List of things this talk will discuss:

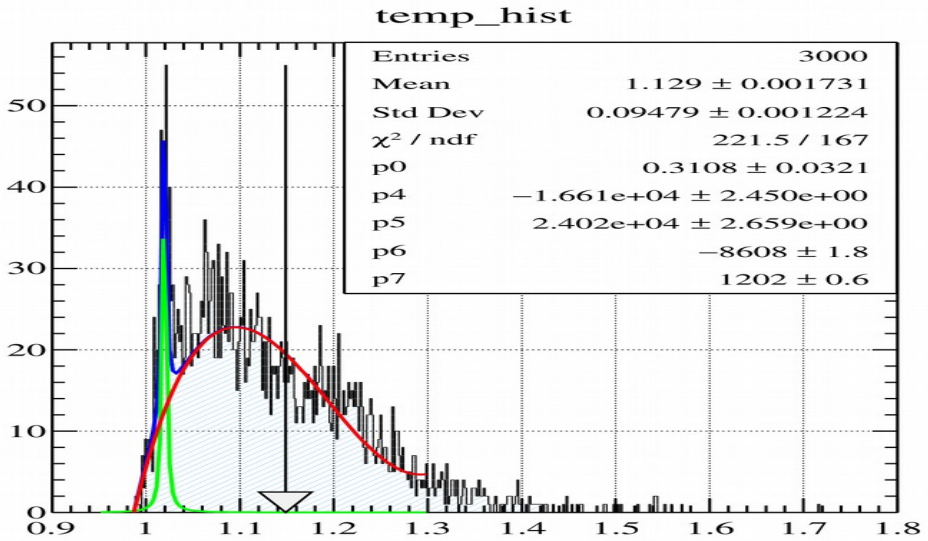
- Testing the ‘cusp’ effect seen in the background histogram for the K+K- invariant mass using:
  - Different fixed Gaussian resolutions + fixed phi mass + fixed phi width
    - Sigma = 0.001
    - Sigma = 0.002
    - Sigma = 0.003
    - Sigma = 0.004
    - Sigma = 0.005
    - Sigma = 0.01
    - Sigma = 0.02
    - Sigma = 0.03
  - Fixed BG polynomial value at K+K- threshold + fixed phi mass + fixed phi width
  - Fixed phi width + Free phi mass
  - Fixed BG polynomial value at K+K- threshold + free phi mass + fixed phi width

Testing the ‘cusp’ effect:

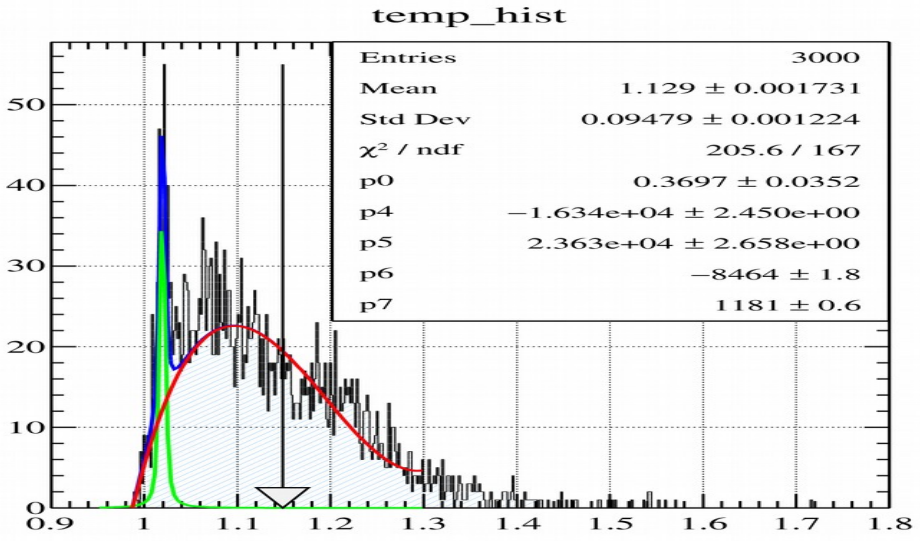
- Background function: 3rd degree Chebyshev polynomial
- Signal function: Voigtian (Non Relativistic Breit-Wigner convoluted with a Gaussian)
- Fixed:
  - Phi Mass
  - Phi Width
  - Phi Resolution (0.001, 0.002. 0.003 ...)
- Free:
  - Polynomial parameters

