QCD background fits in eta bins

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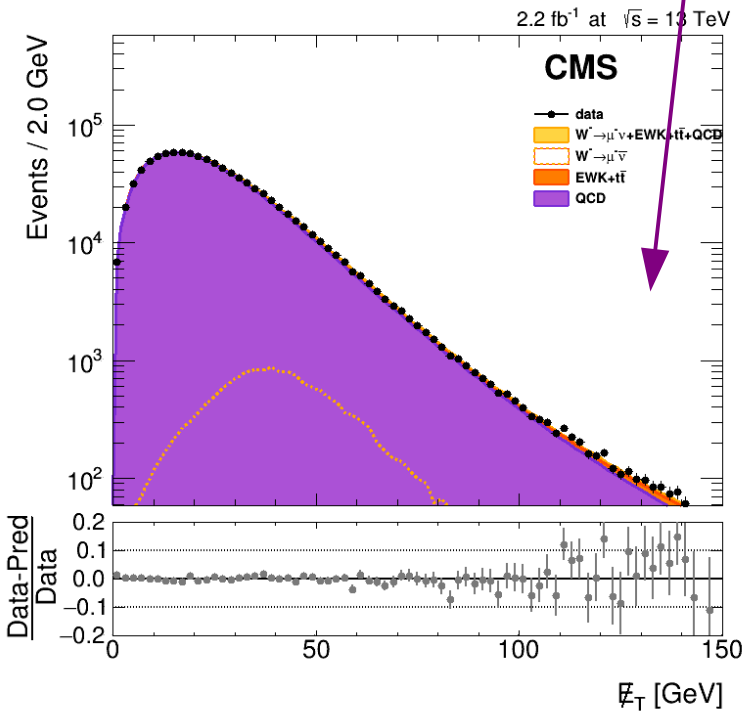
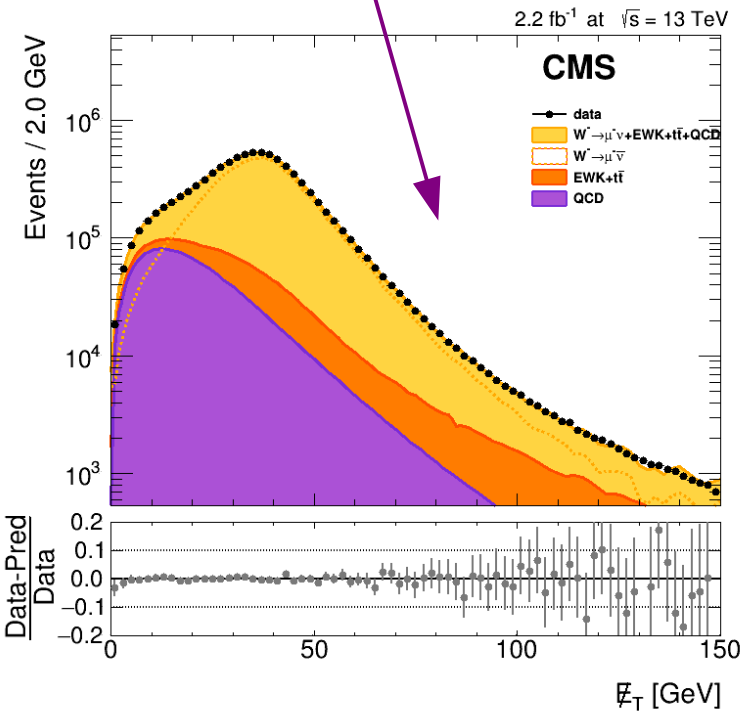
QCD fit function

$$f_{\mathrm{QCD}}(E_{\mathrm{T}}^{\mathrm{miss}}) = E_{\mathrm{T}}^{\mathrm{miss}} \exp\left(-\frac{E_{\mathrm{T}}^{\mathrm{miss2}}}{\sigma_0 + \sigma_1 E_{\mathrm{T}}^{\mathrm{miss2}} + \sigma_2 E_{\mathrm{T}}^{\mathrm{miss}}}\right)$$

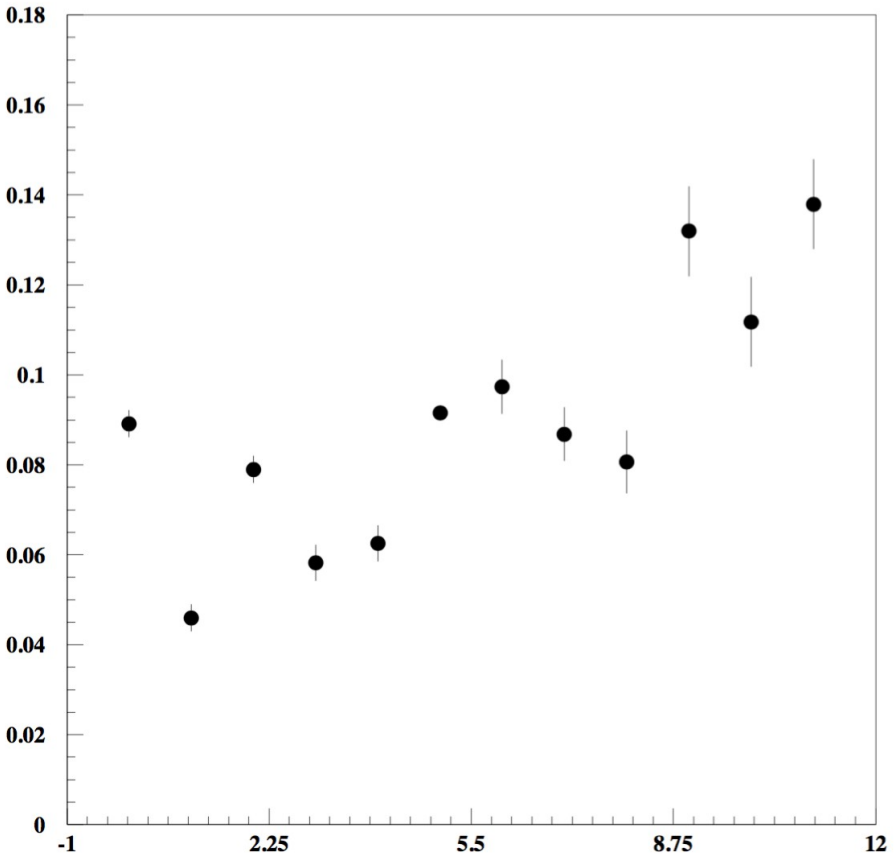
- Fitted simultaneously in control and signal region
- For nominal results sigma$_1$ the same for both regions
- For systematic uncertainties sigma$_1$ different for different regions
  - How does fits look like?



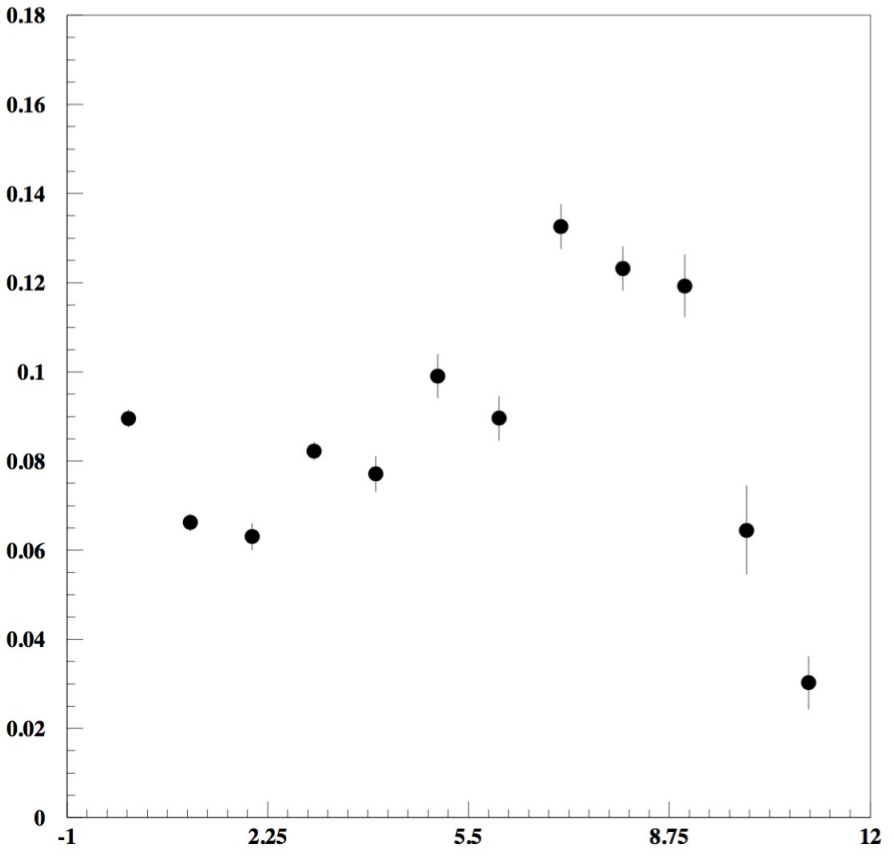


Integral ratio EW BG/signal

EW BG background, W-



EW BG background, W+



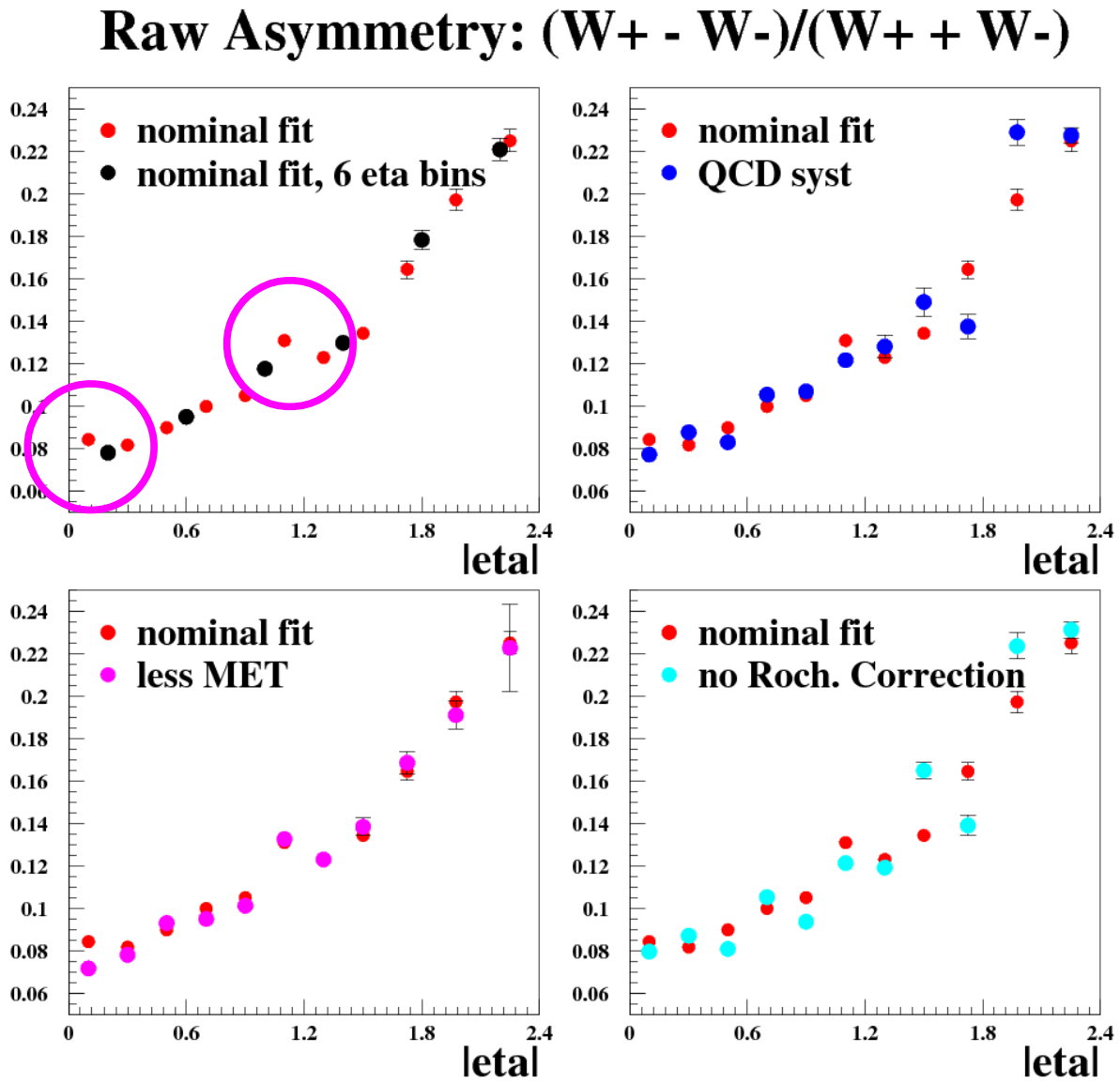
Considered fits

- Nominal fit: 11 eta bins, sigma1 the same for control and signal regions
- Variations checked
  - Using old fitting function (simpler) makes NO difference, not shown
  - 6 eta bins – to check effects of statistics
  - Use sigma1 different for signal and control region – in 8 TeV paper treated as systematic uncertainty
  - Use smaller MET range (100 GeV instead of 150 GeV) – to check effects of low statistics in MC for signal/EW in this region
  - Use MET without Rochester correction – first fits
- Some more discussion what else could be tried later

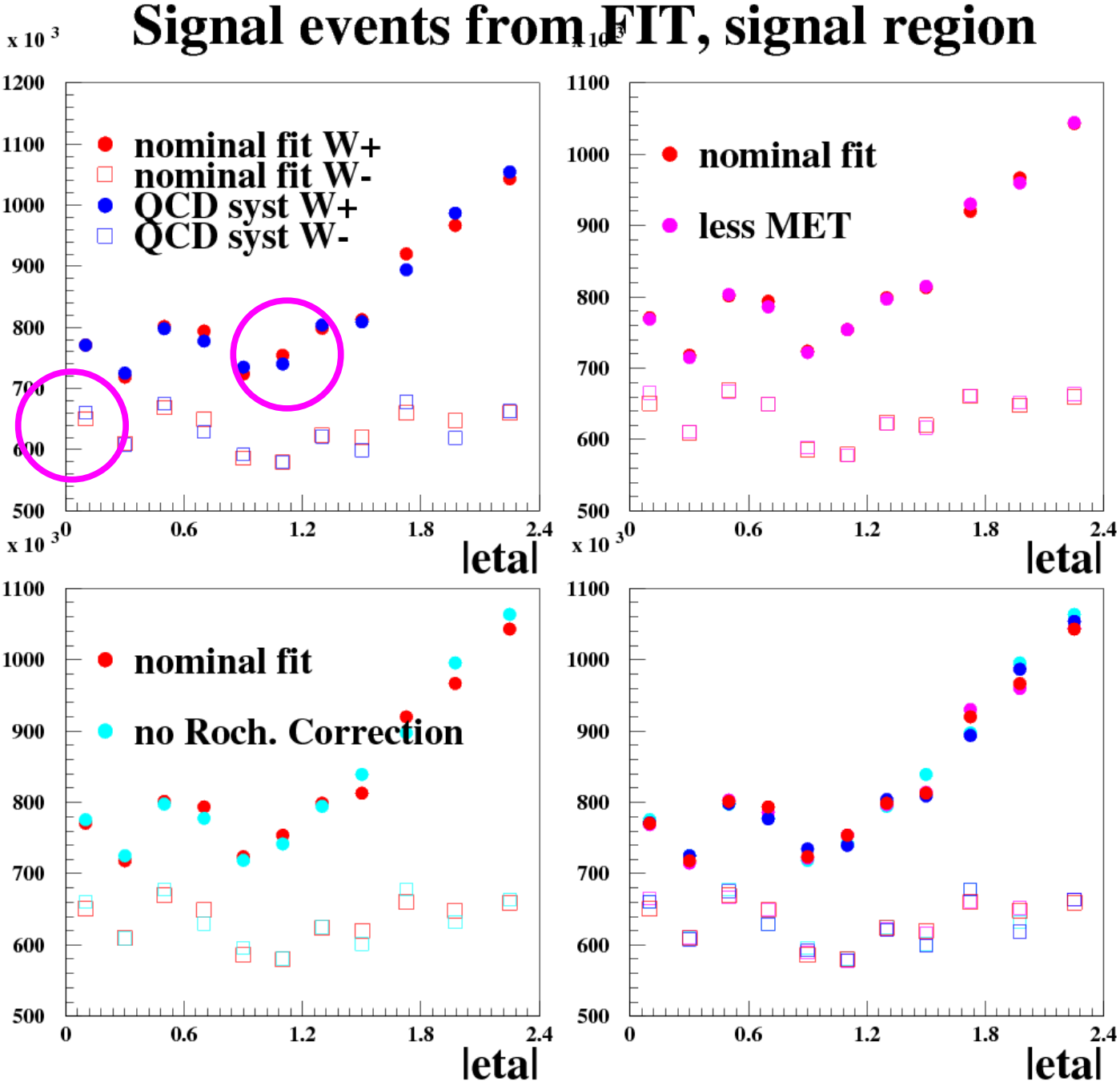
Raw asymmetries: $(W^+ - W^-)/(W^+ + W^-)$

used in previous analysis, corrected for efficiencies

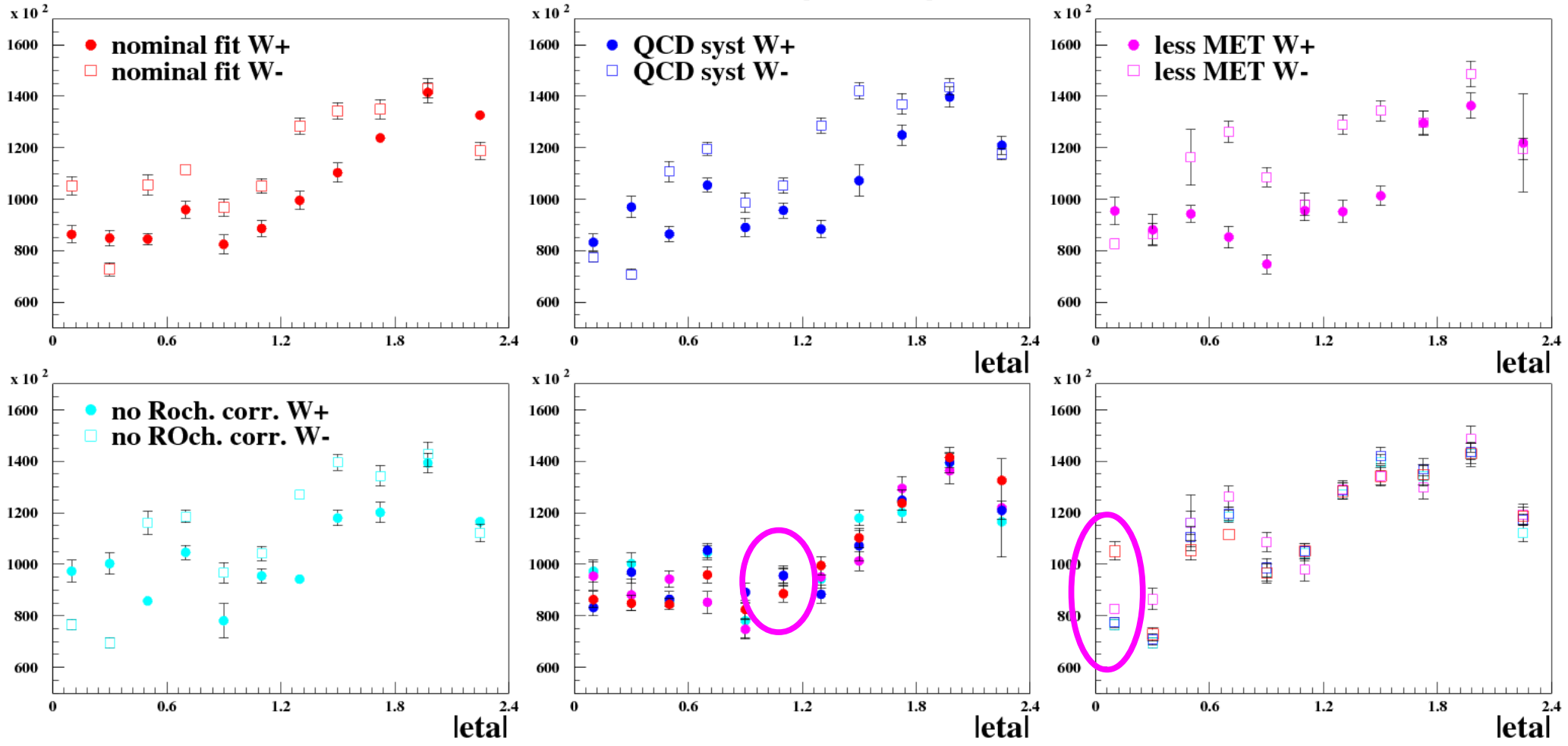
- Problems in bin 1 and 6 of nominal fit
- Bin 1 better in any other fit
- Bin 6 → not better with less MET → probably not MC statistics problem?
- Look for reasons?



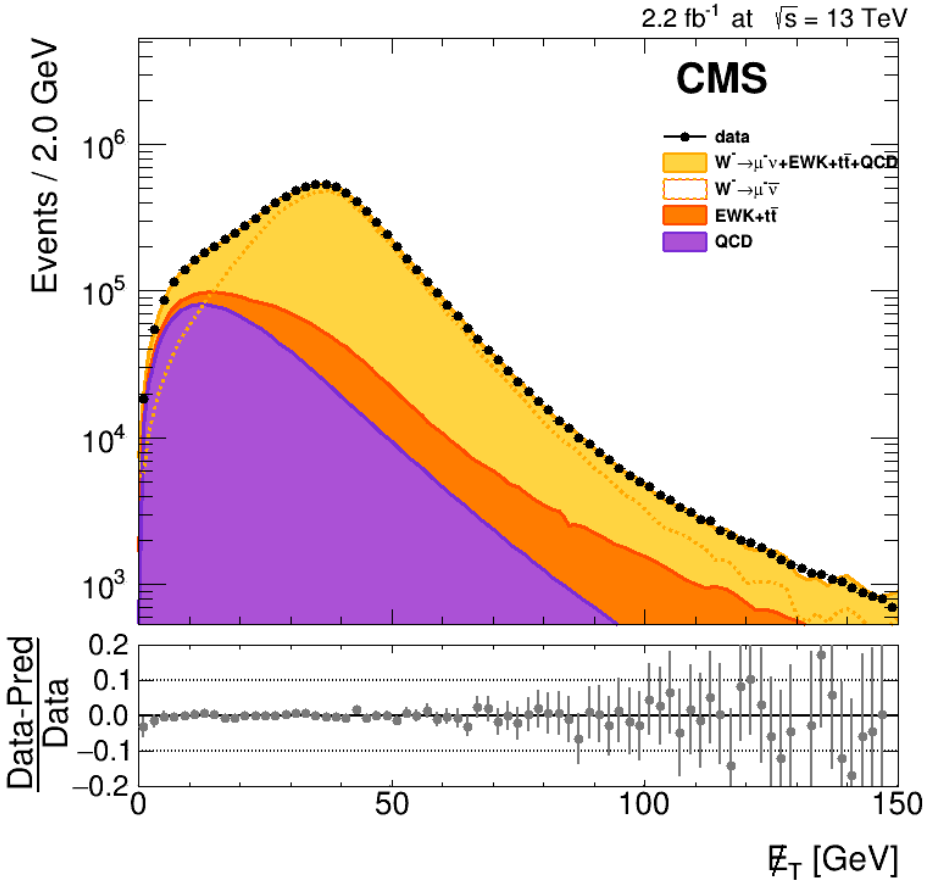
- ?
- Bin 1 → too low W-
- Bin 6 → too high W+

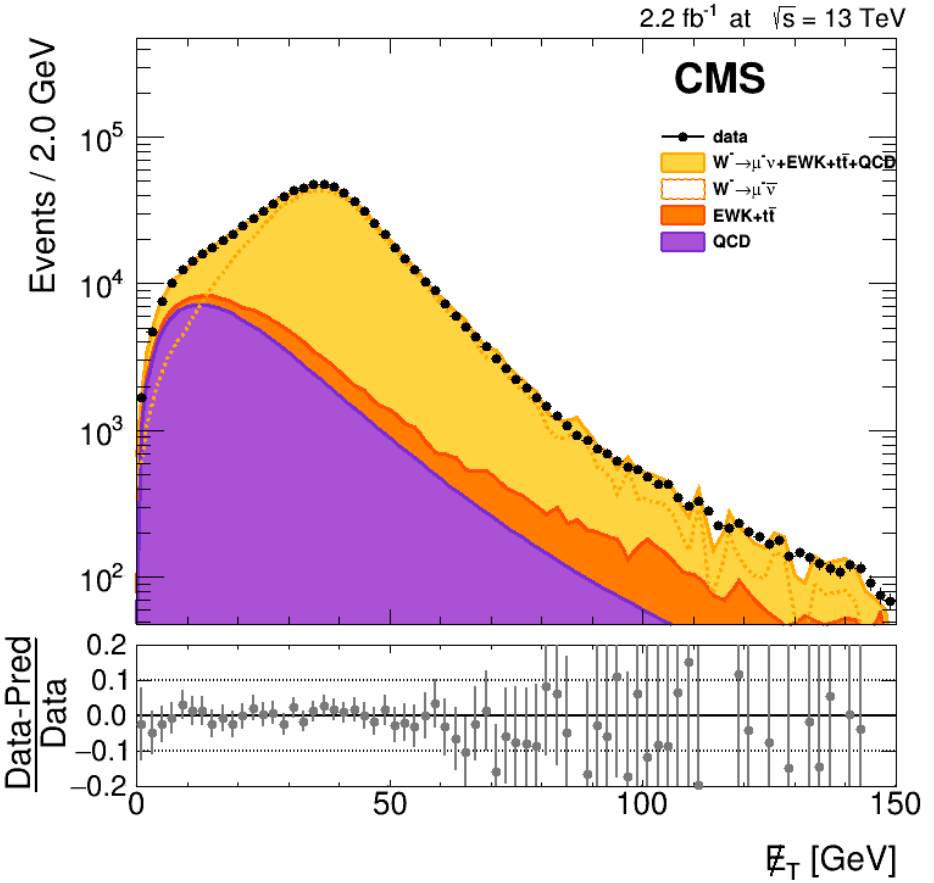


QCD BG events in signal region from FIT

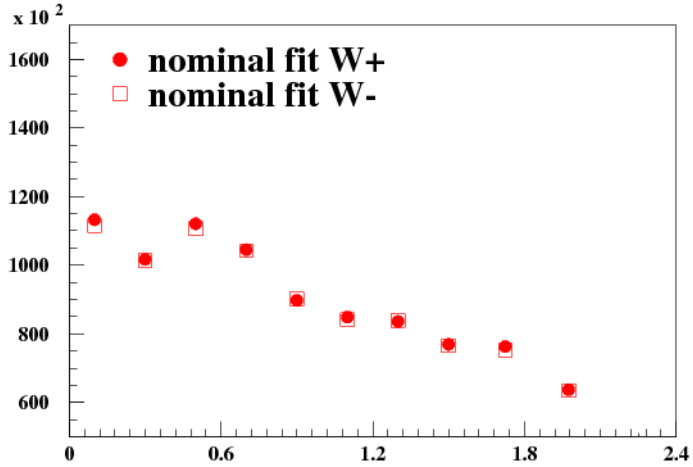


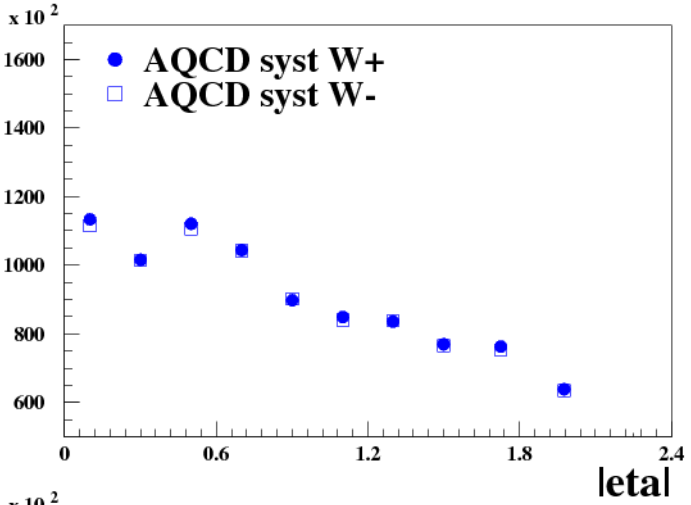
- Why QCD background so different between W+ and W-?
  - Shouldn't be the same?
- Possibly W- QCD BG too high → signal too low, W+ QCD BG too low → signal too high?

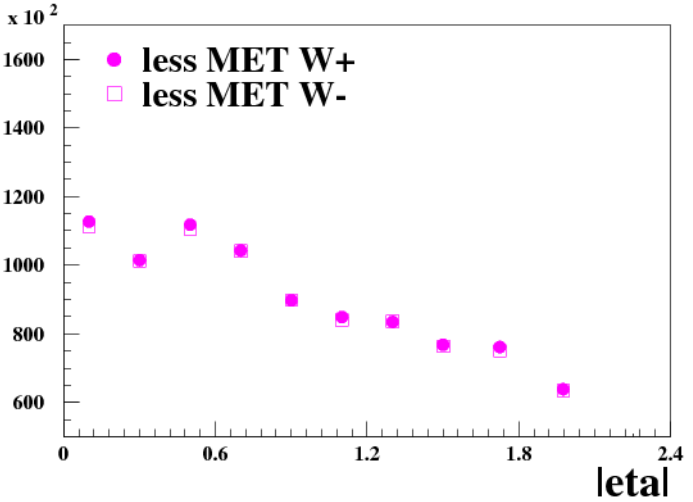

2.2 fb-1 at √s = 13 TeV
CMS
data
W-→μ-ν+EWK+tt̄+QCD
W-→μ-ν̄
EWK+tt̄
QCD
Events / 2.0 GeV
Data-Pred / Data
E̸T [GeV]

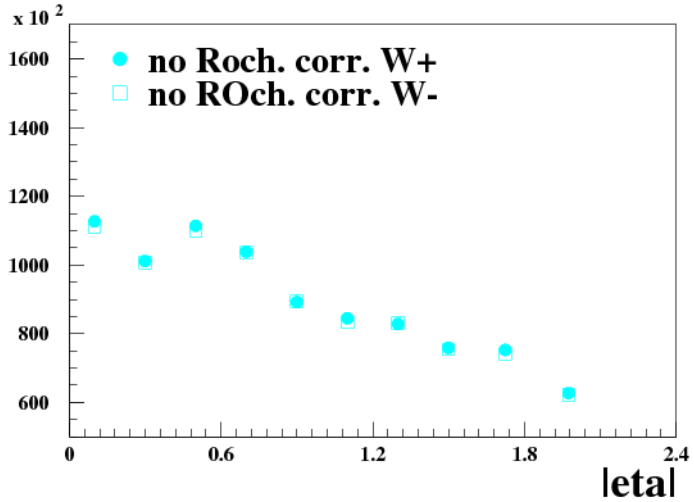

2.2 fb-1 at √s = 13 TeV
CMS
data
W-→μ-ν+EWK+tt̄+QCD
W-→μ-ν̄
EWK+tt̄
QCD
Events / 2.0 GeV
Data-Pred / Data
E̸T [GeV]

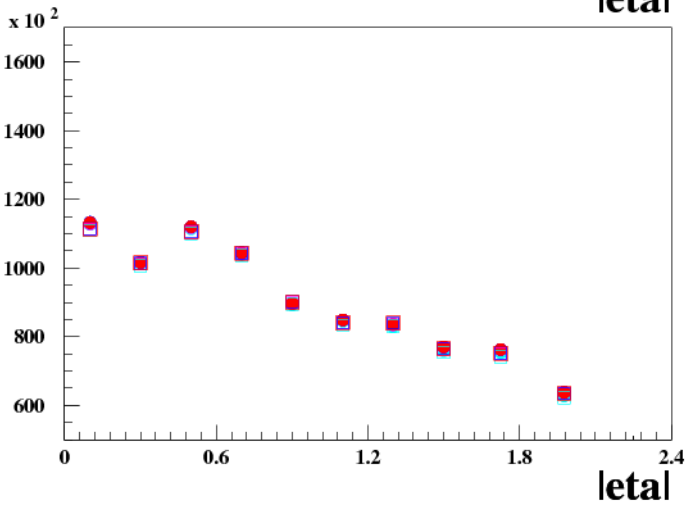
QCD BG events in CONTROL region from FIT



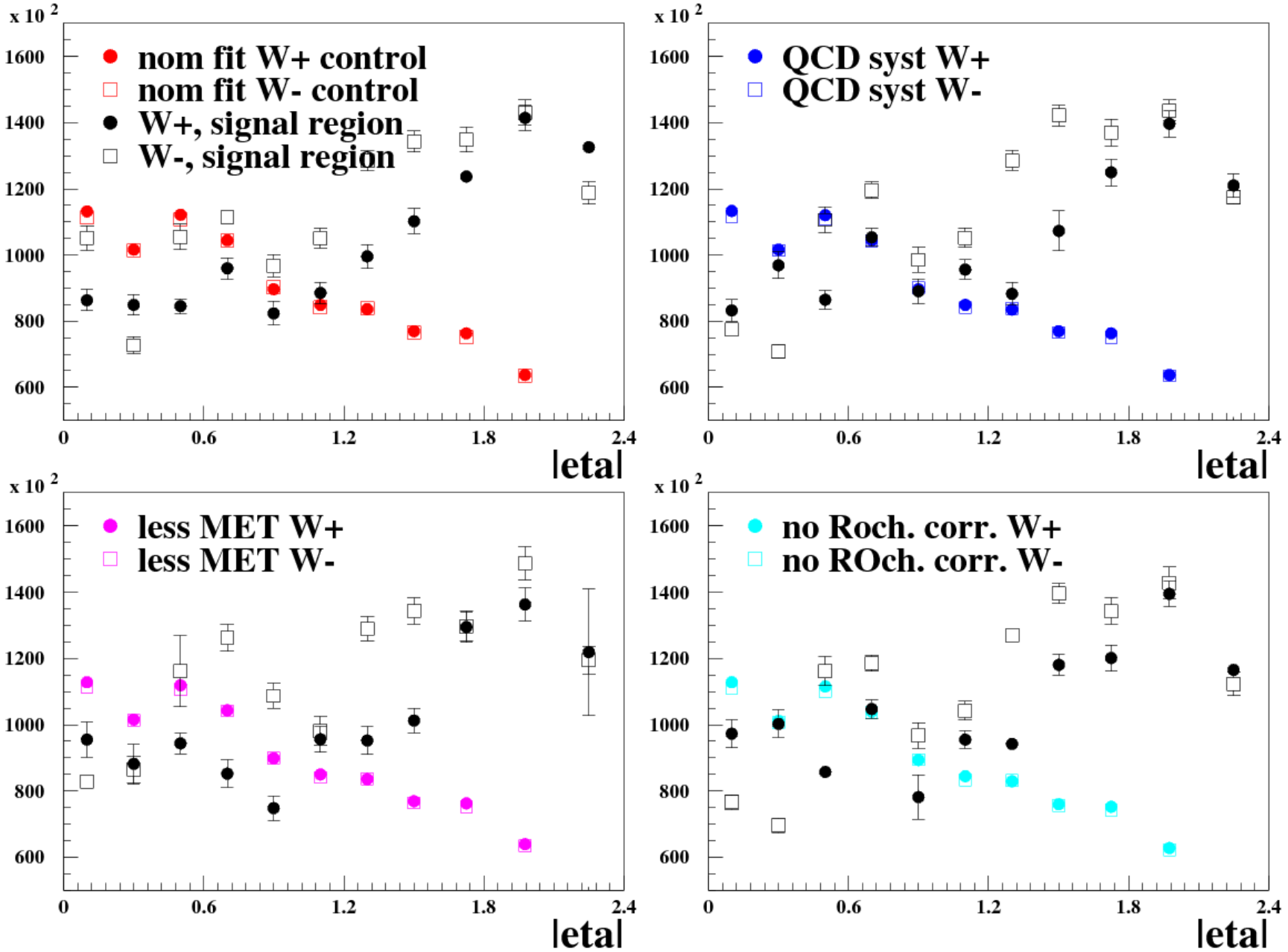




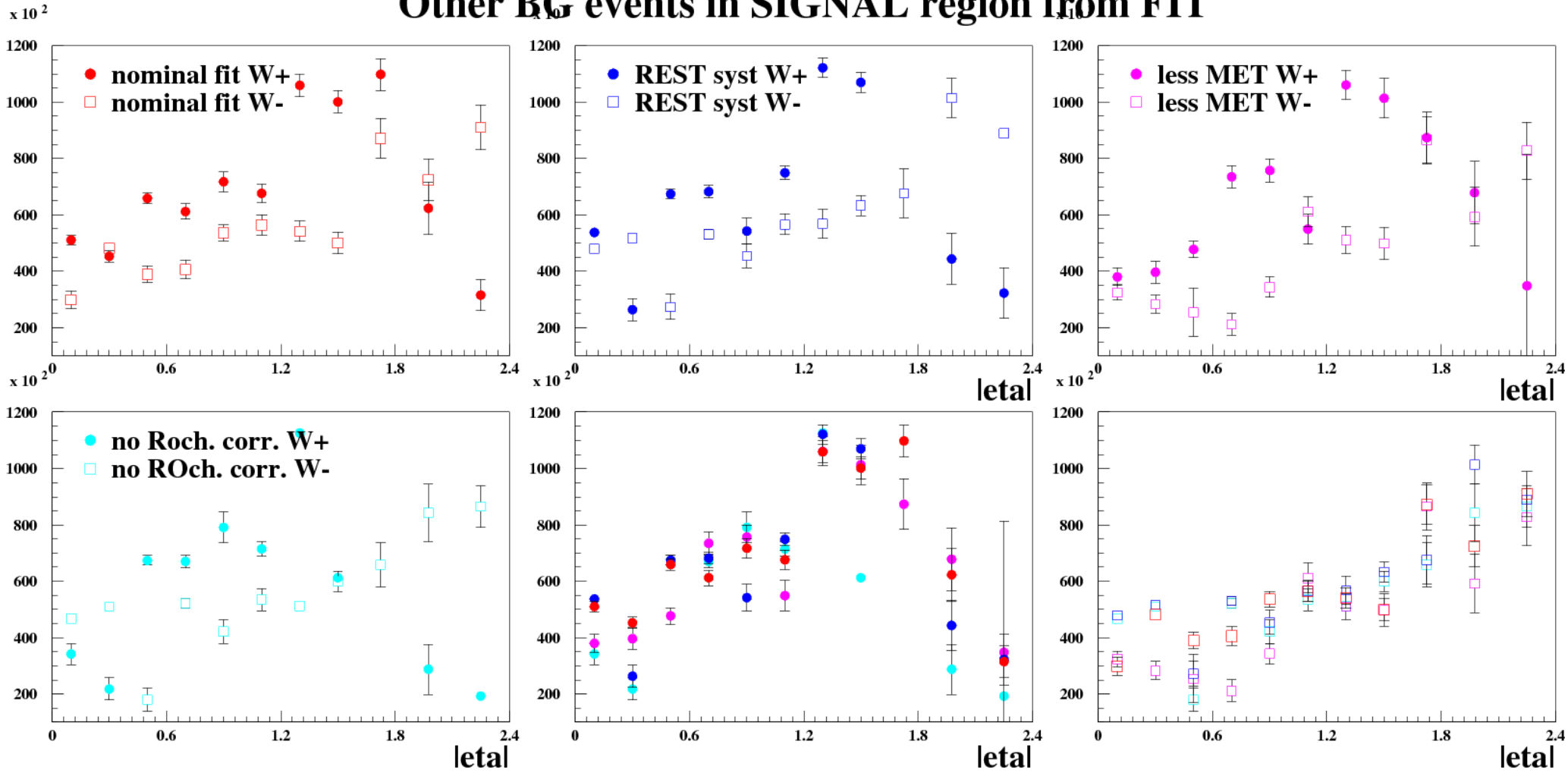




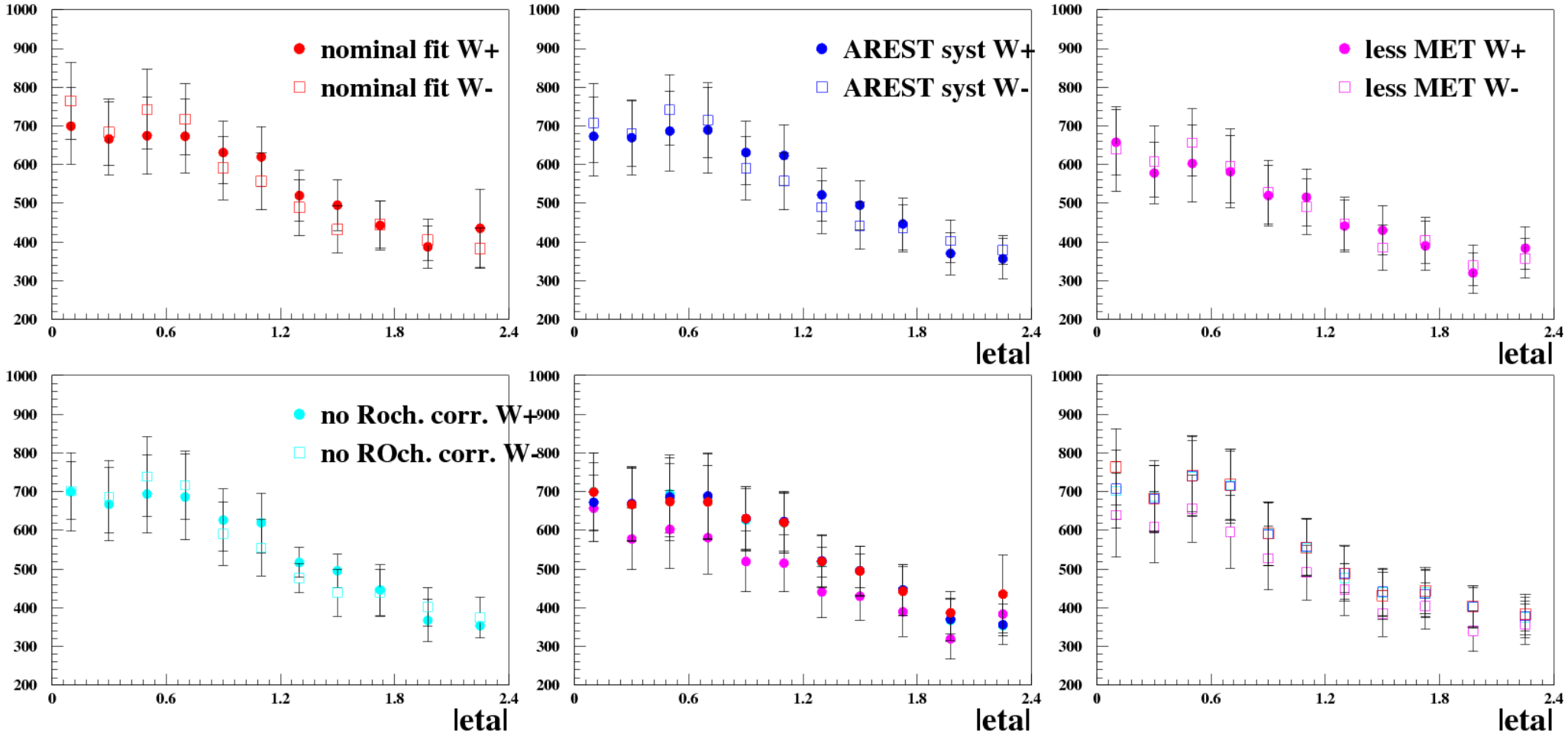
QCD BG events in SIGNAL and CONTROL regions



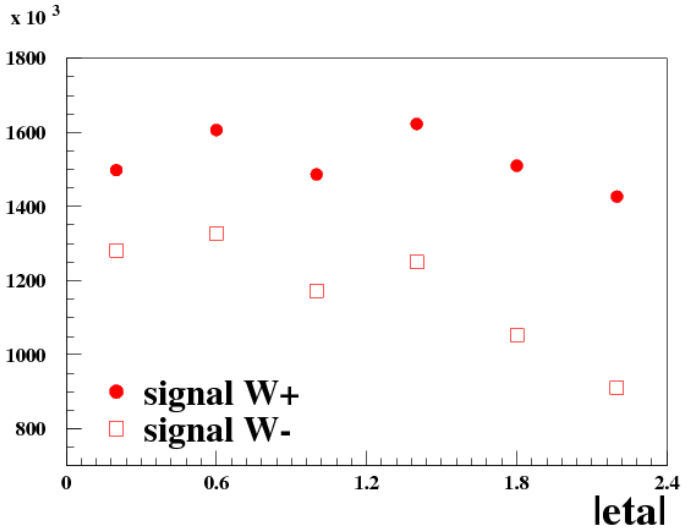
Other BG events in SIGNAL region from FIT

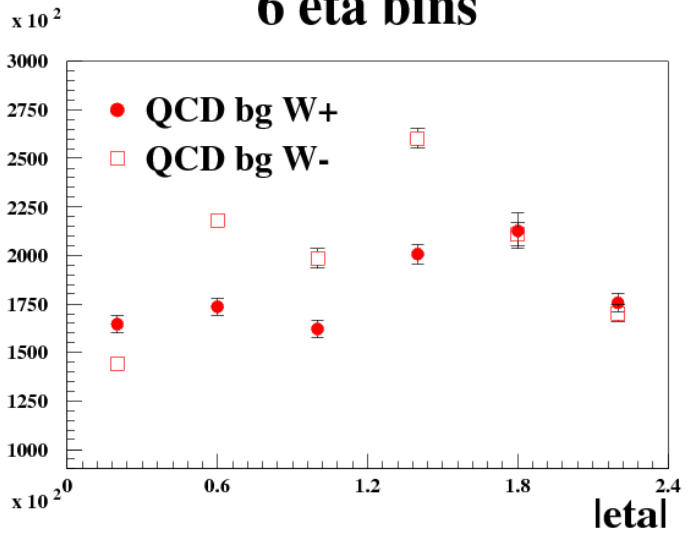


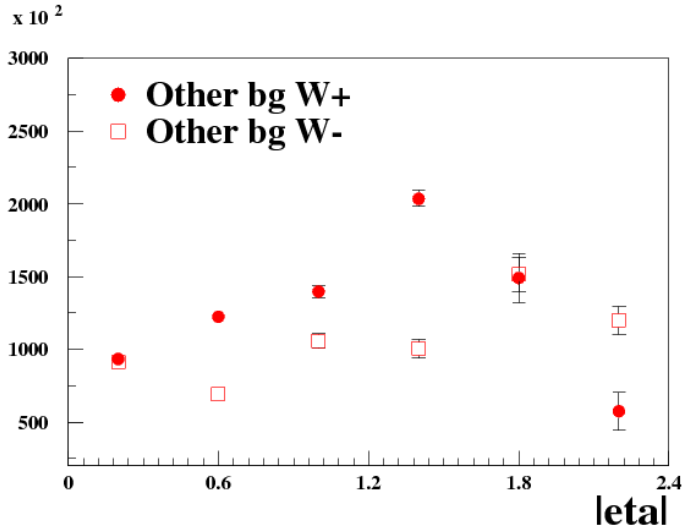
Other BG events in CONTROL region from FIT

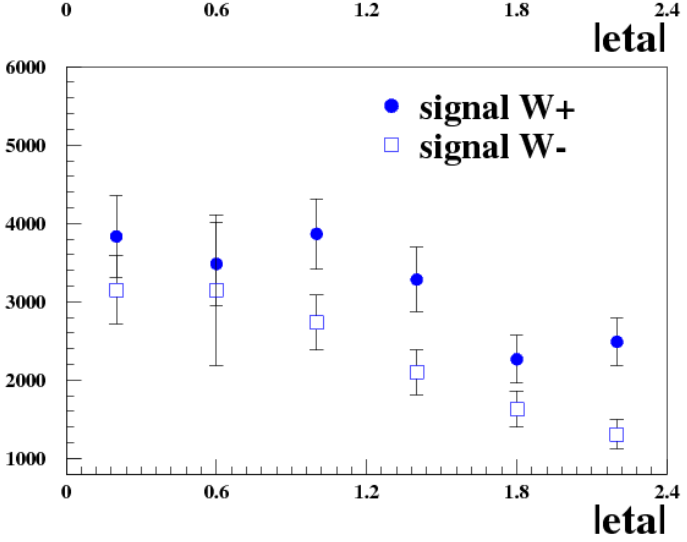


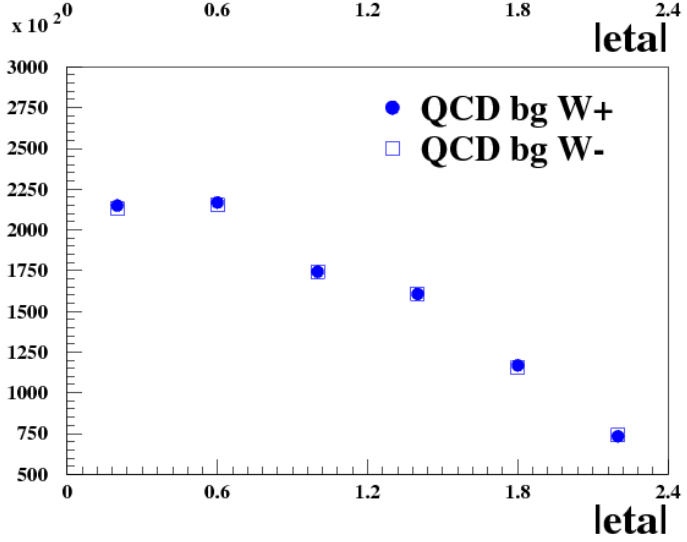
6 eta bins

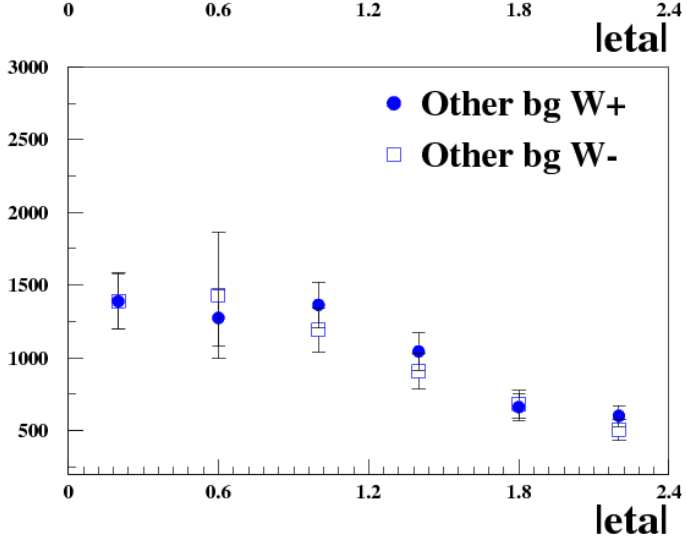

x 10 3
signal W+
signal W-
letal


x 10 2
QCD bg W+
QCD bg W-
letal

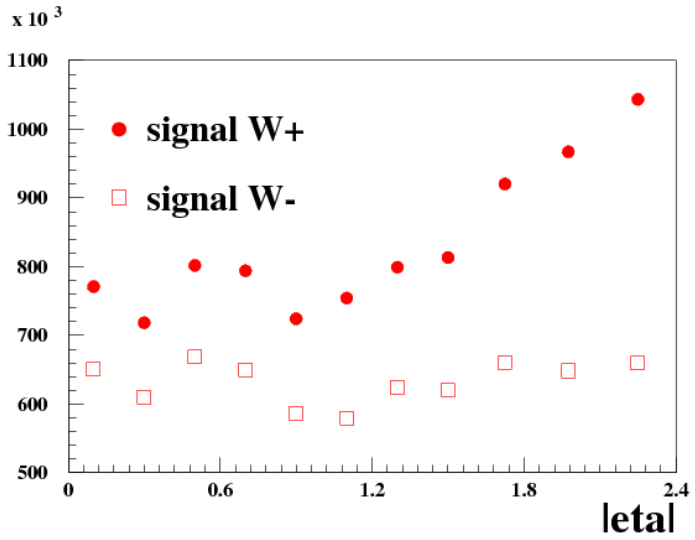

x 10 2
Other bg W+
Other bg W-
letal

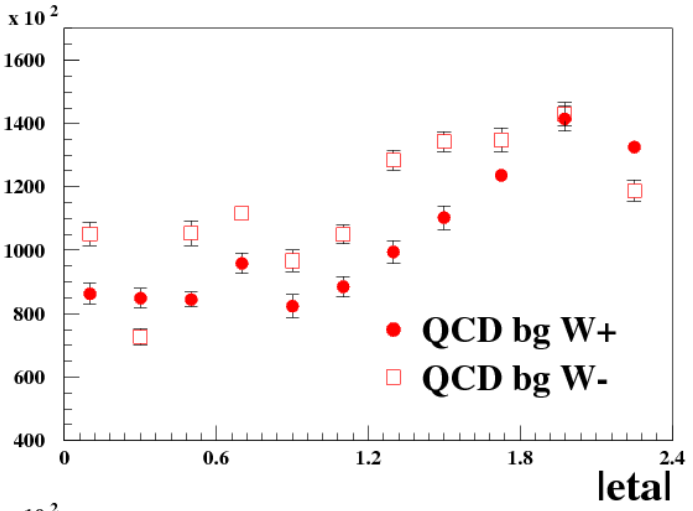

signal W+
signal W-
letal

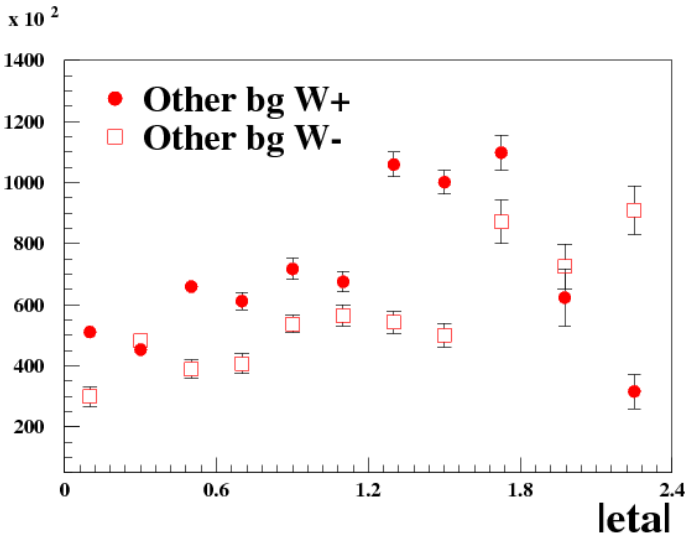

x 10 2
QCD bg W+
QCD bg W-
letal

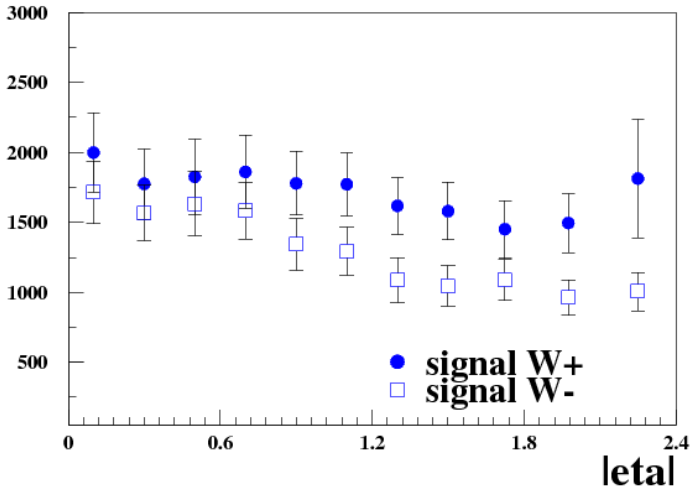

Other bg W+
Other bg W-
letal

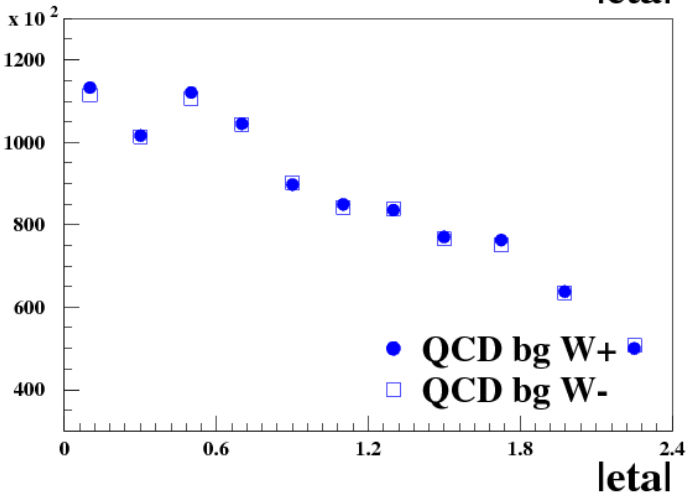
11 eta bins

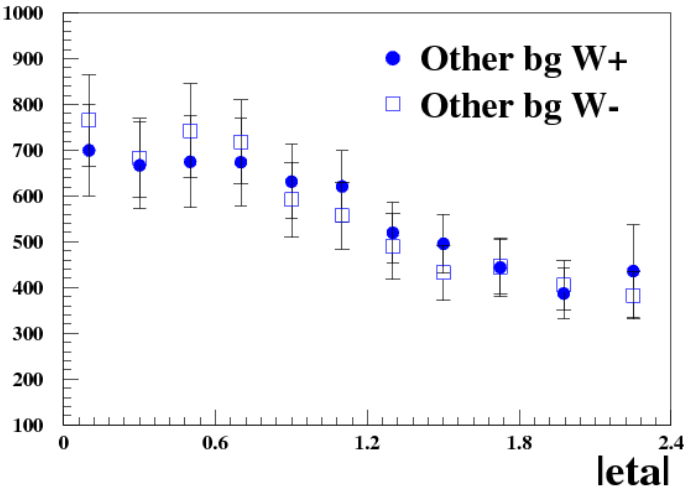

x 10 3
signal W+
signal W-
|etal

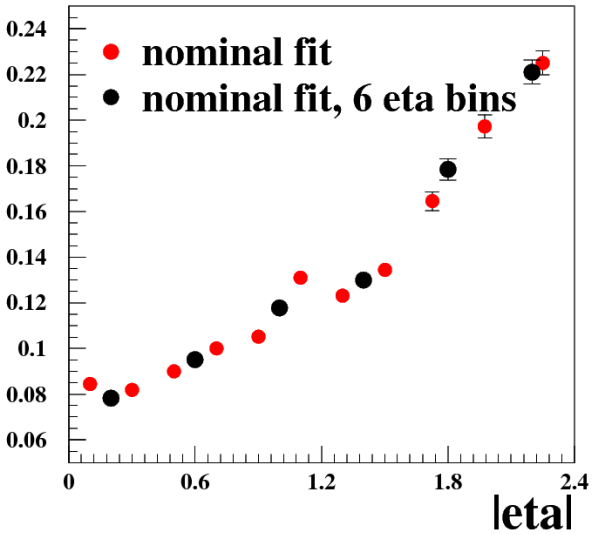

x 10 2
QCD bg W+
QCD bg W-
|etal


x 10 2
Other bg W+
Other bg W-
|etal

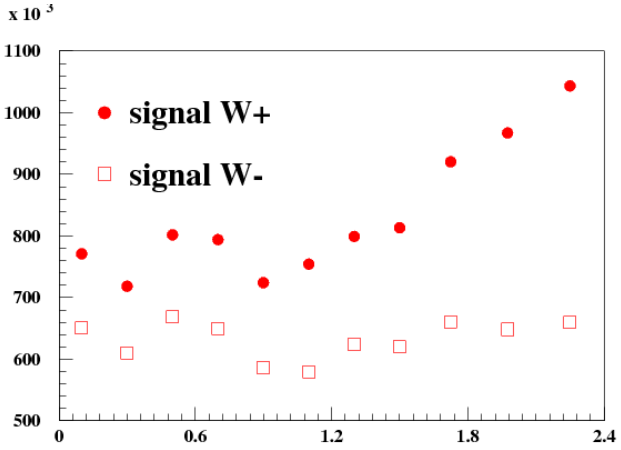

signal W+
signal W-
|etal

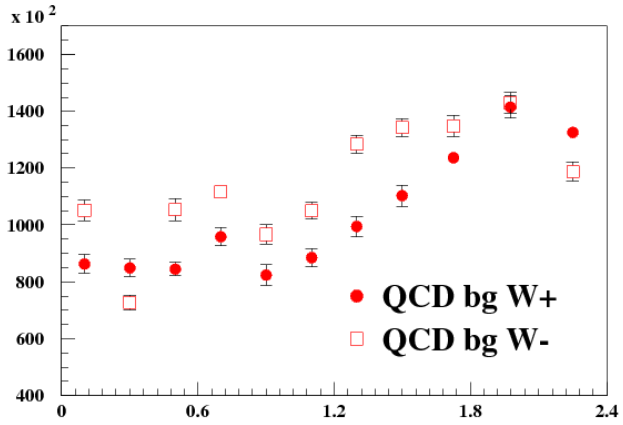

x 10 2
QCD bg W+
QCD bg W-
|etal

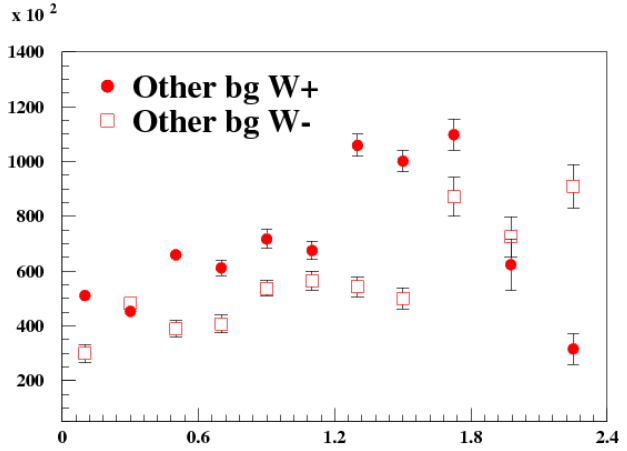

Other bg W+
Other bg W-
|etal



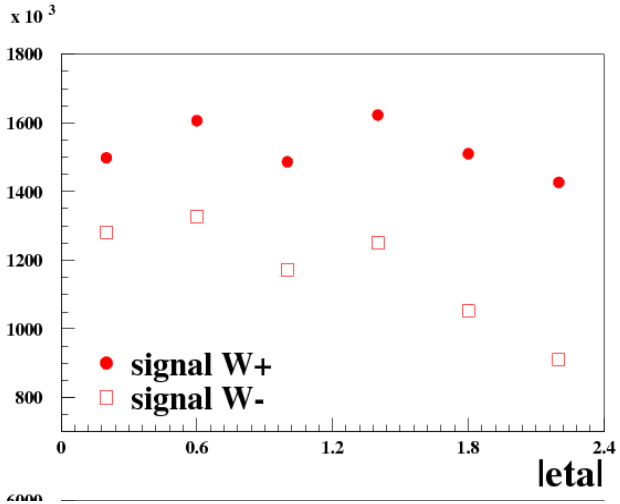
11 eta bins

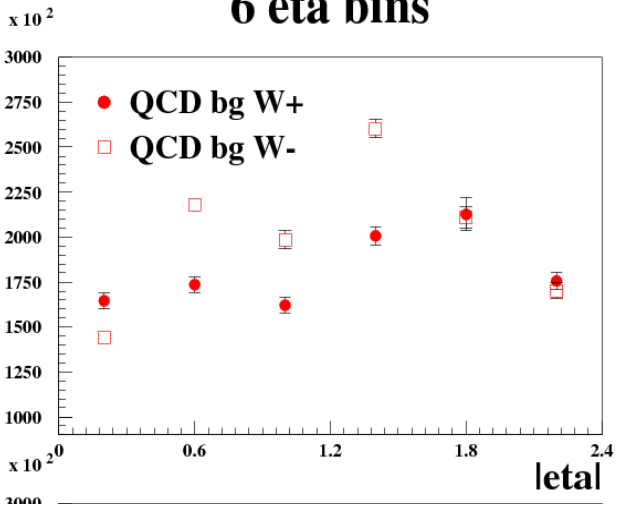


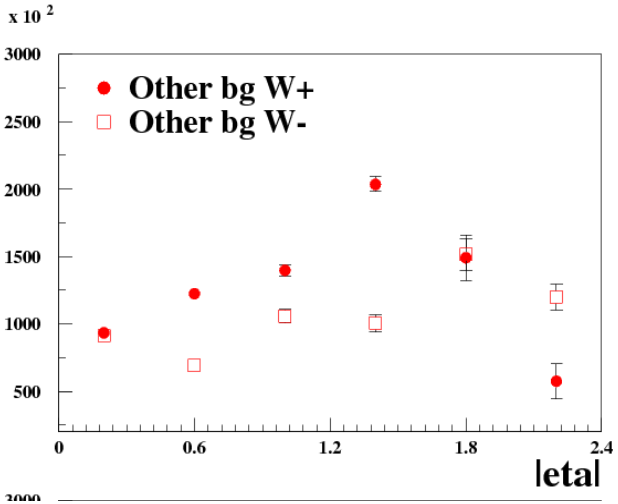


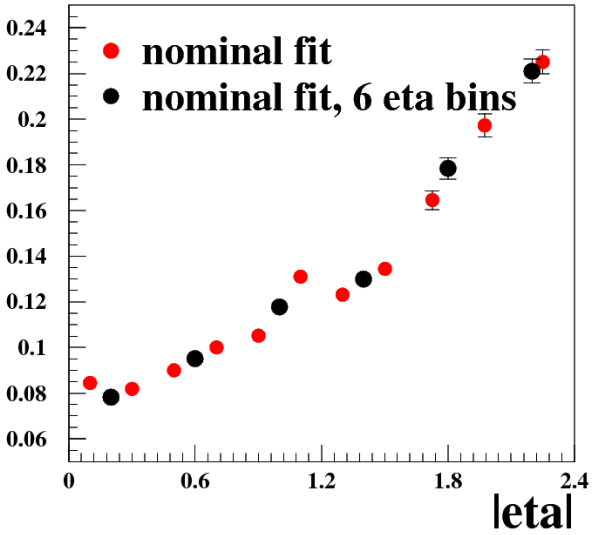


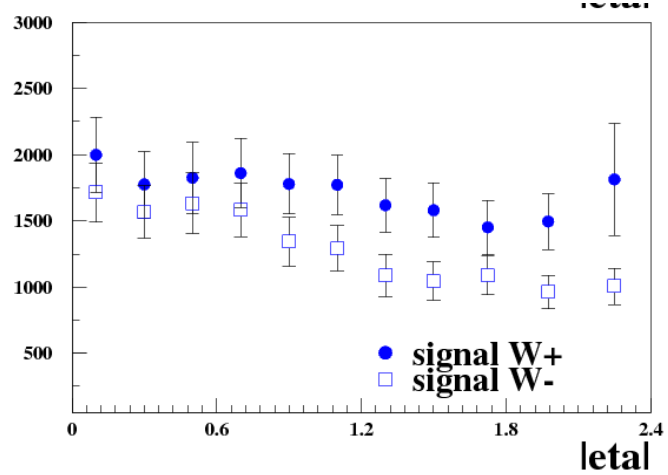
6 eta bins

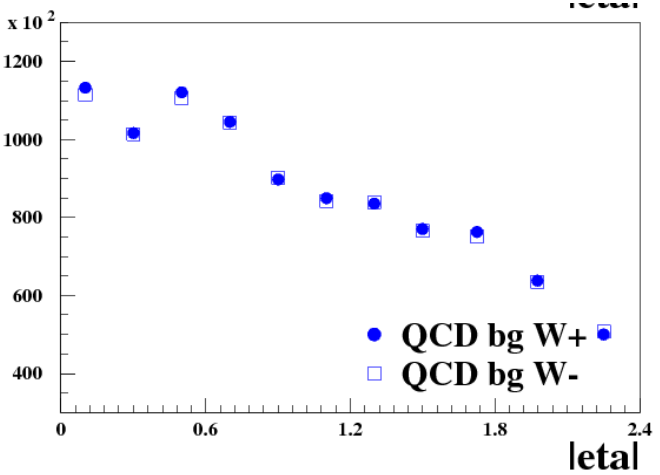


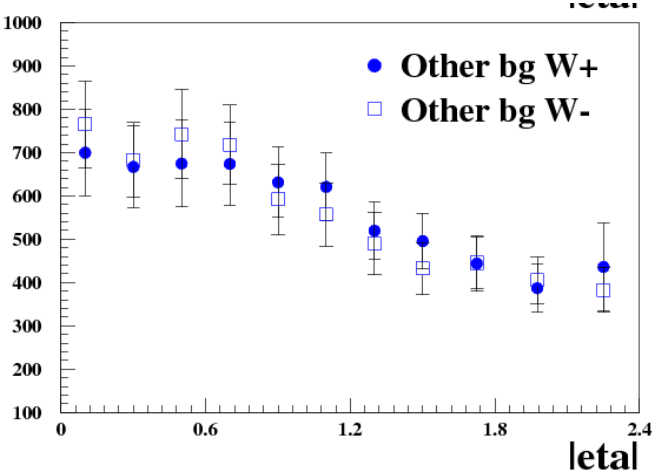


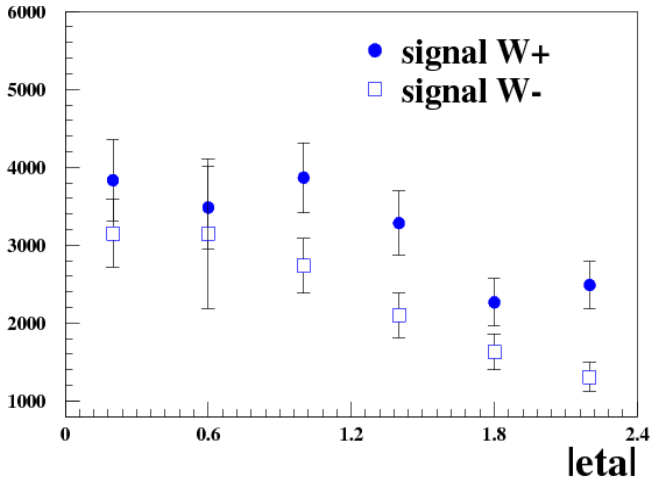


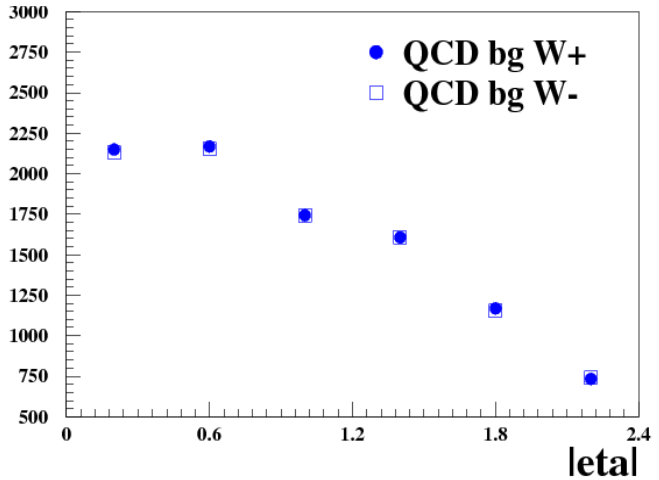

nominal fit
nominal fit, 6 eta bins
|eta|

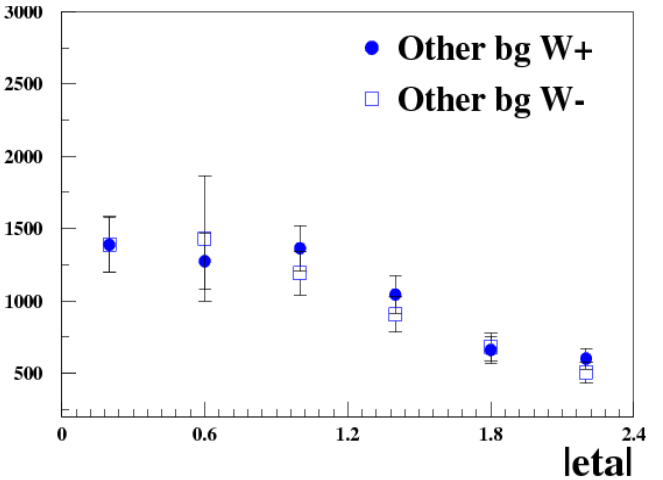

signal W+
signal W-
|eta|


x 10 2
QCD bg W+
QCD bg W-
|eta|

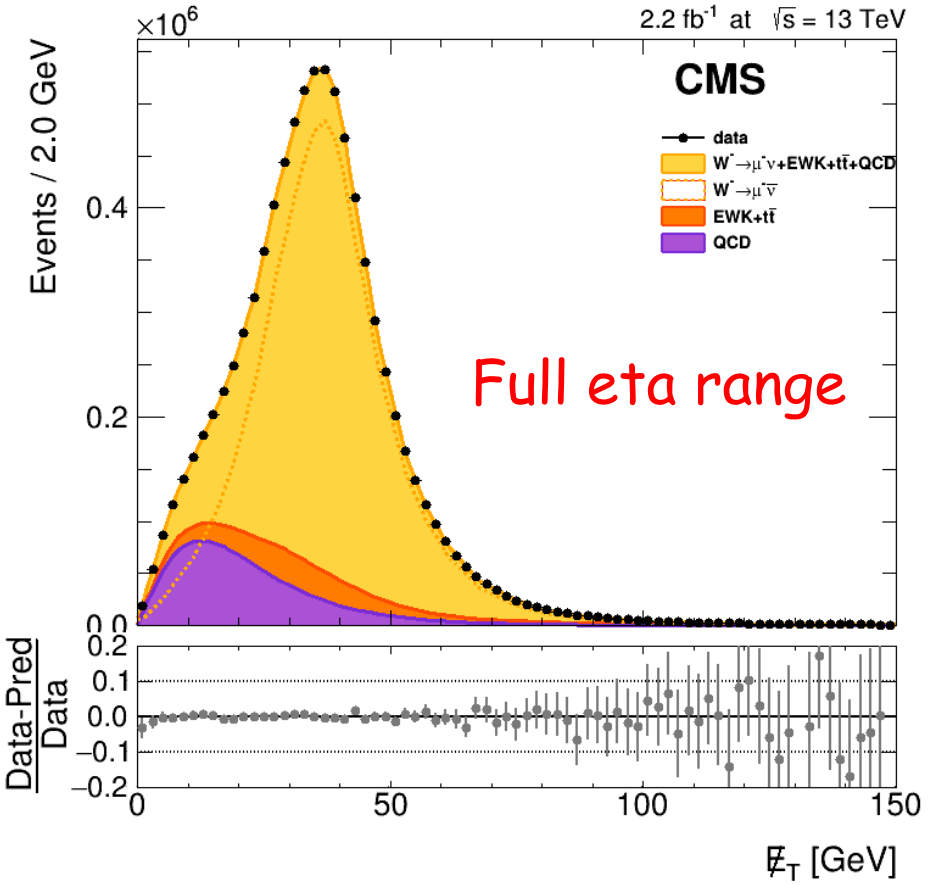

Other bg W+
Other bg W-
|eta|

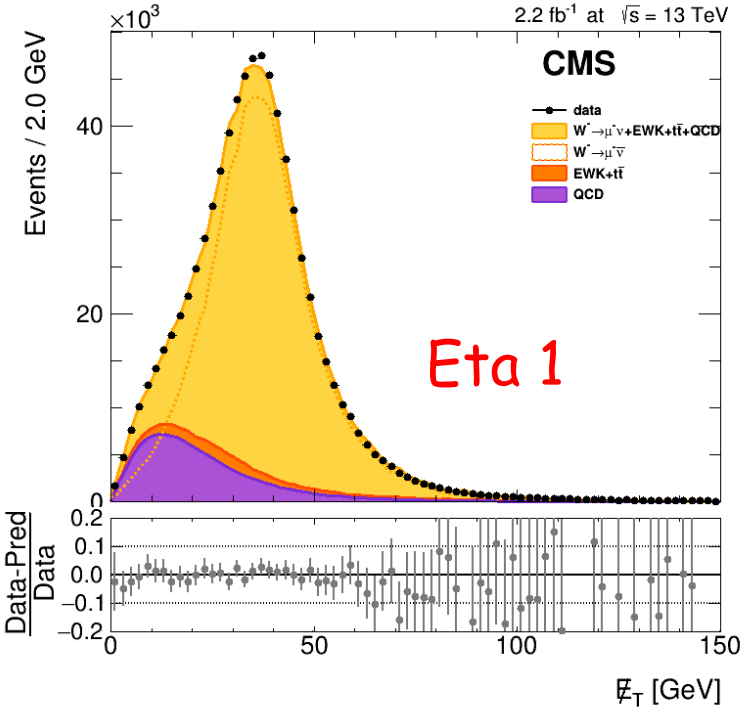

signal W+
signal W-
|eta|

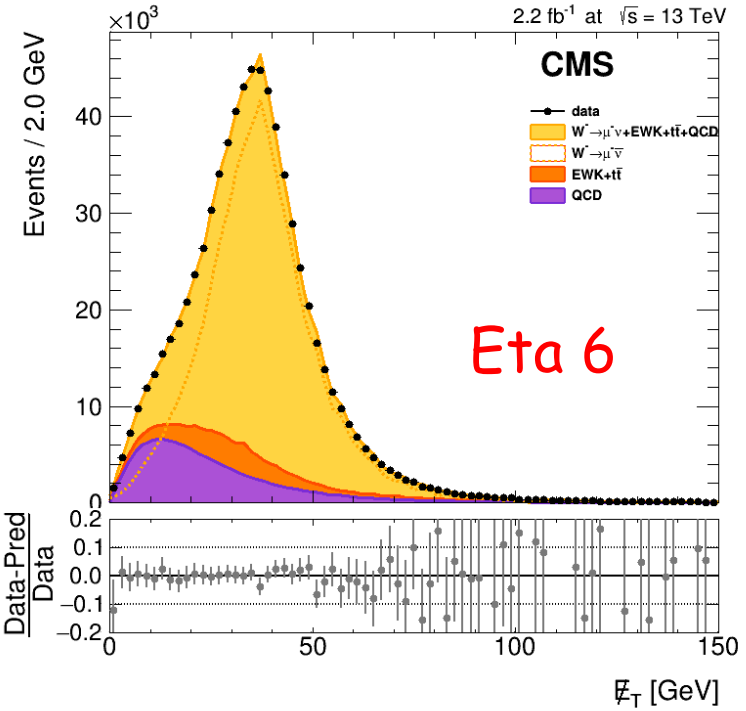

QCD bg W+
QCD bg W-
|eta|


Other bg W+
Other bg W-
|eta|

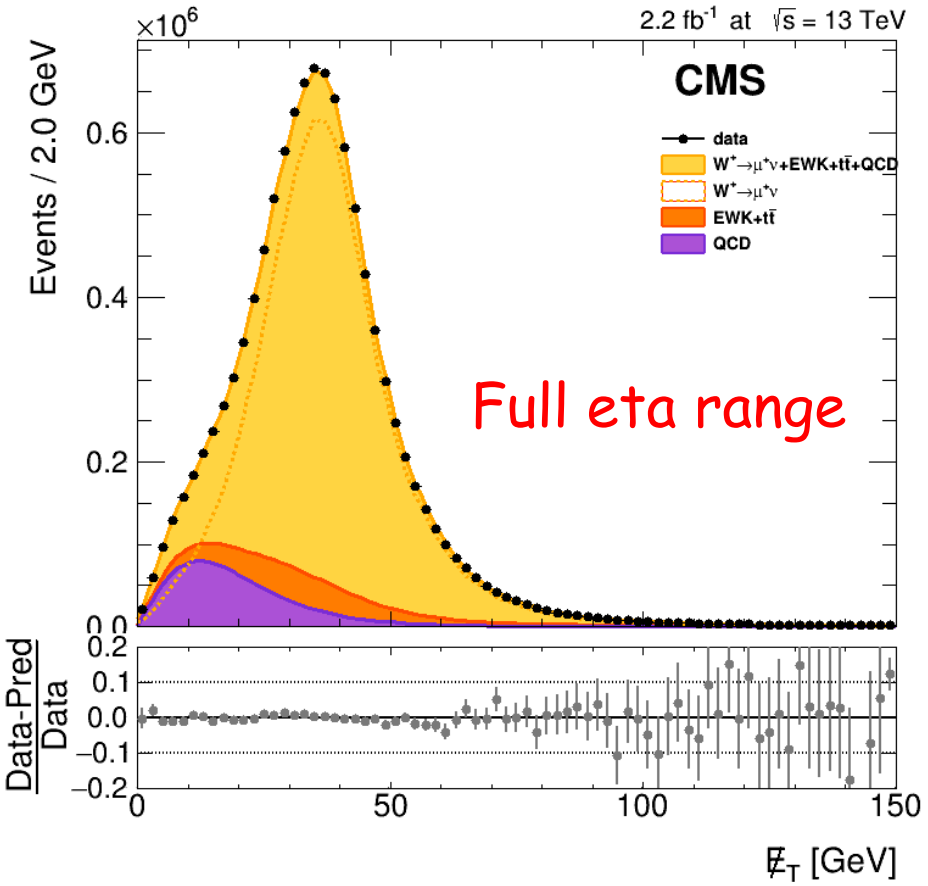
Look at fits in linear scale! W-

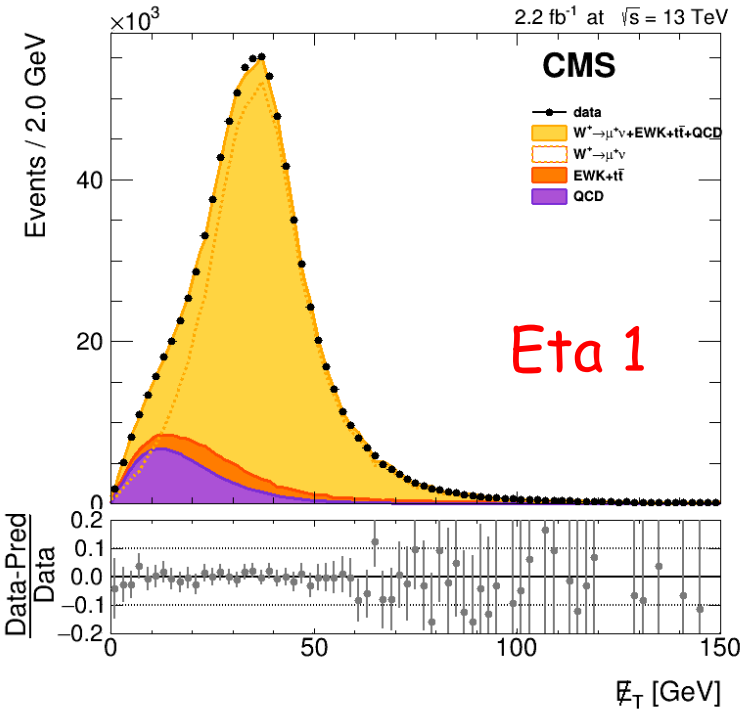


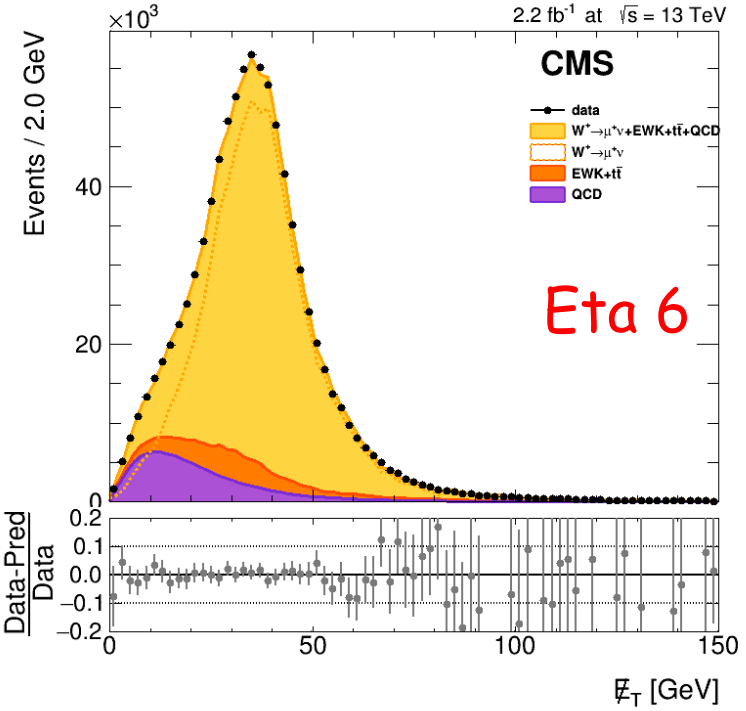




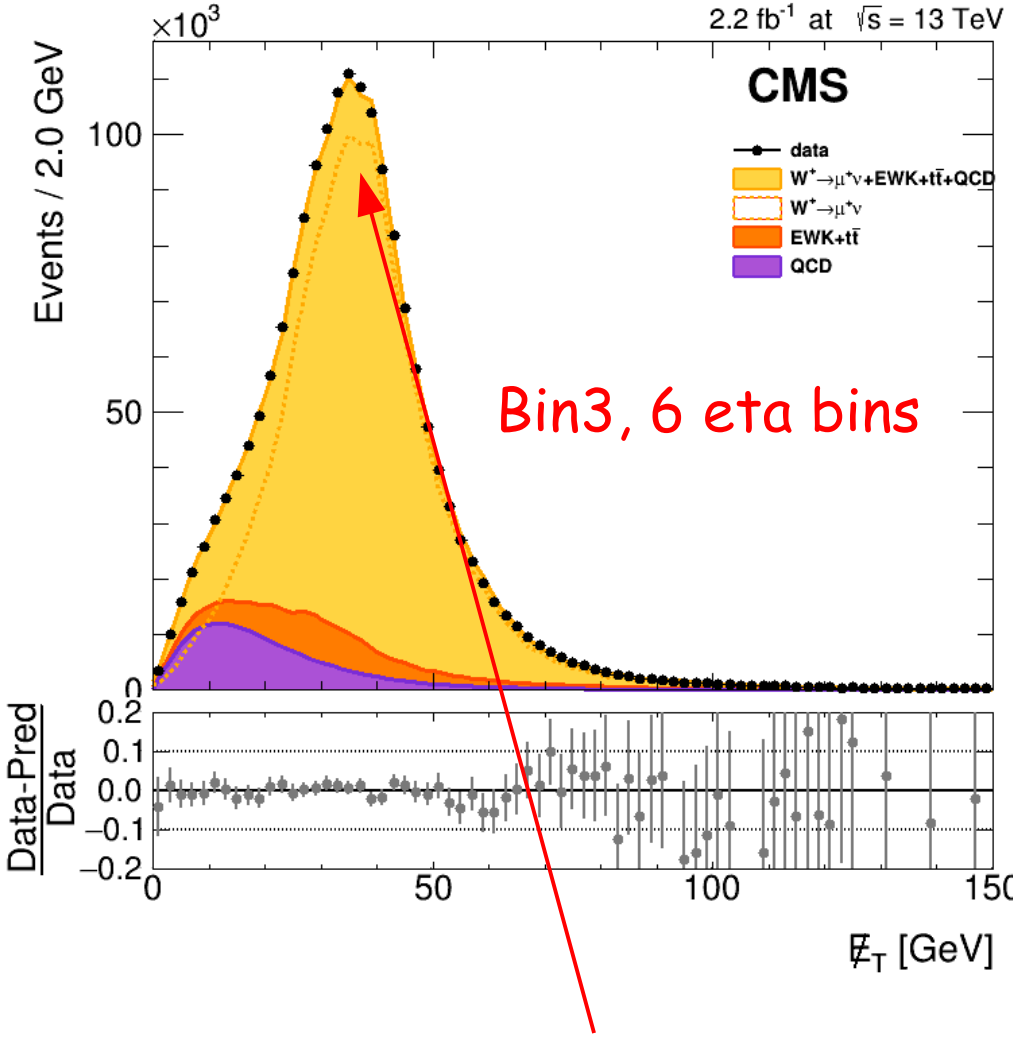
Look at fits in linear scale! W+

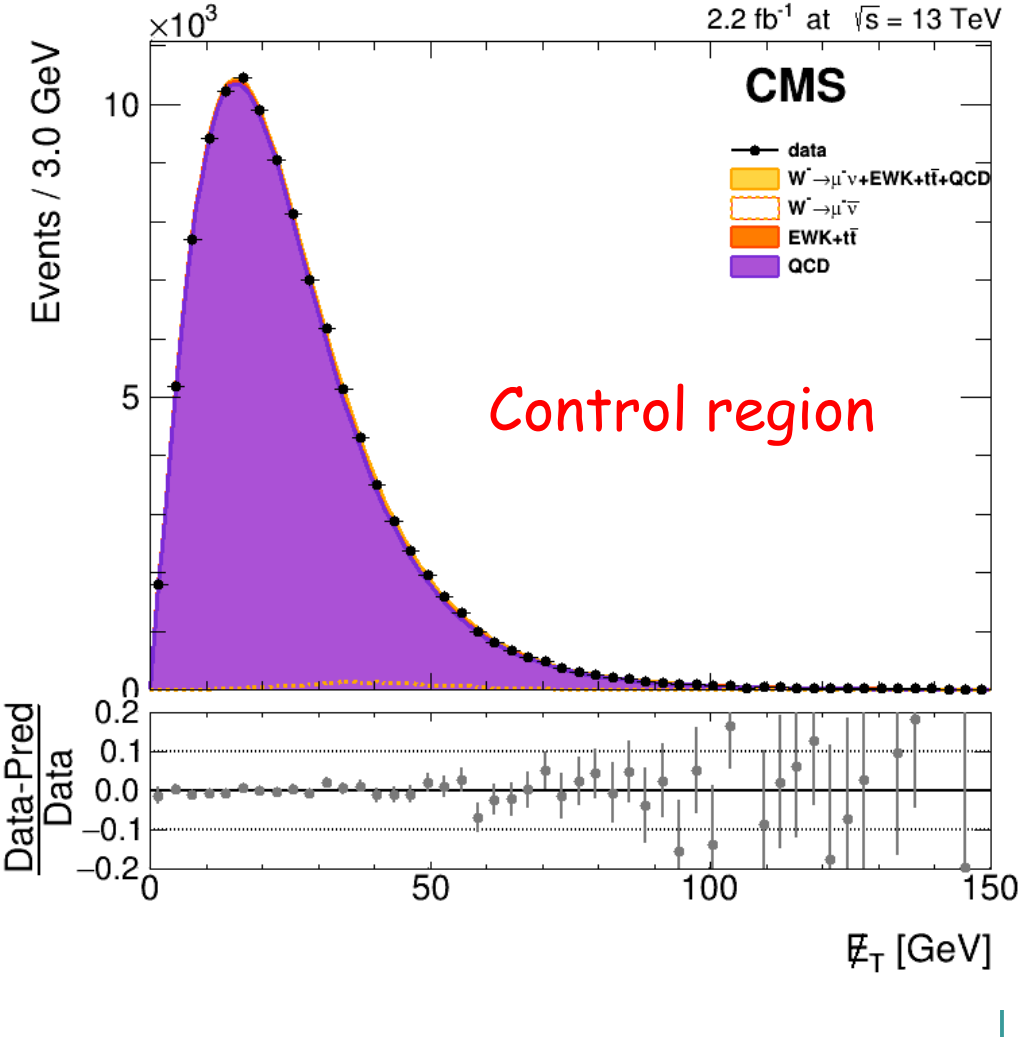






Look at fits in linear scale!





Signal MC might be a problem?? why?

signal events in CONTROL region from FIT