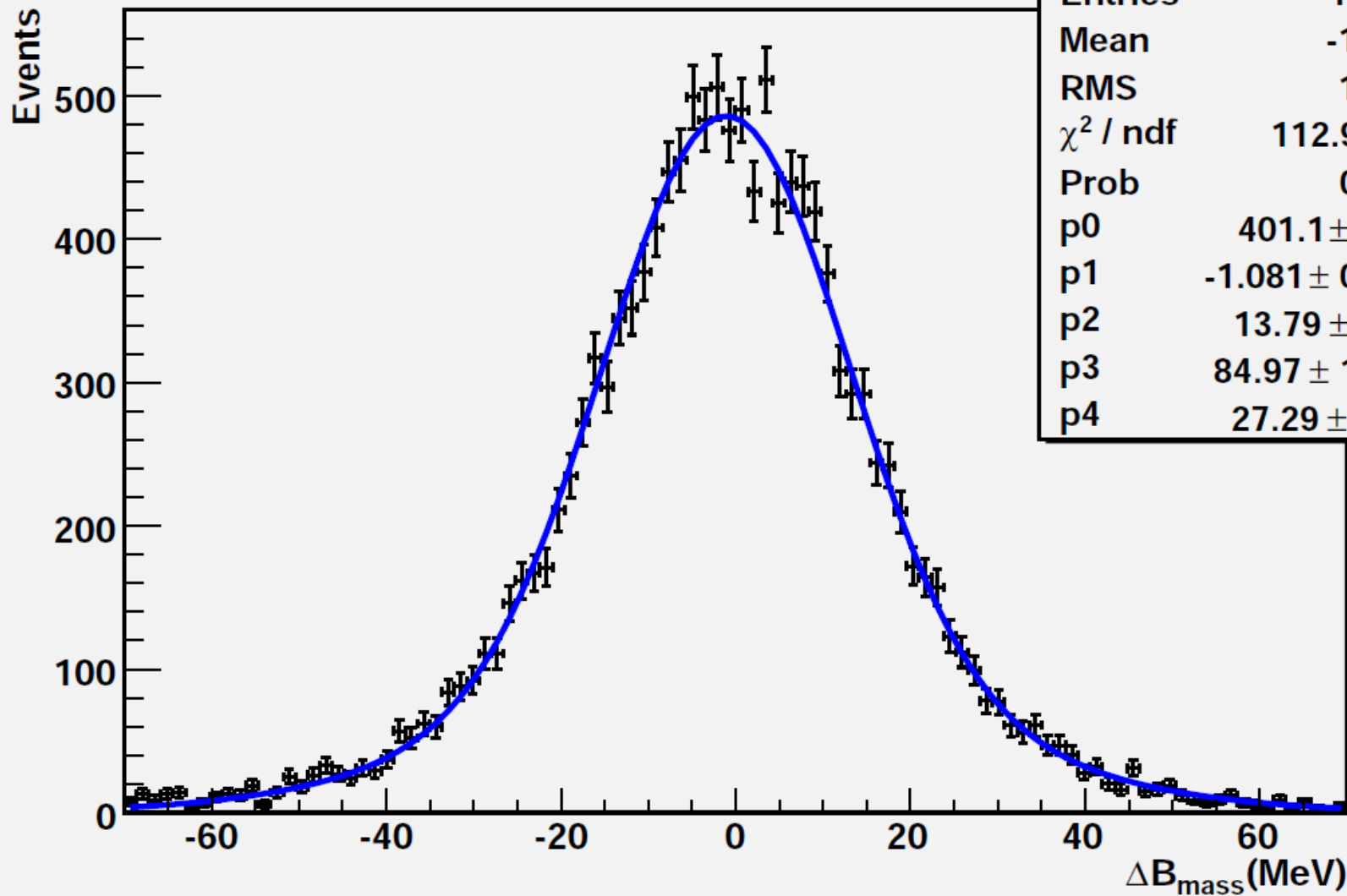


More Resolution Plots(IV)

Celestino Rodríguez Cobo

Mass Resolution

 ΔM_{Bs} 

resBs

Entries	14580
Mean	-1.299
RMS	18.68
χ^2 / ndf	112.9 / 95
Prob	0.102
p0	401.1 ± 15.0
p1	-1.081 ± 0.148
p2	13.79 ± 0.39
p3	84.97 ± 16.18
p4	27.29 ± 1.36

Mass Resolution

$$Res(mass) = p_0 * exp(-0.5 * (\frac{mass - p_1}{p_2})^2) + p_3 * exp(-0.5 * (\frac{mass - p_1}{p_4})^2)$$

- Double gaussian is a decent description, even with the photon effect

It can be improved: use of crystal ball function.

- 2 Crystal balls
- 1 Crystal ball +1 Gaussian

Crystal Ball

- Takes in account photon losses

$$f(x; \alpha, n, \bar{x}, \sigma) = N \cdot \begin{cases} \exp\left(-\frac{(x-\bar{x})^2}{2\sigma^2}\right), & \text{for } \frac{x-\bar{x}}{\sigma} > -\alpha \\ A \cdot \left(B - \frac{x-\bar{x}}{\sigma}\right)^{-n}, & \text{for } \frac{x-\bar{x}}{\sigma} \leq -\alpha \end{cases}$$

$$A = \left(\frac{n}{|\alpha|}\right)^n \cdot \exp\left(-\frac{|\alpha|^2}{2}\right) \quad B = \frac{n}{|\alpha|} - |\alpha|$$

- In our case

$$x = m$$

$$\bar{x} = m_0$$

$$n = 1$$

Crystal Ball

- 3 Methods tested
- Single Crystal Ball (Chi2 per Dof > 2)
- 1- 2 Crystal Balls

$$Res(m) = frac * CB(m, \alpha, n, m_0, \sigma) + (1 - frac) * CB(m, \alpha_2, n, m_0, \sigma_2)$$

- 2- 1 Crystal Ball and 1 Gaussian

$$Res(m) = frac * CB(m, \alpha, n, m_0, \sigma) + (1 - frac) * Gauss(m, m_0, \sigma_2)$$

2 Crystal Ball Fit.

** 28 **MINOS 3000

COVARIANCE MATRIX CALCULATED SUCCESSFULLY

MINUIT WARNING IN MNCROS

===== Cannot find slope of the right sign

 POSITIVE MINOS ERROR NOT CALCULATED FOR PARAMETER 1

FCN=100.846 FROM MINOS STATUS=PROBLEMS 1371 CALLS 2014

TOTAL

 EDM=5.32811e-05 STRATEGY= 1 ERROR MATRIX ACCURATE

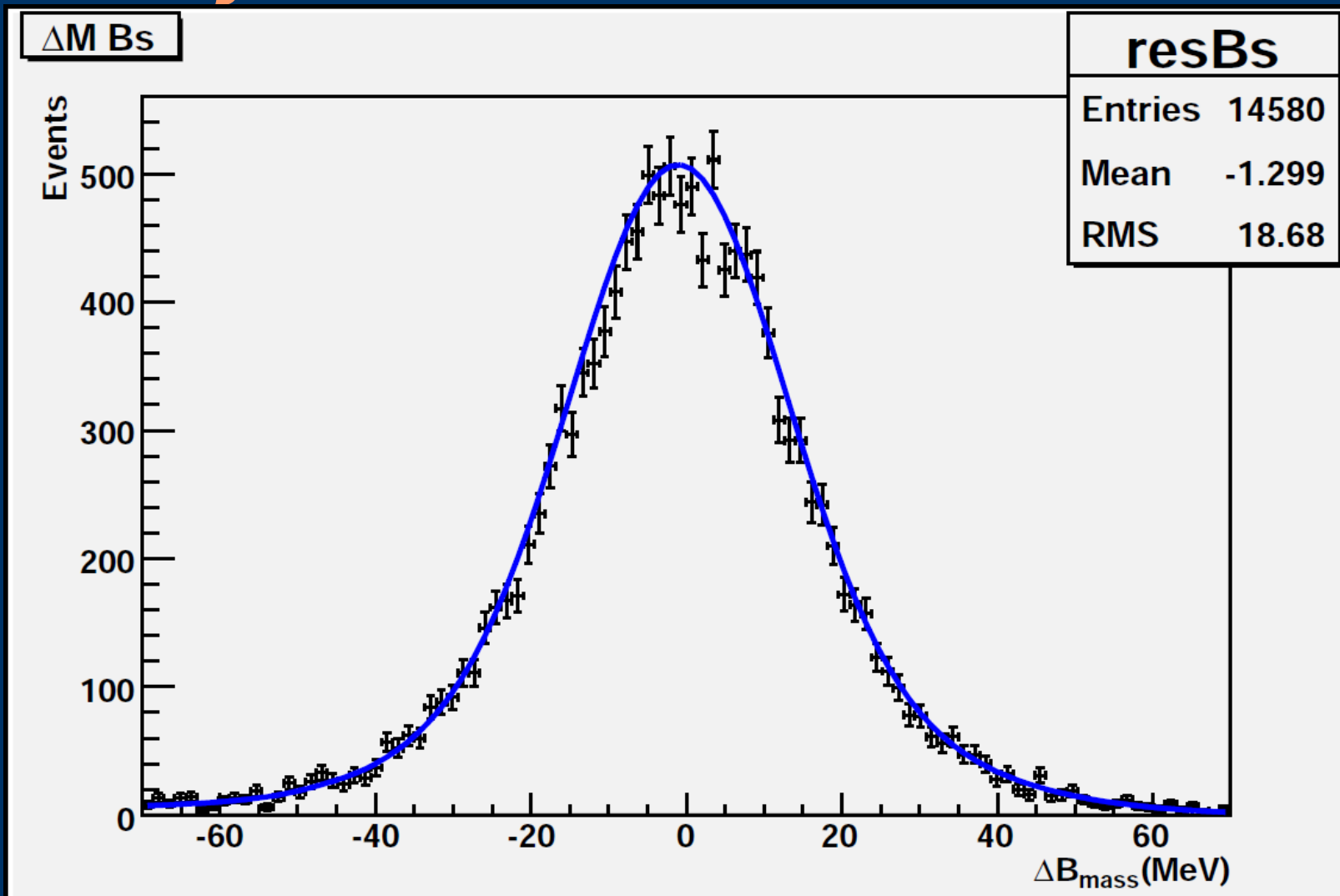
EXT PARAMETER PARABOLIC MINOS ERRORS

NO. NAME VALUE ERROR NEGATIVE POSITIVE

1	al	2.93470e+00	3.52146e-01	-2.95839e-01	
2	al2	1.97707e+00	1.29142e-01	-1.71112e-01	1.26731e-01
3	frac	6.49226e-01	5.31916e-02	-5.52286e-02	5.07047e-02
4	mas0	-1.01418e+00	1.49514e-01	-1.49104e-01	1.49784e-01
5	sig	1.33991e+01	4.51080e-01	-4.66907e-01	4.33457e-01
6	sig2	2.51838e+01	1.22065e+00	-1.15297e+00	1.28418e+00

- $\text{Chi}^2=100.846$ $n\text{Dof}=94$ $\text{Prob}=0.296$

2 Crystal Ball Fit.



- $\text{Chi}^2=100.846$ $n\text{Dof}=94$ $\text{Prob}=0.296$

Crystal Ball + Gauss Fit

** 28 **MINOS 2500

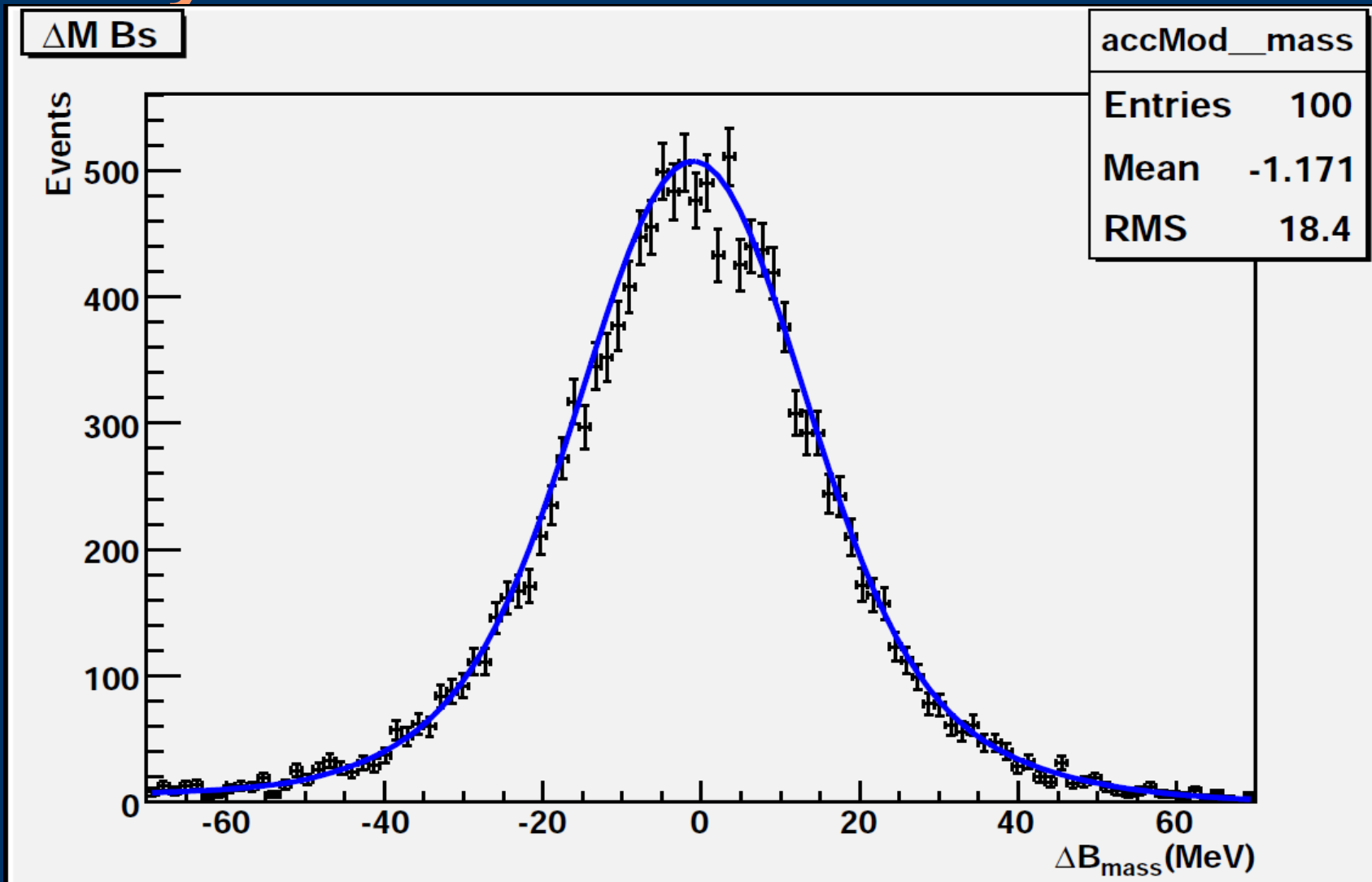
FCN=101.227 FROM MINOS STATUS=SUCCESSFUL 504 CALLS 1029 TOTAL

EDM=1.31804e-06 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER	PARABOLIC	MINOS ERRORS		
NO.	NAME	VALUE	ERROR	NEGATIVE	POSITIVE
1	al	1.89740e+00	1.13003e-01	-1.17986e-01	1.11922e-01
2	frac	3.53700e-01	5.28075e-02	-5.07697e-02	5.47243e-02
3	mas0	-1.02974e+00	1.48491e-01	-1.48481e-01	1.48492e-01
4	sig	2.52485e+01	1.25901e+00	-1.18067e+00	1.34928e+00
5	sig2	1.33728e+01	4.49252e-01	-4.63969e-01	4.34759e-01

- $\text{Chi}^2=101.227$ nDof=95 Prob= 0.312

Crystal Ball + Gauss Fit.



- $\text{Chi}^2=101.227$ nDof=95 Prob= 0.312