ND Data Validation

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Special thanks to Trish Vahle, Mike Kordosky, Anna Hollin

Introduction

- UCL has processed all R.18.2 data up to the shutdown
- Have counted ~1.257e20 POT in data
  - Early data: 1.037e20 POT
  - Later data: 0.221e20 POT
- Have also processed all MC files giving 2.834e19 POT
  - SKZP3 and MODBYRS3 reweighting has been applied
    - Ambiguity over 2.568e+13 or 2.486e+13 POT/snarl for SKZP3
- The same data quality, preselection and PID cuts have been used as for W&C analysis

The Plots

- I have produced 27 distributions each for three sets of cuts: data quality, preselection and PID
- The plots follow the format below:

Distribution showing
Old Data, New Data and MC
normalized to New Data POTs

Ratio of Old Data / New Data

Chi2/ndf shown

Ratios of
Old Data / MC,
New Data / MC,
Old + New Data / MC

Chi2/ndf of (Old+New)/MC shown

Pull distribution: one entry per bin
from Old/New ratio
[(value – 1) / error]

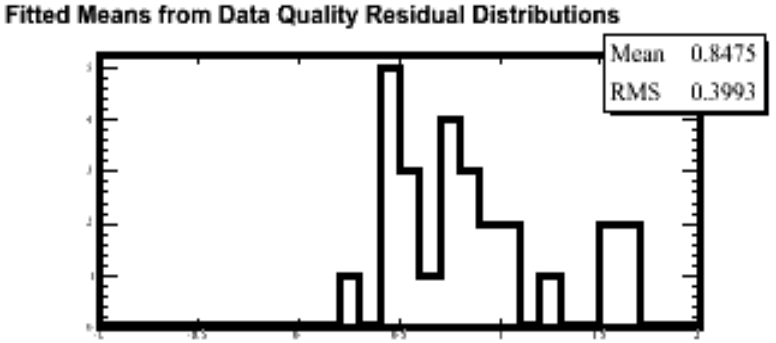
Fit to pull distribution shown

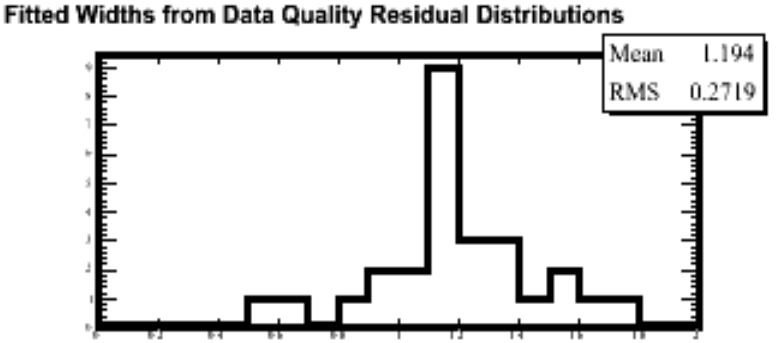
Observations

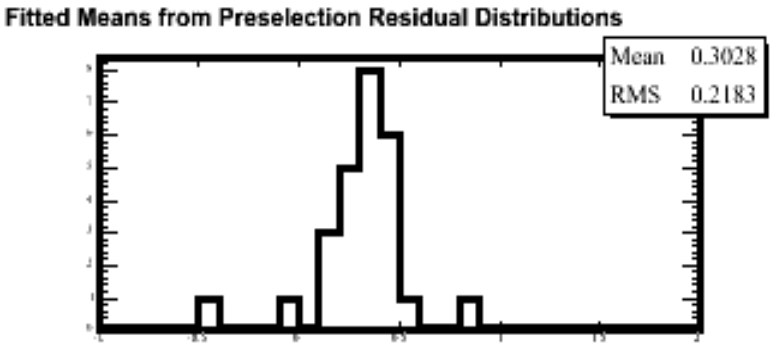
- Generally, the New and Old data show very good agreement
  - Agreement improves as event selection cuts are applied
- Most significant issue relates to the New/Old normalization:
  - The agreement can be significantly improved by increasing the new data POTs by ~0.5%
- Also some shape changes in PH dependent distributions
  - Change in light level not accounted for by calibration?

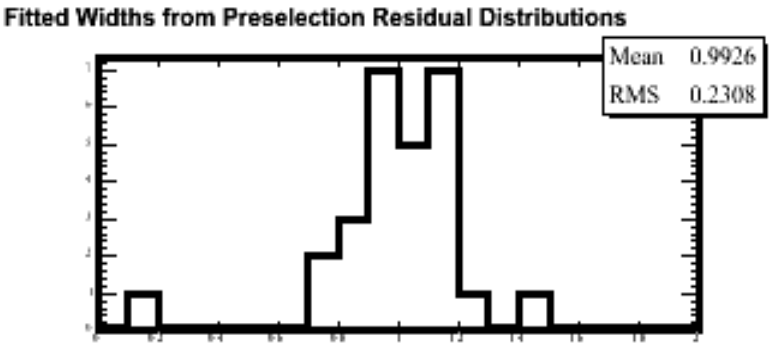
Summary Distribution

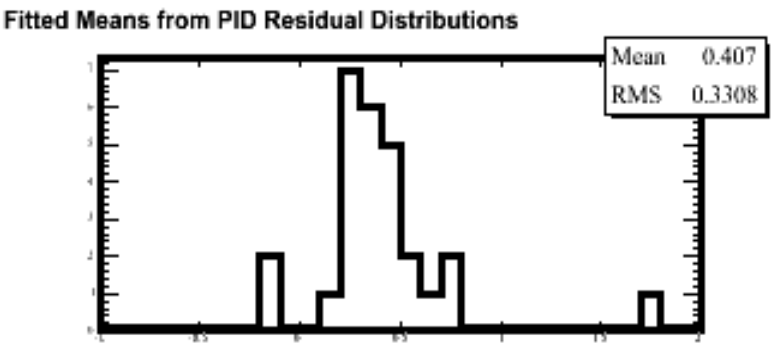
- These histograms show the means and widths from fits to the individual pull distributions. Expect <mean> ~ 0, <width> ~ 1

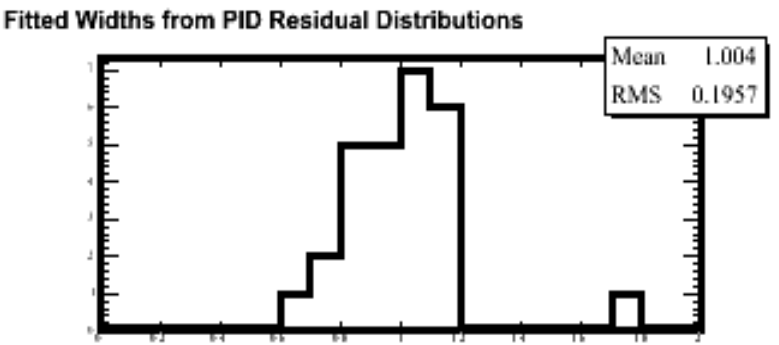






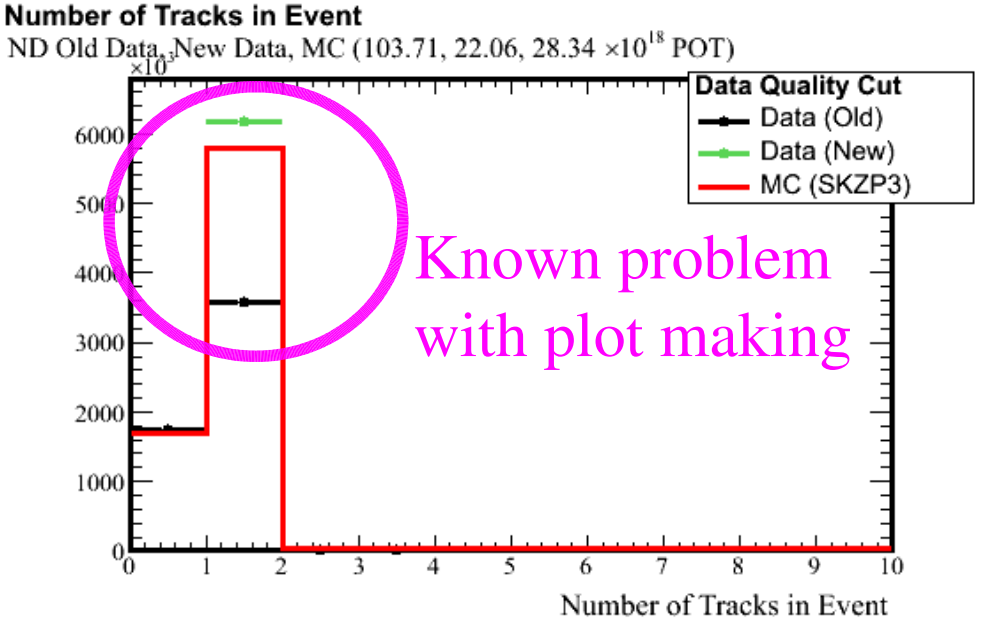


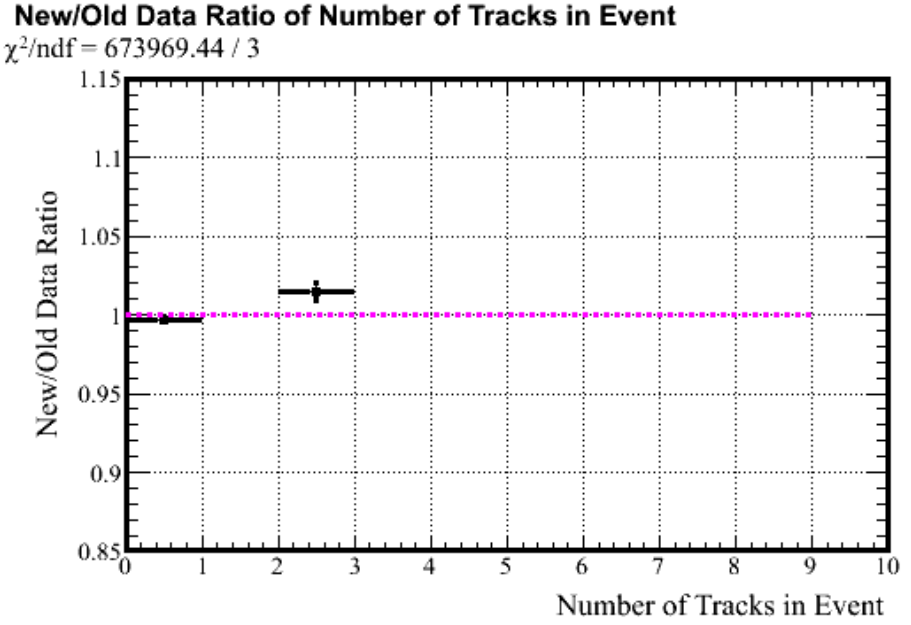


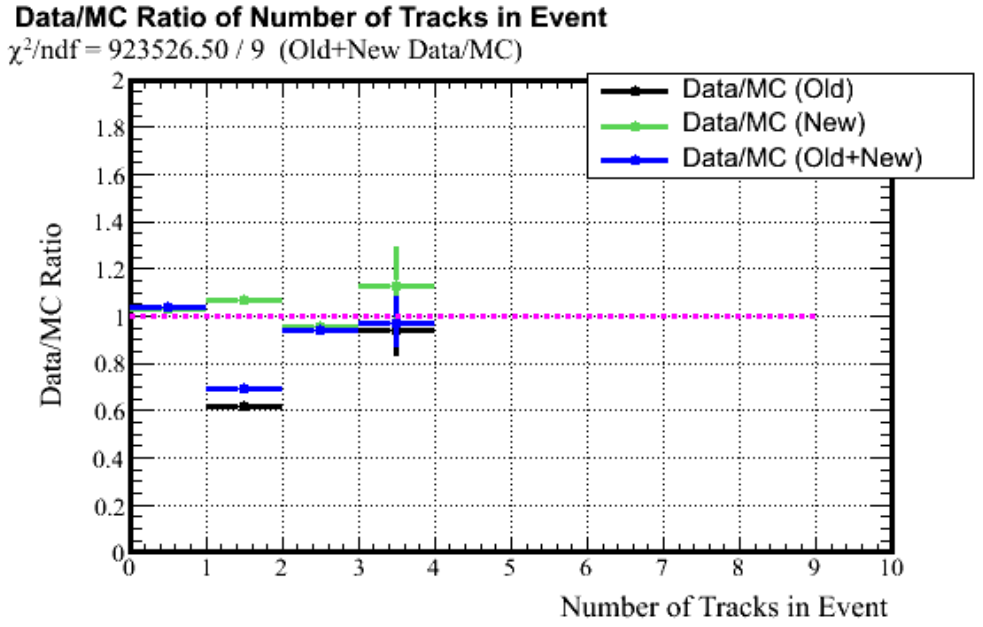


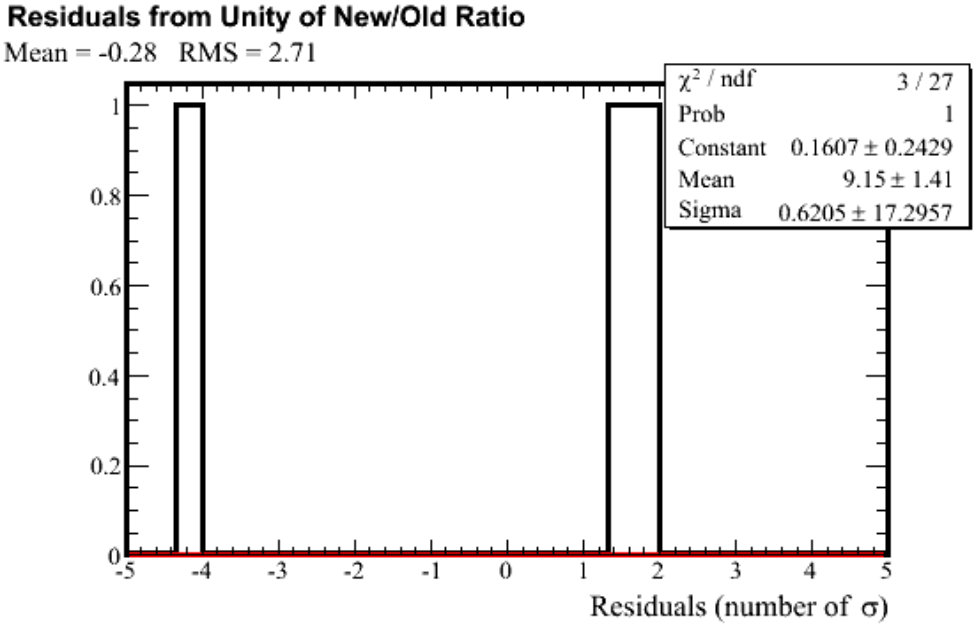
Plot Library

Data Quality









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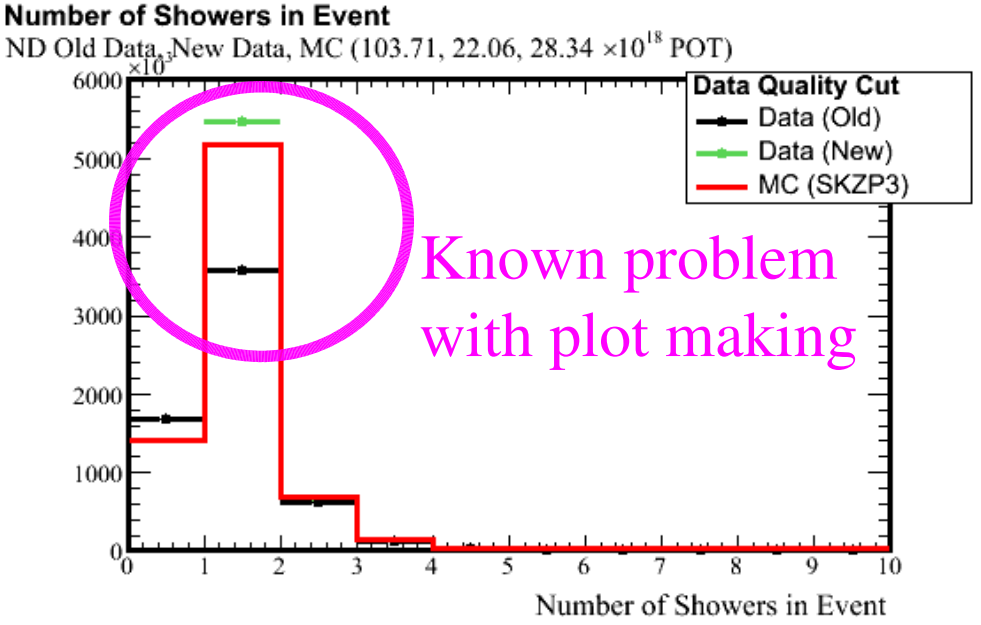

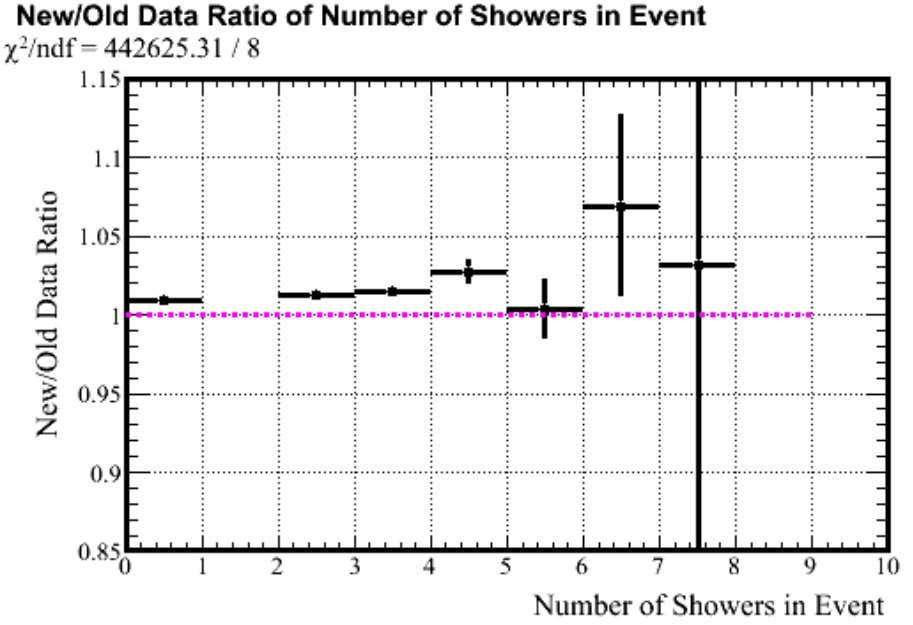

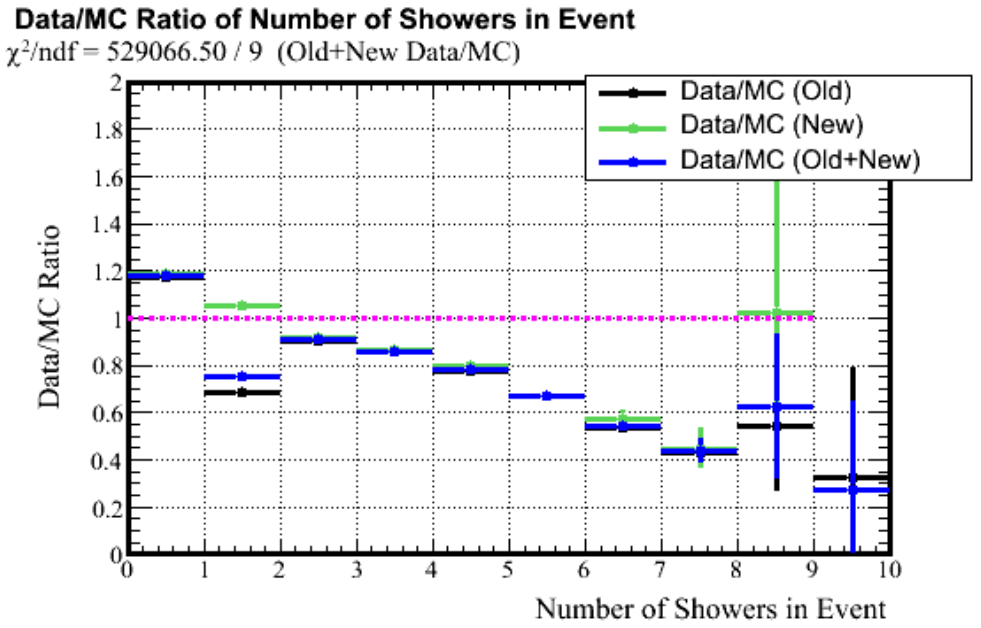

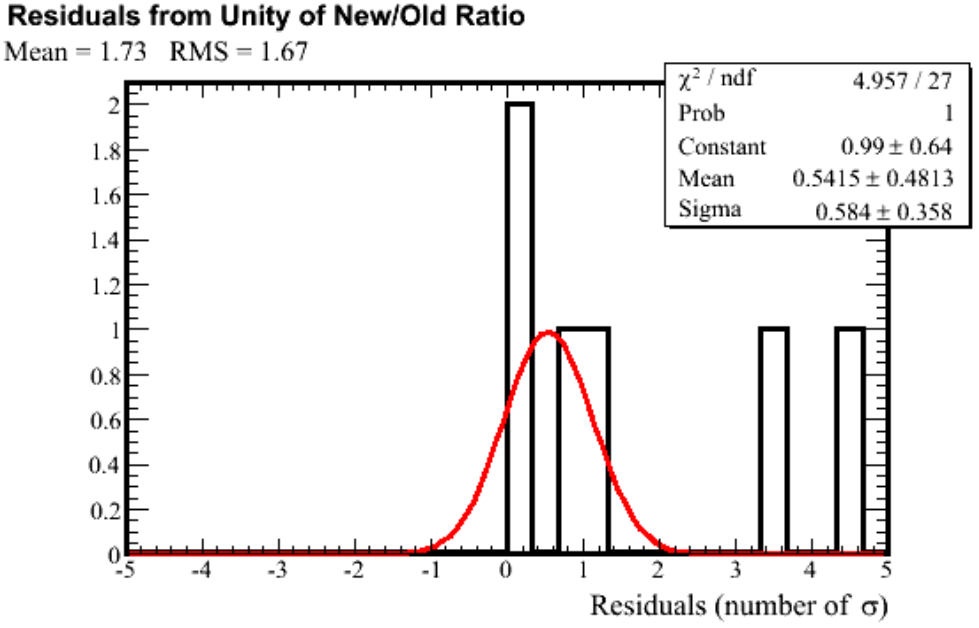

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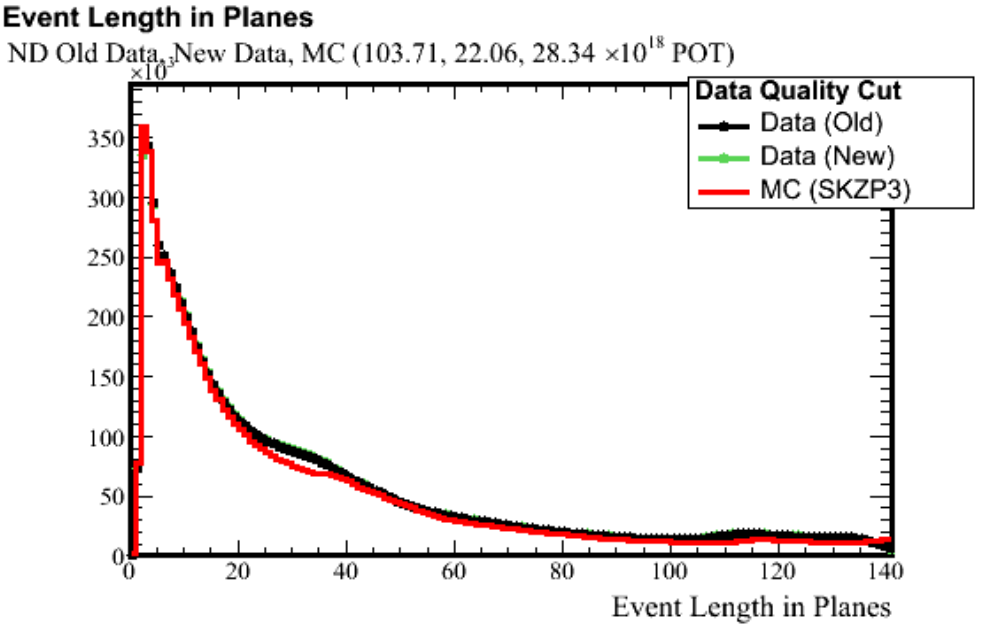

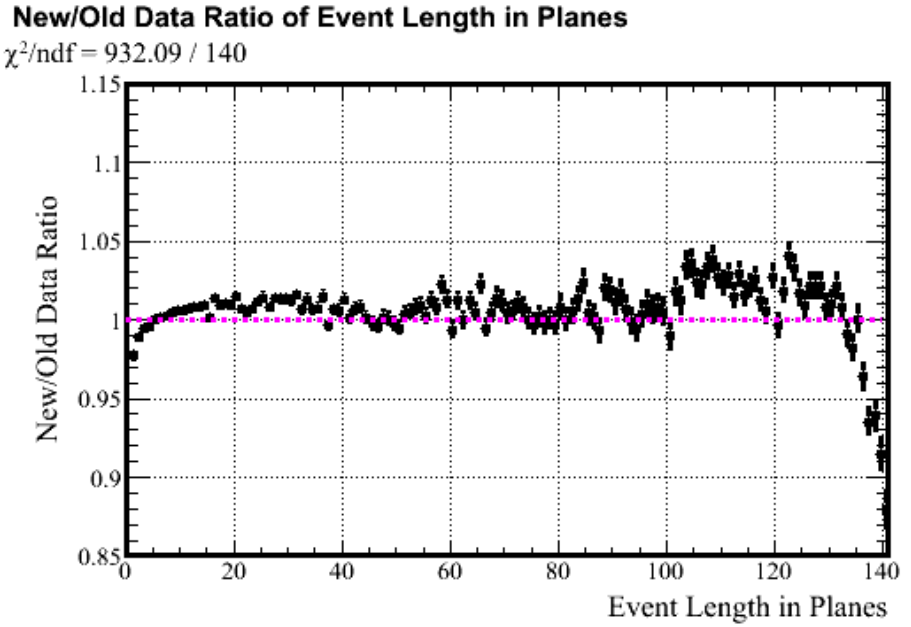

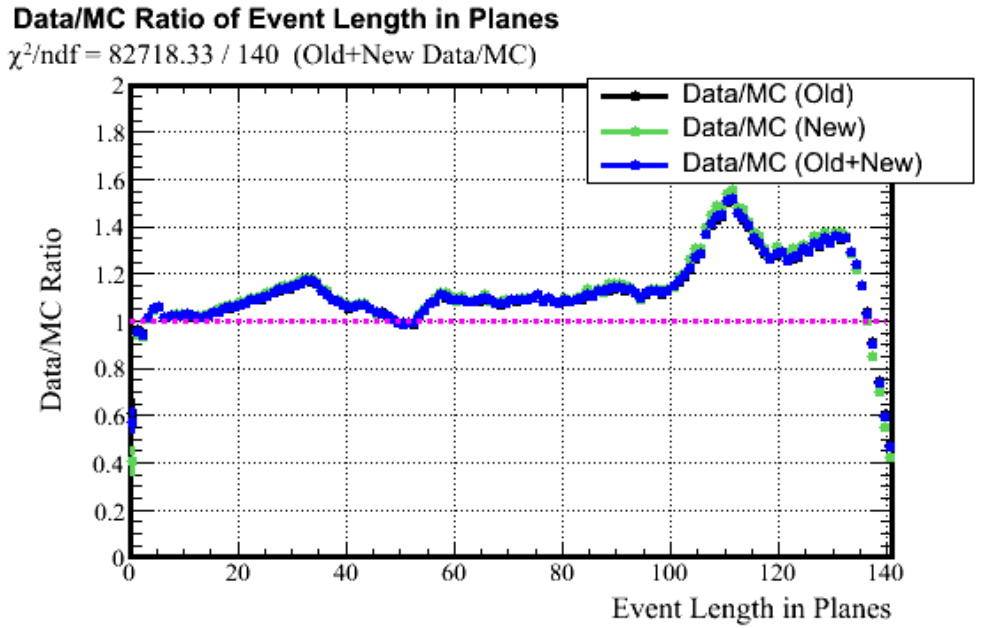

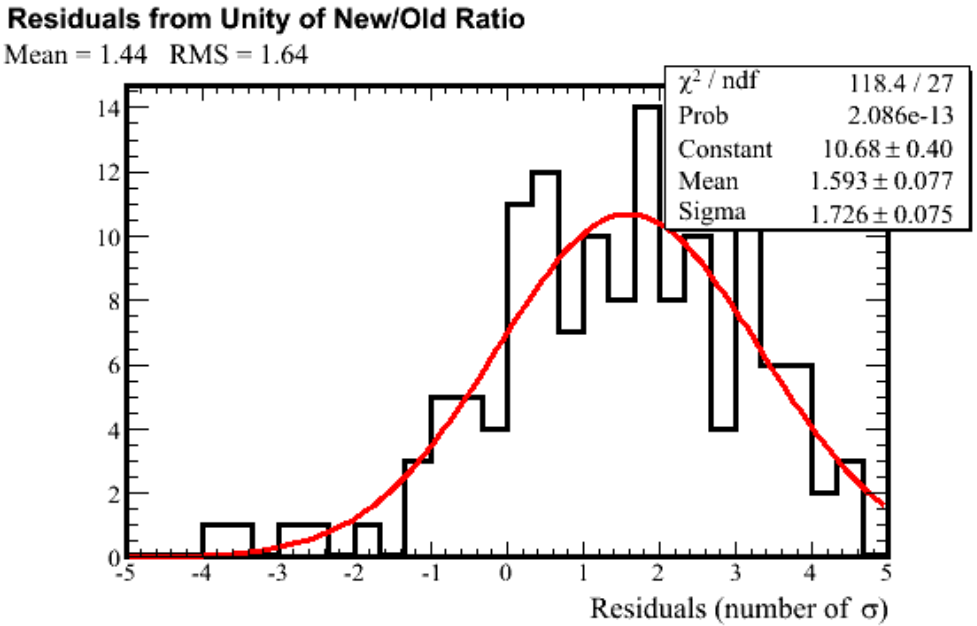

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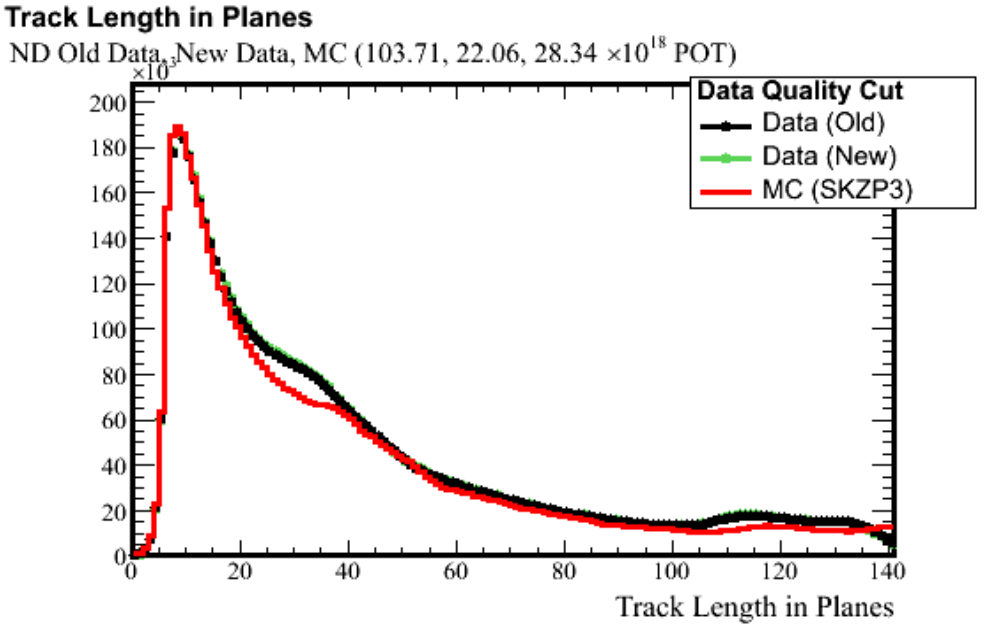

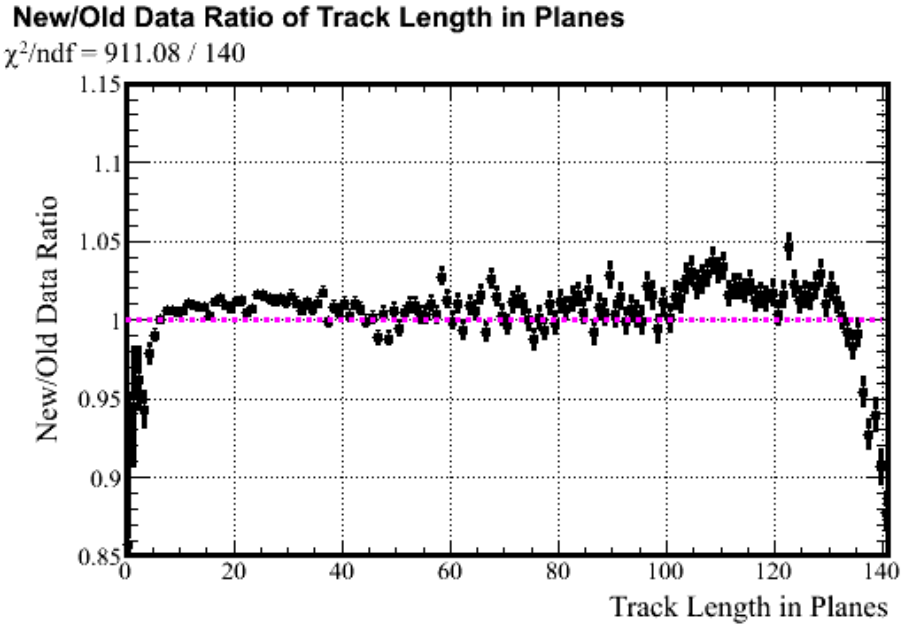

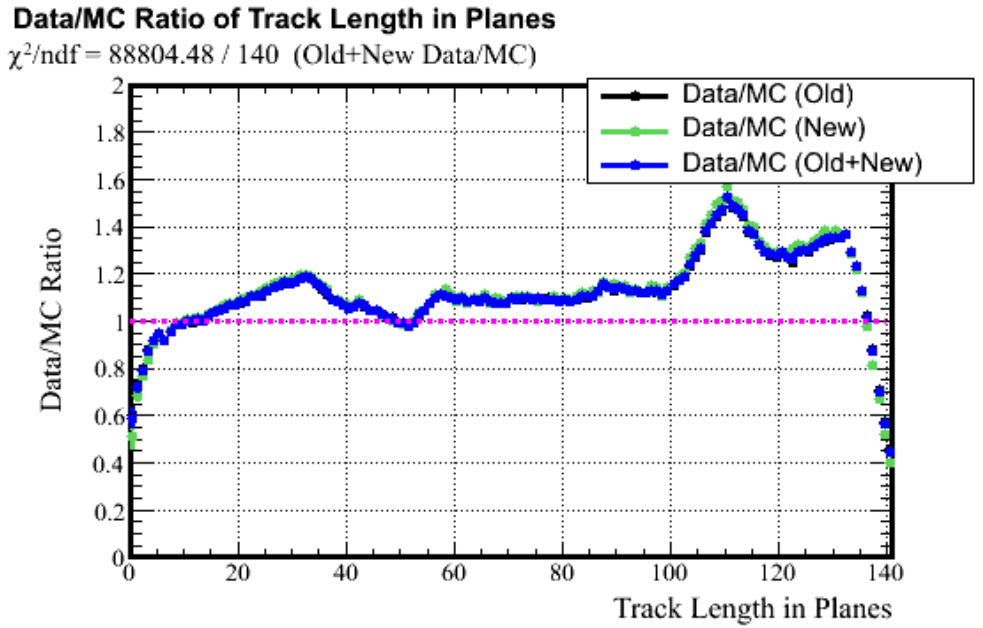

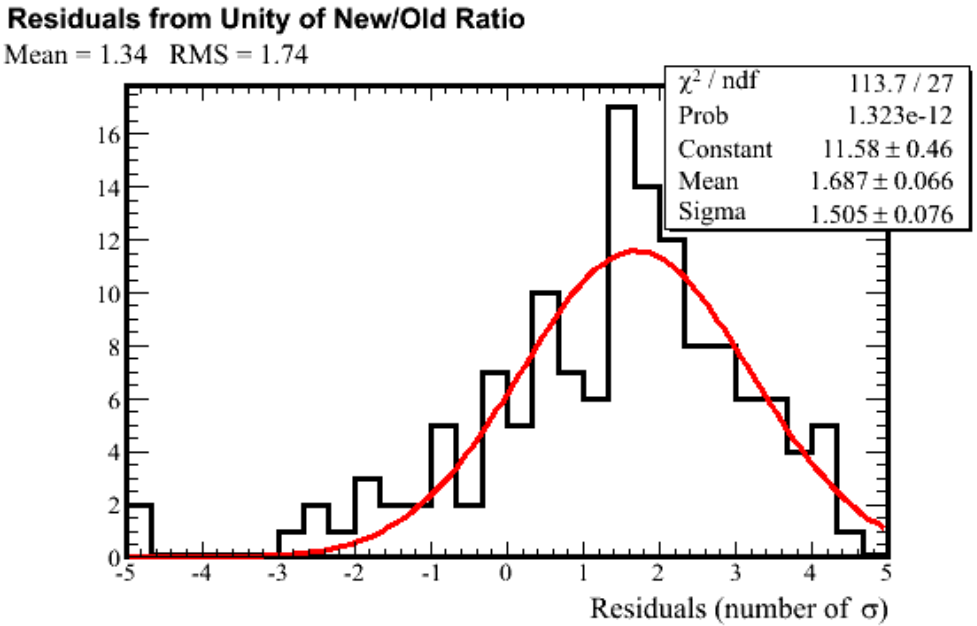

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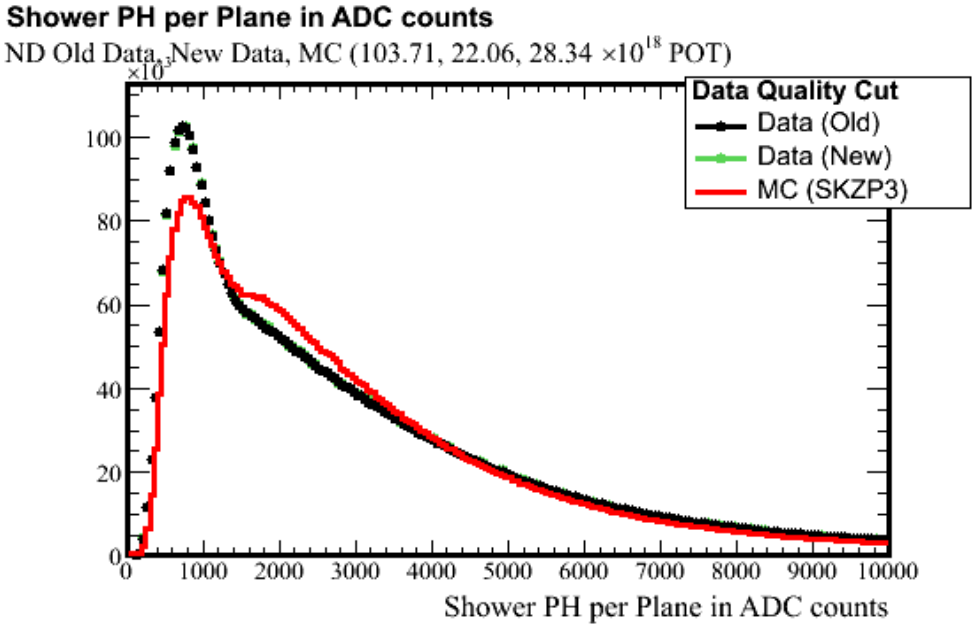

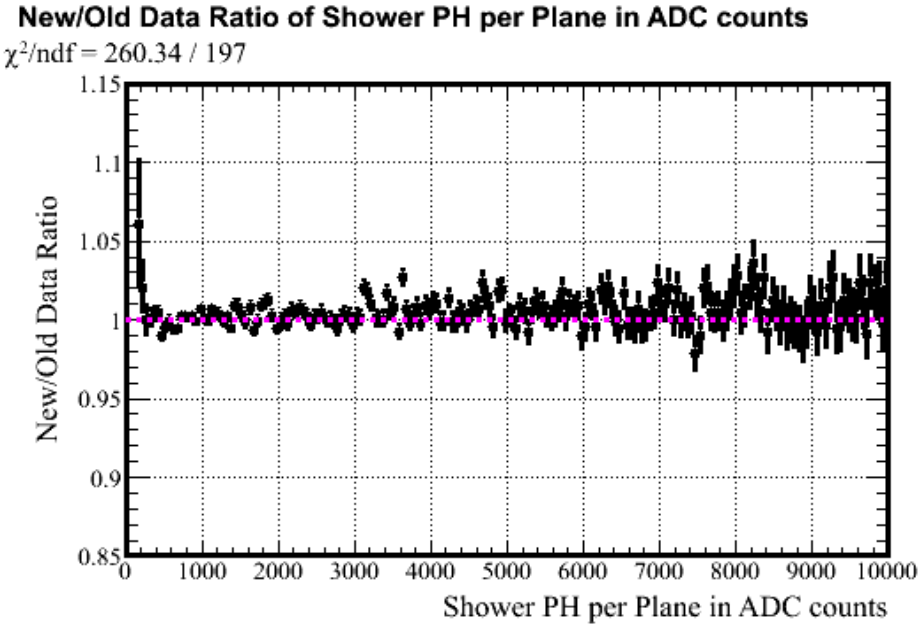

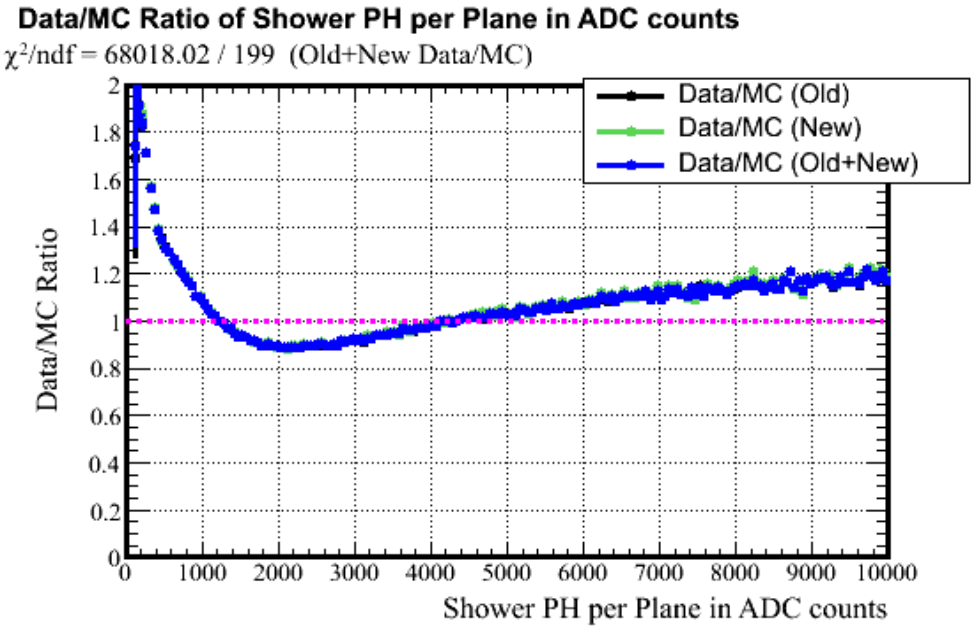

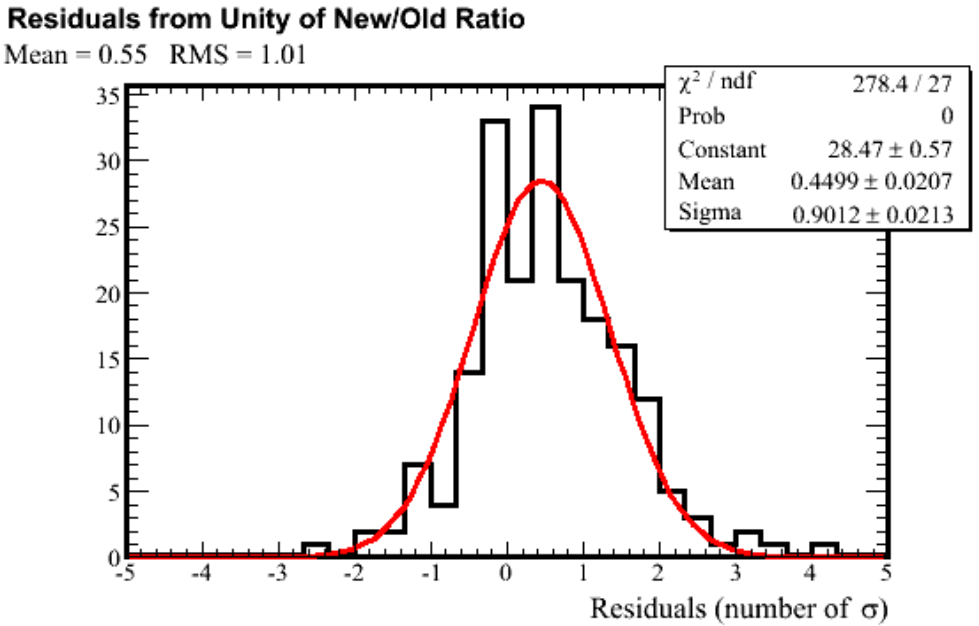

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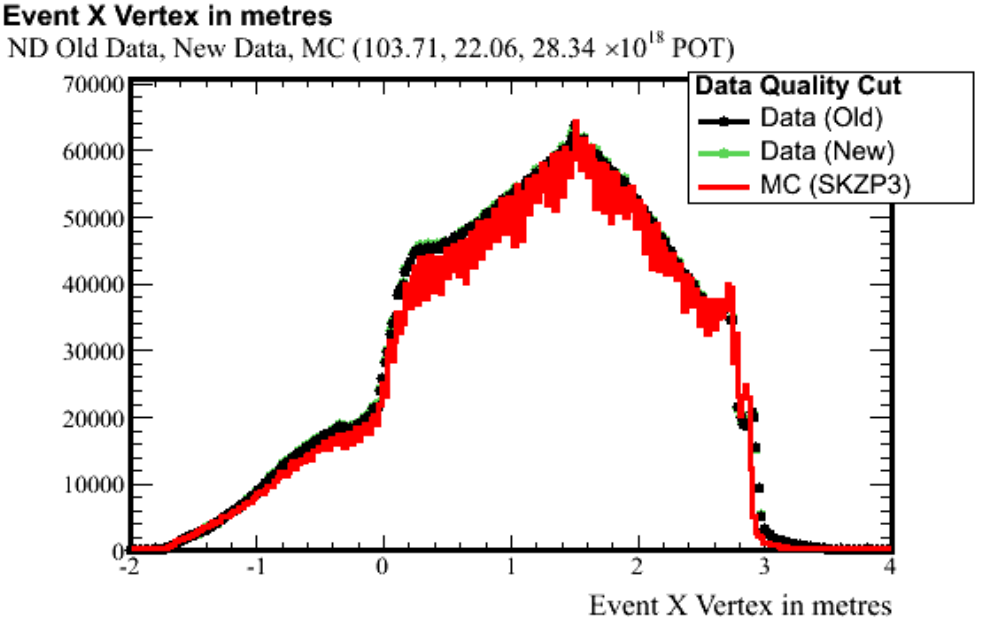

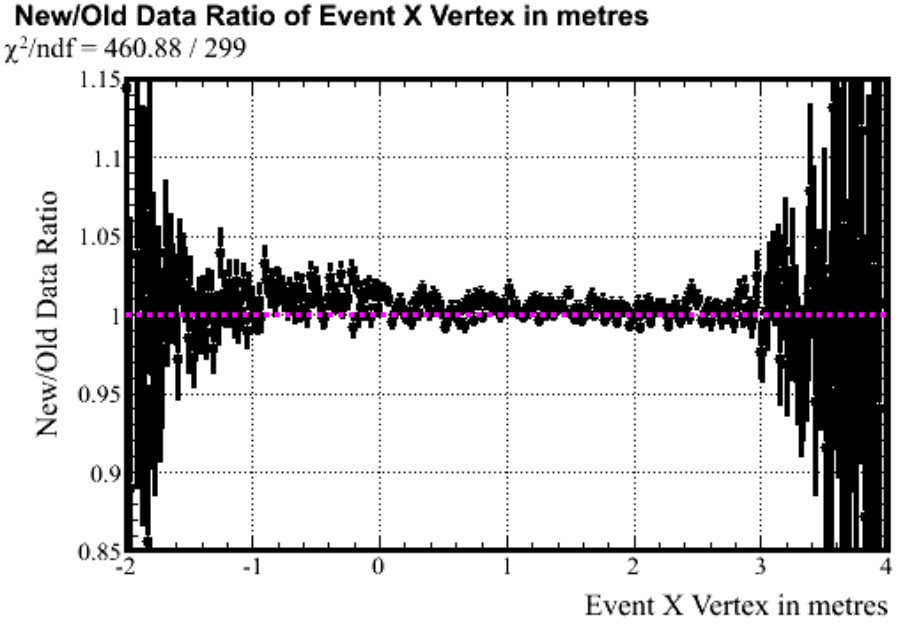

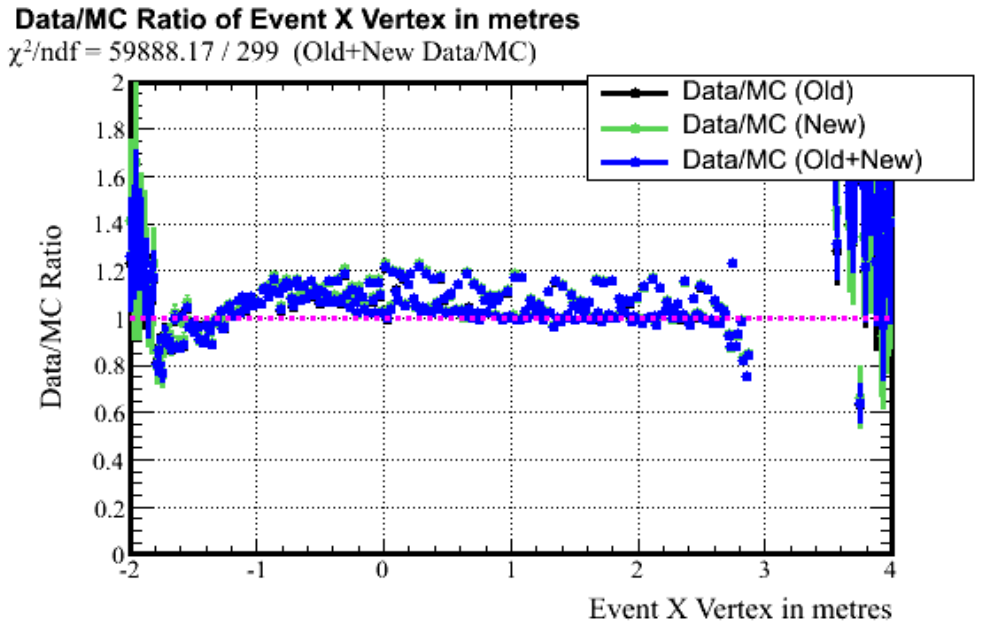

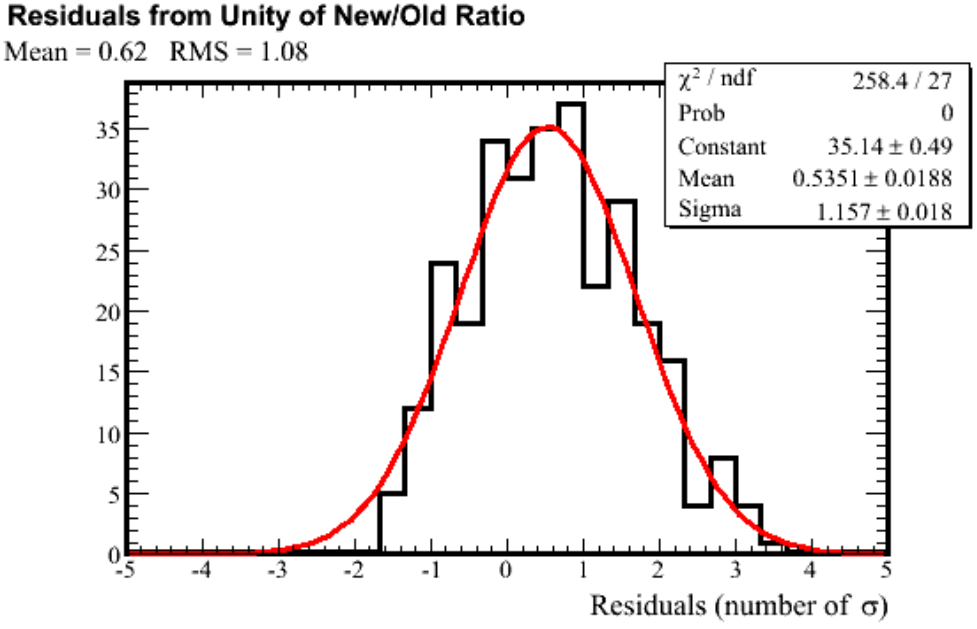

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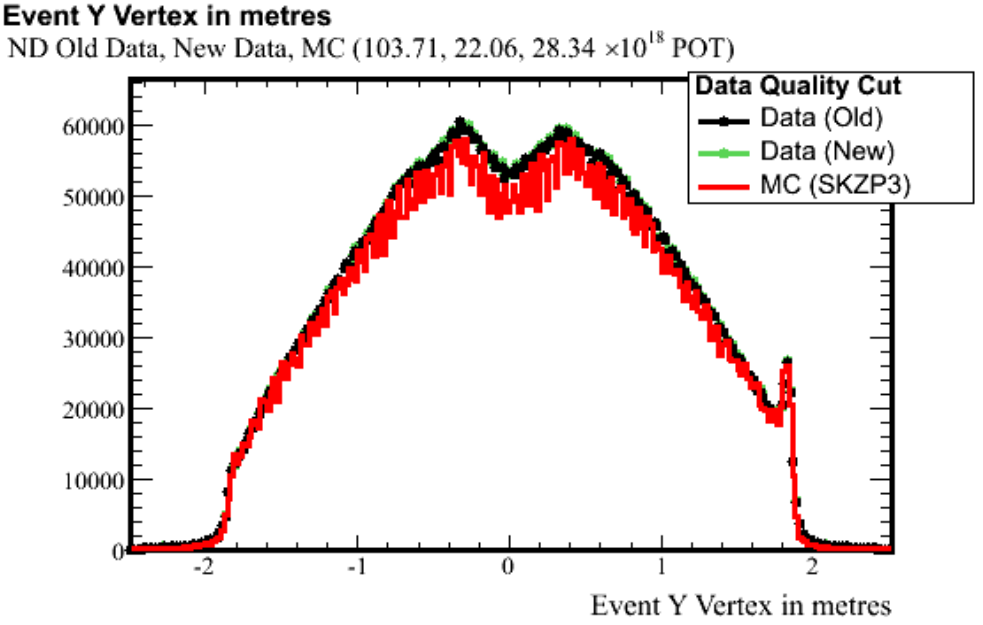

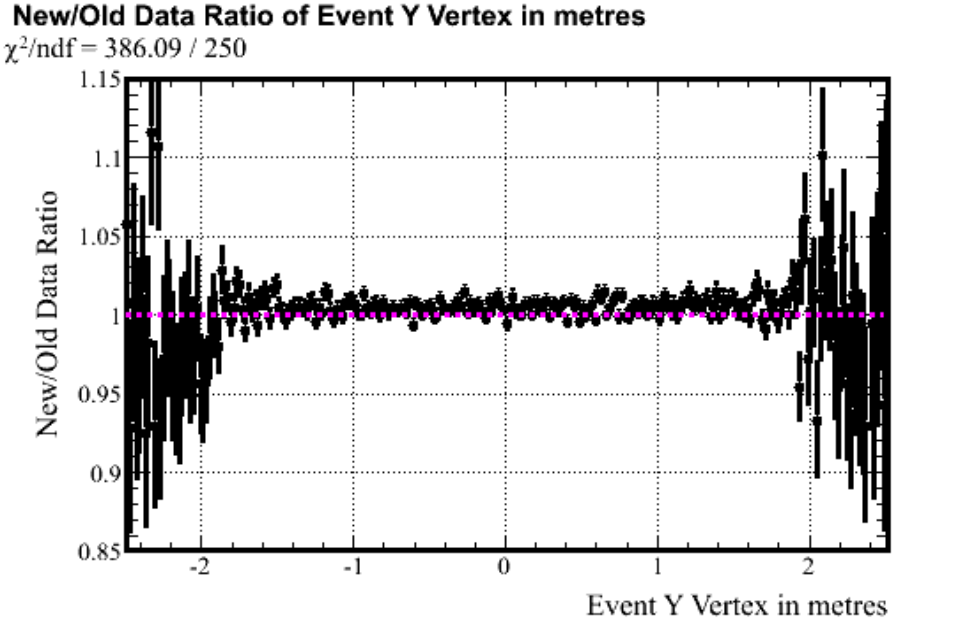

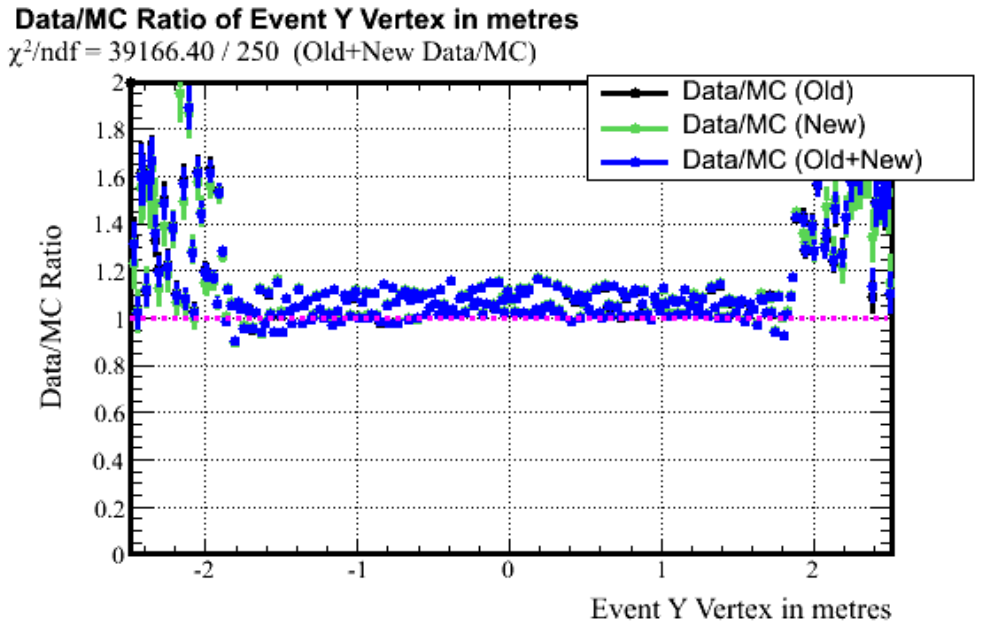

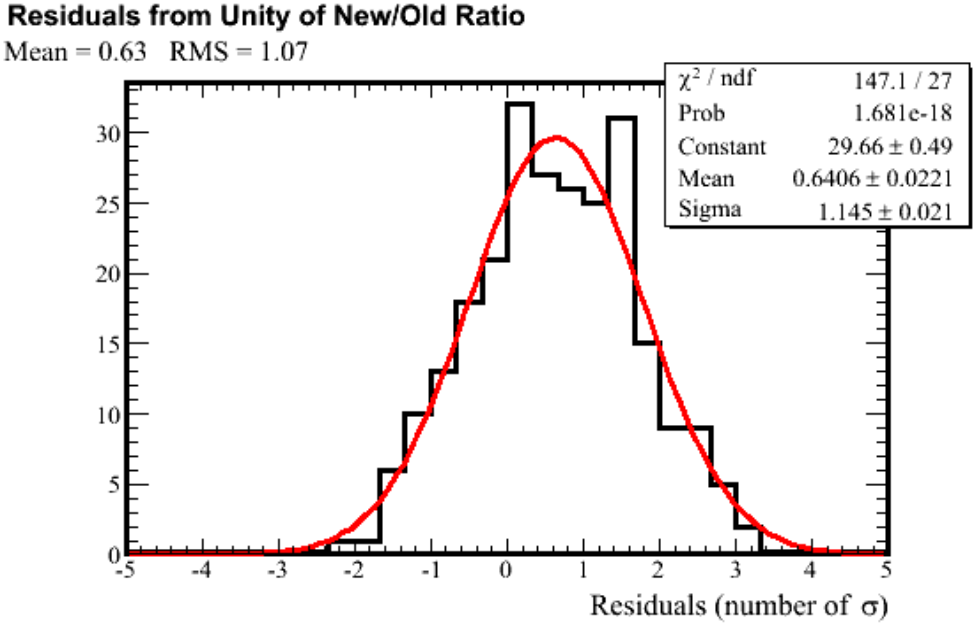

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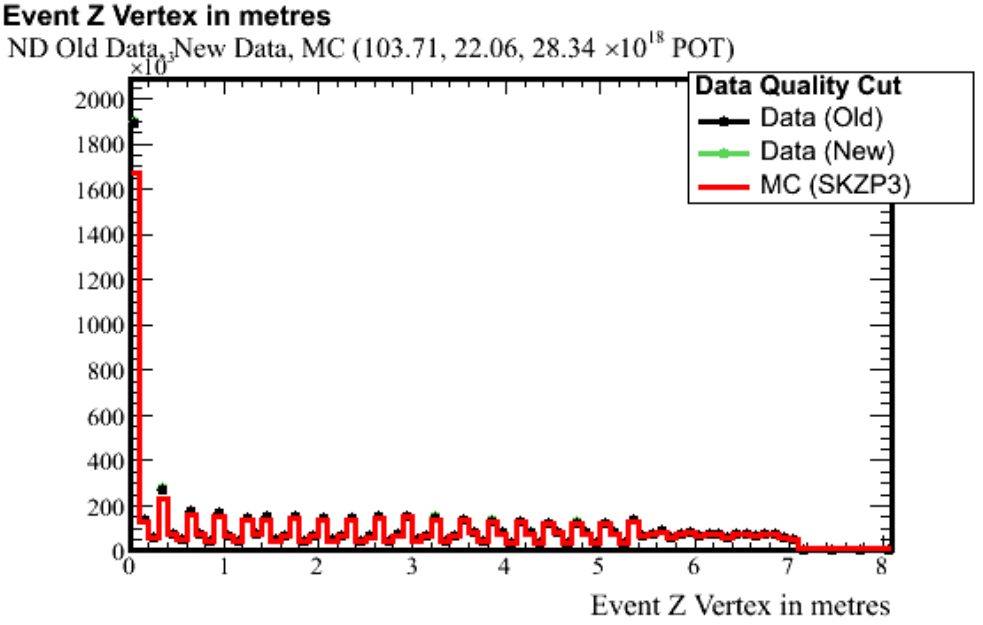

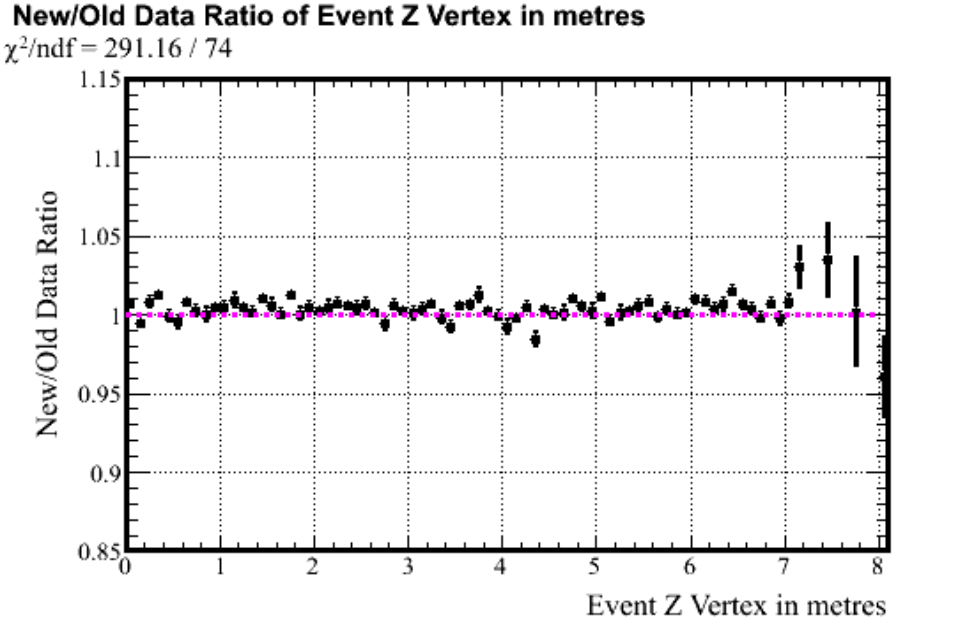

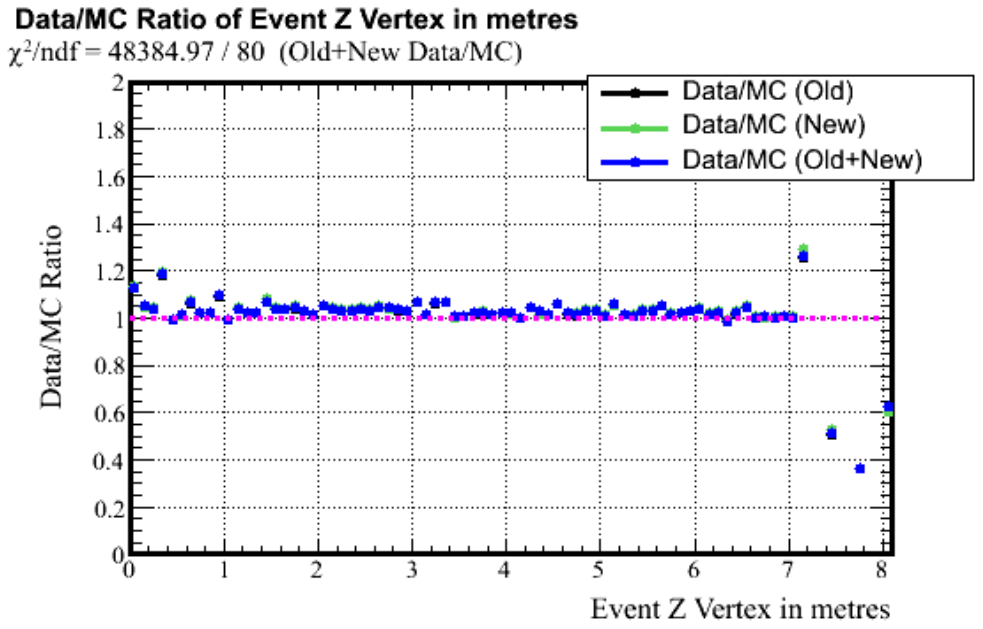

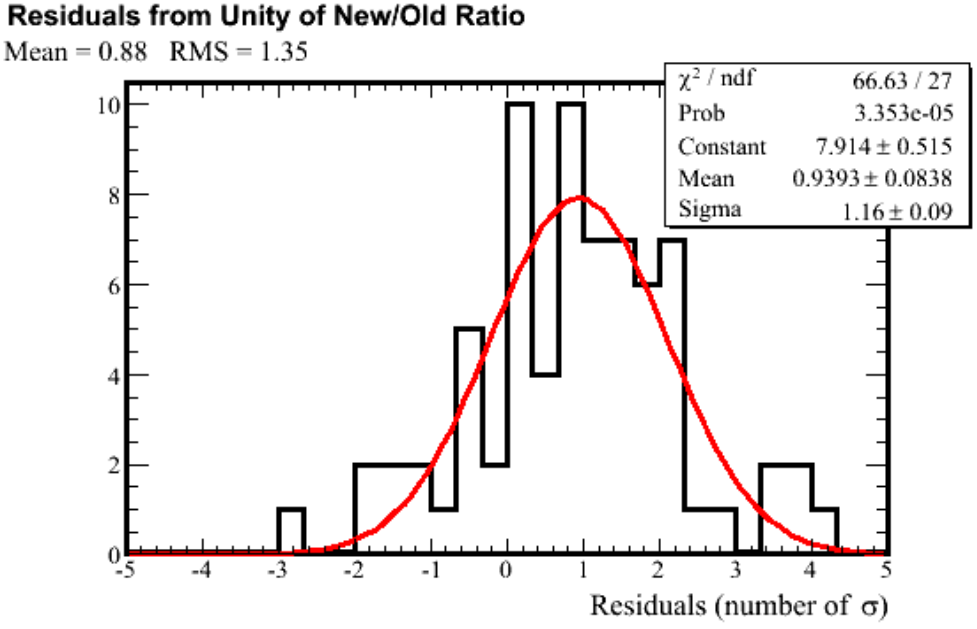

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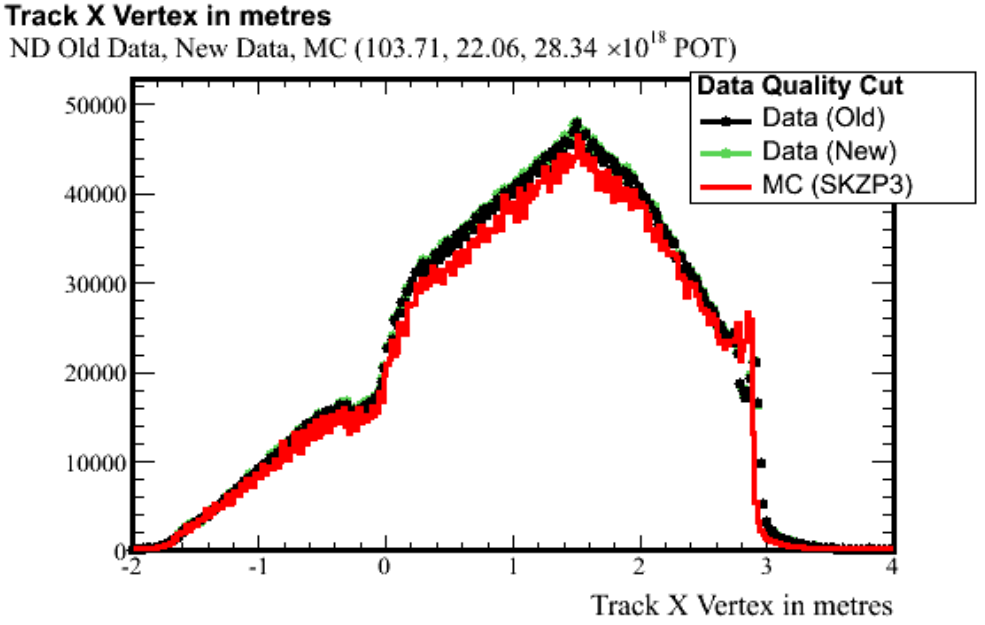

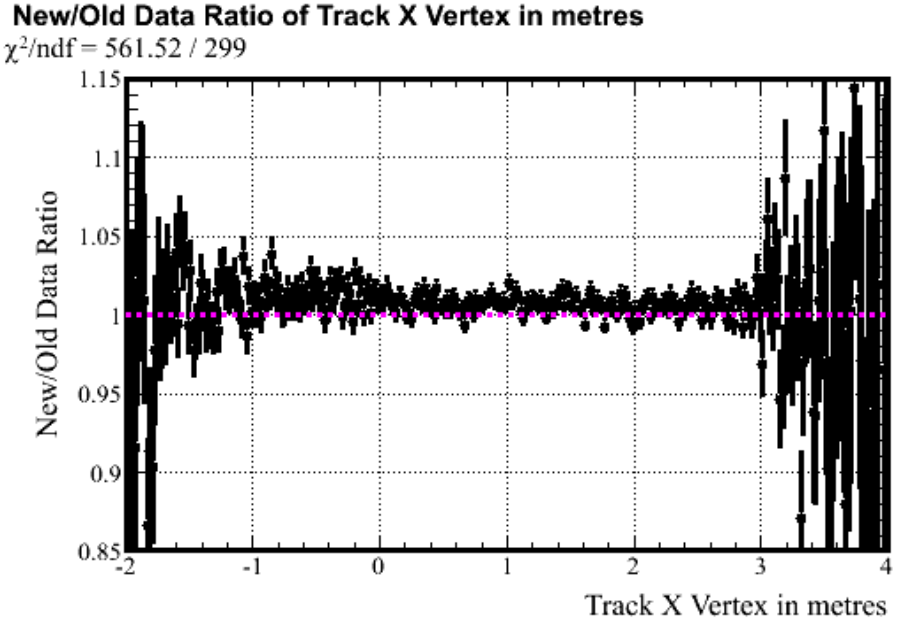

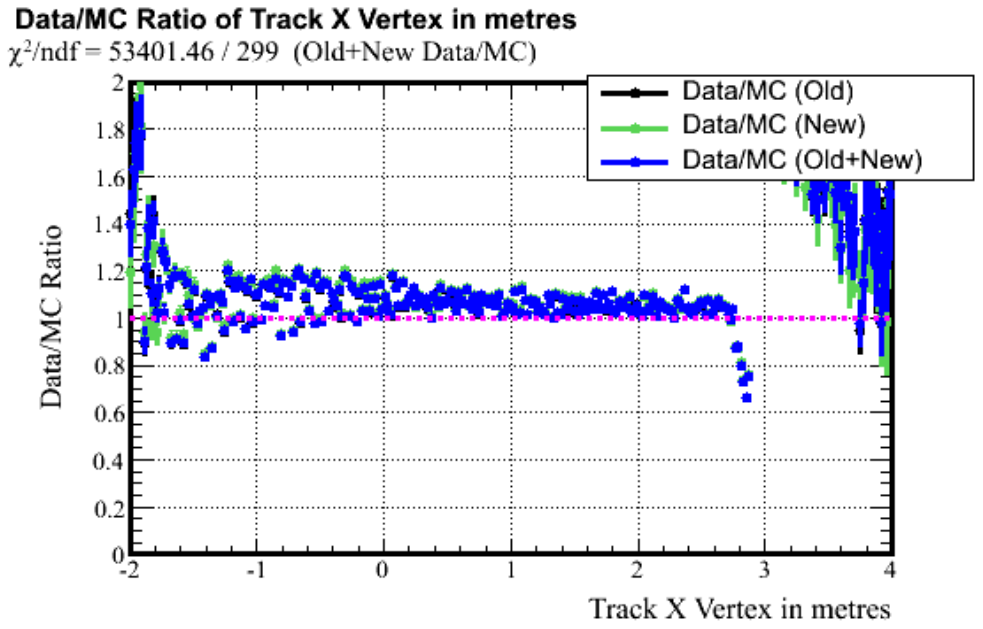

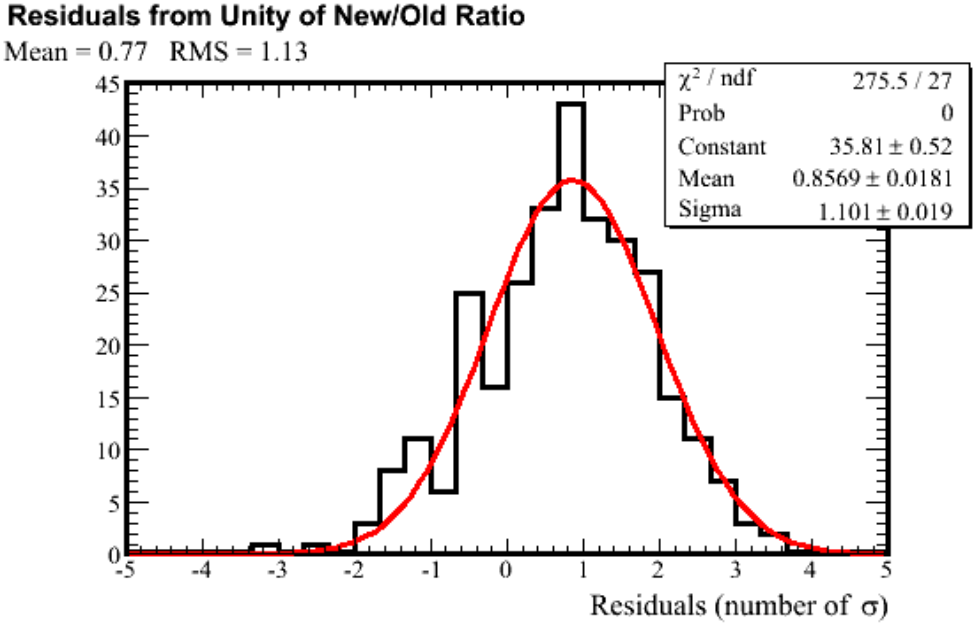

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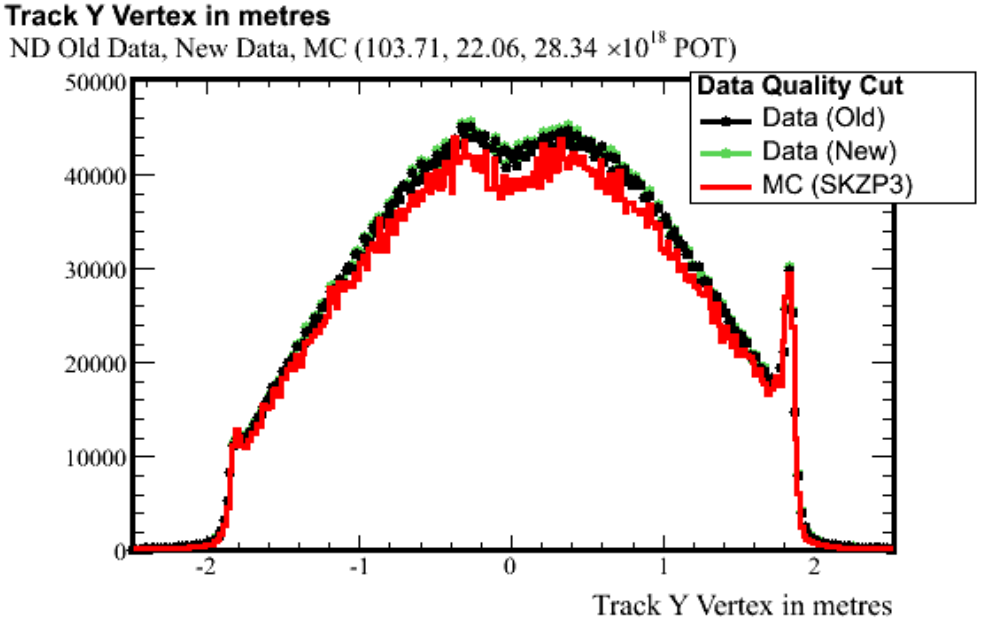

