

# CohJ/ $\psi$ Analysis (**OS- $\mu\mu$** )(**Coil**)(**2-track**)

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February 27, 2017

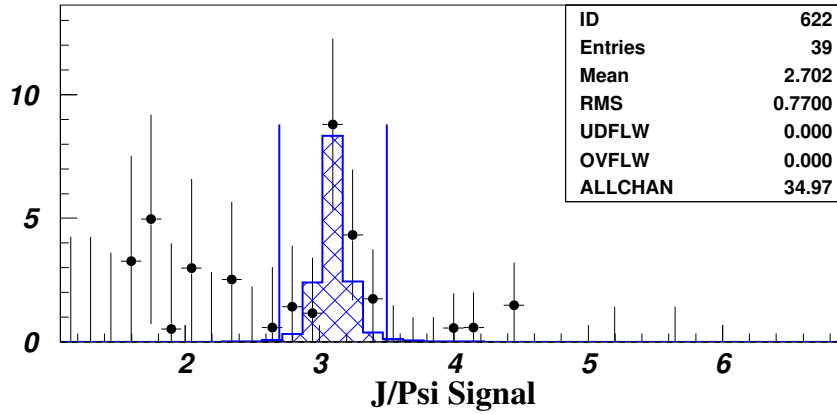
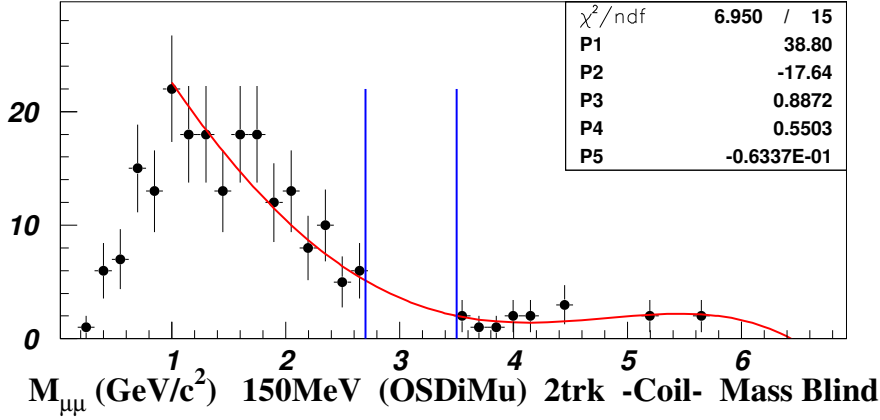
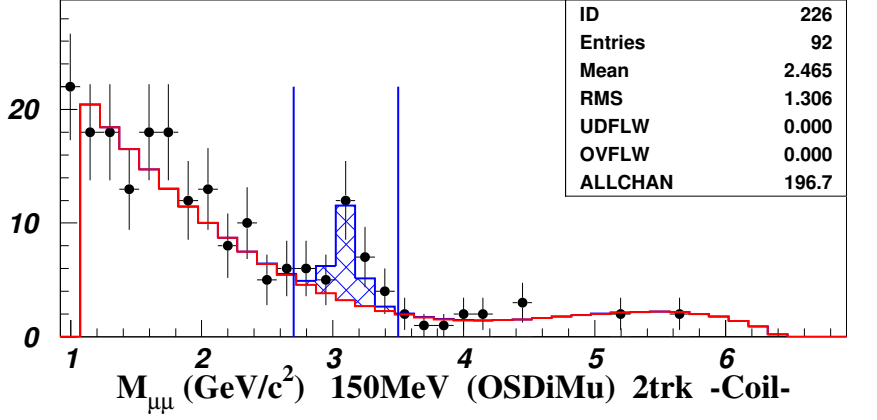
# 1 Zeroth Norms

|          | Gen Number | Zroth Norm |
|----------|------------|------------|
| CCDIS    | 4116629.0  | 1440000.0  |
| NCDIS    | 2451852.2  | 547200.0   |
| JPsi     | 337363.3   | 29.6       |
| CohPi+   | 824186.4   | 10000.0    |
| CohRho+  | 147680.4   | 7380.1     |
| aNuMu CC | 384881.8   | 36000.0    |
| QE       | 418257.5   | 32000.0    |
| CohPi0   | 179844.8   | 5000.0     |
| Nue CC   | 396271.9   | 21600.0    |
| aNue CC  | 193616.5   | 2160.0     |
| aNuMu NC | 189598.9   | 13680.0    |
| CohRho0  | 25235.8    | 1000.0     |
| Res      | 934139.8   | 50400.0    |
| CohPhi0  | 4075.9     | 200.0      |

Table 1: Generated Number of MC Events

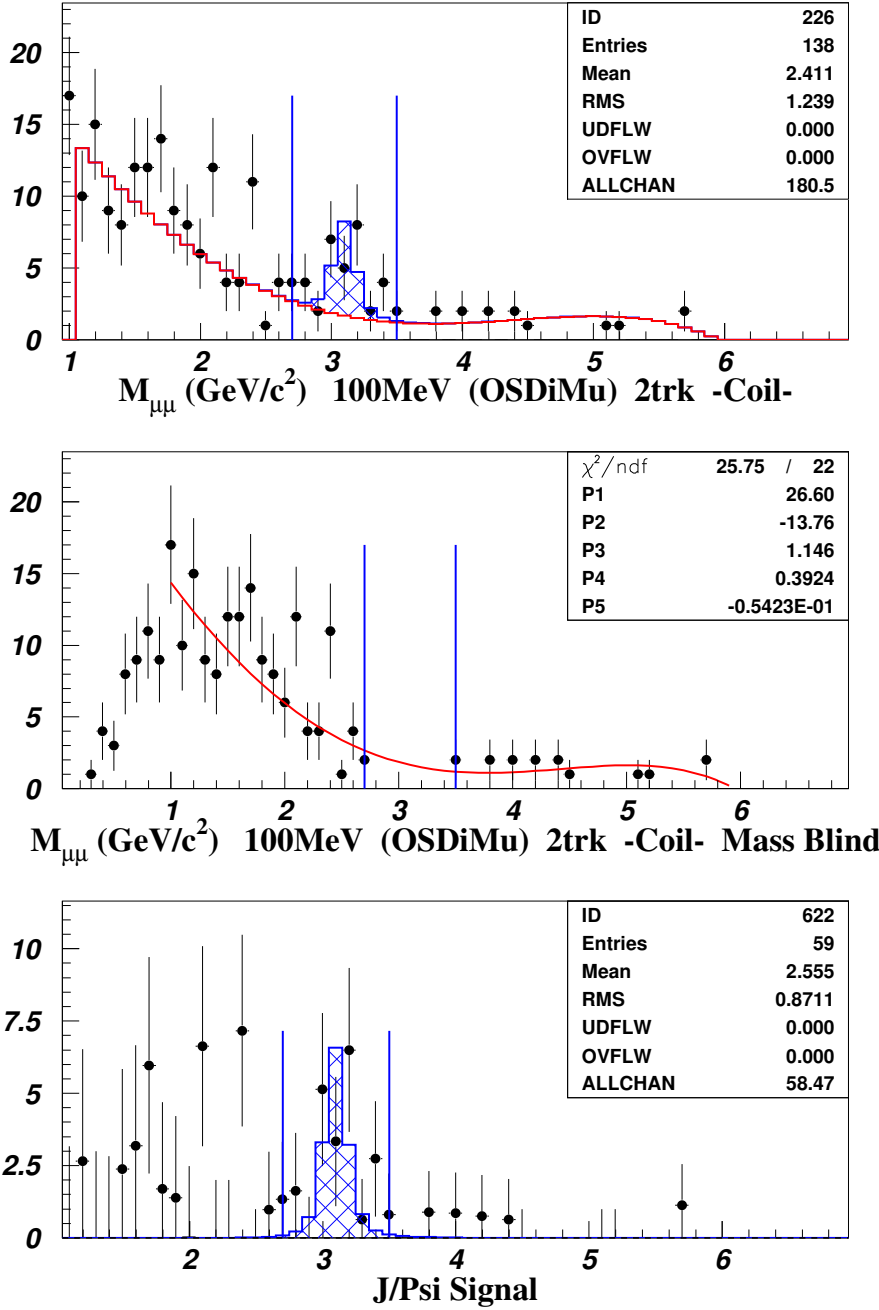
## Extra Normalizations:

- \* Coh $\pi^+$ : 0.985 (From 2V0 analysis)
- \* Coh $\pi^0$ : 0.985 (From 2V0 analysis)
- \* Coh $\rho^+$ : 0.669 (From CohRho0 measurment)
- \* Coh $\rho^0$ : 0.669 (From CohRho0 measurment)
- \* OBG: 0.22 (from CohRho0 analysis)



|                   |              |
|-------------------|--------------|
| Signal range      | 2.72-3.47    |
| Number of signal  | <b>17.45</b> |
| Background        | 16.55        |
| Statistical error | 5.83         |
| Significance      | <b>2.99</b>  |
| Signal range      | 2.87-3.32    |
| Number of signal  | <b>14.28</b> |
| Background        | 9.72         |
| Statistical error | 4.90         |
| Significance      | <b>2.92</b>  |
| Signal range      | 3.02-3.17    |
| Number of signal  | <b>8.80</b>  |
| Background        | 3.20         |
| Statistical error | 3.46         |
| Significance      | <b>2.54</b>  |

Figure 1: 150MeV Data Fit. Signal MC set to calculations in 2nd range. (./figs/data-fit-150mev.pdf)(sigcalc-150mev.tex)



|                   |              |
|-------------------|--------------|
| Signal range      | 2.75-3.45    |
| Number of signal  | <b>19.98</b> |
| Background        | 12.12        |
| Statistical error | 5.66         |
| Significance      | <b>3.53</b>  |
| Signal range      | 2.85-3.35    |
| Number of signal  | <b>15.61</b> |
| Background        | 8.49         |
| Statistical error | 4.90         |
| Significance      | <b>3.18</b>  |
| Signal range      | 2.95-3.25    |
| Number of signal  | <b>14.97</b> |
| Background        | 5.03         |
| Statistical error | 4.47         |
| Significance      | <b>3.35</b>  |

Figure 2: 100MeV Data Fit. Signal MC set to calculations in 2nd range. (./figs/data-fit-100mev.pdf)(sigcalc-150mev.tex)

## 2 MC $\chi^2$ Fit

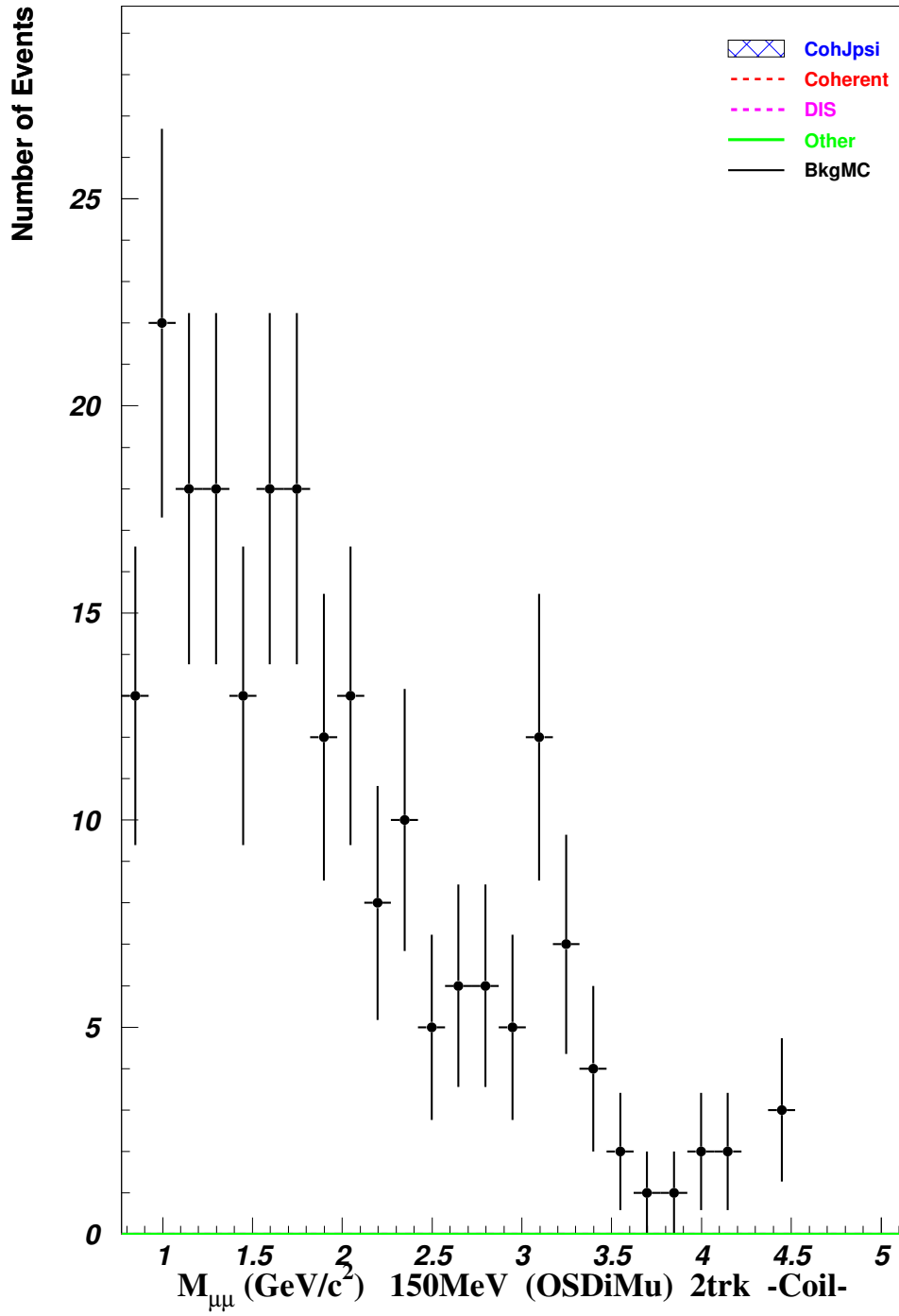


Figure 3: (./figs/mass-0.9to5-150mev.pdf)

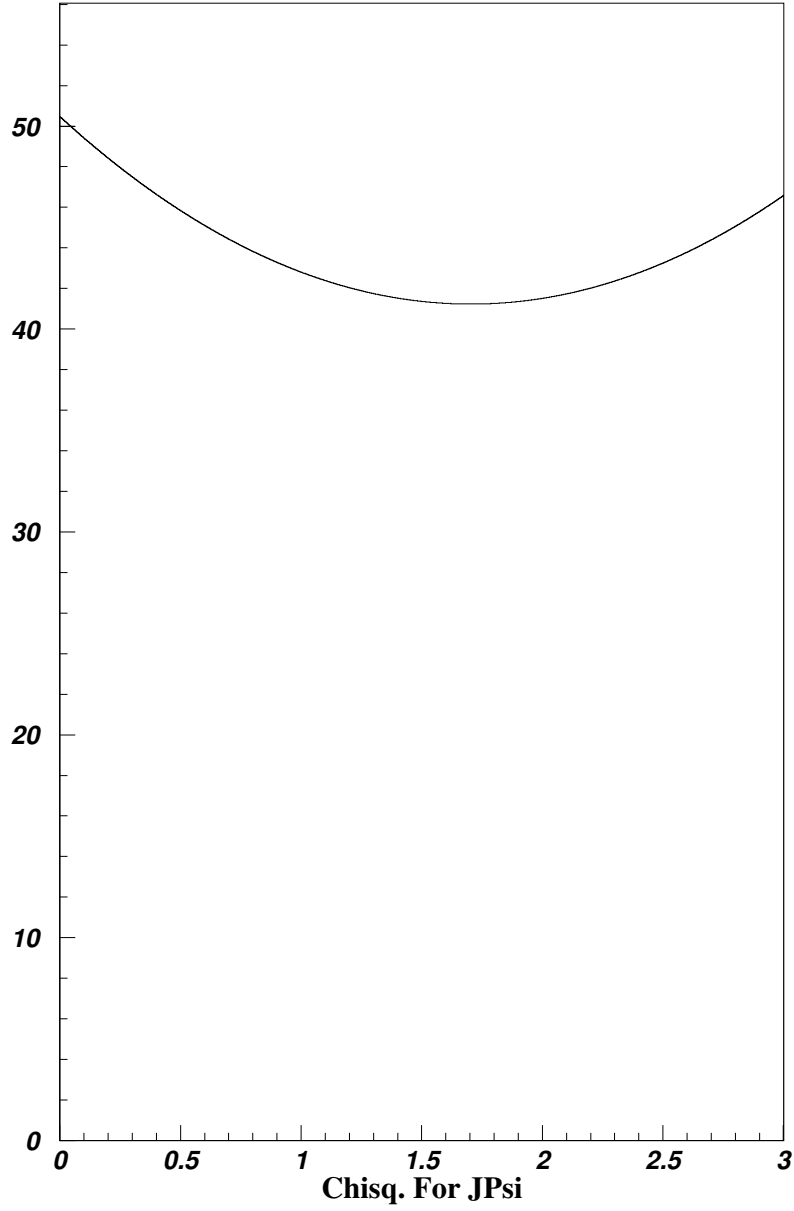


Figure 4: (chisq-jpsi.pdf)

|                          |       |          |
|--------------------------|-------|----------|
| $\chi^2$ Min 41.231      |       |          |
| Number of bins used: 29. |       |          |
| One $\sigma$ : 1.192     |       |          |
| Norm at Min $\chi^2$     | JPsi  |          |
| $-1 \sigma$              | 1.703 |          |
|                          | 1.091 | ( 35.9%) |
| $+1 \sigma$              | 2.315 | ( 35.9%) |

Table 2:  $\chi^2$  for JPsi on plot: 'Mmumu'

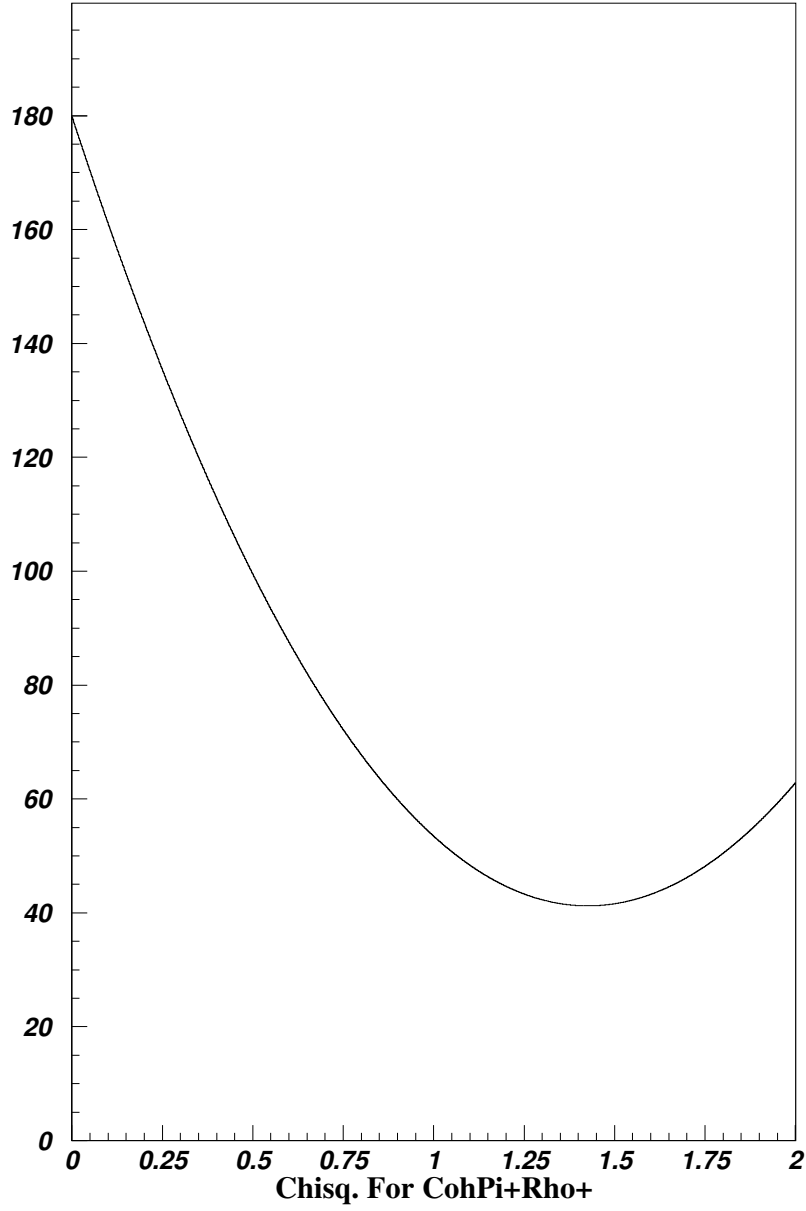


Figure 5: (chisq-cohpi.pdf)

|                          |            |         |
|--------------------------|------------|---------|
| $\chi^2$ Min 41.231      |            |         |
| Number of bins used: 29. |            |         |
| One $\sigma$ : 1.192     |            |         |
| Norm at Min $\chi^2$     | CohPi+Rho+ |         |
| $-1 \sigma$              | 1.425      |         |
|                          | 1.293      | ( 9.3%) |
| $+1 \sigma$              | 1.559      | ( 9.4%) |

Table 3:  $\chi^2$  for CohPi+Rho+ on plot: 'Mmumu'

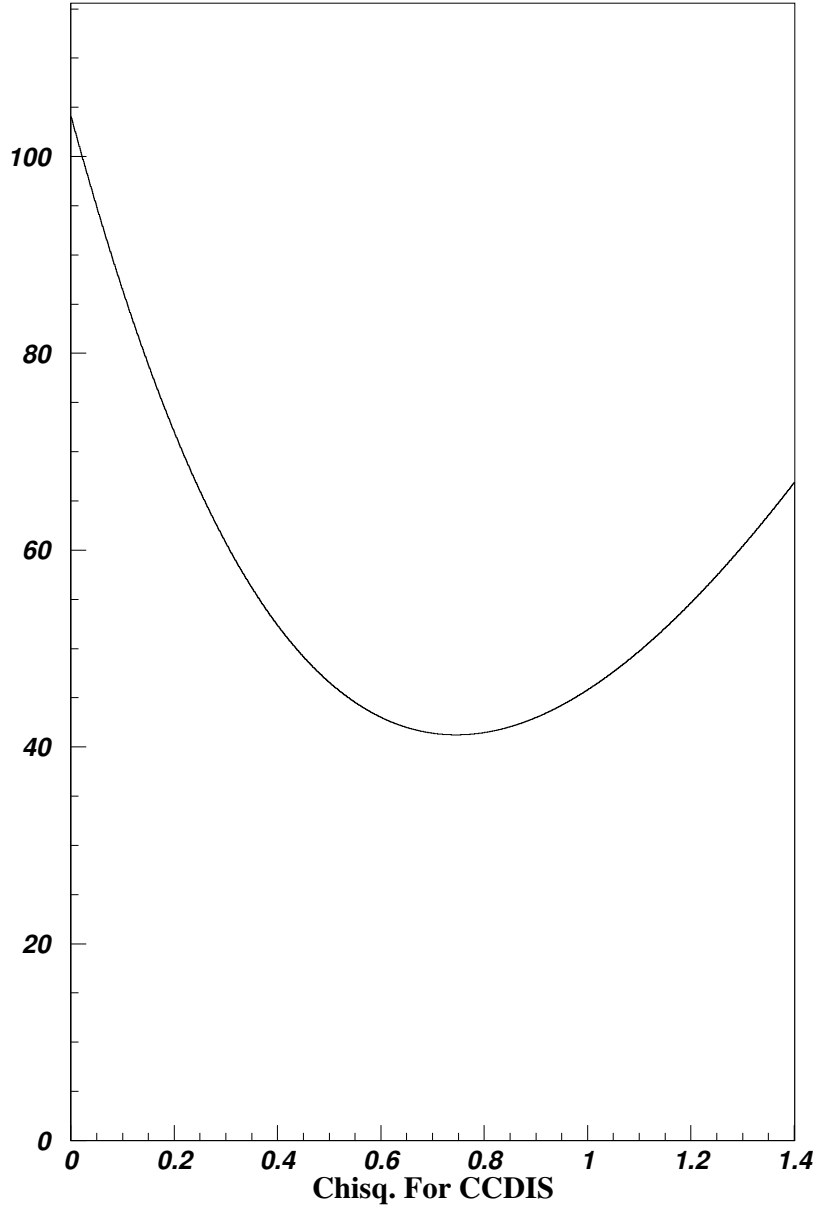


Figure 6: (chisq-ccdiss.pdf)

|                          |       |          |
|--------------------------|-------|----------|
| $\chi^2$ Min 41.231      |       |          |
| Number of bins used: 29. |       |          |
| One $\sigma$ : 1.192     |       |          |
| Norm at Min $\chi^2$     | CCDIS |          |
| $-1 \sigma$              | 0.745 |          |
|                          | 0.626 | ( 16.0%) |
| $+1 \sigma$              | 0.871 | ( 16.9%) |

Table 4:  $\chi^2$  for CCDIS on plot: 'Mmumu'



### 3 Summary Cut Tables

| Cut Name                 | CCDIS | Coh $\pi^+$ | Coh $\rho^+$ | Coh $J/\psi$ | Other | Total | Data   |
|--------------------------|-------|-------------|--------------|--------------|-------|-------|--------|
| 1) Raw Events            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2773.0 |
| 2) OBGfid,Trig+CohGenTh  | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2773.0 |
| 3) Pfermi & W2           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2773.0 |
| 4) Fid. Vol. -X          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2578.0 |
| 5) Fid. Vol. -Y          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2471.0 |
| 6) Fid. Vol. -Z (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2471.0 |
| 7) At Least 1 Mu         | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2471.0 |
| 8) ncand=2,3,4           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2471.0 |
| 9) tnchgd=2              | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2346.0 |
| 10) +/- Tracks (V0)      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2077.0 |
| 11) Tube/Veto Cut        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2077.0 |
| 12) 2 Muons (1mux)       | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2077.0 |
| 13) PmuAsymj0.0          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 397.0  |
| 14) Theta<2.62 rad       | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 397.0  |
| 15) Pt+wrt- >0.05        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 397.0  |
| 16) Mee > 2.0 (OFF)      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 397.0  |
| 17) Upstream Hanger cut  | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 397.0  |
| 18) nsecond<4            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 364.0  |
| 19) Fid. Vol. Hanger cut | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 302.0  |
| 20) No Hangers fromPVert | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 302.0  |
| 21) Pz>0 for tracks      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 302.0  |
| 22) Thprimord<0.4        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 271.0  |
| 23) Nunh*fracunh<200     | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |
| 24) Emumu>2GeV           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |
| 25) P+,P->0.5            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |
| 26) P+,P->1.0 (2.5mux)   | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |
| 27) Emumu>5GeV (8mux)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |
| 28) Phi12>90deg (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |
| 29) Pmumu>10GeV (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 254.0  |

Table 5: Summary Cut Table (**all events**)

| Cut Name                 | CCDIS | Coh $\pi^+$ | Coh $\rho^+$ | Coh $J/\psi$ | Other | Total | Data   |
|--------------------------|-------|-------------|--------------|--------------|-------|-------|--------|
| 1) Raw Events            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2401.0 |
| 2) OBGfid,Trig+CohGenTh  | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2401.0 |
| 3) Pfermi & W2           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2401.0 |
| 4) Fid. Vol. -X          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2224.0 |
| 5) Fid. Vol. -Y          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2131.0 |
| 6) Fid. Vol. -Z (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2131.0 |
| 7) At Least 1 Mu         | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2131.0 |
| 8) ncand=2,3,4           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2131.0 |
| 9) tchgd=2               | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 2016.0 |
| 10) +/- Tracks (V0)      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 1782.0 |
| 11) Tube/Veto Cut        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 1782.0 |
| 12) 2 Muons (1mux)       | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 1782.0 |
| 13) PmuAsymj0.0          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 345.0  |
| 14) Theta<2.62 rad       | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 345.0  |
| 15) Pt+wrt- >0.05        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 345.0  |
| 16) Mee > 2.0 (OFF)      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 345.0  |
| 17) Upstream Hanger cut  | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 345.0  |
| 18) nsecond<4            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 313.0  |
| 19) Fid. Vol. Hanger cut | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 259.0  |
| 20) No Hangers fromPVert | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 259.0  |
| 21) Pz>0 for tracks      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 259.0  |
| 22) Thprimord<0.4        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 233.0  |
| 23) Nunh*fracunh<200     | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |
| 24) Emumu>2GeV           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |
| 25) P+,P->0.5            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |
| 26) P+,P->1.0 (2.5mux)   | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |
| 27) Emumu>5GeV (8mux)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |
| 28) Phi12>90deg (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |
| 29) Pmumu>10GeV (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 220.0  |

Table 6: Summary Cut Table (**mass blind**)

| Cut Name                 | CCDIS | Coh $\pi^+$ | Coh $\rho^+$ | Coh $J/\psi$ | Other | Total | Data  |
|--------------------------|-------|-------------|--------------|--------------|-------|-------|-------|
| 1) Raw Events            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 372.0 |
| 2) OBGfid,Trig+CohGenTh  | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 372.0 |
| 3) Pfermi & W2           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 372.0 |
| 4) Fid. Vol. -X          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 354.0 |
| 5) Fid. Vol. -Y          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 340.0 |
| 6) Fid. Vol. -Z (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 340.0 |
| 7) At Least 1 Mu         | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 340.0 |
| 8) ncand=2,3,4           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 340.0 |
| 9) tnchgd=2              | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 330.0 |
| 10) +/- Tracks (V0)      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 295.0 |
| 11) Tube/Veto Cut        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 295.0 |
| 12) 2 Muons (1mux)       | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 295.0 |
| 13) PmuAsym;0.0          | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 52.0  |
| 14) Theta<2.62 rad       | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 52.0  |
| 15) Pt+wrt- >0.05        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 52.0  |
| 16) Mee > 2.0 (OFF)      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 52.0  |
| 17) Upstream Hanger cut  | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 52.0  |
| 18) nsecond<4            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 51.0  |
| 19) Fid. Vol. Hanger cut | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 43.0  |
| 20) No Hangers fromPVert | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 43.0  |
| 21) Pz>0 for tracks      | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 43.0  |
| 22) Thprimord<0.4        | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 38.0  |
| 23) Nunh*fracunh<200     | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |
| 24) Emumu>2GeV           | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |
| 25) P+,P->0.5            | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |
| 26) P+,P->1.0 (2.5mux)   | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |
| 27) Emumu>5GeV (8mux)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |
| 28) Phi12>90deg (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |
| 29) Pmumu>10GeV (OFF)    | 0.0   | 0.0         | 0.0          | 0.0          | 0.0   | 0.0   | 34.0  |

Table 7: Summary Cut Table (**mass sig.**)

## 4 Plots

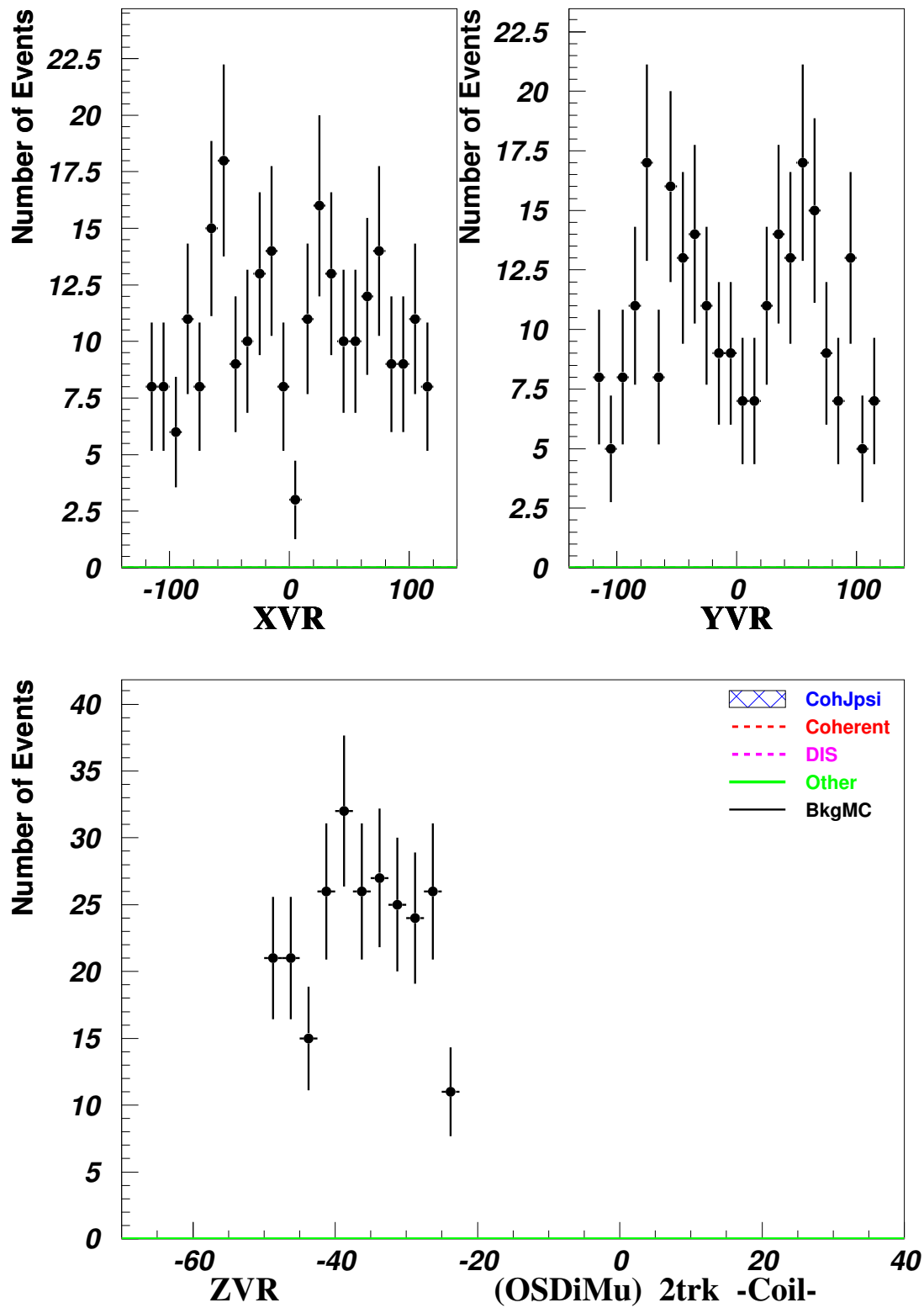


Figure 7: (./figs/vertex.pdf)

