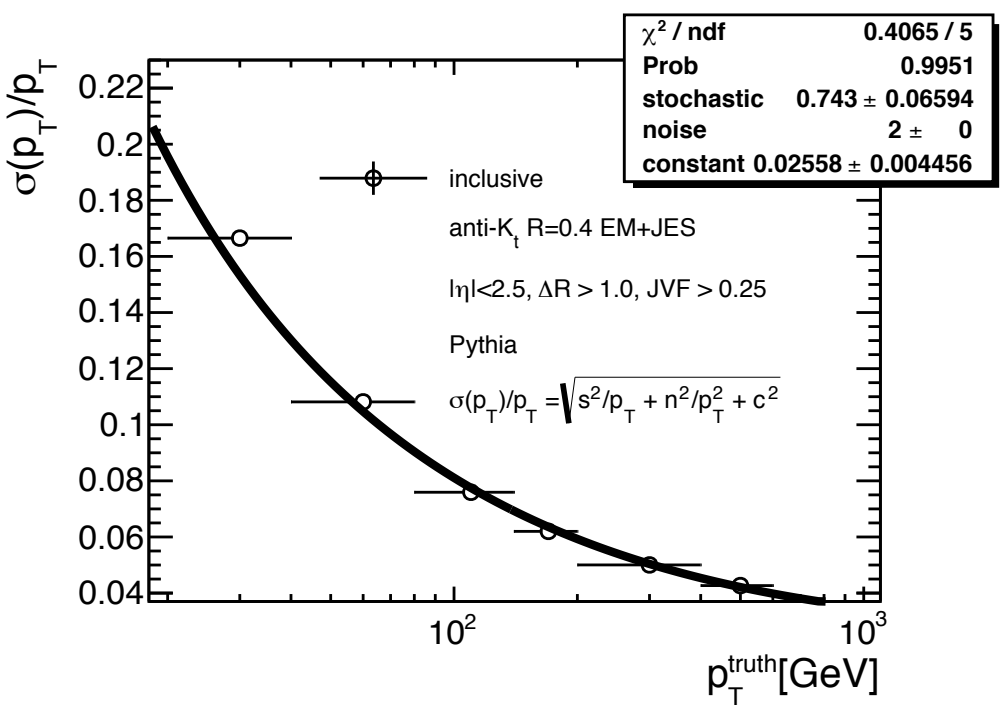
Kyoto Atlas Meeting

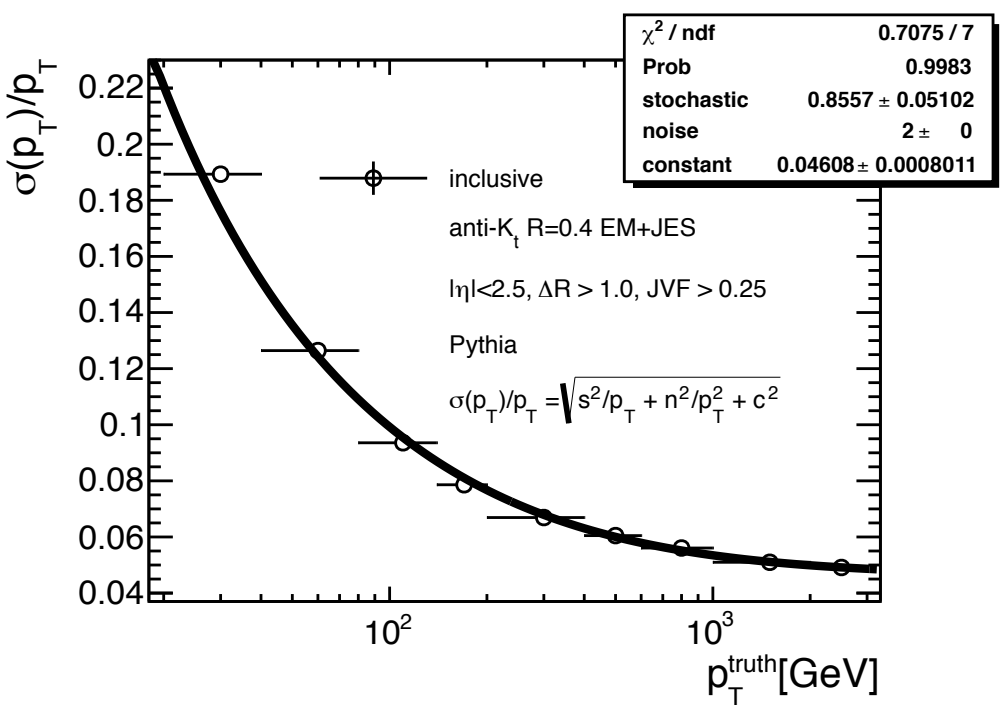
25, Jul, 2013 Naoyuki Kamo

- GSCを使用した場合のresolutionの比較（inclusive jet、各flavor毎の絵はback upにある）
- stochastic項がGSCの方が10%程度小さくなっている

