Dijet+MET Events induced by Cosmic Ray Muons

March 7, 2009

**Data Sample: Inclusive Jet Trigger with $E_T > 100$ GeV**

**Event Selection**

1) $|z_{vtx}| < 60$ cm & $N_{jet} = 2$
   - JetClu ($R_{jet} = 0.7$) with the CDF standard JES corrections
   - $E_T > 160$ GeV, $> 60$ GeV, $< 25$ GeV with $|\eta| < 2$ and at least one jet with $|\eta| < 1.1$

2) $0.15 < EEMF < 0.85$

3) Cosmic ray muon w/o $ECHF$ cut ($> 0.15$)

**References for Cleanup Cuts ($EEMF$ and $ECHF$):**

- "Search for squarks and gluinos in multi-jets + MET final state," arXiv:0811.2512 (appearing on PRL the 11th of March)
Junk events, but rejected by a charge fraction cut

$$E_T(j_1) = 267 \text{ GeV}$$

$$E_T(j_2) = 263 \text{ GeV}$$
Appendix: Jet Cleanup Variables

Event EM Fraction:  \[ EEMF = \sum EMF_{j_i} \cdot E_T(j_i) / \sum E_T(j_i) \]
(Loop over all jets with \( E_T > 25 \) GeV)

Event Charge Fraction:  \[ ECHF = \frac{1}{N_j} \sum \left( \frac{\sum p_{\text{track}}}{E_j} \right), \text{ with } |\eta_j| < 1 \]
Data and Event Selection

Data and MC samples
- Jet100 data
  - Plan to look at the full dataset eventually.
  - For now, looking at 528 pb\(^{-1}\) of data (period 0: 383 pb\(^{-1}\), 6&7: 135 pb\(^{-1}\)).
- Pythia dijets
  - p\(_{T}\)\(>\)90 GeV/c sample

Event Selections
- DQM Good Run list (qcd, good calorimeter bit)
- |Z\(_{\text{vtx}}\)|<60 cm
- JetClu cone R=0.7 jets with the standard level-5 corrections
- E\(_{T}\)(jet1)>160 GeV (ensuring trigger is efficient)
- E\(_{T}\)(jet2)> 60 GeV
- E\(_{T}\)(jet3)< 25 GeV
- |\(\eta\)(jet1,2)|<2, at least one of them with |\(\eta\)(jet)|<1.1
- 0.15<EEMF(average EMF over jets with E\(_{T}\)<25 GeV)<0.85
- ECHF(average SumP/E over jets with |\(\eta\)|<1.1 & E\(_{T}\)\(>\)25 GeV)>0.15
- EMF(jet1,2)<0.9
Event Electromagnetic Fraction: EEMF

\[ EEMF = \sum EMF_{jet-i} \cdot E_{T}^{jet-i} / \sum E_{T}^{jet-i} \]

(Loop over all jets with \( E_{T} > 25 \text{ GeV} \))
Event Charge Fraction: ECHF

$$ECHF = \frac{1}{N_{jets}} \sum \frac{\Sigma P_{track}}{E_{jet}}, \text{ with } |\eta_{jets}| < 1$$
$\alpha_T$ definition

\[ \alpha_T = \frac{E_T(jet\,2)}{m_T(jet\,1,\,jet\,2)} \]

- Jet energy mis-measurement cancel to some extent
  (Useful especially when the jet energy scale is still large)
α_T distribution

Standard clean-up cuts are applied.

The α_T distribution falls 5 order of magnitude from α_T=0.5 to 0.6.

Events such as Z(→νν & μμ)+jets, W(→μν,τν)+jets, ttbar, etc, contribute to high α_T events

\[ α_T = \frac{E_T(\text{jet2})}{m_T(\text{jet1, jet2})} \]
$\alpha_T : H_T [E_T(j1)+E_T(j2)] > 400$ GeV

The sharpness of the "edge" at $\alpha_T \sim 0.55$ stays even with a high $H_T$ cut.