Jet Shapes using MidPoint

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QCD Meeting 5th March 2004

Outlook

- Event Selection
- Comparison of Raw Variables
- Jet Pt corrections using MC
- Jet Shapes
- Prospects and Plans

Event Selection

- Using MidPoint Algorithm (R=0.7) (merging at 75%)

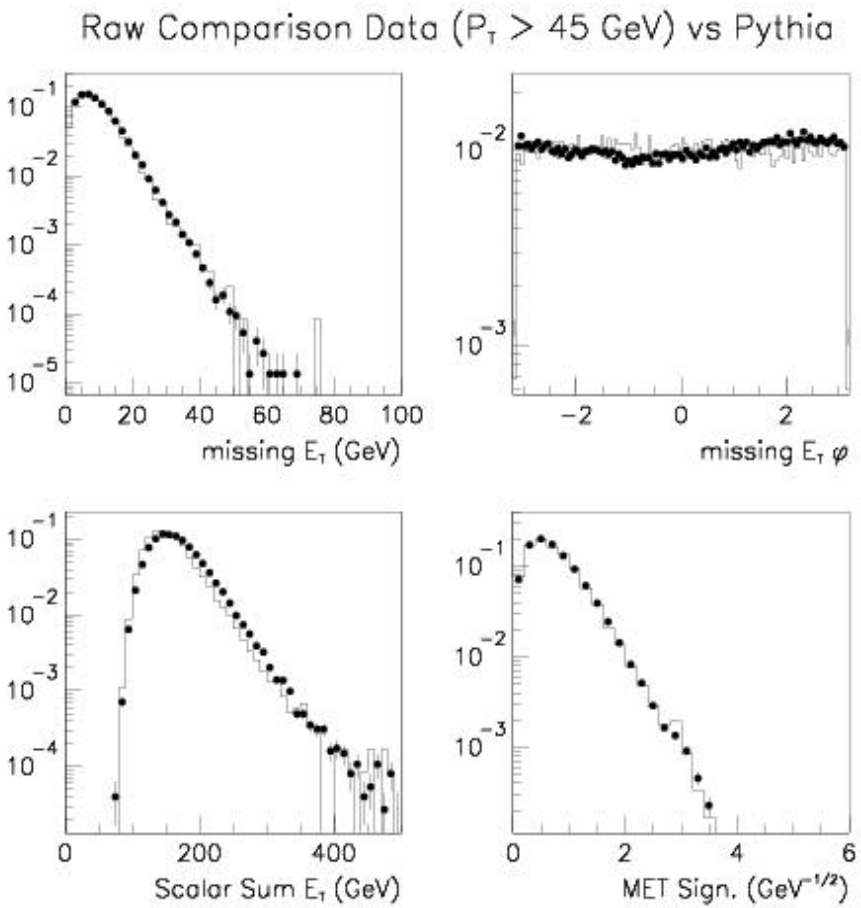
- Using all Jet Data before Shutdown (~200 pb-1)
  - J20 (for Pt > 45 GeV)
  - J50 (for Pt > 70 GeV)
  - J70 (for Pt > 95 GeV)
  - J100(for Pt > 130 GeV)

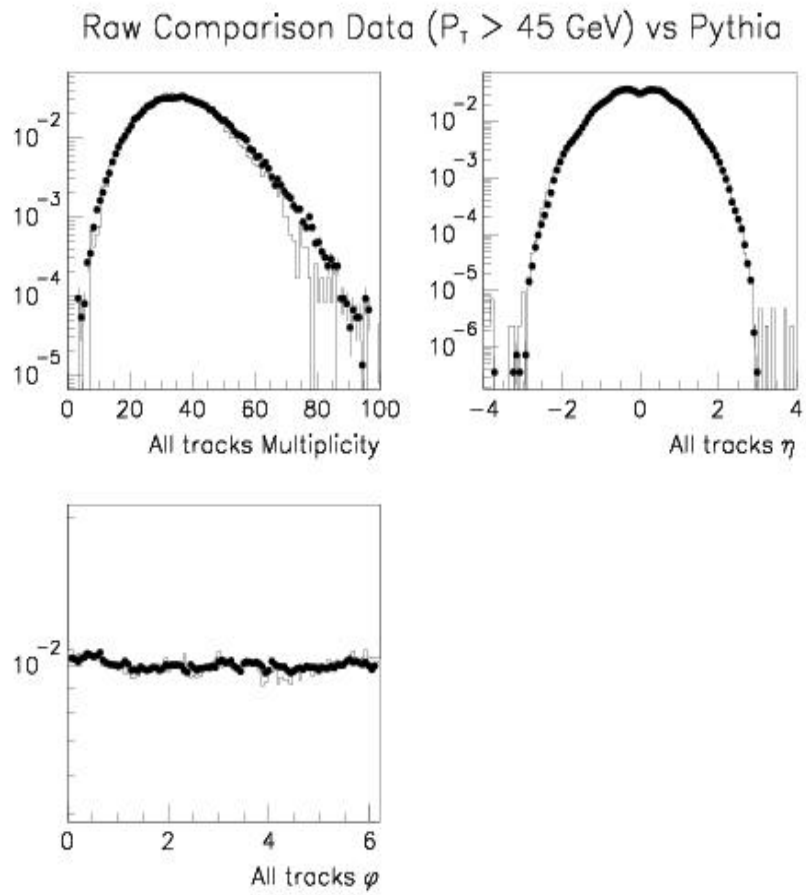
  Based on Monica's Studies

  - (plan to use ST5 to go down to 30 GeV)

- Selection Cuts
  - At least one central jet (0.1 < |Y| < 0.7) with Pt> 45 GeV
  - MET_significance < 3.5 GeV^-1/2
  - |V_z| < 60 cm
  - N(vxt) = 1
- Comparison DATA (5.3.1pre4) with MC Pythia (Herwig later)

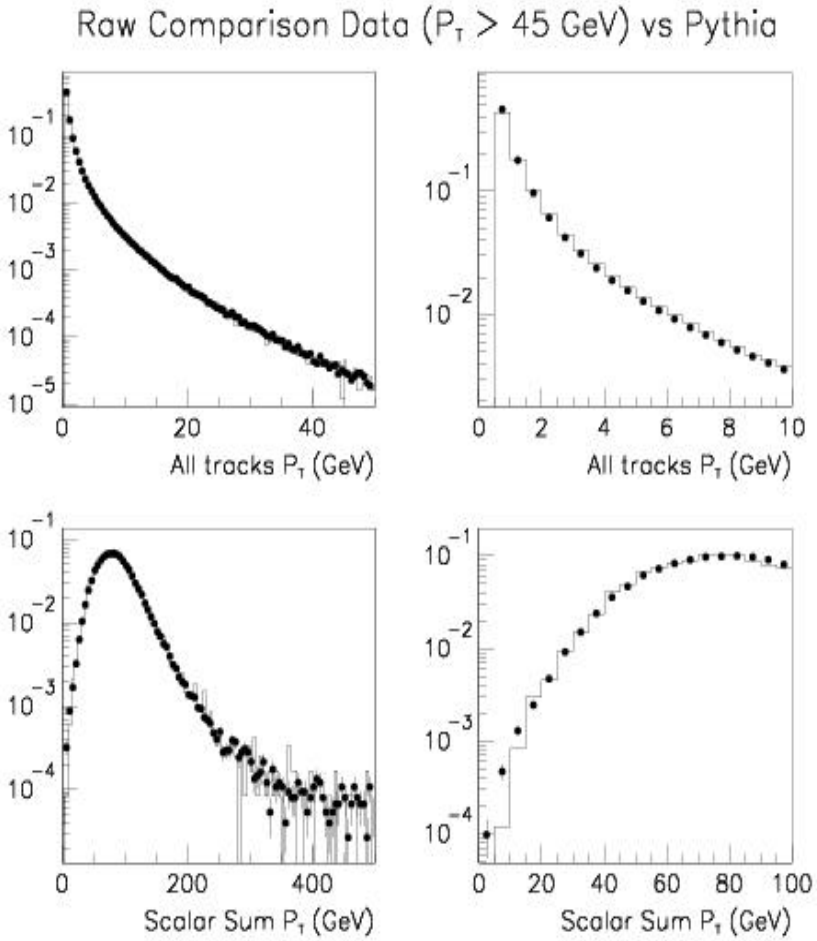
Some Control Plots (Ia)

