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Aug 8 2003

Inclusive Jet Cross Section Blessing: 177 pb^{-1}

Blessing for Summer 2003 conferences...

We now have updated results based on 177 pb^{-1}, more than double the data that was presented in the Spring (85 pb^{-1}) conferences.

We also have a better understanding of the energy scale uncertainty (5% $\rightarrow$ 3%)

Analysis details can be found in CDF6298 (writeup for the blessed Spring 2003 results)

Plots collected at:

`http://ncdf76.fnal.gov/~chlebana/qcd/ana/incJet/blessSummer2003/`

Previously showed results at the preblessing based on 163 pb^{-1}...

- Same unsmearing procedure as used in Run I and for the preliminary Run II results

- Used offline version 4.10.4

- Redid Calorimetry and Jet reconstruction
→ corrected the falling response in the high η region...

- Using the 5.5% energy scale correction and 3% uncertainty

- Offline luminosity scaled by 1.9%

ntuples based on DataAccess located at:

```
fcdfsgi2:/cdf/data40b/s0/qcd/chlebana/jets_4.10.4
```

Good Run Selection

```
AND rc.SHIFTCREW_STATUS = 1
AND rc.RUNCONTROL_STATUS = 1
AND RC.RUNNUMBER >= 138815
AND rc.CLC_STATUS = 1
AND rc.L1T_STATUS = 1
AND rc.L2T_STATUS = 1
AND rc.L3T_STATUS = 1
AND rc.CAL_STATUS = 1
AND rc.CCAL_OFFLINE = 1
AND (rc.COT_STATUS = 1 OR rc.COT_OFFLINE = 1)
```

Started with gjet08 and gjet09 datasets: 220 pb^{-1}

Offline bits set for runs: 138815 - 163527 (about 135 pb^{-1}
No "CCAL bits" for runs: 163956 - 166805 (about 42 pb^{-1})
$\rightarrow$ *removed the rc.CCAL_OFFLINE = 1 requirement*

Also require that event count for the J20 in ntuple match with that recorded in the database, removed 64 runs for 16 pb^{-1}

No offline luminosity for runs 164798 - 166927 (36 pb^{-1})

After discussion with the Lumi group decided to increase the uncertainty on the luminosity taken after May 27 by 3%.

After discussion with Jet Correction Group, decided that the 3% error quoted on the energy scale uncertainty is reasonable.

Prescale Determination

The prescale on the Level 2 15 GeV Cluster (CL15) trigger changed part way into the run.

L1 Trigger	L2 Trigger	L3 Trigger
ST5 (20)	CL15 (12, 25)	J20
	CL40 (1)	J50
ST10 (1)	CL60 (8)	J70
	CL90 (1)	J100

Need to determine the effective prescale from the data

For an independent trigger counted the number of events that "Fired" the trigger compared to the number that was "Accepted" after prescaling.

Trigger	Fired	Accepted	Effective Prescale
ST5	3.32285e+06	166671	19.9366
C15	3.51361e+06	178608	19.6722
C60	2.89855e+06	362323	7.9999

Vertex Cut Correction

$\rightarrow$ Scaling the data by 1.05 before unsmearing.

W.K. Sakumoto and A. Hocker, *"Event* $|Zvtx| < 60cm$ *Cut Efficiency for Run II"*, CDF/ANAL/ELECTROWEAK/CDFR/6331.

