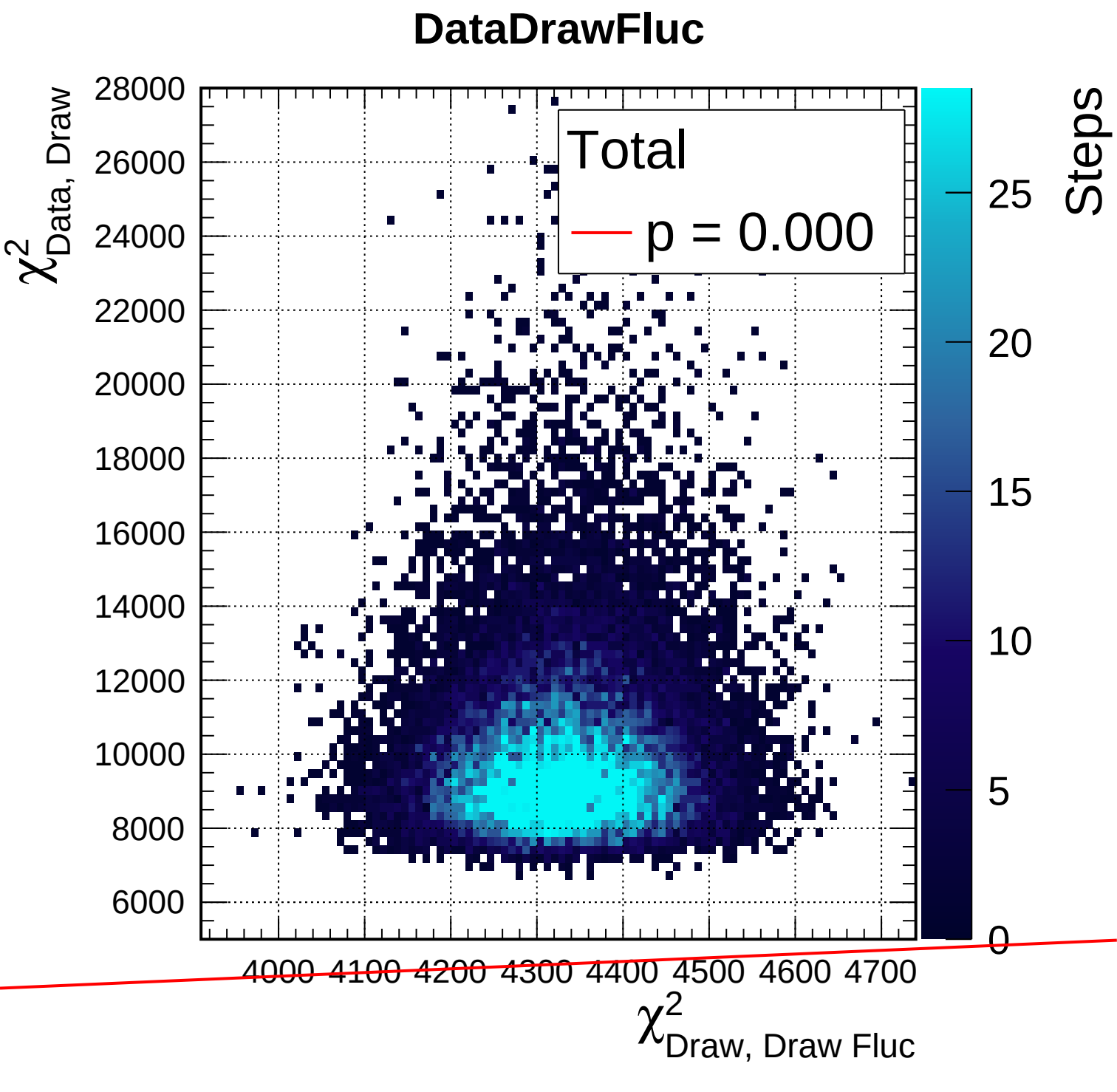
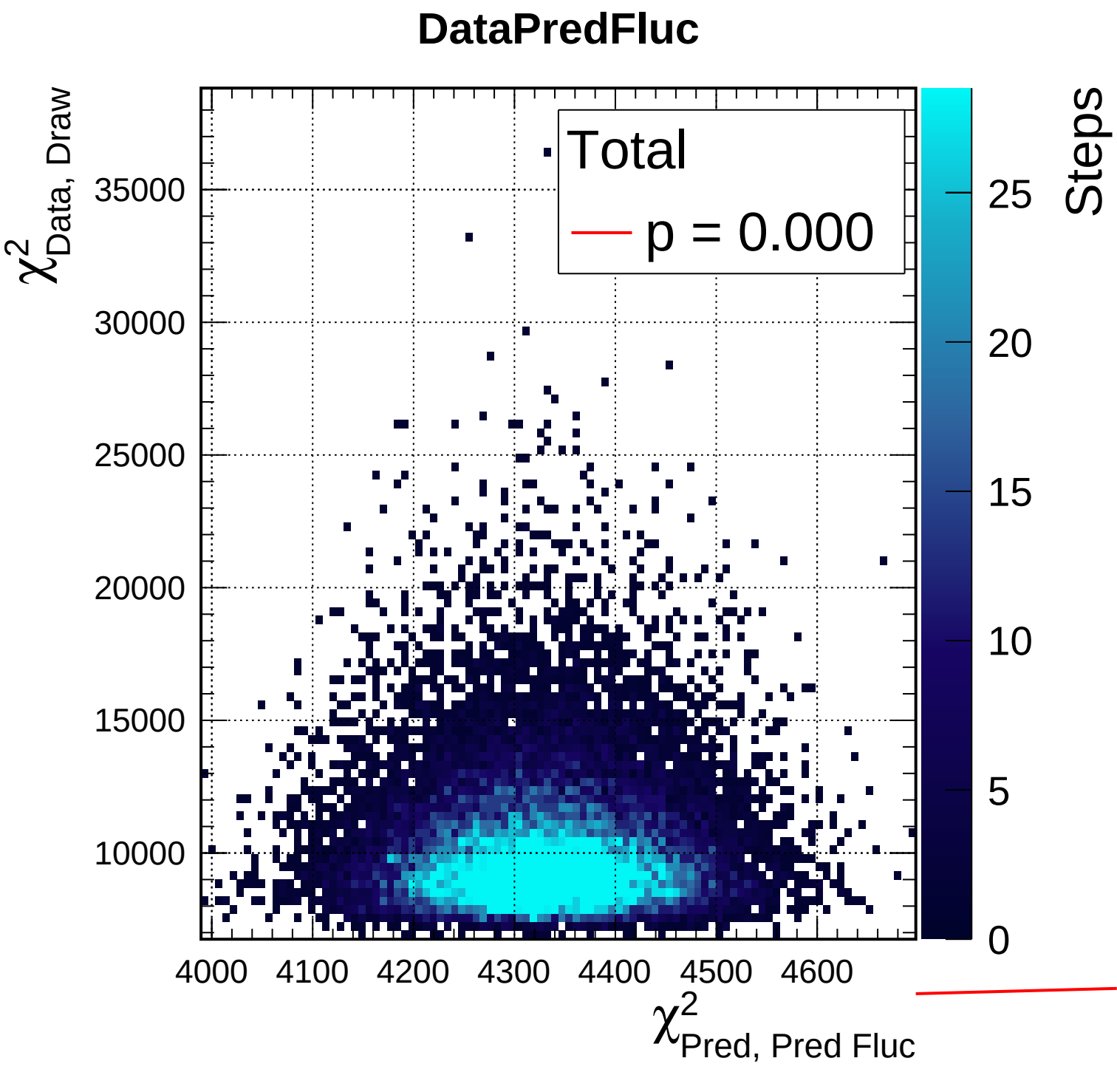
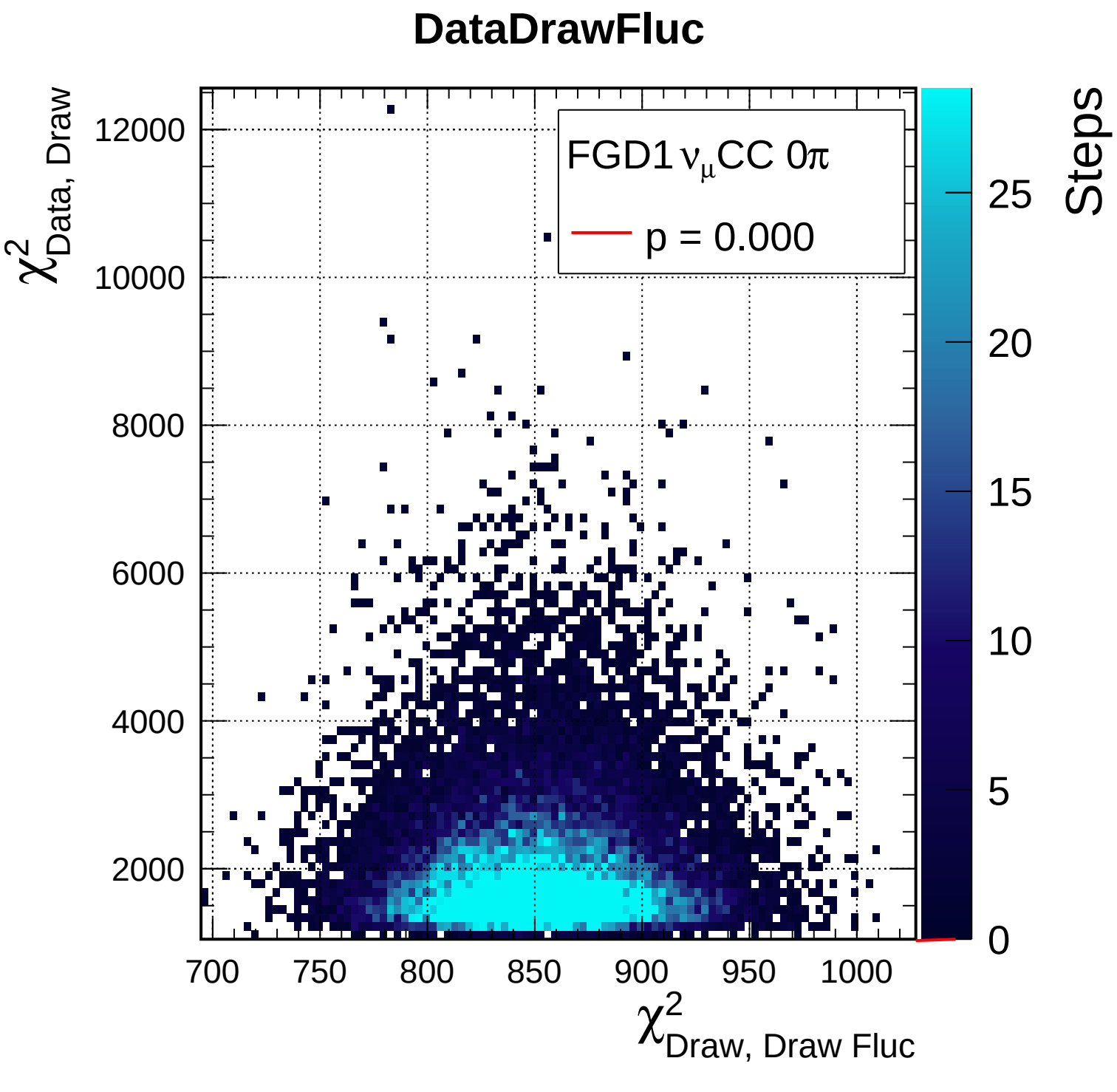
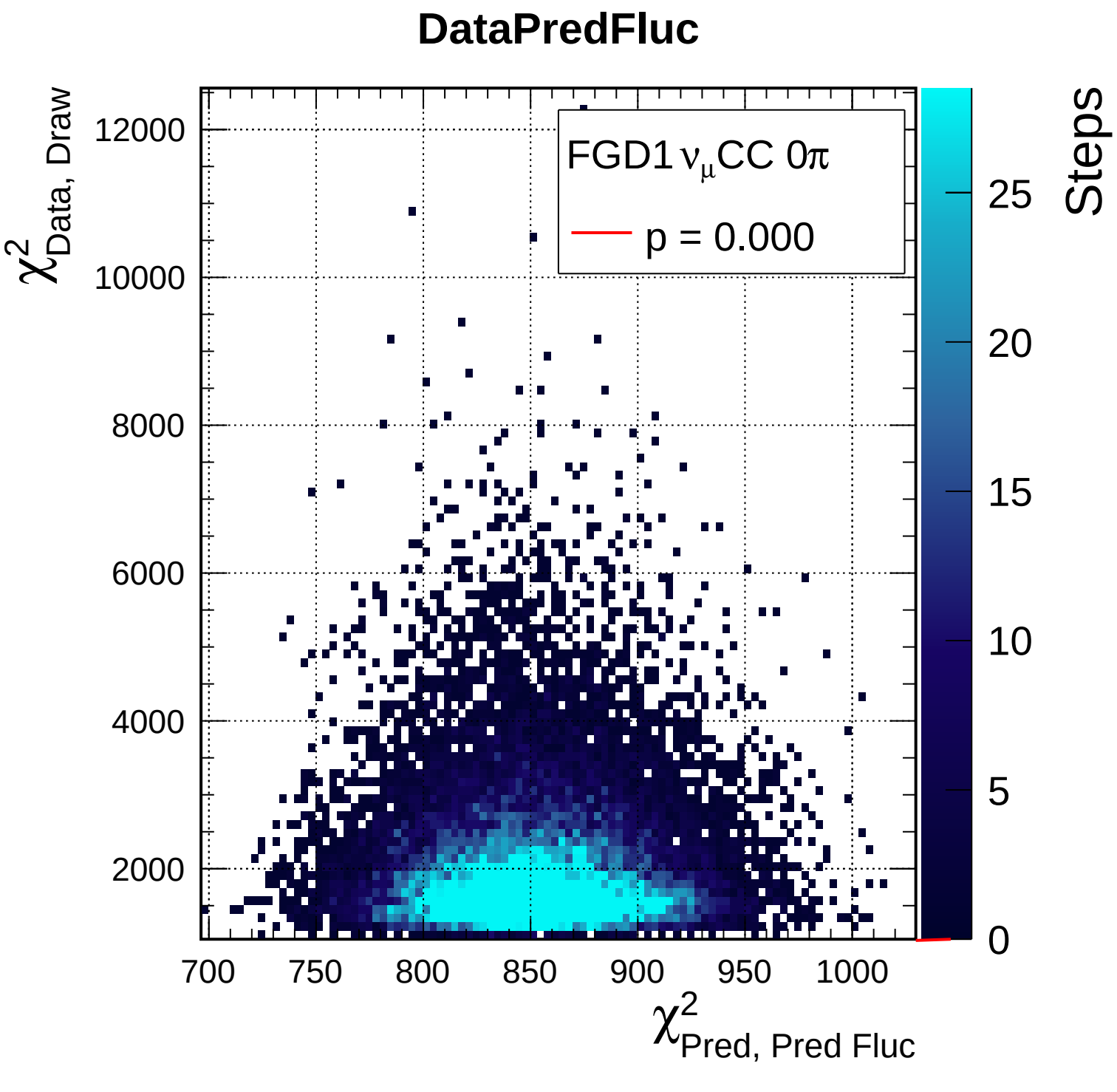
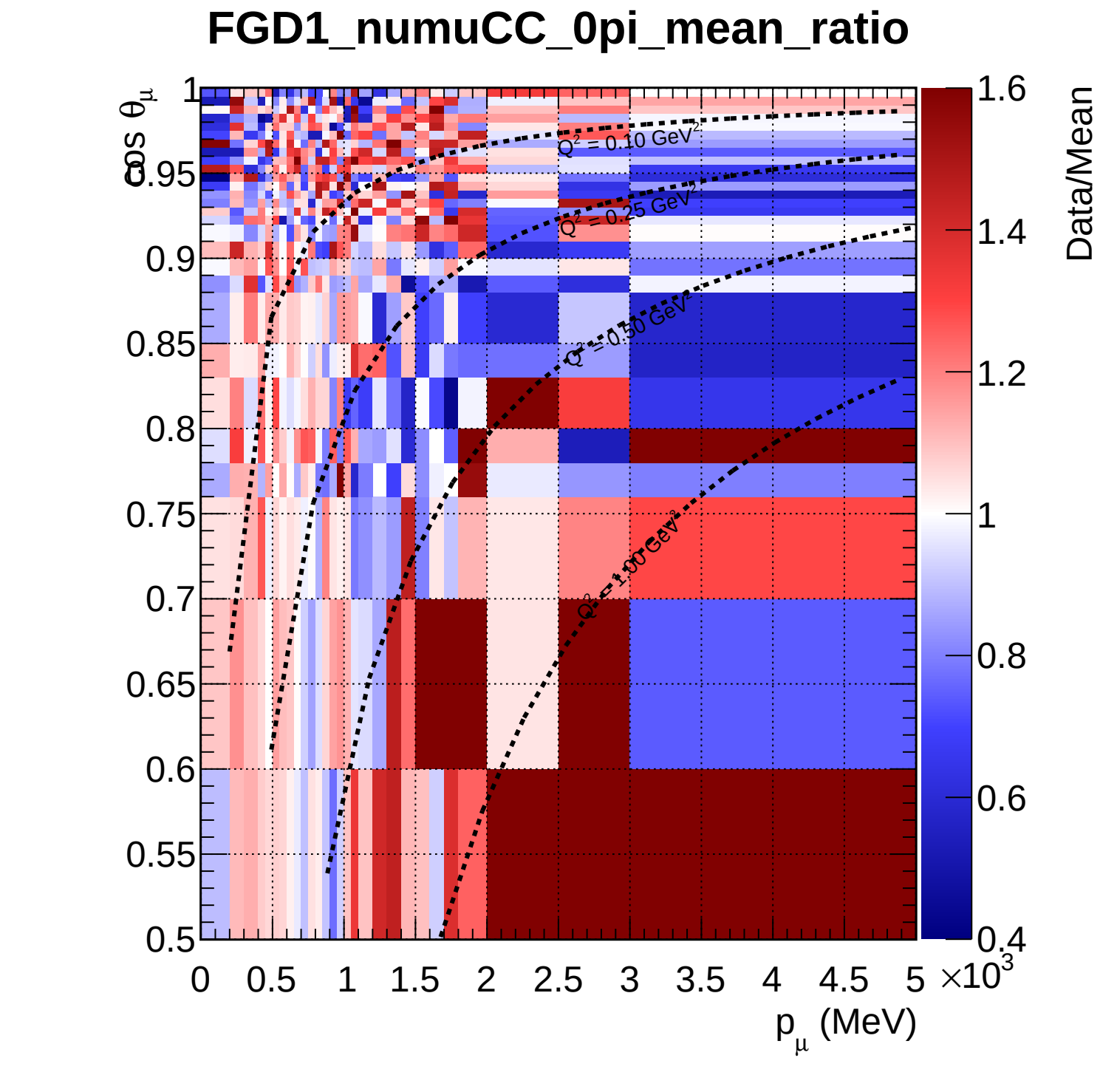
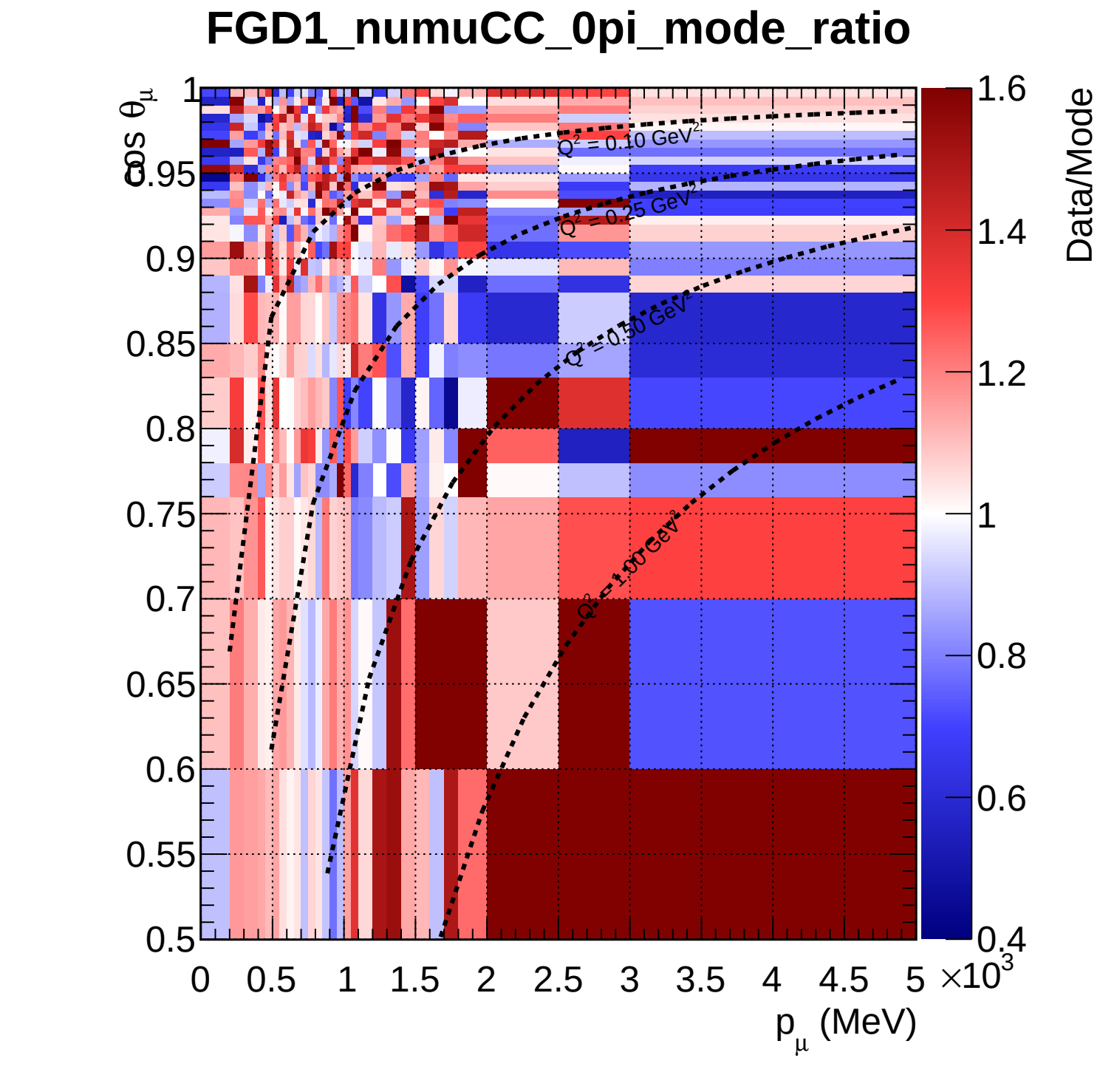

DataDrawFluc
Total
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Draw, Draw Fluc}}$
Steps
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
4100
4200
4300
4400
4500
4600
4700
25
20
15
10
5
0

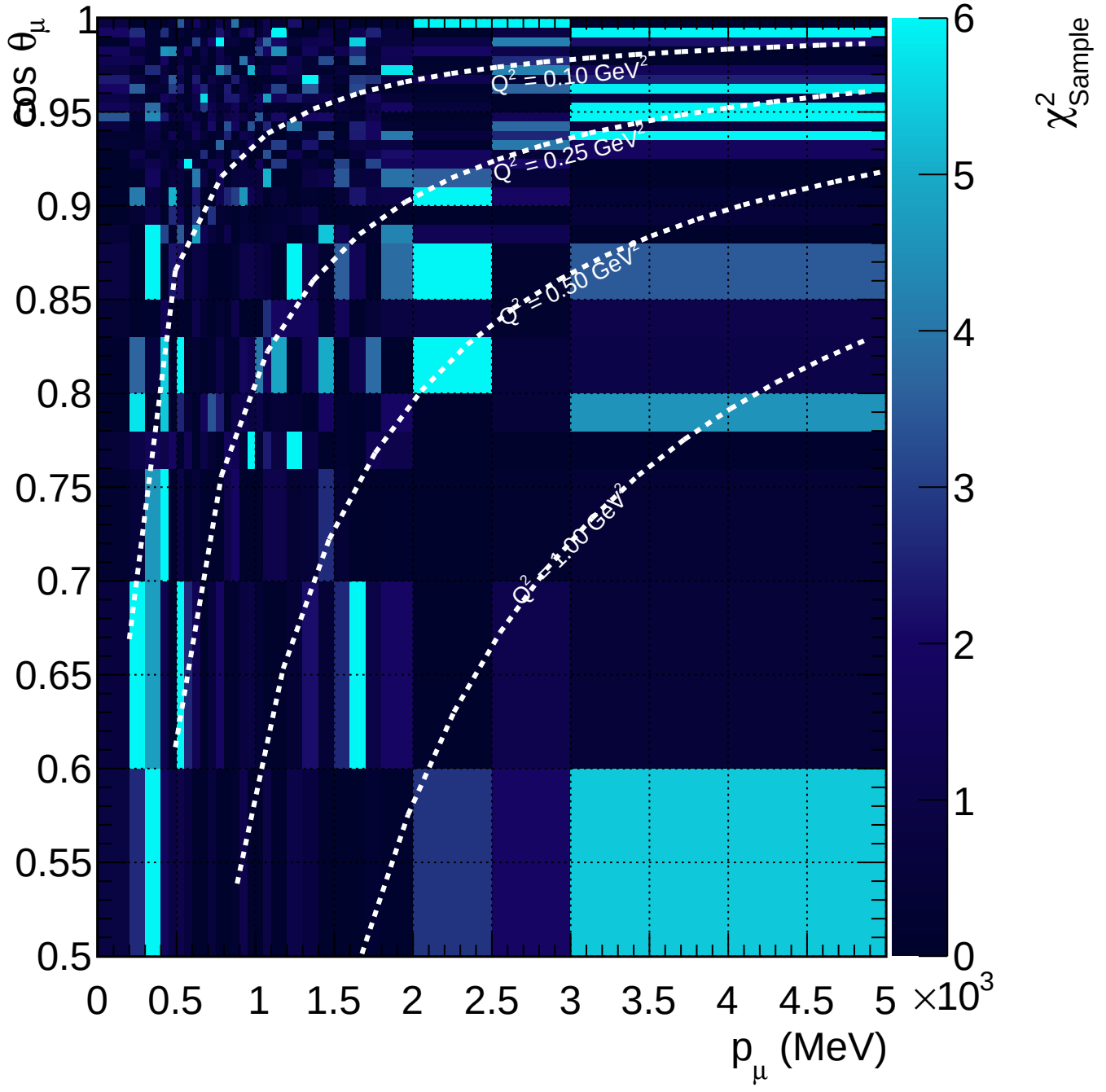

DataPredFluc
Total
p = 0.000
$\chi^2_{\text{Data, Draw}}$
35000
30000
25000
20000
15000
10000
4000
4100
4200
4300
4400
4500
4600
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
25
20
15
10
5
0

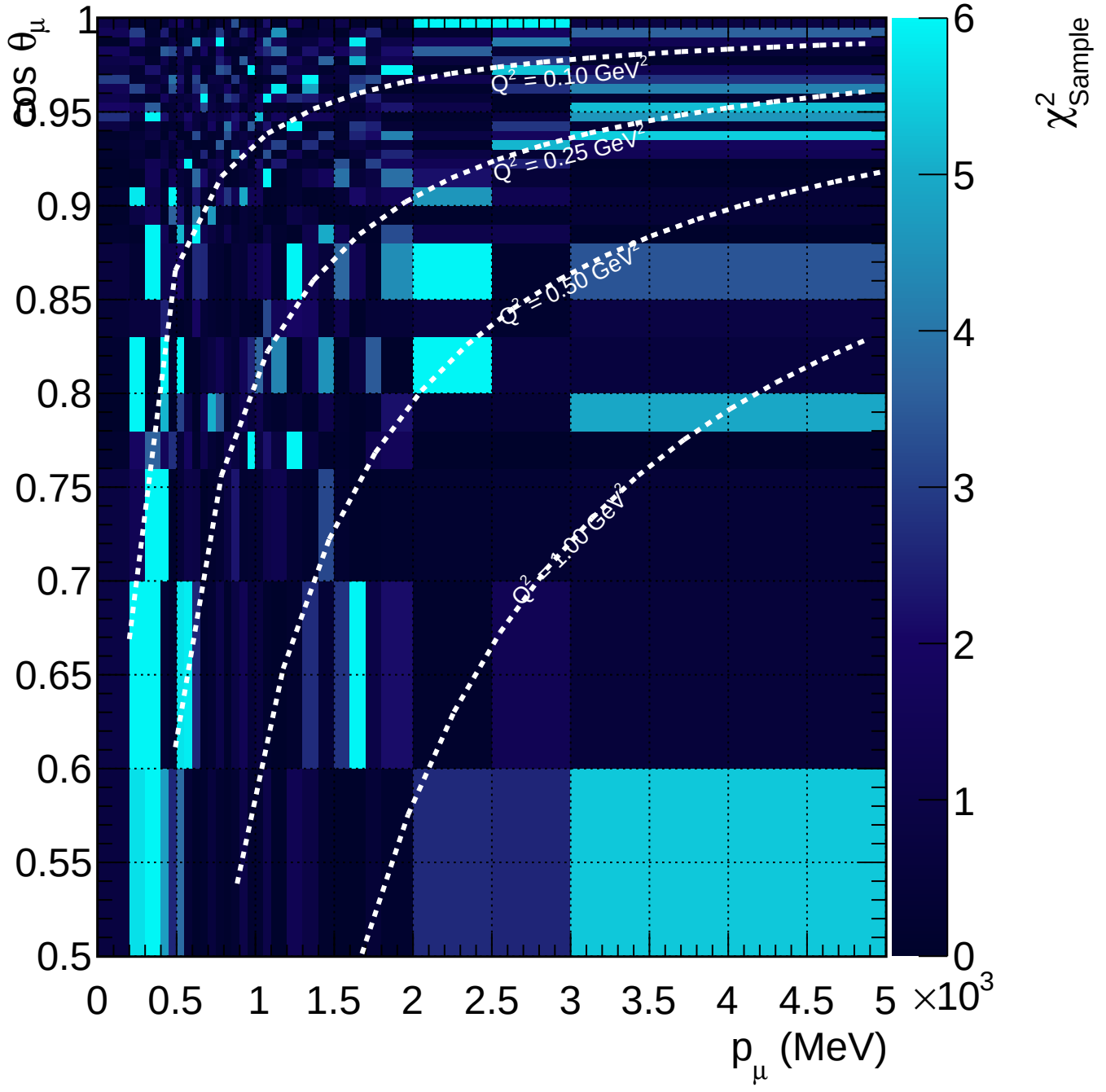

DataDrawFluc
FGD1 ν_μCC 0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Draw, Draw Fluc}}$
Steps
12000
10000
8000
6000
4000
2000
700
750
800
850
900
950
1000
25
20
15
10
5
0

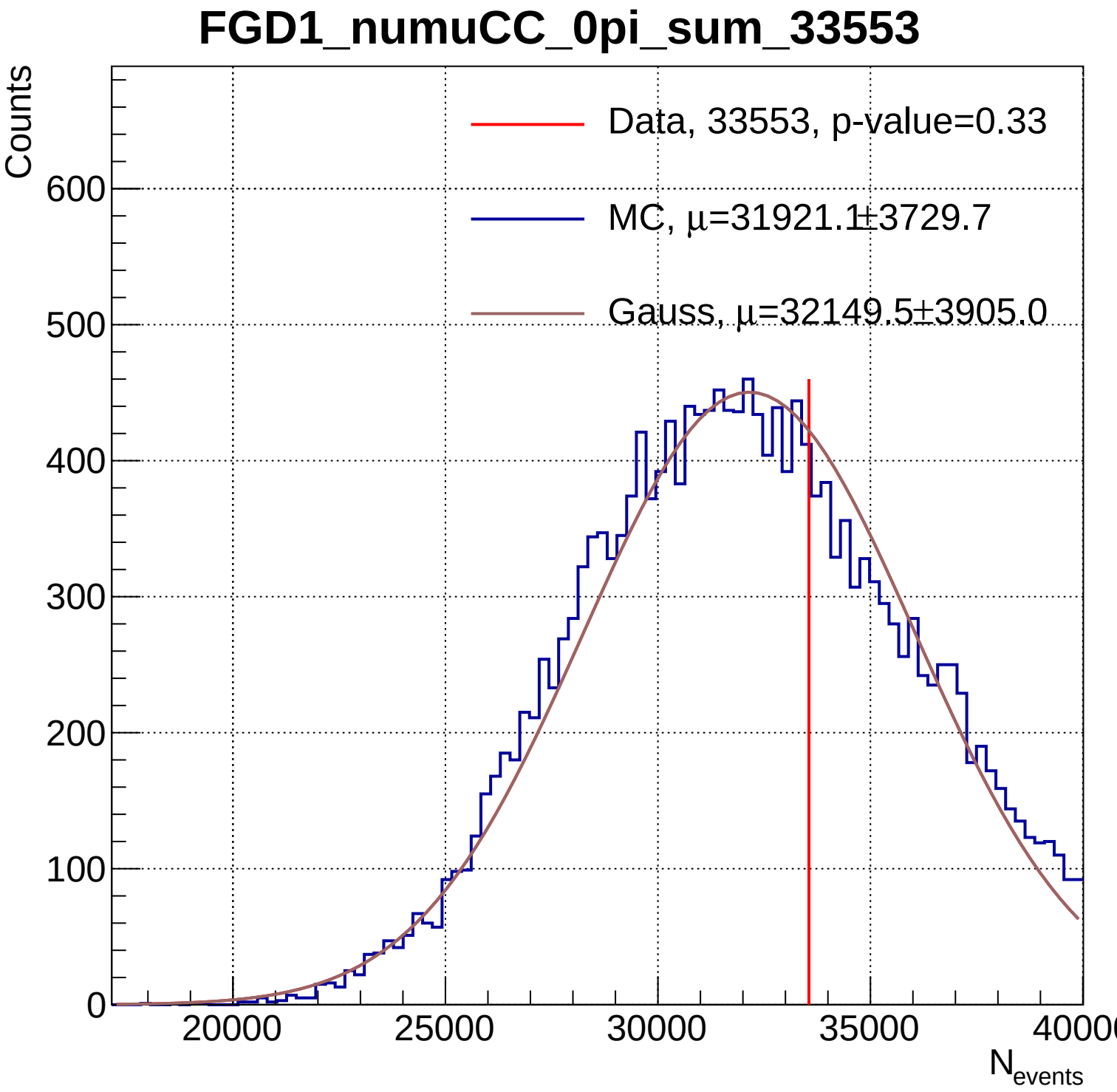

DataPredFluc
FGD1 ν_μCC 0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
12000
10000
8000
6000
4000
2000
700
750
800
850
900
950
1000
25
20
15
10
5
0

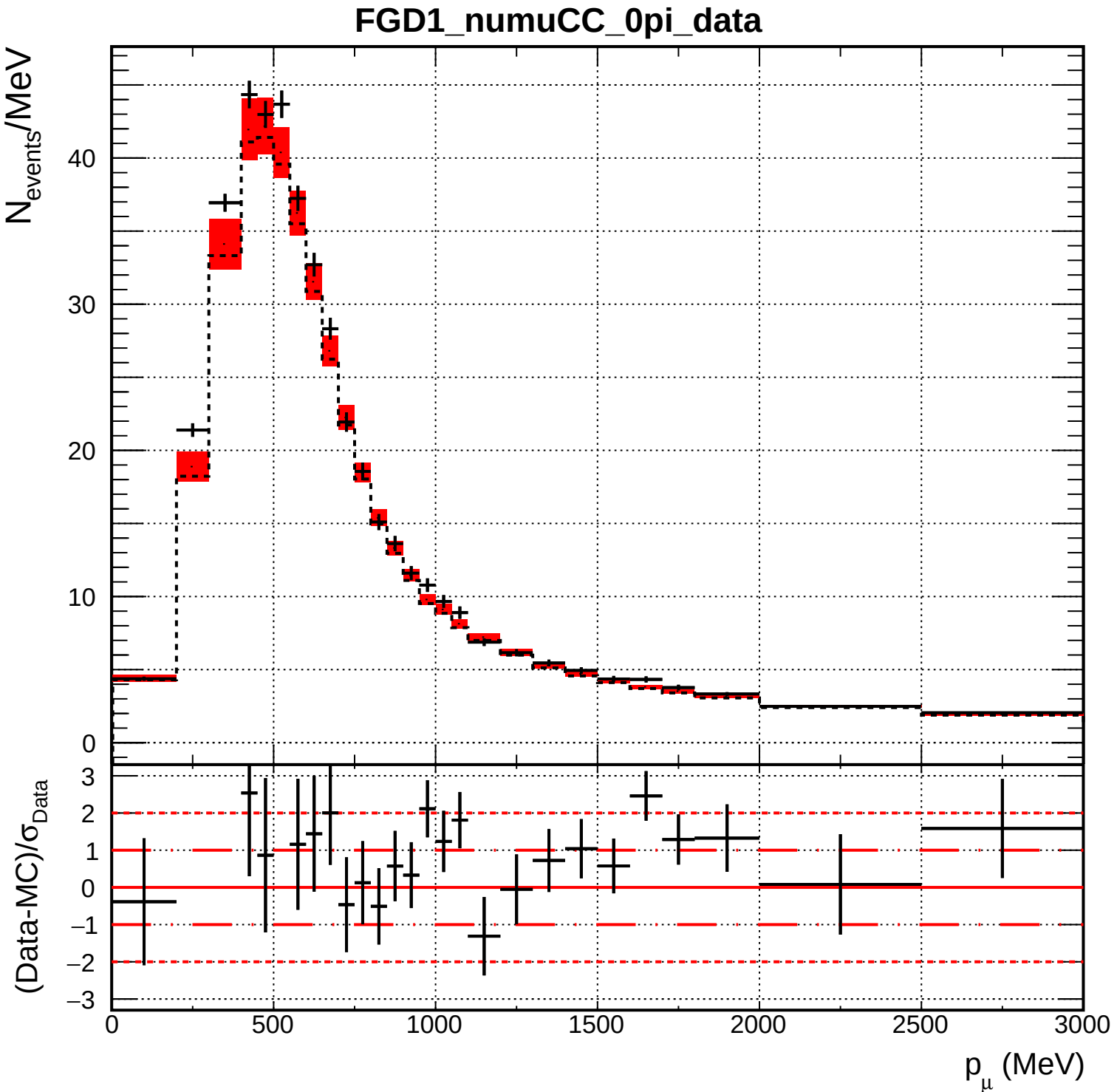

FGD1_numuCC_0pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

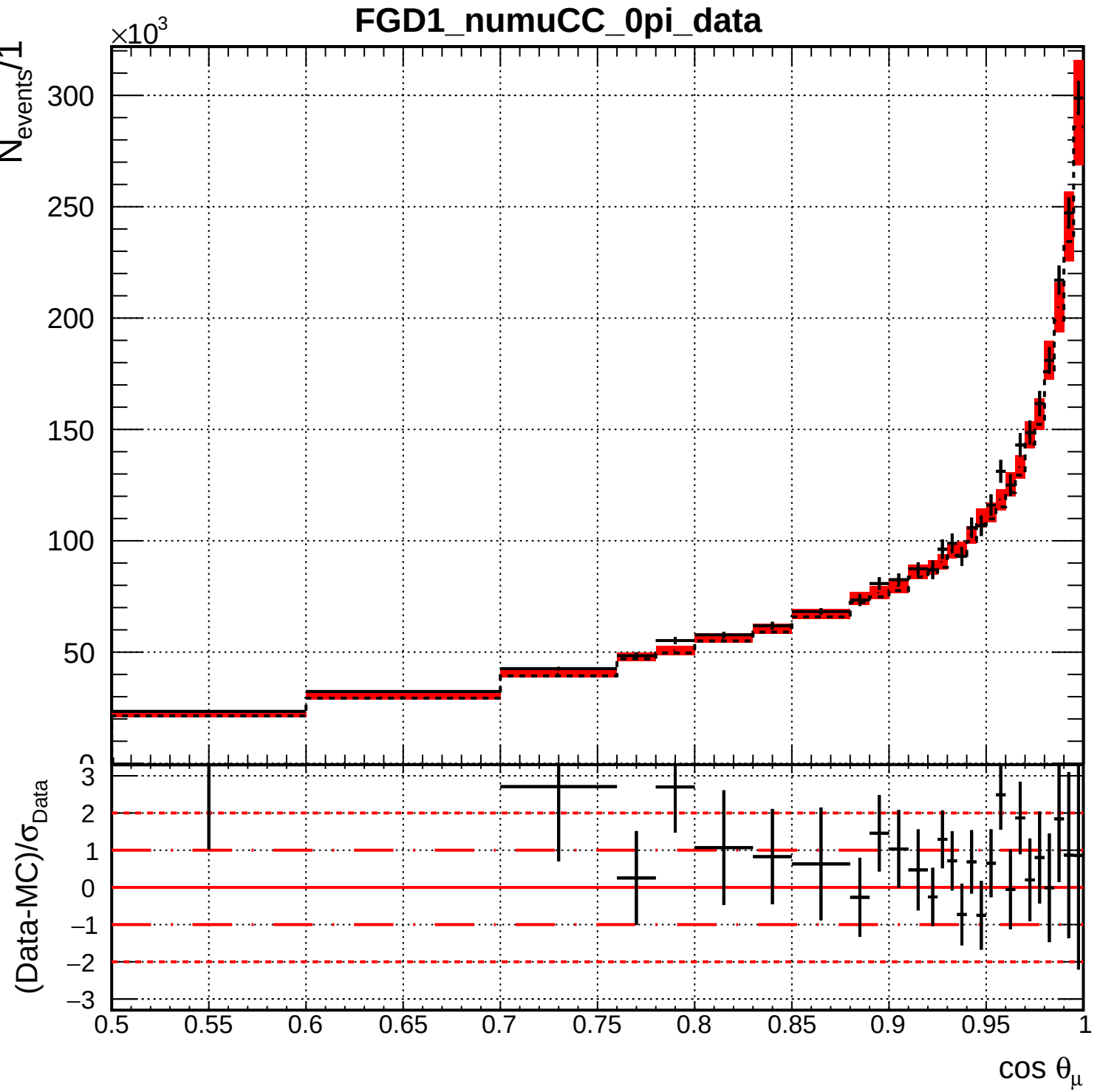

FGD1_numuCC_0pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

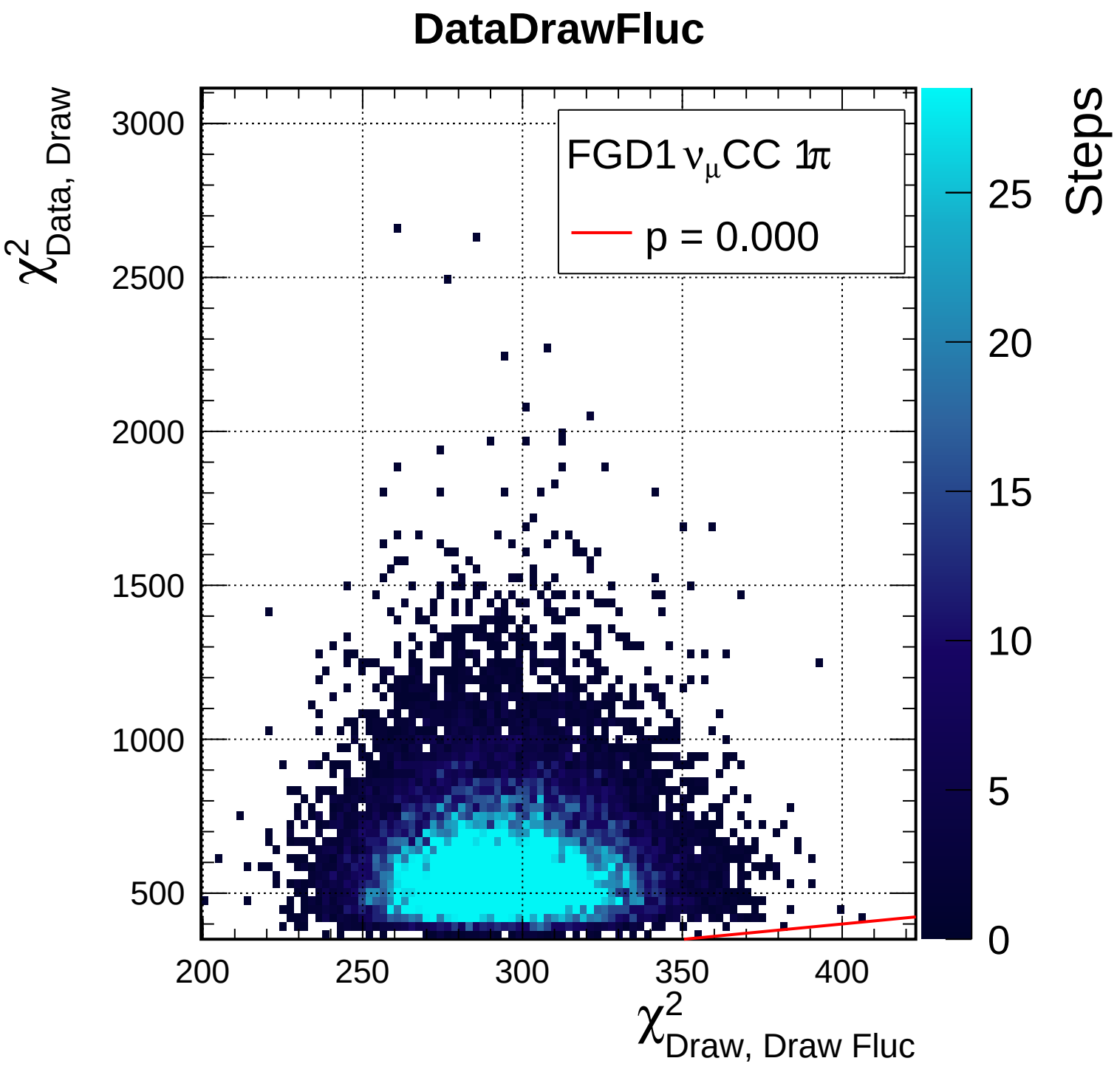

FGD1_numuCC_0pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

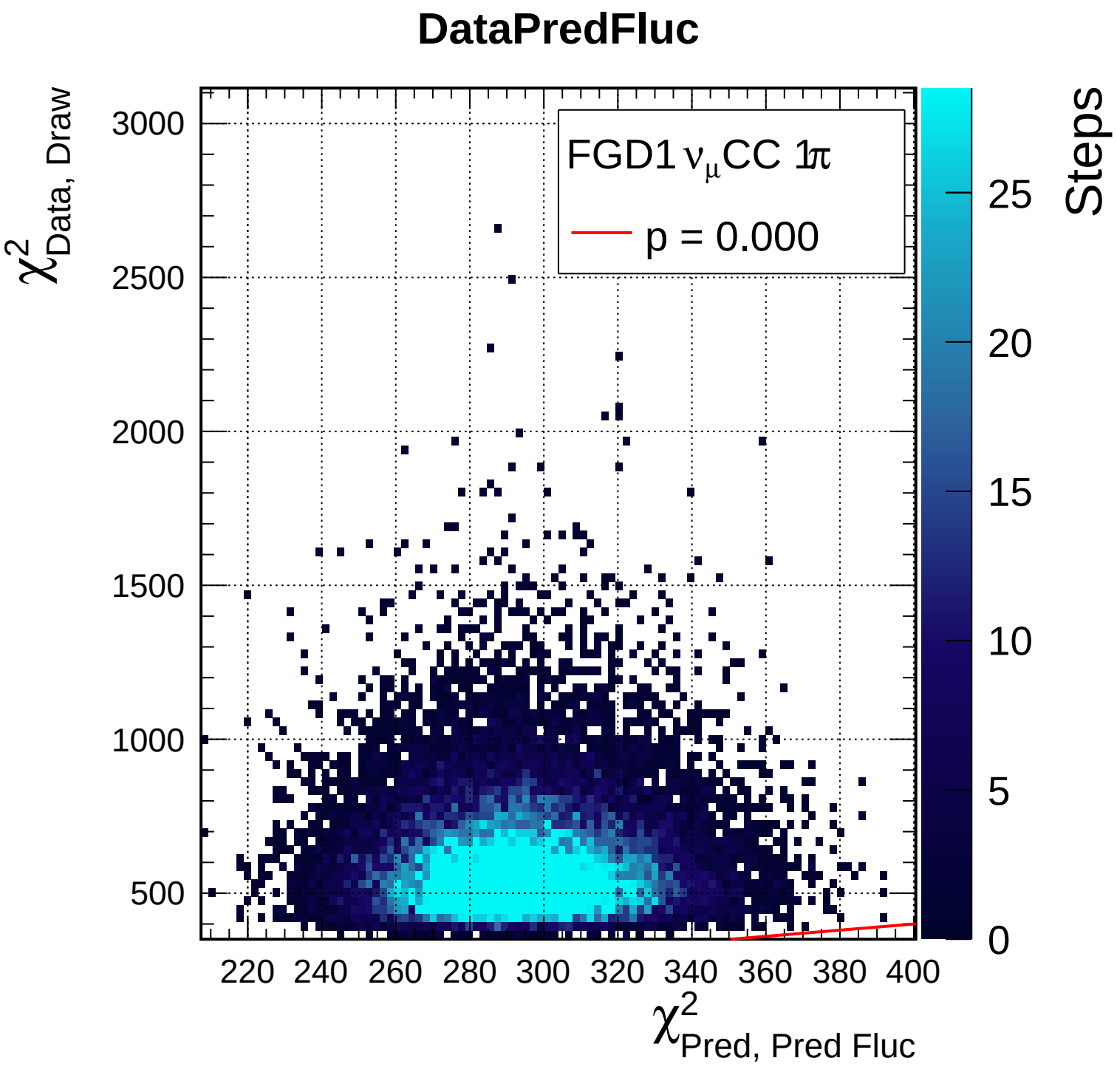

FGD1_numuCC_0pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

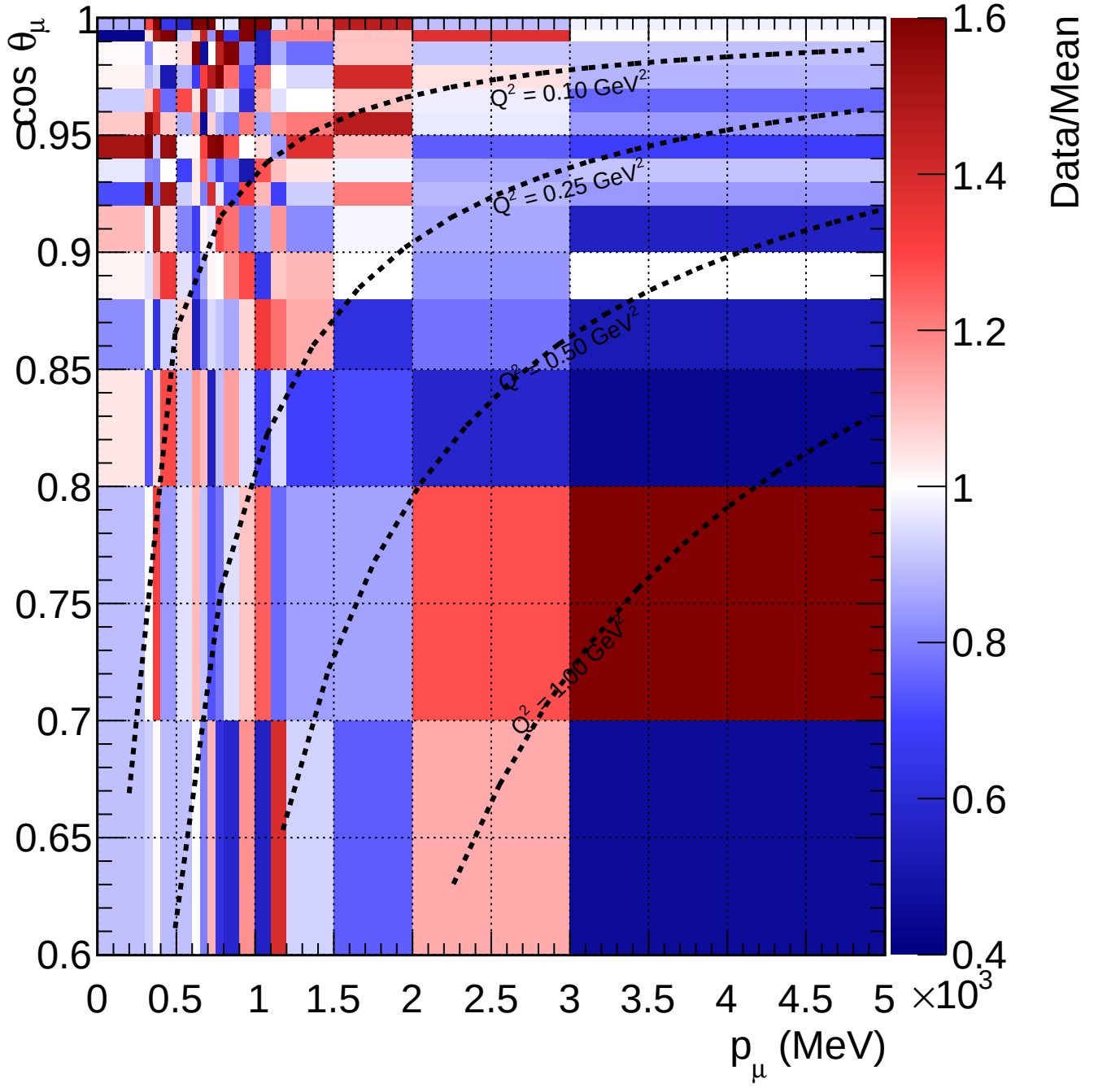

FGD1_numuCC_0pi_sum_33553
Counts
Data, 33553, p-value=0.33
MC, μ=31921.1±3729.7
Gauss, μ=32149.5±3905.0
600
500
400
300
200
100
0
20000
25000
30000
35000
40000
N_events

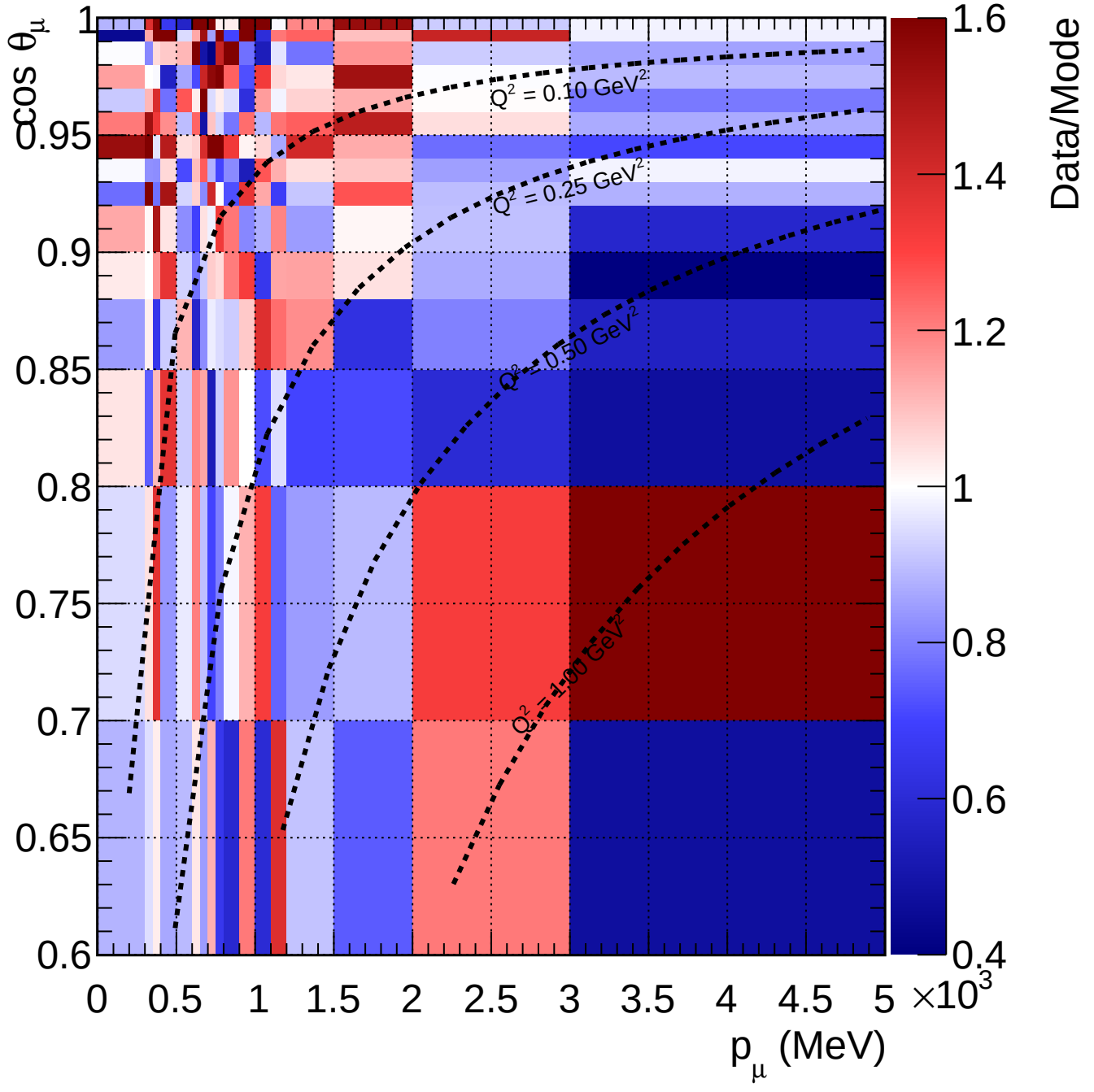

FGD1_numuCC_0pi_data
N_events/MeV
40
30
20
10
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
2500
3000
p_μ (MeV)

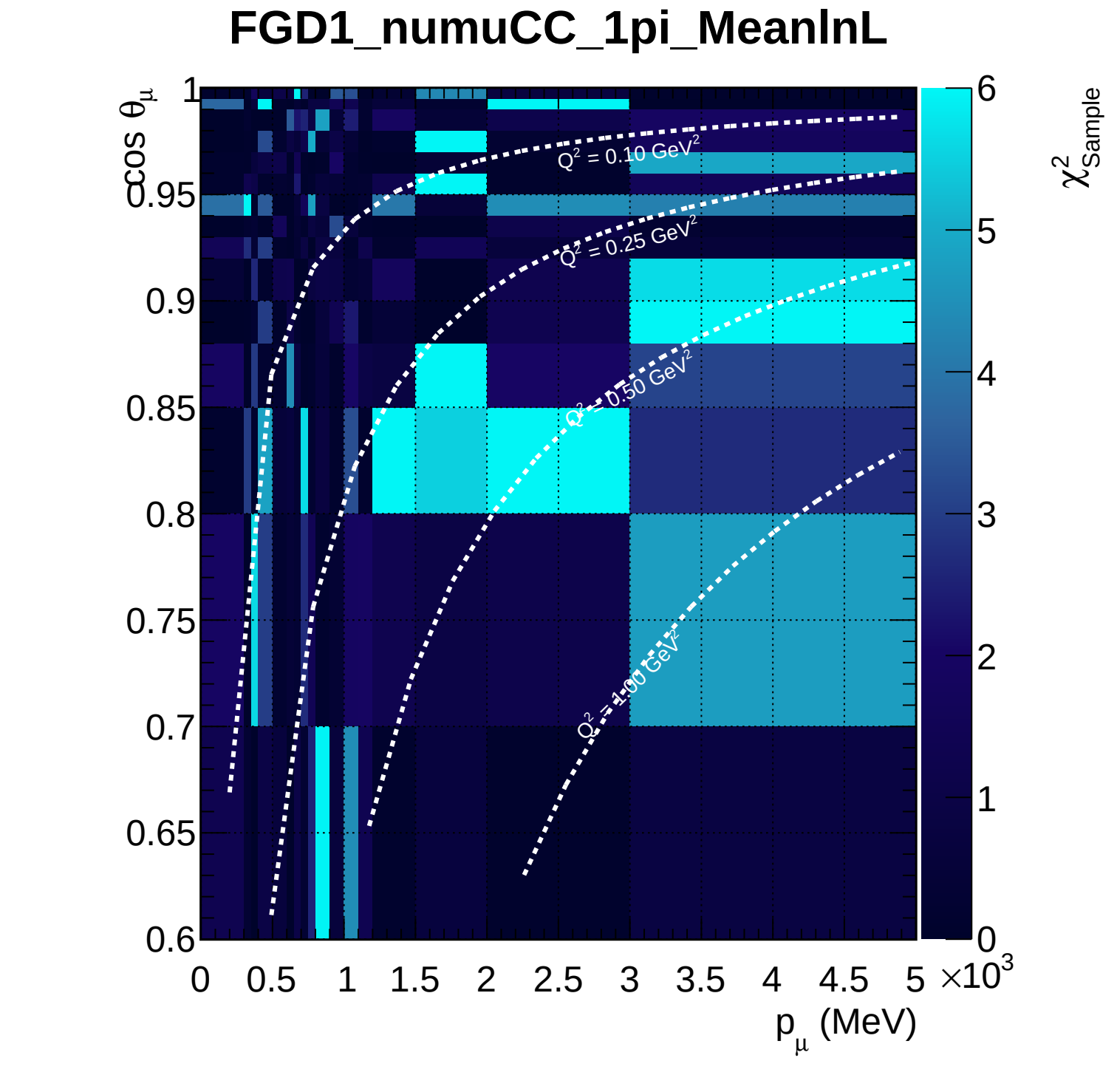

FGD1_numuCC_0pi_data
×10^3
N_events/1
300
250
200
150
100
50
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.5
0.55
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

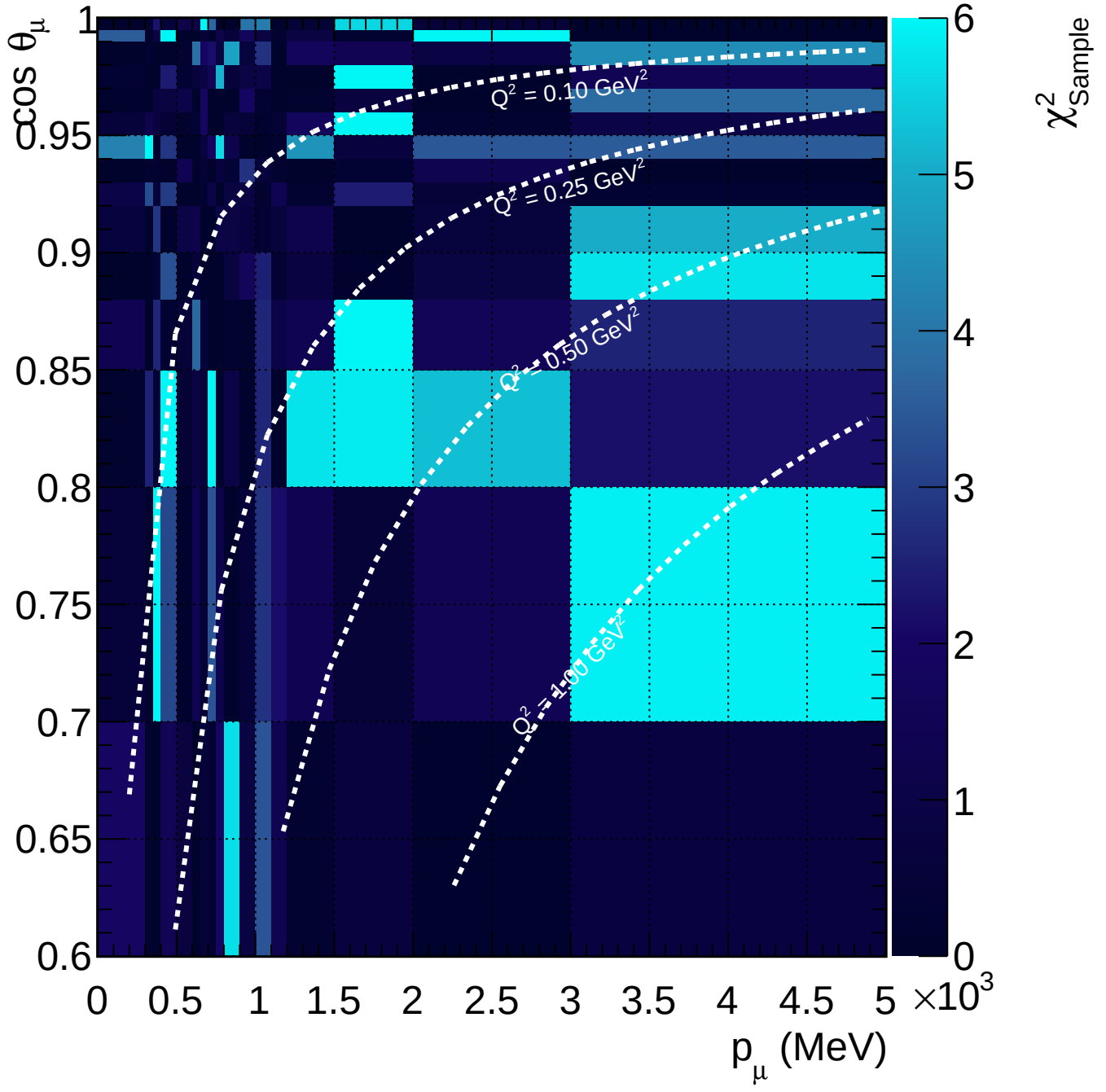

DataDrawFluc
FGD1 ν_μCC 1π
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
3000
2500
2000
1500
1000
500
200
250
300
350
400
25
20
15
10
5
0

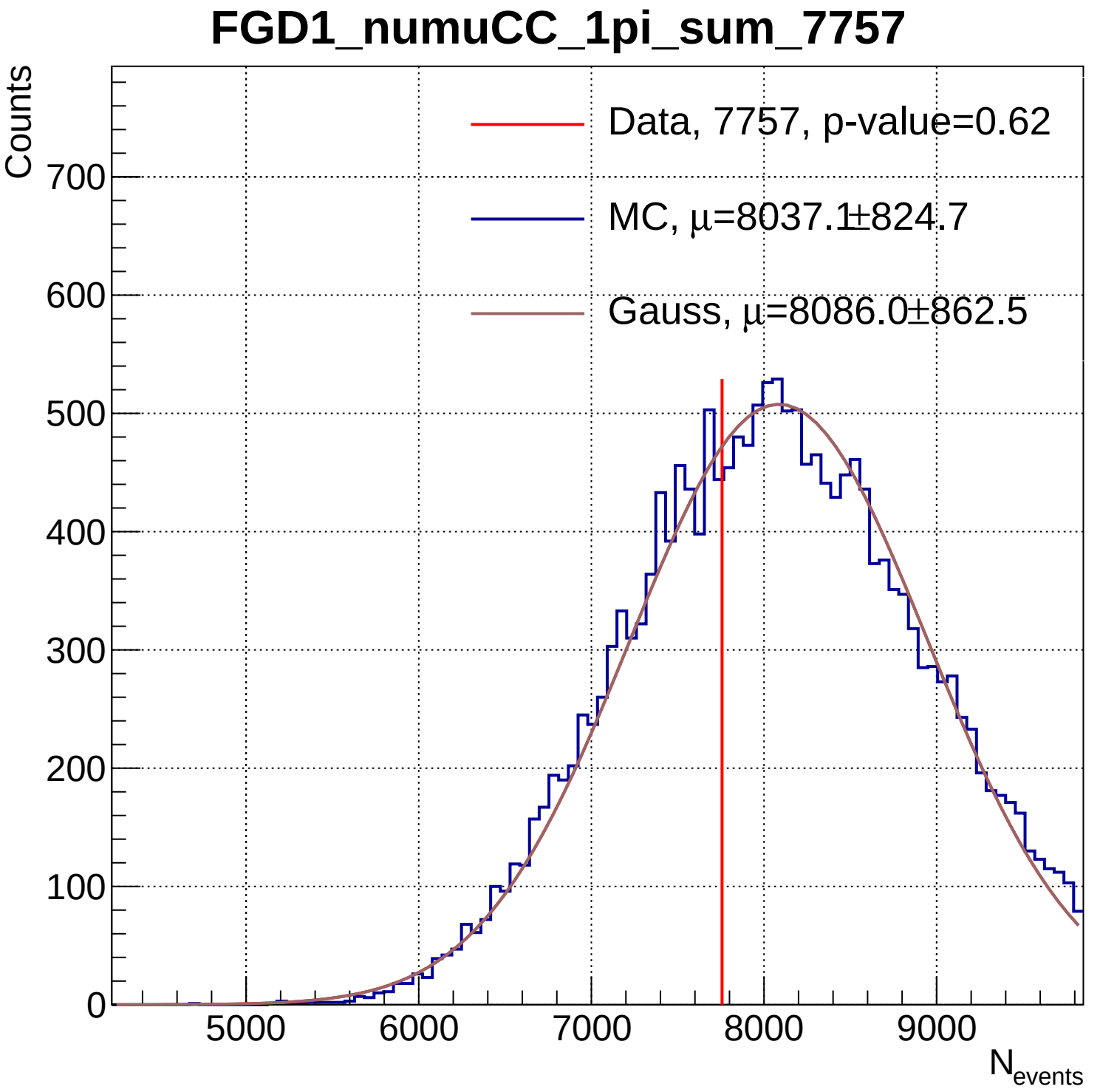

DataPredFluc
FGD1 ν_μCC 1π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
3000
2500
2000
1500
1000
500
220
240
260
280
300
320
340
360
380
400
25
20
15
10
5
0

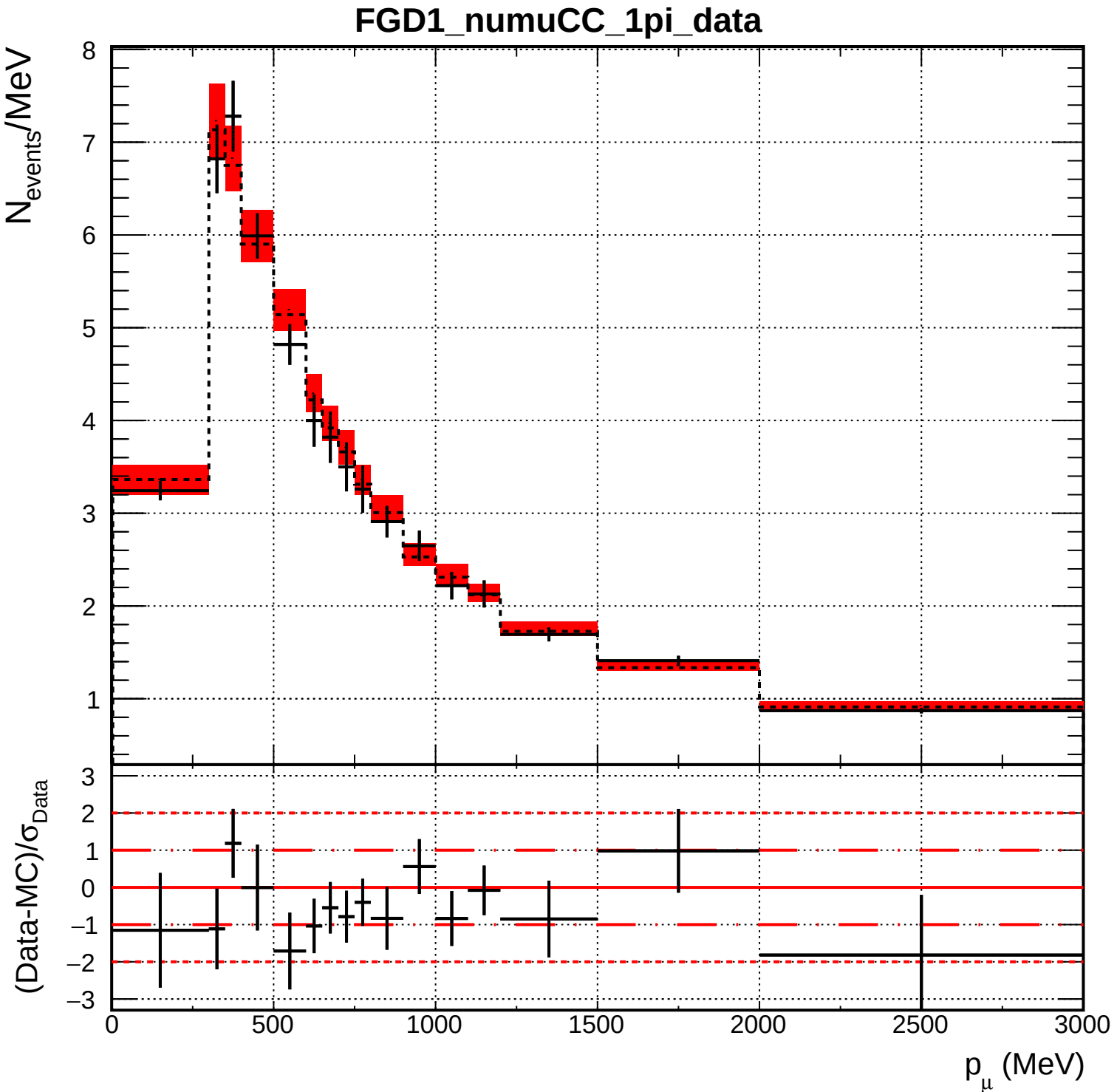

FGD1_numuCC_1pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

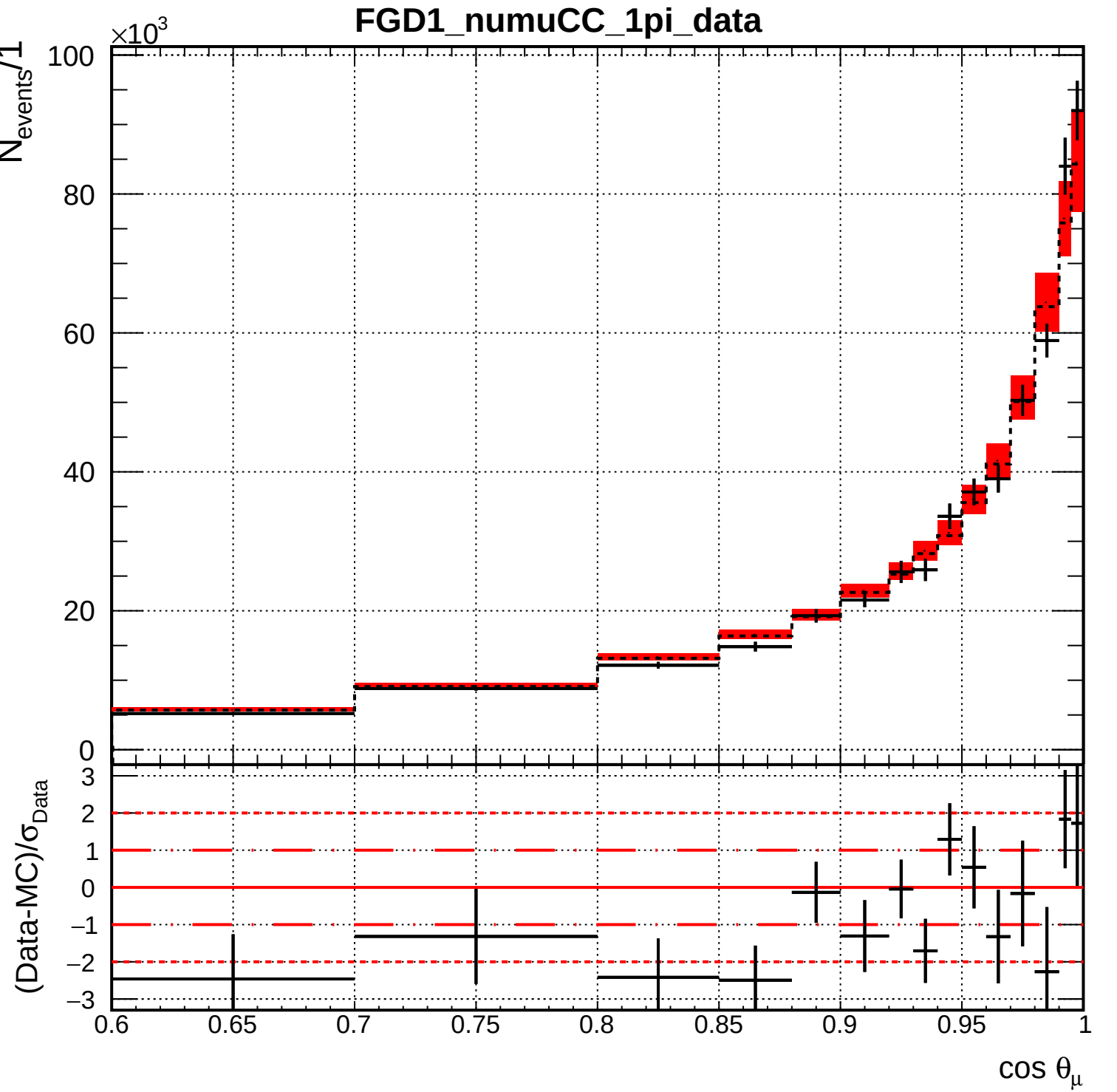

FGD1_numuCC_1pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

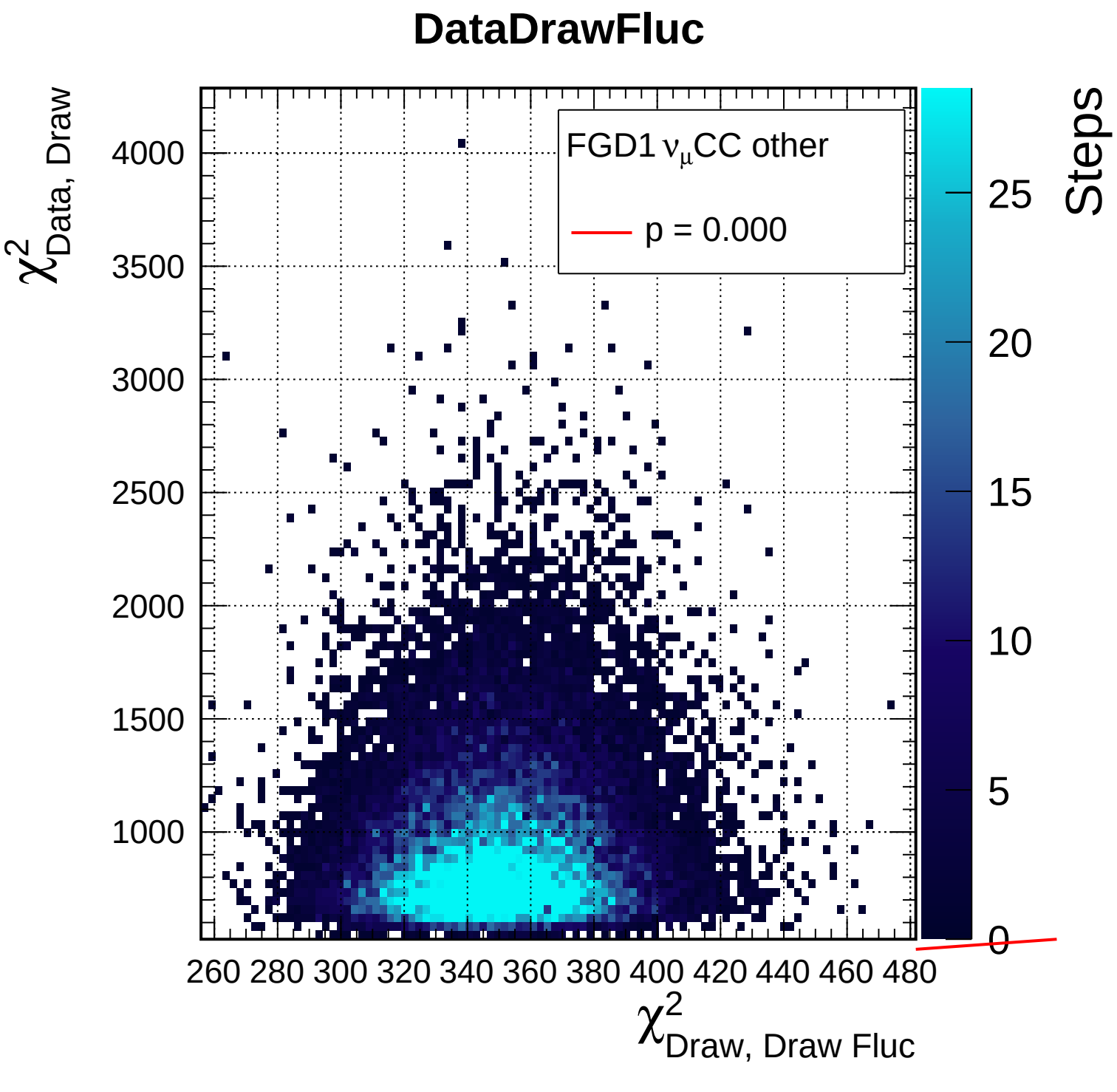

FGD1_numuCC_1pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

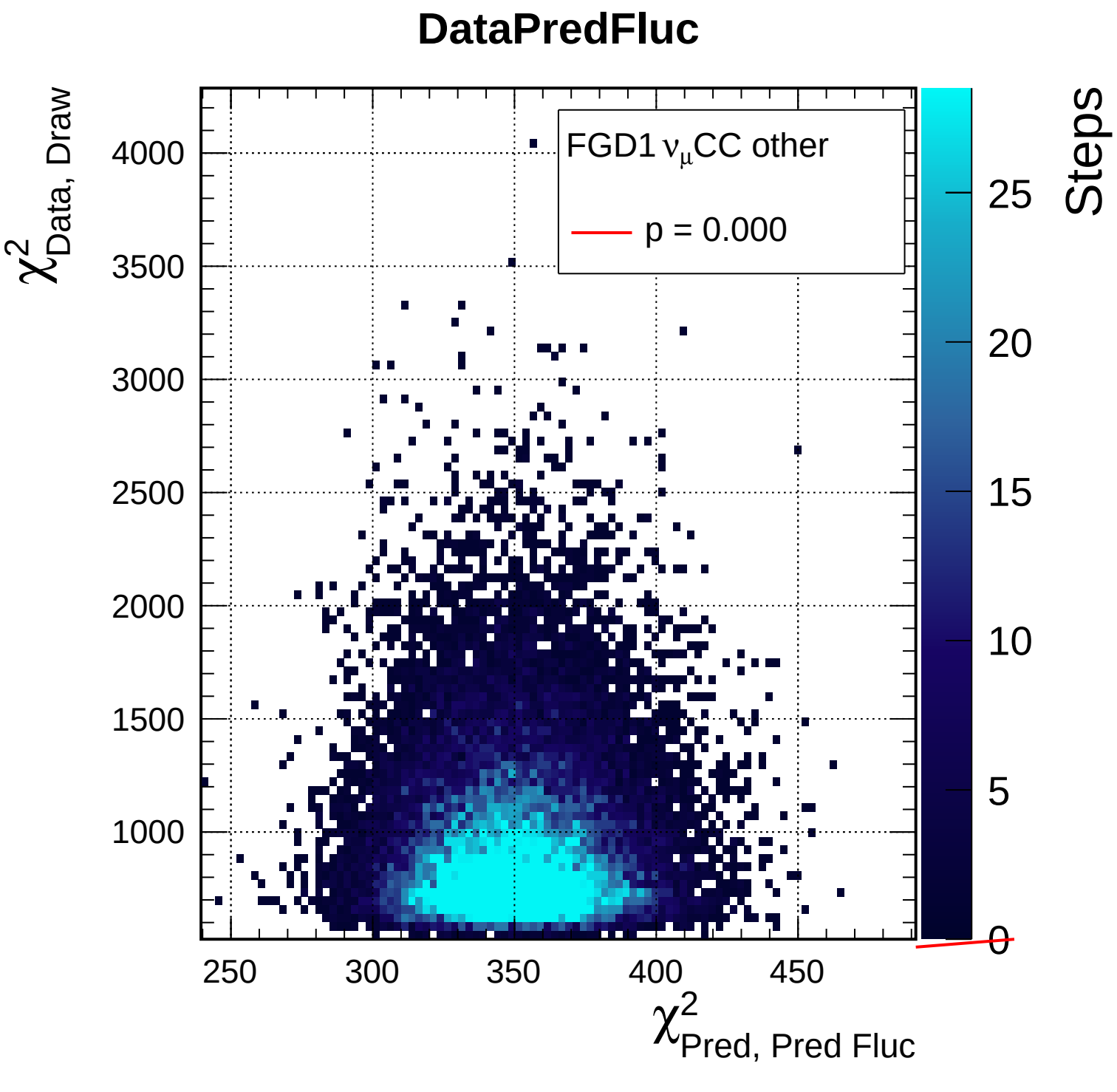

FGD1_numuCC_1pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

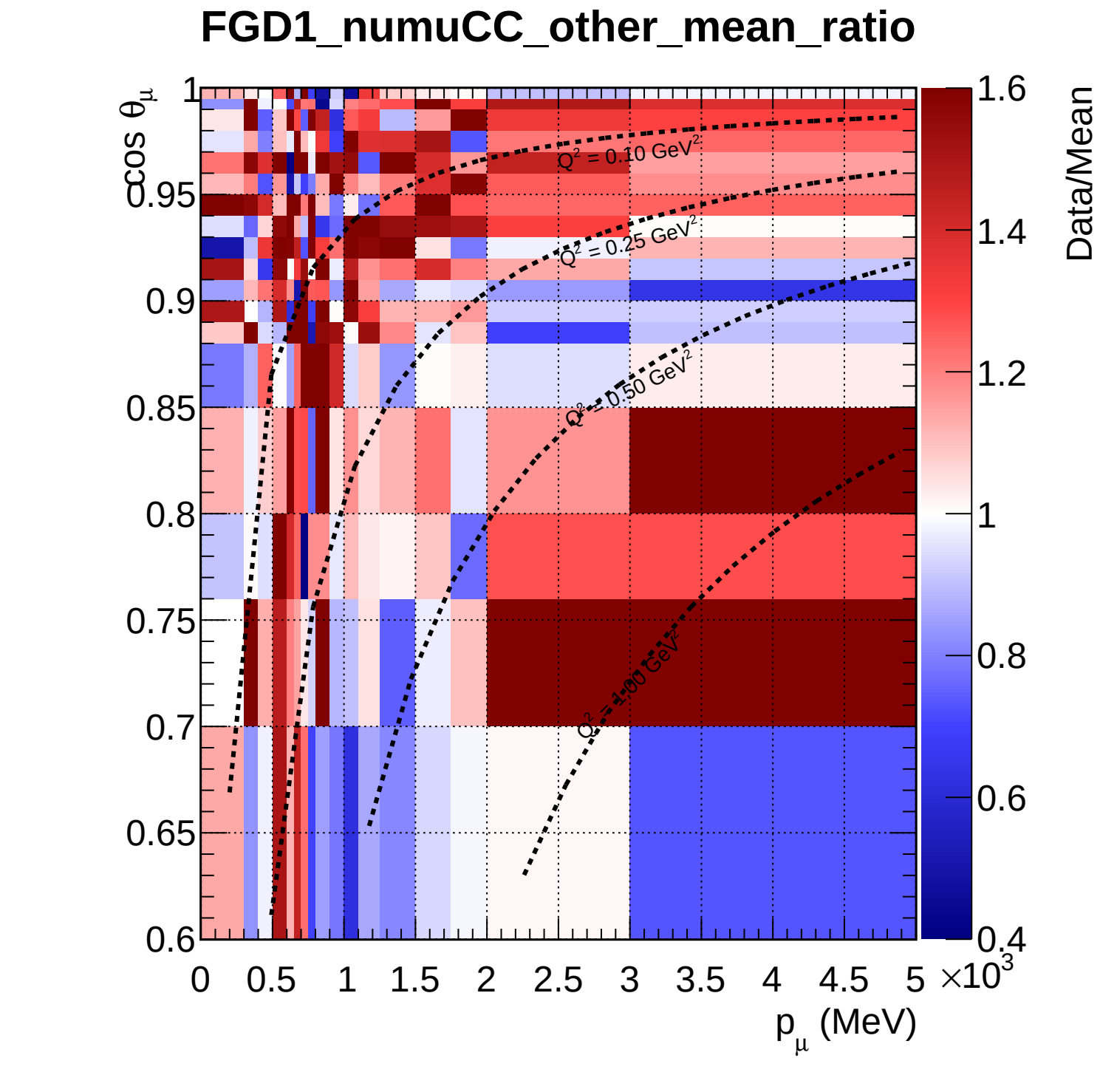

FGD1_numuCC_1pi_sum_7757
Counts
Data, 7757, p-value=0.62
MC, μ=8037.1±824.7
Gauss, μ=8086.0±862.5
0
100
200
300
400
500
600
700
5000
6000
7000
8000
9000
N_events

