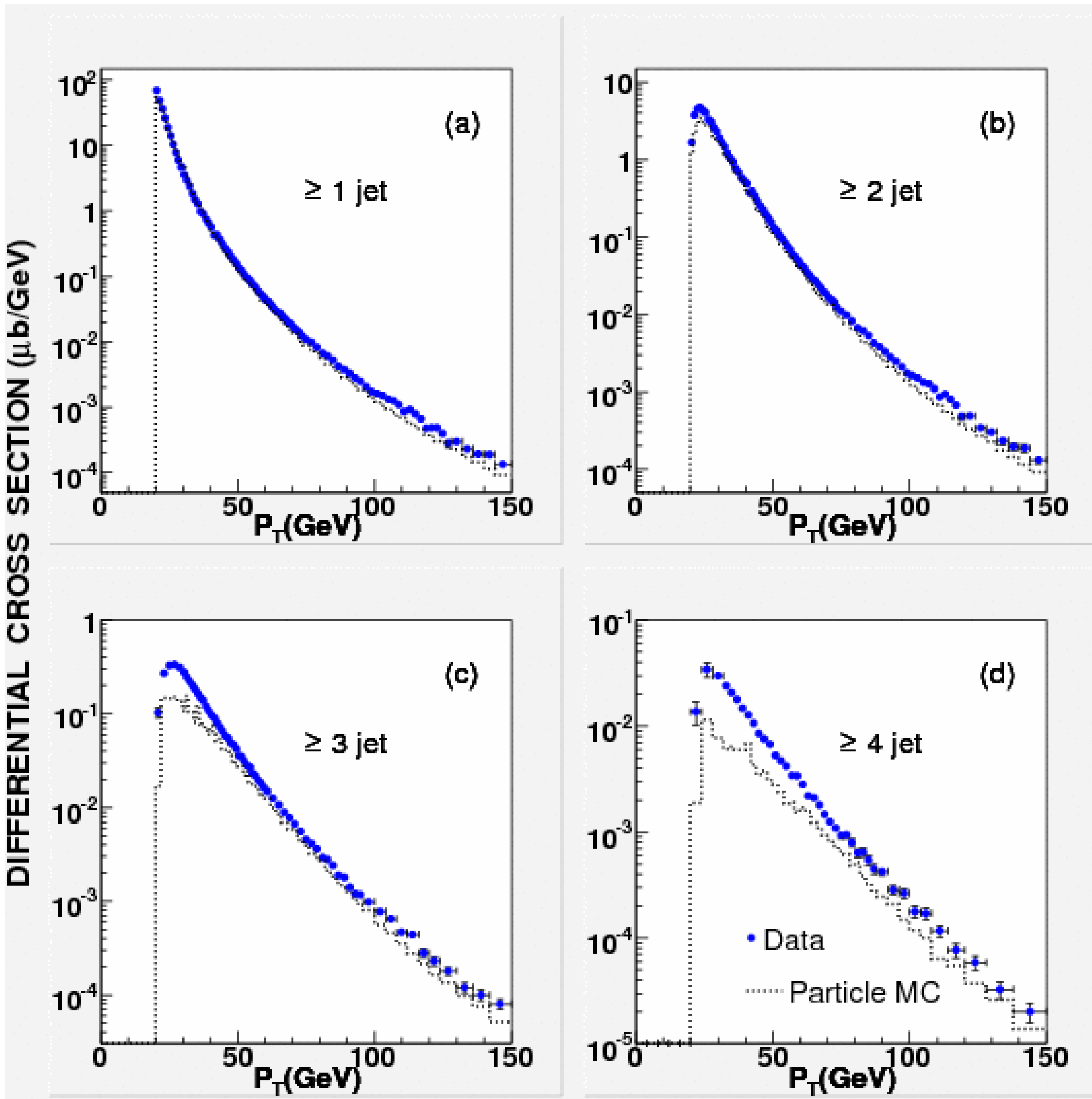
Data and reco MC jets



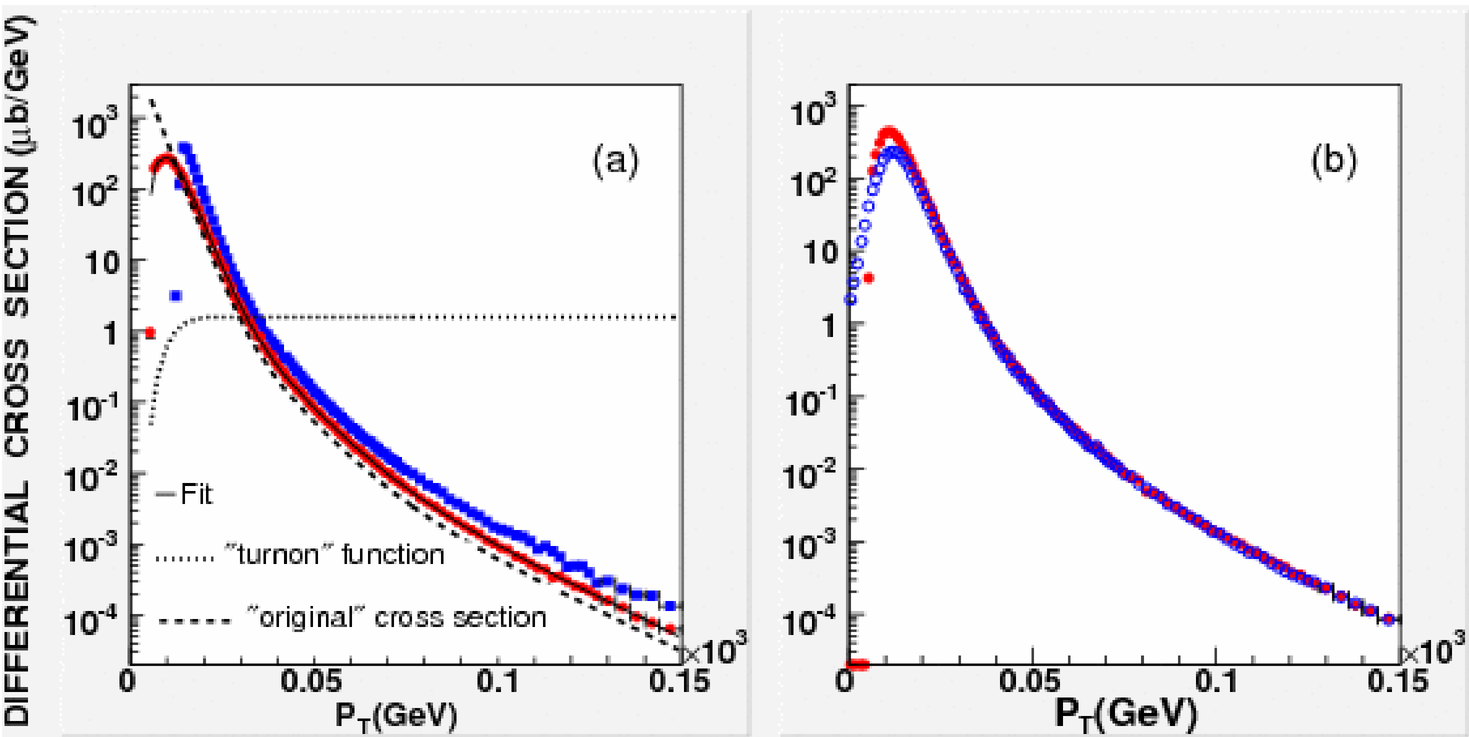
(Data -PYTHIA) / PYTHIA for reco MC jets