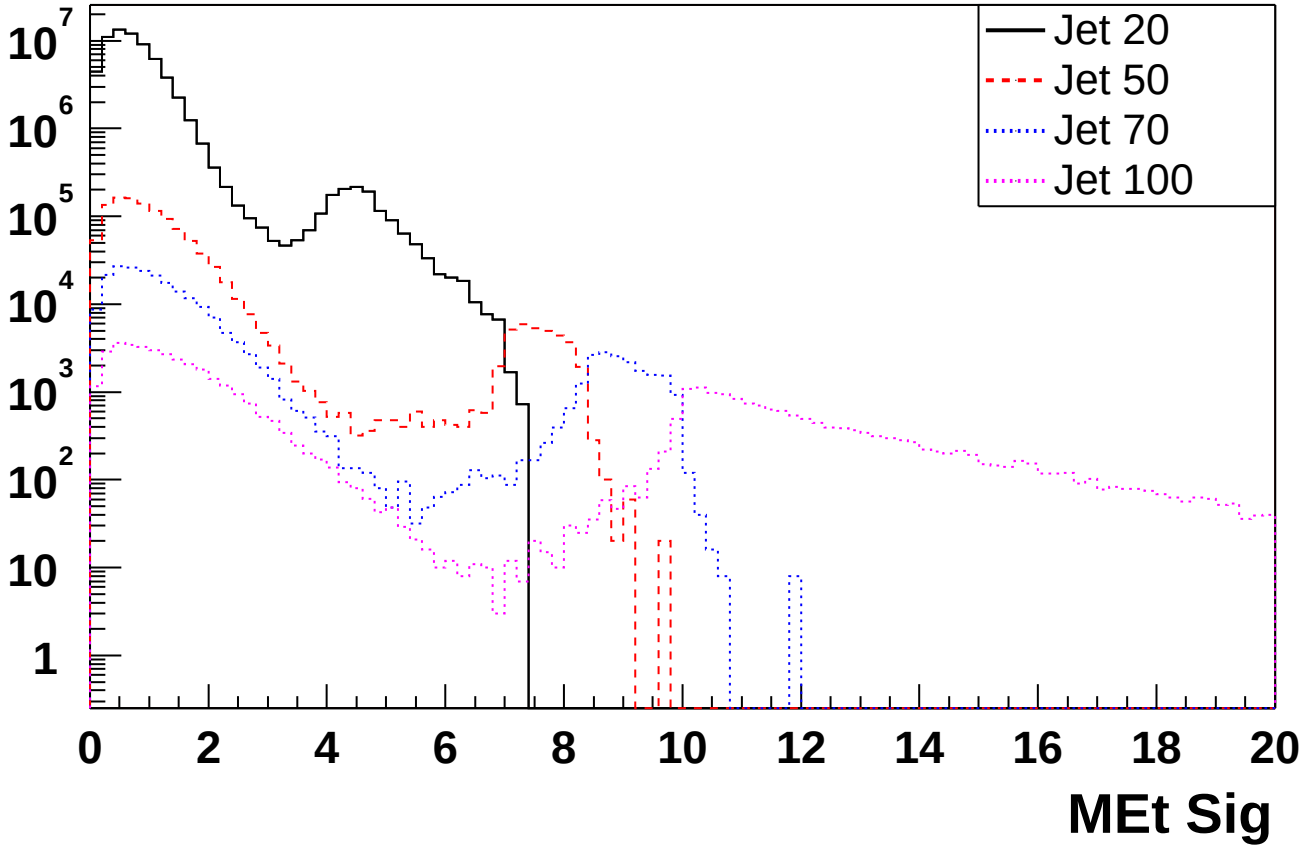
Event Selection

$0.1 < |\eta_{Det}| < 0.7$

$|z| \leq 60$ cm

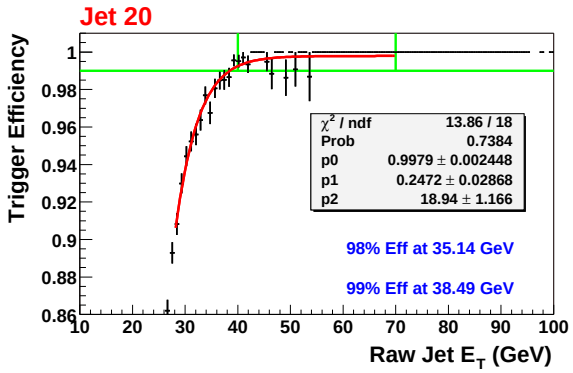
MEtSig $\leq$ X

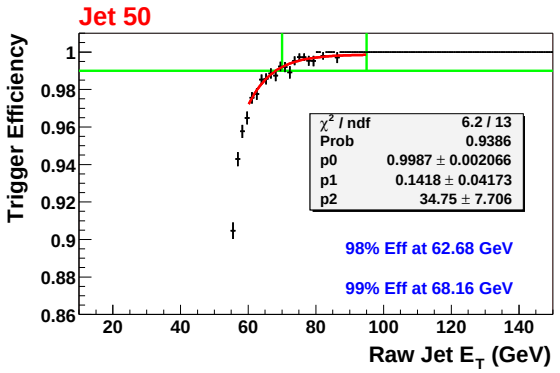
$E_{tot} \leq 1500$ GeV

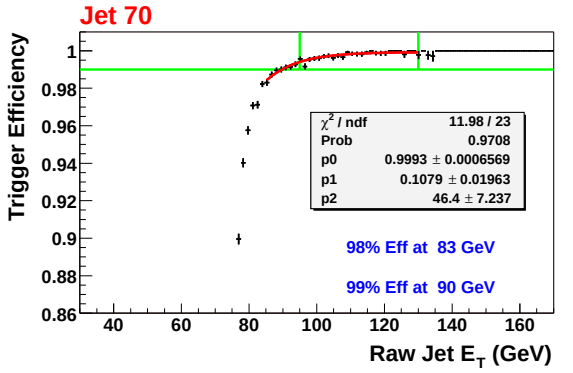


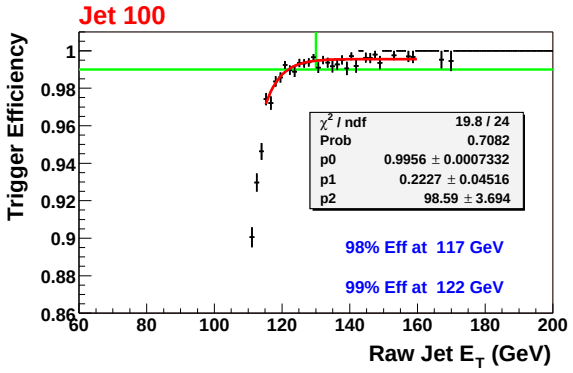

```
if ((jetFlag == 20)  && (metSig > 3.5)) evtOK = 0;
if ((jetFlag == 50)  && (metSig > 5))   evtOK = 0;
if ((jetFlag == 70)  && (metSig > 6))   evtOK = 0;
if ((jetFlag == 100) && (metSig > 7))   evtOK = 0;
```

