

Update of MC based b-JES Systematic

22, May, 2013 Naoyuki Kamo

Motivation

- Additional systematic uncertainties for heavy flavor jets are still in mc11
 - -> update with mc12
- Effect from the higher pileup rate
- ActiveArea based pileup correction
 - -> a new b-JES uncertainty in the uncertainty provider

Monte Carlo samples

- **Pythia**

- mc12_8TeV.
14791*.Pythia8_AU2CT10_jetjet_JZ*W.merge.AOD.e1126_s1469_s1470_r3542_r3549/

- **Herwig**

- mc12_8TeV.
1591*.Herwigpp_EE3CTEQ6L1_jetjet_JZ*W.merge.NTUP_JETMET.e1373_s1499_s1504_r3658_r3549

- **Distorted geometry**

- mc12_8TeV.
14791*.Pythia8_AU2CT10_jetjet_JZ*W.merge.NTUP_JETMET.e1126_s1482_s1470_r3793_r3549_p1344
- -> for systematics from additional dead material

- **Pythia FTFP_BERT**

- mc12_8TeV.
1479*.Pythia8_AU2CT10_jetjet_JZ*W.merge.NTUP_JETMET.e1126_s1625_s1622_r3658_r3549_p1344/
- -> for validation of mc13

Jet selection and Pt response distribution

- **Jet selection**

- $|\eta| < 2.5$
- require isolation from other Jets
 - $\rightarrow \Delta R < 2.5 \times \text{AntiKt_R} \text{ (= 1.0 or 1.5)}$
- $JVF > 0.75$

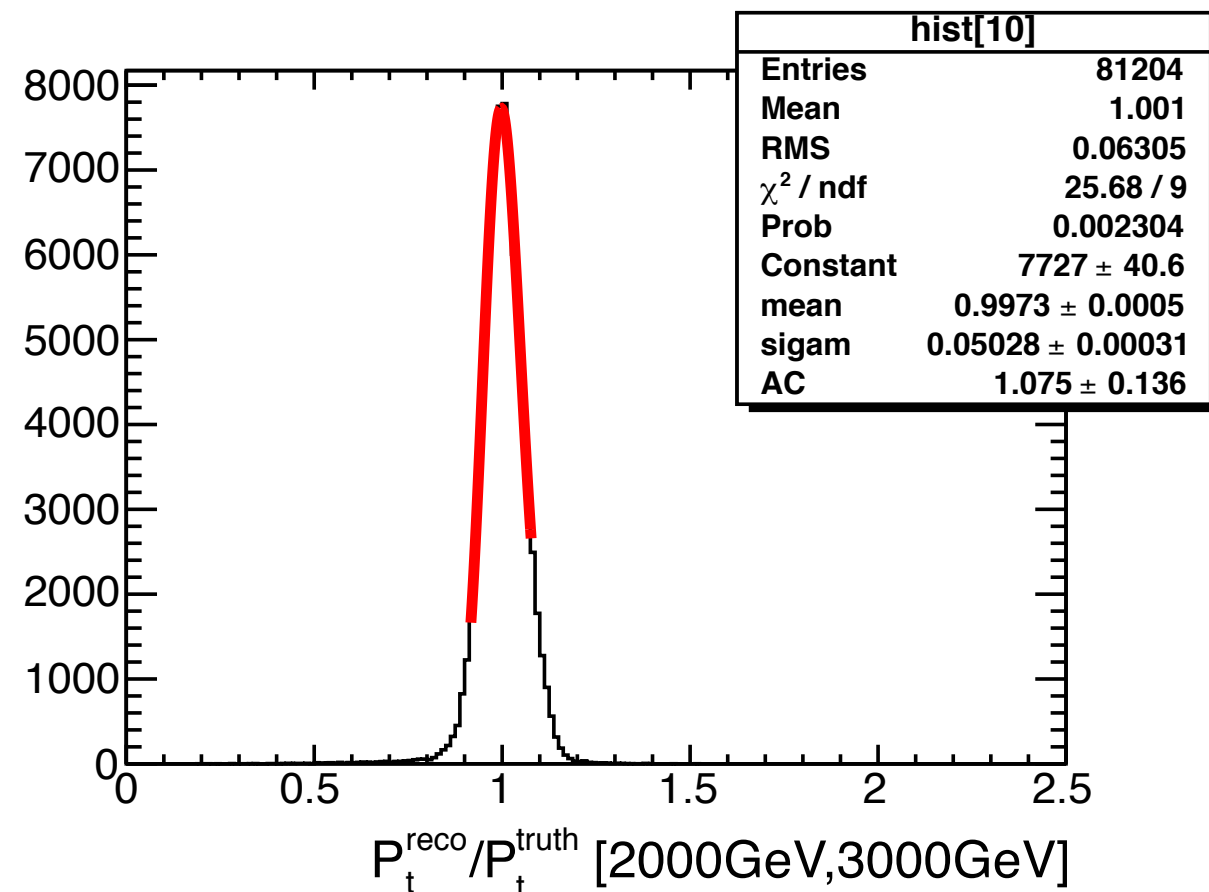
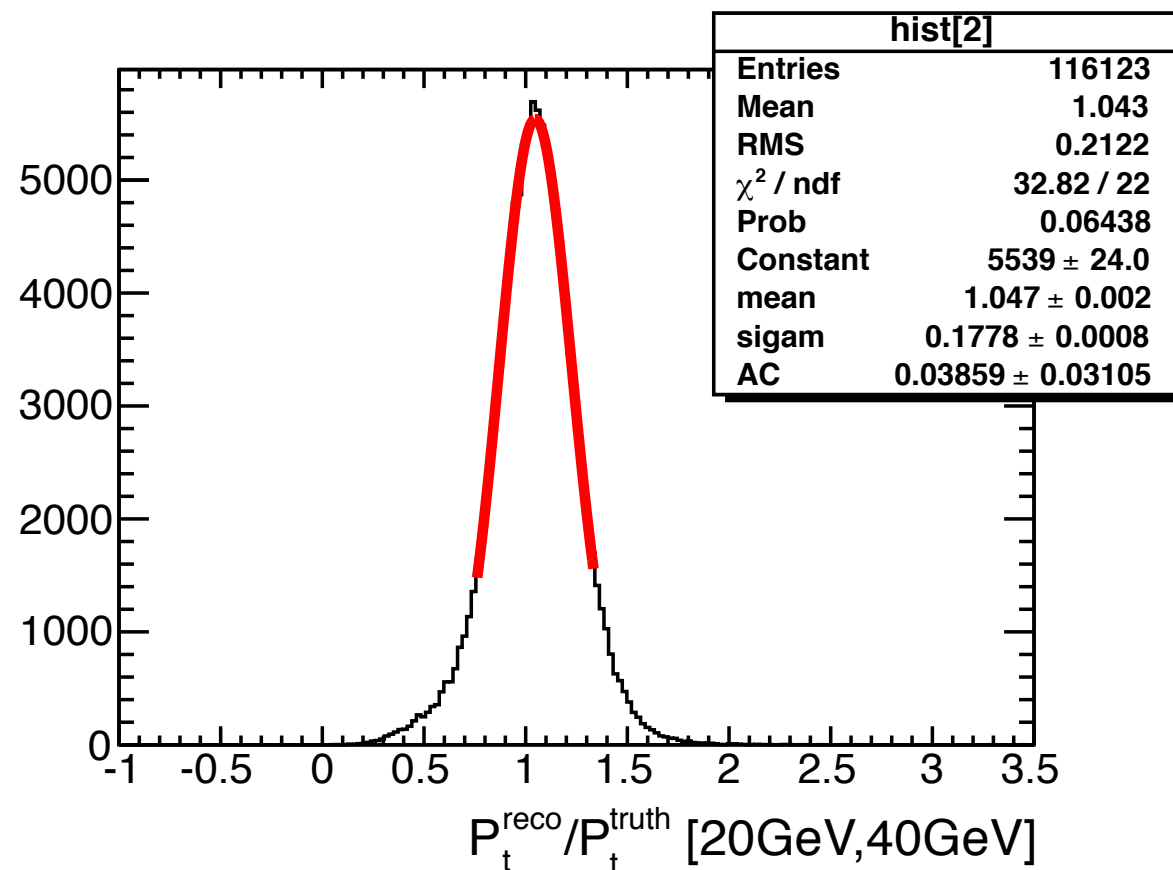
- **Pt_reco/Pt_truth distribution**

- Pt_truth bins :
 $\{20, 40, 80, 140, 200, 400, 600, 1000, 2000, 3000\} \text{ GeV}$
- select nearest reco-Jet from truth-Jet(at least $< \Delta R$)

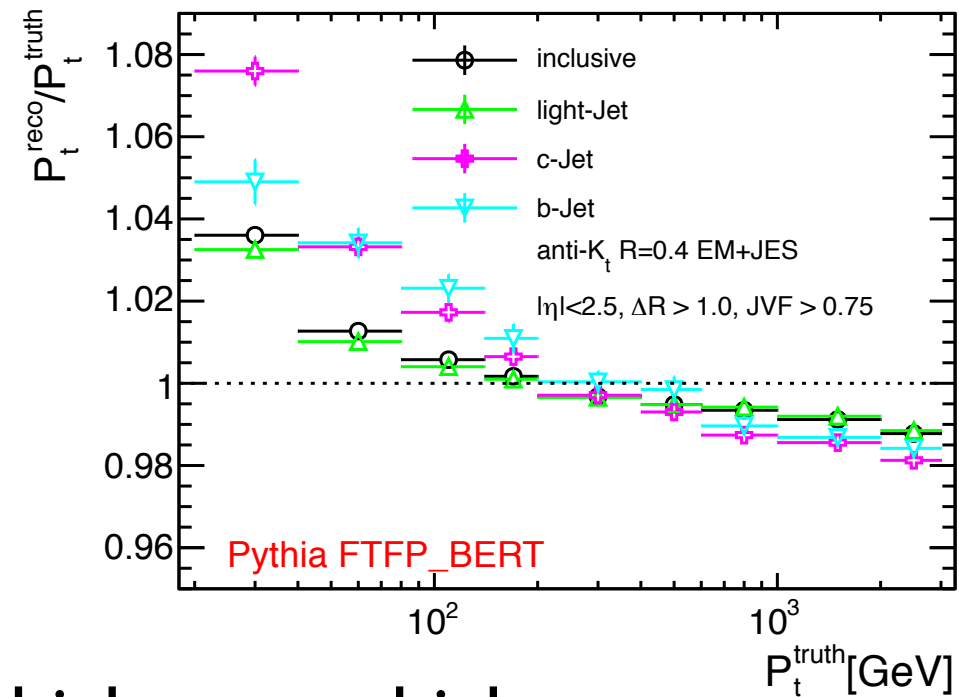
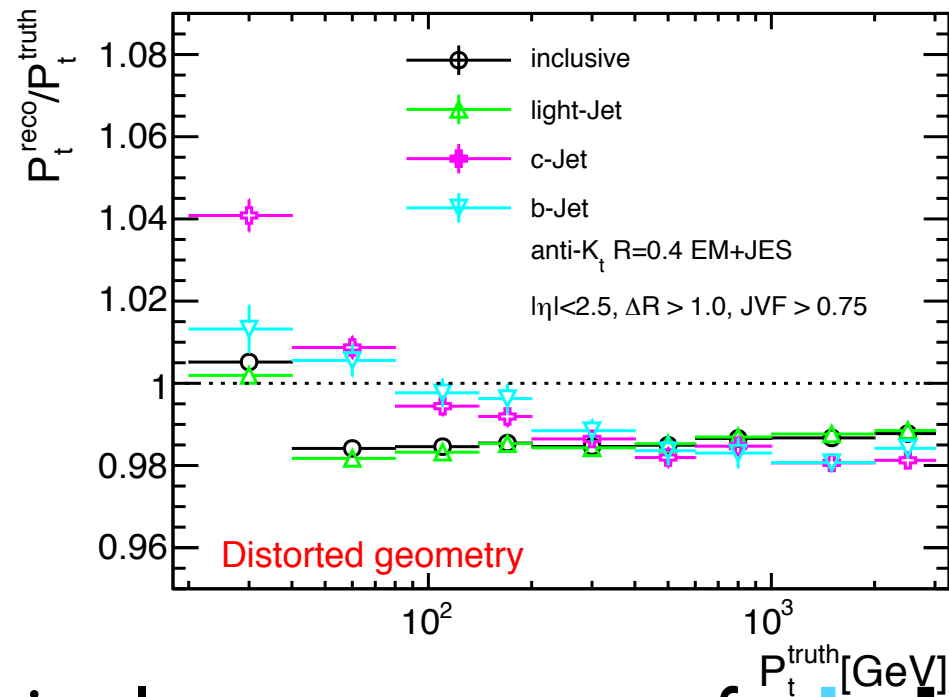
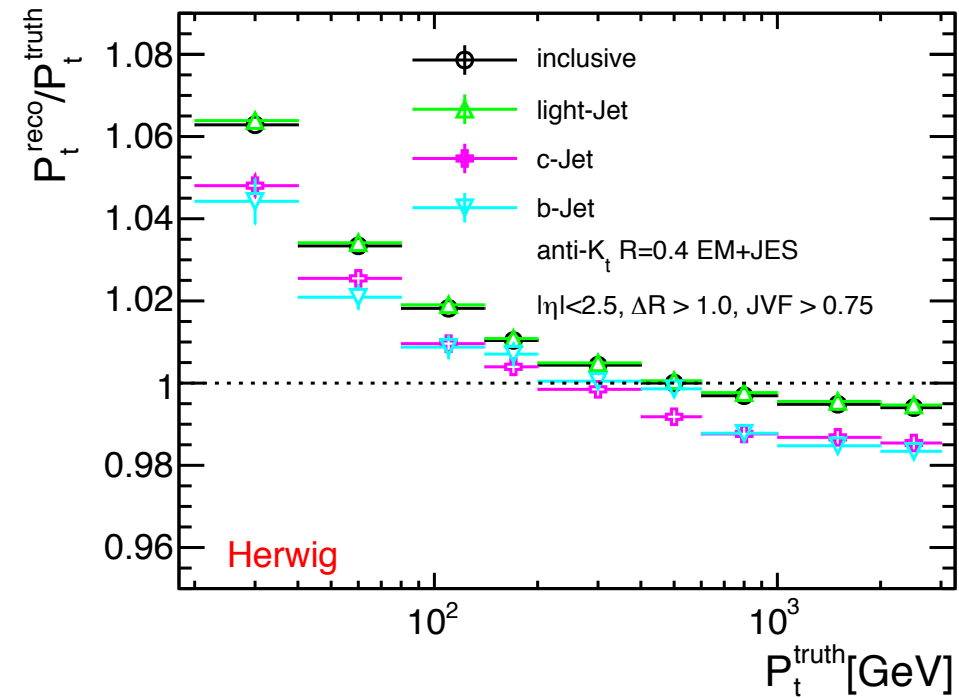
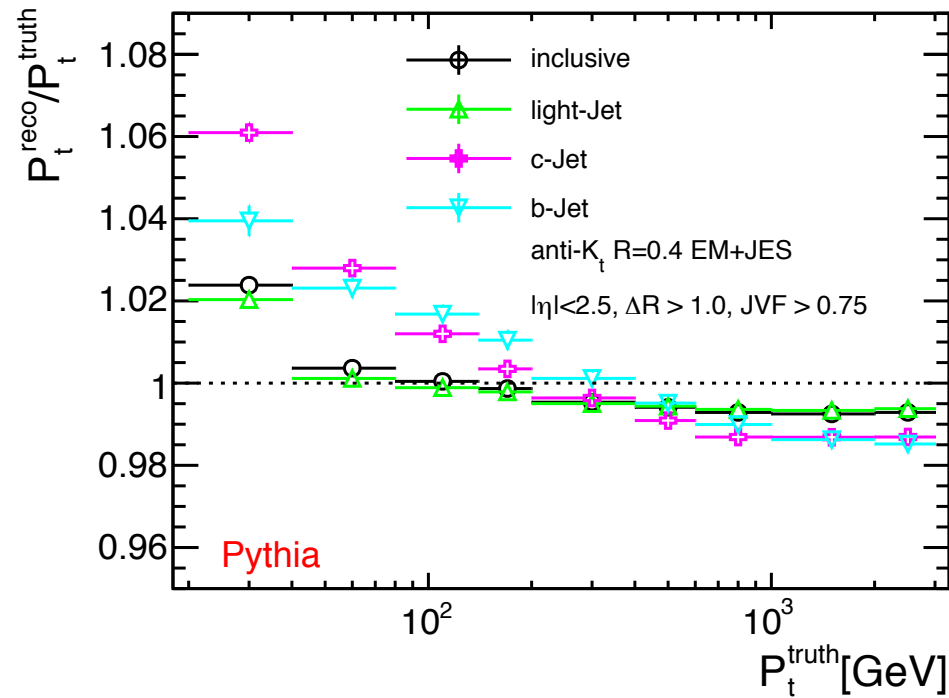
- **compare Jet PT response among the jet flavors**

Fit to asymmetric gaussian

- due to P_{t_reco} threshold(>4GeV), the distribution, especially at low pt range, is distorted
- to derive correct mean of distribution, fit by asymmetric gaussian;
- definition: $\text{Gauss}(x, \text{mean}, \sigma(1 + c(x - \text{mean})))$

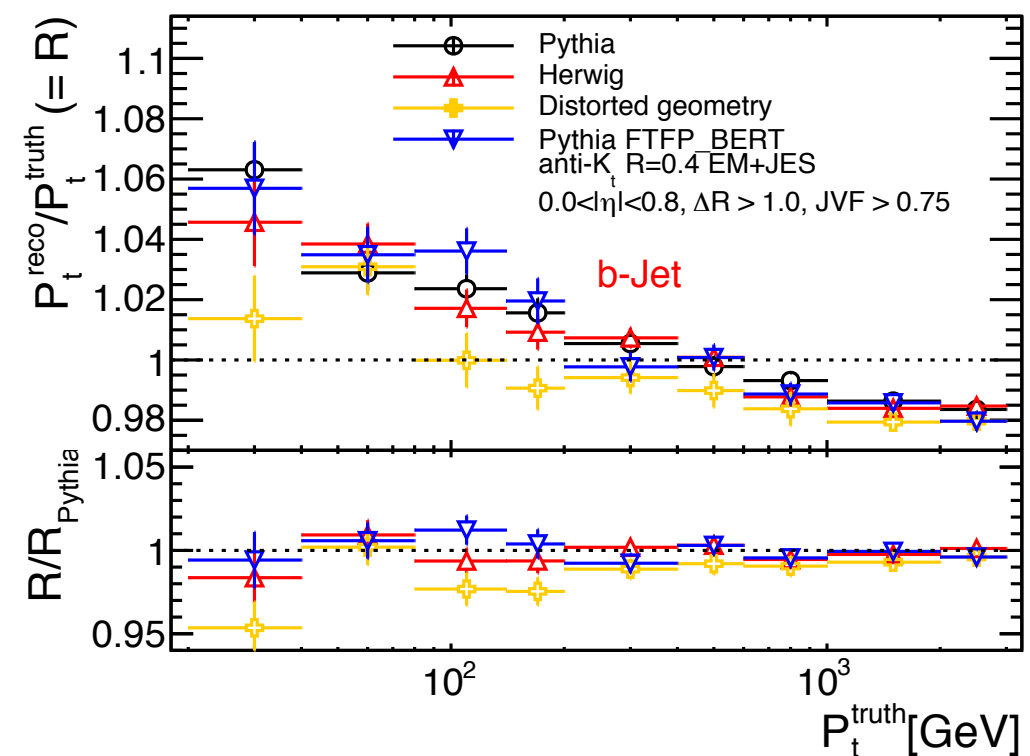
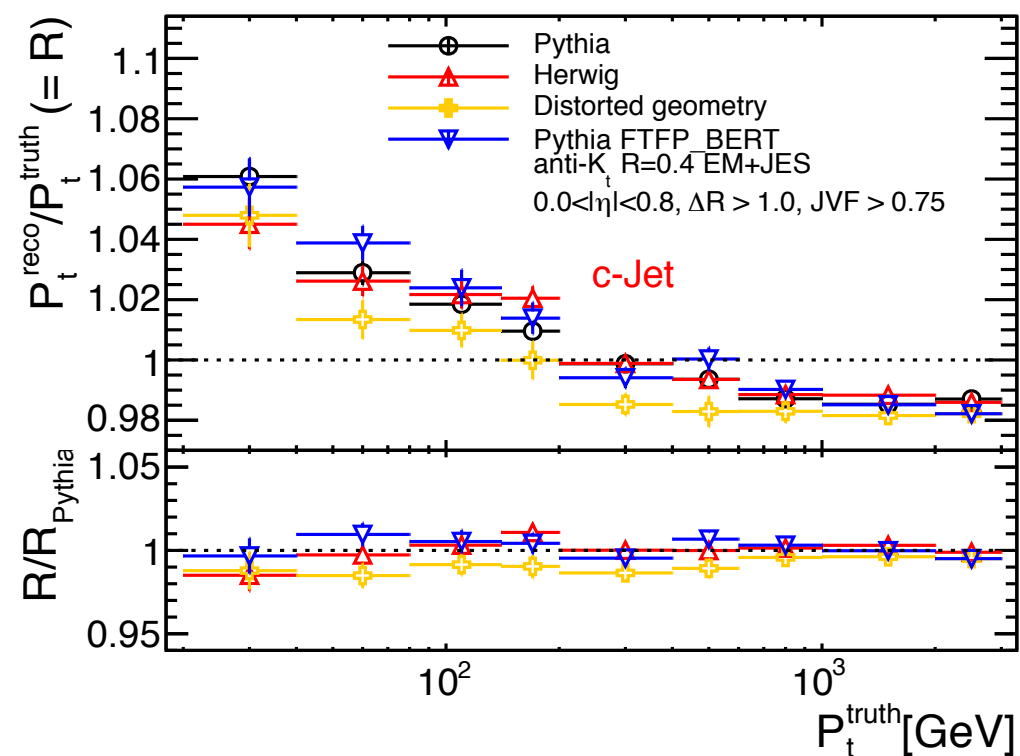
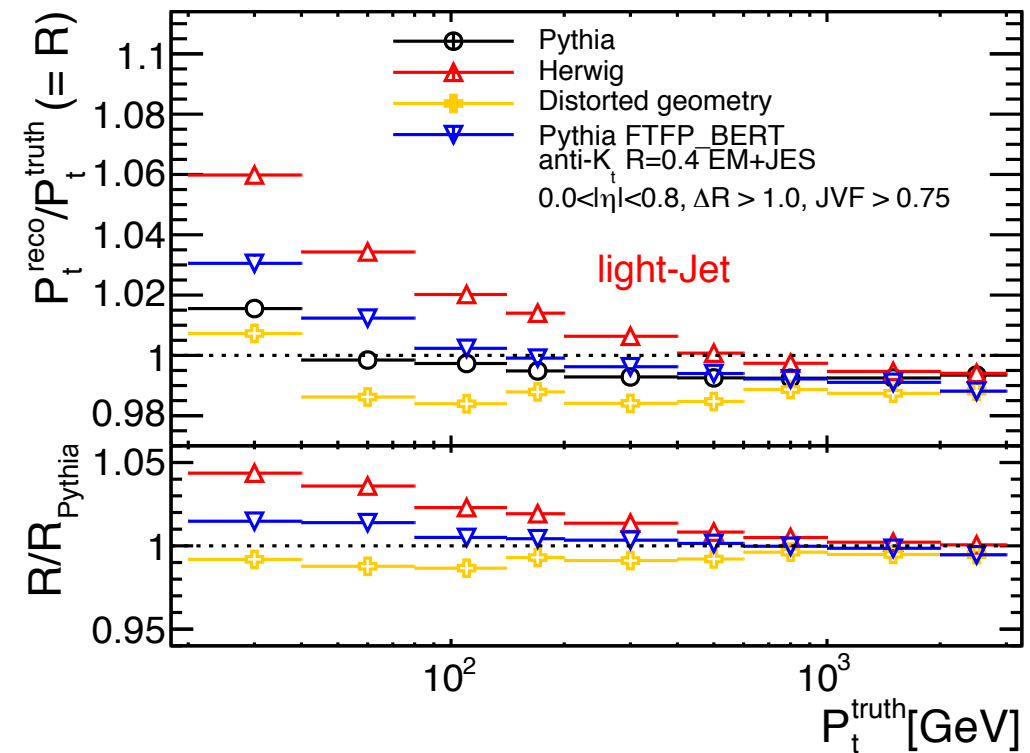
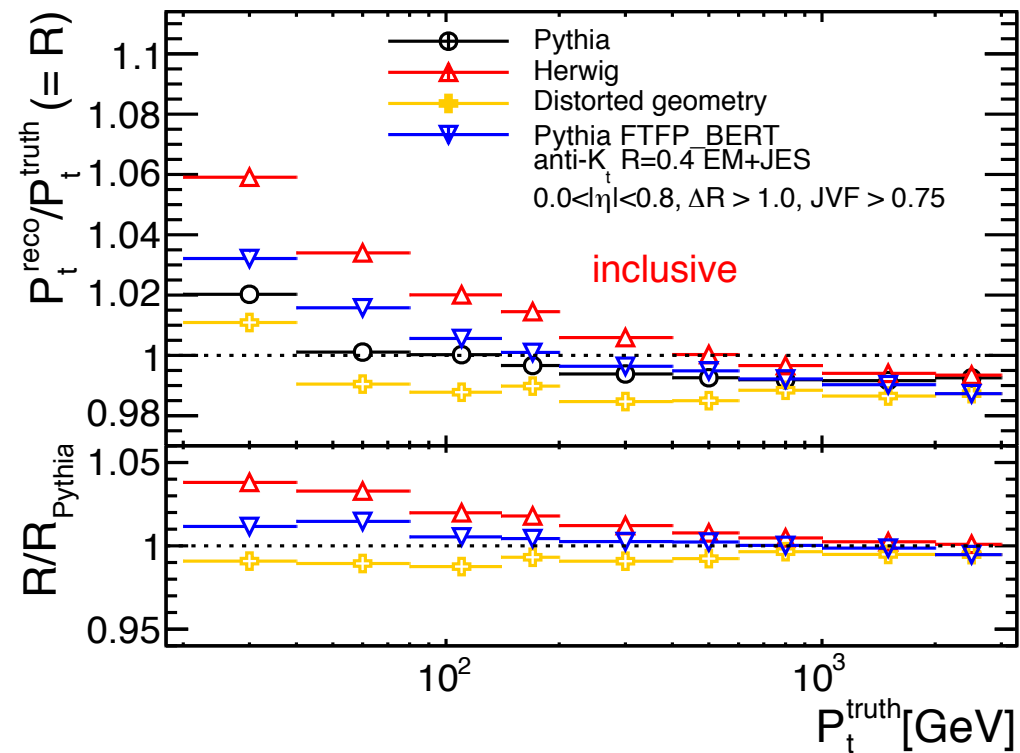