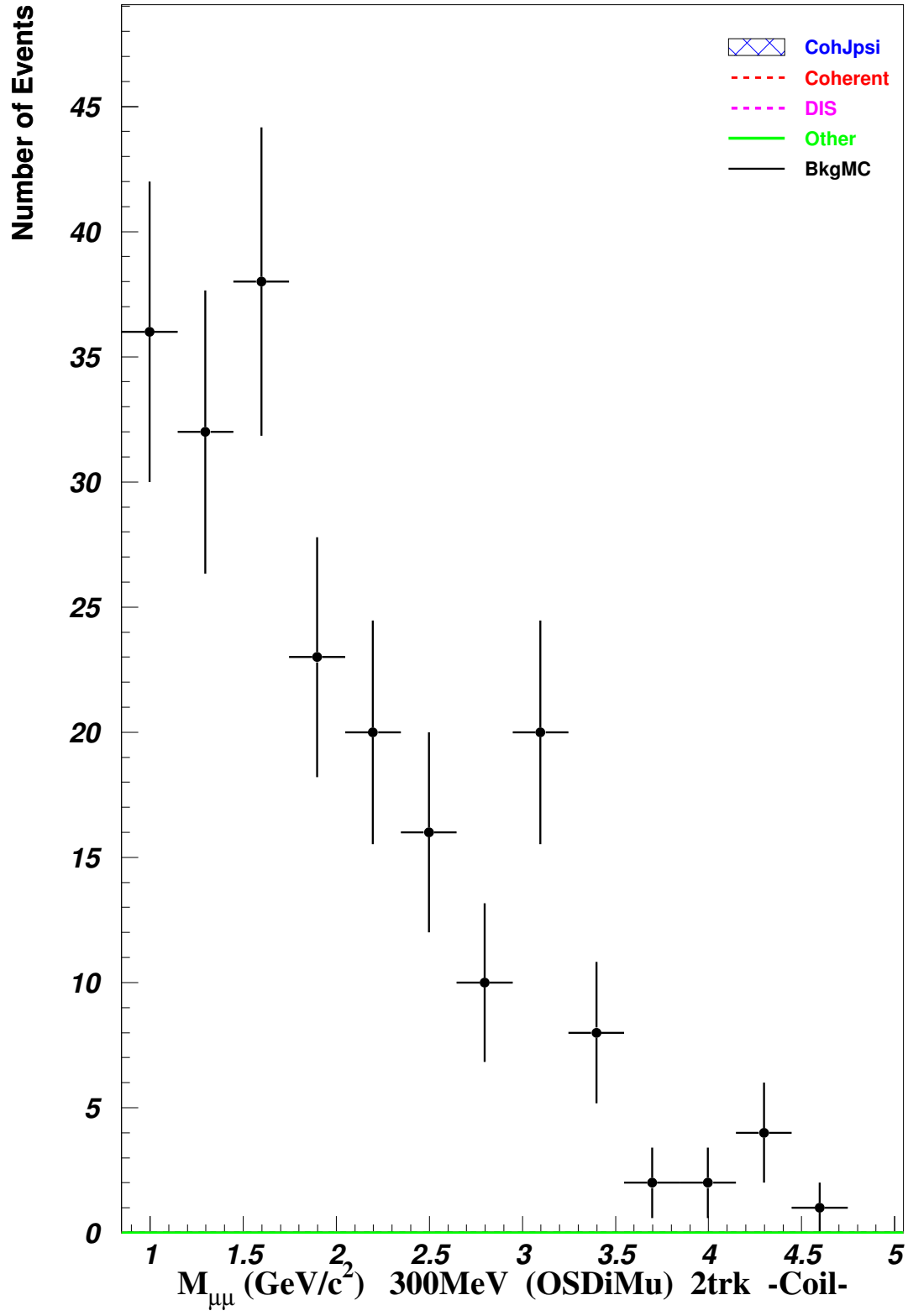


Figure 8: (./figs/mass-0.9to5-300mev.pdf)

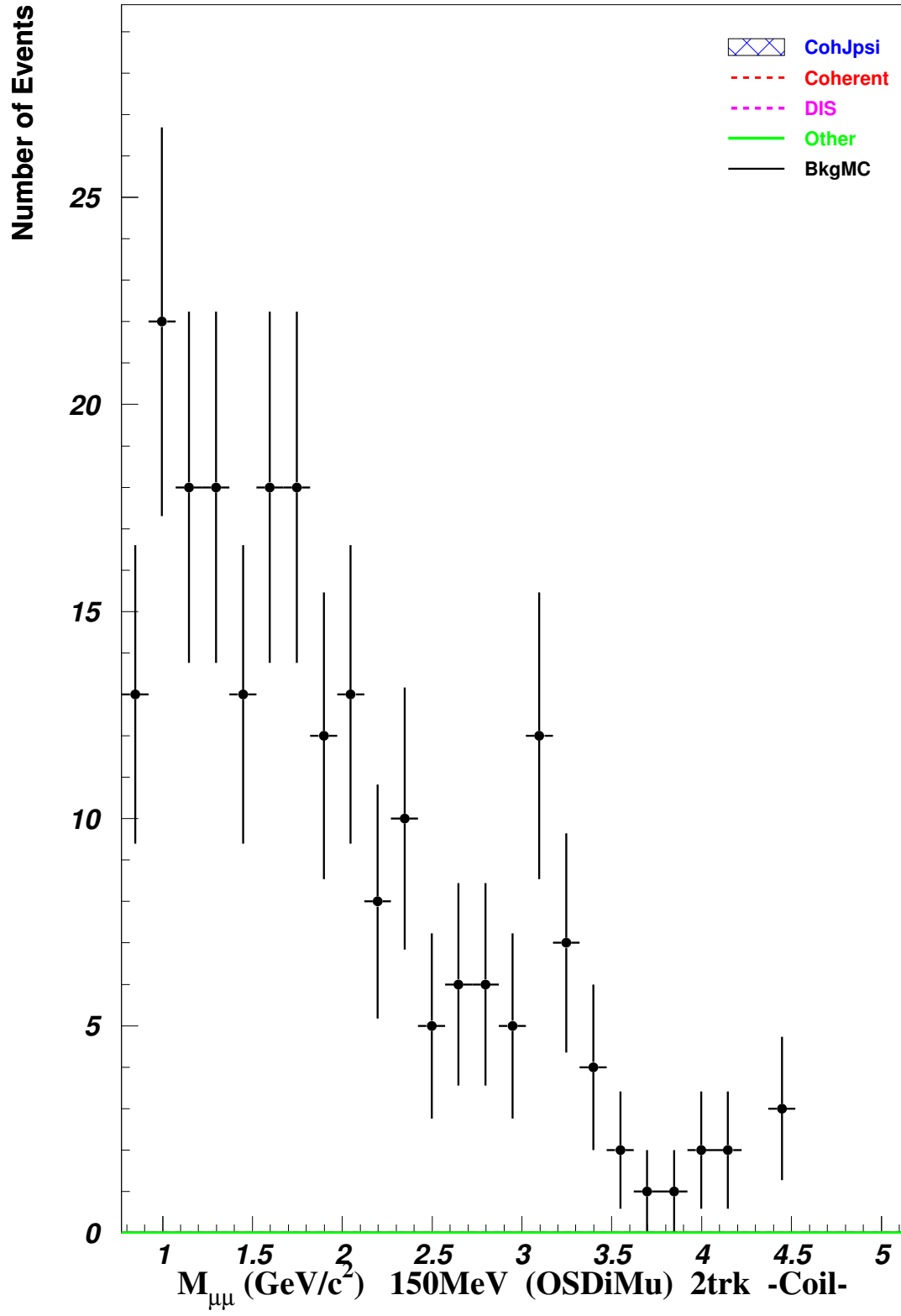


Figure 9: (./figs/mass-0.9to5-150mev.pdf)

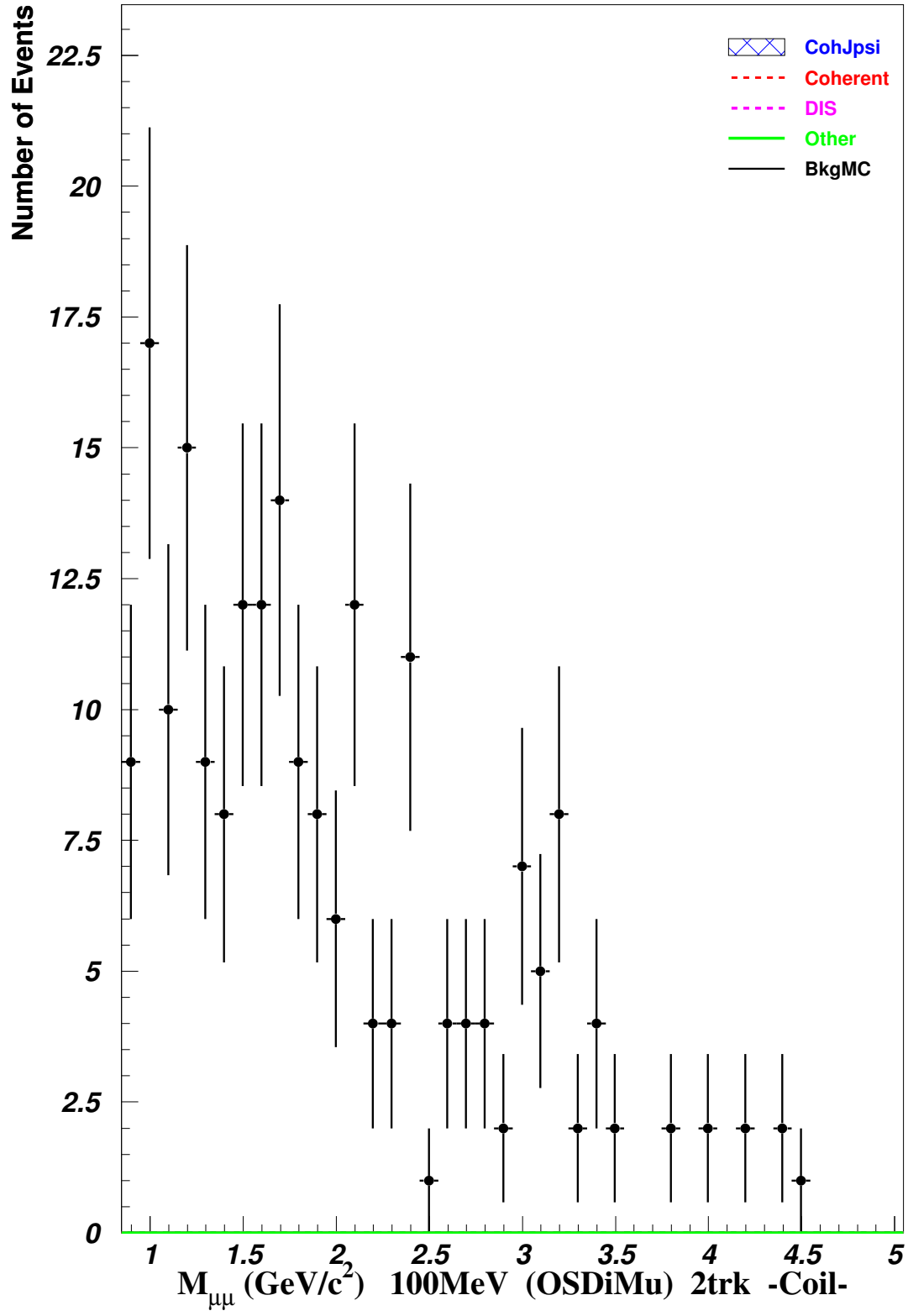


Figure 10: (./figs/mass-0.9to5-100mev.pdf)

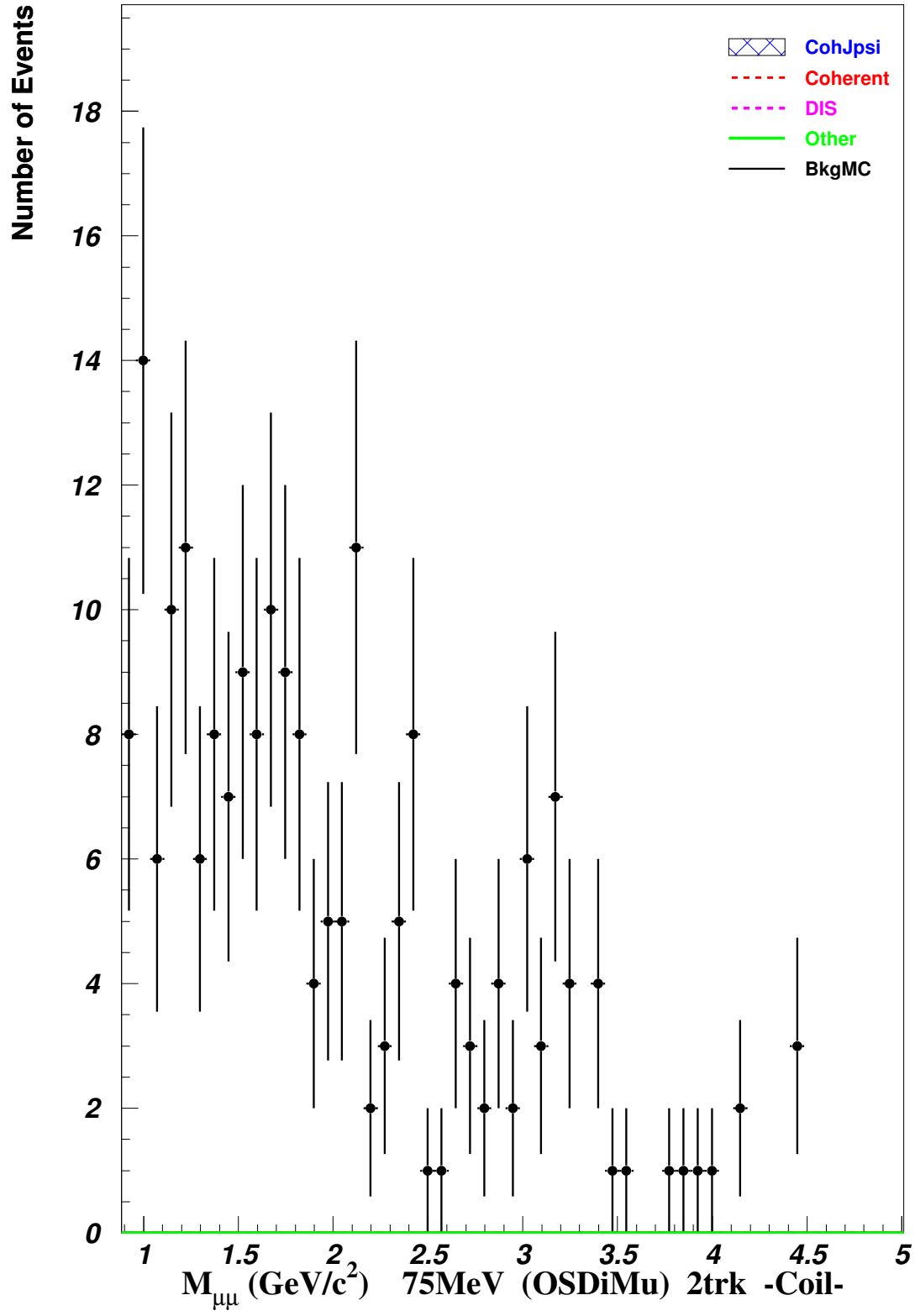


Figure 11: (./figs/mass-0.9to5-75mev.pdf)



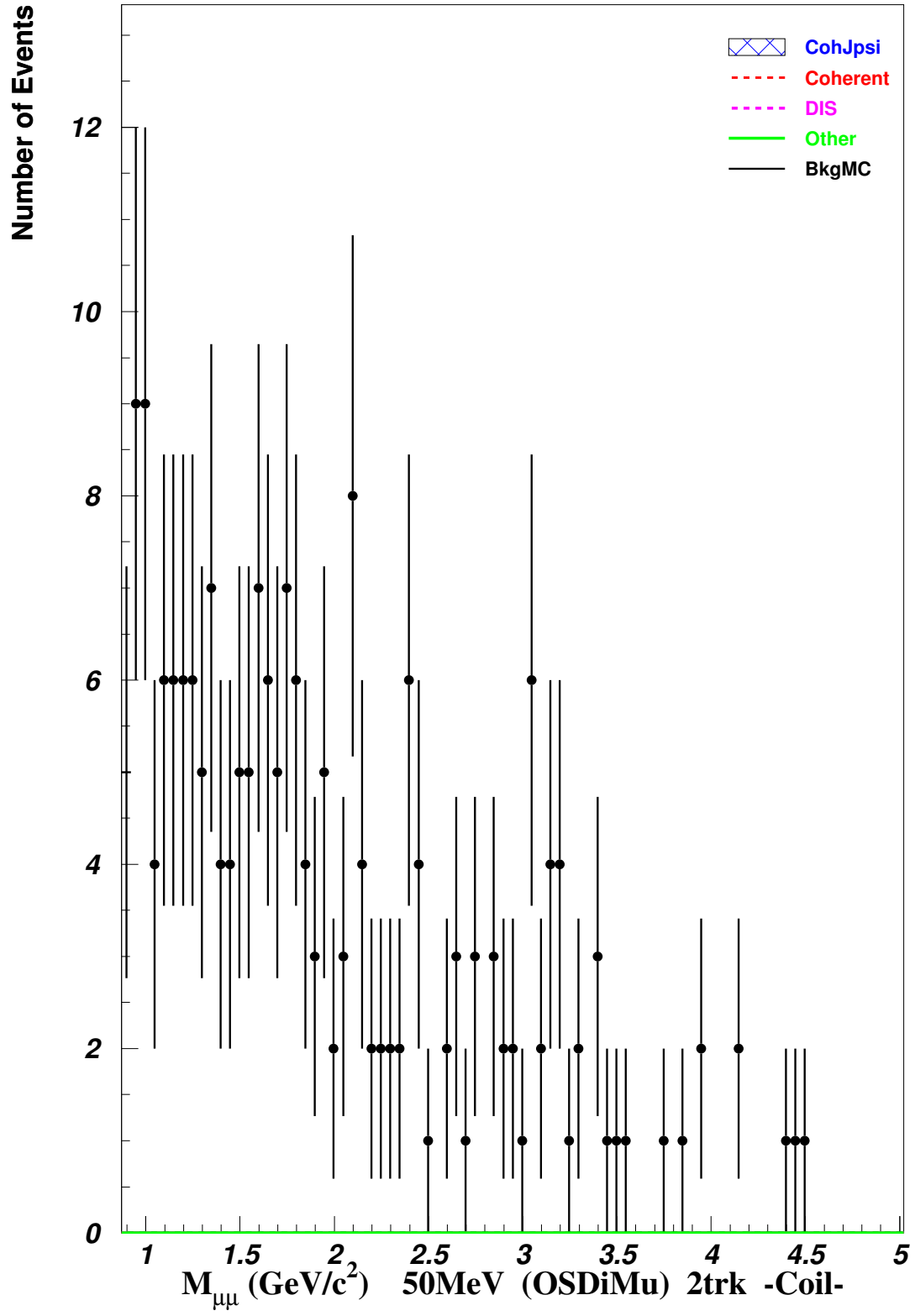


Figure 12: (./figs/mass-0.9to5-50mev.pdf)

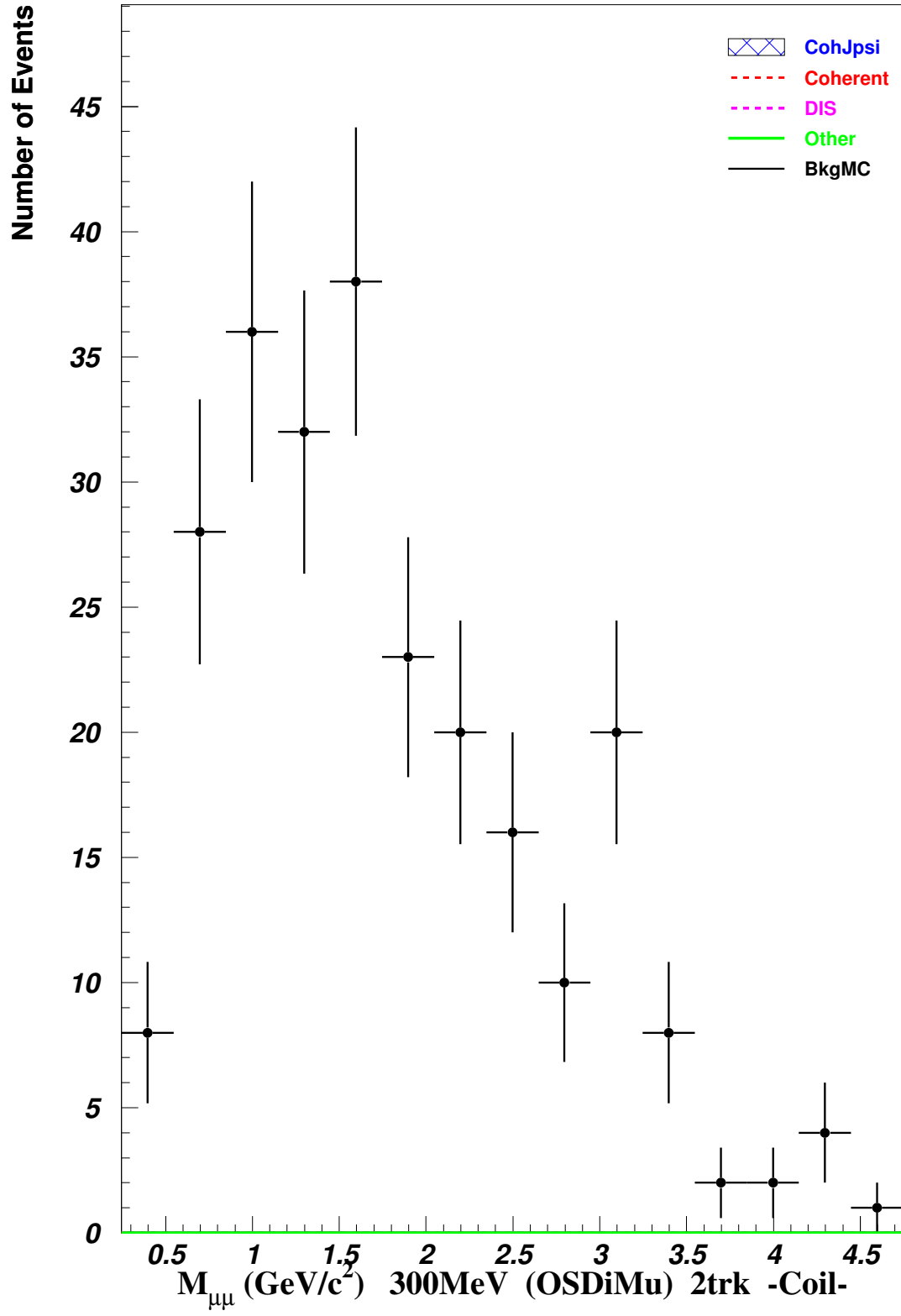


Figure 13: (./figs/mass-0to5-300mev.pdf)

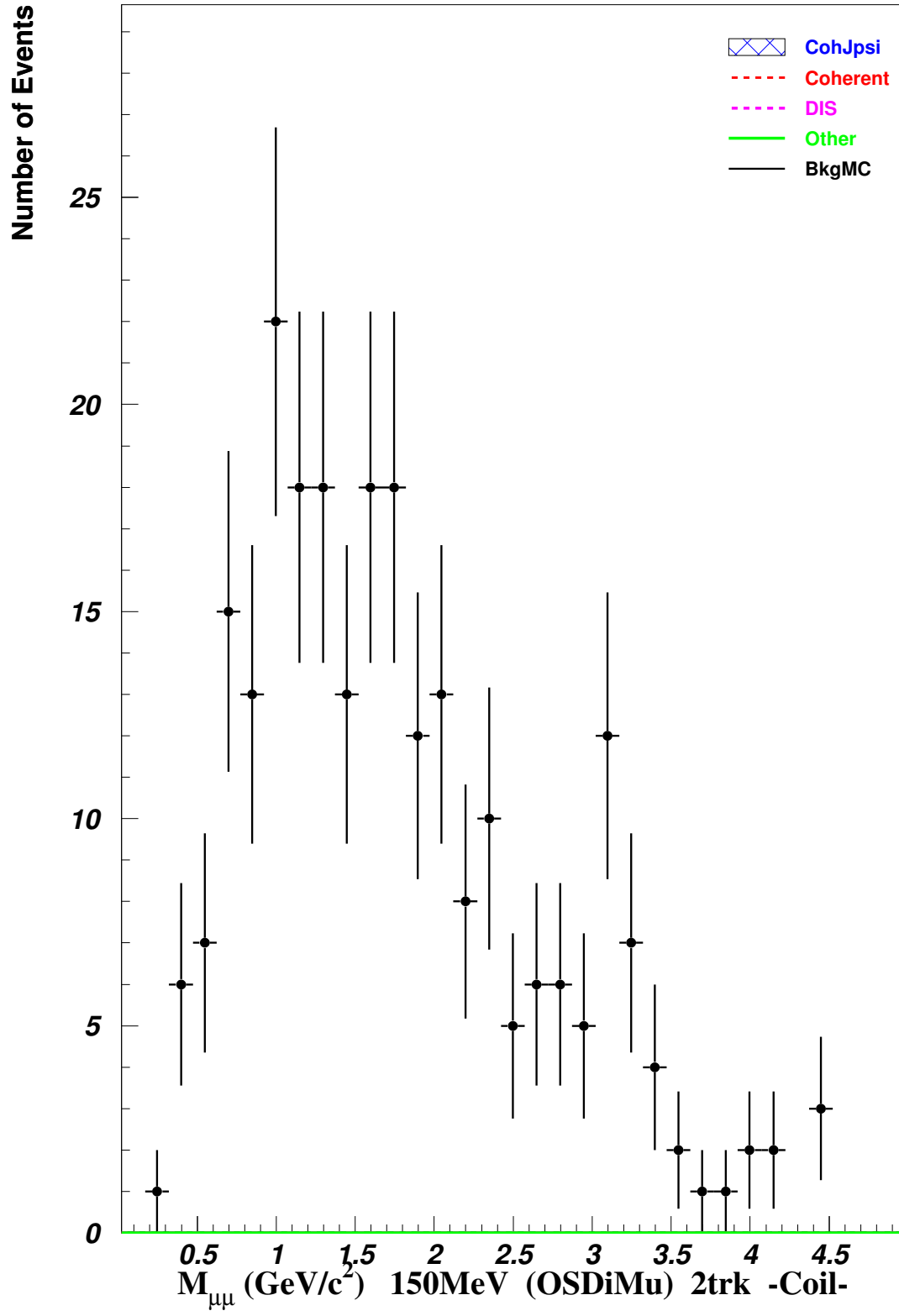


Figure 14: (./figs/mass-0to5-150mev.pdf)

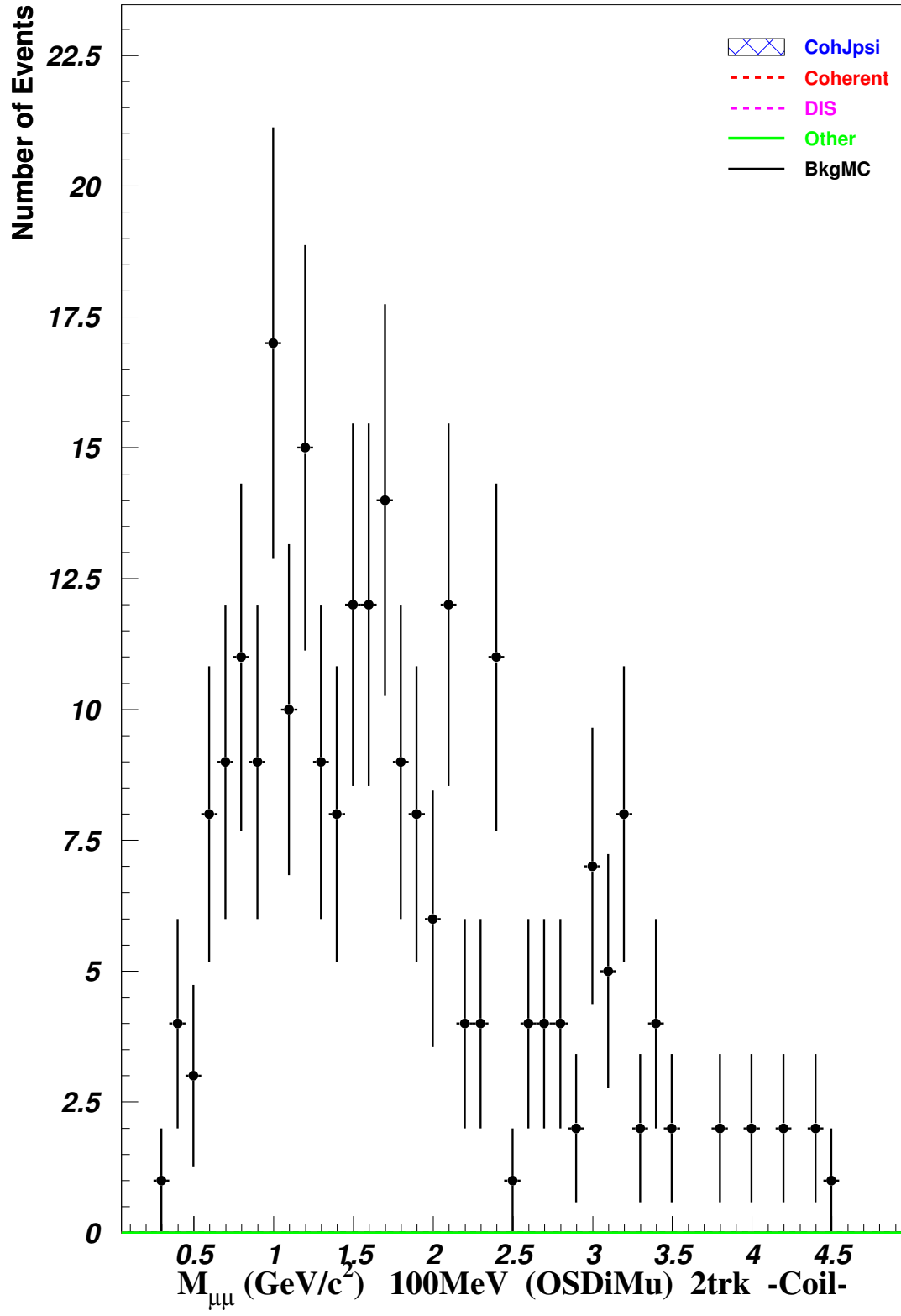


Figure 15: (./figs/mass-0to5-100mev.pdf)