Smeared particle MC jets before 6 GeV threshold correction

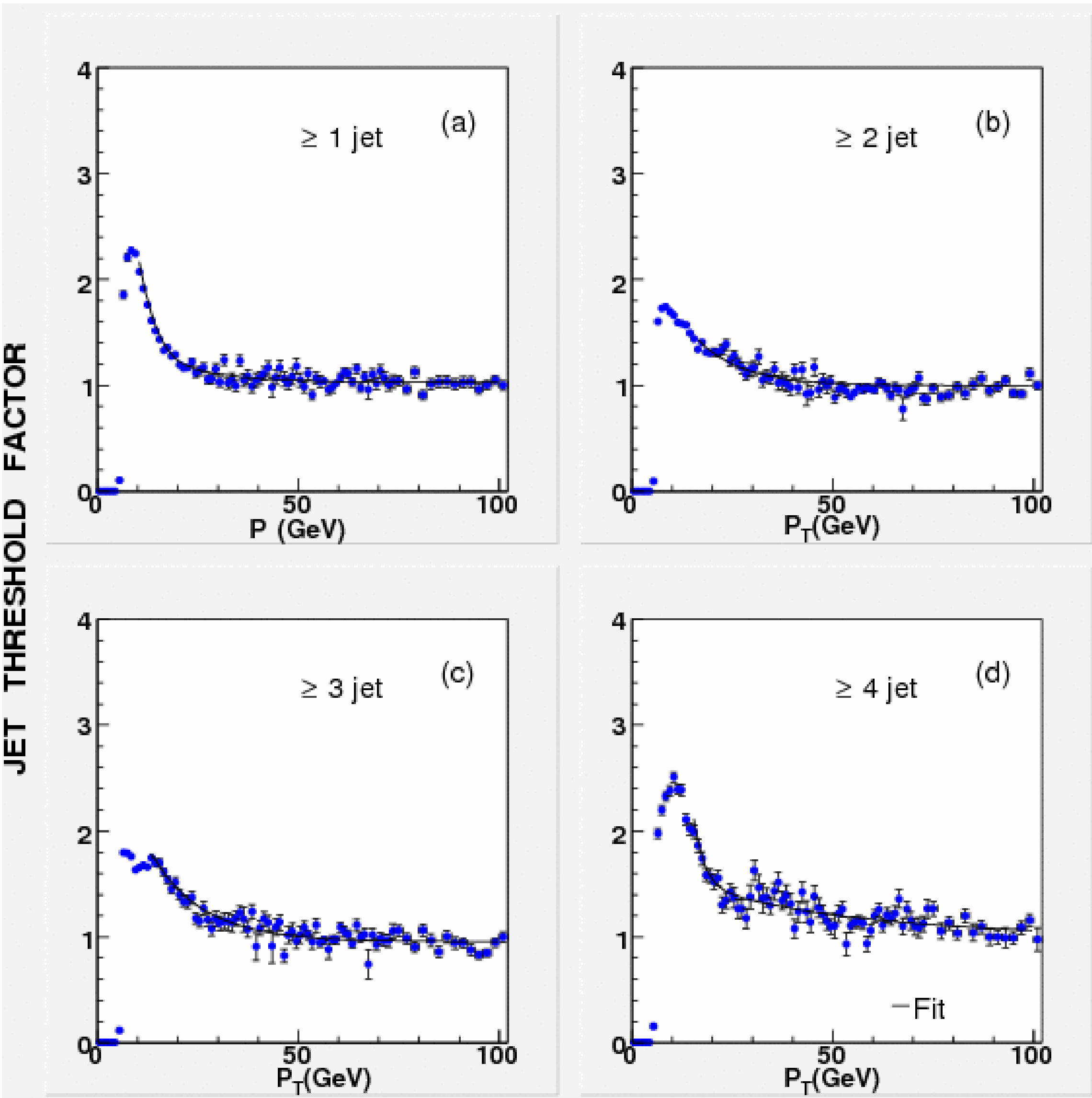


How to make p_T smearing before the 6 GeV threshold turns on?



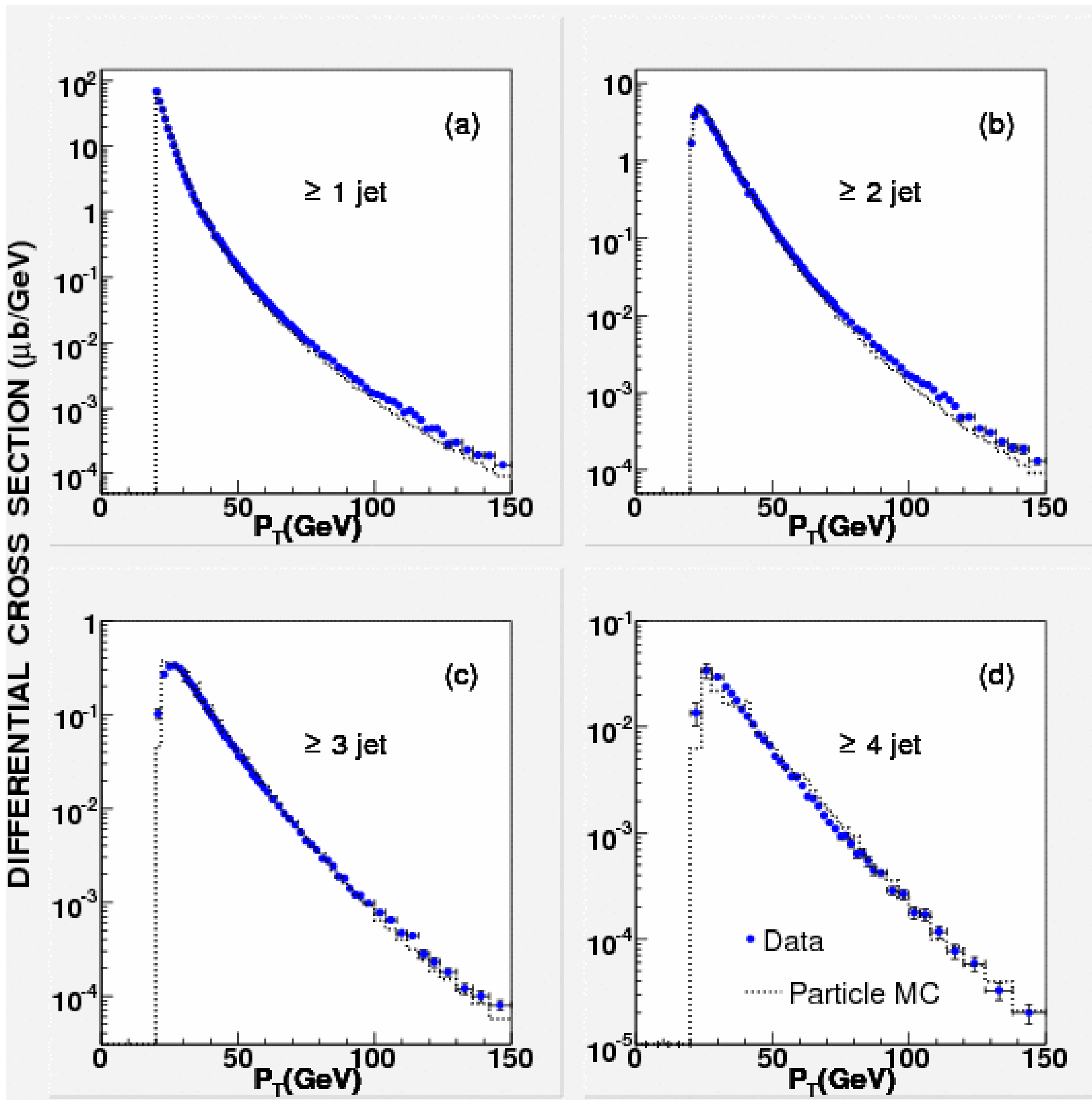
1. MC=original*turnon
2. Smear the original with the p_T resolution, then apply the turnon
3. Take the ratio to the conventional MC

Threshold factor

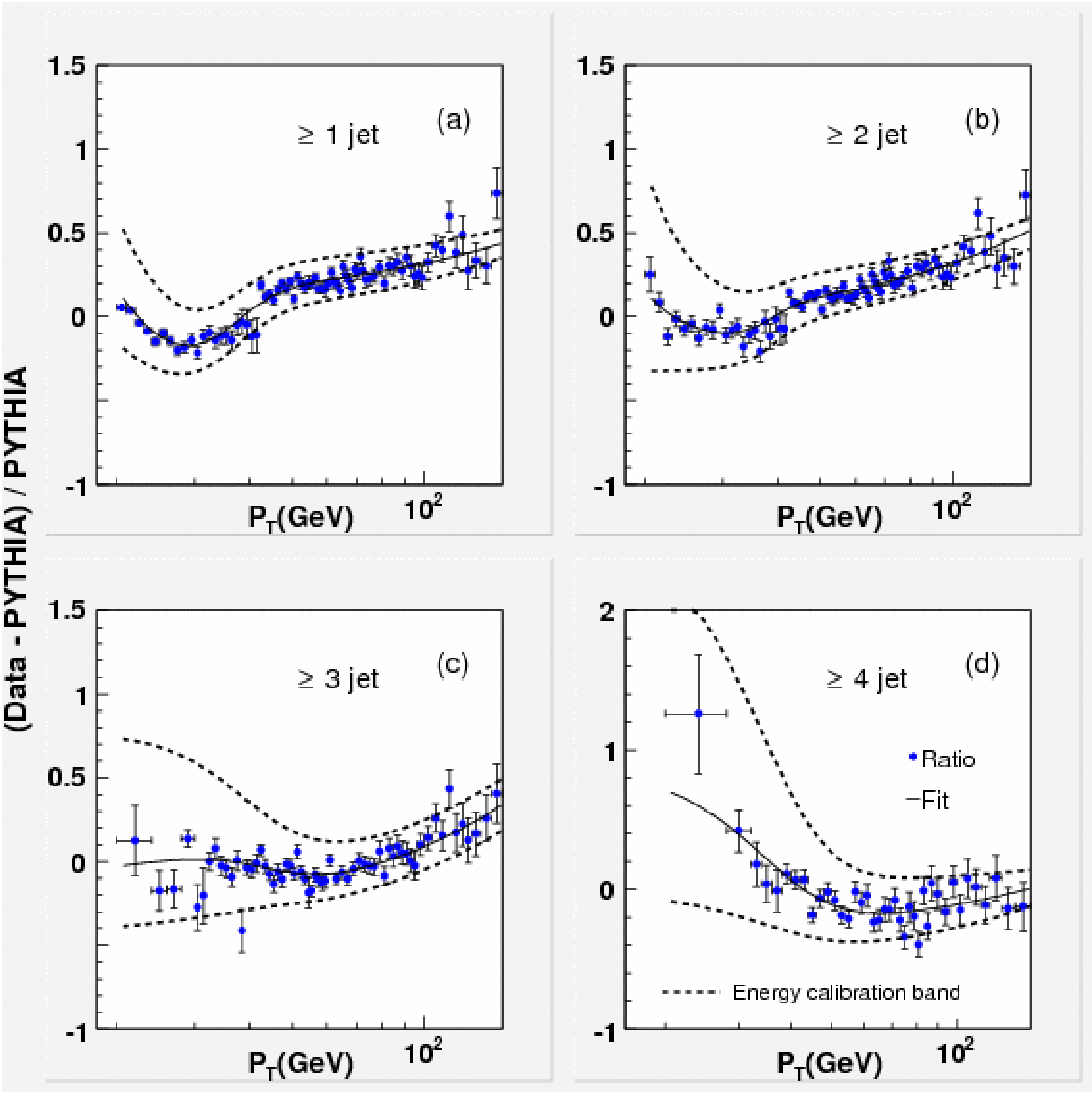


Use p_T spectra of "average jet" samples.

