PROMPT PHOTONS IN DIFFRACTIVE PHOTOPRODUCTION
(status report)

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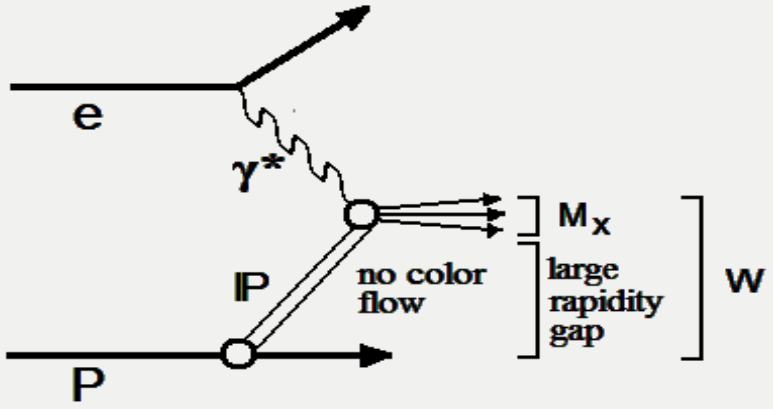
Goals

Investigate two ranges [0,0.9] and [0.9,1] of Z_{IP} variable, namely:

- estimate the fractions of direct:resolved events in these ranges;
- evaluate two corresponding sets of the differential cross sections as functions of:
  - ✓ photon transverse energy
  - ✓ photon pseudorapidity
  - ✓ jet transverse energy
  - ✓ jet pseudorapidity
  - ✓ M_X, X_γ, X_{IP}, Z_{IP}, $\delta\eta$, $\delta\varphi$
- compare cross sections to Rapgap predictions.

Objectives and procedures

Our physics objective is to select diffractively produced prompt photons in photoproduction. These events can be explained if the scattered proton escapes through the beam pipe while emitting a colorless object (pomeron), which scatters with the electron. Therefore such events are characterized by low momentum transfer from proton to the pomeron and a large rapidity gap between the hadrons systems Mx and the proton. In other words we are trying to identify a subset of prompt photon events with low Xp and η_{max}.



Our ***general method*** to distinguish the signal from hadronic background is based on MC fit of the dZ distribution (dZ - *energy weighted mean width of the electromagnetic cluster in Z direction*). This fit allows us statistically separate prompt photon left peak (signal) from π^0 decay right peak (background).

$$dZ = \frac{\sum_i E_i \left| Z_{cluster} - Z_i \right|}{w_{cell} \sum_i E_i}$$

Data samples and event selection

- ***Data***: 9899e, 9900p, 0405e, 06e, 0607p (Mini Ntuples v08b), 91.18 pb^{-1}, 374 pb^{-1}
- ***MC signal***: (Rapgap 3.202 v08b, diffractive php) direct + resolved
- ***MC background***: (Rapgap 3.202 v08b, Pythia 6.2 v08b giant dijet) direct+resolved

True level selection

Event selection

$0.2 < y < 0.7$

$Q^2 < 1\ GeV^2$

Prompt photon selection

Fmck_prt[]=29

$-0.7 < \eta < 0.9$

$5 < Et < 15$ GeV

Eparticle / Ejet > 0.9

Hadronic jet selection

$4 < Et\ jet < 35$ GeV

$-1.5 < \eta\ jet < 1.8$

Diffractive event selection

$\eta_{max} < 2.5$ for Eparticle > 0.4 GeV

$Xp < 0.03$

Detector level selection

Event selection

Trigger HPP16 on

$|Zvtx| < 40$ cm

$|BCAL\ time| < 10$ ns

$Cal\_pt < 10$

$0.2 < Yjb < 0.7$

No SINISTRA electron with prob > 0.9 and $Yel < 0.7$

Hadronic jet selection

$4 < Et\ jet < 35$ GeV

$-1.5 < \eta\ jet < 1.8$

Prompt photon selection

Tufo[][0]=31

$-0.7 < \eta < 0.9$

$5 < Et < 15$ GeV

Ezufo / Ejet > 0.9

Zufoeemc / Zufoecal > 0.9

track isolation in cone 0.2

Diffractive event selection

$\eta_{max} < 2.5$ for Ezufo>0.4 GeV

$Xp < 0.03$

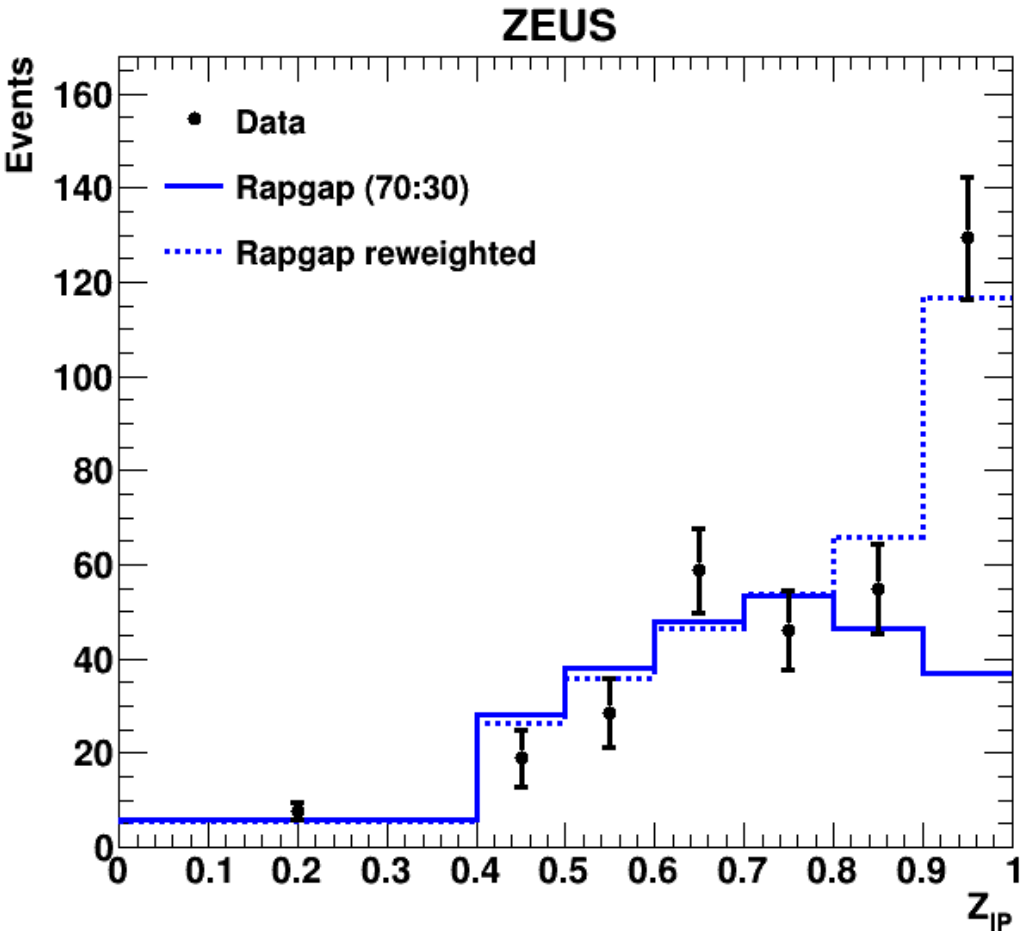
$E_{FPC} < 1$ GeV (in HERAI case)

HERAII, the comparison of Z_{IP} data signal distribution to MC Rapgap signal, γ+jet selection

η_{max}+ X_P *cuts*

data – fitted photons, MC is normalized to data

The reweighting is applied only to direct Rapgap on hadron level



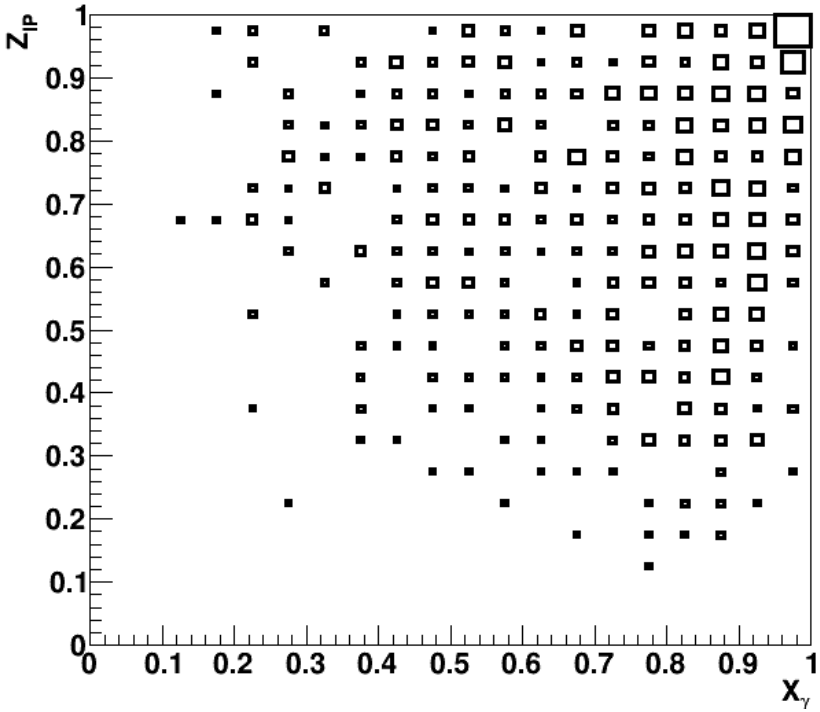
Reweighting formula:

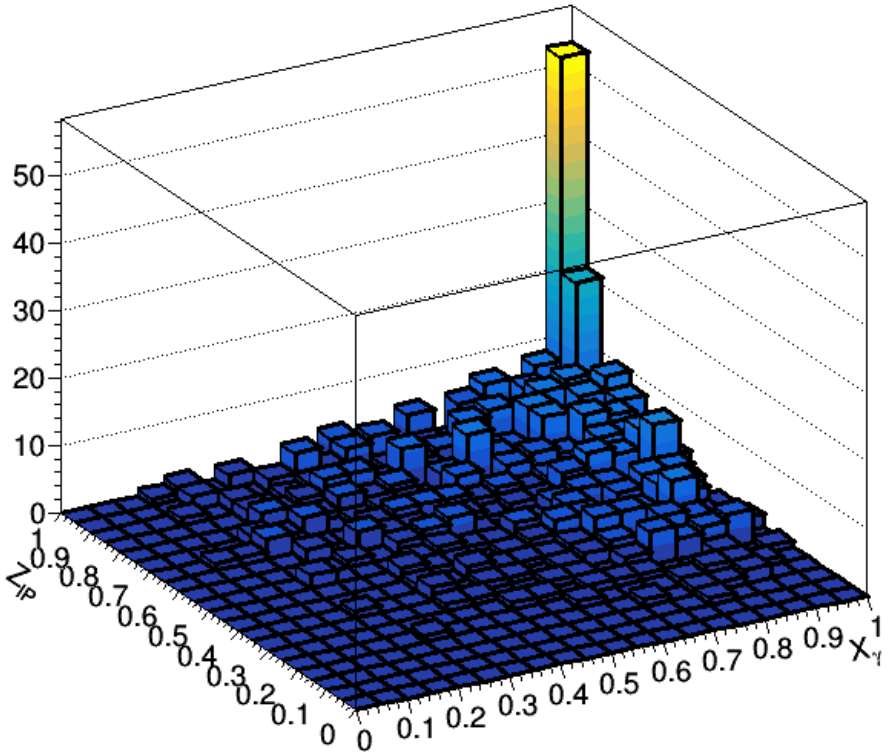
$$w = \begin{cases} 7, & Z_{IP} \geq 0.9 \\ 1, & Z_{IP} < 0.9 \end{cases}$$

Rapgap requires reweighting

HERAII, 2D-distribution of X_γ and Z_{IP} data variables, γ+jet selection

η_{max}+ X_P cuts



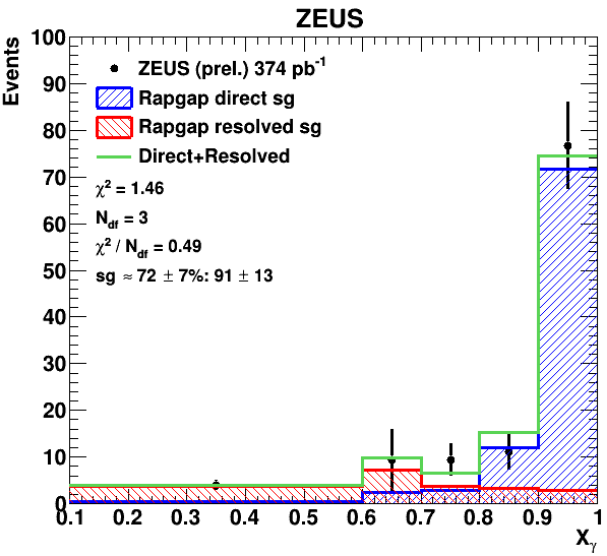


High Z_{IP} corresponds to high X_γ

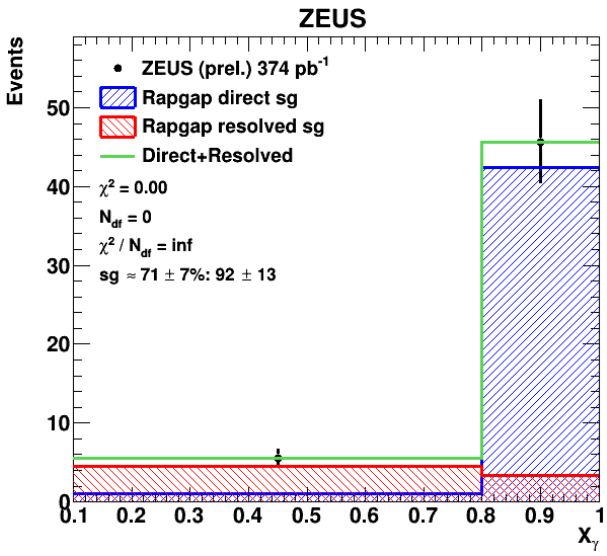
HERAII, estimation of direct:resolved fraction by fitting the MC Rapgap direct and resolved events to X_γ and Z_{IP} data

γ+jet selection, η_{max}+ X_P cuts, data – fitted photons, Rapgap direct is reweighted

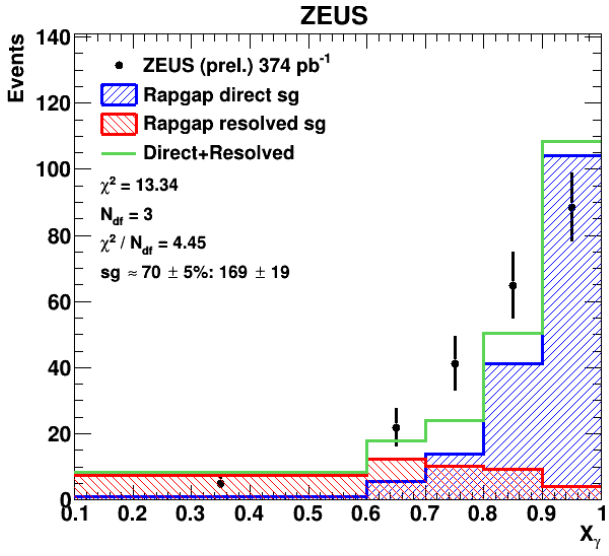
$Z_{IP} \geq 0.9$, 5 bins



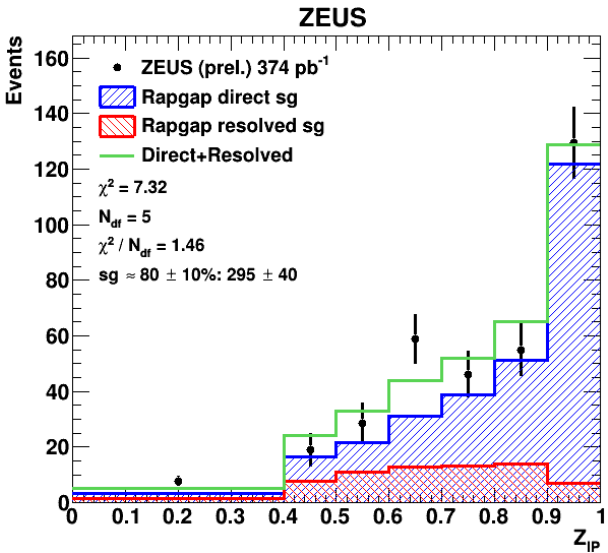
$Z_{IP} \geq 0.9$, 2 bins



$Z_{IP} < 0.9$, 5 bins



$0 < Z_{IP} < 1$



$Z_{IP} < 0.9$:

Both X_γ and Z_{IP} fits give the direct:resolved fraction 70:30%.

$Z_{IP} \geq 0.9$:

X_γ fits provide 70:30% fraction.
Z_{IP} fit provides 95:5% fraction.

Consequently below we analyse the $Z_{IP} \geq 0.9$ data with 70:30% and 100:0% MC ratios to check the influence on cross sections and comparison with Rapgap.

On all following slides:

- **Top plots** - Cross sections without normalization to HERAI.
- **Bottom plots** - Cross sections are multiplied by factor HERAI_tot/HERAII_tot, where:
  HERAI_tot - HERAI total cross section
  HERAII_tot - HERAII total cross section
- **Errors**:
  thick - statistical
  thin - statistical + systematics + normalization error

The origins of systematics errors:

1) variation of the photon energy by ±2%
2) variation of the jet energy by ±2%
3) variation of the top and bottom limits in dZ fit: bottom 0.6, top 1.0 (central is 0.8)
4) variation of the direct/resolved signal fraction by ±14% (0.7 ± 0.1)
5) possible presence of non-diffractive background –10%

The total cross sections values (pb)

HERAI		HERAII	
γ+jet	inclusive	γ+jet	inclusive
1.026 ± 0.140	1.195 ± 0.144	1.198 ± 0.078	1.291 ± 0.079

Cross sections in range:

$$Z_{IP} \geq 0.9$$

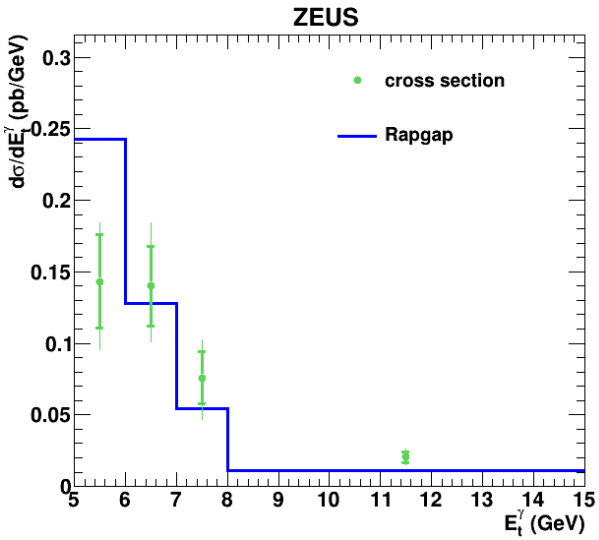
HERAII differential cross sections for photon E_t, γ+jet selection, $Z_{IP} \geq 0.9$

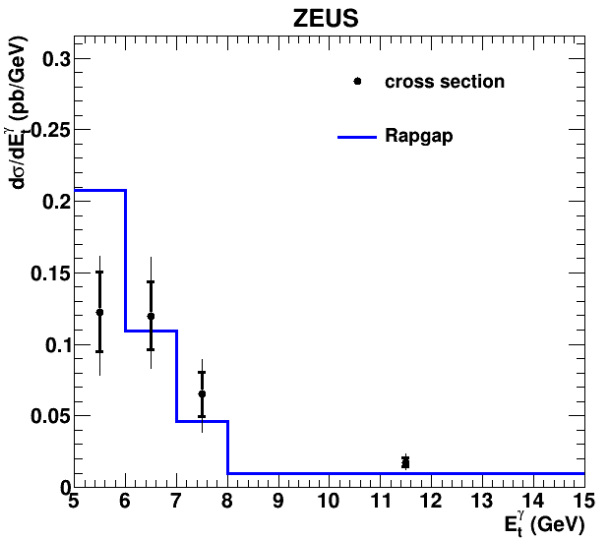
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

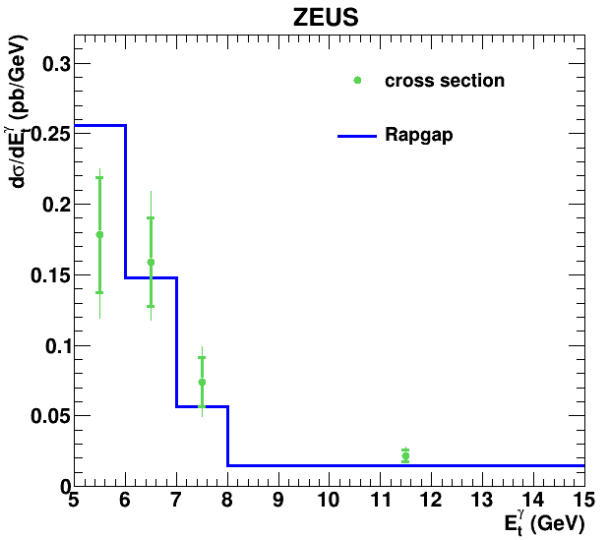
blue – Rapgap prediction normalized to data

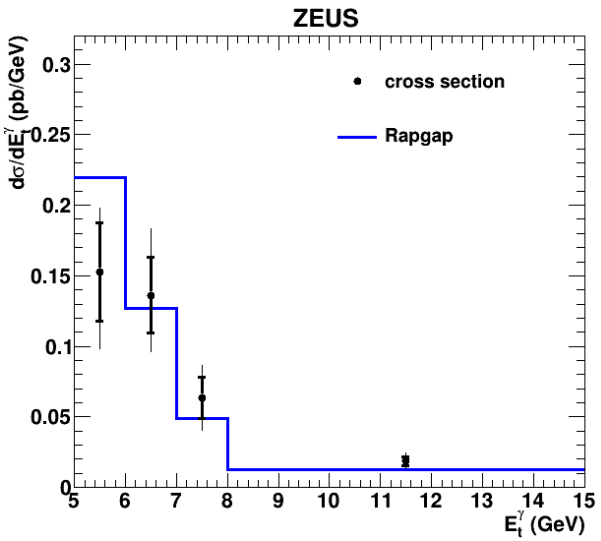
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
5 ÷ 6 GeV	0.123±0.028 0.143±0.033 1.594±0.080	0.153±0.035 0.178±0.041 1.982±0.094
6 ÷ 7 GeV	0.120±0.024 0.140±0.028 1.414±0.080	0.136±0.027 0.159±0.031 1.609±0.076
7 ÷ 8 GeV	0.065±0.016 0.076±0.018 1.313±0.118	0.063±0.015 0.074±0.017 1.280±0.081
8 ÷ 15 GeV	0.018±0.003 0.020±0.004 1.336±0.077	0.019±0.003 0.022±0.004 1.415±0.064

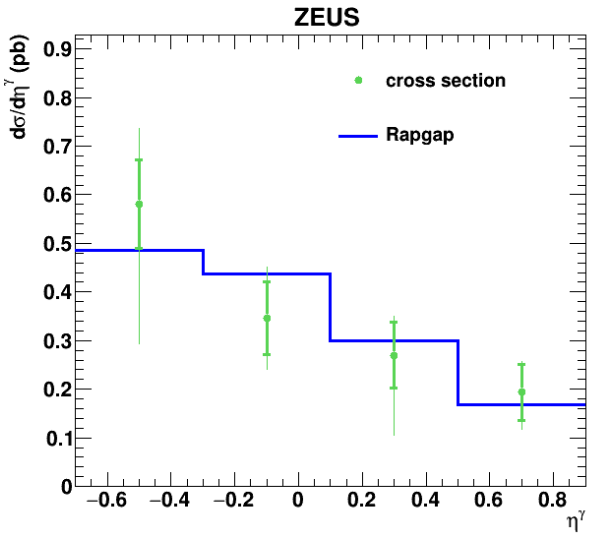
HERAII differential cross sections for photon η, γ+jet selection, $Z_{IP} \geq 0.9$

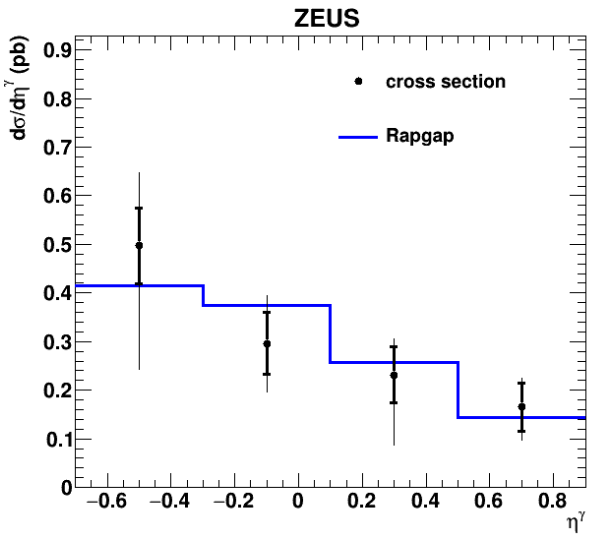
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

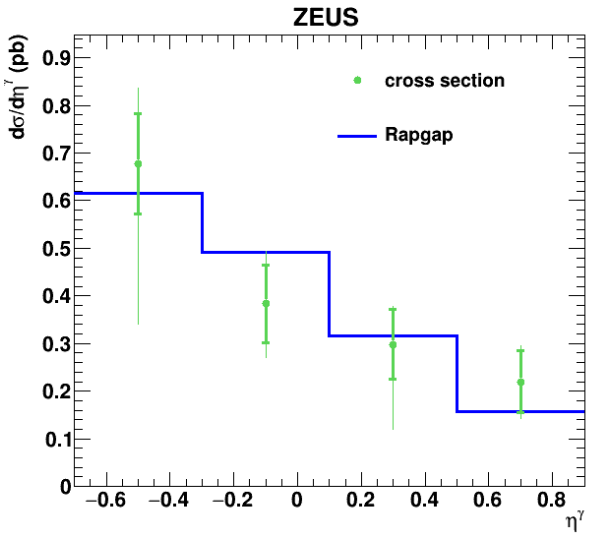
blue – Rapgap prediction normalized to data

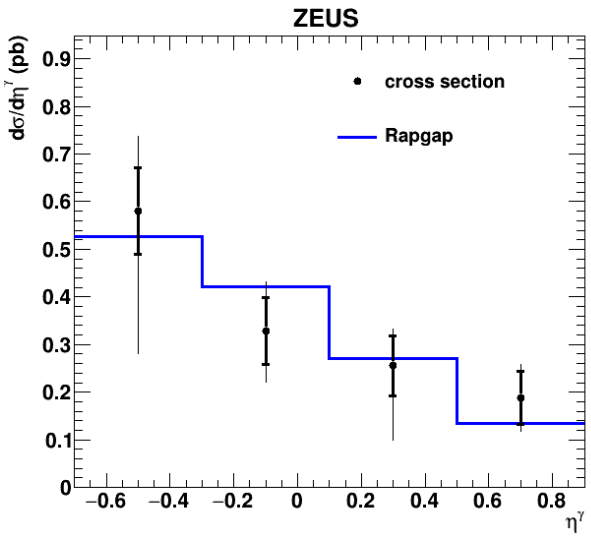
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
0.7 ÷ -0.3	0.497±0.078 0.580±0.091 1.618±0.084	0.580±0.090 0.677±0.106 1.888±0.087
-0.3 ÷ -0.1	0.296±0.064 0.346±0.075 1.423±0.071	0.328±0.070 0.384±0.082 1.577±0.064
-0.1 ÷ 0.5	0.231±0.057 0.270±0.067 1.394±0.081	0.256±0.063 0.298±0.073 1.540±0.075
0.5 ÷ 0.9	0.166±0.050 0.193±0.058 1.314±0.108	0.188±0.056 0.220±0.065 1.493±0.101

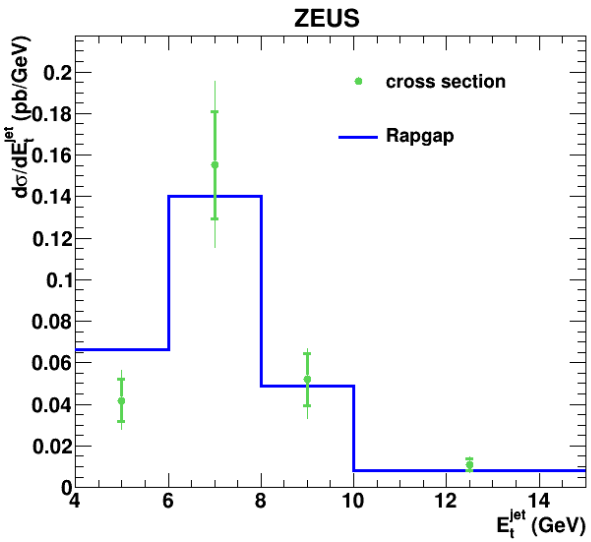
HERAII differential cross sections for jet E_t, γ+jet selection, $Z_{IP} \geq 0.9$

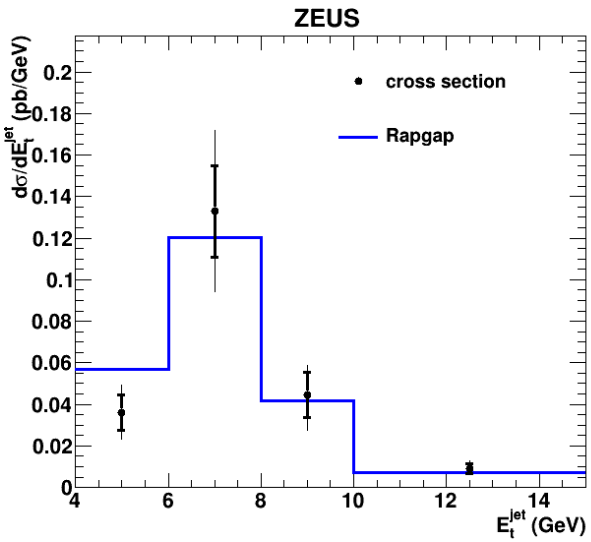
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

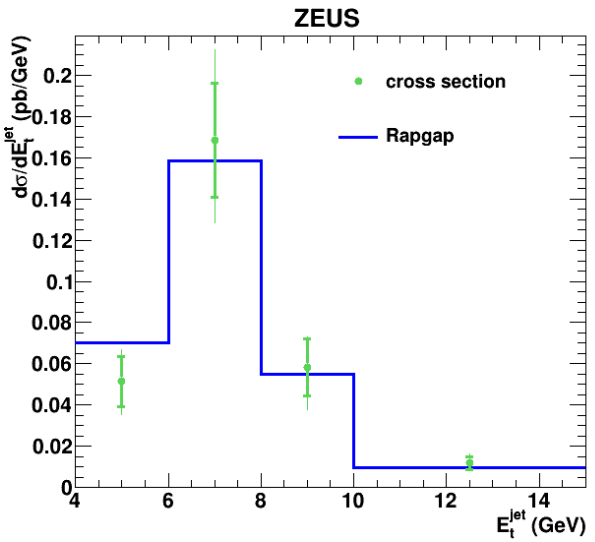
blue – Rapgap prediction normalized to data

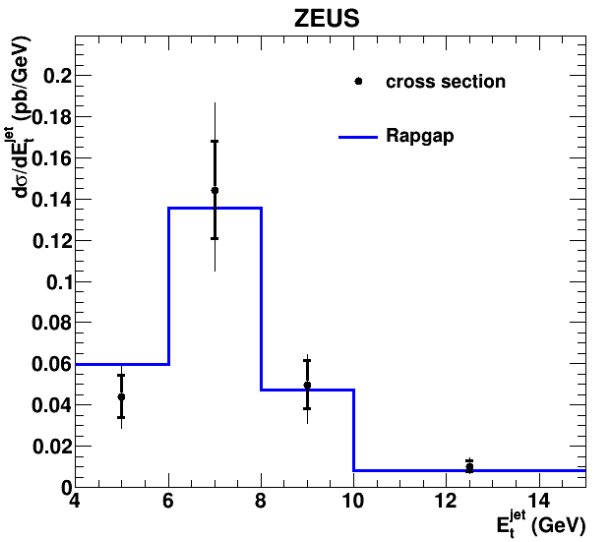
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
4 ÷ 6 GeV	0.036±0.009 0.042±0.010 1.103±0.066	0.044±0.010 0.051±0.012 1.355±0.067
6 ÷ 8 GeV	0.133±0.022 0.155±0.026 1.994±0.099	0.144±0.024 0.169±0.028 2.165±0.094
8 ÷ 10 GeV	0.045±0.011 0.052±0.013 1.333±0.094	0.050±0.012 0.058±0.014 1.492±0.079
10 ÷ 15 GeV	0.009±0.002 0.011±0.003 1.039±0.094	0.010±0.003 0.012±0.003 1.143±0.072

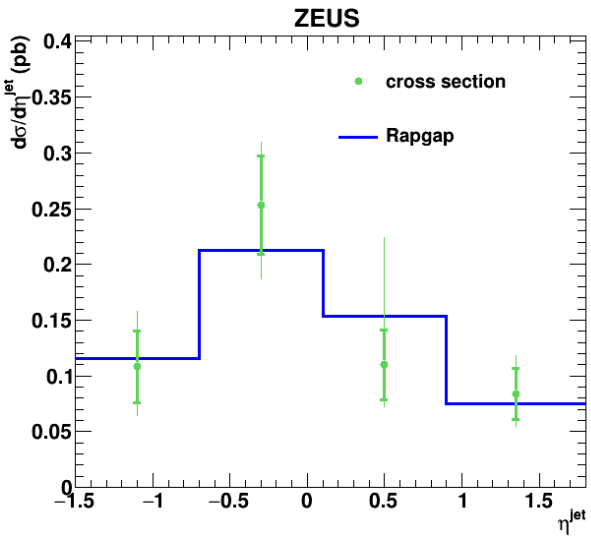
HERAII differential cross sections for jet η, γ+jet selection, $Z_{IP} \geq 0.9$

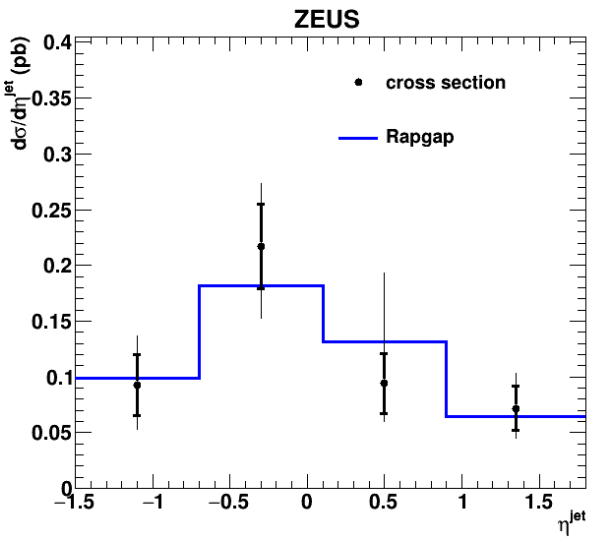
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

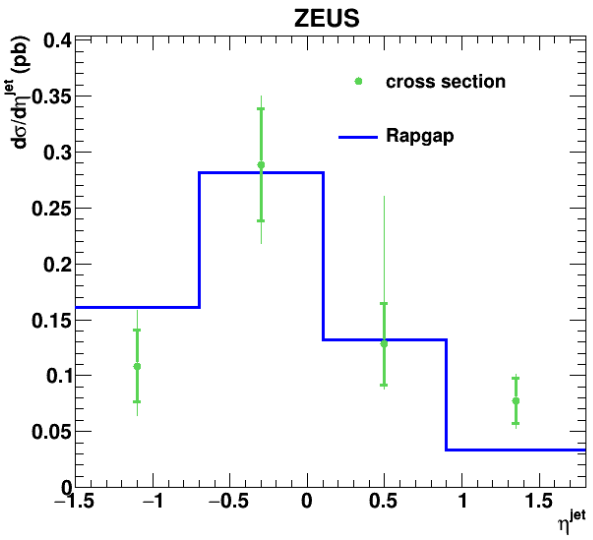
blue – Rapgap prediction normalized to data

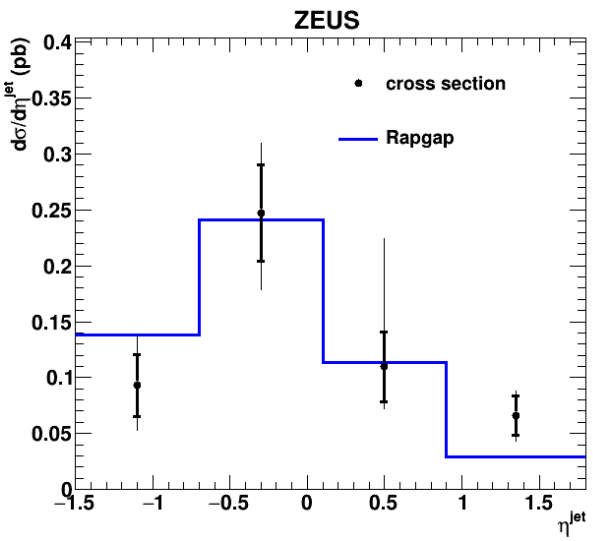
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
-1.5 ÷ -0.7	0.093±0.027 0.108±0.032 1.935±0.114	0.093±0.028 0.109±0.032 1.942±0.108
-0.7 ÷ 0.1	0.217±0.038 0.253±0.044 1.573±0.069	0.247±0.043 0.288±0.050 1.793±0.071
0.1 ÷ 0.9	0.094±0.027 0.110±0.032 1.239±0.069	0.110±0.031 0.128±0.037 1.443±0.068
0.9 ÷ 1.8	0.072±0.020 0.084±0.023 1.142±0.116	0.066±0.017 0.077±0.020 1.051±0.063

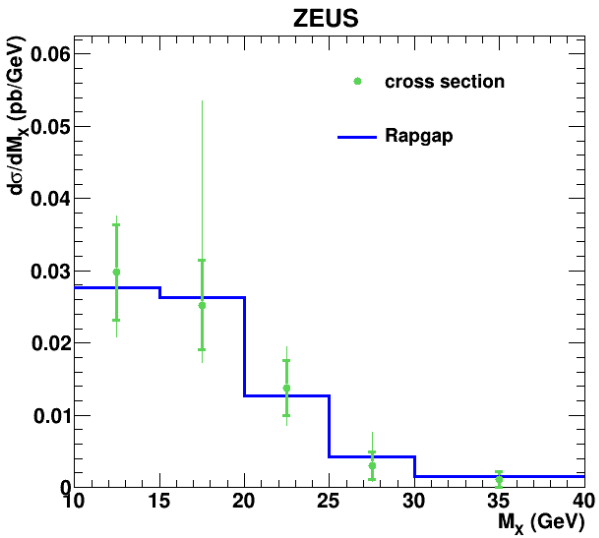
HERAII differential cross sections for M_X, γ+jet selection, $Z_{IP} \geq 0.9$

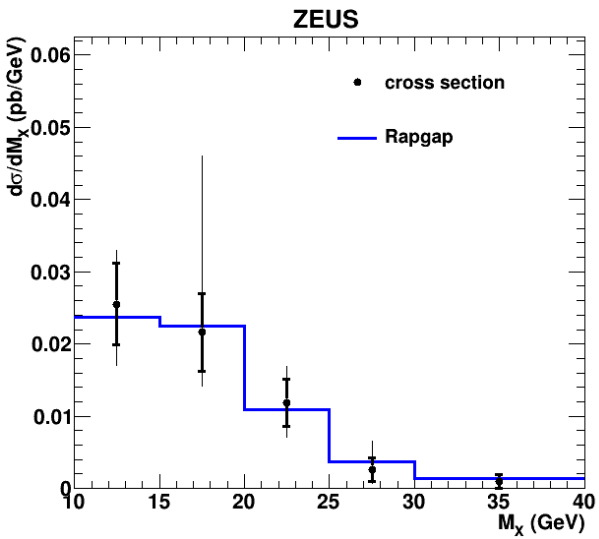
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

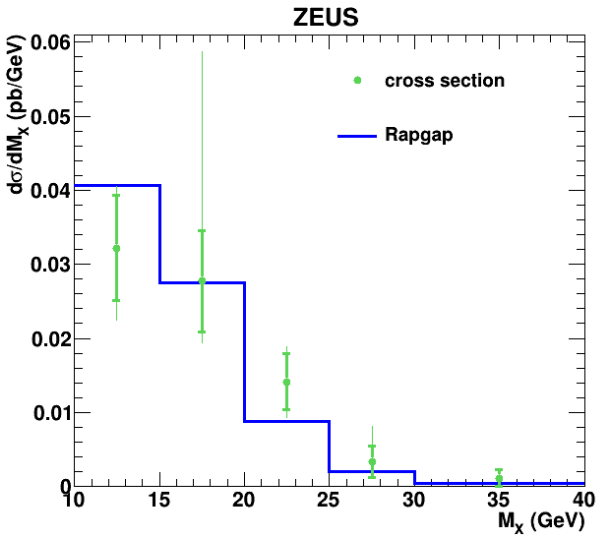
blue – Rapgap prediction normalized to data

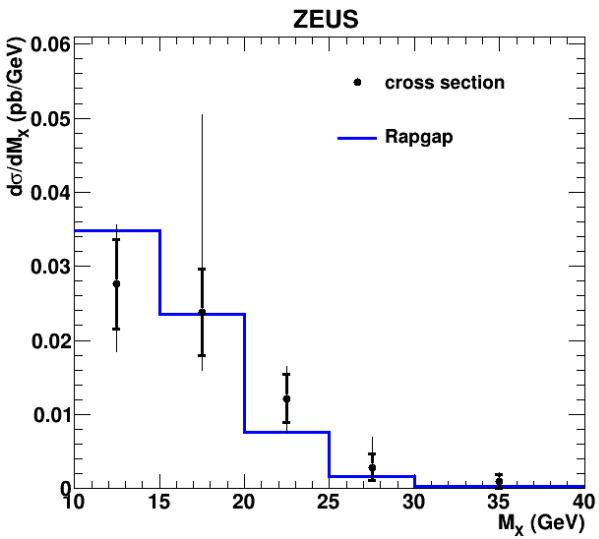
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
10 ÷ 15 GeV	0.026±0.006 0.030±0.007 1.840±0.083	0.028±0.006 0.032±0.007 1.989±0.081
15 ÷ 20 GeV	0.022±0.005 0.025±0.006 1.485±0.075	0.024±0.006 0.028±0.007 1.629±0.066
20 ÷ 25 GeV	0.012±0.003 0.014±0.004 1.053±0.084	0.012±0.003 0.014±0.004 1.079±0.054
25 ÷ 30 GeV	0.003±0.002 0.003±0.002 1.025±0.160	0.003±0.002 0.003±0.002 1.141±0.128
30 ÷ 40 GeV	0.001±0.001 0.001±0.001 1.122±0.272	0.001±0.001 0.001±0.001 1.135±0.208

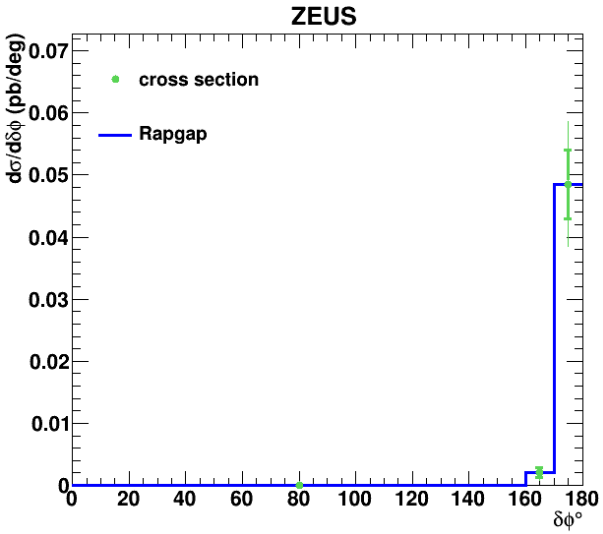
HERAII differential cross sections for angle between photon and jet δϕ, γ+jet selection, $Z_{IP} \geq 0.9$

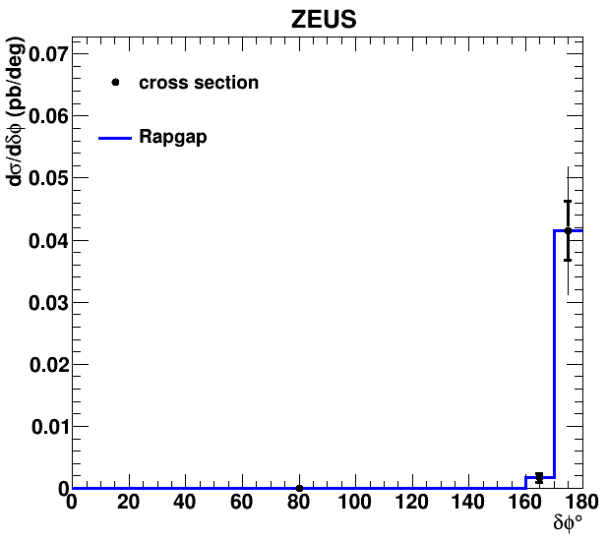
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

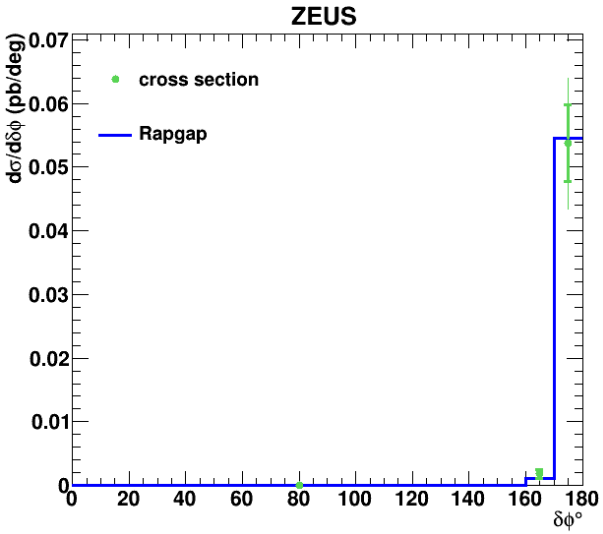
blue – Rapgap prediction normalized to data

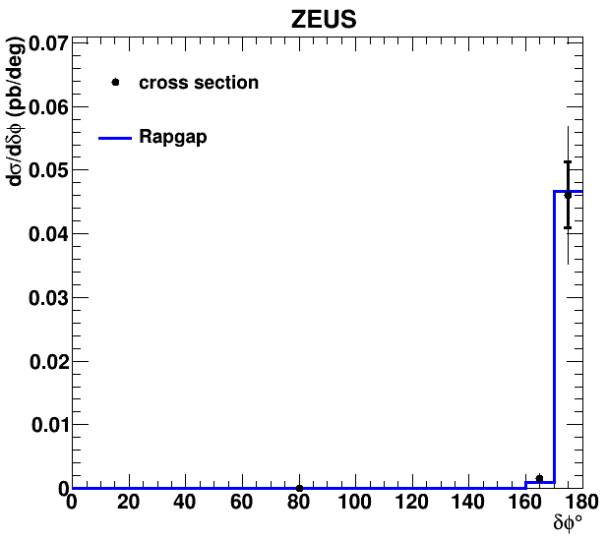
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
0 ÷ 160	0.000±0.000 0.000±0.000 0.000±0.000	0.000±0.000 0.000±0.000 0.000±0.000
160 ÷ 170	0.002±0.001 0.002±0.001 0.464±0.083	0.002±0.001 0.002±0.001 0.429±0.060
170 ÷ 180	0.042±0.005 0.048±0.006 1.596±0.049	0.046±0.005 0.054±0.006 1.771±0.048

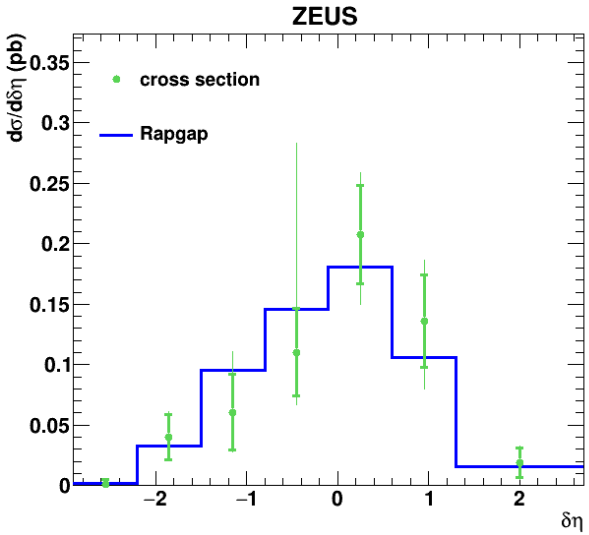
HERAII differential cross sections for angle between photon and jet δη, γ+jet selection, $Z_{IP} \geq 0.9$

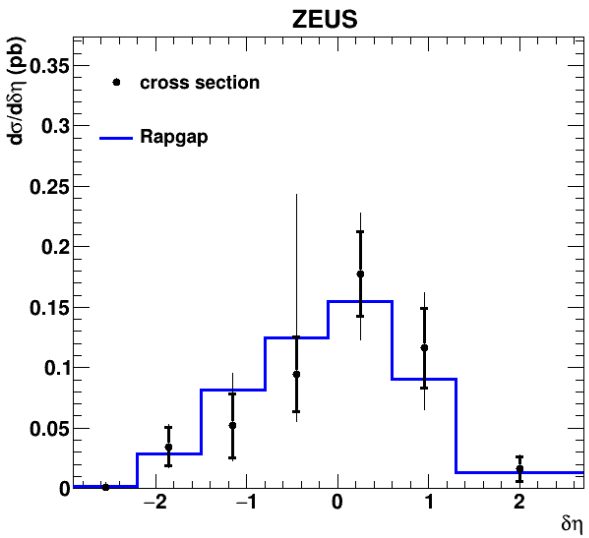
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

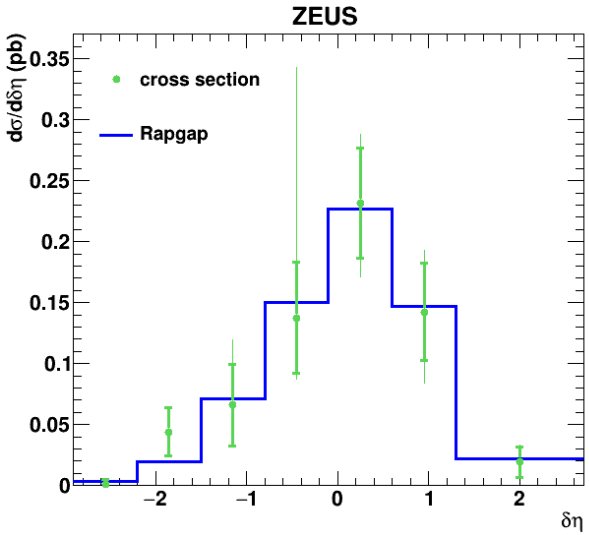
blue – Rapgap prediction normalized to data

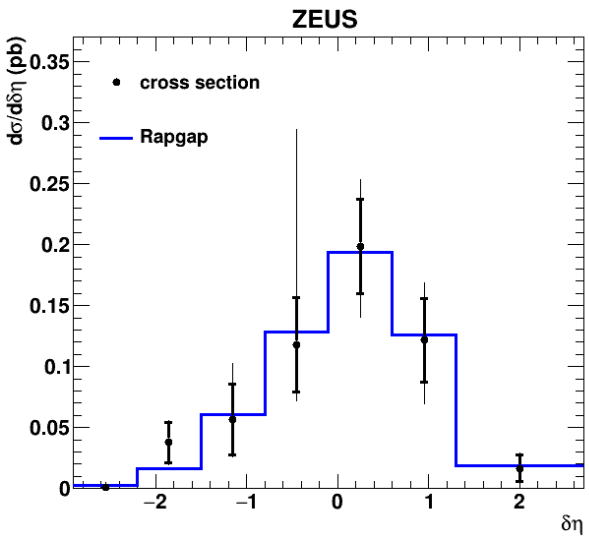
70:30 MC mix





100:0 MC mix



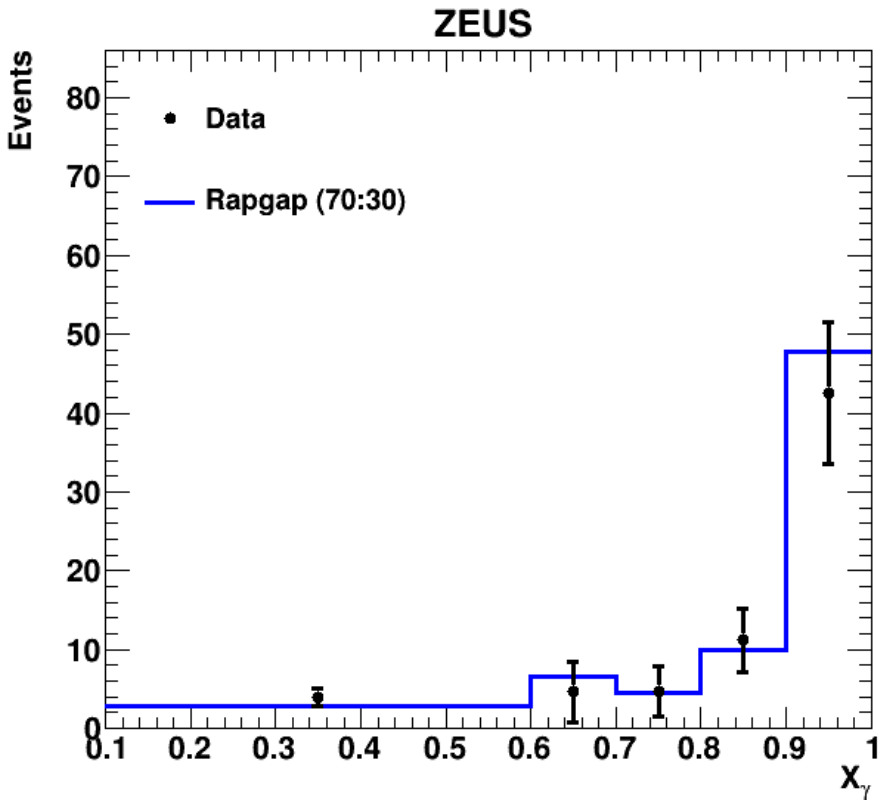


	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
-2.9 ÷ -2.2	0.001±0.003 0.001±0.003 1.000±0.000	0.001±0.003 0.001±0.003 1.000±0.000
-2.2 ÷ -1.5	0.035±0.016 0.040±0.019 1.283±0.218	0.038±0.017 0.044±0.020 1.400±0.153
-1.5 ÷ -0.8	0.052±0.027 0.061±0.031 1.226±0.102	0.056±0.029 0.066±0.034 1.335±0.076
-0.8 ÷ -0.1	0.094±0.031 0.110±0.036 1.400±0.086	0.118±0.039 0.138±0.045 1.750±0.101
-0.1 ÷ 0.6	0.178±0.035 0.208±0.041 1.590±0.079	0.198±0.039 0.231±0.045 1.773±0.079
0.6 ÷ 1.3	0.116±0.033 0.136±0.038 1.529±0.083	0.122±0.034 0.142±0.040 1.601±0.077
1.3 ÷ 2.7	0.016±0.010 0.019±0.012 2.027±0.248	0.016±0.011 0.019±0.012 2.080±0.247

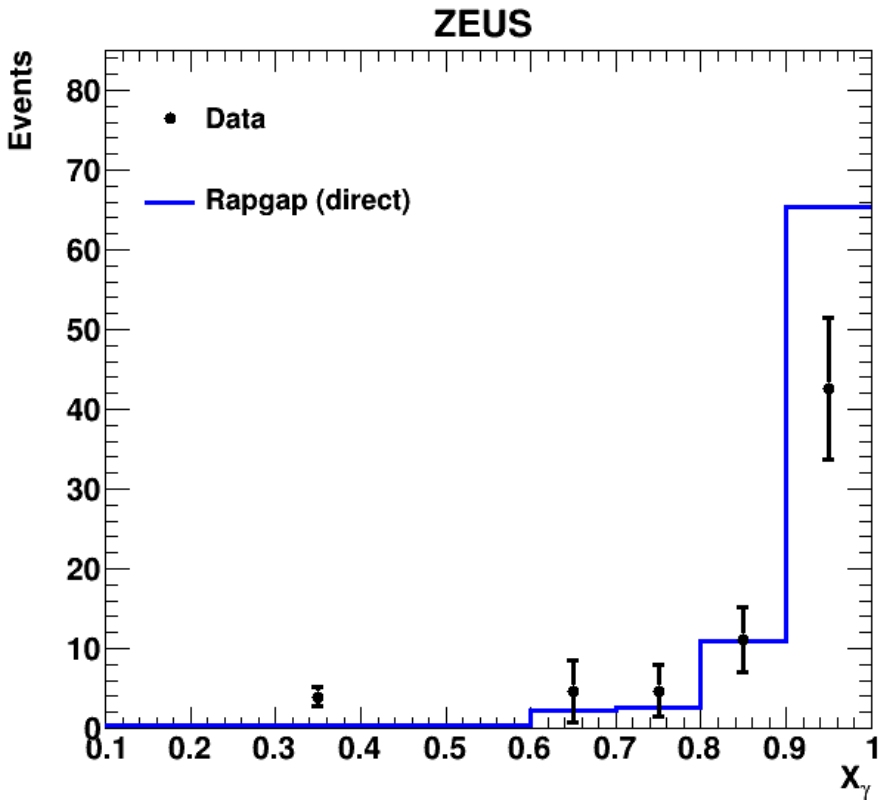
HERAII, the comparison of X_γ data signal distribution to MC Rapgap signal, γ+jet selection, $Z_{IP} \geq 0.9$

data – fitted photons, MC is normalized to data

70:30 MC mix



100:0 MC mix



70:30 mix describes data better than 100:0 mix

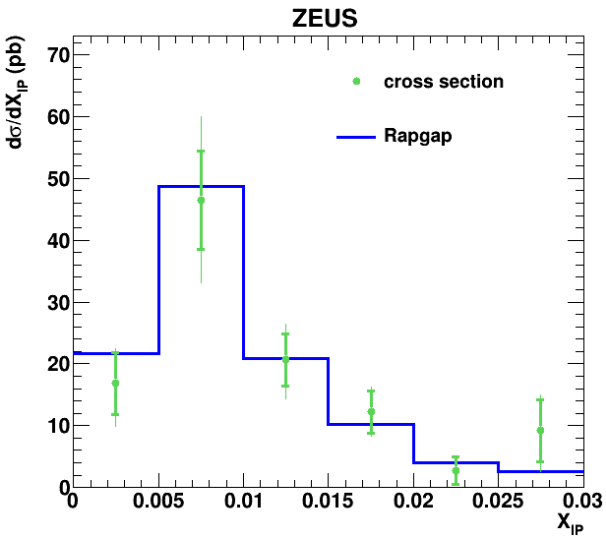
HERAII differential cross sections for X_{IP}, γ+jet selection, $Z_{IP} \geq 0.9$

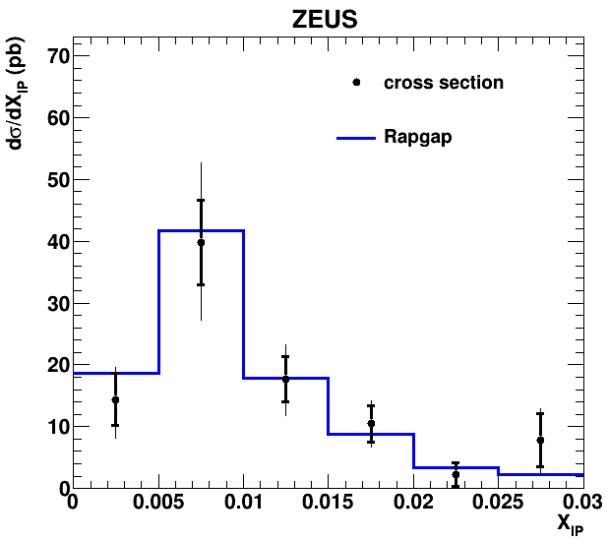
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

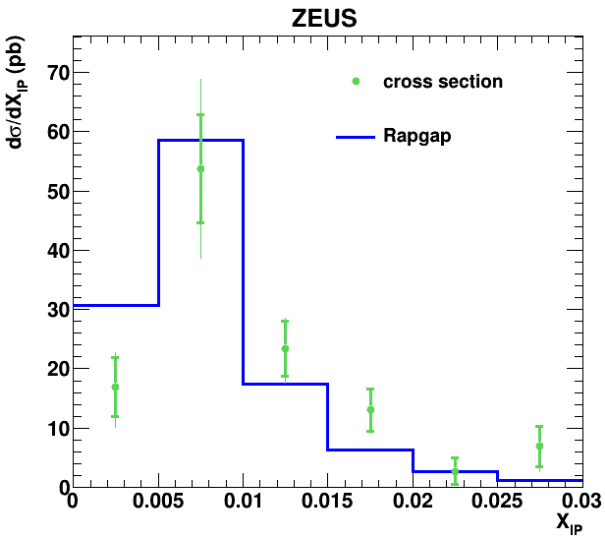
blue – Rapgap prediction normalized to data

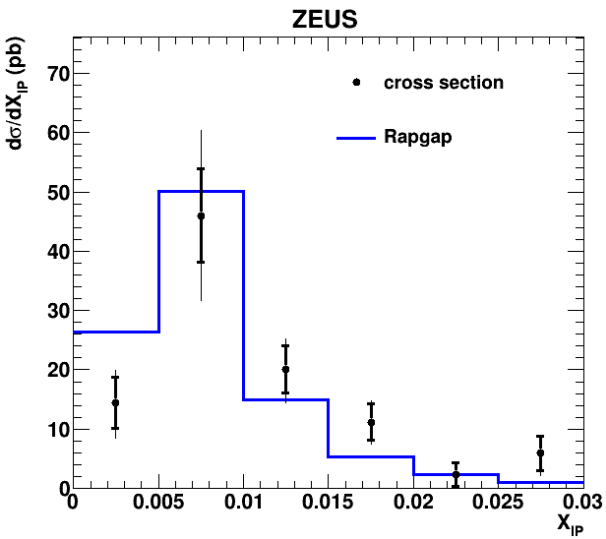
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
0 ÷ 0.005	14.401±4.280 16.816±4.997 2.009±0.122	14.493±4.296 16.922±5.016 2.021±0.115
0.005 ÷ 0.01	39.798±6.801 46.470±7.941 1.536±0.065	46.023±7.819 53.738±9.129 1.776±0.068
0.01 ÷ 0.015	17.671±3.633 20.634±4.241 1.096±0.079	20.051±3.978 23.413±4.644 1.243±0.059
0.015 ÷ 0.02	10.464±2.968 12.218±3.465 1.326±0.160	11.180±3.038 13.054±3.547 1.417±0.126
0.02 ÷ 0.025	2.297±1.909 2.682±2.229 0.936±0.166	2.335±1.912 2.727±2.233 0.951±0.103
0.025 ÷ 0.03	7.852±4.283 9.169±5.001 2.326±0.800	5.907±2.924 6.897±3.414 1.750±0.449

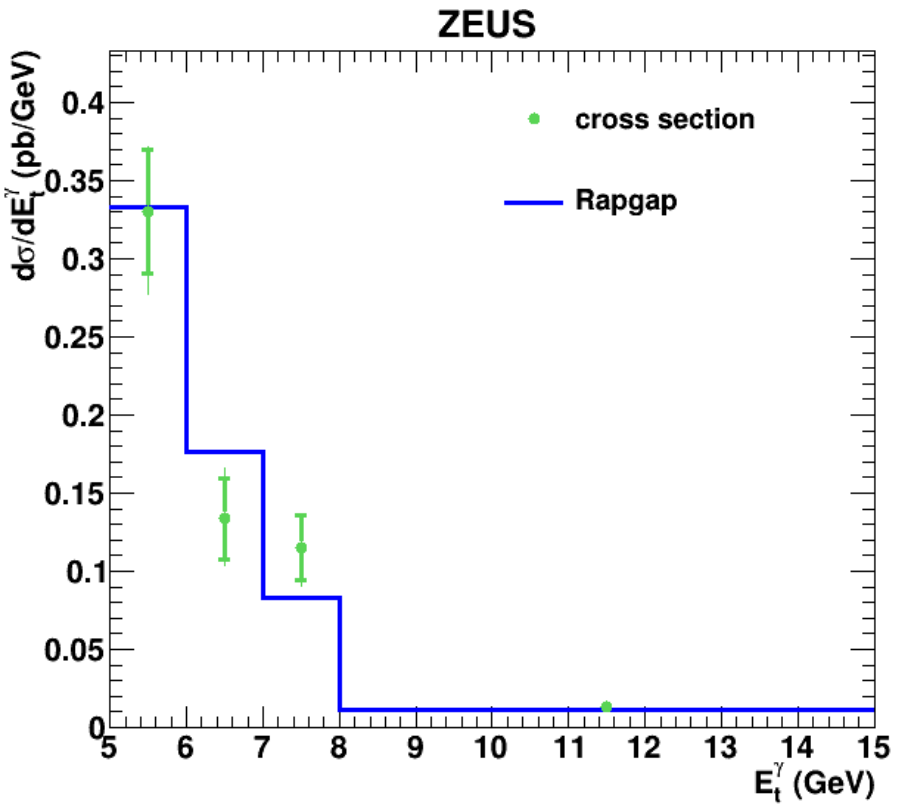
Cross sections in range:
$Z_{IP} < 0.9$

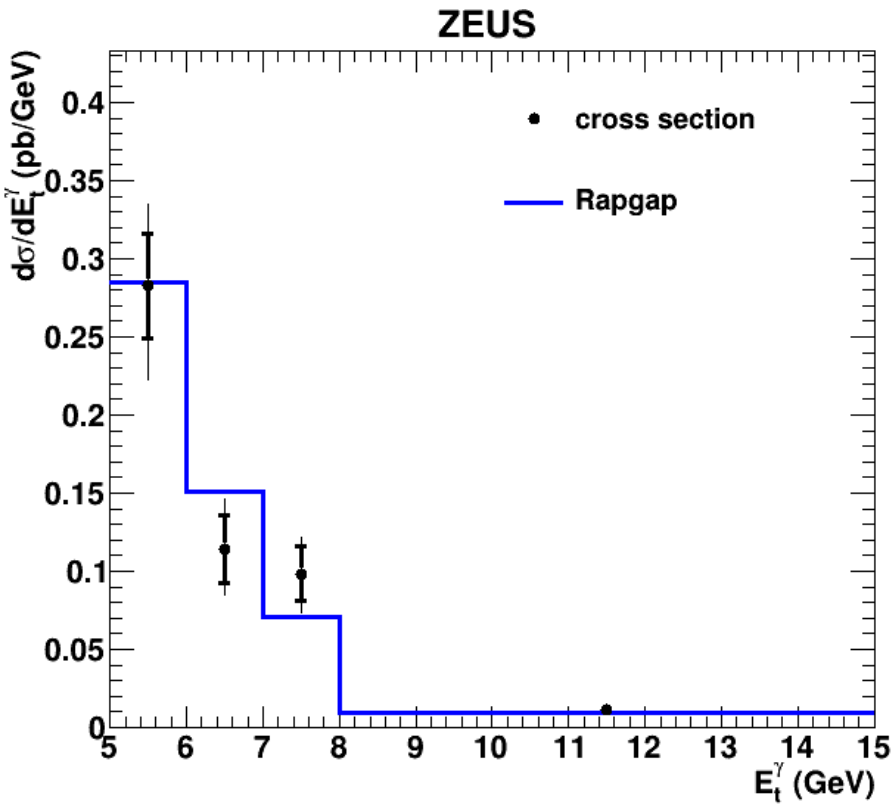
HERAII differential cross sections for photon E_t, γ+jet selection, $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





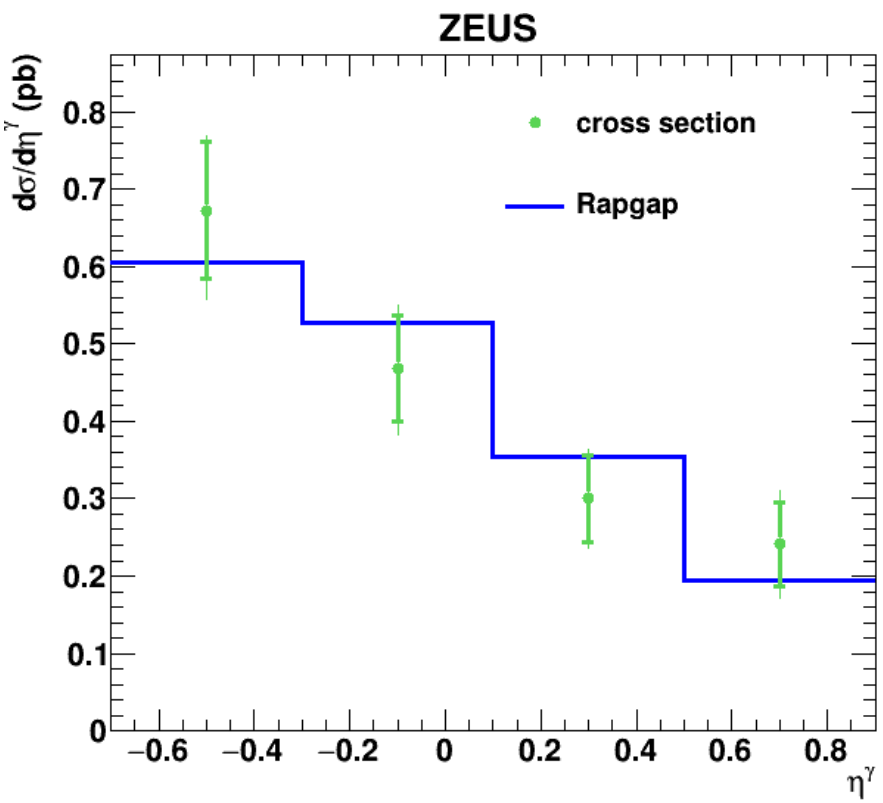
	5 ÷ 6 GeV	6 ÷ 7 GeV	7 ÷ 8 GeV	8 ÷ 15 GeV
cr sec, pb	0.283±0.034	0.114±0.022	0.099±0.018	0.011±0.002
	0.330±0.039	0.134±0.026	0.115±0.021	0.013±0.003
1/acceptance	1.001±0.024	1.014±0.033	0.924±0.042	0.892±0.038

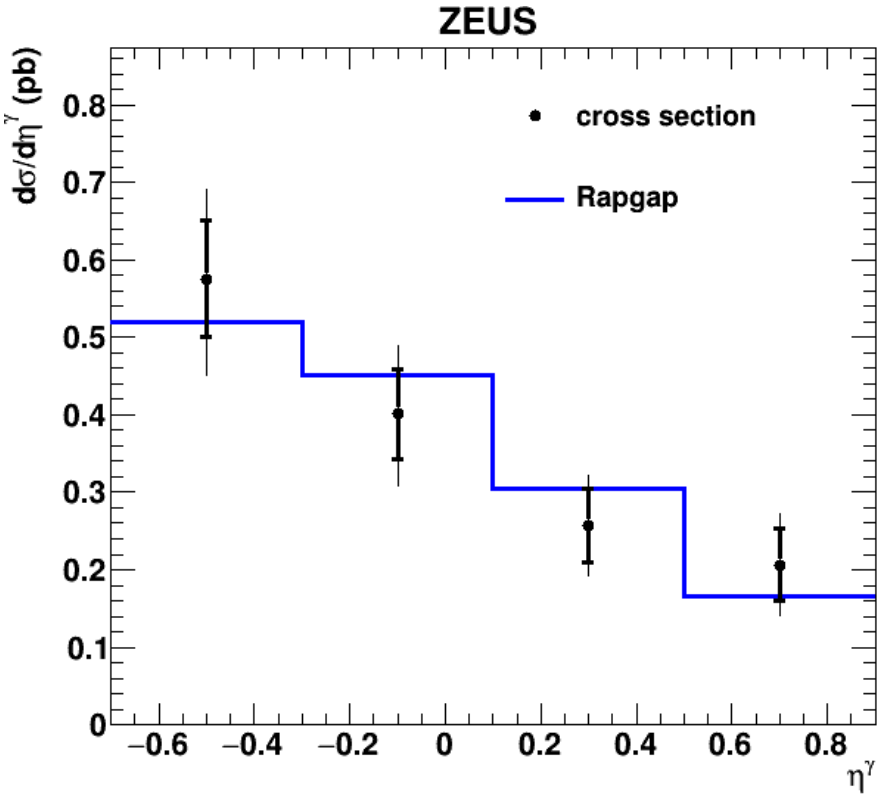
HERAII differential cross sections for photon η, γ+jet selection, $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





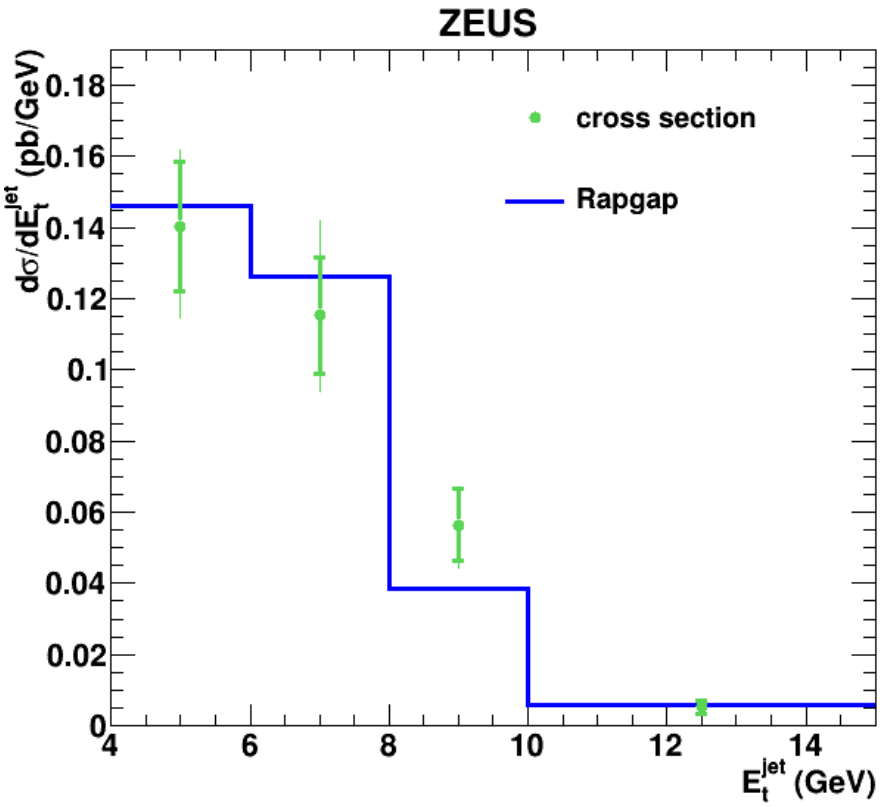
	-0.7 ÷ -0.3	-0.3 ÷ -0.1	-0.1 ÷ 0.5	0.5 ÷ 0.9
cr sec, pb	0.576±0.076	0.401±0.058	0.257±0.048	0.206±0.046
	0.672±0.088	0.468±0.068	0.300±0.056	0.241±0.054
1/acceptance	1.023±0.025	0.939±0.024	0.969±0.031	0.991±0.043

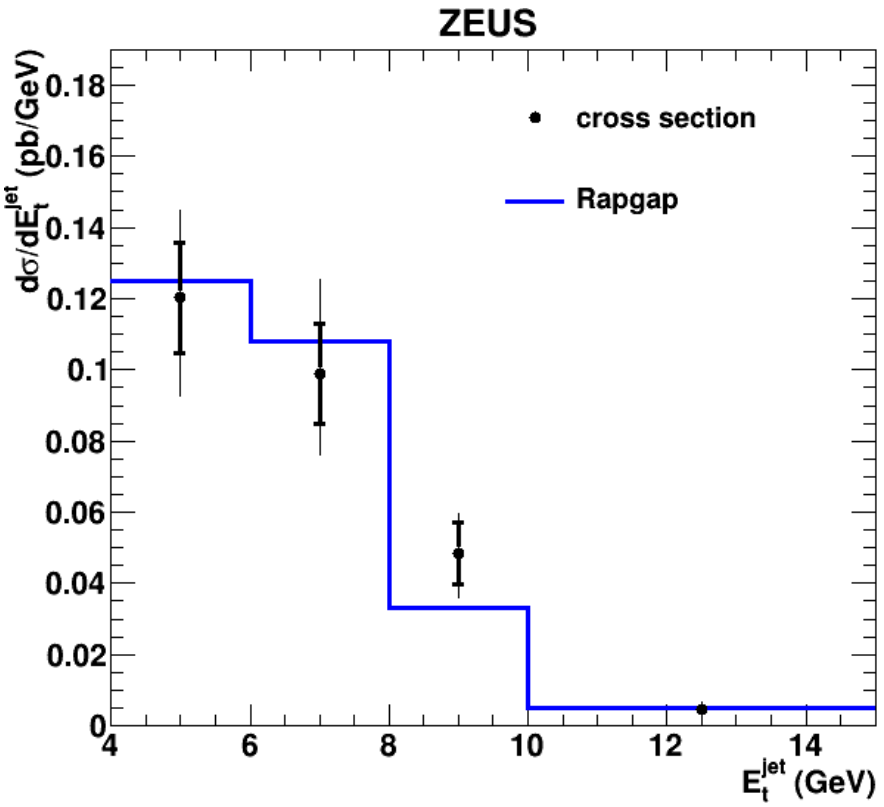
HERAII differential cross sections for jet E_t, γ+jet selection, $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





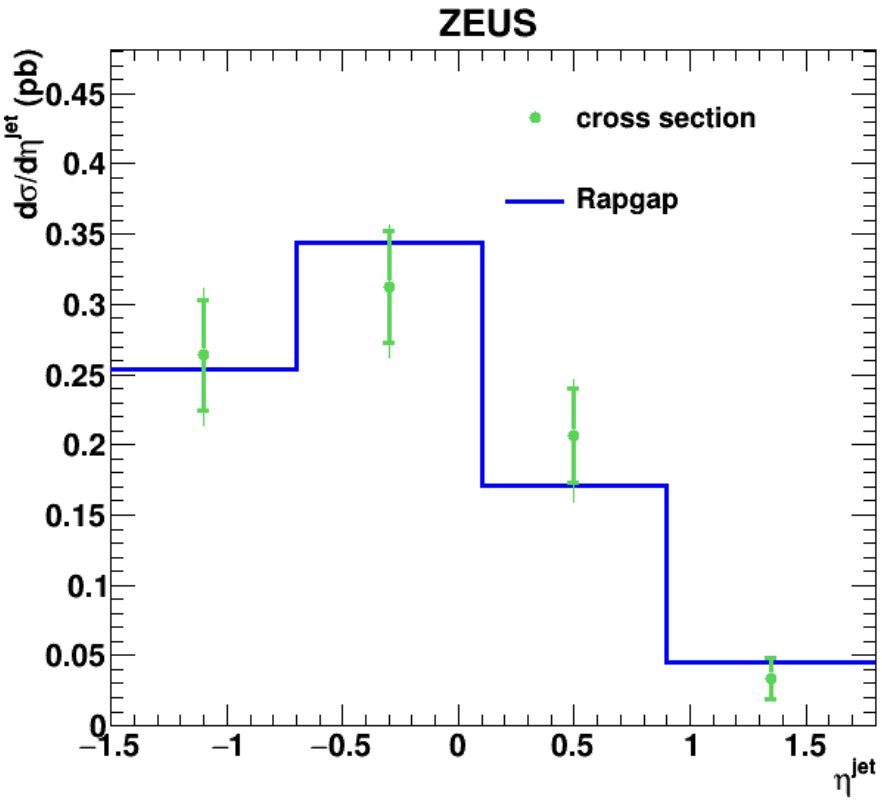
	4 ÷ 6 GeV	6 ÷ 8 GeV	8 ÷ 10 GeV	10 ÷ 15 GeV
cr sec, pb	0.120±0.016	0.099±0.014	0.048±0.009	0.005±0.002
	0.140±0.018	0.115±0.016	0.056±0.010	0.005±0.002
1/acceptance	0.962±0.025	1.089±0.030	0.868±0.042	0.741±0.054

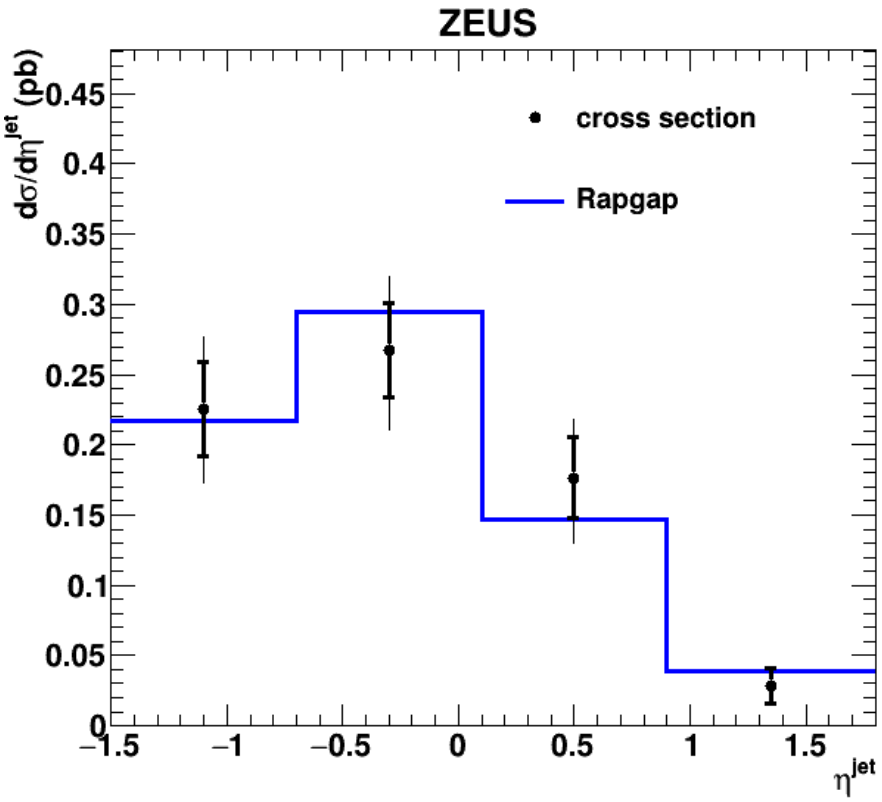
HERAII differential cross sections for jet η , γ+jet selection , $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





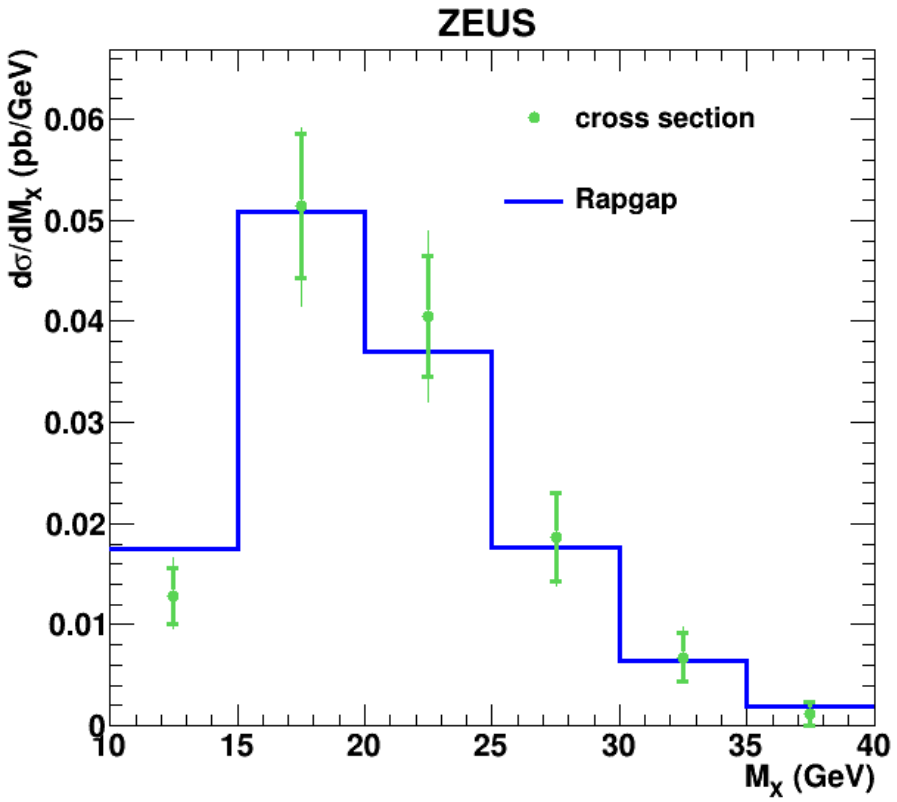
	-1.5 ÷ -0.7	-0.7 ÷ 0.1	0.1 ÷ 0.9	0.9 ÷ 1.8
cr sec, pb	0.226±0.034	0.267±0.034	0.177±0.029	0.028±0.013
	0.264±0.039	0.312±0.040	0.206±0.033	0.033±0.015
1/acceptance	1.117±0.030	0.980±0.022	0.876±0.029	0.794±0.052

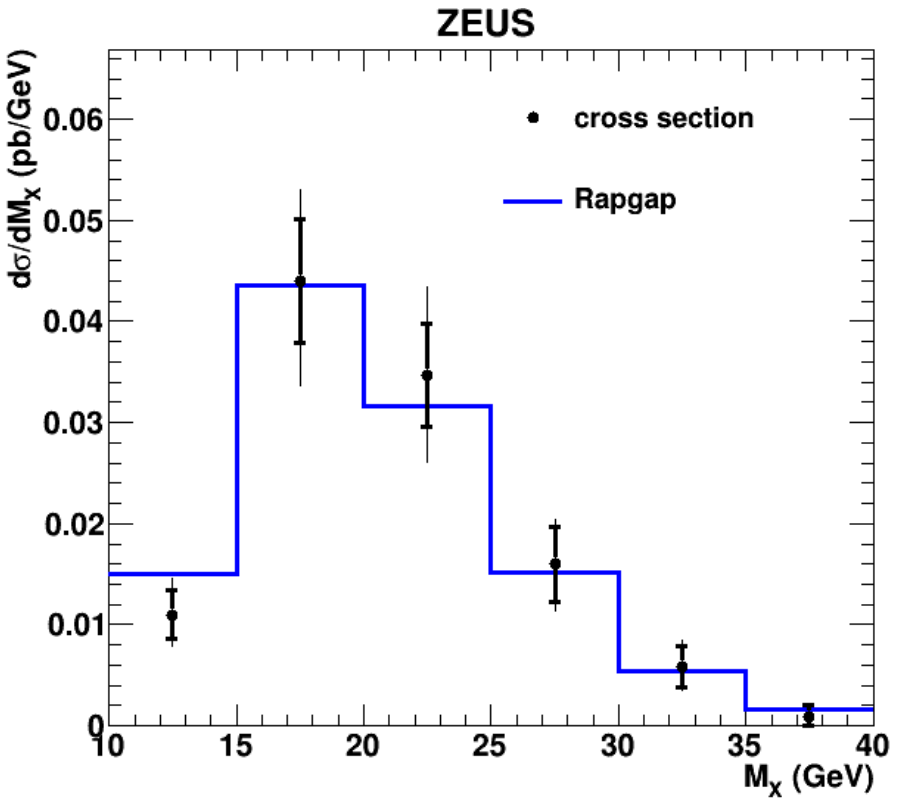
HERAII differential cross sections for M_X, γ+jet selection, $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





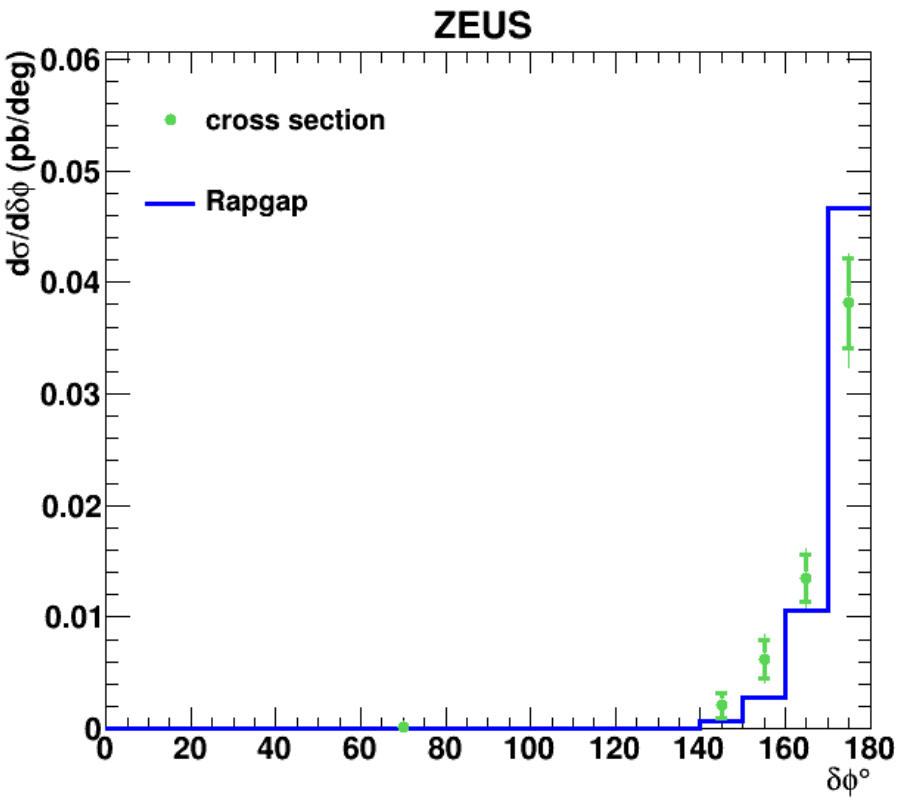
	10 ÷ 15 GeV	15 ÷ 20 GeV	20 ÷ 25 GeV	25 ÷ 30 GeV	30 ÷ 35 GeV	35 ÷ 40 GeV
cr sec, pb	0.011±0.002	0.044±0.006	0.035±0.005	0.016±0.004	0.006±0.002	0.001±0.001
	0.013±0.003	0.051±0.007	0.041±0.006	0.019±0.004	0.007±0.002	0.001±0.001
1/acceptance	0.902±0.041	1.067±0.027	0.999±0.030	0.903±0.041	0.835±0.064	0.783±0.113

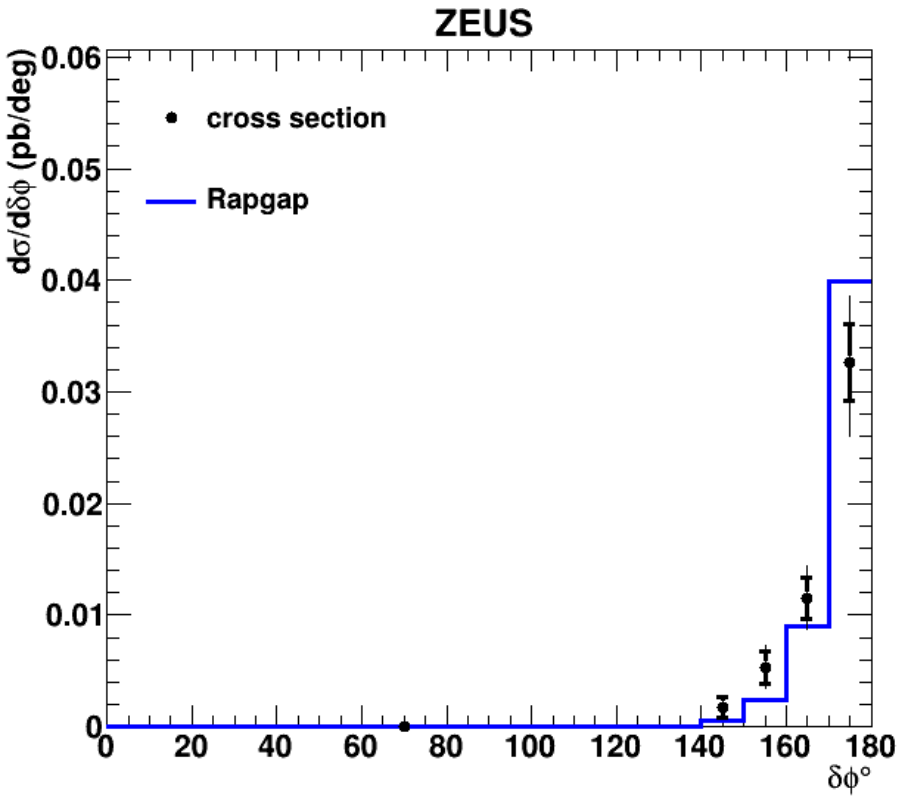
HERAII differential cross sections for angle between photon and jet δϕ, γ+jet selection $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





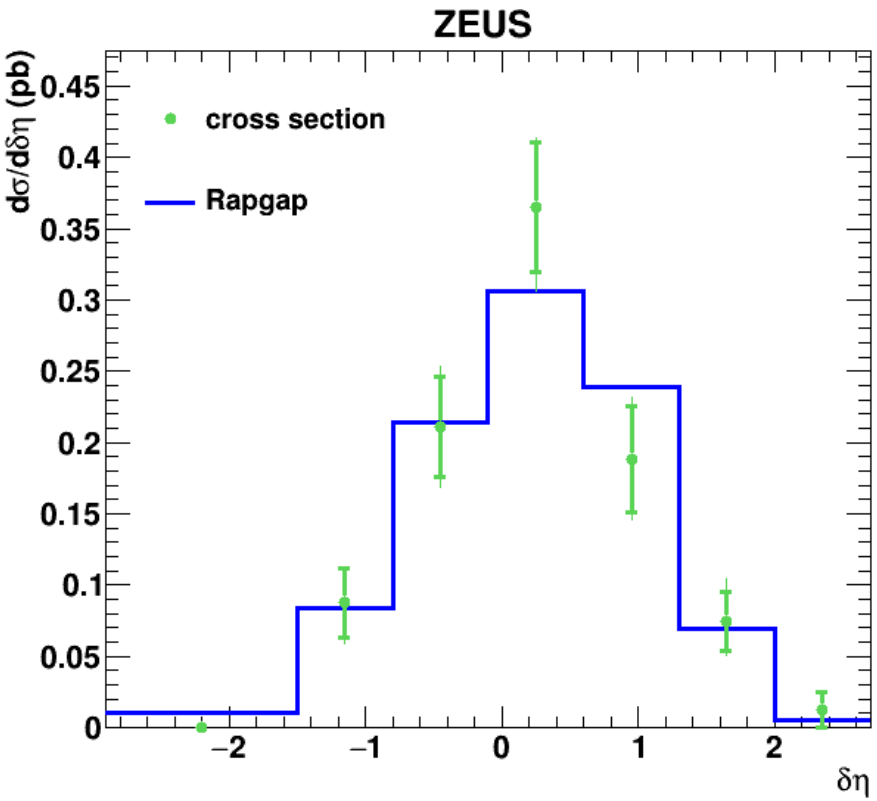
	0 ÷ 140	140 ÷ 150	150 ÷ 160	160 ÷ 170	170 ÷ 180
cr sec, pb	0.000±0.000	0.002±0.001	0.005±0.001	0.012±0.002	0.033±0.003
	0.000±0.000	0.002±0.001	0.006±0.002	0.013±0.002	0.038±0.004
1/acceptance	0.548±0.104	0.761±0.129	0.842±0.069	0.781±0.031	1.062±0.018

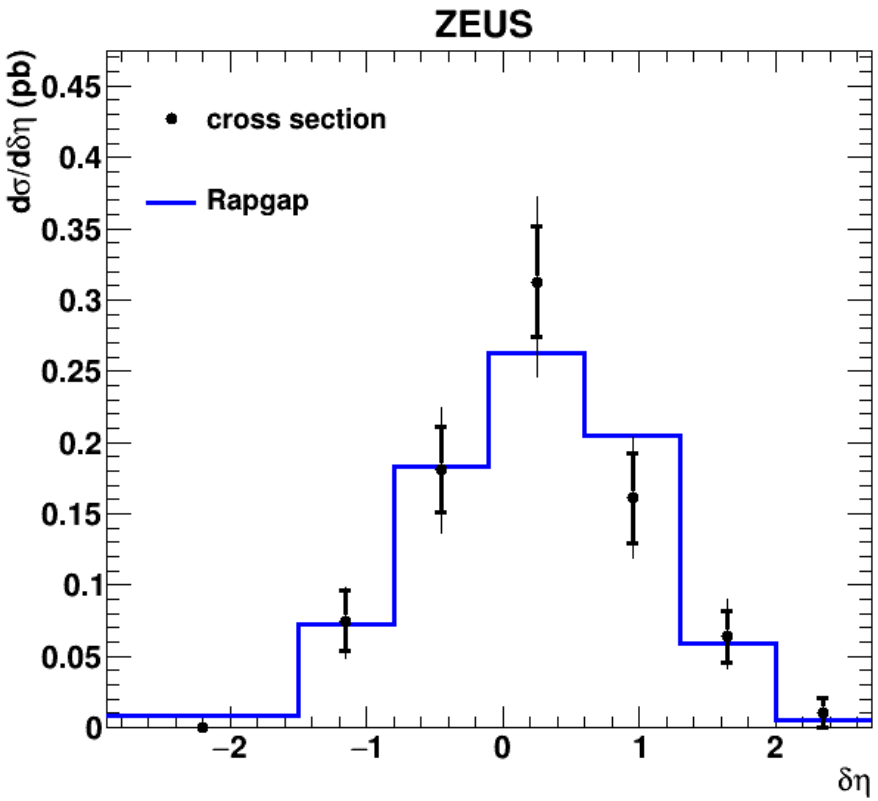
HERAII differential cross sections for angle between photon and jet δη, γ+jet selection $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





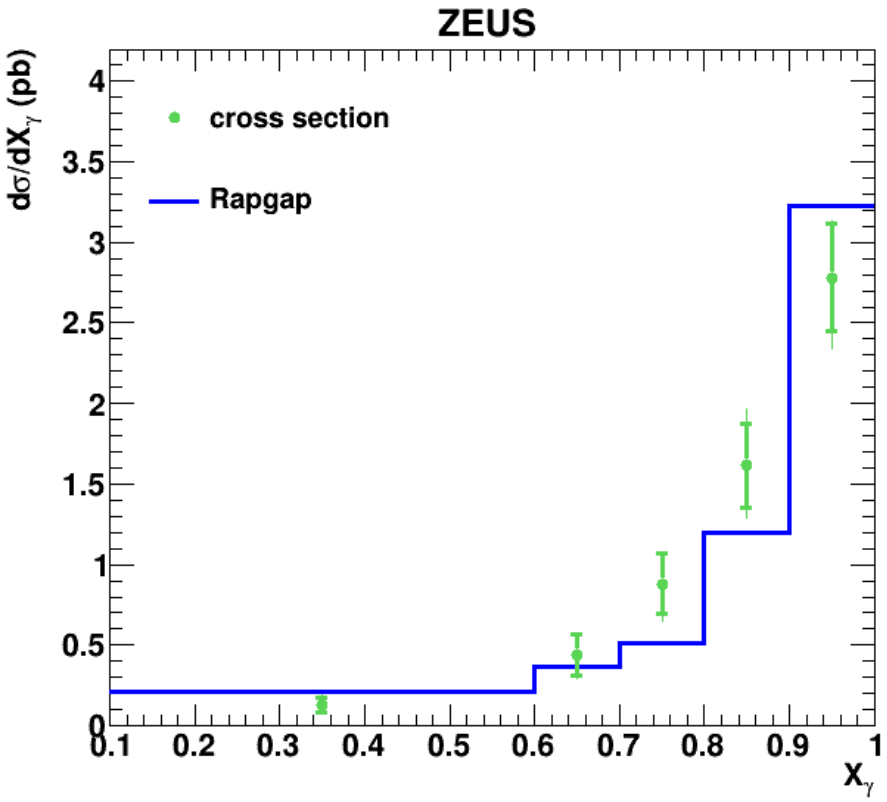
	-2.9 ÷ -1.5	-1.5 ÷ -0.8	-0.8 ÷ -0.1	-0.1 ÷ 0.6	0.6 ÷ 1.3	1.3 ÷ 2.0	2.0 ÷ 2.7
cr sec, pb	0.000±0.004	0.075±0.021	0.181±0.030	0.313±0.039	0.161±0.031	0.064±0.018	0.011±0.010
	0.000±0.004	0.087±0.025	0.211±0.035	0.365±0.045	0.188±0.037	0.075±0.021	0.013±0.012
1/acceptance	0.777±0.092	0.864±0.045	0.911±0.028	0.994±0.026	1.082±0.032	1.055±0.057	1.069±0.224

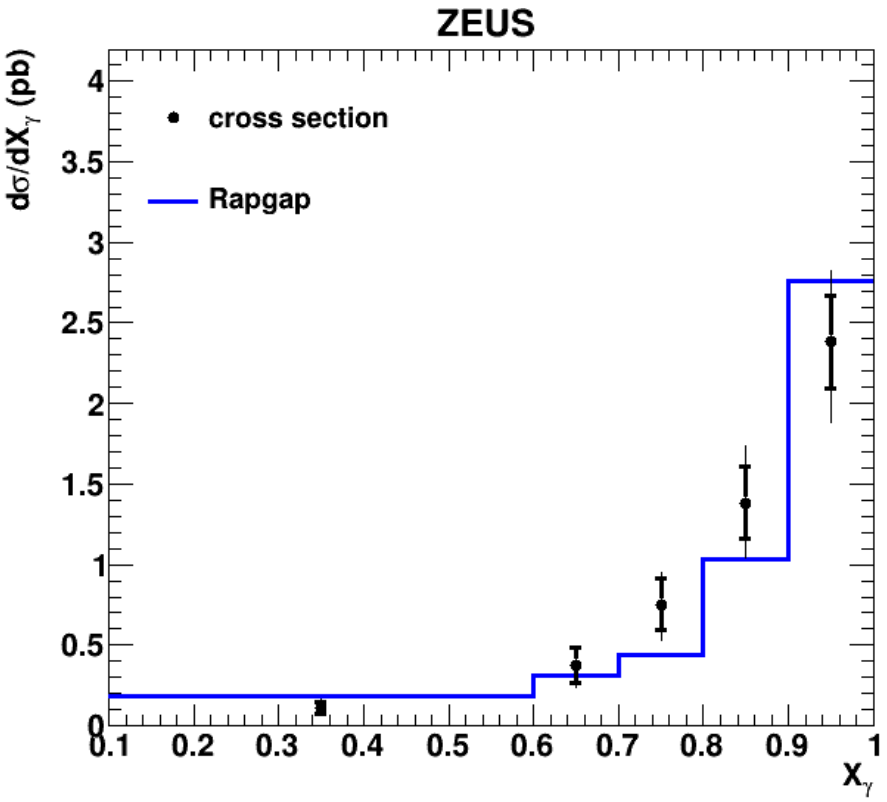
HERAII differential cross sections for X_γ, γ+jet selection , $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





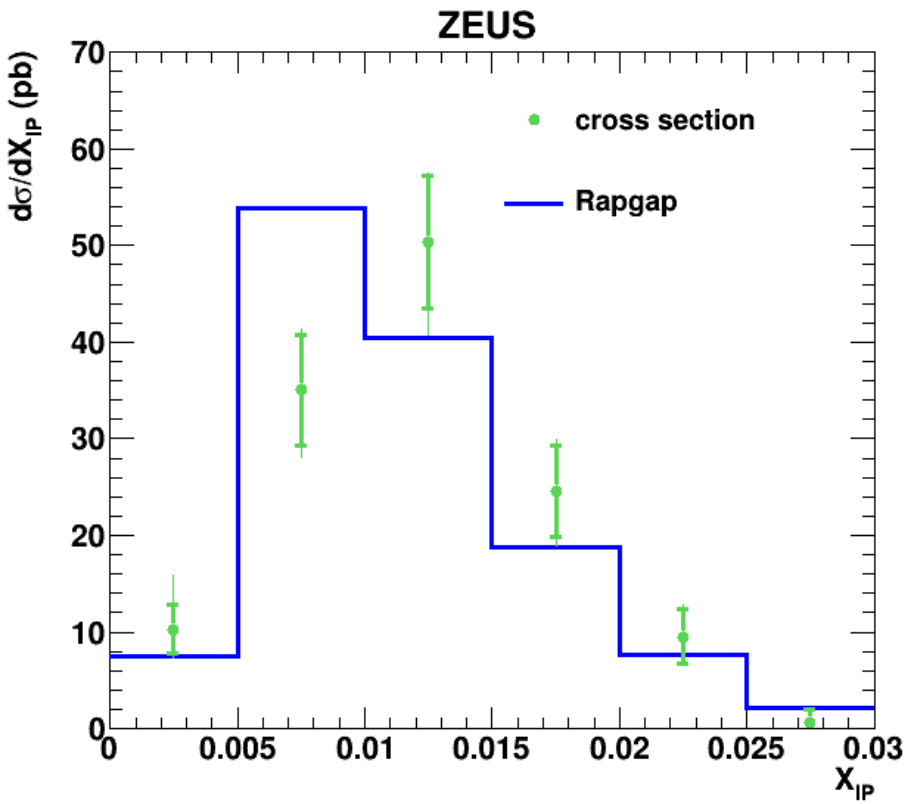
	0.1 ÷ 0.6	0.6 ÷ 0.7	0.7 ÷ 0.8	0.8 ÷ 0.9	0.9 ÷ 1
cr sec, pb	0.109±0.036	0.376±0.106	0.755±0.159	1.382±0.222	2.382±0.285
	0.127±0.043	0.439±0.124	0.881±0.185	1.614±0.260	2.781±0.333
1/acceptance	0.910±0.038	0.725±0.055	0.769±0.049	0.896±0.034	1.135±0.025

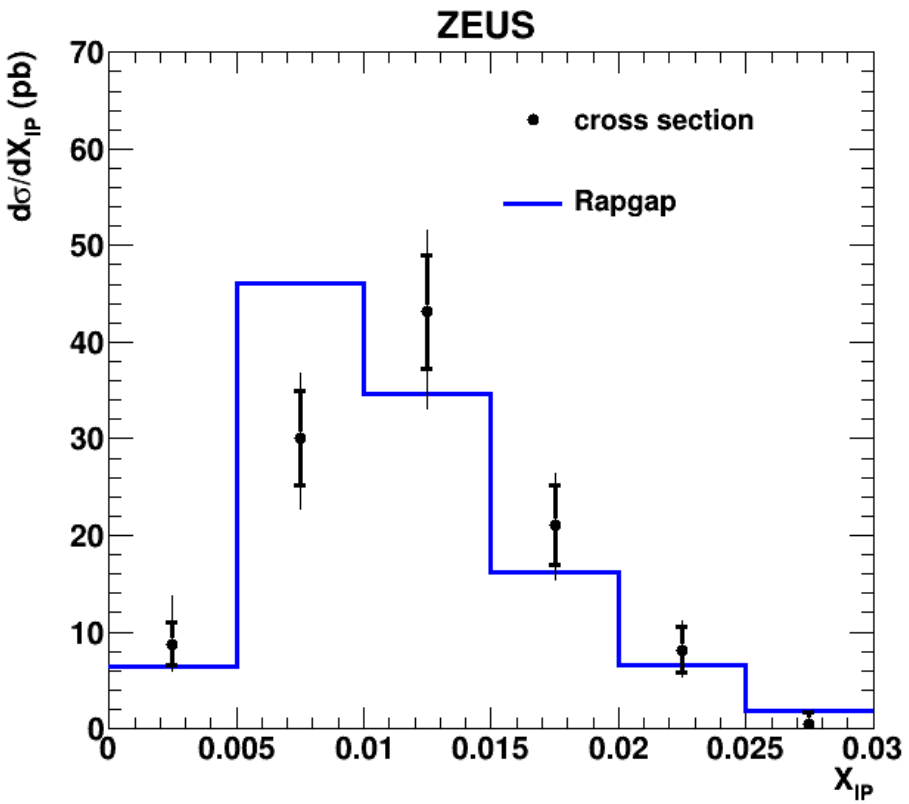
HERAII differential cross sections for X_{IP}, γ+jet selection , $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





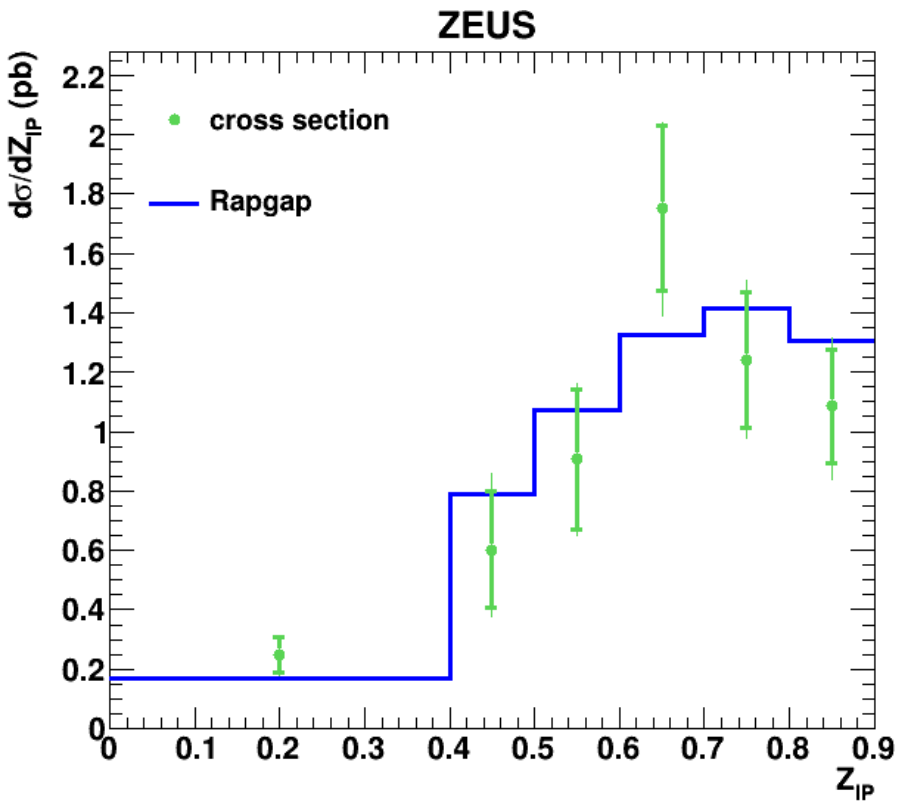
	0 ÷ 0.005	0.005 ÷ 0.01	0.01 ÷ 0.015	0.015 ÷ 0.02	0.02 ÷ 0.025	0.025 ÷ 0.03
cr sec, pb	8.780±2.168	30.034±4.879	43.123±5.839	21.055±4.059	8.161±2.384	0.507±1.149
	10.252±2.531	35.069±5.697	50.352±6.818	24.584±4.739	9.529±2.784	0.592±1.342
1/acceptance	0.850±0.057	1.031±0.024	1.015±0.028	0.960±0.041	0.833±0.056	0.627±0.079

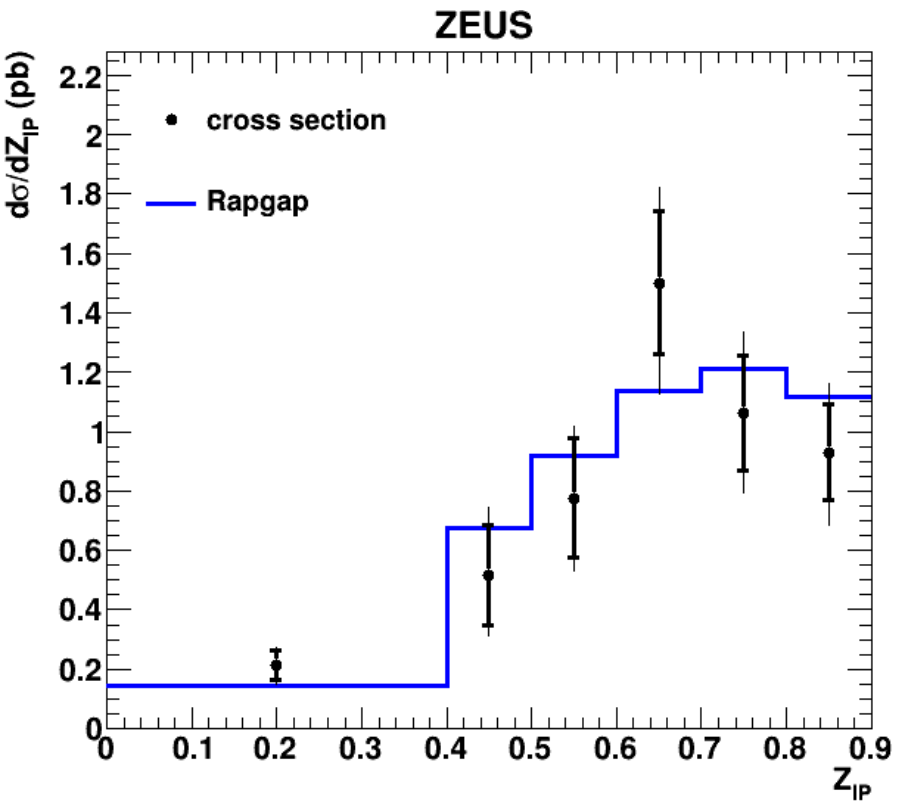
HERAII differential cross sections for Z_{IP}, γ+jet selection, $Z_{IP} < 0.9$

black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

blue – Rapgap (70:30) prediction normalized to data





	0.0 ÷ 0.4	0.4 ÷ 0.5	0.5 ÷ 0.6	0.6 ÷ 0.7	0.7 ÷ 0.8	0.8 ÷ 0.9
cr sec, pb	0.214±0.052	0.515±0.168	0.776±0.202	1.501±0.239	1.062±0.195	0.930±0.163
	0.250±0.060	0.602±0.197	0.906±0.236	1.752±0.279	1.240±0.228	1.086±0.190
1/acceptance	1.186±0.063	1.147±0.061	1.146±0.052	1.074±0.043	0.969±0.035	0.714±0.027

Conclusions

- Reweighted Rapgap gives a reasonable description of the data within statistics for most variables for both Z_{IP} ranges.
- In range $Z_{IP} \geq 0.9$ the 100:0 MC mix gives cross sections about 10% larger than the 70:30 MC mix due to lower direct acceptance.
- In general the values of cross sections in range $Z_{IP} \geq 0.9$ are smaller on about 20% compared to range $Z_{IP} < 0.9$ because of smaller statistics. However the sum of total cross section in range $Z_{IP} \geq 0.9$ (0.538 pb) and in range $Z_{IP} < 0.9$ (0.658 pb) is in agreement with Slide 8 - the overall cross section.

Future plans

- make final group presentation and paper

Thanks for help and support to Peter Bussey, Ian Skillicorn, David Saxon

Backup

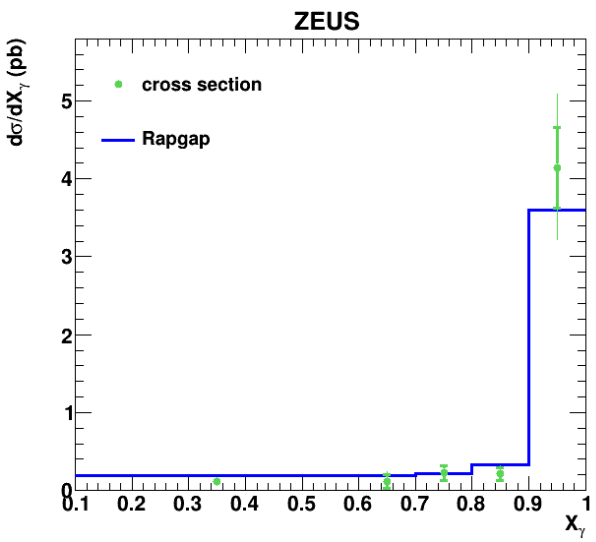
HERAII differential cross sections for X_γ, γ+jet selection, $Z_{IP} \geq 0.9$

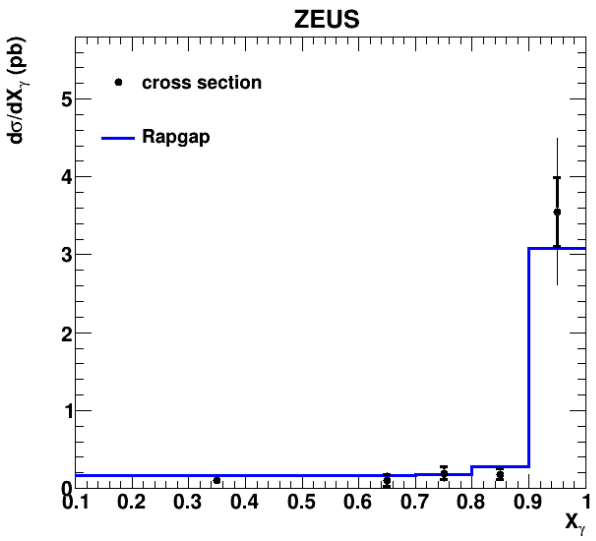
black – cross sections multiplied by HERAI/HERAII total cross section factor

green – cross sections

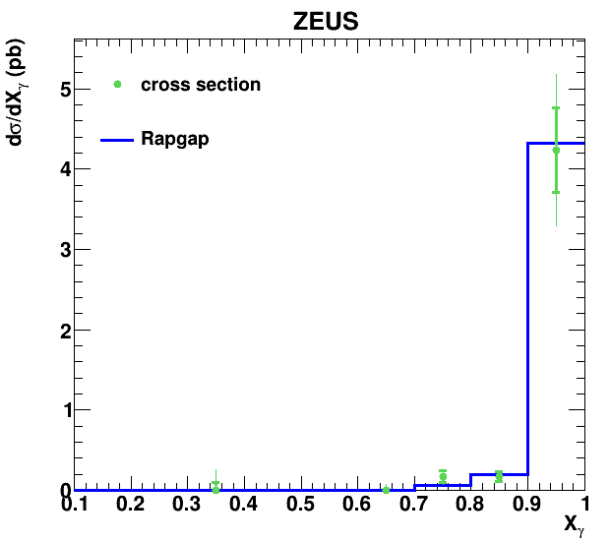
blue – Rapgap prediction normalized to data

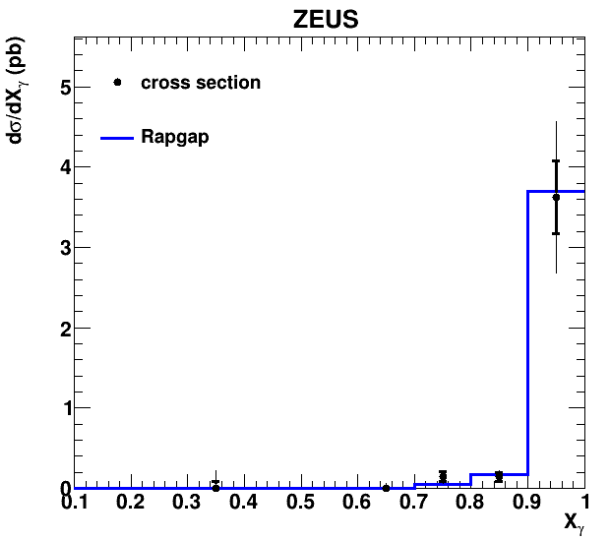
70:30 MC mix





100:0 MC mix





	cr sec, pb cr sec, pb 1/acceptance	
	70:30 mix	100:0 mix
0.1 ÷ 0.6	0.099±0.031 0.115±0.036 1.050±0.124	0.000±0.000 0.000±0.000 0.000±0.000
0.6 ÷ 0.7	0.102±0.077 0.119±0.090 0.461±0.117	0.000±0.000 0.000±0.000 0.000±0.000
0.7 ÷ 0.8	0.193±0.083 0.225±0.097 0.865±0.186	0.151±0.062 0.176±0.073 0.675±0.121
0.8 ÷ 0.9	0.183±0.070 0.213±0.081 0.690±0.087	0.147±0.055 0.172±0.064 0.556±0.052
0.9 ÷ 1	3.546±0.444 4.141±0.519 1.947±0.062	3.628±0.453 4.236±0.529 1.992±0.060

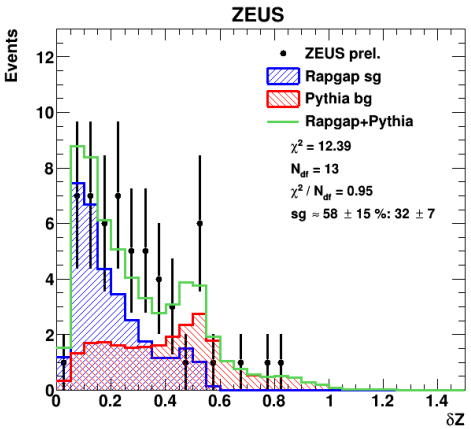
$$Z_{IP} \geq 0.9$$

The dZ fit procedures for photon E_T cross section evaluation

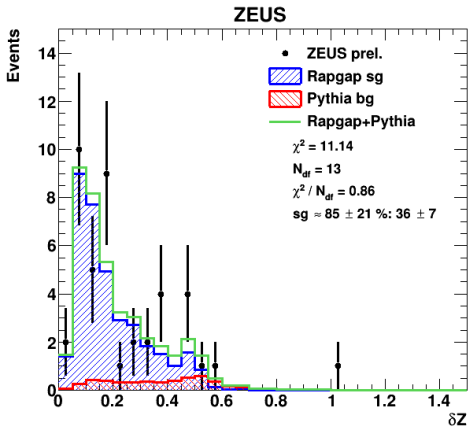
γ+jet selection

$Z_{IP} \geq 0.9$

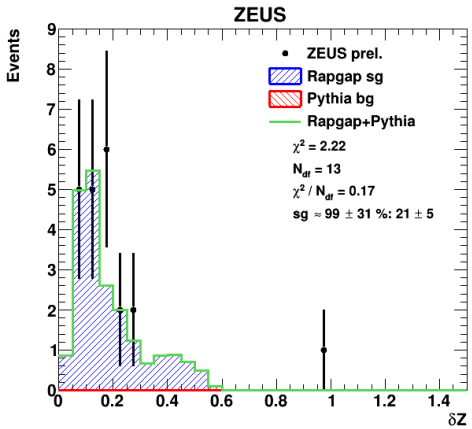
5 ÷ 6



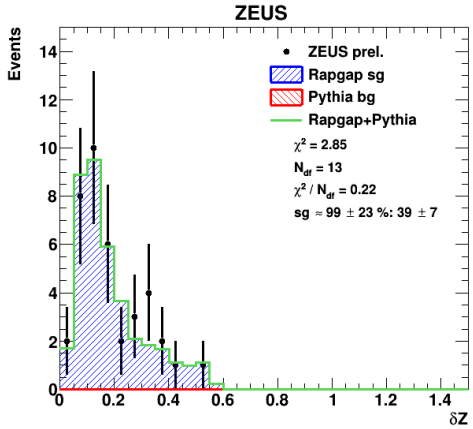
6 ÷ 7



7 ÷ 8



8 ÷ 15

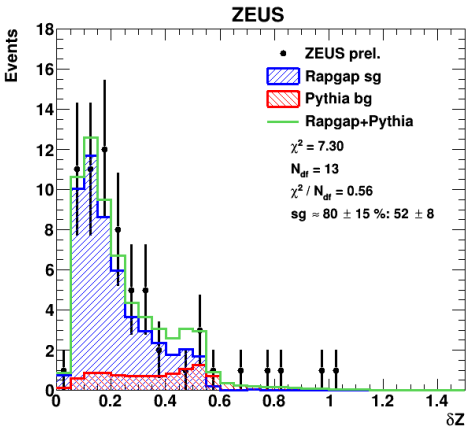


The dZ fit procedures for photon η cross section evaluation

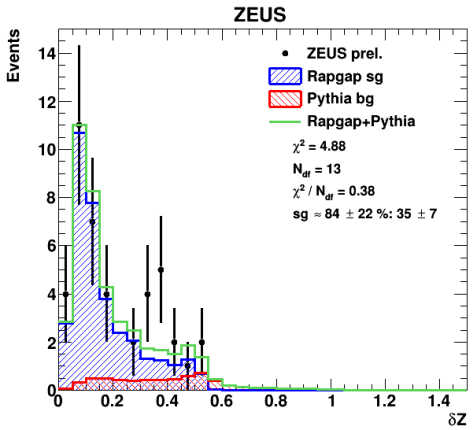
γ+jet selection

$Z_{IP} \geq 0.9$

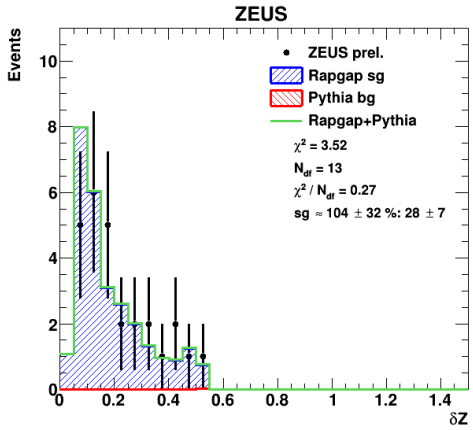
-0.7 ÷ -0.3



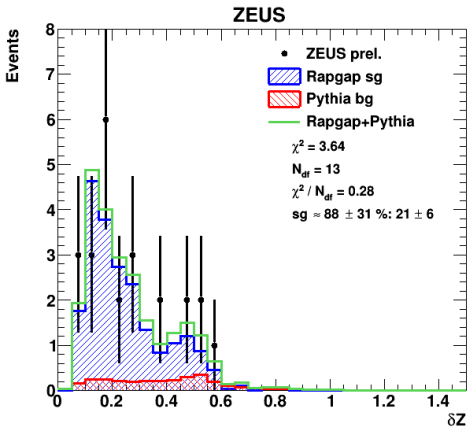
-0.3 ÷ -0.1



-0.1 ÷ 0.5



0.5 ÷ 0.9

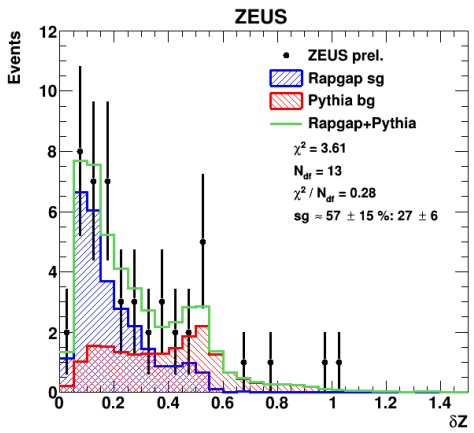


The dZ fit procedures for jet E_T cross section evaluation

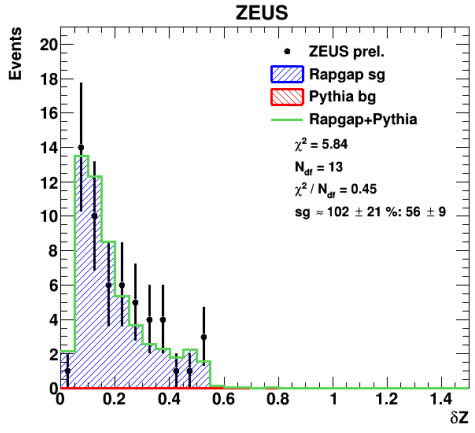
γ+jet selection

$Z_{IP} \geq 0.9$

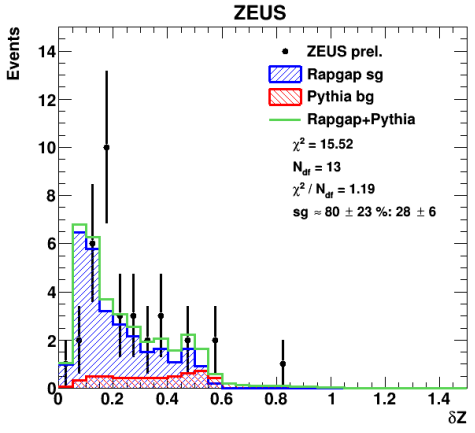
4 ÷ 6



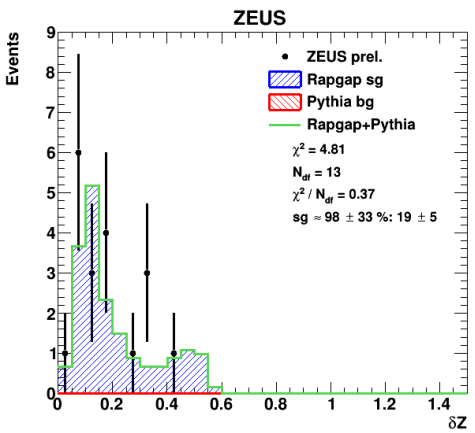
6 ÷ 8



8 ÷ 10



10 ÷ 15

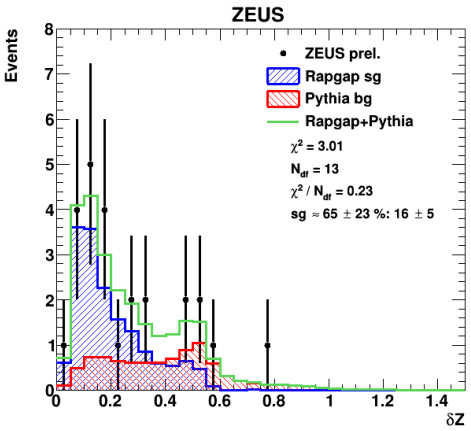


The dZ fit procedures for jet η cross section evaluation

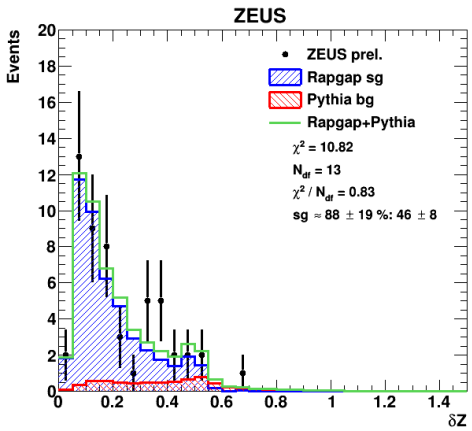
γ+jet selection

$Z_{IP} \geq 0.9$

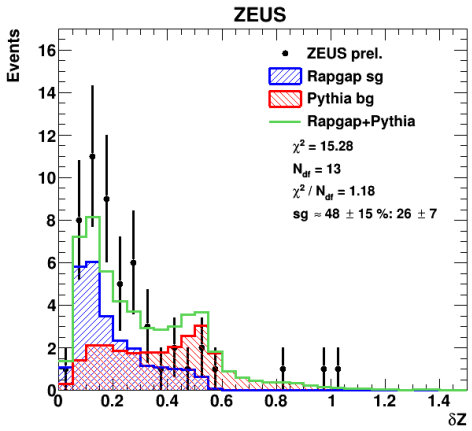
-1.5 ÷ 0.7



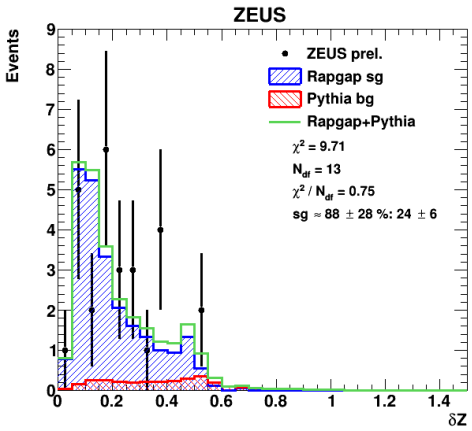
-0.7 ÷ 0.1



0.1 ÷ 0.9



0.9 ÷ 1.8

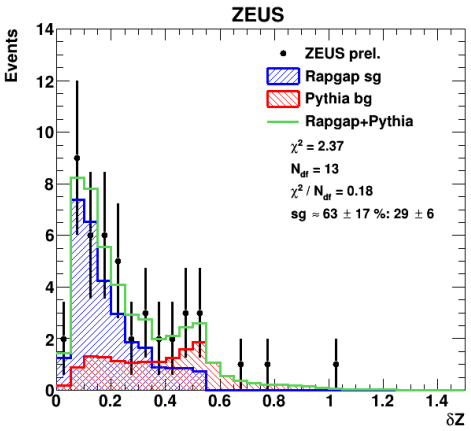


The dZ fit procedures for M_X cross section evaluation

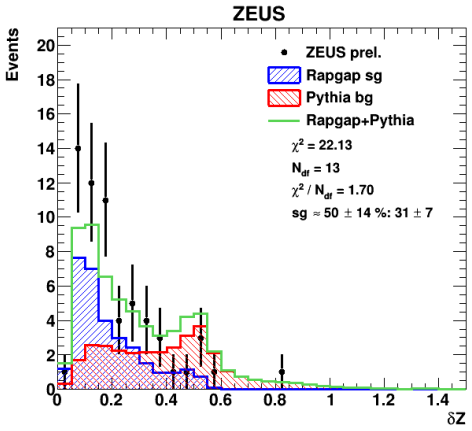
γ+jet selection

$Z_{IP} \geq 0.9$

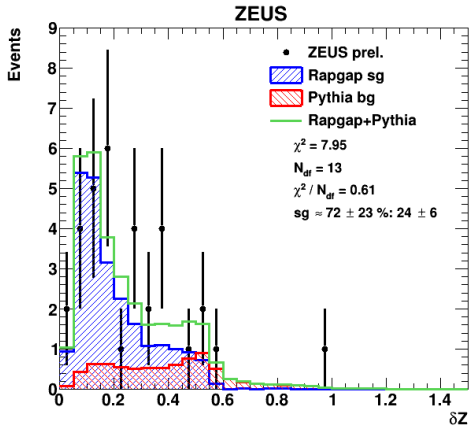
10 ÷ 15



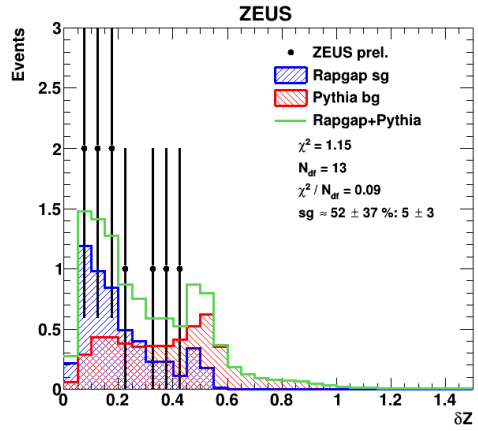
15 ÷ 20



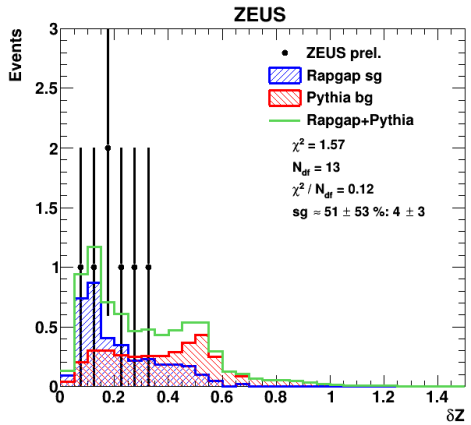
20 ÷ 25



25 ÷ 30



30 ÷ 40

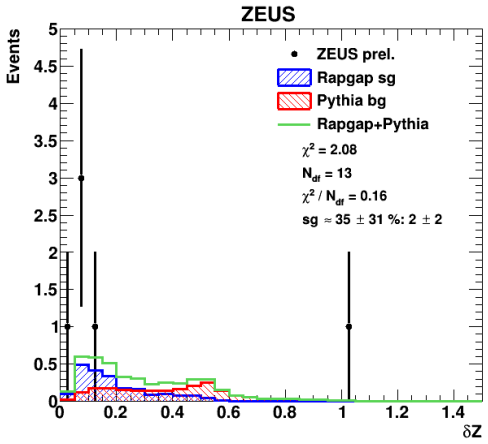


The dZ fit procedures for δϕ cross section evaluation

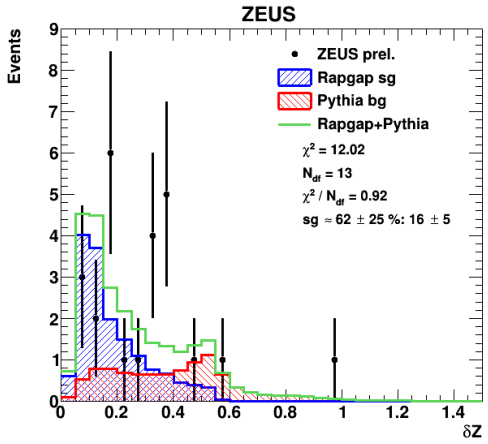
γ+jet selection

$Z_{IP} \geq 0.9$

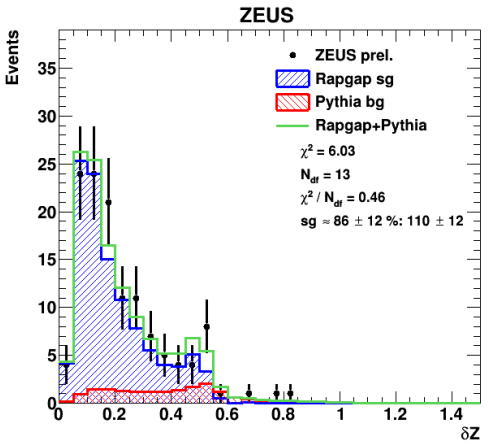
0 ÷ 160



160 ÷ 170



170 ÷ 180

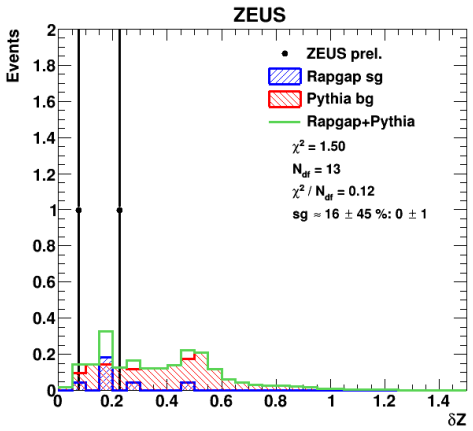


The dZ fit procedures for δη cross section evaluation

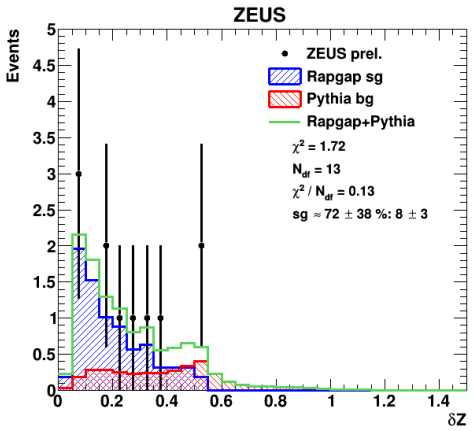
γ+jet selection

$Z_{IP} \geq 0.9$

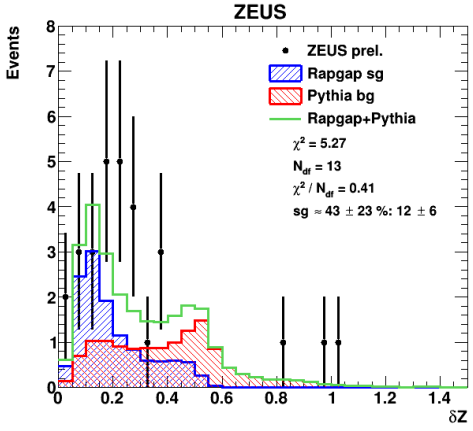
-2.9 ÷ -2.2



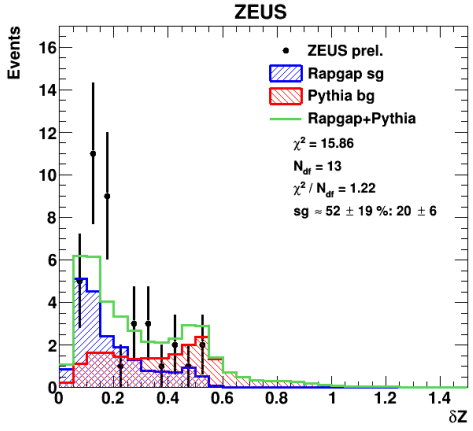
-2.2 ÷ -1.5



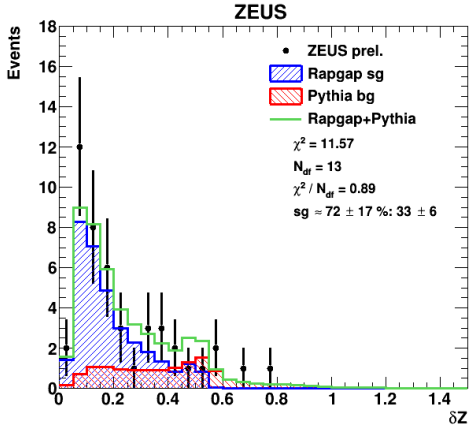
-1.5 ÷ -0.8



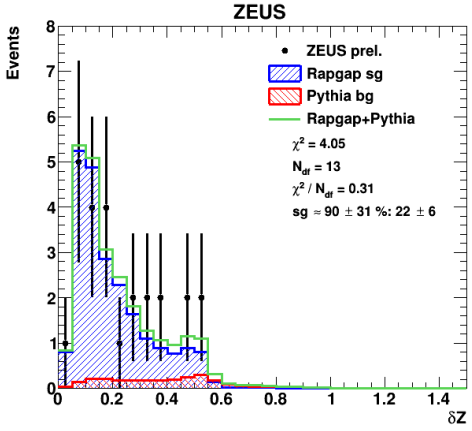
-0.8 ÷ -0.1



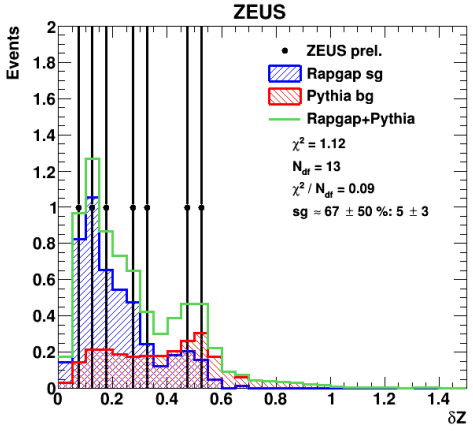
-0.1 ÷ 0.6



0.6 ÷ 1.3



1.3 ÷ 2.7

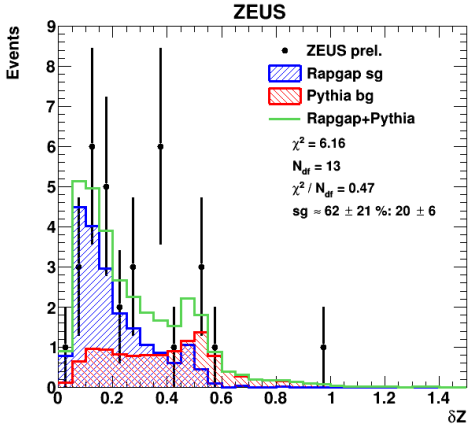


The dZ fit procedures for X_γ cross section evaluation

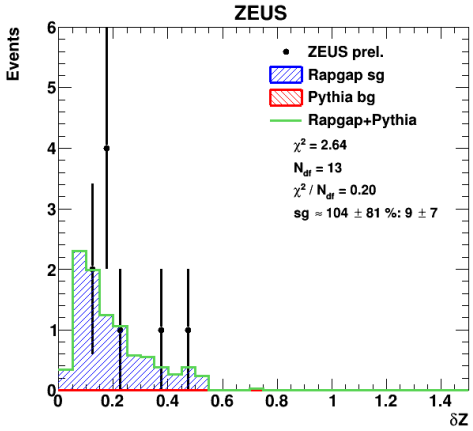
γ+jet selection

$Z_{IP} \geq 0.9$

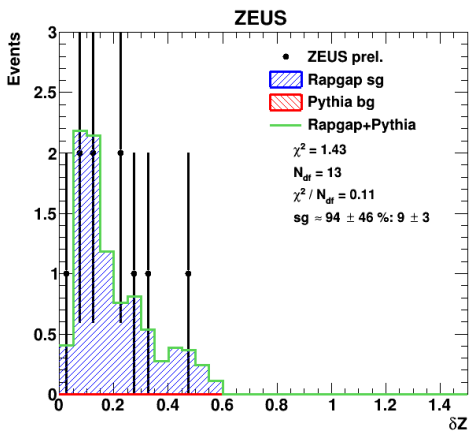
0.1 ÷ 0.6



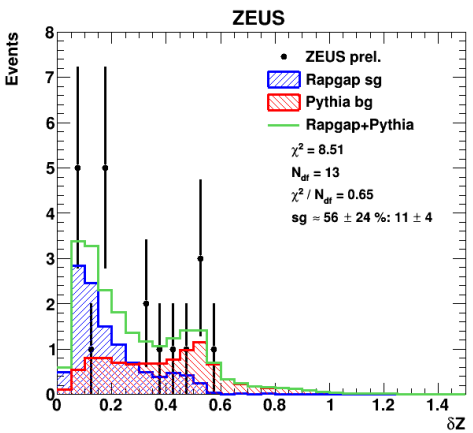
0.6 ÷ 0.7



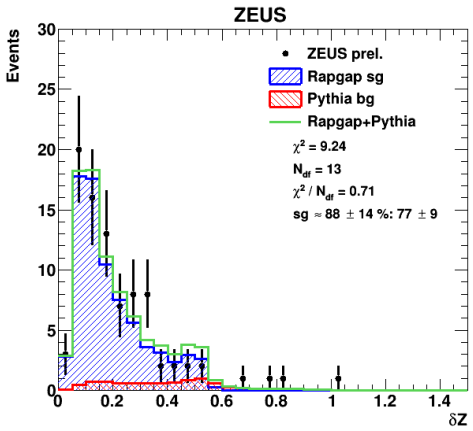
0.7 ÷ 0.8



0.8 ÷ 0.9



0.9 ÷ 1

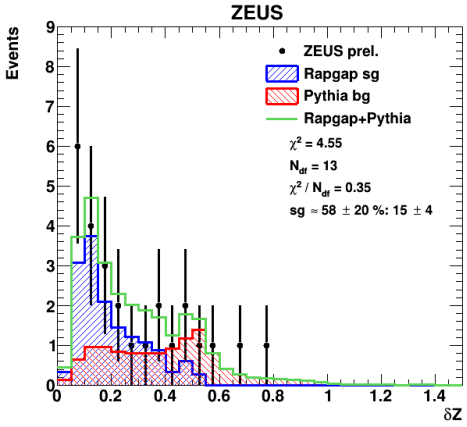


The dZ fit procedures for X_{IP} cross section evaluation

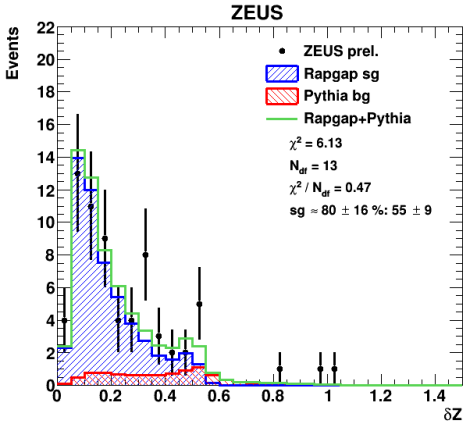
γ+jet selection

$Z_{IP} \geq 0.9$

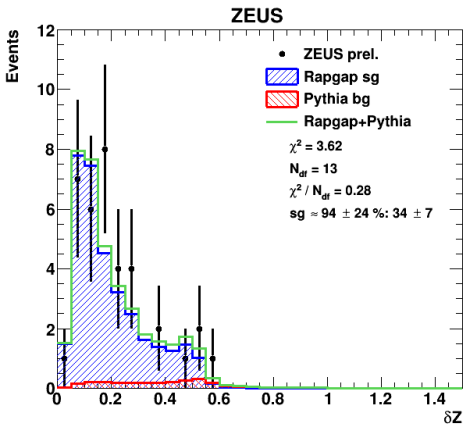
0 ÷ 0.005



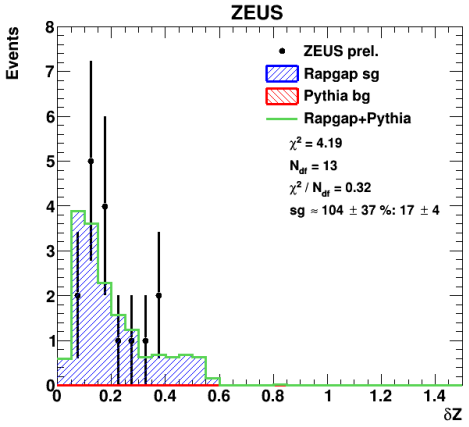
0.005 ÷ 0.01



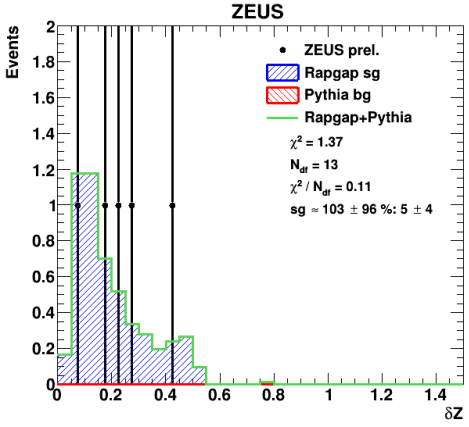
0.01 ÷ 0.015



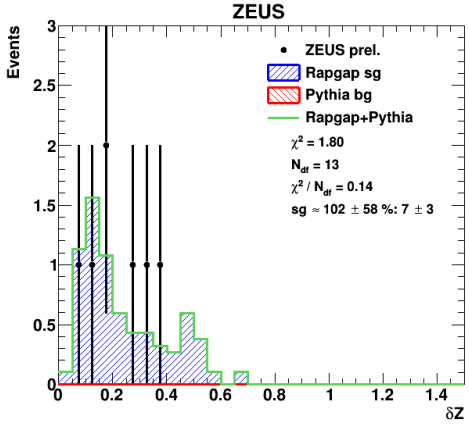
0.015 ÷ 0.02



0.02 ÷ 0.025



0.025 ÷ 0.03

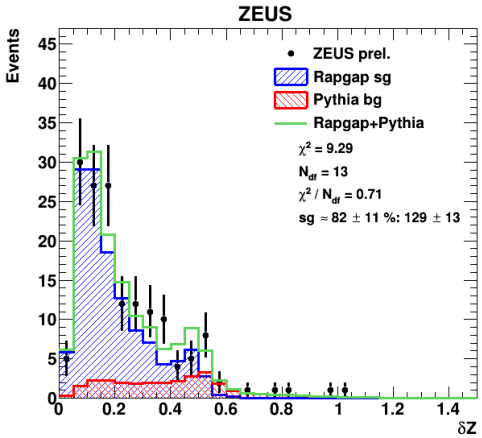


The dZ fit procedures for Z_{IP} cross section evaluation

γ+jet selection

$Z_{IP} \geq 0.9$

0.9 ÷ 1



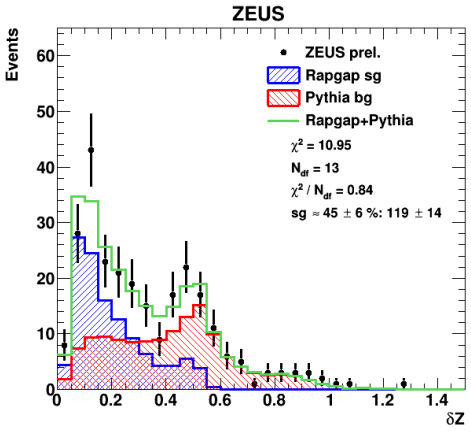
$$Z_{IP} < 0.9$$

The dZ fit procedures for photon E_T cross section evaluation

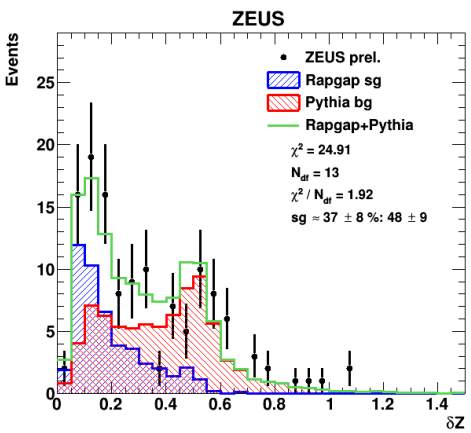
γ+jet selection

Z_{IP} < 0.9

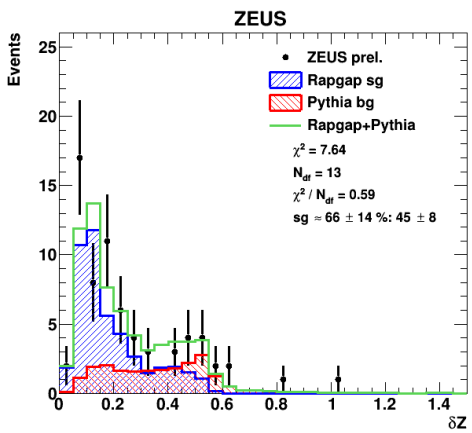
5 ÷ 6



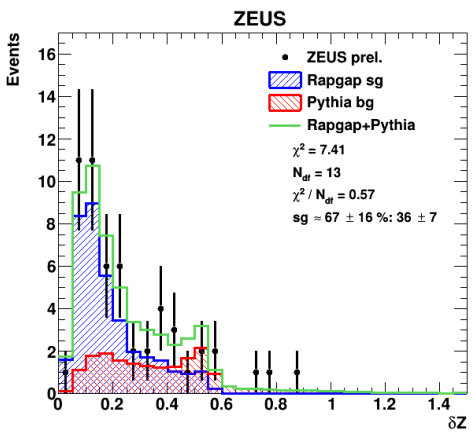
6 ÷ 7



7 ÷ 8



8 ÷ 15

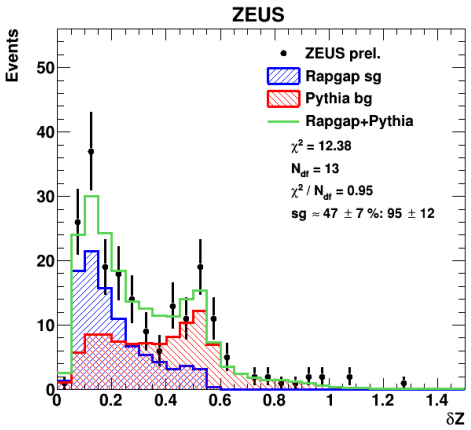


The dZ fit procedures for photon η cross section evaluation

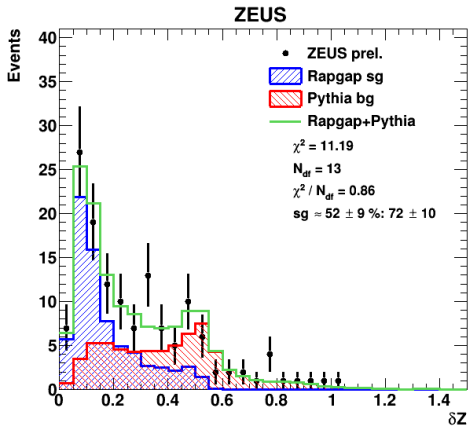
γ+jet selection

Z_{IP} < 0.9

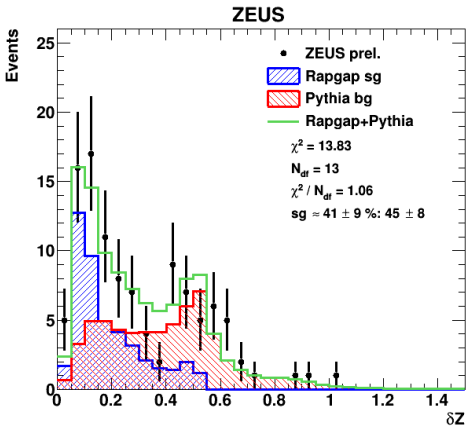
-0.7 ÷ -0.3



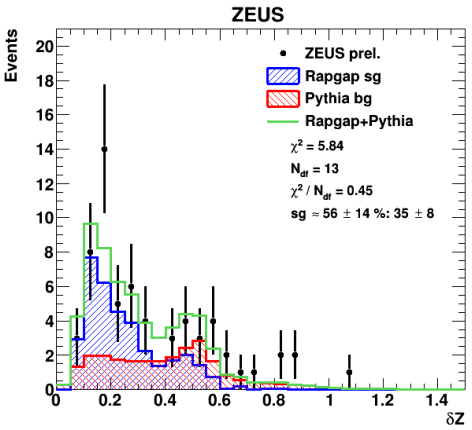
-0.3 ÷ -0.1



-0.1 ÷ 0.5



0.5 ÷ 0.9

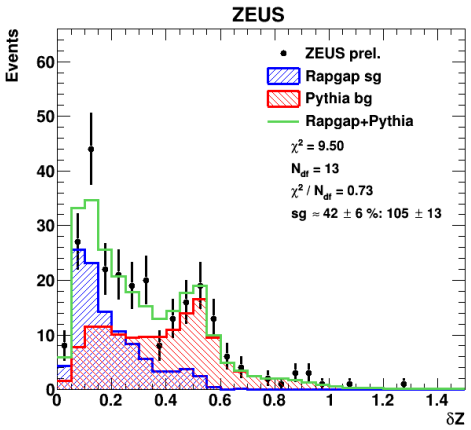


The dZ fit procedures for jet E_T cross section evaluation

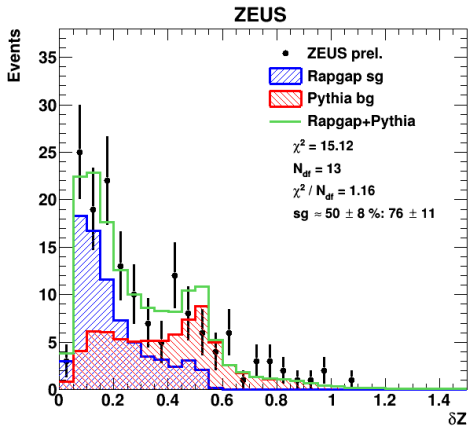
γ+jet selection

Z_{IP} < 0.9

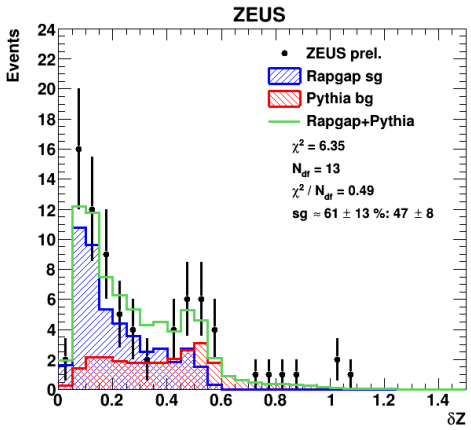
4 ÷ 6



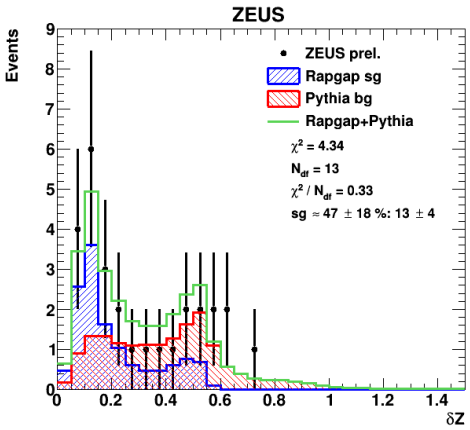
6 ÷ 8



8 ÷ 10



10 ÷ 15

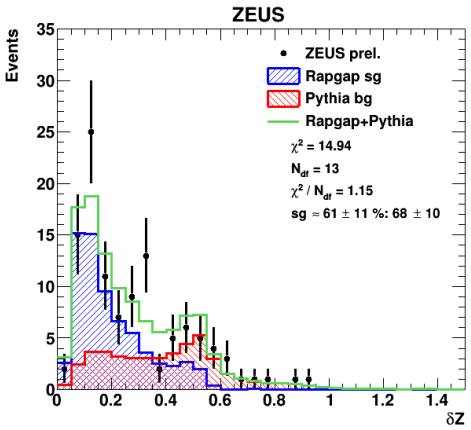


The dZ fit procedures for jet η cross section evaluation

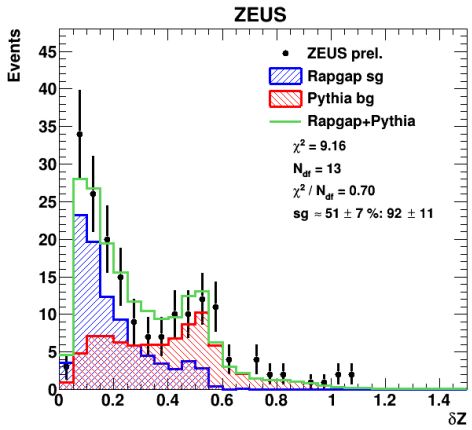
γ+jet selection

$Z_{IP} < 0.9$

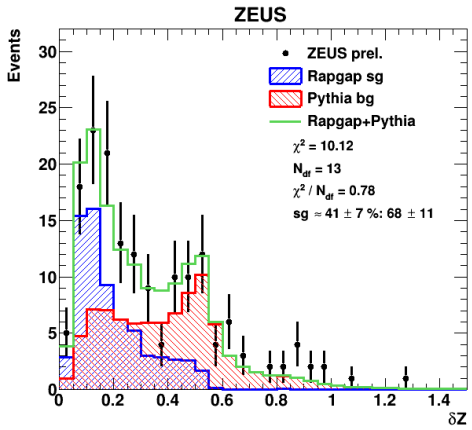
-1.5 ÷ 0.7



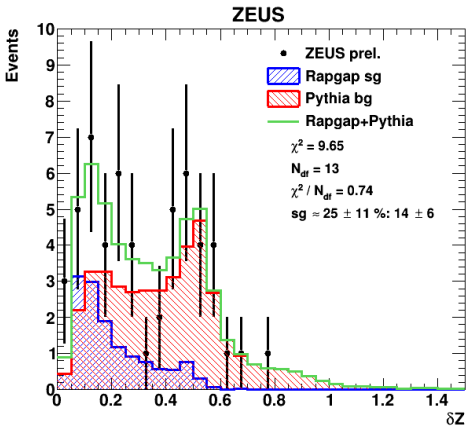
-0.7 ÷ 0.1



0.1 ÷ 0.9



0.9 ÷ 1.8

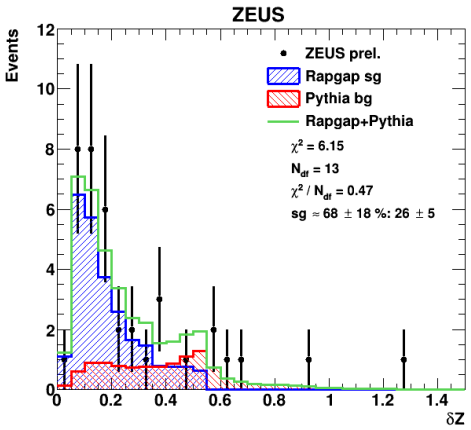


The dZ fit procedures for M_X cross section evaluation

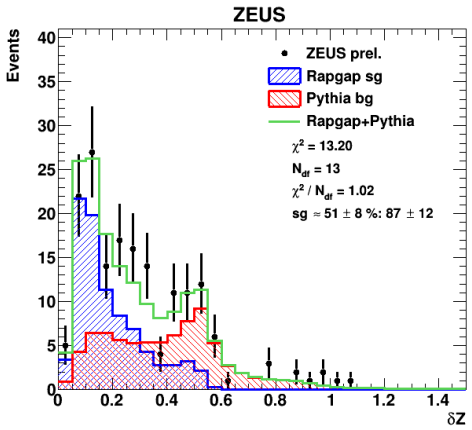
γ+jet selection

$Z_{IP} < 0.9$

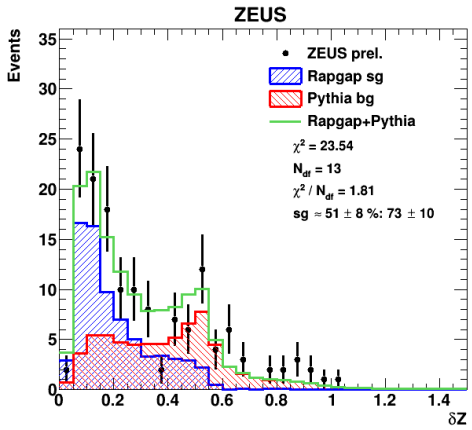
10 ÷ 15



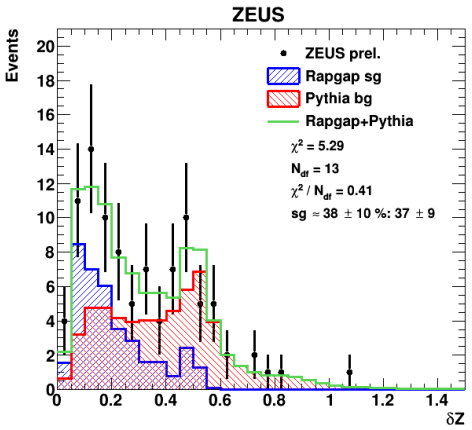
15 ÷ 20



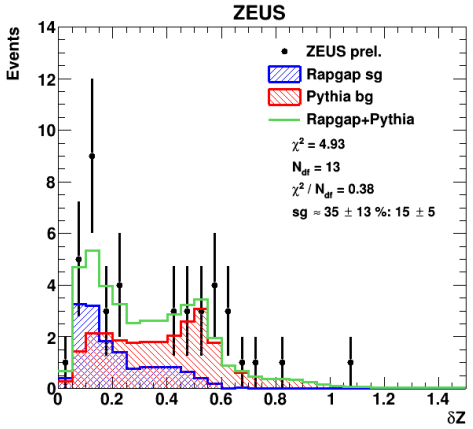
20 ÷ 25



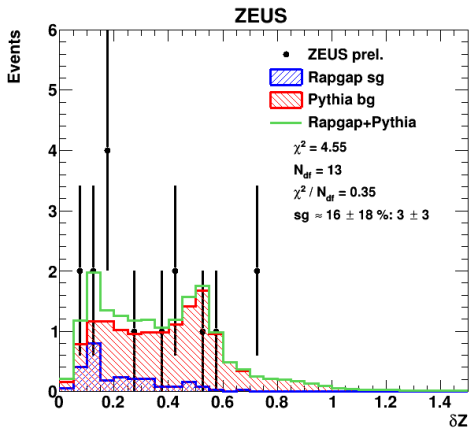
25 ÷ 30



30 ÷ 35



35 ÷ 40

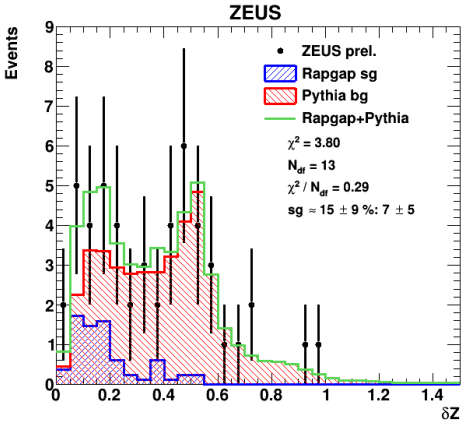


The dZ fit procedures for δϕ cross section evaluation

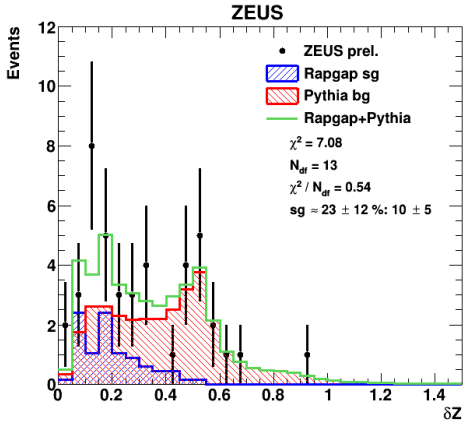
γ+jet selection

Z_{IP} < 0.9

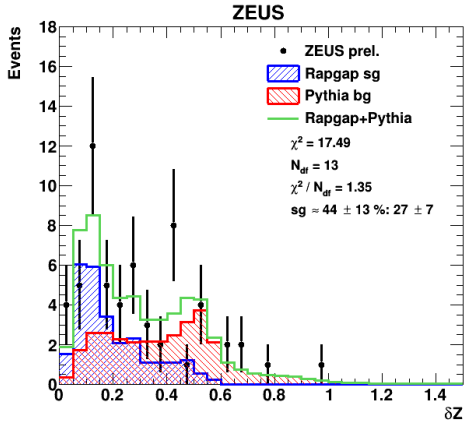
0 ÷ 140



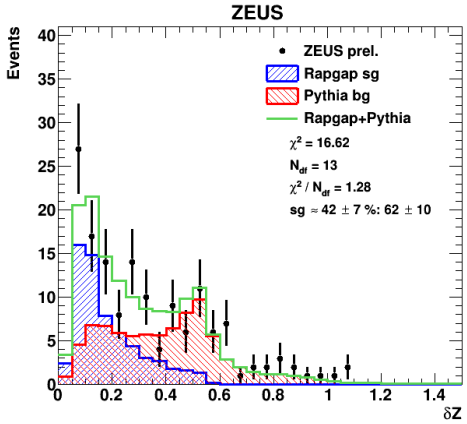
140 ÷ 150



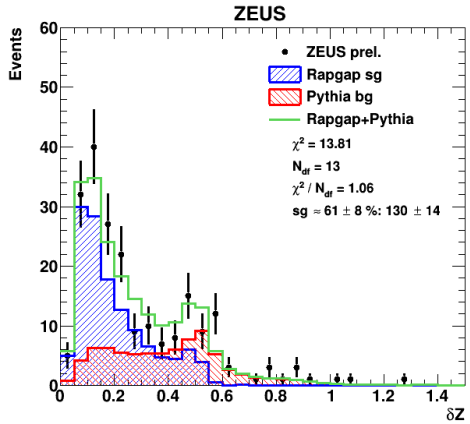
150 ÷ 160



160 ÷ 170



170 ÷ 180

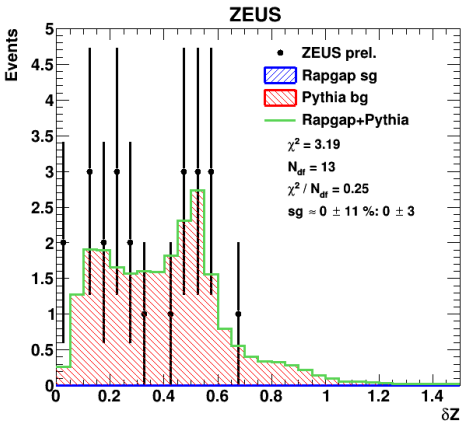


The dZ fit procedures for δη cross section evaluation

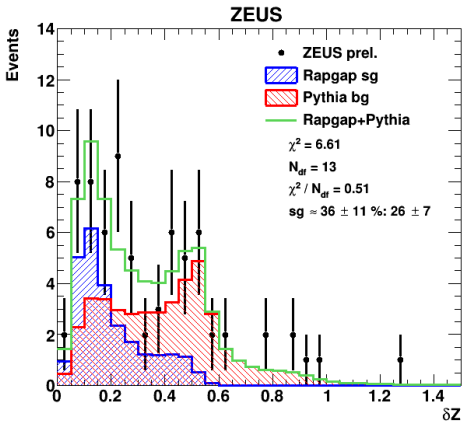
γ+jet selection

$Z_{IP} < 0.9$

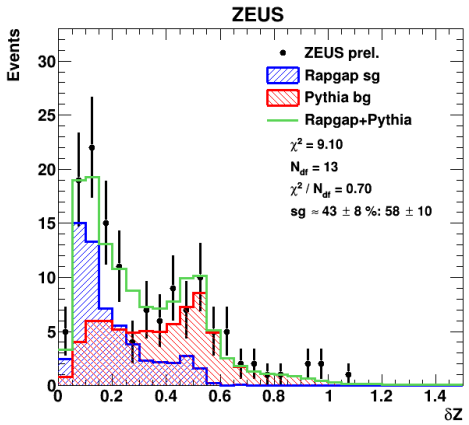
-2.9 ÷ -1.5



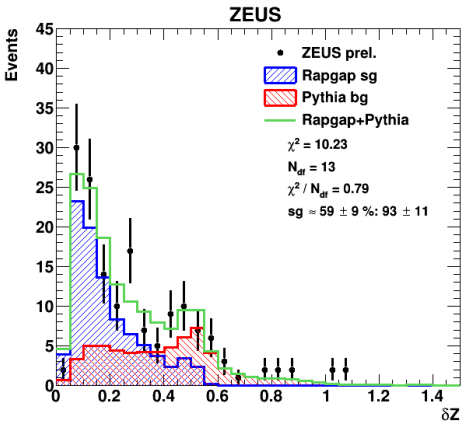
-1.5 ÷ -0.8



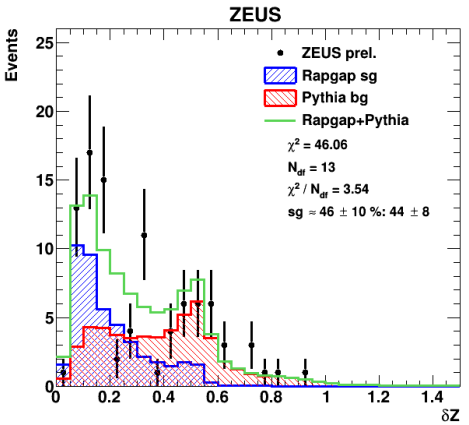
-0.8 ÷ -0.1



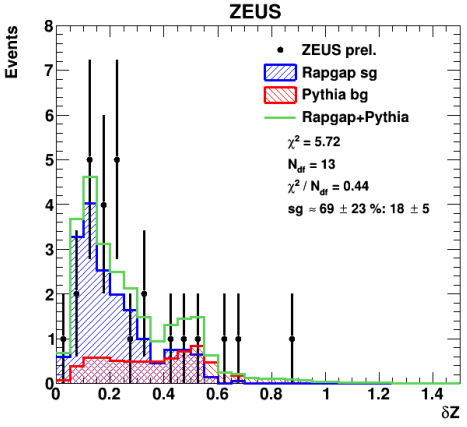
-0.1 ÷ 0.6



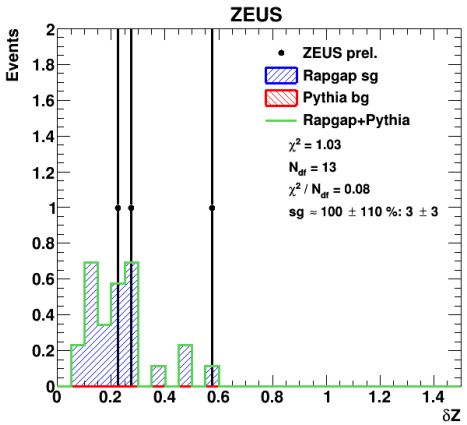
0.6 ÷ 1.3



1.3 ÷ 2.0



2.0 ÷ 2.7

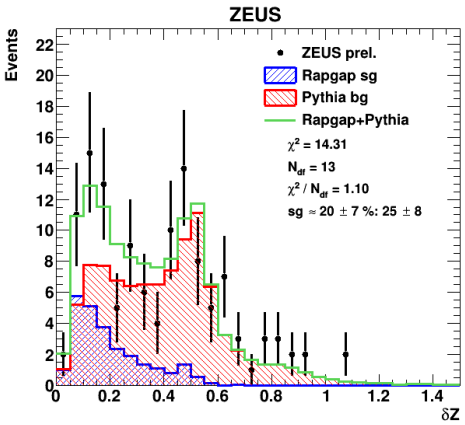


The dZ fit procedures for X_γ cross section evaluation

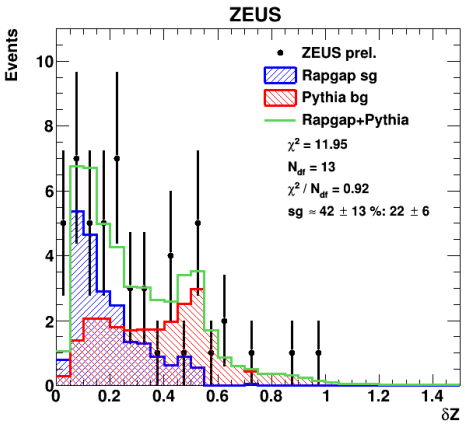
γ+jet selection

$Z_{IP} < 0.9$

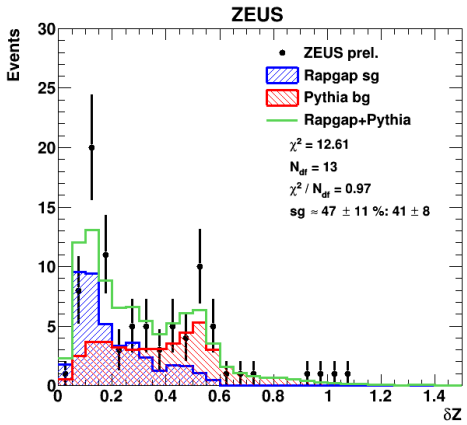
0.1 ÷ 0.6



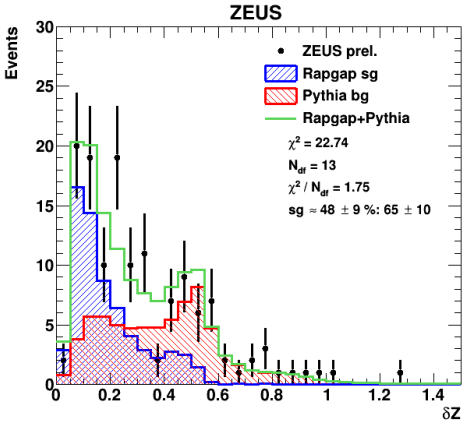
0.6 ÷ 0.7



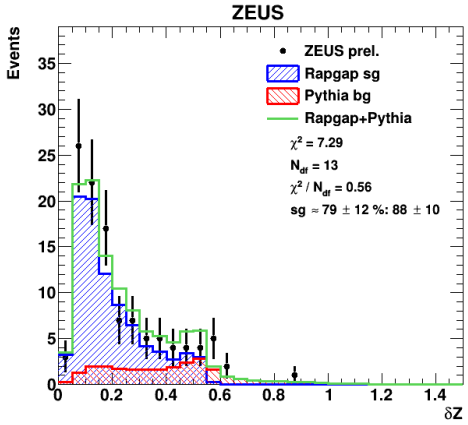
0.7 ÷ 0.8



0.8 ÷ 0.9



0.9 ÷ 1

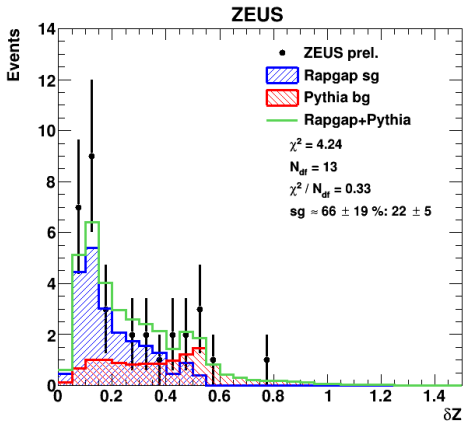


The dZ fit procedures for X_{IP} cross section evaluation

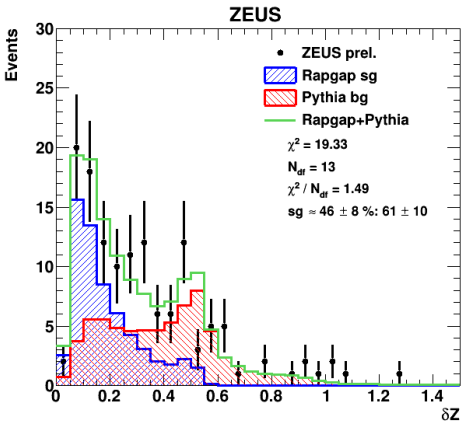
γ+jet selection

$Z_{IP} < 0.9$

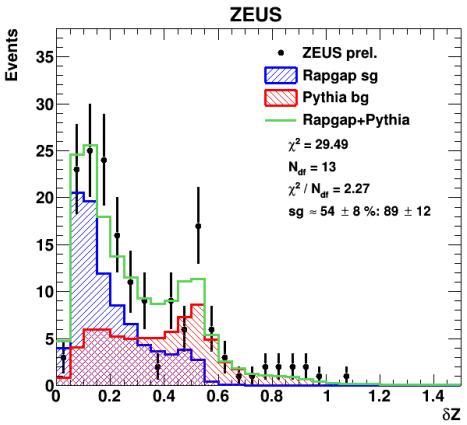
0 ÷ 0.005



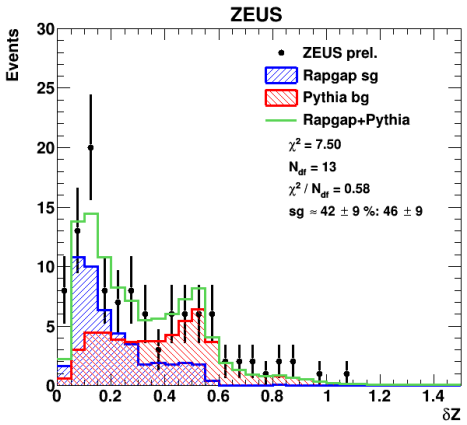
0.005 ÷ 0.01



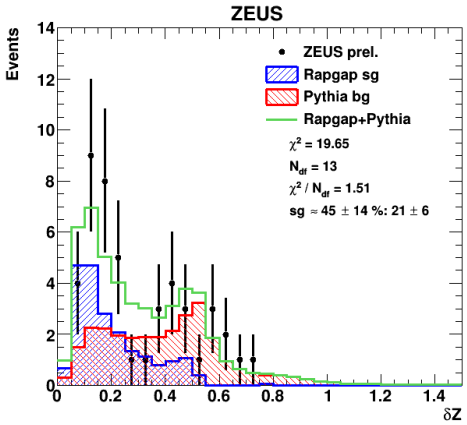
0.01 ÷ 0.015



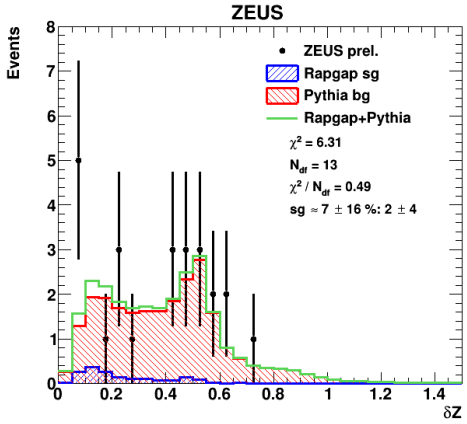
0.015 ÷ 0.02



0.02 ÷ 0.025



0.025 ÷ 0.03

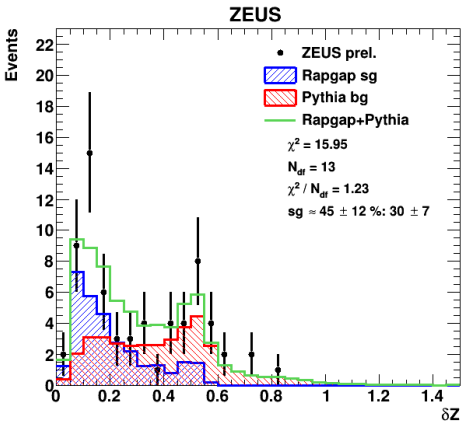


The dZ fit procedures for Z_{IP} cross section evaluation

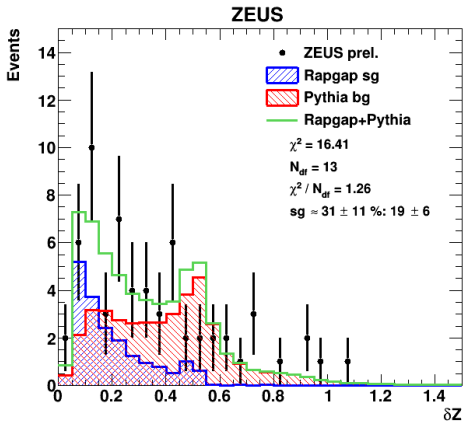
γ+jet selection

$Z_{IP} < 0.9$

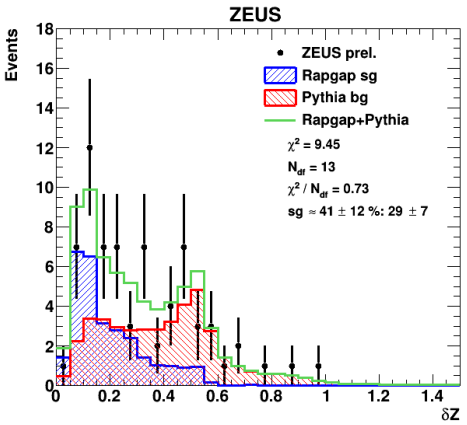
0.0 ÷ 0.4



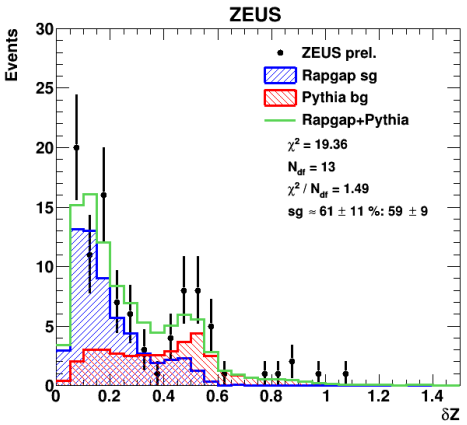
0.4 ÷ 0.5



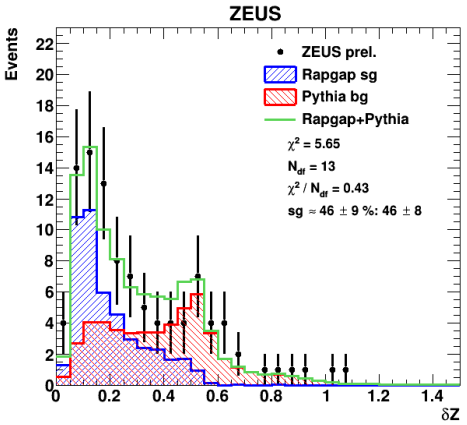
0.5 ÷ 0.6



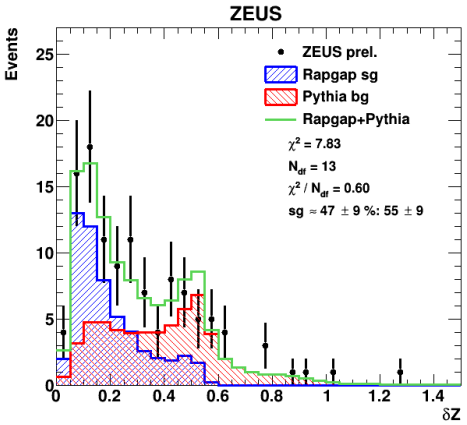
0.6 ÷ 0.7



0.7 ÷ 0.8



0.8 ÷ 0.9



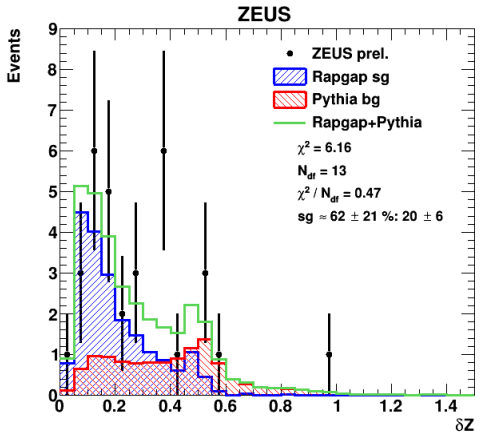
δZ fit procedures for X_γ

The dZ fit procedures for X_γ, 5 bins

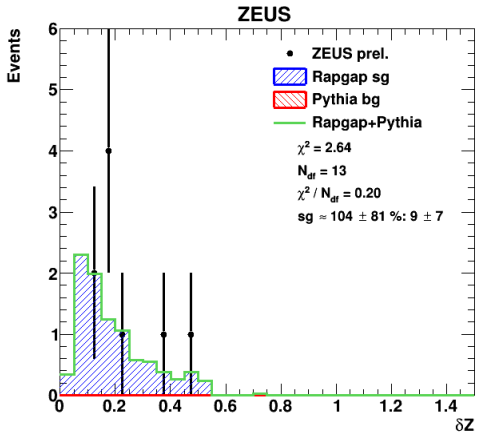
γ+jet selection

$Z_{IP} \geq 0.9$

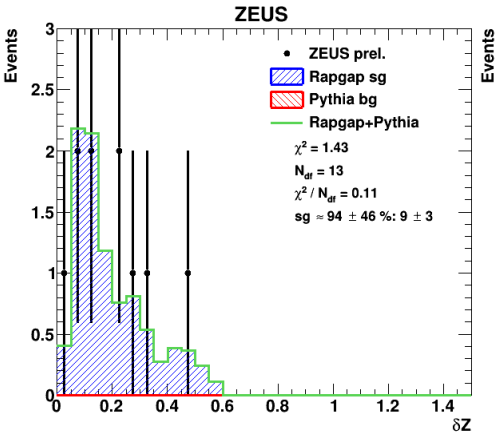
0.1 ÷ 0.6



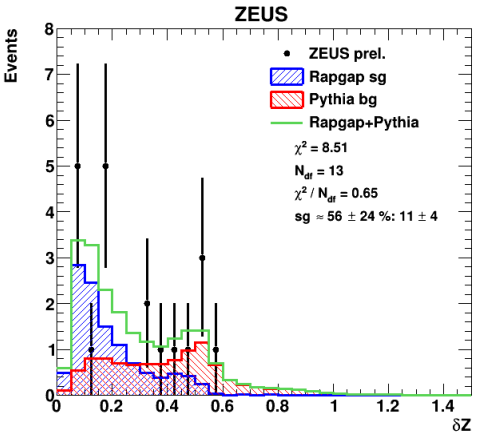
0.6 ÷ 0.7



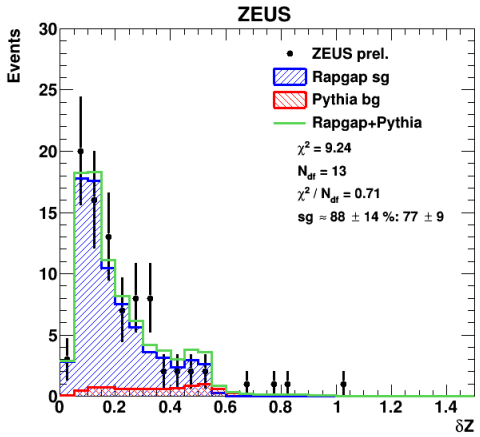
0.7 ÷ 0.8



0.8 ÷ 0.9



0.9 ÷ 1

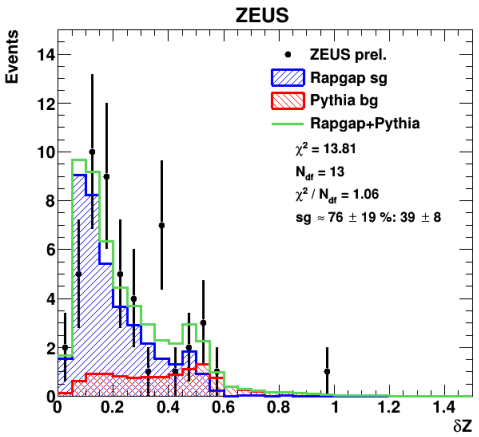


The dZ fit procedures for X_γ, 2 bins

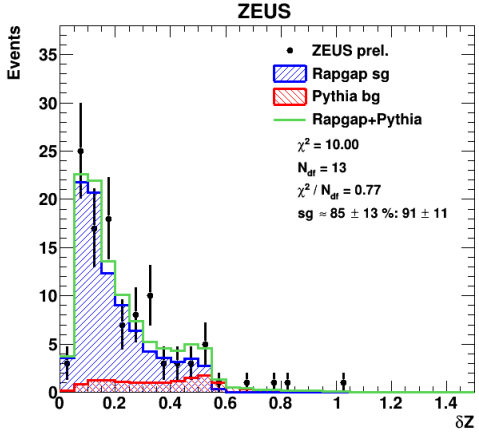
γ+jet selection

$Z_{IP} \geq 0.9$

$0.1 \div 0.8$



$0.8 \div 1$

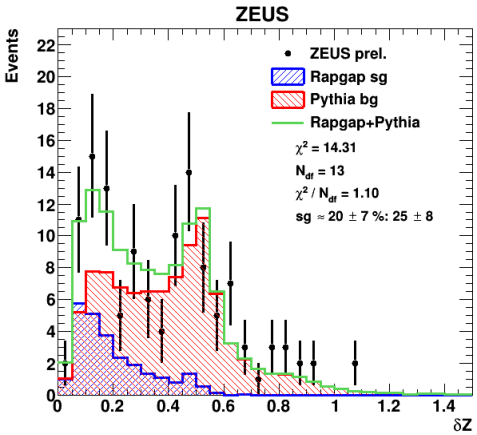


The dZ fit procedures for X_γ, 5 bins

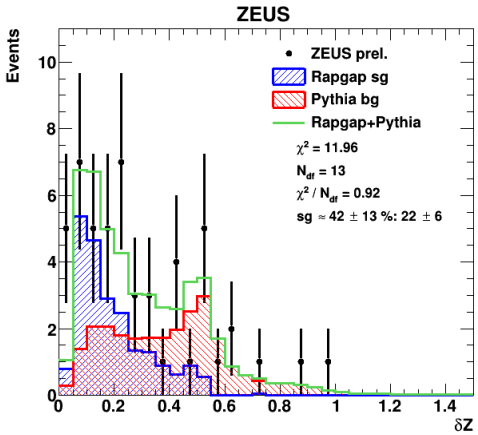
γ+jet selection

$Z_{IP} < 0.9$

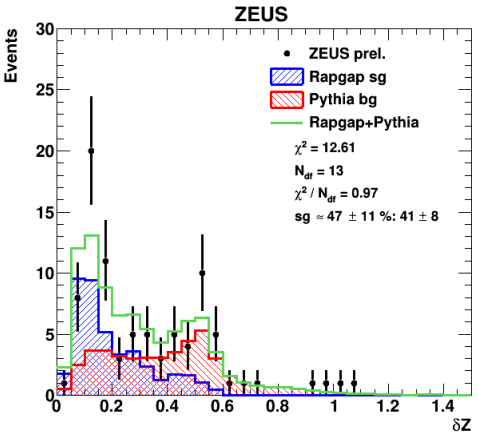
0.1 ÷ 0.6



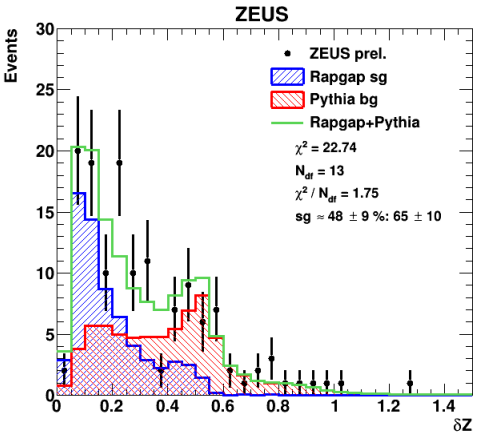
0.6 ÷ 0.7



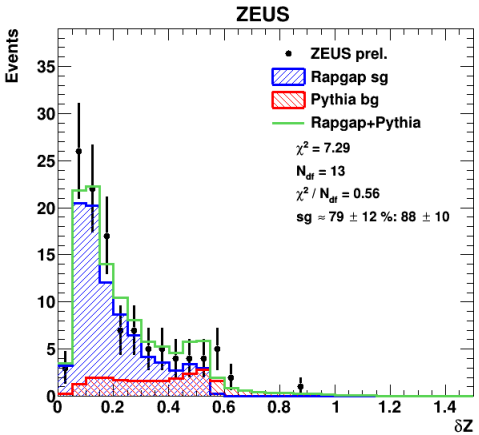
0.7 ÷ 0.8



0.8 ÷ 0.9



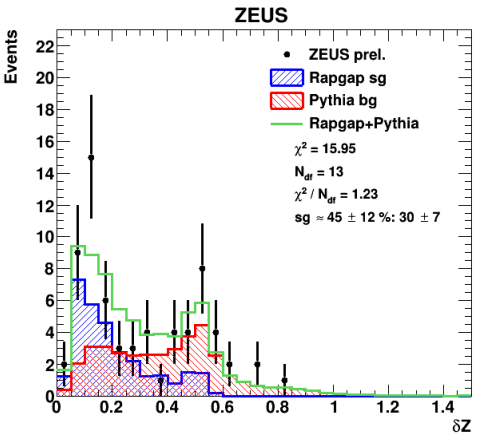
0.9 ÷ 1



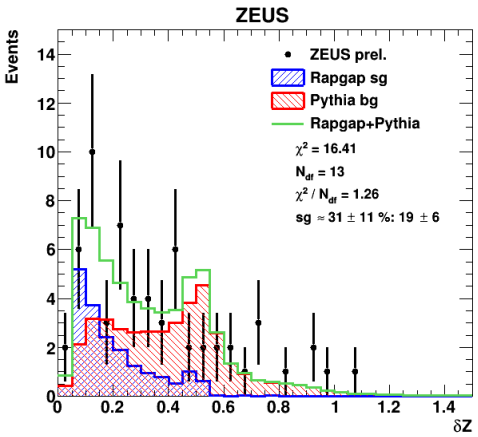
The dZ fit procedures for Z_{IP}

γ+jet selection

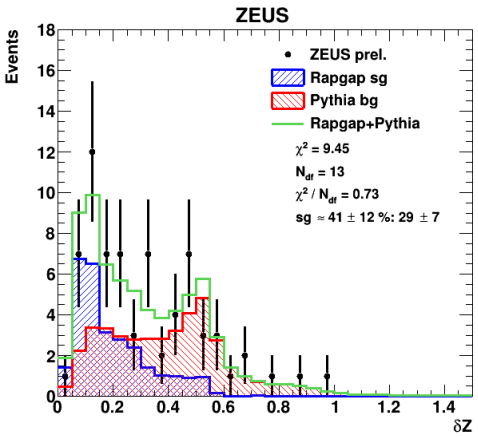
0.0 ÷ 0.4



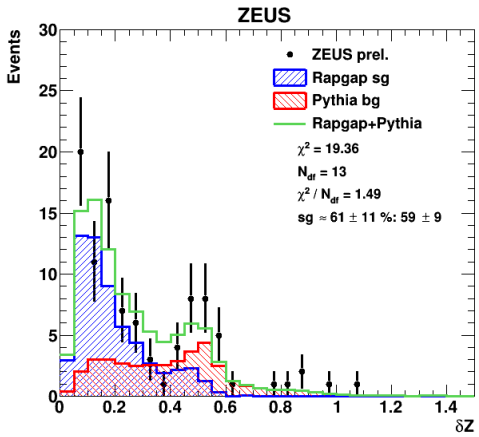
0.4 ÷ 0.5



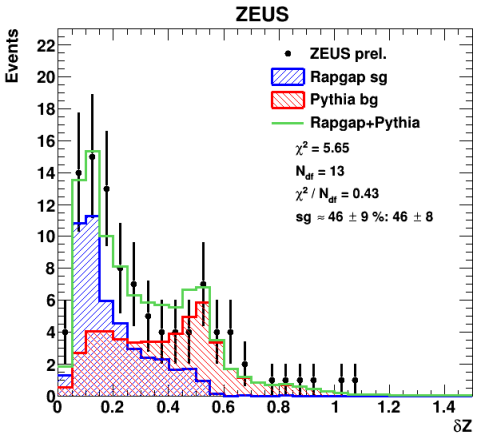
0.5 ÷ 0.6



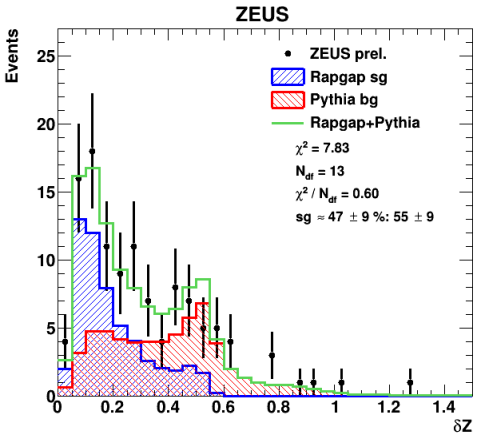
0.6 ÷ 0.7



0.7 ÷ 0.8



0.8 ÷ 0.9



0.9 ÷ 1