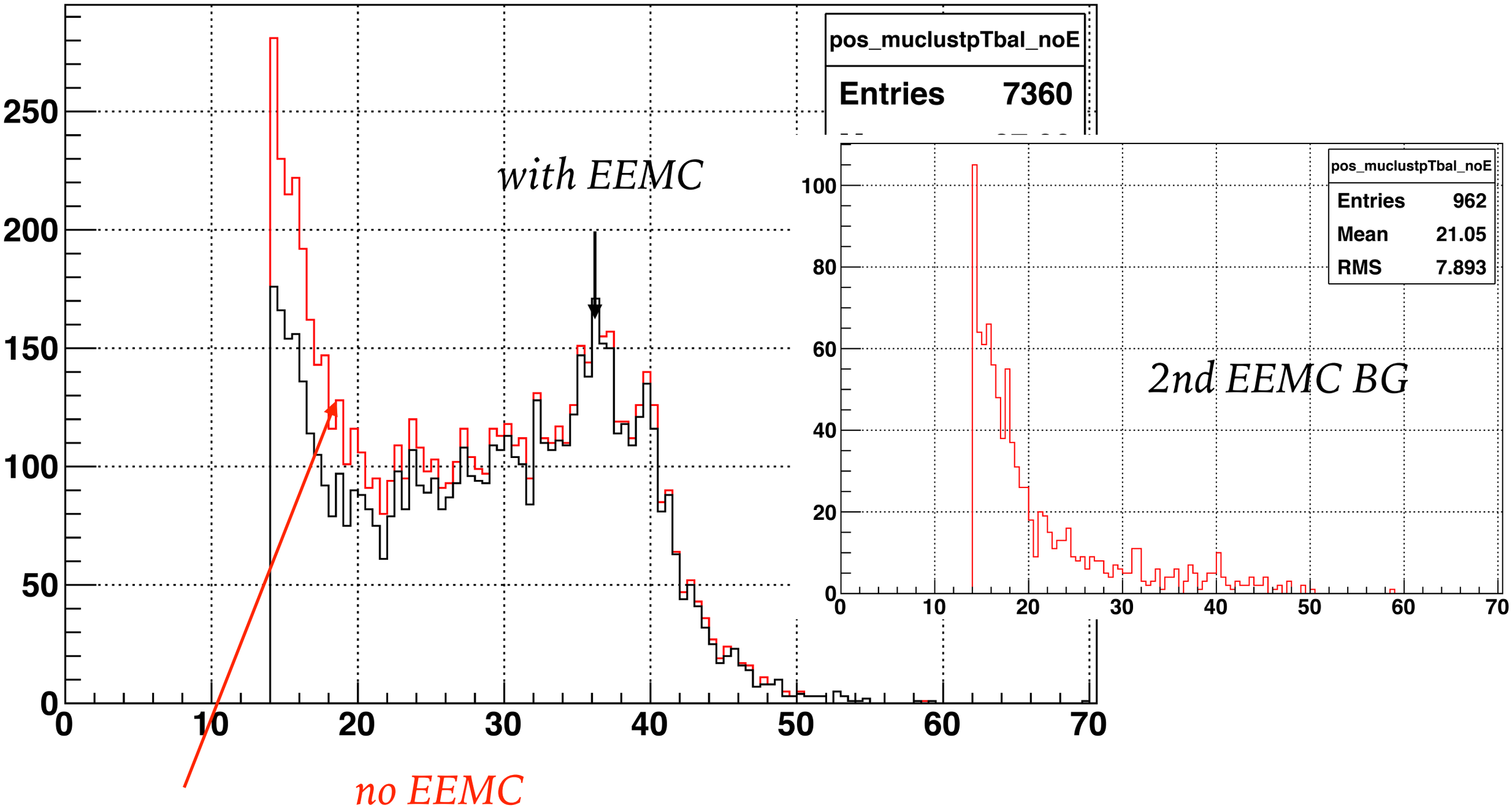
Second EEMC Background correction

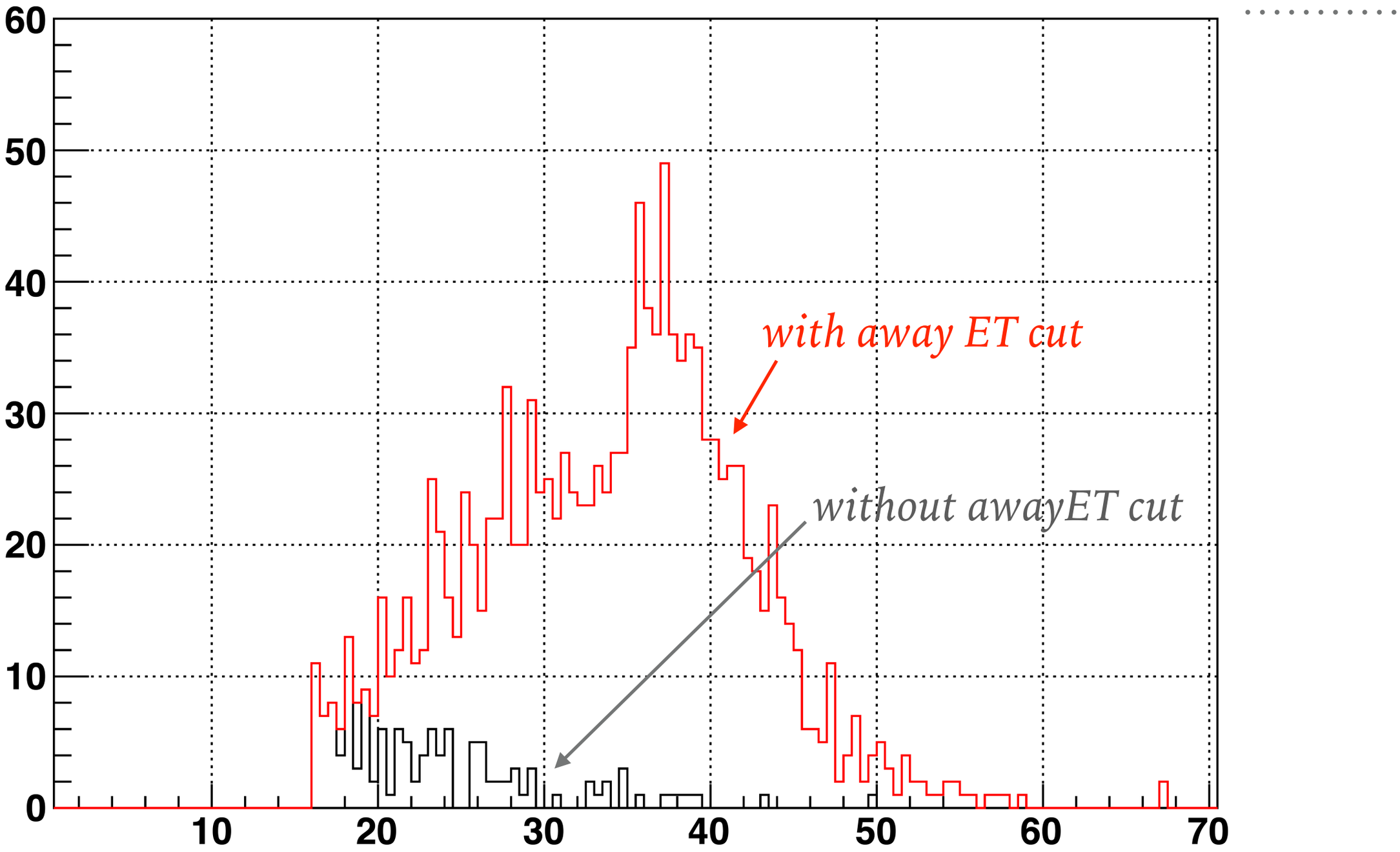
05/17/2018

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.

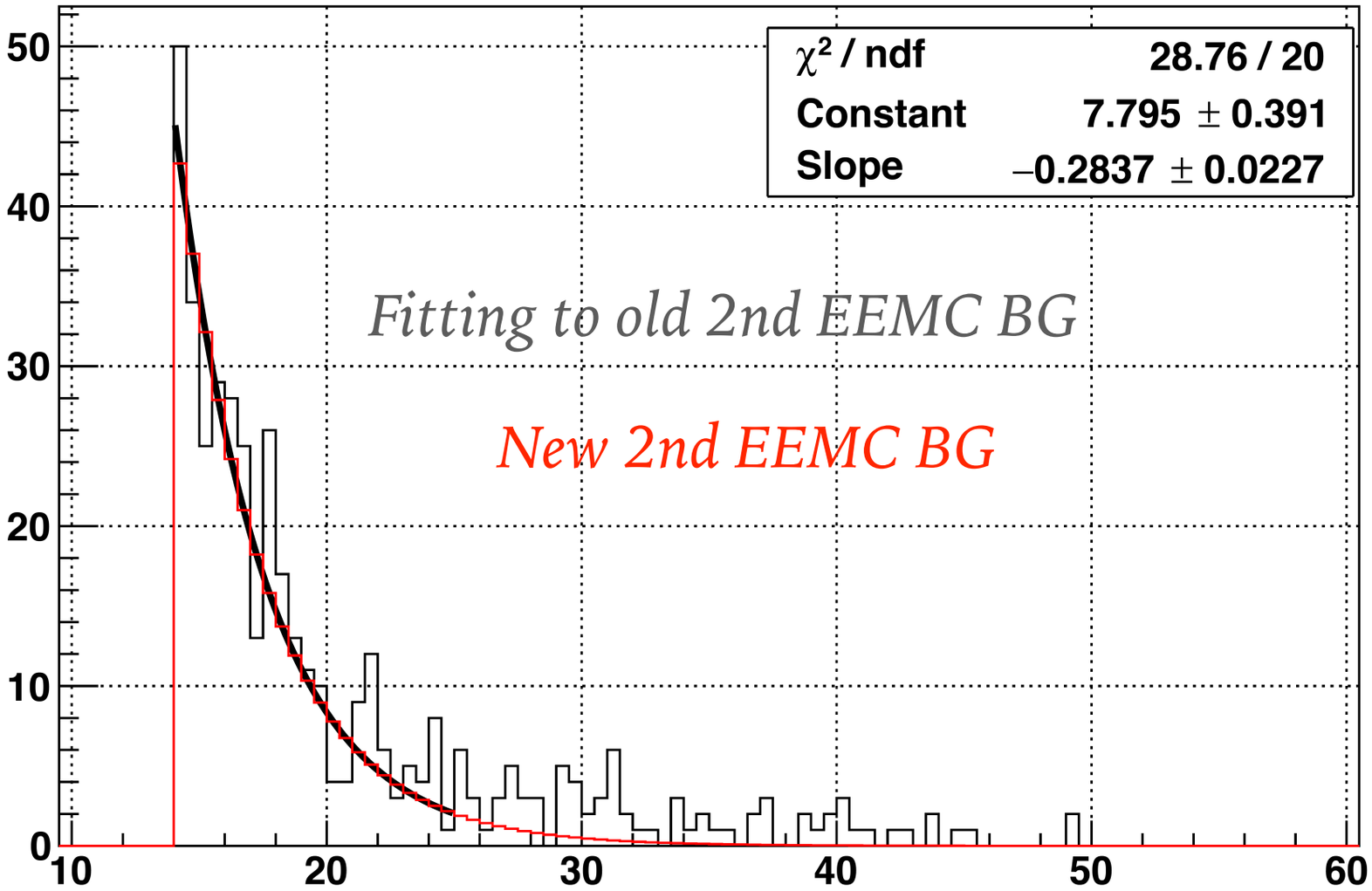
2ND EEMC : MC SECOND EEMC BG



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 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.



BETA AND BETA_ERR

How did we calculate Beta and Beta_Error so far ?

