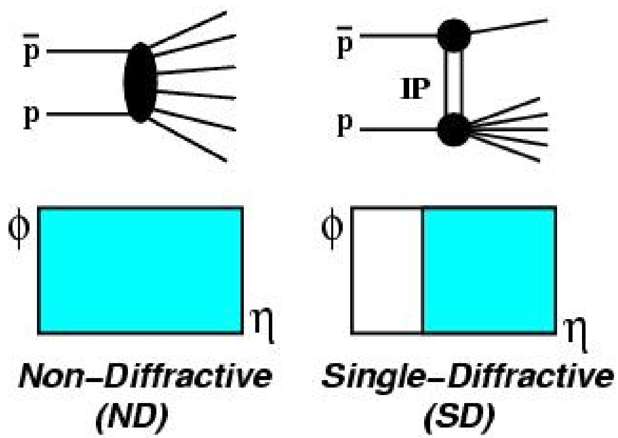
Run II Diffractive Results: Q&A

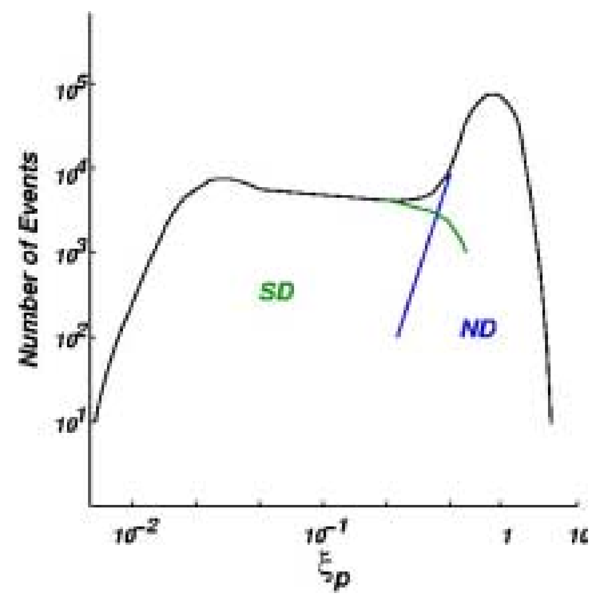
- ✓ Introduction
- ✓ Overlap Rates
- ✓ MP calibration
- ✓ Plots for Blessing

Diffractive Dijets



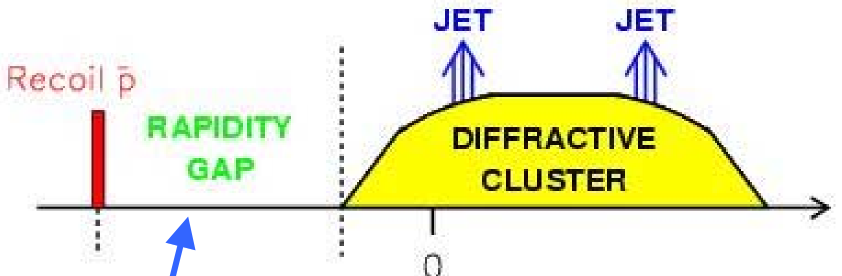
- Compare diffractive events to ND
- Measure diffractive structure function from $R_{SD/ND}$ vs x_{bj}

Measure ξ (pbar momentum loss fraction) from calorimeter information



ξ : Momentum Loss Fraction

Measure fractional momentum loss of anti-proton



$\Delta y = \ln(1/\xi)$

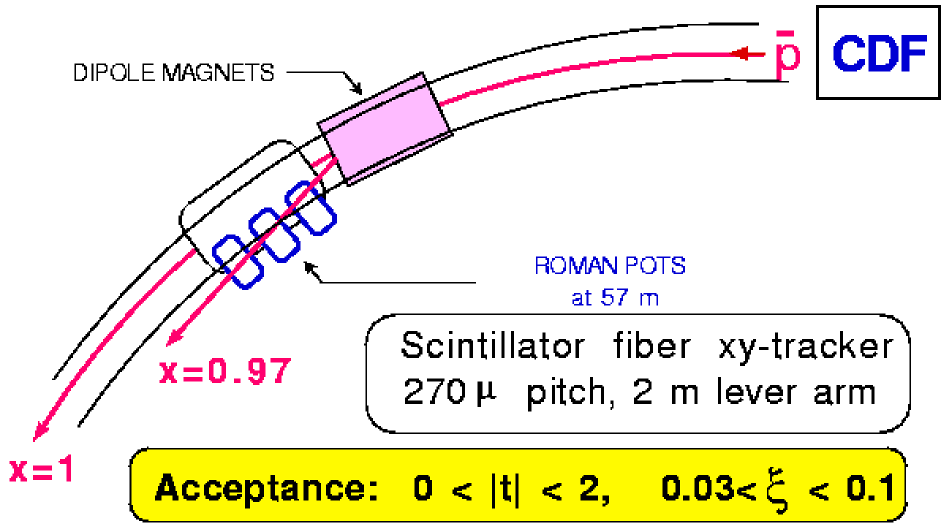
$$\xi = \frac{M_X^{\ 2}}{s}$$

⇨ $\xi = \Sigma E_T e^{-\eta} / \sqrt{s}$

Diffractive events are boosted towards positive η

⇨ small ξ

Trigger



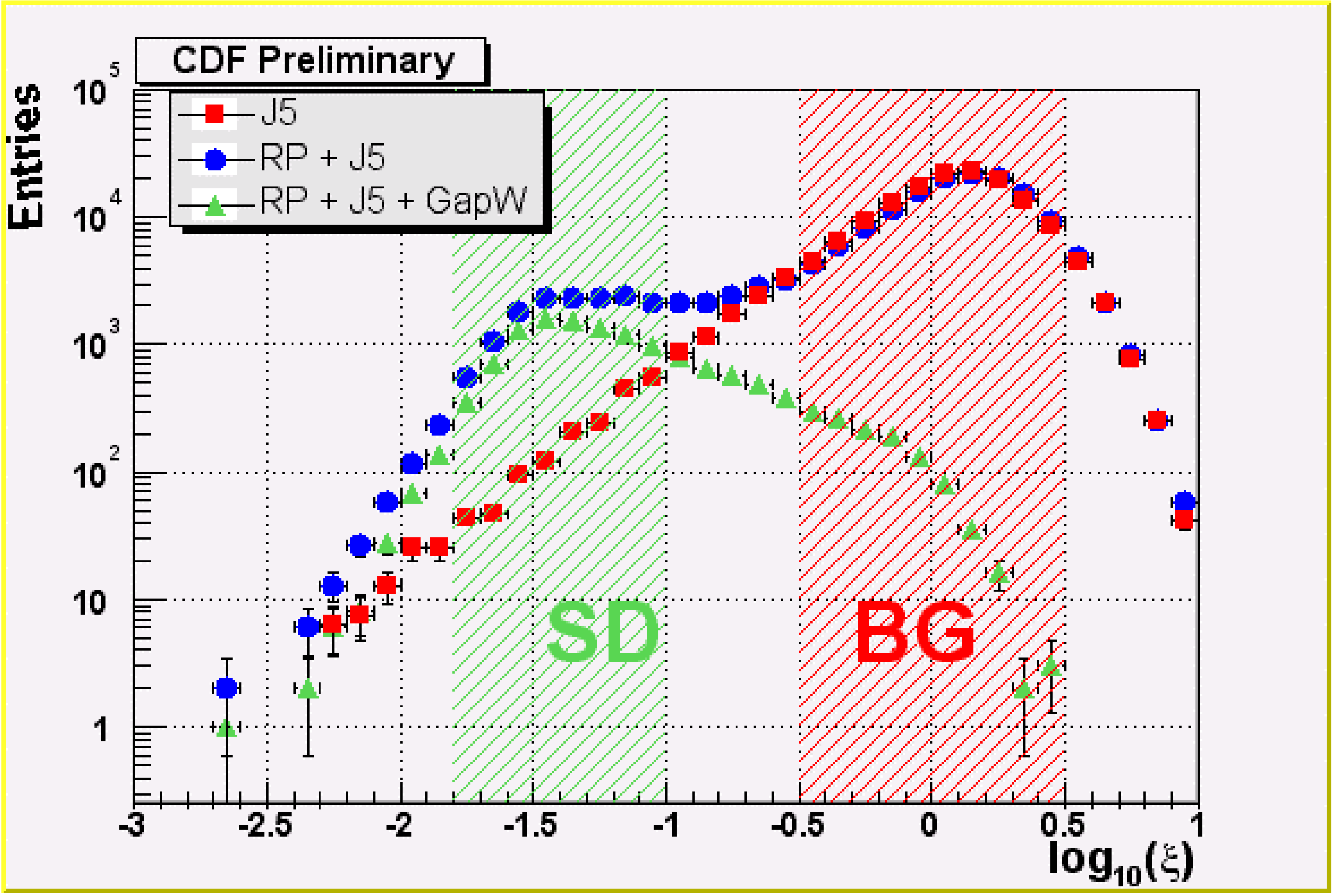
require jets

- RP is triggered on leading antiprotons
- Use RP + jet triggers

Data Sample

- Use dedicated diffractive triggers
  - RP+J5 (diffractive sample)
  - J5 (control sample)
- Data sample ~9 pb^{-1} (PHYSICS_1_03_v1)