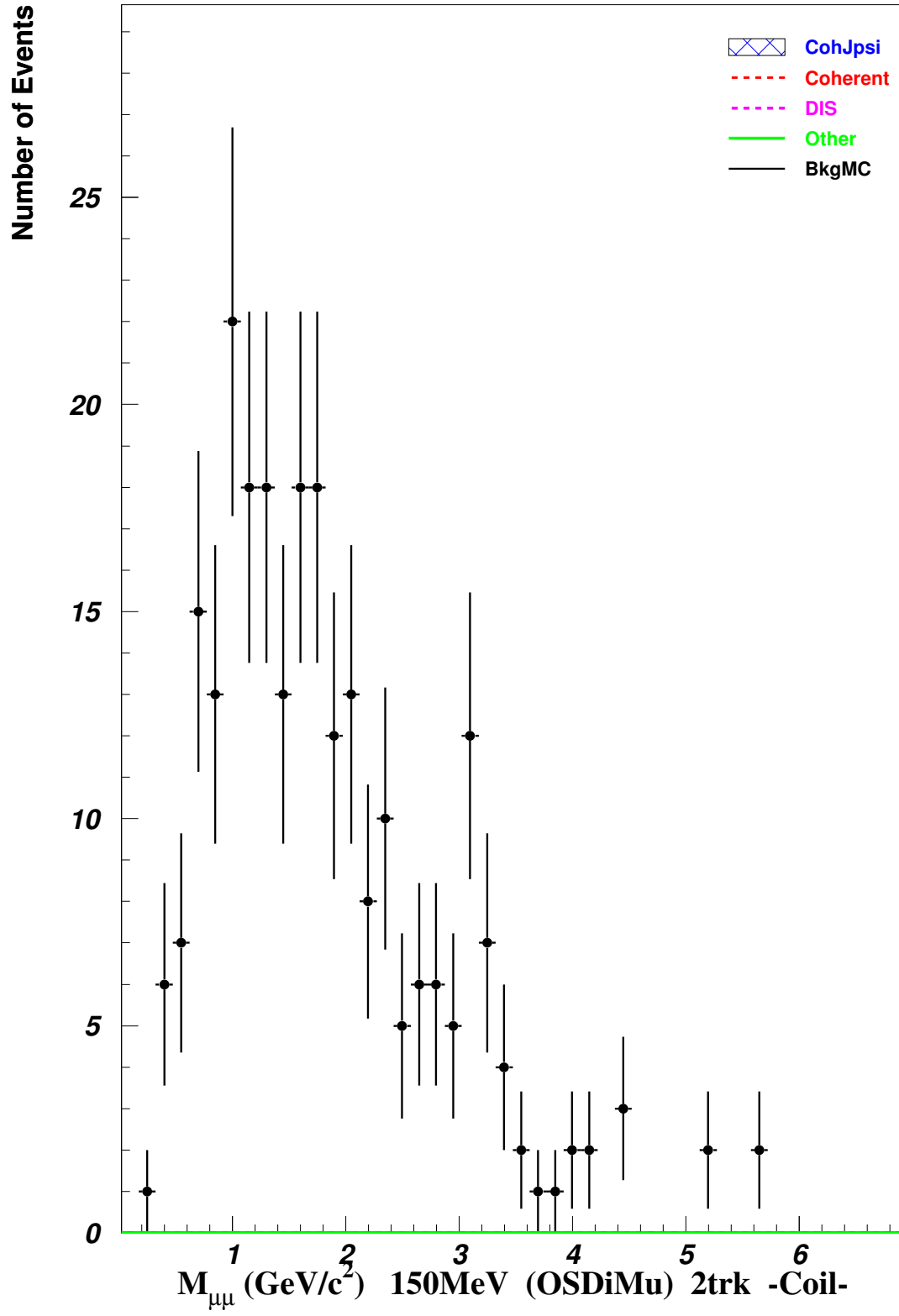


Figure 16: (./figs/mass-0to7-150mev.pdf)

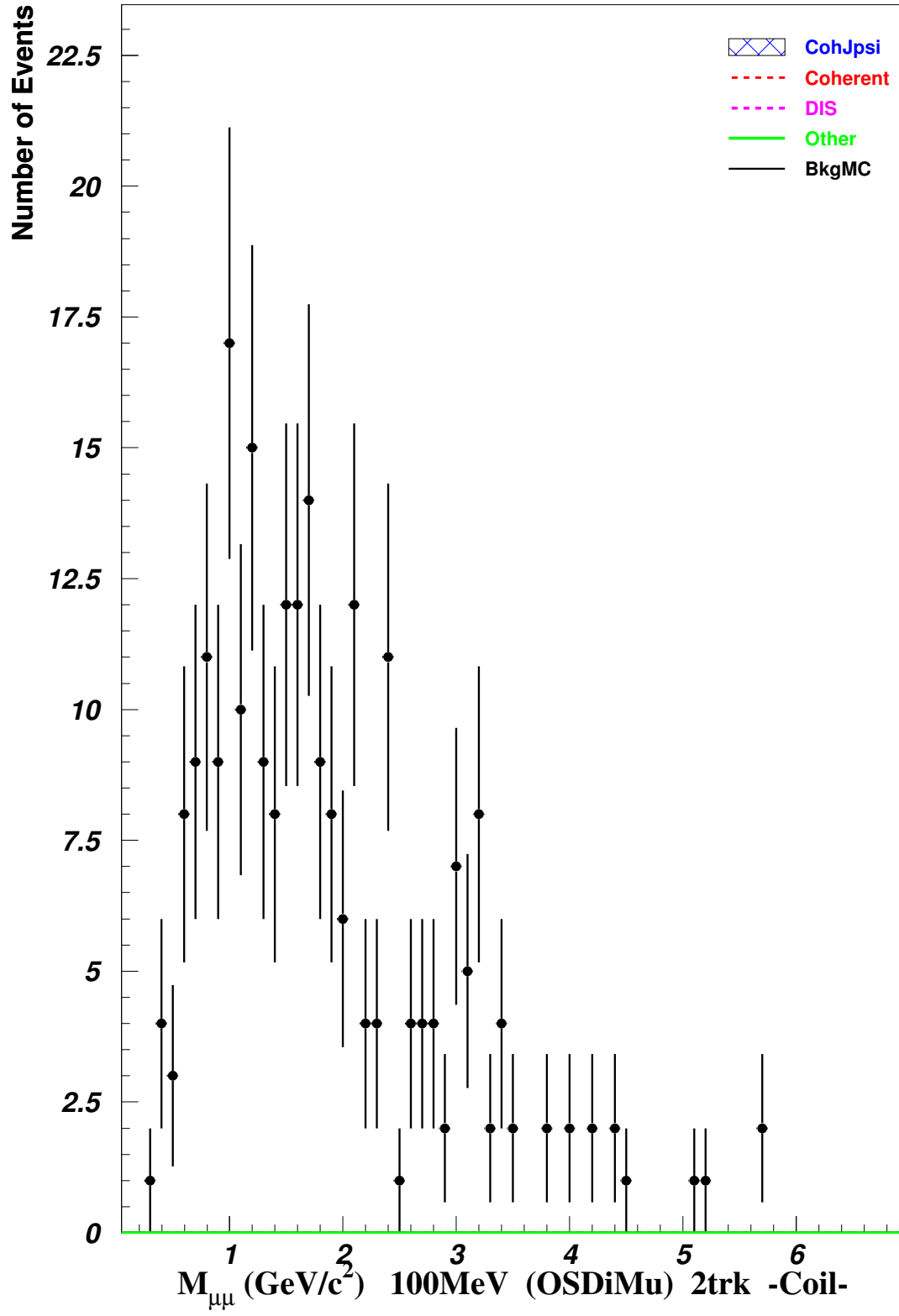


Figure 17: (./figs/mass-0to7-100mev.pdf)

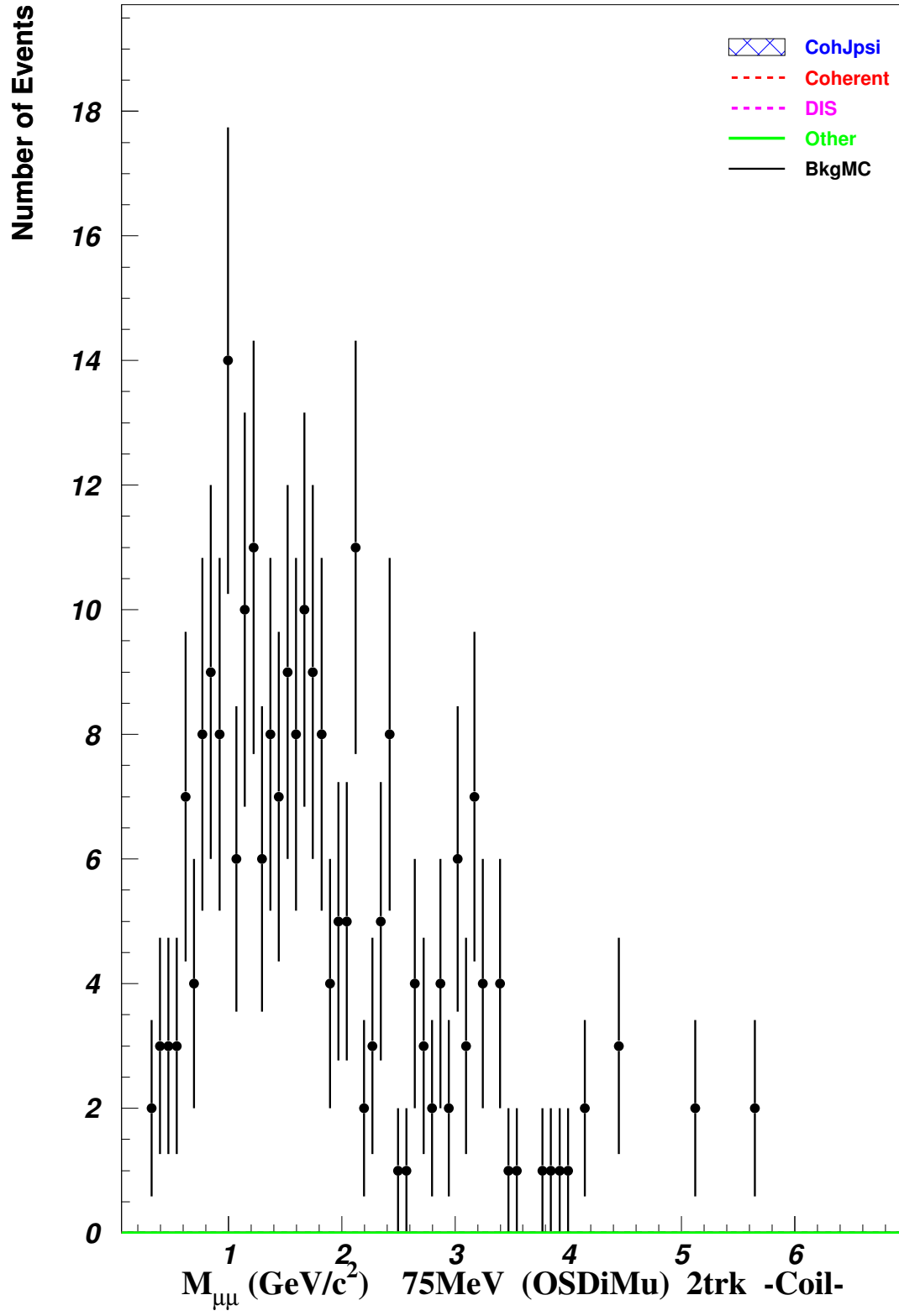


Figure 18: (./figs/mass-0to7-75mev.pdf)

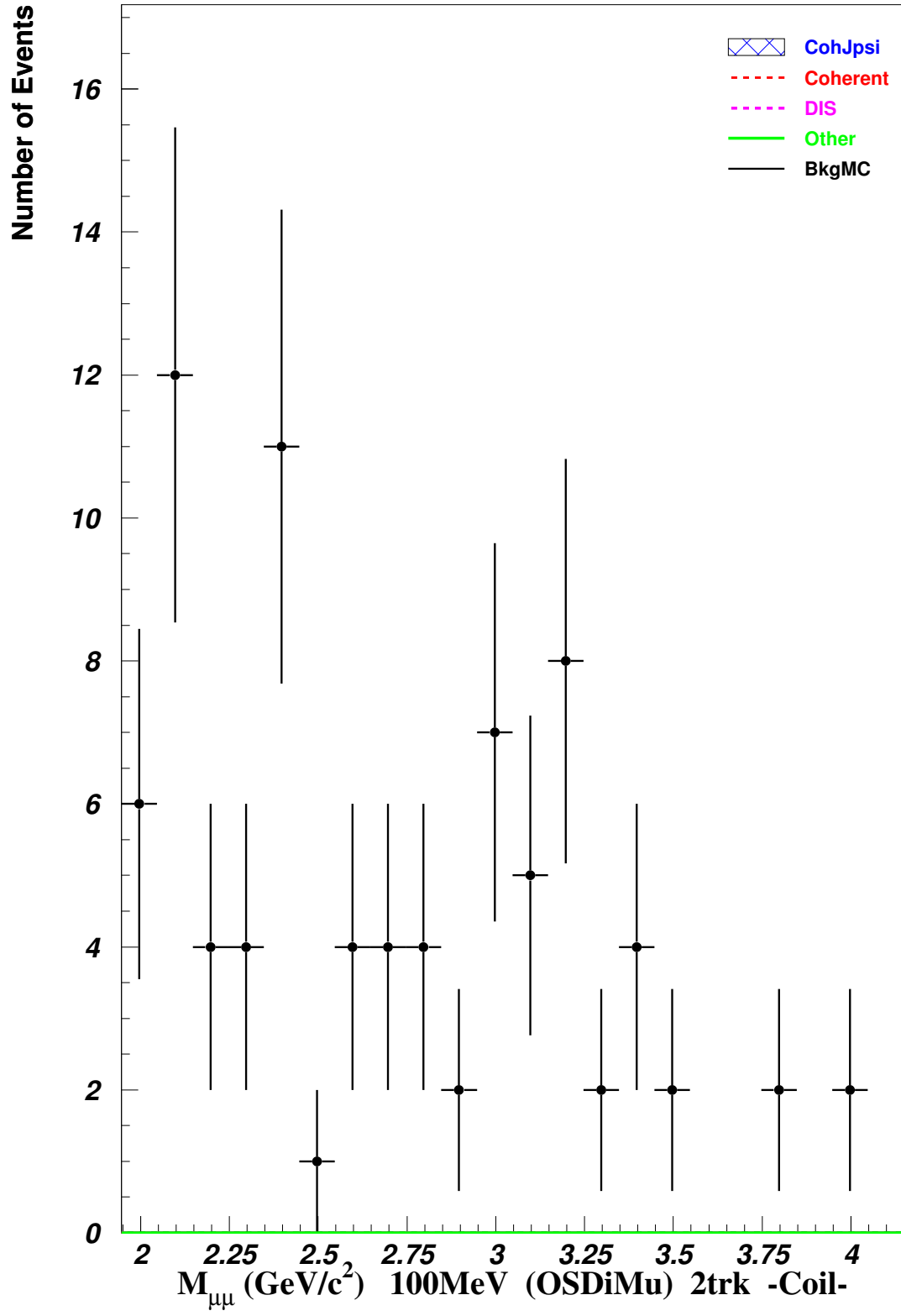


Figure 19: (./figs/mass-2to4-100mev.pdf)



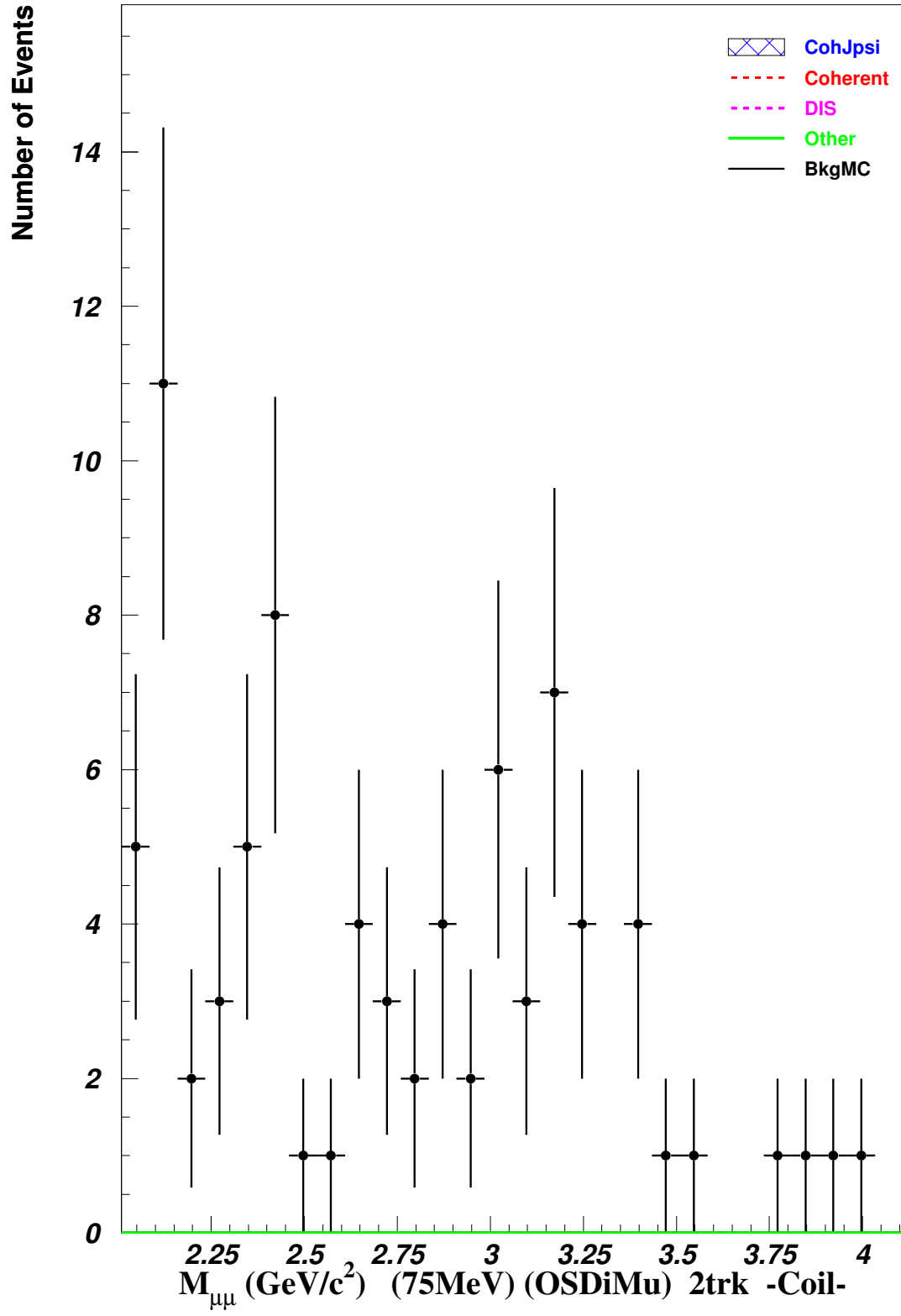


Figure 20: (./figs/mass-2to4-75mev.pdf)

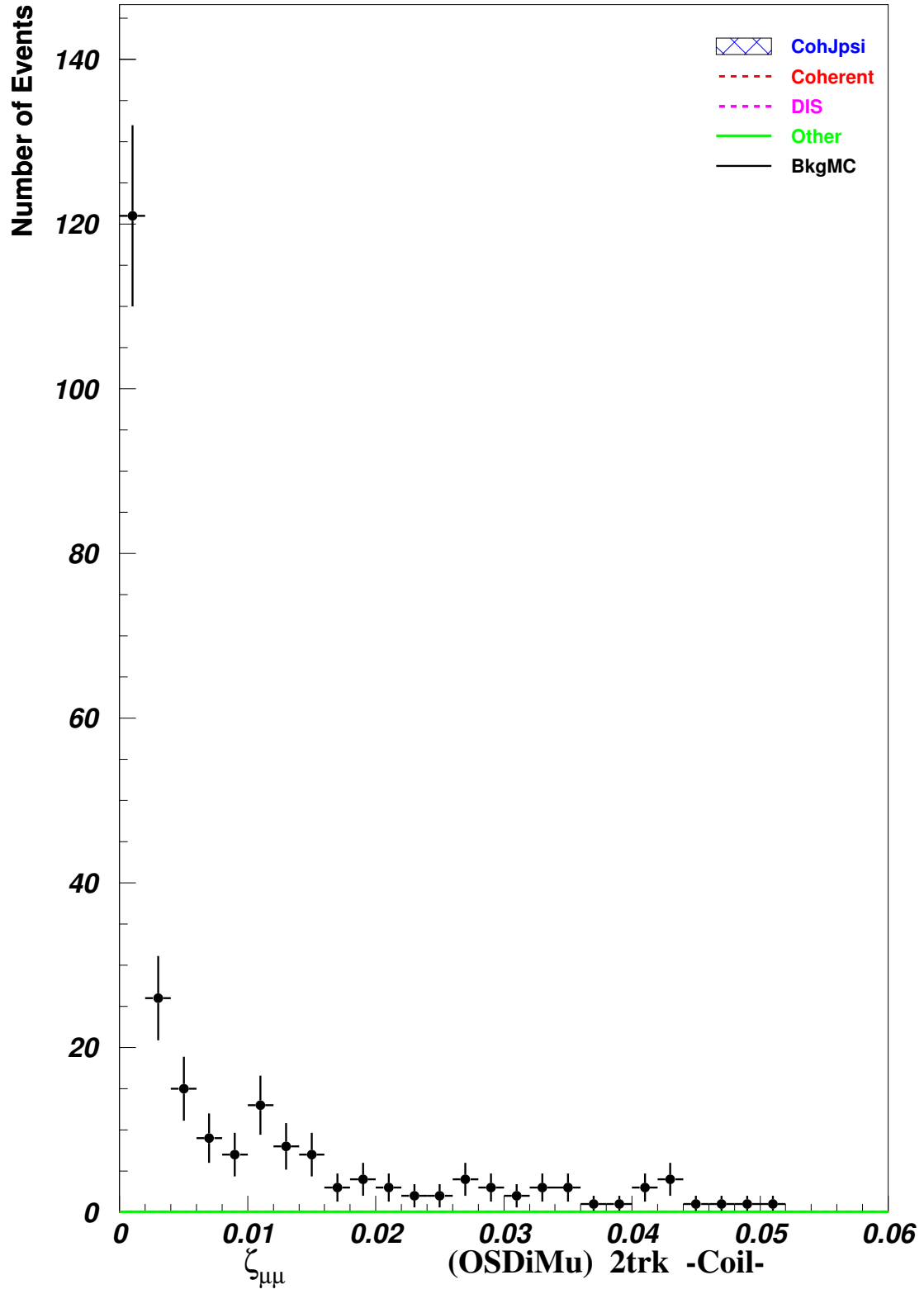


Figure 21: (./figs/zetamumu.pdf)

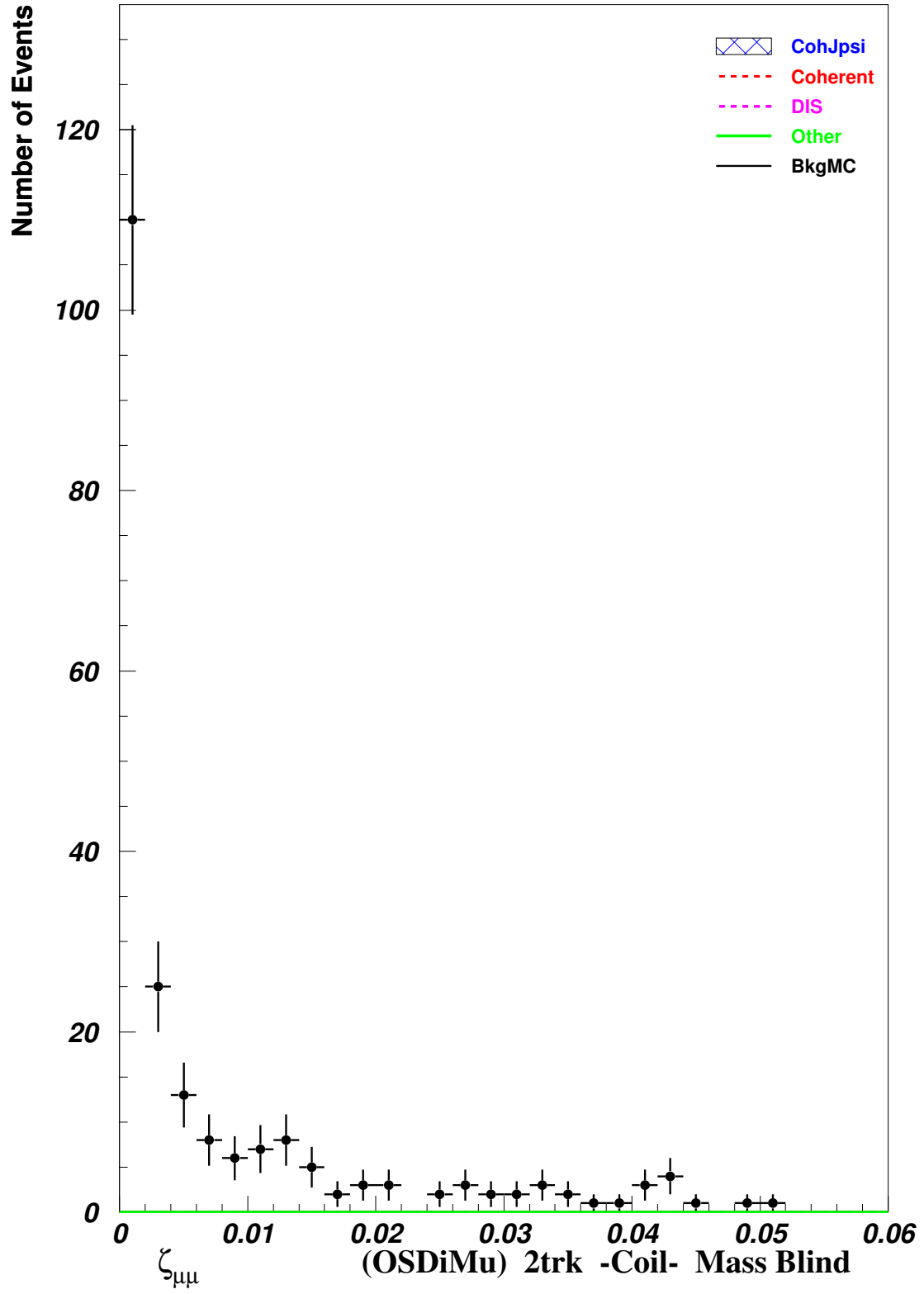


Figure 22: (./figs/zetamumu-mb.pdf)

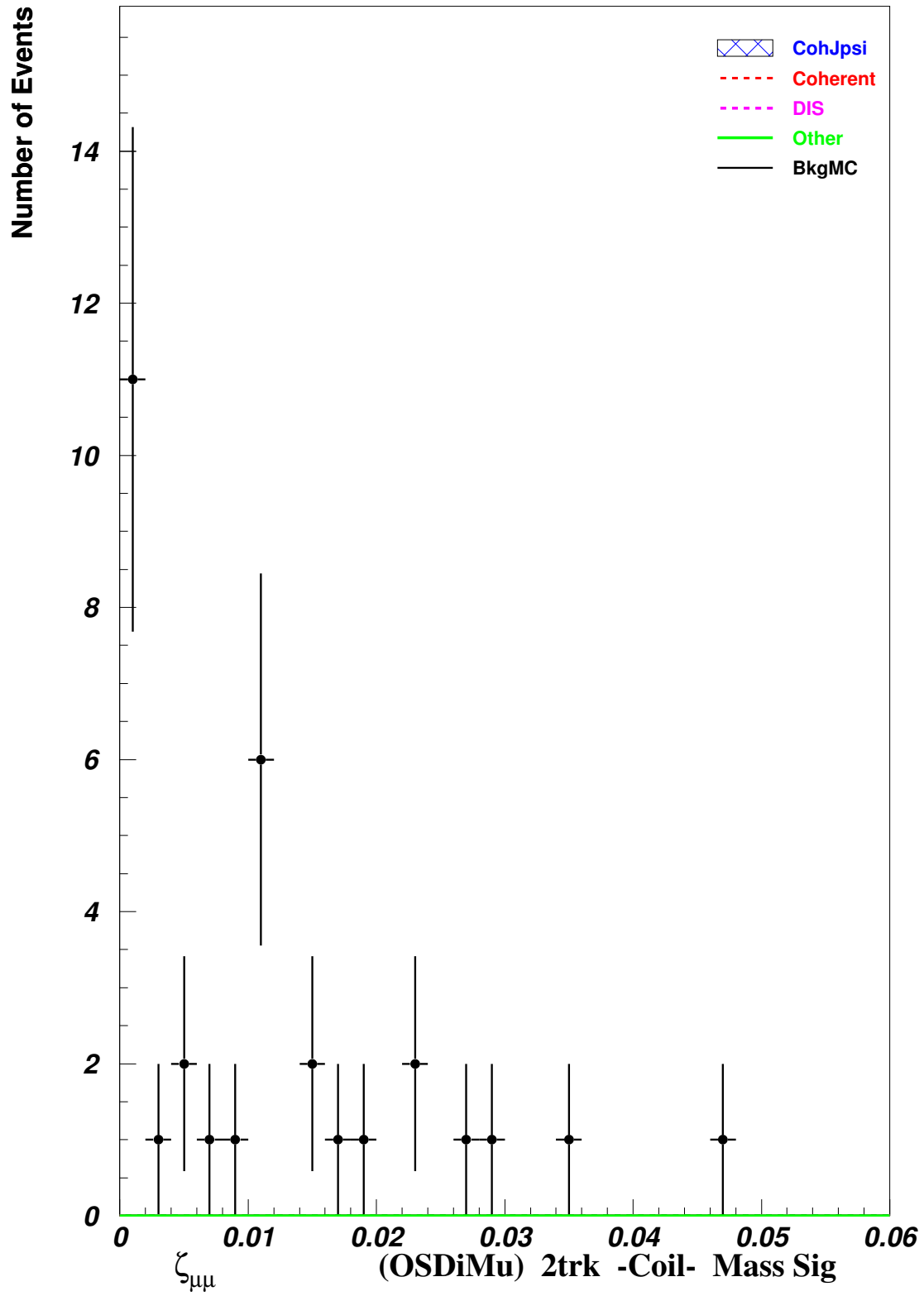


Figure 23: (./figs/zetamumu-msig.pdf)

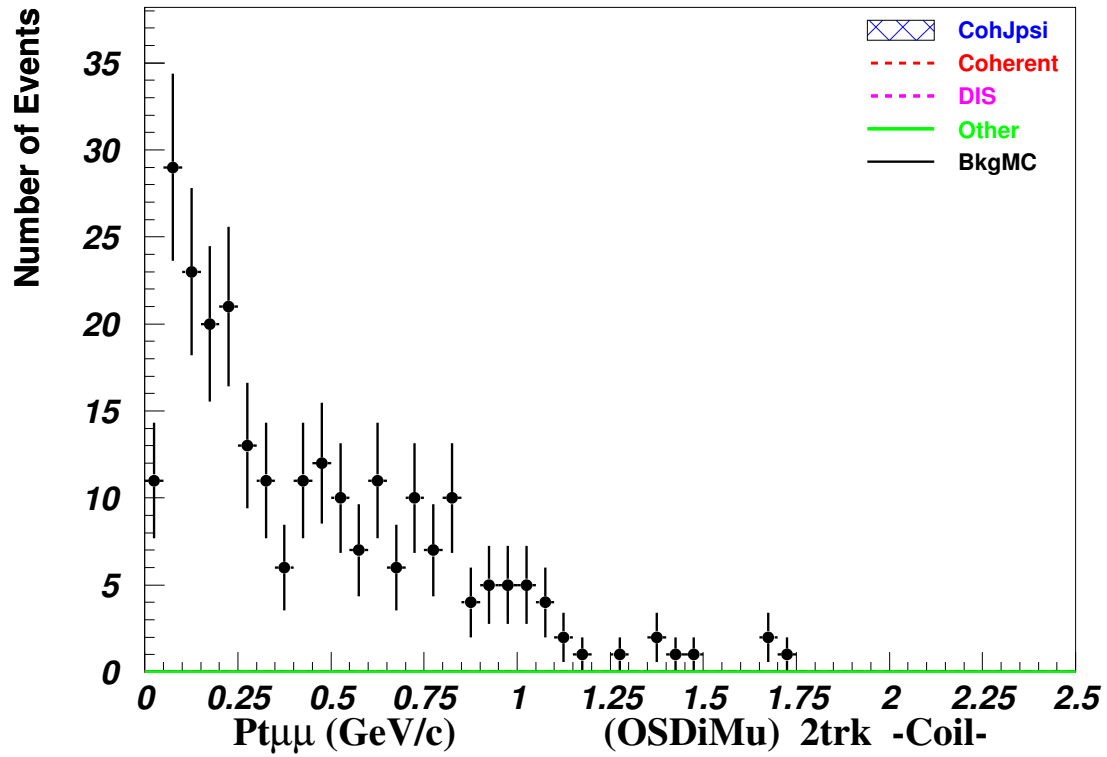
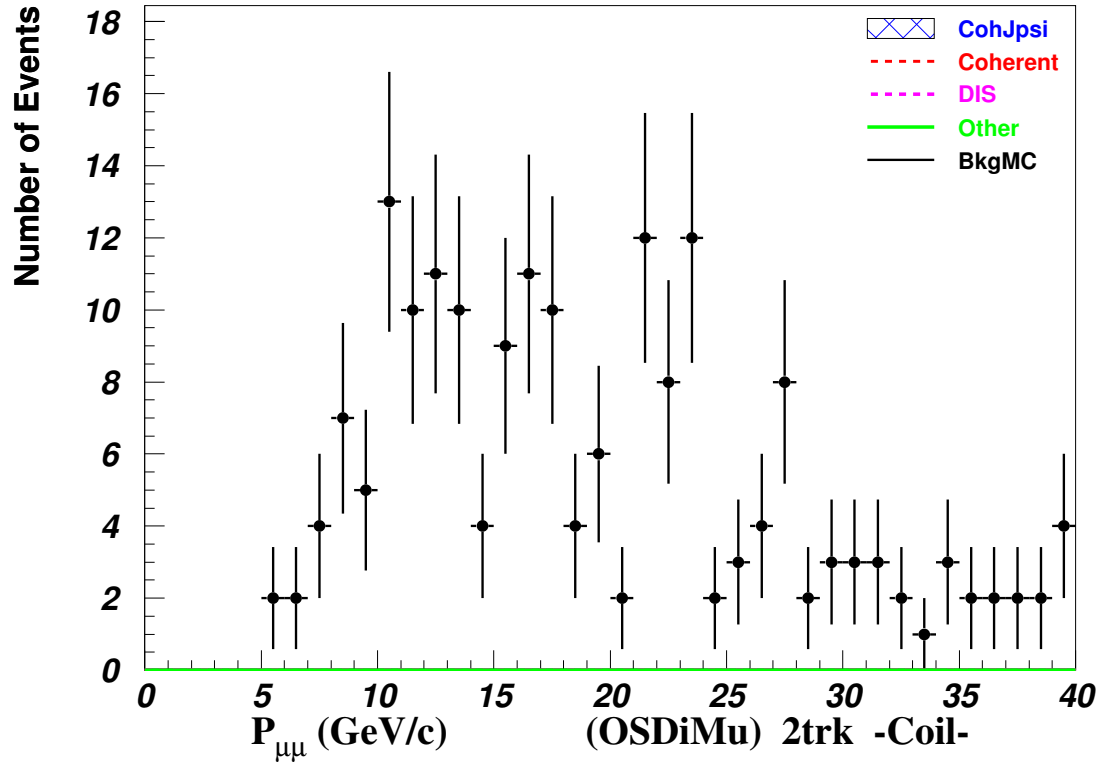