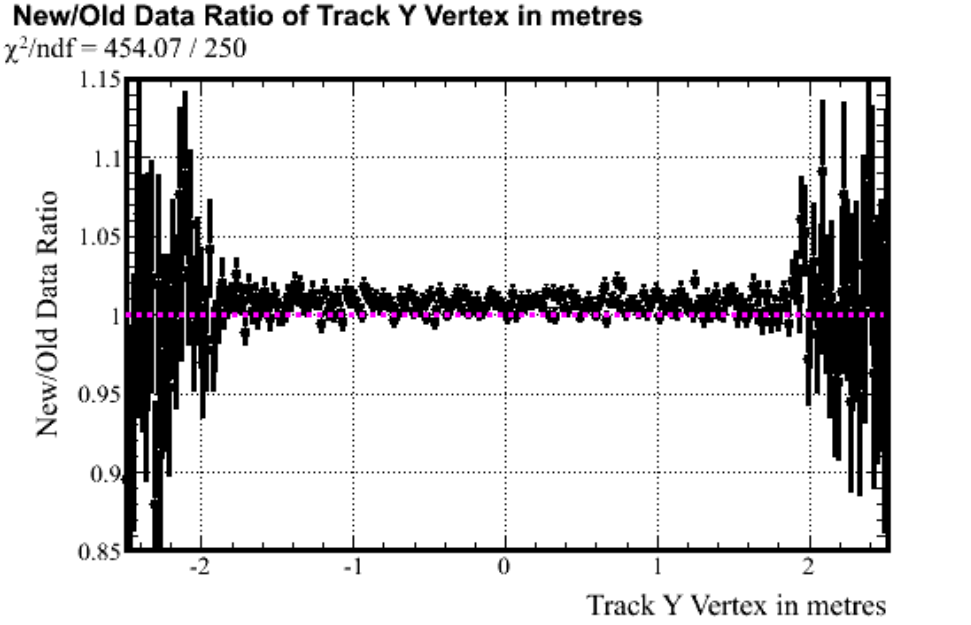

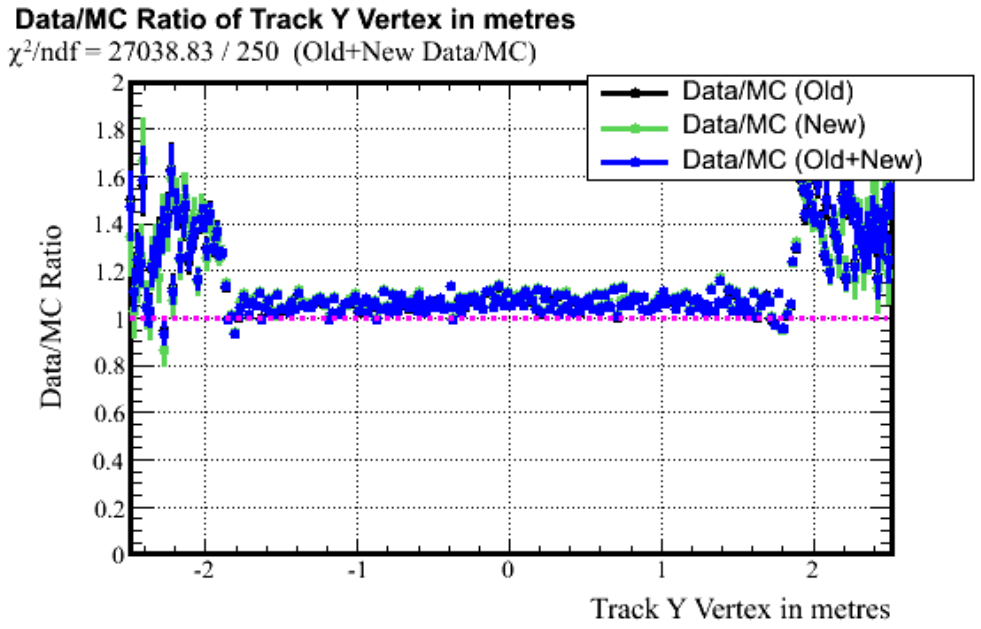

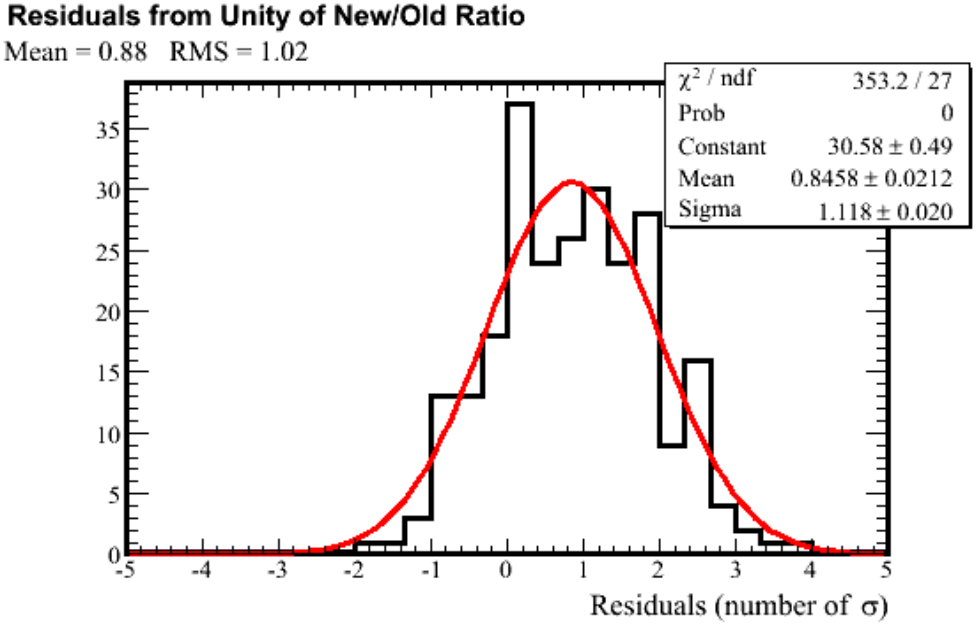

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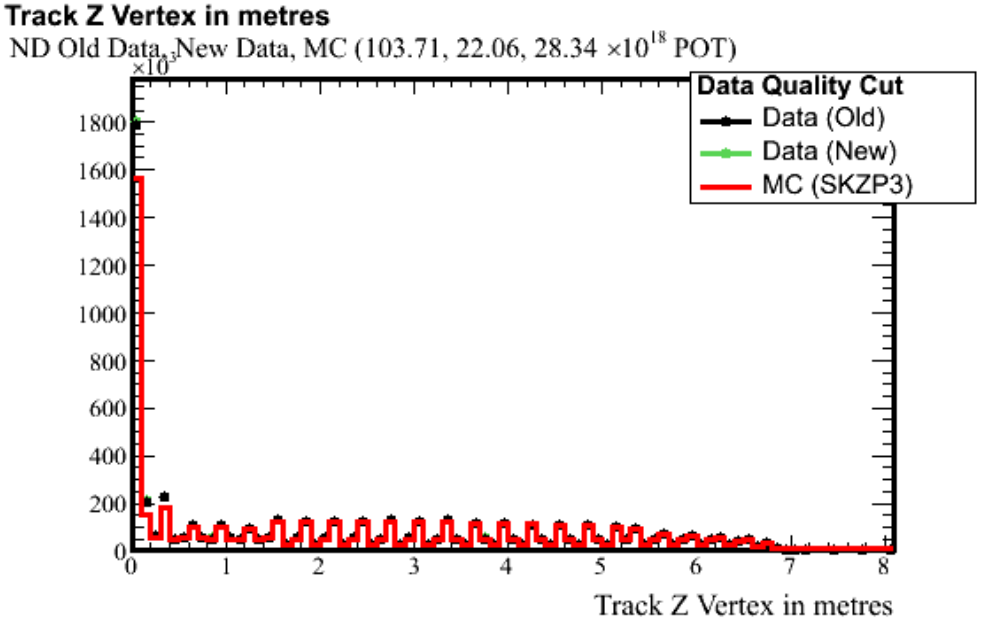

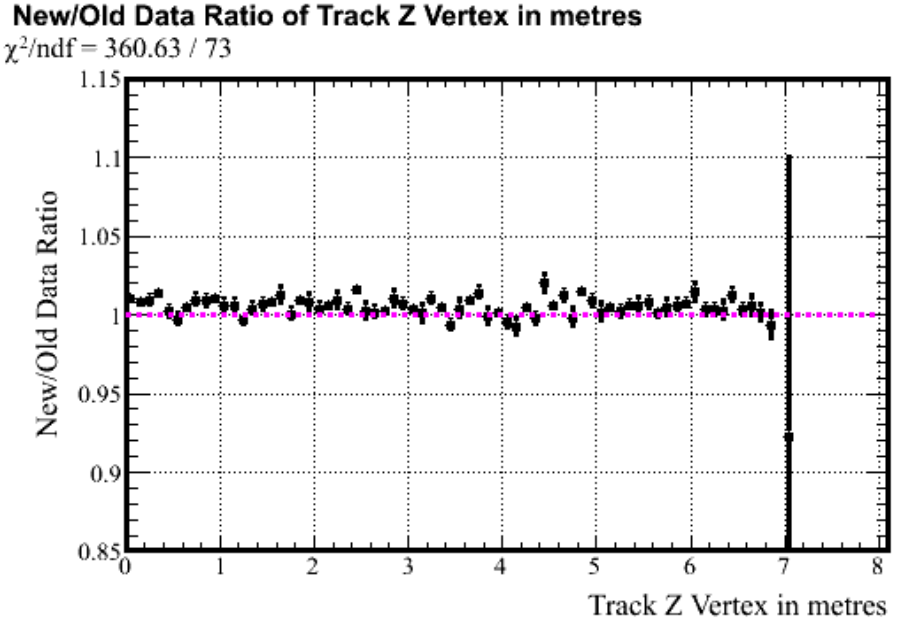

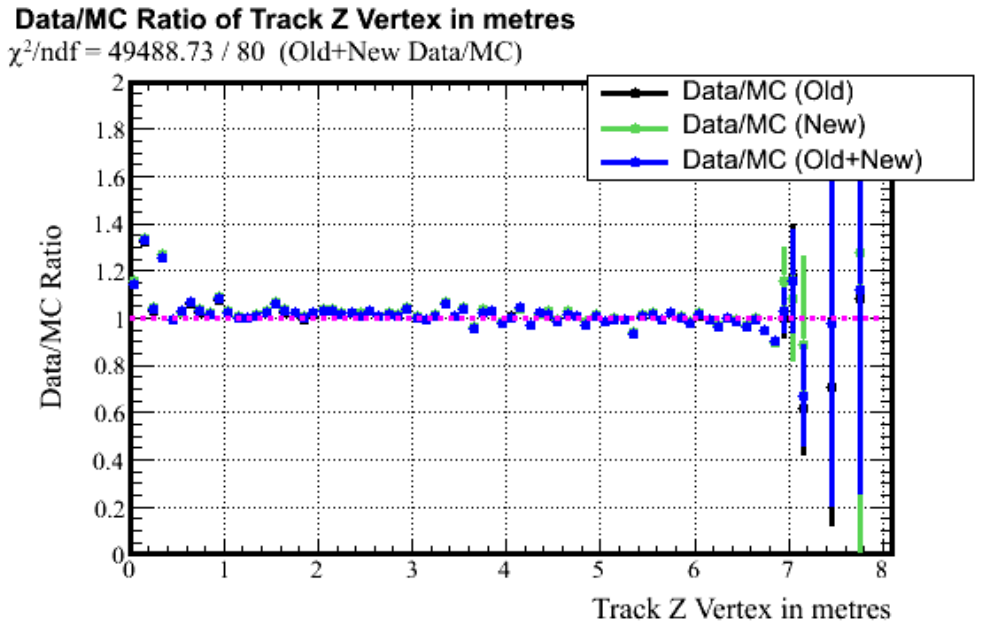

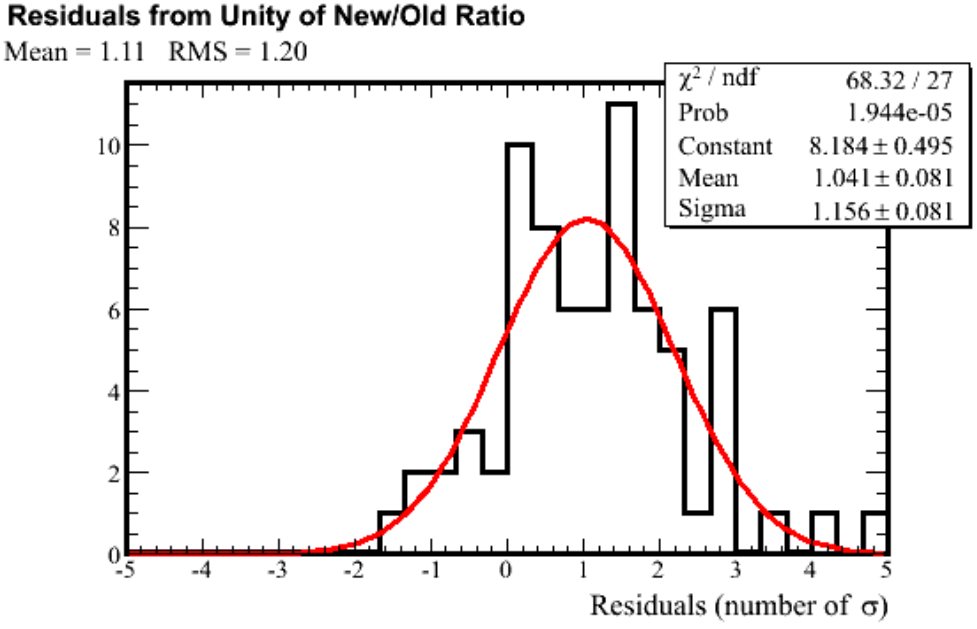

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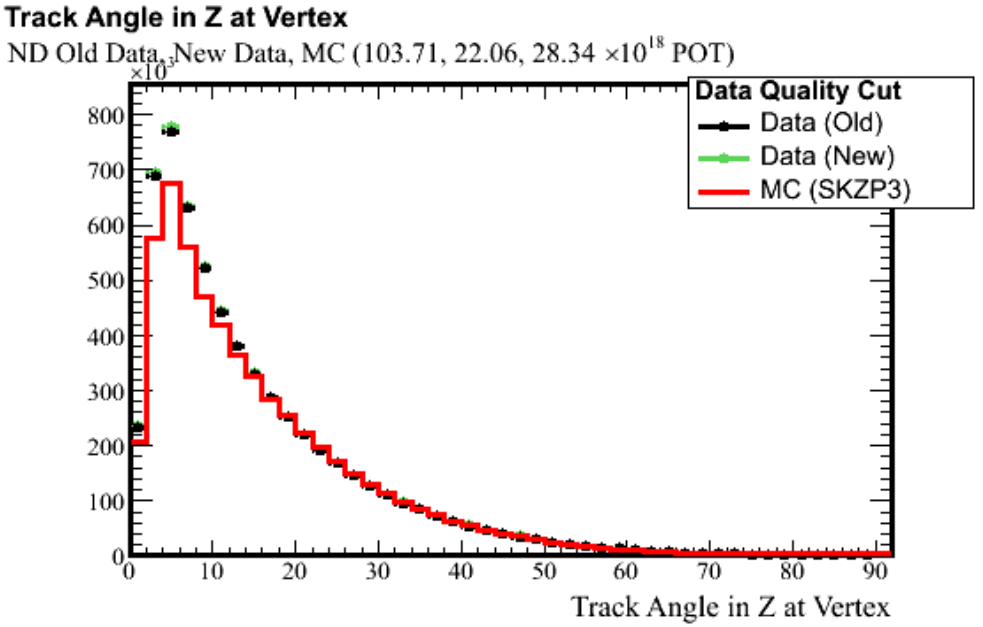

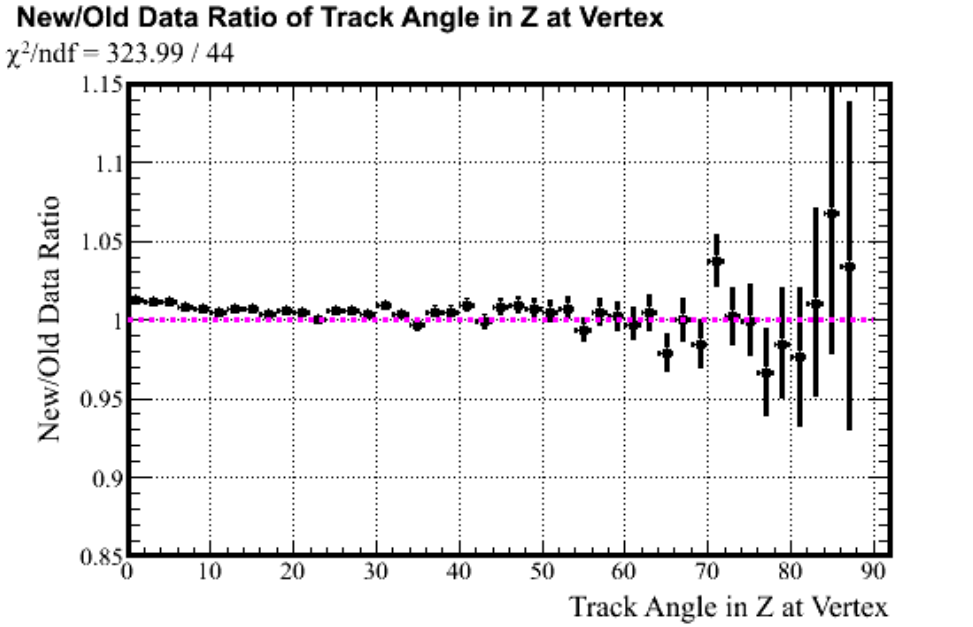

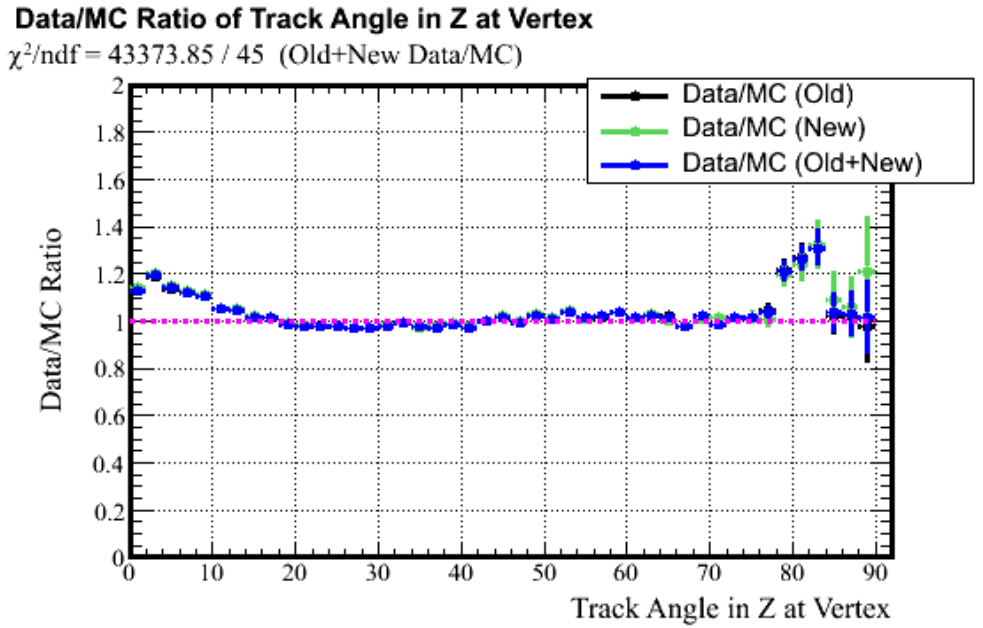

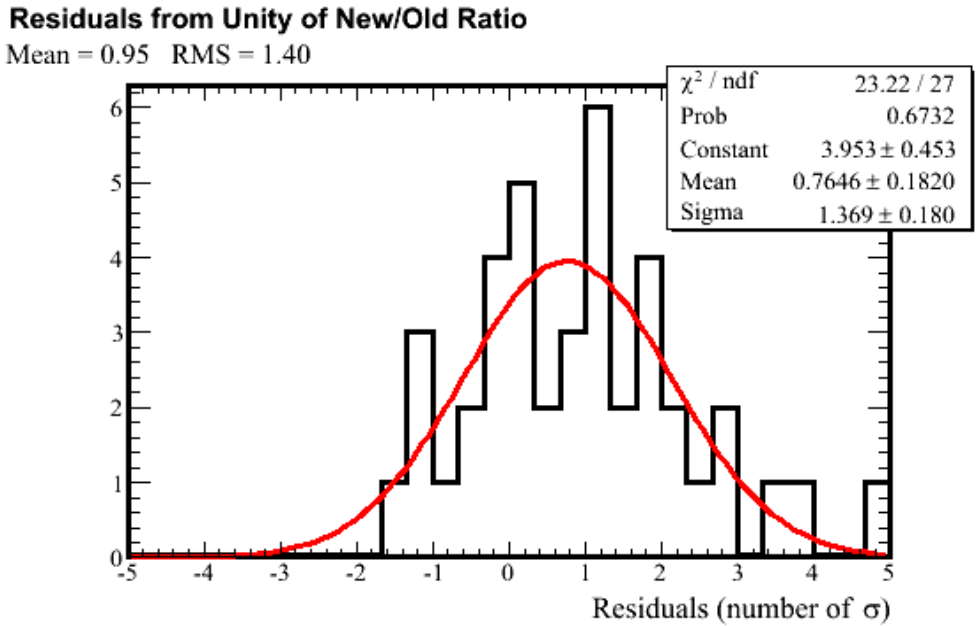

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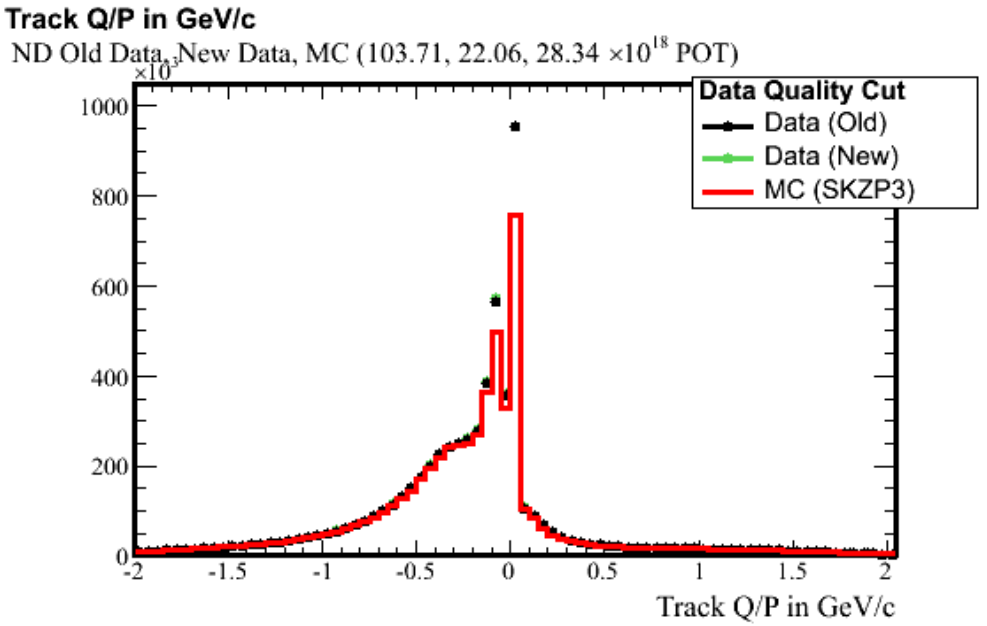

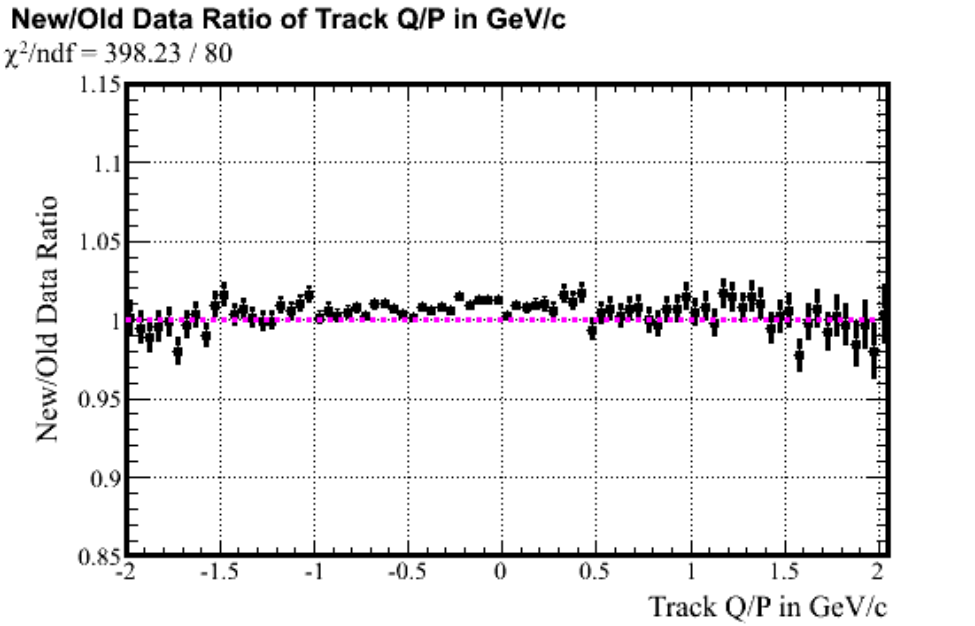

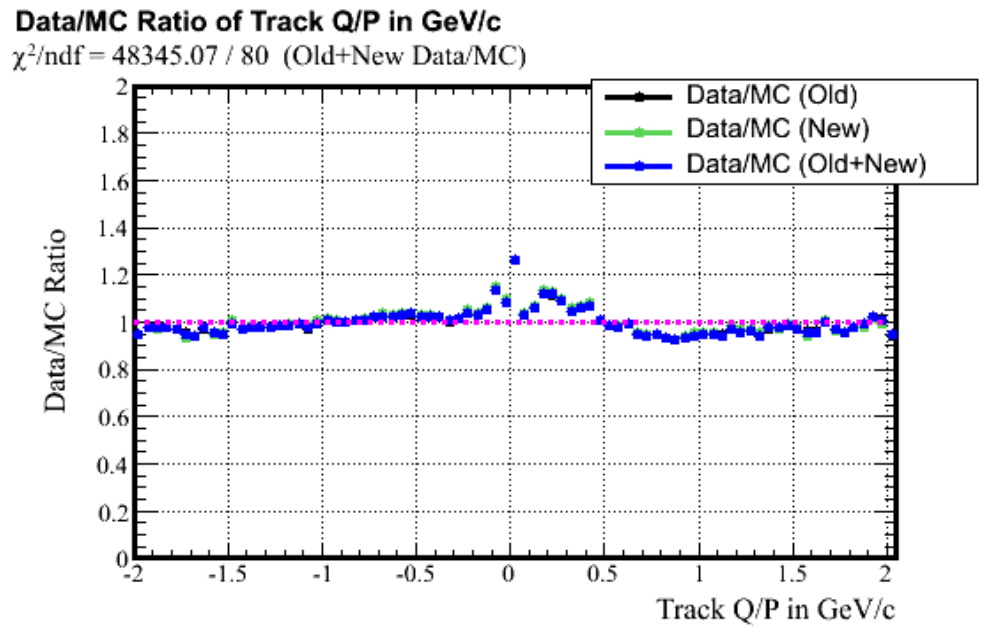

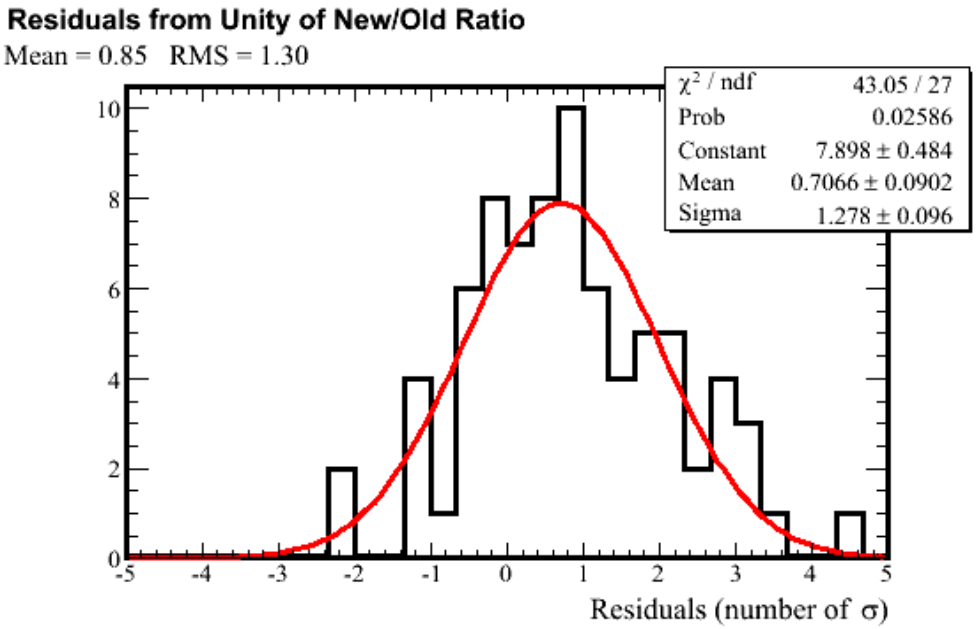

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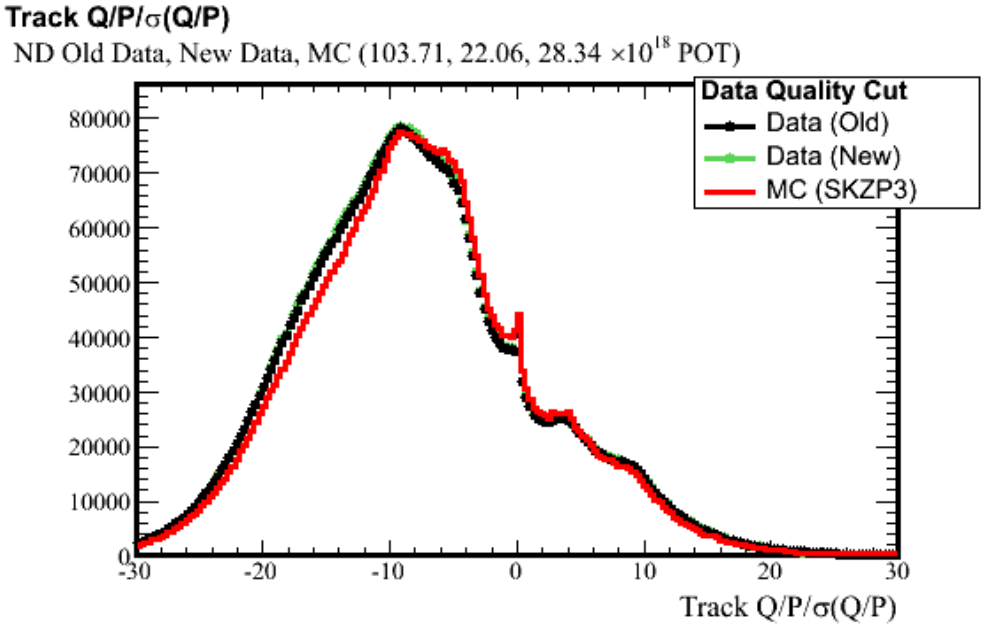

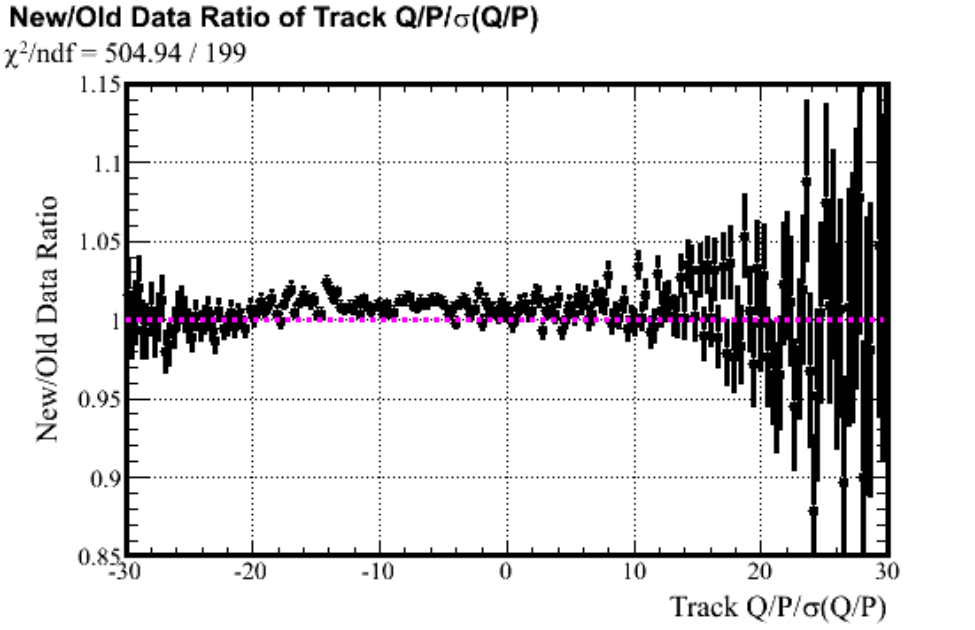

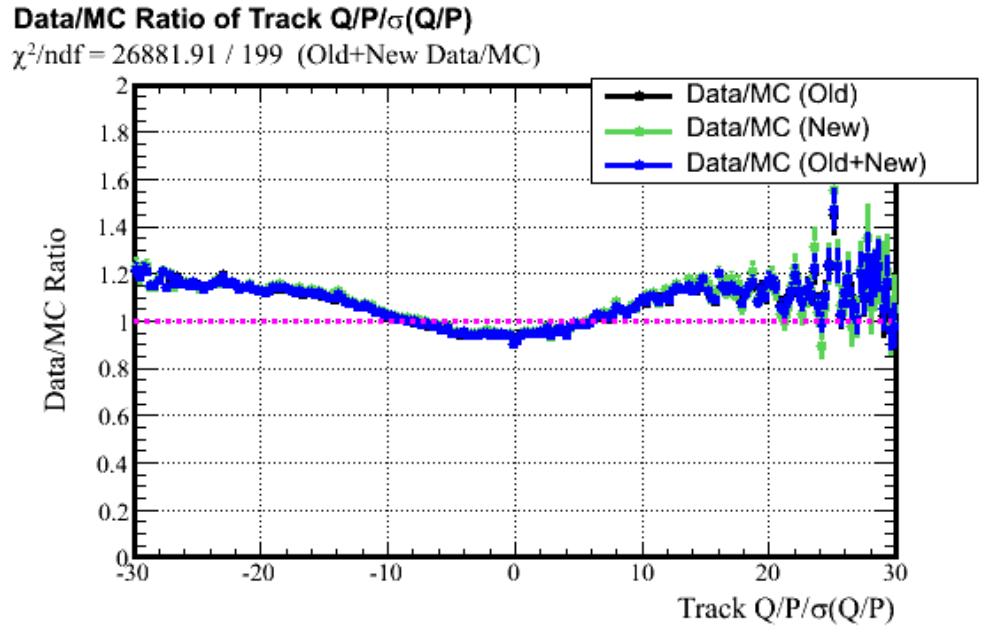

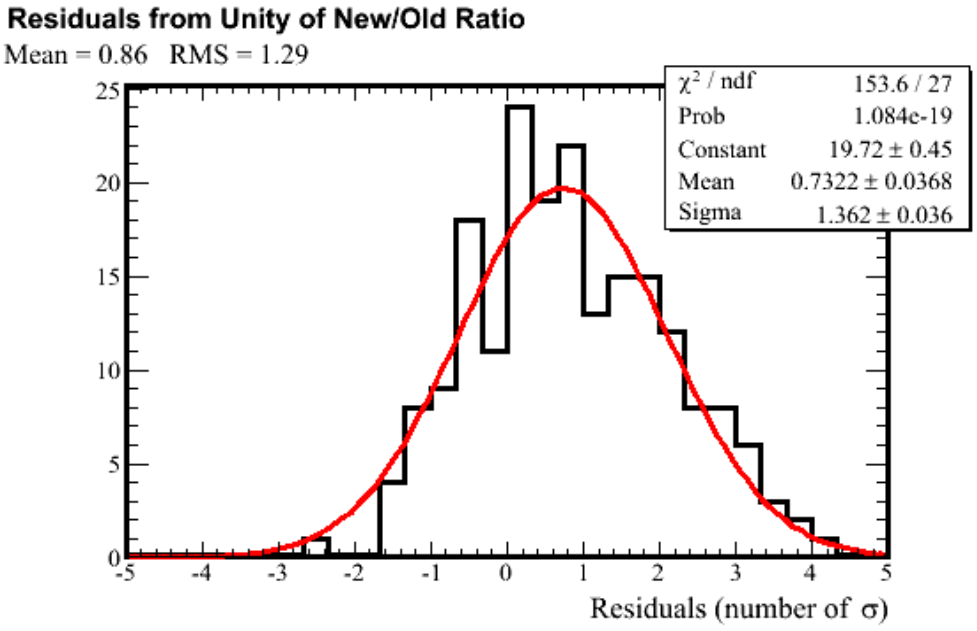

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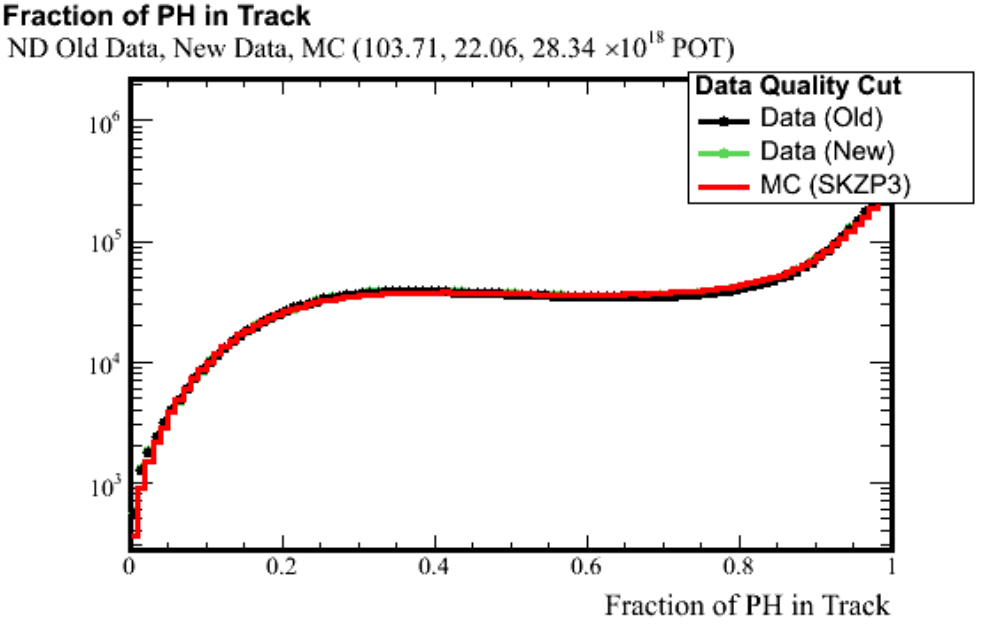

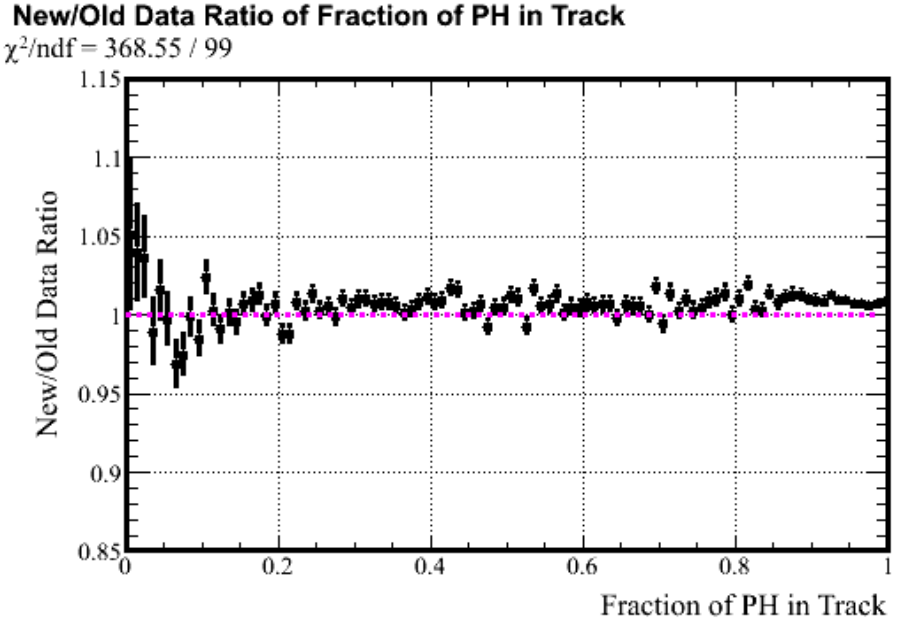

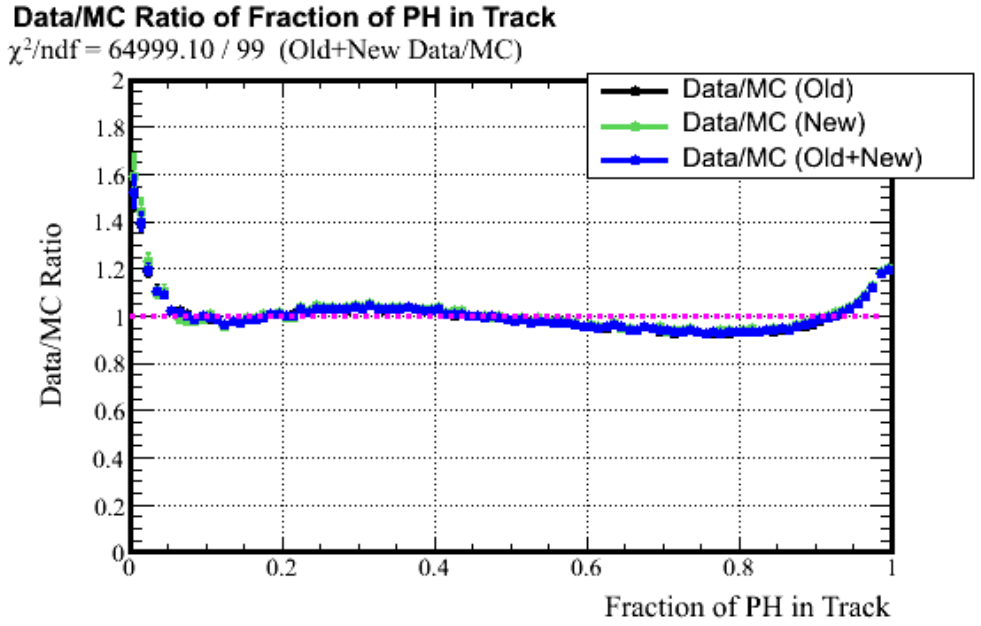

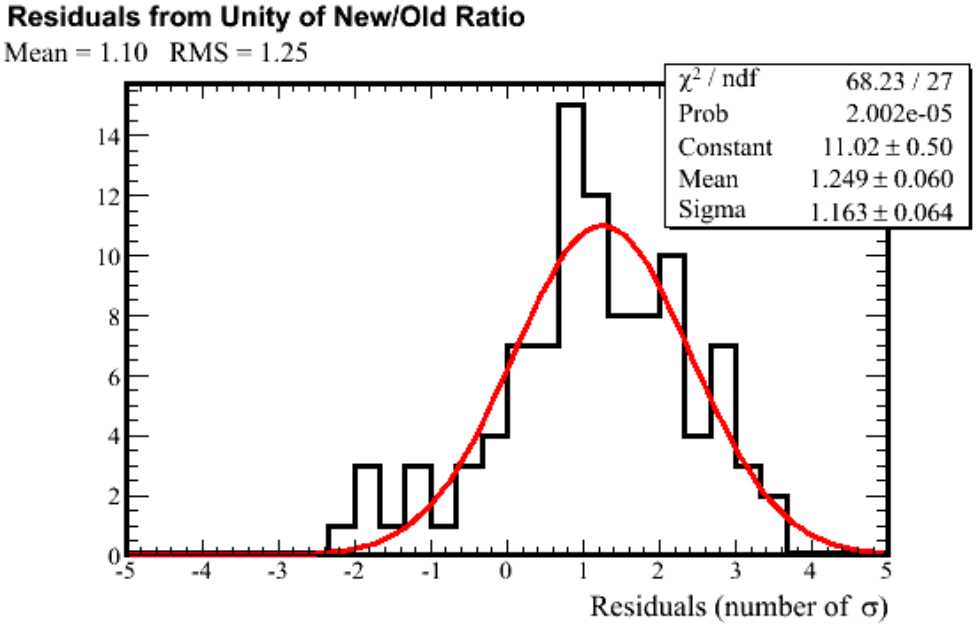

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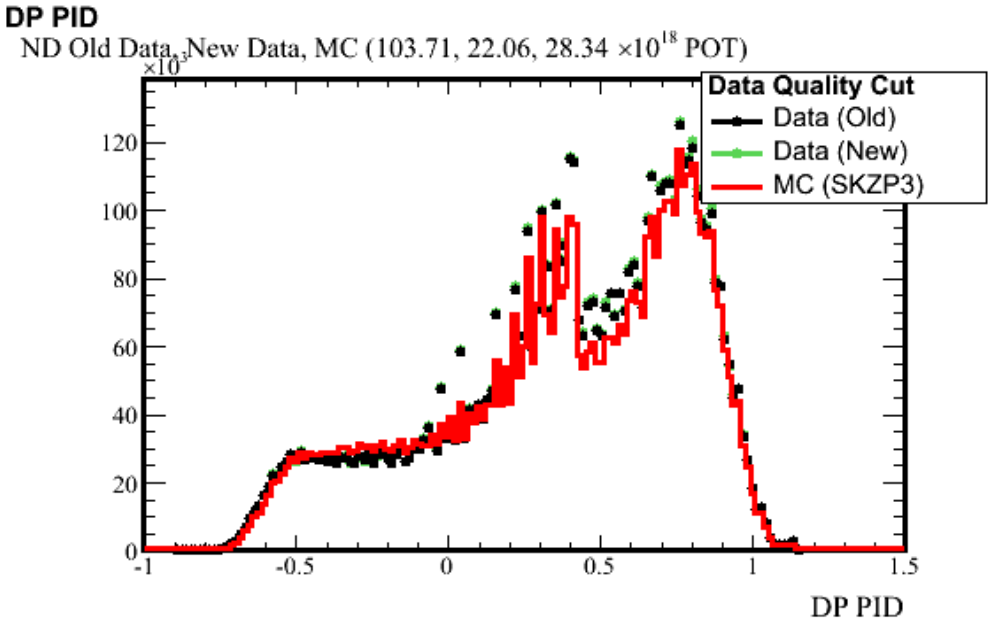

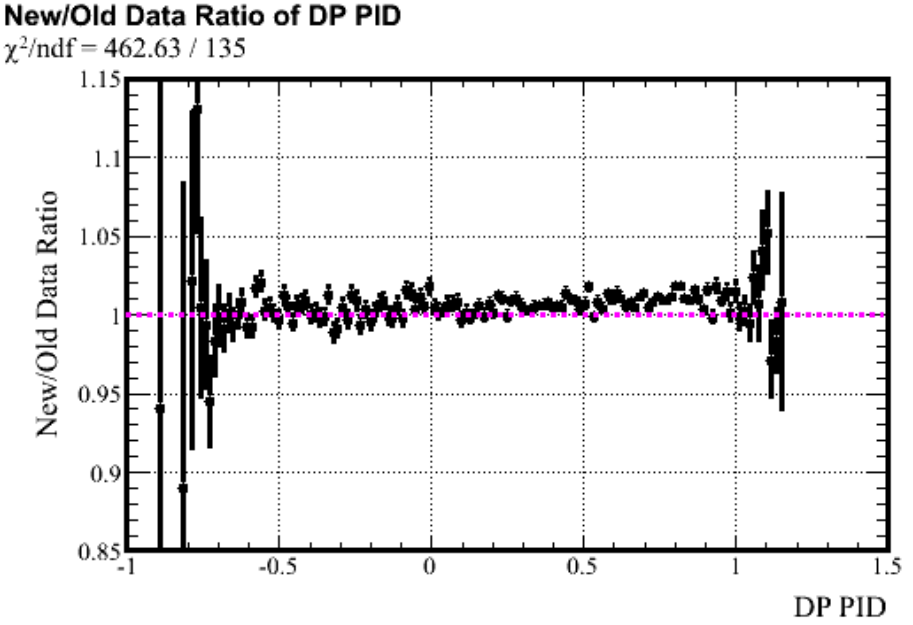

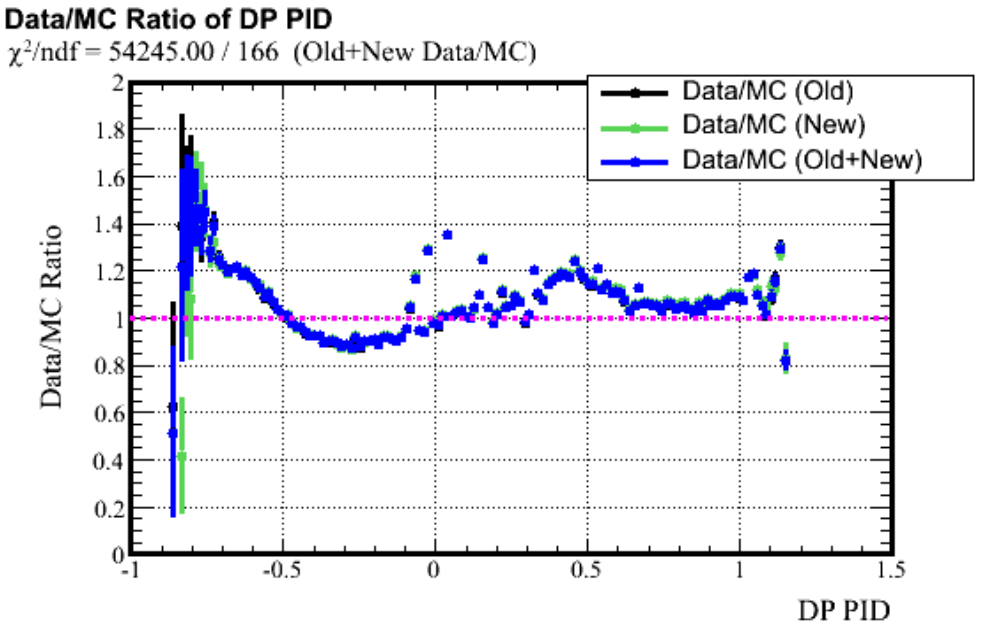

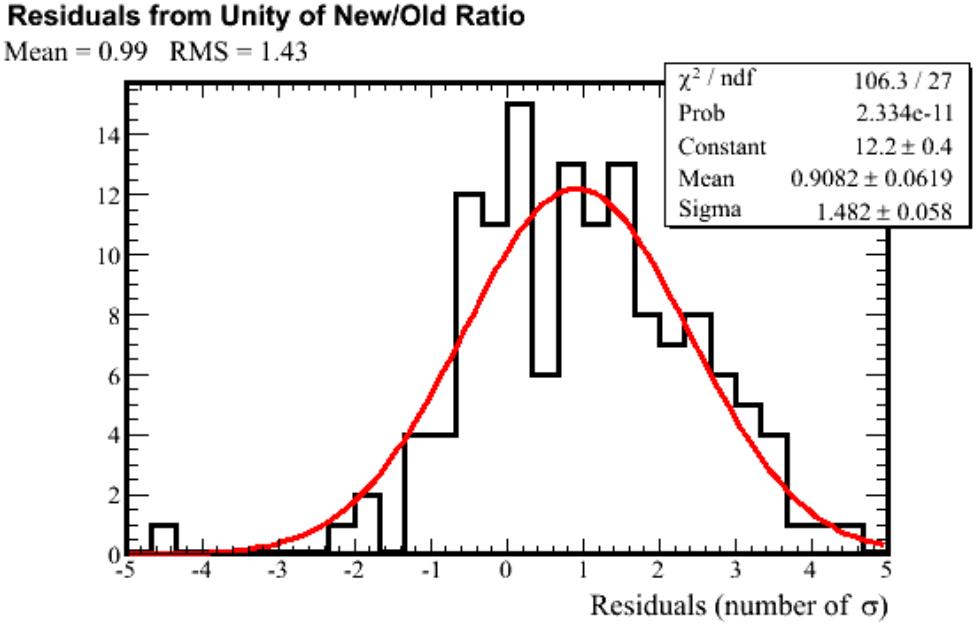

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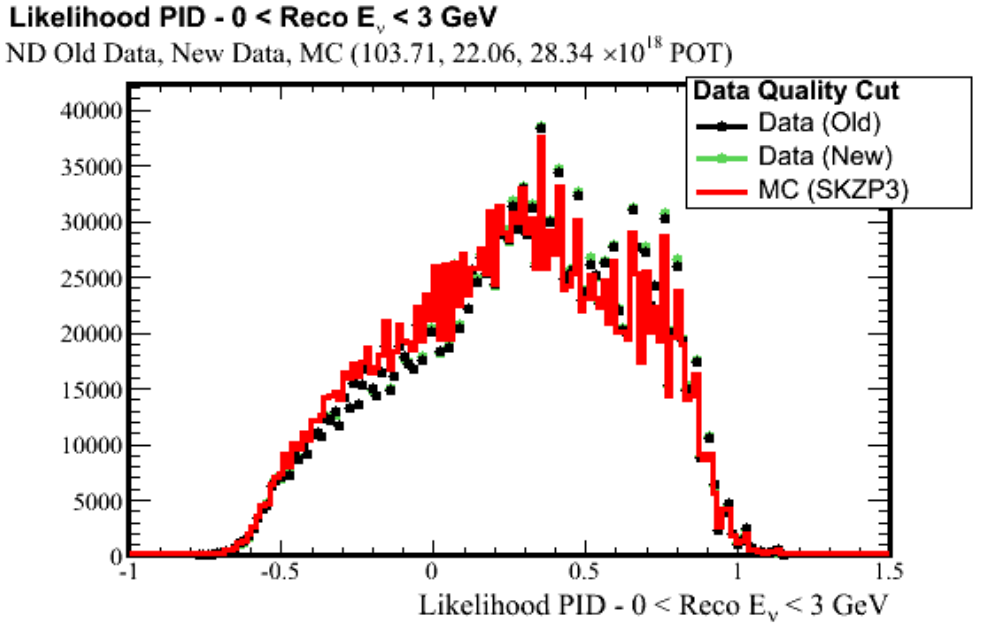

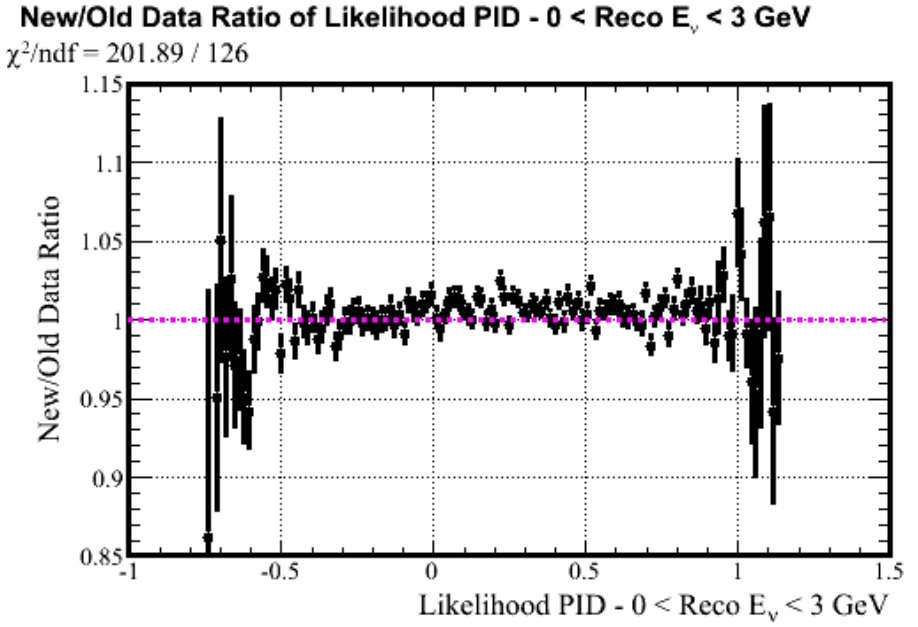

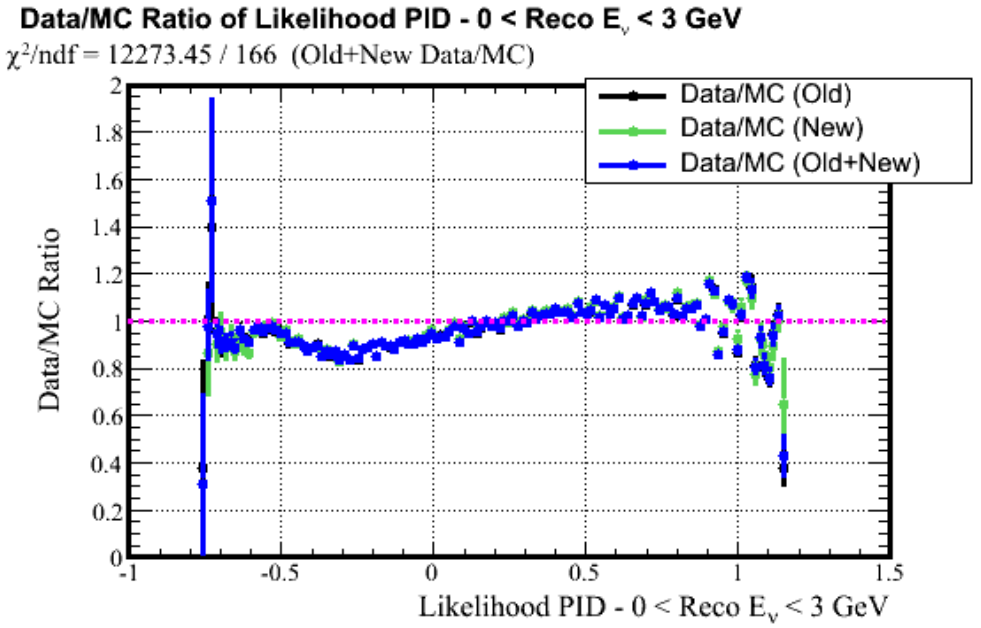

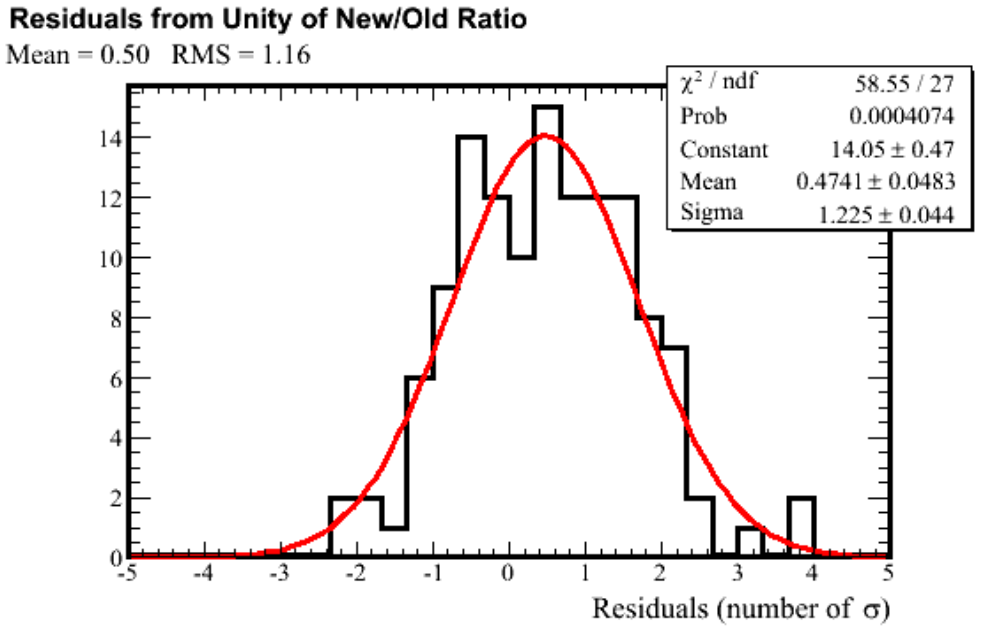

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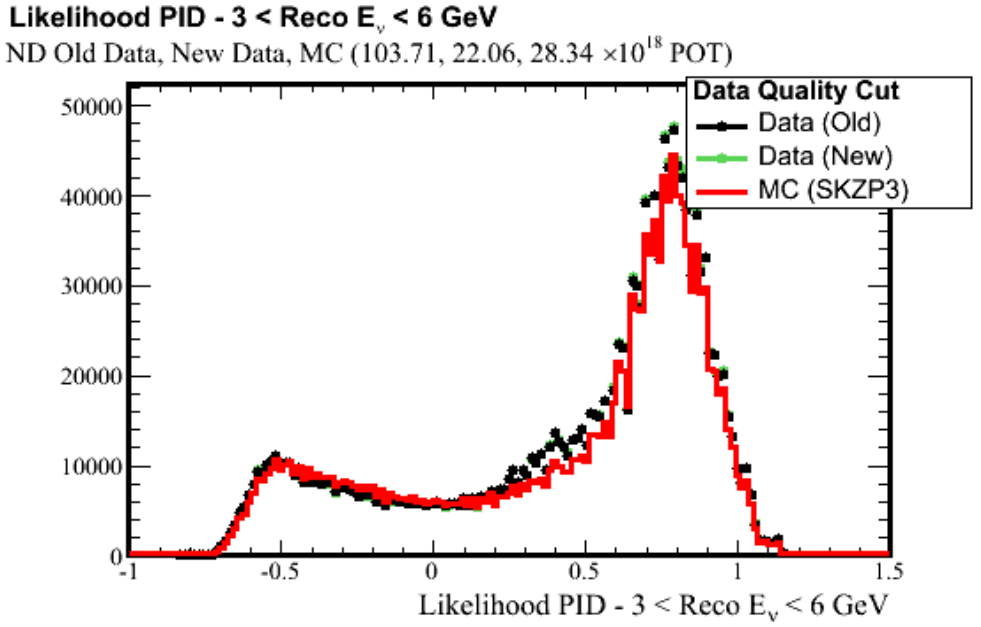

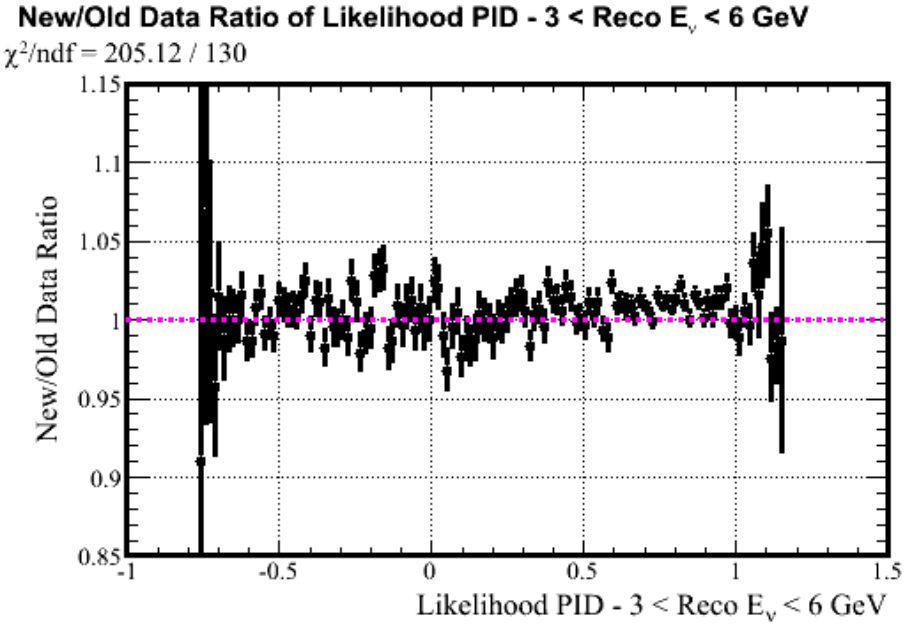

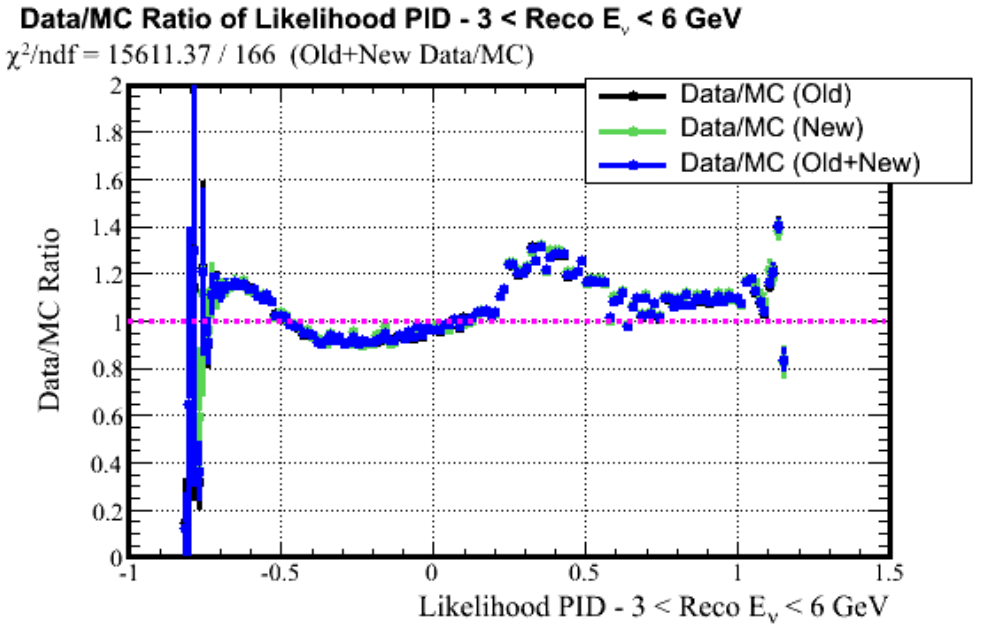

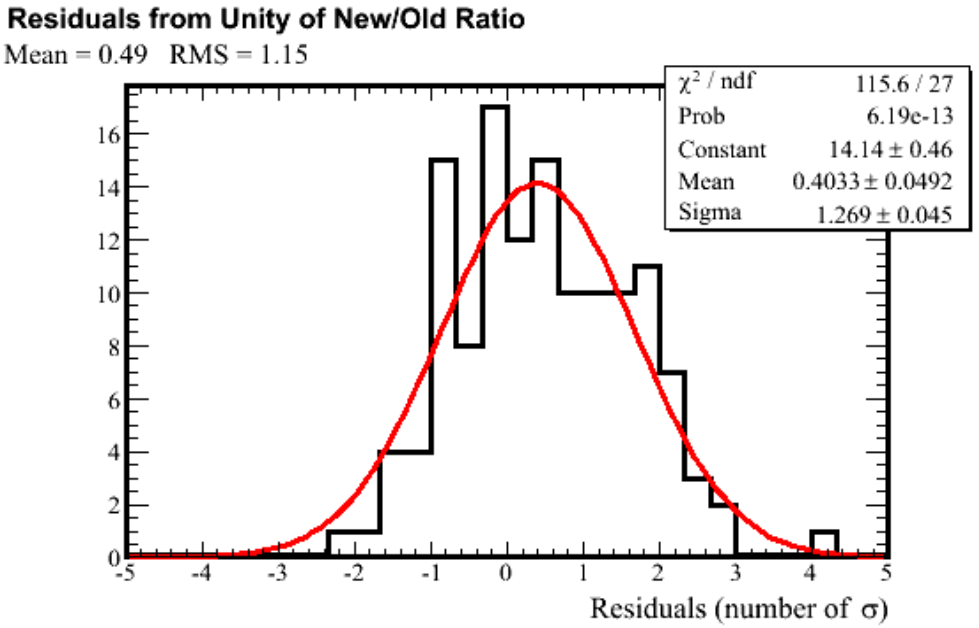

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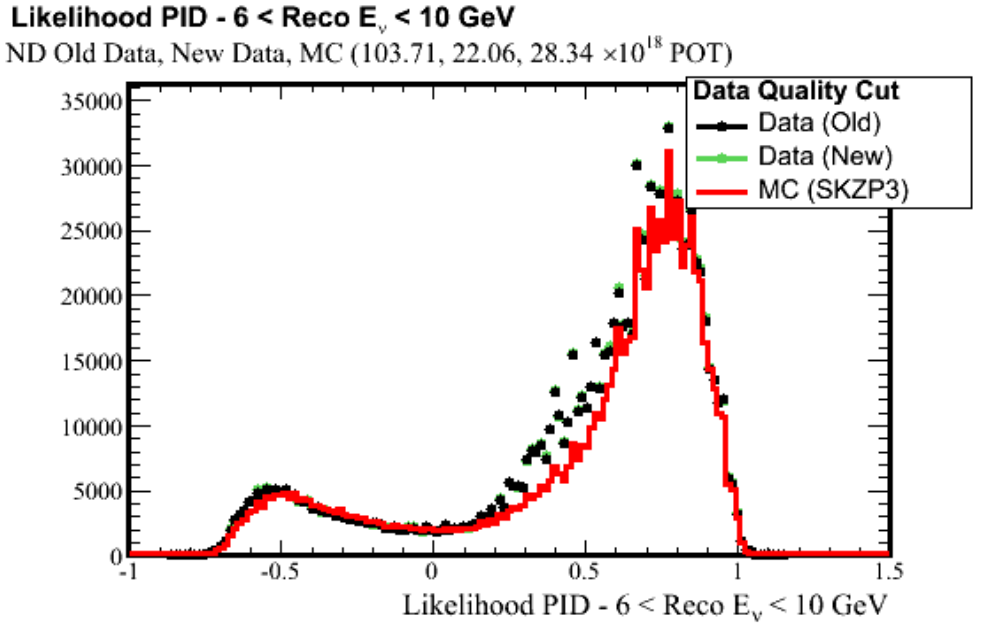

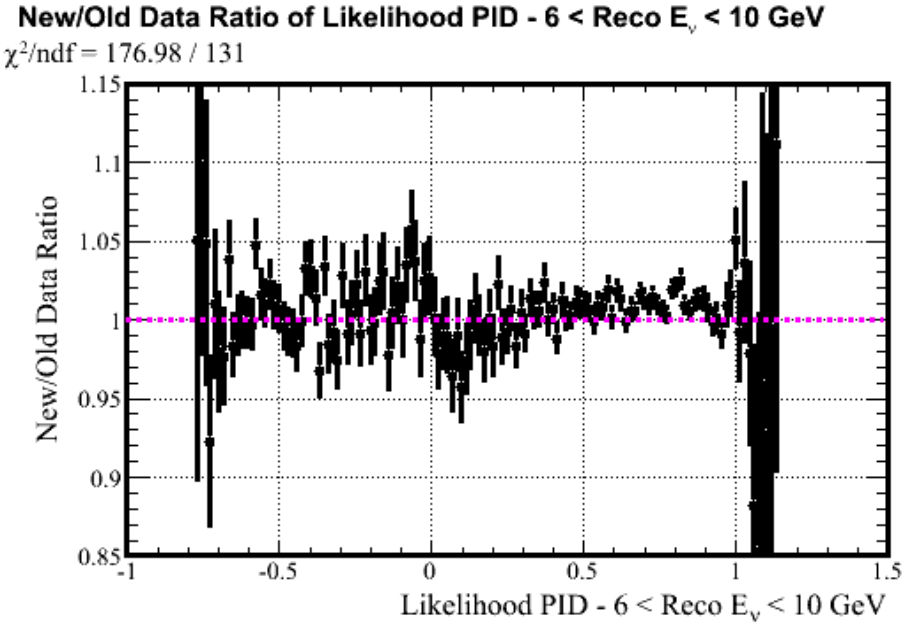

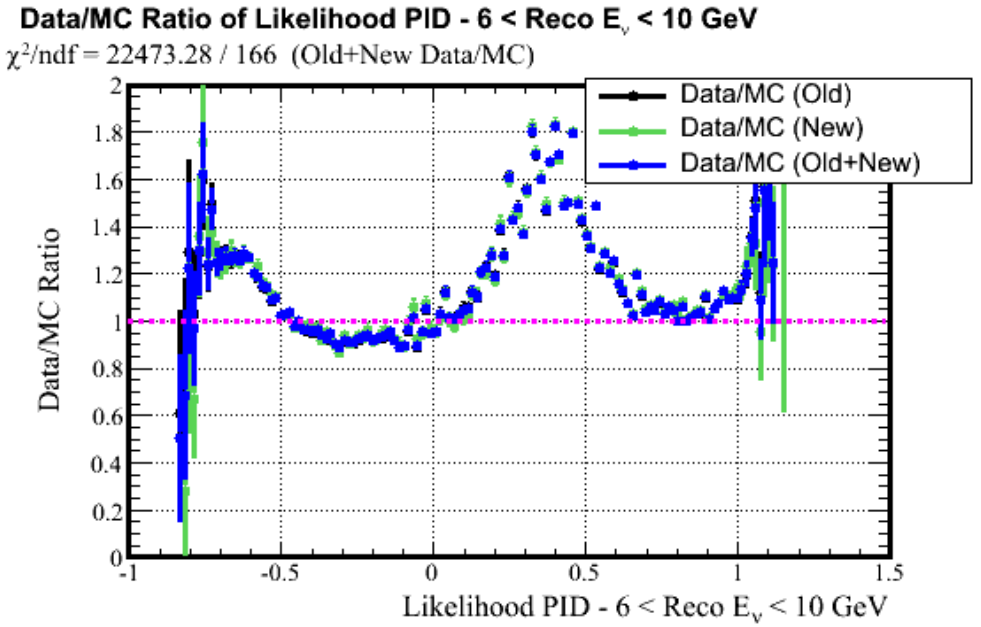

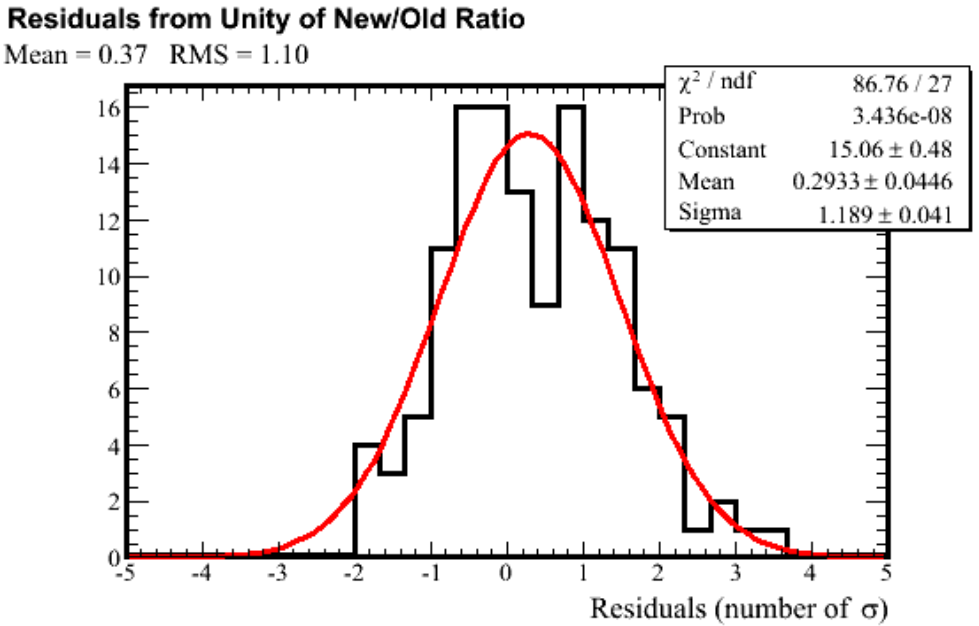

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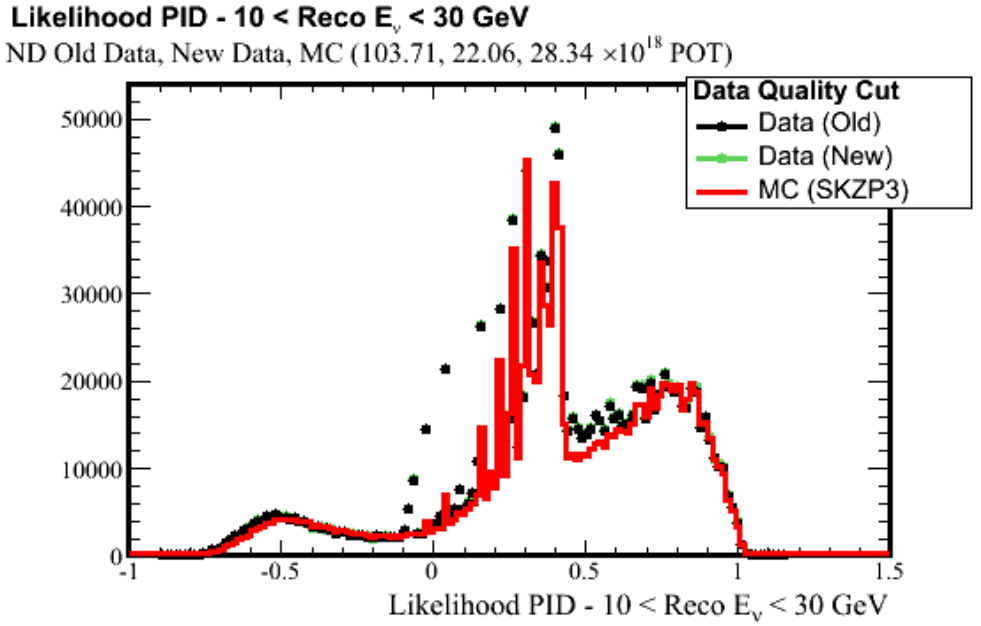

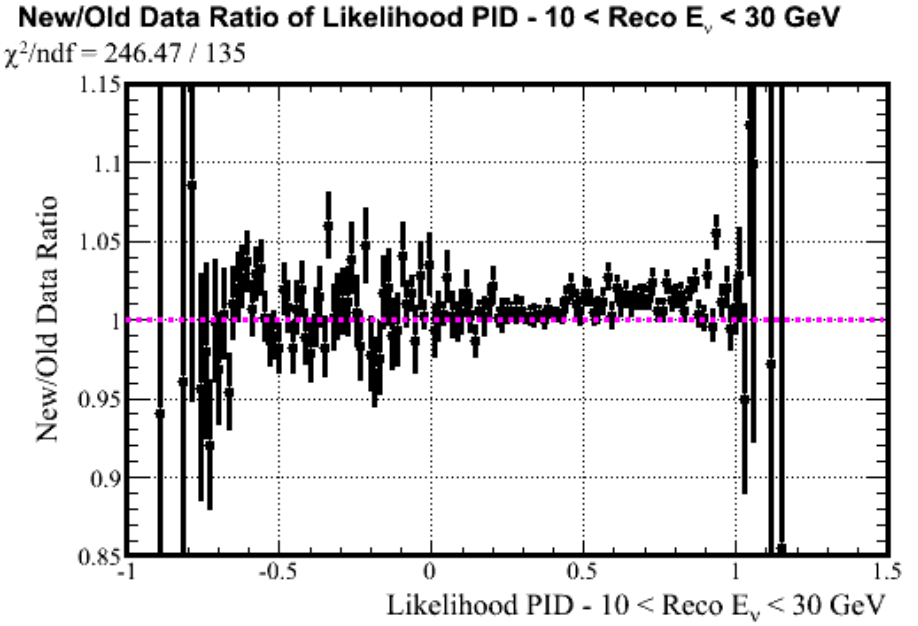

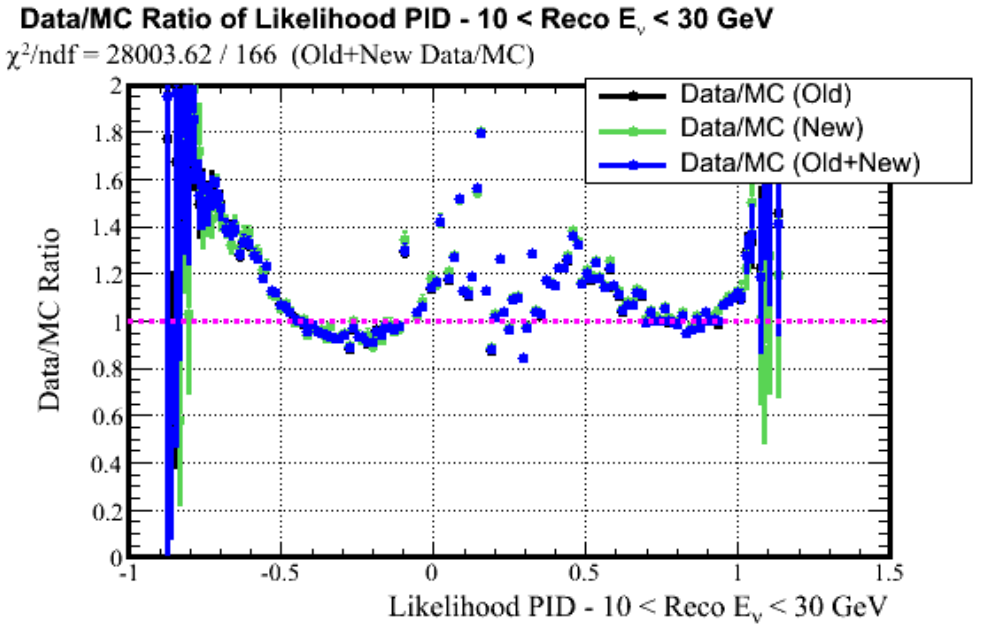

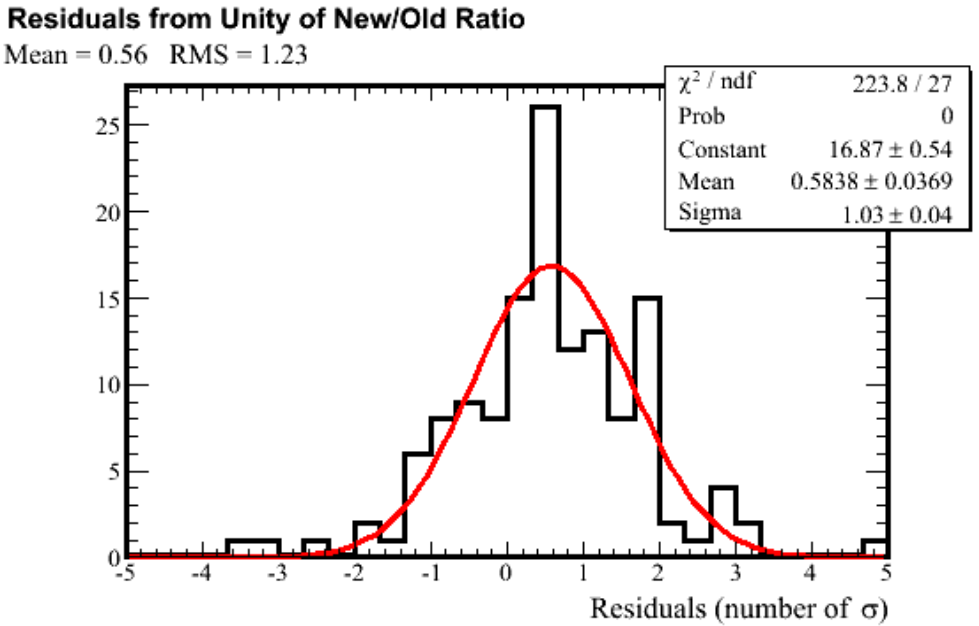

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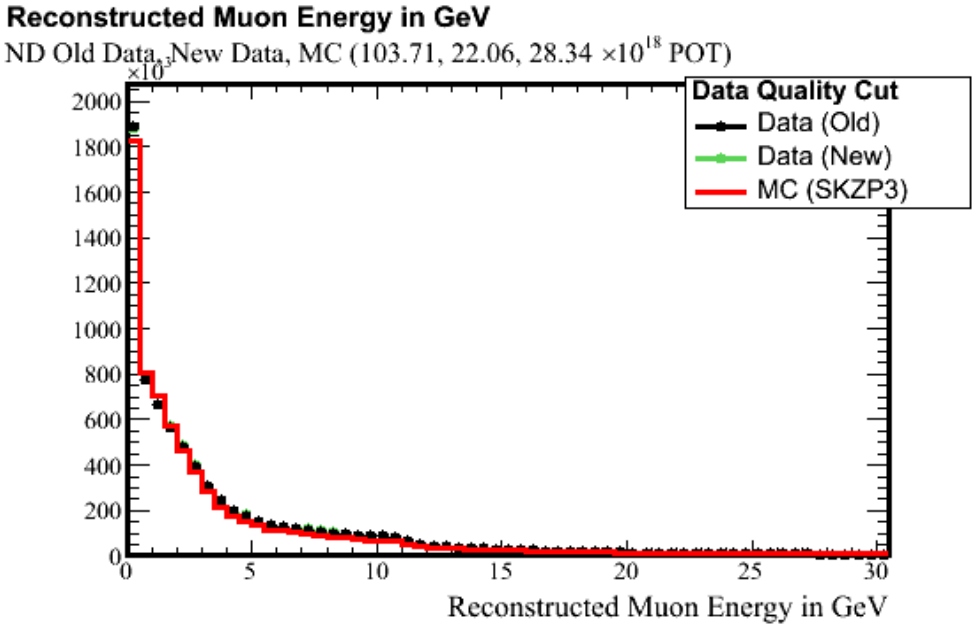

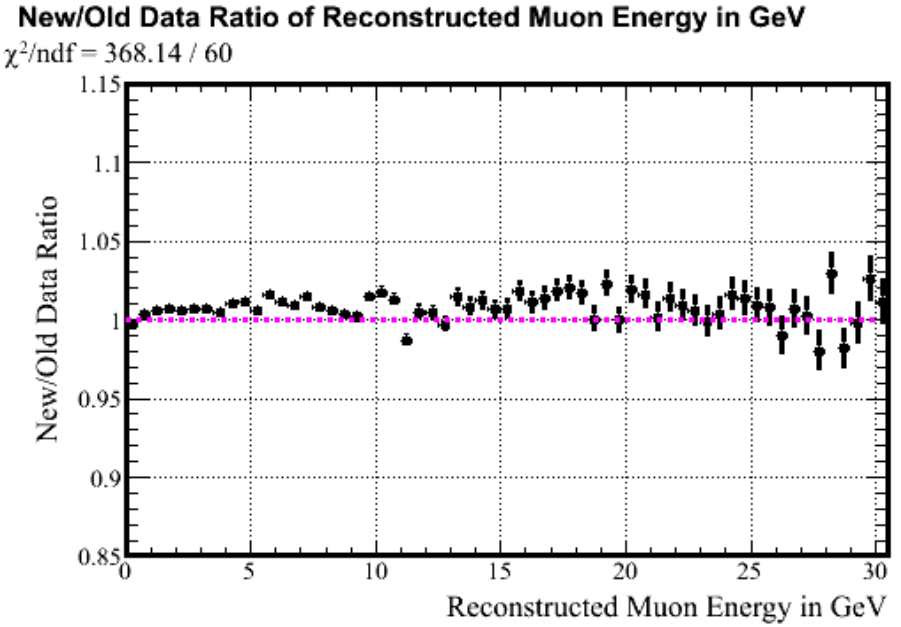

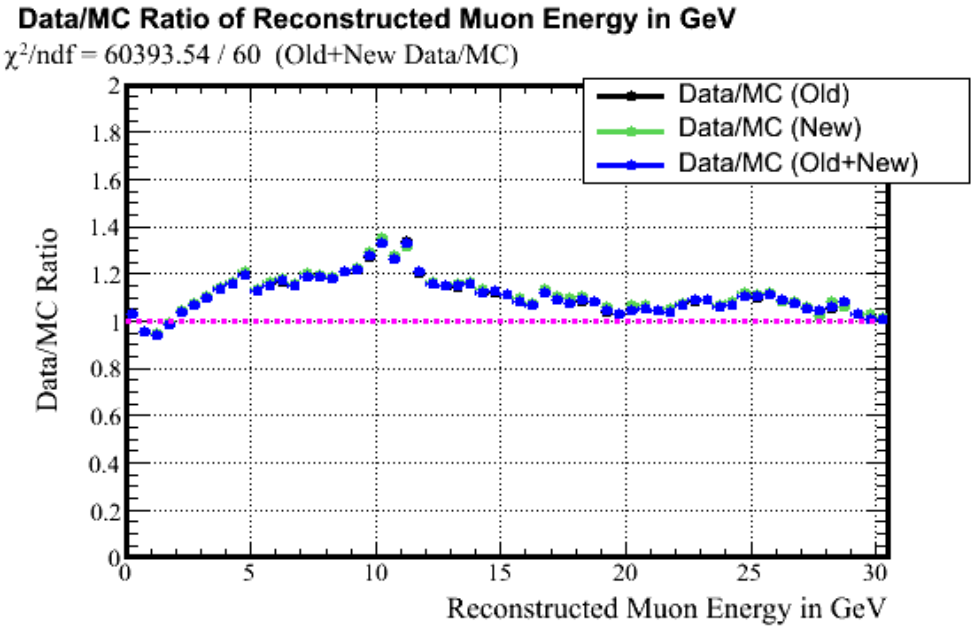

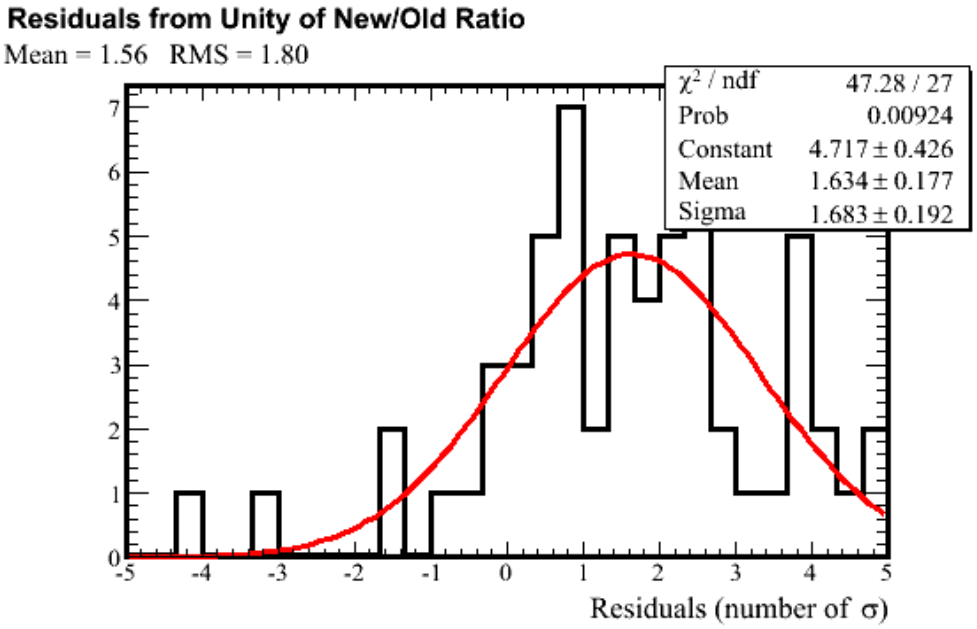

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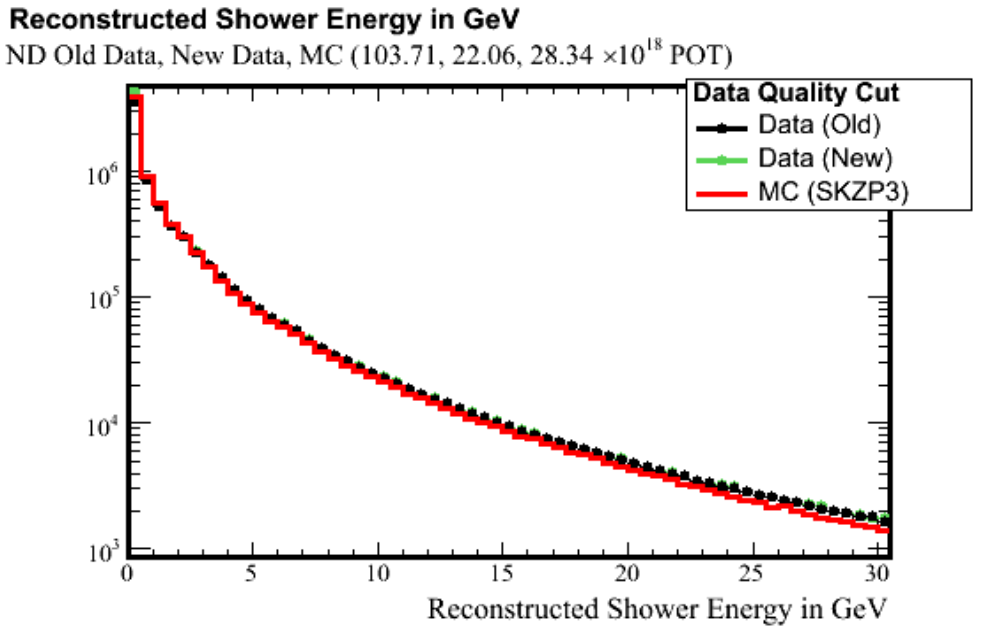

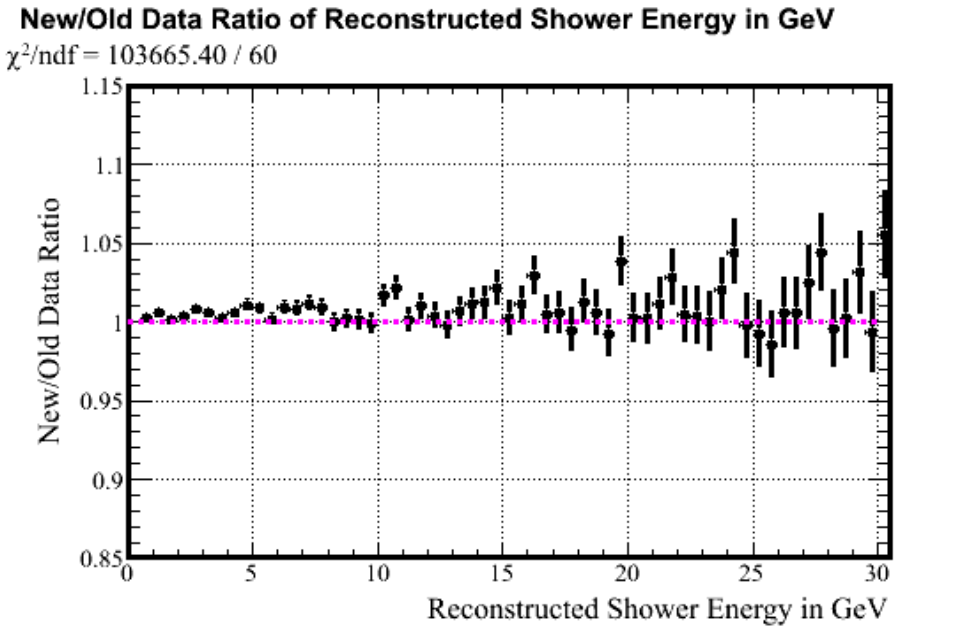

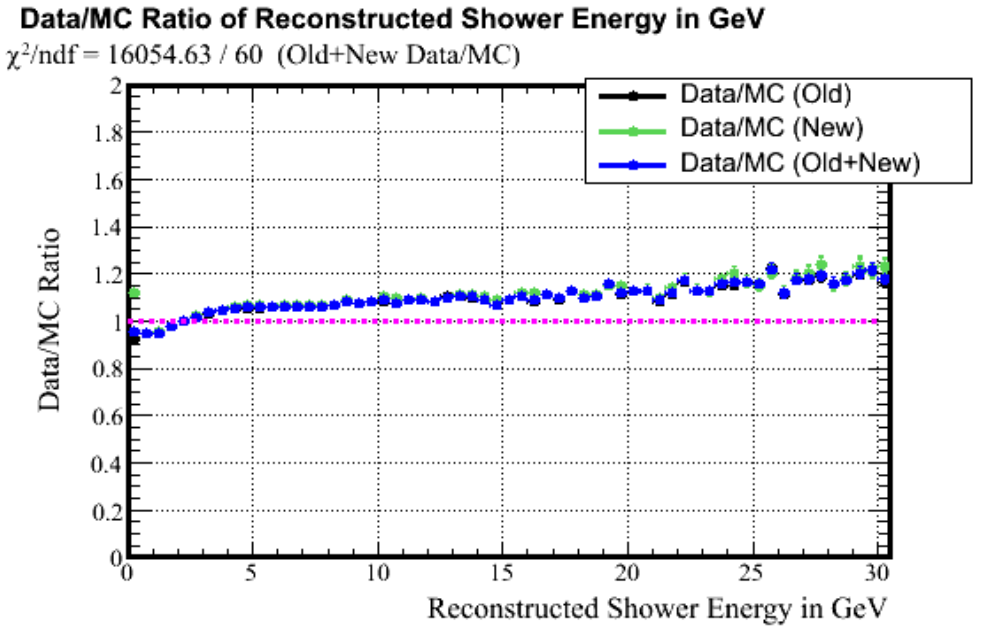

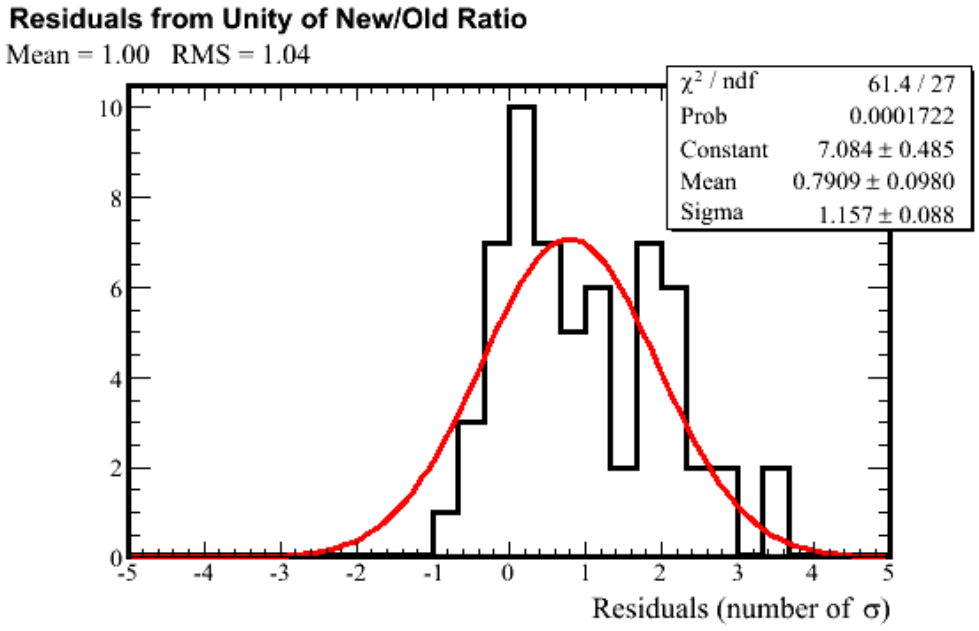

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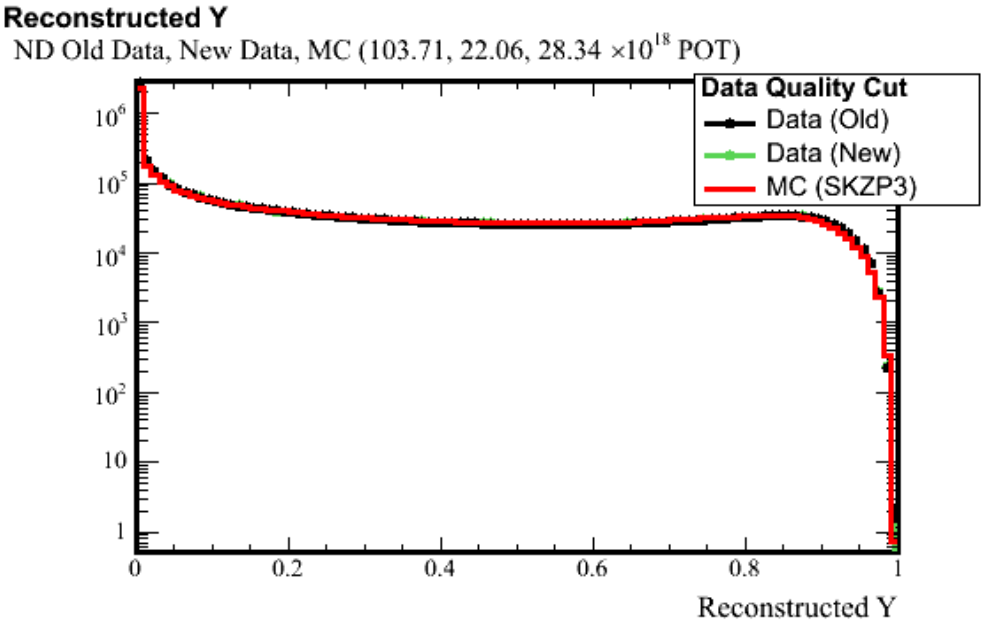

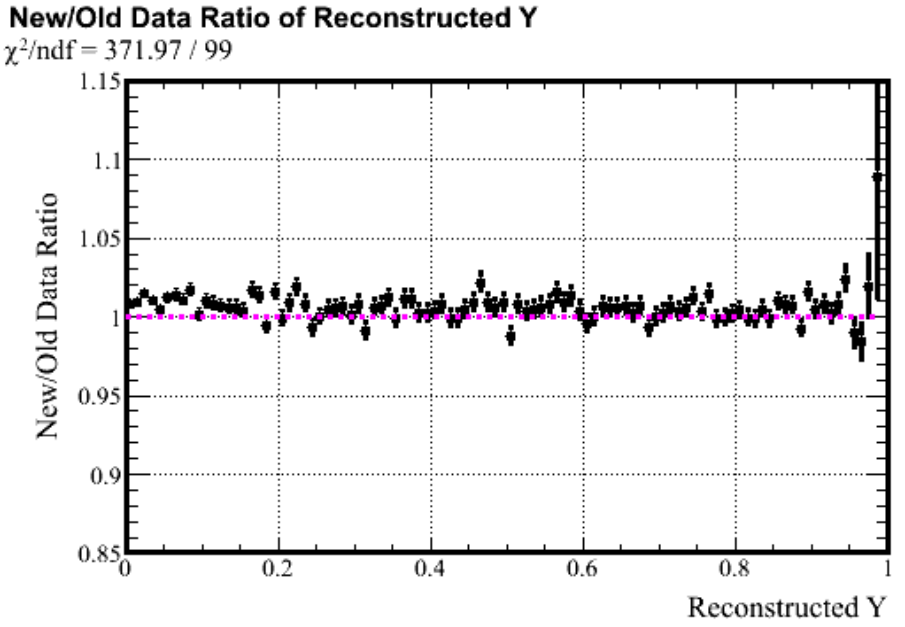

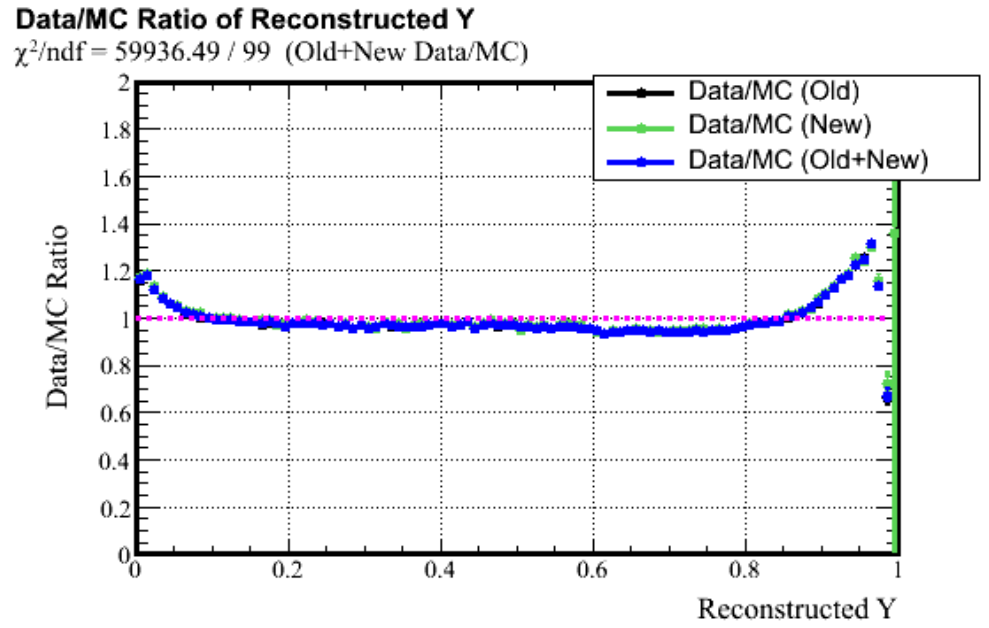

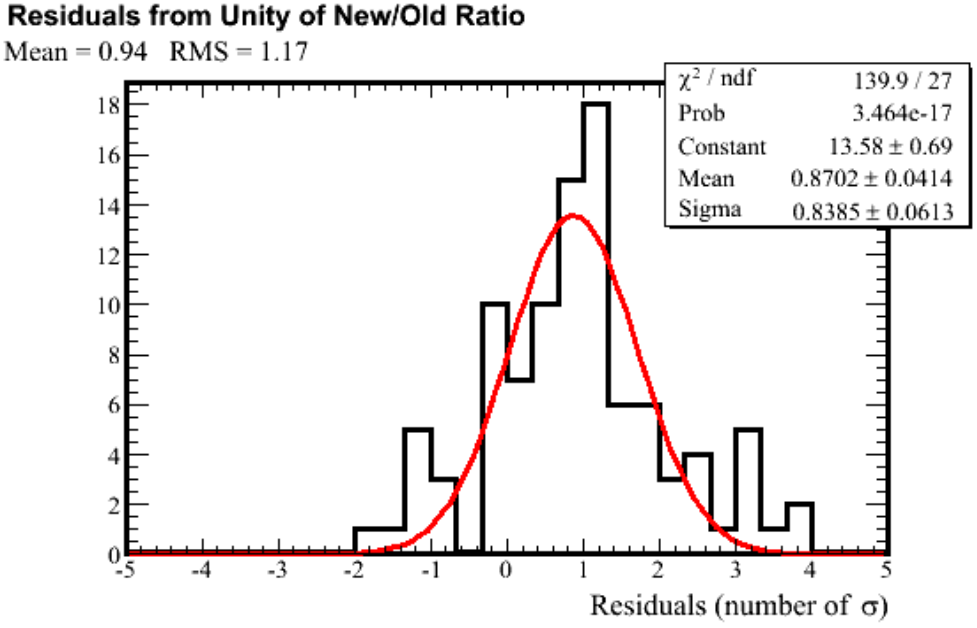

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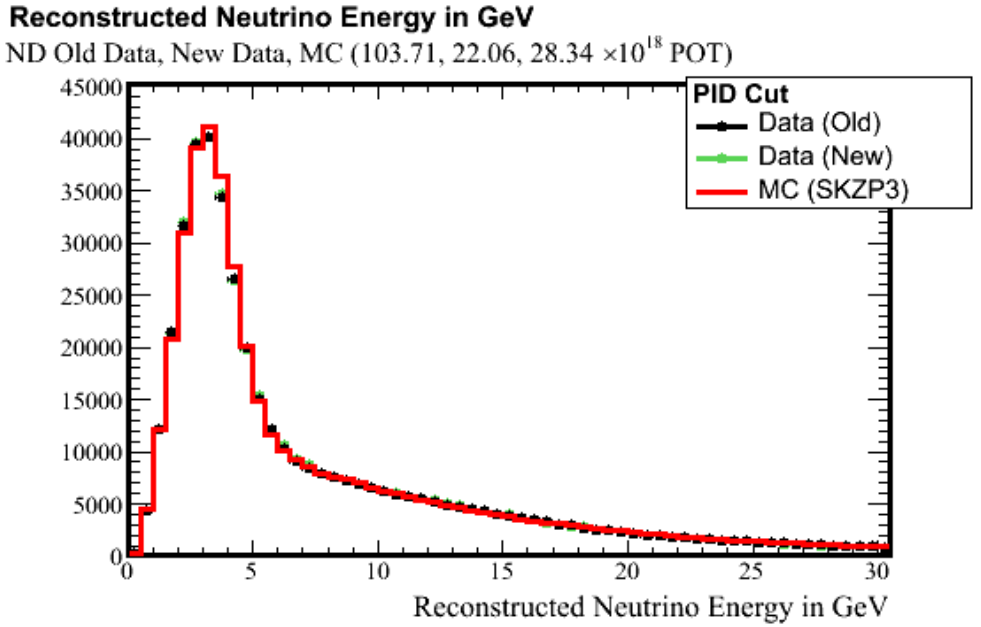

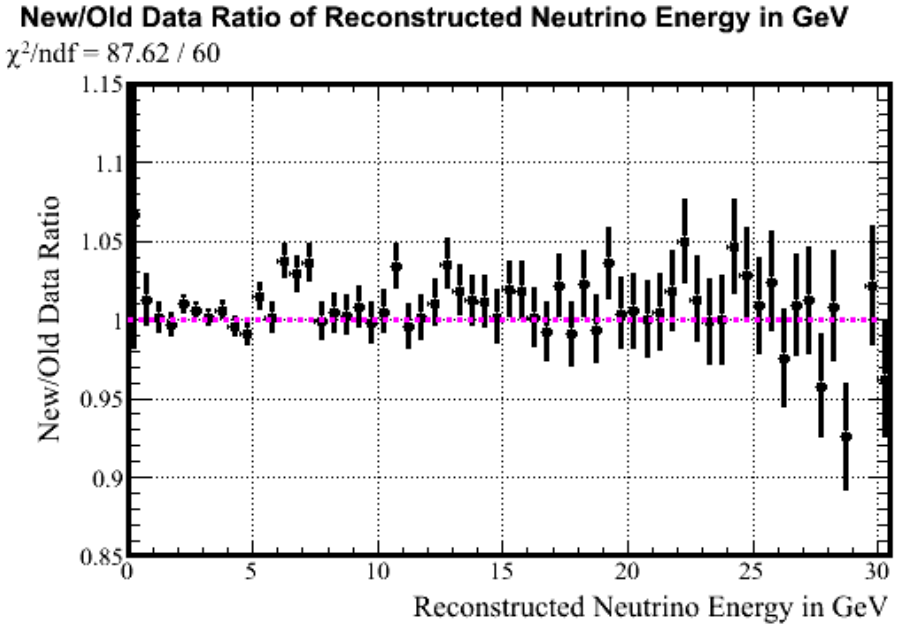

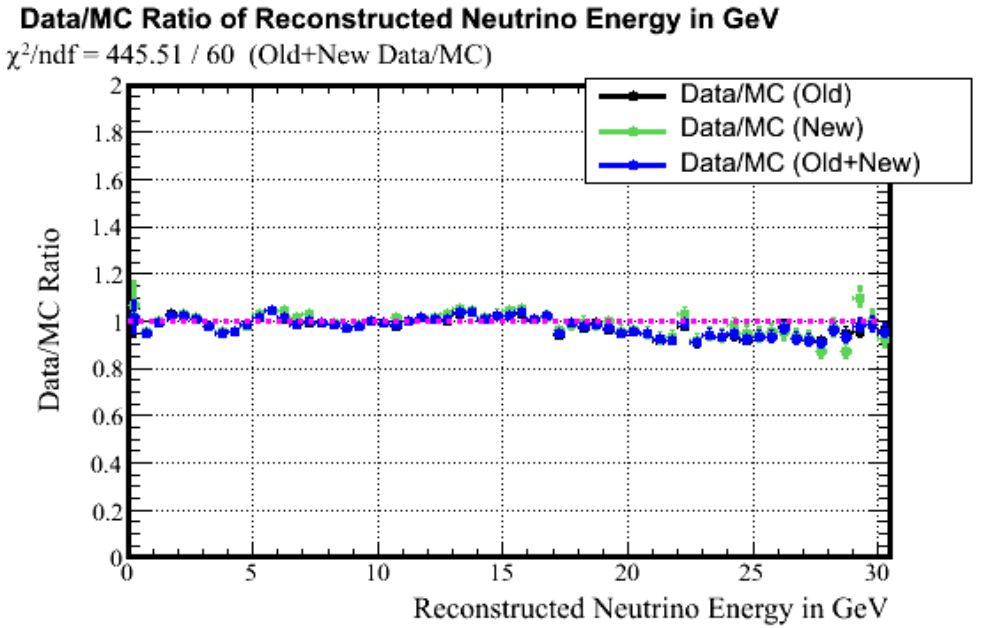

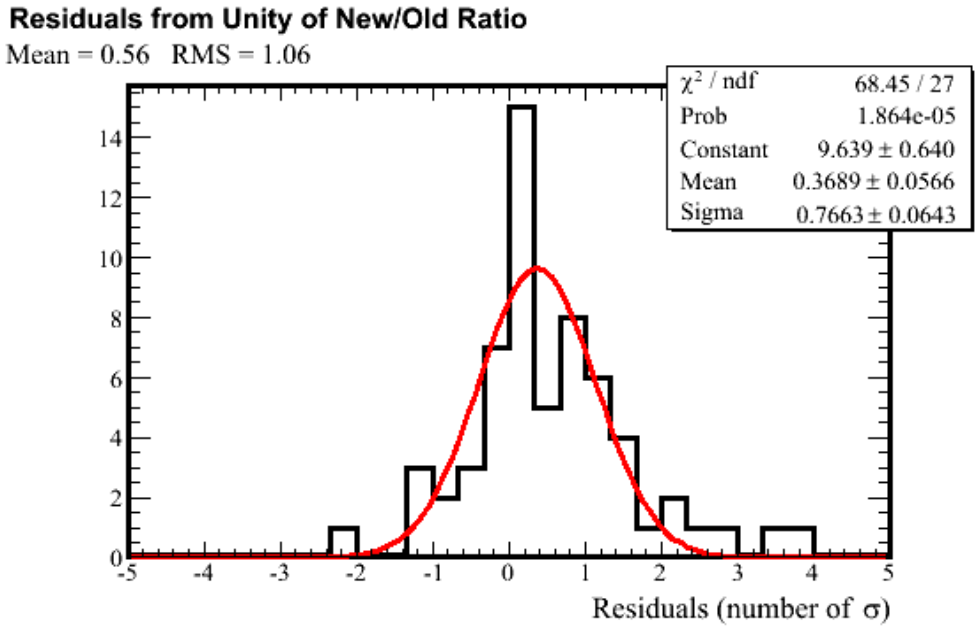

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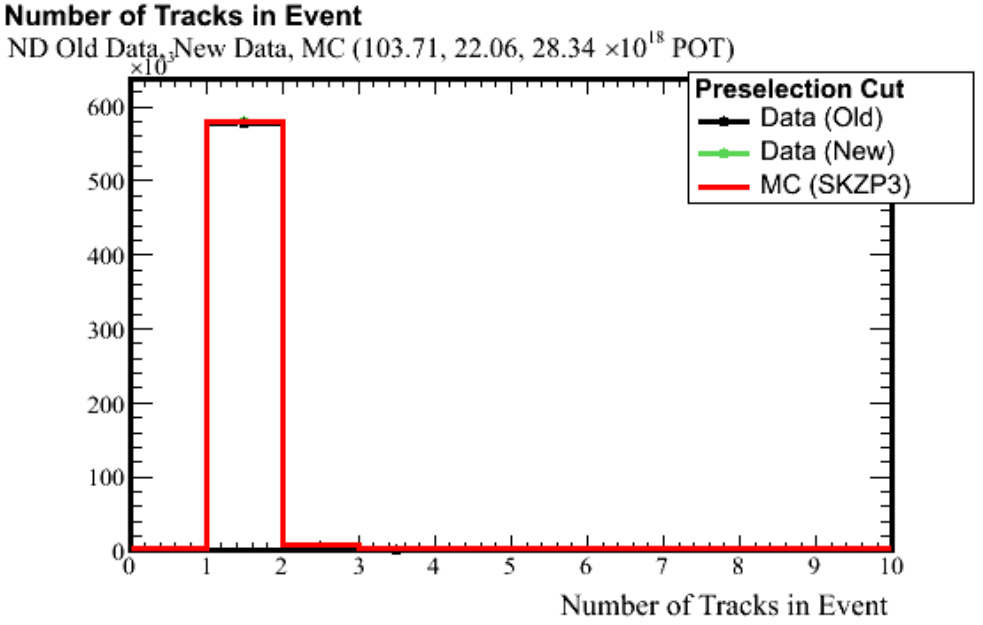

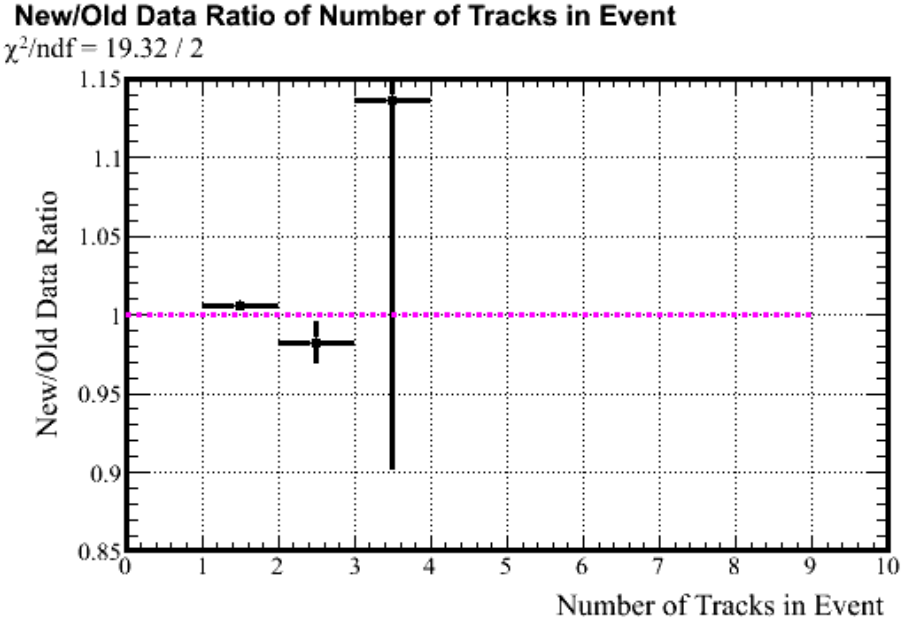

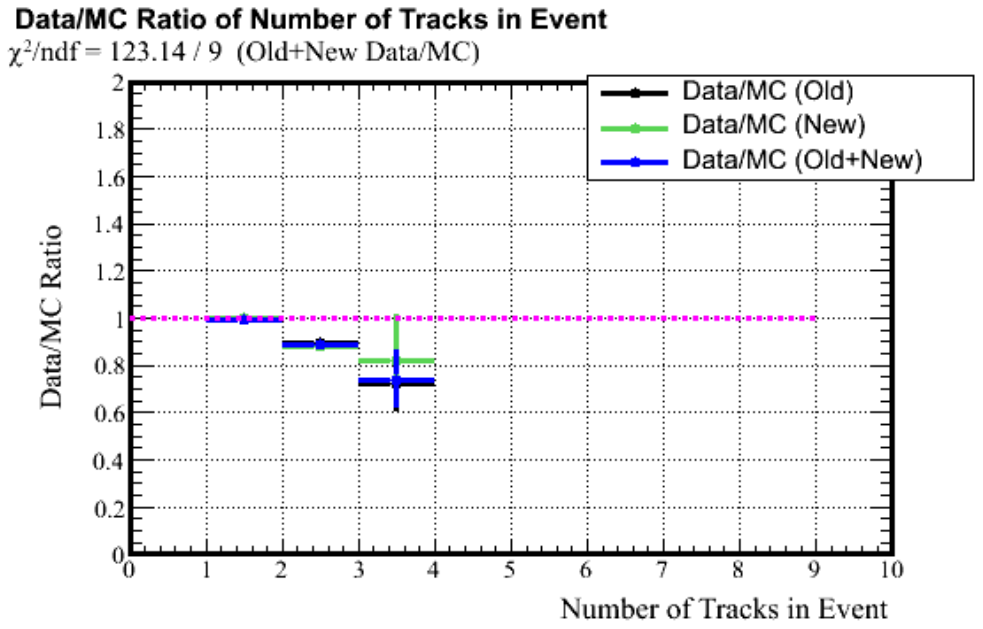

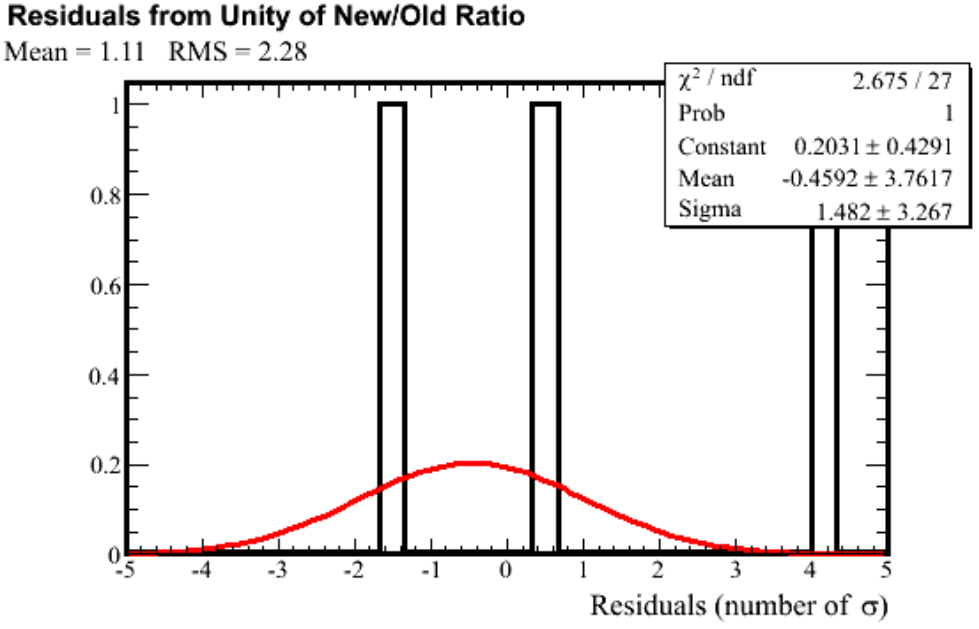

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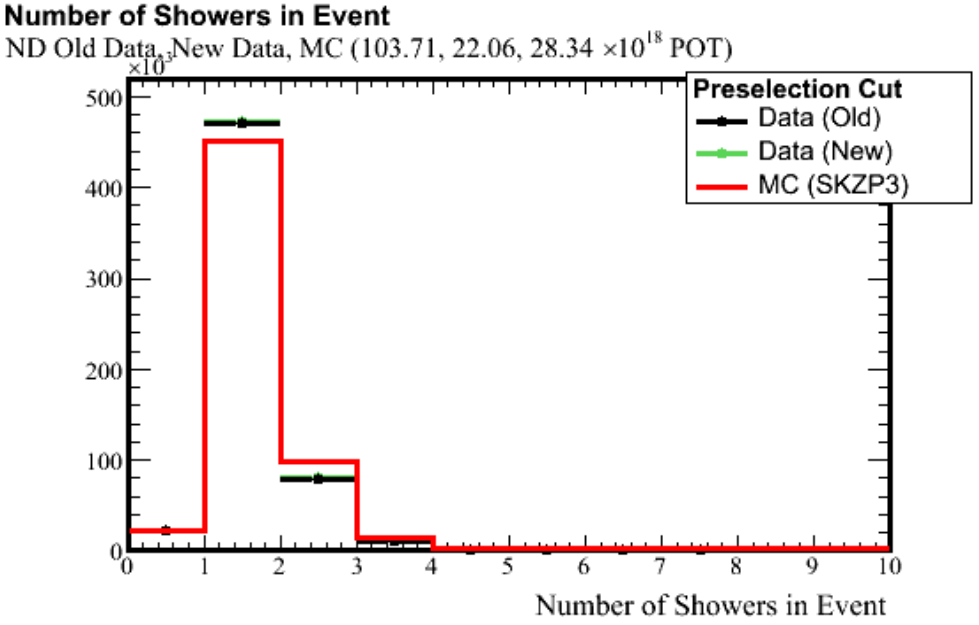

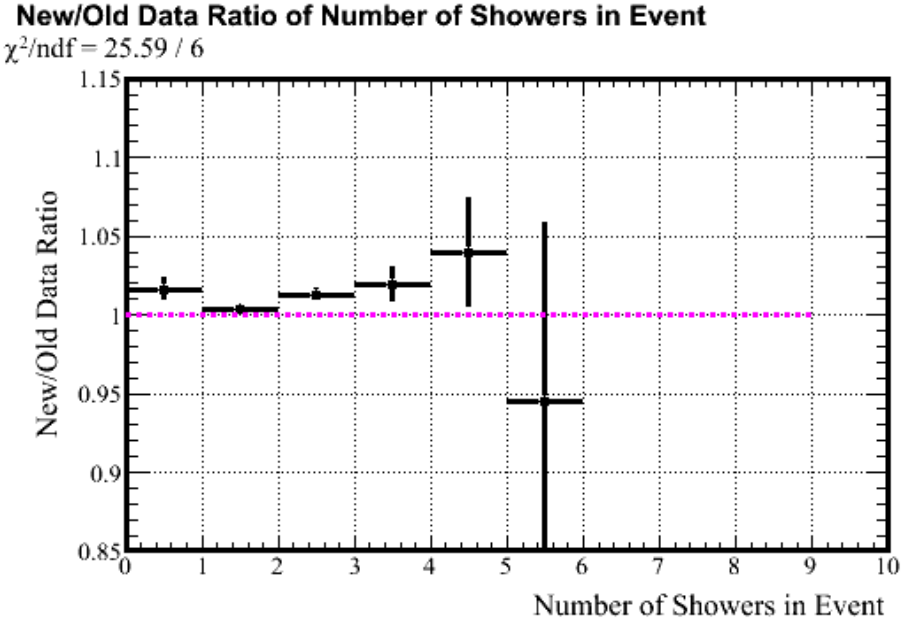

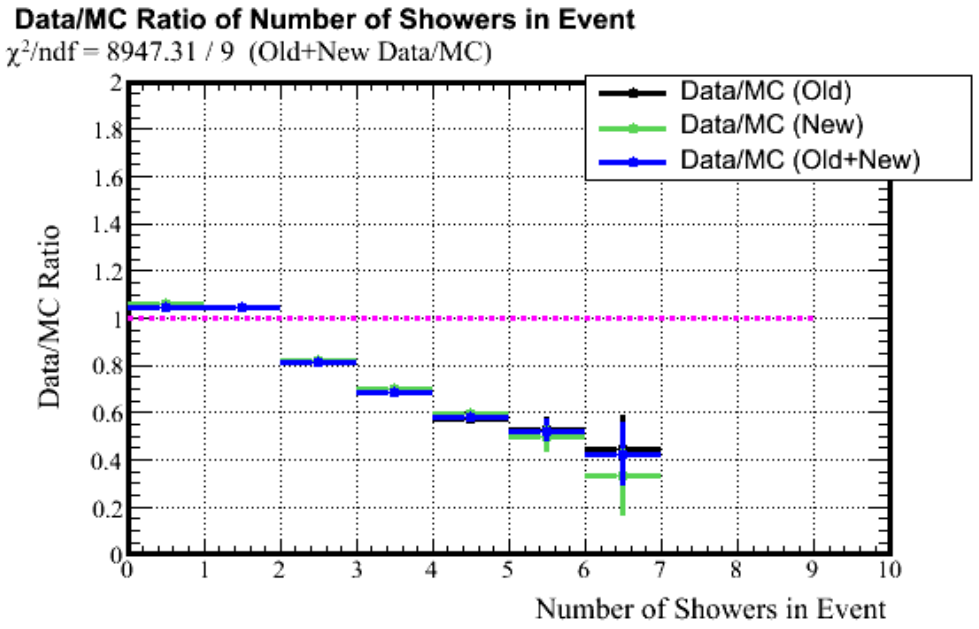

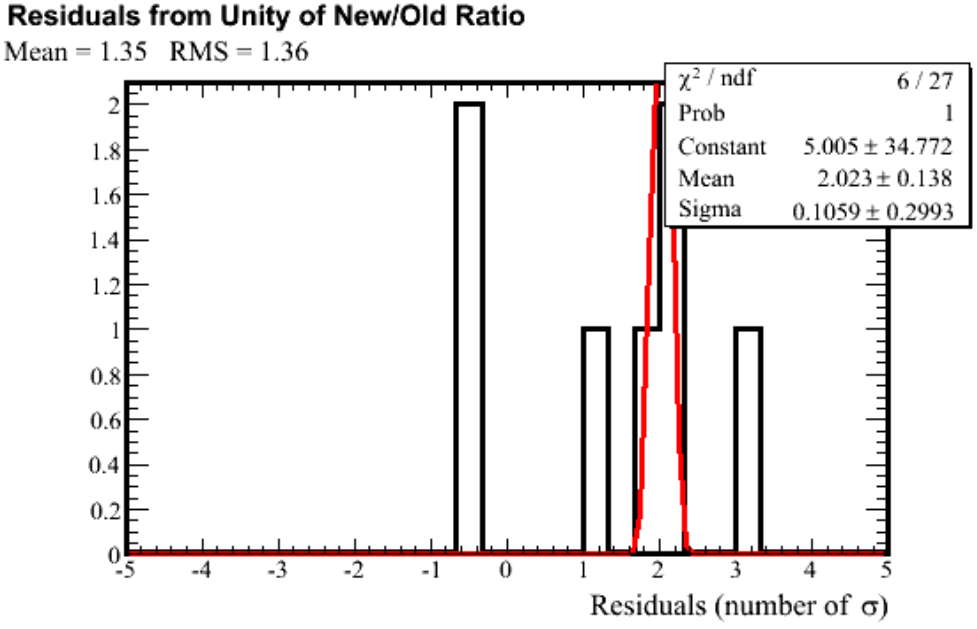

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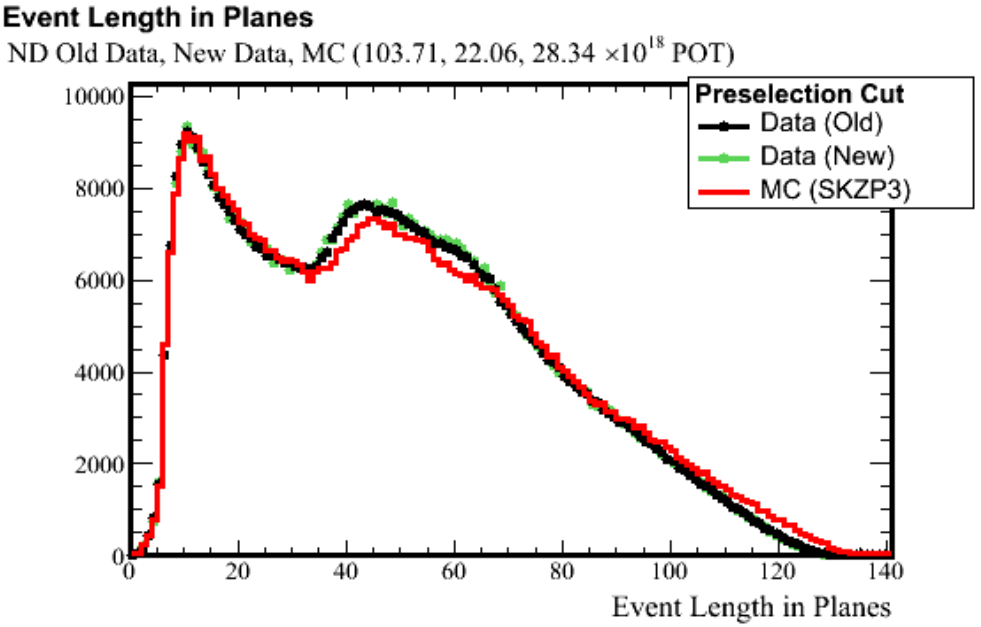

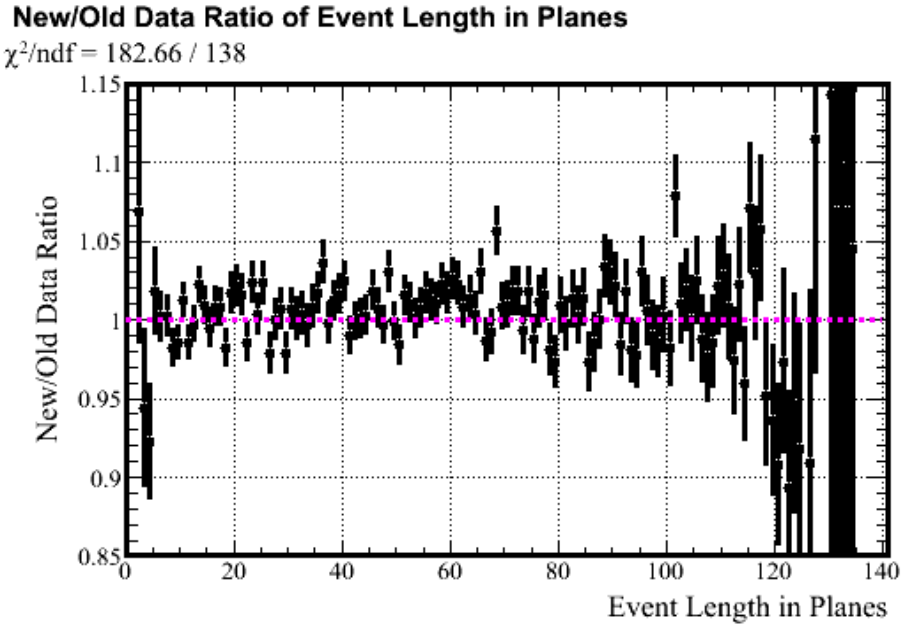

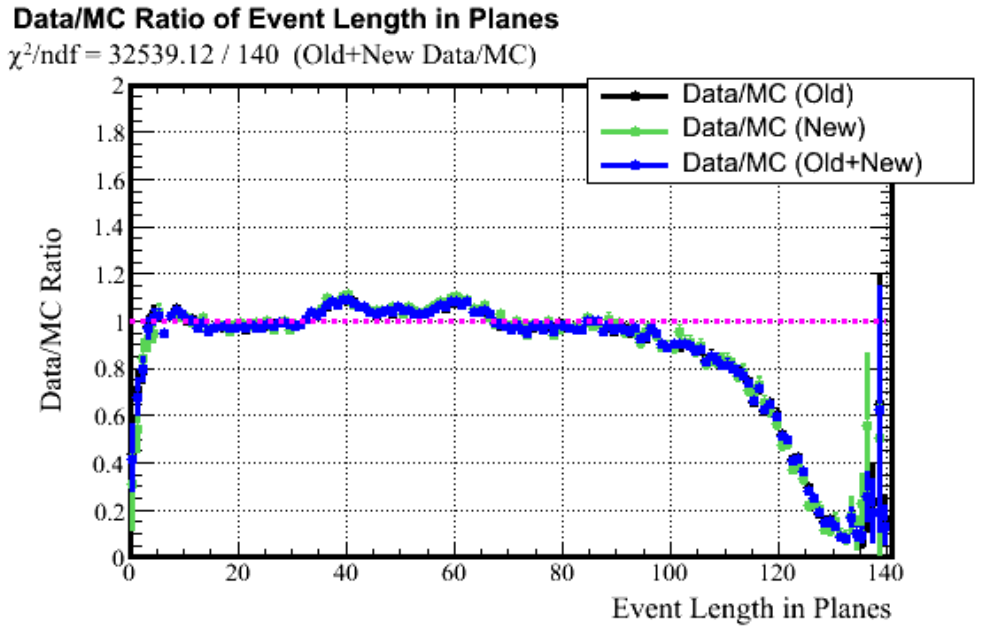

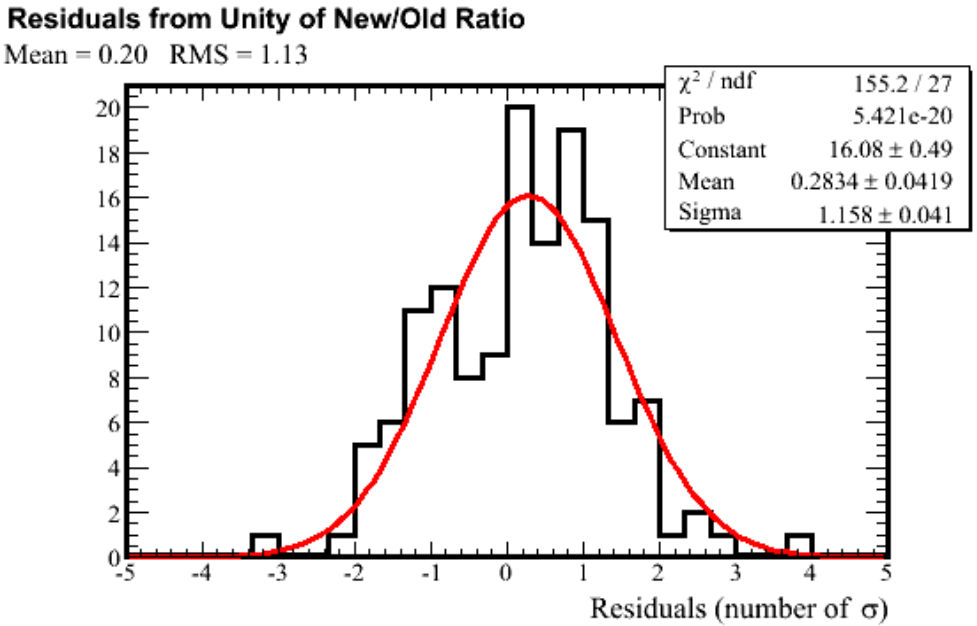

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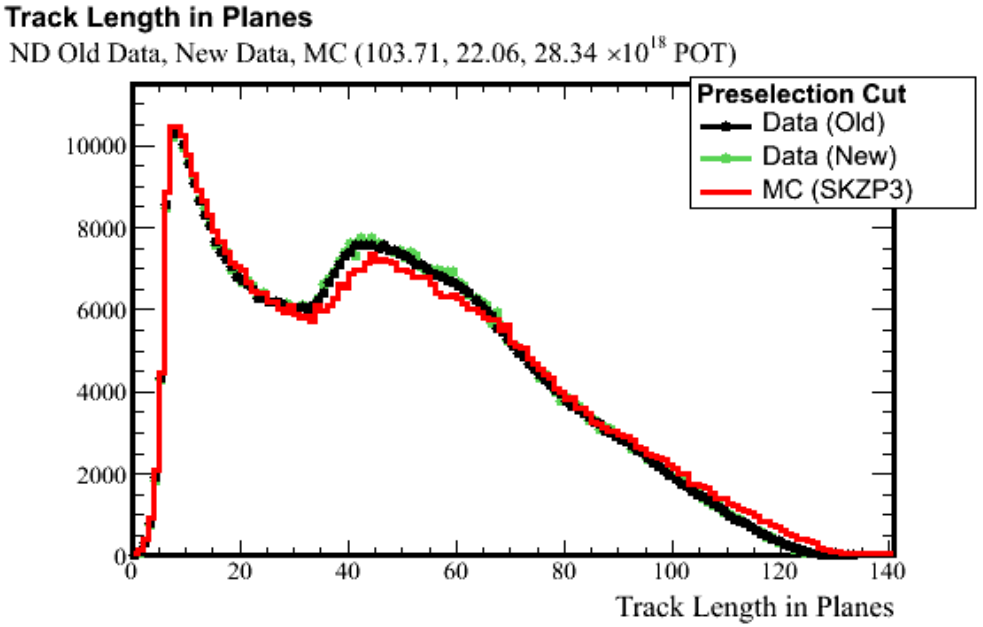

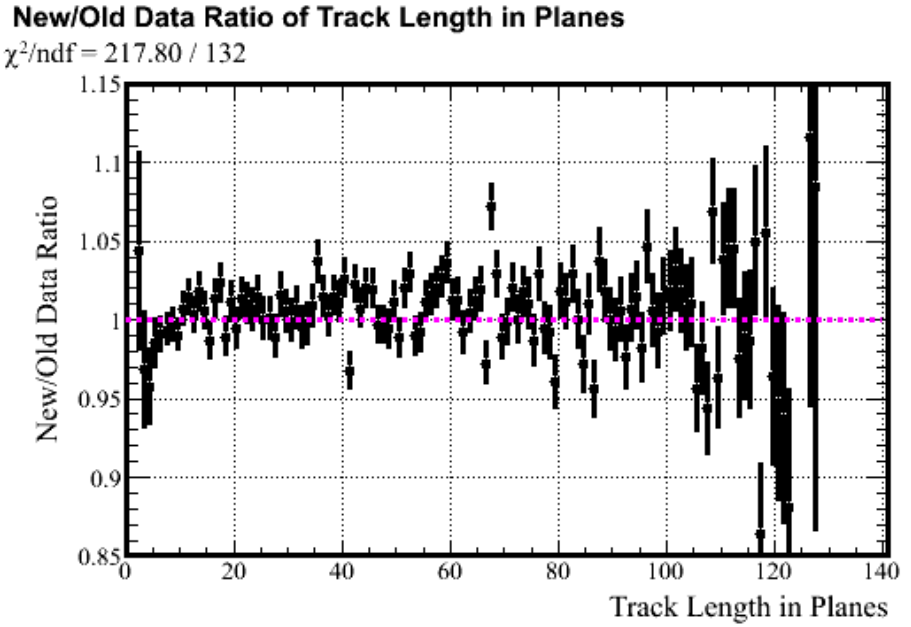

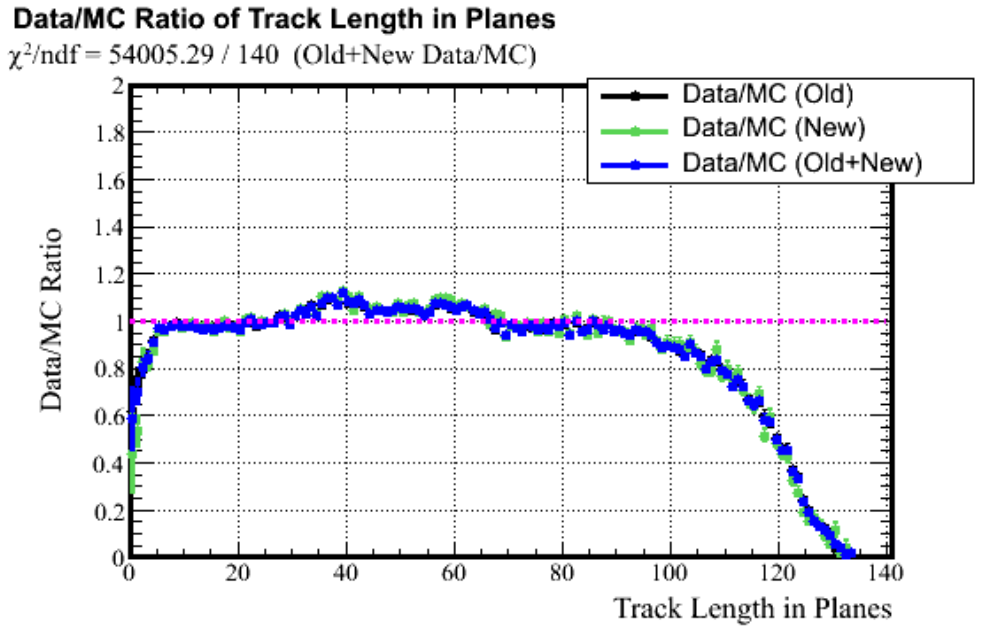

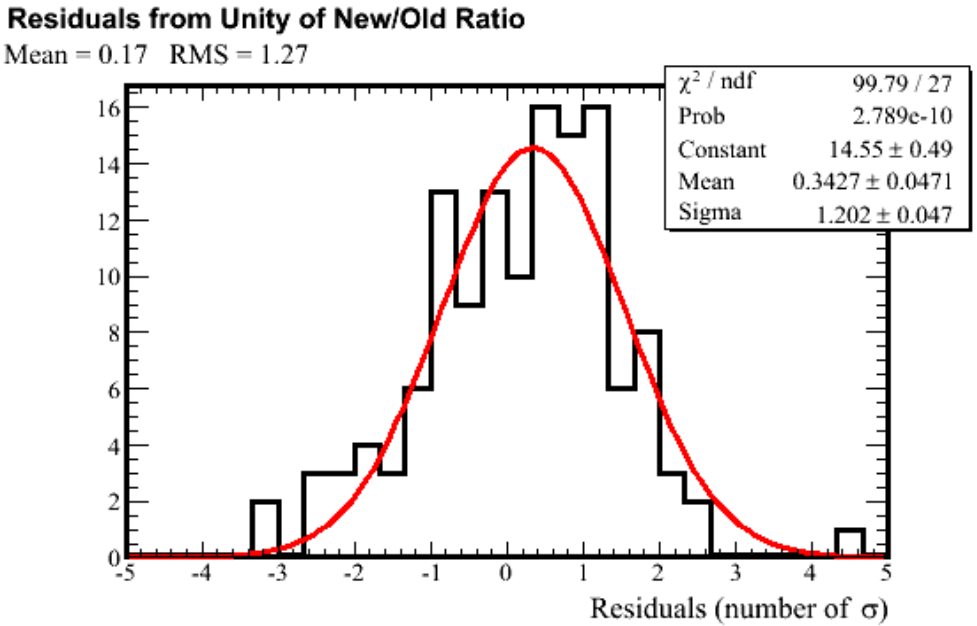

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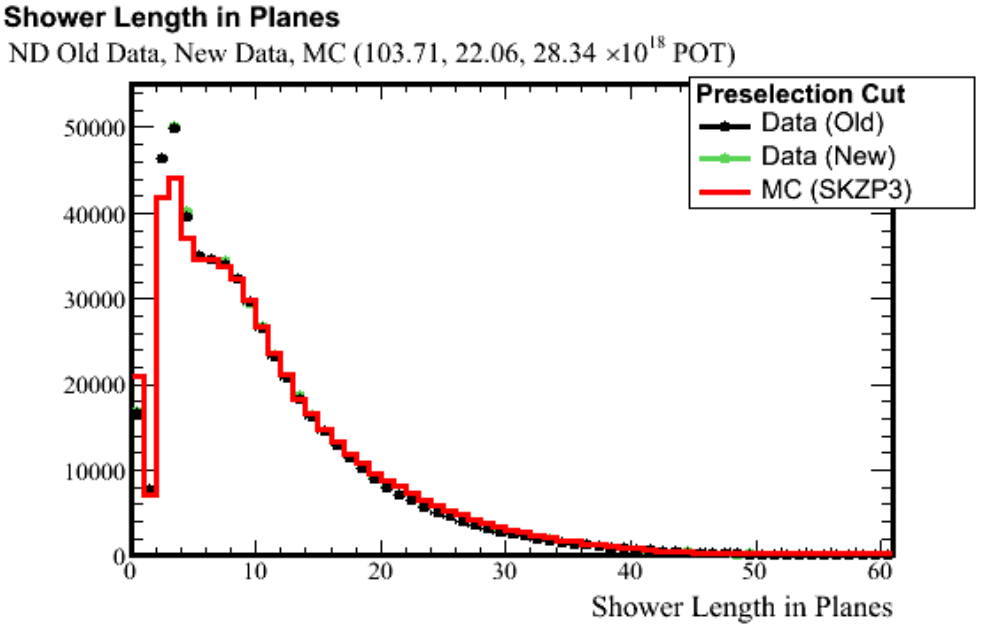

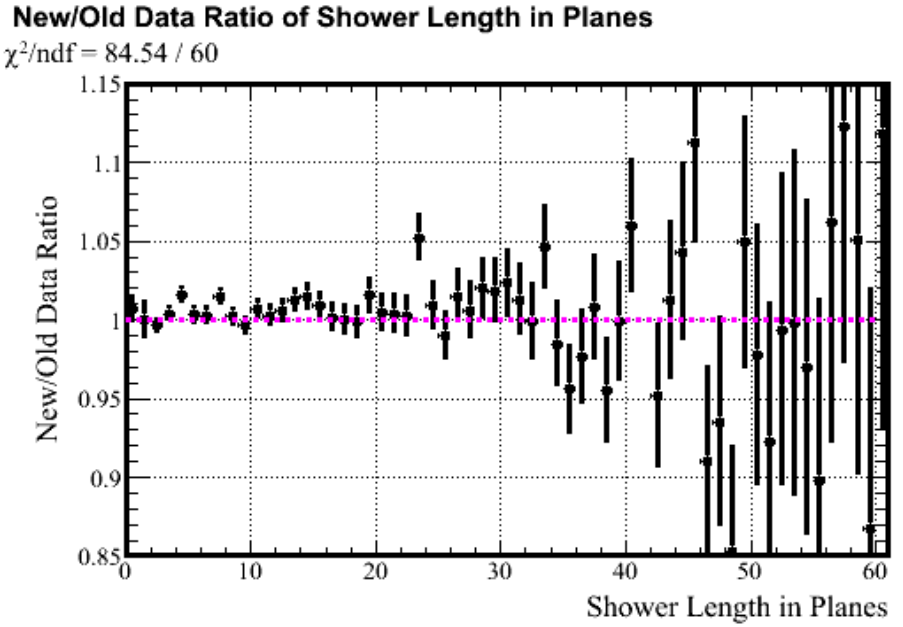

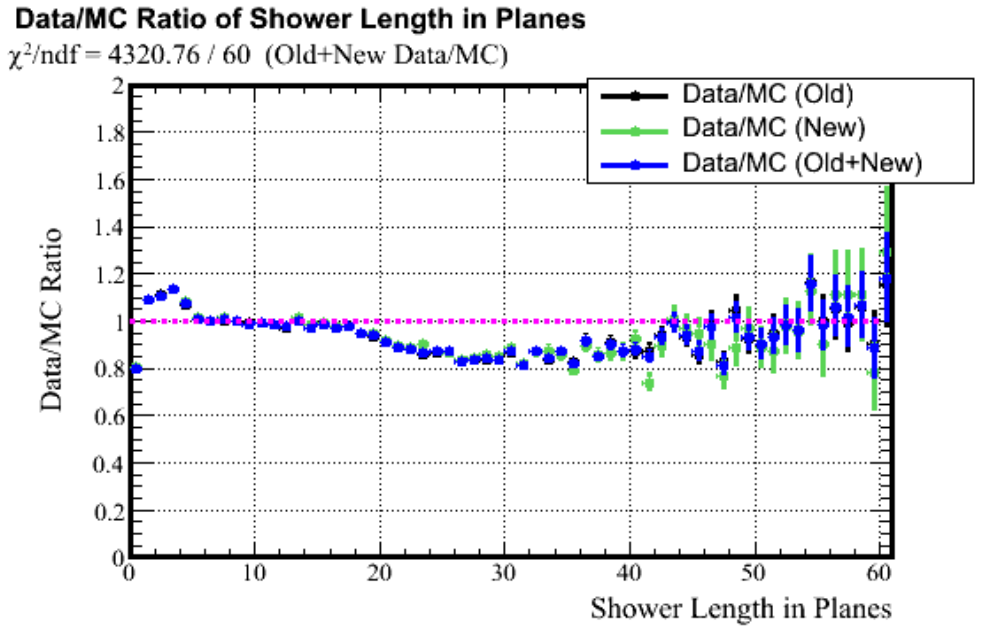

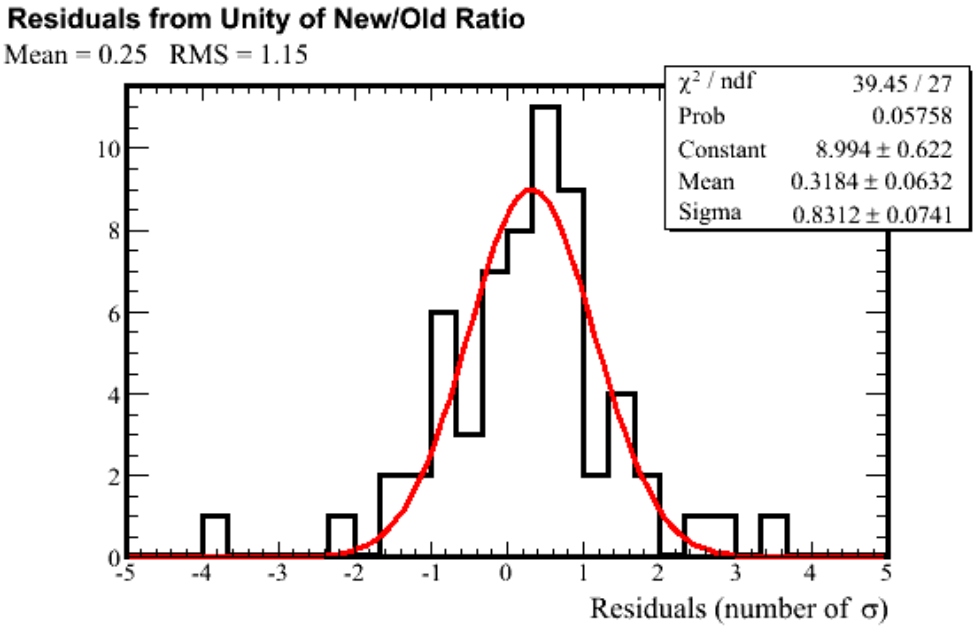

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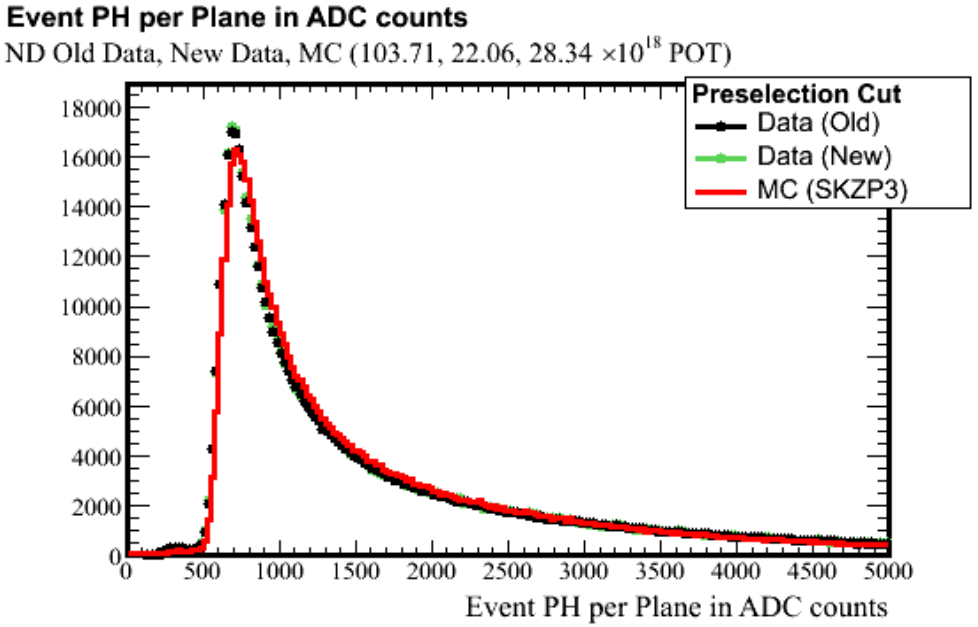

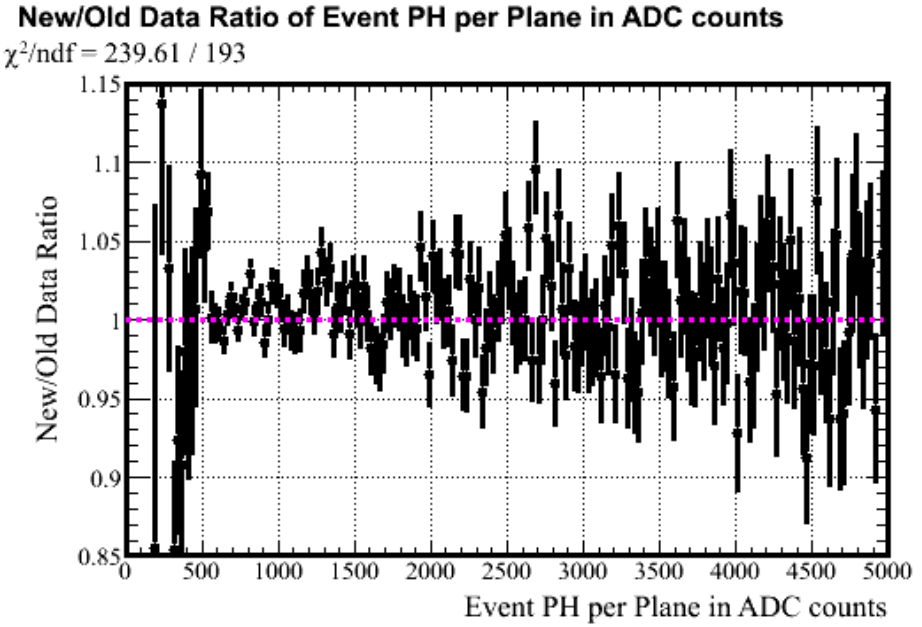

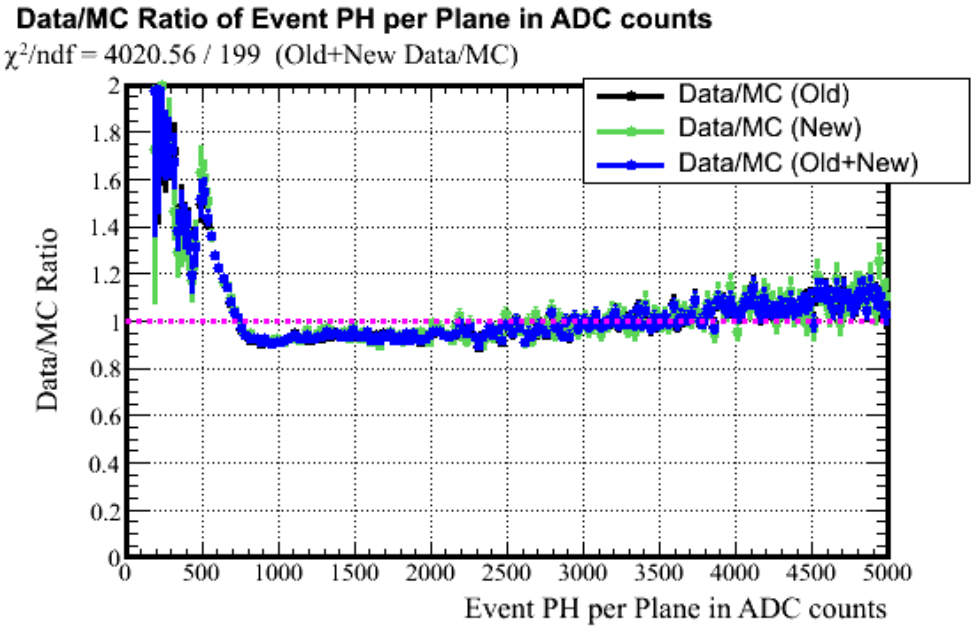

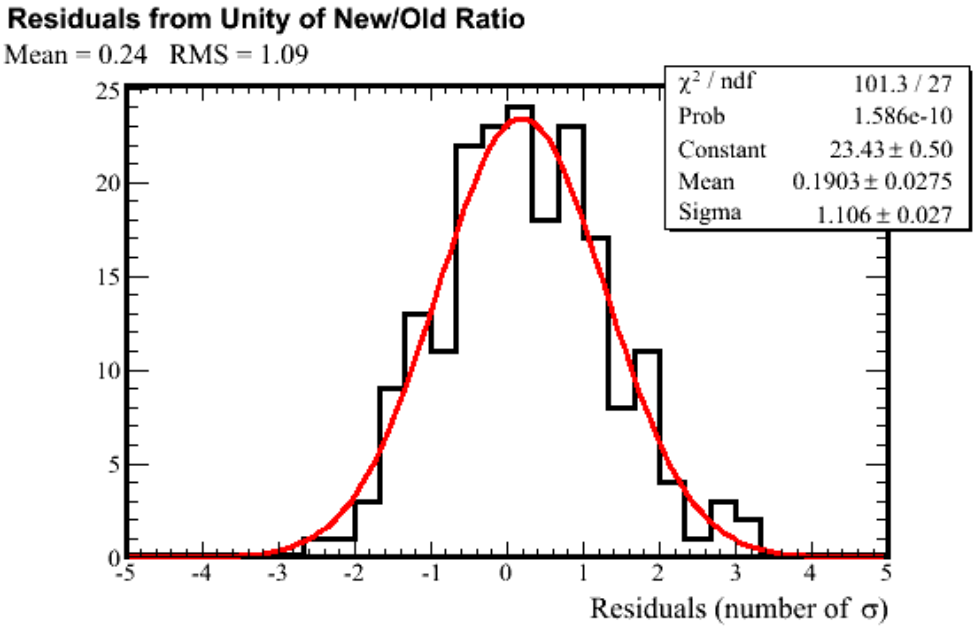

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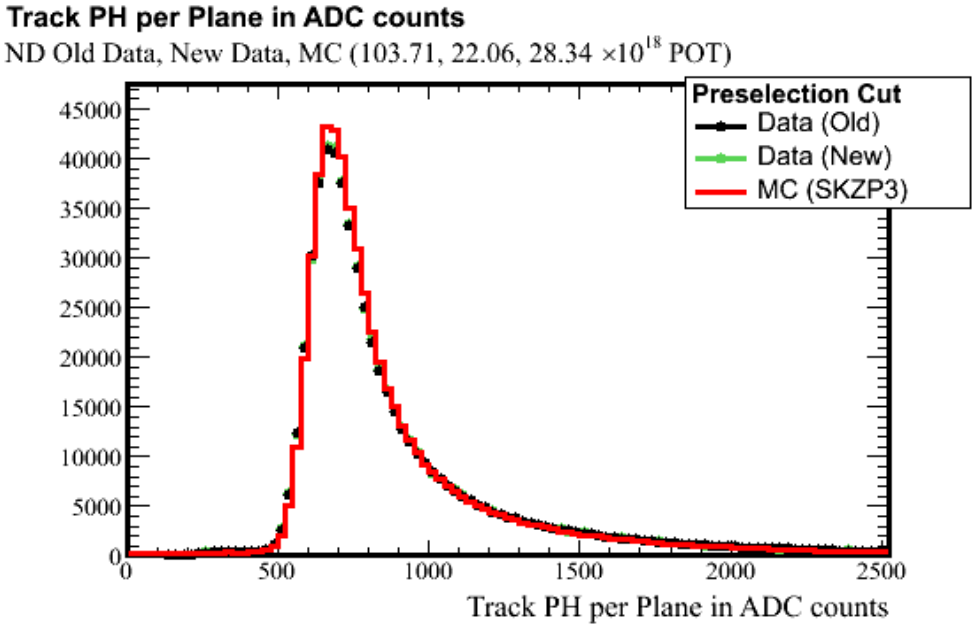

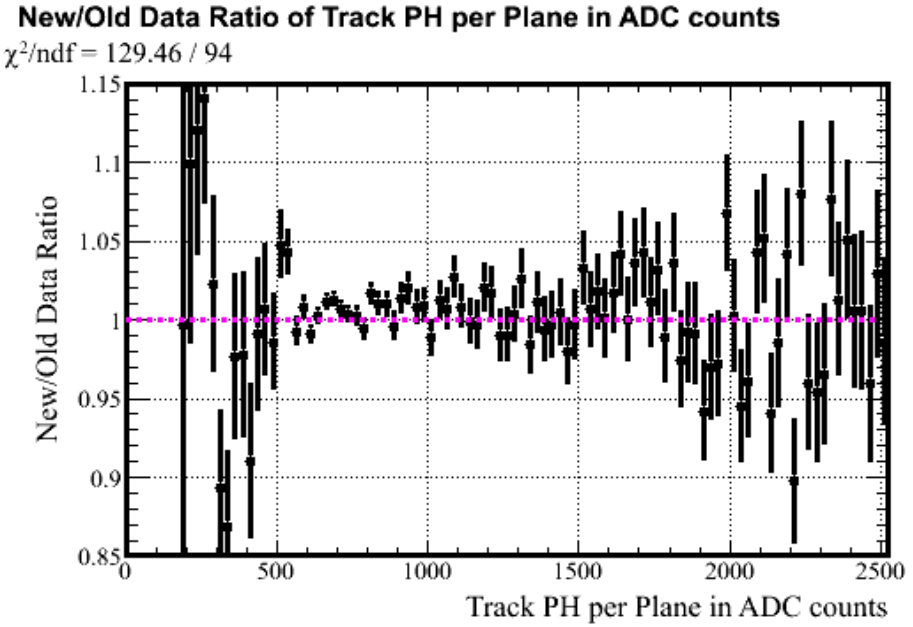

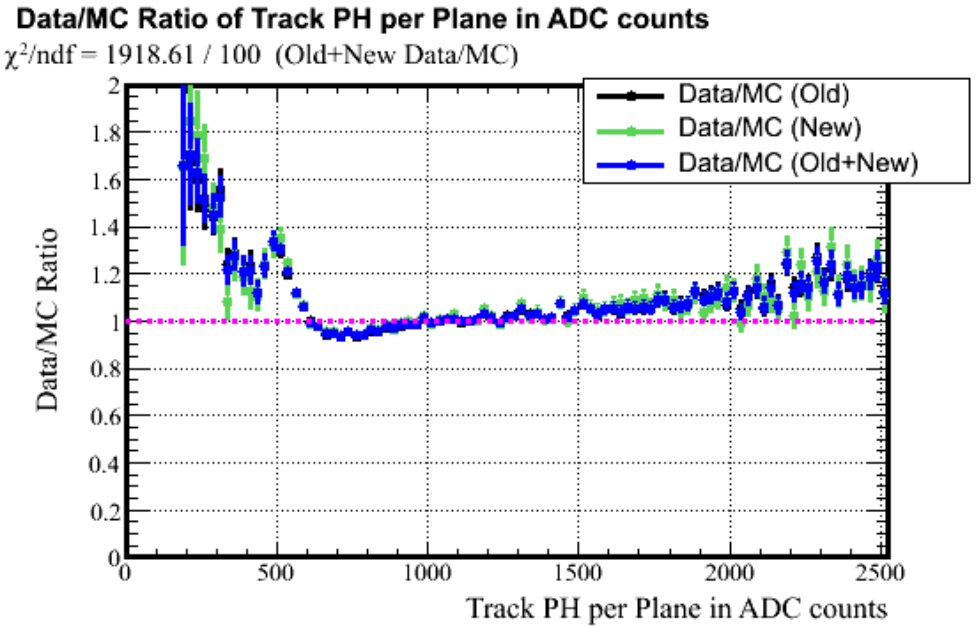

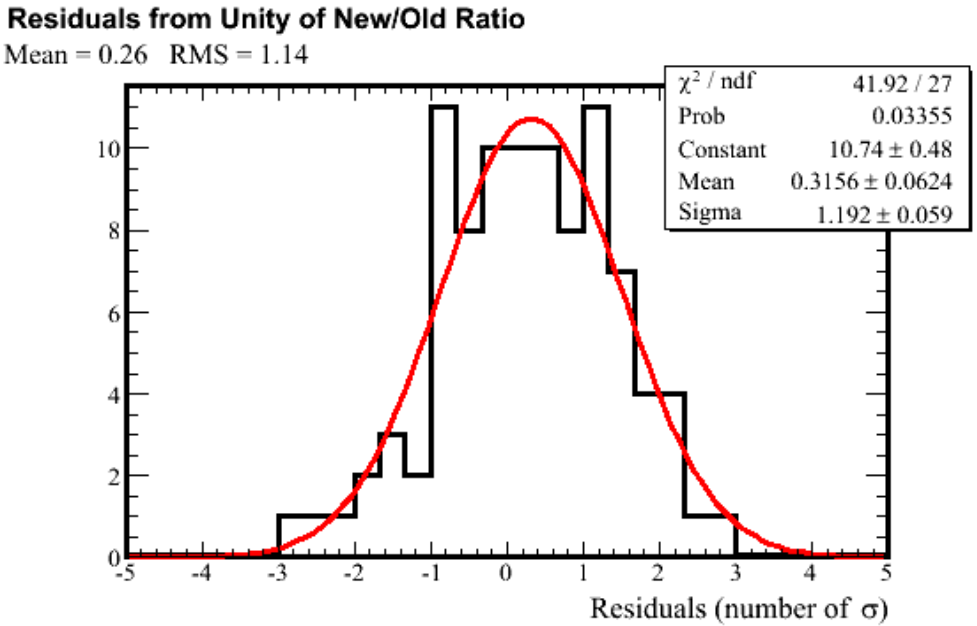

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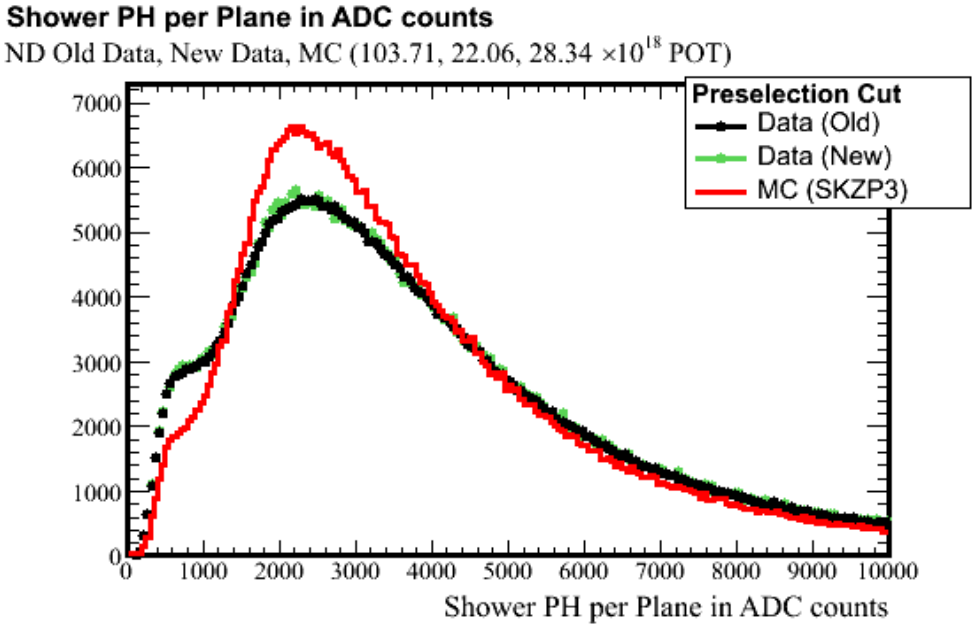

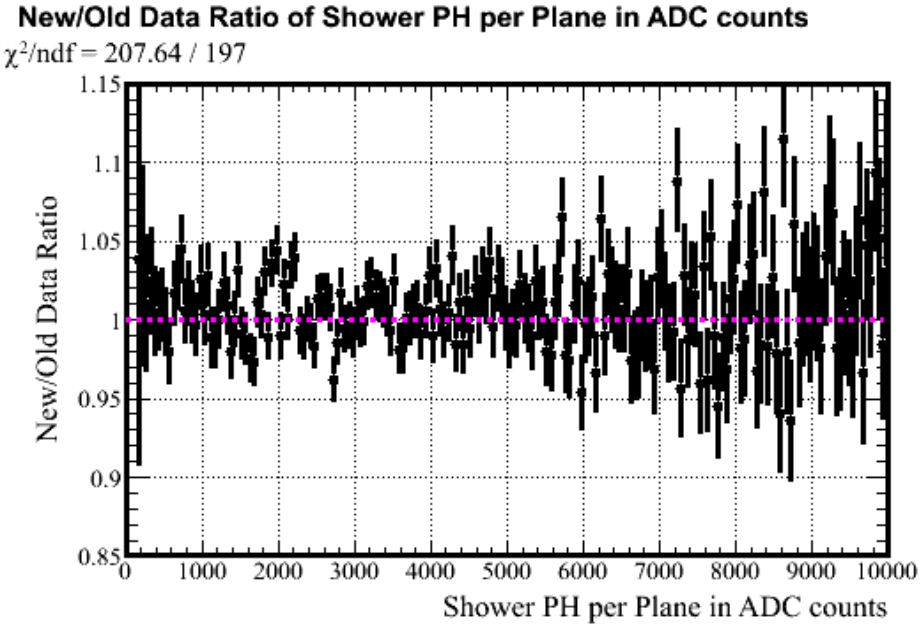

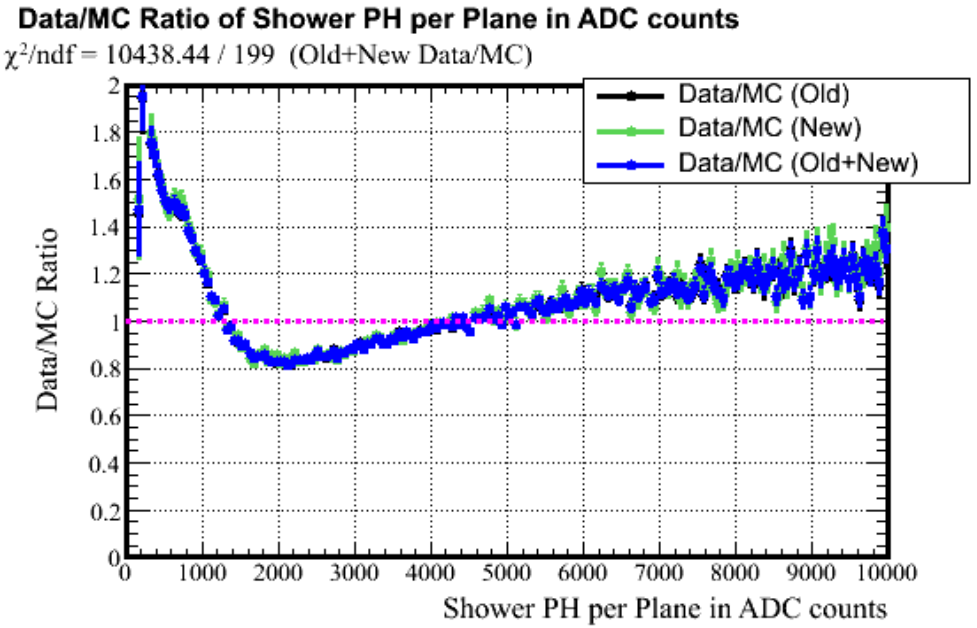

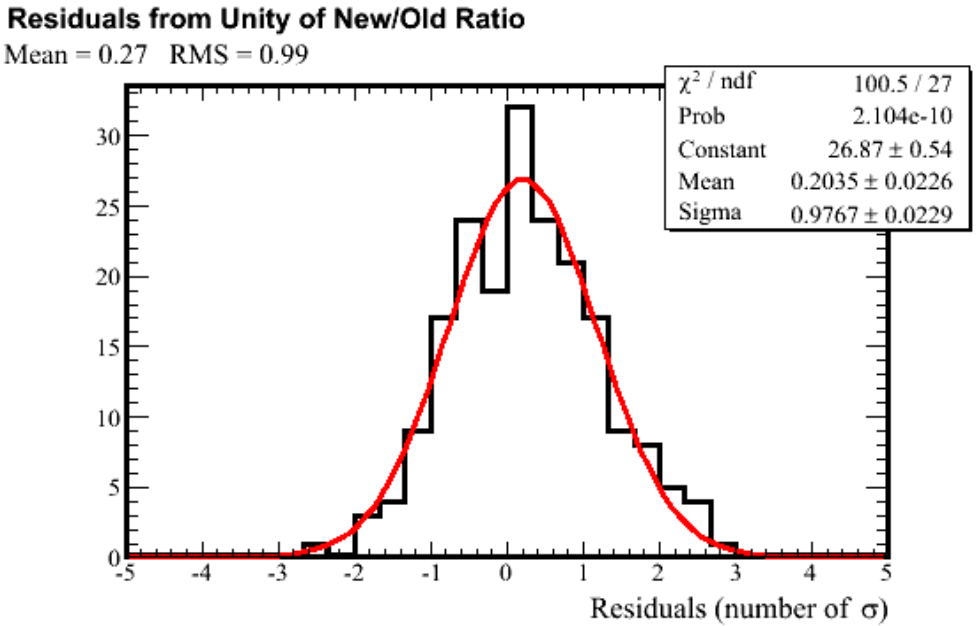

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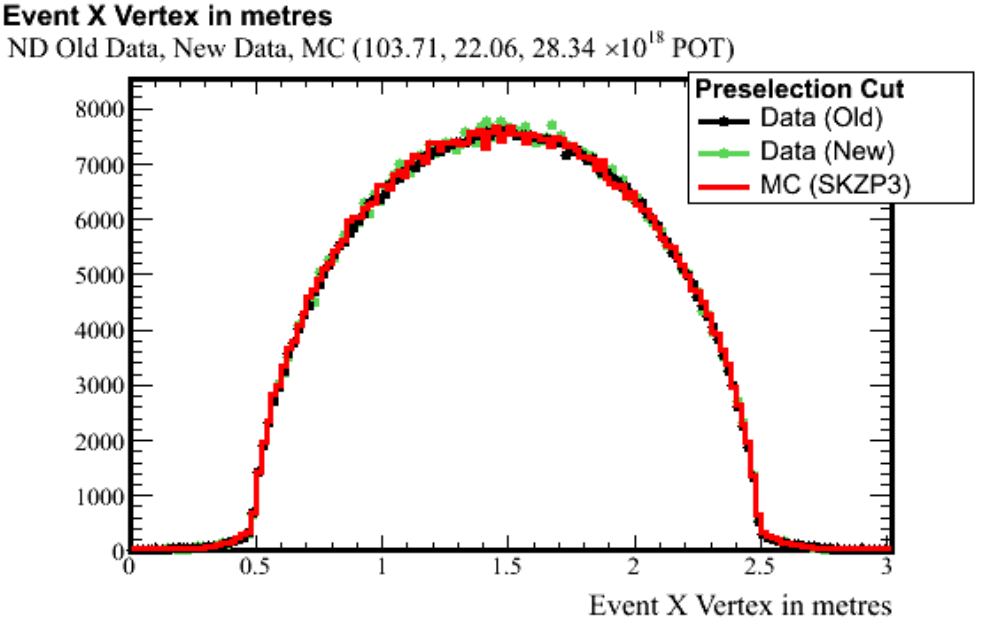

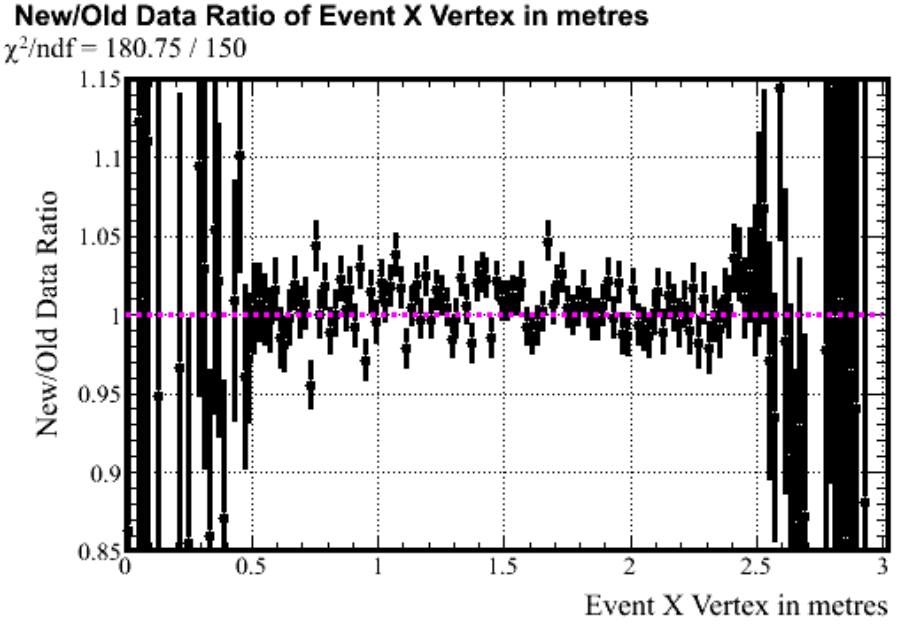

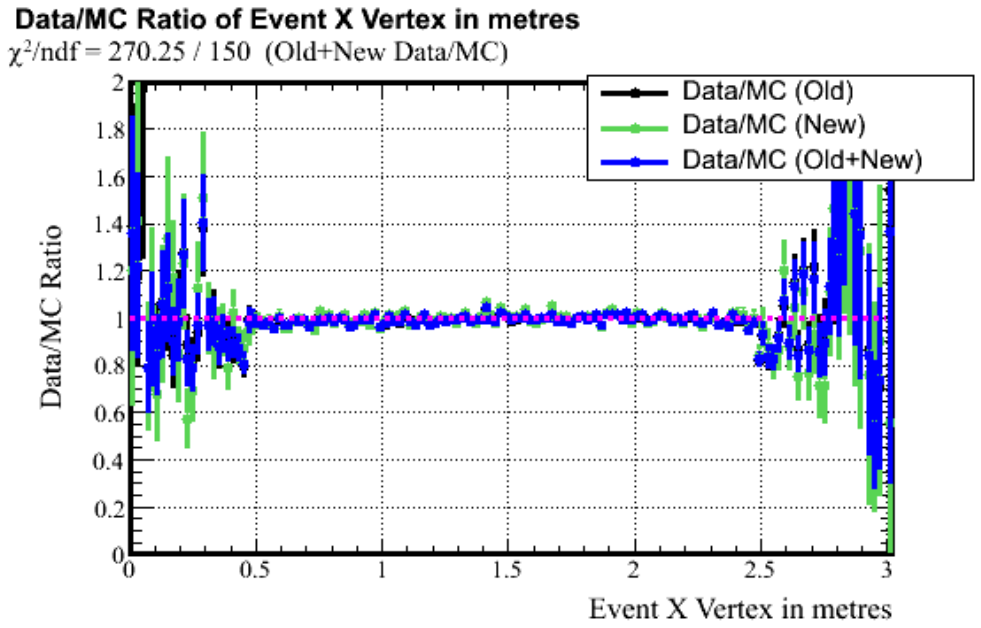

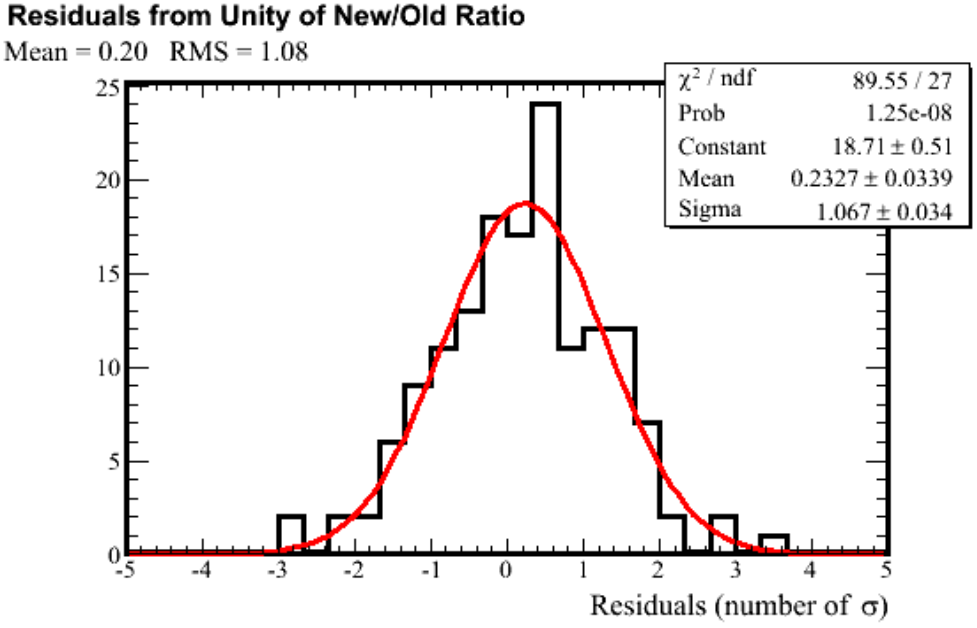

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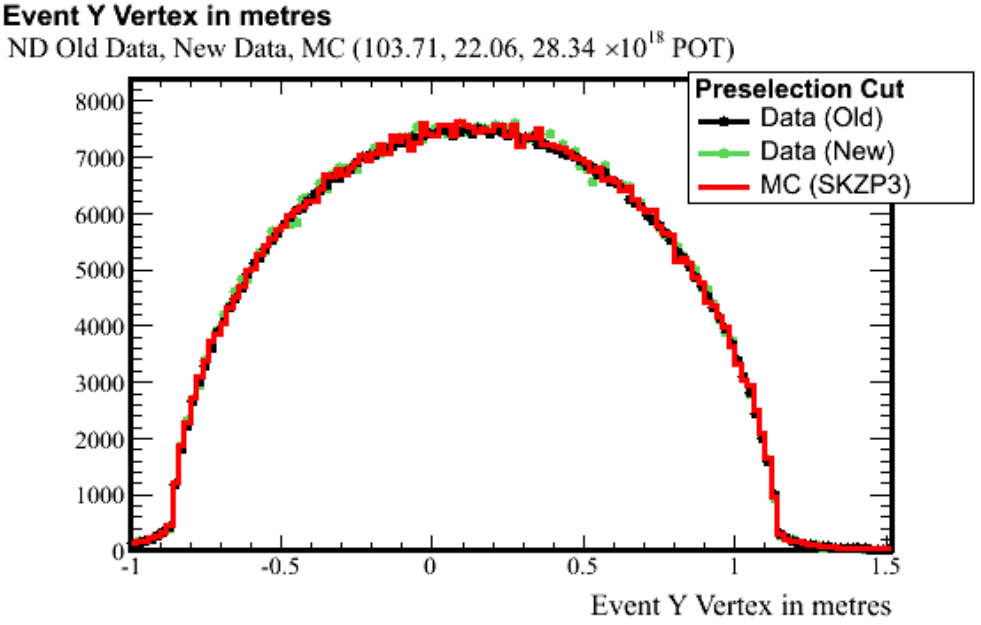

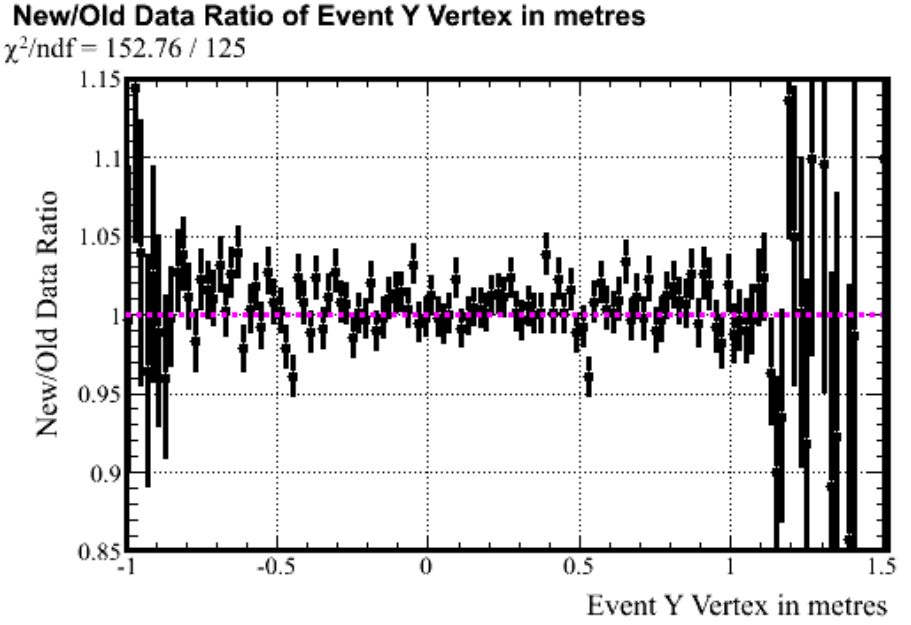

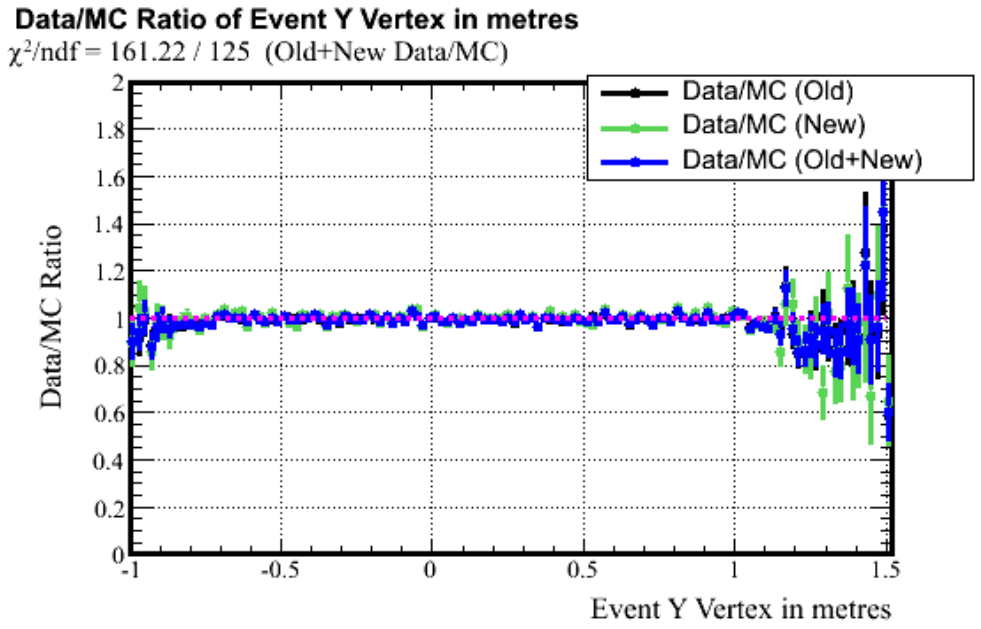

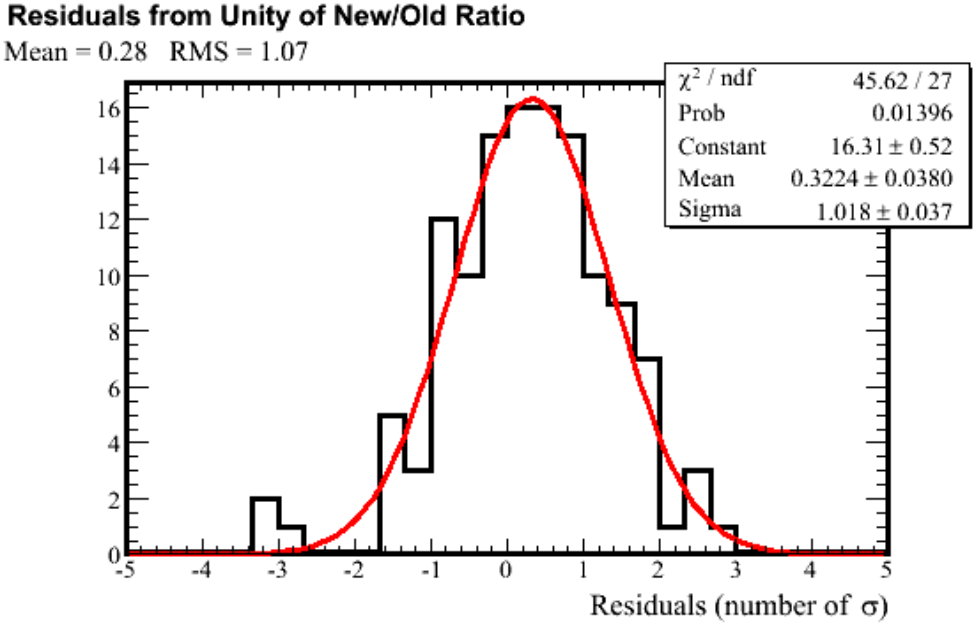

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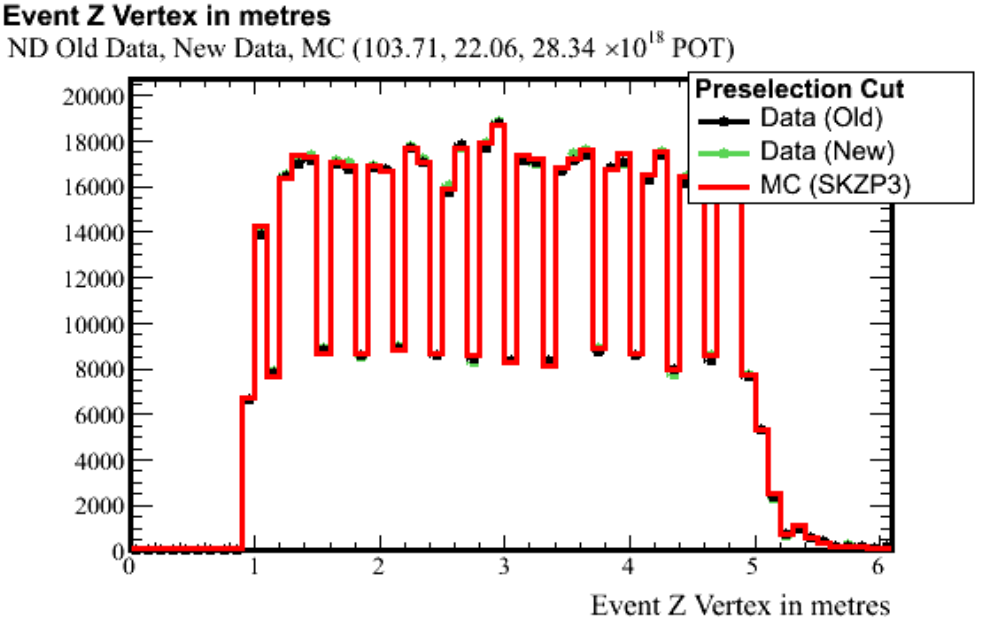

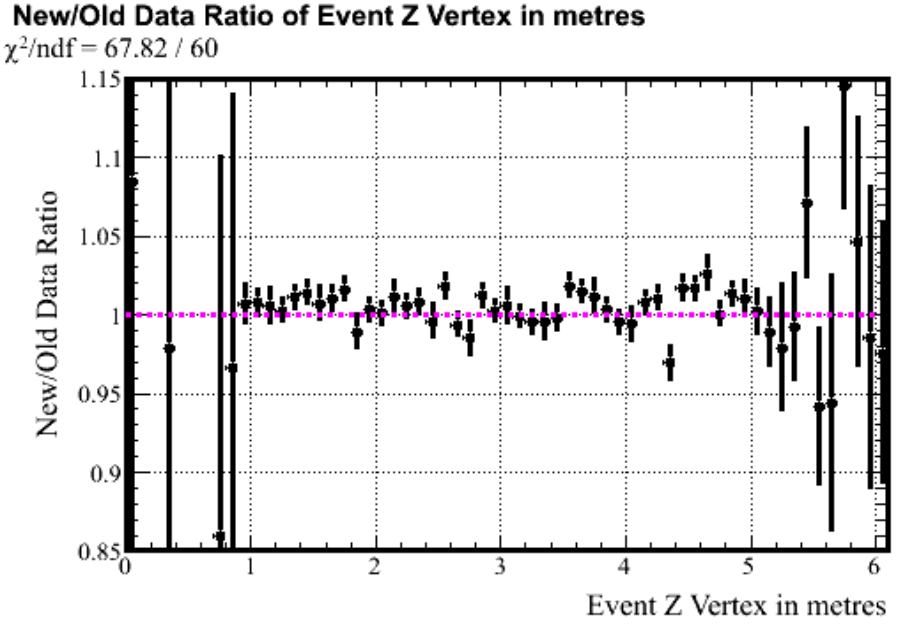

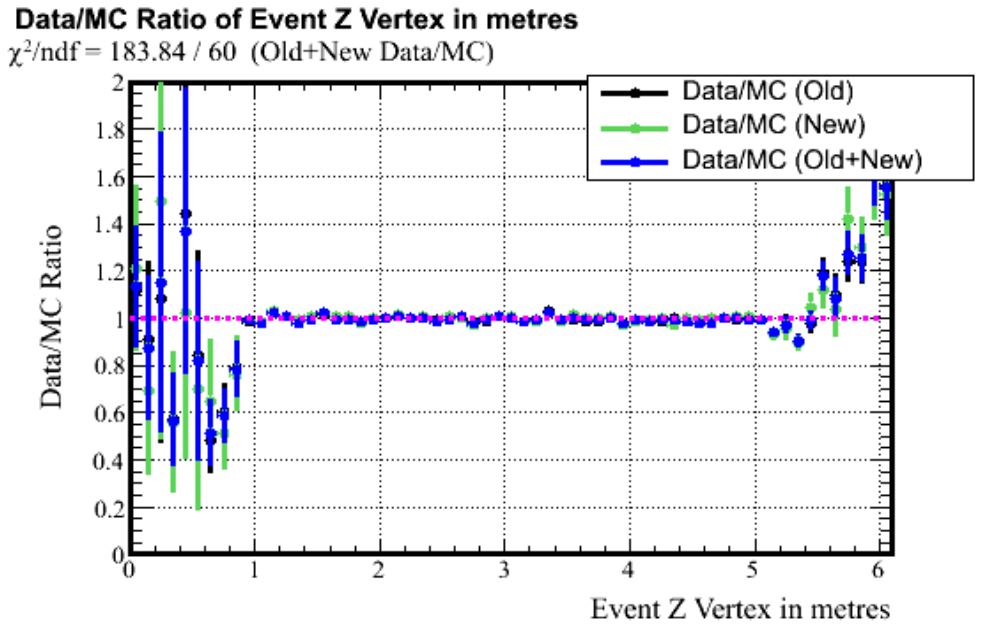

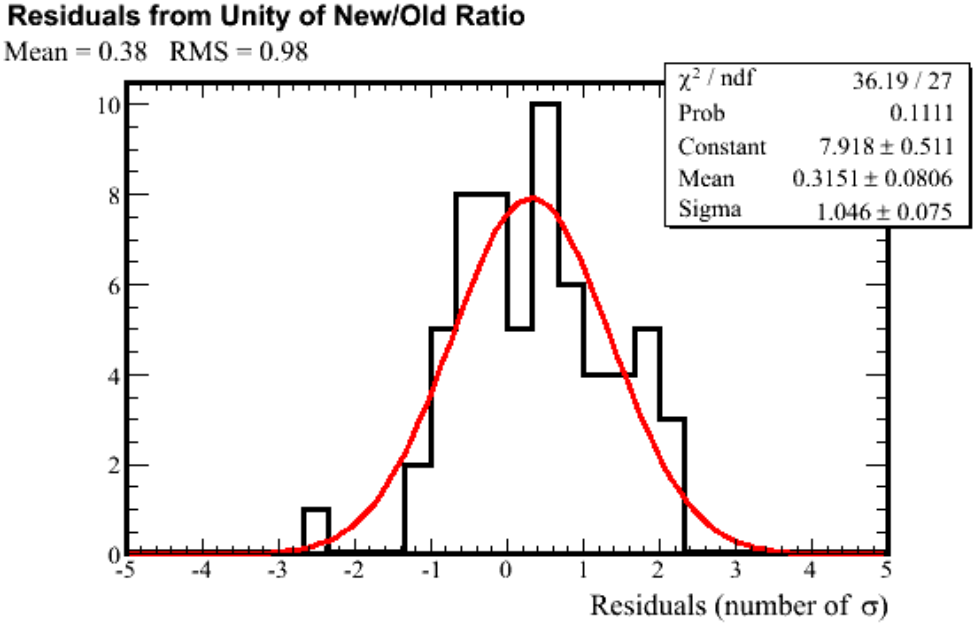

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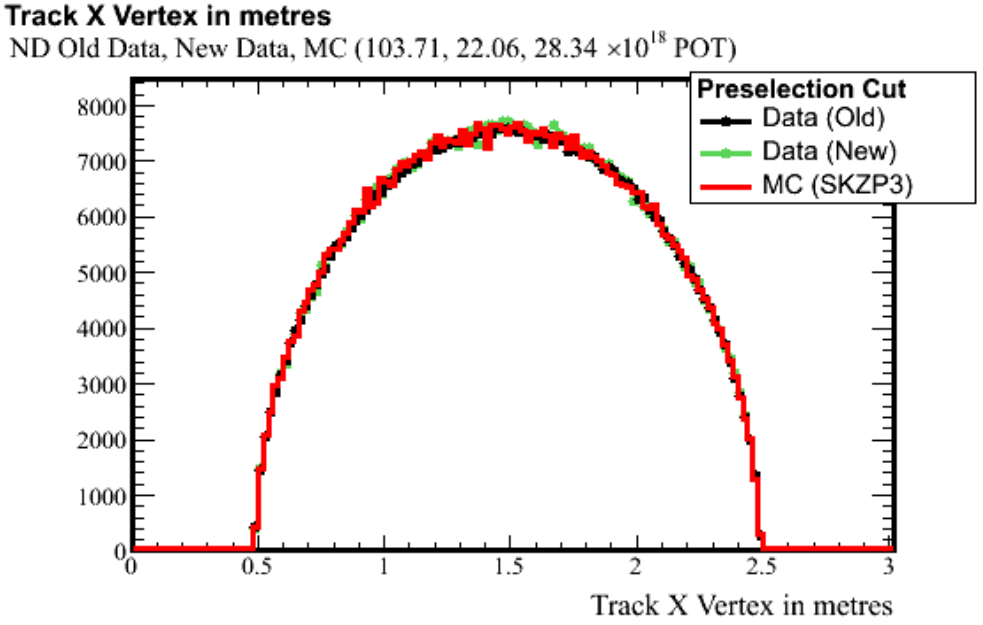

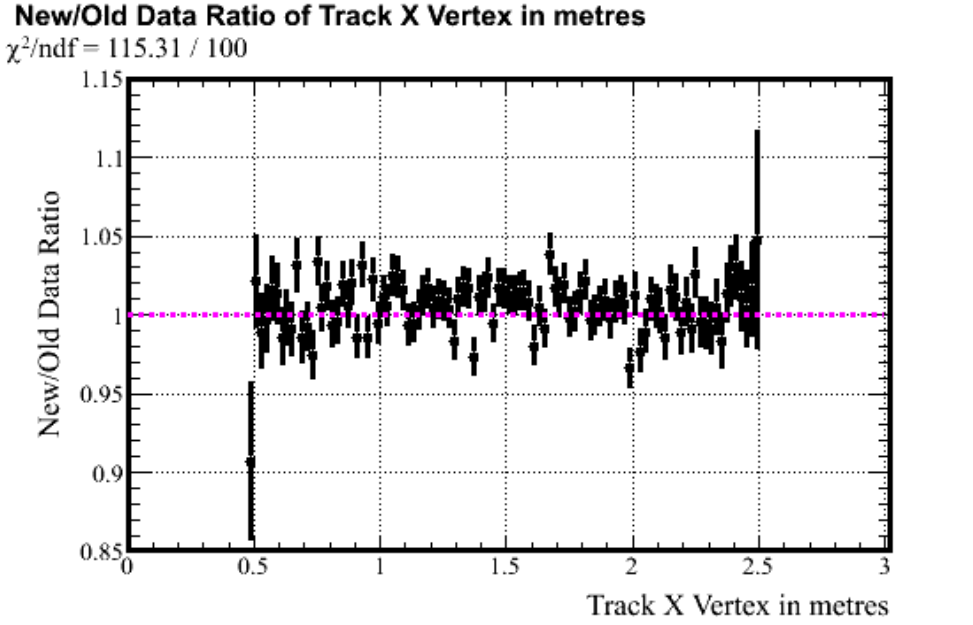

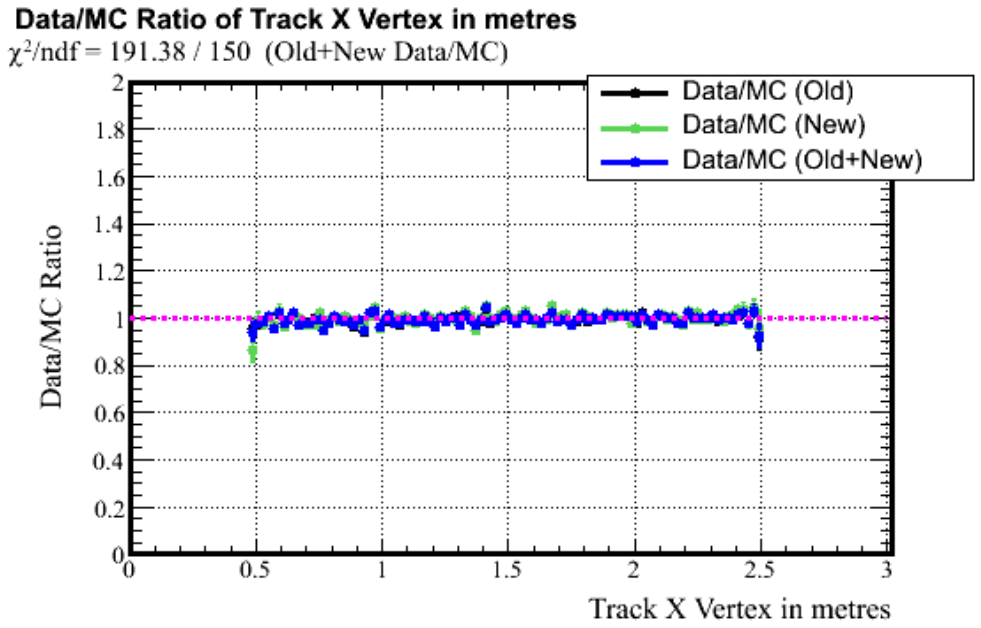

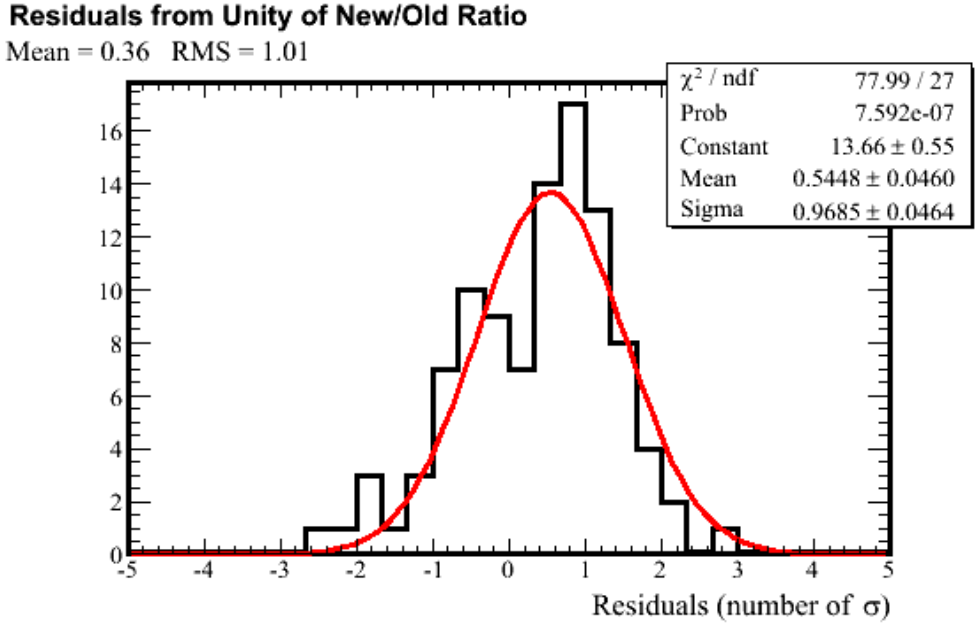

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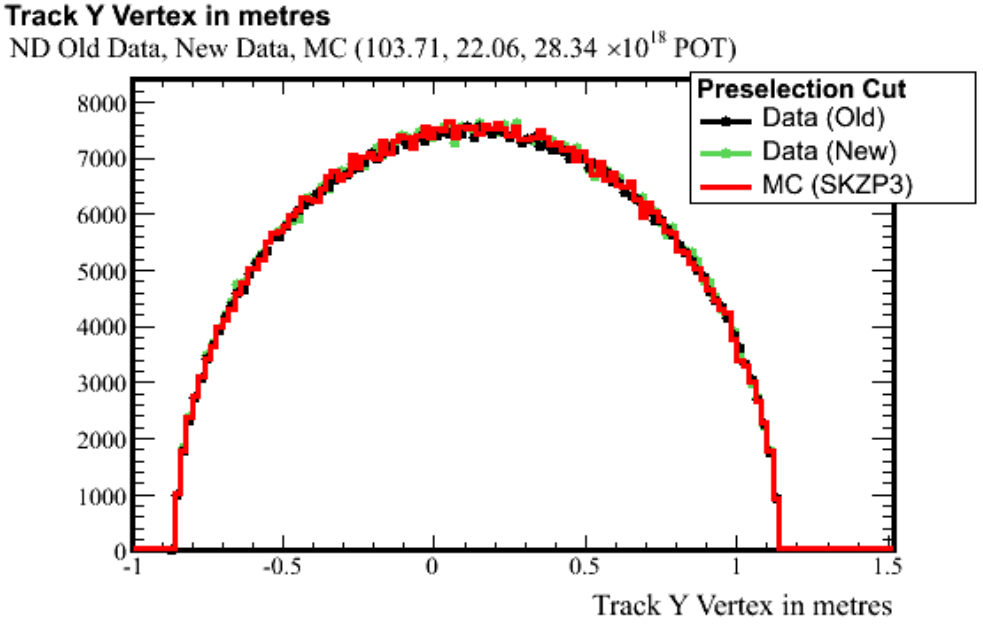

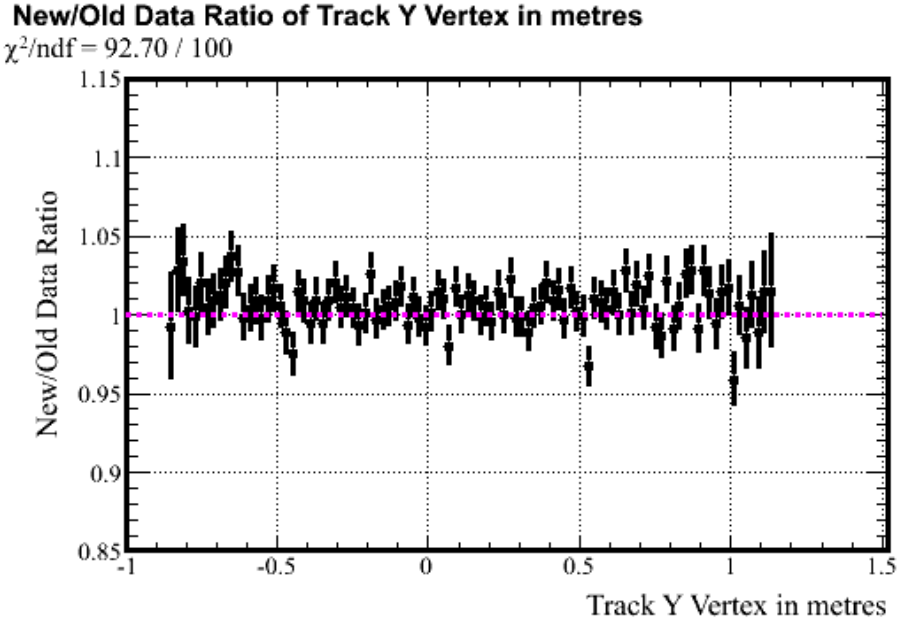

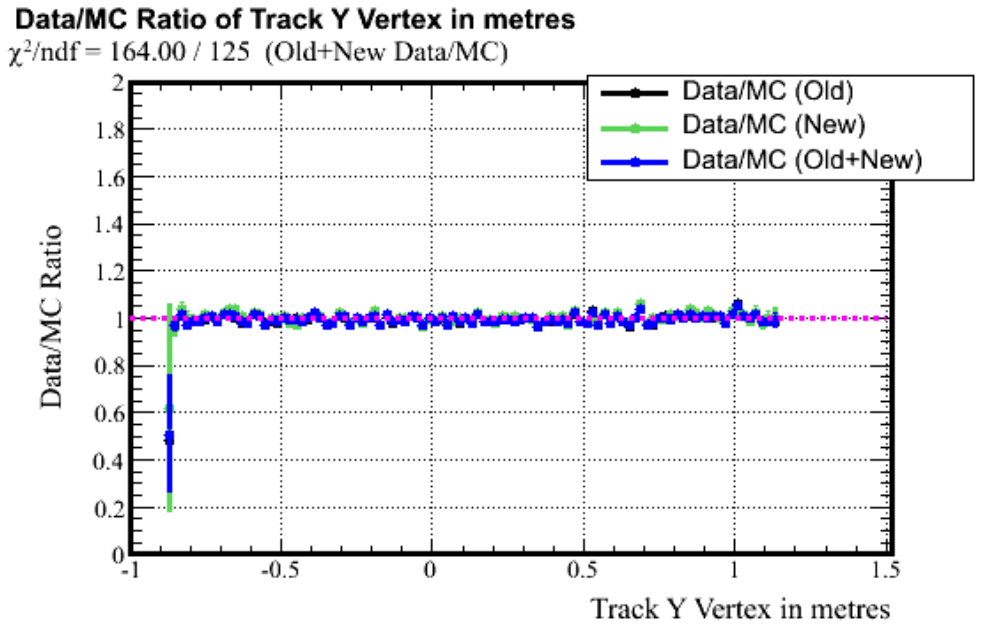

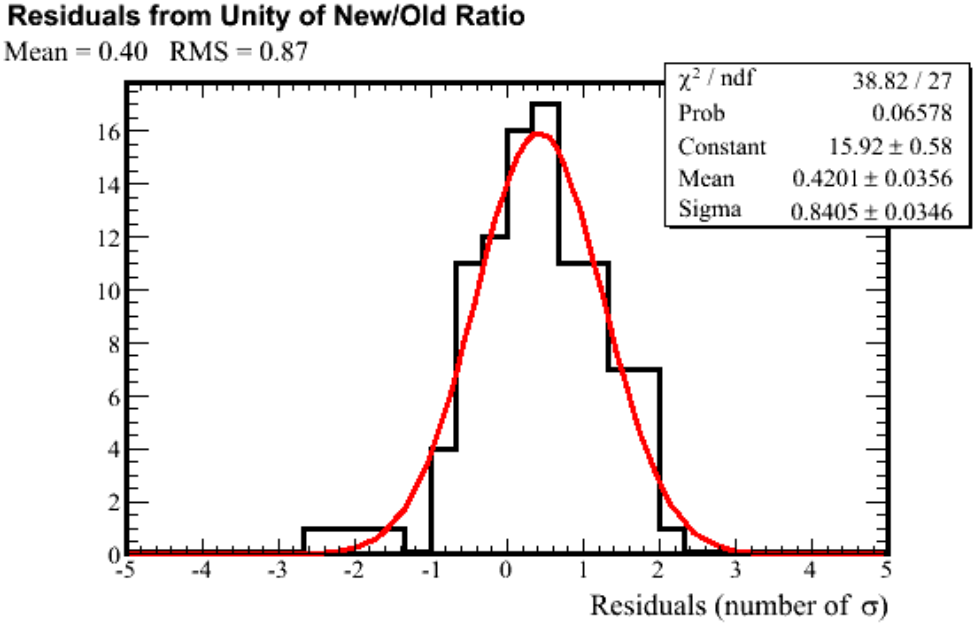

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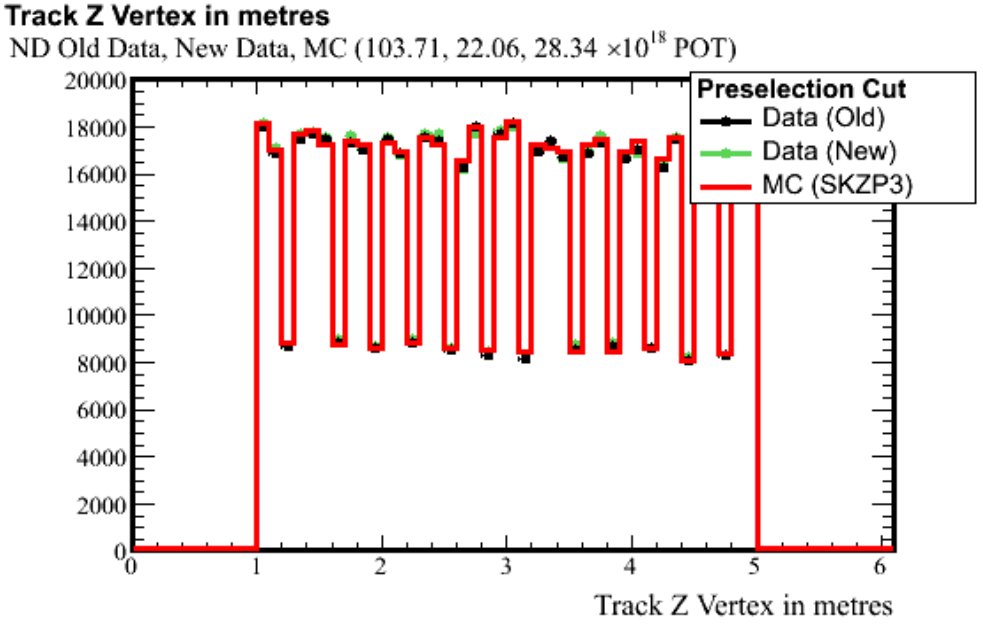

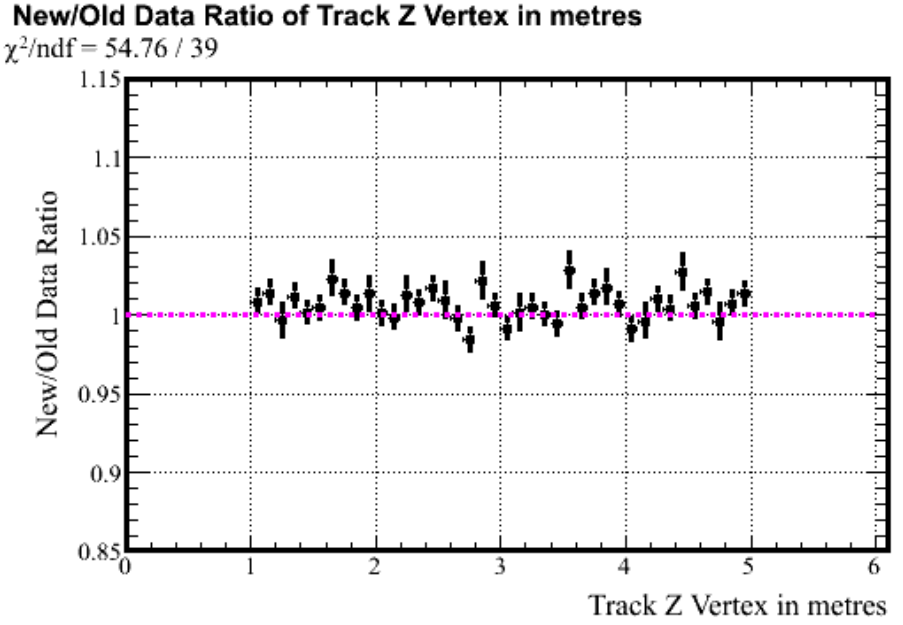

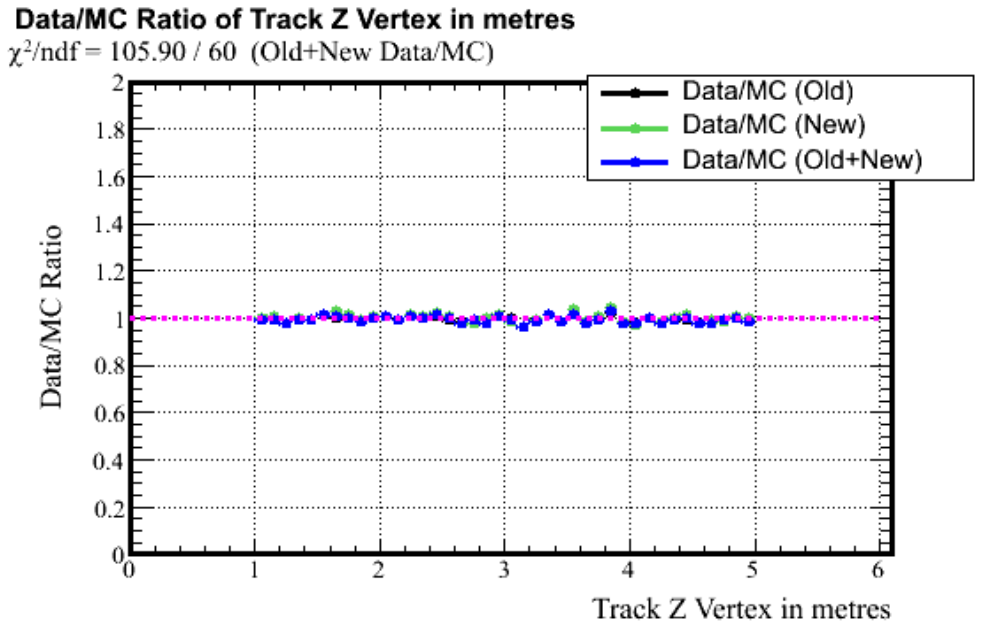

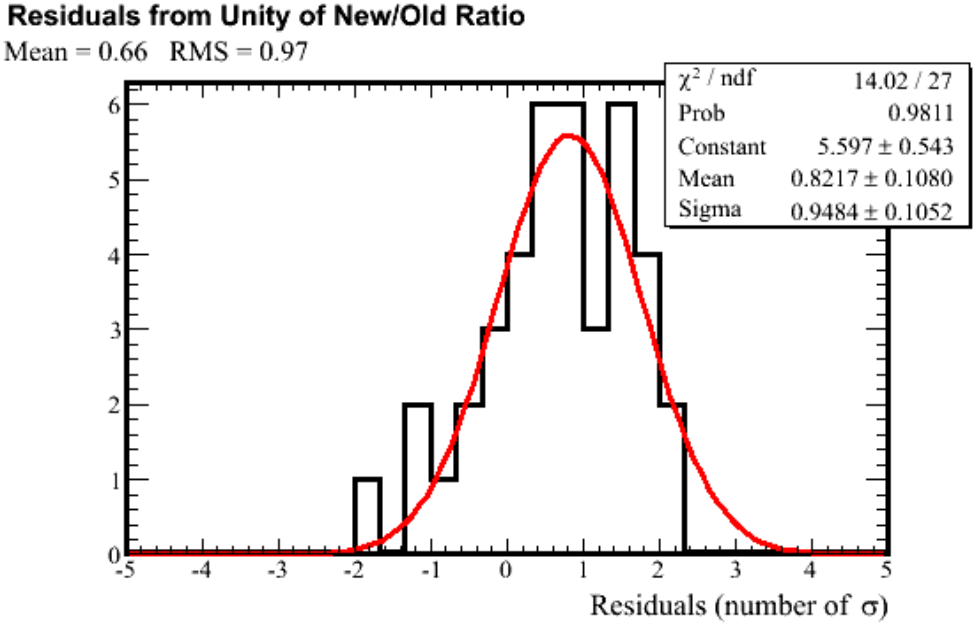

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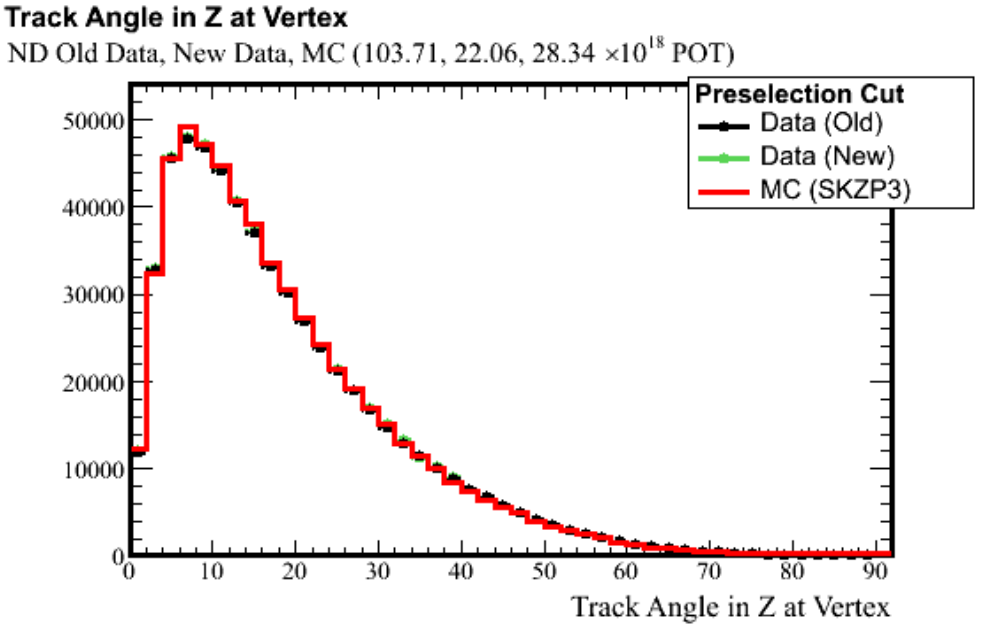

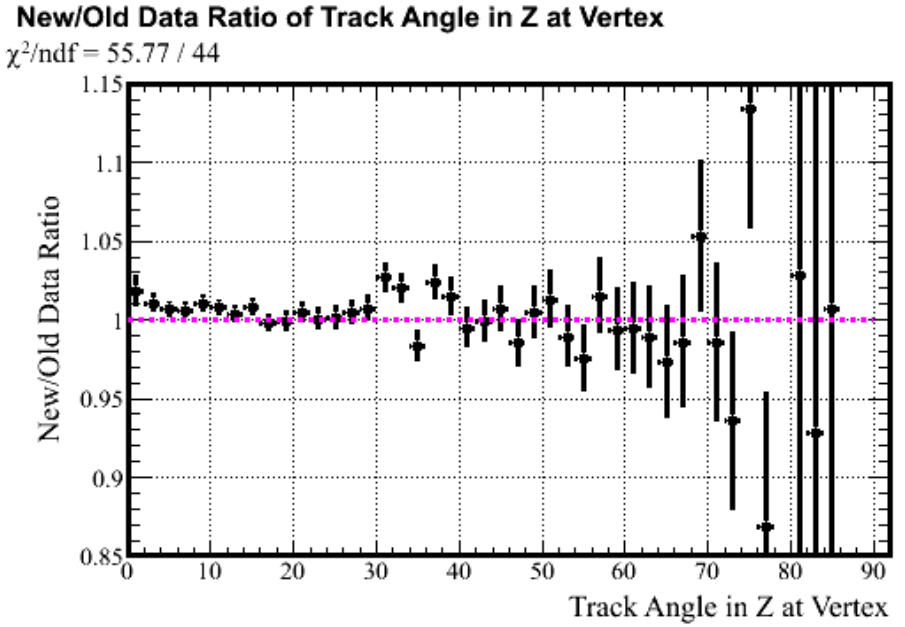

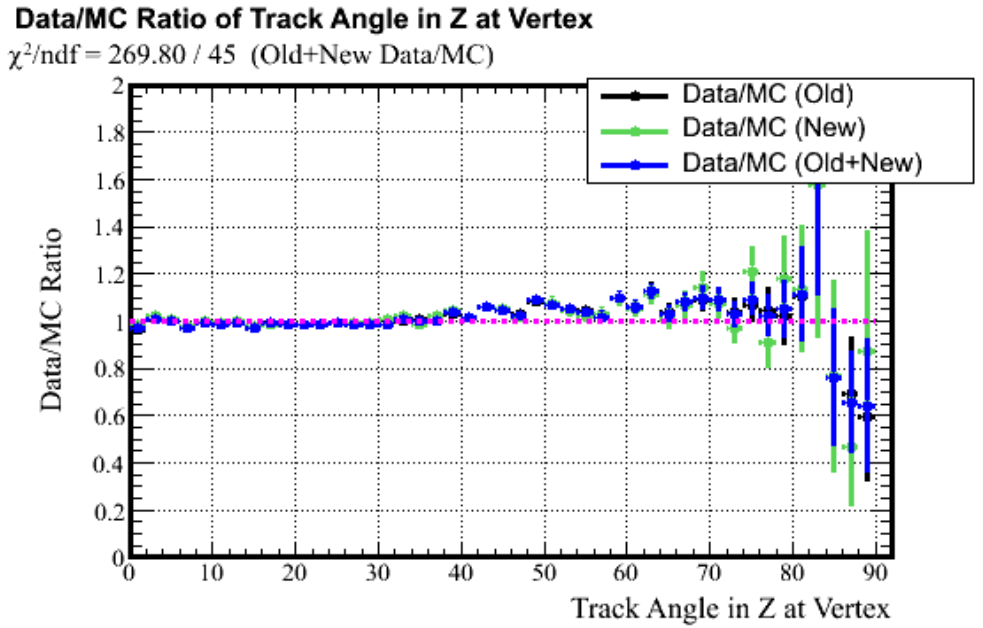

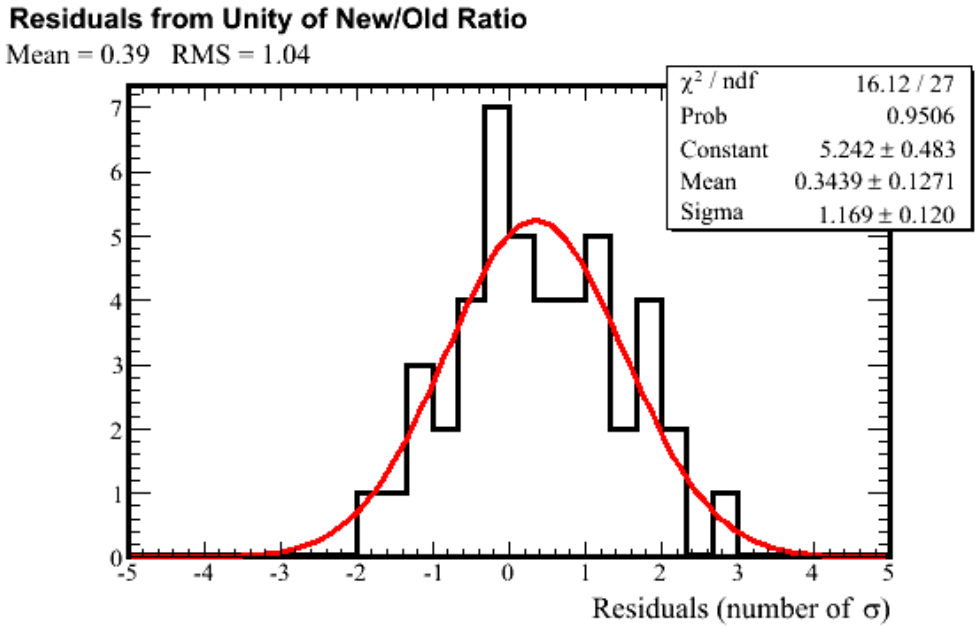

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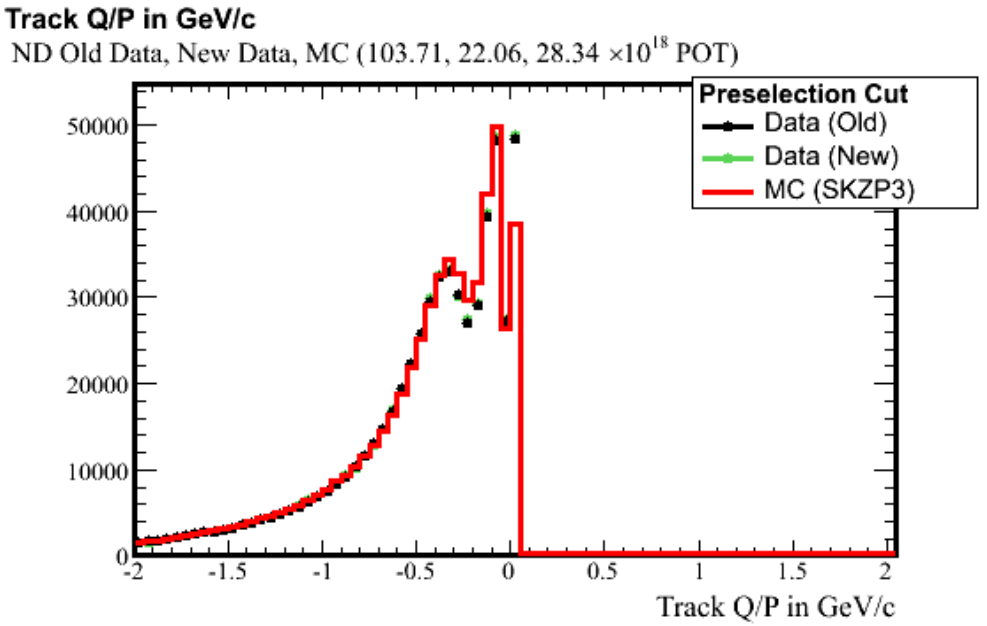