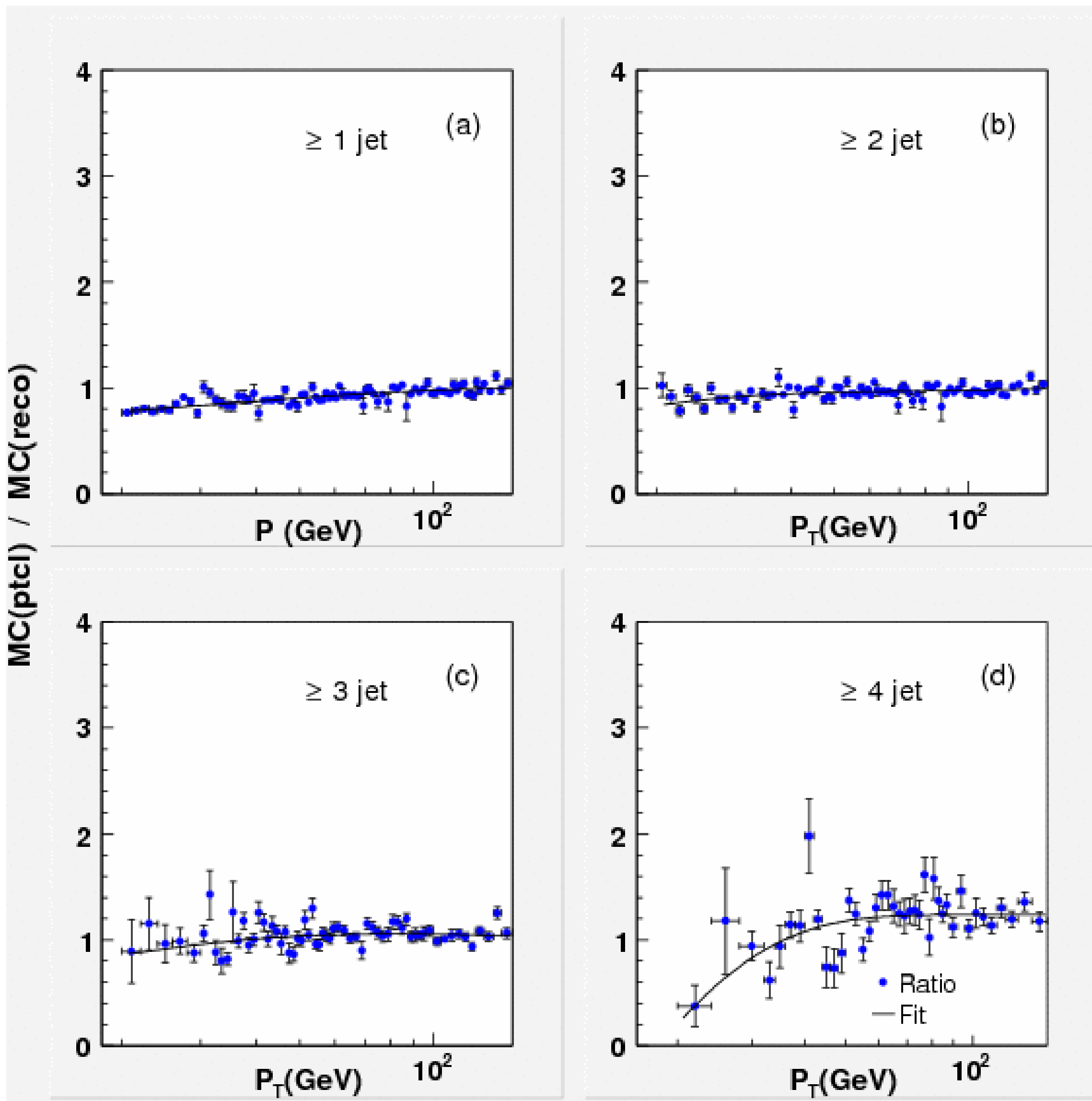
Smeared particle MC jets



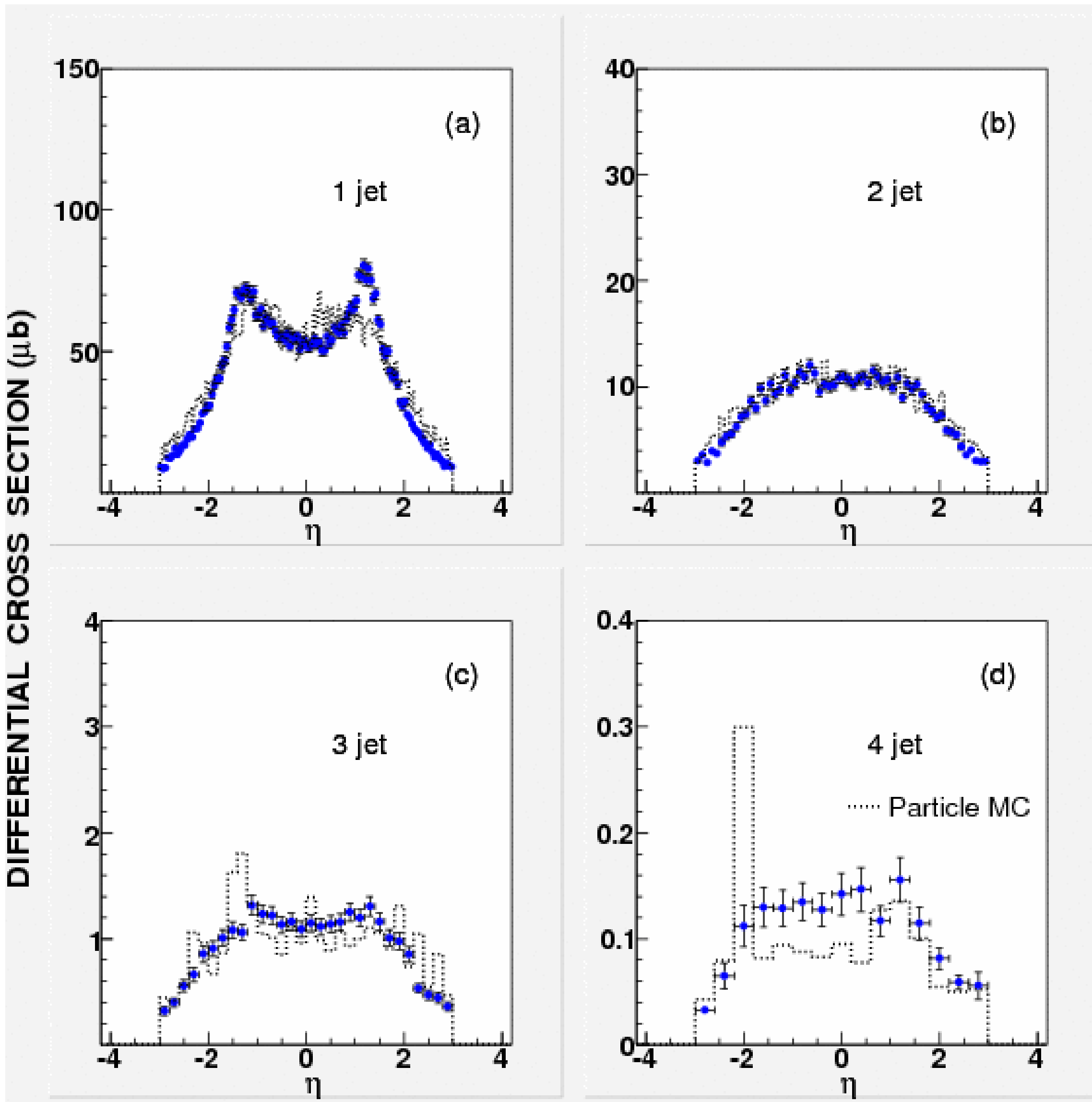
(Data -PYTHIA) / PYTHIA for smeared MC jets