Figure 24: (./figs/p-pt-mumu.pdf)

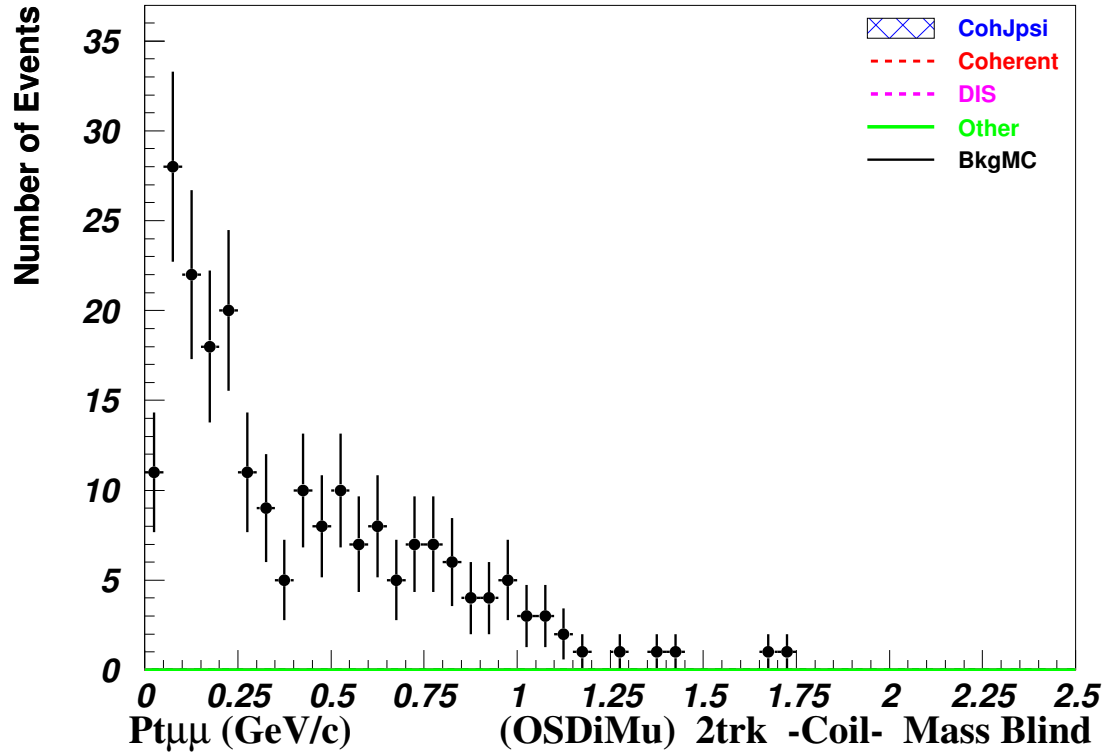
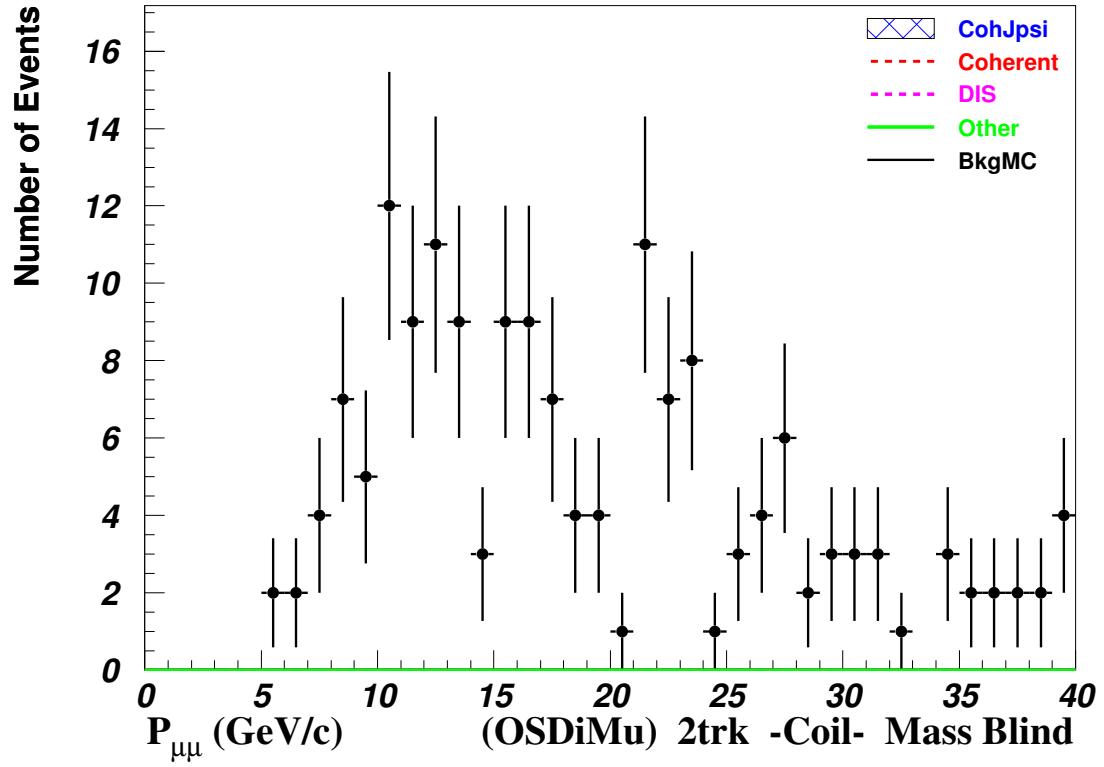


Figure 25: (./figs/p-pt-mumu-mb.pdf)

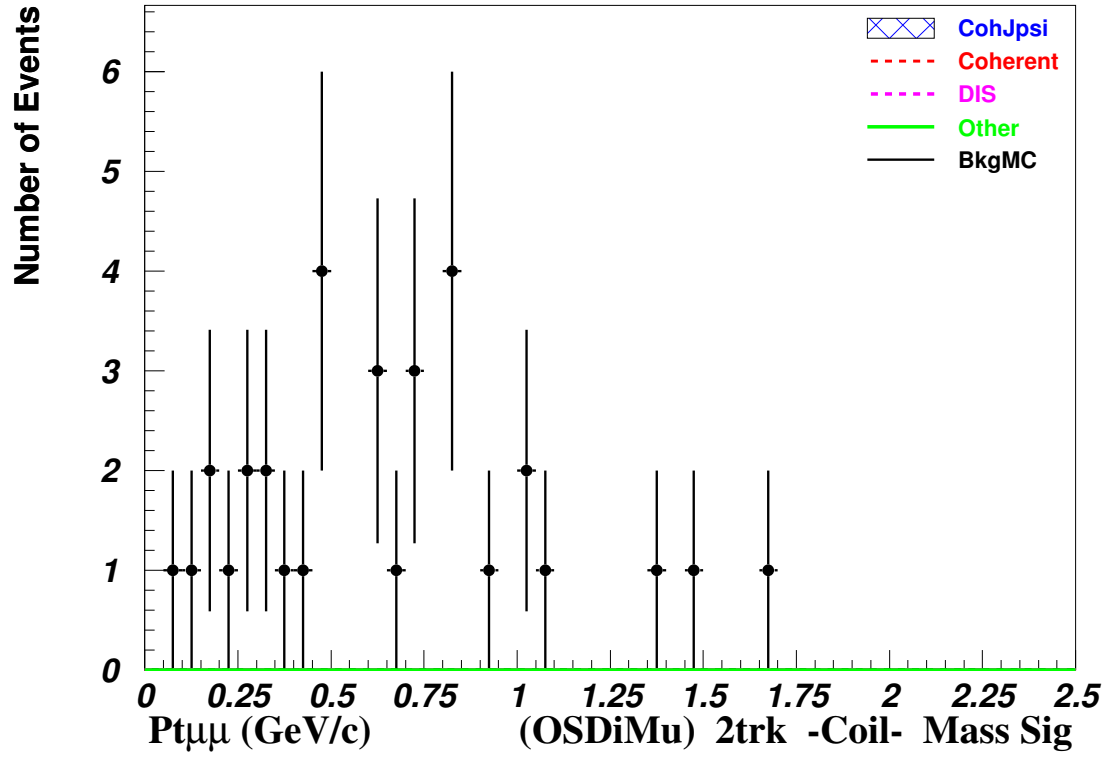
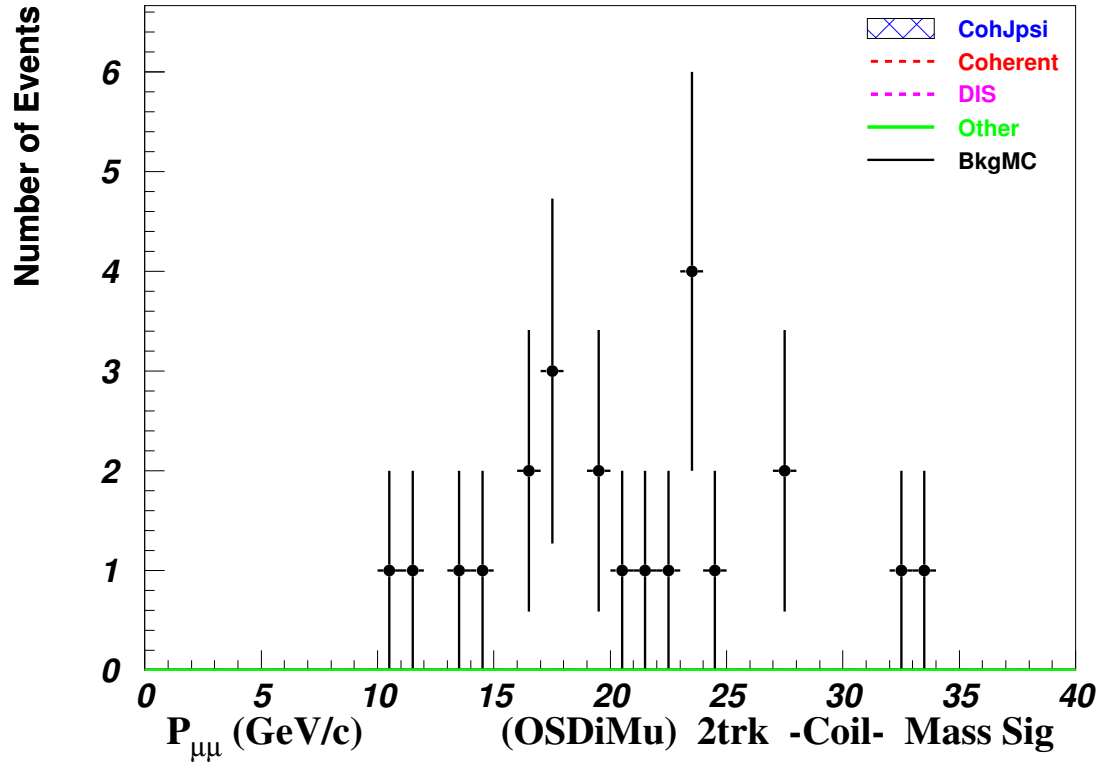


Figure 26: (./figs/p-pt-mumu-msig.pdf)

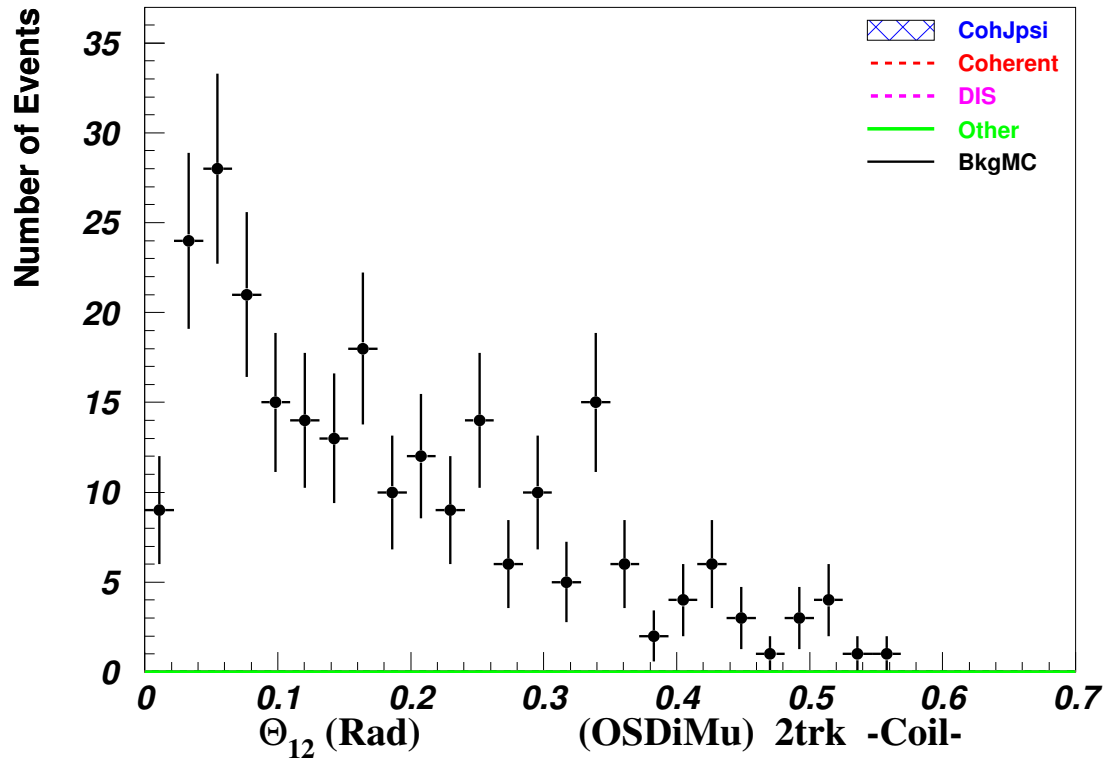
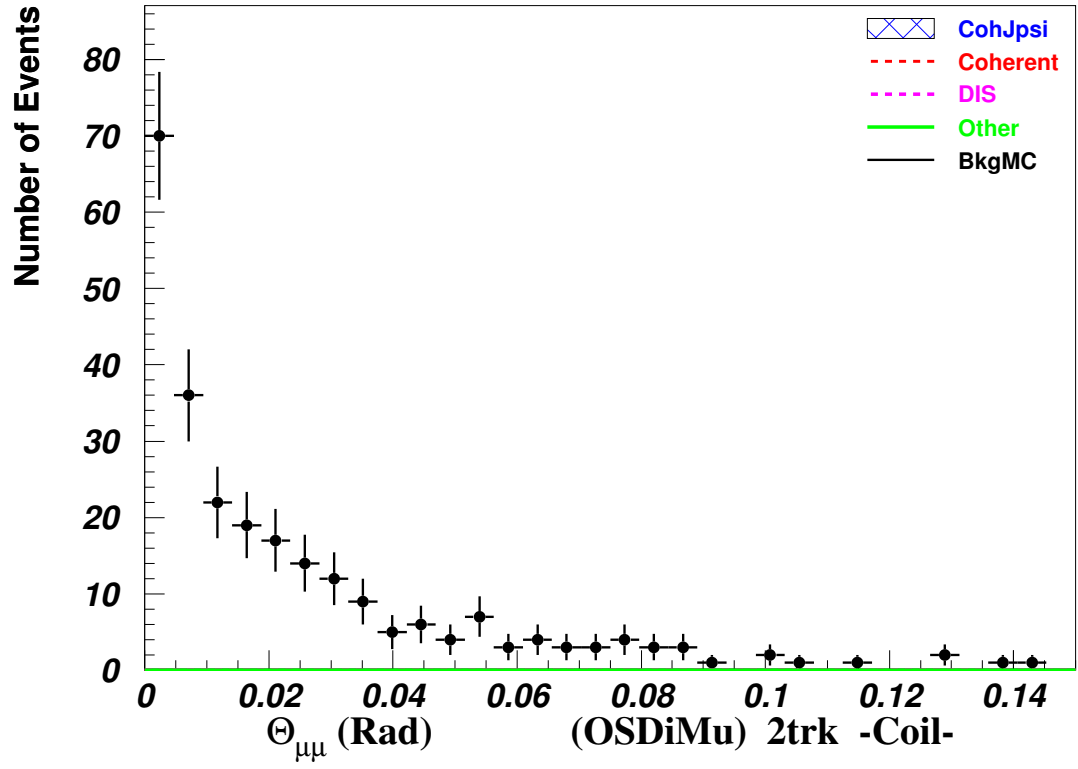


Figure 27: (./figs/thetamumu-theta12.pdf)



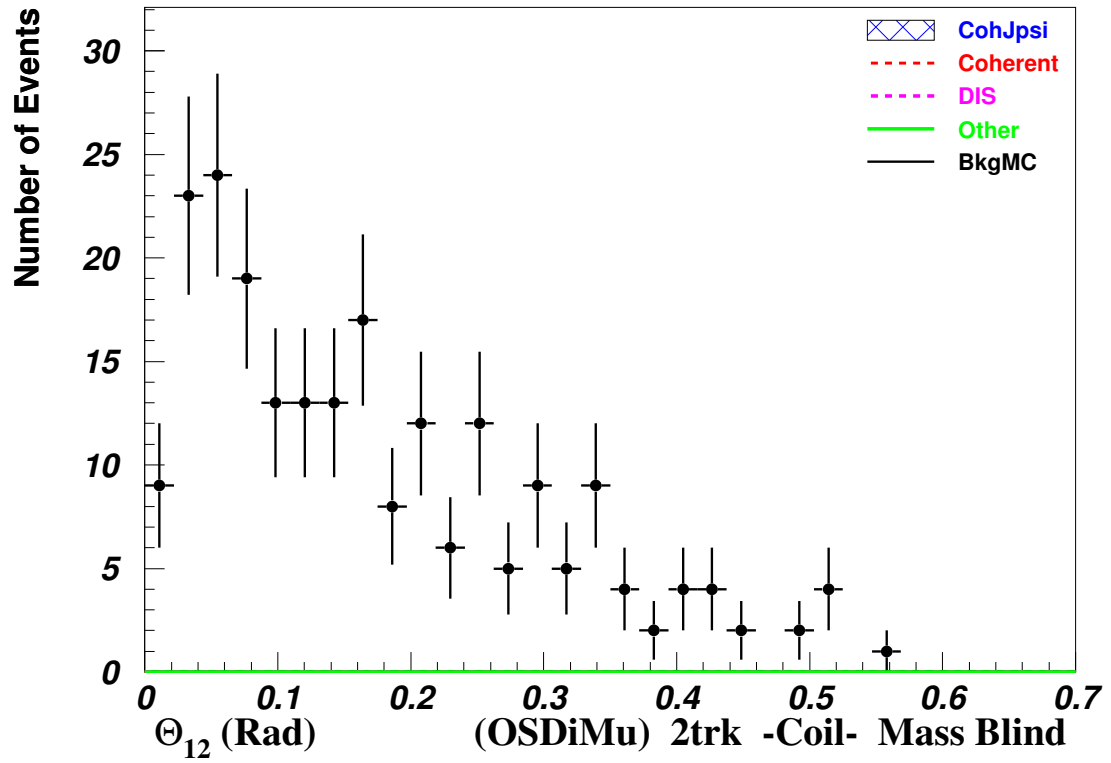
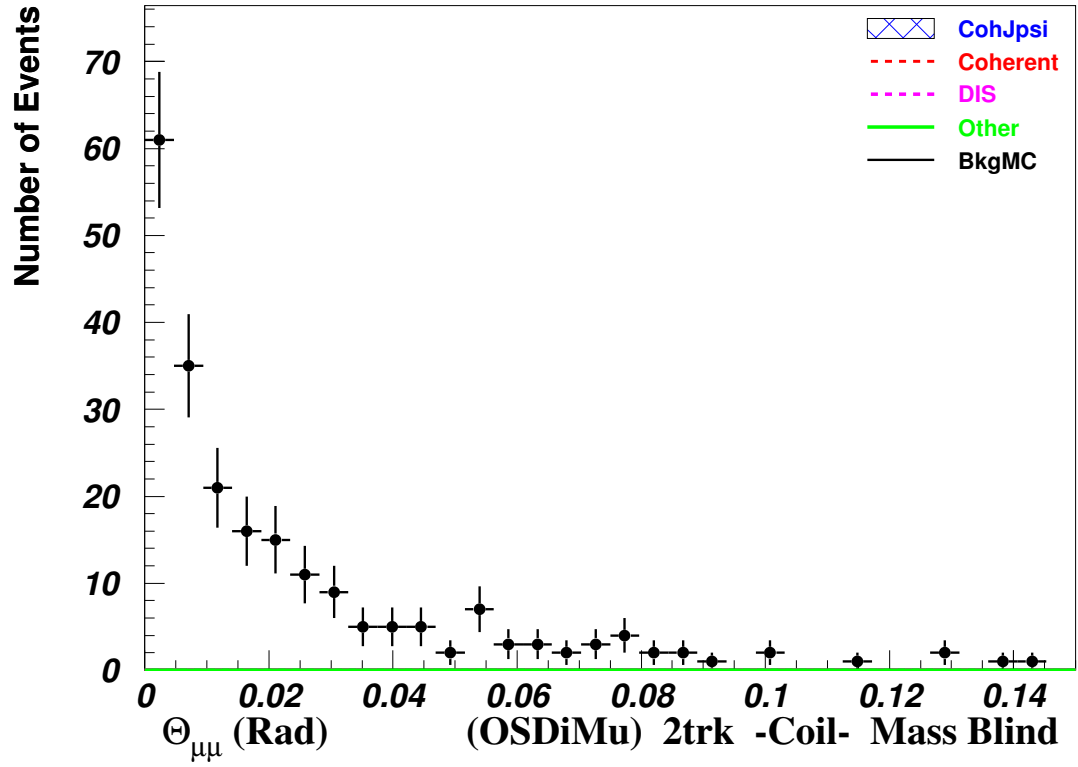


Figure 28: (./figs/thetamumu-theta12-mb.pdf)

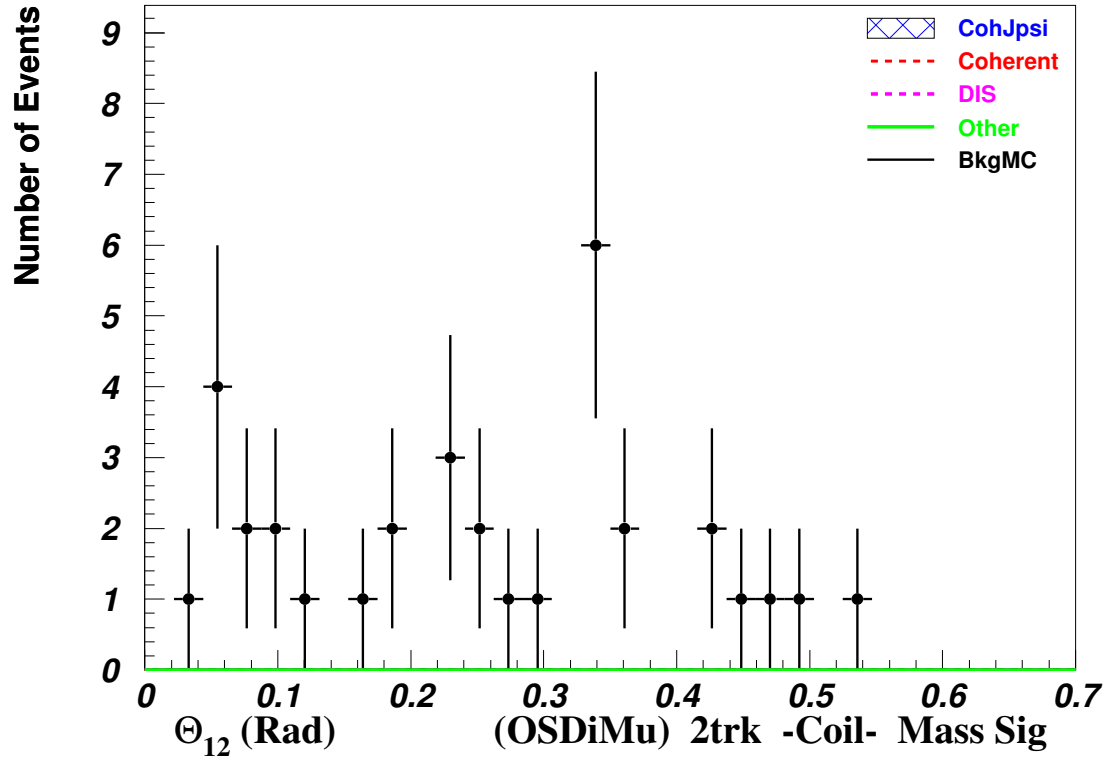
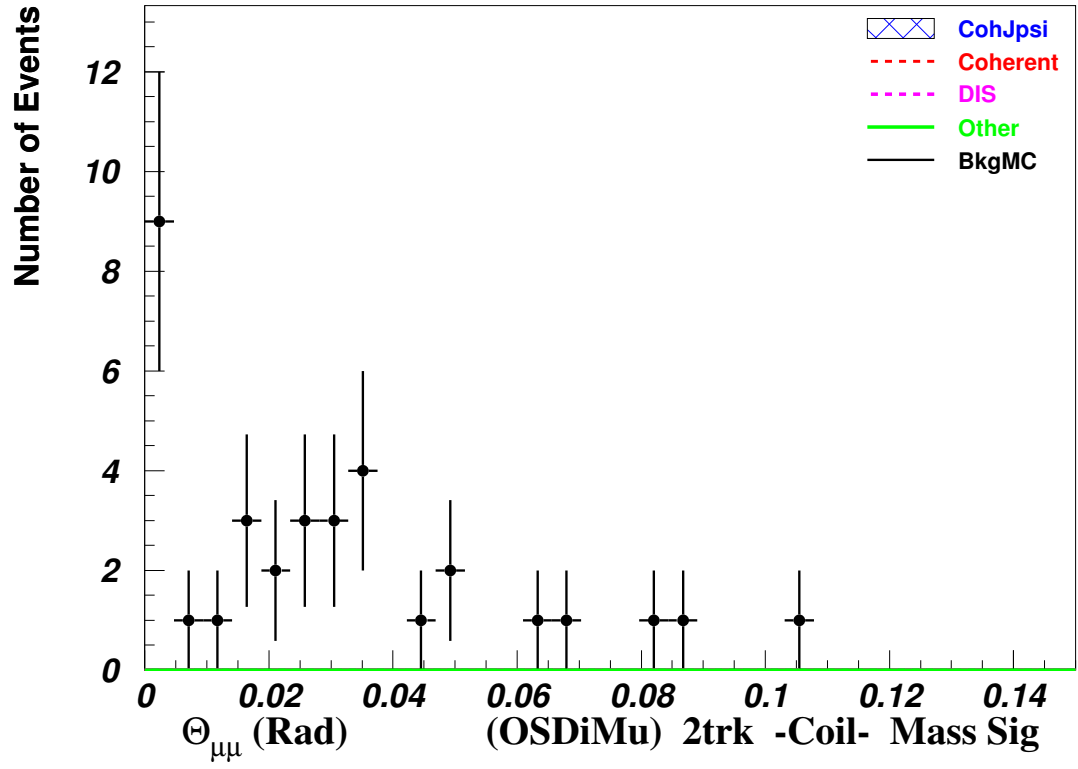


Figure 29: (./figs/thetamumu-theta12-msig.pdf)

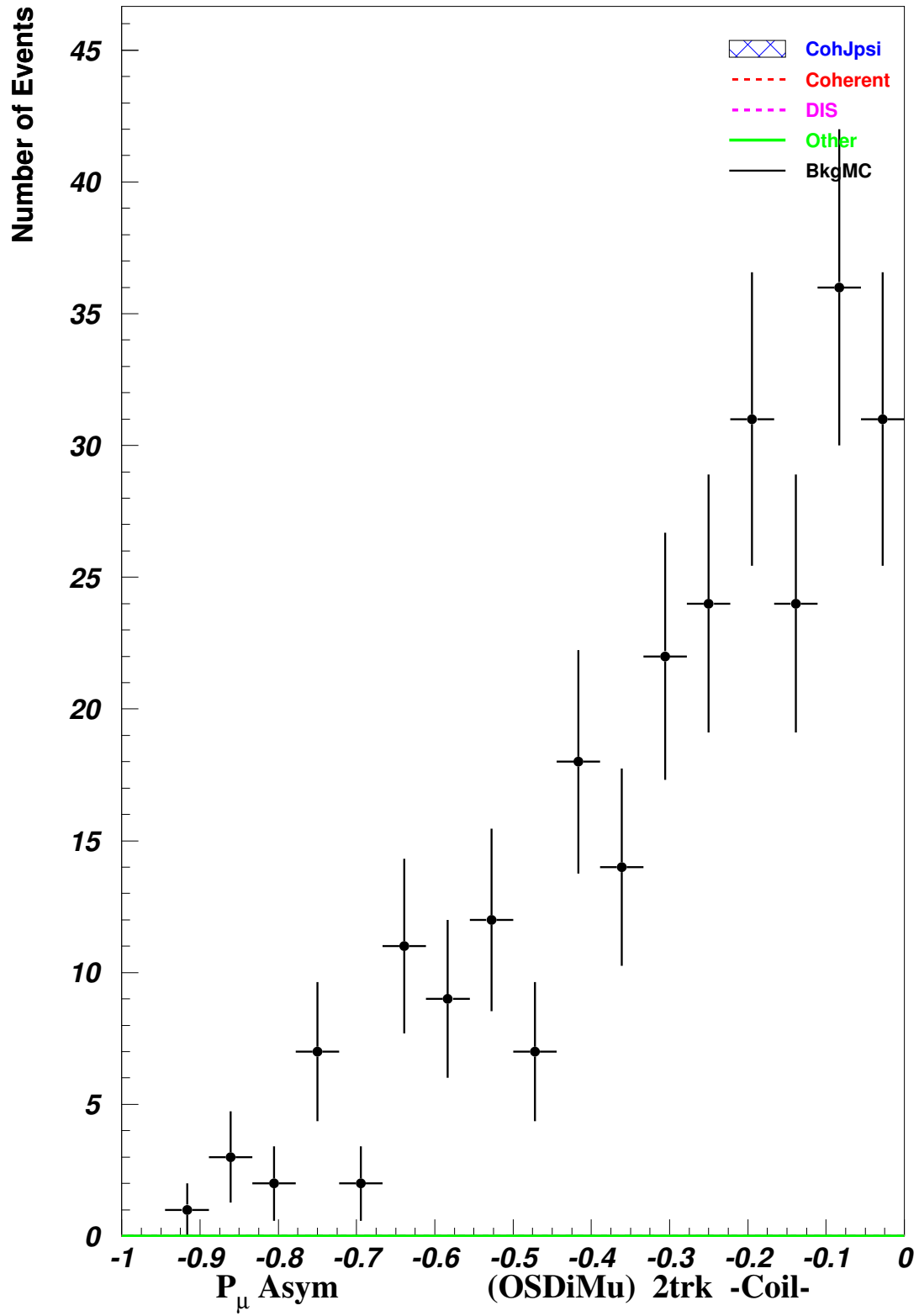


Figure 30: (./figs/pasym.pdf)