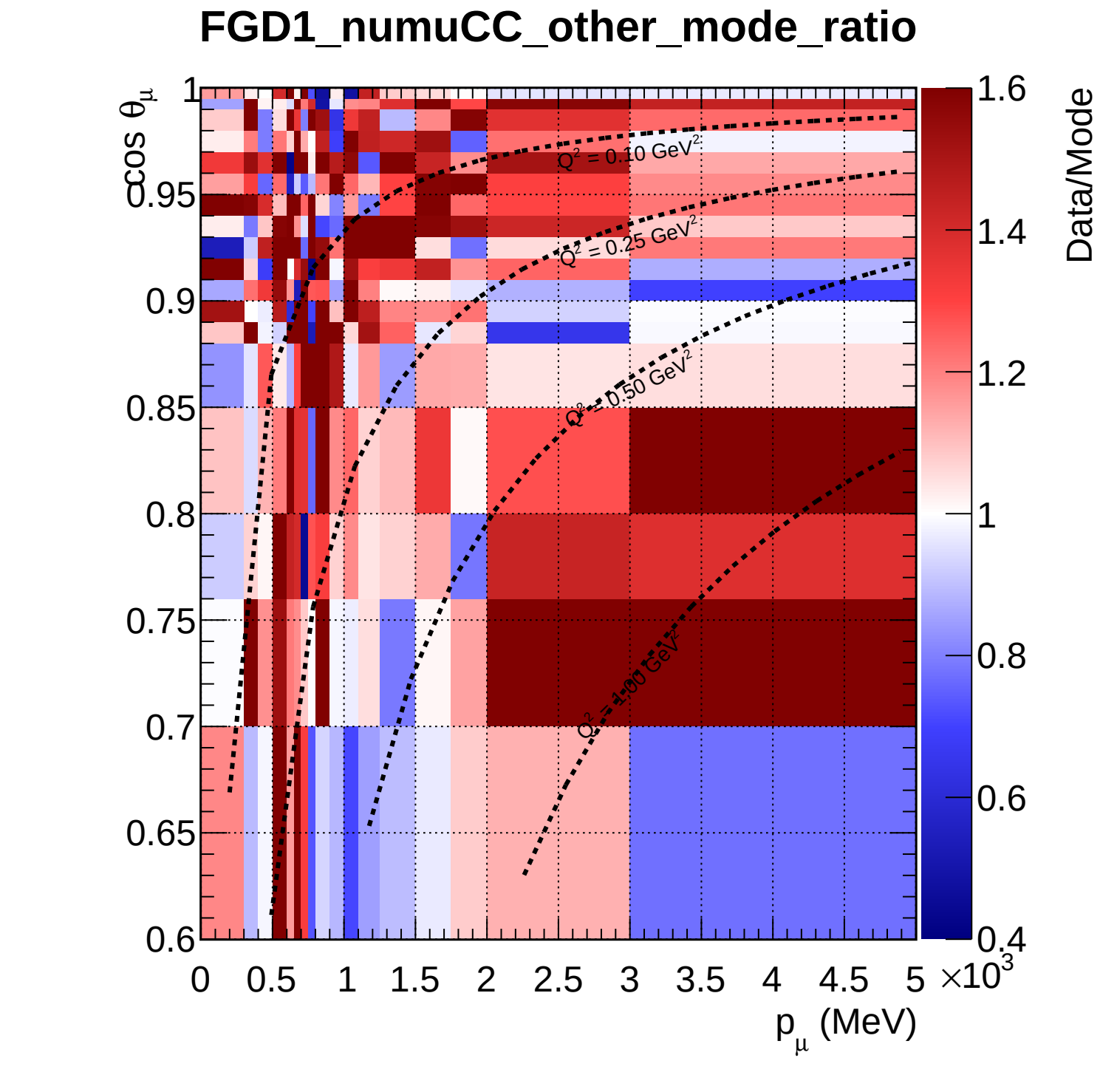

FGD1_numuCC_1pi_data
N_events/MeV
(Data-MC)/σ_Data
p_μ (MeV)
0
500
1000
1500
2000
2500
3000
1
2
3
4
5
6
7
8
−3
−2
−1
0
1
2
3

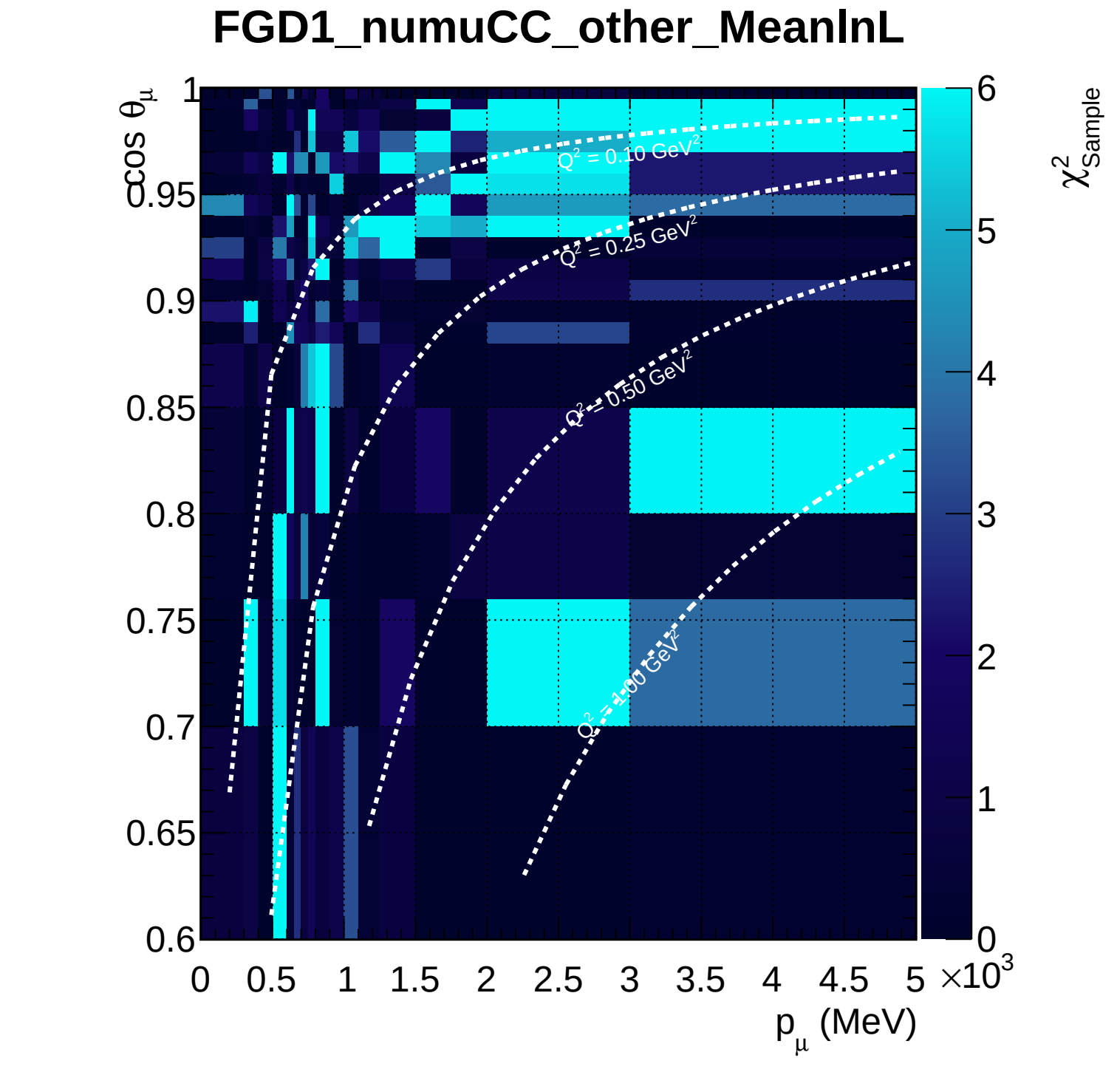

FGD1_numuCC_1pi_data
×10^3
N_events/1
100
80
60
40
20
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

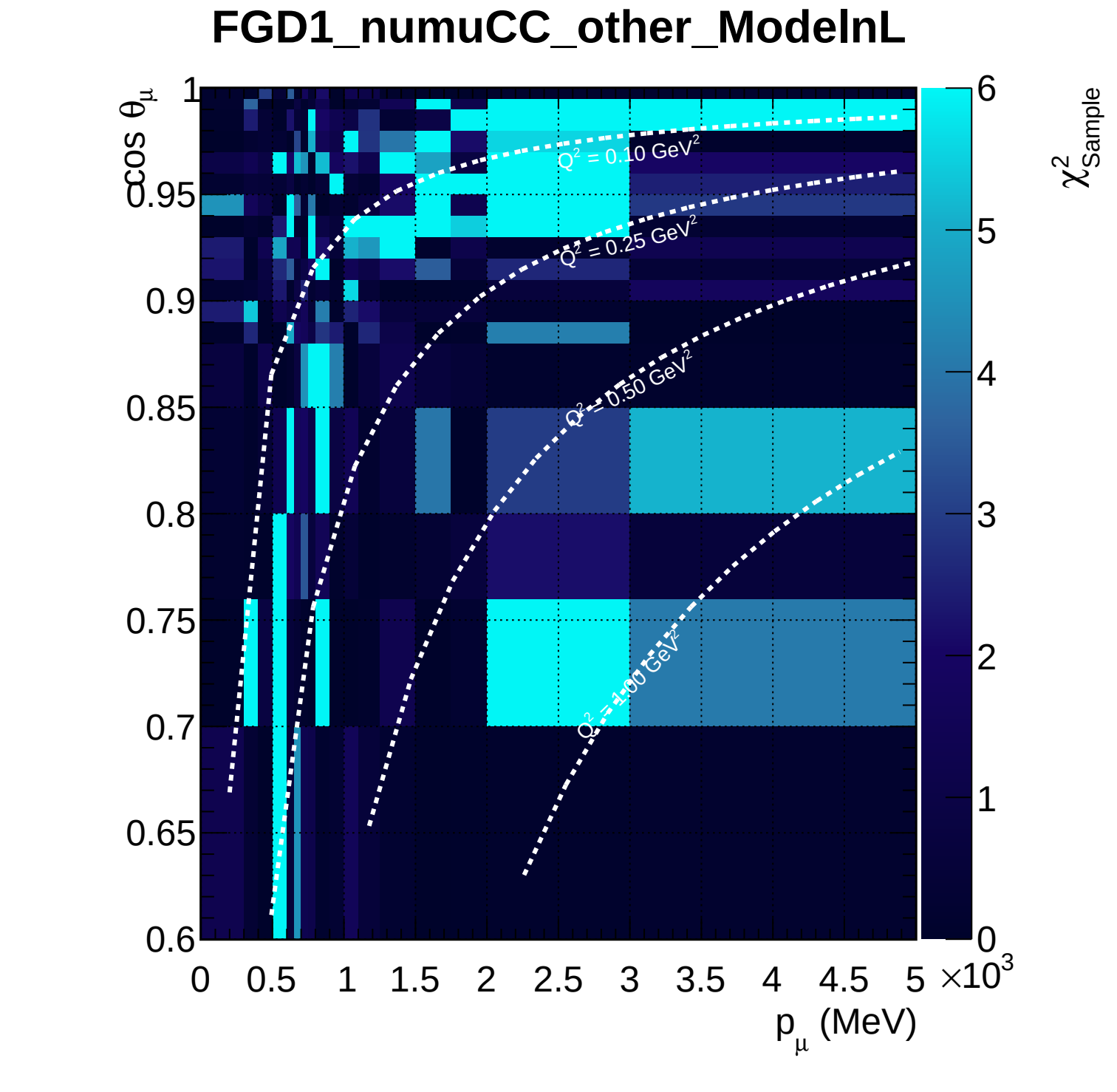

DataDrawFluc
FGD1 ν_μCC other
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
4000
3500
3000
2500
2000
1500
1000
260 280 300 320 340 360 380 400 420 440 460 480
25
20
15
10
5
0

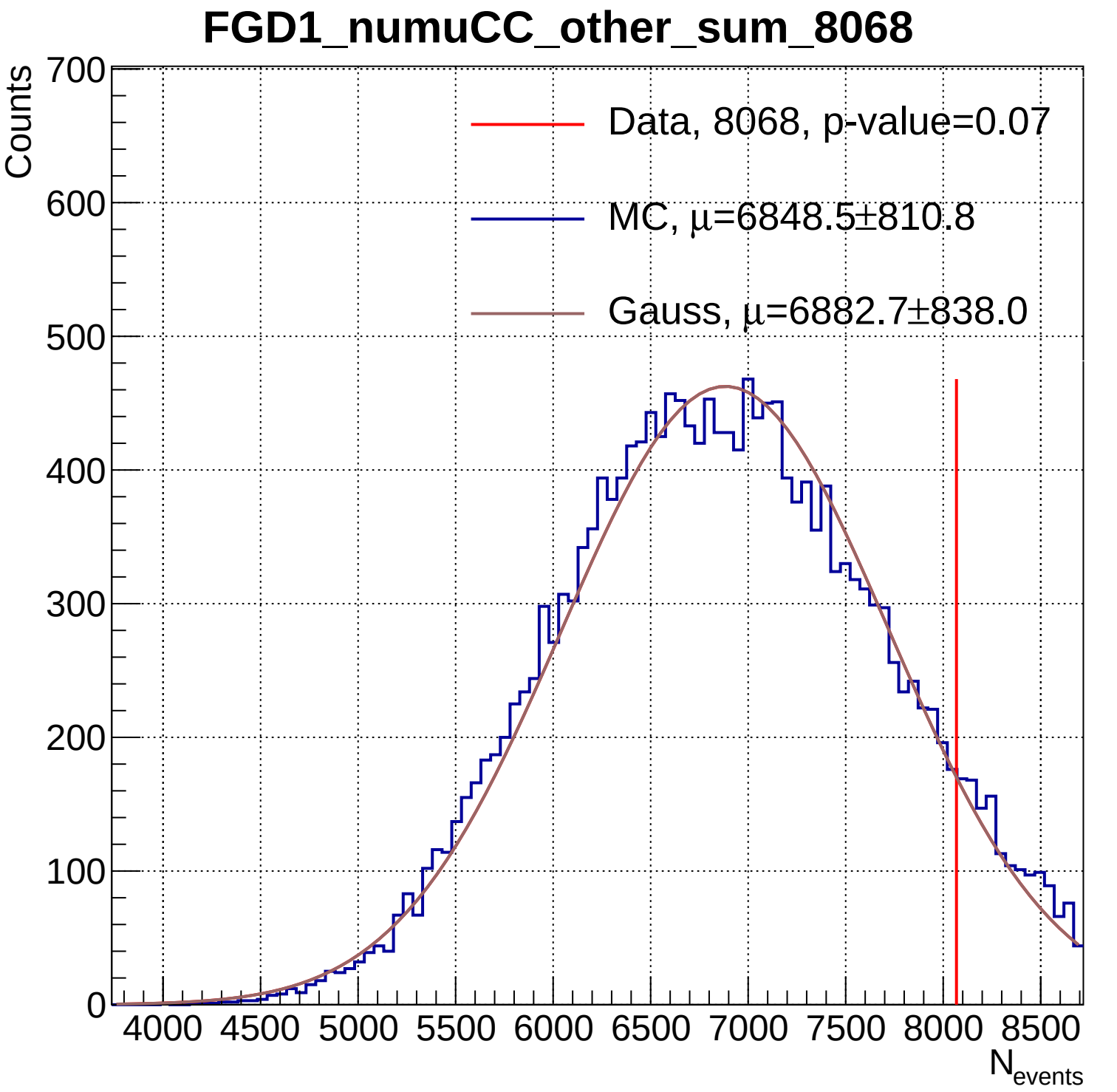

DataPredFluc
FGD1 ν_μCC other
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
4000
3500
3000
2500
2000
1500
1000
250
300
350
400
450
25
20
15
10
5
0

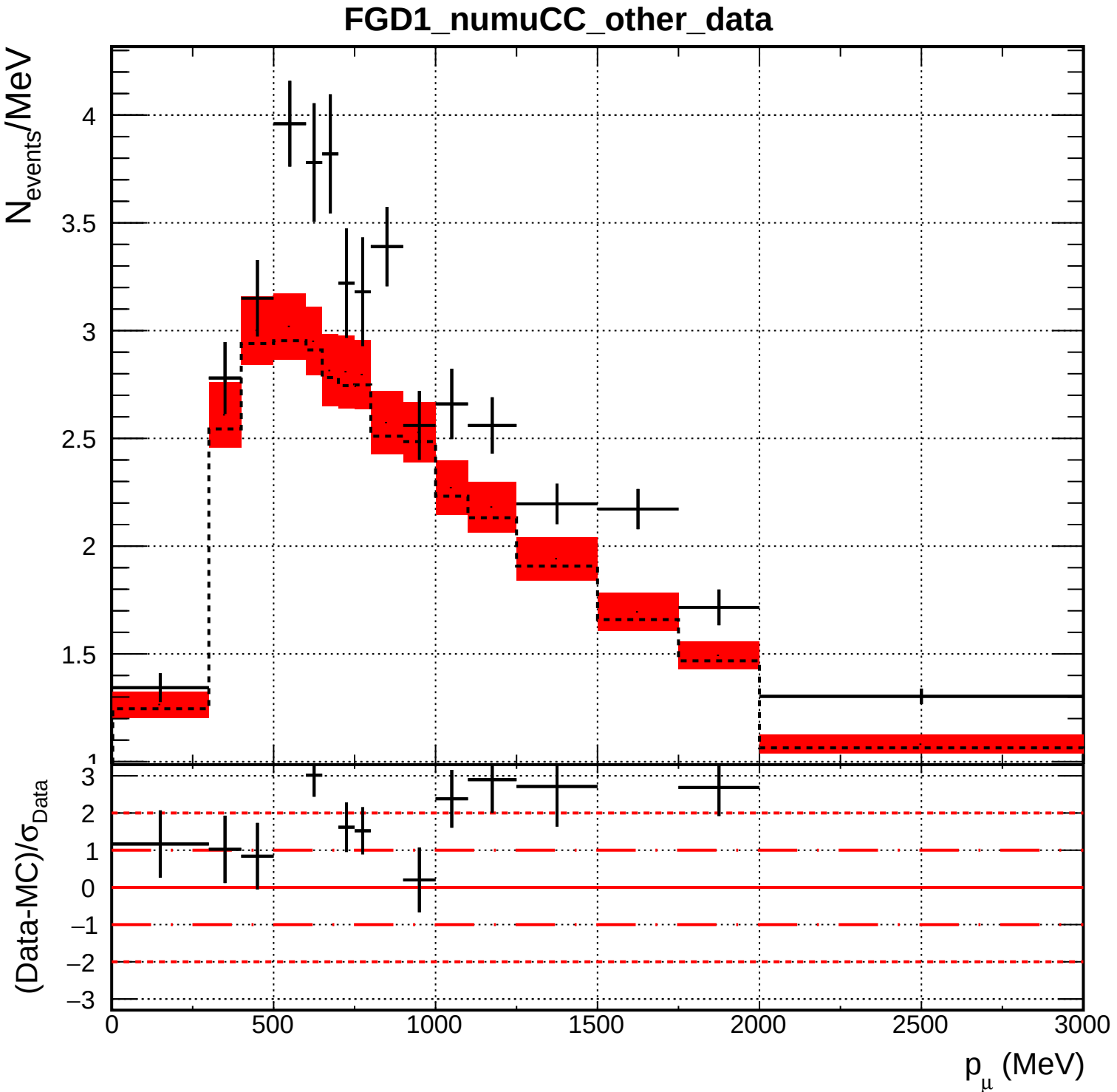

FGD1_numuCC_other_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

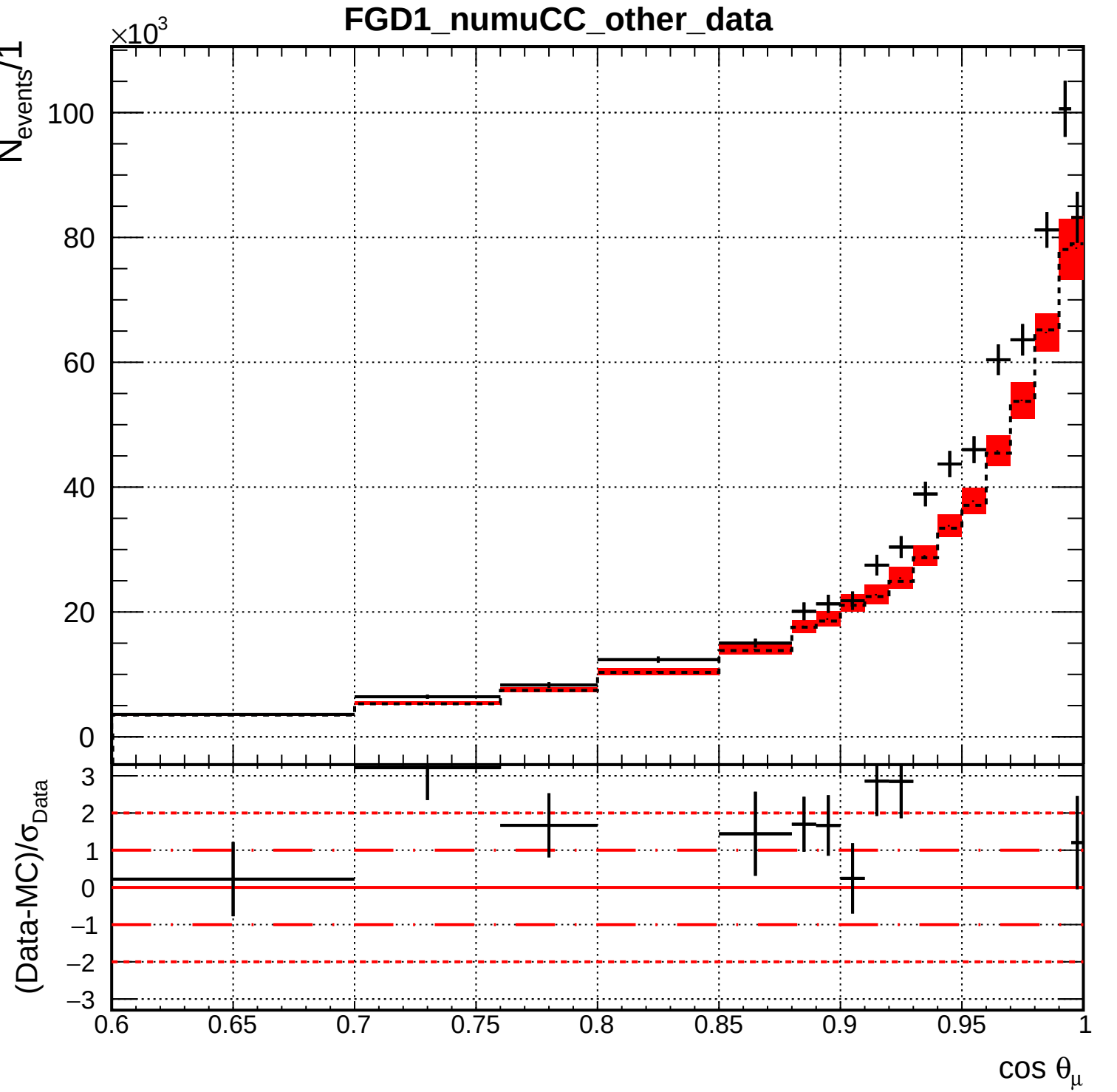

FGD1_numuCC_other_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

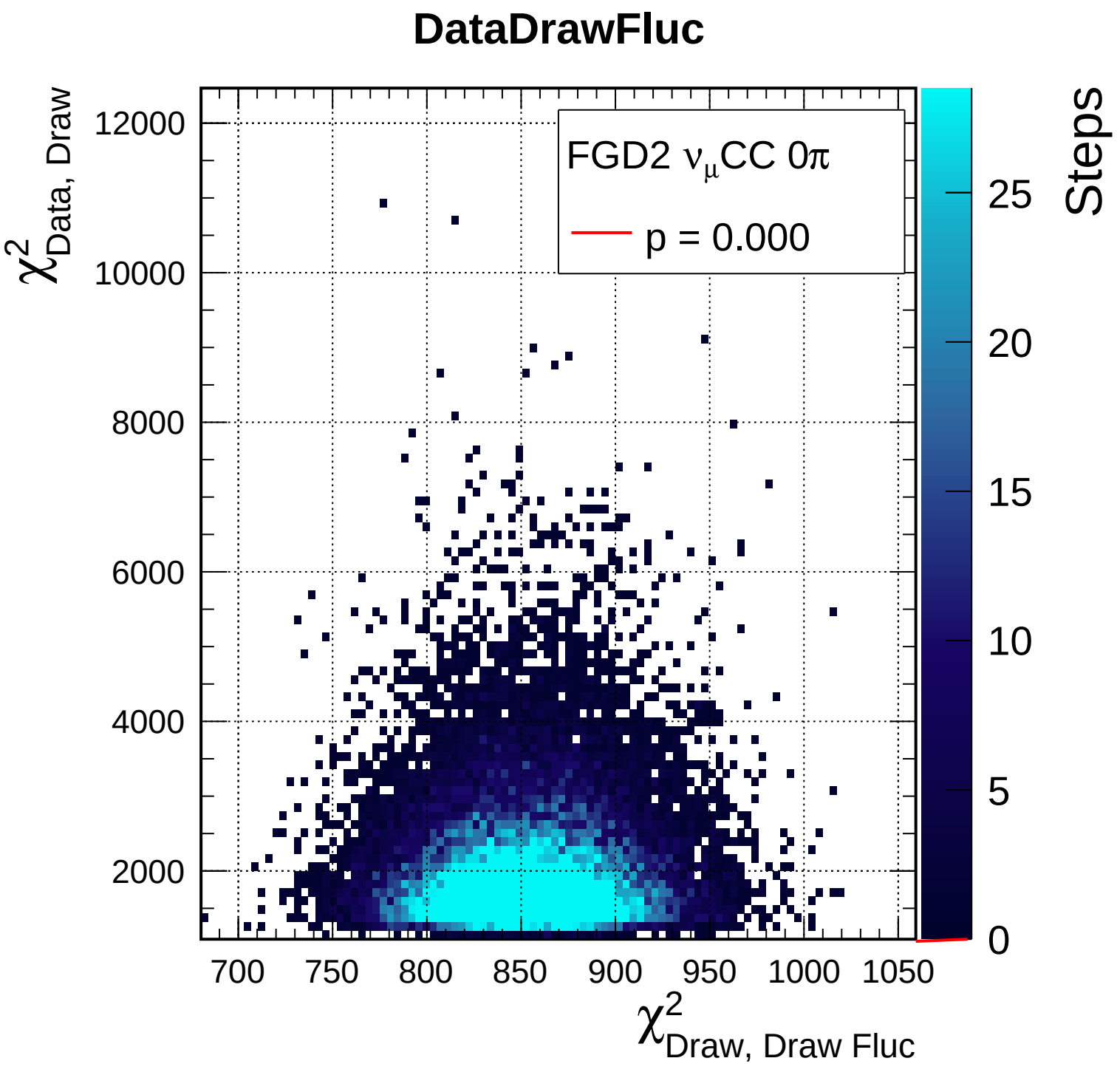

FGD1_numuCC_other_MeanInL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

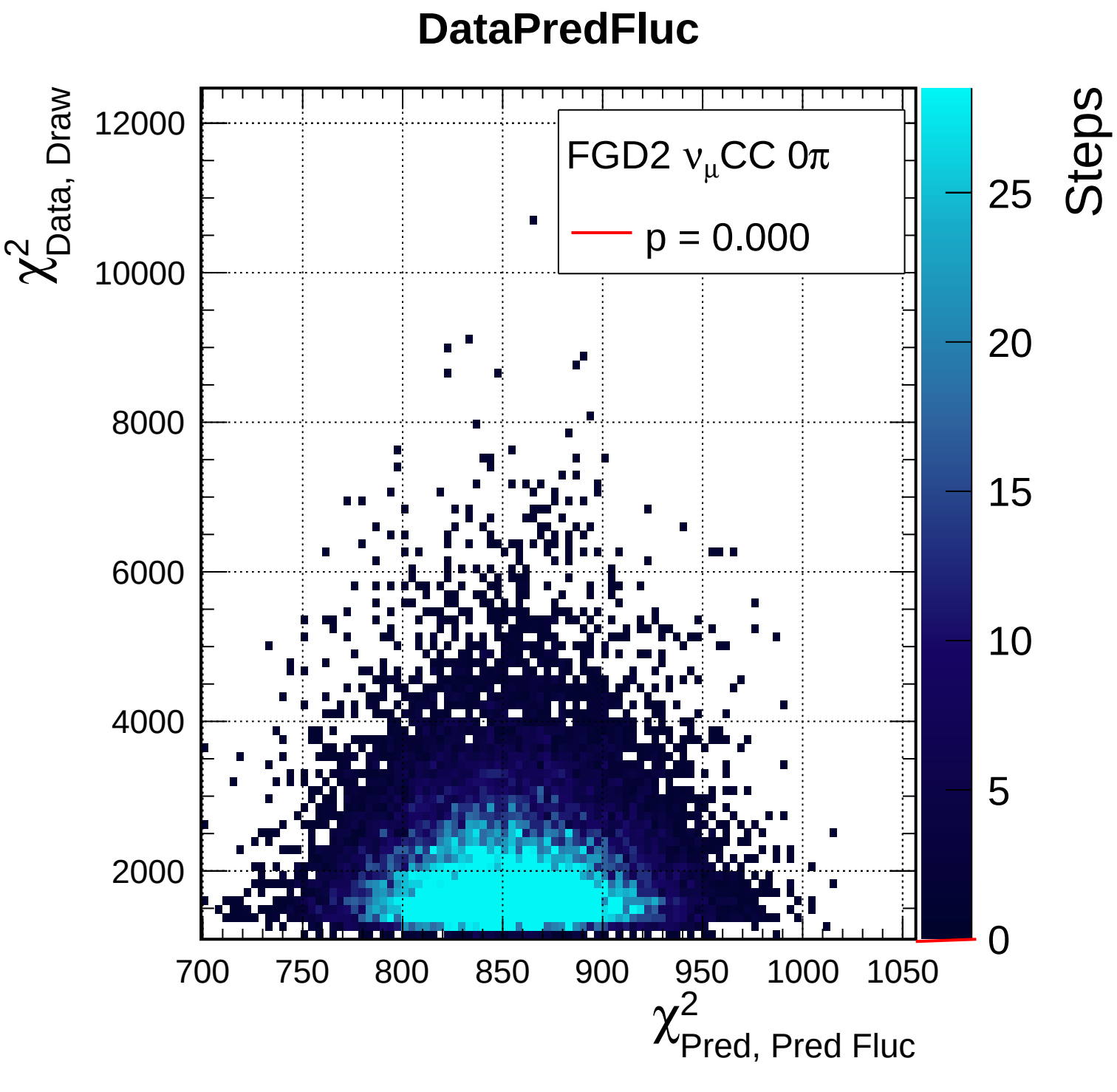

FGD1_numuCC_other_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

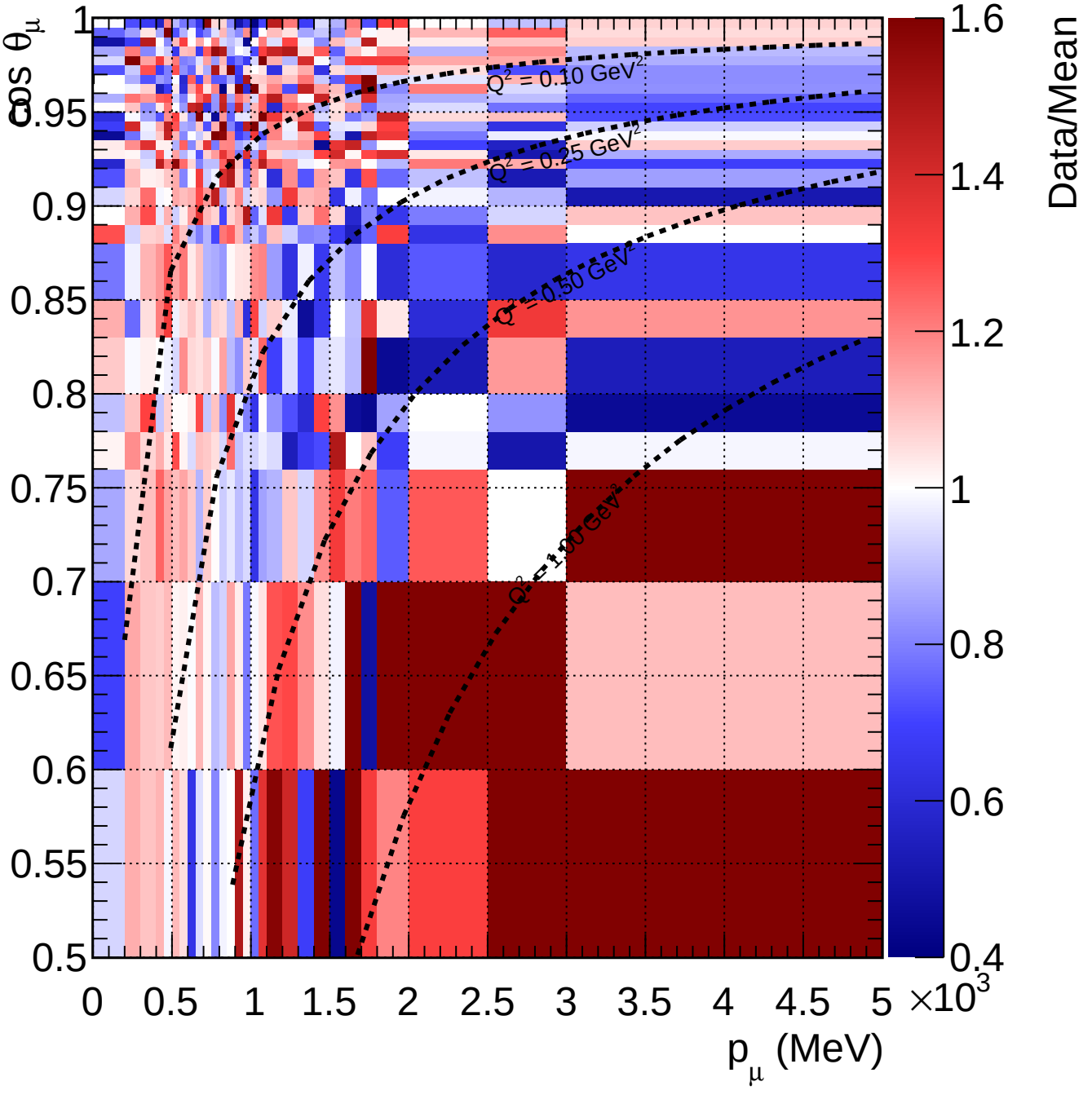

FGD1_numuCC_other_sum_8068
Counts
Data, 8068, p-value=0.07
MC, μ=6848.5±810.8
Gauss, μ=6882.7±838.0
700
600
500
400
300
200
100
0
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
N_events

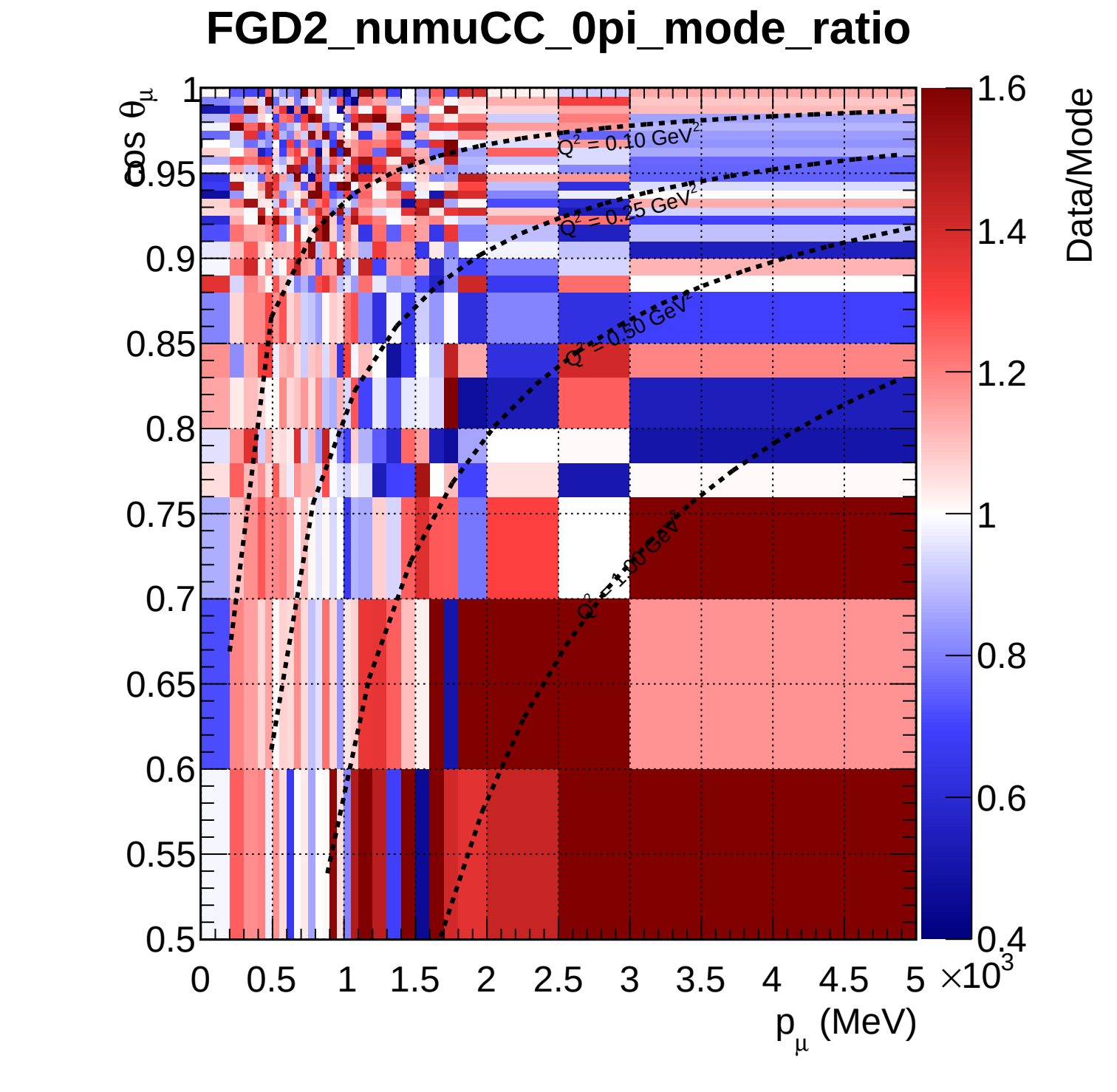

FGD1_numuCC_other_data
N_events/MeV
(Data-MC)/σ_Data
p_μ (MeV)
0
500
1000
1500
2000
2500
3000
1
1.5
2
2.5
3
3.5
4
−3
−2
−1
0
1
2
3

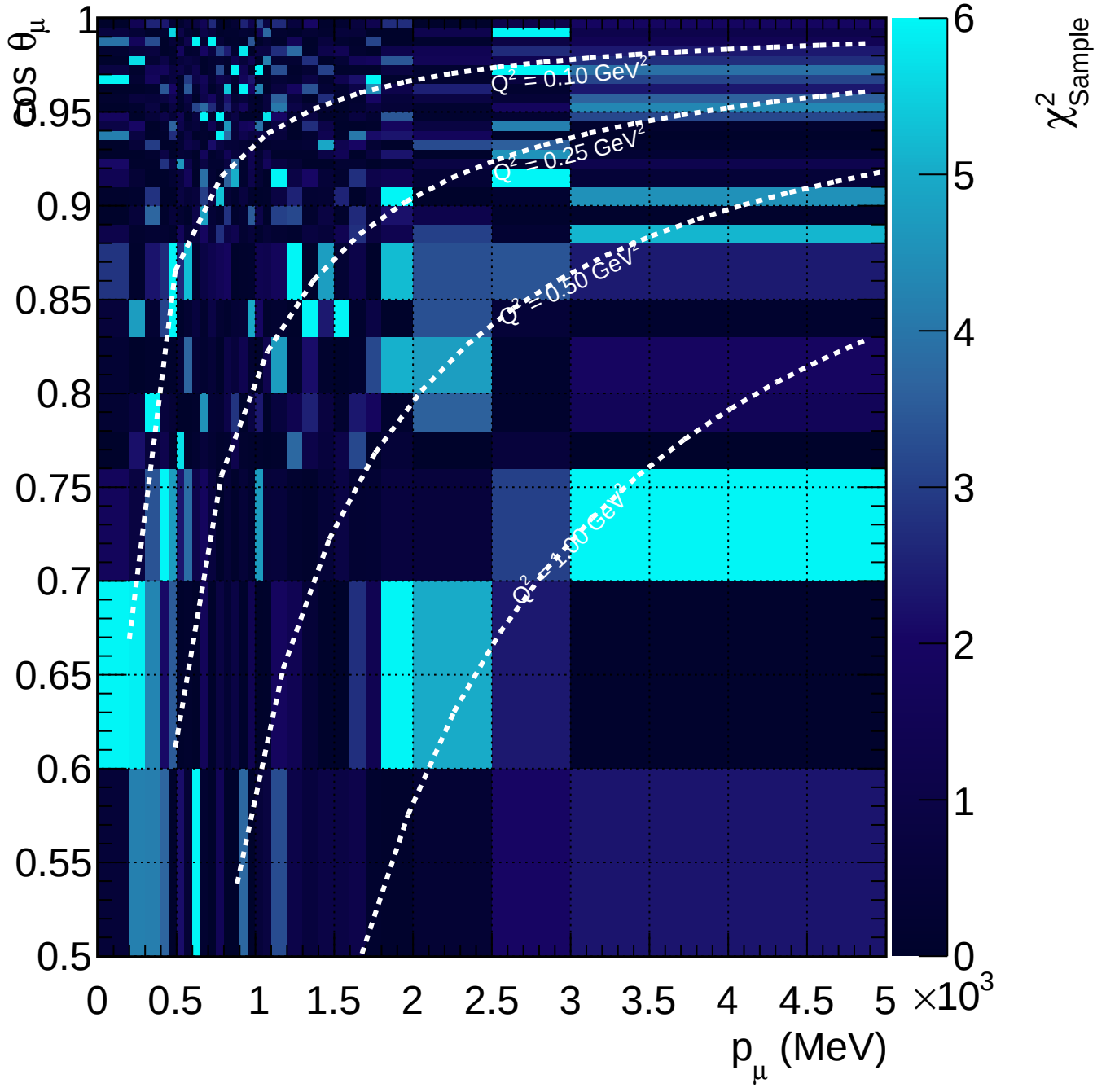

FGD1_numuCC_other_data
×10^3
N_events/1
100
80
60
40
20
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

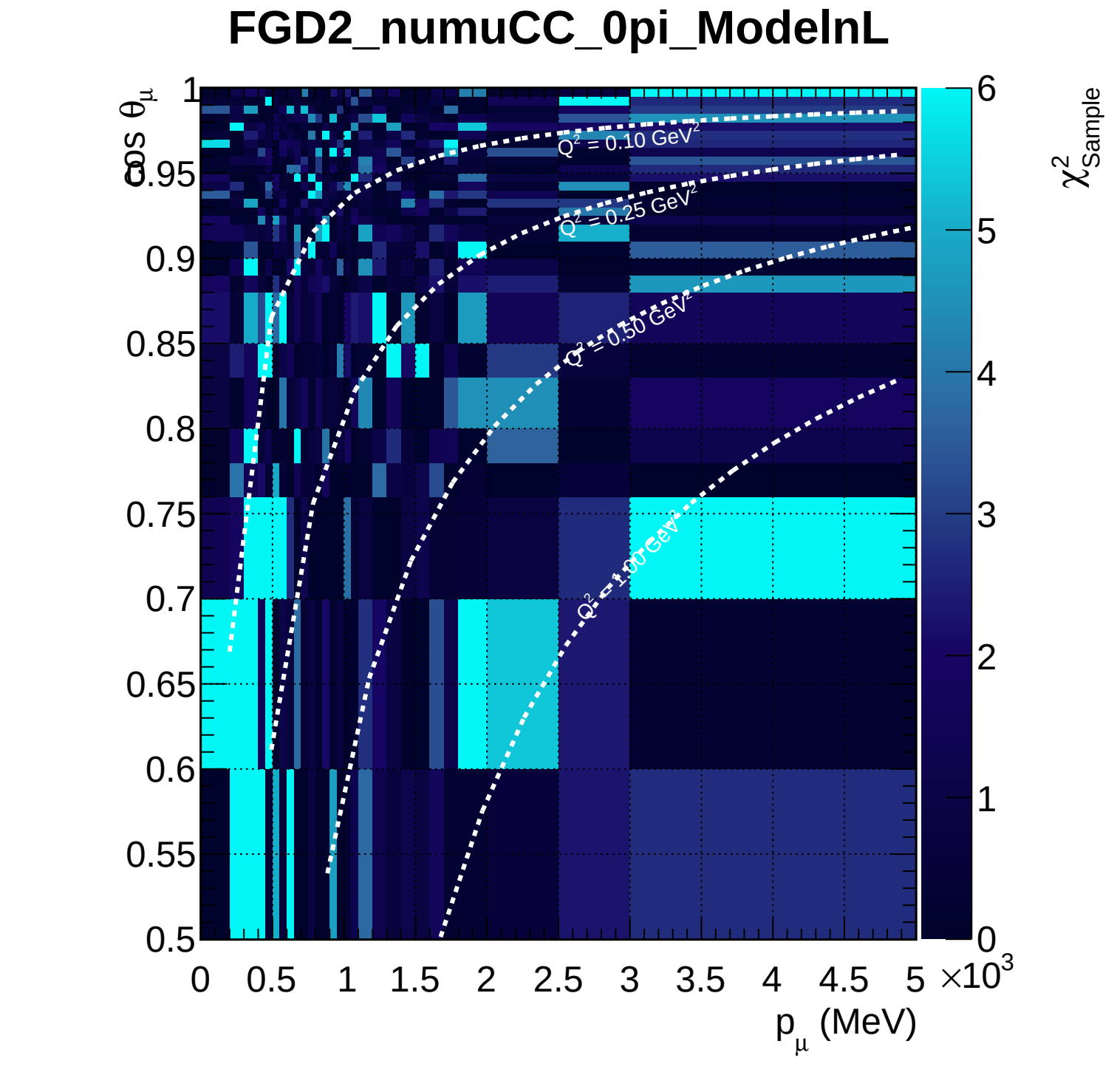

DataDrawFluc
FGD2 ν_μCC 0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Draw, Draw Fluc}}$
Steps
12000
10000
8000
6000
4000
2000
700
750
800
850
900
950
1000
1050
25
20
15
10
5
0

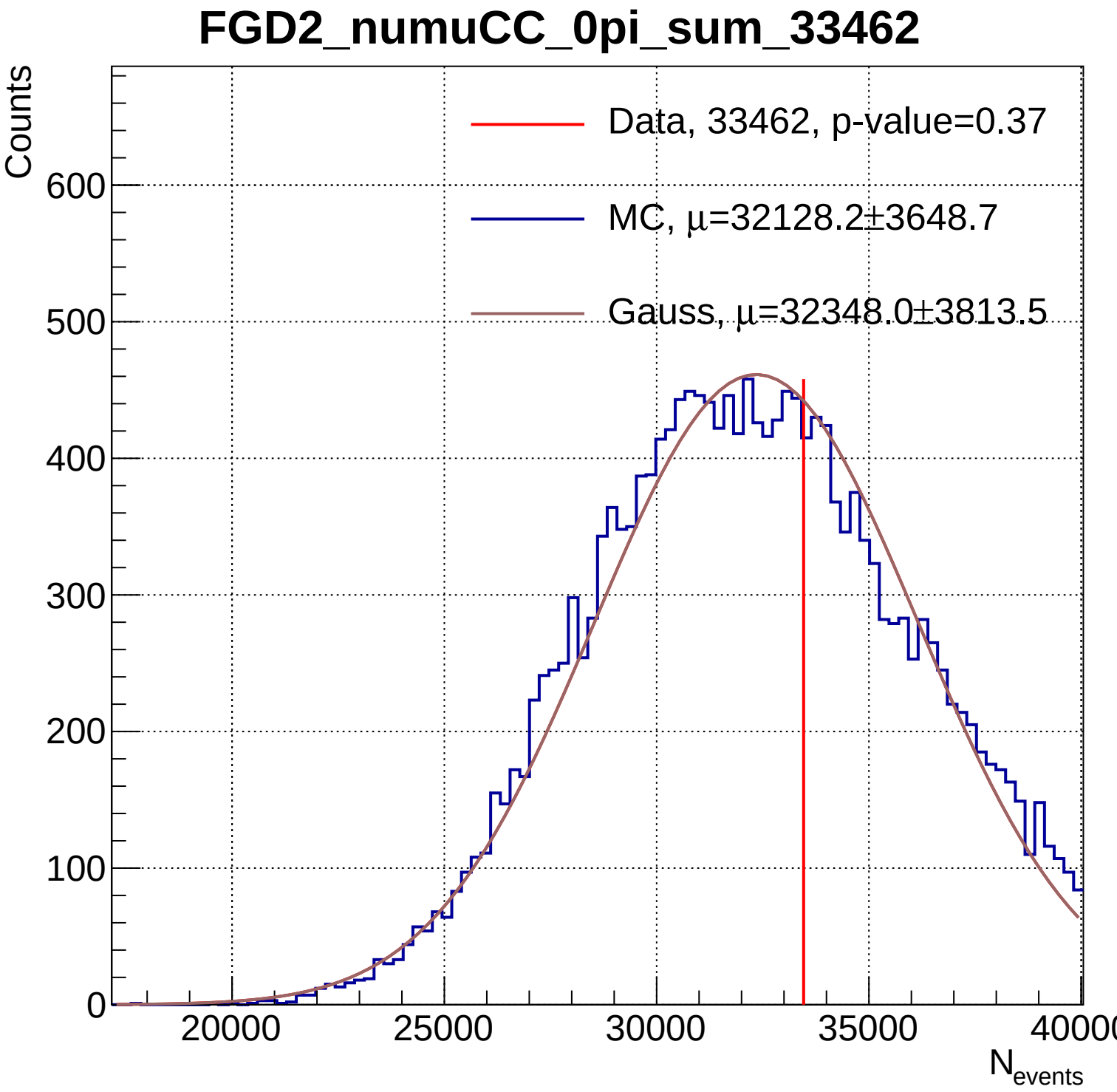

DataPredFluc
FGD2 ν_μCC 0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
12000
10000
8000
6000
4000
2000
700
750
800
850
900
950
1000
1050
25
20
15
10
5
0

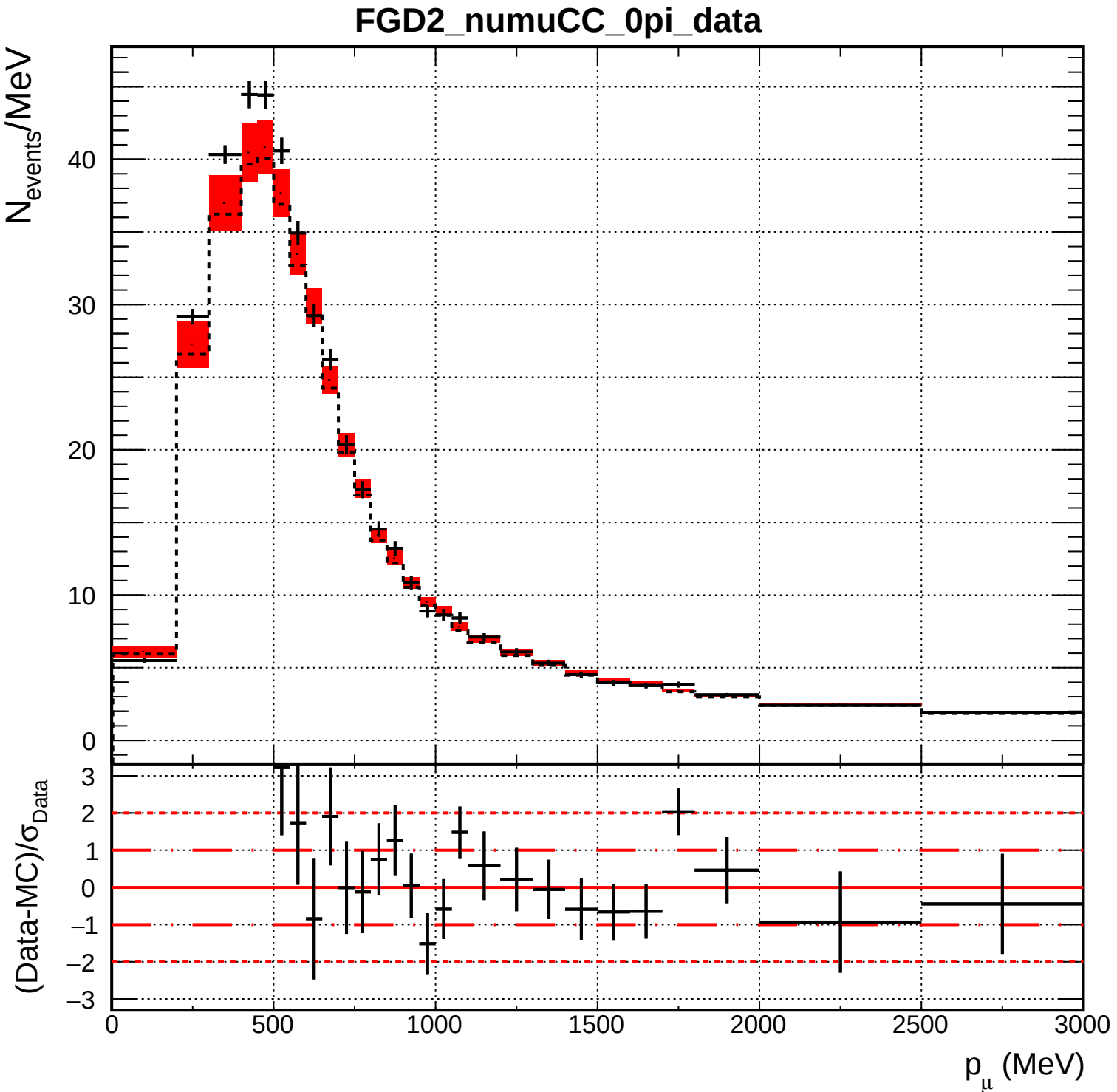

FGD2_numuCC_0pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

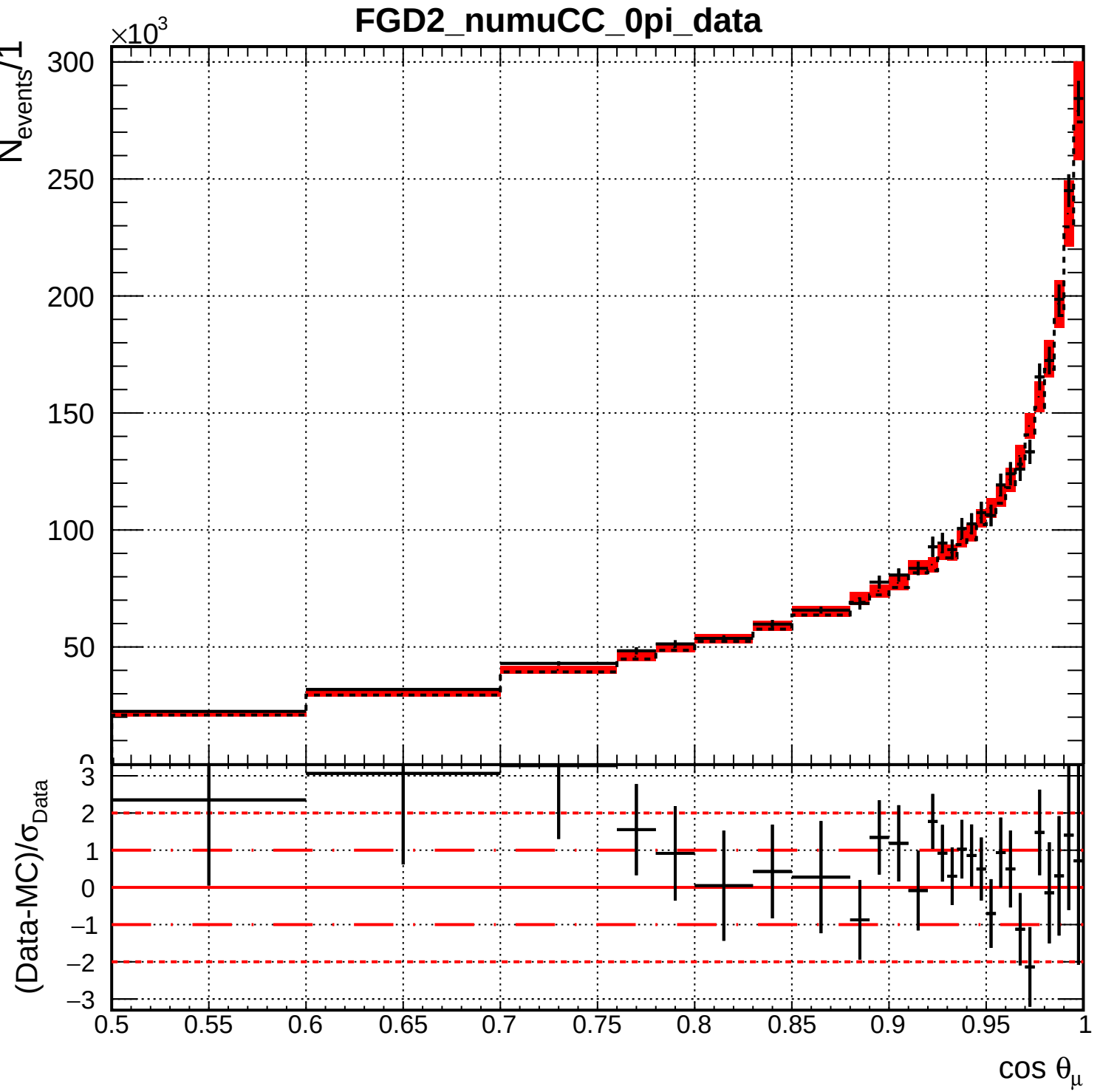

FGD2_numuCC_0pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

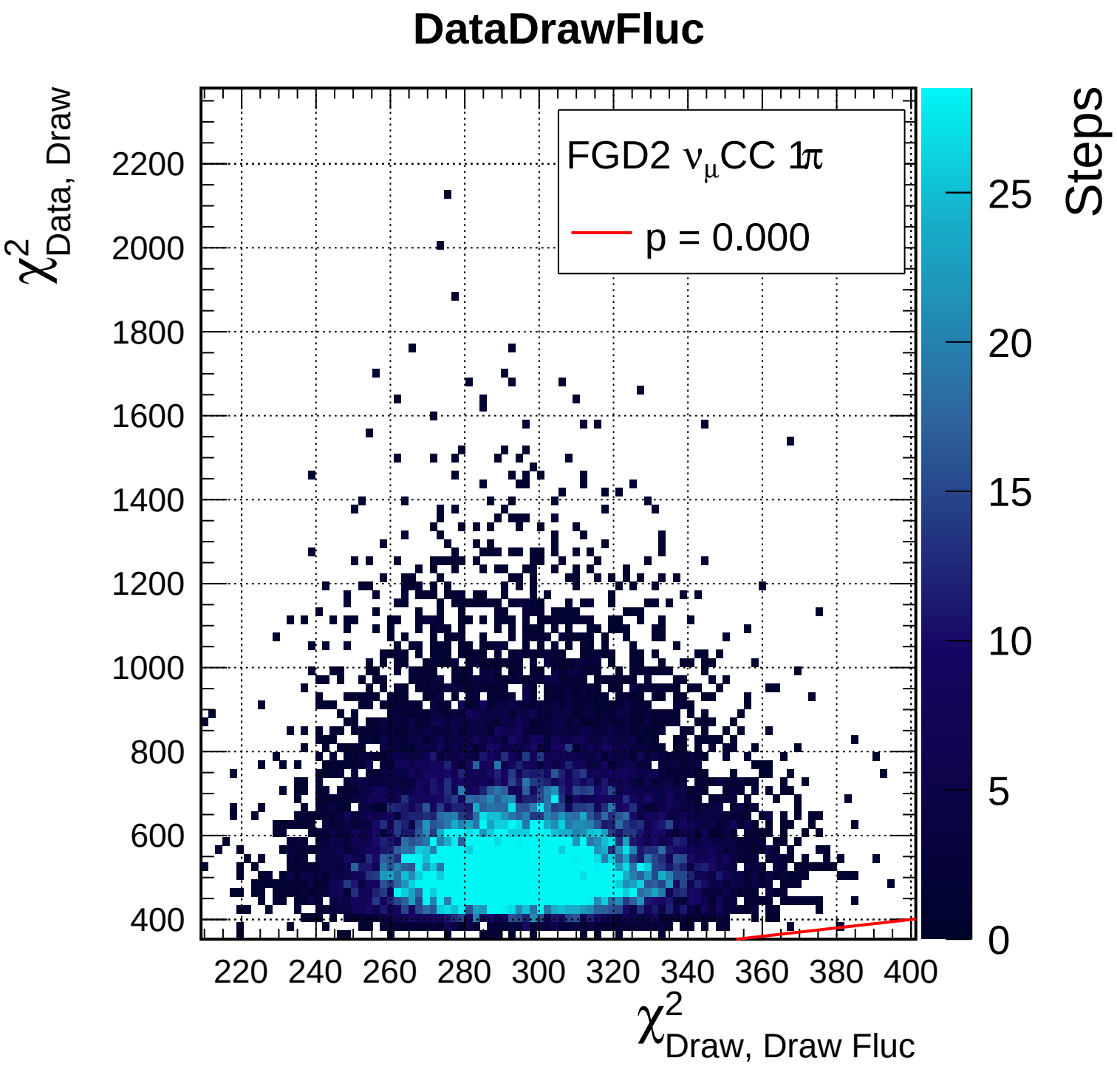

FGD2_numuCC_0pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

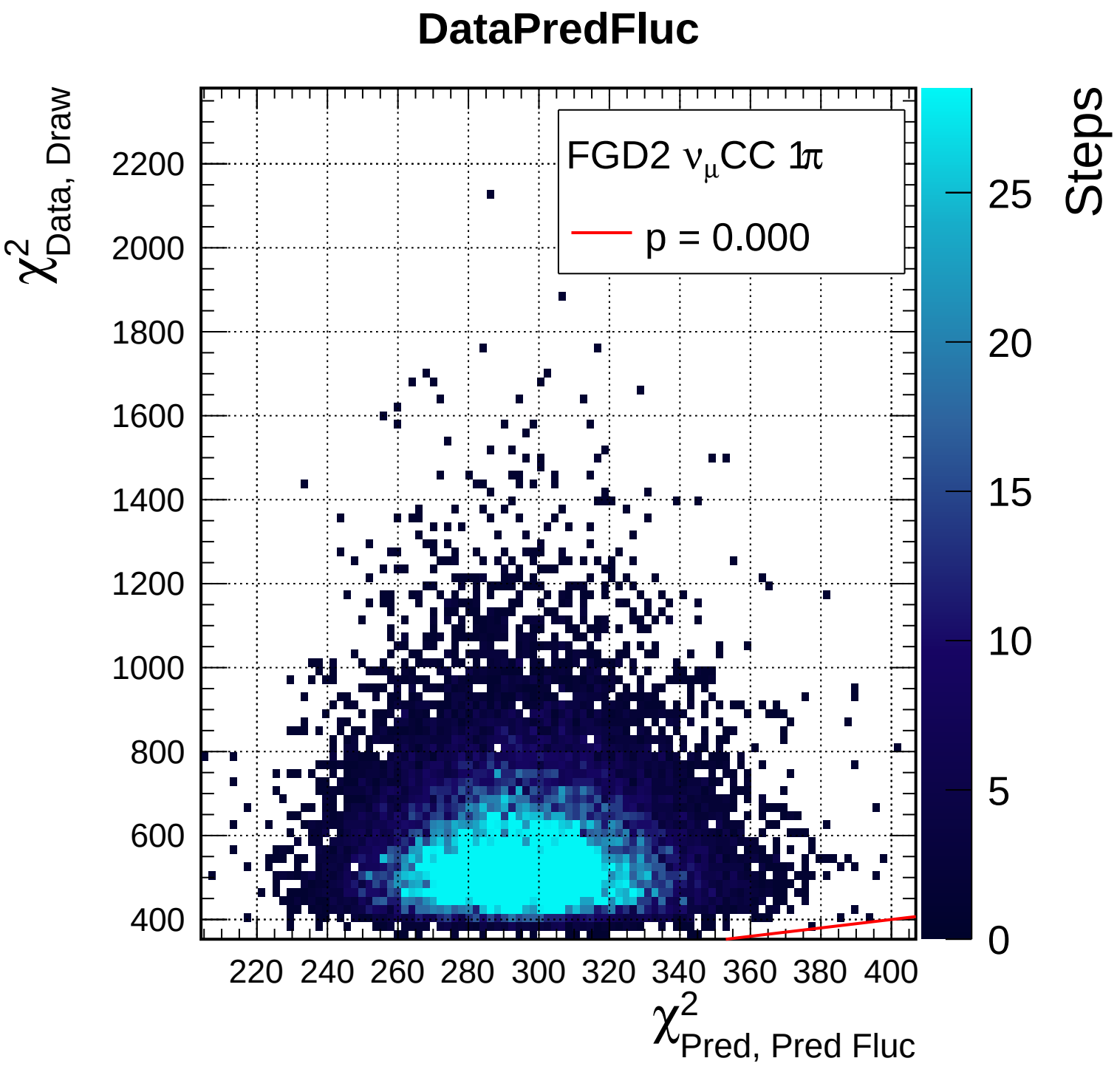

FGD2_numuCC_0pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

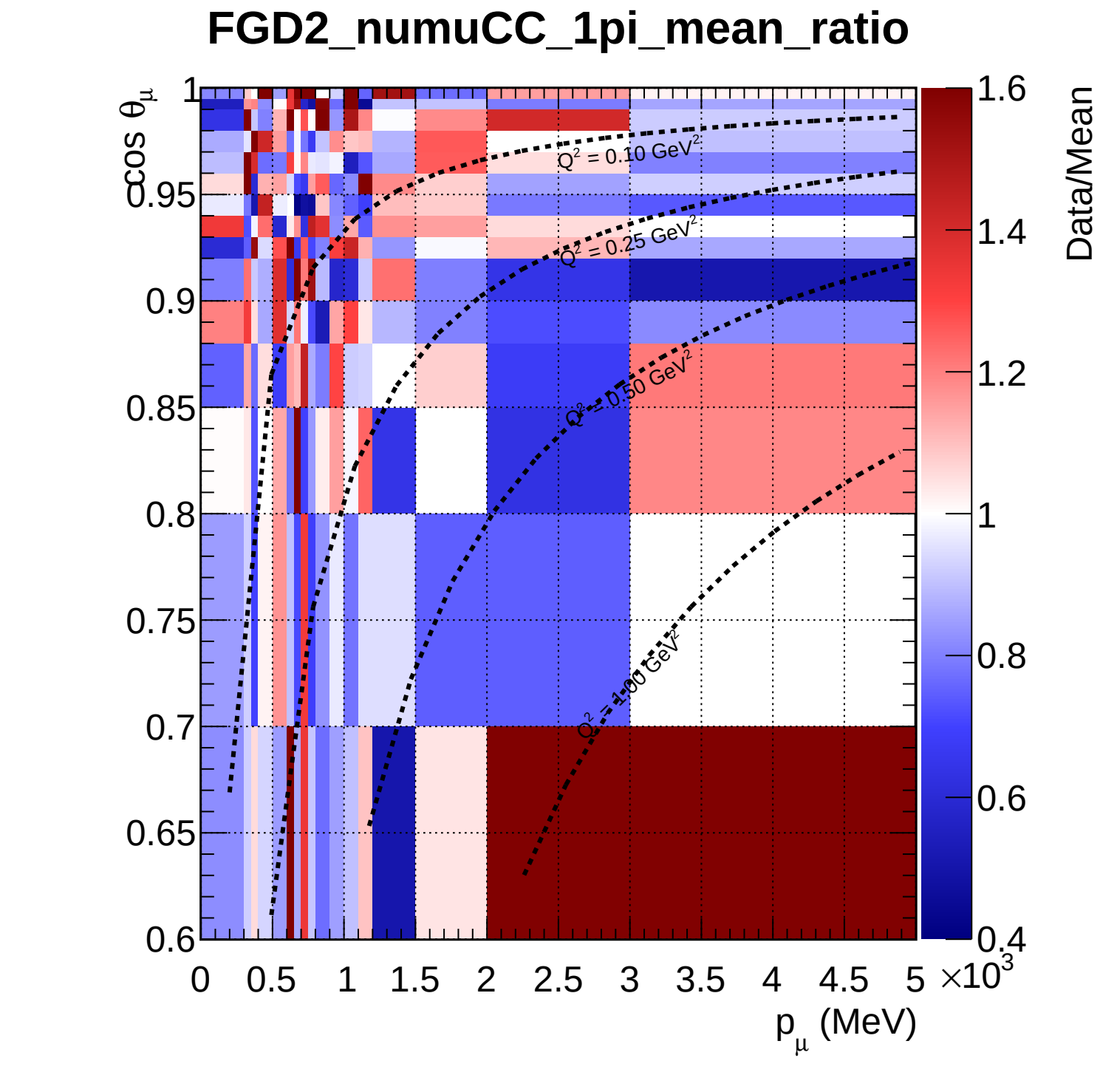

FGD2_numuCC_0pi_sum_33462
Data, 33462, p-value=0.37
MC, μ=32128.2±3648.7
Gauss, μ=32348.0±3813.5
Counts
0
100
200
300
400
500
600
20000
25000
30000
35000
40000
N_events