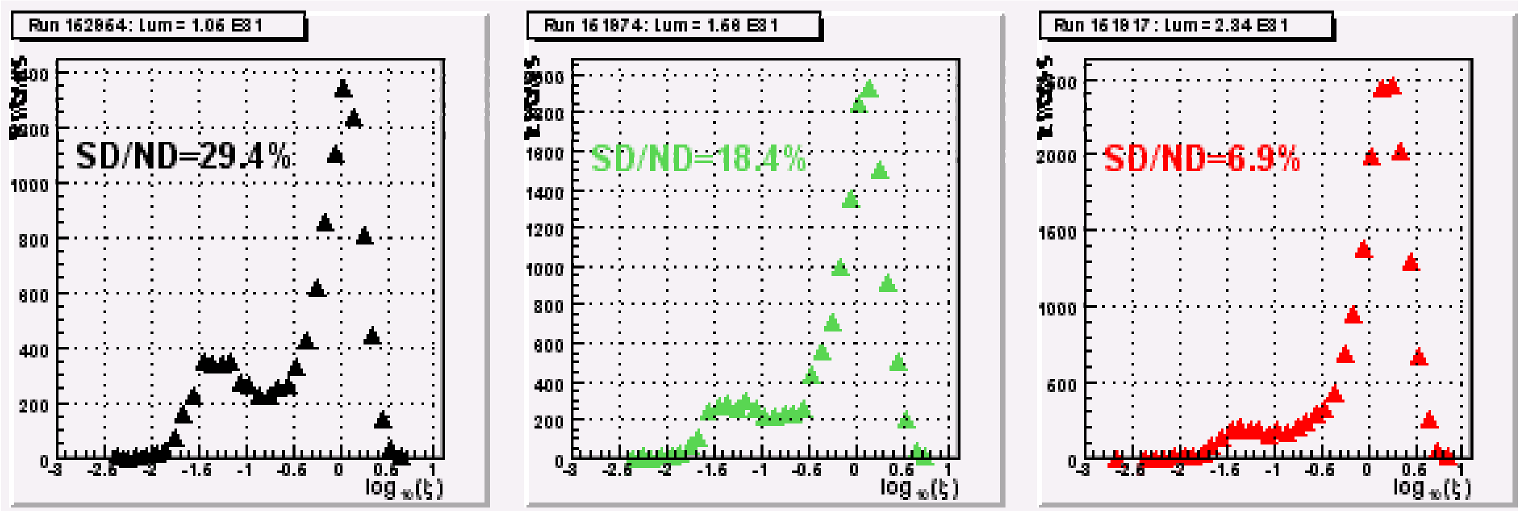
ξ Distribution



Question # 1

Q : Is the BG peak at $\xi \sim 1$ due to overlap events from multiple interactions?

Luminosity Dependence



Luminosity: 1.0 E31 1.5 E31 2.3 E31

Overlap Rate

J5 x RP overlap

SD x MB overlap

$$R\,(ND/SD) = \frac{\sigma^{ND}\,(1 - e^{-n_{RP}}) + \sigma^{SD}\,(1 - e^{-n})}{\sigma^{SD}\, e^{-n}}$$

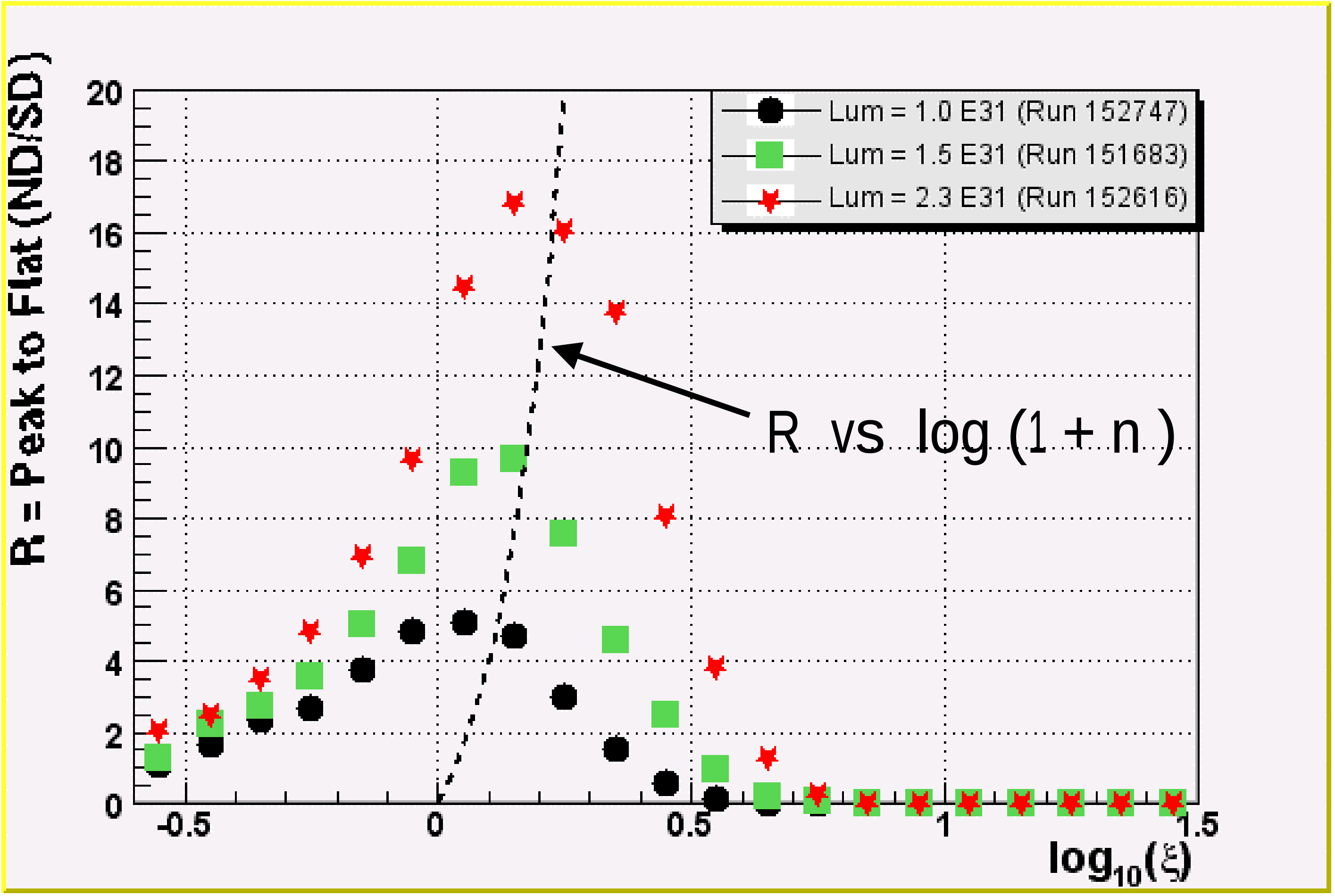
SD surviving MB overlap

$n_{RP} = (1\ \mathrm{mb}/50\ \mathrm{mb}) \times n\,, \quad n = 0.3 \times L[1 \times E31]$

$\sigma^{ND} / \sigma^{SD} \sim 600$

$\Rightarrow R\,(ND/SD) = 12\,n\ e^{n}$

Multiple Interactions Shift ND Peak



Run I vs Run II

	Run I	Run II
L um / bunch	0.16E30 / 6	20.0E30 / 36
$\sigma^{ND} / \sigma^{SD}$	300 (lower jet E_T)	600

R (Run I/Run II) = 1/60

R (Run II) = 10 ⇨ R (Run I) = 0.15

Answer to Q# 1

Q : Is the BG peak at $\xi \sim 1$ due to overlap events from multiple interactions?

A : Yes.

