

Check Left-Right Asymmetry

Constrain the (anti-)neutron after all selection

Details of fixed (anti-)neutron mass:

- On the hypothesis of $\bar{\Lambda}n\gamma\gamma$
- Set a very large chisqCut (50000)
- Set very large Iter Number (500)
- Fixed (anti-)neutron

```
KalmanKinematicFit *kmfit = KalmanKinematicFit::instance();  
kmfit->init();  
kmfit->setBeamPosition(vx);  
kmfit->setVBeamPosition(Evx);  
kmfit->setChisqCut(50000.0);  
kmfit->setIterNumber(500);  
kmfit->AddTrack(0, TrkPar_Lambdabar_VtxFit);  
kmfit->AddTrack(1, 0.0, g1Trk);  
kmfit->AddTrack(2, 0.0, g2Trk);  
kmfit->AddMissTrack(3, mn0_PDG);  
kmfit->AddResonance(0, mpion0, 1, 2);  
kmfit->AddResonance(1, 1.115684, 1, 2, 3);  
kmfit->AddFourMomentum(2, ecms);
```

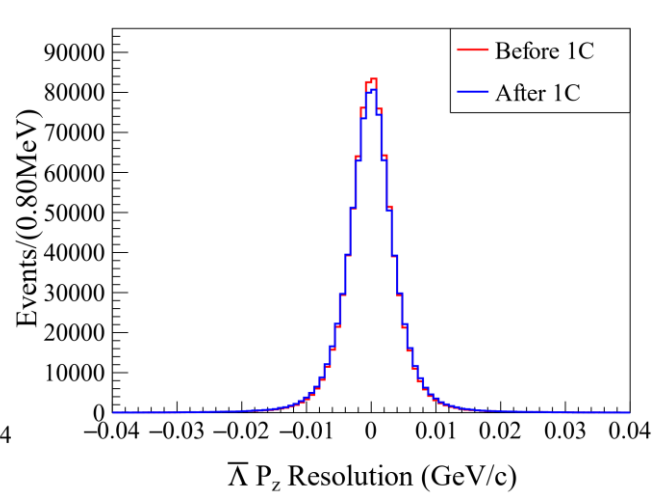
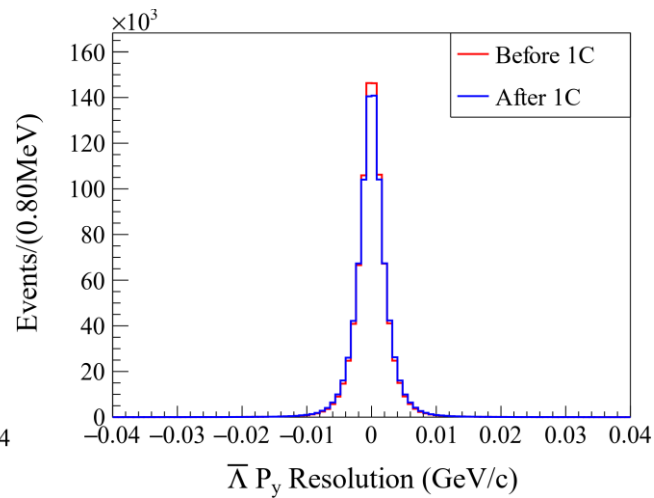
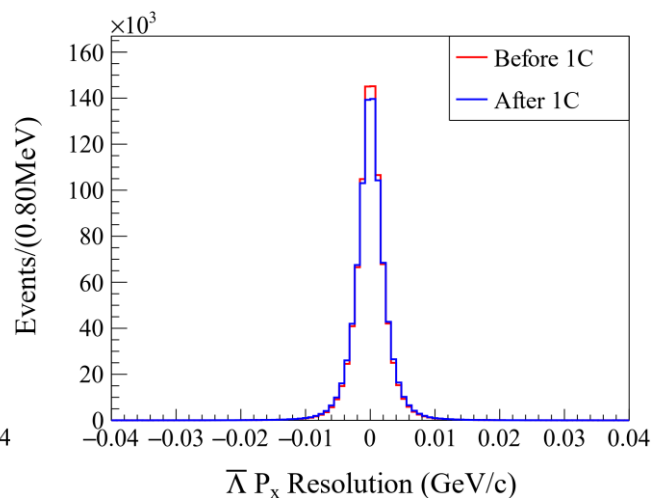
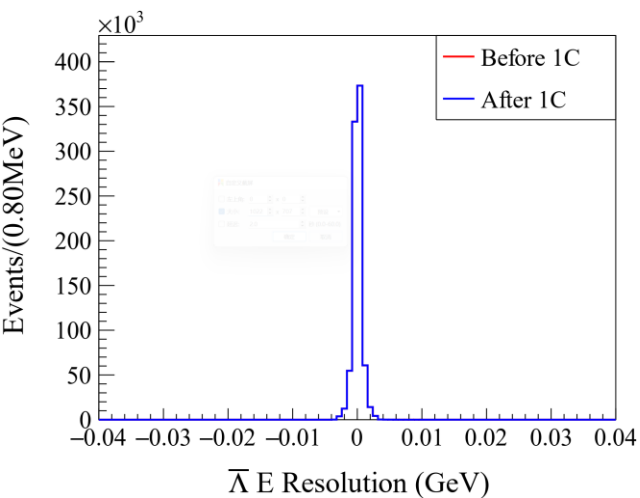
Efficiency Loss: (in signal region)