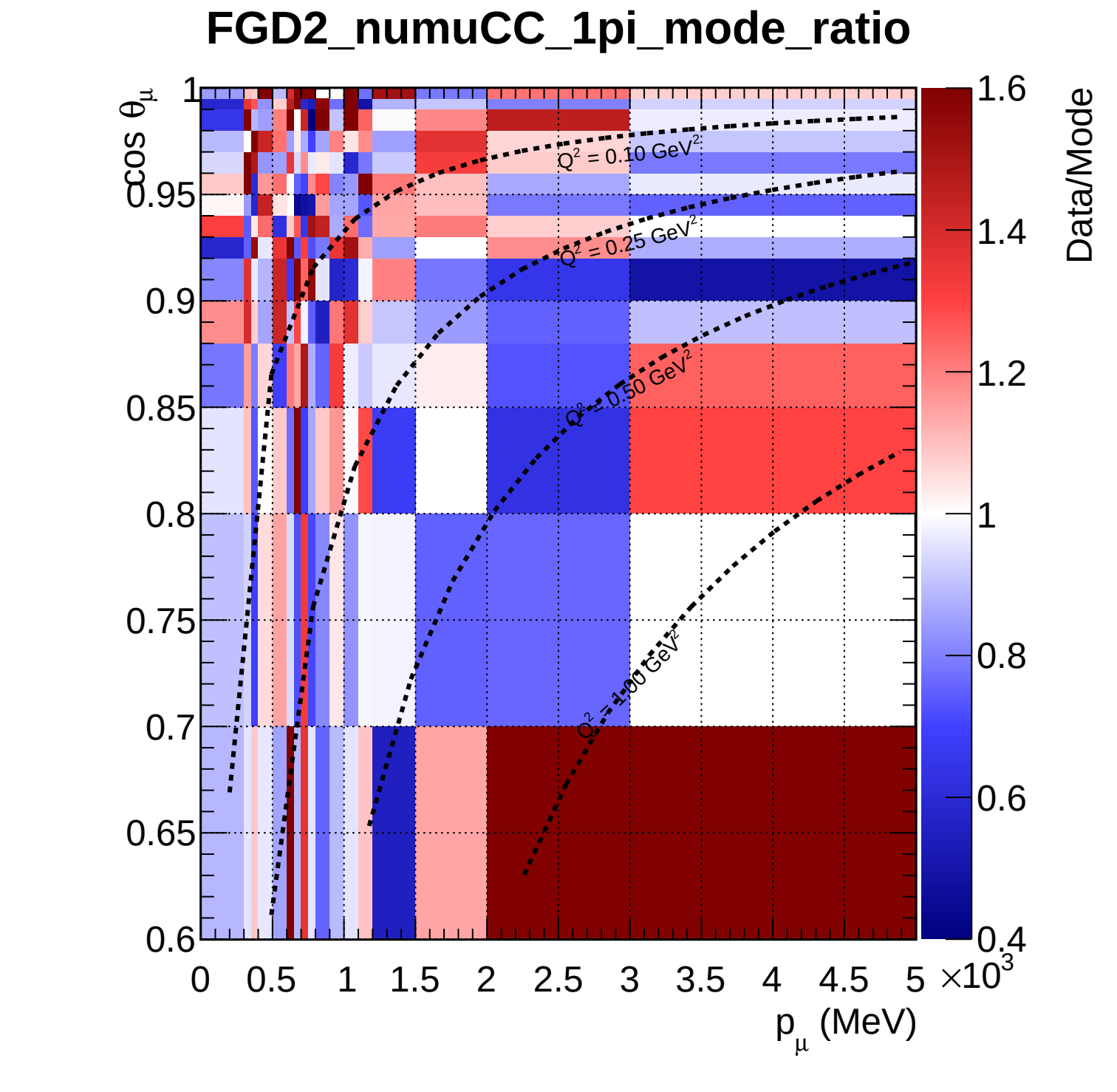

FGD2_numuCC_0pi_data
N_events/MeV
40
30
20
10
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
2500
3000
p_μ (MeV)

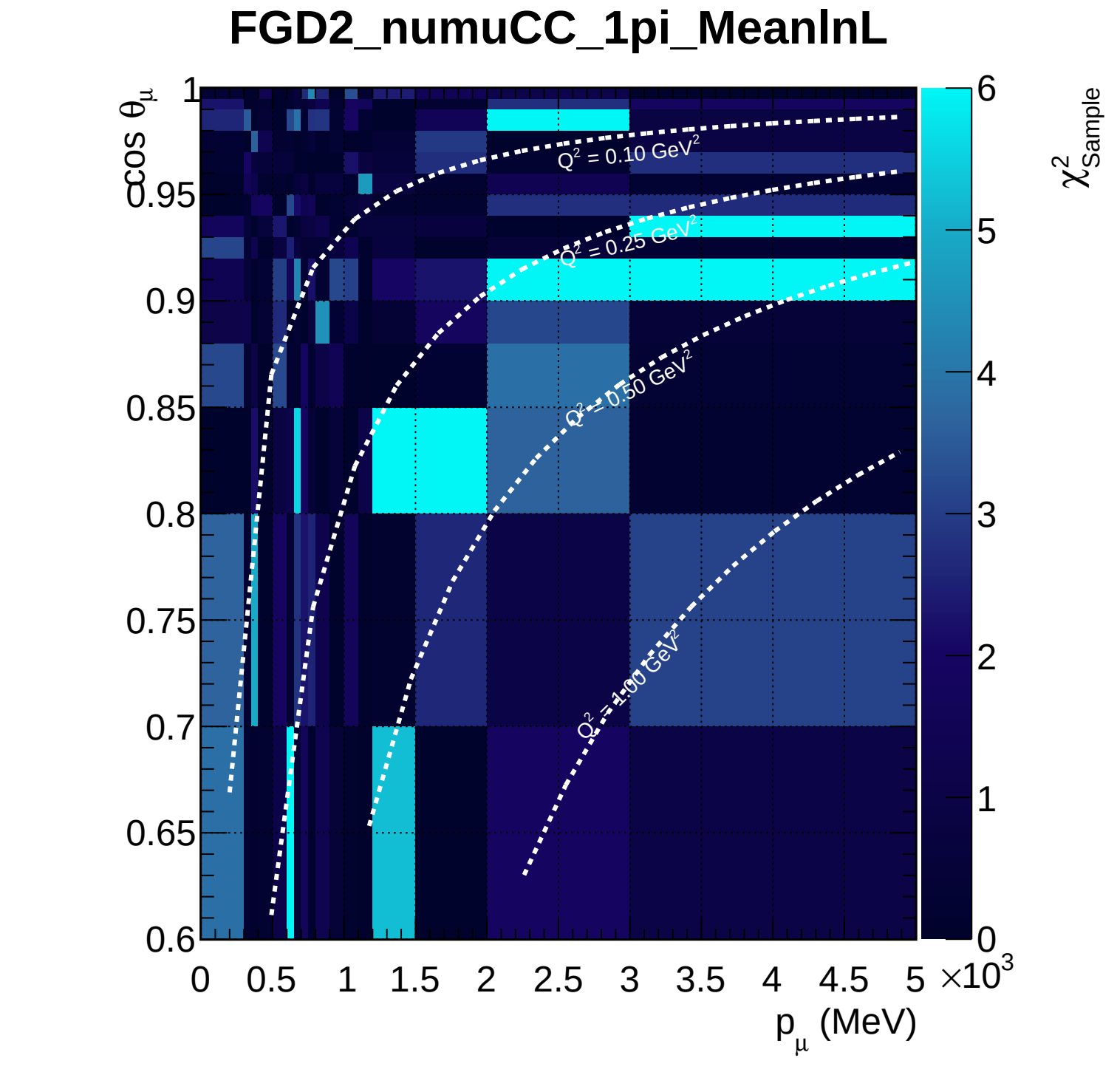

FGD2_numuCC_0pi_data
×10^3
N_events/1
300
250
200
150
100
50
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.5
0.55
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

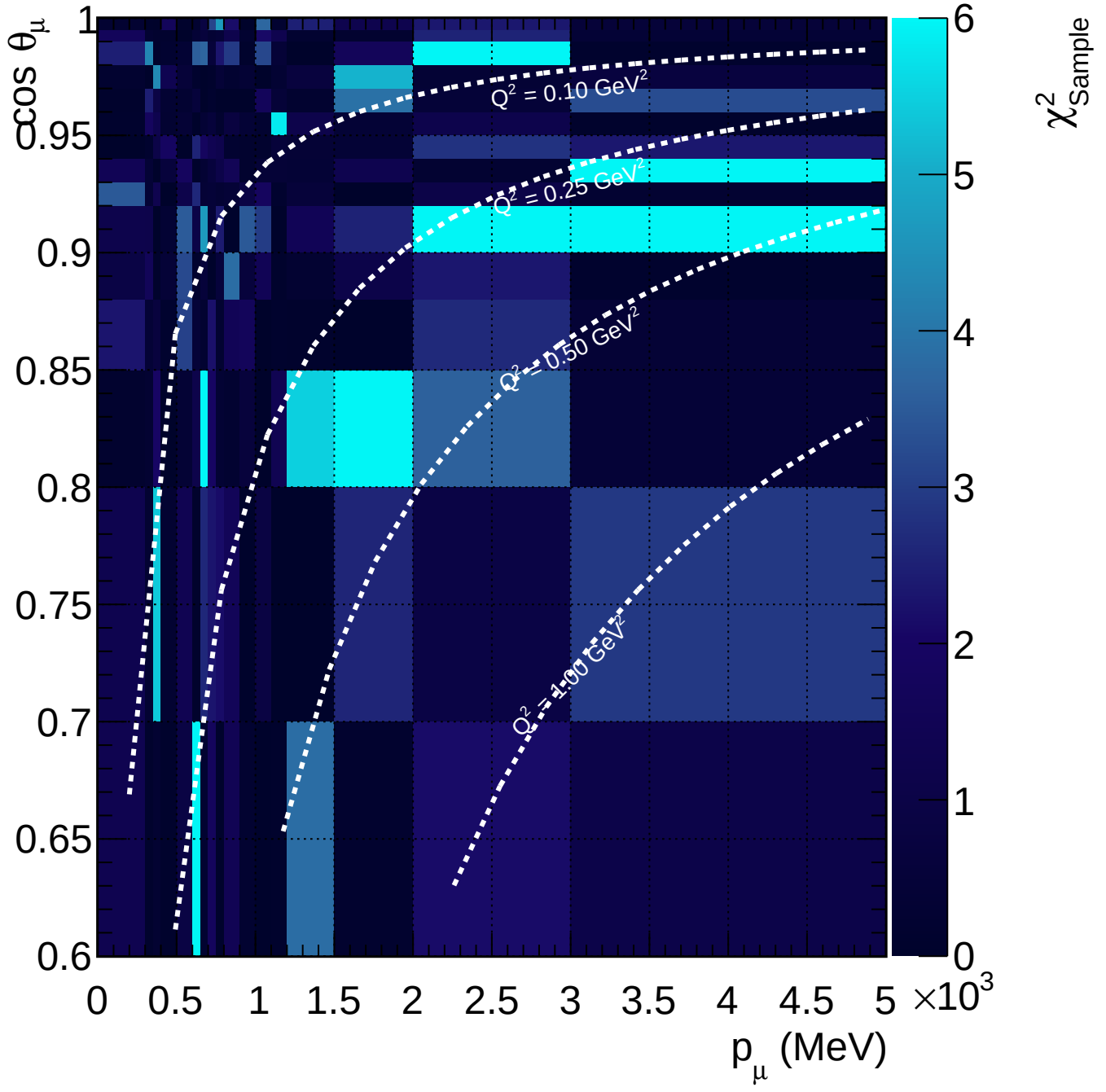

DataDrawFluc
FGD2 ν_μCC 1π
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
2200
2000
1800
1600
1400
1200
1000
800
600
400
220
240
260
280
300
320
340
360
380
400
25
20
15
10
5
0

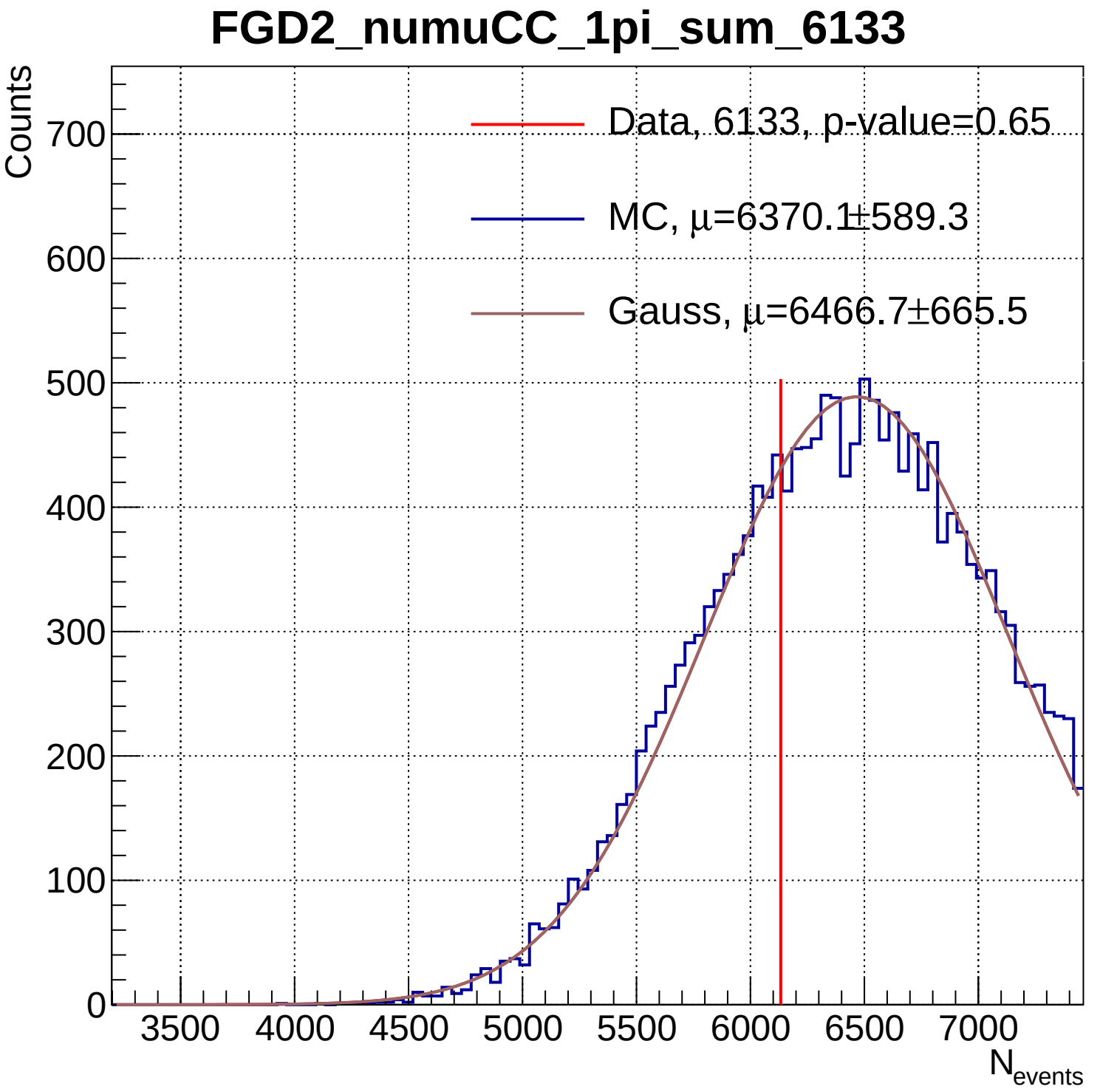

DataPredFluc
FGD2 ν_μCC 1π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
2200
2000
1800
1600
1400
1200
1000
800
600
400
220
240
260
280
300
320
340
360
380
400
25
20
15
10
5
0

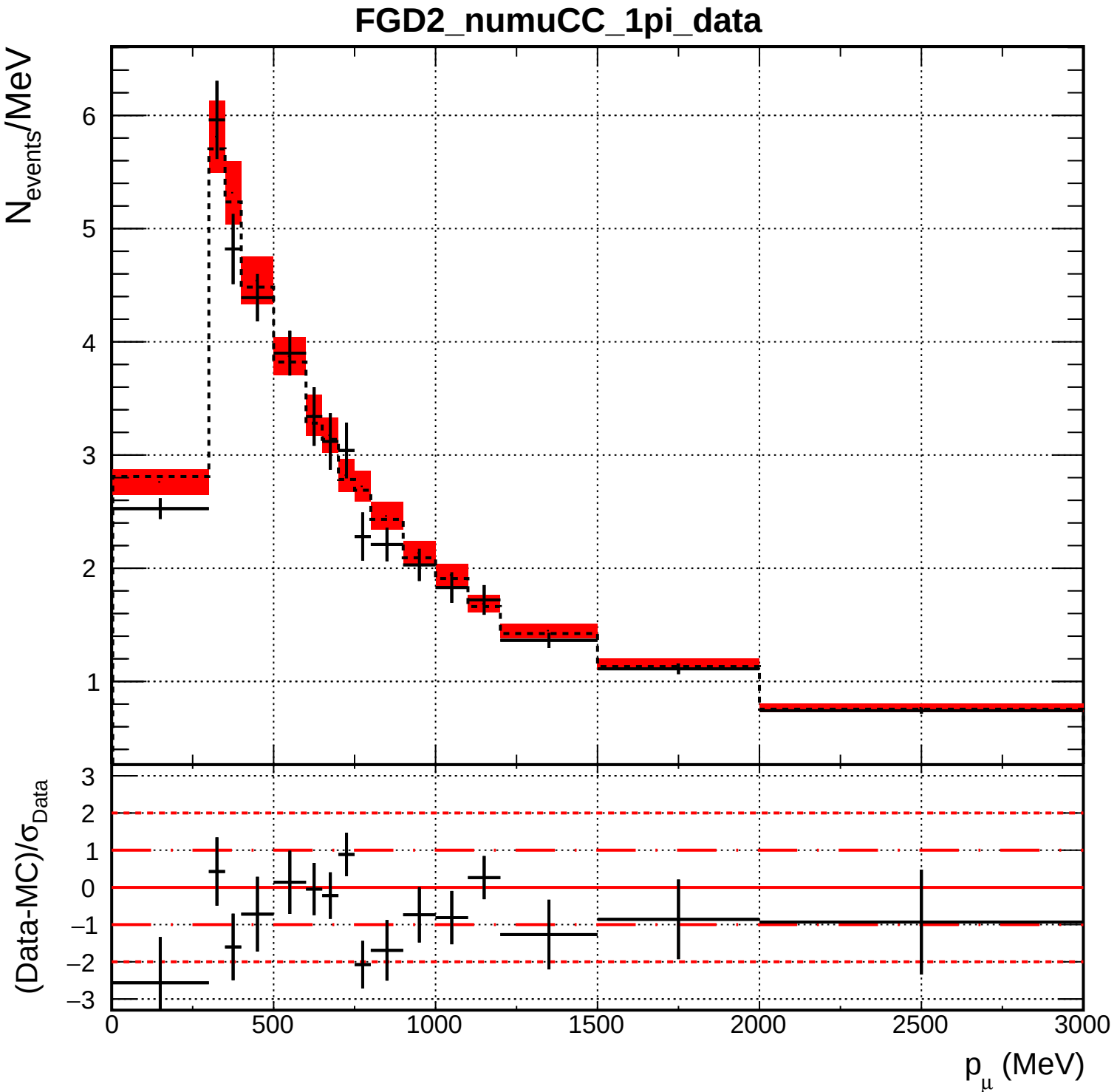

FGD2_numuCC_1pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

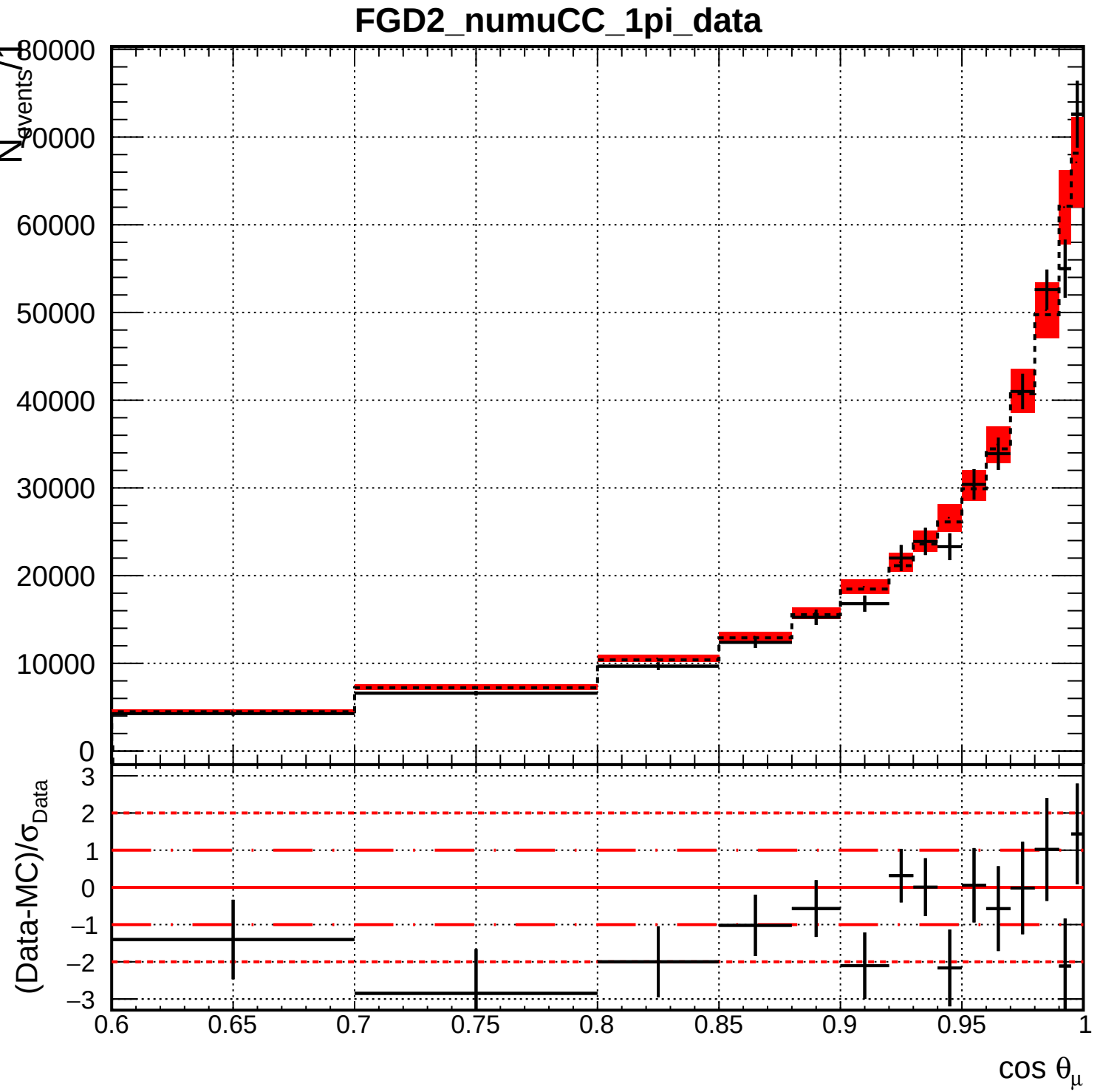

FGD2_numuCC_1pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

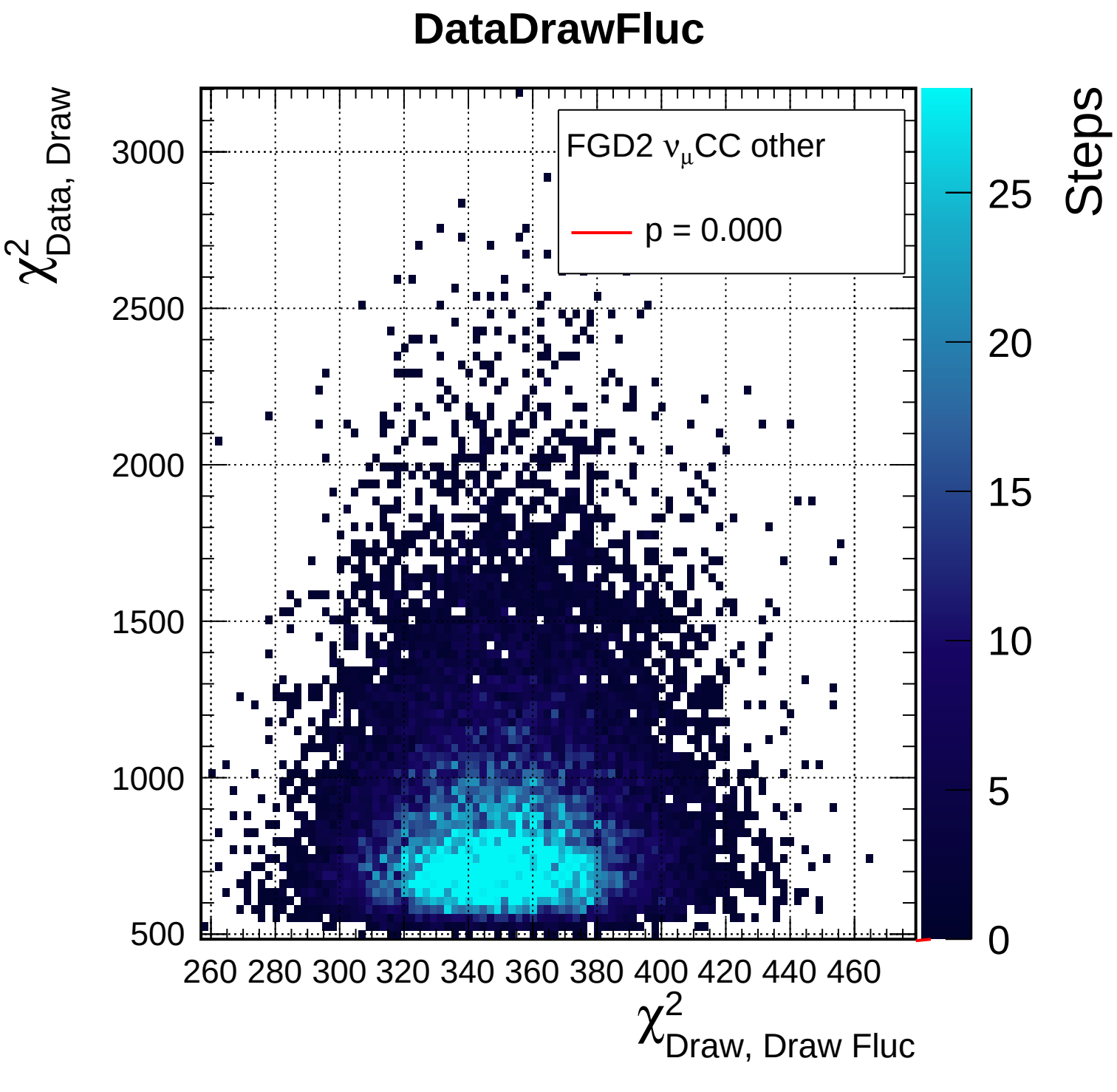

FGD2_numuCC_1pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

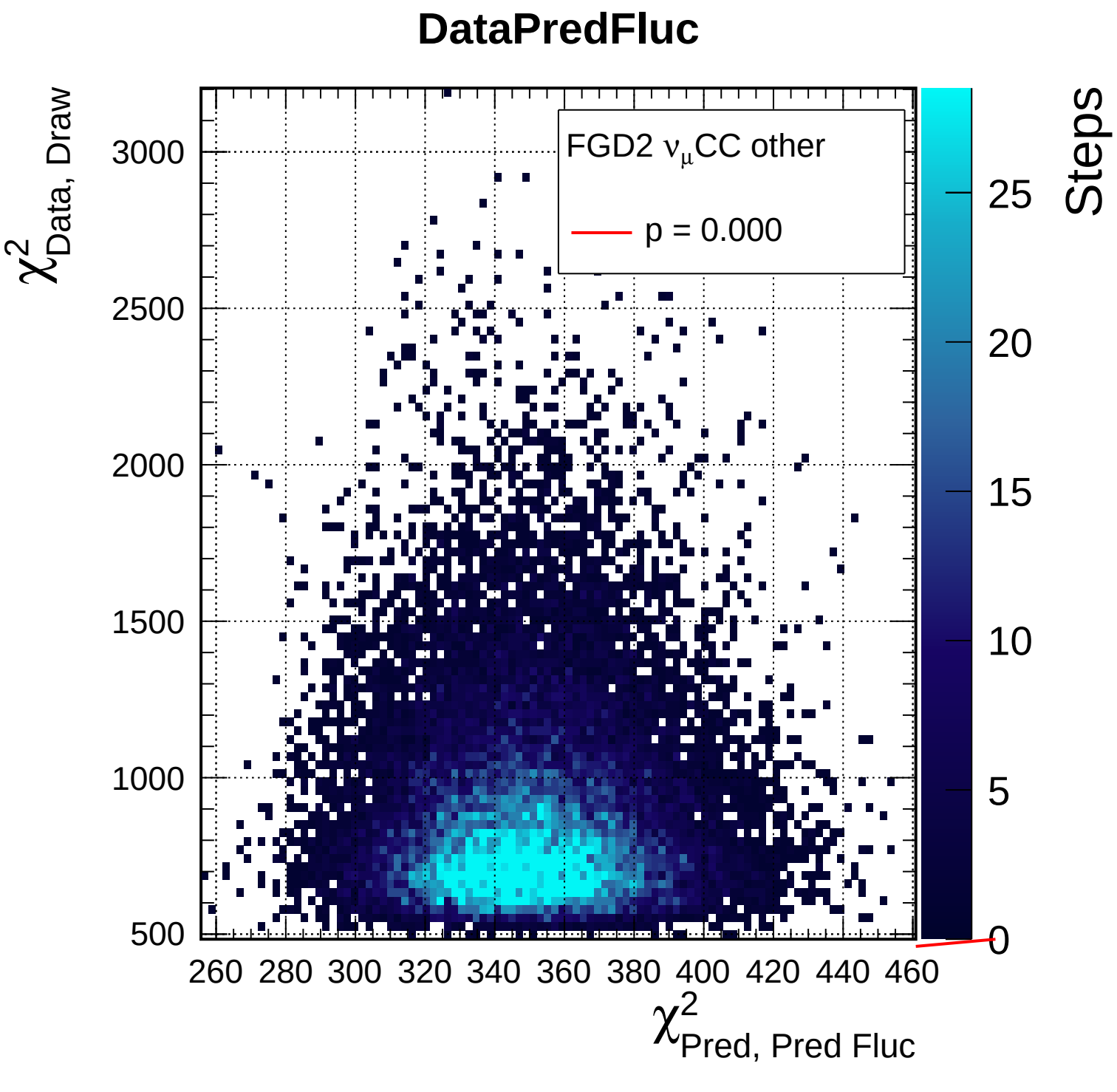

FGD2_numuCC_1pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

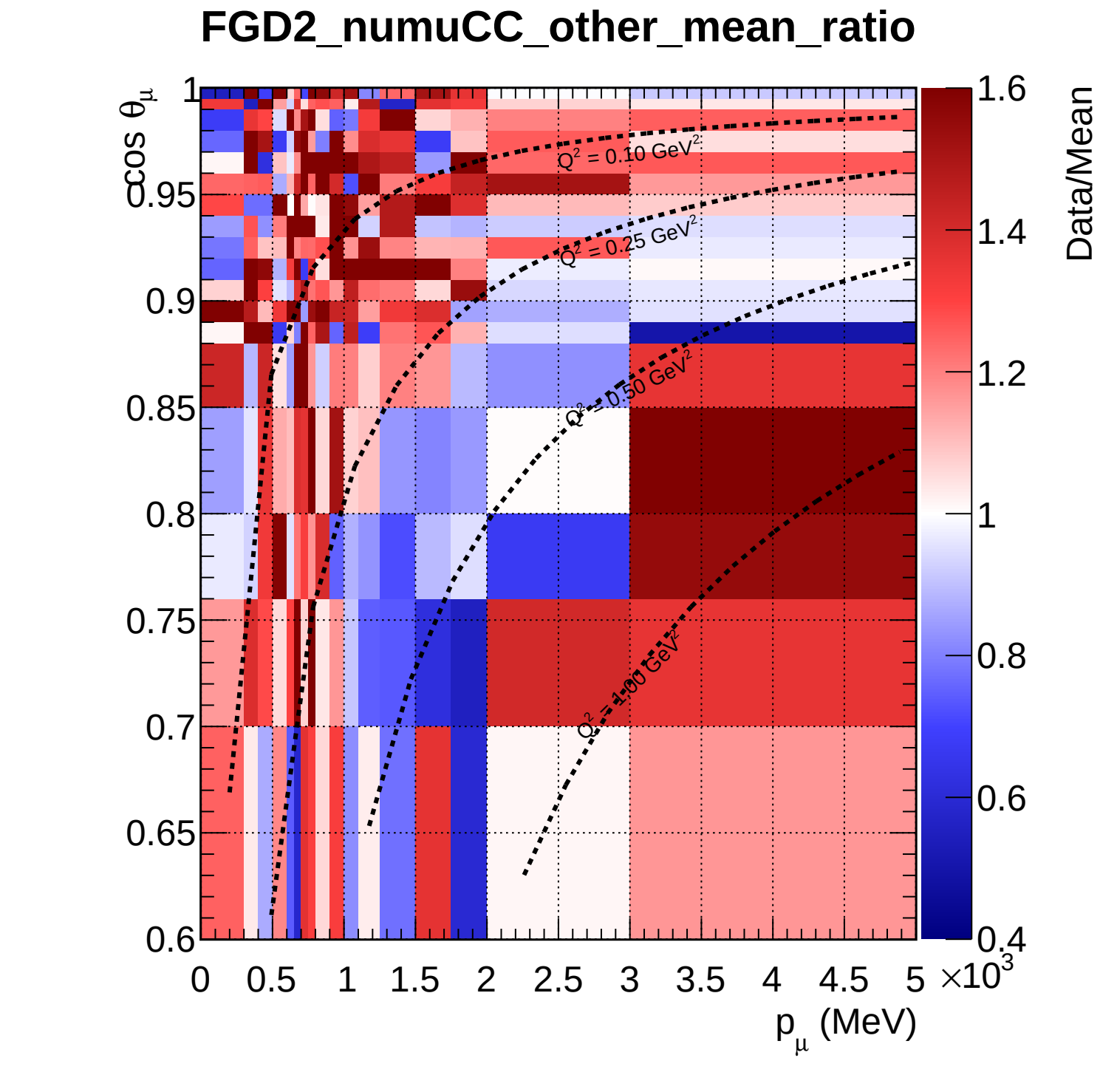

FGD2_numuCC_1pi_sum_6133
Counts
Data, 6133, p-value=0.65
MC, μ=6370.1±589.3
Gauss, μ=6466.7±665.5
0
100
200
300
400
500
600
700
3500
4000
4500
5000
5500
6000
6500
7000
N_events

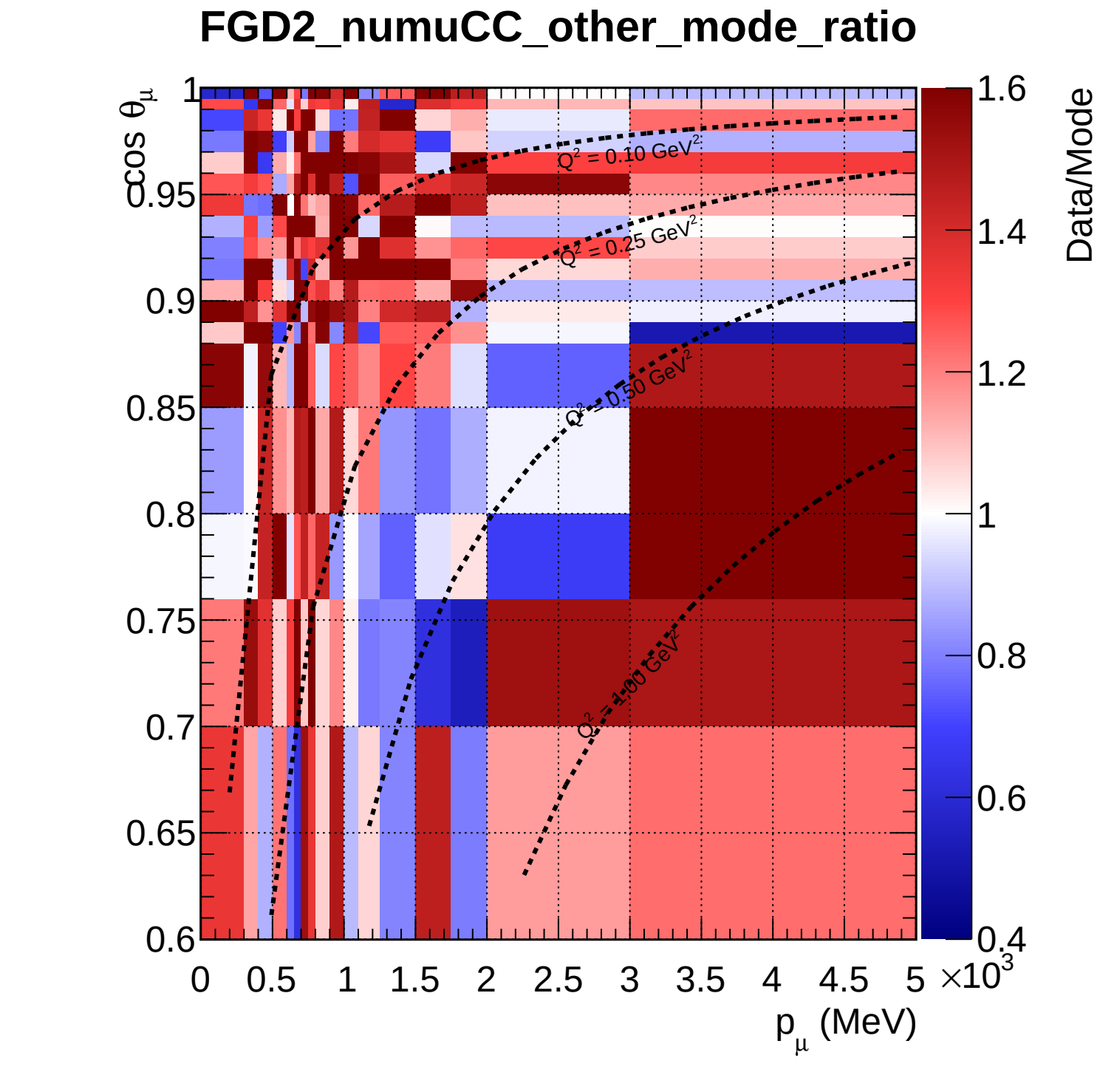

FGD2_numuCC_1pi_data
N_events/MeV
(Data-MC)/σ_Data
p_μ (MeV)
0
500
1000
1500
2000
2500
3000
1
2
3
4
5
6
−1
−2
−3

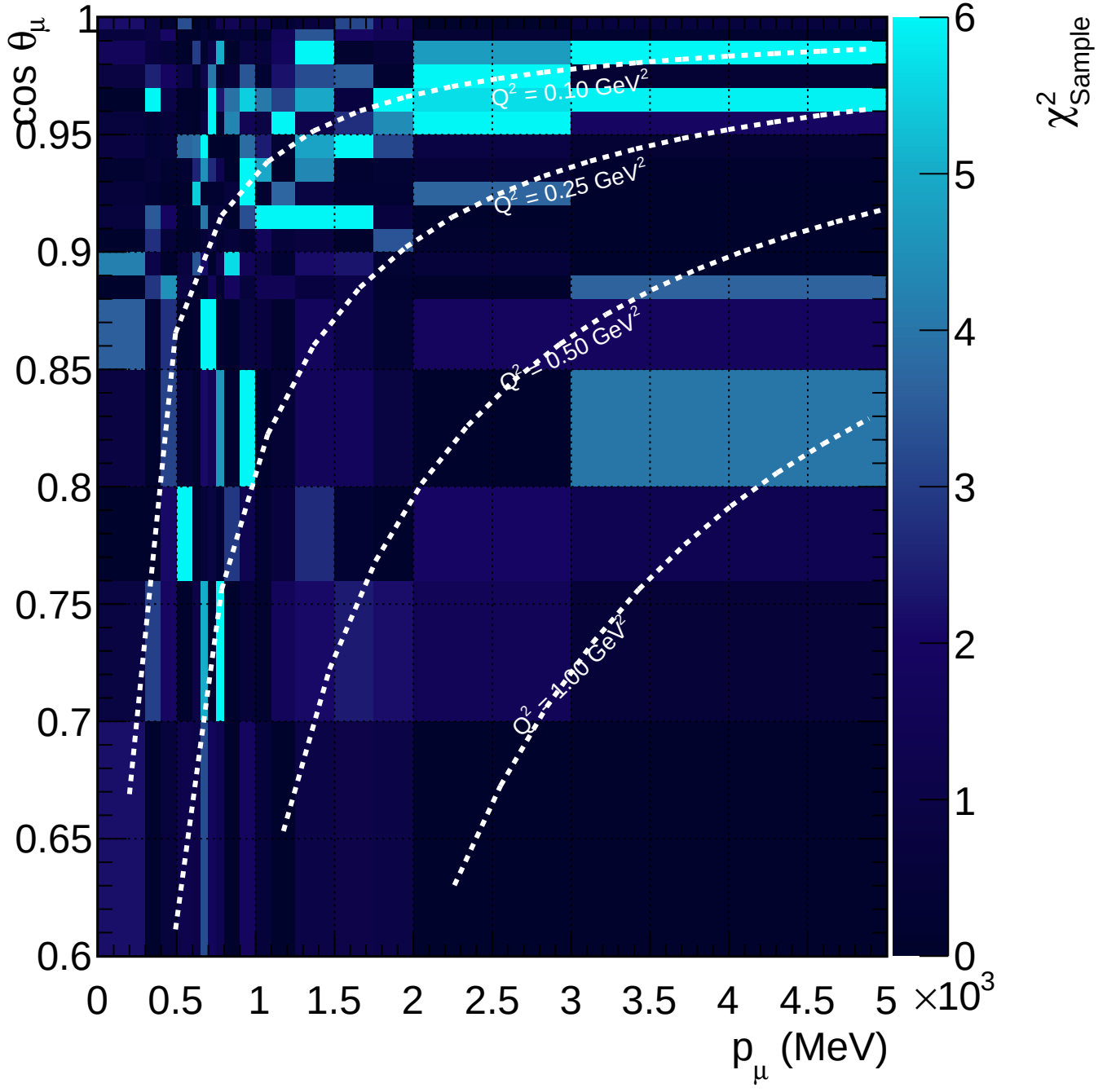

FGD2_numuCC_1pi_data
N_events/1
80000
70000
60000
50000
40000
30000
20000
10000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

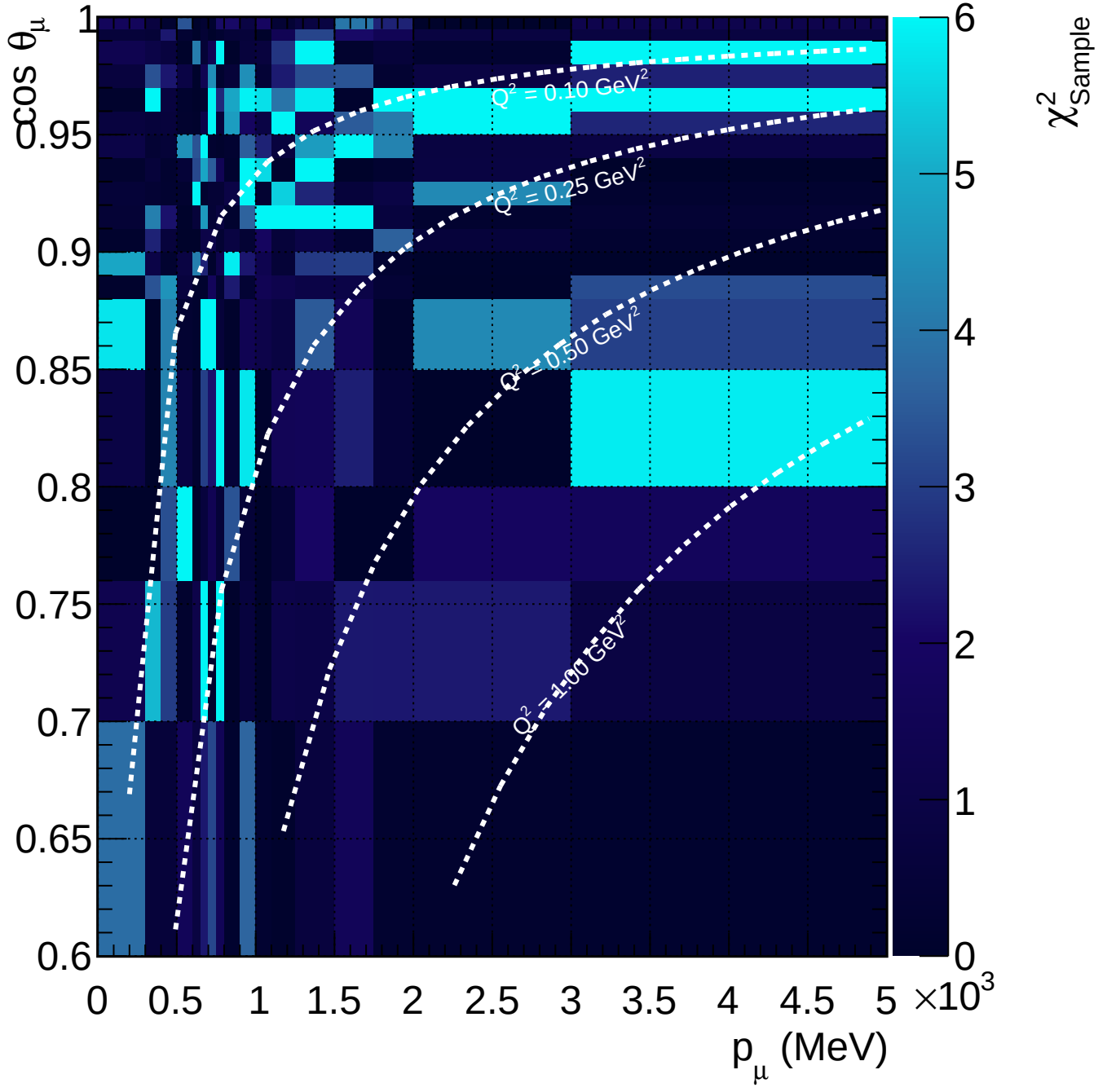

DataDrawFluc
FGD2 ν_μCC other
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
3000
2500
2000
1500
1000
500
260 280 300 320 340 360 380 400 420 440 460
25
20
15
10
5
0

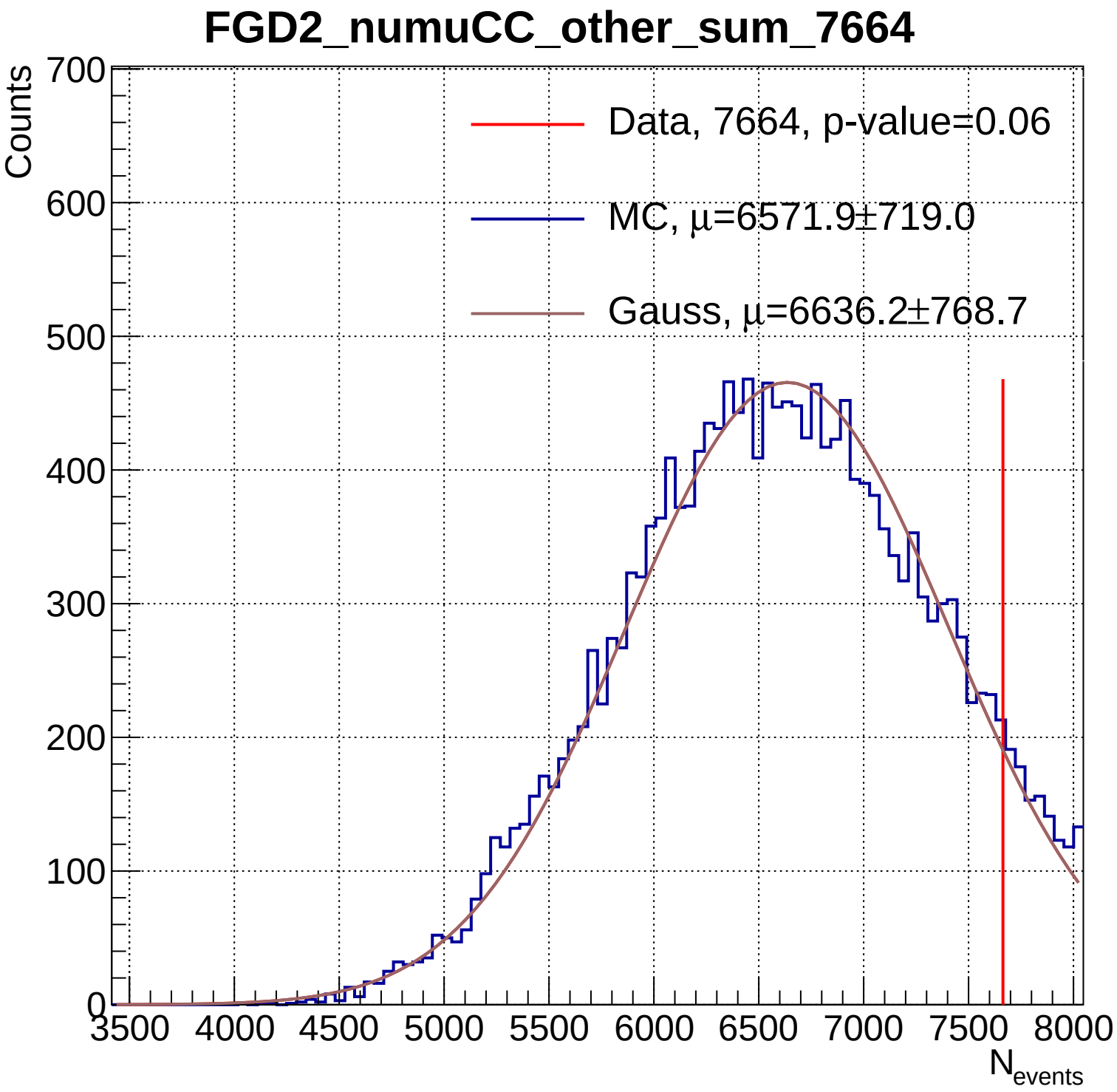

DataPredFluc
FGD2 ν_μCC other
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
3000
2500
2000
1500
1000
500
260 280 300 320 340 360 380 400 420 440 460
25
20
15
10
5
0

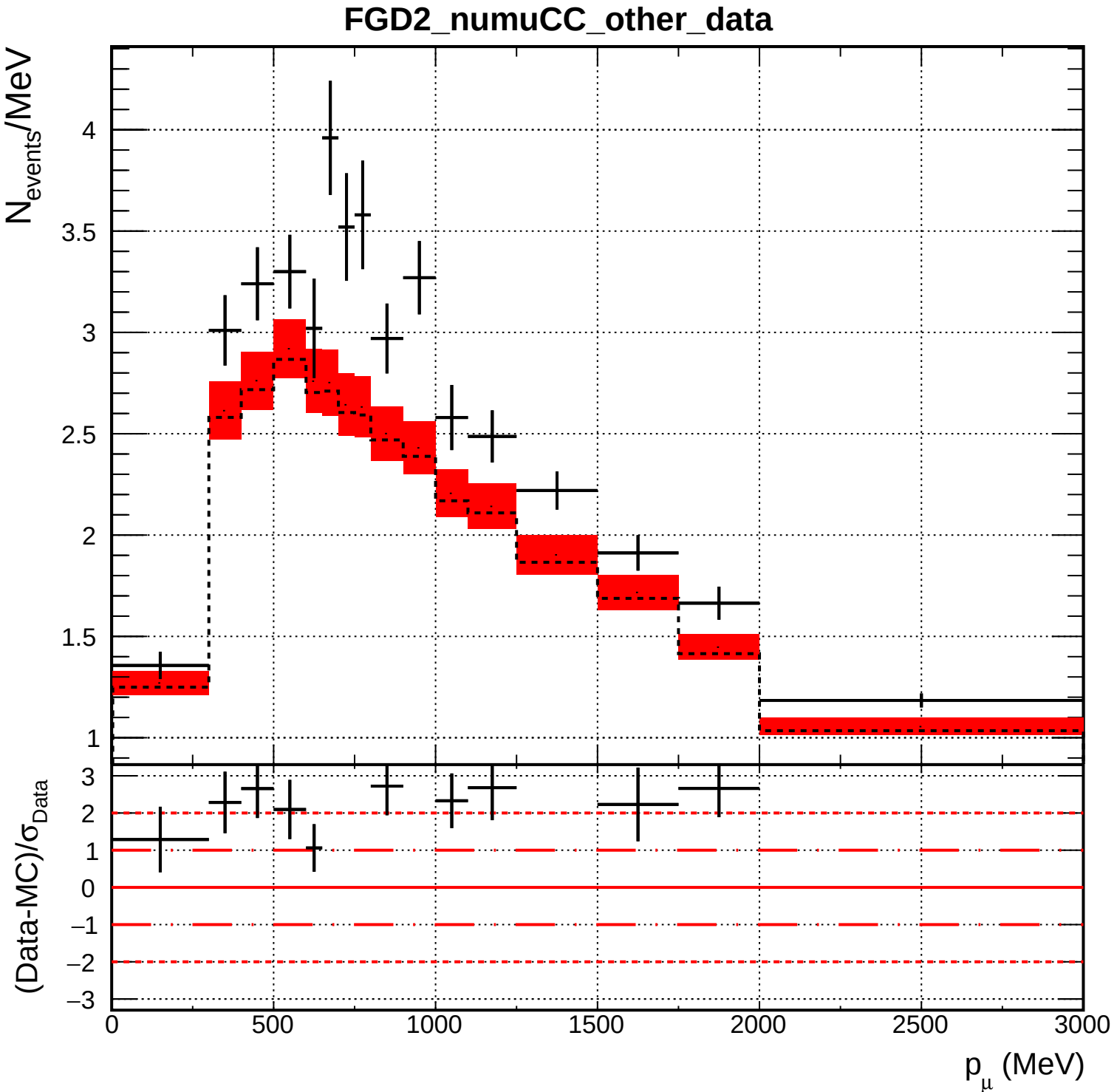

FGD2_numuCC_other_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

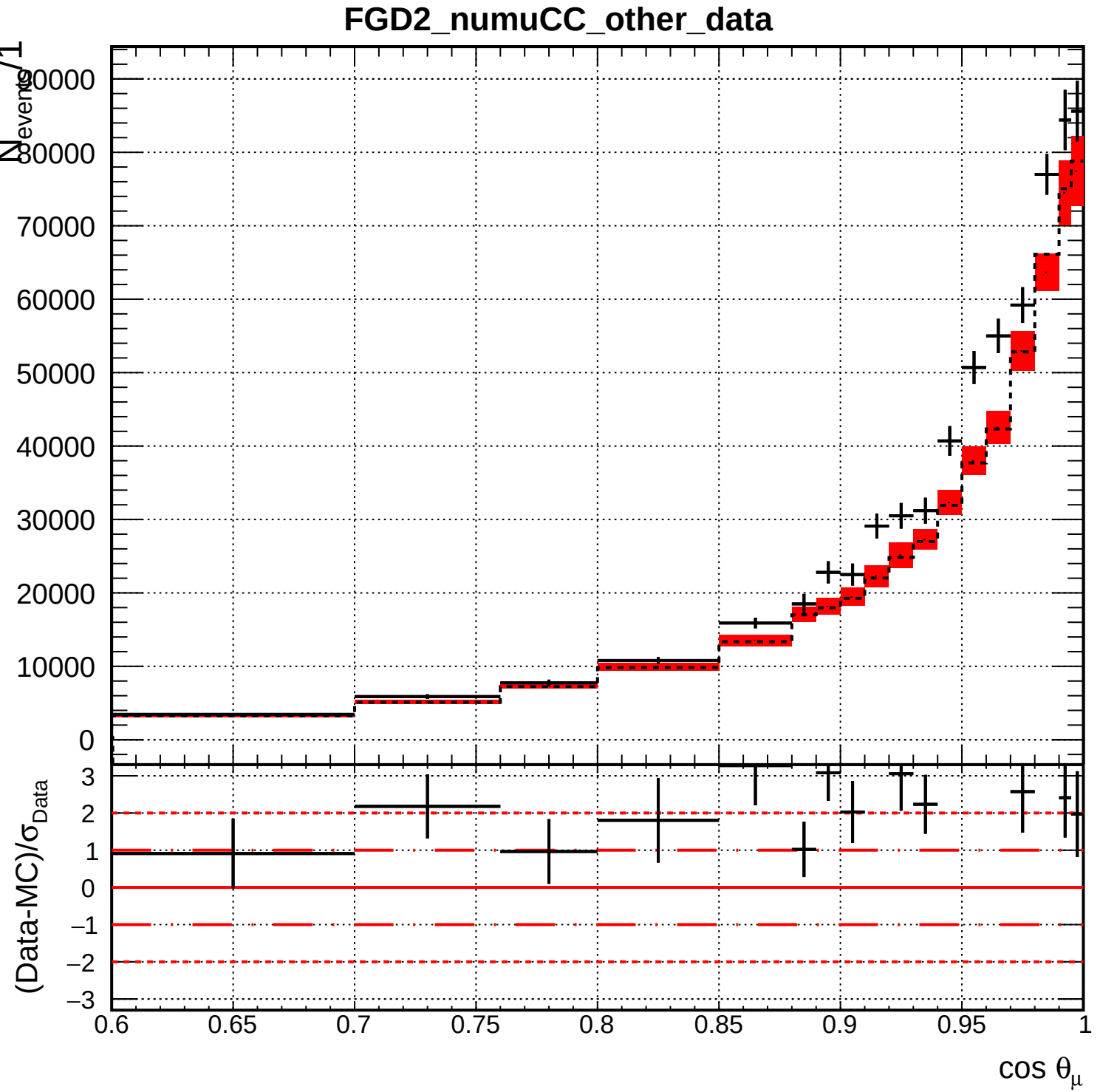

FGD2_numuCC_other_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

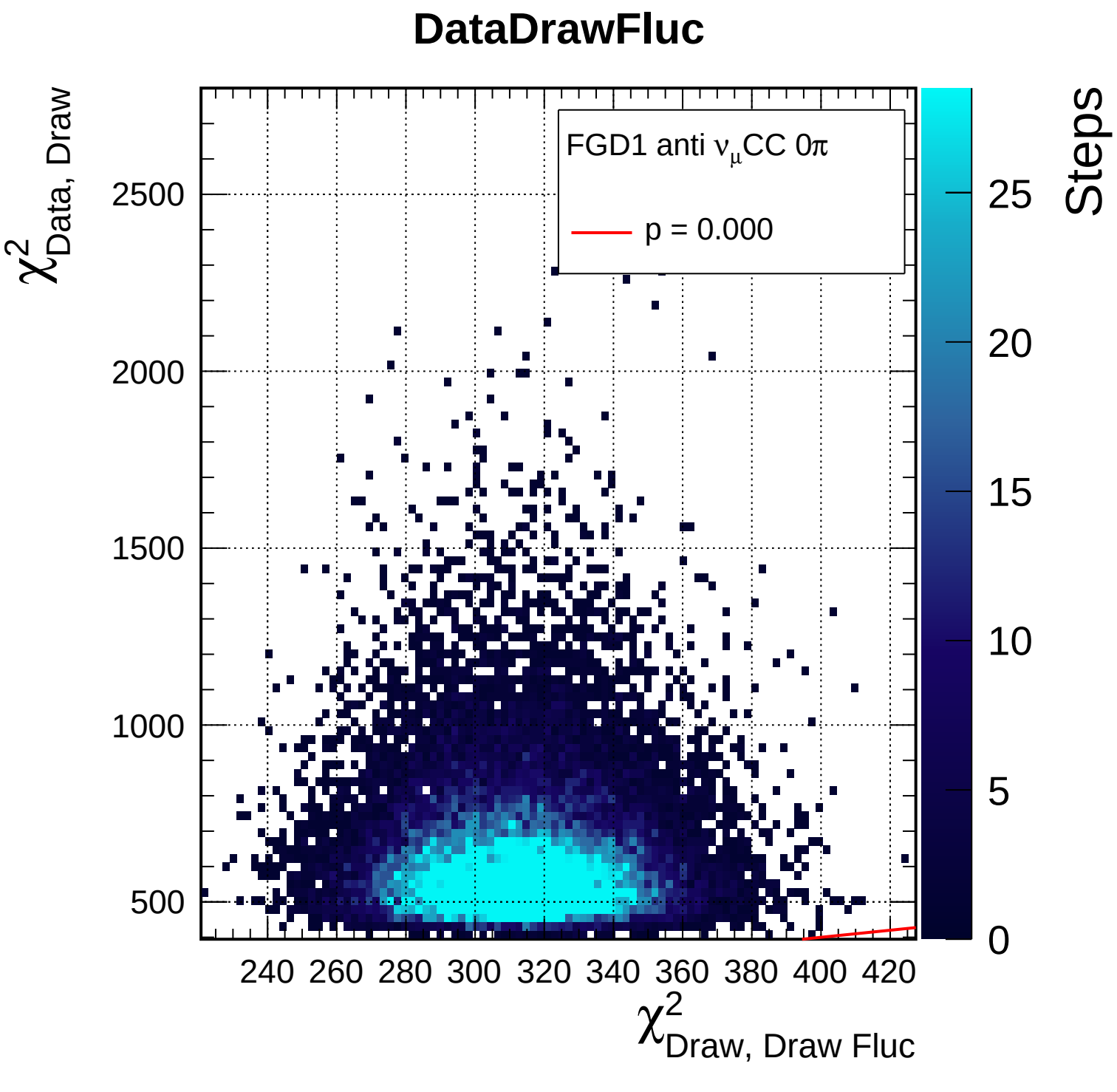

FGD2_numuCC_other_MeanInL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

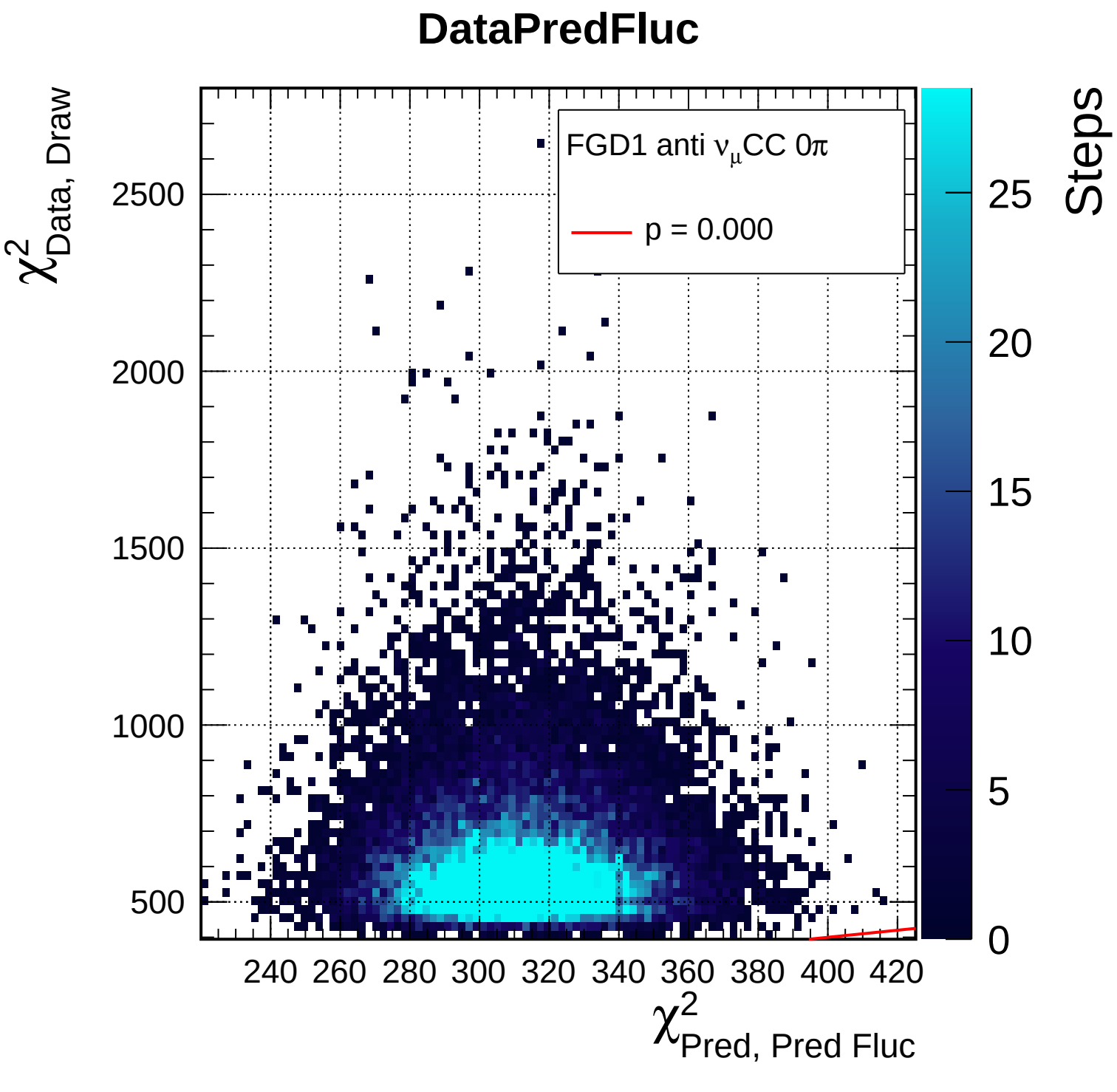

FGD2_numuCC_other_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

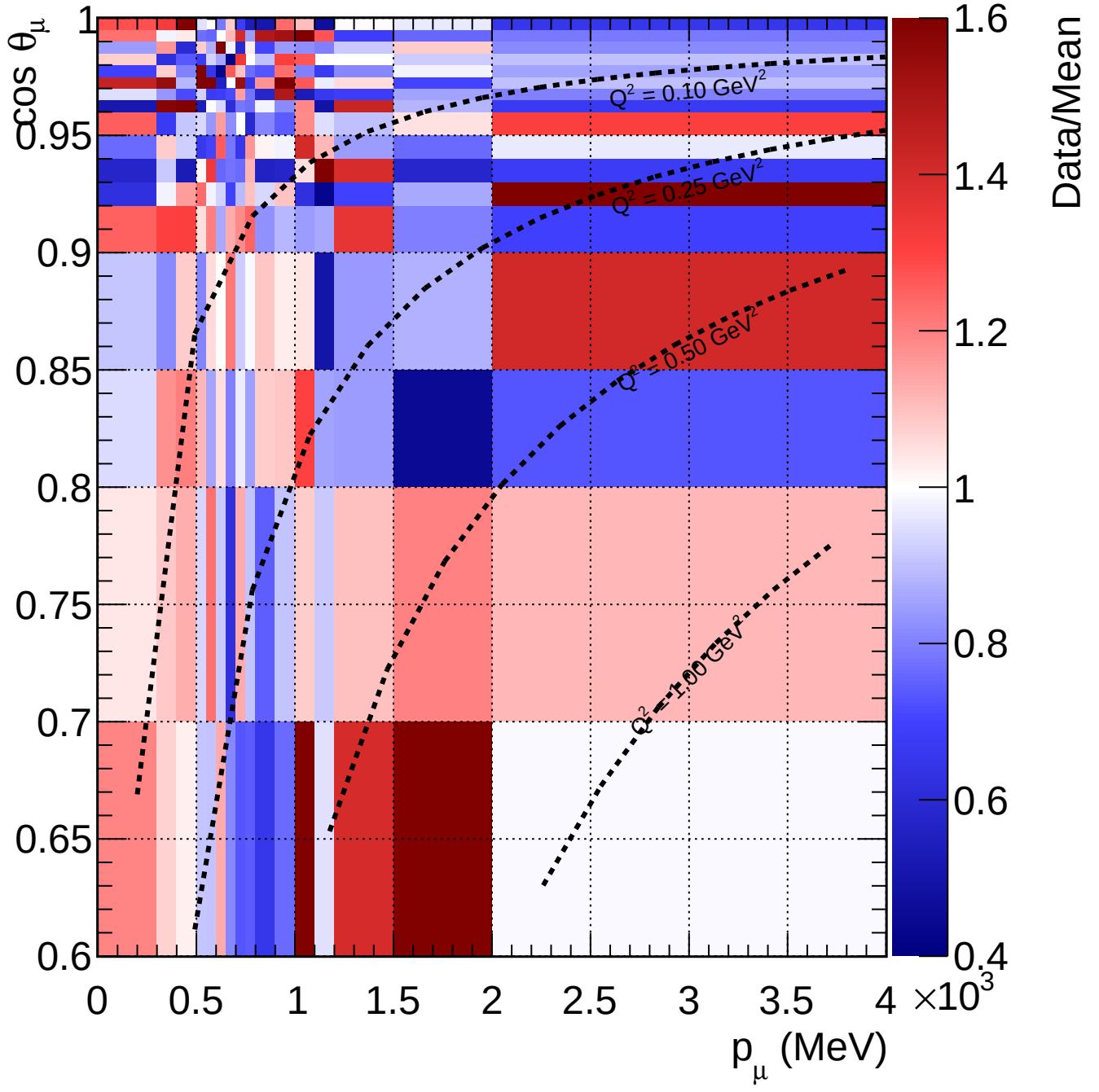

FGD2_numuCC_other_sum_7664
Counts
Data, 7664, p-value=0.06
MC, μ=6571.9±719.0
Gauss, μ=6636.2±768.7
700
600
500
400
300
200
100
0
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
N events

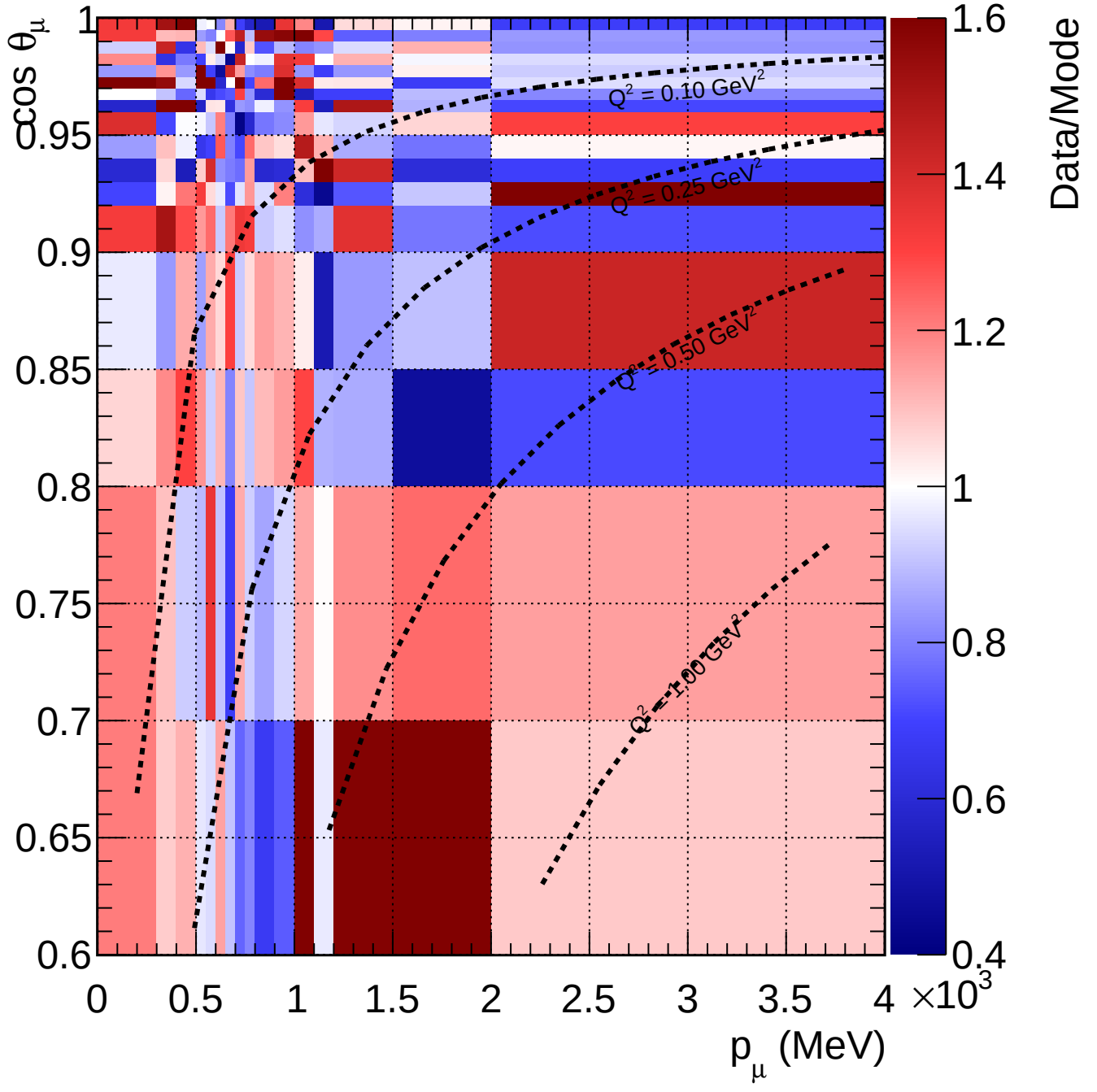

FGD2_numuCC_other_data
N_events/MeV
4
3.5
3
2.5
2
1.5
1
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
2500
3000
p_μ (MeV)

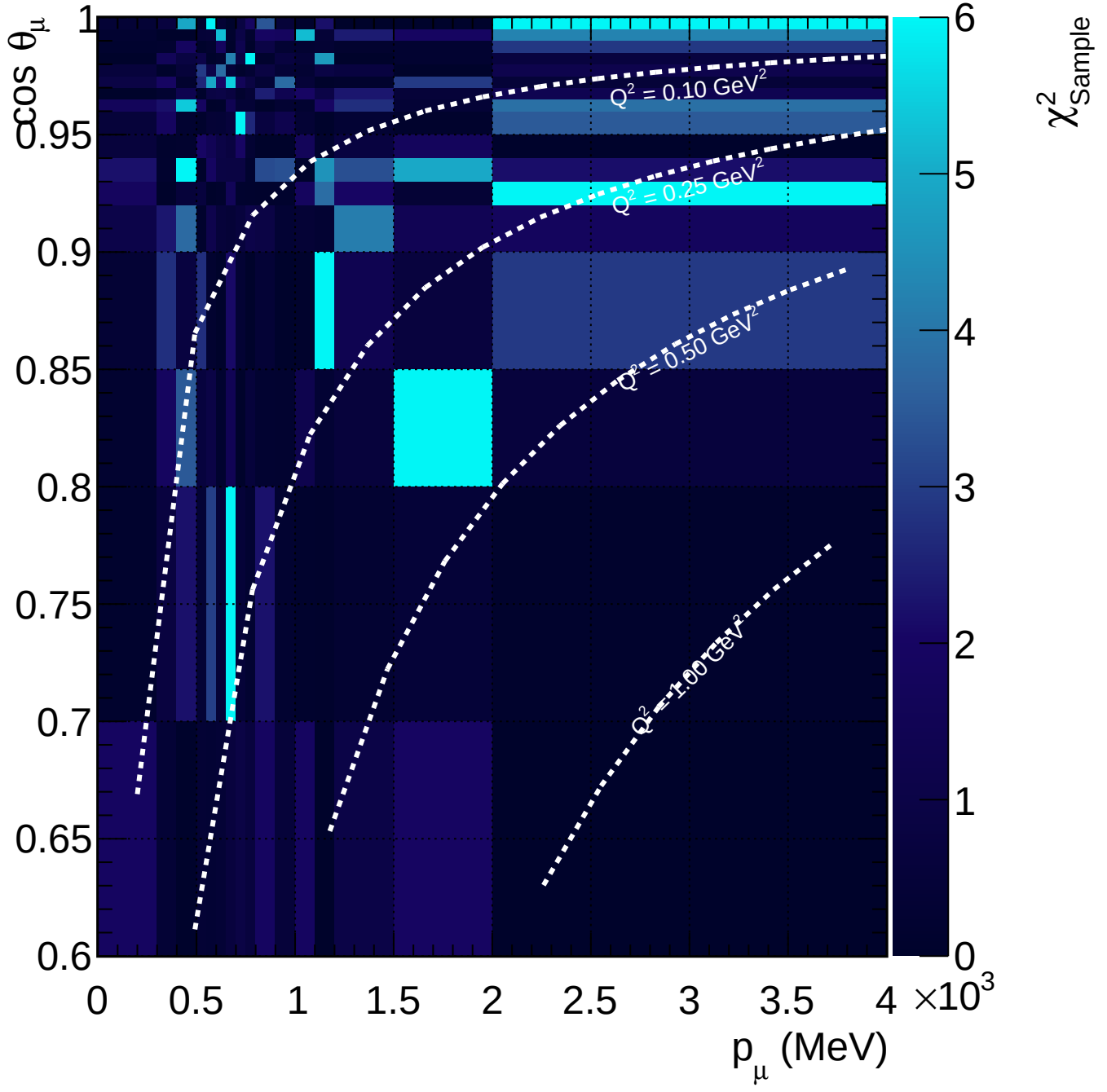

FGD2_numuCC_other_data
N_events/1
80000
70000
60000
50000
40000
30000
20000
10000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

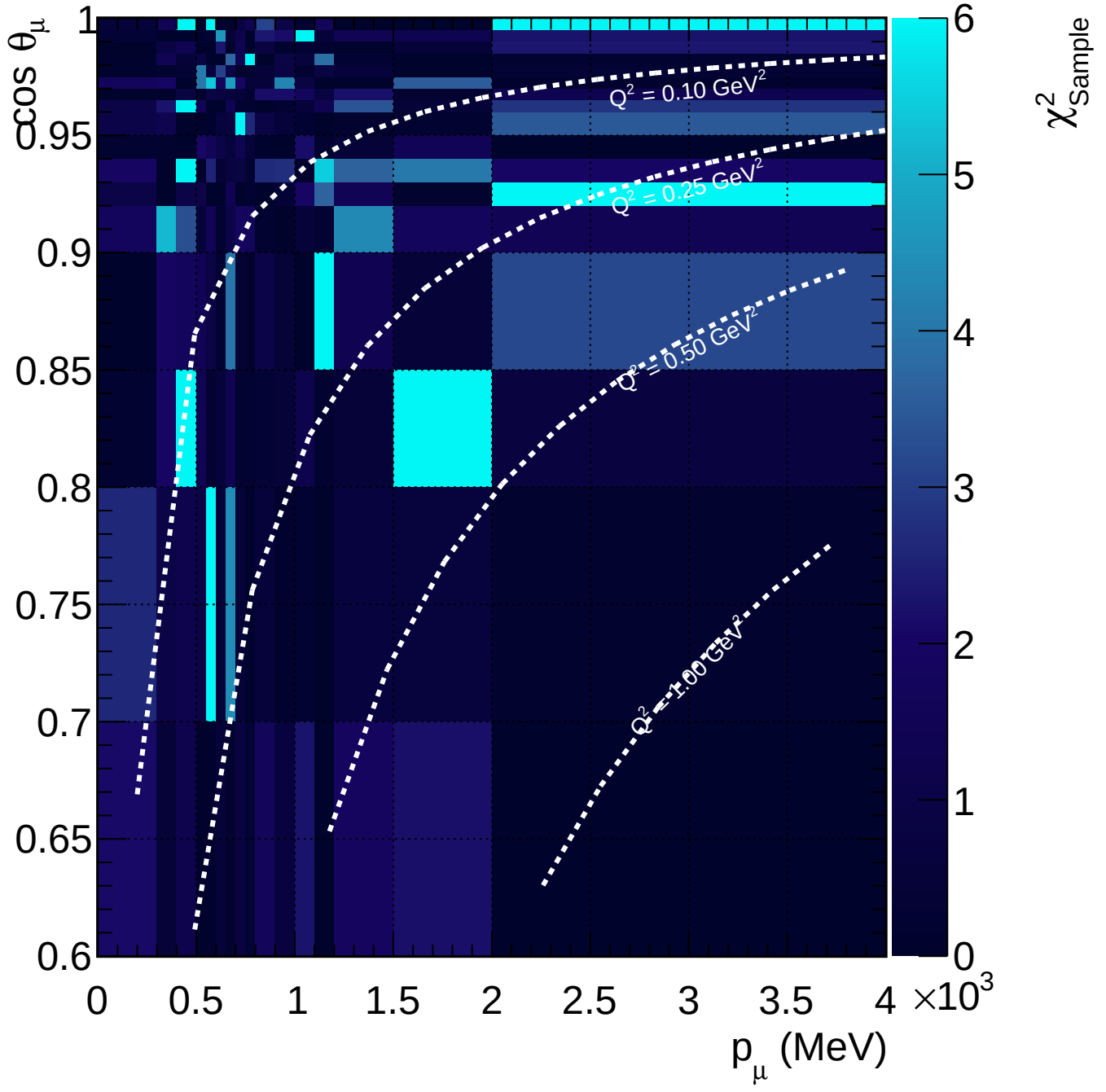

DataDrawFluc
FGD1 anti ν_μCC 0π
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
2500
2000
1500
1000
500
240 260 280 300 320 340 360 380 400 420
25
20
15
10
5
0