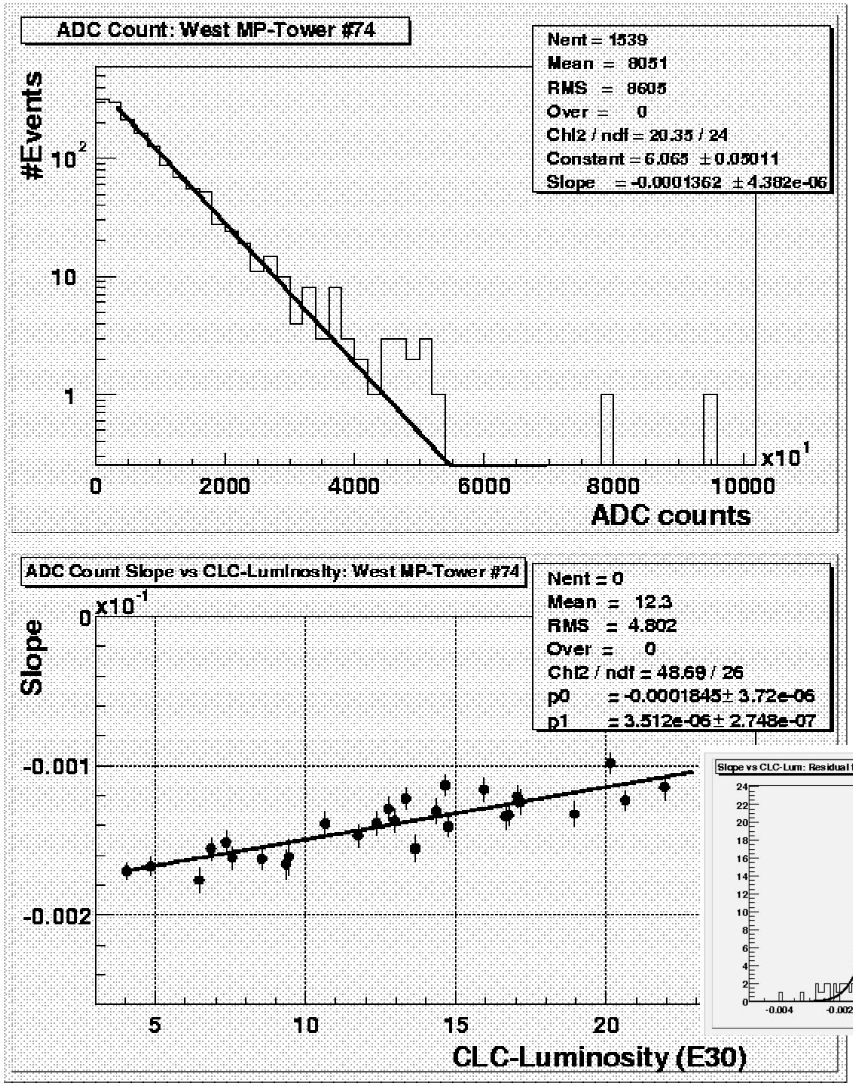
1. Ratio is consistent with Run I numbers and Run II expectations.
2. Peak at $\xi \sim 1$ shifts according to luminosity, as expected.

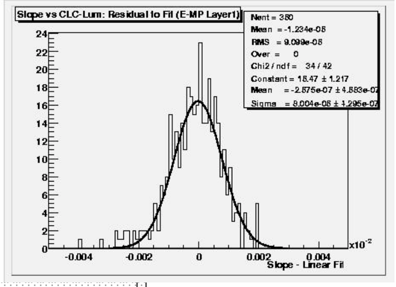
Question #2

Q : What is the effect of the MP energy scale calibration ?

MP Calibration

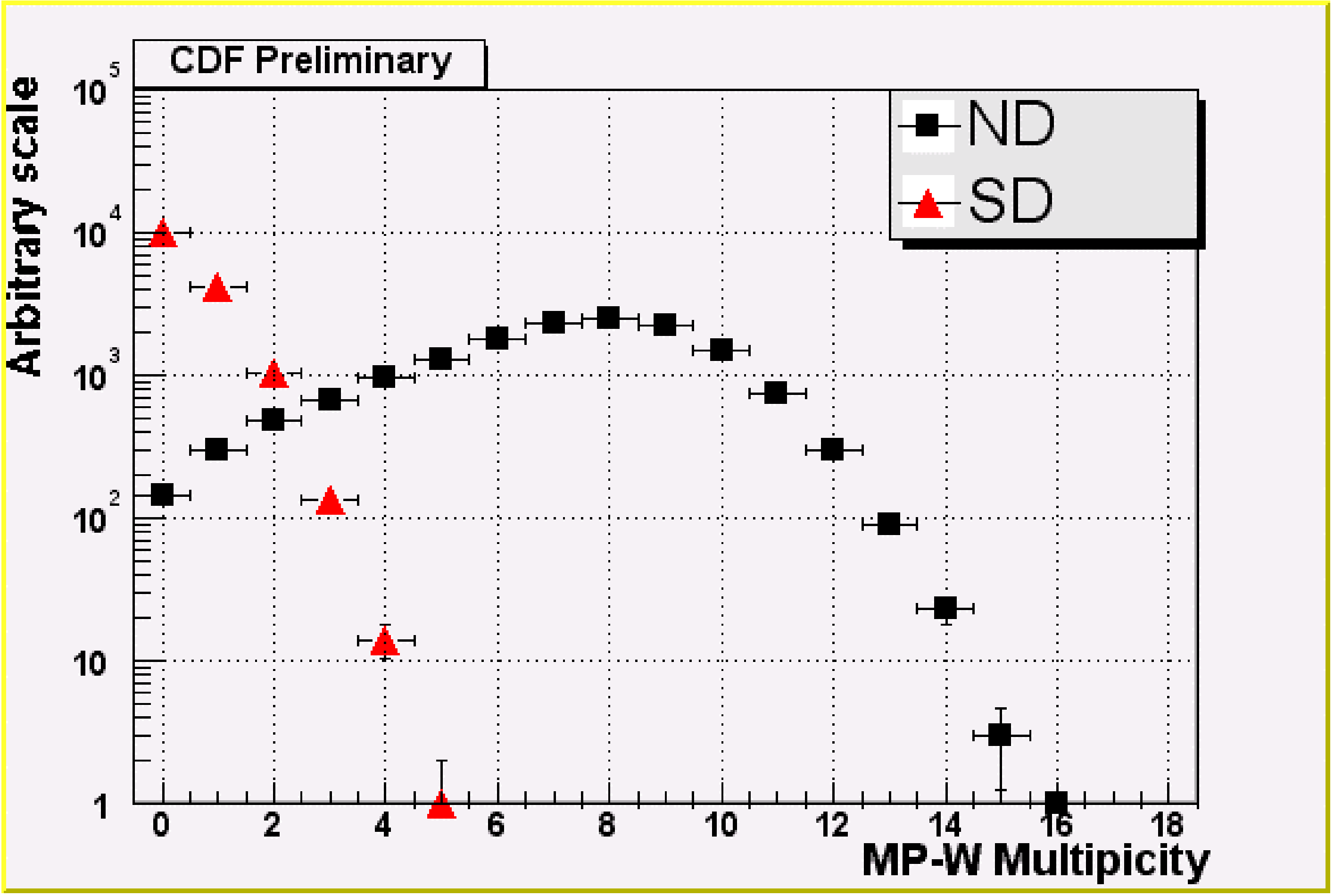
- Use slope from ADC distribution
- Tower-to-tower relative calibration with data/MC
- Energy scale from MC
- MC/MBR