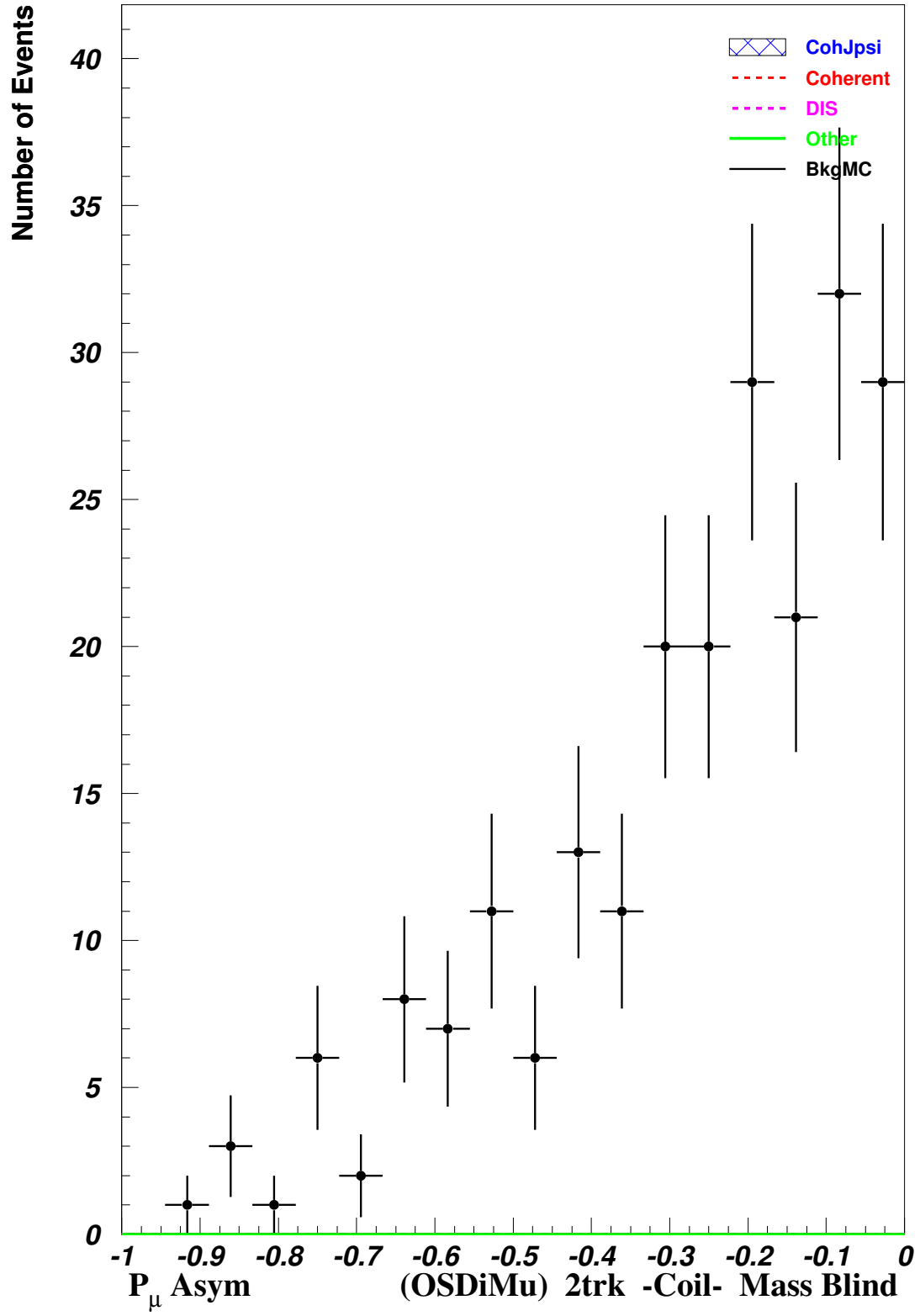


Figure 31: (./figs/pasym-mb.pdf)

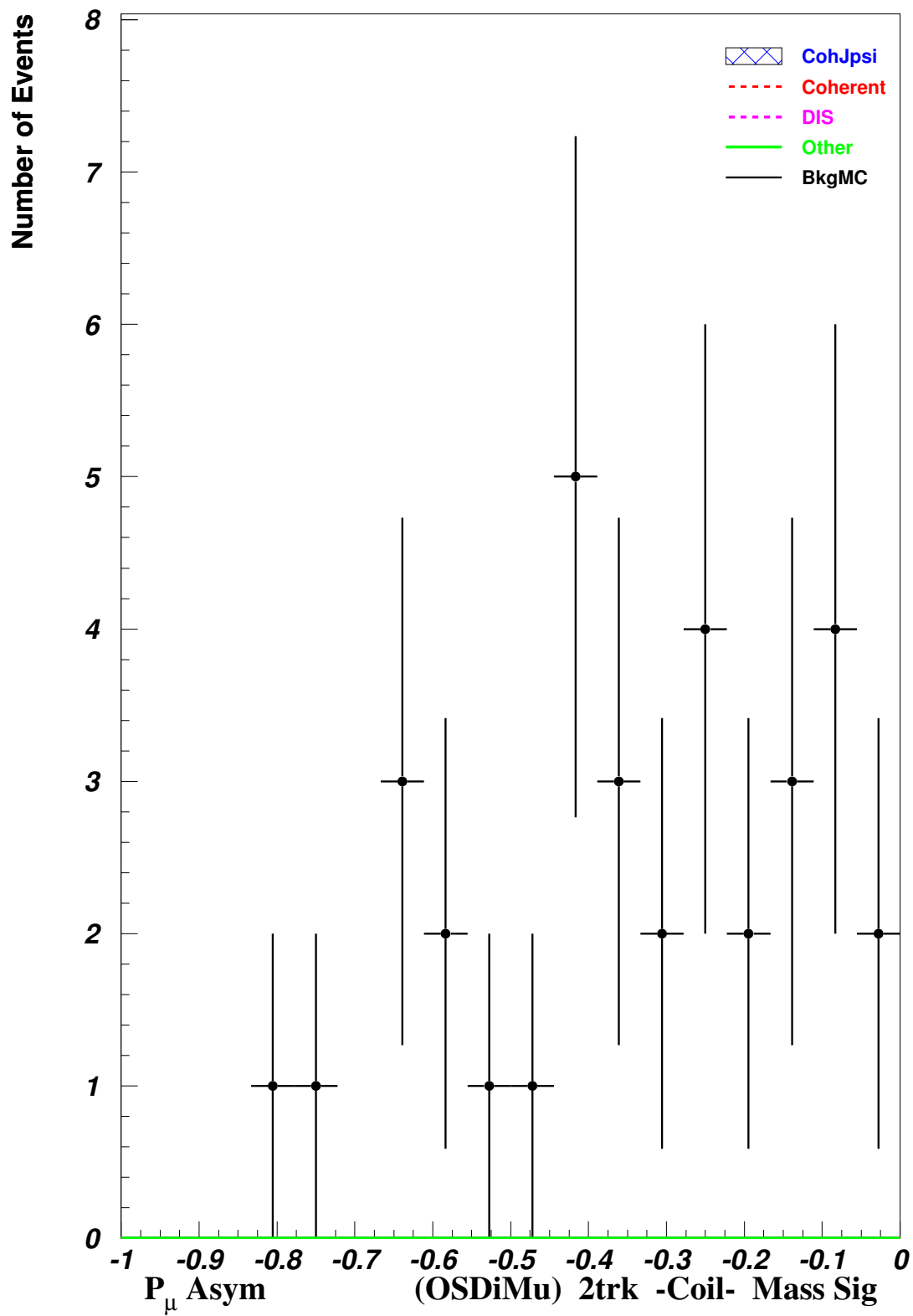


Figure 32: (./figs/pasym-msig.pdf)

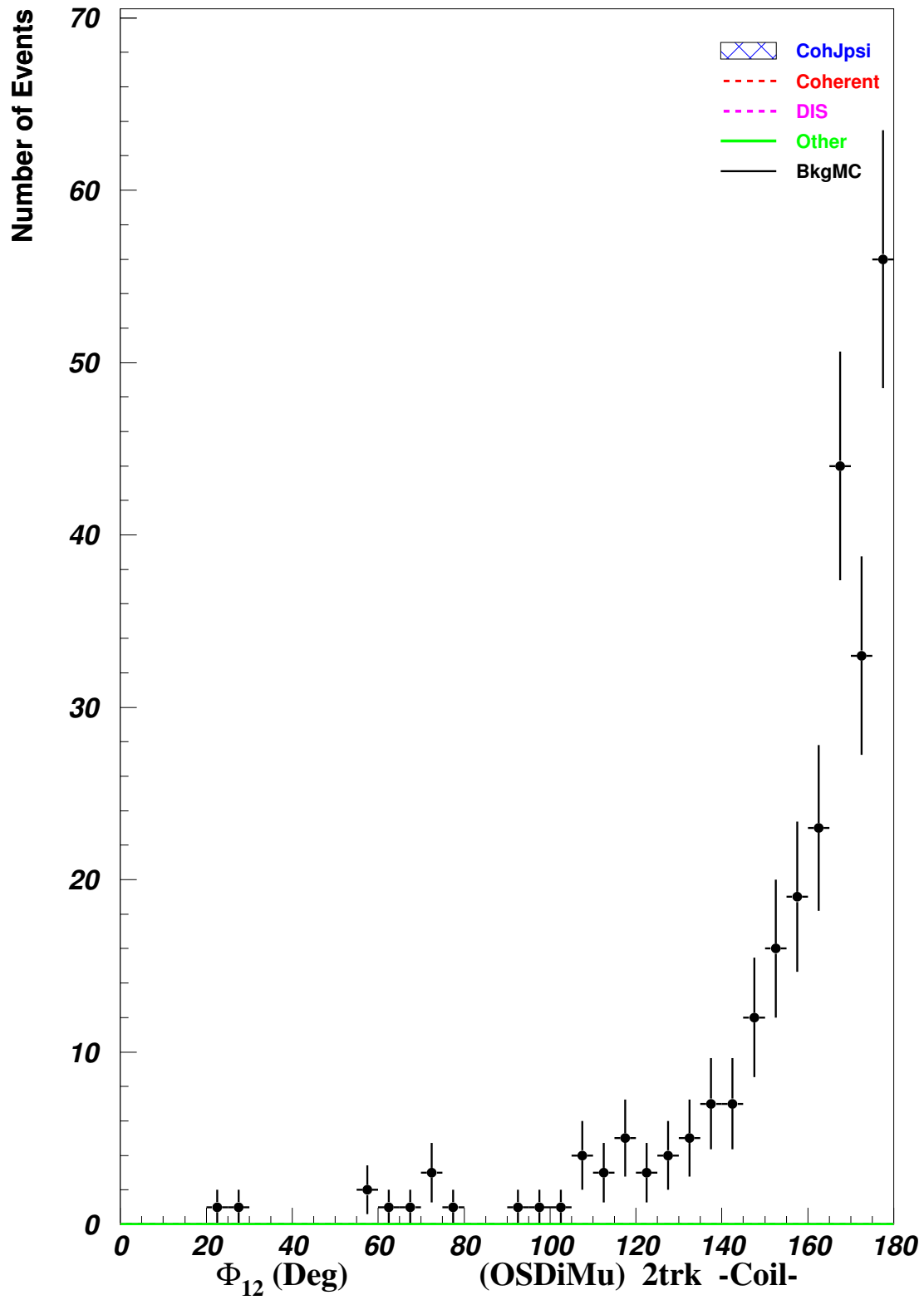


Figure 33: (./figs/phi12.pdf)

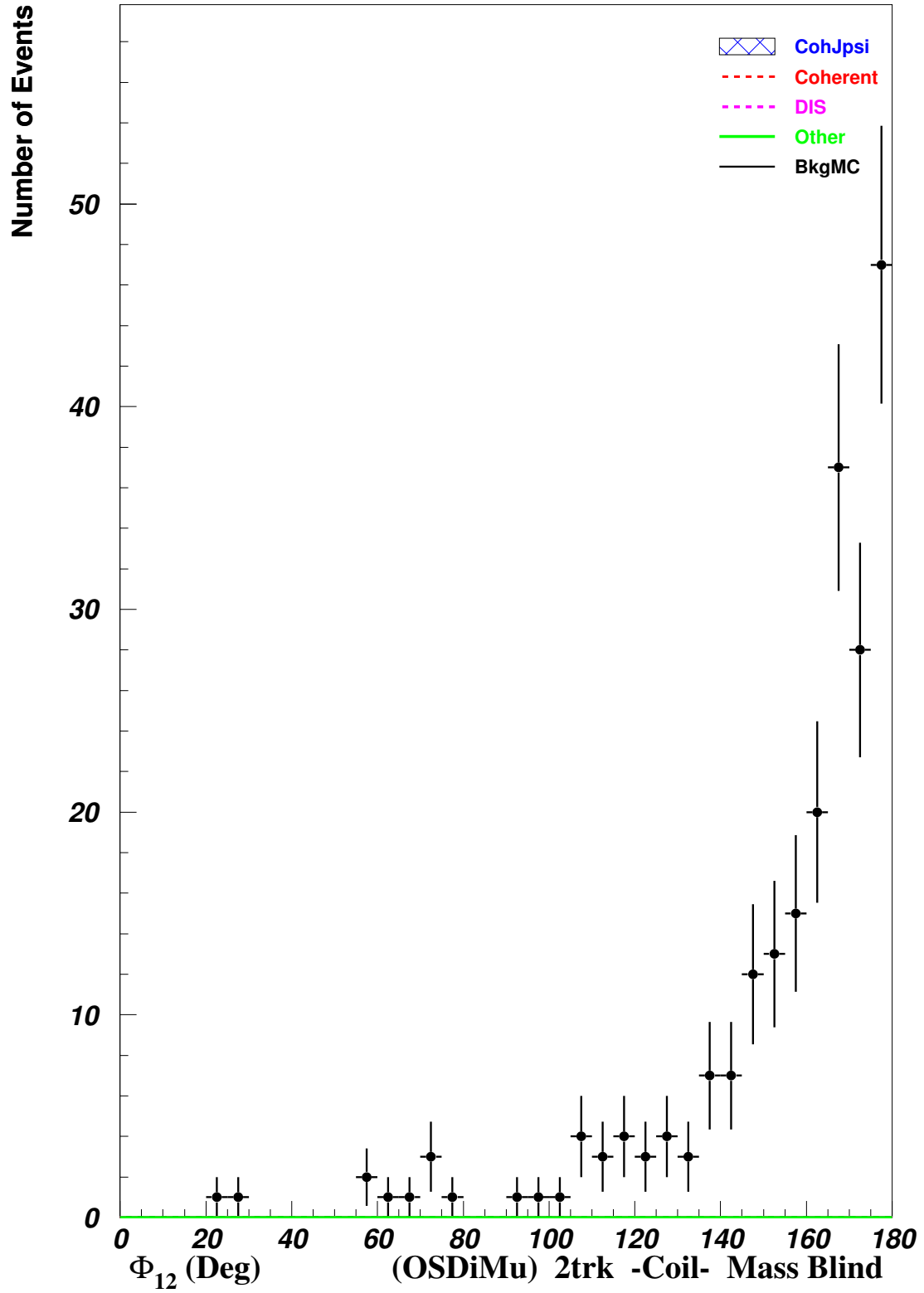


Figure 34: (./figs/phi12-mb.pdf)

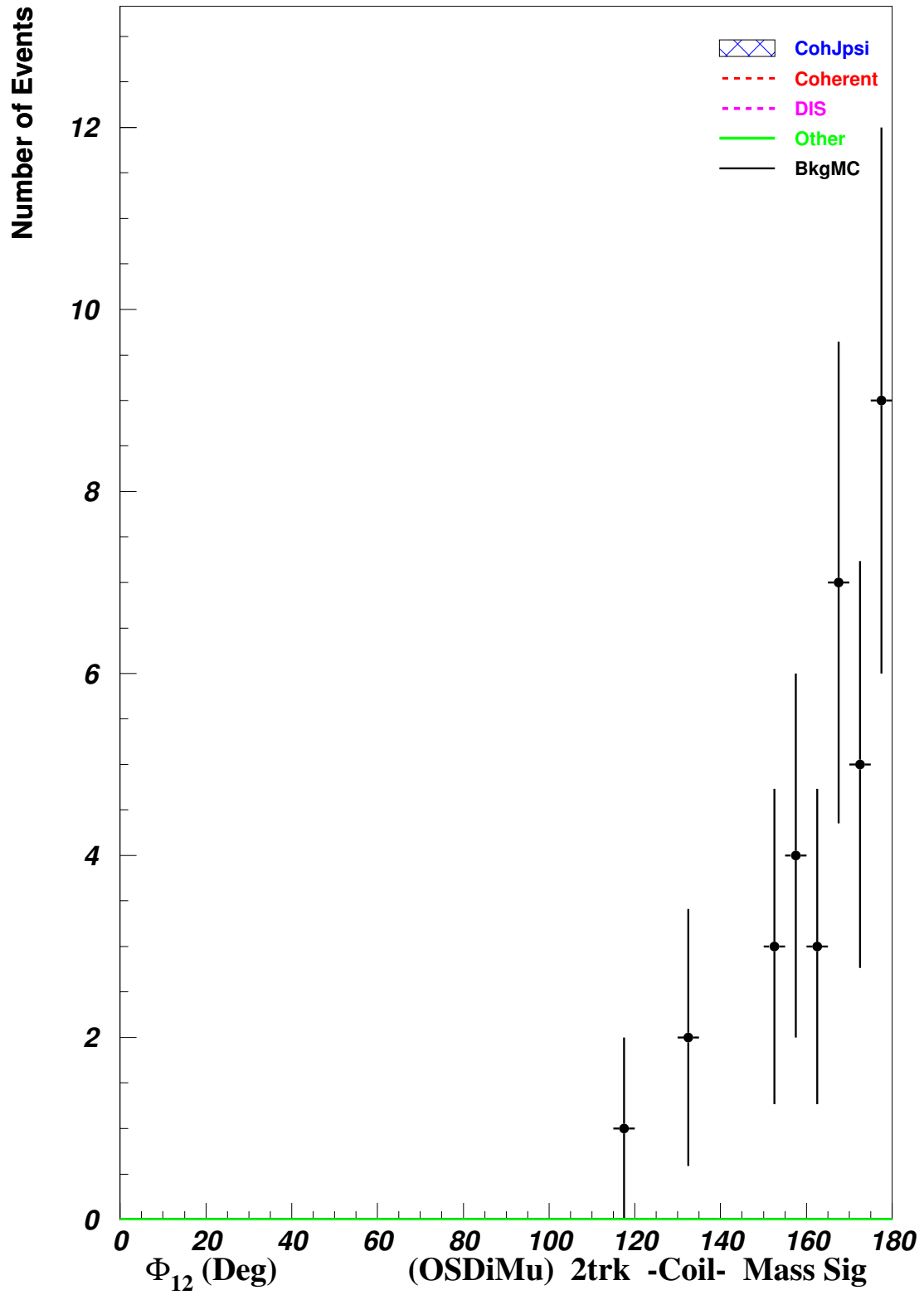


Figure 35: (./figs/phi12-msig.pdf)



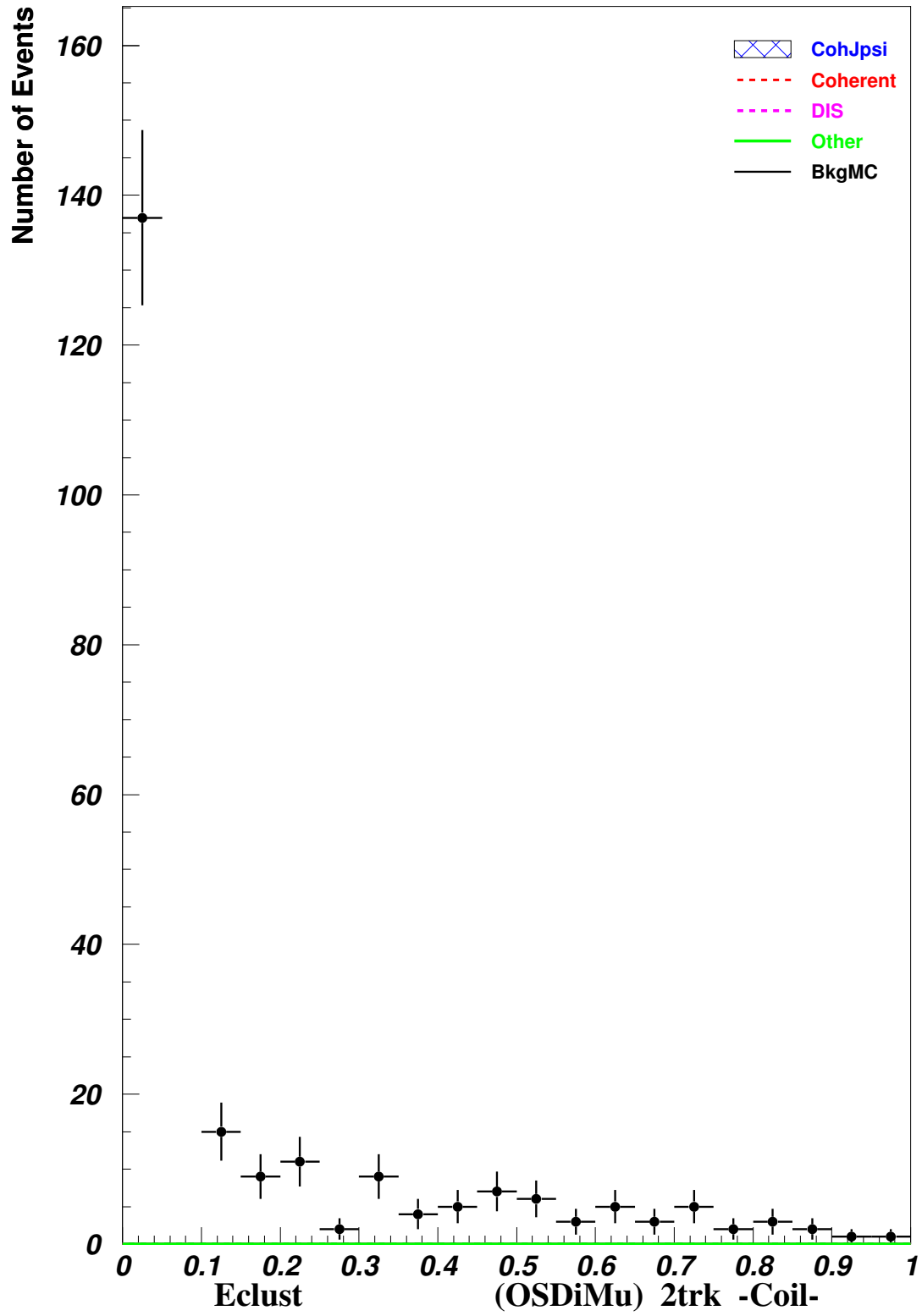


Figure 36: (./figs/eneut.pdf)

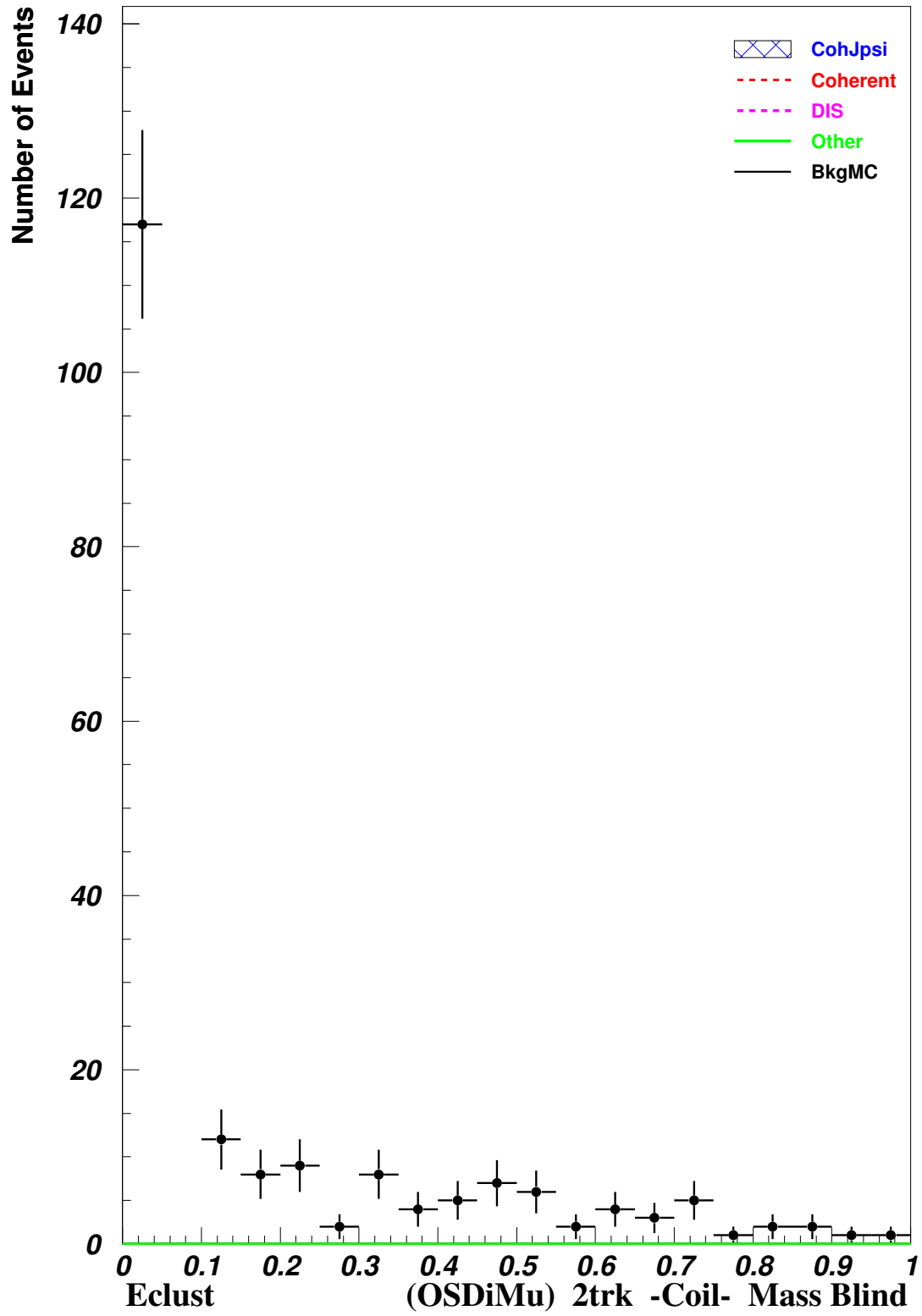


Figure 37: (./figs/eneut-mb.pdf)

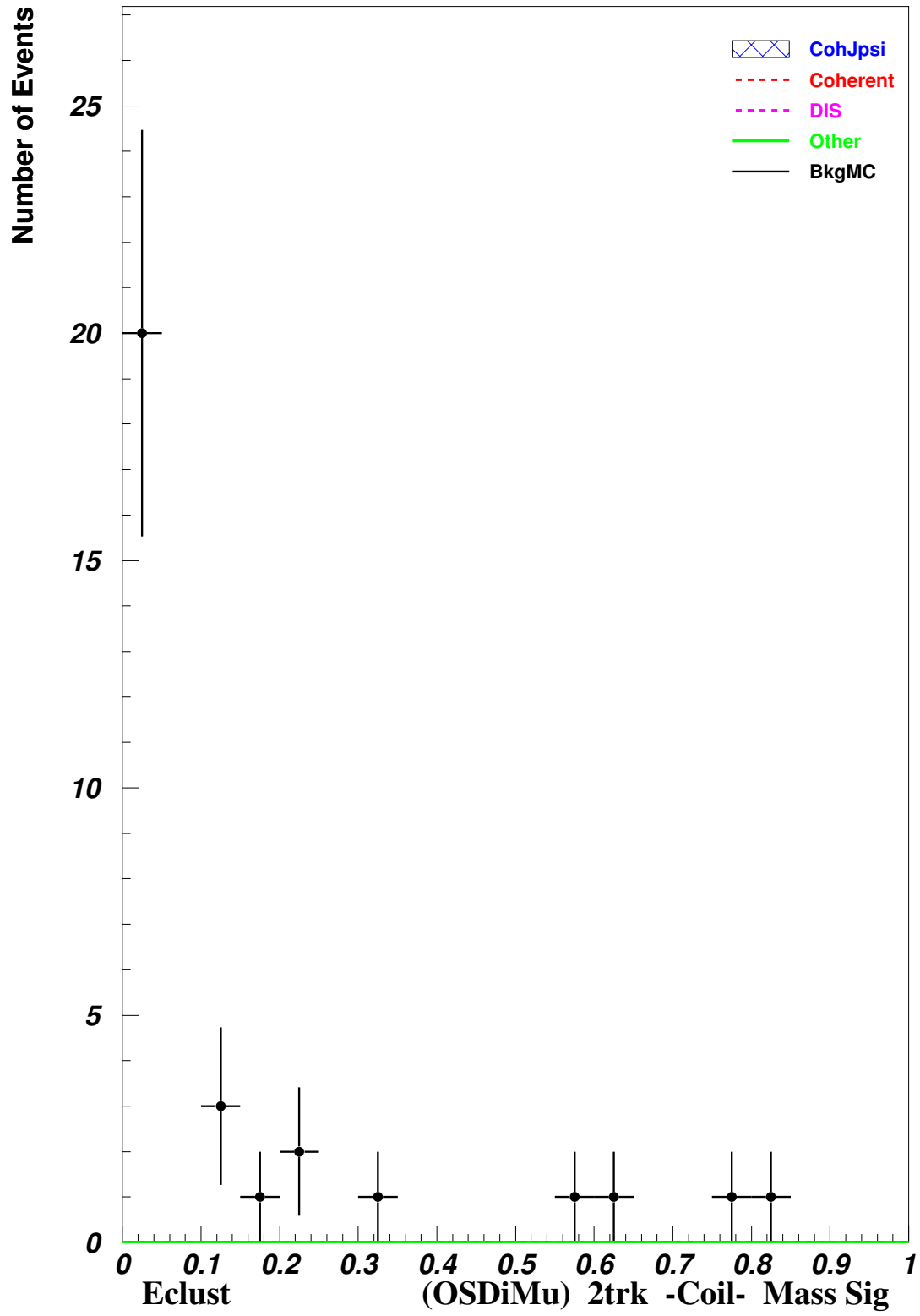


Figure 38: (./figs/eneut-msig.pdf)

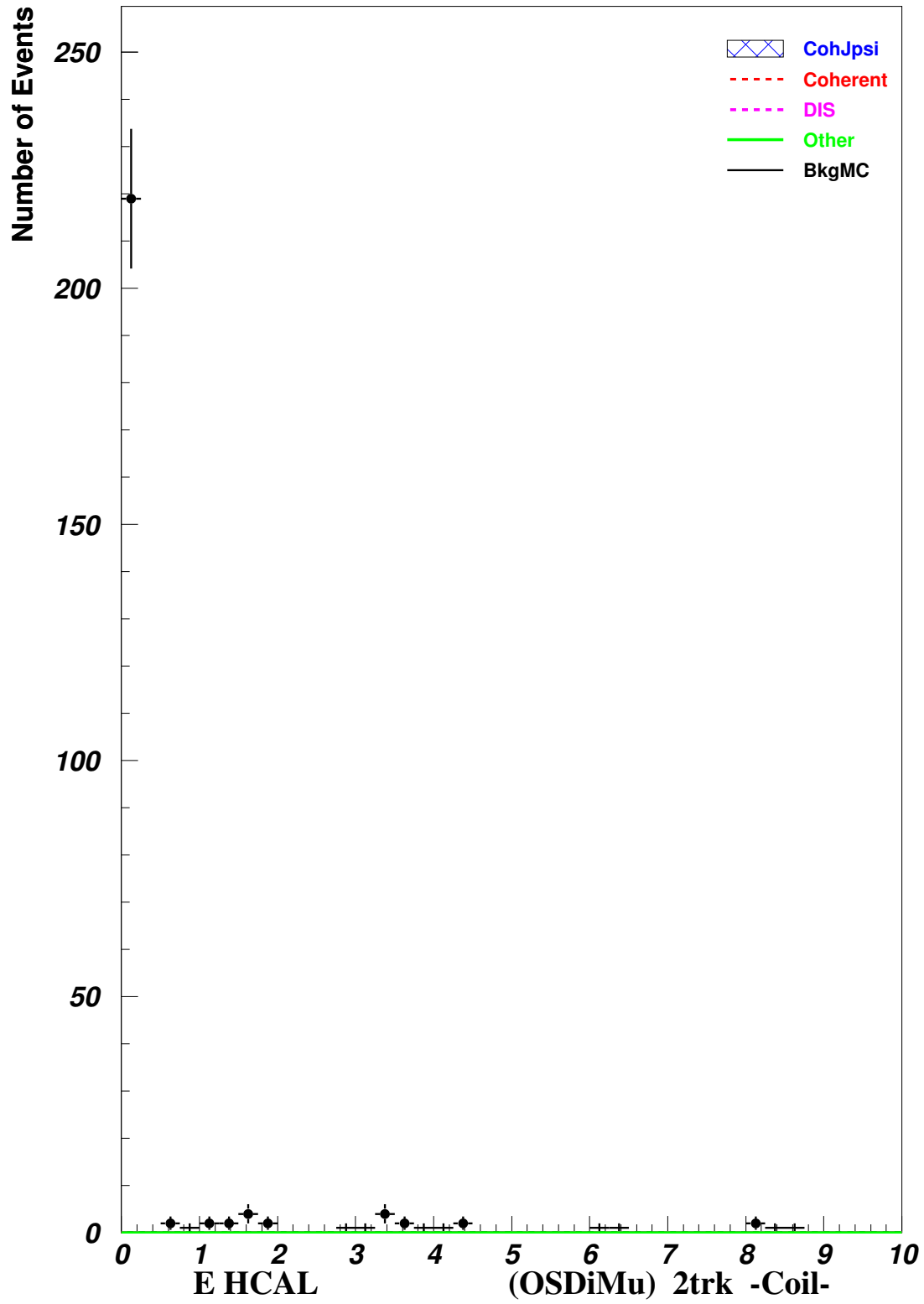


Figure 39: (./figs/ehcal.pdf)

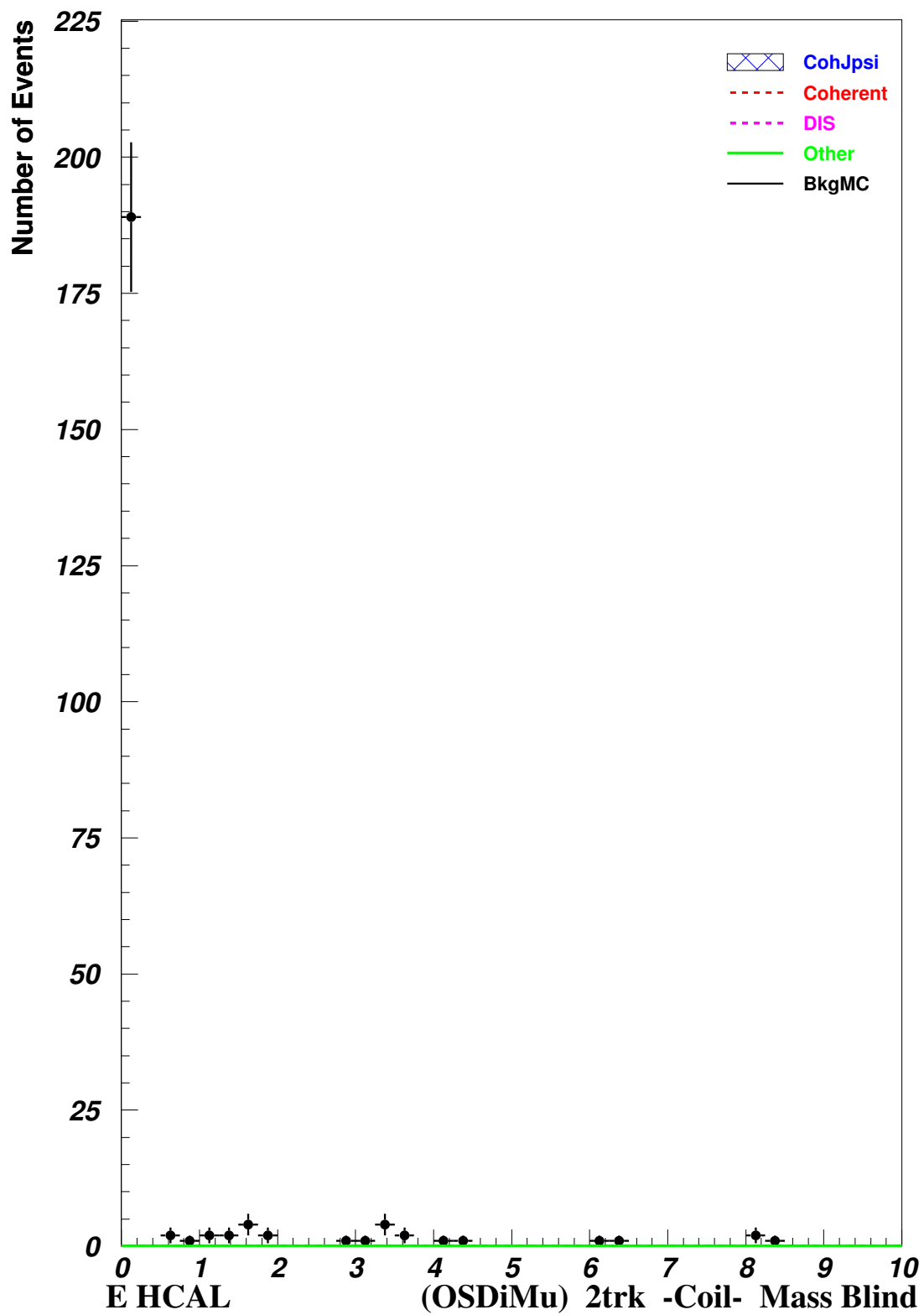


Figure 40: (./figs/ehcal-mb.pdf)

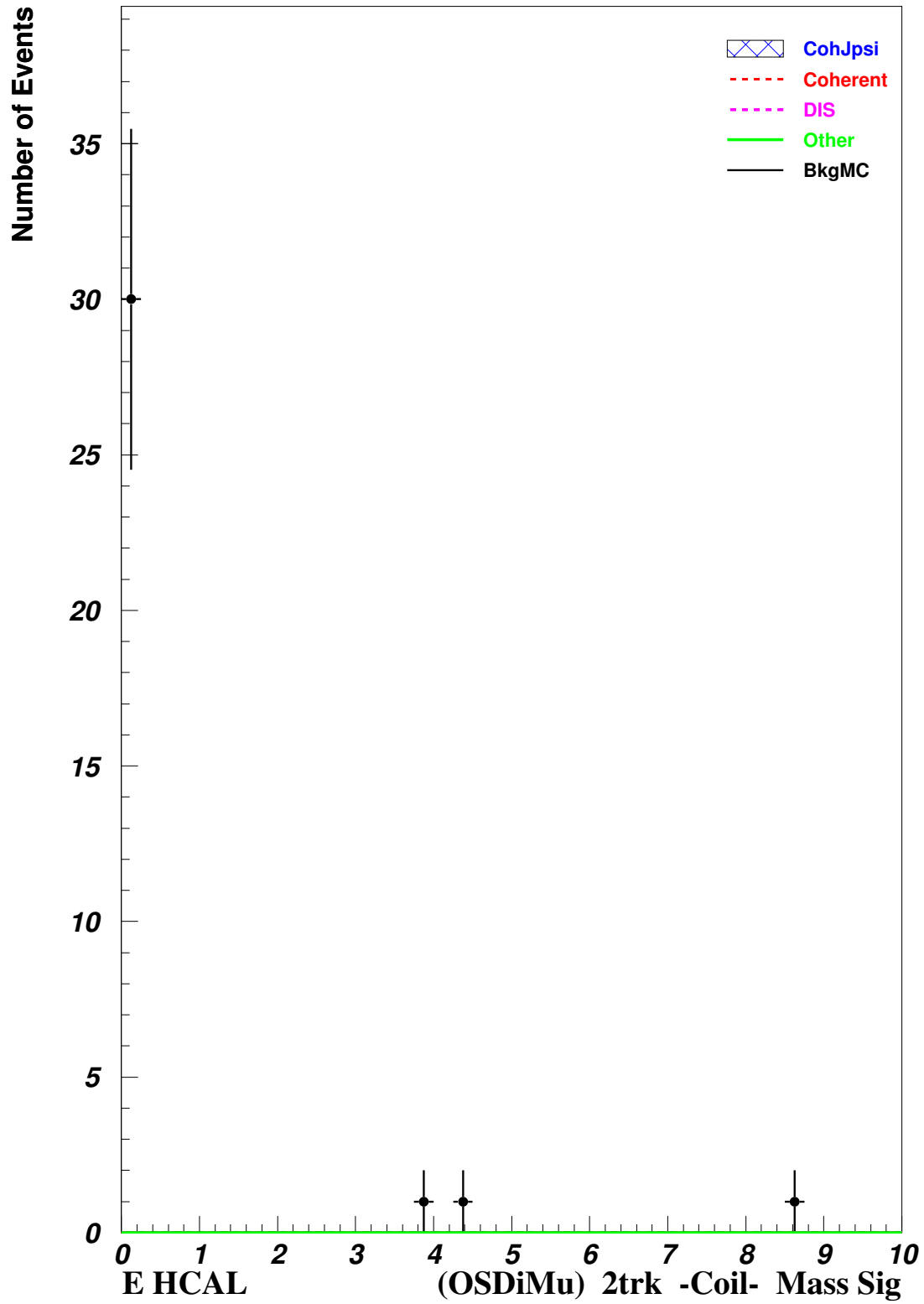


Figure 41: (./figs/ehcal-msig.pdf)

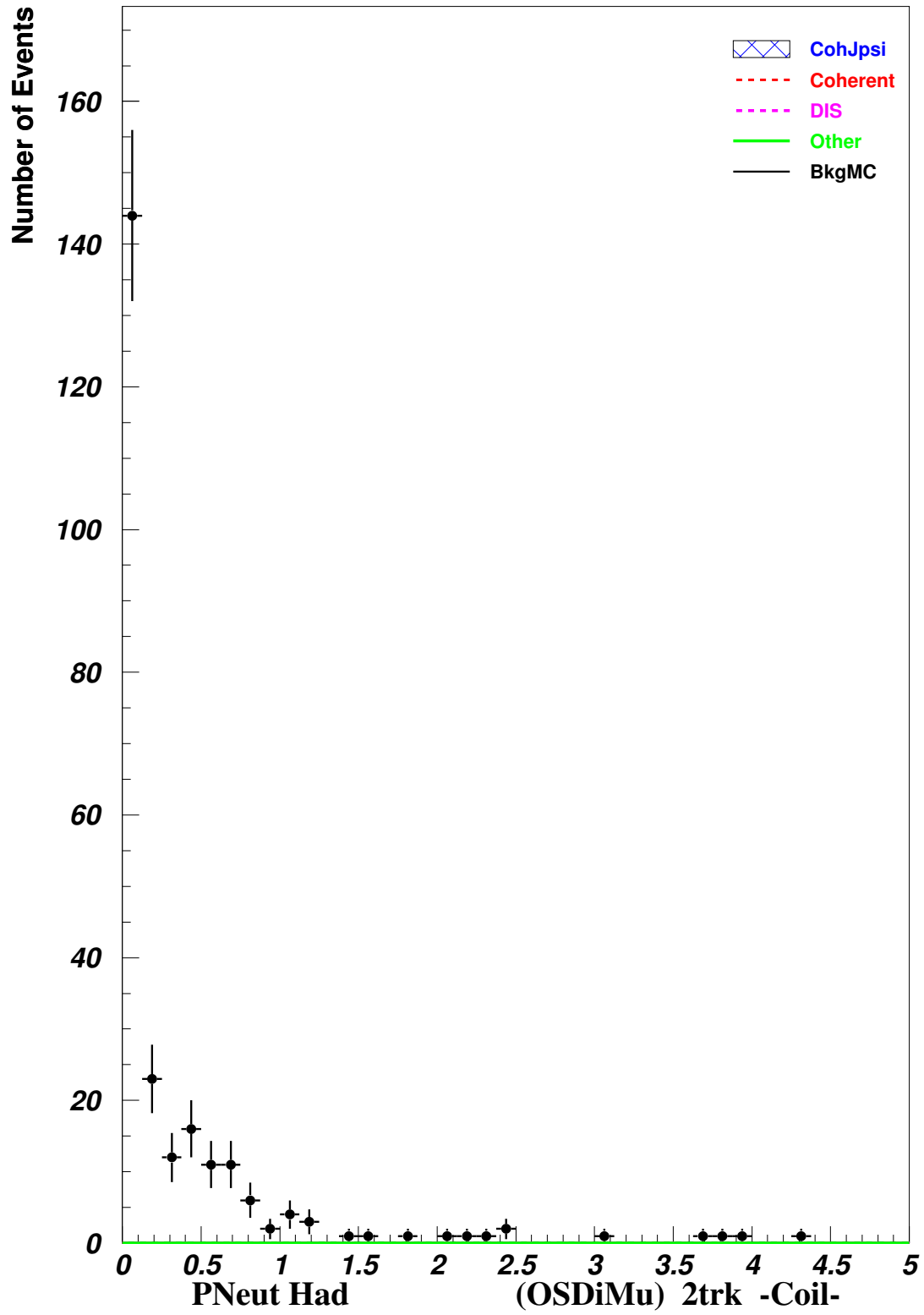


Figure 42: (./figs/pneuth.pdf)

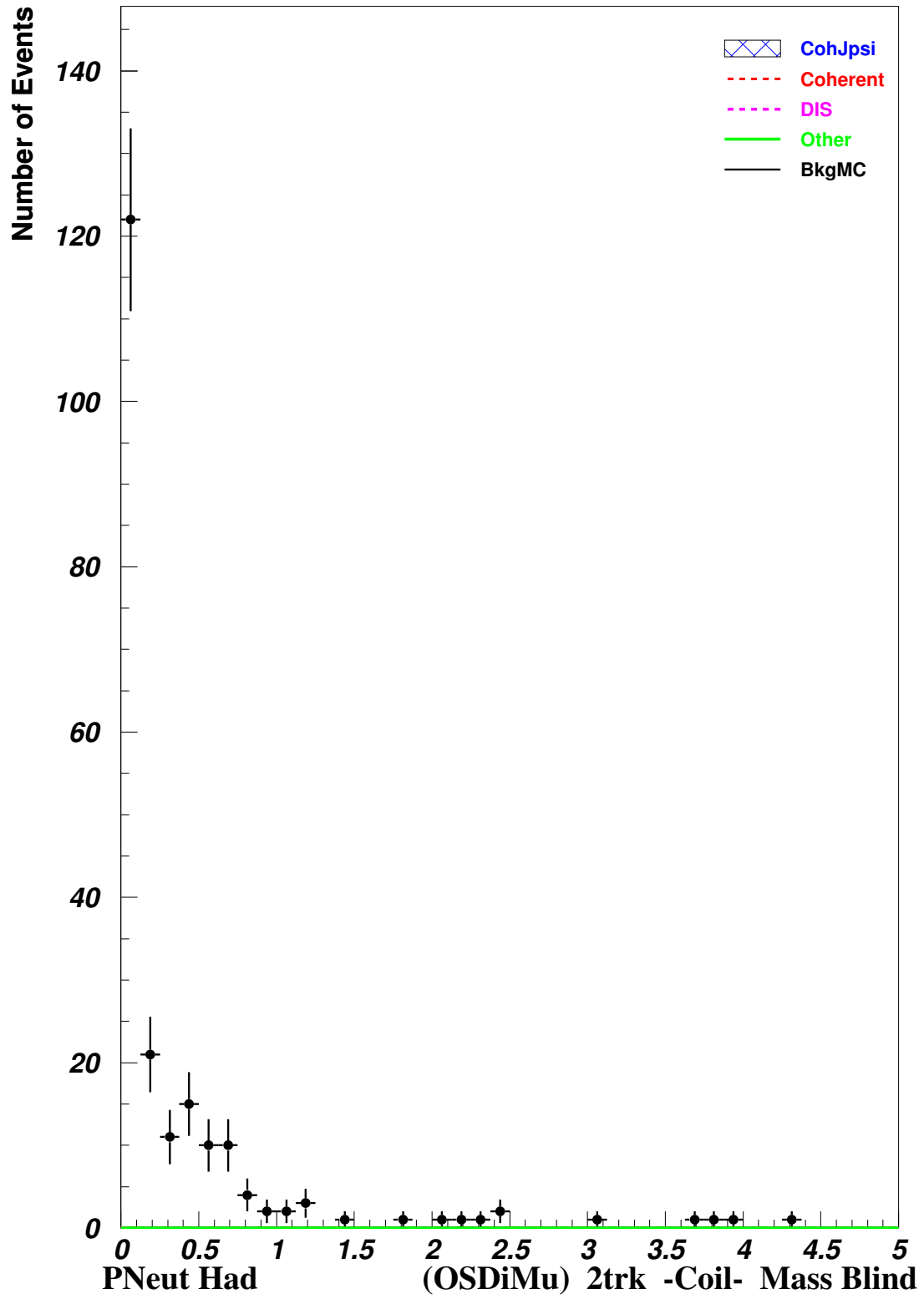


Figure 43: (./figs/pneuth-mb.pdf)



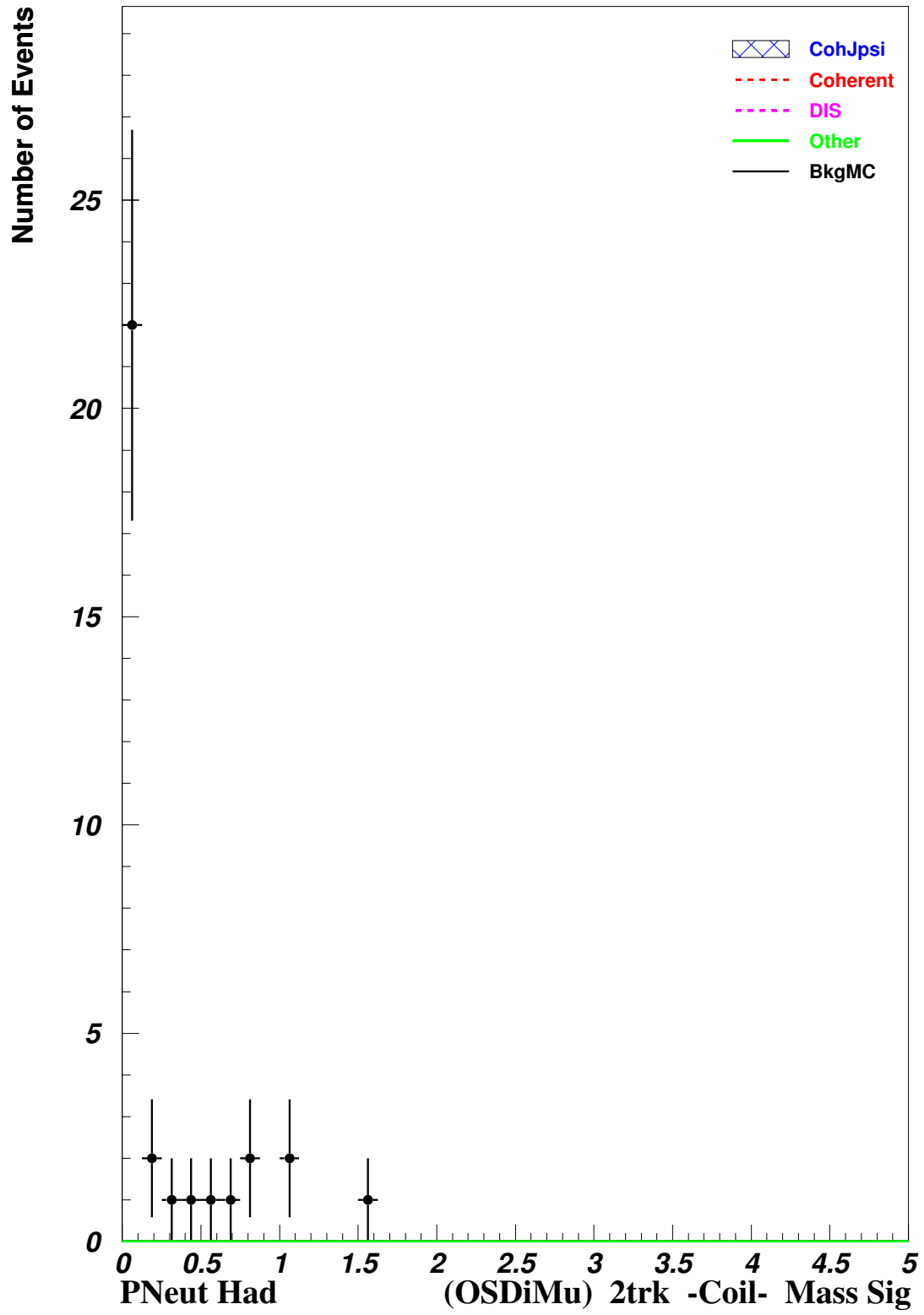


Figure 44: (./figs/pneuth-msig.pdf)

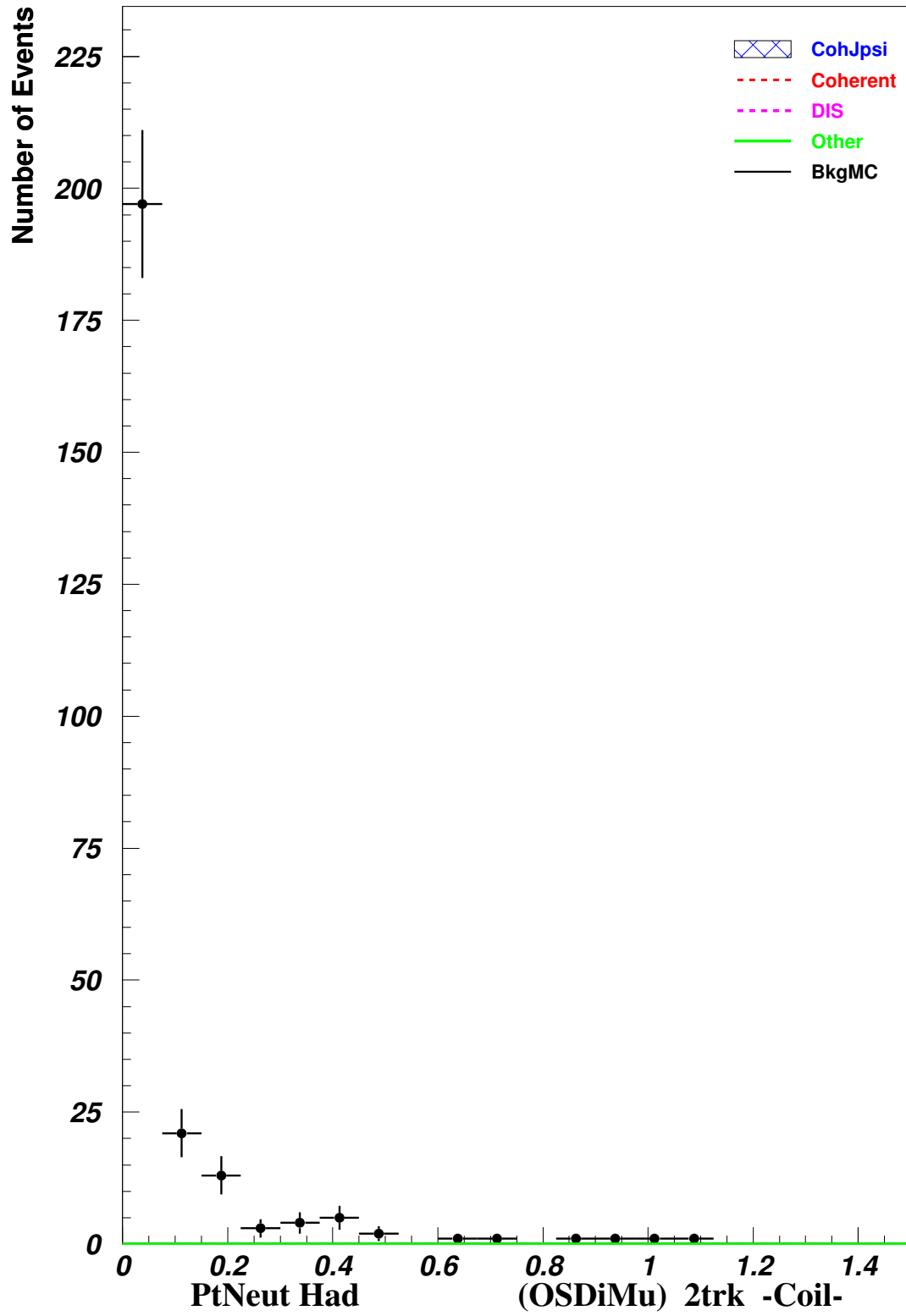


Figure 45: (./figs/ptneuth.pdf)

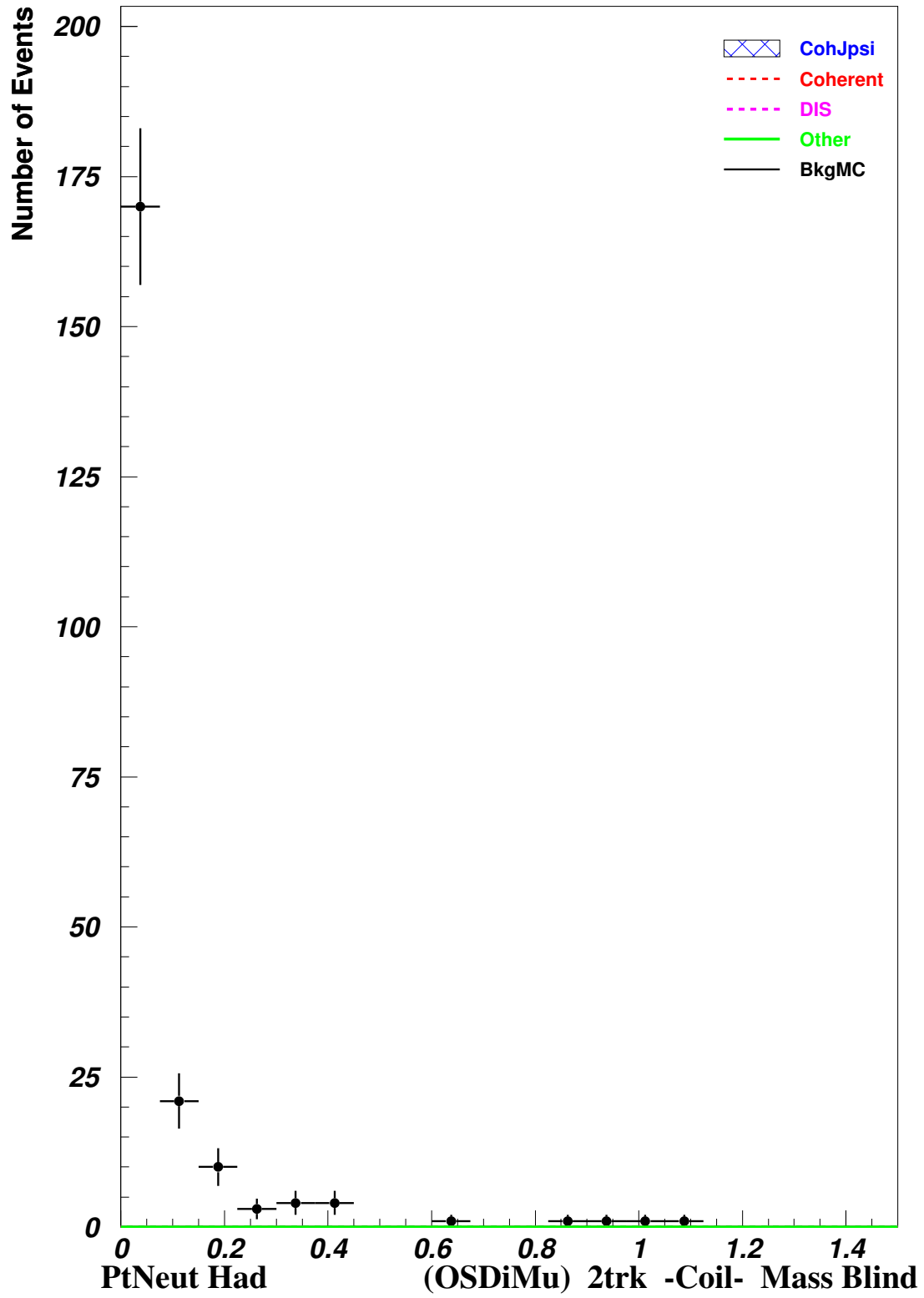


Figure 46: (./figs/ptneuth-mb.pdf)

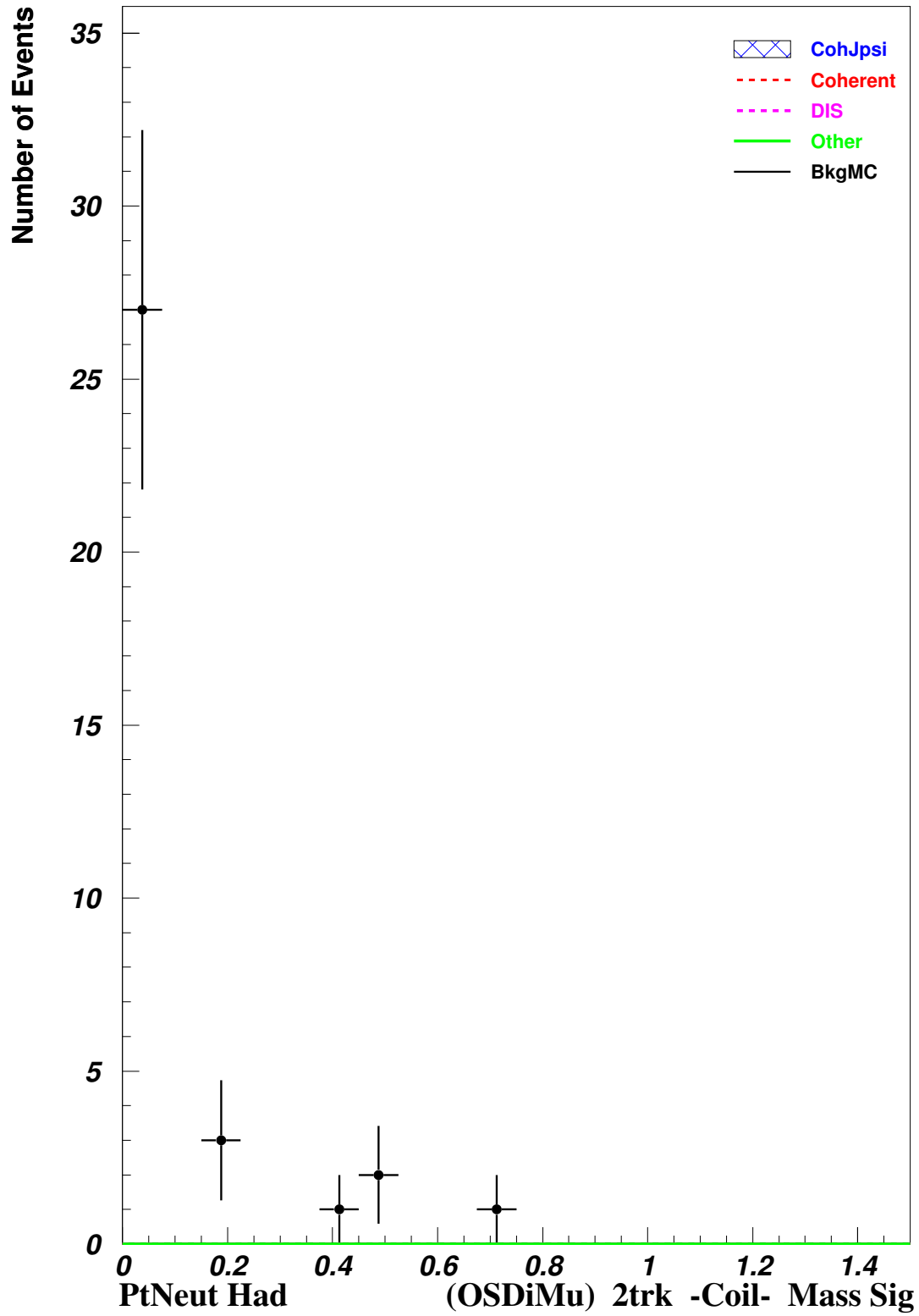


Figure 47: (./figs/ptneuth-msig.pdf)

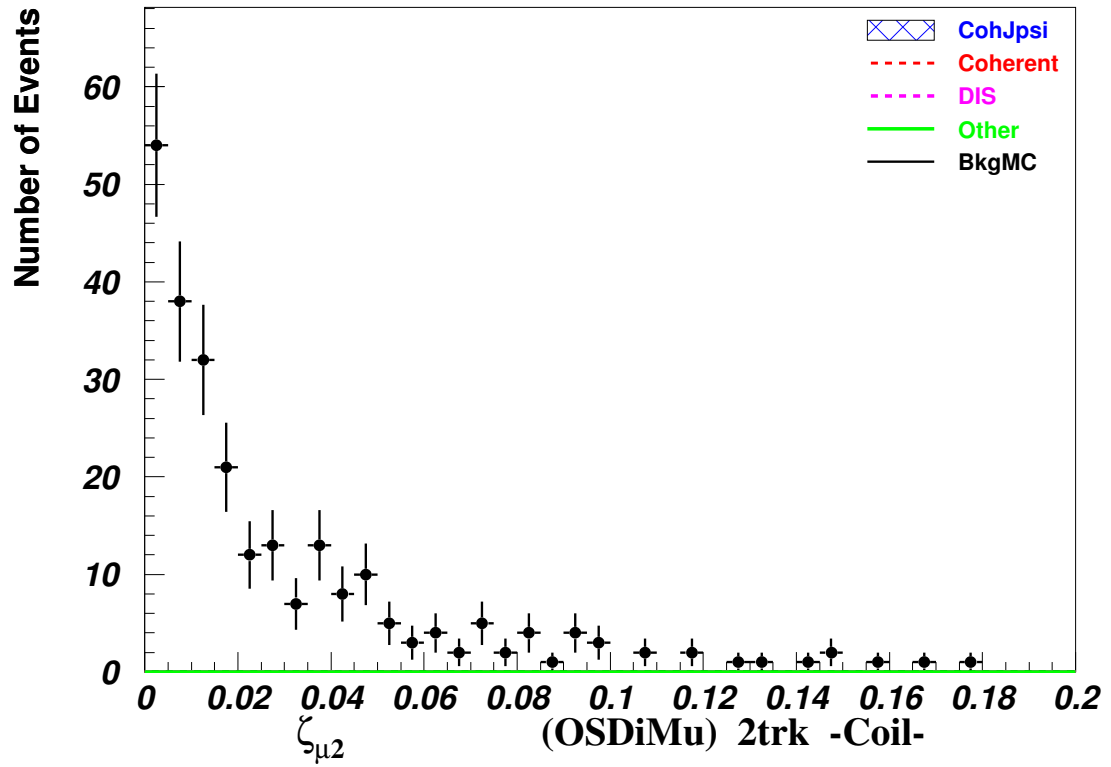
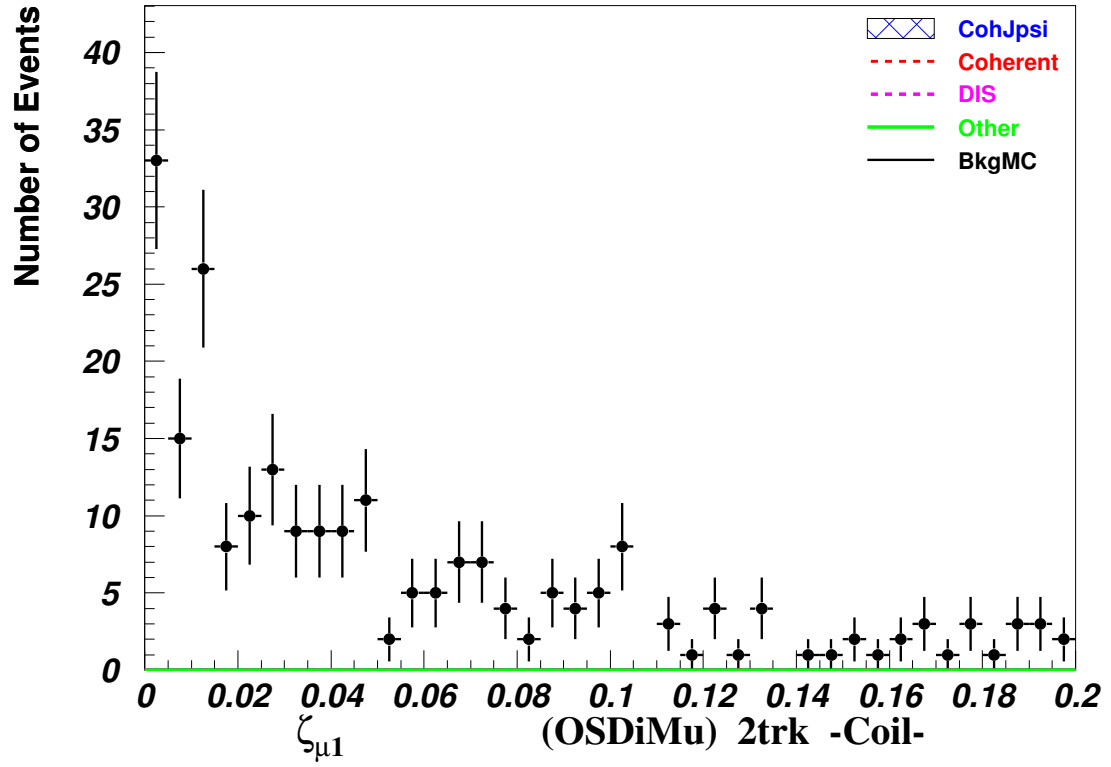


Figure 48: (./figs/zeta1+2.pdf)

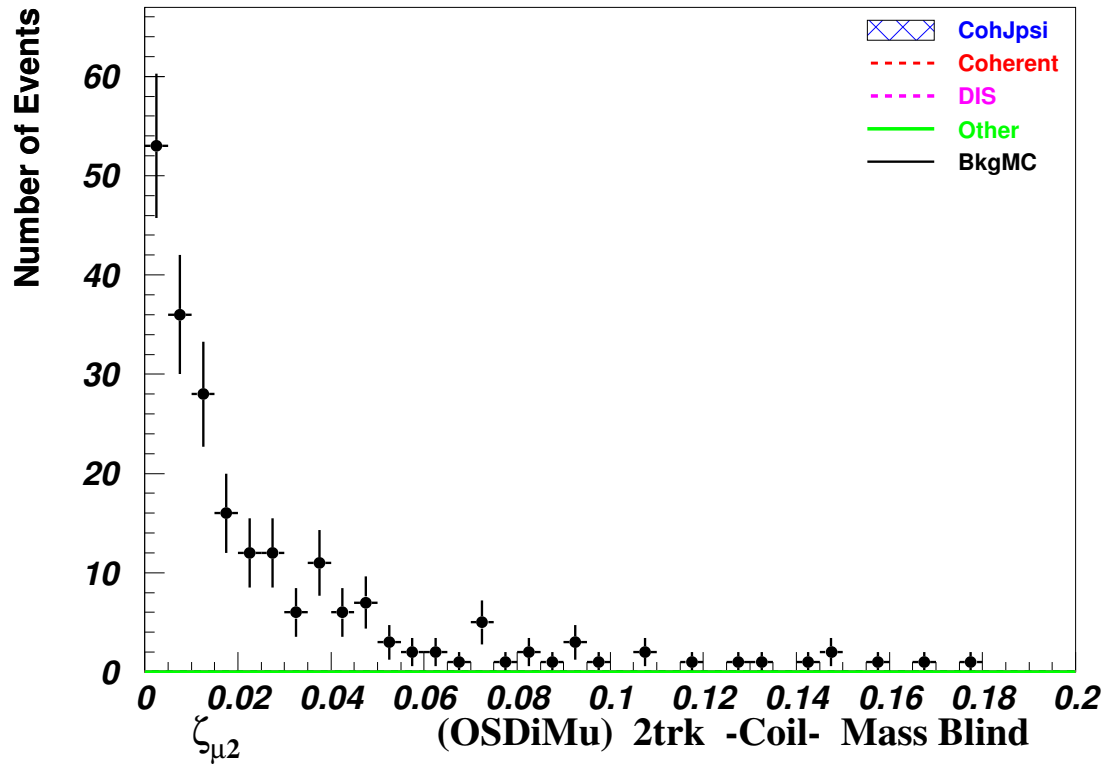
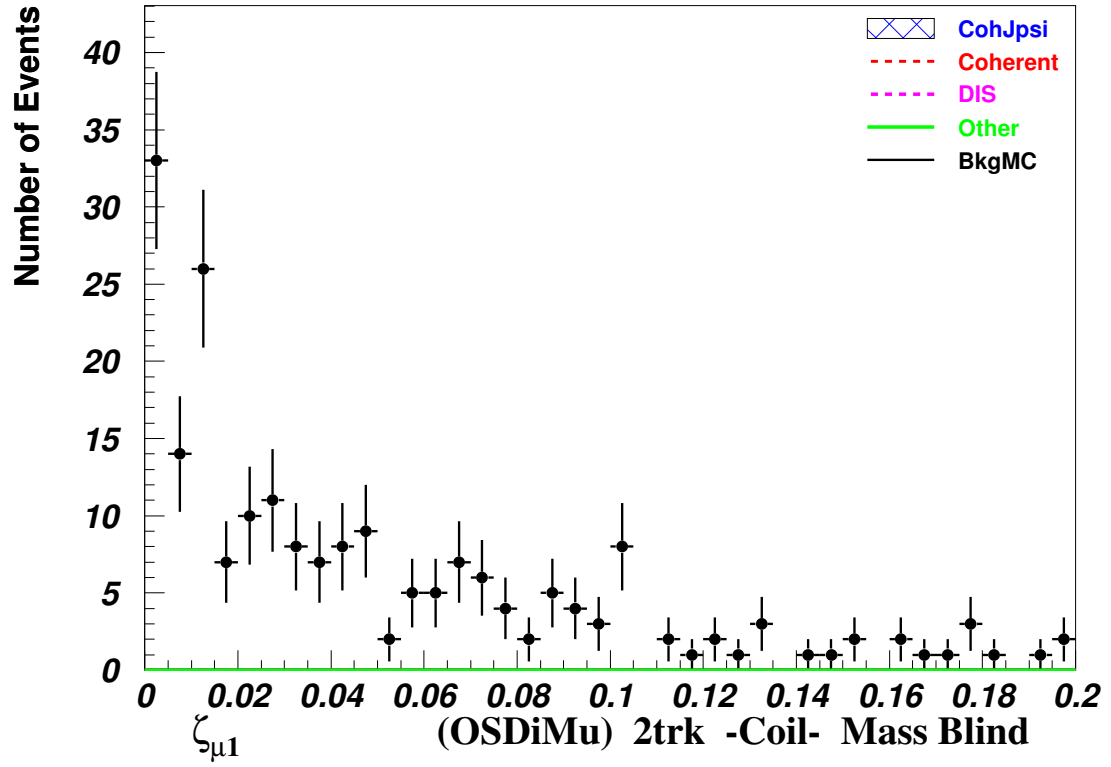


Figure 49: (./figs/zeta1+2-mb.pdf)

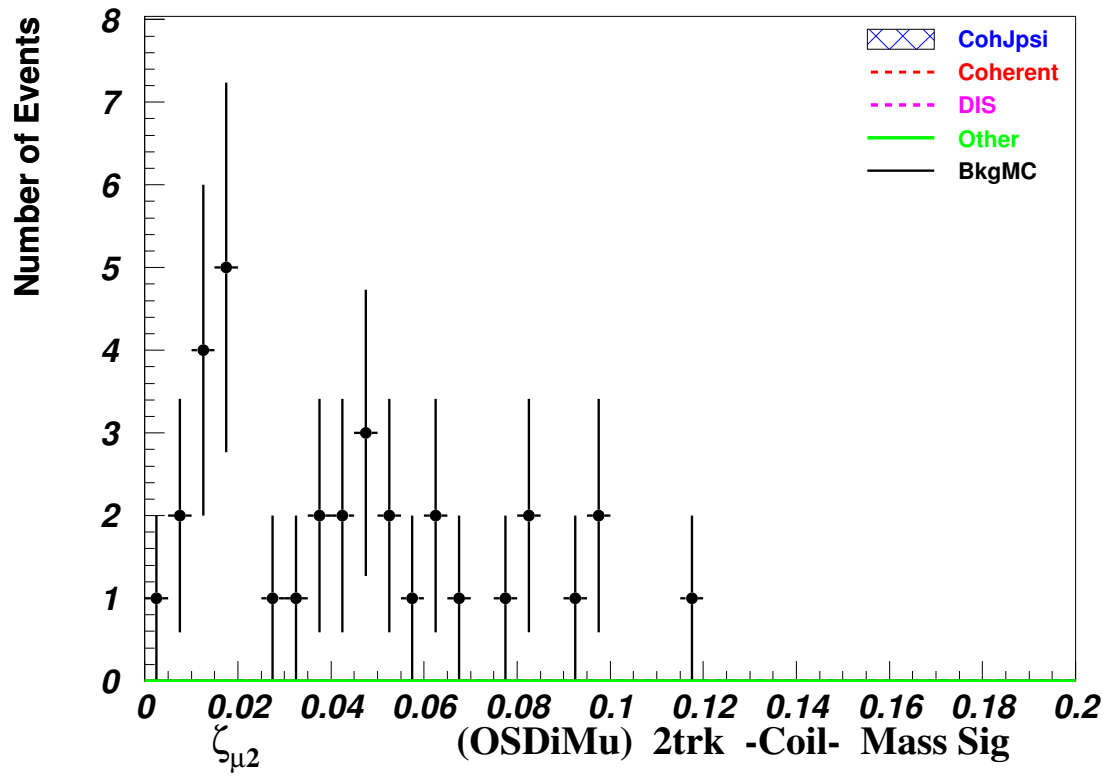
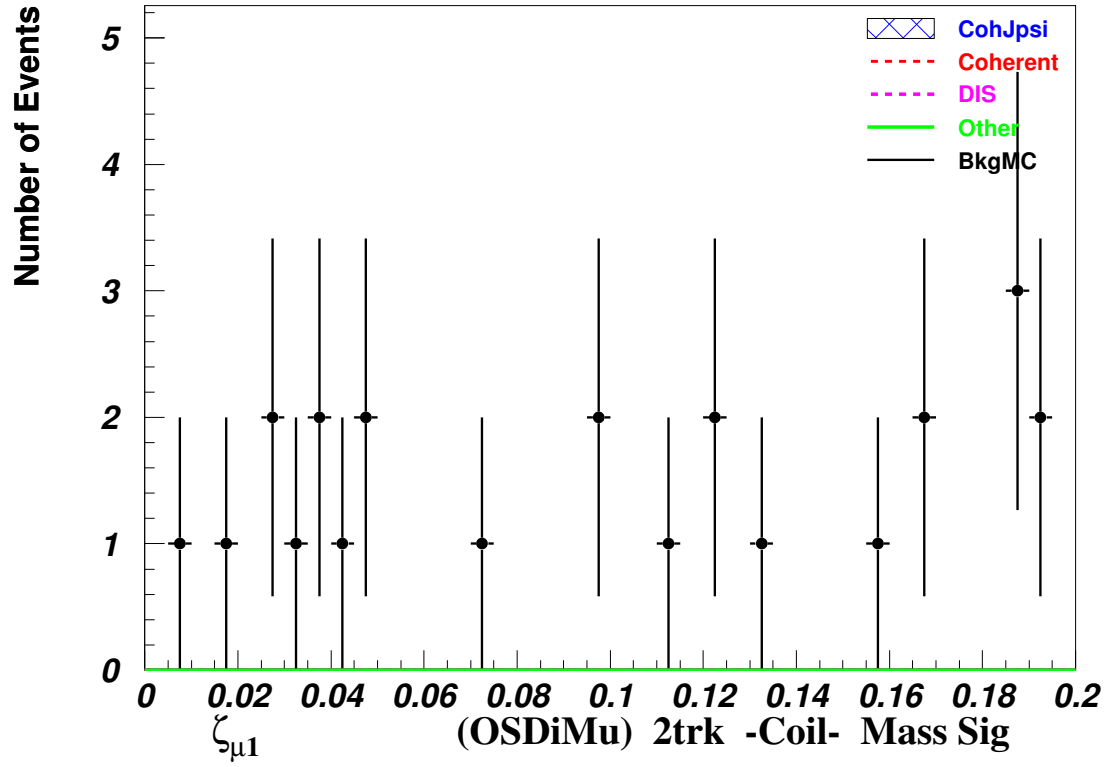


Figure 50: (./figs/zeta1+2-msig.pdf)

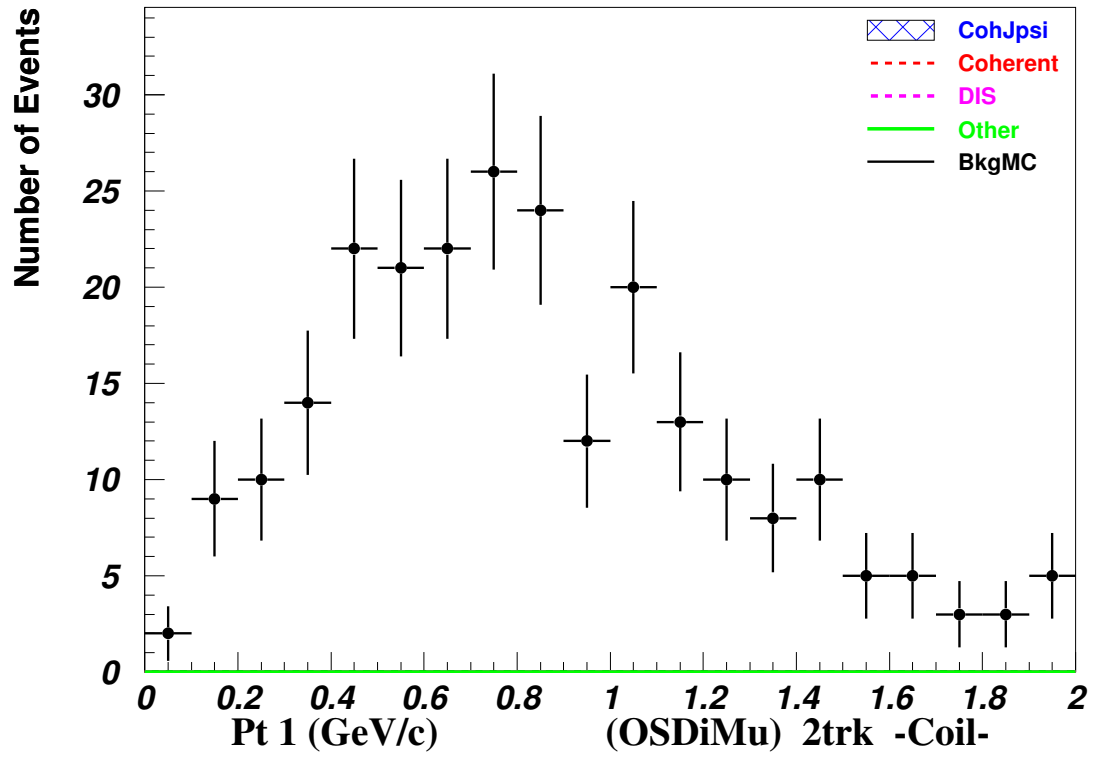
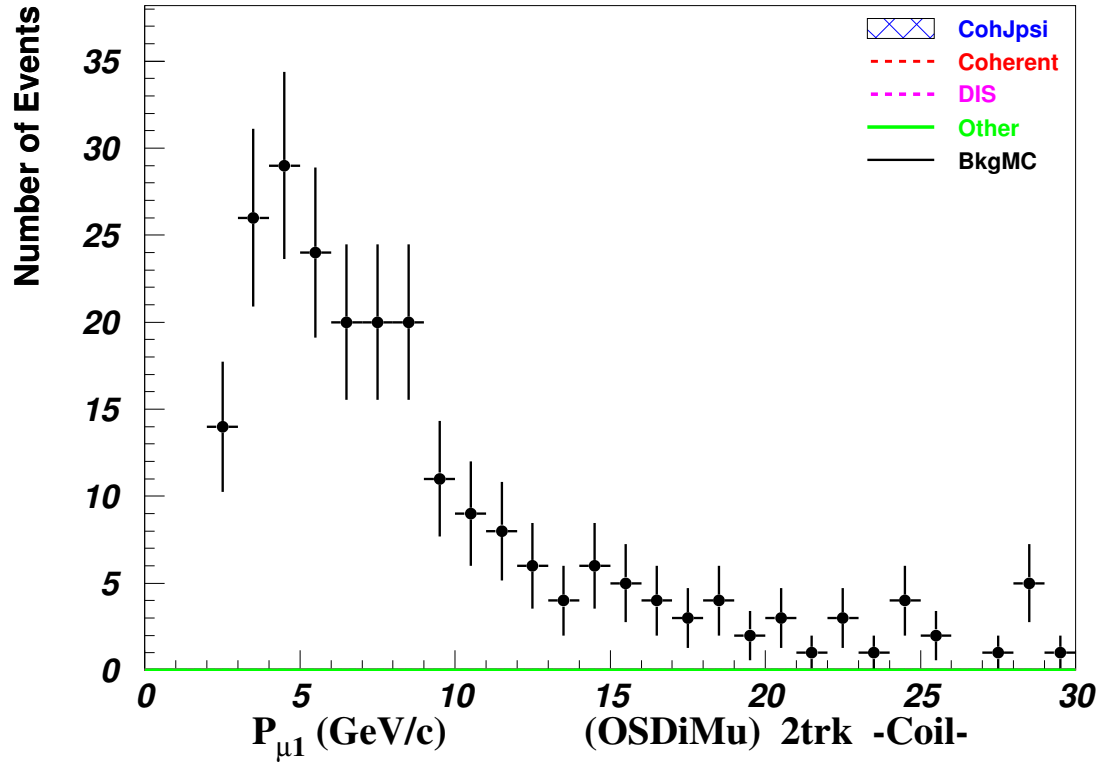


Figure 51: (./figs/p-pt-muneg.pdf)



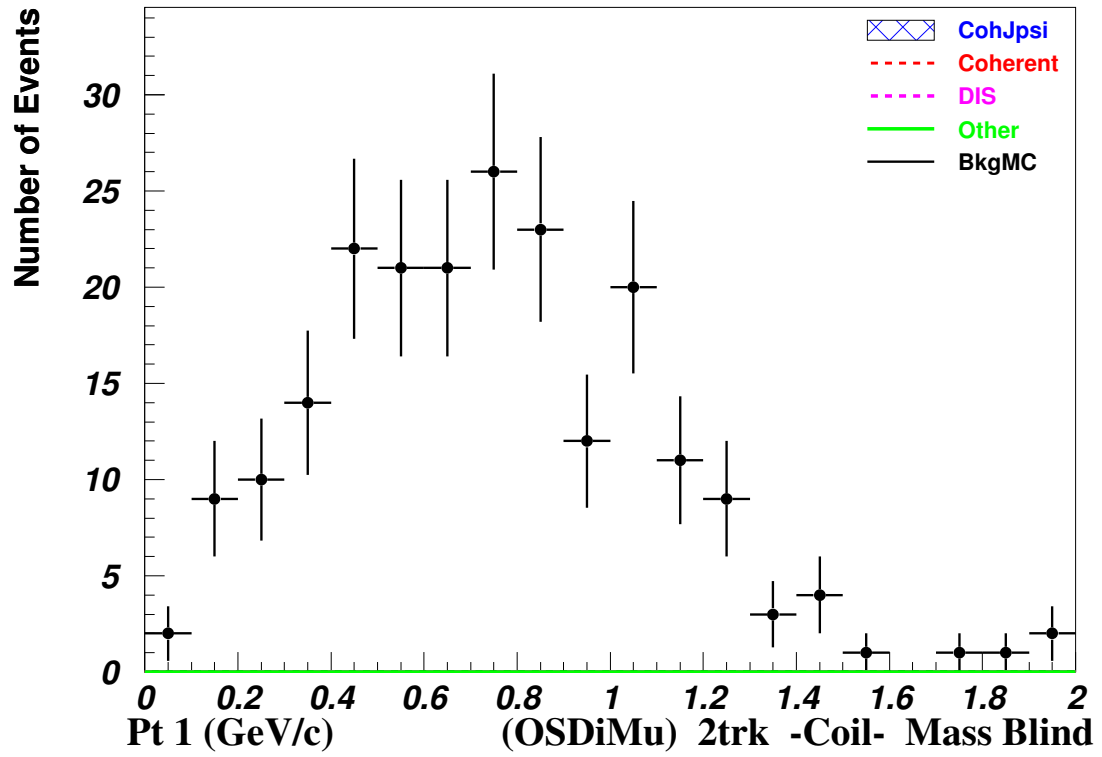
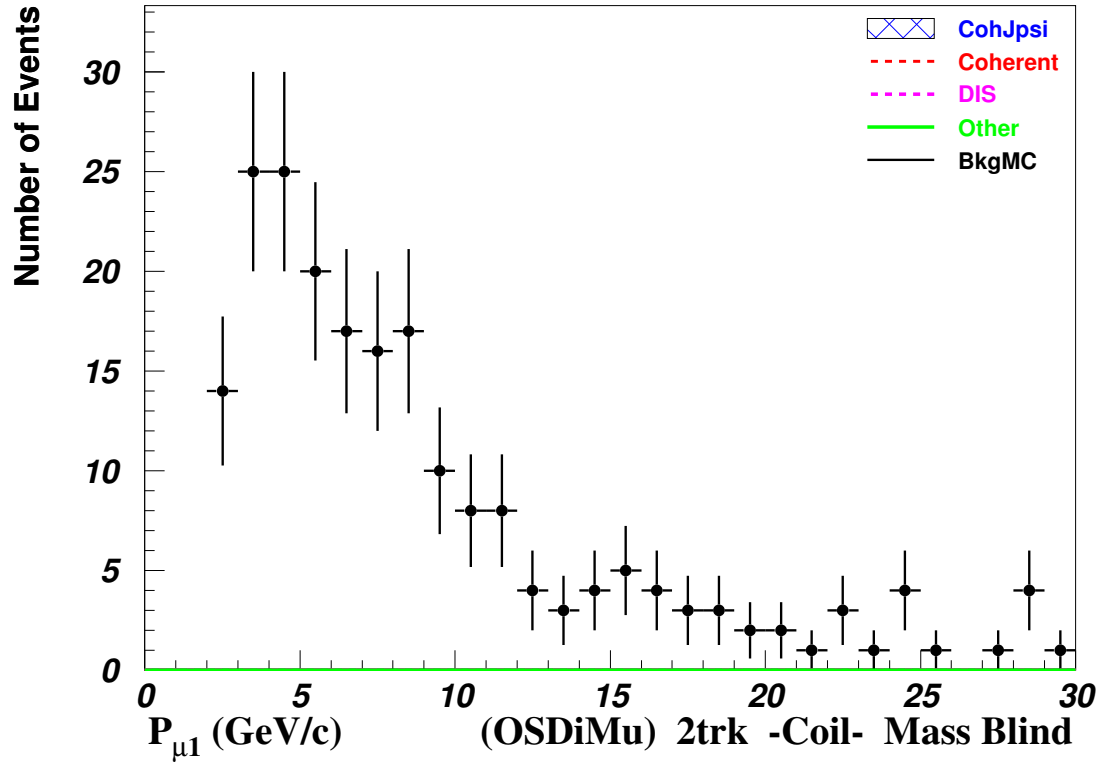


Figure 52: (./figs/p-pt-muneg-mb.pdf)

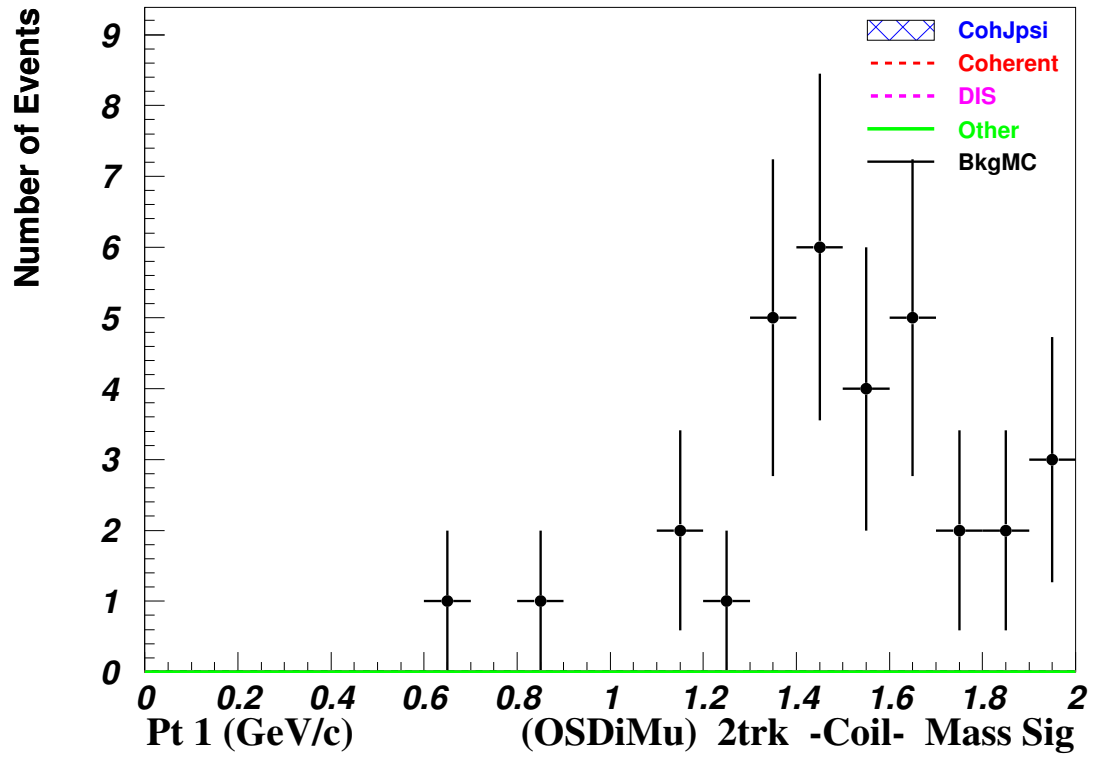
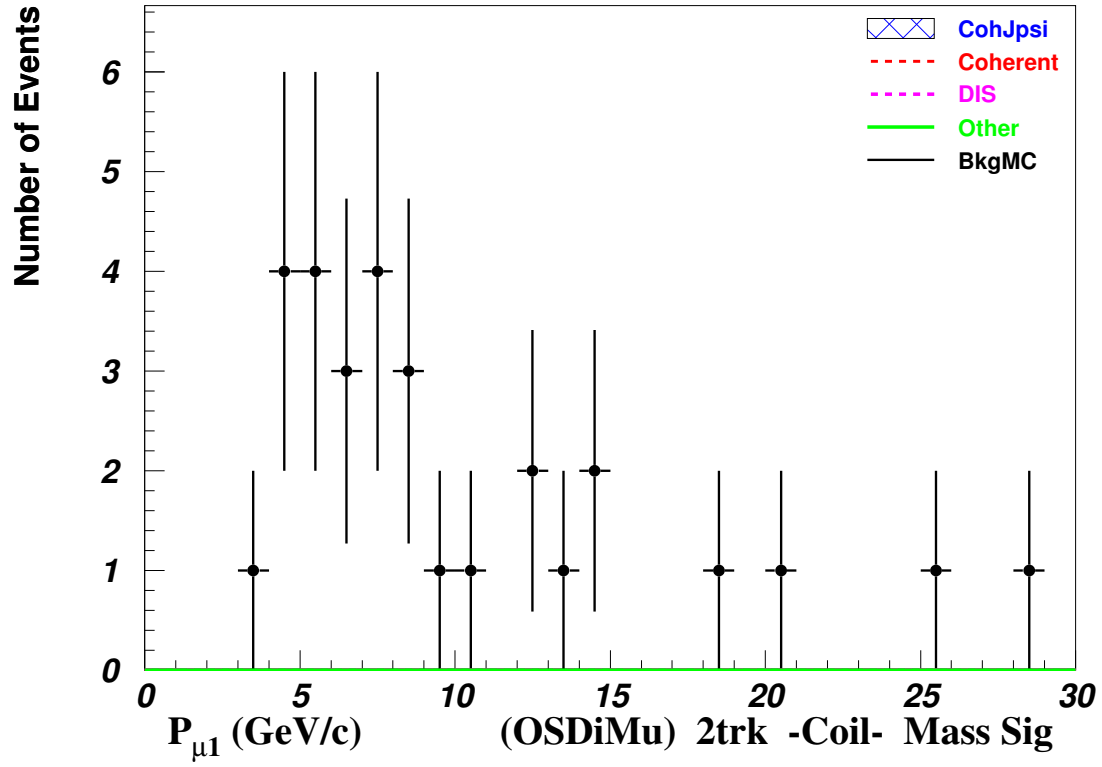


Figure 53: (./figs/p-pt-muneg-msig.pdf)

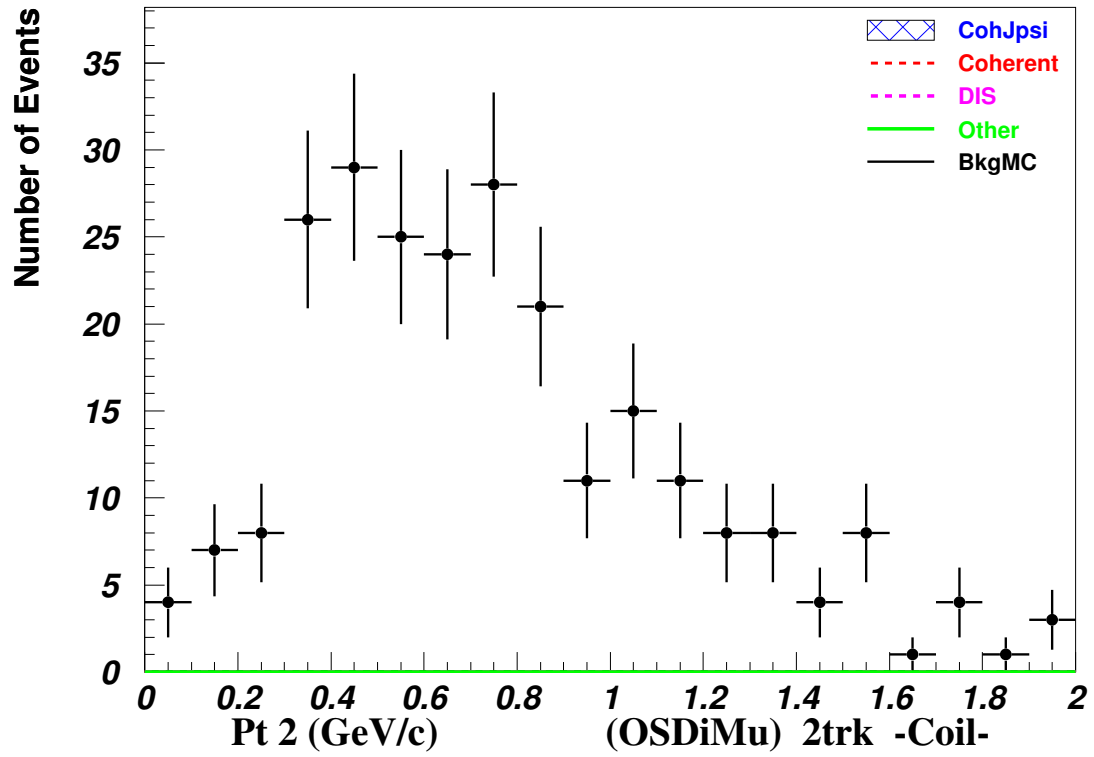
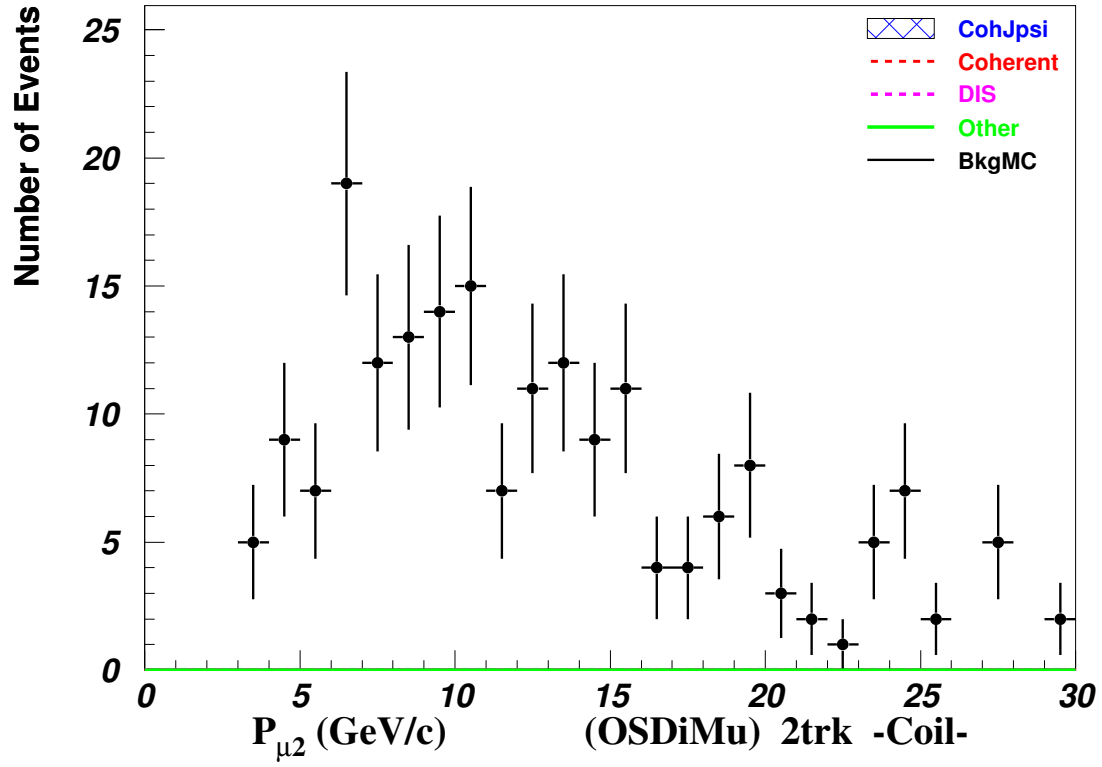


Figure 54: (./figs/p-pt-mupos.pdf)

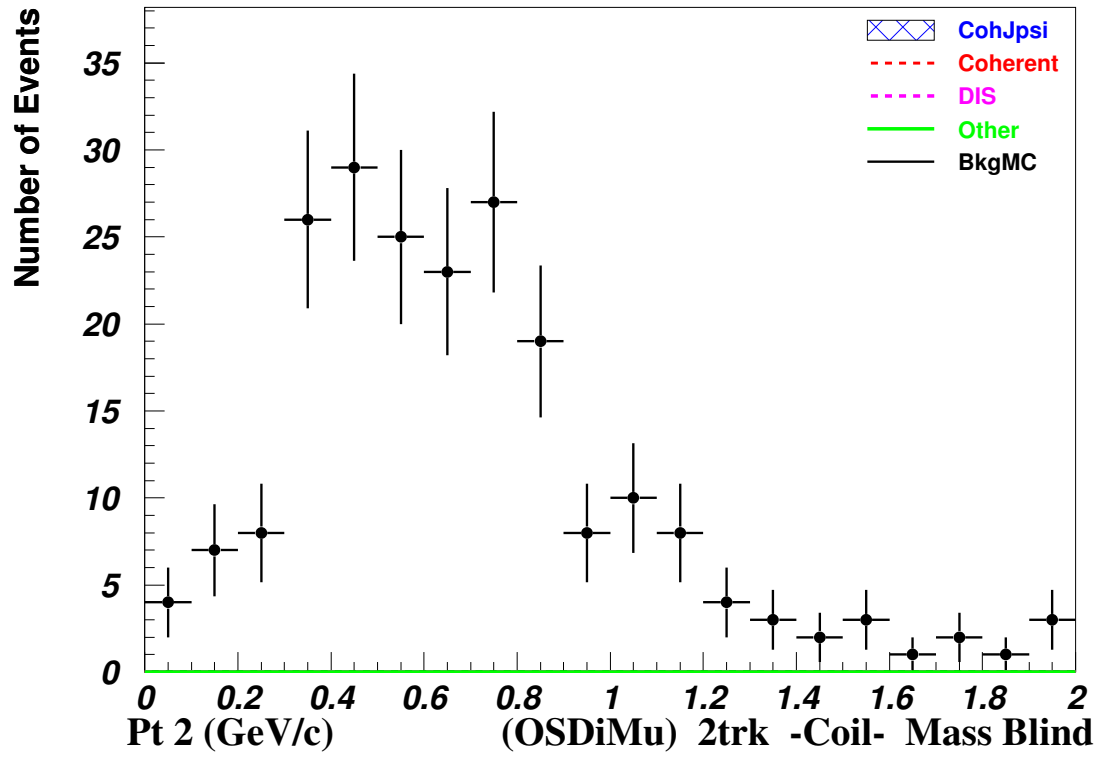
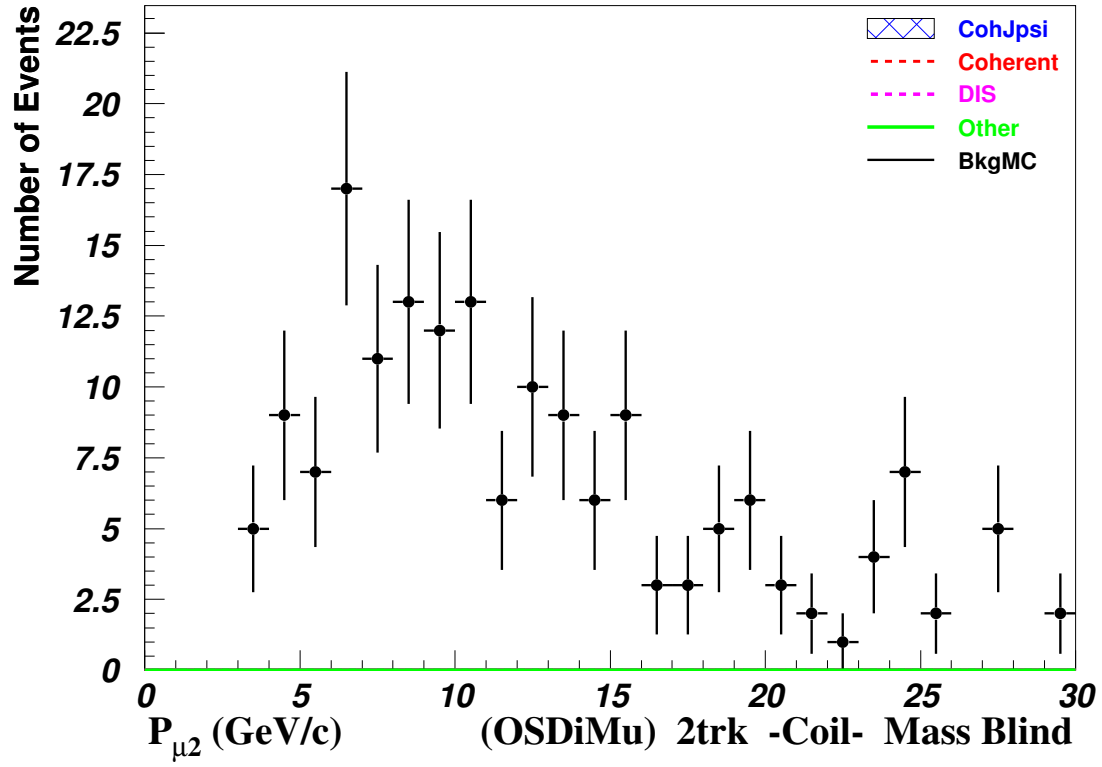


Figure 55: (./figs/p-pt-mupos-mb.pdf)

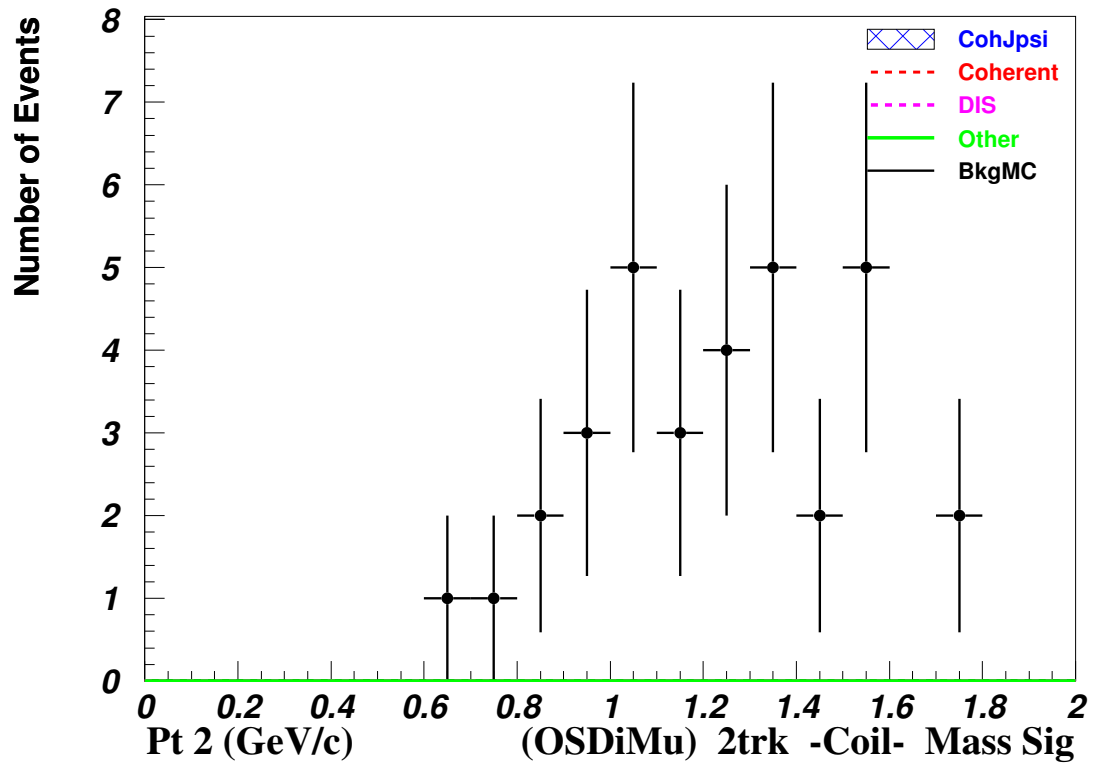
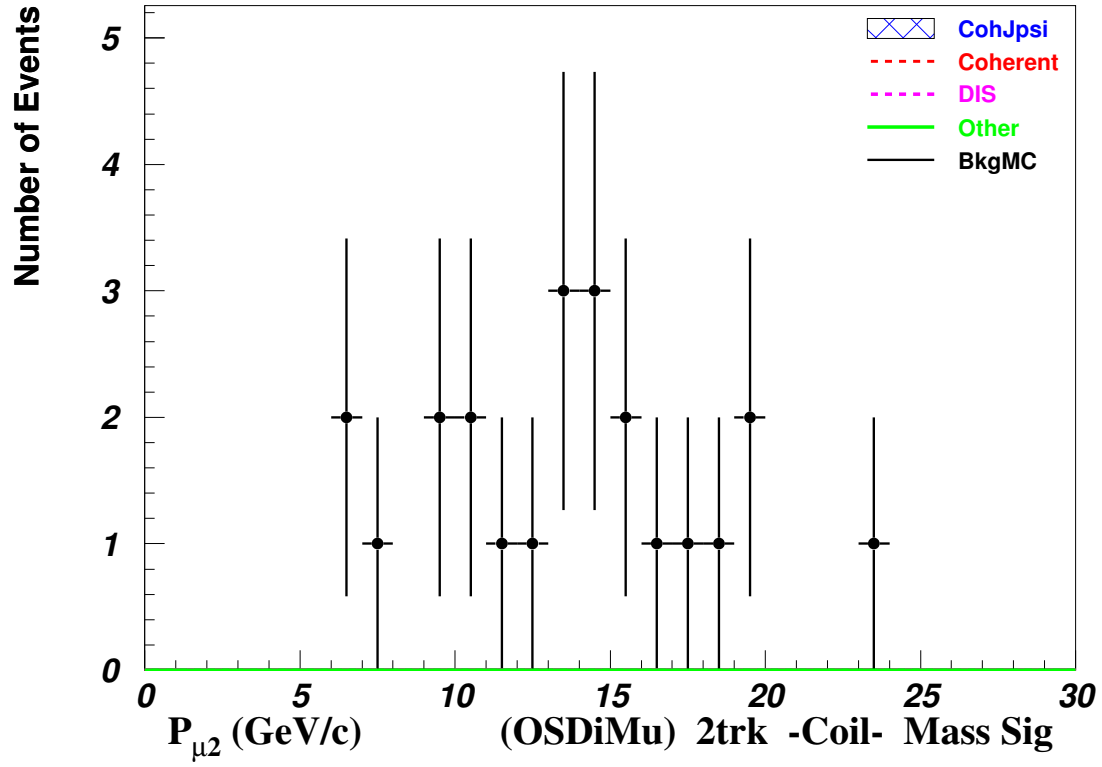


Figure 56: (./figs/p-pt-mupos-msig.pdf)

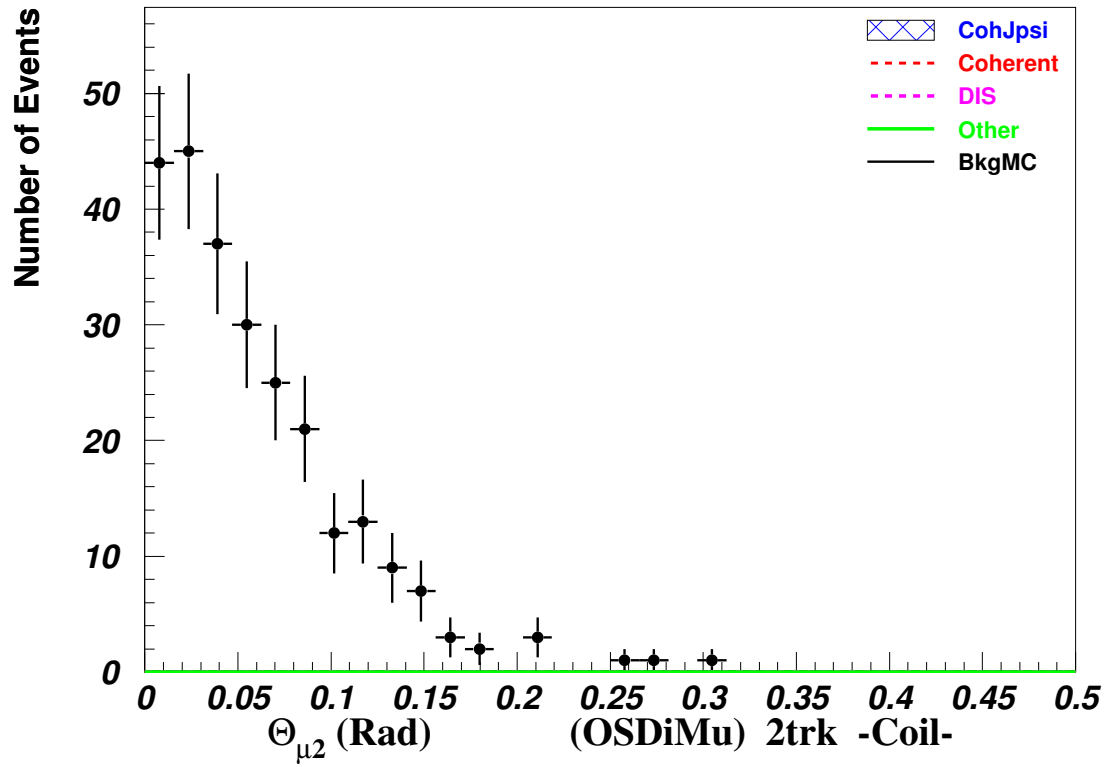
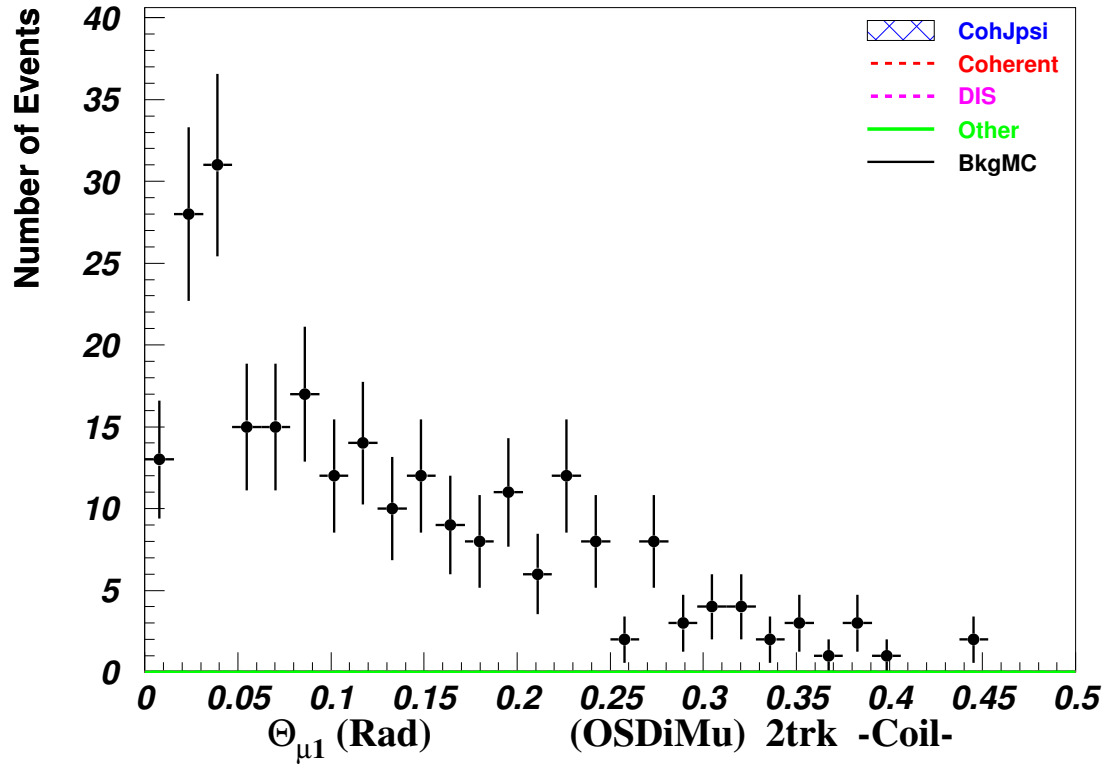


Figure 57: (./figs/theta1+2.pdf)

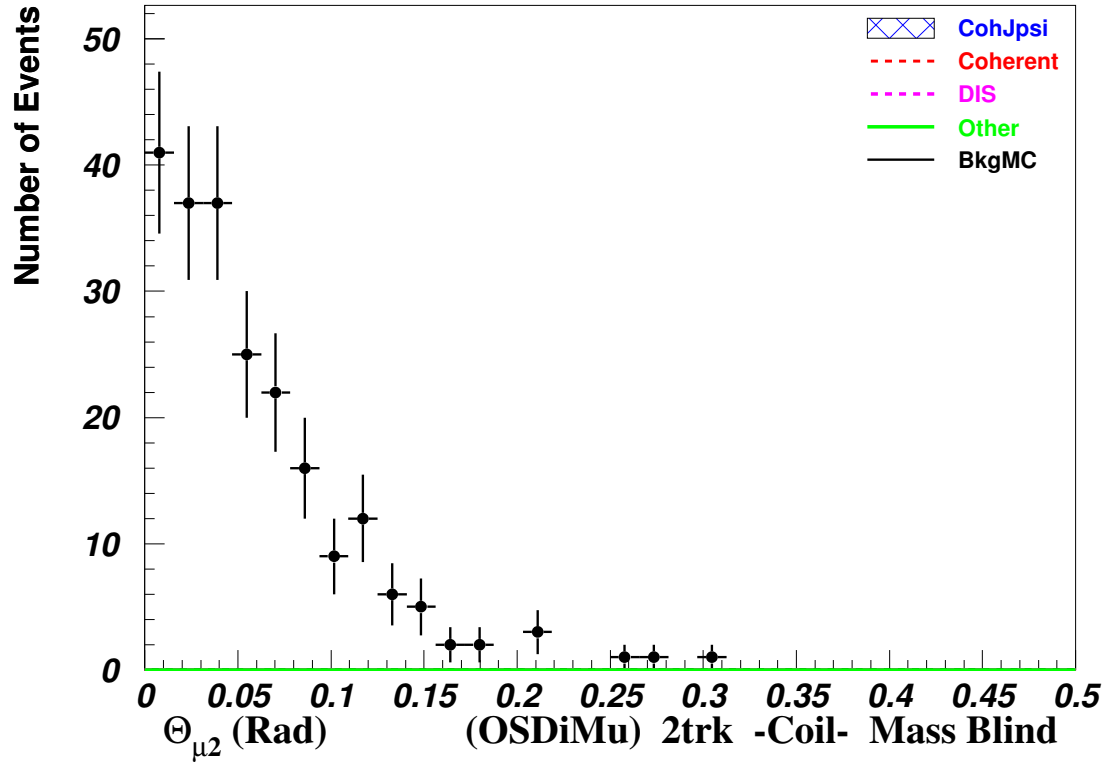
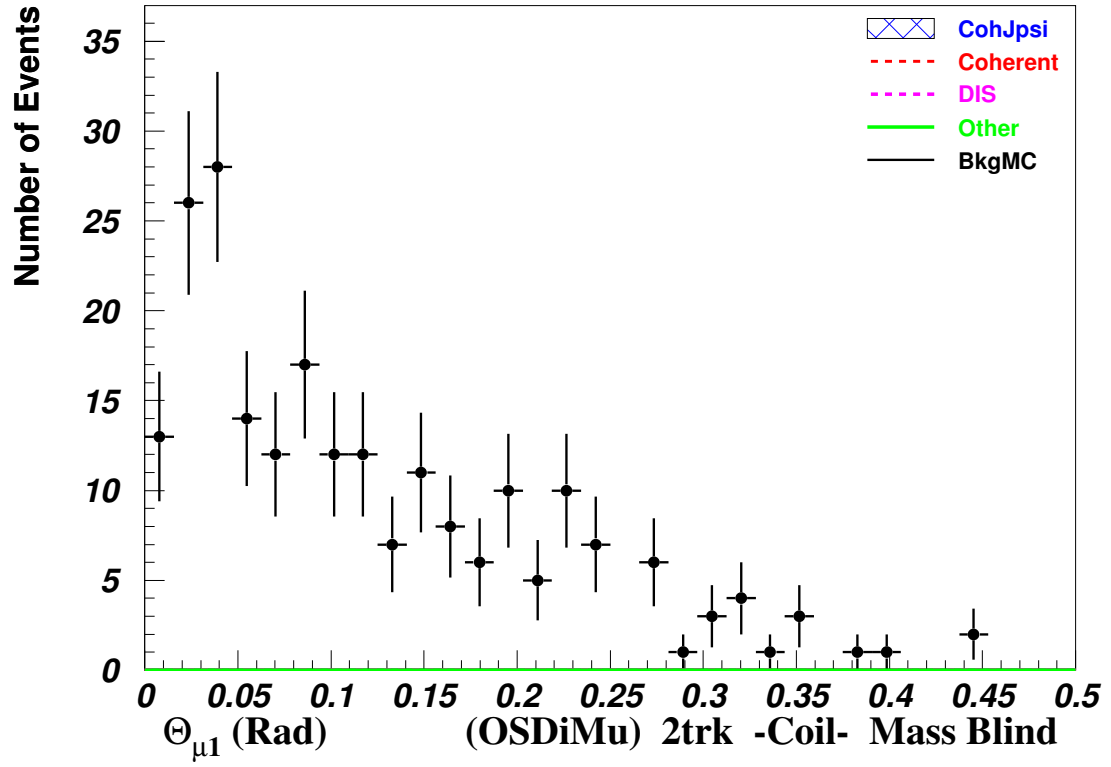


Figure 58: (./figs/theta1+2-mb.pdf)

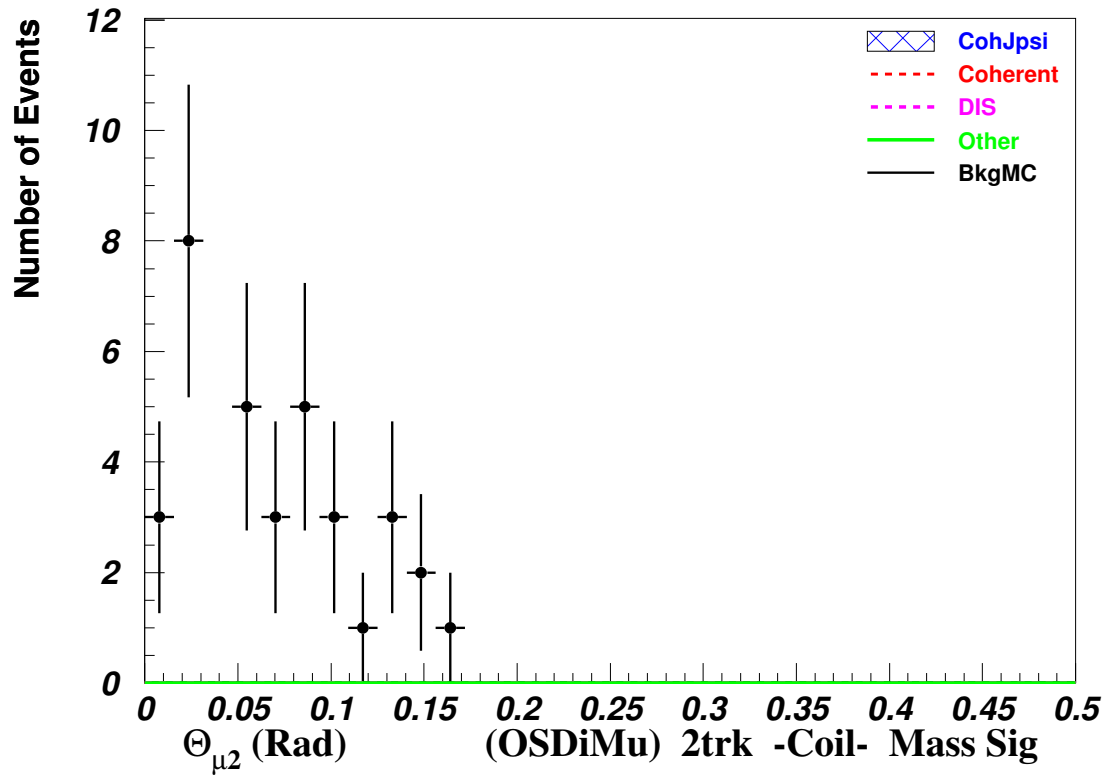
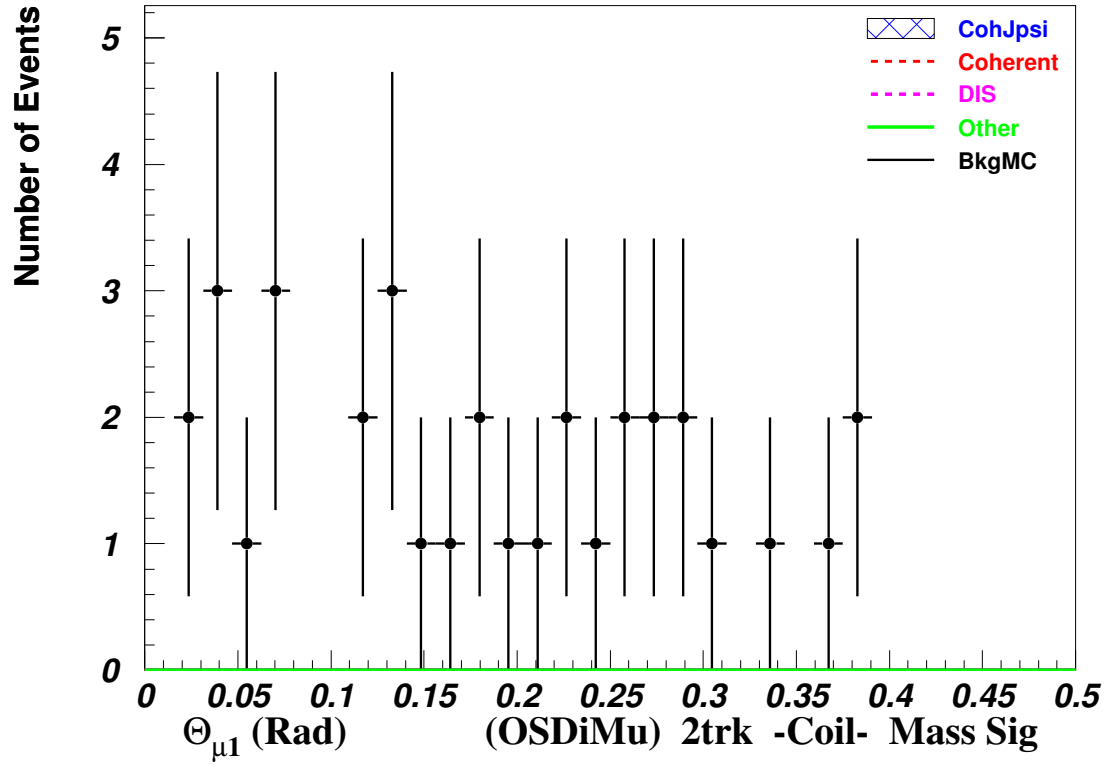


Figure 59: (./figs/theta1+2-msig.pdf)



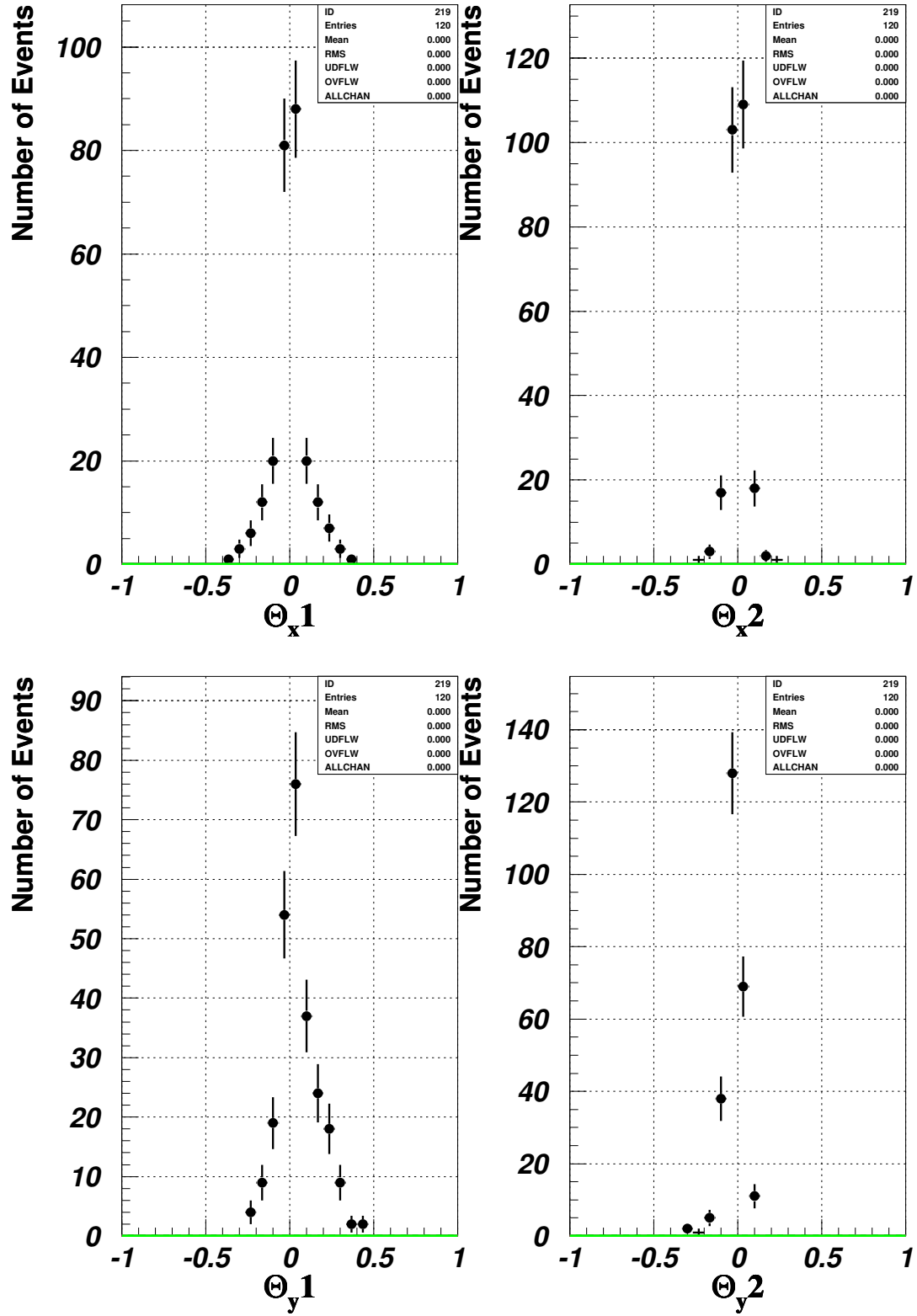


Figure 60: (./figs/thetaxy.pdf)