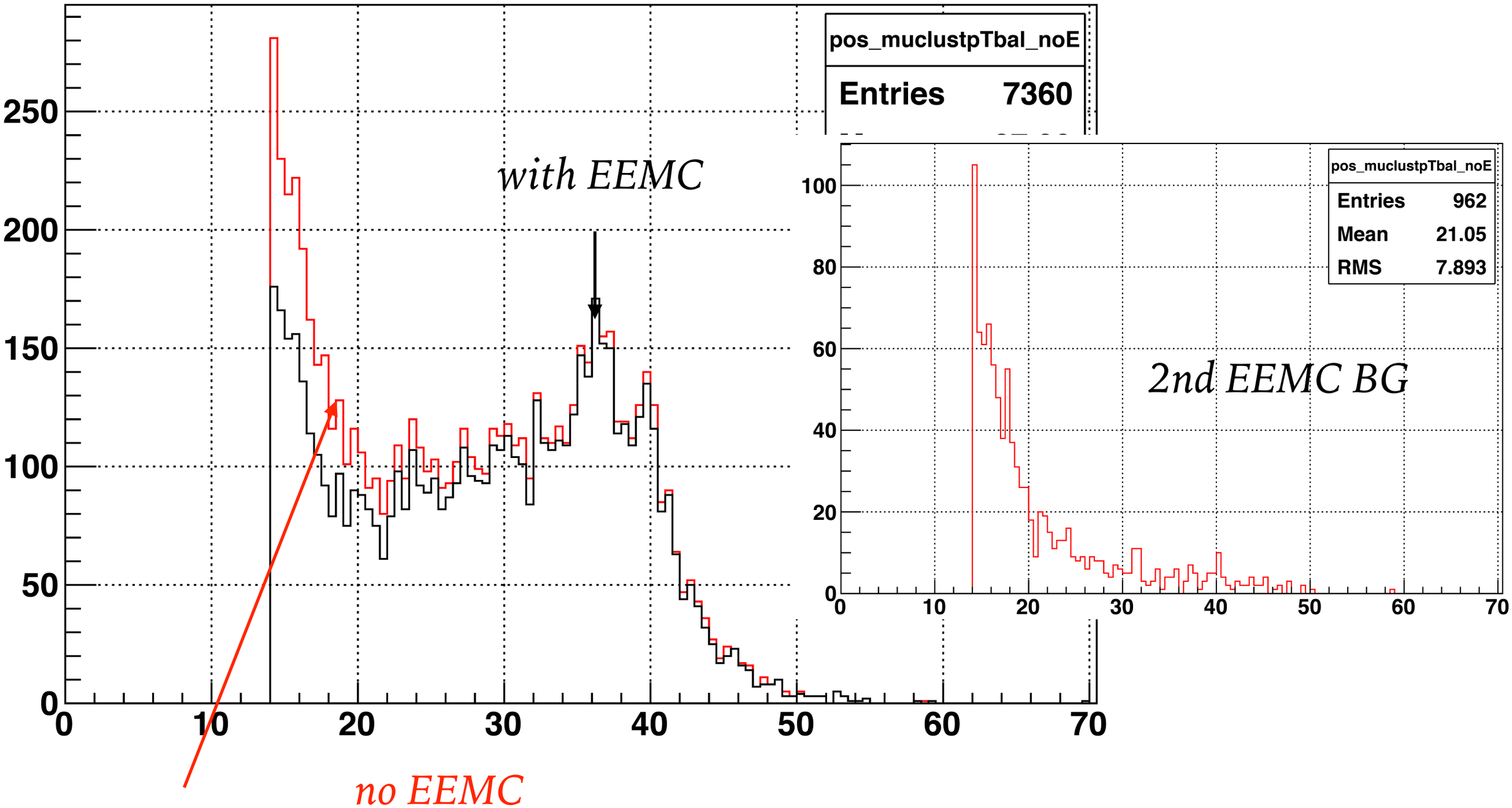
Second EEMC Background correction

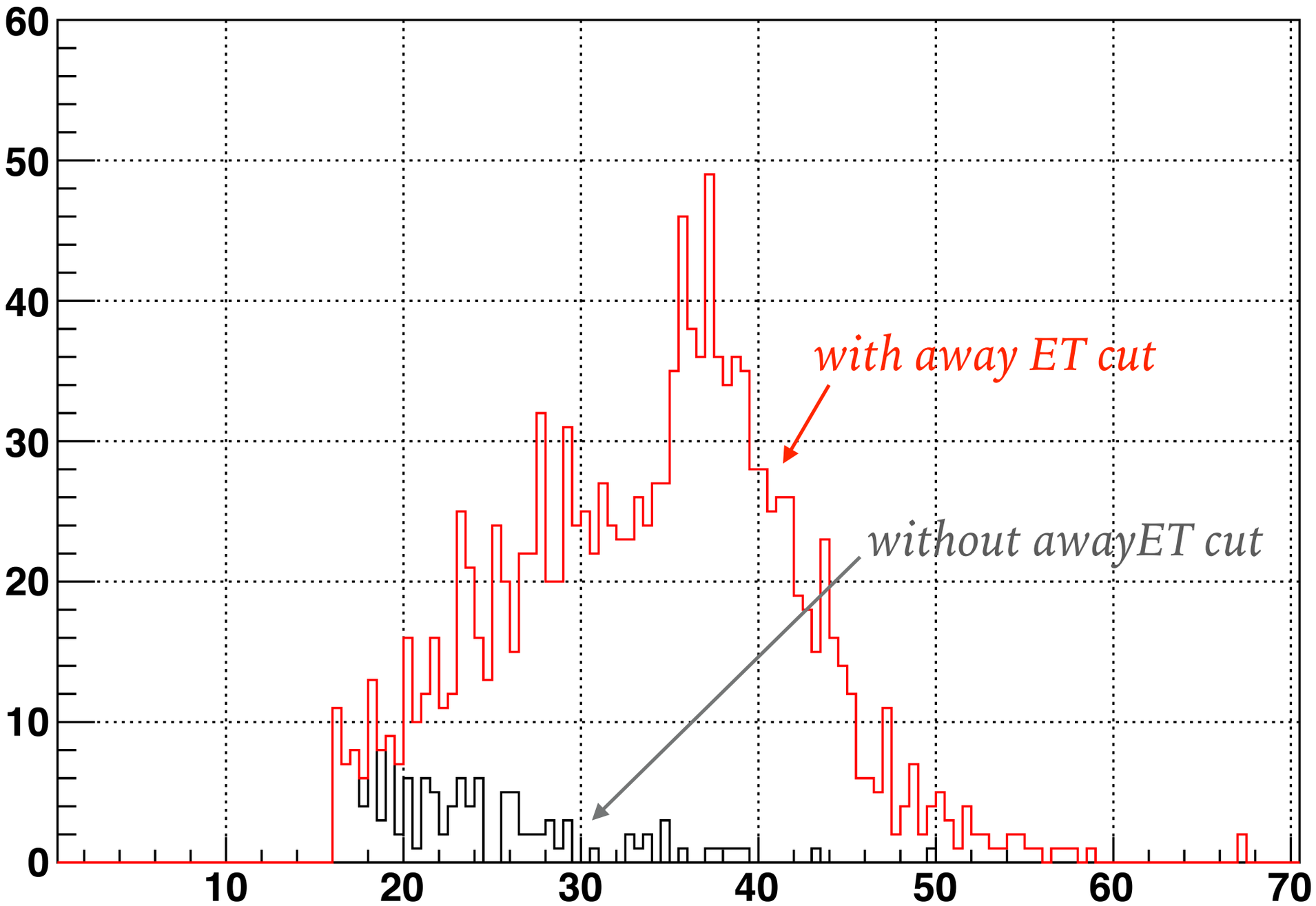
05/17/2018

2ND EEMC BG : THE DIFFERENCE BETWEEN WITH EEMC AND NO EEMC



EEMC is not used in near cone ET reconstruction and in Jet PT reconstruction for sighPT balance variable.