GSC



通常のcalibration

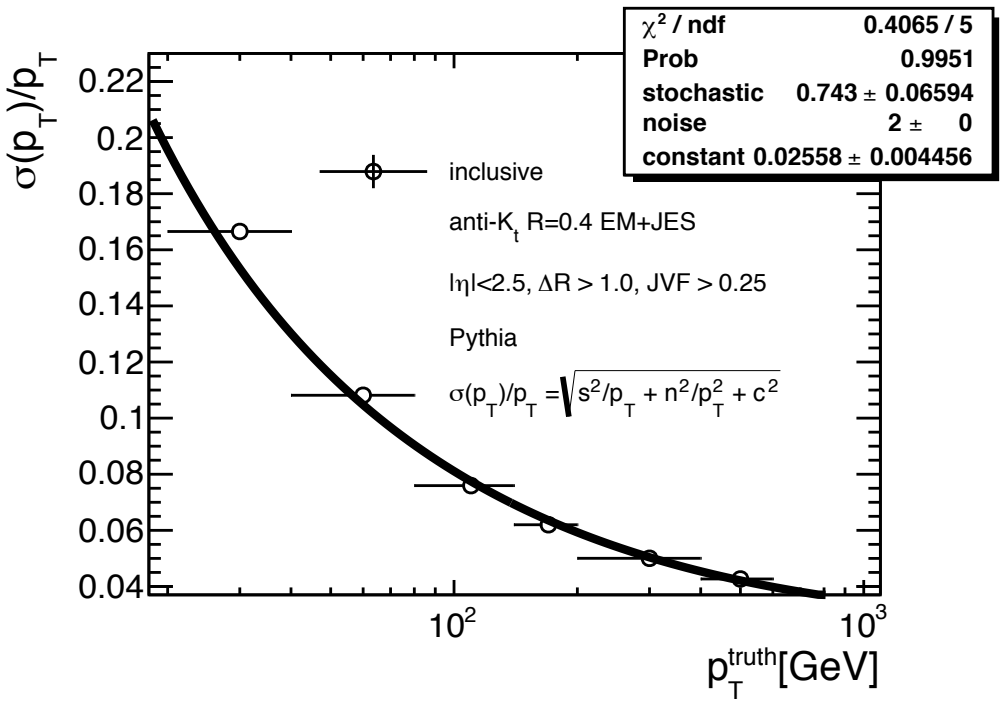


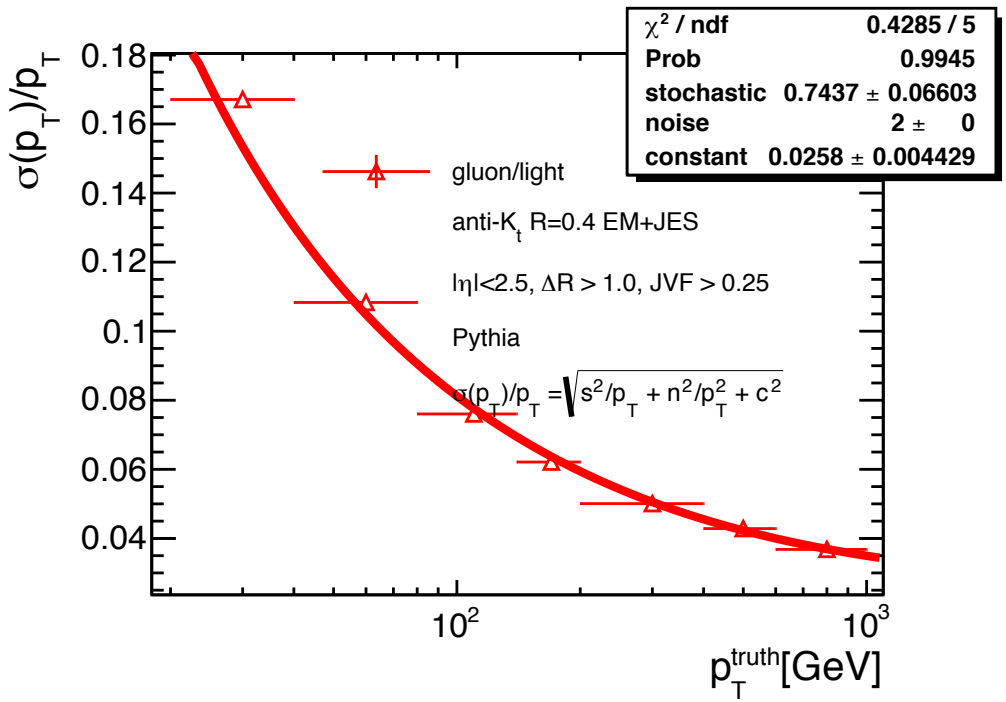
back up

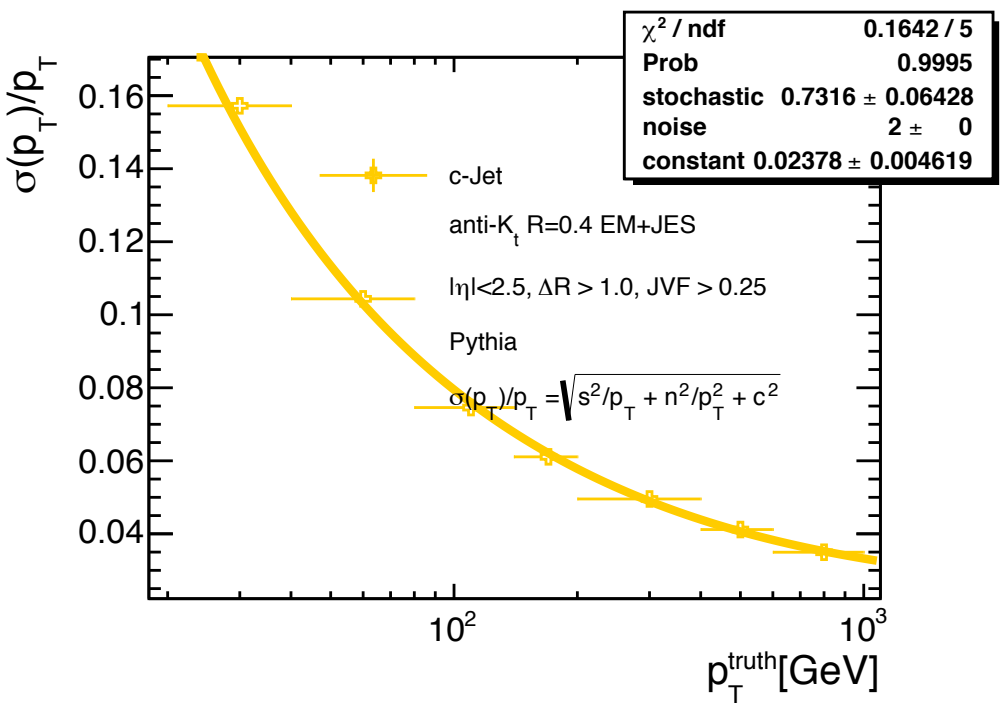
GSCの場合の

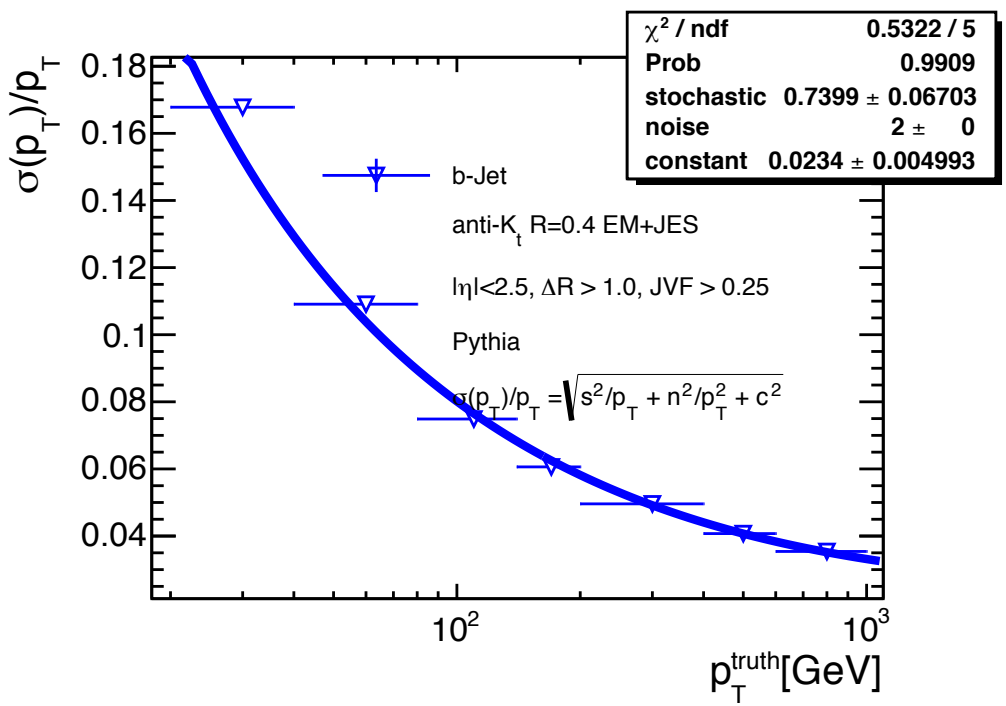
resolution

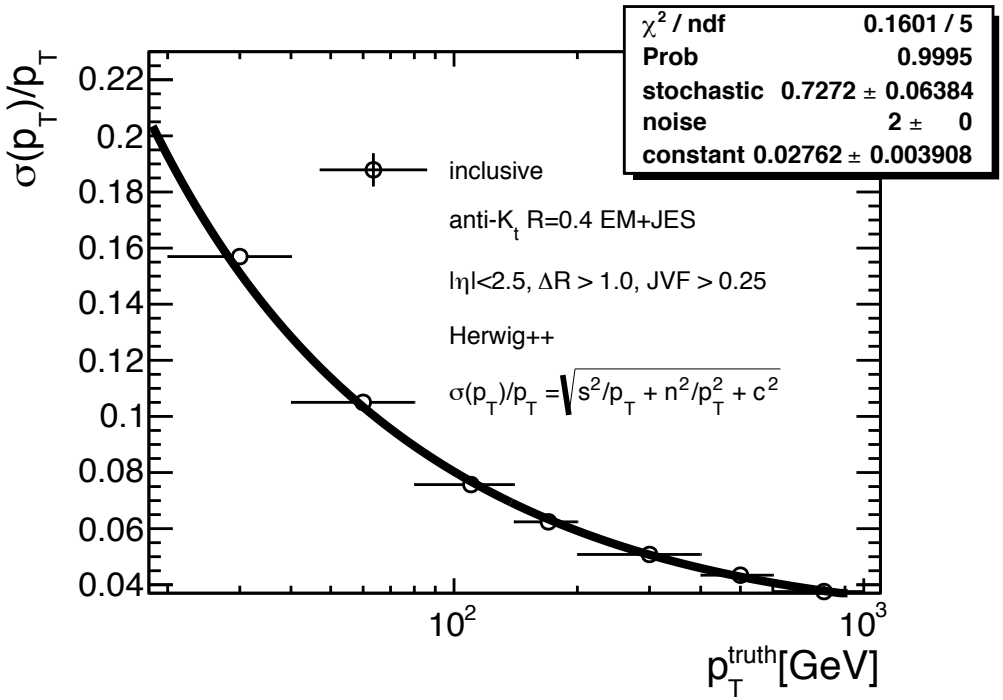
GSCを使用したresolution

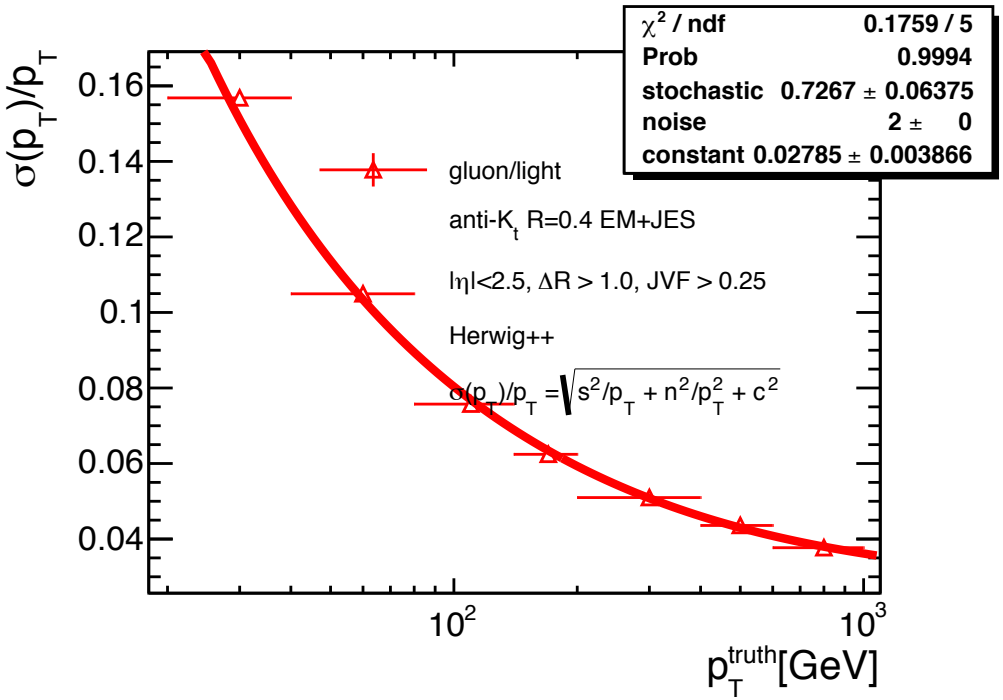


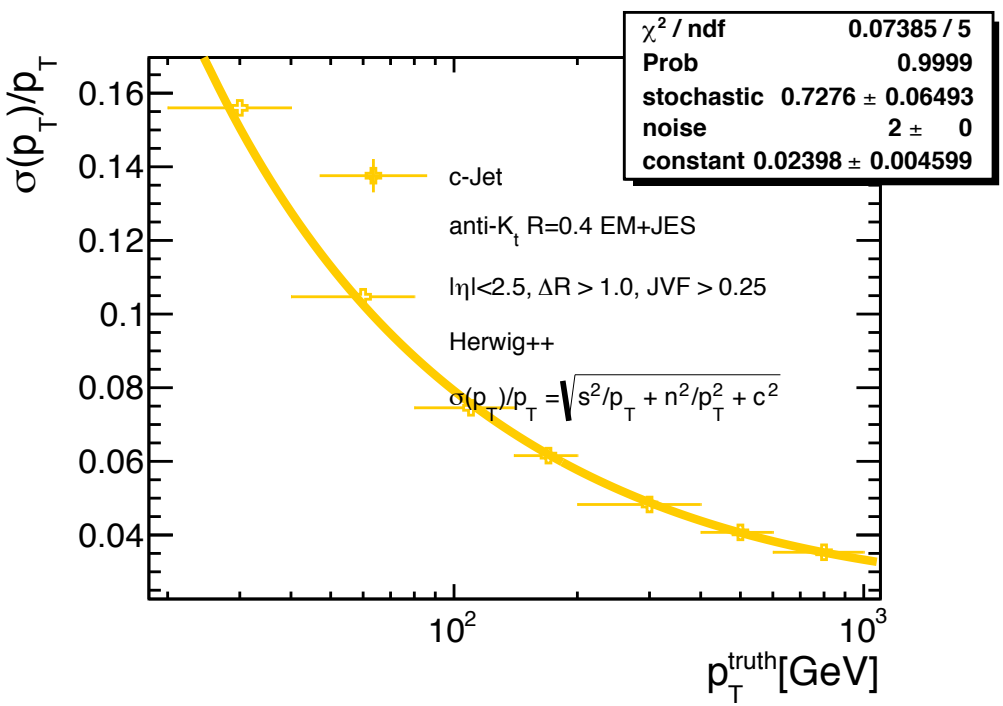


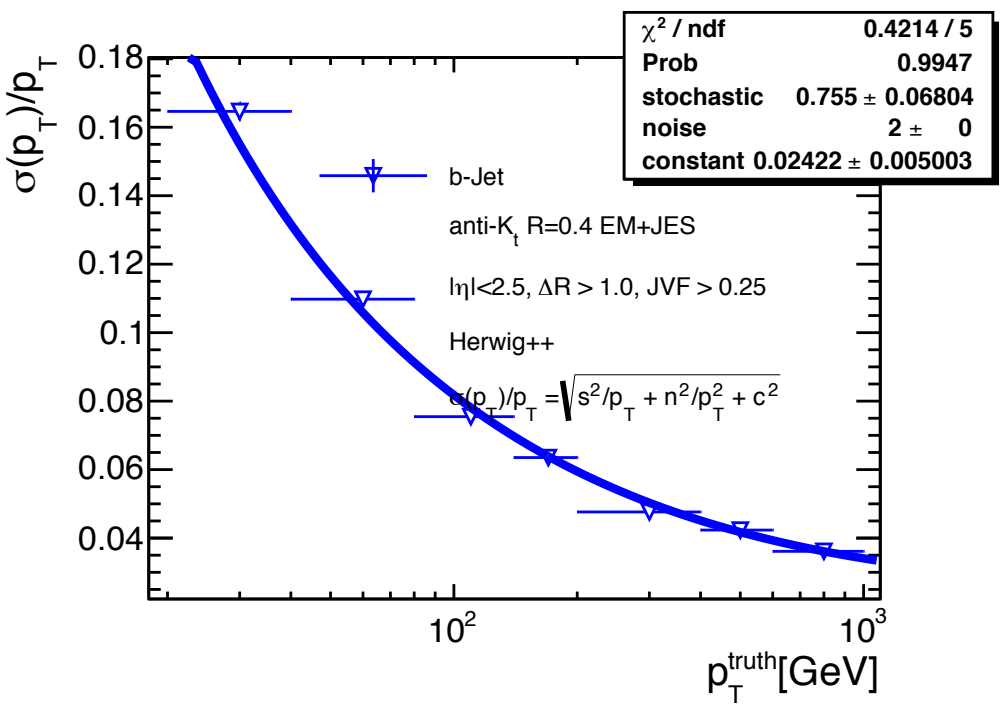


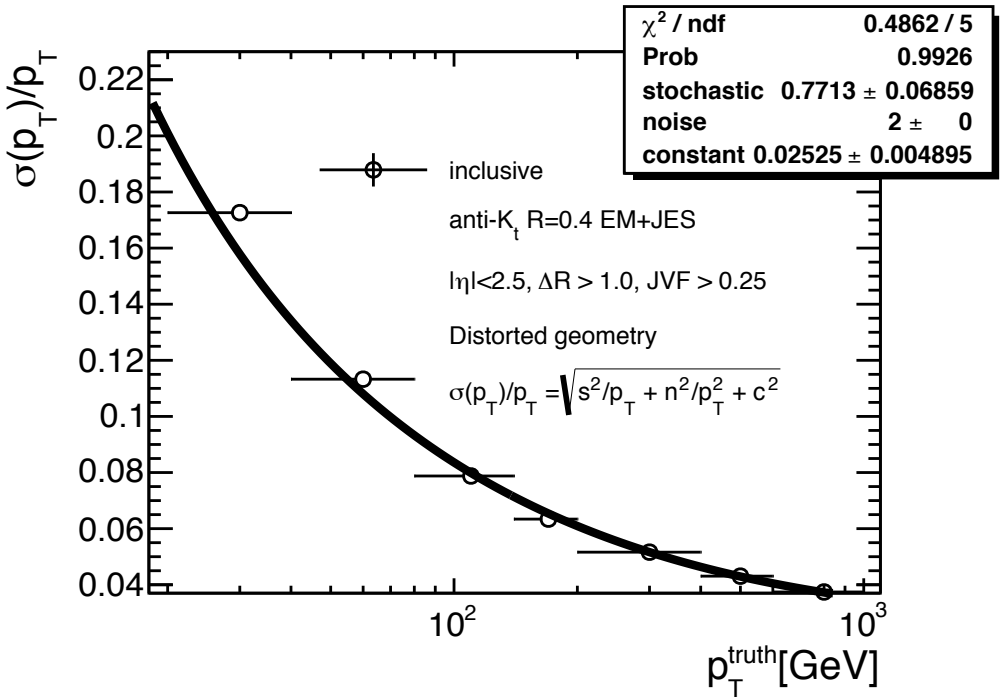


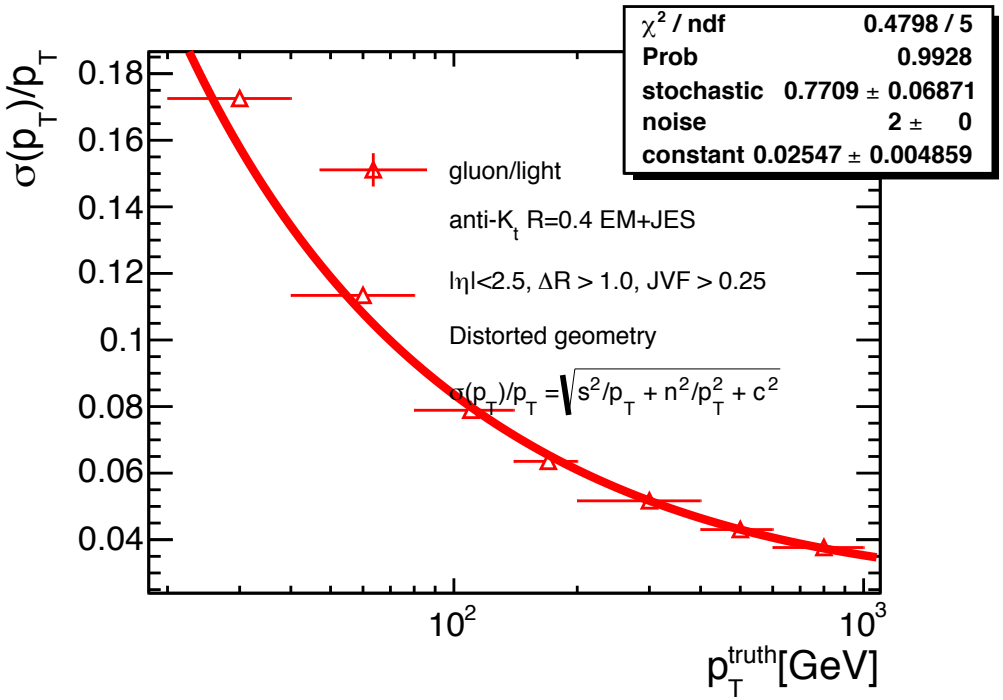

χ^2 / ndf 0.1601 / 5
Prob 0.9995
stochastic 0.7272 ± 0.06384
noise 2 ± 0
constant 0.02762 ± 0.003908
inclusive
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

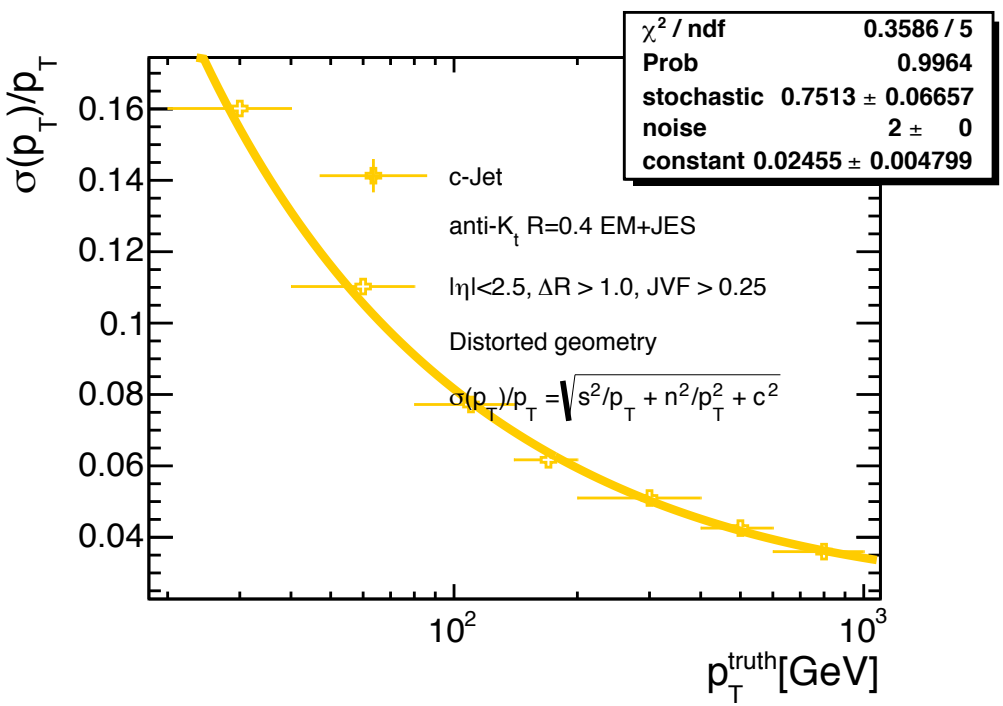

χ^2 / ndf 0.1759 / 5
Prob 0.9994
stochastic 0.7267 ± 0.06375
noise 2 ± 0
constant 0.02785 ± 0.003866
gluon/light
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

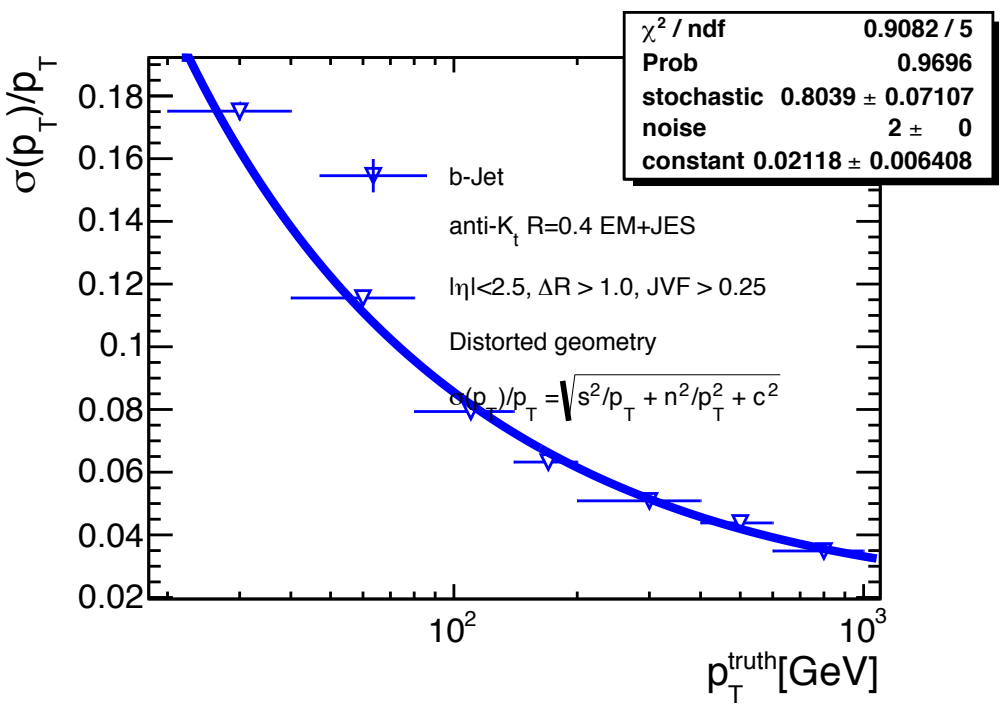

χ^2 / ndf 0.07385 / 5
Prob 0.9999
stochastic 0.7276 ± 0.06493
noise 2 ± 0
constant 0.02398 ± 0.004599
c-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