Flavor dependence of jet pT response



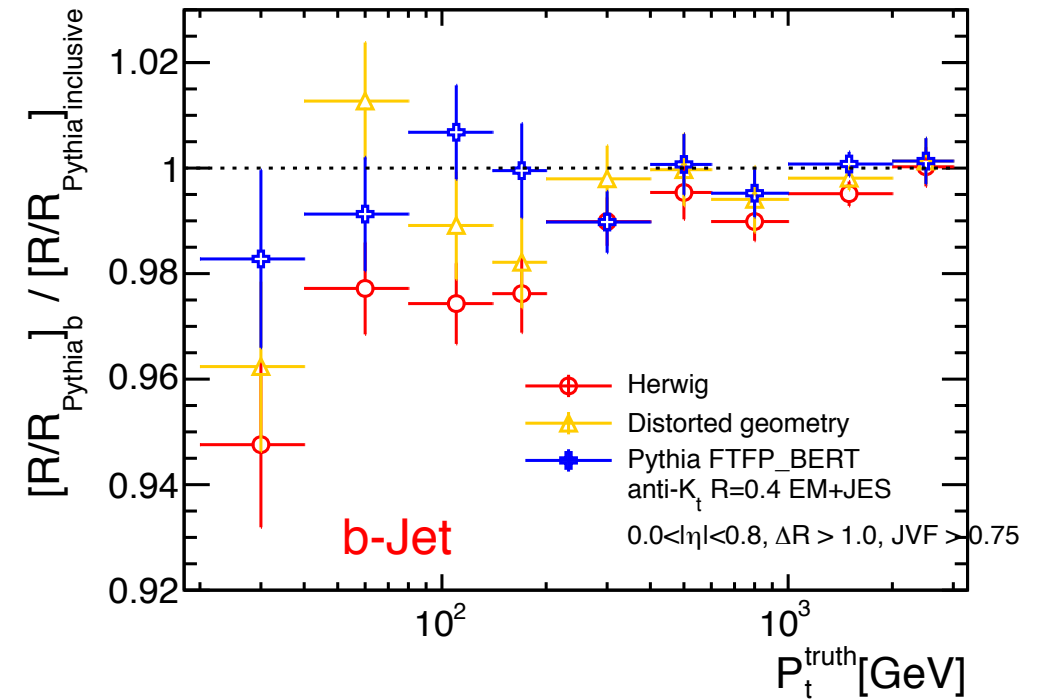
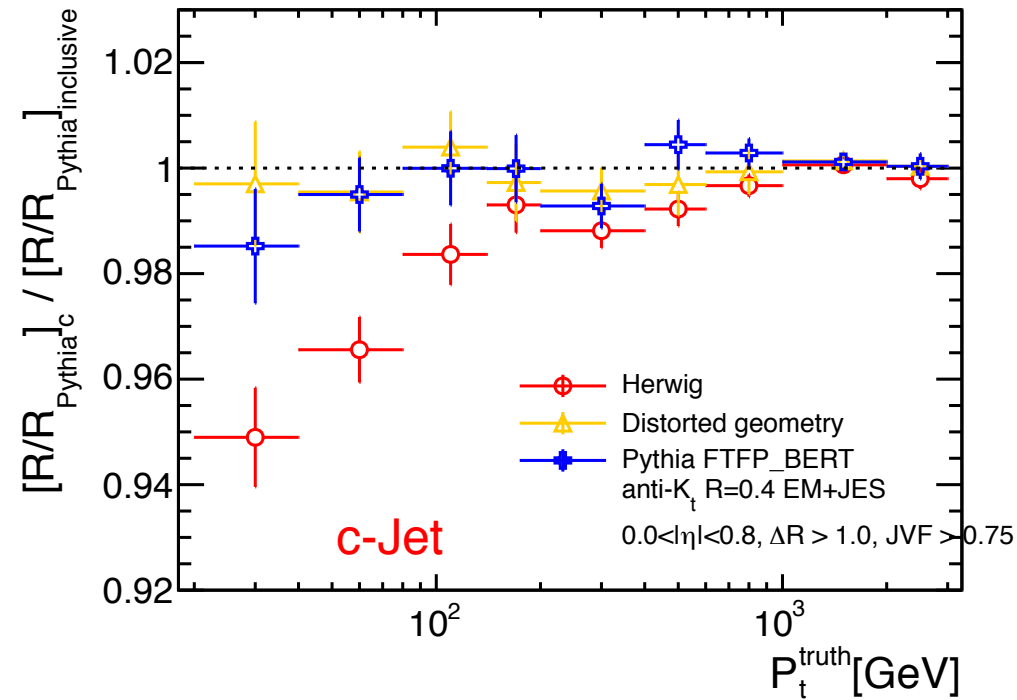
- Pythia : lower response of **c, b-Jet** at high pt, yet higher response at low pt
- Herwig : lower response of **c, b-Jet** at almost all pt region
- Distorted Geometry : reasonably, the response is lower than other samples

Fraction dependence to Pythia

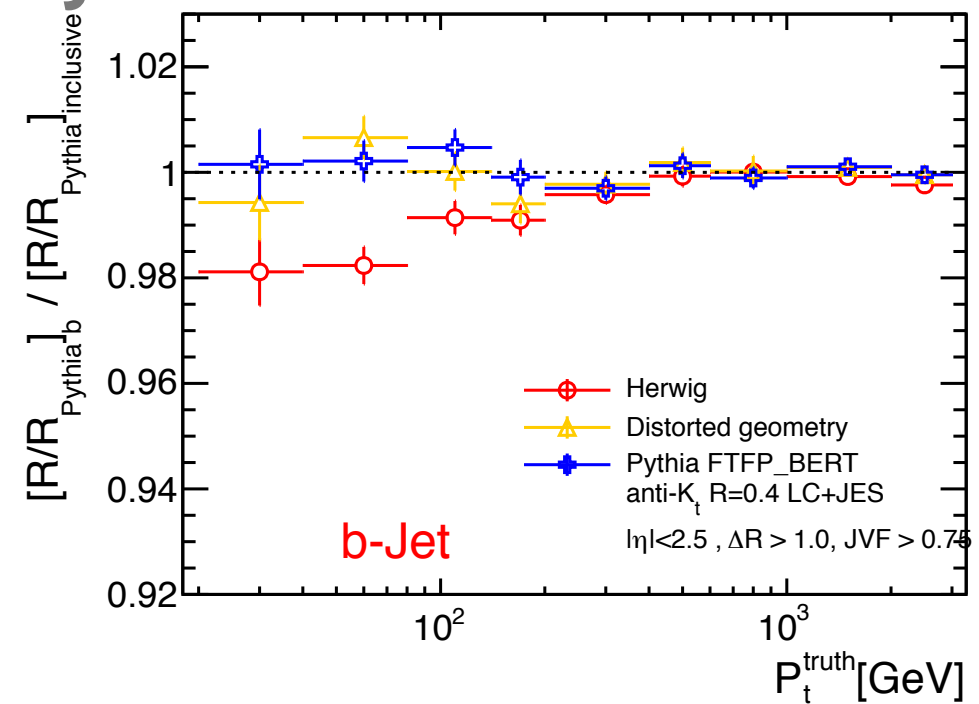
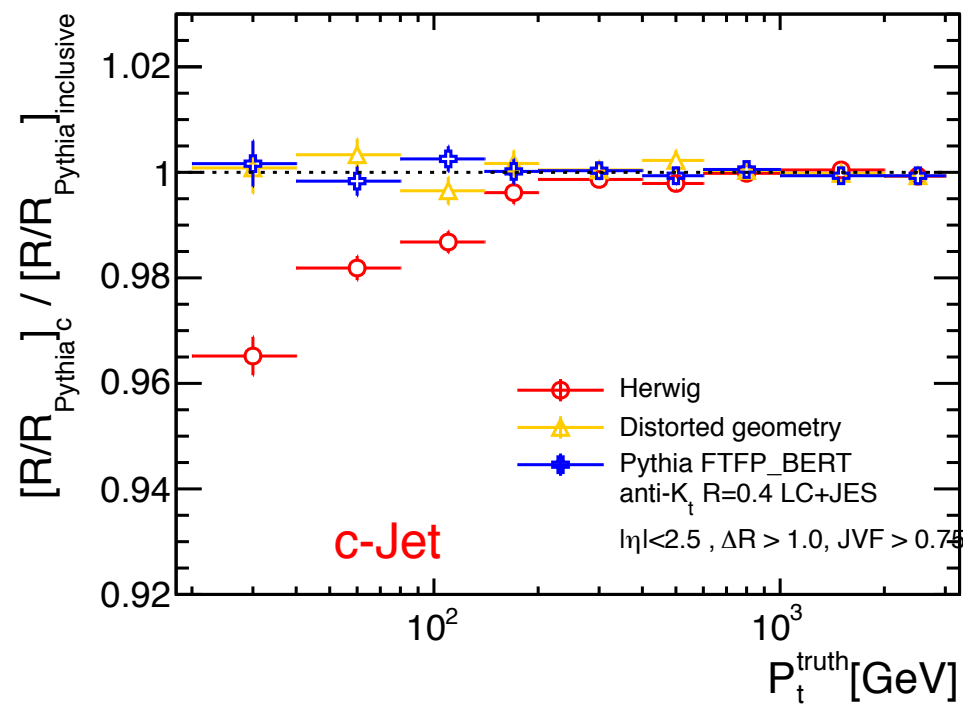


- higher response on **Herwig** than **Pythia**, yet to require c or b-jet, lower response
- due to more N_{track} in c,b-Jet on **Herwig** than **Pythia**

Additional systematic of c-JES and b-JES



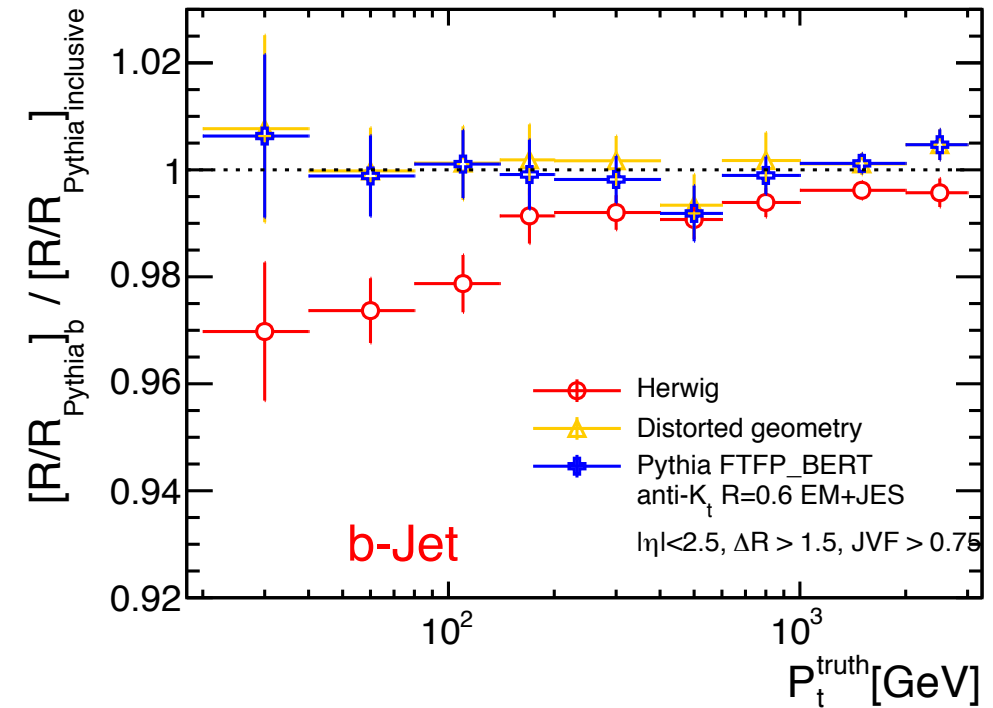
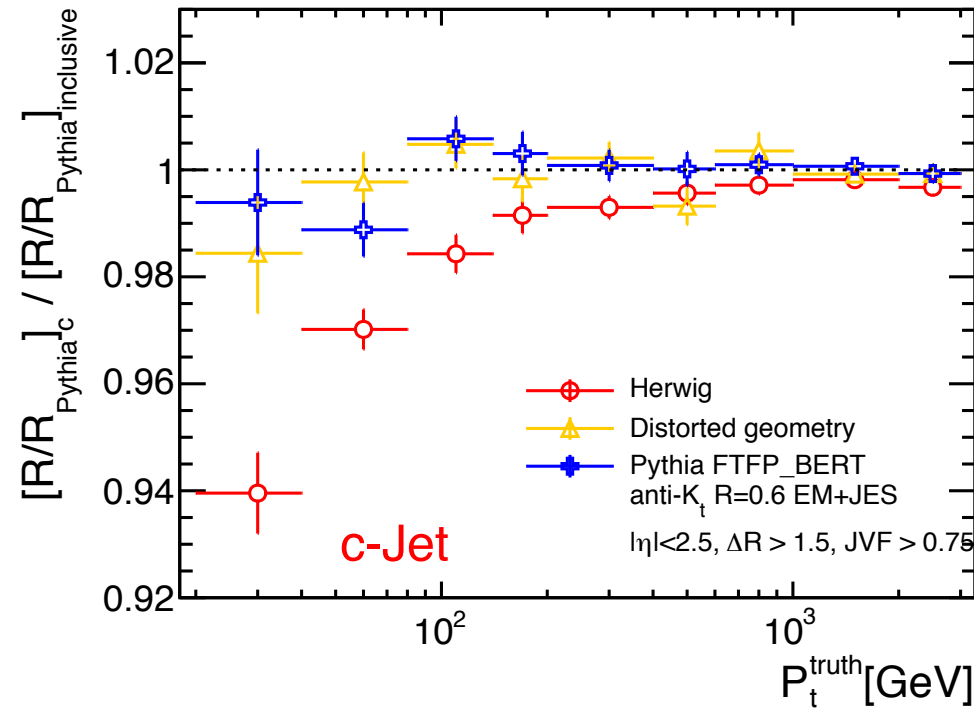
R=0.4 EM+JES



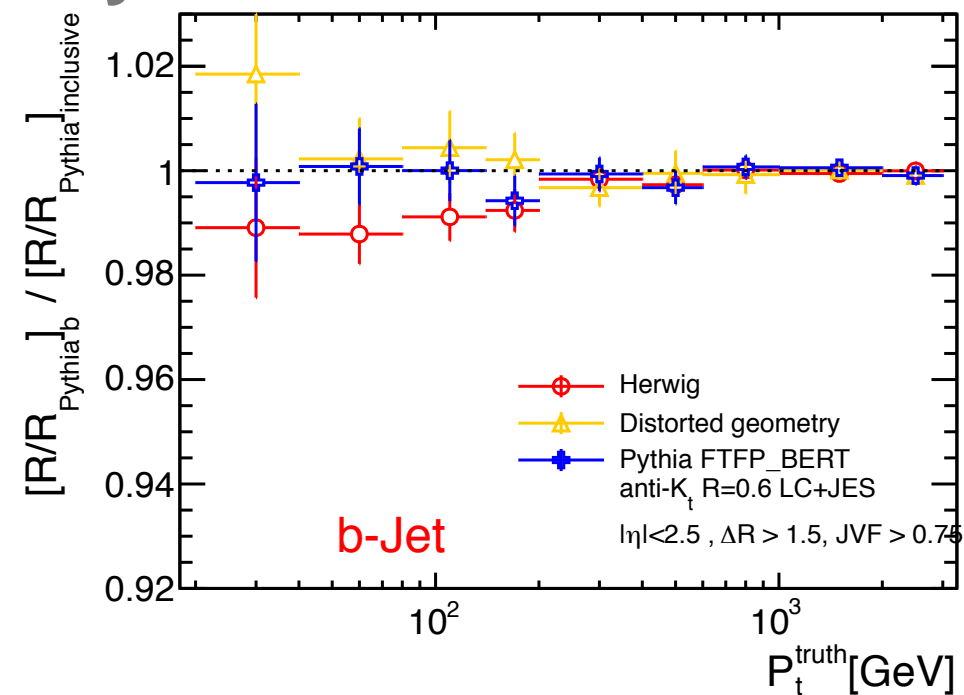
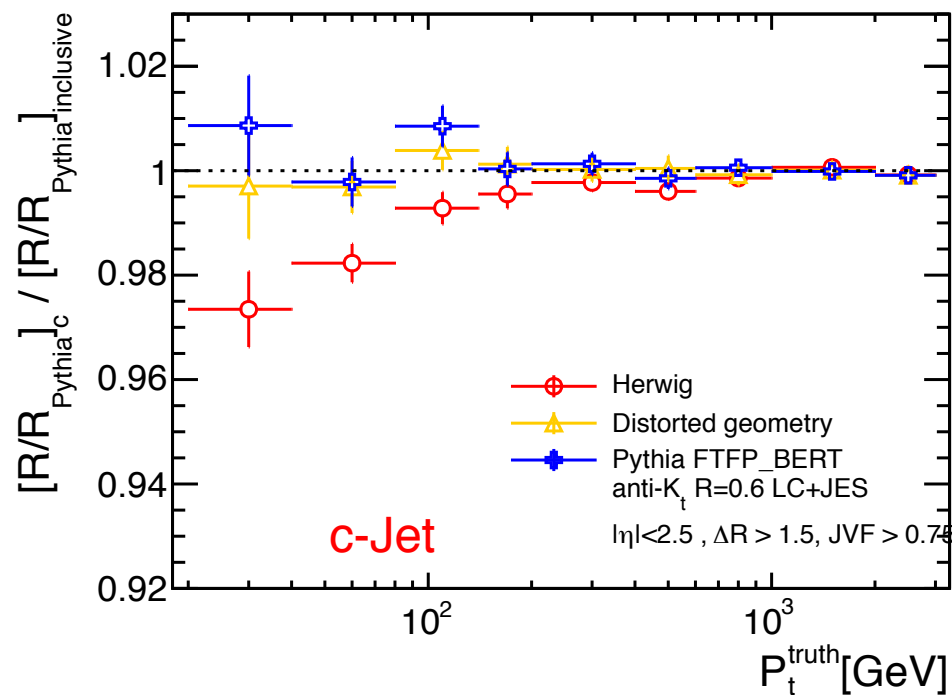
R=0.4 LC+JES

- **Herwig**: bigger systematic in particular at low pt region
- LC + JES : look like smaller systematic

Additional systematic of c-JES and b-JES



R=0.6 EM+JES



R=0.6 LC+JES

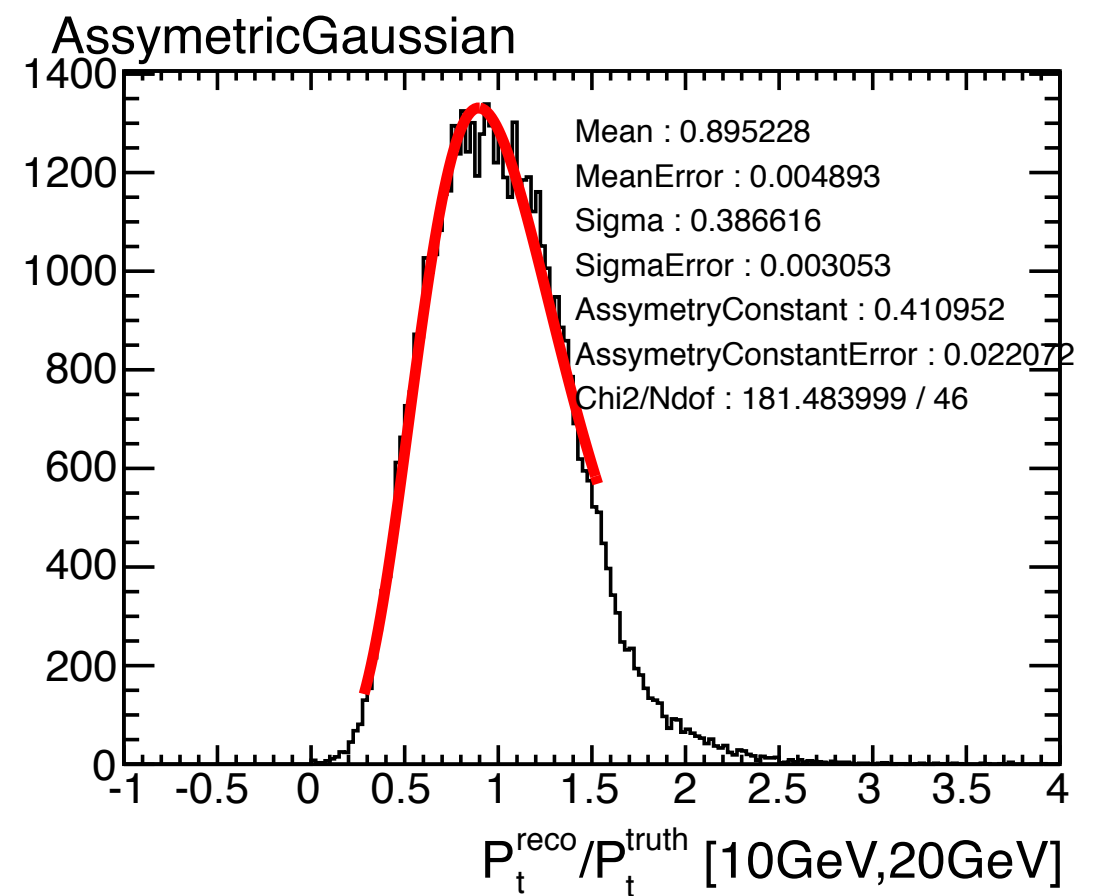
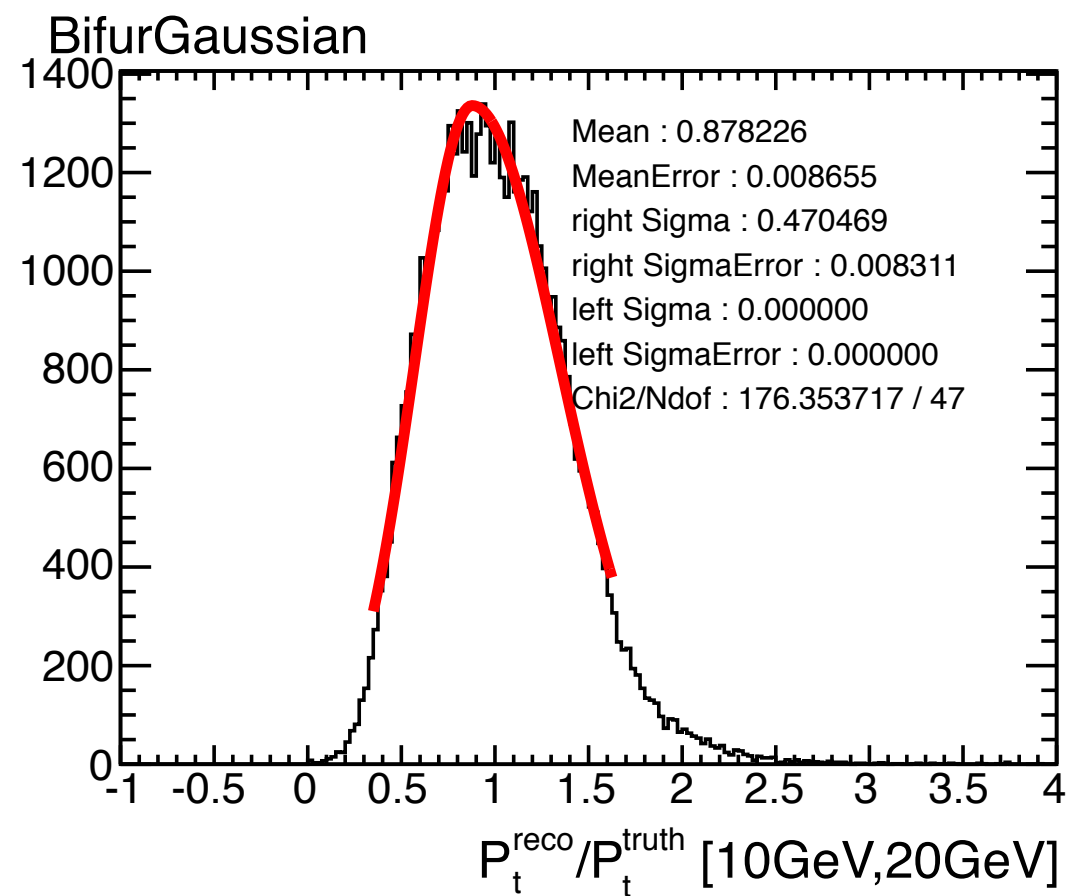
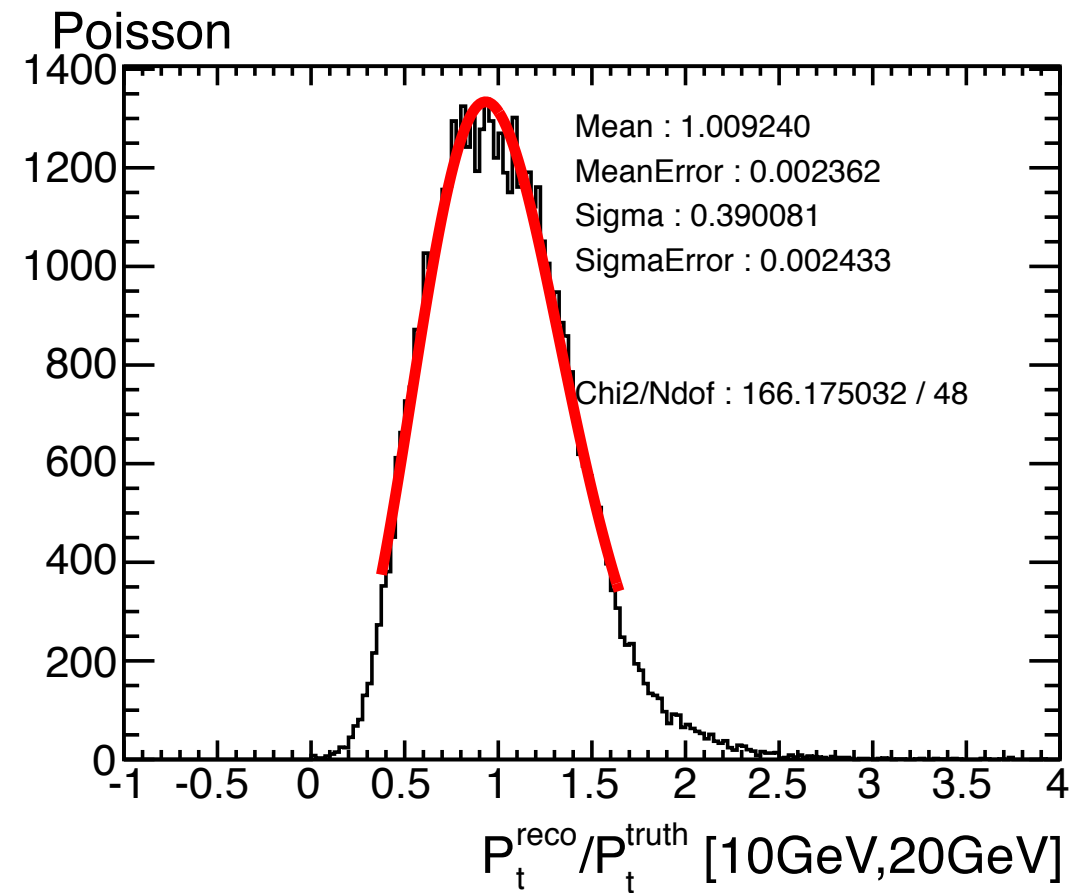
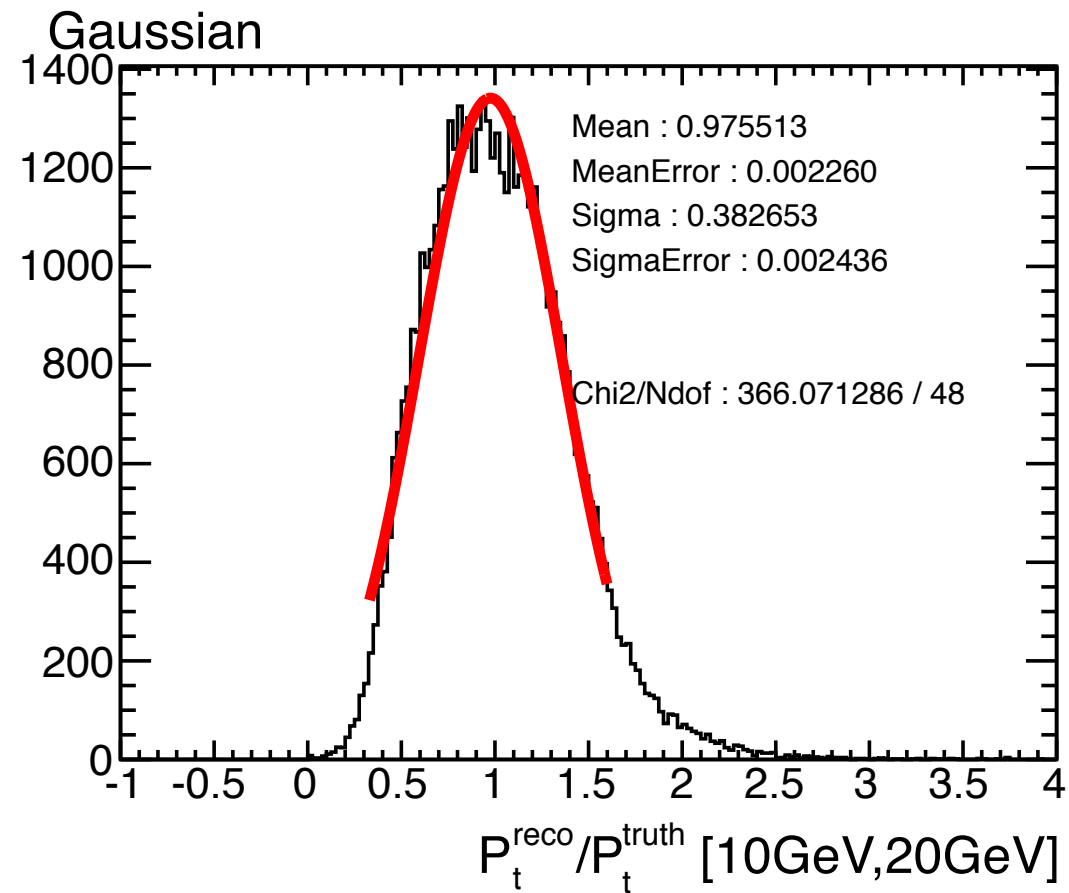
- As with $R = 0.4$, on **Herwig** Bigger systematic in particular at low pt region

Summary

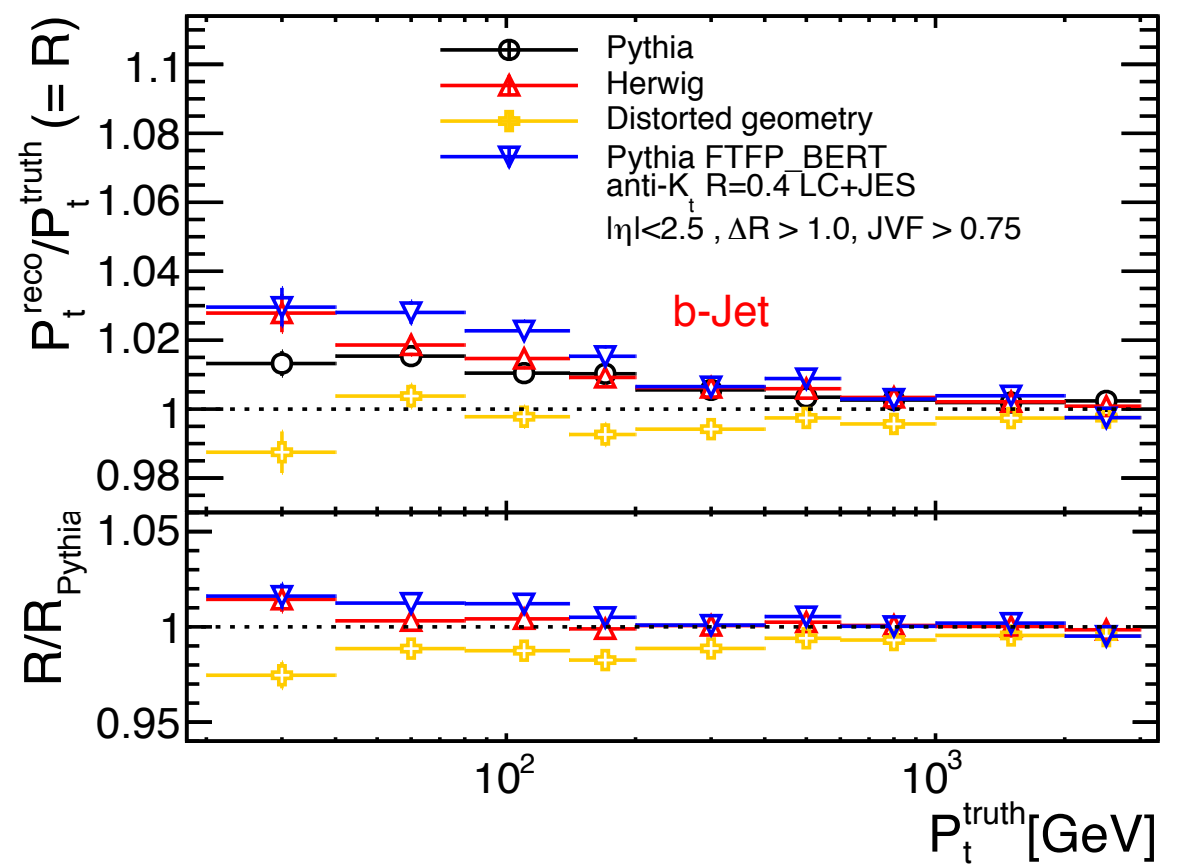
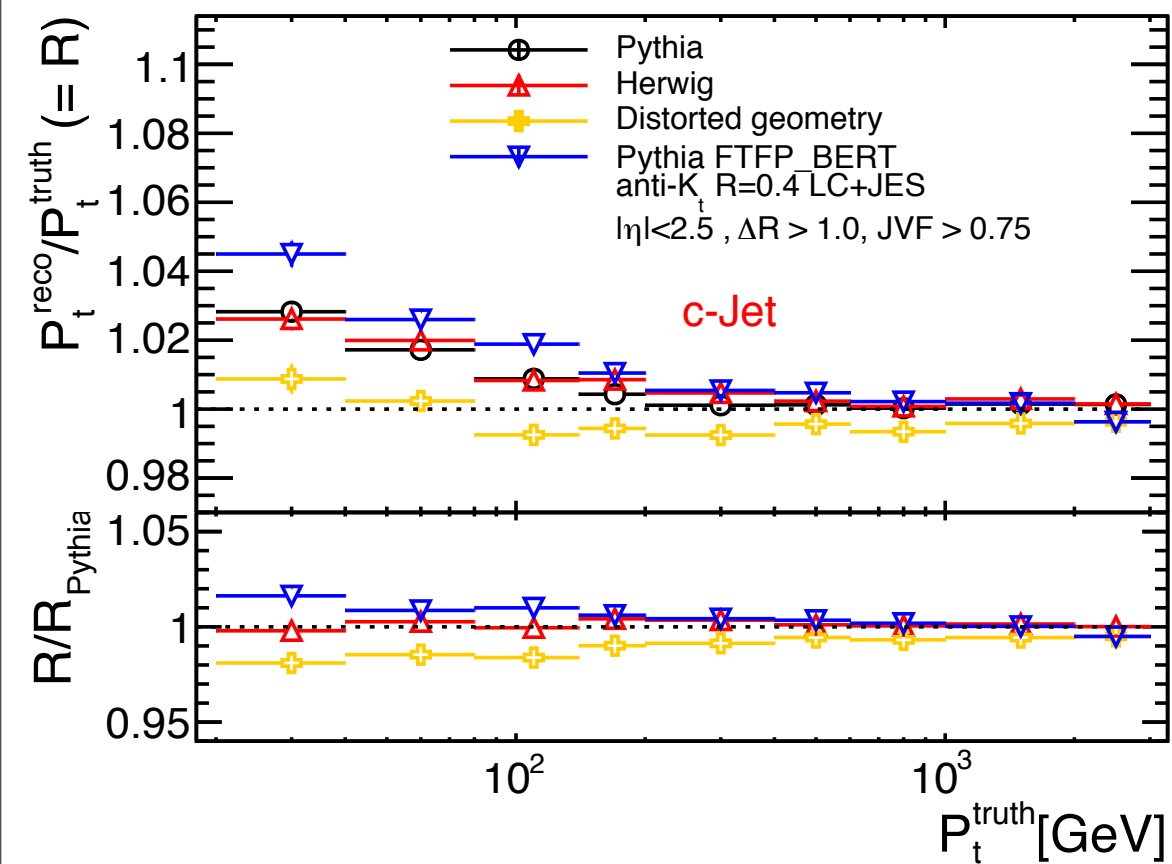
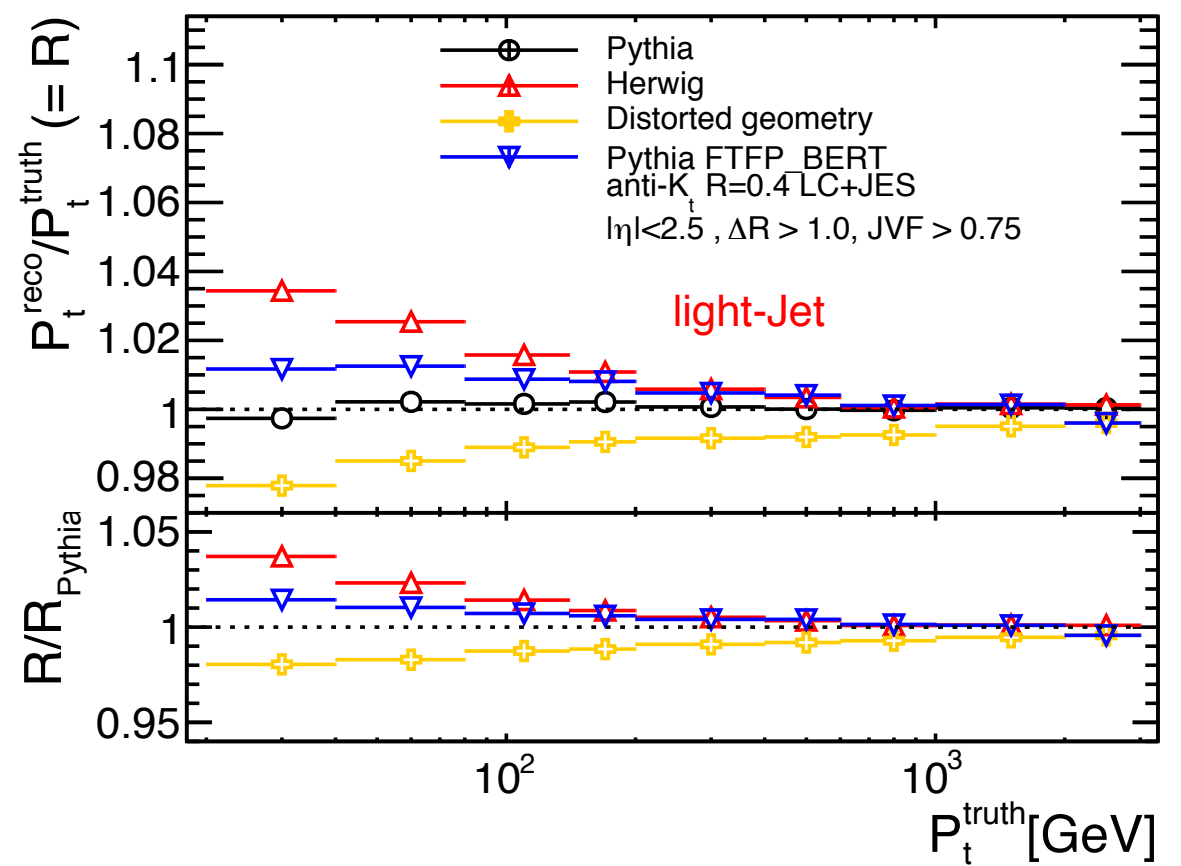
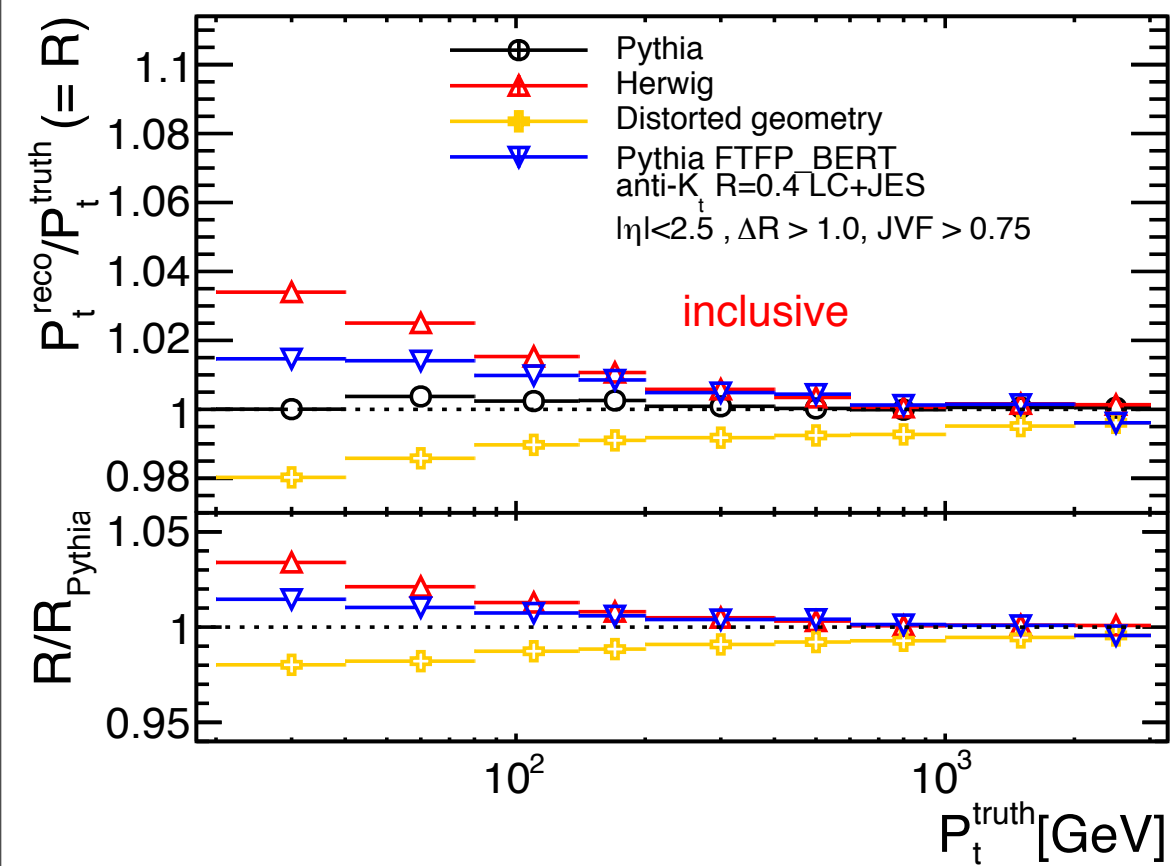
- Update of additional b-jet energy scale systematics uncertainty
- mc12_8TeV : Pythia8, Herwig, Distorted geometry, (FTFP_BERT)
- The result;
 - Herwig: larger additional systematics at low pT region
 - LC + JES :a bit smaller additional systematics
- Other samples e.g. Professor-tune, Perugia, Sherpa : not available in mc12
 - need to produce them if additional systematics from fragmentation necessary