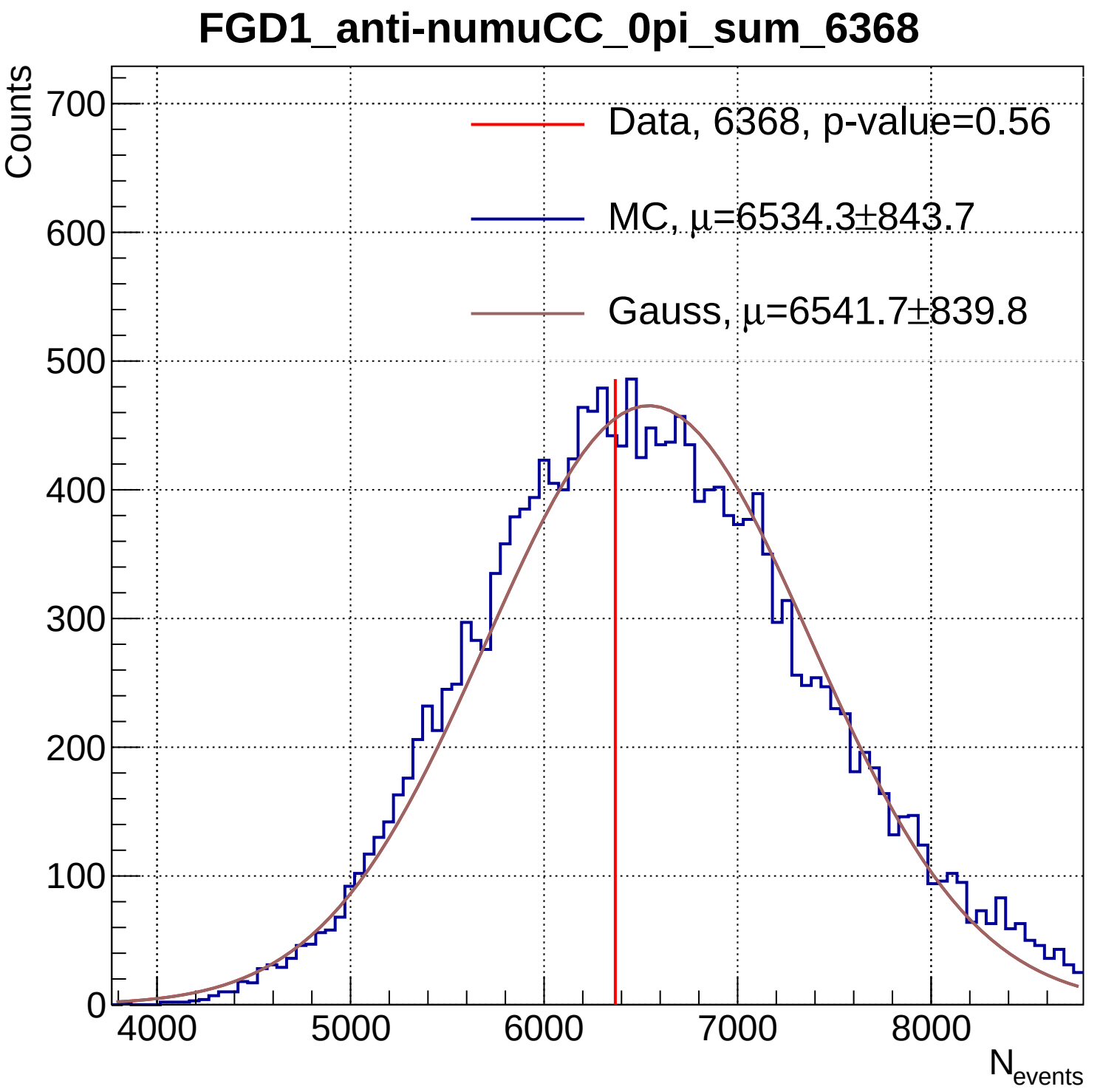

DataPredFluc
FGD1 anti ν_μCC 0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
2500
2000
1500
1000
500
240 260 280 300 320 340 360 380 400 420
25
20
15
10
5
0

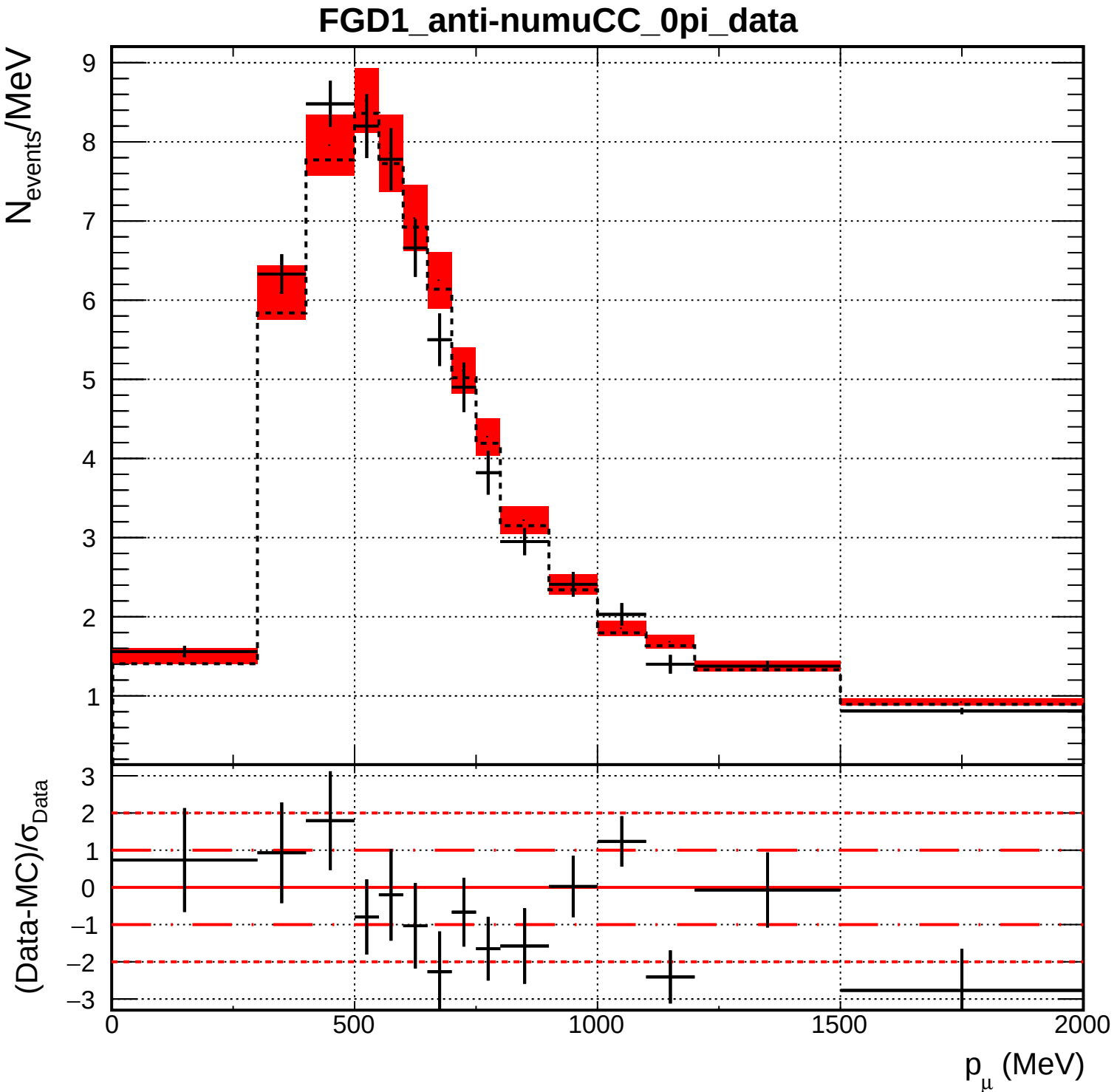

FGD1_anti-numuCC_0pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

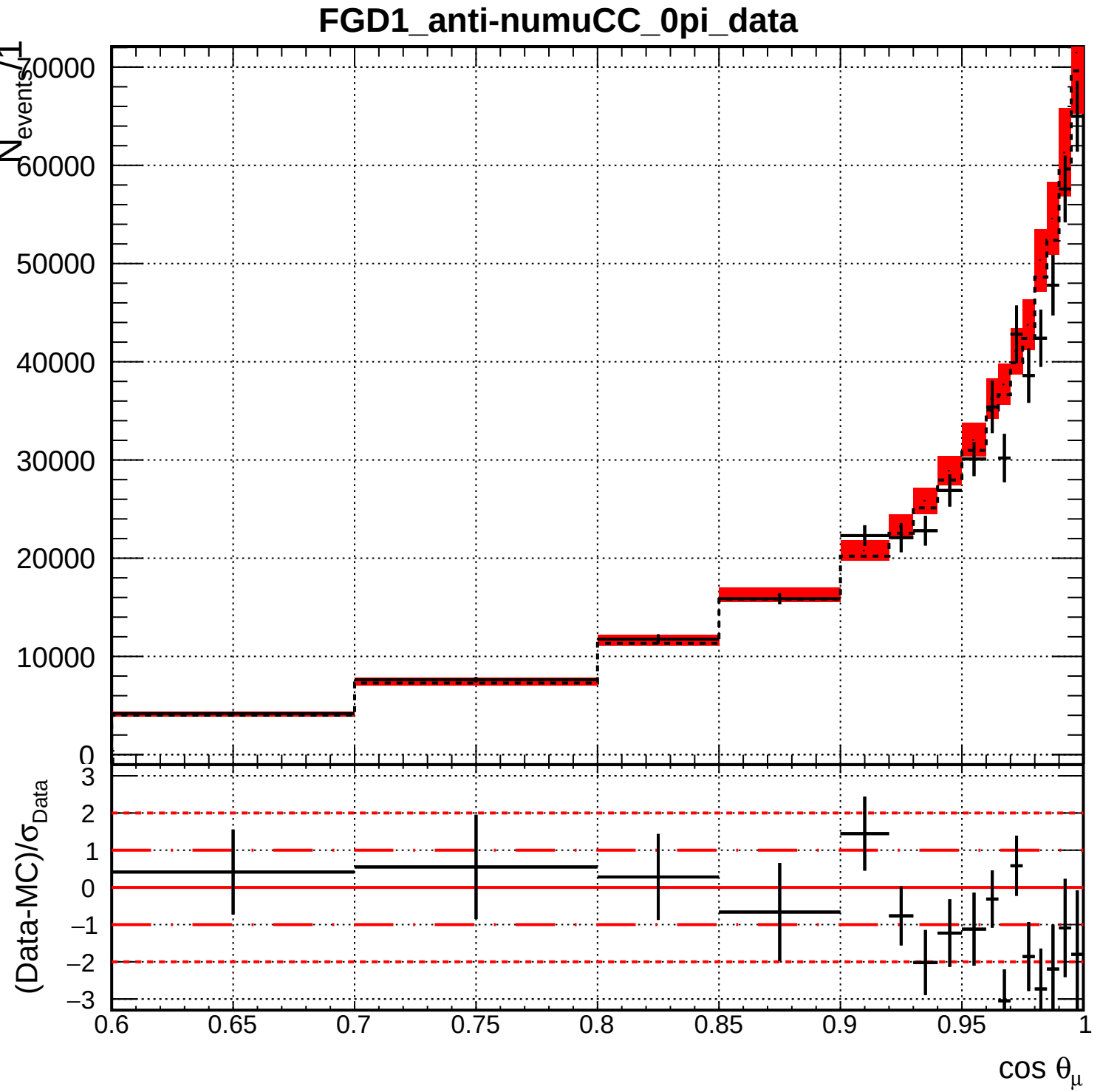

FGD1_anti-numuCC_0pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

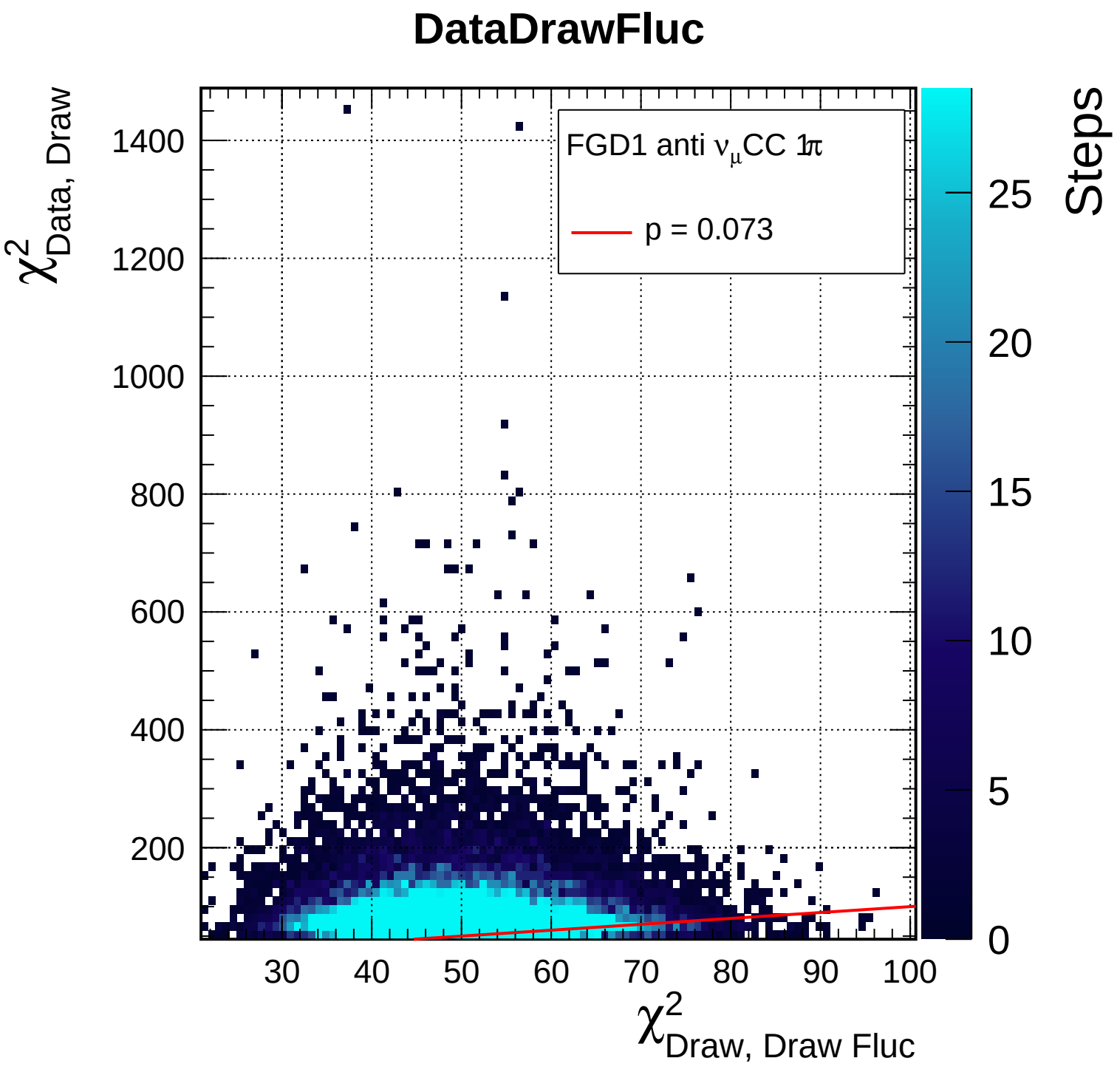

FGD1_anti-numuCC_0pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

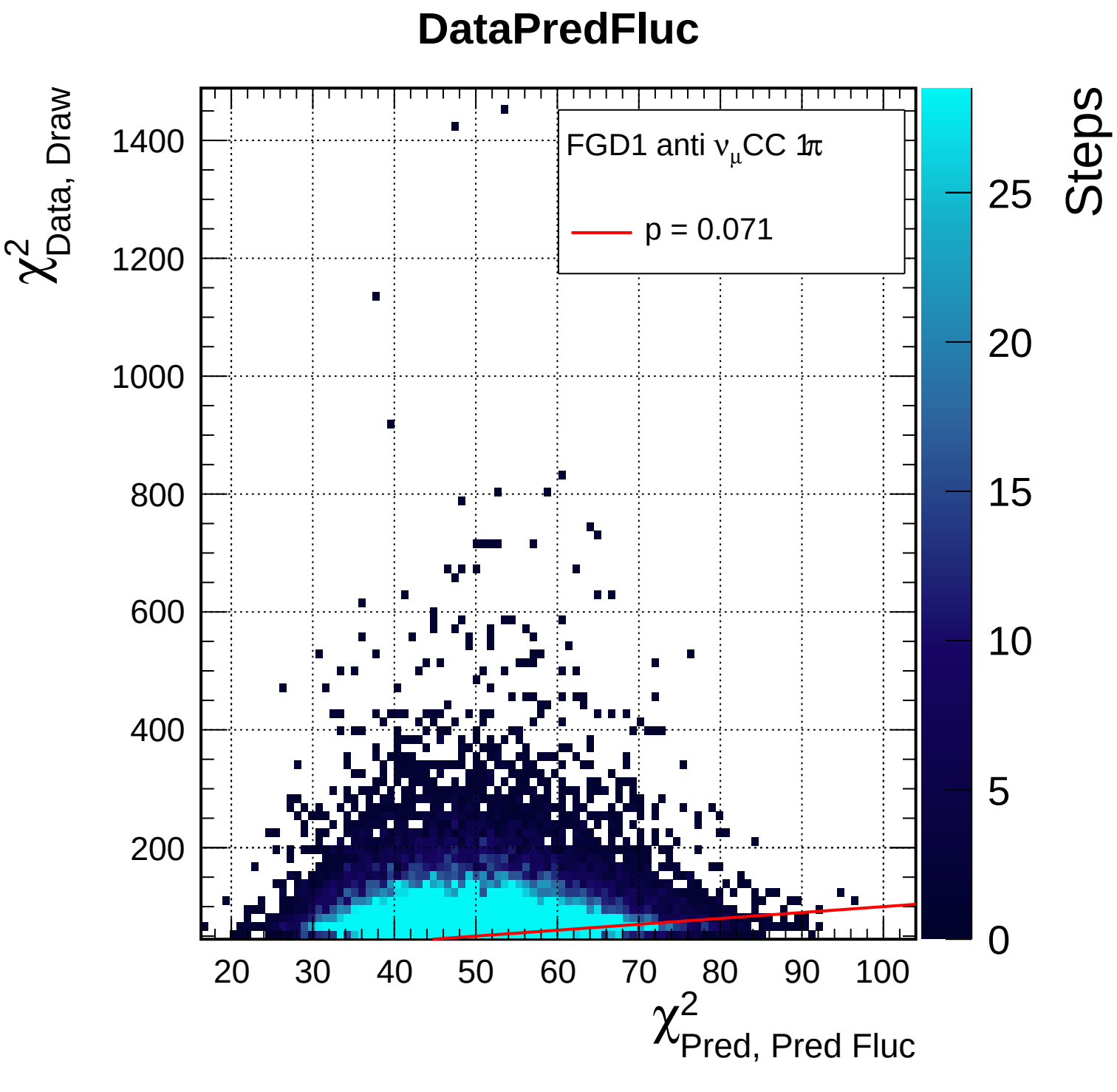

FGD1_anti-numuCC_0pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

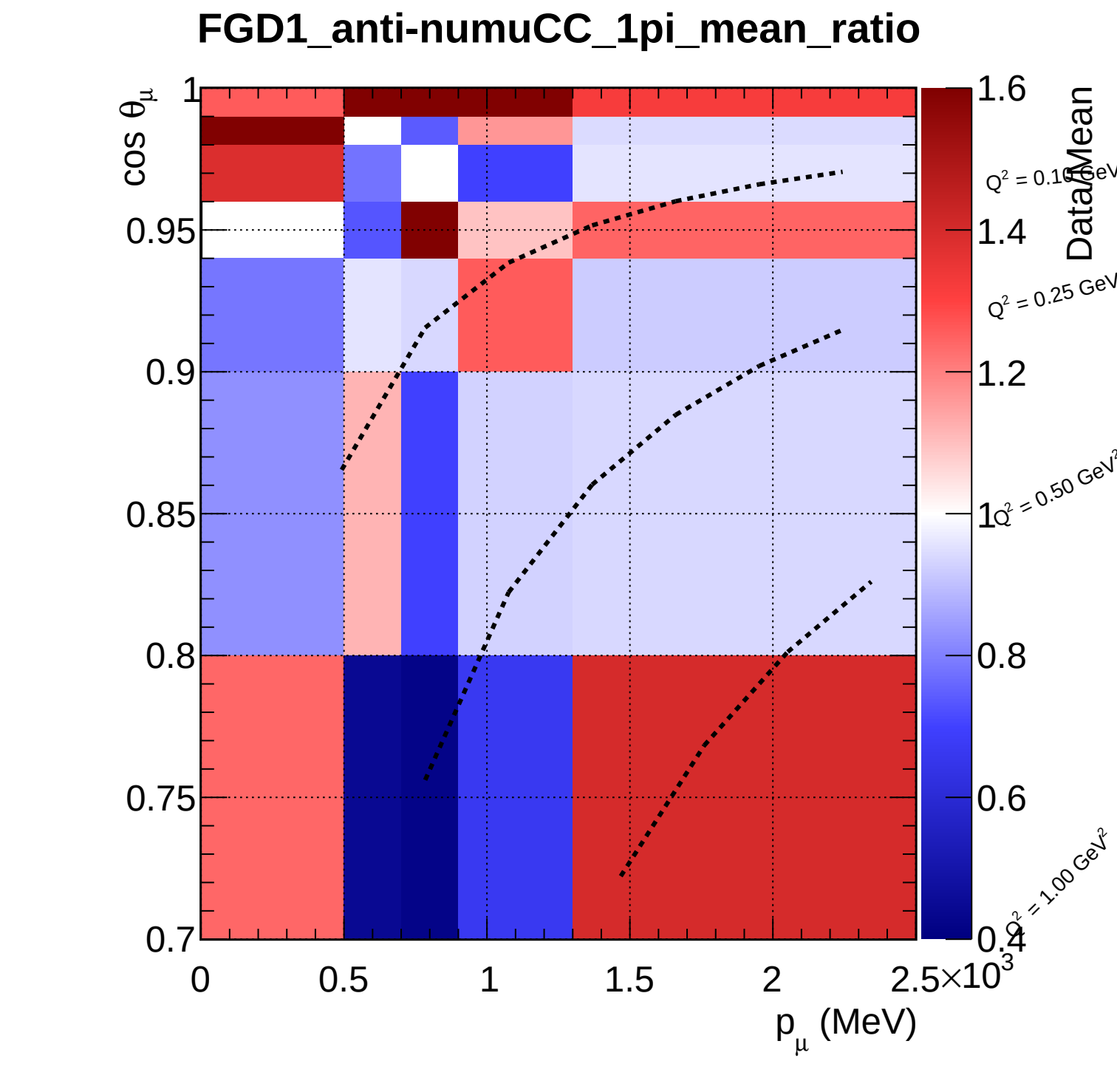

FGD1_anti-numuCC_0pi_sum_6368
Counts
Data, 6368, p-value=0.56
MC, μ=6534.3±843.7
Gauss, μ=6541.7±839.8
0
100
200
300
400
500
600
700
4000
5000
6000
7000
8000
N_events

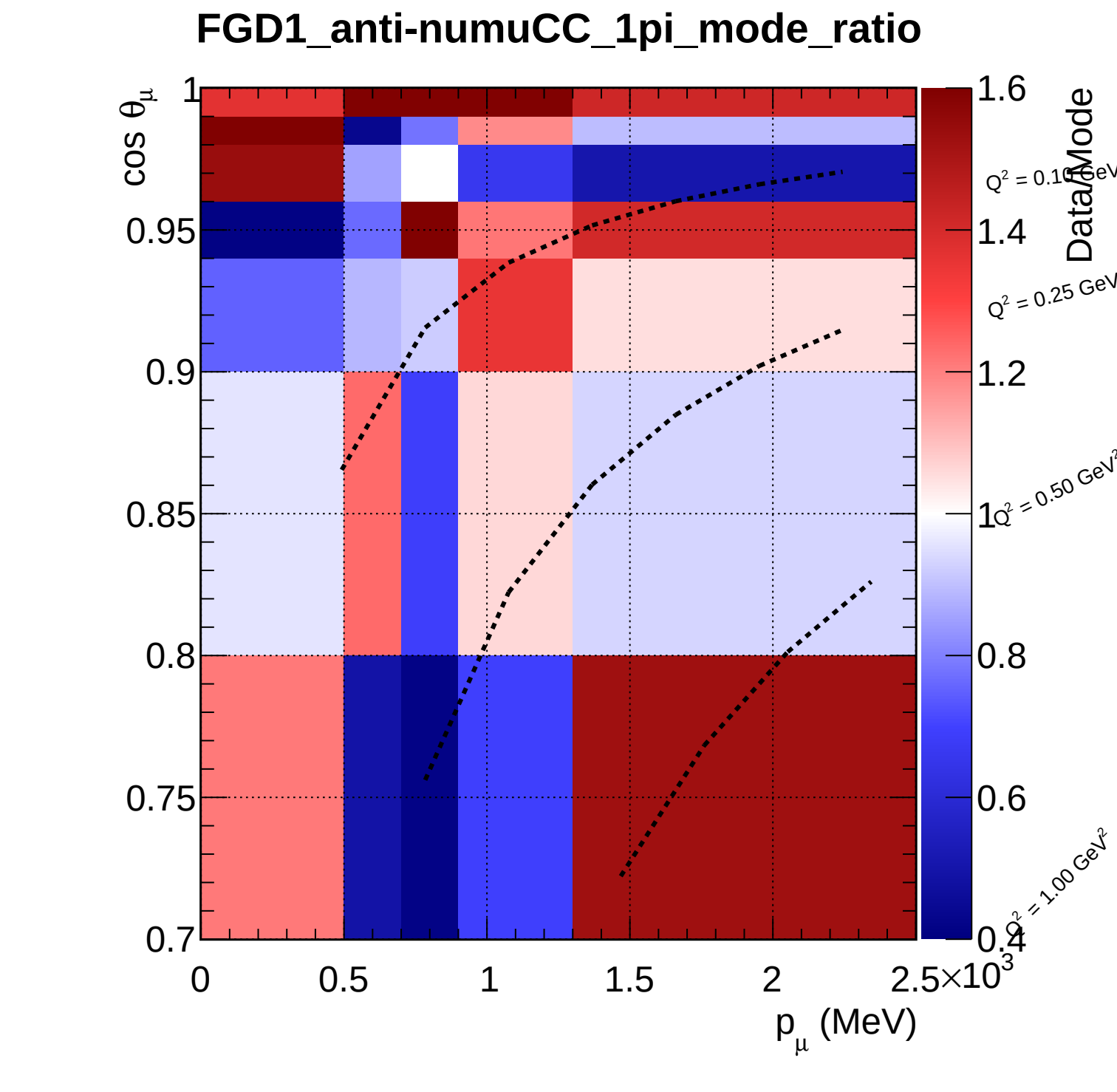

FGD1_anti-numuCC_0pi_data
N_events/MeV
(Data-MC)/σ_Data
p_μ (MeV)
0
500
1000
1500
2000
1
2
3
4
5
6
7
8
9
−3
−2
−1
0
1
2
3

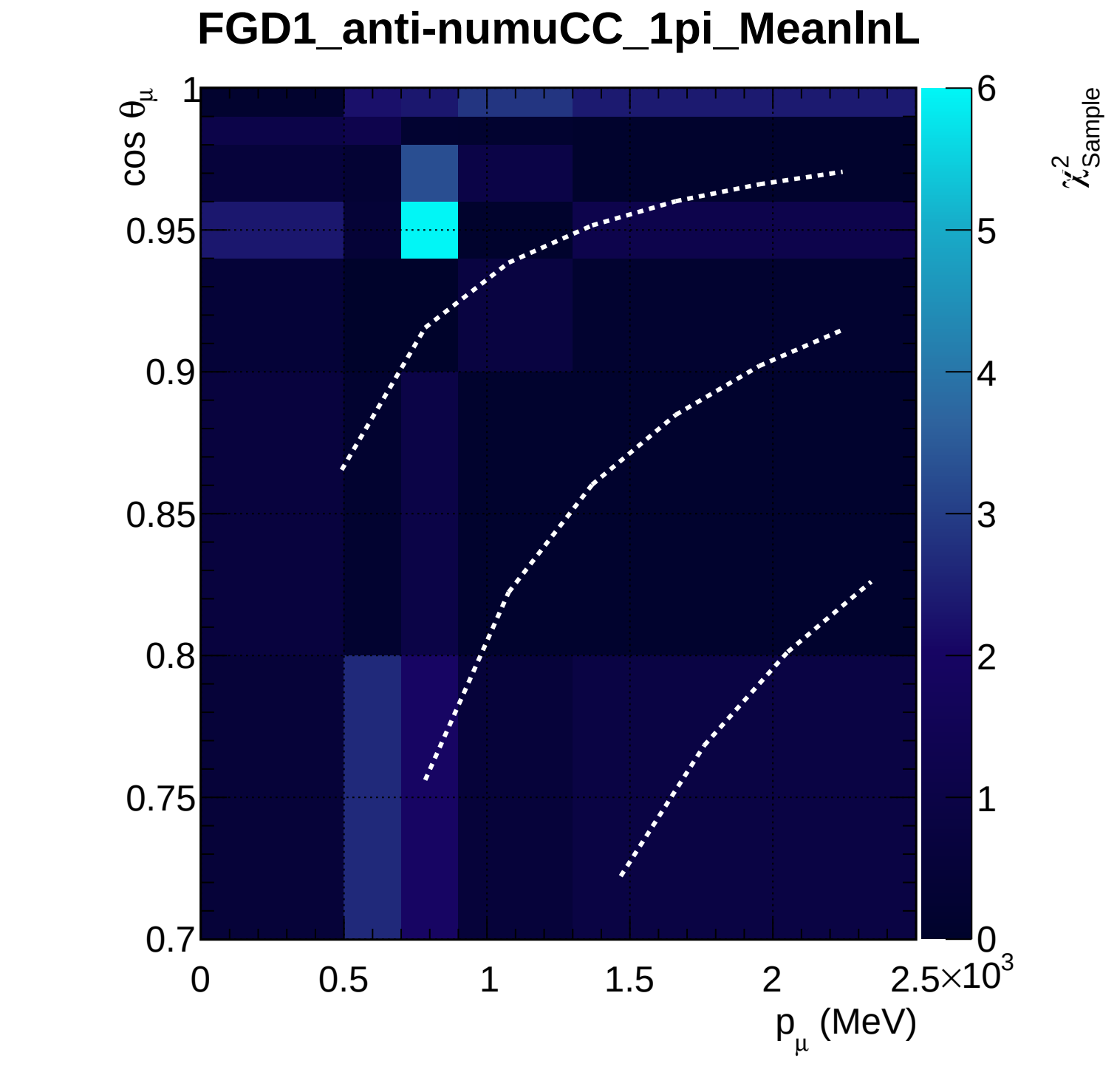

FGD1_anti-numuCC_0pi_data
N_events/1
70000
60000
50000
40000
30000
20000
10000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

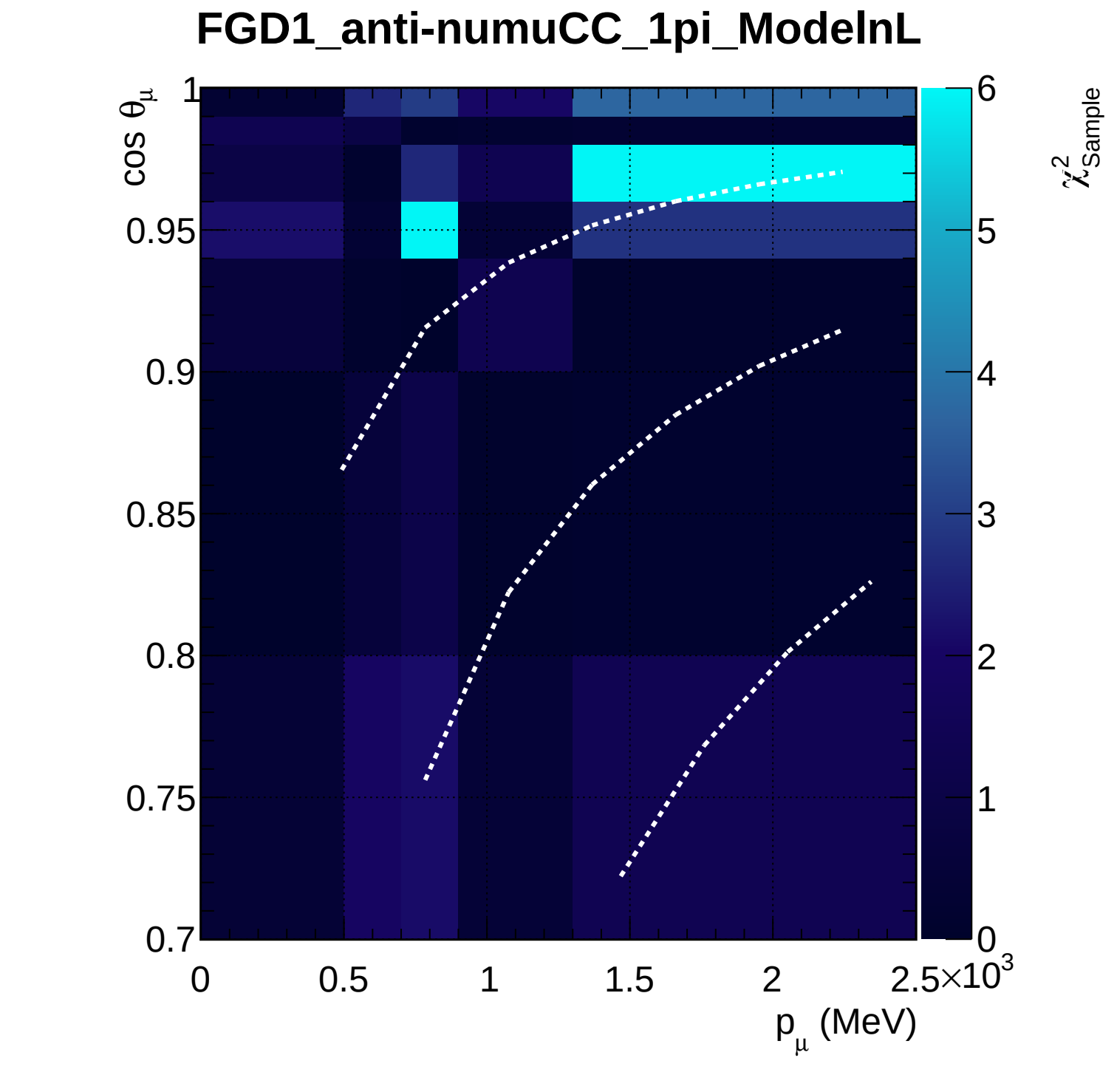

DataDrawFluc
FGD1 anti ν_μCC 1π
p = 0.073
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
1400
1200
1000
800
600
400
200
30
40
50
60
70
80
90
100
25
20
15
10
5
0

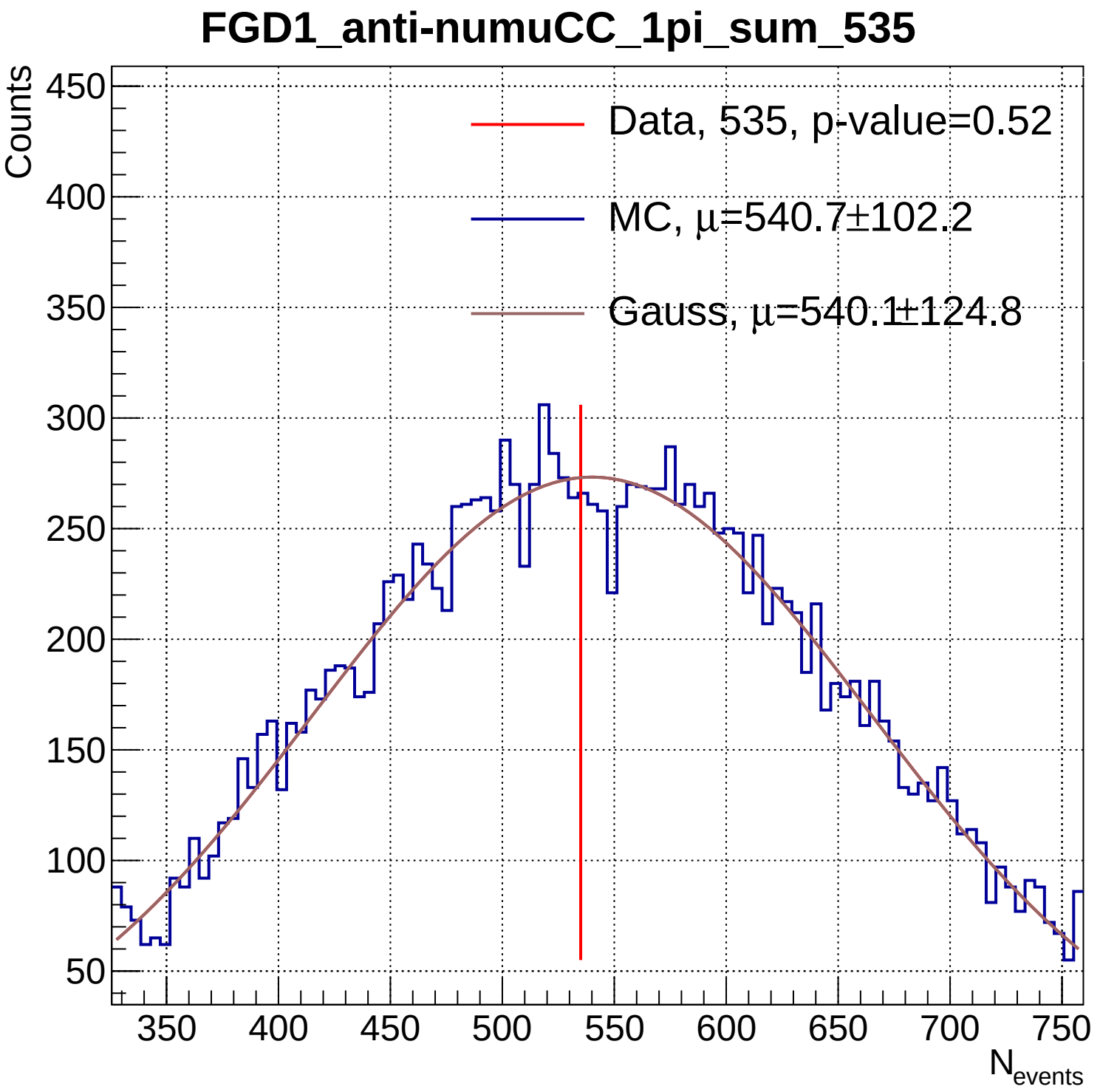

DataPredFluc
FGD1 anti ν_μCC 1π
p = 0.071
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
1400
1200
1000
800
600
400
200
20
30
40
50
60
70
80
90
100
25
20
15
10
5
0

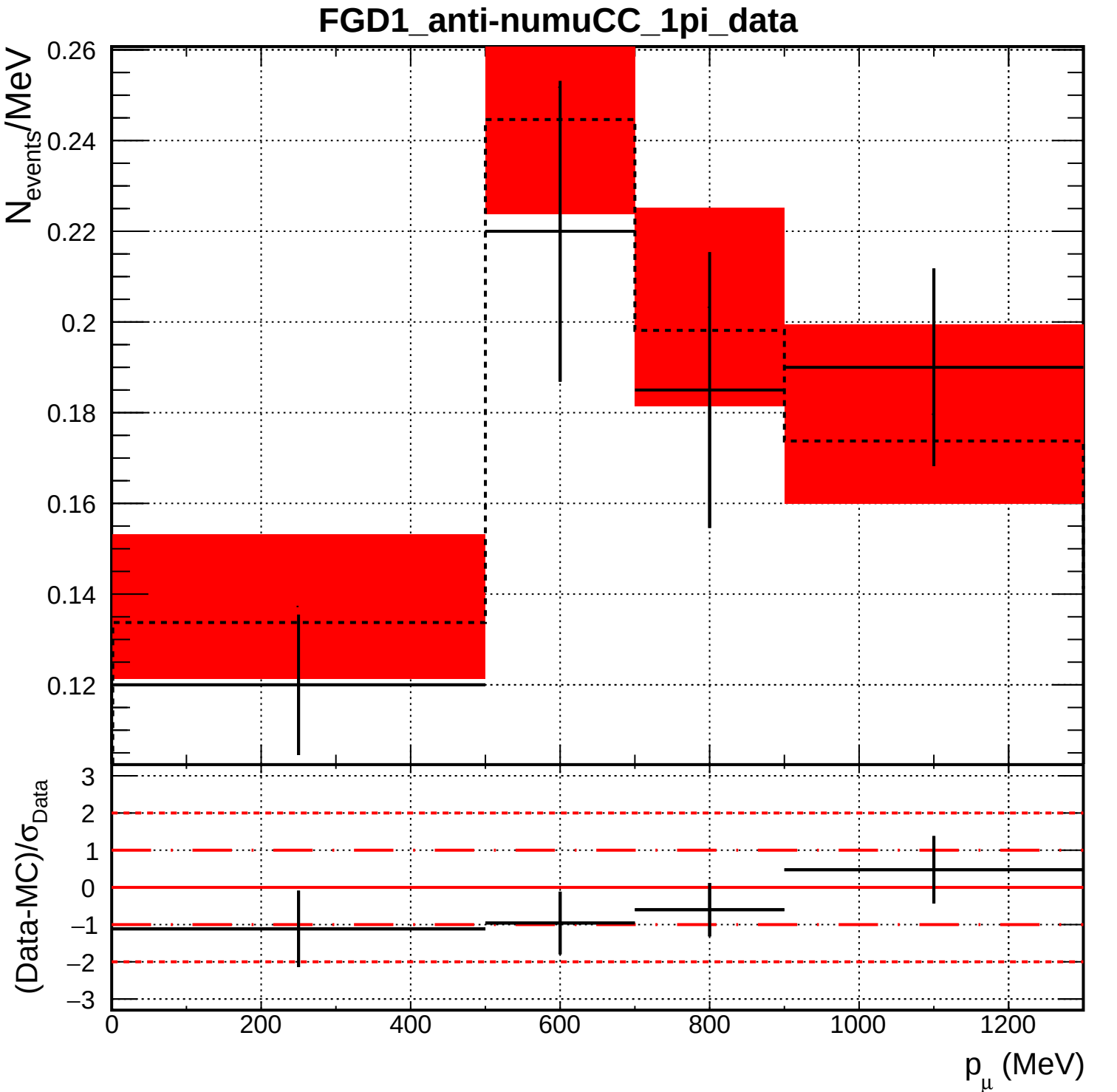

FGD1_anti-numuCC_1pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4
Q² = 0.16 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²

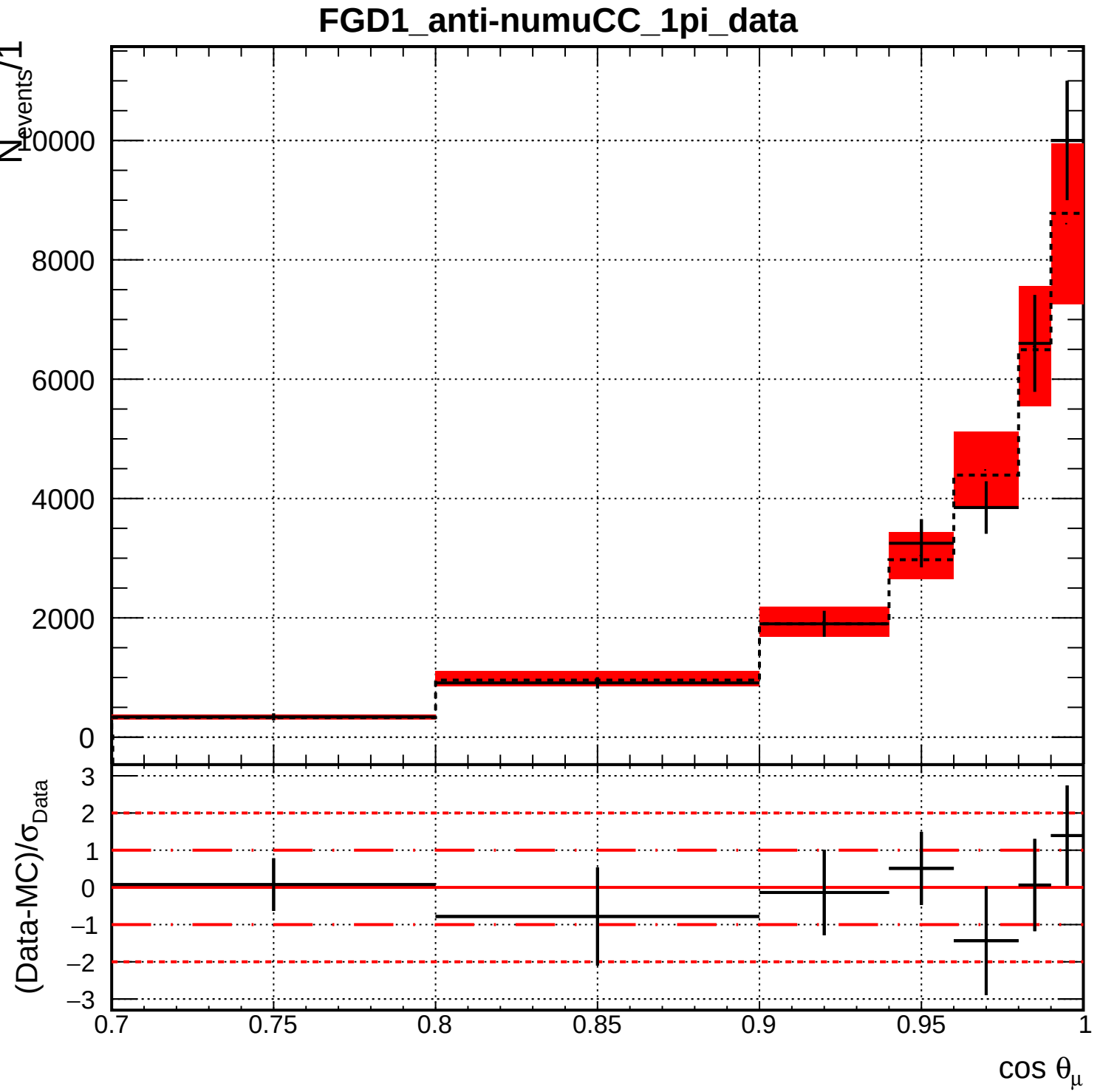

FGD1_anti-numuCC_1pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10^3
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²

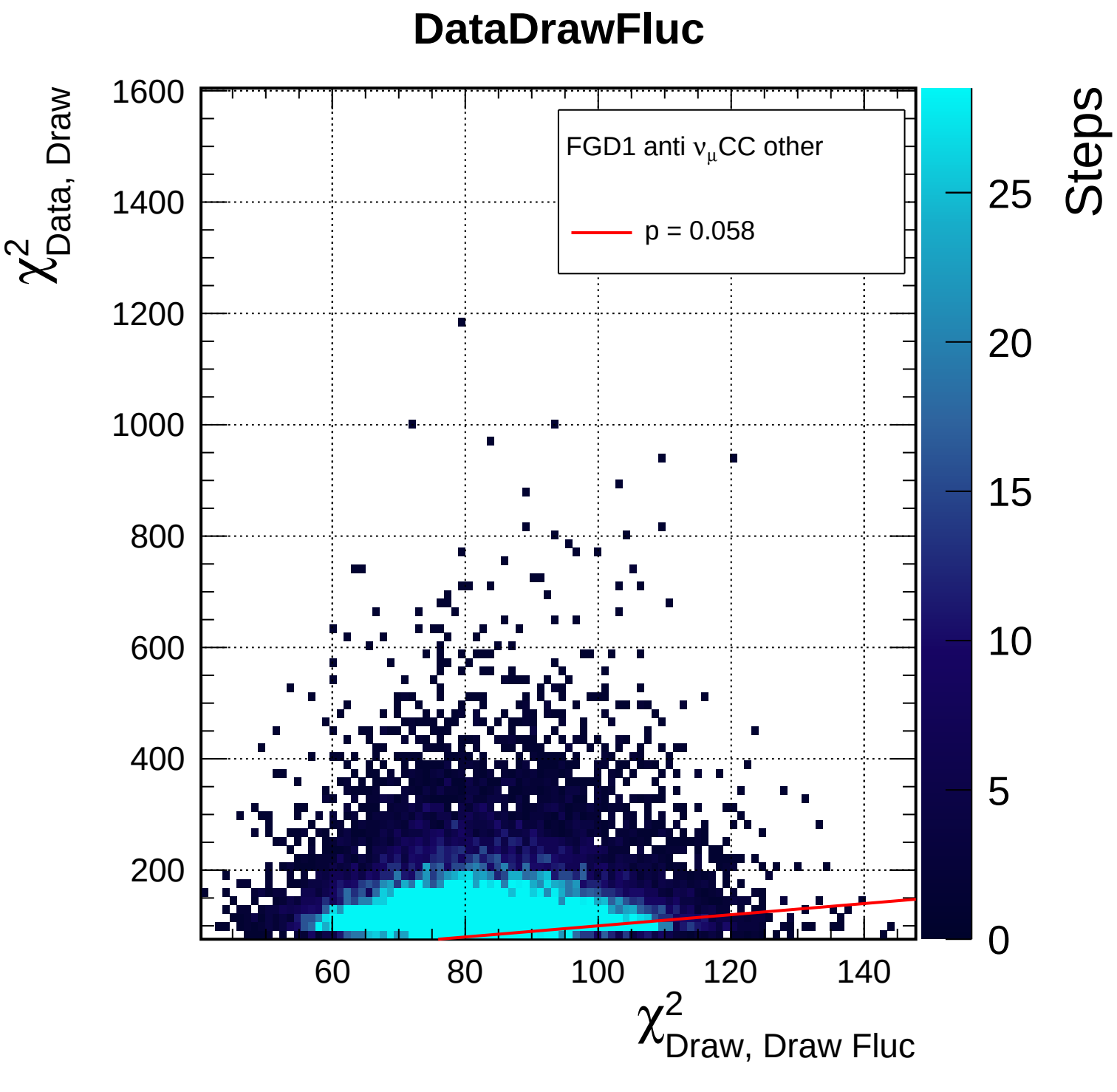

FGD1_anti-numuCC_1pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

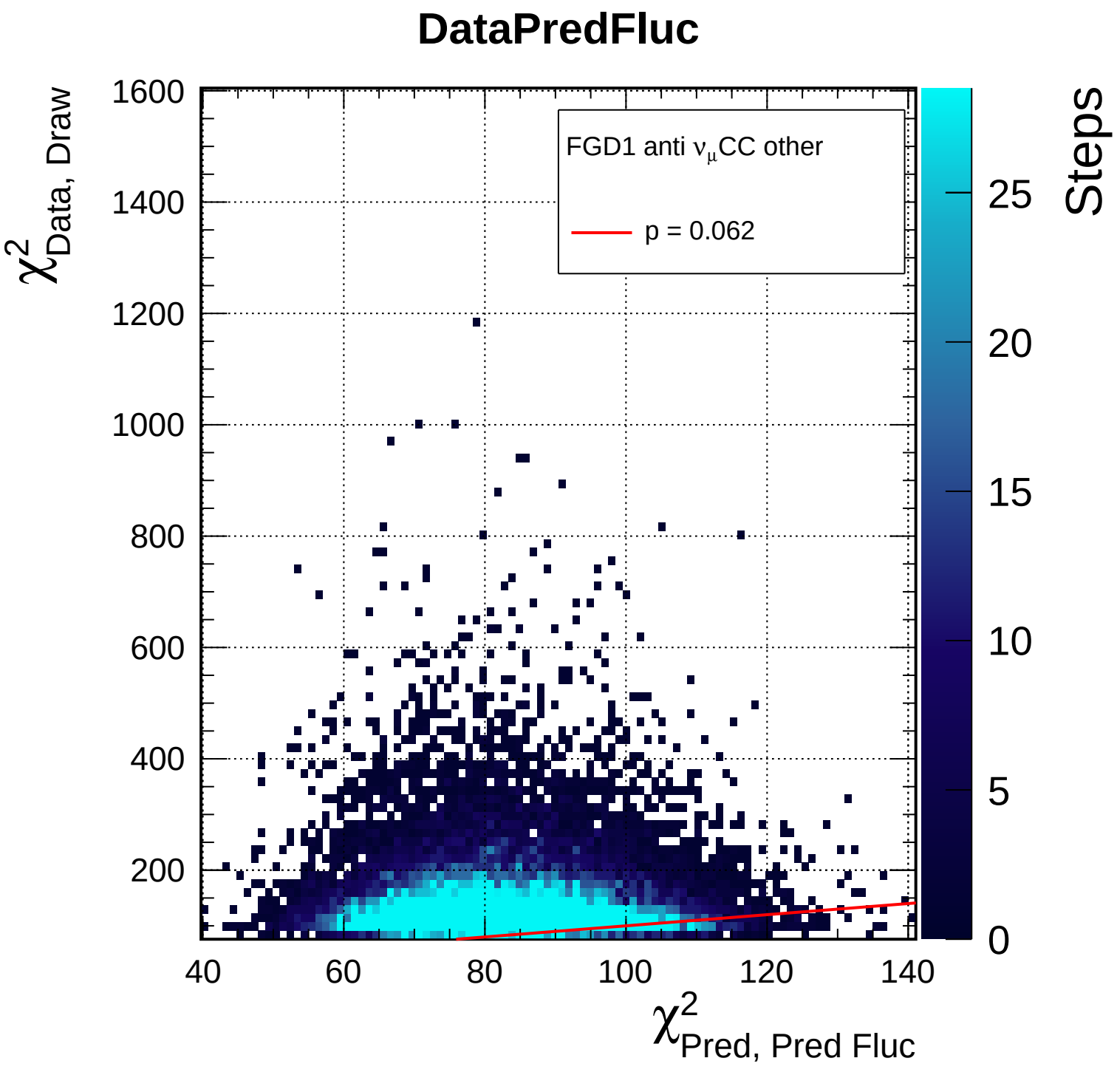

FGD1_anti-numuCC_1pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

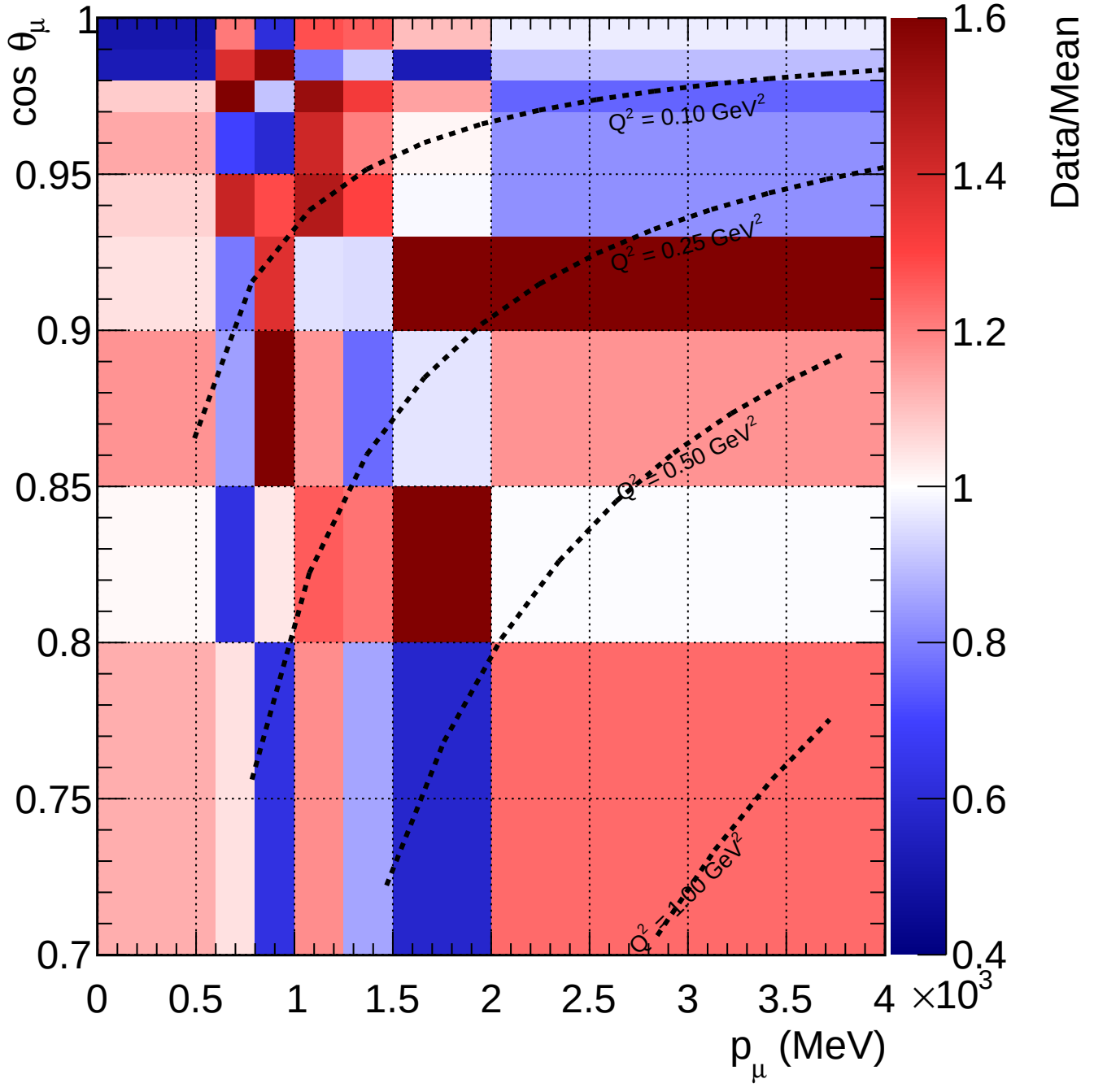

FGD1_anti-numuCC_1pi_sum_535
Counts
Data, 535, p-value=0.52
MC, μ=540.7±102.2
Gauss, μ=540.1±124.8
450
400
350
300
250
200
150
100
50
350
400
450
500
550
600
650
700
750
N events

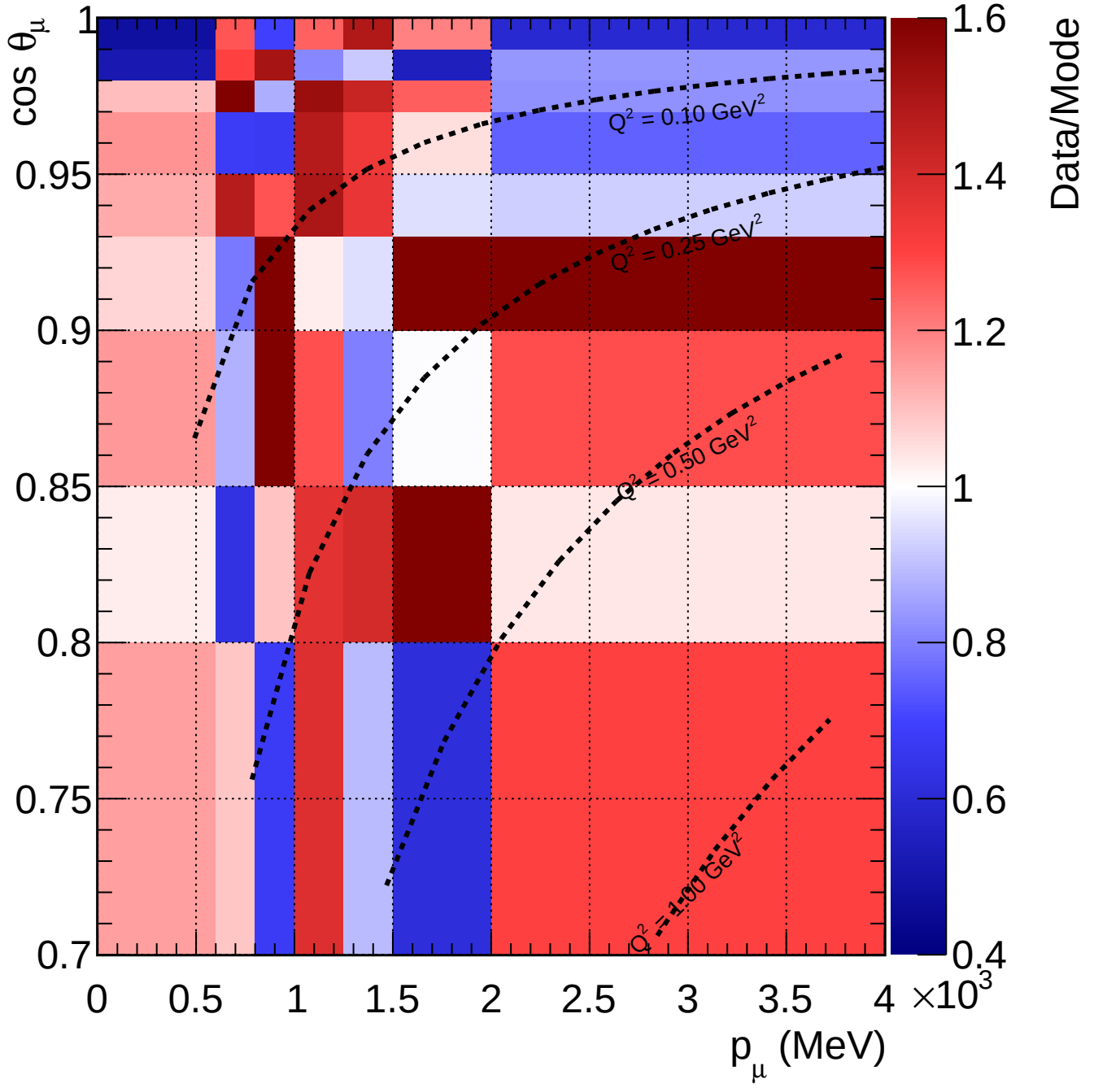

FGD1_anti-numuCC_1pi_data
N_events/MeV
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
200
400
600
800
1000
1200
p_μ (MeV)

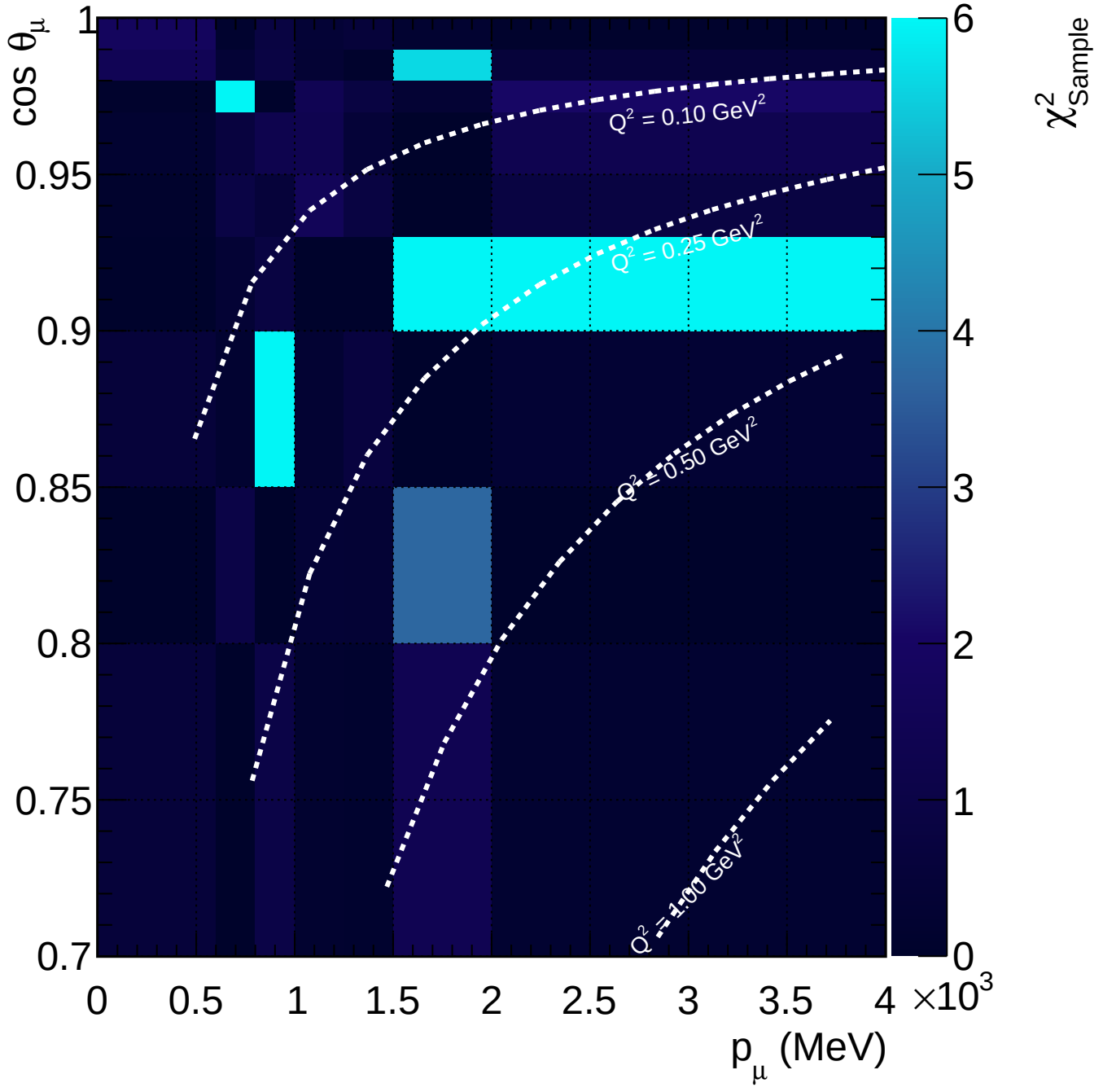

FGD1_anti-numuCC_1pi_data
N_events/1
10000
8000
6000
4000
2000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

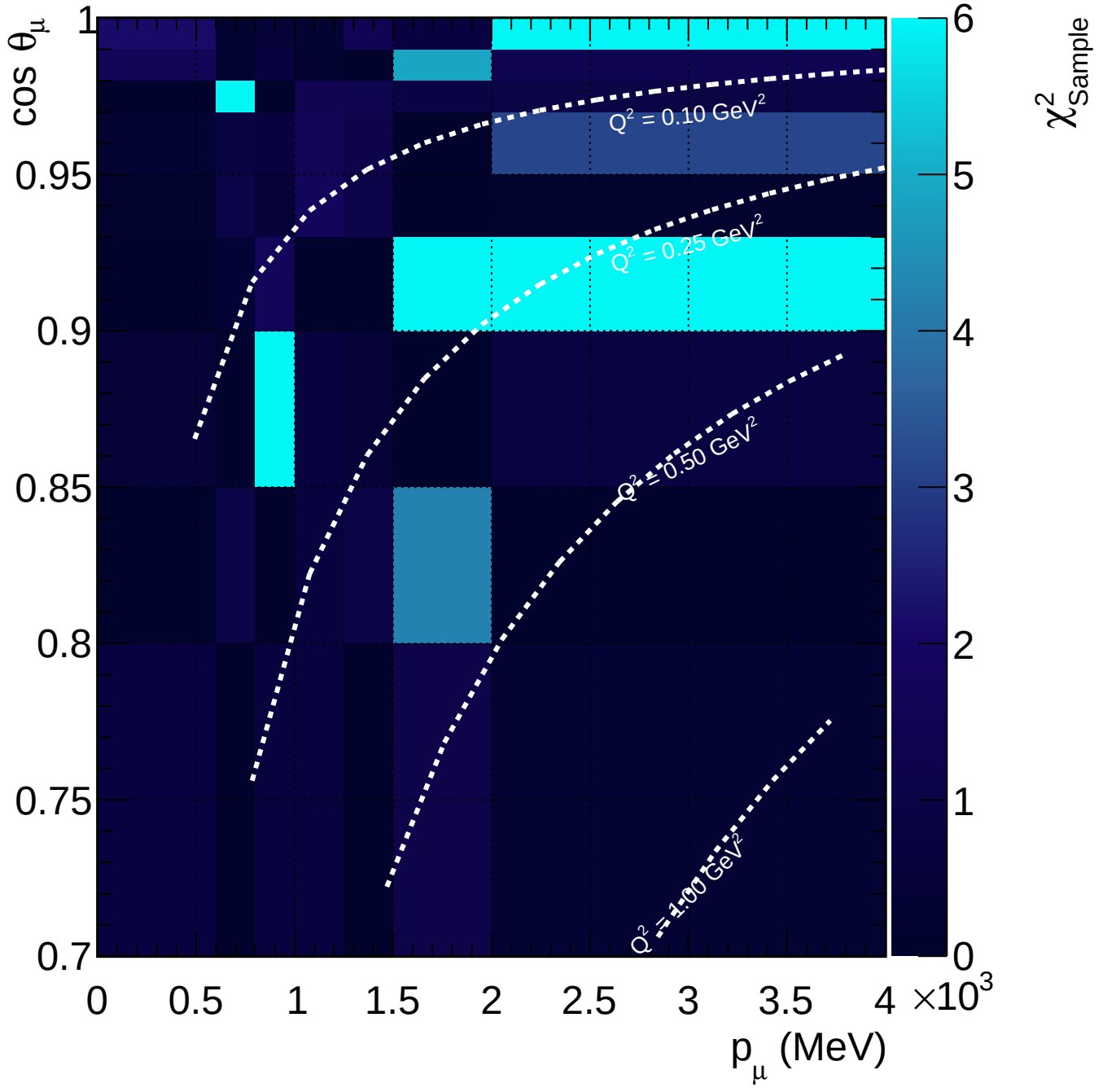

DataDrawFluc
FGD1 anti ν_μCC other
p = 0.058
$\chi^2_{Data,\ Draw}$
$\chi^2_{Draw,\ Draw\ Fluc}$
Steps
1600
1400
1200
1000
800
600
400
200
60
80
100
120
140
25
20
15
10
5
0

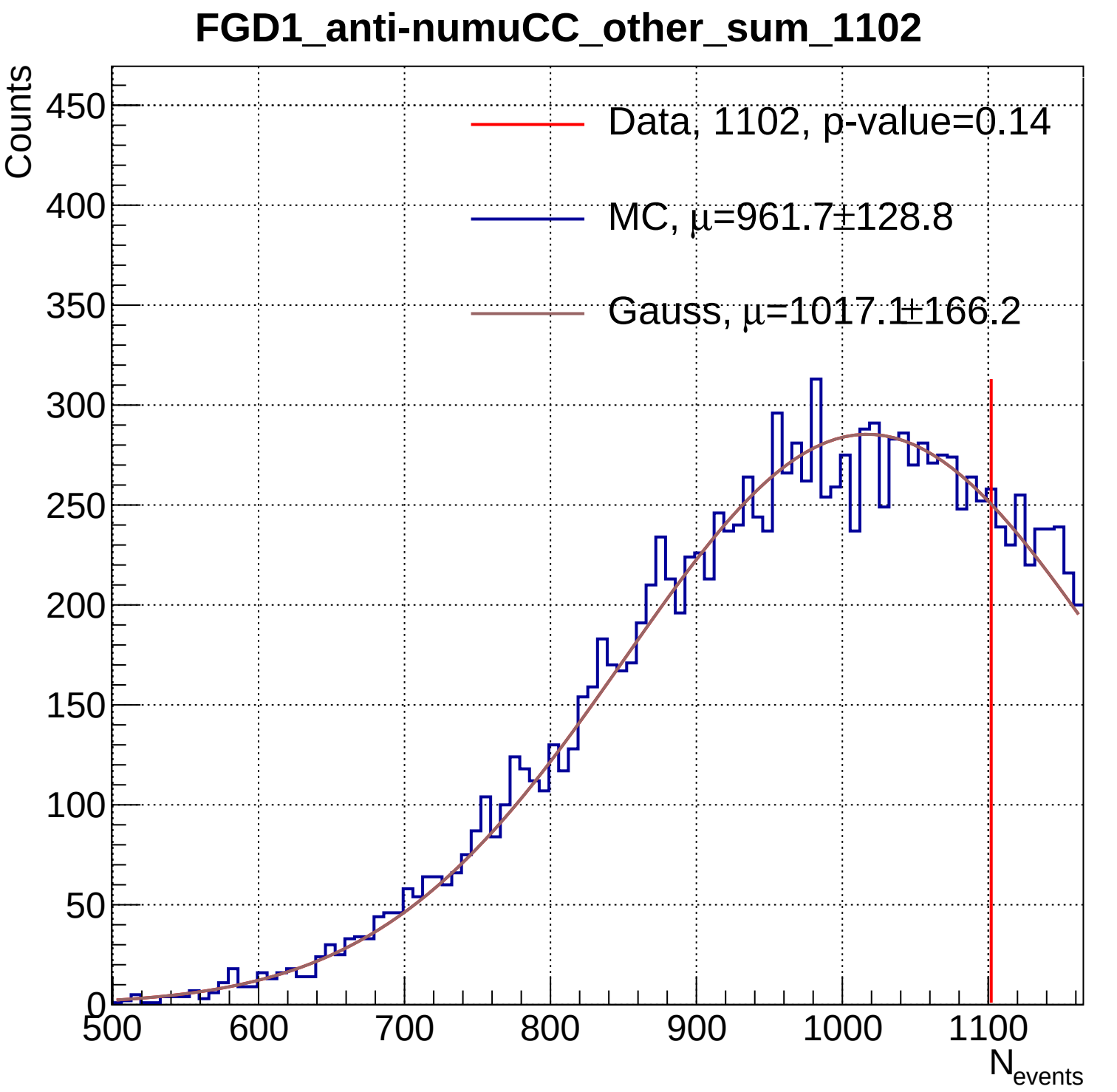

DataPredFluc
FGD1 anti ν_μCC other
p = 0.062
$\chi^2_{Data,\ Draw}$
$\chi^2_{Pred,\ Pred\ Fluc}$
Steps
1600
1400
1200
1000
800
600
400
200
40
60
80
100
120
140
25
20
15
10
5
0