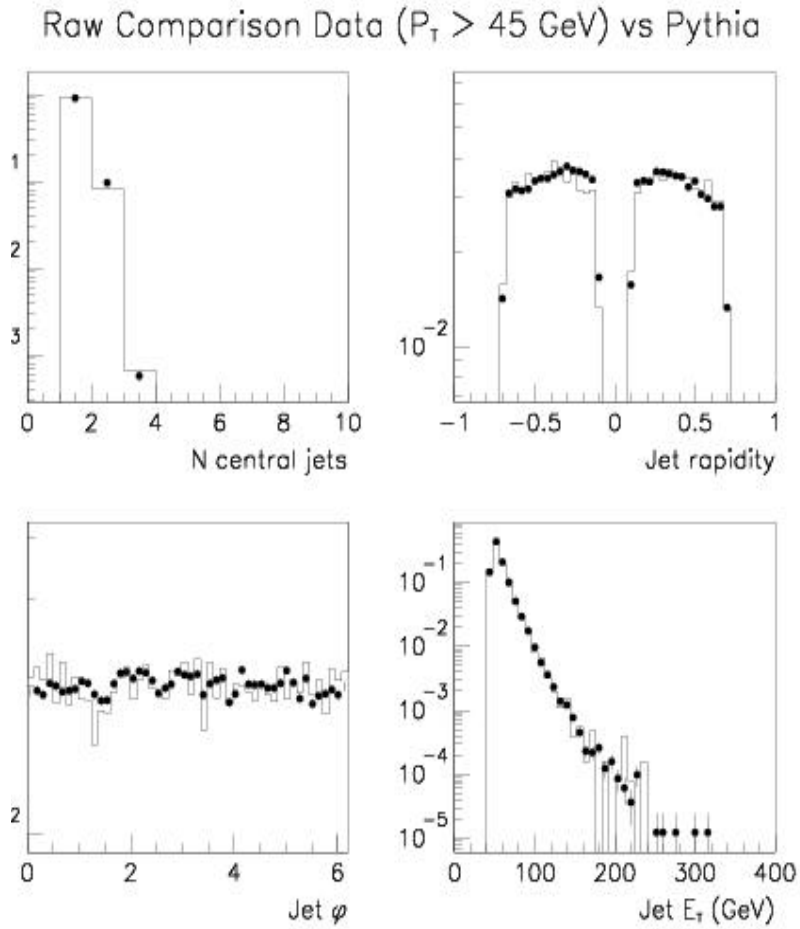




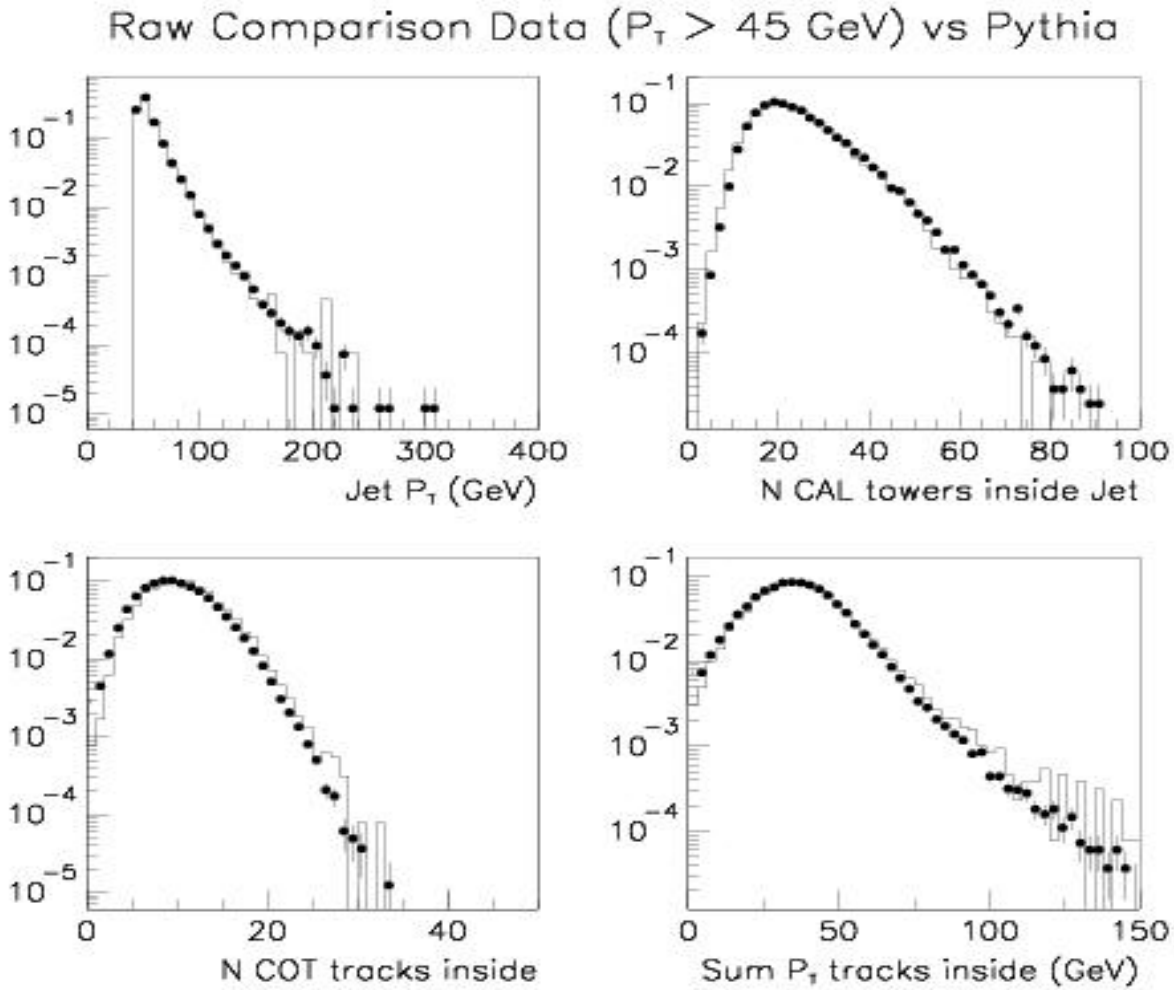
Comparison Data/MC i

Some Control Plots (Ib)



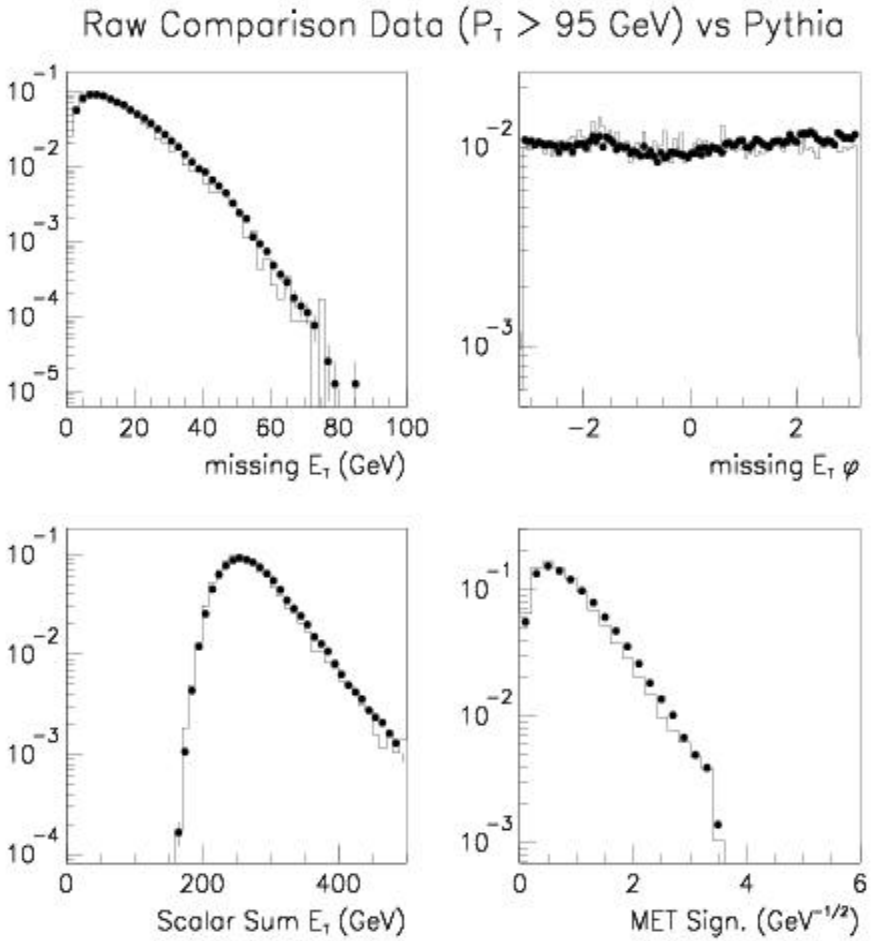


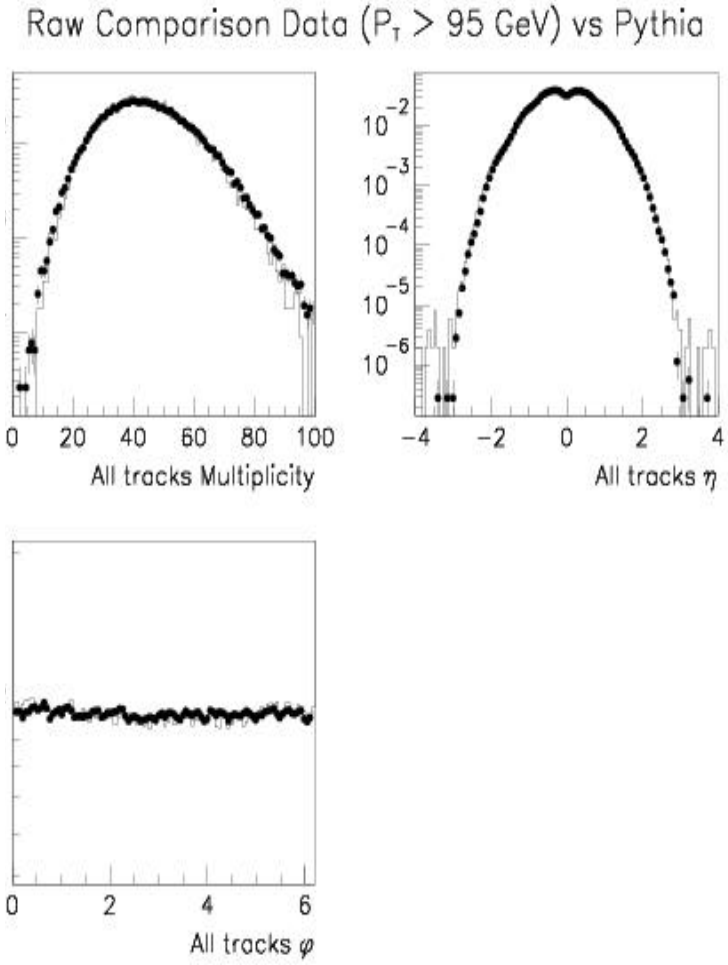
Some Control Plots (Ic)