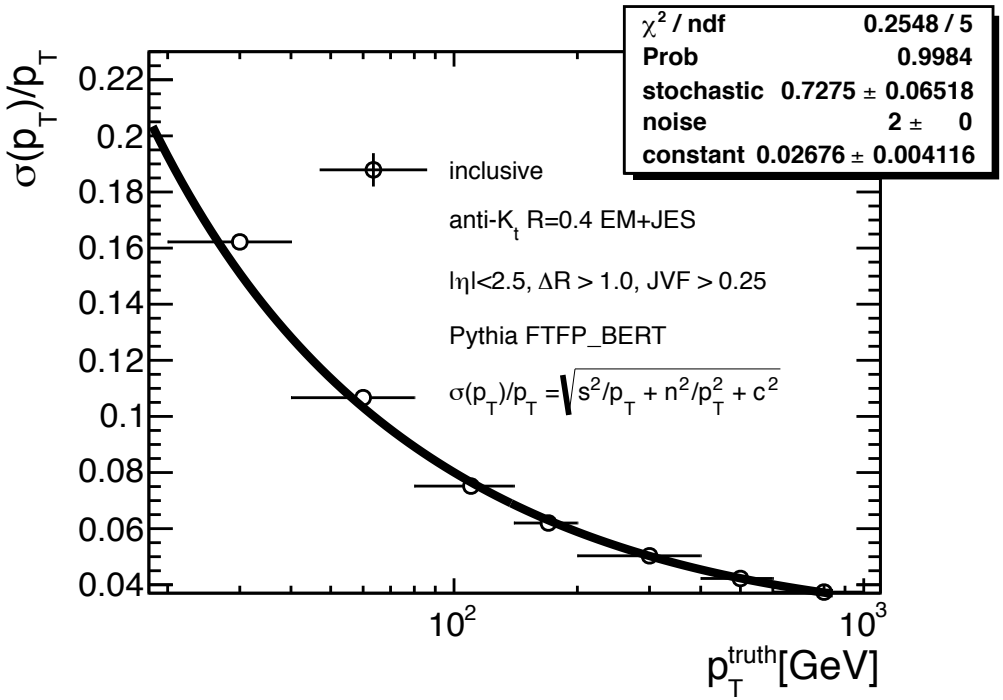

χ^2 / ndf 0.4214 / 5
Prob 0.9947
stochastic 0.755 ± 0.06804
noise 2 ± 0
constant 0.02422 ± 0.005003
b-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

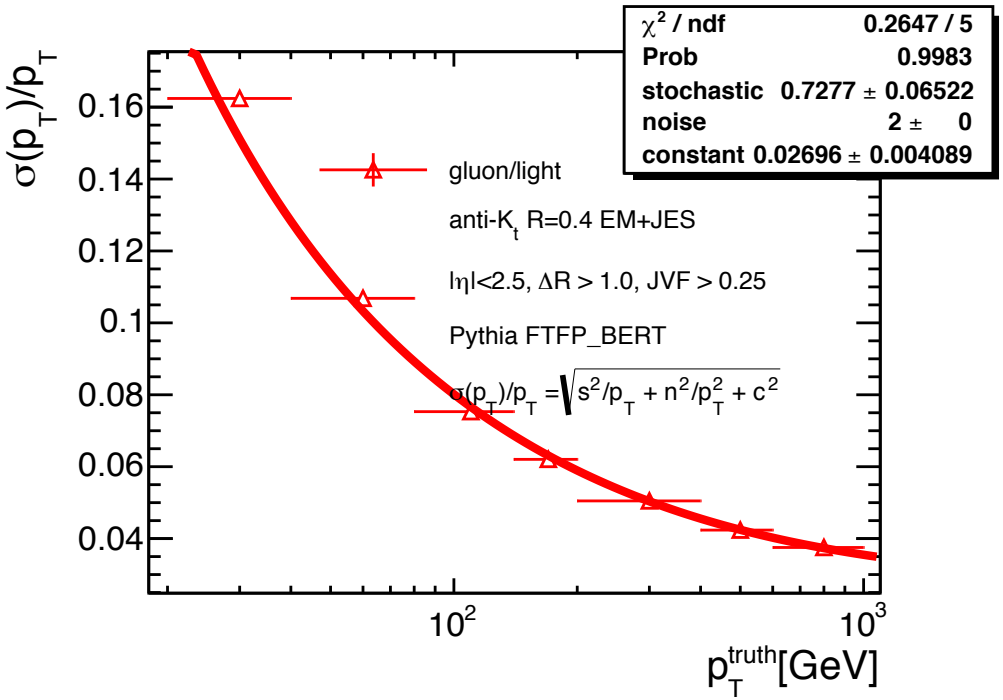

χ^2 / ndf 0.4862 / 5
Prob 0.9926
stochastic 0.7713 ± 0.06859
noise 2 ± 0
constant 0.02525 ± 0.004895
inclusive
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

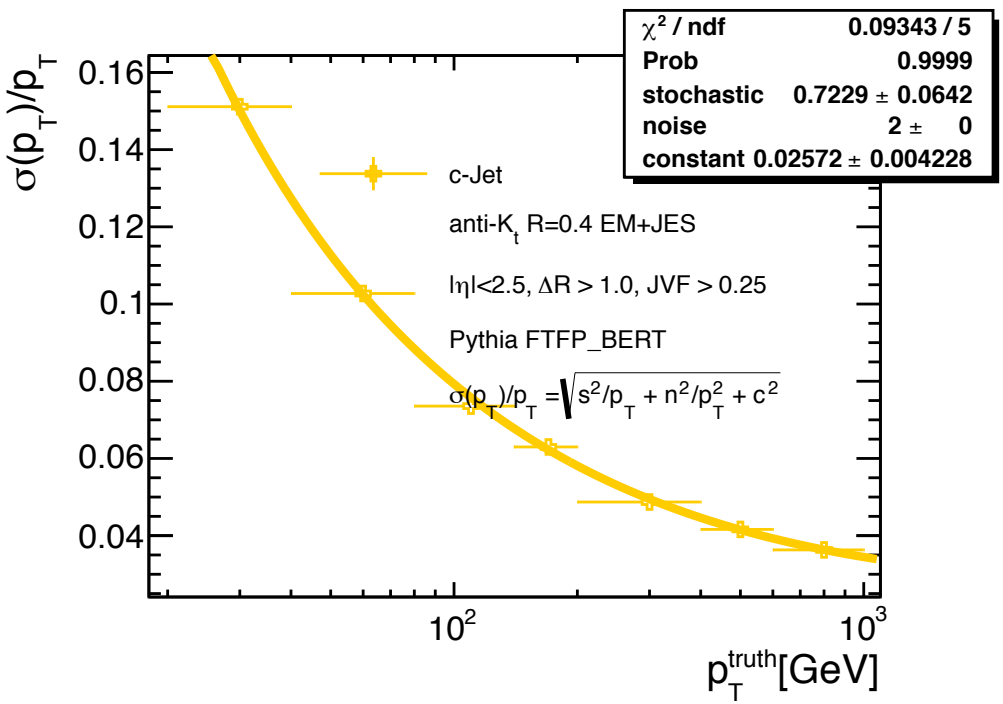

χ^2 / ndf 0.4798 / 5
Prob 0.9928
stochastic 0.7709 ± 0.06871
noise 2 ± 0
constant 0.02547 ± 0.004859
gluon/light
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

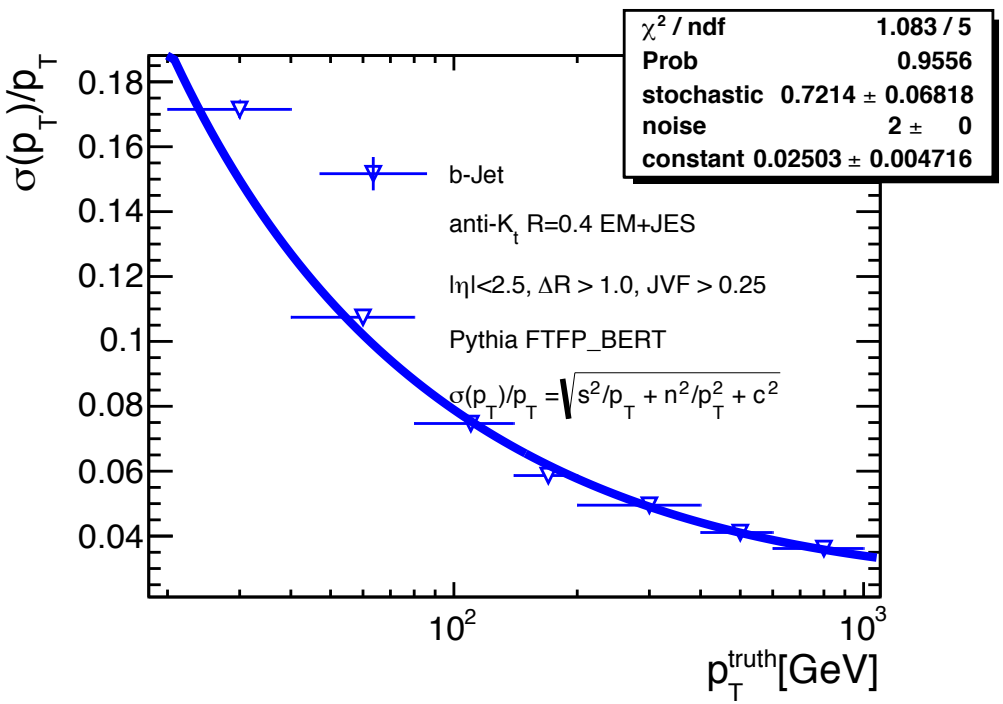

χ^2 / ndf 0.3586 / 5
Prob 0.9964
stochastic 0.7513 ± 0.06657
noise 2 ± 0
constant 0.02455 ± 0.004799
c-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.9082 / 5
Prob 0.9696
stochastic 0.8039 ± 0.07107
noise 2 ± 0
constant 0.02118 ± 0.006408
b-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.2548 / 5
Prob 0.9984
stochastic 0.7275 ± 0.06518
noise 2 ± 0
constant 0.02676 ± 0.004116
inclusive
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