Event #4 – Example Fits

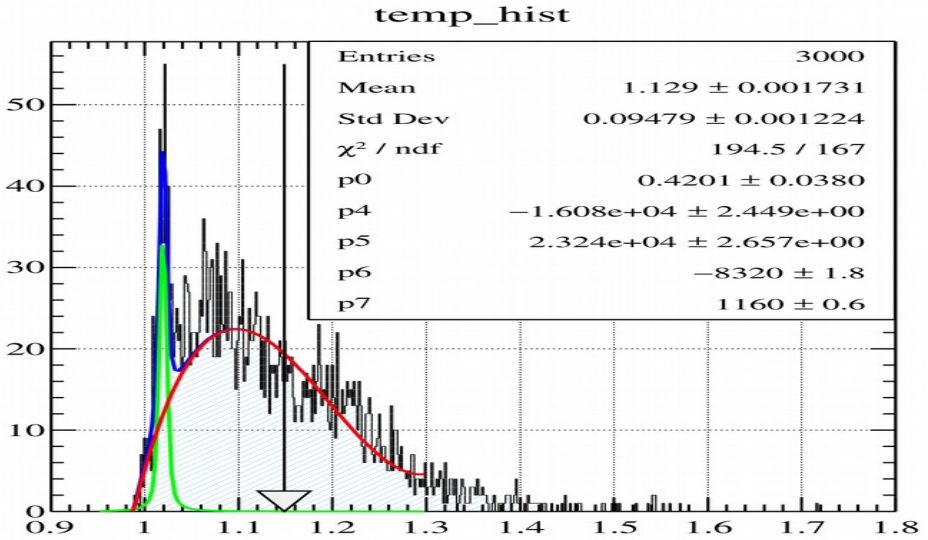
Sigma = 0.001, ChiSq = 1.32



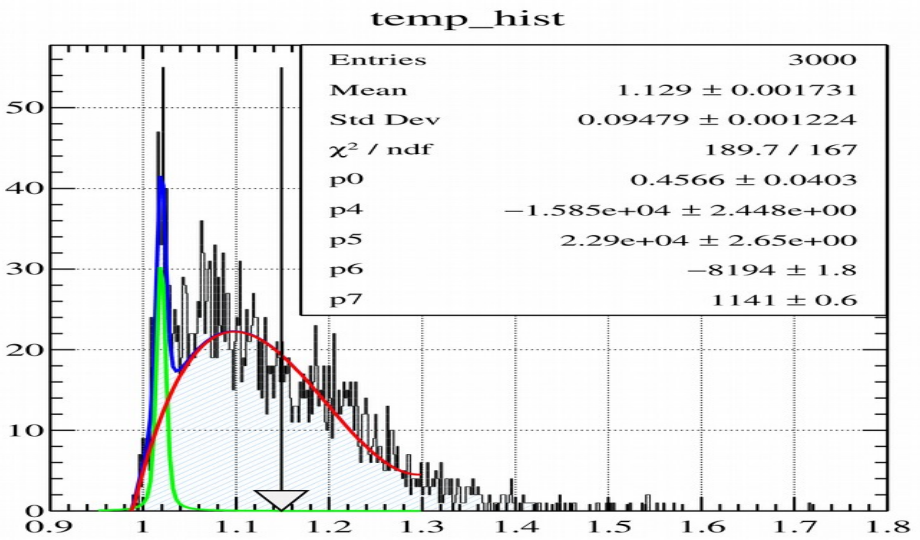
Sigma = 0.002, ChiSq = 1.23



Sigma = 0.003, ChiSq = 1.16

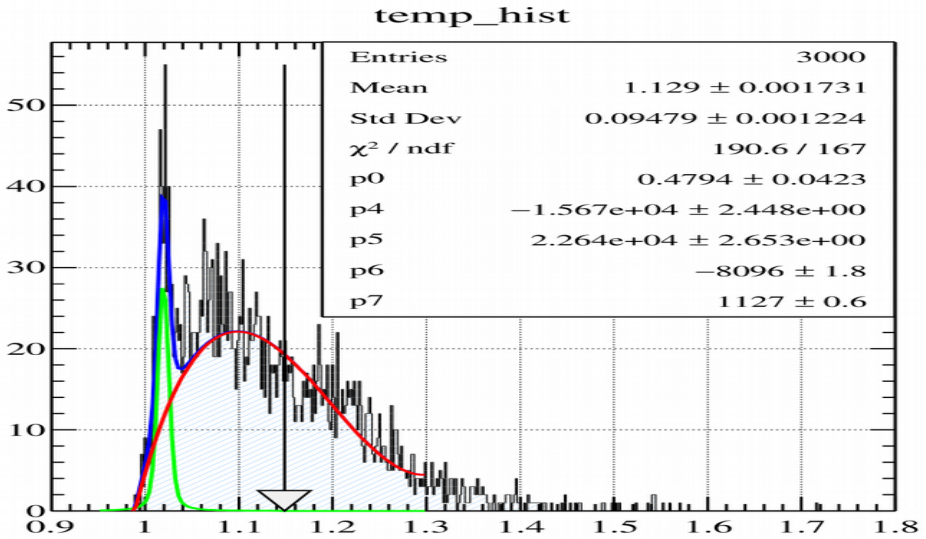


Sigma = 0.004, ChiSq = 1.13

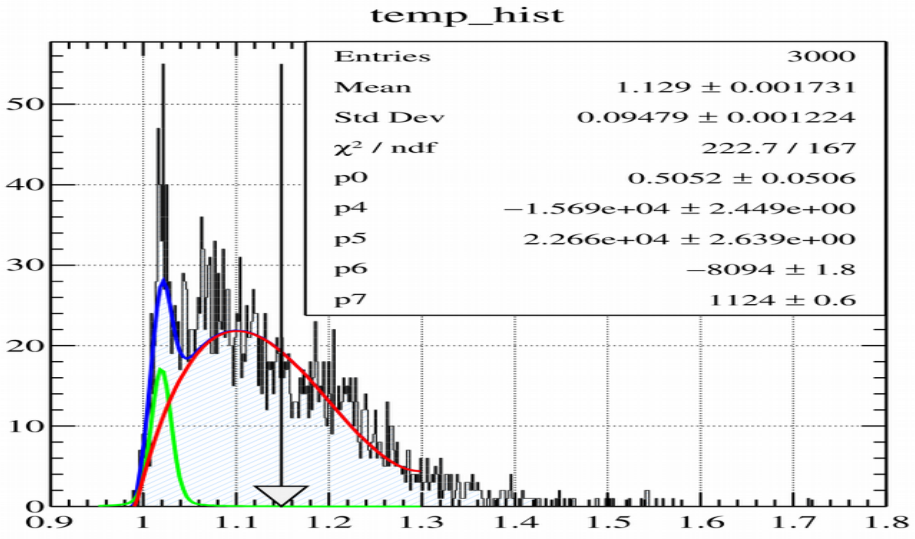


Event #4 – Example Fits

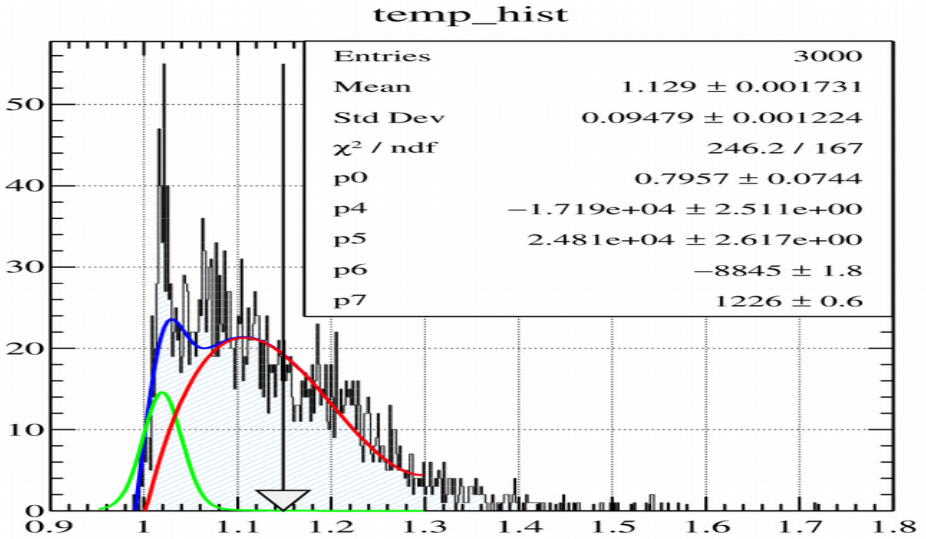
Sigma = 0.005, ChiSq = 1.14



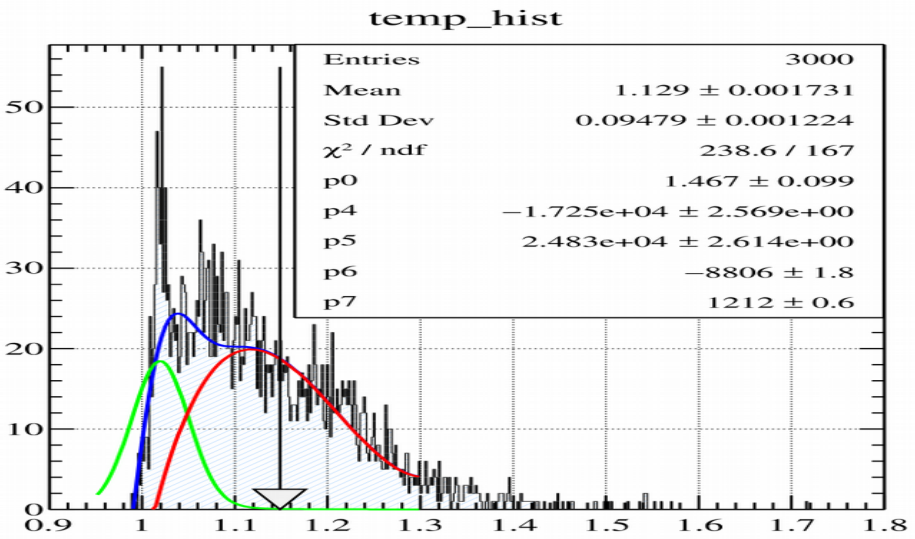
Sigma = 0.01, ChiSq = 1.33



Sigma = 0.02, ChiSq = 1.47

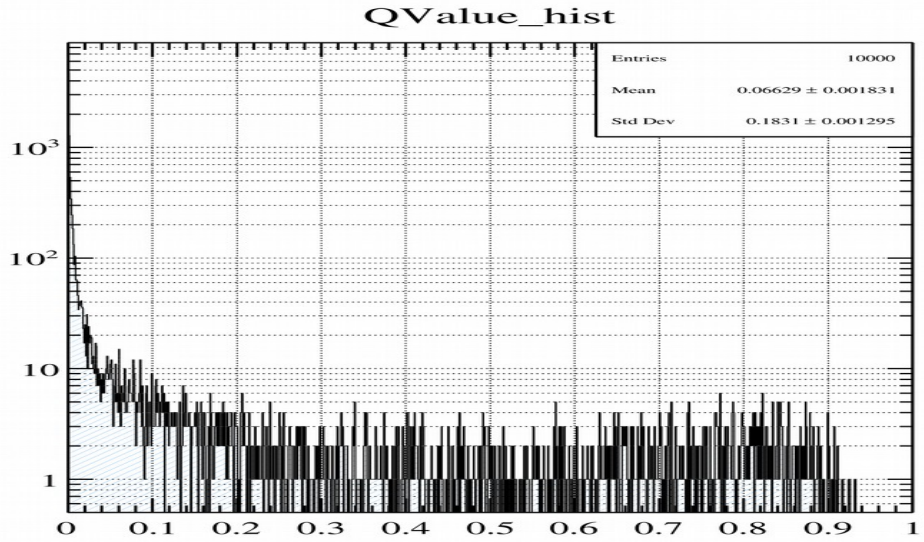


Sigma = 0.03, ChiSq = 1.42

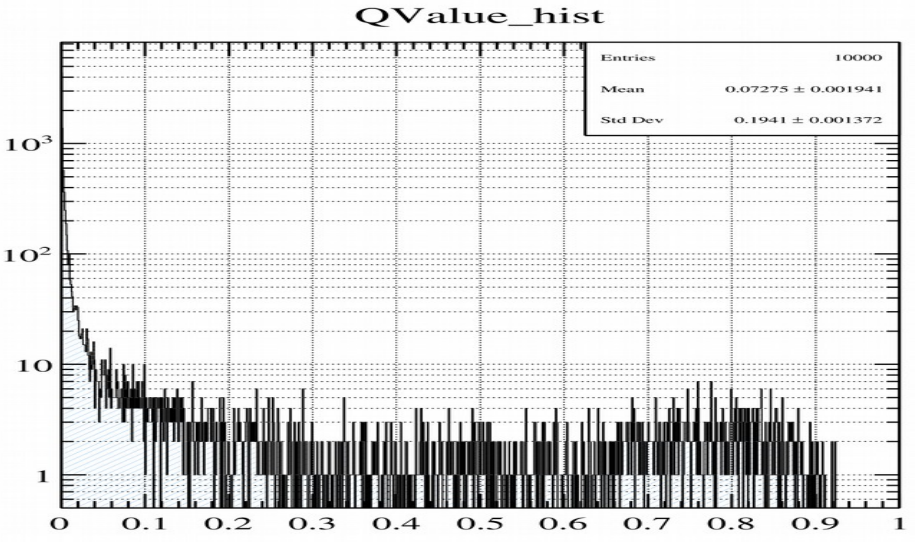


QValues

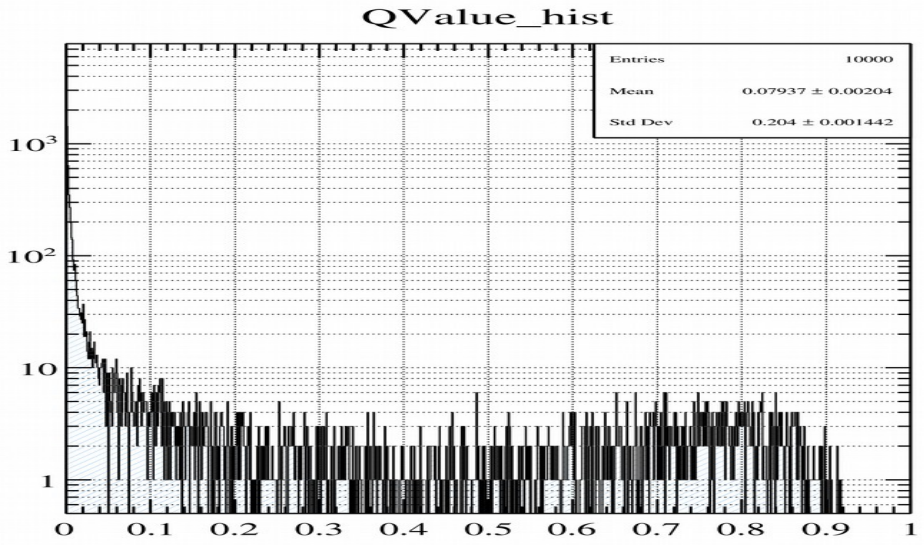
Sigma = 0.001



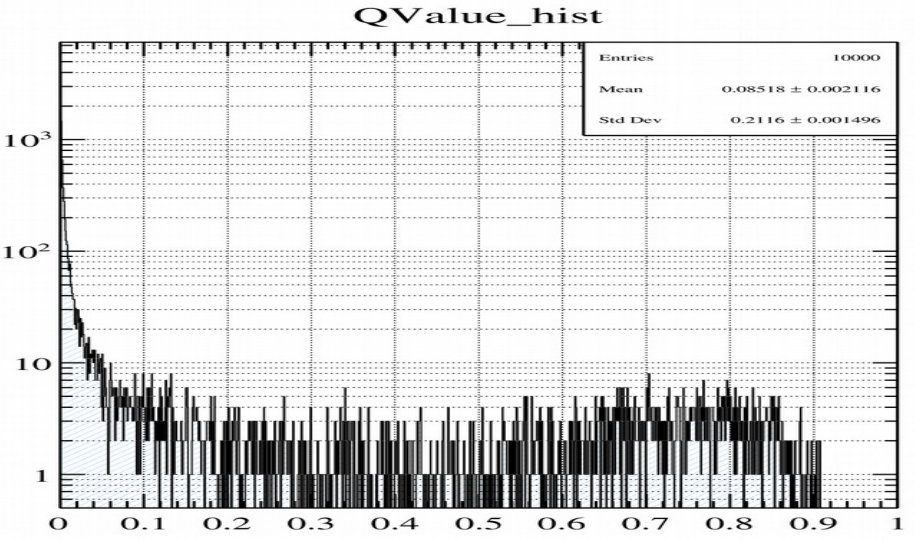