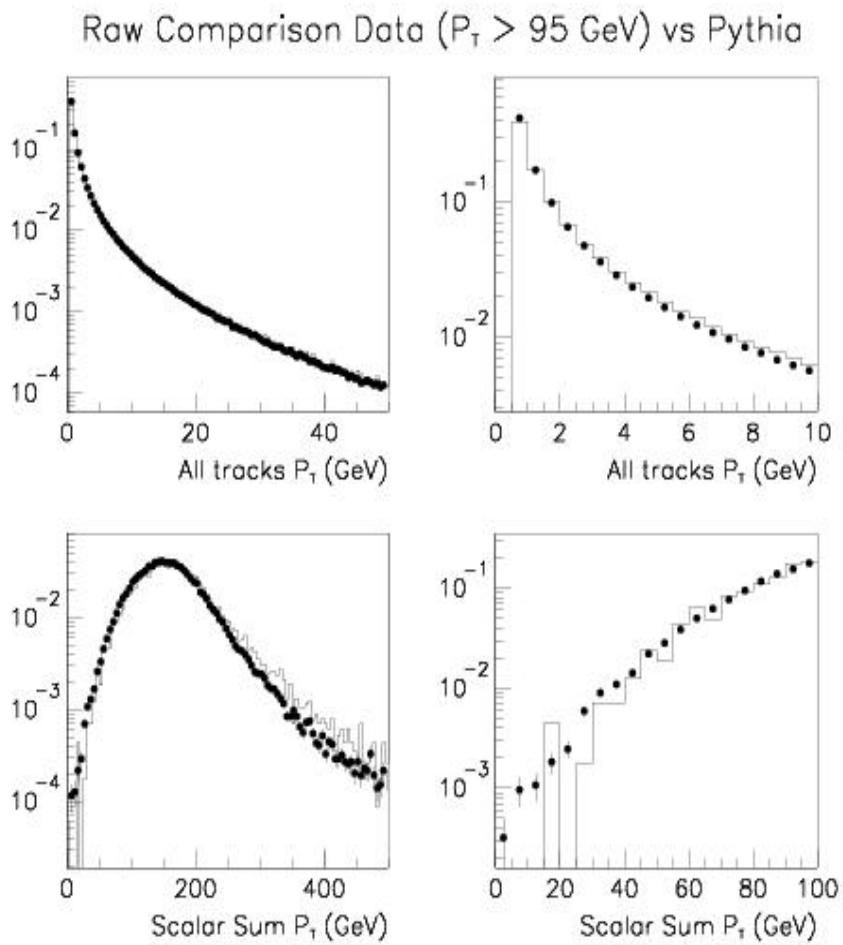
Comparison Data/MC is satisfactory

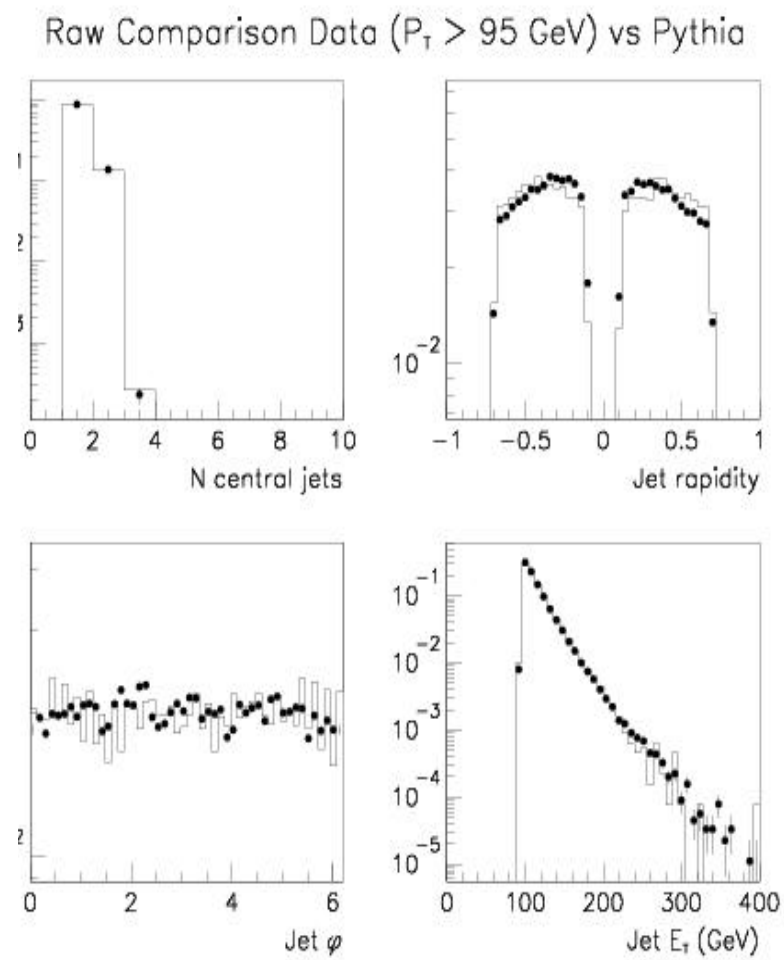
Some Control Plots (IIa)



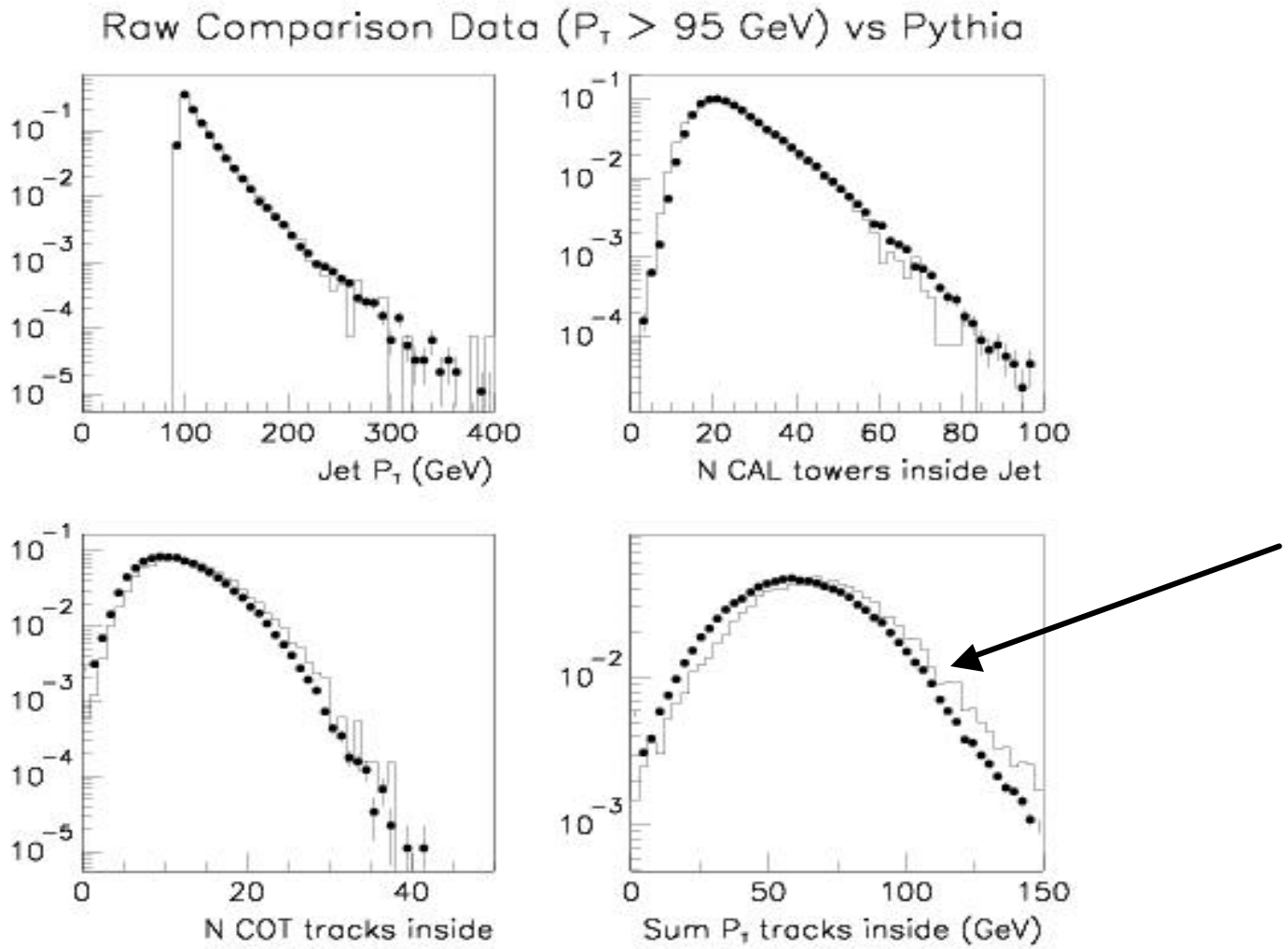


Some Control Plots (IIb)





Some Control Plots (IIc)



Effect of tracking inefficiency at high Pt(jet)

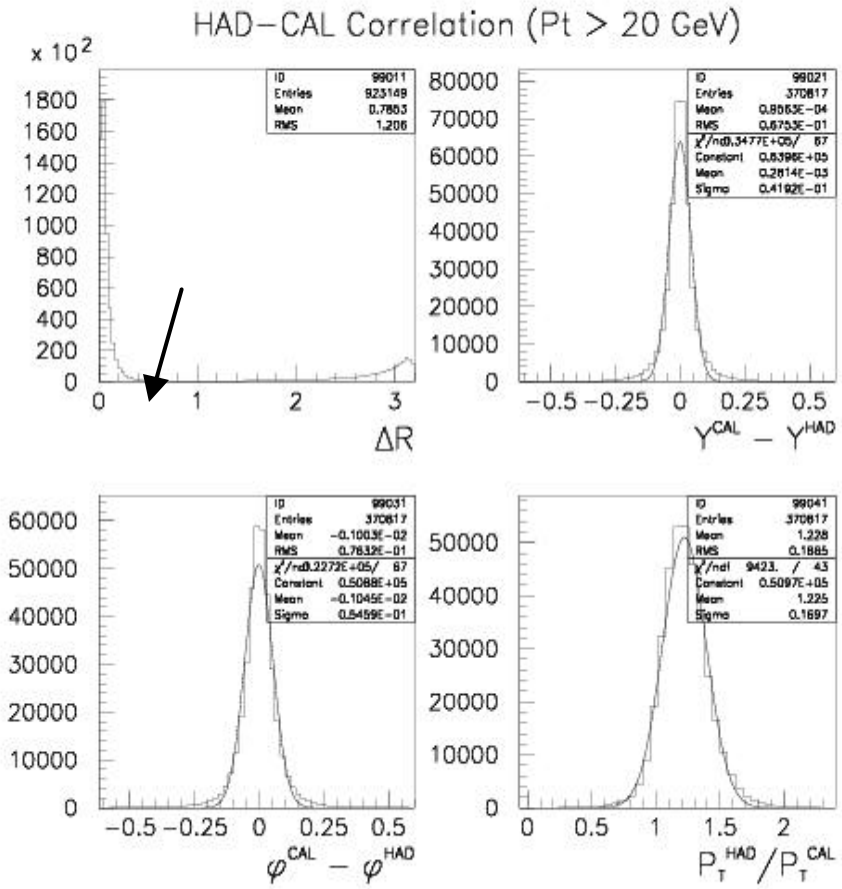
Collab. with Monica

Jet Energy Correction

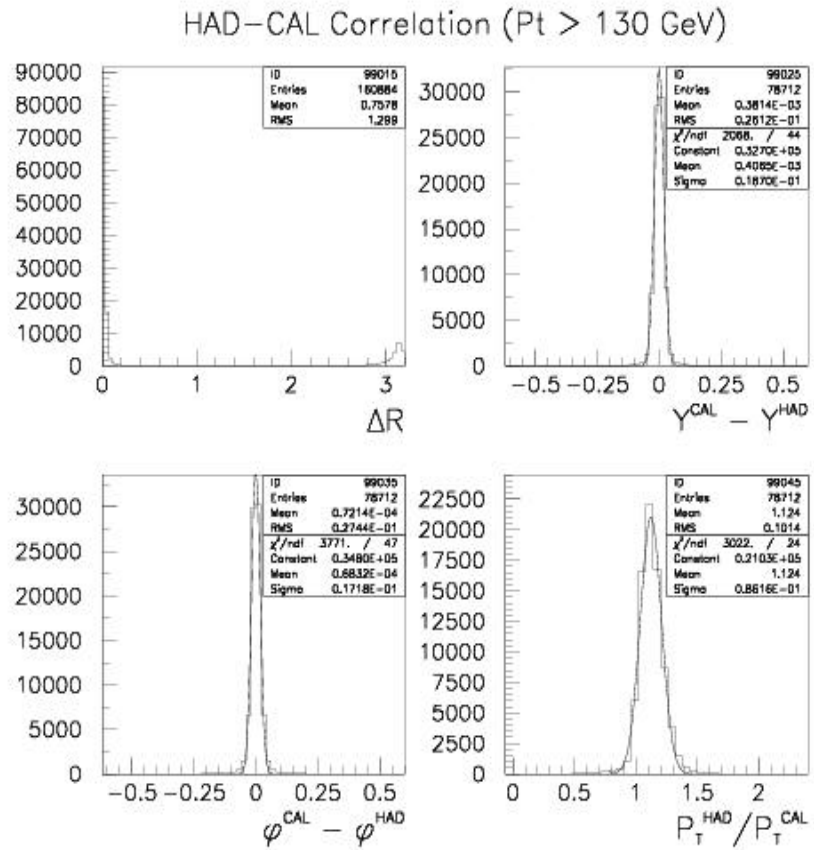
- We intend to use the MC simulation to extract corrections to the hadron level
  - Run MidPoint at CAL and Particle Levels
  - Matching of pairs of leading jets (Y-phi)
  - Fit correlation HAD % CAL
- Be careful with choosing thresholds !
- Apply correction factor to data jet pt's....

…Matching jets….

Pythia 18

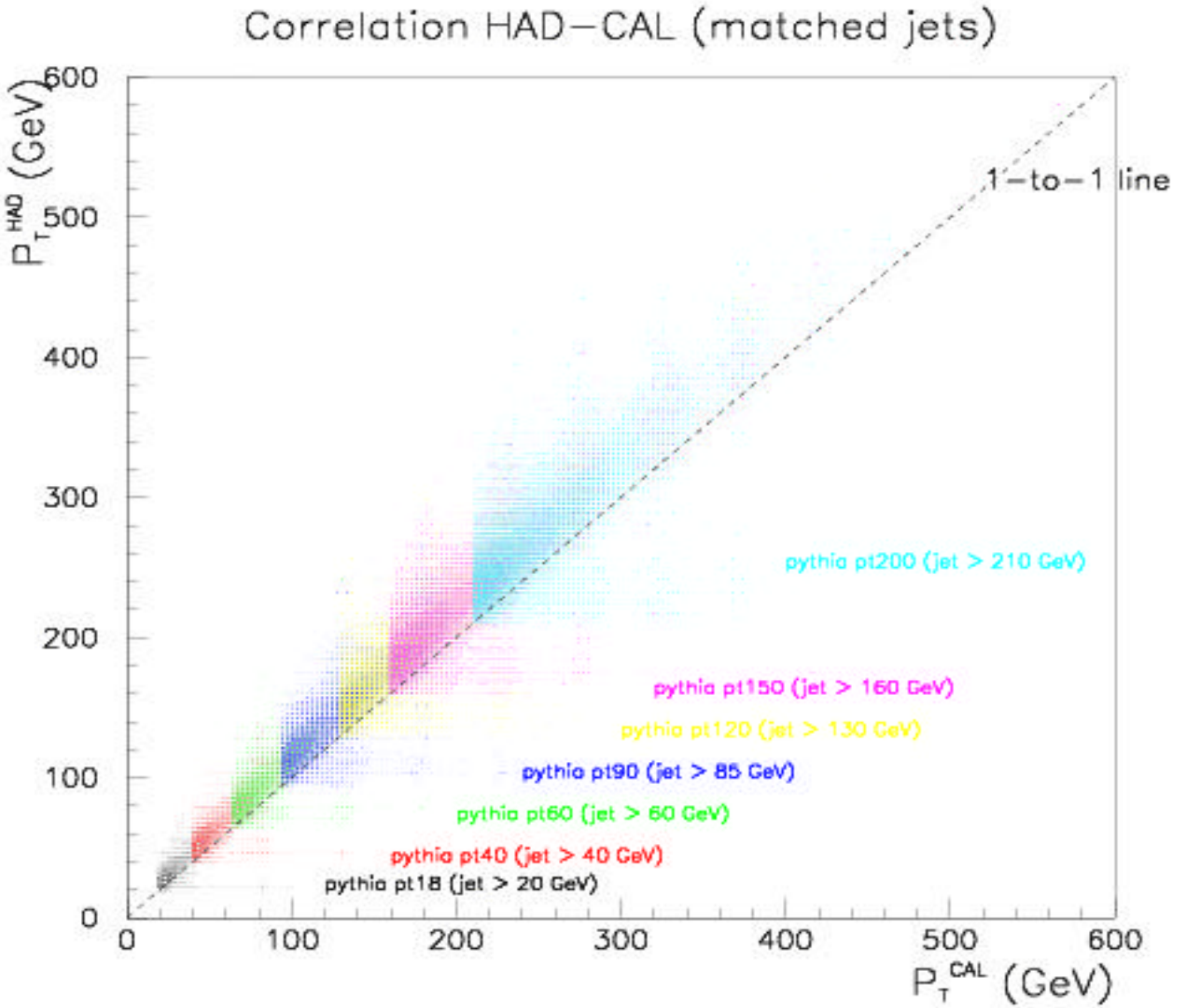


Pythia 120

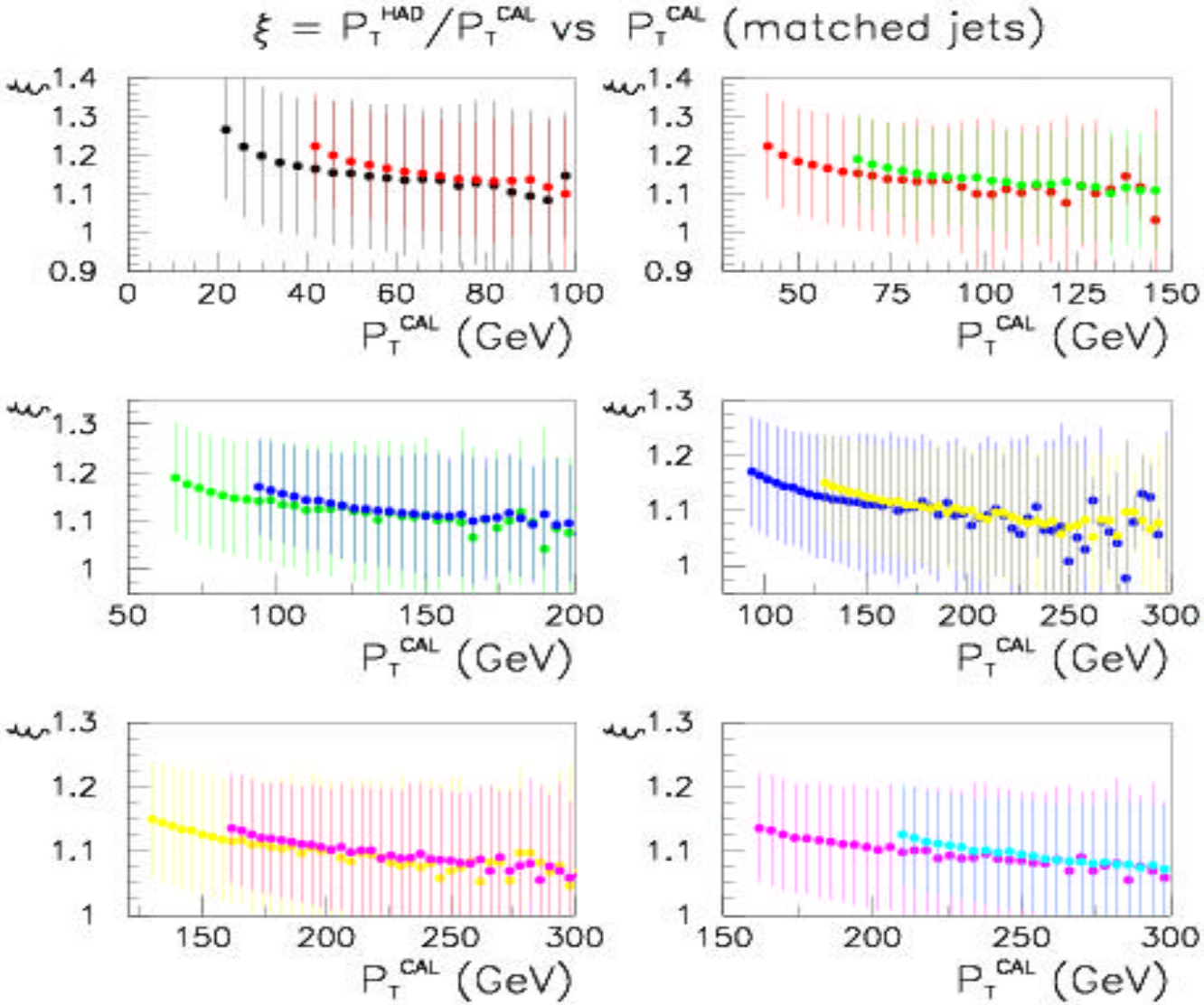


Using CAL leading jets in each MC sample…

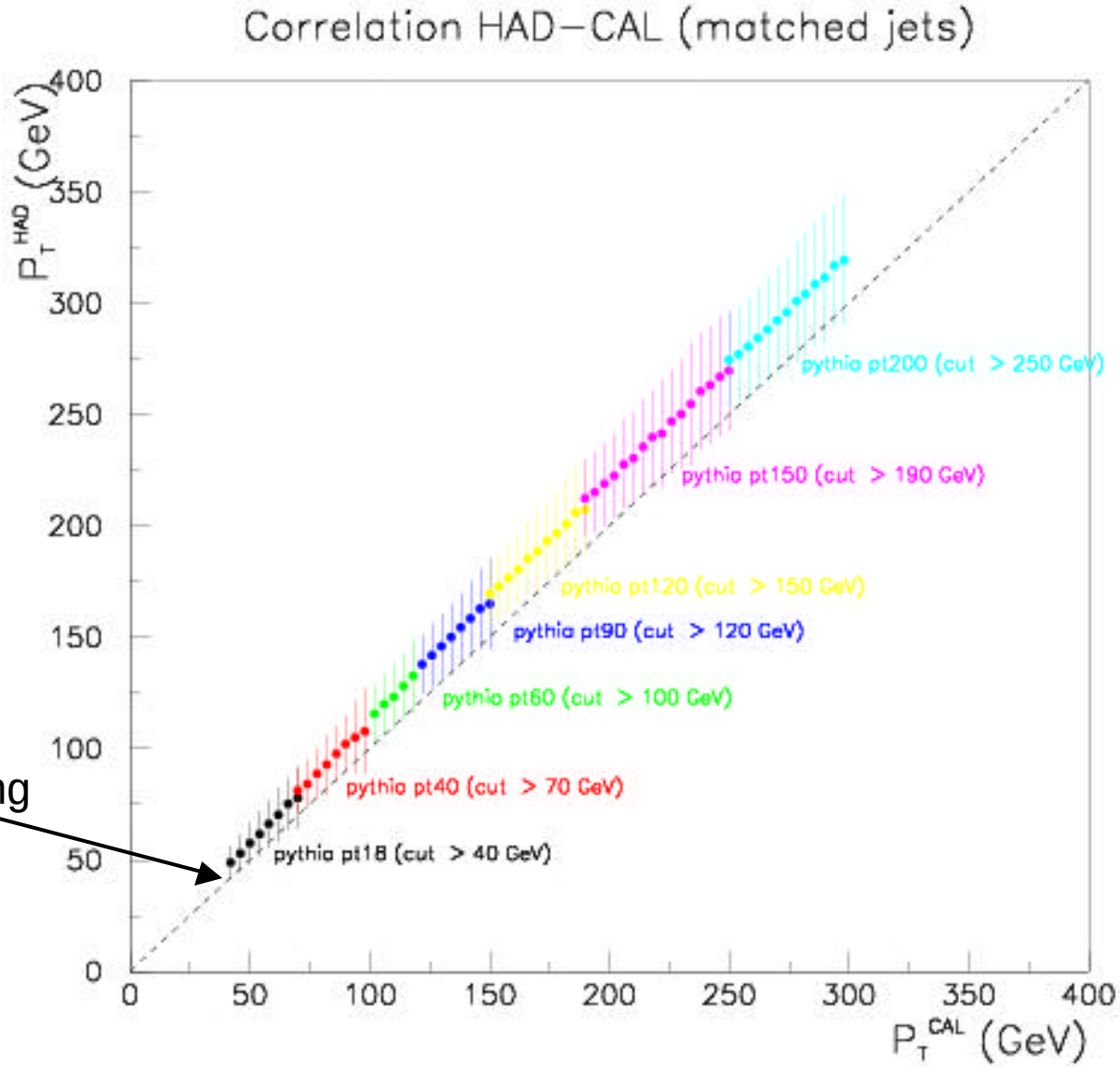
HAD-CAL Correlations (Ia)