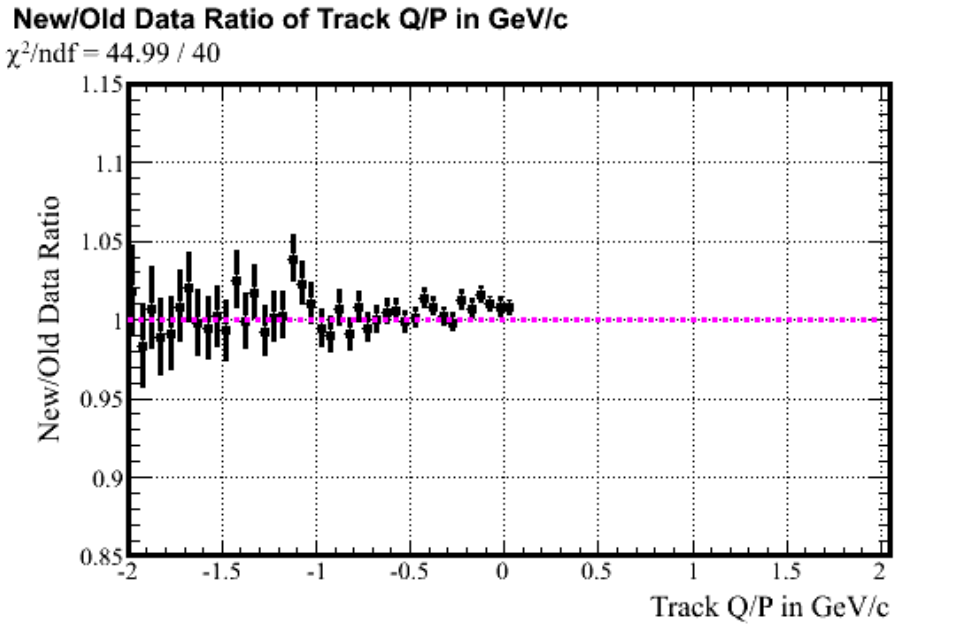

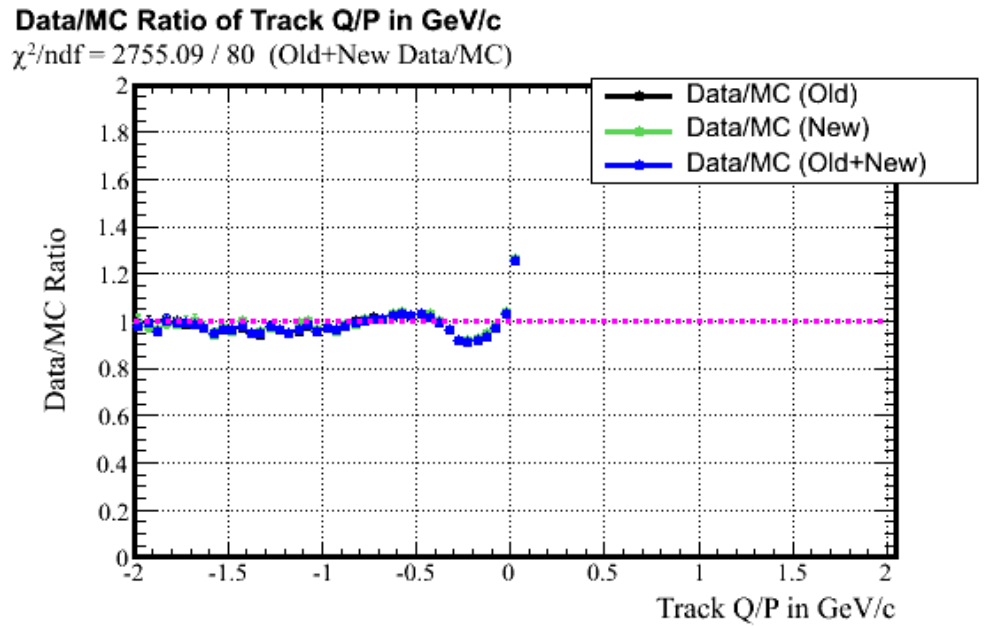

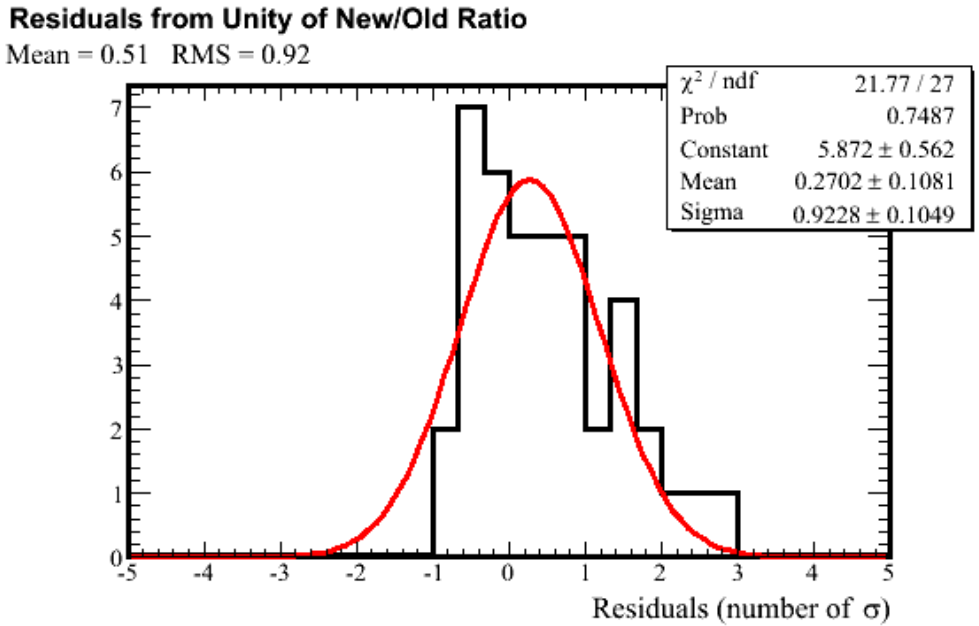

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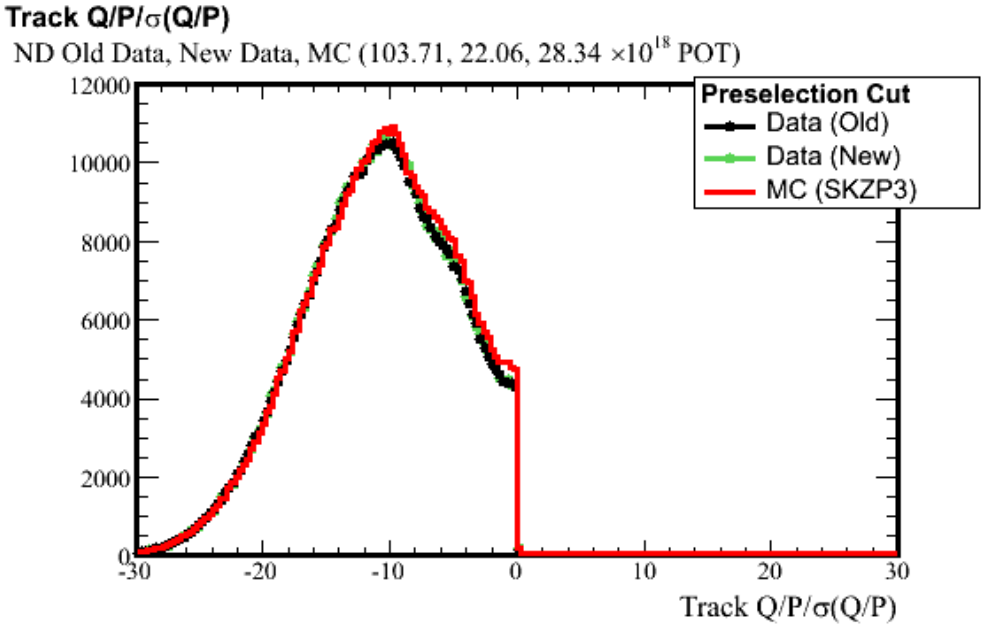

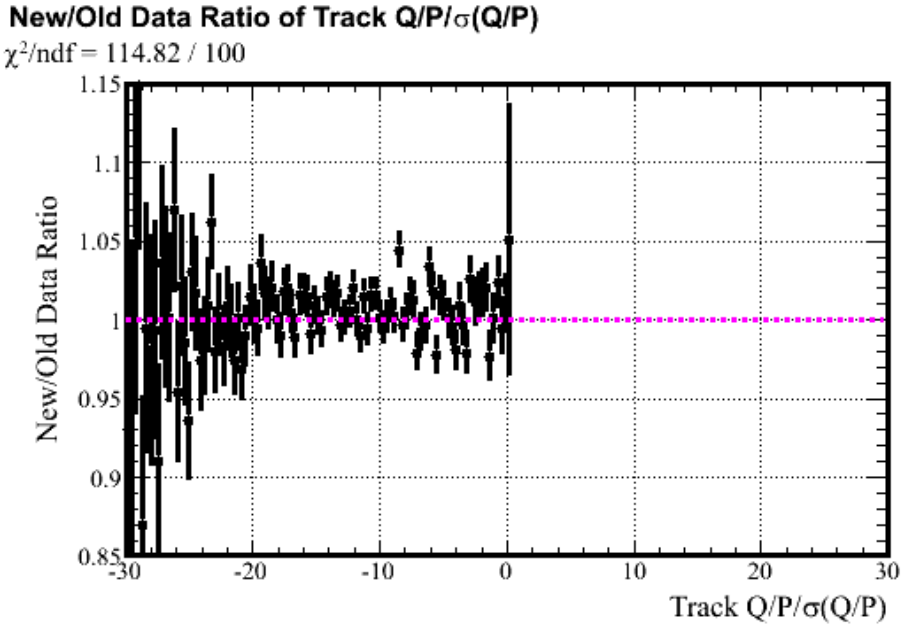

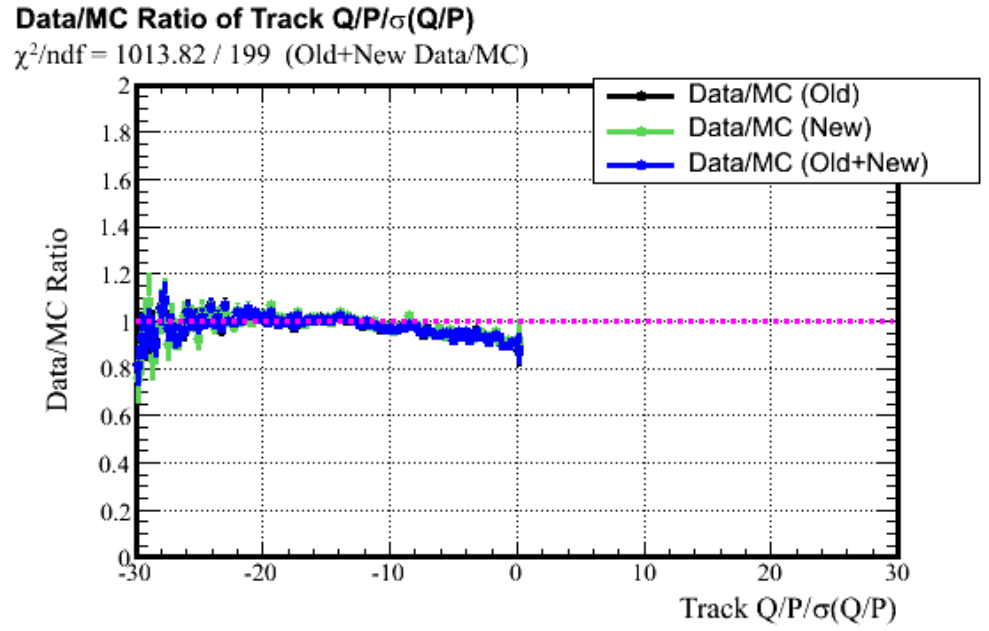

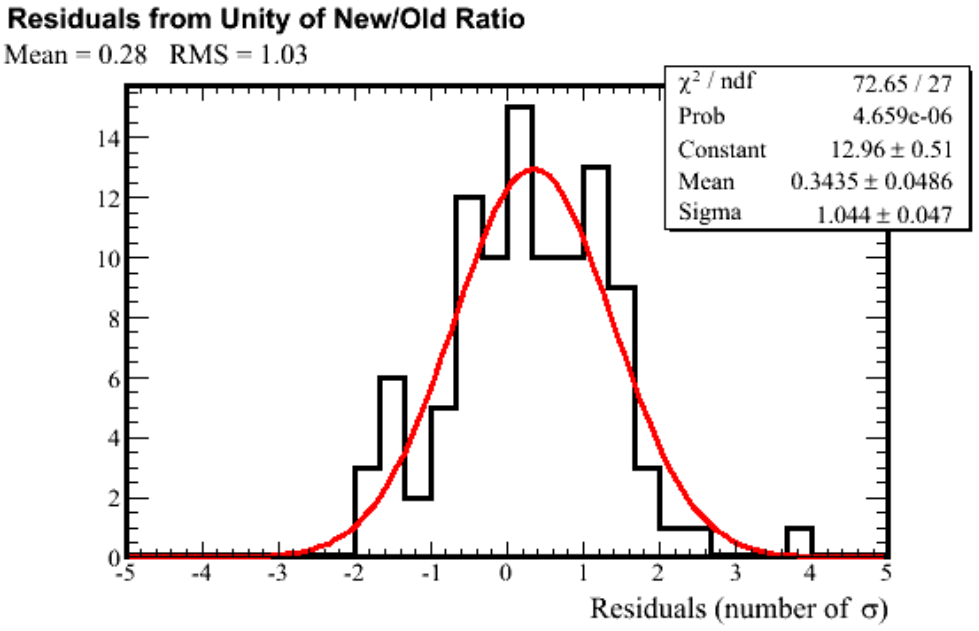

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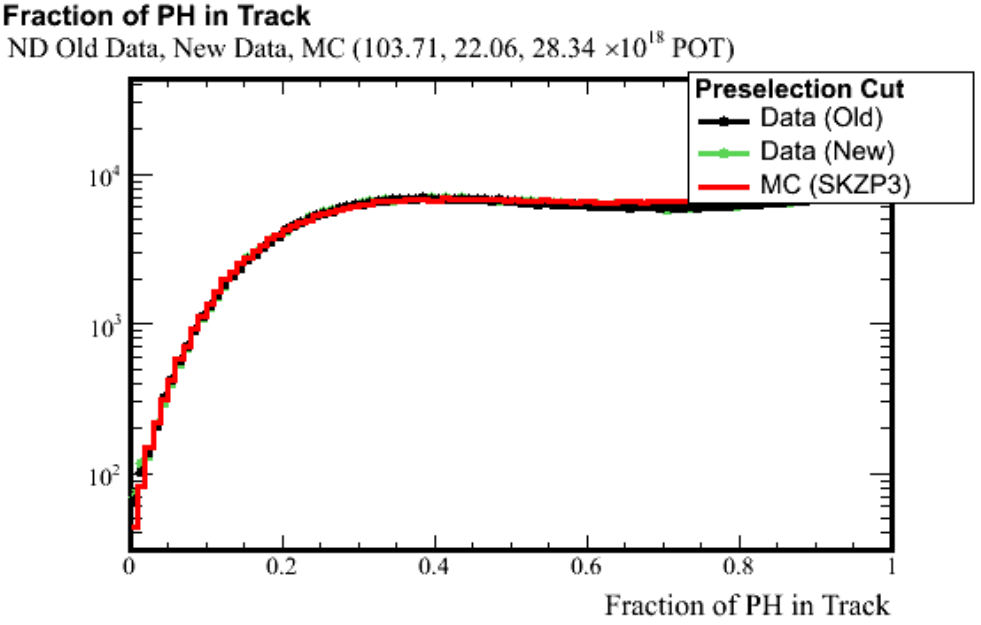

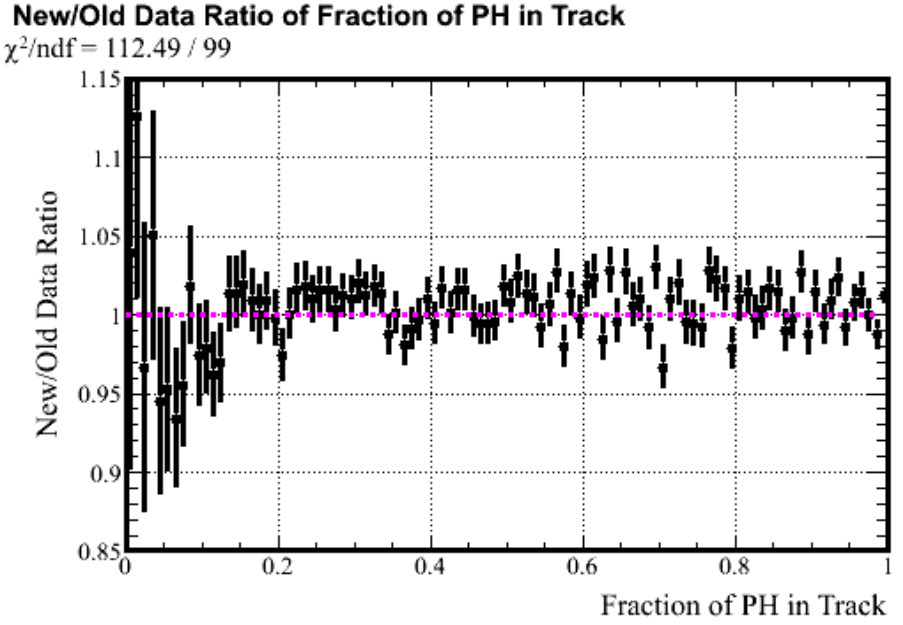

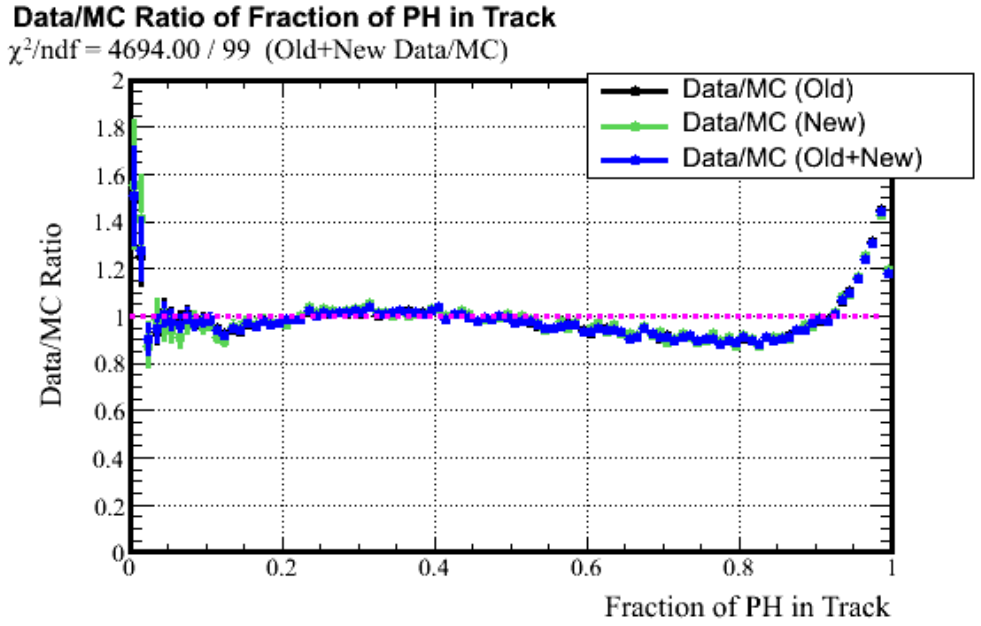

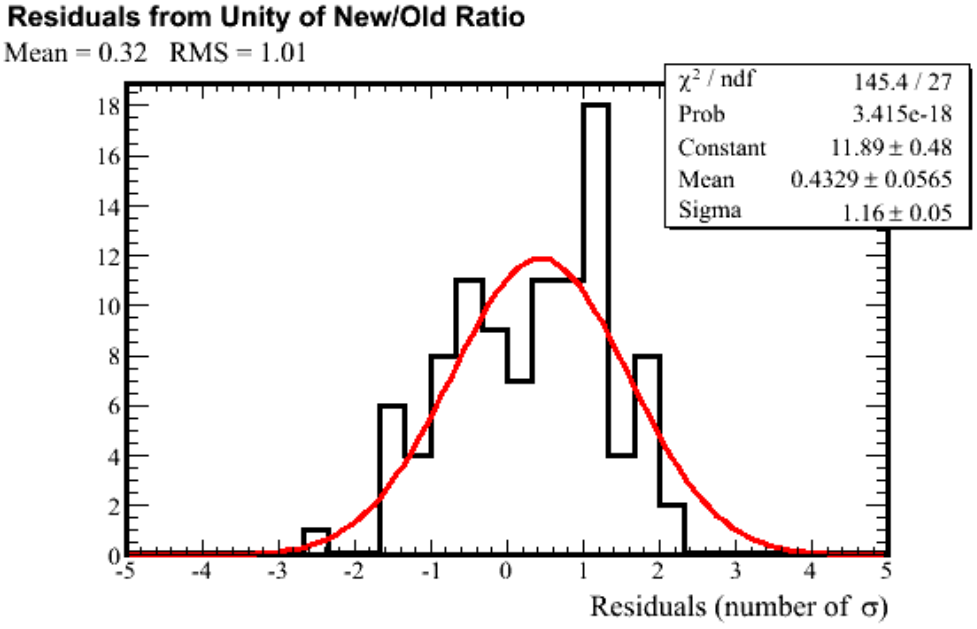

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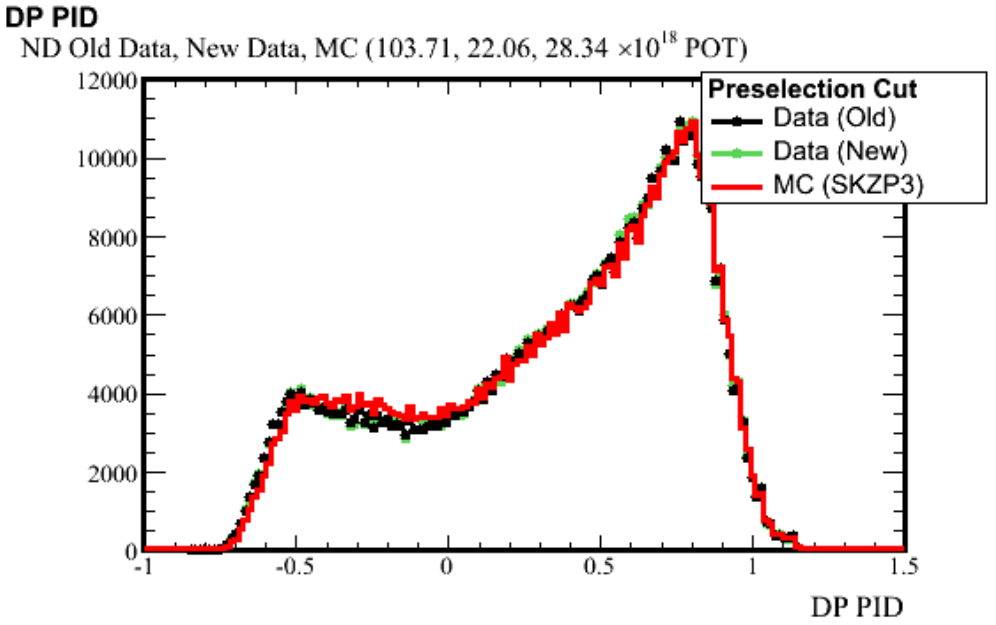

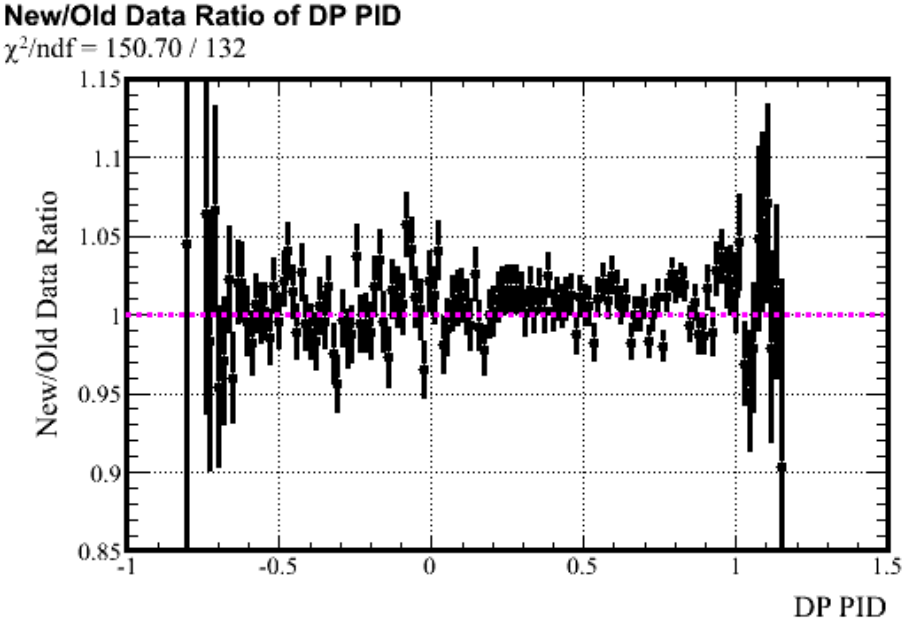

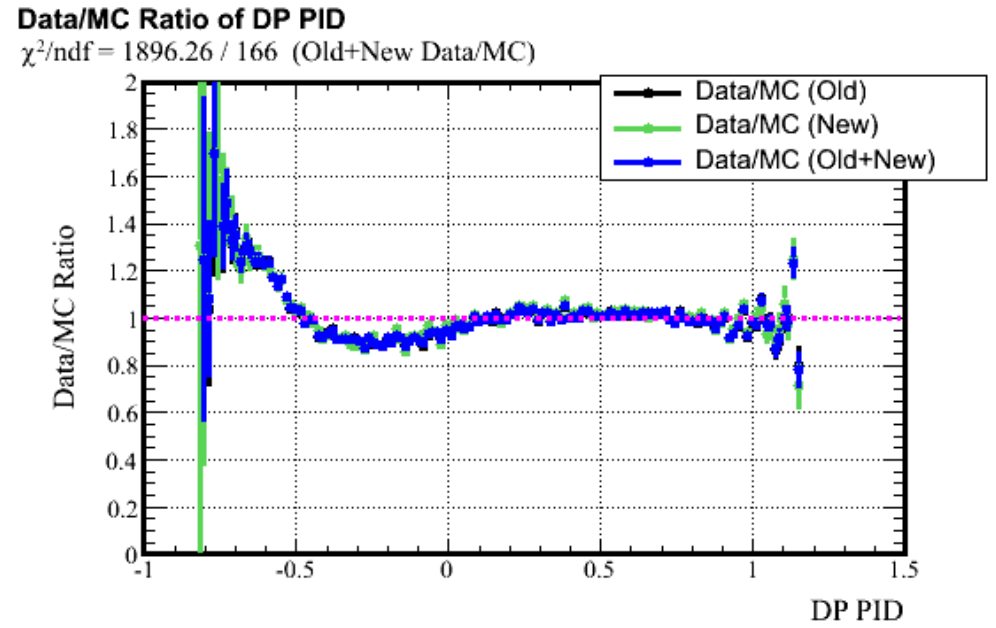

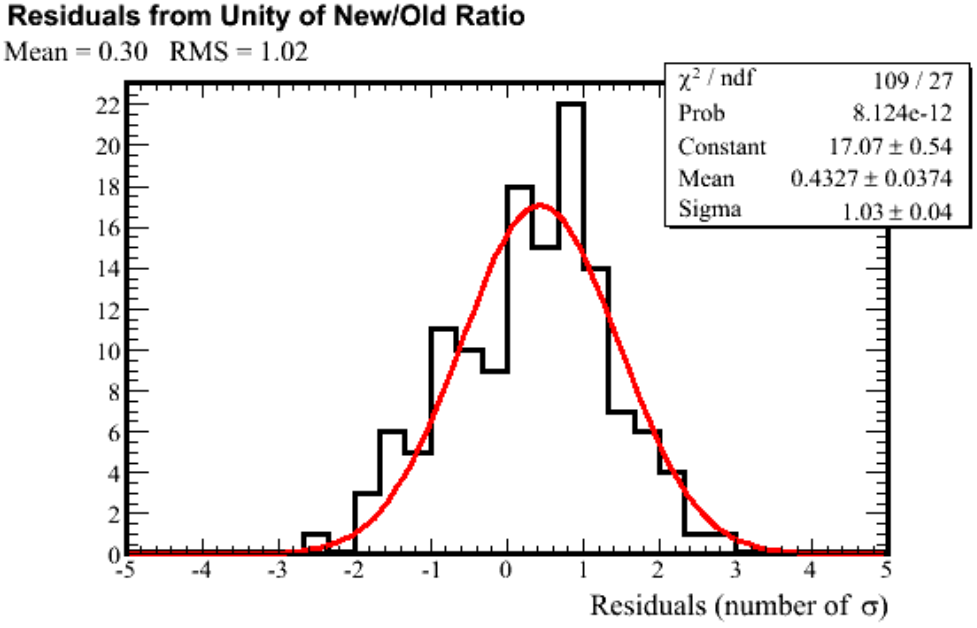

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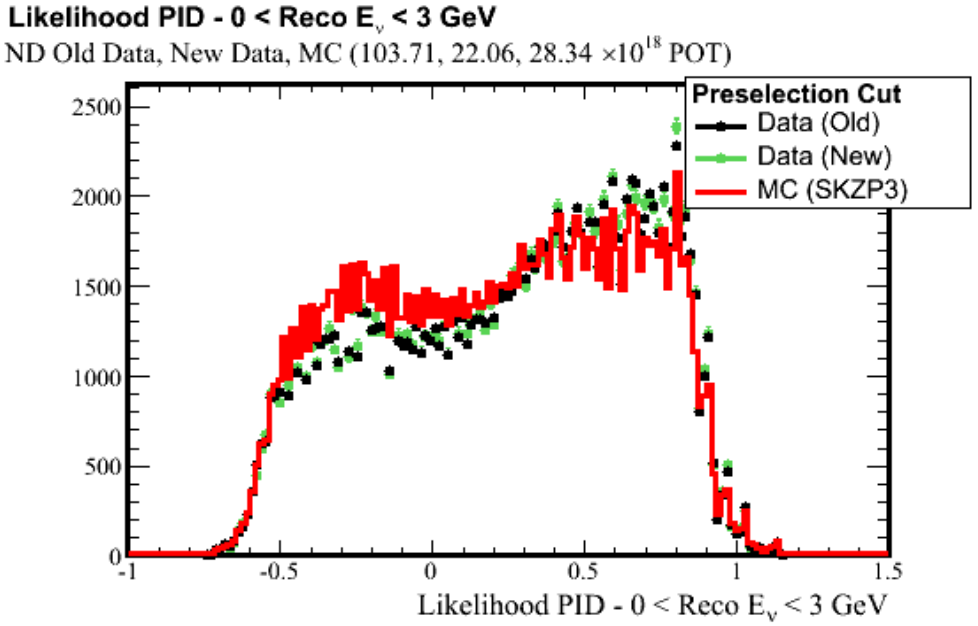

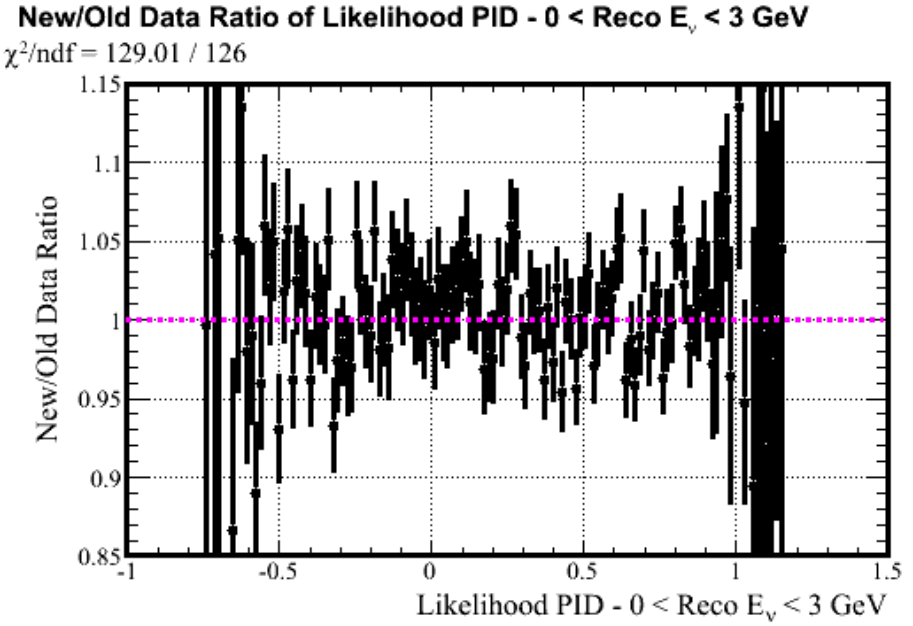

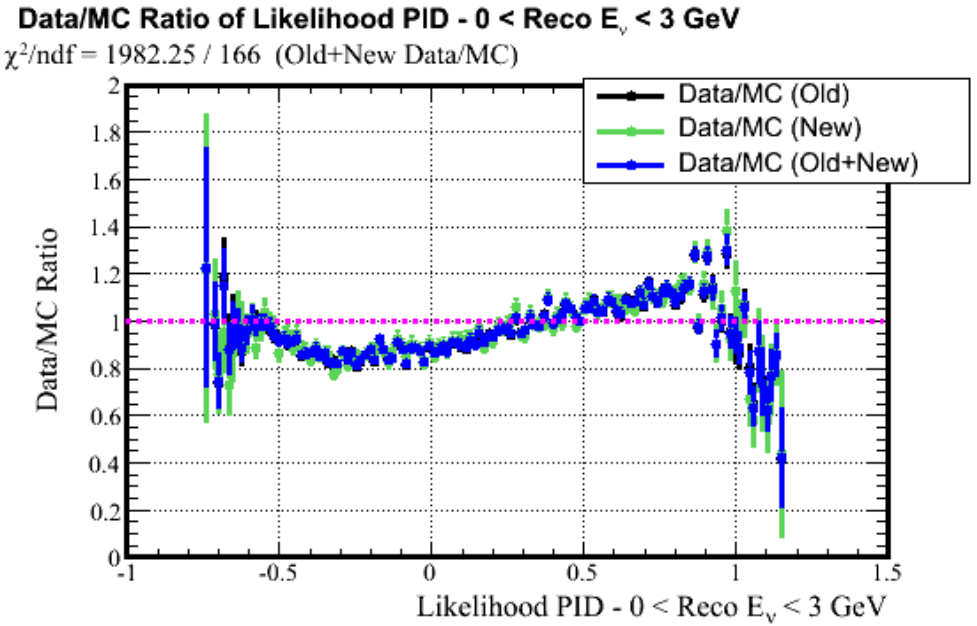

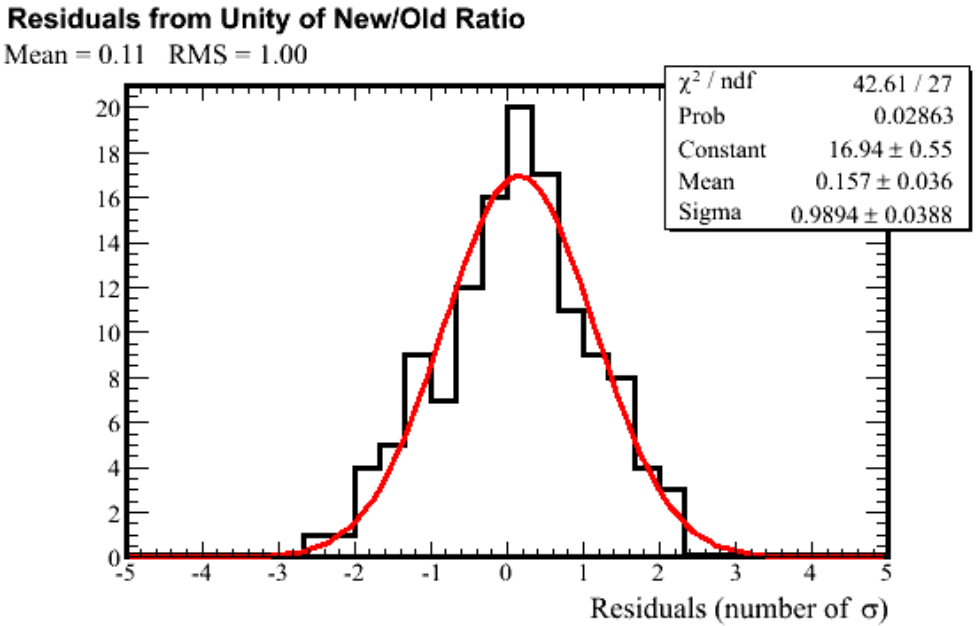

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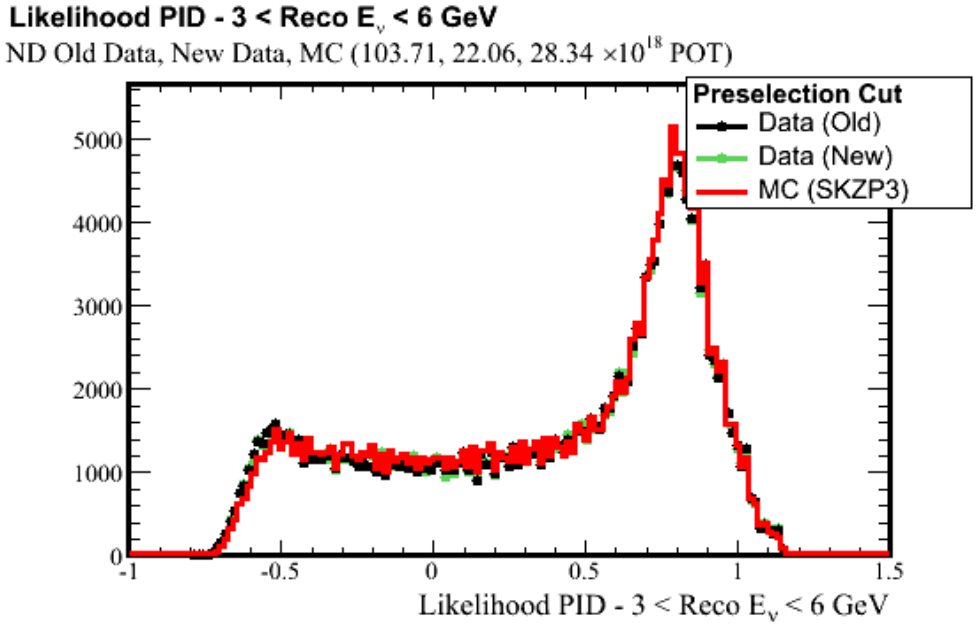

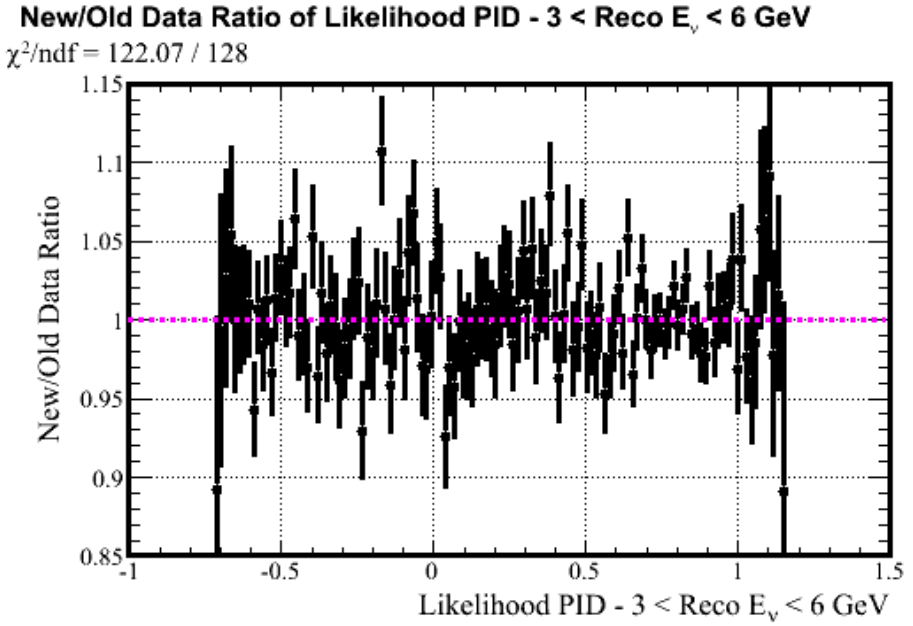

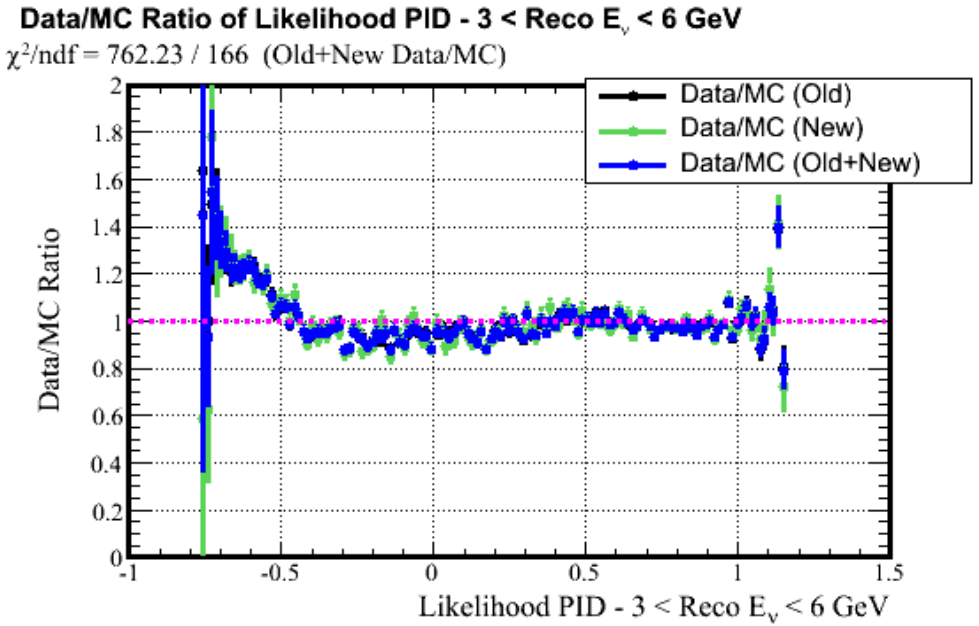

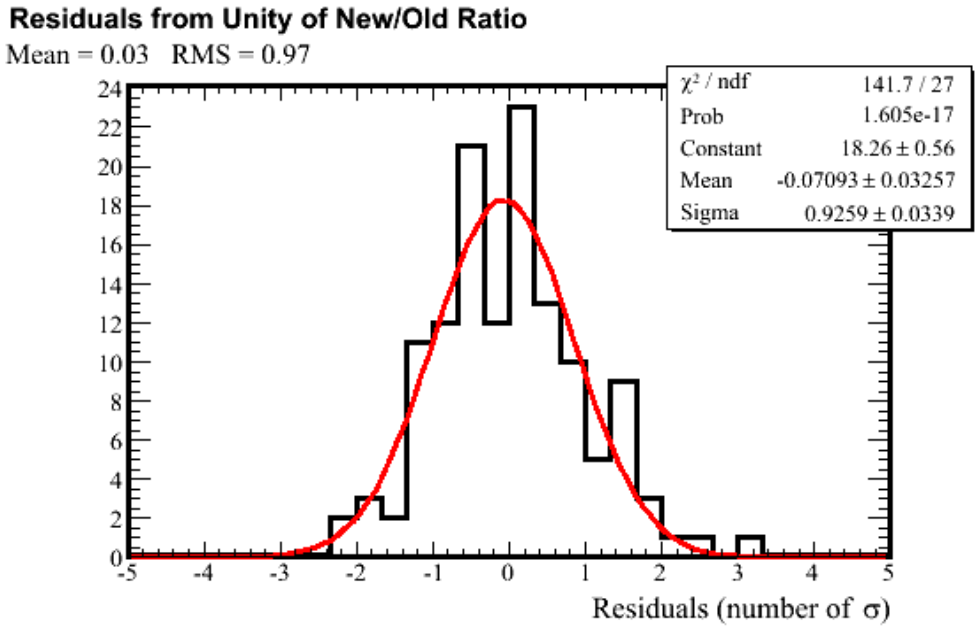

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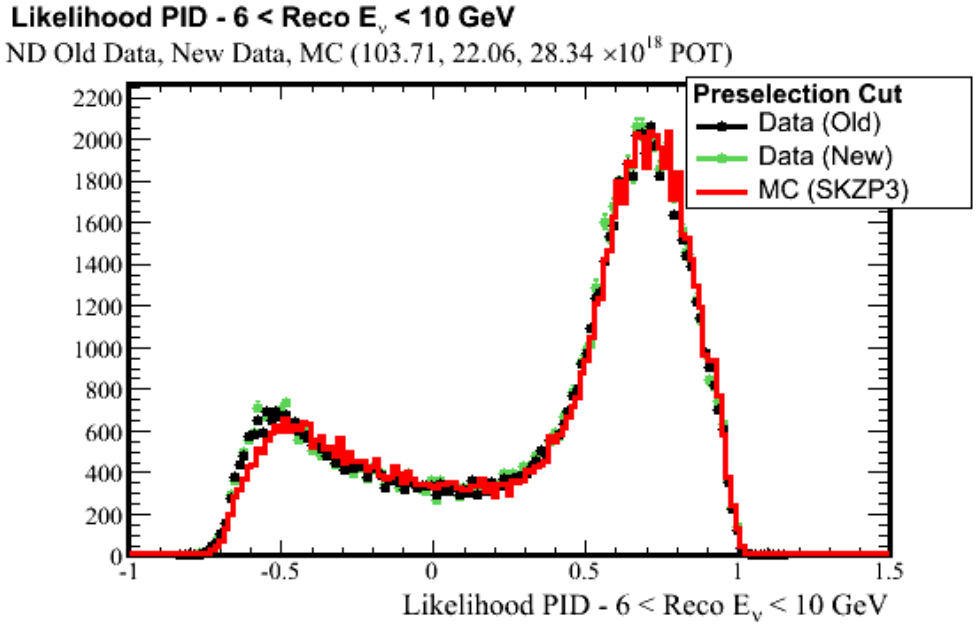

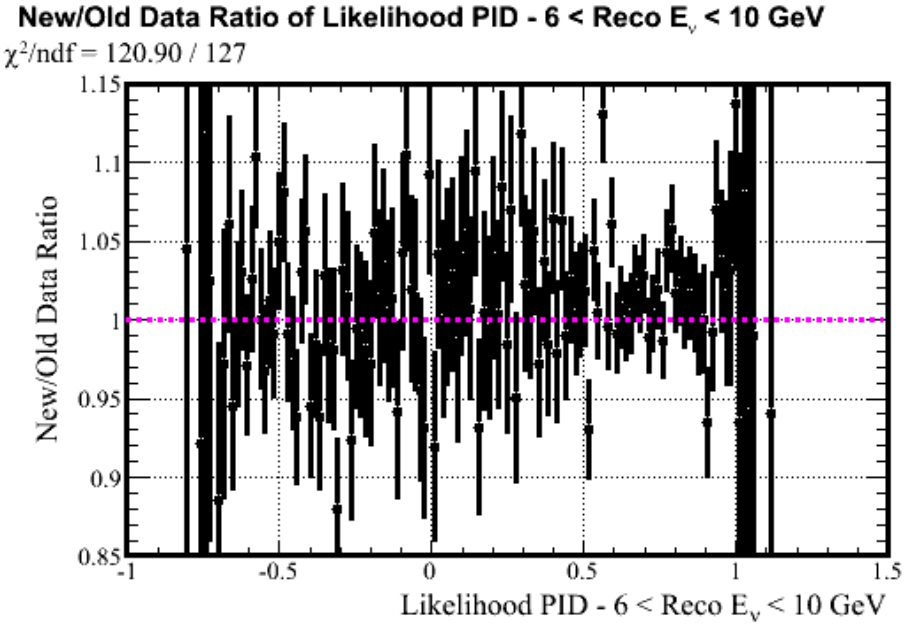

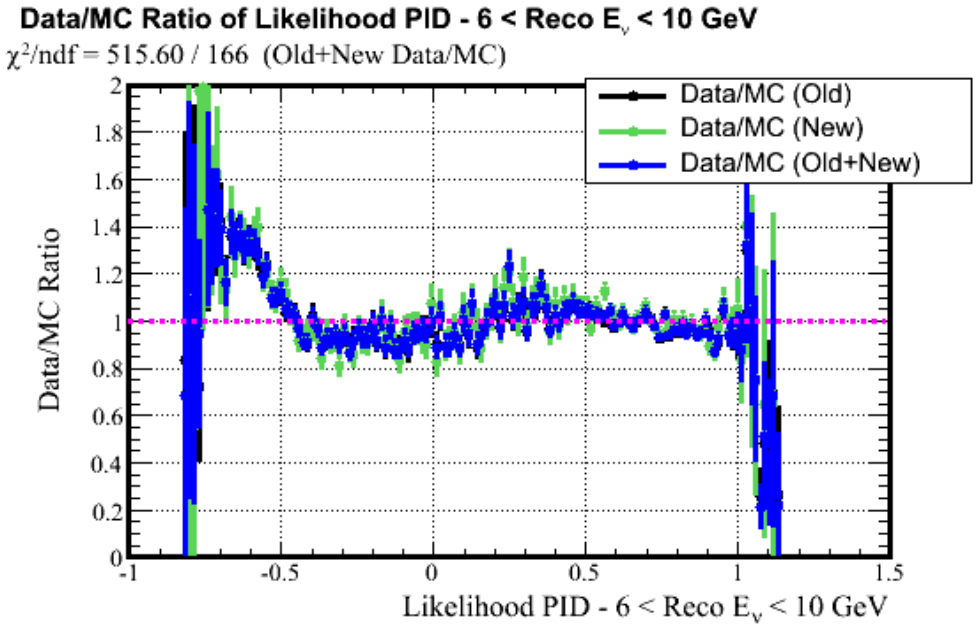

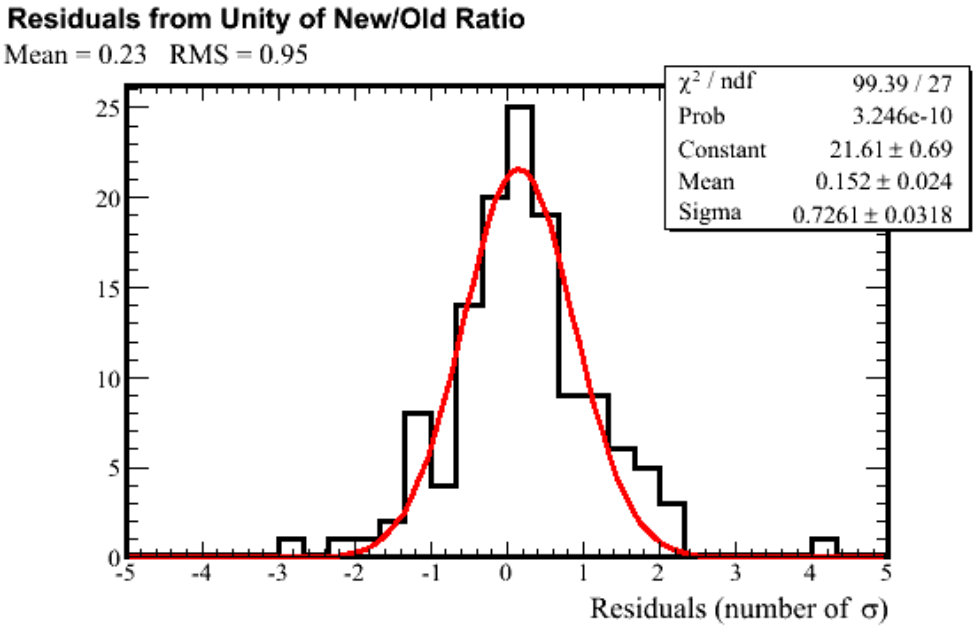

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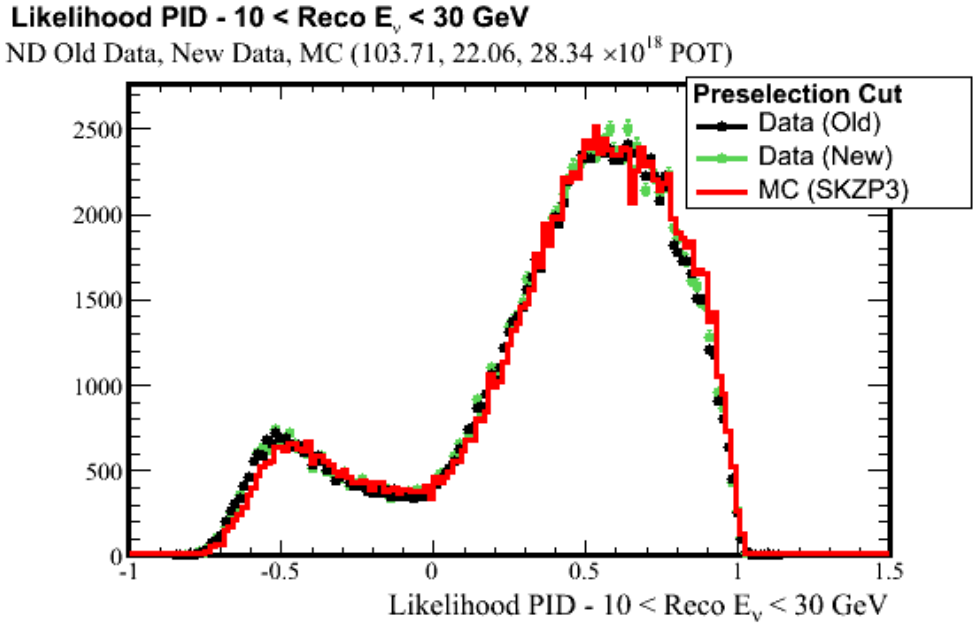

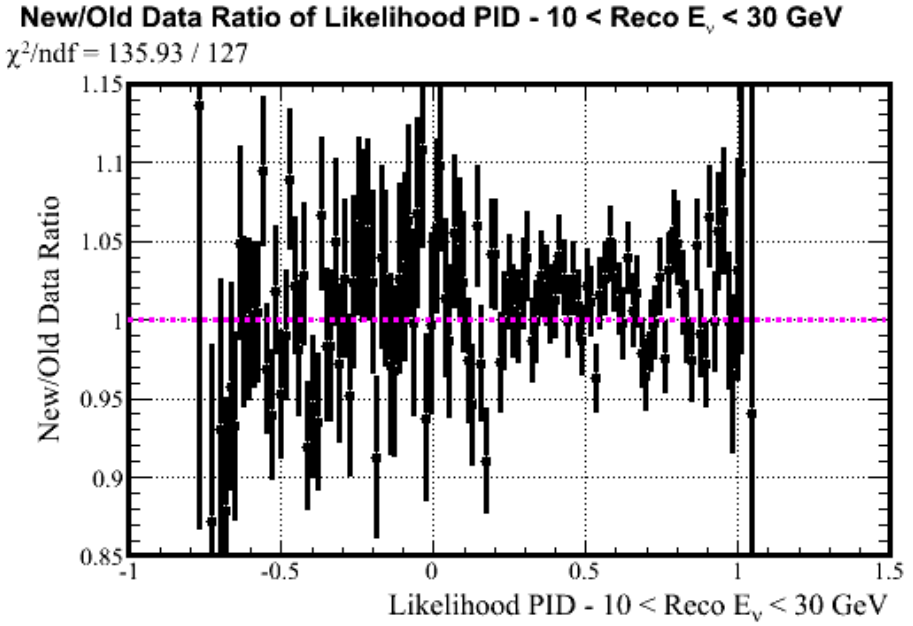

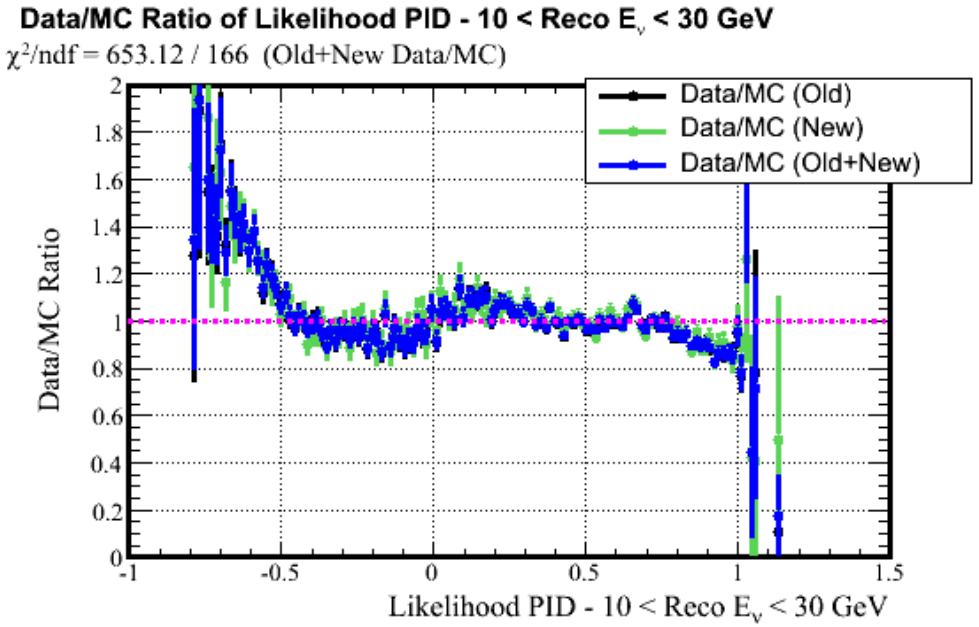

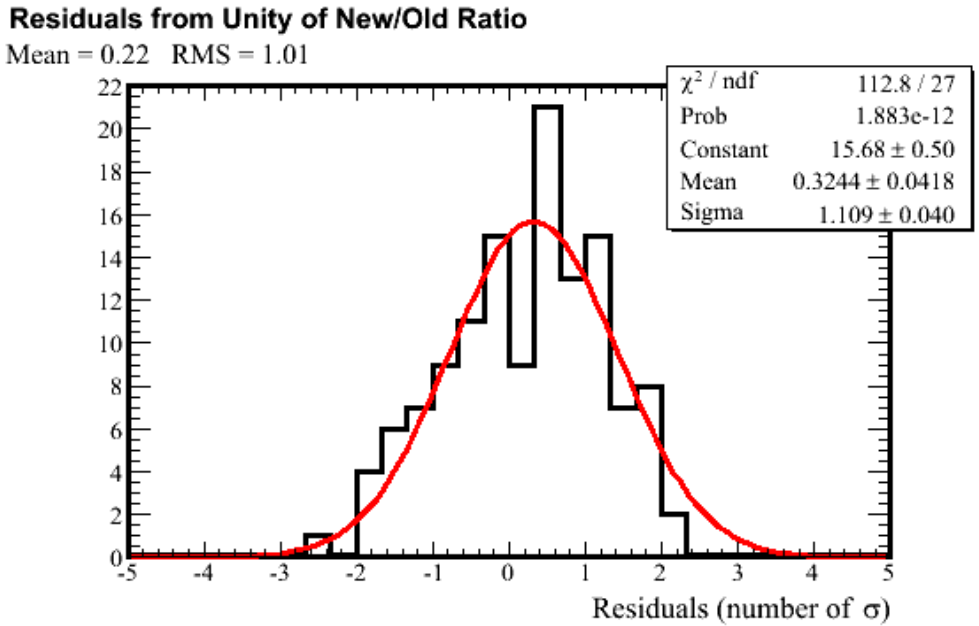

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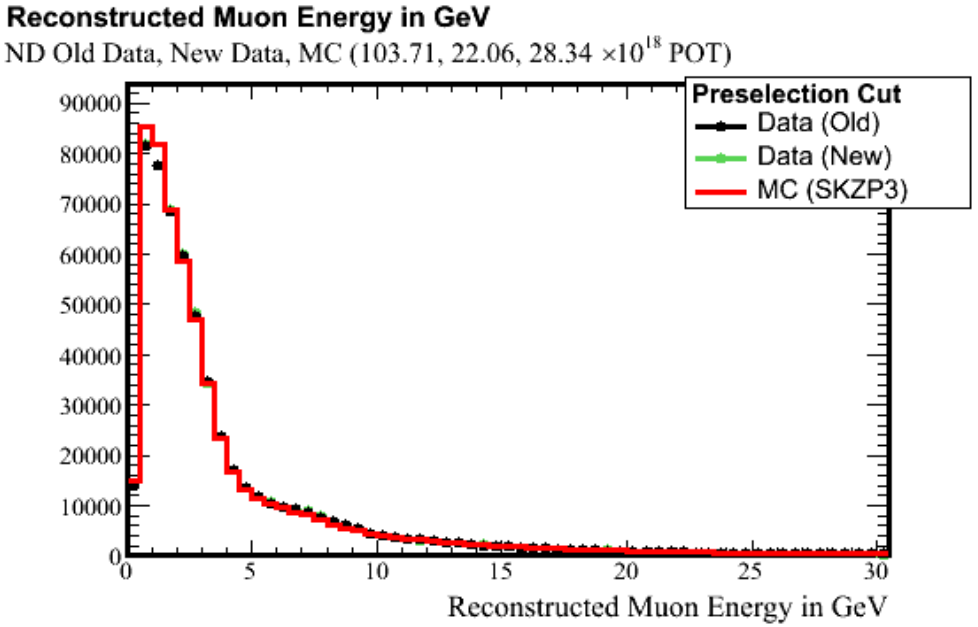

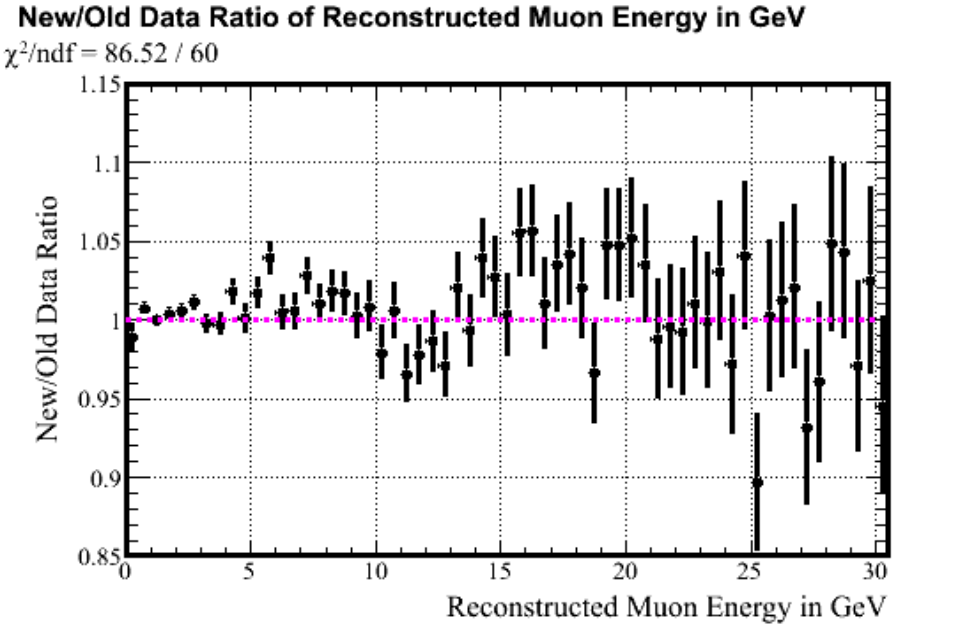

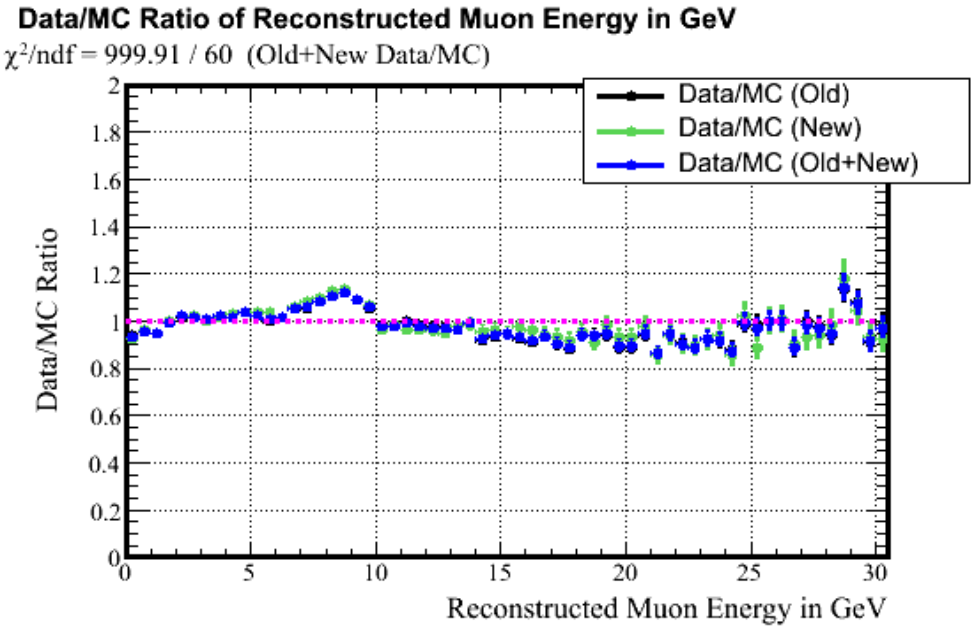

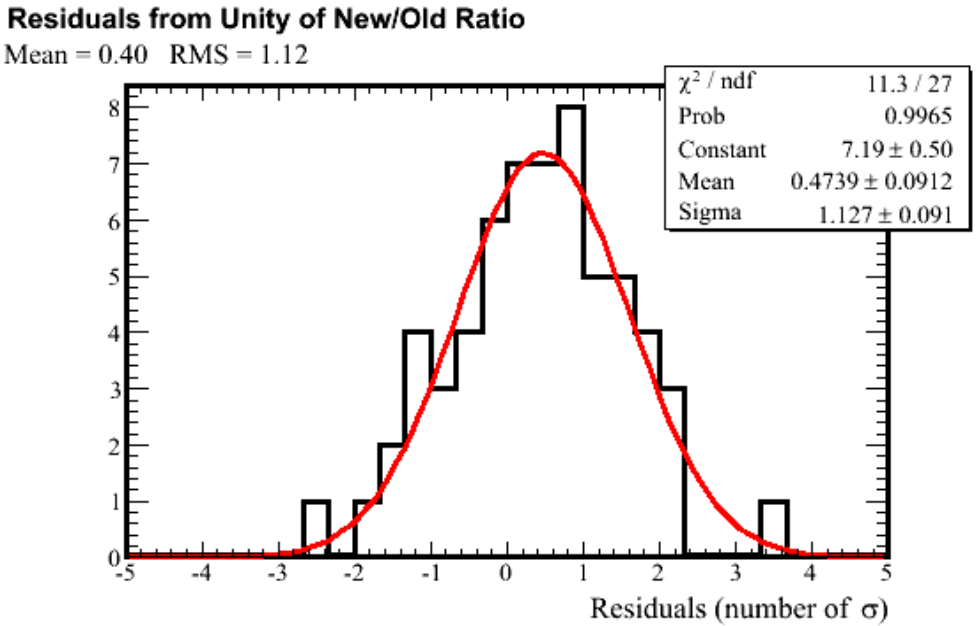

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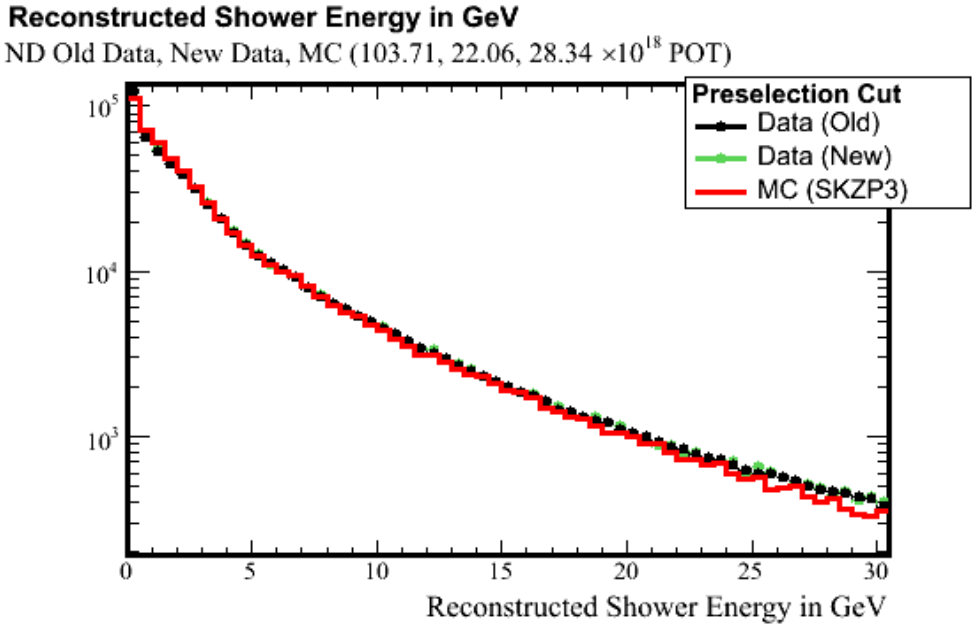

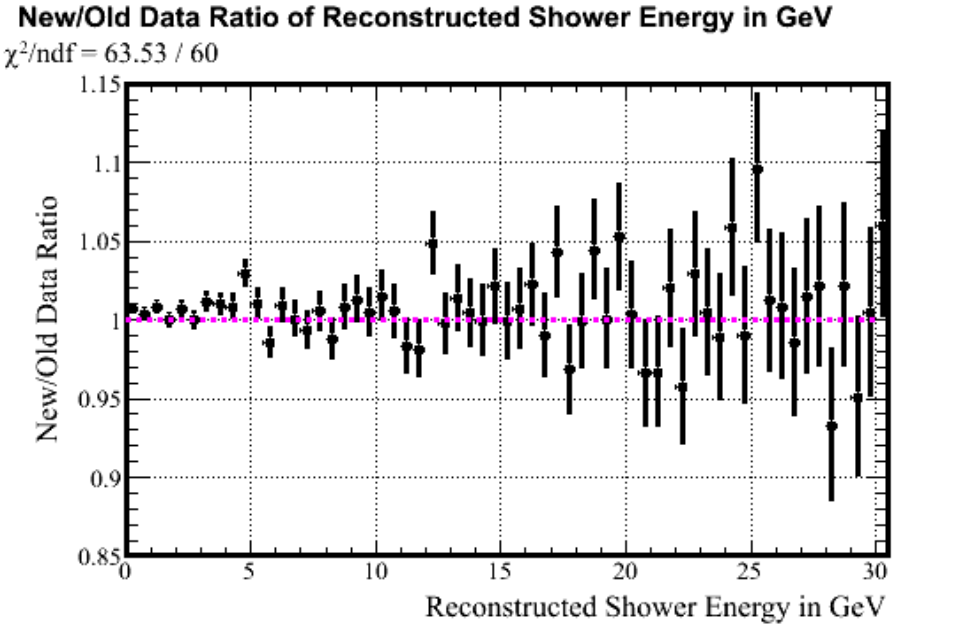

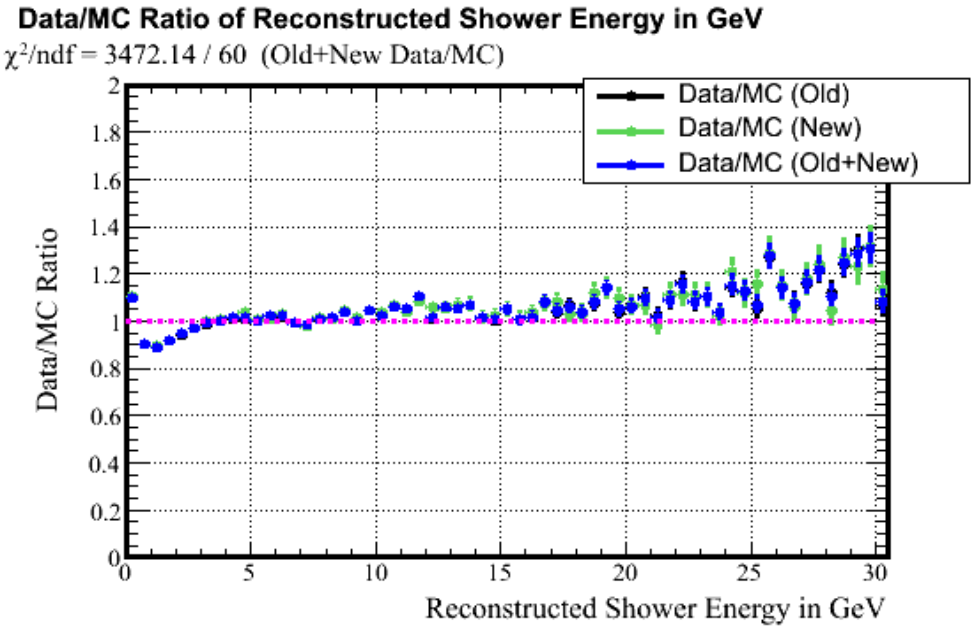

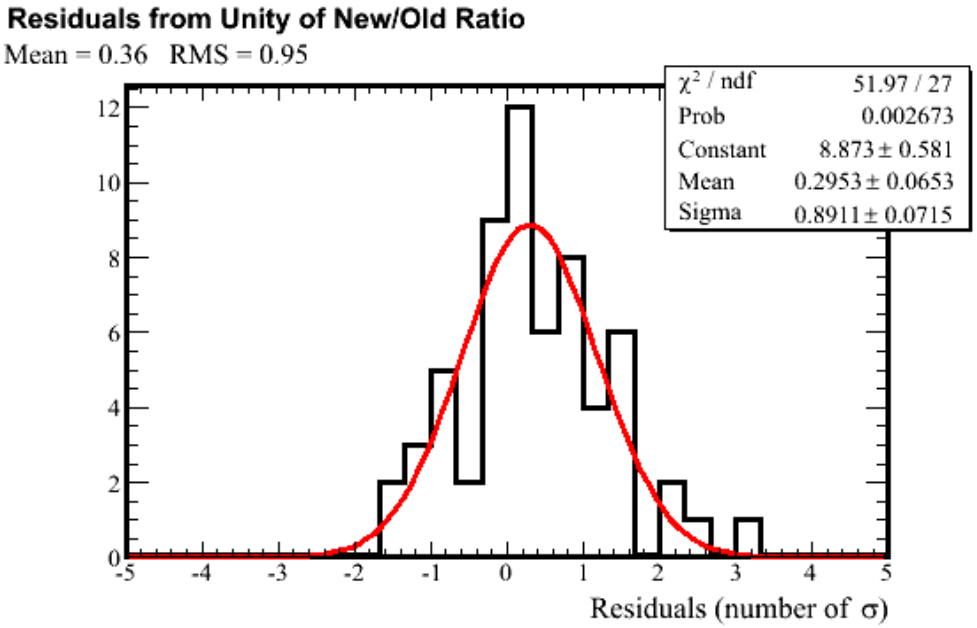

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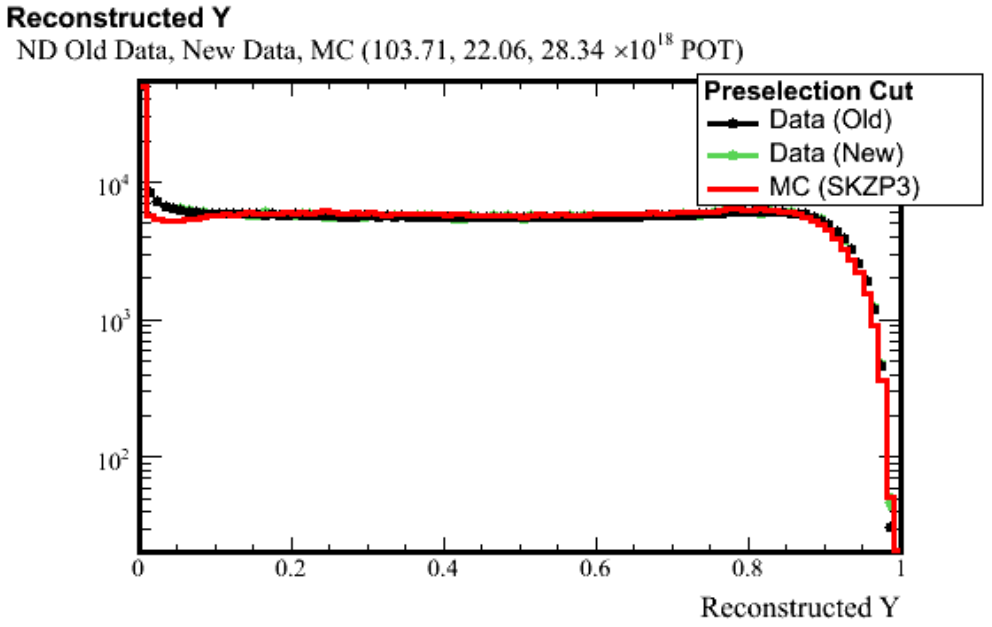

