Diffractive Dijets with VFPS

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Talk Overview

- Control Plots
- Systematics
- Migrations
- Had Corr. + Rad. Corr.
- Unfolding+NLO

Overview of DIS

- VFPS data from
  17.11.06-20.3.07 L=30.2 pb^{-1}, 318 events
- Trigger
  S103 = Hard track + VFPS signal
  ~80 % efficiency
  For these 318 S103 DIS events also S115 fired
- H1oo 4.0.25 and the newest VFPS calib.
- Iterative HFS calibration, jets defined by inclusive kt (R=1) in γp frame
- RAPGAP (IP-bgf,cha,qcdc; IR – bgf) used for detector-level corrections and hadr.,rad. corr.
- Data will be compared with NLOJET++ predictions adapted for diffraction in DIS

Cuts and Trigger

- Scattered electron in SPACAL

$$0.2 < y_{es} < 0.7$$
$$4 < Q^2_{es} < 80$$
$$14.5 < R < 74 \wedge E_e > 9.5$$
$$|z_{vtx}| < 30\,\mathrm{cm}$$

Jet-cuts

$$E_T^{*\,\mathrm{jet1}} > 5.5\,\mathrm{GeV} \quad -1 < \eta_{\mathrm{lab}}^{\mathrm{jet1,2}} < 2.5$$
$$E_T^{*\,\mathrm{jet2}} > 4\,\mathrm{GeV} \quad z_{IP} < 0.8$$

- Trigger signal from both VFPS
- Reconstructed track in both VFPS stations

$$0.010 < x_{IP}^{\mathrm{vfps}} < 0.024$$
$$x_{IP}^{\mathrm{hfs}} < 0.04$$
$$x_{IP}^{\mathrm{vfps}} / x_{IP}^{\mathrm{hfs}} > 0.6$$
$$|t| < 0.6\,\mathrm{GeV}^2$$

From neural network

Q^2, y

e-sigma method

$$z_{IP} = \frac{Q^2 + M_{12}^2}{Q^2 + M_X^2}$$

S103 – Untagged Photoproduction with VFPS (Definition 2 and 3)

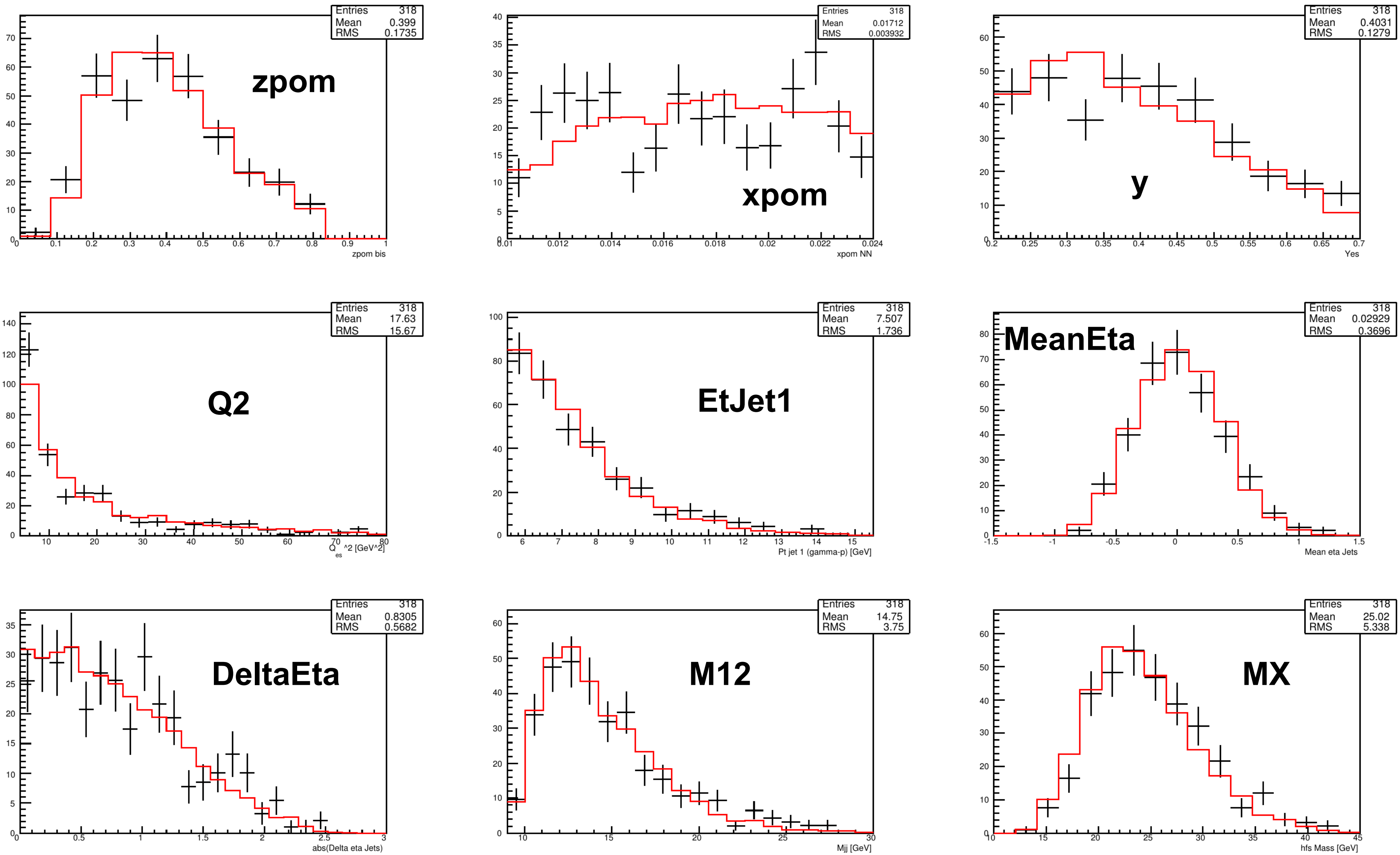
- LAr_IF<2
- CIP_sig>2 && CIP_cosmic && CIP_T0
- FTT_mul_Tc>1 && !FTT_topo_6 && FTT_Td_gt_1_zvtx
- VFPS1 && VFPS2
- *!SPCLh_AToF_E_1*
- *!VETO_BG && !(BtoF_BG && BtoF_Gl && !BToF_IA) && !SToF_BG*

L2

Absent in D2

Control Plots

DIS Data
RAPGAP



Systematics

Model Shifts

Type	Weight
Jet1Pt	$\left(E_T^{\mathrm{jet1}}\right)^{\pm 0.4}$
Xpom	$x_{IP}^{\pm 0.2}$
Zpom	$z_{IP}^{\pm 0.3}$
Xgamma	$x_{\gamma}^{\pm 0.3}$
Y	$y^{\pm 0.3}$
T- slope	$e^{\pm t}$
Q2	$\left(Q^2\right)^{\pm 0.2}$

$$\Delta = \sqrt{\frac{\Delta_{up}^2 + \Delta_{dn}^2}{2}}$$

+ 6% normalization error

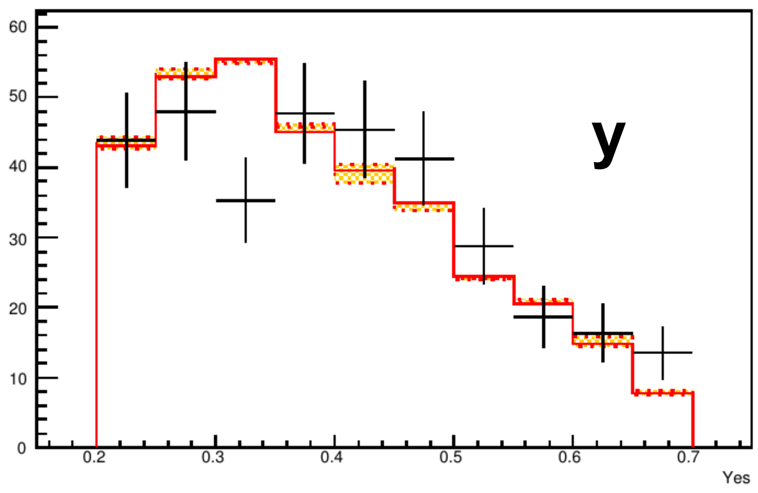
ElecE ± 1%
ElecTheta ± 1 mrad

Type	Effect on X-section
VFPS X	± 0.9%
VFPS Y	± 1.8%
VFPS X'	± 2.2%
VFPS Y'	± 0.7%
VFPS θx	± 2.1%
HFS calib	± 6.0%
Elec E	**± 0.3%**
Elec Theta	**± 0.8%**
Jet1Pt	± 3.7%
Xpom	± 0.6%
Zpom	± 2.1%
Xgamma	± 1.7%
Y	± 0.5%
T-slope	± 2.3%
Q2	± 0.6%

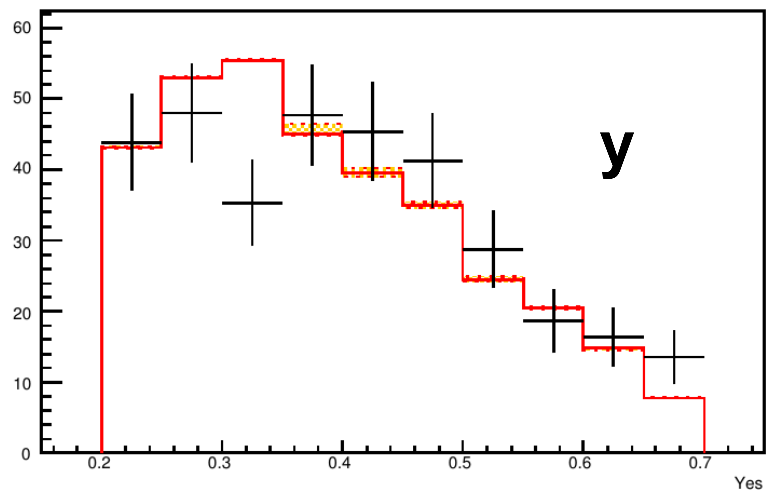
Systematics

- In comparison to PHP case shifted also electron quantities (=elec. E, elec Theta)

ElecE shift

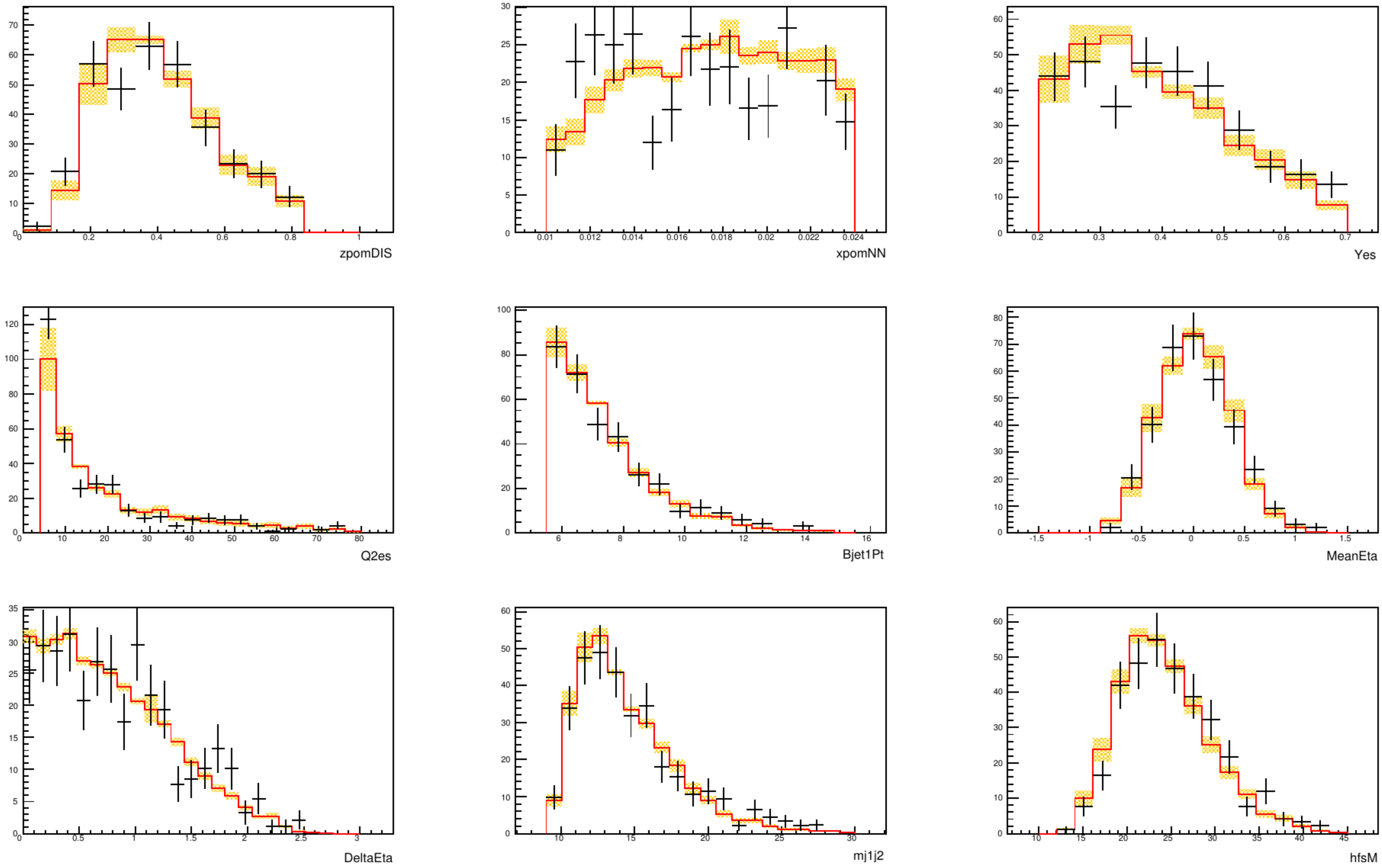


ElecTheta shift

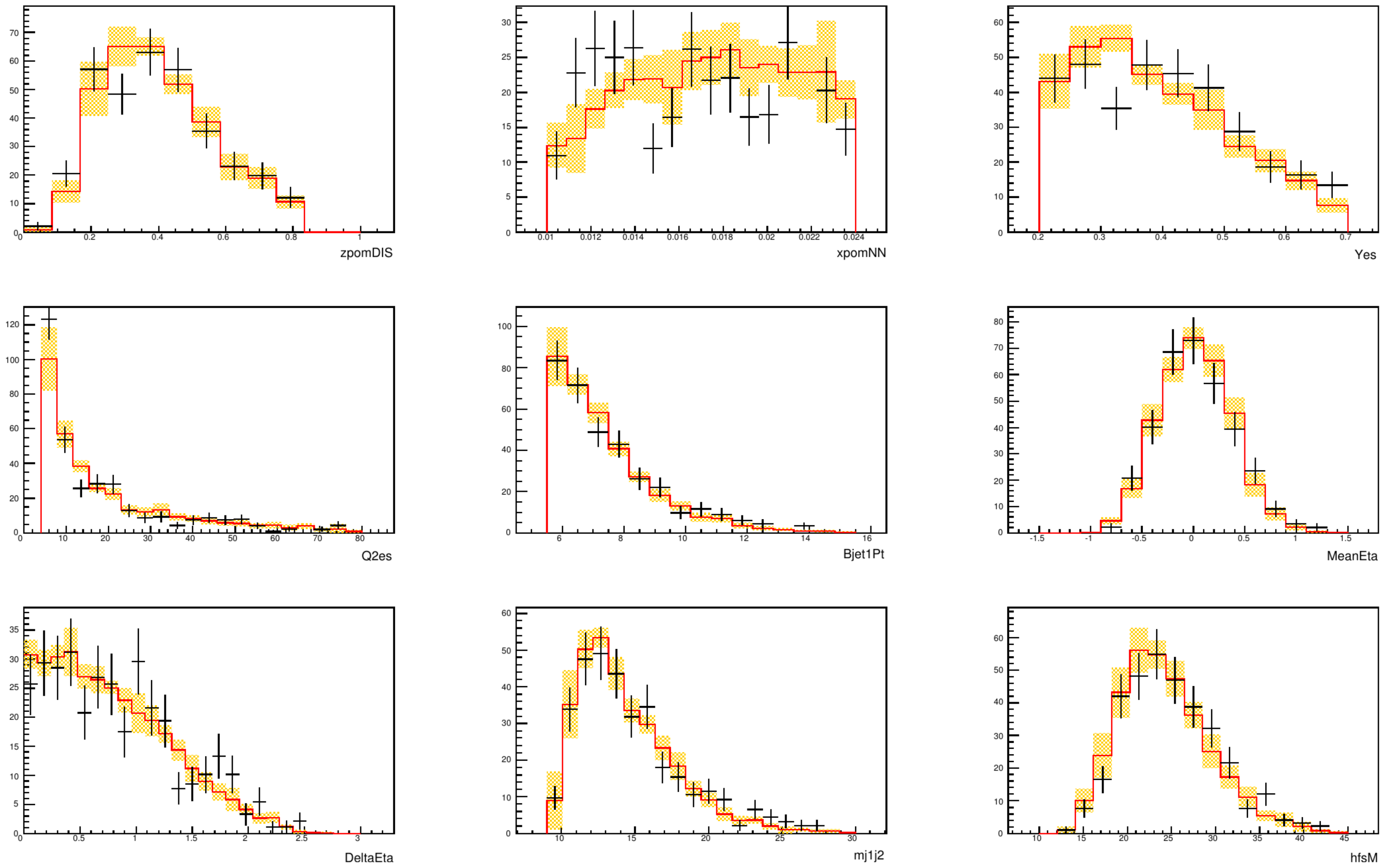


All Model Shifts

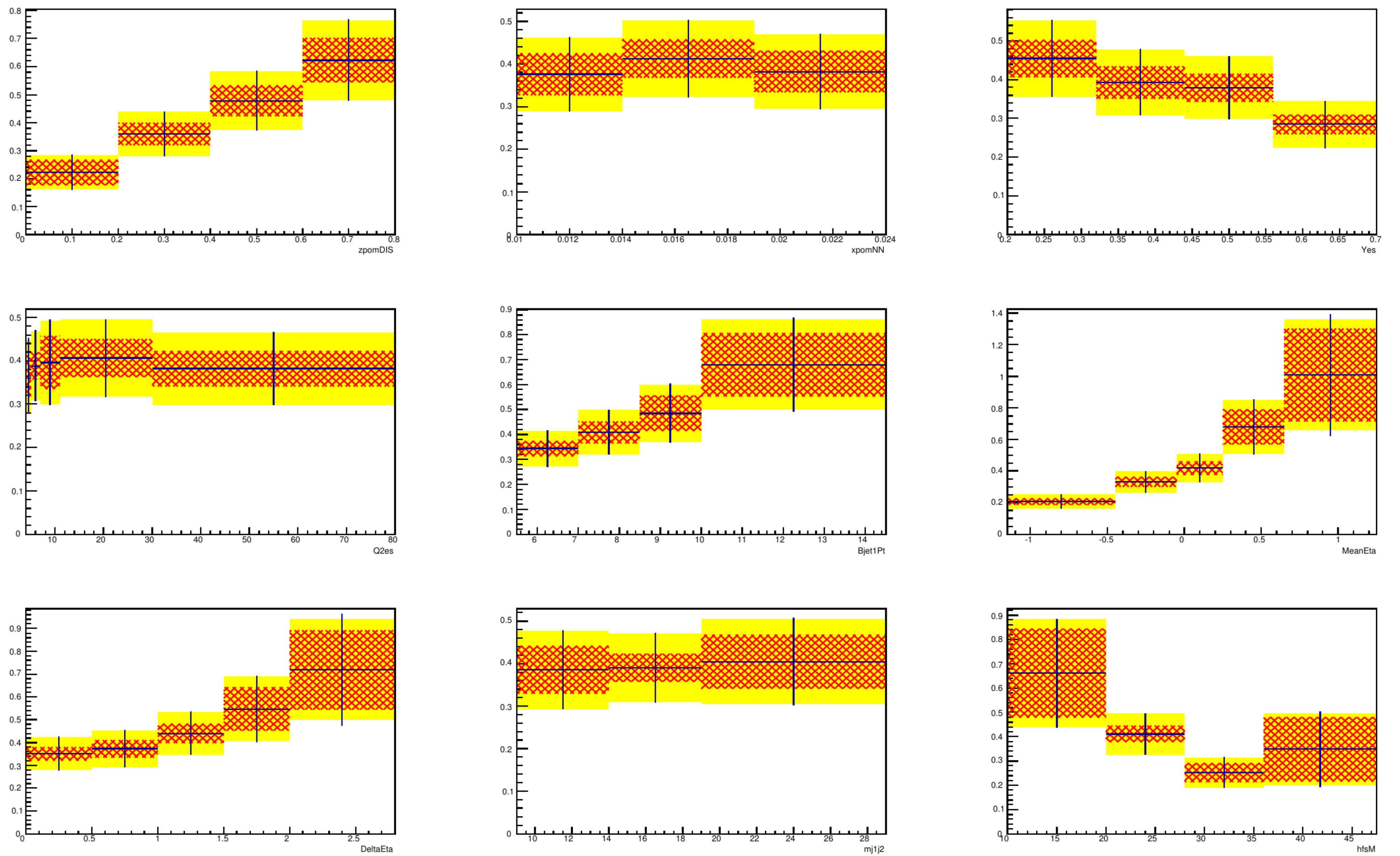
Differences from central value added in quadrature



All Systematics



Acceptance


Syst. error
Norm.+sys.. error
zpomDIS
xpomNN
Yes
Q2es
Bjet1Pt
MeanEta
DeltaEta
mj1j2
hfsM

Migrations

- These phase-spaces chosen to account for migration effects

LowPtJets	Rest
MonoJets	Low Q2
Eta Out	High xpom
PS	Low y
	High zpom

LowPt Jets

$$3.2 < E_T^{*\,jet1} < 5.5$$
$$E_T^{*\,jet2} > 3.2$$

Mono Jets

$$E_T^{*\,jet1} > 5.5$$
$$3.2 < E_T^{*\,jet2} < 4$$

EtaOut Jets

$$\eta^{jet1,2} < -1$$
$$\eta^{jet1,2} > 2.5$$

Low Q2

$$E_T^{*\,jet1} > 4$$
$$E_T^{*\,jet2} > 3.2$$
$$3 < Q^2 < 4$$

Low y

$$E_T^{*\,jet1} > 5.0$$
$$E_T^{*\,jet2} > 3.8$$
$$y < 0.2$$

High zpom

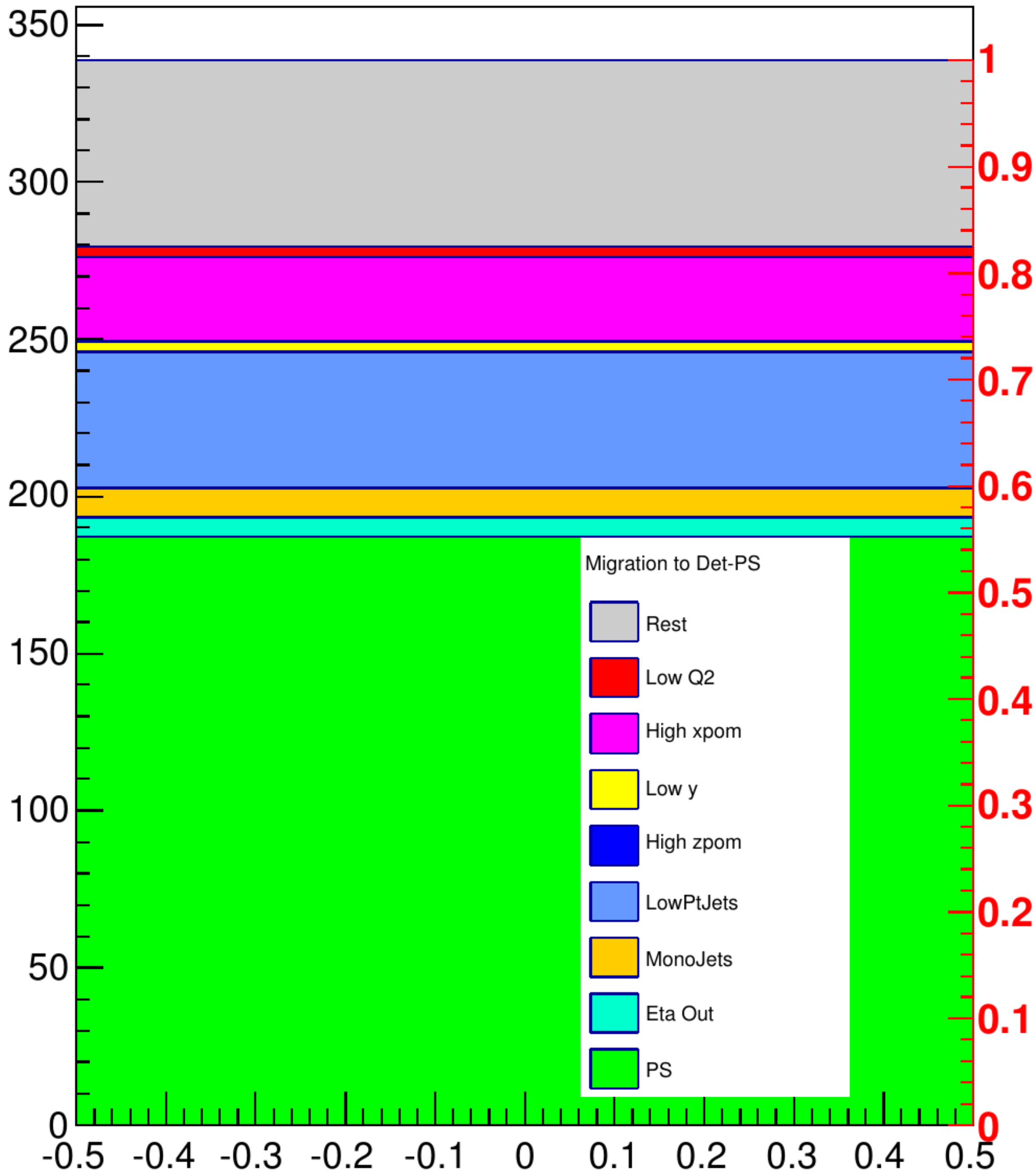
$$E_T^{*\,jet1} > 4$$
$$E_T^{*\,jet2} > 3.2$$
$$z_{IP} > 0.8$$

High xpom

$$E_T^{*\,jet1} > 4$$
$$E_T^{*\,jet2} > 3.2$$
$$0.24 < x_{IP} < 0.28$$

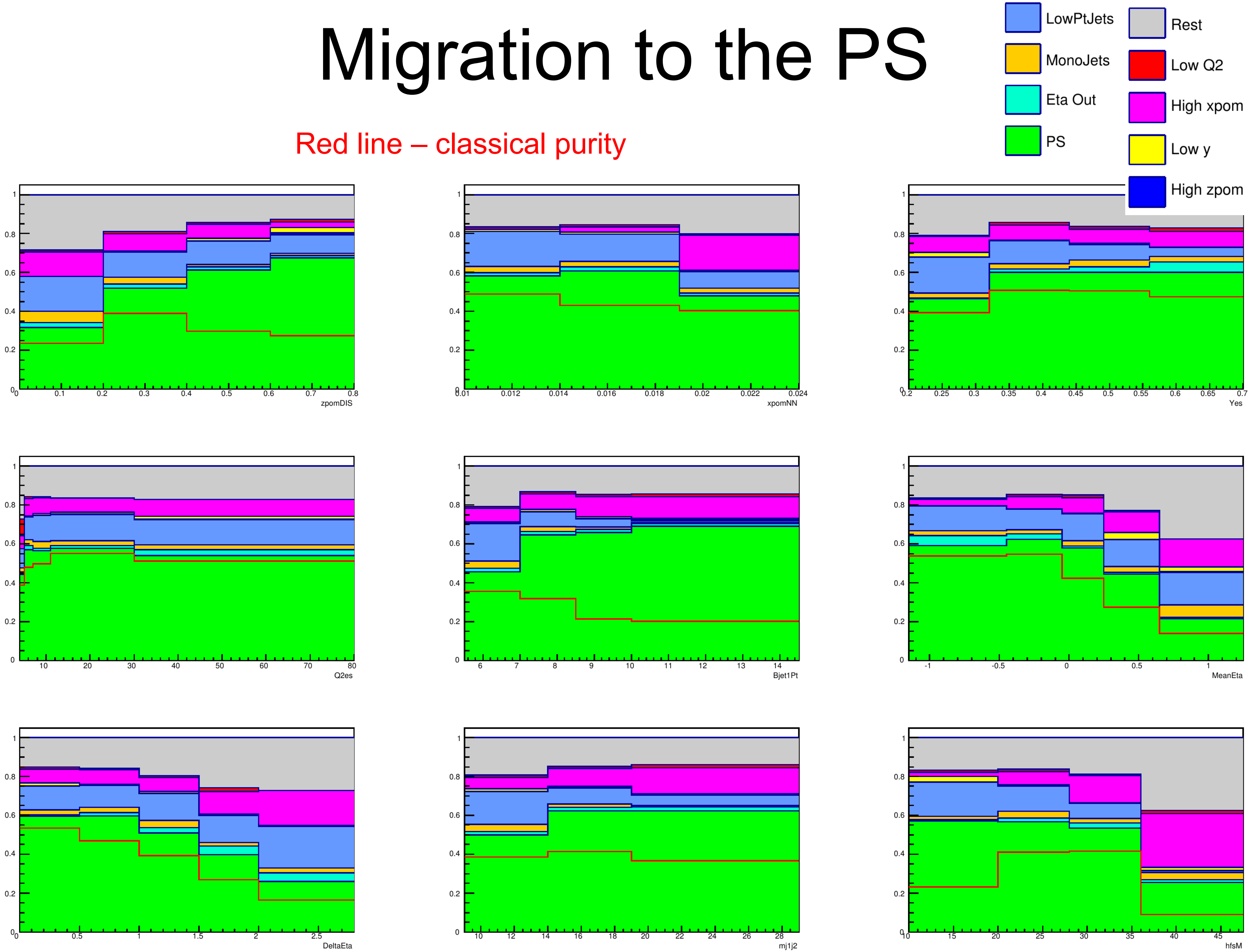
The remaining 18% of impurity mainly from events with even lower pt

Unpurity Sources

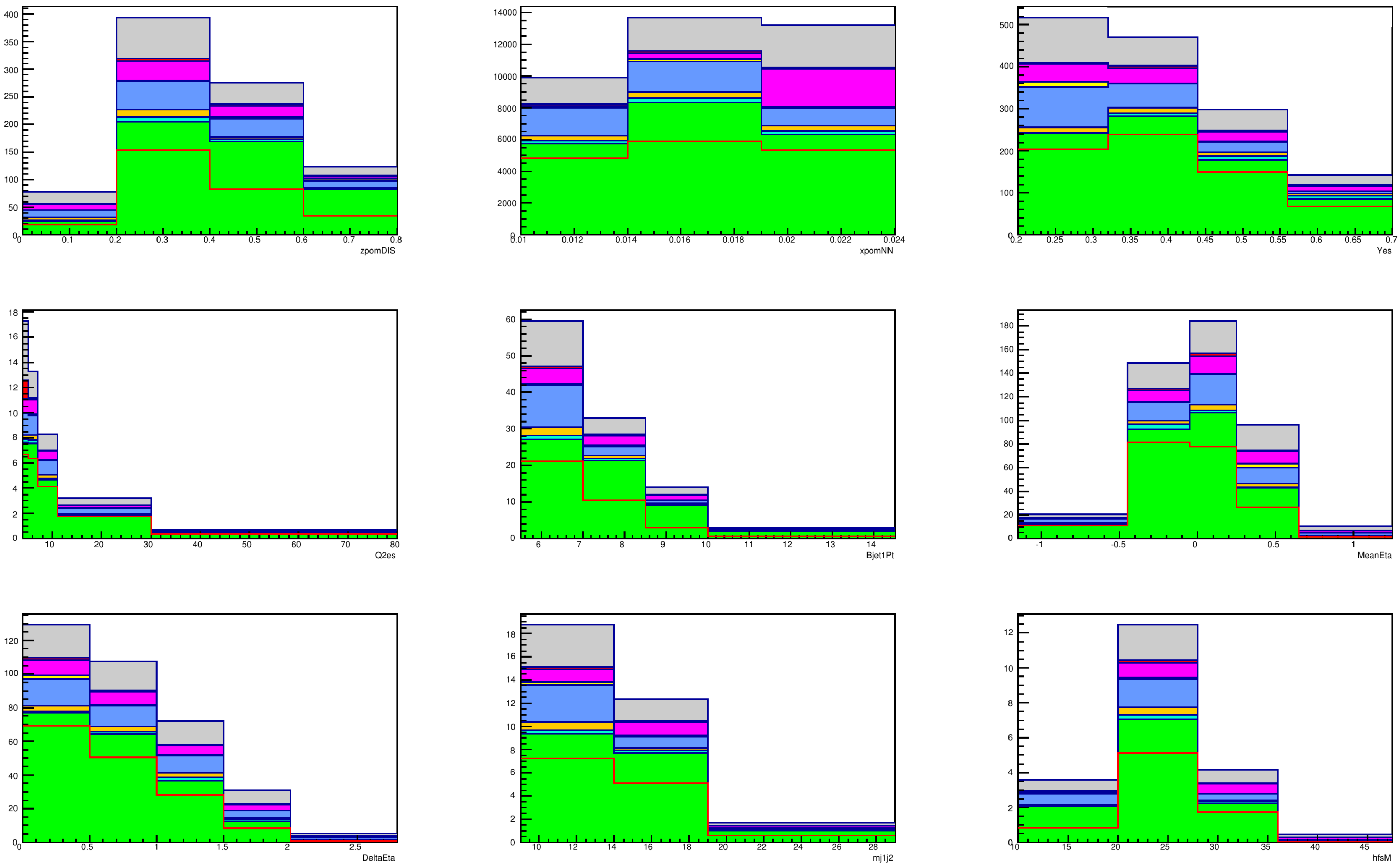


Migration to the PS

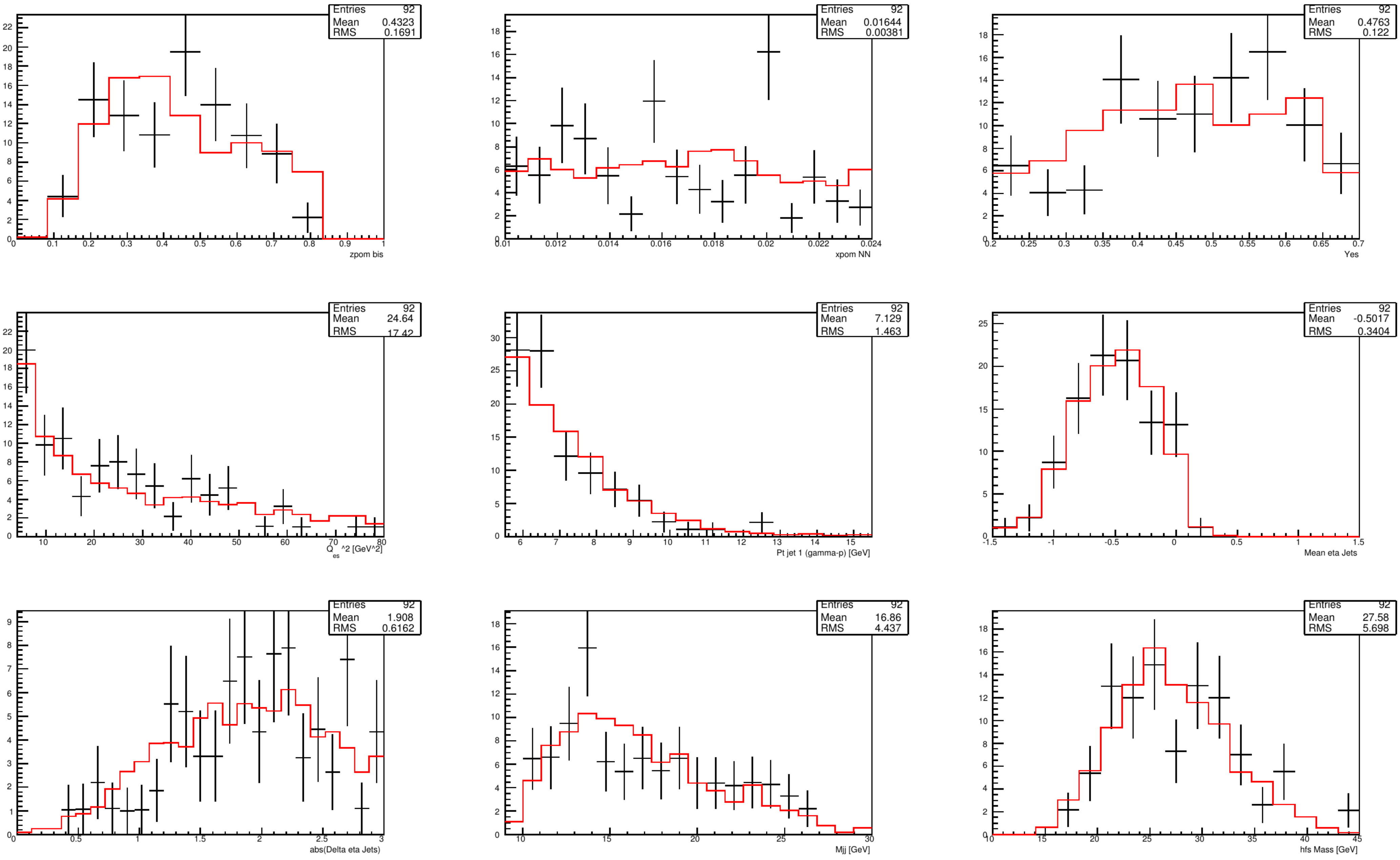
Red line – classical purity



Migration Control Plots

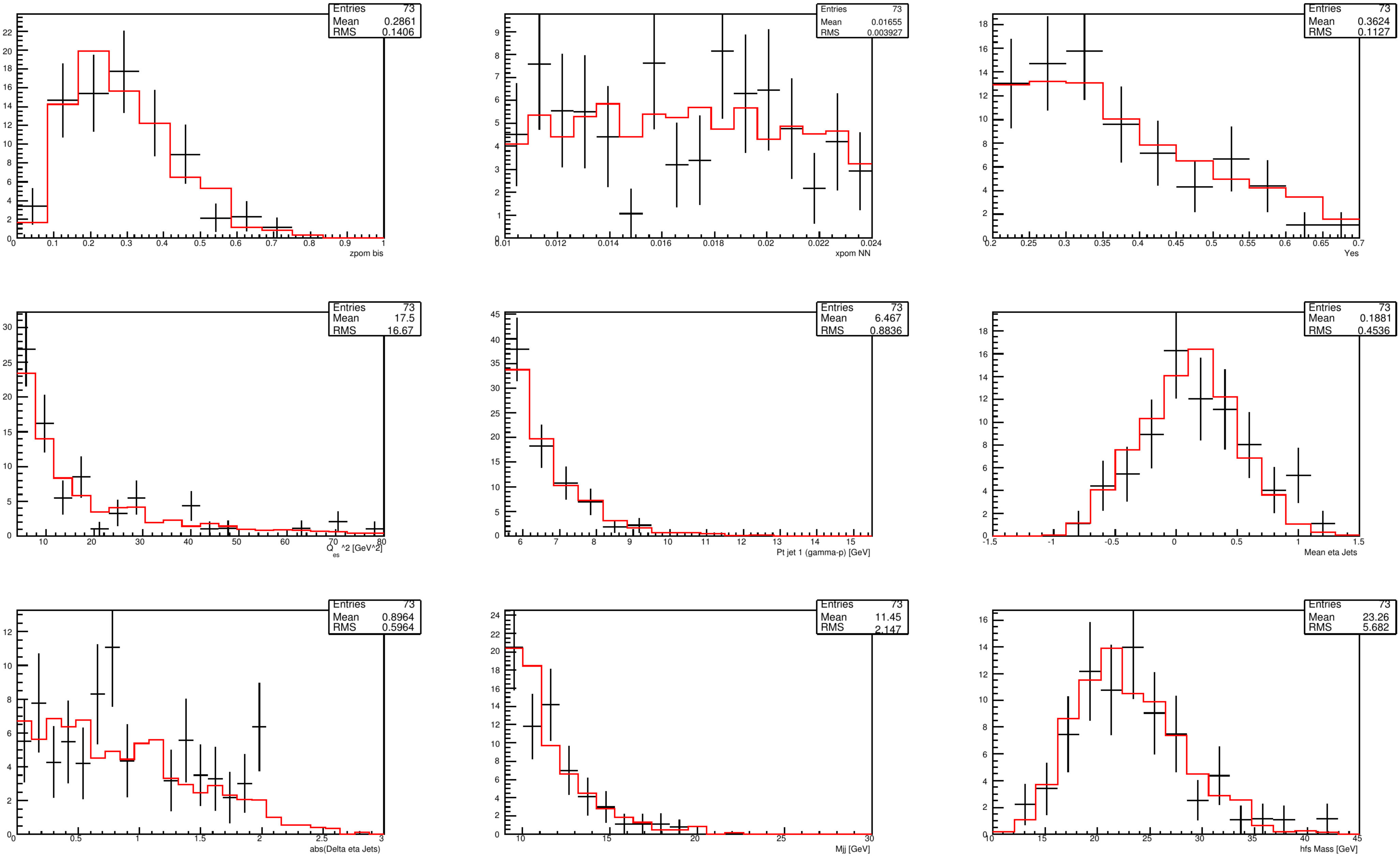


Eta Out

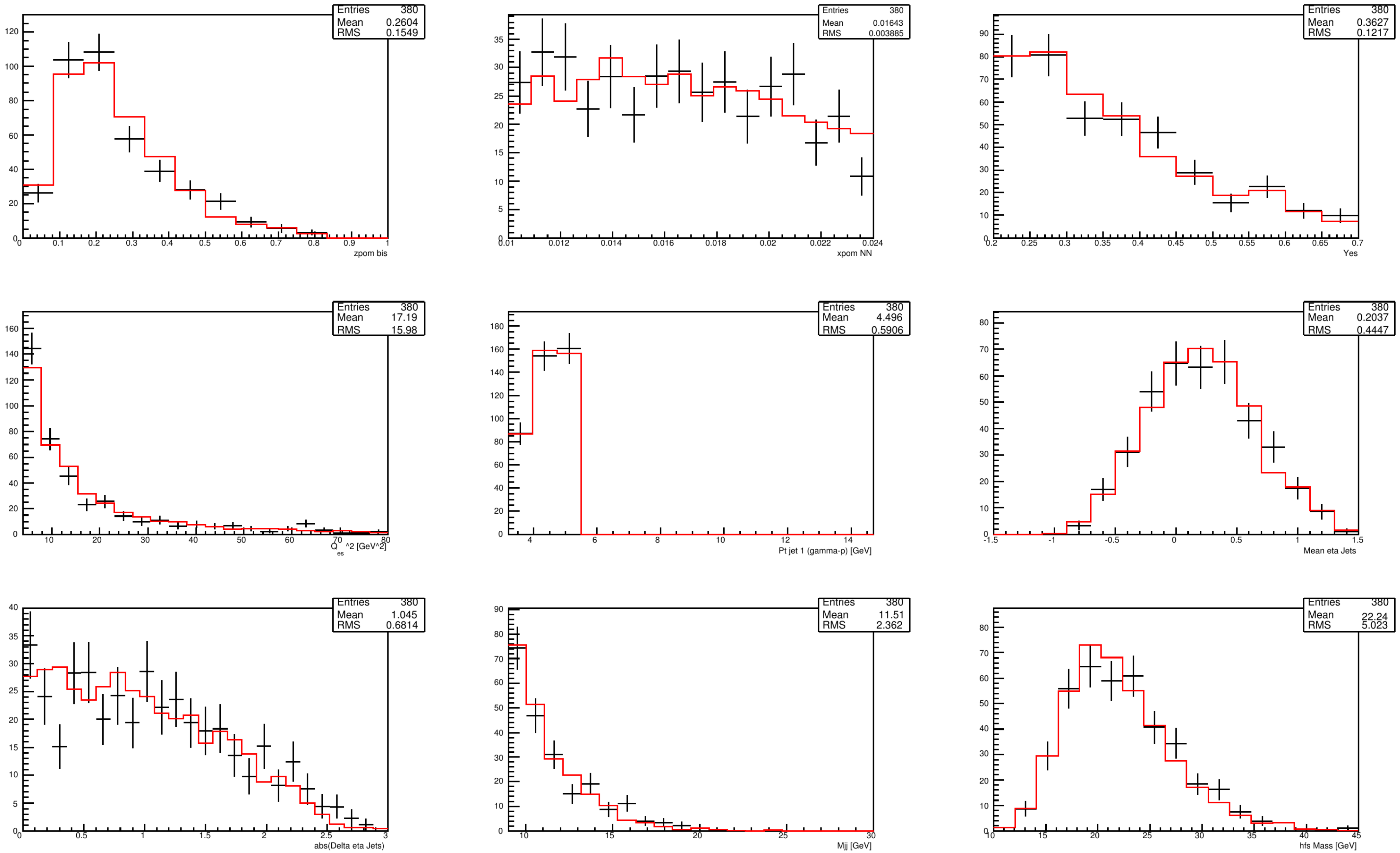


Entries 92
Mean 0.4323
RMS 0.1691
zpom bis
Entries 92
Mean 0.01644
RMS 0.00381
xpom NN
Entries 92
Mean 0.4763
RMS 0.122
Yes
Entries 92
Mean 24.64
RMS 17.42
Q_es^2 [GeV^2]
Entries 92
Mean 7.129
RMS 1.463
Pt jet 1 (gamma-p) [GeV]
Entries 92
Mean -0.5017
RMS 0.3404
Mean eta Jets
Entries 92
Mean 1.908
RMS 0.6162
abs(Delta eta Jets)
Entries 92
Mean 16.86
RMS 4.437
Mjj [GeV]
Entries 92
Mean 27.58
RMS 5.698
hfs Mass [GeV]

Mono Jet

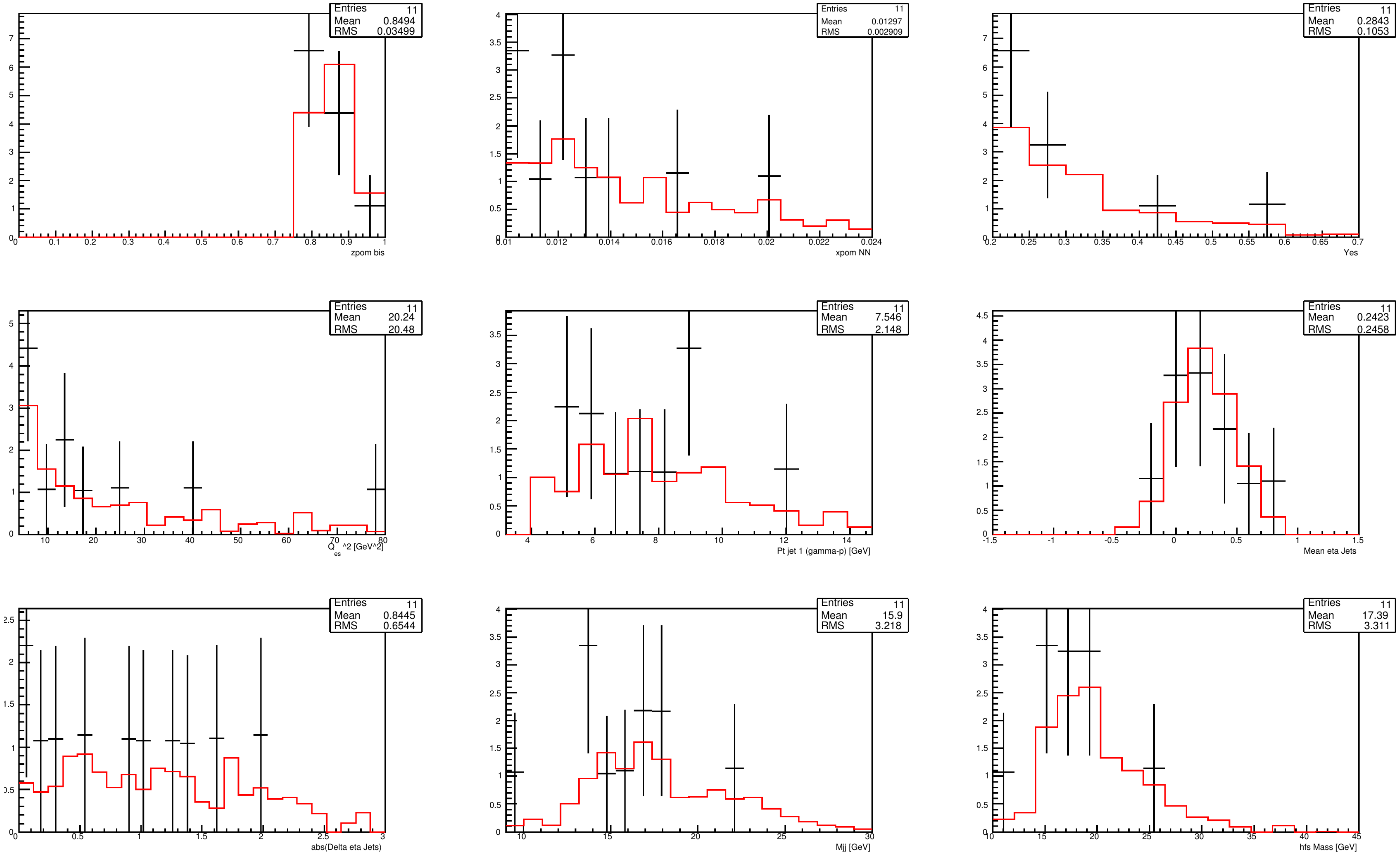

Entries 73
Mean 0.2861
RMS 0.1406
zpom bis
Entries 73
Mean 0.01655
RMS 0.003927
xpom NN
Entries 73
Mean 0.3624
RMS 0.1127
Yes
Entries 73
Mean 17.5
RMS 16.67
Q_es^2 [GeV^2]
Entries 73
Mean 6.467
RMS 0.8836
Pt jet 1 (gamma-p) [GeV]
Entries 73
Mean 0.1881
RMS 0.4536
Mean eta Jets
Entries 73
Mean 0.8964
RMS 0.5964
abs(Delta eta Jets)
Entries 73
Mean 11.45
RMS 2.147
Mjj [GeV]
Entries 73
Mean 23.26
RMS 5.682
hfs Mass [GeV]

Low Pt Jets



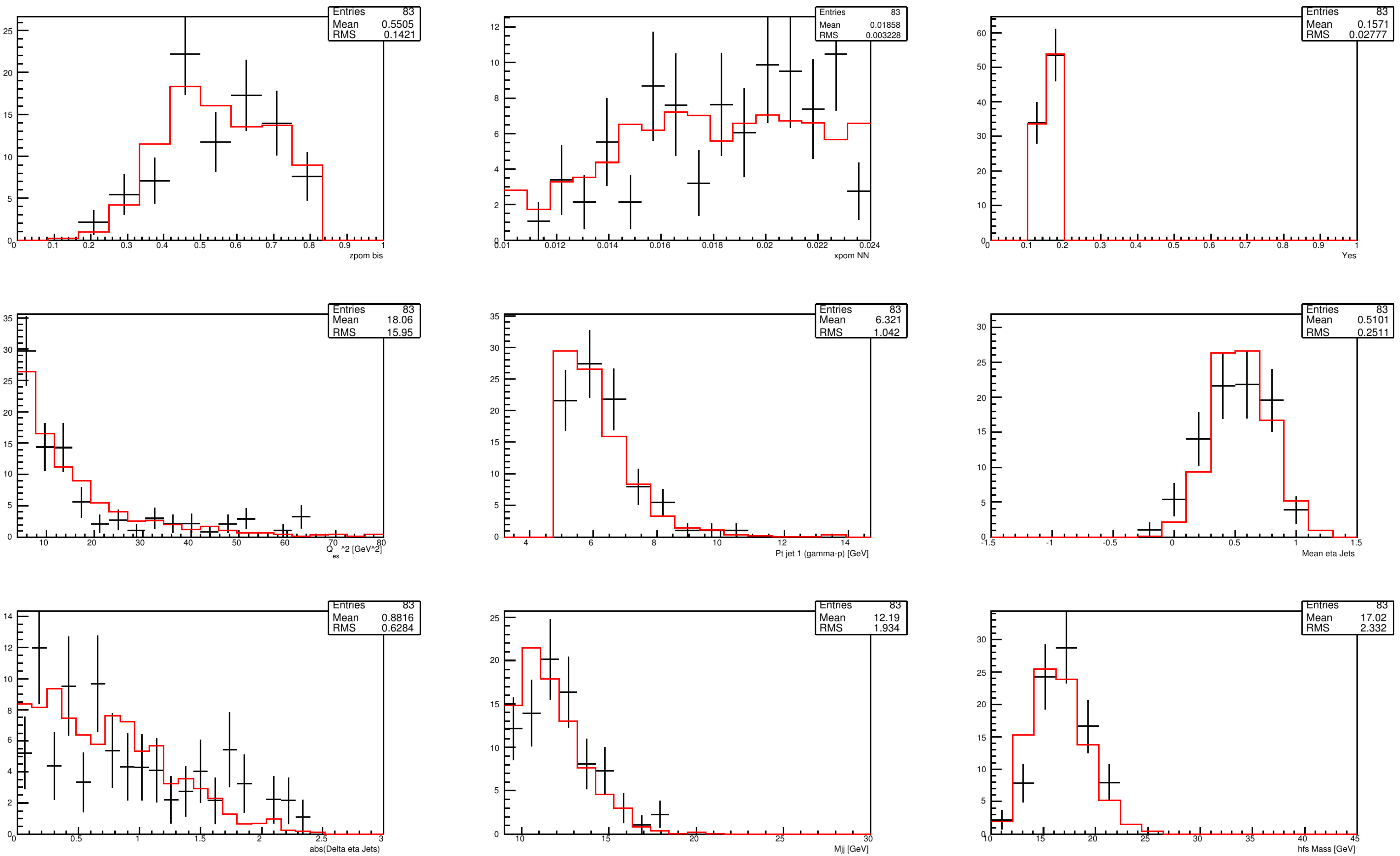
Entries 380
Mean 0.2604
RMS 0.1549
zpom bis
Entries 380
Mean 0.01643
RMS 0.003885
xpom NN
Entries 380
Mean 0.3627
RMS 0.1217
Yes
Entries 380
Mean 17.19
RMS 15.98
Q_es^2 [GeV^2]
Entries 380
Mean 4.496
RMS 0.5906
Pt jet 1 (gamma-p) [GeV]
Entries 380
Mean 0.2037
RMS 0.4447
Mean eta Jets
Entries 380
Mean 1.045
RMS 0.6814
abs(Delta eta Jets)
Entries 380
Mean 11.51
RMS 2.362
Mjj [GeV]
Entries 380
Mean 22.24
RMS 5.023
hfs Mass [GeV]

High Zpom

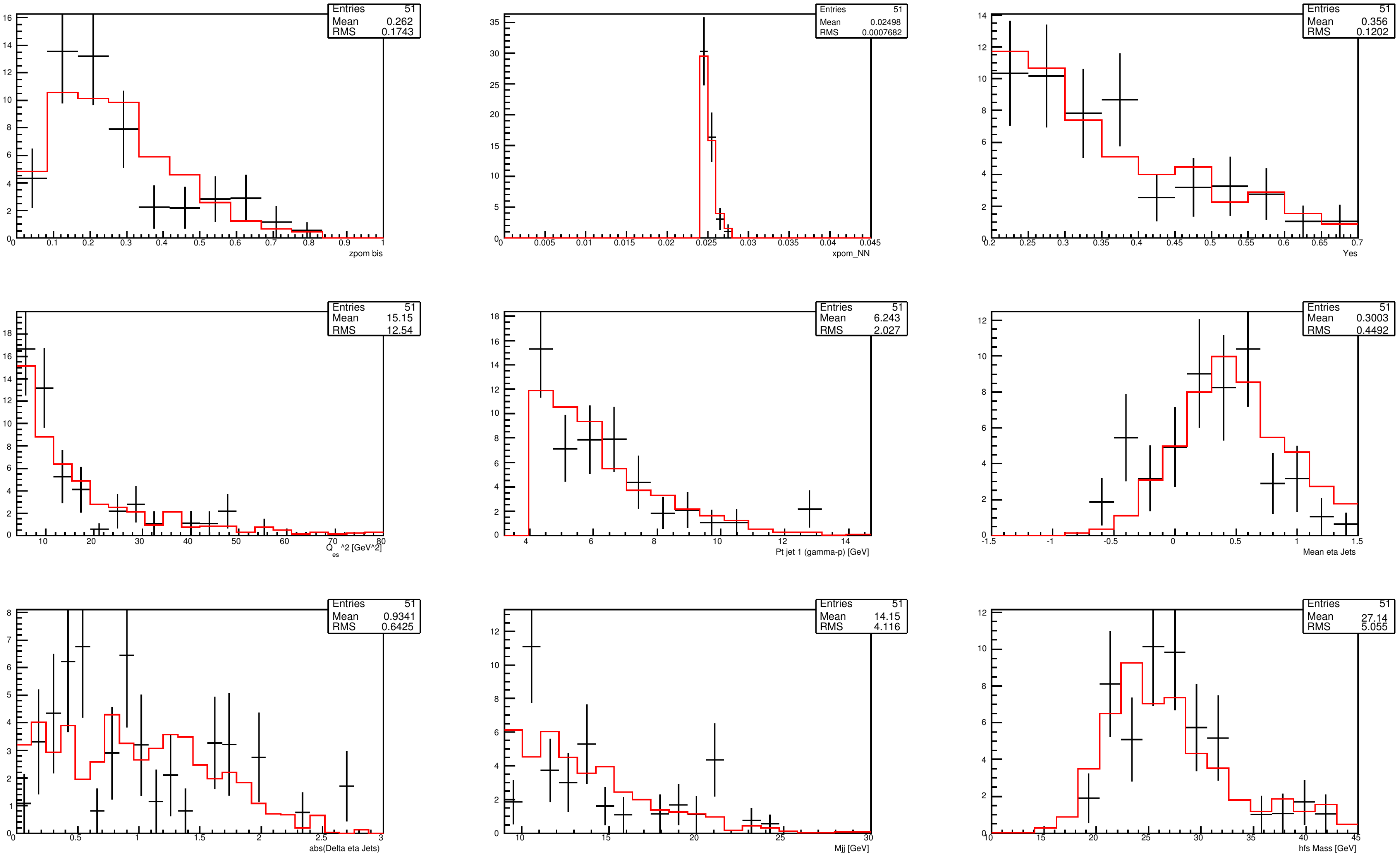


Entries 11
Mean 0.8494
RMS 0.03499
zpom bis
Entries 11
Mean 0.01297
RMS 0.002909
xpom NN
Entries 11
Mean 0.2843
RMS 0.1053
Yes
Entries 11
Mean 20.24
RMS 20.48
Q_es^2 [GeV^2]
Entries 11
Mean 7.546
RMS 2.148
Pt jet 1 (gamma-p) [GeV]
Entries 11
Mean 0.2423
RMS 0.2458
Mean eta Jets
Entries 11
Mean 0.8445
RMS 0.6544
abs(Delta eta Jets)
Entries 11
Mean 15.9
RMS 3.218
Mjj [GeV]
Entries 11
Mean 17.39
RMS 3.311
hfs Mass [GeV]

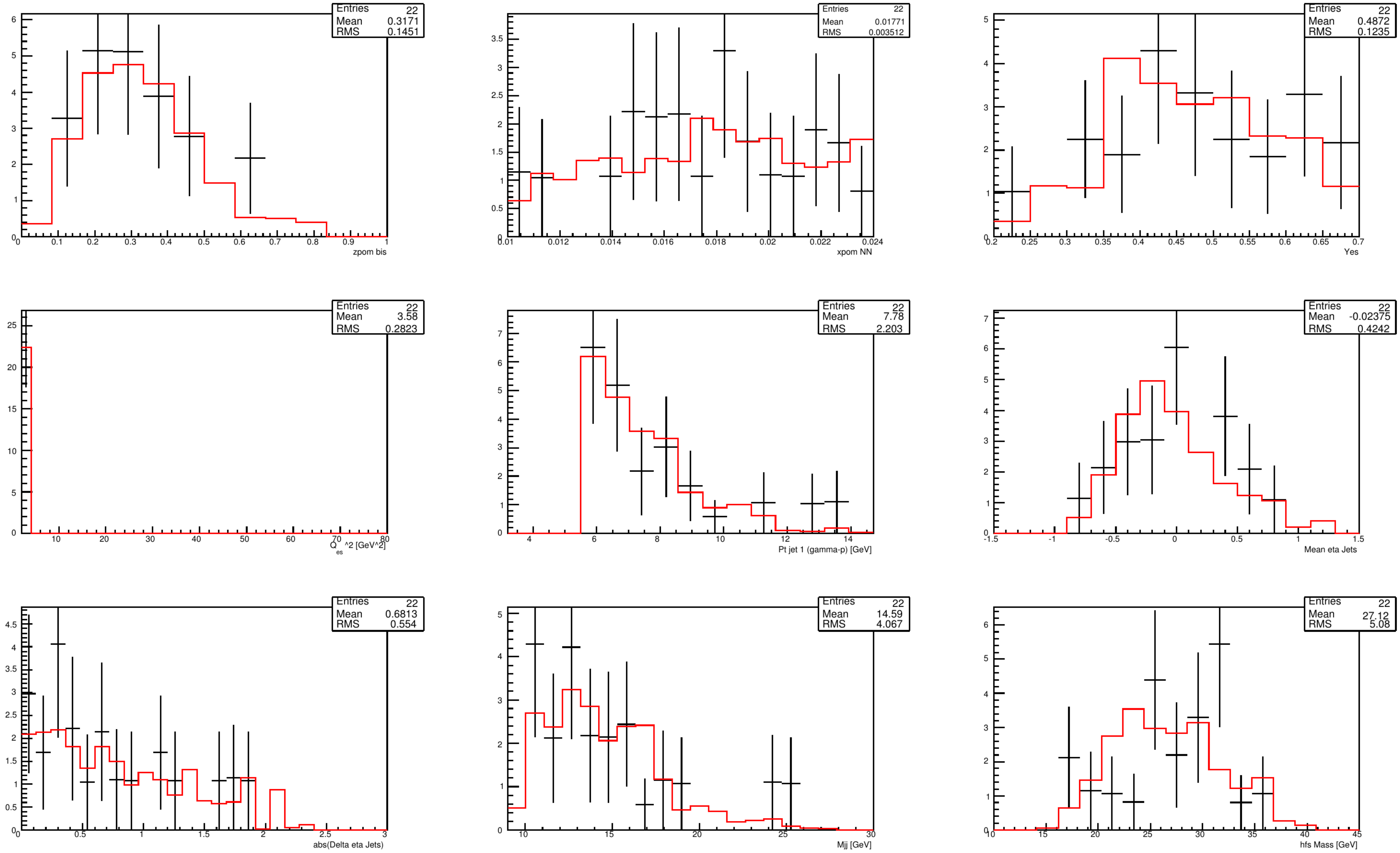
Low Y


Entries 83
Mean 0.5505
RMS 0.1421
zpom bis
Entries 83
Mean 0.01858
RMS 0.003228
xpom NN
Entries 83
Mean 0.1571
RMS 0.02777
Yes
Entries 83
Mean 18.06
RMS 15.95
Q_es^2 [GeV^2]
Entries 83
Mean 6.321
RMS 1.042
Pt jet 1 (gamma-p) [GeV]
Entries 83
Mean 0.5101
RMS 0.2511
Mean eta Jets
Entries 83
Mean 0.8816
RMS 0.6284
abs(Delta eta Jets)
Entries 83
Mean 12.19
RMS 1.934
Mjj [GeV]
Entries 83
Mean 17.02
RMS 2.332
hfs Mass [GeV]

High Xpom


Entries 51
Mean 0.262
RMS 0.1743
zpom bis
Entries 51
Mean 0.02498
RMS 0.0007682
xpom_NN
Entries 51
Mean 0.356
RMS 0.1202
Yes
Entries 51
Mean 15.15
RMS 12.54
Q^2 [GeV^2]
Entries 51
Mean 6.243
RMS 2.027
Pt jet 1 (gamma-p) [GeV]
Entries 51
Mean 0.3003
RMS 0.4492
Mean eta Jets
Entries 51
Mean 0.9341
RMS 0.6425
abs(Delta eta Jets)
Entries 51
Mean 14.15
RMS 4.116
Mjj [GeV]
Entries 51
Mean 27.14
RMS 5.055
hfs Mass [GeV]

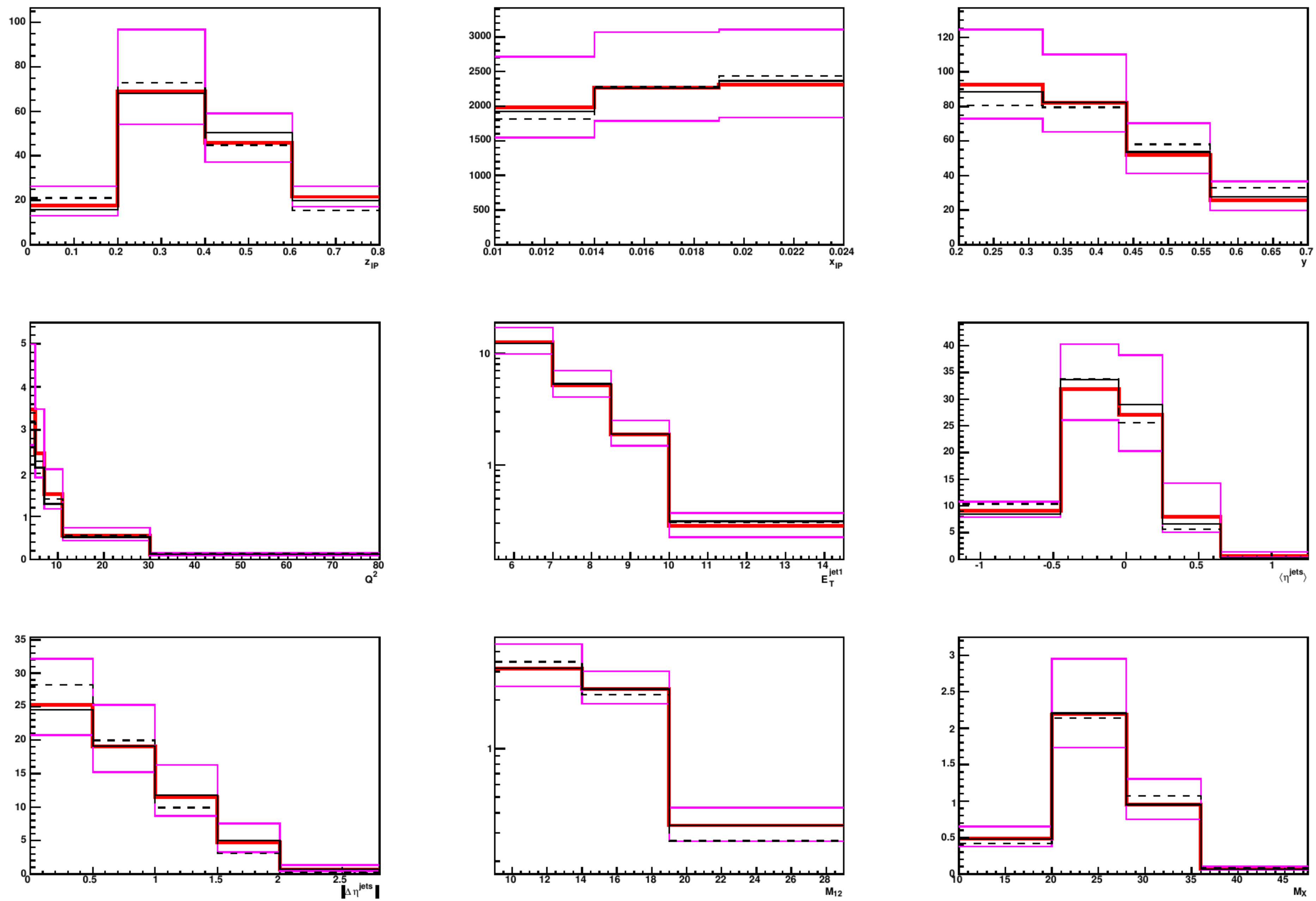
Low Q2



Entries 22
Mean 0.3171
RMS 0.1451
zpom bis
Entries 22
Mean 0.01771
RMS 0.003512
xpom NN
Entries 22
Mean 0.4872
RMS 0.1235
Yes
Entries 22
Mean 3.58
RMS 0.2823
Q_es^2 [GeV^2]
Entries 22
Mean 7.78
RMS 2.203
Pt jet 1 (gamma-p) [GeV]
Entries 22
Mean -0.02375
RMS 0.4242
Mean eta Jets
Entries 22
Mean 0.6813
RMS 0.554
abs(Delta eta Jets)
Entries 22
Mean 14.59
RMS 4.067
Mjj [GeV]
Entries 22
Mean 27.12
RMS 5.08
hfs Mass [GeV]

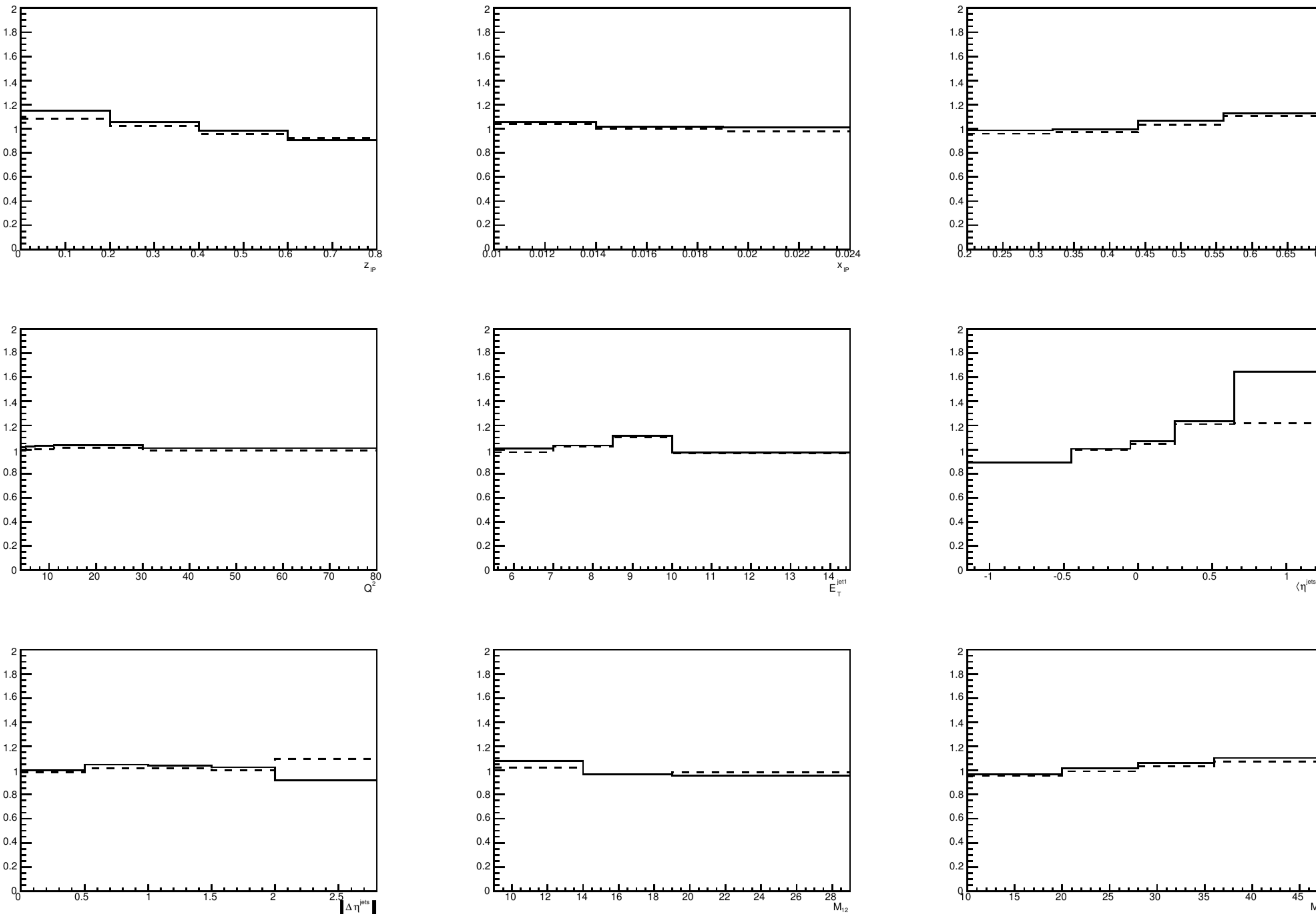
NLO vs Rapgap Parton Level

Central NLO Scale-shifted NLO Dotted-Rapgap Solid-Rapgap reweight



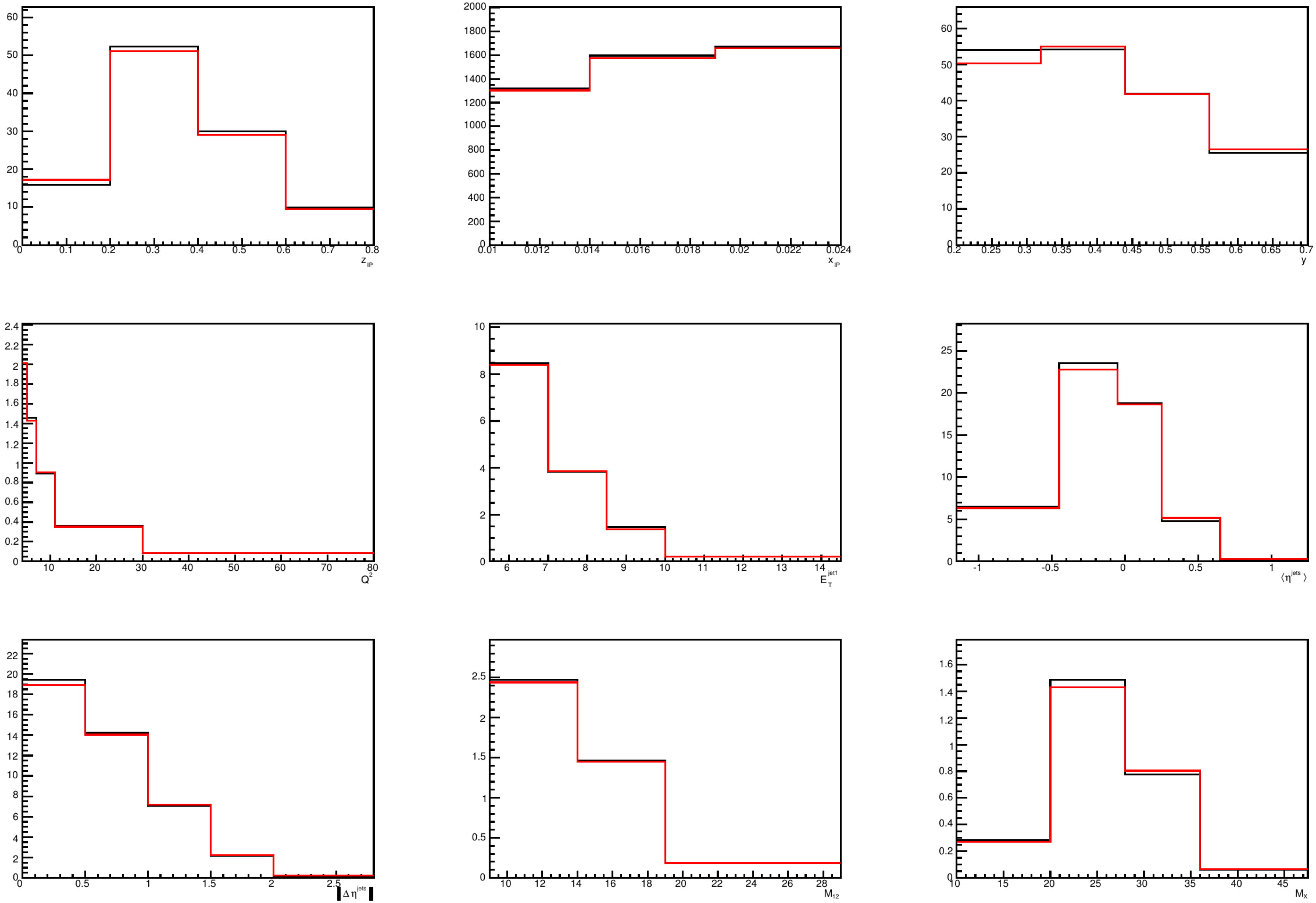
Hadronization Corrections

Dotted-no reweighting Solid-reweight

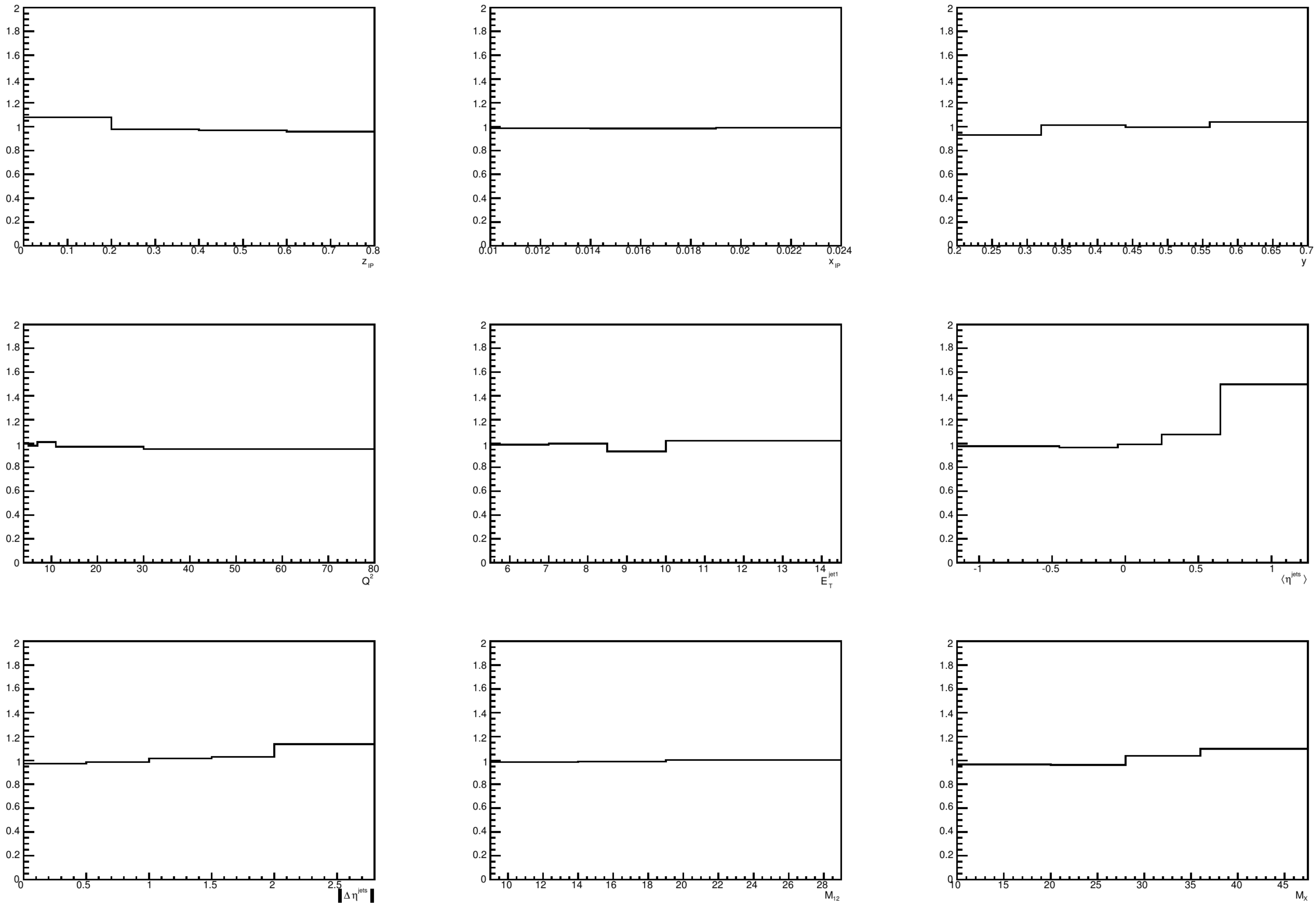


Rad. Vs nRad. Rapgap

Black – non-Rad. Rapgap Red – Rad. Rapgap

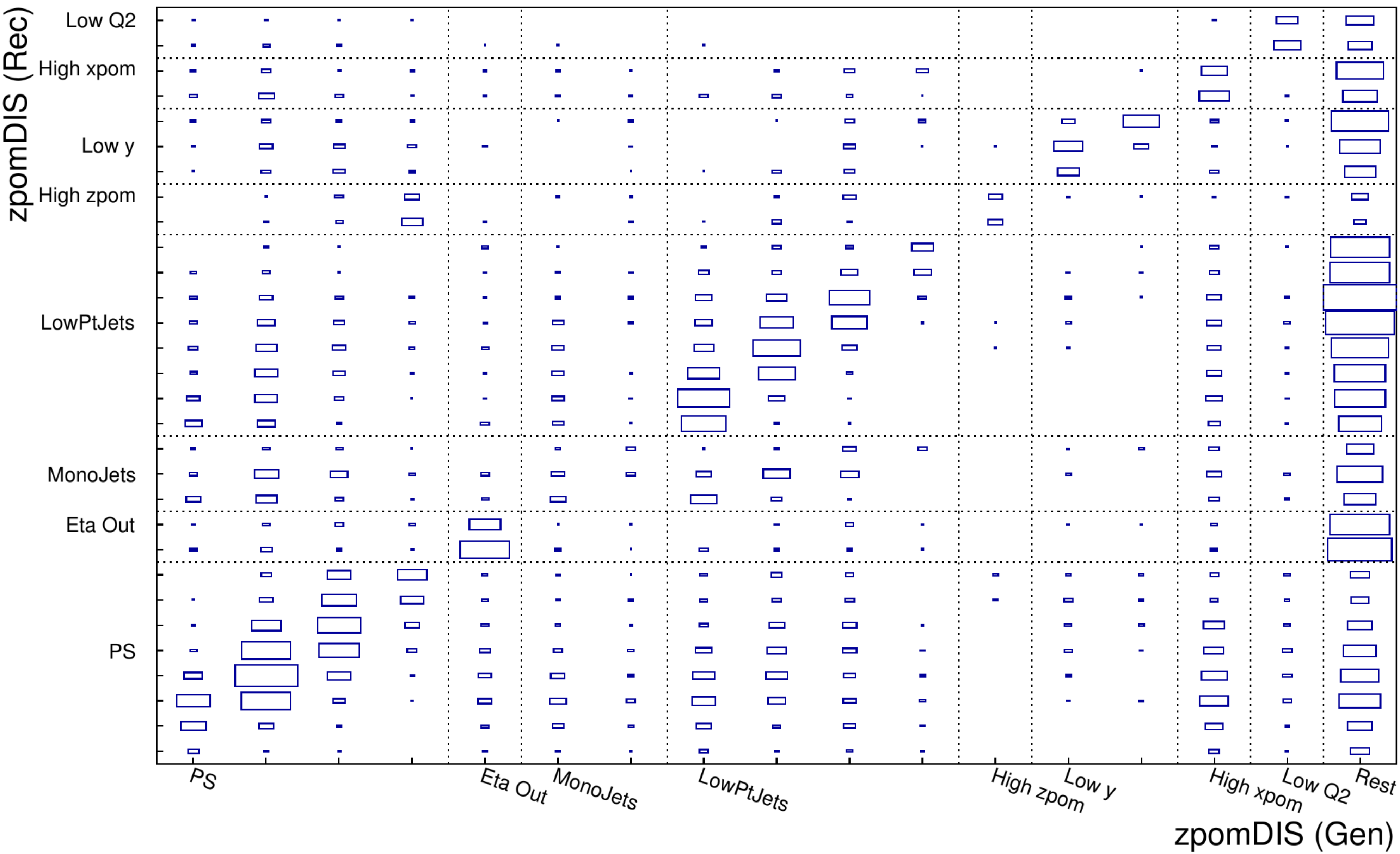


Radiation Corrections

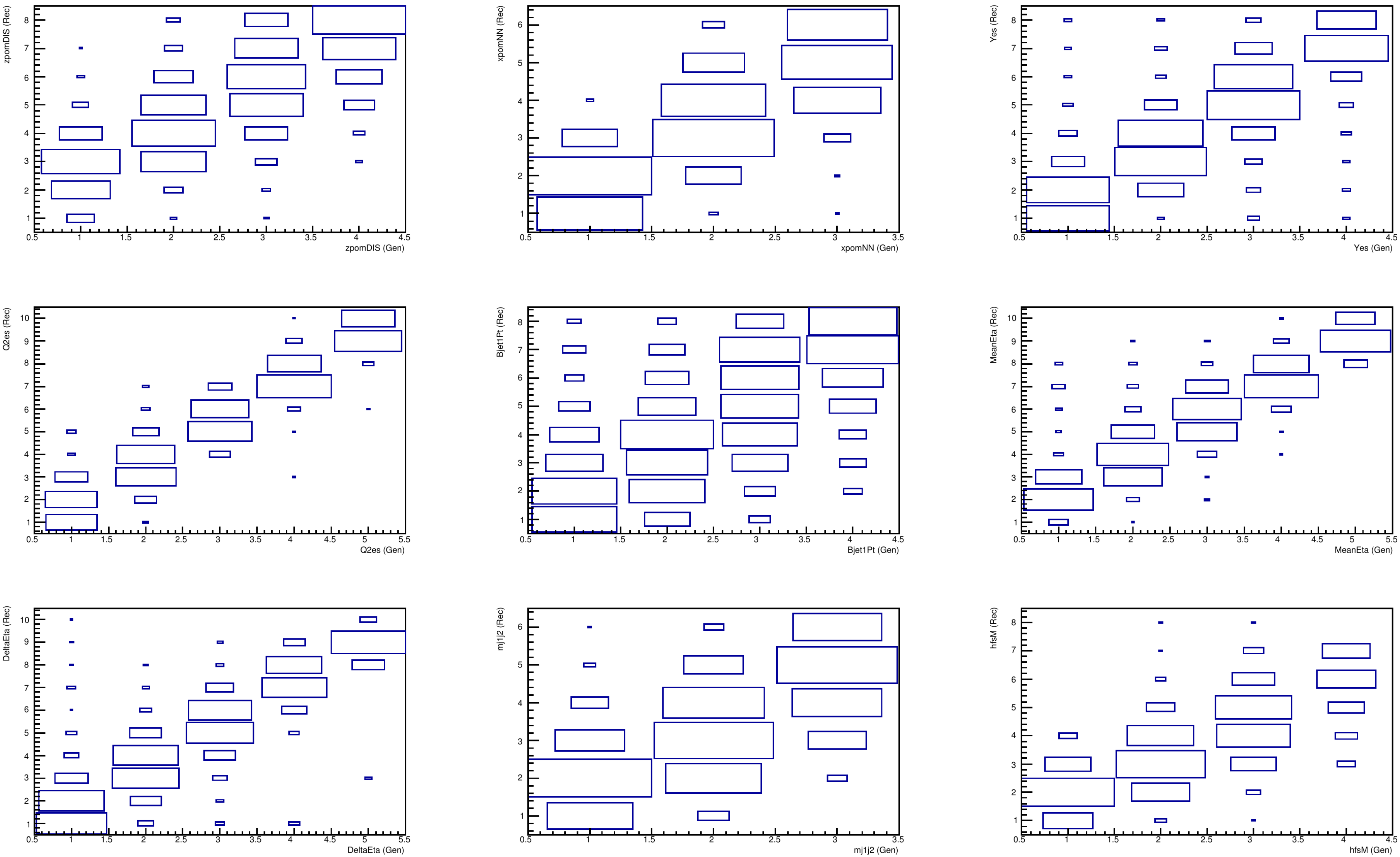


Unfolding

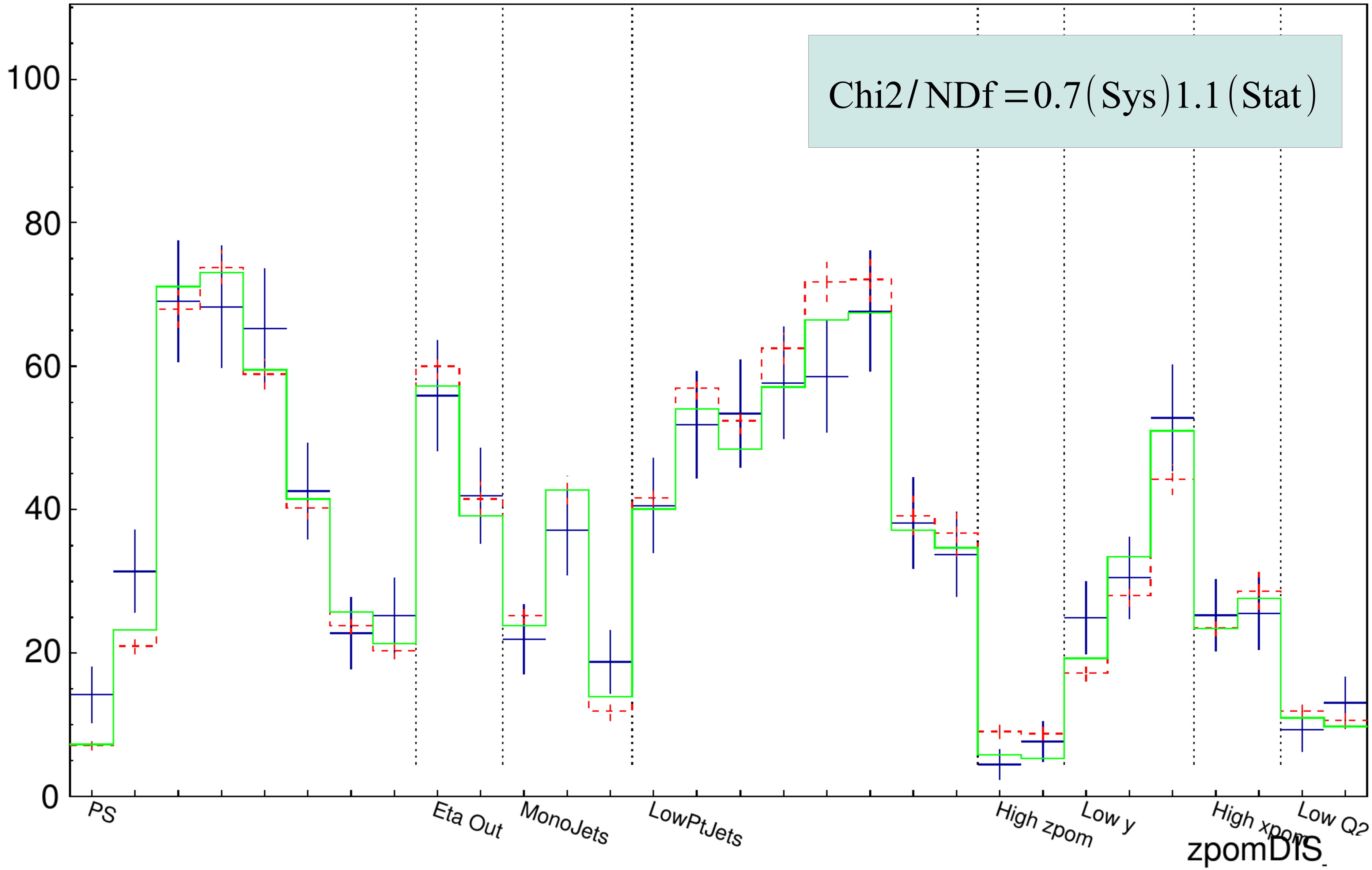
- Example of the migration matrix



Resolutions

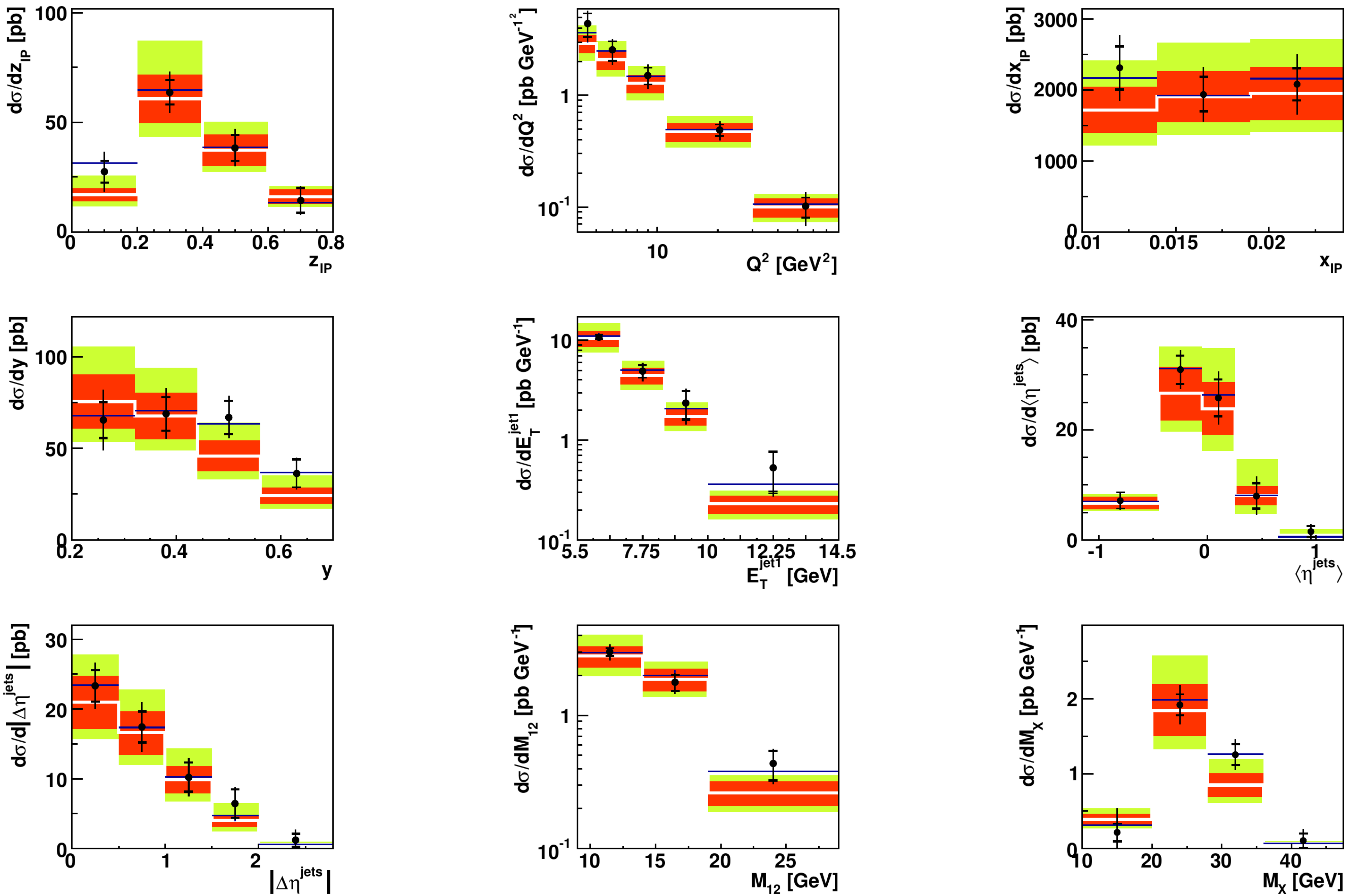


Control Plot in All Phase Spaces



DIS Cross Sections

- Blue – BBB DPDF errors, DPDF+scale errors



Conclusions

- DIS cross sections with S103 measured
- Comparison with NLOJET++ predictions done

Outlook

- Calculate PHP cross sections for zpom<0.8 (like in previous H1 PHP paper)
- Do the double-ratios (PHP/DIS) for some interesting distributions (Et, zpom, …)
- Calculate the double-ratio (PHP/DIS) for total cross section

Draft of the collaboration paper