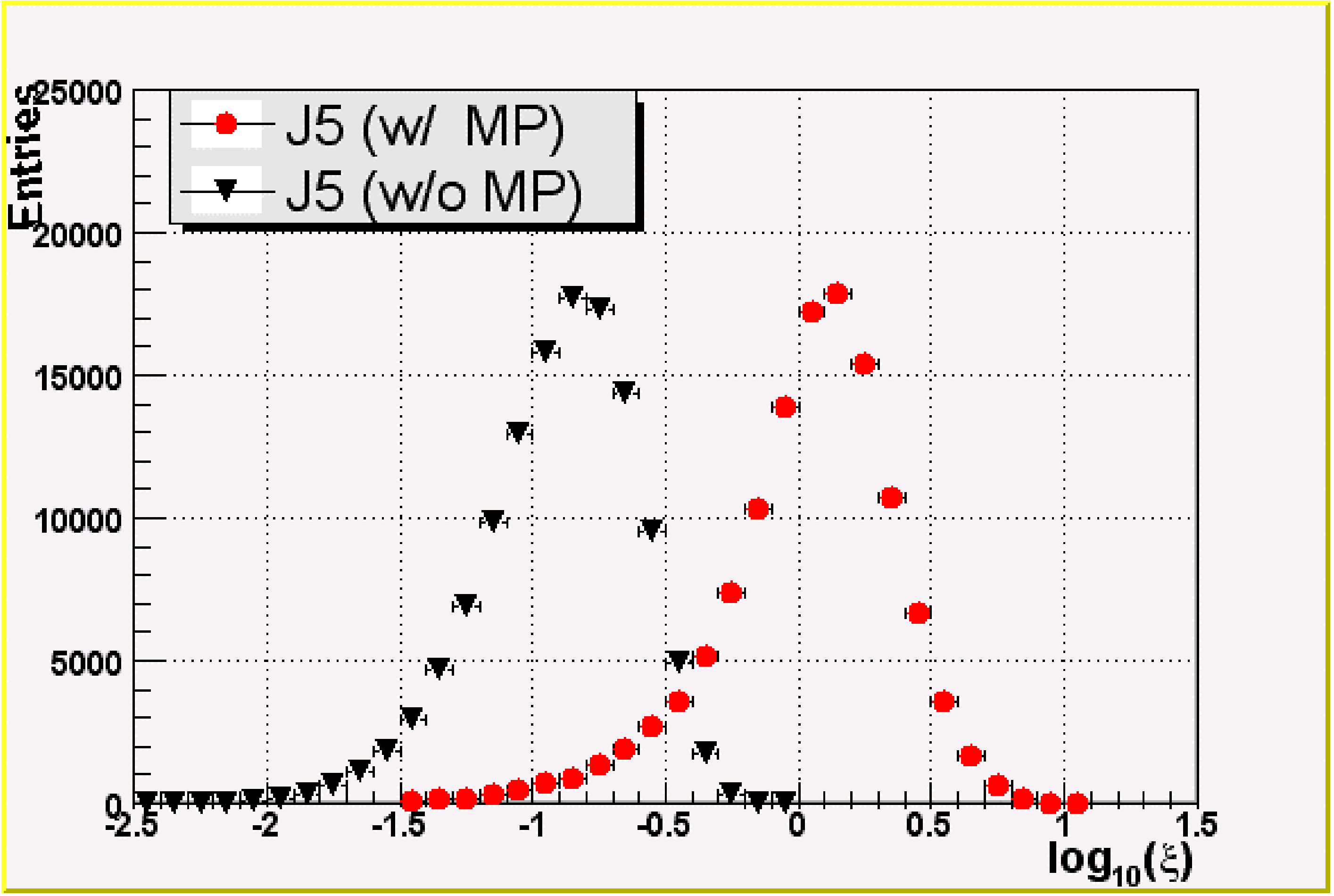


- ✓ Pile-up at high luminosity
- ✓ (Slope-Fit)/Fit ~7% for each η ring
- ✓ Time dependence (LED)

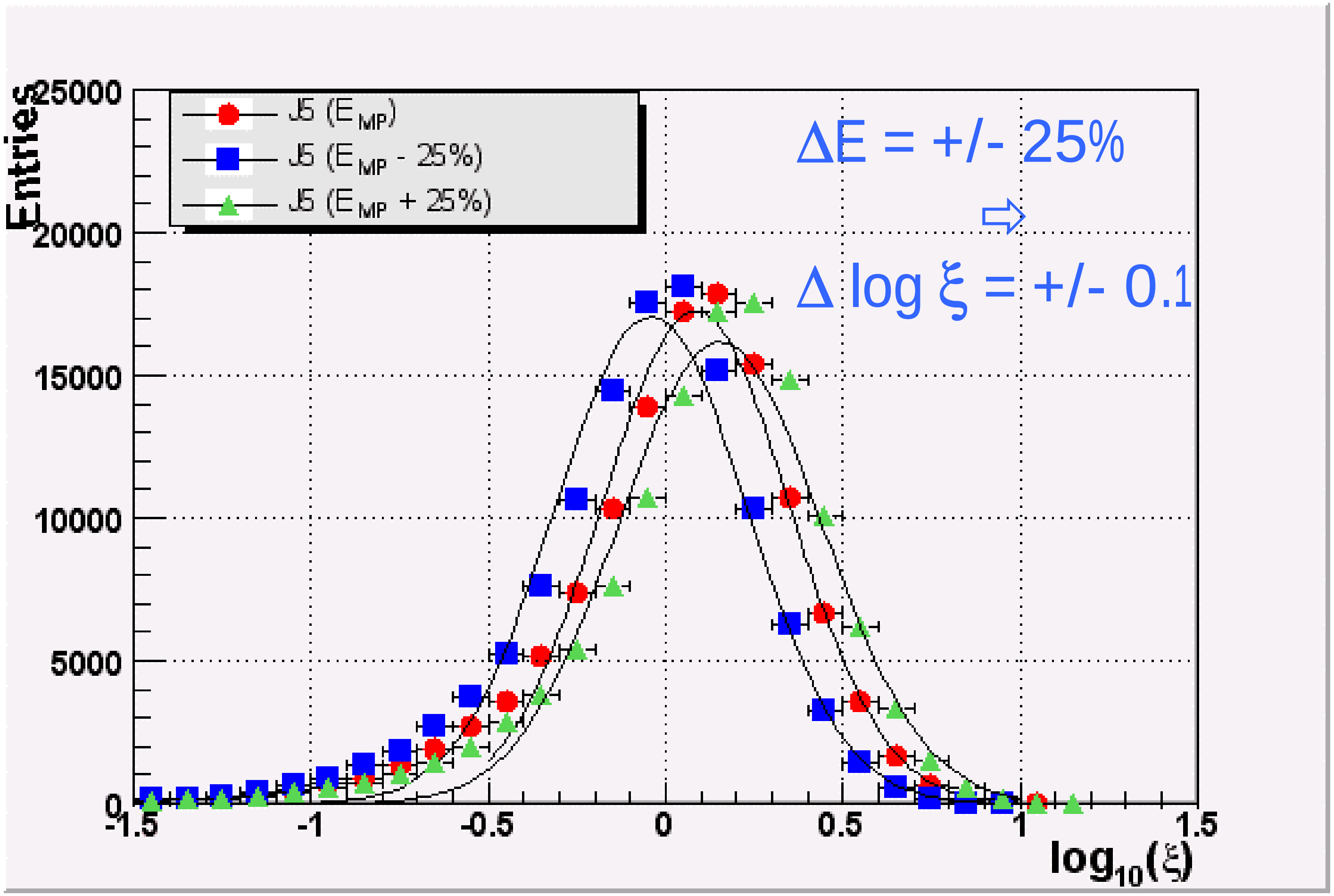
MP Multiplicity



MP Contribution to ξ_{ND}



Effect of MP Energy Scale



Answer to Q#2

Q : What is the effect of the MP energy scale calibration ?

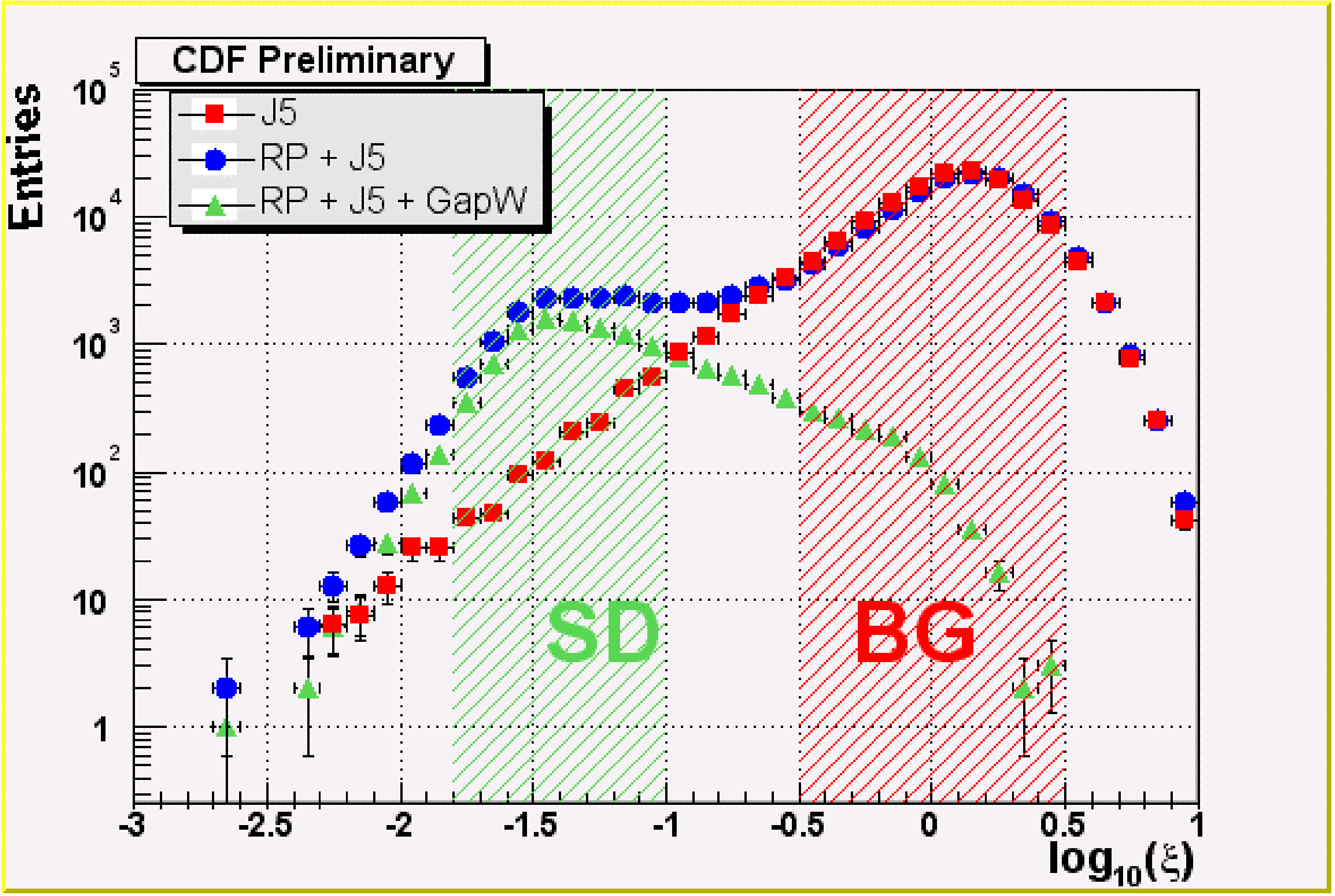
A : An energy scale variation of +/- 25% yields $\Delta \log \xi$ = +/- 0.1.

1. $\Delta \log \xi = 0.1$ is the bin width of our ξ distribution .
2. Peak position in data is centered where expected, indicating the energy scale uncertainty is < 25% .

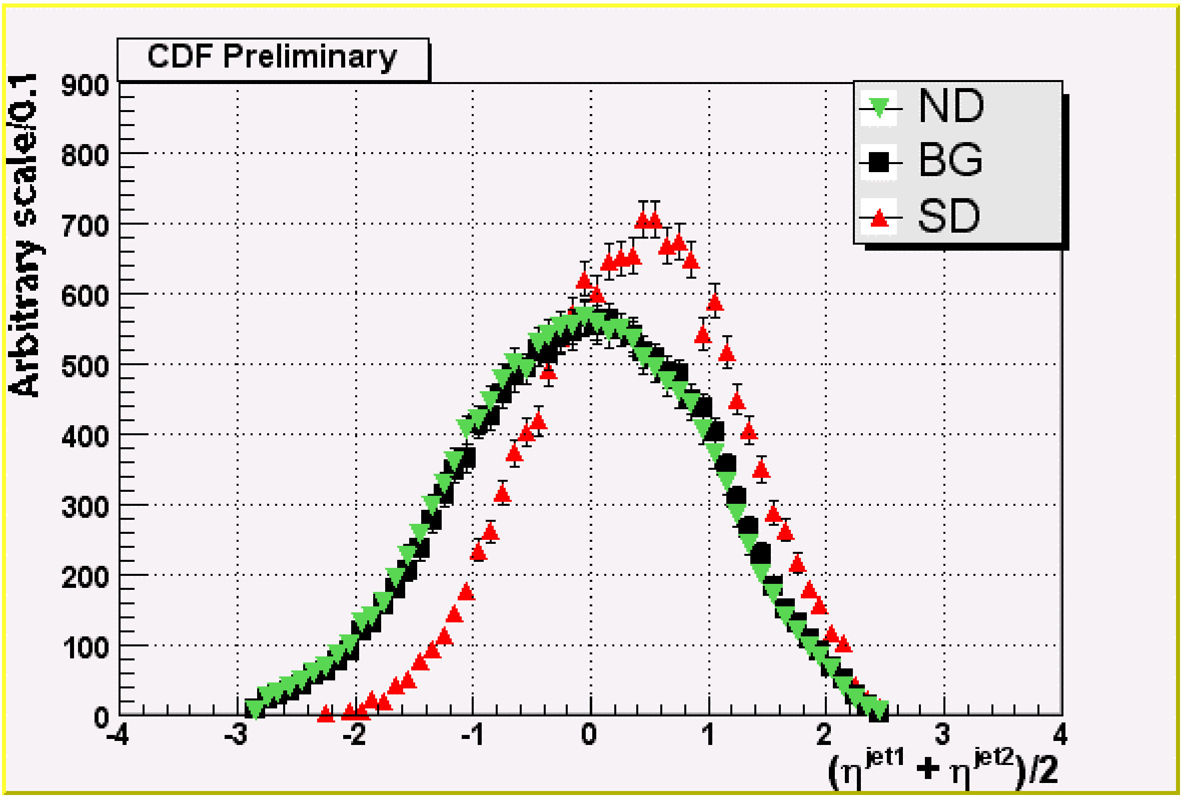
Plots For Blessing

Suggested modifications have been implemented

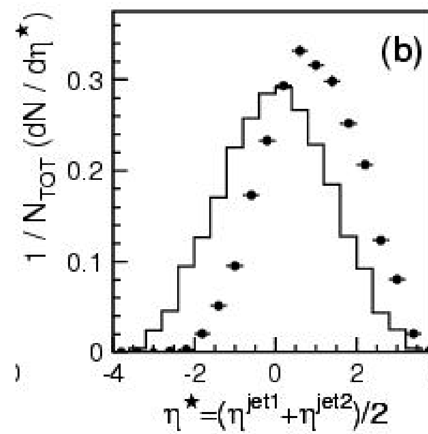
ξ Distribution



Rapidity

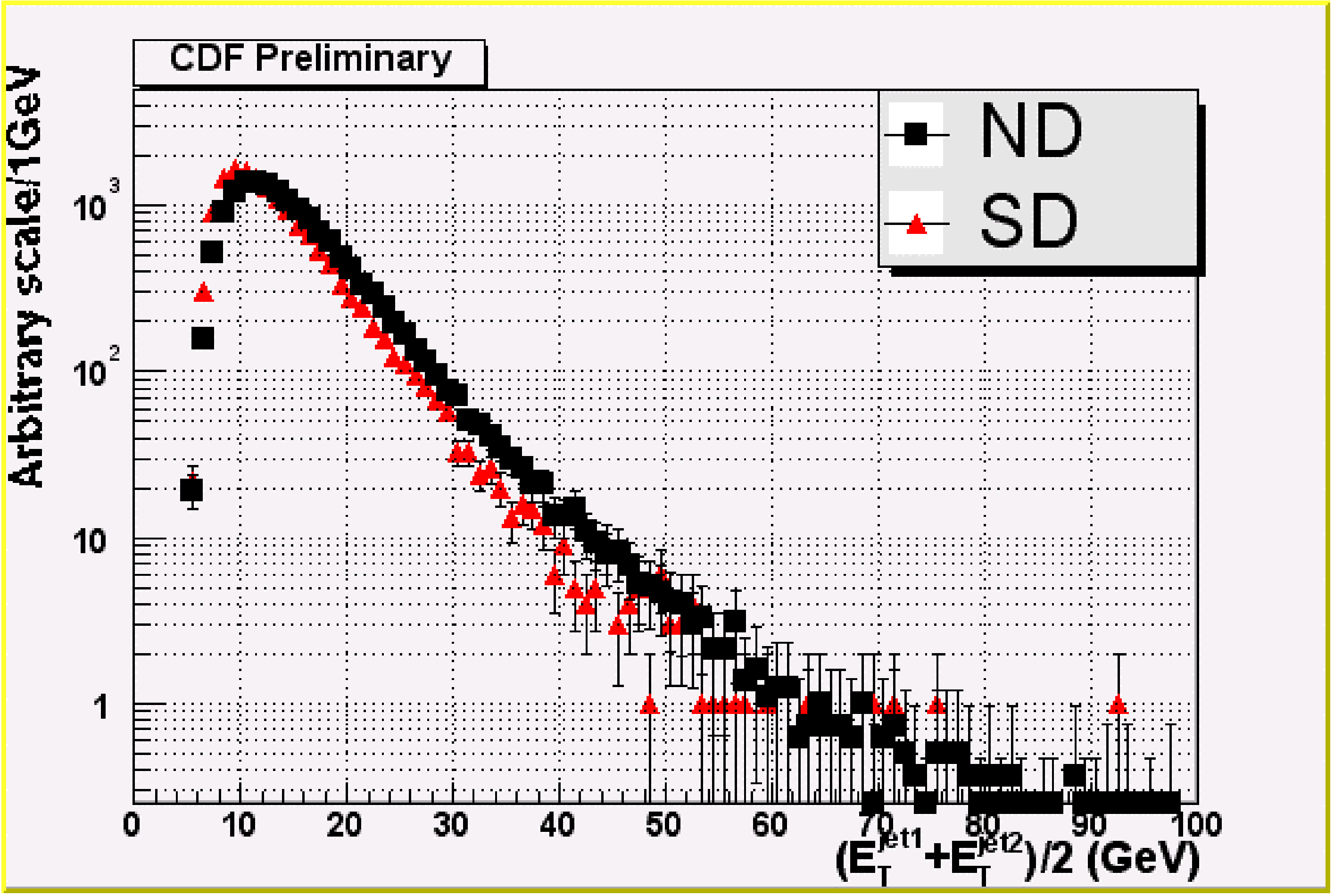


Run I PRL

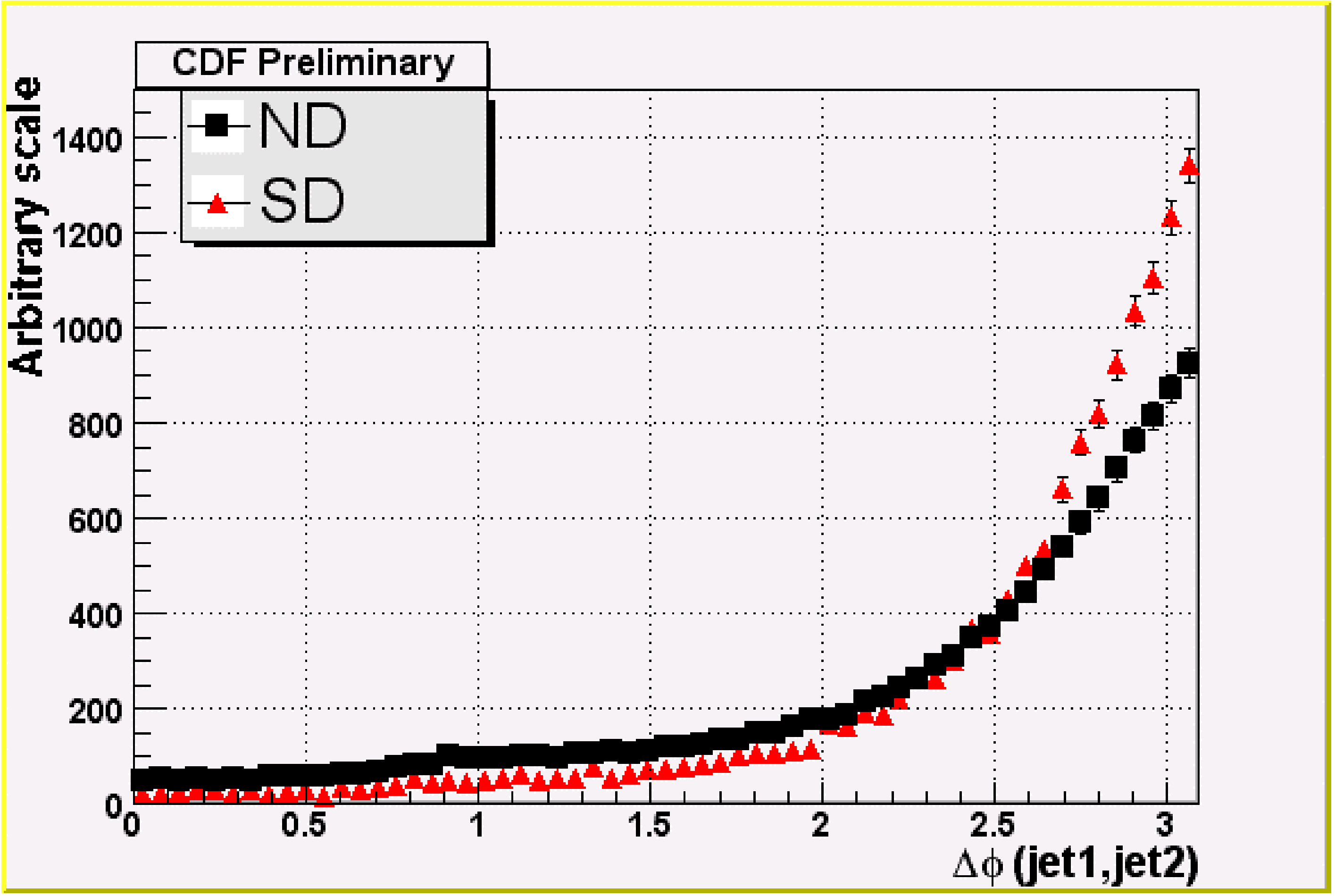


⇨ Diffractive dijets are boosted away from the recoil antiproton

Mean Dijet E_T

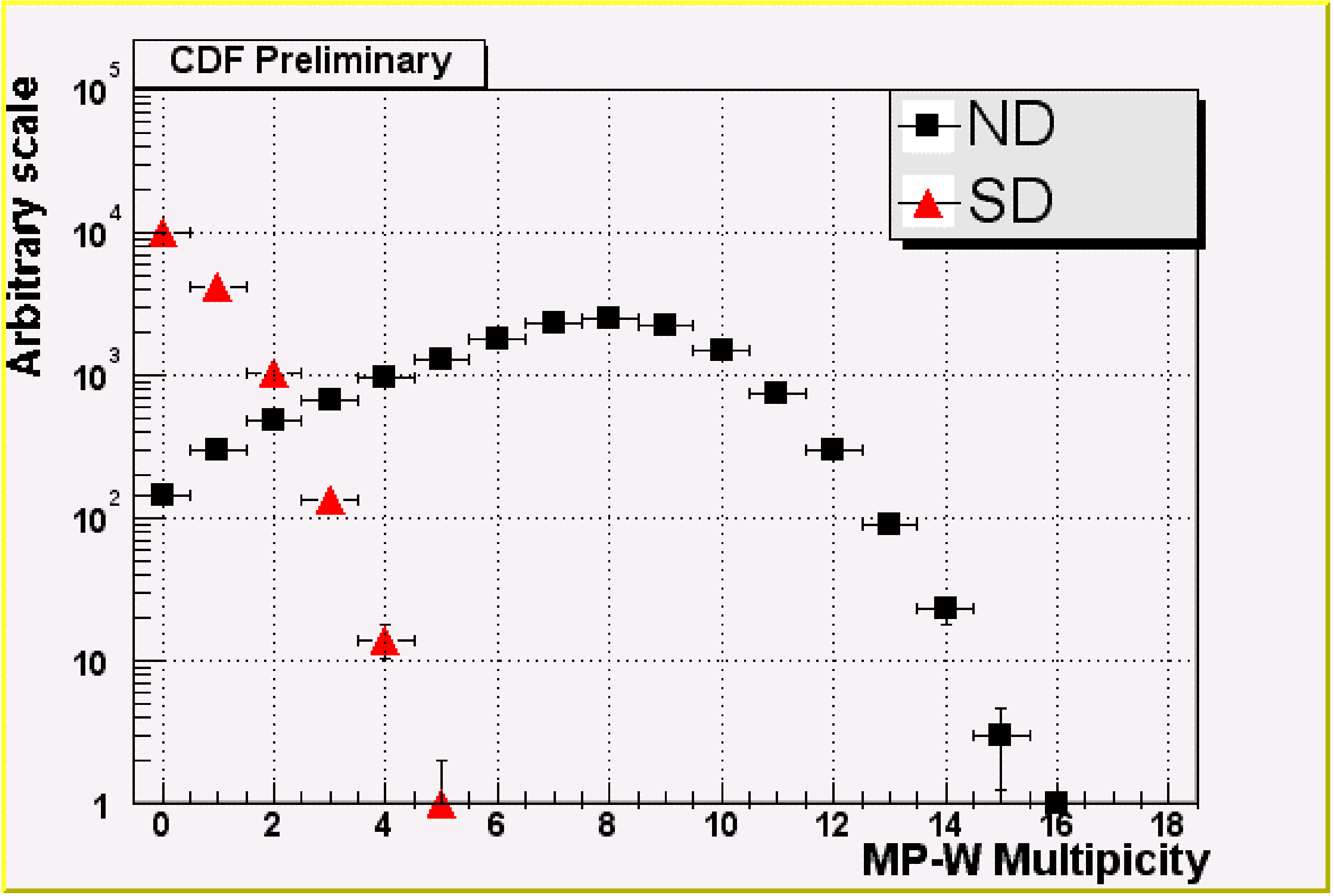


$\Delta\phi$ (jet$_1$-jet$_2$)