CDF Run II Preliminary





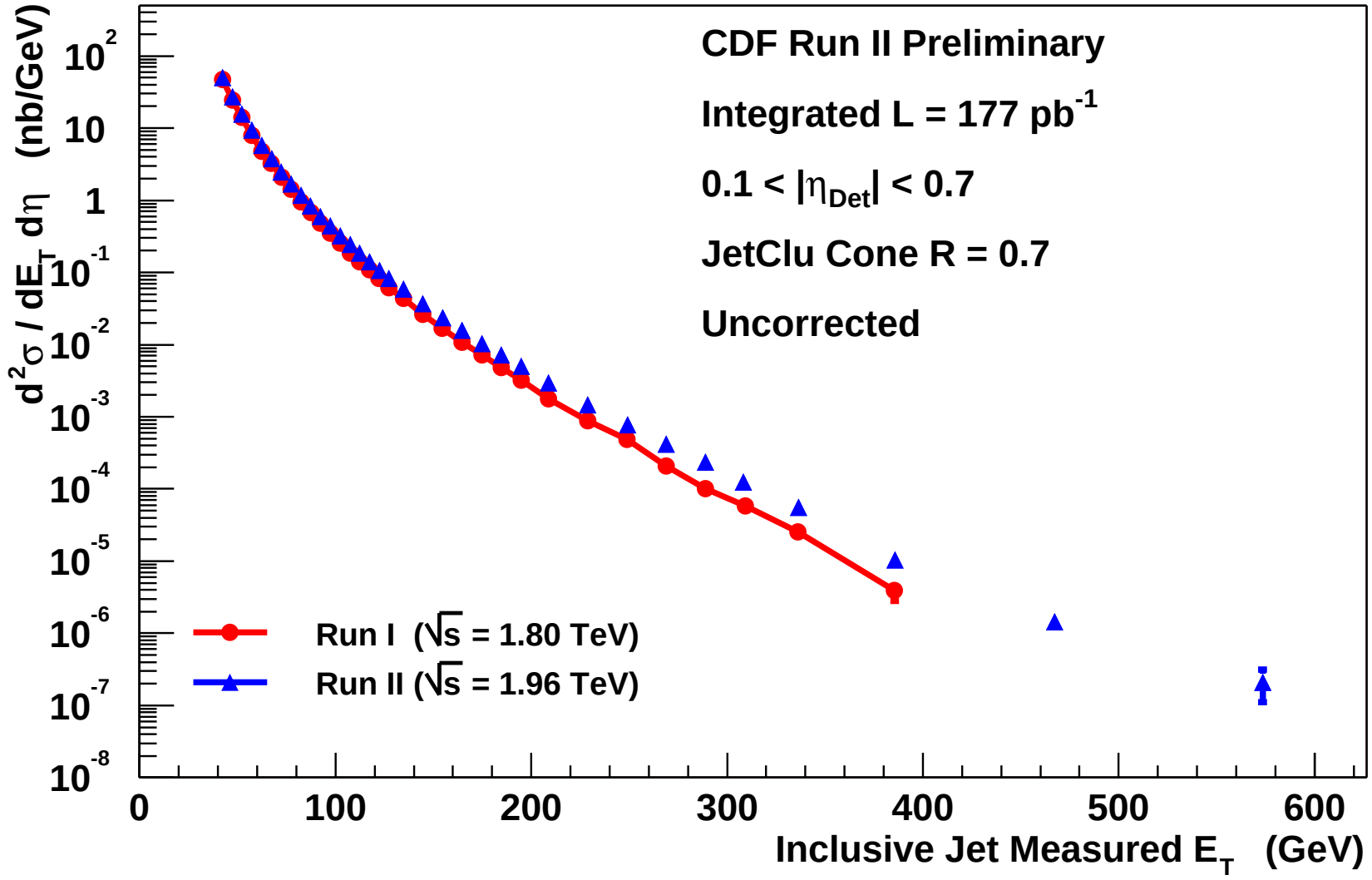




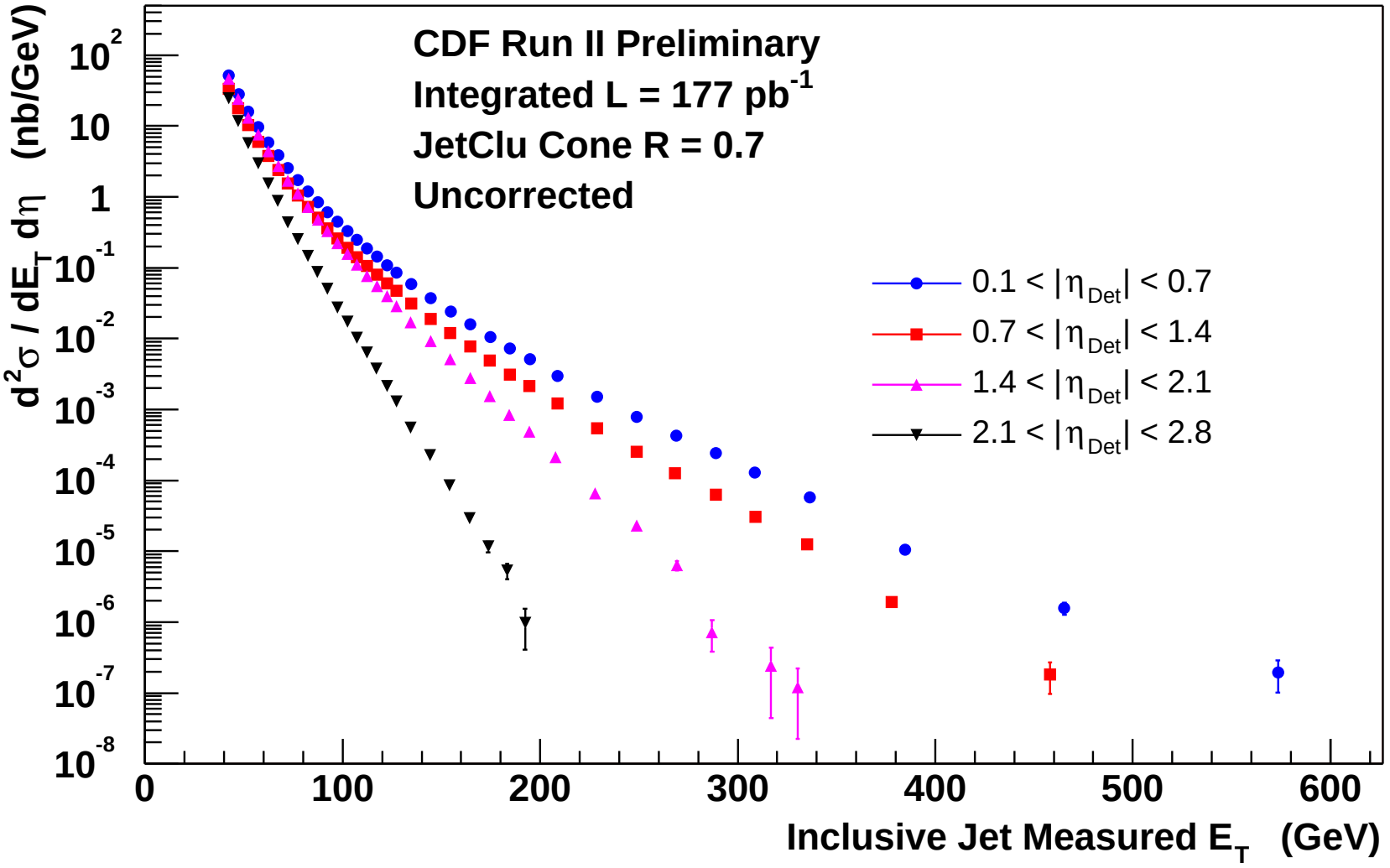
Staying far away from trigger threshold effects...

Trigger	ET Range	Trigger	ET Range
J20	40 - 70	J70	95 - 130
J50	70 - 95	J100	130 - 620