HAD-CAL Correlations (Ib)

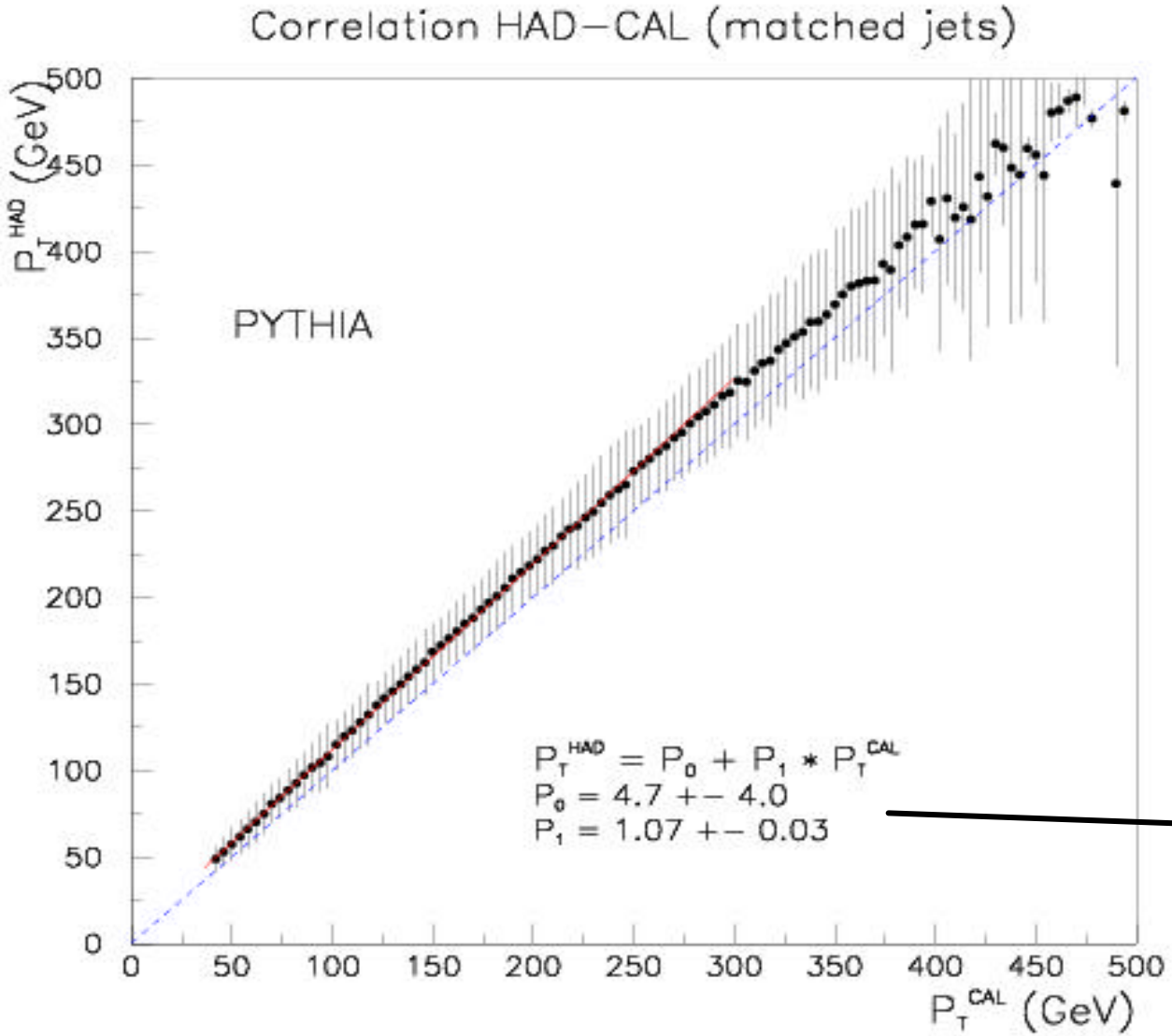


HAD-CAL Correlations (Ic)



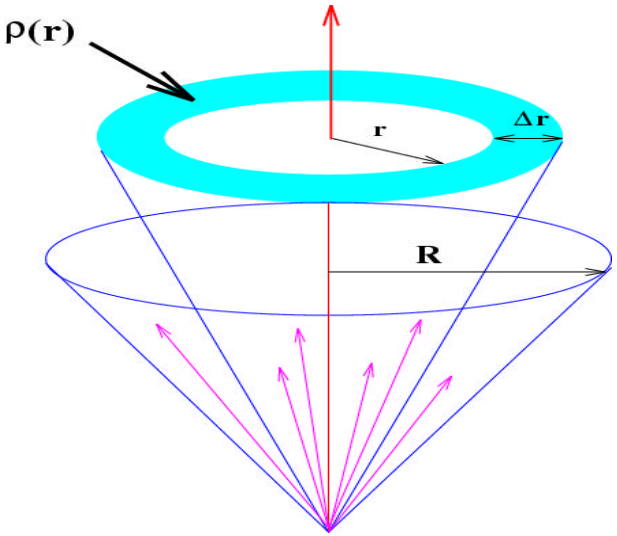
Pyt10 coming

Fitting Correlation (Id)

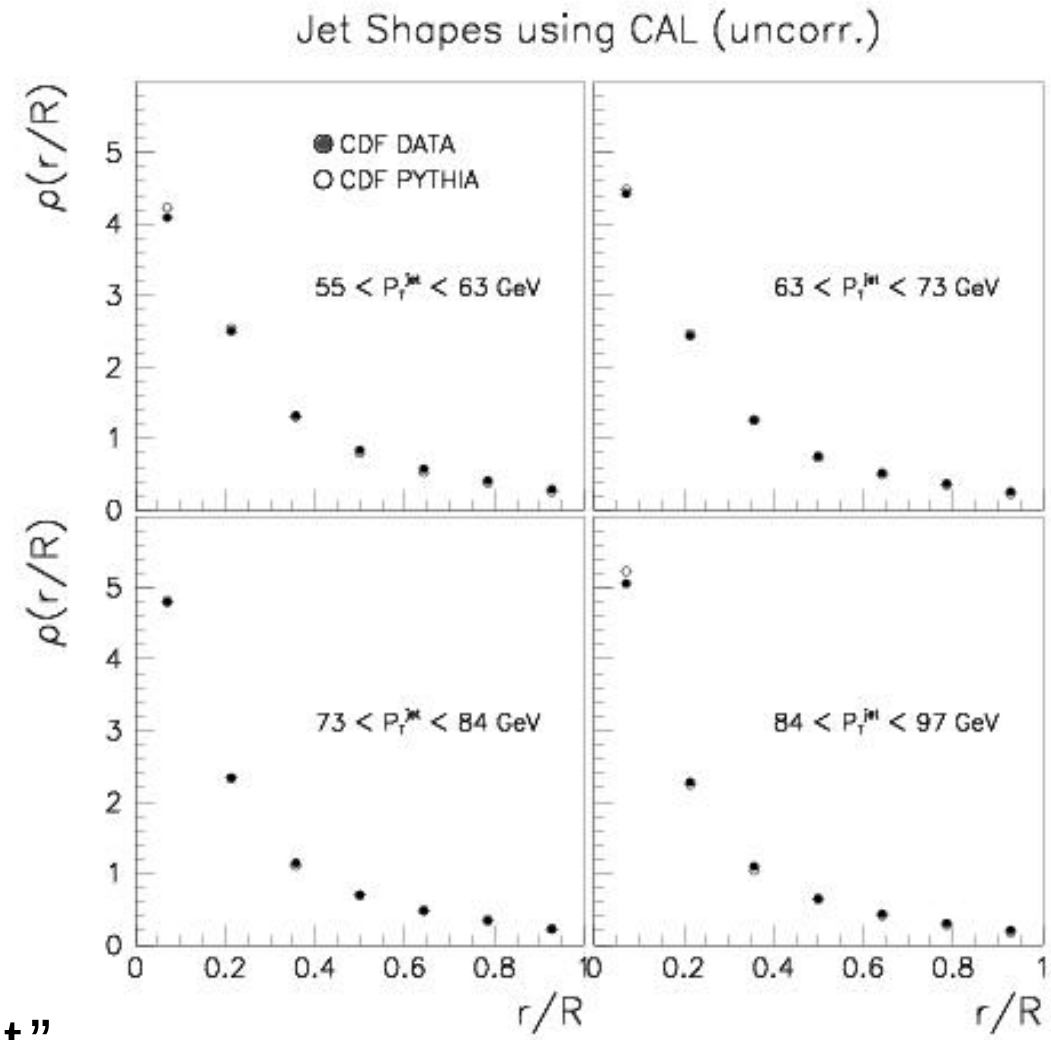


..apply to data…

Jet Shapes using CAL (Ia)



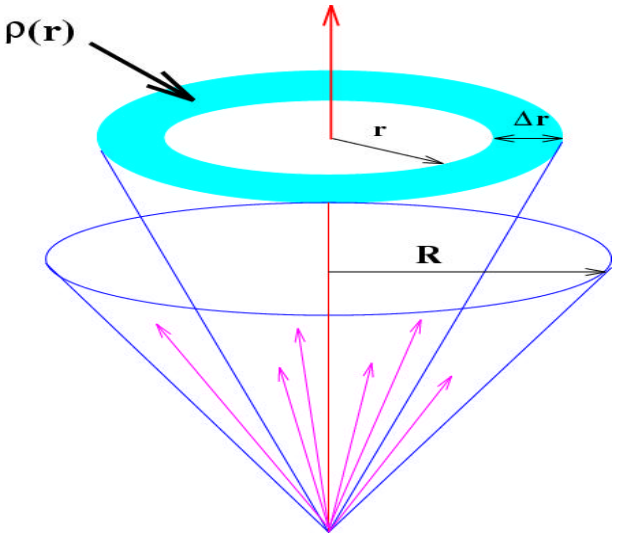
$$r(r) = \frac{1}{\Delta r}\frac{1}{N_{jet}}\frac{\sum P_T(r \pm \Delta r/2)}{\sum P_T(0,R)}$$



For Central Jets

In bin of “corrected Pt”

Jet Shapes using CAL (Ib)