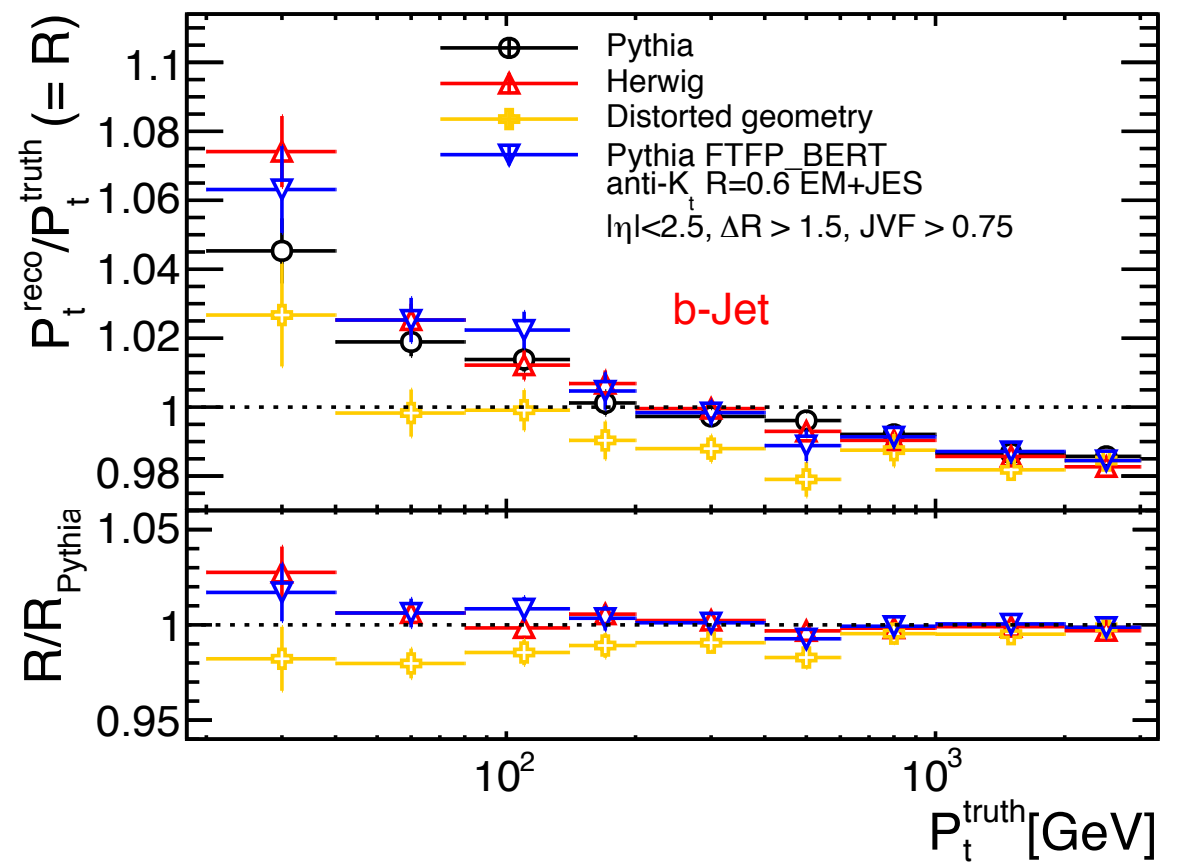
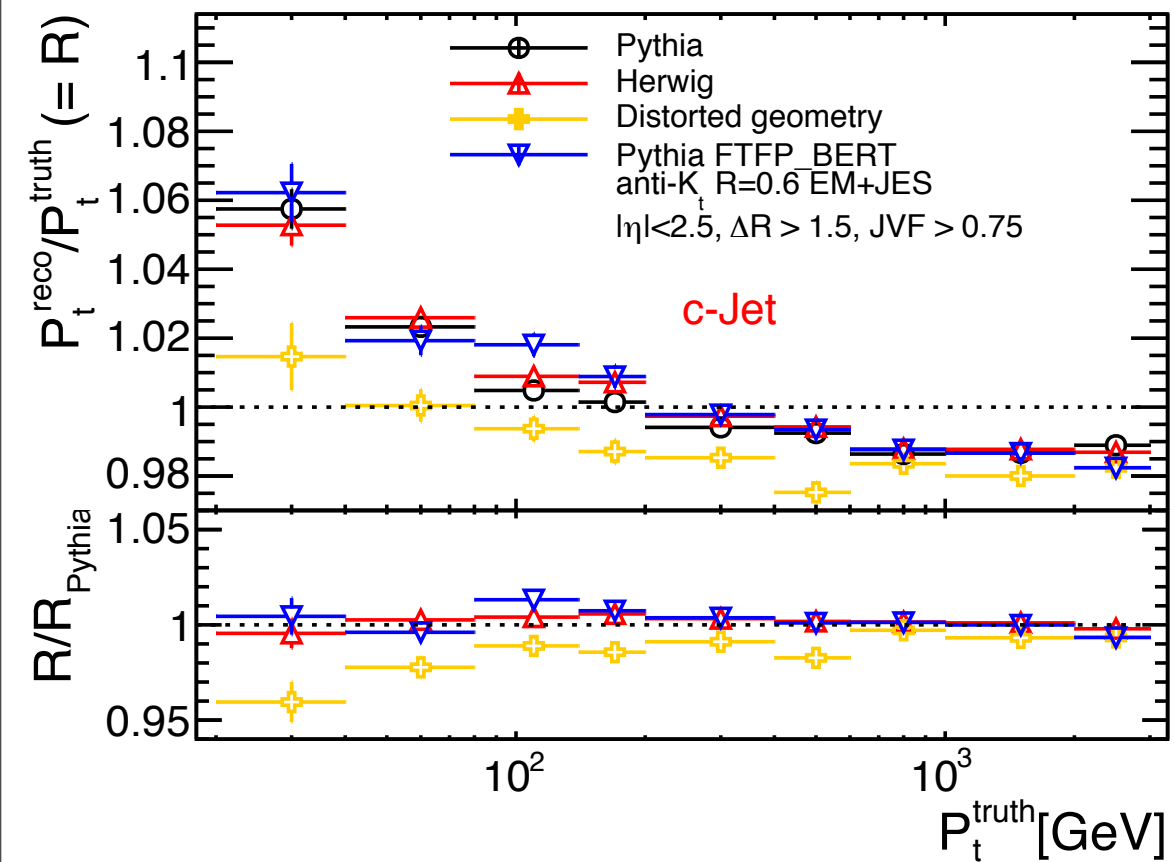
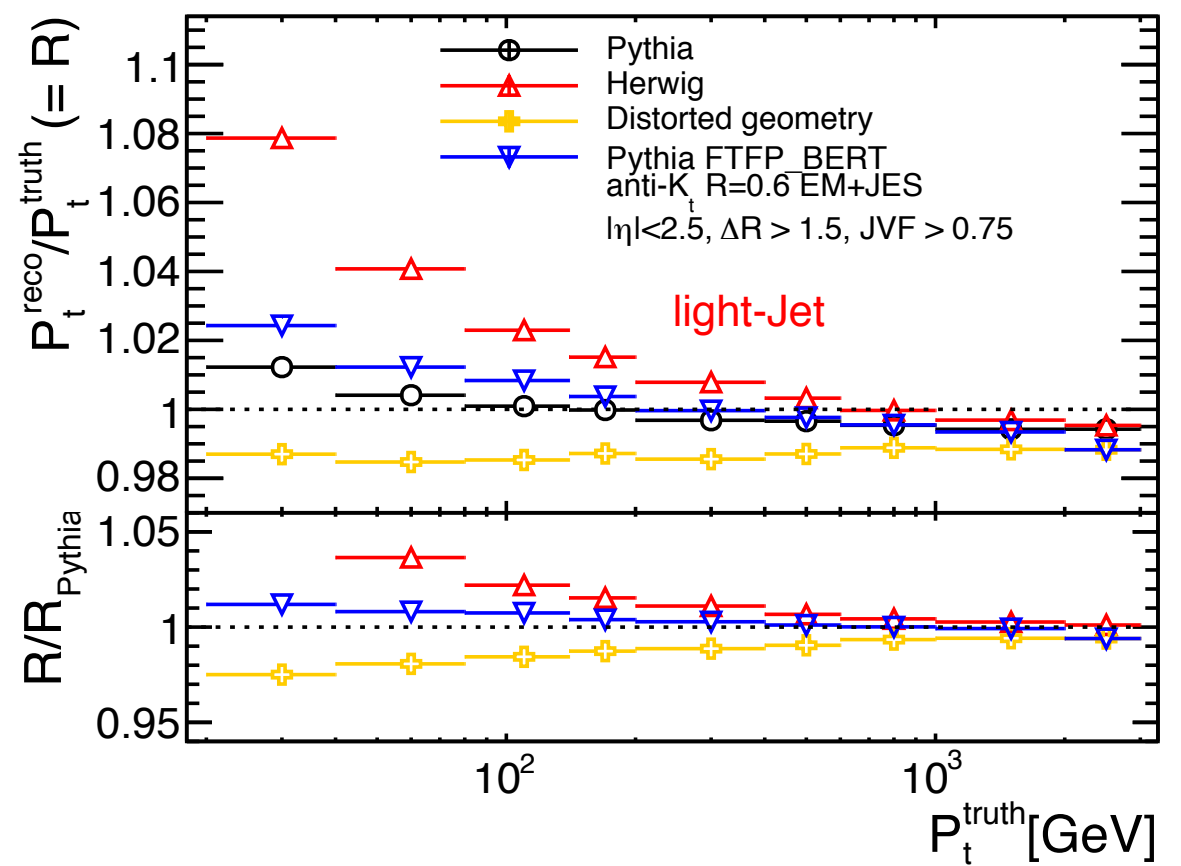
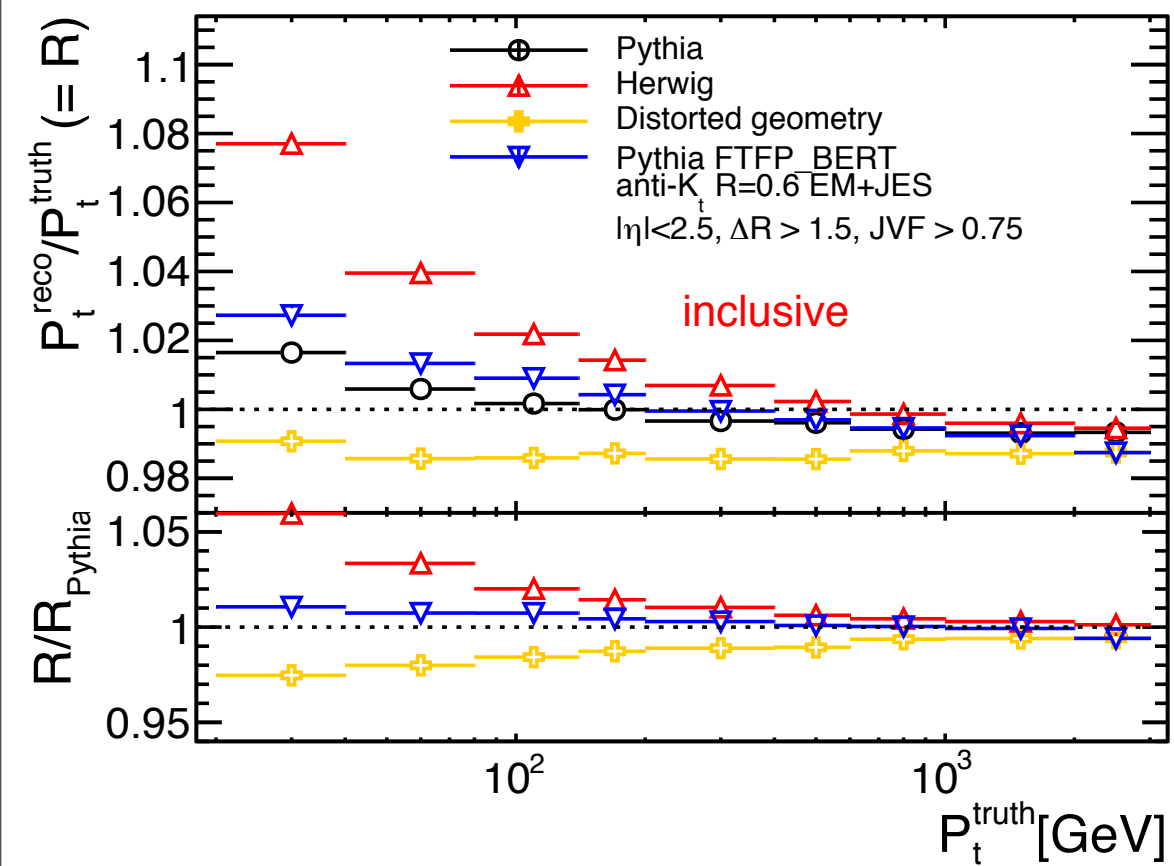
back up

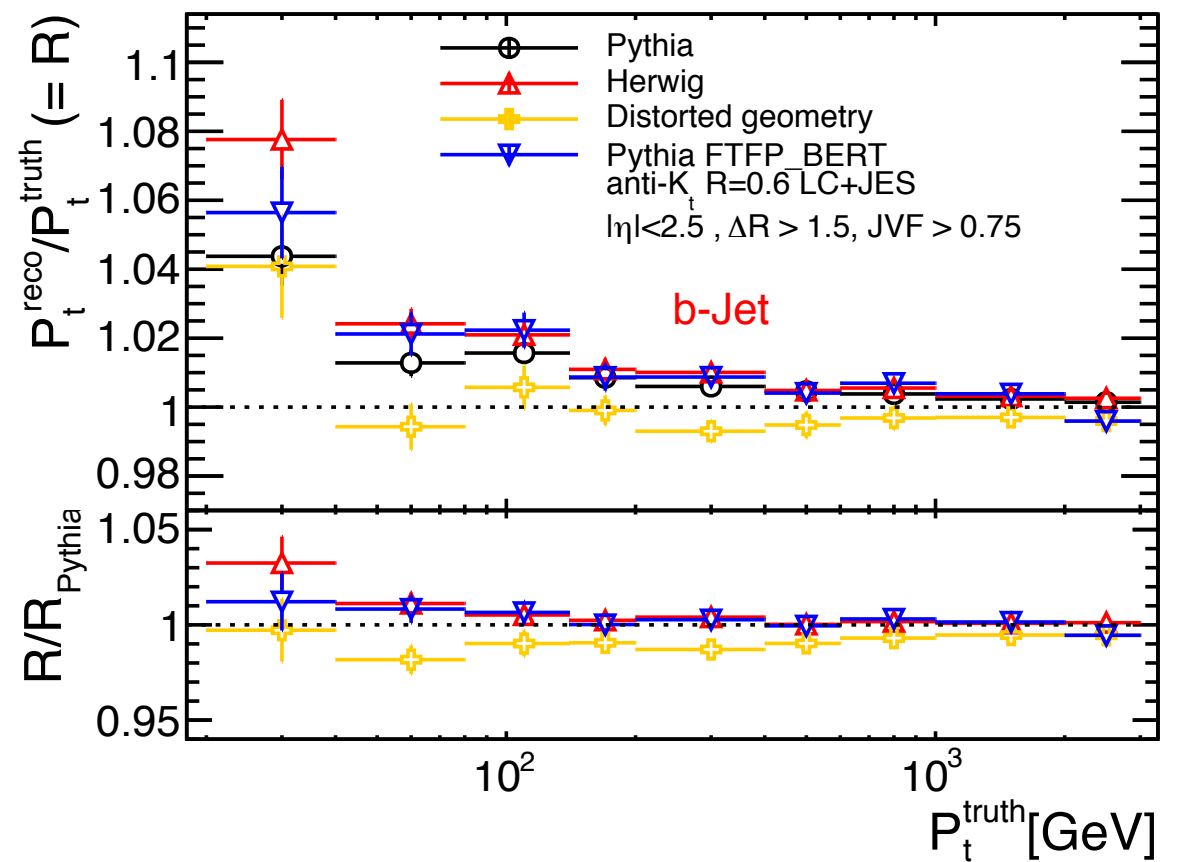
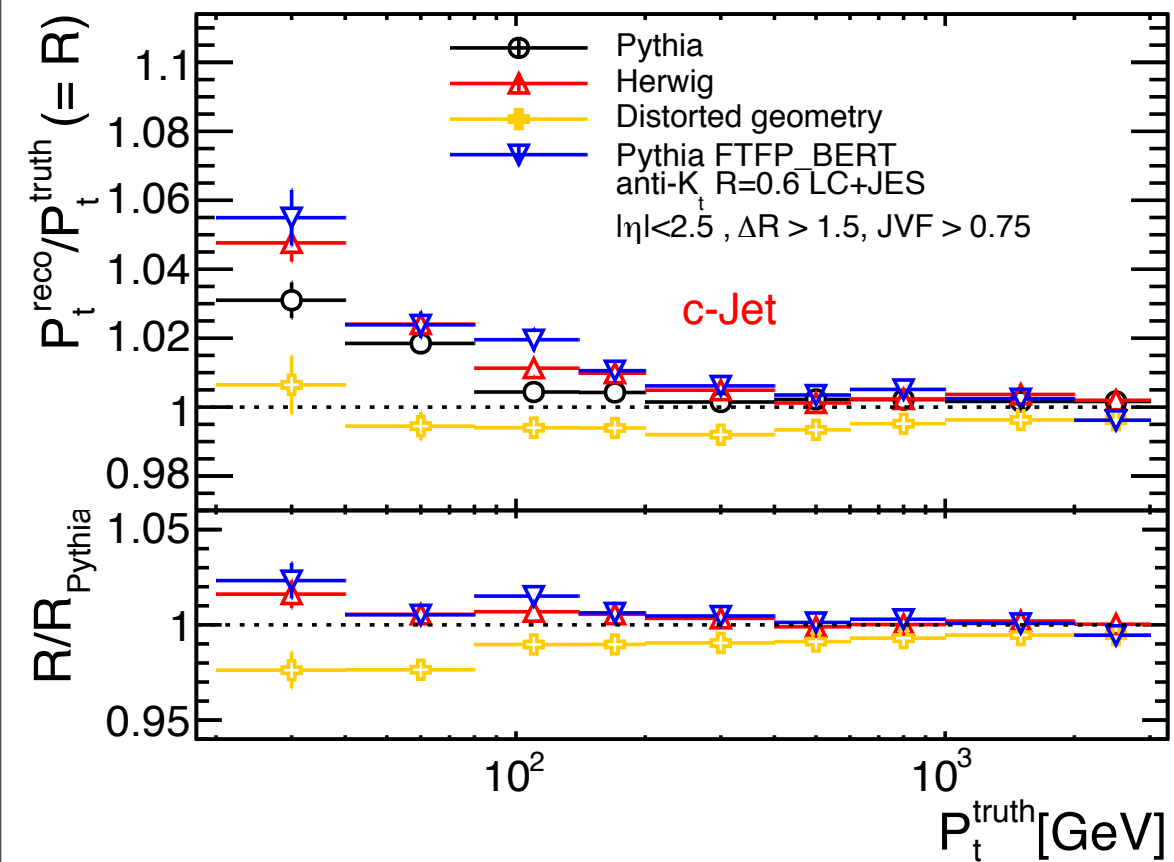
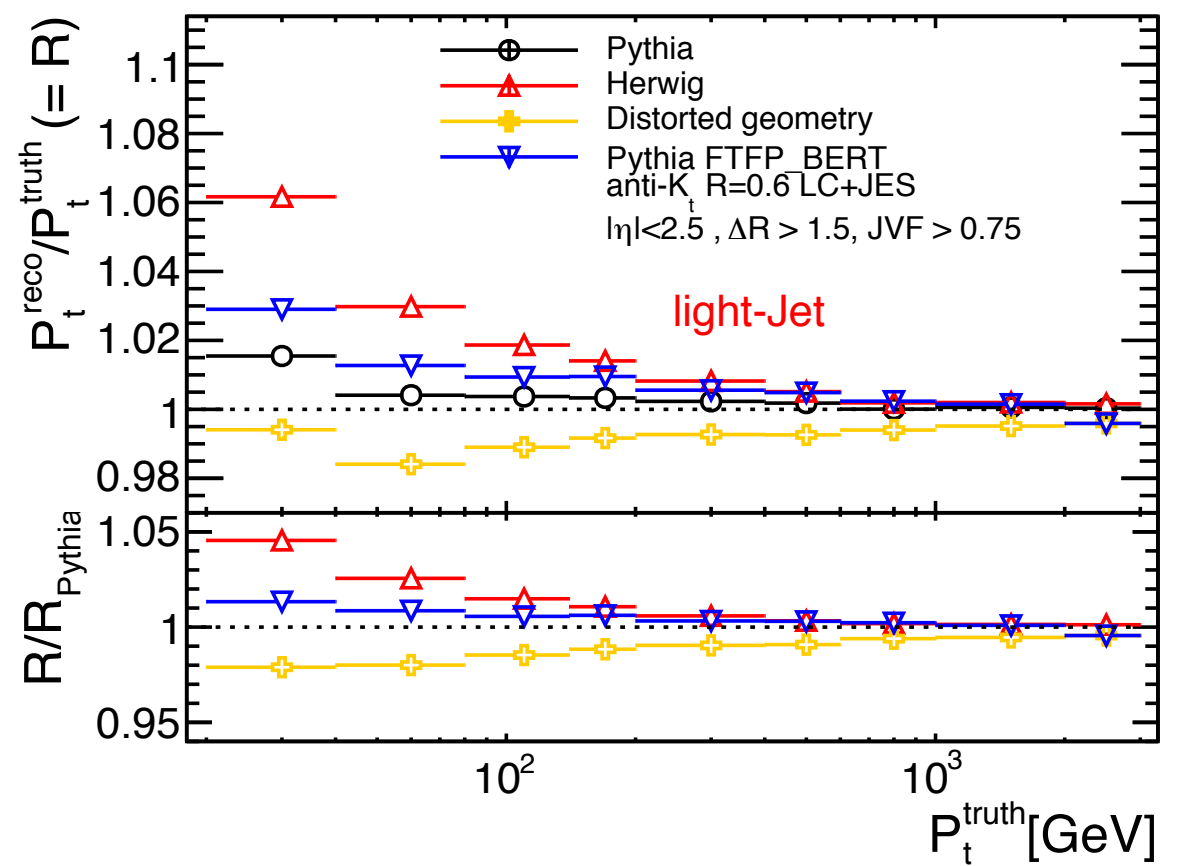
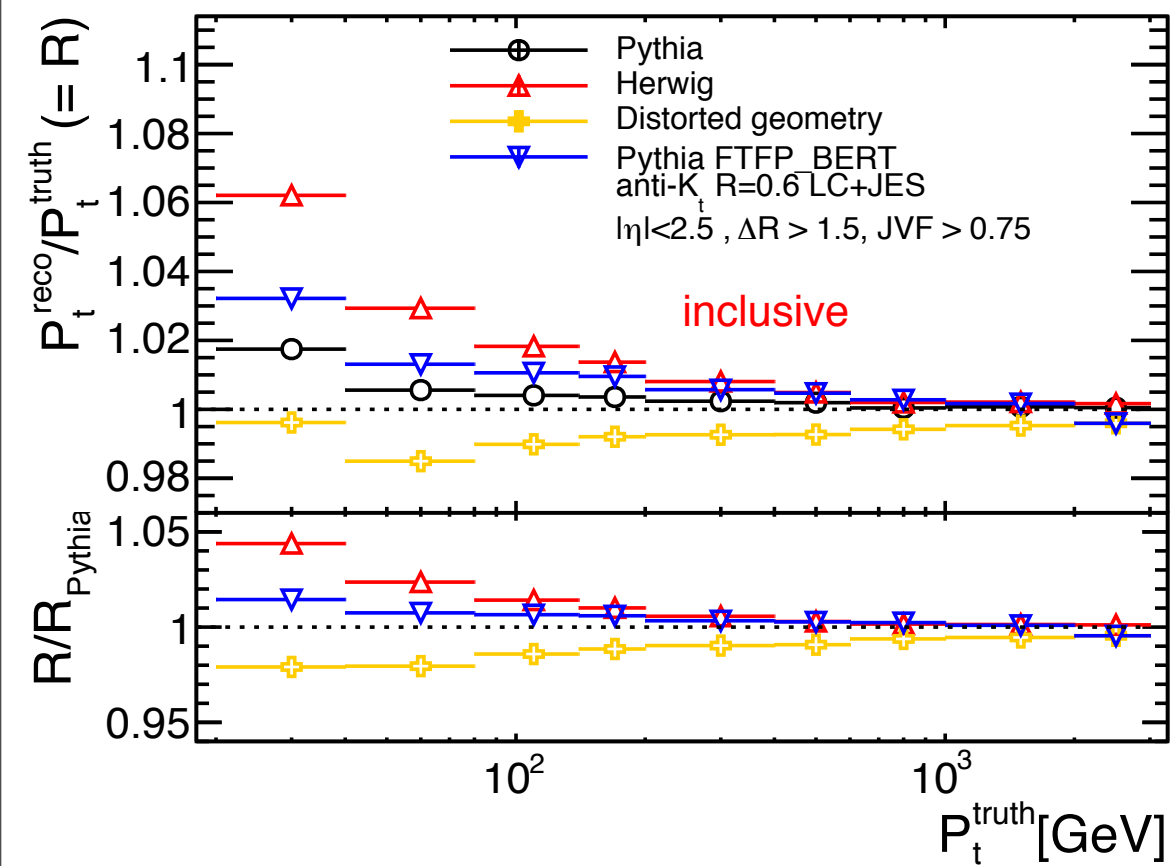
comparison of fit performance