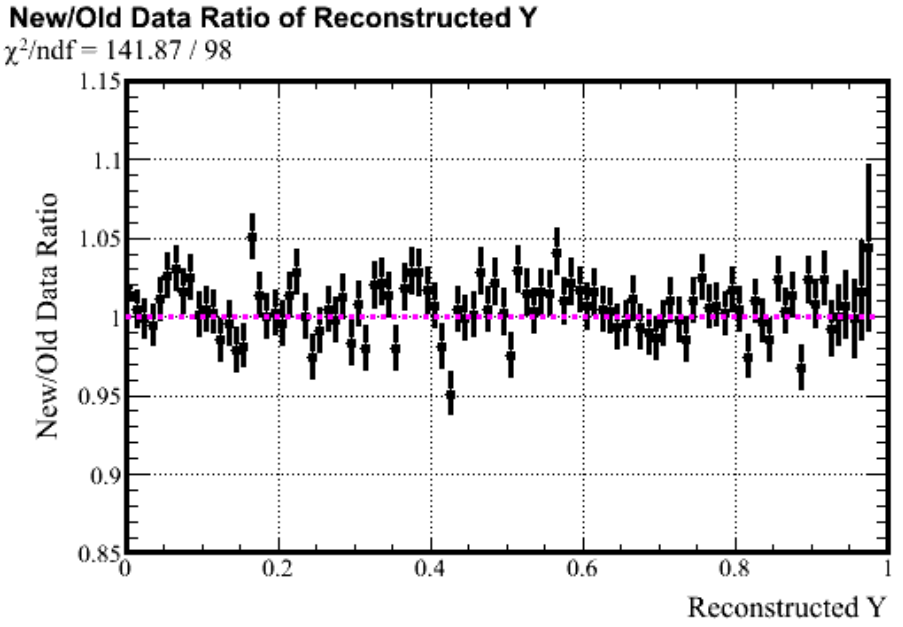

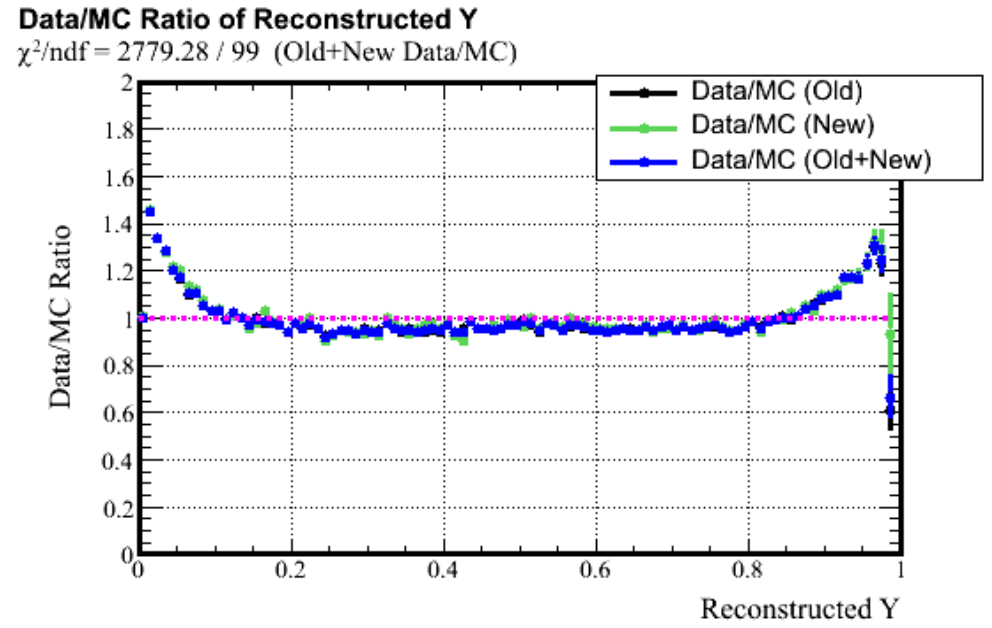

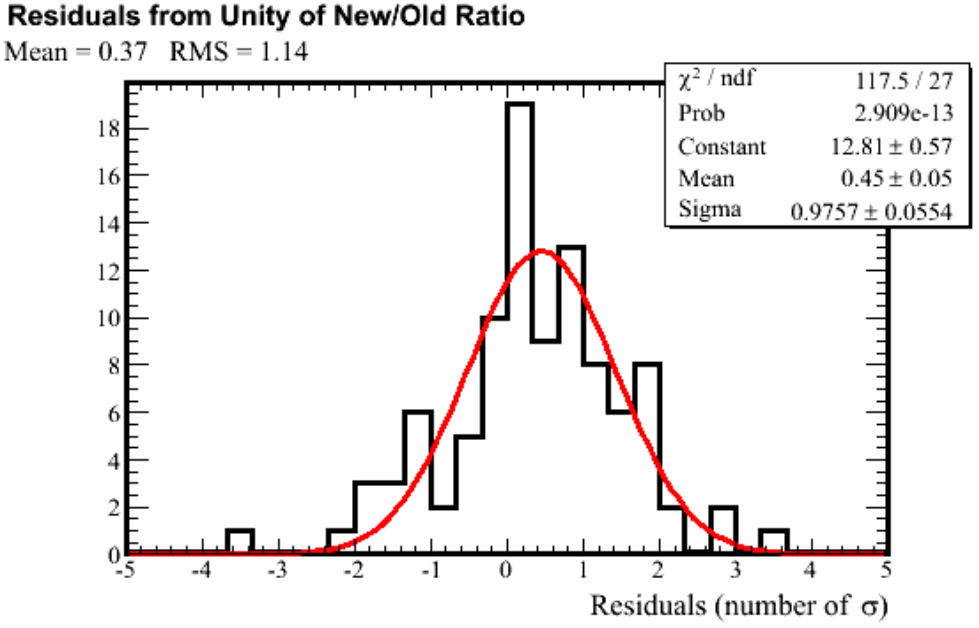

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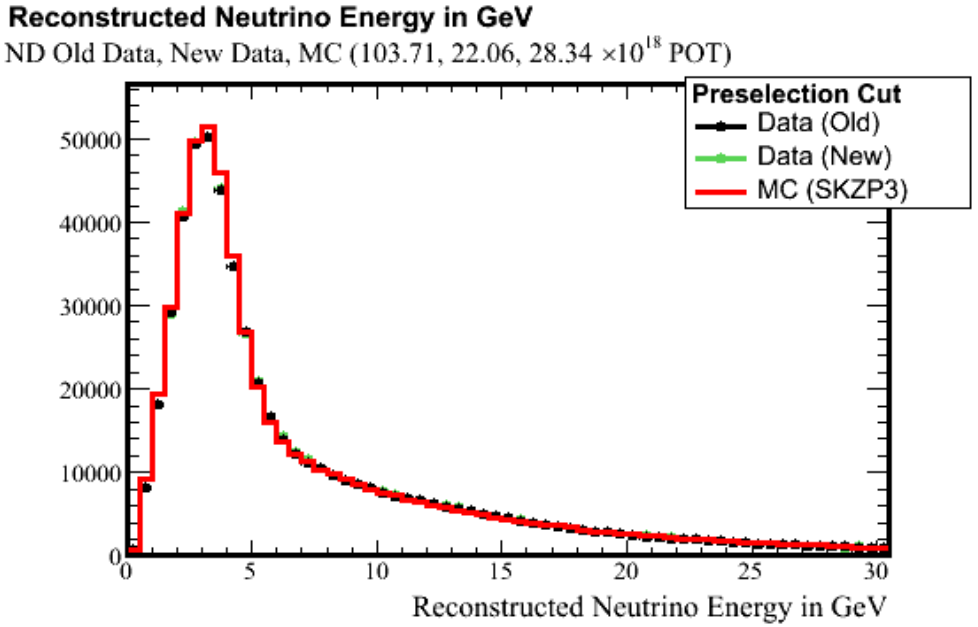
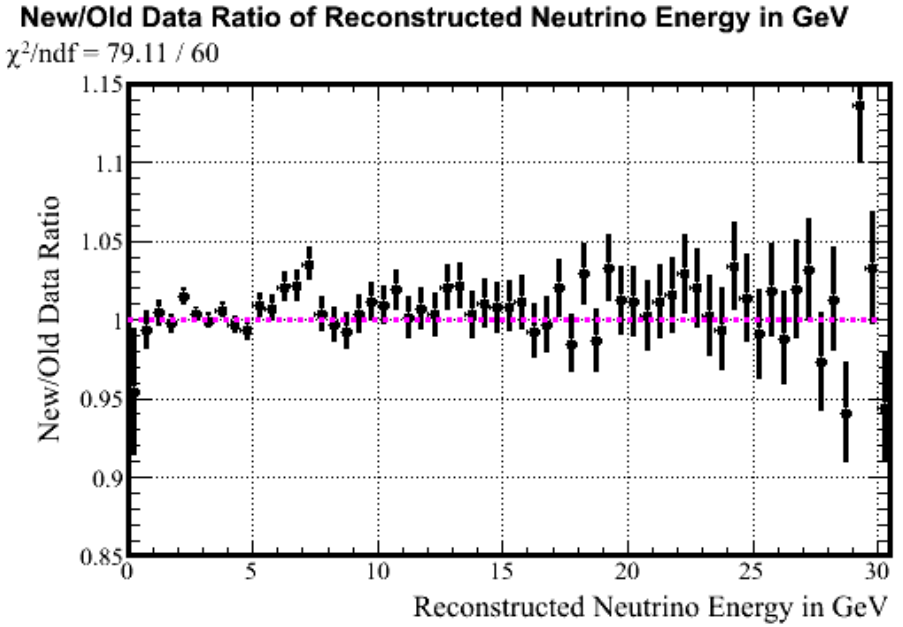
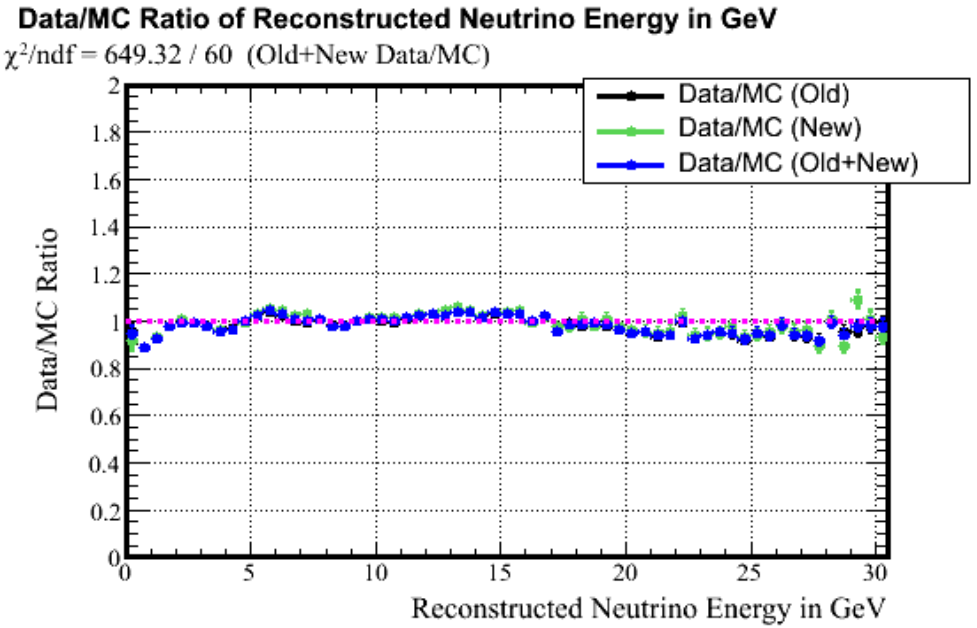
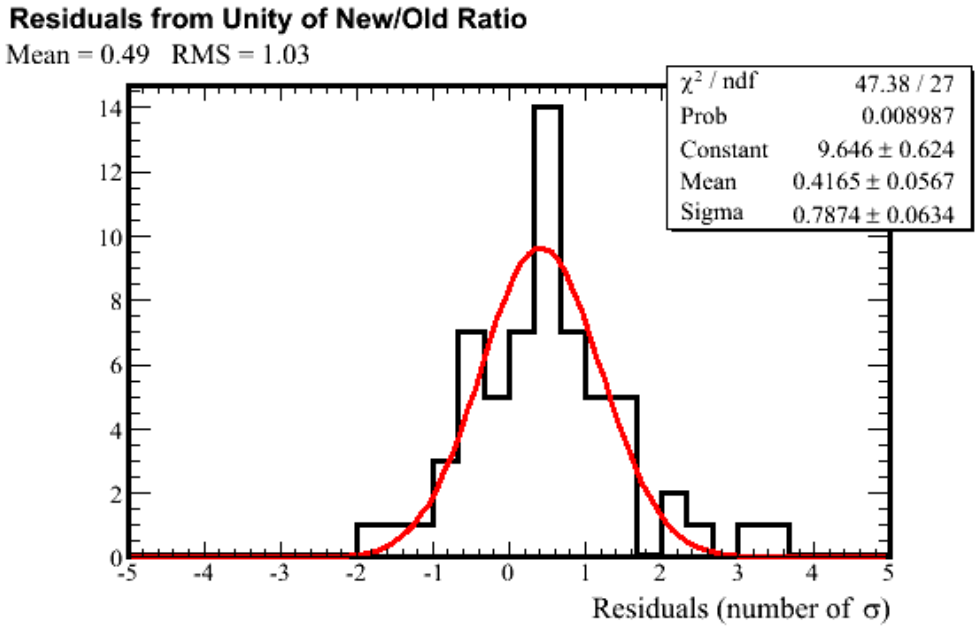
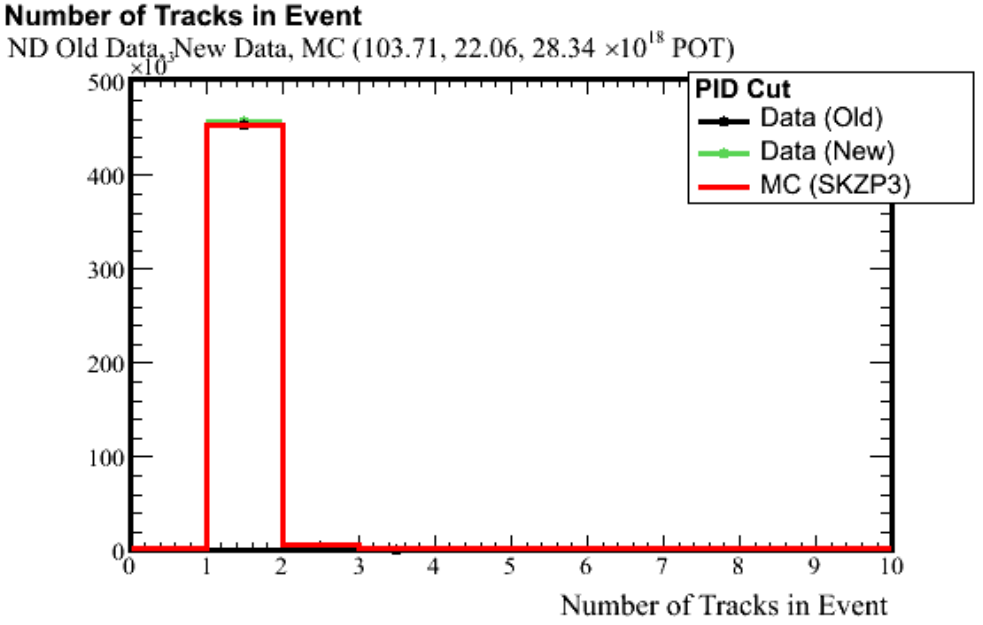


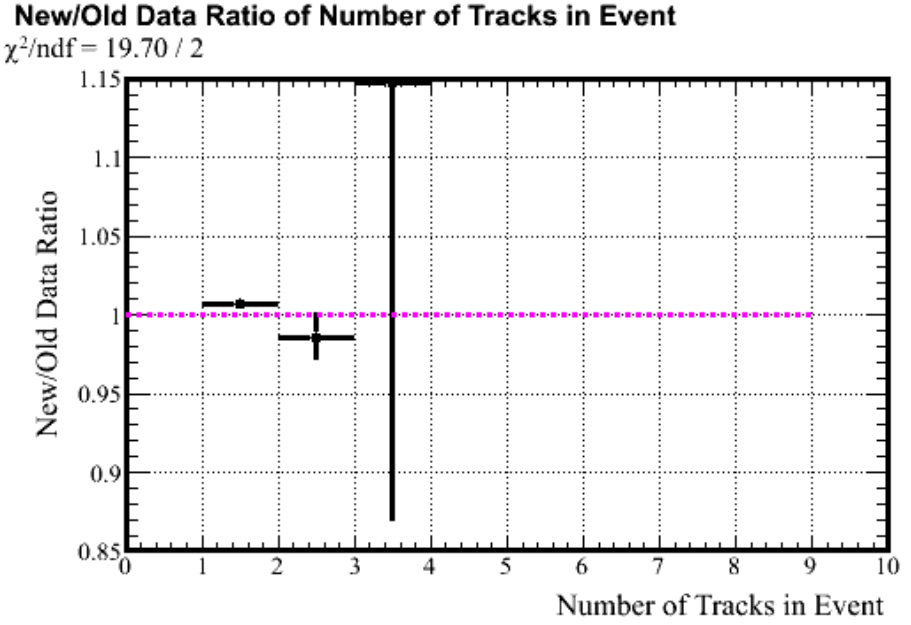


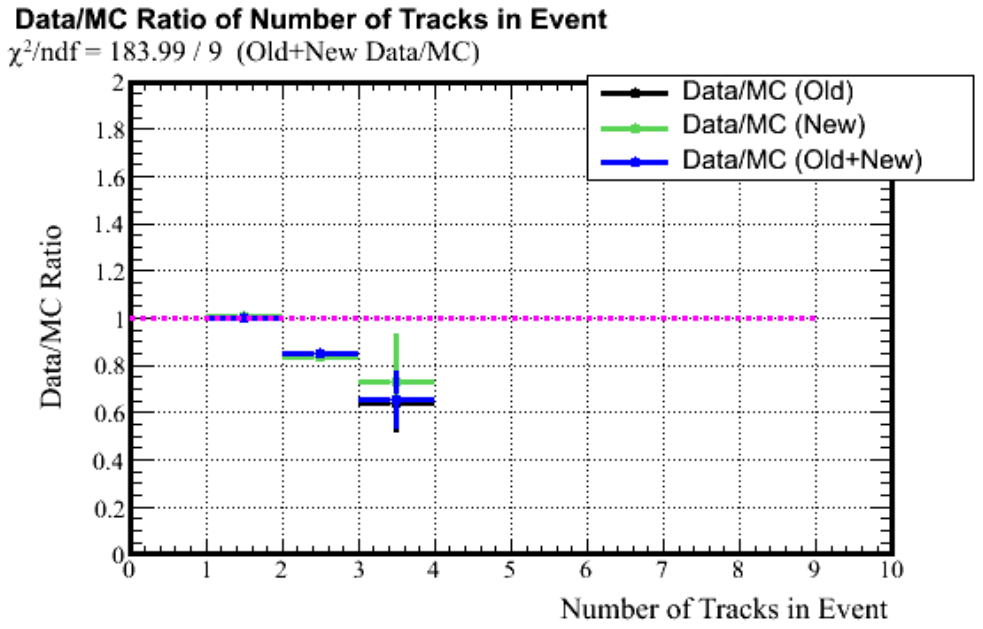


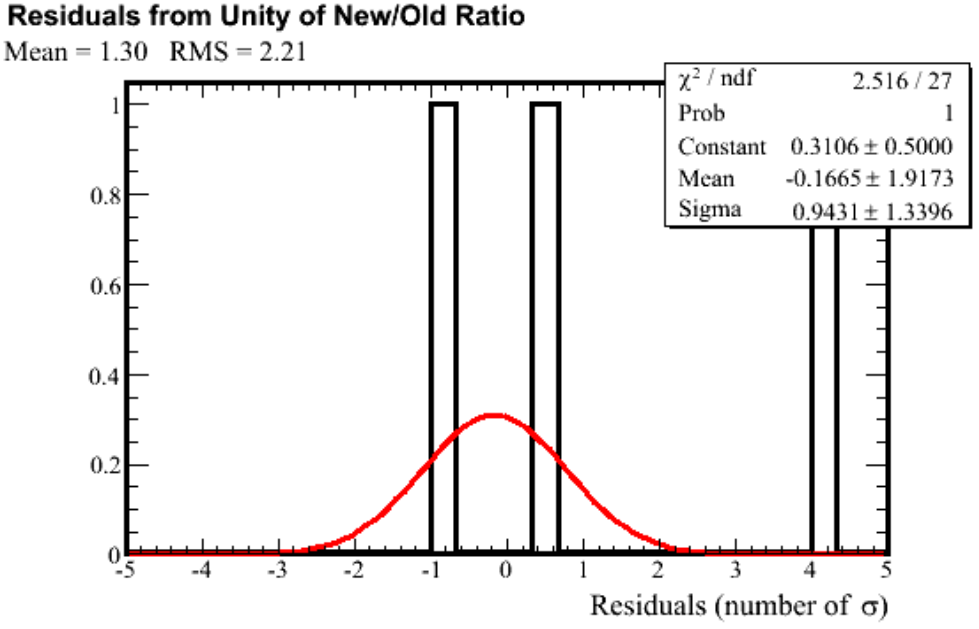


PID

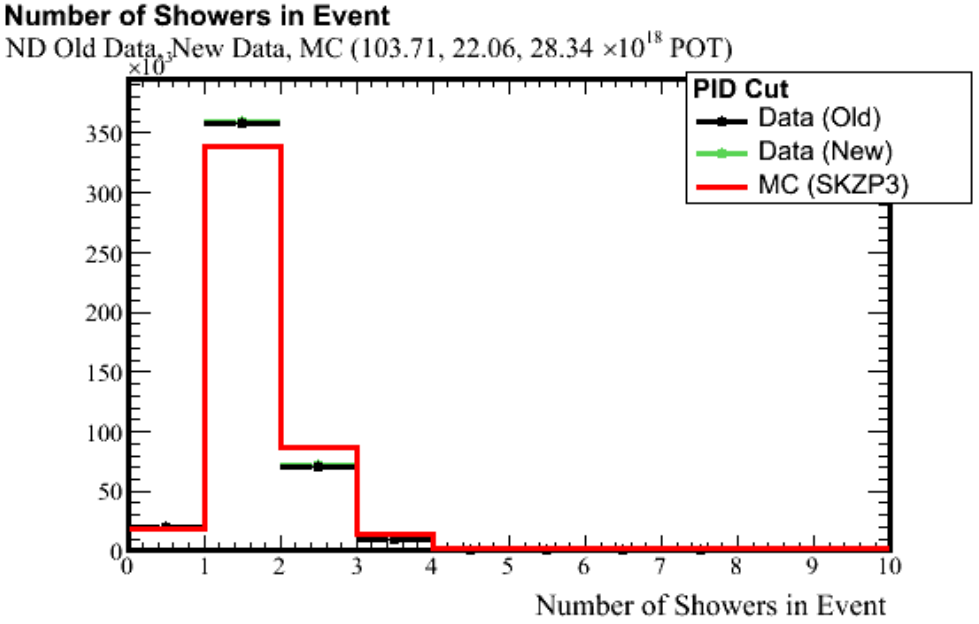

Number of Tracks in Event
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
×10^3
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Number of Tracks in Event

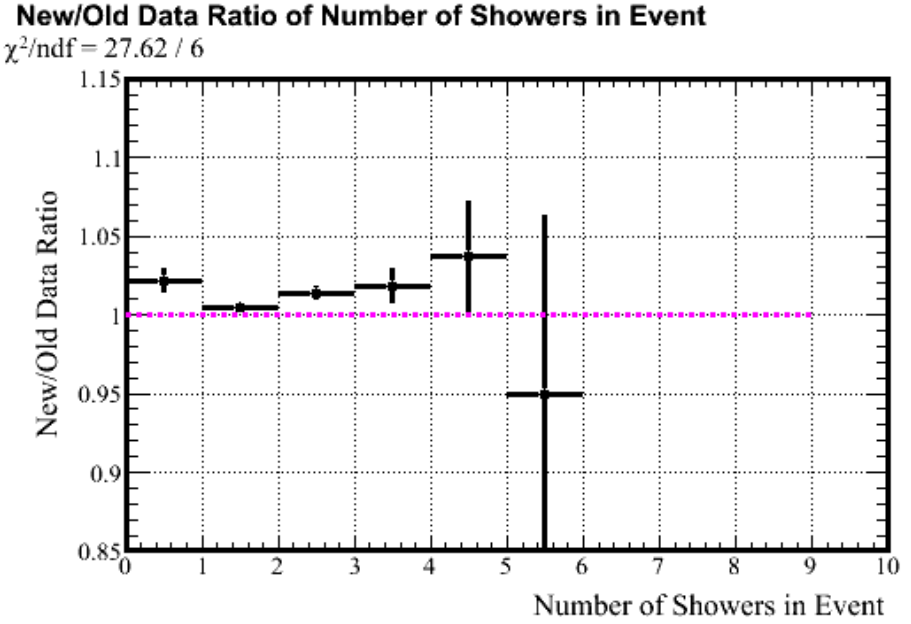

New/Old Data Ratio of Number of Tracks in Event
χ²/ndf = 19.70 / 2
New/Old Data Ratio
Number of Tracks in Event

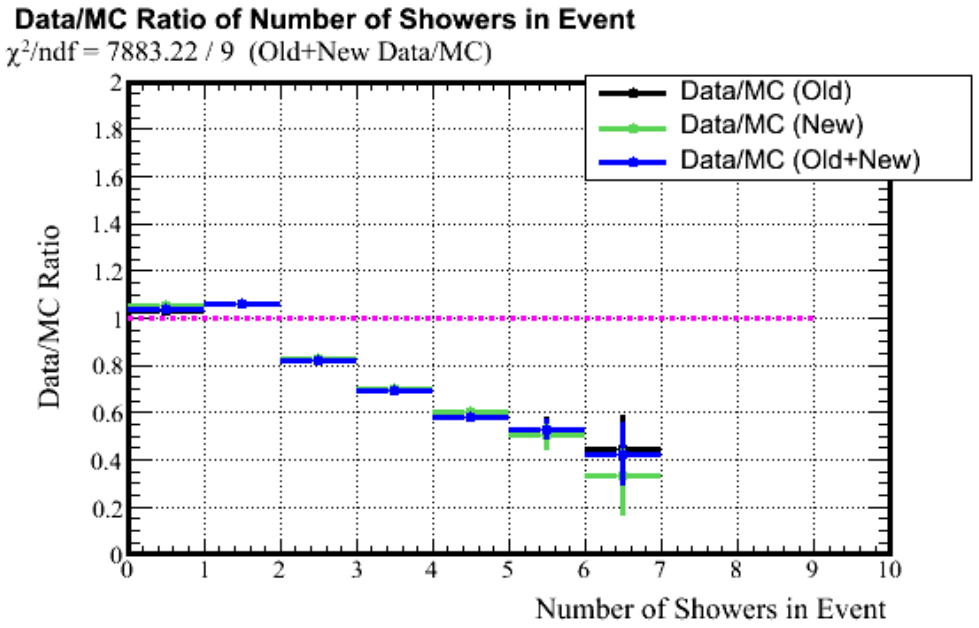

Data/MC Ratio of Number of Tracks in Event
χ²/ndf = 183.99 / 9 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Number of Tracks in Event

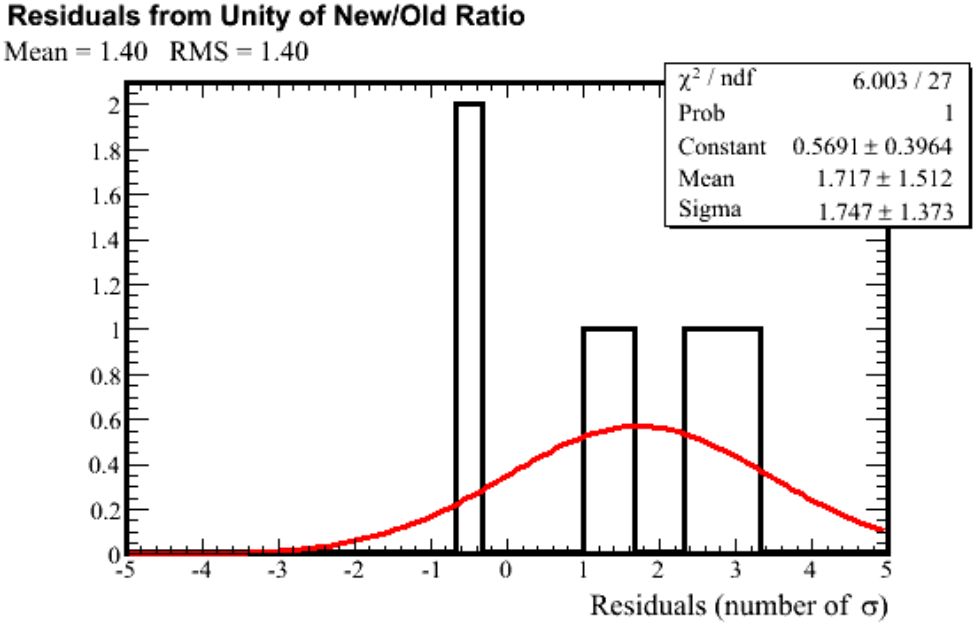

Residuals from Unity of New/Old Ratio
Mean = 1.30 RMS = 2.21
χ² / ndf 2.516 / 27
Prob 1
Constant 0.3106 ± 0.5000
Mean -0.1665 ± 1.9173
Sigma 0.9431 ± 1.3396
Residuals (number of σ)

PID

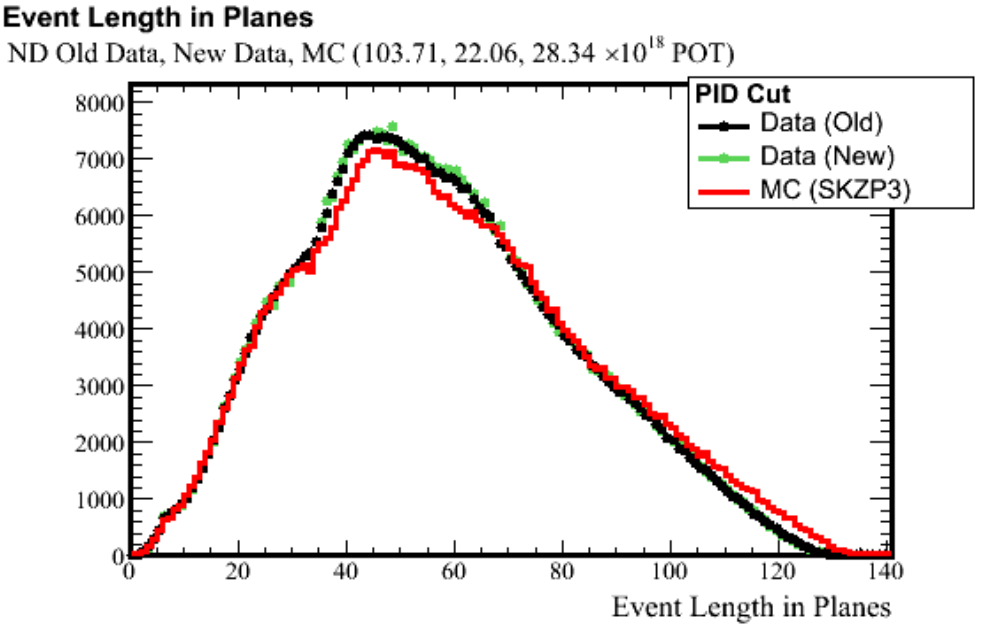

Number of Showers in Event
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
×10^3
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Number of Showers in Event

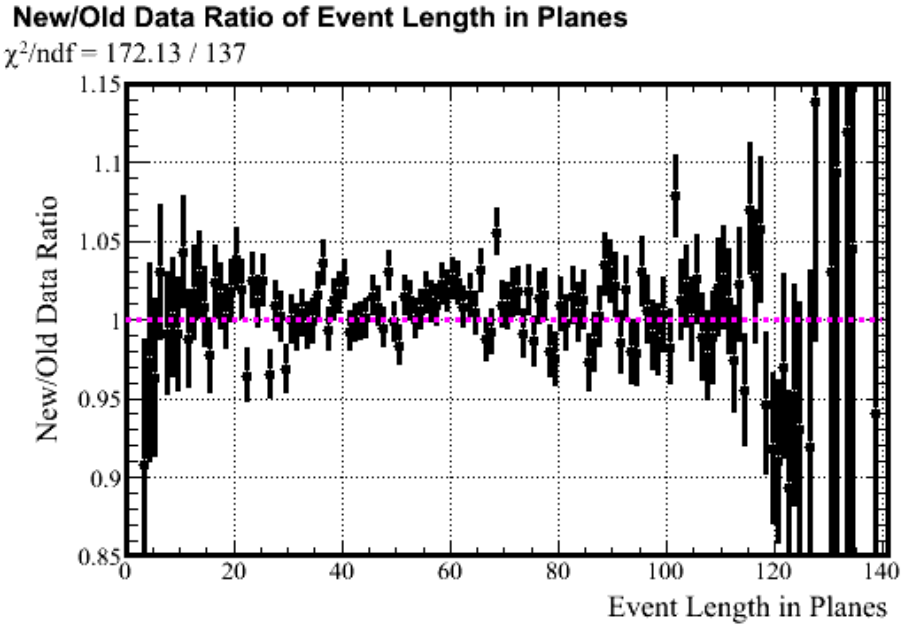

New/Old Data Ratio of Number of Showers in Event
χ²/ndf = 27.62 / 6
New/Old Data Ratio
Number of Showers in Event

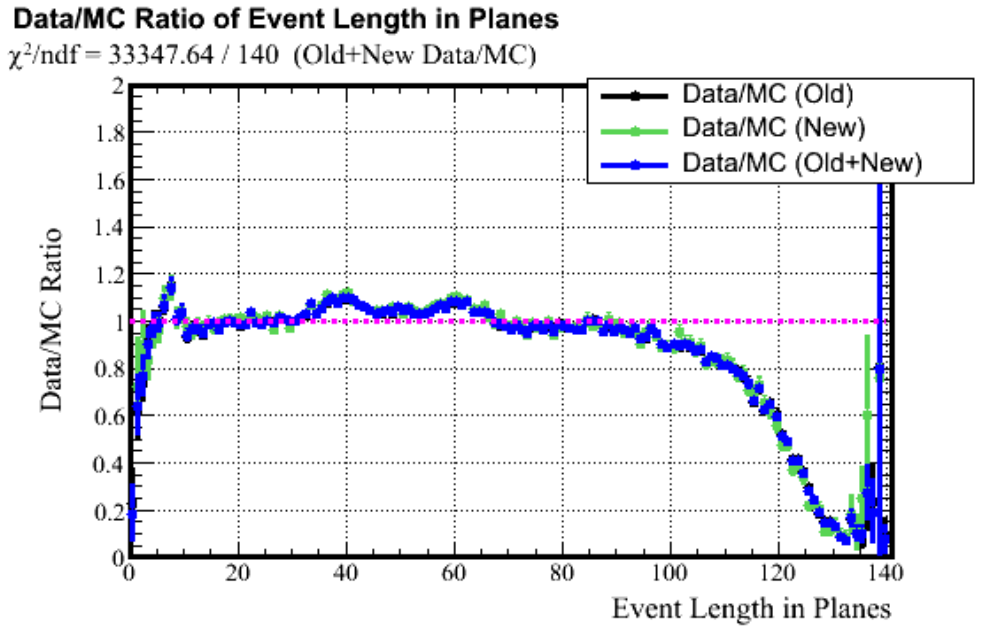

Data/MC Ratio of Number of Showers in Event
χ²/ndf = 7883.22 / 9 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Number of Showers in Event

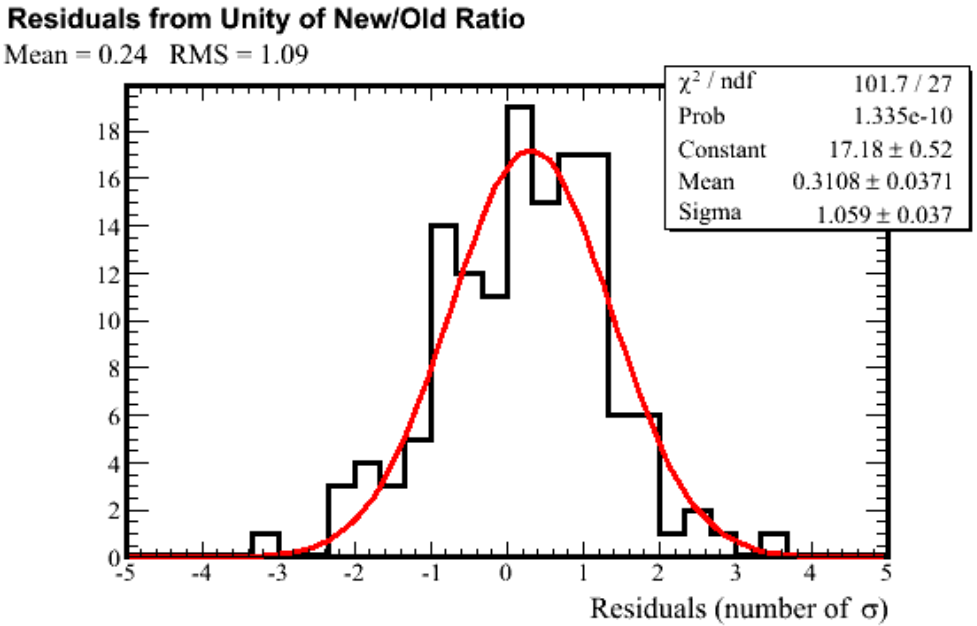

Residuals from Unity of New/Old Ratio
Mean = 1.40 RMS = 1.40
χ² / ndf 6.003 / 27
Prob 1
Constant 0.5691 ± 0.3964
Mean 1.717 ± 1.512
Sigma 1.747 ± 1.373
Residuals (number of σ)

PID

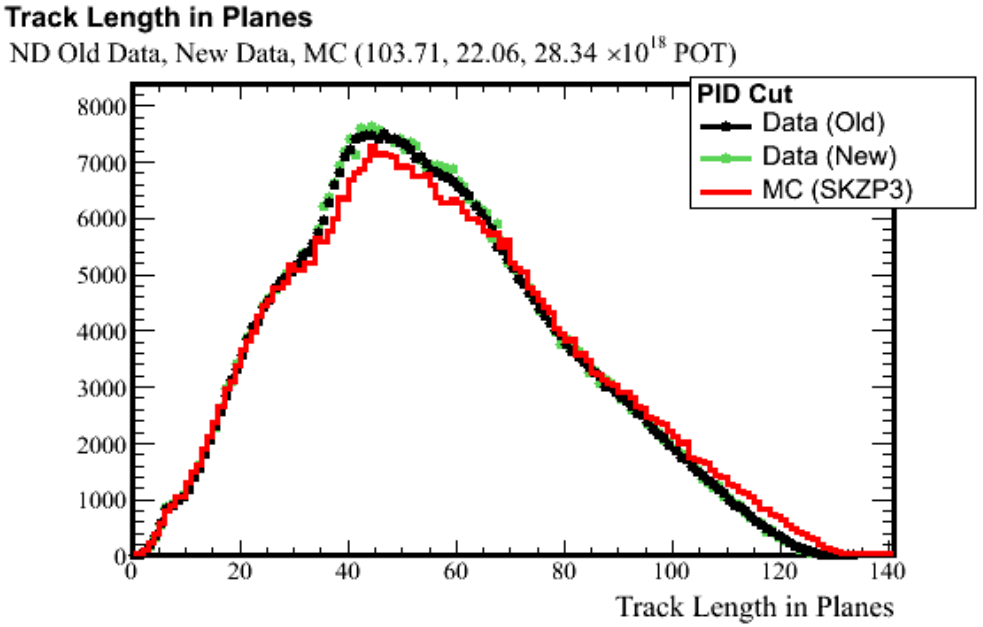

Event Length in Planes
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Event Length in Planes

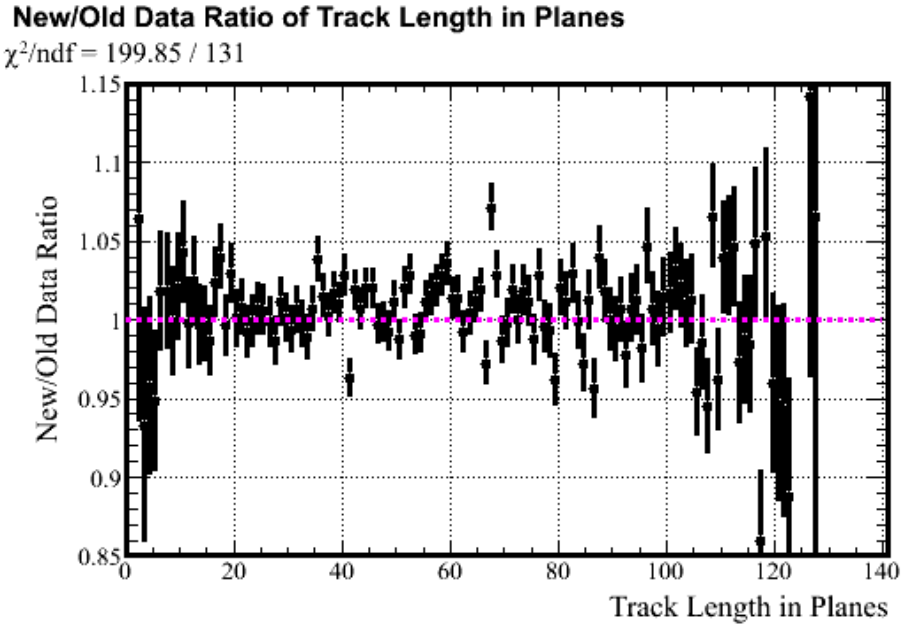

New/Old Ratio of Event Length in Planes
χ²/ndf = 172.13 / 137
New/Old Data Ratio
Event Length in Planes

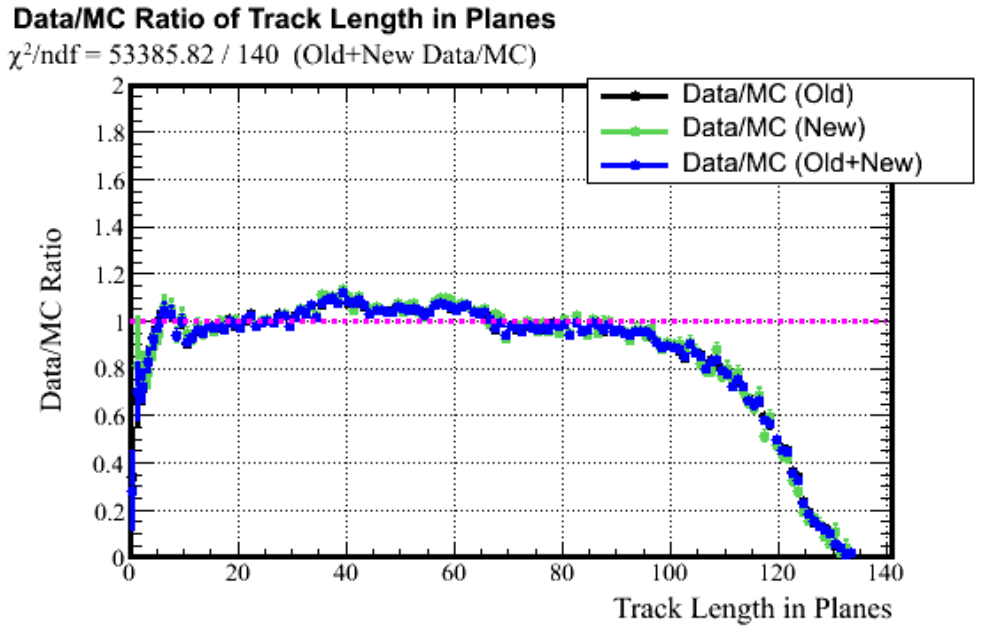

Data/MC Ratio of Event Length in Planes
χ²/ndf = 33347.64 / 140 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Event Length in Planes

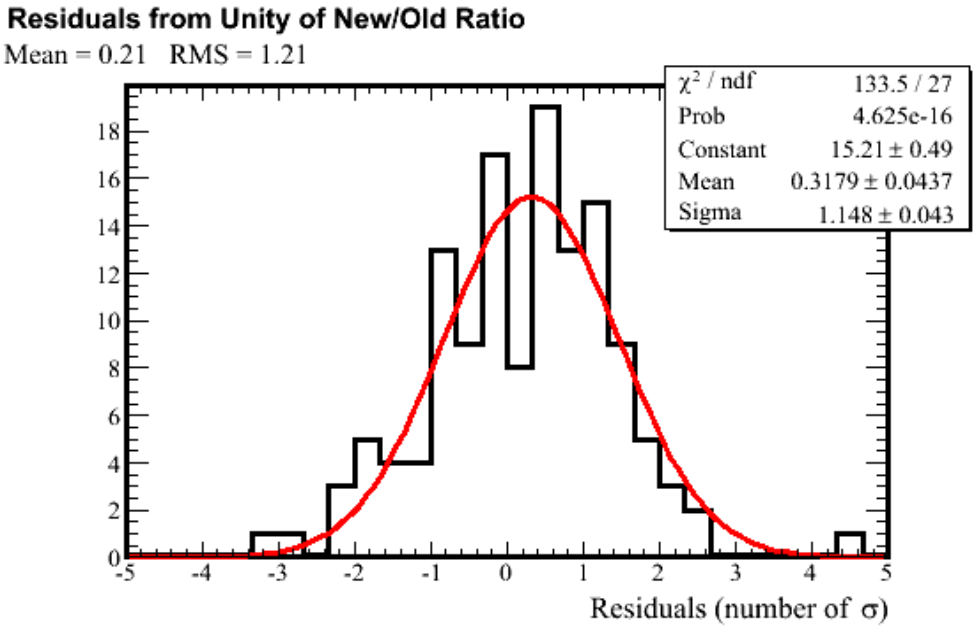

Residuals from Unity of New/Old Ratio
Mean = 0.24 RMS = 1.09
χ² / ndf 101.7 / 27
Prob 1.335e-10
Constant 17.18 ± 0.52
Mean 0.3108 ± 0.0371
Sigma 1.059 ± 0.037
Residuals (number of σ)

PID

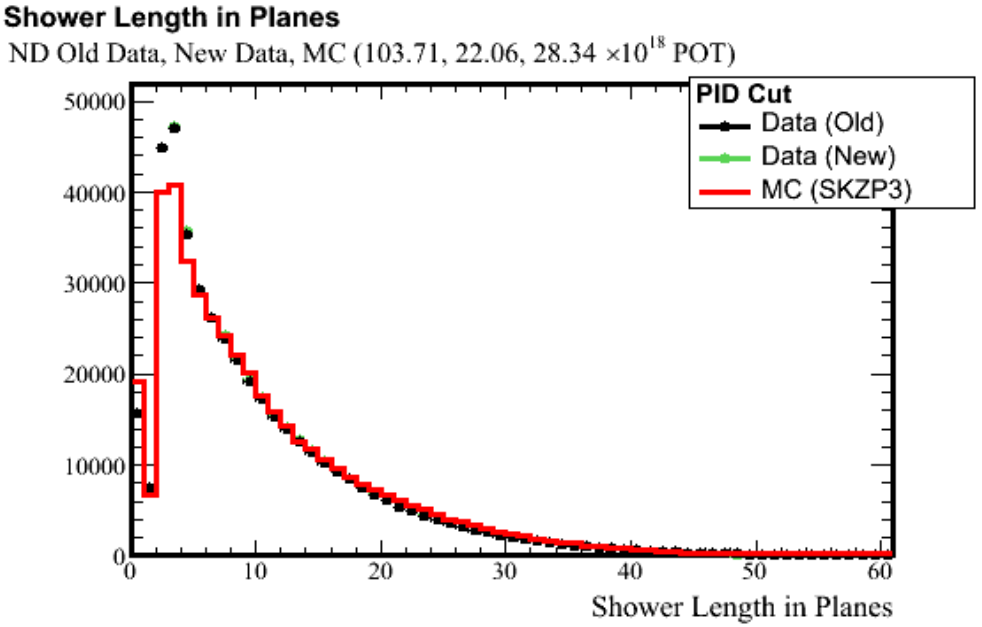

Track Length in Planes
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track Length in Planes

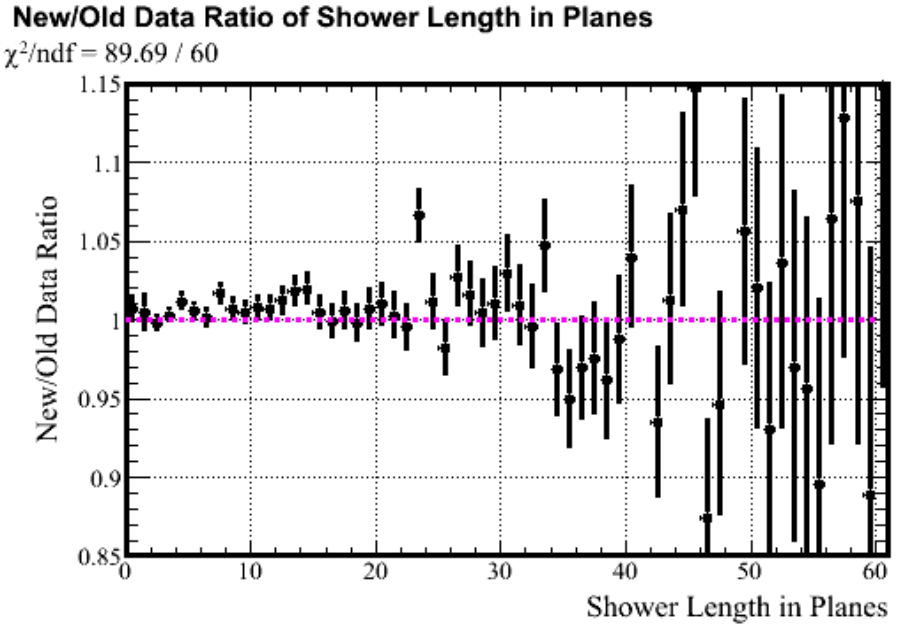

New/Old Data Ratio of Track Length in Planes
χ²/ndf = 199.85 / 131
New/Old Data Ratio
Track Length in Planes

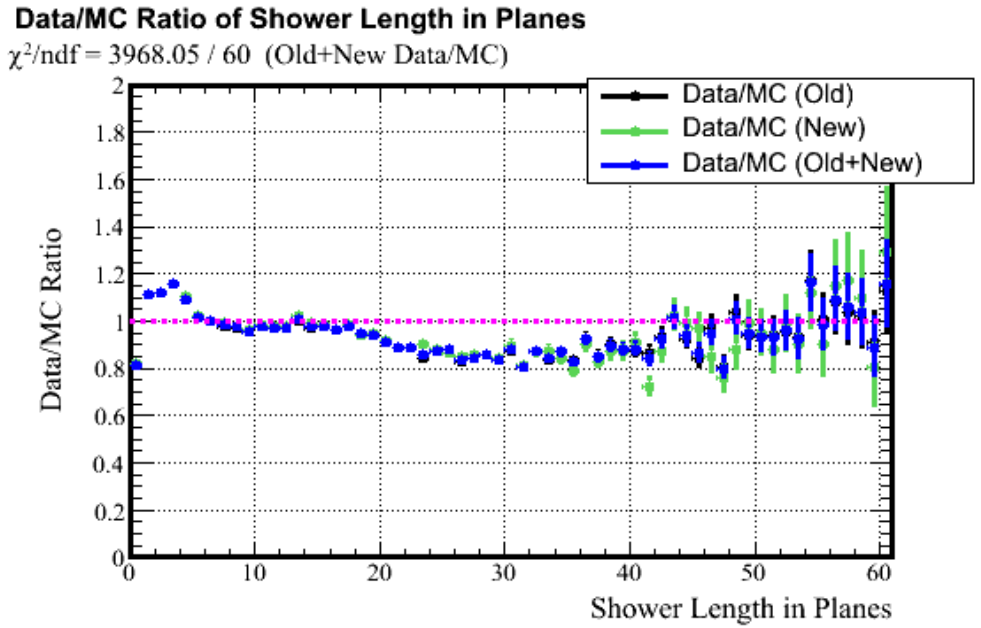

Data/MC Ratio of Track Length in Planes
χ²/ndf = 53385.82 / 140 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track Length in Planes

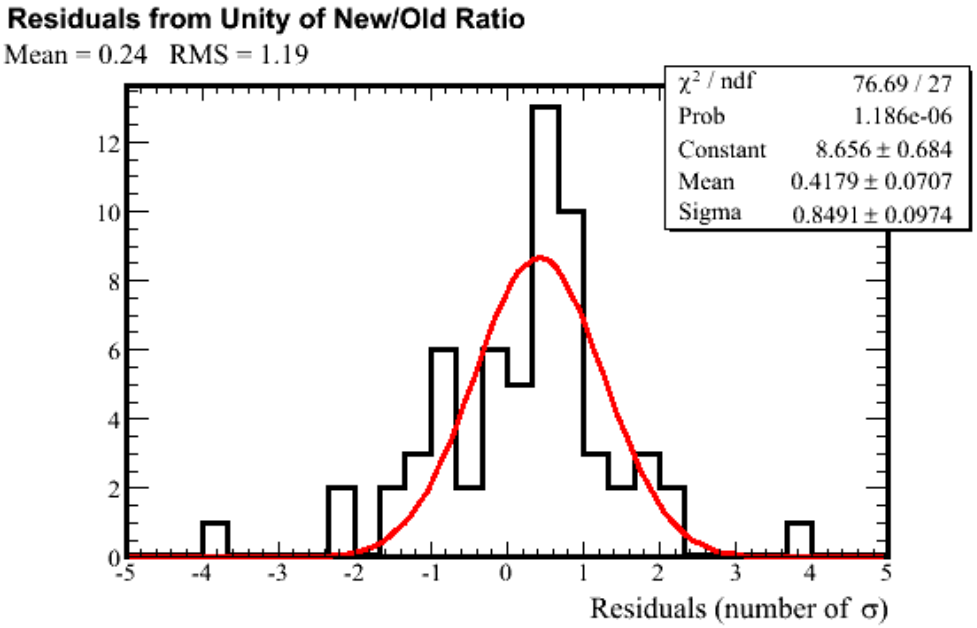

Residuals from Unity of New/Old Ratio
Mean = 0.21 RMS = 1.21
χ² / ndf 133.5 / 27
Prob 4.625e-16
Constant 15.21 ± 0.49
Mean 0.3179 ± 0.0437
Sigma 1.148 ± 0.043
Residuals (number of σ)

PID

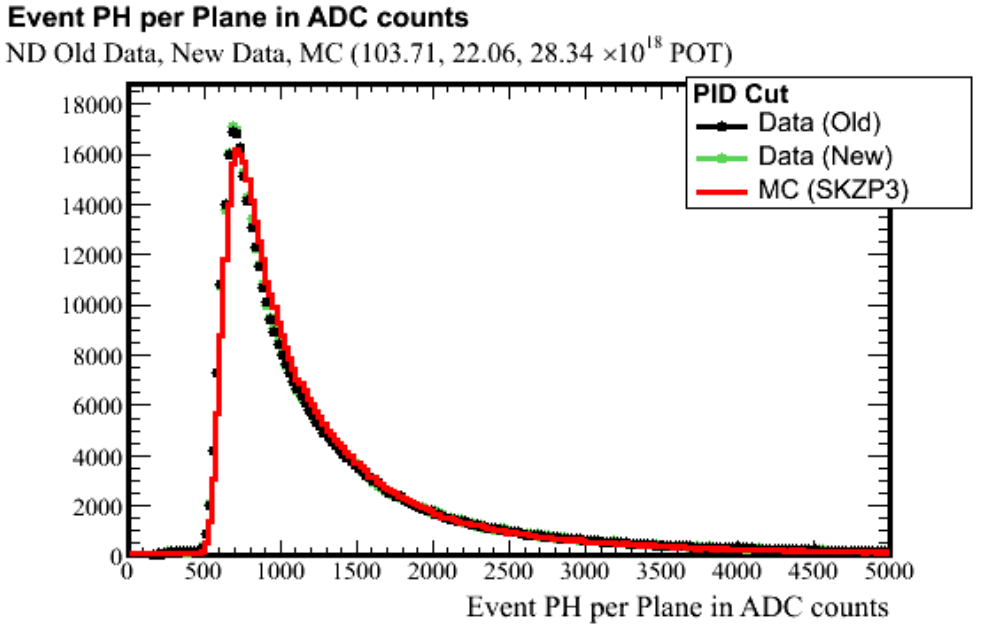

Shower Length in Planes
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Shower Length in Planes

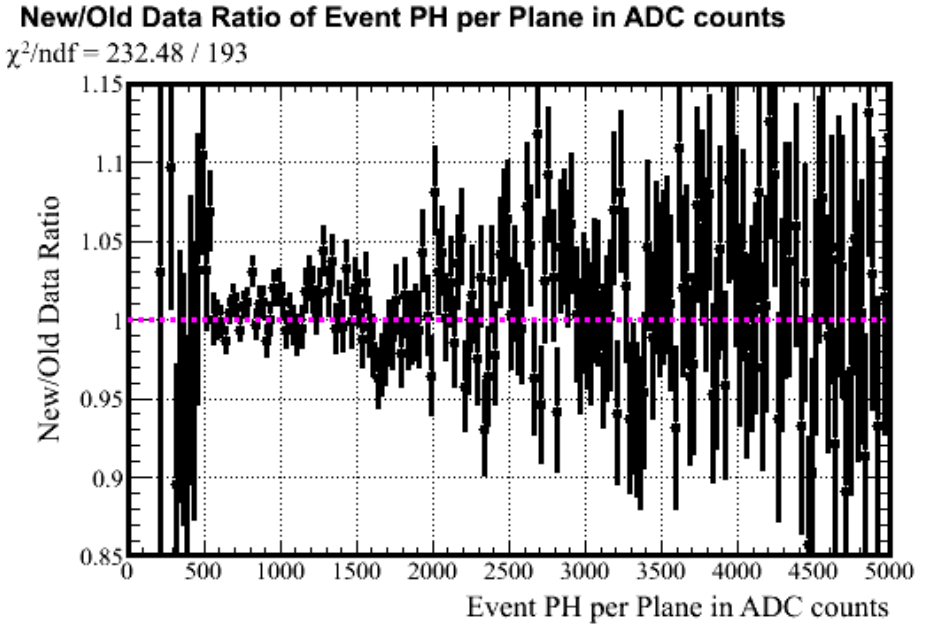

New/Old Data Ratio of Shower Length in Planes
χ²/ndf = 89.69 / 60
New/Old Data Ratio
Shower Length in Planes

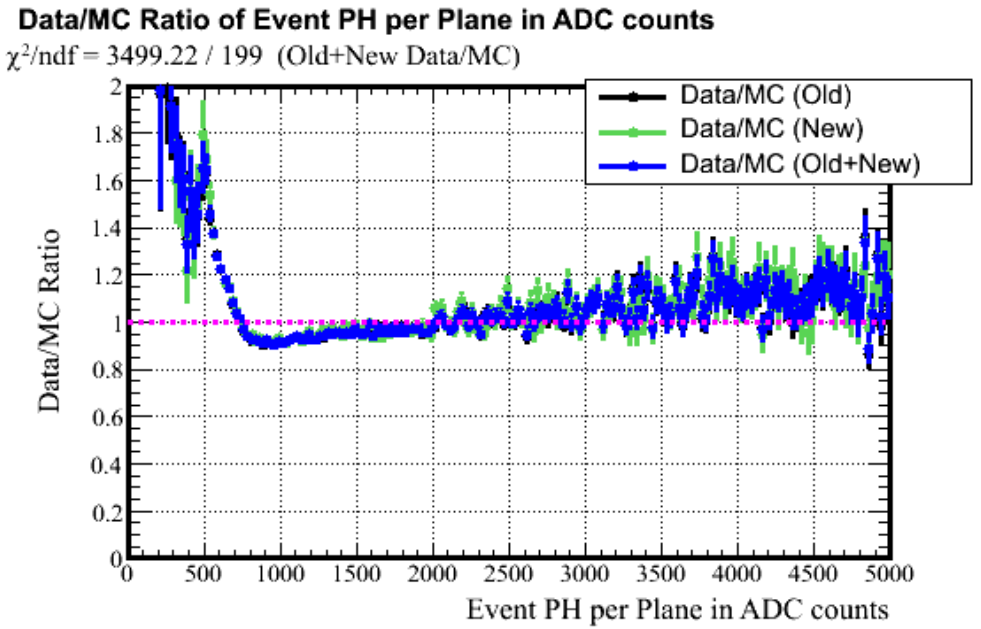

Data/MC Ratio of Shower Length in Planes
χ²/ndf = 3968.05 / 60 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Shower Length in Planes

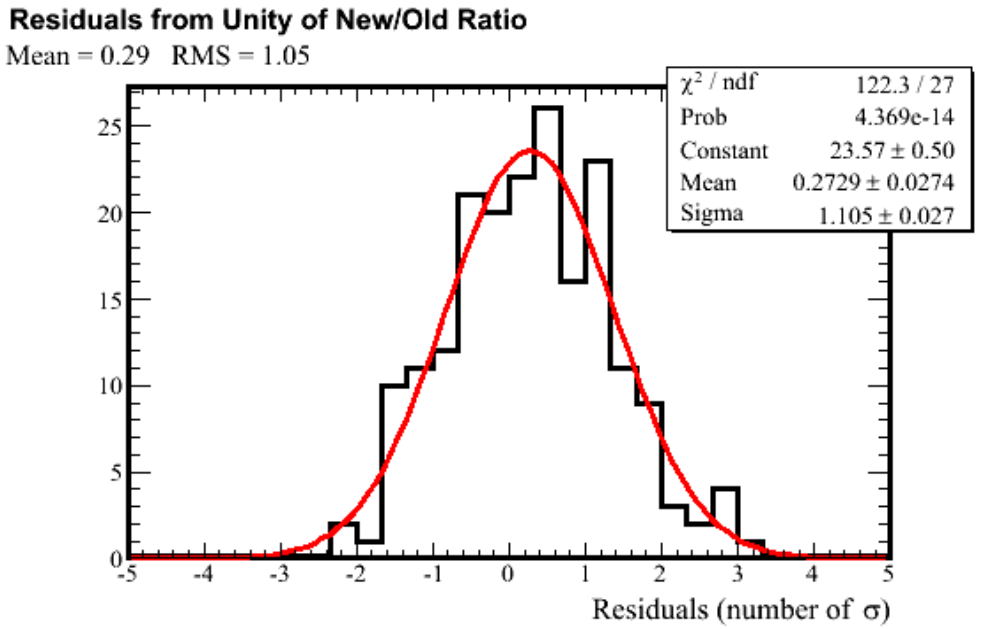

Residuals from Unity of New/Old Ratio
Mean = 0.24 RMS = 1.19
χ² / ndf 76.69 / 27
Prob 1.186e-06
Constant 8.656 ± 0.684
Mean 0.4179 ± 0.0707
Sigma 0.8491 ± 0.0974
Residuals (number of σ)

PID

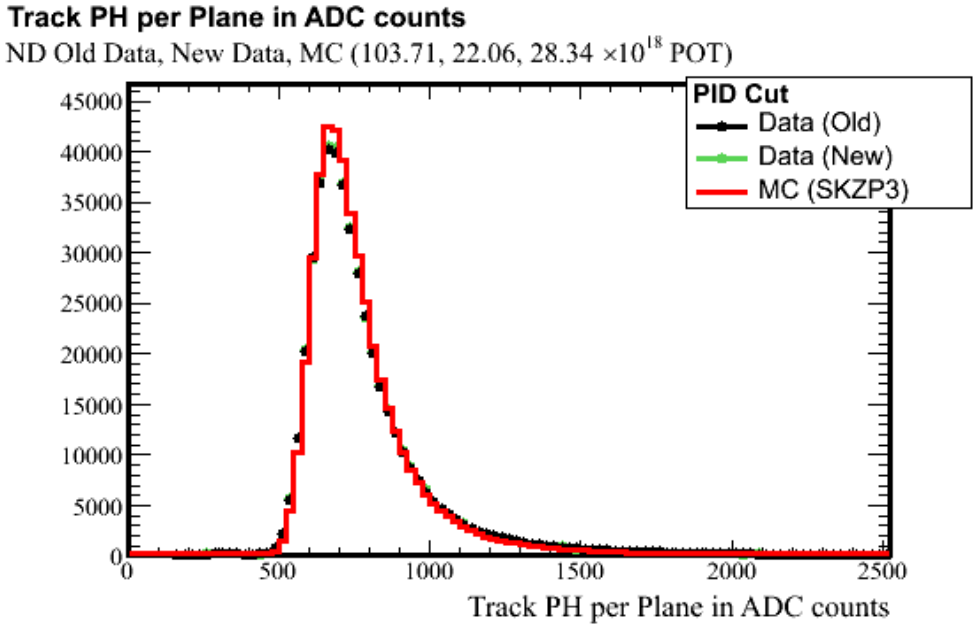

Event PH per Plane in ADC counts
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Event PH per Plane in ADC counts

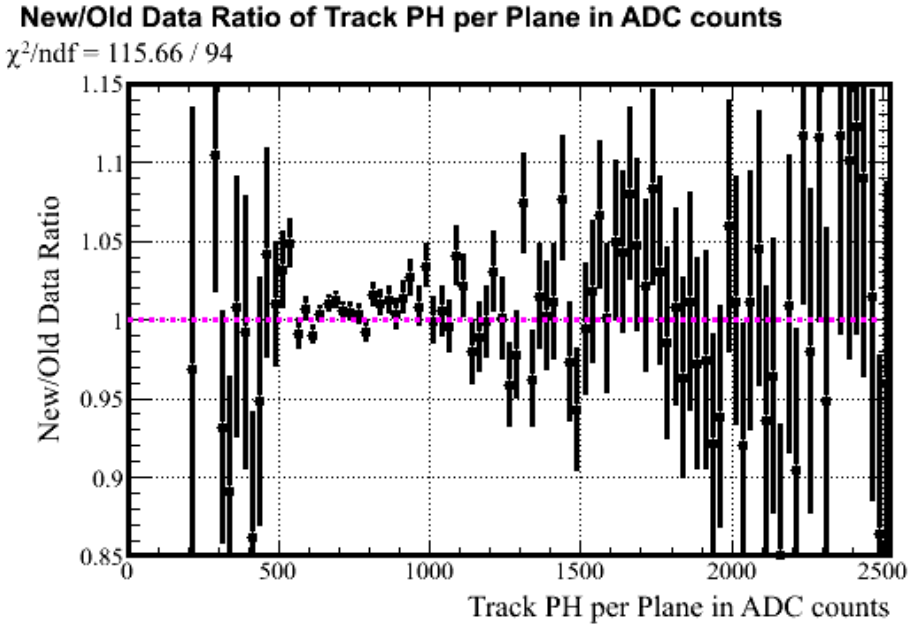

New/Old Data Ratio of Event PH per Plane in ADC counts
χ²/ndf = 232.48 / 193
New/Old Data Ratio
Event PH per Plane in ADC counts

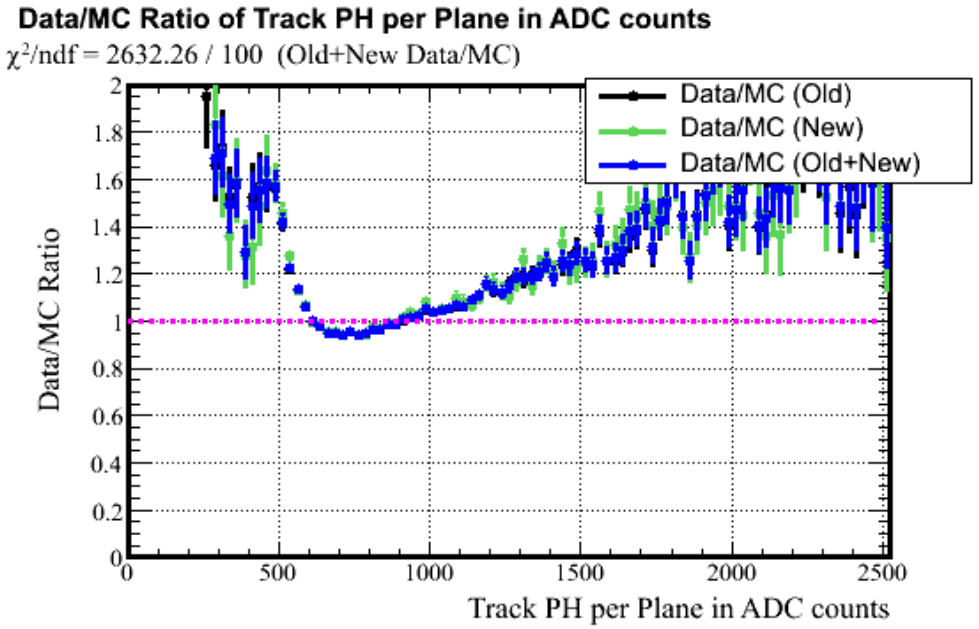

Data/MC Ratio of Event PH per Plane in ADC counts
χ²/ndf = 3499.22 / 199 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Event PH per Plane in ADC counts

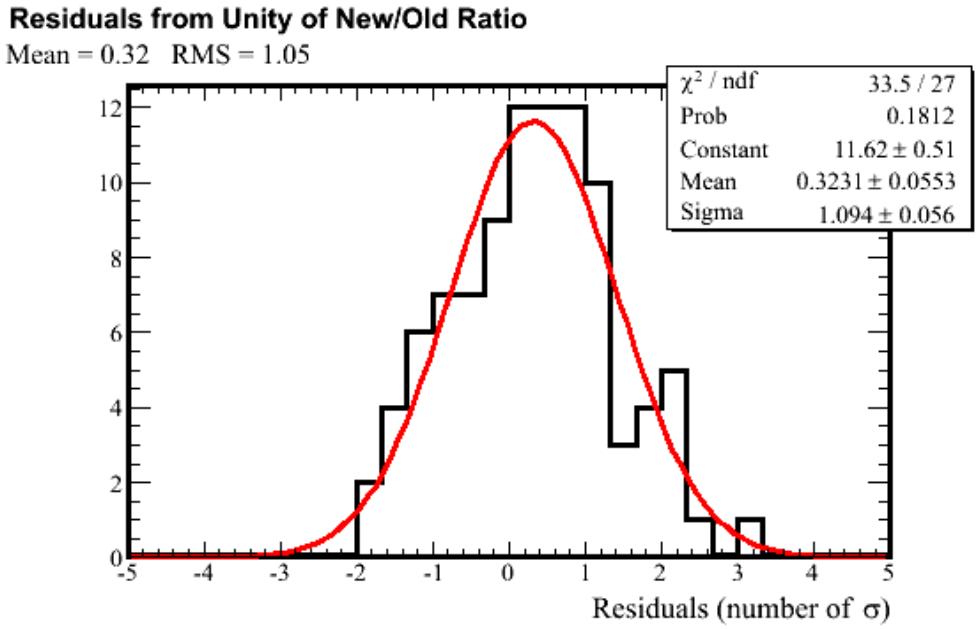

Residuals from Unity of New/Old Ratio
Mean = 0.29 RMS = 1.05
χ² / ndf 122.3 / 27
Prob 4.369e-14
Constant 23.57 ± 0.50
Mean 0.2729 ± 0.0274
Sigma 1.105 ± 0.027
Residuals (number of σ)

PID

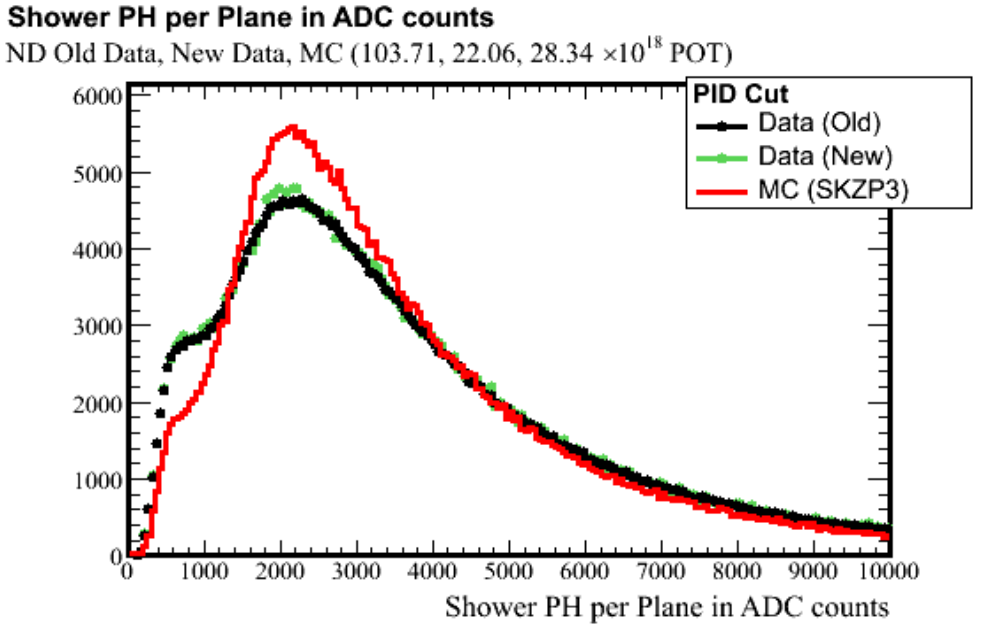

Track PH per Plane in ADC counts
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track PH per Plane in ADC counts

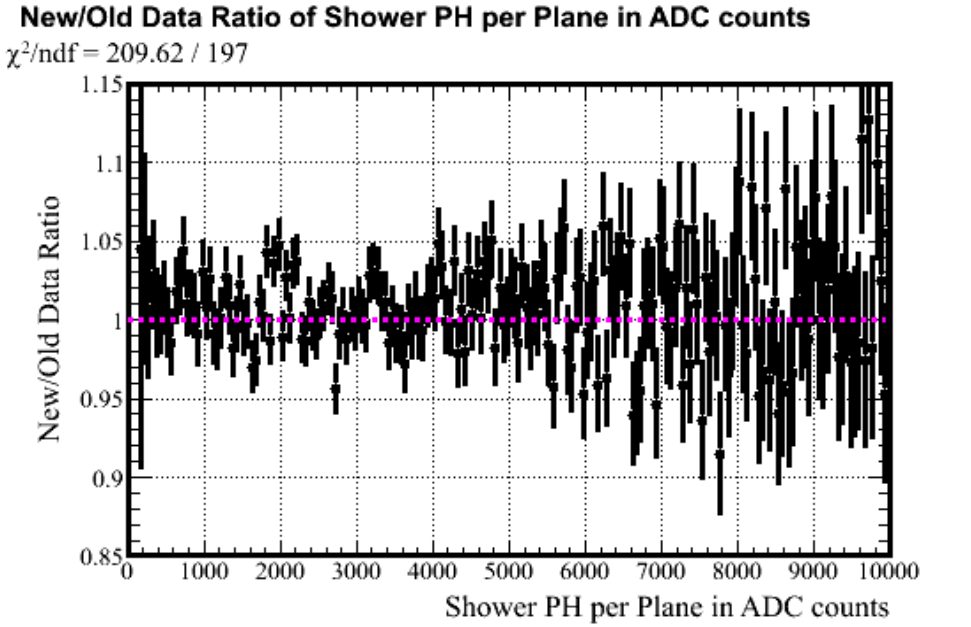

New/Old Data Ratio of Track PH per Plane in ADC counts
χ²/ndf = 115.66 / 94
New/Old Data Ratio
Track PH per Plane in ADC counts

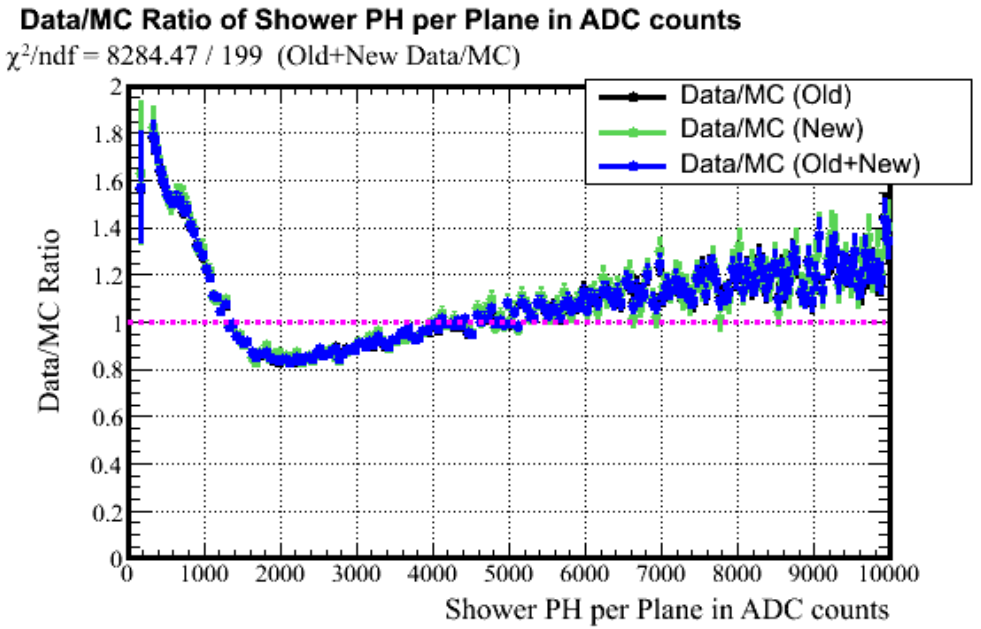

Data/MC Ratio of Track PH per Plane in ADC counts
χ²/ndf = 2632.26 / 100 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track PH per Plane in ADC counts

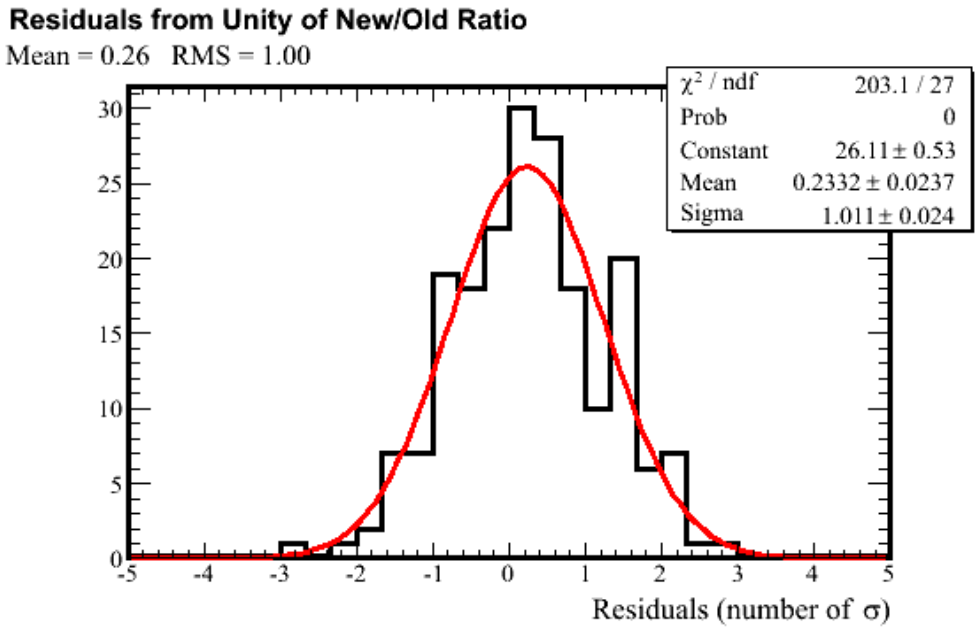

Residuals from Unity of New/Old Ratio
Mean = 0.32 RMS = 1.05
χ² / ndf 33.5 / 27
Prob 0.1812
Constant 11.62 ± 0.51
Mean 0.3231 ± 0.0553
Sigma 1.094 ± 0.056
Residuals (number of σ)

PID

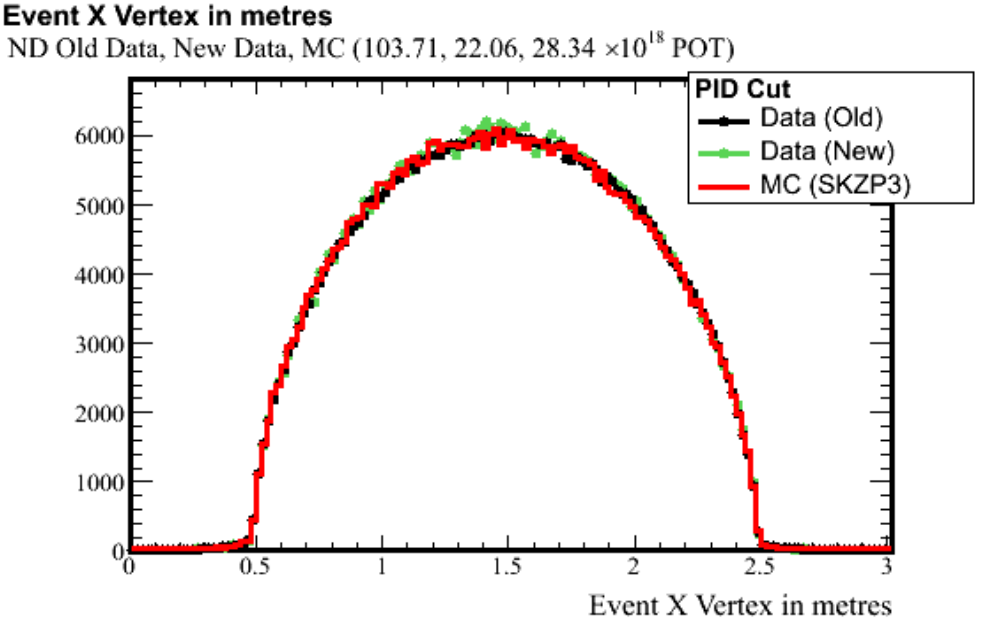

Shower PH per Plane in ADC counts
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Shower PH per Plane in ADC counts

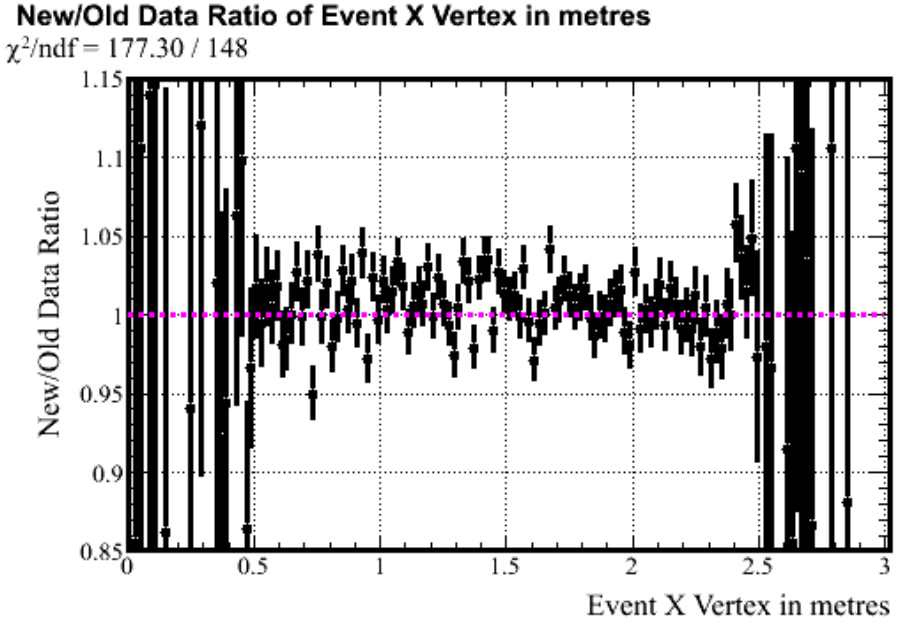

New/Old Ratio of Shower PH per Plane in ADC counts
χ²/ndf = 209.62 / 197
New/Old Data Ratio
Shower PH per Plane in ADC counts