For Blessing



For Blessing



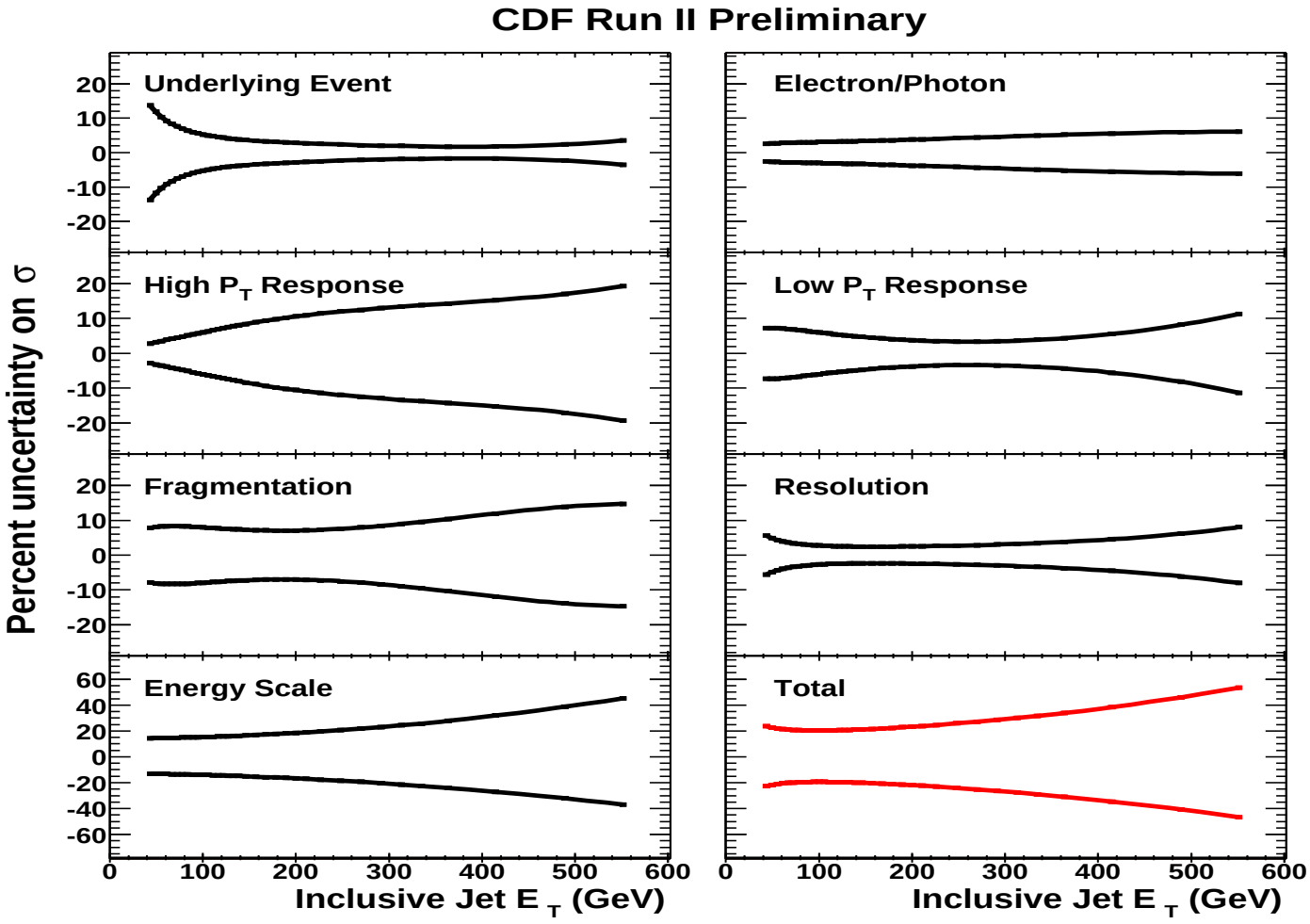
Systematic Errors

Consider the same sources of systematic error as in Run I.

Details can be found in FERMILAB-Pub-01/008-E

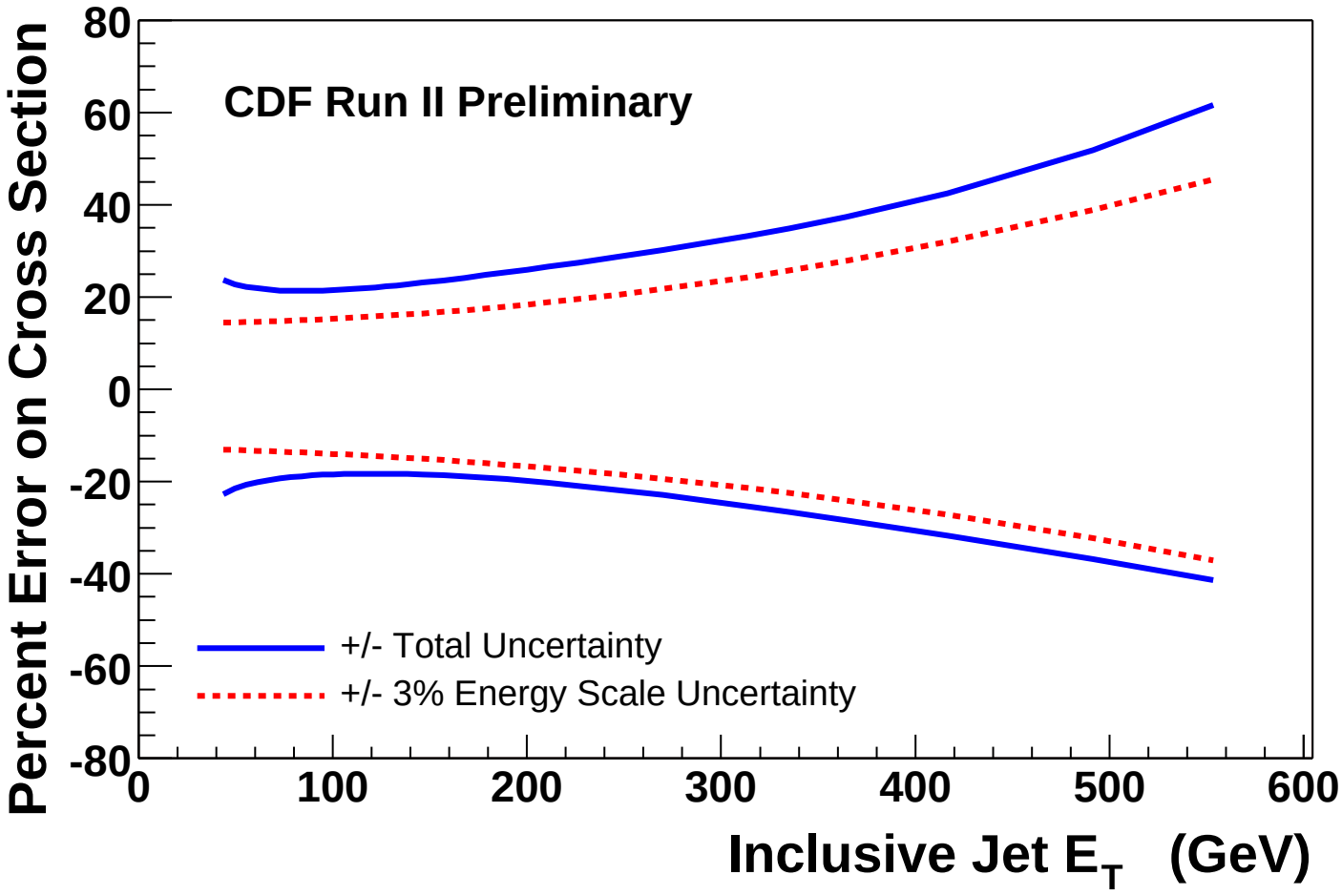
- "hi pt": High p_T hadronic response +3.2% -2.2%.
- "lo pt": Low p_T hadronic response $\pm$5%.
- "E scale": Energy scale stability $\pm$5%.
- "frag": Fragmentation.
- "uEvt": Underlying event $\pm$30%.
- "el/ph": Electron/photon response $\pm$2%.
- "Res": Calorimeter resolution $\pm$10%.

For Blessing



The dominant source of systematic error comes from the energy scale uncertainty (reduced from 5% to 3%).

For Blessing...



Error bands on the plots now show the total systematic error

Other Sanity Checks

• Comparisons of the MC and DATA measured distributions have the same qualitative features

• Varied the resolution functions used in the unsmearing → had a negligible effect on the corrected cross section.

• Unsmeared the MC.

