Systematics uncertainties in Jet Shape measurements

1. Definitions

Sample under study: CMSSW_1_6_7-CSA07-Gumbo

Jet clustering algo – Kt algorithm

Corresponding luminosity – 100 pb^{-1}

Integral jet shape variables: δR^2, $\delta\eta^2$, $\delta\varphi^2$

$$\delta R^2 = \frac{\Sigma \Delta R^2(constit, jet) * E_T^{constit}}{\Sigma E_T^{constit}}$$

$$\delta \eta^2 = \frac{\Sigma \Delta \eta^2(constit, jet) * E_T^{constit}}{\Sigma E_T^{constit}}$$

$$\delta \phi^2 = \frac{\Sigma \Delta \phi^2(constit, jet) * E_T^{constit}}{\Sigma E_T^{constit}}$$

2. Sources of uncertainties

2.1 For Jet energy

Jet energy scale correction

Jet energy resolution

2.2 For Jet eta

2.3 For integral jet shape

Non lineal calorimeter response:

- Non linear hadronic signal
- Noise
- Thresholds

Magnetic field

HCAL granularity

Shower size

Difference in jet clustering for particles and calo towers

2.4 For quark/gluon ratio

Uncertainty in MC simulation for quark/gluon shape vs E_T and η

Uncertainty in jet integral shape measurement (different for quark and gluons)

3. Control samples and objects (for data)

3.1 ttbar –for pure quark jets

3.2 Gamma+jets – jet energy scale

3.3 Jet+track object

- The same energy scale for quark/gluon jets
- Correction for response non linearity

3.4 Tracker shape

- magnetic field impact
- calorimeter non linearity

3.5 delta-eta and delta-phi

- test of magnetic field impact

4. Plan for MC study of systemtics

4.1 Jet energy scale – 10% as for jet cross section measurements

4.2 Jet integral shape

4.3 Quark to gluon ratio

- Comparison for PYTHIA and HERWIG++ samples at gen level