- $n\pi^0$ channel: 0.02%
- $\bar{n}\pi^0$ channel: 0.03%

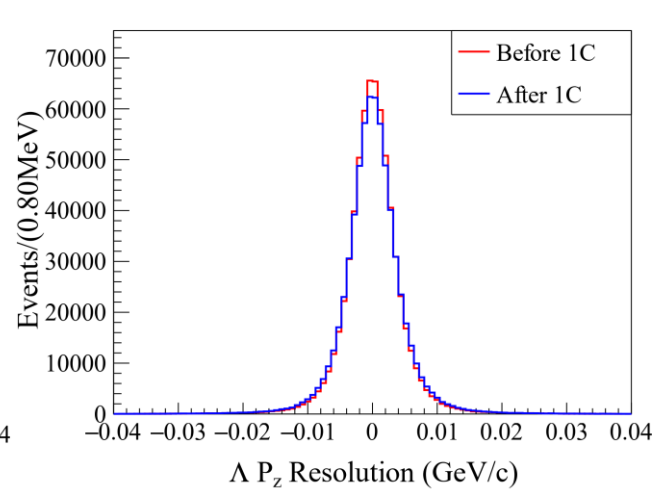
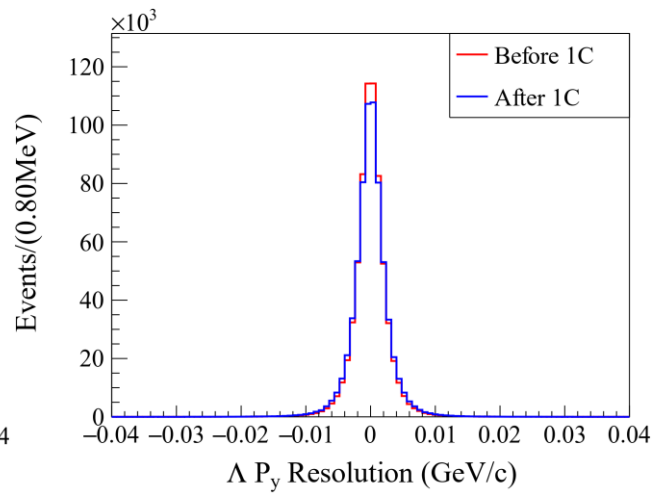
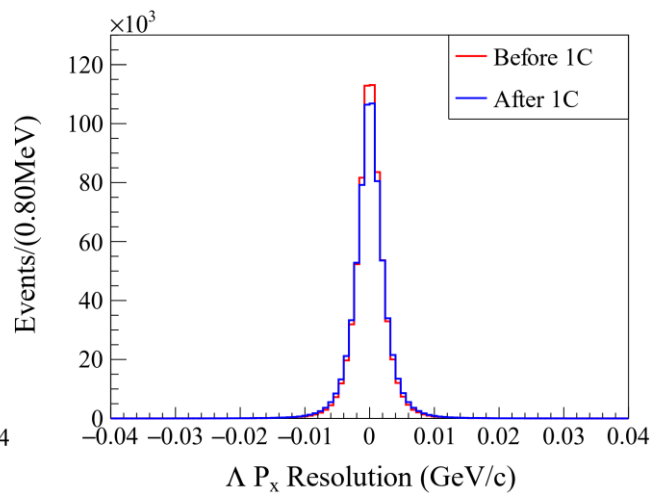
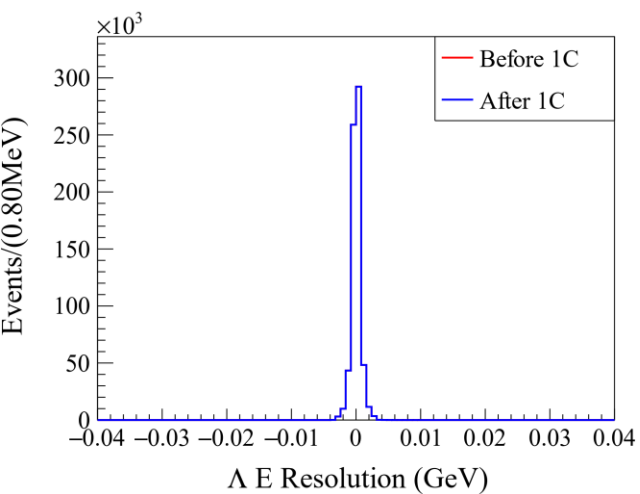
Compare after fixing (anti-)neutron mass (1C)

Charged Λ

$$\Lambda \rightarrow n\pi^0$$



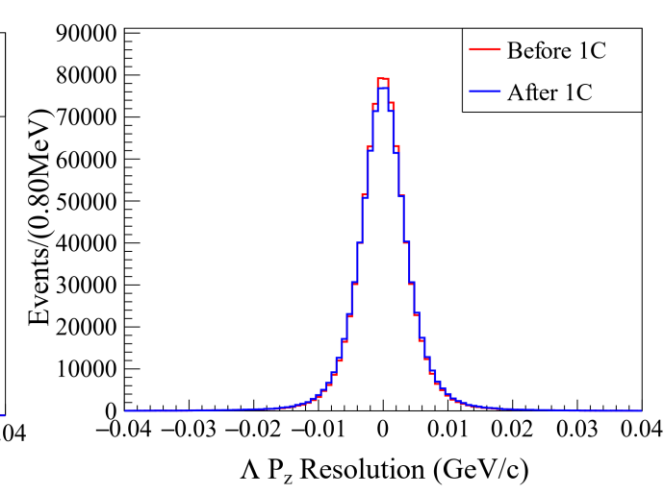
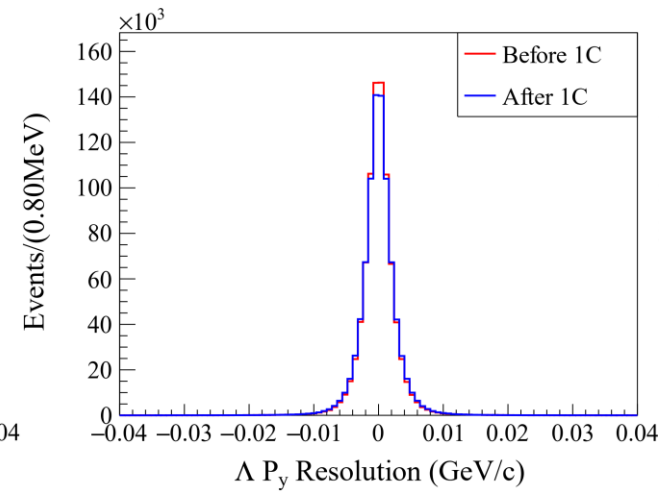
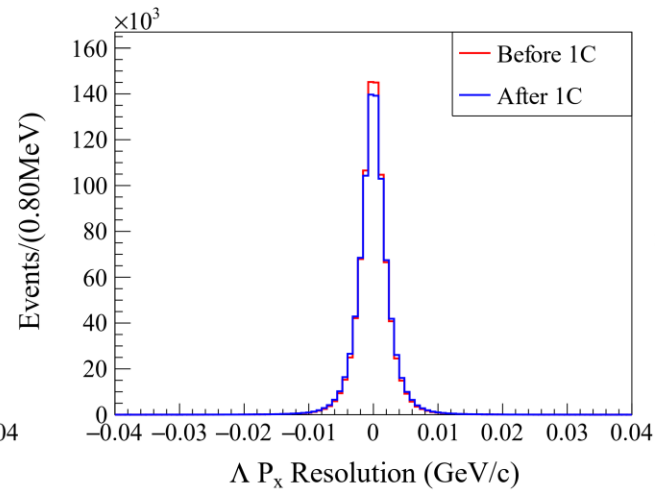
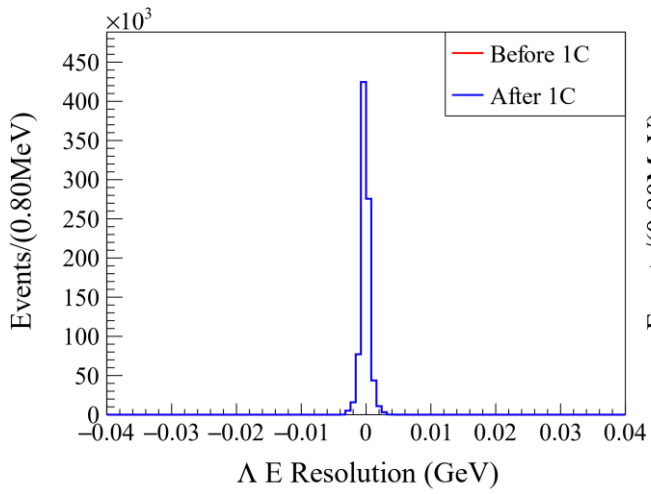
$$\bar{\Lambda} \rightarrow \bar{n}\pi^0$$