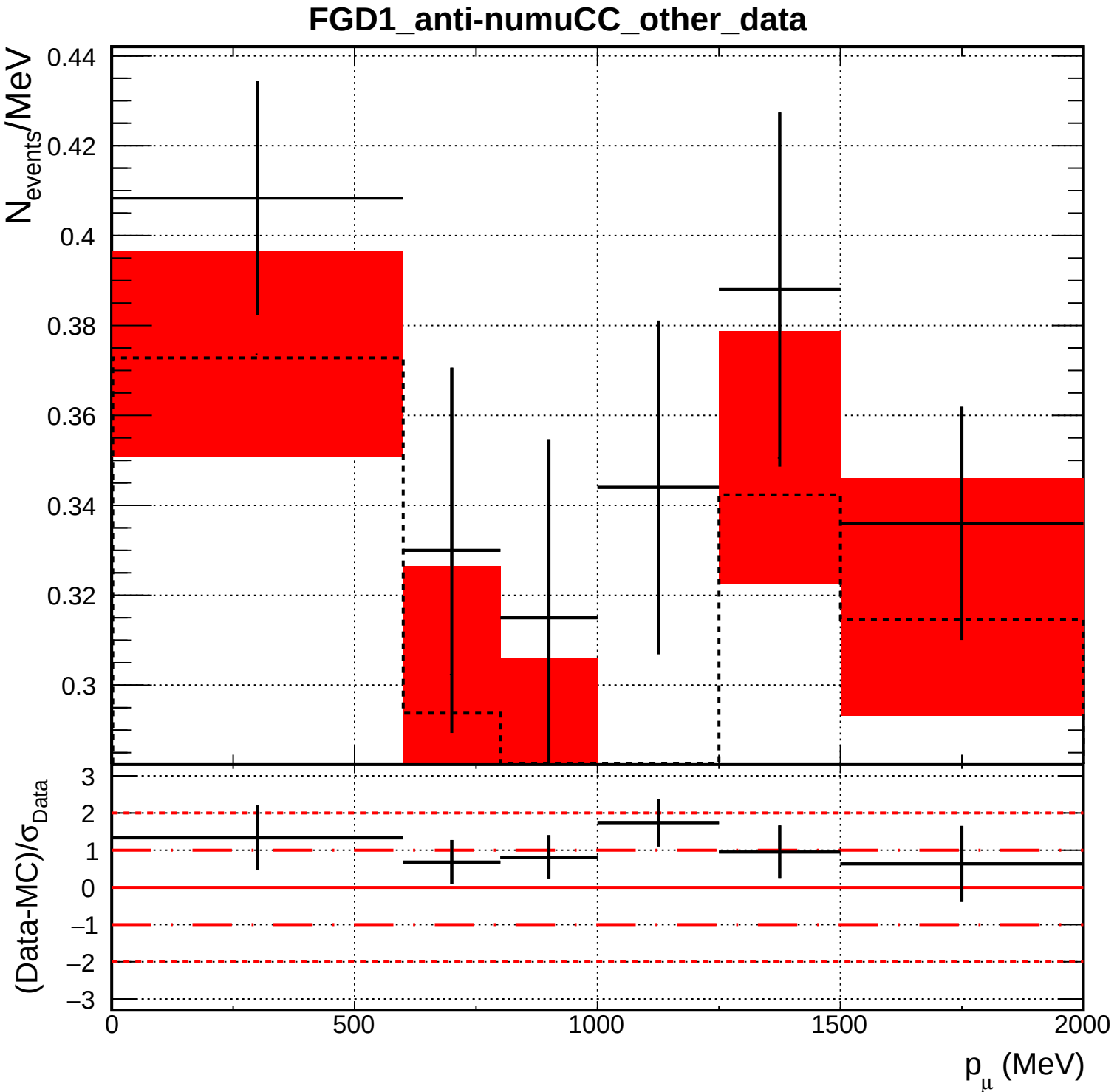

FGD1_anti-numuCC_other_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

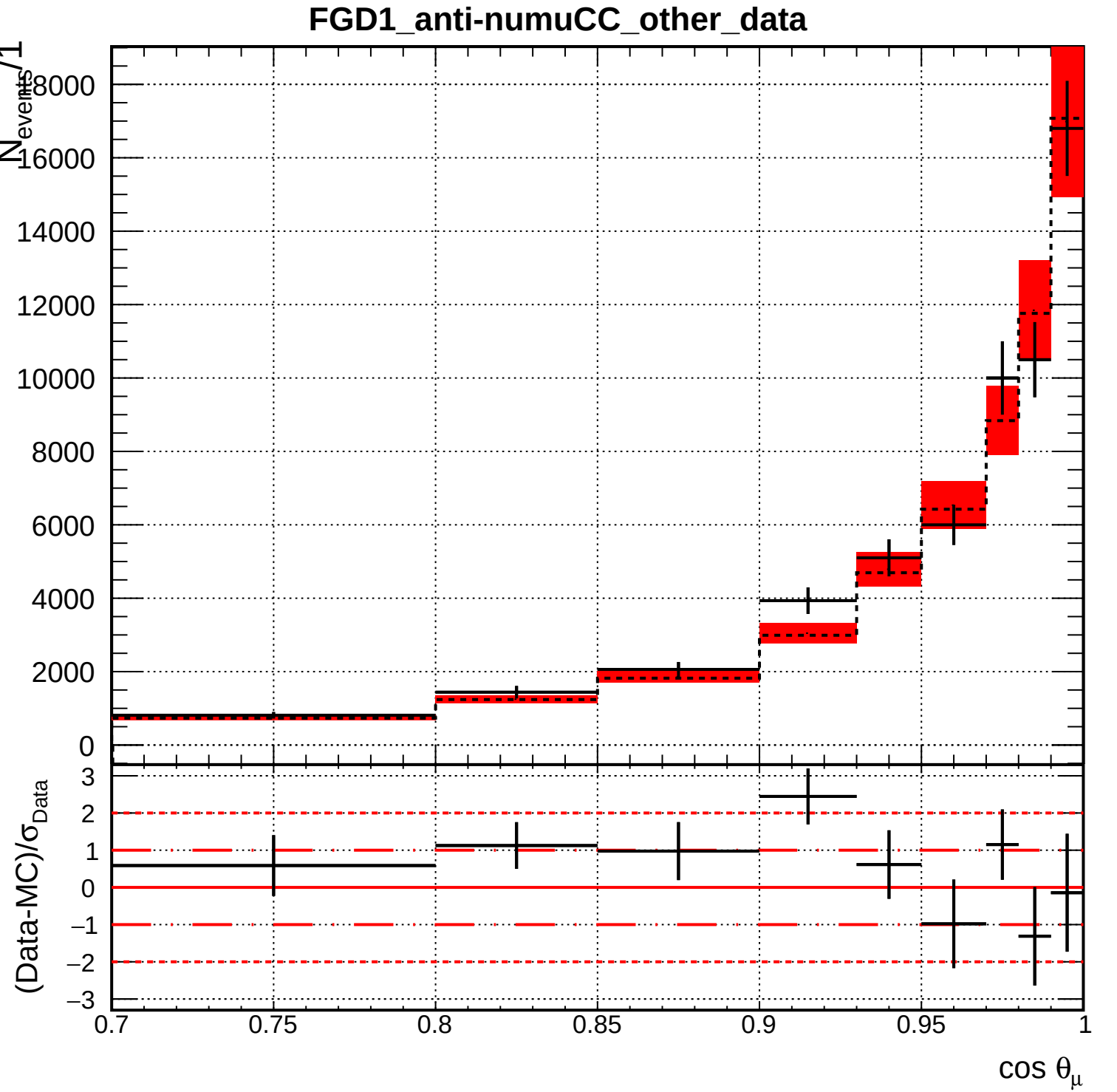

FGD1_anti-numuCC_other_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

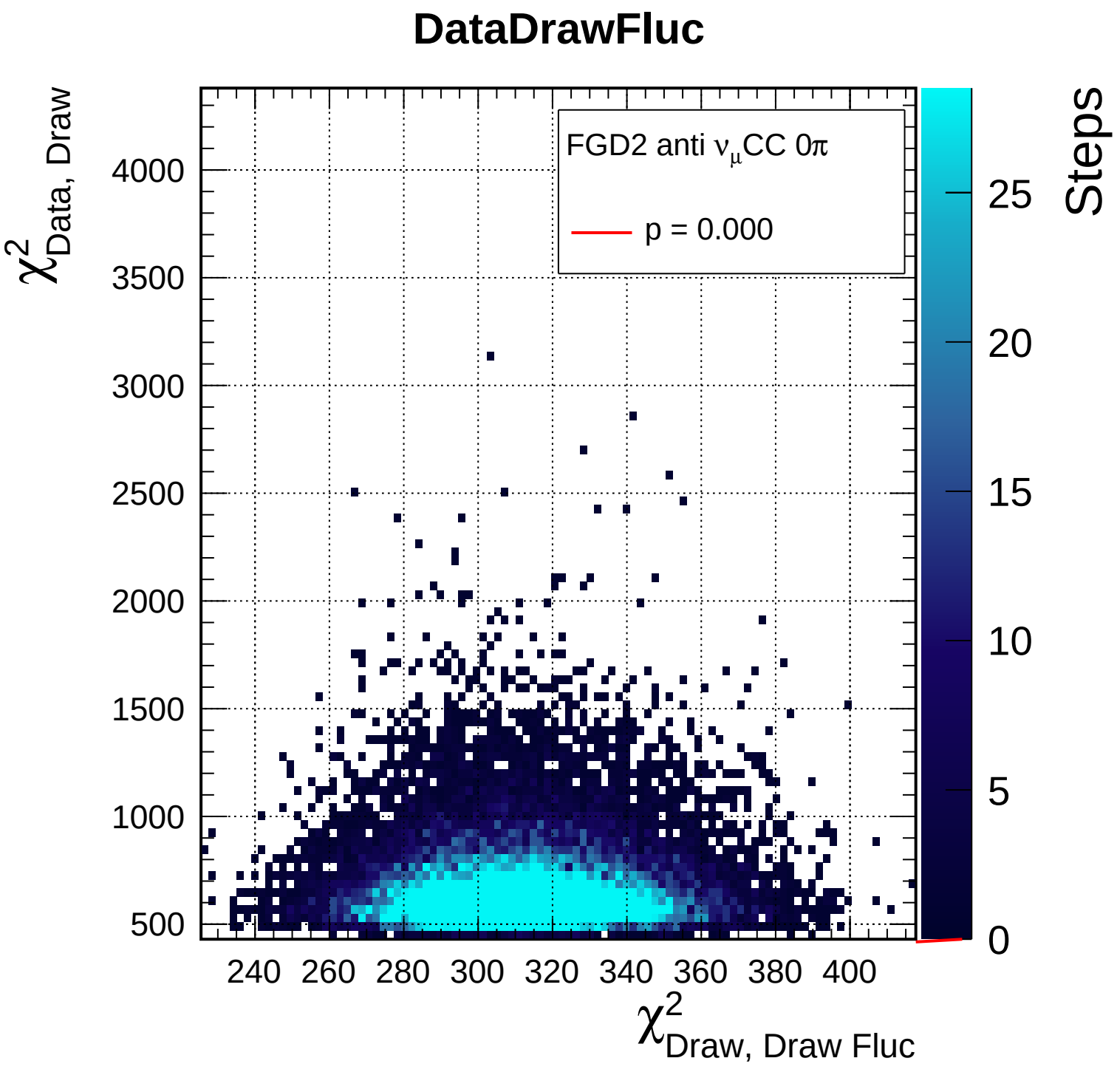

FGD1_anti-numuCC_other_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

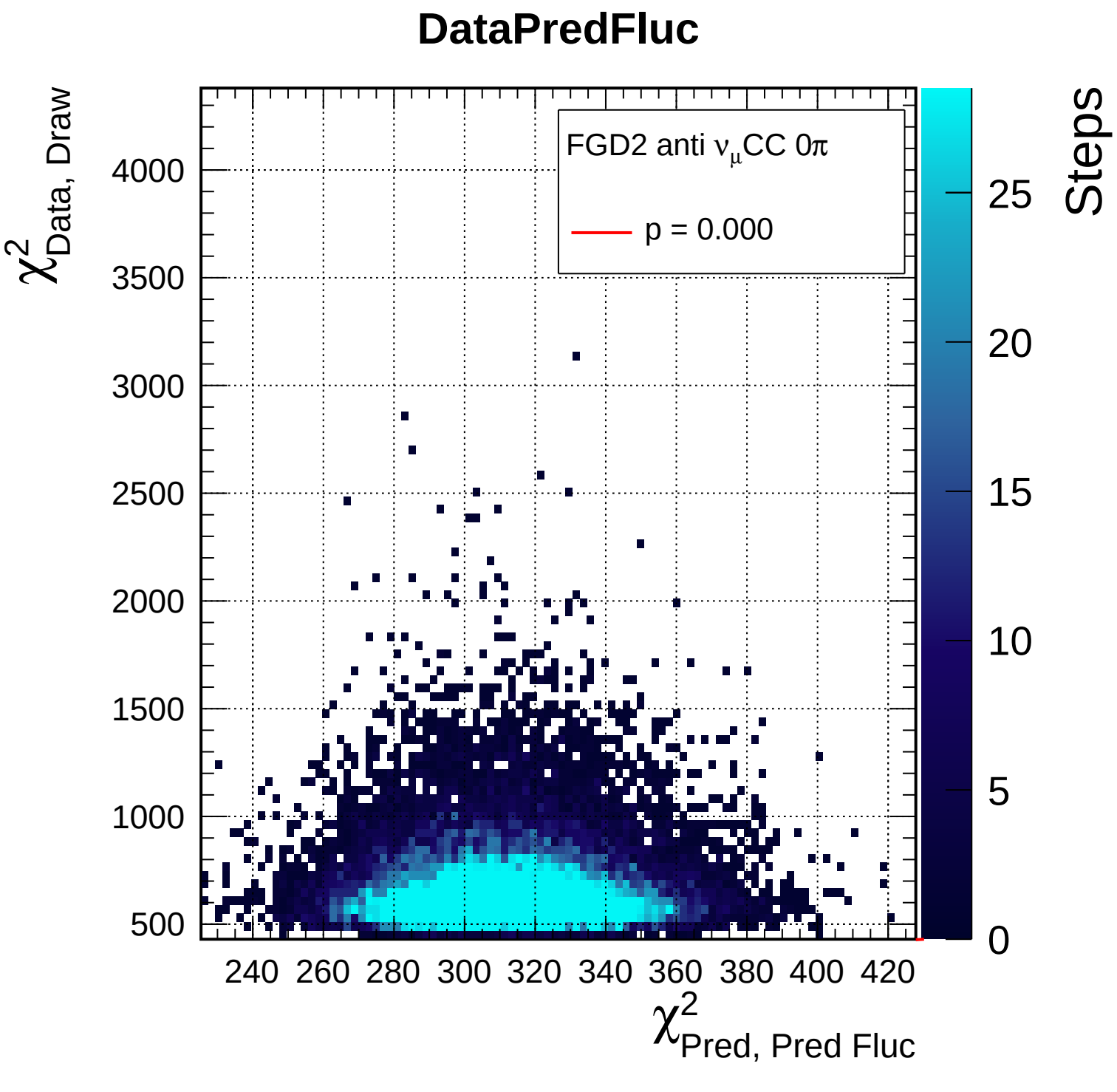

FGD1_anti-numuCC_other_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

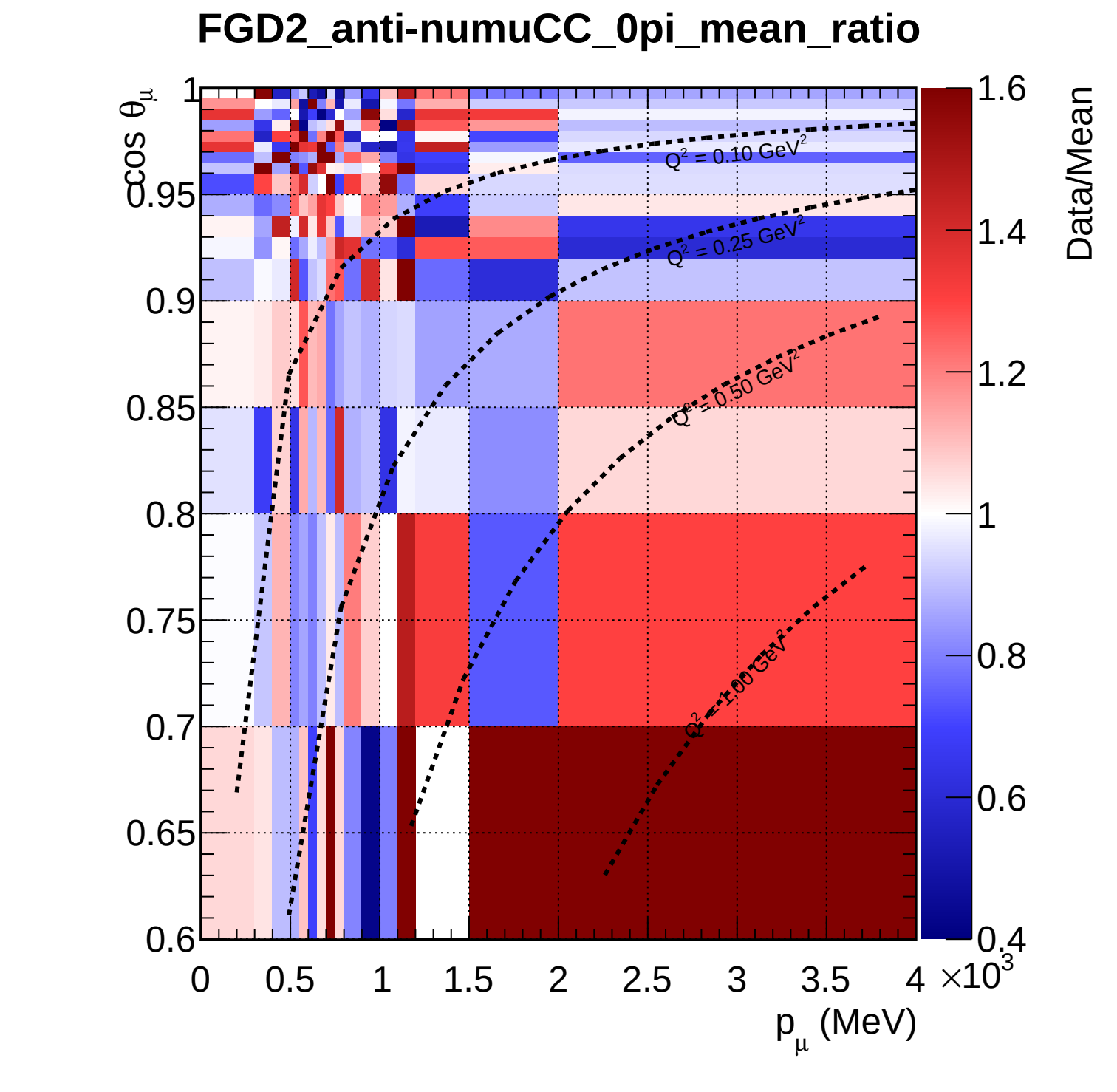

FGD1_anti-numuCC_other_sum_1102
Counts
Data, 1102, p-value=0.14
MC, μ=961.7±128.8
Gauss, μ=1017.1±166.2
0
50
100
150
200
250
300
350
400
450
500
600
700
800
900
1000
1100
N events

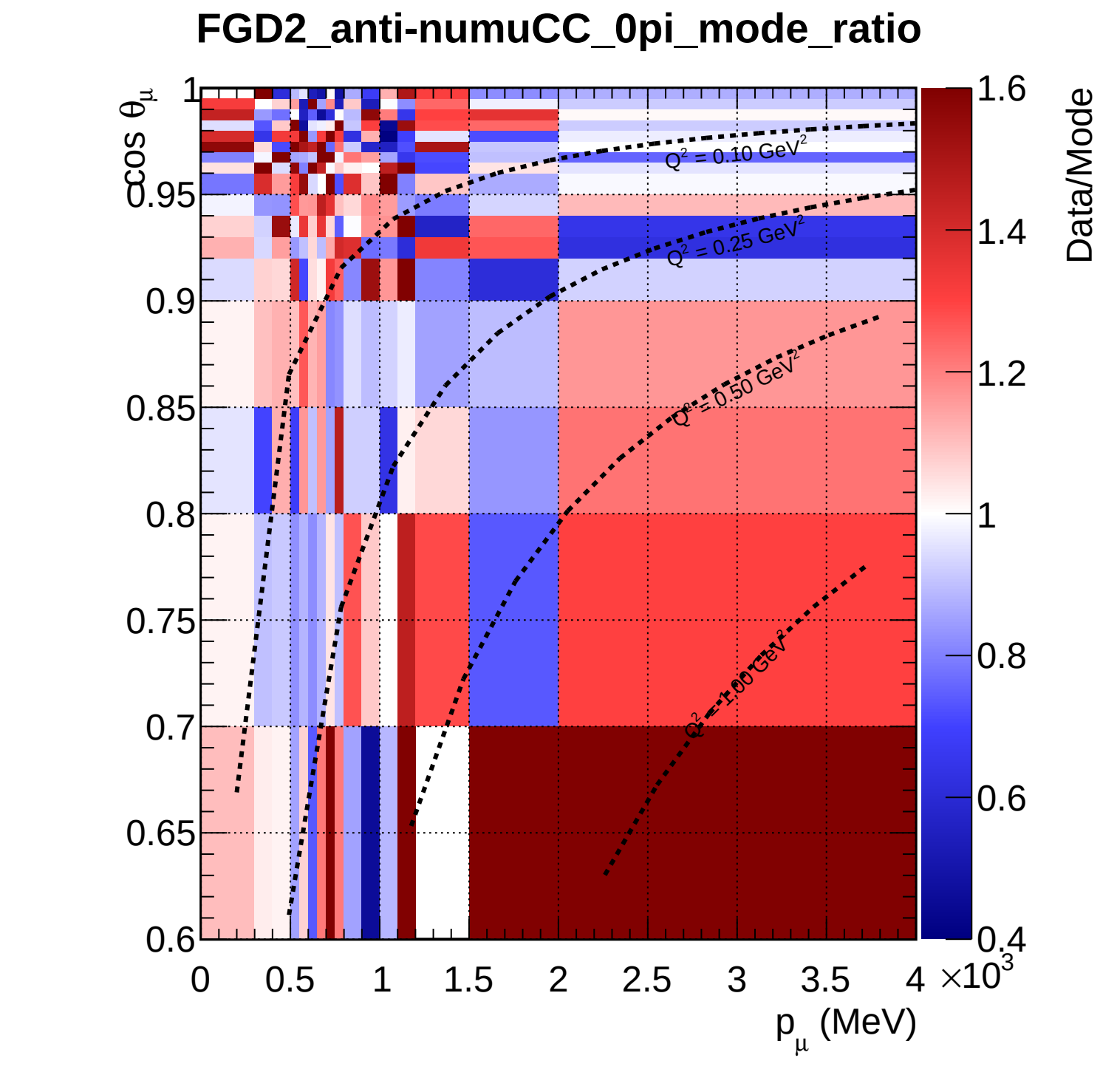

FGD1_anti-numuCC_other_data
N_events/MeV
0.44
0.42
0.4
0.38
0.36
0.34
0.32
0.3
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
p_μ (MeV)

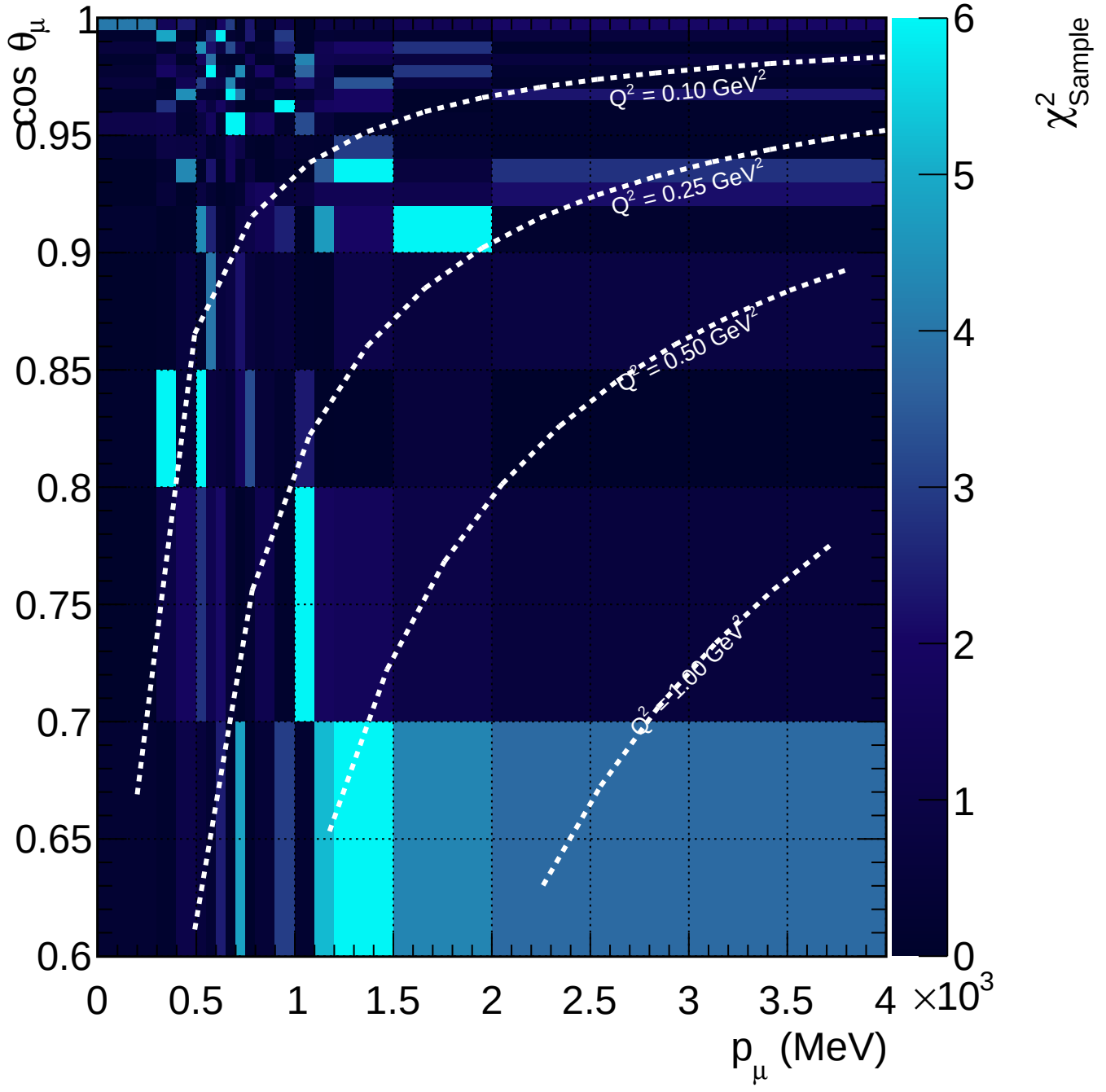

FGD1_anti-numuCC_other_data
N_events/1
8000
16000
14000
12000
10000
8000
6000
4000
2000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

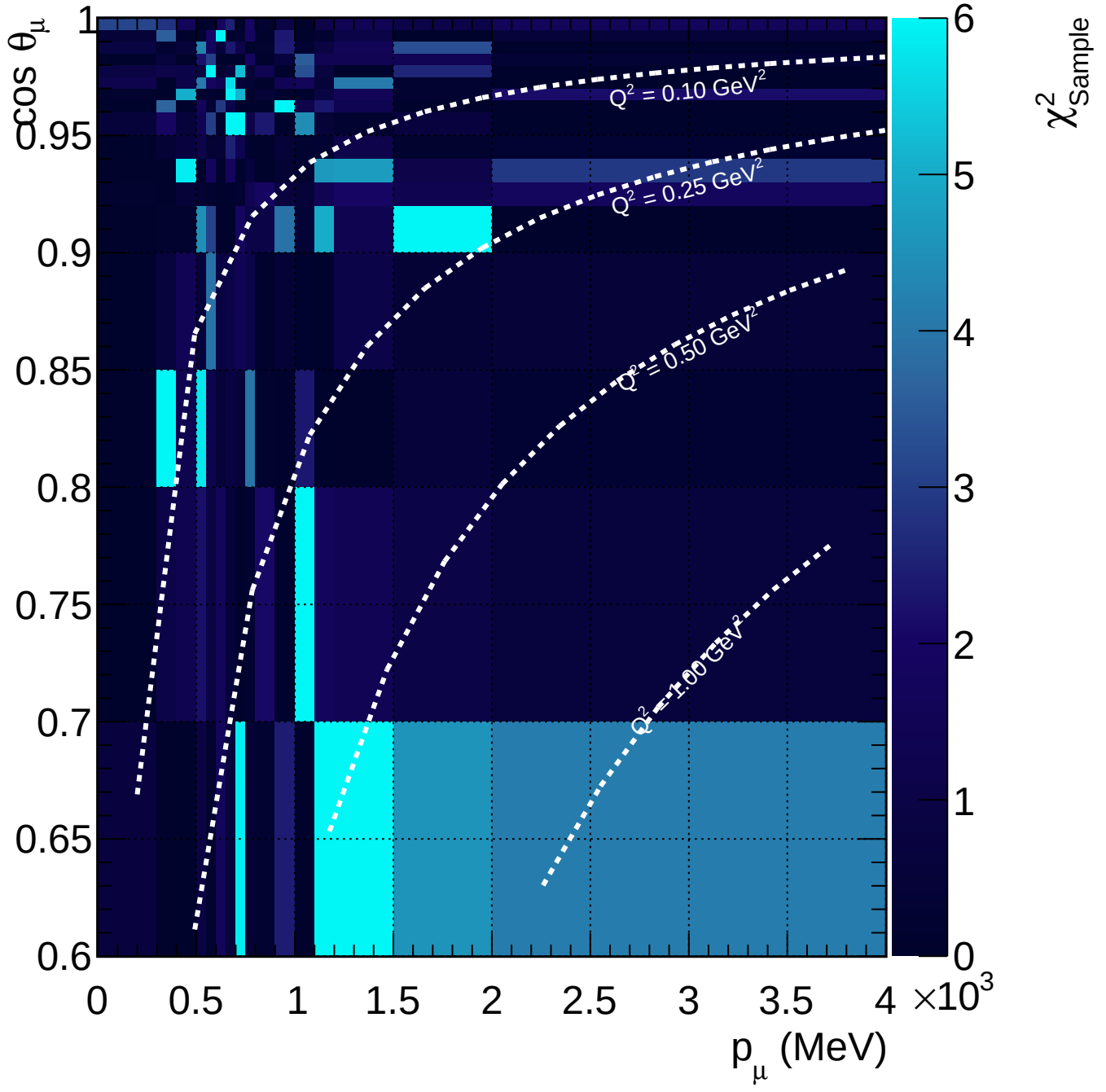

DataDrawFluc
FGD2 anti ν_μCC 0π
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
4000
3500
3000
2500
2000
1500
1000
500
240
260
280
300
320
340
360
380
400
25
20
15
10
5
0

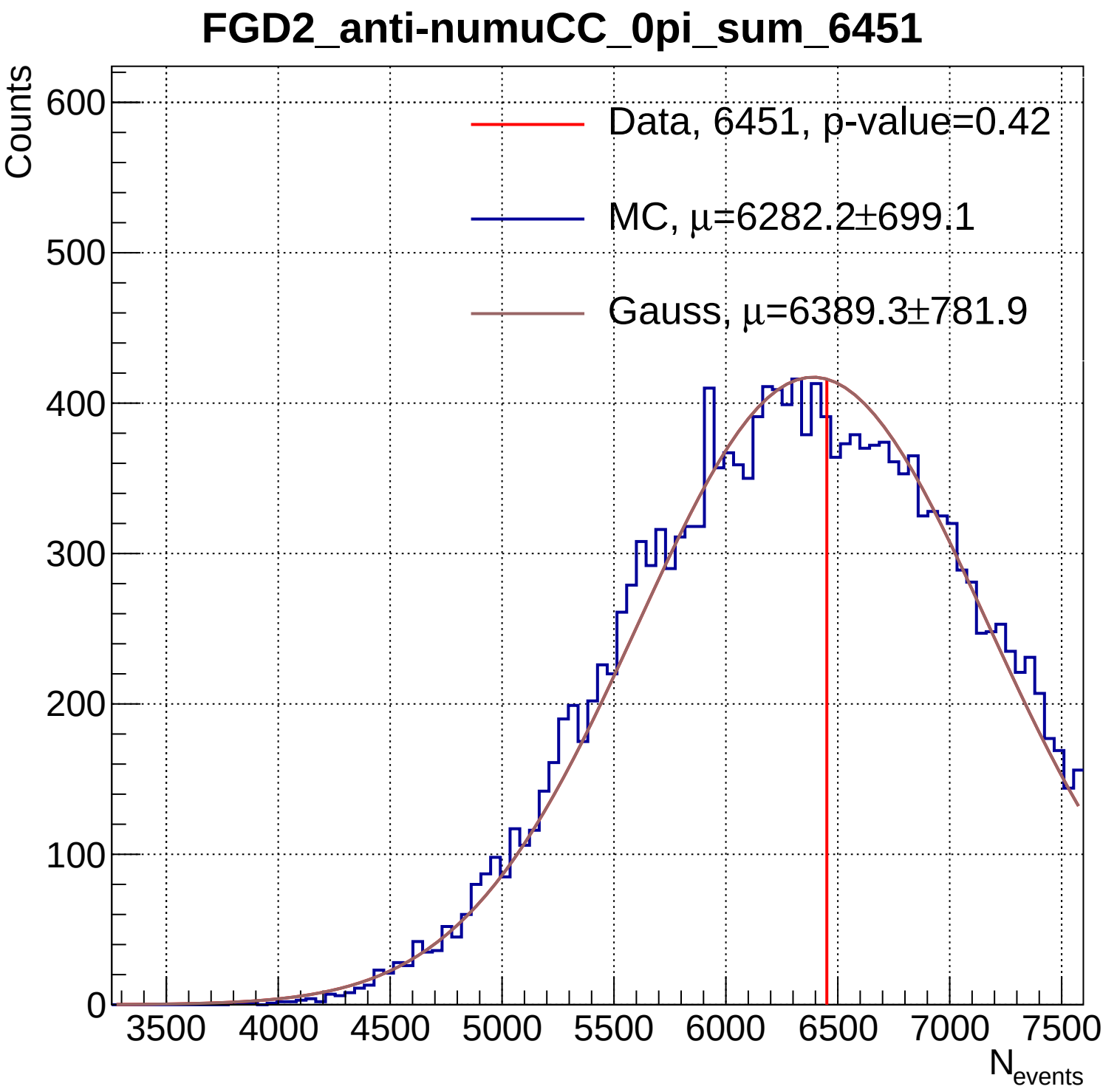

DataPredFluc
FGD2 anti ν_μCC 0π
p = 0.000
$\chi^2_{Data,\ Draw}$
$\chi^2_{Pred,\ Pred\ Fluc}$
Steps
4000
3500
3000
2500
2000
1500
1000
500
240
260
280
300
320
340
360
380
400
420
25
20
15
10
5
0

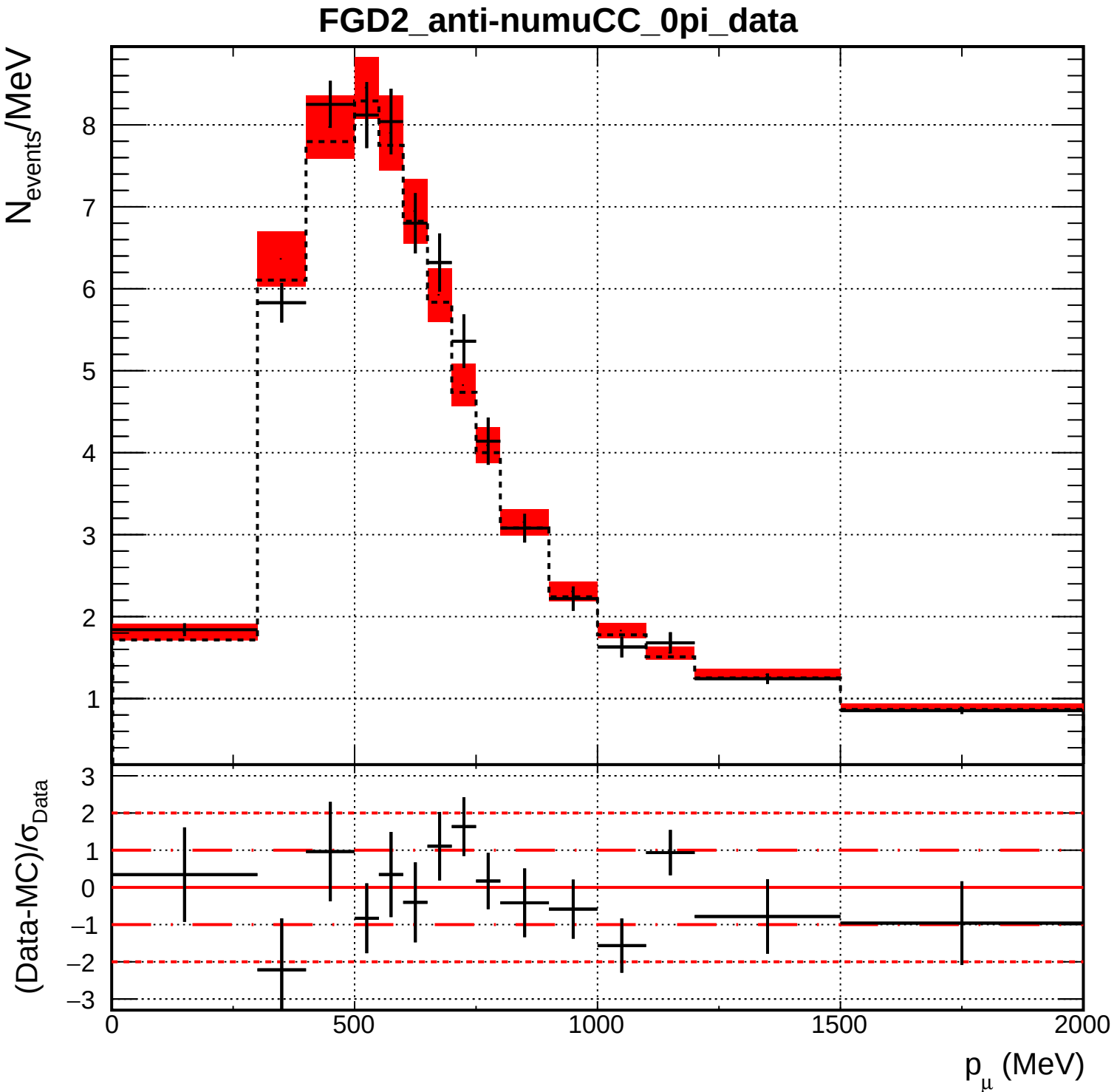

FGD2_anti-numuCC_0pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

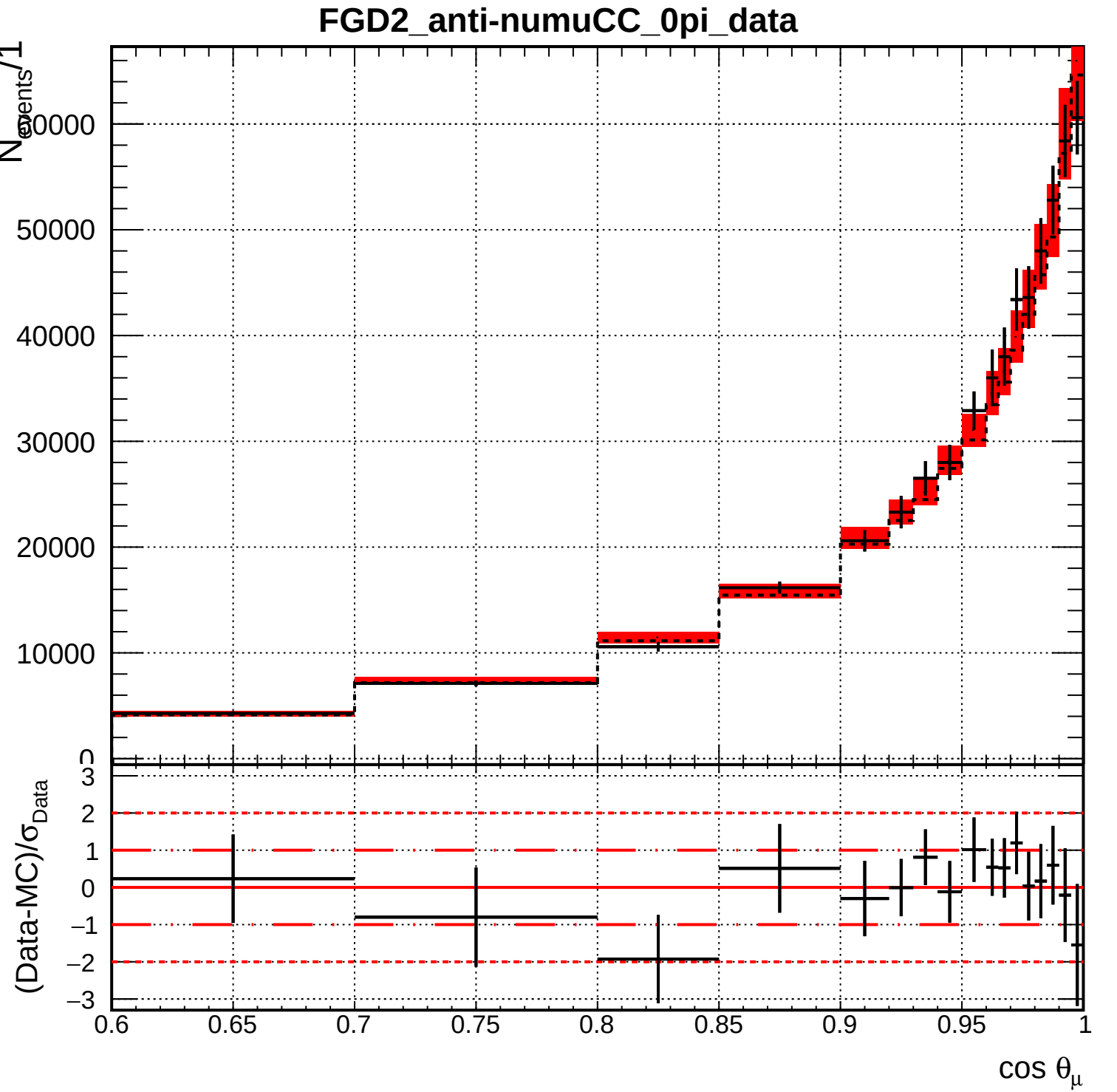

FGD2_anti-numuCC_0pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

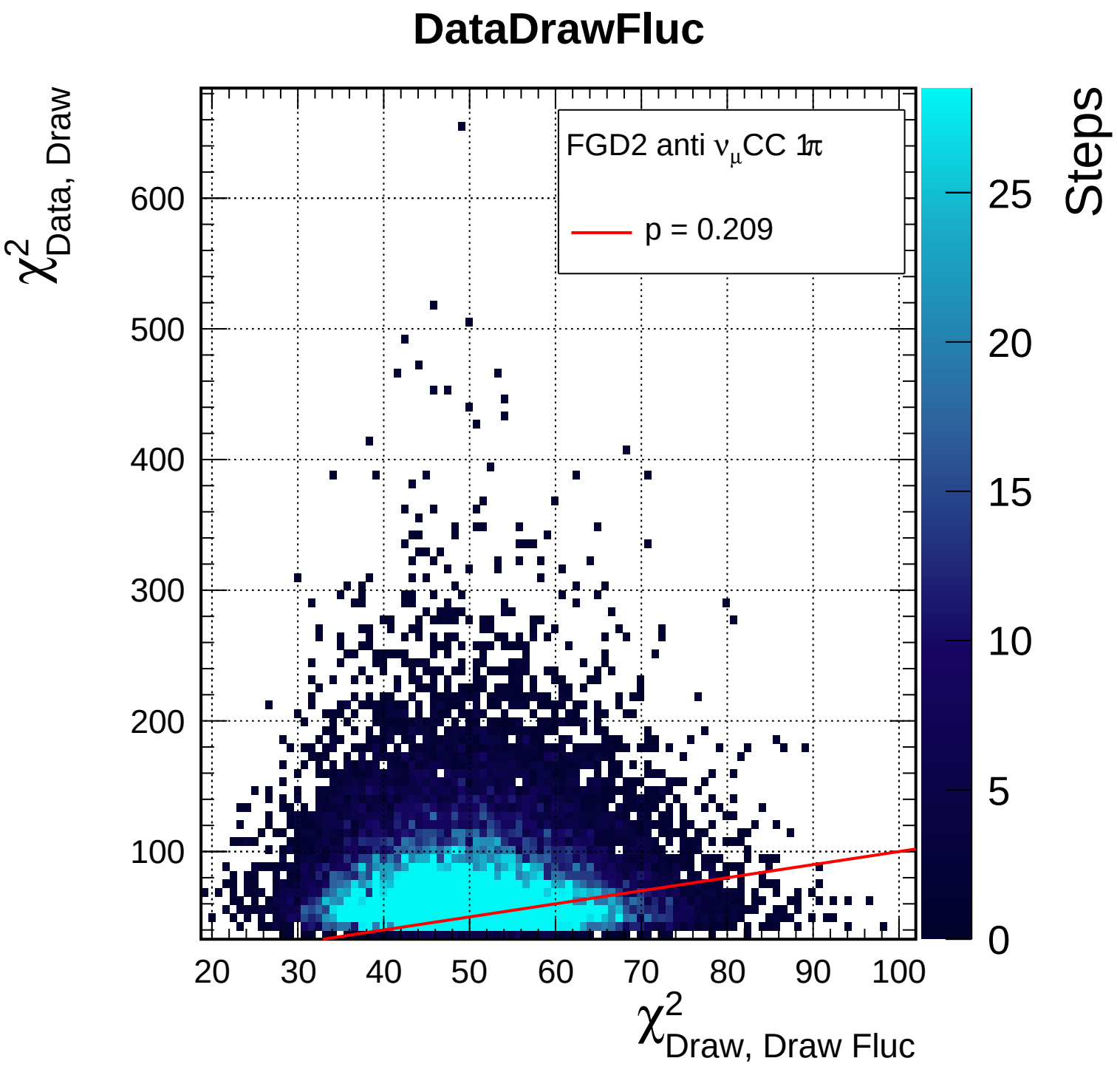

FGD2_anti-numuCC_0pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

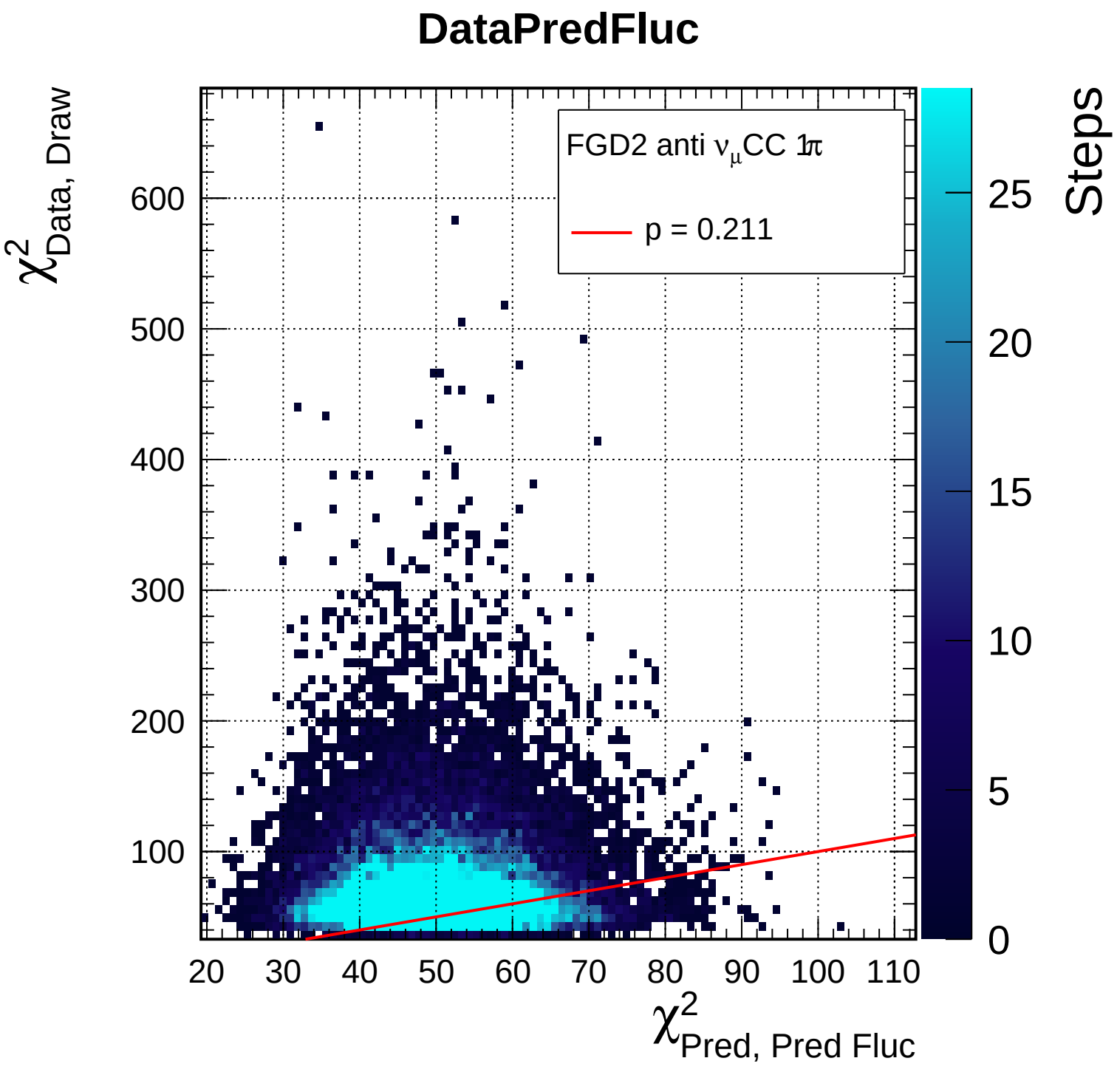

FGD2_anti-numuCC_0pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
×10³
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

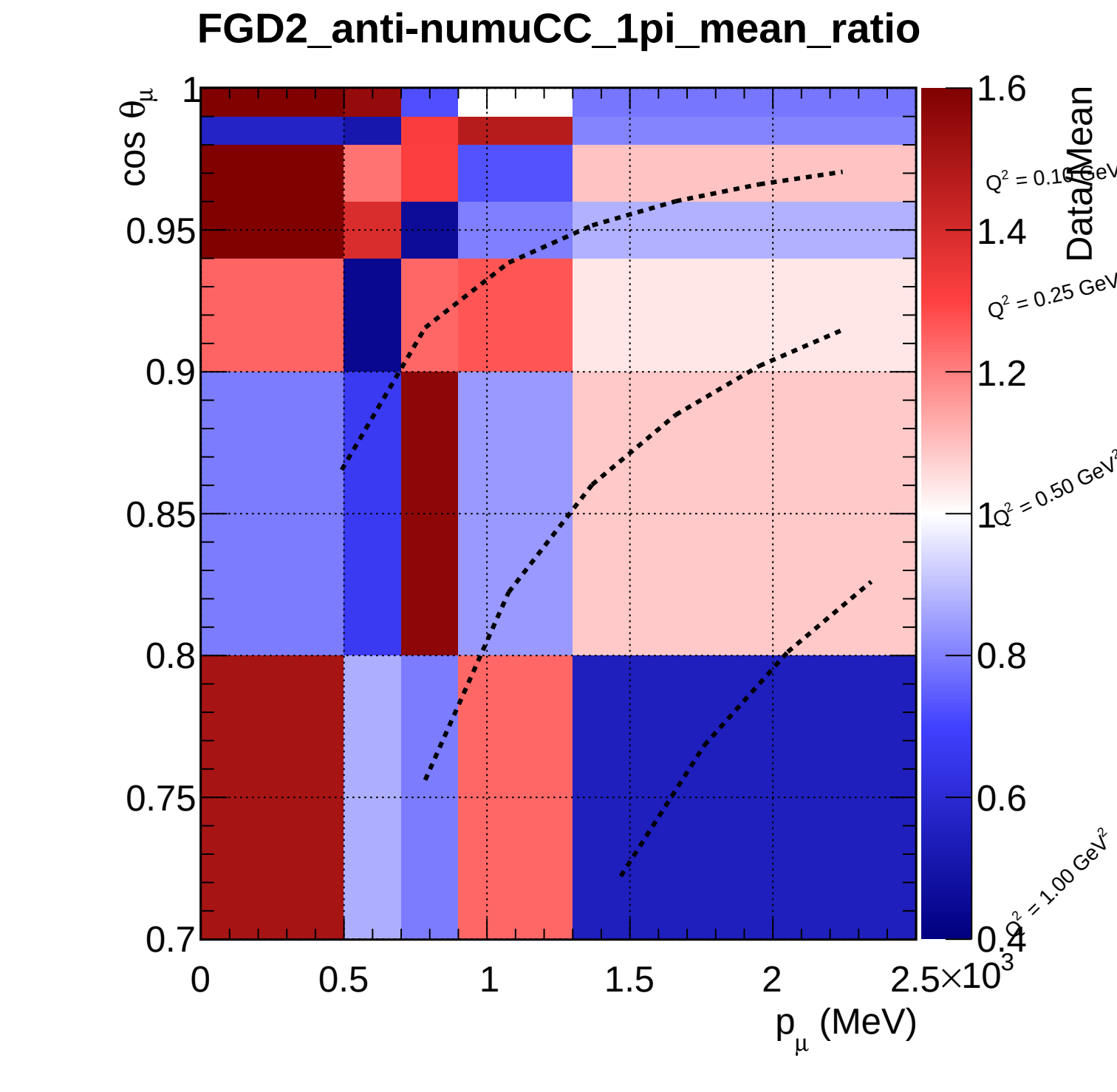

FGD2_anti-numuCC_0pi_sum_6451
Counts
600
500
400
300
200
100
0
Data, 6451, p-value=0.42
MC, μ=6282.2±699.1
Gauss, μ=6389.3±781.9
3500
4000
4500
5000
5500
6000
6500
7000
7500
N events

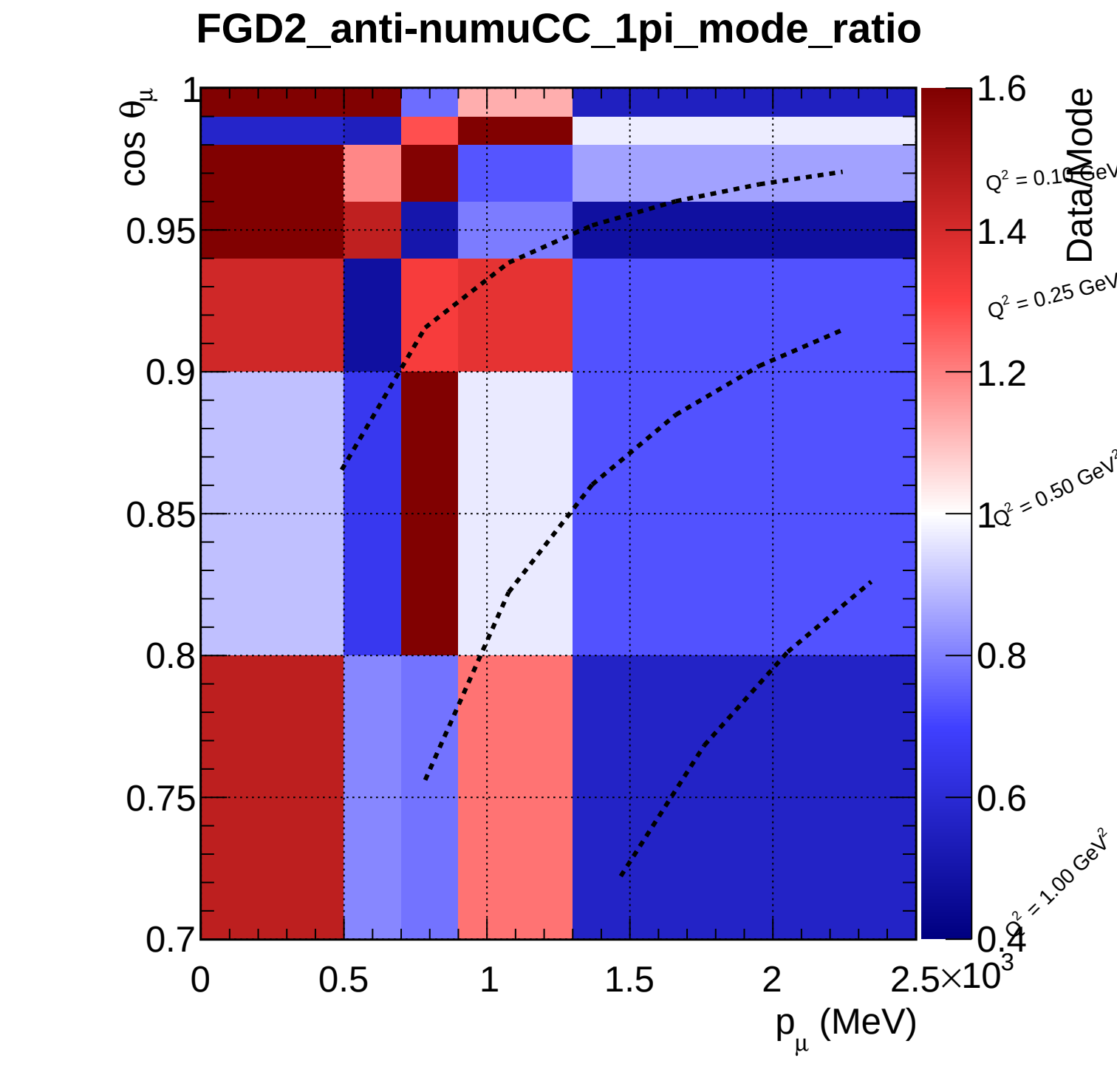

FGD2_anti-numuCC_0pi_data
N_events/MeV
(Data-MC)/σ_Data
p_μ (MeV)
0
500
1000
1500
2000
1
2
3
4
5
6
7
8
−3
−2
−1
0
1
2
3

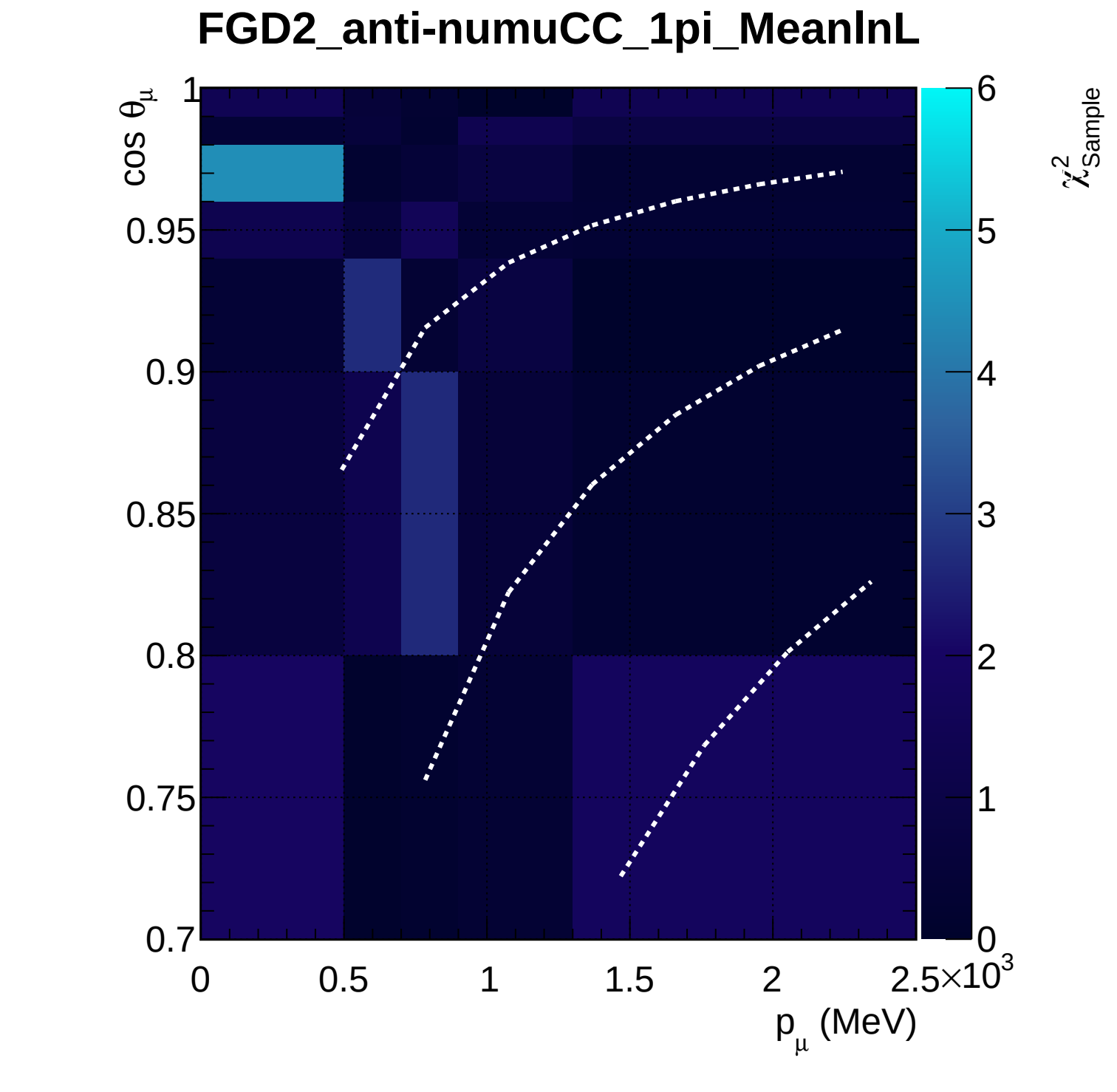

FGD2_anti-numuCC_0pi_data
N_events/1
50000
40000
30000
20000
10000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

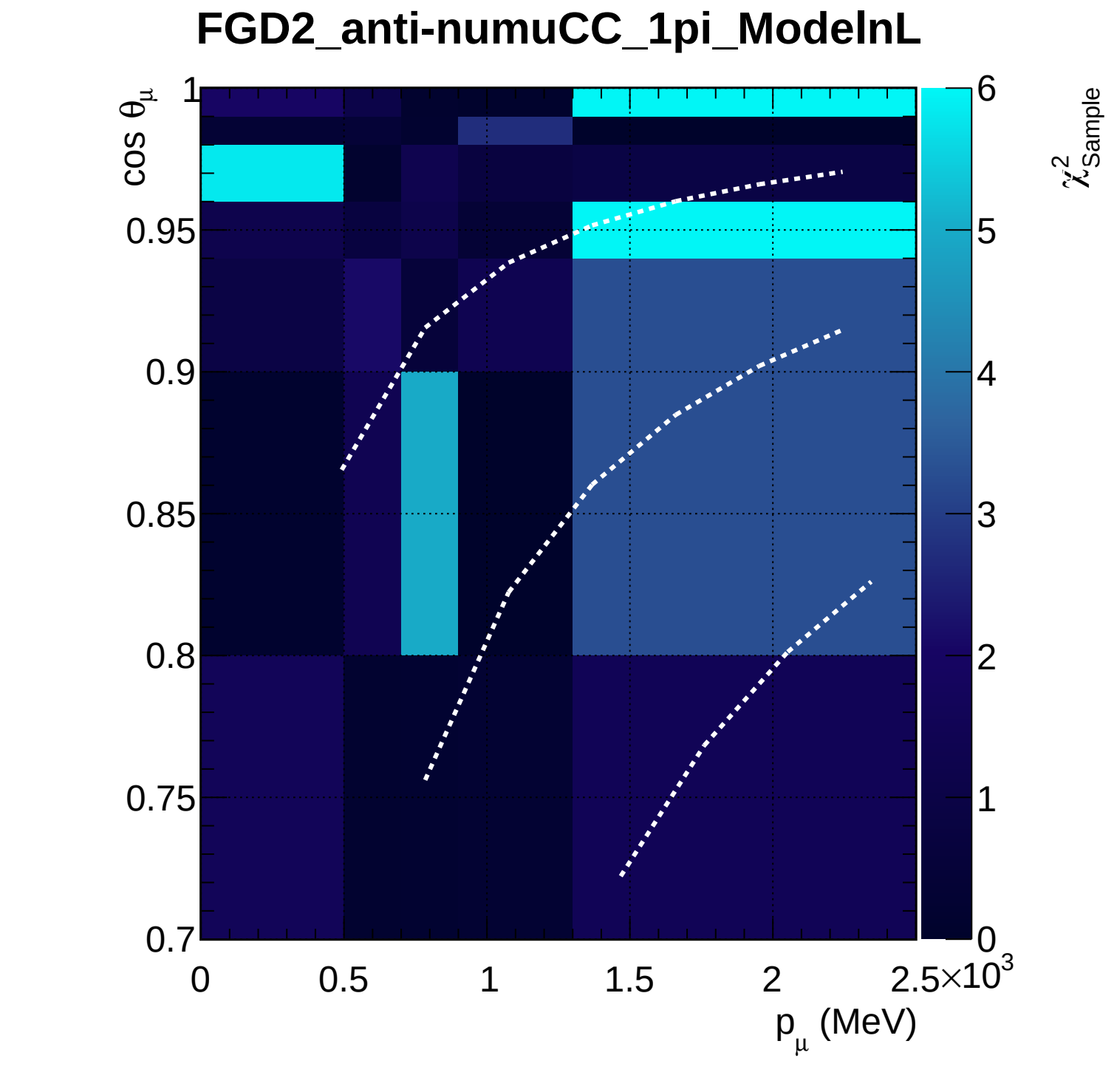

DataDrawFluc
FGD2 anti ν_μCC 1π
p = 0.209
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
600
500
400
300
200
100
20
30
40
50
60
70
80
90
100
25
20
15
10
5
0

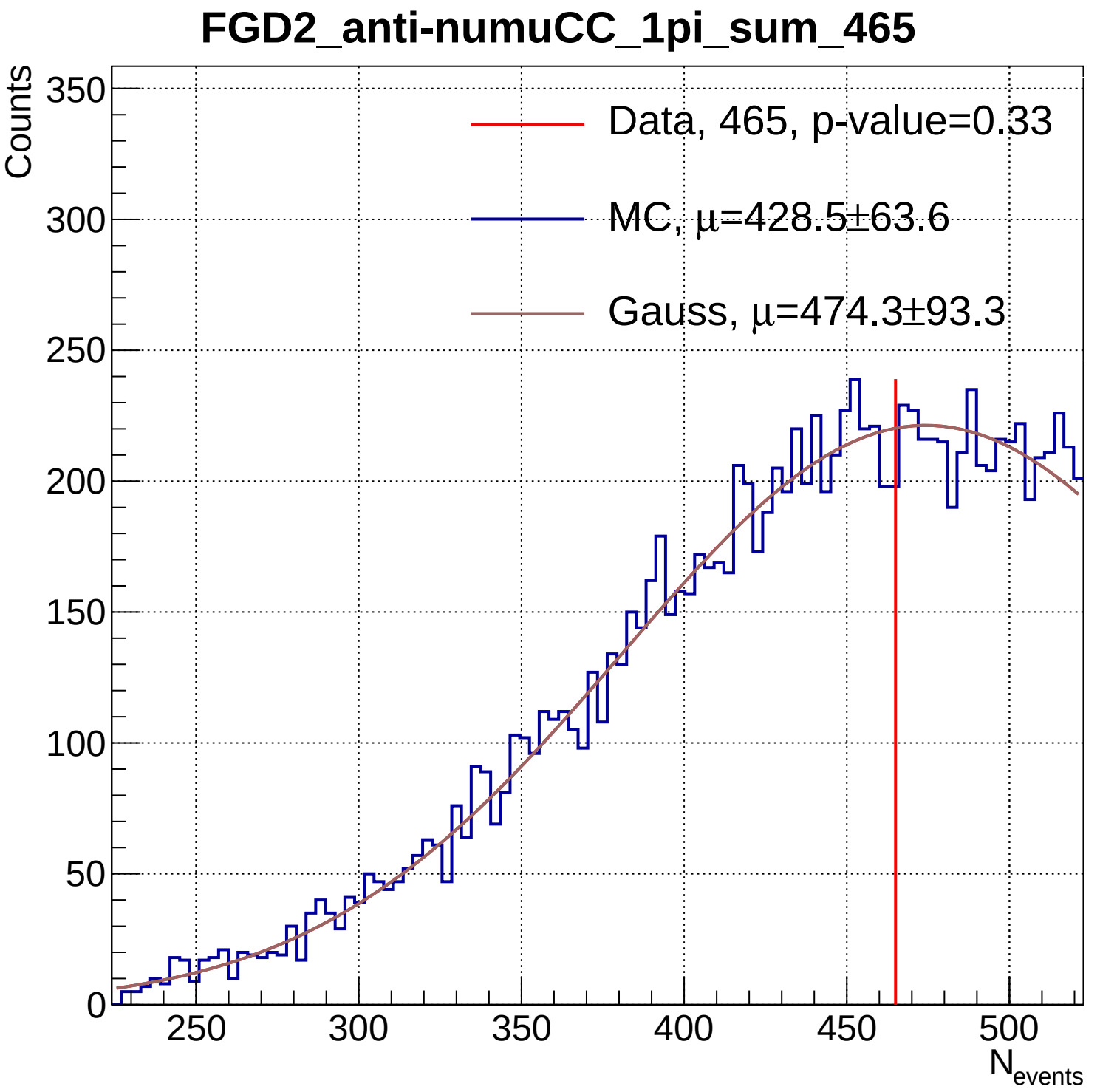

DataPredFluc
FGD2 anti ν_μCC 1π
p = 0.211
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
600
500
400
300
200
100
20
30
40
50
60
70
80
90
100
110
25
20
15
10
5
0

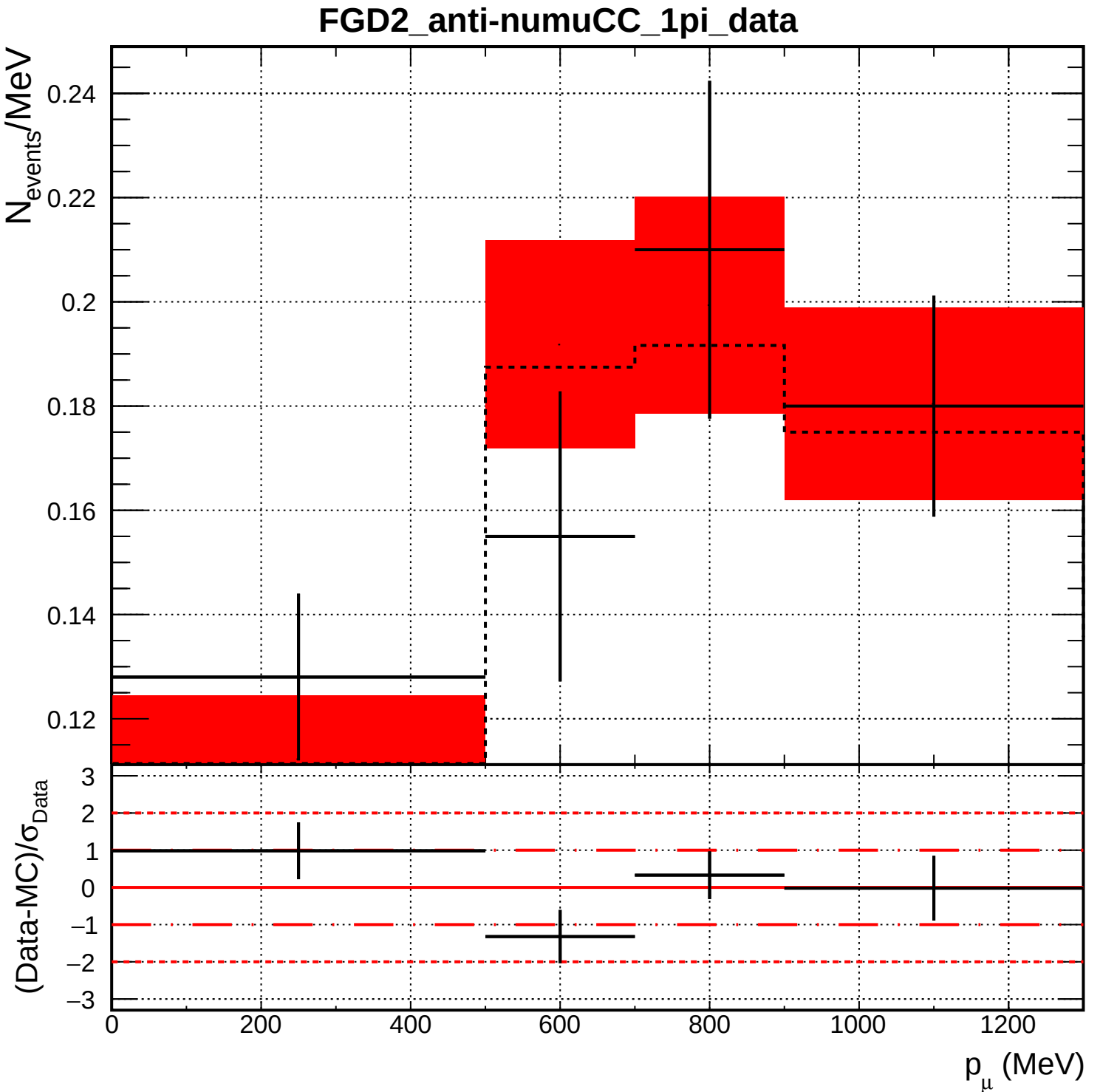

FGD2_anti-numuCC_1pi_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10³
pμ (MeV)
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²

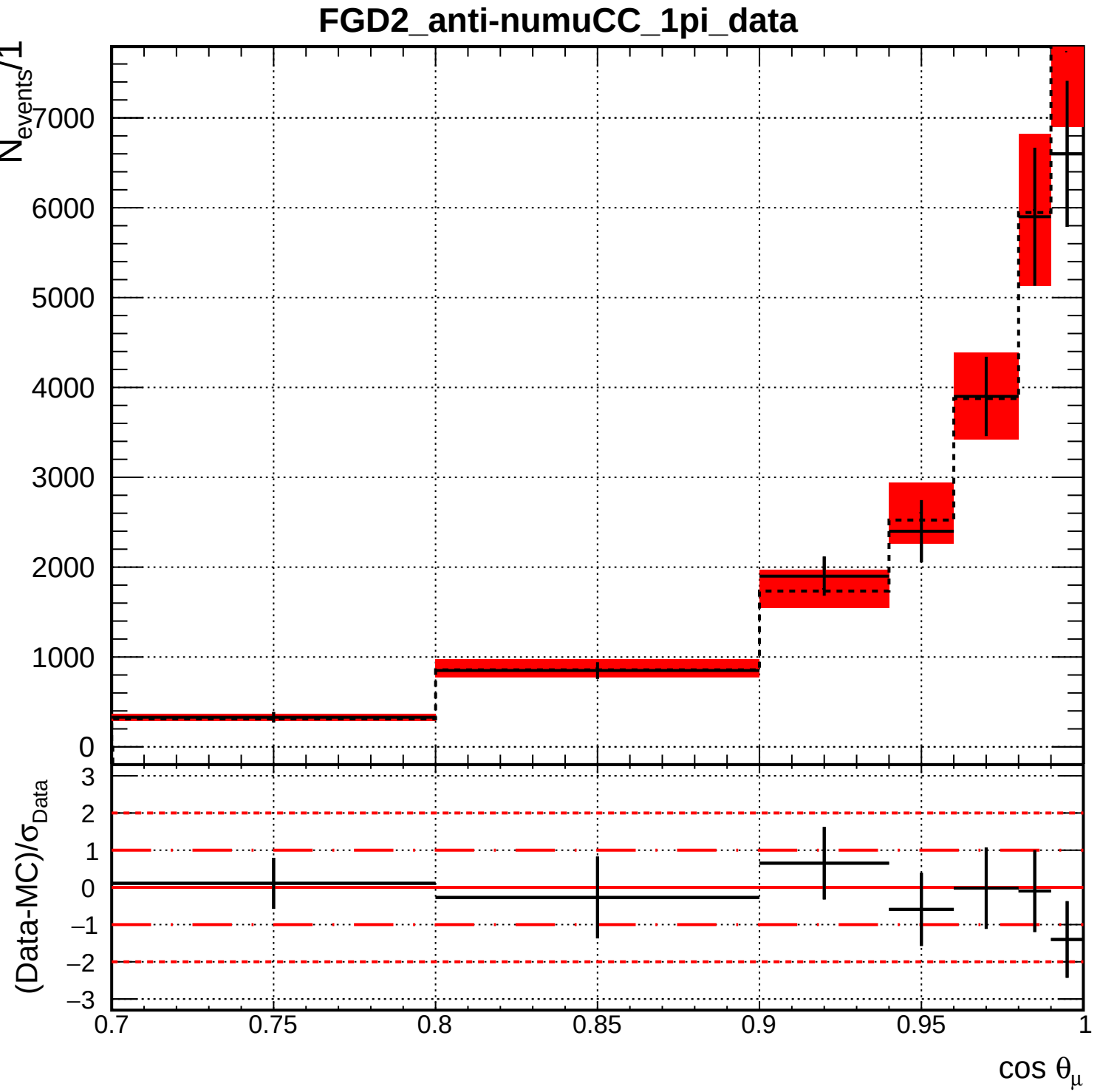

FGD2_anti-numuCC_1pi_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10^3
pμ (MeV)
1.6
1.4
1.2
1
0.8
0.6
0.4
Data/MC Mode
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²

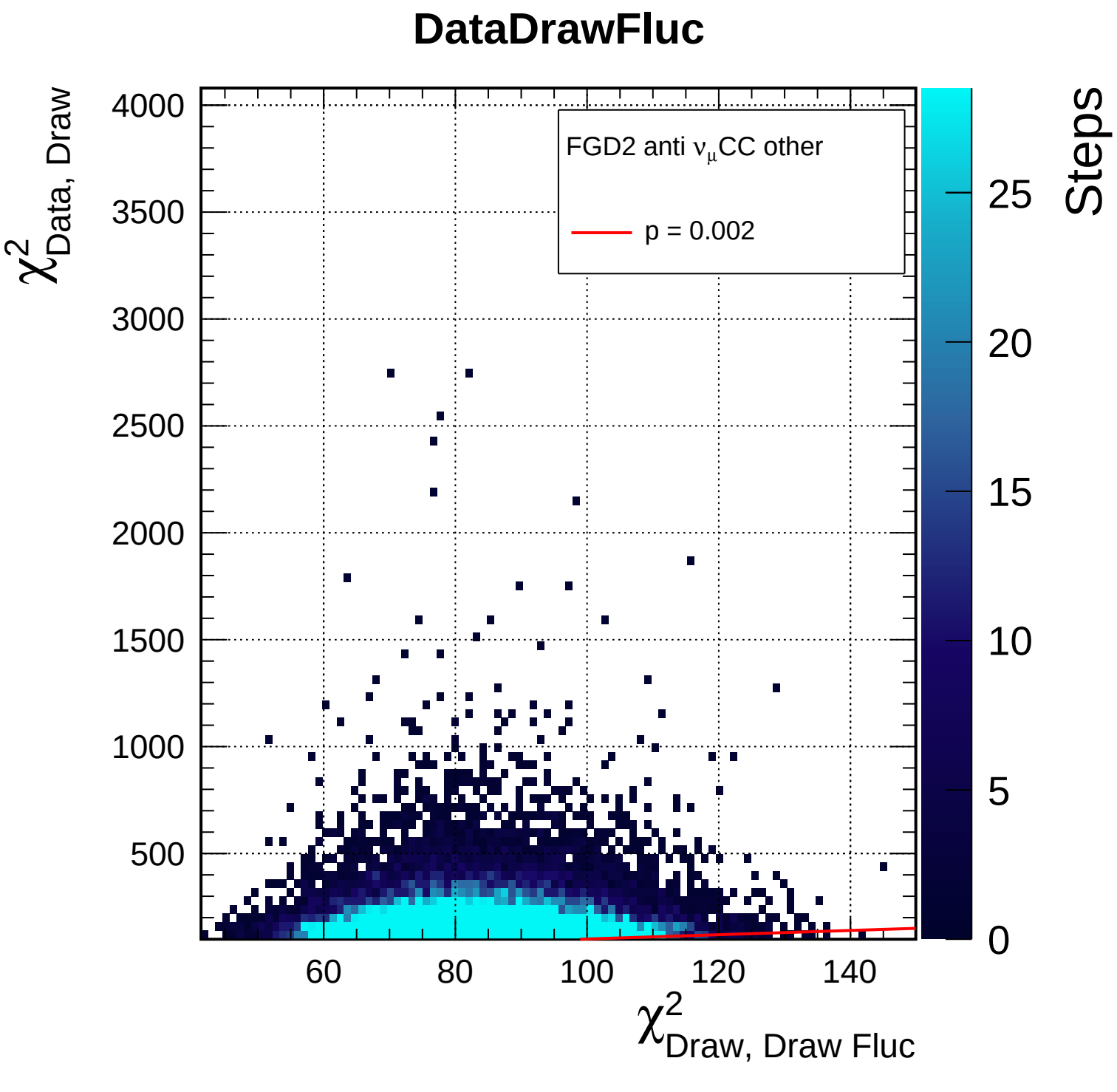

FGD2_anti-numuCC_1pi_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

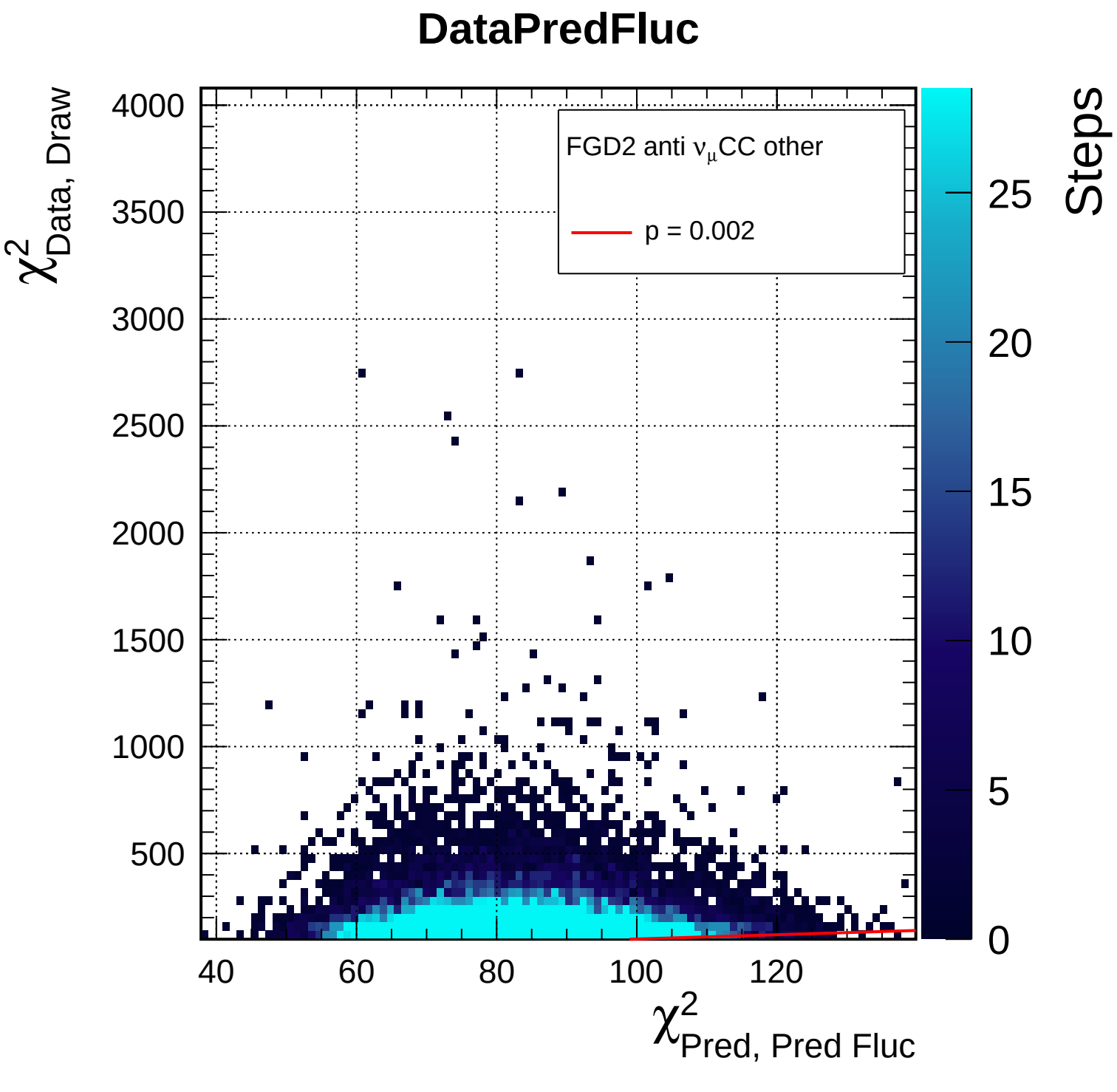

FGD2_anti-numuCC_1pi_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

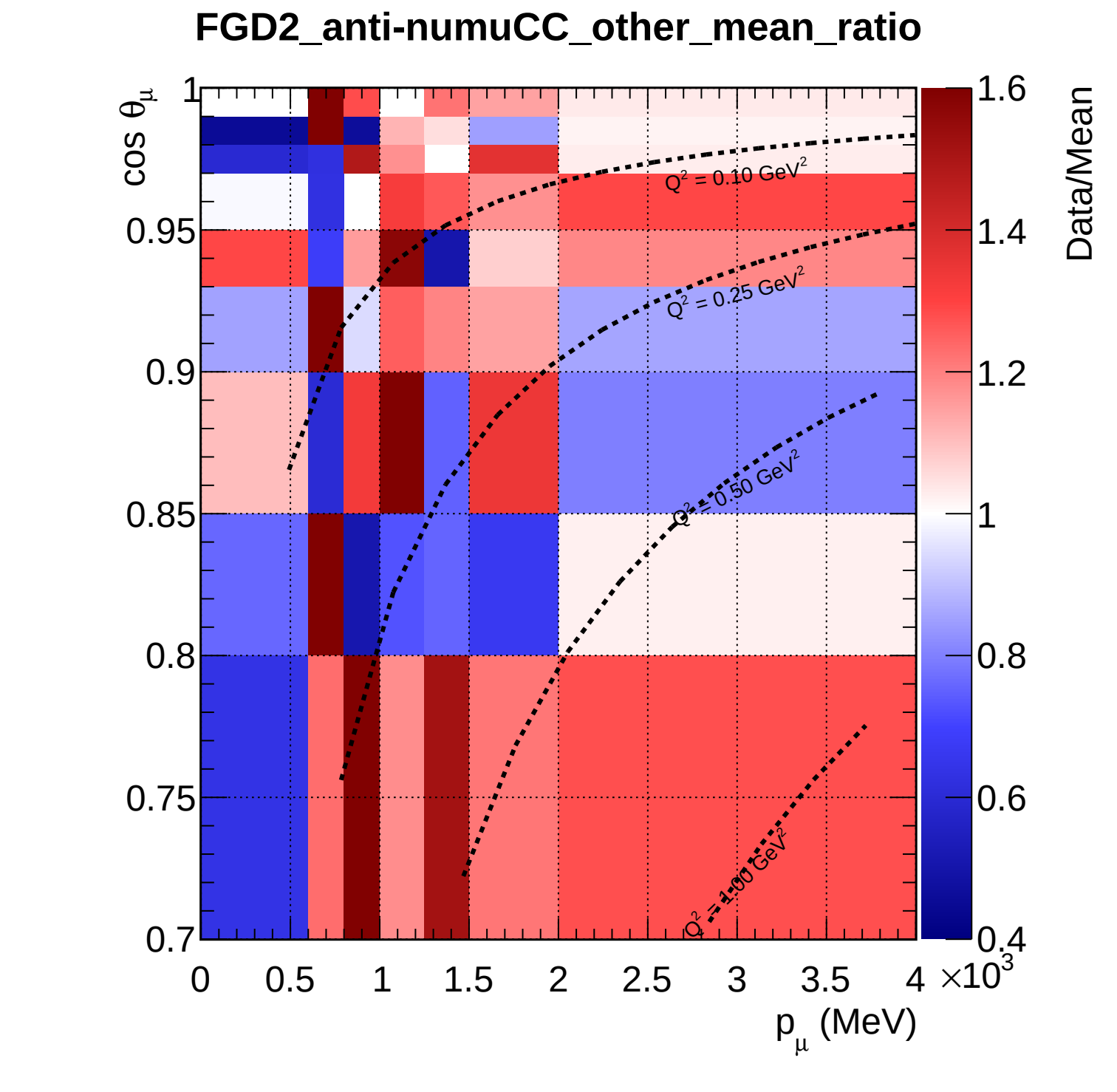

FGD2_anti-numuCC_1pi_sum_465
Counts
Data, 465, p-value=0.33
MC, μ=428.5±63.6
Gauss, μ=474.3±93.3
0
50
100
150
200
250
300
350
250
300
350
400
450
500
N events

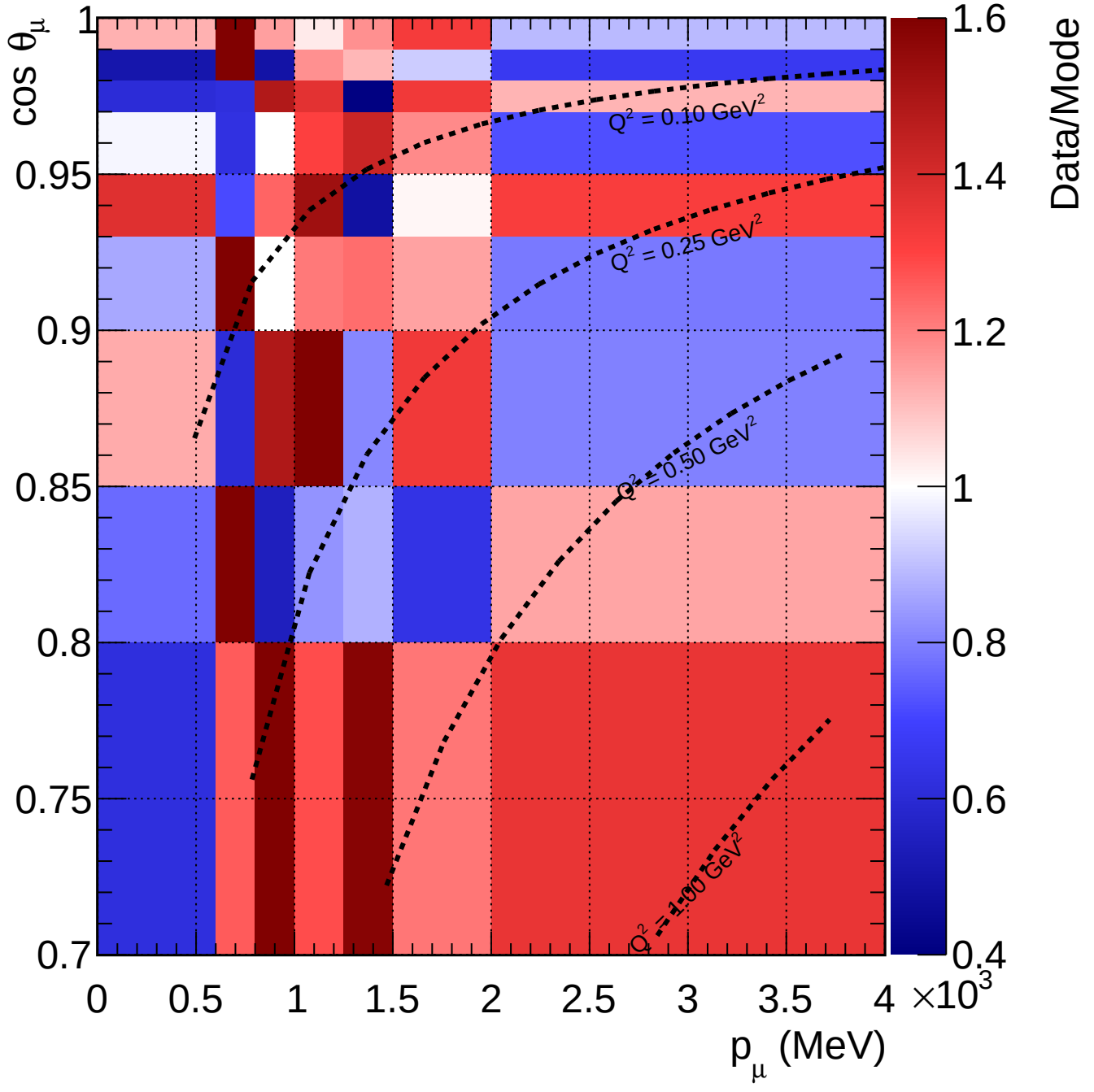

FGD2_anti-numuCC_1pi_data
N_events/MeV
0.24
0.22
0.2
0.18
0.16
0.14
0.12
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
200
400
600
800
1000
1200
p_μ (MeV)

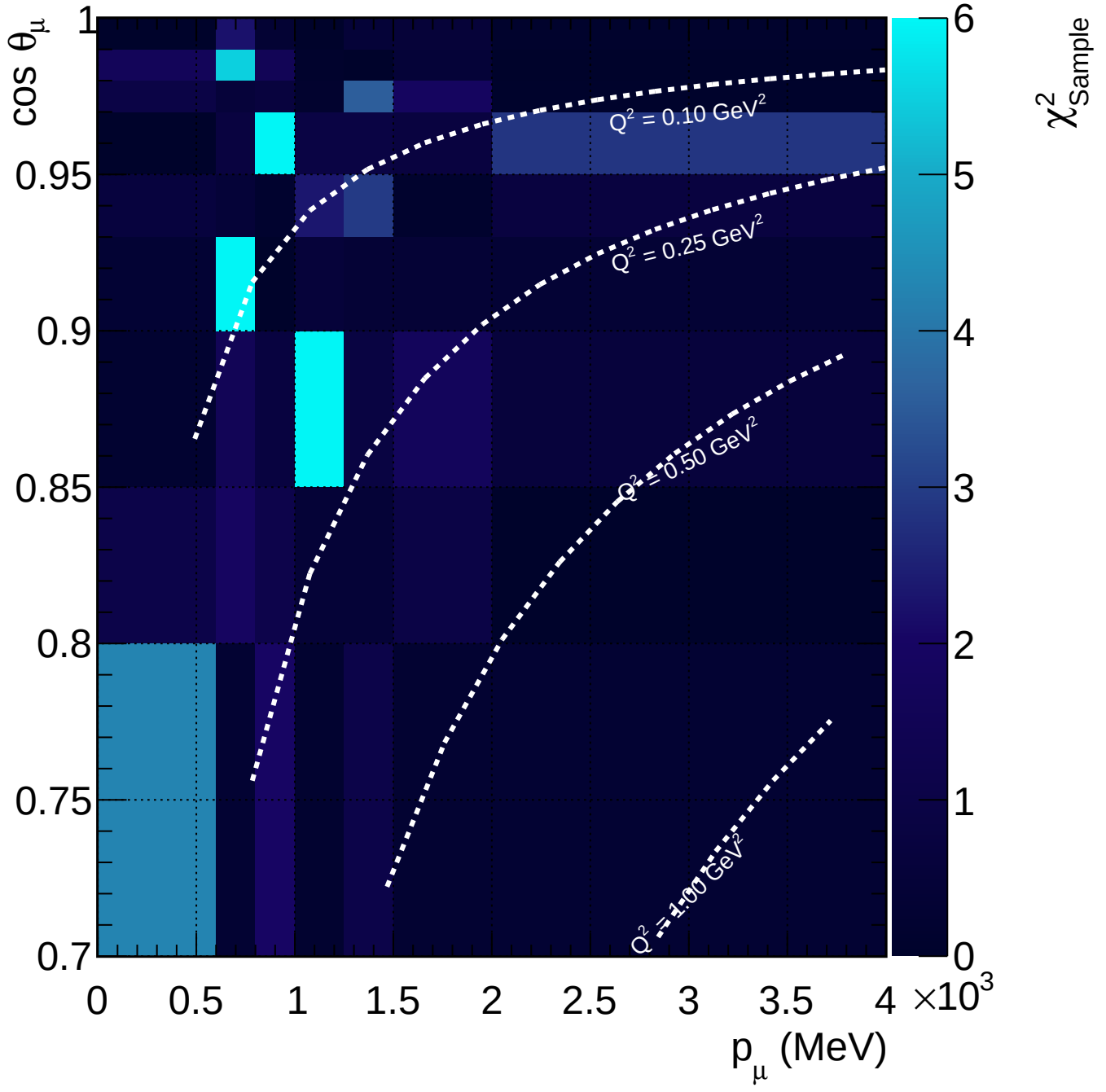

FGD2_anti-numuCC_1pi_data
N_events/1
7000
6000
5000
4000
3000
2000
1000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

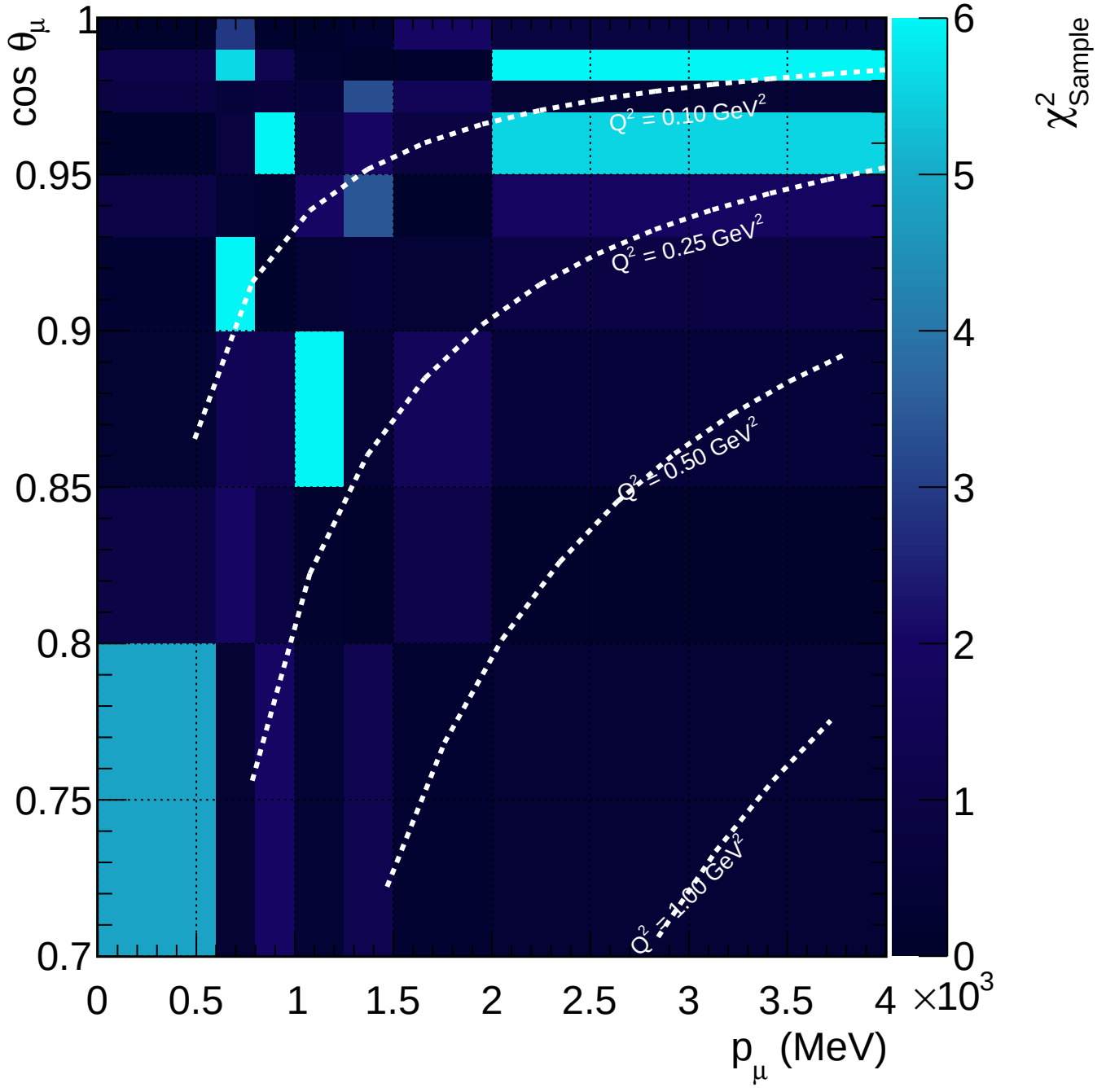

DataDrawFluc
FGD2 anti ν_μCC other
p = 0.002
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
4000
3500
3000
2500
2000
1500
1000
500
60
80
100
120
140
25
20
15
10
5
0

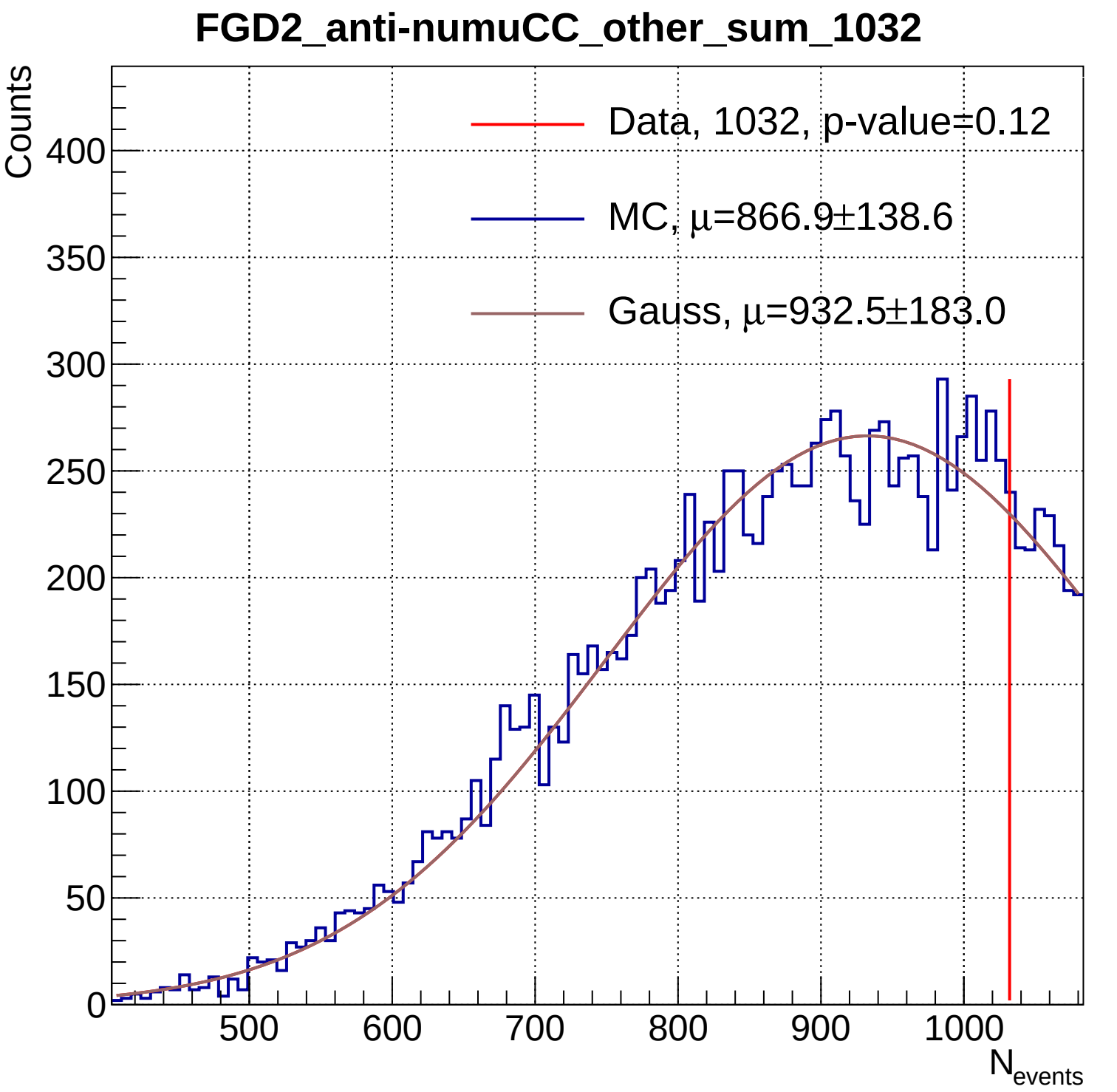

DataPredFluc
FGD2 anti ν_μCC other
p = 0.002
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
4000
3500
3000
2500
2000
1500
1000
500
40
60
80
100
120
25
20
15
10
5
0

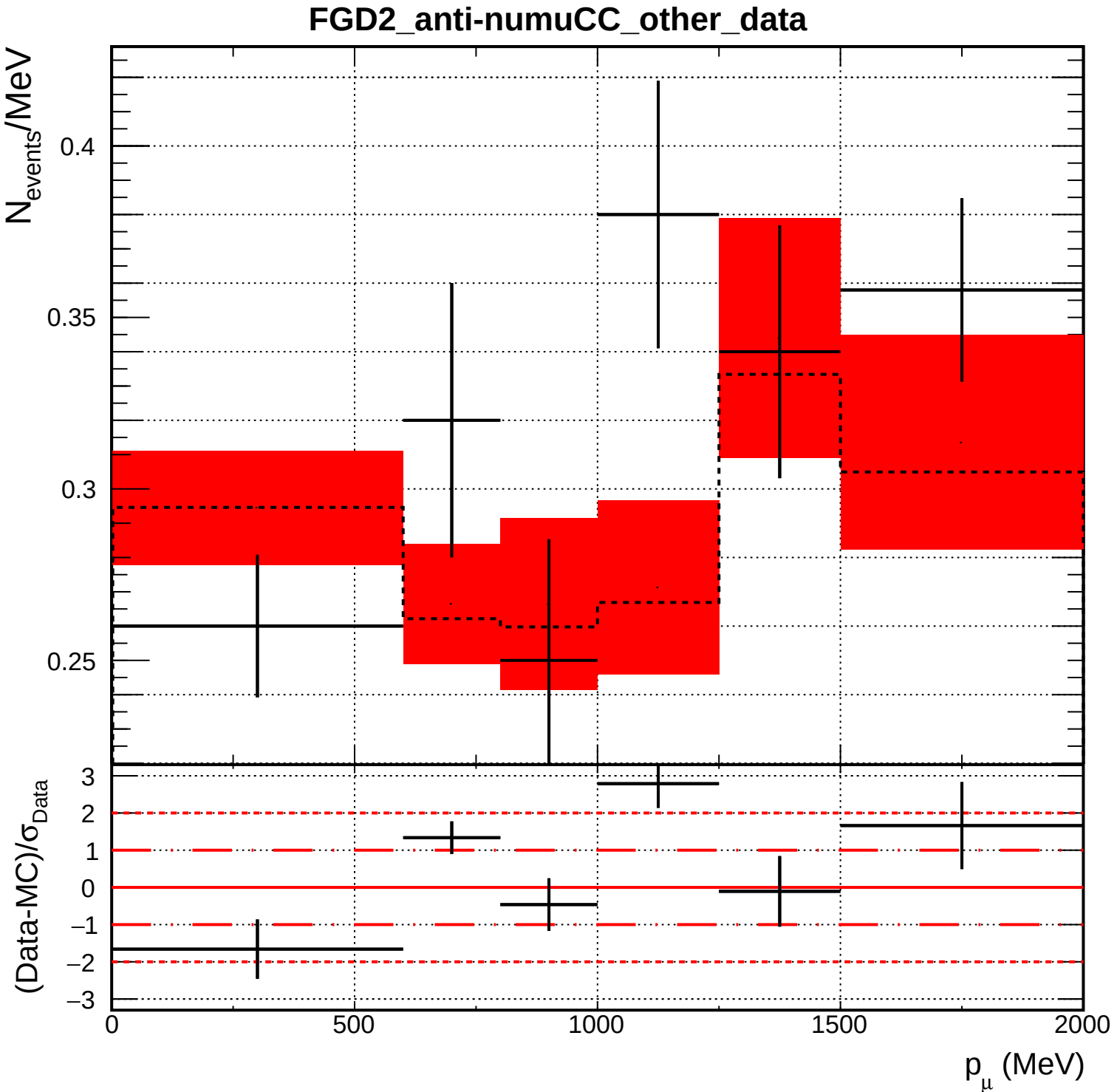

FGD2_anti-numuCC_other_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

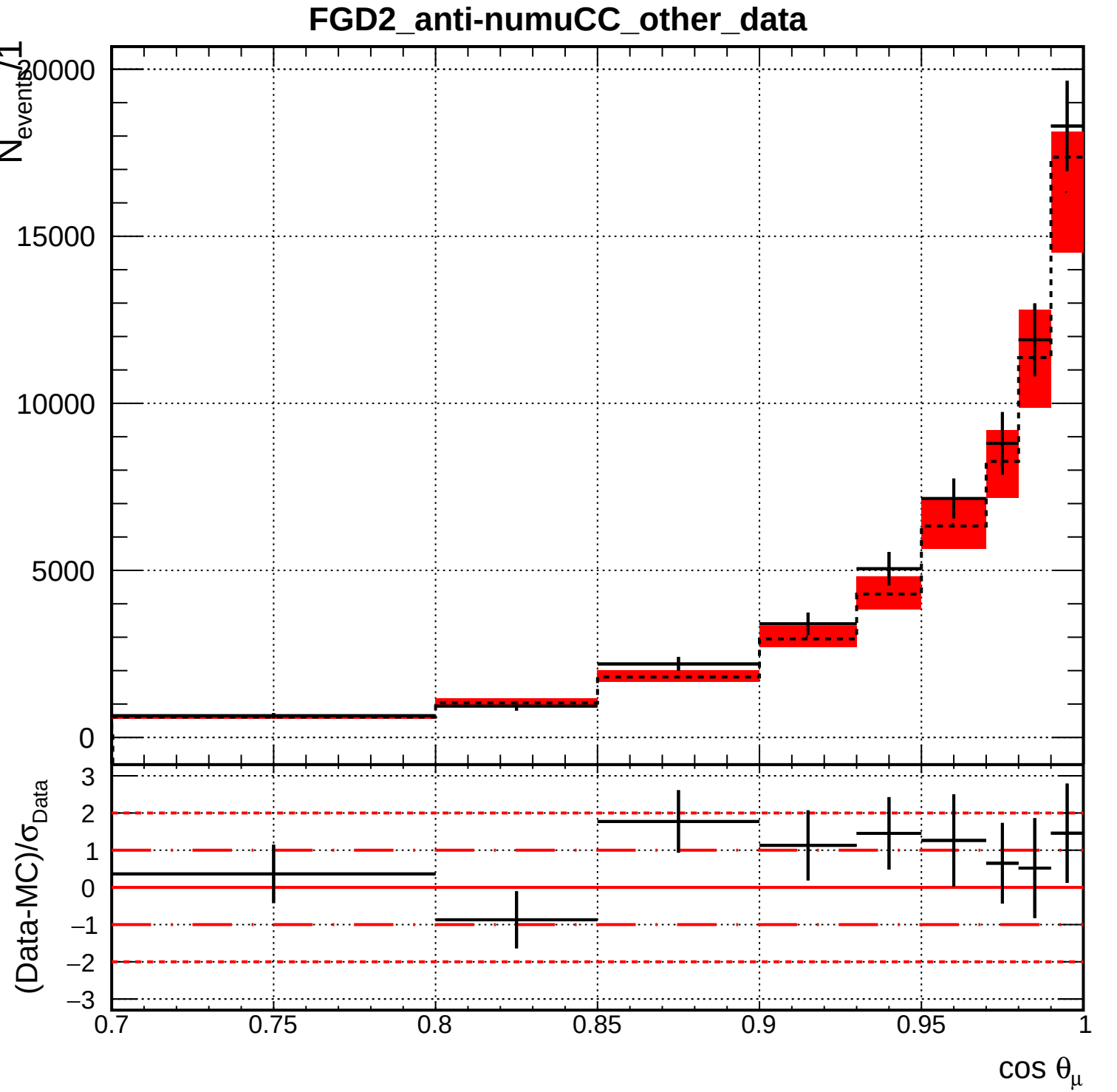

FGD2_anti-numuCC_other_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

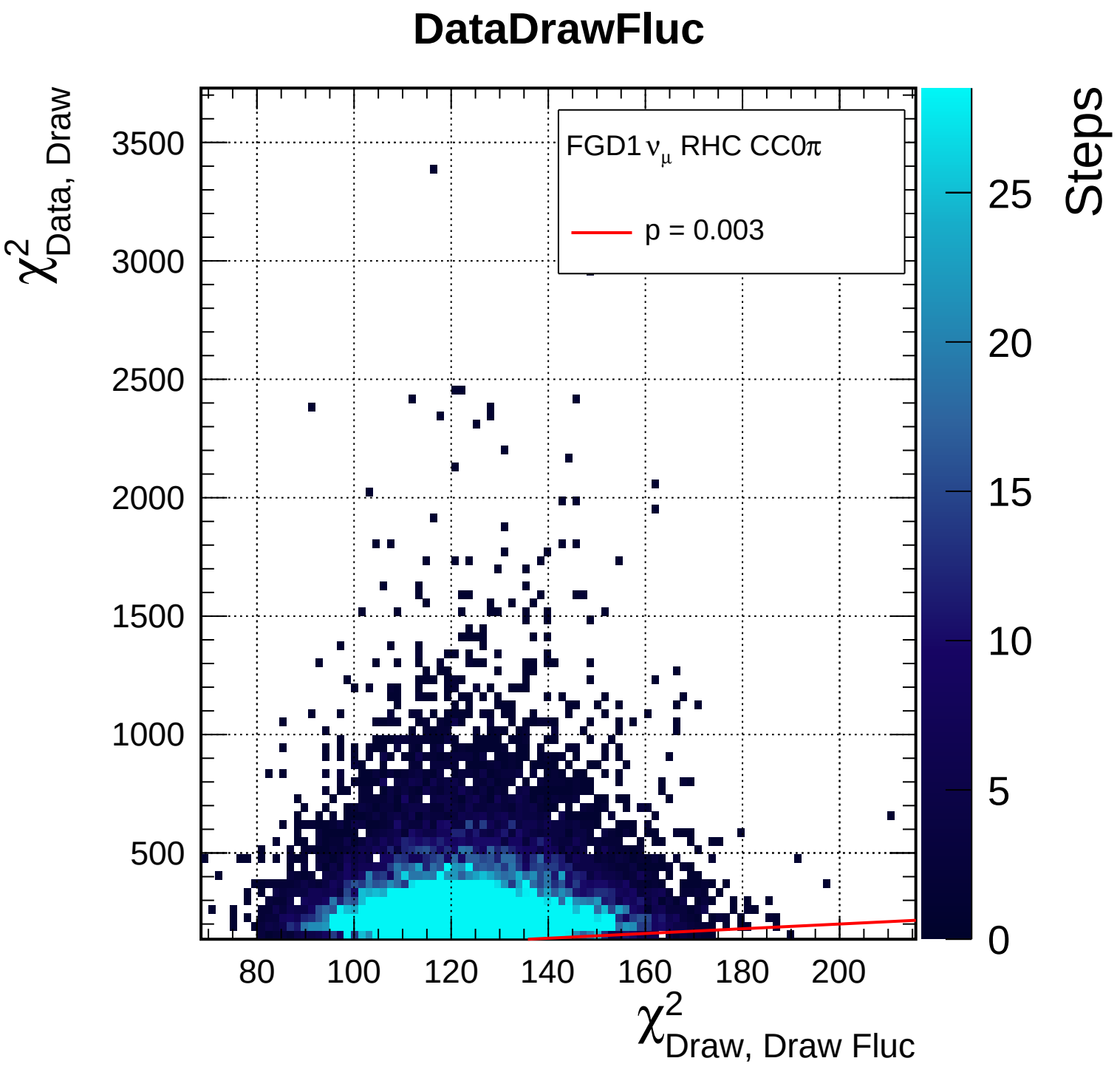

FGD2_anti-numuCC_other_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

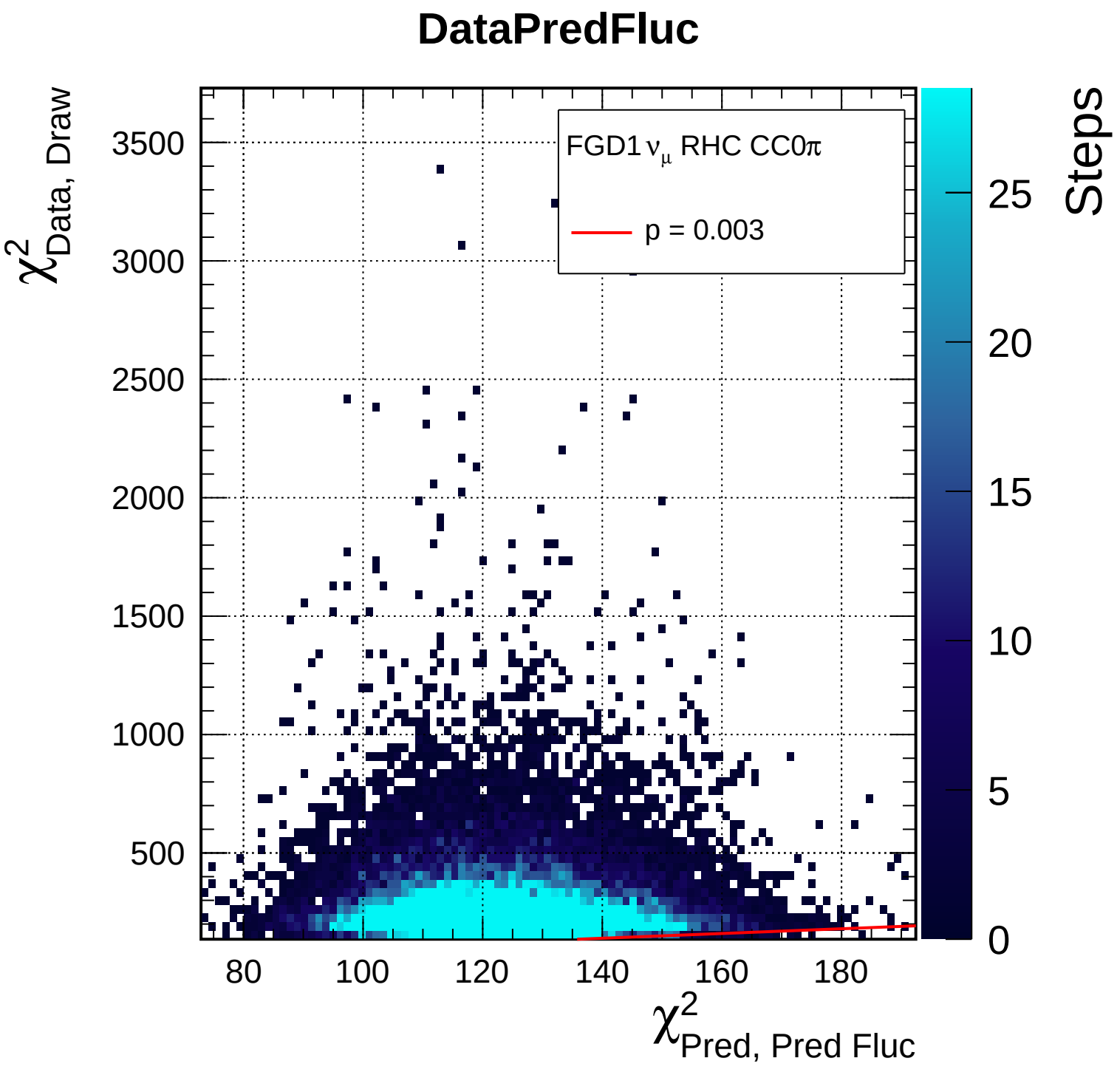

FGD2_anti-numuCC_other_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

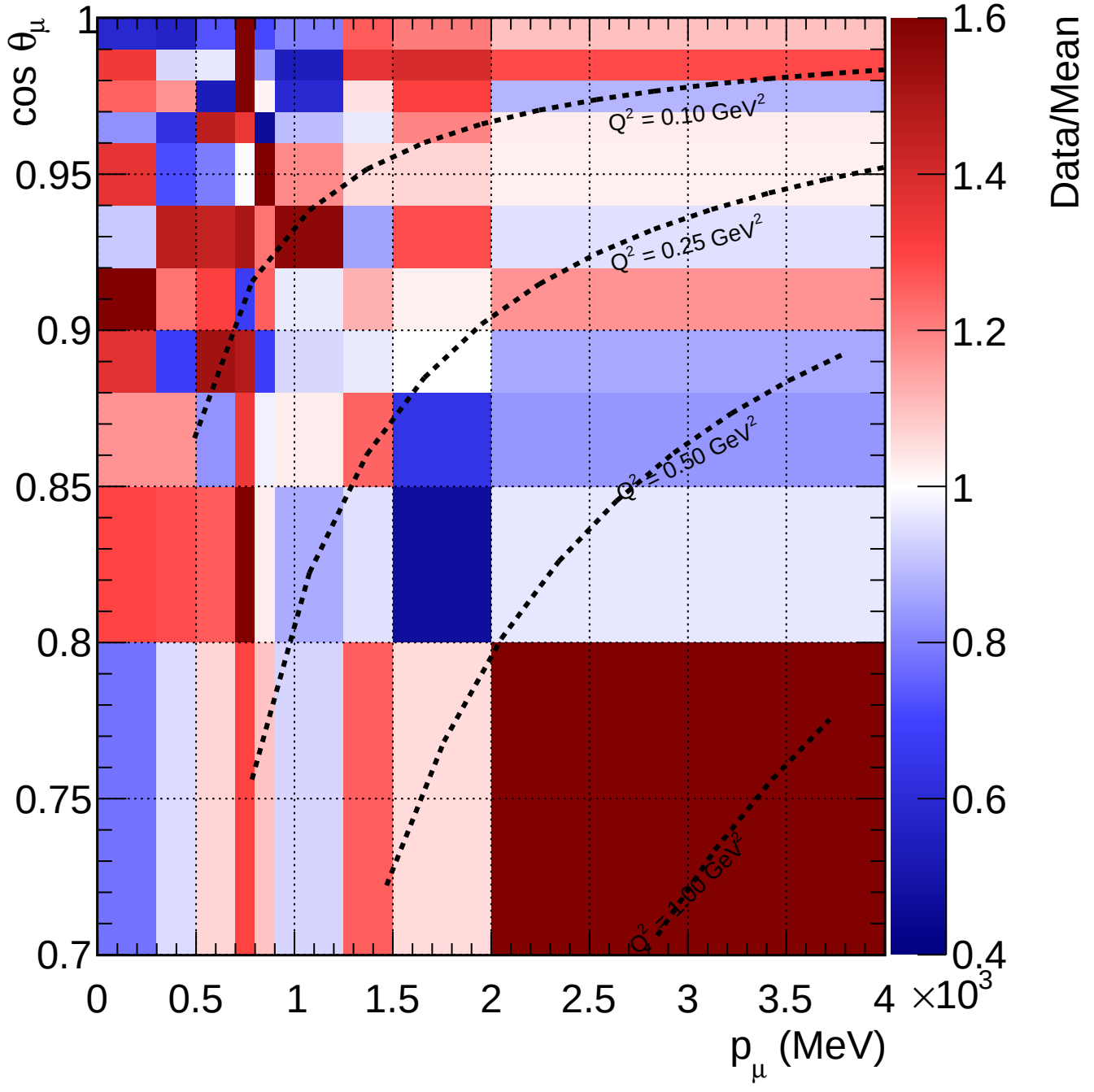

FGD2_anti-numuCC_other_sum_1032
Counts
Data, 1032, p-value=0.12
MC, μ=866.9±138.6
Gauss, μ=932.5±183.0
0
50
100
150
200
250
300
350
400
500
600
700
800
900
1000
N events

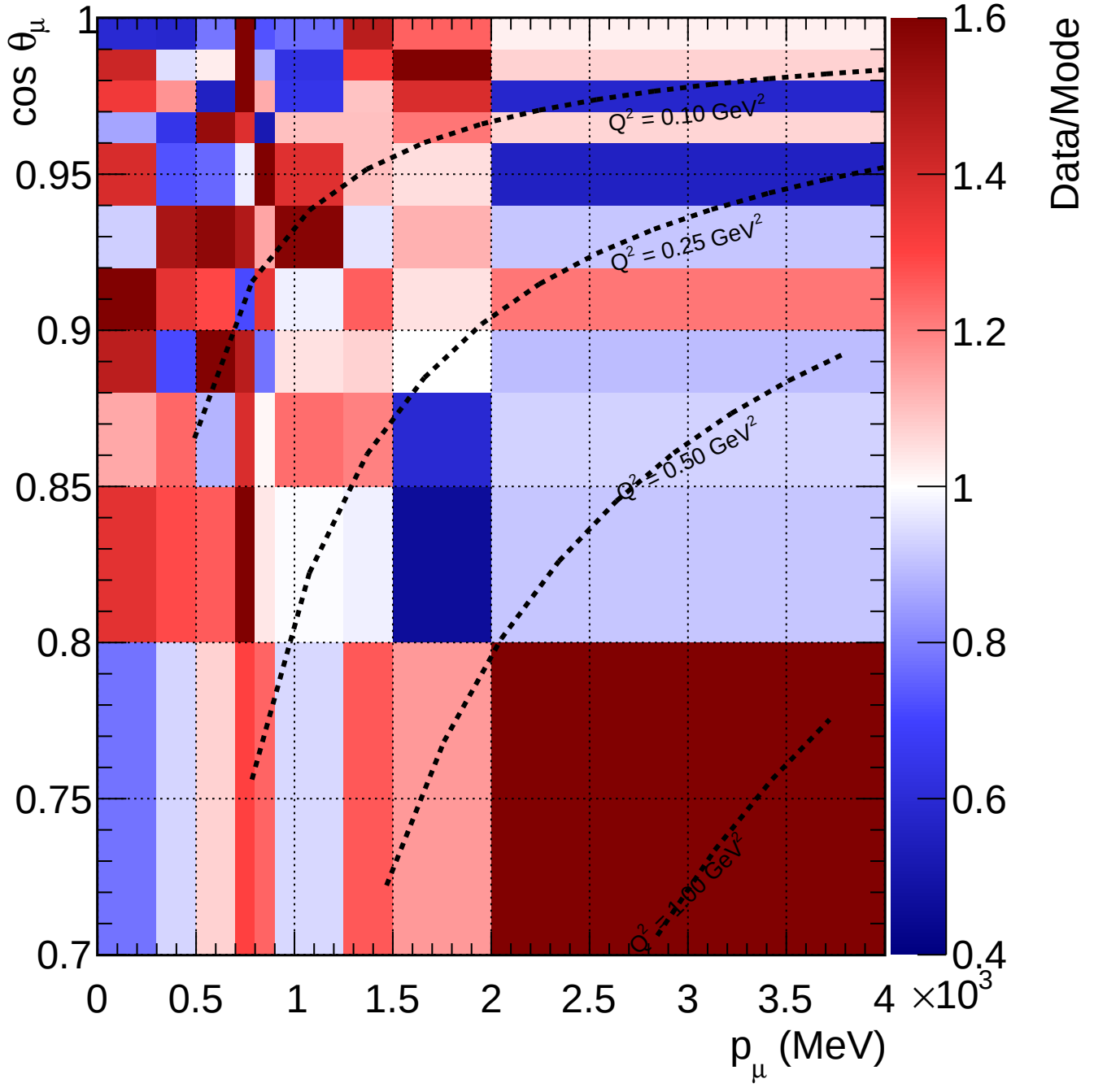

FGD2_anti-numuCC_other_data
N_events/MeV
0.4
0.35
0.3
0.25
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
p_μ (MeV)

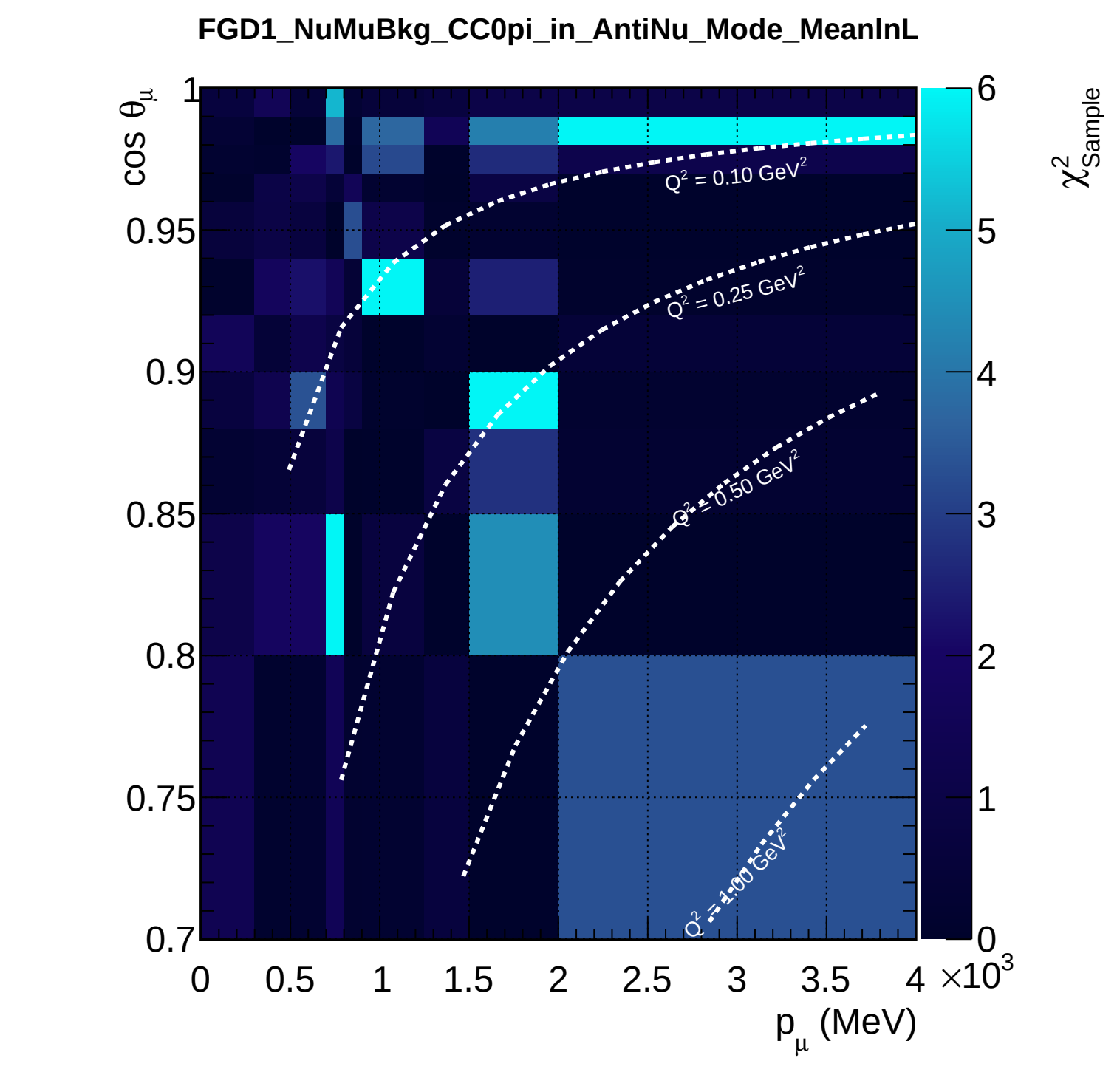

FGD2_anti-numuCC_other_data
N_events/1
20000
15000
10000
5000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

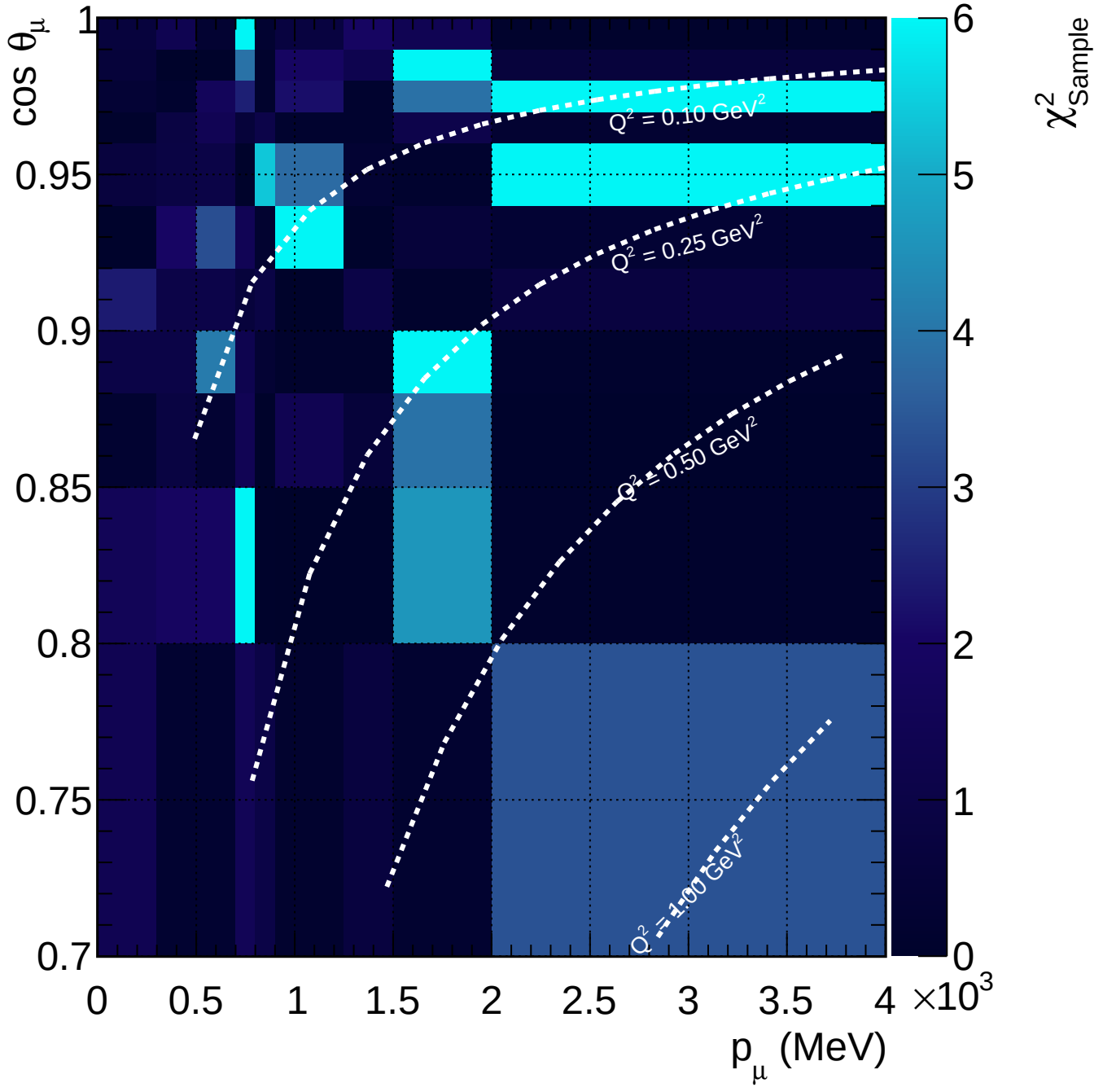

DataDrawFluc
FGD1 ν_μ RHC CC0π
p = 0.003
$\chi^2_{Data,\ Draw}$
$\chi^2_{Draw,\ Draw\ Fluc}$
Steps
3500
3000
2500
2000
1500
1000
500
80
100
120
140
160
180
200
25
20
15
10
5
0

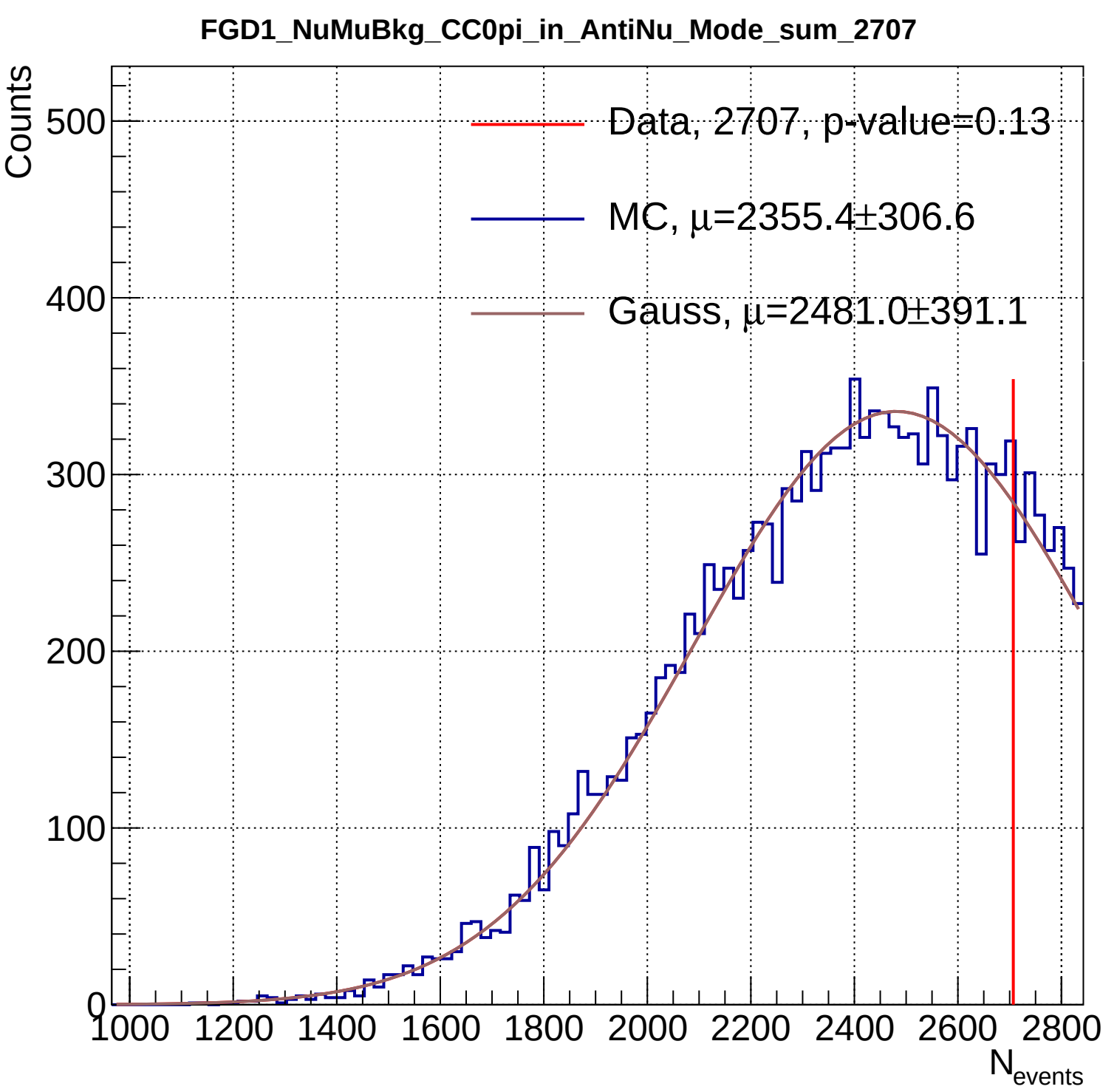

DataPredFluc
FGD1 ν_μ RHC CC0π
p = 0.003
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
3500
3000
2500
2000
1500
1000
500
80
100
120
140
160
180
25
20
15
10
5
0

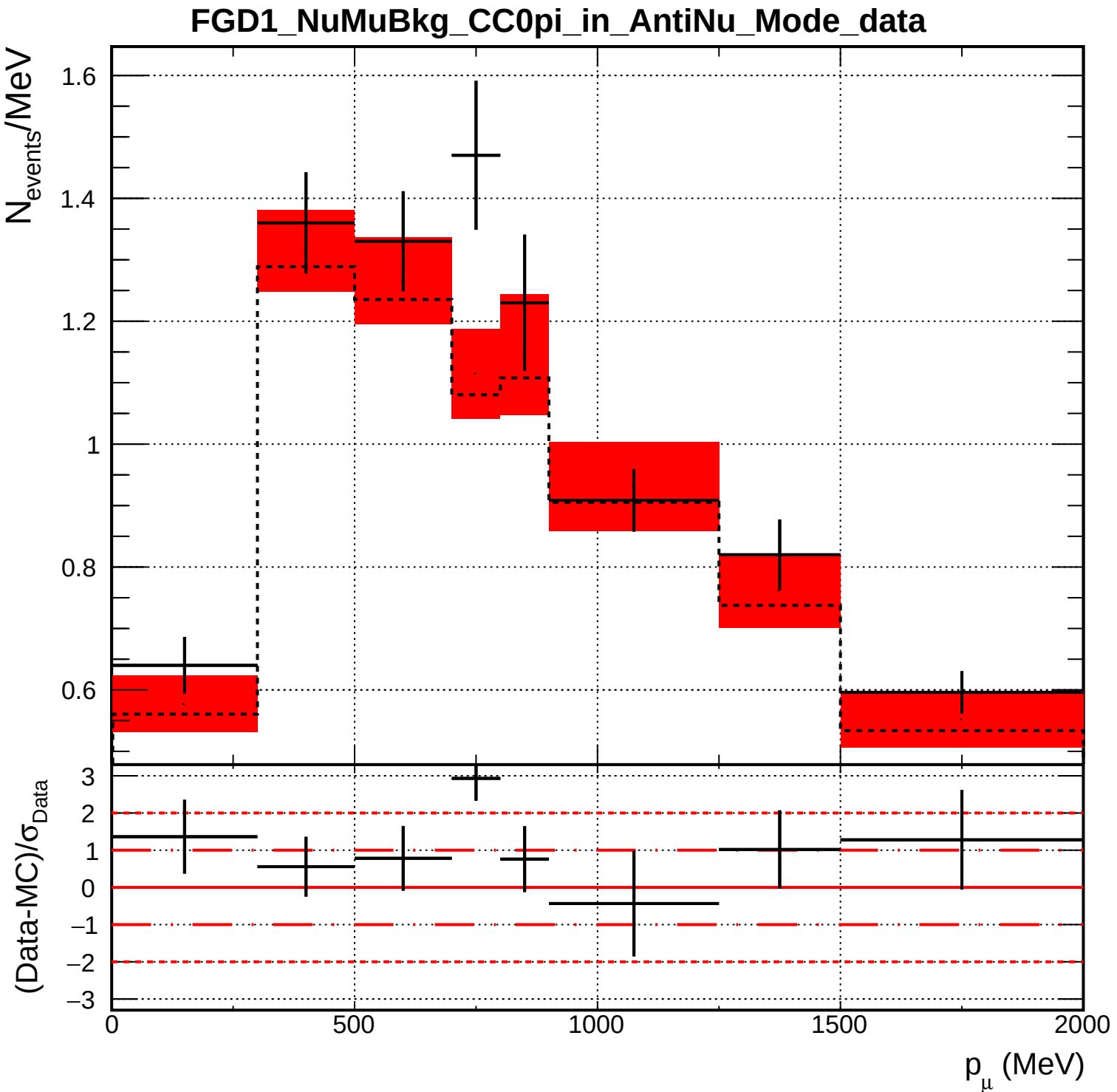

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

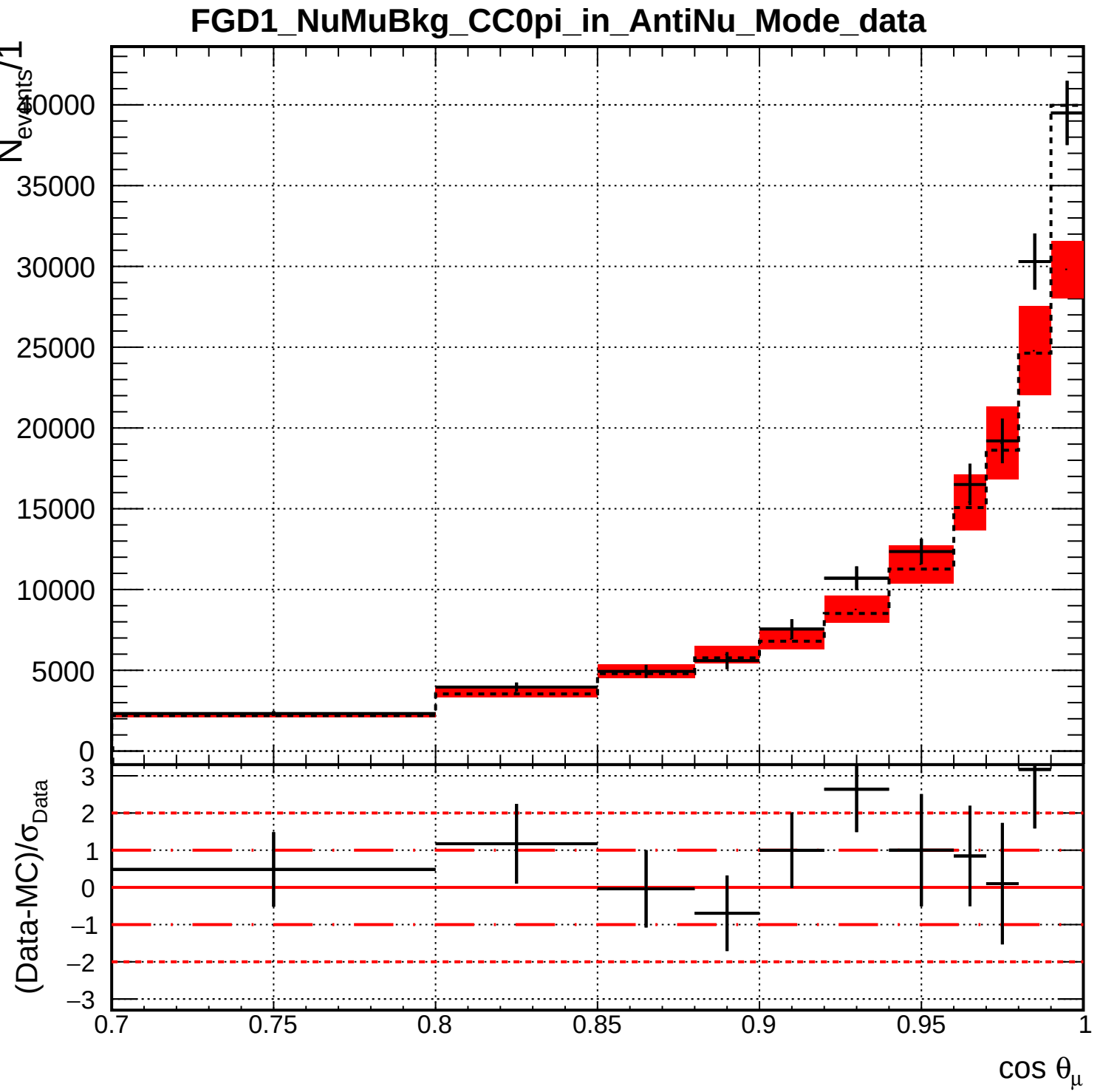

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
0
0.5
1
1.5
2
2.5
3
3.5
4
×10³
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

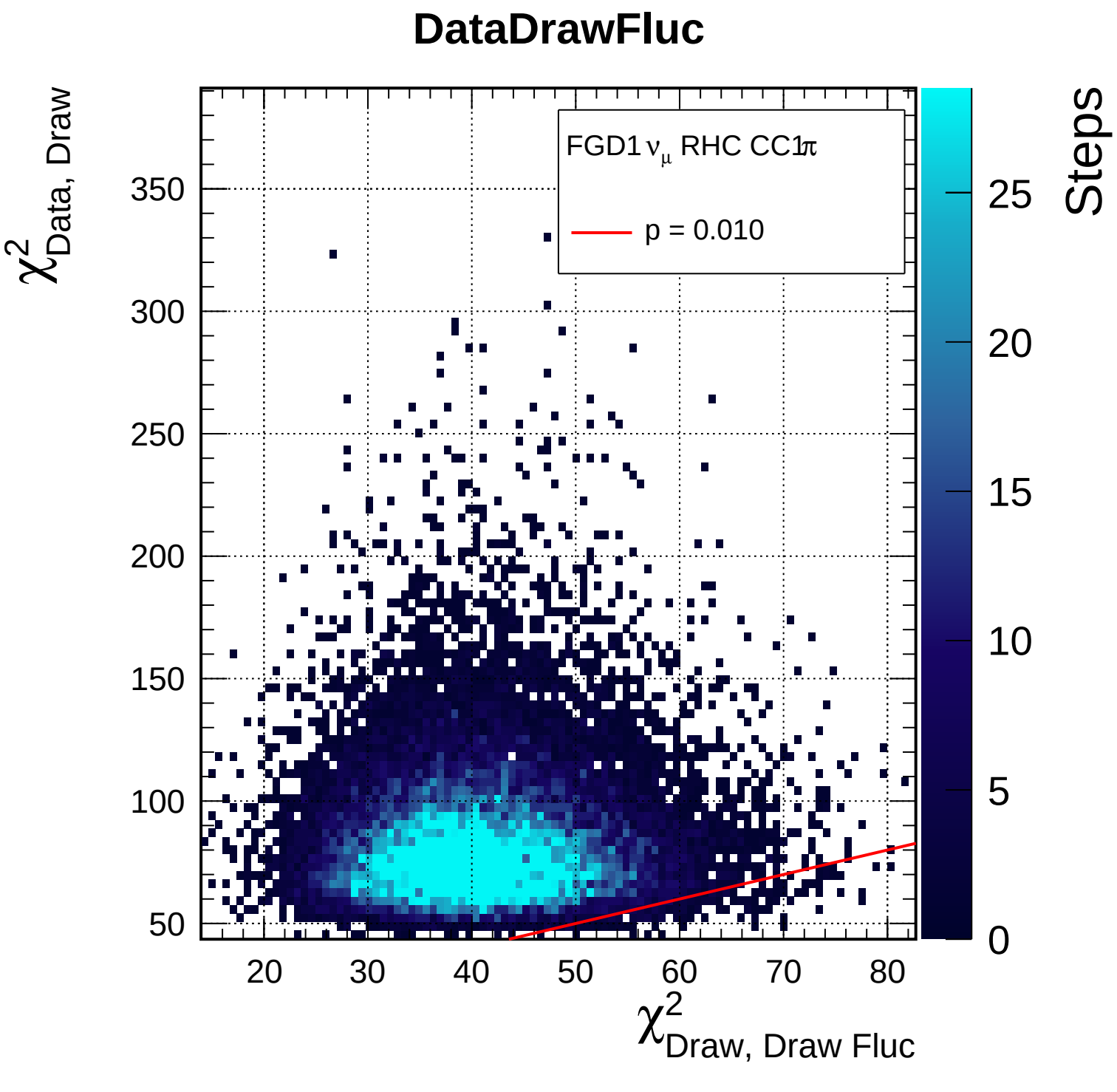

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
6
5
4
3
2
1
0
χ²Sample

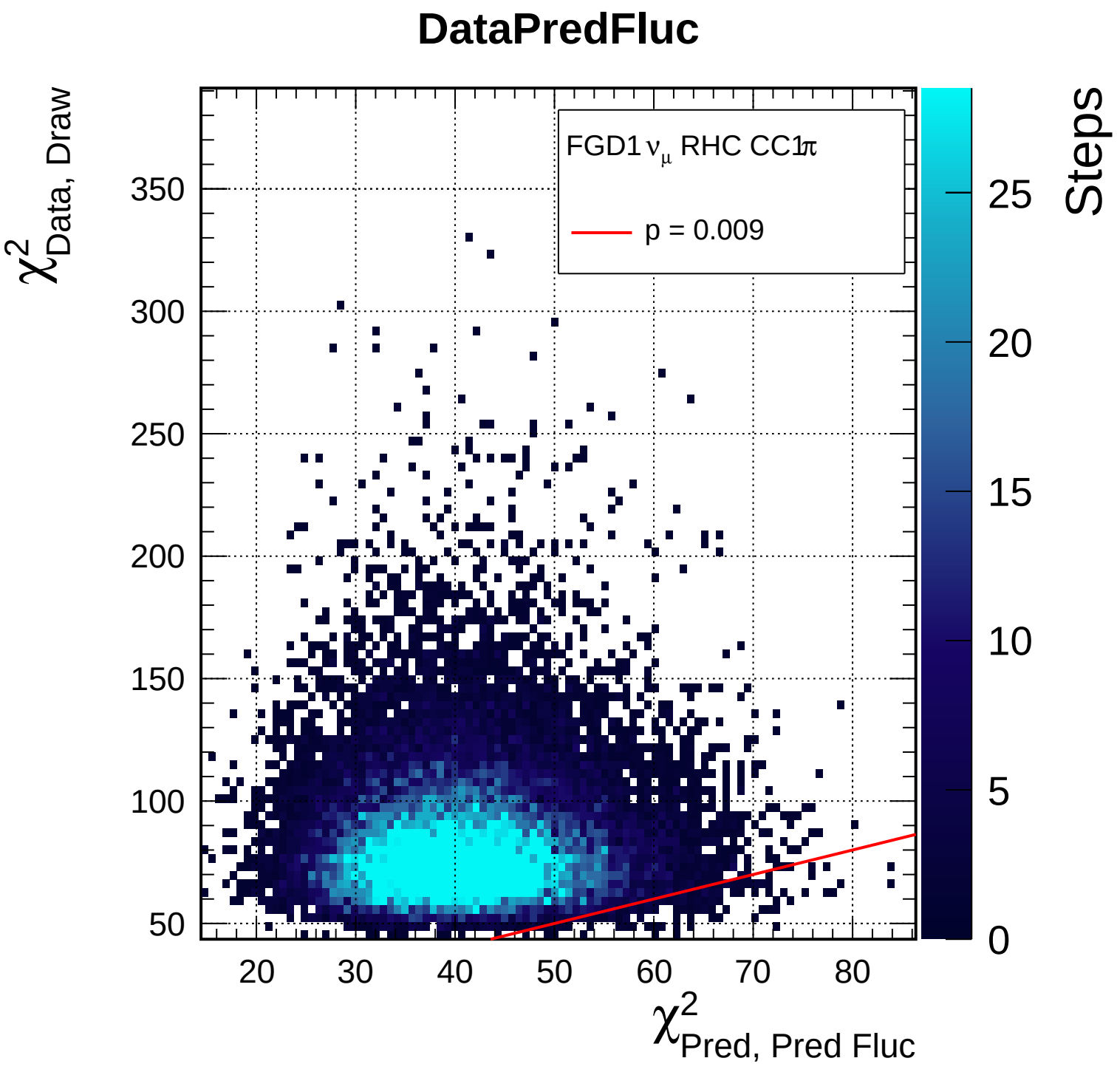

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
6
5
4
3
2
1
0
χ²Sample

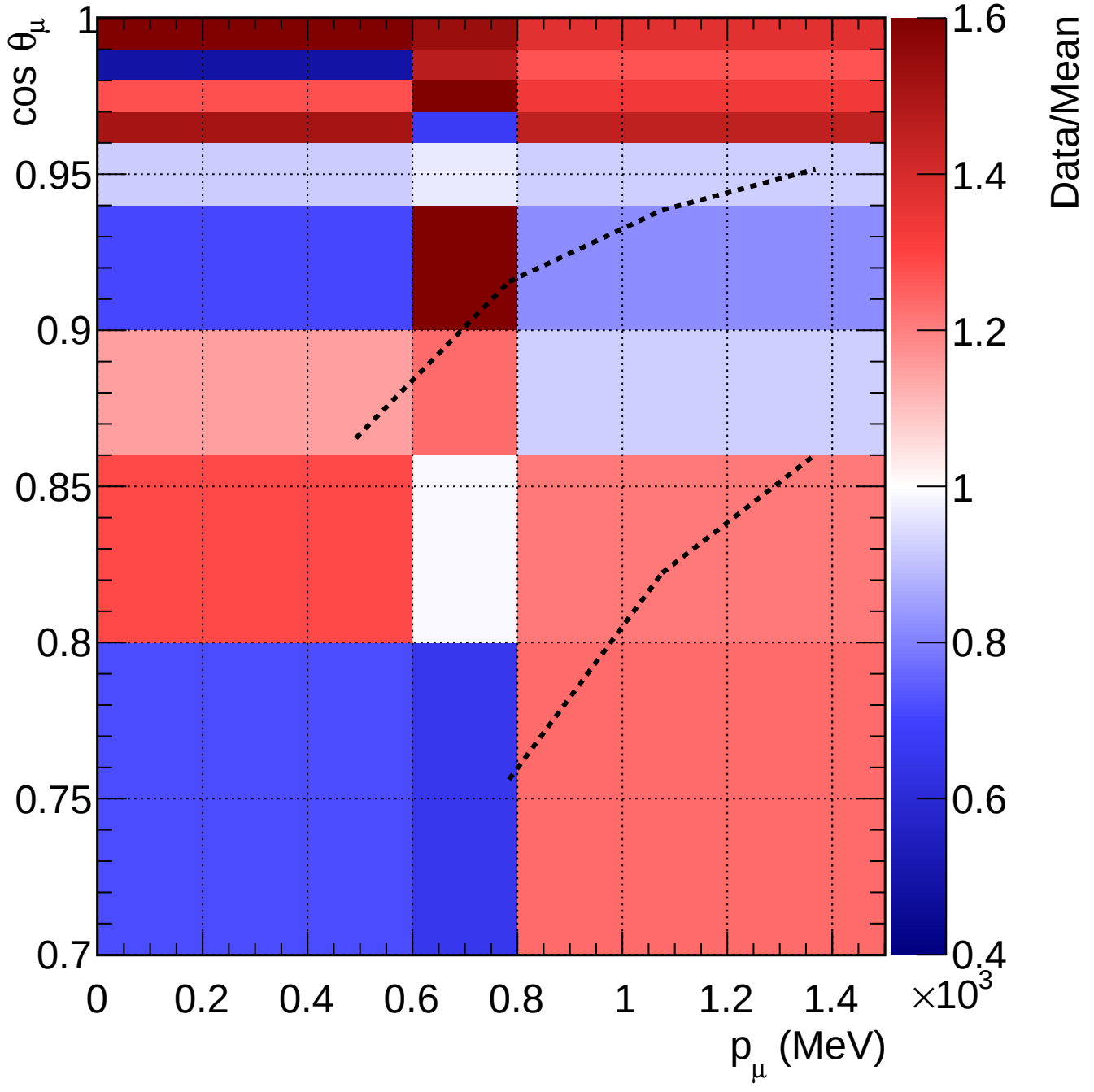

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_sum_2707
Counts
500
400
300
200
100
0
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
N events
Data, 2707, p-value=0.13
MC, μ=2355.4±306.6
Gauss, μ=2481.0±391.1

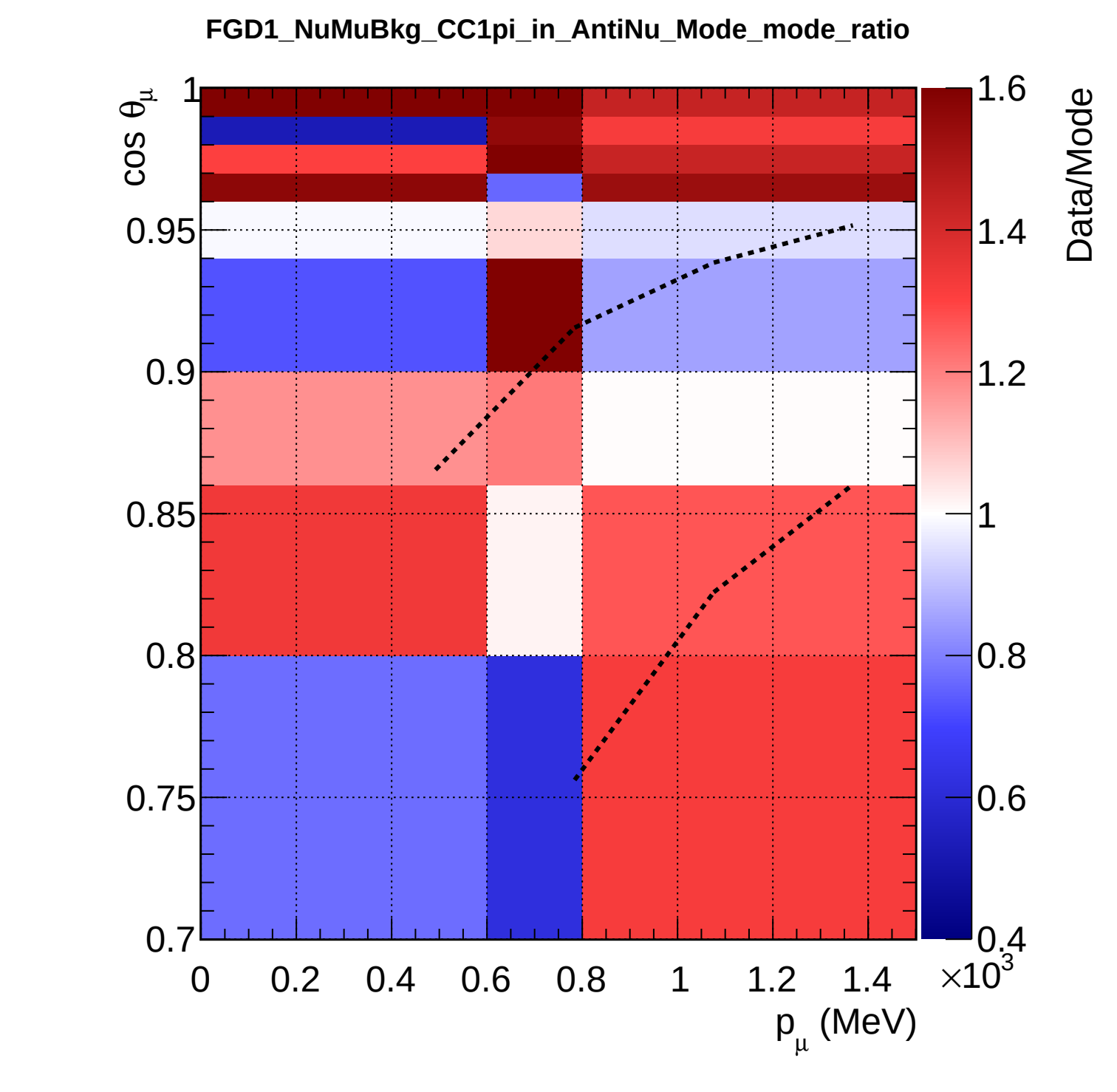

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_data
N_events/MeV
1.6
1.4
1.2
1
0.8
0.6
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
p_μ (MeV)

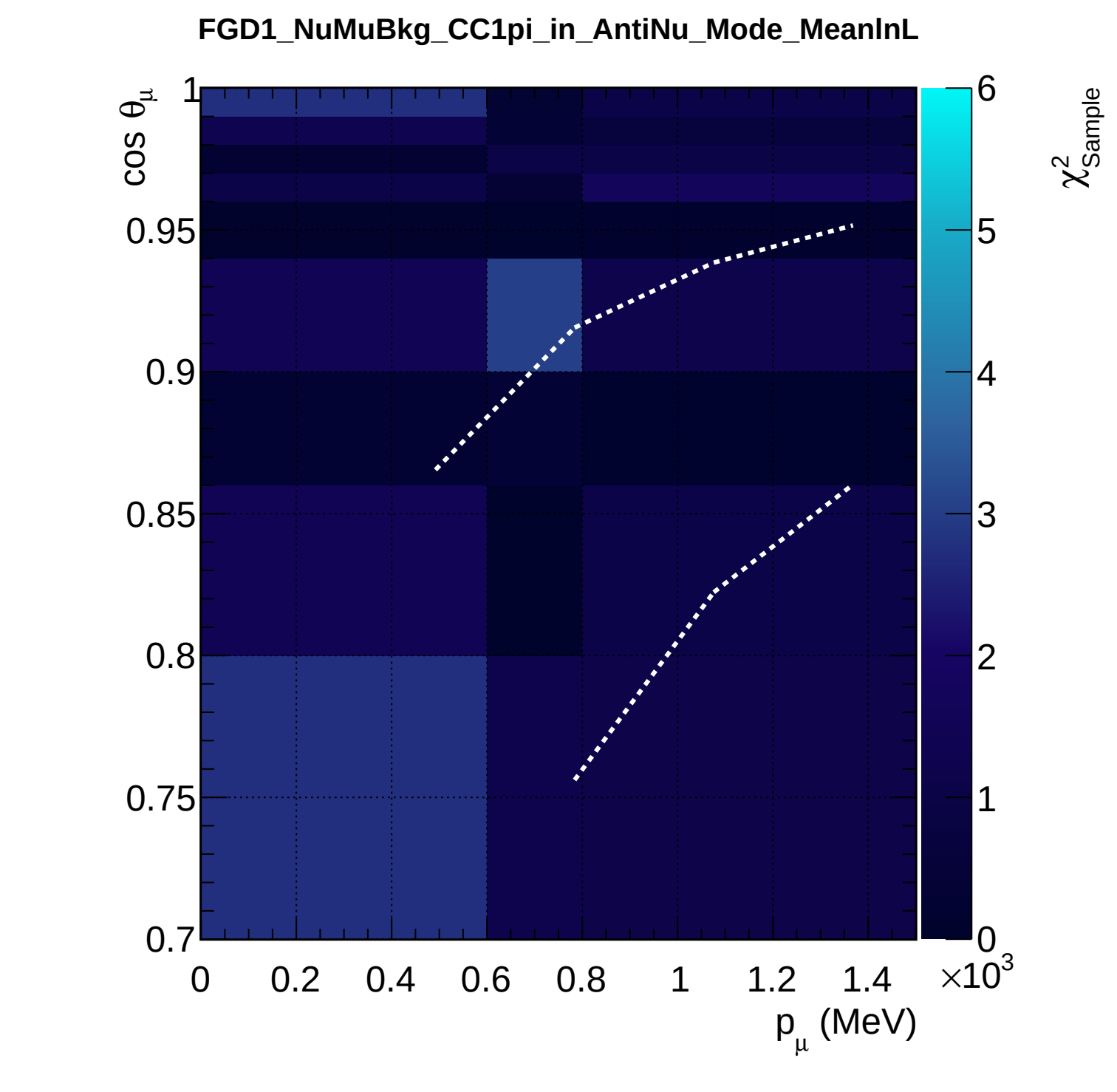

FGD1_NuMuBkg_CC0pi_in_AntiNu_Mode_data
N_events/1
40000
35000
30000
25000
20000
15000
10000
5000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

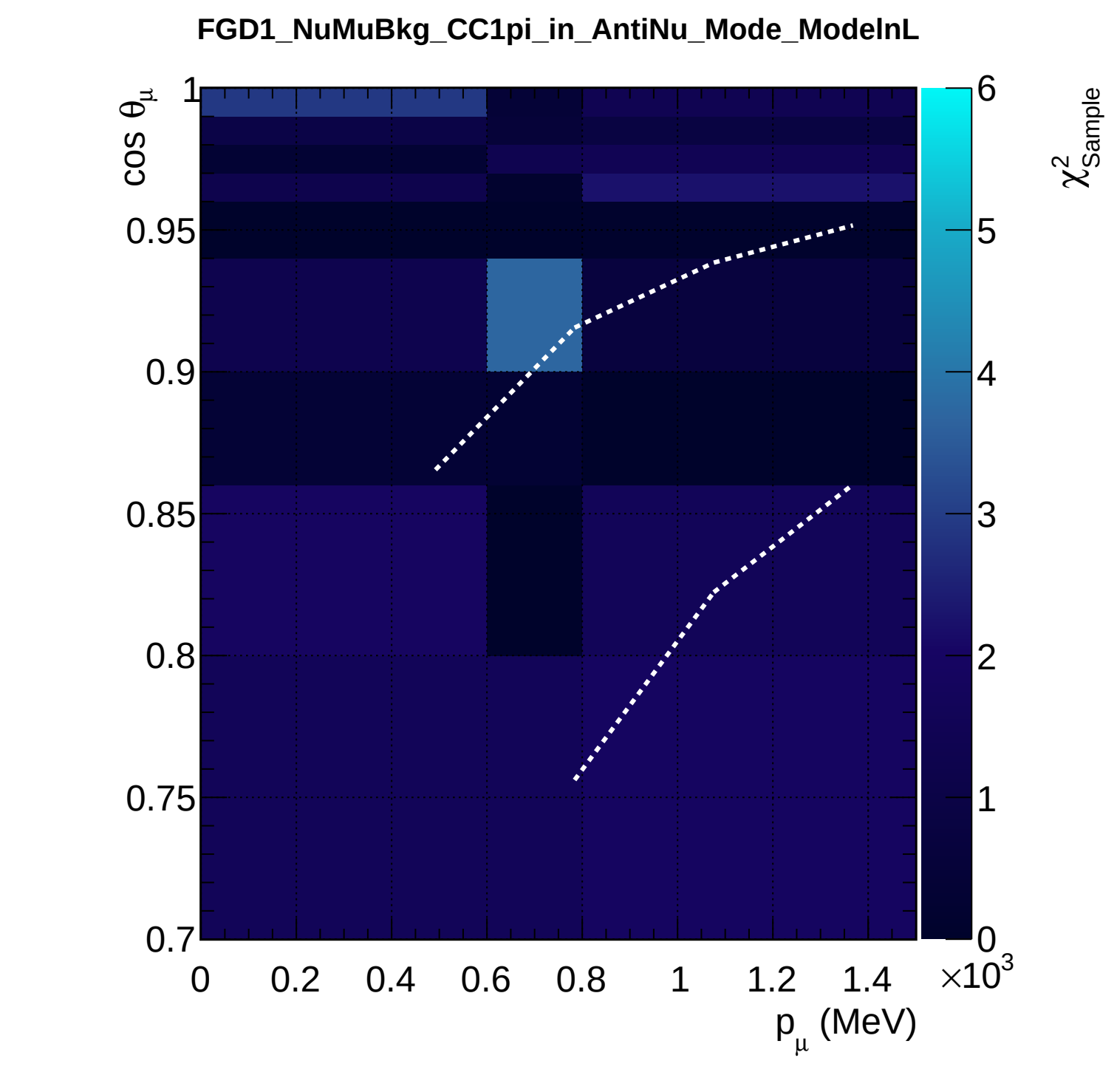

DataDrawFluc
FGD1 ν_μ RHC CC1π
p = 0.010
χ²Data, Draw
χ²Draw, Draw Fluc
Steps
350
300
250
200
150
100
50
20
30
40
50
60
70
80
25
20
15
10
5
0

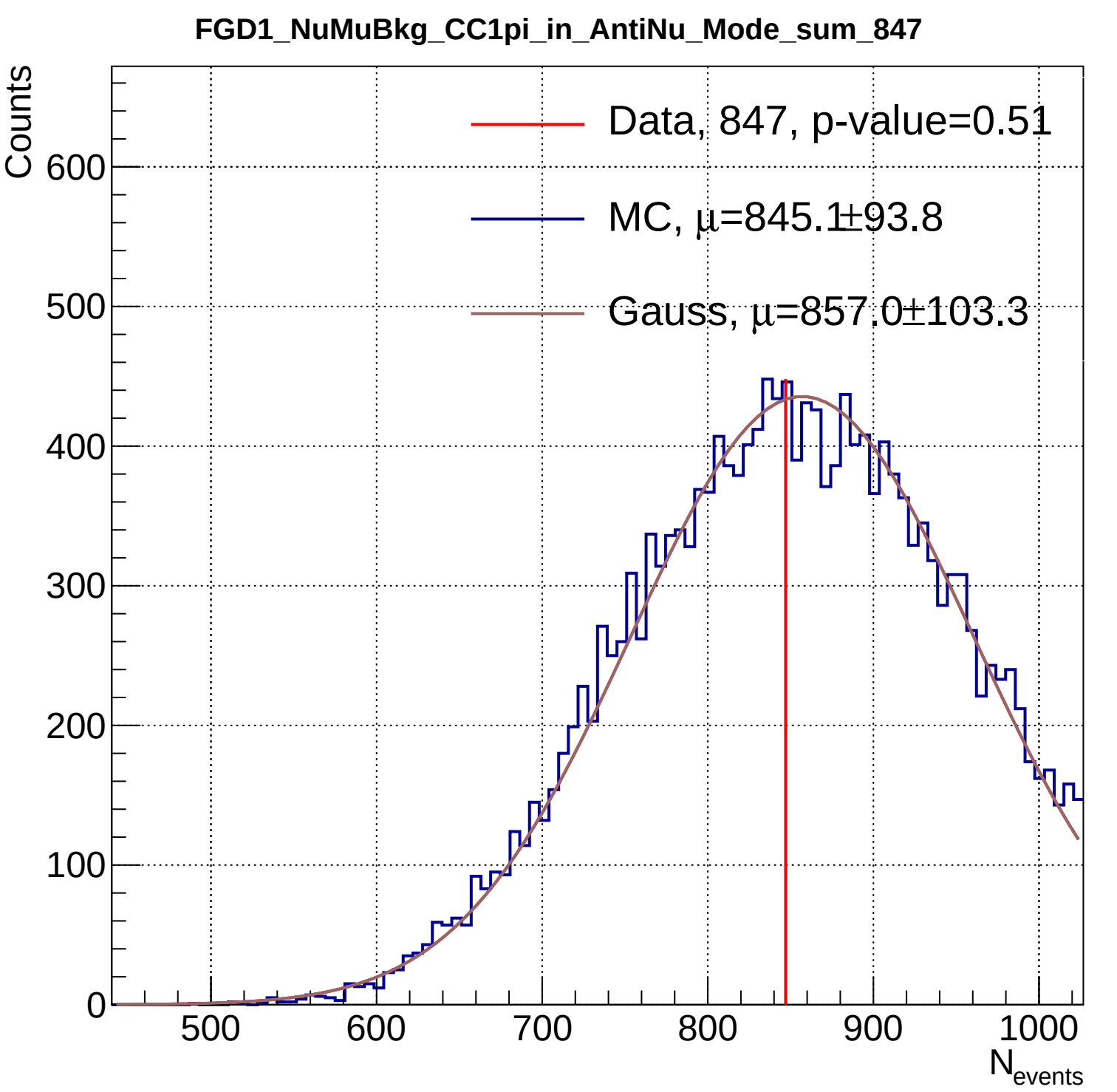

DataPredFluc
FGD1 ν_μ RHC CC1π
p = 0.009
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
350
300
250
200
150
100
50
20
30
40
50
60
70
80
25
20
15
10
5
0

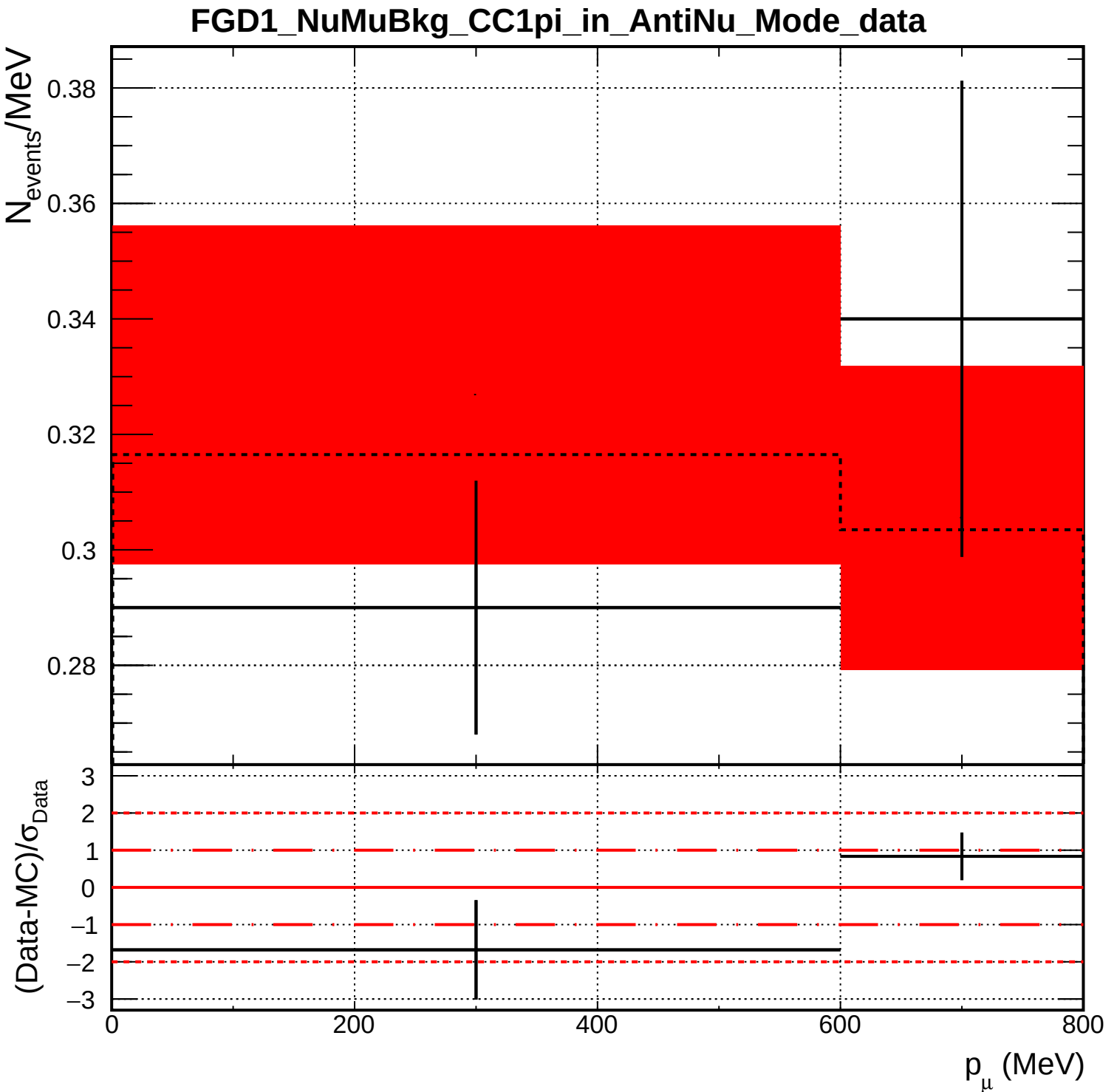

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
1.6
1.4
1.2
1
0.8
0.6
0.4
Data/Mean

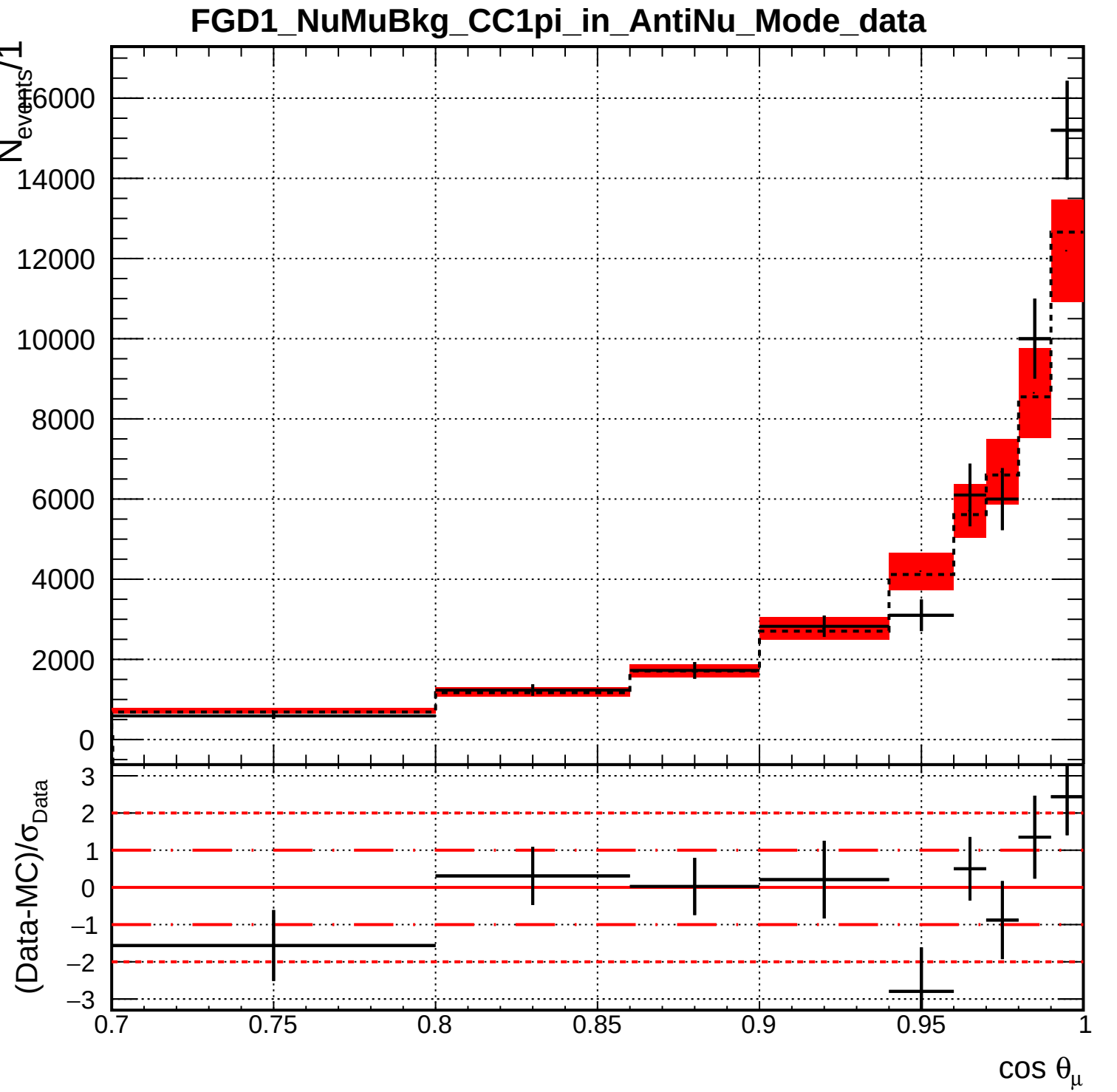

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

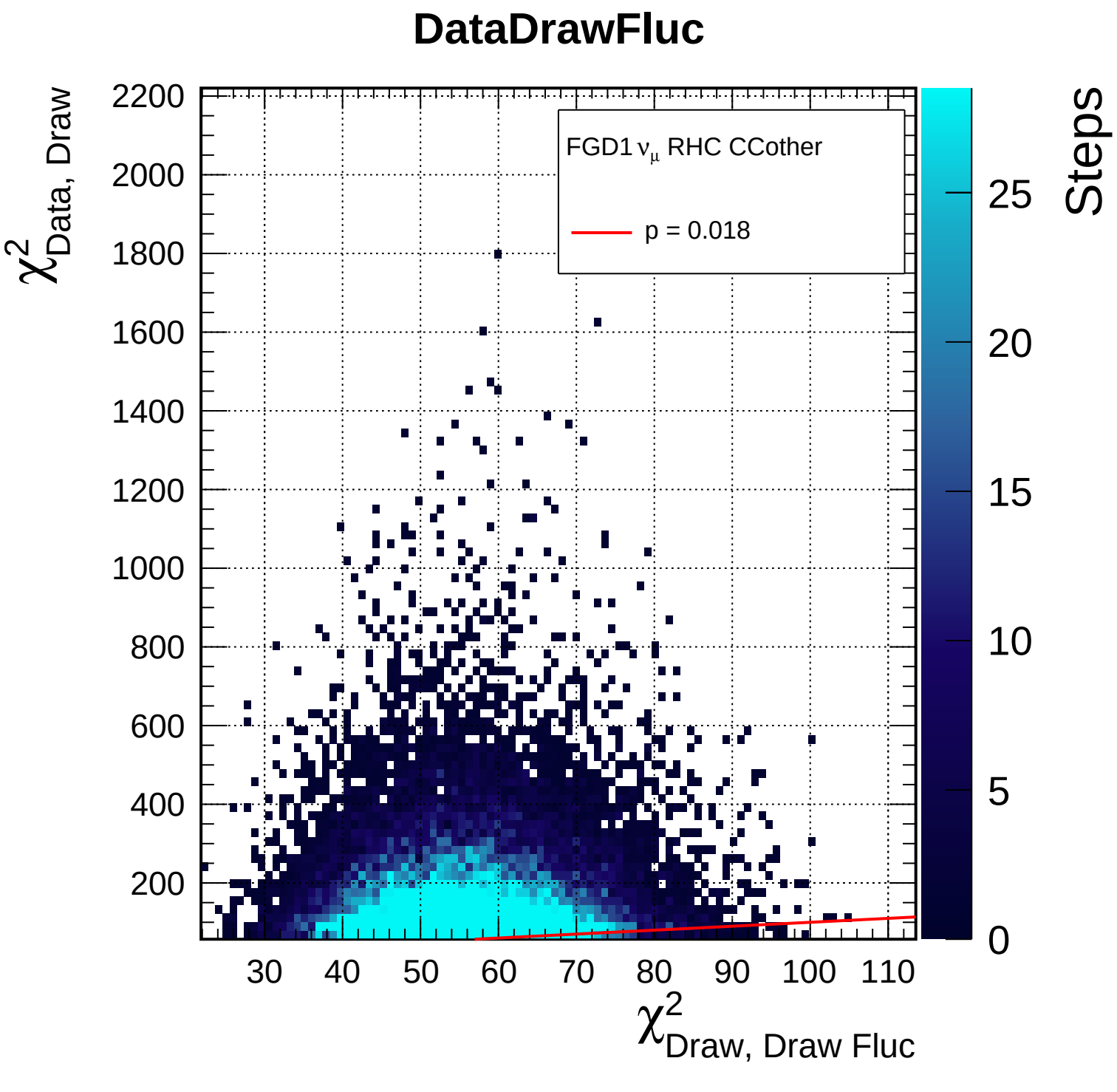

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

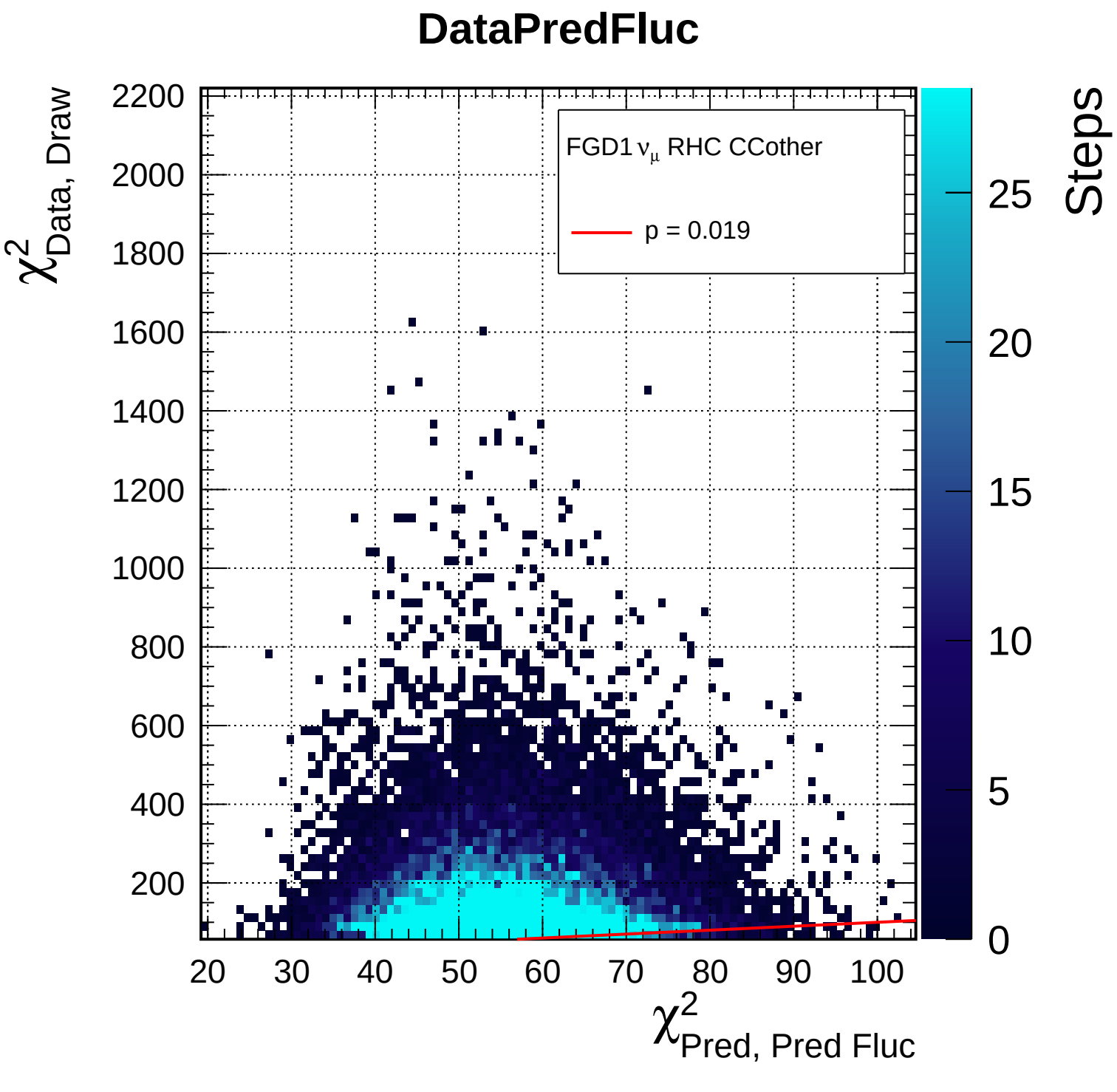

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

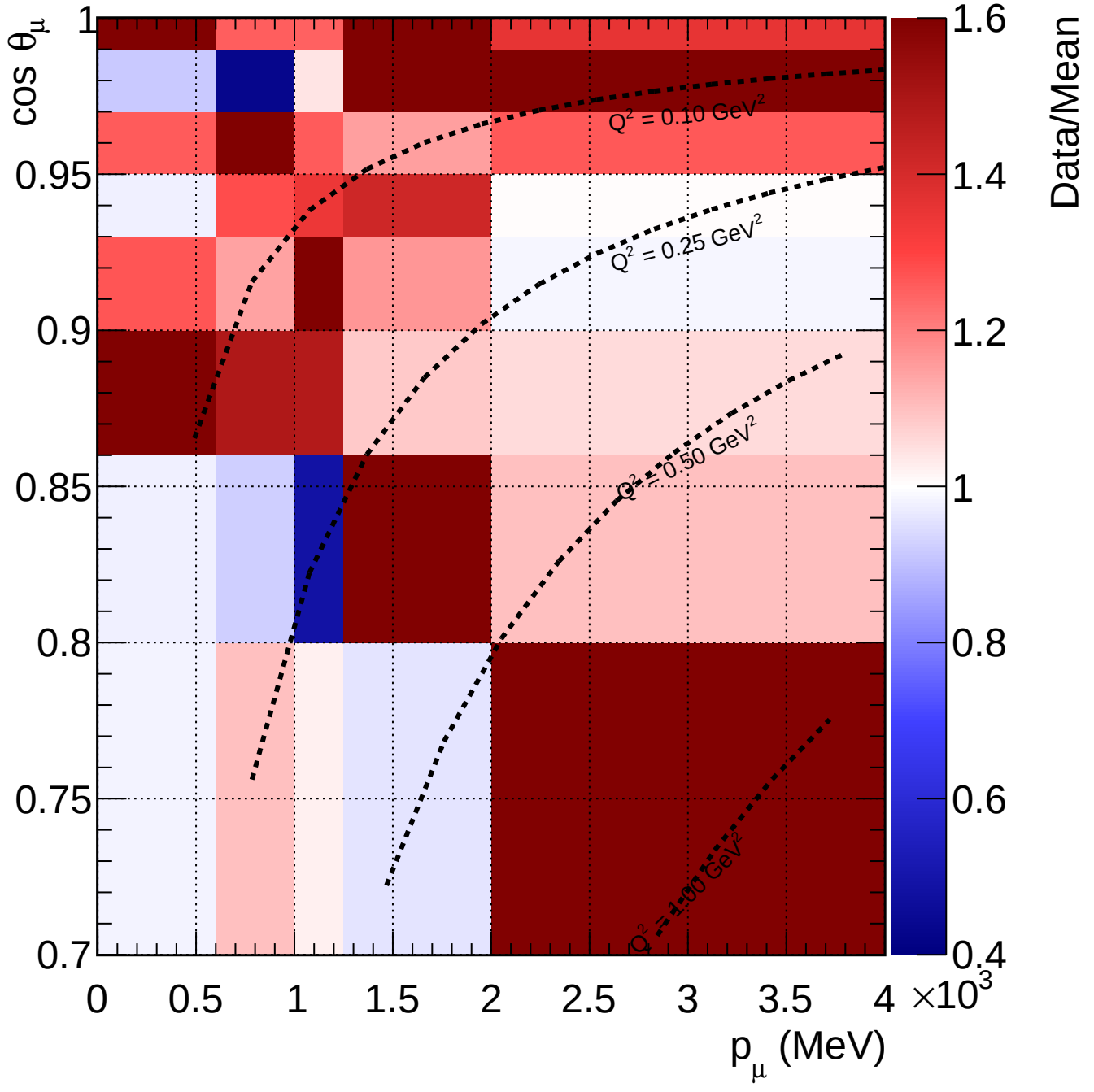

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_sum_847
Counts
Data, 847, p-value=0.51
MC, μ=845.1±93.8
Gauss, μ=857.0±103.3
0
100
200
300
400
500
600
500
600
700
800
900
1000
N events

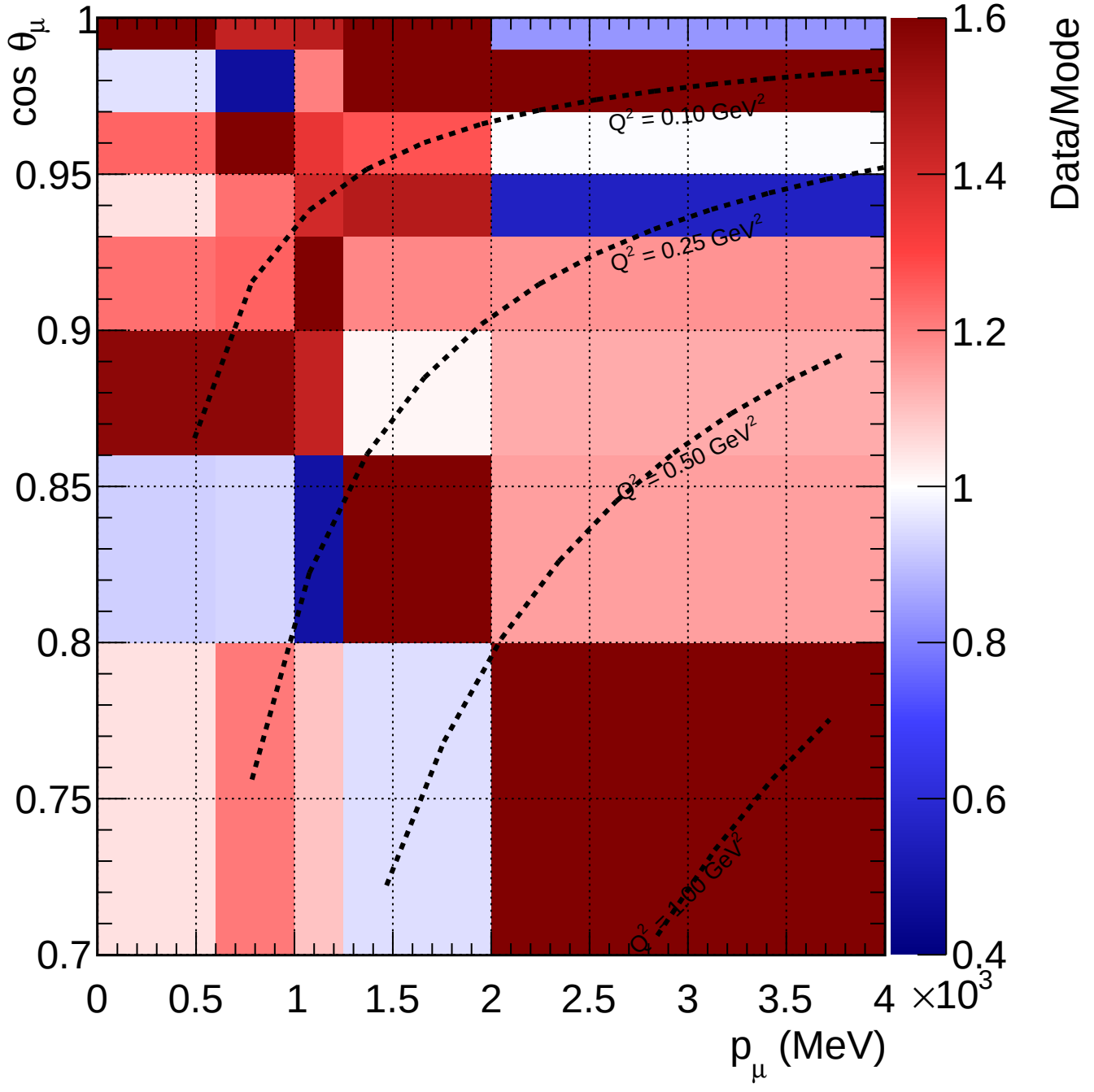

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_data
N_events/MeV
0.38
0.36
0.34
0.32
0.3
0.28
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
200
400
600
800
p_μ (MeV)

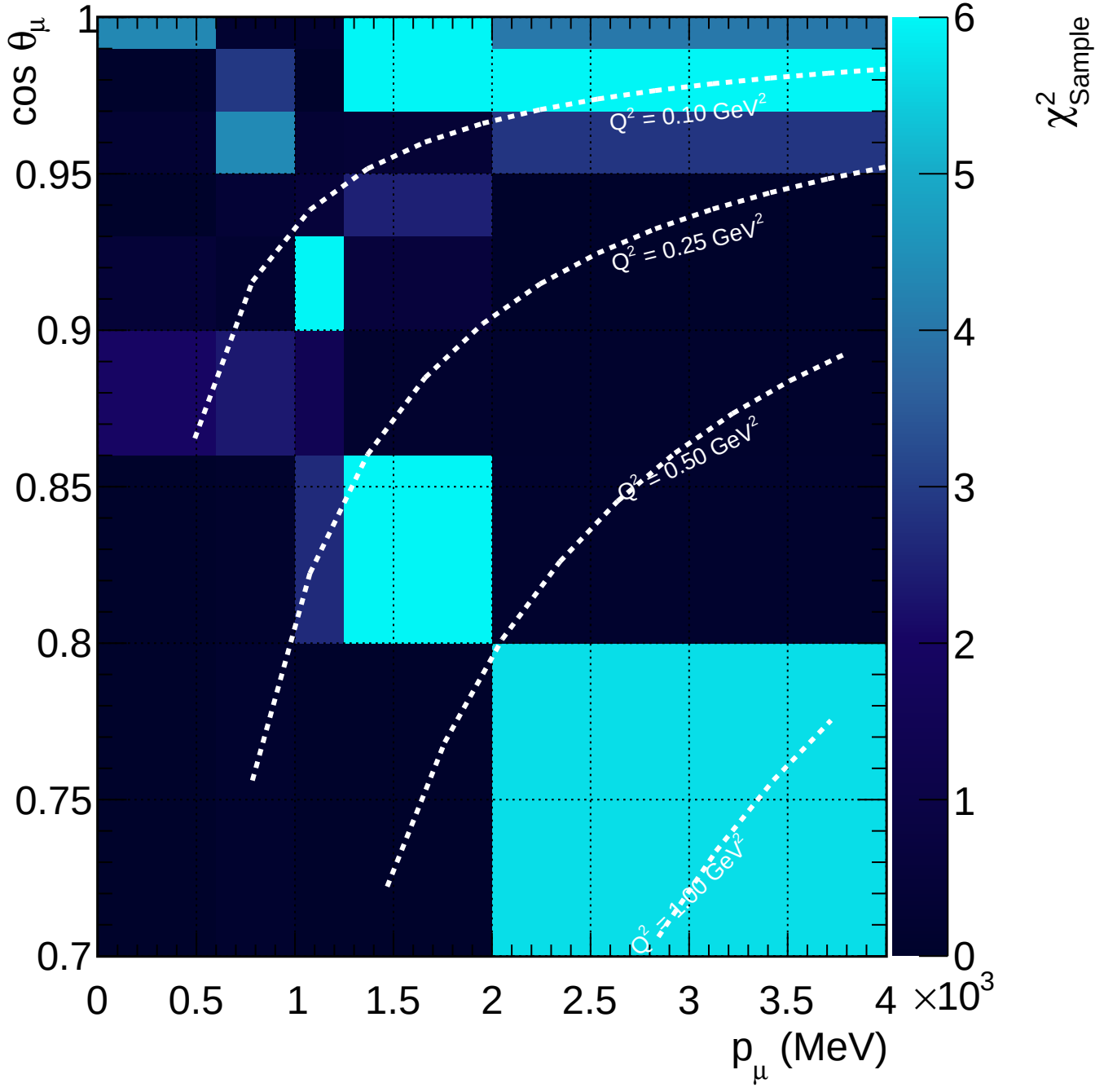

FGD1_NuMuBkg_CC1pi_in_AntiNu_Mode_data
N_events/1
16000
14000
12000
10000
8000
6000
4000
2000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

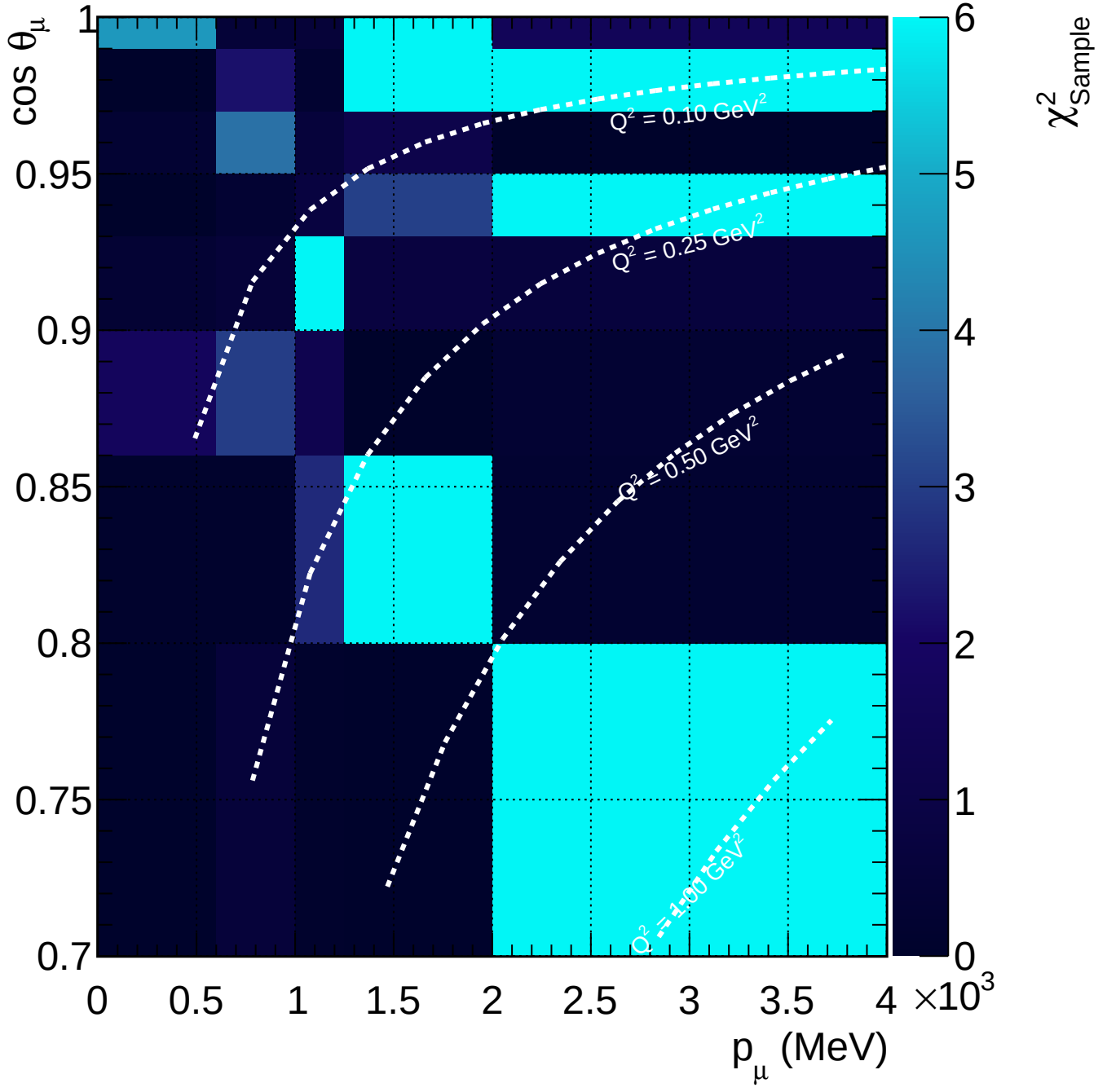

DataDrawFluc
FGD1 ν_μ RHC CCother
p = 0.018
$\chi^2_{Data,\ Draw}$
$\chi^2_{Draw,\ Draw\ Fluc}$
Steps
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
30
40
50
60
70
80
90
100
110
25
20
15
10
5
0

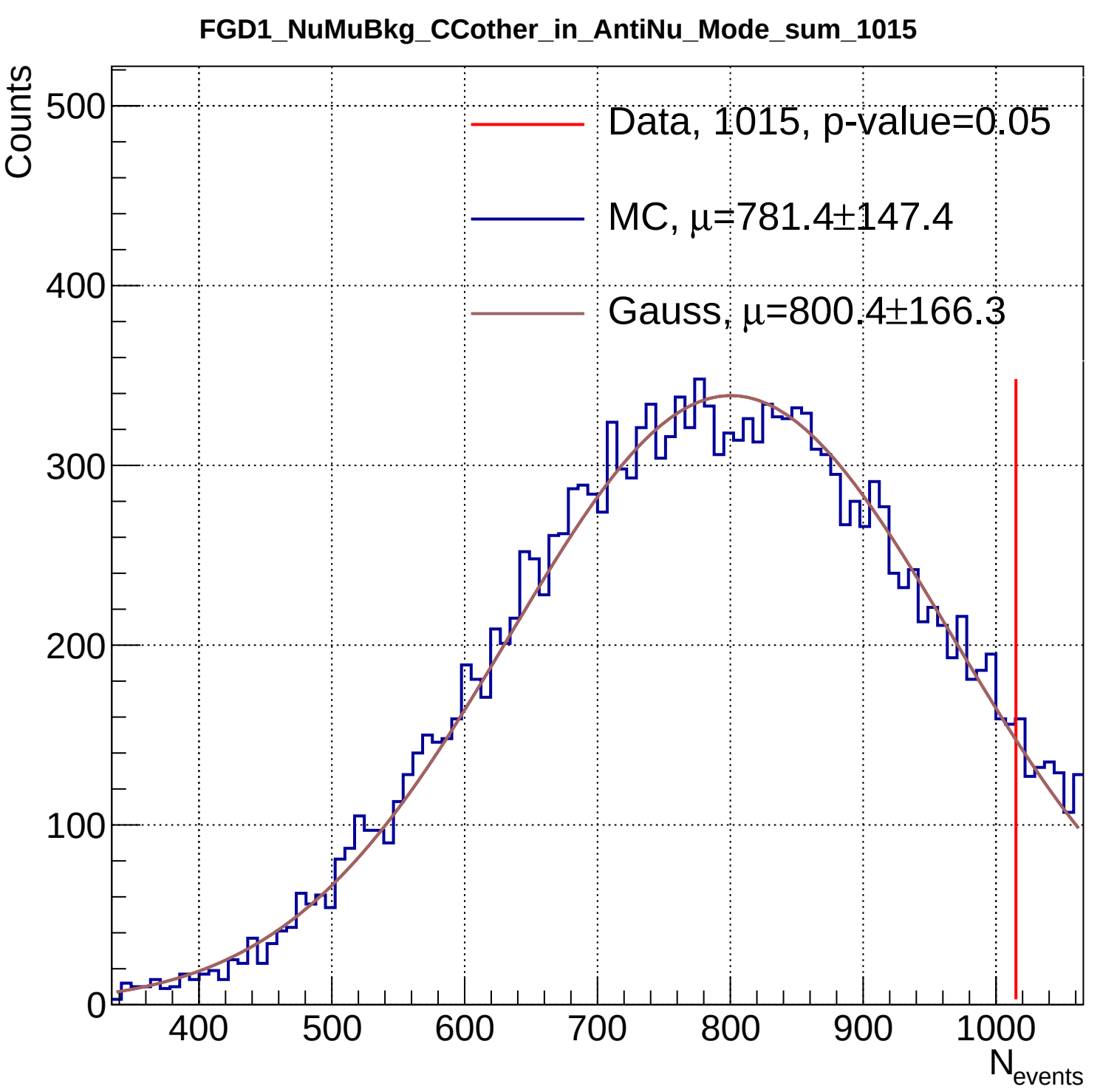

DataPredFluc
FGD1 ν_μ RHC CCother
p = 0.019
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
20
30
40
50
60
70
80
90
100
25
20
15
10
5
0

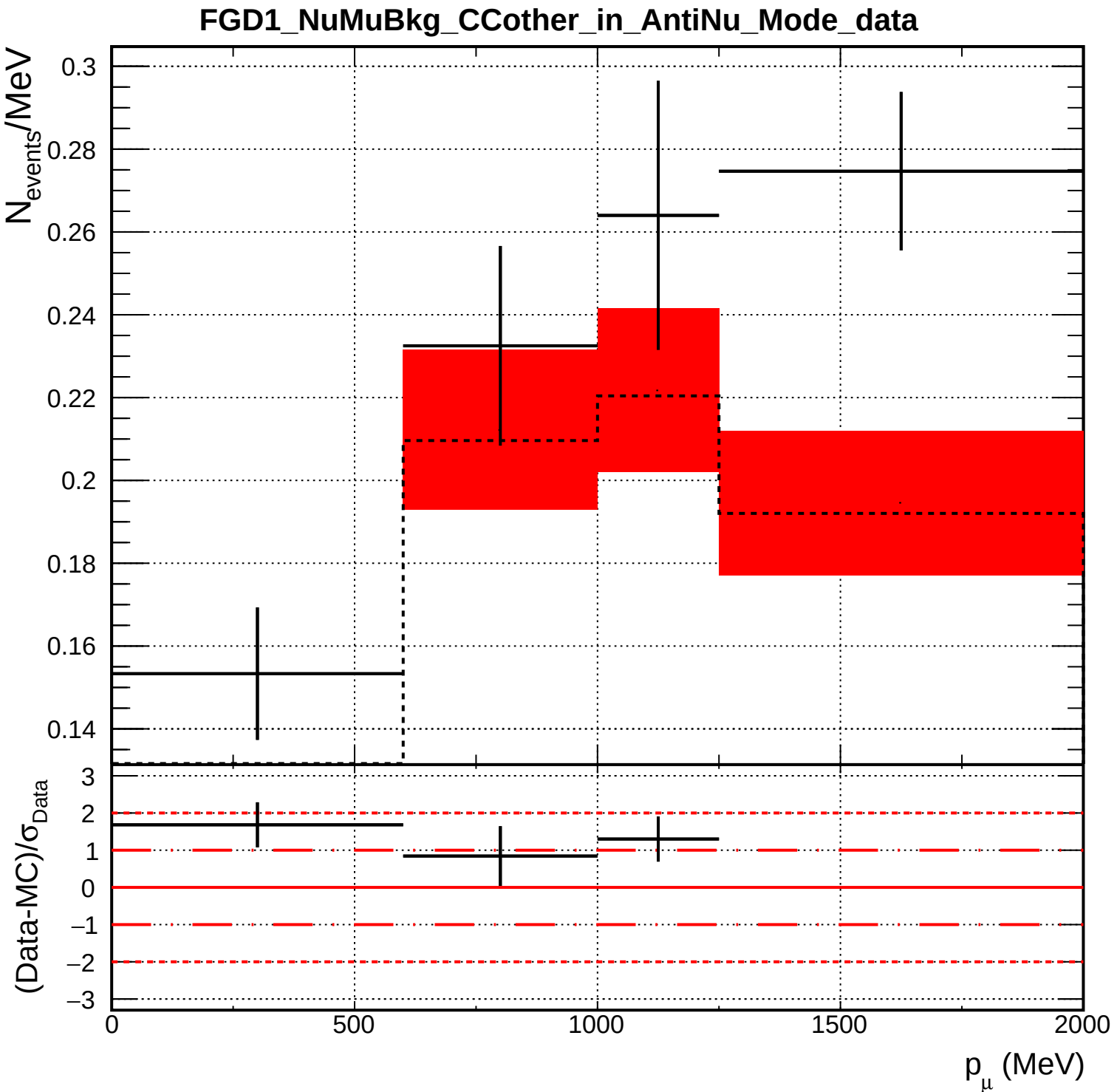

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

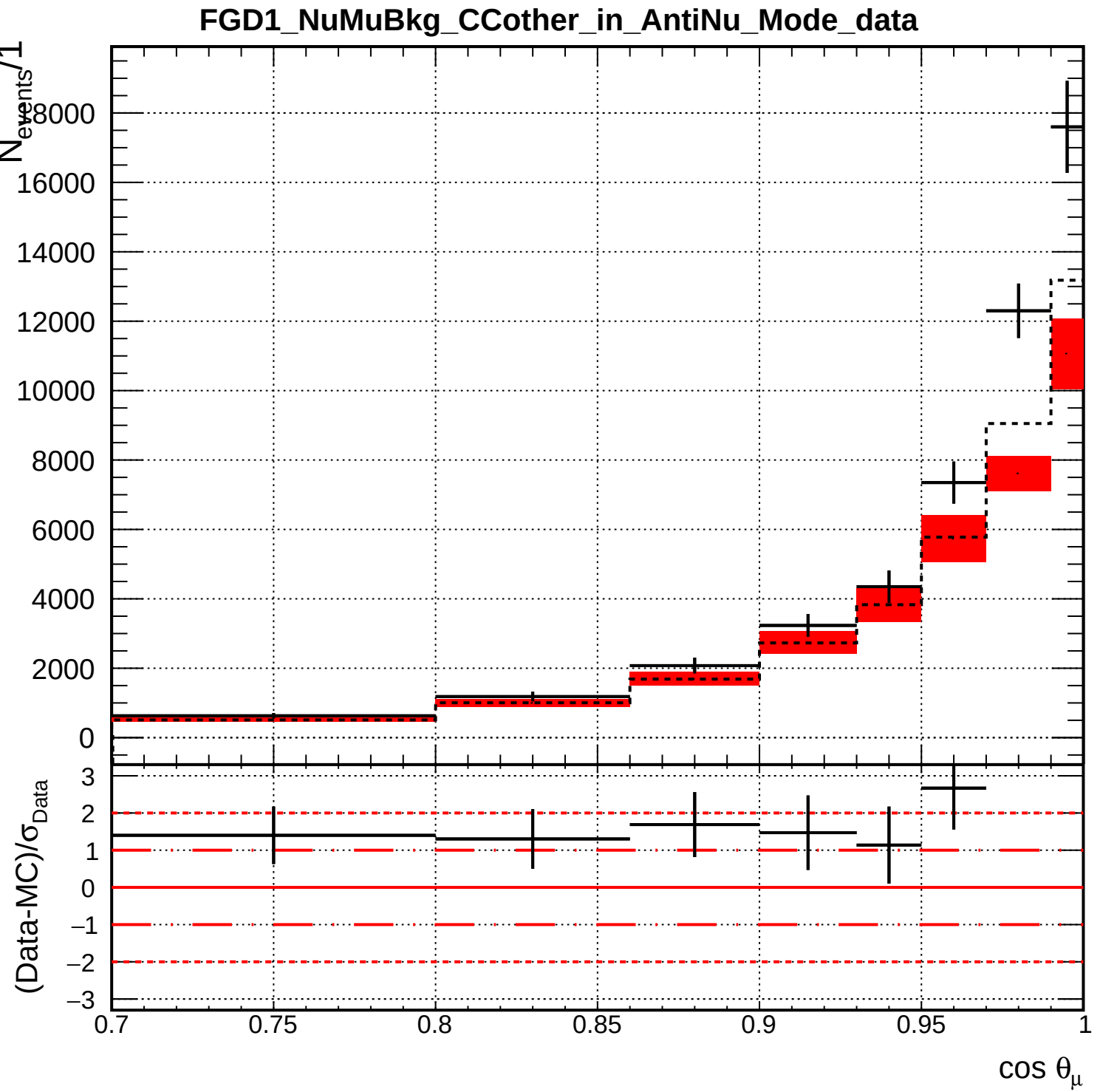

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

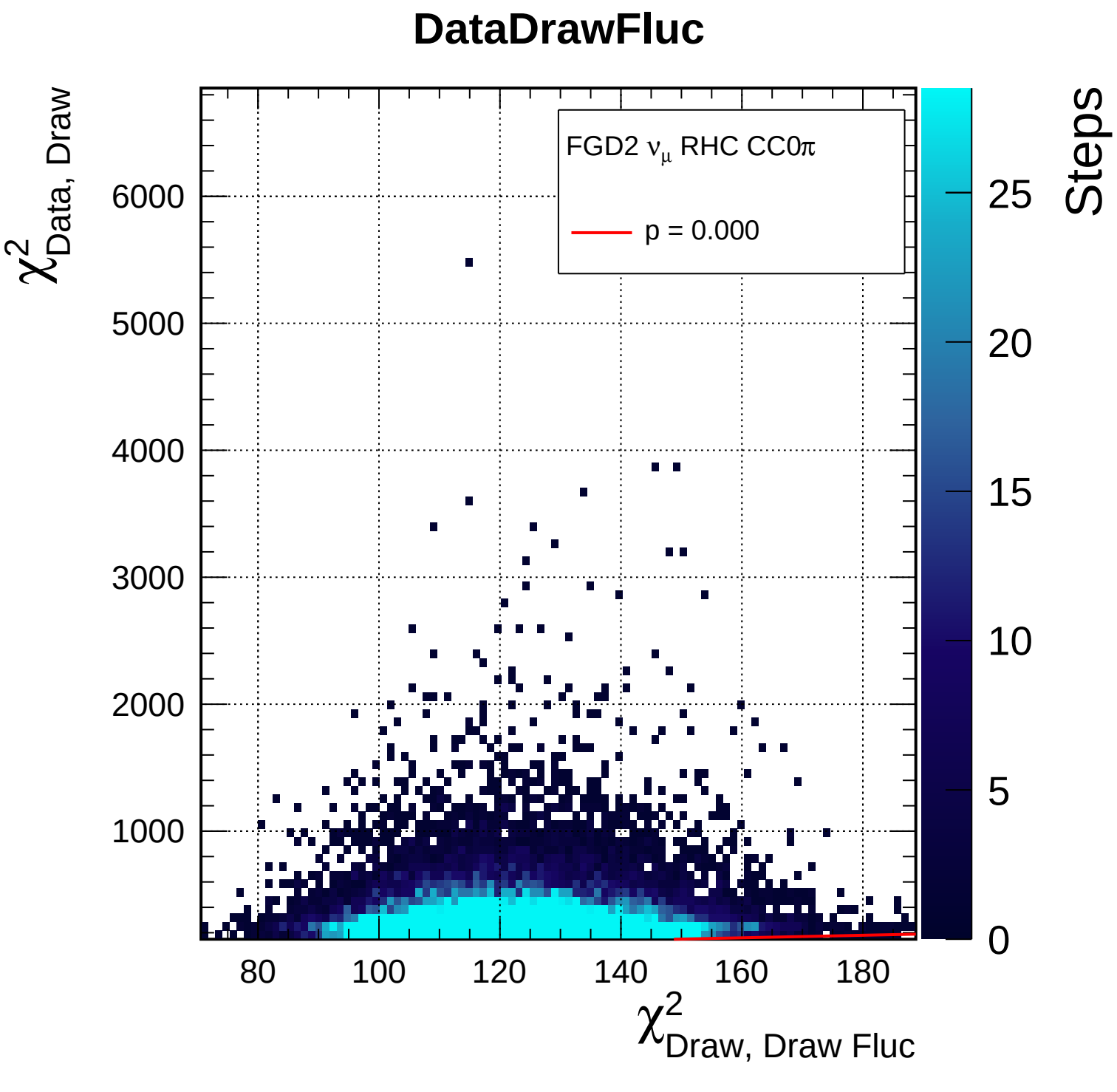

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

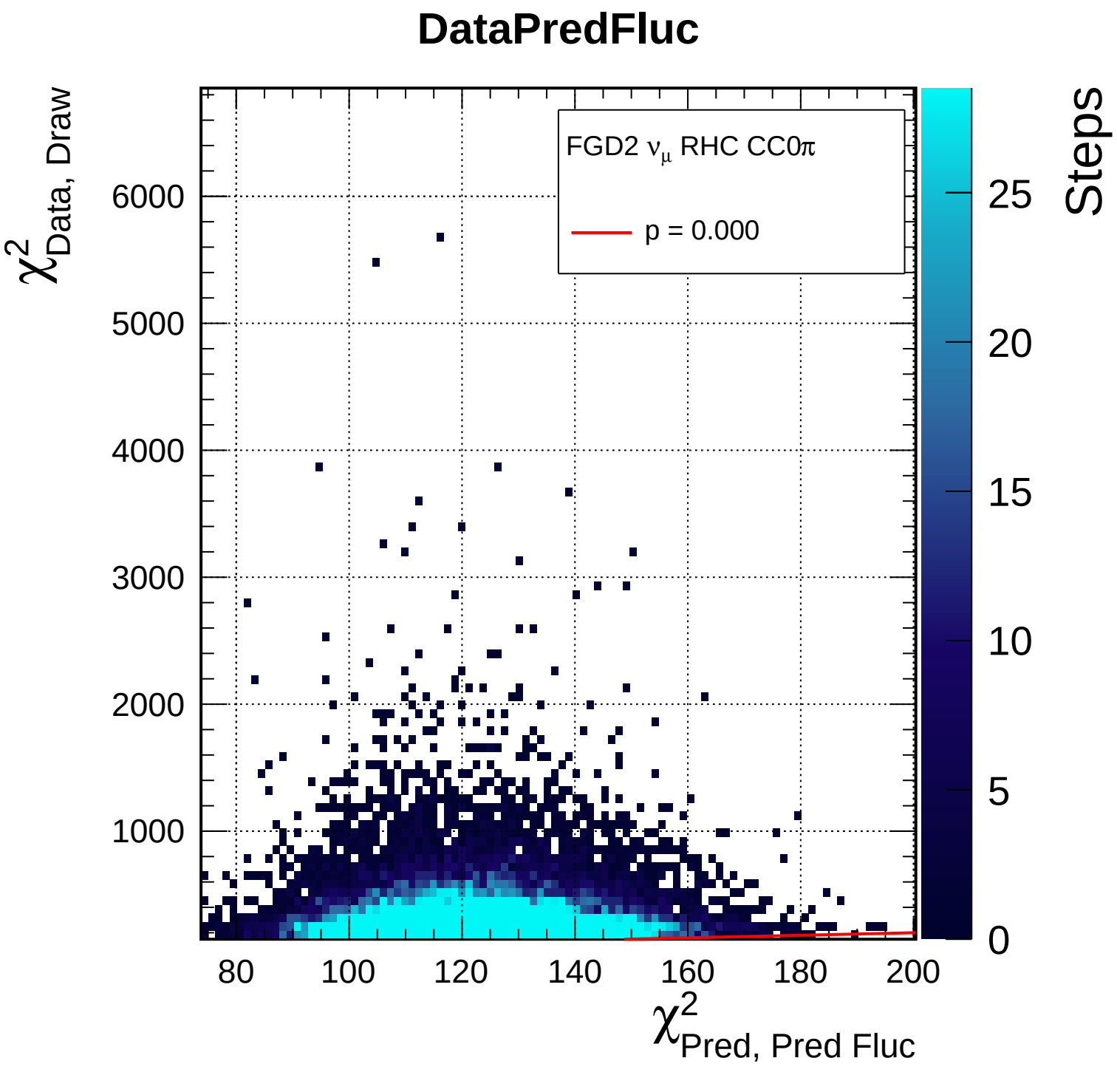

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
6
5
4
3
2
1
0
χ²Sample

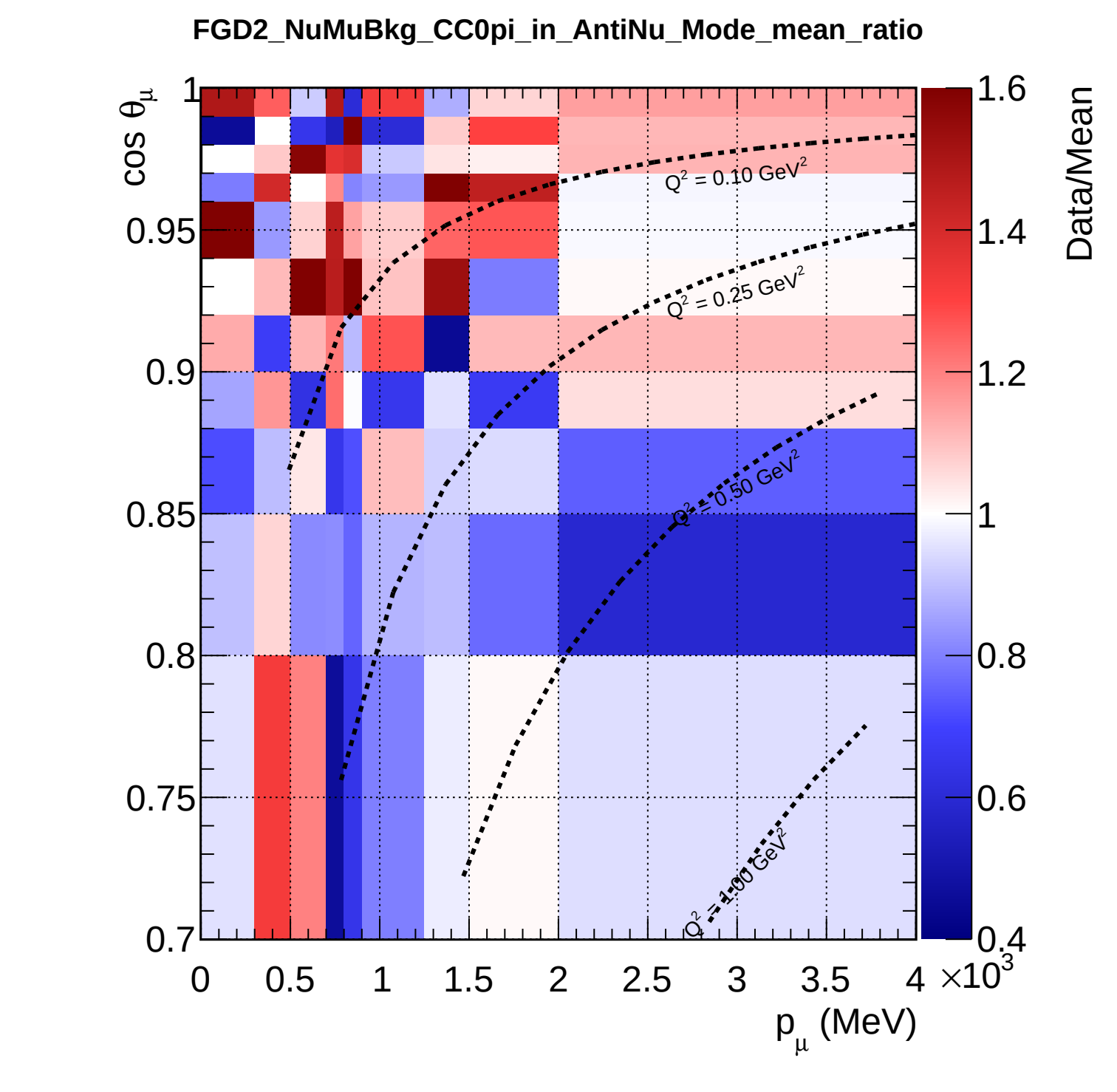

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_sum_1015
Counts
500
400
300
200
100
0
400
500
600
700
800
900
1000
N events
Data, 1015, p-value=0.05
MC, μ=781.4±147.4
Gauss, μ=800.4±166.3

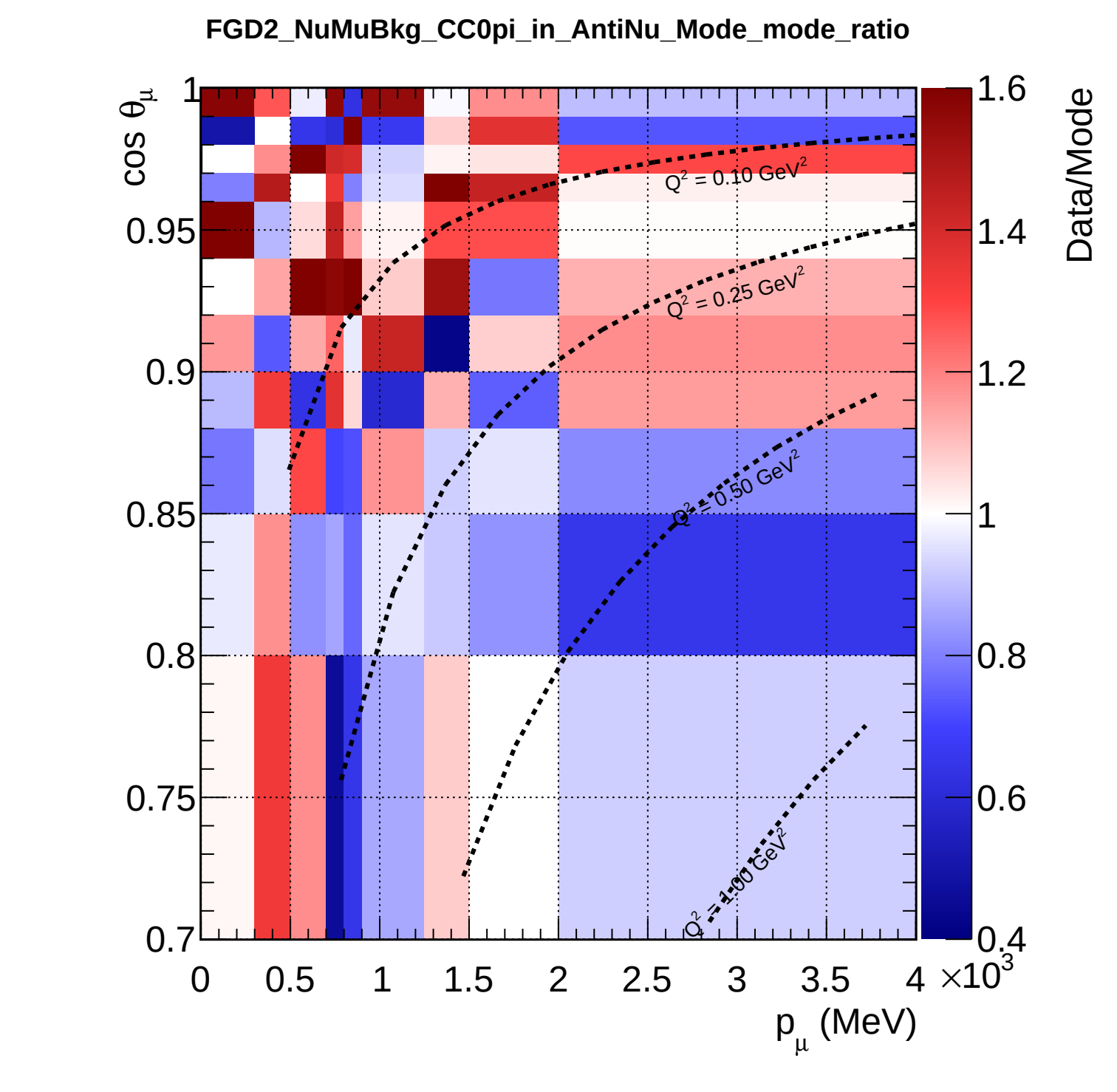

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_data
N_events/MeV
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
p_μ (MeV)

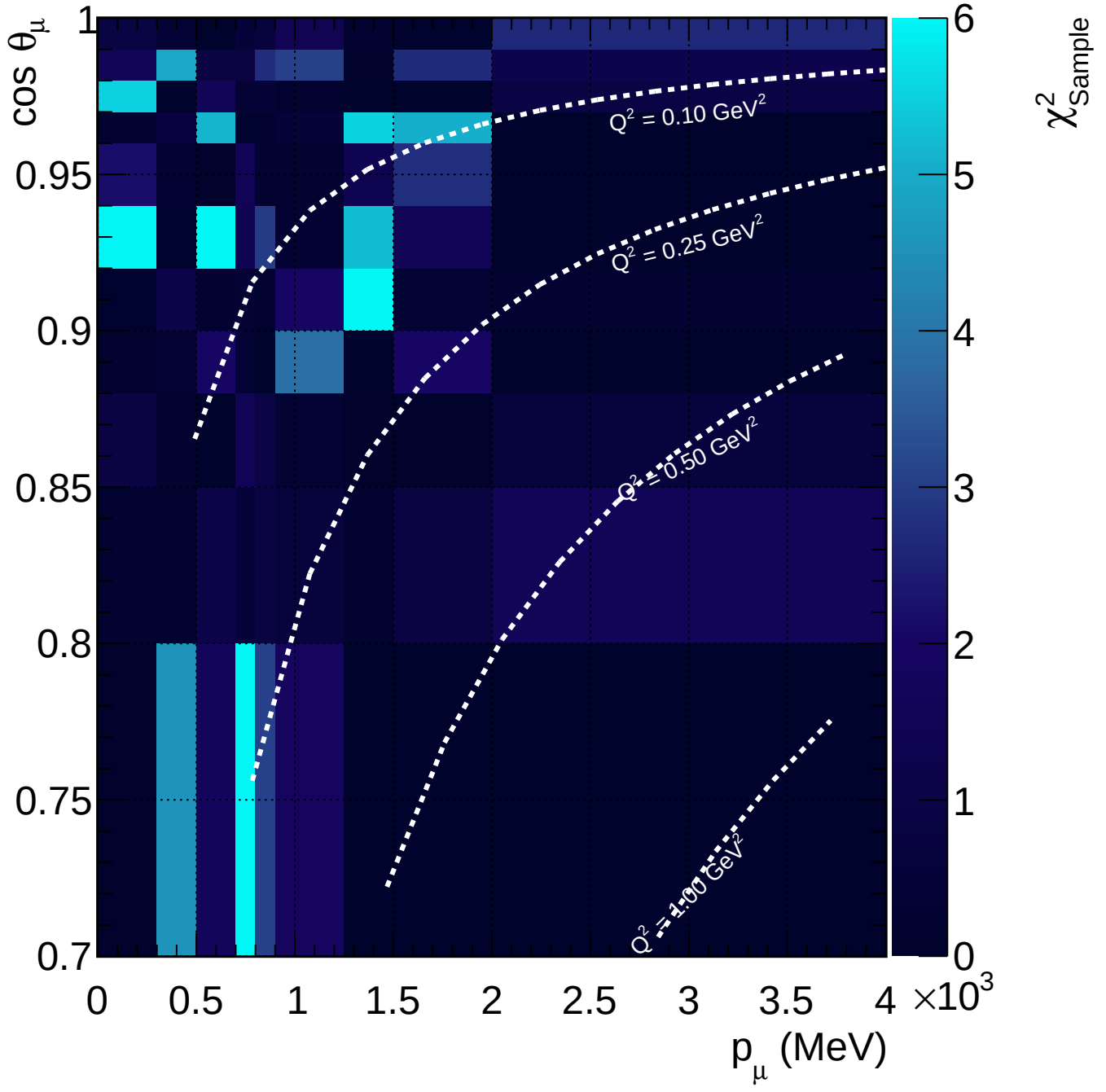

FGD1_NuMuBkg_CCother_in_AntiNu_Mode_data
N_events/1
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

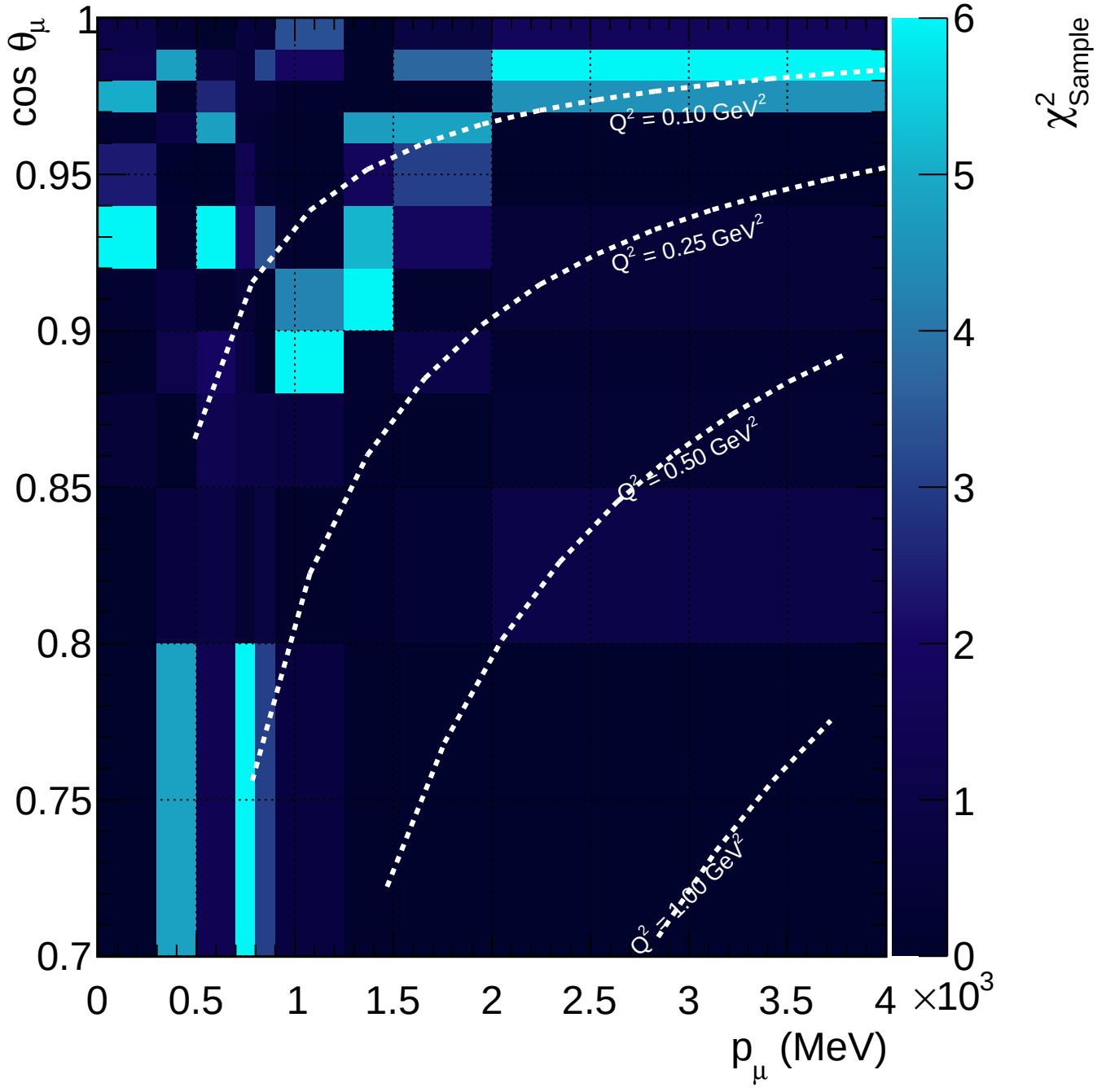

DataDrawFluc
FGD2 ν_μ RHC CC0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Draw, Draw Fluc}}$
Steps
6000
5000
4000
3000
2000
1000
80
100
120
140
160
180
25
20
15
10
5
0

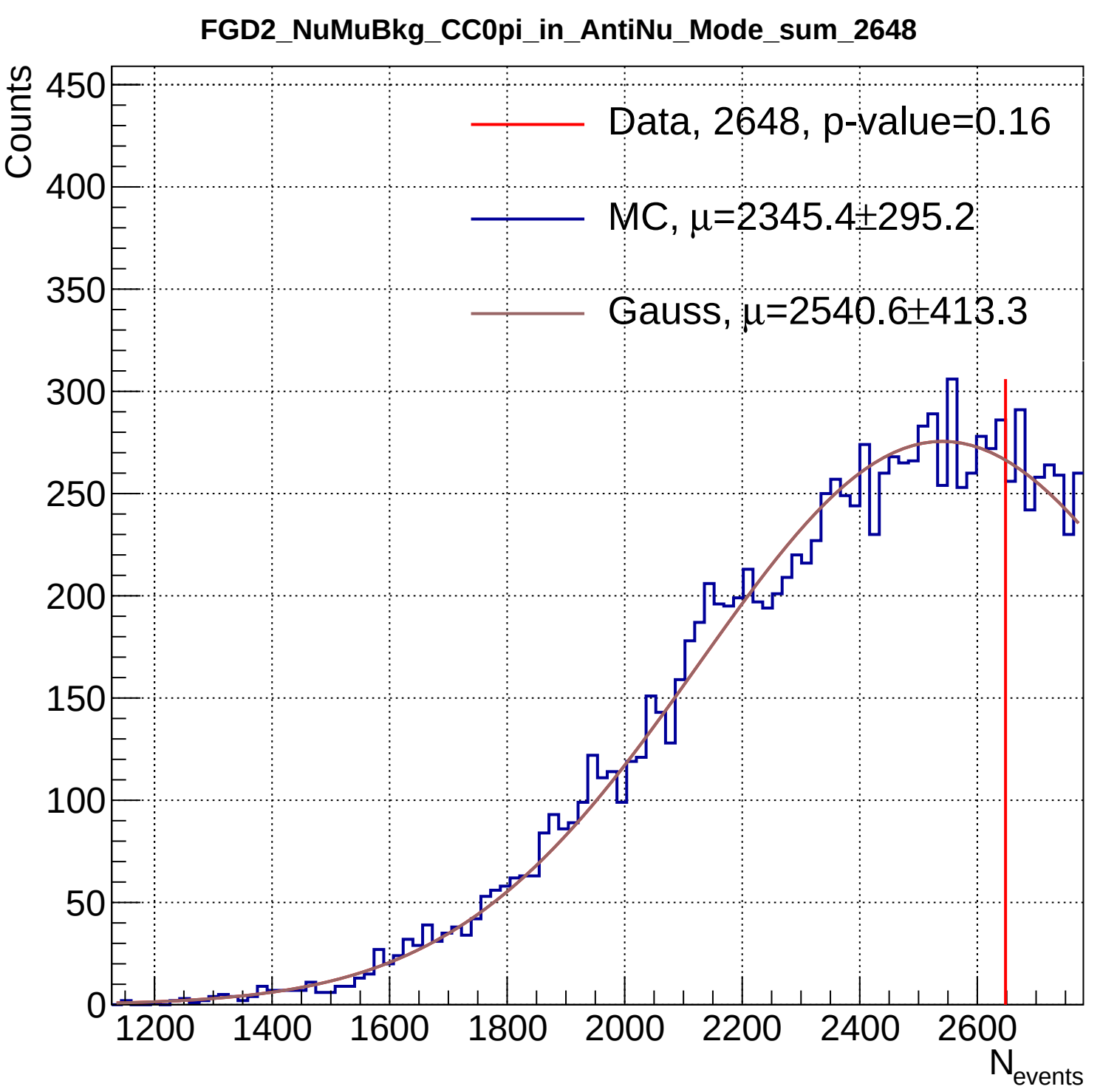

DataPredFluc
FGD2 ν_μ RHC CC0π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
6000
5000
4000
3000
2000
1000
80
100
120
140
160
180
200
25
20
15
10
5
0

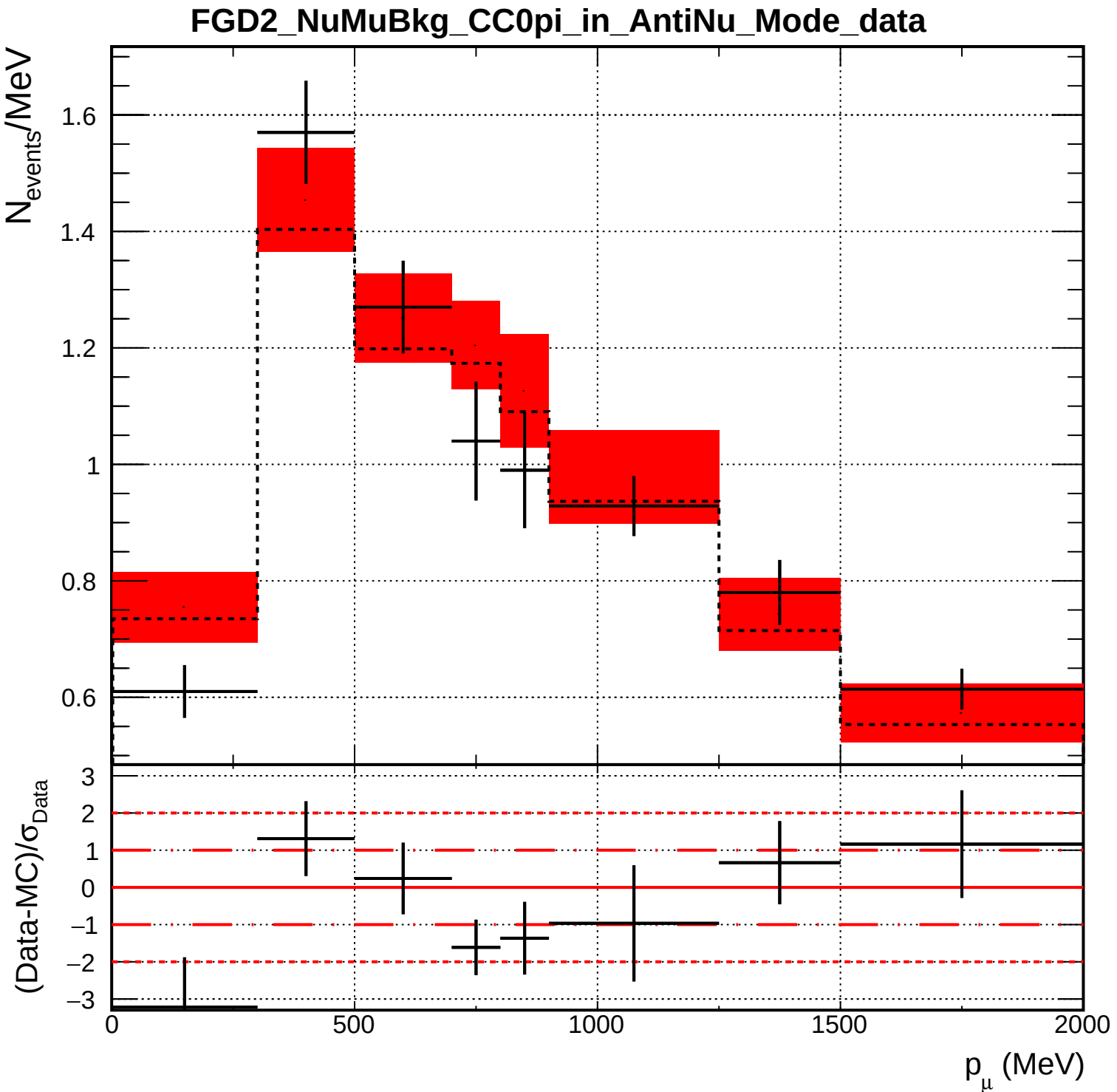

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

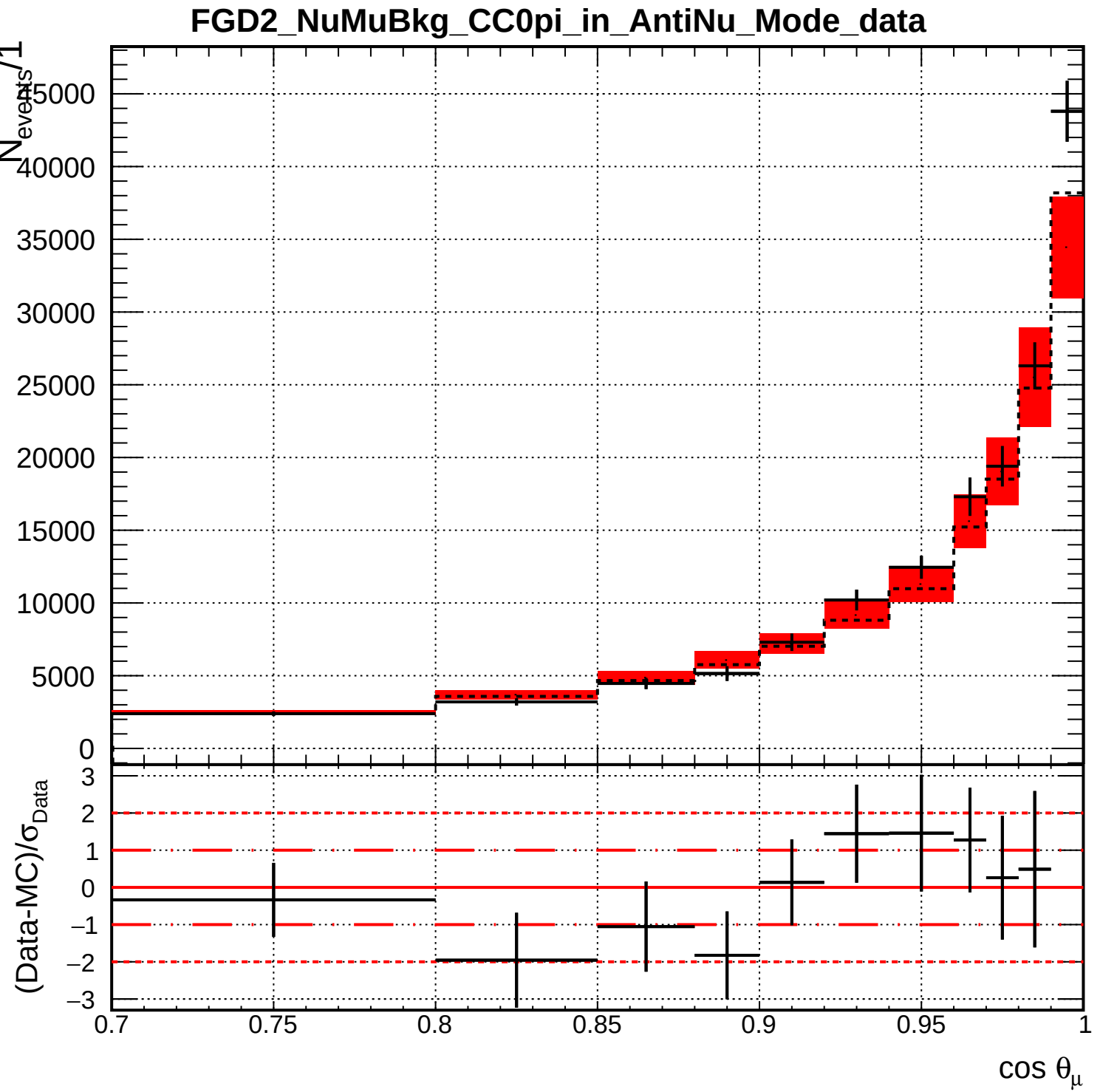

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4

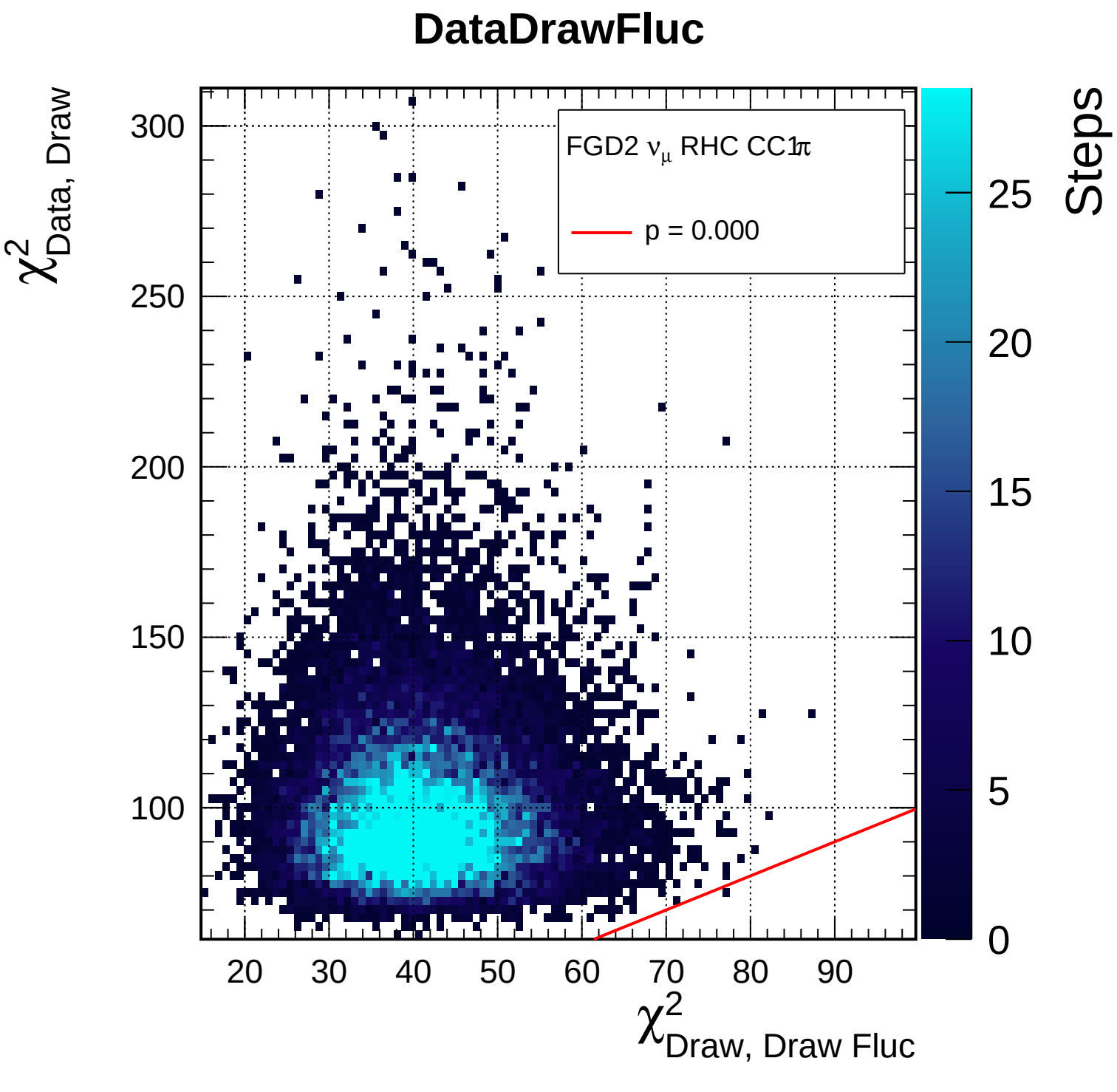

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

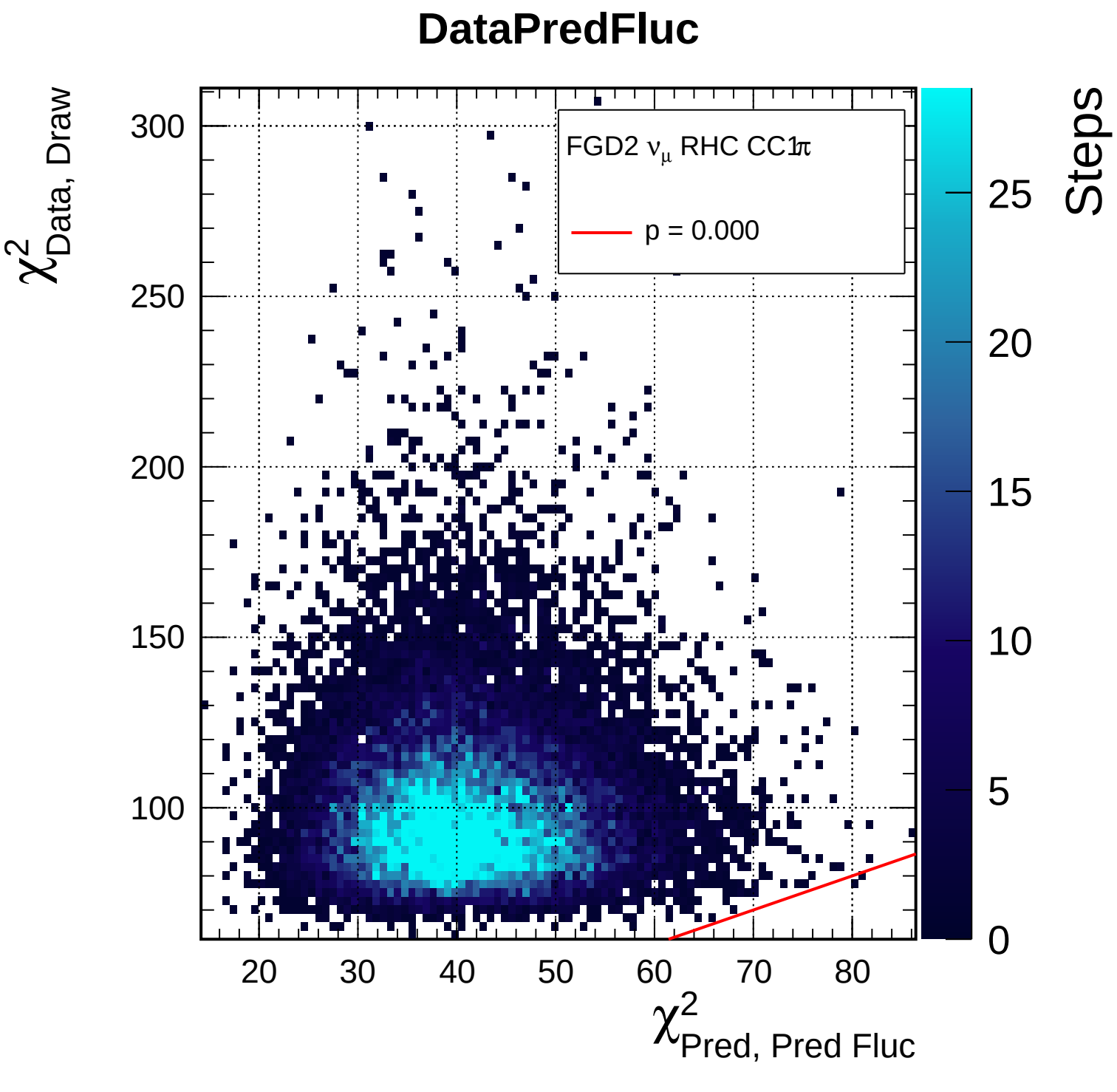

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
χ²Sample
6
5
4
3
2
1
0

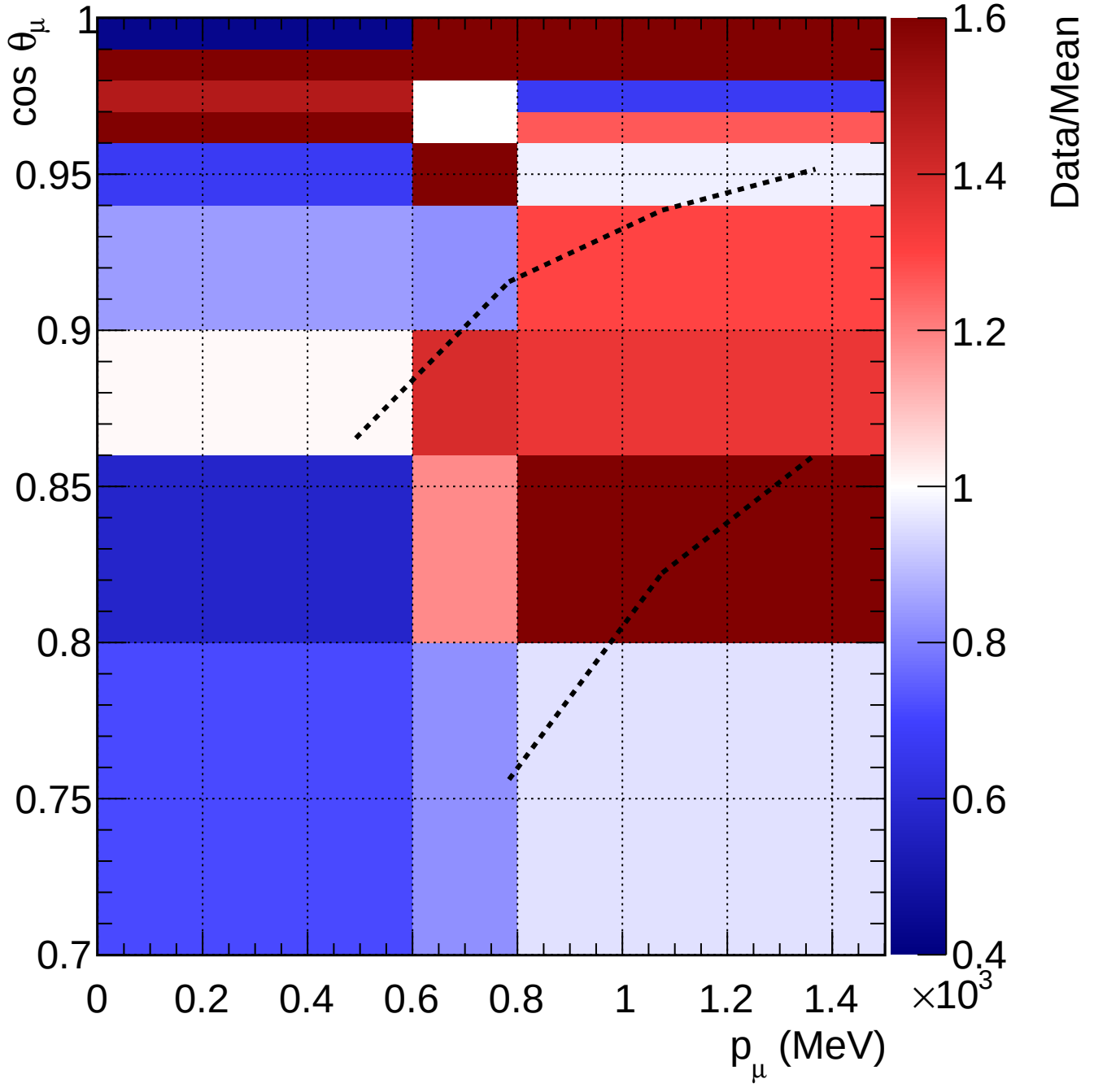

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_sum_2648
Counts
Data, 2648, p-value=0.16
MC, μ=2345.4±295.2
Gauss, μ=2540.6±413.3
0
50
100
150
200
250
300
350
400
450
1200
1400
1600
1800
2000
2200
2400
2600
N events

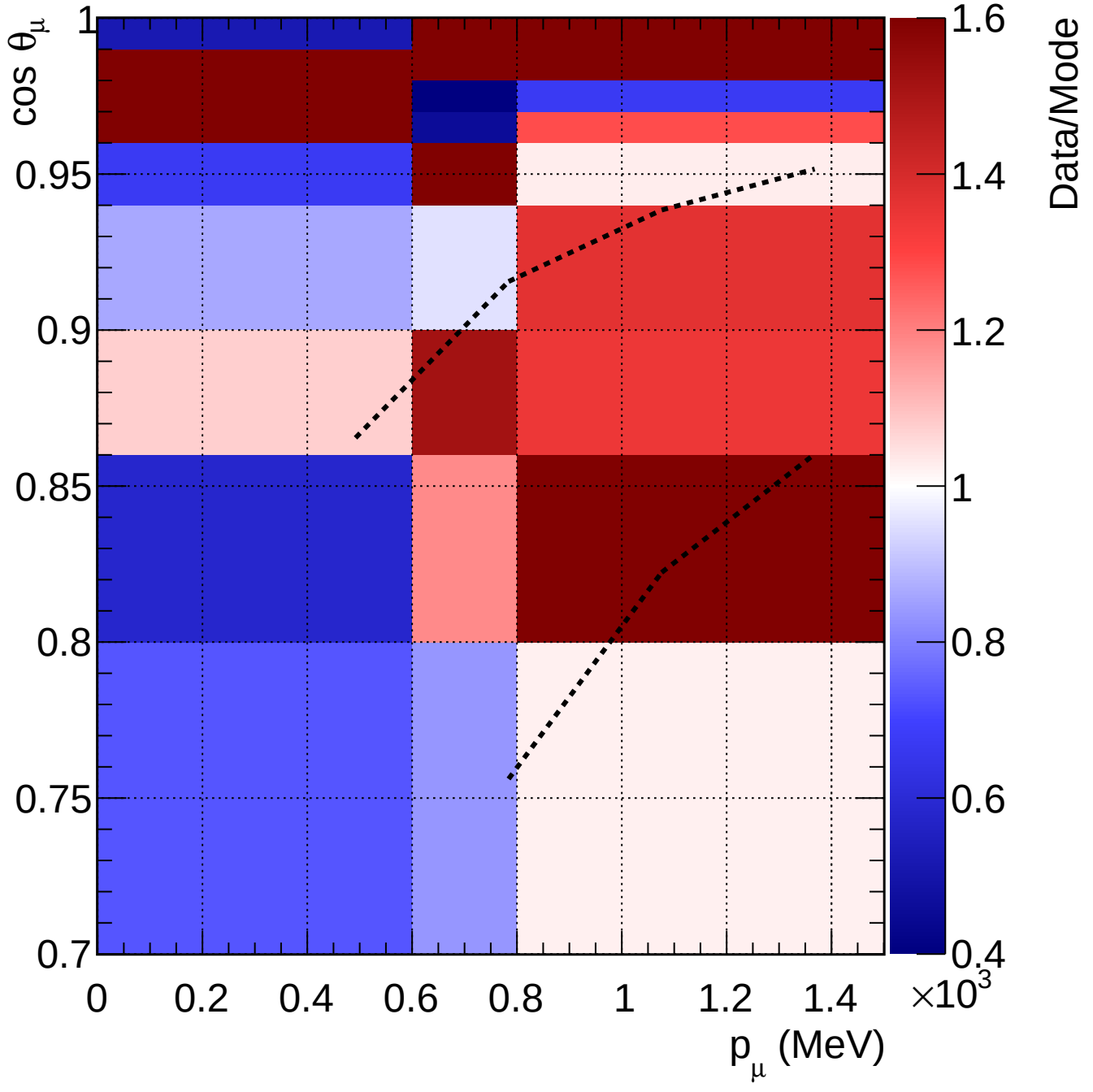

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_data
N_events/MeV
1.6
1.4
1.2
1
0.8
0.6
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
p_μ (MeV)

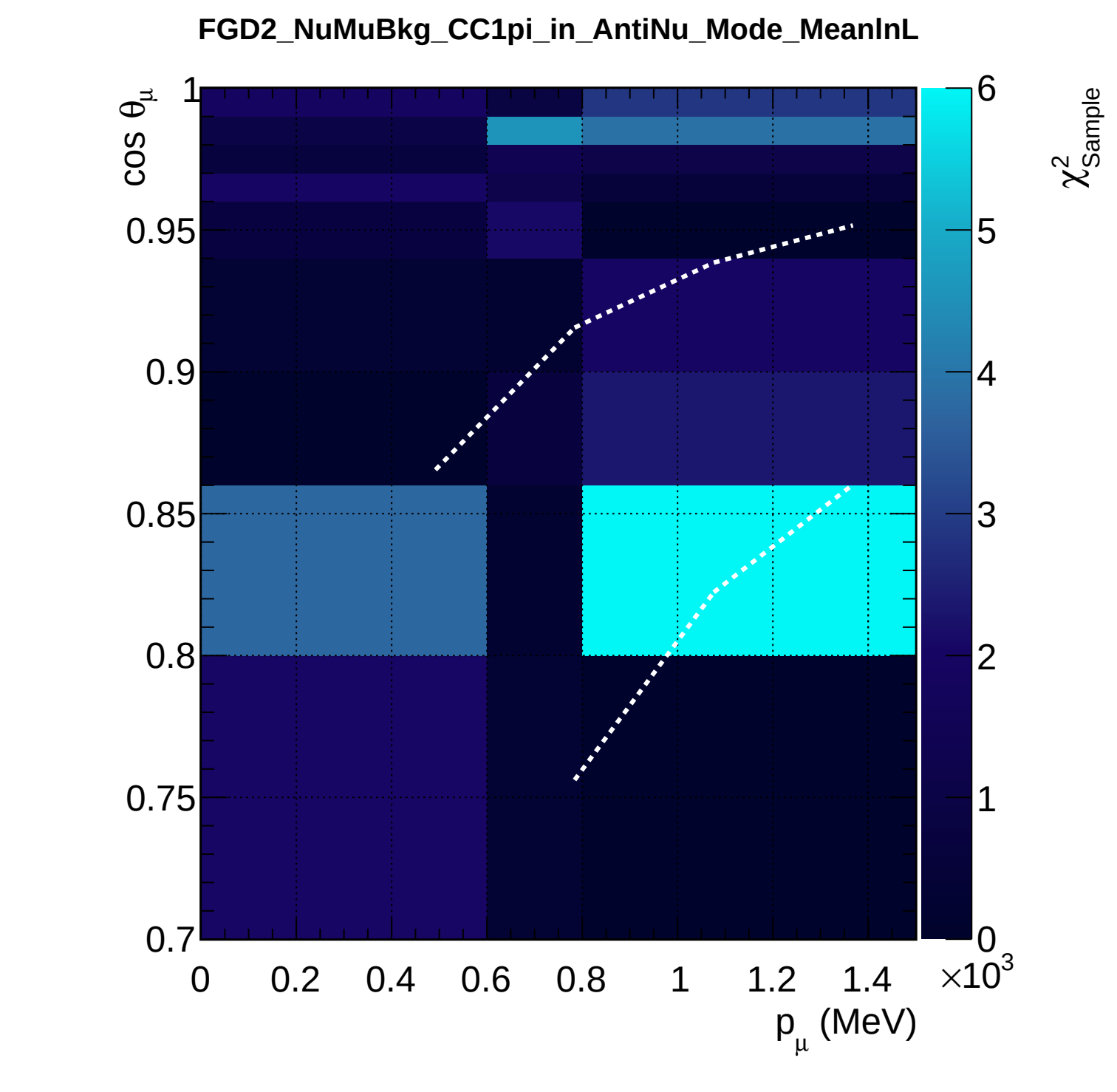

FGD2_NuMuBkg_CC0pi_in_AntiNu_Mode_data
N_events/1
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

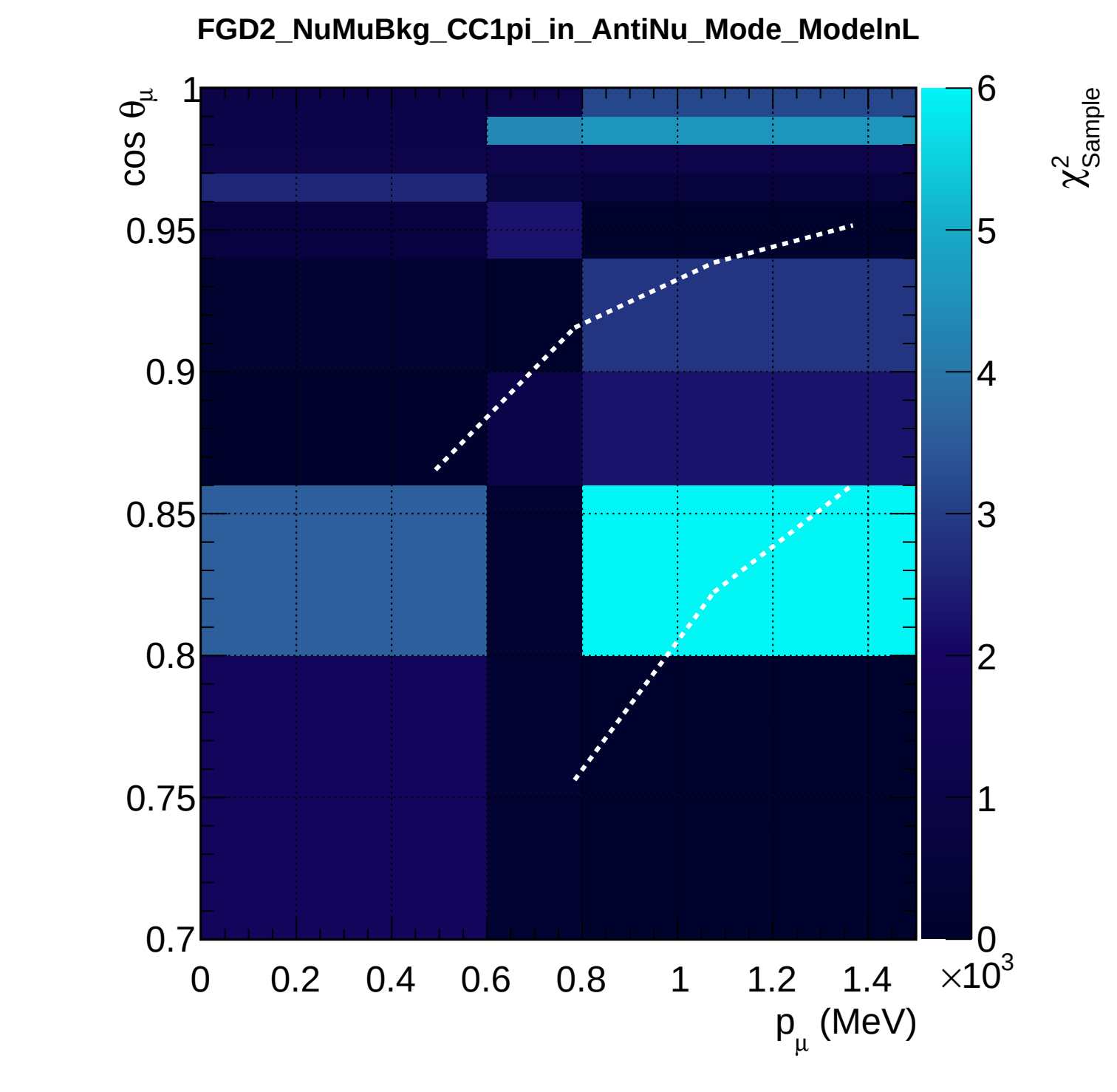

DataDrawFluc
FGD2 ν_μ RHC CC1π
p = 0.000
$\chi^2_{Data, Draw}$
$\chi^2_{Draw, Draw Fluc}$
Steps
300
250
200
150
100
20
30
40
50
60
70
80
90
25
20
15
10
5
0

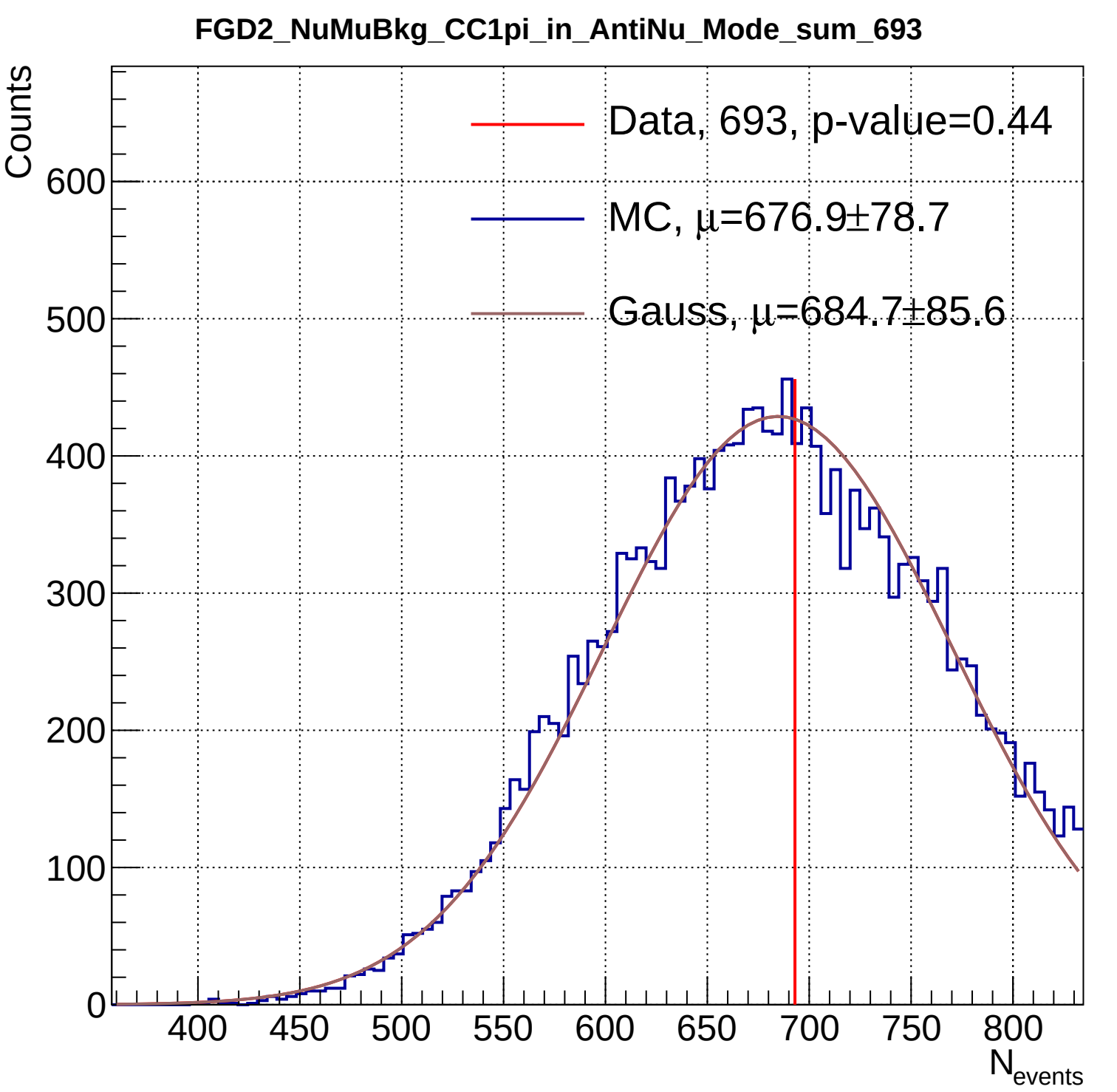

DataPredFluc
FGD2 ν_μ RHC CC1π
p = 0.000
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
300
250
200
150
100
20
30
40
50
60
70
80
25
20
15
10
5
0

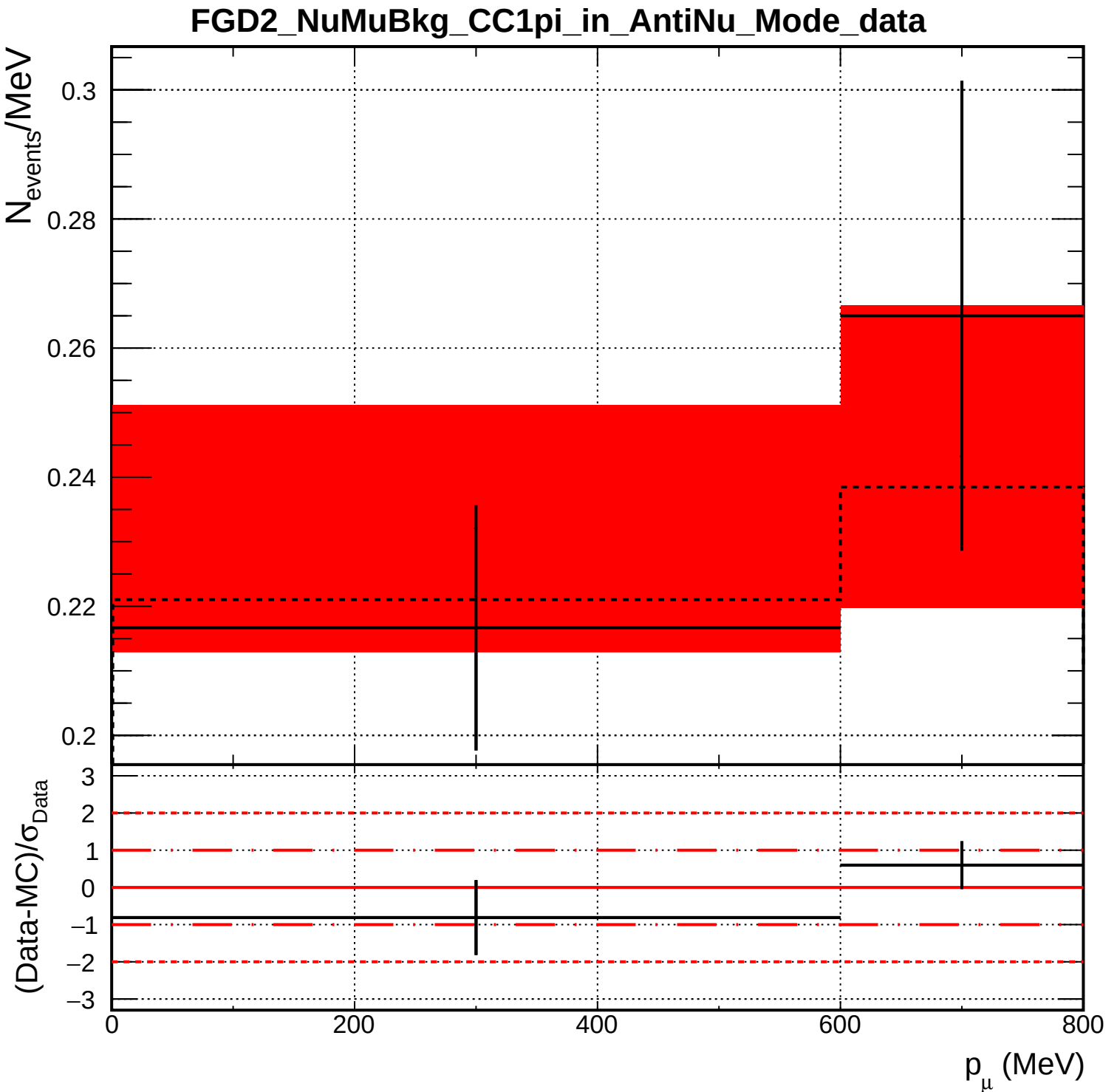

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
1.6
1.4
1.2
1
0.8
0.6
0.4
Data/Mean

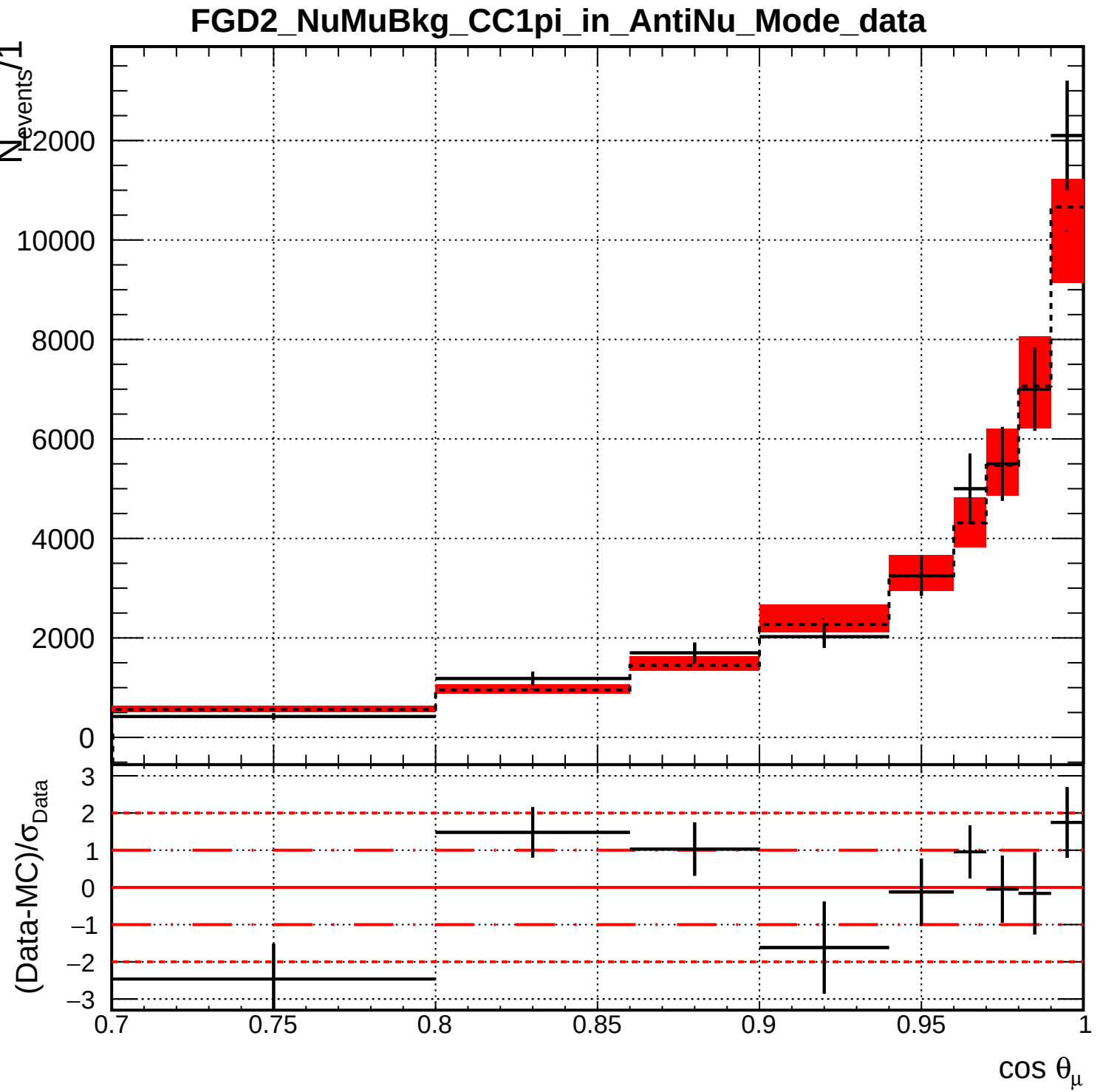

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
1.6
1.4
1.2
1
0.8
0.6
0.4
Data/Mode

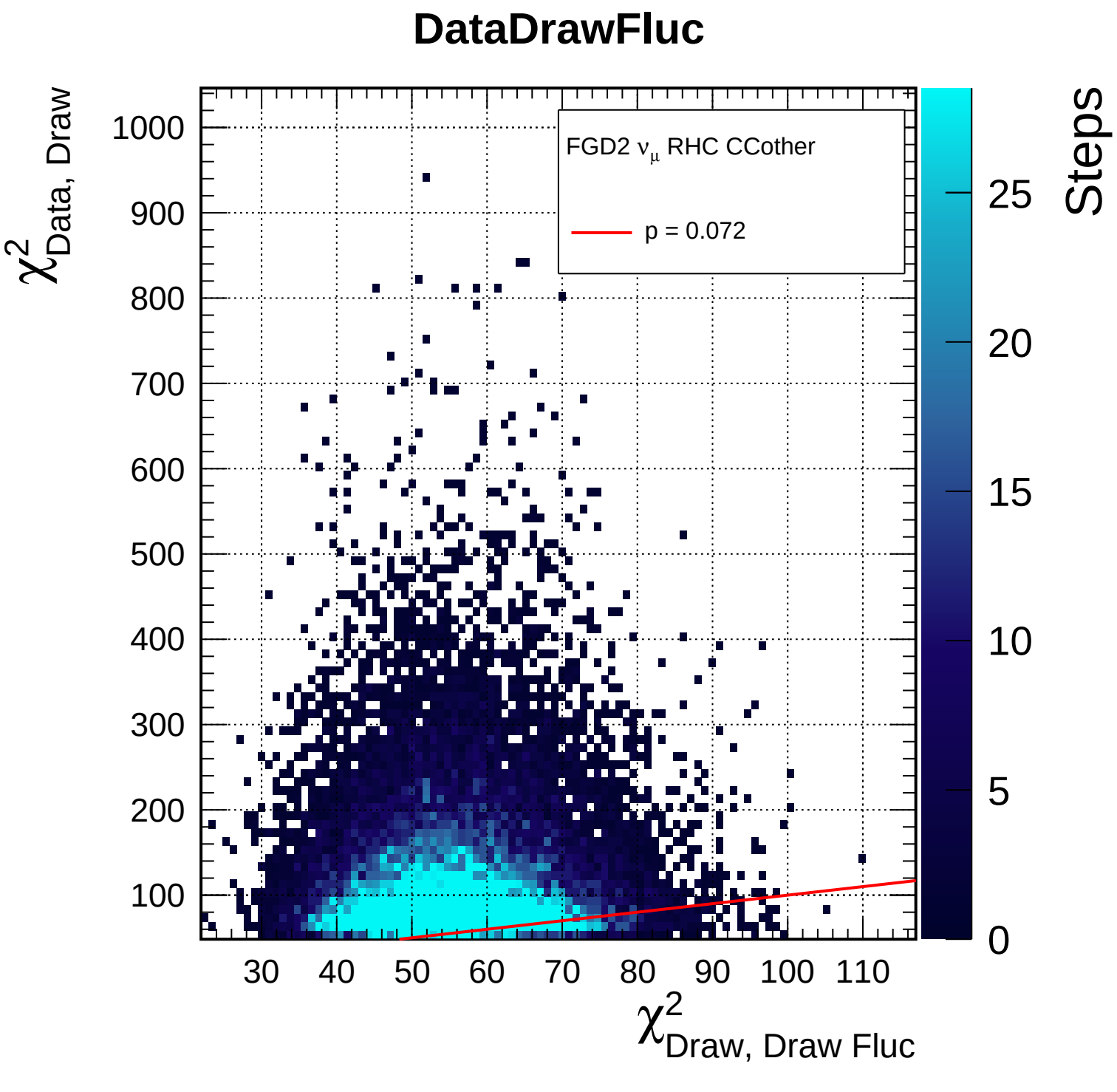

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

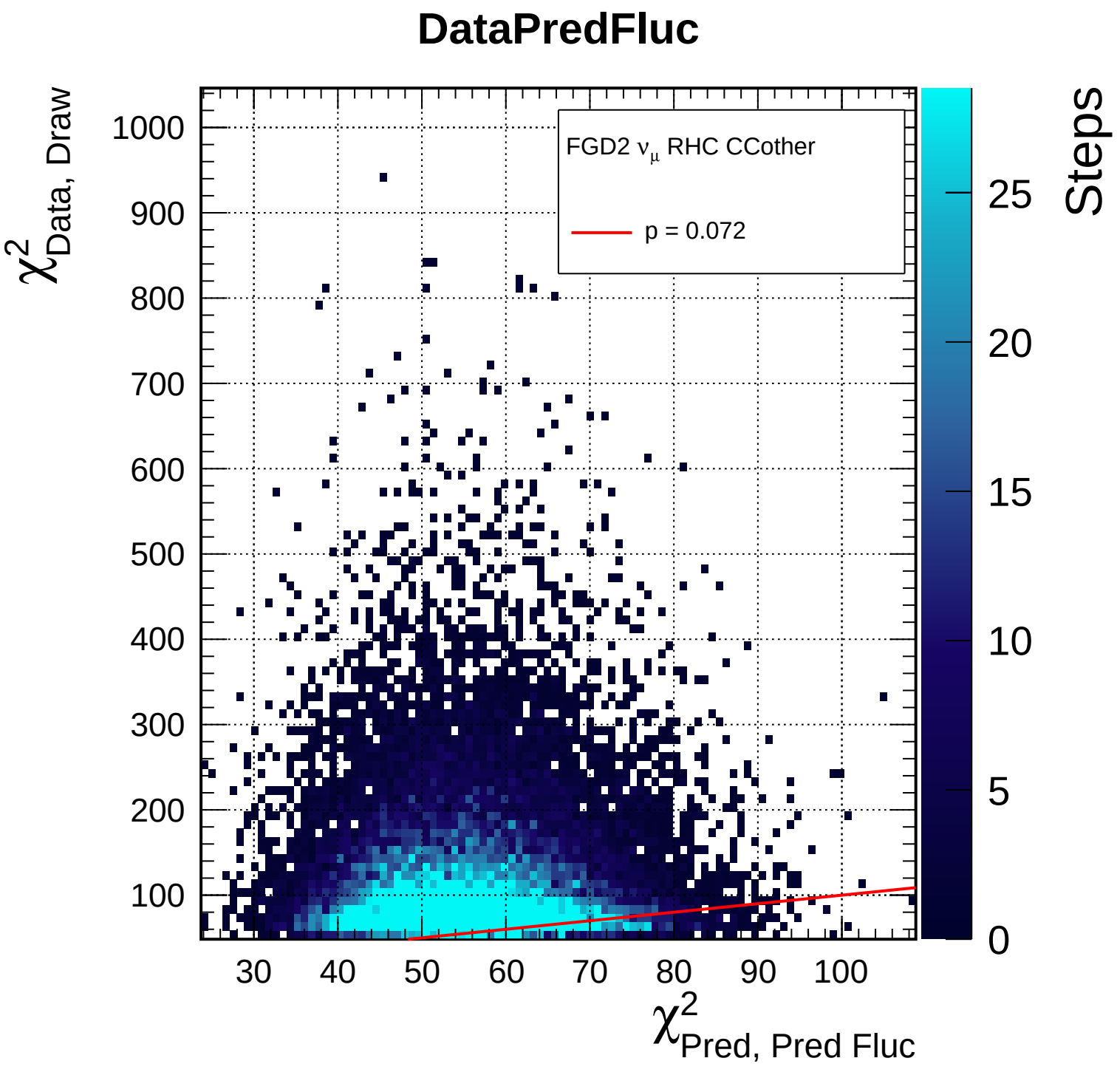

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.2
0.4
0.6
0.8
1
1.2
1.4
×10^3
pμ (MeV)
6
5
4
3
2
1
0
χ²Sample

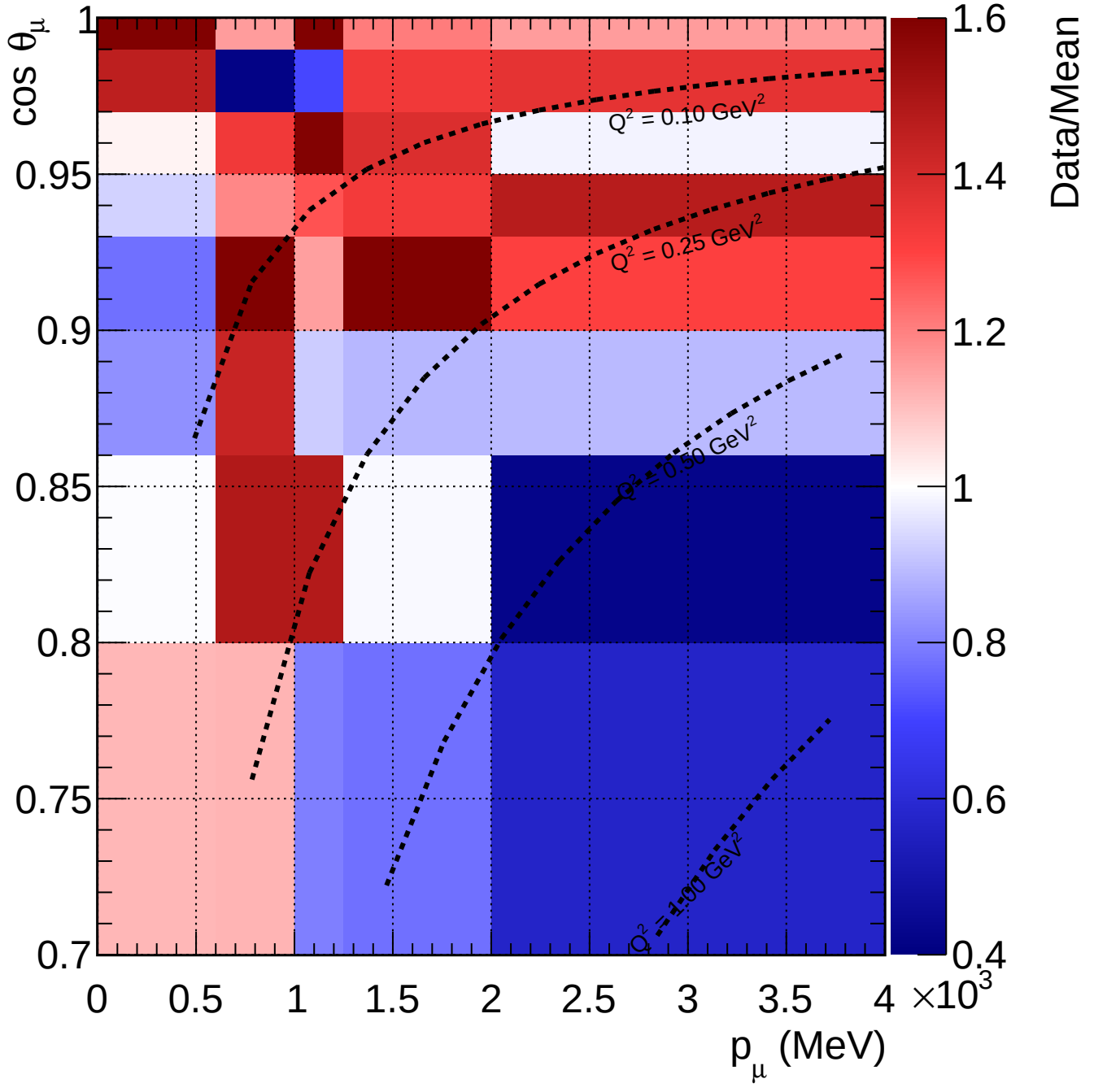

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_sum_693
Counts
Data, 693, p-value=0.44
MC, μ=676.9±78.7
Gauss, μ=684.7±85.6
0
100
200
300
400
500
600
400
450
500
550
600
650
700
750
800
N events

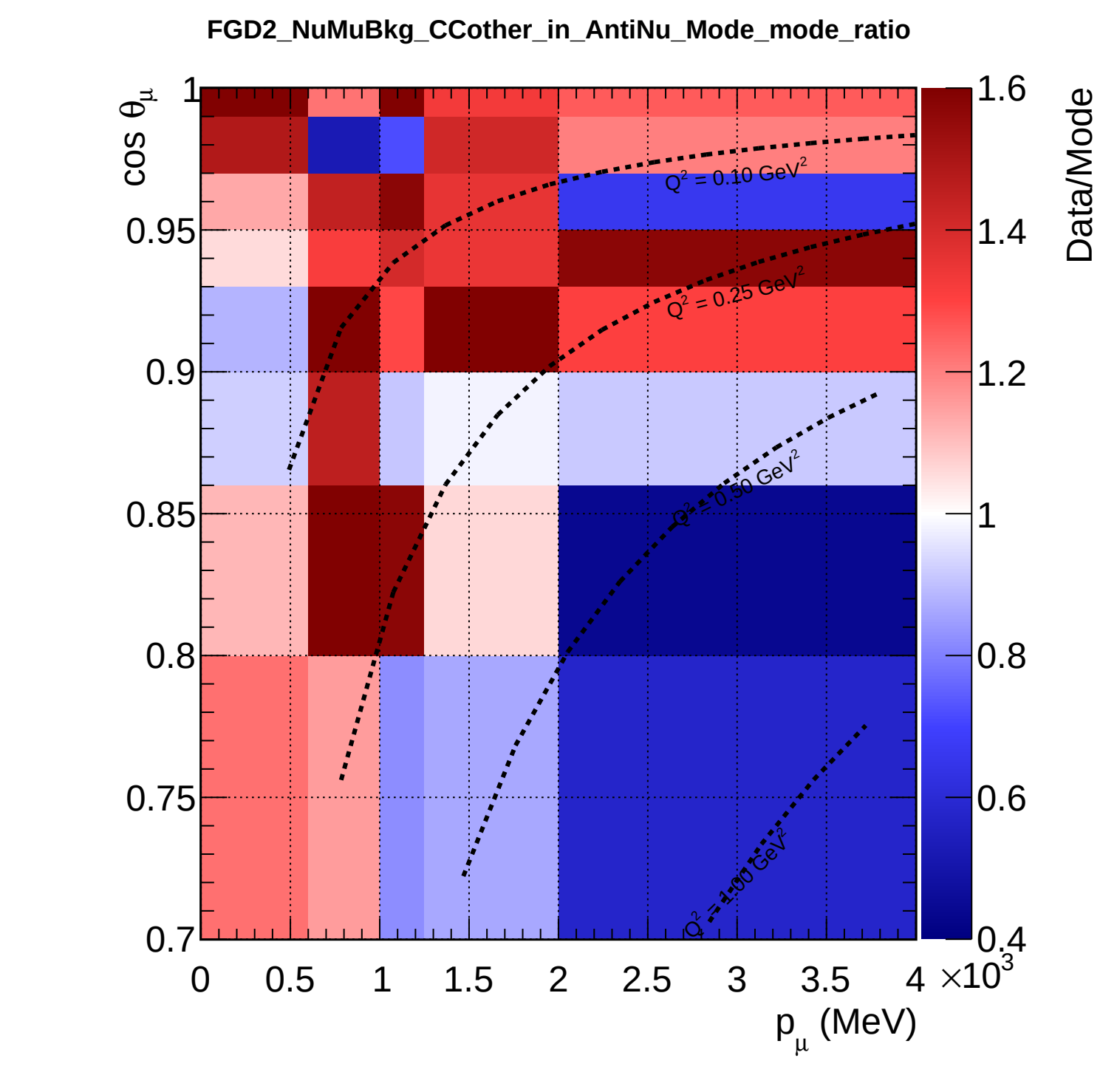

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_data
N_events/MeV
0.3
0.28
0.26
0.24
0.22
0.2
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
200
400
600
800
p_μ (MeV)

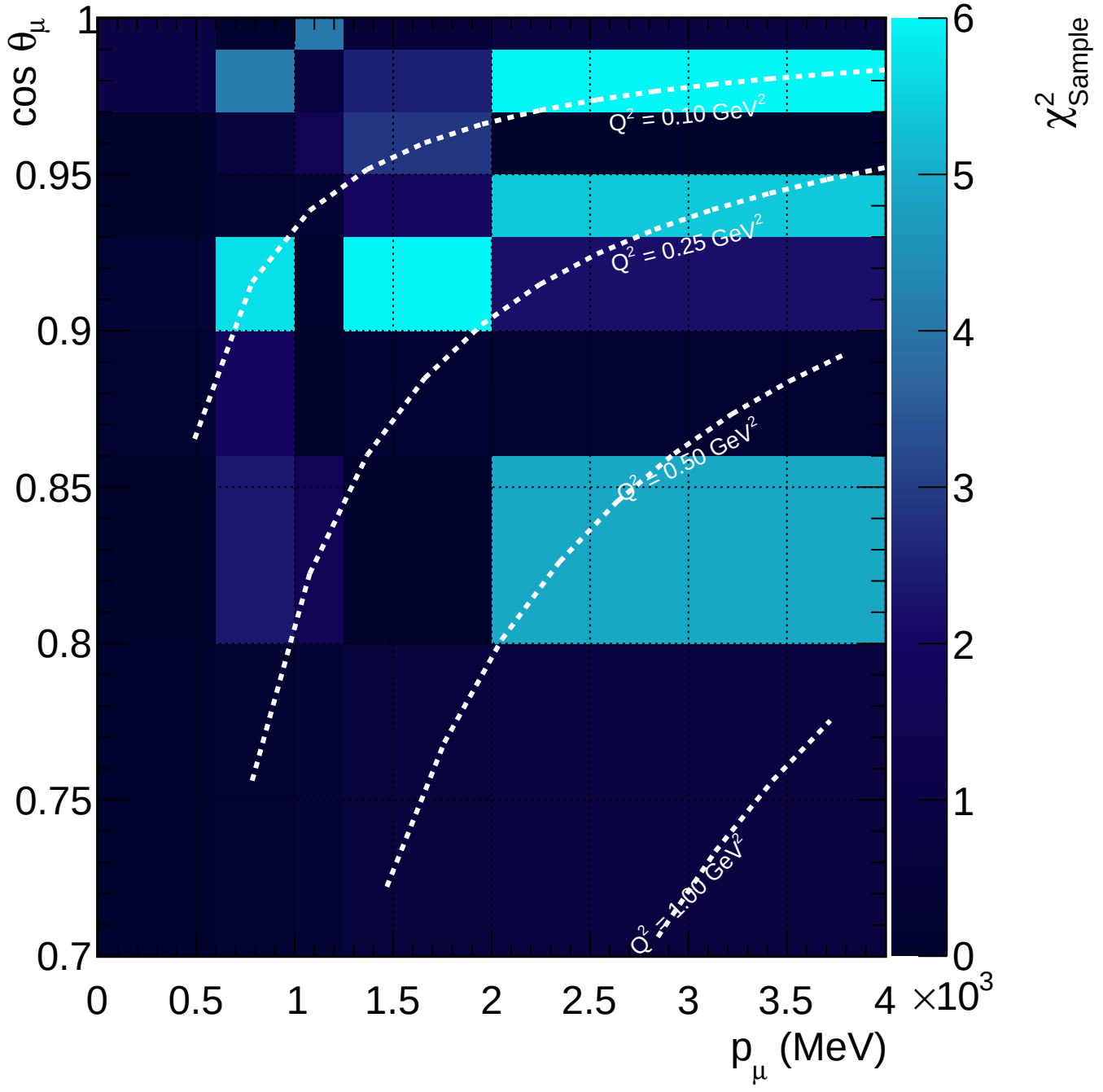

FGD2_NuMuBkg_CC1pi_in_AntiNu_Mode_data
N_events/1
12000
10000
8000
6000
4000
2000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ

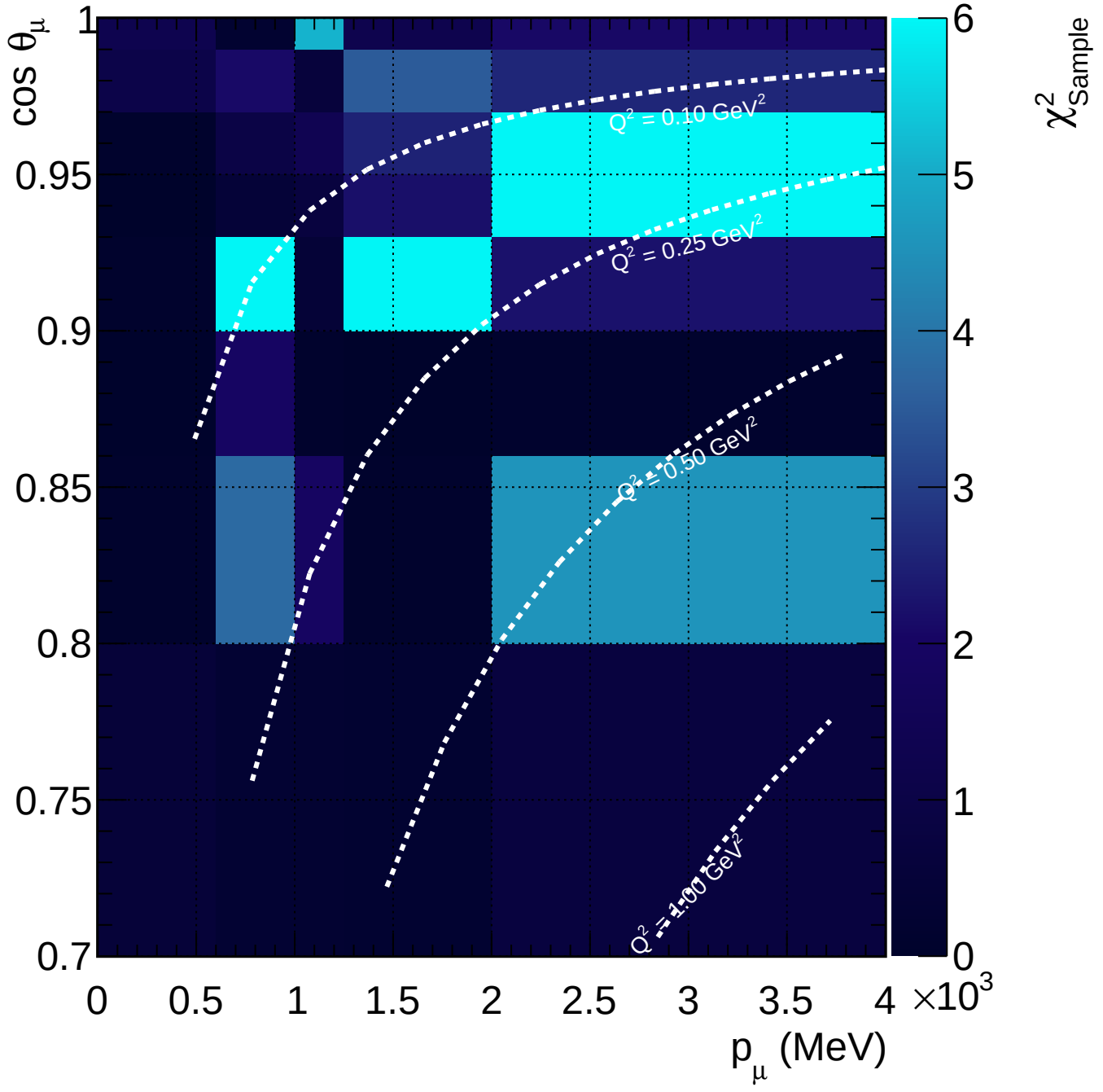

DataDrawFluc
FGD2 ν_μ RHC CCother
p = 0.072
$\chi^2_{Data,\ Draw}$
$\chi^2_{Draw,\ Draw\ Fluc}$
Steps
1000
900
800
700
600
500
400
300
200
100
30
40
50
60
70
80
90
100
110
25
20
15
10
5
0

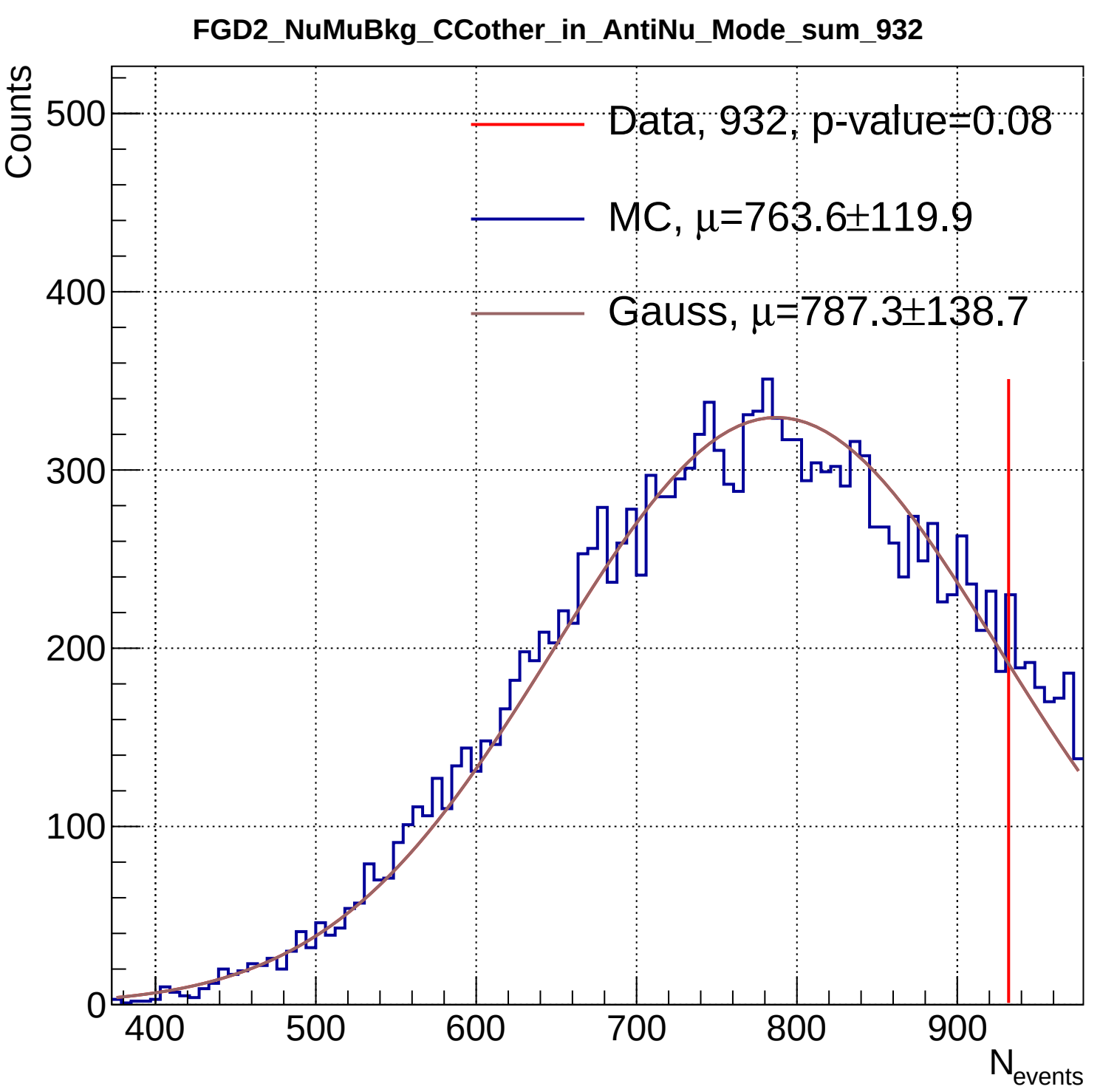

DataPredFluc
FGD2 ν_μ RHC CCother
p = 0.072
$\chi^2_{\text{Data, Draw}}$
$\chi^2_{\text{Pred, Pred Fluc}}$
Steps
1000
900
800
700
600
500
400
300
200
100
30
40
50
60
70
80
90
100
25
20
15
10
5
0

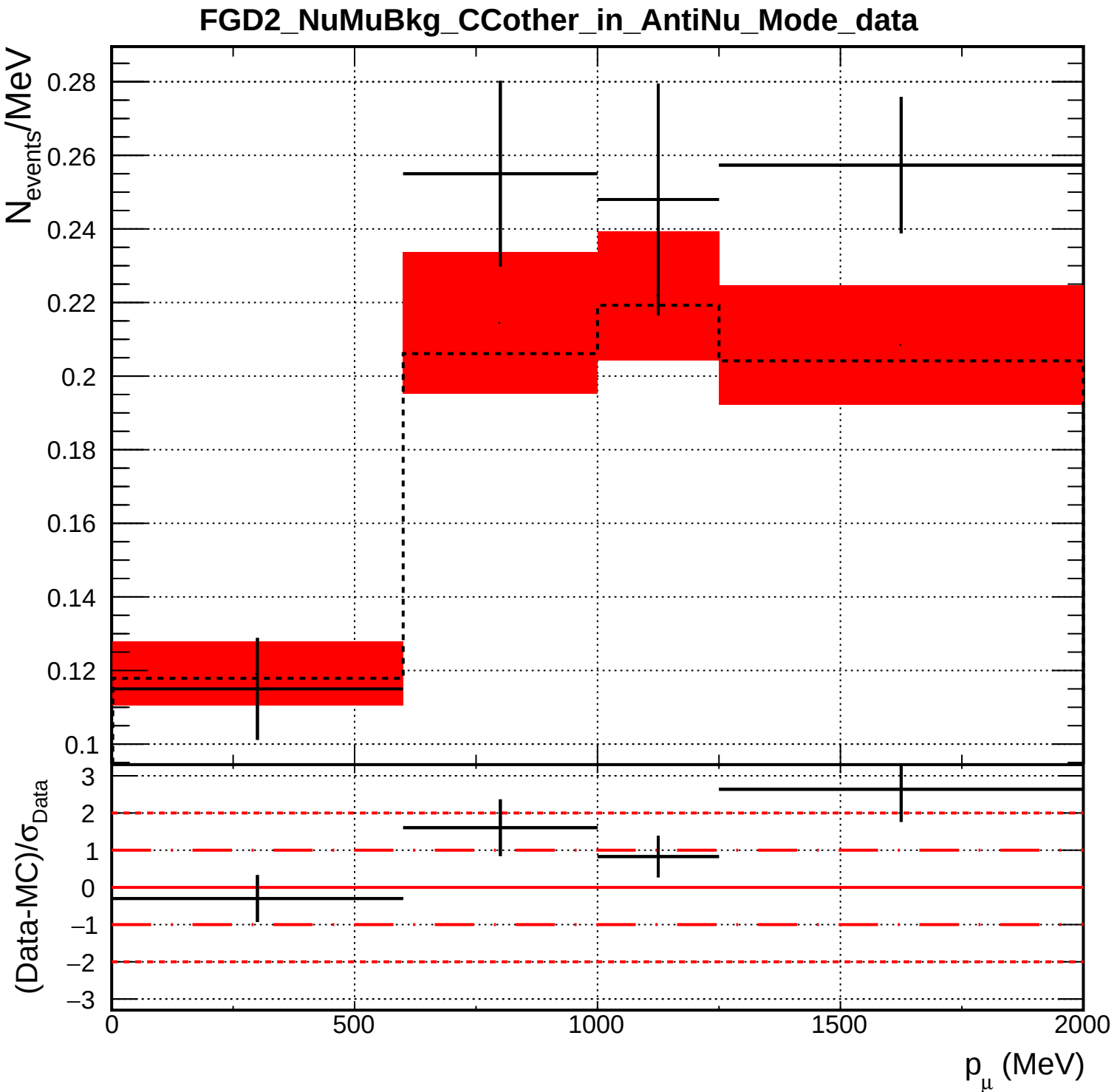

FGD2_NuMuBkg_CCother_in_AntiNu_Mode_mean_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mean
1.6
1.4
1.2
1
0.8
0.6
0.4

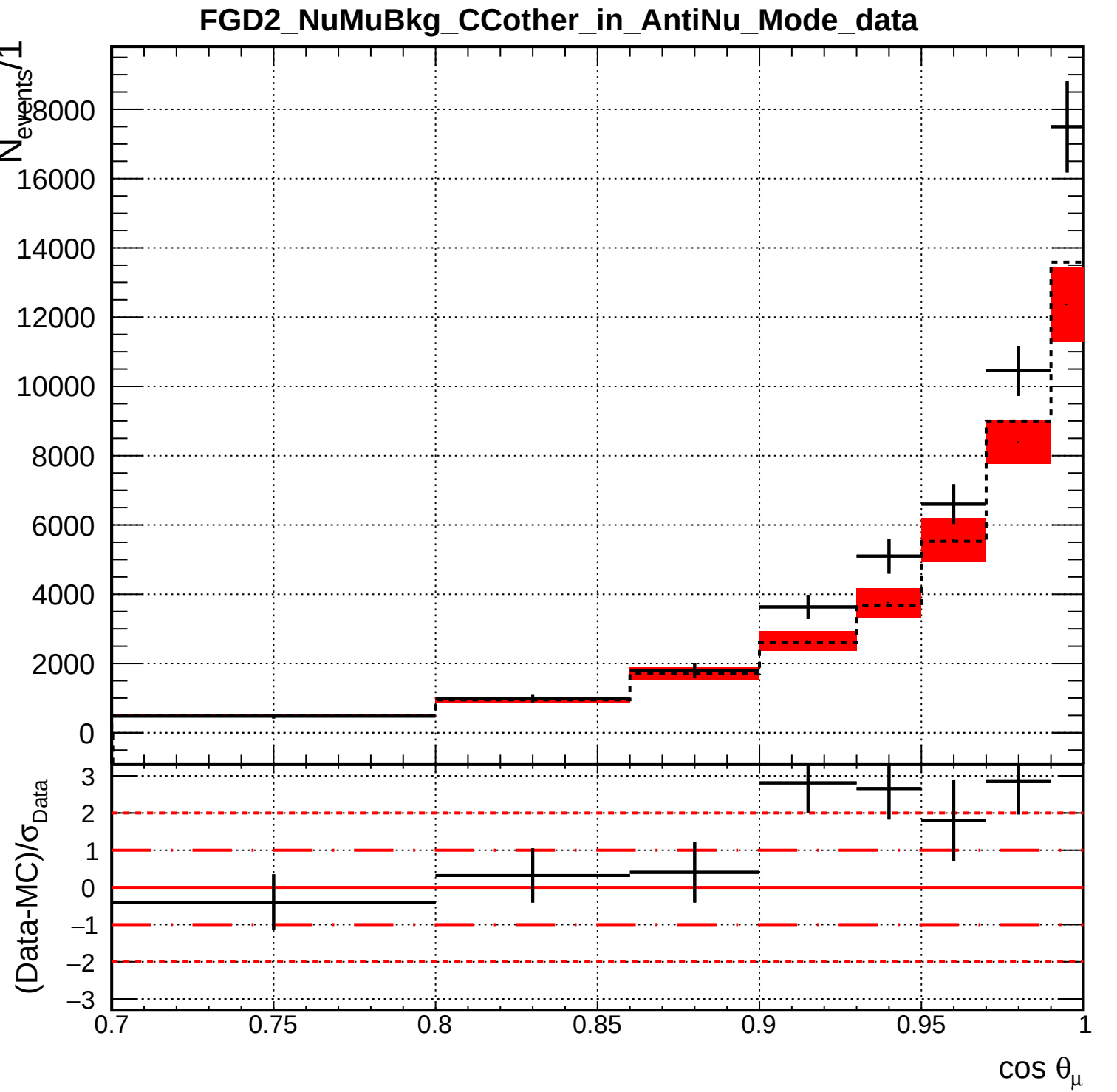

FGD2_NuMuBkg_CCother_in_AntiNu_Mode_mode_ratio
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
Data/Mode
1.6
1.4
1.2
1
0.8
0.6
0.4


FGD2_NuMuBkg_CCother_in_AntiNu_Mode_MeanlnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
6
5
4
3
2
1
0
χ²Sample


FGD2_NuMuBkg_CCother_in_AntiNu_Mode_ModelnL
cos θμ
1
0.95
0.9
0.85
0.8
0.75
0.7
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^3
pμ (MeV)
Q² = 0.10 GeV²
Q² = 0.25 GeV²
Q² = 0.50 GeV²
Q² = 1.00 GeV²
6
5
4
3
2
1
0
χ²Sample


FGD2_NuMuBkg_CCother_in_AntiNu_Mode_sum_932
Counts
500
400
300
200
100
0
400
500
600
700
800
900
N events
Data, 932, p-value=0.08
MC, μ=763.6±119.9
Gauss, μ=787.3±138.7


FGD2_NuMuBkg_CCother_in_AntiNu_Mode_data
N_events/MeV
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0
500
1000
1500
2000
p_μ (MeV)


FGD2_NuMuBkg_CCother_in_AntiNu_Mode_data
N_events/1
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
(Data-MC)/σ_Data
3
2
1
0
−1
−2
−3
0.7
0.75
0.8
0.85
0.9
0.95
1
cos θ_μ