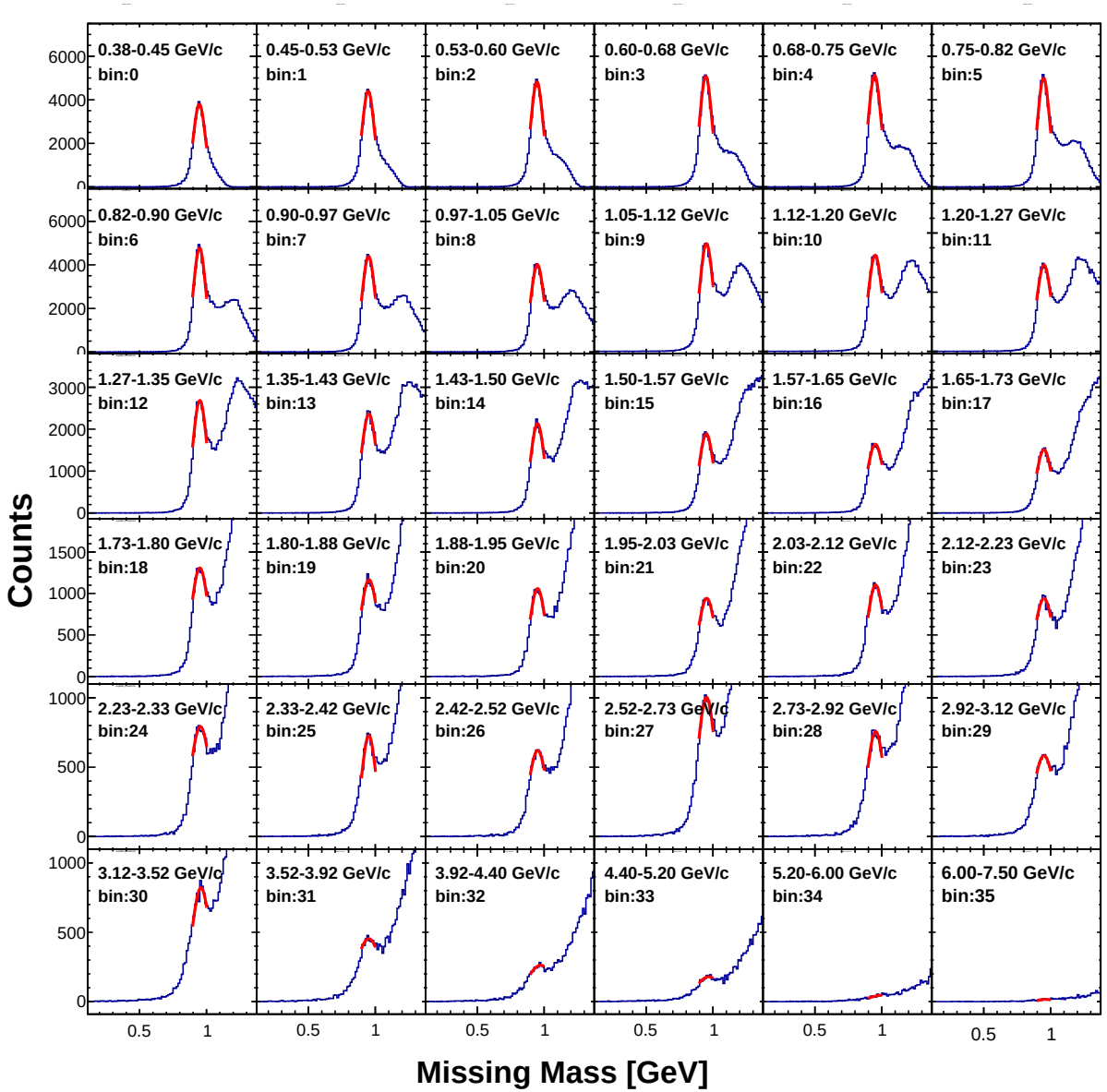
Fit Expected MM Core distributions - 1

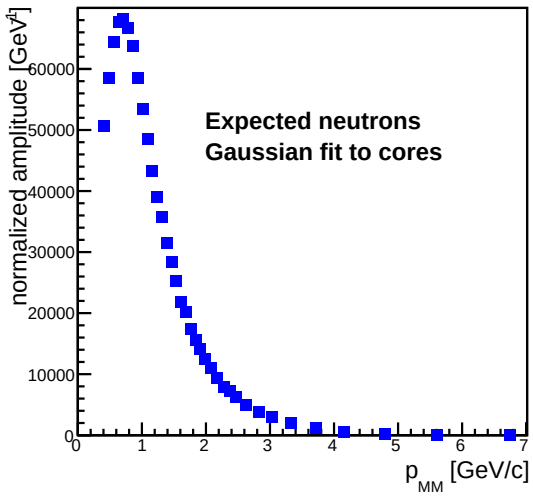


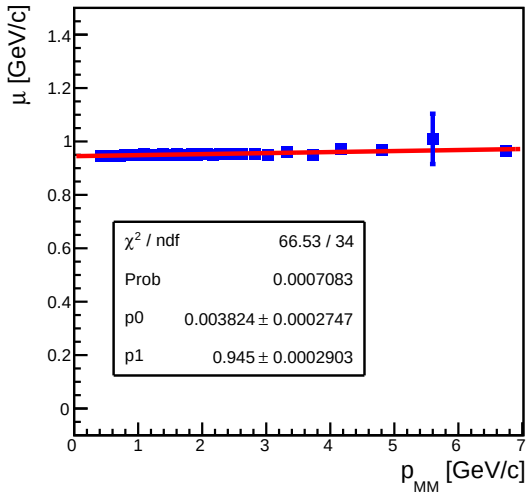
Data file:
data10p6nosidiscutv4.root

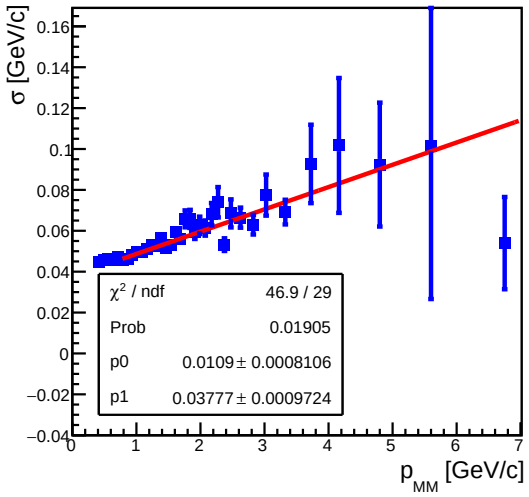
Histograms:
expMM_Pmmbin

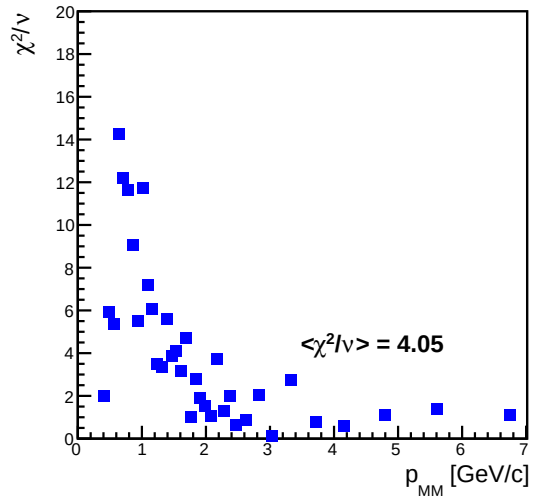
Vary μ and σ, range fixed: 0.895166-1.00242 GeV

Fit Expected MM Core distributions - 2





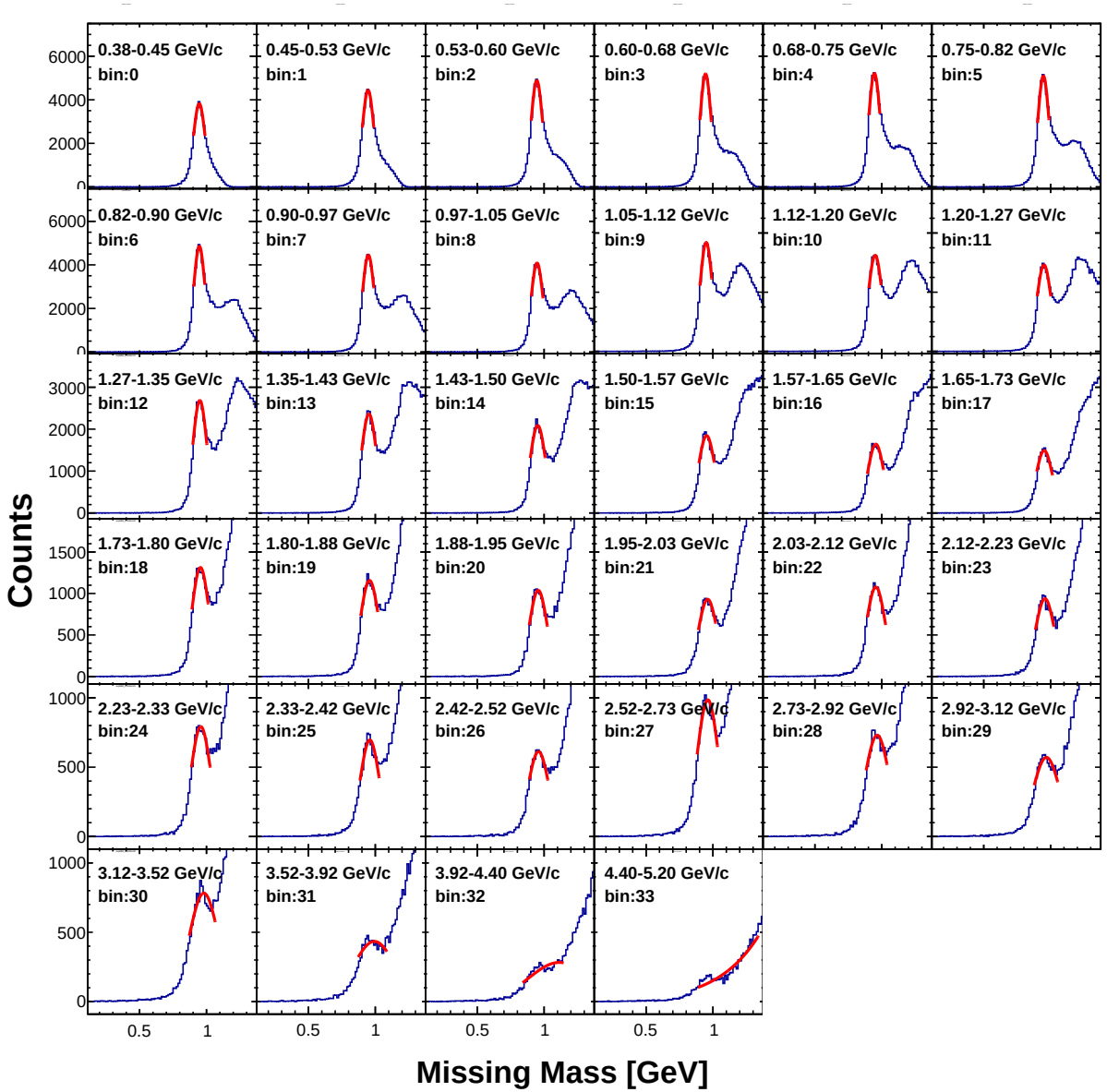




Wed Aug 17 19:31:43 2022

Vary μ and σ, range fixed: 0.895166-1.00242 GeV

Fit Expected MM Core distributions - 3

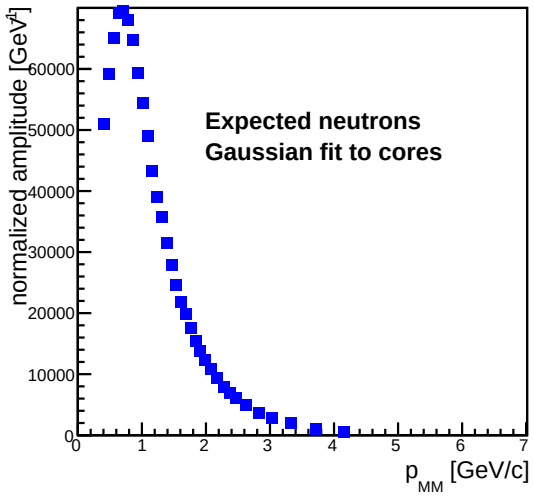


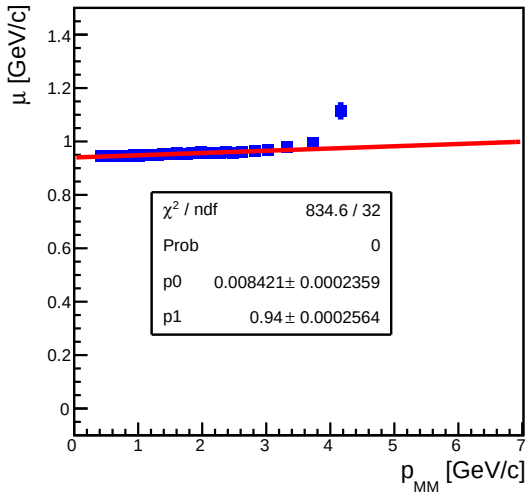
Vary μ and σ, range $\mu \pm \sigma$

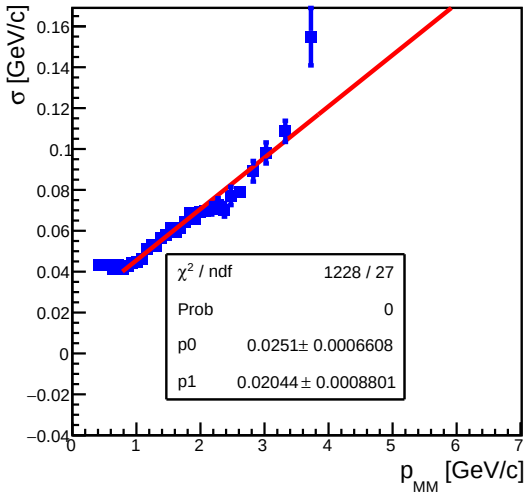
Data file:
data10p6nosidiscutv4.root

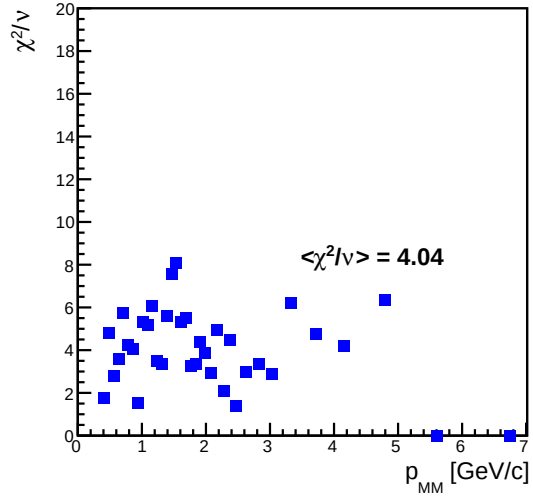
Histograms:
expMM_Pmmbin

Fit Expected MM Core distributions - 4





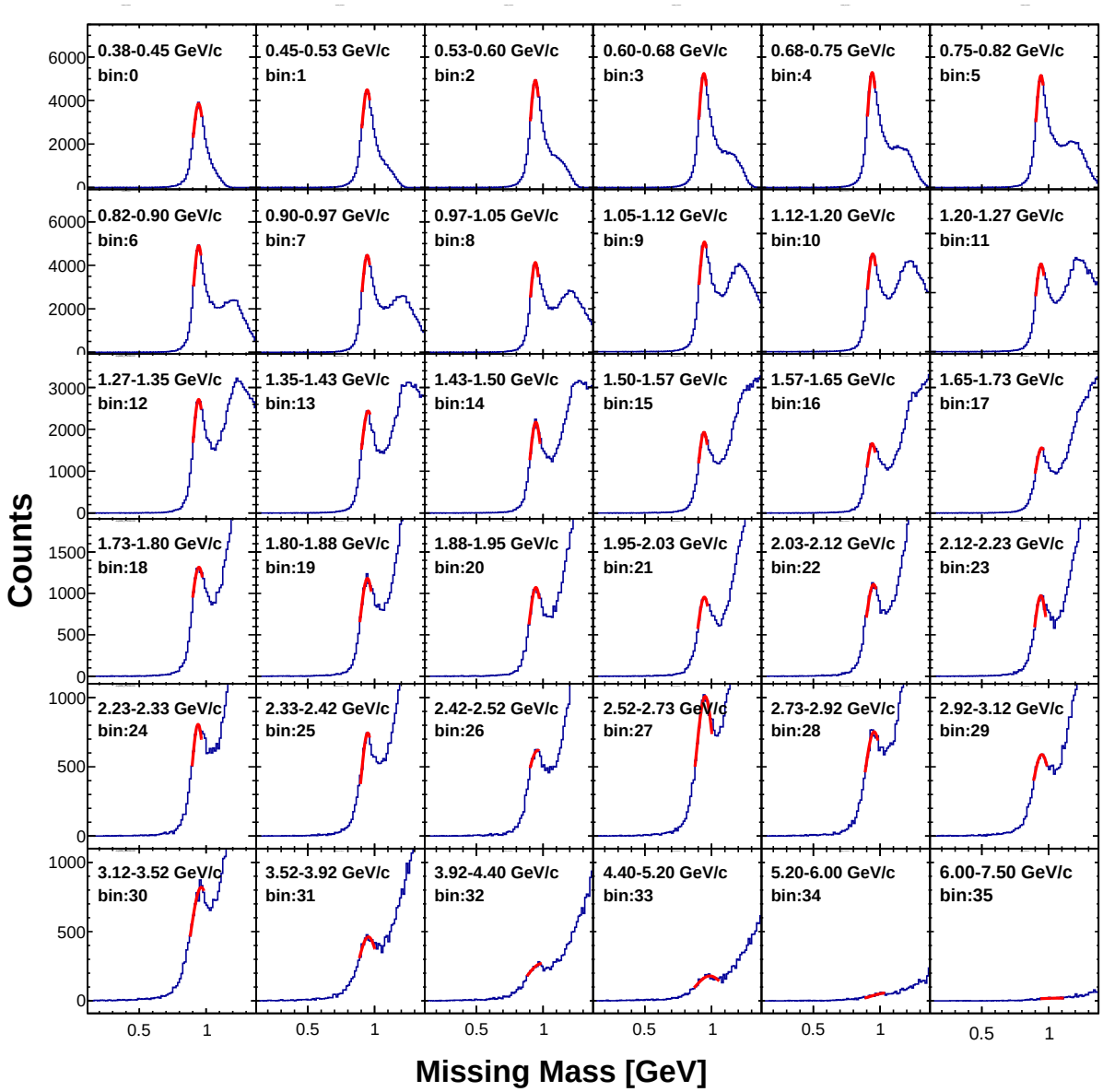




Thu Aug 18 10:18:44 2022

Vary μ and σ, range $\mu \pm \sigma$

Fit Expected MM Core distributions - 6

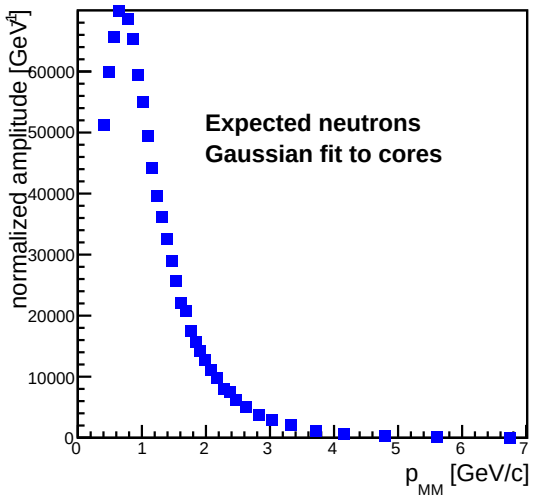


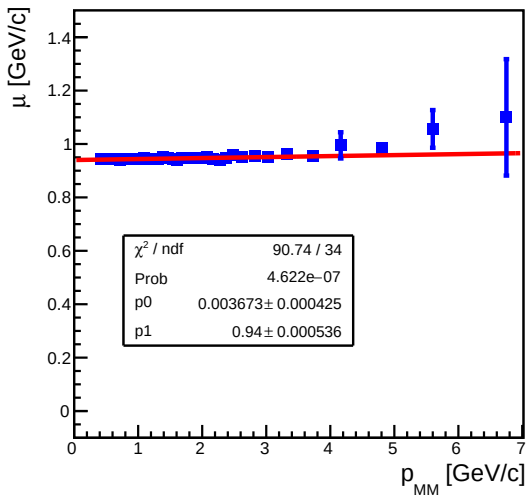
Vary μ and σ, range: $\mu - \sigma \rightarrow \mu + \frac{\sigma}{2}$

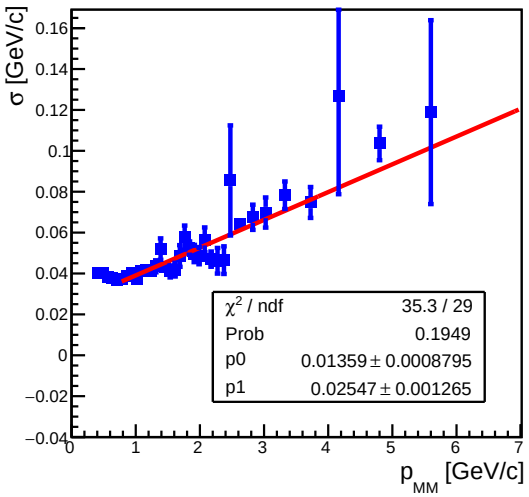
Data file:
data10p6nosidiscutv4.root

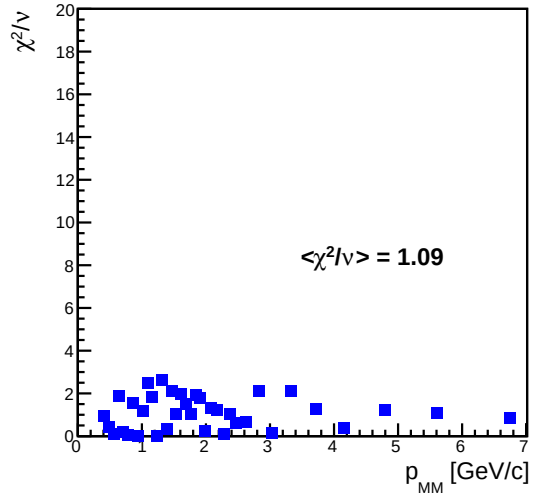
Histograms:
expMM_Pmmbin

Fit Expected MM Core distributions - 7





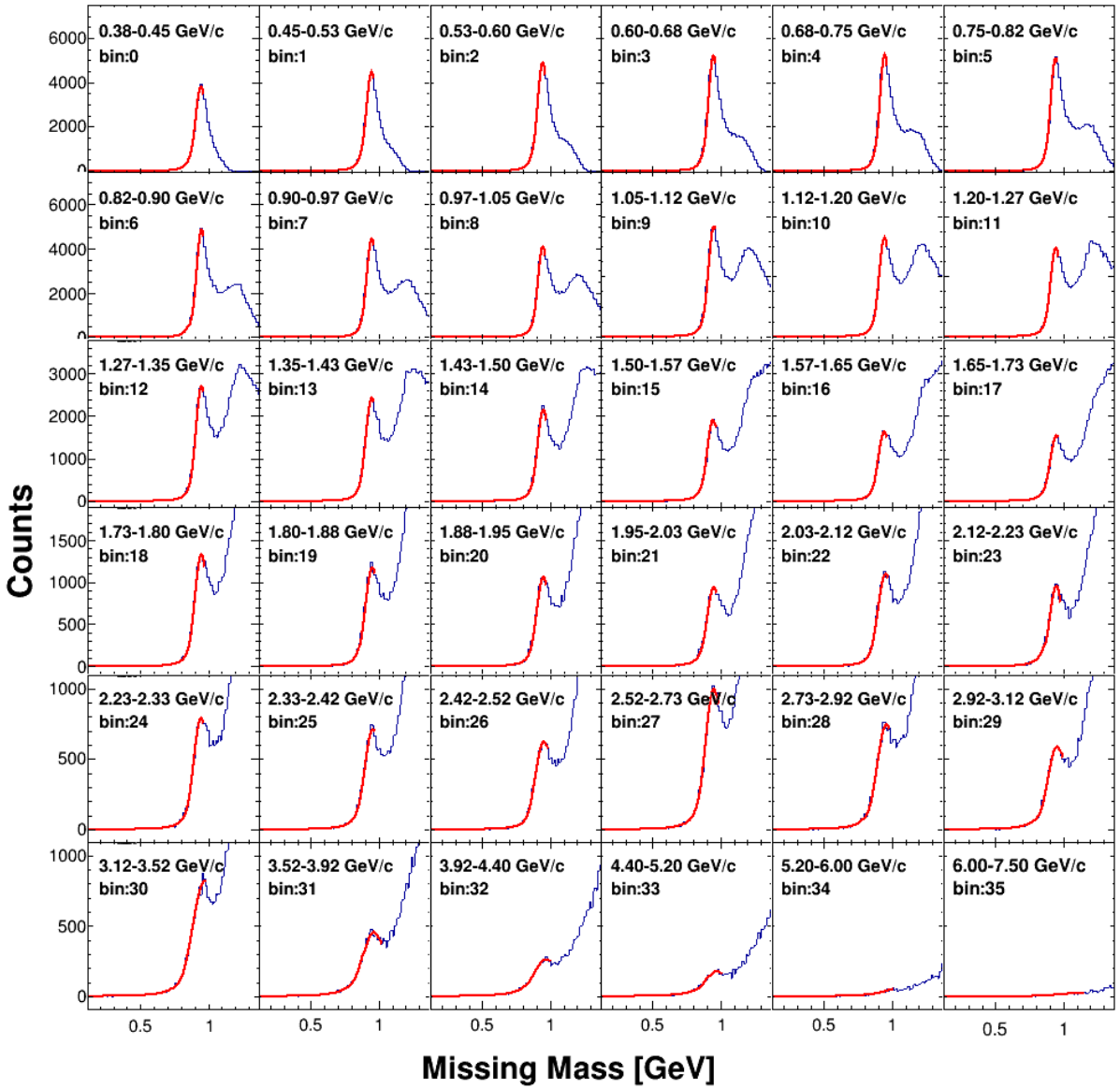




Thu Aug 18 09:48:17 2022

Vary μ and σ, range: $\mu - \sigma \rightarrow \mu + \frac{\sigma}{2}$

Fit Expected MM LE+Core distributions - 1

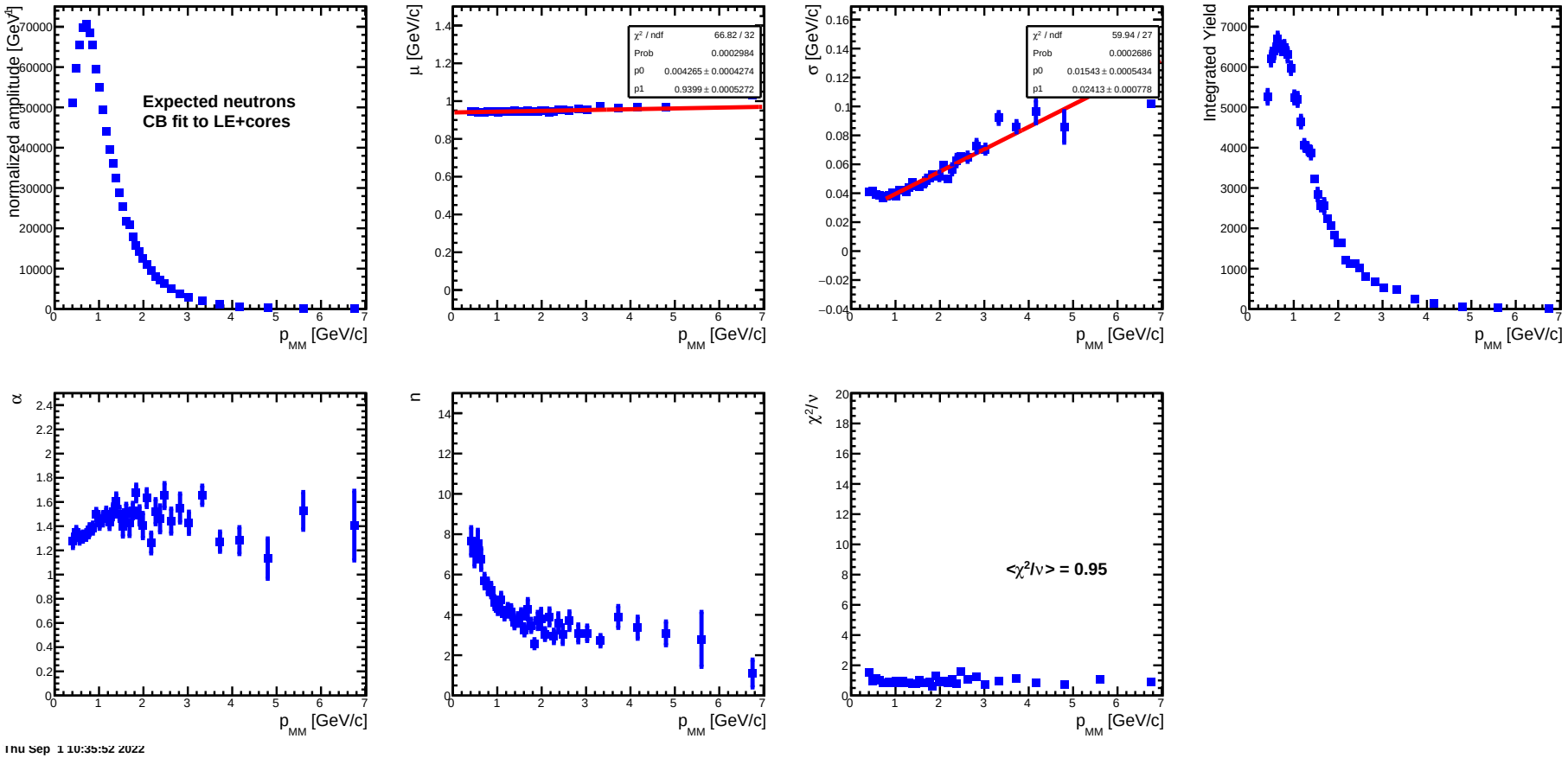


Vary μ and σ, range: $0.0 \rightarrow \mu + \frac{\sigma}{2}$

Data file:
data10p6nosidiscutv4.root

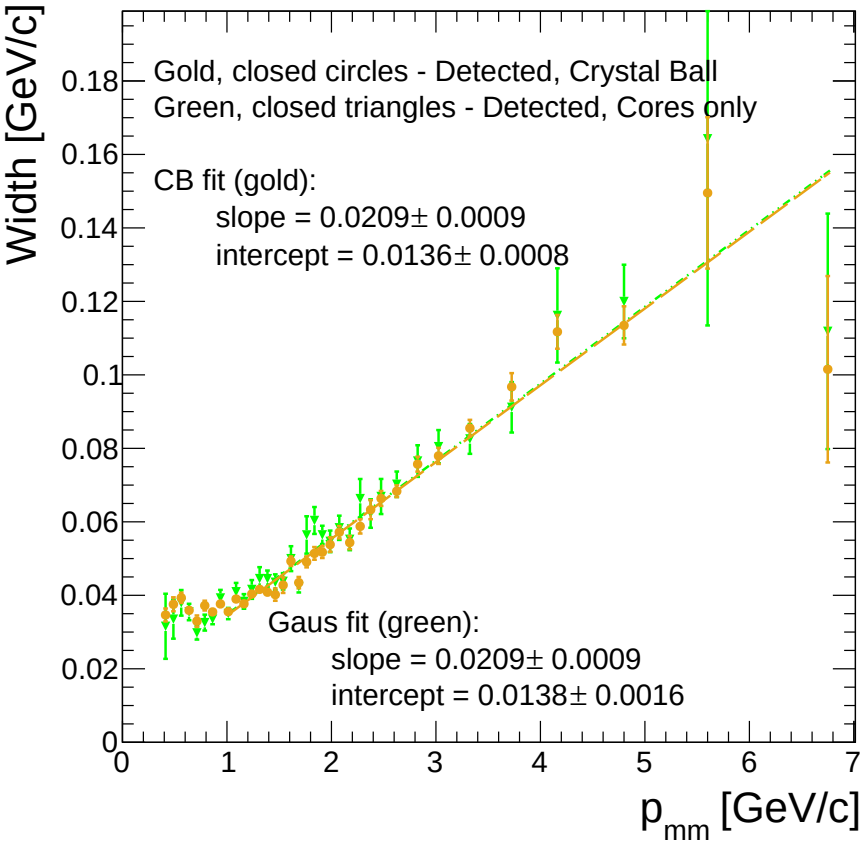
Histograms:
expMM_Pmmbin

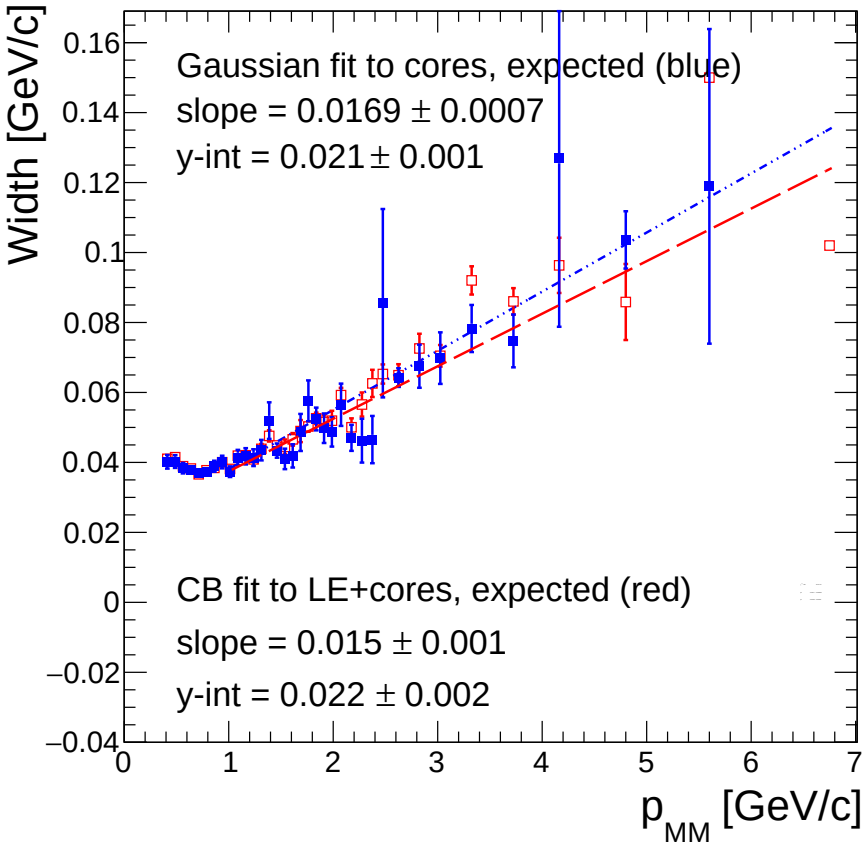
Fit Expected MM LE+Core distributions - 2



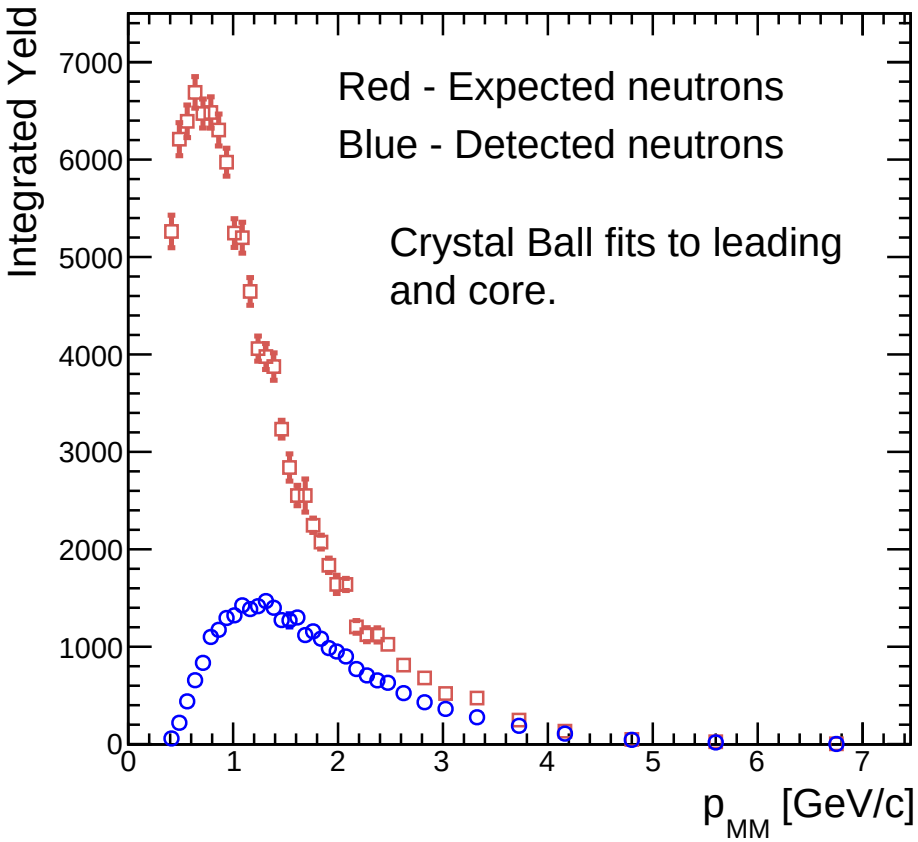
Vary μ and σ, range: $0.0 \rightarrow \mu + \frac{\sigma}{2}$

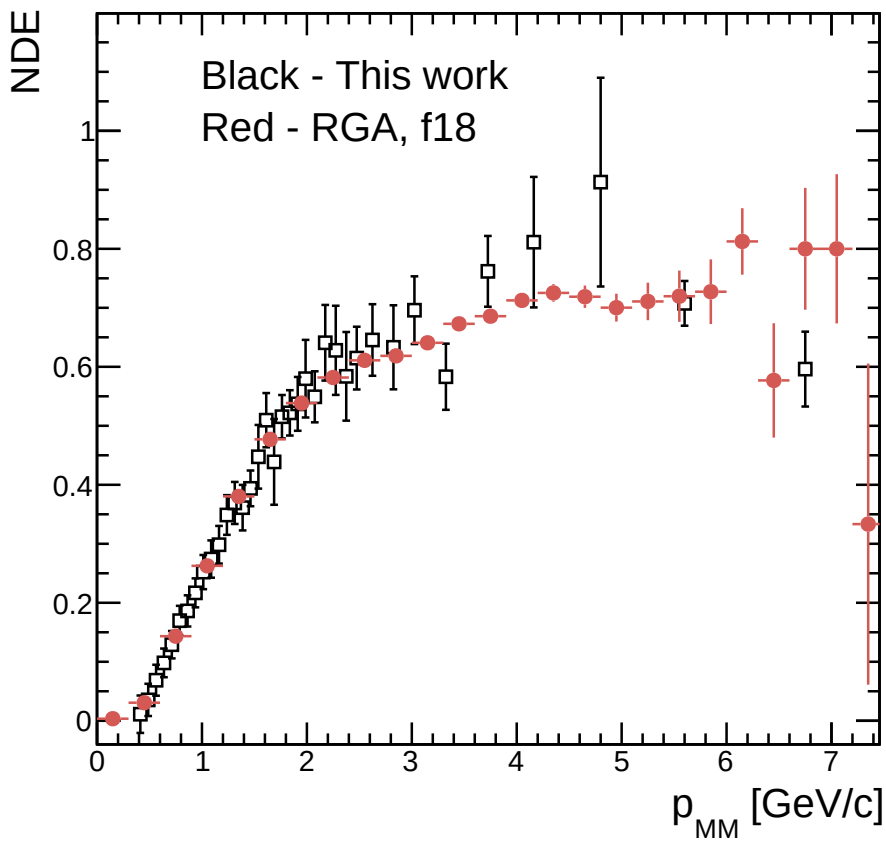
Compare Widths - Detected and Expected



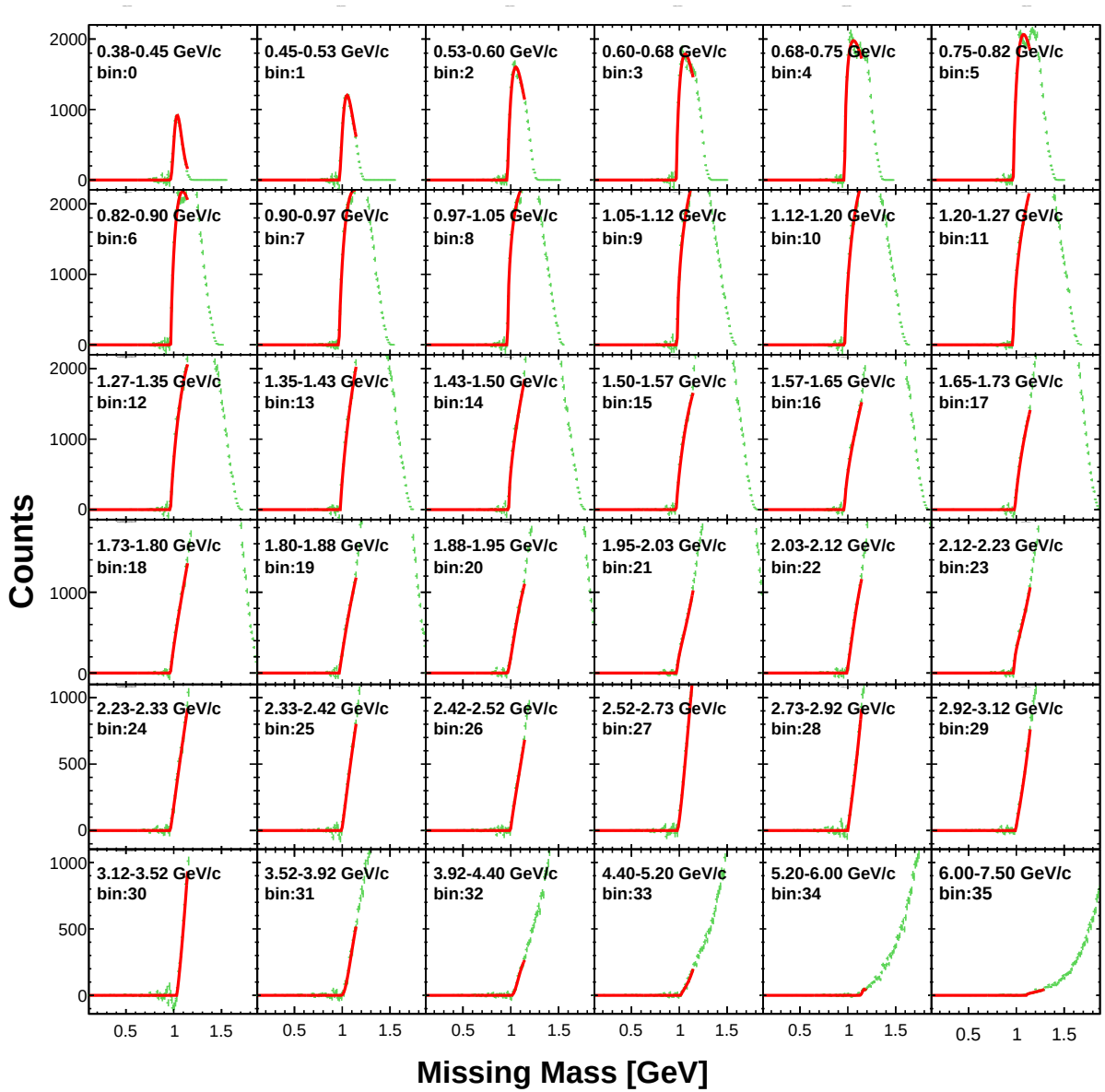


Integrated Yields and NDE



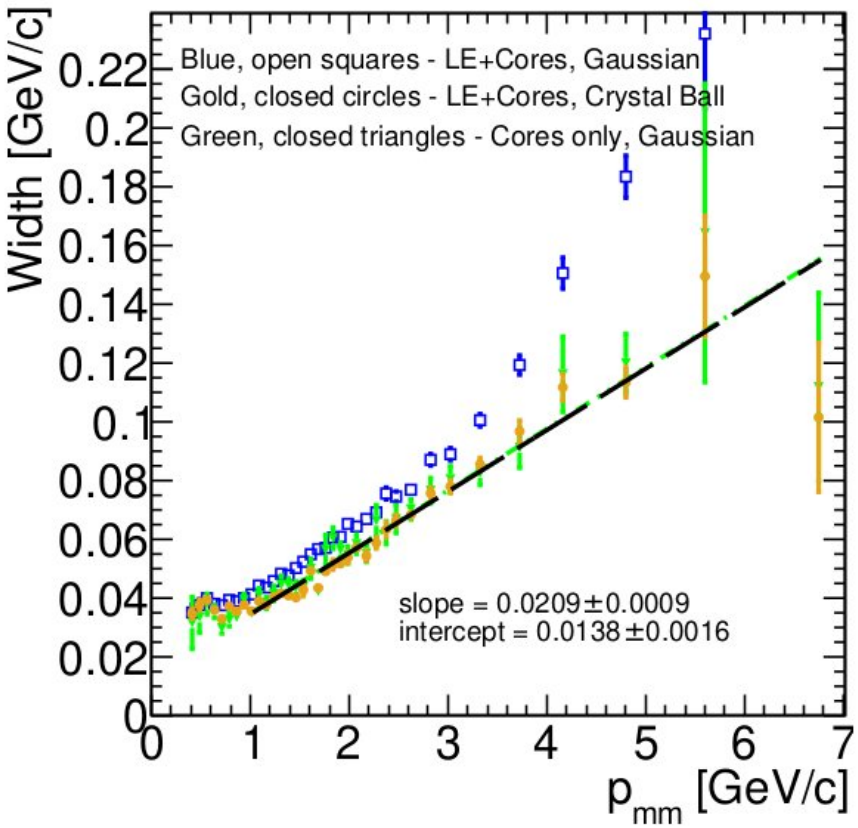


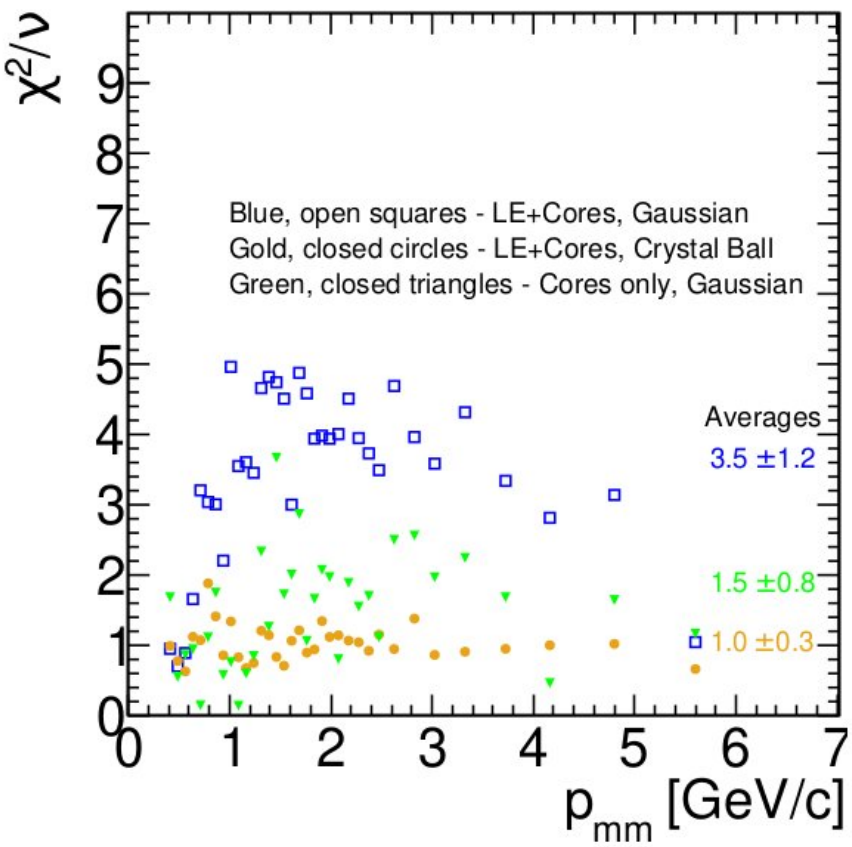
Thu Sep 1 12:35:38 2022


0.38-0.45 GeV/c bin:0
0.45-0.53 GeV/c bin:1
0.53-0.60 GeV/c bin:2
0.60-0.68 GeV/c bin:3
0.68-0.75 GeV/c bin:4
0.75-0.82 GeV/c bin:5
0.82-0.90 GeV/c bin:6
0.90-0.97 GeV/c bin:7
0.97-1.05 GeV/c bin:8
1.05-1.12 GeV/c bin:9
1.12-1.20 GeV/c bin:10
1.20-1.27 GeV/c bin:11
1.27-1.35 GeV/c bin:12
1.35-1.43 GeV/c bin:13
1.43-1.50 GeV/c bin:14
1.50-1.57 GeV/c bin:15
1.57-1.65 GeV/c bin:16
1.65-1.73 GeV/c bin:17
1.73-1.80 GeV/c bin:18
1.80-1.88 GeV/c bin:19
1.88-1.95 GeV/c bin:20
1.95-2.03 GeV/c bin:21
2.03-2.12 GeV/c bin:22
2.12-2.23 GeV/c bin:23
2.23-2.33 GeV/c bin:24
2.33-2.42 GeV/c bin:25
2.42-2.52 GeV/c bin:26
2.52-2.73 GeV/c bin:27
2.73-2.92 GeV/c bin:28
2.92-3.12 GeV/c bin:29
3.12-3.52 GeV/c bin:30
3.52-3.92 GeV/c bin:31
3.92-4.40 GeV/c bin:32
4.40-5.20 GeV/c bin:33
5.20-6.00 GeV/c bin:34
6.00-7.50 GeV/c bin:35
Counts
Missing Mass [GeV]

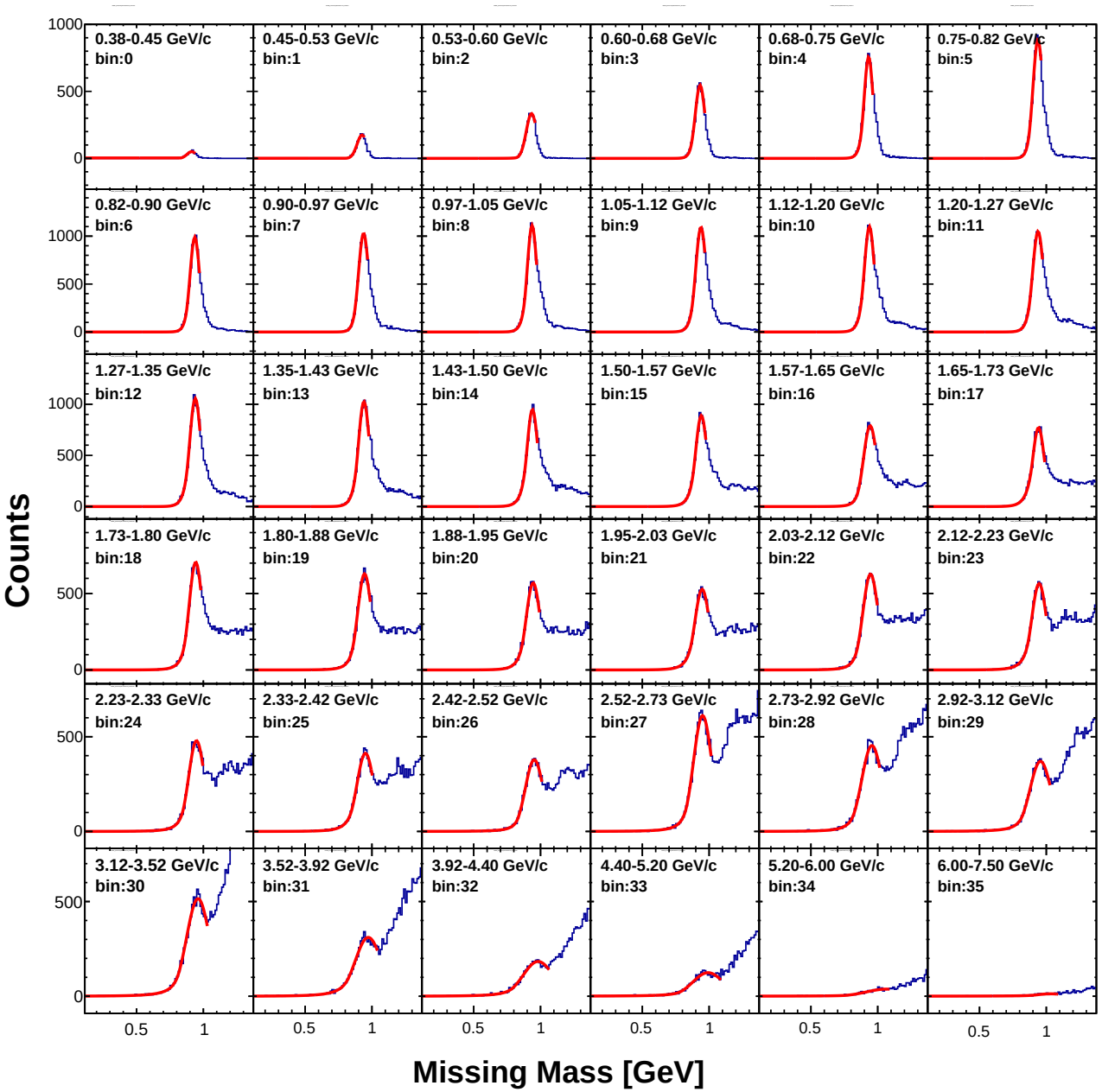
Additional Slides

Detected Neutron Width and χ^2/ν





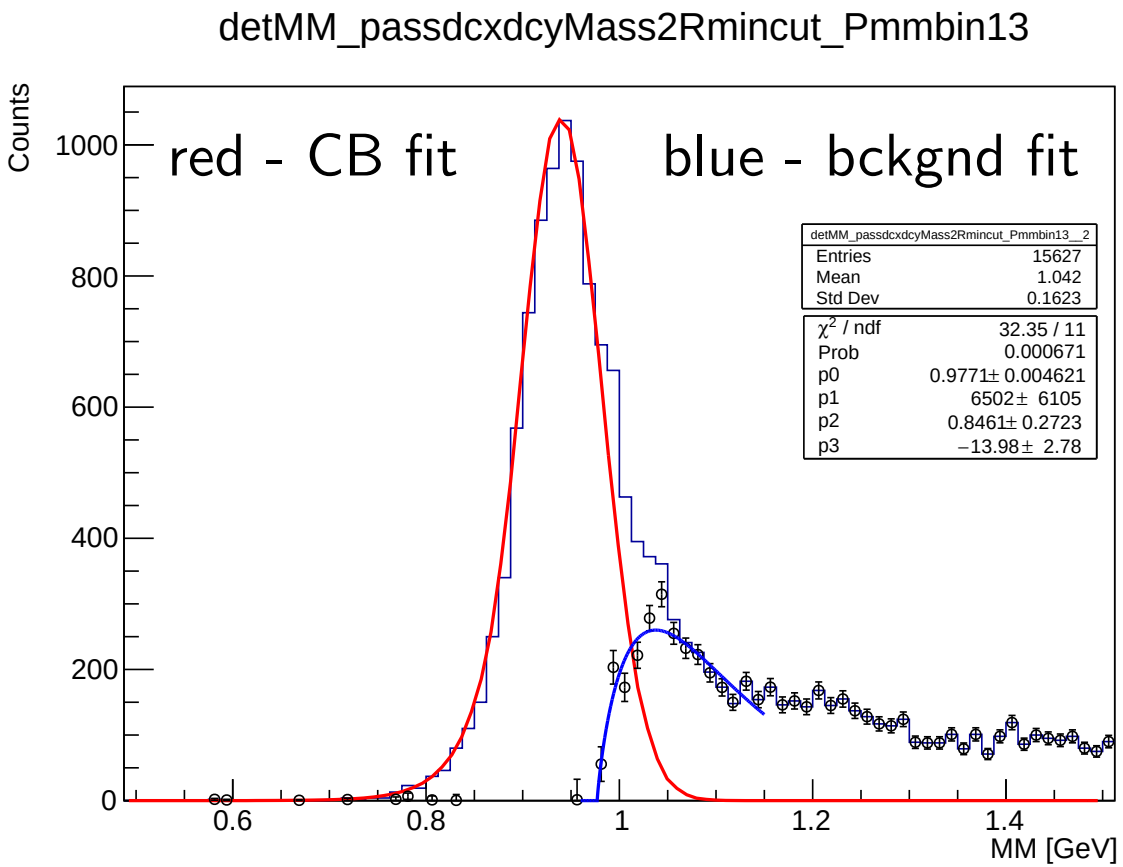
Fit Crystal Ball Function (Detected neutrons)



Data file:
data10p6nosidiscutv4.root

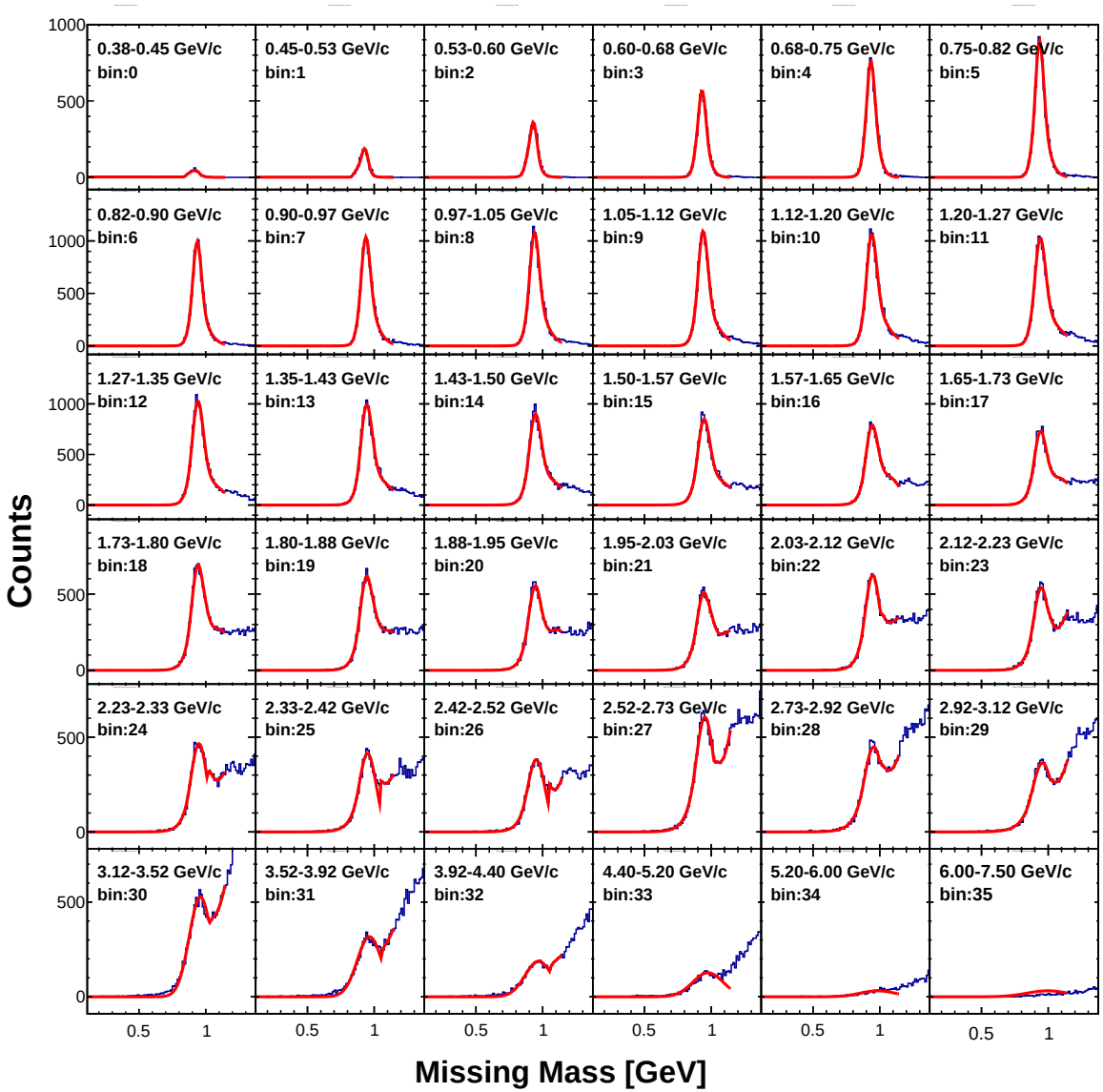
Histograms:
detMM_passdcxdcyMass2Rmincut_Pmmbin

Background Lineshape (Detected neutrons)



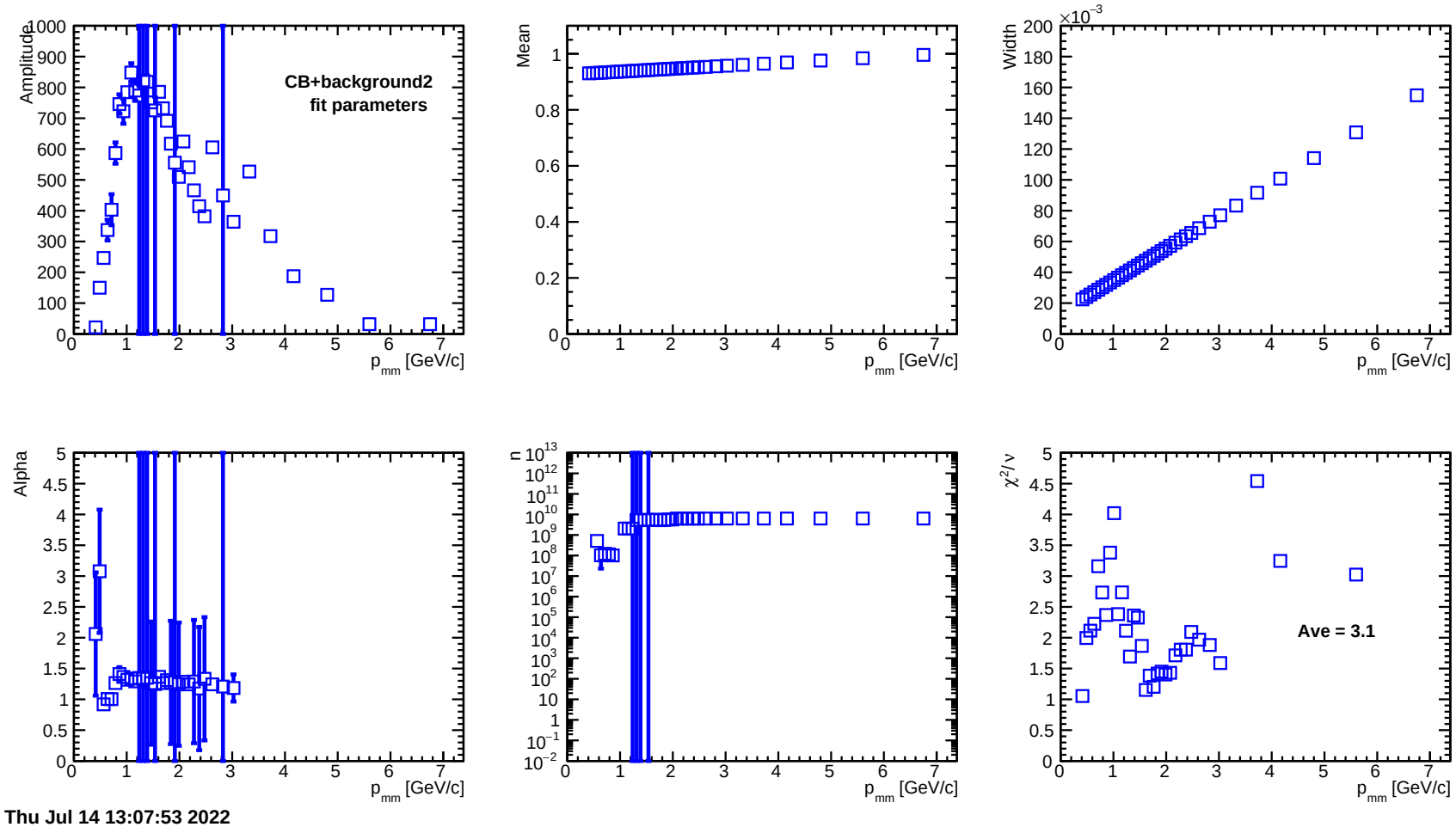
1. Fit the range from $MM = 0 \rightarrow \overline{MM} + \sigma$ with Crystal Ball fn.
2. Using full data range subtract fit from data $\Delta = N_{data} - M_{fit}$
3. Use result to guide choice of fitting function.
4. $bckgnd = N(MM - MM_0)^n e^{\lambda(MM - MM_0)}$

Use results for mean and width from CB LE+core fits



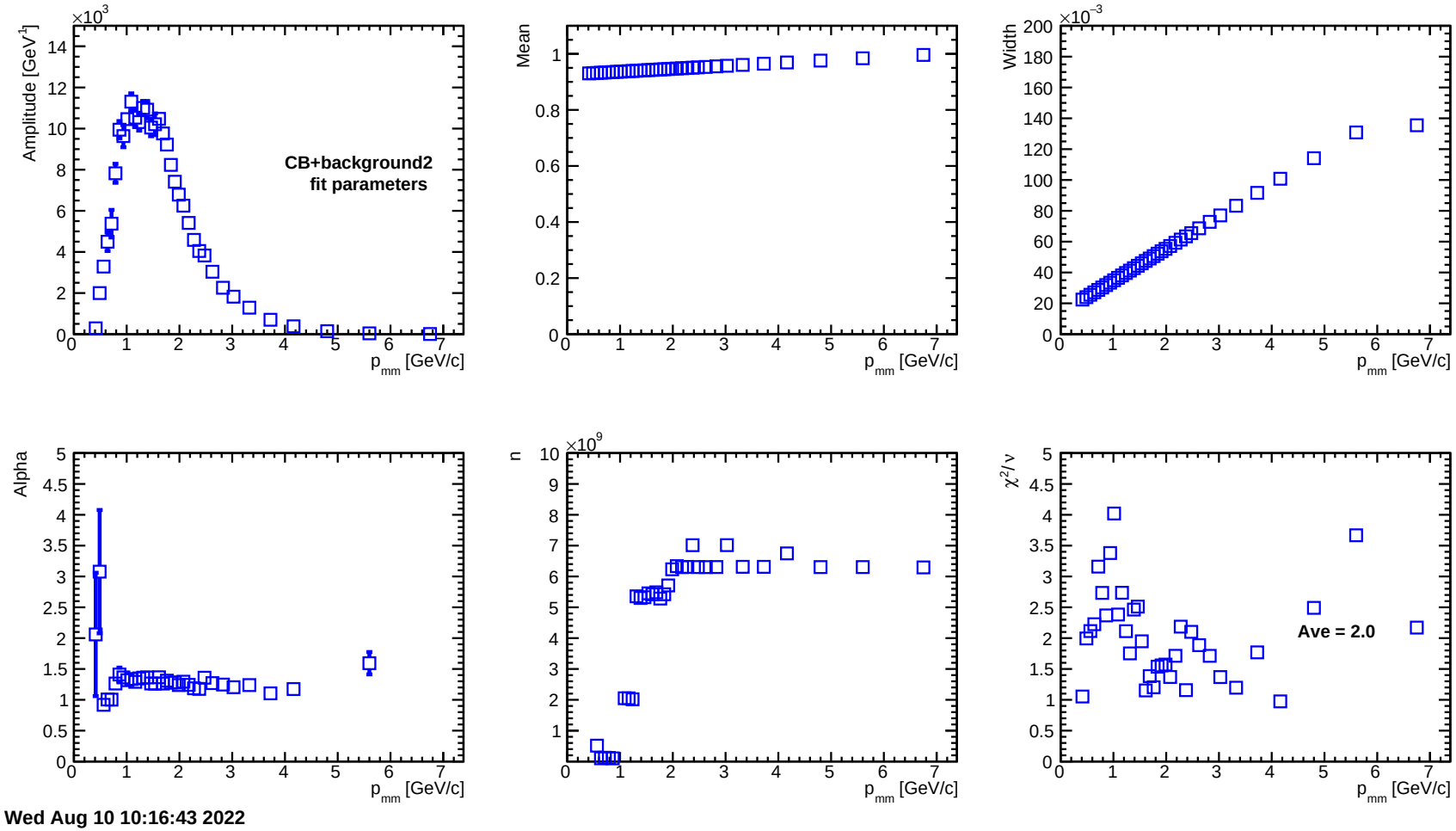
fix μ and σ, range to 1.15 GeV

Fit Parameters from CB LE+core fits - 1



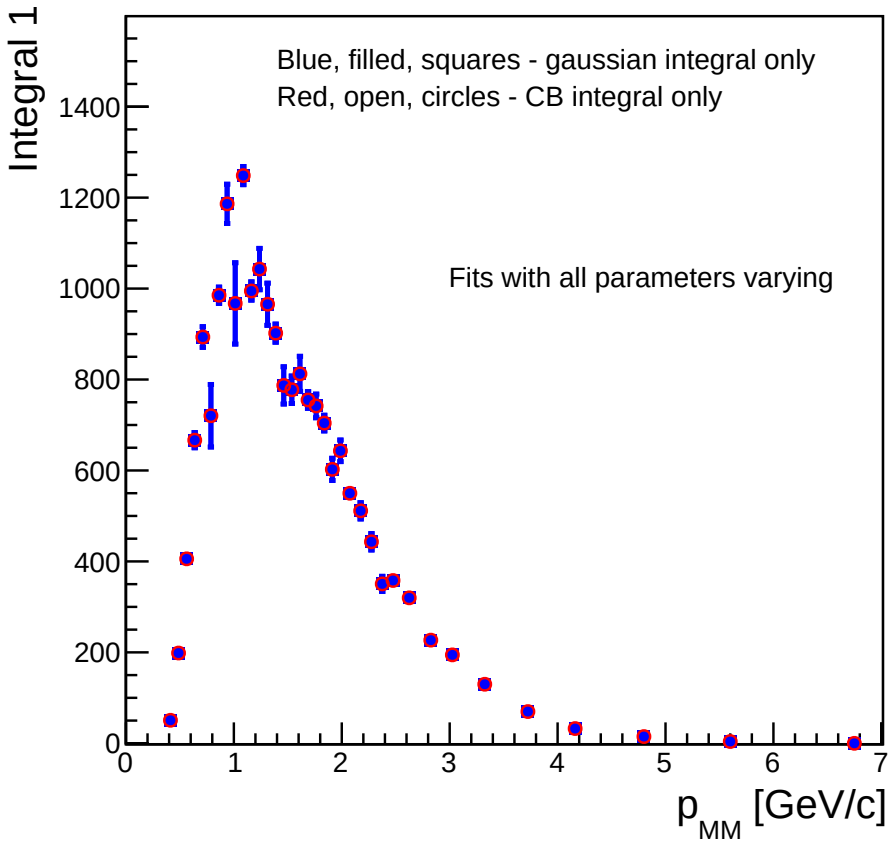
fix μ and σ, range to 1.15 GeV

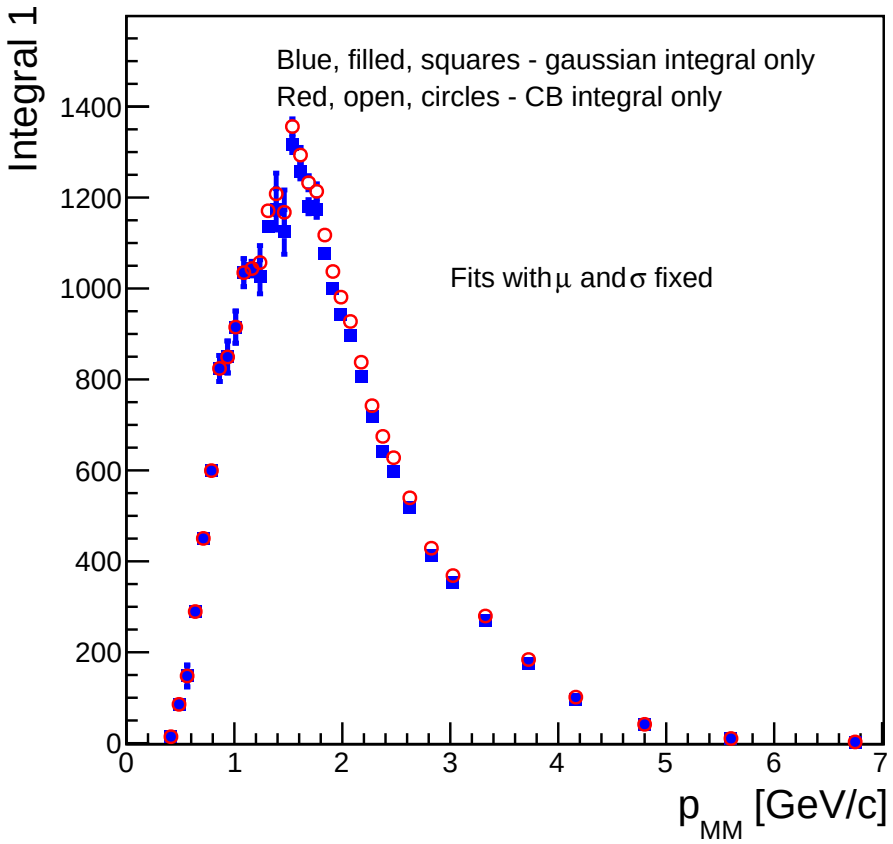
Fit Parameters from CB LE+core fits - 2



fix μ and σ, range to 1.15 GeV

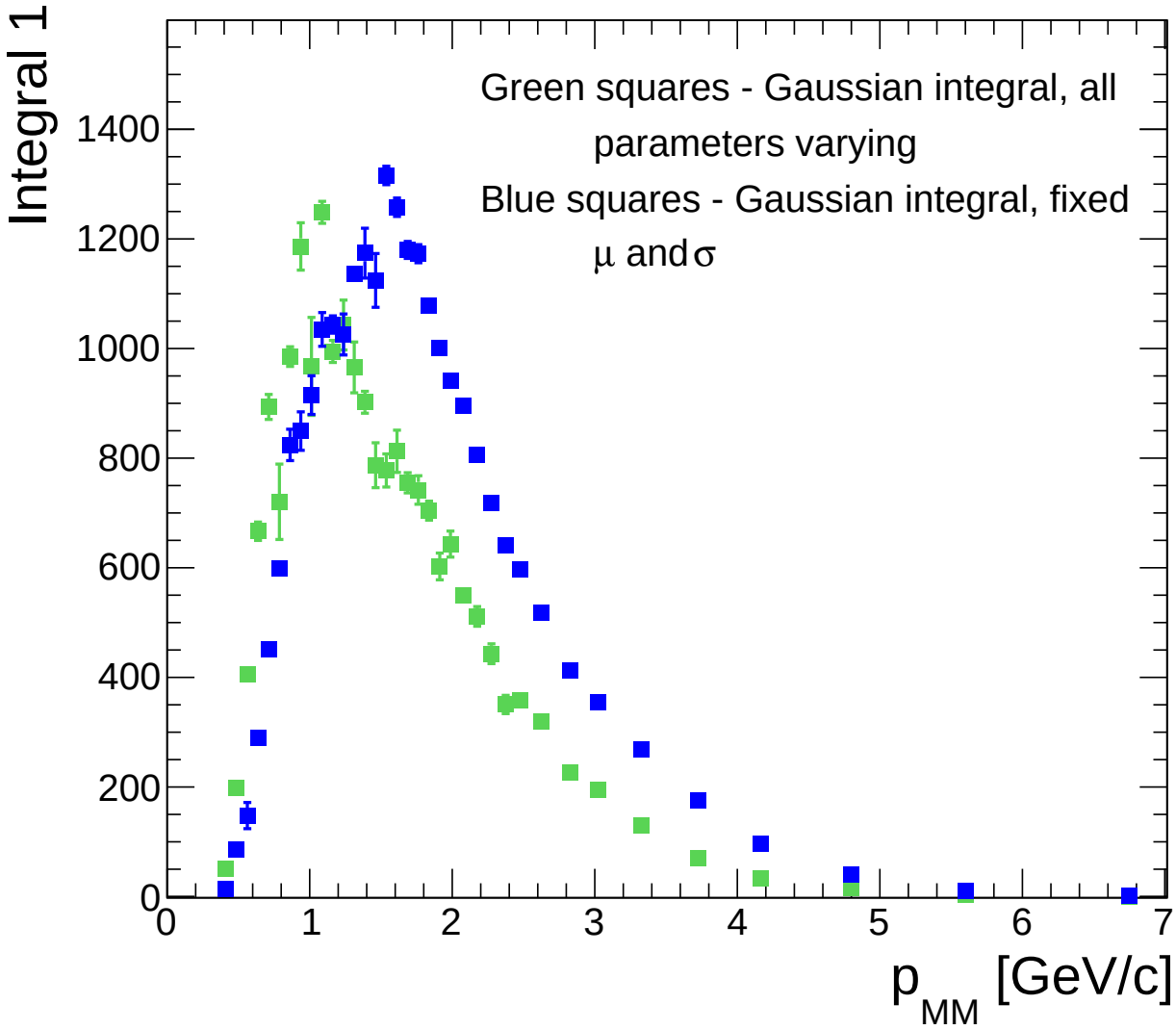
Fit Parameters from CB LE+core fits - 3





Red: fix μ and σ, range to 1.15 GeV

Blue: allow μ and σ to vary, MM range to 1.15 GeV



$\langle \chi^2/\nu \rangle = 2.0$ (blue)

$\langle \chi^2/\nu \rangle = 1.7$ (green)

The Crystal Ball function is given by

$$f(x;\alpha,n,\overline{x},\sigma) = N\exp\left(-\frac{(x-\overline{x})^2}{2\sigma^2}\right), \qquad \text{for}\,\frac{x-\overline{x}}{\sigma} > -\alpha$$

$$= N\cdot A\cdot\left(B-\frac{x-\overline{x}}{\sigma}\right)^{-n}, \qquad \text{for}\,\frac{x-\overline{x}}{\sigma} < -\alpha$$

where

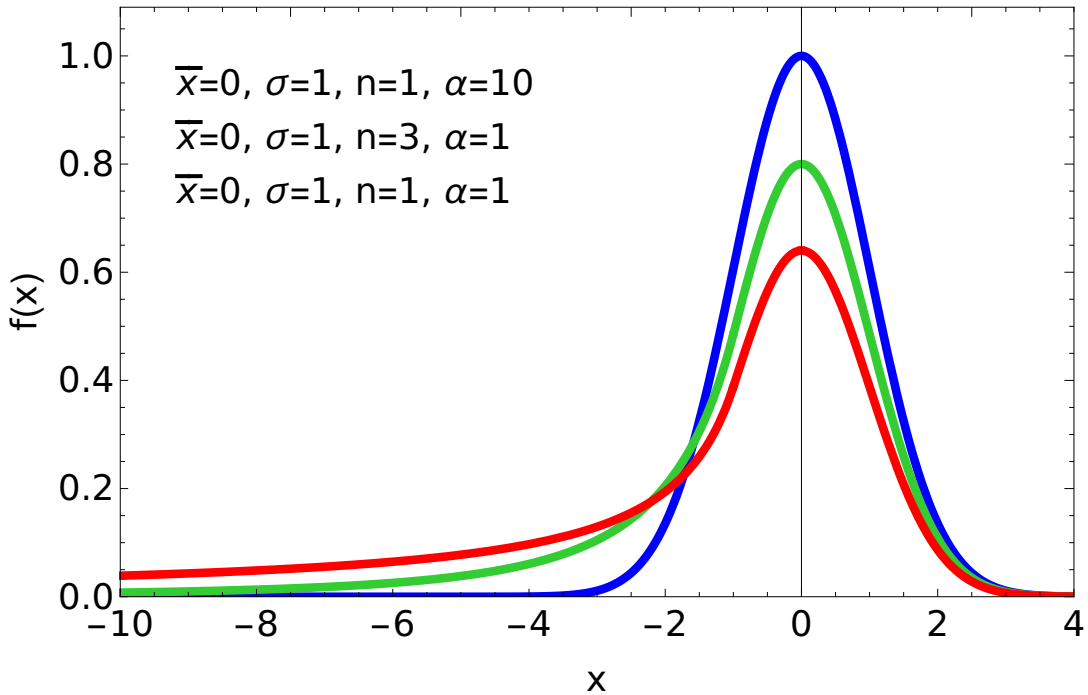
$$A = \left(\frac{n}{|\alpha|}\right)^n\cdot\exp\left(-\frac{|\alpha|^2}{2}\right),$$

$$B = \frac{n}{|\alpha|} - |\alpha|,$$

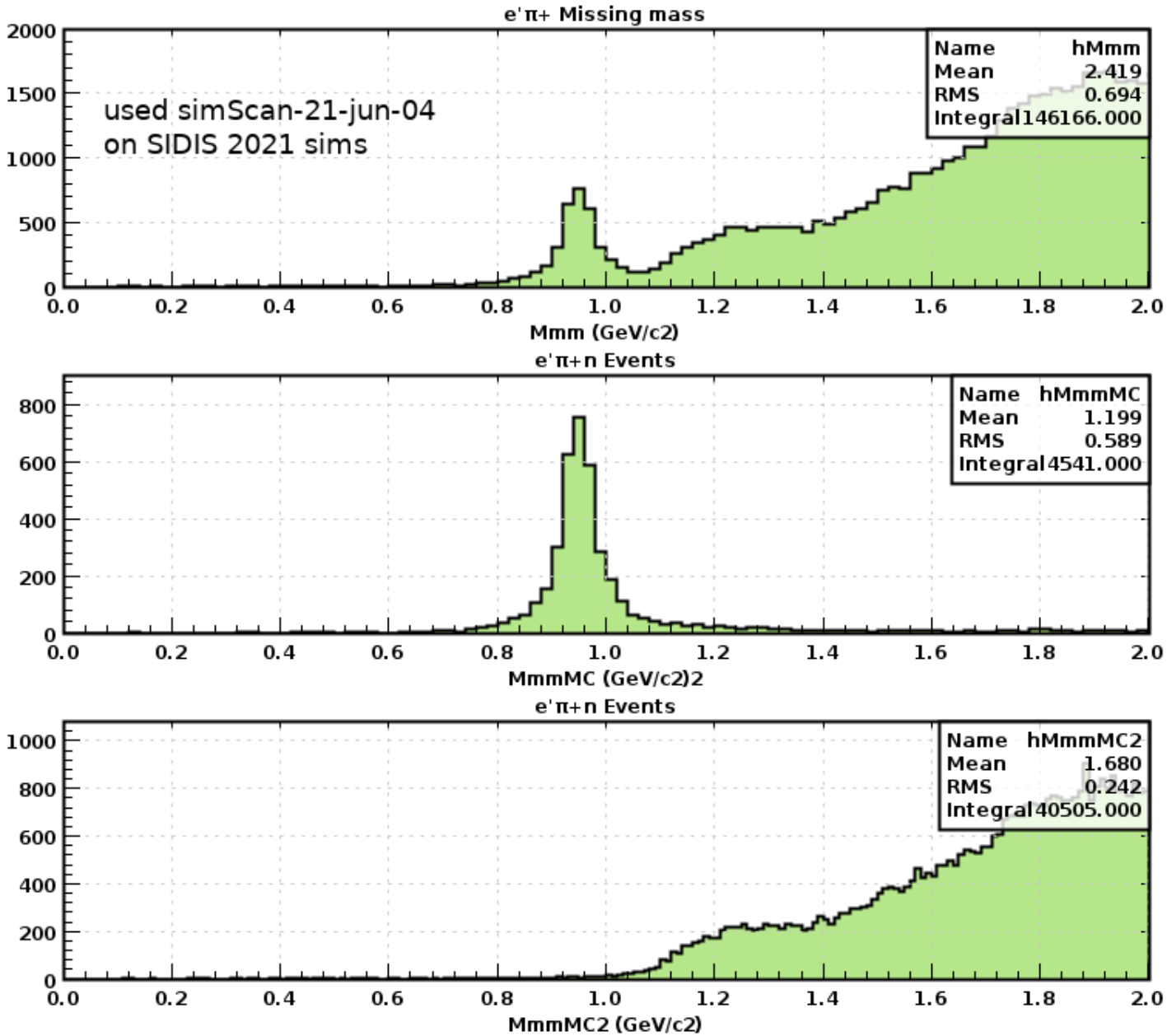
$$N = \frac{1}{\sigma(C+D)},$$

$$C = \frac{n}{|\alpha|}\cdot\frac{1}{n-1}\cdot\exp\left(-\frac{|\alpha|^2}{2}\right),$$

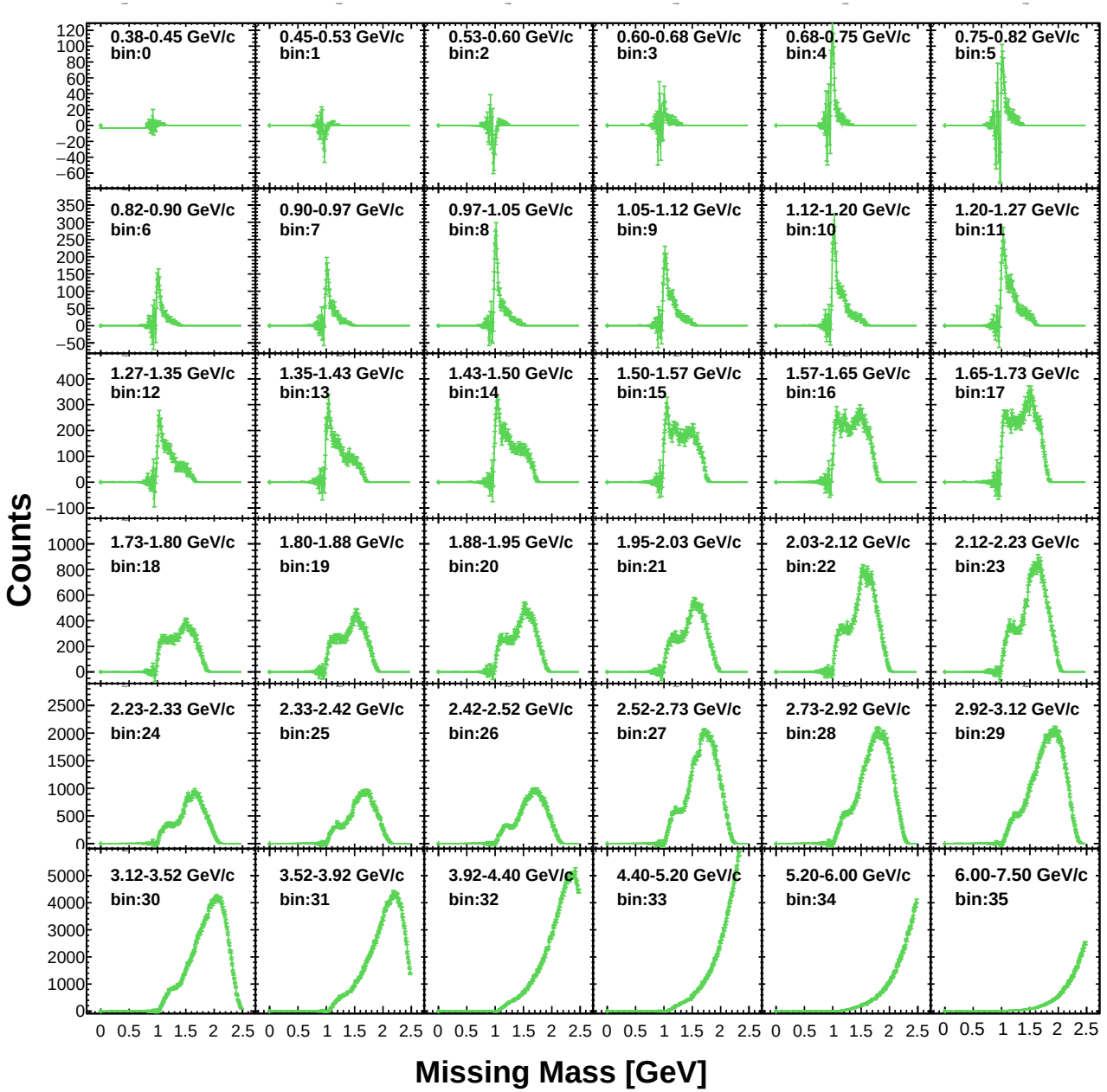
$$D = \sqrt{\frac{\pi}{2}}\left(1+\text{erf}\left(\frac{|\alpha|^2}{2}\right)\right)$$



Simulated (SIDIS) Proton Results



Background Lineshape (Detected neutrons)



1. Fit the range $MM = 0 \rightarrow \overline{MM} + \sigma$ with Crystal Ball fn.
2. Using full data range subtract fit from data $\Delta = N_{data} - M_{fit}$
3. Use result to guide choice of fitting function.