Sigma = 0.002



Sigma = 0.003

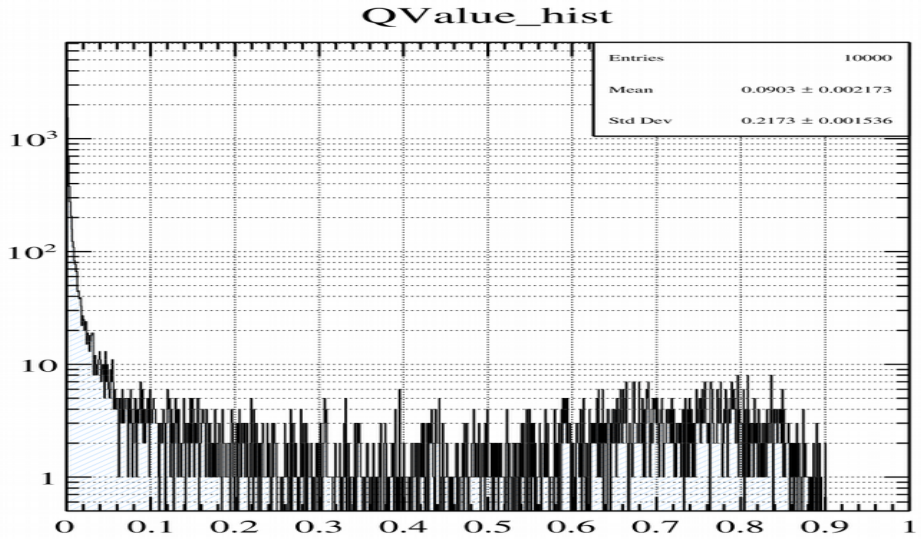


Sigma = 0.004

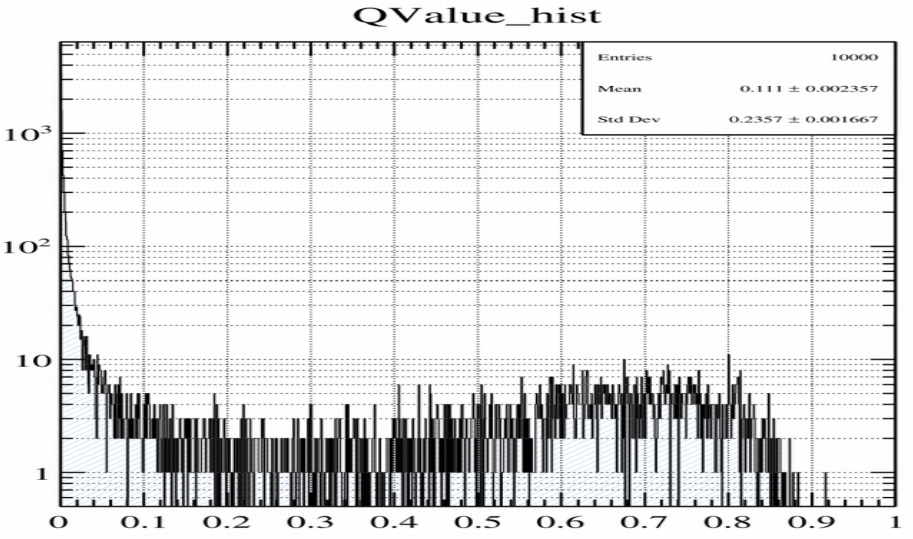


QValues

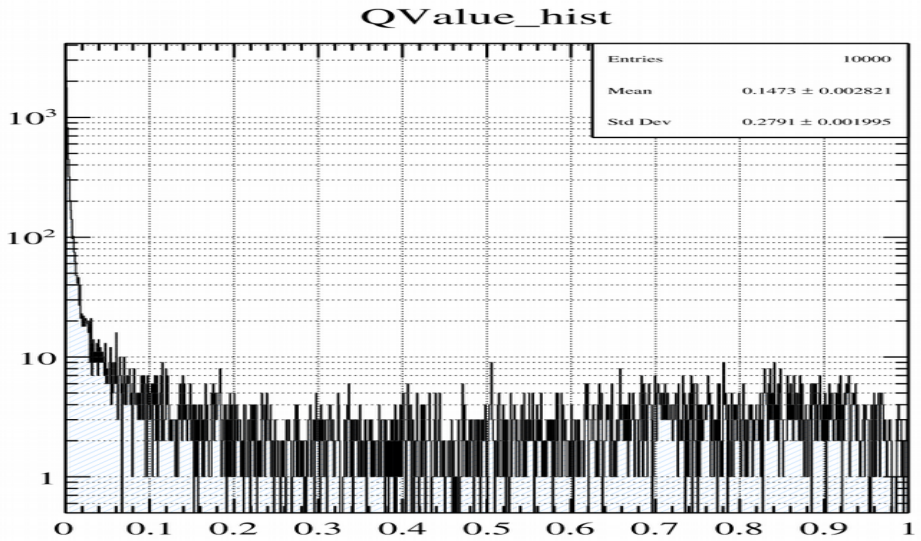
Sigma = 0.005



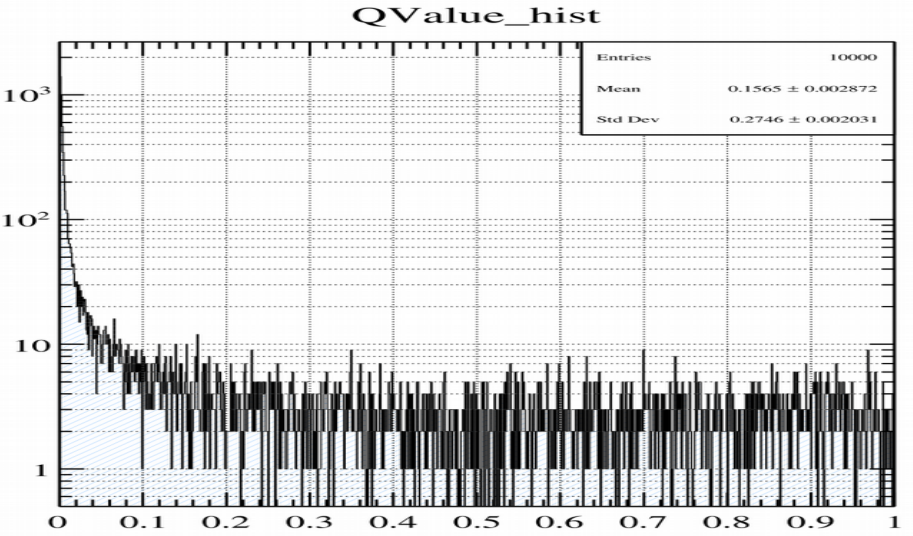
Sigma = 0.01



Sigma = 0.02

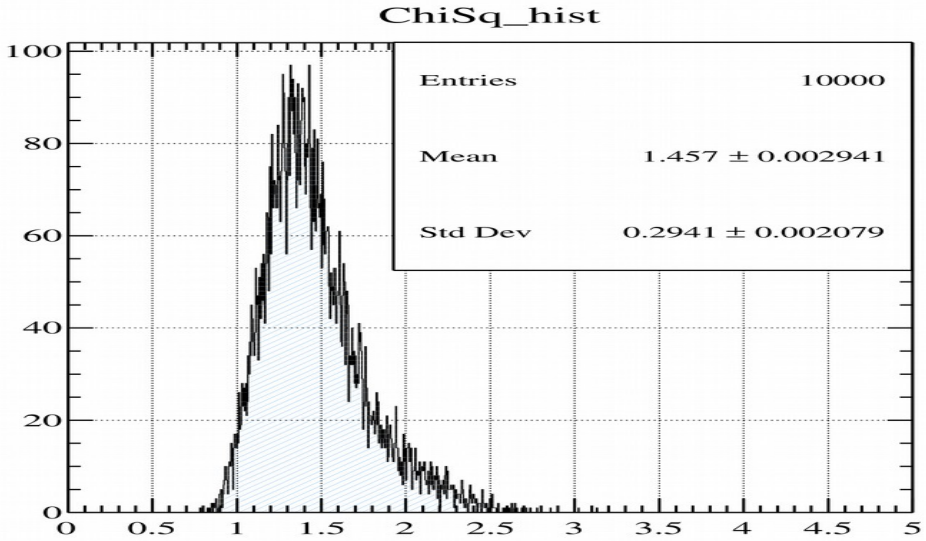


Sigma = 0.03

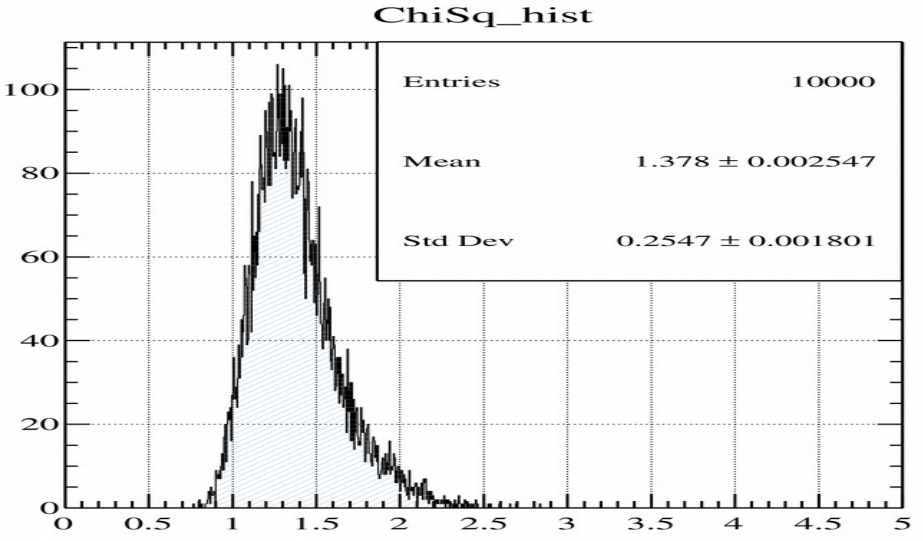


Chi^2/NDF

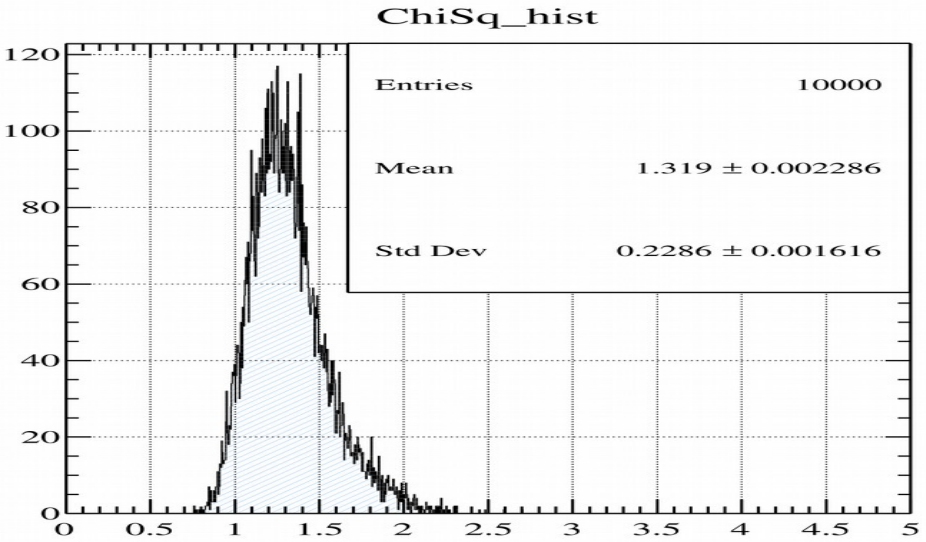
Sigma = 0.001



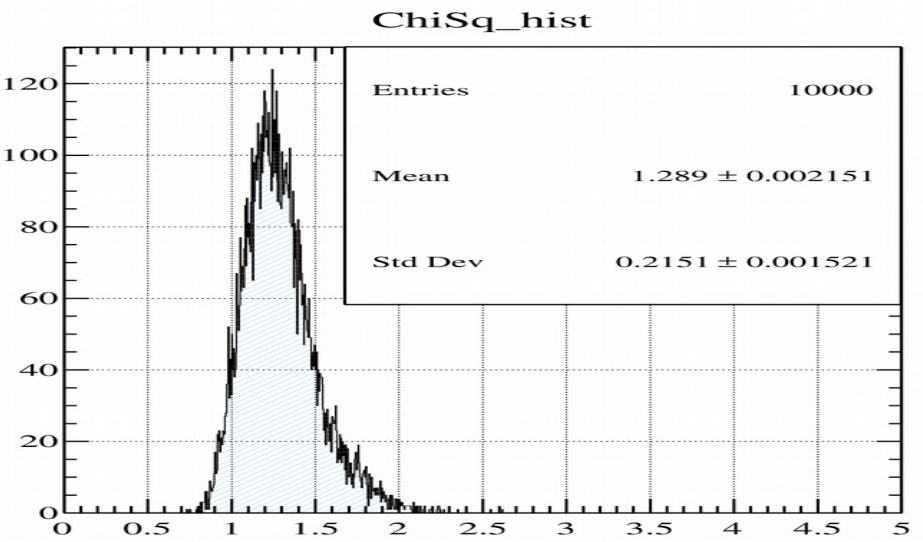
Sigma = 0.002



Sigma = 0.003

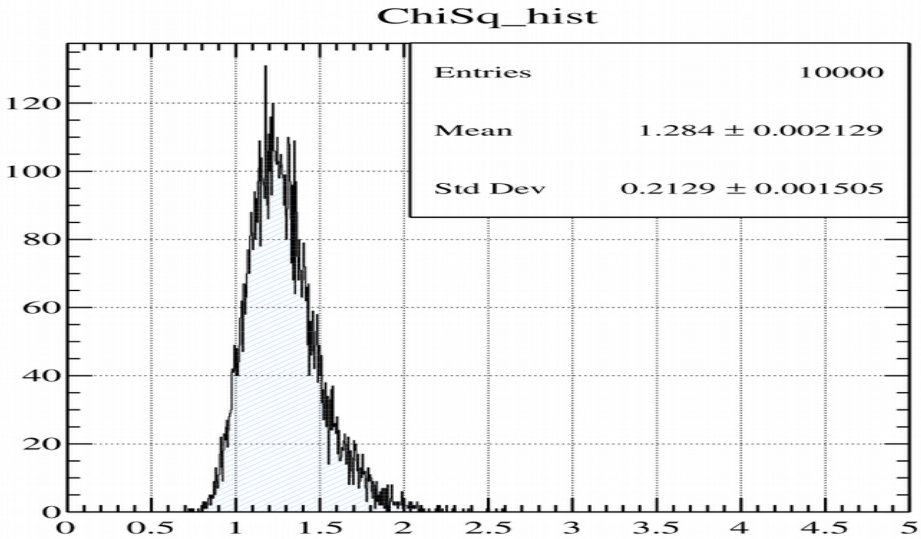


Sigma = 0.004

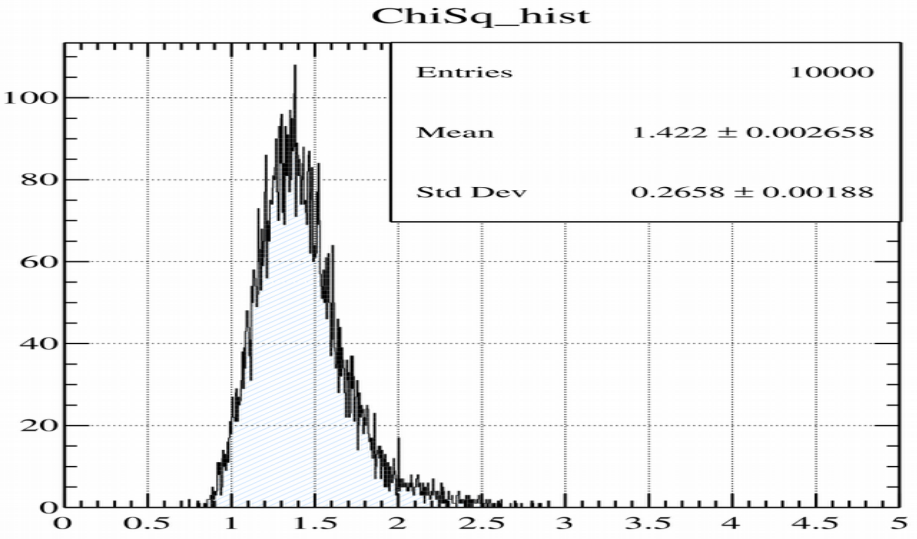


Chi^2/NDF

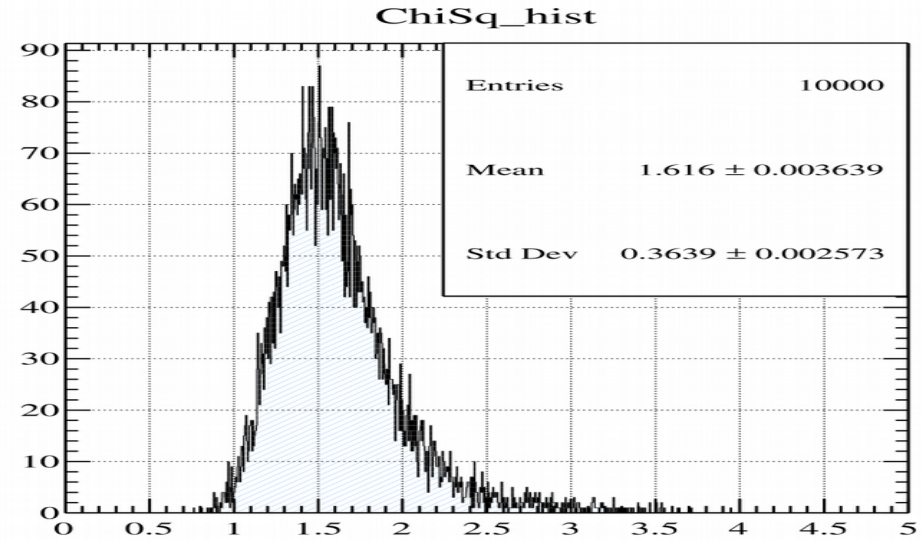
Sigma = 0.005



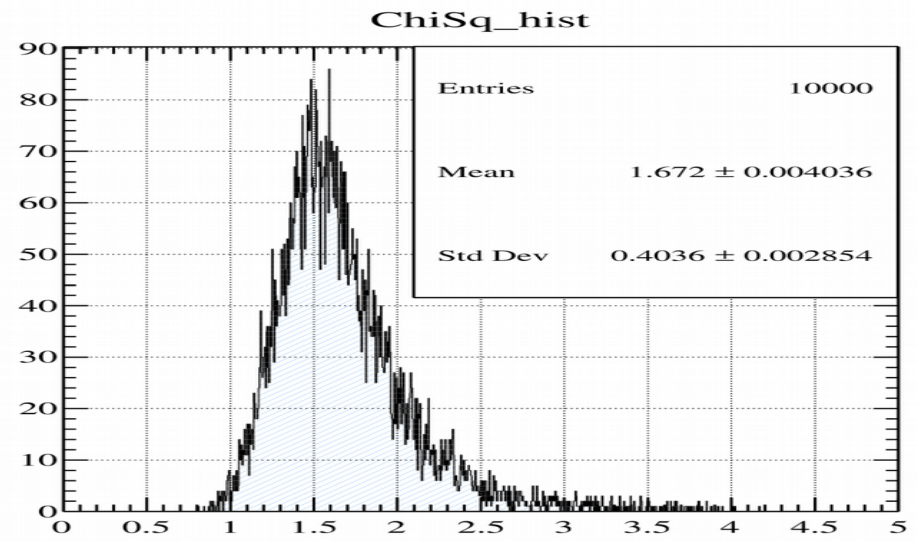