➤ Beta = 1 - f_Z - f_eemc - f_QCD

➤ hBeta = 1 - f_Z - f_eemc - f_QCD (i) , i =729

Beta = hBeta->GetMean()

Beta_Error = sqrt(Beta_stat^2 + hBeta->GetRMS())

Beta_stat = sqrt(f^{stat}_z*f^{stat}_z + f^{stat}_eemc*f^{stat}_eemc+f^{stat}_QCD*f^{stat}_QCD)

BETA AND BETA_ERR

$$f\_i = N\_i / N\_raw$$

$$f^{stat}\_z = f\_z*sqrt(zsig\_stat*zsig\_stat/zsig\_sum/zsig\_sum + 1./raw\_sum)$$

$$f^{stat}\_eemc = f\_eemc*sqrt(eemc\_stat*eemc\_stat/eemc\_sum/eemc\_sum + 1./raw\_sum)$$

$$f^{stat}\_QCD = f\_QCD*sqrt(QCD\_stat*QCD\_stat/QCD\_sum/QCD\_sum + 1./raw\_sum)$$

$$zsig\_stat = Z\_norm*sqrt(zsig\_sum/Z\_norm)$$

$$QCD\_stat = data\text{-}driven\_norm*sqrt(QCD\_sum/data\text{-}driven\text{-}norm);$$

$$eemc\_stat = feldmanCousins(eemc\_sum);$$

BETA AND BETA_ERR : NEW METHOD

nominal Beta

➤ Beta = 1 - f_Z - f_eemc$_{(nominal)}$ - f_QCD$_{(nominal)}$

➤ $\delta\beta$ = sqrt [δ(f_Z) ^ 2 + δ(f_eemc) ^ 2 + δ(f_QCD) ^ 2]

δ(f_Z) = f^{stat}_Z ^ 2 + f^{sys}_Z ^ 2 —-—(1)

δ(f_eemc) = f^{stat}_eemc ^ 2 + f^{sys}_eemc ^ 2————(2)

δ(f_QCD) = f^{stat}_QCD ^ 2 + f^{sys}_QCD ^ 2 ————(3)

➤ $\delta\beta$ = sqrt [β_stat ^ 2 + β_sys ^ 2]

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

f^{sys}_eemc = hf_eemc = f_eemc (i =1400) -> GetRMS();

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

PERIOD 1 – WITH CORRECTION

WN	backgr ound	summa ry:	yields	25<ET< 50	GeV								
starPhy sEtaBin	rawYiel d	qcdBkg d	second EEMC	zeeBkg d	wTauYi eld	totalBk gd	wYield	beta	+/ -	err	stat	syst	No correctio	No correctio
1	251	7.03	3	3.58	5.09	14.22	236.78	0.943	+/ -	0.01	0.01	0.003	0.866	0.02
2	269	10.43	8	8.23	6.14	27.38	241.62	0.898	+/ -	0.015	0.014	0.006	0.822	0.022
3	263	13.08	33	4.02	6.4	50.21	212.79	0.809	+/ -	0.028	0.024	0.014	0.851	0.02
4	315	11.54	2	3.11	5.44	17.3	297.7	0.945	+/ -	0.009	0.008	0.004	0.904	0.014
8	1110	34.52	26	17.78	23.07	79.3	1030.7	0.929	+/ -	0.008	0.005	0.006	0.871	0.009

WP	backgr ound	summa ry:	yields	25<ET< 50	GeV								
starPhy sEtaBin	rawYiel d	qcdBkg d	second EEMC	zeeBkg d	wTauYi eld	totalBk gd	wYield	beta	+/ -	err	stat	syst	
1	762	8.13	13	4.21	14.1	25.58	736.42	0.966	+/ -	0.017	0.005	0.017	0.905	0.01
2	1255	7.08	9	7.19	23.68	23.72	1231.28	0.981	+/ -	0.006	0.003	0.005	0.945	0.006
3	1286	12.07	6	7.65	22.62	26.2	1259.8	0.98	+/ -	0.008	0.003	0.008	0.943	0.006
4	764	20.51	22	3.77	14.99	46.47	717.53	0.939	+/ -	0.009	0.007	0.006	0.934	0.007
8	4077	41.58	63	23.68	75.4	128.53	3948.47	0.968	+/ -	0.004	0.002	0.004	0.936	0.004

PERIOD 1 – NO CORRECTION

WN background summary: yields 25<ET<50 GeV

starPhysEta Bin	rawYield	qcdBkgd	secondEEM C	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/- err	+/-syst
1	258	6.94	24	3.68	5.23	34.81	223.19	0.866 +/- 0.020	0.002
2	270	11.21	29	8.46	6.31	49.13	220.87	0.822 +/- 0.022	0.005
3	259	13.15	22	4.13	6.58	39.33	219.67	0.851 +/- 0.020	0.005
4	315	8.93	18	3.2	5.59	30.49	284.51	0.904 +/- 0.014	0.002
8	1113	34.75	92	18.28	23.72	145.03	967.97	0.871 +/- 0.009	0.003

WP background summary: yields 25<ET<50 GeV

starPhysEta Bin	rawYield	qcdBkgd	secondEEM C	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/- err	+/-syst
1	781	8.12	61	4.33	14.5	73.83	707.17	0.905 +/- 0.010	0.001
2	1246	8.69	53	7.39	24.35	69.28	1176.72	0.945 +/- 0.006	0.001
3	1282	12.73	52	7.87	23.25	73.1	1208.9	0.943 +/- 0.006	0.001
4	775	17.09	30	3.87	15.41	51.2	723.8	0.934 +/- 0.007	0.003
8	4094	41.55	197	24.35	77.51	262.9	3831.1	0.936 +/- 0.004	0.001

PERIOD 2 – WITH CORRECTION

WN starPhysEtaBi	backgr ound rawYield	summary: qcdBkgd	yields second EEMC	25<ET<50 GeV zeeBkgd	wTauYield	totalBkgd	wYield	beta	+/-	err	stat	syst	No correctio	No correctio
1	236	9.06	7	4.37	3.92	20.89	215.11	0.911	+/-	0.02	0.015	0.014	0.856	0.021
2	199	7.17	4	7.02	5.69	18.59	180.41	0.907	+/-	0.019	0.015	0.012	0.823	0.026
3	221	8.3	10	6.9	6.97	25.53	195.47	0.884	+/-	0.017	0.016	0.008	0.819	0.025
4	263	6.46	11	5.22	4.4	22.72	240.28	0.914	+/-	0.02	0.013	0.014	0.915	0.014
8	925	27.31	25	23.22	20.98	76.35	848.65	0.917	+/-	0.02	0.006	0.019	0.857	0.011

WP starPhysEtaBi	backgr ound rawYield	summary: qcdBkgd	yields second EEMC	25<ET<50 GeV zeeBkgd	wTauYield	totalBkgd	wYield	beta	+/-	err	stat	syst		
1	618	12.62	11	5.75	11.11	29.58	588.42	0.952	+/-	0.029	0.006	0.028	0.893	0.012
2	903	9.37	10	5.42	19.13	25.09	877.91	0.972	+/-	0.004	0.004	0.002	0.93	0.008
3	1054	9.73	5	5.5	23.59	21.12	1032.88	0.98	+/-	0.02	0.003	0.02	0.948	0.006
4	709	10.13	20	5.12	15	35.77	673.23	0.95	+/-	0.008	0.007	0.005	0.919	0.01
8	3287	37.01	54	21.44	68.99	113.24	3173.76	0.966	+/-	0.005	0.002	0.004	0.928	0.004

PERIOD 2 – NO CORRECTION

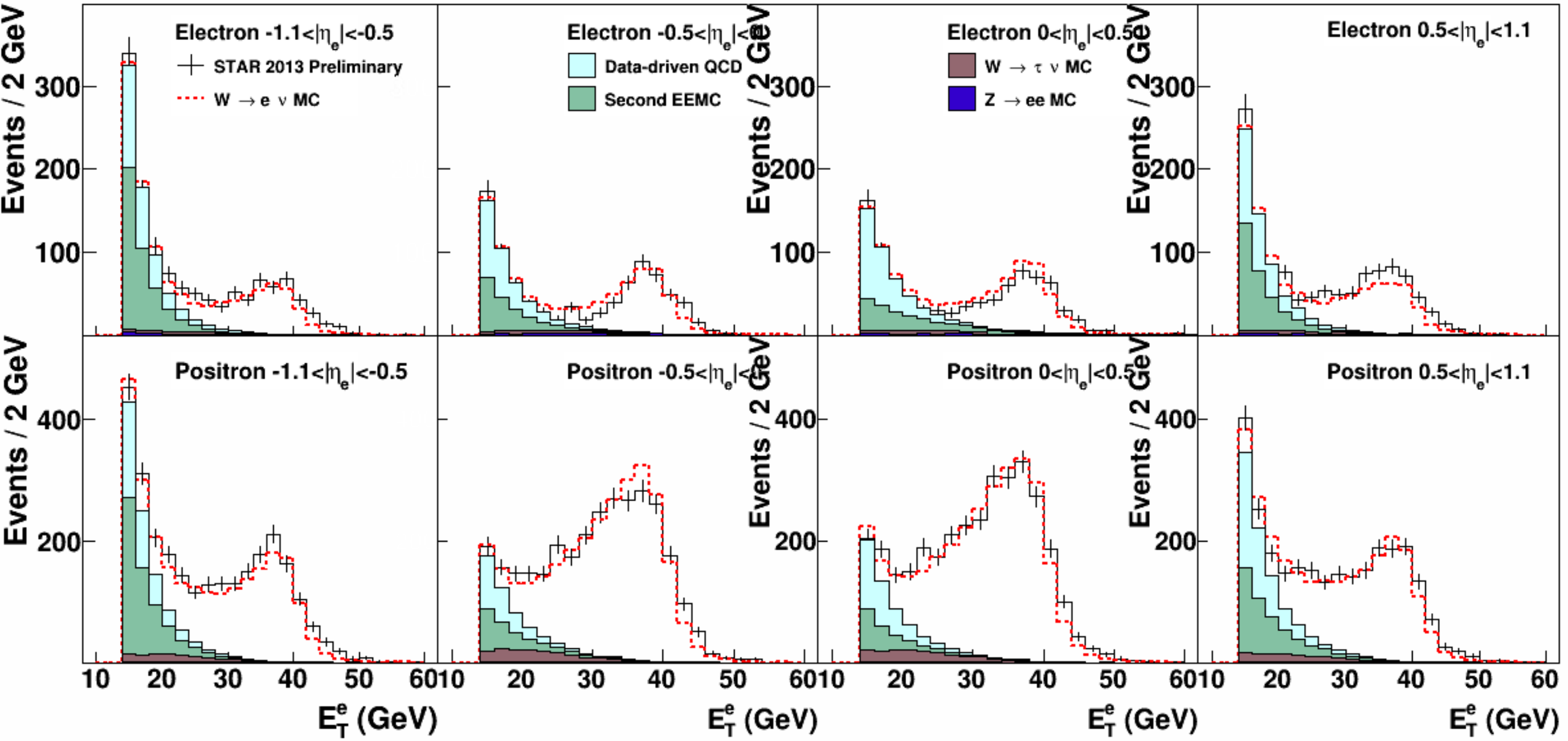
WN background summary: yields 25<ET<50 GeV

starPhysEta Bin	rawYield	qcdBkgd	secondEEM C	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/- err	+/-syst
1	228	7.63	21	4.32	3.88	32.95	195.05	0.856 +/- 0.021	0.003
2	190	5.85	20	6.94	5.63	33.5	156.5	0.823 +/- 0.026	0.004
3	211	6.75	24	6.83	6.89	37.99	173.01	0.819 +/- 0.025	0.005
4	257	4.8	11	5.17	4.36	21.96	235.04	0.915 +/- 0.014	0.005
8	891	22.67	82	22.98	20.76	127.64	763.36	0.857 +/- 0.011	0.003

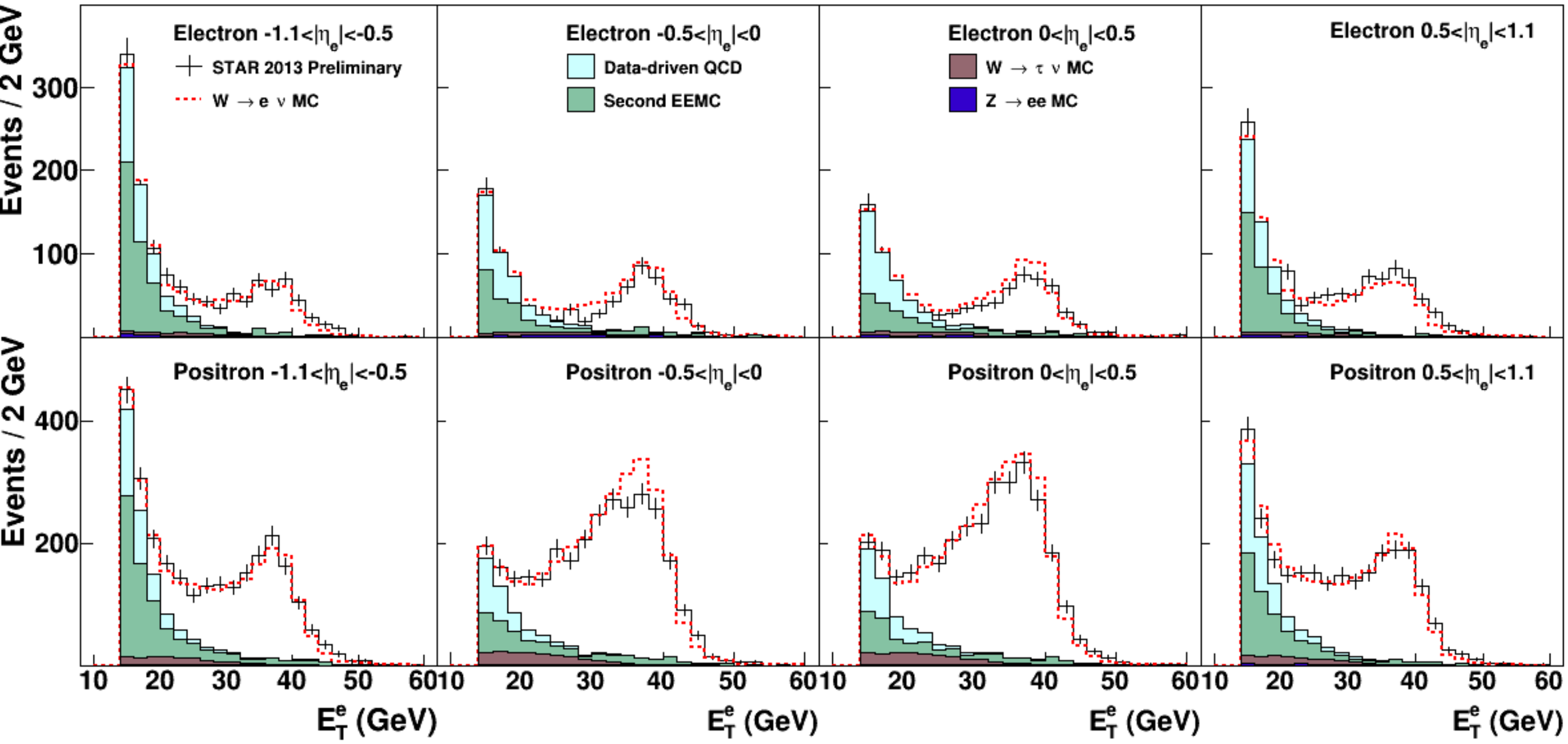
WP background summary: yields 25<ET<50 GeV

starPhysEta Bin	rawYield	qcdBkgd	secondEEM C	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/- err	+/-syst
1	604	10.39	49	5.69	10.99	65.64	538.36	0.893 +/- 0.012	0.002
2	883	8.24	47	5.36	18.93	61.3	821.7	0.930 +/- 0.008	0.001
3	1031	7.63	39	5.45	23.34	53.03	977.97	0.948 +/- 0.006	0.001
4	686	6.4	44	5.07	14.84	55.86	630.14	0.919 +/- 0.010	0.001
8	3207	29.77	181	21.22	68.26	231.99	2975.01	0.928 +/- 0.004	0.001

FITT CORRECTION



NO CORRECTION



AL

No Correction

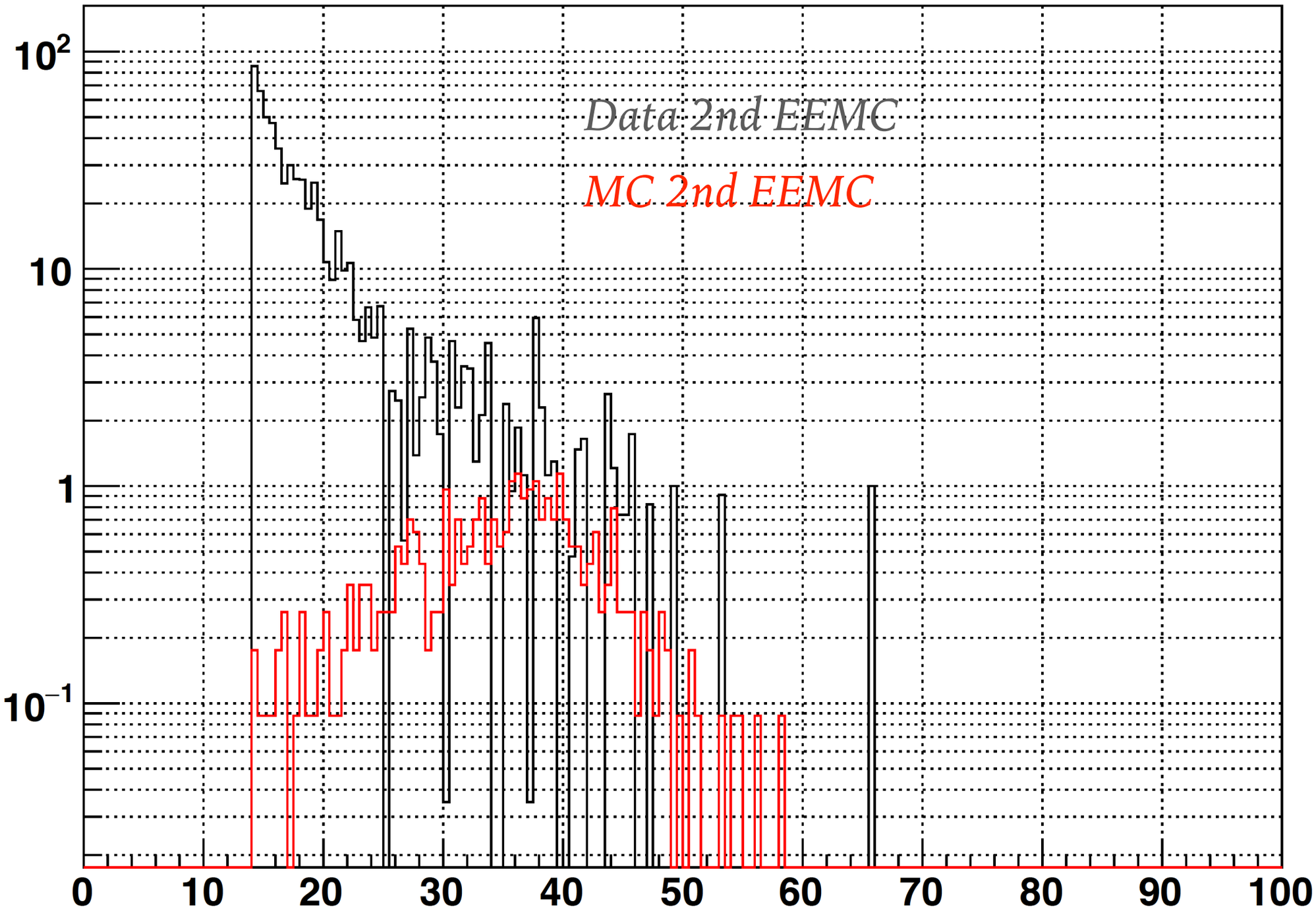
==== W P====
Etabin1, AL+/-Err: -0.267+/-0.036
Etabin2, AL+/-Err: -0.336+/-0.028
Etabin3, AL+/-Err: -0.420+/-0.027
Etabin4, AL+/-Err: -0.583+/-0.035
==== W N====
Etabin1, AL+/-Err: 0.260+/-0.062
Etabin2, AL+/-Err: 0.302+/-0.069
Etabin3, AL+/-Err: 0.255+/-0.069
Etabin4, AL+/-Err: 0.387+/-0.061

Fit correction

==== W P====
Etabin1, AL+/-Err: -0.256+/-0.035
Etabin2, AL+/-Err: -0.325+/-0.027
Etabin3, AL+/-Err: -0.406+/-0.027
Etabin4, AL+/-Err: -0.557+/-0.034
==== W N====
Etabin1, AL+/-Err: 0.248+/-0.058
Etabin2, AL+/-Err: 0.295+/-0.066
Etabin3, AL+/-Err: 0.251+/-0.066
Etabin4, AL+/-Err: 0.370+/-0.058

MC METHOD

- Subtract MC 2nd EEMC BG from data 2nd EEMC BG.



MC METHOD

Nominal method

Period 1

WN background summary: yields 25<ET<50 GeV

starPhysEt	rawYield	qcdBkgd	secondEE	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/-	err
1	251	6.69	25	3.58	5.09	35.38	215.62	0.859 +/-	0.021
2	269	9.6	33	8.23	6.14	51.08	217.92	0.812 +/-	0.023
3	263	12.31	20	4.02	6.4	37.33	225.67	0.859 +/-	0.018
4	315	11.02	21	3.11	5.44	35.74	279.26	0.888 +/-	0.015
8	1110	34.48	98	17.78	23.07	150.27	959.73	0.865 +/-	0.009

WP background summary: yields 25<ET<50 GeV

starPhysEt	rawYield	qcdBkgd	secondEE	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/-	err
1	762	7.34	73	4.21	14.1	85.02	676.98	0.888 +/-	0.012
2	1255	6.9	51	7.19	23.68	65.39	1189.61	0.948 +/-	0.006
3	1286	10.69	49	7.65	22.62	67.69	1218.31	0.947 +/-	0.006
4	764	18.99	29	3.77	14.99	51.92	712.08	0.933 +/-	0.007
8	4077	39.53	204	23.68	75.4	267.21	3809.79	0.934 +/-	0.004

MC method

WN background summary: yields 25<ET<50 GeV

starPhysEtaBi	rawYield	qcdBkgd	secondEEMC	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/- err
1	251	6.75	15	3.58	5.09	25.41	225.59	0.898 +/-
2	269	9.6	27	8.23	6.14	45.66	223.34	0.832 +/-
3	263	12.31	16	4.02	6.4	32.63	230.37	0.877 +/-
4	315	11.02	16	3.11	5.44	30.53	284.47	0.904 +/-
8	1110	34.58	72	17.78	23.07	124.57	985.43	0.888 +/-

WP background summary: yields 25<ET<50 GeV

starPhysEtaBi	rawYield	qcdBkgd	secondEEMC	zeeBkgd	wTauYield	totalBkgd	wYield	beta +/- err
1	762	7.74	49	4.21	14.1	61.41	700.59	0.919 +/-
2	1255	6.95	19	7.19	23.68	33.33	1221.67	0.973 +/-
3	1286	10.76	20	7.65	22.62	38.8	1247.2	0.969 +/-
4	764	19.11	10	3.77	14.99	33.55	730.45	0.957 +/-
8	4077	40.3	99	23.68	75.4	163.14	3913.86	0.960 +/-

AL

Nominal

==== 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

MC method

==== W P====
Etabin1, AL+/-Err: -0.259+/-0.035
Etabin2, AL+/-Err: -0.327+/-0.027
Etabin3, AL+/-Err: -0.409+/-0.027
Etabin4, AL+/-Err: -0.566+/-0.034
==== W N====
Etabin1, AL+/-Err: 0.254+/-0.060
Etabin2, AL+/-Err: 0.295+/-0.067
Etabin3, AL+/-Err: 0.248+/-0.067
Etabin4, AL+/-Err: 0.378+/-0.060

AL : FITT CORRECTION VS MC CORRECTION

Fit correction

==== W P====

Etabin1, AL+/-Err: -0.256+/-0.035
Etabin2, AL+/-Err: -0.325+/-0.027
Etabin3, AL+/-Err: -0.406+/-0.027
Etabin4, AL+/-Err: -0.557+/-0.034

==== W N====

Etabin1, AL+/-Err: 0.248+/-0.058
Etabin2, AL+/-Err: 0.295+/-0.066
Etabin3, AL+/-Err: 0.251+/-0.066
Etabin4, AL+/-Err: 0.370+/-0.058

MC method

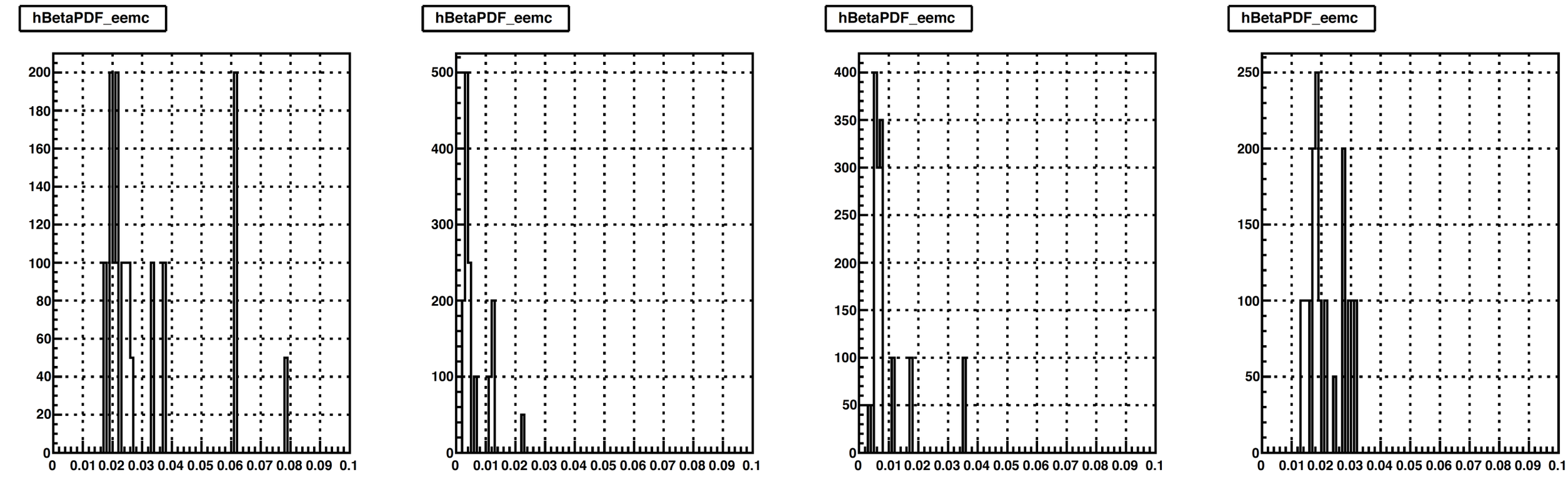
==== W P====

Etabin1, AL+/-Err: -0.259+/-0.035
Etabin2, AL+/-Err: -0.327+/-0.027
Etabin3, AL+/-Err: -0.409+/-0.027
Etabin4, AL+/-Err: -0.566+/-0.034

==== W N====

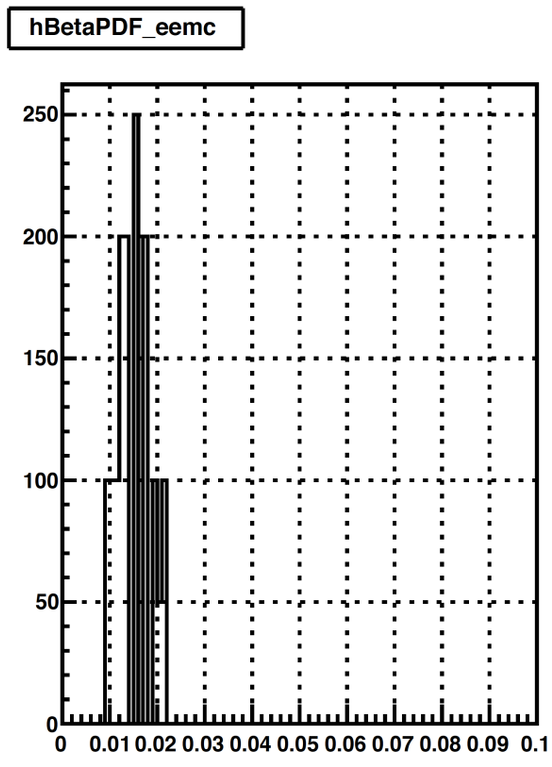
Etabin1, AL+/-Err: 0.254+/-0.060
Etabin2, AL+/-Err: 0.295+/-0.067
Etabin3, AL+/-Err: 0.248+/-0.067
Etabin4, AL+/-Err: 0.378+/-0.060

BACK UP – F_EEMC(I); I = 1400

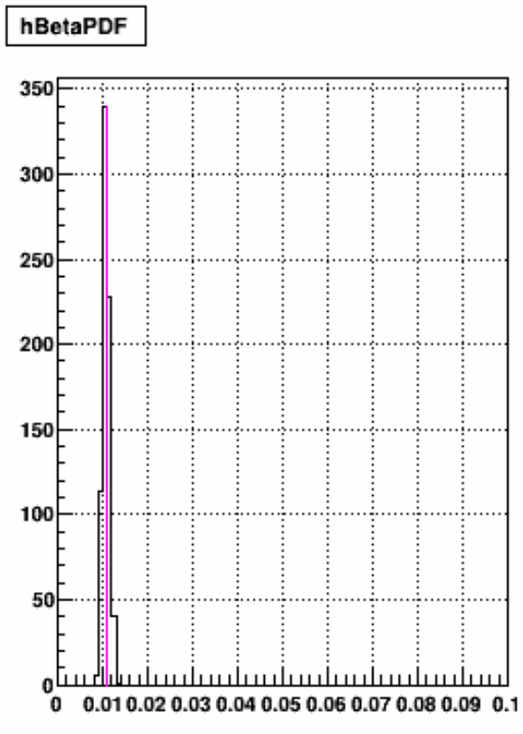


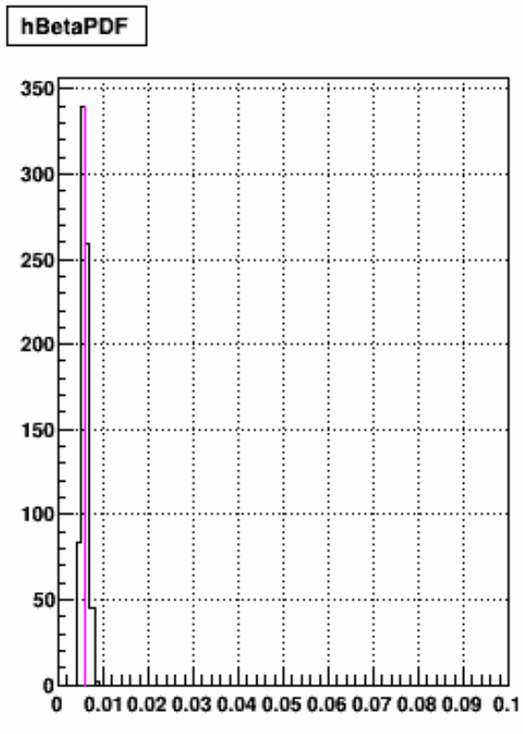
*Fit window = 14,18+i*0.005*

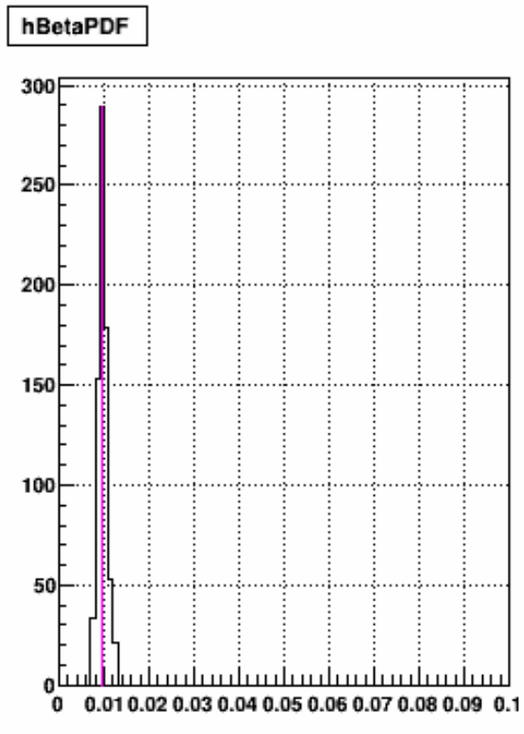
Nominal = 14,25

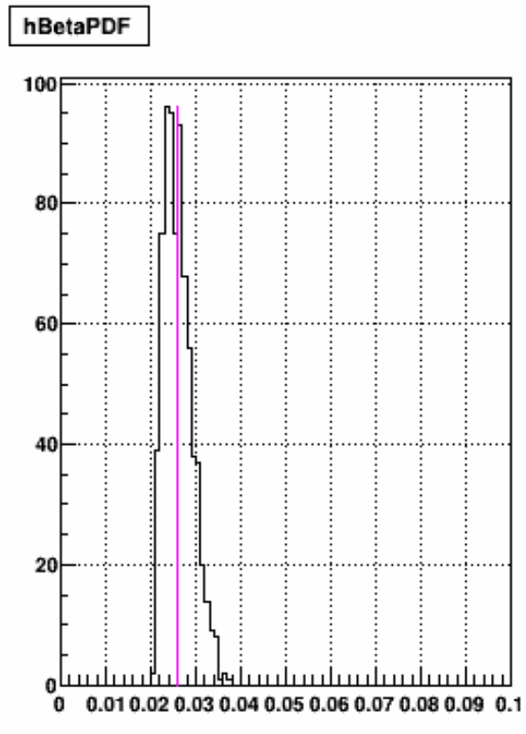


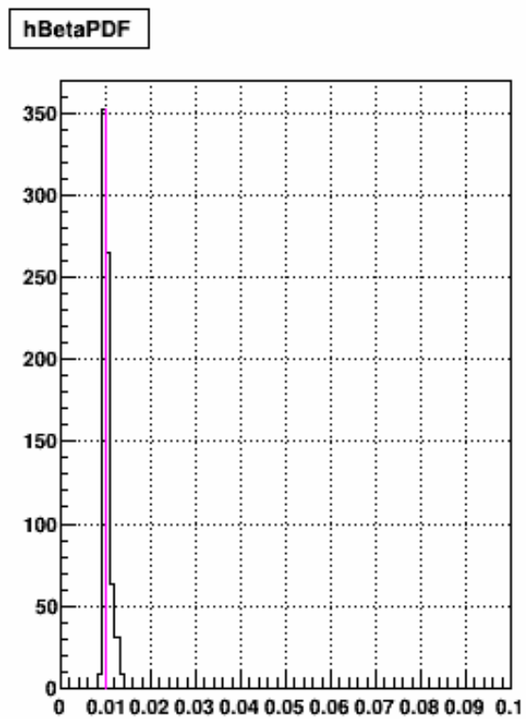
BACK UP – F_QCD(I); I = 729











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