



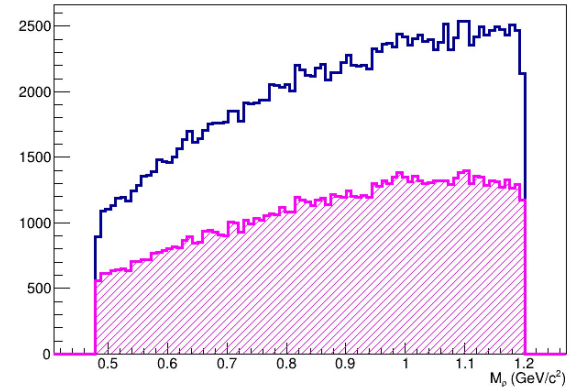
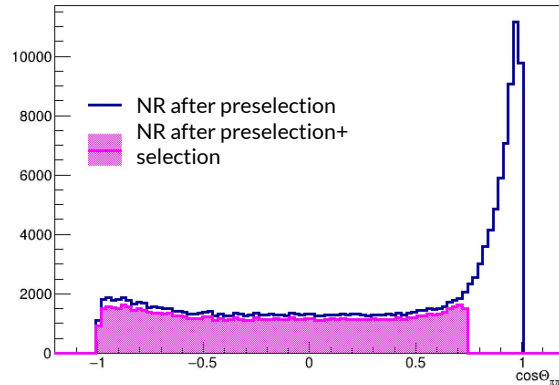
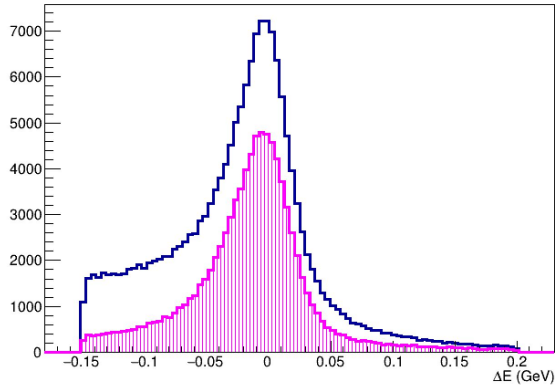
Toward $\mathcal{B}(B \rightarrow D^0 \rho)$

TS analysis meeting
july 2022

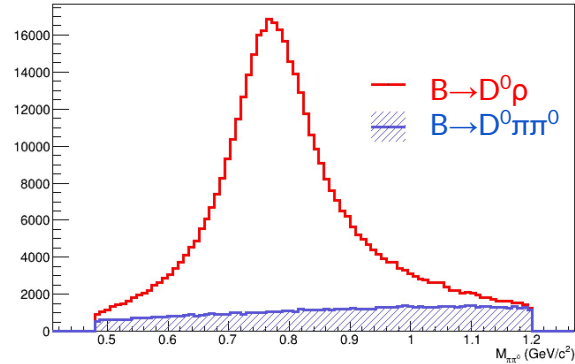
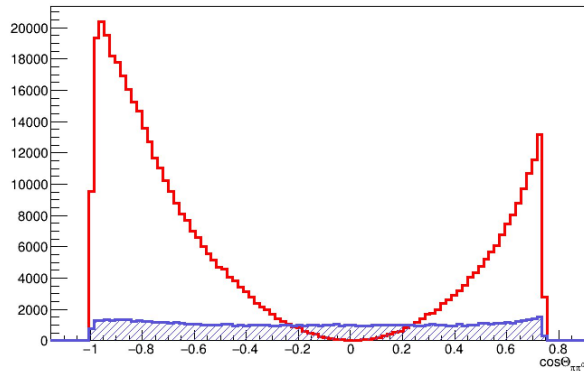
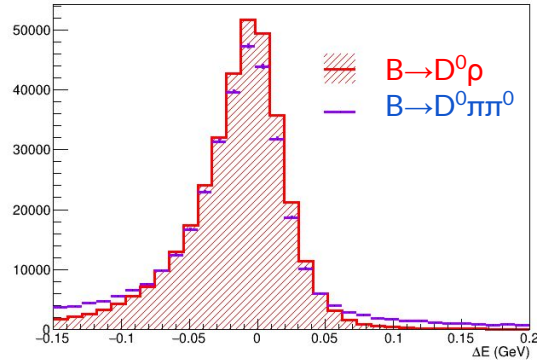
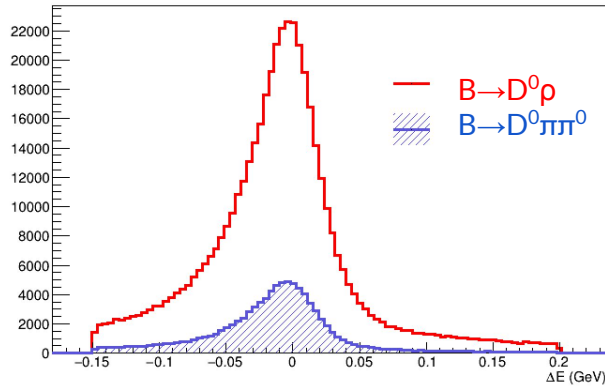
Mirco Dorigo
Riccardo Manfredi
Olga Werbycka

Efficiency for non-resonant decay $B \rightarrow D^0 \pi \pi^0$

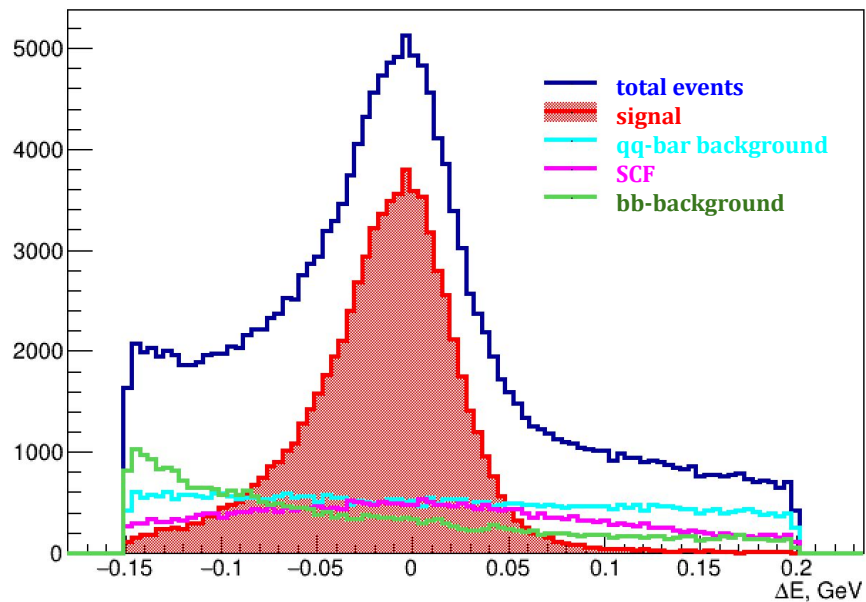
	After preselection	After preselection + selection
NR eff (ϵ)	$\sim 8.4\%$	$\sim 4.5\%$