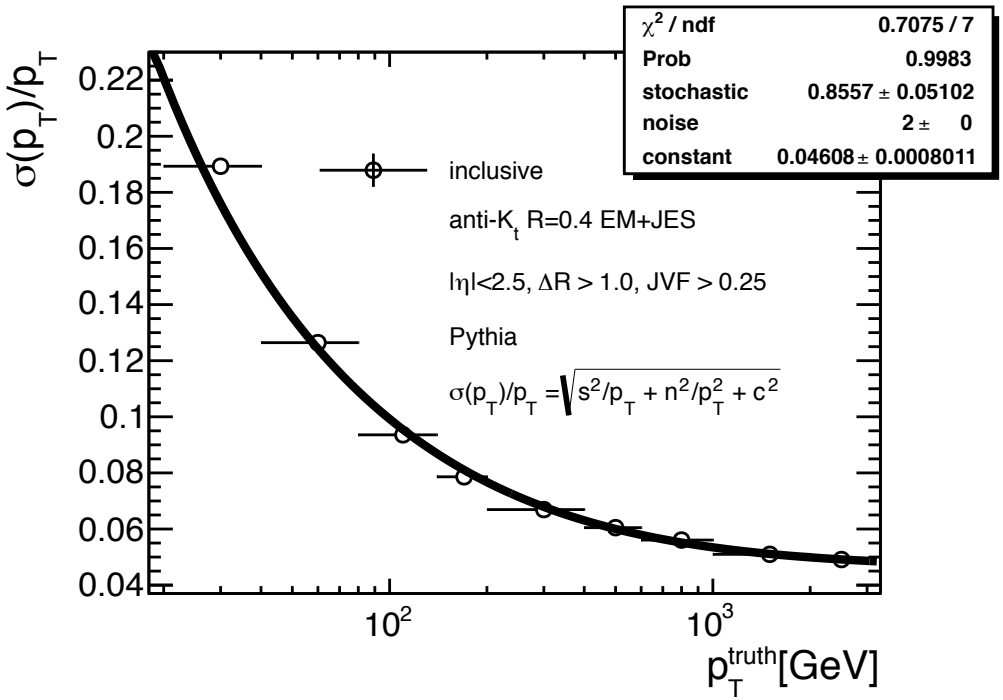

χ^2 / ndf 0.2647 / 5
Prob 0.9983
stochastic 0.7277 ± 0.06522
noise 2 ± 0
constant 0.02696 ± 0.004089
gluon/light
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

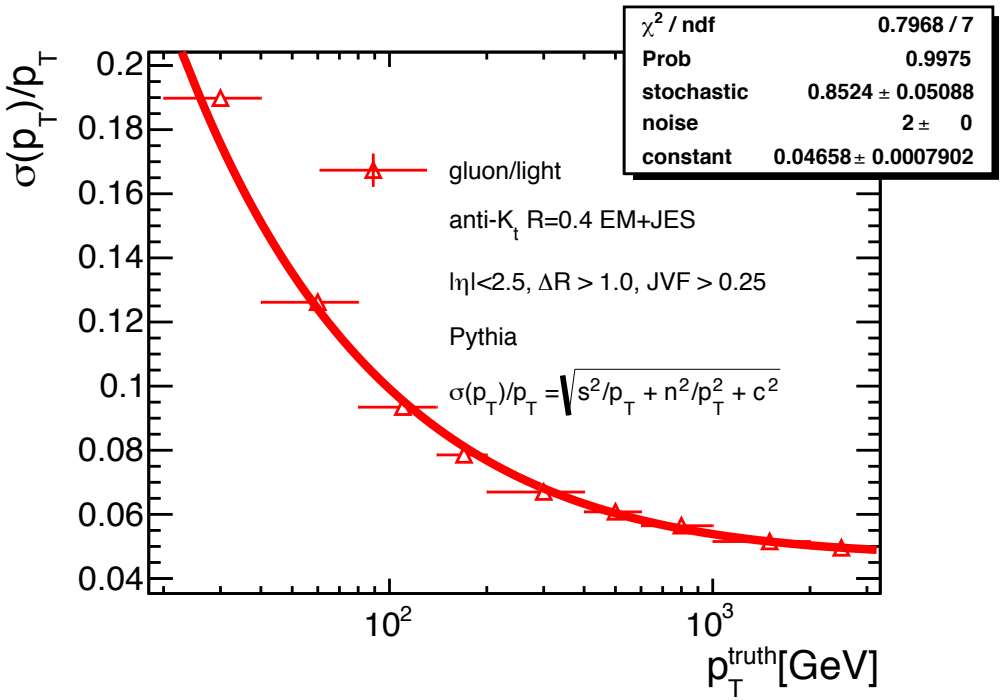

χ^2 / ndf 0.09343 / 5
Prob 0.9999
stochastic 0.7229 ± 0.0642
noise 2 ± 0
constant 0.02572 ± 0.004228
c-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

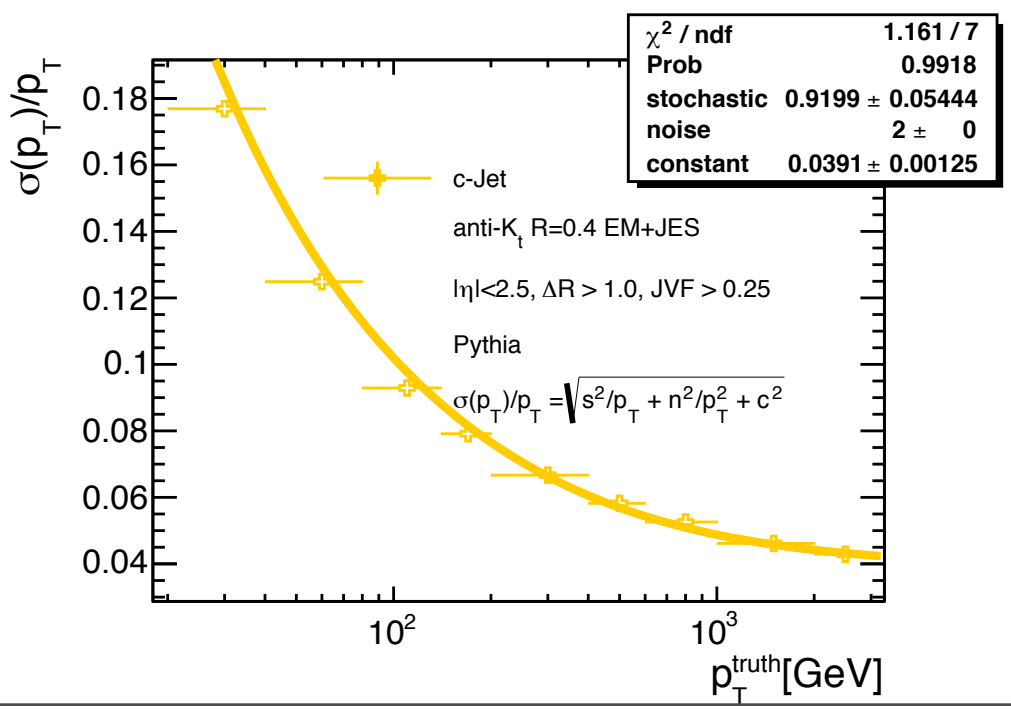

χ^2 / ndf 1.083 / 5
Prob 0.9556
stochastic 0.7214 ± 0.06818
noise 2 ± 0
constant 0.02503 ± 0.004716
b-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