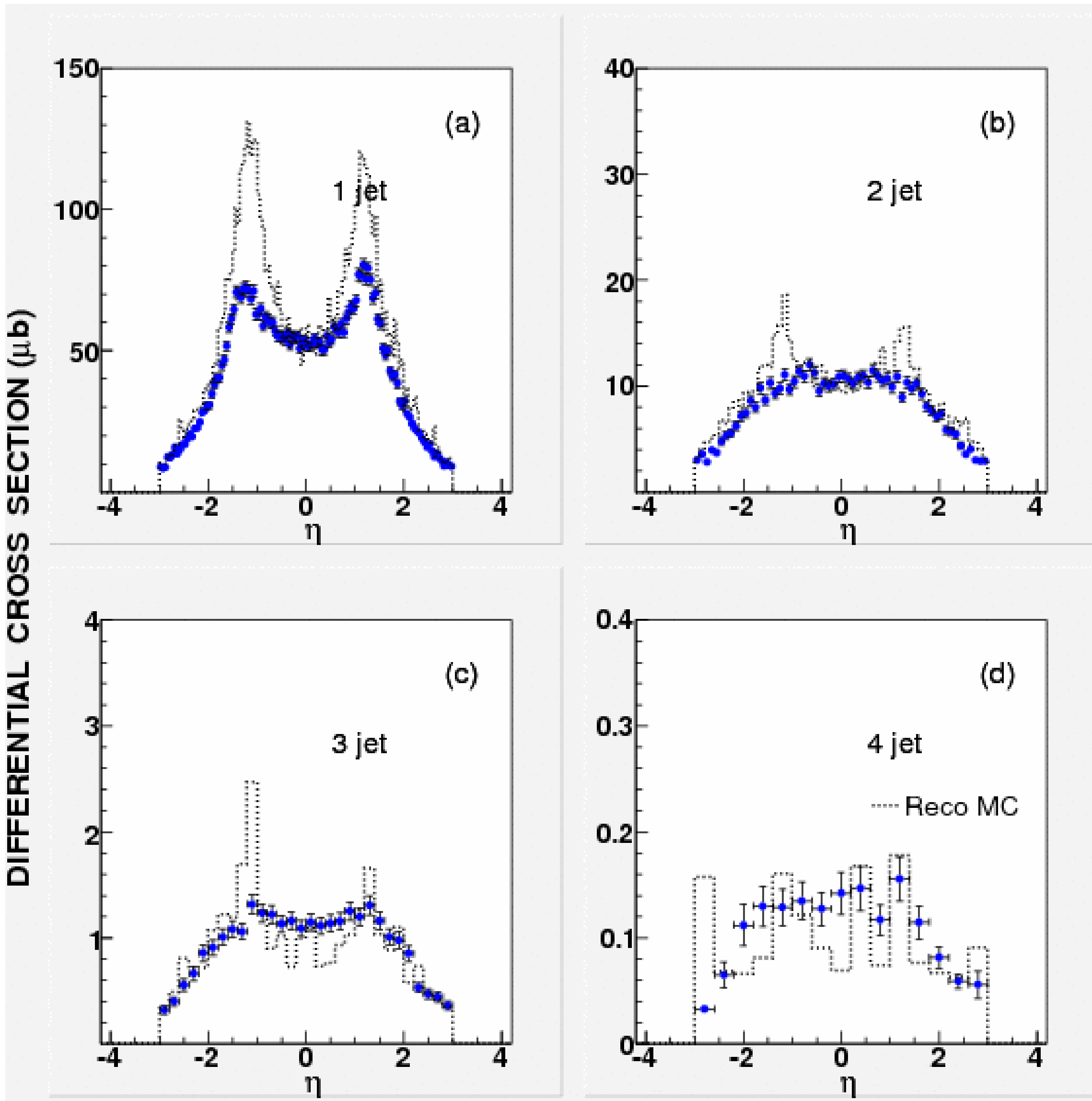
Smeared particle MC jets / Reco MC jets



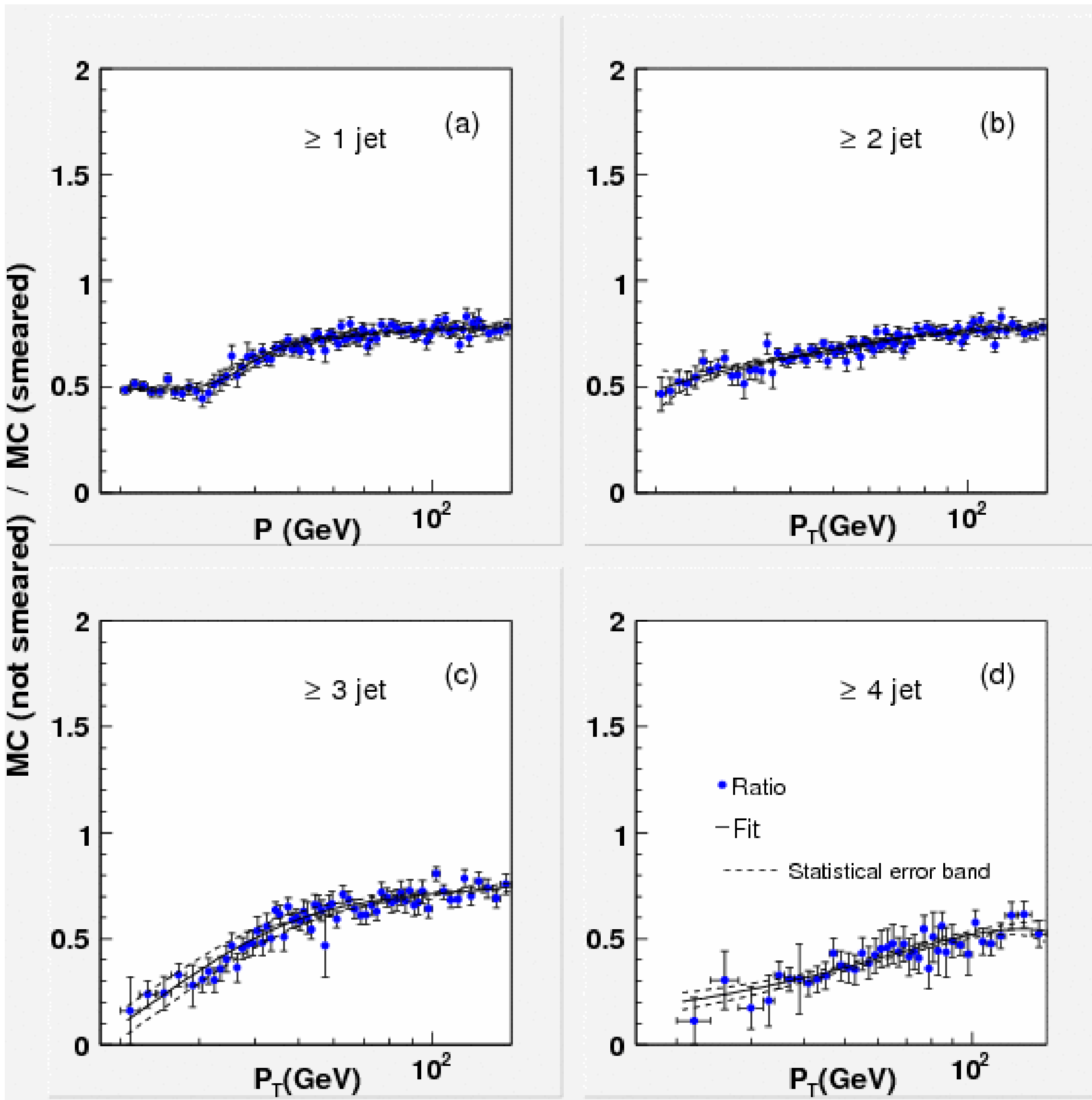
Data and smeared MC jets η distributions