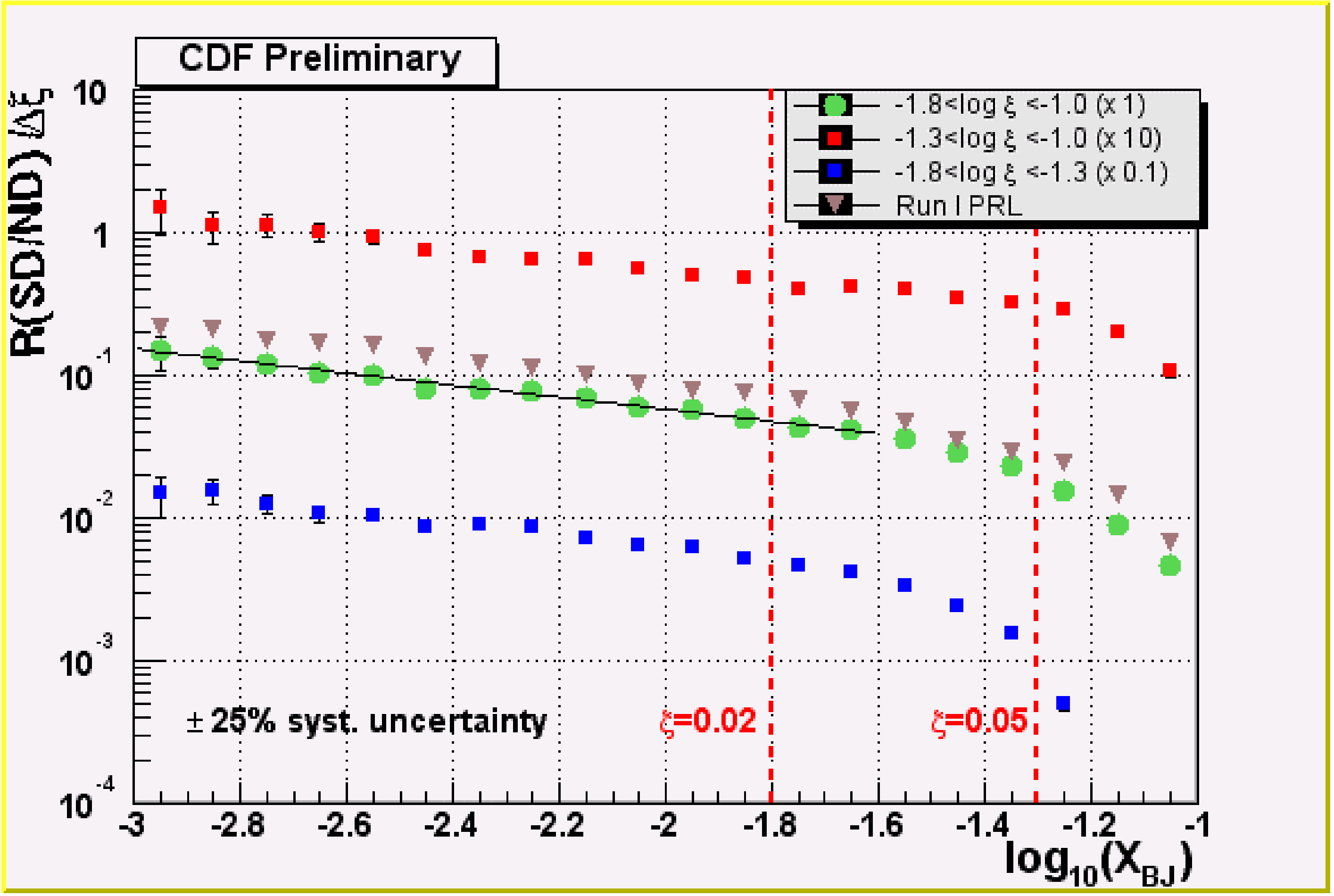


⇨ Diffractive dijets are more back to back

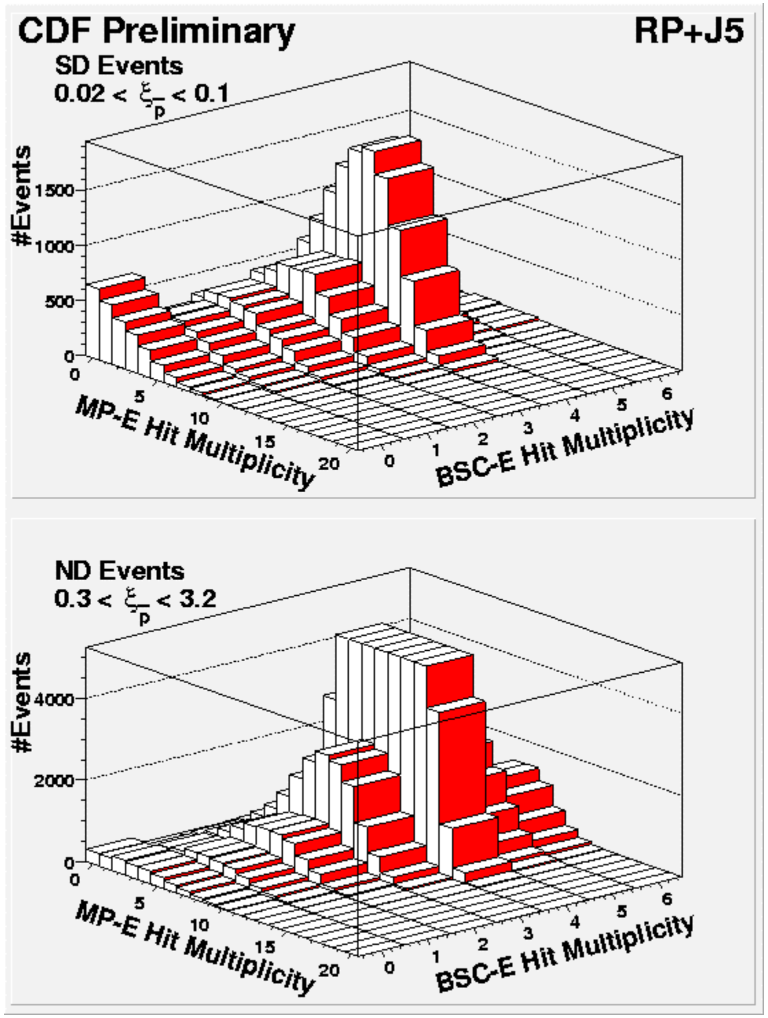
MP Multiplicity



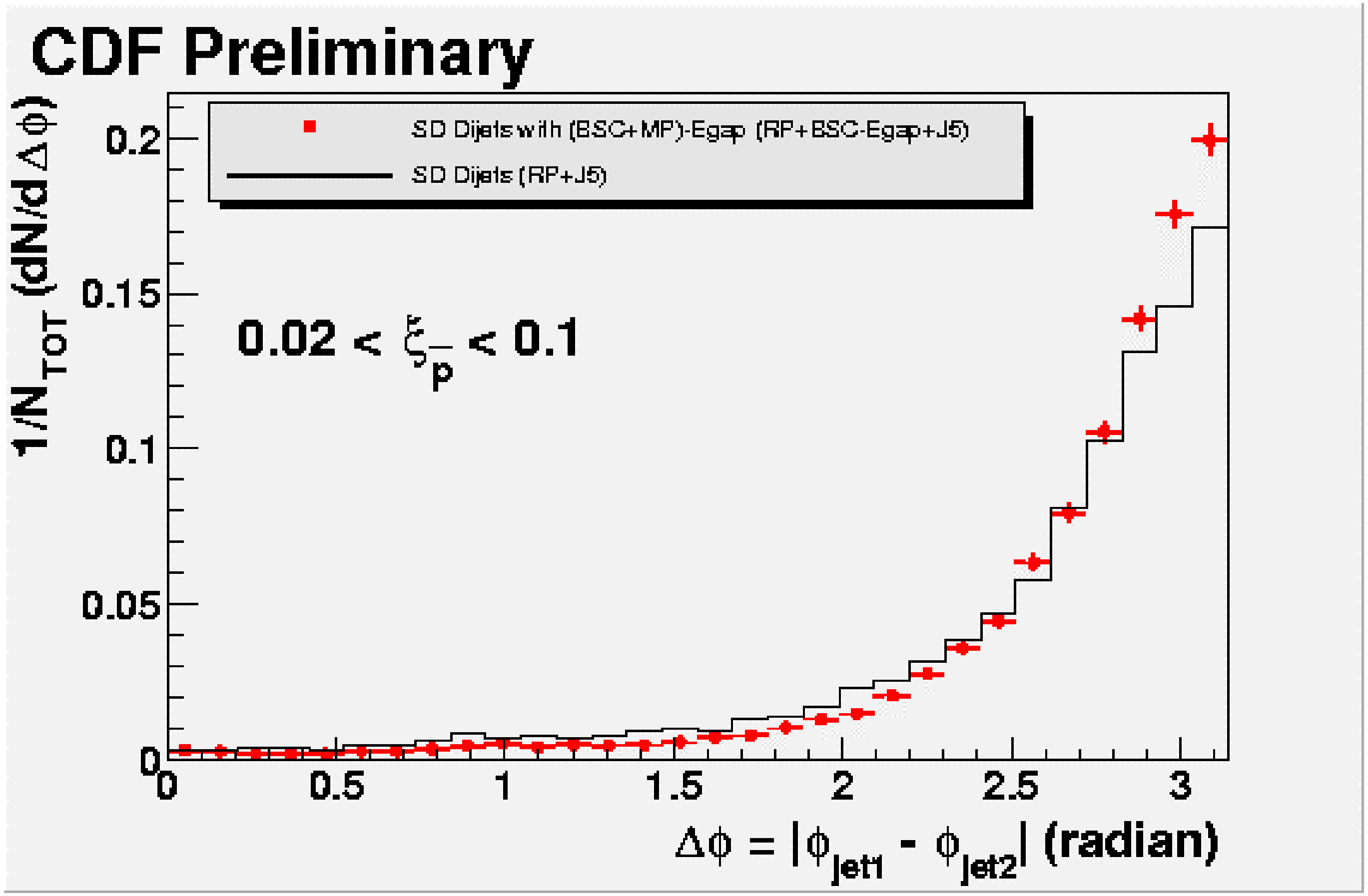
Diffractive Structure Function