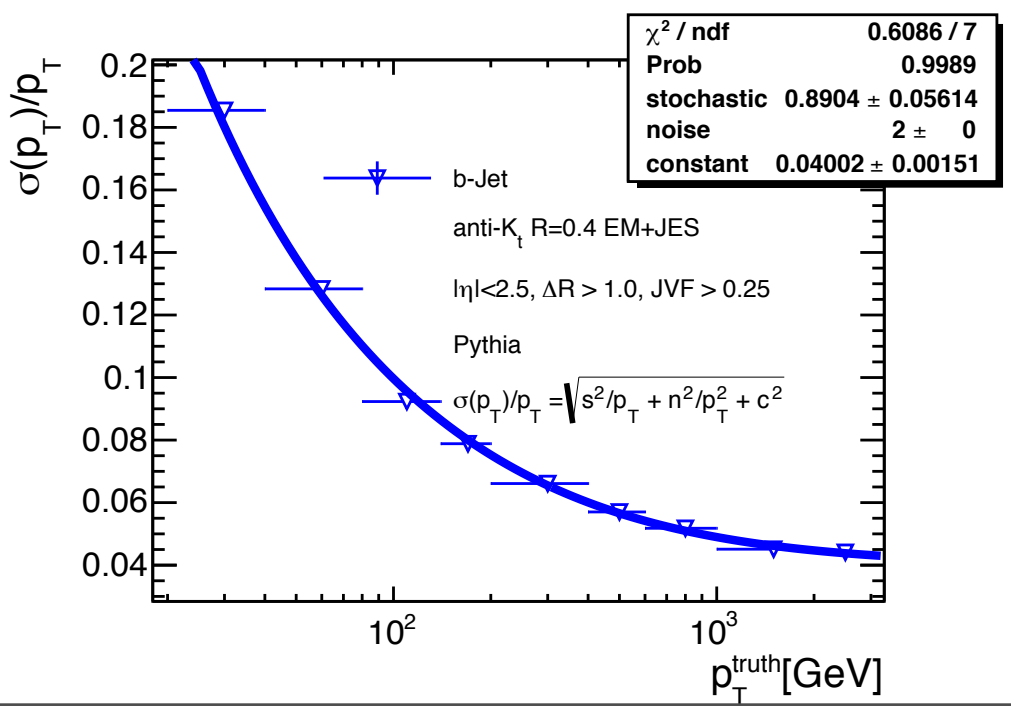
通常のcalibrationの resolution

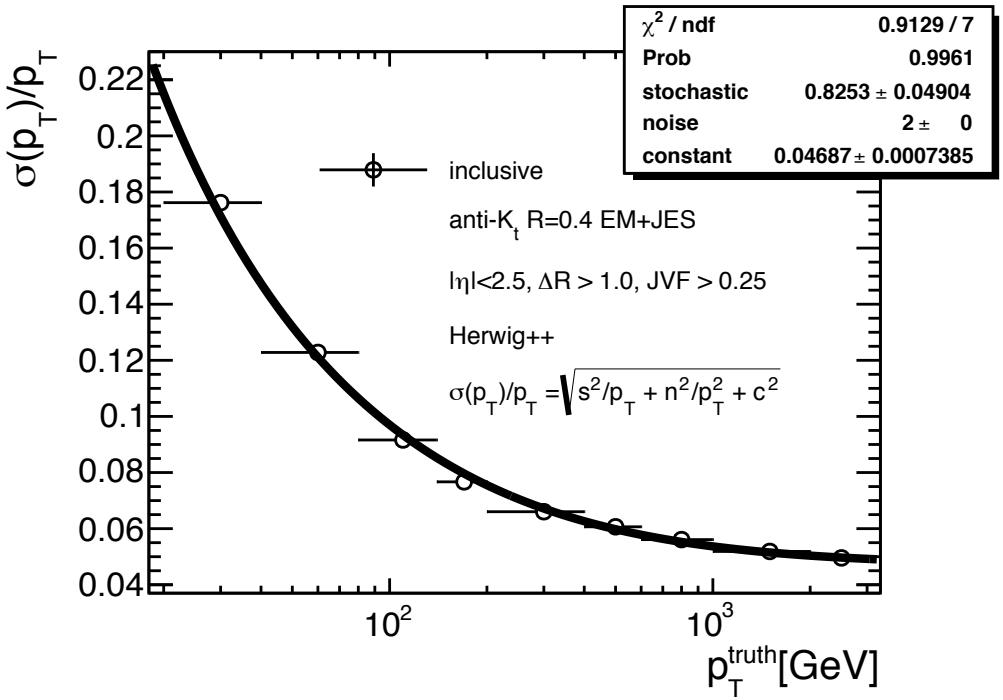
通常のcaibrationによるresolution

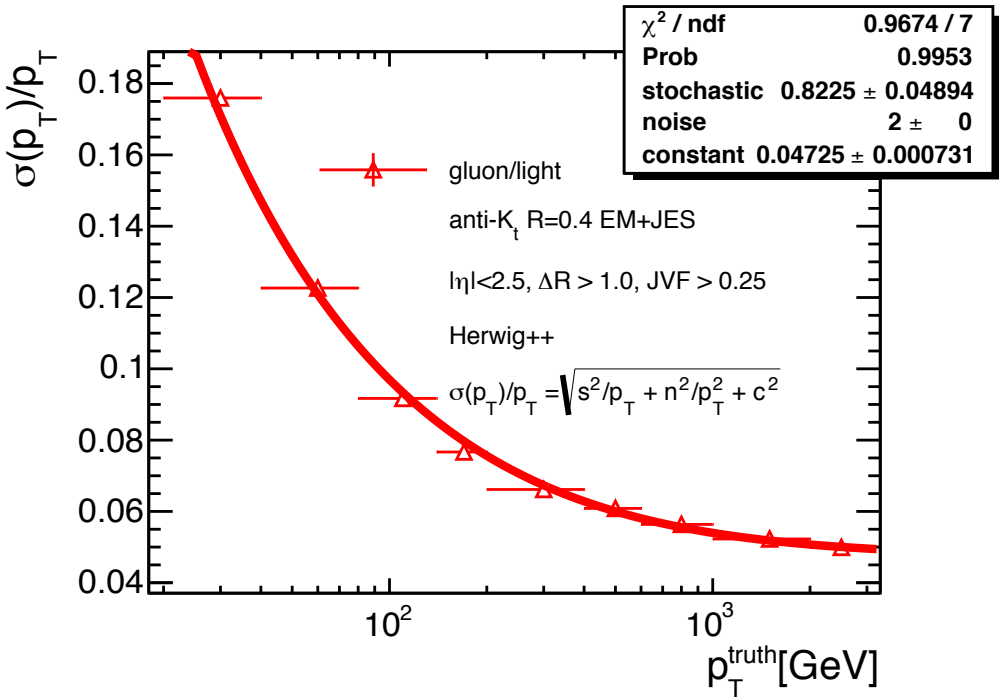


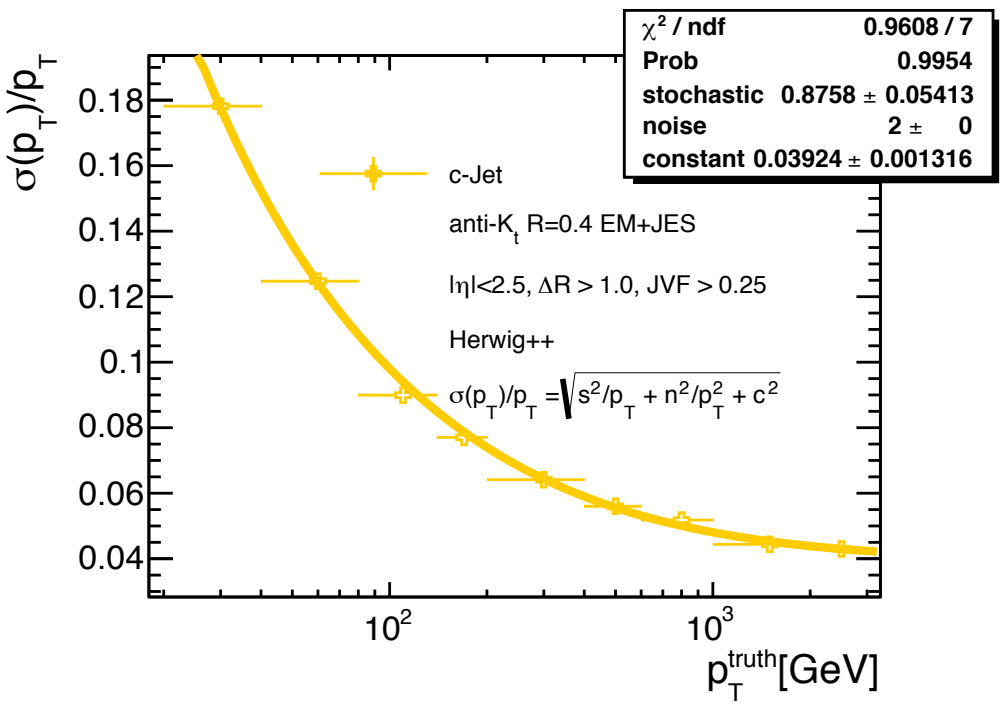


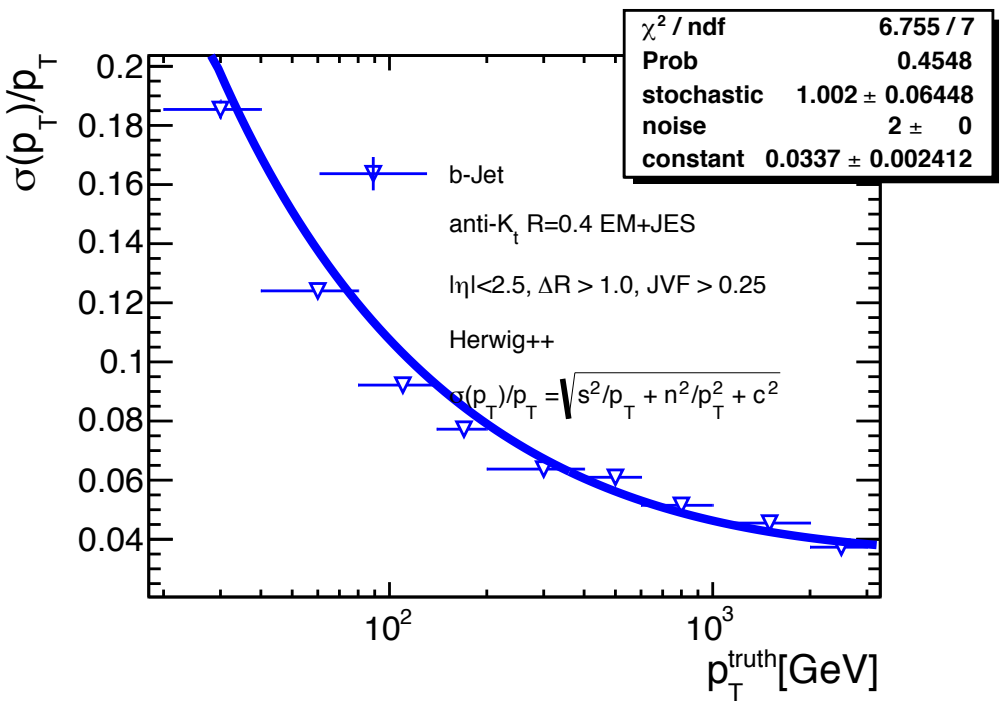


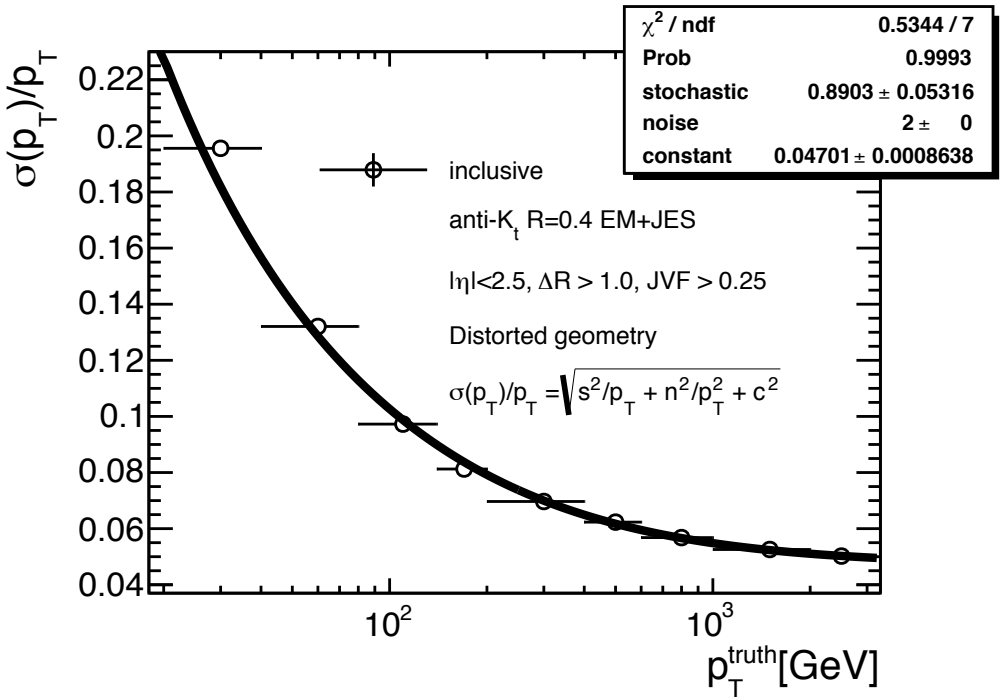


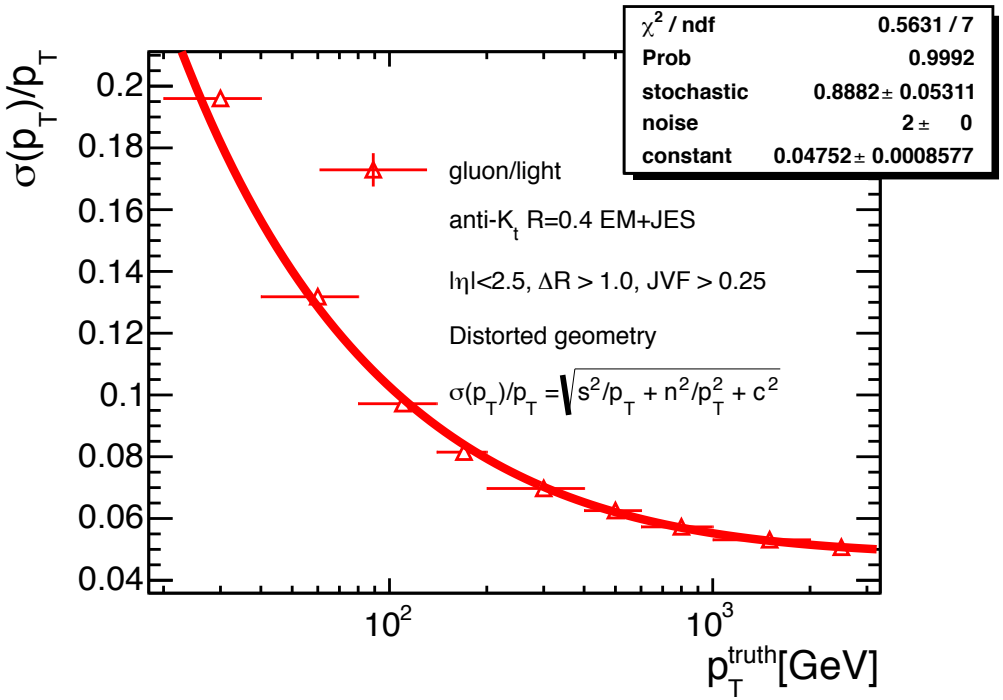

χ^2 / ndf 0.9129 / 7
Prob 0.9961
stochastic 0.8253 ± 0.04904
noise 2 ± 0
constant 0.04687 ± 0.0007385
inclusive
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

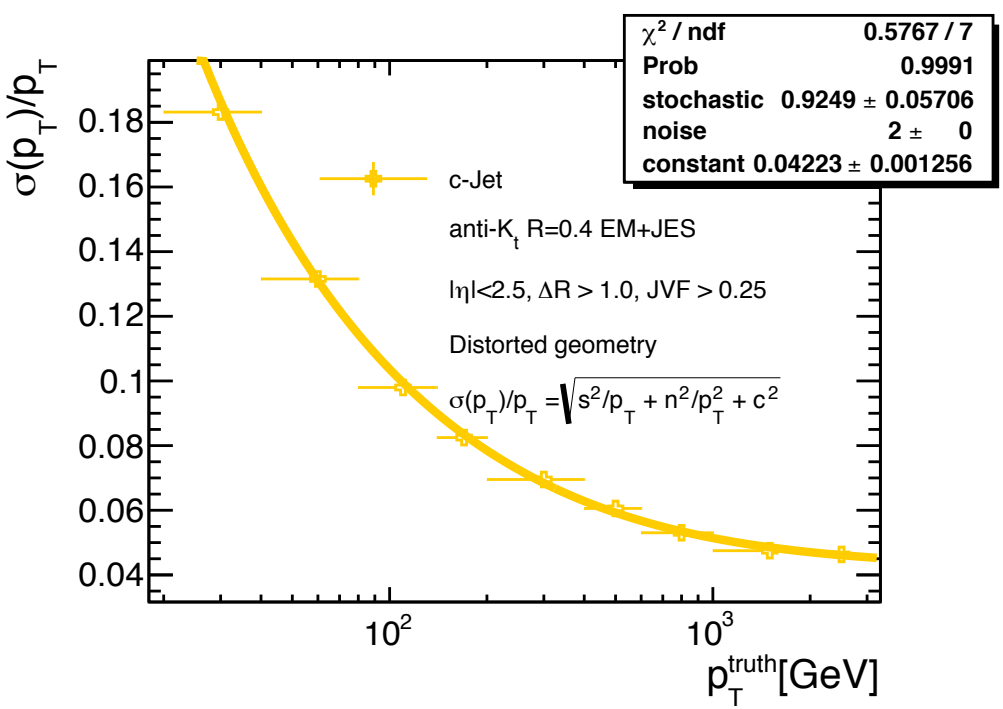

χ^2 / ndf 0.9674 / 7
Prob 0.9953