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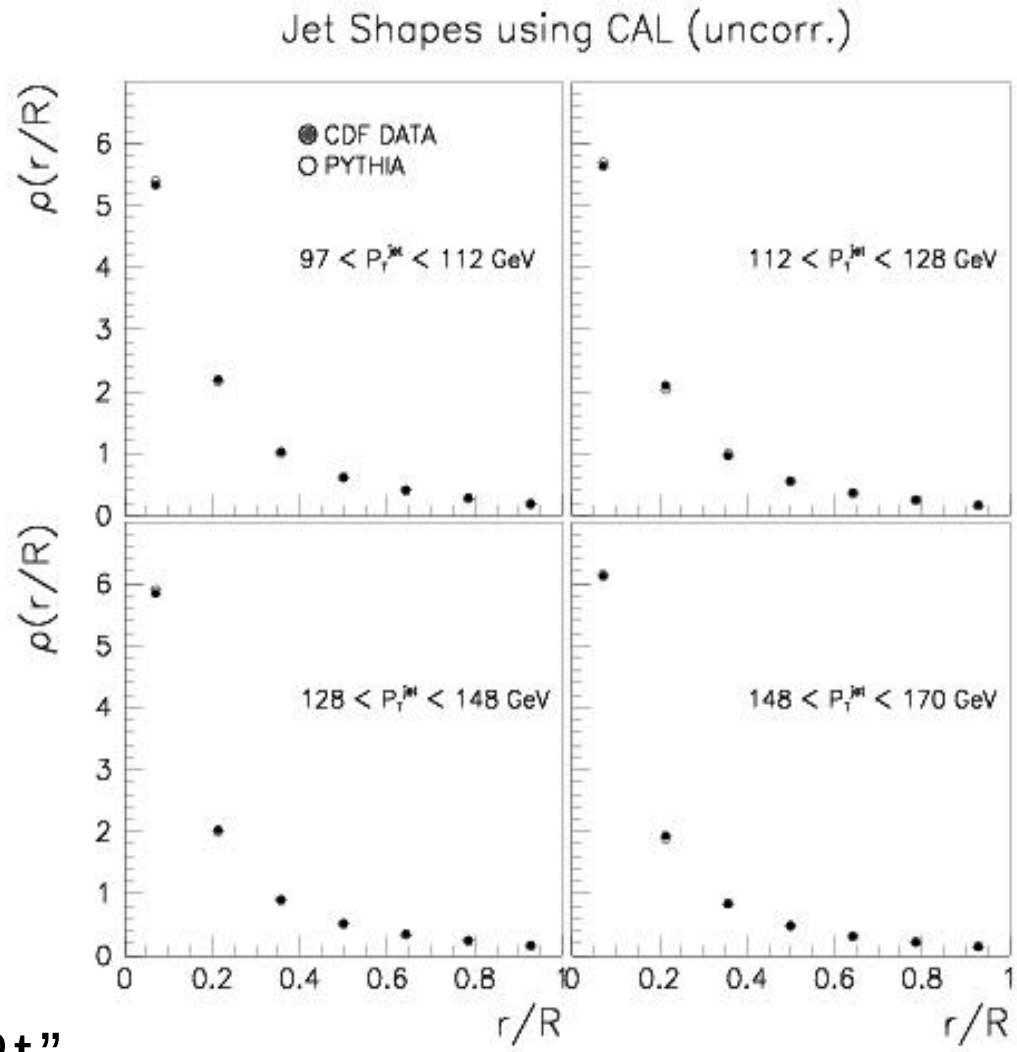
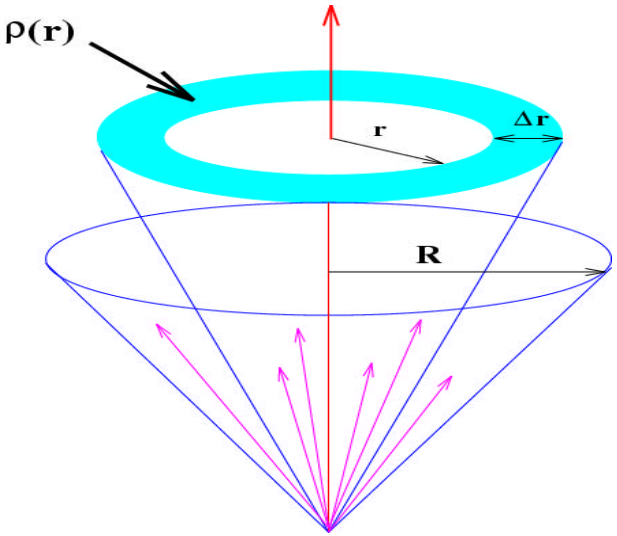


For Central Jets

In bin of "corrected Pt"

Jet Shapes using CAL (Ic)



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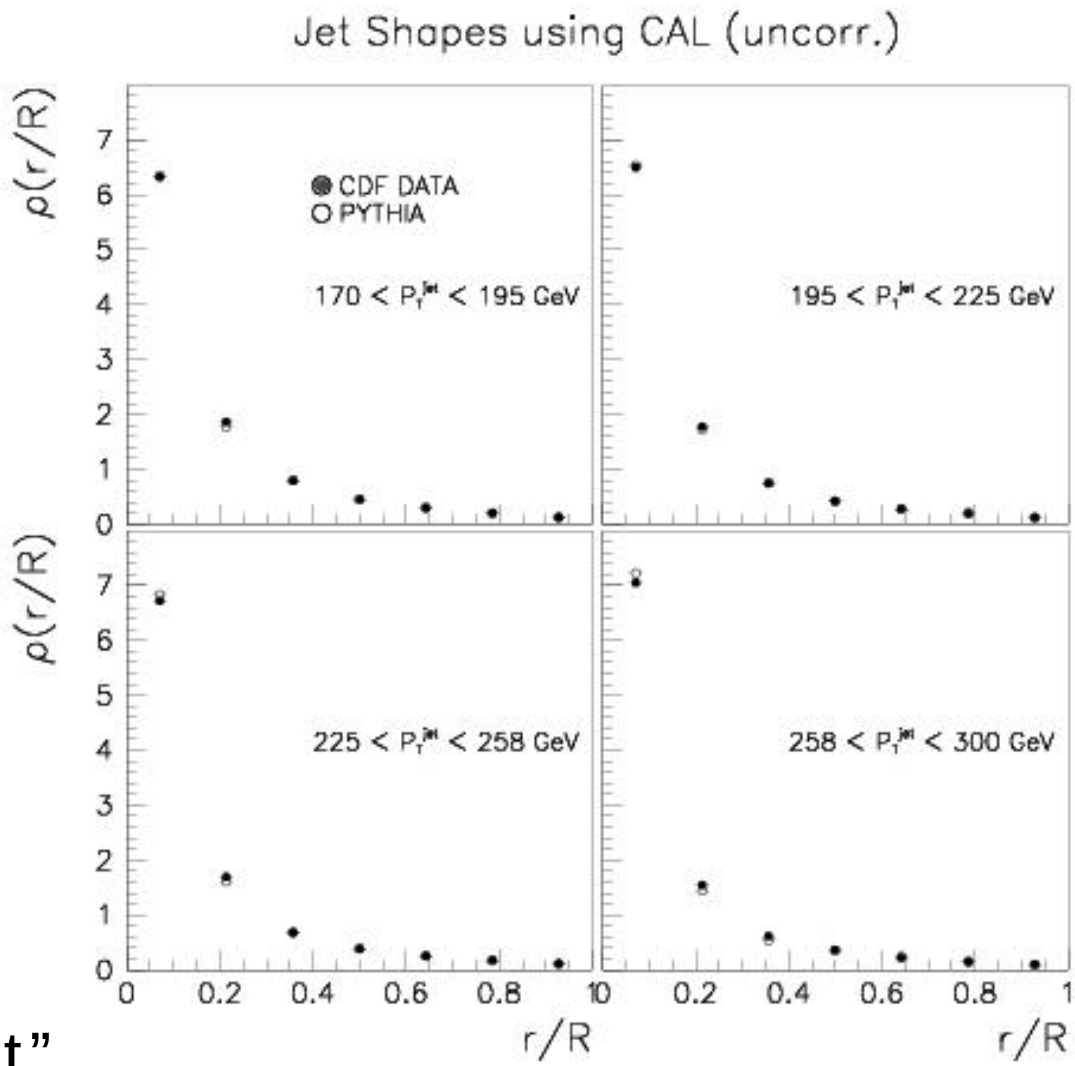
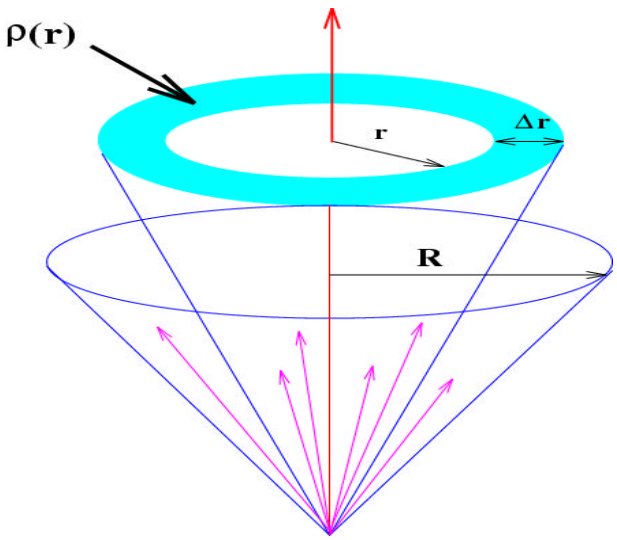


For Central Jets

In bin of "corrected Pt"

Jet Shapes CAL/COT (Ia)



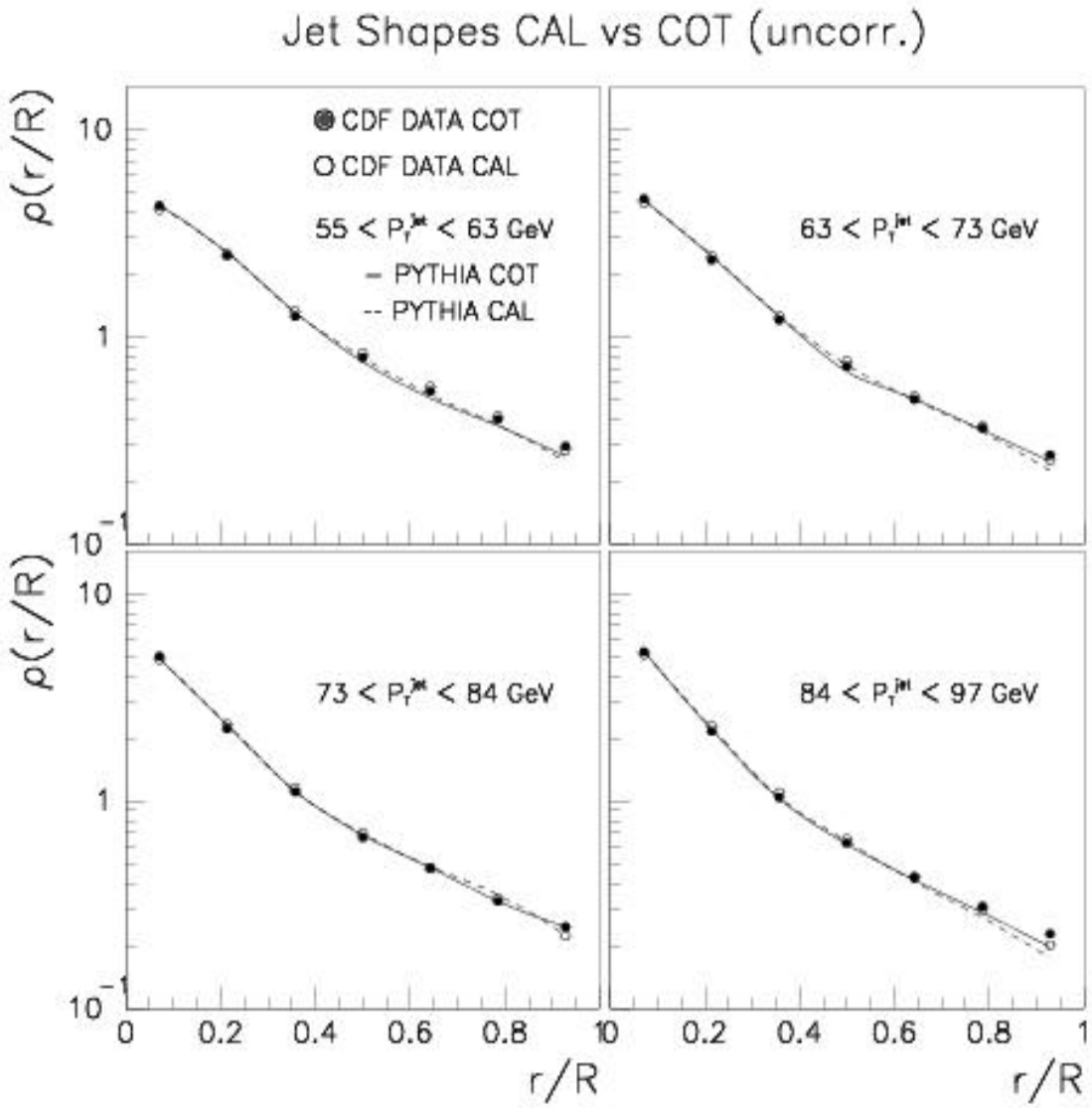
$$\rho(r) = \frac{1}{\Delta r}\frac{1}{N_{jet}}\frac{\sum P_T^{tracks}(r \pm \Delta r/2)}{\sum P_T^{tracks}(0,R)}$$

$$0.5\,\mathrm{GeV} < P_T^{track} < 100\,GeV$$

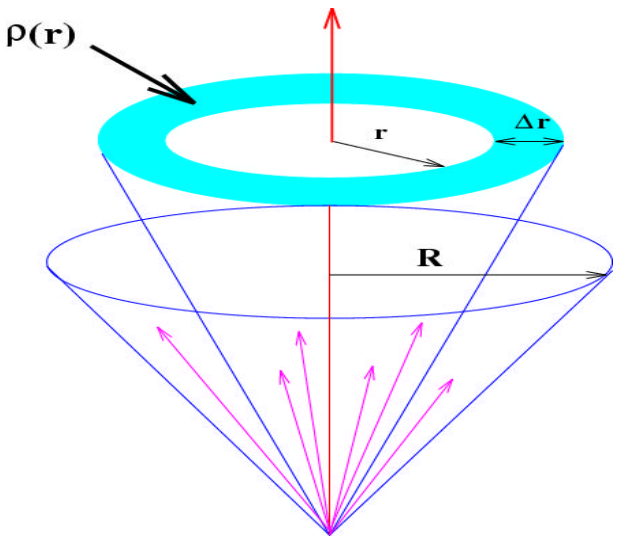
$$|h^{track}| < 1.5$$

$$|z^{track} - V_z| < 2\,\mathrm{cm}$$

$$\Delta R(\mathrm{track-jet}) < 0.7$$



Jet Shapes CAL/COT (Ib)



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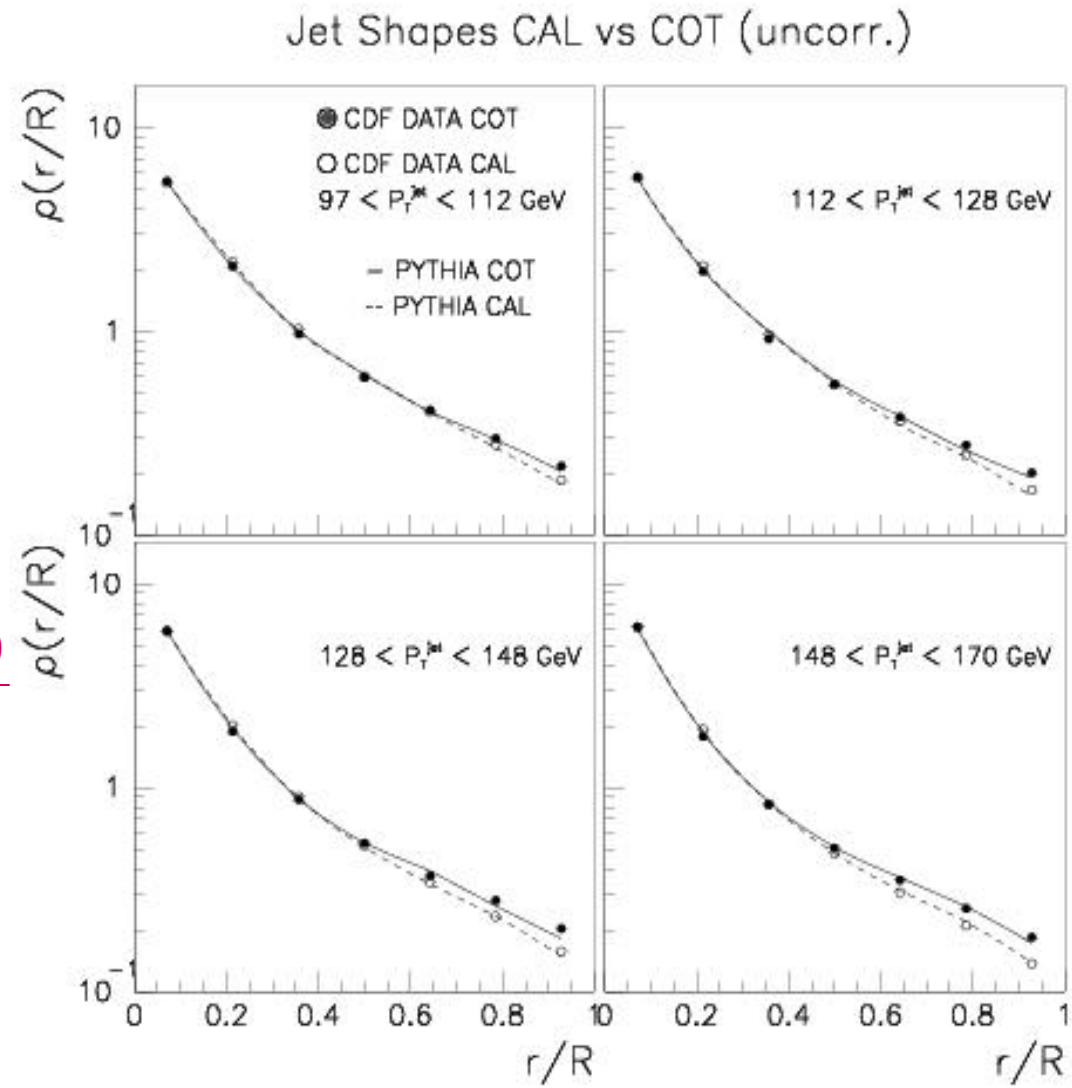
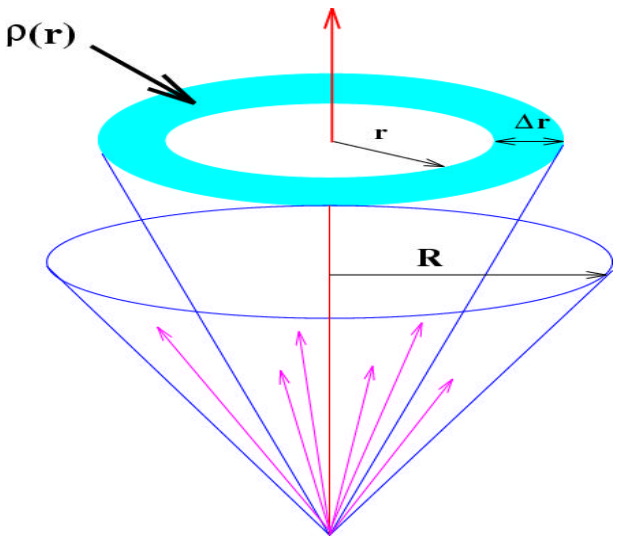
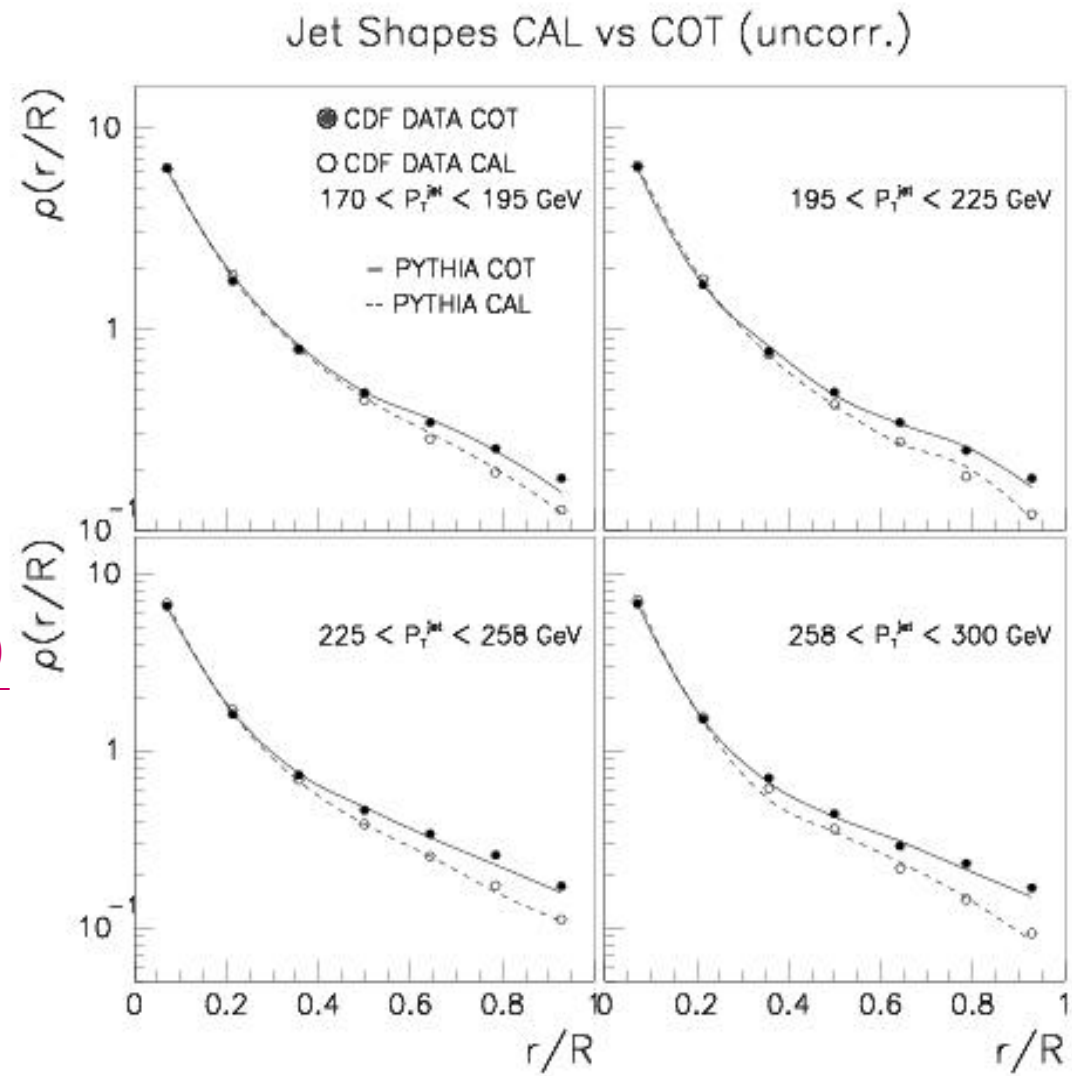