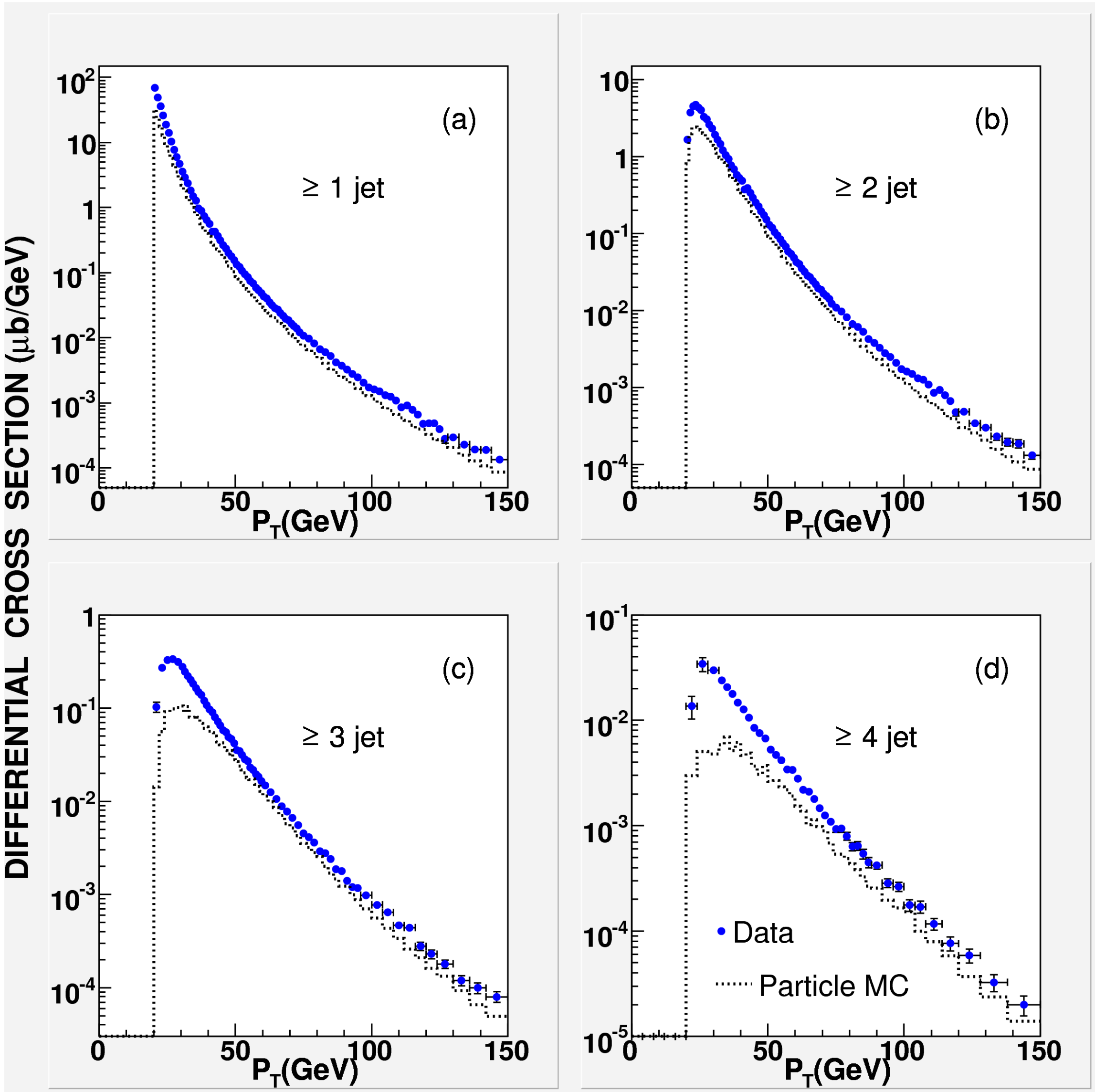
Data and reco MC jets η distributions



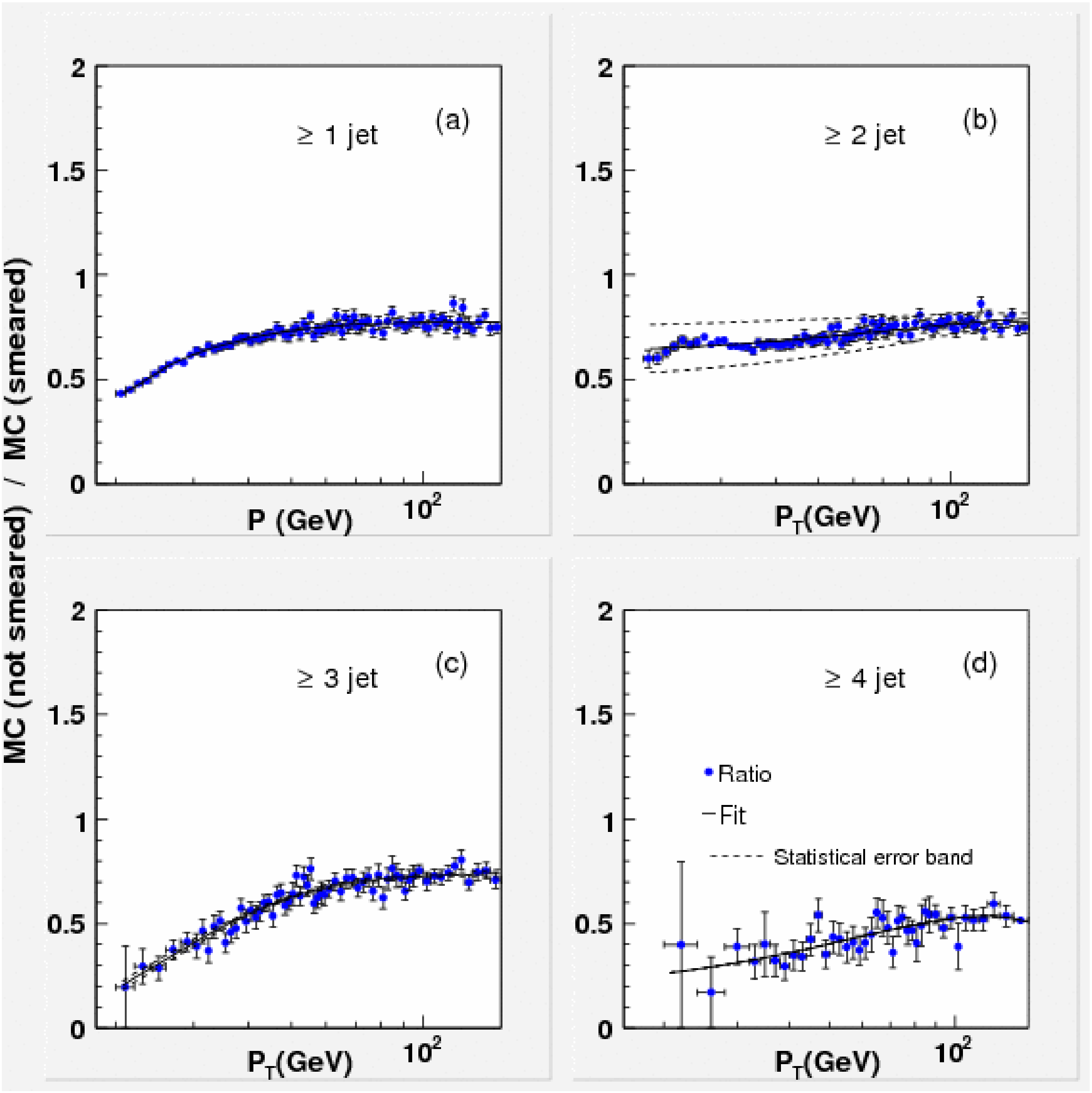
Unsmearing correction factor



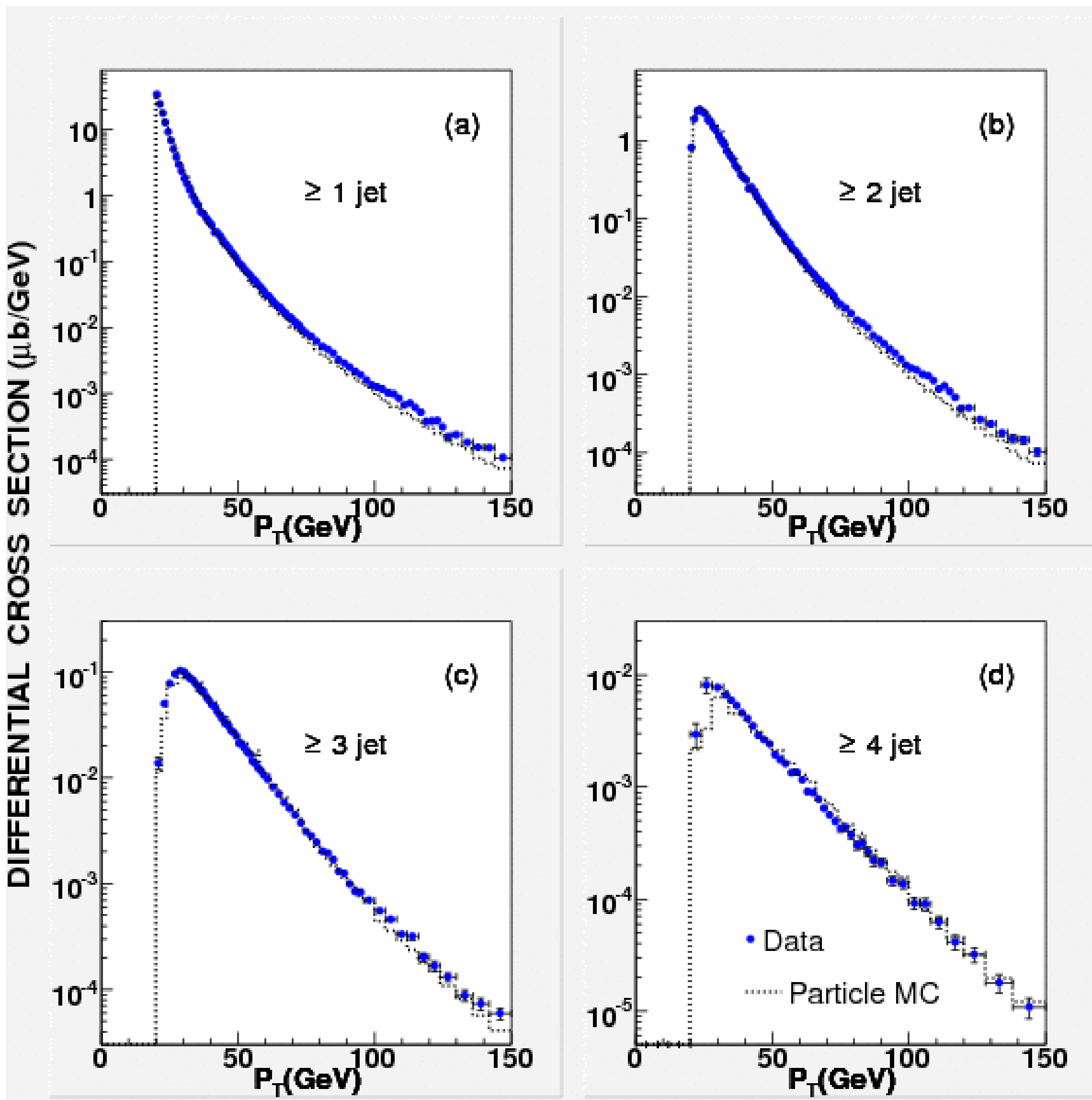
Smeared MC jets with MPI off



