Forward Physics at the LHC
Manchester, UK, 8-12 Dec 2007

Alignment and Calibrations

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The Forward Detectors of CDF
MiniPlug Construction

About 1500 wavelength shifting fibers of 1 mm dia. are 'strung' through holes drilled in 36x\(\frac{1}{4}\)” lead plates sandwiched between reflective Al sheets and guided into bunches to be viewed individually by multi-channel photomultipliers.
Measurements with the MiniPlugs

Multiplicities of SD and ND events

ADC counts in MiniPlug towers in a pbar-p event at 1960 GeV.
- “jet” indicates an energy cluster and may be just a hadron.
- 1000 counts ~ 1 GeV

\[ \xi_{\text{CAL}} = \frac{\sum_i E_T^i e^{-\eta_i}}{\sqrt{S}} \]
RPS Tracking Calibration

CDF Run II Preliminary

slice

with RPS tracking

$0.055 < \xi_{\text{RPS}} < 0.060$
Diffractive Dijet Signal

2002-2003 data: \(<\text{InstL}> \sim 1.5\times 10^{31}\)

Low InstLum \(\sim 0.5\times 10^{30}\)

\[
\frac{d\sigma}{d\xi} \propto \frac{1}{\xi} \Rightarrow \frac{d\sigma}{d\log\xi} = \text{constant}
\]

\[
\xi_{\text{CAL}} = \frac{\sum_{i} E_{i}^{i} e^{-\eta_{i}}}{\sqrt{s}}
\]
Dynamic Alignment of RPS Detectors

Method: iteratively adjust the RPS X and Y offsets from the nominal beam axis until a maximum in the b-slope is obtained @ t=0.

Limiting factors:
1-statistics
2-beam size
3-beam jitter

@ CDF w/ lowlum data ± 30 μm
**P_L Balance → M_W**

\[ \xi_{\text{CAL}} = \sum_i E_T^i e^{-\eta_i} / \sqrt{S} \]

\[ p_L^\nu = (1 - \xi) \times p_{\text{beam}} - \sum p_{L \text{cal}} \]

\[ p_T^\nu = \text{missing } E_T \]

**CDF Run II Preliminary**

Entries: 369
Mean: 81.92
RMS: 13.96
\( \chi^2 / \text{ndf} \): 9.386 / 17
Prob: 0.9274
Constant: 22.58 ± 1.80
Mean: 80.37 ± 0.87
Sigma: 12.09 ± 1.07
**$E_T^{jet}$ Calibration**

- **use RPS information to check jet energy corrections**

CDF Run II Data

- $E_T^{jet,2} > 10$ GeV
- $E_T^{jet} < 5$ GeV
- $0.035 \leq \xi_{RPS} \leq 0.095$
- $3.6 < |\eta_{gap}| < 5.9$
- $R_{jj} > 0.8$

Calibrate $E_T^{jet}$ or $\xi$, as you wish!

$\Delta \xi = \xi_{RPS} - \xi_{jj}^{X}$

<table>
<thead>
<tr>
<th></th>
<th>Raw Jets (dotted)</th>
<th>L5 Corrected Jets (dashed)</th>
<th>L7 Corrected Jets (shaded)</th>
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<tbody>
<tr>
<td>Entries</td>
<td>160</td>
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<td>Mean</td>
<td>0.02438</td>
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<td>RMS</td>
<td>0.01115</td>
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</tbody>
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thank you