Comparison of resonant and NR signal MC

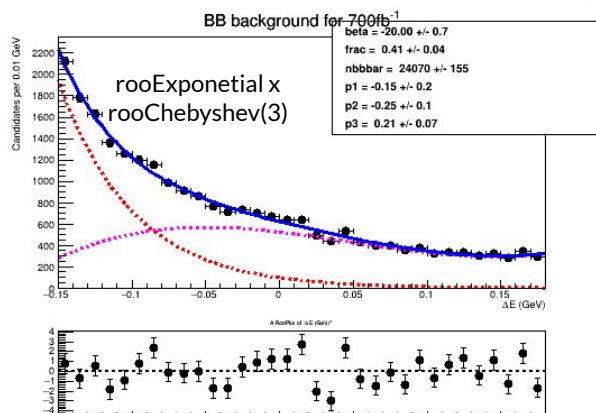
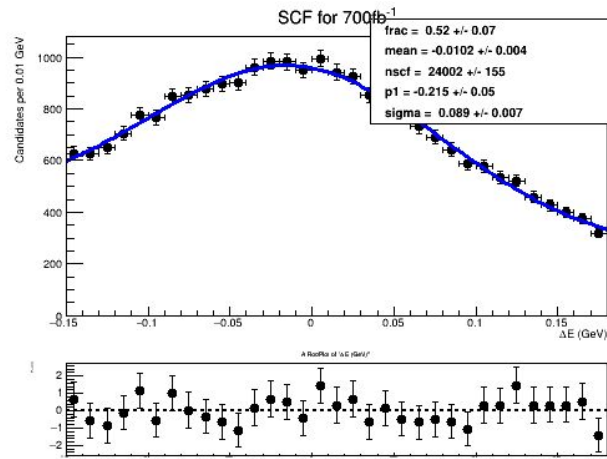
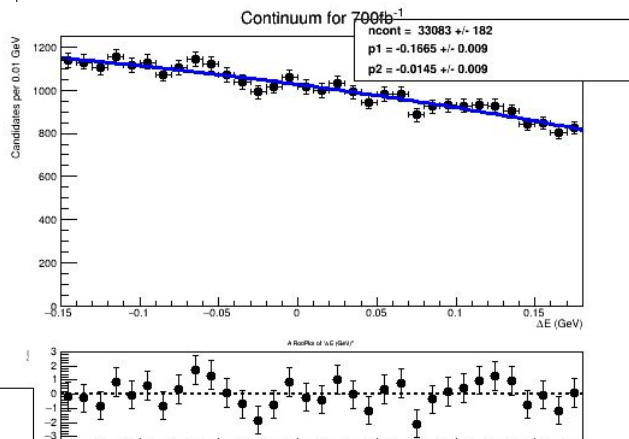
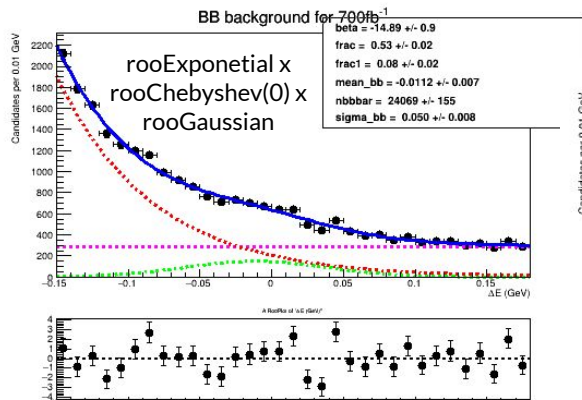


ΔE fit for MC14_{ri} 700 fb⁻¹



Composition	N events	Fraction
Signal	69223	0.46
Continuum	33083	0.22
SCF	24003	0.16
BB-bar bkg	24070	0.16

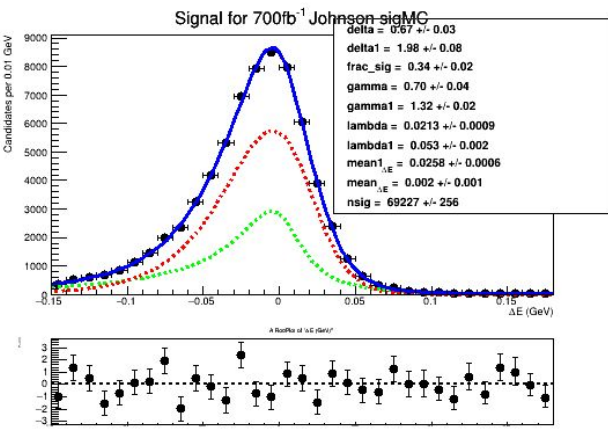
Fits for SCF, BBbar and Continuum of ΔE (700 fb^{-1})



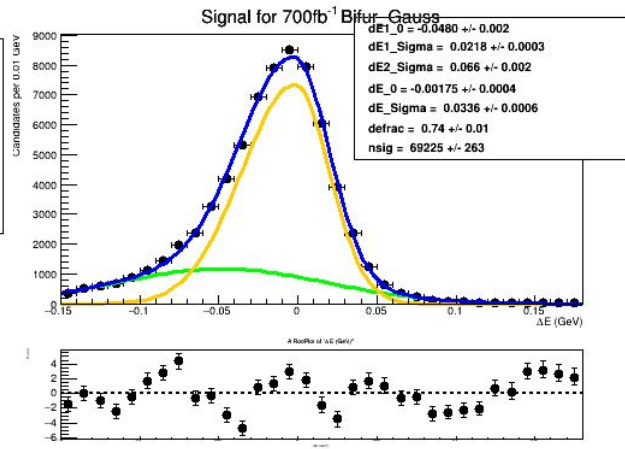
rooChebyshev (2)

rooChebyshev(0) x
rooGaussian

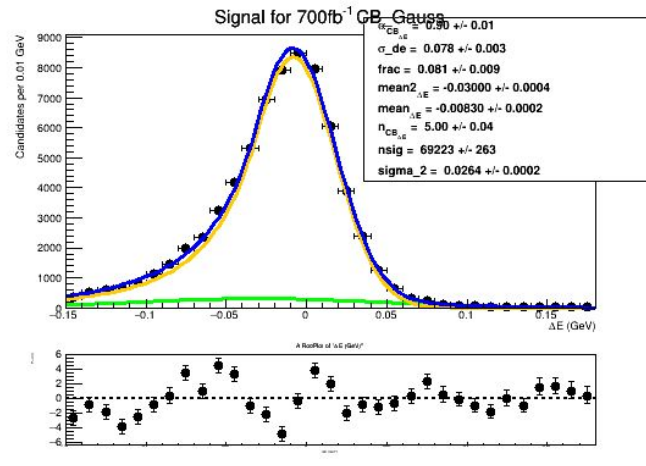
Fits for signal ΔE (MC14_{ri} 700 fb⁻¹)



rooJohnson x
rooJohnson

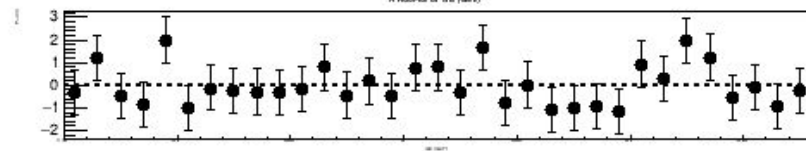
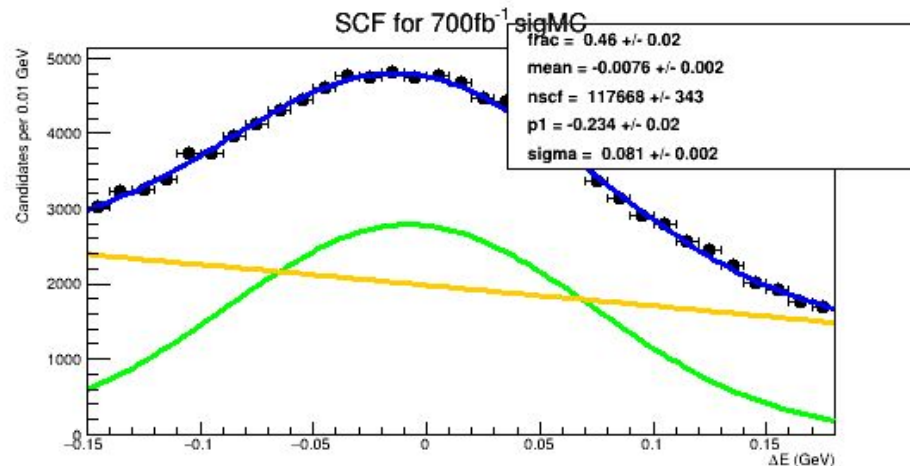
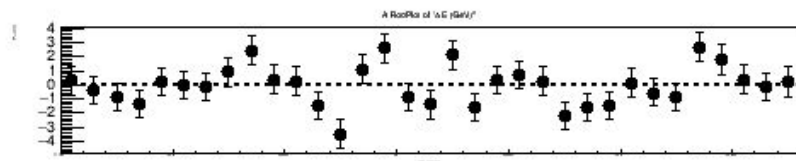
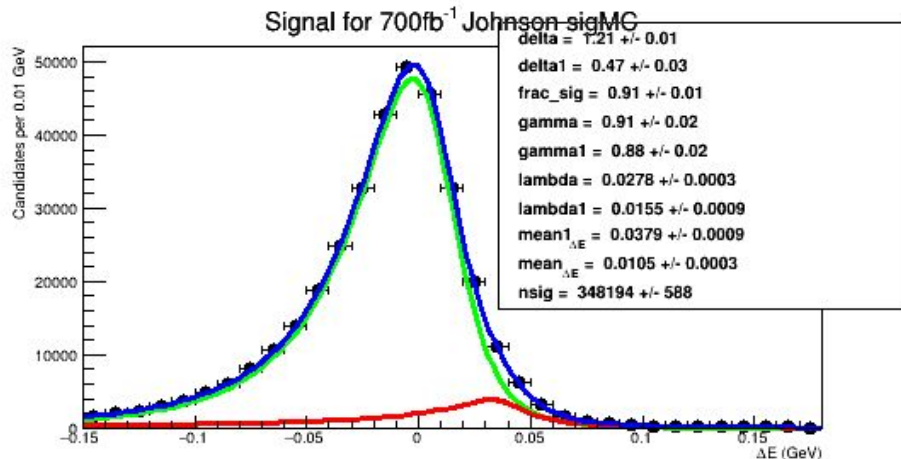


rooBifurGauss x
rooGaussian



rooCBShape x
rooGaussian

Fit parameters of signal MC for $B \rightarrow D^0 \rho$



New BBbar parametrization Signal PDF fixed from GMC

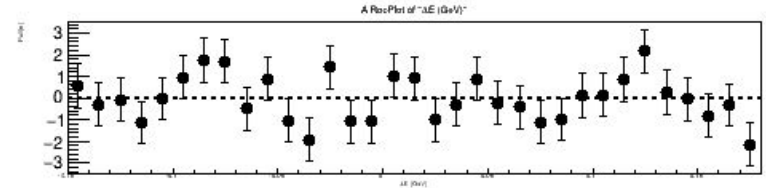
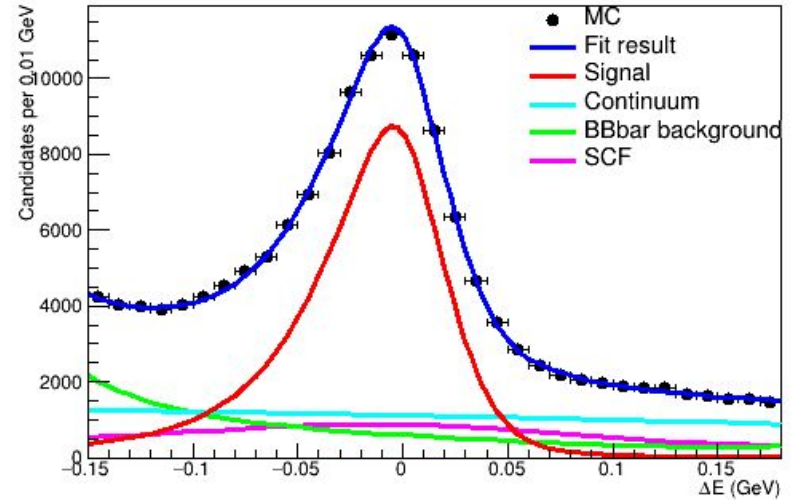
```

FCN=-1.83765e+06 FROM HESSE STATUS=OK 23 CALLS 159 TOTAL
EDM=0.00066996 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT PARAMETER INTERNAL INTERNAL
NO. NAME VALUE ERROR STEP SIZE VALUE
1 nbbbar 2.35989e+04 5.88740e+02 7.87054e-04 -9.35405e-02
2 ncont 3.42478e+04 1.98056e+03 6.37768e-04 2.14022e-01
3 nscf 2.34525e+04 2.29988e+03 7.09610e-04 -3.33525e-01
4 nsig 6.90840e+04 5.67152e+02 3.56222e-04 4.97351e-01

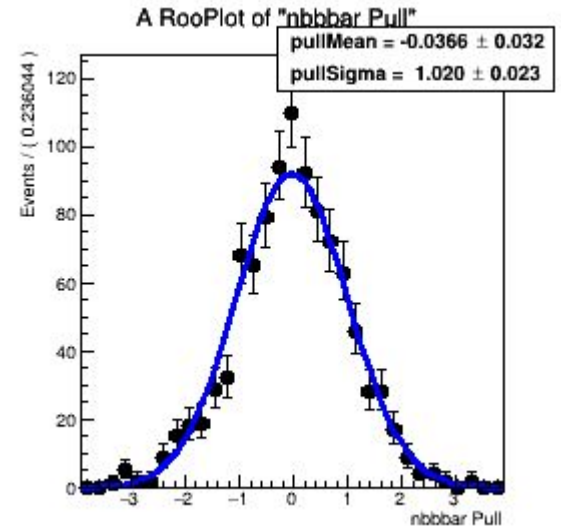
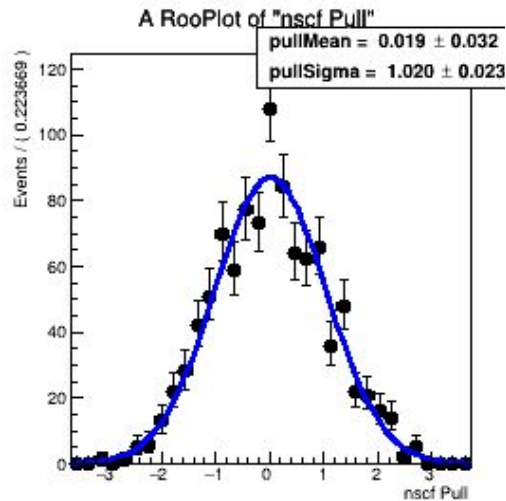
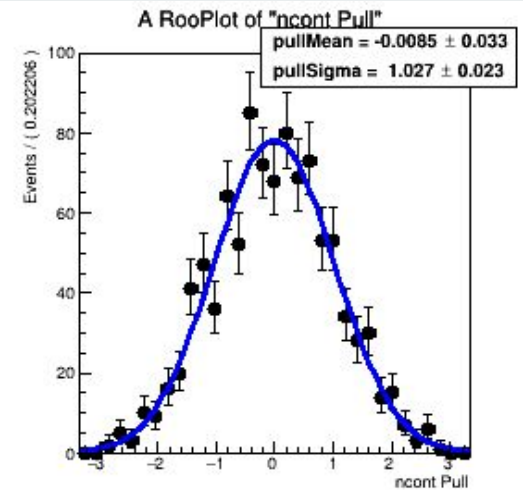
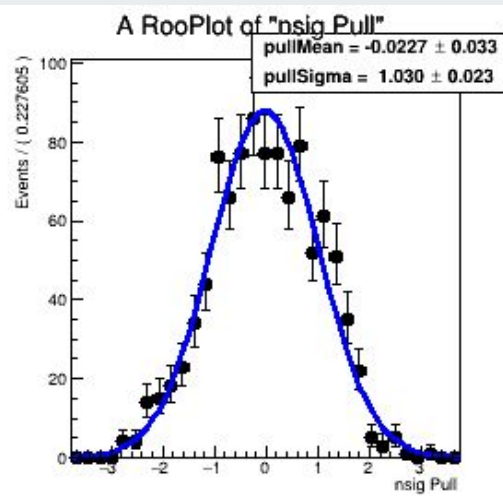
ERR DEF= 0.5
EXTERNAL ERROR MATRIX. NDIM= 25 NPAR= 4 ERR DEF=0.5
3.468e+05 -2.938e+05 -5.070e+03 -2.435e+04
-2.938e+05 3.936e+06 -4.334e+06 7.259e+05
-5.070e+03 -4.334e+06 5.316e+06 -9.540e+05
-2.435e+04 7.259e+05 -9.540e+05 3.217e+05
PARAMETER CORRELATION COEFFICIENTS
NO. GLOBAL 1 2 3 4
1 0.84609 1.000 -0.251 -0.004 -0.073
2 0.98582 -0.251 1.000 -0.947 0.645
3 0.98786 -0.004 -0.947 1.000 -0.730
4 0.80766 -0.073 0.645 -0.730 1.000
    
```

Fit for 700fb⁻¹ 2Johnson fixed_binned



Composition	Nevents	Fraction after fit	σ
Signal	69223	69084 ± 567	-0.2
Continuum	33083	34247 ± 1981	0.6
SCF	24003	23453 ± 2300	-0.2
BB-bar bkg	24070	23599 ± 589	-0.8

TOY MC result



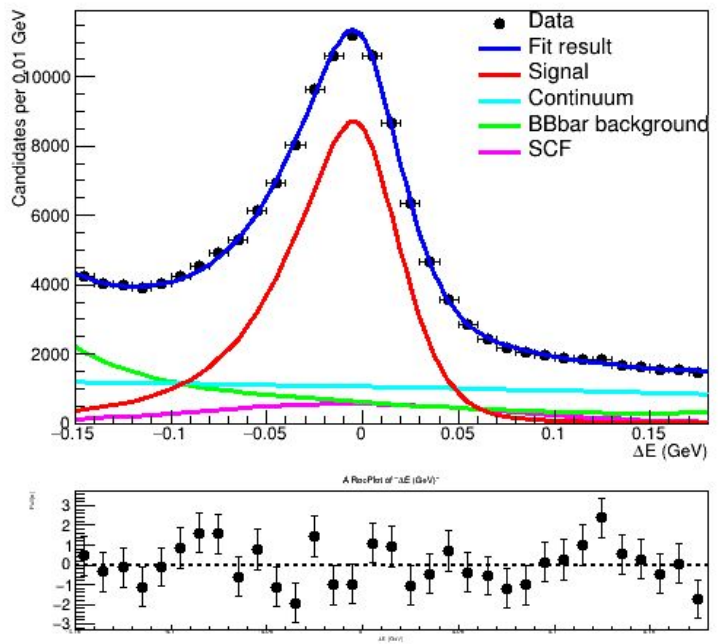
$$N_{scf} + b\bar{b} = f \cdot PDF_{scf} + (1 - f) \cdot PDF_{b\bar{b}} \quad f = \frac{N_{SCF}}{N_{b\bar{b}} + N_{SCF}}$$

```

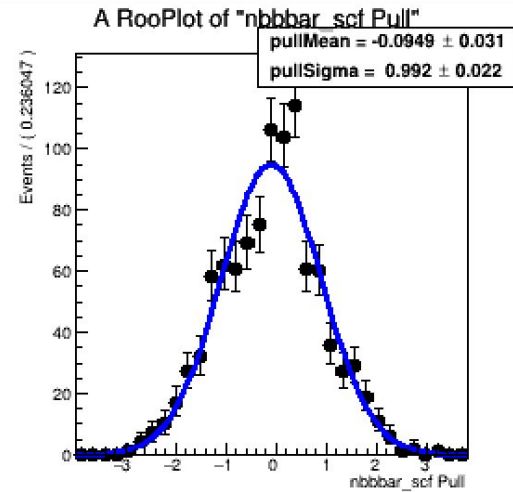
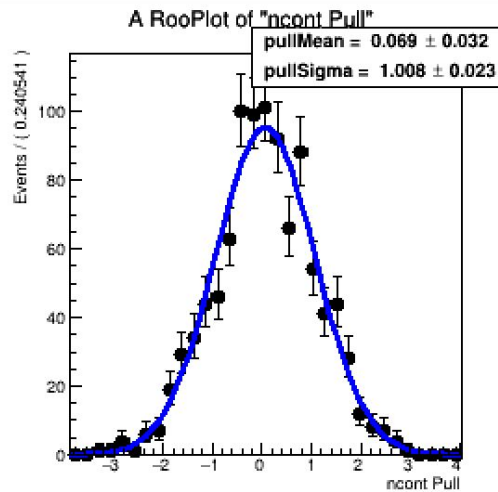
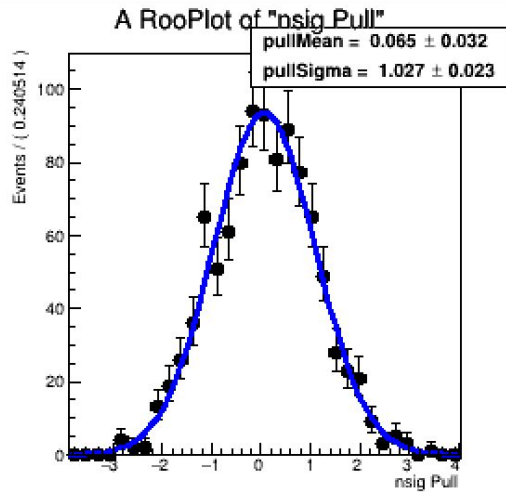
FCN=-1.83767e+06 FROM HESSE STATUS=OK 16 CALLS 93 TOTAL
EDM=5.10093e-05 STRATEGY= 1 ERROR MATRIX ACCURATE
EXT PARAMETER INTERNAL INTERNAL
NO. NAME VALUE ERROR STEP SIZE VALUE
1 nbbar_scf 4.71701e+04 1.13669e+03 5.07974e-04 3.59322e-01
2 ncont 3.41289e+04 1.02579e+03 7.69649e-04 3.88494e-01
3 nsig 6.90825e+04 4.11304e+02 4.93490e-04 7.58828e-01
ERR DEF= 0.5
EXTERNAL ERROR MATRIX. NDIM= 25 NPAR= 3 ERR DEF=0.5
1.293e+06 -1.083e+06 -1.632e+05
-1.083e+06 1.054e+06 6.312e+04
-1.632e+05 6.312e+04 1.692e+05
PARAMETER CORRELATION COEFFICIENTS
NO. GLOBAL 1 2 3
1 0.95159 1.000 -0.928 -0.349
2 0.94596 -0.928 1.000 0.150
3 0.58216 -0.349 0.150 1.000
    
```

Composition	Nevents	Fraction after fit	σ
Signal	69223	69083 ± 411	-0.4
Continuum	33083	34129 ± 1026	0.5
SCF_BB-bar bkg	48073	47170 ± 1137	-0.8

Fit for 700fb⁻¹ 2Johnson fixed Nscf+Nbbbar



TOY MC result



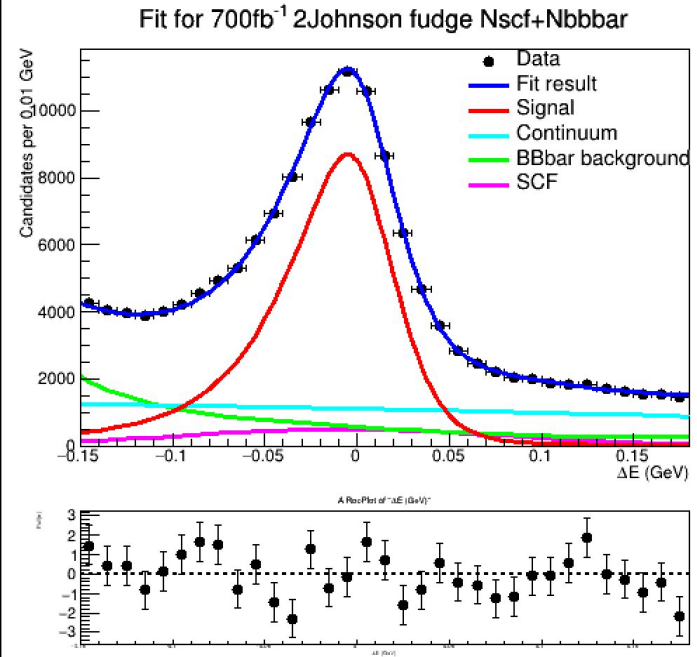
Sig PDF (Johnson + Johnson)	cont PDF (Chebyshev)	SCF PDF (Gauss+Cheb)	BBbar PDF (Exp + Cheb(3))
Sig Yield	Cont Yield	SCF Yield +	BB Yield
gamma	Cheb1	mean_scf	beta
delta	Cheb2	sigma_scf x fudge	fraction1
lambda x fudge		Cheb(0)	Cheb1
frac_sig		frac_scf	Cheb2
mean_sig			Cheb3
gamma1			
delta1			
lambda1			
mean_sig2			

```

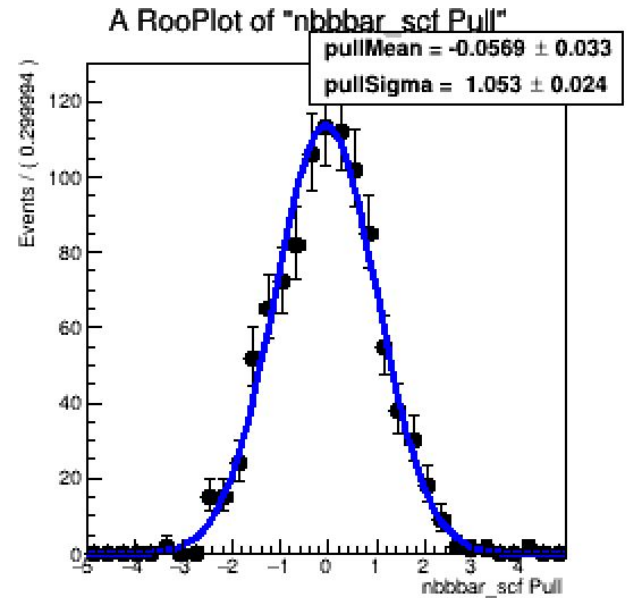
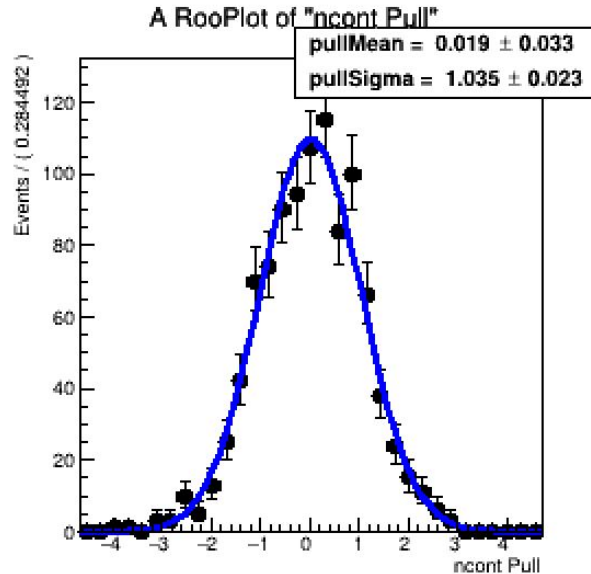
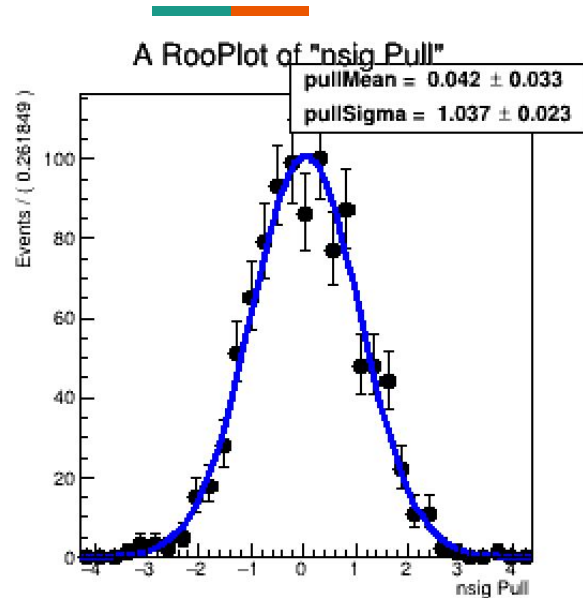
COVARIANCE MATRIX CALCULATED SUCCESSFULLY
FCN=-1.83767e+06 FROM HESSE      STATUS=OK          25 CALLS      140 TOTAL
EDM=0.00020167      STRATEGY= 1      ERROR MATRIX ACCURATE
EXT PARAMETER
NO.   NAME      VALUE      ERROR      INTERNAL  INTERNAL
      NAME      VALUE      ERROR      STEP SIZE VALUE
  1  fudge      1.01331e+00  4.85758e-02  2.41580e-04 -9.22871e-01
  2  nbdbar_scf  4.70140e+04  1.28670e+03  5.06797e-04  3.53267e-01
  3  ncont      3.40566e+04  1.05179e+03  7.68070e-04  3.84030e-01
  4  nsig       6.93087e+04  9.22963e+02  4.97599e-04  7.67772e-01
ERR DEF= 0.5
EXTERNAL ERROR MATRIX.      NDIM= 25      NPAR= 4      ERR DEF=0.5
2.360e-03 -2.929e+01 -1.087e+01  4.015e+01
-2.929e+01  1.657e+06 -9.503e+05 -6.596e+05
-1.087e+01 -9.503e+05  1.108e+06 -1.234e+05
4.015e+01 -6.596e+05 -1.234e+05  8.522e+05
PARAMETER CORRELATION COEFFICIENTS
NO.   GLOBAL      1      2      3      4
  1  0.91613    1.000 -0.468 -0.213  0.895
  2  0.96250   -0.468  1.000 -0.701 -0.555
  3  0.94868   -0.213 -0.701  1.000 -0.127
  4  0.93197   0.895 -0.555 -0.127  1.000

```

Composition	Nevents	Fraction after fit	σ
Signal	69223	69309 ± 923	0.1
Continuum	33083	34057 ± 1052	0.9
SCF_BB-bar bkg	48073	47014 ± 1287	-0.8



TOY MC result



Sig PDF (Johnson + Johnson)	cont PDF (Chebyshev)	SCF PDF (Gauss+Cheb)	BBbar PDF (Exp + Cheb(3))
Sig Yield	Cont Yield	SCF Yield +	BB Yield
gamma	Cheb1 free	mean_scf	beta
delta	Cheb2 free	sigma_scf x fudge	fraction1
lambda x fudge		Cheb(0)	Cheb1
frac_sig		frac_scf	Cheb2
mean_sig			Cheb3
gamma1			
delta1			
lambda1			
mean_sig2			

FCN=-1.83765e+06 FROM HESSE STATUS=OK 52 CALLS 1125 TOTAL

EDM=0.000256094 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT NO.	PARAMETER NAME	VALUE	ERROR	INTERNAL STEP SIZE	INTERNAL VALUE
1	fudge	9.92903e-01	7.53226e-03	1.67693e-03	-9.29665e-01
2	nbbbar_scf	3.68513e+04	6.63765e+02	1.19044e-02	-2.35912e-02
3	ncont	4.47758e+04	4.11900e+02	1.07730e-01	1.41055e+00
4	nsig	6.87505e+04	5.99087e+02	1.21526e-02	7.45836e-01
5	p1	-2.87208e-01	1.19781e-02	1.07017e-02	-2.91311e-01
6	p2	-4.79877e-03	1.41457e-02	1.11069e-02	-4.79879e-03

ERR DEF= 0.5

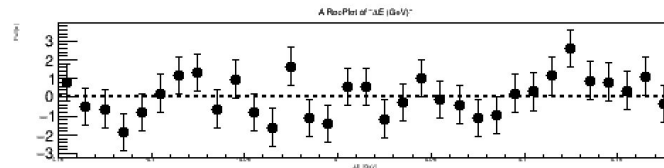
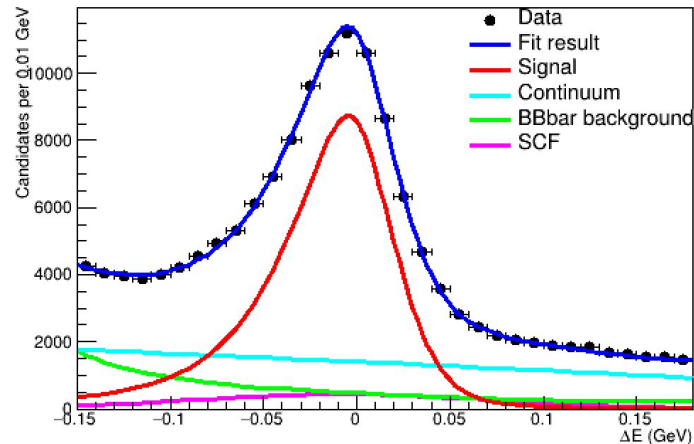
EXTERNAL ERROR MATRIX. NDIM= 25 NPAR= 6 ERR DEF=0.5

5.674e-05	-2.770e+00	-8.429e-02	2.852e+00	2.701e-05	1.041e-05
-2.770e+00	4.407e+05	-1.097e+05	-2.868e+05	-7.816e-01	-3.714e+00
-8.429e-02	-1.097e+05	1.709e+05	-3.714e+03	-9.785e-01	8.634e-02
2.852e+00	-2.868e+05	-3.714e+03	3.590e+05	1.811e+00	3.611e+00
2.701e-05	-7.816e-01	-9.785e-01	1.811e+00	1.435e-04	-1.559e-05
1.041e-05	-3.714e+00	8.634e-02	3.611e+00	-1.559e-05	2.001e-04

PARAMETER CORRELATION COEFFICIENTS

NO.	GLOBAL	1	2	3	4	5	6
1	0.70293	1.000	-0.554	-0.027	0.632	0.299	0.098
2	0.85006	-0.554	1.000	-0.400	-0.721	-0.098	-0.396
3	0.62726	-0.027	-0.400	1.000	-0.015	-0.198	0.015
4	0.83046	0.632	-0.721	-0.015	1.000	0.252	0.426
5	0.40528	0.299	-0.098	-0.198	0.252	1.000	-0.092
6	0.54454	0.098	-0.396	0.015	0.426	-0.092	1.000

Fit for $700\text{fb}^{-1} 2\text{Johnson free cont Nscf+Nbbbar}$

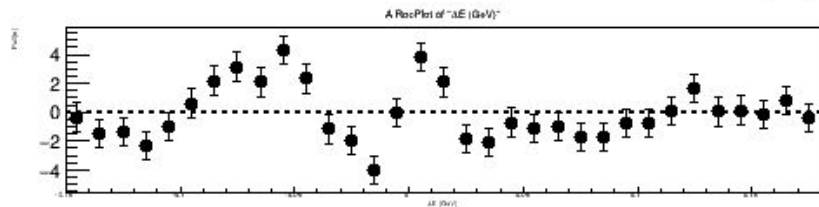
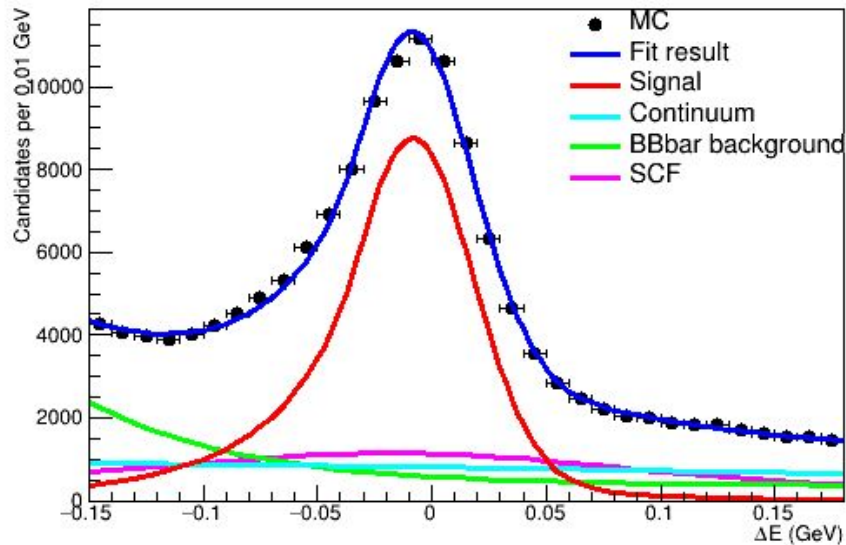


Composition	Nevents	Fraction after fit	σ
Signal	69223	68751 ± 599	-0.8
Continuum	33083	44776 ± 412	28.4
SCF_BB-bar bkg	48073	36851 ± 664	-16.9

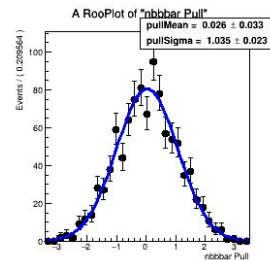
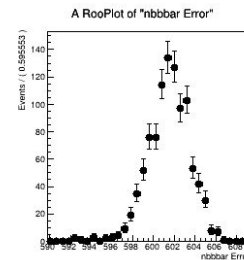
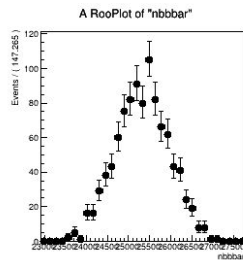
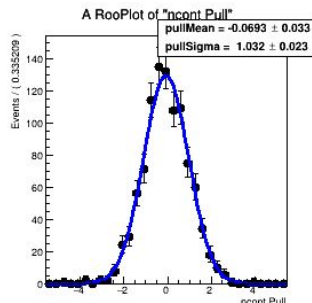
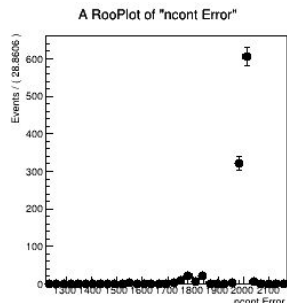
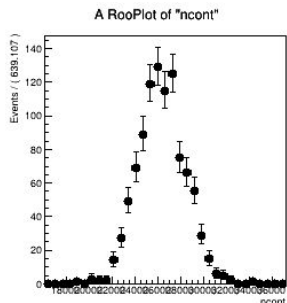
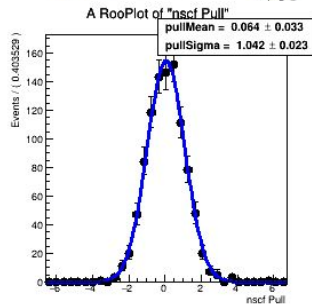
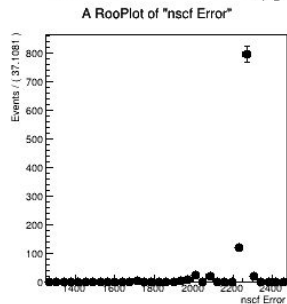
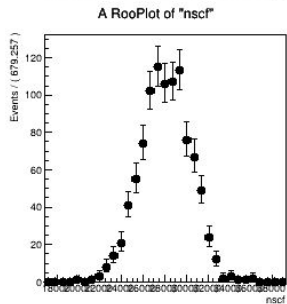
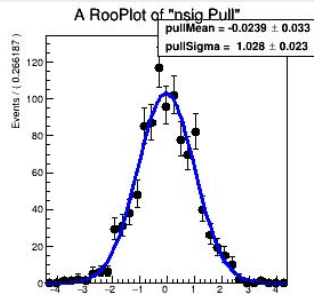
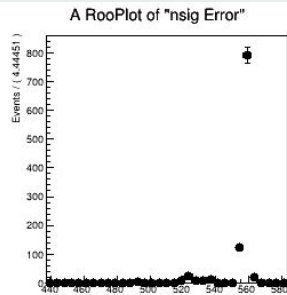
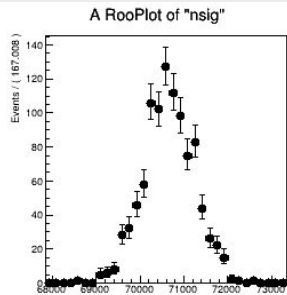


Backup

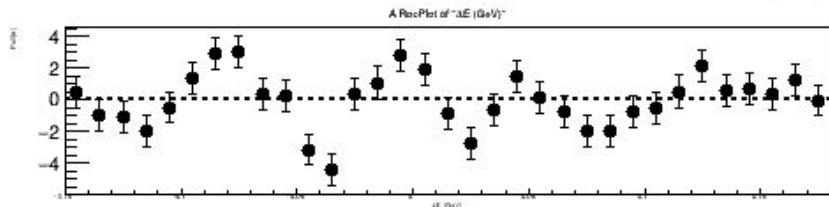
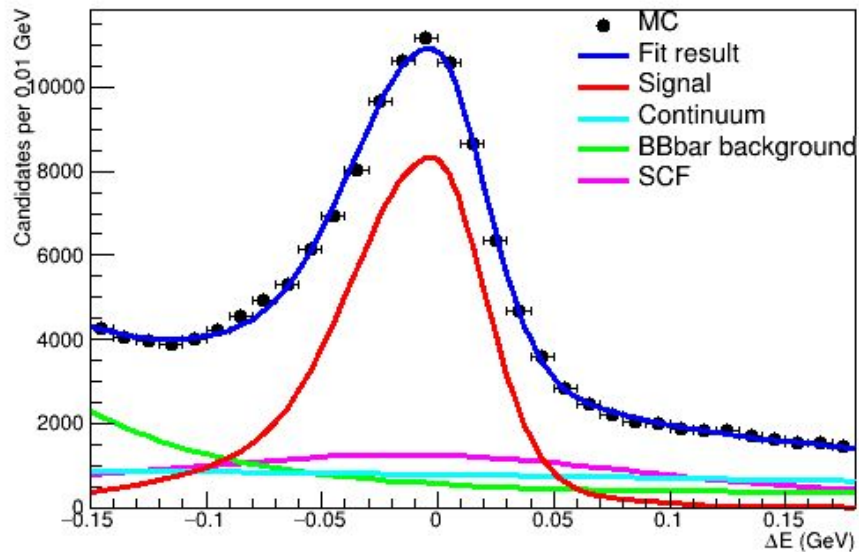
Fit for 700fb⁻¹ CB+Gauss fixed NEW



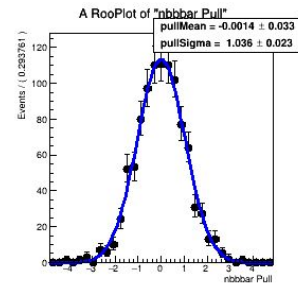
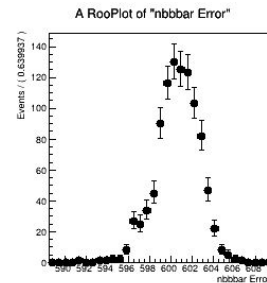
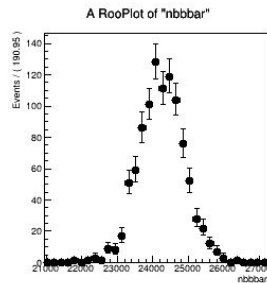
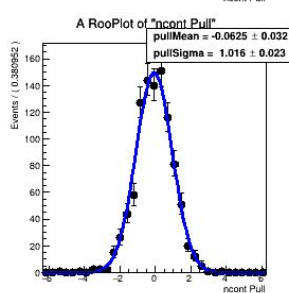
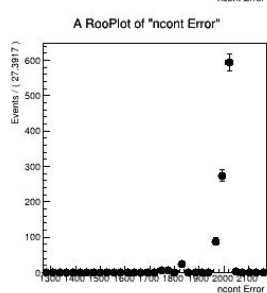
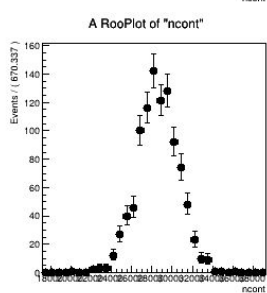
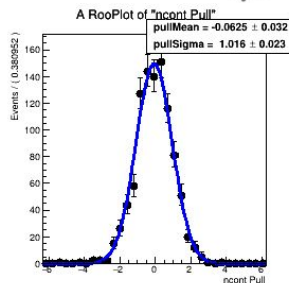
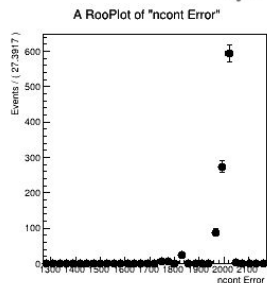
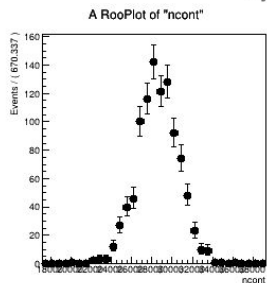
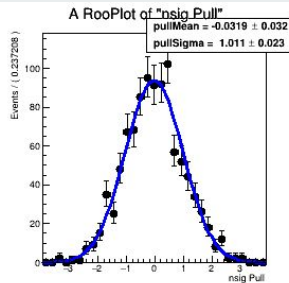
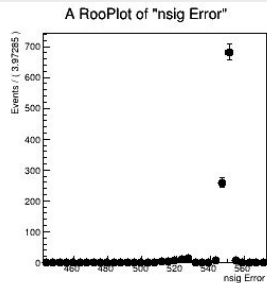
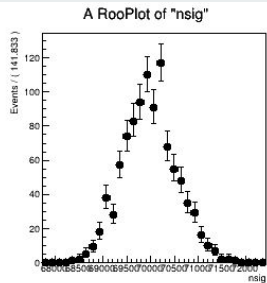
Composition	Nevents	Fraction after fit	σ
Signal	69257	70663 ± 561	2.5
Continuum	34681	26425 ± 2001	-4.1
SCF	24702	27979 ± 2273	1.4
BB-bar bkg	24588	25312 ± 604	1.2



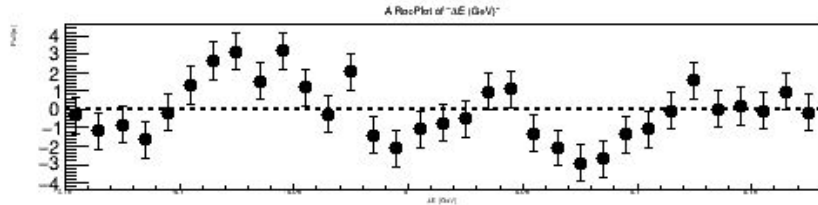
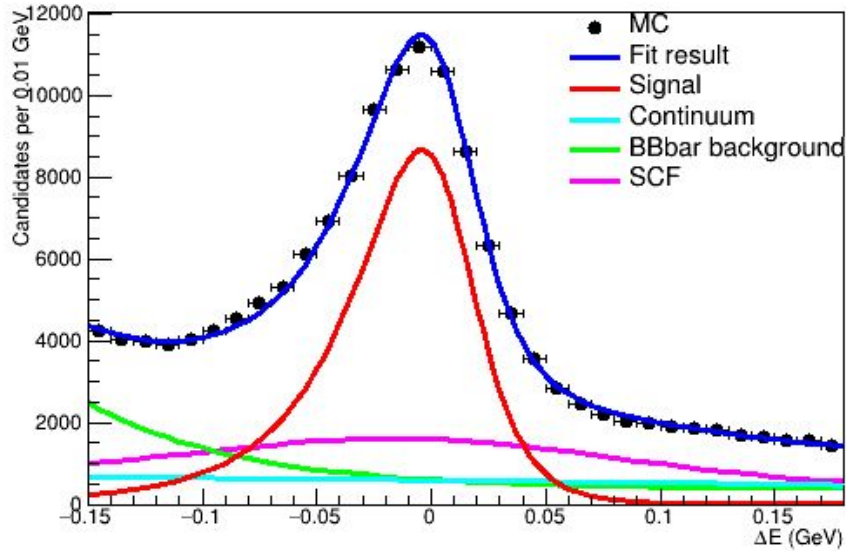
Fit for 700fb^{-1} BifurcatedGauss fixed NEW



Composition	Nevents	Fraction after fit	σ
Signal	69257	69995 ± 550	1.3
Continuum	34681	28693 ± 2008	-3.0
SCF	24702	27453 ± 2262	1.2
BB-bar bkg	24588	24241 ± 602	-0.6



Fit for 700fb^{-1} Johnson fixed NEW



Composition	Nevents	Fraction after fit	σ
Signal	69257	64977 ± 371	-11.5
Continuum	34681	18588 ± 678	-32.7
SCF	24702	39925 ± 266	57.
BB-bar bkg	24588	26886 ± 603	3.8