→ Want to see if we can get back the inputted PDF when unsmearing the Run II MC using the Run I unsmearing proceedure

→ Using Pythia Tune A with CTEQ 5L (LO)

→ Combined the different samples PT 18, 40, 60, 90, 120

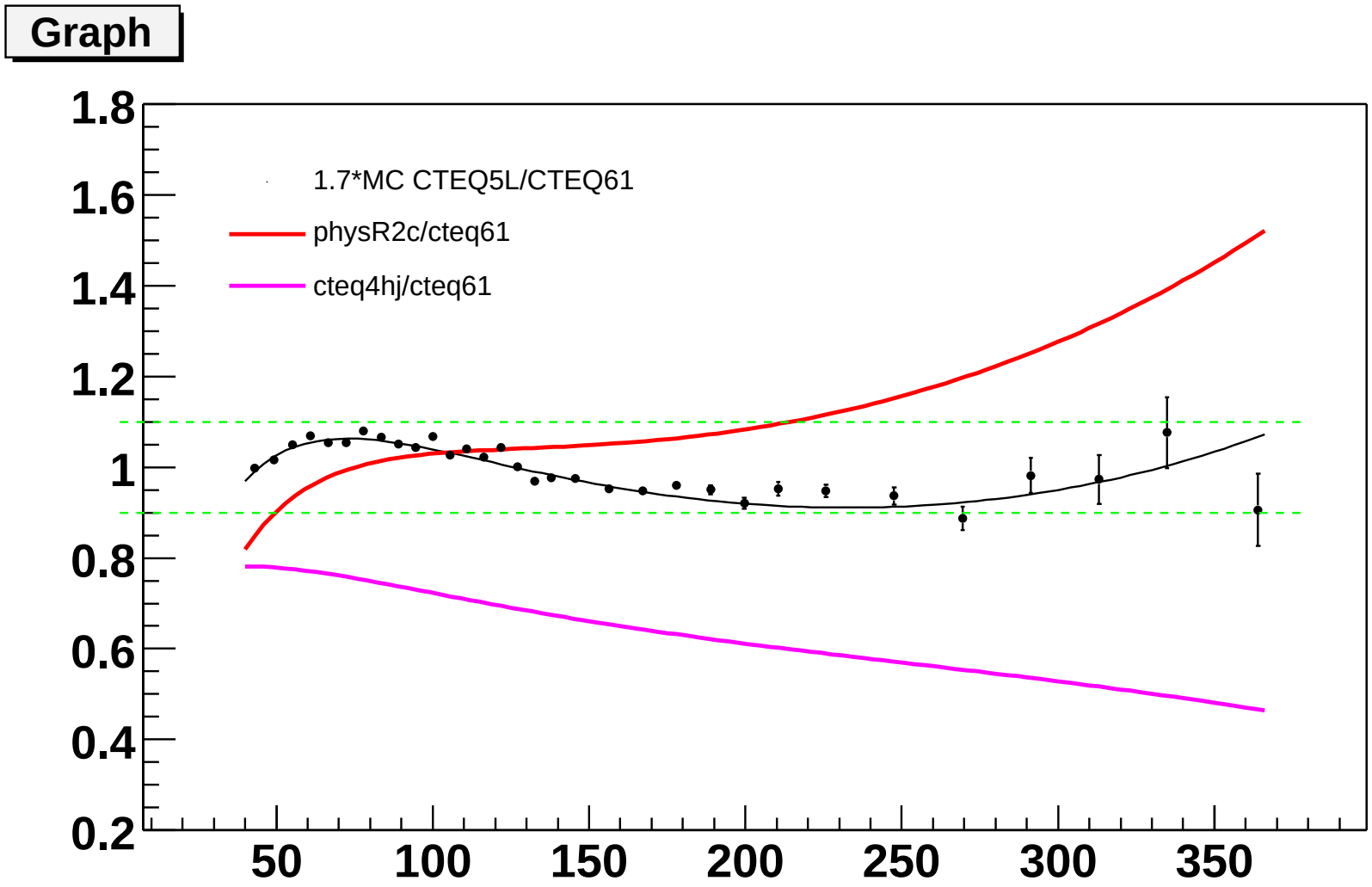
Issues:

The Run II MC simulation does not reproduced the Run I energy response.

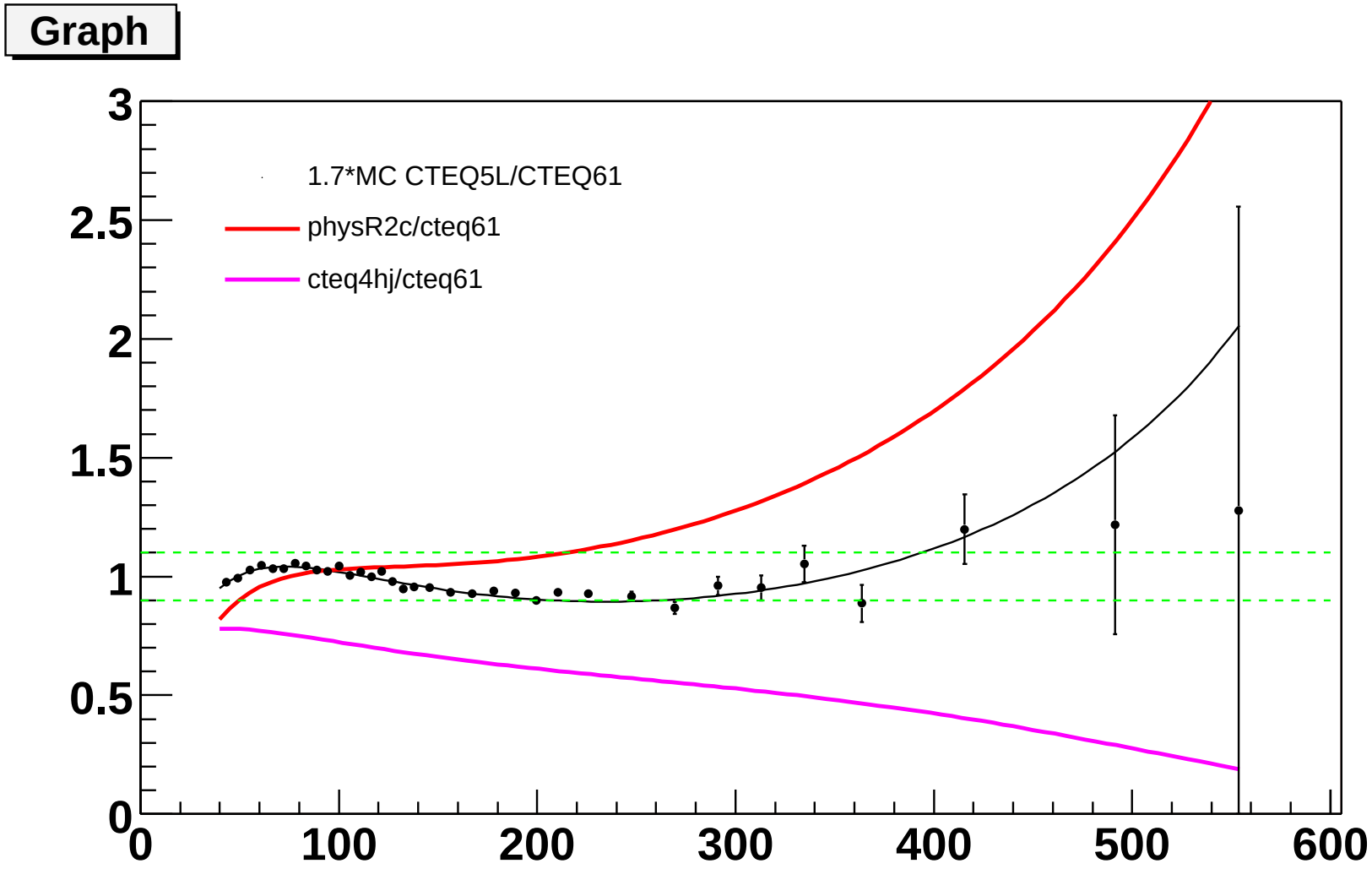
Using Run I unsmearing (central calorimeter region is the same...)