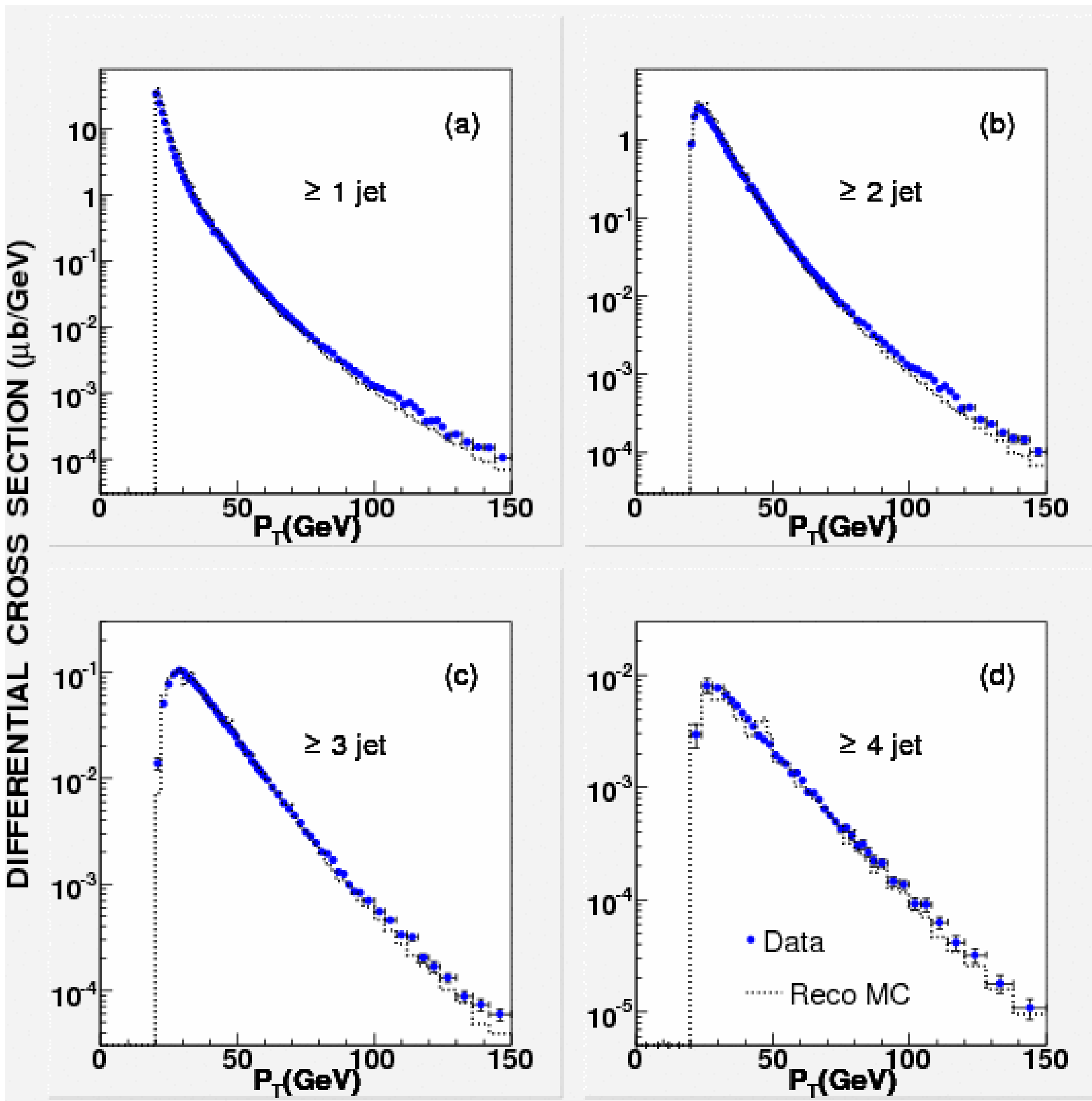
Correction factor with MPI off



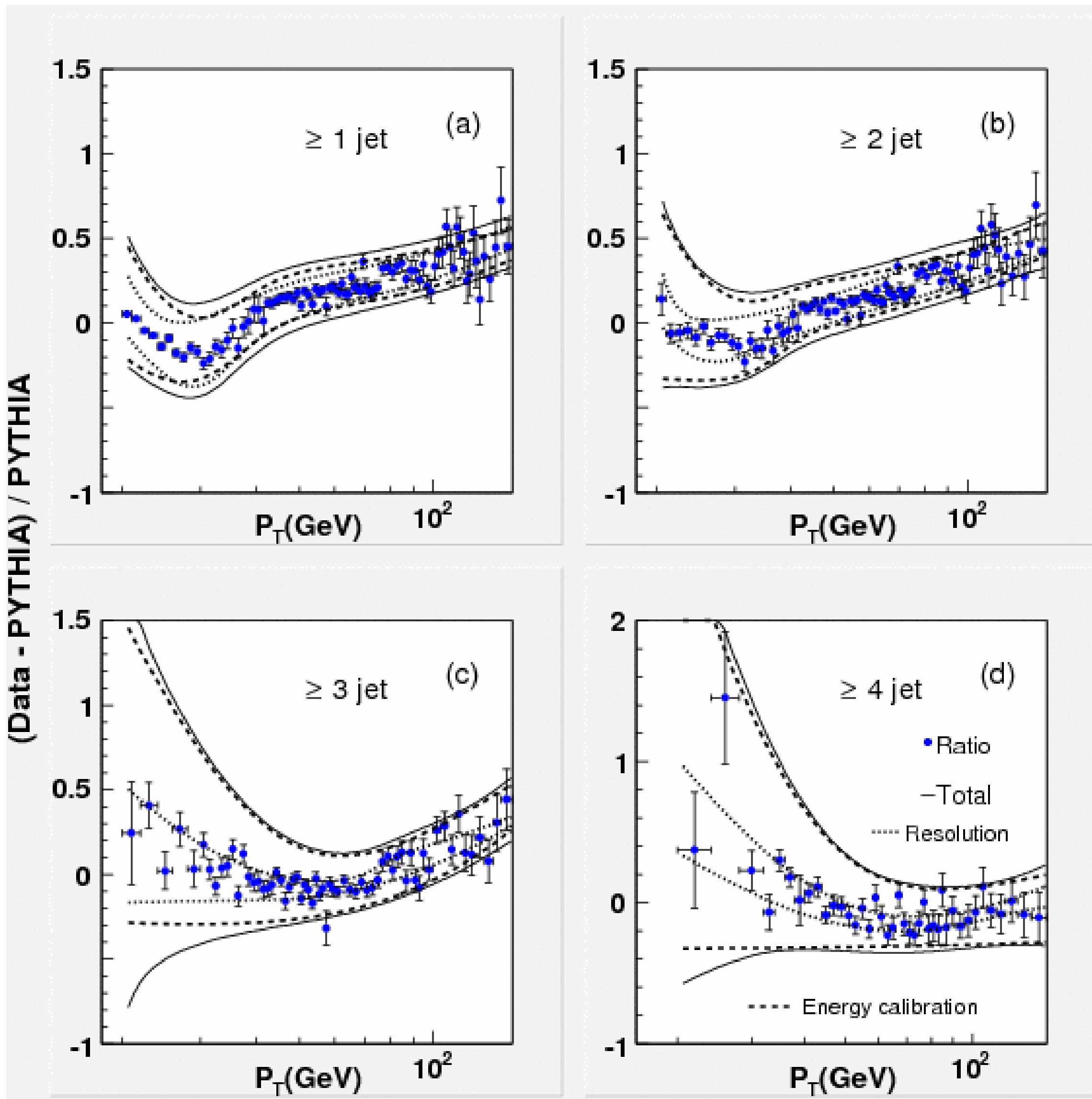
Unfolded data and smeared MC jets



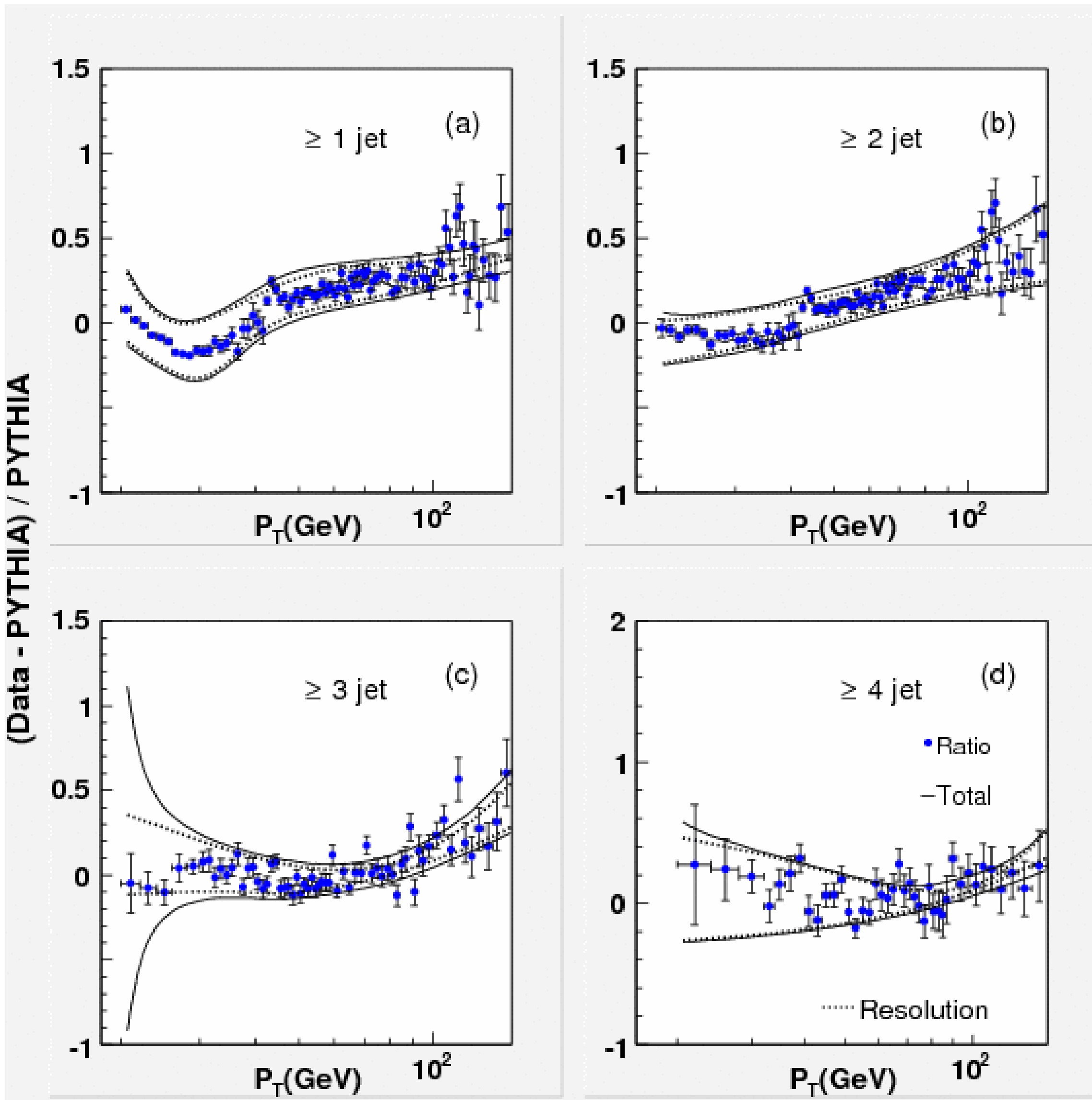