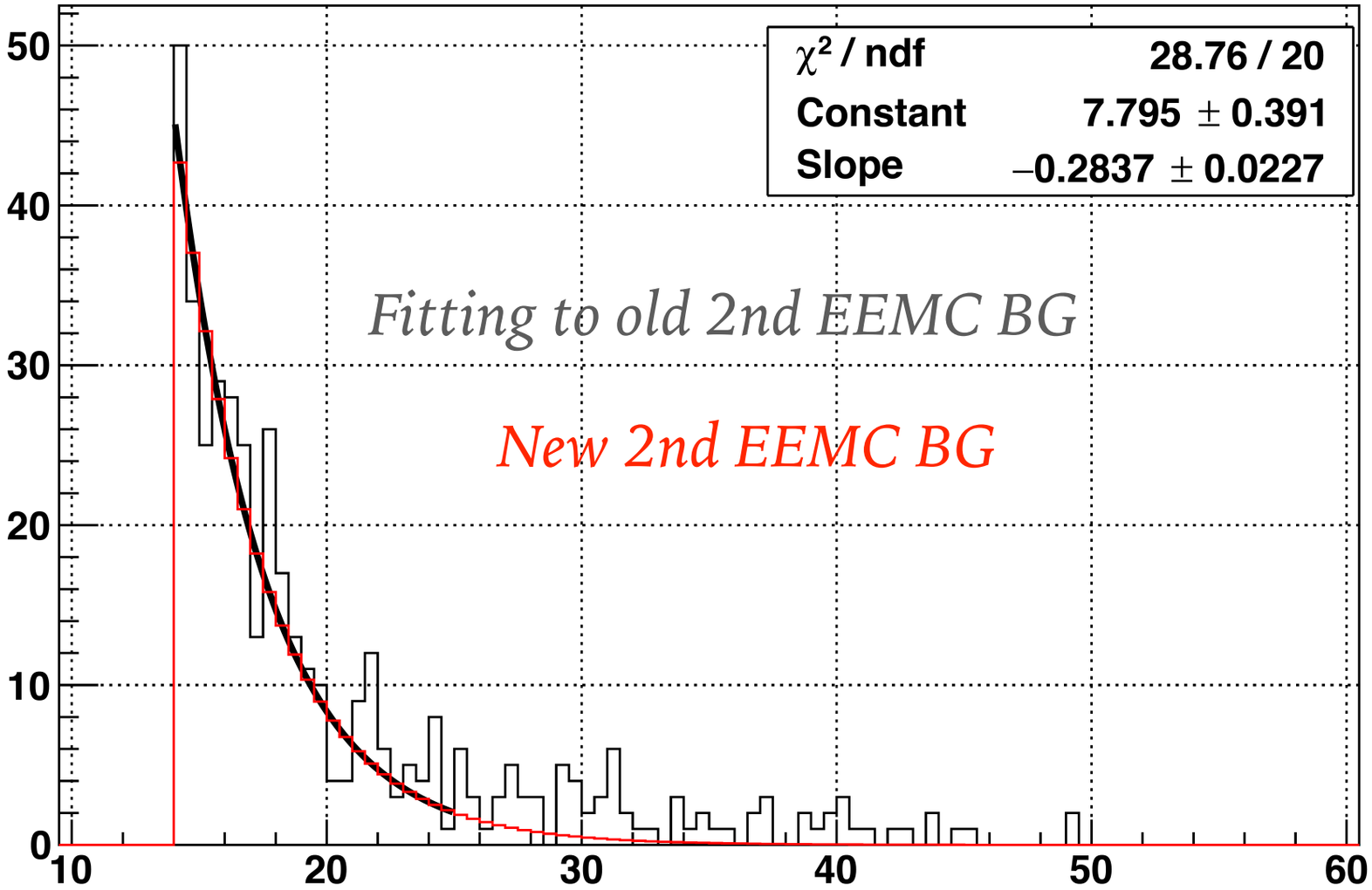
2ND EEMC : MC SECOND EEMC BG SHOWS WE NEED CORRECTION !



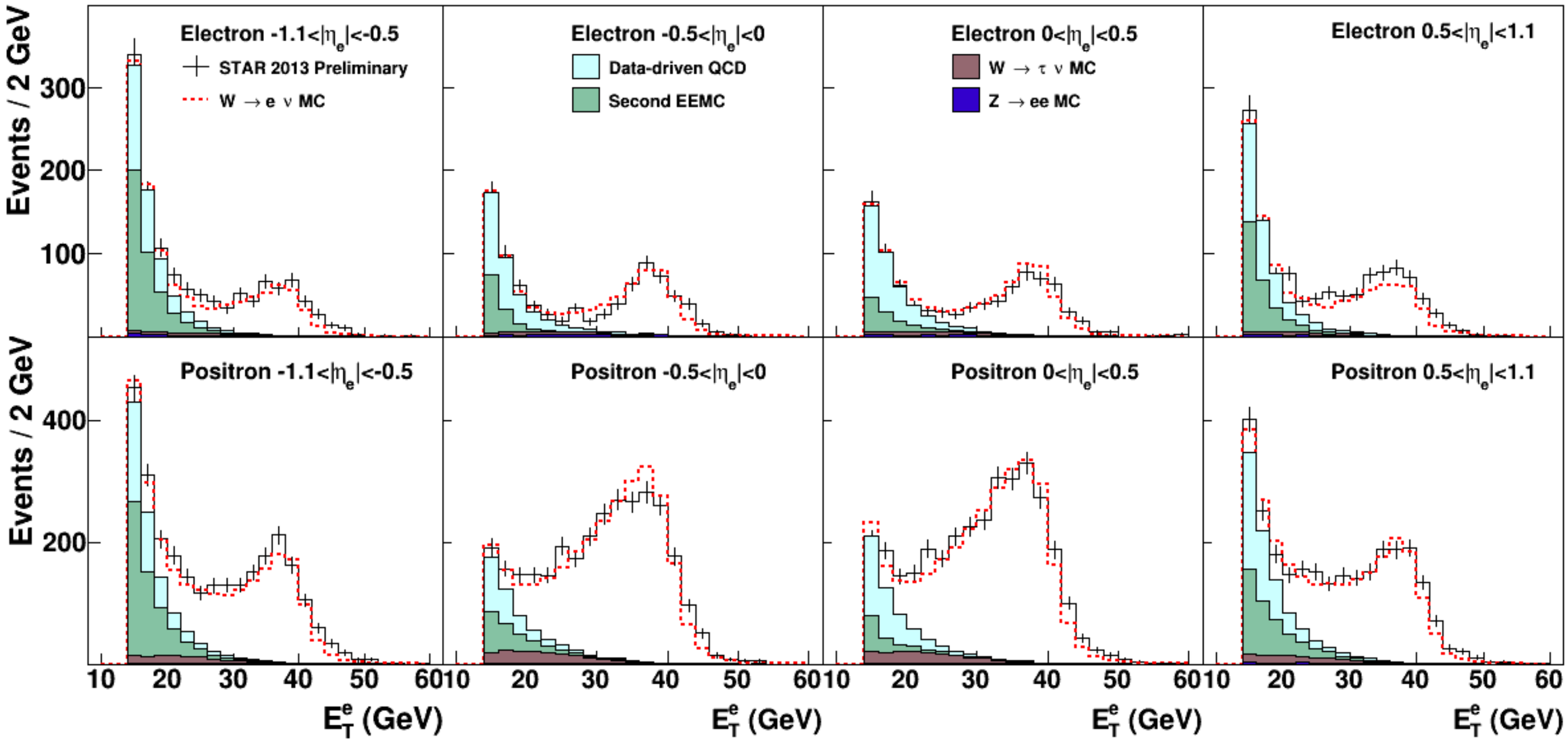
When veto ing on EEMC some good W that goes away from awayET cut comes back or more event falls below the threshold of the away ET cut.

-FITTING-MTD

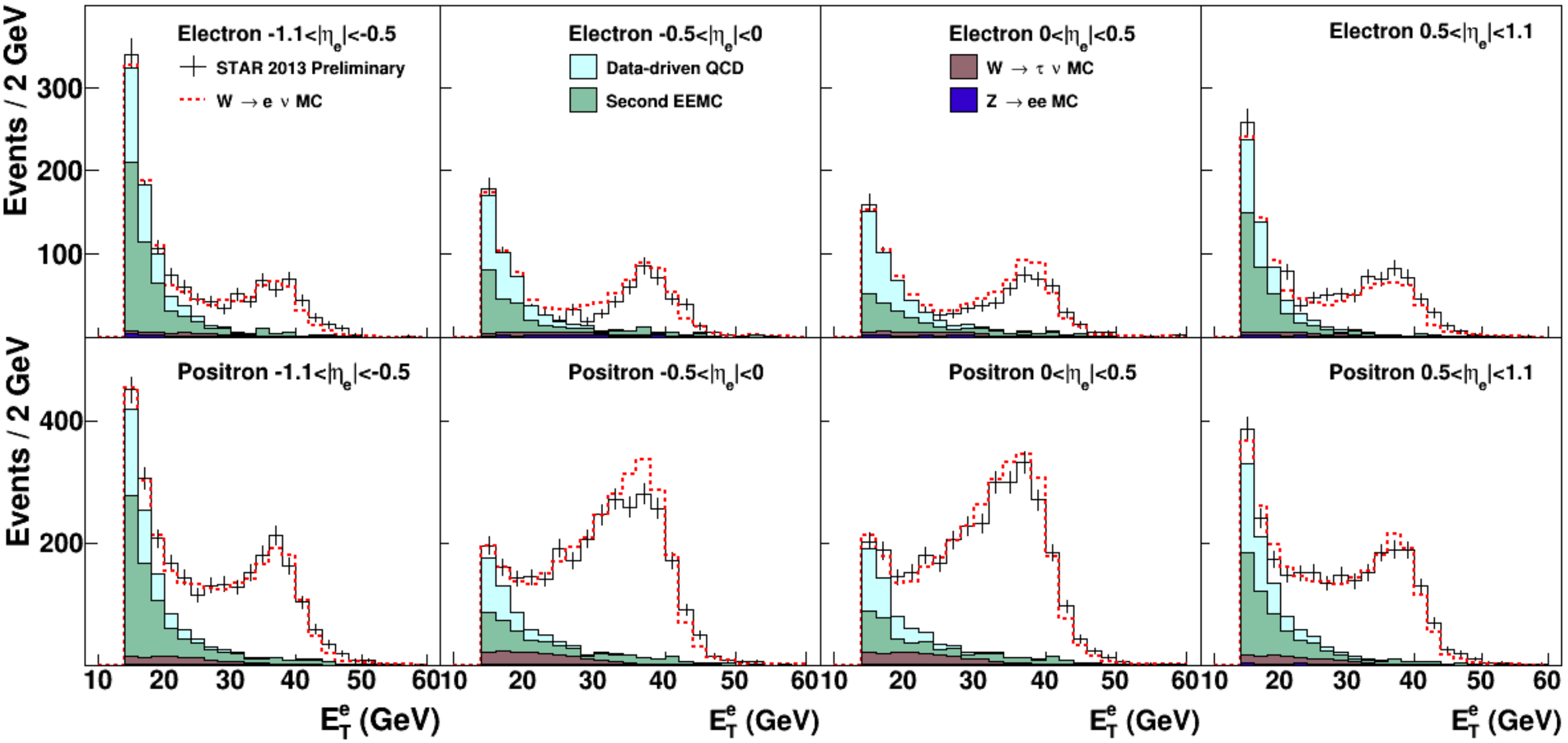
- Fit 2nd EEMC BG (Zee and tau component subtracted) distribution using a exponential function in the range 14-25 GeV and extrapolate to the signal region.
- Take the integral of the exponential function in each bin and store in a histogram to get the 2nd EEMC BG.



BG – PLOT – WITH CORRECTION



BG – PLOT – NO CORRECTION



BG – COUNTS – WITH CORRECTION – PERIOD 1

WN	backgro und	summar y:	yields	25<ET<5 0	GeV							
starPhys EtaBin	rawYield	qcdBkgd	secondE EMC	zeeBkgd	wTauYie ld	totalBkg d	wYield	beta	+/-	err	stat	syst
1	251	7.27	2	3.58	5.09	13.18	237.82	0.948	+/-	0.01	0.01	0.003
2	269	10.77	0	8.23	6.14	19.18	249.82	0.929	+/-	0.036	0.007	0.035
3	263	13.31	5	4.02	6.4	23.02	239.98	0.912	+/-	0.019	0.012	0.014
4	315	11.71	0	3.11	5.44	15.55	299.45	0.951	+/-	0.007	0.005	0.004
8	1110	35.34	20	17.78	23.07	73.63	1036.37	0.934	+/-	0.006	0.005	0.004

WP	backgro und	summar y:	yields	25<ET<5 0	GeV							
starPhys EtaBin	rawYield	qcdBkgd	secondE EMC	zeeBkgd	wTauYie ld	totalBkg d	wYield	beta	+/-	err	stat	syst
1	762	8.47	12	4.21	14.1	25.18	736.82	0.967	+/-	0.006	0.005	0.004
2	1255	7.2	6	7.19	23.68	20.71	1234.29	0.983	+/-	0.003	0.003	0.001
3	1286	12.3	4	7.65	22.62	24.48	1261.52	0.981	+/-	0.009	0.002	0.009
4	764	20.54	17	3.77	14.99	41.63	722.37	0.946	+/-	0.007	0.006	0.004
8	4077	42.13	50	23.68	75.4	116.26	3960.74	0.971	+/-	0.003	0.002	0.002

BG – COUNTS – WITH CORRECTION – PERIOD 2

WN	backgro und	summar y:	yields	25<ET< 50	GeV							
starPhys EtaBin	rawYiel d	qcdBkgd	secondE EMC	zeeBkgd	wTauYie ld	totalBkg d	wYield	beta	+/-	err	stat	syst
1	236	9.36	6	4.37	3.92	20.62	215.38	0.913	+/-	0.03	0.015	0.026
2	199	7.86	0	7.02	5.69	15.26	183.74	0.923	+/-	0.016	0.009	0.013
3	221	8.51	0	6.9	6.97	16.33	204.67	0.926	+/-	0.01	0.008	0.006
4	263	6.87	4	5.22	4.4	16.4	246.6	0.938	+/-	0.012	0.011	0.005
8	925	28.18	22	23.22	20.98	73.75	851.25	0.92	+/-	0.008	0.006	0.006

WP	backgro und	summar y:	yields	25<ET< 50	GeV							
starPhys EtaBin	rawYiel d	qcdBkgd	secondE EMC	zeeBkgd	wTauYie ld	totalBkg d	wYield	beta	+/-	err	stat	syst
1	618	12.99	10	5.75	11.11	28.75	589.25	0.953	+/-	0.021	0.006	0.02
2	903	9.6	10	5.42	19.13	25.64	877.36	0.972	+/-	0.004	0.004	0.002
3	1054	11.88	0	5.5	23.59	17.38	1036.62	0.984	+/-	0.009	0.002	0.009
4	709	10.25	14	5.12	15	30.03	678.97	0.958	+/-	0.007	0.006	0.003
8	3287	37.75	46	21.44	68.99	106.11	3180.89	0.968	+/-	0.003	0.002	0.003

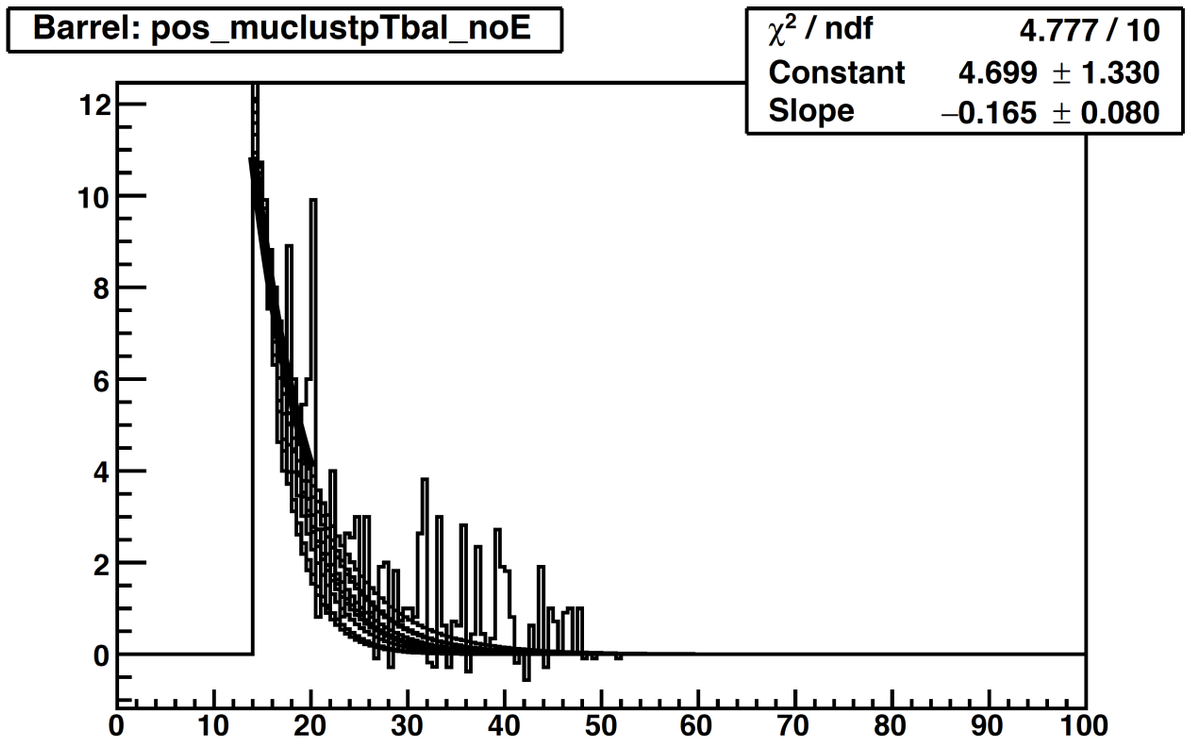
SYSTEMATICS – FOLDED INTO BETA

nominal Beta

➤ Beta = 1 - f_Z - $f\_eemc_{(nominal)}$ - $f\_QCD_{(nominal)}$

➤ $\delta\beta = \text{sqrt}\,[\,\delta(f\_Z)\,\hat{}\,2 + \delta(f\_eemc)\,\hat{}\,2 + \delta(f\_QCD)\,\hat{}\,2\,]$

➤ $\delta\beta = \text{sqrt}\,[\,\beta\_stat\,\hat{}\,2 + \beta\_sys\,\hat{}\,2]$



$f^{sys}\_eemc = hf\_eemc =$ f_eemc (i =1000) -> GetRMS();

$\delta(f\_Z) = f^{stat}\_Z\,\hat{}\,2 + f^{sys}\_Z\,\hat{}\,2$ ——(1)

$\delta(f\_eemc) = f^{stat}\_eemc\,\hat{}\,2 + f^{sys}\_eemc\,\hat{}\,2$————(2)

$\delta(f\_QCD) = f^{stat}\_QCD\,\hat{}\,2 + f^{sys}\_QCD\,\hat{}\,2$ ————(3)

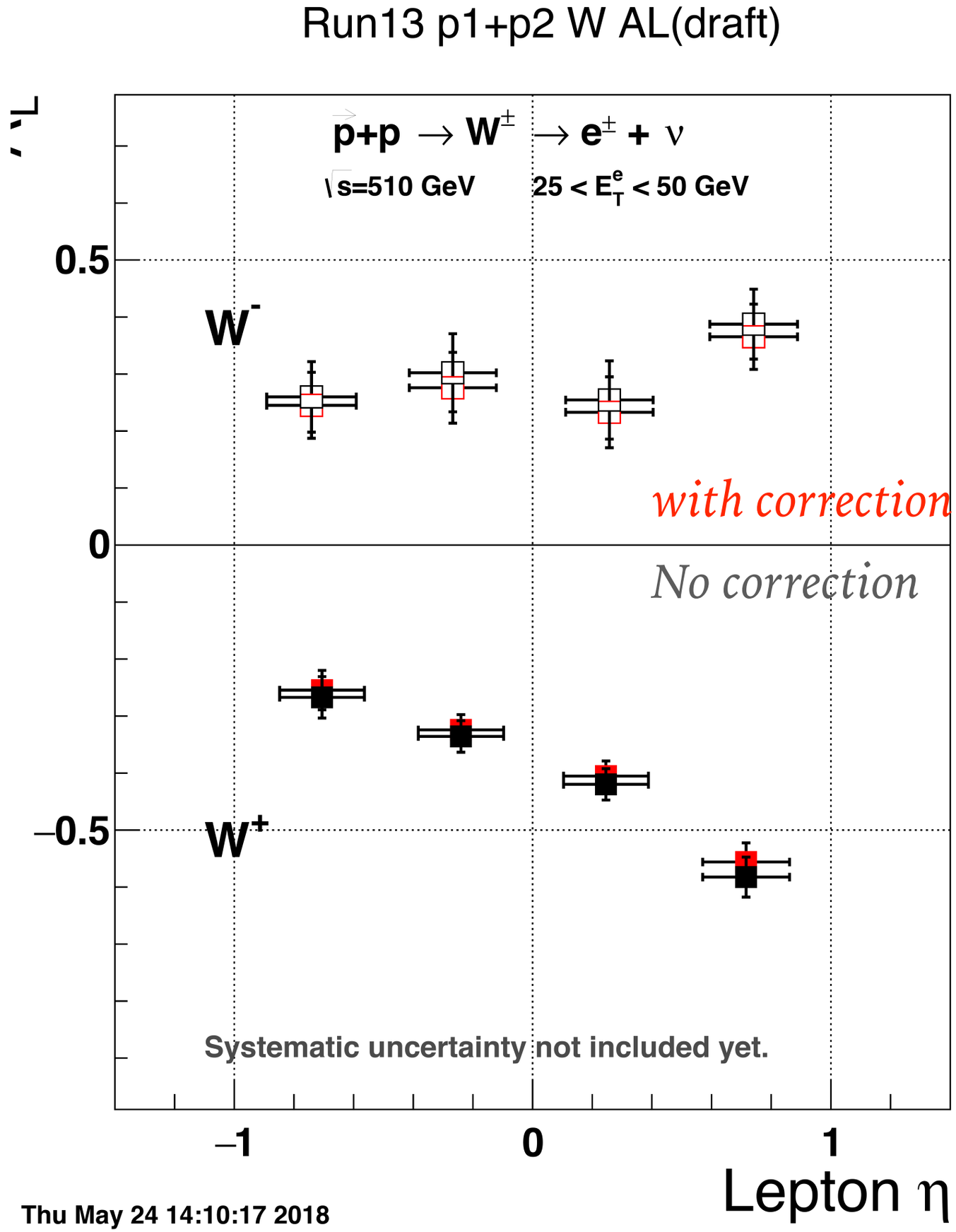
$f^{sys}\_Z = 0.09 * f\_Z$; 9% - run 13 lumi uncertainty

$f^{sys}\_QCD = hf\_QCD =$ f_QCD (i = 729) -> GetRMS();

RESULT

==== W P====
Etabin1, AL+/-Err: -0.267+/-0.036
Etabin2, AL+/-Err: -0.336+/-0.028
Etabin3, AL+/-Err: -0.420+/-0.027
Etabin4, AL+/-Err: -0.583+/-0.035
==== W N====
Etabin1, AL+/-Err: 0.260+/-0.062
Etabin2, AL+/-Err: 0.302+/-0.069
Etabin3, AL+/-Err: 0.255+/-0.069
Etabin4, AL+/-Err: 0.387+/-0.061

==== W P====
Etabin1, AL+/-Err: -0.255+/-0.035
Etabin2, AL+/-Err: -0.324+/-0.027
Etabin3, AL+/-Err: -0.405+/-0.027
Etabin4, AL+/-Err: -0.556+/-0.034
==== W N====
Etabin1, AL+/-Err: 0.245+/-0.058
Etabin2, AL+/-Err: 0.276+/-0.062
Etabin3, AL+/-Err: 0.233+/-0.062
Etabin4, AL+/-Err: 0.365+/-0.057



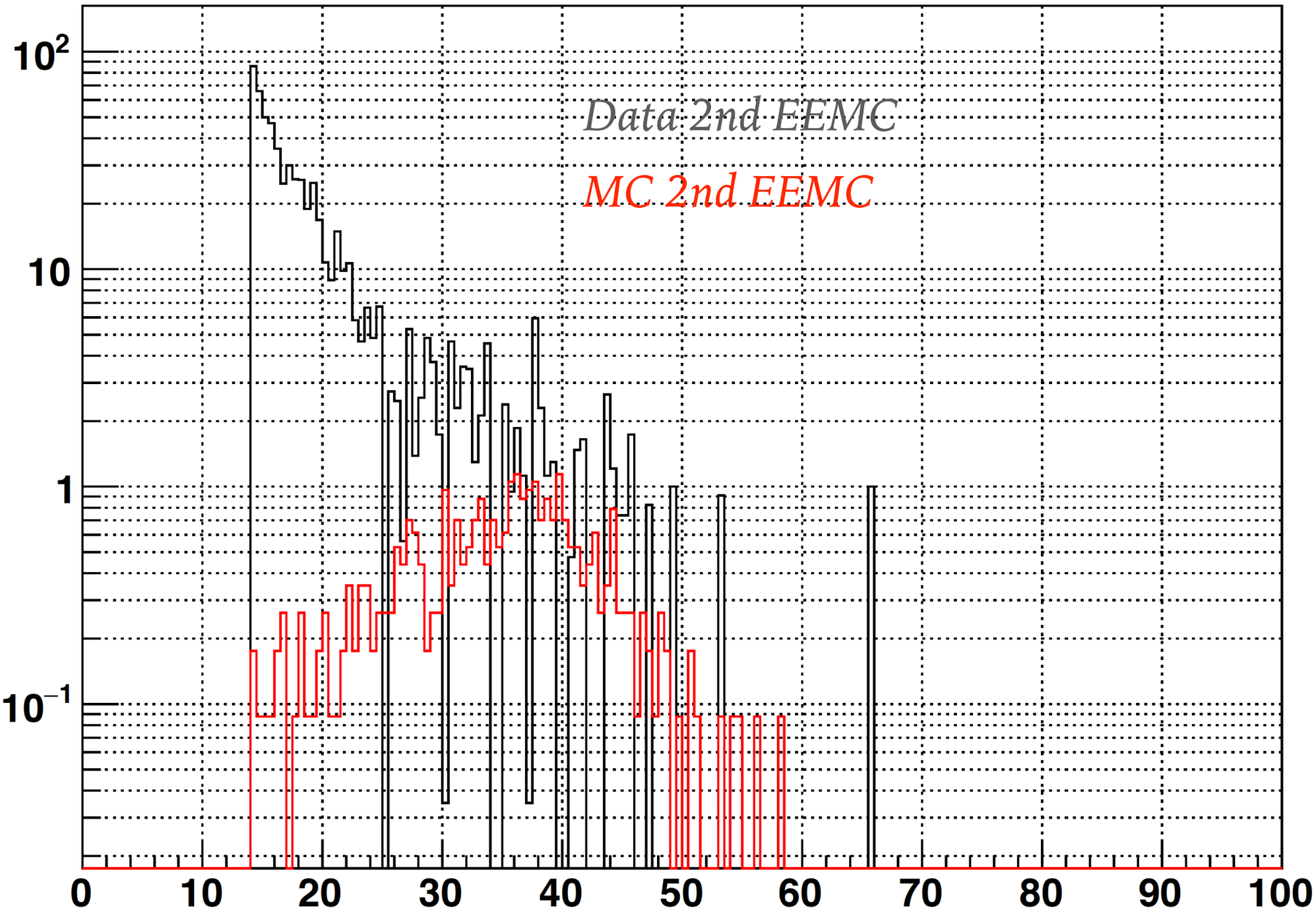
CONCLUSION

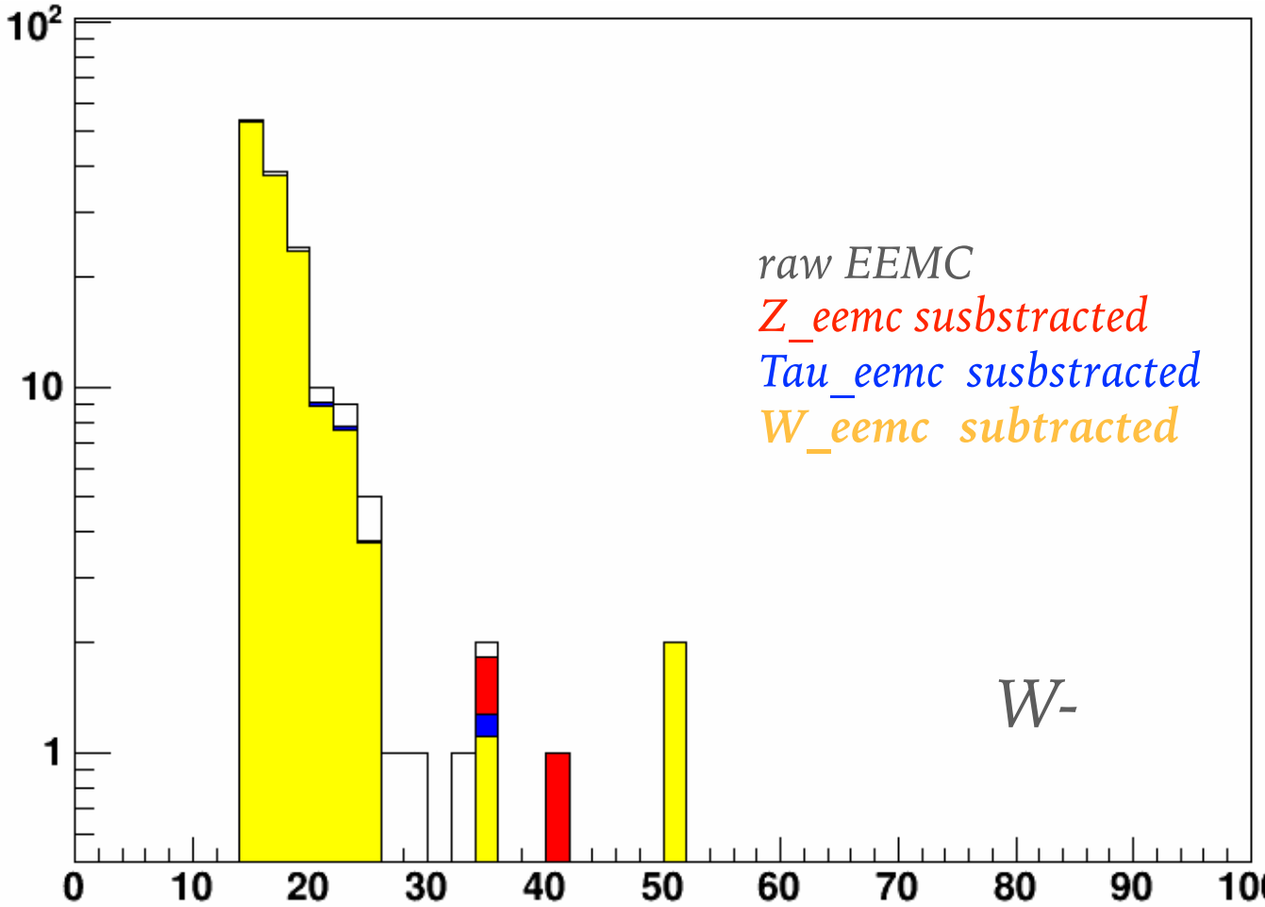
- Suggest to use Fitt method as it does not rely on MC sample and therefore any bias MC could affect on the correction.
- Results consist within Errors.
- Systematics is calculate by varying the upper limit if the fitting window from 20 to 25 GeV and folded into beta.
- Nominal Beta is calculate from the nominal fitting window (14,25) GeV.

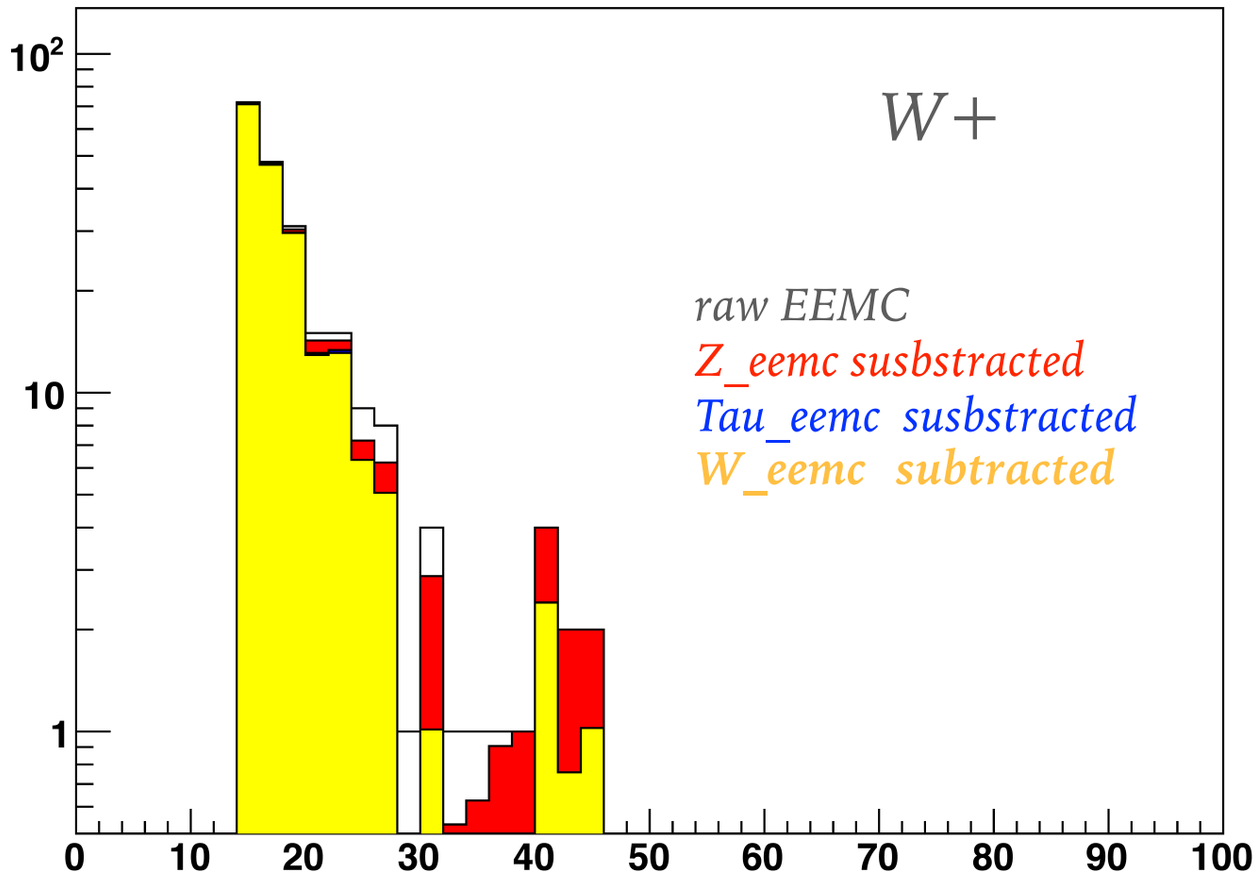
BACK UP

MC METHOD

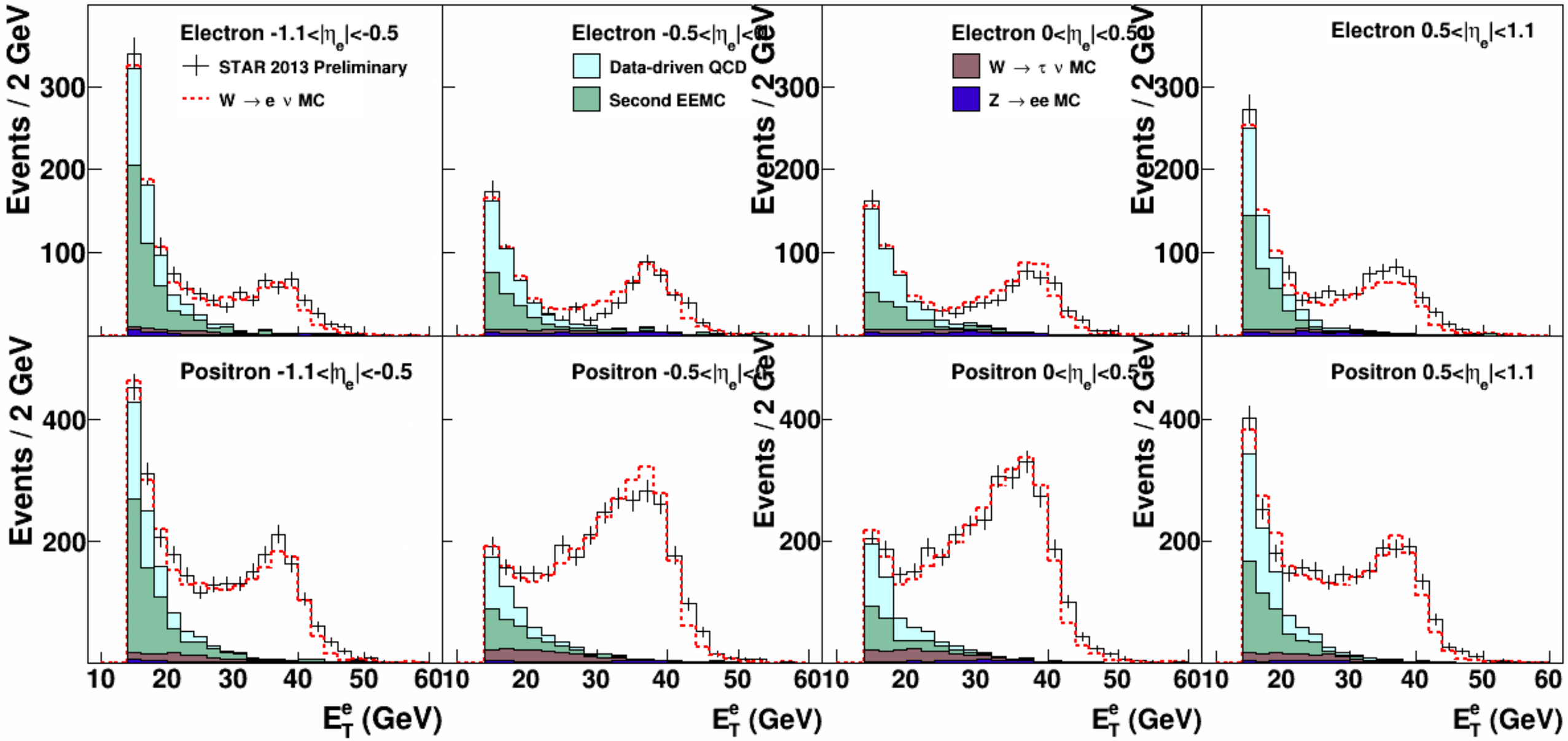
➤ Subtract MC 2nd EEMC BG from data 2nd EEMC BG (z and tau component substracted).



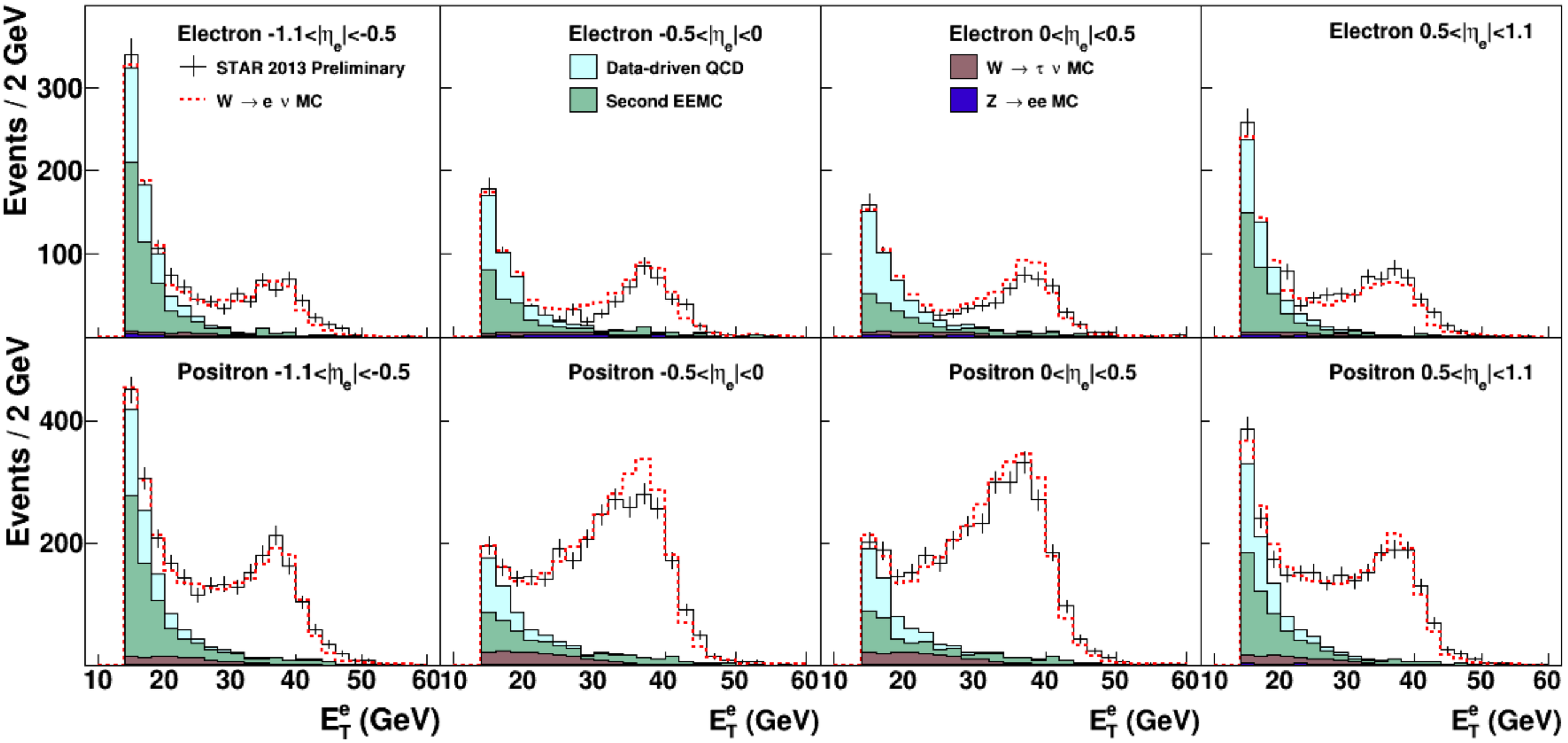

raw EEMC
Z_eemc susbstracted
Tau_eemc susbstracted
W_eemc subtracted
W-
10^2
10
1
0
10
20
30
40
50
60
70
80
90
100


W+
raw EEMC
Z_eemc susbstracted
Tau_eemc susbstracted
W_eemc subtracted
10^2
10
1
0
10
20
30
40
50
60
70
80
90
100

BG – PLOT – WITH CORRECTION



BG – PLOT – NO CORRECTION



BG – COUNTS – WITH CORRECTION – PERIOD 1

WN starPhysEtaBin	background rawYield	summary qcdBkgd	yields secondEEMC	25<ET<50 GeV zeeBkgd	wTauYield	totalBkgd	wYield	beta	+/-	err	+/-syst
1	251	6.82	10	6.36	5.09	23.33	227.67	0.907	+/-	0.014	0.002
2	269	9.61	18	15.91	6.14	44.12	224.88	0.837	+/-	0.018	0.005
3	263	12.31	4	13.29	6.4	30.13	232.87	0.887	+/-	0.013	0.005
4	315	11.04	9	6.65	5.44	27.51	287.49	0.914	+/-	0.013	0.003
8	1110	34.67	45	42.31	23.07	122.76	987.24	0.89	+/-	0.007	0.003

WP starPhysEtaBin	background rawYield	summary qcdBkgd	yields secondEEMC	25<ET<50 GeV zeeBkgd	wTauYield	totalBkgd	wYield	beta	+/-	err	+/-syst
1	762	7.83	44	7.68	14.1	59.69	702.31	0.921	+/-	0.009	0.001
2	1255	6.99	9	14.41	23.68	30.78	1224.22	0.975	+/-	0.003	0.001
3	1286	10.85	9	16.75	22.62	36.9	1249.1	0.971	+/-	0.003	0.001
4	764	19.17	3	8.8	14.99	31.68	732.32	0.959	+/-	0.004	0.003
8	4077	40.52	72	47.64	75.4	160.3	3916.7	0.961	+/-	0.002	0.001

BG – COUNTS – WITH CORRECTION – PERIOD 2

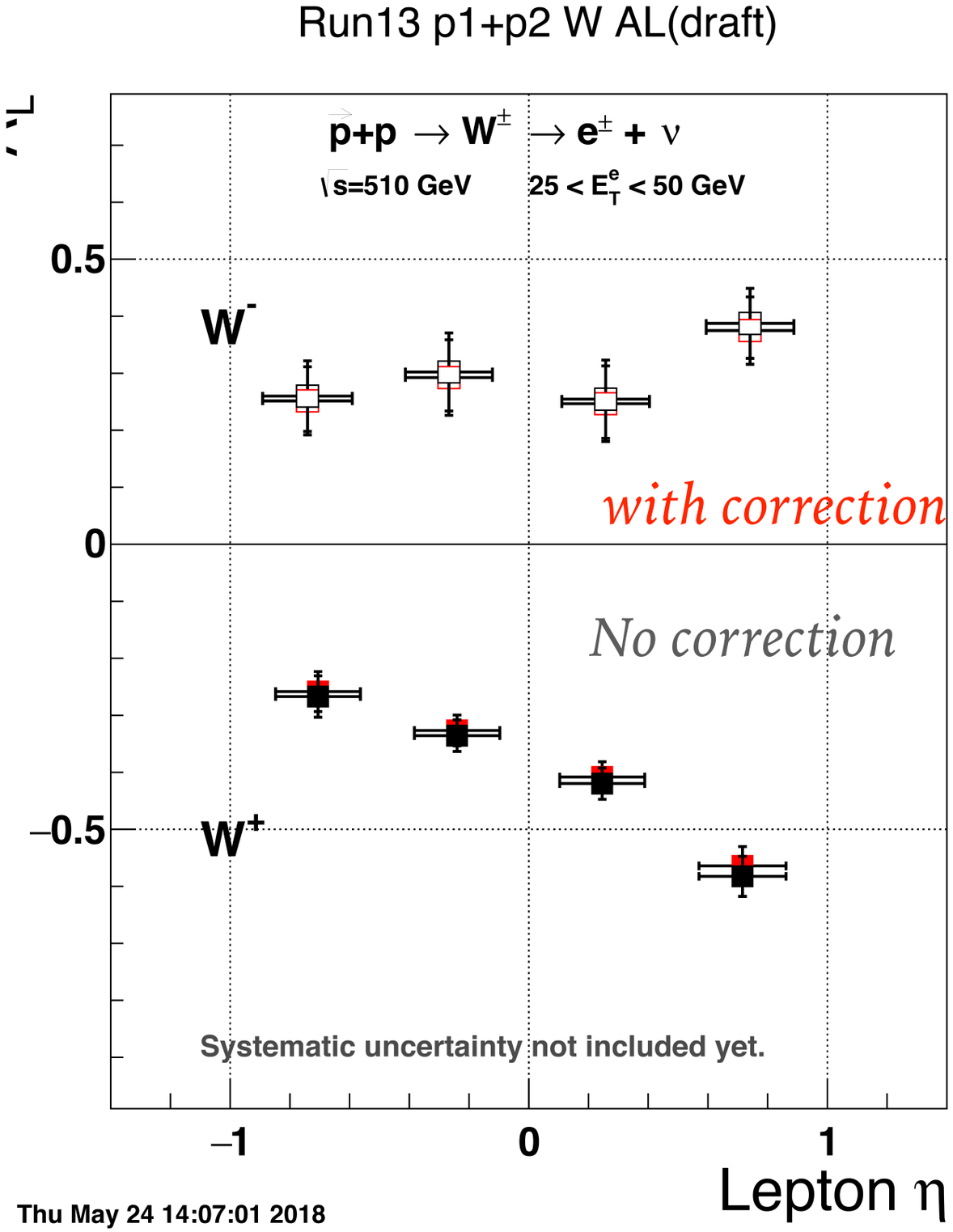
WN	backgro und	summar y:	yields	25<ET<5 0	GeV						
starPhys EtaBin	rawYield	qcdBkgd	secondE EMC	zeeBkgd	wTauYiel d	totalBkg d	wYield	beta	+/-	err	+/-syst
1	236	8.6	15	7.03	3.92	30.8	205.2	0.87	+/-	0.018	0.003
2	199	6.83	3	13.98	5.69	24.27	174.73	0.878	+/-	0.014	0.005
3	221	7.52	7	15	6.97	30	191	0.862	+/-	0.017	0.005
4	263	5.76	1	8.48	4.4	15.76	247.24	0.941	+/-	0.008	0.005
8	925	26.12	33	44.58	20.98	104.58	820.42	0.887	+/-	0.007	0.003

WP	backgro und	summar y:	yields	25<ET<5 0	GeV						
starPhys EtaBin	rawYield	qcdBkgd	secondE EMC	zeeBkgd	wTauYiel d	totalBkg d	wYield	beta	+/-	err	+/-syst
1	618	13.24	16	8.31	11.11	37.79	580.21	0.941	+/-	0.007	0.002
2	903	8.99	5	12.2	19.13	26.98	876.02	0.97	+/-	0.003	0.001
3	1054	8.73	0	14.15	23.59	22.89	1031.11	0.978	+/-	0.001	0.001
4	709	9.37	15	10.43	15	35.31	673.69	0.951	+/-	0.006	0.001
8	3287	37.25	36	45.26	68.99	118.9	3168.1	0.964	+/-	0.002	0.001

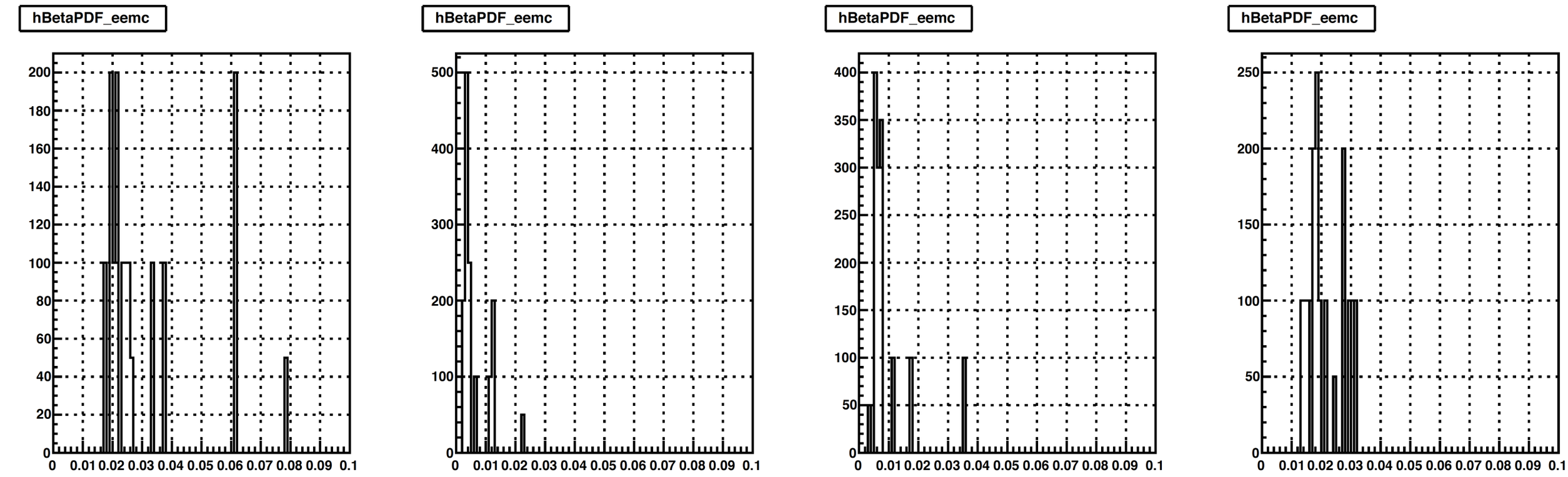
RESULTS

==== W P====
Etabin1, AL+/-Err: -0.267+/-0.036
Etabin2, AL+/-Err: -0.336+/-0.028
Etabin3, AL+/-Err: -0.420+/-0.027
Etabin4, AL+/-Err: -0.583+/-0.035
==== W N====
Etabin1, AL+/-Err: 0.260+/-0.062
Etabin2, AL+/-Err: 0.302+/-0.069
Etabin3, AL+/-Err: 0.255+/-0.069
Etabin4, AL+/-Err: 0.387+/-0.061

==== W P====
Etabin1, AL+/-Err: -0.258+/-0.035
Etabin2, AL+/-Err: -0.327+/-0.027
Etabin3, AL+/-Err: -0.408+/-0.027
Etabin4, AL+/-Err: -0.564+/-0.034
==== W N====
Etabin1, AL+/-Err: 0.252+/-0.060
Etabin2, AL+/-Err: 0.292+/-0.066
Etabin3, AL+/-Err: 0.247+/-0.066
Etabin4, AL+/-Err: 0.375+/-0.059

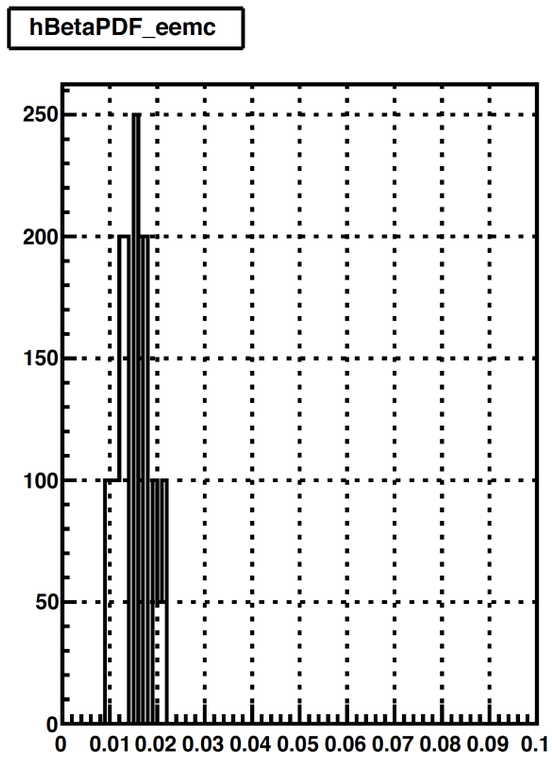


BACK UP – F_EEMC(I); I = 1000

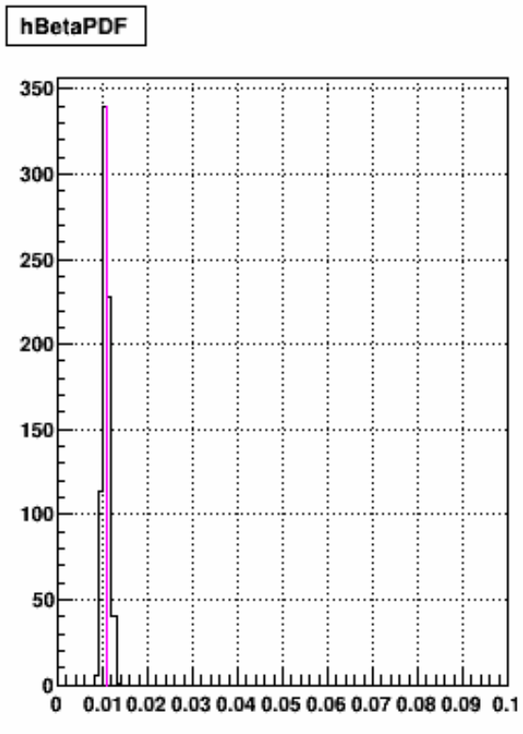


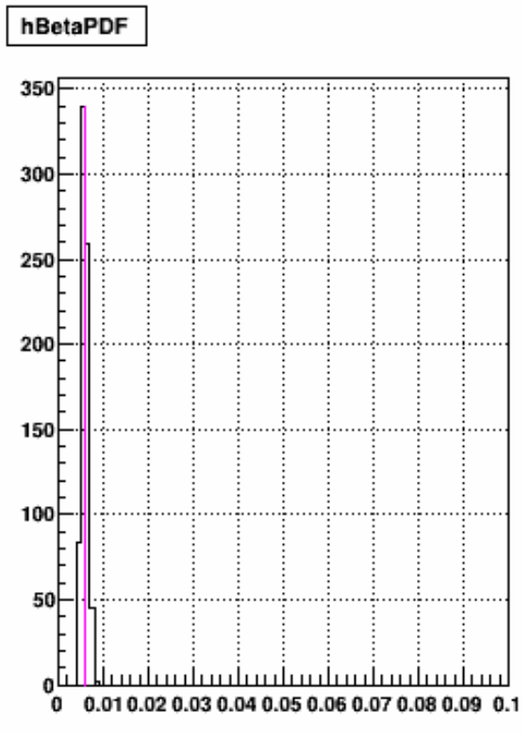
*Fit window = 14,20+i*0.005*

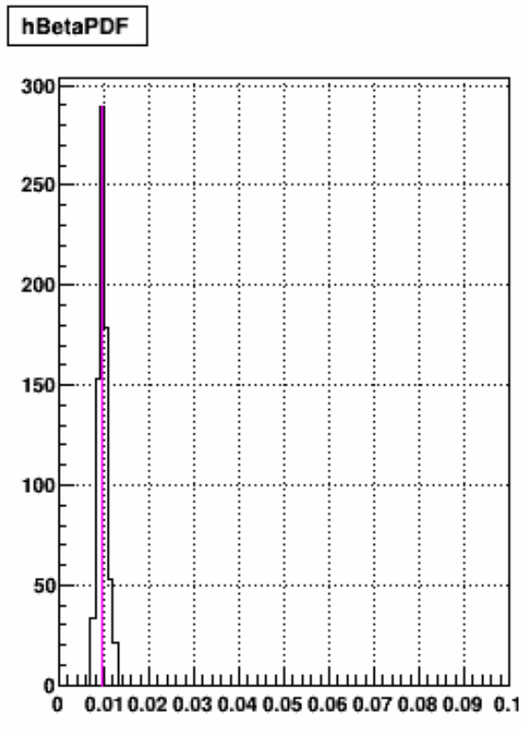
Nominal = 14,25

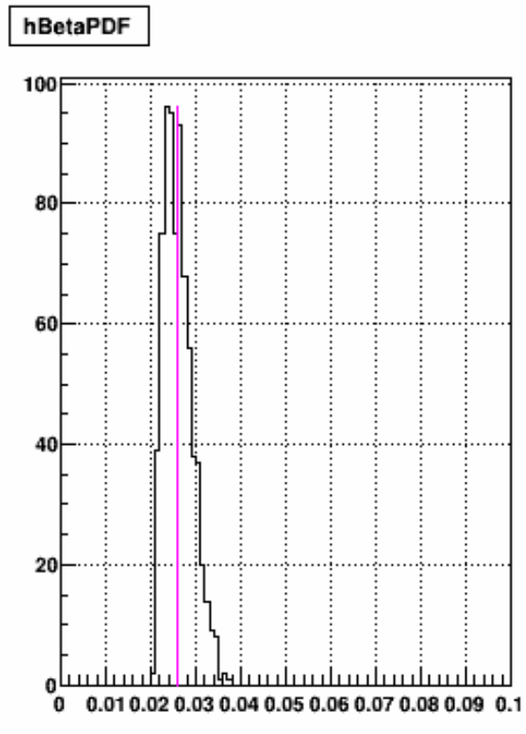


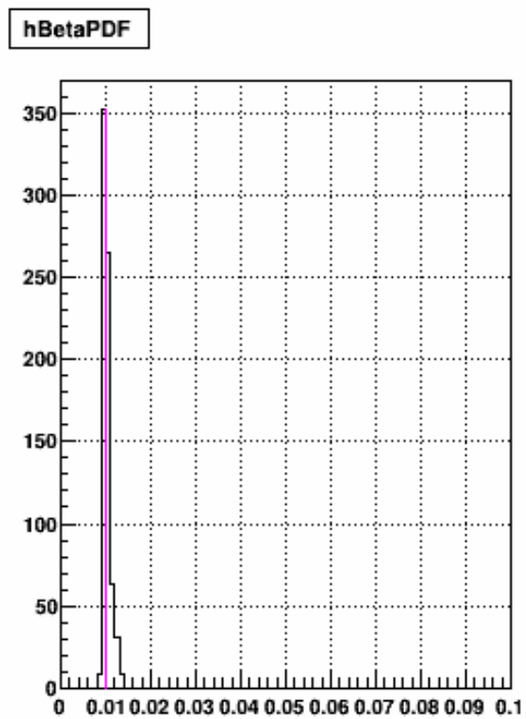
BACK UP – F_QCD(I); I = 729











BACK UP - 1-F_Z - F_EEMC - F_QCD (I) ; I = 729 , EEMC-NO CORRECTION