Compared the unsmeared results to CTEQ6.1, not CTEQ5L.

Added PT18 and PT120 samples and removed PT5 and PT10 to reduce fluctuations from having large weights.



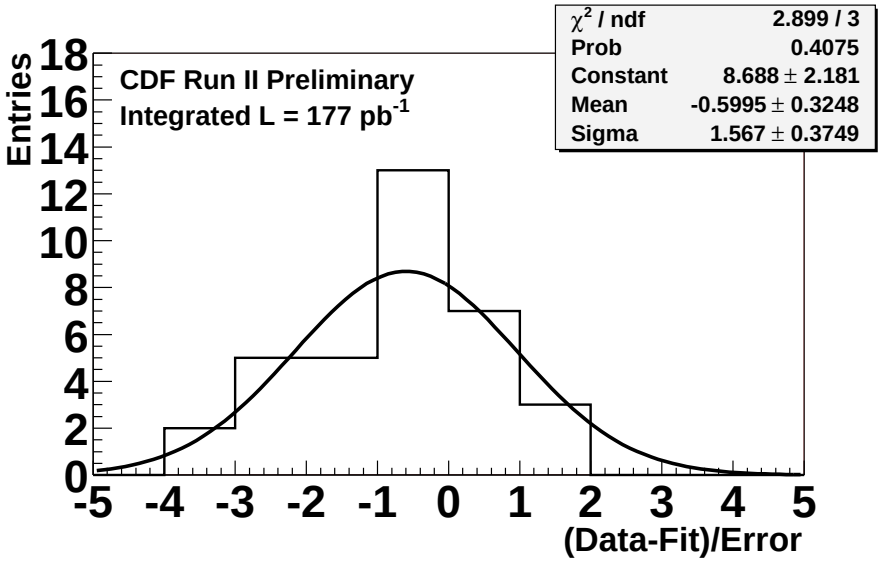
Looks encouraging - Does not appear that the unsmearing procedure is doing something crazy...

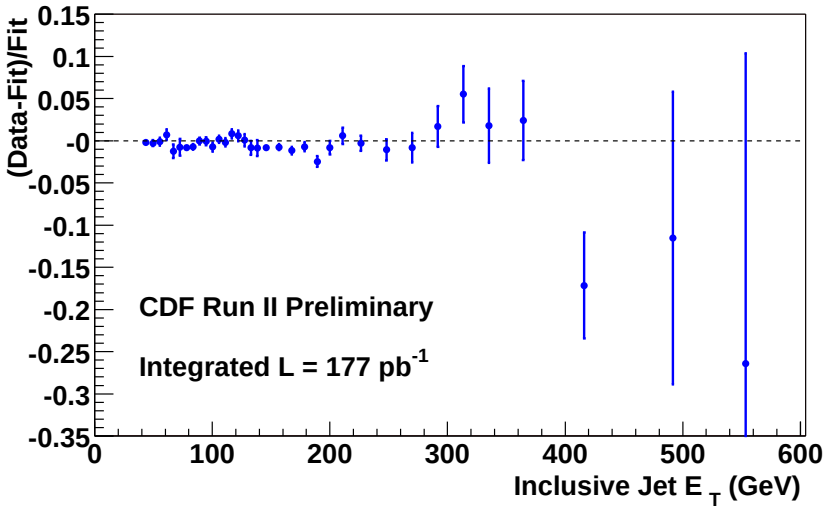


Need more MC at higher E_T...

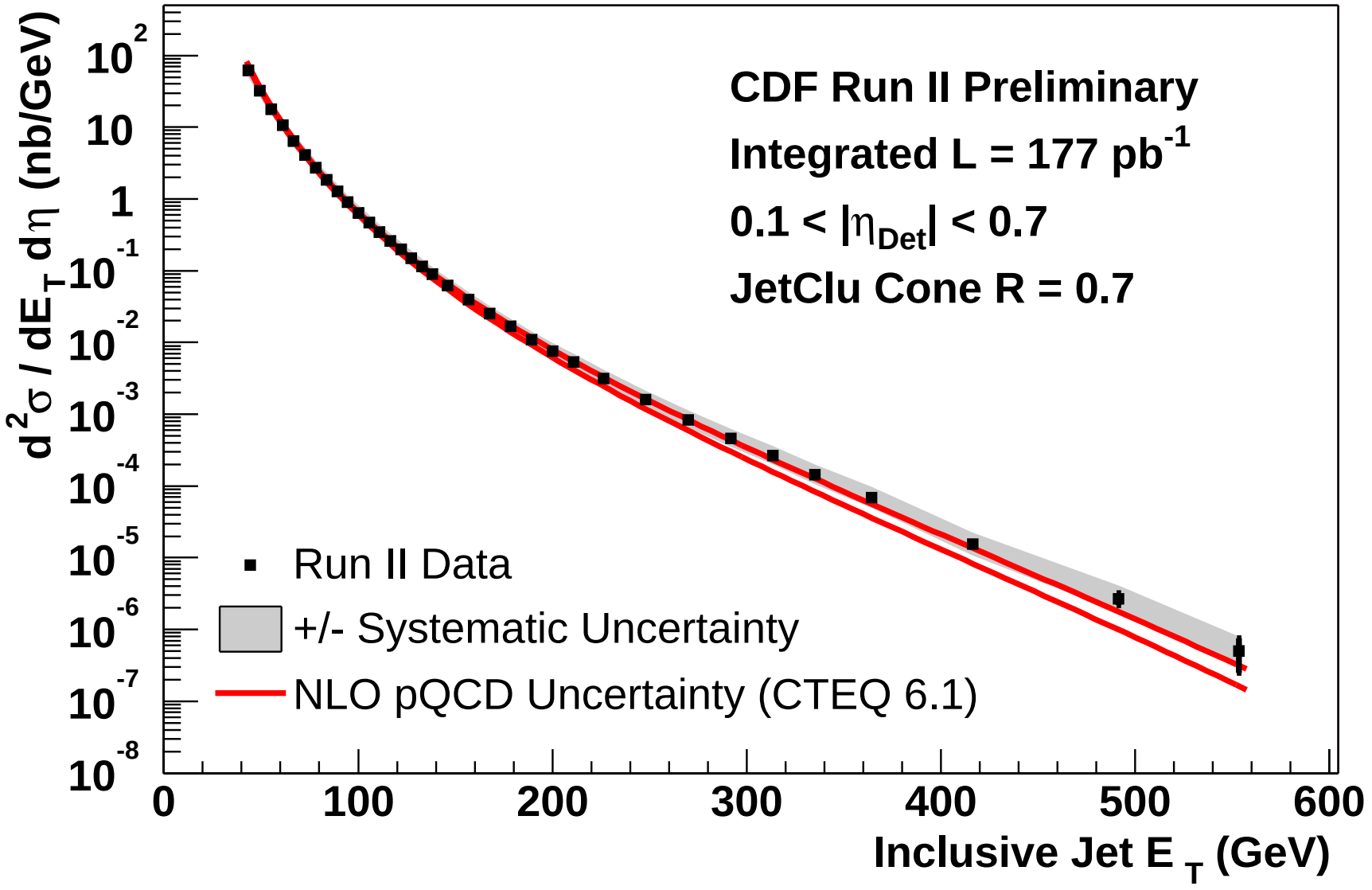
With the increased statistics the data is smoothing out.