Jet Shapes CAL/COT (Ic)





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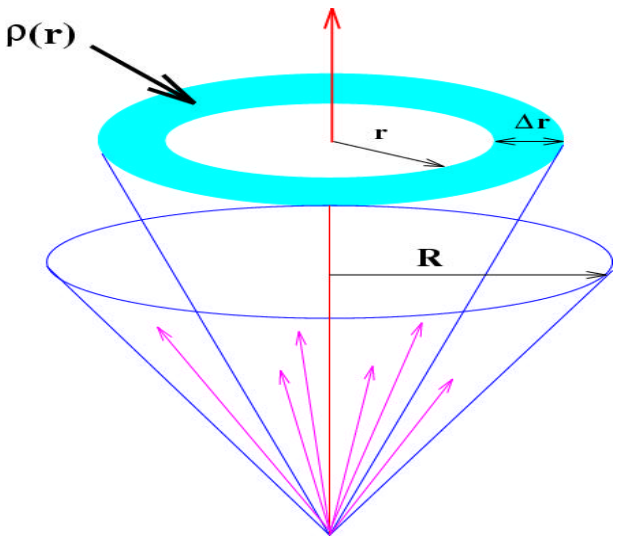
Jet Shapes Hadron vs Detector (Ic)



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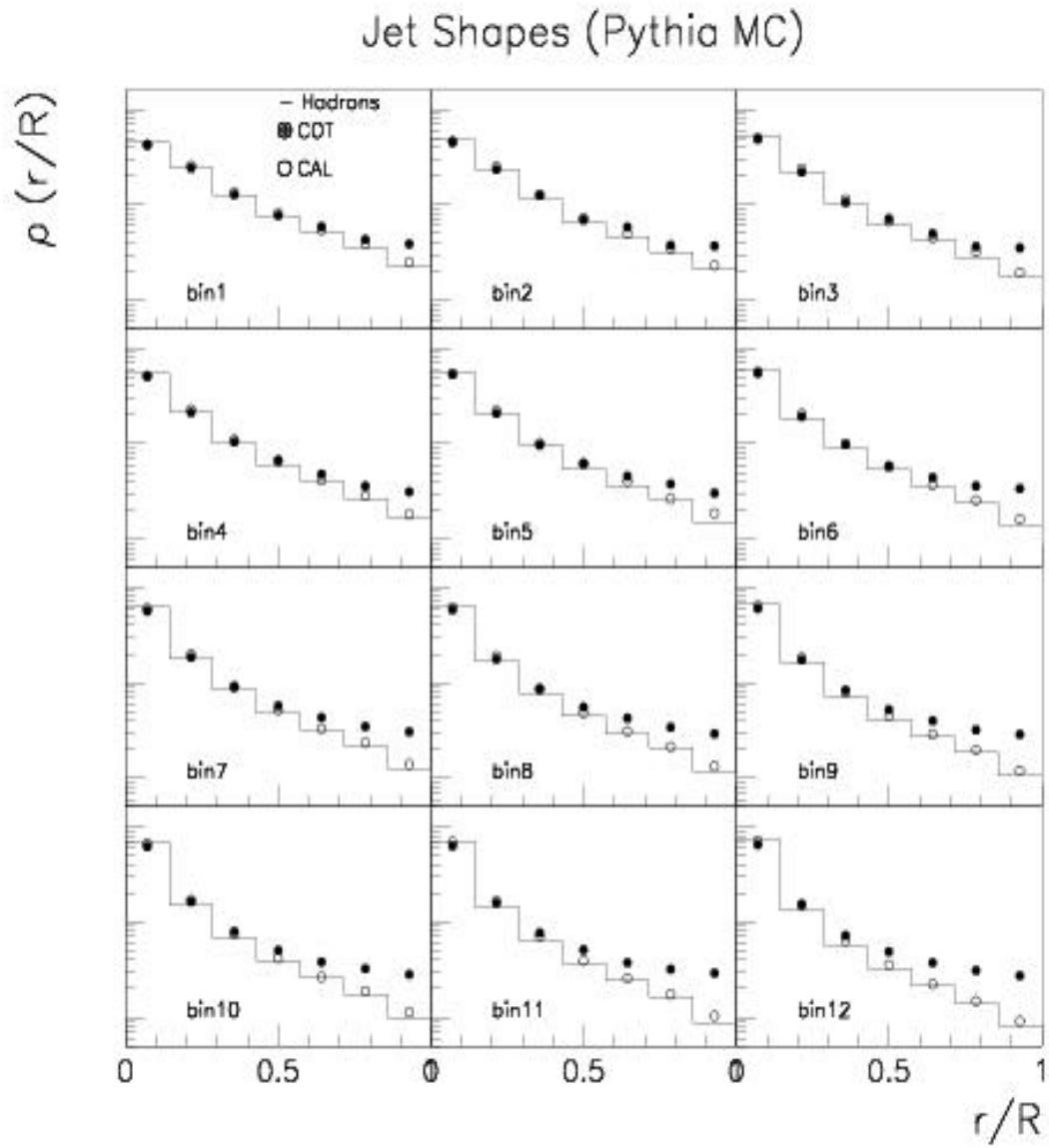
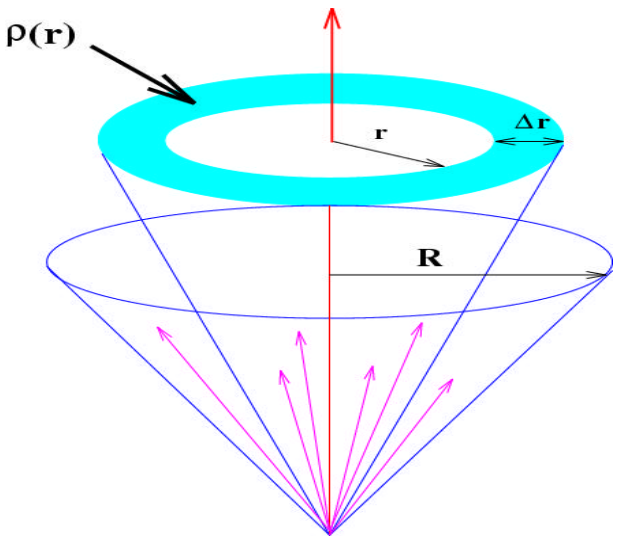


Jet Shapes Correction Factor



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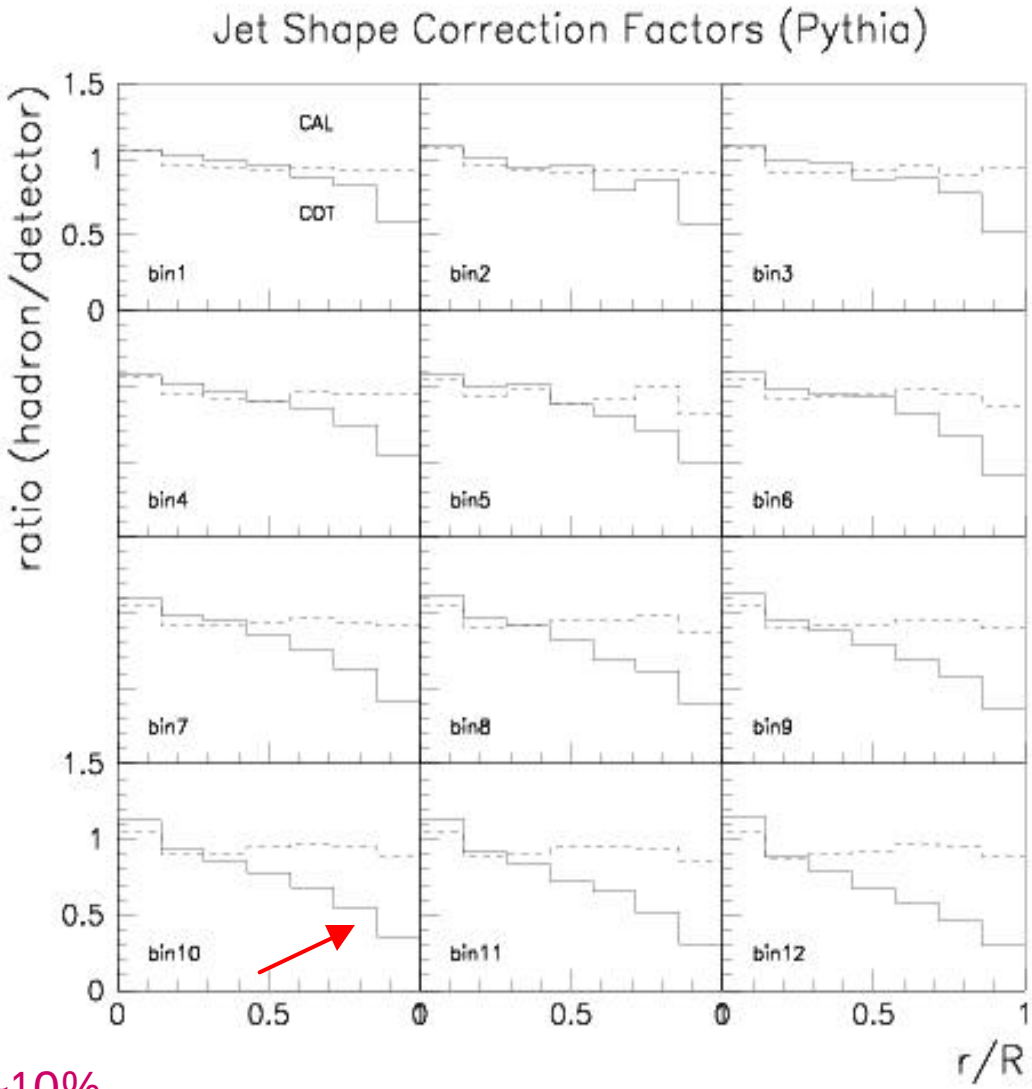

COT: HAD/DET -> f(r) ☹

(we measured broader jets…)

CAL: HAD/DET -> flat within ~10%

Plans and Prospects

- Fully corrected to hadron level in a week with bug fixed (MidPoint…must be negligible..however)

- Comparison with HERWIG

- Systematics
  - Energy Scale
  - Unfolding (Pythia vs Herwig)
  - Simulation (CAL/COT in Data and MC)
  - COT and CAL non-linearities….
  - Try new simulation 5.3.1…

- Plan to have final measurement for APS
- …and a paper before end of year……