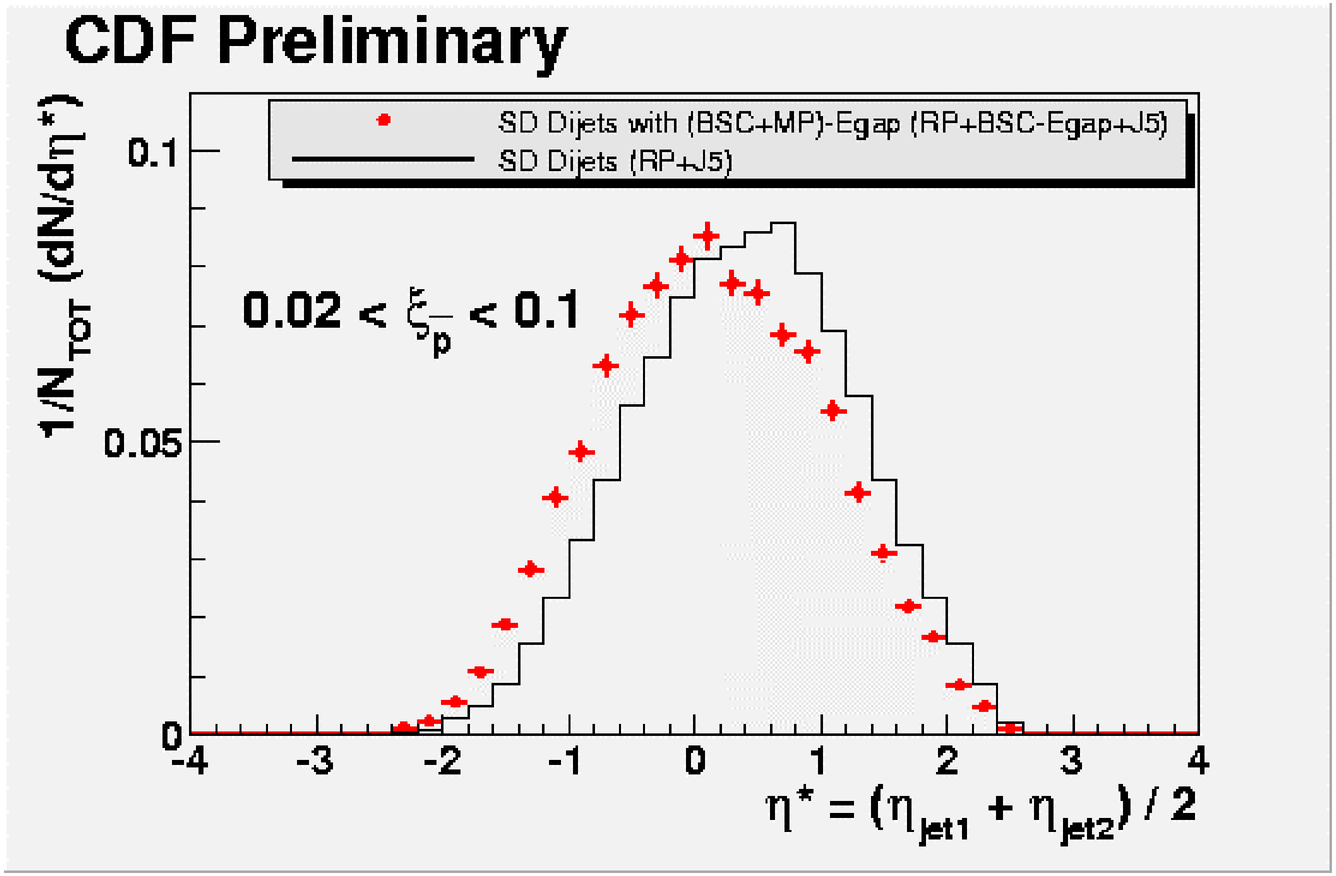
East Multiplicity: BSC vs MP



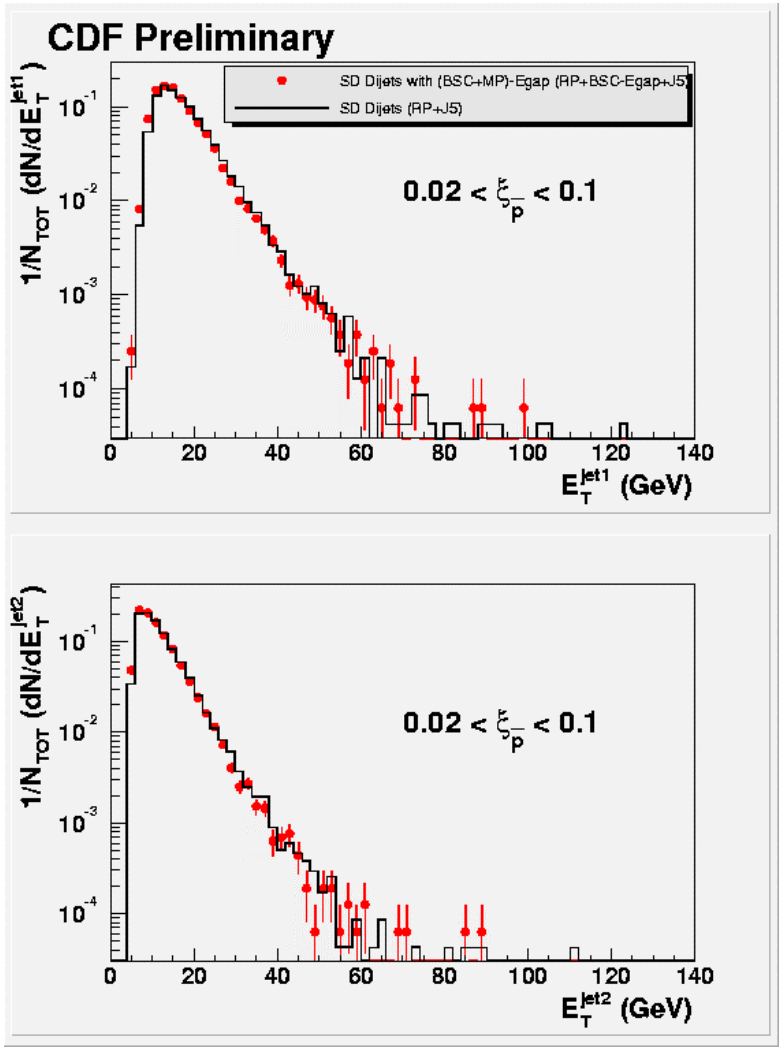
$\Delta\phi$ (jet$_1$-jet$_2$)



Dijet Mean Rapidity



Jet Transverse Energy



Conclusions

All is well