For Blessing

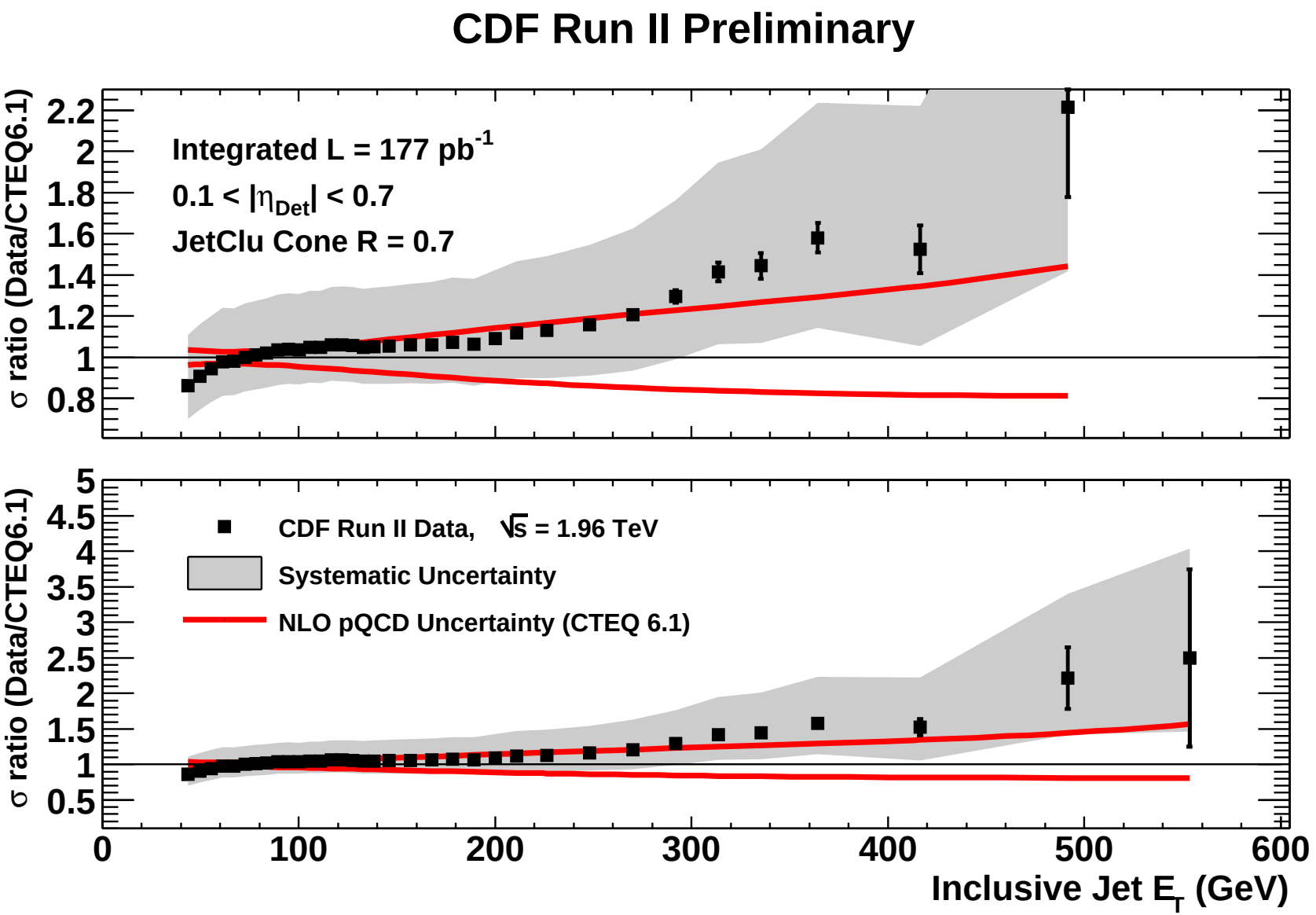




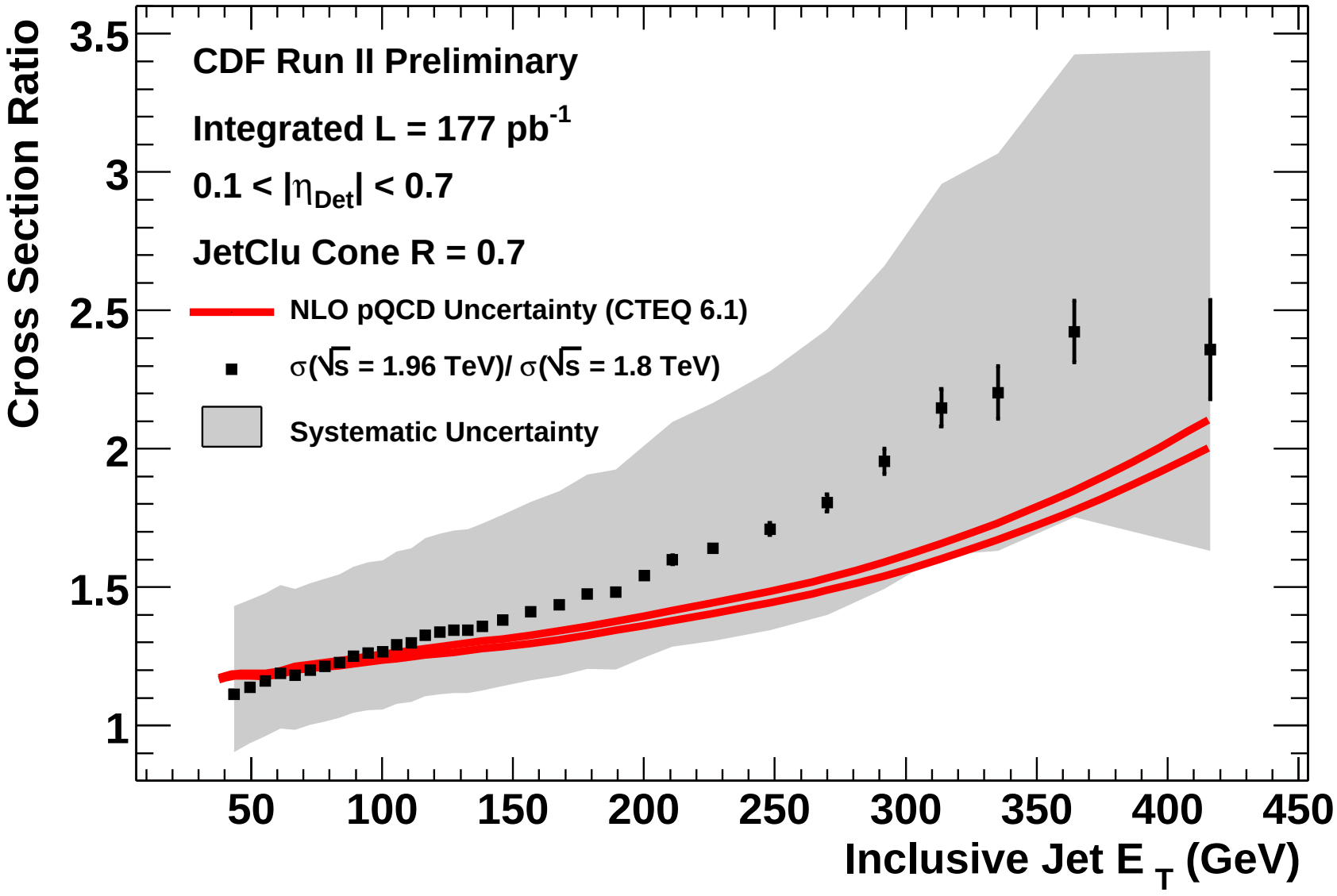
For Blessing…



For Blessing…

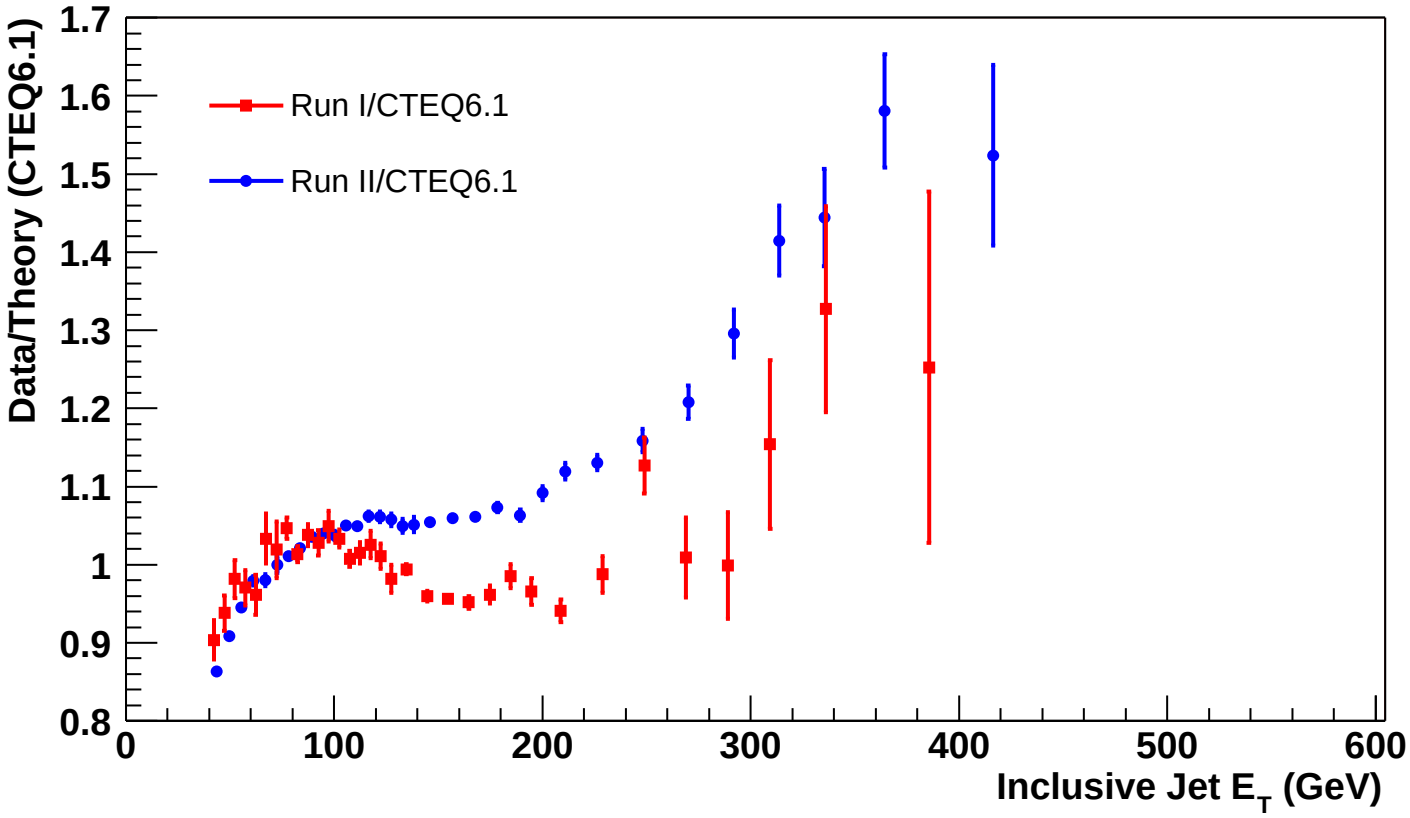


For Blessing…



See same features as in Run I

Low at low E_T high at high E_T



With the increased statistics these features are more evident...

Conclusions

We now have significantly more data, more than the Run I analysis and more than double our preliminary Run II result.

Better understanding of the energy scale (5% $\rightarrow$ 3%).

Have done a number of checks, varied the resolution function, compared data with MC and unsmeared the MC...

See same features as in Run I and with the increased statistics they are more evident.