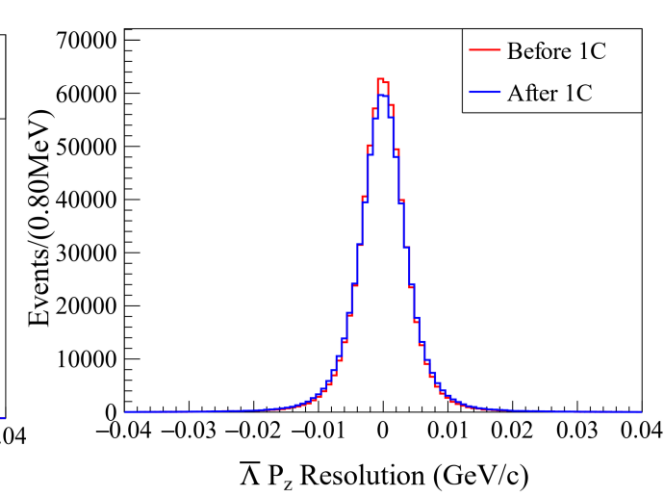
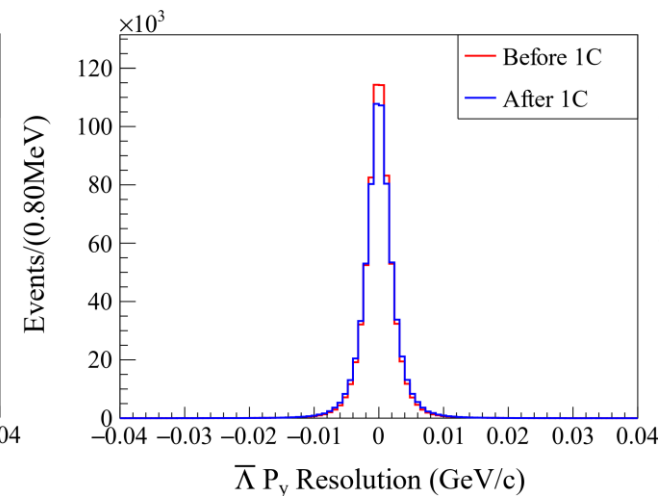
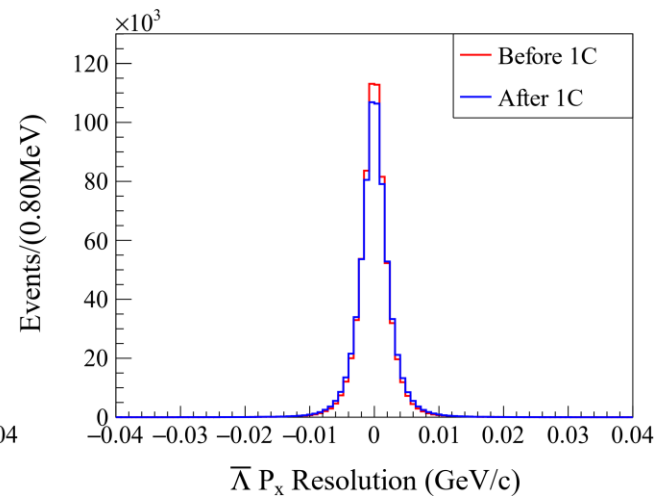
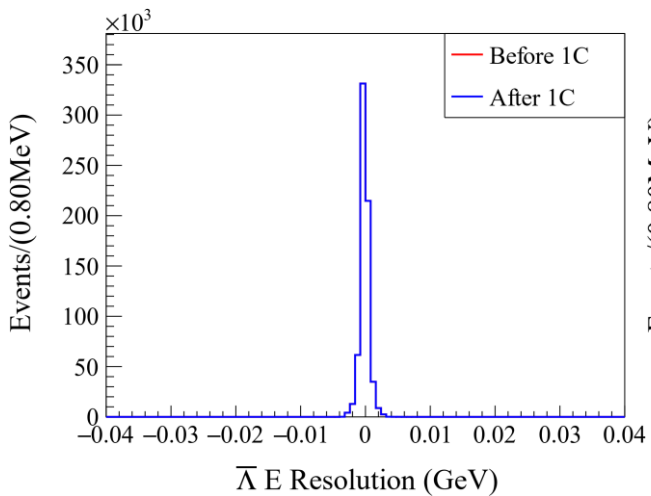
Compare after fixing (anti-)neutron mass (1C)

Neutral Λ

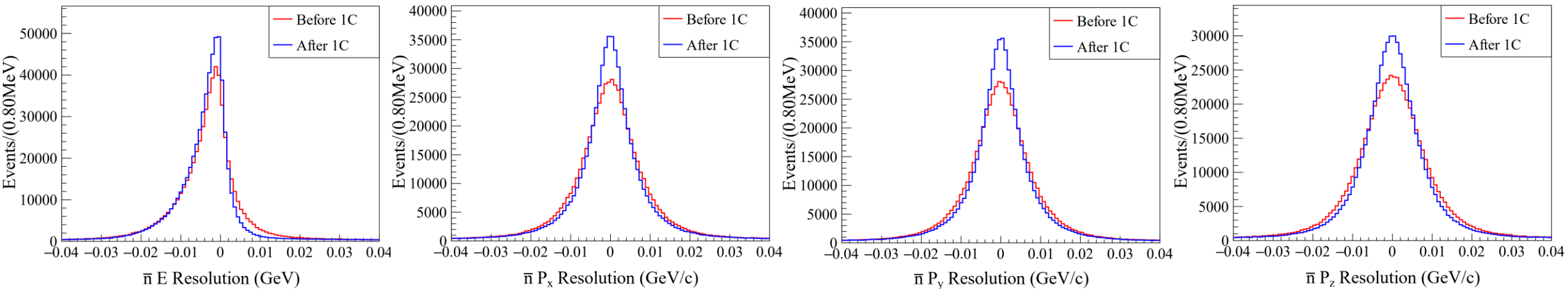
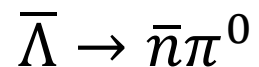
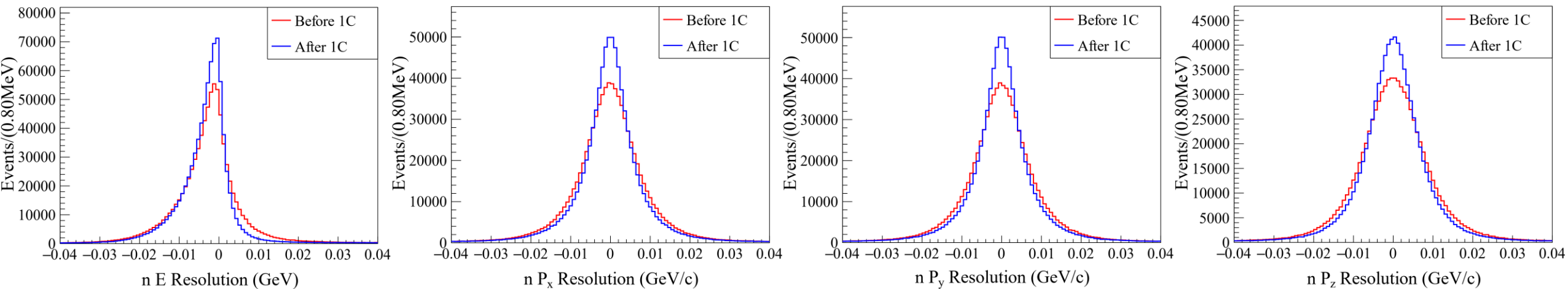
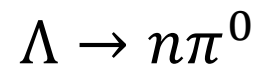
$$\Lambda \rightarrow n\pi^0$$



$$\bar{\Lambda} \rightarrow \bar{n}\pi^0$$



Compare after fixing (anti-)neutron mass (1C)

 n/\bar{n} 

SIG Fixed M_n

$\Lambda \rightarrow n\pi^0$

Fixed the neutron mass

after selection:

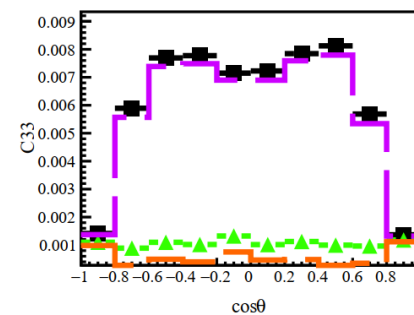
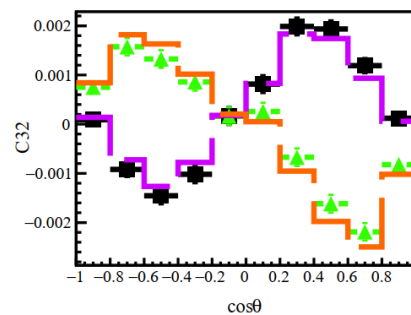
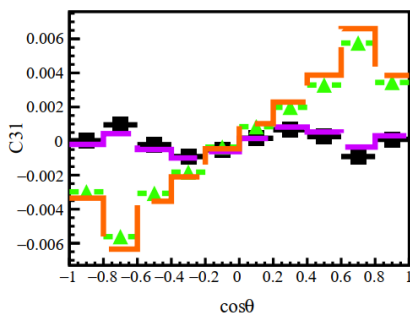
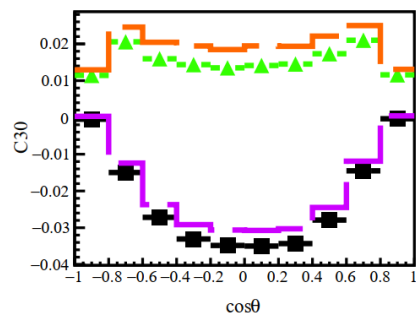
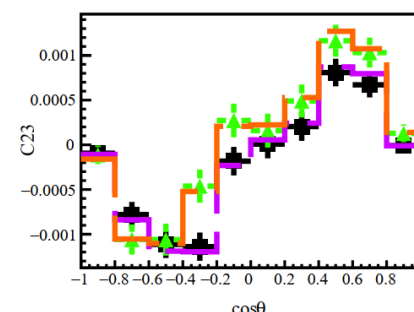
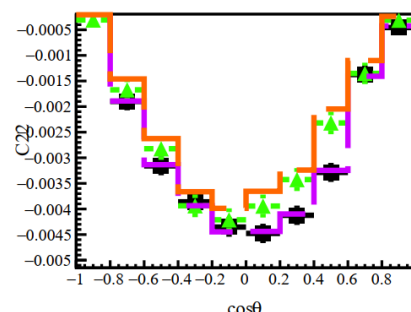
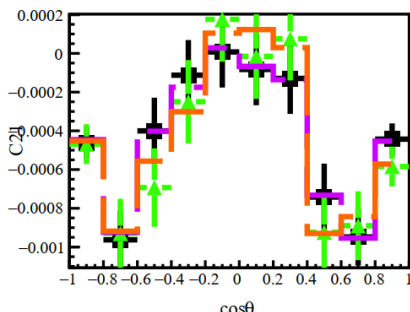
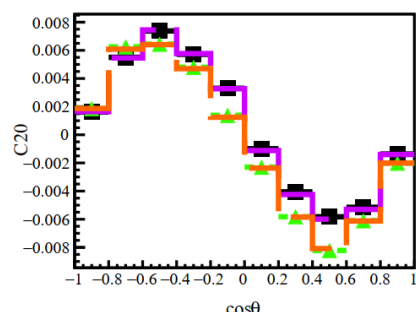
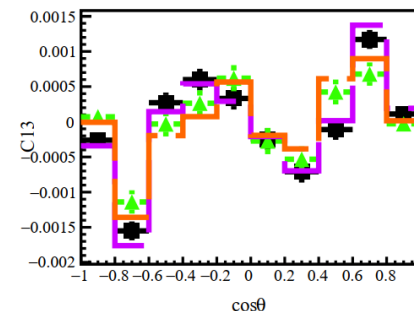
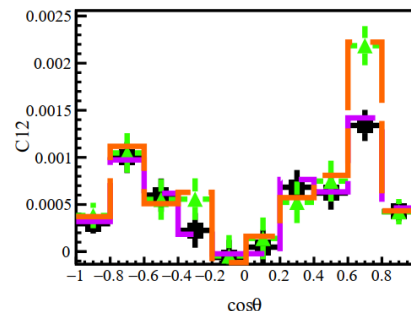
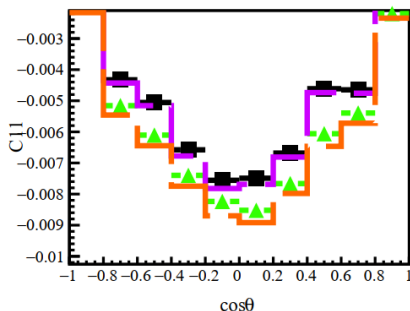
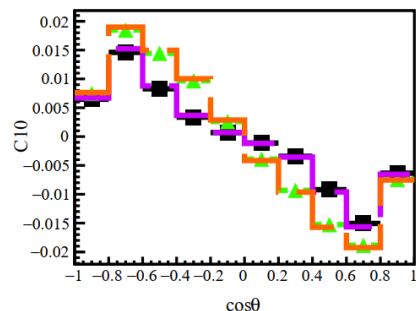
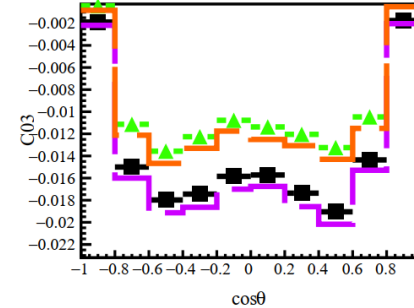
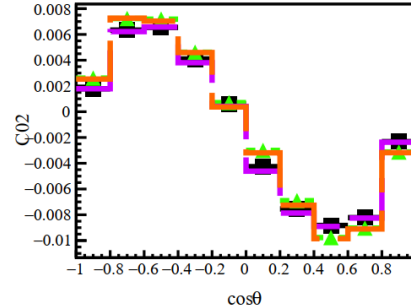
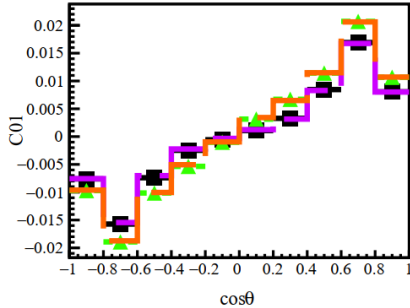
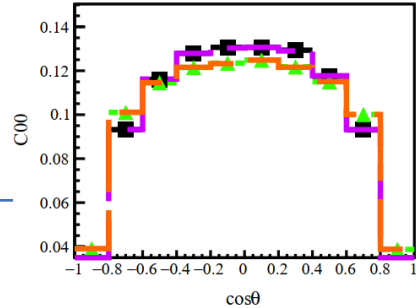
- Eff loss = 0.02%

Left Signal Region:

- Rec: Black ■
- Truth: Purple Dashed

Right Signal Region:

- Rec: Green ▲
- Truth: Orange Dashed



SIG Fixed M_n

$\bar{\Lambda} \rightarrow \bar{n}\pi^0$

Fixed the neutron mass

after selection:

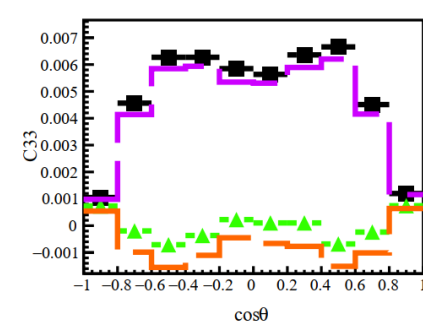
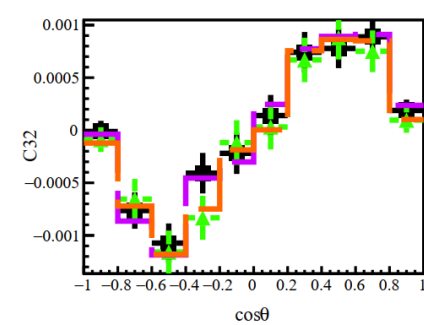
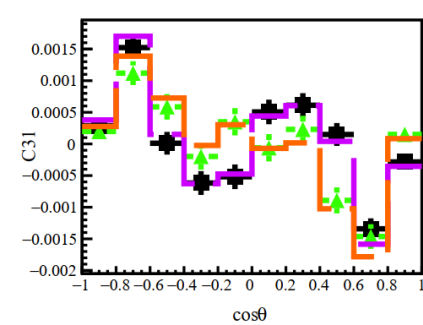
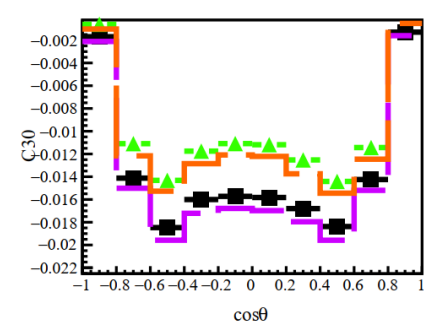
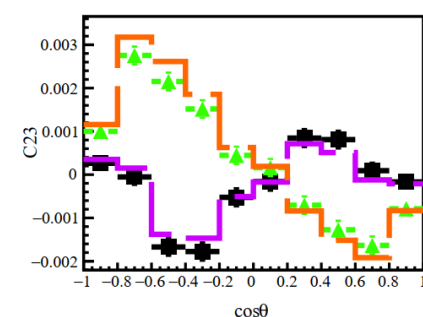
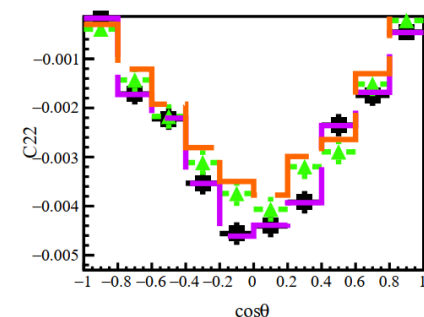
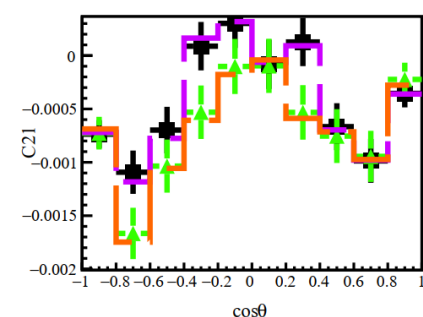
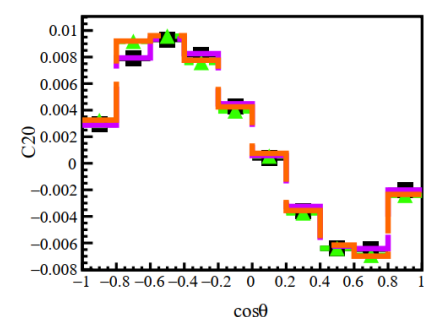
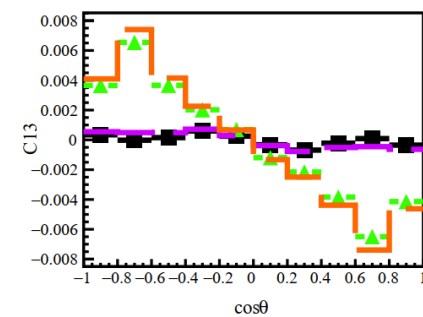
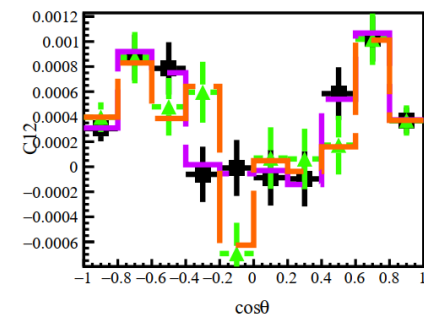
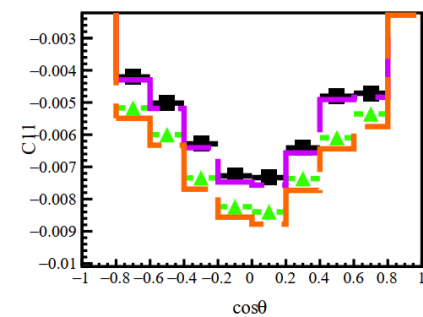
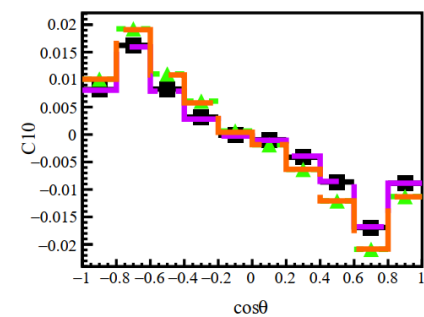
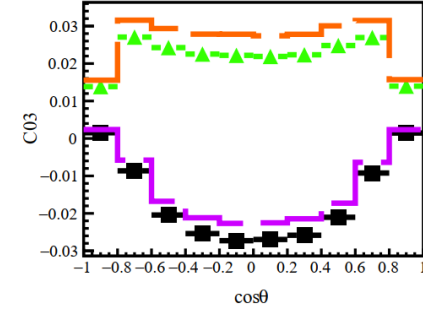
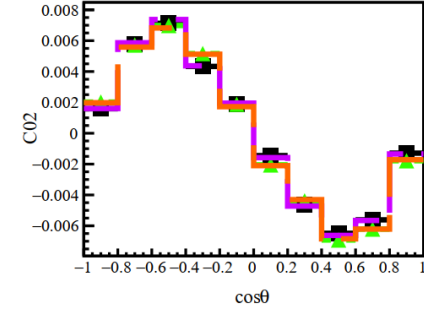
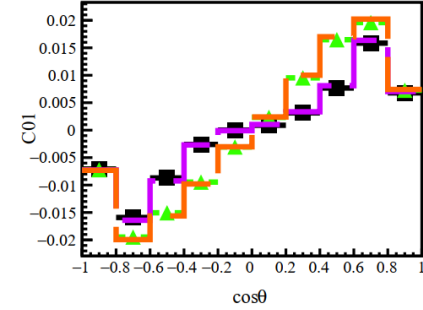
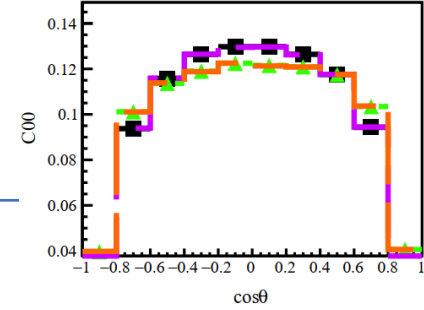
- Eff loss = 0.03%

Left Signal Region:

- Rec: Black ■
- Truth: Purple Dashed

Right Signal Region:

- Rec: Green ▲
- Truth: Orange Dashed

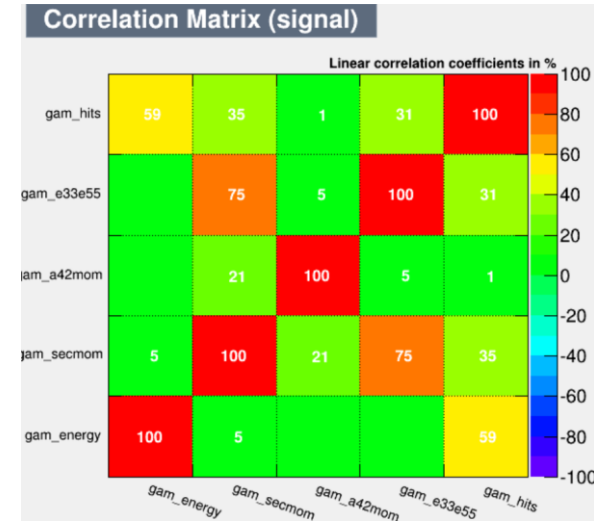
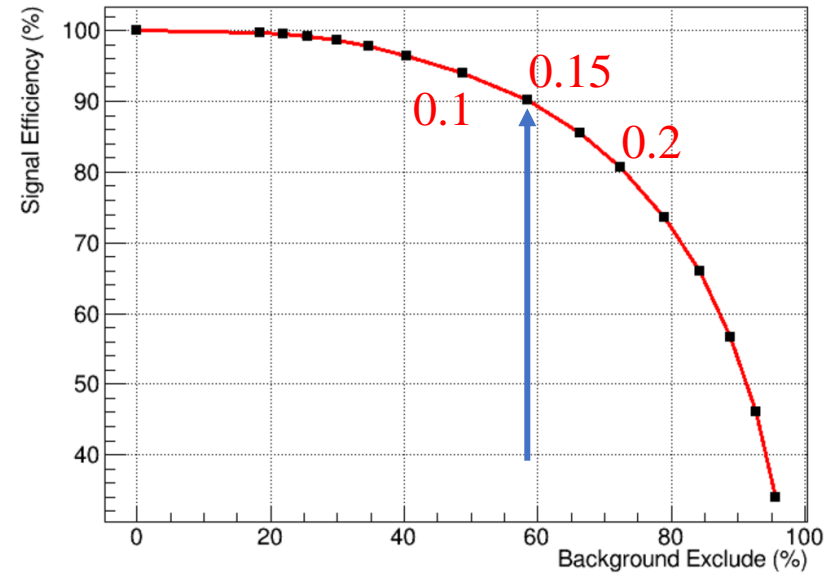
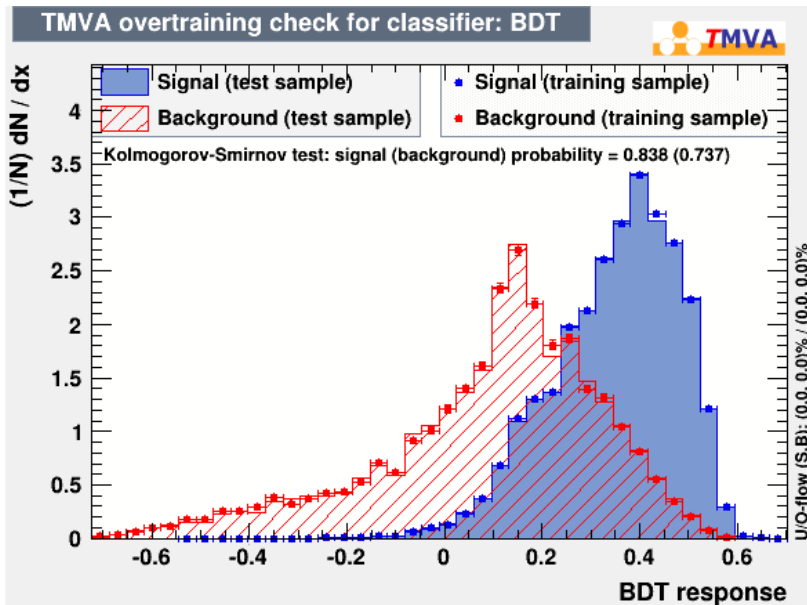
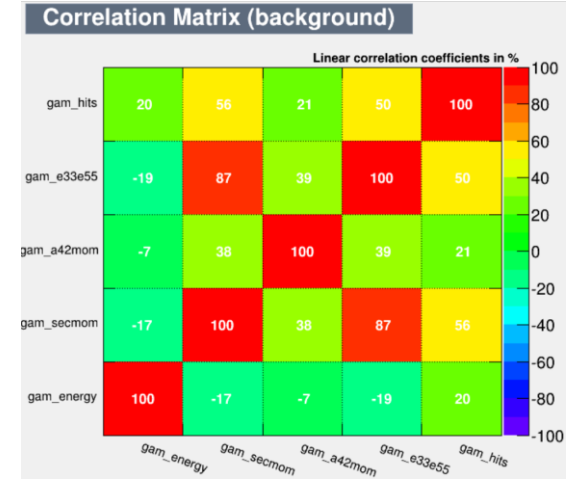


BDT in Event Selection

BDT

- **Input variable:** $E, N_{hit}, A_{42}, \frac{e5 \times 5 - e3 \times 3}{e5 \times 5}, A_{sec}$
- **Signal:** Matched gamma (object level)
- **Background:** unmatched gamma
- BDT response > 0.15 for two γ of π^0

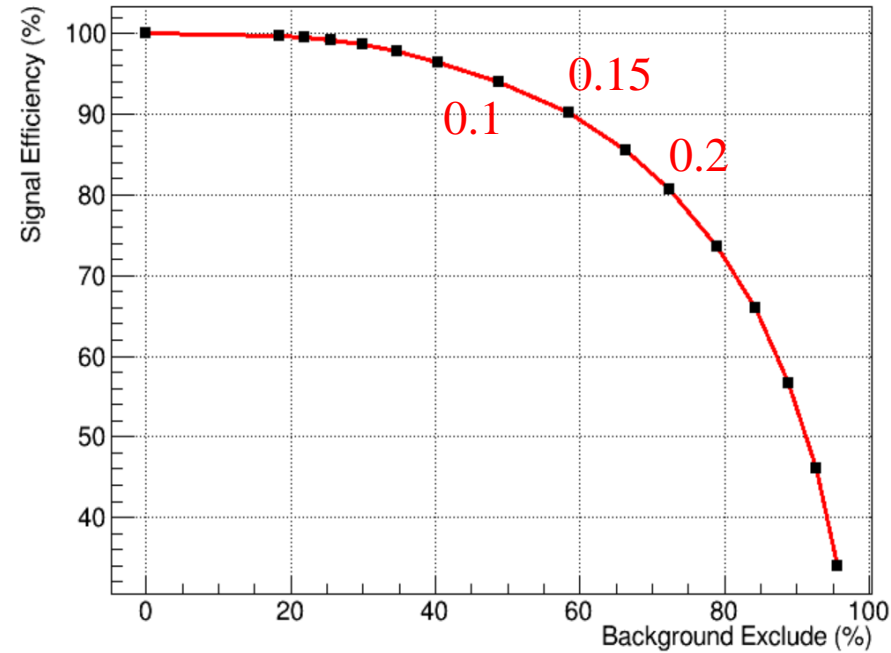
Rank	Variable	Separation
1	gam_energy	2.599e-01
2	gam_secmom	1.538e-01
3	gam_e33e55	1.228e-01
4	gam_a42mom	7.456e-02
5	gam_hits	5.548e-02



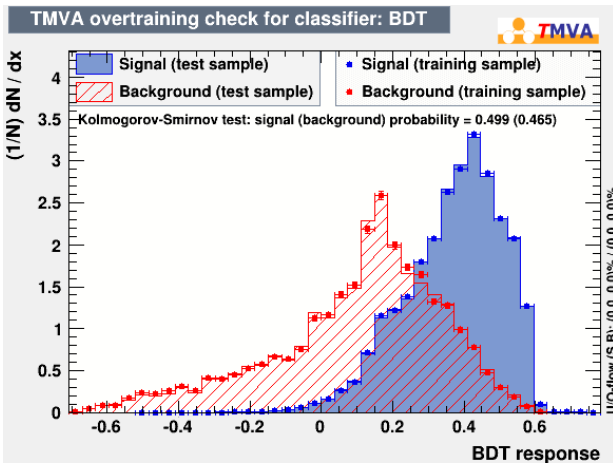
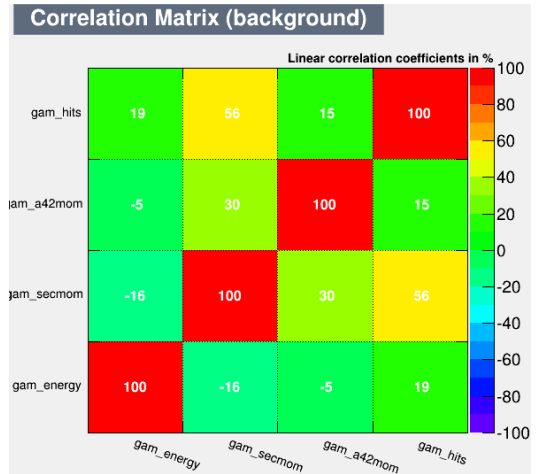
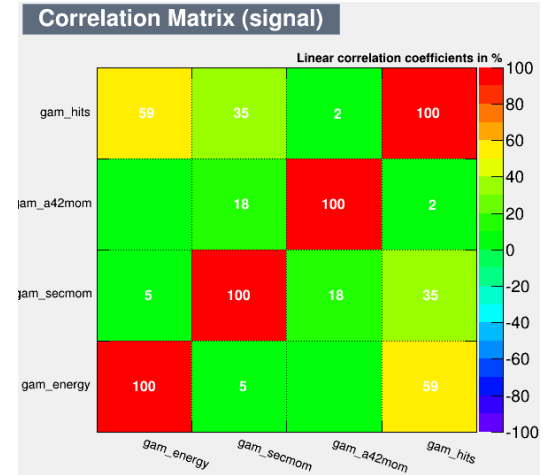
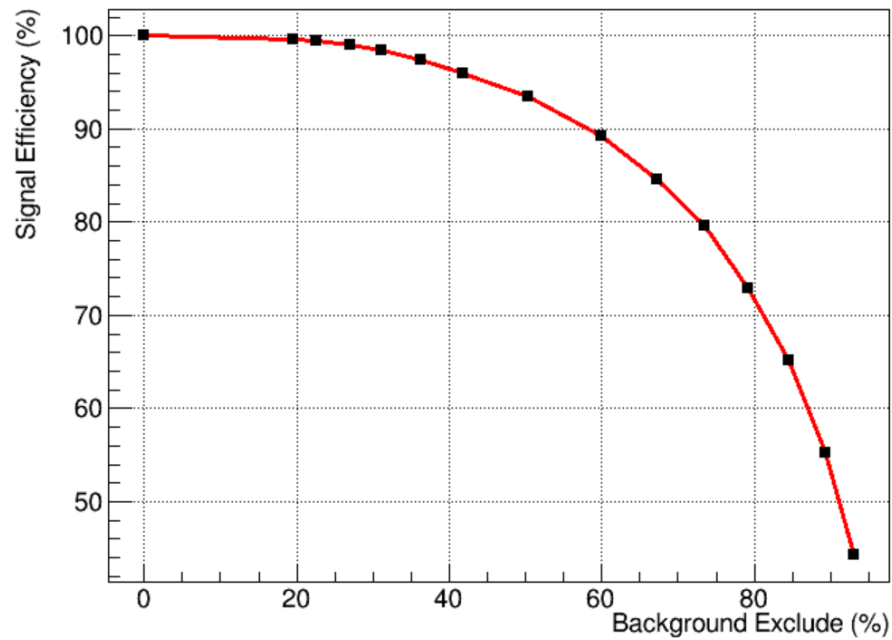
BDT (no e33e55)

Input variable: $E, N_{hit}, A_{42}, A_{sec}$

5 variables



No e33e55

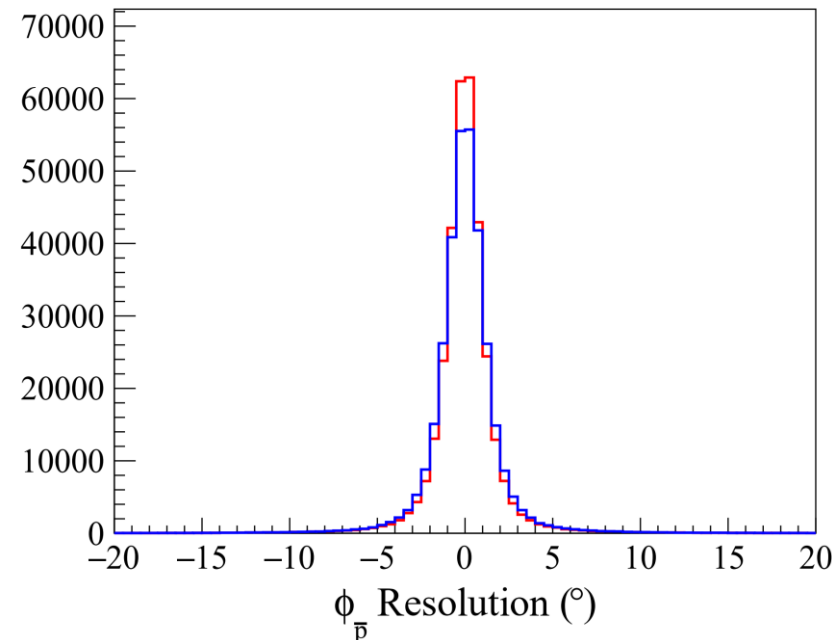
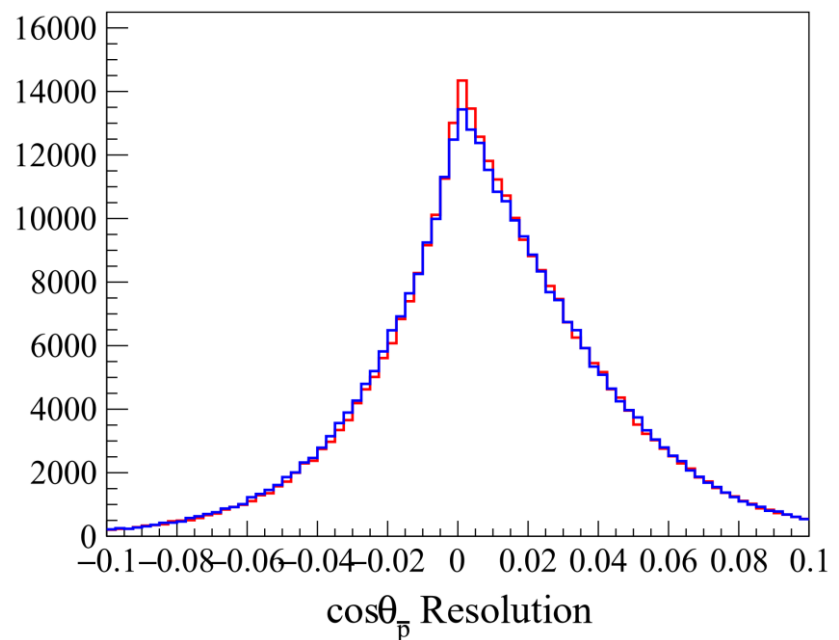
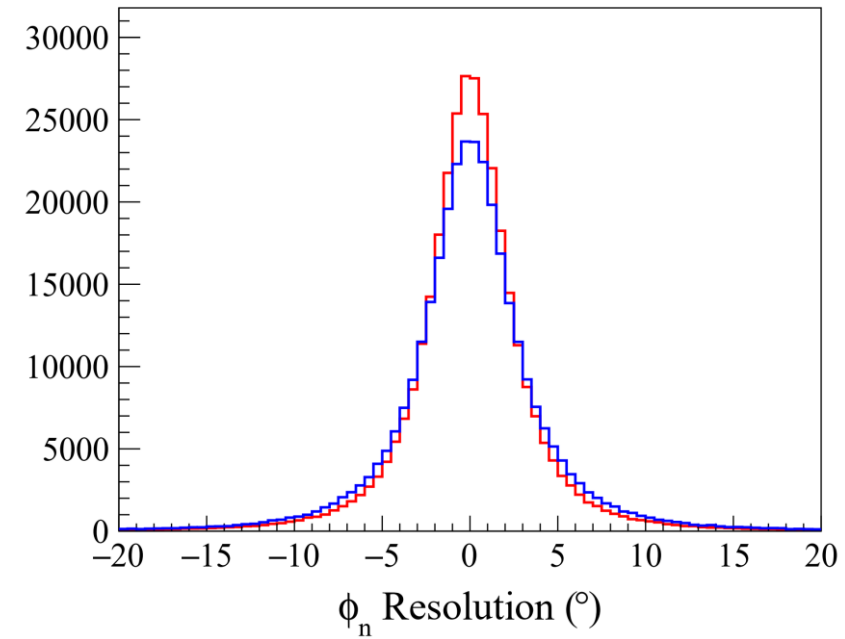
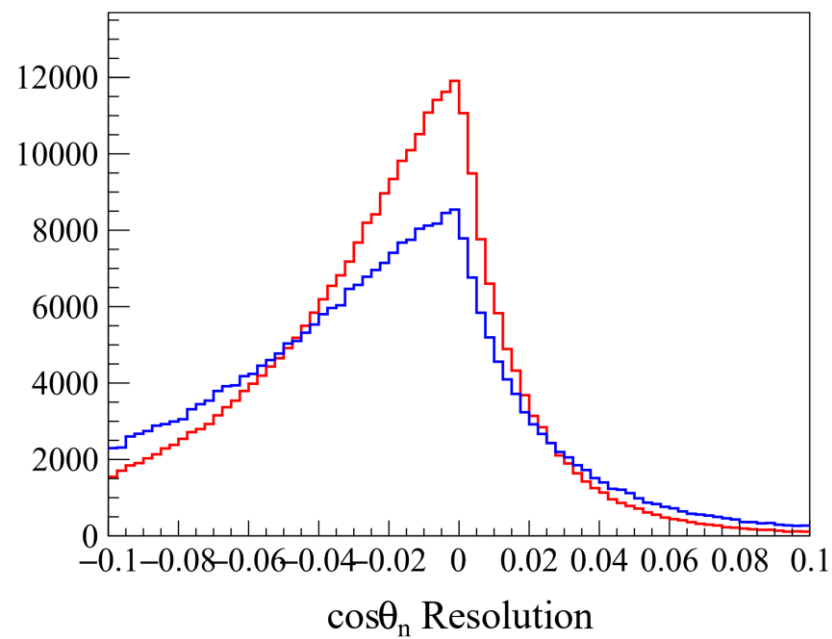
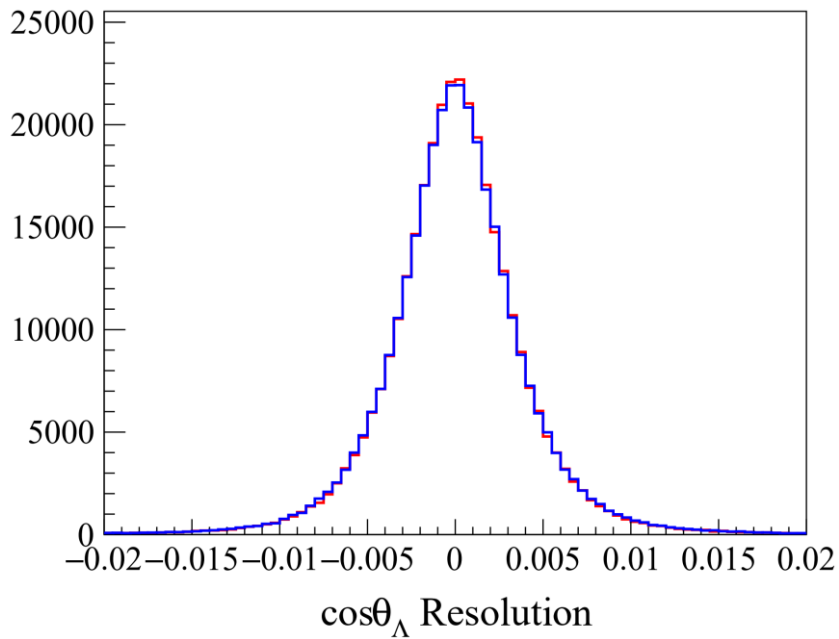


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Rank : variable : separation
-----
1 : gam_energy : 2.599e-01
2 : gam_secmom : 1.538e-01
3 : gam_a42mom : 7.456e-02
4 : gam_hits   : 5.548e-02
-----
    
```

Back up

Helicity Angle Resolution Distributions of $\Lambda \rightarrow n\pi^0$ with Matched Sig



RedLine: Left Signal Region

BlueLine: Right Signal Region

Momentum Unit Vector Resoluton of n and \bar{p} of Signal