stochastic 0.8225 ± 0.04894
noise 2 ± 0
constant 0.04725 ± 0.000731
gluon/light
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

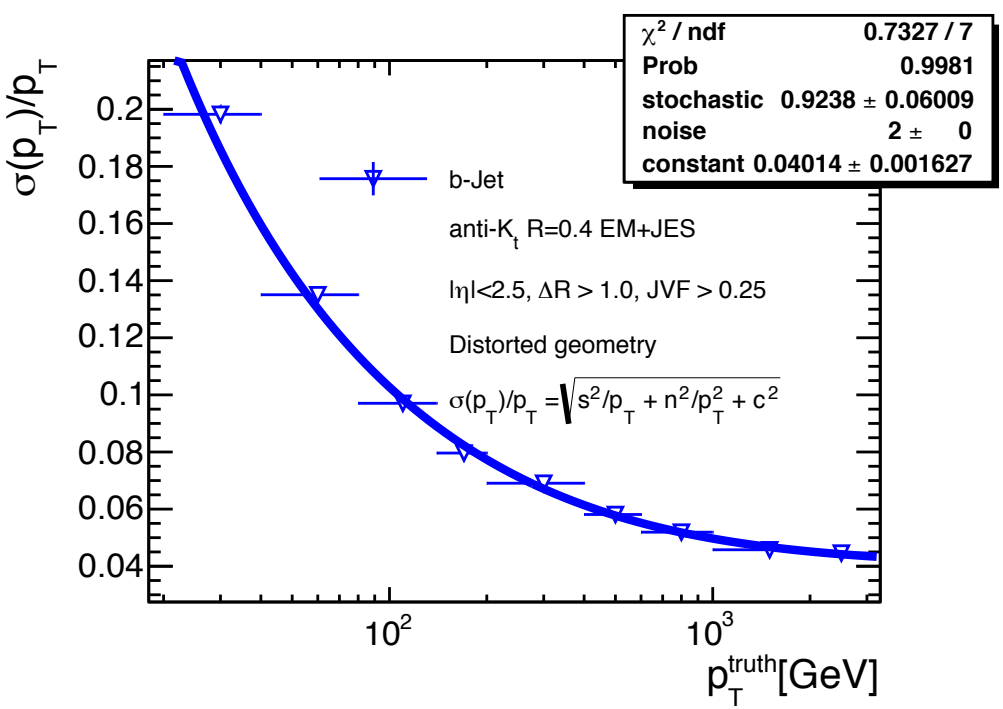

χ^2 / ndf 0.9608 / 7
Prob 0.9954
stochastic 0.8758 ± 0.05413
noise 2 ± 0
constant 0.03924 ± 0.001316
c-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

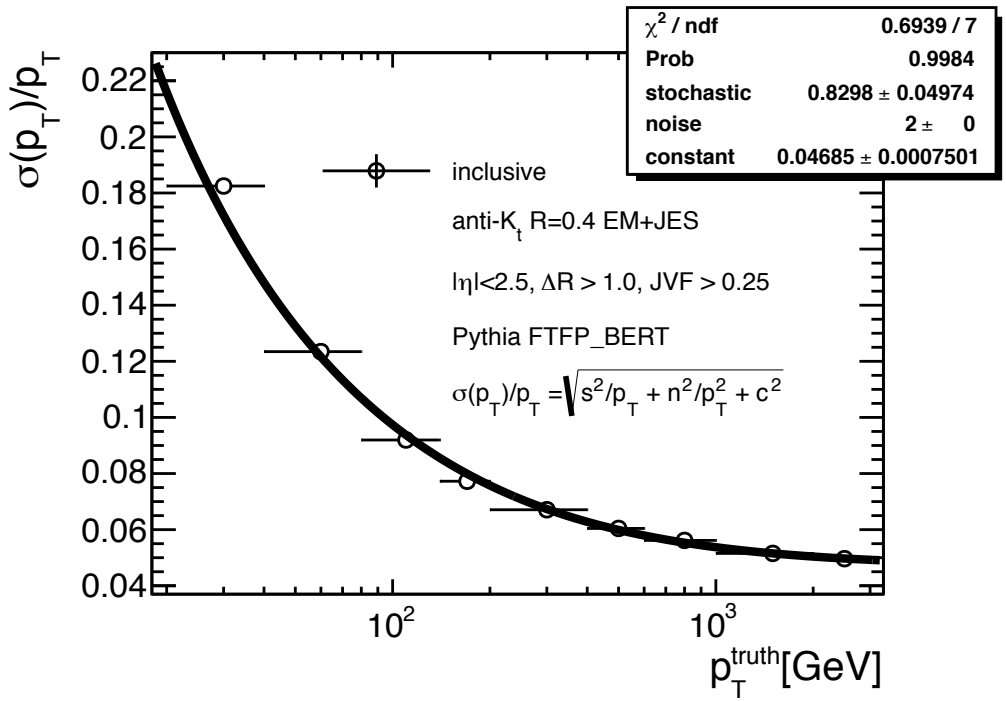

χ^2 / ndf 6.755 / 7
Prob 0.4548
stochastic 1.002 ± 0.06448
noise 2 ± 0
constant 0.0337 ± 0.002412
b-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Herwig++
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

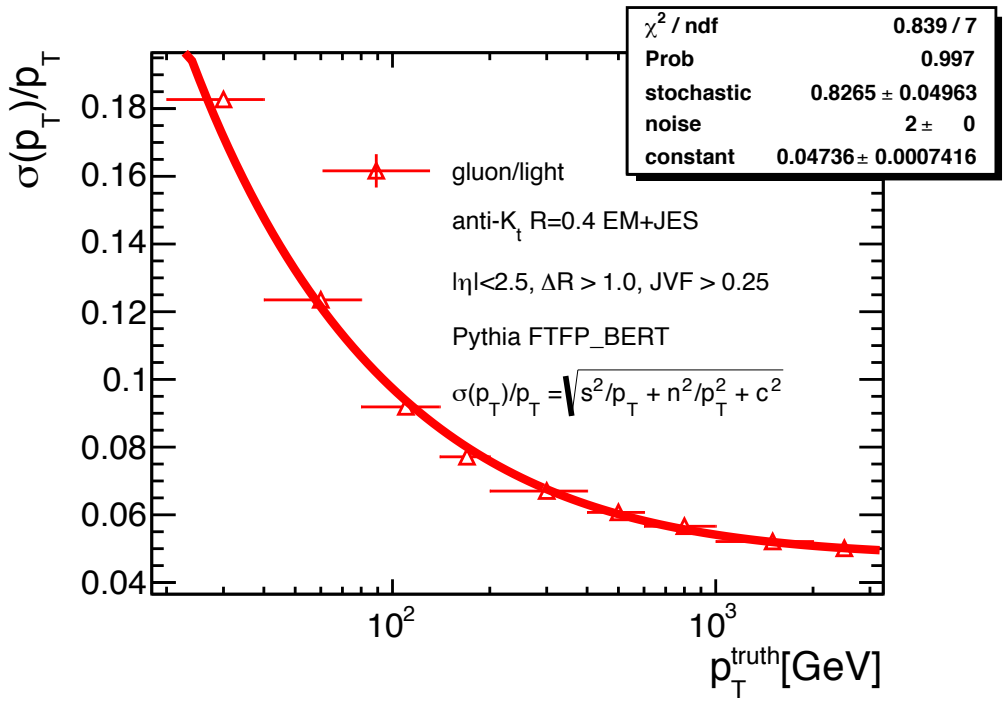

χ^2 / ndf 0.5344 / 7
Prob 0.9993
stochastic 0.8903 ± 0.05316
noise 2 ± 0
constant 0.04701 ± 0.0008638
inclusive
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

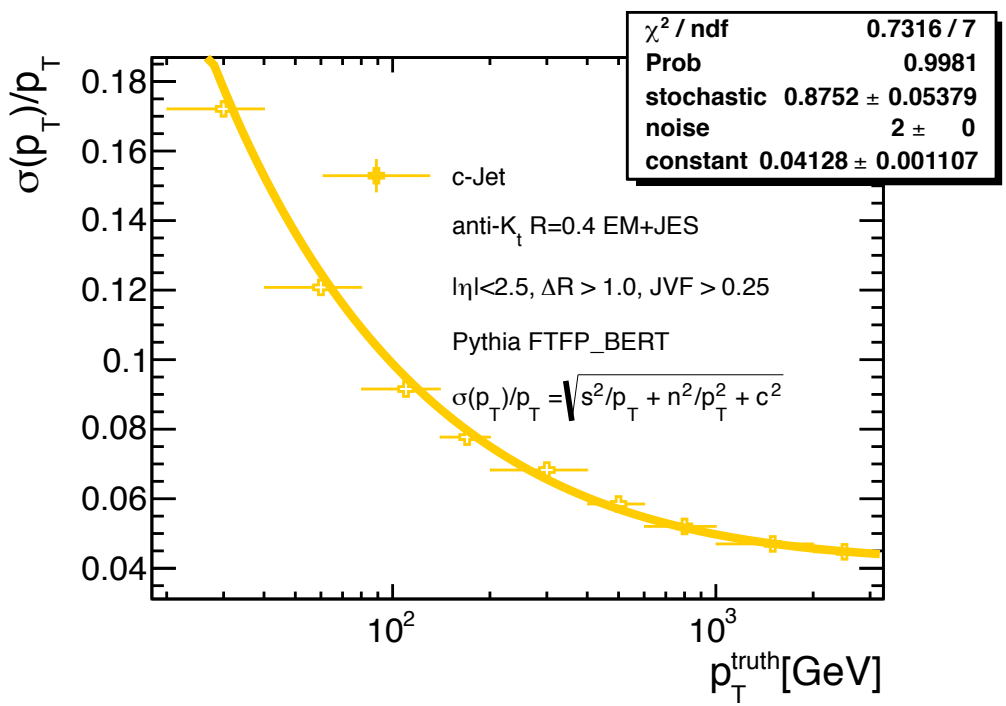

χ^2 / ndf 0.5631 / 7
Prob 0.9992
stochastic 0.8882 ± 0.05311
noise 2 ± 0
constant 0.04752 ± 0.0008577
gluon/light
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

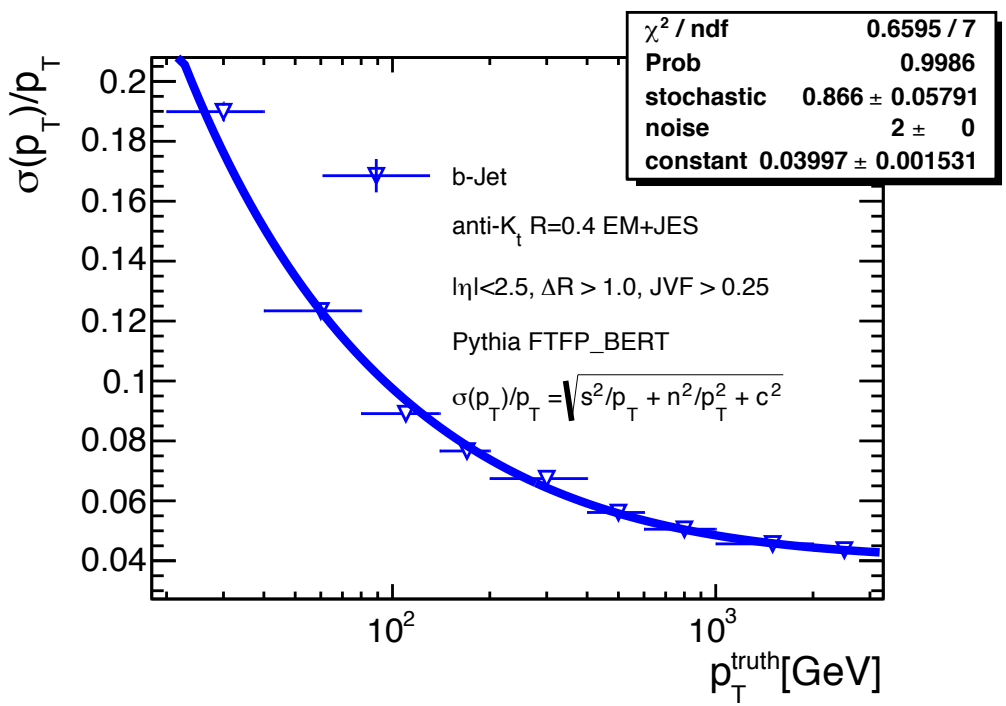

χ^2 / ndf 0.5767 / 7
Prob 0.9991
stochastic 0.9249 ± 0.05706
noise 2 ± 0
constant 0.04223 ± 0.001256
c-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.7327 / 7
Prob 0.9981
stochastic 0.9238 ± 0.06009
noise 2 ± 0
constant 0.04014 ± 0.001627
b-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Distorted geometry
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.6939 / 7
Prob 0.9984
stochastic 0.8298 ± 0.04974
noise 2 ± 0
constant 0.04685 ± 0.0007501
inclusive
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.839 / 7
Prob 0.997
stochastic 0.8265 ± 0.04963
noise 2 ± 0
constant 0.04736 ± 0.0007416
gluon/light
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.7316 / 7
Prob 0.9981
stochastic 0.8752 ± 0.05379
noise 2 ± 0
constant 0.04128 ± 0.001107
c-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]


χ^2 / ndf 0.6595 / 7
Prob 0.9986
stochastic 0.866 ± 0.05791
noise 2 ± 0
constant 0.03997 ± 0.001531
b-Jet
anti-K_t R=0.4 EM+JES
|η|<2.5, ΔR > 1.0, JVF > 0.25
Pythia FTFP_BERT
$\sigma(p_T)/p_T = \sqrt{s^2/p_T + n^2/p_T^2 + c^2}$
$\sigma(p_T)/p_T$
p_T^{truth}[GeV]

やることリスト

- Z+jet 解析
  - z+b-jetが統計的に可能かどうか調べる
- MC di-jetを使用したrespose
  - withMuIntでresponseを調べる
  - semi leptonic decayによるmuonをtaggingするためにmuonの素性を調べる
  - mc情報を使って、gluon jetとlight jetのtaggingをしてresponseを見る
  - GS Calibrationでflavor毎のresponseを見てみる
  - JVF > 0.25 , 0.5 , 0.75でプロットを作る
  - (new)b-hadronのpTなどを考慮したb-tagの方法を考える
  - response分布にFitするときの範囲を変えたときの中心値の不定性の評価

Monte Carlo samples

- **Pythia**
  - mc12_8TeV.14791*.Pythia8_AU2CT10_jetjet_JZ*W.merge.NTUP_JETMET.e1126_s1469_s1470_r3542_r3549_p1344
- **Herwig++**
  - mc12_8TeV.1591*.Herwigpp_EE3CTEQ6L1_jetjet_JZ*W.merge.NTUP_JETMET.e1373_s1499_s1504_r3658_r3549_p1344
  - -> for generator difference
- **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 ,p_T response distribution

- **Jet selection**
  - $|\eta|<2.5$
  - require isolation from other jets
    - -> $\Delta R >= 1.0$ or 1.5
  - JVF > 0.25
  - select closest reco-jet to matched truth-jet ($\Delta R(reco,truth) < 0.3$)
    - reco-jet : calorimeter jet
    - truth-jet : truth particle jet
- **p_T^{reco}/p_T^{truth}**
  - p_T^{truth} bin separation :{20,40,80,140,200,400,600,1000,2000,3000} GeV
- **Flavor tagging**
  - require hadrons with b- or c-quark exist in the R-size of each jet