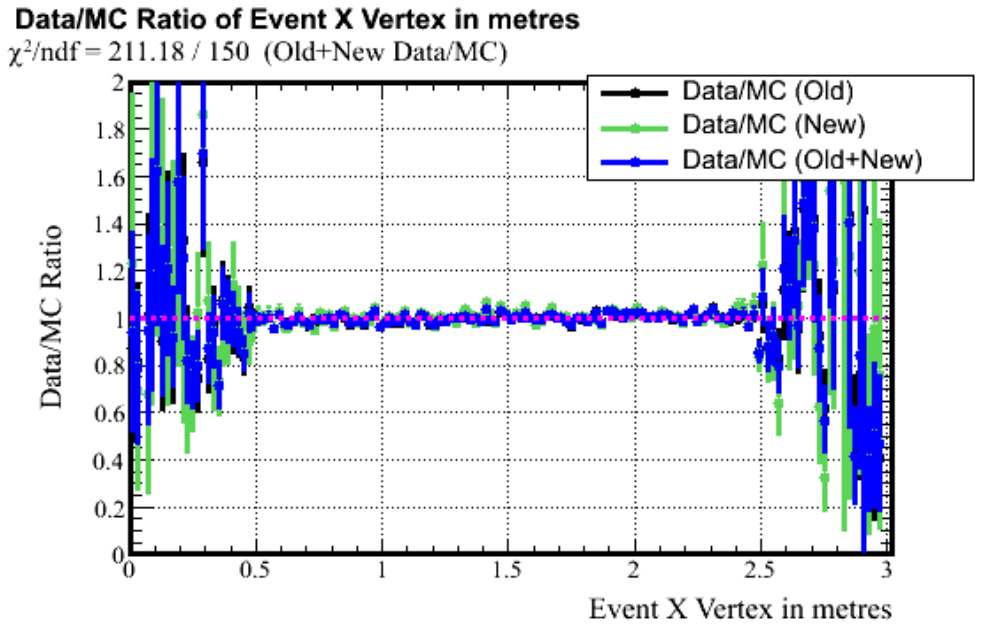

Data/MC Ratio of Shower PH per Plane in ADC counts
χ²/ndf = 8284.47 / 199 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Shower PH per Plane in ADC counts

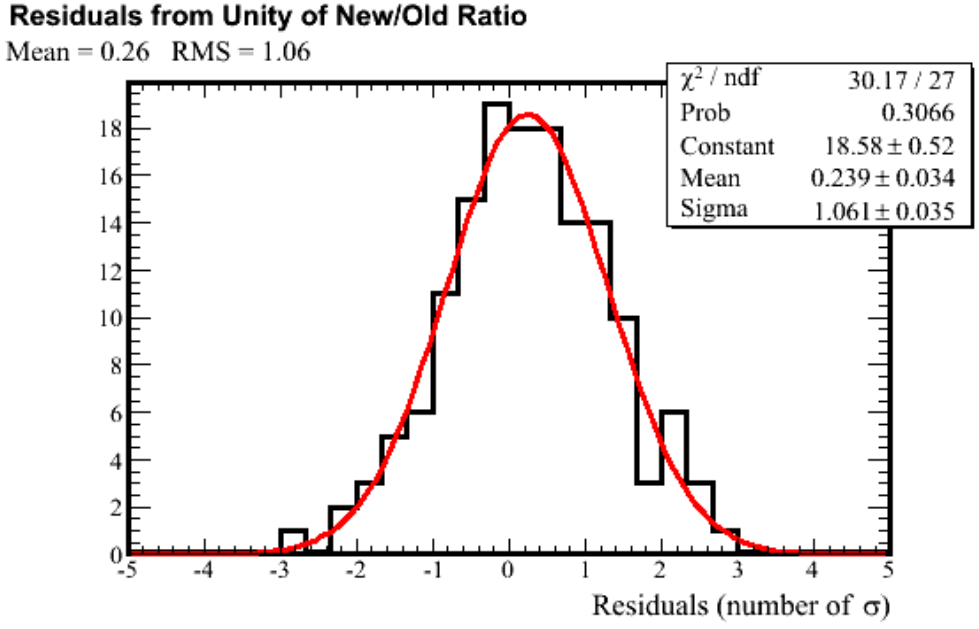

Residuals from Unity of New/Old Ratio
Mean = 0.26 RMS = 1.00
χ² / ndf 203.1 / 27
Prob 0
Constant 26.11 ± 0.53
Mean 0.2332 ± 0.0237
Sigma 1.011 ± 0.024
Residuals (number of σ)

PID

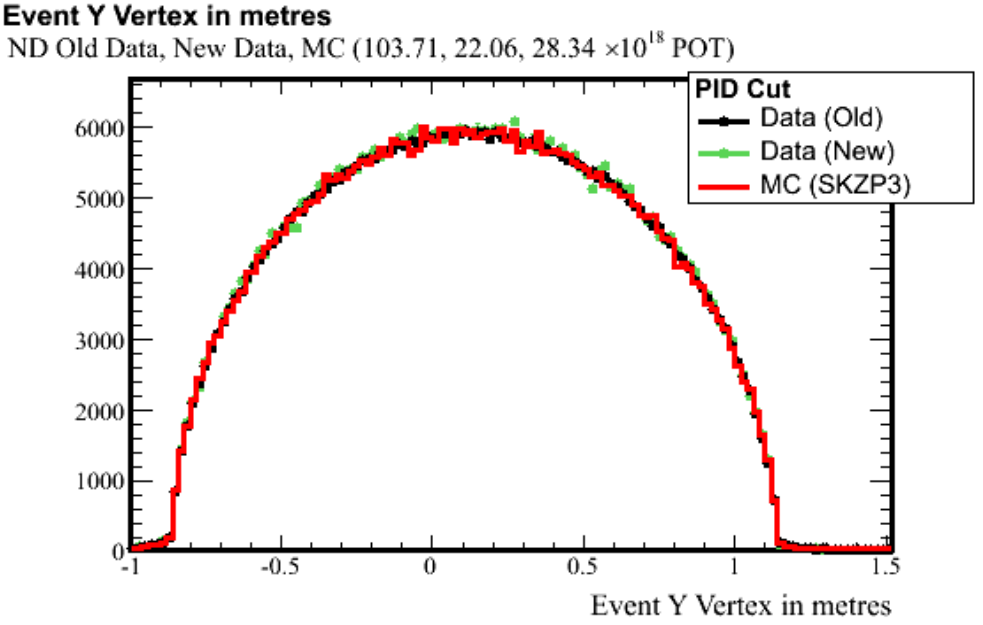

Event X Vertex in metres
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Event X Vertex in metres

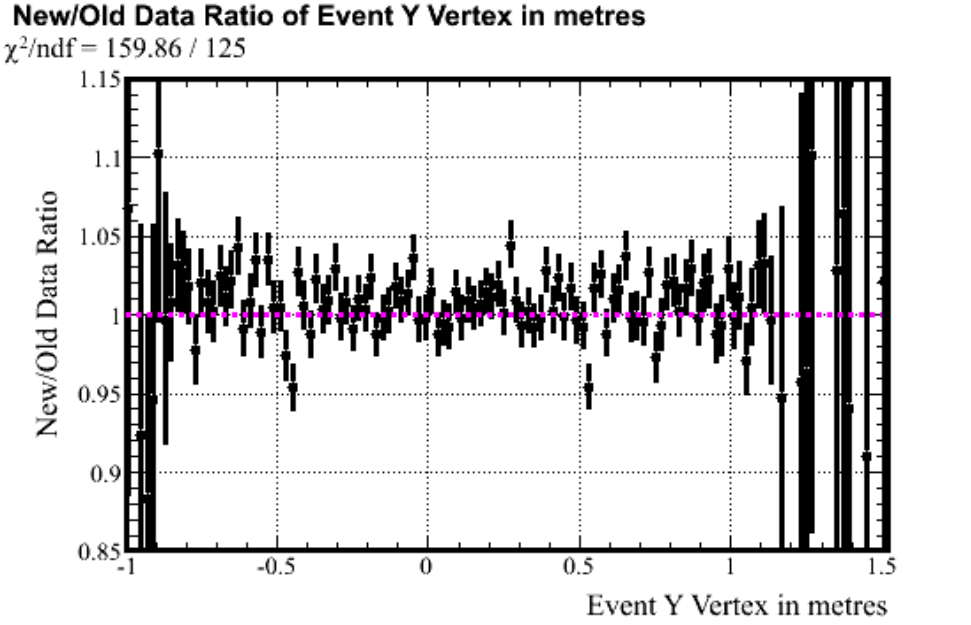

New/Old Data Ratio of Event X Vertex in metres
χ²/ndf = 177.30 / 148
New/Old Data Ratio
Event X Vertex in metres

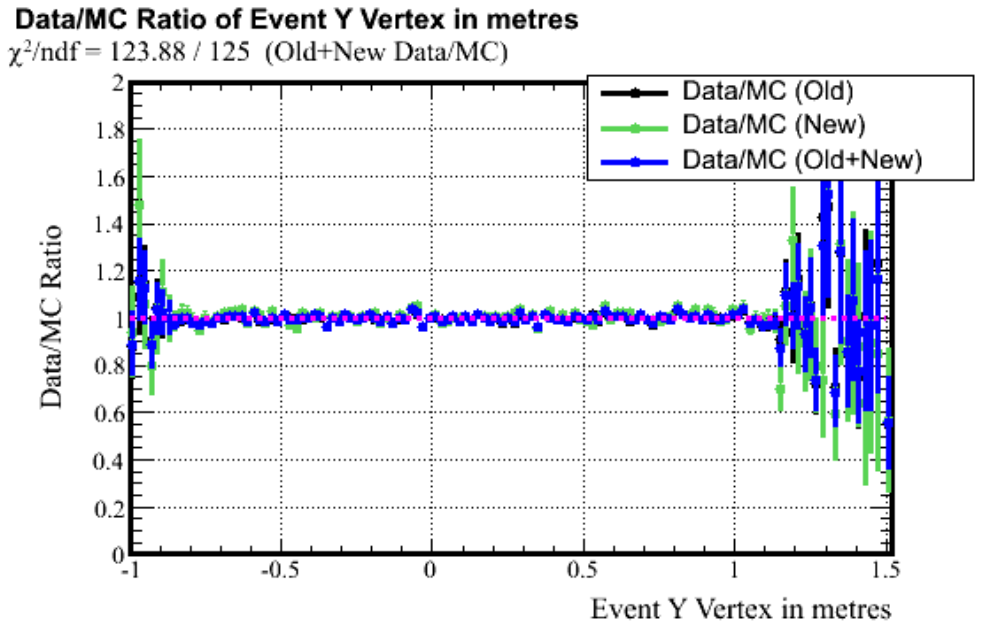

Data/MC Ratio of Event X Vertex in metres
χ²/ndf = 211.18 / 150 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Event X Vertex in metres

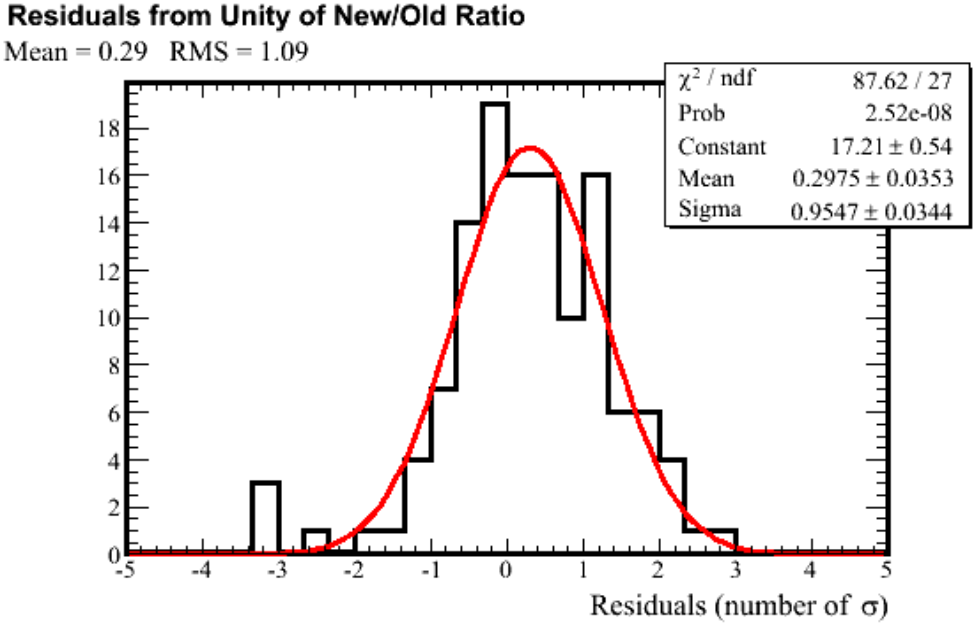

Residuals from Unity of New/Old Ratio
Mean = 0.26 RMS = 1.06
χ² / ndf 30.17 / 27
Prob 0.3066
Constant 18.58 ± 0.52
Mean 0.239 ± 0.034
Sigma 1.061 ± 0.035
Residuals (number of σ)

PID

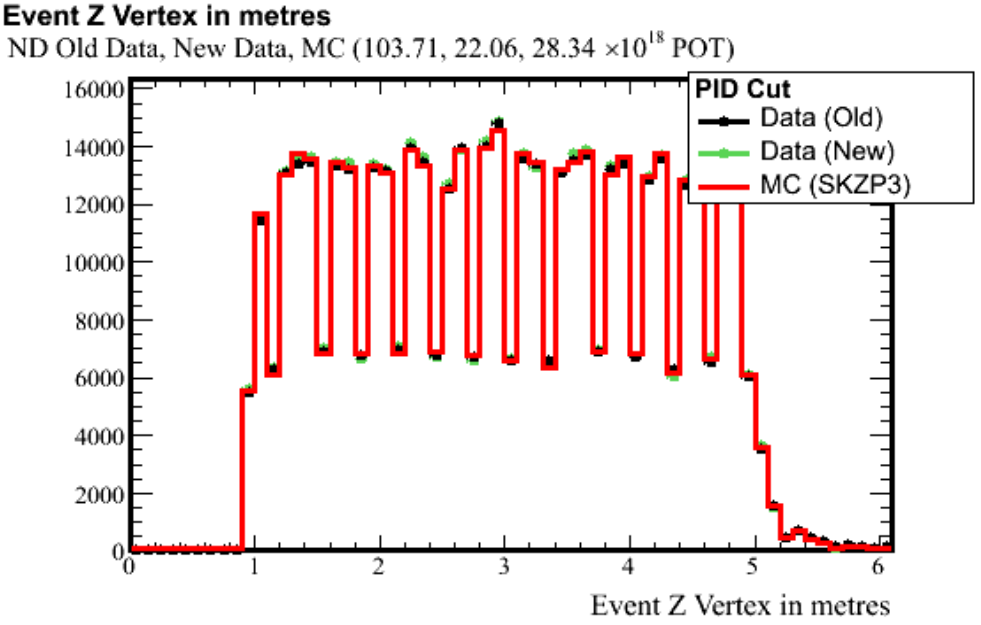

Event Y Vertex in metres
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Event Y Vertex in metres

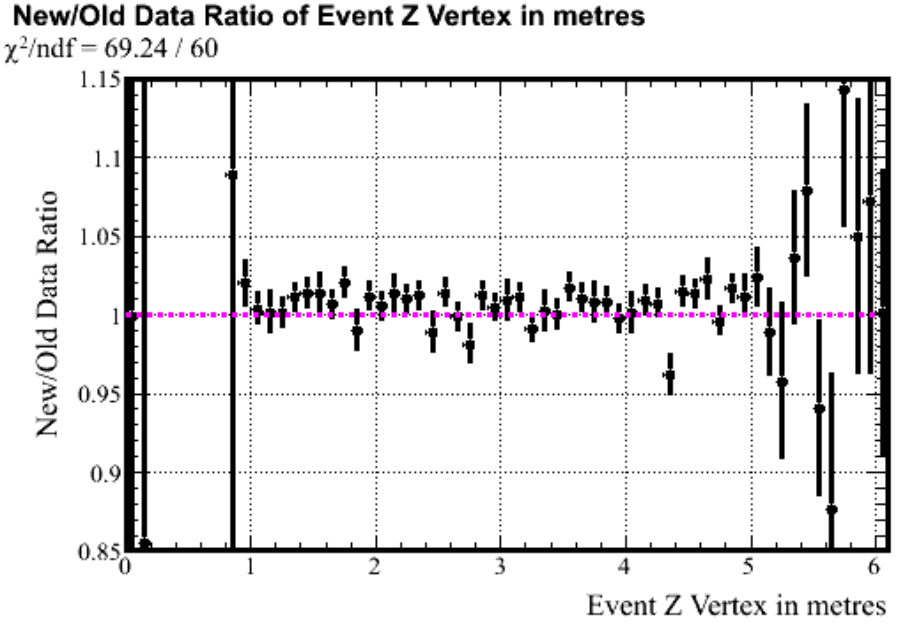

New/Old Data Ratio of Event Y Vertex in metres
χ²/ndf = 159.86 / 125
New/Old Data Ratio
Event Y Vertex in metres

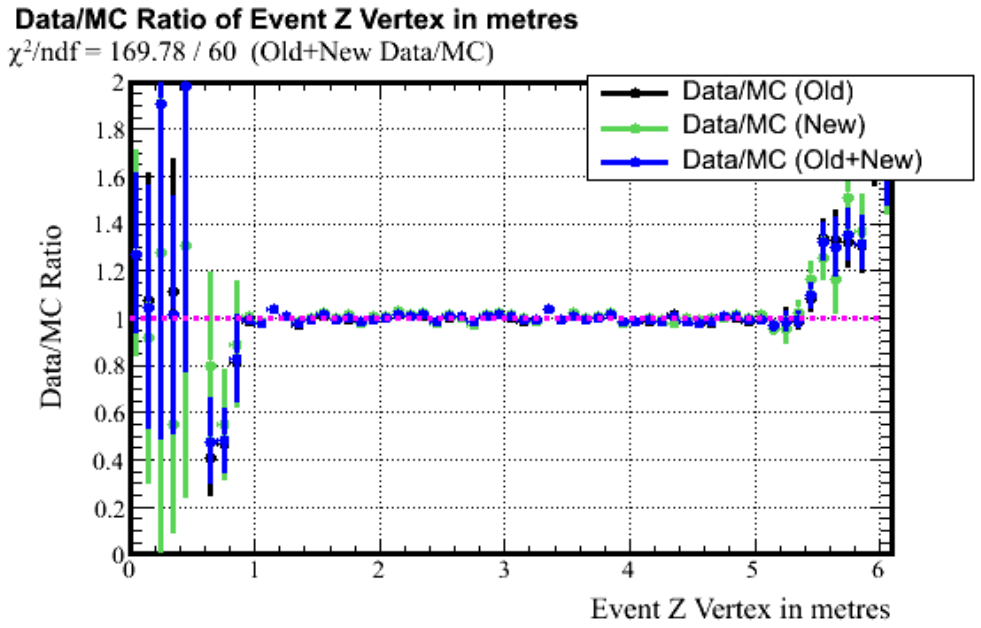

Data/MC Ratio of Event Y Vertex in metres
χ²/ndf = 123.88 / 125 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Event Y Vertex in metres

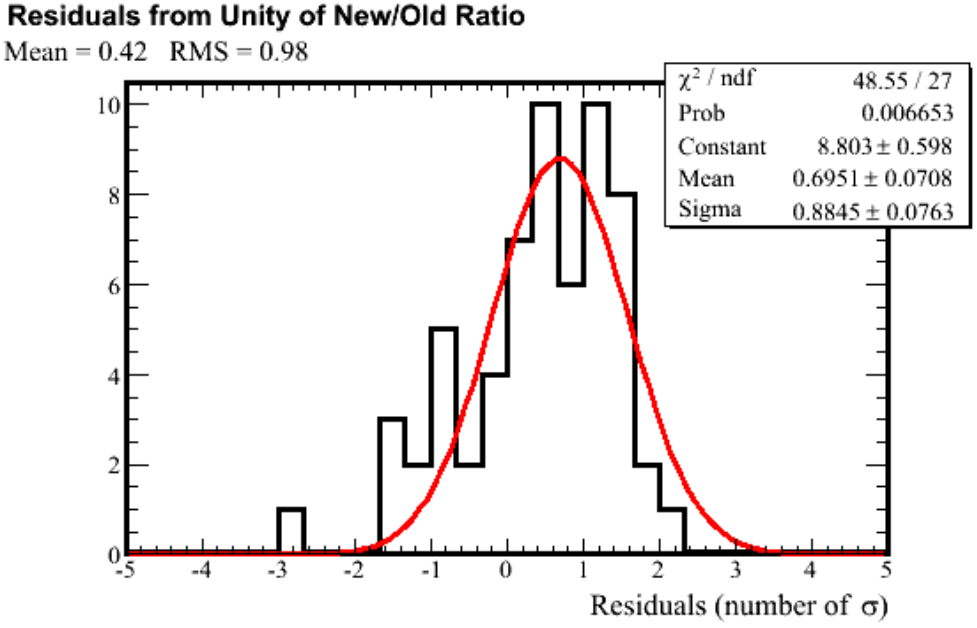

Residuals from Unity of New/Old Ratio
Mean = 0.29 RMS = 1.09
χ² / ndf 87.62 / 27
Prob 2.52e-08
Constant 17.21 ± 0.54
Mean 0.2975 ± 0.0353
Sigma 0.9547 ± 0.0344
Residuals (number of σ)

PID

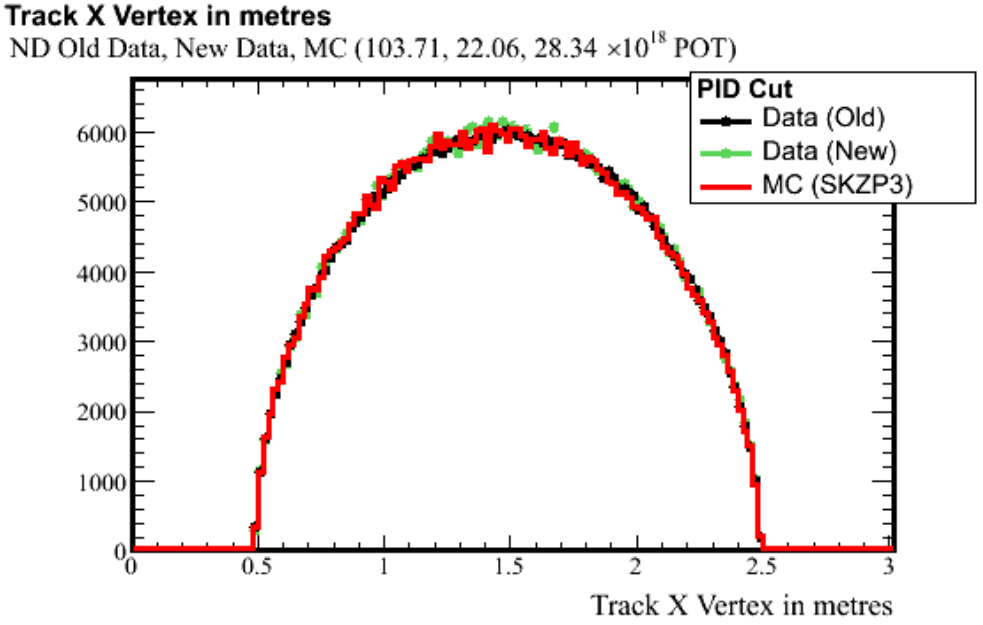

Event Z Vertex in metres
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Event Z Vertex in metres

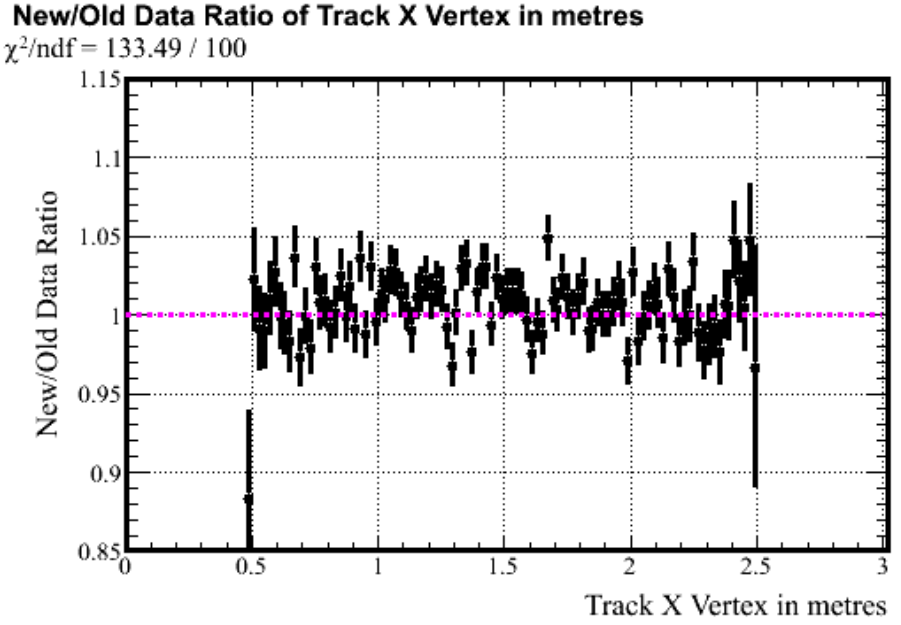

New/Old Data Ratio of Event Z Vertex in metres
χ²/ndf = 69.24 / 60
New/Old Data Ratio
Event Z Vertex in metres

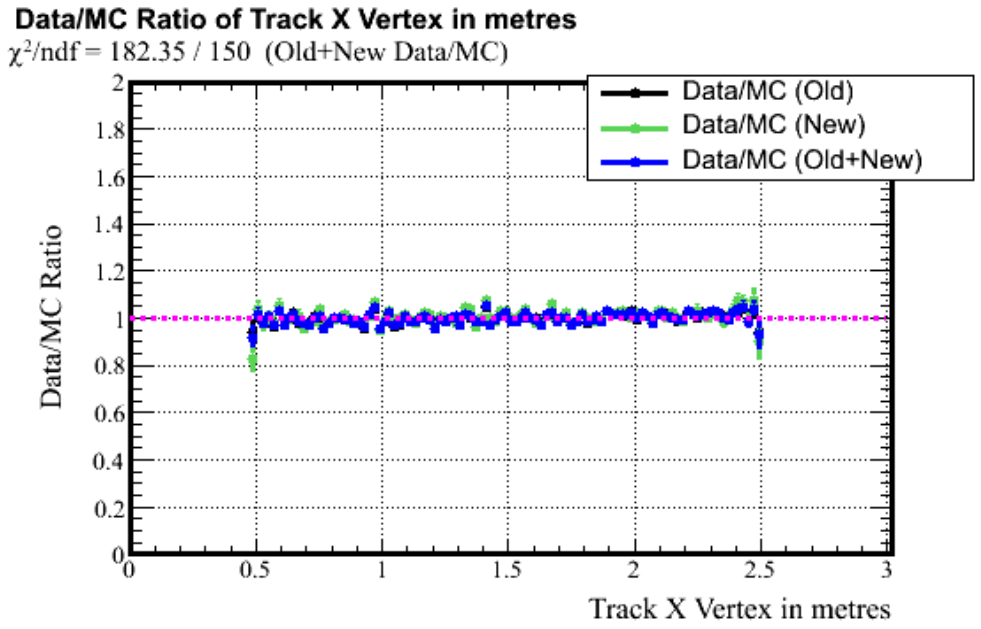

Data/MC Ratio of Event Z Vertex in metres
χ²/ndf = 169.78 / 60 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Event Z Vertex in metres

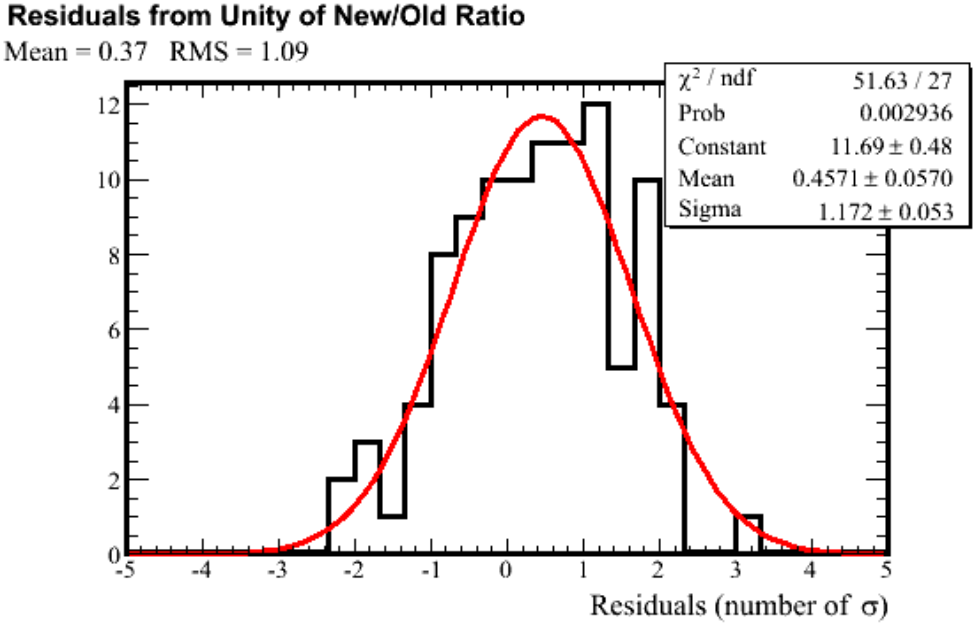

Residuals from Unity of New/Old Ratio
Mean = 0.42 RMS = 0.98
χ² / ndf 48.55 / 27
Prob 0.006653
Constant 8.803 ± 0.598
Mean 0.6951 ± 0.0708
Sigma 0.8845 ± 0.0763
Residuals (number of σ)

PID

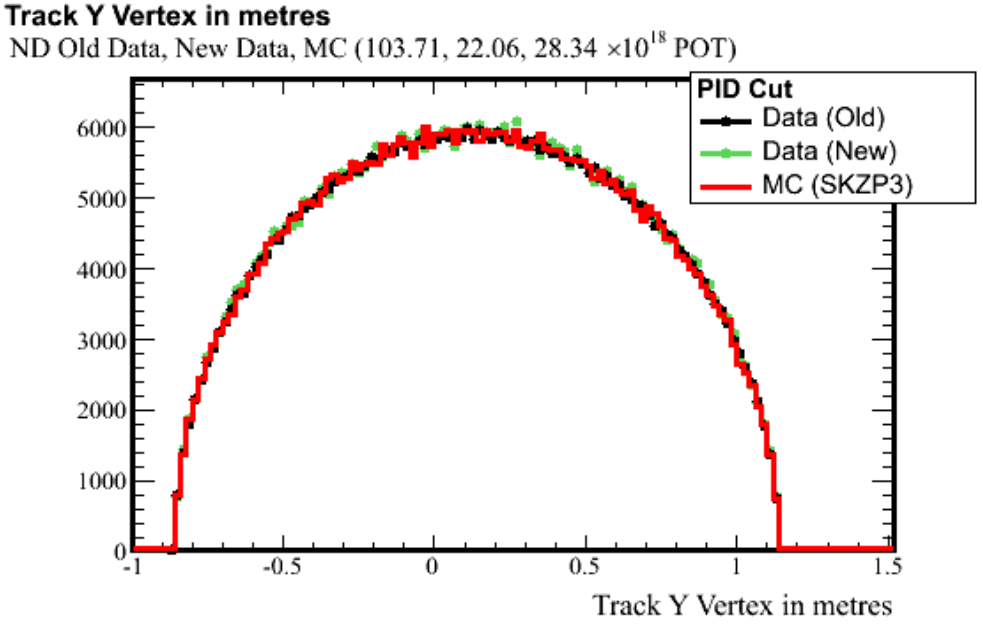

Track X Vertex in metres
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track X Vertex in metres

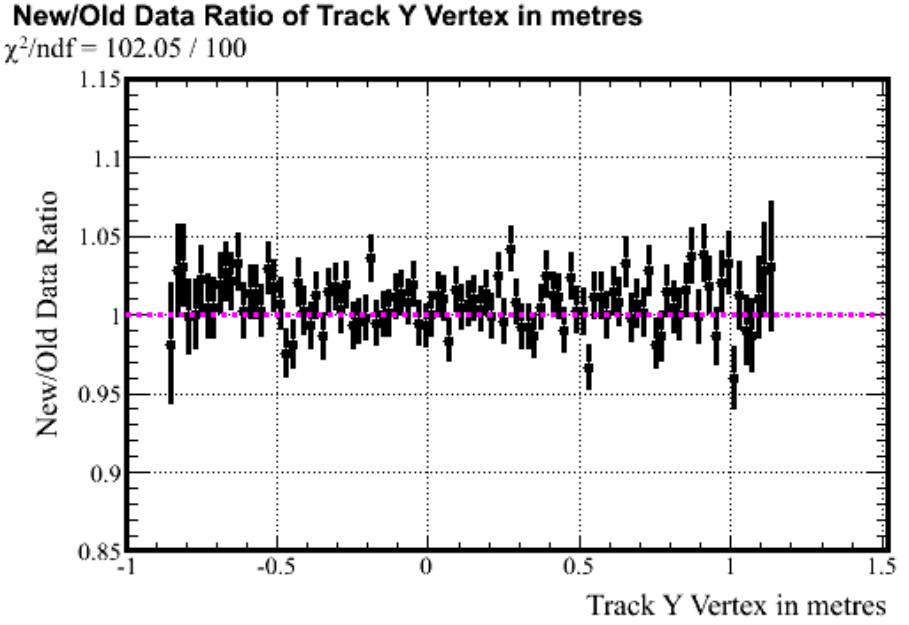

New/Old Data Ratio of Track X Vertex in metres
χ²/ndf = 133.49 / 100
New/Old Data Ratio
Track X Vertex in metres

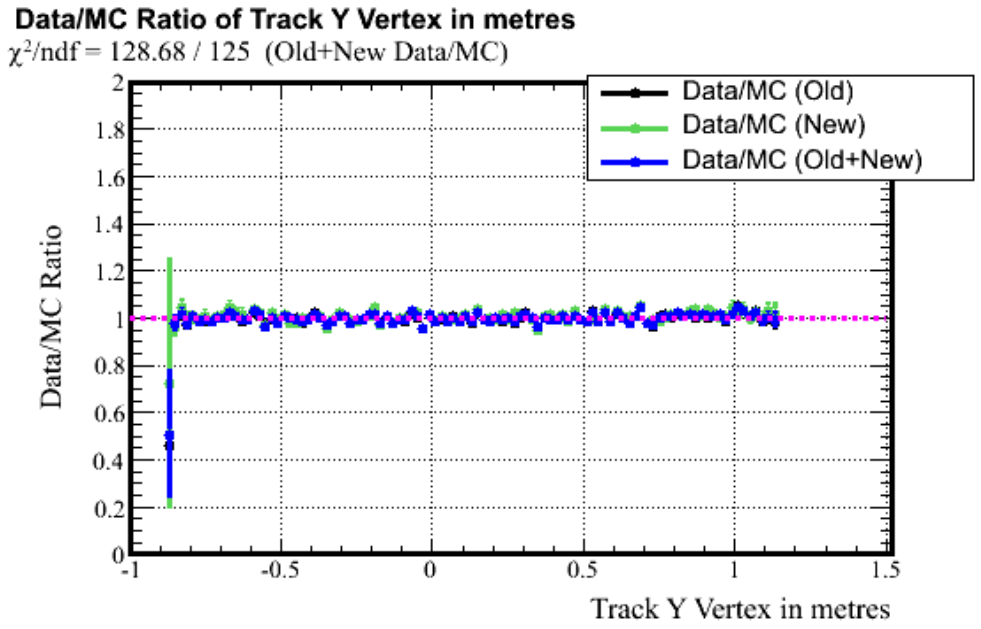

Data/MC Ratio of Track X Vertex in metres
χ²/ndf = 182.35 / 150 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track X Vertex in metres

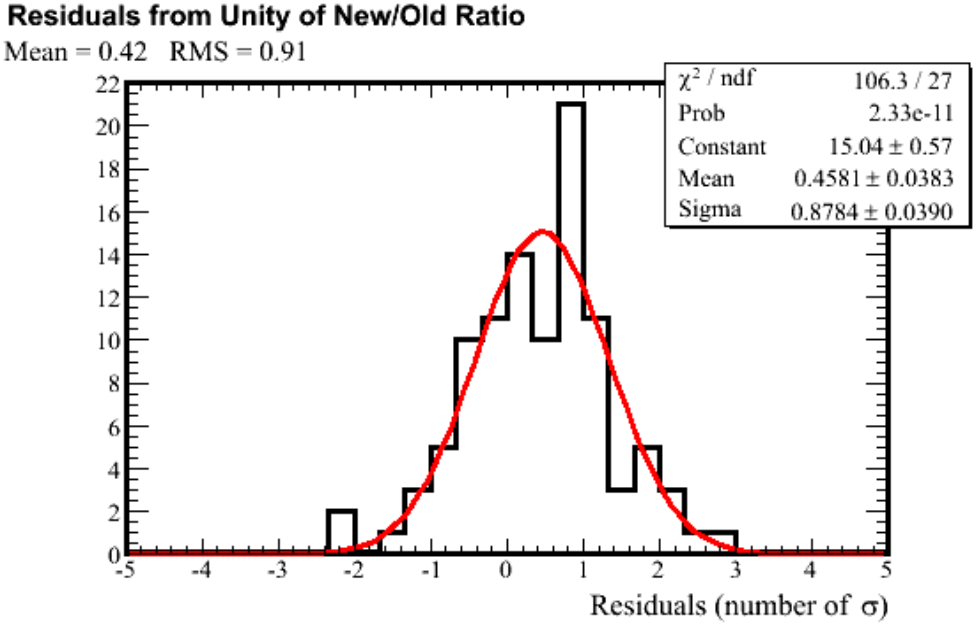

Residuals from Unity of New/Old Ratio
Mean = 0.37 RMS = 1.09
χ² / ndf 51.63 / 27
Prob 0.002936
Constant 11.69 ± 0.48
Mean 0.4571 ± 0.0570
Sigma 1.172 ± 0.053
Residuals (number of σ)

PID

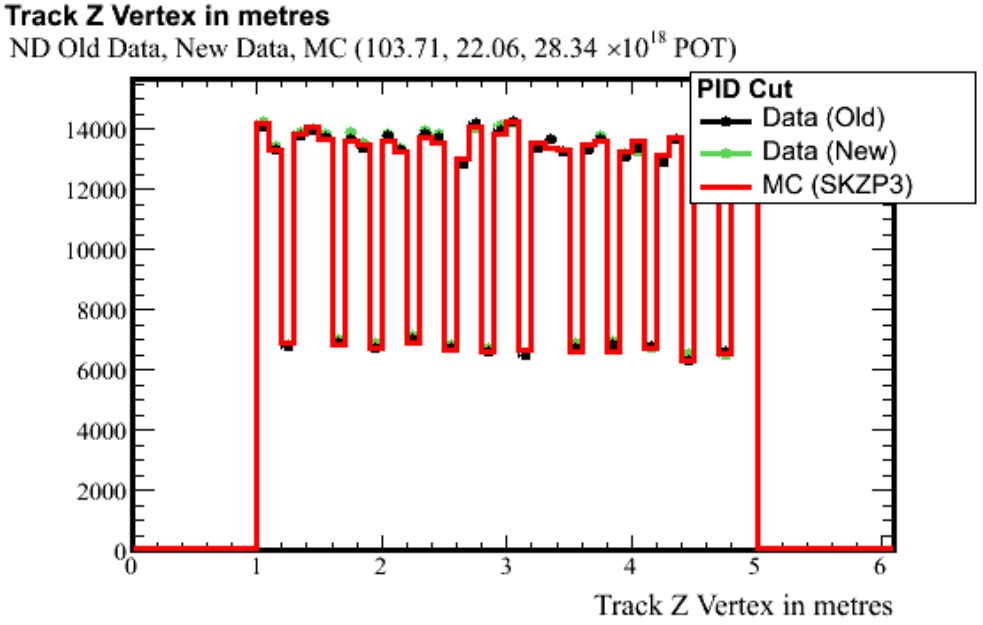

Track Y Vertex in metres
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track Y Vertex in metres

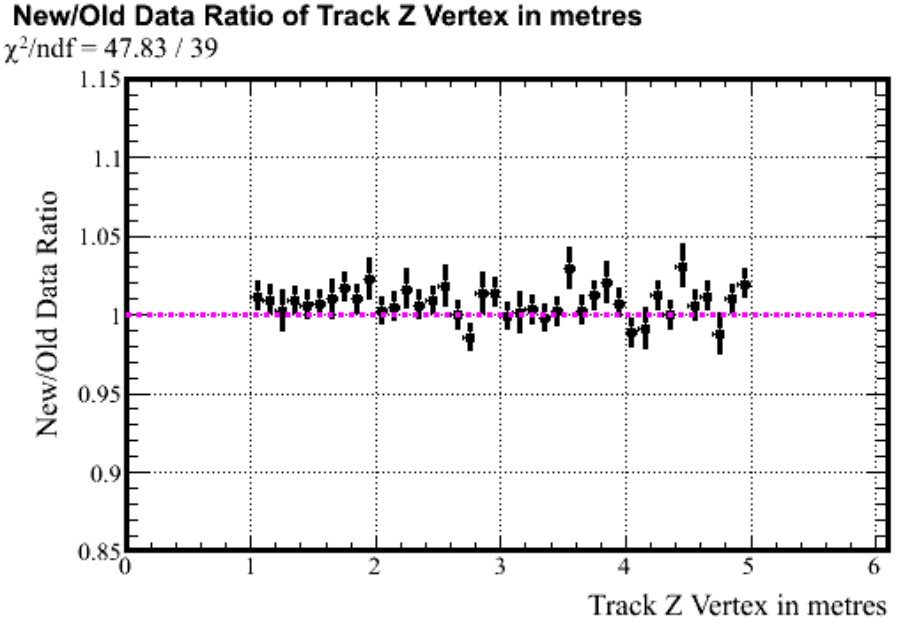

New/Old Data Ratio of Track Y Vertex in metres
χ²/ndf = 102.05 / 100
New/Old Data Ratio
Track Y Vertex in metres

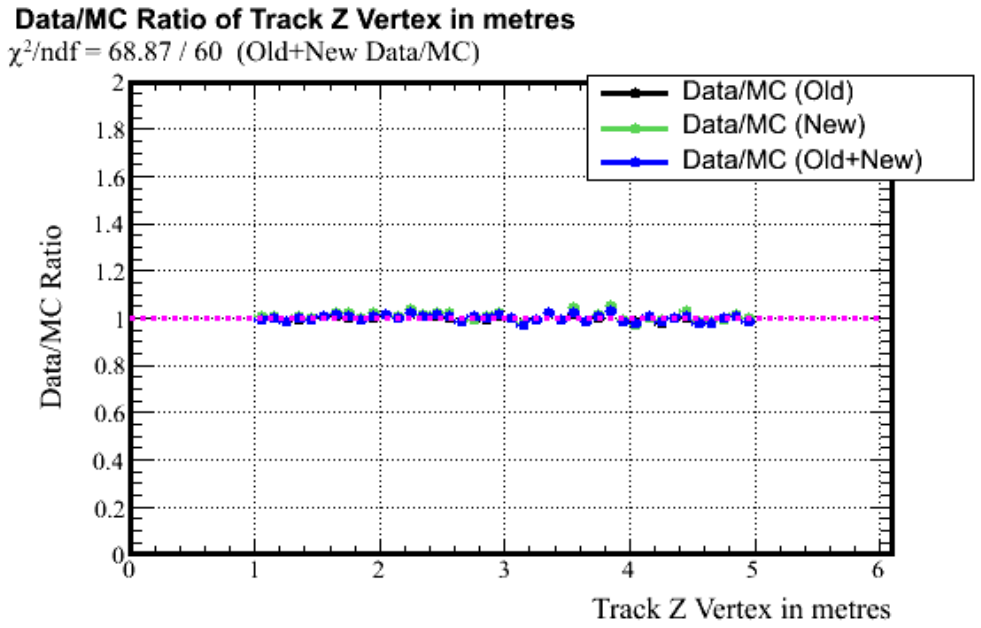

Data/MC Ratio of Track Y Vertex in metres
χ²/ndf = 128.68 / 125 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track Y Vertex in metres

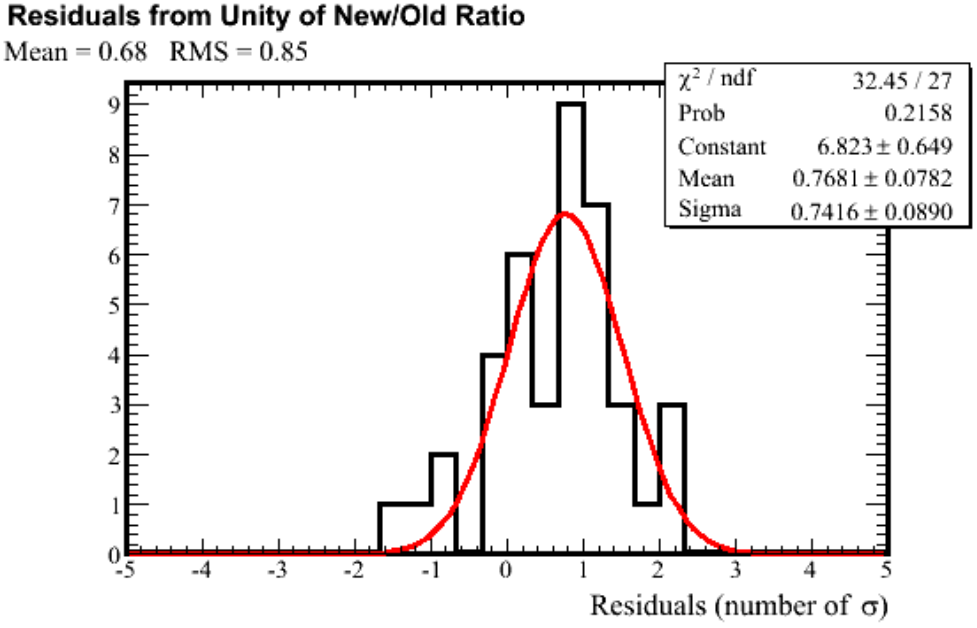

Residuals from Unity of New/Old Ratio
Mean = 0.42 RMS = 0.91
χ² / ndf 106.3 / 27
Prob 2.33e-11
Constant 15.04 ± 0.57
Mean 0.4581 ± 0.0383
Sigma 0.8784 ± 0.0390
Residuals (number of σ)

PID

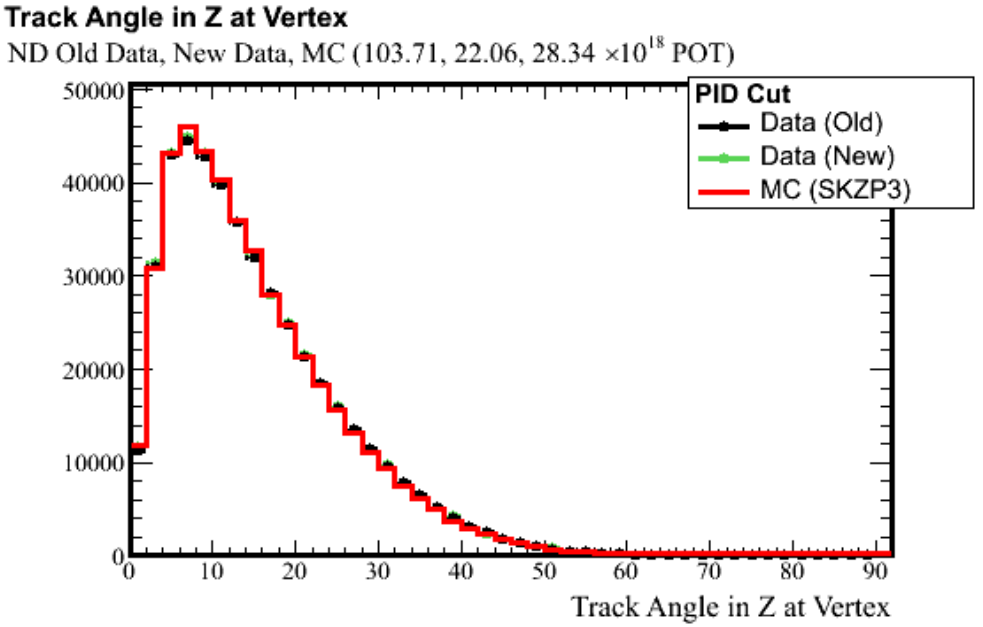

Track Z Vertex in metres
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track Z Vertex in metres

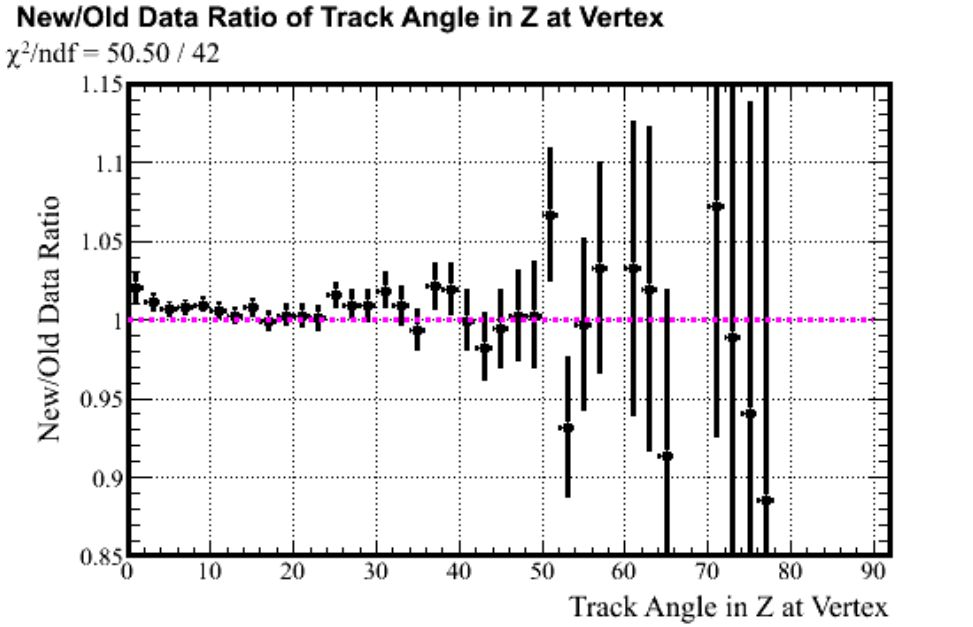

New/Old Data Ratio of Track Z Vertex in metres
χ²/ndf = 47.83 / 39
New/Old Data Ratio
Track Z Vertex in metres

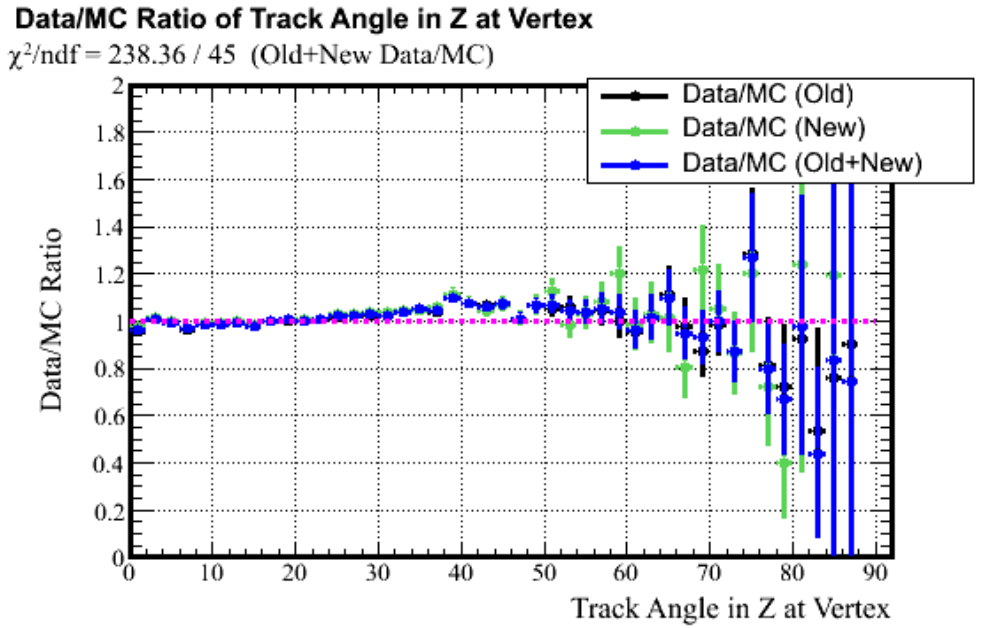

Data/MC Ratio of Track Z Vertex in metres
χ²/ndf = 68.87 / 60 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track Z Vertex in metres

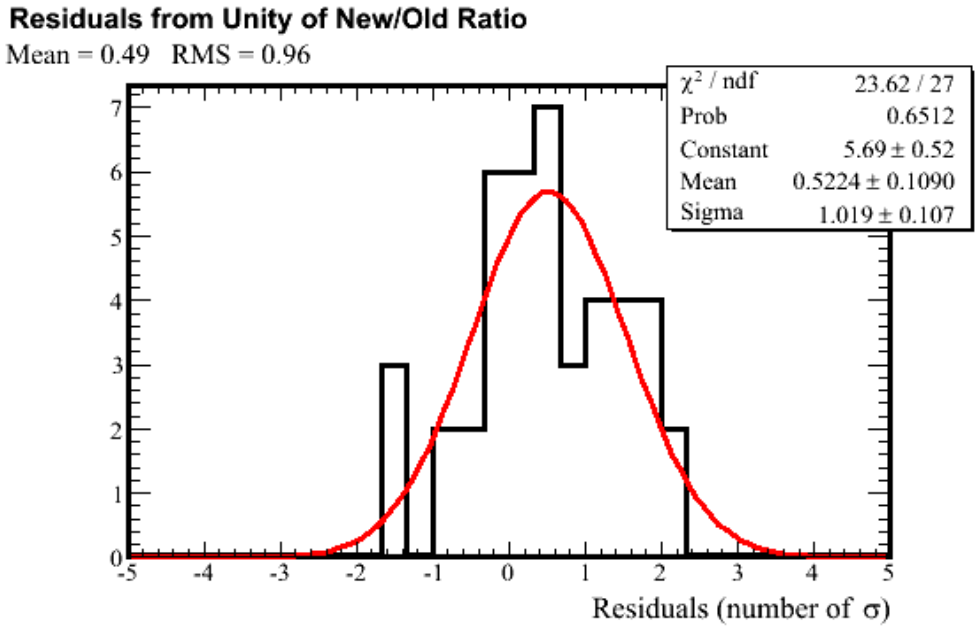

Residuals from Unity of New/Old Ratio
Mean = 0.68 RMS = 0.85
χ² / ndf 32.45 / 27
Prob 0.2158
Constant 6.823 ± 0.649
Mean 0.7681 ± 0.0782
Sigma 0.7416 ± 0.0890
Residuals (number of σ)

PID

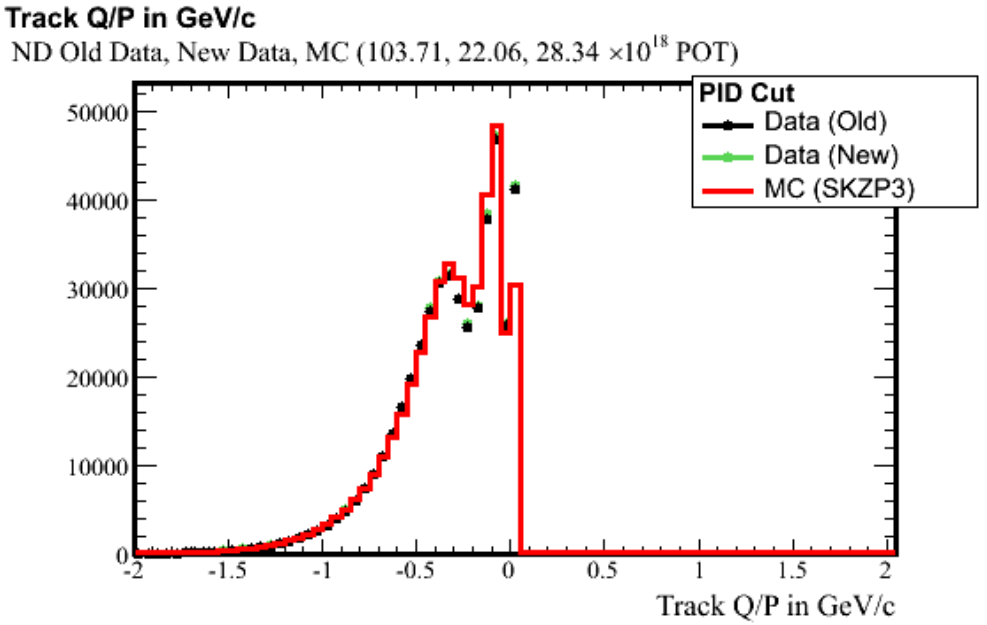

Track Angle in Z at Vertex
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track Angle in Z at Vertex

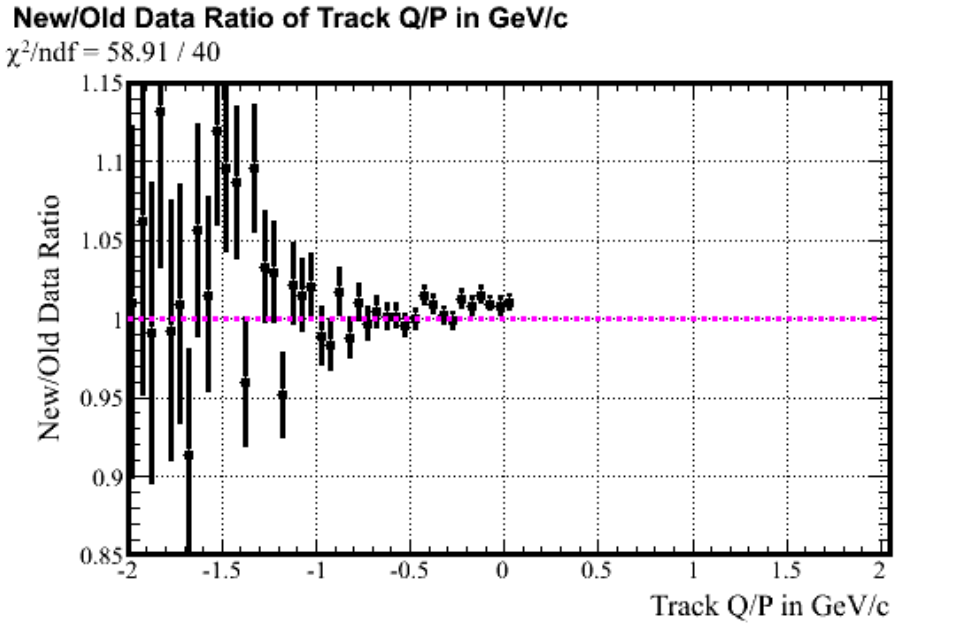

New/Old Data Ratio of Track Angle in Z at Vertex
χ²/ndf = 50.50 / 42
New/Old Data Ratio
Track Angle in Z at Vertex

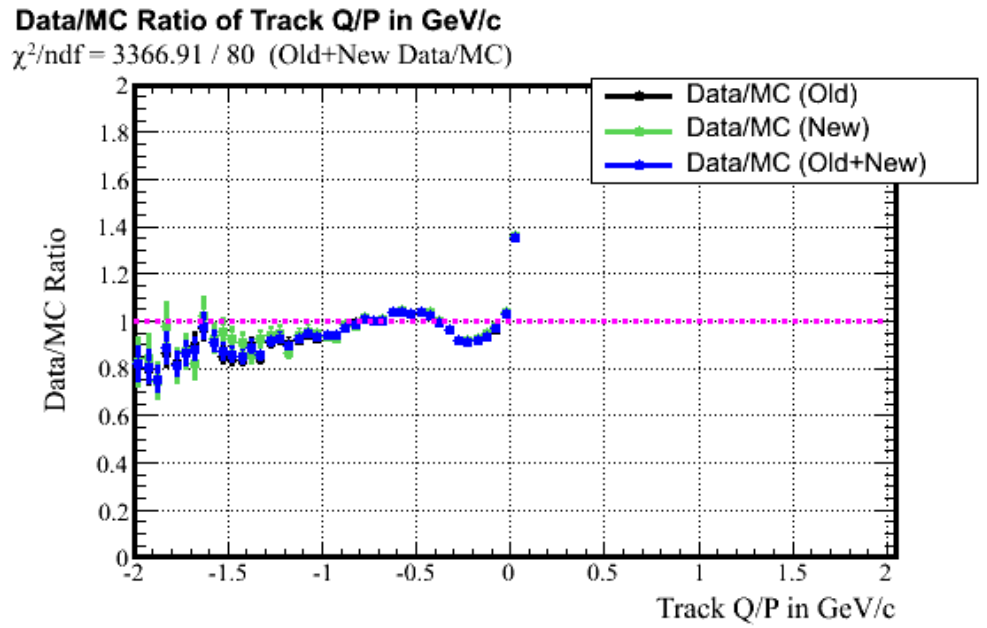

Data/MC Ratio of Track Angle in Z at Vertex
χ²/ndf = 238.36 / 45 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track Angle in Z at Vertex

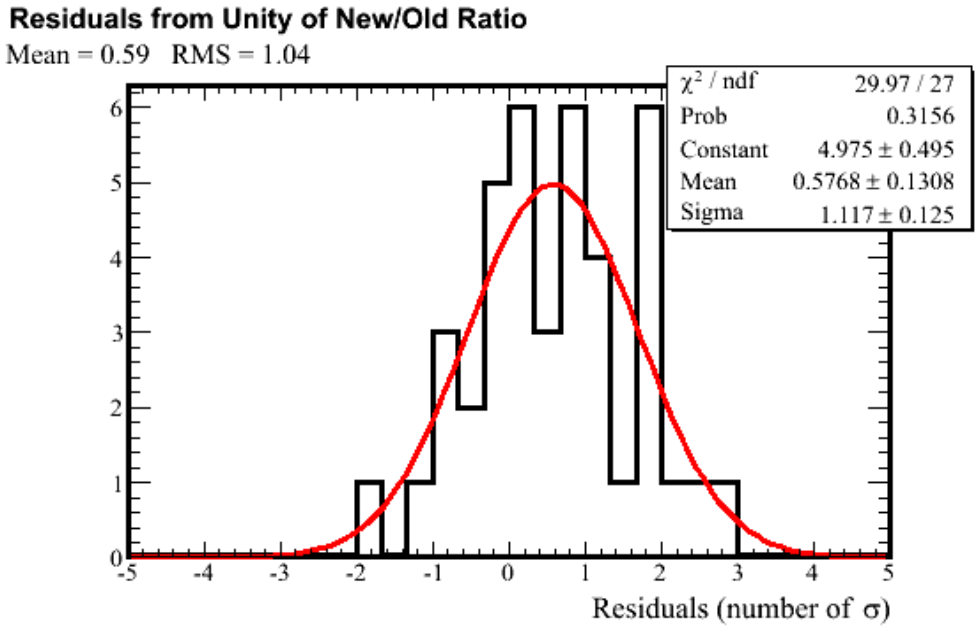

Residuals from Unity of New/Old Ratio
Mean = 0.49 RMS = 0.96
χ² / ndf 23.62 / 27
Prob 0.6512
Constant 5.69 ± 0.52
Mean 0.5224 ± 0.1090
Sigma 1.019 ± 0.107
Residuals (number of σ)

PID

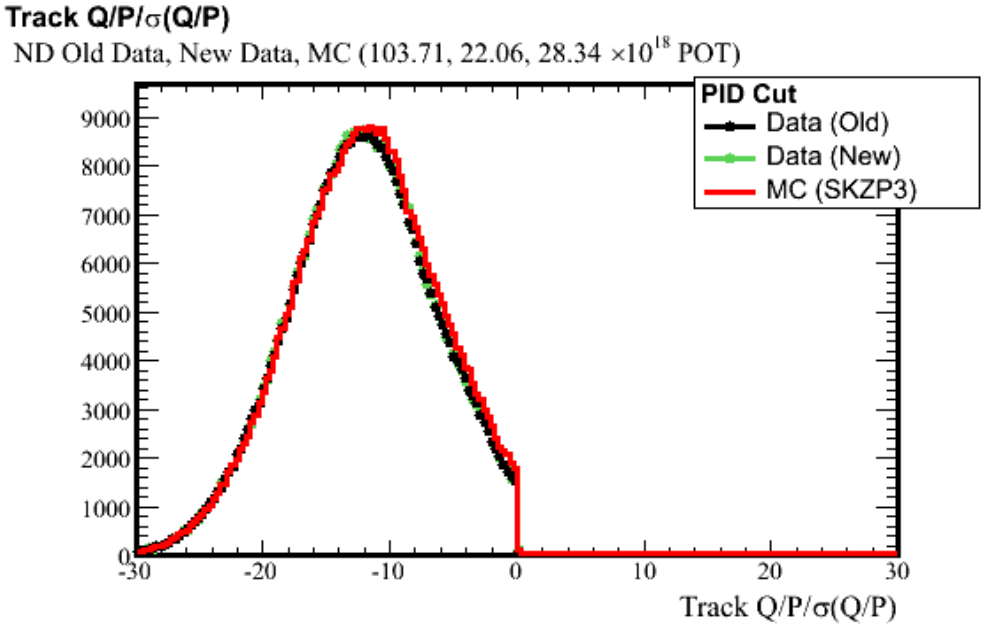

Track Q/P in GeV/c
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track Q/P in GeV/c

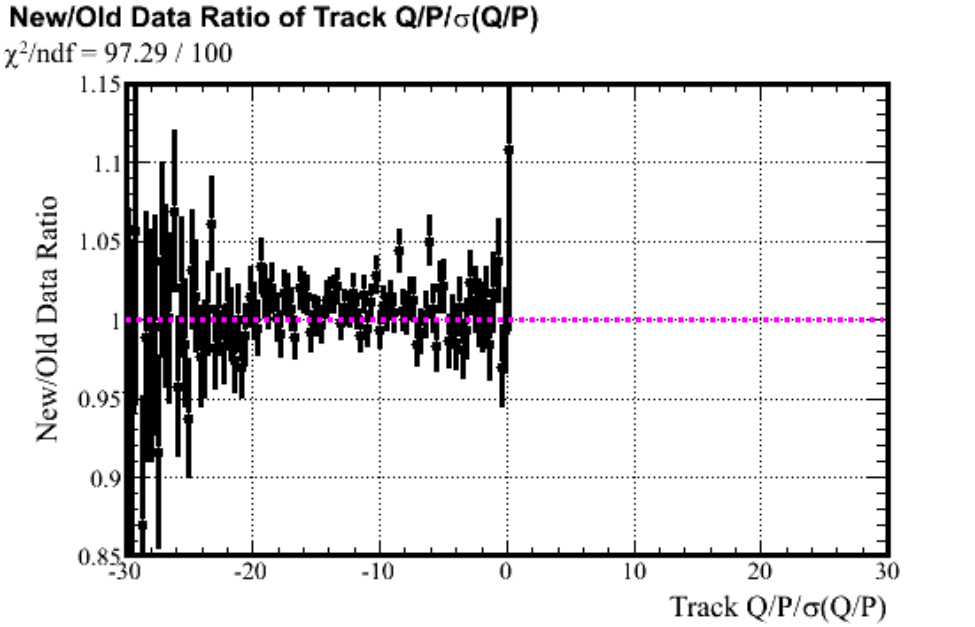

New/Old Data Ratio of Track Q/P in GeV/c
χ²/ndf = 58.91 / 40
New/Old Data Ratio
Track Q/P in GeV/c

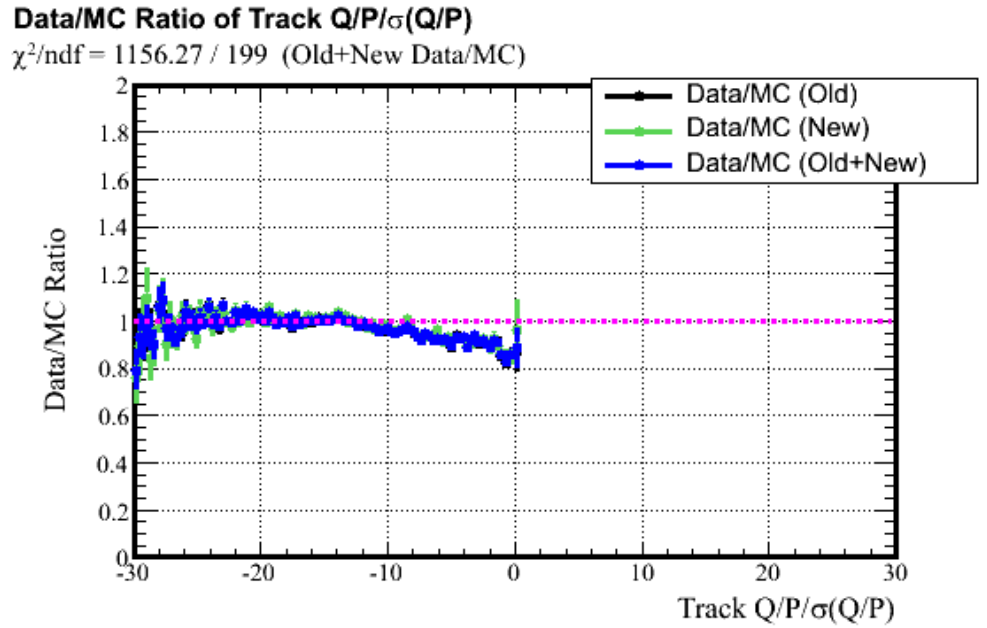

Data/MC Ratio of Track Q/P in GeV/c
χ²/ndf = 3366.91 / 80 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track Q/P in GeV/c

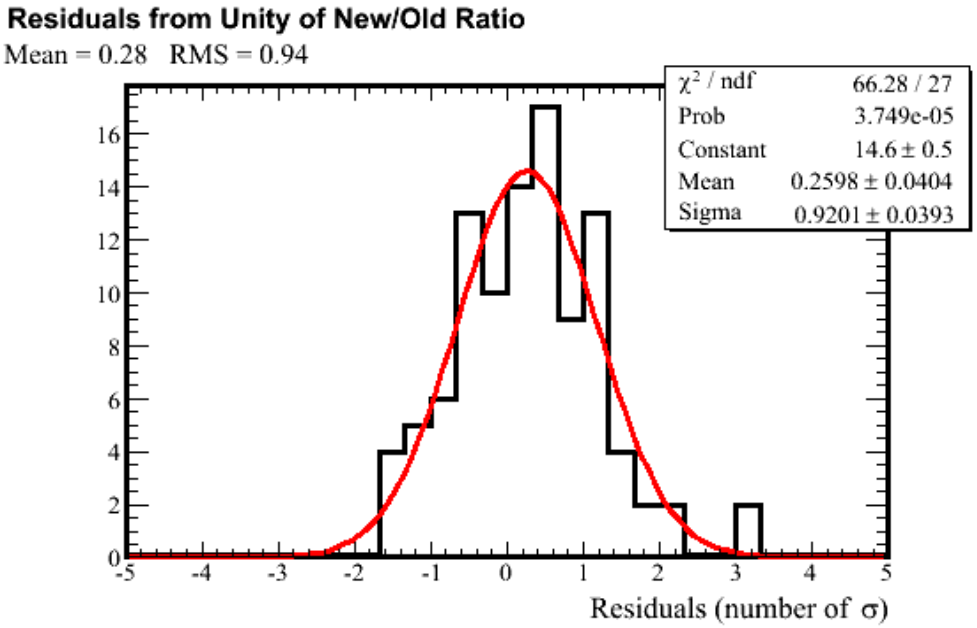

Residuals from Unity of New/Old Ratio
Mean = 0.59 RMS = 1.04
χ² / ndf 29.97 / 27
Prob 0.3156
Constant 4.975 ± 0.495
Mean 0.5768 ± 0.1308
Sigma 1.117 ± 0.125
Residuals (number of σ)

PID

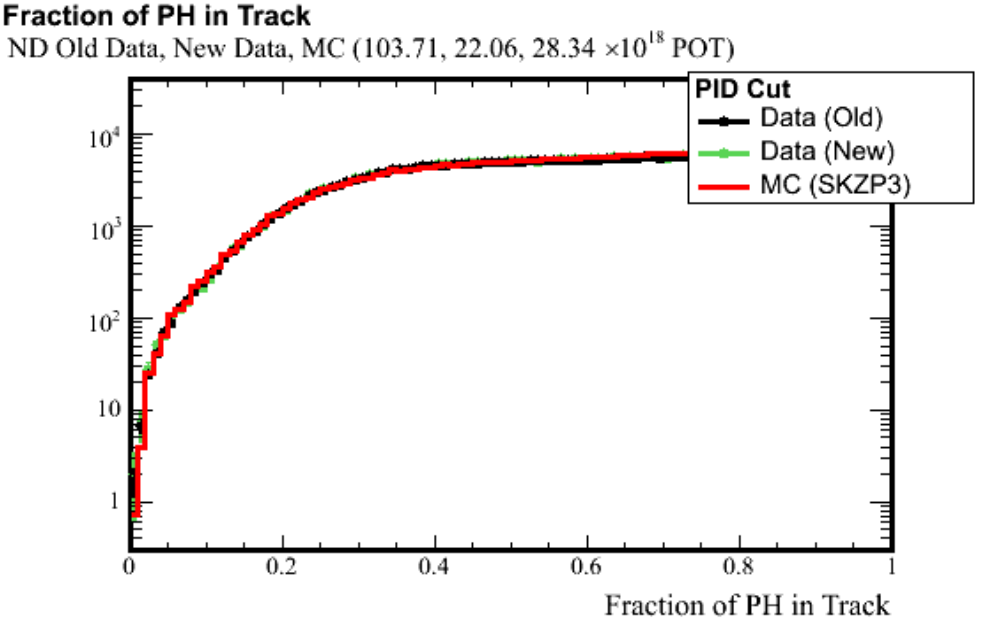

Track Q/P/σ(Q/P)
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Track Q/P/σ(Q/P)

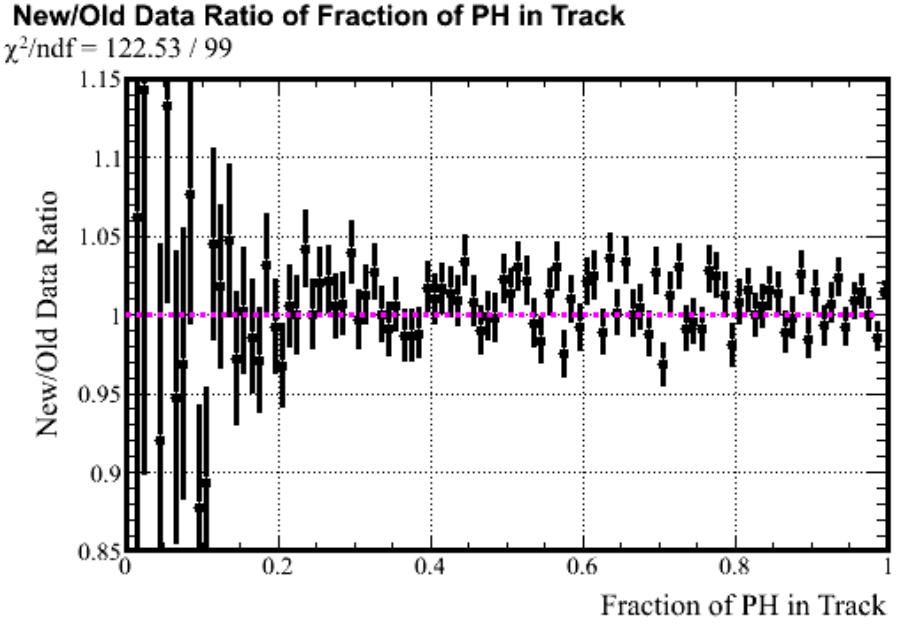

New/Old Data Ratio of Track Q/P/σ(Q/P)
χ²/ndf = 97.29 / 100
New/Old Data Ratio
Track Q/P/σ(Q/P)

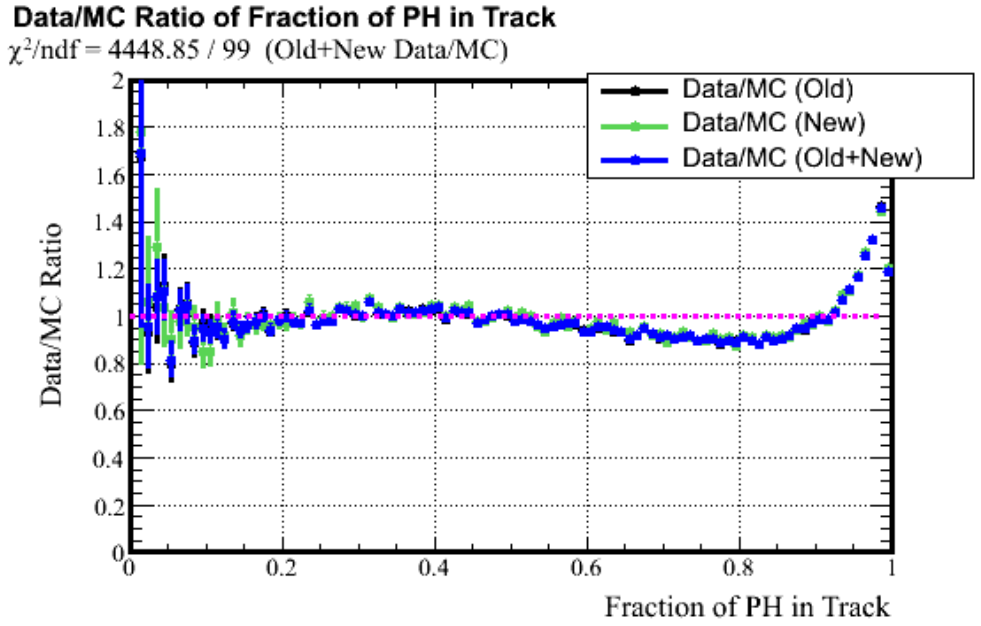

Data/MC Ratio of Track Q/P/σ(Q/P)
χ²/ndf = 1156.27 / 199 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Track Q/P/σ(Q/P)

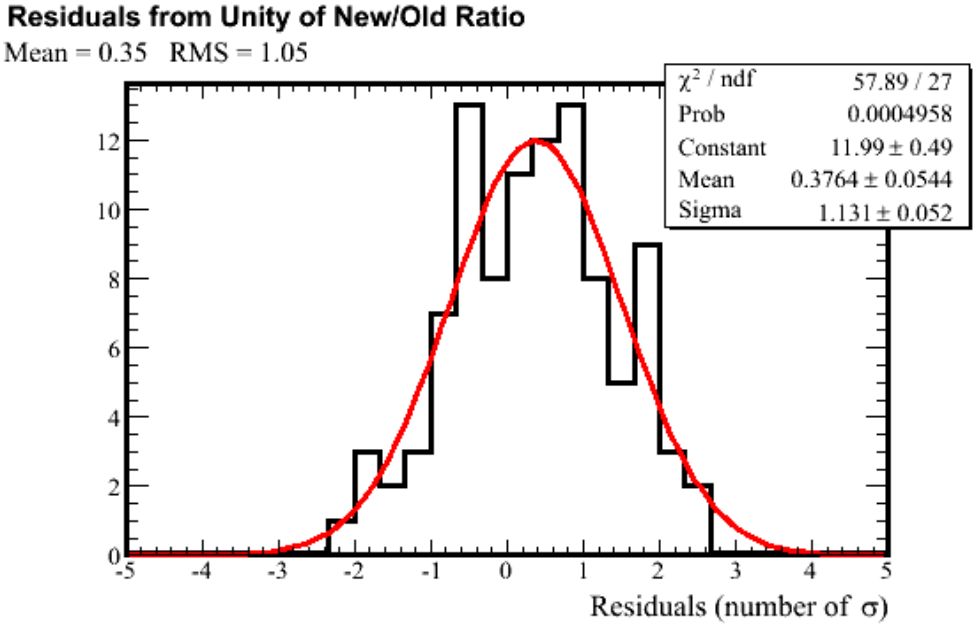

Residuals from Unity of New/Old Ratio
Mean = 0.28 RMS = 0.94
χ² / ndf 66.28 / 27
Prob 3.749e-05
Constant 14.6 ± 0.5
Mean 0.2598 ± 0.0404
Sigma 0.9201 ± 0.0393
Residuals (number of σ)

PID

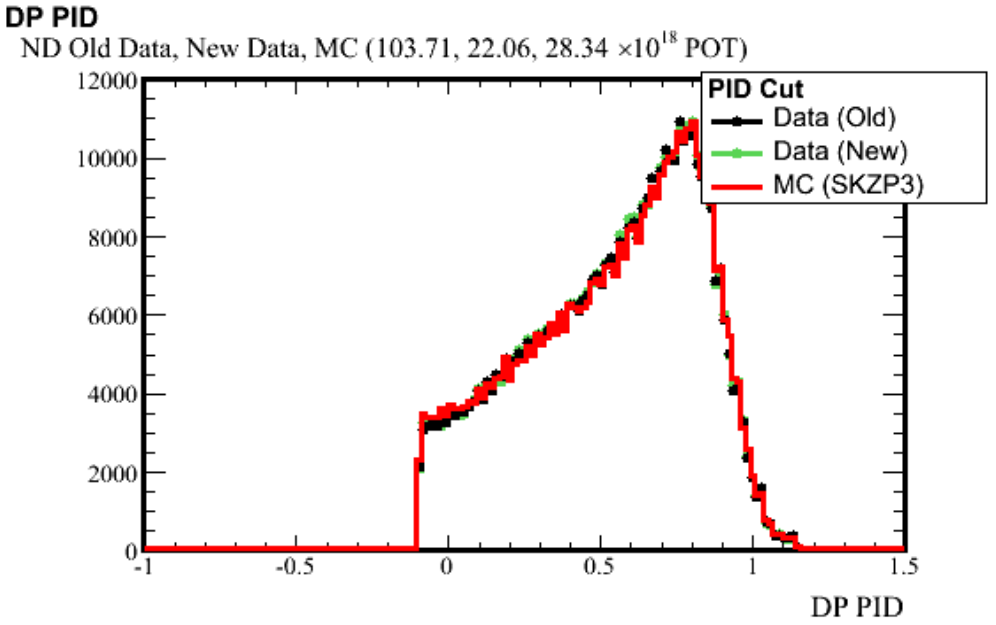

Fraction of PH in Track
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Fraction of PH in Track

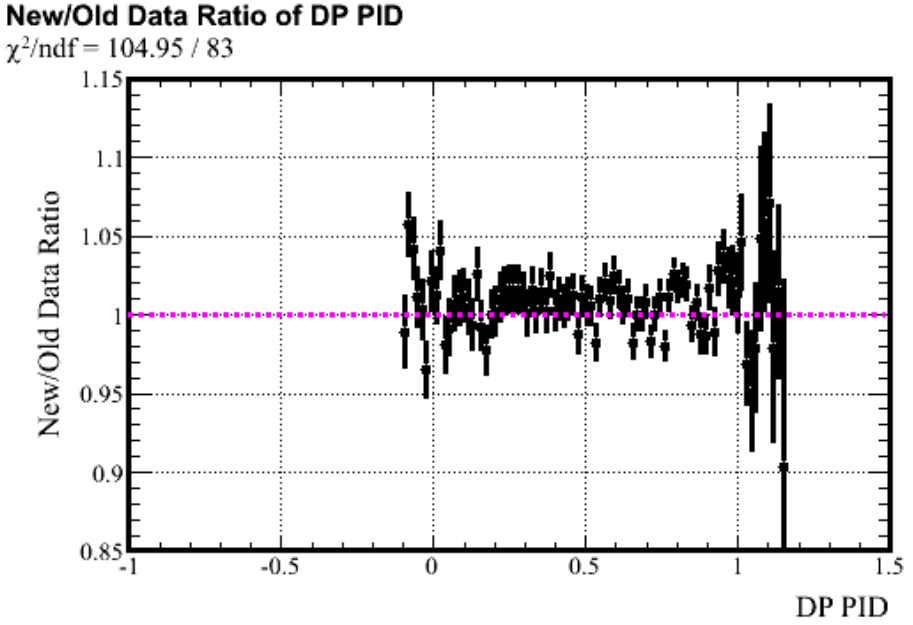

New/Old Data Ratio of Fraction of PH in Track
χ²/ndf = 122.53 / 99
New/Old Data Ratio
Fraction of PH in Track

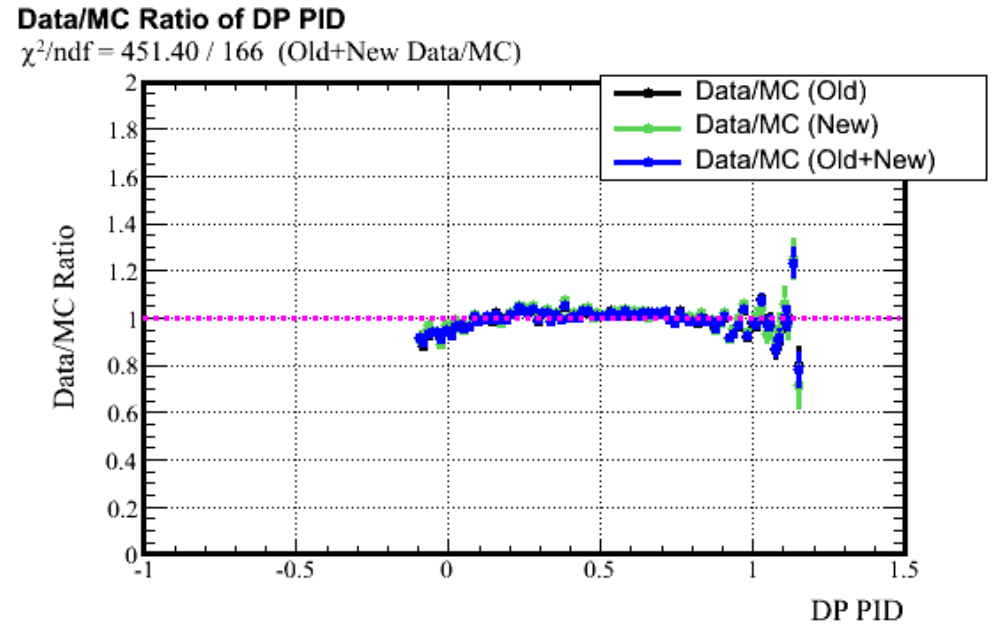

Data/MC Ratio of Fraction of PH in Track
χ²/ndf = 4448.85 / 99 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Fraction of PH in Track

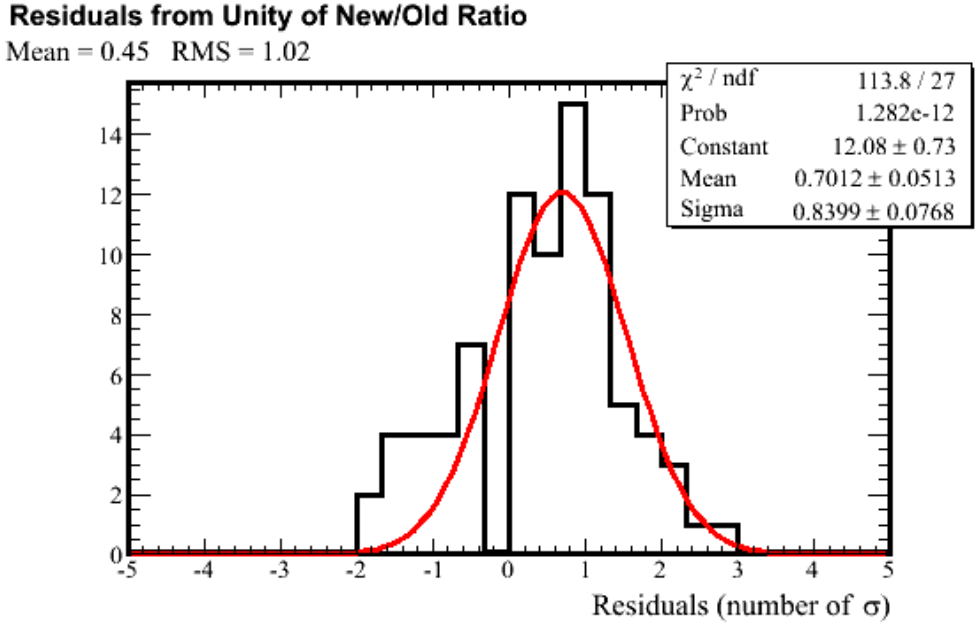

Residuals from Unity of New/Old Ratio
Mean = 0.35 RMS = 1.05
χ² / ndf 57.89 / 27
Prob 0.0004958
Constant 11.99 ± 0.49
Mean 0.3764 ± 0.0544
Sigma 1.131 ± 0.052
Residuals (number of σ)

PID

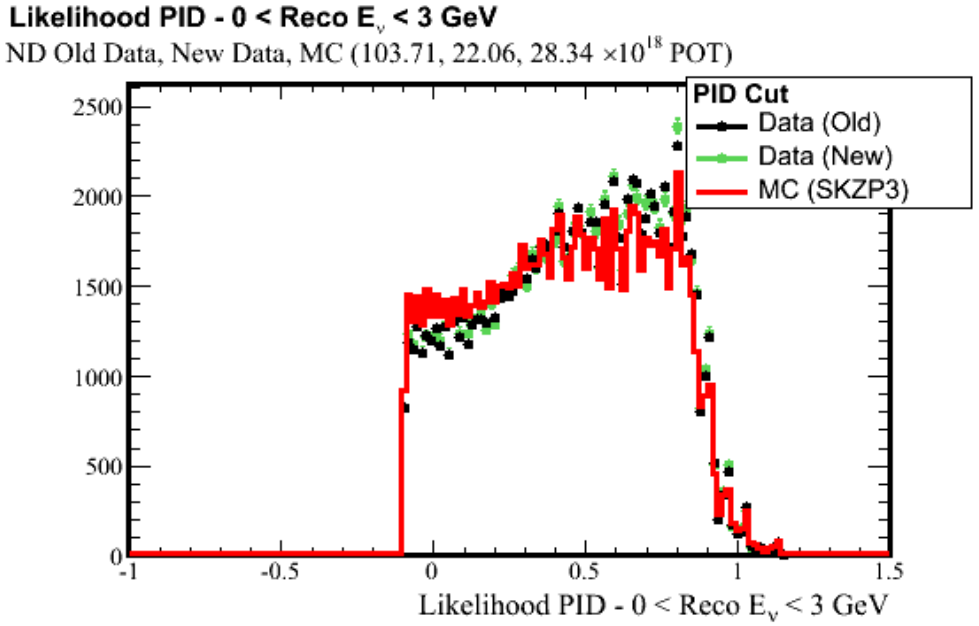

DP PID
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
DP PID

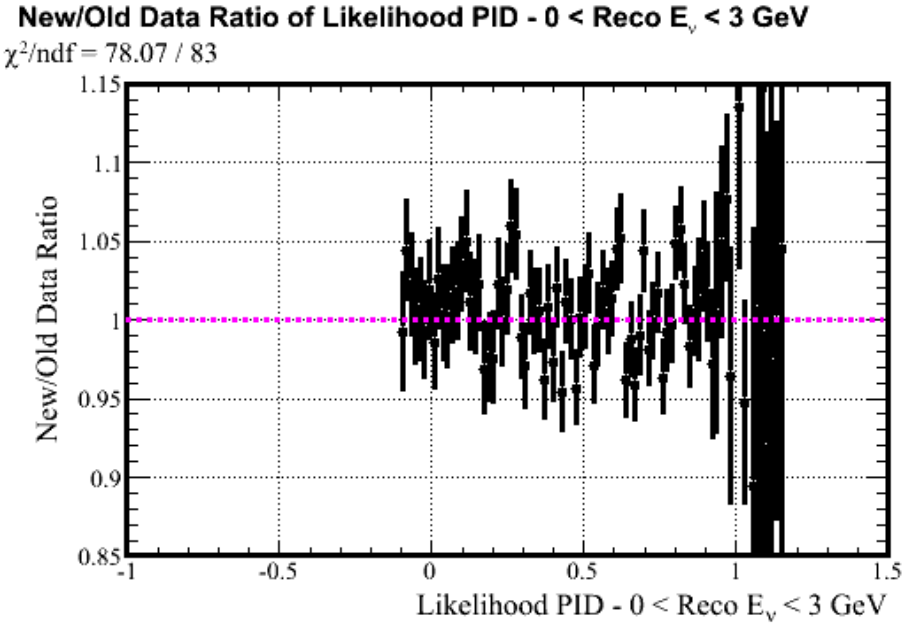

New/Old Data Ratio of DP PID
χ²/ndf = 104.95 / 83
New/Old Data Ratio
DP PID

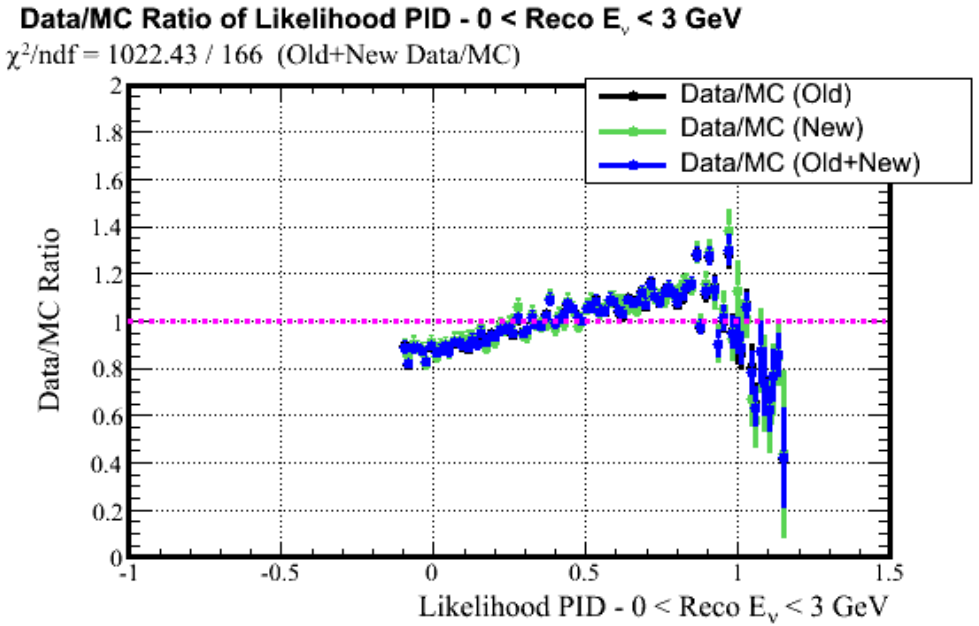

Data/MC Ratio of DP PID
χ²/ndf = 451.40 / 166 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
DP PID

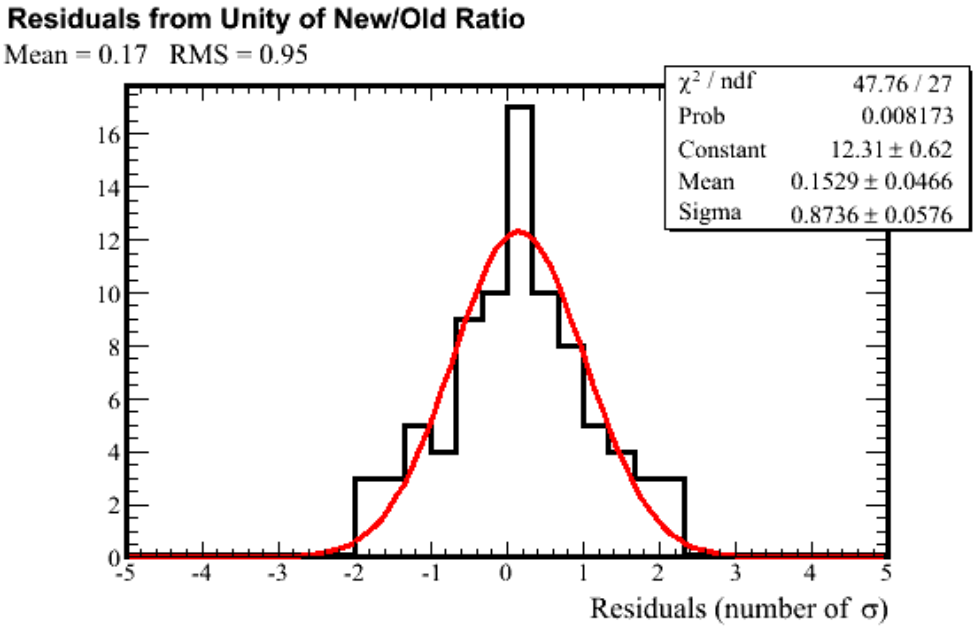

Residuals from Unity of New/Old Ratio
Mean = 0.45 RMS = 1.02
χ² / ndf 113.8 / 27
Prob 1.282e-12
Constant 12.08 ± 0.73
Mean 0.7012 ± 0.0513
Sigma 0.8399 ± 0.0768
Residuals (number of σ)

PID

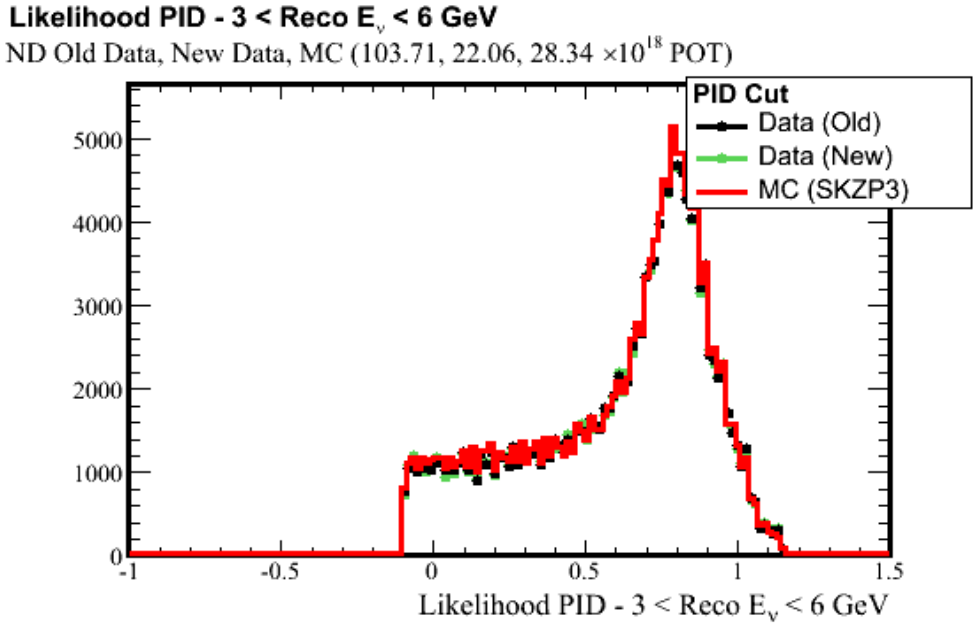

Likelihood PID - 0 < Reco E$_\nu$ < 3 GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^{18} POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Likelihood PID - 0 < Reco E$_\nu$ < 3 GeV

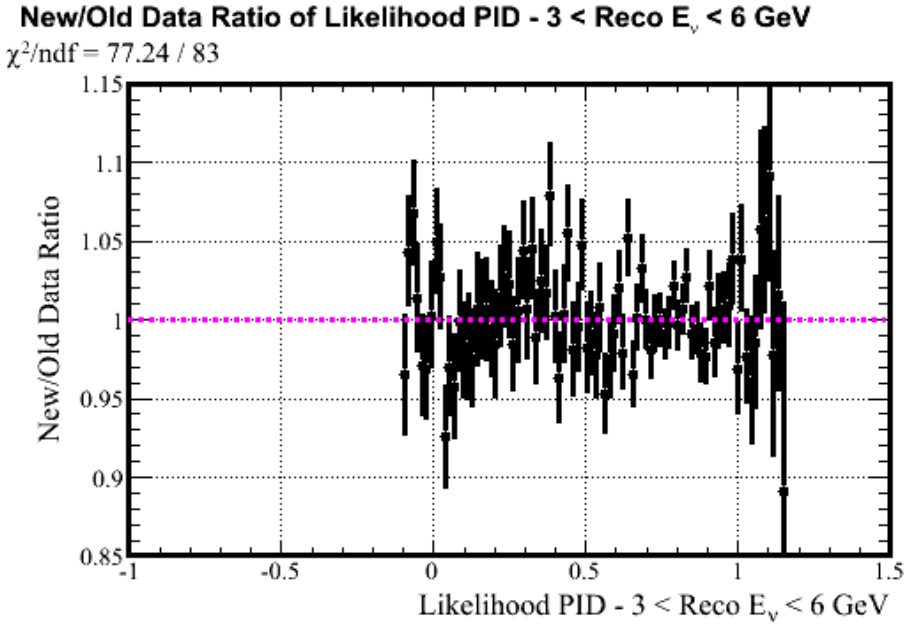

New/Old Data Ratio of Likelihood PID - 0 < Reco E$_\nu$ < 3 GeV
χ^2/ndf = 78.07 / 83
New/Old Data Ratio
Likelihood PID - 0 < Reco E$_\nu$ < 3 GeV

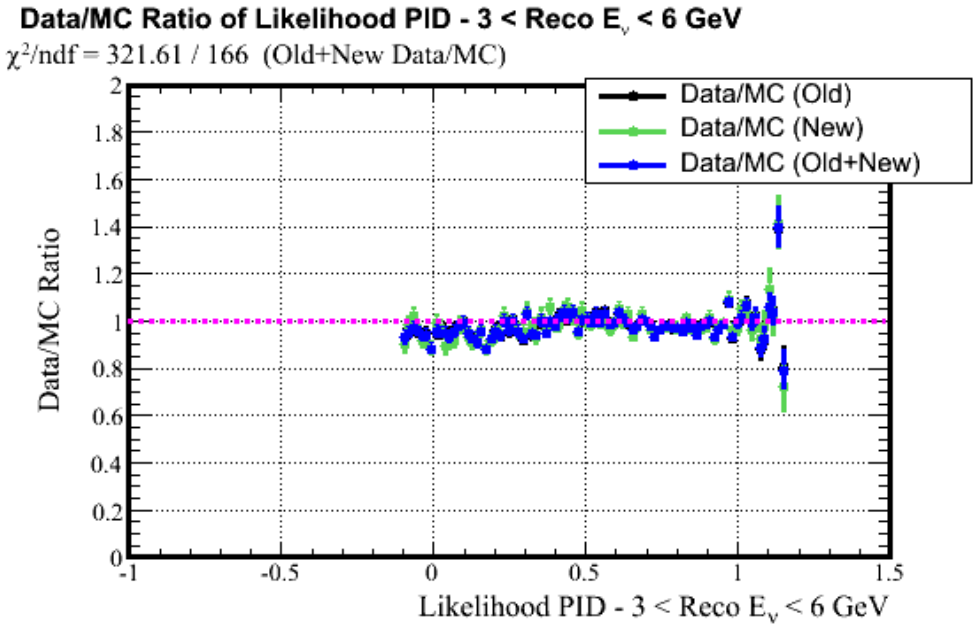

Data/MC Ratio of Likelihood PID - 0 < Reco E$_\nu$ < 3 GeV
χ^2/ndf = 1022.43 / 166 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Likelihood PID - 0 < Reco E$_\nu$ < 3 GeV

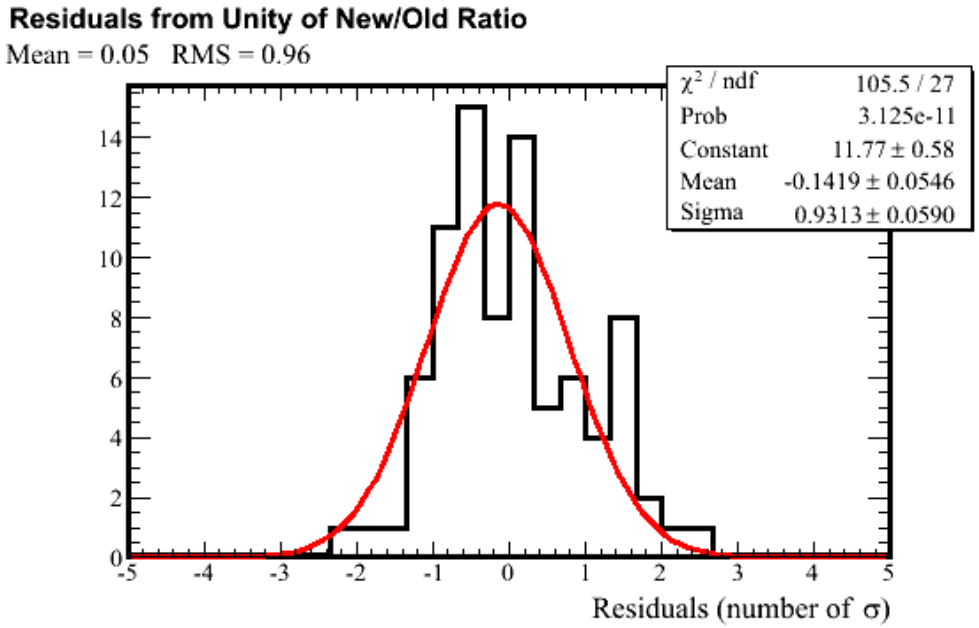

Residuals from Unity of New/Old Ratio
Mean = 0.17 RMS = 0.95
χ^2 / ndf 47.76 / 27
Prob 0.008173
Constant 12.31 ± 0.62
Mean 0.1529 ± 0.0466
Sigma 0.8736 ± 0.0576
Residuals (number of σ)

PID

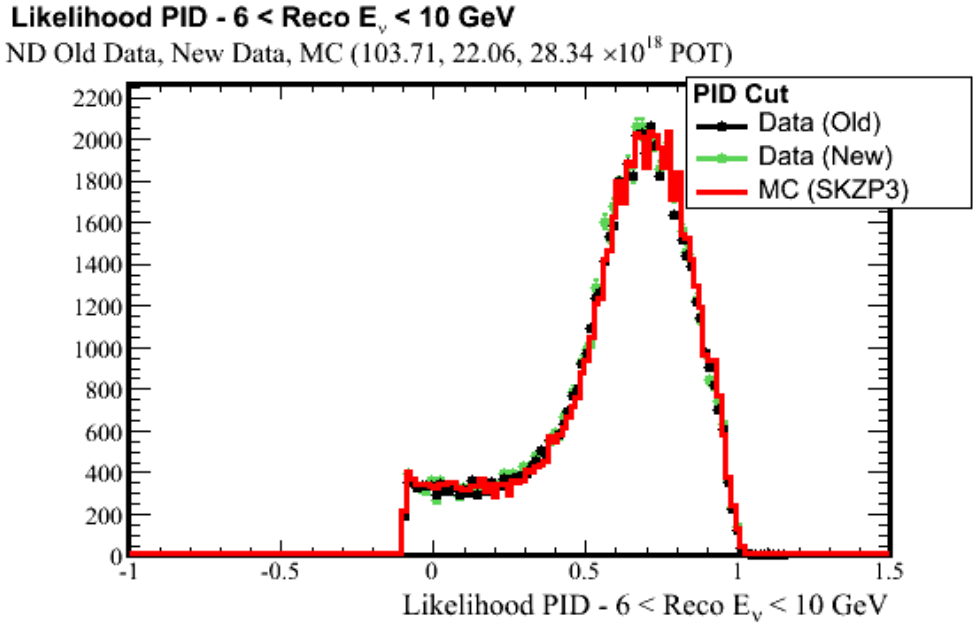

Likelihood PID - 3 < Reco E$_\nu$ < 6 GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^{18} POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Likelihood PID - 3 < Reco E$_\nu$ < 6 GeV

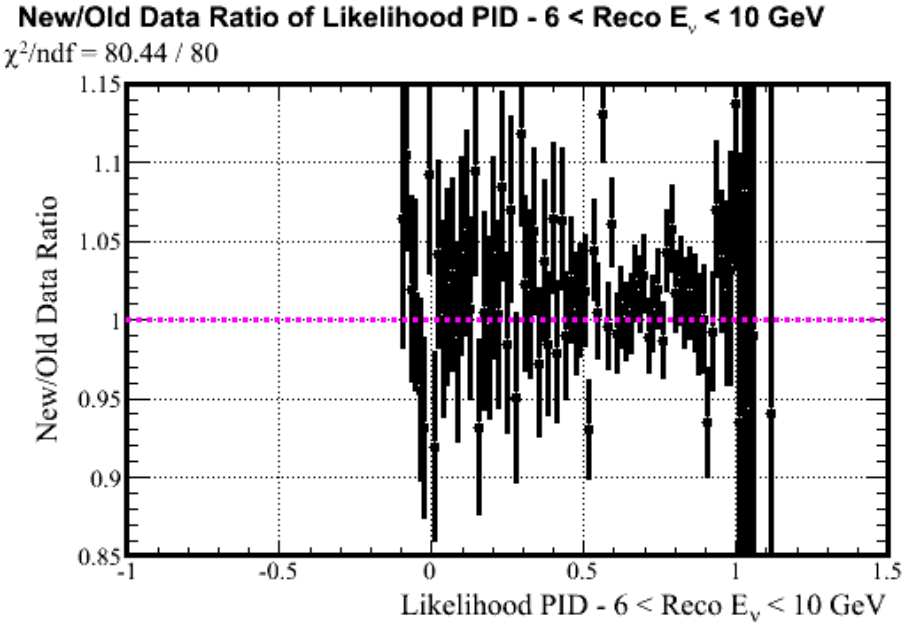

New/Old Data Ratio of Likelihood PID - 3 < Reco E$_\nu$ < 6 GeV
χ^2/ndf = 77.24 / 83
New/Old Data Ratio
Likelihood PID - 3 < Reco E$_\nu$ < 6 GeV

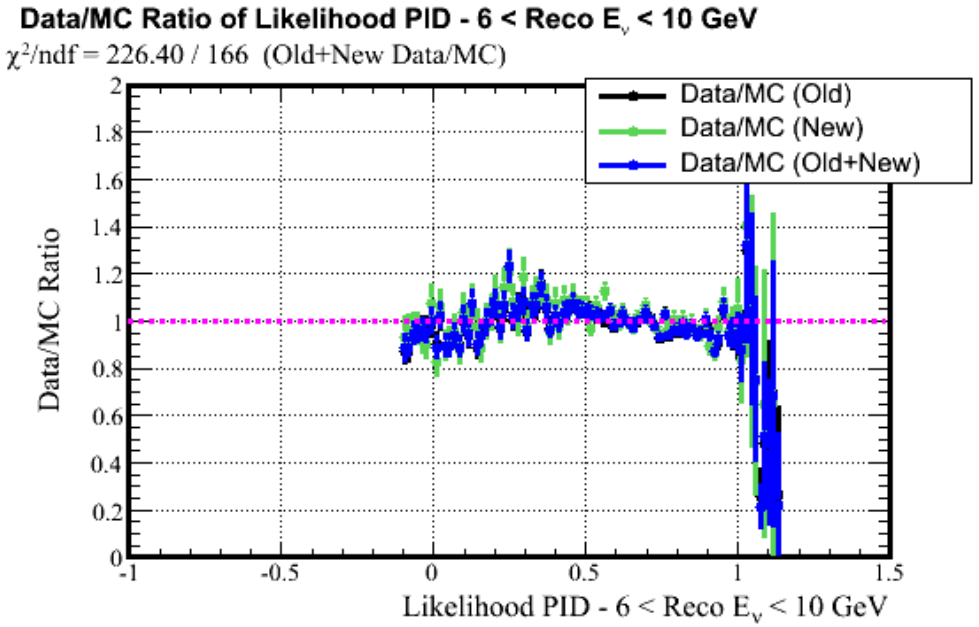

Data/MC Ratio of Likelihood PID - 3 < Reco E$_\nu$ < 6 GeV
χ^2/ndf = 321.61 / 166 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Likelihood PID - 3 < Reco E$_\nu$ < 6 GeV

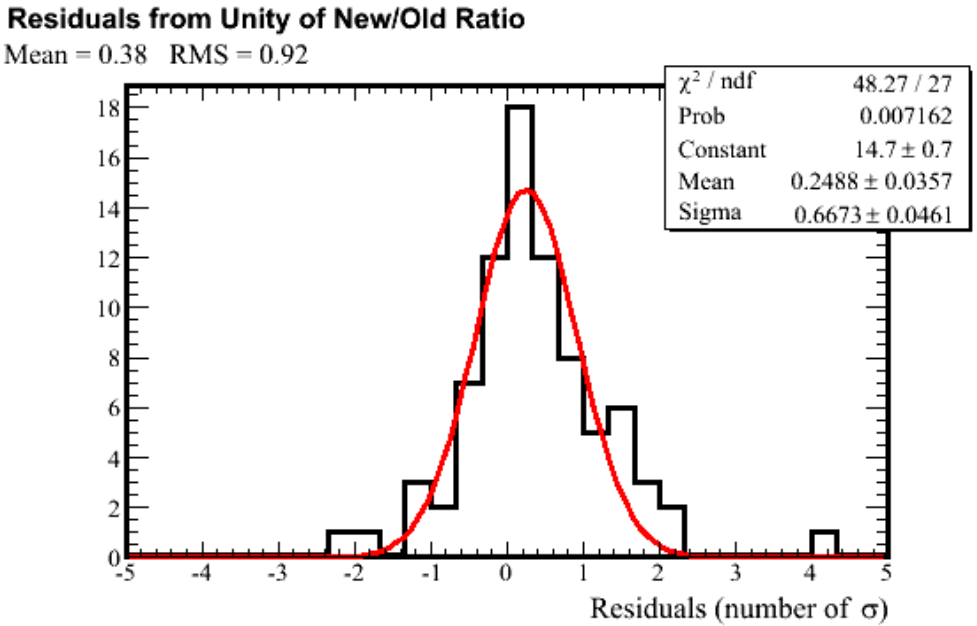

Residuals from Unity of New/Old Ratio
Mean = 0.05 RMS = 0.96
χ^2 / ndf 105.5 / 27
Prob 3.125e-11
Constant 11.77 ± 0.58
Mean -0.1419 ± 0.0546
Sigma 0.9313 ± 0.0590
Residuals (number of σ)

PID

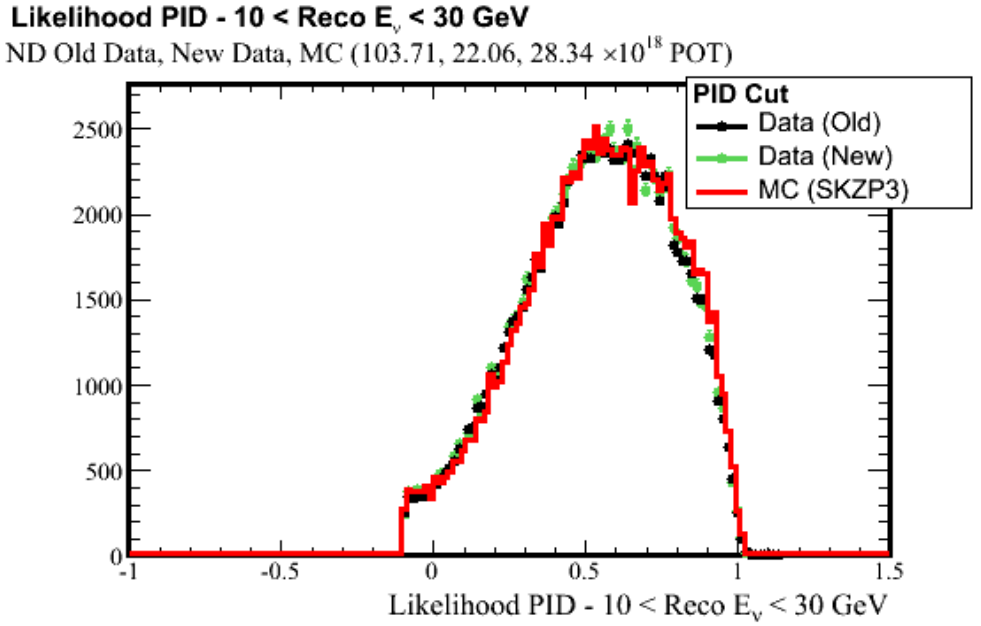

Likelihood PID - 6 < Reco E$_\nu$ < 10 GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^{18} POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Likelihood PID - 6 < Reco E$_\nu$ < 10 GeV

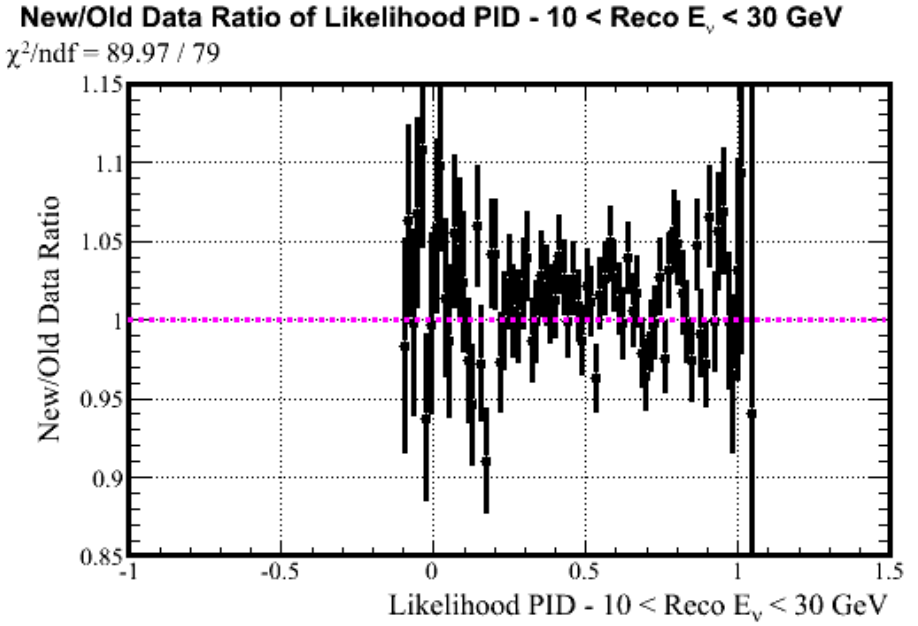

New/Old Data Ratio of Likelihood PID - 6 < Reco E$_\nu$ < 10 GeV
χ^2/ndf = 80.44 / 80
New/Old Data Ratio
Likelihood PID - 6 < Reco E$_\nu$ < 10 GeV

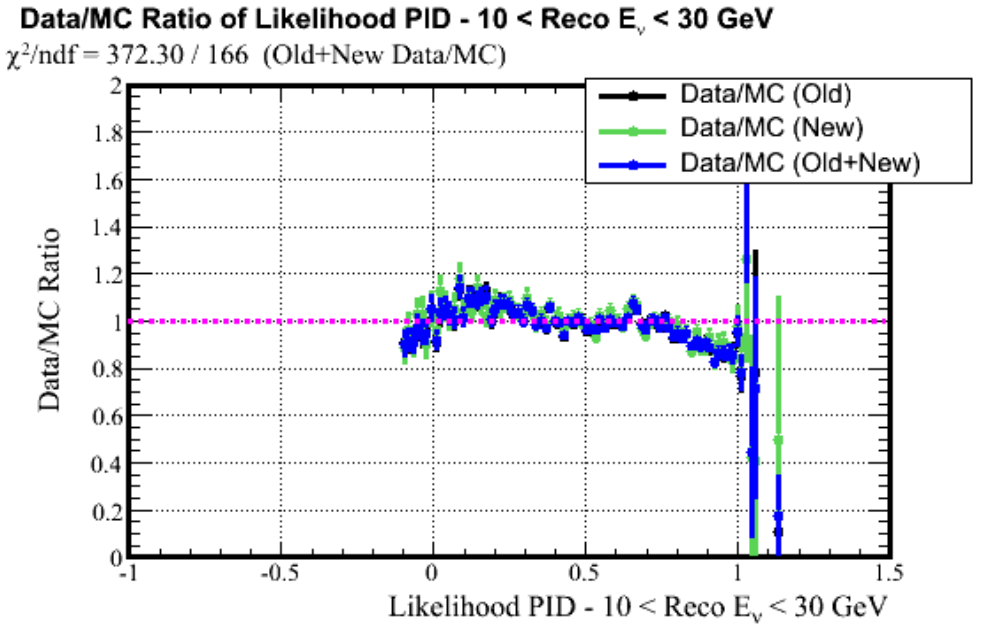

Data/MC Ratio of Likelihood PID - 6 < Reco E$_\nu$ < 10 GeV
χ^2/ndf = 226.40 / 166 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Likelihood PID - 6 < Reco E$_\nu$ < 10 GeV

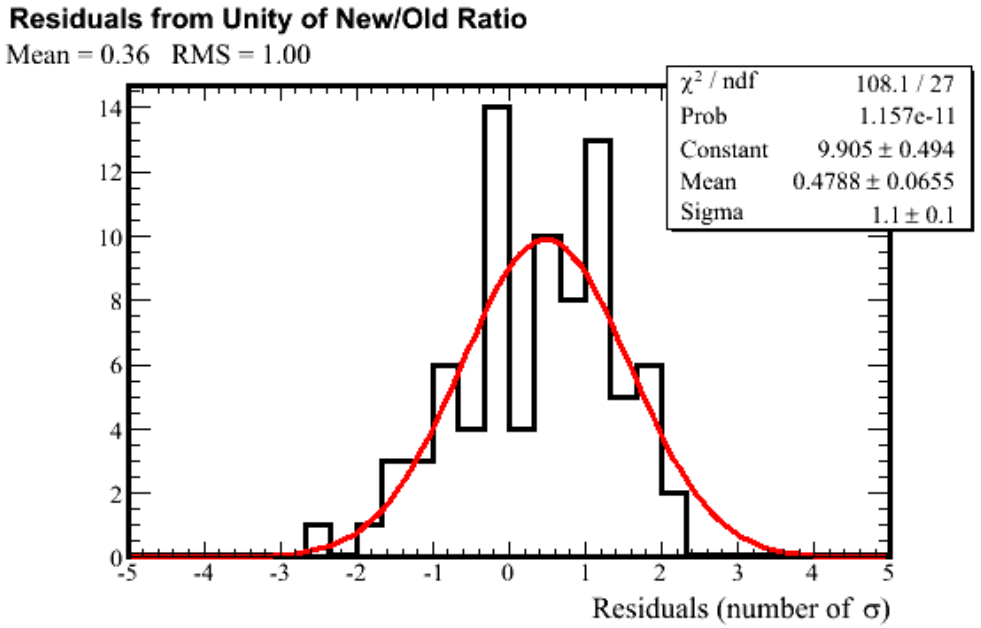

Residuals from Unity of New/Old Ratio
Mean = 0.38 RMS = 0.92
χ^2 / ndf 48.27 / 27
Prob 0.007162
Constant 14.7 ± 0.7
Mean 0.2488 ± 0.0357
Sigma 0.6673 ± 0.0461
Residuals (number of σ)

PID

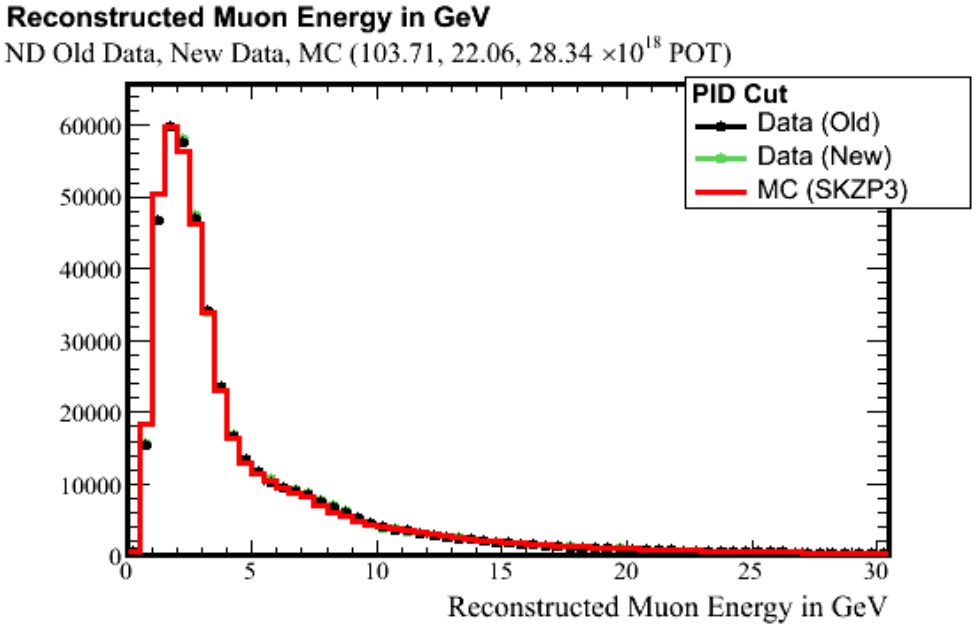

Likelihood PID - 10 < Reco E$_\nu$ < 30 GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^{18} POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Likelihood PID - 10 < Reco E$_\nu$ < 30 GeV

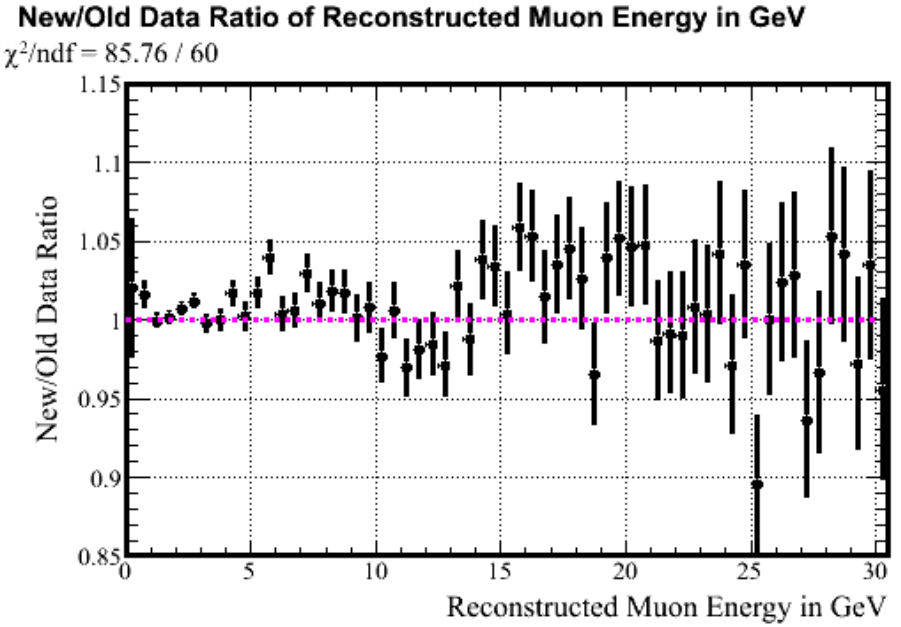

New/Old Data Ratio of Likelihood PID - 10 < Reco E$_\nu$ < 30 GeV
χ^2/ndf = 89.97 / 79
New/Old Data Ratio
Likelihood PID - 10 < Reco E$_\nu$ < 30 GeV

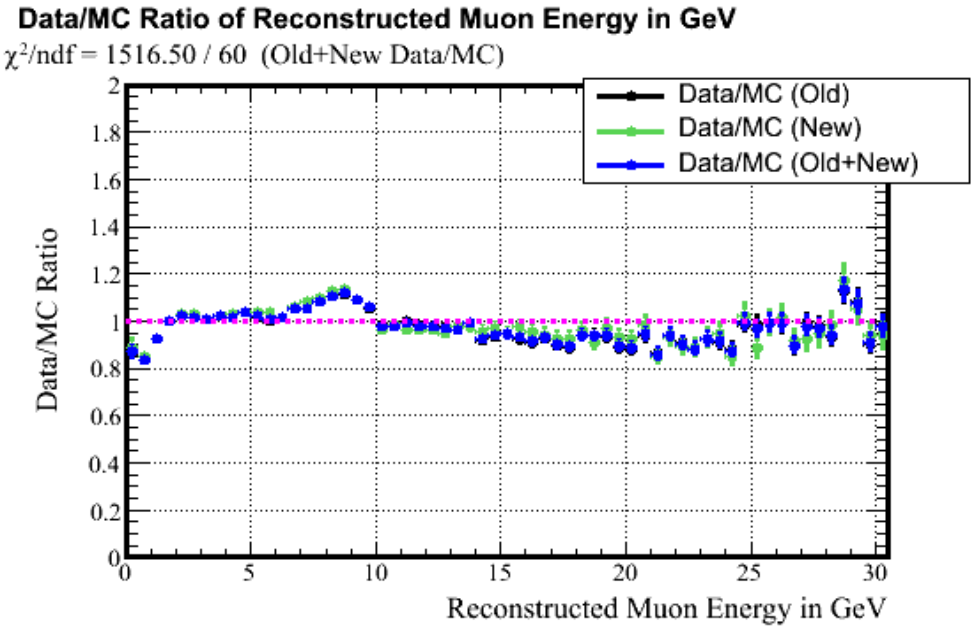

Data/MC Ratio of Likelihood PID - 10 < Reco E$_\nu$ < 30 GeV
χ^2/ndf = 372.30 / 166 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Likelihood PID - 10 < Reco E$_\nu$ < 30 GeV

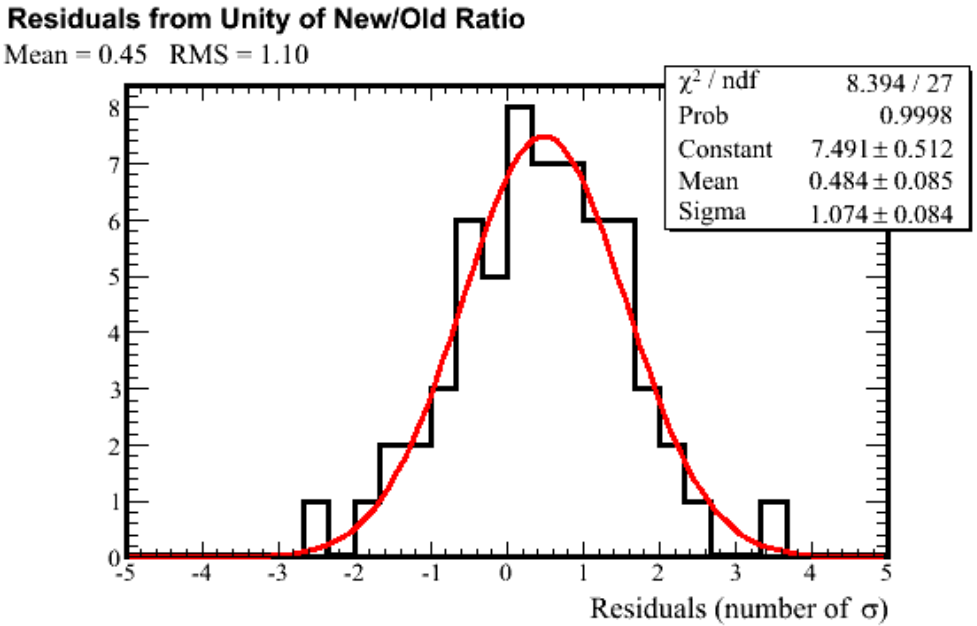

Residuals from Unity of New/Old Ratio
Mean = 0.36 RMS = 1.00
χ^2 / ndf 108.1 / 27
Prob 1.157e-11
Constant 9.905 ± 0.494
Mean 0.4788 ± 0.0655
Sigma 1.1 ± 0.1
Residuals (number of σ)

PID

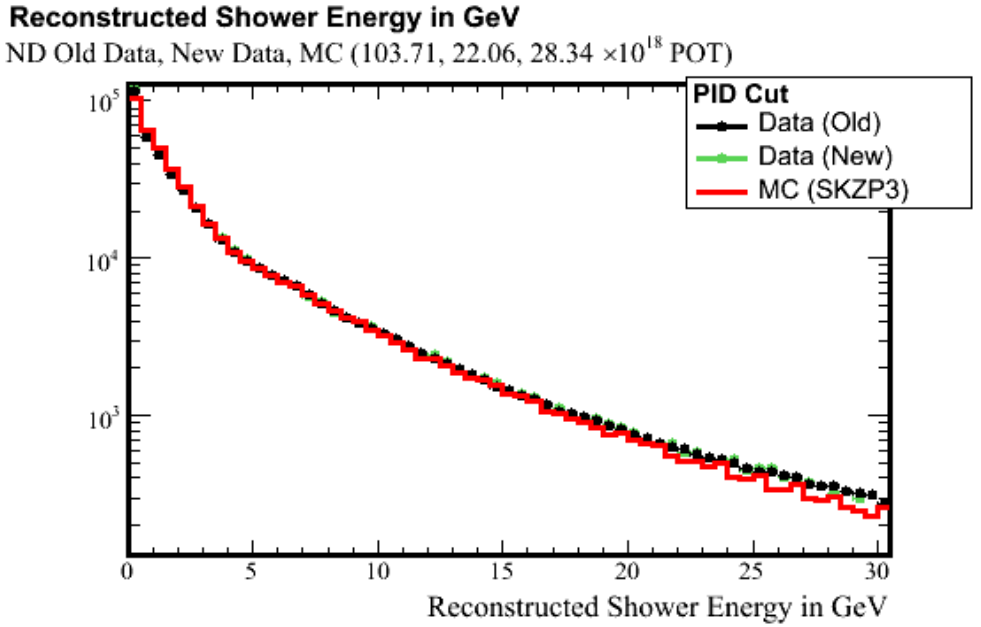

Reconstructed Muon Energy in GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Reconstructed Muon Energy in GeV

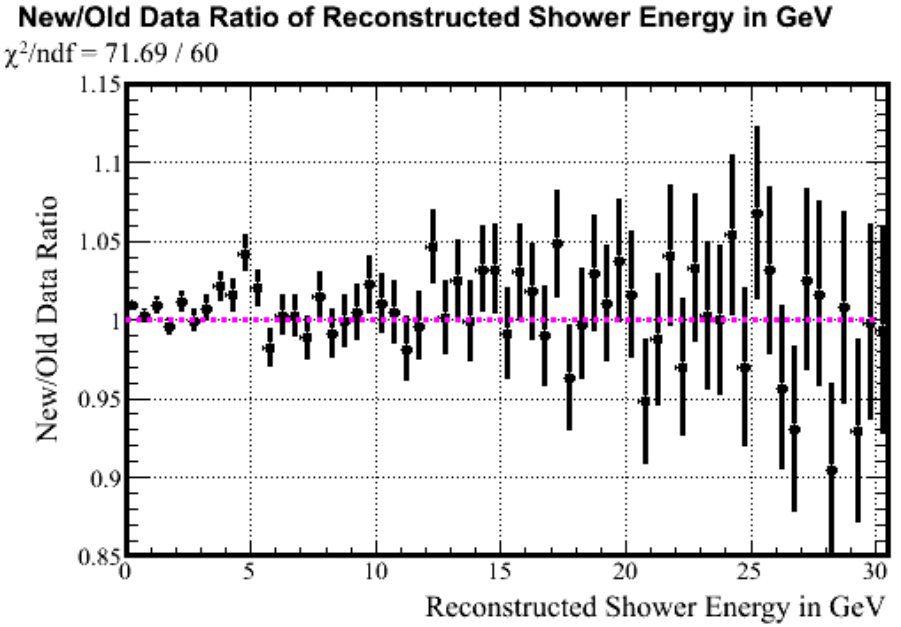

New/Old Data Ratio of Reconstructed Muon Energy in GeV
χ²/ndf = 85.76 / 60
New/Old Data Ratio
Reconstructed Muon Energy in GeV

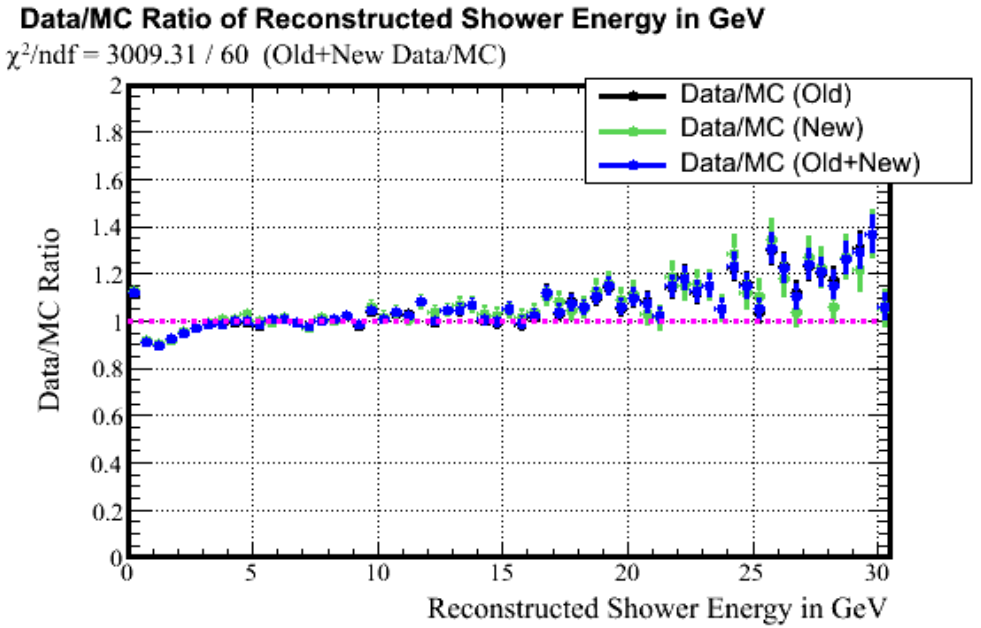

Data/MC Ratio of Reconstructed Muon Energy in GeV
χ²/ndf = 1516.50 / 60 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Reconstructed Muon Energy in GeV

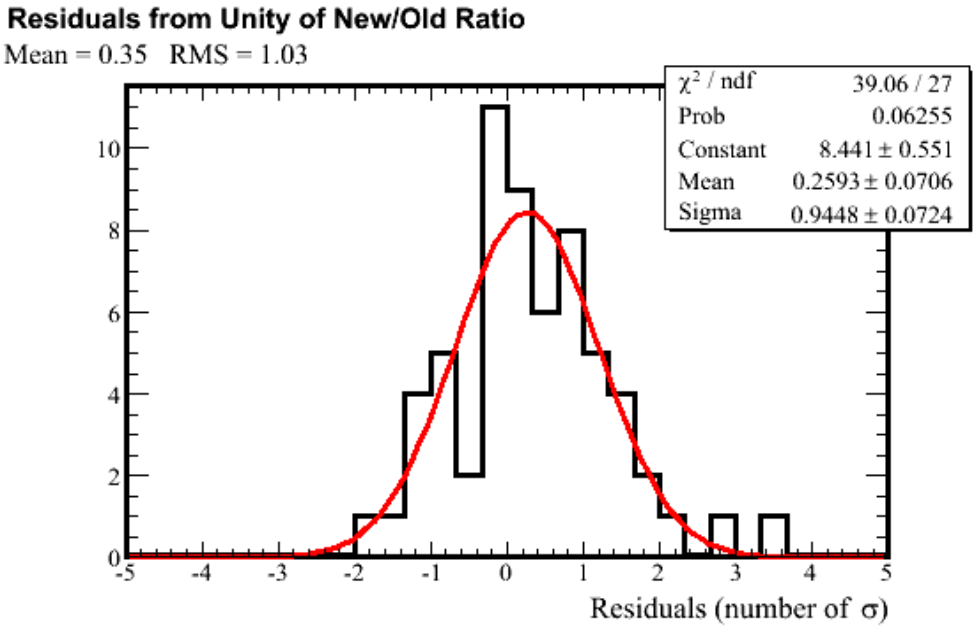

Residuals from Unity of New/Old Ratio
Mean = 0.45 RMS = 1.10
χ² / ndf 8.394 / 27
Prob 0.9998
Constant 7.491 ± 0.512
Mean 0.484 ± 0.085
Sigma 1.074 ± 0.084
Residuals (number of σ)

PID

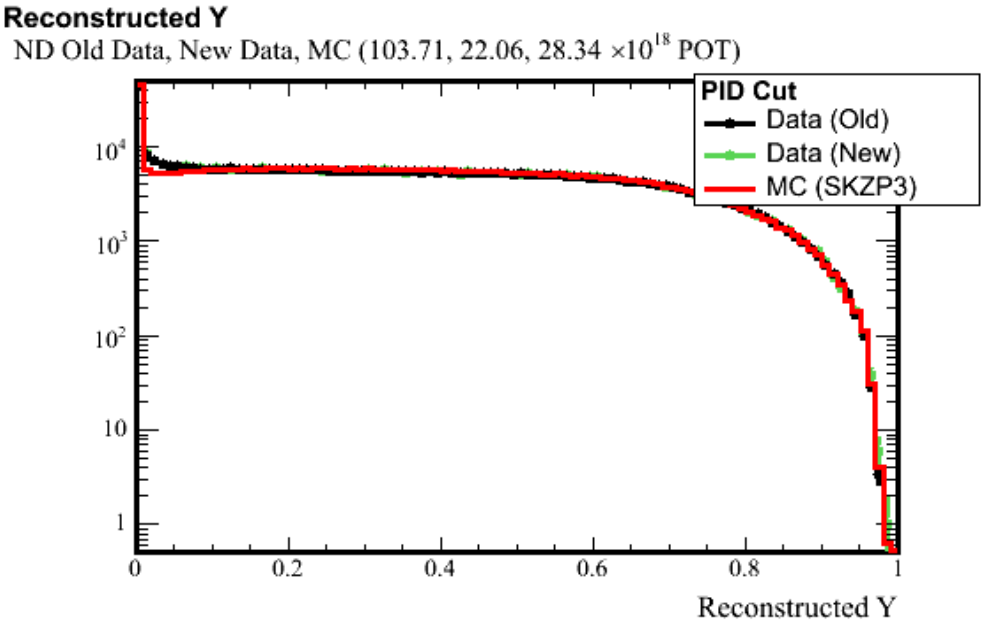

Reconstructed Shower Energy in GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Reconstructed Shower Energy in GeV

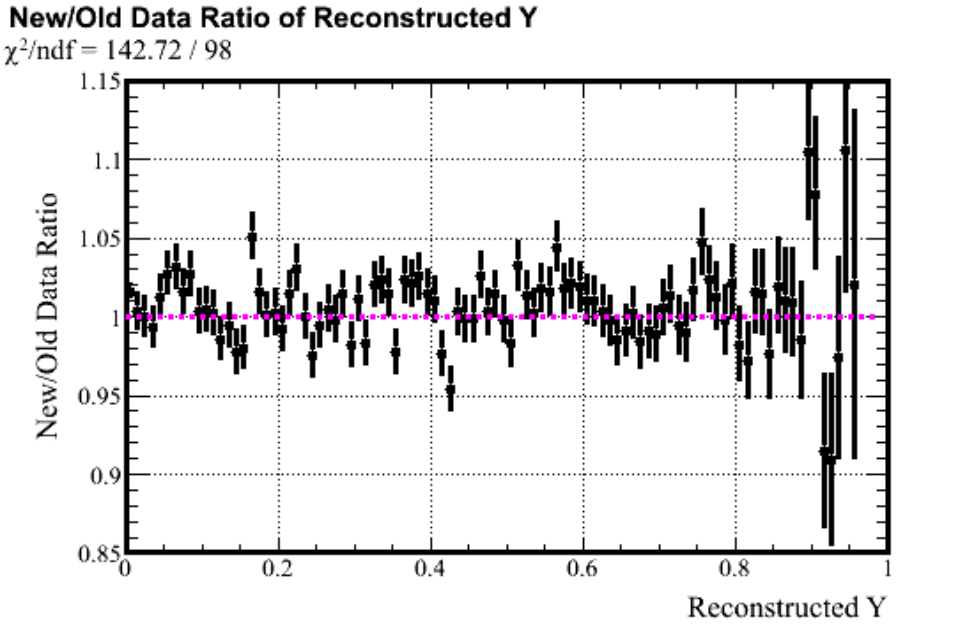

New/Old Data Ratio of Reconstructed Shower Energy in GeV
χ²/ndf = 71.69 / 60
New/Old Data Ratio
Reconstructed Shower Energy in GeV

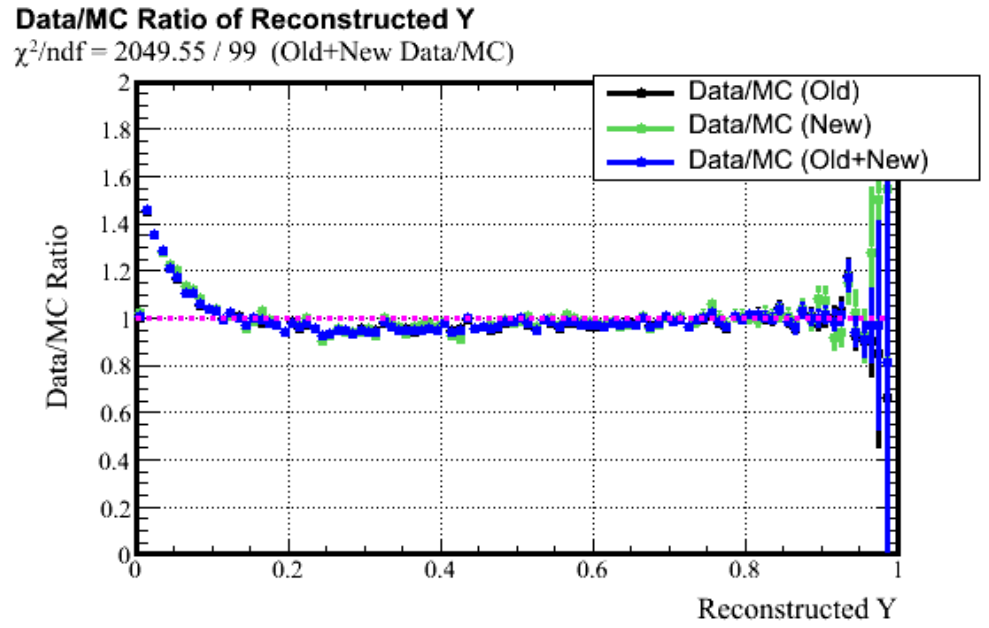

Data/MC Ratio of Reconstructed Shower Energy in GeV
χ²/ndf = 3009.31 / 60 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Reconstructed Shower Energy in GeV

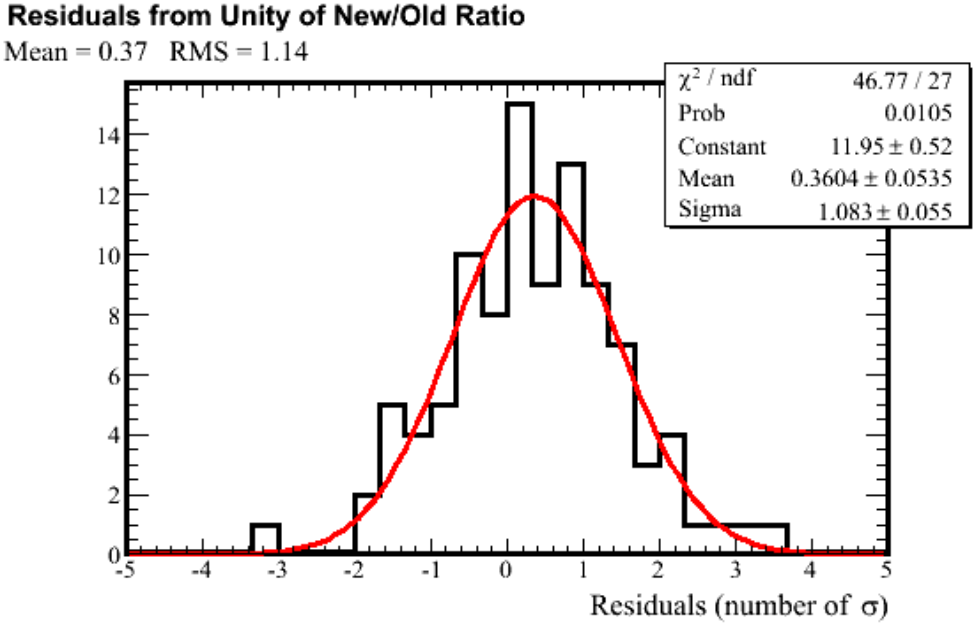

Residuals from Unity of New/Old Ratio
Mean = 0.35 RMS = 1.03
χ² / ndf 39.06 / 27
Prob 0.06255
Constant 8.441 ± 0.551
Mean 0.2593 ± 0.0706
Sigma 0.9448 ± 0.0724
Residuals (number of σ)

PID

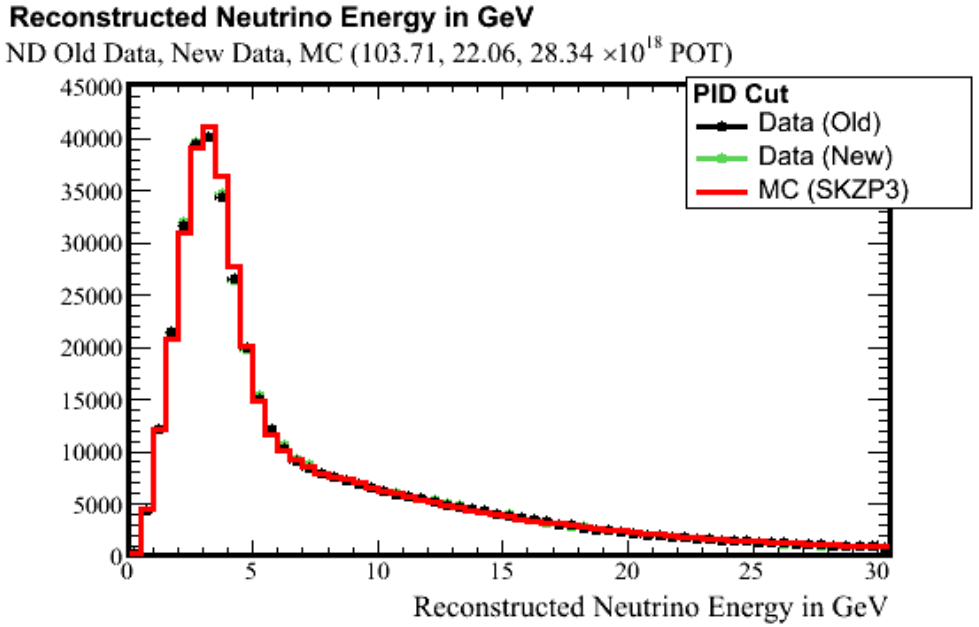

Reconstructed Y
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Reconstructed Y

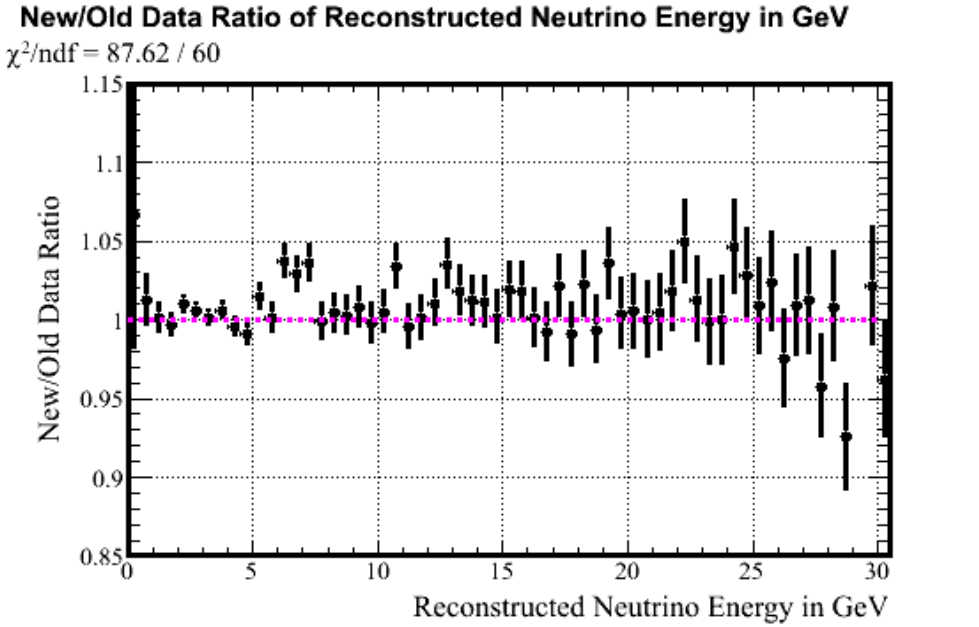

New/Old Data Ratio of Reconstructed Y
χ²/ndf = 142.72 / 98
New/Old Data Ratio
Reconstructed Y

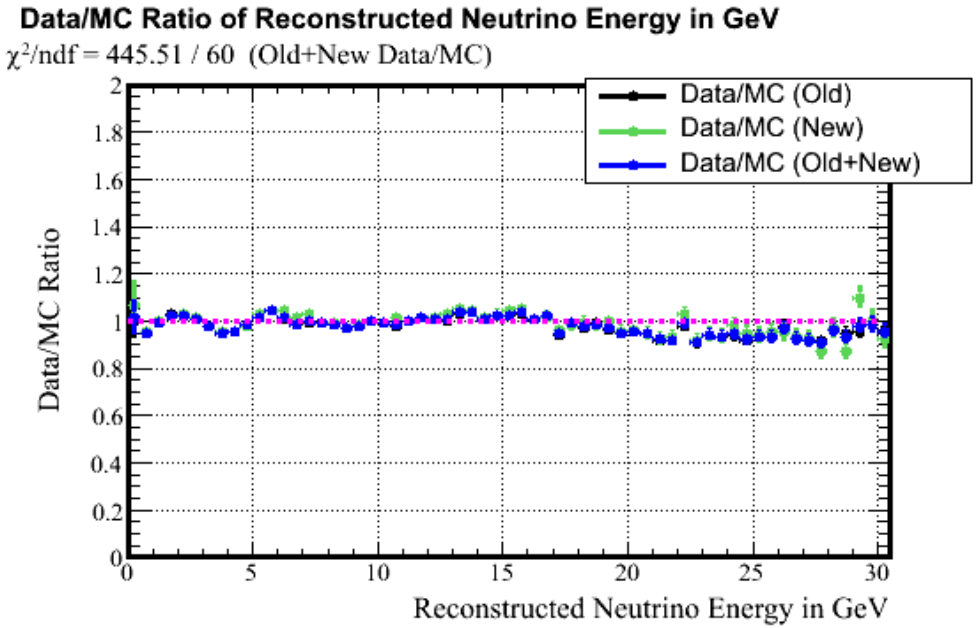

Data/MC Ratio of Reconstructed Y
χ²/ndf = 2049.55 / 99 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Reconstructed Y

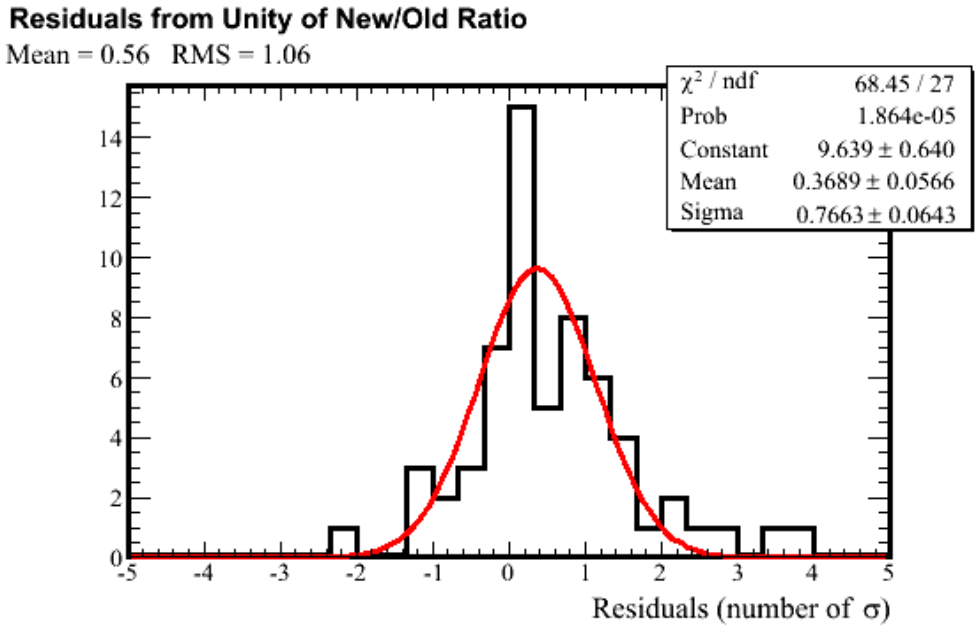

Residuals from Unity of New/Old Ratio
Mean = 0.37 RMS = 1.14
χ² / ndf 46.77 / 27
Prob 0.0105
Constant 11.95 ± 0.52
Mean 0.3604 ± 0.0535
Sigma 1.083 ± 0.055
Residuals (number of σ)

PID


Reconstructed Neutrino Energy in GeV
ND Old Data, New Data, MC (103.71, 22.06, 28.34 ×10^18 POT)
PID Cut
Data (Old)
Data (New)
MC (SKZP3)
Reconstructed Neutrino Energy in GeV


New/Old Data Ratio of Reconstructed Neutrino Energy in GeV
χ²/ndf = 87.62 / 60
New/Old Data Ratio
Reconstructed Neutrino Energy in GeV


Data/MC Ratio of Reconstructed Neutrino Energy in GeV
χ²/ndf = 445.51 / 60 (Old+New Data/MC)
Data/MC (Old)
Data/MC (New)
Data/MC (Old+New)
Data/MC Ratio
Reconstructed Neutrino Energy in GeV


Residuals from Unity of New/Old Ratio
Mean = 0.56 RMS = 1.06
χ² / ndf 68.45 / 27
Prob 1.864e-05
Constant 9.639 ± 0.640
Mean 0.3689 ± 0.0566
Sigma 0.7663 ± 0.0643
Residuals (number of σ)