Sigma = 0.01



Sigma = 0.02

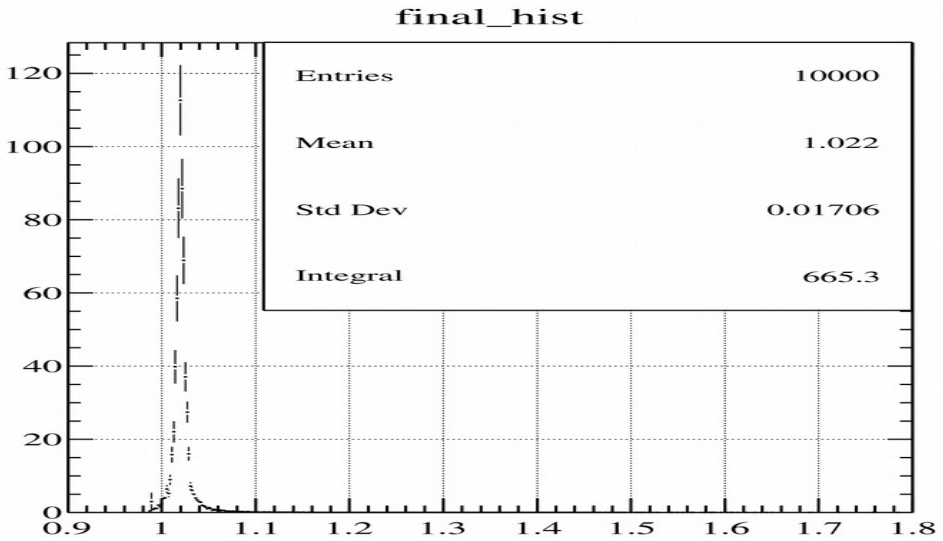


Sigma = 0.03

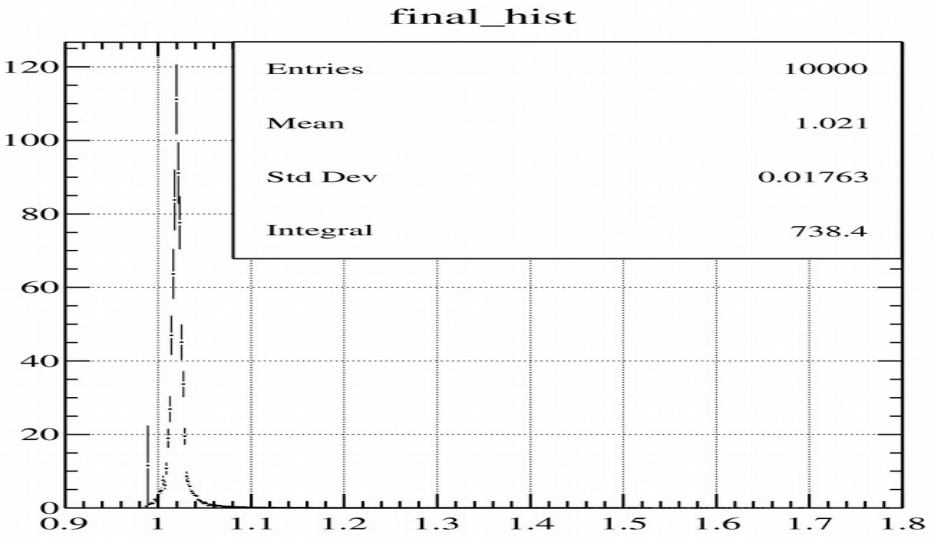


Signal Events

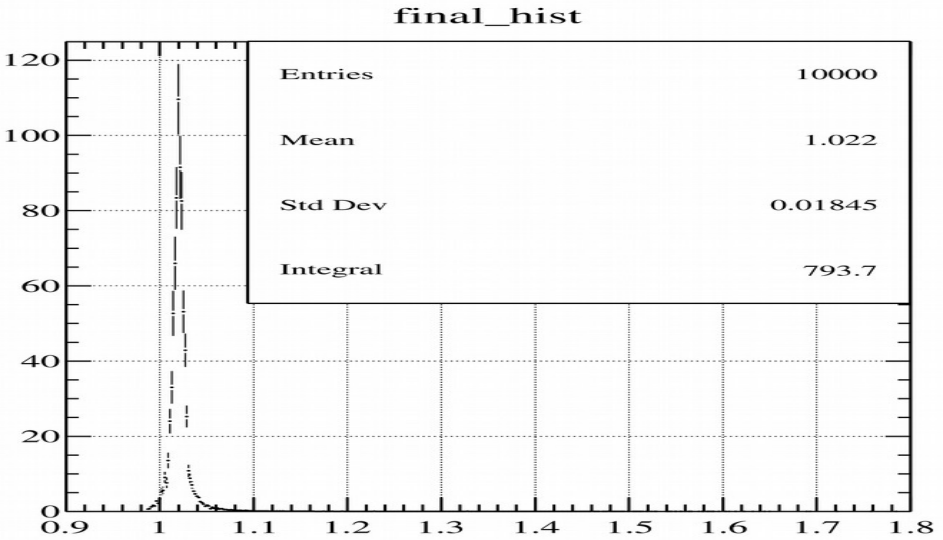
Sigma = 0.001



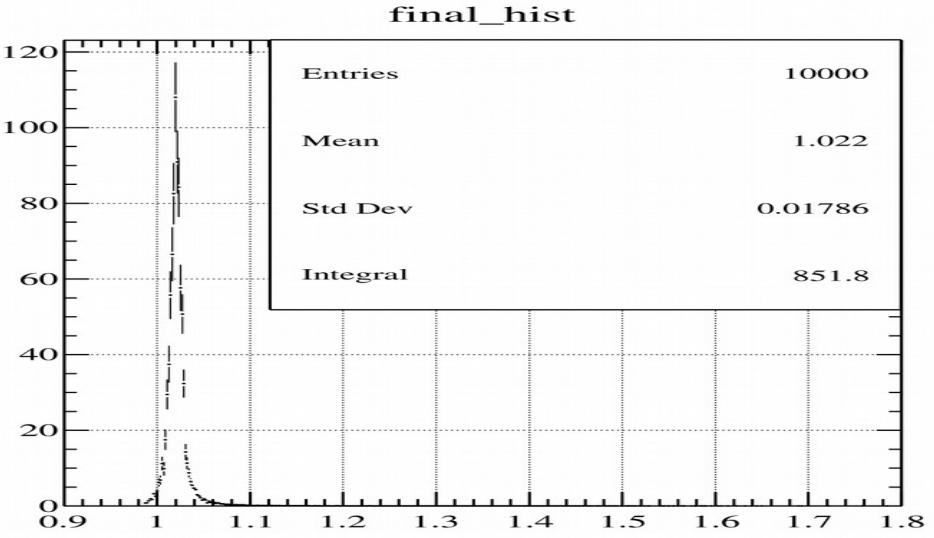
Sigma = 0.002



Sigma = 0.003

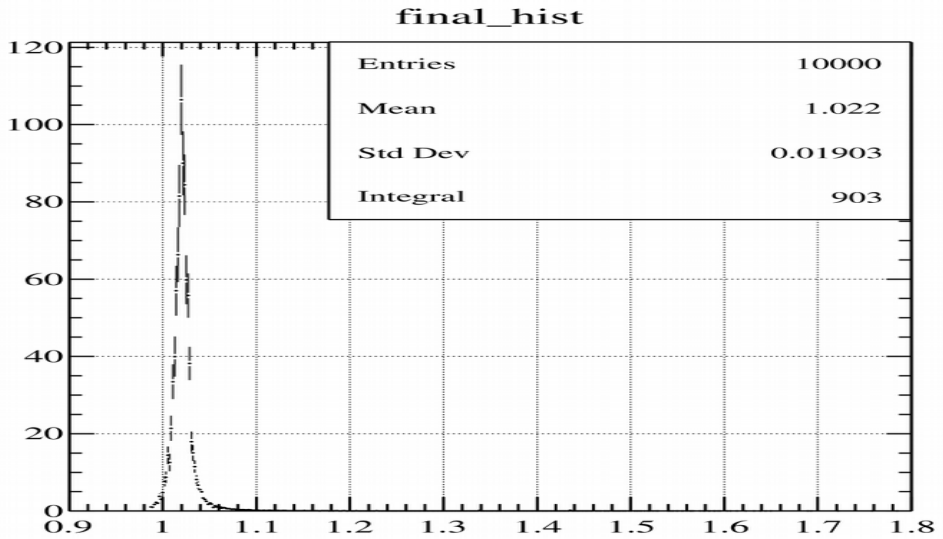


Sigma = 0.004

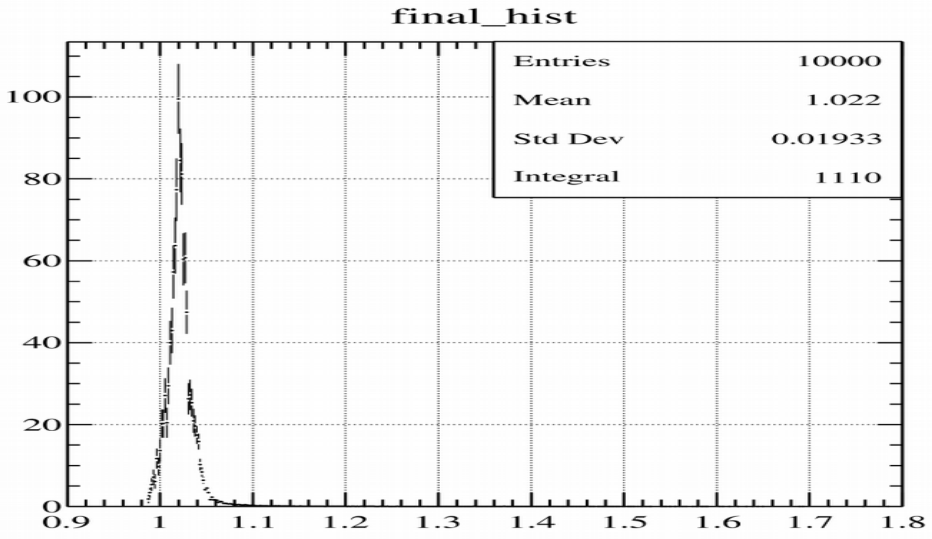


Signal Events

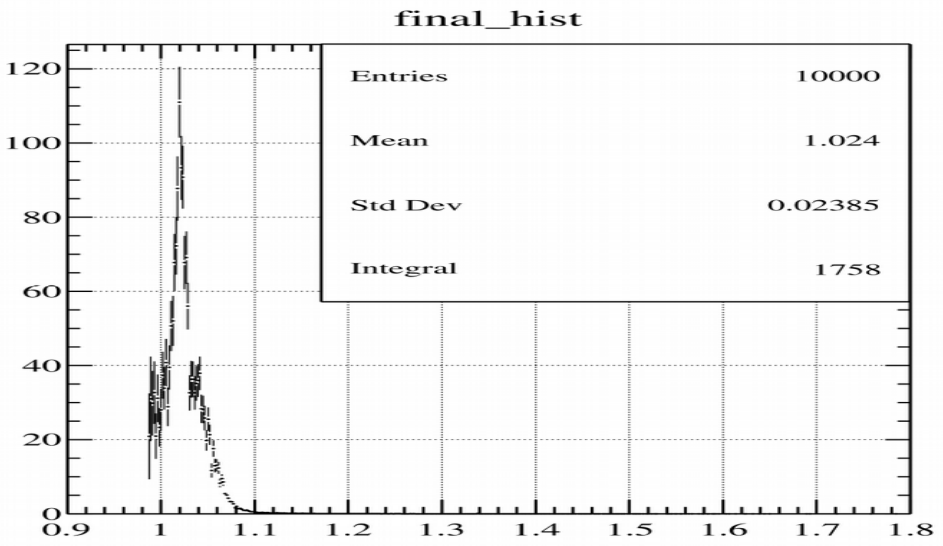
Sigma = 0.005



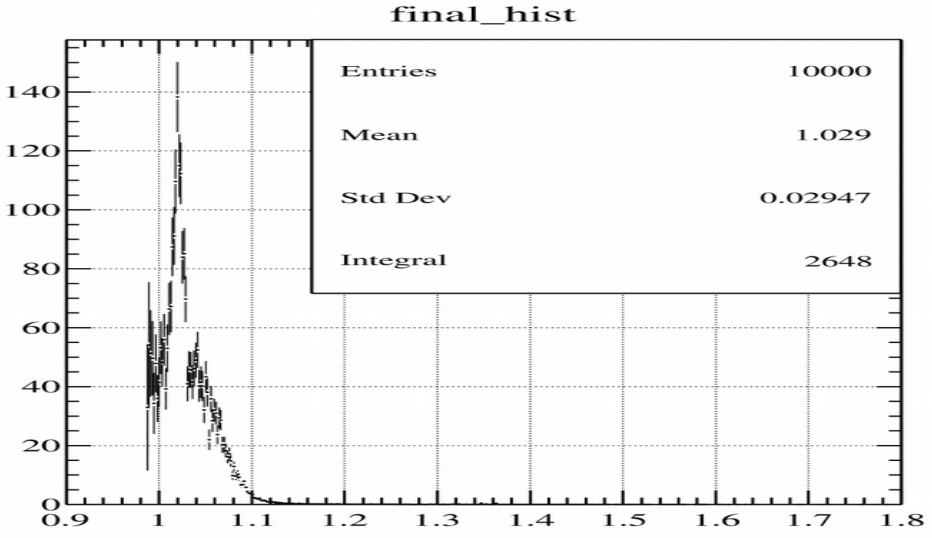
Sigma = 0.01



Sigma = 0.02

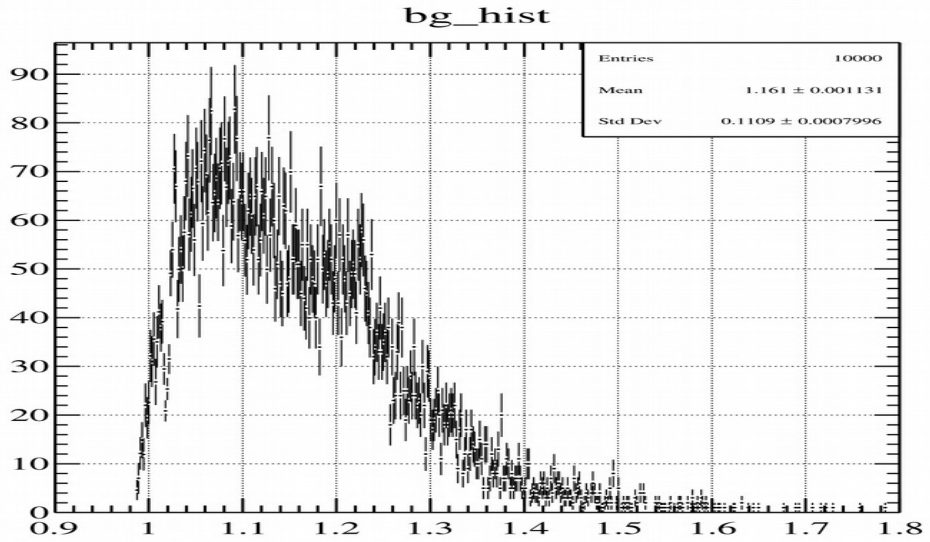


Sigma = 0.03

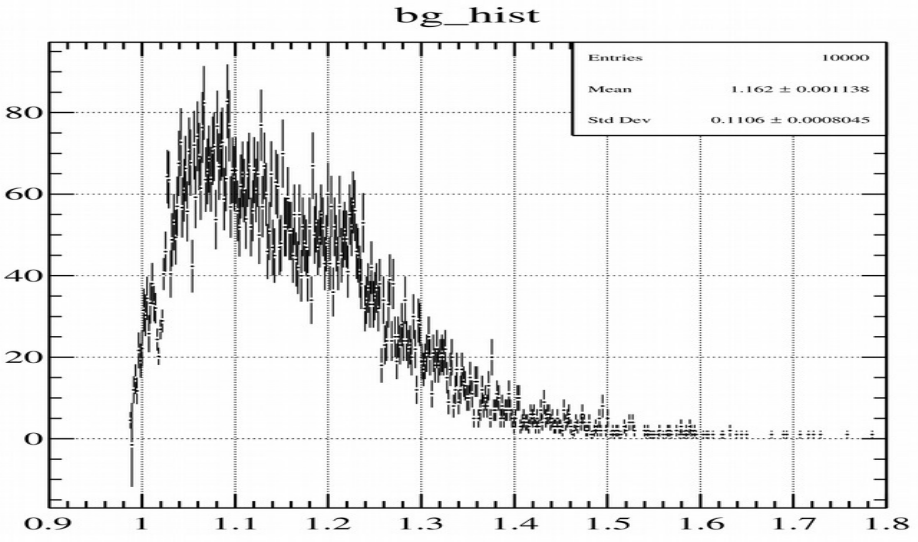


Background Events

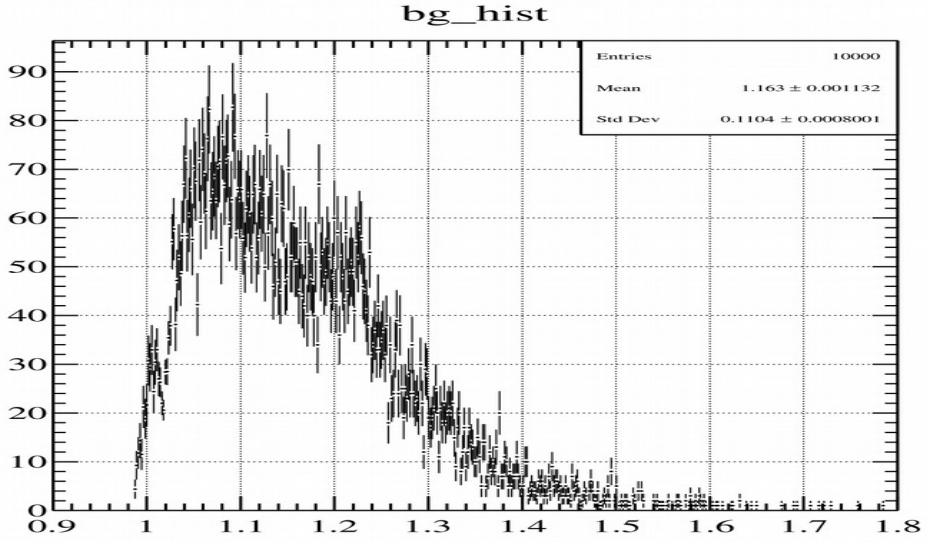
Sigma = 0.001



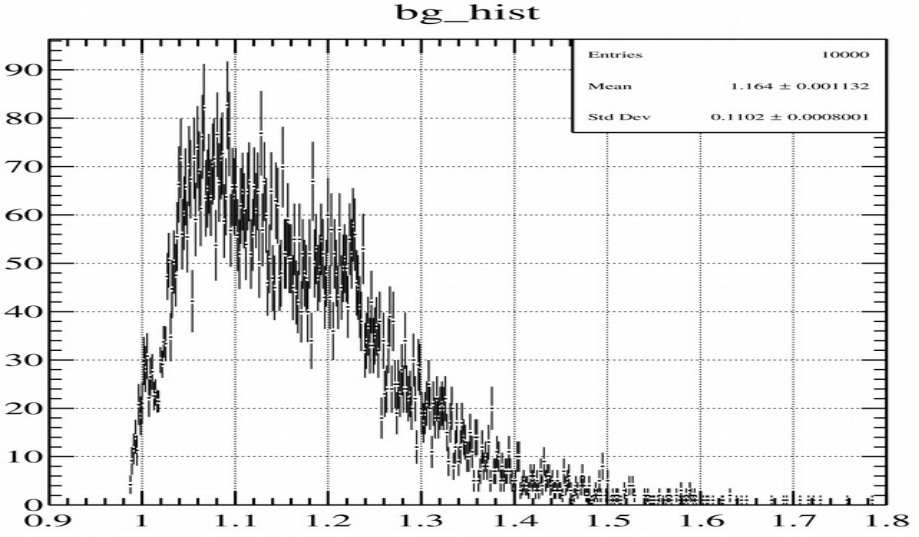
Sigma = 0.002



Sigma = 0.003

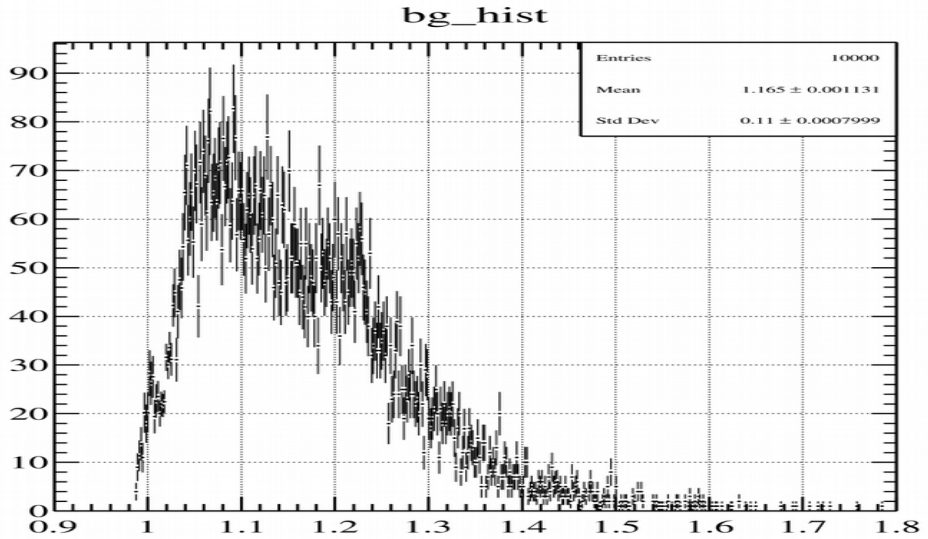


Sigma = 0.004

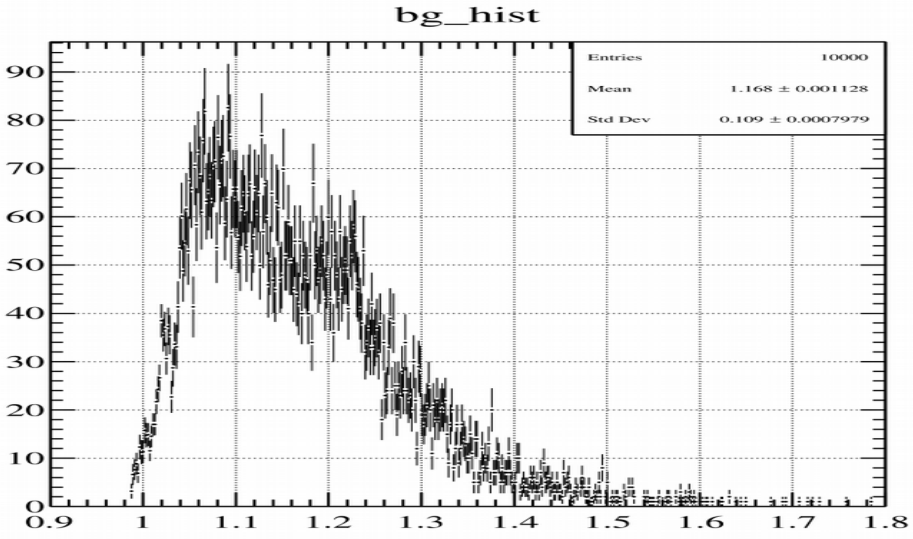


Background Events

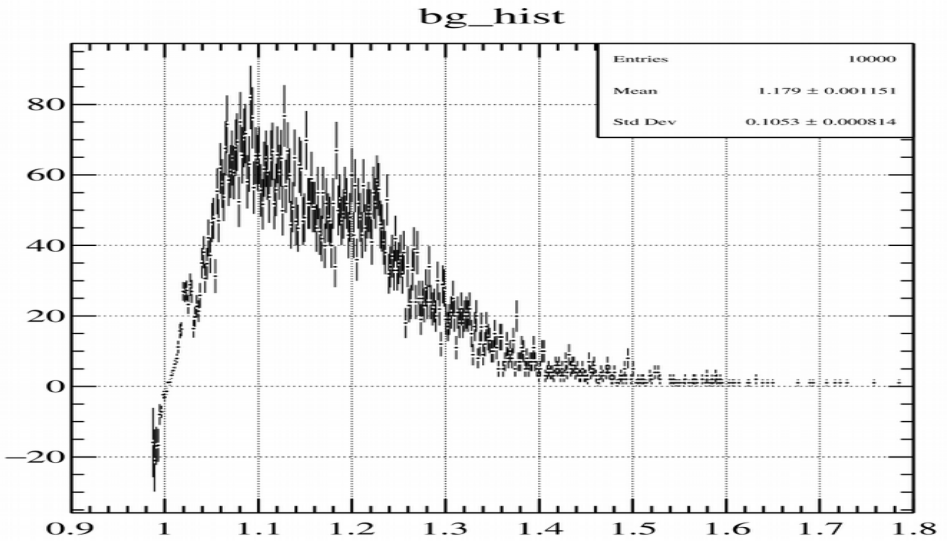
Sigma = 0.005



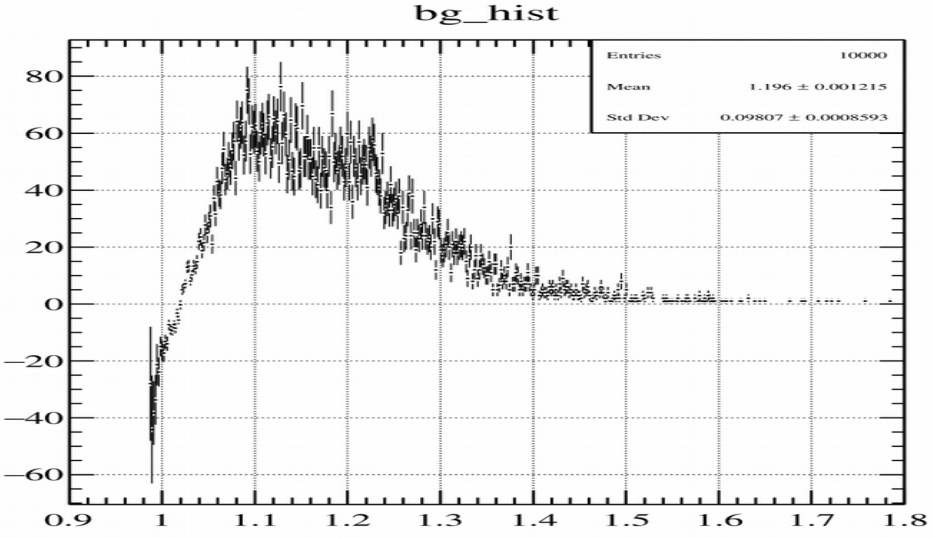
Sigma = 0.01



Sigma = 0.02



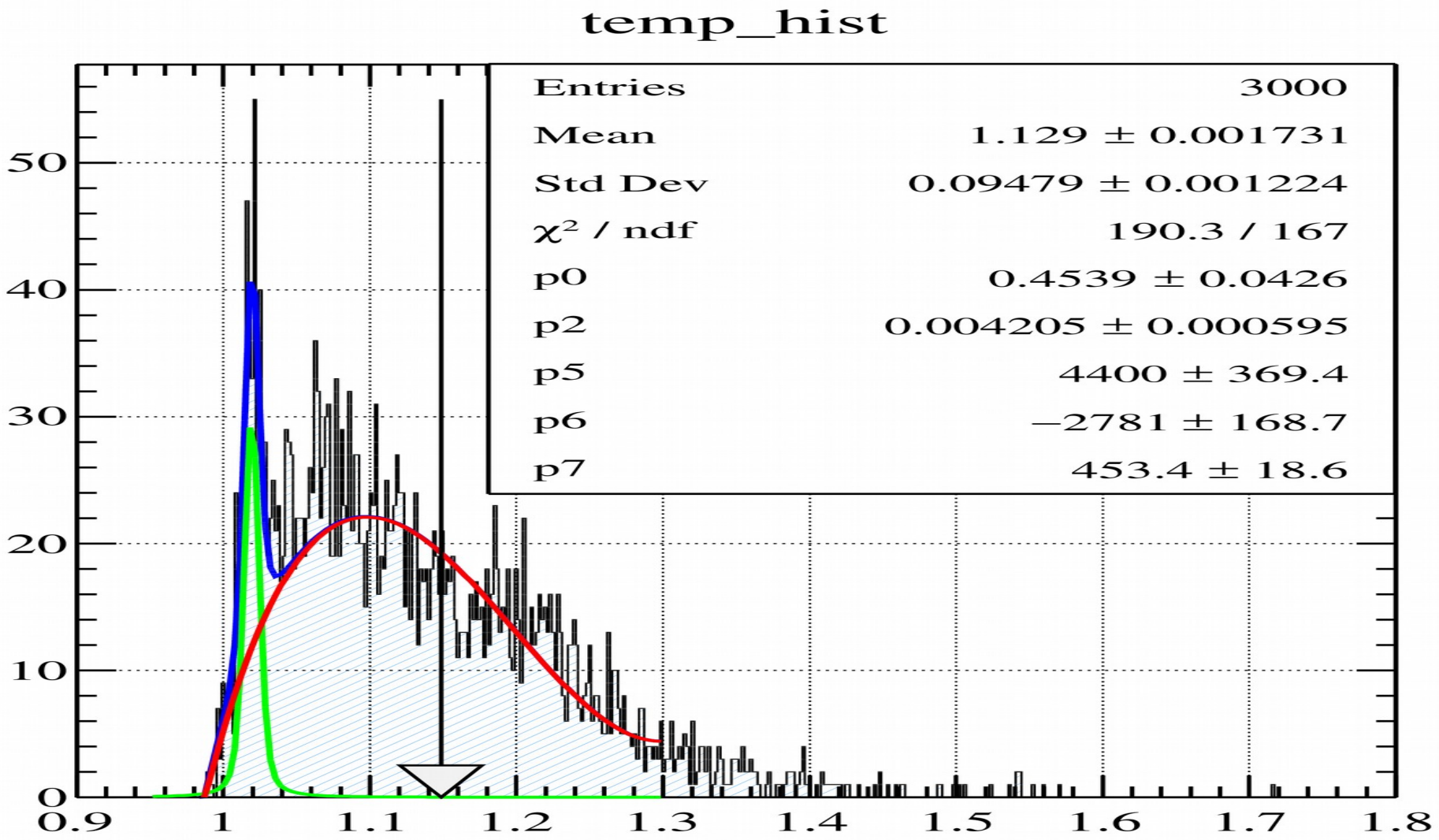
Sigma = 0.03



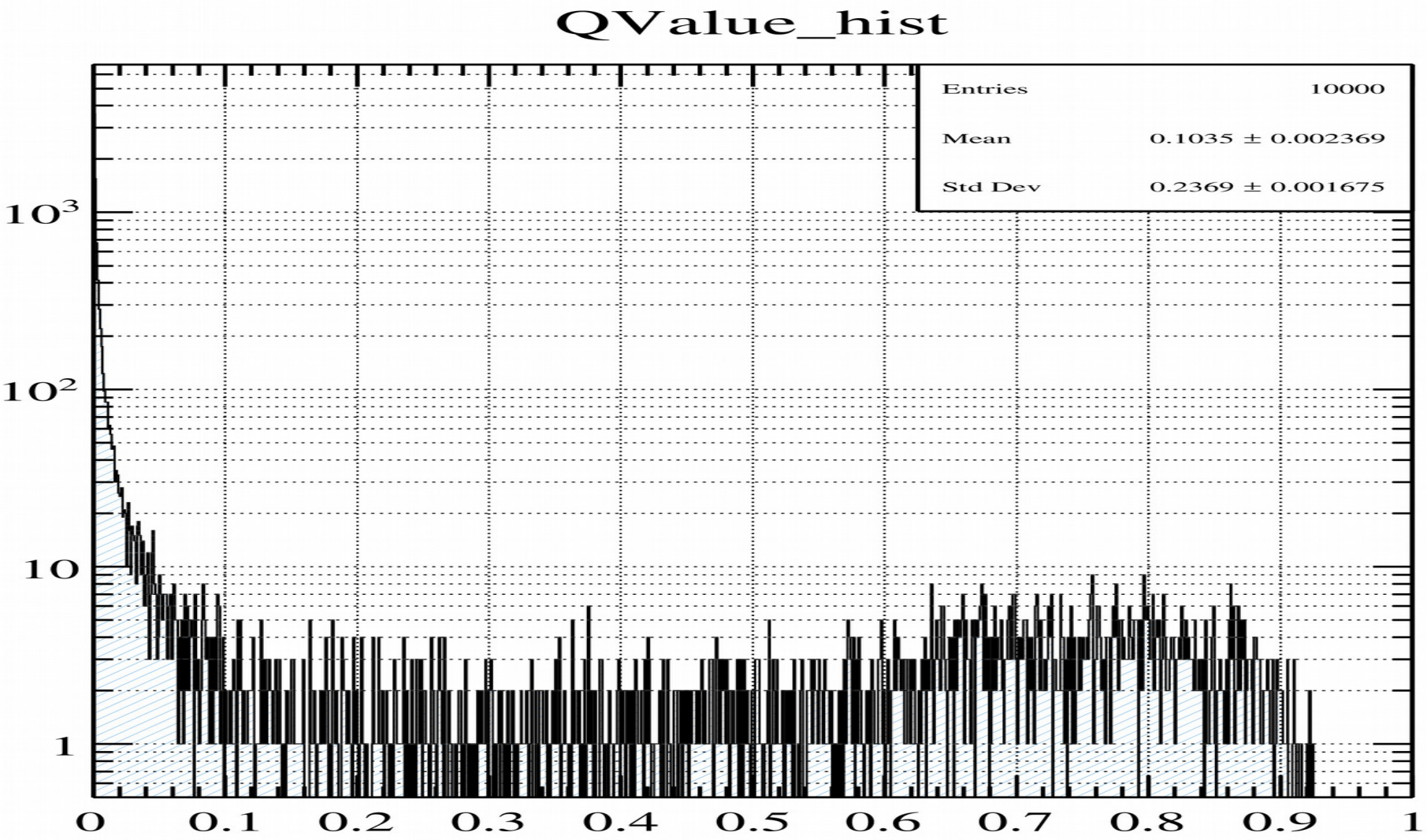
Testing the ‘cusp’ effect:

- Background function: 3rd degree Chebyshev polynomial
- Signal function: Voigtian (Non Relativistic Breit-Wigner convoluted with a Gaussian)
- Fixed:
  - Phi Mass
  - Phi Width
  - BG Value at K+K- threshold = 0
- Free:
  - Phi Resolution
  - 3 out of 4 Polynomial Parameters

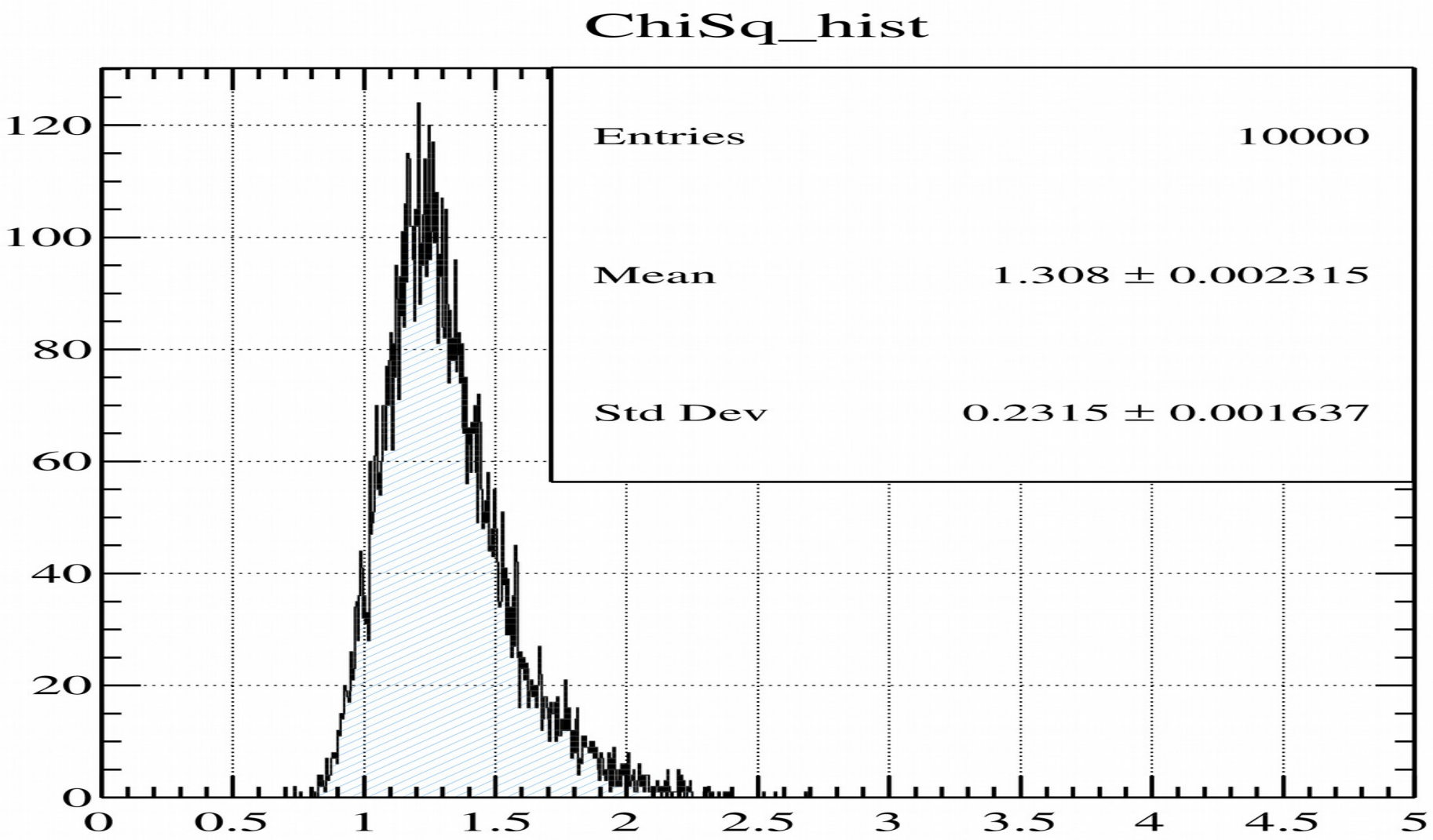
Event #4 – Example Fit, ChiSq = 1.13



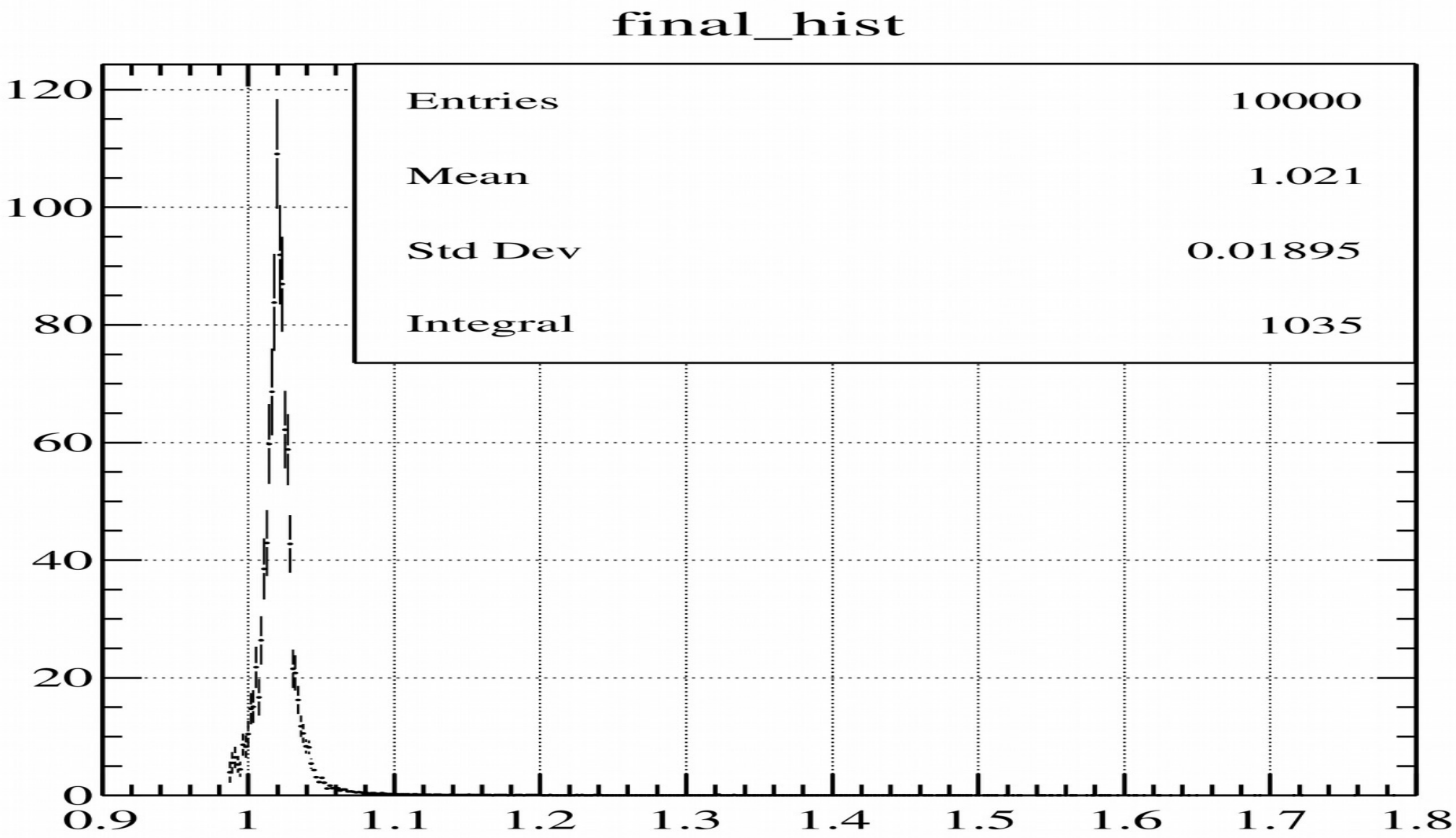
QValue


QValue_hist
Entries 10000
Mean 0.1035 ± 0.002369
Std Dev 0.2369 ± 0.001675
10³
10²
10
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

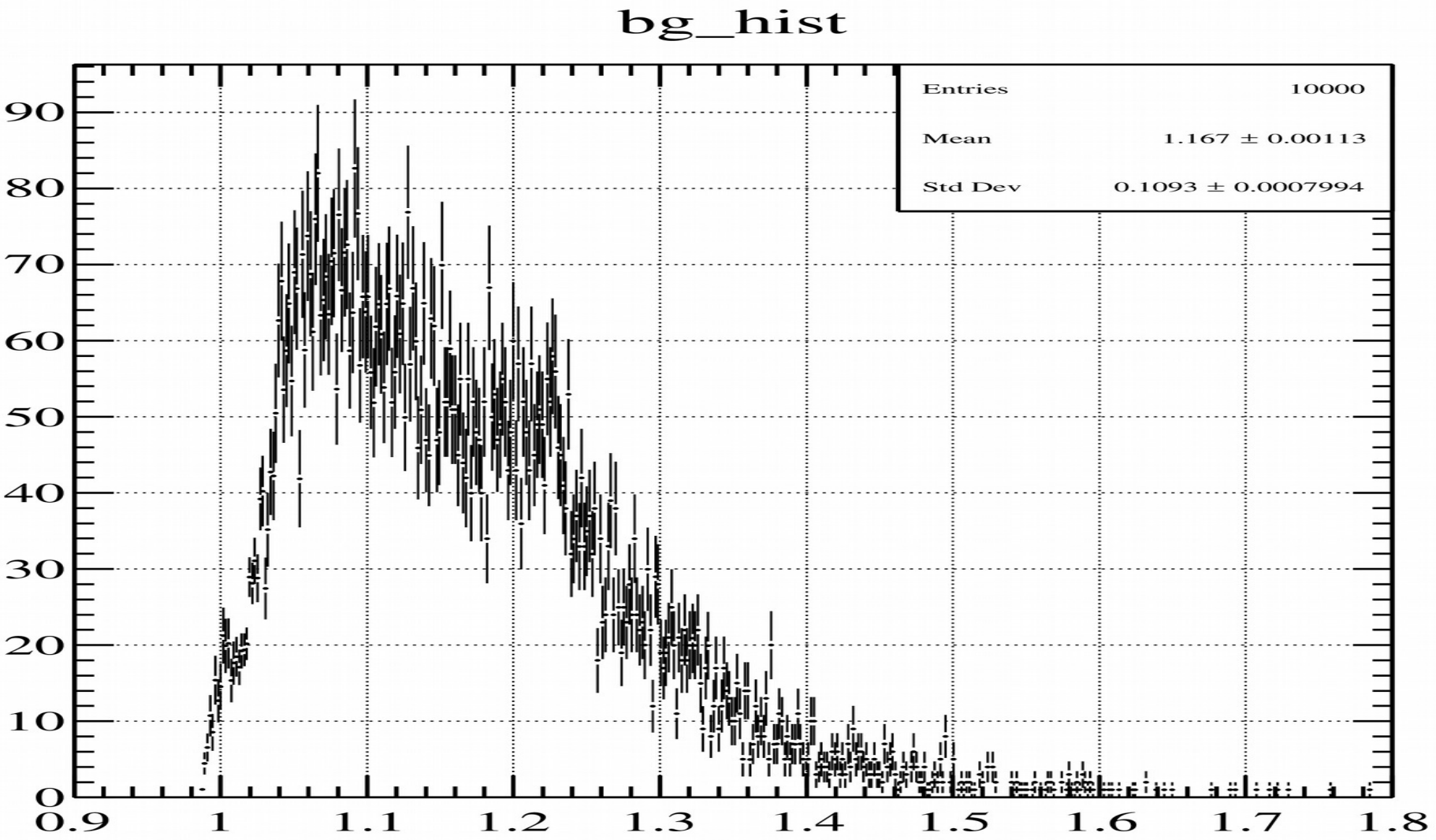
Chi^2/NDF


ChiSq_hist
Entries 10000
Mean 1.308 ± 0.002315
Std Dev 0.2315 ± 0.001637
120
100
80
60
40
20
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5

Signal Events



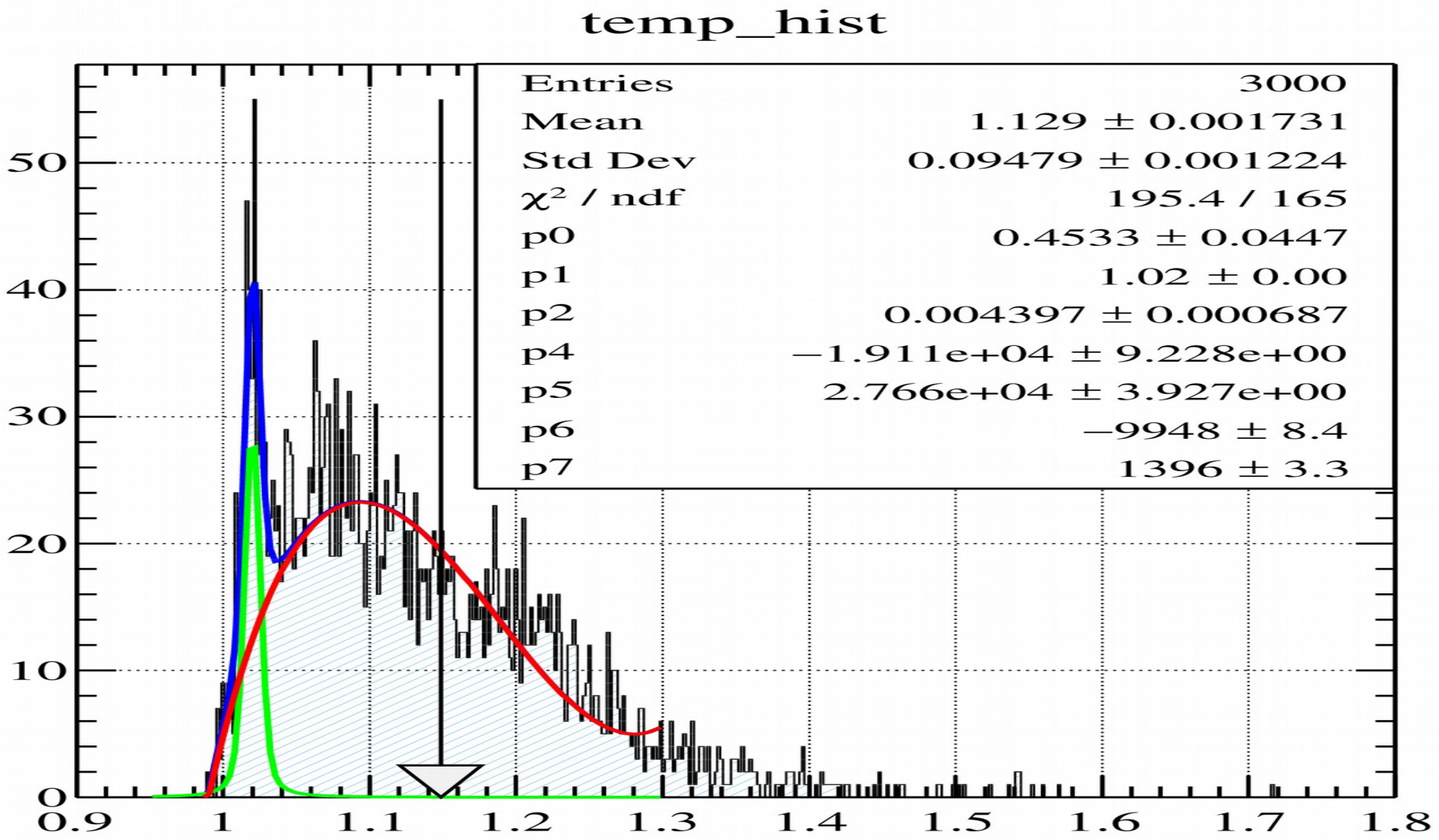
Background Events



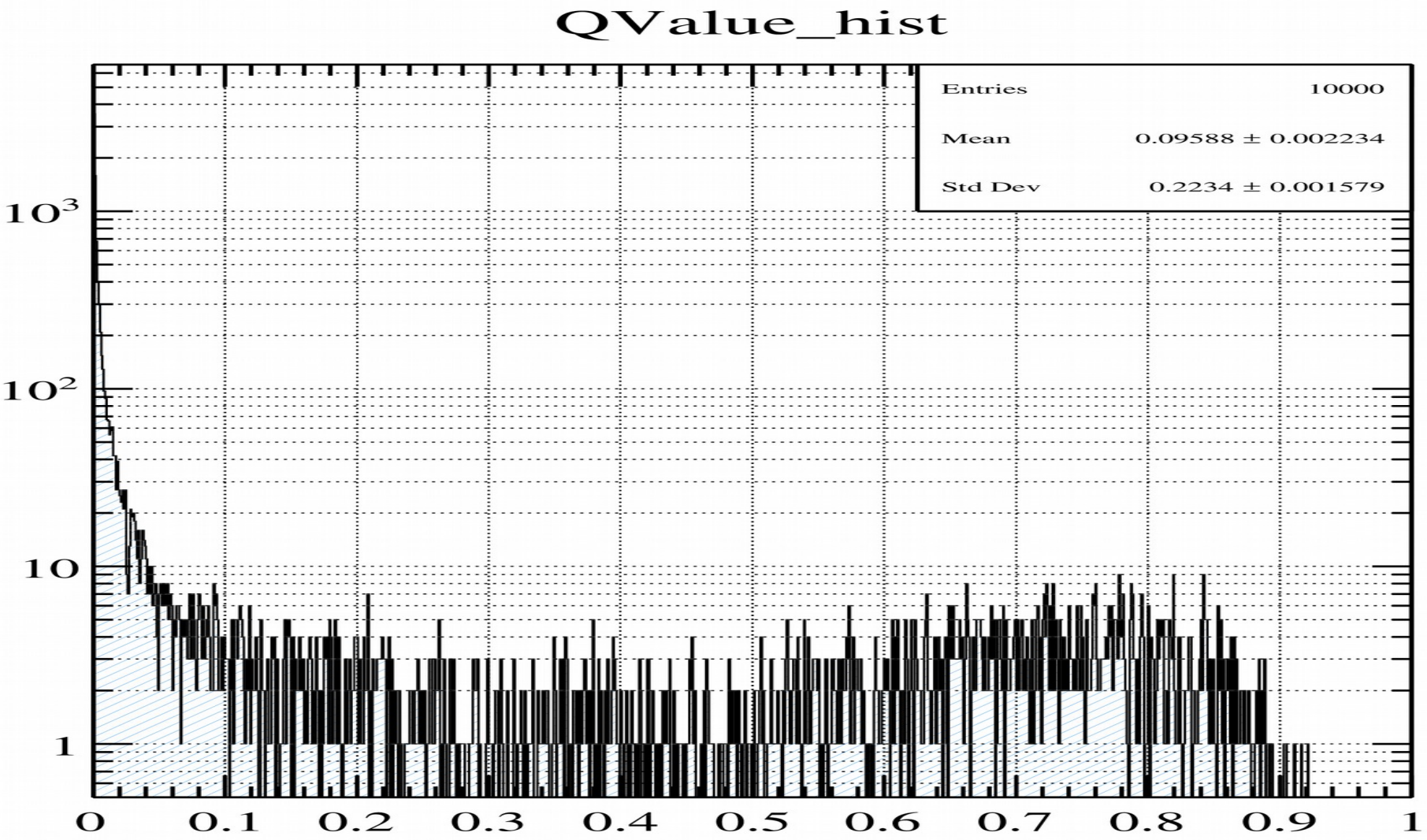
Testing the ‘cusp’ effect:

- Background function: 3rd degree Chebyshev polynomial
- Signal function: Voigtian (Non Relativistic Breit-Wigner convoluted with a Gaussian)
- Fixed:
  - Phi Width
- Free:
  - Phi Mass
  - Phi Resolution
  - Polynomial Parameters

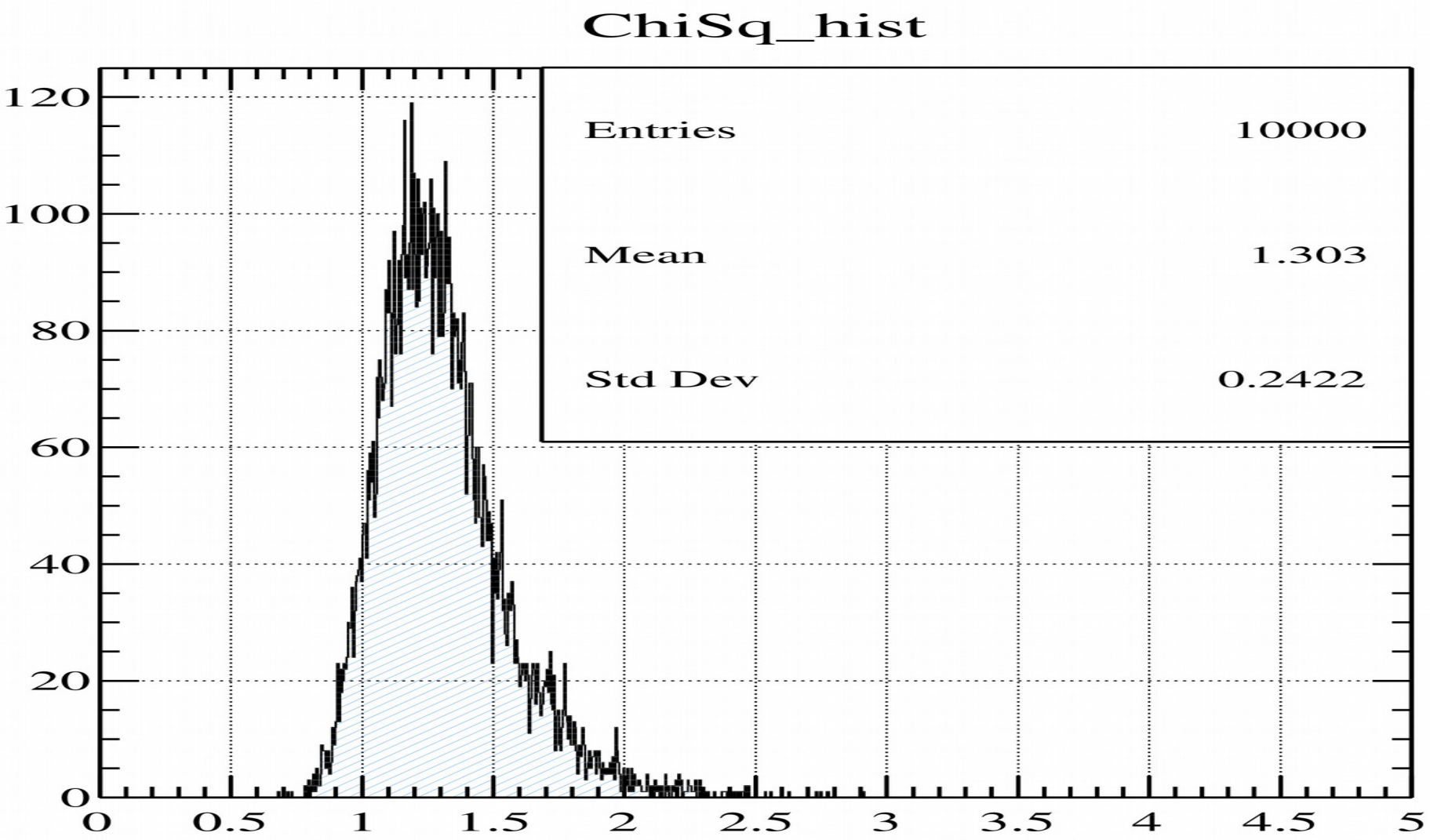
Event #4 – Example Fit, ChiSq = 1.18



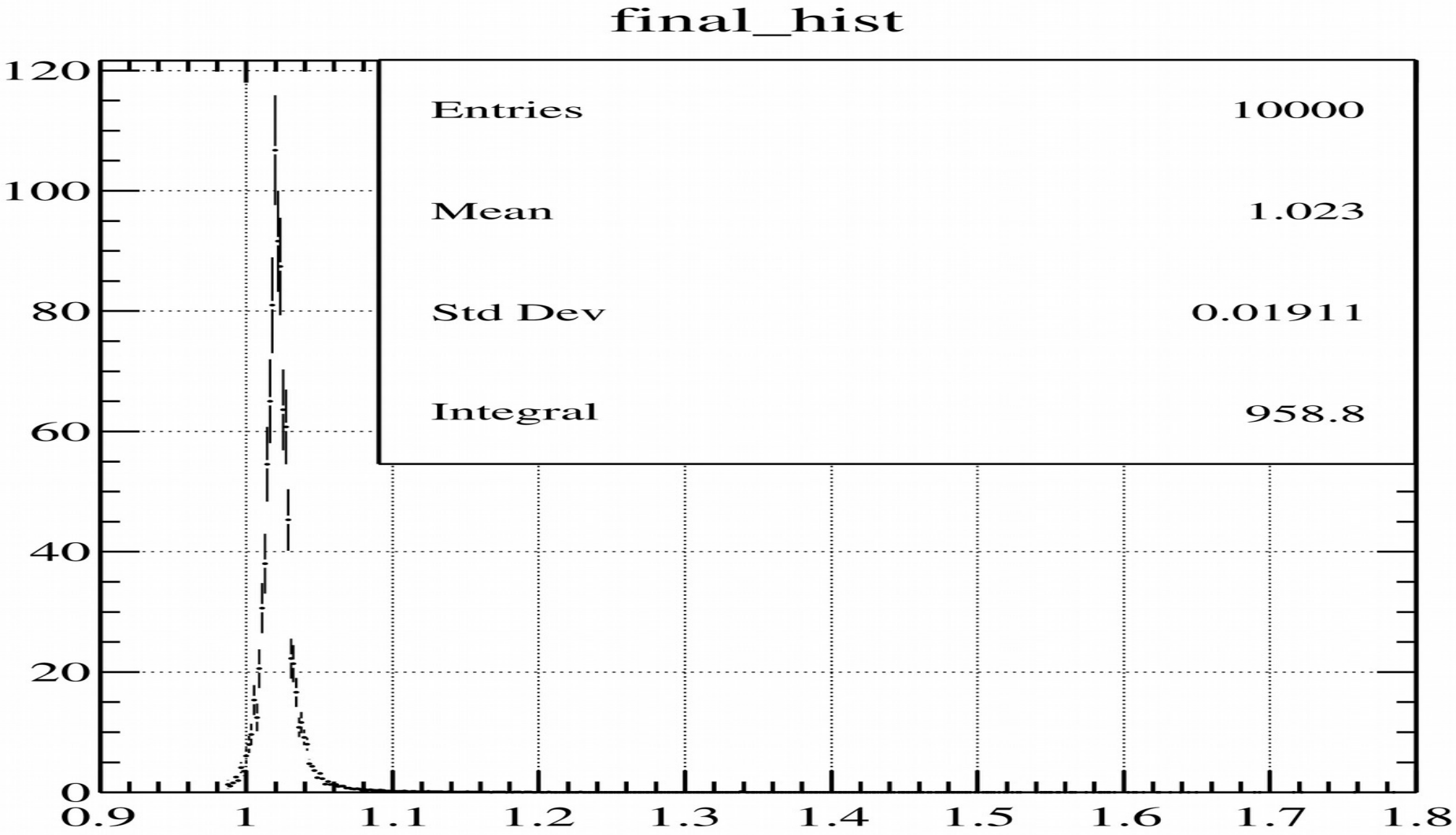
QValue


QValue_hist
Entries 10000
Mean 0.09588 ± 0.002234
Std Dev 0.2234 ± 0.001579
10³
10²
10
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

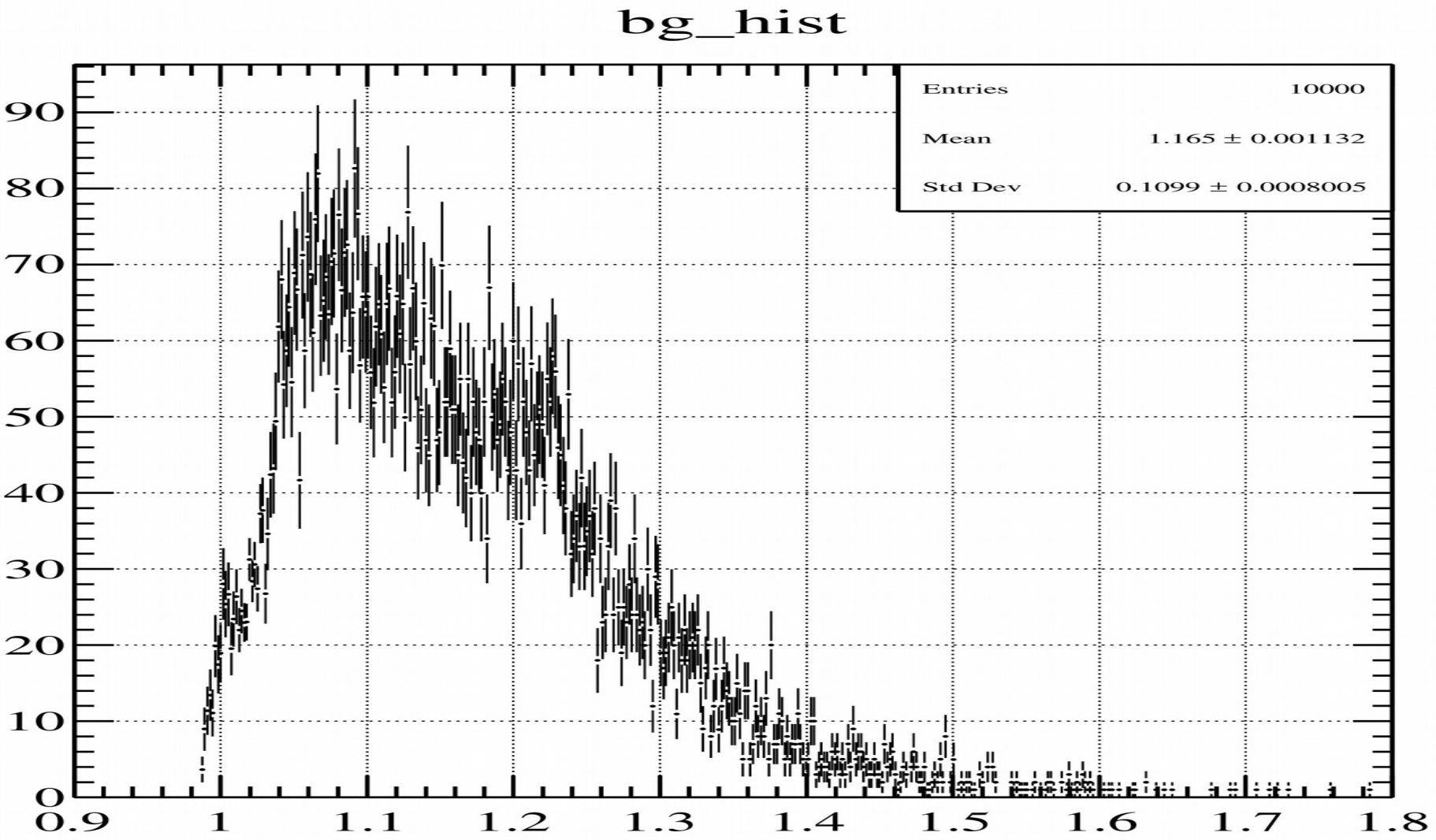
Chi^2/NDF


ChiSq_hist
Entries 10000
Mean 1.303
Std Dev 0.2422
120
100
80
60
40
20
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5

Signal Events



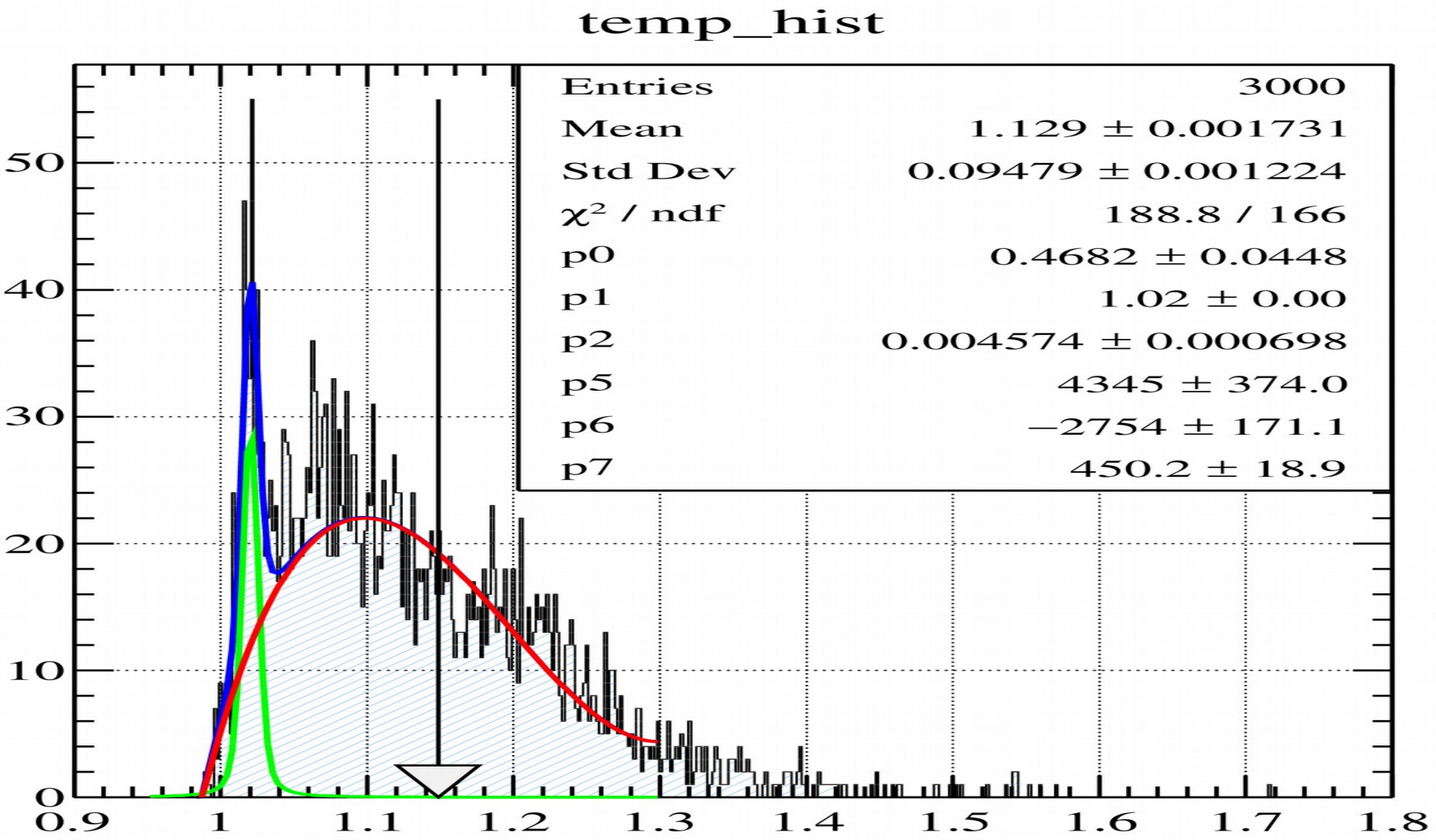
Background Events



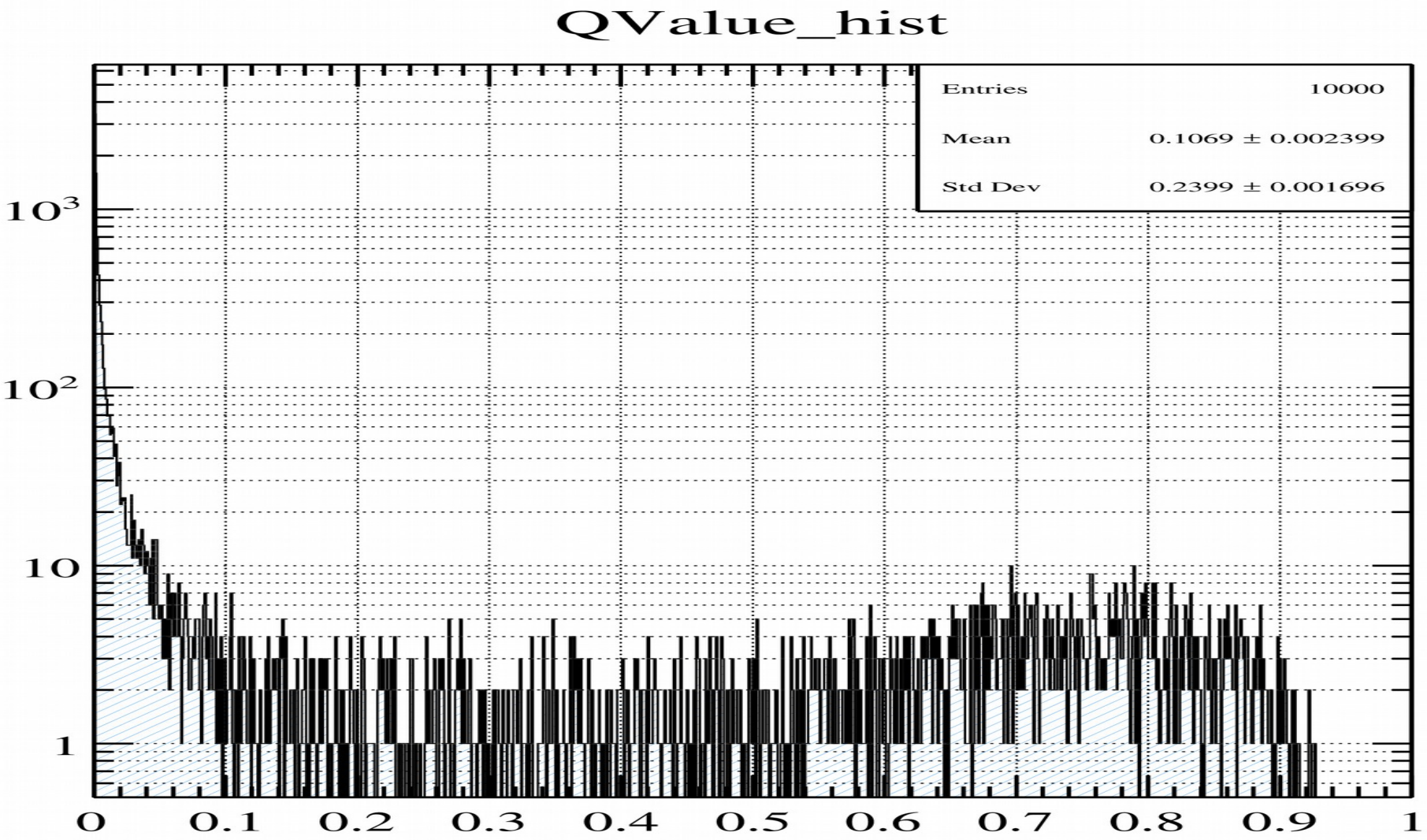
Testing the ‘cusp’ effect:

- Background function: 3rd degree Chebyshev polynomial
- Signal function: Voigtian (Non Relativistic Breit-Wigner convoluted with a Gaussian)
- Fixed:
  - Phi Width
  - BG value at K+K- threshold = 0
- Free:
  - Phi Mass
  - Phi Resolution
  - 3 out of 4 Polynomial Parameters

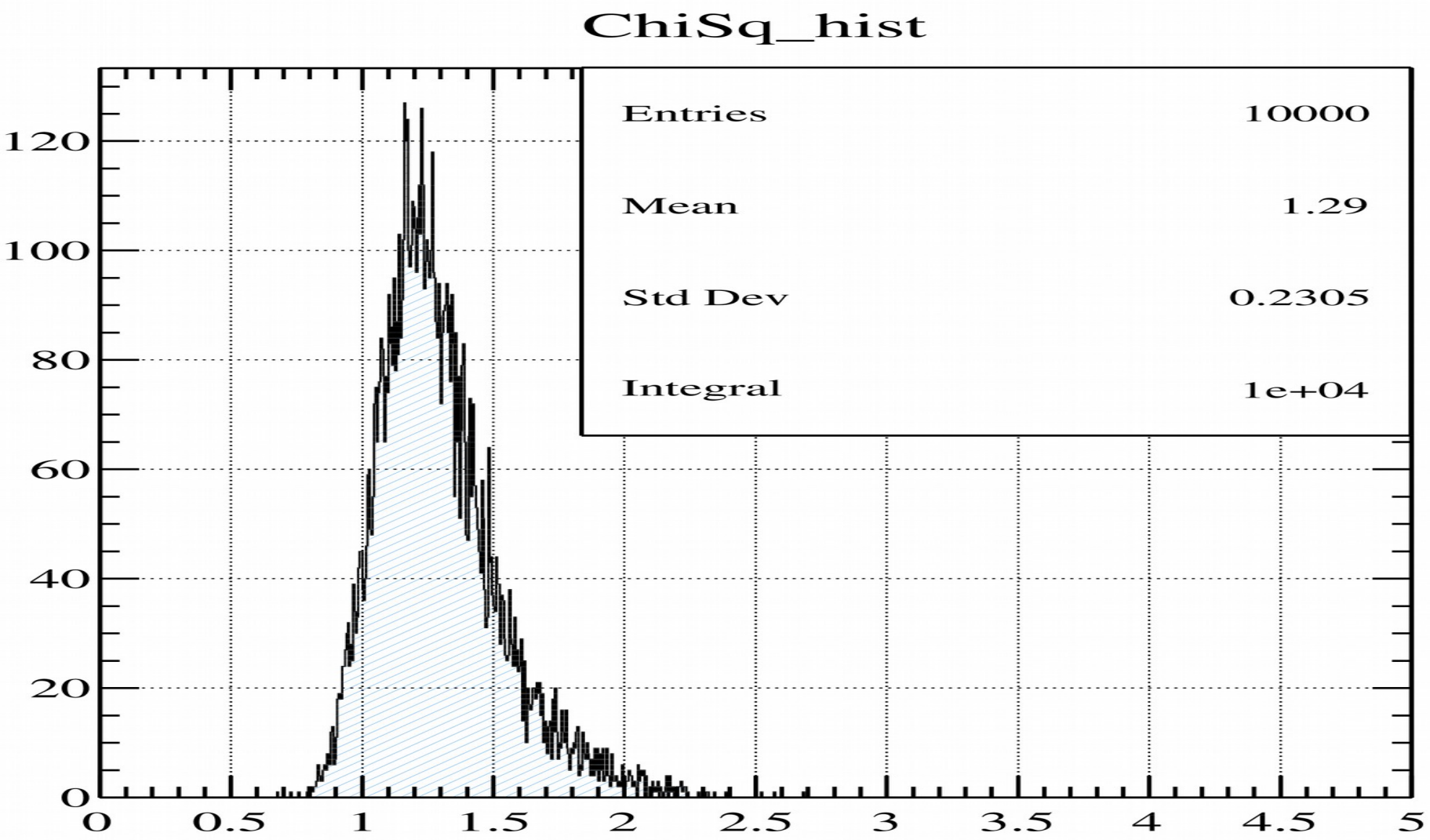
Event #4 – Example Fit, ChiSq = 1.13



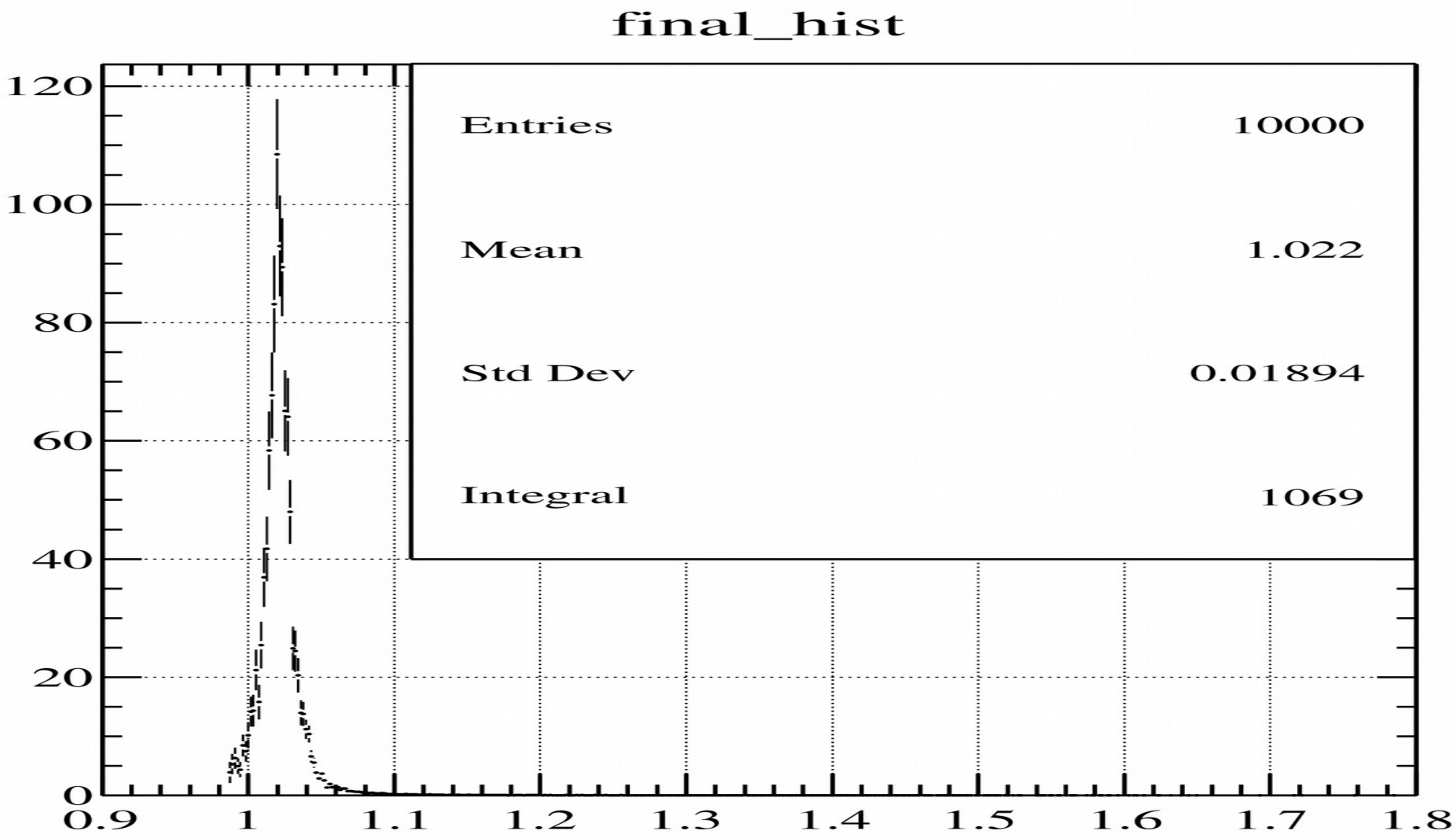
QValue


QValue_hist
Entries 10000
Mean 0.1069 ± 0.002399
Std Dev 0.2399 ± 0.001696
10³
10²
10
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

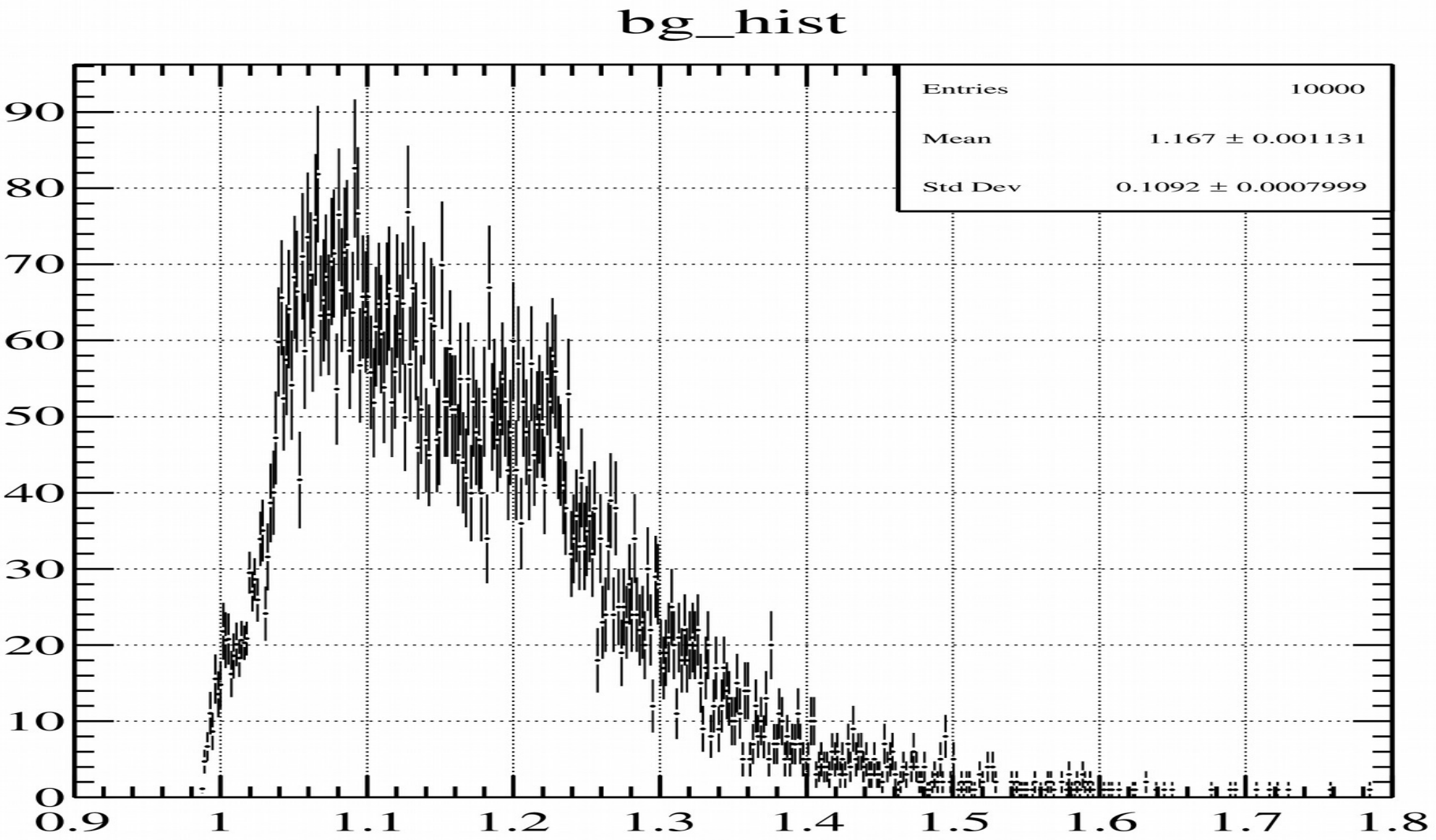
Chi^2/NDF


ChiSq_hist
Entries 10000
Mean 1.29
Std Dev 0.2305
Integral 1e+04
120
100
80
60
40
20
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5

Signal Events



Background Events



Why I did not test with a Relativistic Breit-Wigner convoluted with a Gaussian: