Run 3 Forward Electron Energy Calibration in ATLAS, with a focus on pileup noise

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DESY

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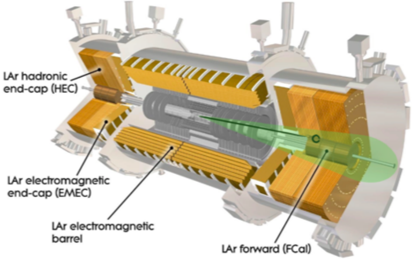
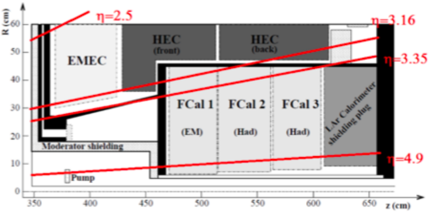
ATLAS and Forward Region

The study is interested in the forward region of the ATLAS detector, which is characterized by a pseudorapidity[1] $\eta > 2.5$. The forward region is split into two different kind of calorimeters: EMEC and FCAL

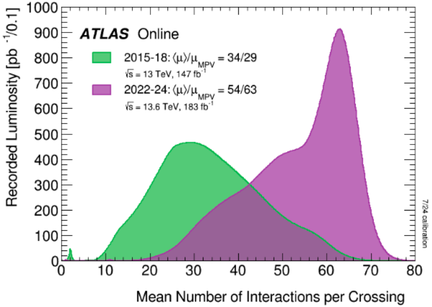


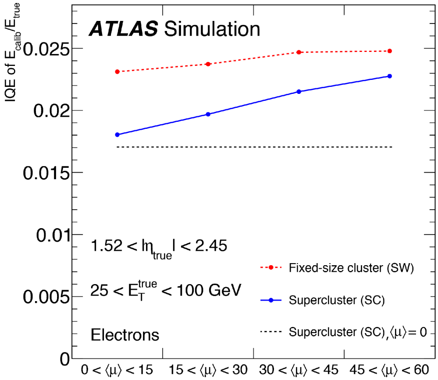


[1] $\eta = -\ln(\tan(\frac{\theta}{2}))$

Goal

Investigate the energy resolution of electrons in the forward region from simulation, with a dedicated study of pile-up noise[2]

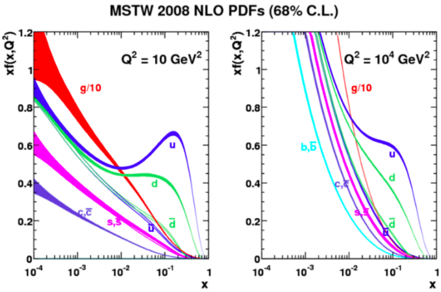


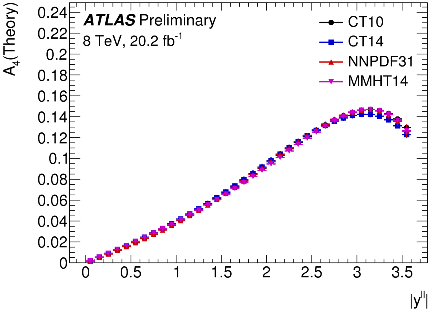


Pile-up refers to the phenomenon where multiple, independent proton-proton collisions occur simultaneously within the same

Good calibration on forward electrons allow us to:

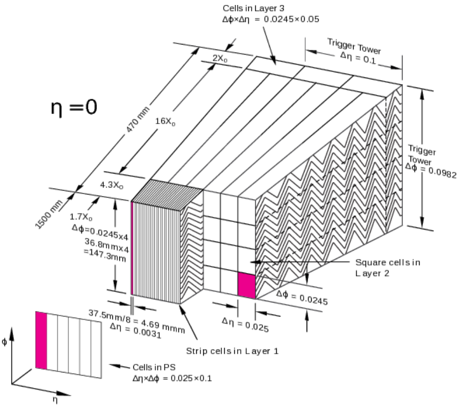
- Study PDFs with low and high x values
- Perform precise measurments of the EW mixing angle: $\sin(\theta_W)$

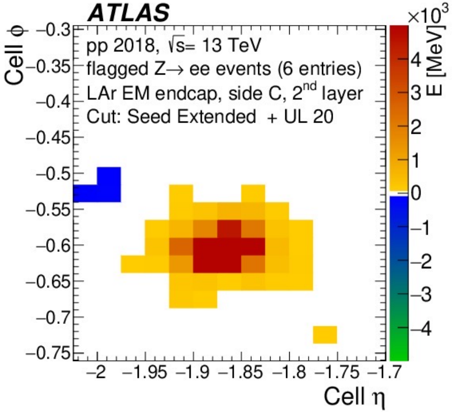




Energy Reconstruction

Energy is reconstructed by the electromagnetic calorimeters which are divided in cells. The entire e.m. shower is spread across different cells which are then unified in a cluster. $E_{cluster} = E_{reconstructed}$



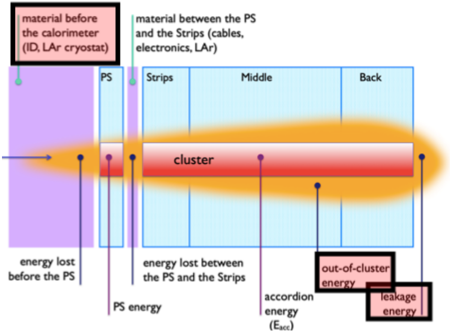


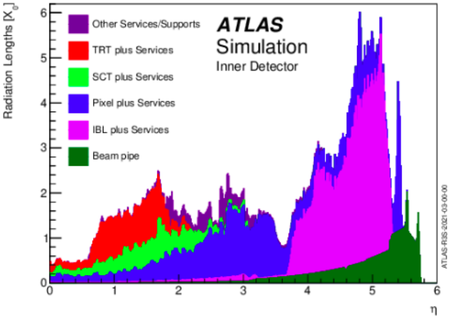
The images refers to the central region of the calorimeters where everything is well understood. The forward region is more of a unknown territory.

Energy Reconstruction

For this project the energy resolution is it going to be estimated by the difference between reconstructed and real energy, so for the relative uncertainty

$$\frac{E_{reconstructed} - E_{truth}}{E_{truth}} = \frac{E_{reconstructed}}{E_{truth}} - 1$$





Energy Reconstruction

$$\frac{\sigma_E}{E} = \frac{a}{\sqrt{E}} \oplus \frac{b}{E} \oplus c \tag{1}$$

- **a**: stochastic term (Poissonian)
- **b**: noise term made up by pile-up and electronics

$$b = \sigma_{pile-up} \oplus \sigma_{electronics} \tag{2}$$

- **c**: constant term due to calibration uncertainty, non uniform detector response, leakage, ...

Pile-up Noise

The resolution receives contribution from a bunch crossing number[3]-dependent part[4], term related to the pile-up, and a constant part:

$$\frac{\sigma}{E_t} = \beta\sqrt{\mu} \oplus \alpha \tag{3}$$

$$(\frac{\sigma}{E_t})^2 = \frac{\beta^2}{E_t^2} \cdot \mu + constants$$

To extract the pileup-noise a simple linear fit $(A + Bx)$ on the σ^2 vs μ is needed, where the slope(B) contains the pileup noise factor-β

$$\beta \text{ [GeV]} = \sqrt{B} \cdot E_t \tag{4}$$

[3] μ
[4] Poissonian

Extraction Method

The data used are MC simulated data of a forward electron coming from the Z boson decay.

The work can be divided into steps:

- Create distributions of $\frac{E_{reconstructed}}{E_{truth}}$ for the electron in diffent bins in p_t, η and μ
- Fit sigma and mean from a Gaussian $\rightarrow \sigma_E$
- Create σ^2 vs μ for each bin
- Extract β using (4) from the linear fit

Binning

- **Binning in** η_{probe} ($N_\eta = 7$ bins):

$$\{2.5,\ 2.7,\ 2.9,\ 3.1,\ 3.1,\ 3.35,\ 3.5,\ 3.5,\ 3.8,\ 4.9\}$$

  From 3.1 to 3.5 is going to be considered crack region, therefore not shown in plots.

- **Binning in** p_t ($N_{p_t} = 4$ bins):

$$\{20,\ 30,\ 40,\ 50,\ 1000\}\ \mathrm{GeV}$$

- **Binning in** μ ($N_\mu = 7$ bins):

$$\{0,\ 30,\ 40,\ 50,\ 55,\ 60,\ 70,\ 100\}$$

E_{reco}/E_{true}

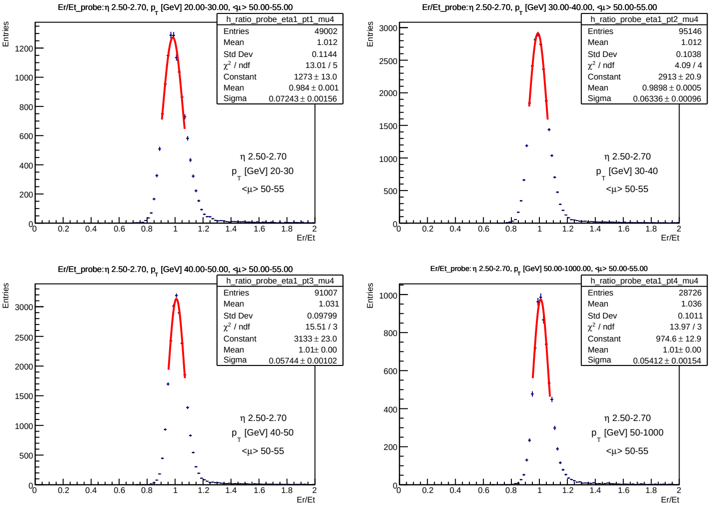


Figure: Example of fitted E_{reco}/E_{truth} distributions for different p_t bins for $2.5 < \eta < 2.7$ and $50 < \mu < 55$

Sigma Trend

Higher $\mu \rightarrow$ higher σ

$$\frac{\sigma}{E_t} = \beta\sqrt{\mu} \oplus \alpha$$

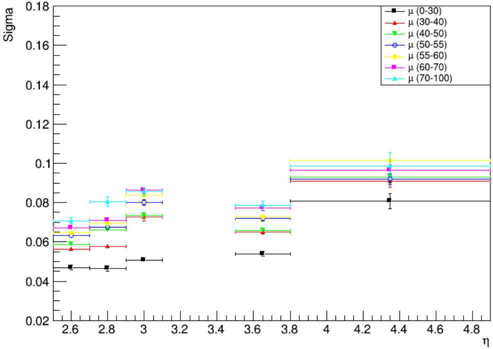
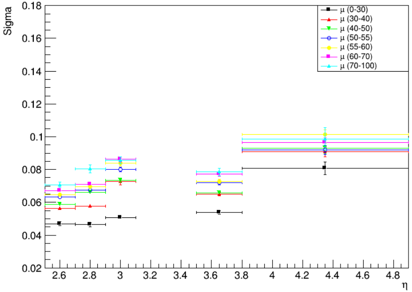


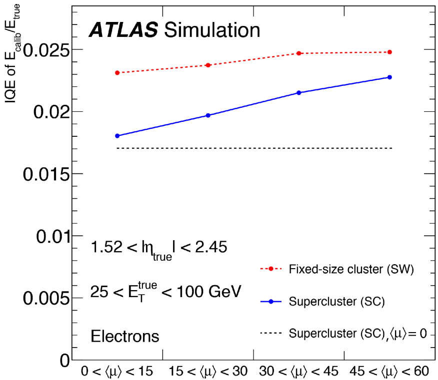
Figure: σ vs η for different μ bins for $30 < p_t[\mathrm{GeV}] < 40$

Differences in η are due to differences in the materials before the calorimeters.

Sigma Difference with Central Case

The resolution in the forward region is much worse than in the central case.





Sigma Trend

Higher $p_t \rightarrow$ smaller σ

$$\frac{\sigma_E}{E} = \frac{a}{\sqrt{E}} \oplus \frac{b}{E} \oplus c$$

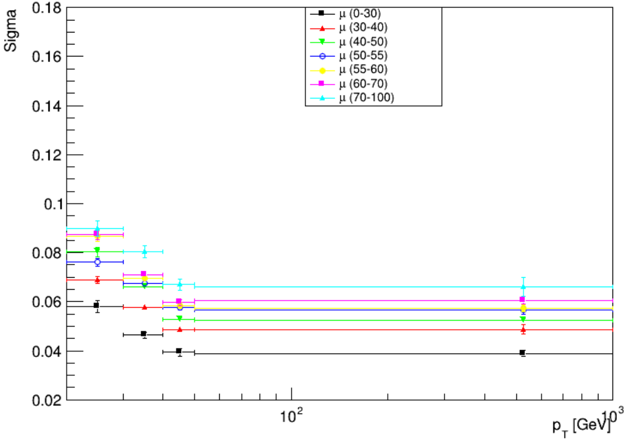


Figure: σ vs p_t for different μ bins for $2.7 < \eta < 2.9$

Linear fit

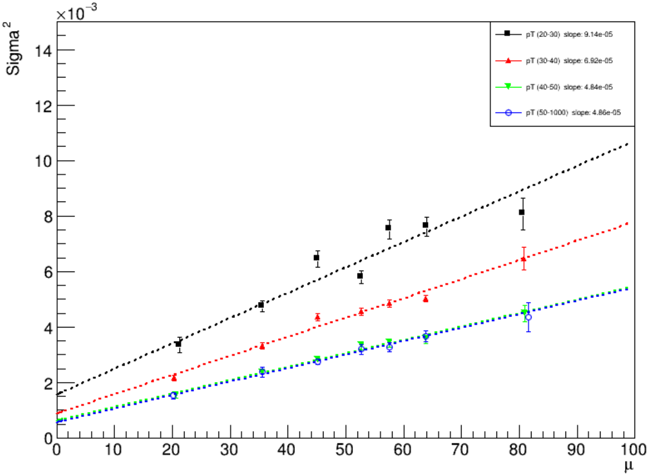


Figure: Linear fit from σ^2 vs μ for different p_t bins for $2.7 < \eta < 2.9$

β Extraction

From the linear fit[5] is it possible to extract the pile-up noise for each p_t and η bin of the forward electrons[6]:

$$\beta\ [\text{GeV}] = \sqrt{B} \cdot E_t$$

$\eta \backslash p_t$ bins	20–30 GeV	30–40 GeV	40–50 GeV	50–1000 GeV
2.50–2.70	0.222 ± 0.010	0.251 ± 0.0073	0.302 ± 0.0073	0.355 ± 0.017
2.70–2.90	0.251 ± 0.010	0.296 ± 0.0067	0.310 ± 0.010	0.424 ± 0.015
2.90–3.10	0.252 ± 0.013	0.368 ± 0.0068	$(5.2 \times 10^{-7}) \pm 1.3 \times 10^{5}$	$(5.7 \times 10^{-6}) \pm 4.0 \times 10^{3}$
3.10–3.50	*crack region (excluded)*			
3.50–3.80	0.184 ± 0.011	0.271 ± 0.0083	0.344 ± 0.028	0.504 ± 0.061
3.80–4.90	0.089 ± 0.029	0.265 ± 0.033	0.352 ± 0.098	$(3.8 \times 10^{-6}) \pm 2.9 \times 10^{5}$

Table: Values of β [GeV] with uncertainties for different η and p_T bins. The crack region is shaded and excluded.

[5] B is the slope of the linear fit

[6] Previous studies found $\beta \sim 0.1$ GeV for a 50 GeV electron

β vs p_t

The pile-up noise in the forward region is much more significant than in the central case.

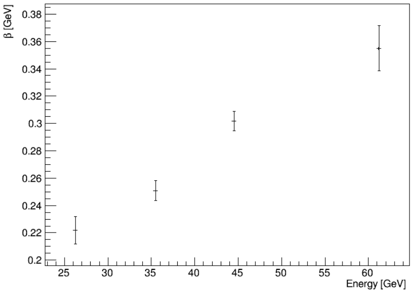


Figure: β vs p_t for $2.5 < \eta < 2.7$

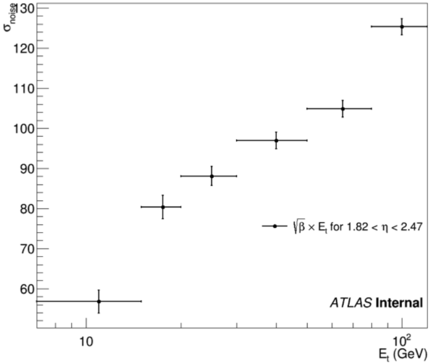


Figure: Results (in MeV) previously obtained for the central region

Conclusions

This work has presented an effective way to estimate the pile-up noise contribution to the energy resolution from simulated electrons in the forward region of the ATLAS calorimeters for the first time.

However, there is still some trends to better understand and problems to overcome, see next slides

Mean[7] Trend

Higher $\mu \not\to$ higher mean

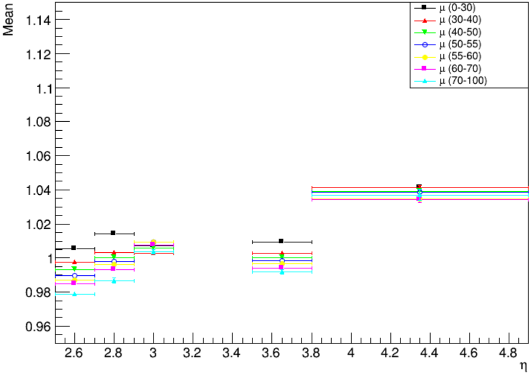


Figure: Mean vs η for different μ bins for $30 < p_t[\mathrm{GeV}] < 40$

[7] Data have not undergone a MVA global calibration, should be the reason for the huge oscillation of the mean

Kinematic Constraint

The analysis is limited by the Z boson decay kinematics.

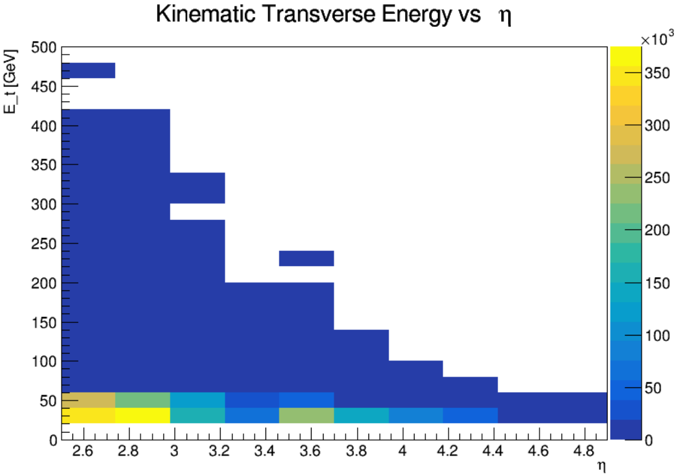


Figure: Number of events for values of E_t and η

Future prospects

Further prospects include:

- Use simulation of single electrons with flat distribution in p_t to avoid statistic problems
- Repeat the study for central electrons

Calorimeter Geometry

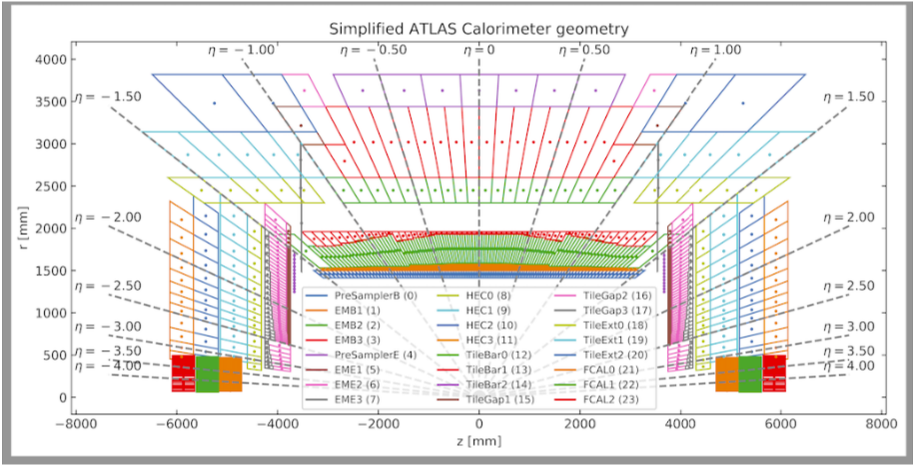


Figure: Full calorimeter disposition

Cookie-Cutting

To have a better linear energy response of the calorimeter cookie-cutting can be applied

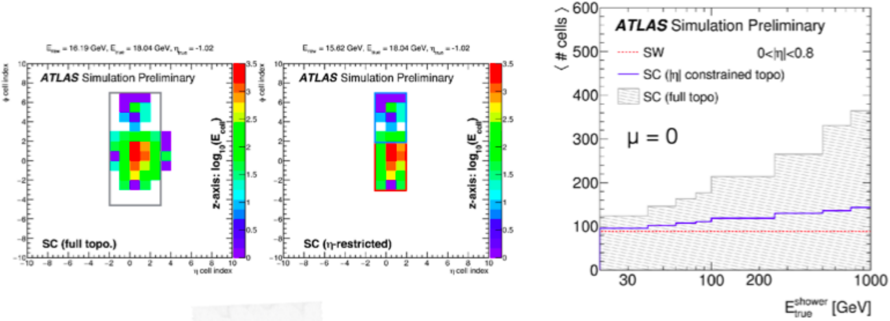
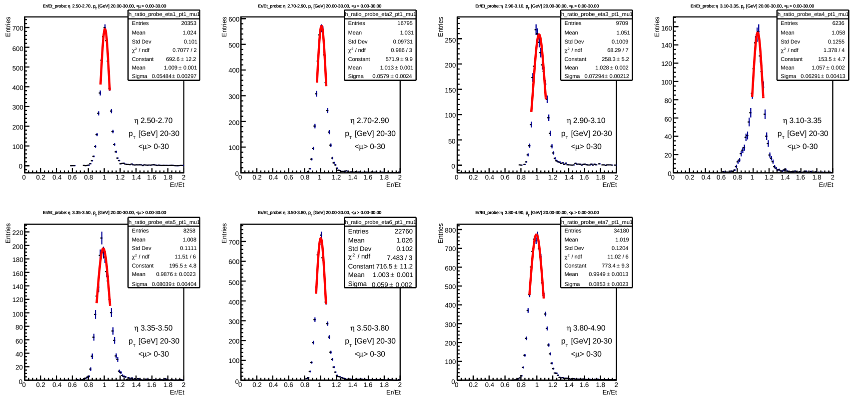
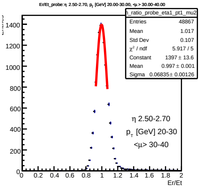


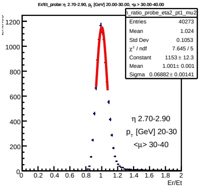
Figure: Cookie-cutting visual representation

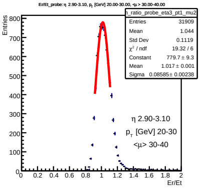
Plot p_t 1, μ 1

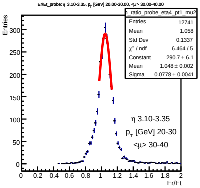

h_ratio_probe_eta1_pt1_mu1
Entries 20353
Mean 1.024
Std Dev 0.101
χ² / ndf 0.7077 / 2
Constant 692.6 ± 12.2
Mean 1.009 ± 0.001
Sigma 0.05484 ± 0.00297
η 2.50-2.70
p_T [GeV] 20-30
<μ> 0-30
h_ratio_probe_eta2_pt1_mu1
Entries 16795
Mean 1.031
Std Dev 0.09731
χ² / ndf 0.986 / 3
Constant 571.9 ± 9.9
Mean 1.013 ± 0.001
Sigma 0.0579 ± 0.0024
η 2.70-2.90
p_T [GeV] 20-30
<μ> 0-30
h_ratio_probe_eta3_pt1_mu1
Entries 9709
Mean 1.051
Std Dev 0.1009
χ² / ndf 68.29 / 7
Constant 258.3 ± 5.2
Mean 1.028 ± 0.002
Sigma 0.07294 ± 0.00212
η 2.90-3.10
p_T [GeV] 20-30
<μ> 0-30
h_ratio_probe_eta4_pt1_mu1
Entries 6236
Mean 1.058
Std Dev 0.1255
χ² / ndf 1.378 / 4
Constant 153.5 ± 4.7
Mean 1.057 ± 0.002
Sigma 0.06291 ± 0.00413
η 3.10-3.35
p_T [GeV] 20-30
<μ> 0-30
h_ratio_probe_eta5_pt1_mu1
Entries 8258
Mean 1.008
Std Dev 0.1111
χ² / ndf 11.51 / 6
Constant 195.5 ± 4.8
Mean 0.9876 ± 0.0023
Sigma 0.08039 ± 0.00404
η 3.35-3.50
p_T [GeV] 20-30
<μ> 0-30
h_ratio_probe_eta6_pt1_mu1
Entries 22760
Mean 1.026
Std Dev 0.102
χ² / ndf 7.483 / 3
Constant 716.5 ± 11.2
Mean 1.003 ± 0.001
Sigma 0.059 ± 0.002
η 3.50-3.80
p_T [GeV] 20-30
<μ> 0-30
h_ratio_probe_eta7_pt1_mu1
Entries 34180
Mean 1.019
Std Dev 0.1204
χ² / ndf 11.02 / 6
Constant 773.4 ± 9.3
Mean 0.9949 ± 0.0013
Sigma 0.0853 ± 0.0023
η 3.80-4.90
p_T [GeV] 20-30
<μ> 0-30
Entries
Er/Et

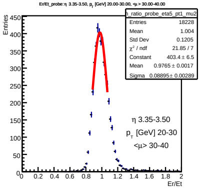
Plot p_t 1, μ 2

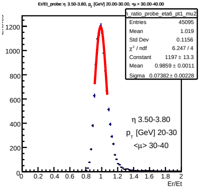

h_ratio_probe_eta1_pt1_mu2
Entries 48867
Mean 1.017
Std Dev 0.107
χ² / ndf 5.917 / 5
Constant 1397 ± 13.6
Mean 0.997 ± 0.001
Sigma 0.06835 ± 0.00126
η 2.50-2.70
p_T [GeV] 20-30
<μ> 30-40
Er/Et

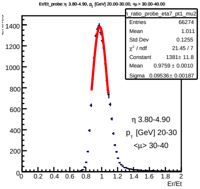

h_ratio_probe_eta2_pt1_mu2
Entries 40273
Mean 1.024
Std Dev 0.1053
χ² / ndf 7.645 / 5
Constant 1153 ± 12.3
Mean 1.001 ± 0.001
Sigma 0.06882 ± 0.00141
η 2.70-2.90
p_T [GeV] 20-30
<μ> 30-40
Er/Et


h_ratio_probe_eta3_pt1_mu2
Entries 31909
Mean 1.044
Std Dev 0.1119
χ² / ndf 19.32 / 6
Constant 779.7 ± 9.3
Mean 1.017 ± 0.001
Sigma 0.08585 ± 0.00238
η 2.90-3.10
p_T [GeV] 20-30
<μ> 30-40
Entries
Er/Et

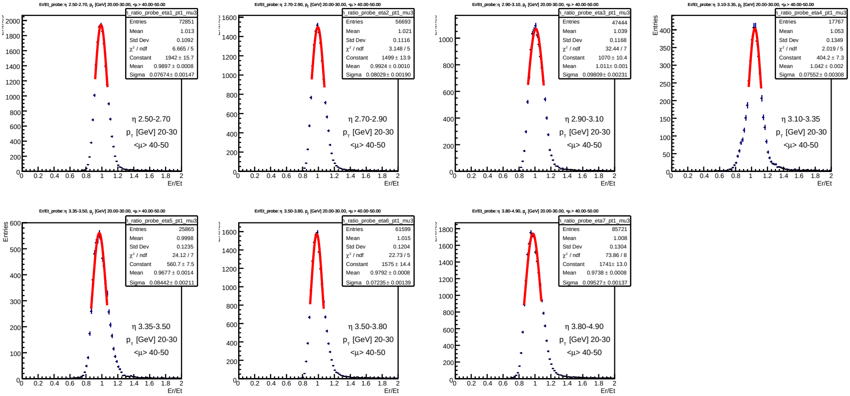

h_ratio_probe_eta4_pt1_mu2
Entries 12741
Mean 1.058
Std Dev 0.1337
χ² / ndf 6.464 / 5
Constant 290.7 ± 6.1
Mean 1.048 ± 0.002
Sigma 0.0778 ± 0.0041
η 3.10-3.35
p_T [GeV] 20-30
<μ> 30-40
Entries
Er/Et


h_ratio_probe_eta5_pt1_mu2
Entries 18228
Mean 1.004
Std Dev 0.1205
χ² / ndf 21.85 / 7
Constant 403.4 ± 6.5
Mean 0.9765 ± 0.0017
Sigma 0.08895 ± 0.00289
η 3.35-3.50
p_T [GeV] 20-30
<μ> 30-40
Entries
Er/Et

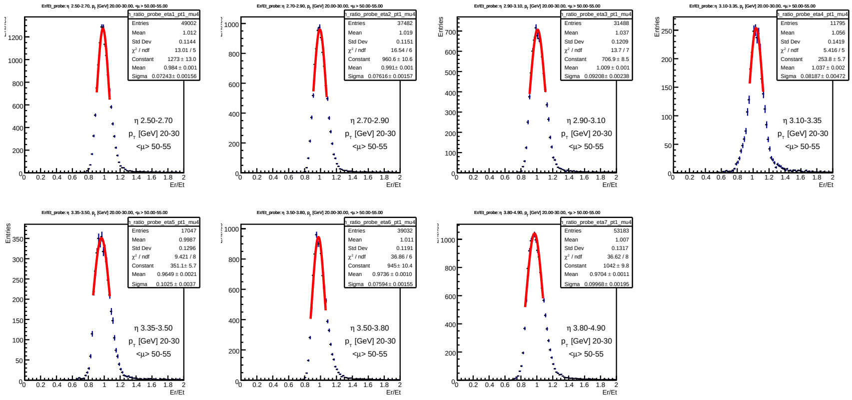

h_ratio_probe_eta6_pt1_mu2
Entries 45095
Mean 1.019
Std Dev 0.1156
χ² / ndf 6.247 / 4
Constant 1197 ± 13.3
Mean 0.9859 ± 0.0011
Sigma 0.07382 ± 0.00228
η 3.50-3.80
p_T [GeV] 20-30
<μ> 30-40
Er/Et


h_ratio_probe_eta7_pt1_mu2
Entries 66274
Mean 1.011
Std Dev 0.1255
χ² / ndf 21.45 / 7
Constant 1381 ± 11.8
Mean 0.9759 ± 0.0010
Sigma 0.09536 ± 0.00187
η 3.80-4.90
p_T [GeV] 20-30
<μ> 30-40
Er/Et

Plot p_t 1, μ 3

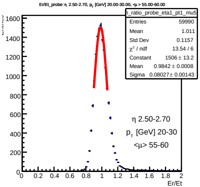

h_ratio_probe_eta1_pt1_mu3
Entries 72851
Mean 1.013
Std Dev 0.1092
χ² / ndf 6.665 / 5
Constant 1942 ± 15.7
Mean 0.9897 ± 0.0008
Sigma 0.07674 ± 0.00147
η 2.50-2.70
p_T [GeV] 20-30
<μ> 40-50
Er/Et
h_ratio_probe_eta2_pt1_mu3
Entries 56693
Mean 1.021
Std Dev 0.1116
χ² / ndf 3.148 / 5
Constant 1499 ± 13.9
Mean 0.9924 ± 0.0010
Sigma 0.08029 ± 0.00190
η 2.70-2.90
p_T [GeV] 20-30
<μ> 40-50
Er/Et
h_ratio_probe_eta3_pt1_mu3
Entries 47444
Mean 1.039
Std Dev 0.1168
χ² / ndf 32.44 / 7
Constant 1070 ± 10.4
Mean 1.011 ± 0.001
Sigma 0.09809 ± 0.00231
η 2.90-3.10
p_T [GeV] 20-30
<μ> 40-50
Er/Et
Entries
h_ratio_probe_eta4_pt1_mu3
Entries 17767
Mean 1.053
Std Dev 0.1349
χ² / ndf 2.019 / 5
Constant 404.2 ± 7.3
Mean 1.042 ± 0.002
Sigma 0.07552 ± 0.00308
η 3.10-3.35
p_T [GeV] 20-30
<μ> 40-50
Er/Et
Entries
h_ratio_probe_eta5_pt1_mu3
Entries 25865
Mean 0.9998
Std Dev 0.1235
χ² / ndf 24.12 / 7
Constant 560.7 ± 7.5
Mean 0.9677 ± 0.0014
Sigma 0.08442 ± 0.00211
η 3.35-3.50
p_T [GeV] 20-30
<μ> 40-50
Er/Et
h_ratio_probe_eta6_pt1_mu3
Entries 61599
Mean 1.015
Std Dev 0.1204
χ² / ndf 22.73 / 5
Constant 1575 ± 14.4
Mean 0.9792 ± 0.0008
Sigma 0.07235 ± 0.00139
η 3.50-3.80
p_T [GeV] 20-30
<μ> 40-50
Er/Et
h_ratio_probe_eta7_pt1_mu3
Entries 85721
Mean 1.008
Std Dev 0.1304
χ² / ndf 73.86 / 8
Constant 1741 ± 13.0
Mean 0.9738 ± 0.0008
Sigma 0.09527 ± 0.00137
η 3.80-4.90
p_T [GeV] 20-30
<μ> 40-50
Er/Et

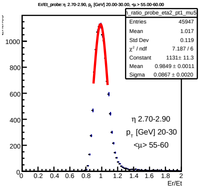
Plot p_t 1, μ 4

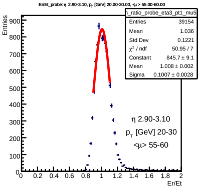


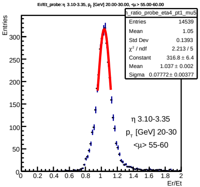
h_ratio_probe_eta1_pt1_mu4
Entries 49002
Mean 1.012
Std Dev 0.1144
χ² / ndf 13.01 / 5
Constant 1273 ± 13.0
Mean 0.984 ± 0.001
Sigma 0.07243 ± 0.00156
η 2.50-2.70
p_T [GeV] 20-30
<μ> 50-55
Er/Et
h_ratio_probe_eta2_pt1_mu4
Entries 37482
Mean 1.019
Std Dev 0.1151
χ² / ndf 16.54 / 6
Constant 960.6 ± 10.6
Mean 0.991 ± 0.001
Sigma 0.07616 ± 0.00157
η 2.70-2.90
p_T [GeV] 20-30
<μ> 50-55
Er/Et
h_ratio_probe_eta3_pt1_mu4
Entries 31488
Mean 1.037
Std Dev 0.1209
χ² / ndf 13.7 / 7
Constant 706.9 ± 8.5
Mean 1.009 ± 0.001
Sigma 0.09208 ± 0.00238
η 2.90-3.10
p_T [GeV] 20-30
<μ> 50-55
Er/Et
h_ratio_probe_eta4_pt1_mu4
Entries 11795
Mean 1.056
Std Dev 0.1419
χ² / ndf 5.416 / 5
Constant 253.8 ± 5.7
Mean 1.037 ± 0.002
Sigma 0.08187 ± 0.00472
η 3.10-3.35
p_T [GeV] 20-30
<μ> 50-55
Er/Et
h_ratio_probe_eta5_pt1_mu4
Entries 17047
Mean 0.9987
Std Dev 0.1296
χ² / ndf 9.421 / 8
Constant 351.1 ± 5.7
Mean 0.9649 ± 0.0021
Sigma 0.1025 ± 0.0037
η 3.35-3.50
p_T [GeV] 20-30
<μ> 50-55
Er/Et
h_ratio_probe_eta6_pt1_mu4
Entries 39032
Mean 1.011
Std Dev 0.1191
χ² / ndf 36.86 / 6
Constant 945 ± 10.4
Mean 0.9736 ± 0.0010
Sigma 0.07594 ± 0.00155
η 3.50-3.80
p_T [GeV] 20-30
<μ> 50-55
Er/Et
h_ratio_probe_eta7_pt1_mu4
Entries 53183
Mean 1.007
Std Dev 0.1317
χ² / ndf 36.62 / 8
Constant 1042 ± 9.8
Mean 0.9704 ± 0.0011
Sigma 0.09968 ± 0.00195
η 3.80-4.90
p_T [GeV] 20-30
<μ> 50-55
Er/Et

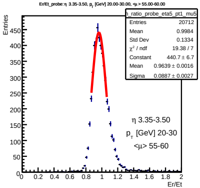
Plot p_t 1, μ 5

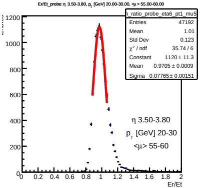

Er/Et_probe:η 2.50-2.70, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta1_pt1_mu5
Entries 59990
Mean 1.011
Std Dev 0.1157
χ² / ndf 13.54 / 6
Constant 1506 ± 13.2
Mean 0.9842 ± 0.0008
Sigma 0.08027 ± 0.00143
η 2.50-2.70
p_T [GeV] 20-30
<μ> 55-60
Er/Et

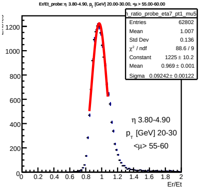

Er/Et_probe:η 2.70-2.90, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta2_pt1_mu5
Entries 45947
Mean 1.017
Std Dev 0.119
χ² / ndf 7.187 / 6
Constant 1131 ± 11.3
Mean 0.9849 ± 0.0011
Sigma 0.0867 ± 0.0020
η 2.70-2.90
p_T [GeV] 20-30
<μ> 55-60
Er/Et


Er/Et_probe:η 2.90-3.10, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta3_pt1_mu5
Entries
Entries 39154
Mean 1.036
Std Dev 0.1221
χ² / ndf 50.95 / 7
Constant 845.7 ± 9.1
Mean 1.008 ± 0.002
Sigma 0.1007 ± 0.0028
η 2.90-3.10
p_T [GeV] 20-30
<μ> 55-60
Er/Et

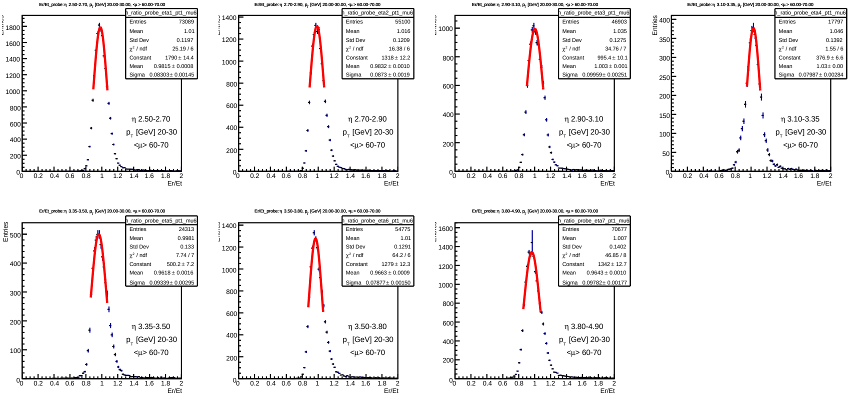

Er/Et_probe:η 3.10-3.35, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta4_pt1_mu5
Entries
Entries 14539
Mean 1.05
Std Dev 0.1393
χ² / ndf 2.213 / 5
Constant 316.8 ± 6.4
Mean 1.037 ± 0.002
Sigma 0.07772 ± 0.00377
η 3.10-3.35
p_T [GeV] 20-30
<μ> 55-60
Er/Et


Er/Et_probe:η 3.35-3.50, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta5_pt1_mu5
Entries
Entries 20712
Mean 0.9984
Std Dev 0.1334
χ² / ndf 19.38 / 7
Constant 440.7 ± 6.7
Mean 0.9639 ± 0.0016
Sigma 0.0887 ± 0.0027
η 3.35-3.50
p_T [GeV] 20-30
<μ> 55-60
Er/Et


Er/Et_probe:η 3.50-3.80, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta6_pt1_mu5
Entries 47192
Mean 1.01
Std Dev 0.123
χ² / ndf 35.74 / 6
Constant 1120 ± 11.3
Mean 0.9705 ± 0.0009
Sigma 0.07765 ± 0.00151
η 3.50-3.80
p_T [GeV] 20-30
<μ> 55-60
Er/Et

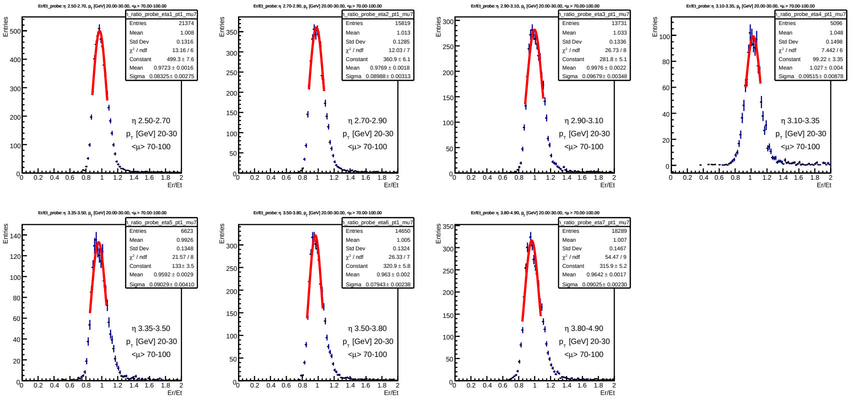

Er/Et_probe:η 3.80-4.90, p_T [GeV] 20.00-30.00, <μ> 55.00-60.00
h_ratio_probe_eta7_pt1_mu5
Entries 62802
Mean 1.007
Std Dev 0.136
χ² / ndf 88.6 / 9
Constant 1225 ± 10.2
Mean 0.969 ± 0.001
Sigma 0.09242 ± 0.00122
η 3.80-4.90
p_T [GeV] 20-30
<μ> 55-60
Er/Et

Plot p_t 1, μ 6

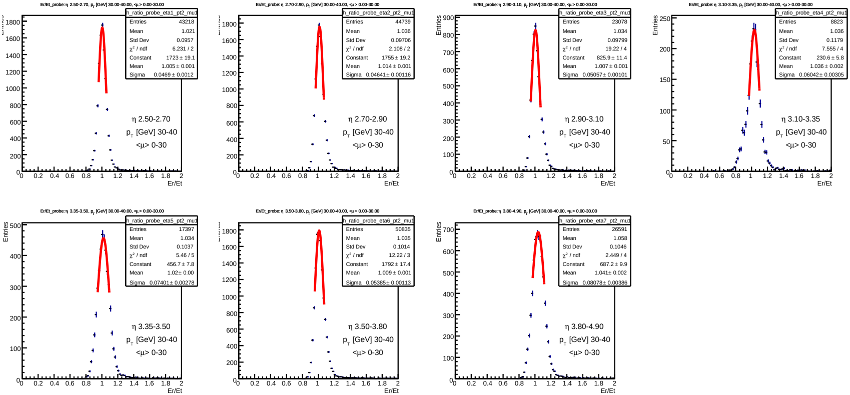


Er/Et_probe:η 2.50-2.70, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta1_pt1_mu6
Entries 73089
Mean 1.01
Std Dev 0.1197
χ² / ndf 25.19 / 6
Constant 1790 ± 14.4
Mean 0.9815 ± 0.0008
Sigma 0.08303 ± 0.00145
η 2.50-2.70
p_T [GeV] 20-30
<μ> 60-70
Er/Et
Er/Et_probe:η 2.70-2.90, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta2_pt1_mu6
Entries 55100
Mean 1.016
Std Dev 0.1209
χ² / ndf 16.38 / 6
Constant 1318 ± 12.2
Mean 0.9832 ± 0.0010
Sigma 0.0873 ± 0.0019
η 2.70-2.90
p_T [GeV] 20-30
<μ> 60-70
Er/Et
Er/Et_probe:η 2.90-3.10, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta3_pt1_mu6
Entries 46903
Mean 1.035
Std Dev 0.1275
χ² / ndf 34.76 / 7
Constant 995.4 ± 10.1
Mean 1.003 ± 0.001
Sigma 0.09959 ± 0.00251
η 2.90-3.10
p_T [GeV] 20-30
<μ> 60-70
Er/Et
Er/Et_probe:η 3.10-3.35, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta4_pt1_mu6
Entries 17797
Mean 1.046
Std Dev 0.1392
χ² / ndf 1.55 / 6
Constant 376.9 ± 6.6
Mean 1.03 ± 0.00
Sigma 0.07987 ± 0.00284
Entries
η 3.10-3.35
p_T [GeV] 20-30
<μ> 60-70
Er/Et
Er/Et_probe:η 3.35-3.50, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta5_pt1_mu6
Entries 24313
Mean 0.9981
Std Dev 0.133
χ² / ndf 7.74 / 7
Constant 500.2 ± 7.2
Mean 0.9618 ± 0.0016
Sigma 0.09339 ± 0.00295
Entries
η 3.35-3.50
p_T [GeV] 20-30
<μ> 60-70
Er/Et
Er/Et_probe:η 3.50-3.80, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta6_pt1_mu6
Entries 54775
Mean 1.01
Std Dev 0.1291
χ² / ndf 64.2 / 6
Constant 1279 ± 12.3
Mean 0.9663 ± 0.0009
Sigma 0.07877 ± 0.00150
η 3.50-3.80
p_T [GeV] 20-30
<μ> 60-70
Er/Et
Er/Et_probe:η 3.80-4.90, p_T [GeV] 20.00-30.00, <μ> 60.00-70.00
h_ratio_probe_eta7_pt1_mu6
Entries 70677
Mean 1.007
Std Dev 0.1402
χ² / ndf 46.85 / 8
Constant 1342 ± 12.7
Mean 0.9643 ± 0.0010
Sigma 0.09782 ± 0.00177
η 3.80-4.90
p_T [GeV] 20-30
<μ> 60-70
Er/Et

Plot p_t 1, μ 7

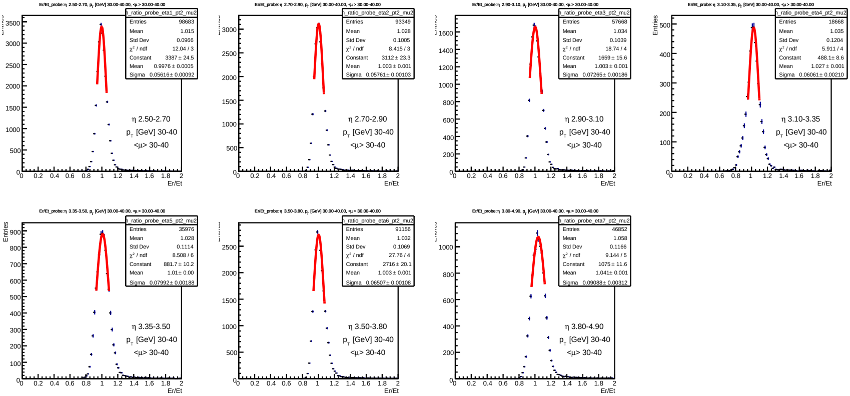

h_ratio_probe_eta1_pt1_mu7
Entries 21374
Mean 1.008
Std Dev 0.1316
χ² / ndf 13.16 / 6
Constant 499.3 ± 7.6
Mean 0.9723 ± 0.0016
Sigma 0.08325 ± 0.00275
η 2.50-2.70
p_T [GeV] 20-30
<μ> 70-100
h_ratio_probe_eta2_pt1_mu7
Entries 15819
Mean 1.013
Std Dev 0.1285
χ² / ndf 12.03 / 7
Constant 360.9 ± 6.1
Mean 0.9769 ± 0.0018
Sigma 0.08988 ± 0.00313
η 2.70-2.90
p_T [GeV] 20-30
<μ> 70-100
h_ratio_probe_eta3_pt1_mu7
Entries 13731
Mean 1.033
Std Dev 0.1336
χ² / ndf 26.73 / 8
Constant 281.8 ± 5.1
Mean 0.9976 ± 0.0022
Sigma 0.09679 ± 0.00348
η 2.90-3.10
p_T [GeV] 20-30
<μ> 70-100
h_ratio_probe_eta4_pt1_mu7
Entries 5096
Mean 1.048
Std Dev 0.1498
χ² / ndf 7.442 / 6
Constant 99.22 ± 3.35
Mean 1.027 ± 0.004
Sigma 0.09515 ± 0.00878
η 3.10-3.35
p_T [GeV] 20-30
<μ> 70-100
h_ratio_probe_eta5_pt1_mu7
Entries 6623
Mean 0.9926
Std Dev 0.1348
χ² / ndf 21.57 / 8
Constant 133 ± 3.5
Mean 0.9592 ± 0.0029
Sigma 0.09029 ± 0.00410
η 3.35-3.50
p_T [GeV] 20-30
<μ> 70-100
h_ratio_probe_eta6_pt1_mu7
Entries 14650
Mean 1.005
Std Dev 0.1324
χ² / ndf 26.33 / 7
Constant 320.9 ± 5.8
Mean 0.963 ± 0.002
Sigma 0.07943 ± 0.00238
η 3.50-3.80
p_T [GeV] 20-30
<μ> 70-100
h_ratio_probe_eta7_pt1_mu7
Entries 18289
Mean 1.007
Std Dev 0.1467
χ² / ndf 54.47 / 9
Constant 315.9 ± 5.2
Mean 0.9642 ± 0.0017
Sigma 0.09025 ± 0.00230
η 3.80-4.90
p_T [GeV] 20-30
<μ> 70-100
Entries
Er/Et

Plot p_t 2, μ 1

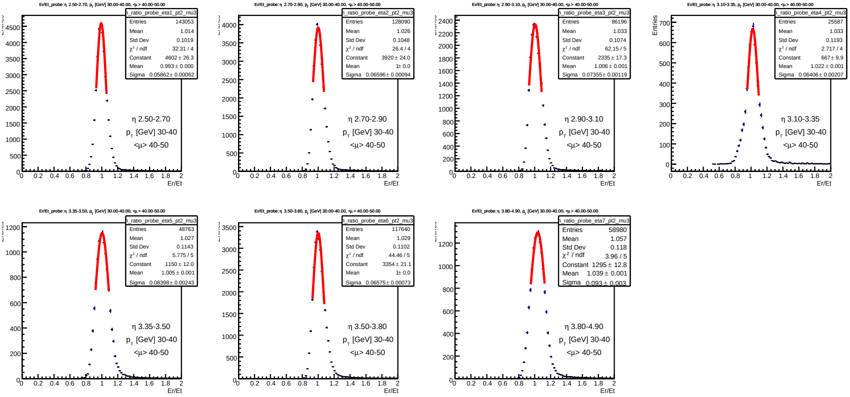


h_ratio_probe_eta1_pt2_mu1
Entries 43218
Mean 1.021
Std Dev 0.0957
χ² / ndf 6.231 / 2
Constant 1723 ± 19.1
Mean 1.005 ± 0.001
Sigma 0.0469 ± 0.0012
η 2.50-2.70
p_T [GeV] 30-40
<μ> 0-30
Er/Et
h_ratio_probe_eta2_pt2_mu1
Entries 44739
Mean 1.036
Std Dev 0.09706
χ² / ndf 2.108 / 2
Constant 1755 ± 19.2
Mean 1.014 ± 0.001
Sigma 0.04641 ± 0.00116
η 2.70-2.90
p_T [GeV] 30-40
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta3_pt2_mu1
Entries 23078
Mean 1.034
Std Dev 0.09799
χ² / ndf 19.22 / 4
Constant 825.9 ± 11.4
Mean 1.007 ± 0.001
Sigma 0.05057 ± 0.00101
η 2.90-3.10
p_T [GeV] 30-40
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta4_pt2_mu1
Entries 8823
Mean 1.036
Std Dev 0.1179
χ² / ndf 7.555 / 4
Constant 230.6 ± 5.8
Mean 1.036 ± 0.002
Sigma 0.06042 ± 0.00305
η 3.10-3.35
p_T [GeV] 30-40
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta5_pt2_mu1
Entries 17397
Mean 1.034
Std Dev 0.1037
χ² / ndf 5.46 / 5
Constant 456.7 ± 7.8
Mean 1.02 ± 0.00
Sigma 0.07401 ± 0.00278
η 3.35-3.50
p_T [GeV] 30-40
<μ> 0-30
Er/Et
h_ratio_probe_eta6_pt2_mu1
Entries 50835
Mean 1.035
Std Dev 0.1014
χ² / ndf 12.22 / 3
Constant 1792 ± 17.4
Mean 1.009 ± 0.001
Sigma 0.05385 ± 0.00113
η 3.50-3.80
p_T [GeV] 30-40
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta7_pt2_mu1
Entries 26591
Mean 1.058
Std Dev 0.1046
χ² / ndf 2.449 / 4
Constant 687.2 ± 9.9
Mean 1.041 ± 0.002
Sigma 0.08078 ± 0.00386
η 3.80-4.90
p_T [GeV] 30-40
<μ> 0-30
Er/Et

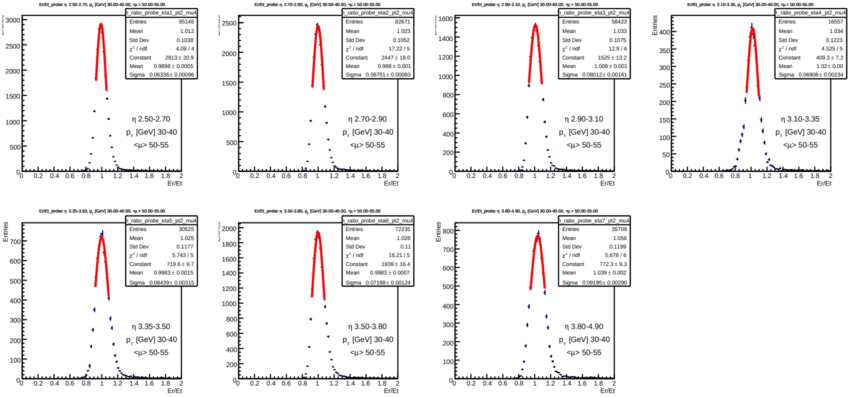
Plot p_t 2, μ 2


h_ratio_probe_eta1_pt2_mu2
Entries 98683
Mean 1.015
Std Dev 0.0966
χ² / ndf 12.04 / 3
Constant 3387 ± 24.5
Mean 0.9976 ± 0.0005
Sigma 0.05616 ± 0.00092
η 2.50-2.70
p_T [GeV] 30-40
<μ> 30-40
h_ratio_probe_eta2_pt2_mu2
Entries 93349
Mean 1.028
Std Dev 0.1005
χ² / ndf 8.415 / 3
Constant 3112 ± 23.3
Mean 1.003 ± 0.001
Sigma 0.05761 ± 0.00103
η 2.70-2.90
p_T [GeV] 30-40
<μ> 30-40
h_ratio_probe_eta3_pt2_mu2
Entries 57668
Mean 1.034
Std Dev 0.1039
χ² / ndf 18.74 / 4
Constant 1659 ± 15.6
Mean 1.003 ± 0.001
Sigma 0.07265 ± 0.00186
η 2.90-3.10
p_T [GeV] 30-40
<μ> 30-40
h_ratio_probe_eta4_pt2_mu2
Entries 18668
Mean 1.035
Std Dev 0.1204
χ² / ndf 5.911 / 4
Constant 488.1 ± 8.6
Mean 1.027 ± 0.001
Sigma 0.06061 ± 0.00210
η 3.10-3.35
p_T [GeV] 30-40
<μ> 30-40
h_ratio_probe_eta5_pt2_mu2
Entries 35976
Mean 1.028
Std Dev 0.1114
χ² / ndf 8.508 / 6
Constant 881.7 ± 10.2
Mean 1.01 ± 0.00
Sigma 0.07992 ± 0.00188
η 3.35-3.50
p_T [GeV] 30-40
<μ> 30-40
h_ratio_probe_eta6_pt2_mu2
Entries 91156
Mean 1.032
Std Dev 0.1069
χ² / ndf 27.76 / 4
Constant 2716 ± 20.1
Mean 1.003 ± 0.001
Sigma 0.06507 ± 0.00108
η 3.50-3.80
p_T [GeV] 30-40
<μ> 30-40
h_ratio_probe_eta7_pt2_mu2
Entries 46852
Mean 1.058
Std Dev 0.1166
χ² / ndf 9.144 / 5
Constant 1075 ± 11.6
Mean 1.041 ± 0.001
Sigma 0.09088 ± 0.00312
η 3.80-4.90
p_T [GeV] 30-40
<μ> 30-40
Entries
Er/Et

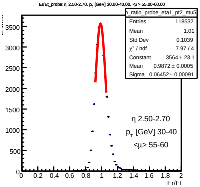
Plot p_t 2, μ 3


h_ratio_probe_eta1_pt2_mu3
Entries 143053
Mean 1.014
Std Dev 0.1019
χ² / ndf 32.31 / 4
Constant 4602 ± 26.3
Mean 0.993 ± 0.000
Sigma 0.05862 ± 0.00062
η 2.50-2.70
p_T [GeV] 30-40
<μ> 40-50
Er/Et
h_ratio_probe_eta2_pt2_mu3
Entries 128090
Mean 1.026
Std Dev 0.1048
χ² / ndf 26.4 / 4
Constant 3920 ± 24.0
Mean 1 ± 0.0
Sigma 0.06596 ± 0.00094
η 2.70-2.90
p_T [GeV] 30-40
<μ> 40-50
Er/Et
h_ratio_probe_eta3_pt2_mu3
Entries 86196
Mean 1.033
Std Dev 0.1074
χ² / ndf 62.15 / 5
Constant 2335 ± 17.3
Mean 1.006 ± 0.001
Sigma 0.07355 ± 0.00119
η 2.90-3.10
p_T [GeV] 30-40
<μ> 40-50
Er/Et
h_ratio_probe_eta4_pt2_mu3
Entries
Entries 25587
Mean 1.033
Std Dev 0.1193
χ² / ndf 2.717 / 4
Constant 667 ± 9.9
Mean 1.022 ± 0.001
Sigma 0.06406 ± 0.00207
η 3.10-3.35
p_T [GeV] 30-40
<μ> 40-50
Er/Et
h_ratio_probe_eta5_pt2_mu3
Entries 48763
Mean 1.027
Std Dev 0.1143
χ² / ndf 5.775 / 5
Constant 1150 ± 12.0
Mean 1.005 ± 0.001
Sigma 0.08398 ± 0.00243
η 3.35-3.50
p_T [GeV] 30-40
<μ> 40-50
Er/Et
h_ratio_probe_eta6_pt2_mu3
Entries 117640
Mean 1.029
Std Dev 0.1102
χ² / ndf 44.46 / 5
Constant 3354 ± 21.1
Mean 1 ± 0.0
Sigma 0.06575 ± 0.00073
η 3.50-3.80
p_T [GeV] 30-40
<μ> 40-50
Er/Et
h_ratio_probe_eta7_pt2_mu3
Entries 58980
Mean 1.057
Std Dev 0.118
χ² / ndf 3.96 / 5
Constant 1295 ± 12.8
Mean 1.039 ± 0.001
Sigma 0.093 ± 0.003
η 3.80-4.90
p_T [GeV] 30-40
<μ> 40-50
Er/Et

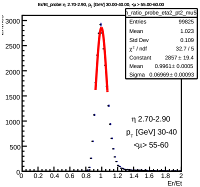
Plot p_t 2, μ 4


h_ratio_probe_eta1_pt2_mu4
Entries 95146
Mean 1.012
Std Dev 0.1038
χ² / ndf 4.09 / 4
Constant 2913 ± 20.9
Mean 0.9898 ± 0.0005
Sigma 0.06336 ± 0.00096
η 2.50-2.70
p_T [GeV] 30-40
<μ> 50-55
Er/Et
h_ratio_probe_eta2_pt2_mu4
Entries 82671
Mean 1.023
Std Dev 0.1052
χ² / ndf 17.22 / 5
Constant 2447 ± 18.0
Mean 0.998 ± 0.001
Sigma 0.06751 ± 0.00093
η 2.70-2.90
p_T [GeV] 30-40
<μ> 50-55
Er/Et
h_ratio_probe_eta3_pt2_mu4
Entries 58423
Mean 1.033
Std Dev 0.1075
χ² / ndf 12.9 / 6
Constant 1525 ± 13.2
Mean 1.009 ± 0.001
Sigma 0.08012 ± 0.00141
η 2.90-3.10
p_T [GeV] 30-40
<μ> 50-55
Er/Et
h_ratio_probe_eta4_pt2_mu4
Entries 16557
Mean 1.034
Std Dev 0.1223
χ² / ndf 4.525 / 5
Constant 409.3 ± 7.2
Mean 1.02 ± 0.00
Sigma 0.06908 ± 0.00234
η 3.10-3.35
p_T [GeV] 30-40
<μ> 50-55
Entries
Er/Et
h_ratio_probe_eta5_pt2_mu4
Entries 30525
Mean 1.025
Std Dev 0.1177
χ² / ndf 5.743 / 5
Constant 719.6 ± 9.7
Mean 0.9983 ± 0.0015
Sigma 0.08439 ± 0.00315
η 3.35-3.50
p_T [GeV] 30-40
<μ> 50-55
Entries
Er/Et
h_ratio_probe_eta6_pt2_mu4
Entries 72235
Mean 1.028
Std Dev 0.11
χ² / ndf 16.21 / 5
Constant 1939 ± 16.4
Mean 0.9983 ± 0.0007
Sigma 0.07188 ± 0.00124
η 3.50-3.80
p_T [GeV] 30-40
<μ> 50-55
Er/Et
h_ratio_probe_eta7_pt2_mu4
Entries 35709
Mean 1.056
Std Dev 0.1199
χ² / ndf 5.678 / 6
Constant 772.3 ± 9.3
Mean 1.039 ± 0.002
Sigma 0.09195 ± 0.00290
η 3.80-4.90
p_T [GeV] 30-40
<μ> 50-55
Entries
Er/Et

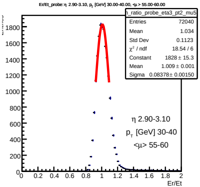
Plot p_t 2, μ 5



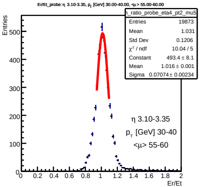
Er/Et_probe:η 2.50-2.70, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta1_pt2_mu5
Entries 118532
Mean 1.01
Std Dev 0.1039
χ² / ndf 7.97 / 4
Constant 3564 ± 23.1
Mean 0.9872 ± 0.0005
Sigma 0.06452 ± 0.00091
η 2.50-2.70
p_T [GeV] 30-40
<μ> 55-60
Er/Et



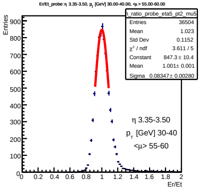
Er/Et_probe:η 2.70-2.90, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta2_pt2_mu5
Entries 99825
Mean 1.023
Std Dev 0.109
χ² / ndf 32.7 / 5
Constant 2857 ± 19.4
Mean 0.9961 ± 0.0005
Sigma 0.06969 ± 0.00093
η 2.70-2.90
p_T [GeV] 30-40
<μ> 55-60
Er/Et



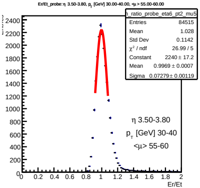
Er/Et_probe:η 2.90-3.10, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta3_pt2_mu5
Entries 72040
Mean 1.034
Std Dev 0.1123
χ² / ndf 18.54 / 6
Constant 1828 ± 15.3
Mean 1.009 ± 0.001
Sigma 0.08378 ± 0.00150
η 2.90-3.10
p_T [GeV] 30-40
<μ> 55-60
Er/Et



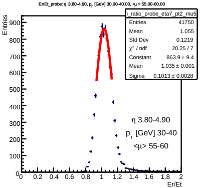
Er/Et_probe:η 3.10-3.35, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta4_pt2_mu5
Entries 19873
Mean 1.031
Std Dev 0.1206
χ² / ndf 10.04 / 5
Constant 493.4 ± 8.1
Mean 1.016 ± 0.001
Sigma 0.07074 ± 0.00234
η 3.10-3.35
p_T [GeV] 30-40
<μ> 55-60
Entries
Er/Et



Er/Et_probe:η 3.35-3.50, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta5_pt2_mu5
Entries 36504
Mean 1.023
Std Dev 0.1152
χ² / ndf 3.611 / 5
Constant 847.3 ± 10.4
Mean 1.001 ± 0.001
Sigma 0.08347 ± 0.00280
η 3.35-3.50
p_T [GeV] 30-40
<μ> 55-60
Entries
Er/Et

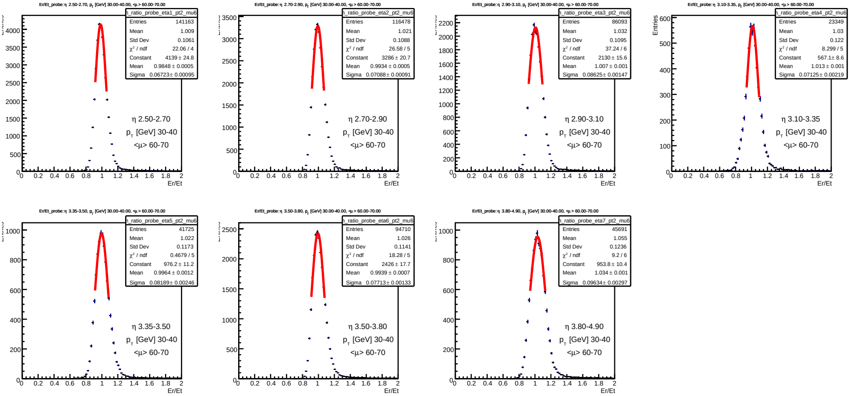


Er/Et_probe:η 3.50-3.80, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta6_pt2_mu5
Entries 84515
Mean 1.028
Std Dev 0.1142
χ² / ndf 26.99 / 5
Constant 2240 ± 17.2
Mean 0.9969 ± 0.0007
Sigma 0.07279 ± 0.00119
η 3.50-3.80
p_T [GeV] 30-40
<μ> 55-60
Er/Et

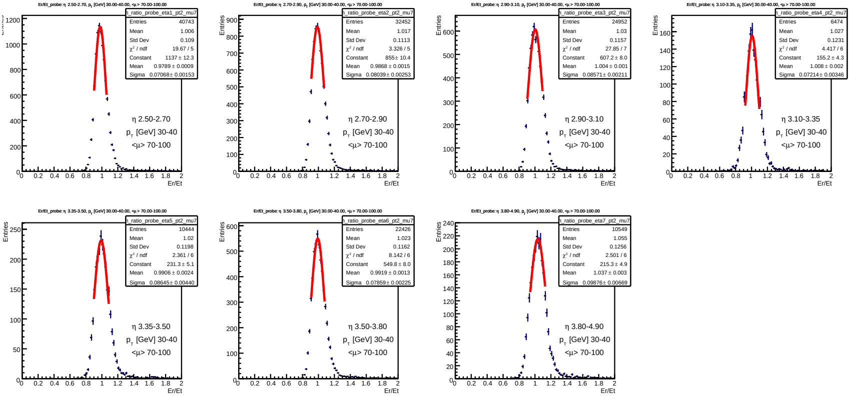


Er/Et_probe:η 3.80-4.90, p_T [GeV] 30.00-40.00, <μ> 55.00-60.00
h_ratio_probe_eta7_pt2_mu5
Entries 41750
Mean 1.055
Std Dev 0.1219
χ² / ndf 20.25 / 7
Constant 863.9 ± 9.4
Mean 1.035 ± 0.001
Sigma 0.1013 ± 0.0028
η 3.80-4.90
p_T [GeV] 30-40
<μ> 55-60
Entries
Er/Et

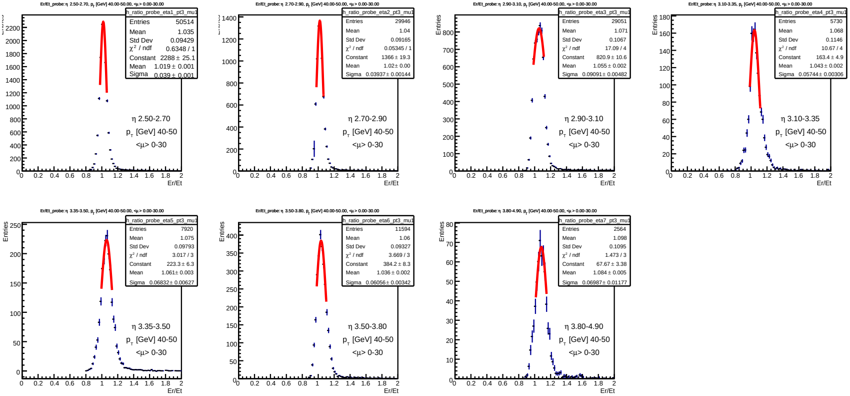
Plot p_t 2, μ 6


h_ratio_probe_eta1_pt2_mu6
Entries 141163
Mean 1.009
Std Dev 0.1061
χ² / ndf 22.06 / 4
Constant 4139 ± 24.8
Mean 0.9848 ± 0.0005
Sigma 0.06723± 0.00095
η 2.50-2.70
p_T [GeV] 30-40
<μ> 60-70
Er/Et
h_ratio_probe_eta2_pt2_mu6
Entries 116478
Mean 1.021
Std Dev 0.1088
χ² / ndf 26.58 / 5
Constant 3286 ± 20.7
Mean 0.9934 ± 0.0005
Sigma 0.07088± 0.00091
η 2.70-2.90
p_T [GeV] 30-40
<μ> 60-70
Er/Et
h_ratio_probe_eta3_pt2_mu6
Entries 86093
Mean 1.032
Std Dev 0.1095
χ² / ndf 37.24 / 6
Constant 2130 ± 15.6
Mean 1.007 ± 0.001
Sigma 0.08625± 0.00147
η 2.90-3.10
p_T [GeV] 30-40
<μ> 60-70
Er/Et
h_ratio_probe_eta4_pt2_mu6
Entries 23349
Mean 1.03
Std Dev 0.122
χ² / ndf 8.299 / 5
Constant 567.1± 8.6
Mean 1.013 ± 0.001
Sigma 0.07125± 0.00219
η 3.10-3.35
p_T [GeV] 30-40
<μ> 60-70
Entries
Er/Et
h_ratio_probe_eta5_pt2_mu6
Entries 41725
Mean 1.022
Std Dev 0.1173
χ² / ndf 0.4679 / 5
Constant 976.2 ± 11.2
Mean 0.9964 ± 0.0012
Sigma 0.08189± 0.00246
η 3.35-3.50
p_T [GeV] 30-40
<μ> 60-70
Er/Et
h_ratio_probe_eta6_pt2_mu6
Entries 94710
Mean 1.026
Std Dev 0.1141
χ² / ndf 18.28 / 5
Constant 2426 ± 17.7
Mean 0.9939 ± 0.0007
Sigma 0.07713± 0.00133
η 3.50-3.80
p_T [GeV] 30-40
<μ> 60-70
Er/Et
h_ratio_probe_eta7_pt2_mu6
Entries 45691
Mean 1.055
Std Dev 0.1236
χ² / ndf 9.2 / 6
Constant 953.8 ± 10.4
Mean 1.034 ± 0.001
Sigma 0.09634± 0.00297
η 3.80-4.90
p_T [GeV] 30-40
<μ> 60-70
Er/Et

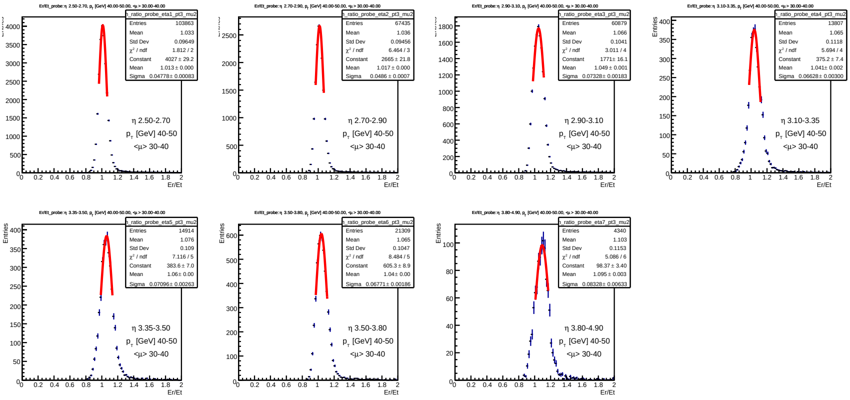
Plot p_t 2, μ 7


Er/Et_probe: η 2.50-2.70, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta1_pt2_mu7
Entries 40743
Mean 1.006
Std Dev 0.109
χ² / ndf 19.67 / 5
Constant 1137 ± 12.3
Mean 0.9789 ± 0.0009
Sigma 0.07068 ± 0.00153
η 2.50-2.70
p_T [GeV] 30-40
<μ> 70-100
Er/Et
Er/Et_probe: η 2.70-2.90, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta2_pt2_mu7
Entries 32452
Mean 1.017
Std Dev 0.1113
χ² / ndf 3.326 / 5
Constant 855 ± 10.4
Mean 0.9868 ± 0.0015
Sigma 0.08039 ± 0.00253
η 2.70-2.90
p_T [GeV] 30-40
<μ> 70-100
Entries
Er/Et
Er/Et_probe: η 2.90-3.10, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta3_pt2_mu7
Entries 24952
Mean 1.03
Std Dev 0.1157
χ² / ndf 27.85 / 7
Constant 607.2 ± 8.0
Mean 1.004 ± 0.001
Sigma 0.08571 ± 0.00211
η 2.90-3.10
p_T [GeV] 30-40
<μ> 70-100
Entries
Er/Et
Er/Et_probe: η 3.10-3.35, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta4_pt2_mu7
Entries 6474
Mean 1.027
Std Dev 0.1231
χ² / ndf 4.417 / 6
Constant 155.2 ± 4.3
Mean 1.008 ± 0.002
Sigma 0.07214 ± 0.00346
η 3.10-3.35
p_T [GeV] 30-40
<μ> 70-100
Entries
Er/Et
Er/Et_probe: η 3.35-3.50, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta5_pt2_mu7
Entries 10444
Mean 1.02
Std Dev 0.1198
χ² / ndf 2.361 / 6
Constant 231.3 ± 5.1
Mean 0.9906 ± 0.0024
Sigma 0.08645 ± 0.00440
η 3.35-3.50
p_T [GeV] 30-40
<μ> 70-100
Entries
Er/Et
Er/Et_probe: η 3.50-3.80, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta6_pt2_mu7
Entries 22426
Mean 1.023
Std Dev 0.1162
χ² / ndf 8.142 / 6
Constant 549.8 ± 8.0
Mean 0.9919 ± 0.0013
Sigma 0.07859 ± 0.00225
η 3.50-3.80
p_T [GeV] 30-40
<μ> 70-100
Entries
Er/Et
Er/Et_probe: η 3.80-4.90, p_T [GeV] 30.00-40.00, <μ> 70.00-100.00
h_ratio_probe_eta7_pt2_mu7
Entries 10549
Mean 1.055
Std Dev 0.1256
χ² / ndf 2.501 / 6
Constant 215.3 ± 4.9
Mean 1.037 ± 0.003
Sigma 0.09876 ± 0.00669
η 3.80-4.90
p_T [GeV] 30-40
<μ> 70-100
Entries
Er/Et

Plot p_t 3, μ 1

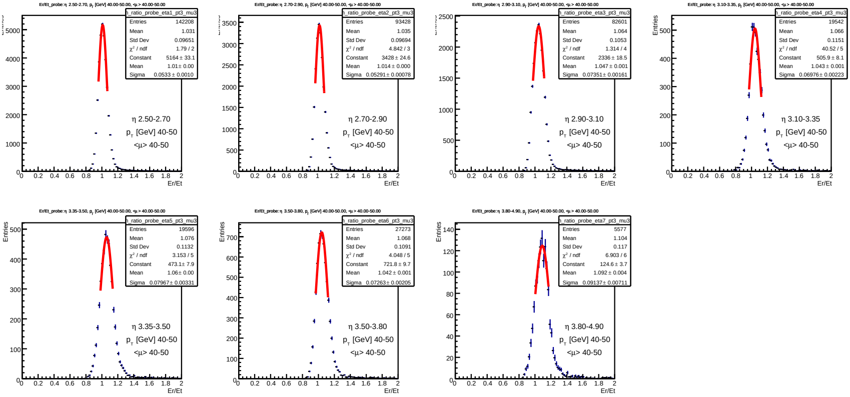

h_ratio_probe_eta1_pt3_mu1
Entries 50514
Mean 1.035
Std Dev 0.09429
χ² / ndf 0.6348 / 1
Constant 2288 ± 25.1
Mean 1.019 ± 0.001
Sigma 0.039 ± 0.001
η 2.50-2.70
p_T [GeV] 40-50
<μ> 0-30
Er/Et
h_ratio_probe_eta2_pt3_mu1
Entries 29946
Mean 1.04
Std Dev 0.09165
χ² / ndf 0.05345 / 1
Constant 1366 ± 19.3
Mean 1.02 ± 0.00
Sigma 0.03937 ± 0.00144
η 2.70-2.90
p_T [GeV] 40-50
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta3_pt3_mu1
Entries 29051
Mean 1.071
Std Dev 0.1067
χ² / ndf 17.09 / 4
Constant 820.9 ± 10.6
Mean 1.055 ± 0.002
Sigma 0.09091 ± 0.00482
η 2.90-3.10
p_T [GeV] 40-50
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta4_pt3_mu1
Entries 5730
Mean 1.068
Std Dev 0.1146
χ² / ndf 10.67 / 4
Constant 163.4 ± 4.9
Mean 1.043 ± 0.002
Sigma 0.05744 ± 0.00306
η 3.10-3.35
p_T [GeV] 40-50
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta5_pt3_mu1
Entries 7920
Mean 1.075
Std Dev 0.09793
χ² / ndf 3.017 / 3
Constant 223.3 ± 6.3
Mean 1.061 ± 0.003
Sigma 0.06832 ± 0.00627
η 3.35-3.50
p_T [GeV] 40-50
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta6_pt3_mu1
Entries 11594
Mean 1.06
Std Dev 0.09327
χ² / ndf 3.669 / 3
Constant 384.2 ± 8.3
Mean 1.036 ± 0.002
Sigma 0.06056 ± 0.00342
η 3.50-3.80
p_T [GeV] 40-50
<μ> 0-30
Er/Et
Entries
h_ratio_probe_eta7_pt3_mu1
Entries 2564
Mean 1.098
Std Dev 0.1095
χ² / ndf 1.473 / 3
Constant 67.67 ± 3.38
Mean 1.084 ± 0.005
Sigma 0.06987 ± 0.01177
η 3.80-4.90
p_T [GeV] 40-50
<μ> 0-30
Er/Et

Plot p_t 3, μ 2

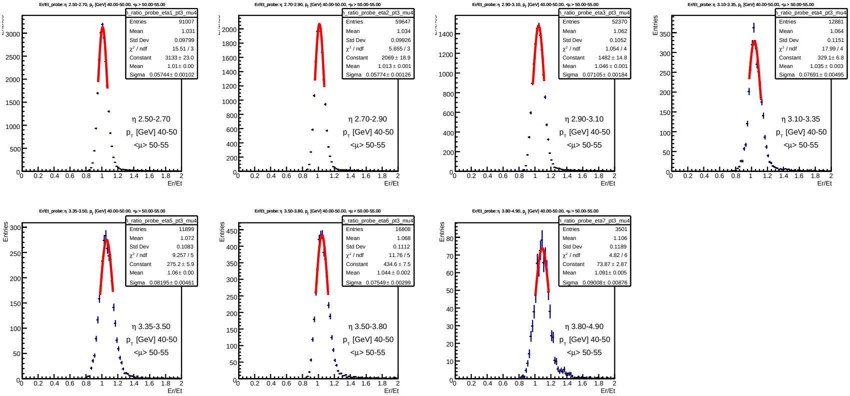


h_ratio_probe_eta1_pt3_mu2
Entries 103863
Mean 1.033
Std Dev 0.09649
χ² / ndf 1.812 / 2
Constant 4027 ± 29.2
Mean 1.013 ± 0.000
Sigma 0.04778 ± 0.00083
η 2.50-2.70
p_T [GeV] 40-50
<μ> 30-40
Er/Et
h_ratio_probe_eta2_pt3_mu2
Entries 67435
Mean 1.036
Std Dev 0.09456
χ² / ndf 6.464 / 3
Constant 2665 ± 21.8
Mean 1.017 ± 0.000
Sigma 0.0486 ± 0.0007
η 2.70-2.90
p_T [GeV] 40-50
<μ> 30-40
Er/Et
h_ratio_probe_eta3_pt3_mu2
Entries 60879
Mean 1.066
Std Dev 0.1041
χ² / ndf 3.011 / 4
Constant 1771 ± 16.1
Mean 1.049 ± 0.001
Sigma 0.07328 ± 0.00183
η 2.90-3.10
p_T [GeV] 40-50
<μ> 30-40
Er/Et
h_ratio_probe_eta4_pt3_mu2
Entries 13807
Mean 1.065
Std Dev 0.1118
χ² / ndf 5.694 / 4
Constant 375.2 ± 7.4
Mean 1.041 ± 0.002
Sigma 0.06628 ± 0.00300
η 3.10-3.35
p_T [GeV] 40-50
<μ> 30-40
Entries
Er/Et
h_ratio_probe_eta5_pt3_mu2
Entries 14914
Mean 1.076
Std Dev 0.109
χ² / ndf 7.116 / 5
Constant 383.6 ± 7.0
Mean 1.06 ± 0.00
Sigma 0.07096 ± 0.00263
η 3.35-3.50
p_T [GeV] 40-50
<μ> 30-40
Entries
Er/Et
h_ratio_probe_eta6_pt3_mu2
Entries 21309
Mean 1.065
Std Dev 0.1047
χ² / ndf 8.484 / 5
Constant 605.3 ± 8.9
Mean 1.04 ± 0.00
Sigma 0.06771 ± 0.00186
η 3.50-3.80
p_T [GeV] 40-50
<μ> 30-40
Entries
Er/Et
h_ratio_probe_eta7_pt3_mu2
Entries 4340
Mean 1.103
Std Dev 0.1153
χ² / ndf 5.086 / 6
Constant 98.37 ± 3.40
Mean 1.095 ± 0.003
Sigma 0.08328 ± 0.00633
η 3.80-4.90
p_T [GeV] 40-50
<μ> 30-40
Entries
Er/Et

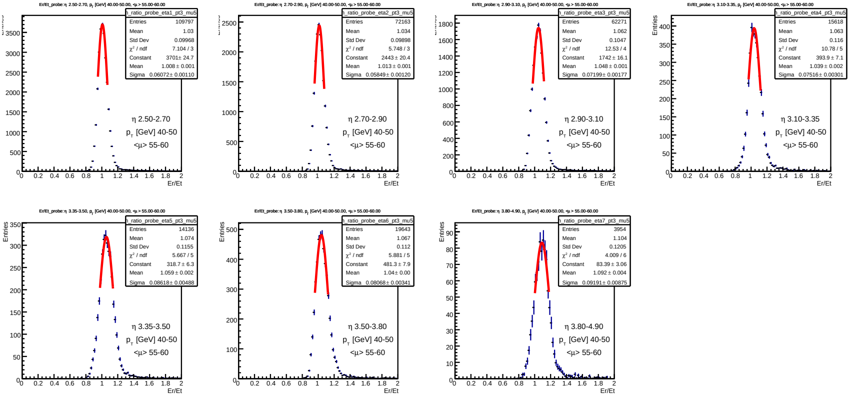
Plot p_t 3, μ 3


h_ratio_probe_eta1_pt3_mu3
Entries 142208
Mean 1.031
Std Dev 0.09651
χ² / ndf 1.79 / 2
Constant 5164 ± 33.1
Mean 1.01 ± 0.00
Sigma 0.0533 ± 0.0010
η 2.50-2.70
p_T [GeV] 40-50
<μ> 40-50
h_ratio_probe_eta2_pt3_mu3
Entries 93428
Mean 1.035
Std Dev 0.09694
χ² / ndf 4.842 / 3
Constant 3428 ± 24.6
Mean 1.014 ± 0.000
Sigma 0.05291 ± 0.00078
η 2.70-2.90
p_T [GeV] 40-50
<μ> 40-50
h_ratio_probe_eta3_pt3_mu3
Entries 82601
Mean 1.064
Std Dev 0.1053
χ² / ndf 1.314 / 4
Constant 2336 ± 18.5
Mean 1.047 ± 0.001
Sigma 0.07351 ± 0.00161
η 2.90-3.10
p_T [GeV] 40-50
<μ> 40-50
h_ratio_probe_eta4_pt3_mu3
Entries 19542
Mean 1.066
Std Dev 0.1151
χ² / ndf 40.52 / 5
Constant 505.9 ± 8.1
Mean 1.043 ± 0.001
Sigma 0.06976 ± 0.00223
η 3.10-3.35
p_T [GeV] 40-50
<μ> 40-50
h_ratio_probe_eta5_pt3_mu3
Entries 19596
Mean 1.076
Std Dev 0.1132
χ² / ndf 3.153 / 5
Constant 473.1 ± 7.9
Mean 1.06 ± 0.00
Sigma 0.07967 ± 0.00331
η 3.35-3.50
p_T [GeV] 40-50
<μ> 40-50
h_ratio_probe_eta6_pt3_mu3
Entries 27273
Mean 1.068
Std Dev 0.1091
χ² / ndf 4.048 / 5
Constant 721.8 ± 9.7
Mean 1.042 ± 0.001
Sigma 0.07263 ± 0.00205
η 3.50-3.80
p_T [GeV] 40-50
<μ> 40-50
h_ratio_probe_eta7_pt3_mu3
Entries 5577
Mean 1.104
Std Dev 0.117
χ² / ndf 6.903 / 6
Constant 124.6 ± 3.7
Mean 1.092 ± 0.004
Sigma 0.09137 ± 0.00711
η 3.80-4.90
p_T [GeV] 40-50
<μ> 40-50
Entries
Er/Et

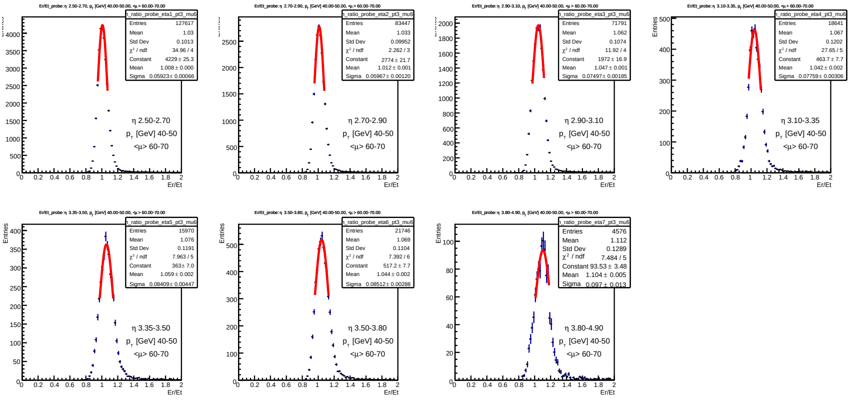
Plot p_t 3, μ 4


h_ratio_probe_eta1_pt3_mu4
Entries 91007
Mean 1.031
Std Dev 0.09799
χ² / ndf 15.51 / 3
Constant 3133 ± 23.0
Mean 1.01 ± 0.00
Sigma 0.05744 ± 0.00102
η 2.50-2.70
p_T [GeV] 40-50
<μ> 50-55
Er/Et
h_ratio_probe_eta2_pt3_mu4
Entries 59647
Mean 1.034
Std Dev 0.09926
χ² / ndf 5.655 / 3
Constant 2069 ± 18.9
Mean 1.013 ± 0.001
Sigma 0.05774 ± 0.00126
η 2.70-2.90
p_T [GeV] 40-50
<μ> 50-55
Er/Et
h_ratio_probe_eta3_pt3_mu4
Entries 52370
Mean 1.062
Std Dev 0.1052
χ² / ndf 1.054 / 4
Constant 1482 ± 14.8
Mean 1.046 ± 0.001
Sigma 0.07105 ± 0.00184
η 2.90-3.10
p_T [GeV] 40-50
<μ> 50-55
Er/Et
h_ratio_probe_eta4_pt3_mu4
Entries 12881
Mean 1.064
Std Dev 0.1151
χ² / ndf 17.99 / 4
Constant 329.1 ± 6.8
Mean 1.035 ± 0.003
Sigma 0.07691 ± 0.00495
η 3.10-3.35
p_T [GeV] 40-50
<μ> 50-55
Entries
Er/Et
h_ratio_probe_eta5_pt3_mu4
Entries 11899
Mean 1.072
Std Dev 0.1083
χ² / ndf 9.257 / 5
Constant 275.2 ± 5.9
Mean 1.06 ± 0.00
Sigma 0.08195 ± 0.00461
η 3.35-3.50
p_T [GeV] 40-50
<μ> 50-55
Entries
Er/Et
h_ratio_probe_eta6_pt3_mu4
Entries 16808
Mean 1.068
Std Dev 0.1112
χ² / ndf 11.76 / 5
Constant 434.6 ± 7.5
Mean 1.044 ± 0.002
Sigma 0.07549 ± 0.00299
η 3.50-3.80
p_T [GeV] 40-50
<μ> 50-55
Entries
Er/Et
h_ratio_probe_eta7_pt3_mu4
Entries 3501
Mean 1.106
Std Dev 0.1189
χ² / ndf 4.82 / 6
Constant 73.87 ± 2.87
Mean 1.091 ± 0.005
Sigma 0.09008 ± 0.00876
η 3.80-4.90
p_T [GeV] 40-50
<μ> 50-55
Entries
Er/Et

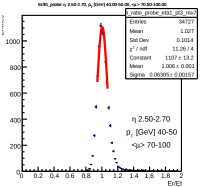
Plot p_t 3, μ 5


h_ratio_probe_eta1_pt3_mu5
Entries 109797
Mean 1.03
Std Dev 0.09968
χ² / ndf 7.104 / 3
Constant 3701 ± 24.7
Mean 1.008 ± 0.001
Sigma 0.06072 ± 0.00110
η 2.50-2.70
p_T [GeV] 40-50
<μ> 55-60
Er/Et
h_ratio_probe_eta2_pt3_mu5
Entries 72163
Mean 1.034
Std Dev 0.09898
χ² / ndf 5.748 / 3
Constant 2443 ± 20.4
Mean 1.013 ± 0.001
Sigma 0.05849 ± 0.00120
η 2.70-2.90
p_T [GeV] 40-50
<μ> 55-60
Er/Et
h_ratio_probe_eta3_pt3_mu5
Entries 62271
Mean 1.062
Std Dev 0.1047
χ² / ndf 12.53 / 4
Constant 1742 ± 16.1
Mean 1.048 ± 0.001
Sigma 0.07199 ± 0.00177
η 2.90-3.10
p_T [GeV] 40-50
<μ> 55-60
Er/Et
h_ratio_probe_eta4_pt3_mu5
Entries 15618
Mean 1.063
Std Dev 0.116
χ² / ndf 10.78 / 5
Constant 393.9 ± 7.1
Mean 1.039 ± 0.002
Sigma 0.07516 ± 0.00301
η 3.10-3.35
p_T [GeV] 40-50
<μ> 55-60
Entries
Er/Et
h_ratio_probe_eta5_pt3_mu5
Entries 14136
Mean 1.074
Std Dev 0.1155
χ² / ndf 5.667 / 5
Constant 318.7 ± 6.3
Mean 1.059 ± 0.002
Sigma 0.08618 ± 0.00488
η 3.35-3.50
p_T [GeV] 40-50
<μ> 55-60
Entries
Er/Et
h_ratio_probe_eta6_pt3_mu5
Entries 19643
Mean 1.067
Std Dev 0.112
χ² / ndf 5.881 / 5
Constant 481.3 ± 7.9
Mean 1.04 ± 0.00
Sigma 0.08068 ± 0.00341
η 3.50-3.80
p_T [GeV] 40-50
<μ> 55-60
Entries
Er/Et
h_ratio_probe_eta7_pt3_mu5
Entries 3954
Mean 1.104
Std Dev 0.1205
χ² / ndf 4.009 / 6
Constant 83.39 ± 3.06
Mean 1.092 ± 0.004
Sigma 0.09191 ± 0.00875
η 3.80-4.90
p_T [GeV] 40-50
<μ> 55-60
Entries
Er/Et

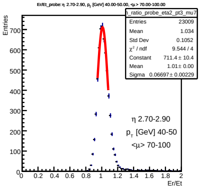
Plot p_t 3, μ 6


h_ratio_probe_eta1_pt3_mu6
Entries 127617
Mean 1.03
Std Dev 0.1013
χ² / ndf 34.96 / 4
Constant 4229 ± 25.3
Mean 1.008 ± 0.000
Sigma 0.05923 ± 0.00066
η 2.50-2.70
p_T [GeV] 40-50
<μ> 60-70
h_ratio_probe_eta2_pt3_mu6
Entries 83447
Mean 1.033
Std Dev 0.09952
χ² / ndf 2.262 / 3
Constant 2774 ± 21.7
Mean 1.012 ± 0.001
Sigma 0.05967 ± 0.00120
η 2.70-2.90
p_T [GeV] 40-50
<μ> 60-70
h_ratio_probe_eta3_pt3_mu6
Entries 71791
Mean 1.062
Std Dev 0.1074
χ² / ndf 11.92 / 4
Constant 1972 ± 16.9
Mean 1.047 ± 0.001
Sigma 0.07497 ± 0.00185
η 2.90-3.10
p_T [GeV] 40-50
<μ> 60-70
h_ratio_probe_eta4_pt3_mu6
Entries 18641
Mean 1.067
Std Dev 0.1202
χ² / ndf 27.65 / 5
Constant 463.7 ± 7.7
Mean 1.042 ± 0.002
Sigma 0.07759 ± 0.00306
η 3.10-3.35
p_T [GeV] 40-50
<μ> 60-70
h_ratio_probe_eta5_pt3_mu6
Entries 15970
Mean 1.076
Std Dev 0.1191
χ² / ndf 7.963 / 5
Constant 363 ± 7.0
Mean 1.059 ± 0.002
Sigma 0.08409 ± 0.00447
η 3.35-3.50
p_T [GeV] 40-50
<μ> 60-70
h_ratio_probe_eta6_pt3_mu6
Entries 21746
Mean 1.069
Std Dev 0.1104
χ² / ndf 7.392 / 6
Constant 517.2 ± 7.7
Mean 1.044 ± 0.002
Sigma 0.08512 ± 0.00288
η 3.50-3.80
p_T [GeV] 40-50
<μ> 60-70
h_ratio_probe_eta7_pt3_mu6
Entries 4576
Mean 1.112
Std Dev 0.1289
χ² / ndf 7.484 / 5
Constant 93.53 ± 3.48
Mean 1.104 ± 0.005
Sigma 0.097 ± 0.013
η 3.80-4.90
p_T [GeV] 40-50
<μ> 60-70
Entries
Er/Et

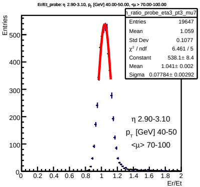
Plot p_t 3, μ 7



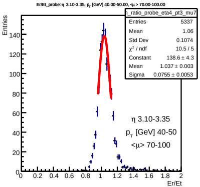
h_ratio_probe_eta1_pt3_mu7
Entries 34727
Mean 1.027
Std Dev 0.1014
χ² / ndf 11.26 / 4
Constant 1107 ± 13.2
Mean 1.006 ± 0.001
Sigma 0.06305 ± 0.00157
η 2.50-2.70
p_T [GeV] 40-50
<μ> 70-100
Er/Et



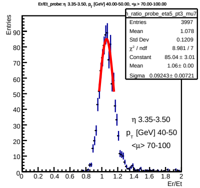
h_ratio_probe_eta2_pt3_mu7
Entries 23009
Mean 1.034
Std Dev 0.1052
χ² / ndf 9.544 / 4
Constant 711.4 ± 10.4
Mean 1.01 ± 0.00
Sigma 0.06697 ± 0.00229
η 2.70-2.90
p_T [GeV] 40-50
<μ> 70-100
Entries
Er/Et



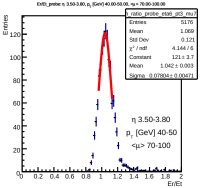
h_ratio_probe_eta3_pt3_mu7
Entries 19647
Mean 1.059
Std Dev 0.1077
χ² / ndf 6.461 / 5
Constant 538.1 ± 8.4
Mean 1.041 ± 0.002
Sigma 0.07784 ± 0.00292
η 2.90-3.10
p_T [GeV] 40-50
<μ> 70-100
Entries
Er/Et



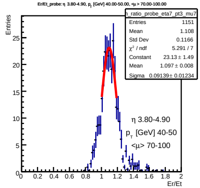
h_ratio_probe_eta4_pt3_mu7
Entries 5337
Mean 1.06
Std Dev 0.1074
χ² / ndf 10.5 / 5
Constant 138.6 ± 4.3
Mean 1.037 ± 0.003
Sigma 0.0755 ± 0.0053
η 3.10-3.35
p_T [GeV] 40-50
<μ> 70-100
Entries
Er/Et



h_ratio_probe_eta5_pt3_mu7
Entries 3997
Mean 1.078
Std Dev 0.1209
χ² / ndf 8.981 / 7
Constant 85.04 ± 3.01
Mean 1.06 ± 0.00
Sigma 0.09243 ± 0.00721
η 3.35-3.50
p_T [GeV] 40-50
<μ> 70-100
Entries
Er/Et

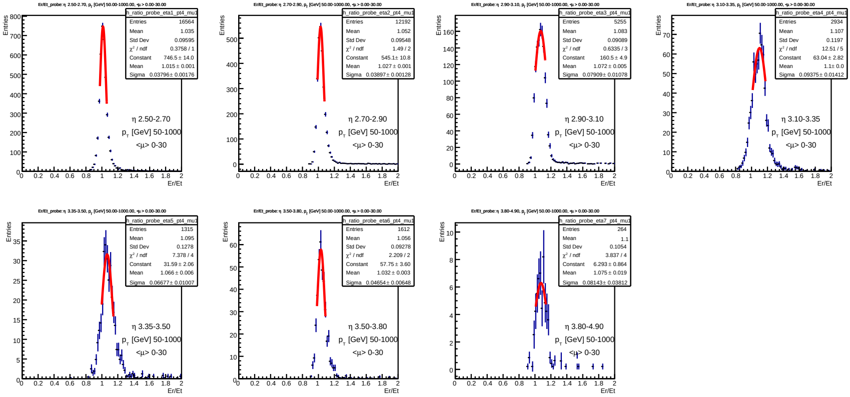


h_ratio_probe_eta6_pt3_mu7
Entries 5176
Mean 1.069
Std Dev 0.121
χ² / ndf 4.144 / 6
Constant 121 ± 3.7
Mean 1.042 ± 0.003
Sigma 0.07804 ± 0.00471
η 3.50-3.80
p_T [GeV] 40-50
<μ> 70-100
Entries
Er/Et

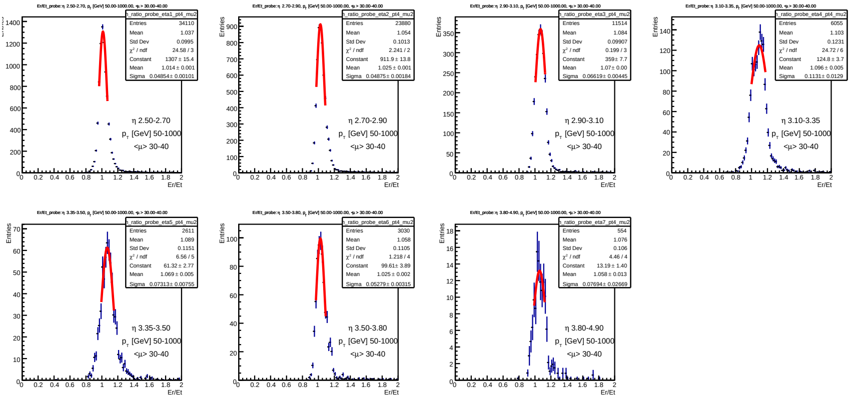


h_ratio_probe_eta7_pt3_mu7
Entries 1151
Mean 1.108
Std Dev 0.1166
χ² / ndf 5.291 / 7
Constant 23.13 ± 1.49
Mean 1.097 ± 0.008
Sigma 0.09139 ± 0.01234
η 3.80-4.90
p_T [GeV] 40-50
<μ> 70-100
Entries
Er/Et

Plot p_t 4, μ 1

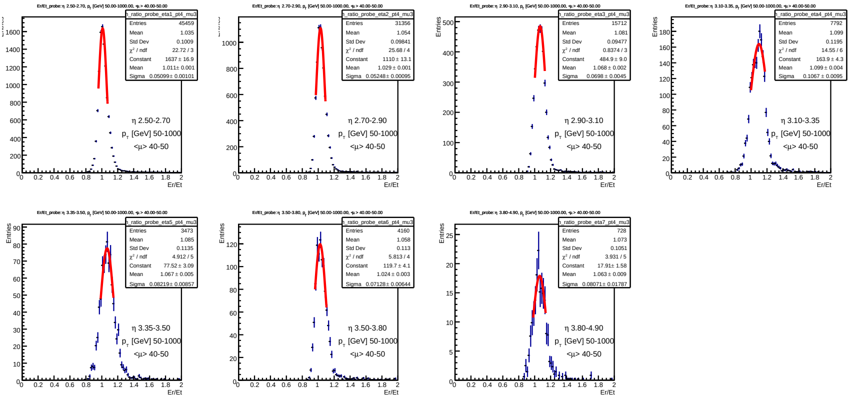

h_ratio_probe_eta1_pt4_mu1
Entries 16564
Mean 1.035
Std Dev 0.09595
χ² / ndf 0.3758 / 1
Constant 746.5 ± 14.0
Mean 1.015 ± 0.001
Sigma 0.03796 ± 0.00176
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 0-30
h_ratio_probe_eta2_pt4_mu1
Entries 12192
Mean 1.052
Std Dev 0.09548
χ² / ndf 1.49 / 2
Constant 545.1 ± 10.8
Mean 1.027 ± 0.001
Sigma 0.03897 ± 0.00128
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 0-30
h_ratio_probe_eta3_pt4_mu1
Entries 5255
Mean 1.083
Std Dev 0.09089
χ² / ndf 0.6335 / 3
Constant 160.5 ± 4.9
Mean 1.072 ± 0.005
Sigma 0.07909 ± 0.01078
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 0-30
h_ratio_probe_eta4_pt4_mu1
Entries 2934
Mean 1.107
Std Dev 0.1197
χ² / ndf 12.51 / 5
Constant 63.04 ± 2.82
Mean 1.1 ± 0.0
Sigma 0.09375 ± 0.01412
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 0-30
h_ratio_probe_eta5_pt4_mu1
Entries 1315
Mean 1.095
Std Dev 0.1278
χ² / ndf 7.378 / 4
Constant 31.59 ± 2.06
Mean 1.066 ± 0.006
Sigma 0.06677 ± 0.01007
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 0-30
h_ratio_probe_eta6_pt4_mu1
Entries 1612
Mean 1.056
Std Dev 0.09278
χ² / ndf 2.209 / 2
Constant 57.75 ± 3.60
Mean 1.032 ± 0.003
Sigma 0.04654 ± 0.00648
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 0-30
h_ratio_probe_eta7_pt4_mu1
Entries 264
Mean 1.1
Std Dev 0.1054
χ² / ndf 3.837 / 4
Constant 6.293 ± 0.864
Mean 1.075 ± 0.019
Sigma 0.08143 ± 0.03812
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 0-30
Entries
Er/Et

Plot p_t 4, μ 2



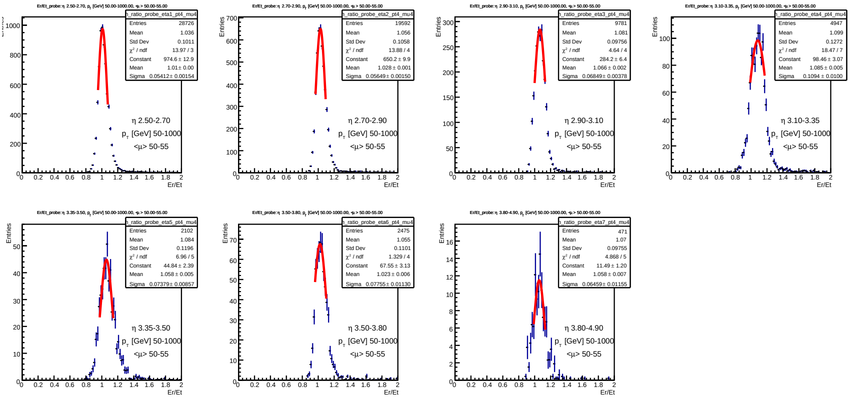
h_ratio_probe_eta1_pt4_mu2
Entries 34110
Mean 1.037
Std Dev 0.0995
χ² / ndf 24.58 / 3
Constant 1307 ± 15.4
Mean 1.014 ± 0.001
Sigma 0.04854 ± 0.00101
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 30-40
h_ratio_probe_eta2_pt4_mu2
Entries 23880
Mean 1.054
Std Dev 0.1013
χ² / ndf 2.241 / 2
Constant 911.9 ± 13.8
Mean 1.025 ± 0.001
Sigma 0.04875 ± 0.00184
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 30-40
h_ratio_probe_eta3_pt4_mu2
Entries 11514
Mean 1.084
Std Dev 0.09907
χ² / ndf 0.199 / 3
Constant 359 ± 7.7
Mean 1.07 ± 0.00
Sigma 0.06619 ± 0.00445
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 30-40
h_ratio_probe_eta4_pt4_mu2
Entries 6055
Mean 1.103
Std Dev 0.1231
χ² / ndf 24.72 / 6
Constant 124.8 ± 3.7
Mean 1.096 ± 0.005
Sigma 0.1131 ± 0.0129
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 30-40
h_ratio_probe_eta5_pt4_mu2
Entries 2611
Mean 1.089
Std Dev 0.1151
χ² / ndf 6.56 / 5
Constant 61.32 ± 2.77
Mean 1.069 ± 0.005
Sigma 0.07313 ± 0.00755
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 30-40
h_ratio_probe_eta6_pt4_mu2
Entries 3030
Mean 1.058
Std Dev 0.1105
χ² / ndf 1.218 / 4
Constant 99.61 ± 3.89
Mean 1.025 ± 0.002
Sigma 0.05279 ± 0.00315
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 30-40
h_ratio_probe_eta7_pt4_mu2
Entries 554
Mean 1.076
Std Dev 0.106
χ² / ndf 4.46 / 4
Constant 13.19 ± 1.40
Mean 1.058 ± 0.013
Sigma 0.07694 ± 0.02669
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 30-40
Entries
Er/Et

Plot p_t 4, μ 3



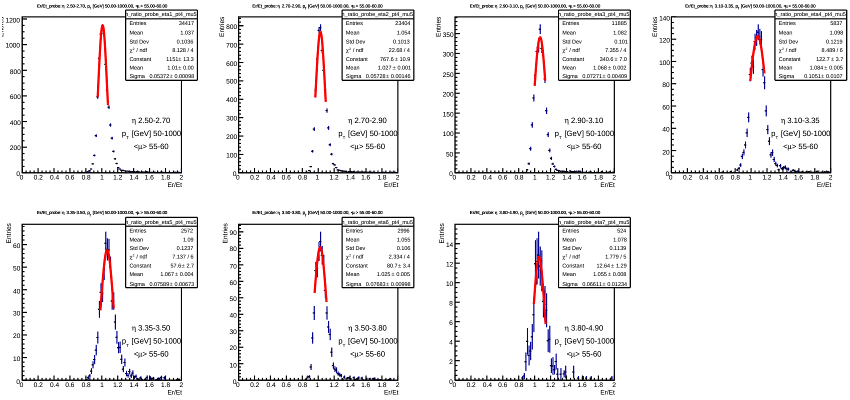
h_ratio_probe_eta1_pt4_mu3
Entries 45459
Mean 1.035
Std Dev 0.1009
χ² / ndf 22.72 / 3
Constant 1637 ± 16.9
Mean 1.011 ± 0.001
Sigma 0.05099 ± 0.00101
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 40-50
Er/Et
h_ratio_probe_eta2_pt4_mu3
Entries 31356
Mean 1.054
Std Dev 0.09841
χ² / ndf 25.68 / 4
Constant 1110 ± 13.1
Mean 1.029 ± 0.001
Sigma 0.05248 ± 0.00095
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 40-50
Er/Et
h_ratio_probe_eta3_pt4_mu3
Entries 15712
Mean 1.081
Std Dev 0.09477
χ² / ndf 0.8374 / 3
Constant 484.9 ± 9.0
Mean 1.068 ± 0.002
Sigma 0.0698 ± 0.0045
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 40-50
Entries
Er/Et
h_ratio_probe_eta4_pt4_mu3
Entries 7792
Mean 1.099
Std Dev 0.1195
χ² / ndf 14.55 / 6
Constant 163.9 ± 4.3
Mean 1.099 ± 0.004
Sigma 0.1067 ± 0.0095
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 40-50
Entries
Er/Et
h_ratio_probe_eta5_pt4_mu3
Entries 3473
Mean 1.085
Std Dev 0.1135
χ² / ndf 4.912 / 5
Constant 77.52 ± 3.09
Mean 1.067 ± 0.005
Sigma 0.08219 ± 0.00857
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 40-50
Entries
Er/Et
h_ratio_probe_eta6_pt4_mu3
Entries 4160
Mean 1.058
Std Dev 0.113
χ² / ndf 5.813 / 4
Constant 119.7 ± 4.1
Mean 1.024 ± 0.003
Sigma 0.07128 ± 0.00644
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 40-50
Entries
Er/Et
h_ratio_probe_eta7_pt4_mu3
Entries 728
Mean 1.073
Std Dev 0.1051
χ² / ndf 3.931 / 5
Constant 17.91 ± 1.58
Mean 1.063 ± 0.009
Sigma 0.08071 ± 0.01787
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 40-50
Entries
Er/Et

Plot p_t 4, μ 4

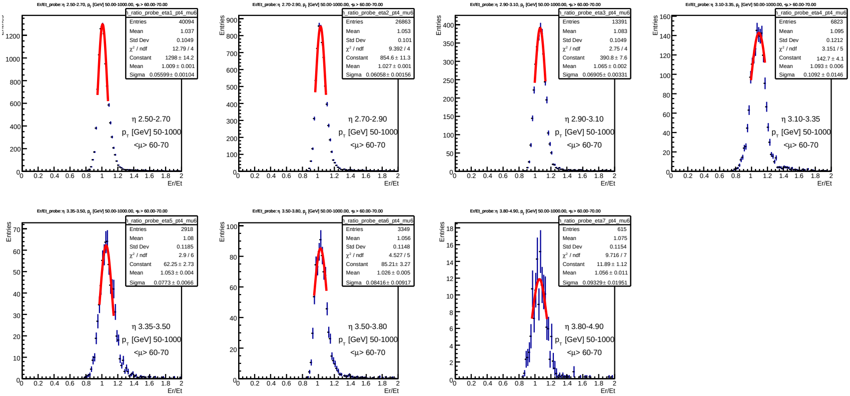


h_ratio_probe_eta1_pt4_mu4
Entries 28726
Mean 1.036
Std Dev 0.1011
χ² / ndf 13.97 / 3
Constant 974.6 ± 12.9
Mean 1.01 ± 0.00
Sigma 0.05412 ± 0.00154
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 50-55
h_ratio_probe_eta2_pt4_mu4
Entries 19592
Mean 1.056
Std Dev 0.1058
χ² / ndf 13.88 / 4
Constant 650.2 ± 9.9
Mean 1.028 ± 0.001
Sigma 0.05649 ± 0.00150
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 50-55
h_ratio_probe_eta3_pt4_mu4
Entries 9781
Mean 1.081
Std Dev 0.09756
χ² / ndf 4.64 / 4
Constant 284.2 ± 6.4
Mean 1.066 ± 0.002
Sigma 0.06849 ± 0.00378
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 50-55
h_ratio_probe_eta4_pt4_mu4
Entries 4947
Mean 1.099
Std Dev 0.1272
χ² / ndf 18.47 / 7
Constant 98.46 ± 3.07
Mean 1.085 ± 0.005
Sigma 0.1094 ± 0.0100
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 50-55
h_ratio_probe_eta5_pt4_mu4
Entries 2102
Mean 1.084
Std Dev 0.1196
χ² / ndf 6.96 / 5
Constant 44.84 ± 2.39
Mean 1.058 ± 0.005
Sigma 0.07379 ± 0.00857
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 50-55
h_ratio_probe_eta6_pt4_mu4
Entries 2475
Mean 1.055
Std Dev 0.1101
χ² / ndf 1.329 / 4
Constant 67.55 ± 3.13
Mean 1.023 ± 0.006
Sigma 0.07755 ± 0.01130
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 50-55
h_ratio_probe_eta7_pt4_mu4
Entries 471
Mean 1.07
Std Dev 0.09755
χ² / ndf 4.868 / 5
Constant 11.49 ± 1.20
Mean 1.058 ± 0.007
Sigma 0.06459 ± 0.01155
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 50-55
Entries
Er/Et

Plot p_t 4, μ 5

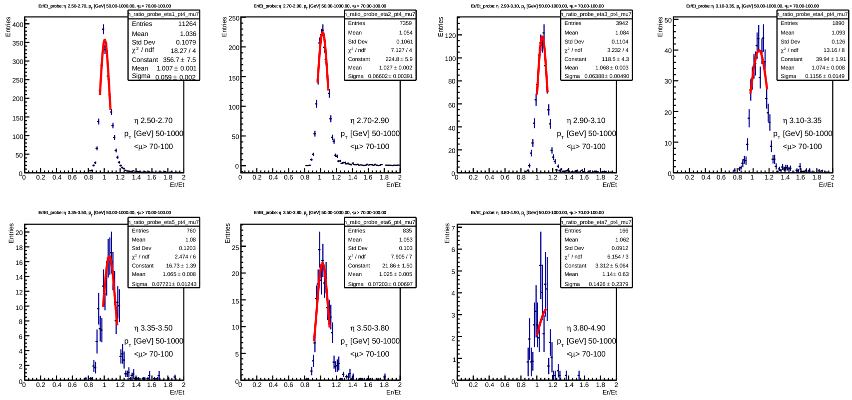

h_ratio_probe_eta1_pt4_mu5
Entries 34417
Mean 1.037
Std Dev 0.1036
χ² / ndf 8.128 / 4
Constant 1151 ± 13.3
Mean 1.01 ± 0.00
Sigma 0.05372 ± 0.00098
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 55-60
h_ratio_probe_eta2_pt4_mu5
Entries 23404
Mean 1.054
Std Dev 0.1013
χ² / ndf 22.68 / 4
Constant 767.6 ± 10.9
Mean 1.027 ± 0.001
Sigma 0.05728 ± 0.00146
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 55-60
h_ratio_probe_eta3_pt4_mu5
Entries 11885
Mean 1.082
Std Dev 0.101
χ² / ndf 7.355 / 4
Constant 340.6 ± 7.0
Mean 1.068 ± 0.002
Sigma 0.07271 ± 0.00409
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 55-60
h_ratio_probe_eta4_pt4_mu5
Entries 5837
Mean 1.098
Std Dev 0.1219
χ² / ndf 8.489 / 6
Constant 122.7 ± 3.7
Mean 1.084 ± 0.005
Sigma 0.1051 ± 0.0107
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 55-60
h_ratio_probe_eta5_pt4_mu5
Entries 2572
Mean 1.09
Std Dev 0.1237
χ² / ndf 7.137 / 6
Constant 57.6 ± 2.7
Mean 1.067 ± 0.004
Sigma 0.07589 ± 0.00673
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 55-60
h_ratio_probe_eta6_pt4_mu5
Entries 2996
Mean 1.055
Std Dev 0.106
χ² / ndf 2.334 / 4
Constant 80.7 ± 3.4
Mean 1.025 ± 0.005
Sigma 0.07683 ± 0.00998
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 55-60
h_ratio_probe_eta7_pt4_mu5
Entries 524
Mean 1.078
Std Dev 0.1139
χ² / ndf 1.779 / 5
Constant 12.64 ± 1.29
Mean 1.055 ± 0.008
Sigma 0.06611 ± 0.01234
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 55-60
Entries
Er/Et

Plot p_t 4, μ 6

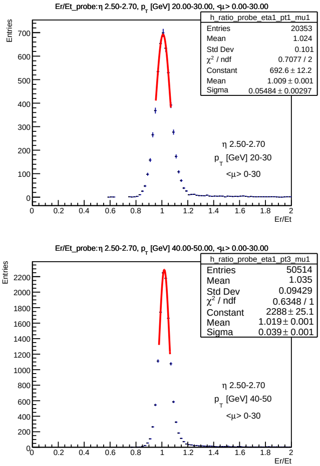


h_ratio_probe_eta1_pt4_mu6
Entries 40094
Mean 1.037
Std Dev 0.1049
χ² / ndf 12.79 / 4
Constant 1298 ± 14.2
Mean 1.009 ± 0.001
Sigma 0.05599 ± 0.00104
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 60-70
h_ratio_probe_eta2_pt4_mu6
Entries 26863
Mean 1.053
Std Dev 0.101
χ² / ndf 9.392 / 4
Constant 854.6 ± 11.3
Mean 1.027 ± 0.001
Sigma 0.06058 ± 0.00156
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 60-70
h_ratio_probe_eta3_pt4_mu6
Entries 13391
Mean 1.083
Std Dev 0.1049
χ² / ndf 2.75 / 4
Constant 390.8 ± 7.6
Mean 1.065 ± 0.002
Sigma 0.06905 ± 0.00331
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 60-70
h_ratio_probe_eta4_pt4_mu6
Entries 6823
Mean 1.095
Std Dev 0.1212
χ² / ndf 3.151 / 5
Constant 142.7 ± 4.1
Mean 1.093 ± 0.006
Sigma 0.1092 ± 0.0146
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 60-70
h_ratio_probe_eta5_pt4_mu6
Entries 2918
Mean 1.08
Std Dev 0.1185
χ² / ndf 2.9 / 6
Constant 62.25 ± 2.73
Mean 1.053 ± 0.004
Sigma 0.0773 ± 0.0066
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 60-70
h_ratio_probe_eta6_pt4_mu6
Entries 3349
Mean 1.056
Std Dev 0.1148
χ² / ndf 4.527 / 5
Constant 85.21 ± 3.27
Mean 1.026 ± 0.005
Sigma 0.08416 ± 0.00917
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 60-70
h_ratio_probe_eta7_pt4_mu6
Entries 615
Mean 1.075
Std Dev 0.1154
χ² / ndf 9.716 / 7
Constant 11.89 ± 1.12
Mean 1.056 ± 0.011
Sigma 0.09329 ± 0.01951
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 60-70
Entries
Er/Et

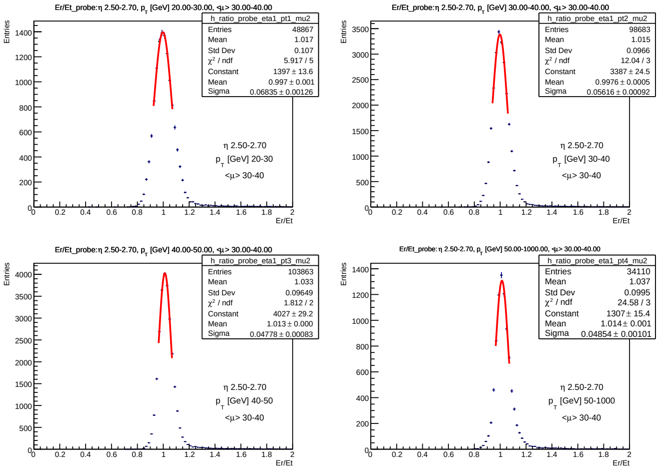
Plot p_t 4, μ 7


h_ratio_probe_eta1_pt4_mu7
Entries 11264
Mean 1.036
Std Dev 0.1079
χ² / ndf 18.27 / 4
Constant 356.7 ± 7.5
Mean 1.007 ± 0.001
Sigma 0.059 ± 0.002
η 2.50-2.70
p_T [GeV] 50-1000
<μ> 70-100
h_ratio_probe_eta2_pt4_mu7
Entries 7359
Mean 1.054
Std Dev 0.1061
χ² / ndf 7.127 / 4
Constant 224.8 ± 5.9
Mean 1.027 ± 0.002
Sigma 0.06602 ± 0.00391
η 2.70-2.90
p_T [GeV] 50-1000
<μ> 70-100
h_ratio_probe_eta3_pt4_mu7
Entries 3942
Mean 1.084
Std Dev 0.1104
χ² / ndf 3.232 / 4
Constant 118.5 ± 4.3
Mean 1.068 ± 0.003
Sigma 0.06388 ± 0.00490
η 2.90-3.10
p_T [GeV] 50-1000
<μ> 70-100
h_ratio_probe_eta4_pt4_mu7
Entries 1890
Mean 1.093
Std Dev 0.126
χ² / ndf 13.16 / 8
Constant 39.94 ± 1.91
Mean 1.074 ± 0.008
Sigma 0.1156 ± 0.0149
η 3.10-3.35
p_T [GeV] 50-1000
<μ> 70-100
h_ratio_probe_eta5_pt4_mu7
Entries 760
Mean 1.08
Std Dev 0.1203
χ² / ndf 2.474 / 6
Constant 16.73 ± 1.39
Mean 1.065 ± 0.008
Sigma 0.07721 ± 0.01243
η 3.35-3.50
p_T [GeV] 50-1000
<μ> 70-100
h_ratio_probe_eta6_pt4_mu7
Entries 835
Mean 1.053
Std Dev 0.103
χ² / ndf 7.905 / 7
Constant 21.86 ± 1.50
Mean 1.025 ± 0.005
Sigma 0.07203 ± 0.00697
η 3.50-3.80
p_T [GeV] 50-1000
<μ> 70-100
h_ratio_probe_eta7_pt4_mu7
Entries 166
Mean 1.062
Std Dev 0.0912
χ² / ndf 6.154 / 3
Constant 3.312 ± 5.064
Mean 1.14 ± 0.63
Sigma 0.1426 ± 0.2379
η 3.80-4.90
p_T [GeV] 50-1000
<μ> 70-100
Entries
Er/Et

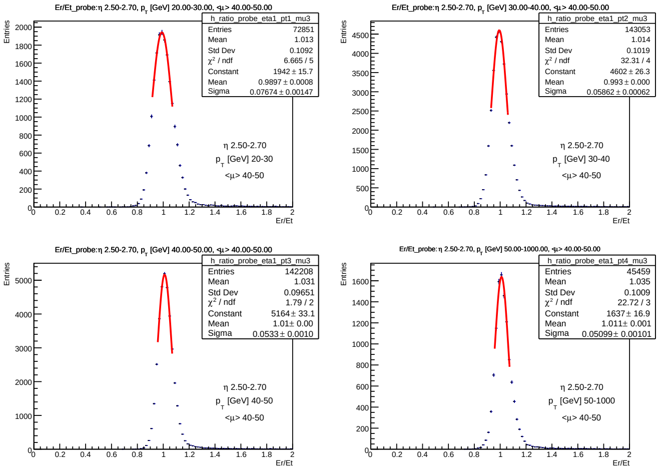
Plot η 1, μ 1



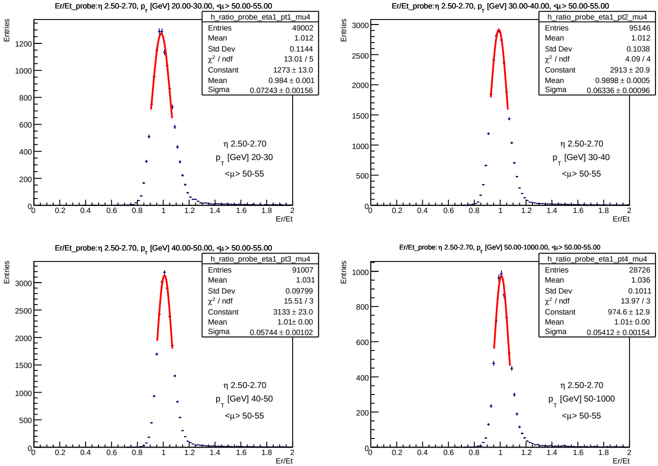
Plot η 1, μ 2



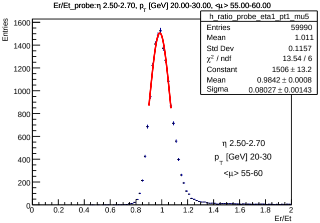
Plot η 1, μ 3

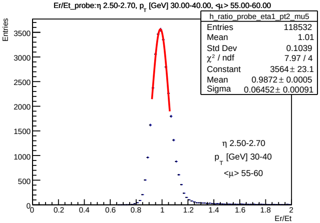


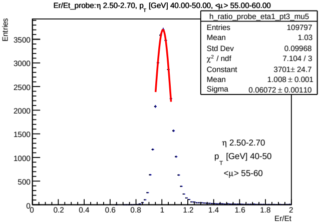
Plot η 1, μ 4

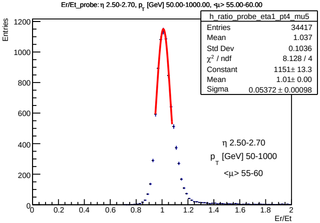


Plot η 1, μ 5

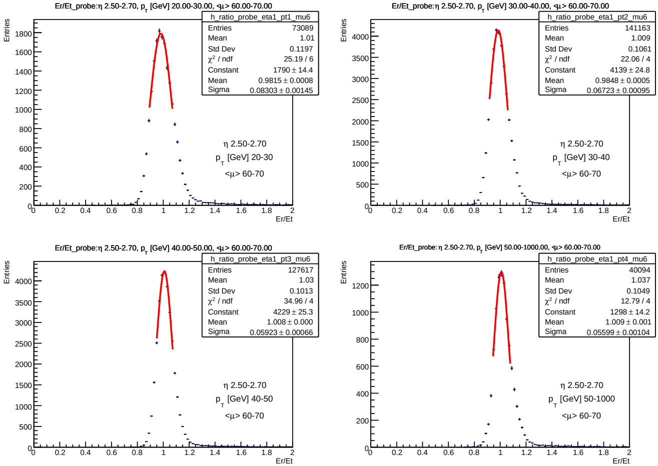




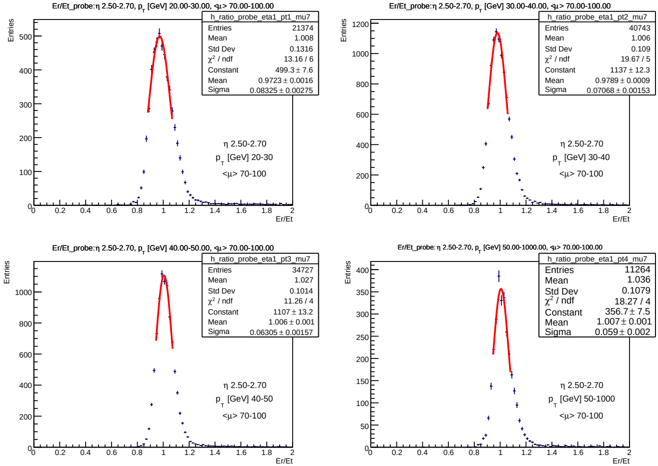




Plot η 1, μ 6



Plot η 1, μ 7



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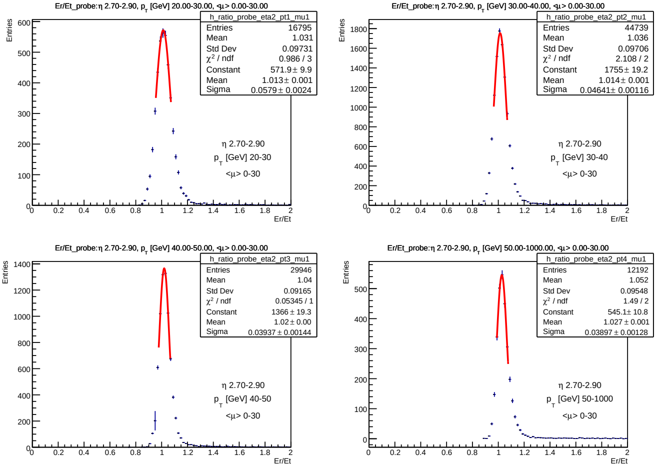

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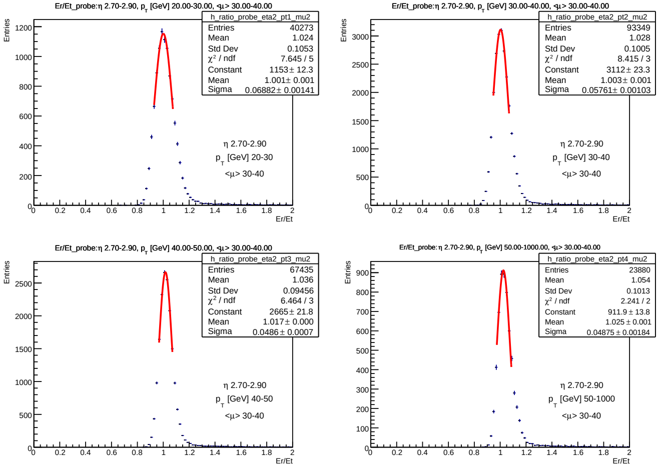
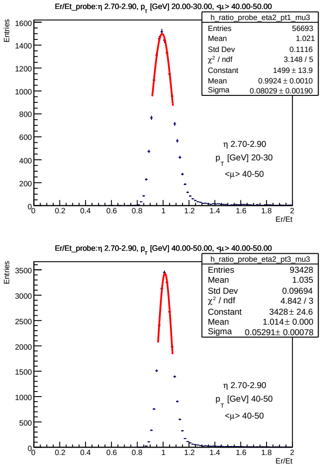
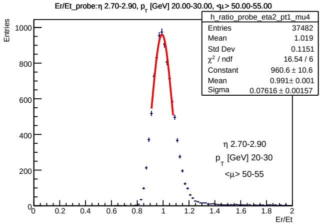
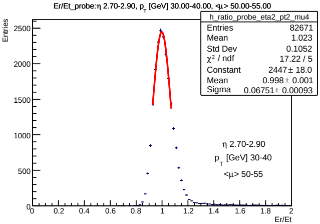


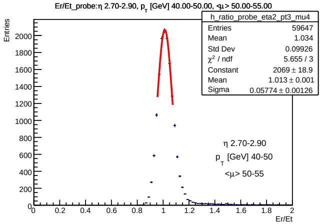
Plot η 2, μ 3

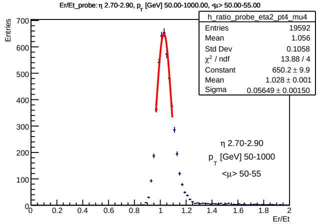


Plot η 2, μ 4

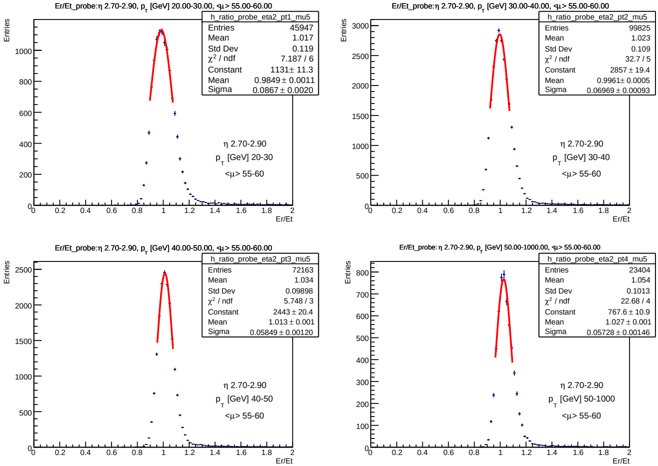




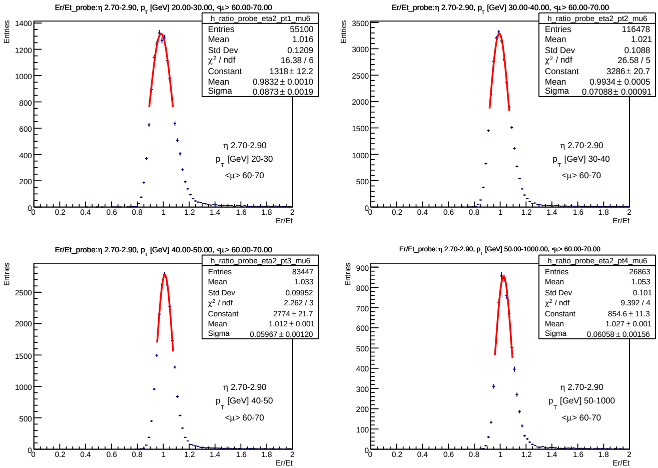




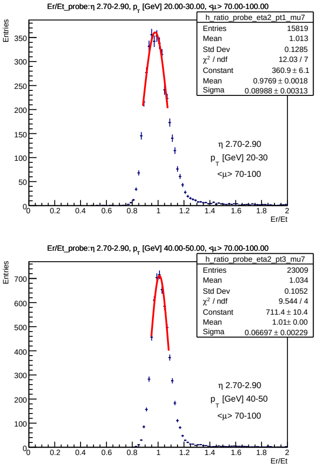
Plot η 2, μ 5



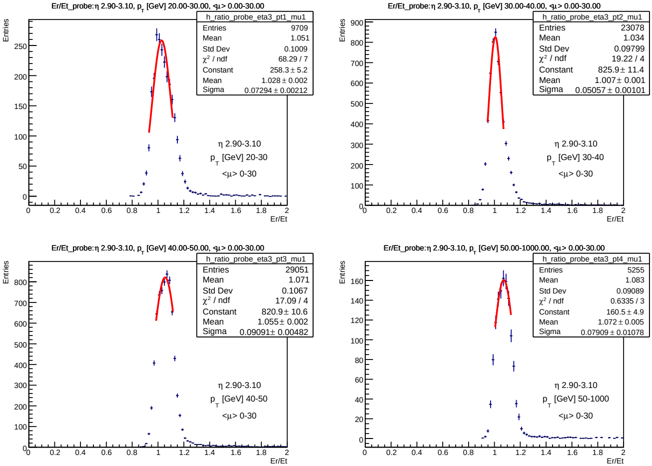
Plot η 2, μ 6



Plot η 2, μ 7



Plot η 3, μ 1



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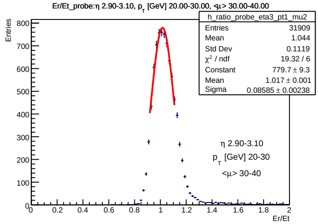

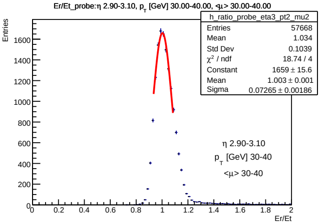

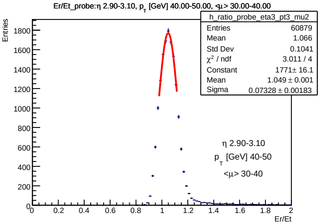

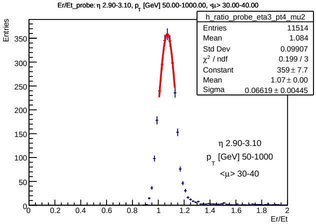

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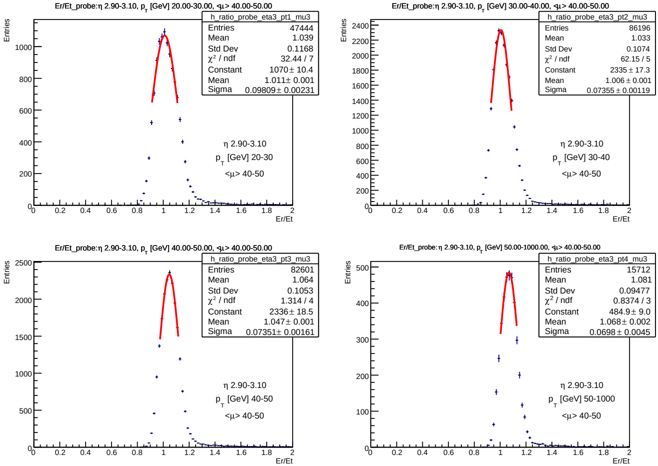
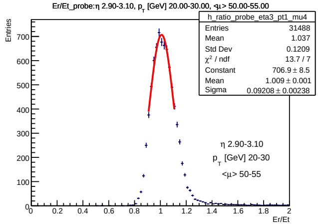
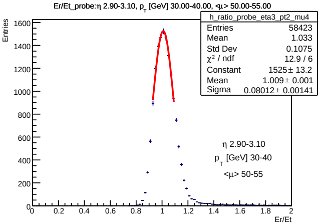
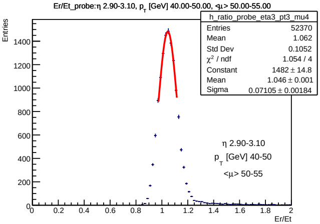
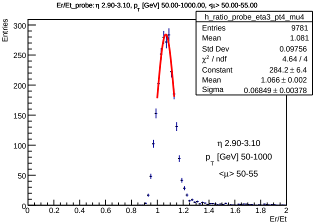


Plot η 3, μ 4

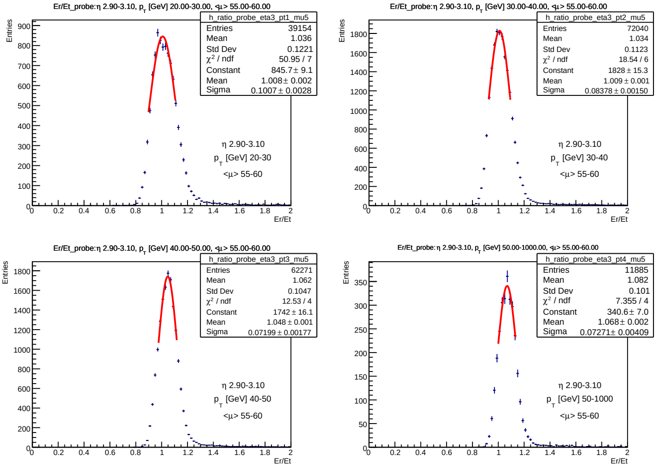




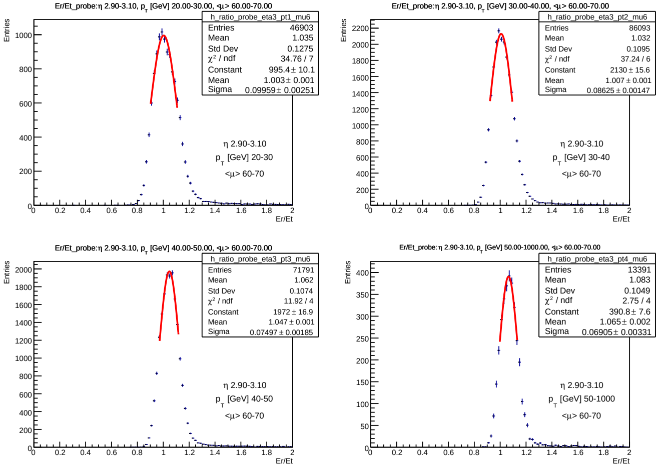




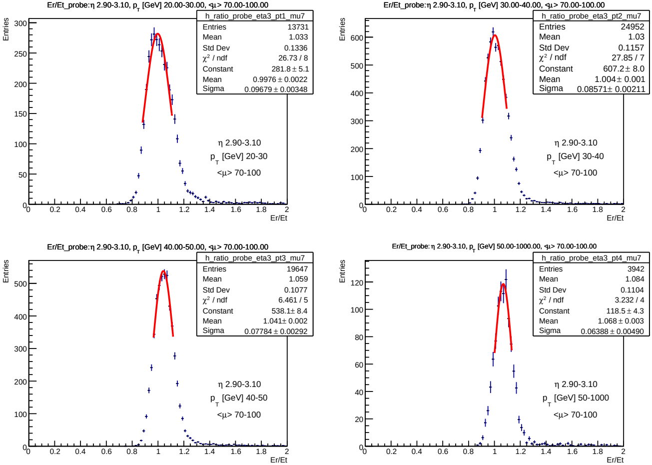
Plot η 3, μ 5



Plot η 3, μ 6



Plot η 3, μ 7



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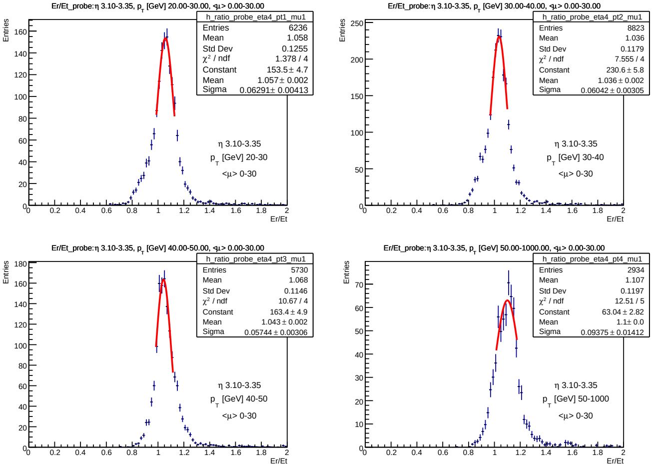
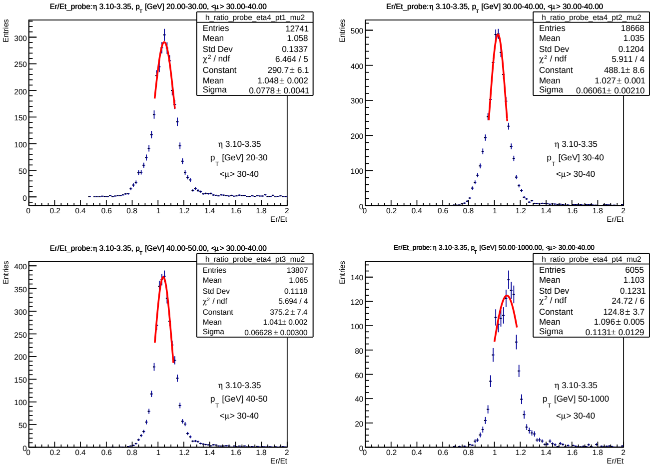
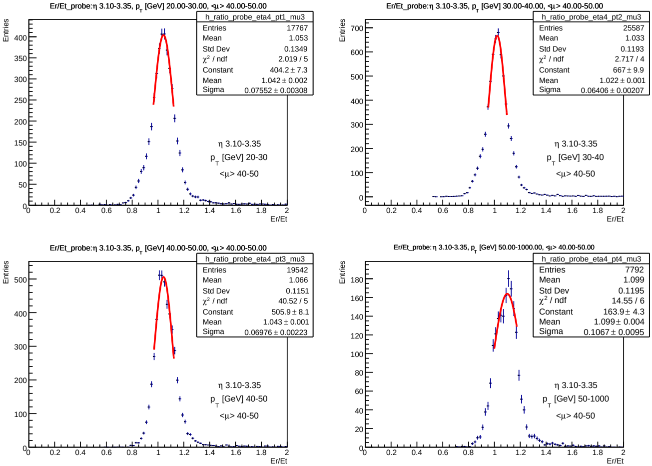


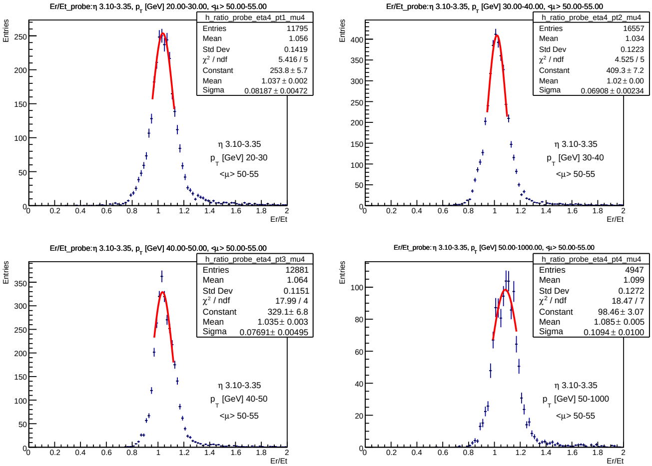
Plot η 4, μ 2



Plot η 4, μ 3



Plot η 4, μ 4



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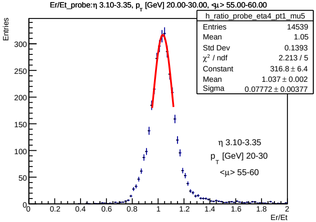

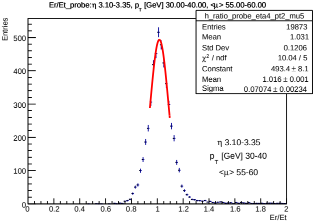

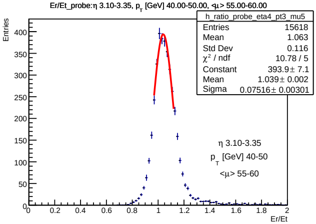

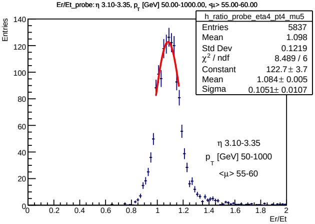

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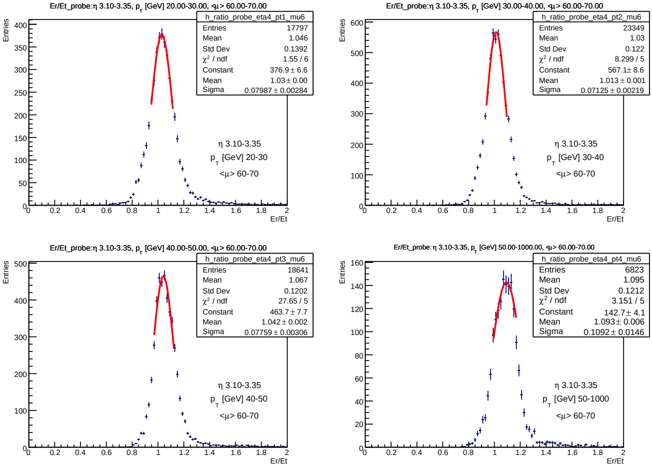

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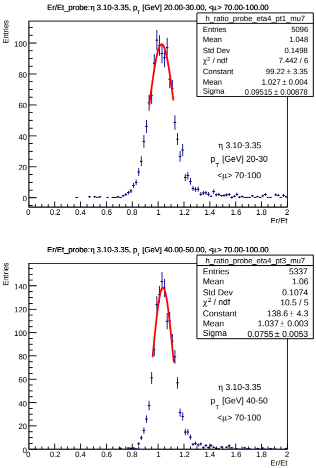
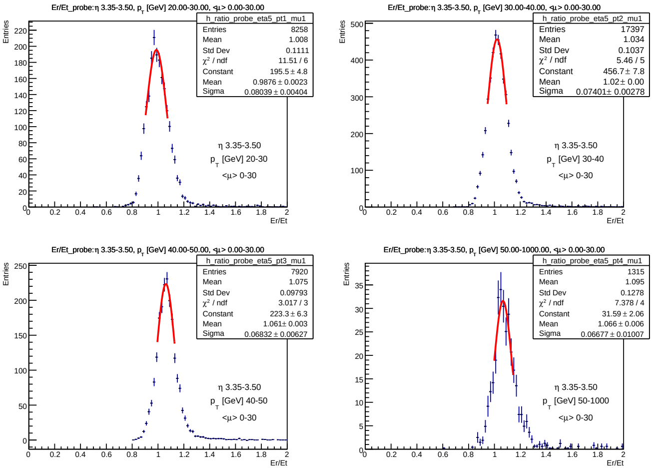


Plot η 5, μ 1



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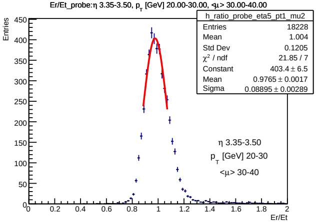

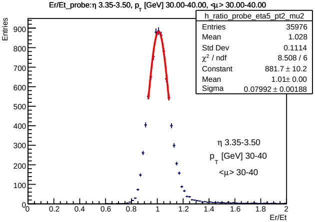

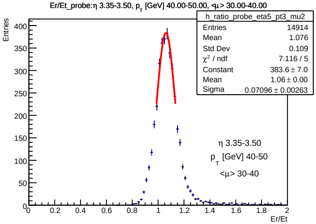

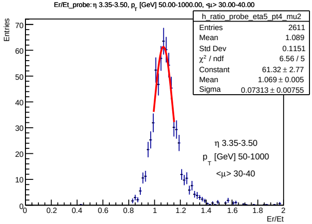

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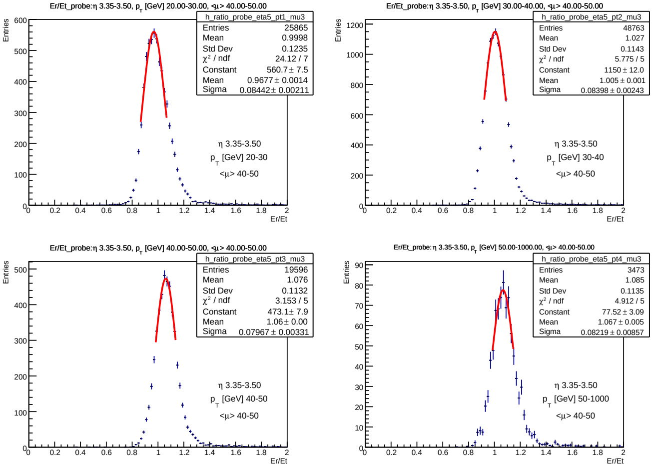
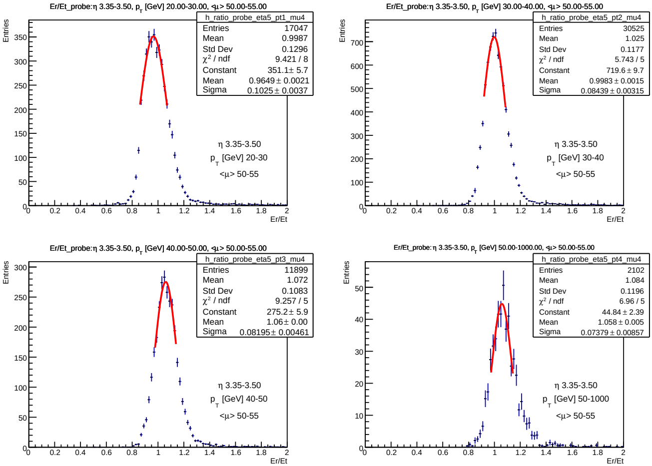
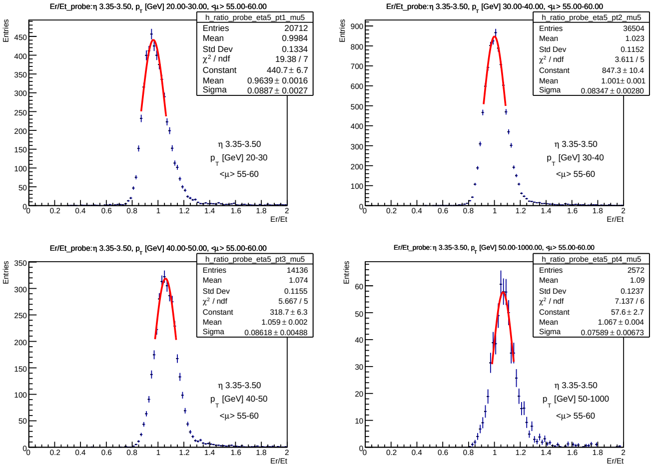


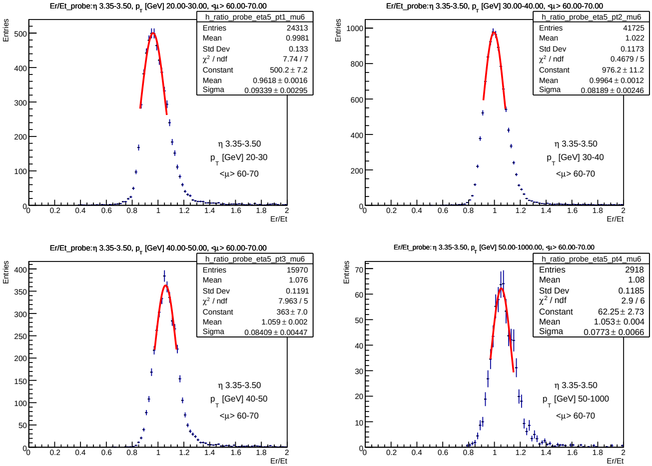
Plot η 5, μ 4



Plot η 5, μ 5



Plot η 5, μ 6



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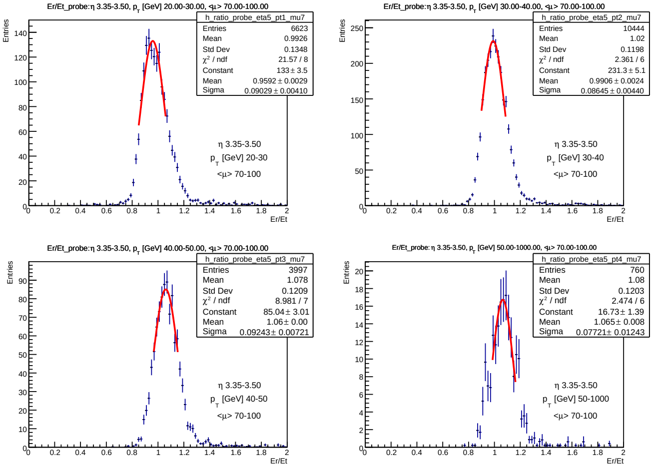
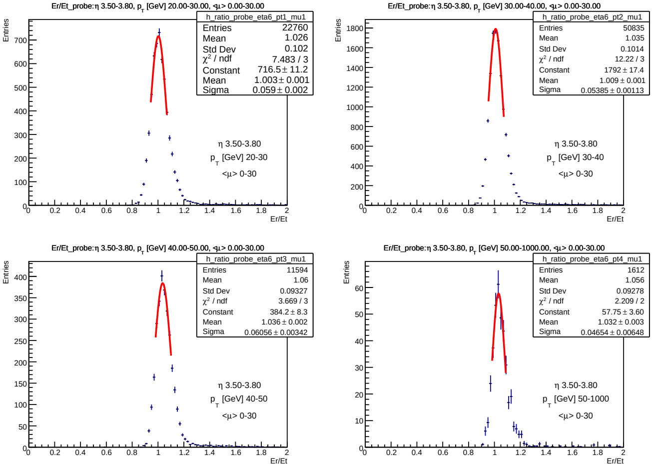


Plot η 6, μ 1



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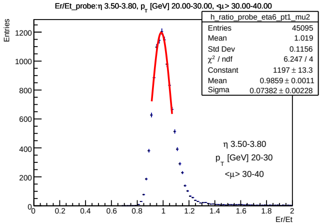

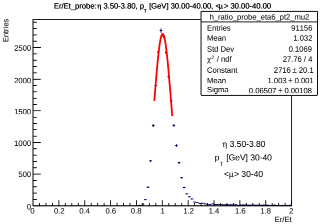

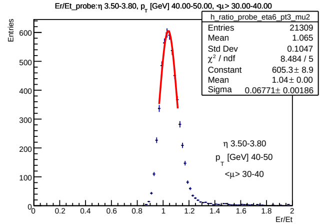

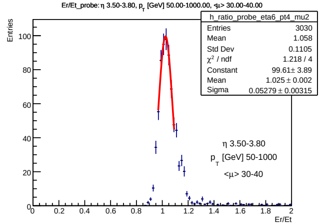

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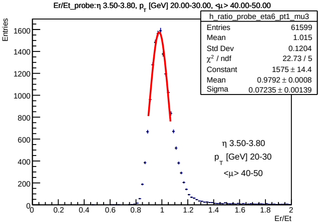
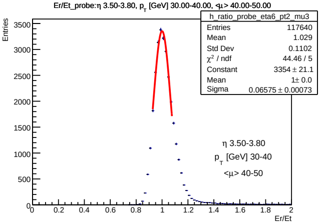
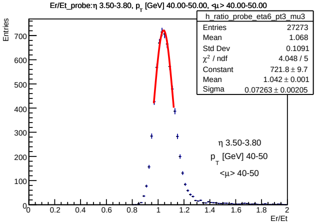
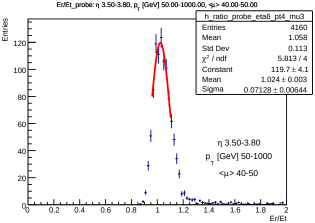
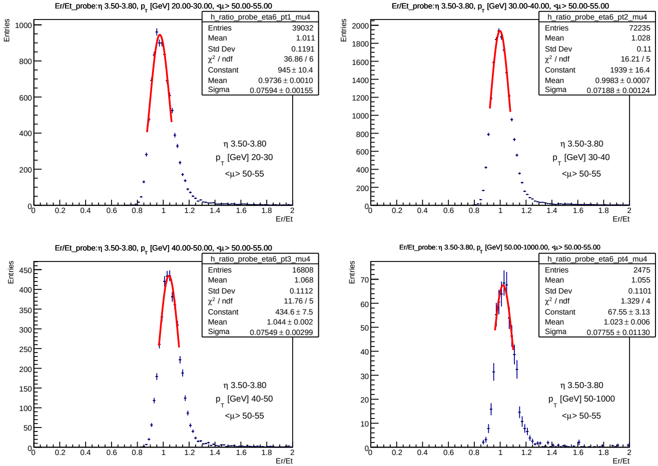




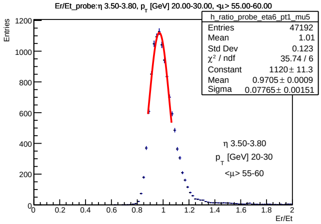


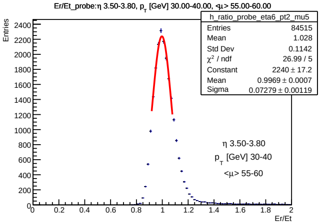


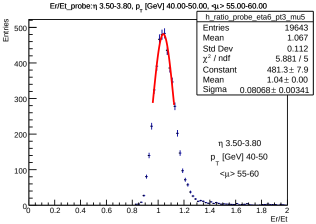
Plot η 6, μ 4

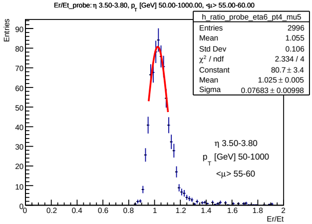


Plot η 6, μ 5

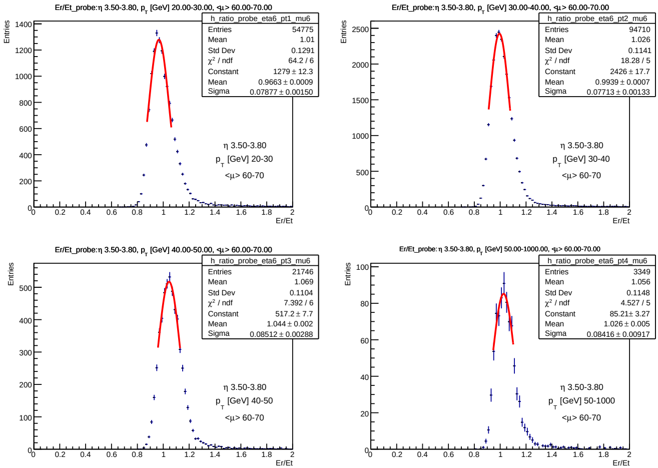




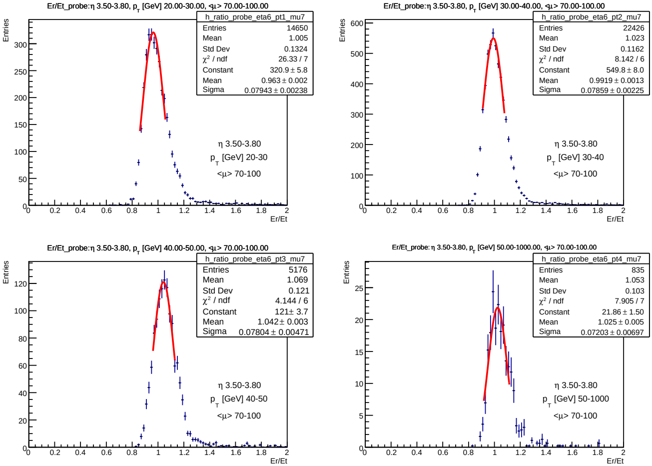




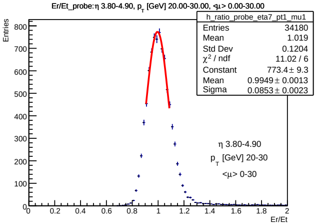
Plot η 6, μ 6

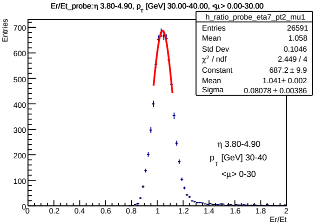


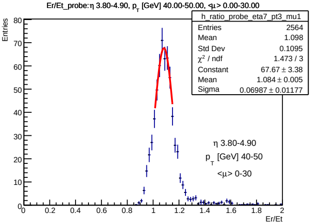
Plot η 6, μ 7

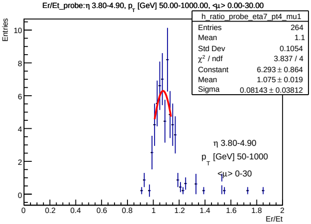


Plot η 7, μ 1

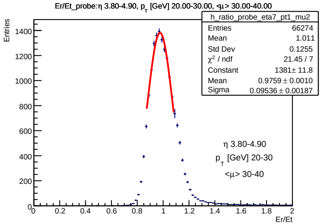


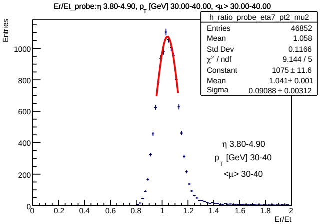


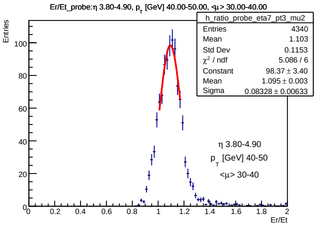


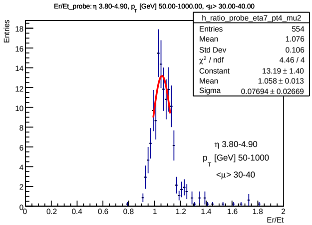


Plot η 7, μ 2

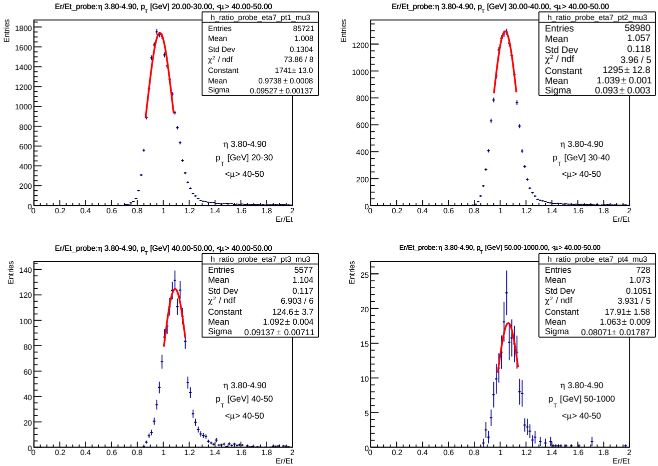




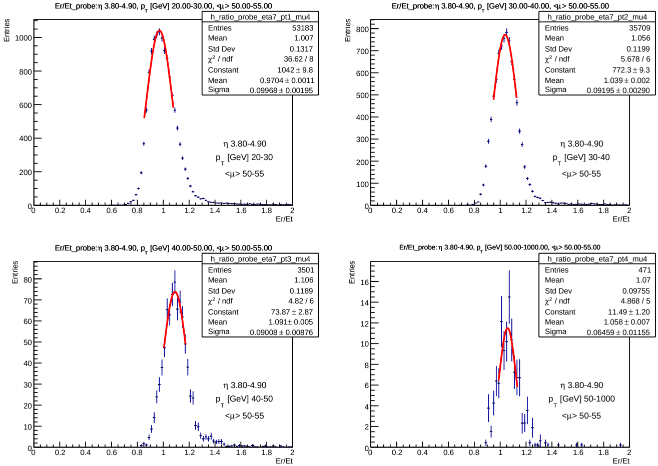




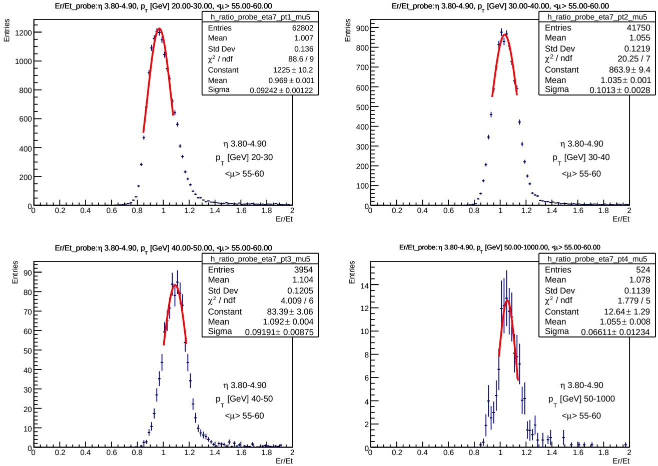
Plot η 7, μ 3



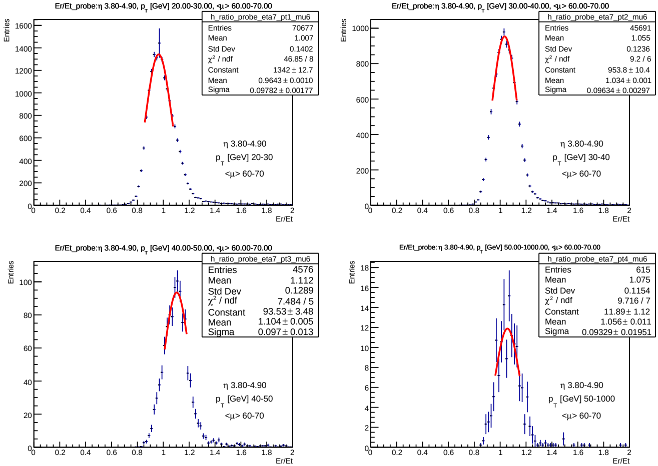
Plot η 7, μ 4



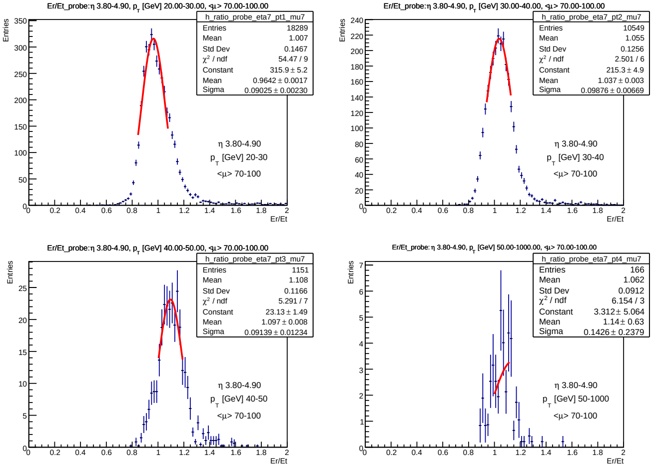
Plot η 7, μ 5



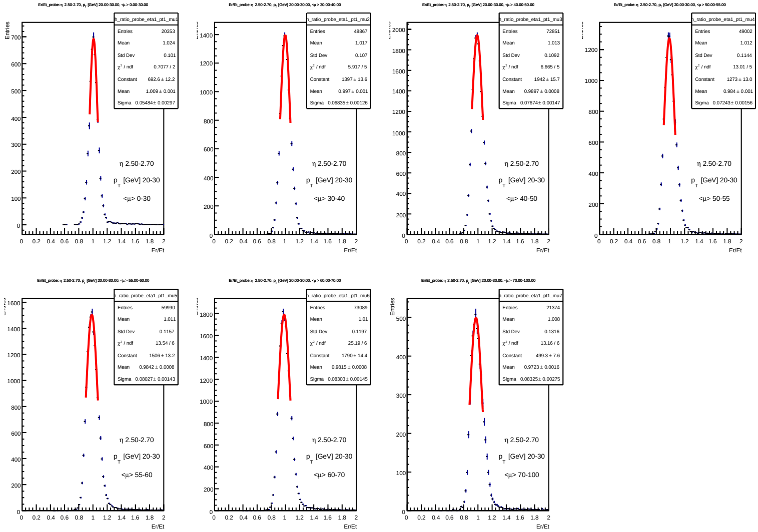
Plot η 7, μ 6



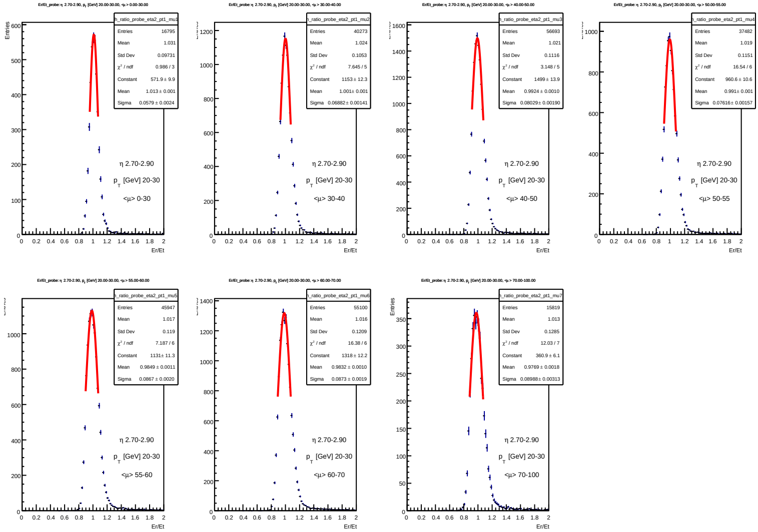
Plot η 7, μ 7



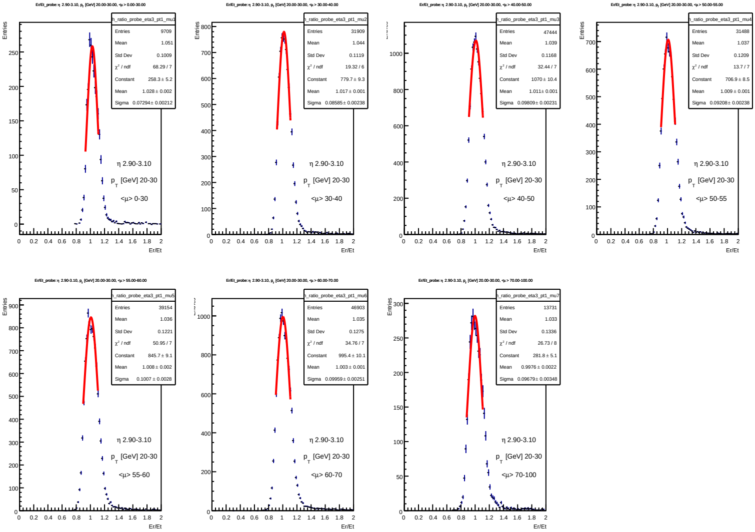
Plot p_t 1, η 1



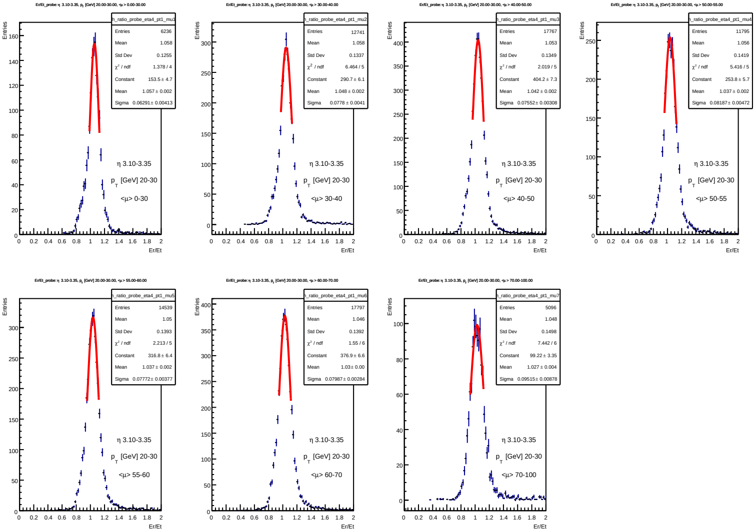
Plot p_t 1, η 2



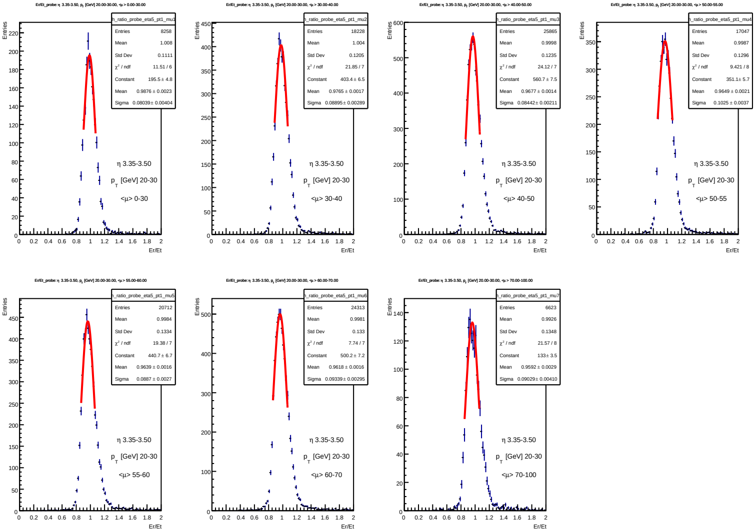
Plot p_t 1, η 3



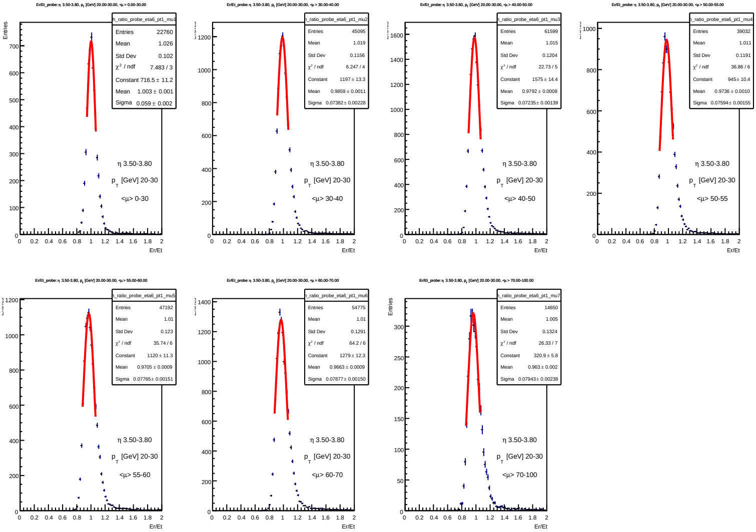
Plot p_t 1, η 4



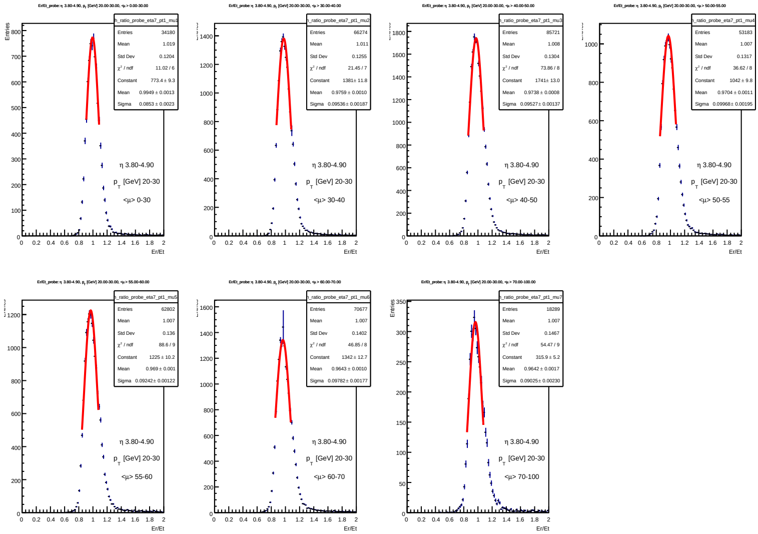
Plot p_t 1, η 5



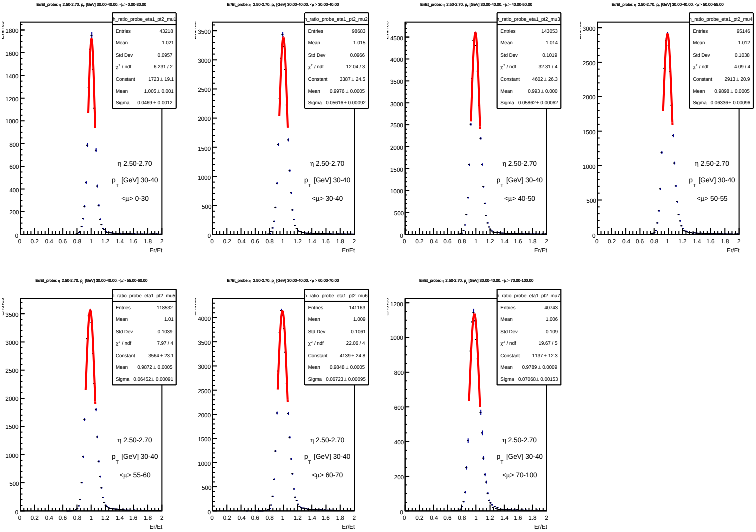
Plot p_t 1, η 6



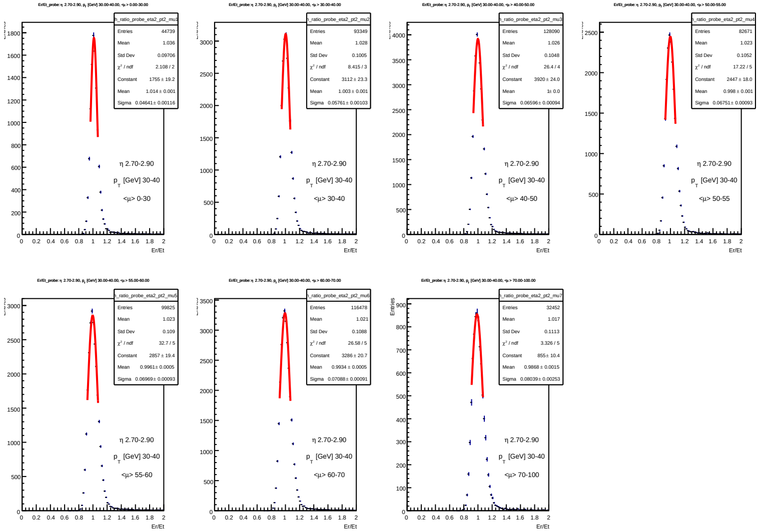
Plot p_t 1, η 7



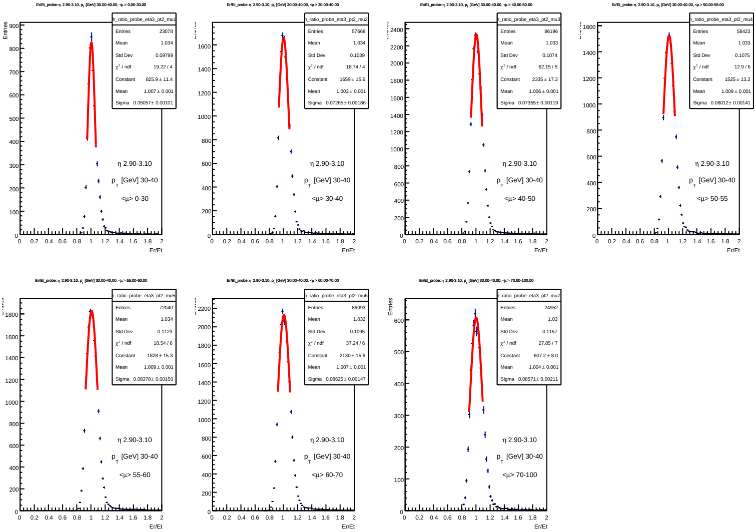
Plot p_t 2, η 1



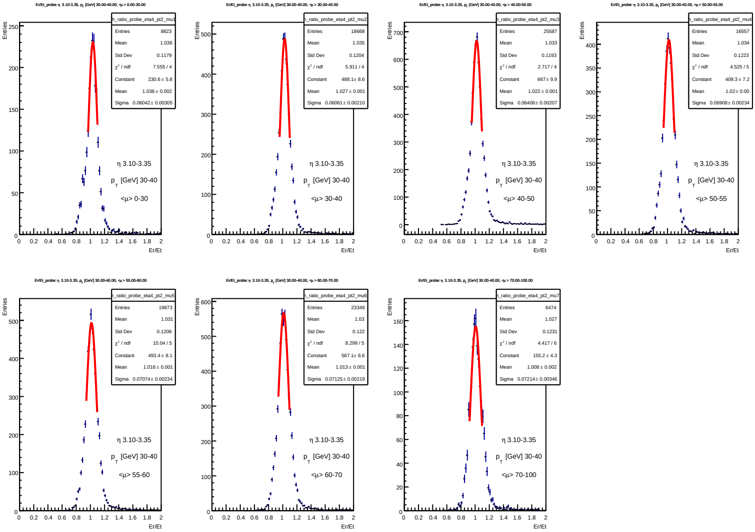
Plot p_t 2, η 2



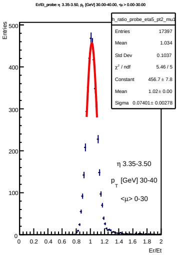
Plot p_t 2, η 3

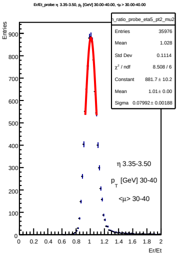


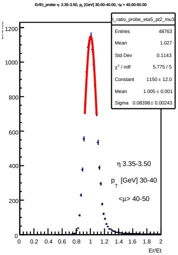
Plot p_t 2, η 4

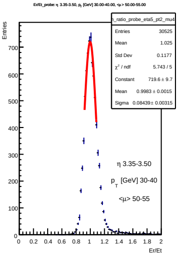


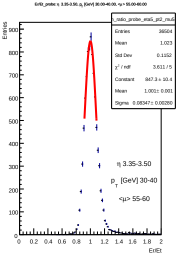
Plot p_t 2, η 5

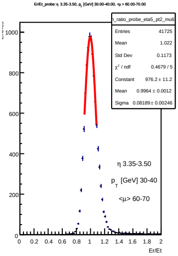


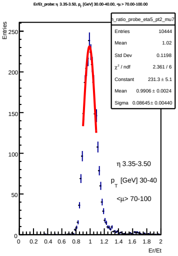




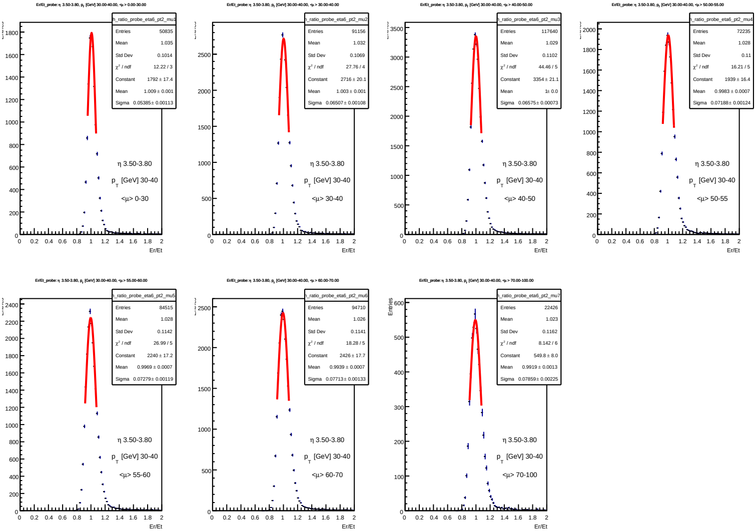




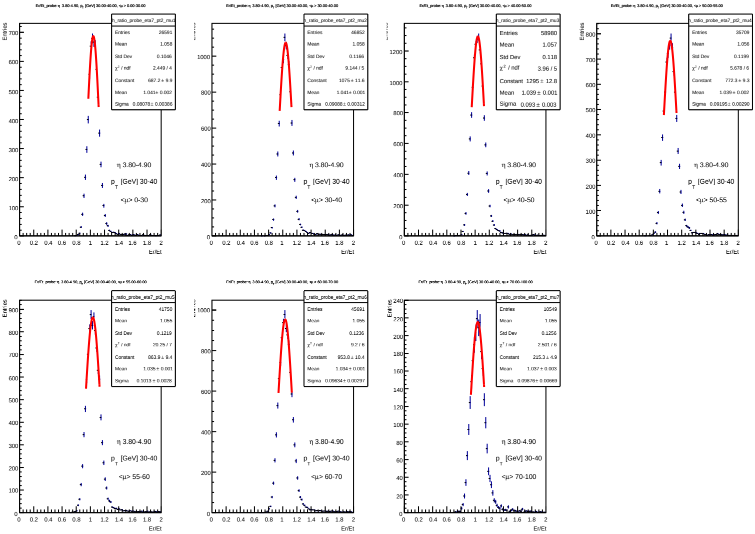




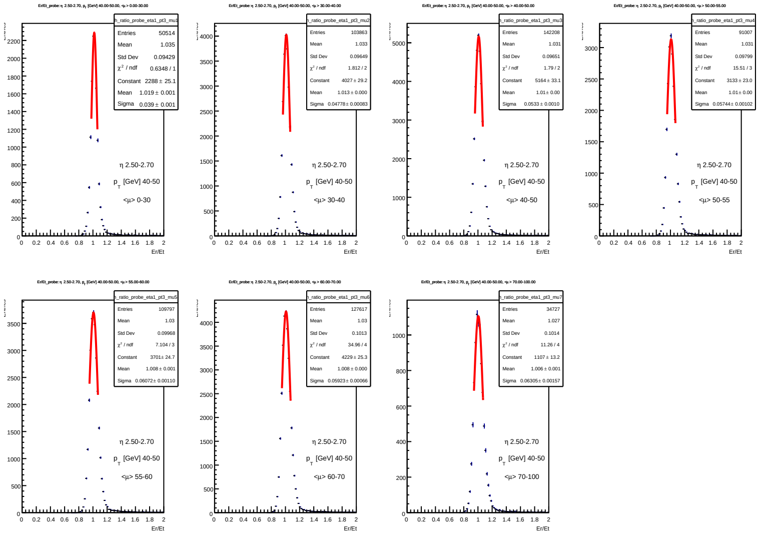
Plot p_t 2, η 6



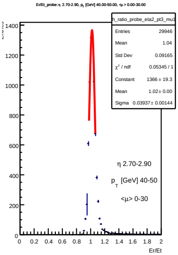
Plot p_t 2, η 7

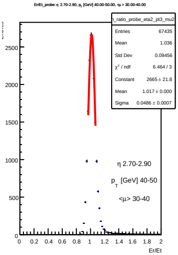


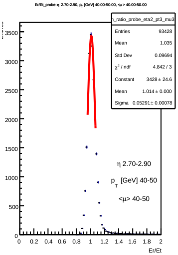
Plot p_t 3, η 1

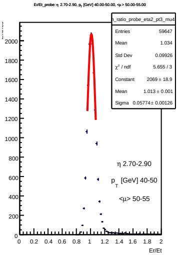


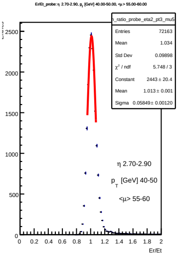
Plot p_t 3, η 2

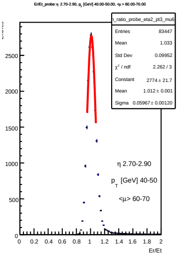


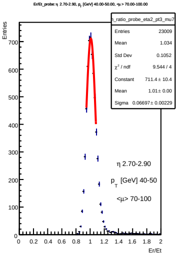




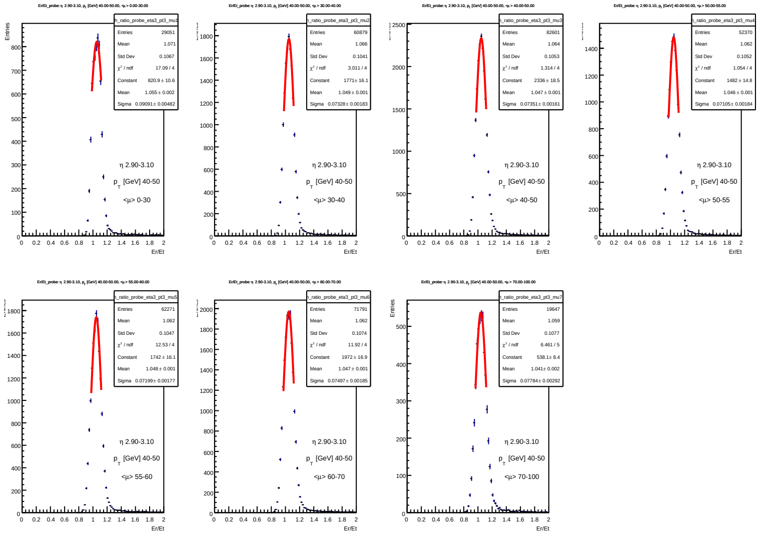




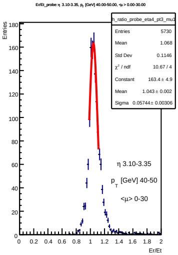


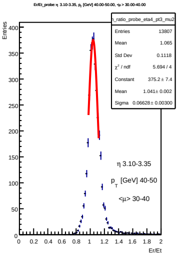


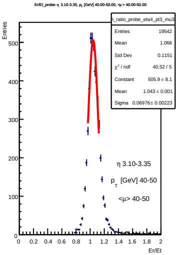
Plot p_t 3, η 3

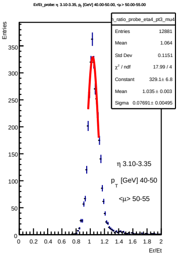


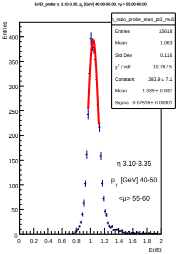
Plot p_t 3, η 4

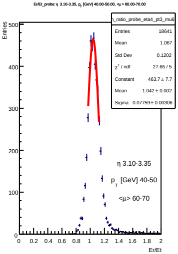


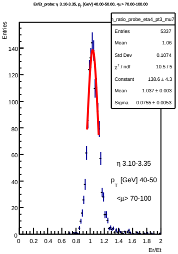




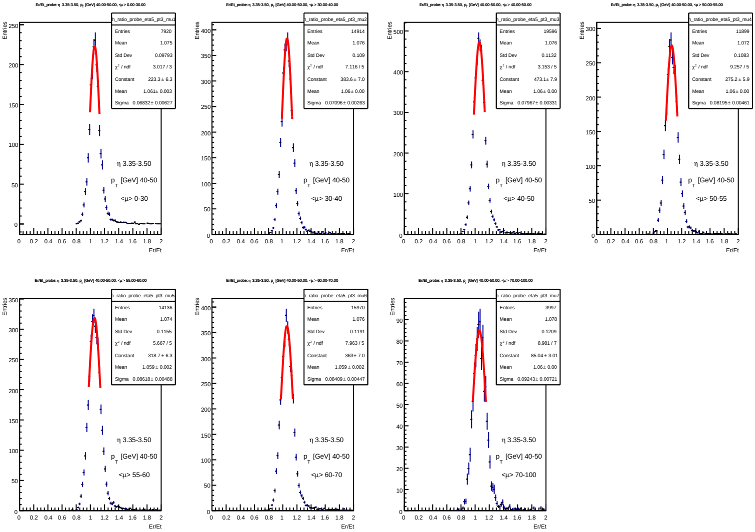




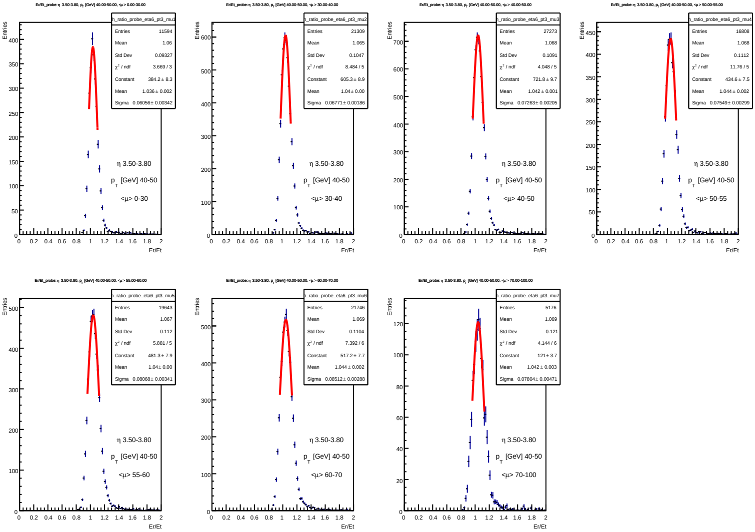




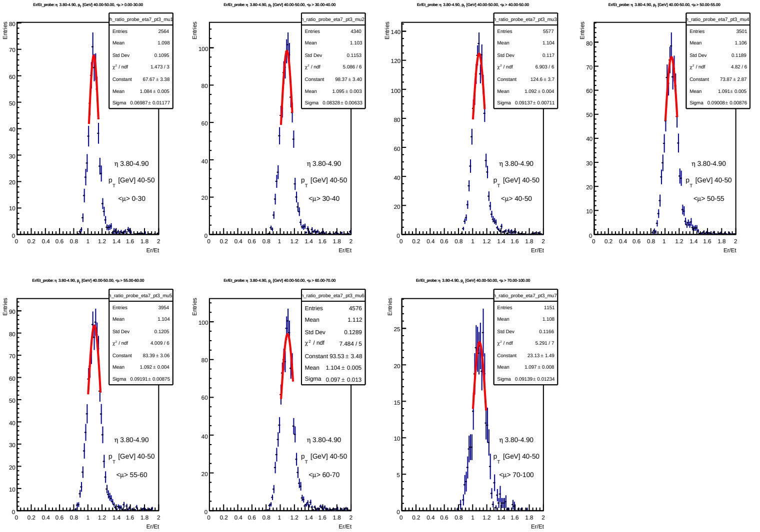
Plot p_t 3, η 5



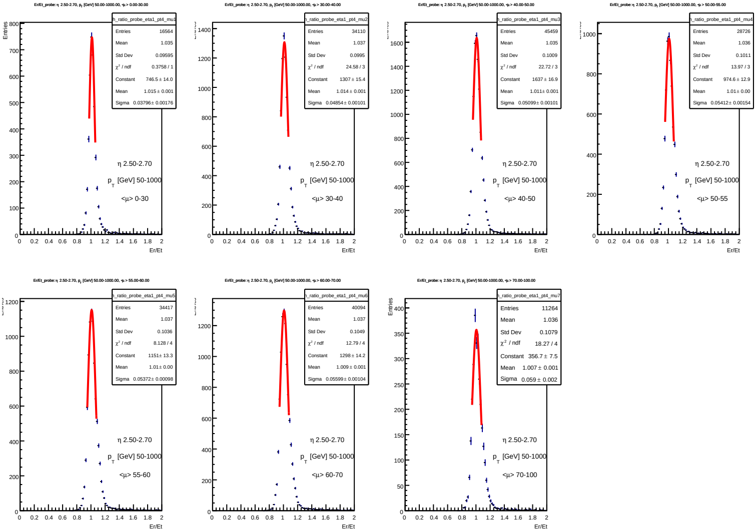
Plot p_t 3, η 6



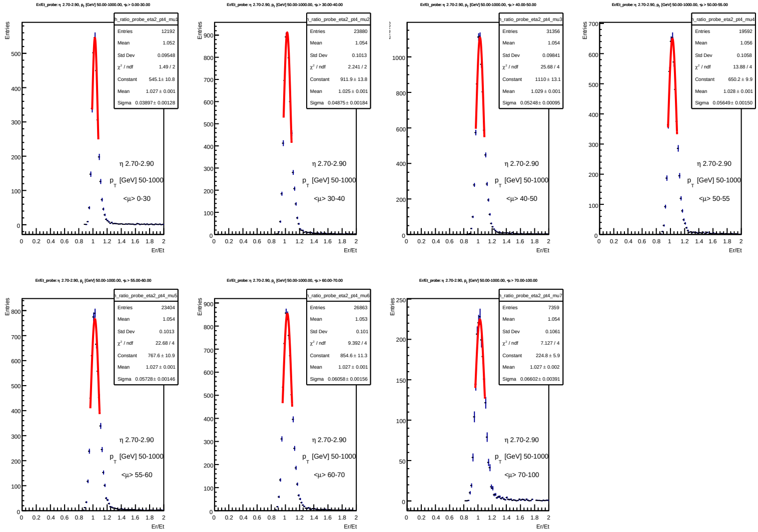
Plot p_t 3, η 7



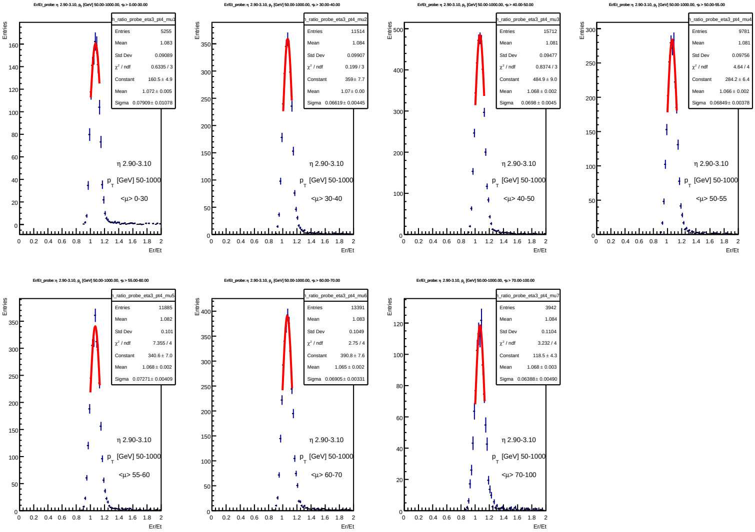
Plot p_t 4, η 1



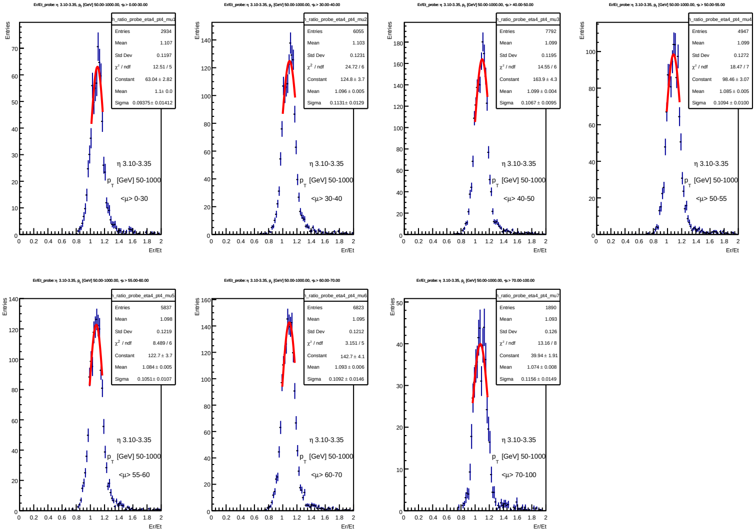
Plot p_t 4, η 2



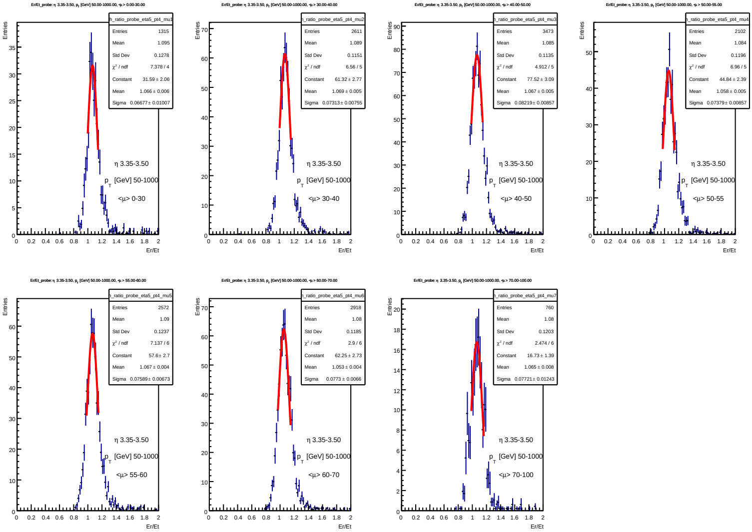
Plot p_t 4, η 3



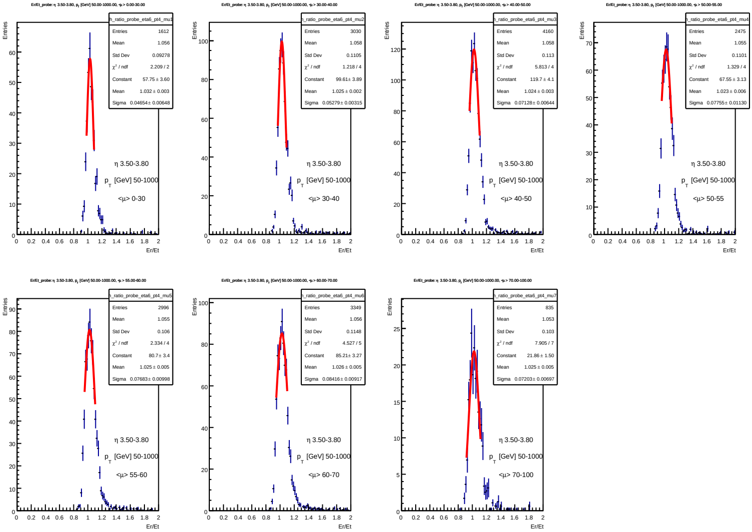
Plot p_t 4, η 4



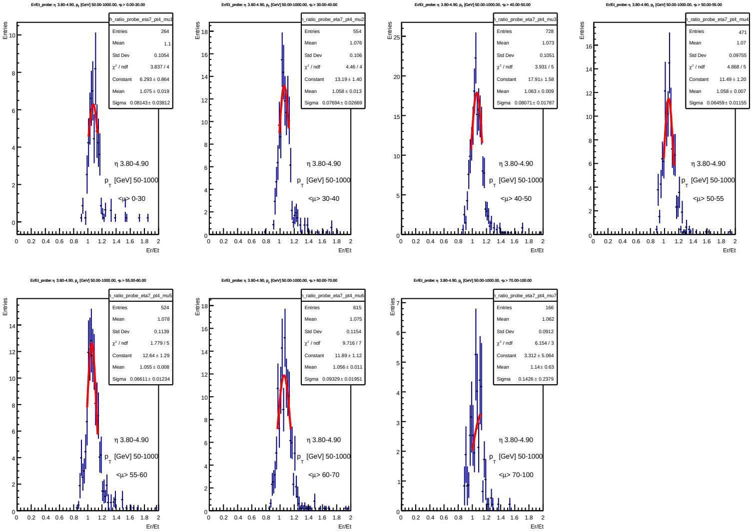
Plot p_t 4, η 5



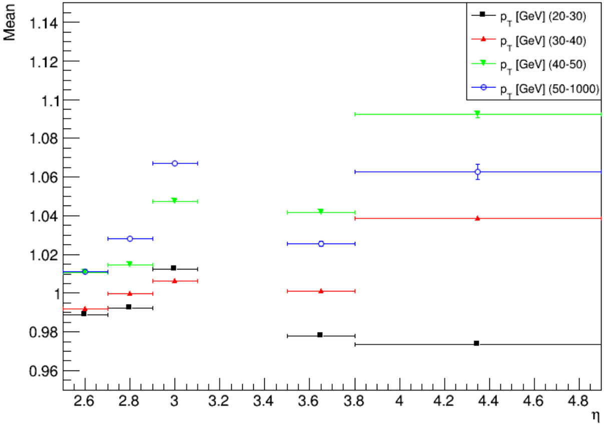
Plot p_t 4, η 6



Plot p_t 4, η 7



Mean μ 0


Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
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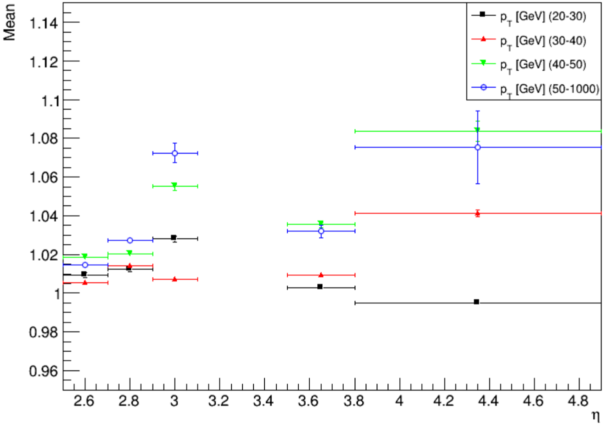
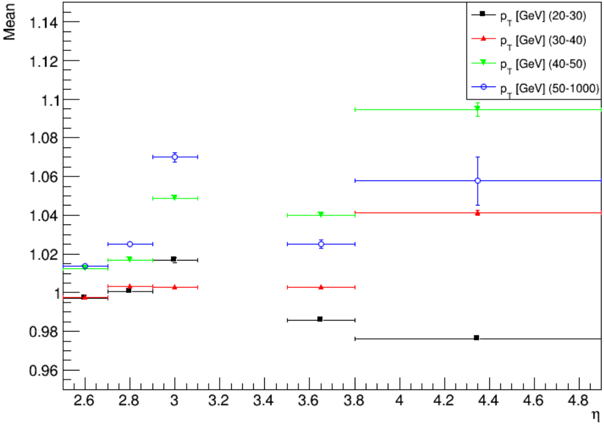
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 1



Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 2



Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
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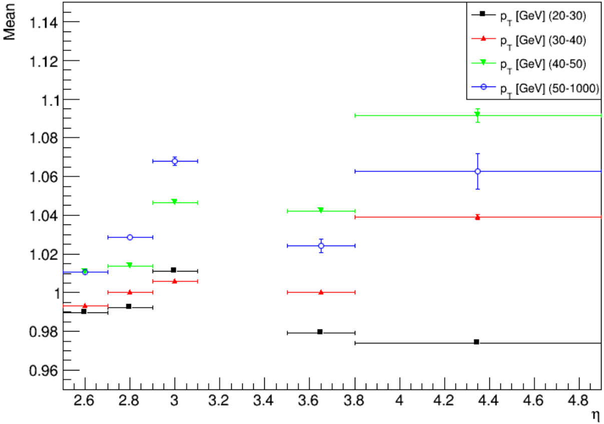
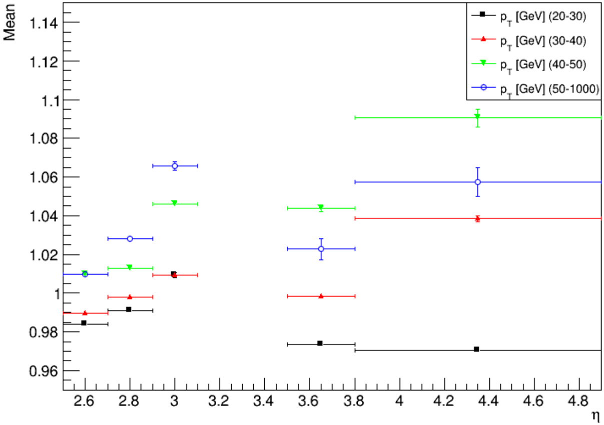
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 3



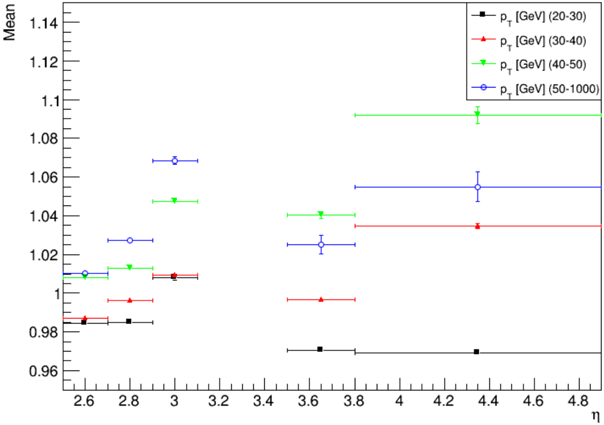
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 4



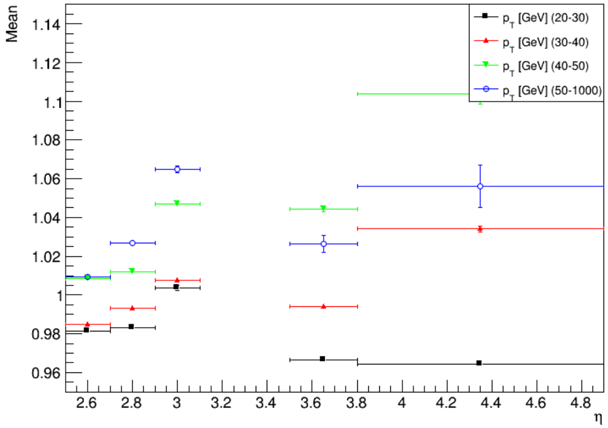
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 5



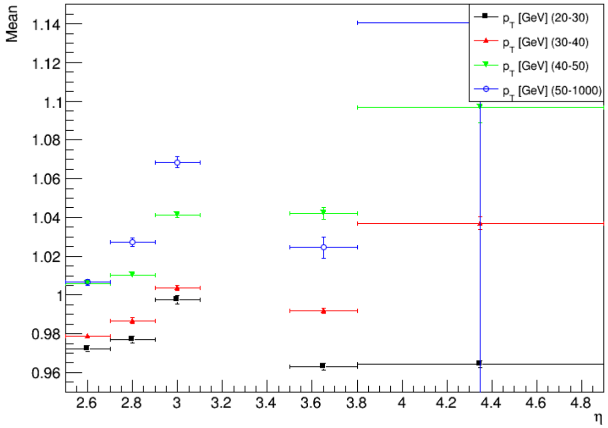
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 6



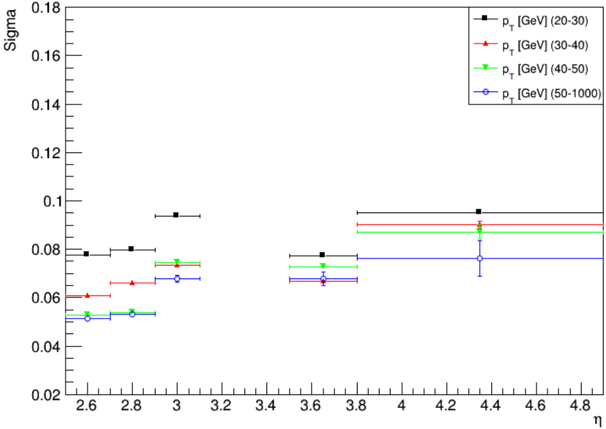
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean μ 7



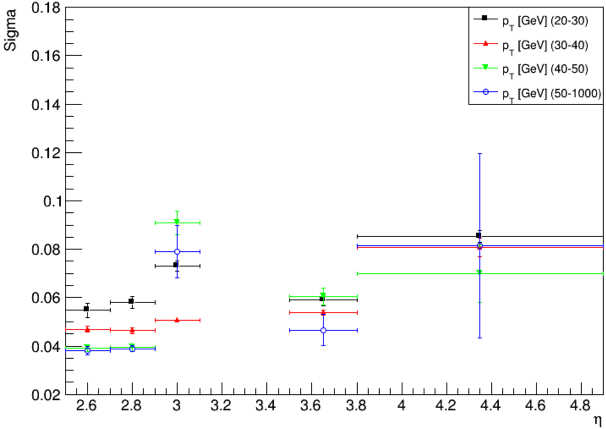
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 0



Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 1



Sigma
0.18
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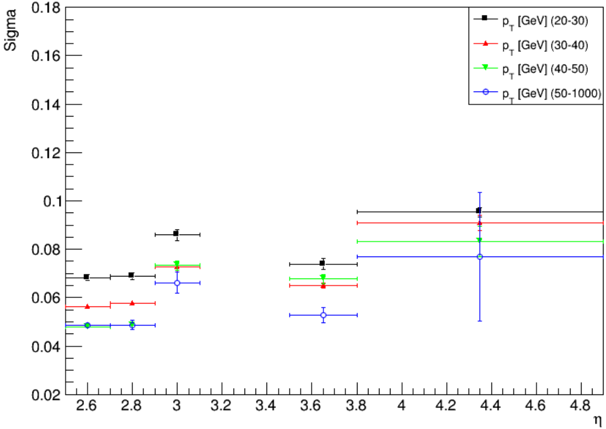
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 2


Sigma
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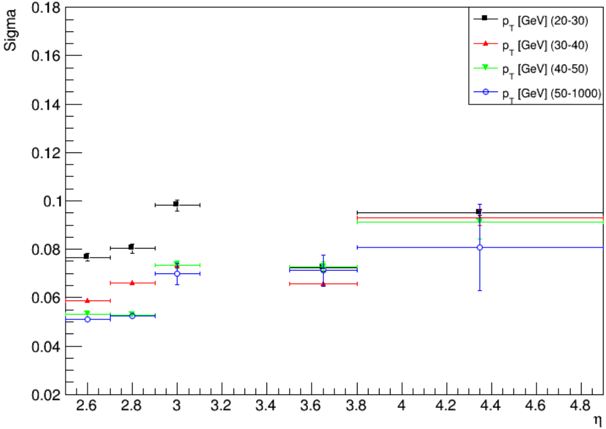
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 3



Sigma
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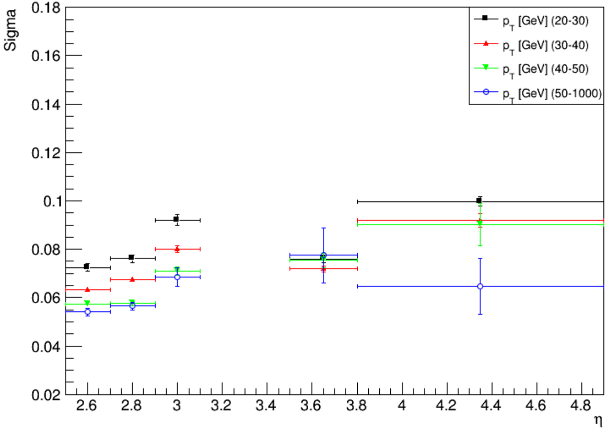
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 4



Sigma
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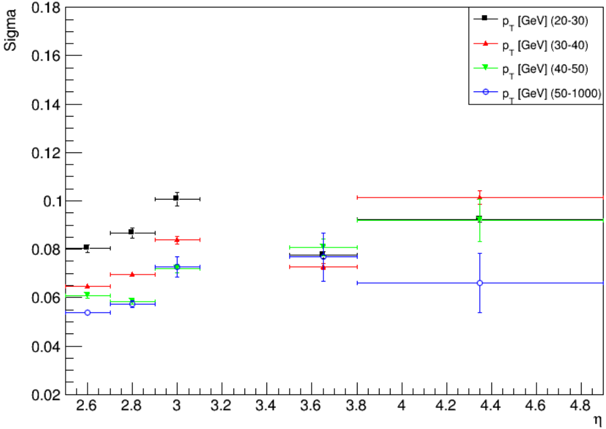
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 5



Sigma
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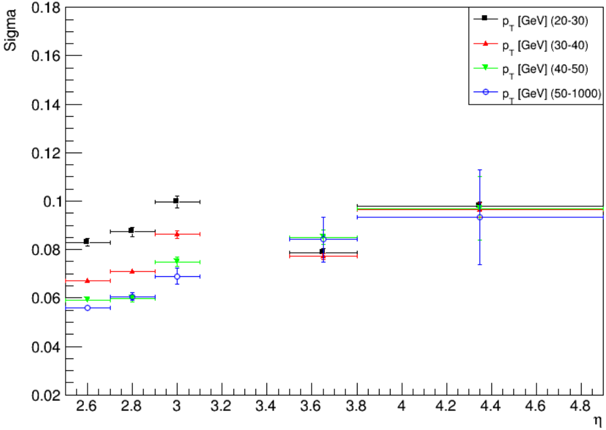
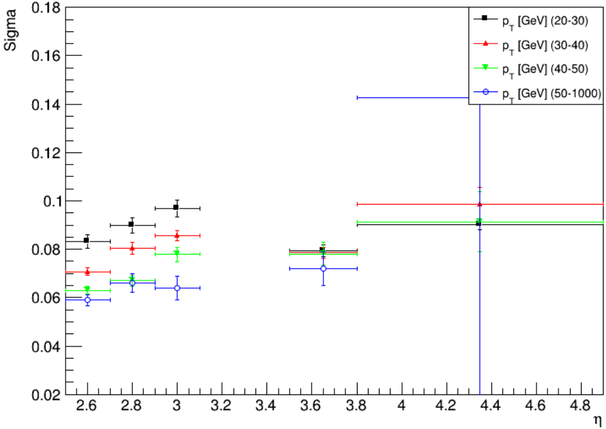
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 6



Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Sigma μ 7



Sigma
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0.14
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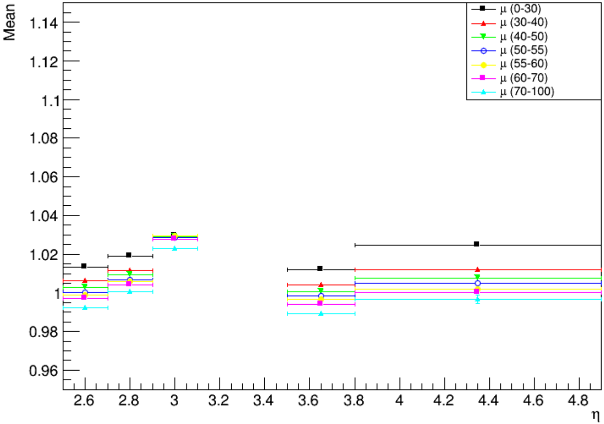
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean *pt* 0



Mean
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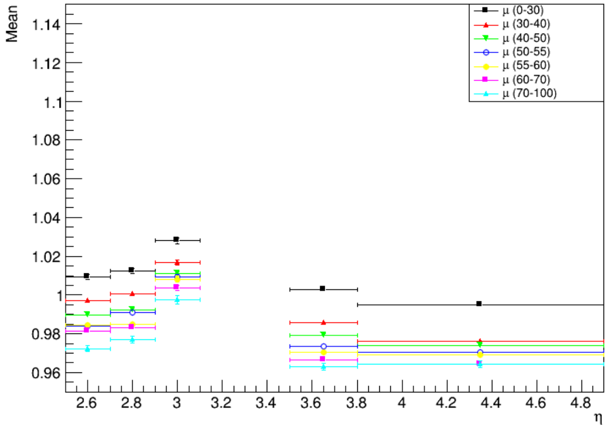
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Mean *pt* 1


Mean
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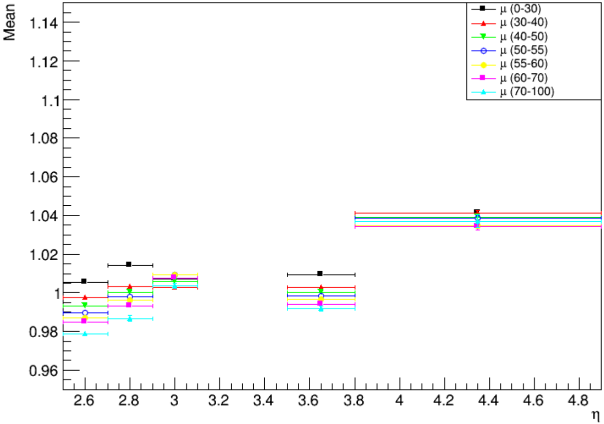
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Mean *pt* 2



Mean
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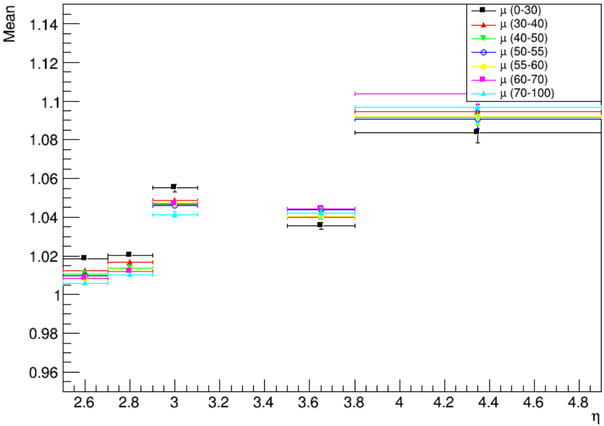
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Mean *pt* 3



Mean
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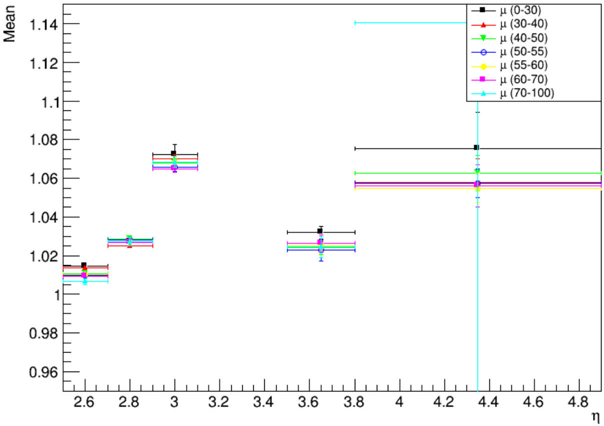
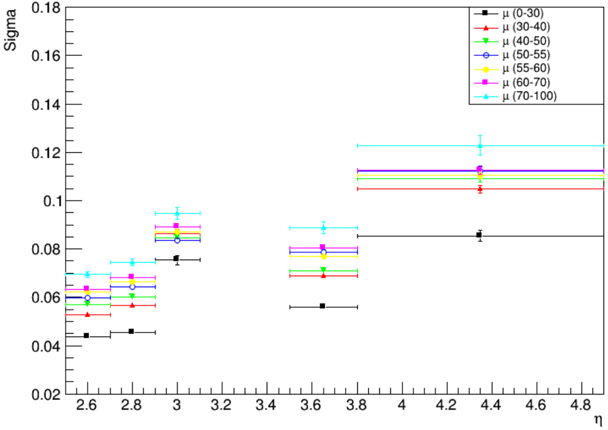
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Mean *pt* 4



Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
µ (0-30)
µ (30-40)
µ (40-50)
µ (50-55)
µ (55-60)
µ (60-70)
µ (70-100)

Sigma *pt* 0



Sigma
0.18
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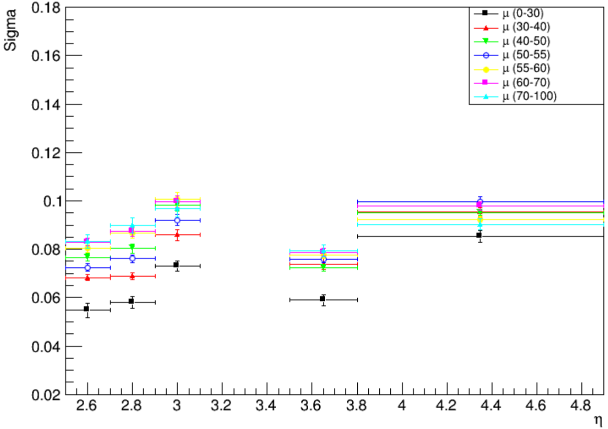
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Sigma *pt* 1



Sigma
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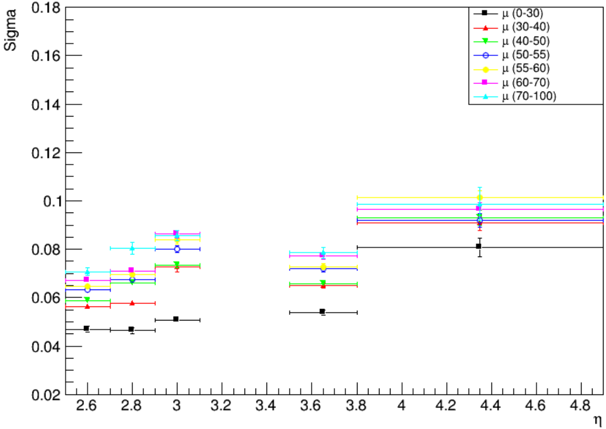
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Sigma *pt* 2



Sigma
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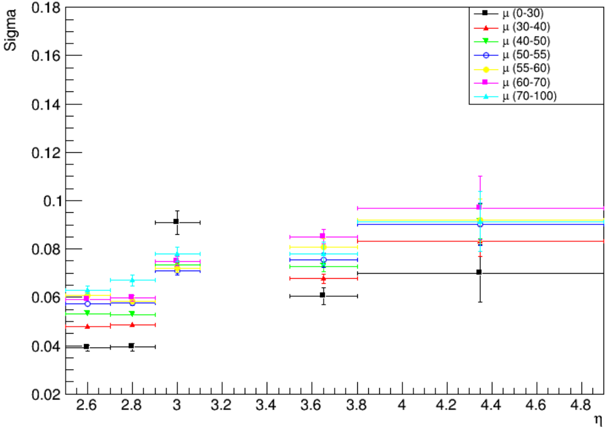
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Sigma *pt* 3


Sigma
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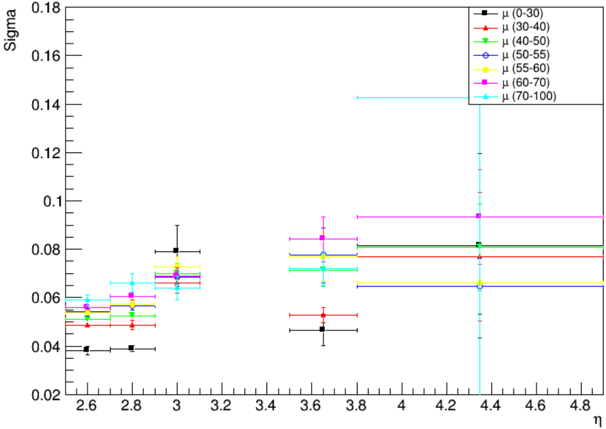
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Sigma *pt* 4



Sigma
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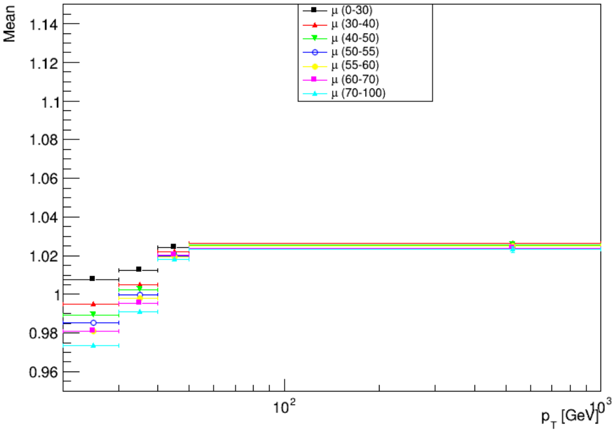
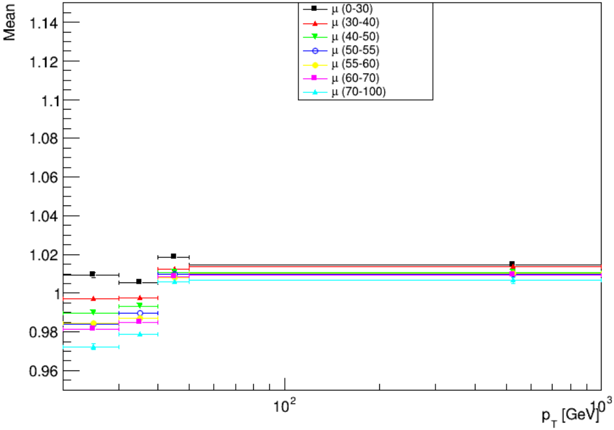
0.14
0.12
0.1
0.08
0.06
0.04
0.02
2.6
2.8
3
3.2
3.4
3.6
3.8
4
4.2
4.4
4.6
4.8
η
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Mean η 0



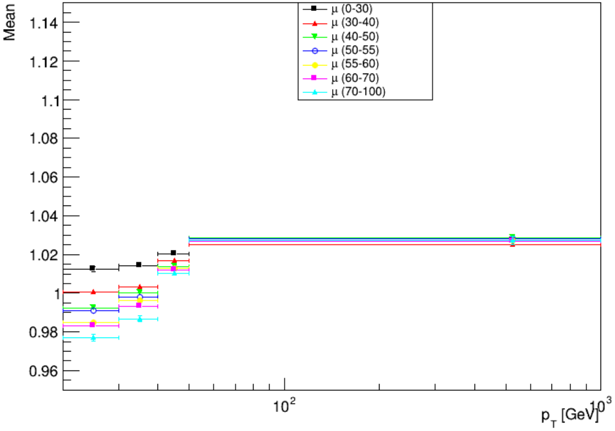
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 1



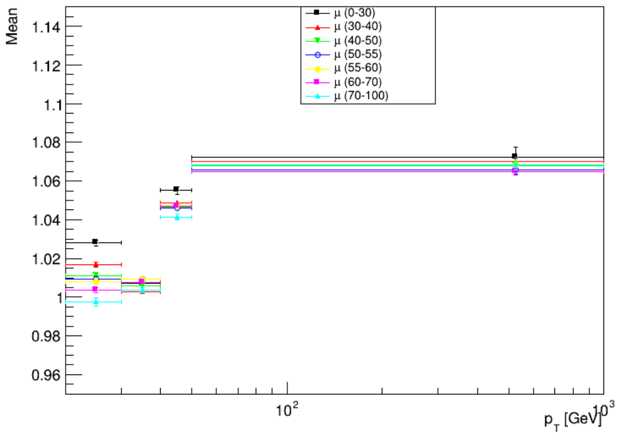
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 2



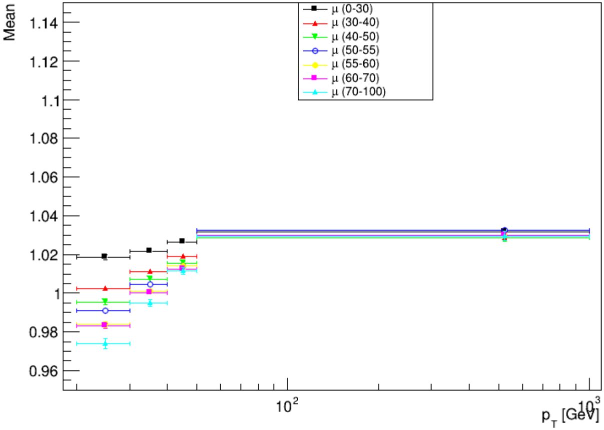
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 3



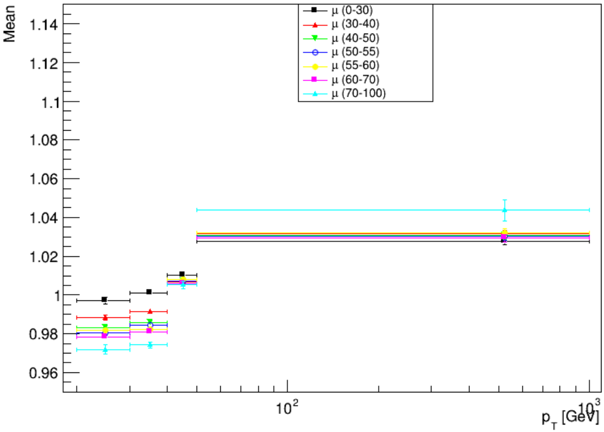
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 4



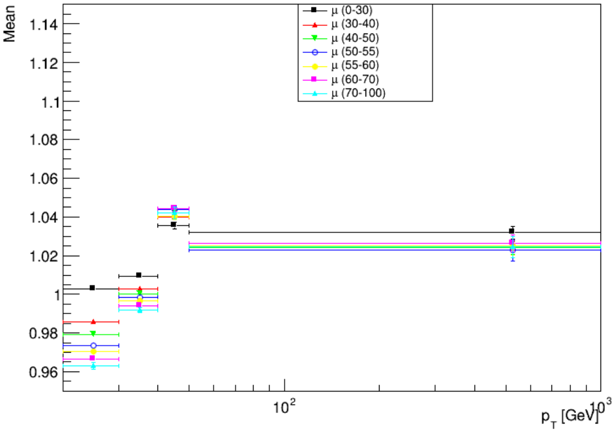
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 5



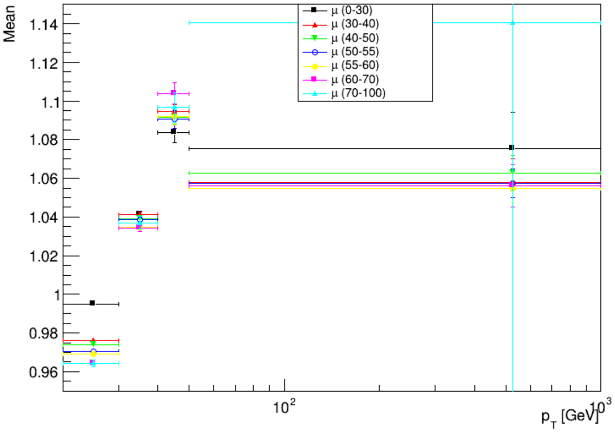
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 6



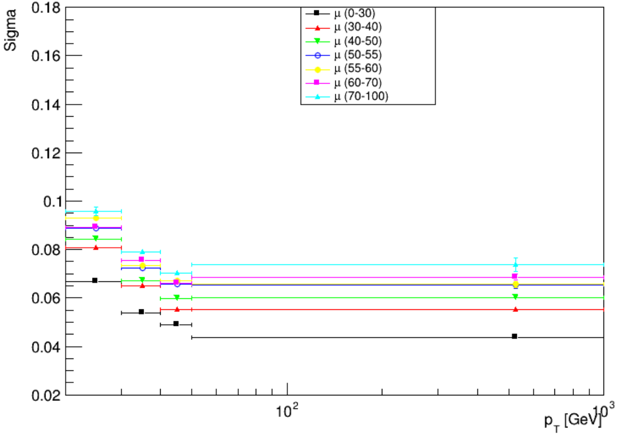
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean η 7



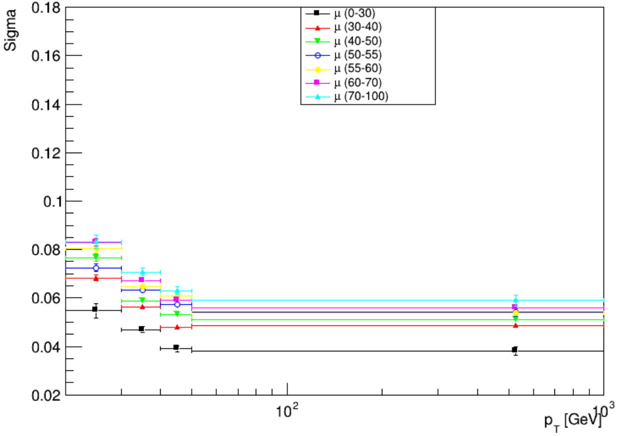
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
10^2
10^3
p_T [GeV]
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)

Sigma η 0



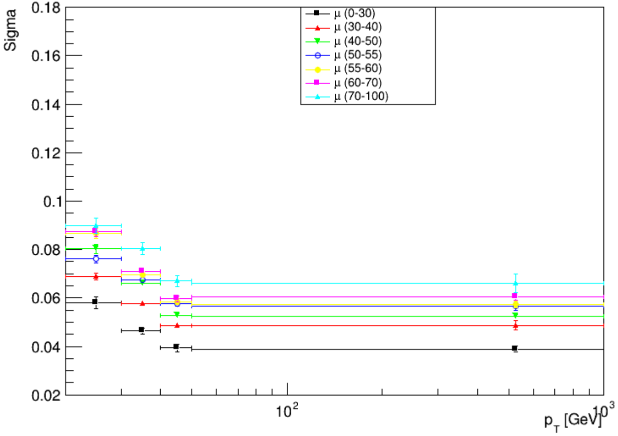
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 1



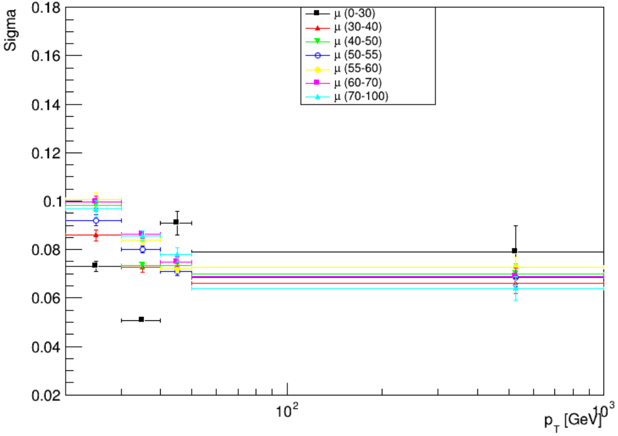
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 2



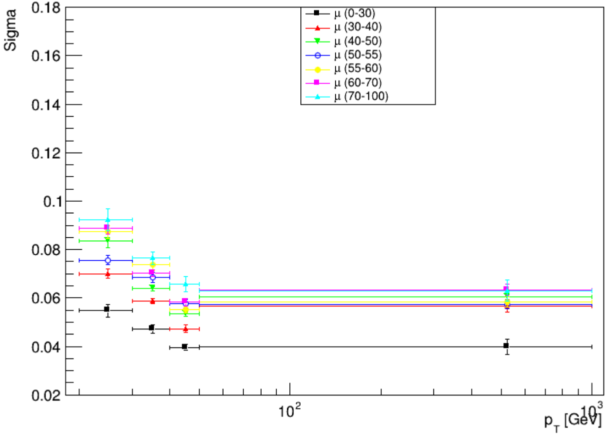
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 3



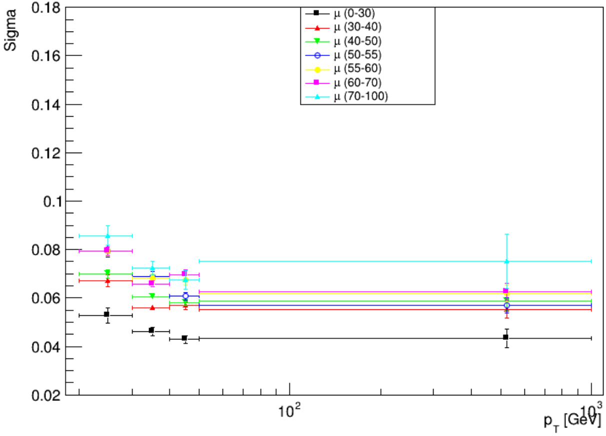
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 4



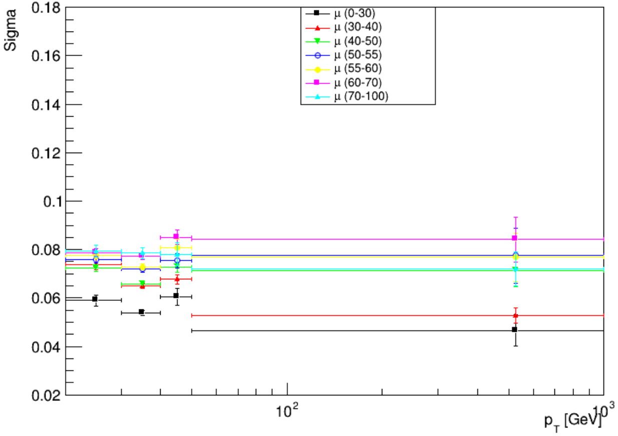
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 5



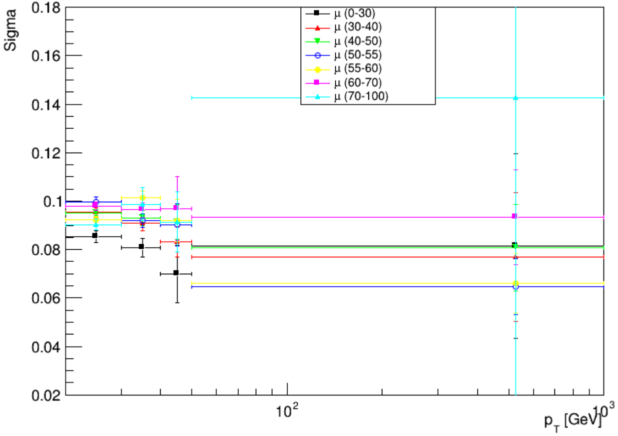
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 6



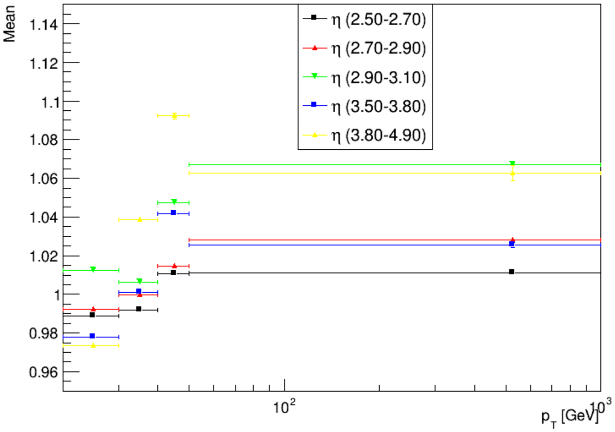
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Sigma η 7



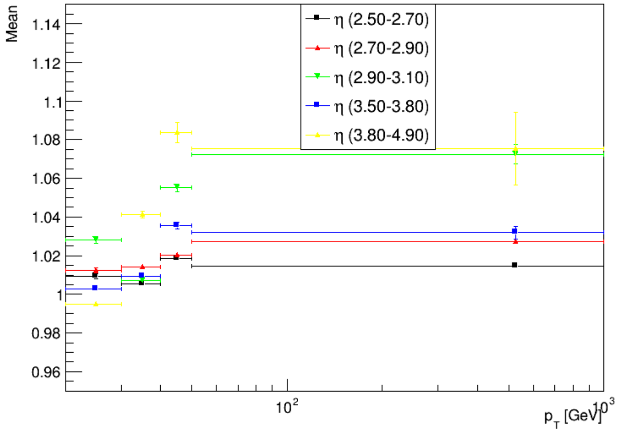
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
μ (0-30)
μ (30-40)
μ (40-50)
μ (50-55)
μ (55-60)
μ (60-70)
μ (70-100)
10^2
10^3
p_T [GeV]

Mean μ 0



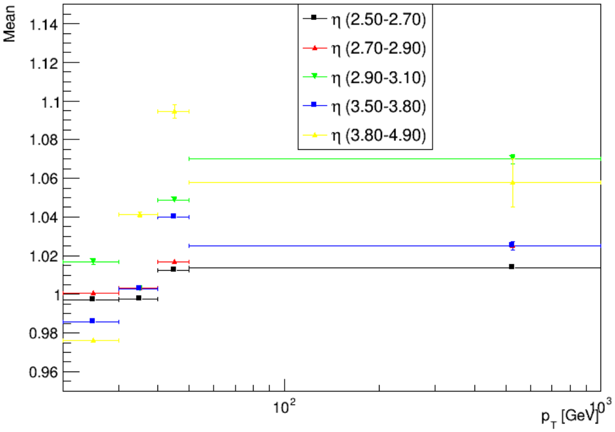
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Mean μ 1



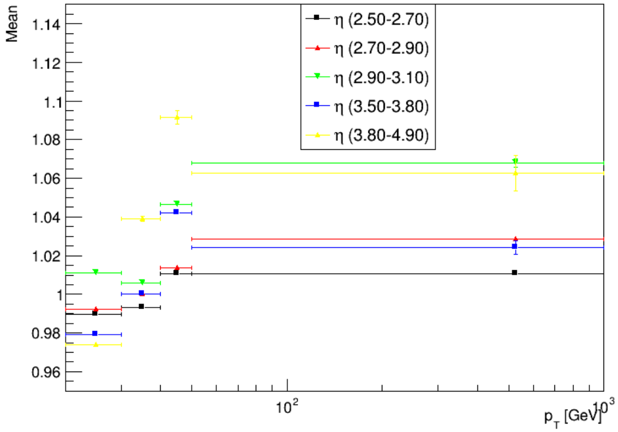
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Mean μ 2



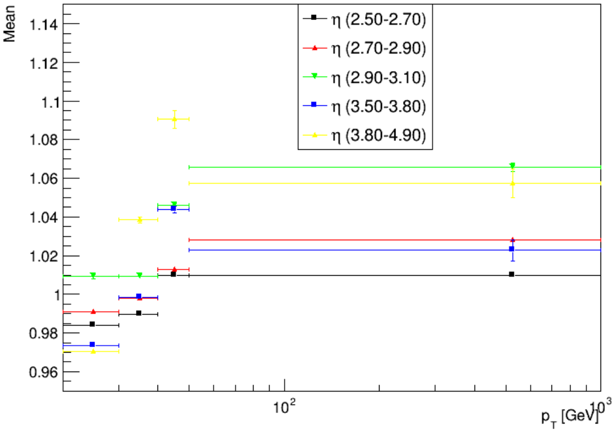
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Mean μ 3

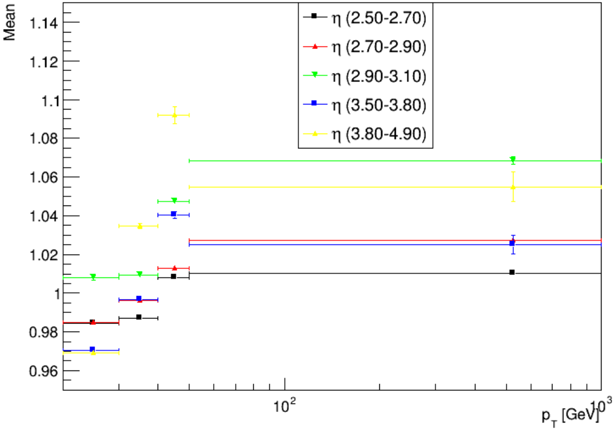


Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Mean μ 4

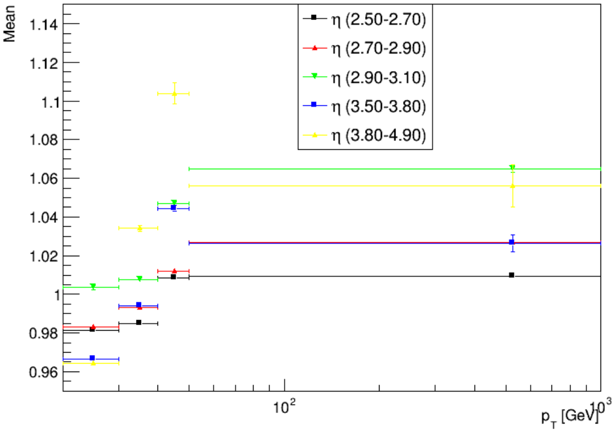

Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Mean μ 5



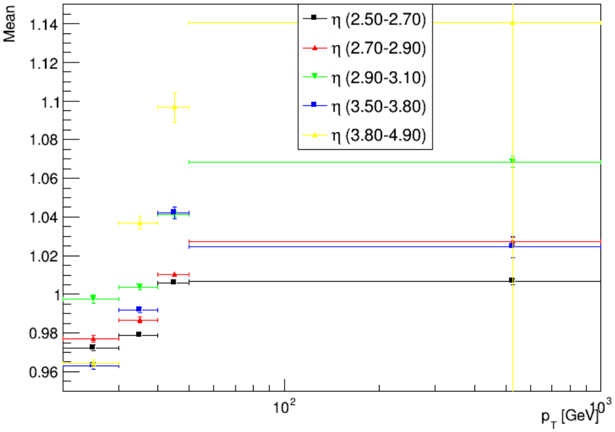
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
10^2
10^3
p_T [GeV]
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Mean μ 6



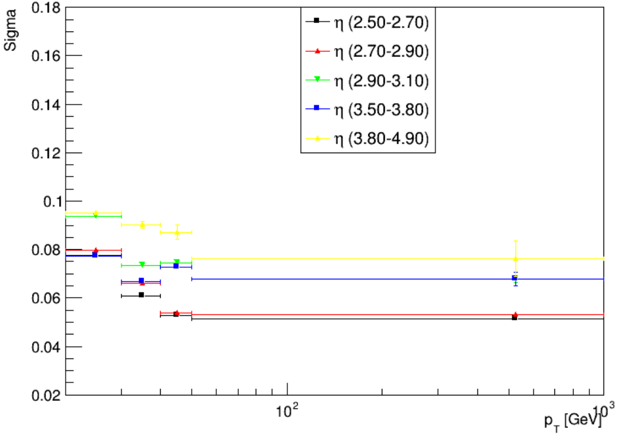
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Mean μ 7



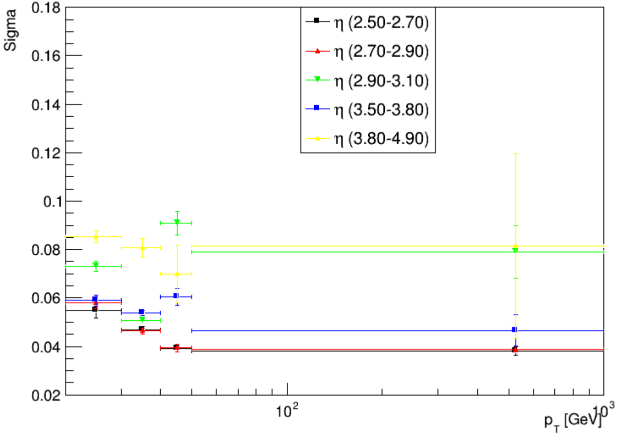
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
10^2
10^3
p_T [GeV]
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Sigma μ 0



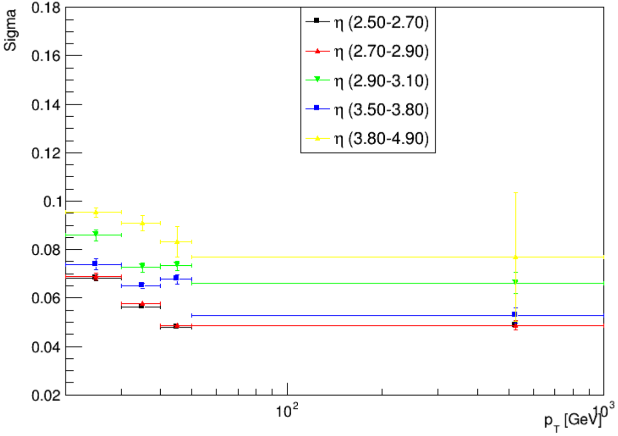
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 1



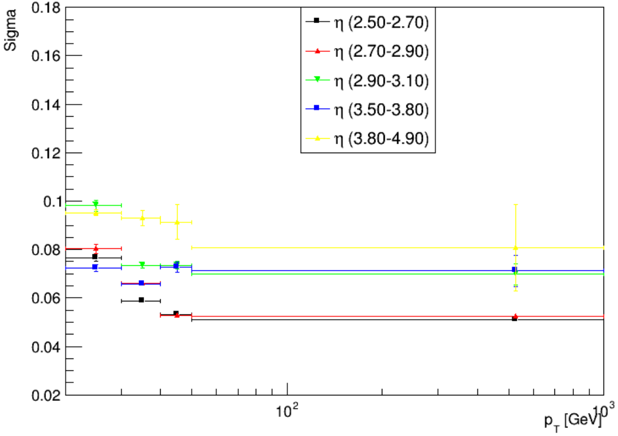
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 2



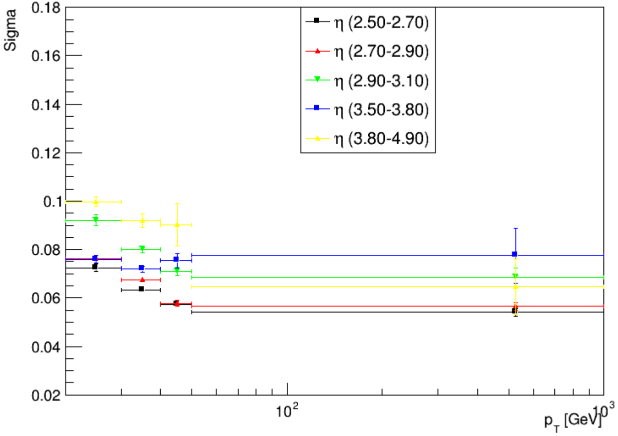
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 3

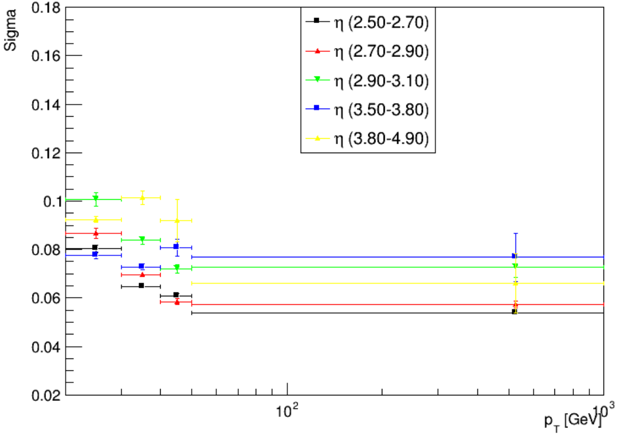


Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 4

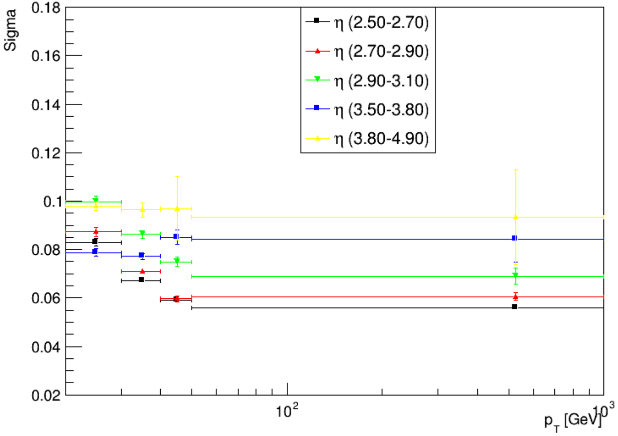

Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 5



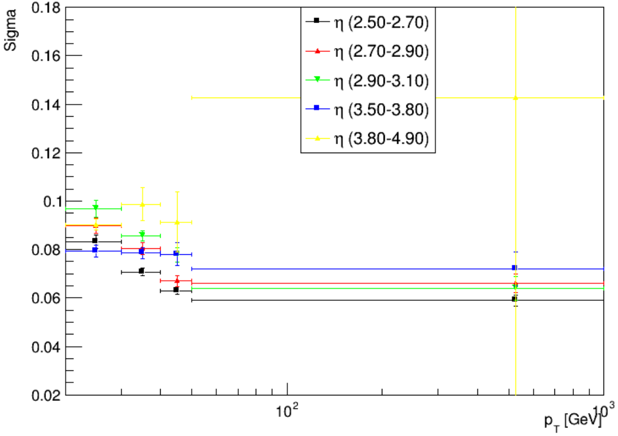
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 6



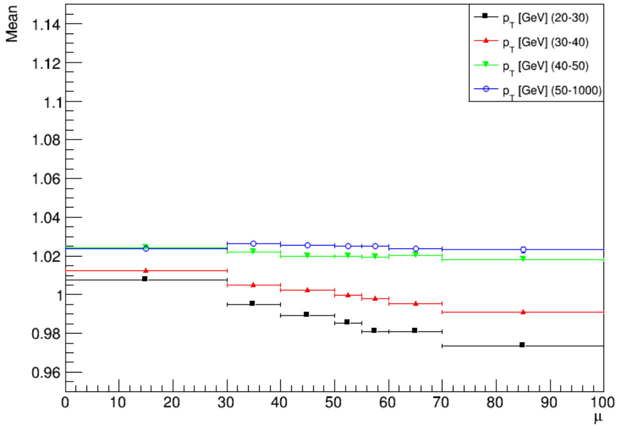
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)
10^2
10^3
p_T [GeV]

Sigma μ 7



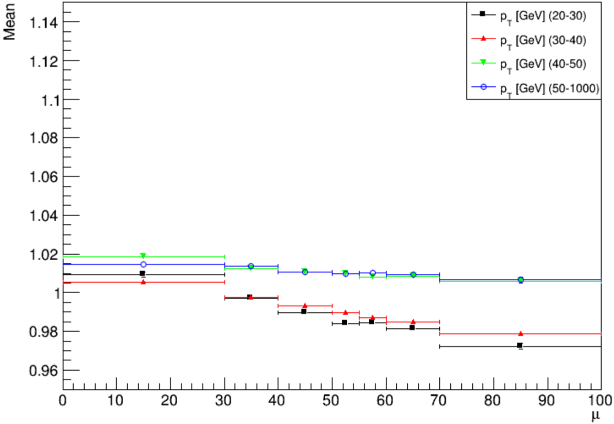
Sigma
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
10^2
10^3
p_T [GeV]
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Mean η 0



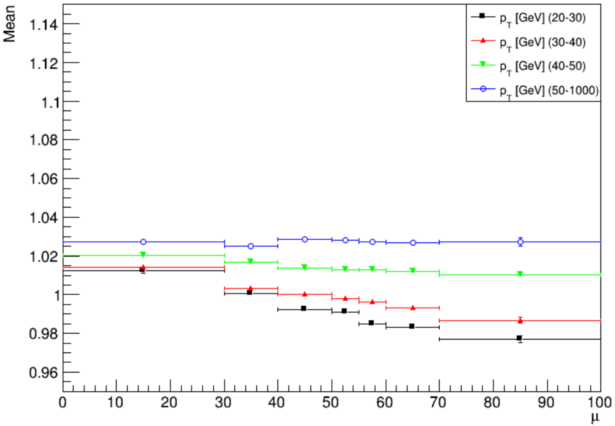
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 1

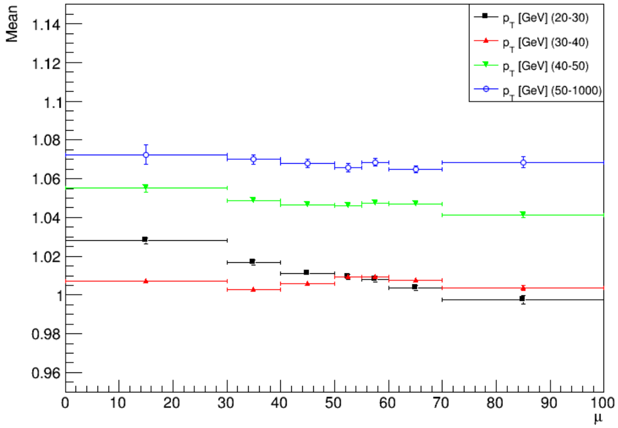


Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 2

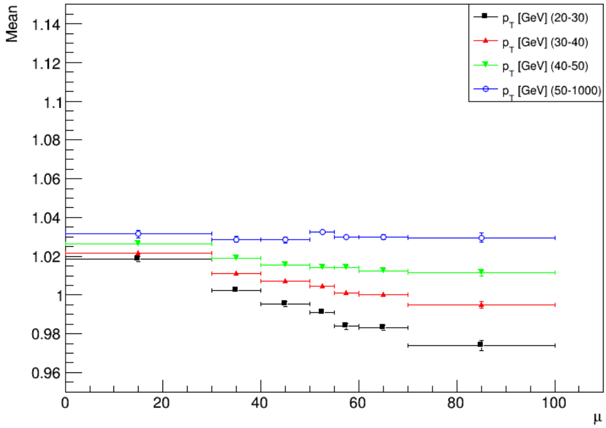

Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 3



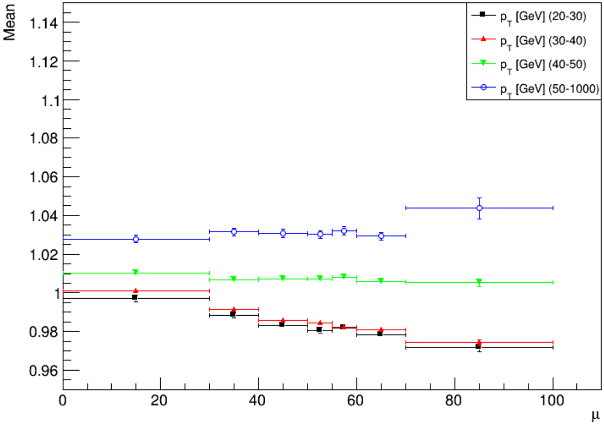
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 4



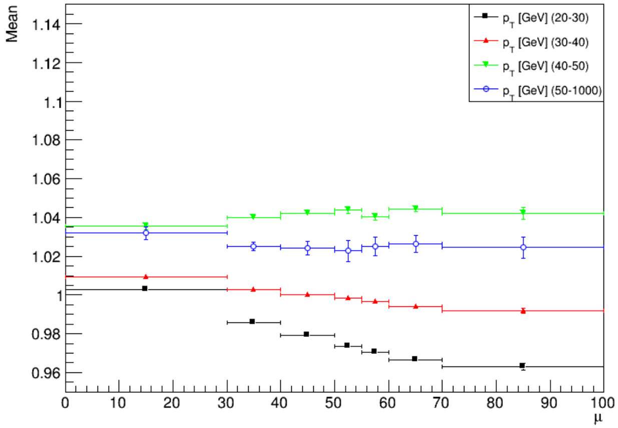
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
20
40
60
80
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 5



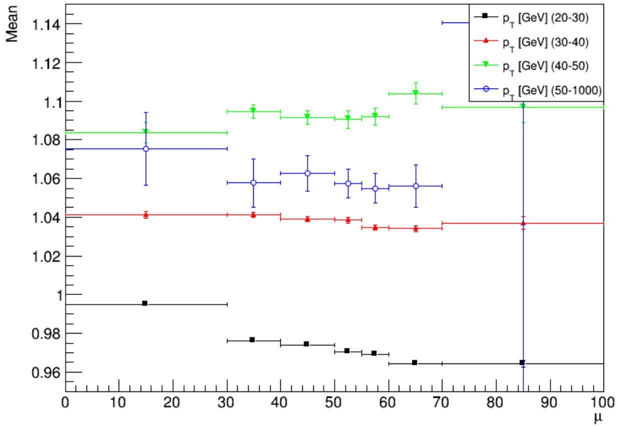
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
20
40
60
80
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 6



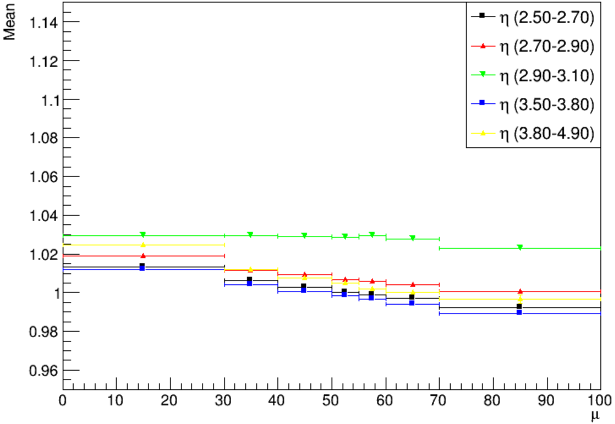
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean η 7



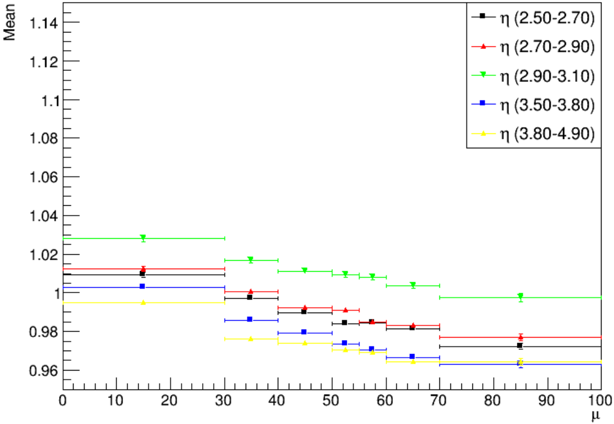
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
p_T [GeV] (20-30)
p_T [GeV] (30-40)
p_T [GeV] (40-50)
p_T [GeV] (50-1000)

Mean p_T 0



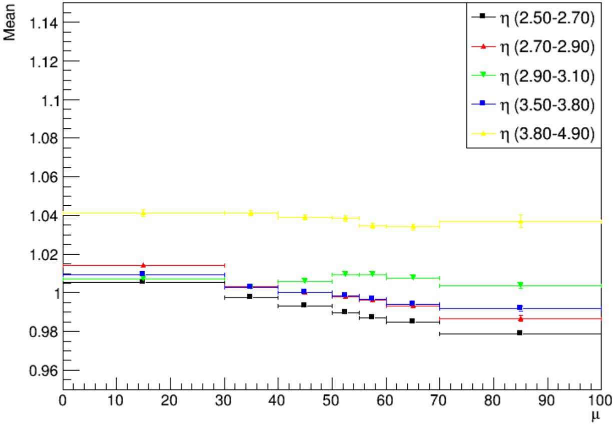
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Mean p_T 1



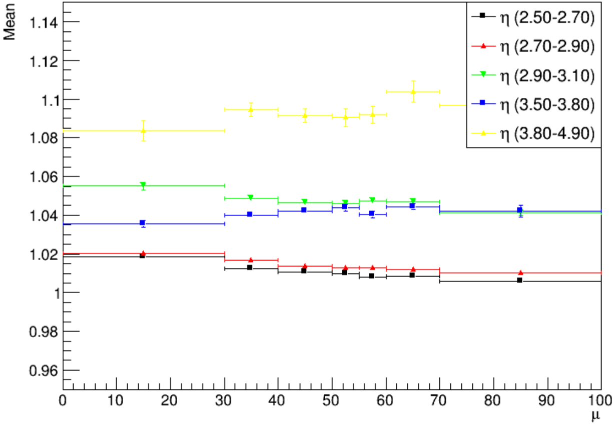
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Mean p_T 2



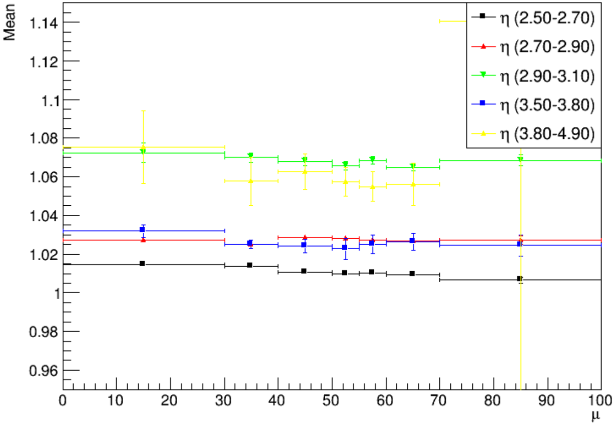
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Mean p_T 3



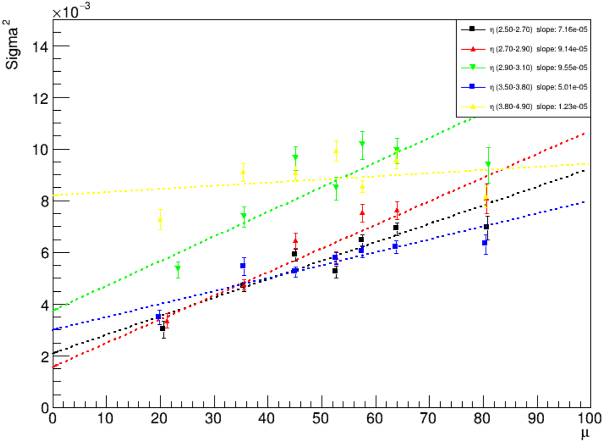
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Mean p_T 4



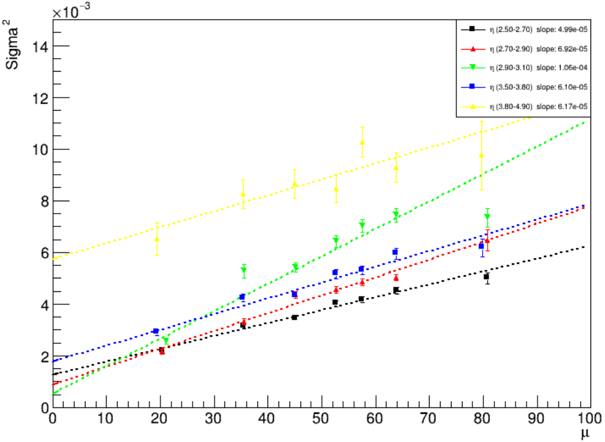
Mean
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
0.96
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70)
η (2.70-2.90)
η (2.90-3.10)
η (3.50-3.80)
η (3.80-4.90)

Sigma^2 p_T 1



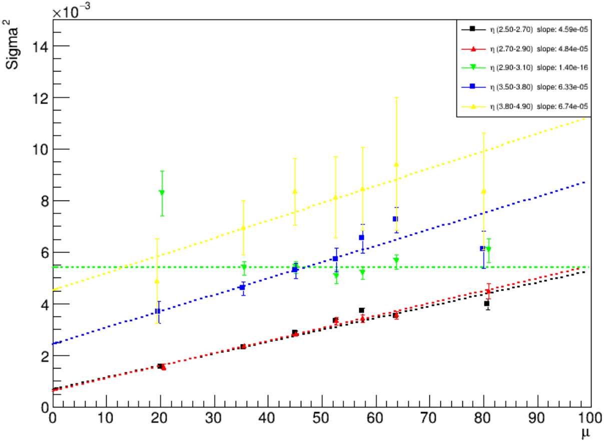
×10^-3
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70) slope: 7.16e-05
η (2.70-2.90) slope: 9.14e-05
η (2.90-3.10) slope: 9.55e-05
η (3.50-3.80) slope: 5.01e-05
η (3.80-4.90) slope: 1.23e-05

Sigma^2 p_T 2



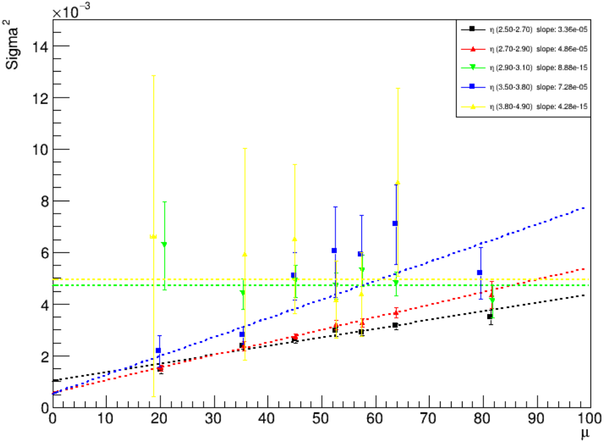
×10⁻³
Sigma²
η (2.50-2.70) slope: 4.99e-05
η (2.70-2.90) slope: 6.92e-05
η (2.90-3.10) slope: 1.06e-04
η (3.50-3.80) slope: 6.10e-05
η (3.80-4.90) slope: 6.17e-05
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
70
80
90
100
μ

Sigma^2 p_T 3



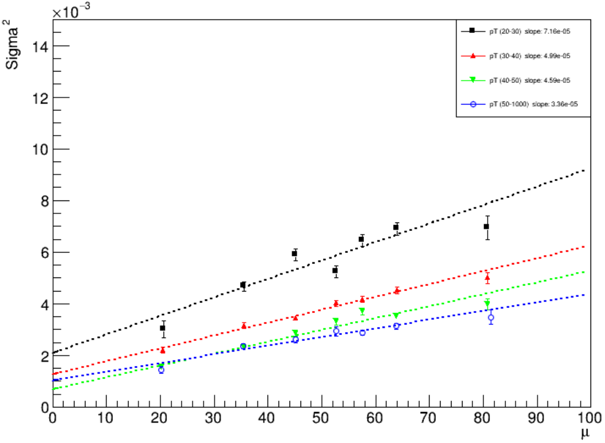
×10^-3
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70) slope: 4.59e-05
η (2.70-2.90) slope: 4.84e-05
η (2.90-3.10) slope: 1.40e-16
η (3.50-3.80) slope: 6.33e-05
η (3.80-4.90) slope: 6.74e-05

Sigma^2 p_T 4



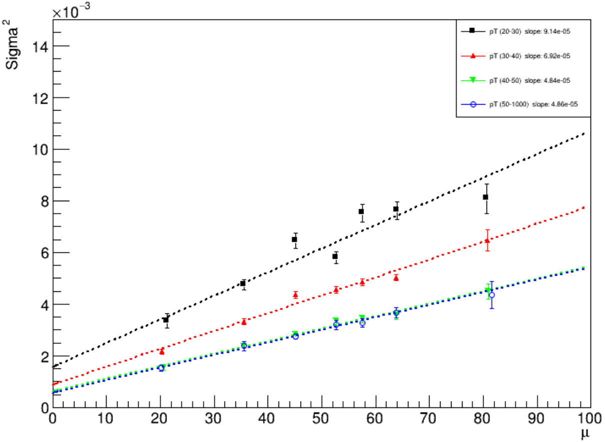
×10^-3
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
η (2.50-2.70) slope: 3.36e-05
η (2.70-2.90) slope: 4.86e-05
η (2.90-3.10) slope: 8.88e-15
η (3.50-3.80) slope: 7.28e-05
η (3.80-4.90) slope: 4.28e-15

Sigma^2 η 1



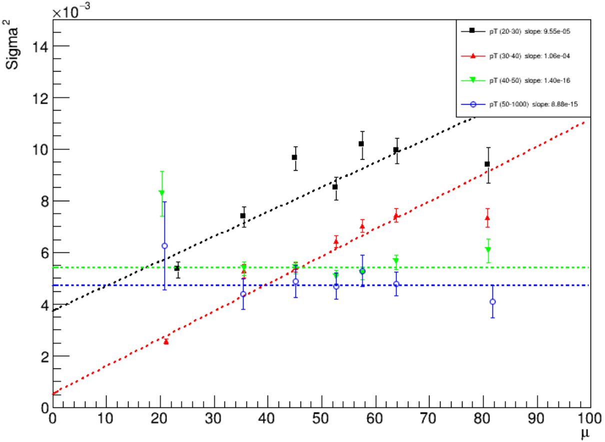
$\times 10^{-3}$
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
pT (20-30) slope: 7.16e-05
pT (30-40) slope: 4.99e-05
pT (40-50) slope: 4.59e-05
pT (50-1000) slope: 3.36e-05

Sigma^2 η 2



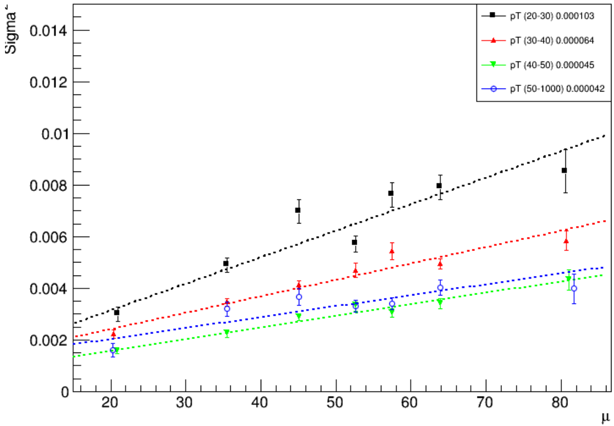
×10^-3
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
pT (20-30) slope: 9.14e-05
pT (30-40) slope: 6.92e-05
pT (40-50) slope: 4.84e-05
pT (50-1000) slope: 4.86e-05

Sigma^2 η 3



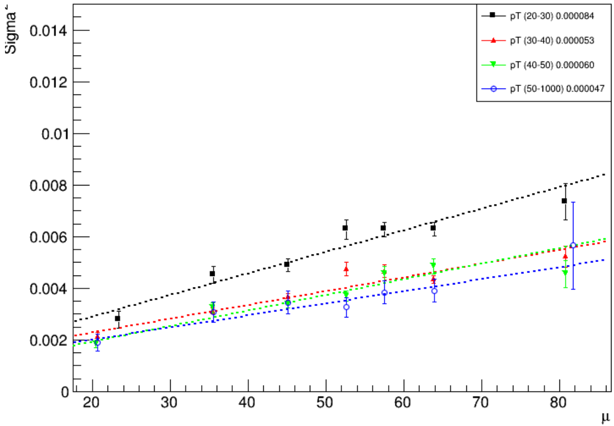
×10^-3
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
pT (20-30) slope: 9.55e-05
pT (30-40) slope: 1.06e-04
pT (40-50) slope: 1.40e-16
pT (50-1000) slope: 8.88e-15

Sigma^2 η 4



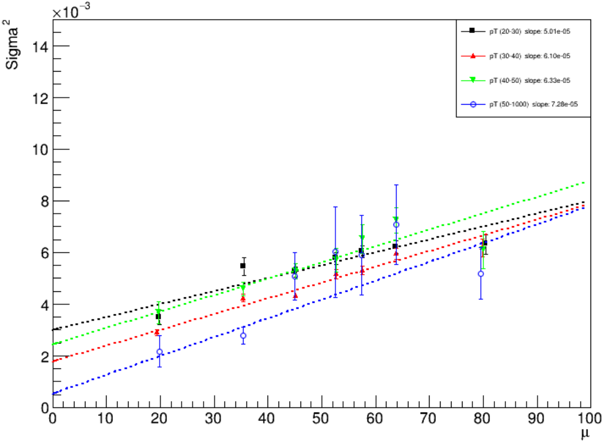
Sigma^
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
20
30
40
50
60
70
80
μ
pT (20-30) 0.000103
pT (30-40) 0.000064
pT (40-50) 0.000045
pT (50-1000) 0.000042

Sigma^2 η 5



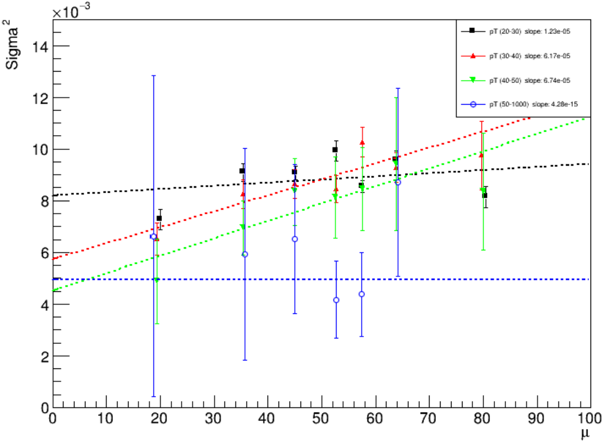
Sigma^
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
20
30
40
50
60
70
80
μ
pT (20-30) 0.000084
pT (30-40) 0.000053
pT (40-50) 0.000060
pT (50-1000) 0.000047

Sigma^2 η 6



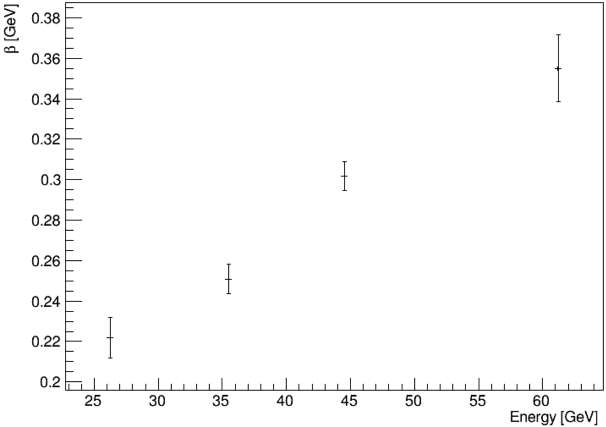
×10^-3
Sigma^2
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
μ
pT (20-30) slope: 5.01e-05
pT (30-40) slope: 6.10e-05
pT (40-50) slope: 6.33e-05
pT (50-1000) slope: 7.28e-05

Sigma^2 η 7

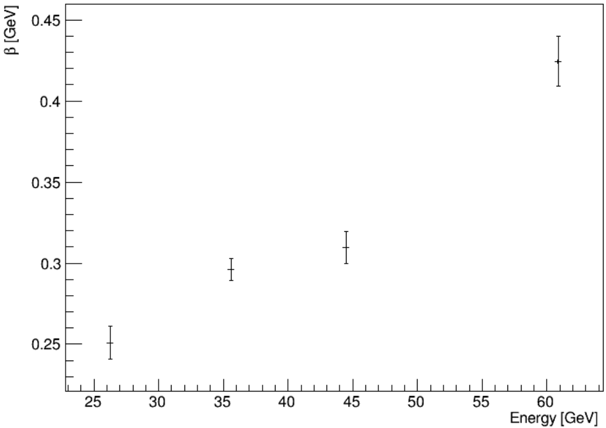


$\times10^{-3}$
Sigma^2
pT (20-30) slope: 1.23e-05
pT (30-40) slope: 6.17e-05
pT (40-50) slope: 6.74e-05
pT (50-1000) slope: 4.28e-15
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
70
80
90
100
μ

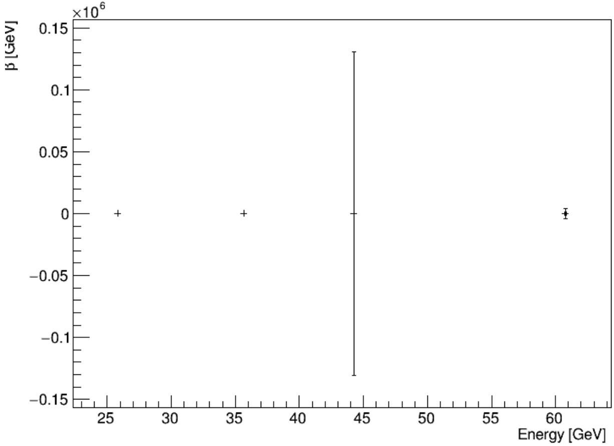
Beta vs p_t η 1



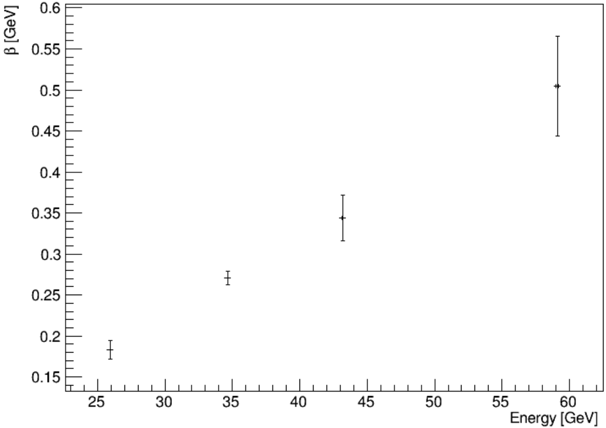
Beta vs p_t η 2



Beta vs p_t η 3



Beta vs p_t η 6



Beta vs p_t η 7