Unfolded data and reco MC jets



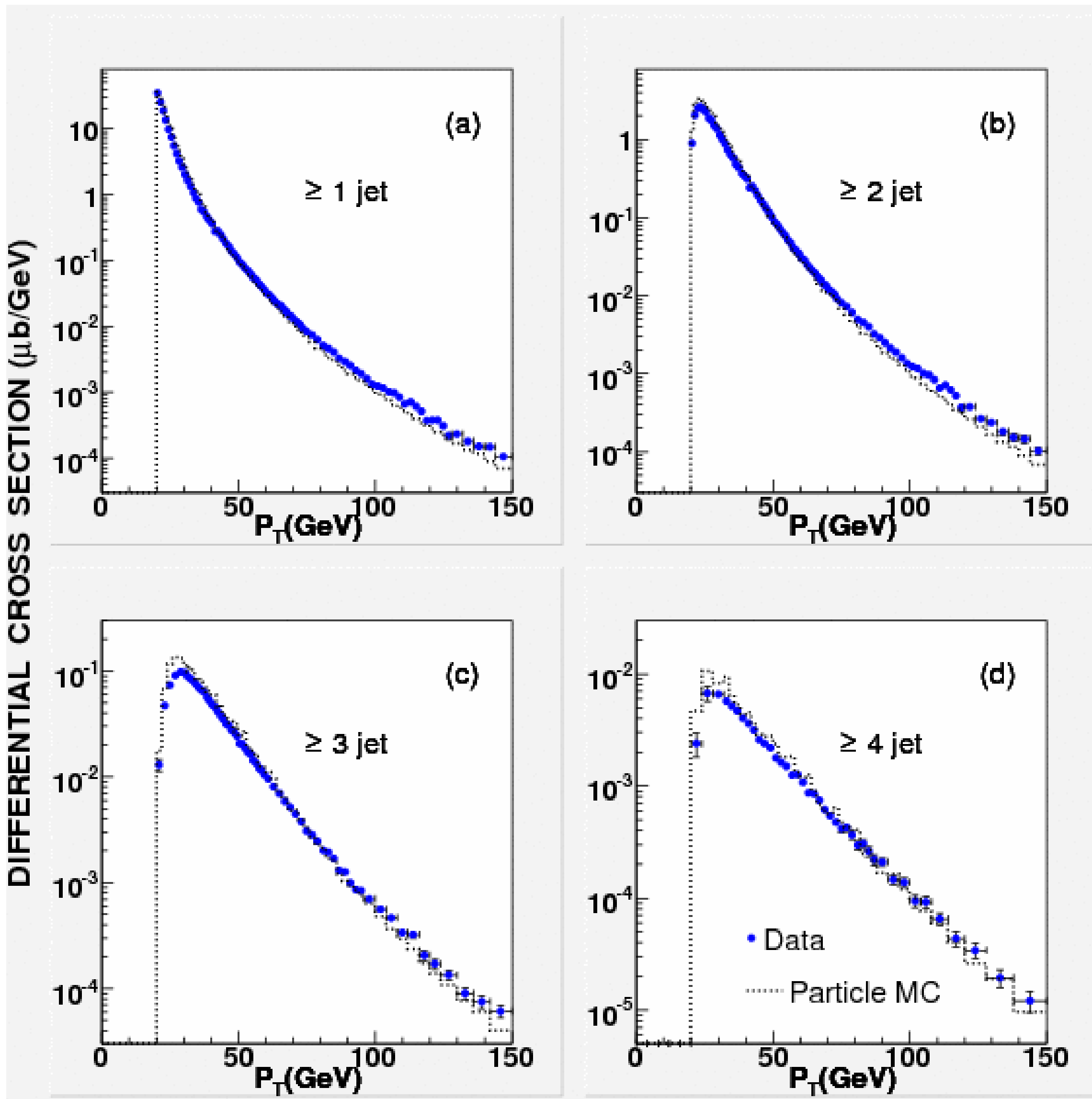
(Data -PYTHIA) / PYTHIA for unfolded smeared MC jets



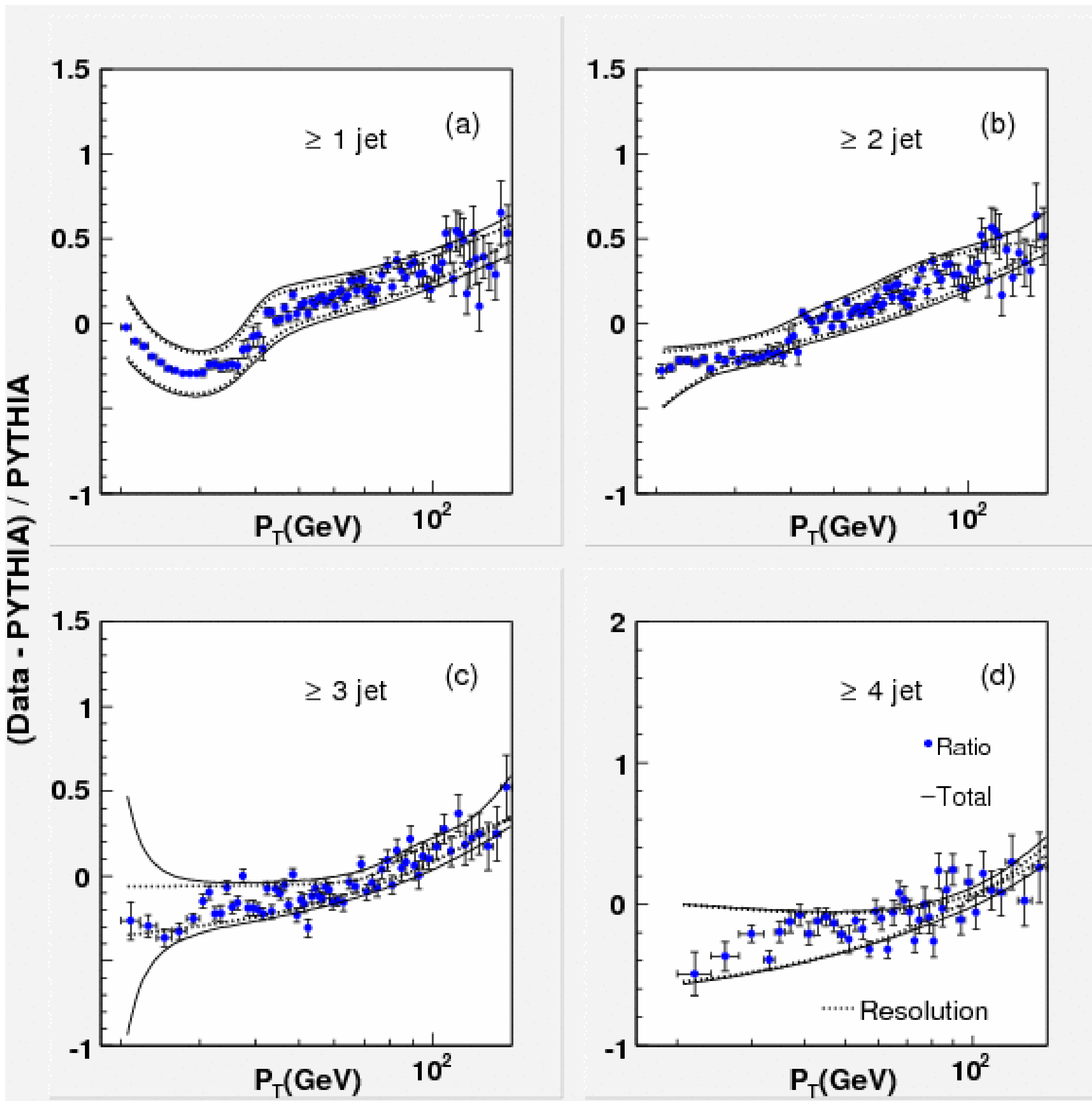
(Data -PYTHIA) / PYTHIA for fast MC jets



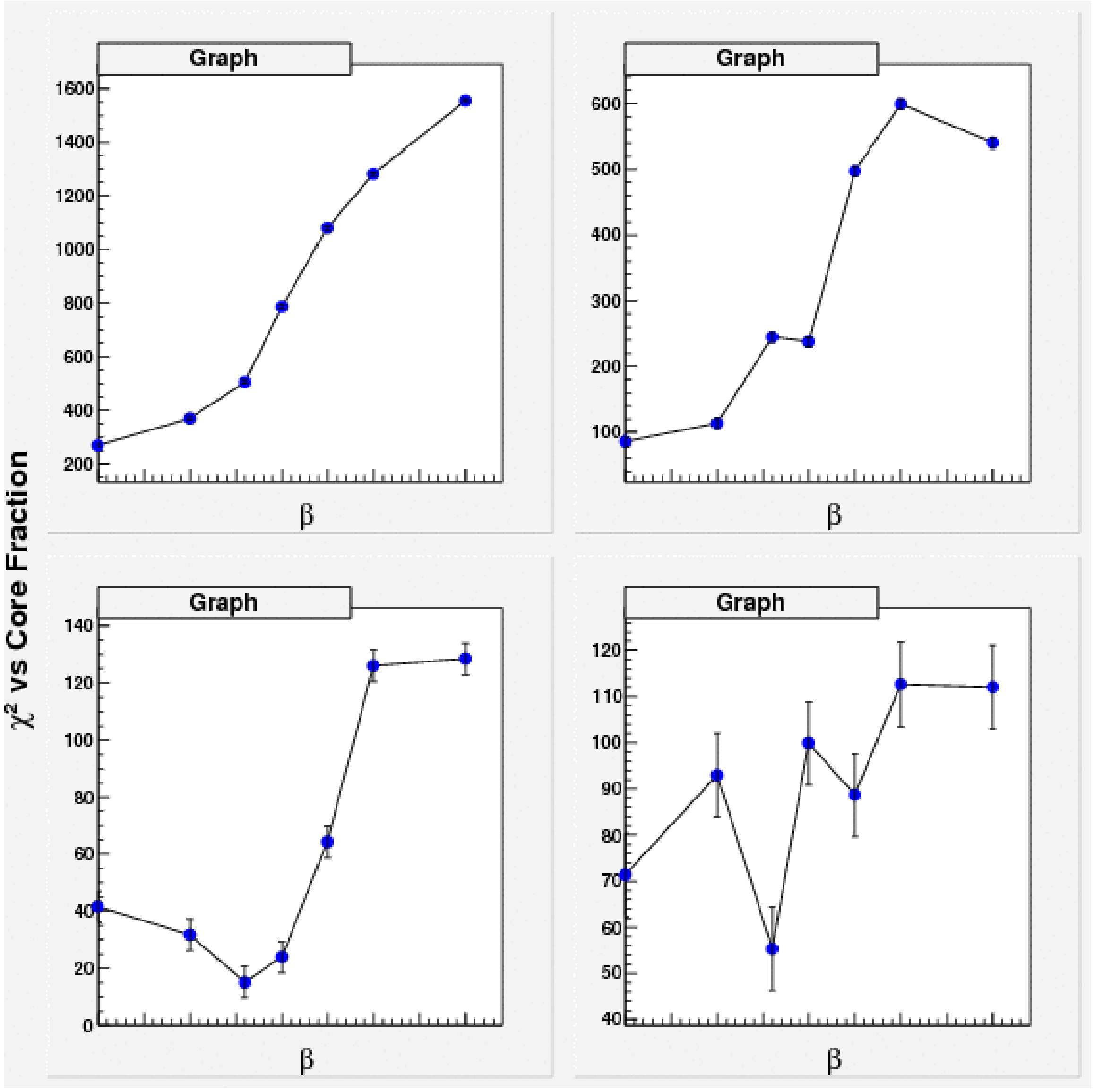
Unfolded data and fast MC with β=0.5



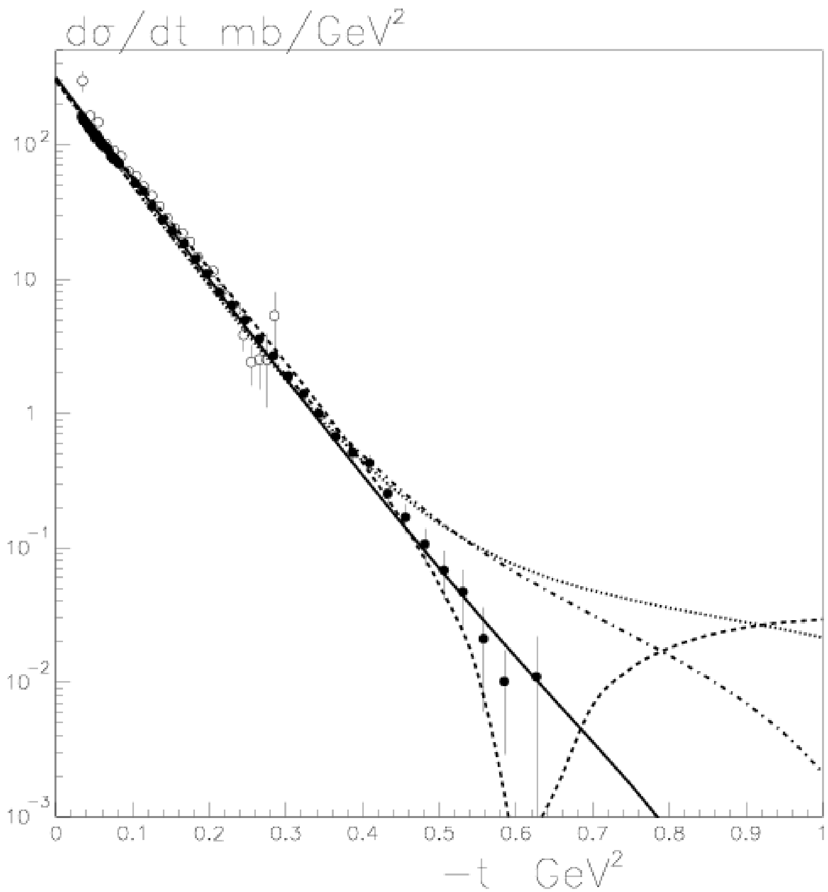
(Data -PYTHIA) / PYTHIA for fast MC with β=0.5

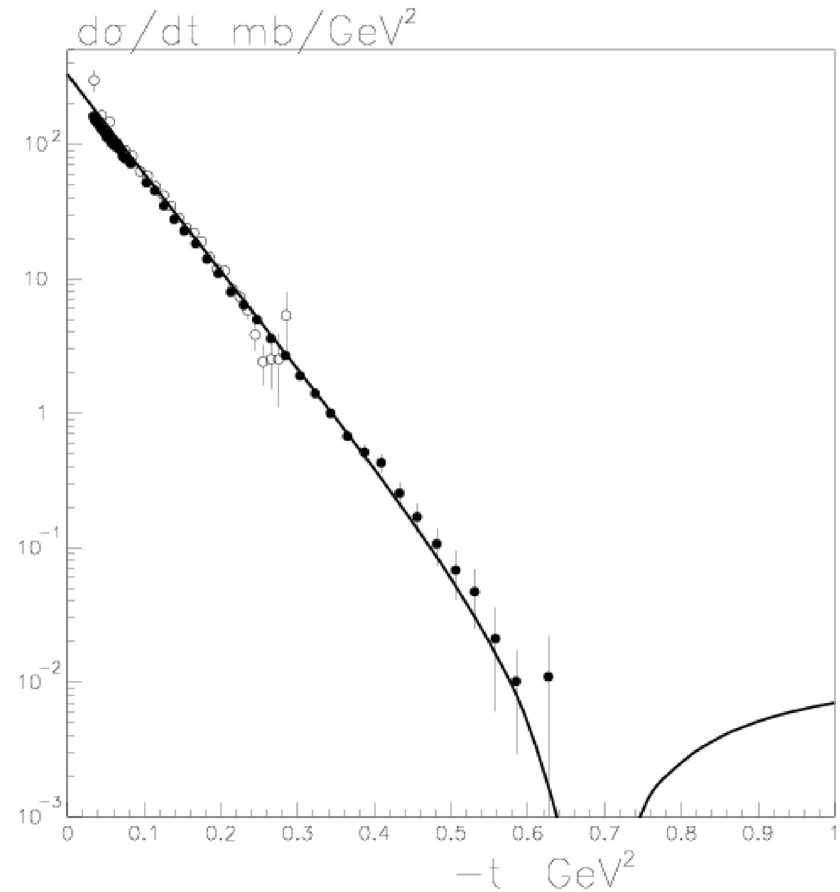


$X^2(\beta)$ profile



Diffraction





Conclusions (very preliminary):

- Pythia describes the data as in Run I. Large Run II statistics exposes some disagreement in a slope at P_T~50–150 GeV
- Reco and Ptcl jets are consistent in the description of the data
- The data confirms the core fraction of the hadronic matter distribution

Appendix: