Weekly meeting

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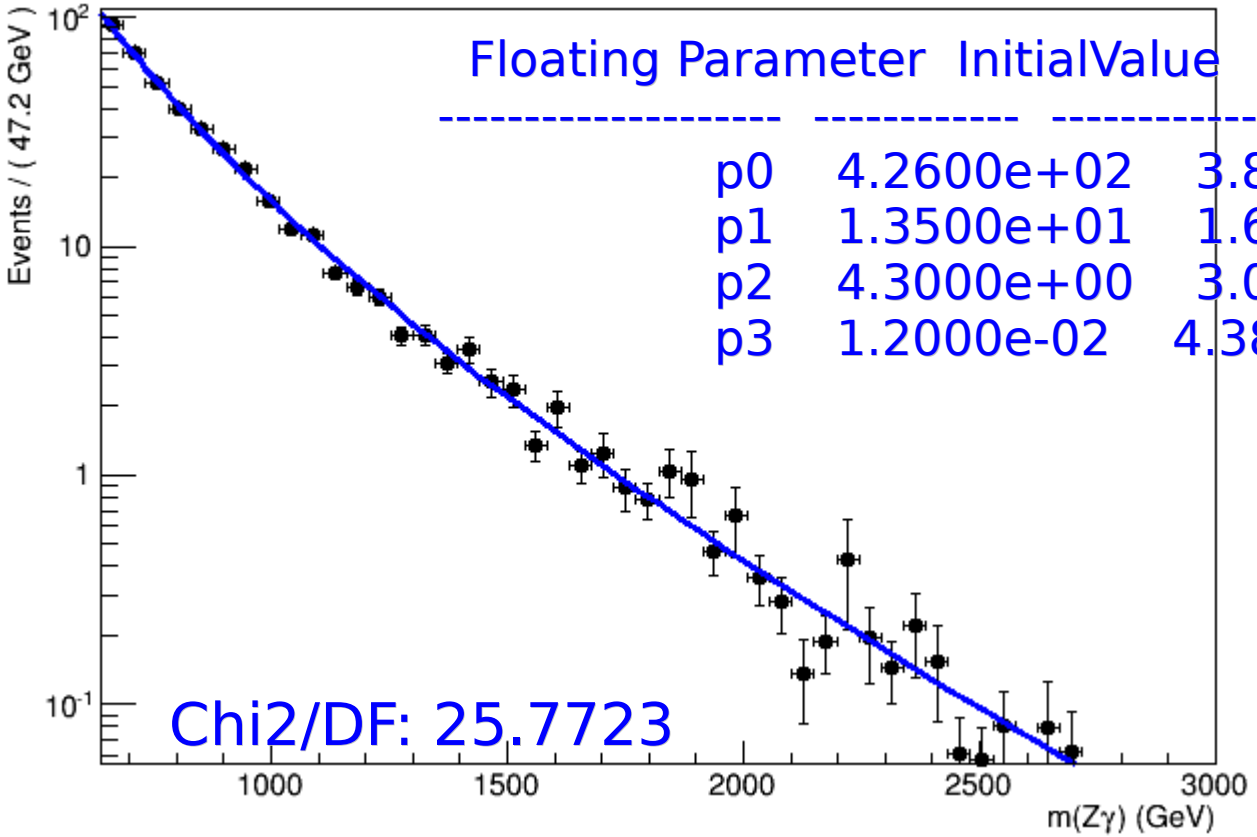
IHEP

Zy background fit

- Fit background model to background-only MC samples

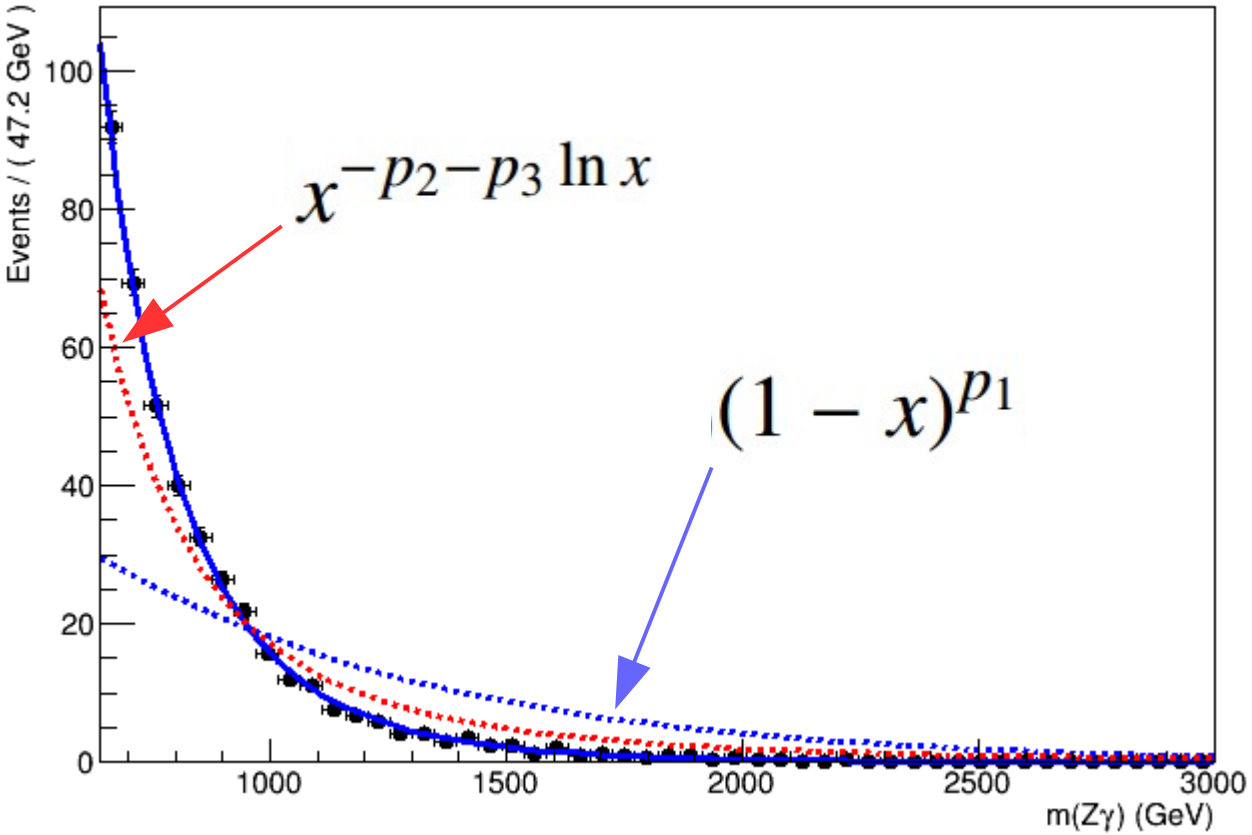
$$m(x \equiv m_{\gamma,\mathrm{jet}}/\sqrt{s}) = p_0(1-x)^{p_1} x^{-p_2-p_3 \ln x}$$

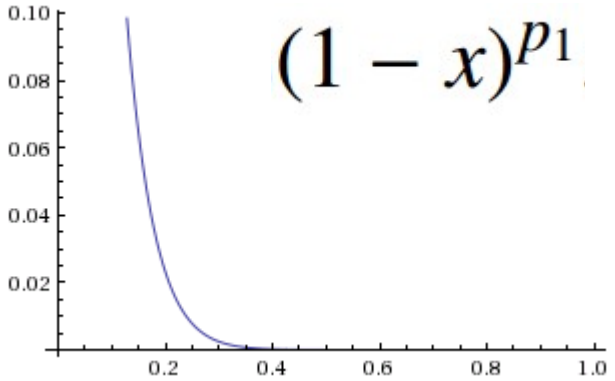


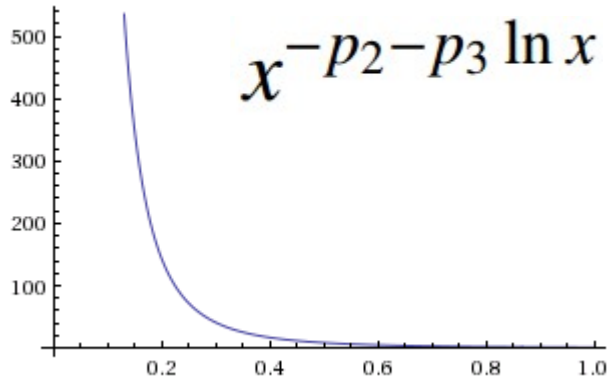
Floating Parameter	InitialValue	FinalValue +/- Error	GblCorr.
p0	4.2600e+02	3.8992e+02 +/- 3.60e+01	<none>
p1	1.3500e+01	1.6860e+01 +/- 2.16e+00	<none>
p2	4.3000e+00	3.0855e+00 +/- 1.97e-01	<none>
p3	1.2000e-02	4.3889e-03 +/- 1.34e-01	<none>

Zγ background model terms

- Two terms: one pulls up X→640 peak; one rises up X→ 3000 tail





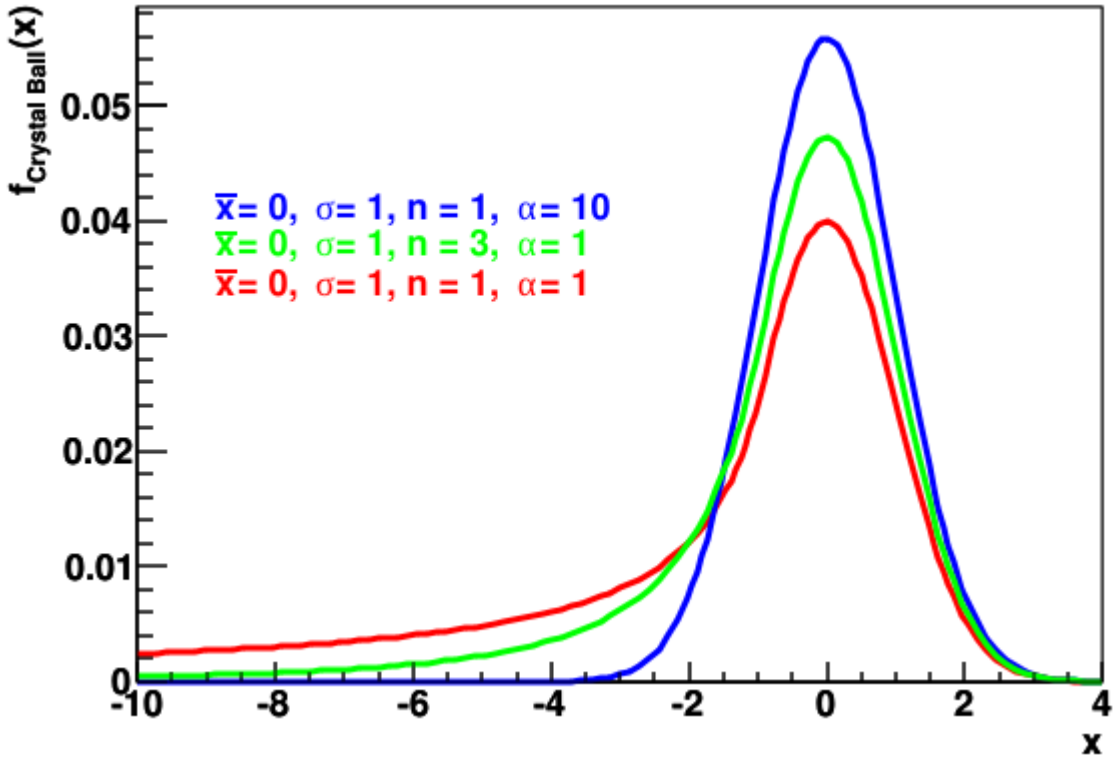


Zy signal modeling – cbN issue

- Use one-sided CB + Gauss ~ 6 free param

$$f_{signal}(m(\gamma J)) = f_{CB} \cdot CB(m(\gamma J); \mu, \sigma_{CB}, \alpha_{CB}, n_{CB}) + (1 - f_{CB}) \cdot Gauss(m(\gamma J); \mu, \sigma_{Gauss})$$

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



cbN controls the rise of the one-sided tail: the smaller cbN the higher the tail shows up

In our low mass cases, tails are small → we need large cbN; setting free cbN in fit gives very large cbN ~100

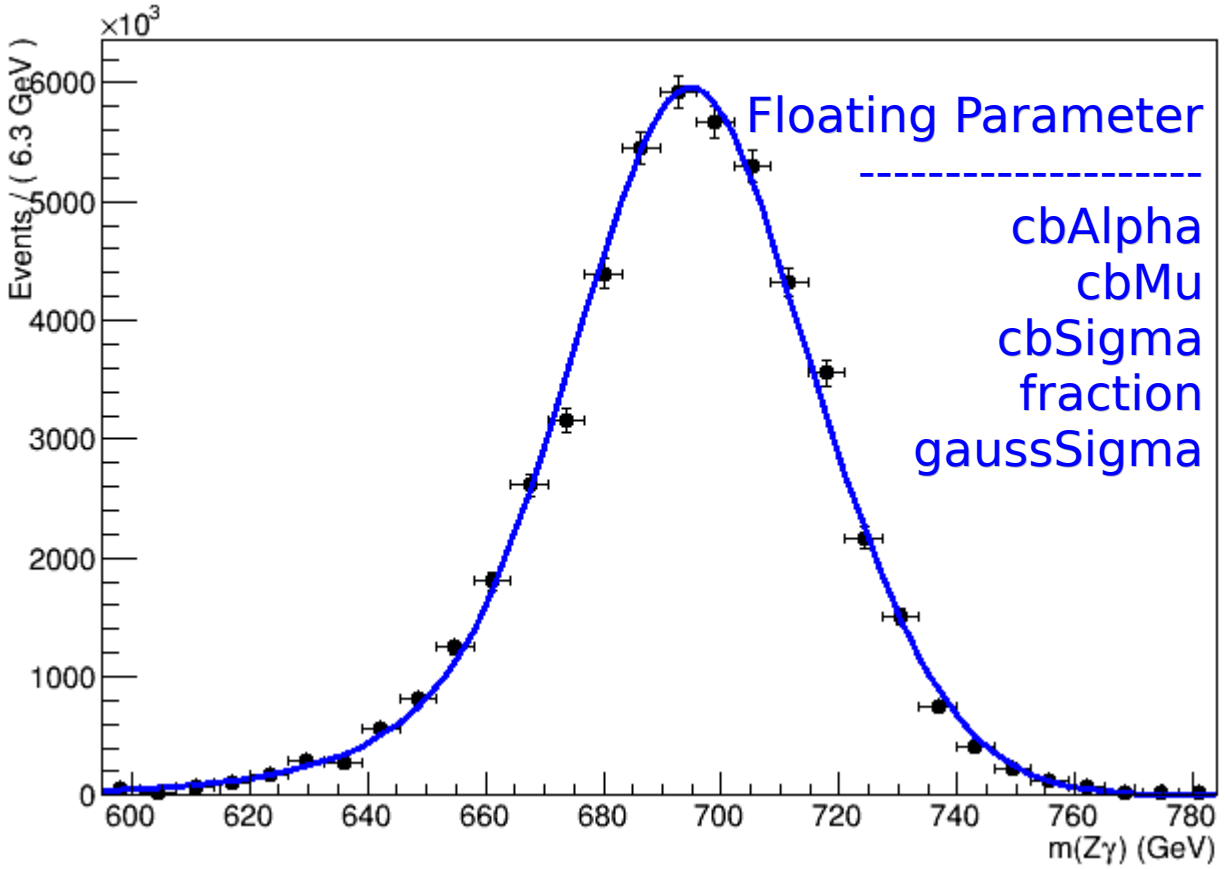
In fact, too large cbN causes numeric problems "NAN" in RooFit as I found during fitting or limit setting https://sft.its.cern.ch/jira/browse/ROOT-5345

Fixed parameter

- To walk around the numeric issue in CBShape, I fix in low mass (<=1000) range cbMu=10 as much as possible until fitted cbMu values exists within 10 (in high mass > 1000)

Sig 700

- Chi2/DOF: 4.35113



Floating Parameter	FinalValue +/- Error
cbAlpha	1.5282e+00 +/- 4.40e-02
cbMu	6.9472e+02 +/- 2.20e-01
cbSigma	2.2060e+01 +/- 3.48e-01
fraction	9.6364e-01 +/- 3.11e-02
gaussSigma	9.7974e+00 +/- 4.22e+00