fraction dependence to
pythia

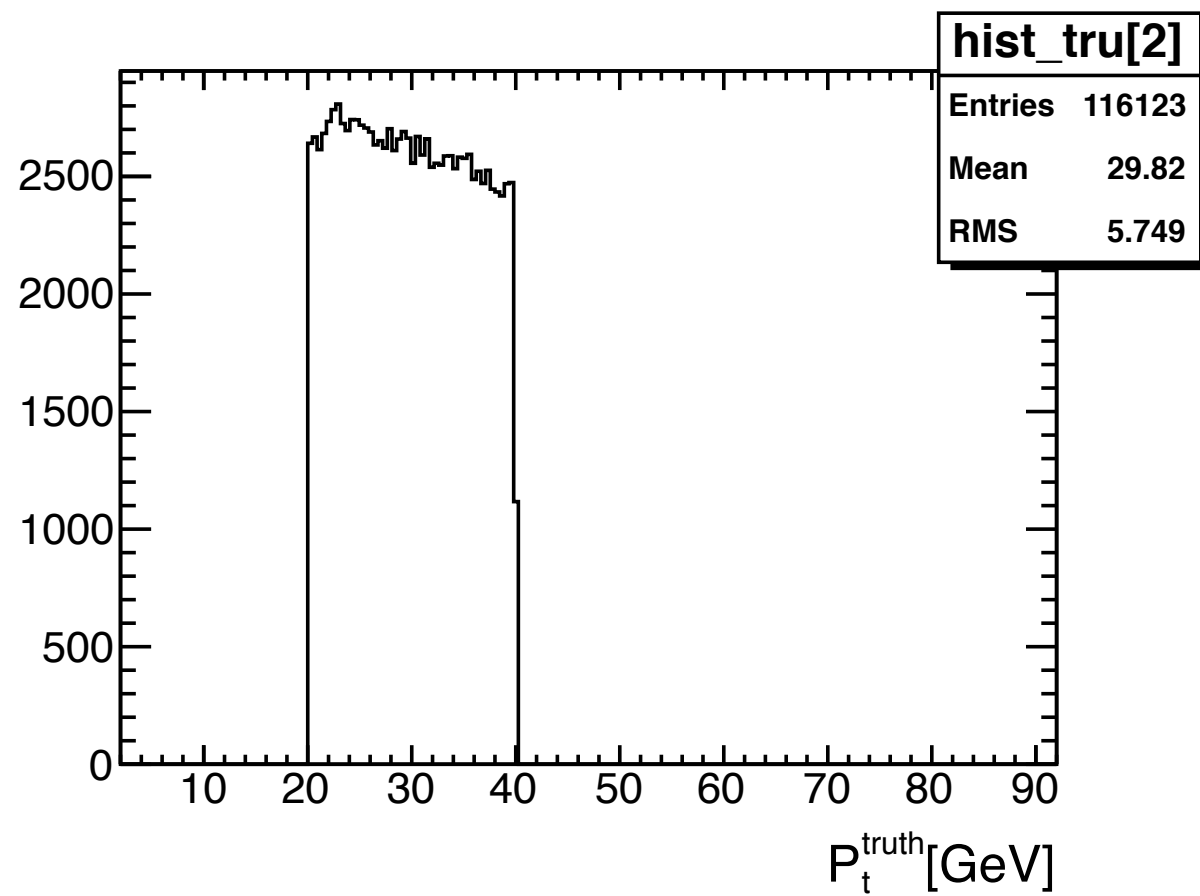
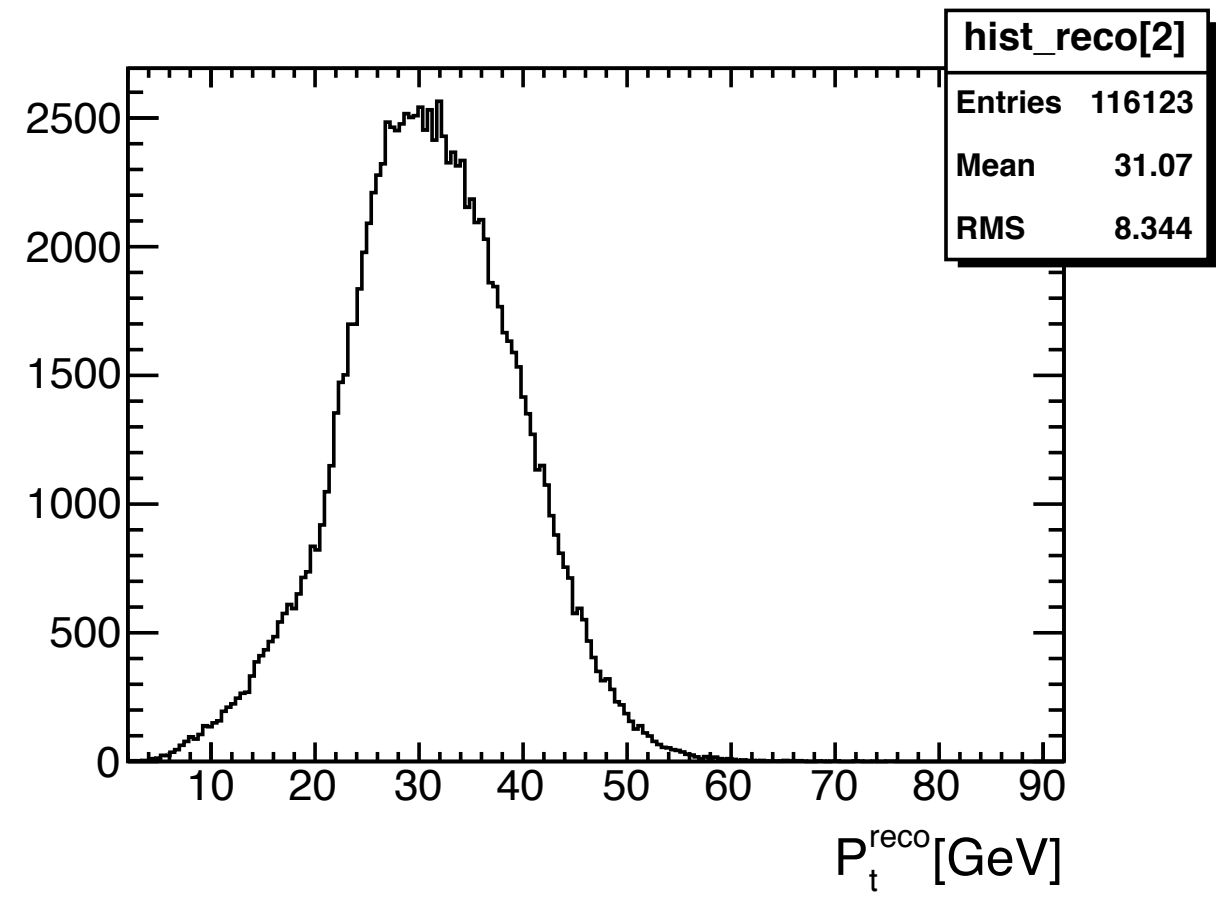
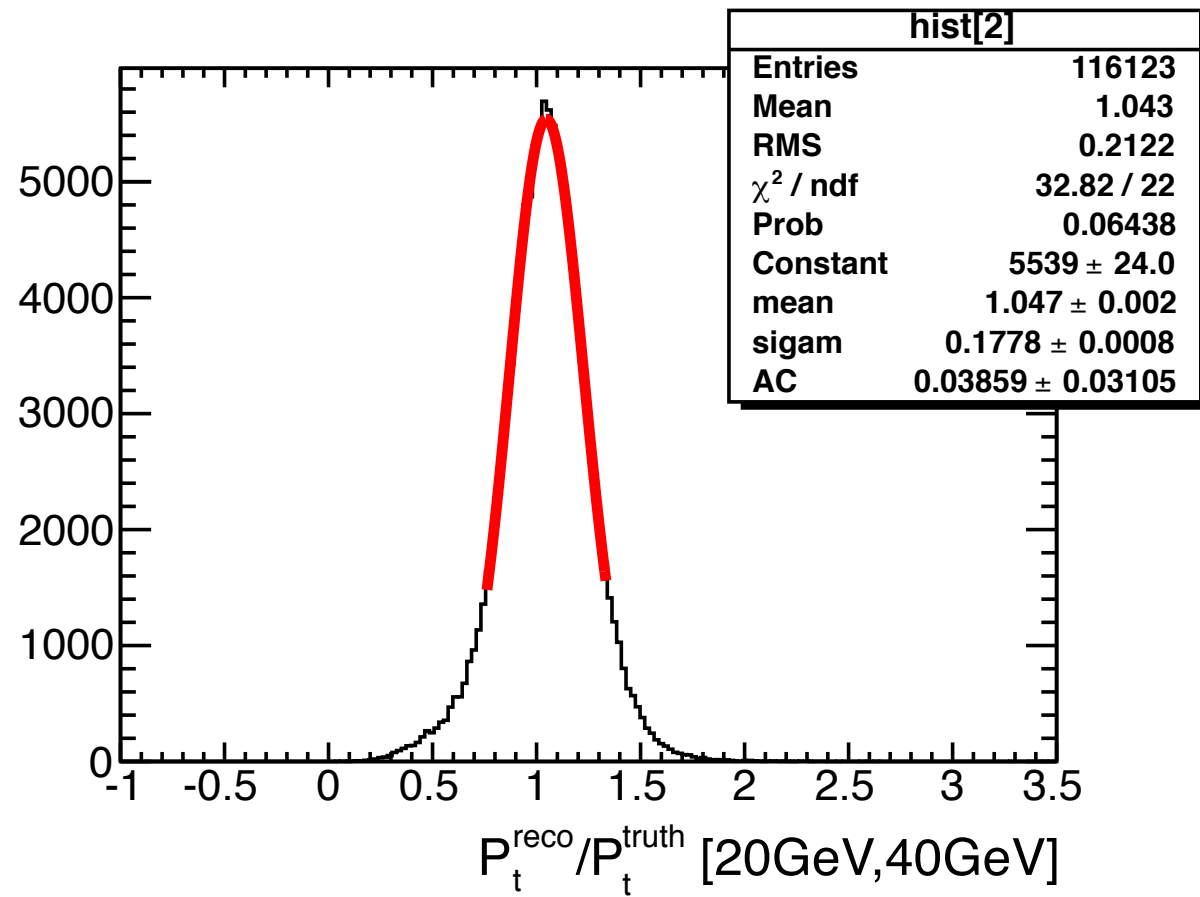


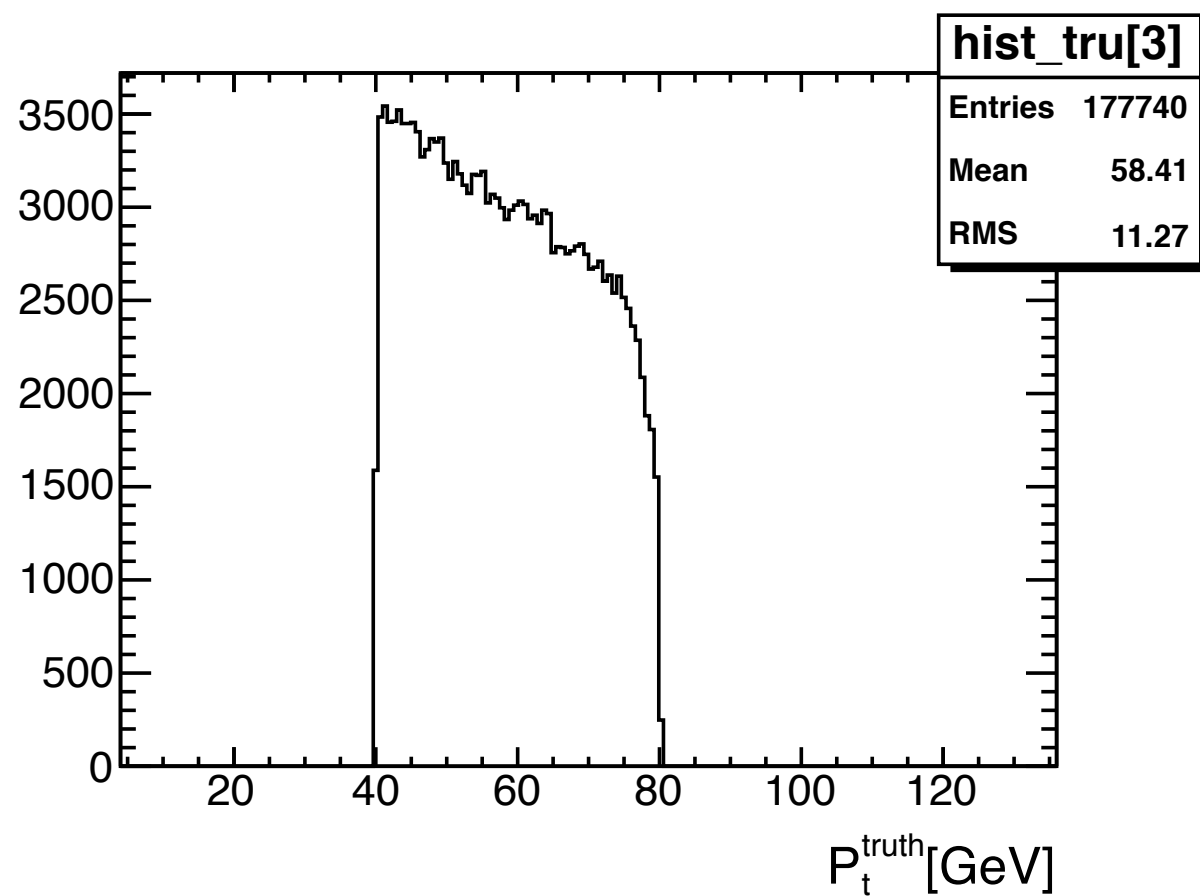
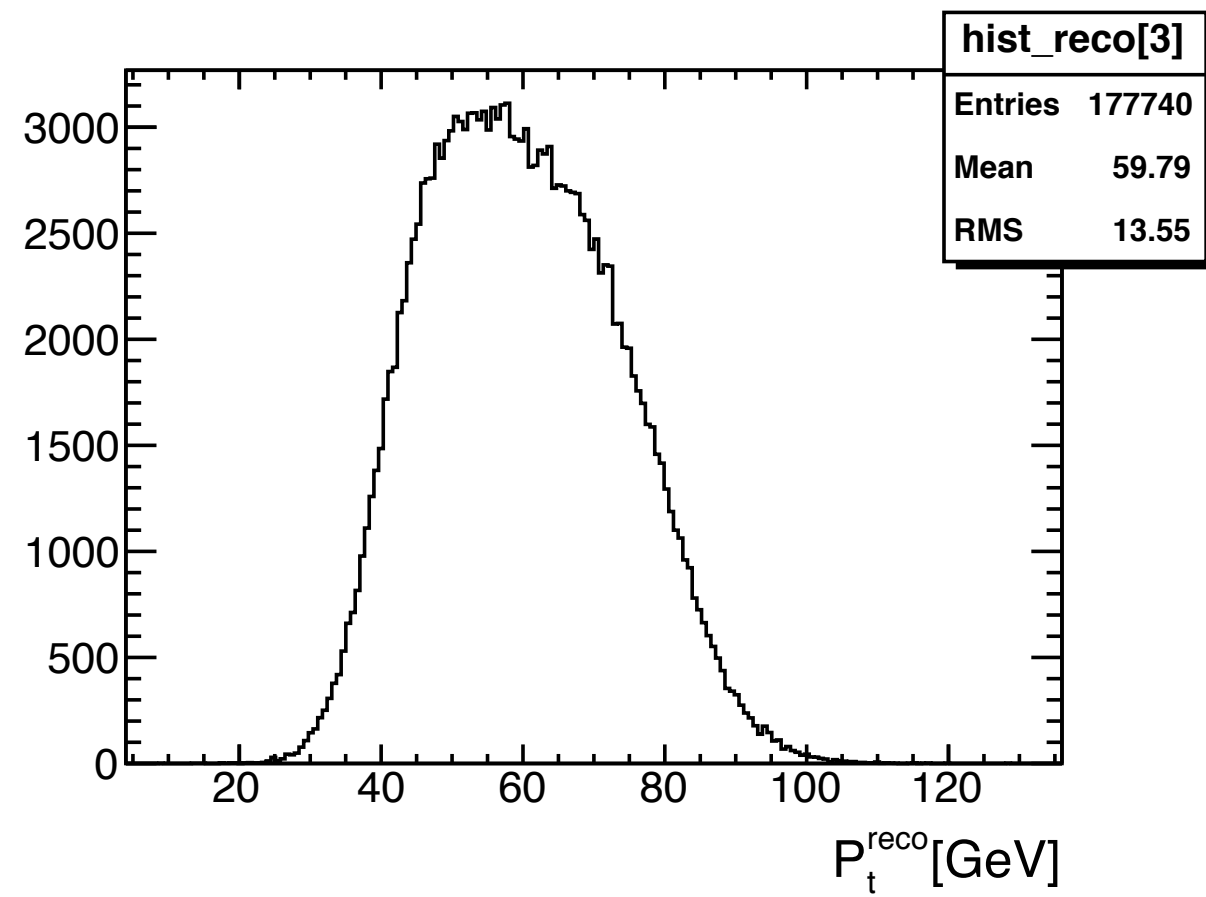
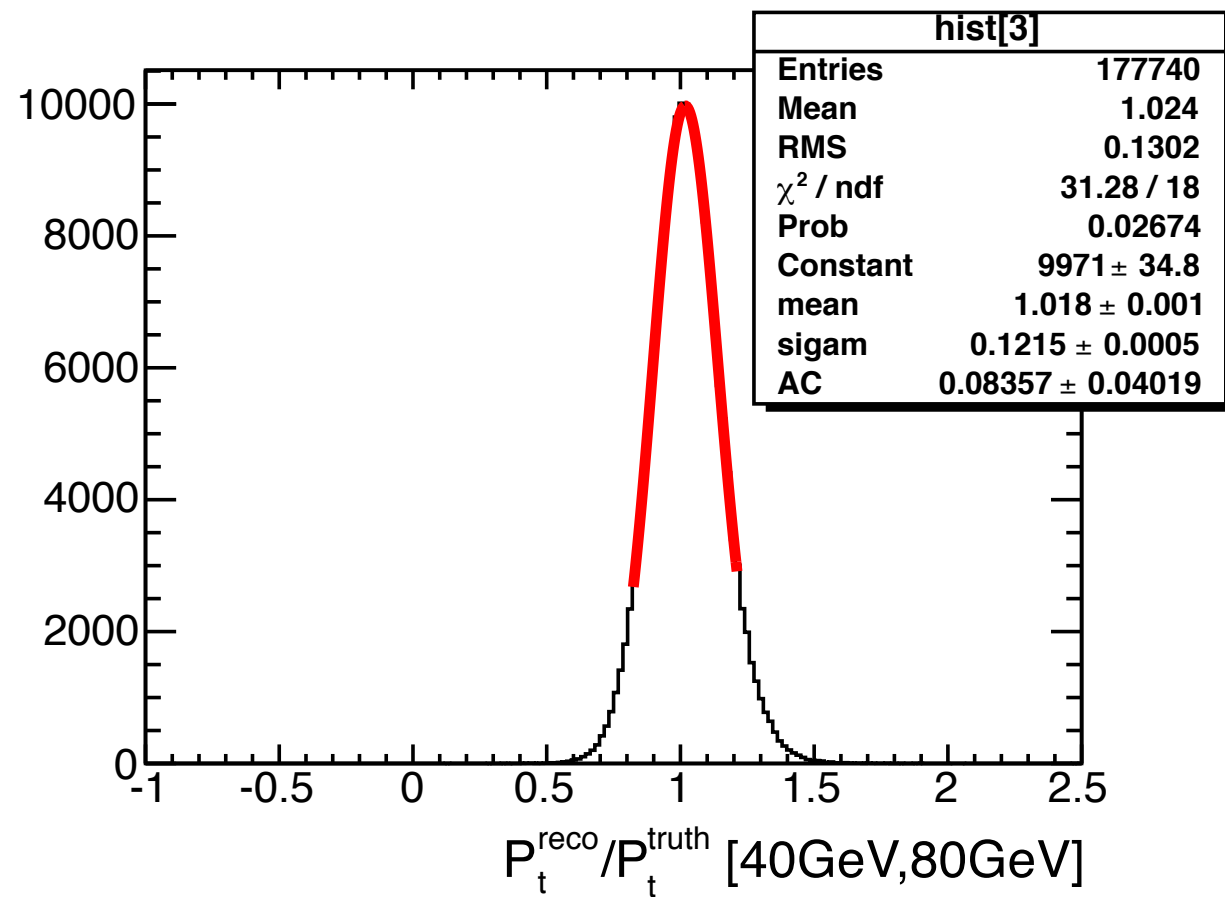


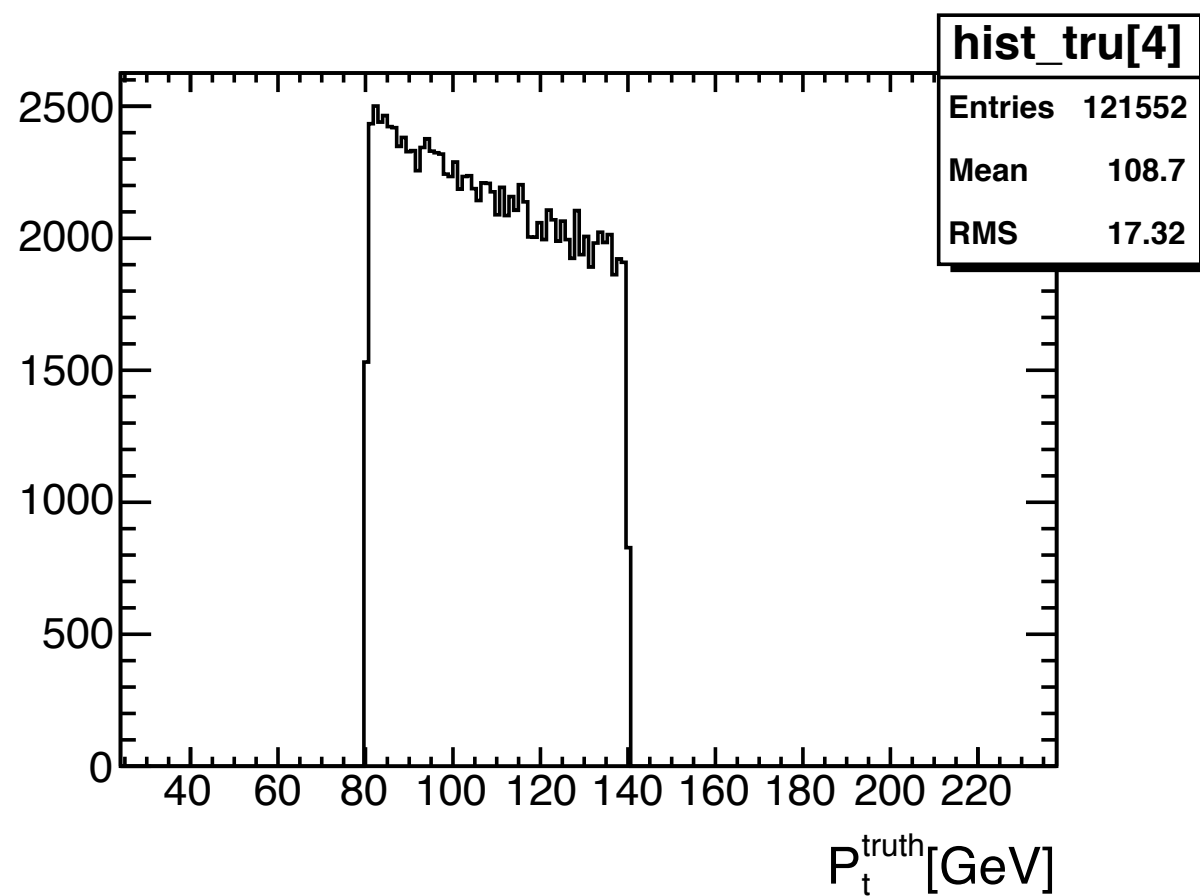
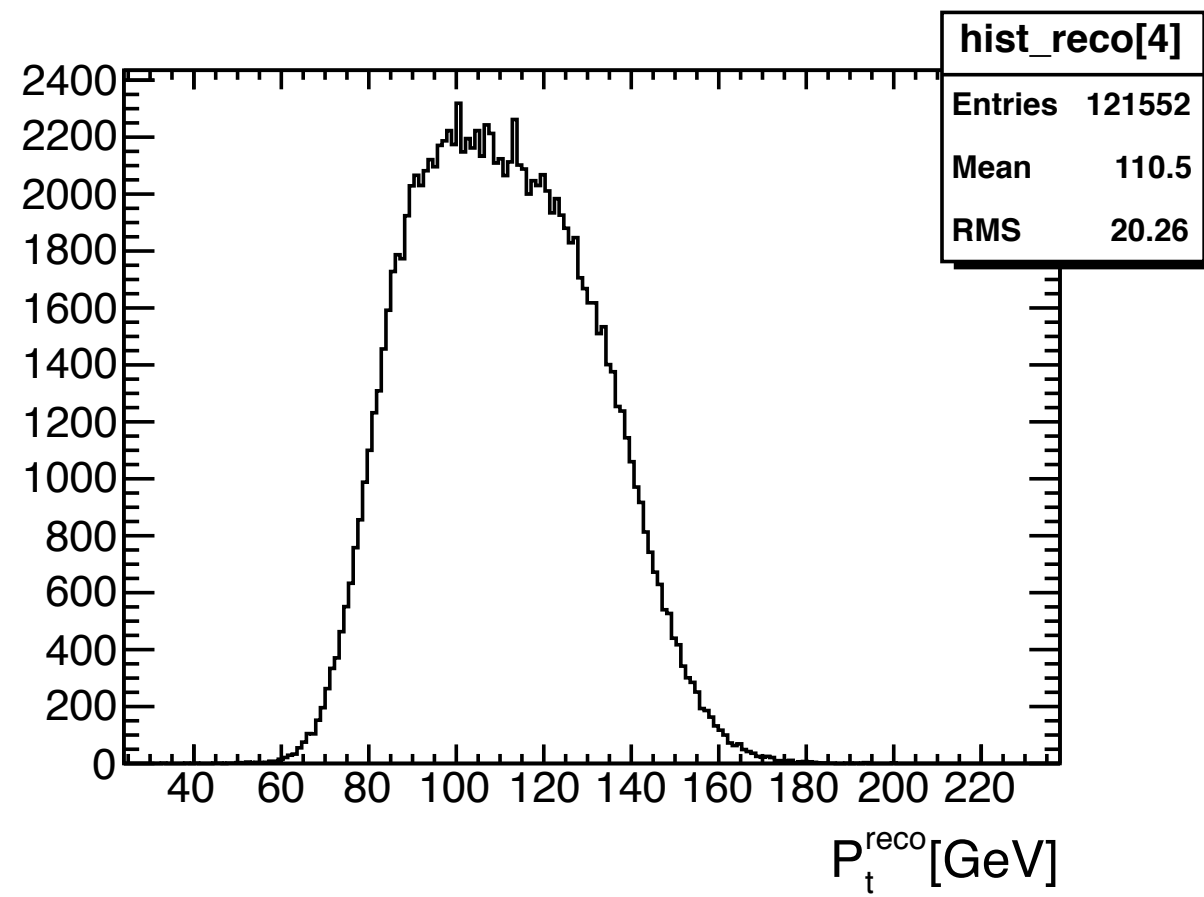
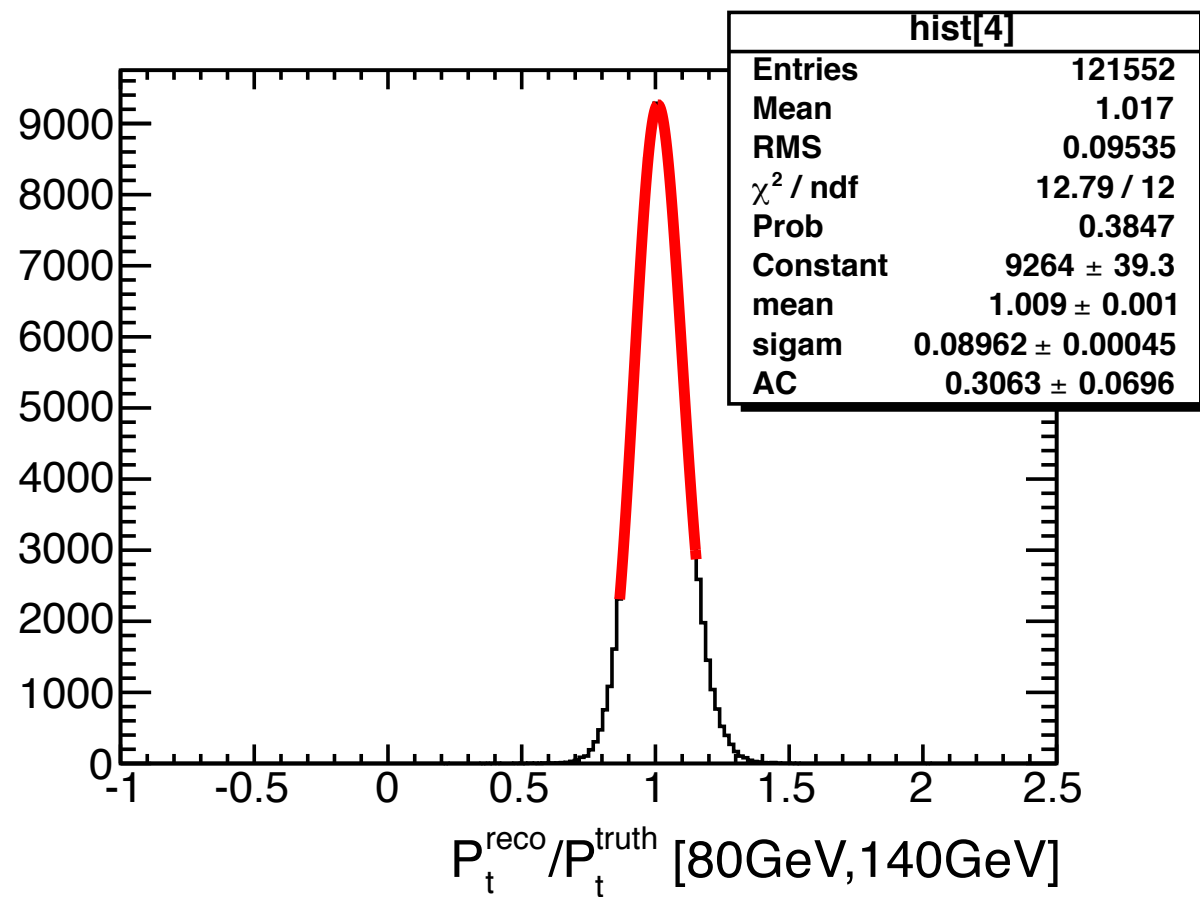


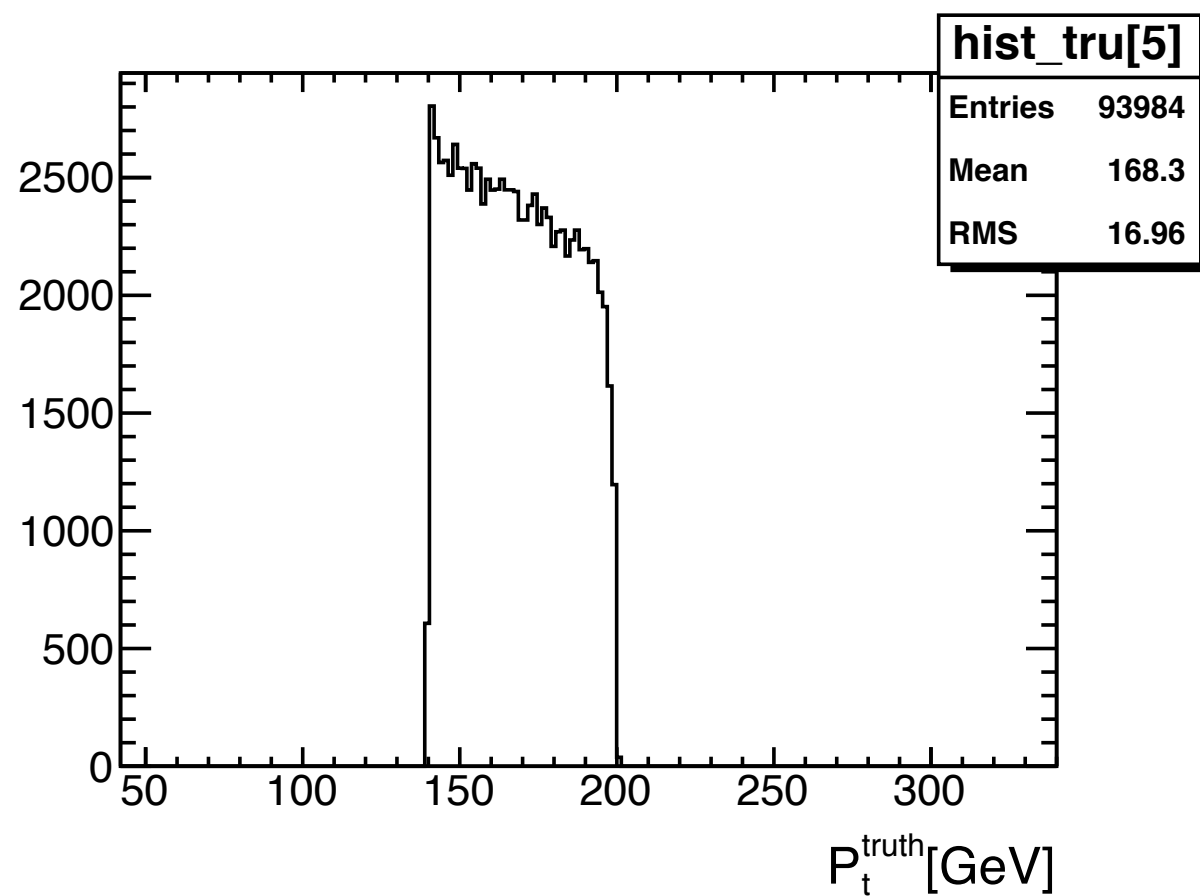
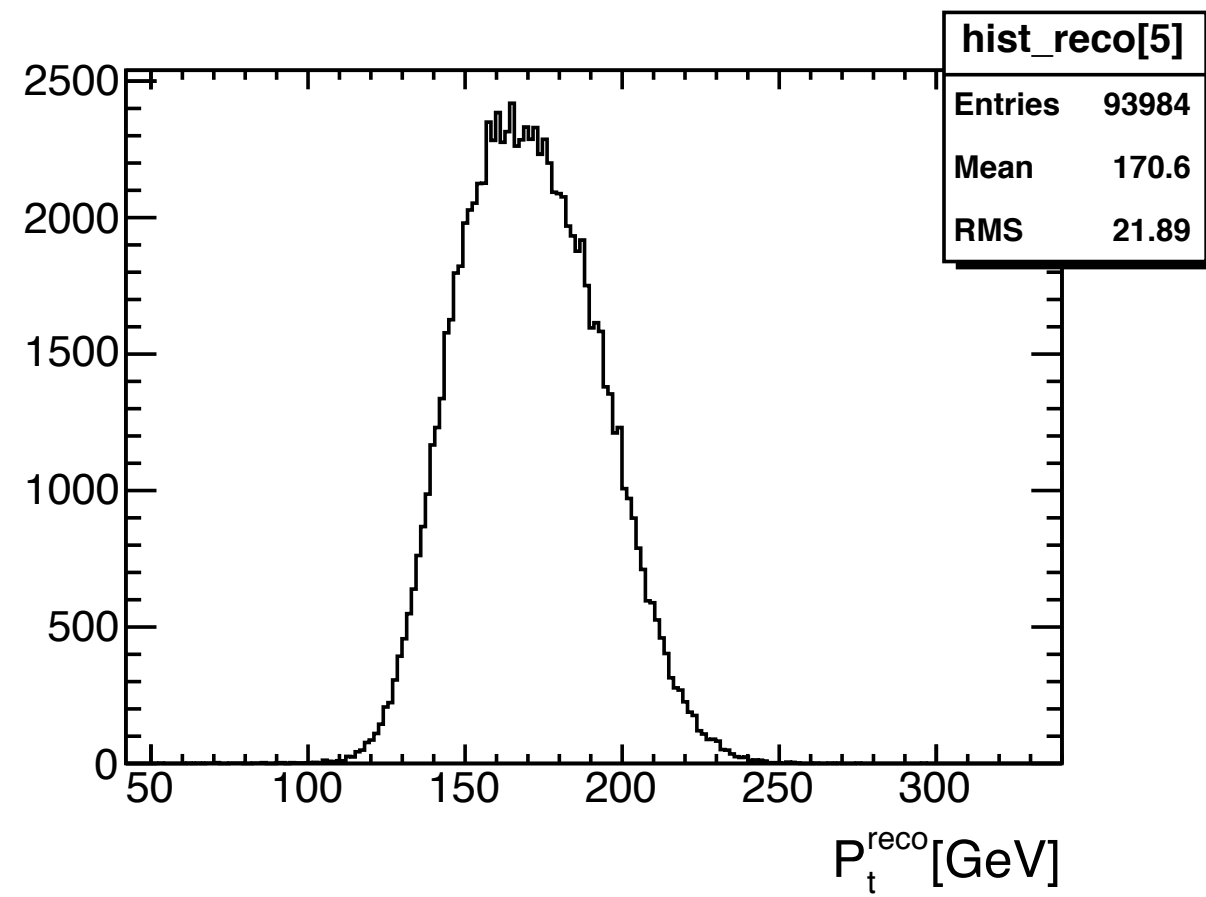
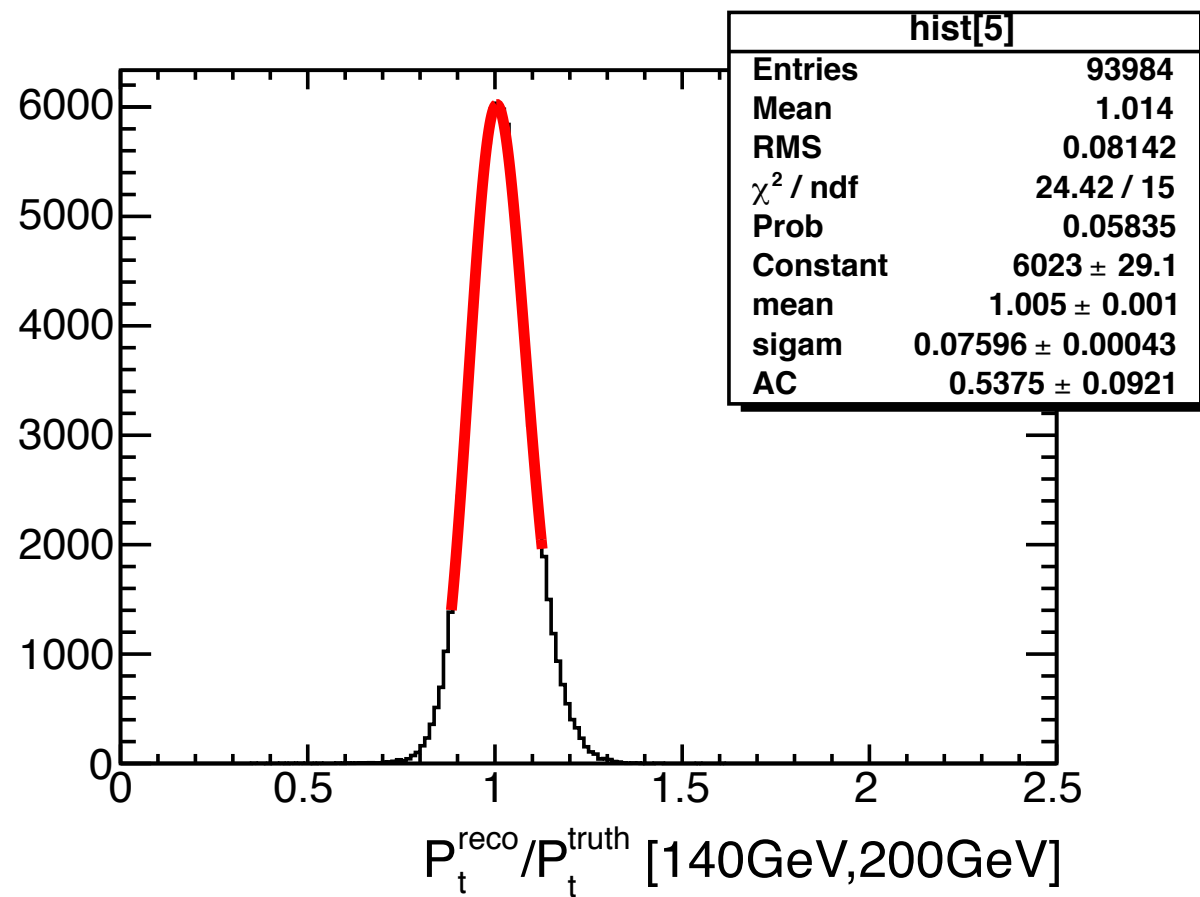
Fraction dependence to Pythia

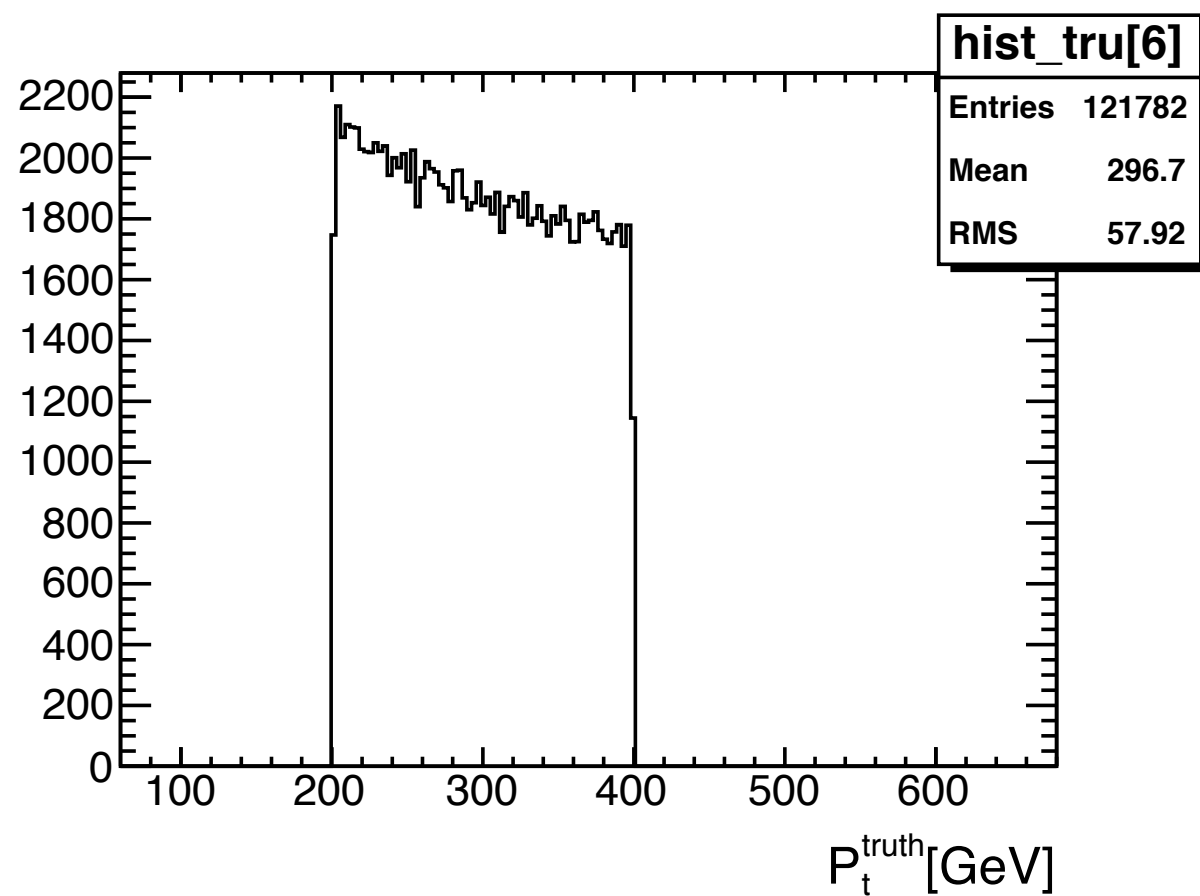
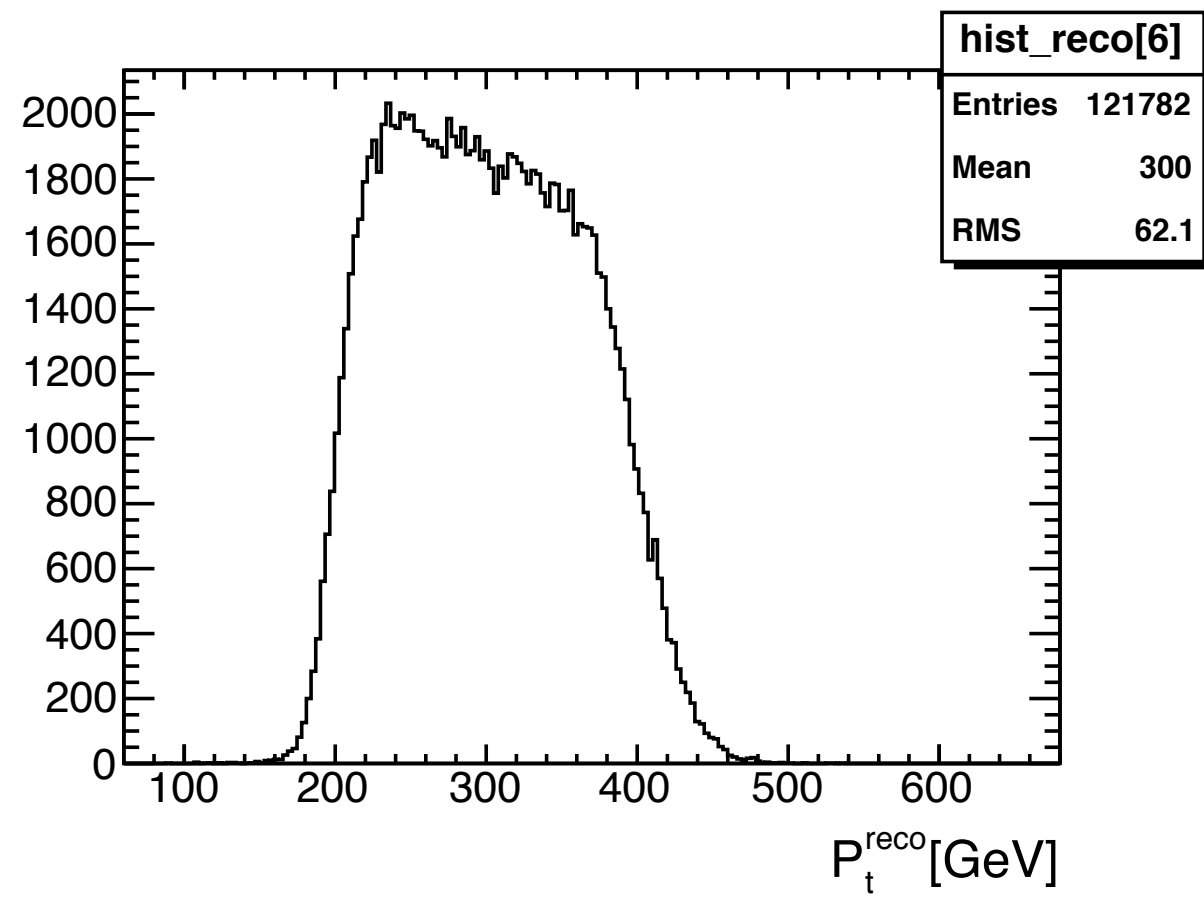
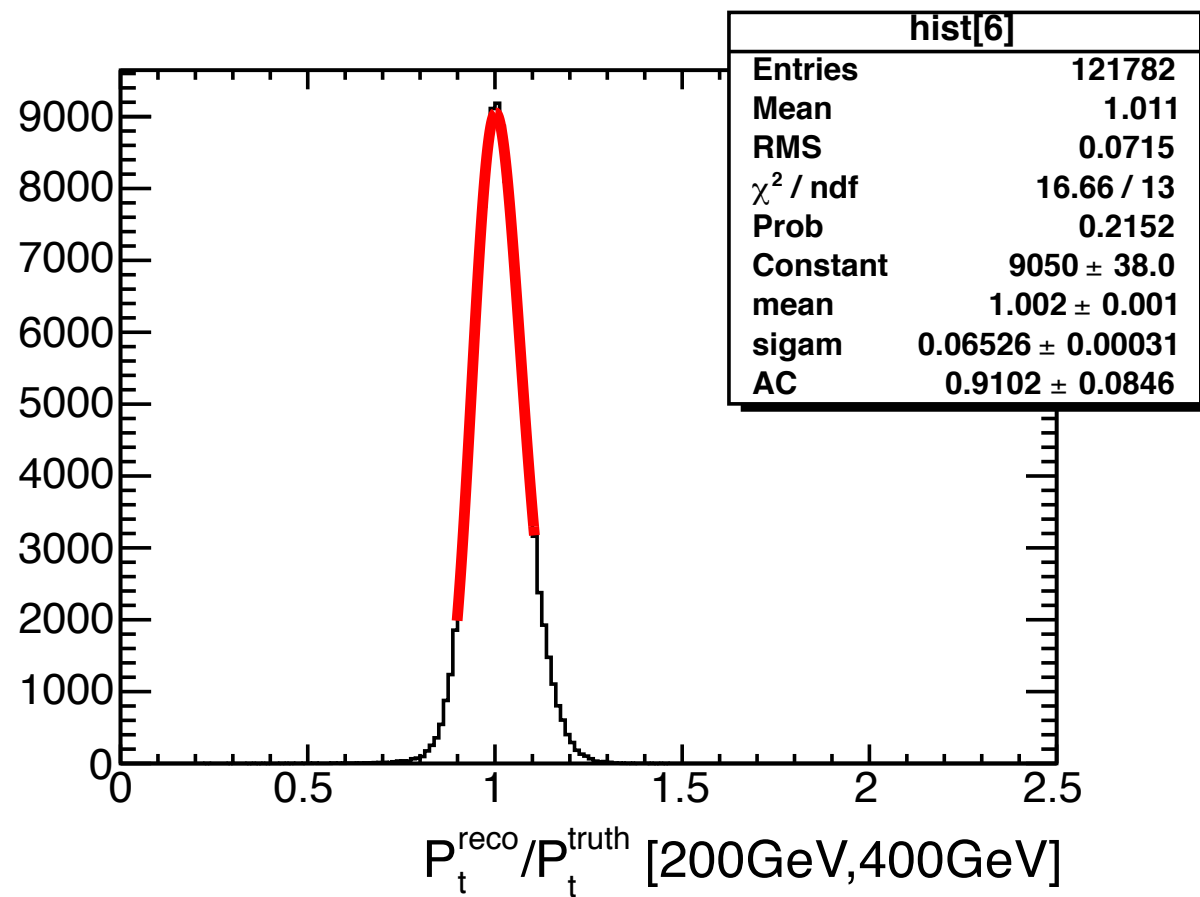
response and Pt distribution
R=0.4, EM+JES
inclusive-Jet

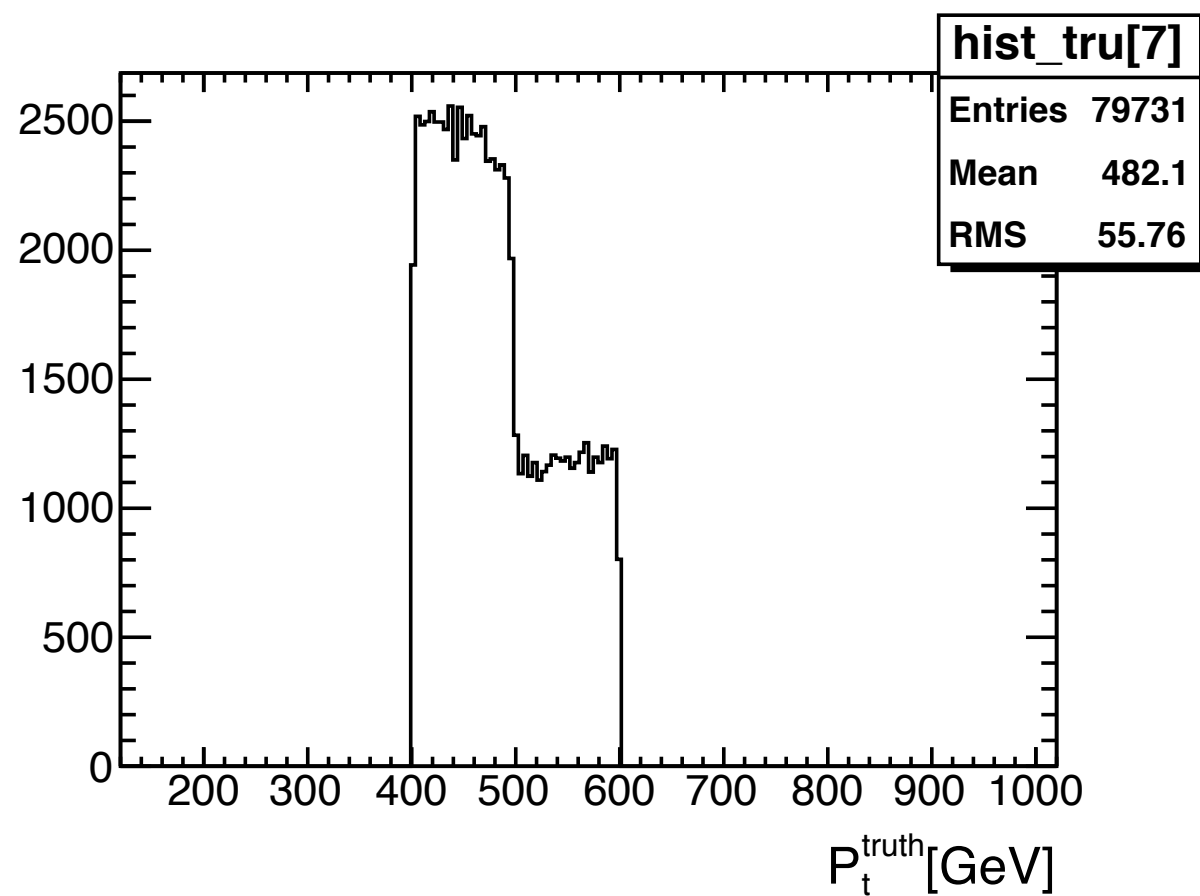
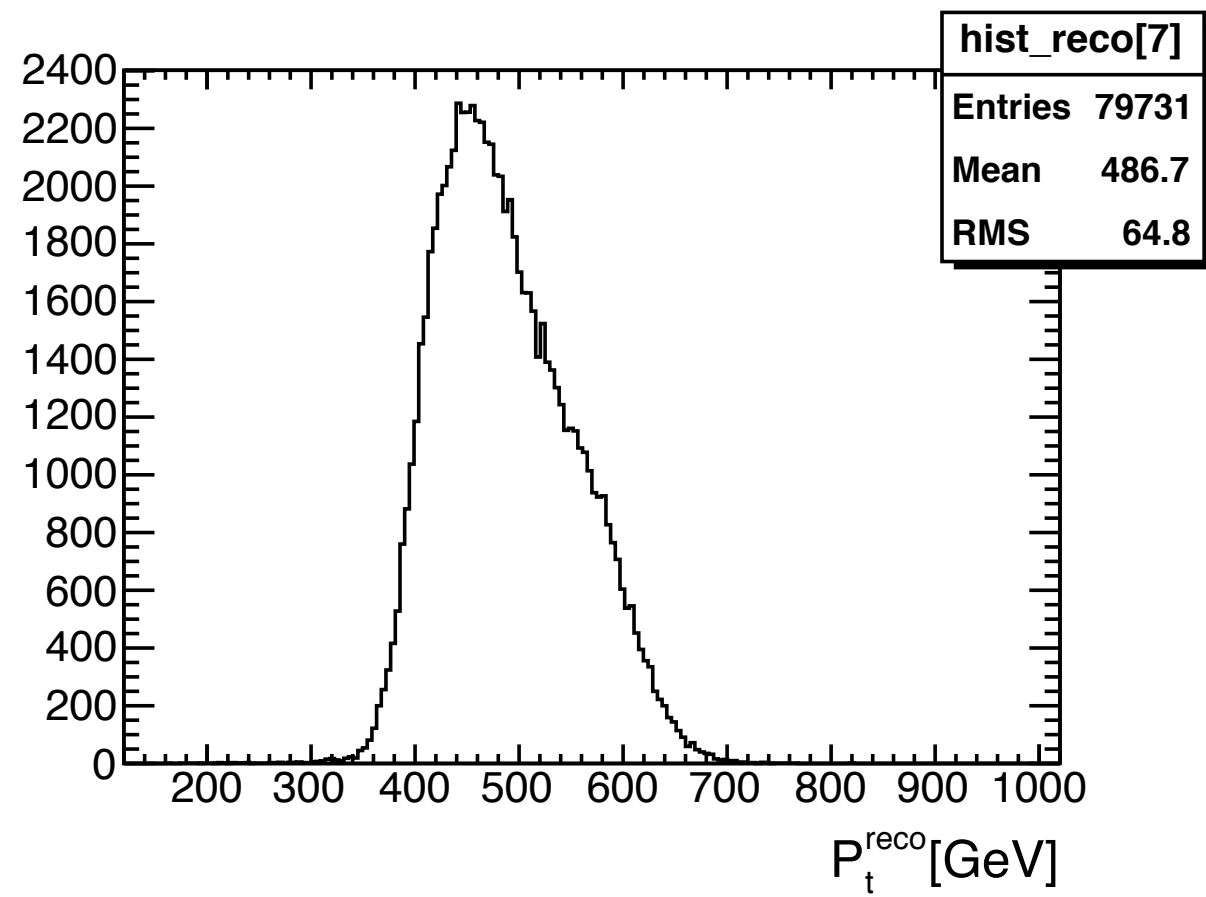
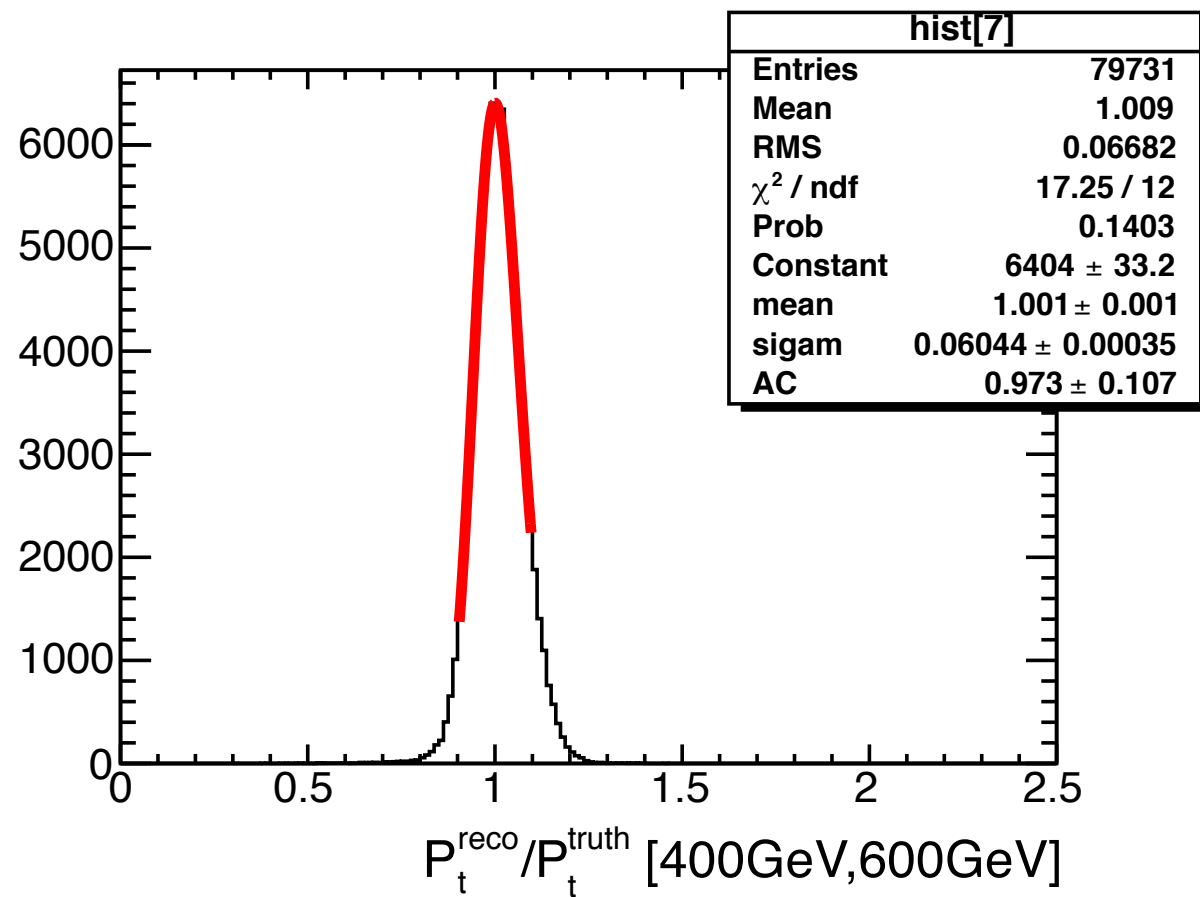


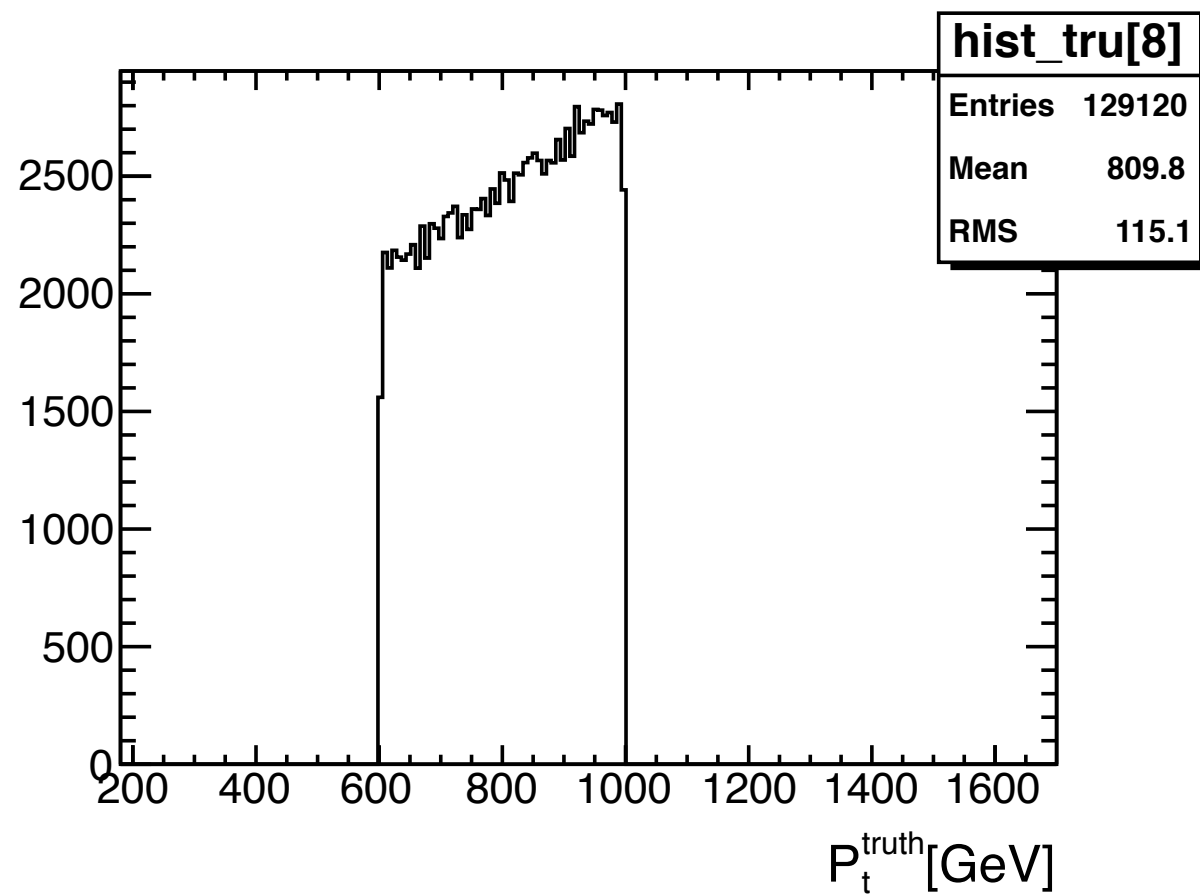
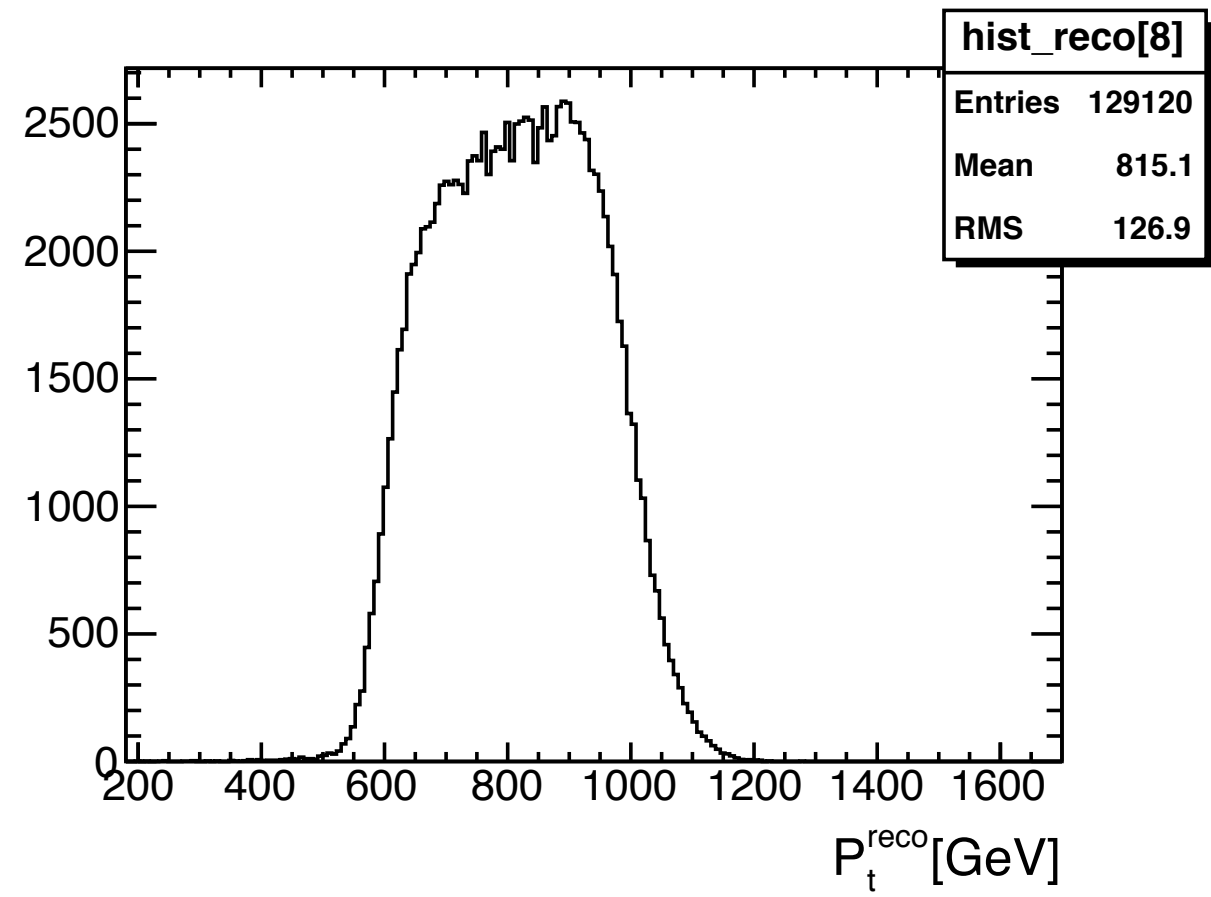
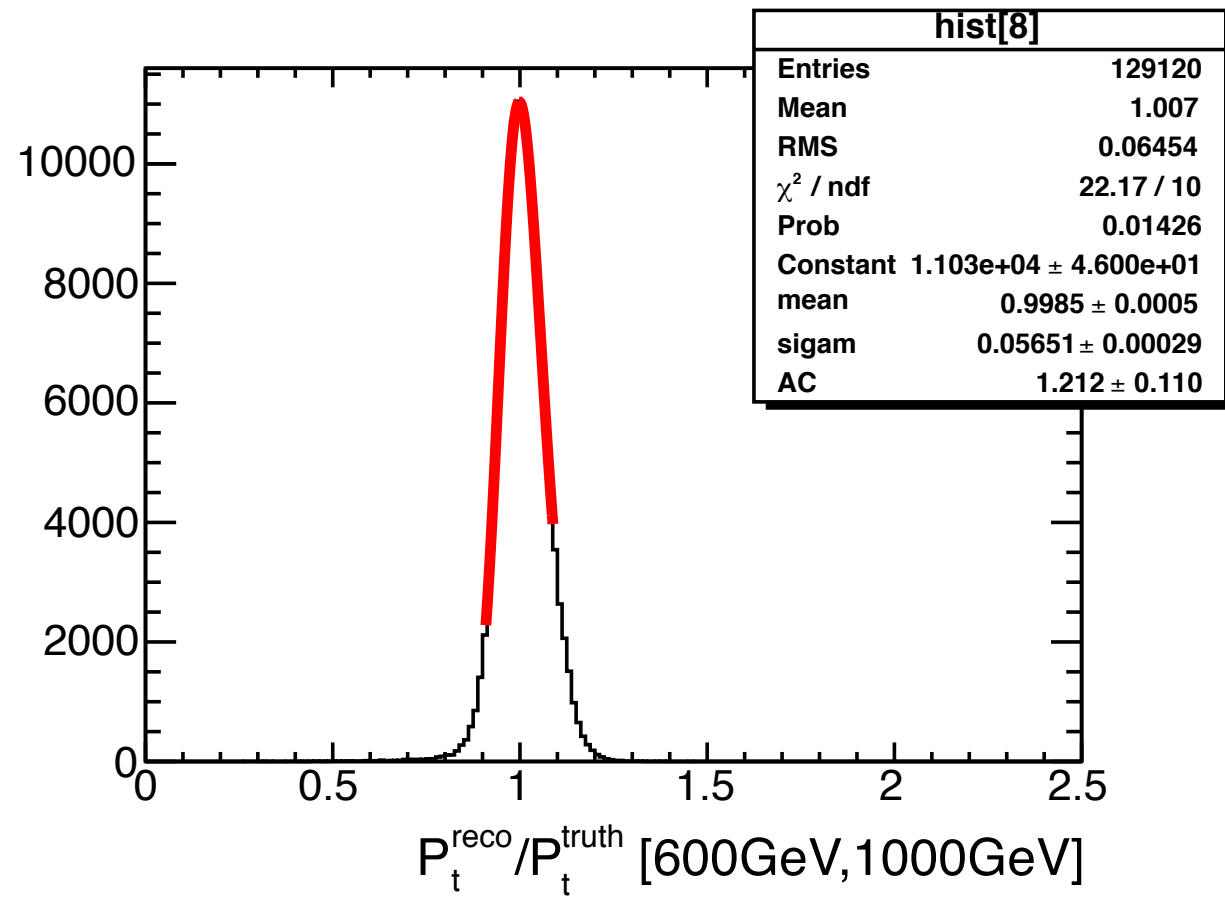


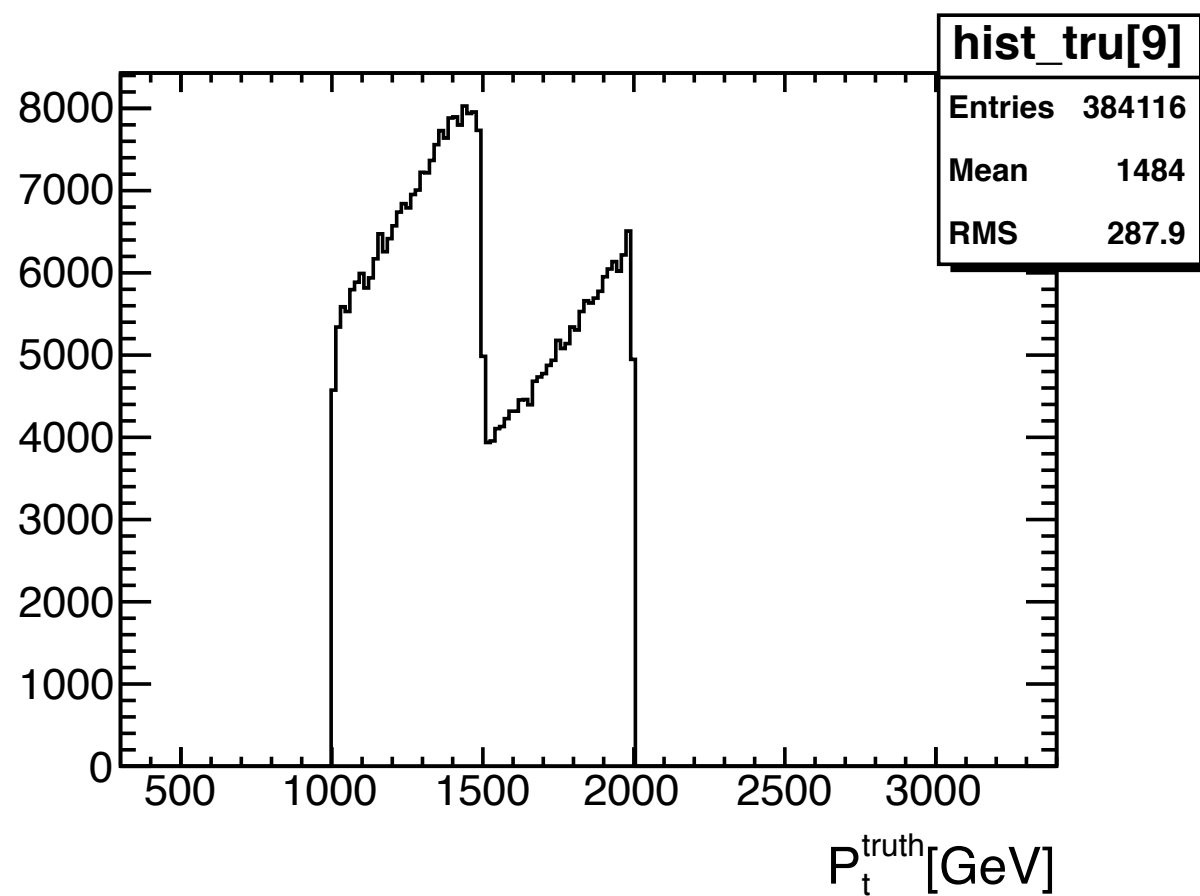
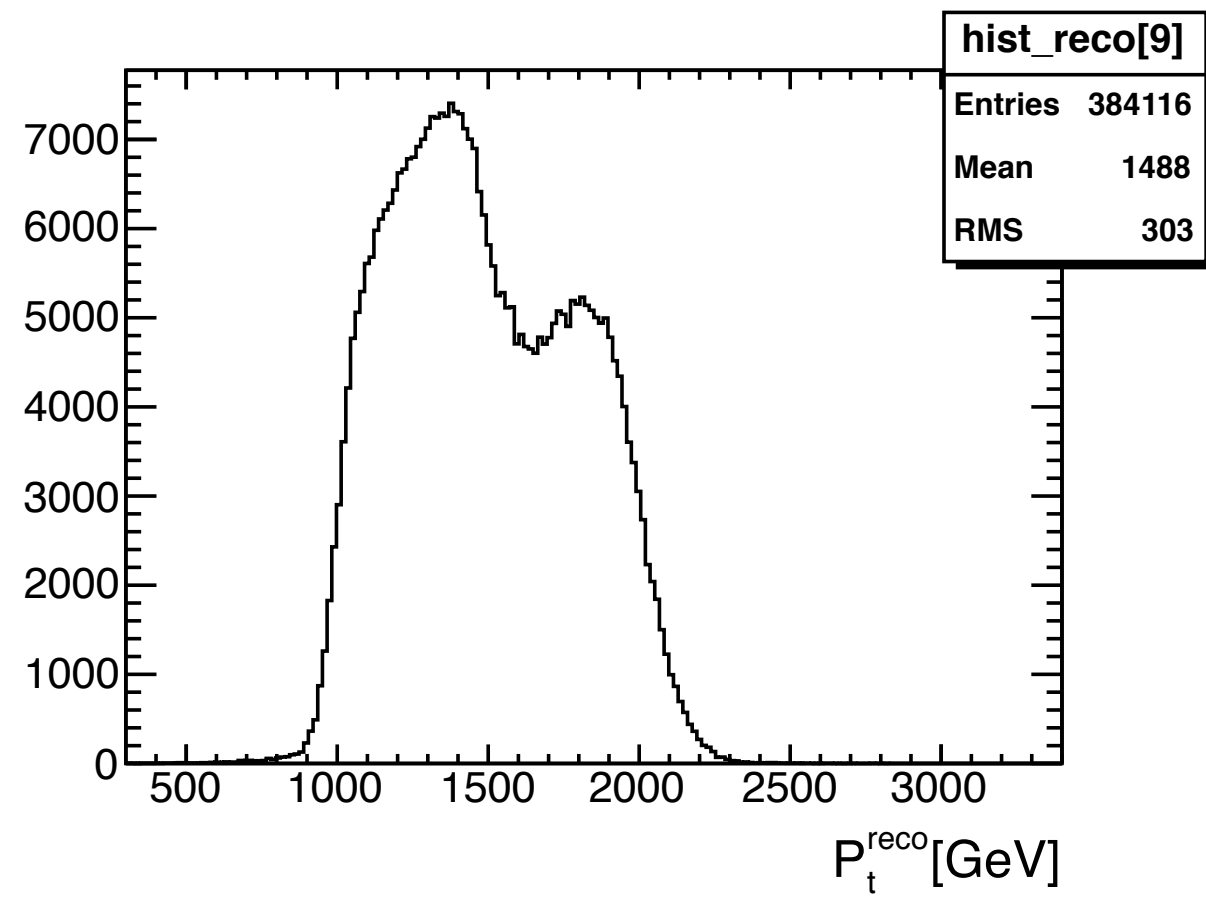
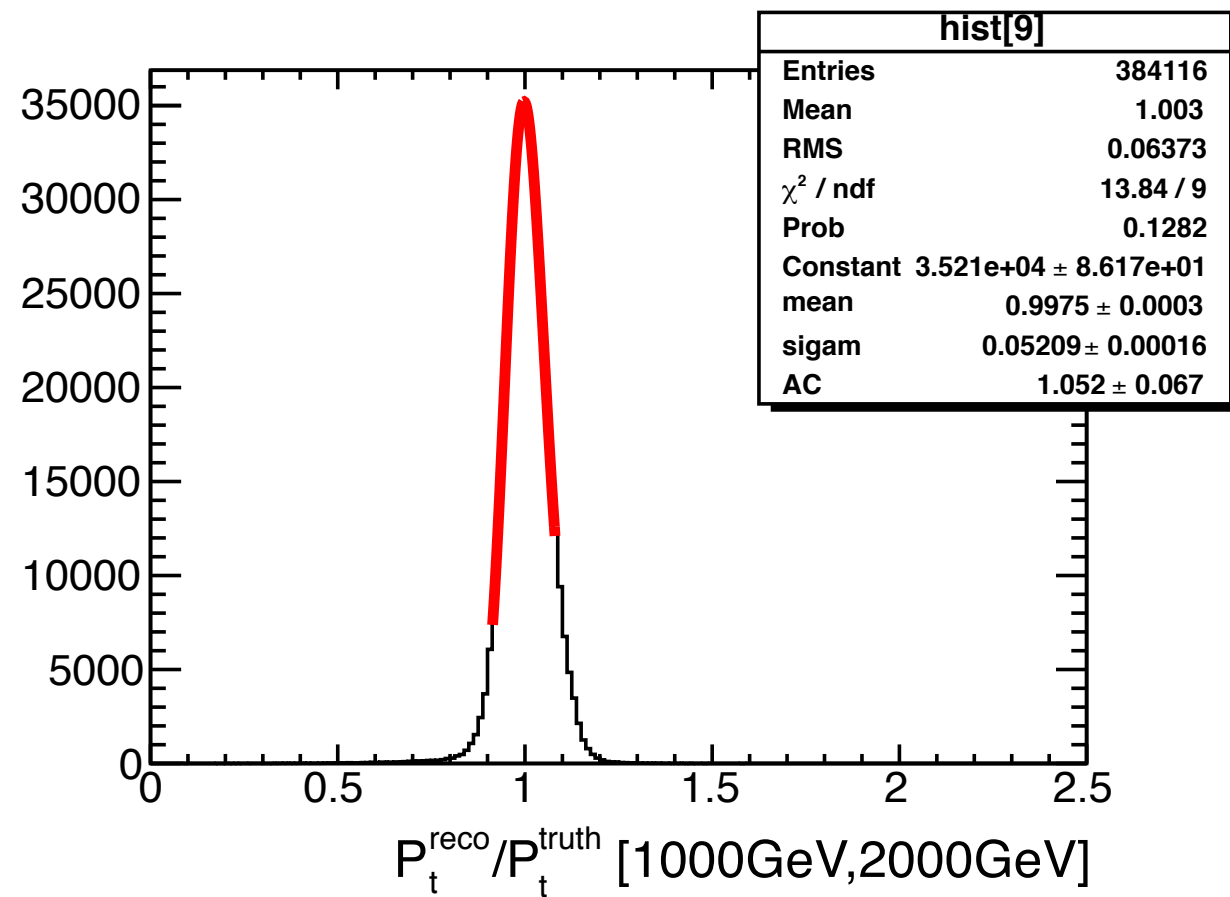


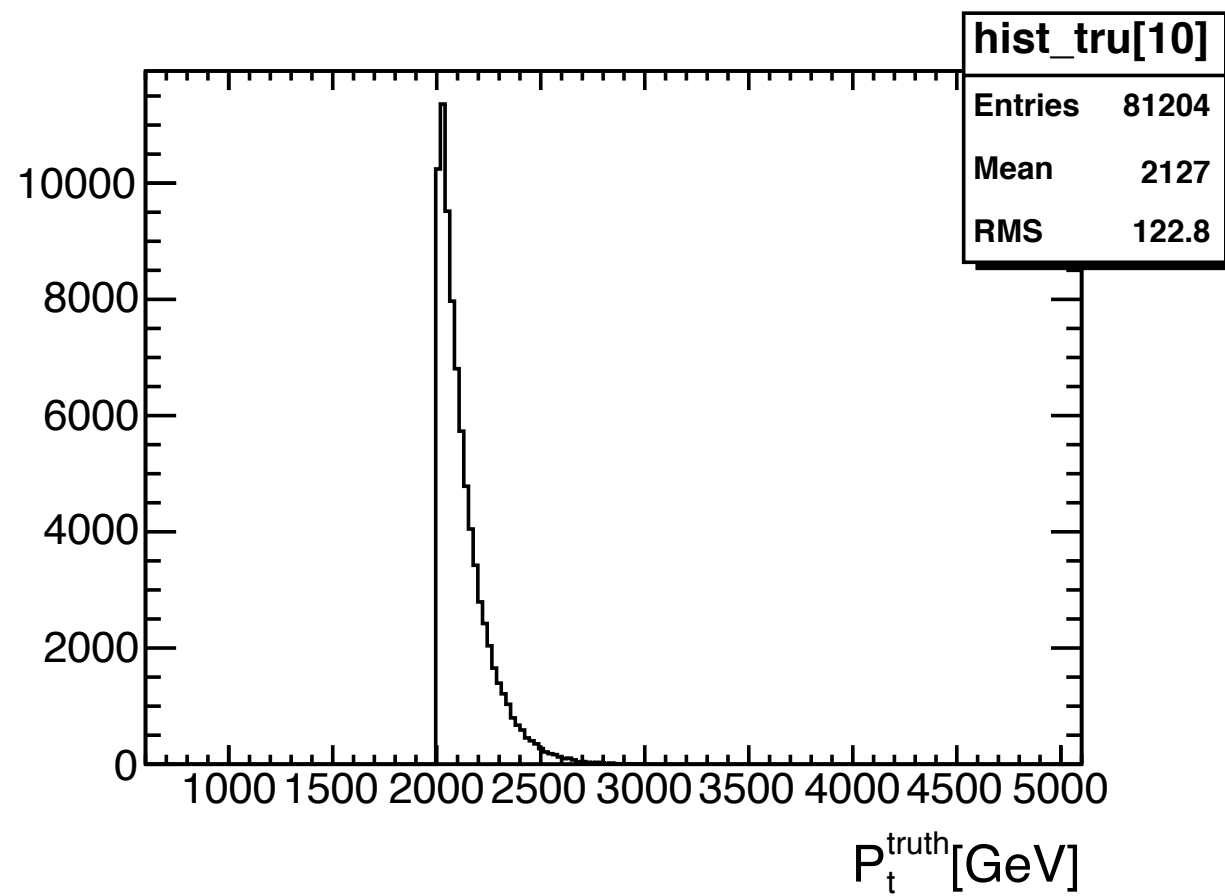
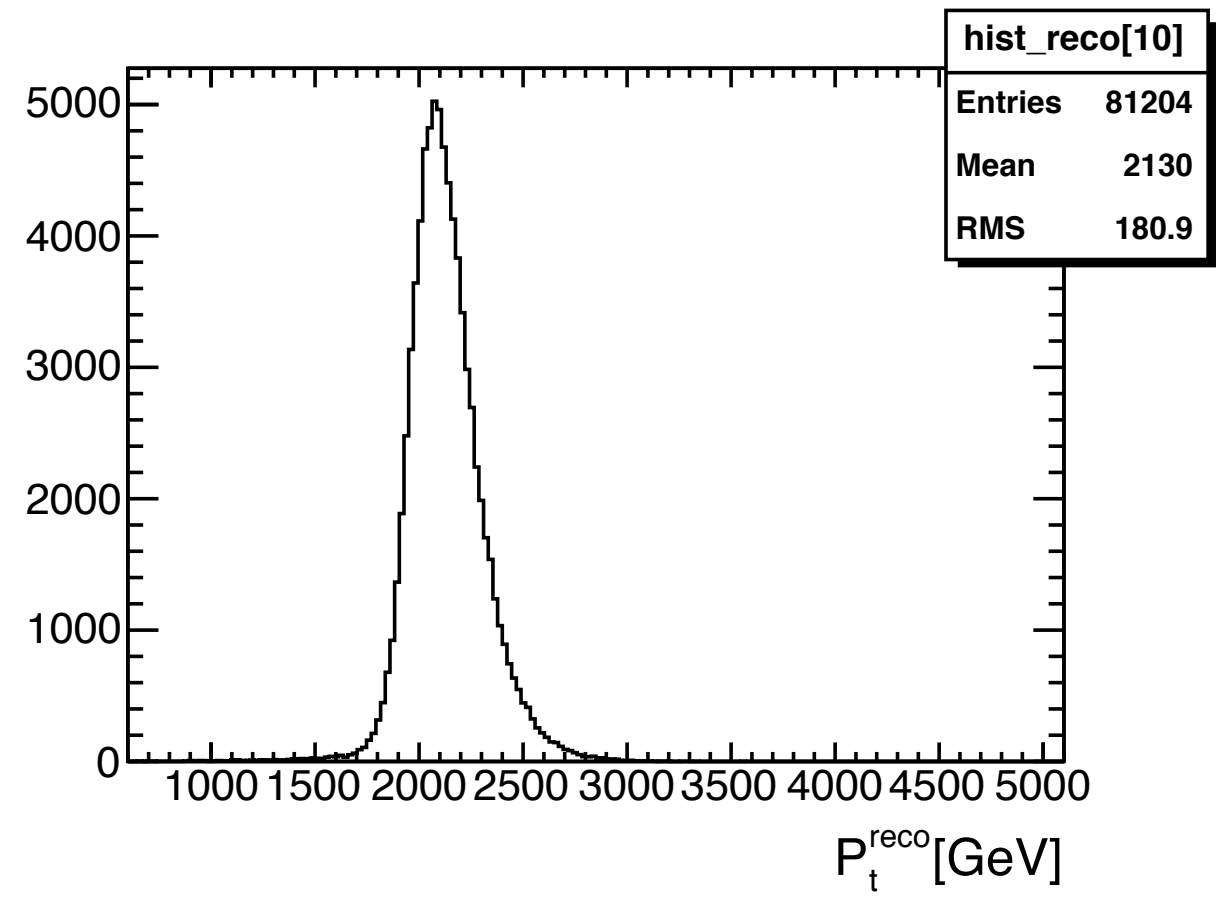
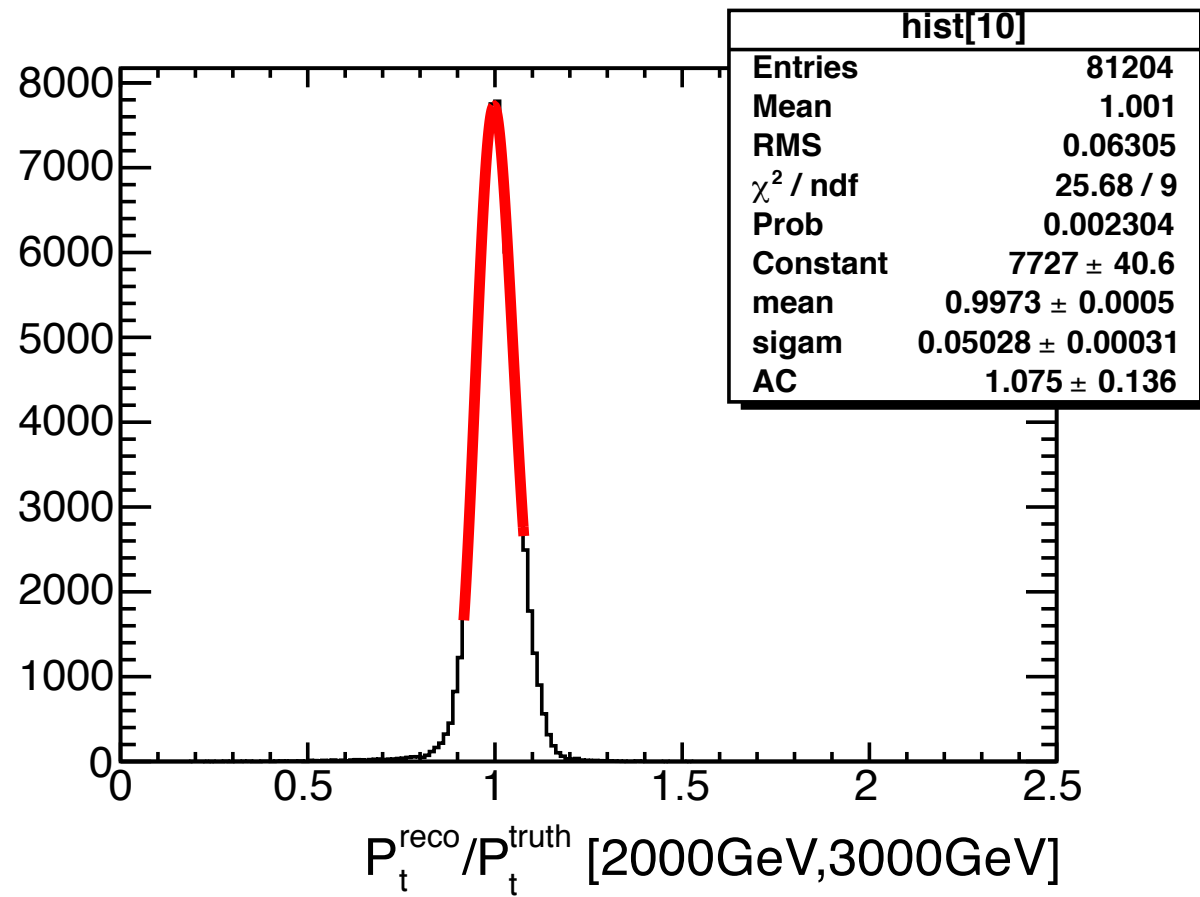












response and Pt distribution
R=0.4, EM+JES
b-Jet

