

pPb 8 TeV Upsilon v2 status

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Information

- dataset: /PADoubleMuon/PARun2016C-PromptReco-v1/AOD
- Acceptance range: muon $p_T > 4$ GeV
- Twiki: <https://twiki.cern.ch/twiki/bin/viewauth/CMS/PPb8TeVUpsilonv2>
- Github: <https://github.com/KiSooLee/8TeVpPbUpsilonv2>
- Two particle correlation method is used

Soft muon

- TMOneStationTight
- # track with Measure > 5
- # pixel with Measure > 0
- $d_{xy} < 0.3$
- $dz < 20.0$
- **highPurity**

Good track

- not muon track
- highPurity
- $|dz/\sigma(dz)| < 3.0$
- $|d_{xy}/\sigma(d_{xy})| < 3.0$
- $\sigma(p_T)/p_T < 0.1$
- $p_T > 0.4$
- $|\eta| < 2.4$

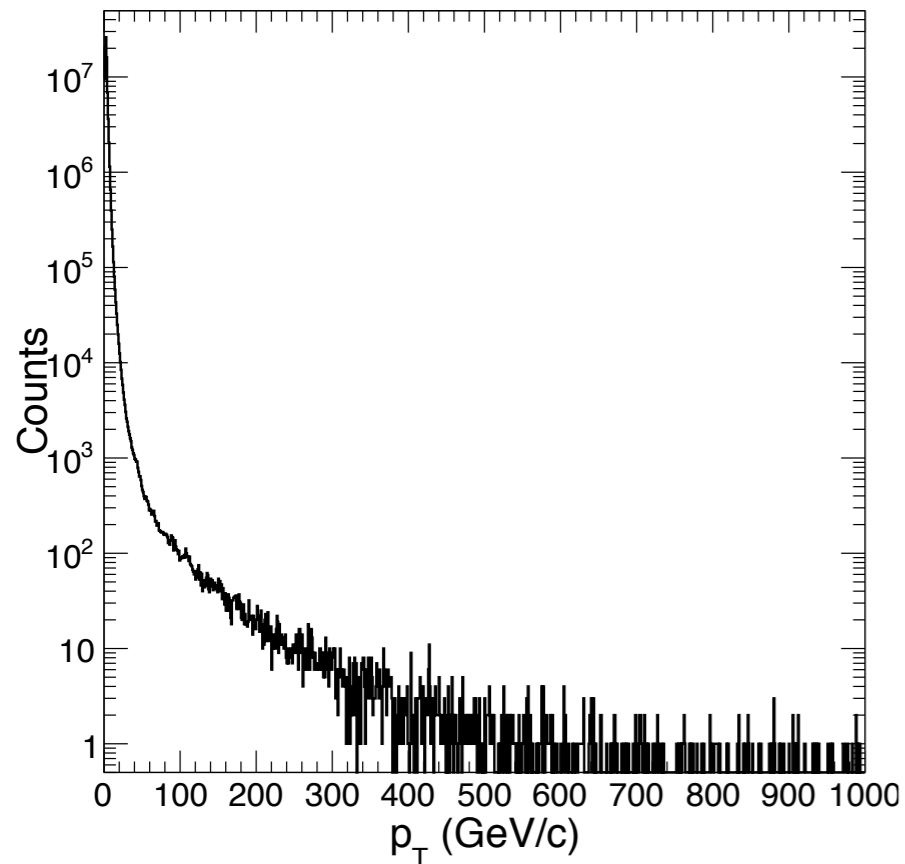
Triggered events

	HLT path	Number of events
seeded by L1 trigger	HLT_PAFullTracks_Multiplicity120	286.51M
	HLT_PAFullTracks_Multiplicity150	216.14M
seeded by tower count	HLT_PAFullTracks_Multiplicity185*	795.7M
	HLT_PAFullTracks_Multiplicity250	64M
	HLT_PAFullTracks_Multiplicity280	13.36M

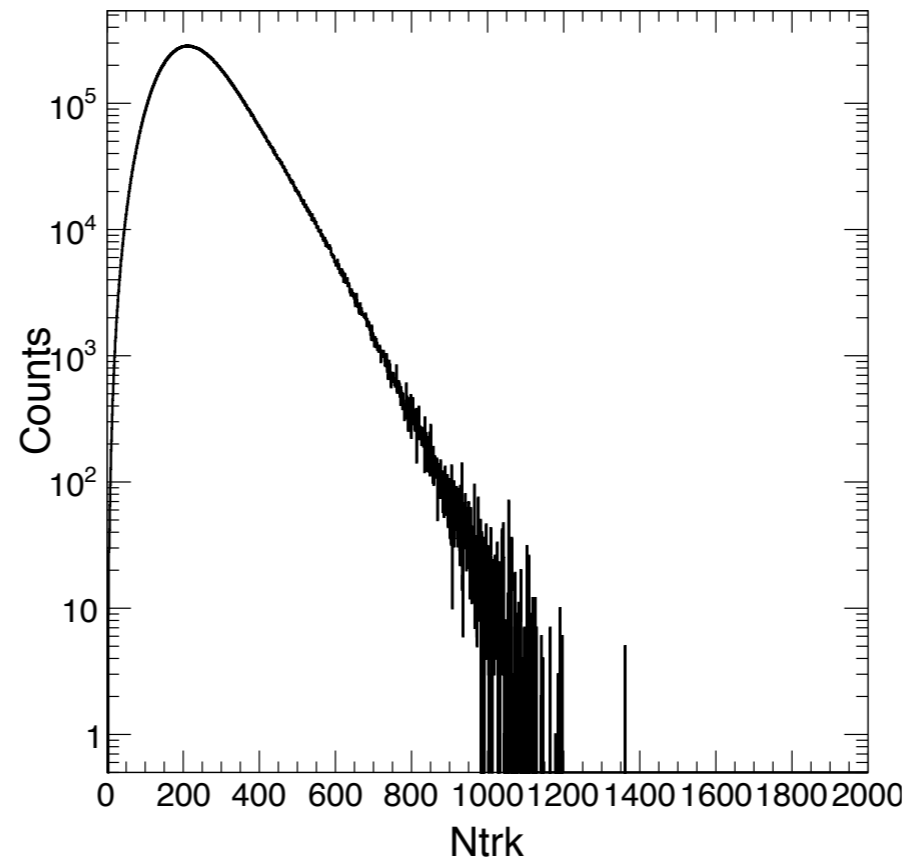
- 47 M events triggered by di-muon trigger
- Smaller than D^0 meson at pPb 8 TeV

Rearrange limits

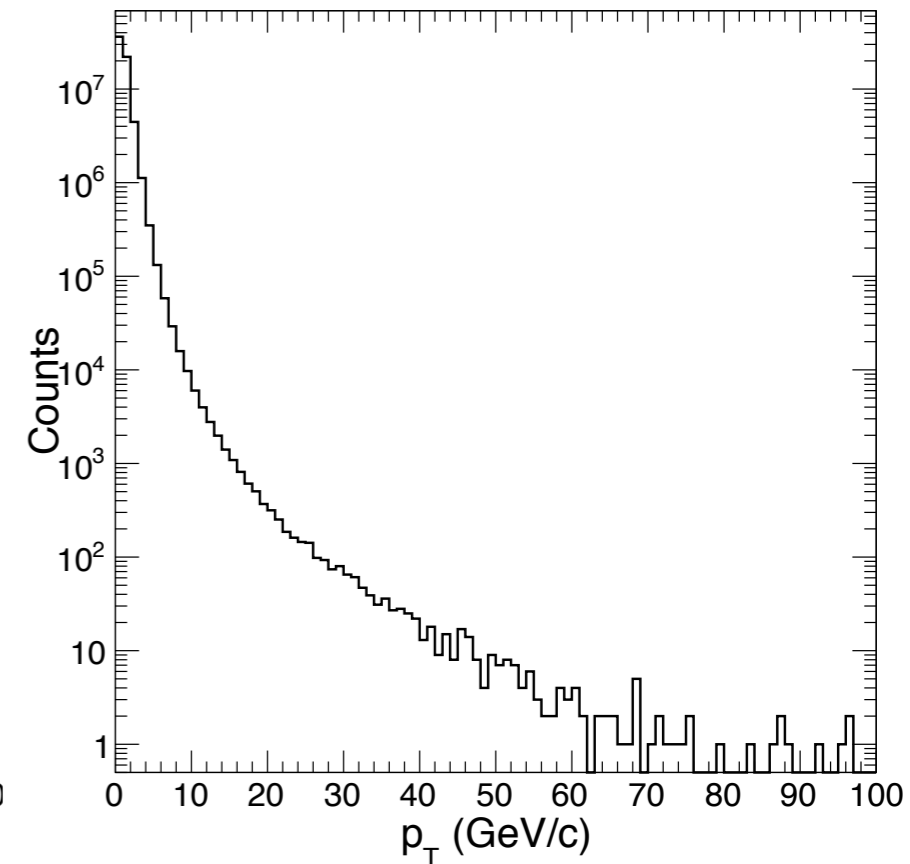
di-muon p_T



of track



track p_T



- Distribution of variables are replotted to set limits again
- di-muon trigger cut and mass range ($8 < m_{\mu\mu} < 14$) cut are applied
- $0 < N_{trk} < 1500$, $0 < p_{T}^{\mu\mu} < 500$, $0 < p_{T}^{trk} < 100$ are chosen for the new limits

KISTI process

Sort

KUNPL

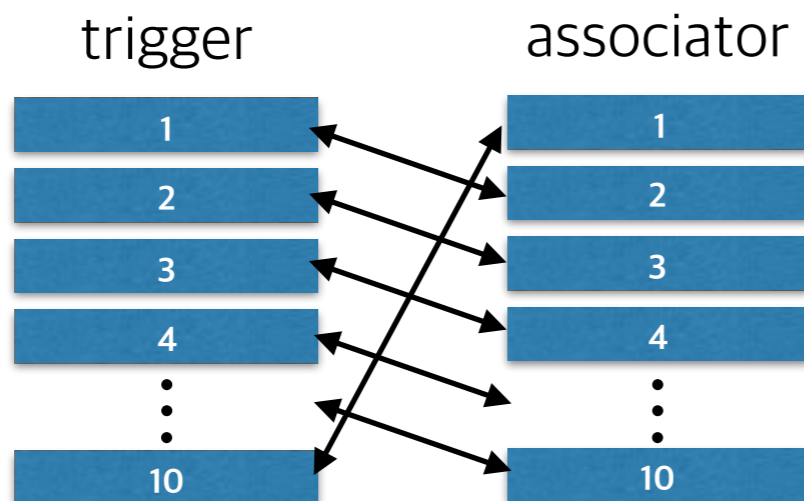
- Pbp+pPb 10 file
- 1 file for 5 M events

KISTI

- Pbp A 120 file
- Pbp B 120 file
- pPb A 120 file
- pPb B 120 file
- 1 file for 100 MeV mass range
- A: first half of total event
- B: rest event

Correlate B

KUNPL



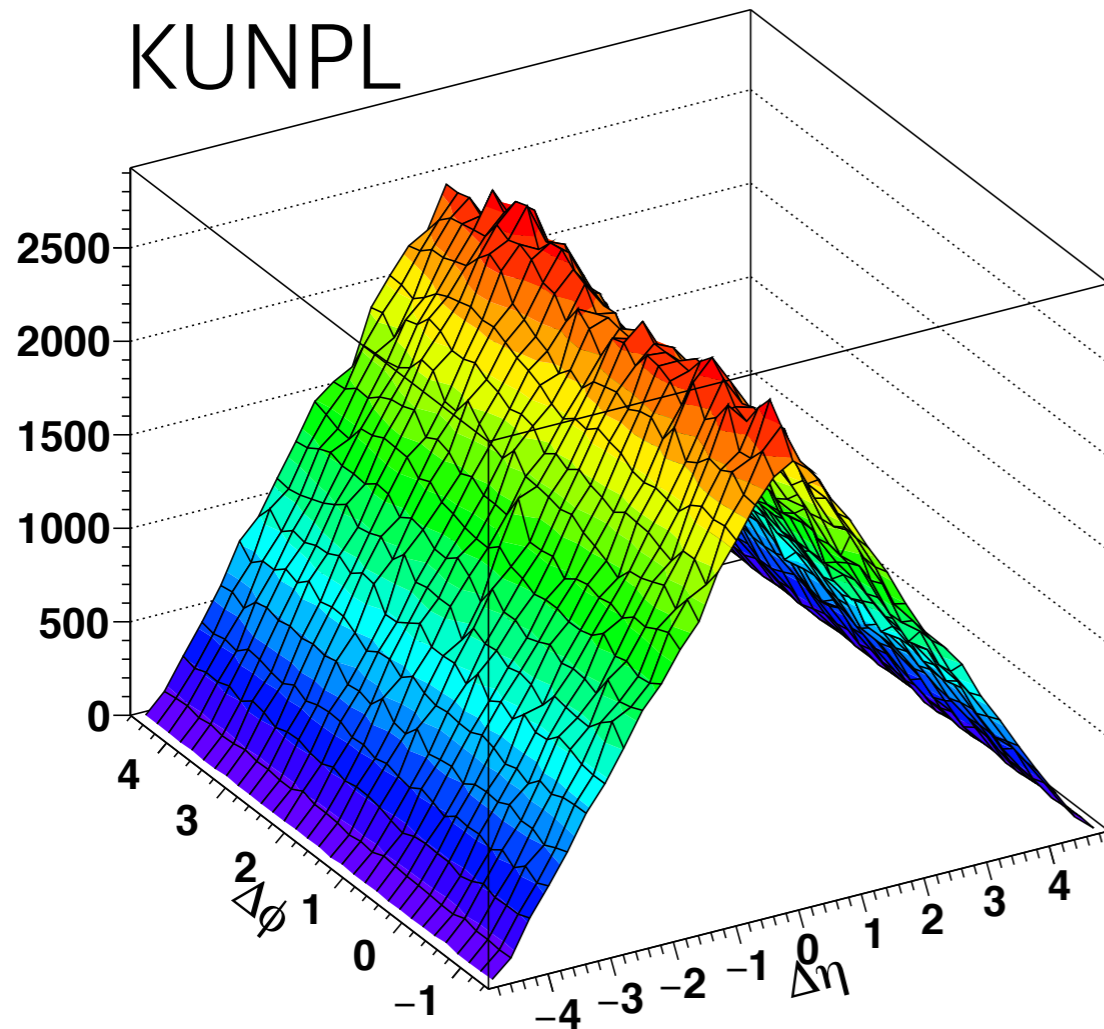
KISTI

- Correlate in same mass bin
- Pbp: trigger A + associator B
- Pbp: trigger B + associator A
- pPb: trigger A + associator B
- pPb: trigger B + associator A

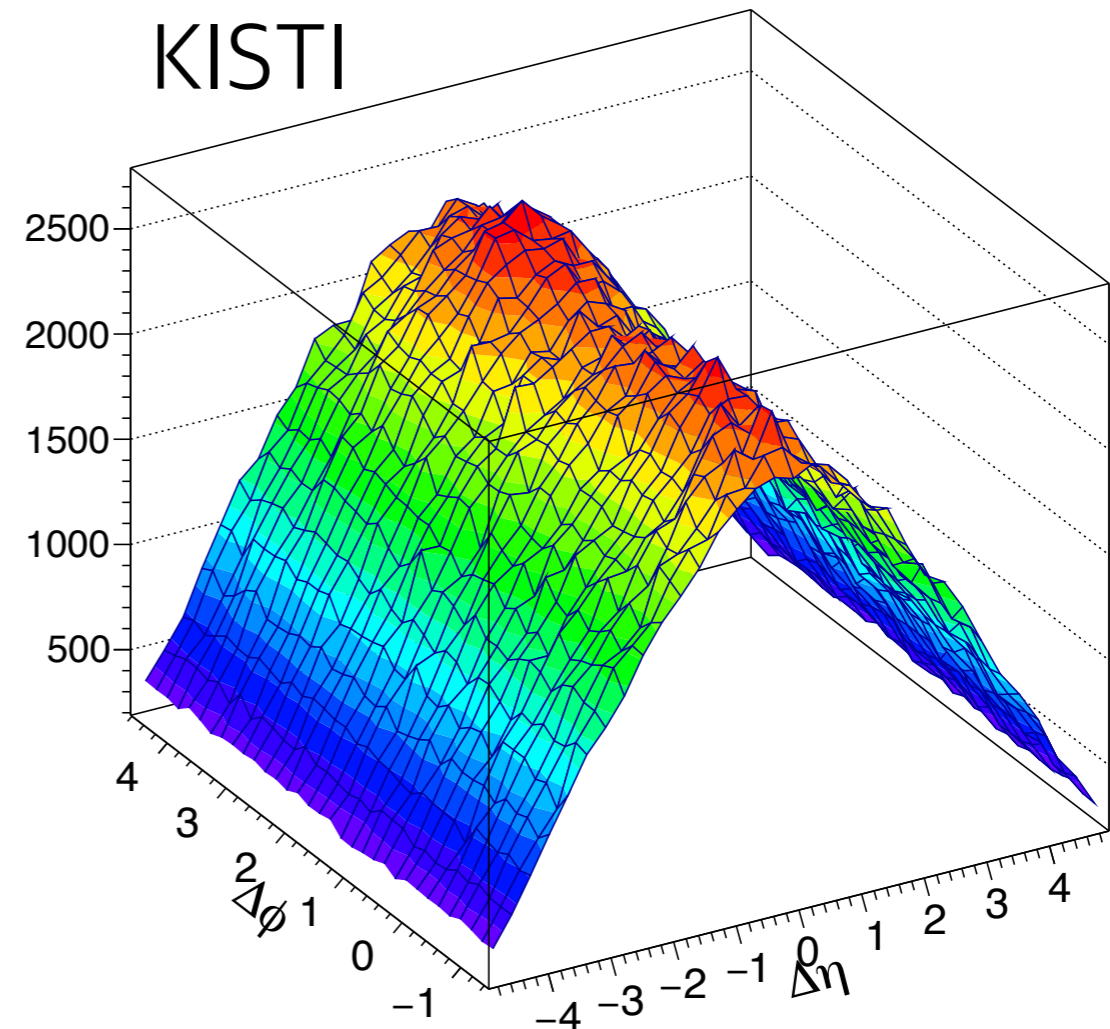
Feature

- Advantage of KISTI
 - Batch job with many work nod is available(Running time is saved by separated files with 120 mass bin)
 - Background correlation in the same mass range is available
- muon hiPurity cut is applied
- $B(0, 0)$ scaling is not used
- $d\eta, d\phi$ bin(33, 33), (15, 15) are tried
- 36 $d\phi$ bin $|d\eta| > 1$ is used in the ATLAS

Yield comparison($9.2 < m_{\mu\mu} < 9.5$)



$0 < \text{mult.} < 300$
 $0 < p_{T\mu\mu} < 30$
 $1 < p_{T\text{trk}} < 3$



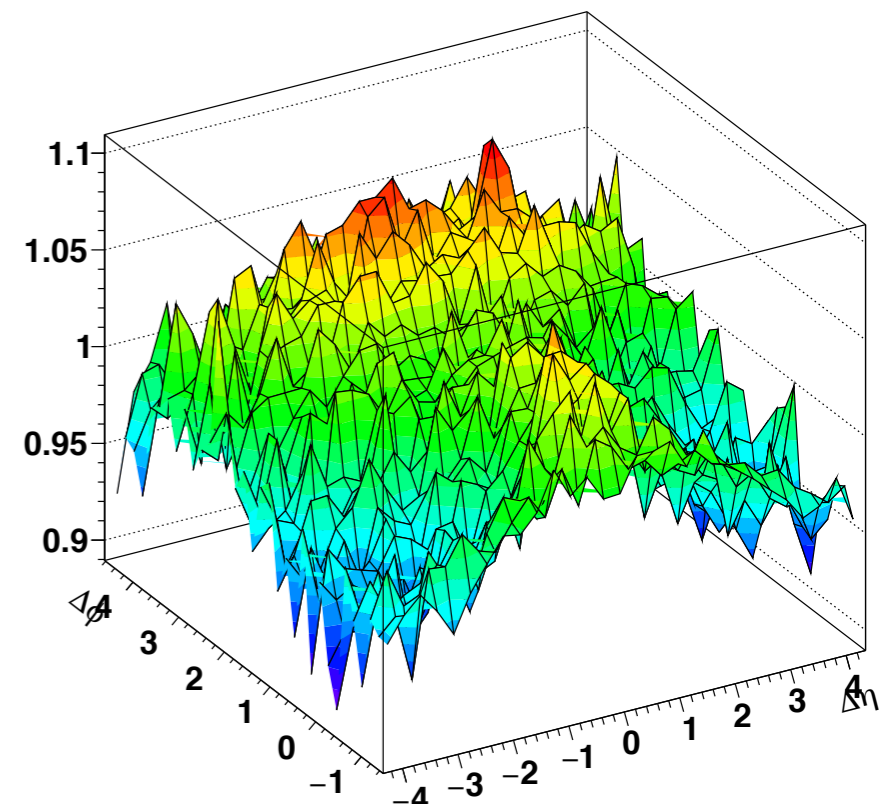
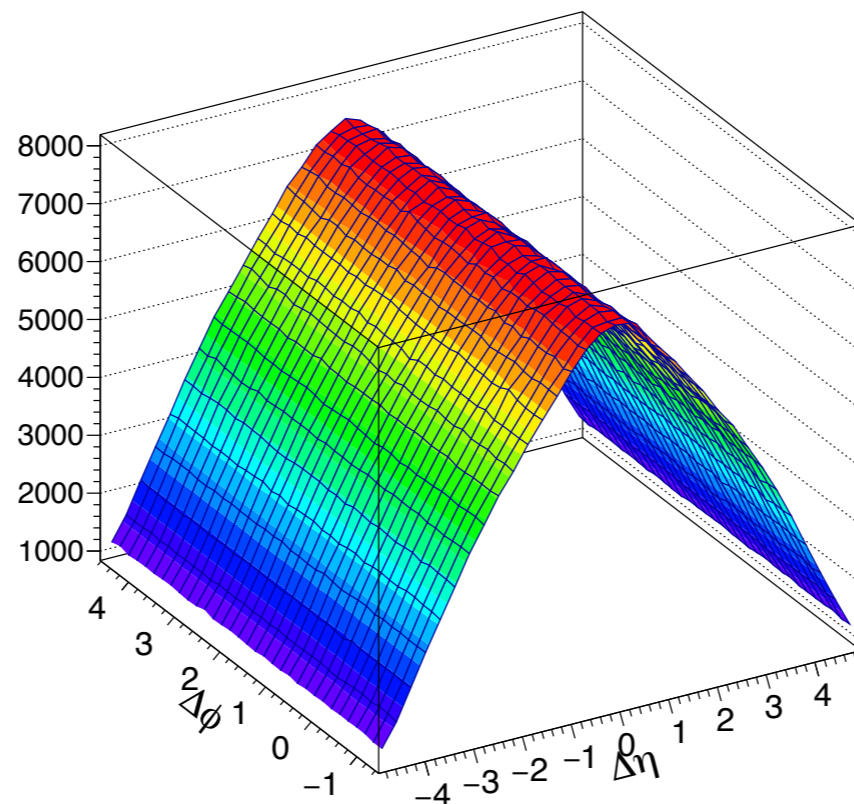
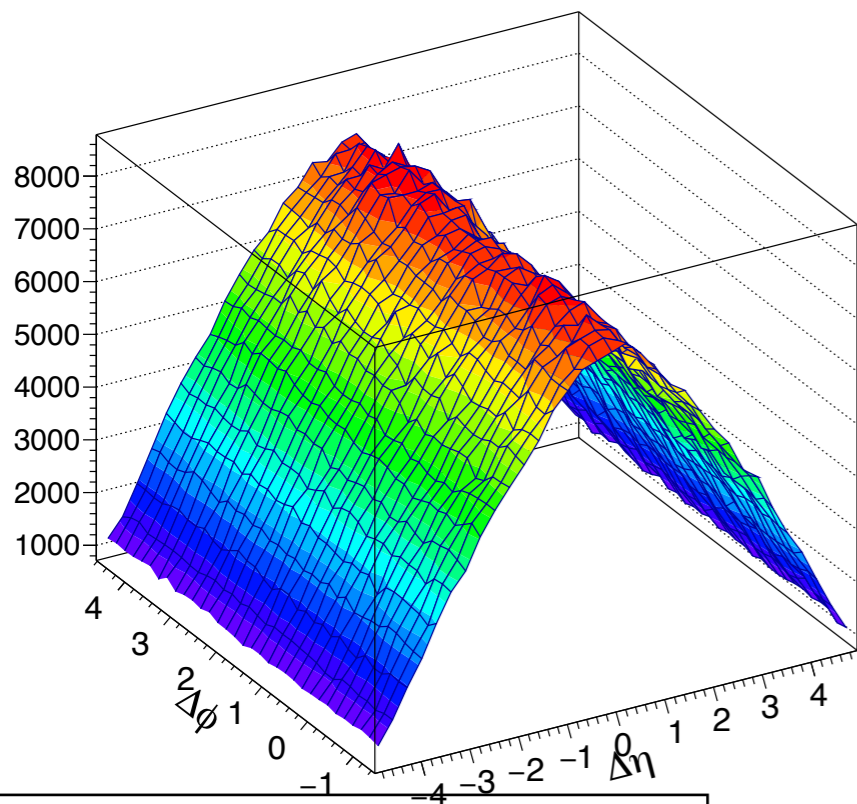
$0 < \text{mult.} < 1500$
 $0 < p_{T\mu\mu} < 500$
 $1 < p_{T\text{trk}} < 3$

- More smooth curve achieved with new range

Correlation($9.2 < m_{\mu\mu} < 9.5$)

$$S(\Delta\eta, \Delta\phi) = \frac{1}{N_{trig}} \frac{d^2 N^{same}}{d\Delta\eta d\Delta\phi}$$

$$\frac{1}{N_{trig}} \frac{d^2 N^{pair}}{d\Delta\eta d\Delta\phi} = \frac{S(\Delta\eta, \Delta\phi)}{B(\Delta\eta, \Delta\phi)}$$

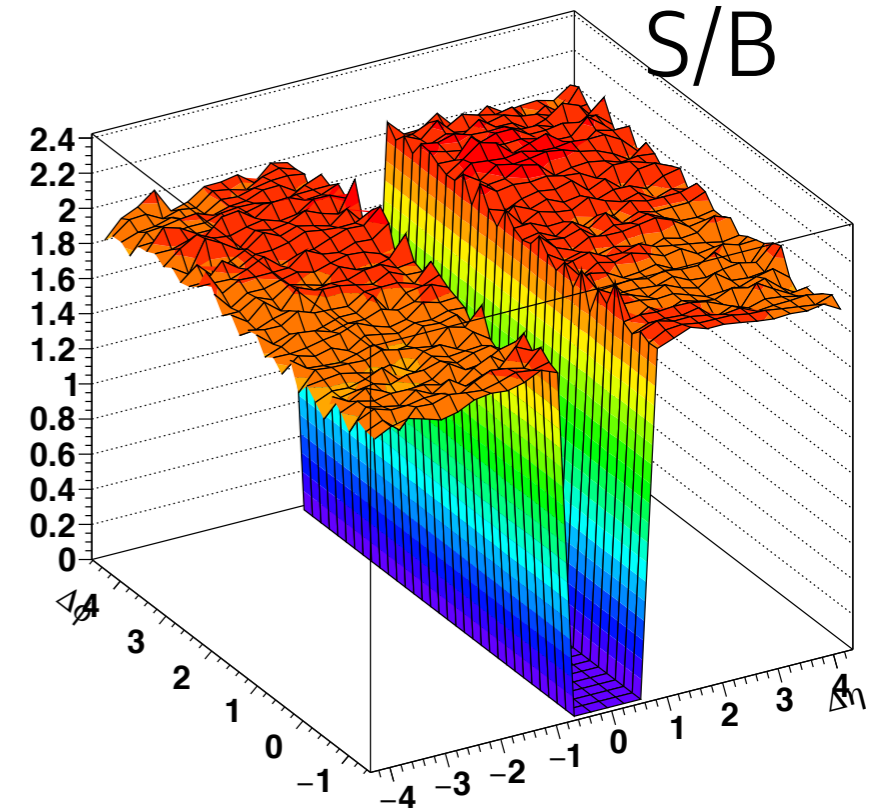
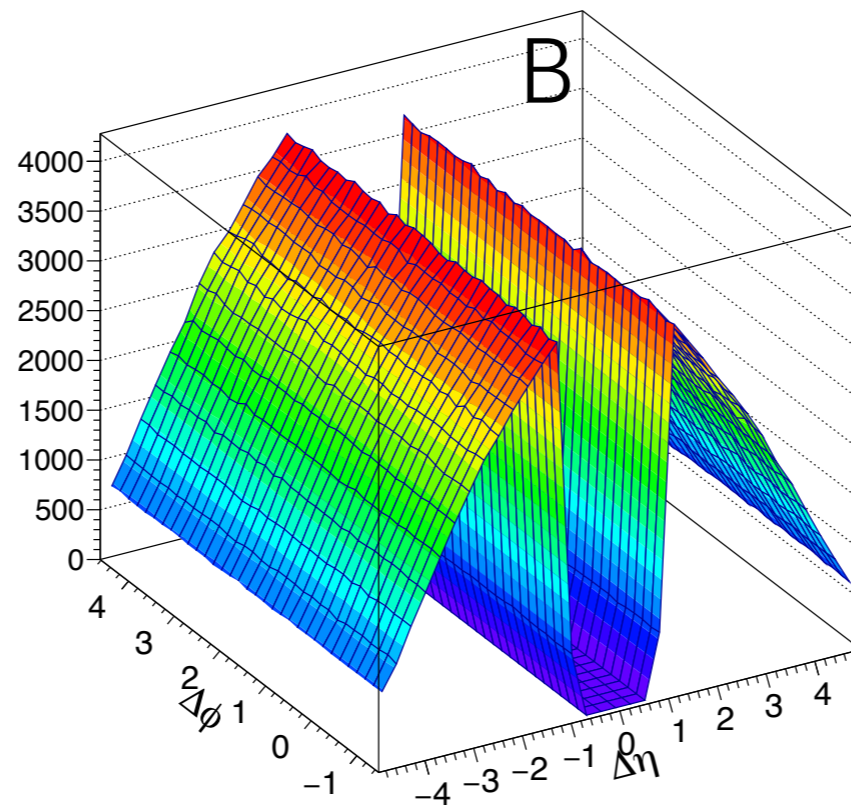
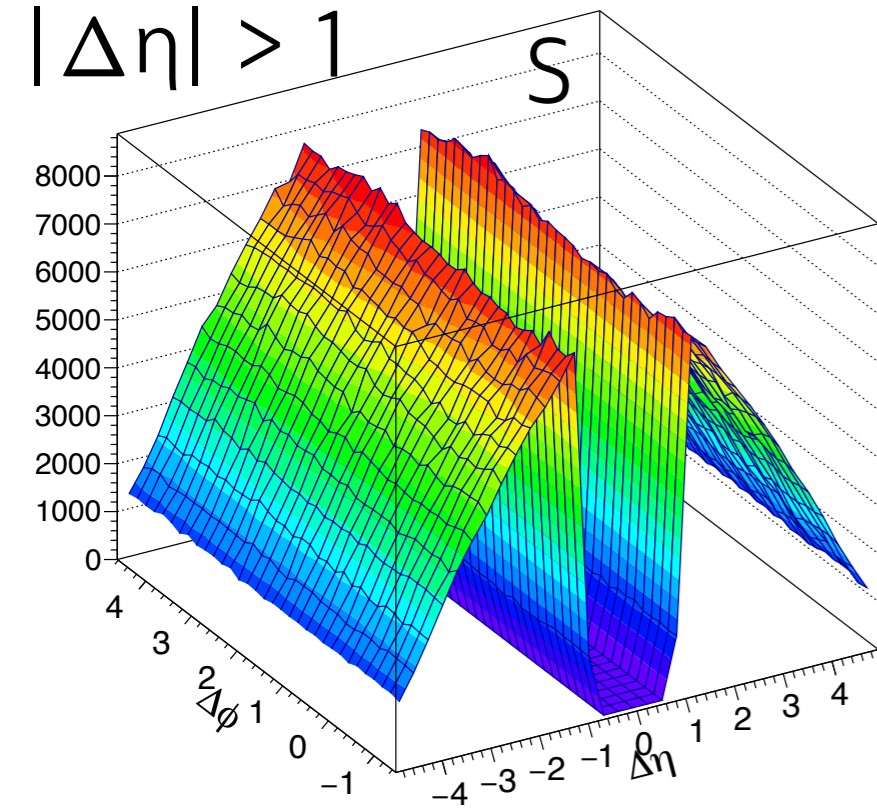


$0 < \text{mult.} < 1500$
 $0 < p_{T\mu\mu} < 500$
 $0 < p_{T}^{\text{trk}} < 100$

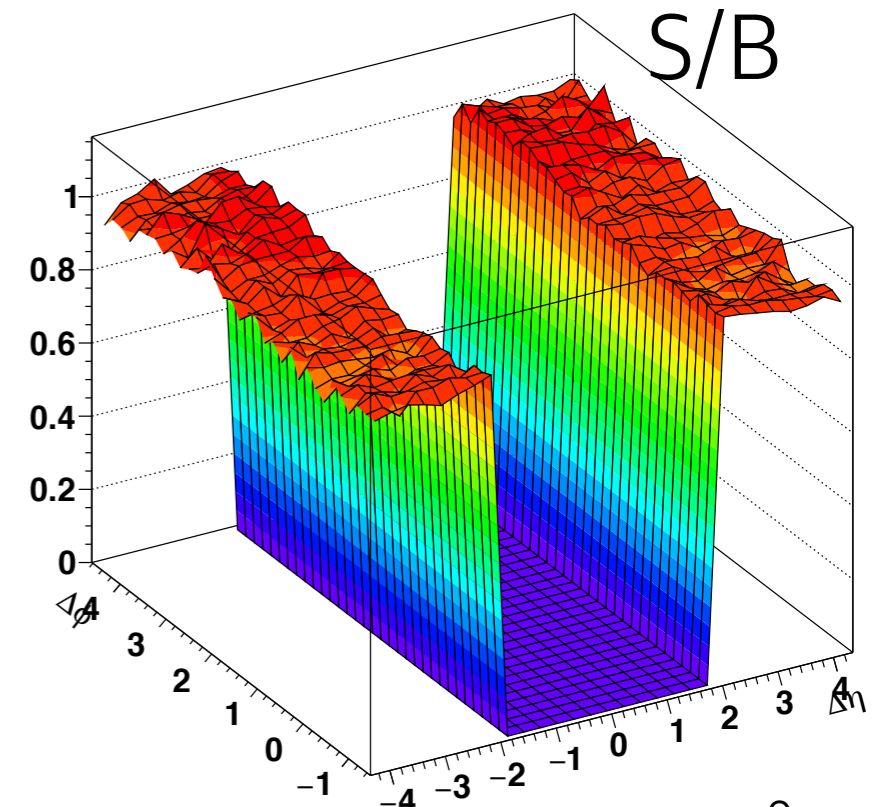
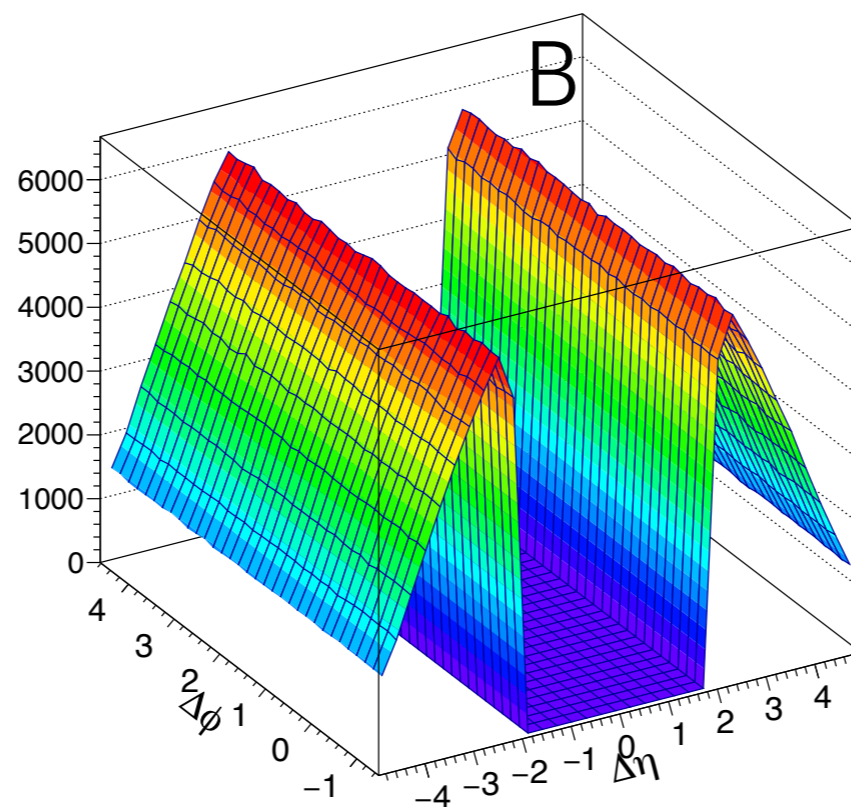
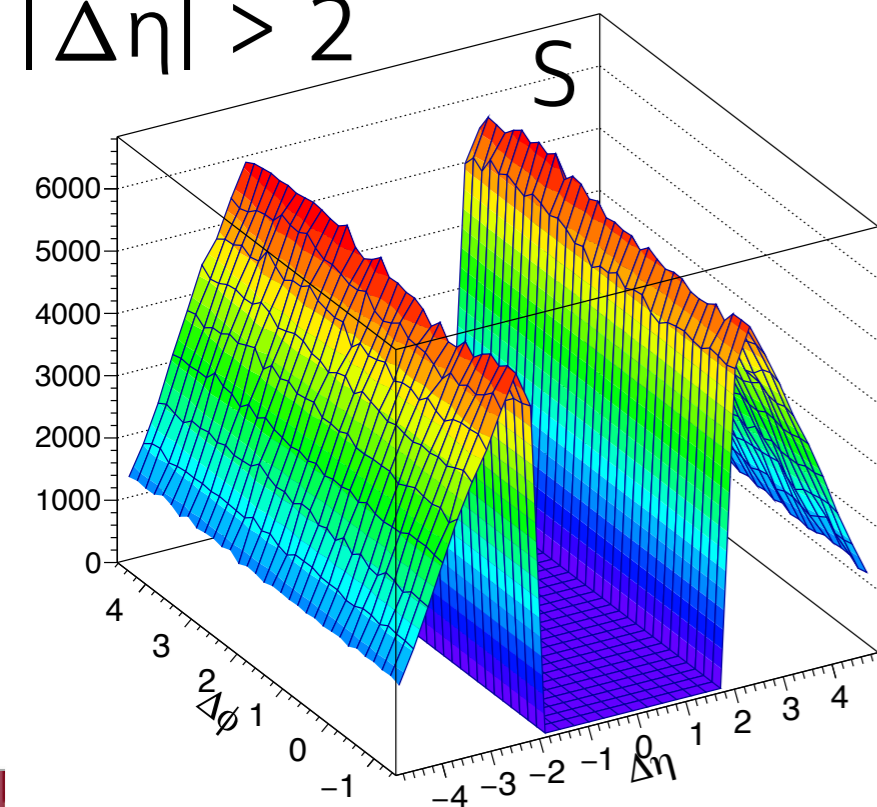
$$B(\Delta\eta, \Delta\phi) = \frac{1}{N_{trig}} \frac{d^2 N^{mix}}{d\Delta\eta d\Delta\phi}$$

Correlation($9.2 < m_{\mu\mu} < 9.5$)

$|\Delta\eta| > 1$

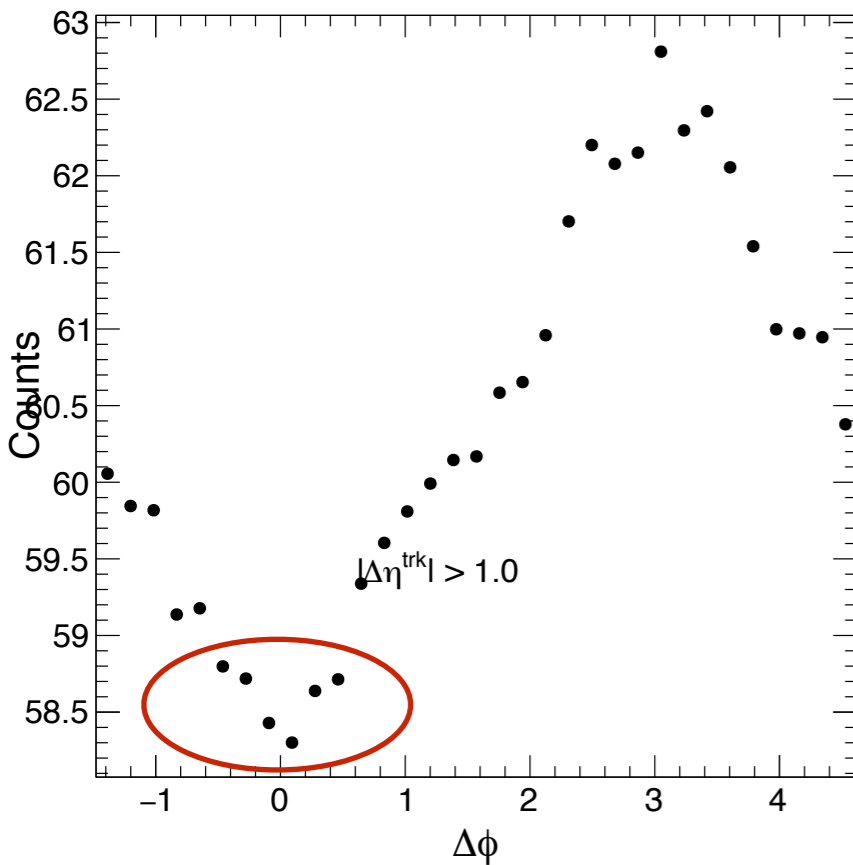


$|\Delta\eta| > 2$

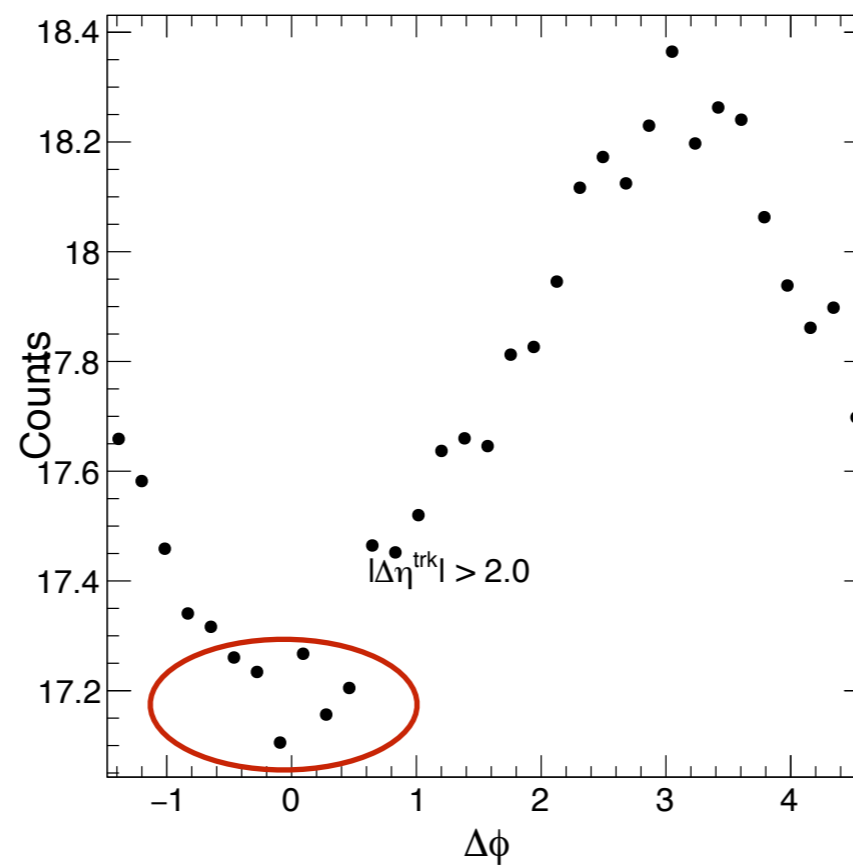


$d\phi$ distribution

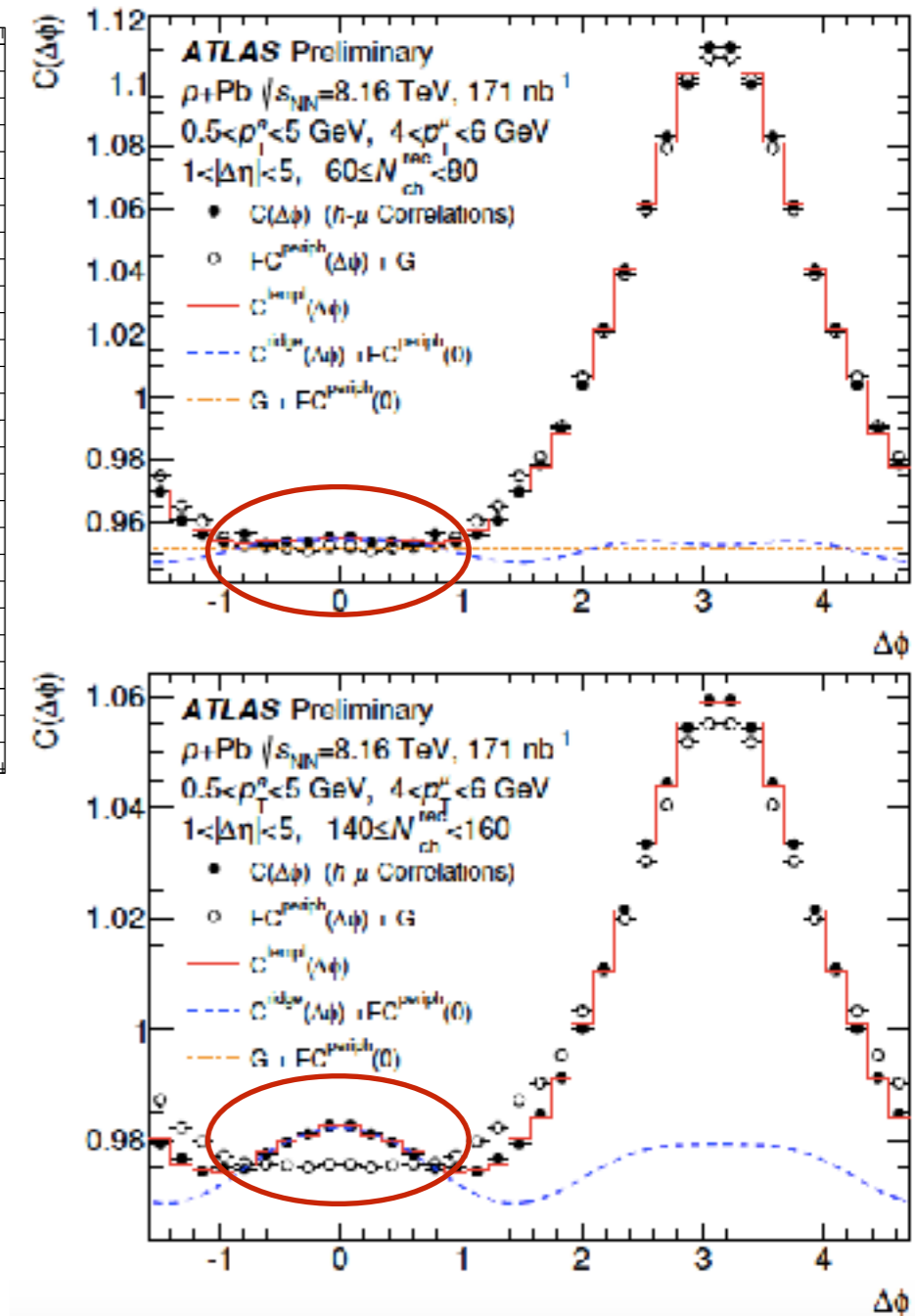
$|\Delta\eta| > 1$



$|\Delta\eta| > 2$



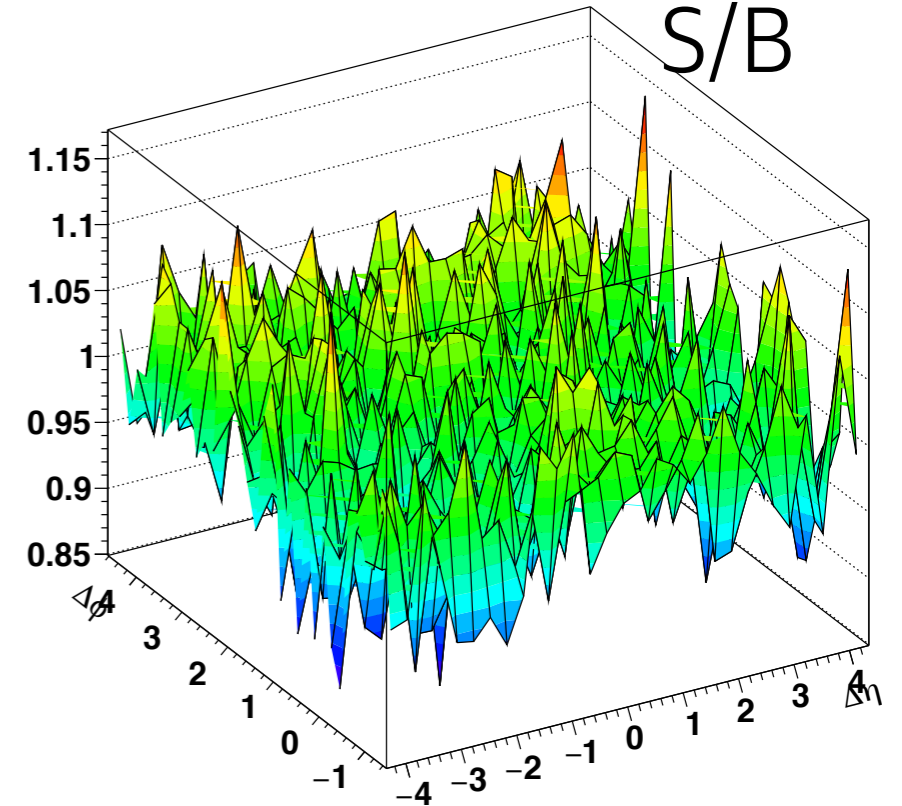
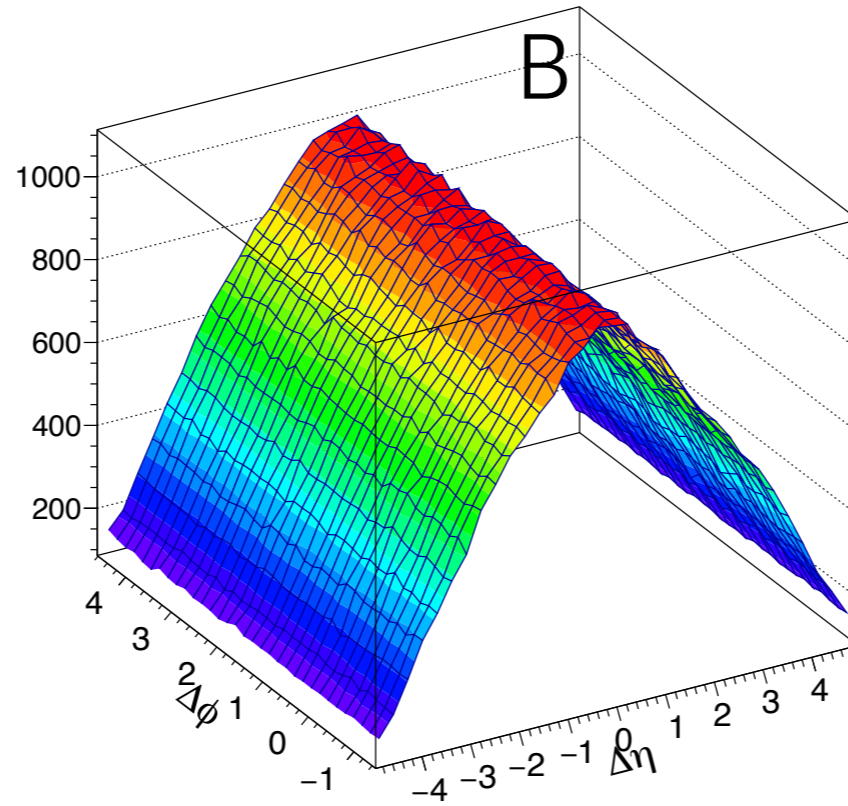
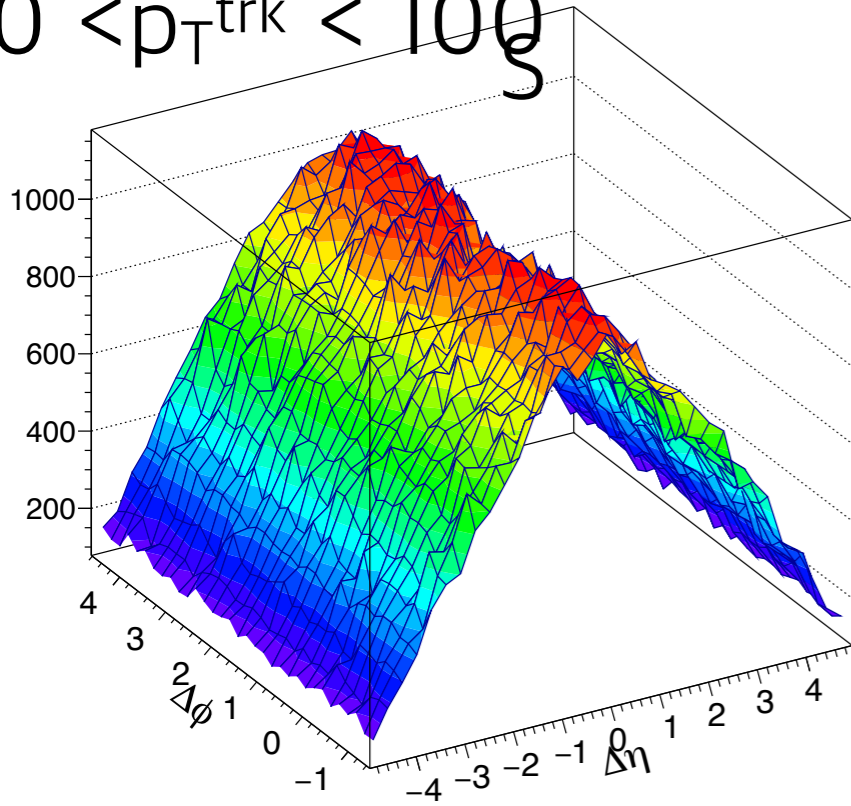
ATLAS



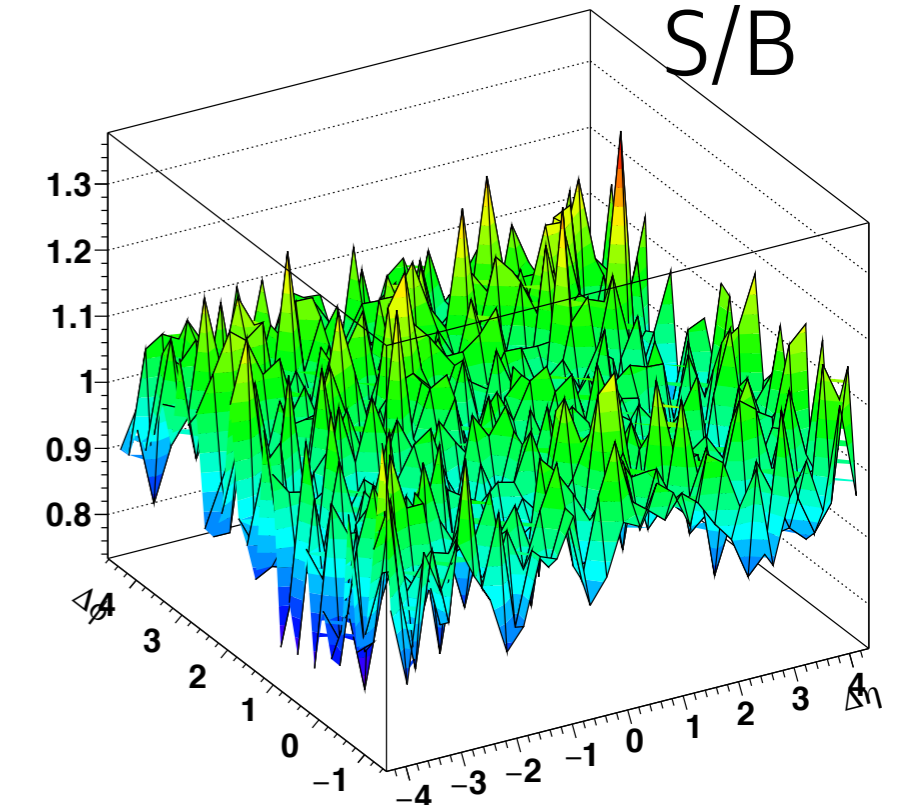
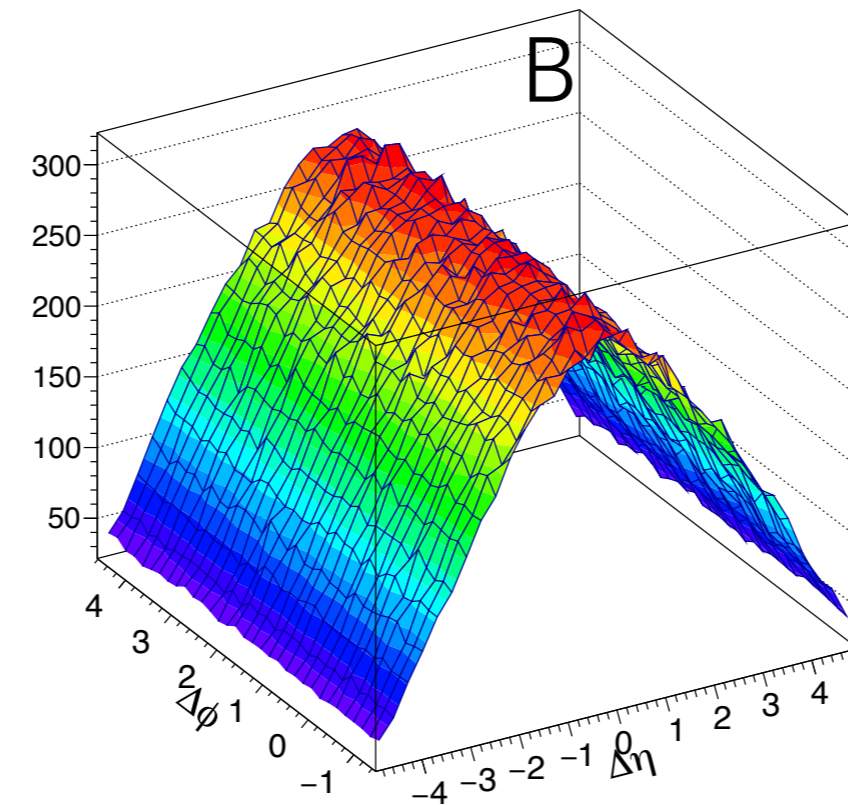
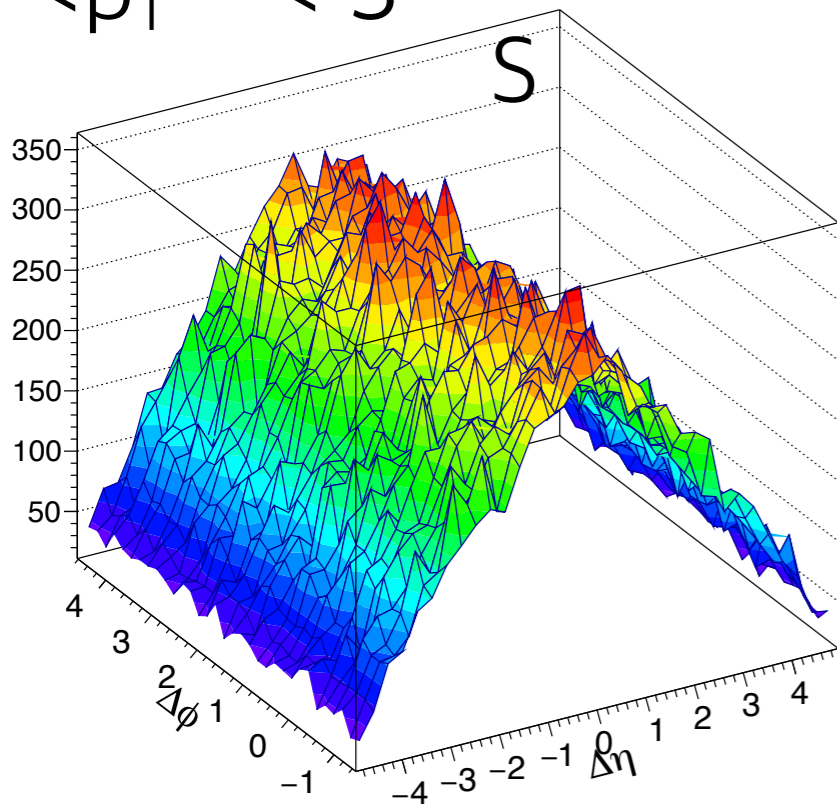
- Jet peak is removed even in $|\Delta\eta| > 1$
- $\Delta\eta$ cut affect to $|\Delta\phi| < 1$ region
- More fine $\Delta\phi$ bin is needed

High multiplicity result ($200 < \text{mult.} < 1500, 9.2 < m_{\mu\mu} < 9.5$)

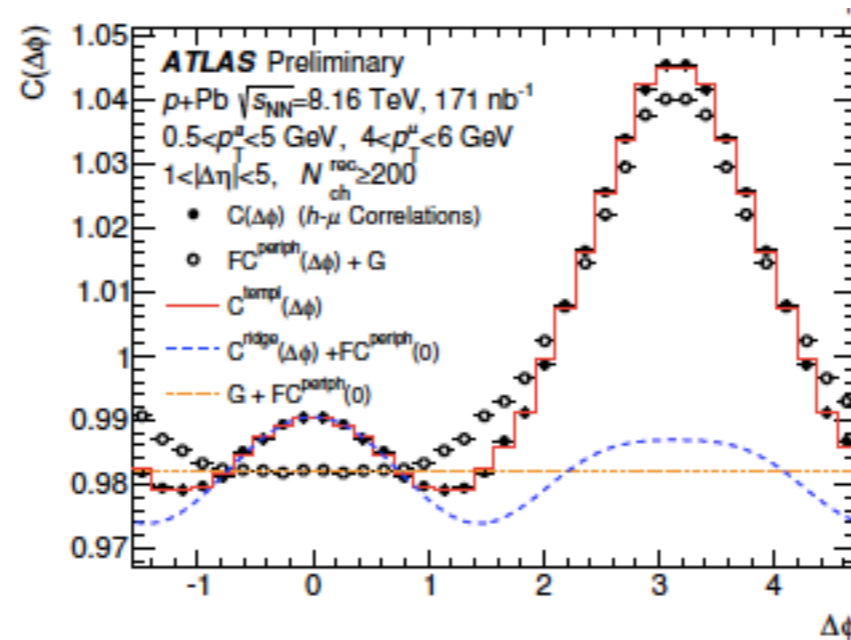
$0 < p_{T\text{trk}} < 100$



$1 < p_{T\text{trk}} < 3$



extract v2



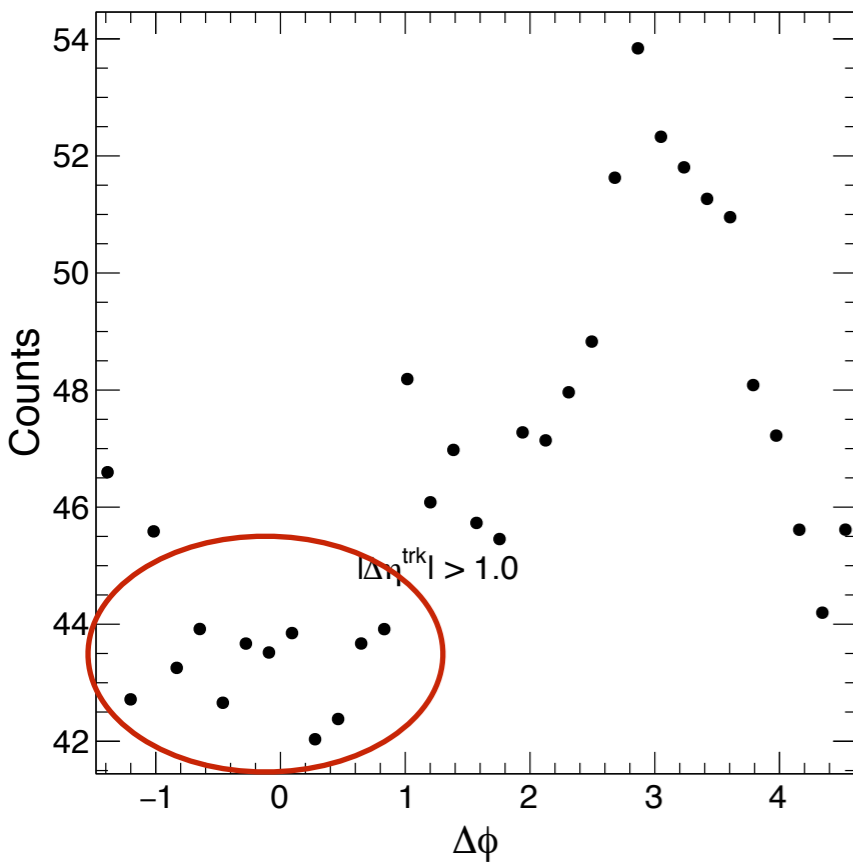
$$C^{templ}(\Delta\phi) = F C^{periph}(\Delta\phi) + C^{ridge}(\Delta\phi)$$

$$C^{ridge}(\Delta\phi) = G \left(1 + \sum_{n=2}^{\infty} 2v_n \cos(n\Delta\phi) \right)$$

- $C(\Delta\phi)$ is data distribution
- ATLAS achieved peripheral result from $0 < \text{multiplicity} < 40$
- Flow function is achieved by fitting data with peripheral result

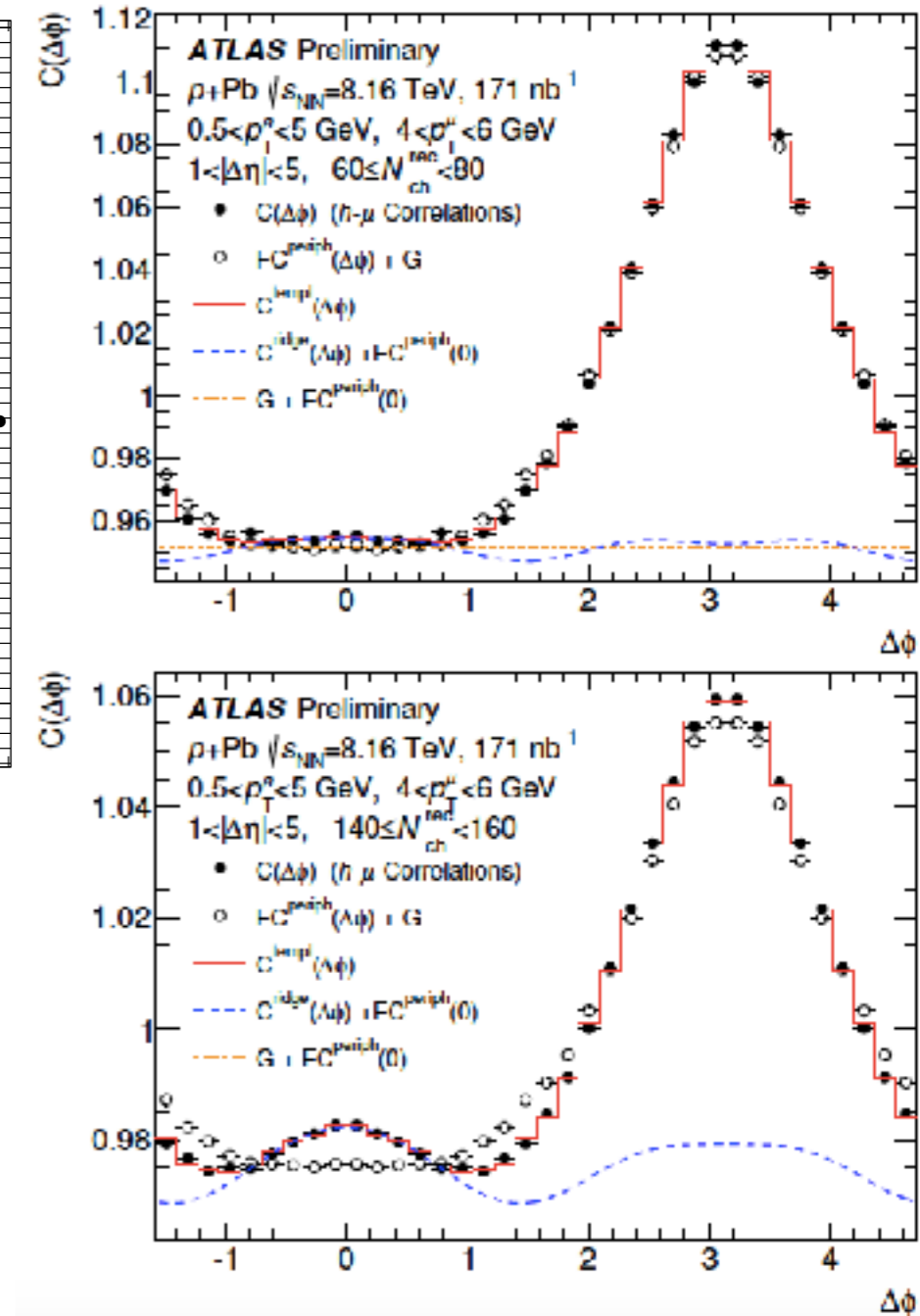
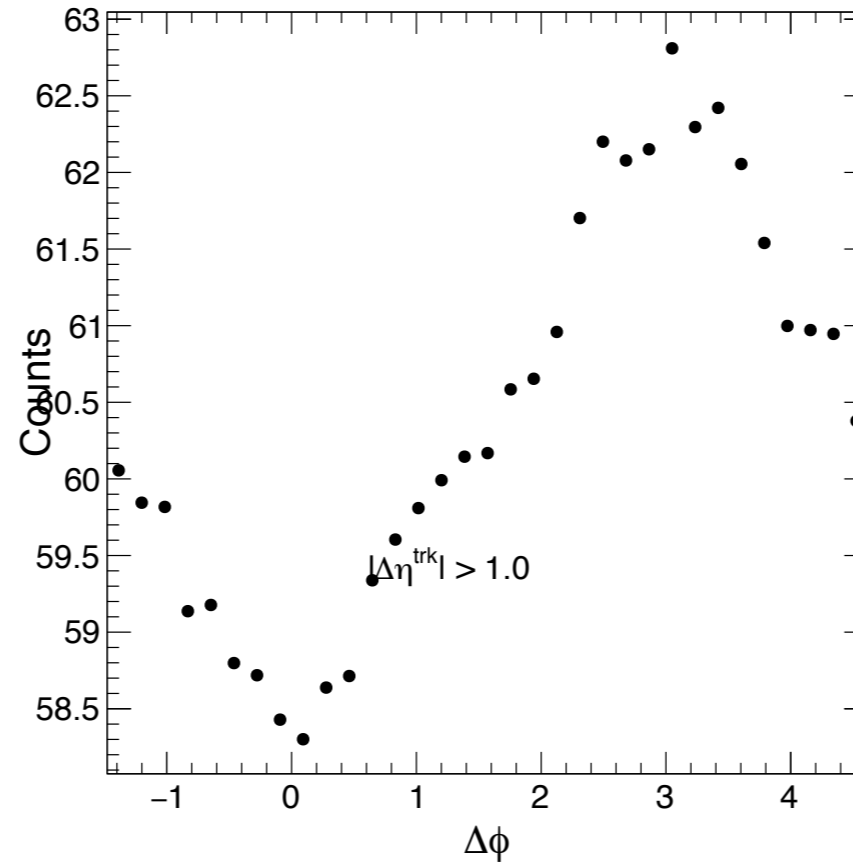
Low multiplicity

$0 < \text{mult.} < 40$



Really flat?

$0 < \text{mult.} < 1500$



Summary

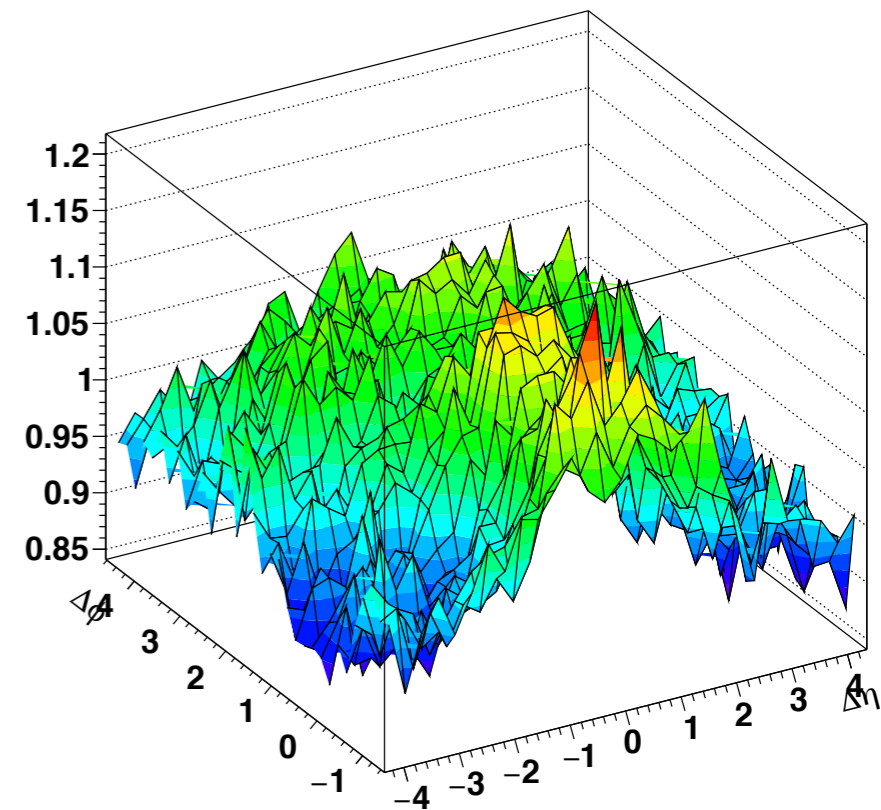
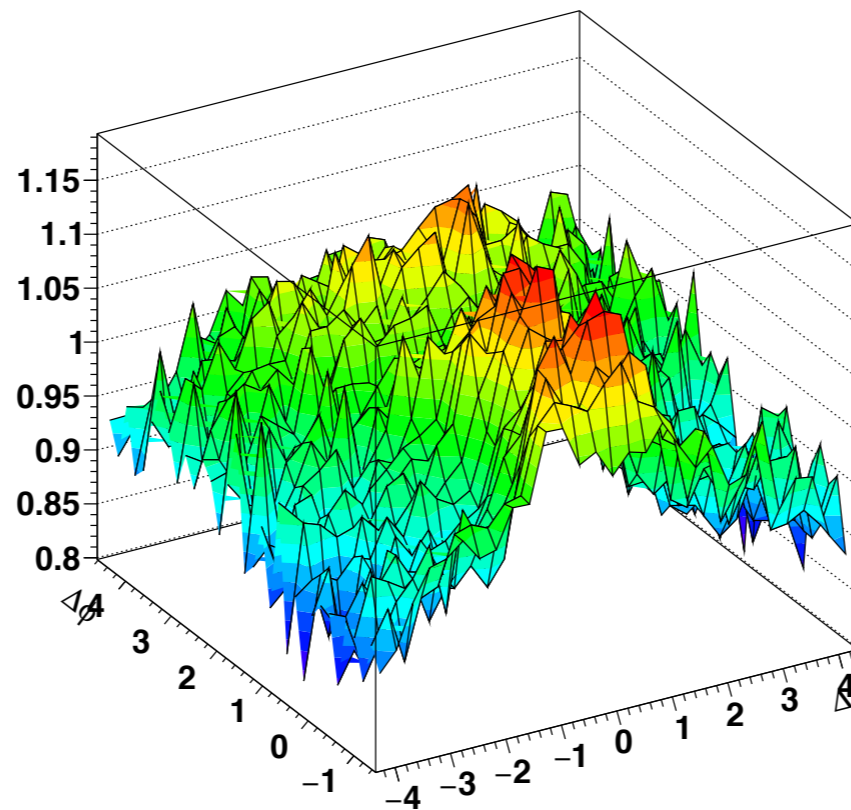
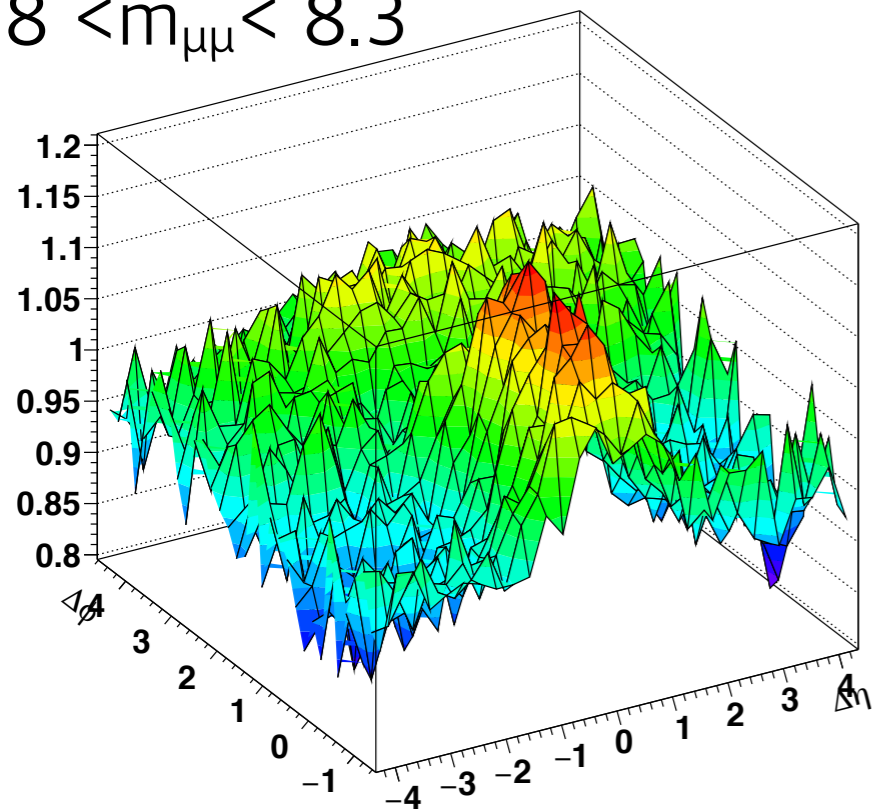
- Integrated range is changed
 - Yields are increased
- Working server is changed
 - working speed is increased
- Ridge like shape is not observed at multiplicity > 200 (seems due to low statistics)
 - $> 150, 100$ are running to increase statistics
- $d\phi$ projection result has deep at 0
 - Shape is similar to photon-track correlation result



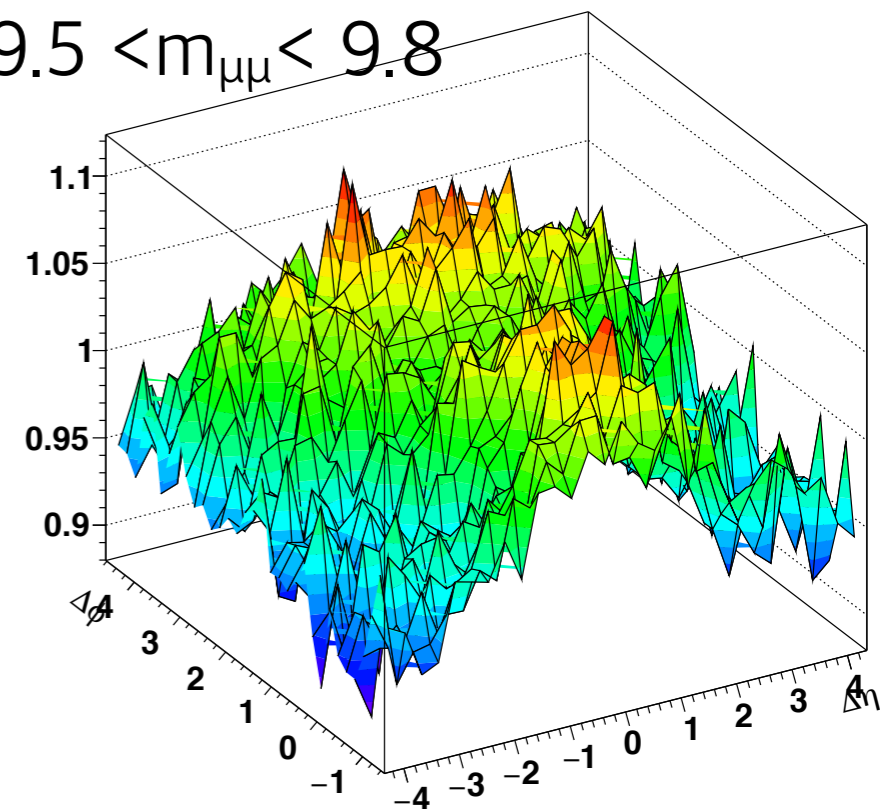
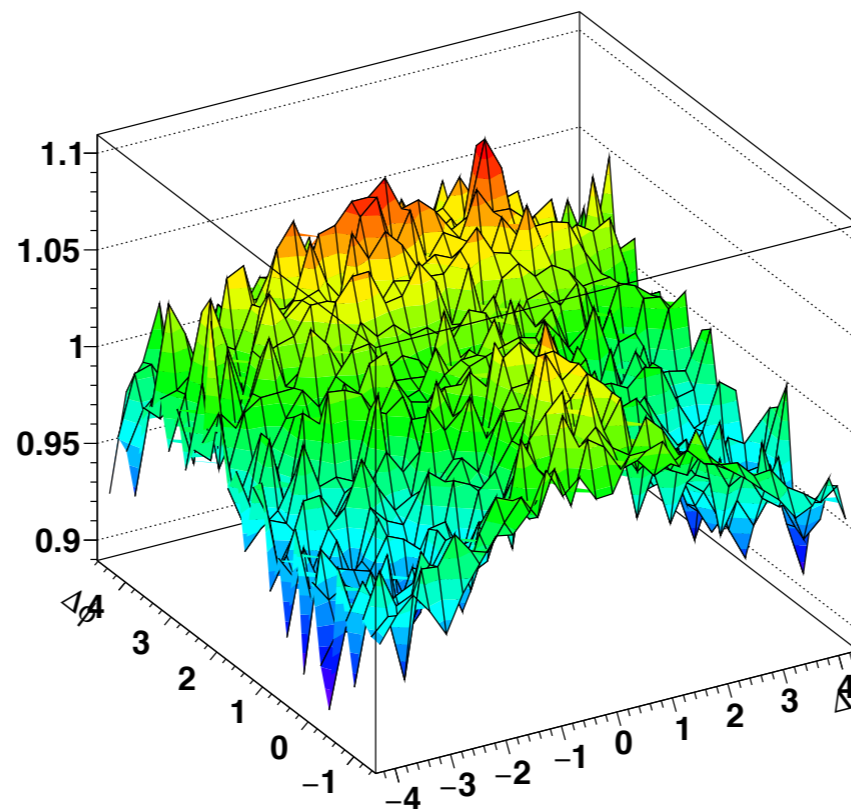
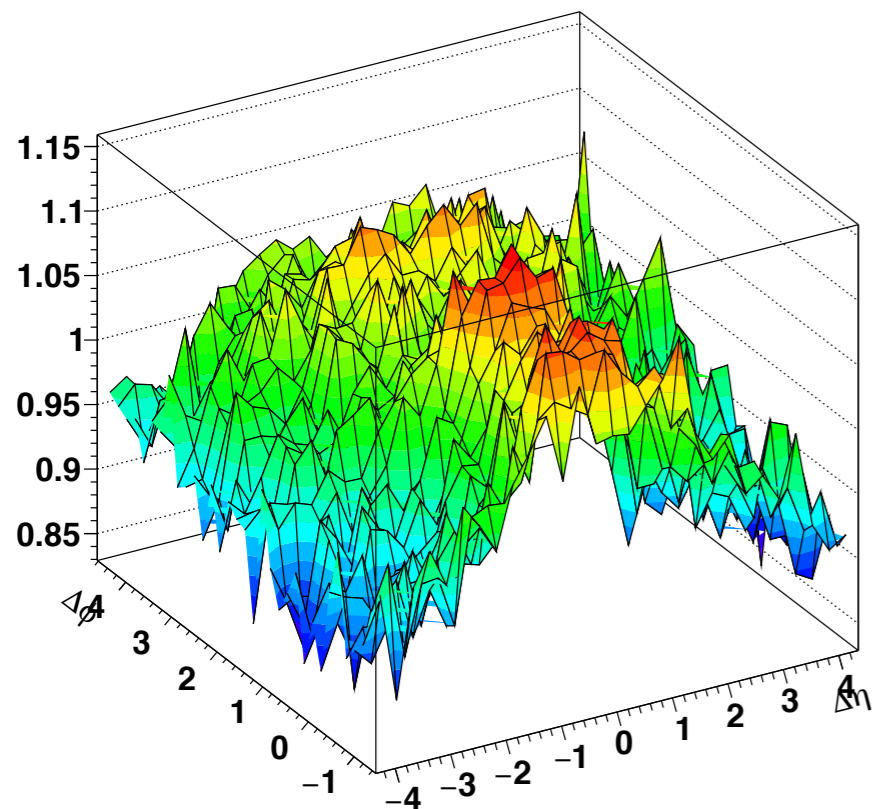
back up

$0 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$8 < m_{\mu\mu} < 8.3$

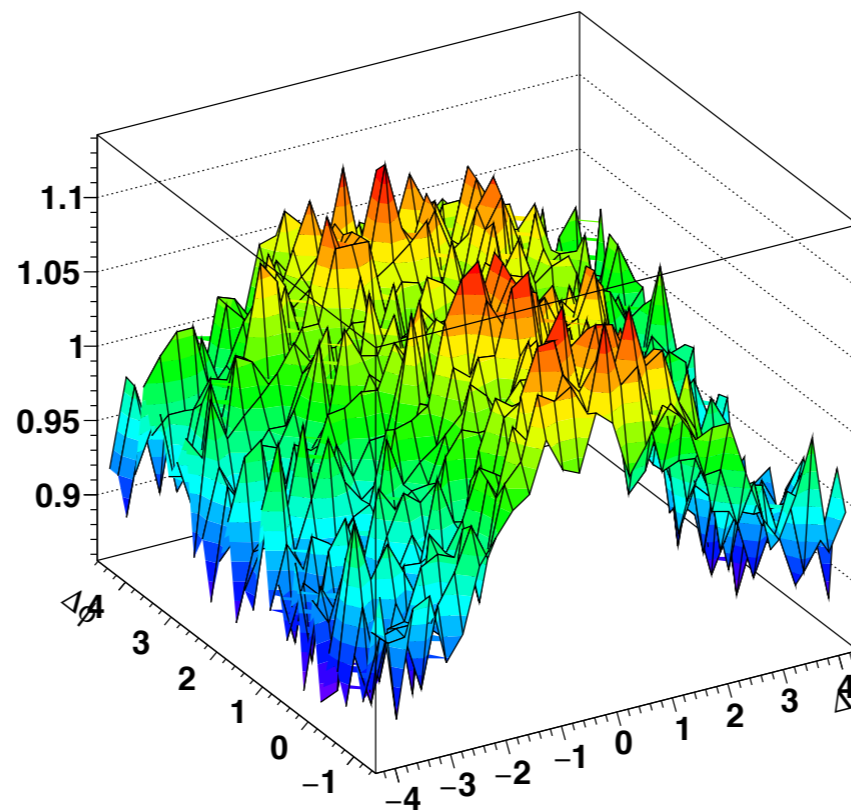
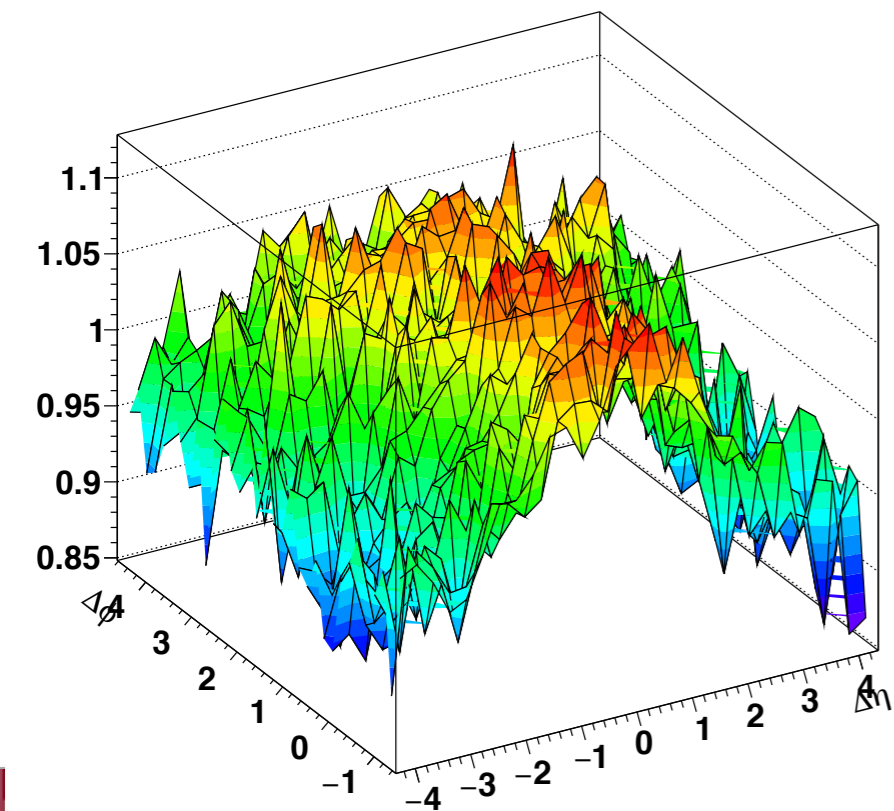
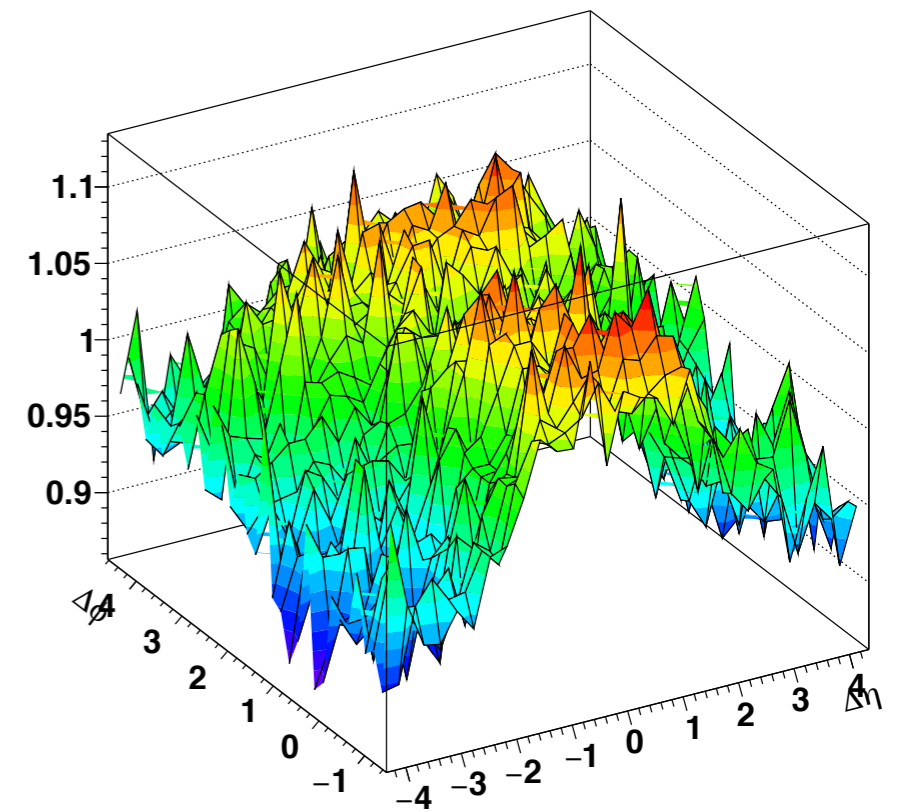
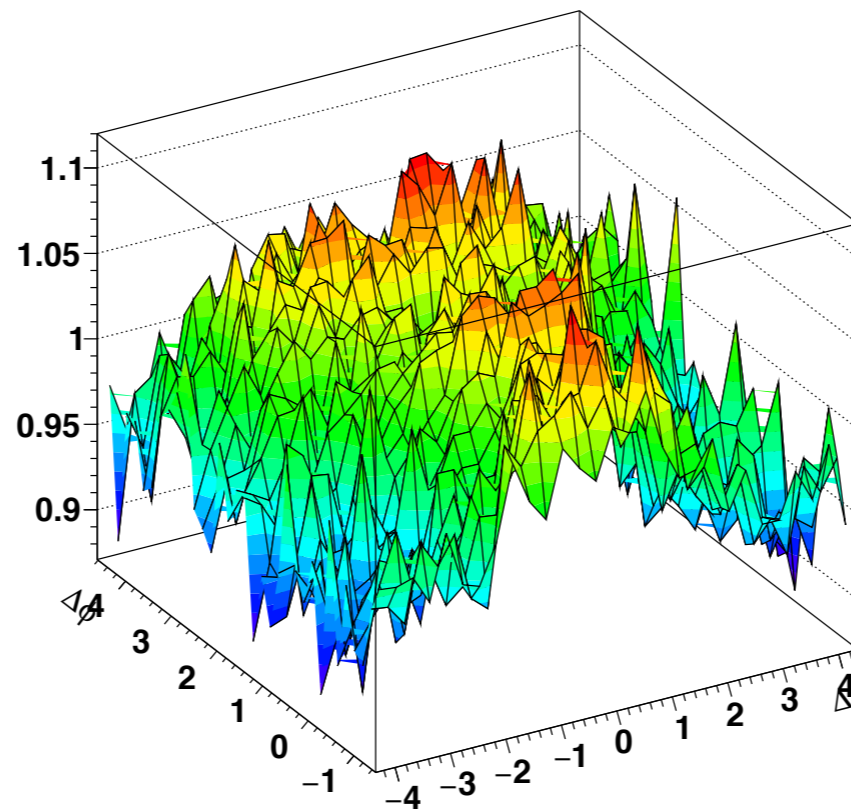
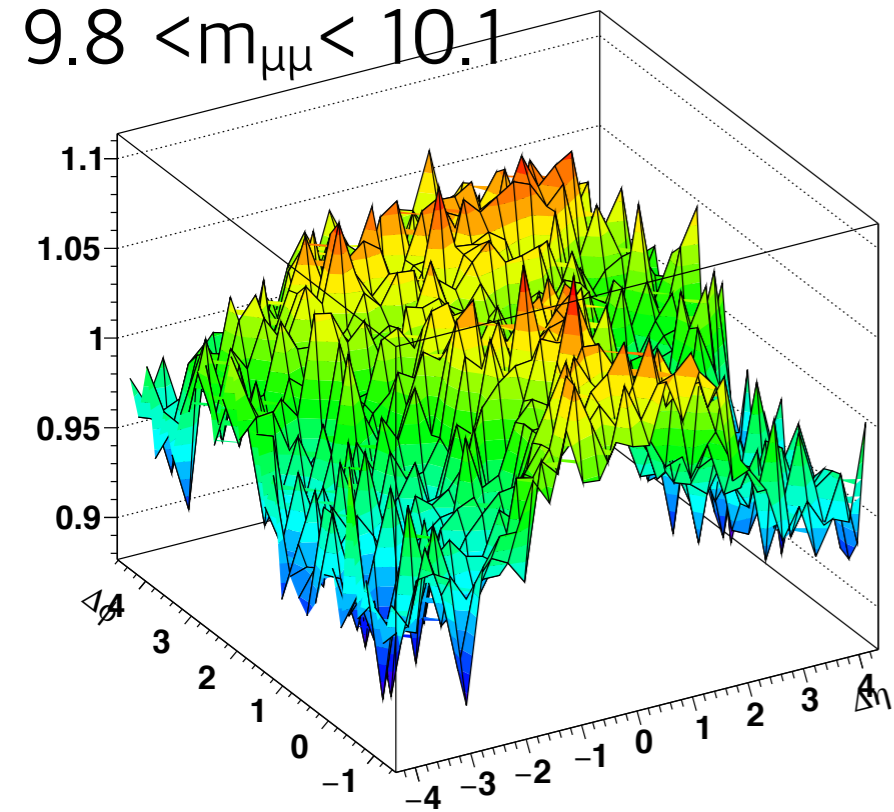


$9.5 < m_{\mu\mu} < 9.8$

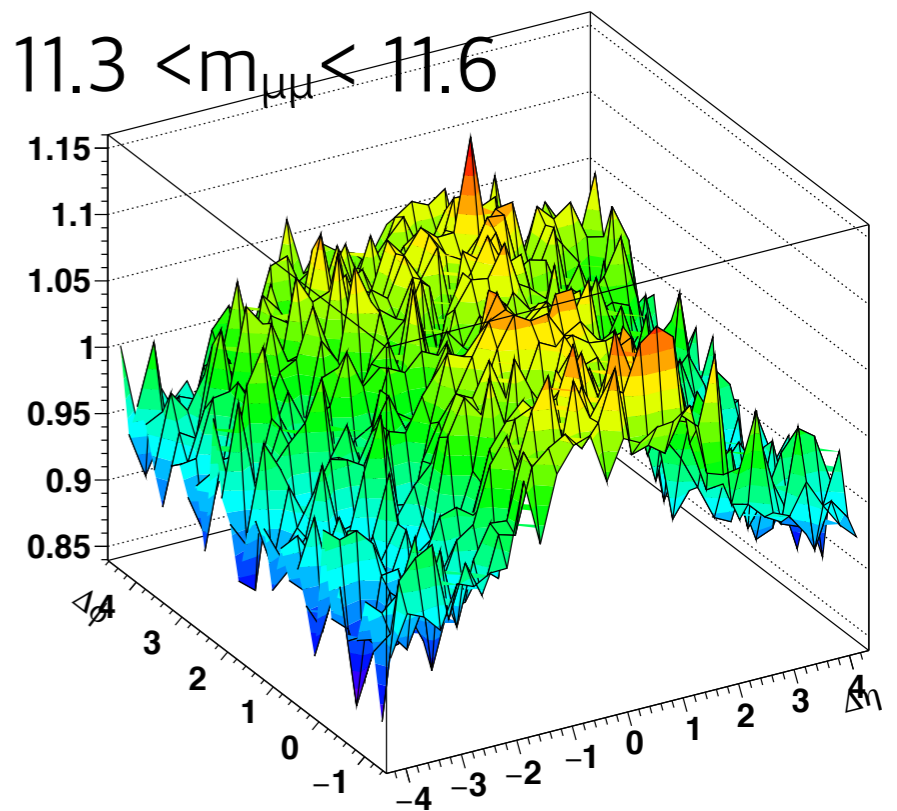


$0 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$9.8 < m_{\mu\mu} < 10.1$

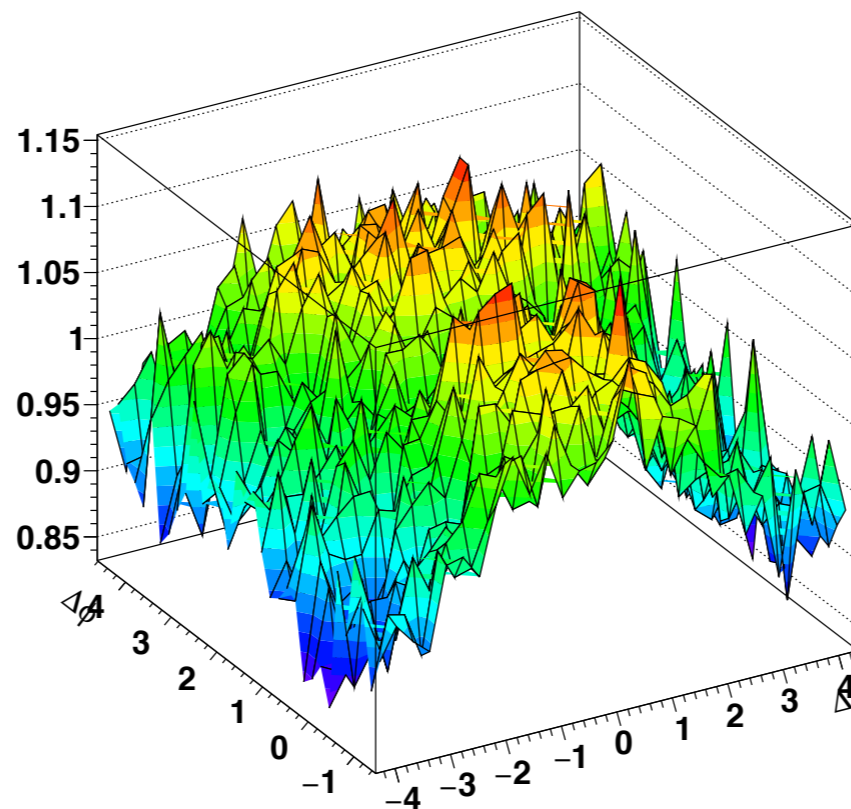
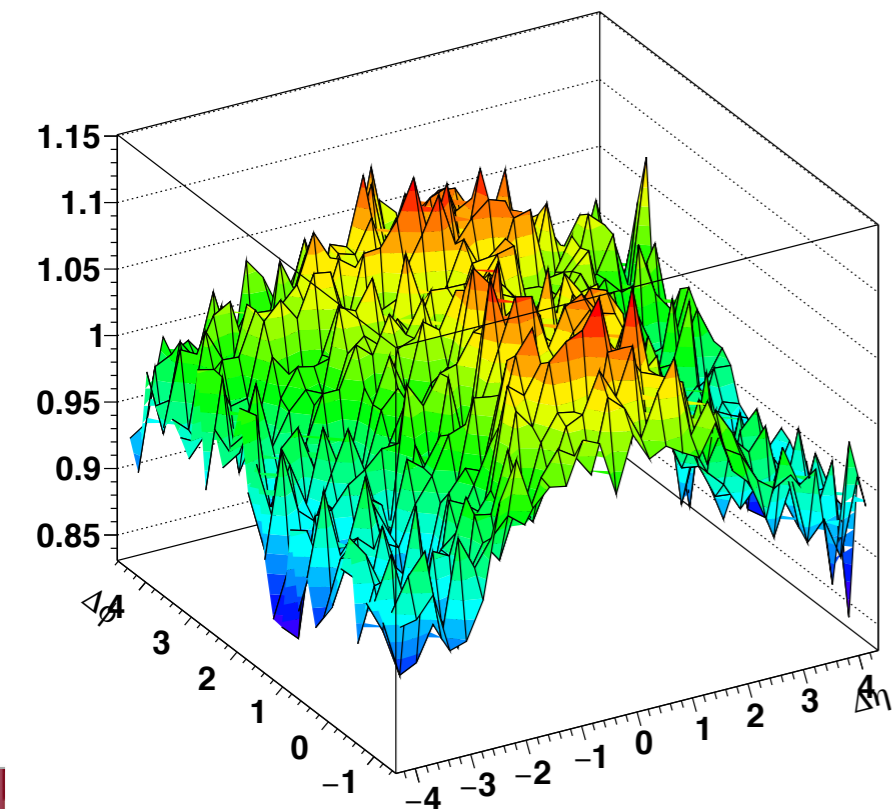
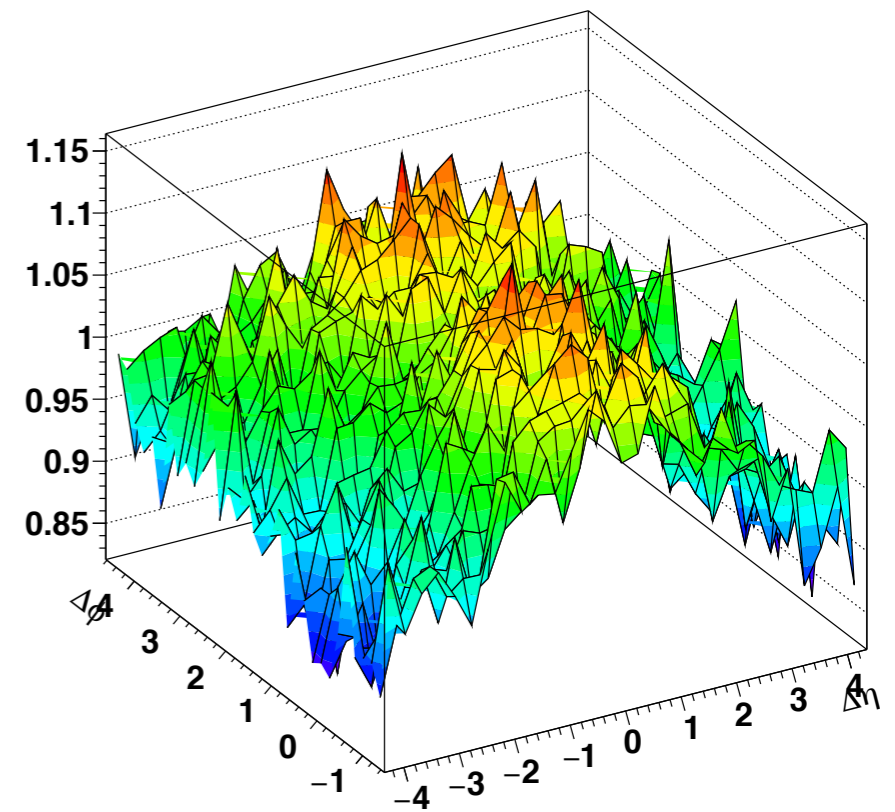
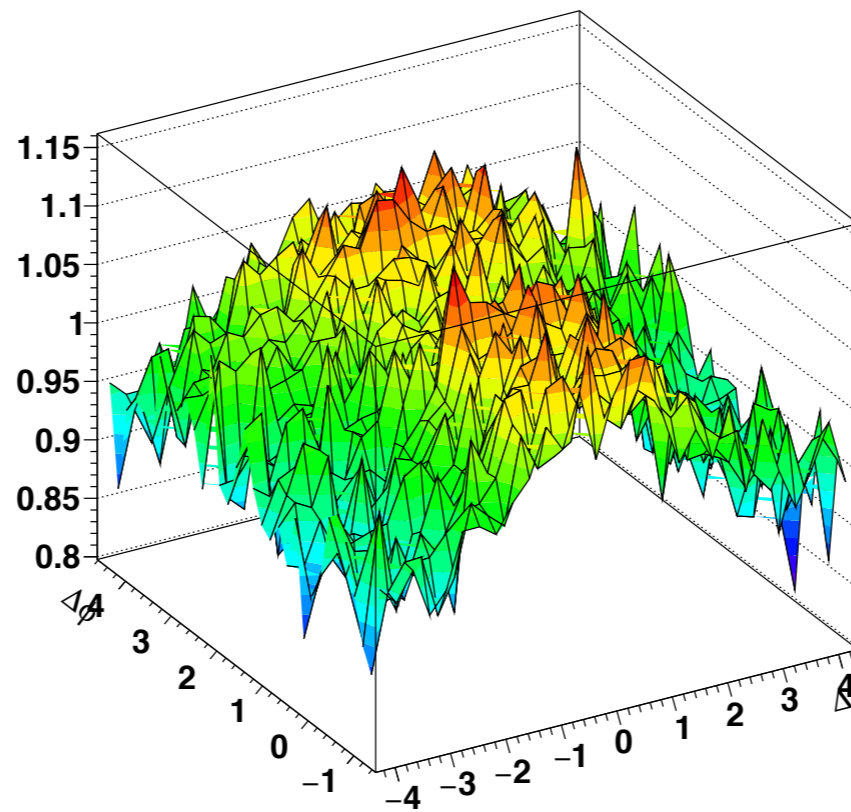
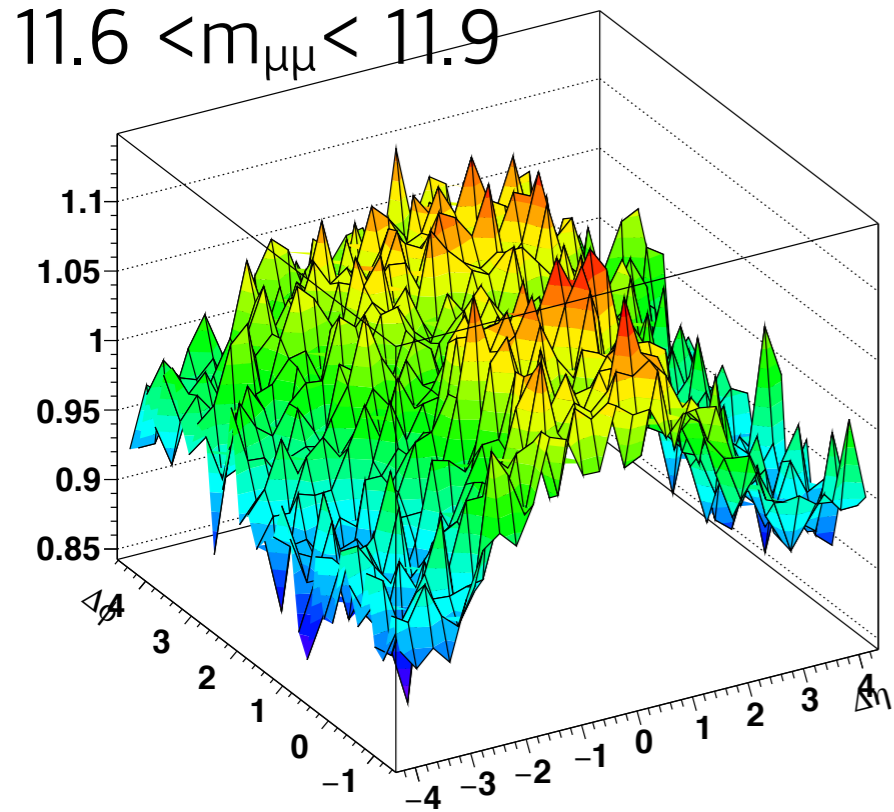


$11.3 < m_{\mu\mu} < 11.6$

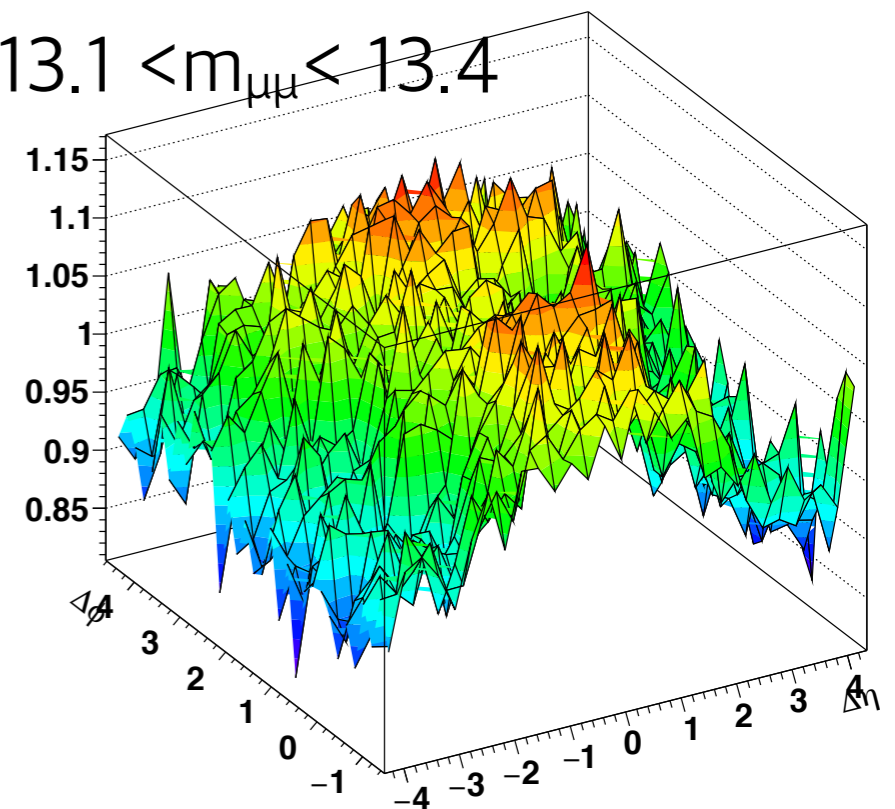


$0 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

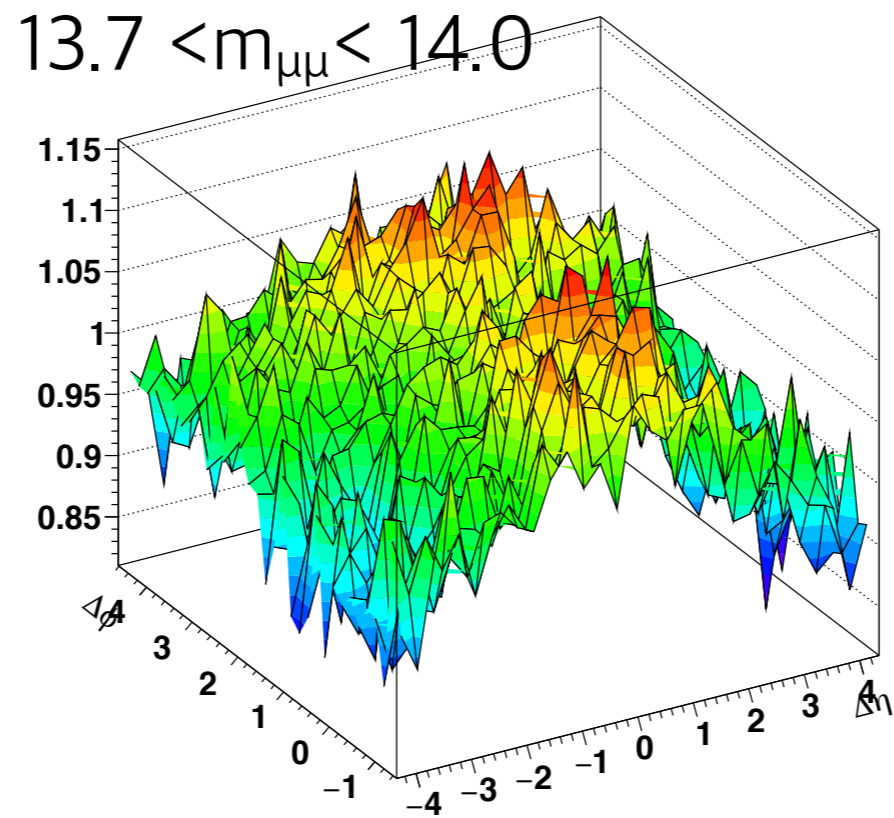
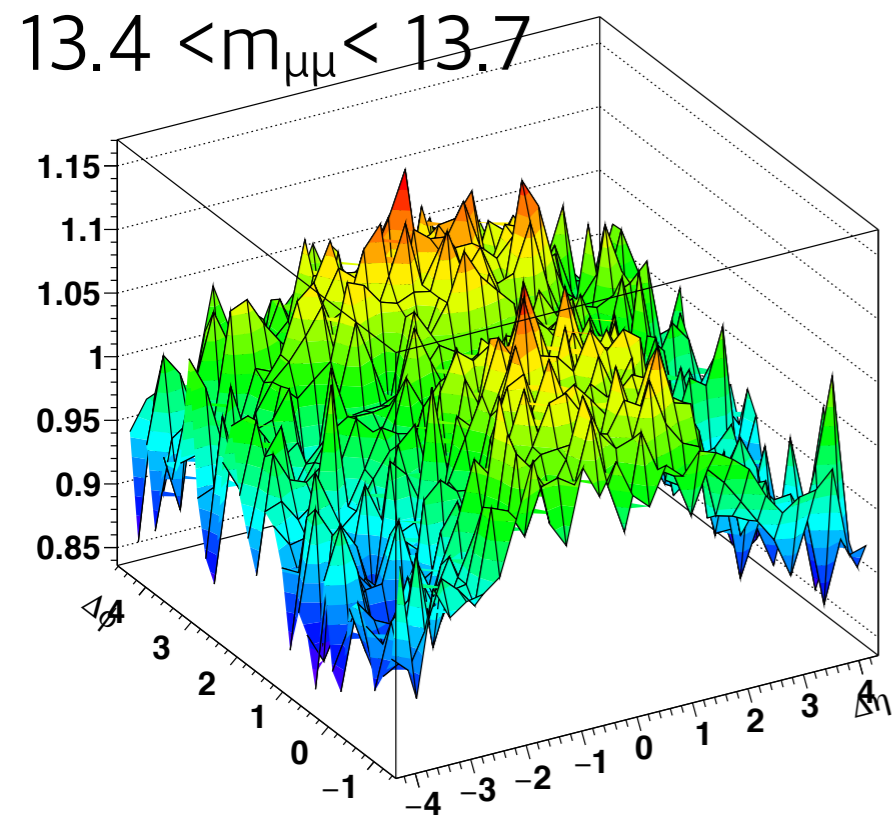
$11.6 < m_{\mu\mu} < 11.9$



$13.1 < m_{\mu\mu} < 13.4$

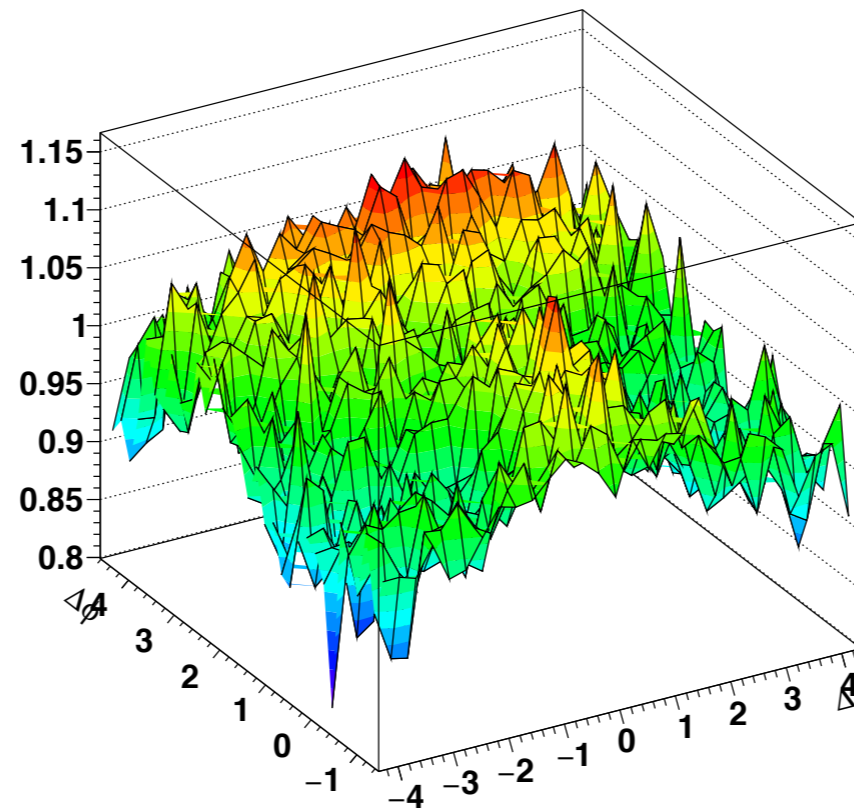
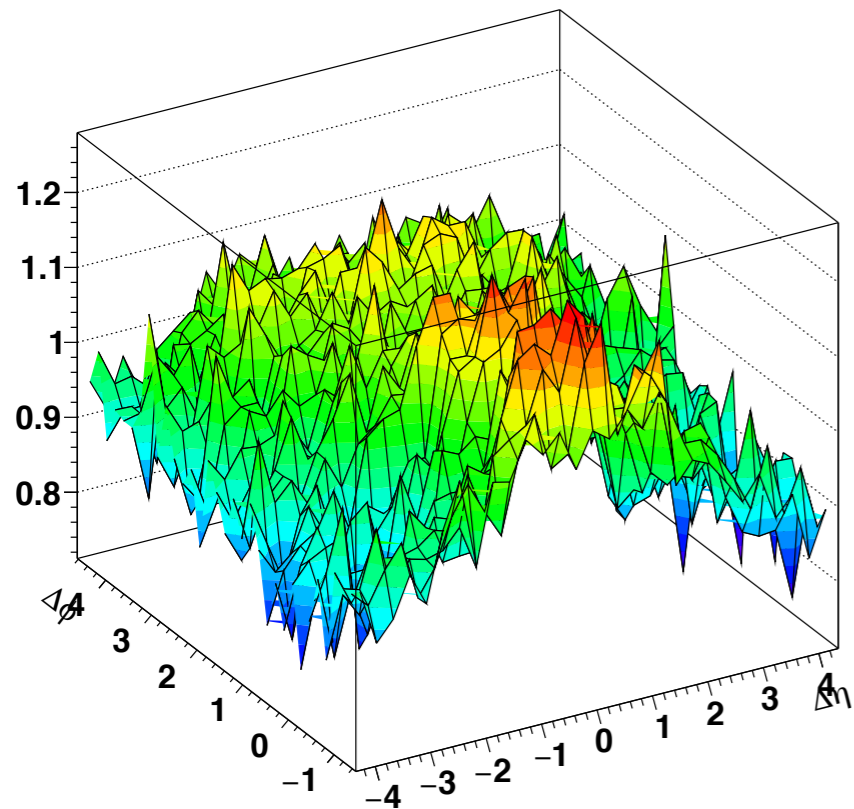
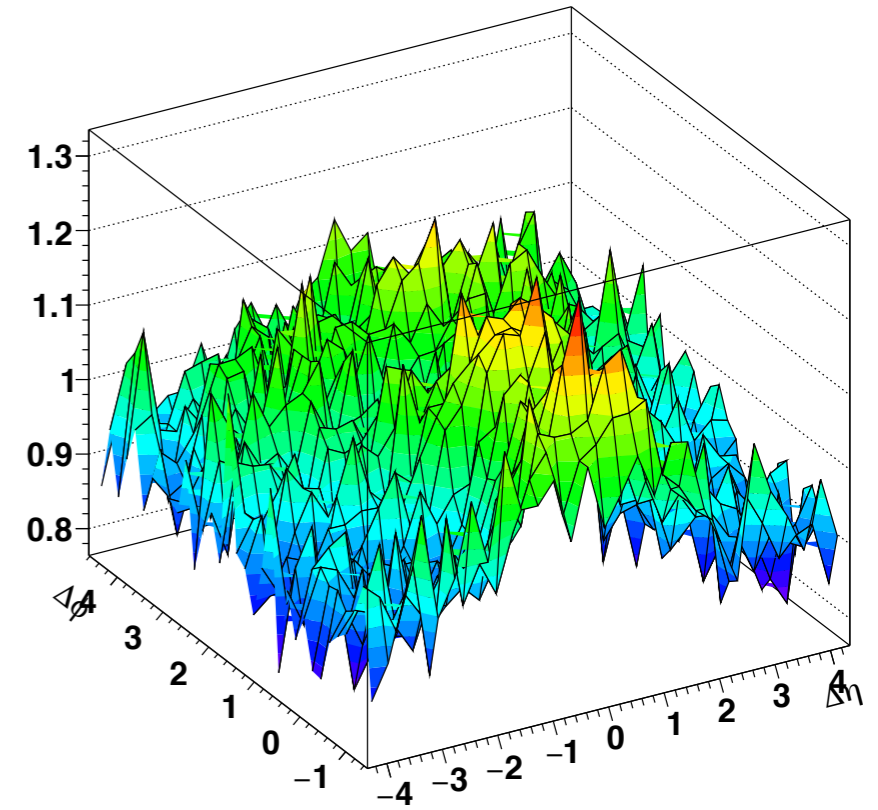
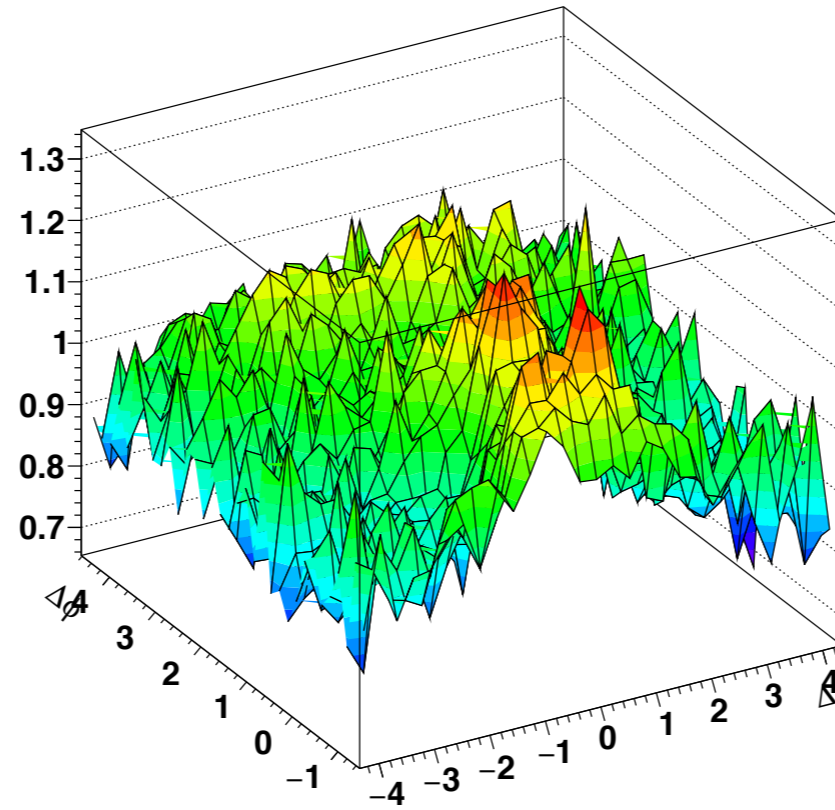
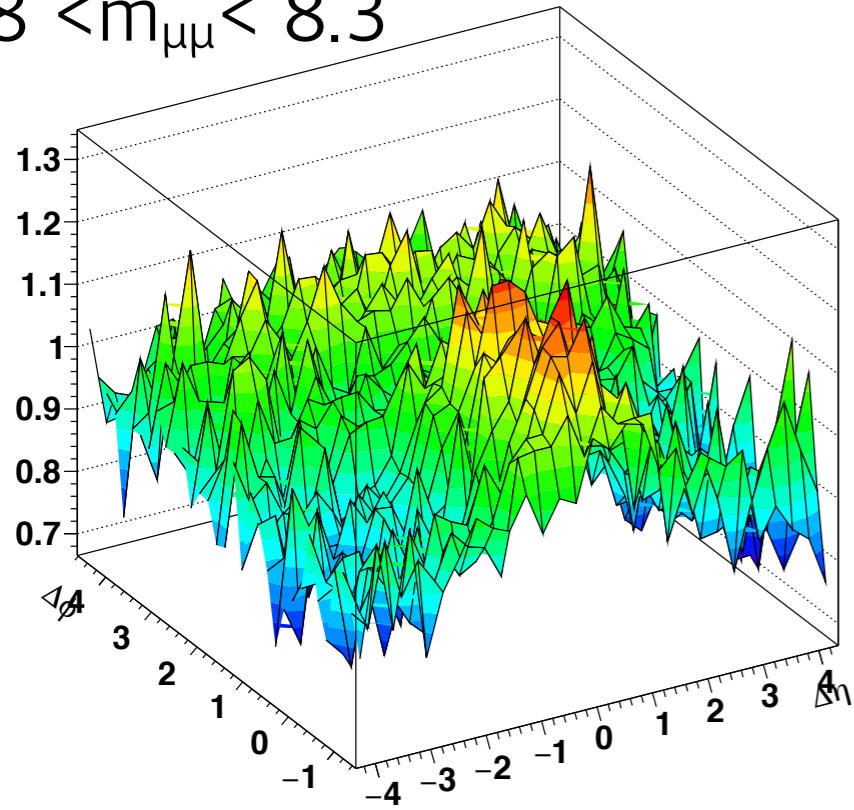


$0 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

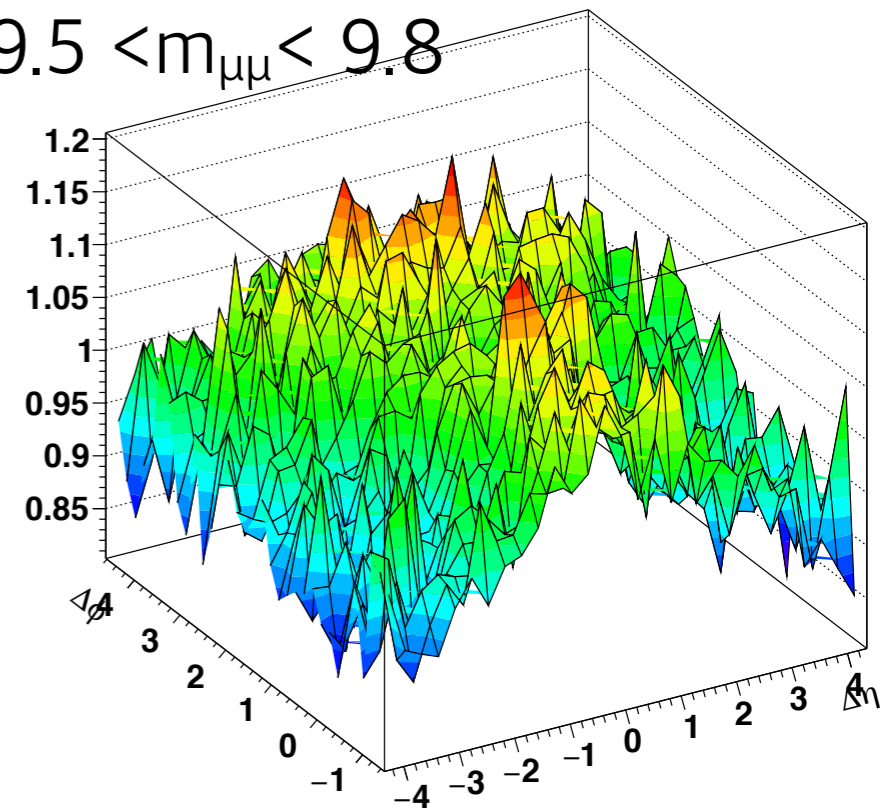


$0 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

$8 < m_{\mu\mu} < 8.3$

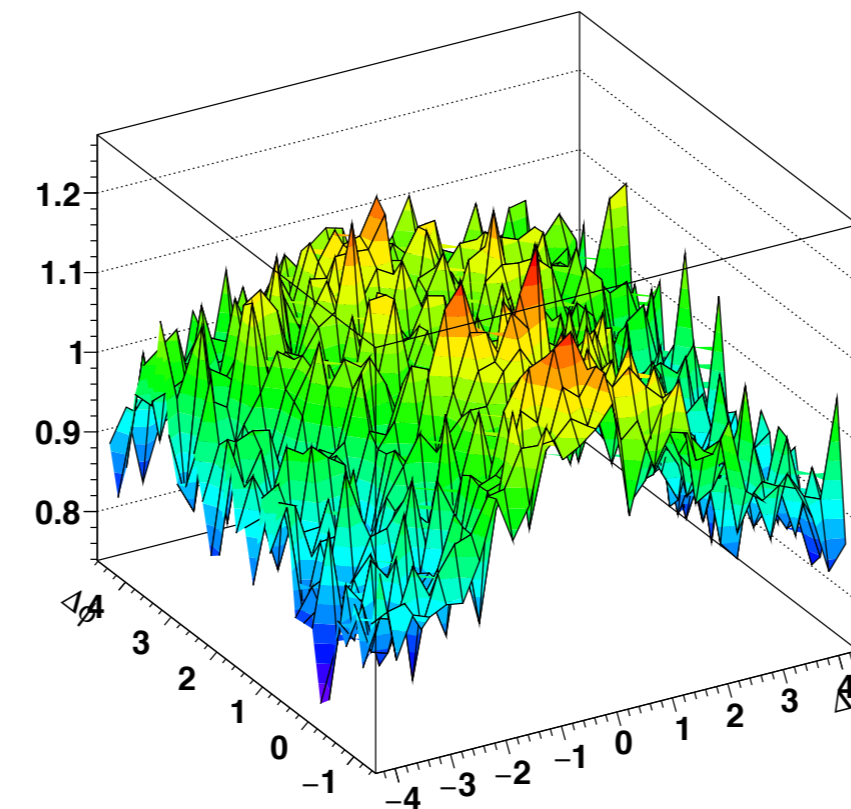
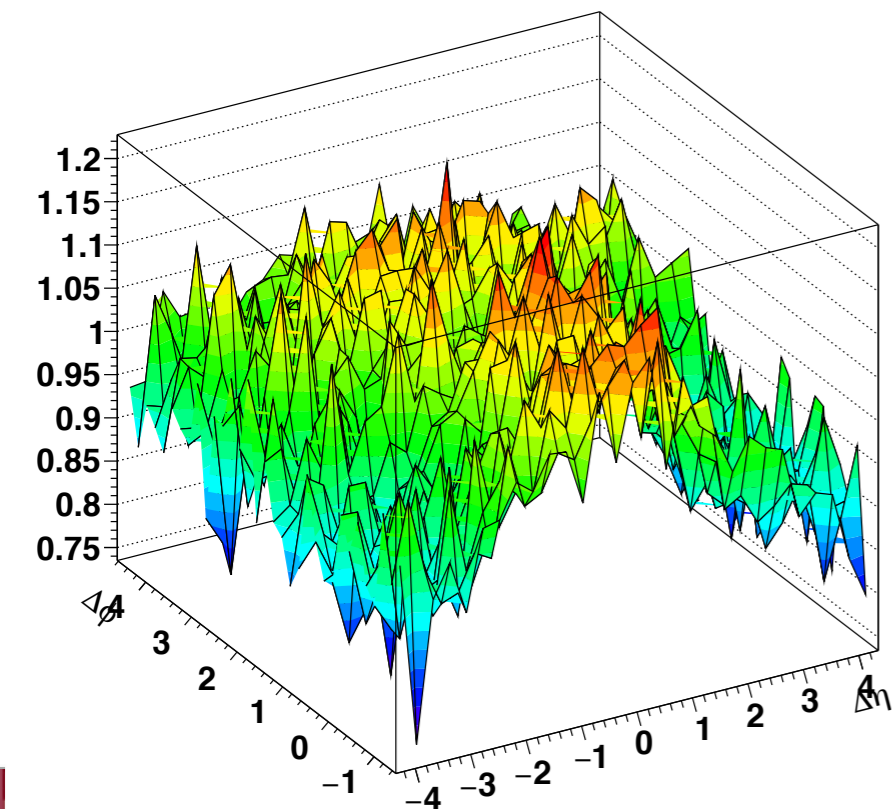
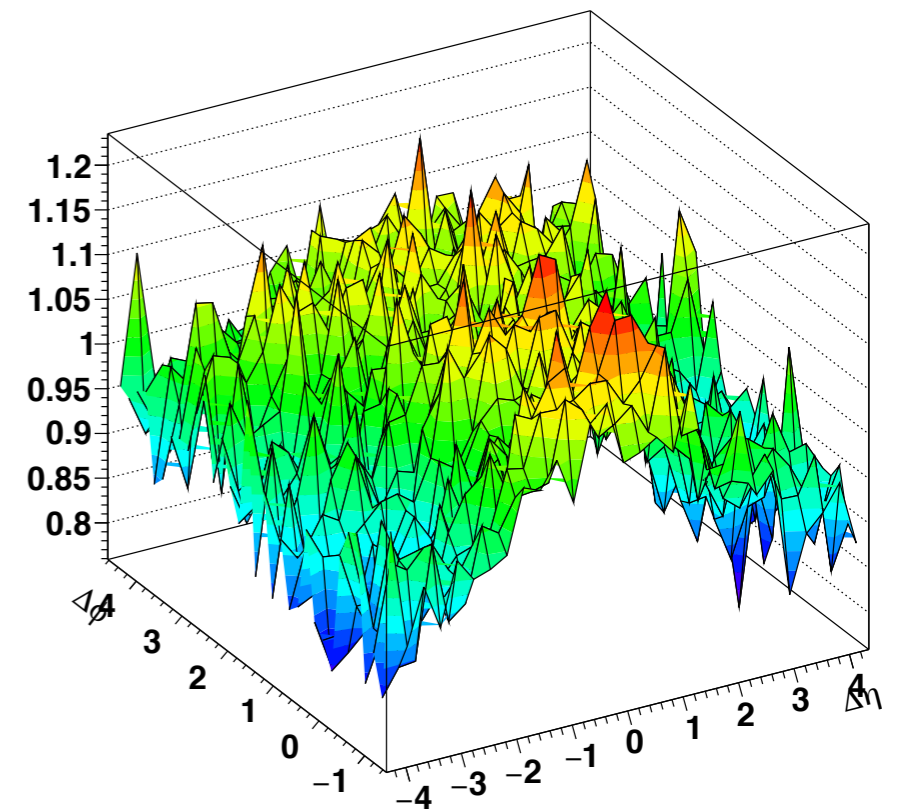
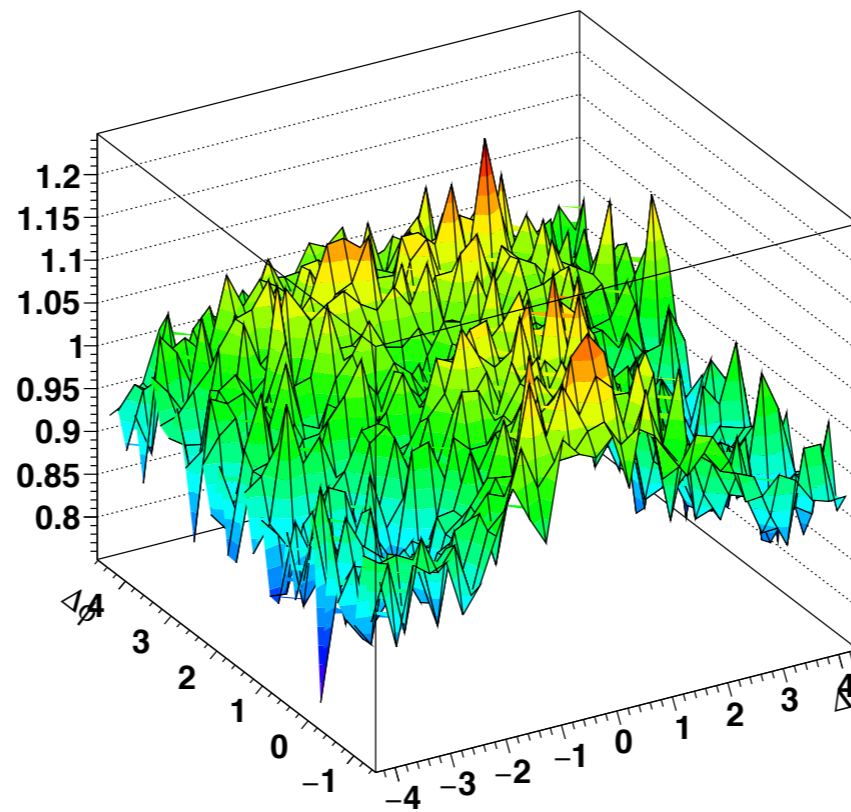
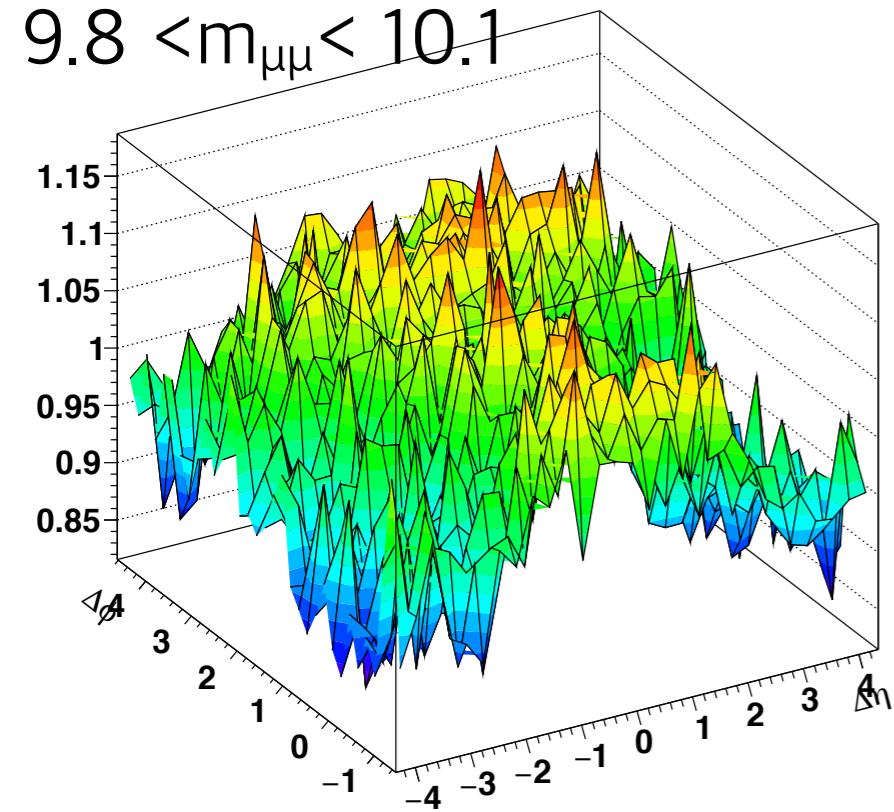


$9.5 < m_{\mu\mu} < 9.8$

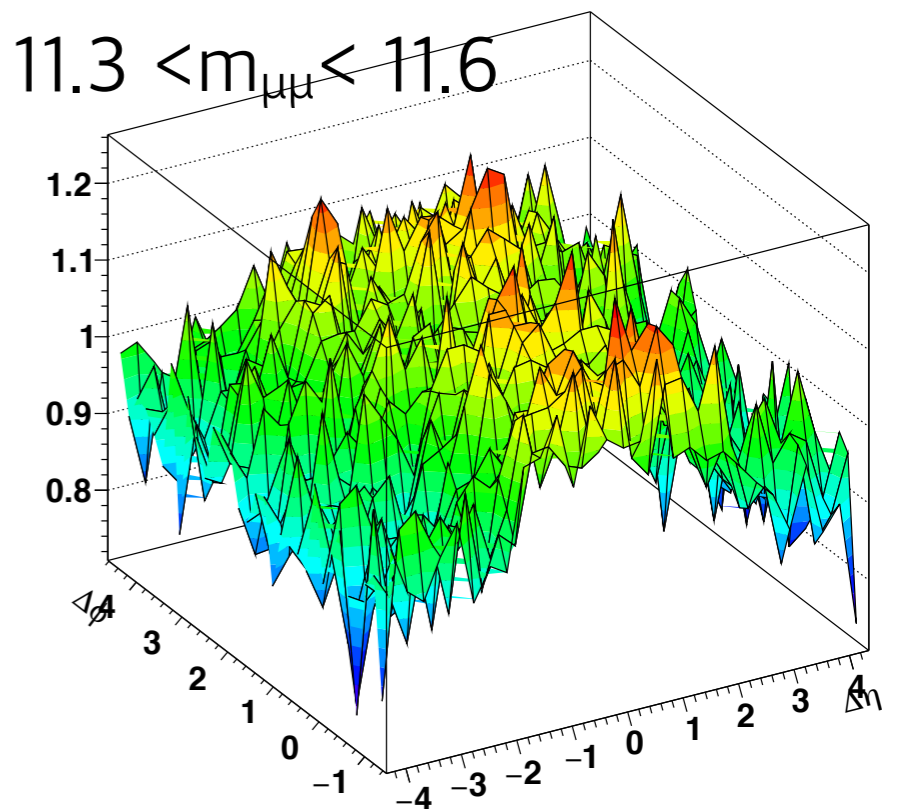


$0 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

$9.8 < m_{\mu\mu} < 10.1$

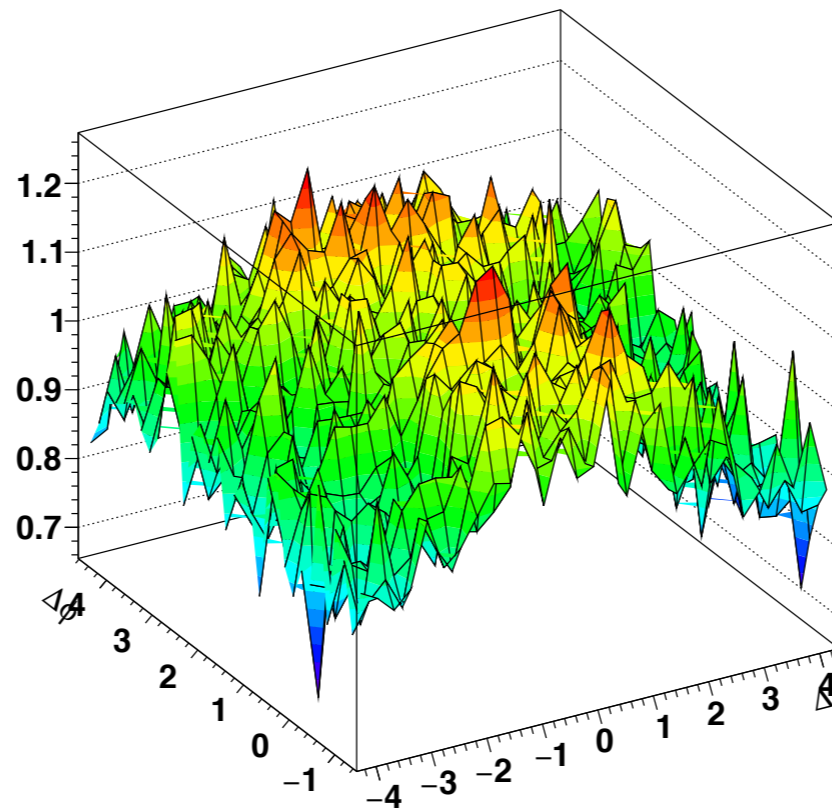
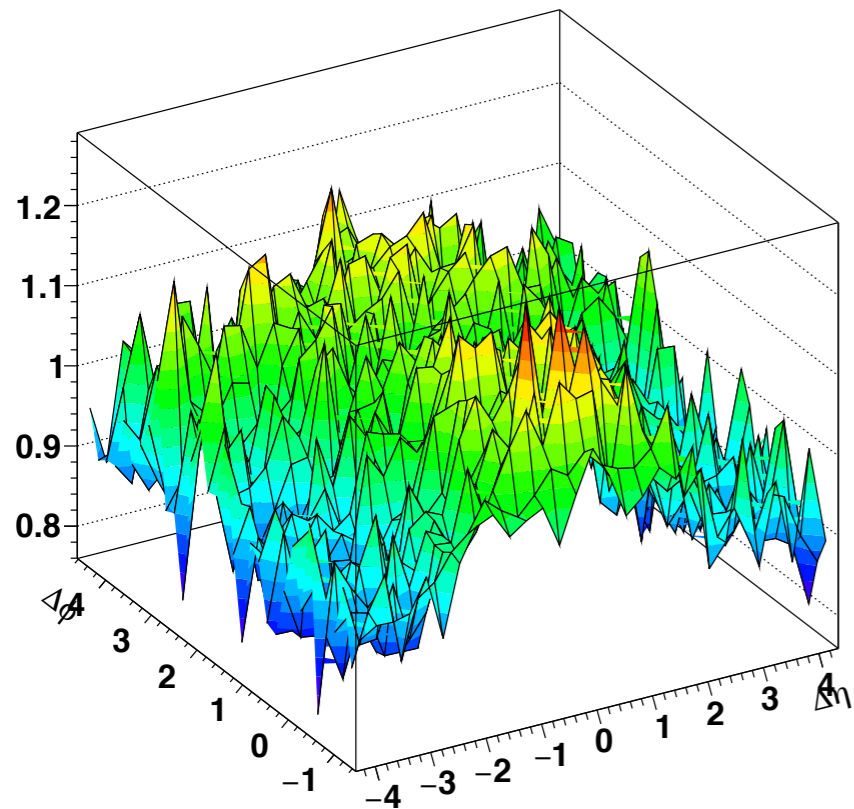
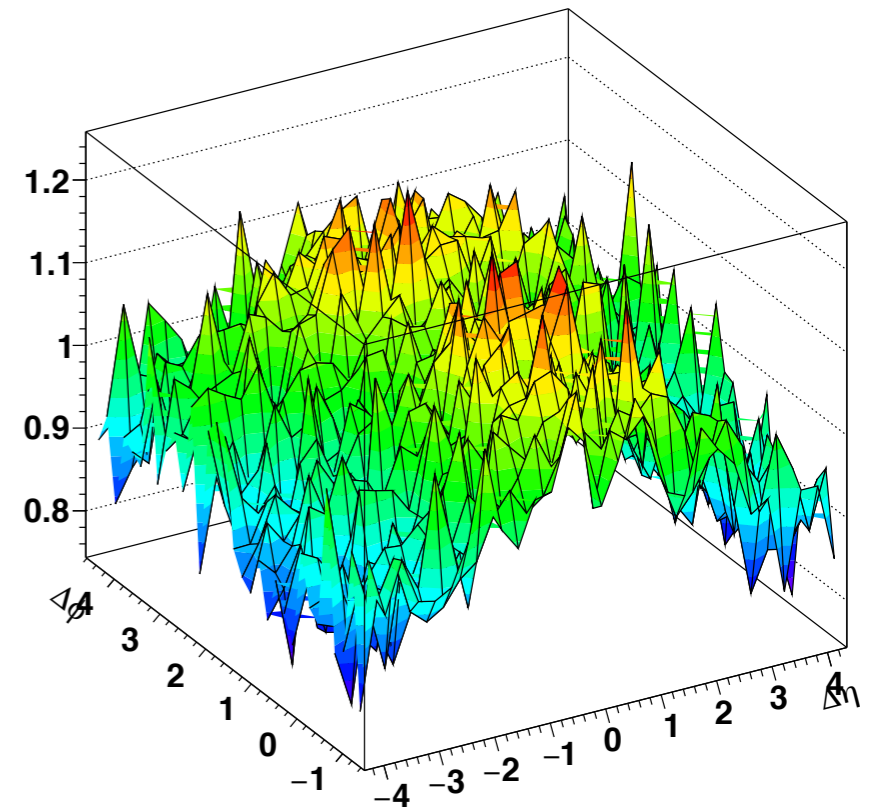
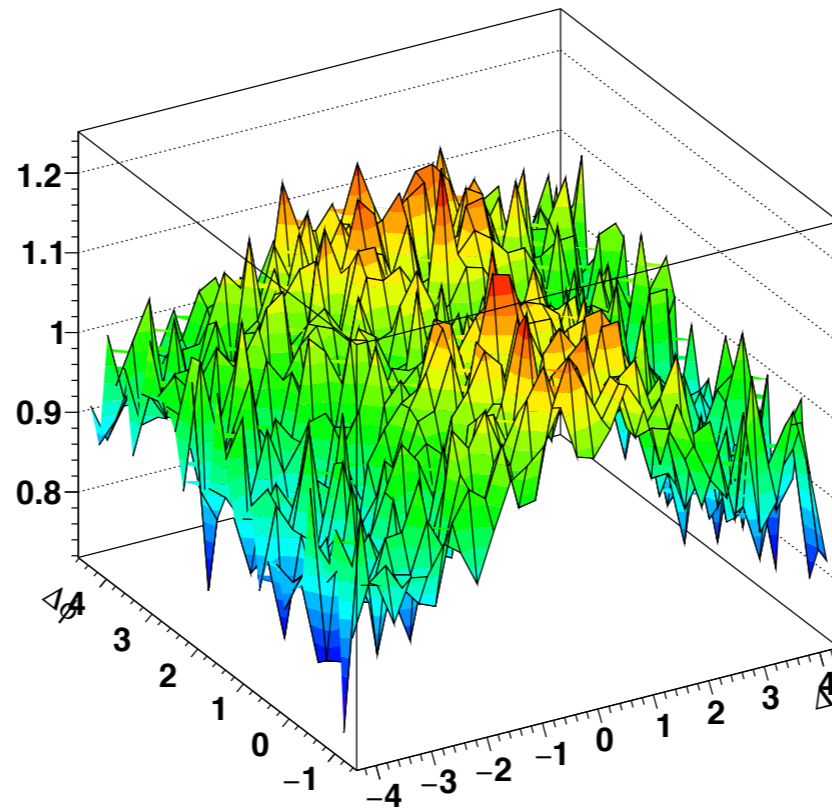
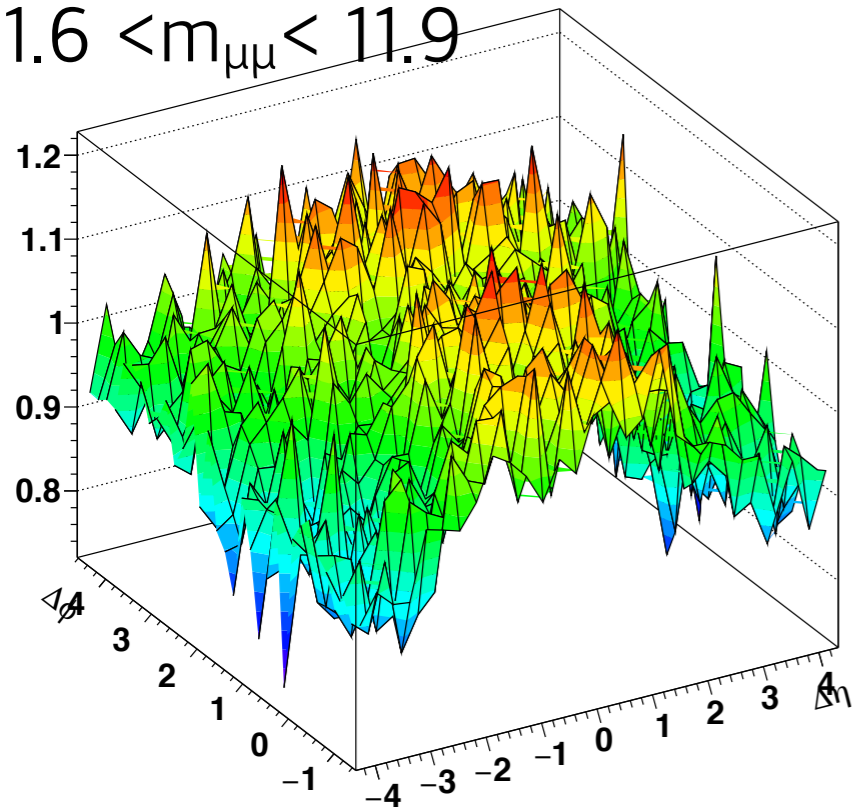


$11.3 < m_{\mu\mu} < 11.6$

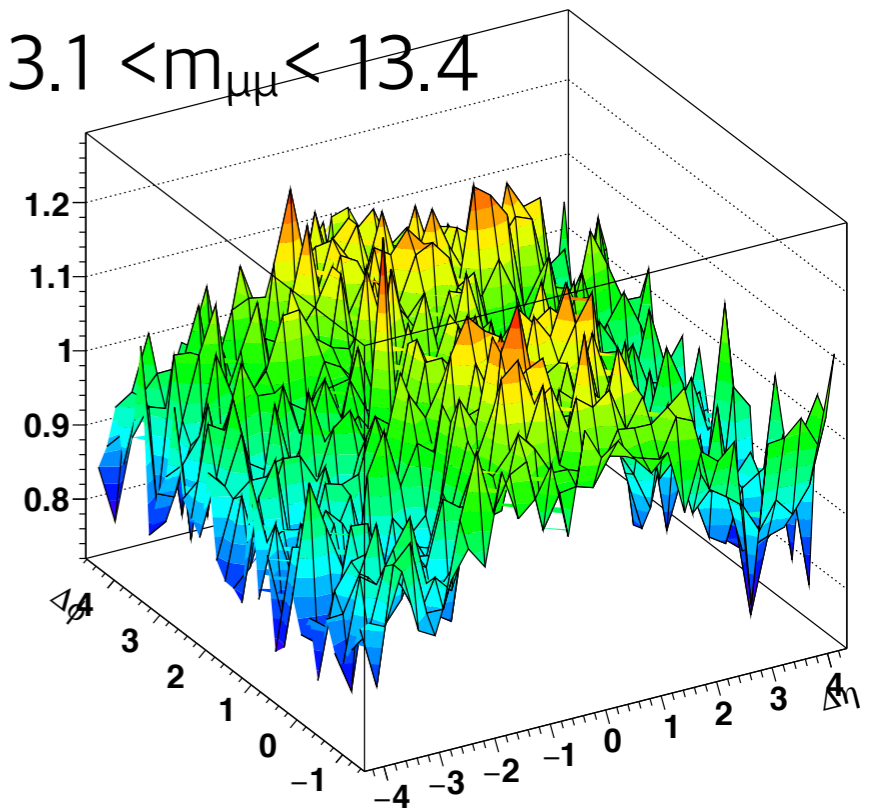


$0 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

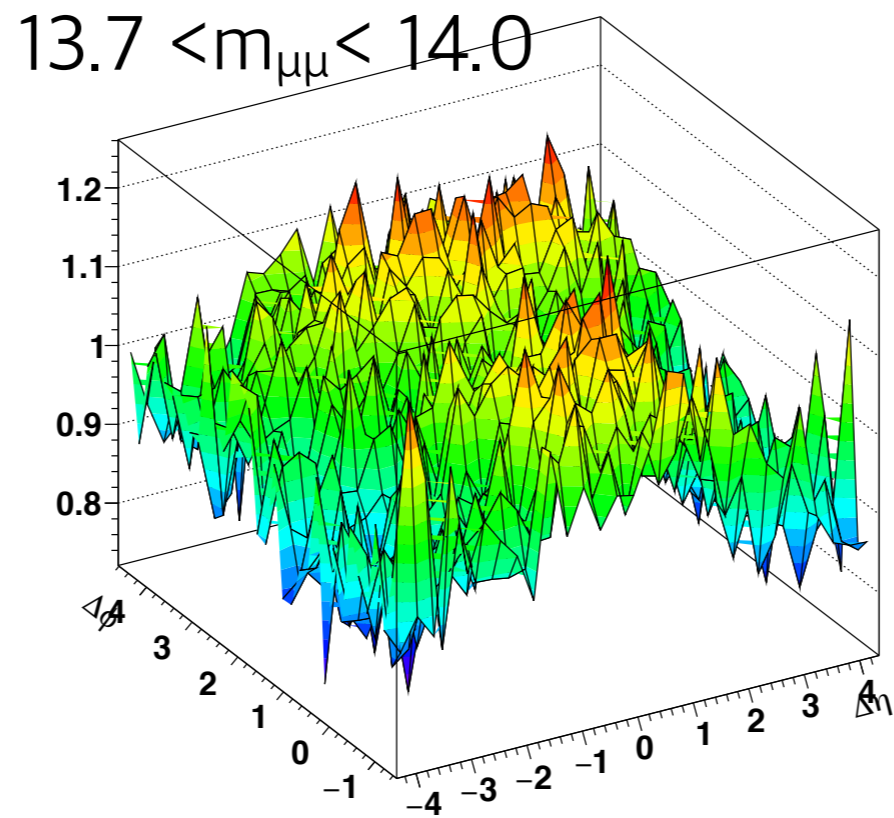
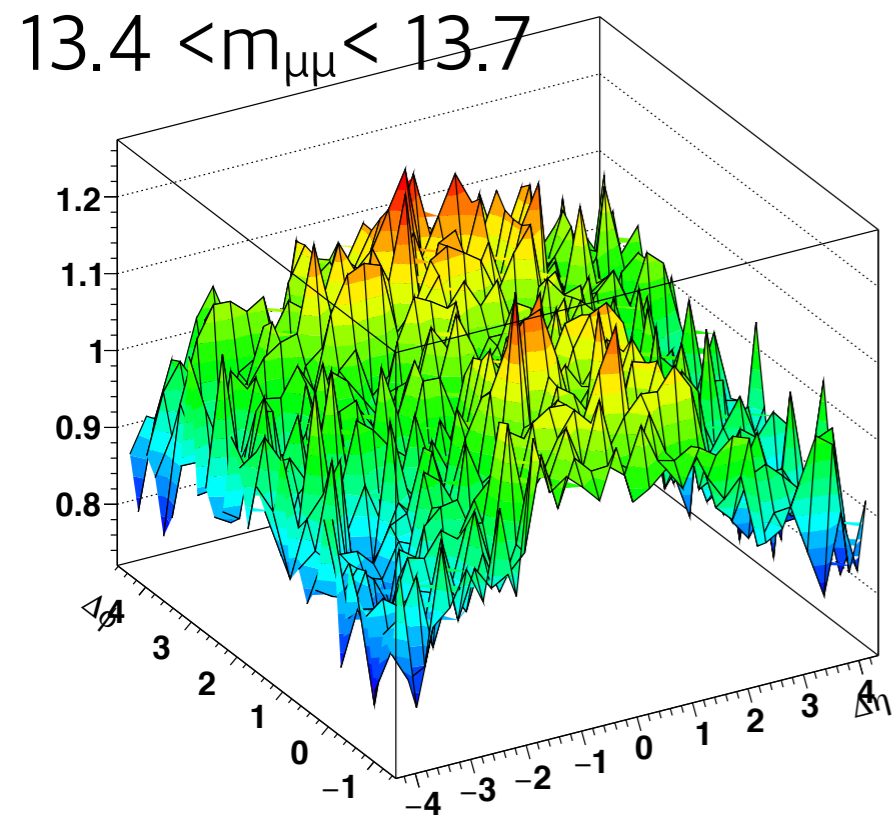
$11.6 < m_{\mu\mu} < 11.9$



$13.1 < m_{\mu\mu} < 13.4$

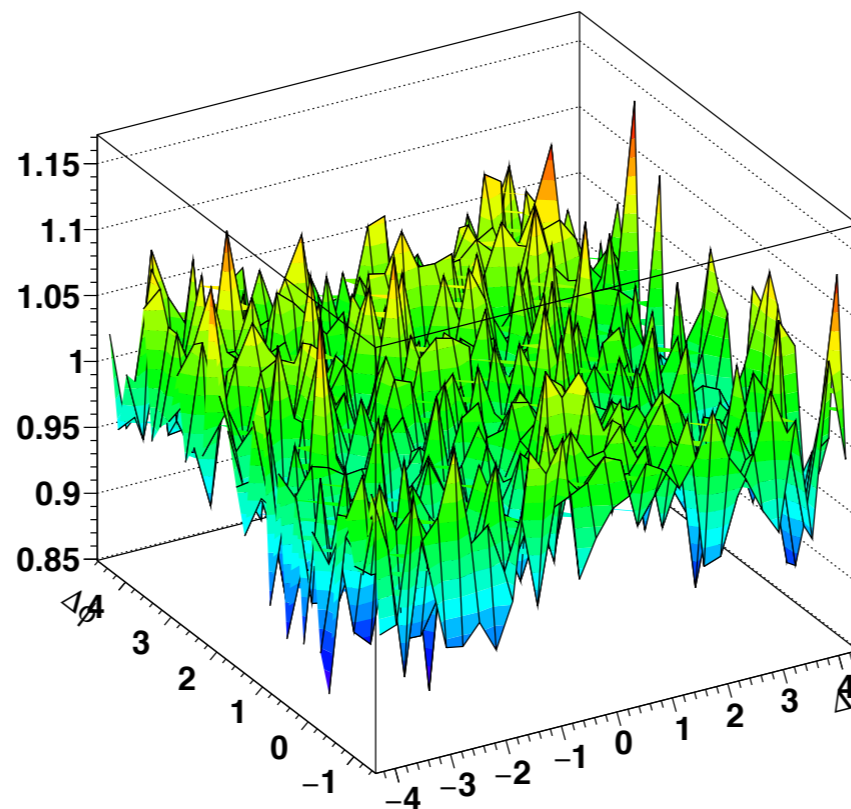
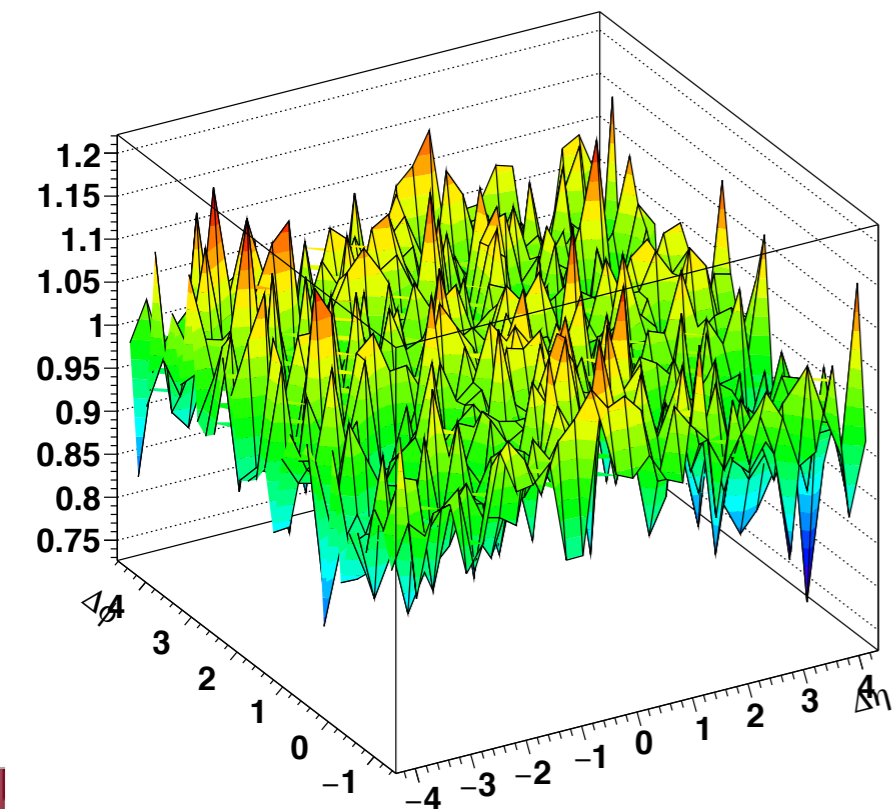
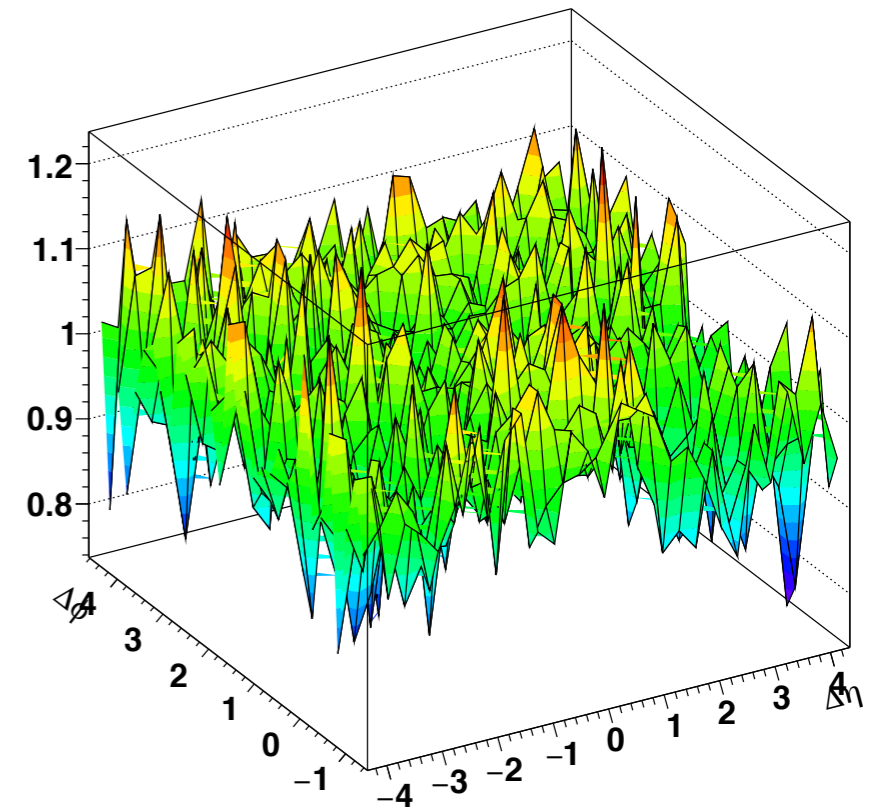
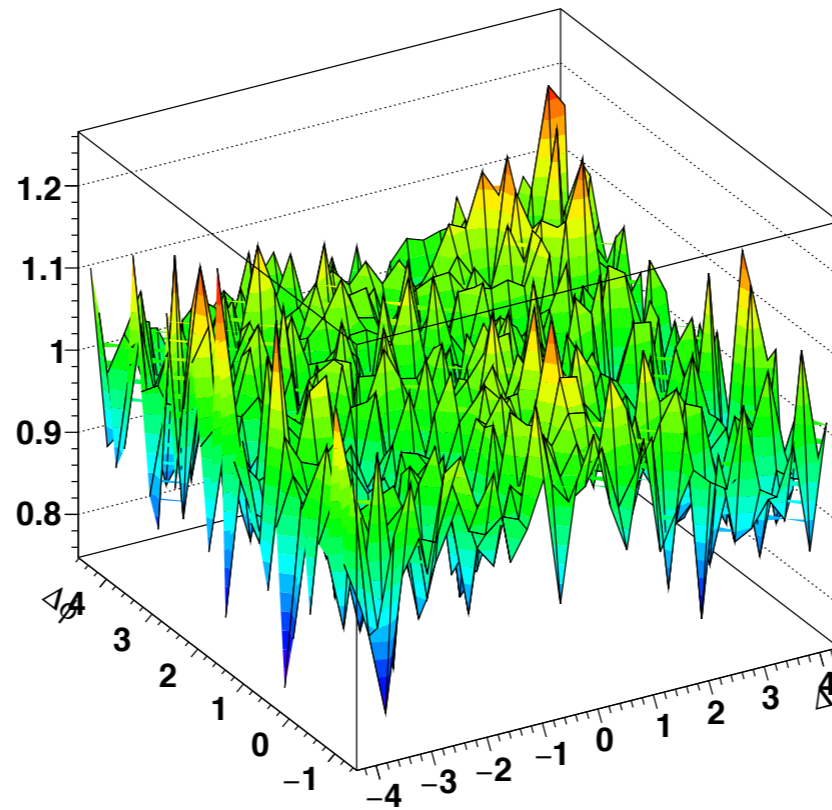
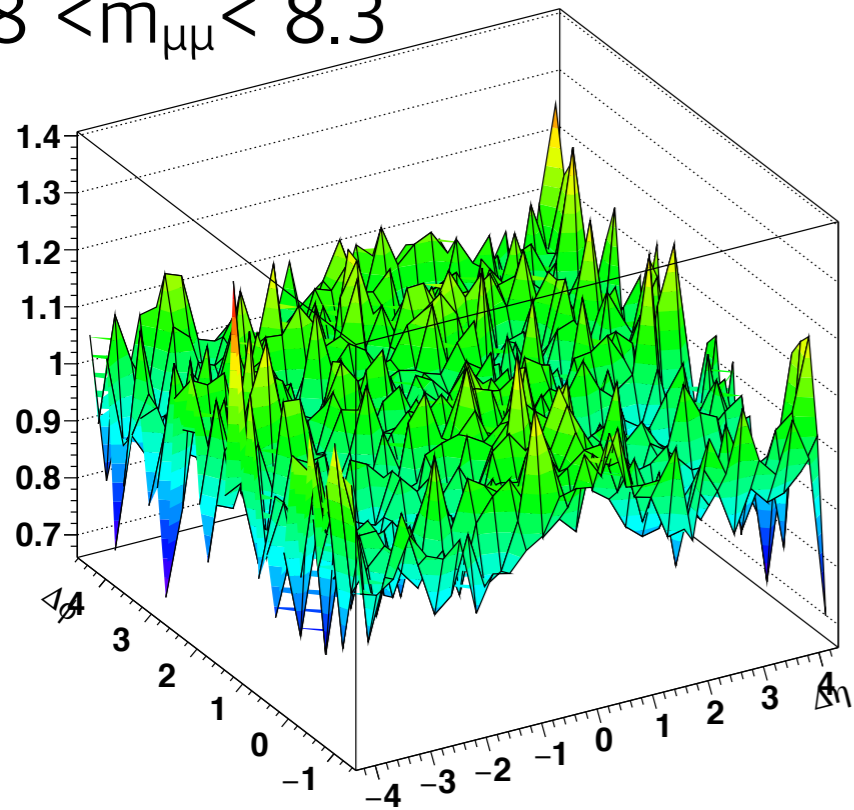


$0 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

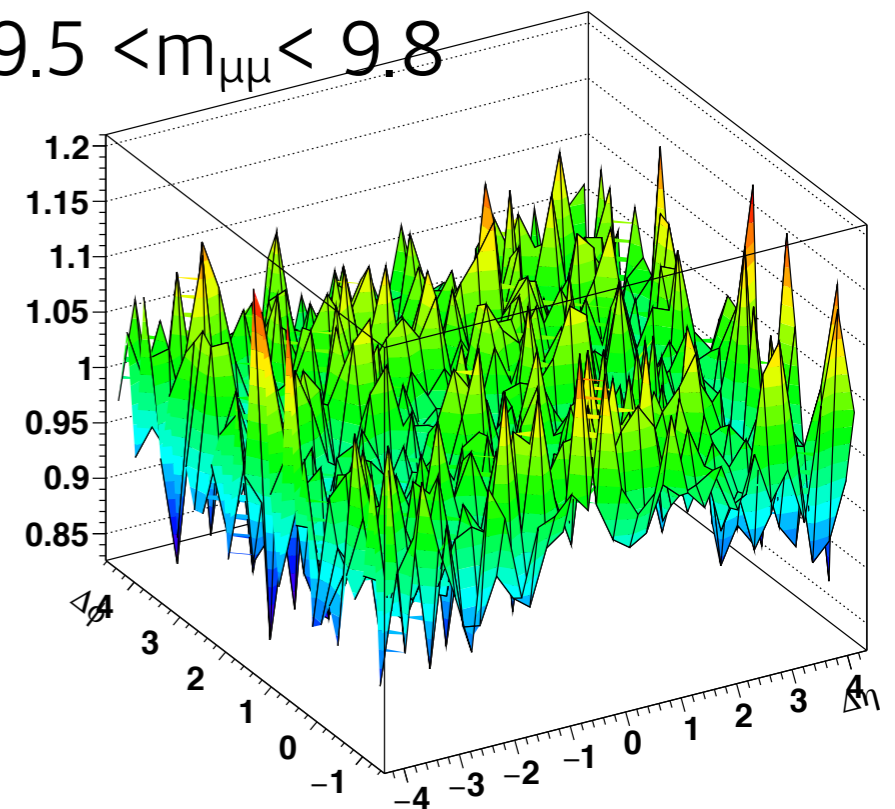


$200 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$8 < m_{\mu\mu} < 8.3$

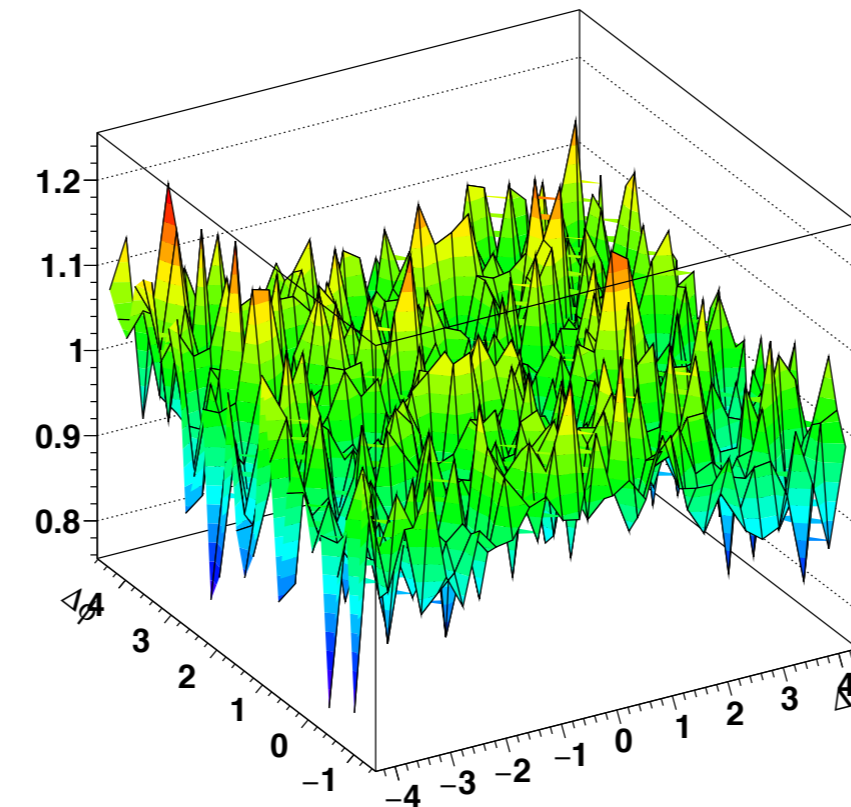
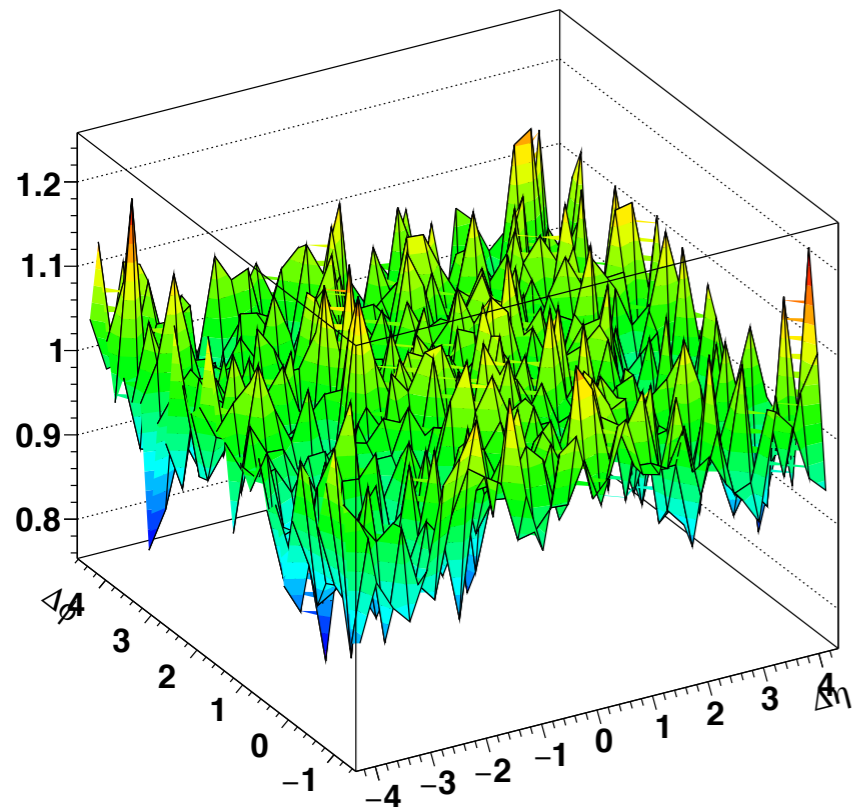
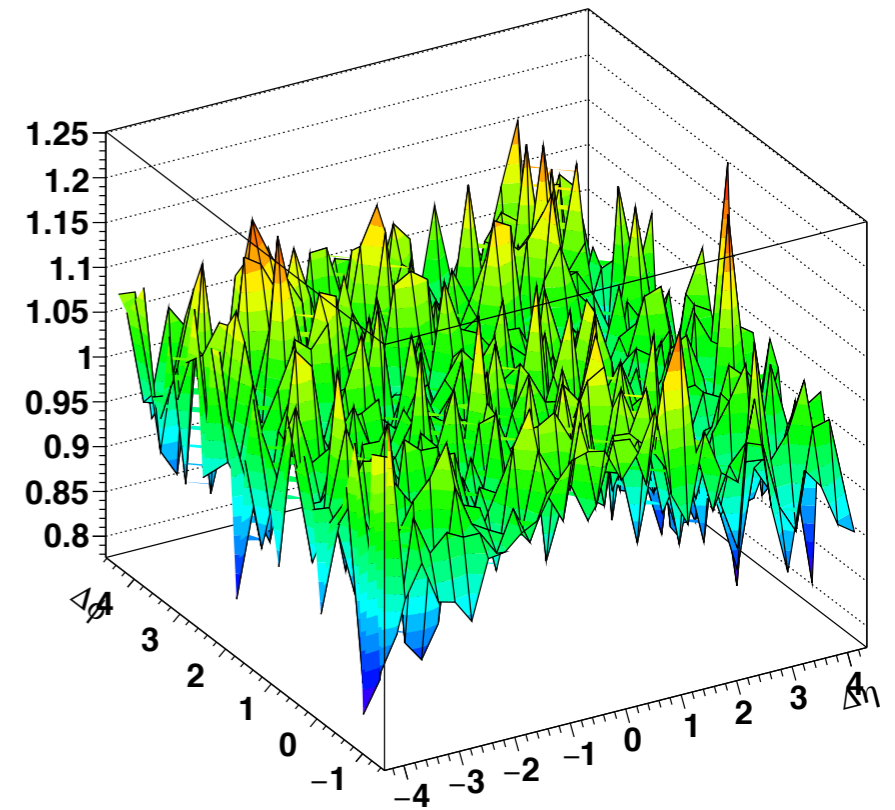
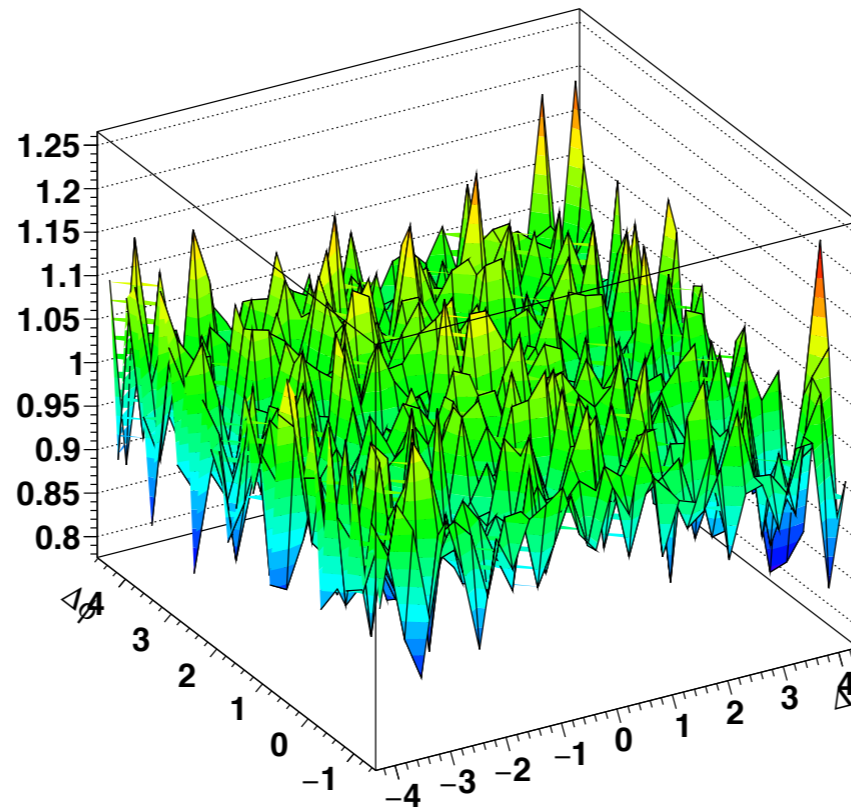
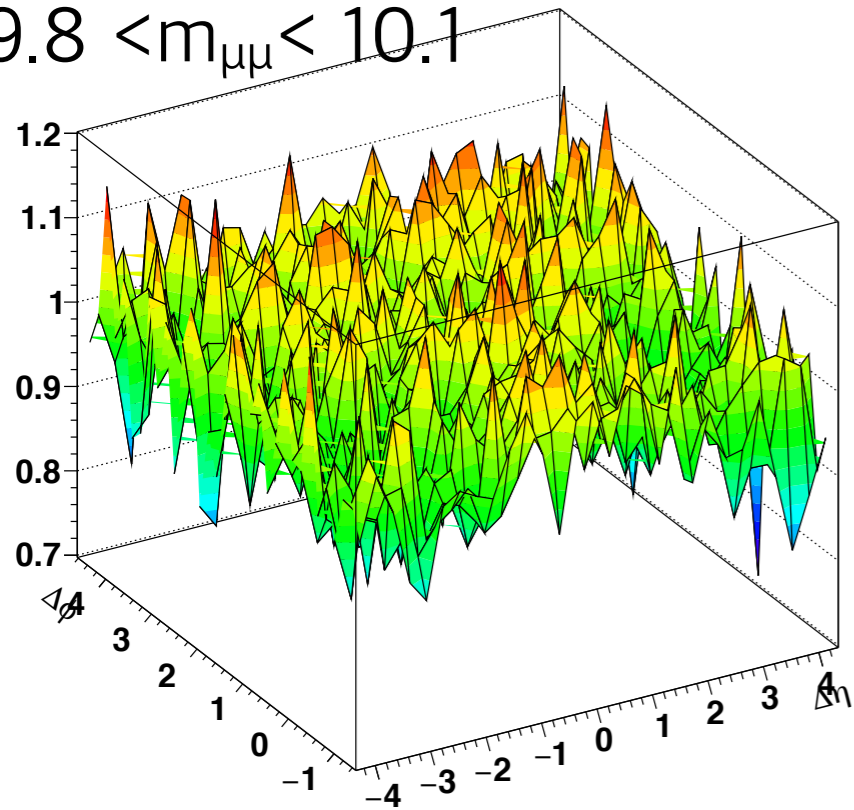


$9.5 < m_{\mu\mu} < 9.8$

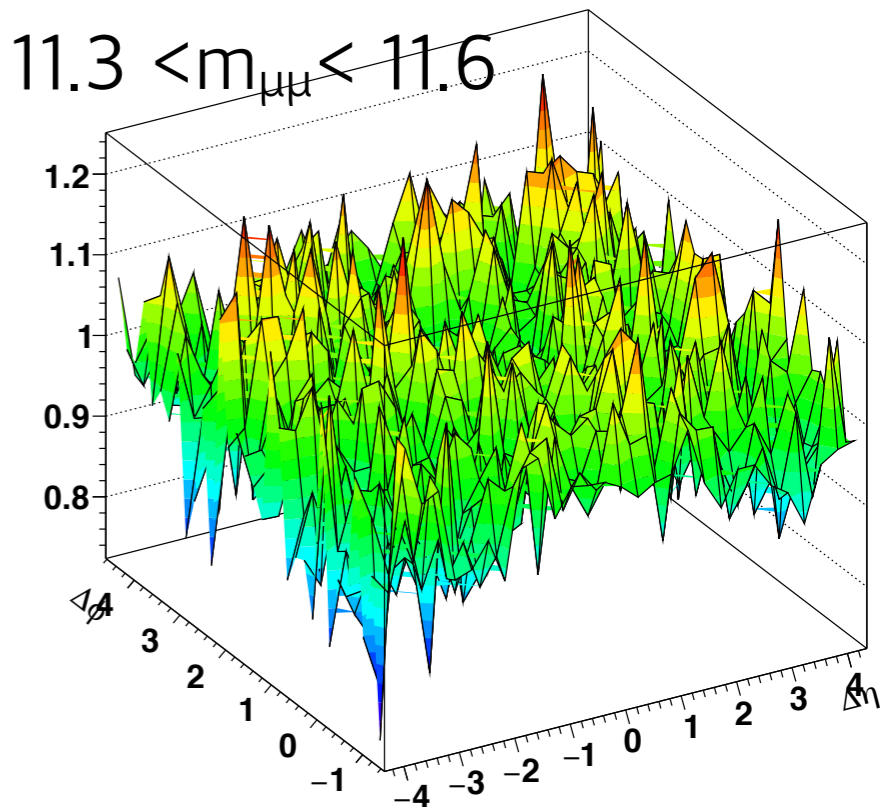


$200 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$9.8 < m_{\mu\mu} < 10.1$

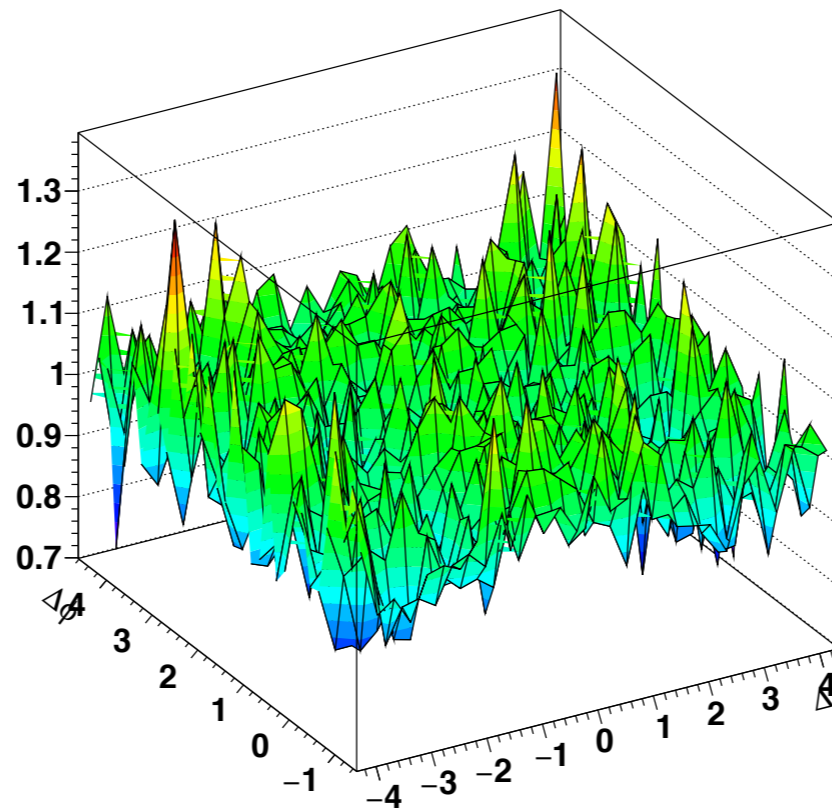
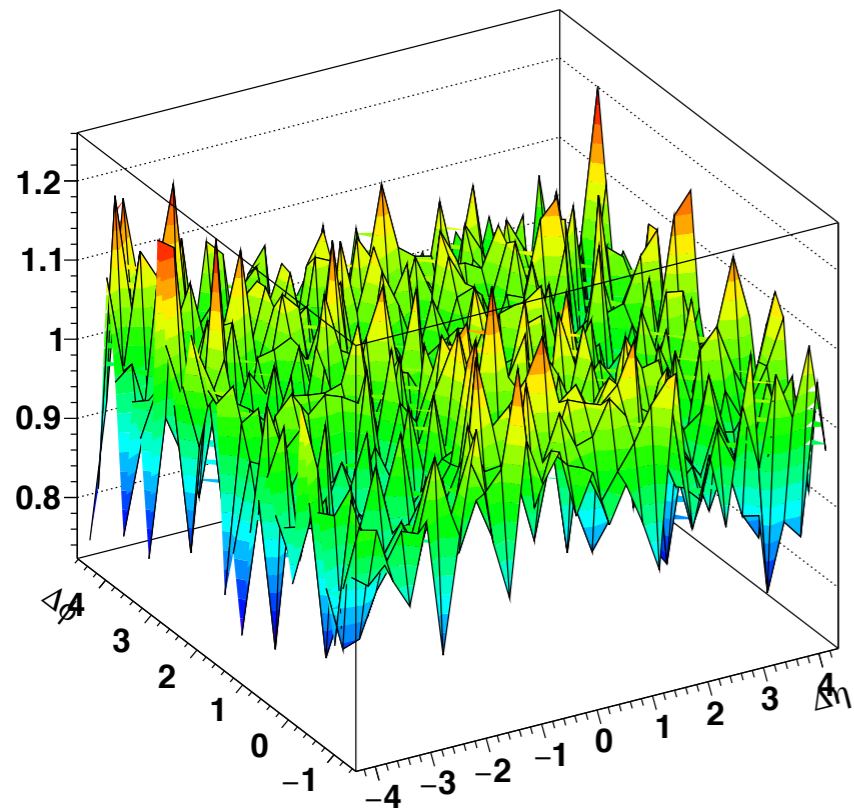
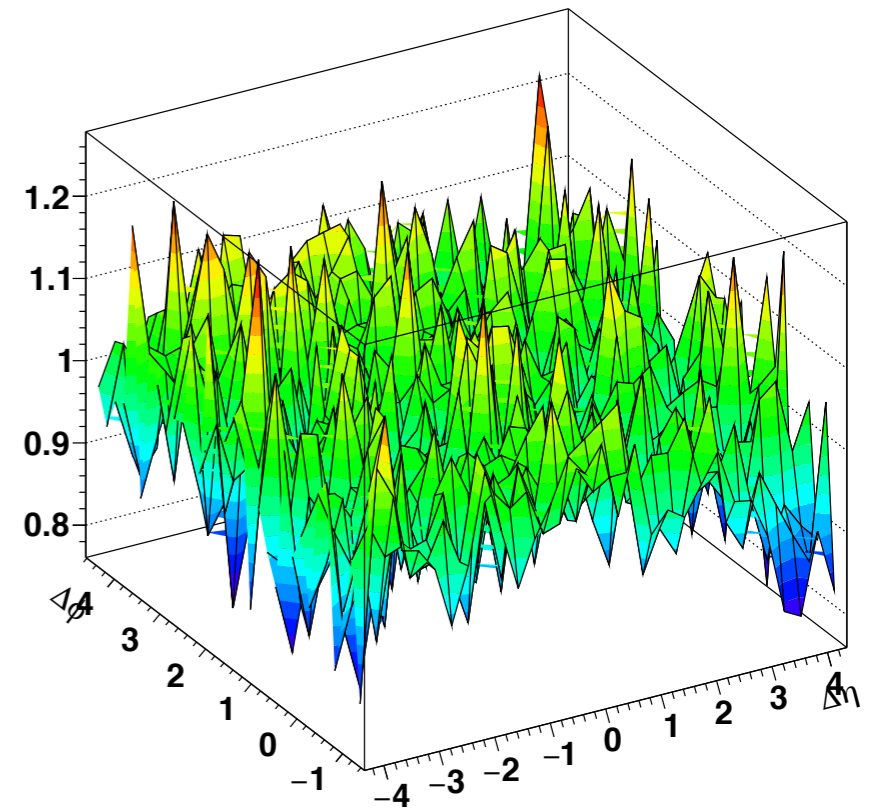
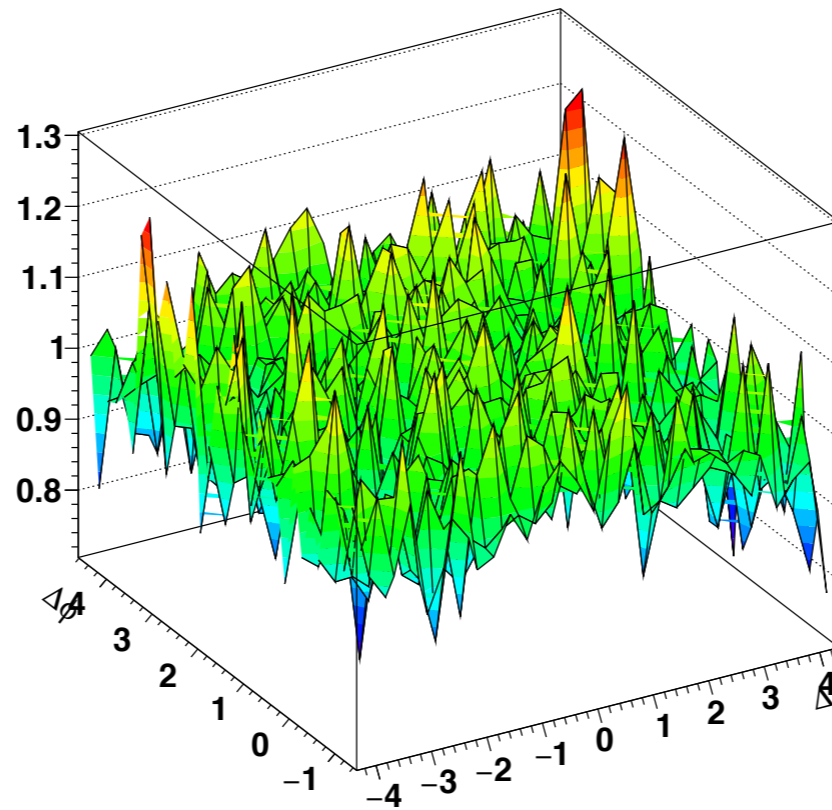
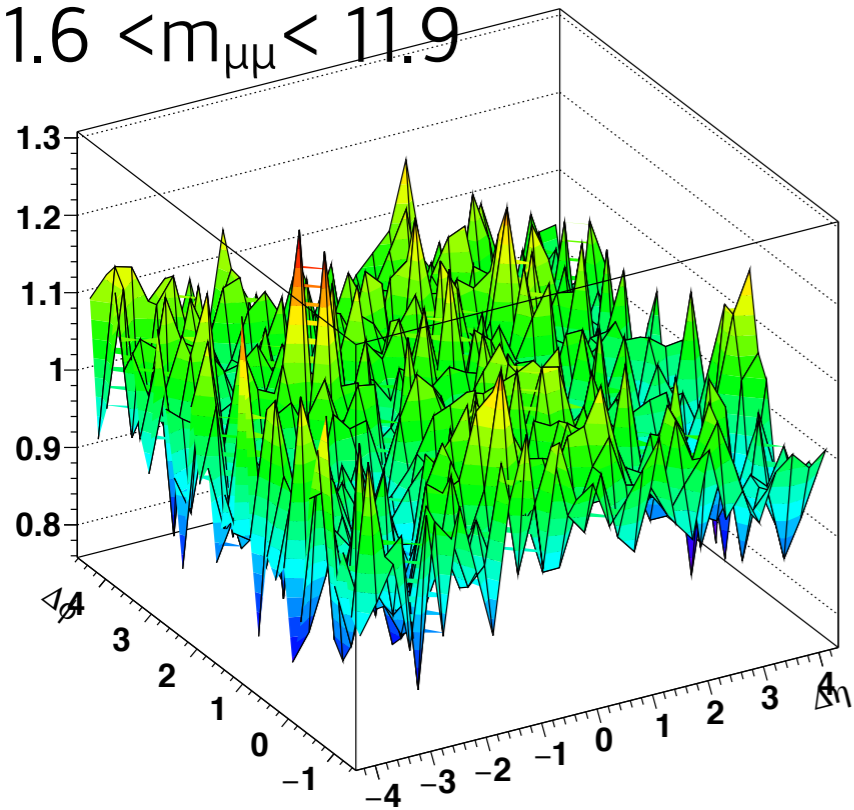


$11.3 < m_{\mu\mu} < 11.6$

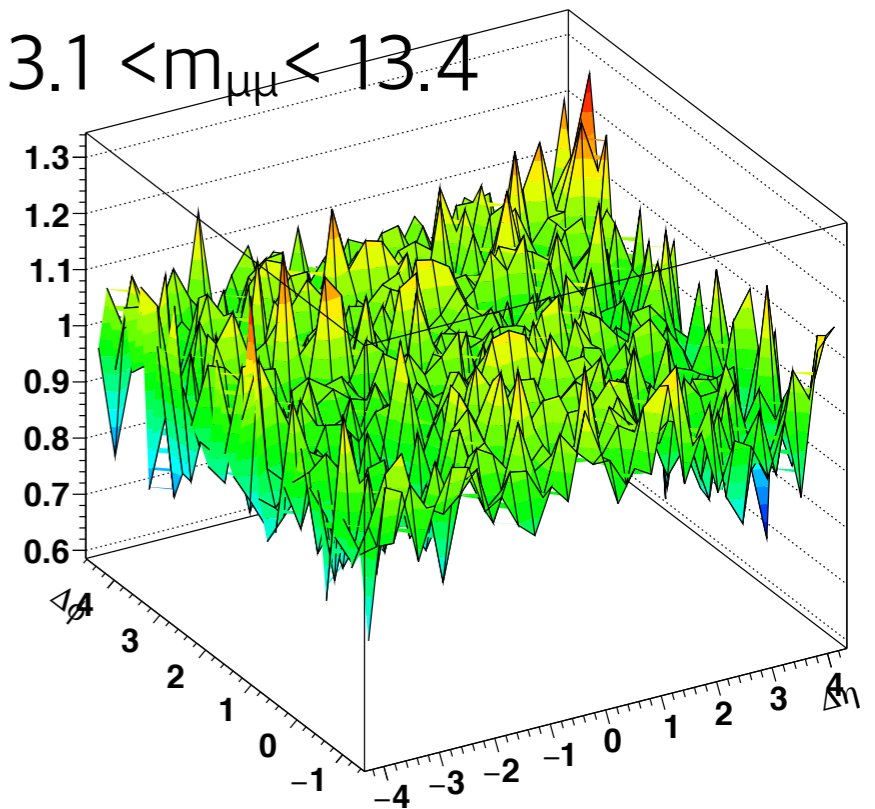


$200 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

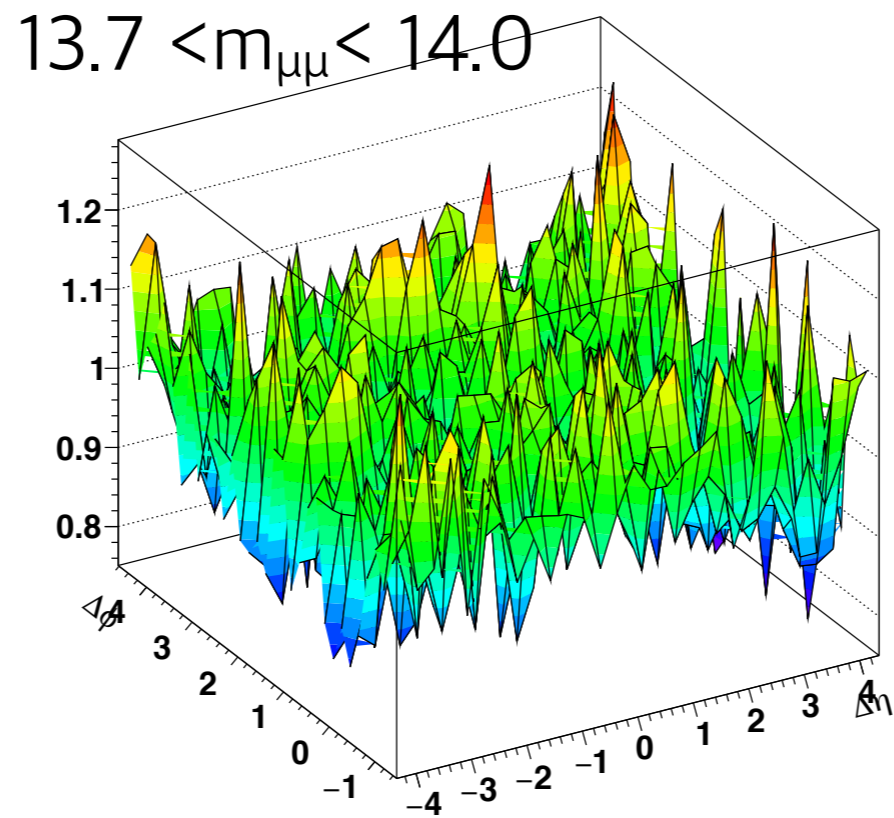
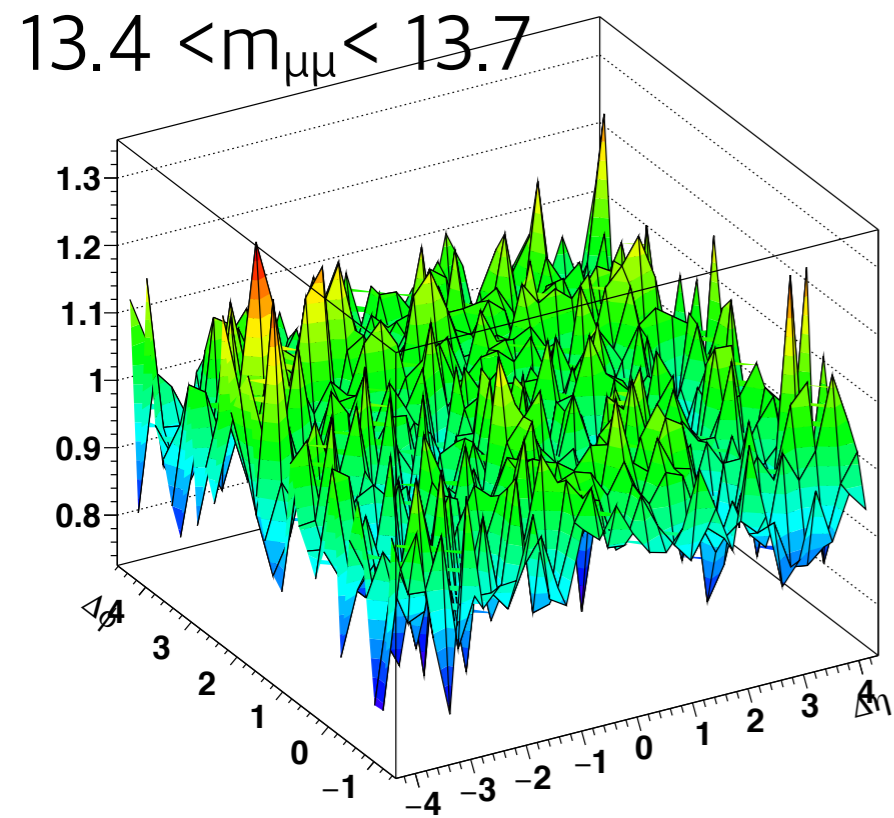
$11.6 < m_{\mu\mu} < 11.9$



$13.1 < m_{\mu\mu} < 13.4$

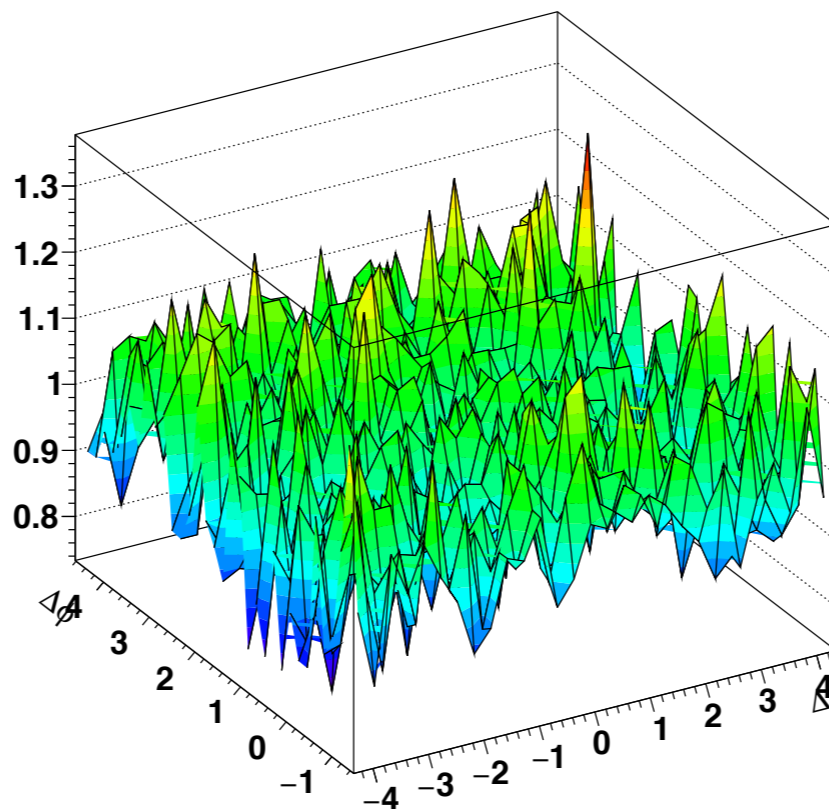
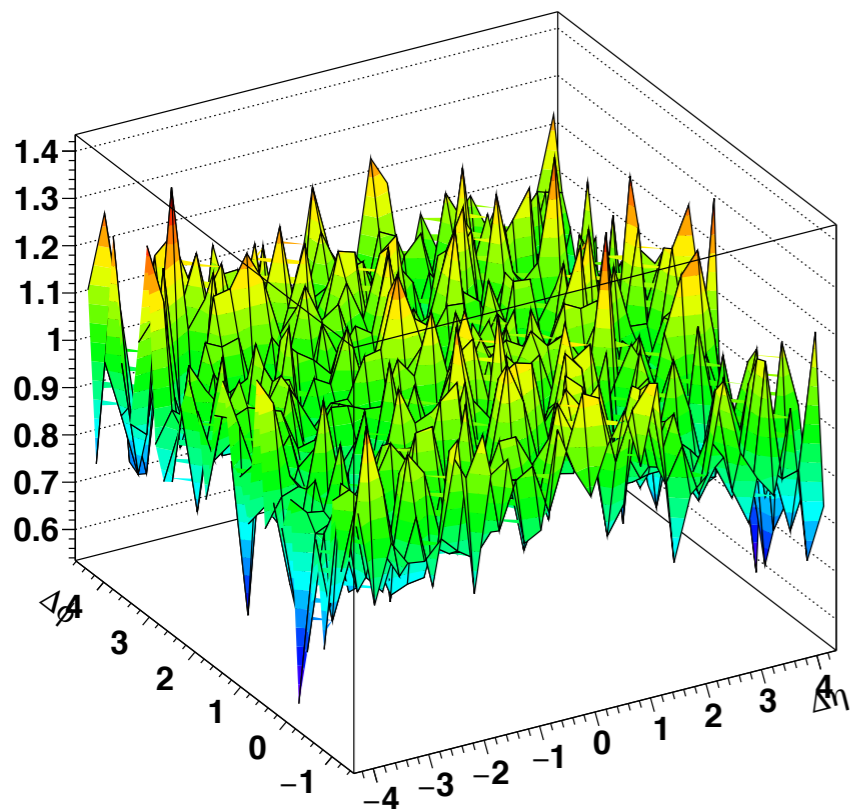
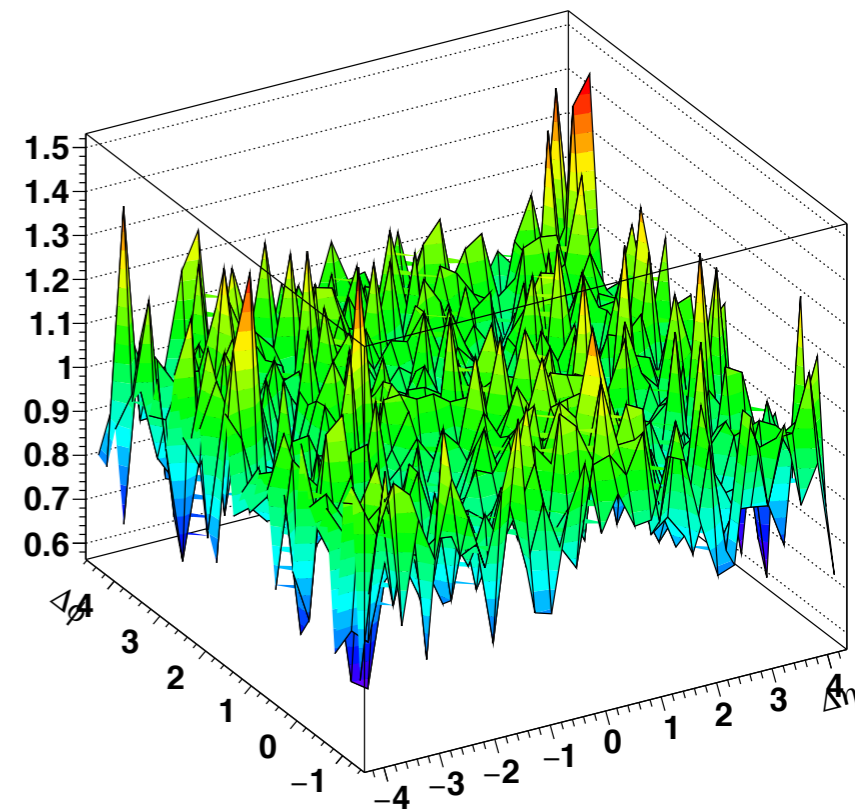
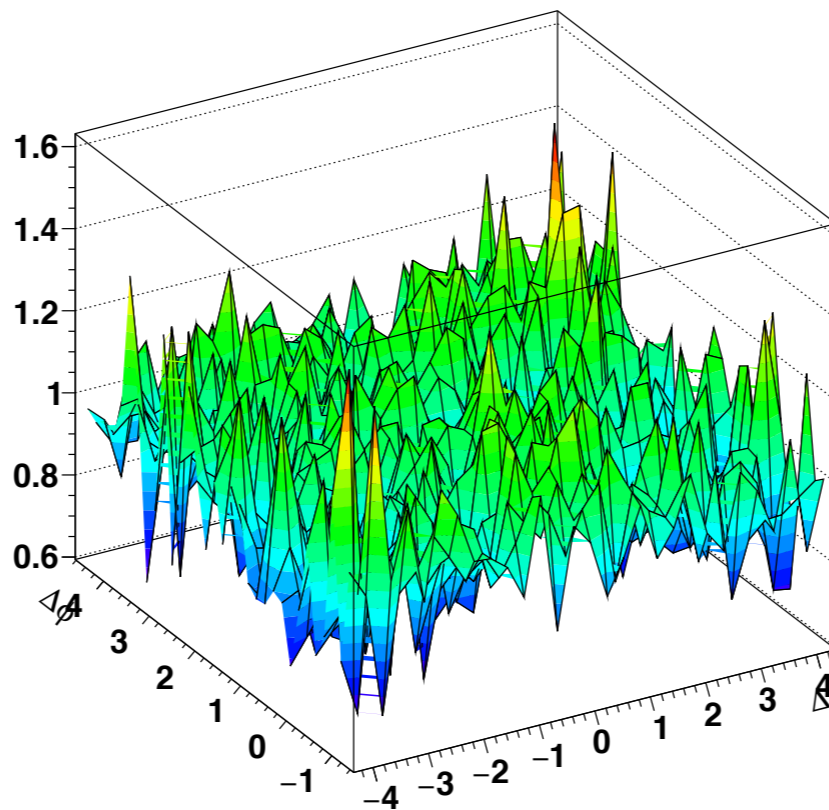
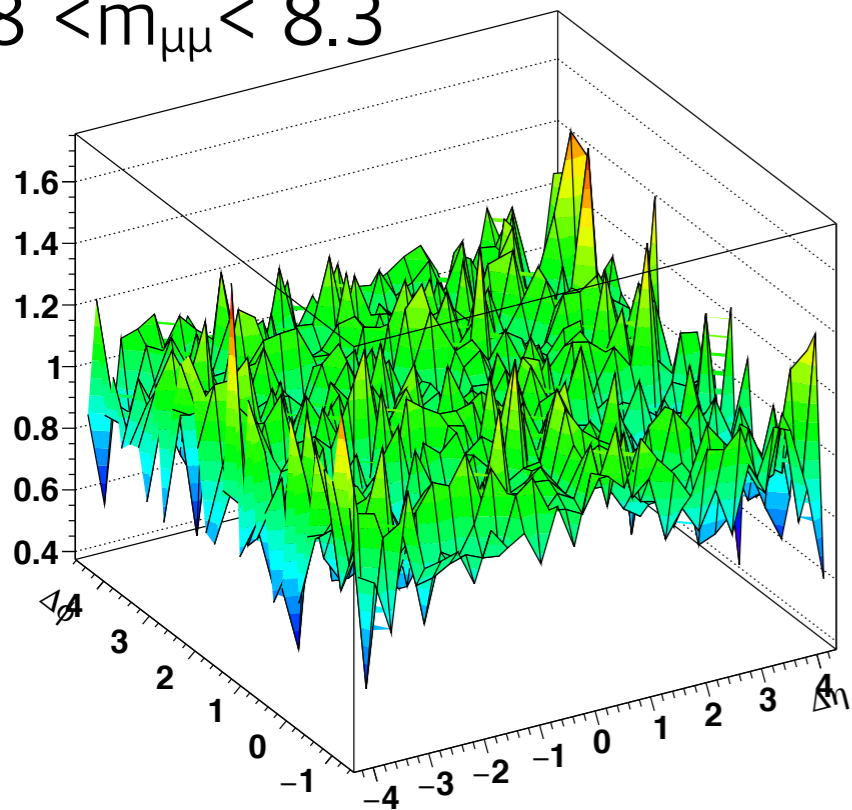


$200 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100(\text{S/B})$

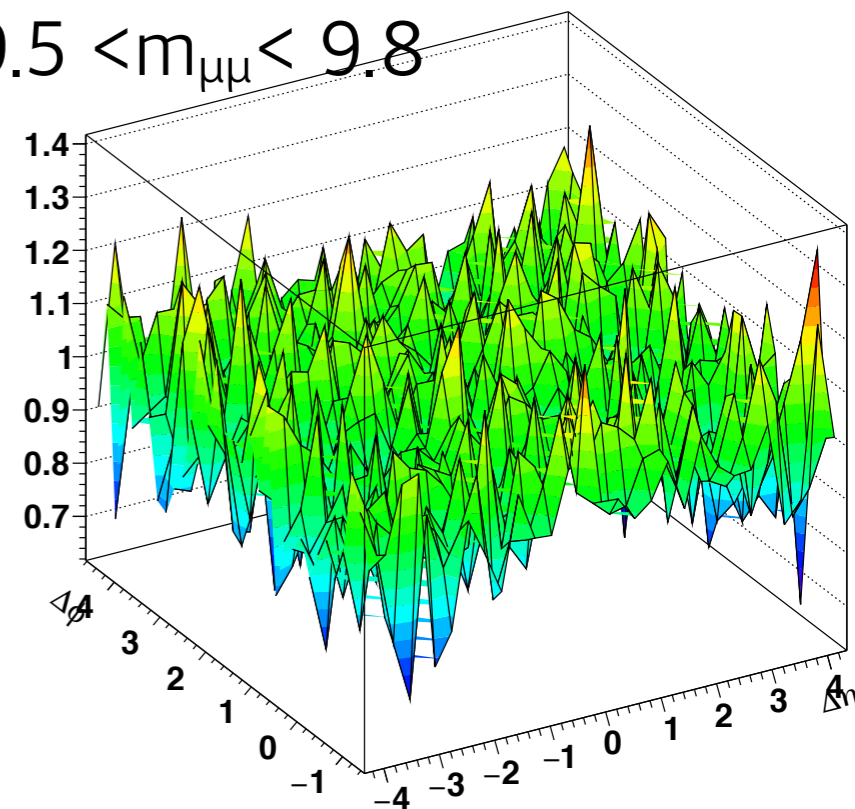


$200 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

$8 < m_{\mu\mu} < 8.3$

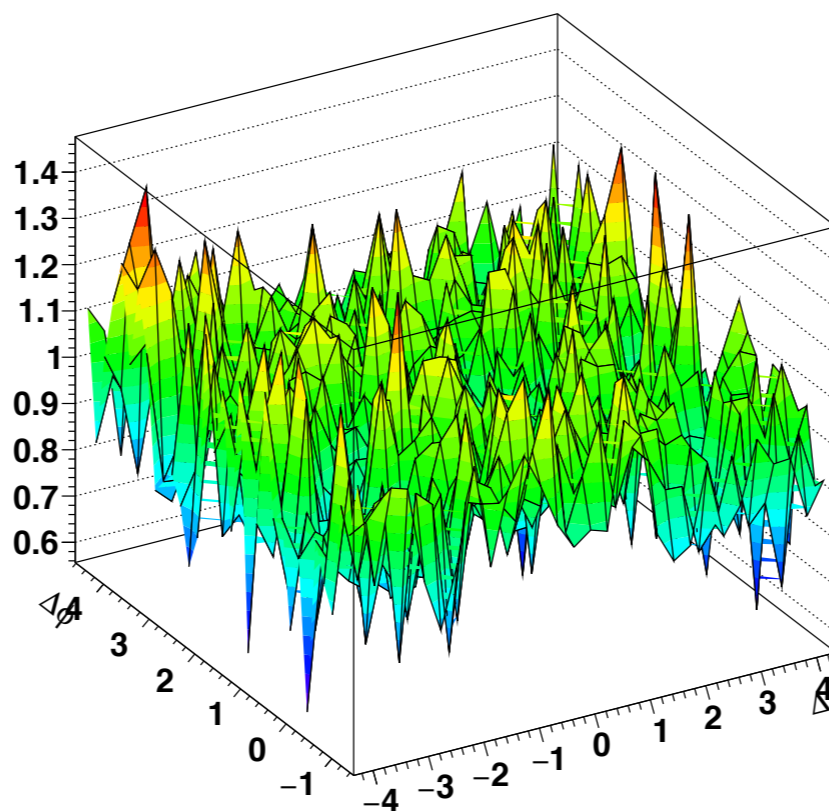
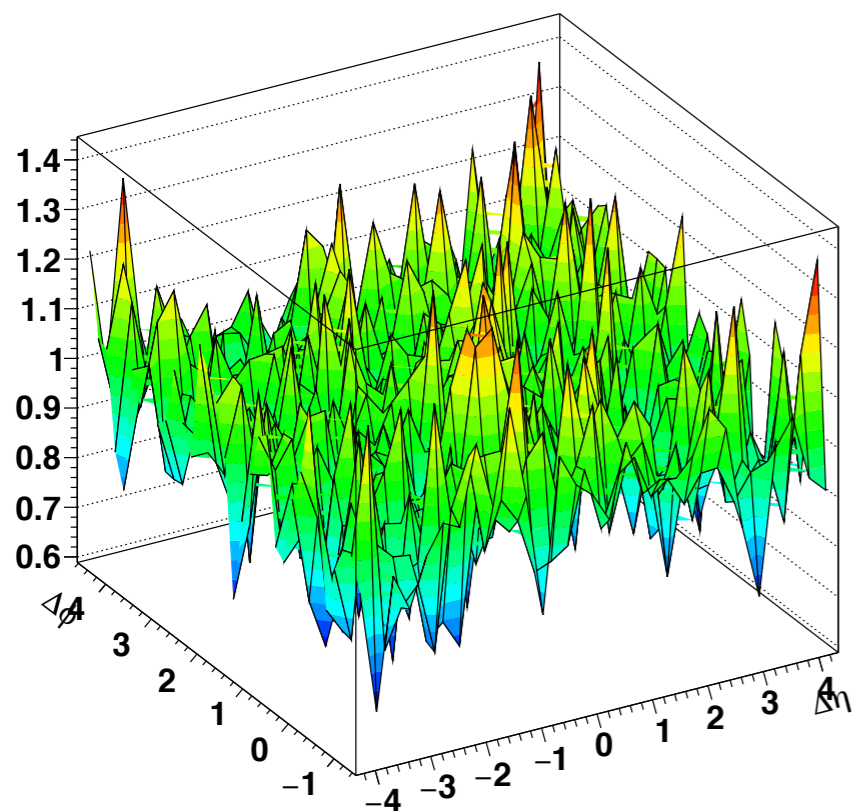
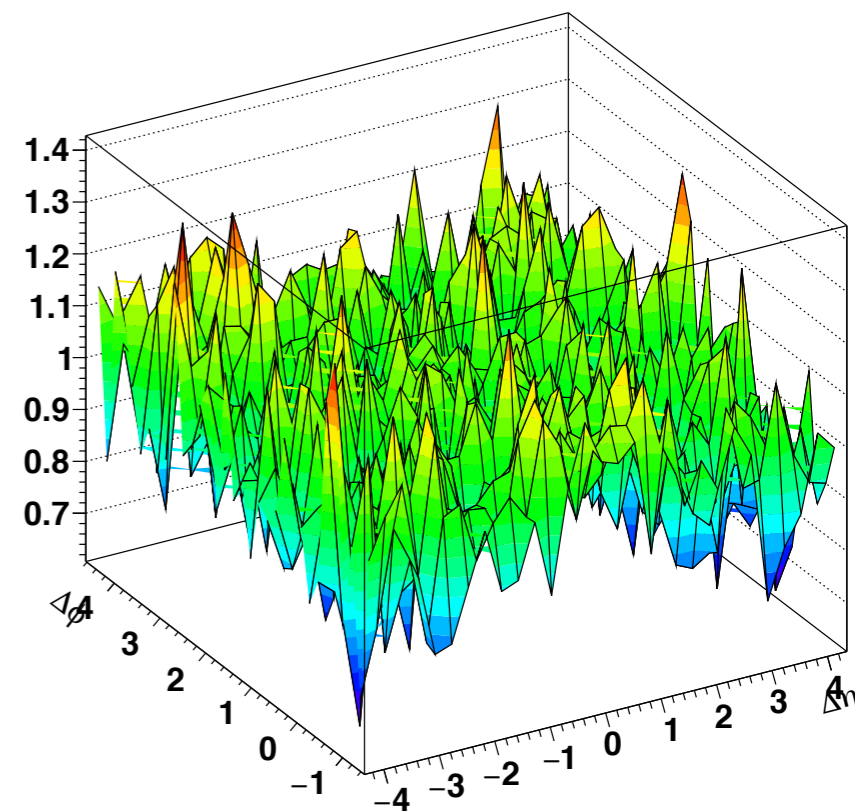
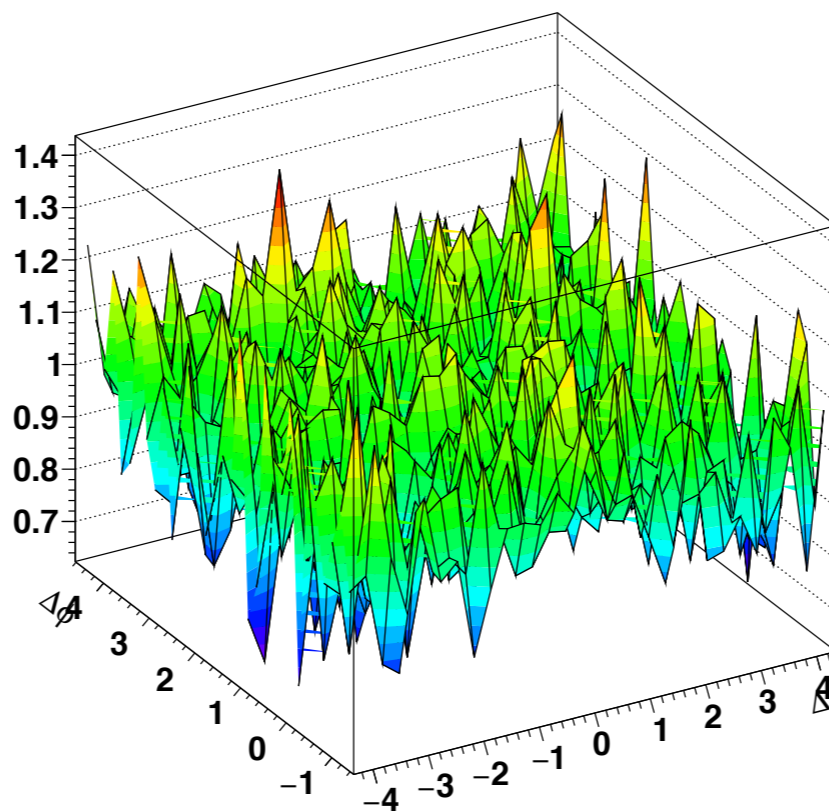
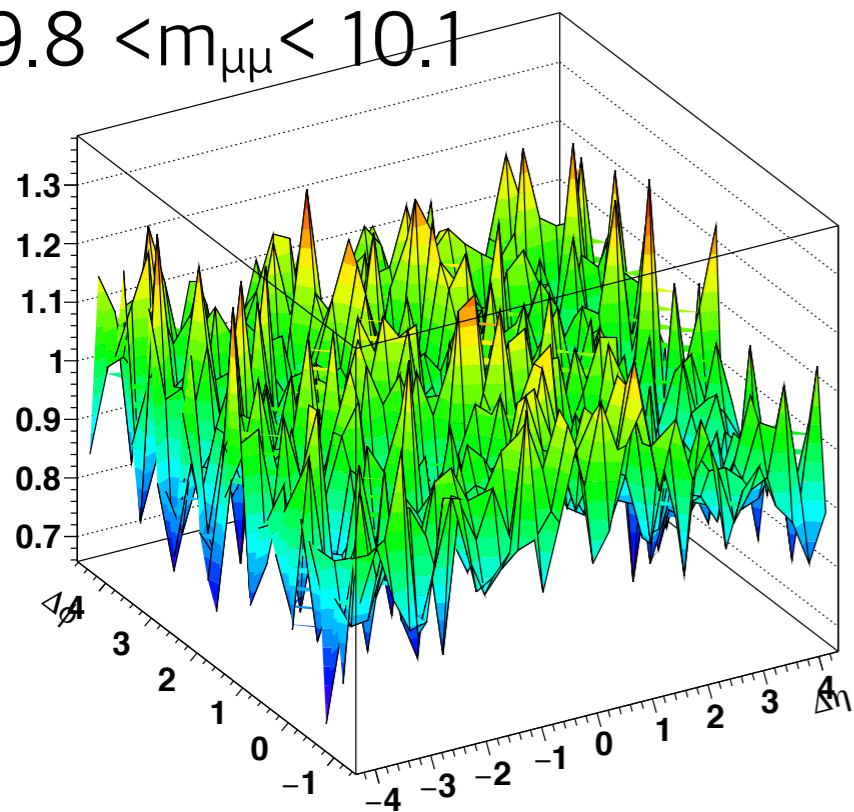


$9.5 < m_{\mu\mu} < 9.8$

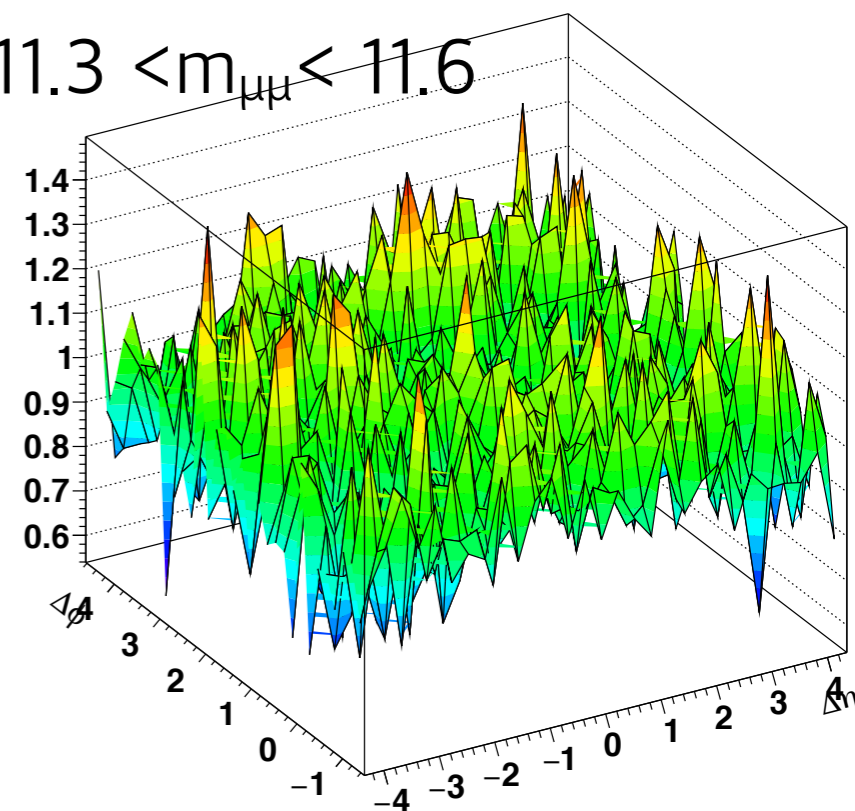


$200 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

$9.8 < m_{\mu\mu} < 10.1$

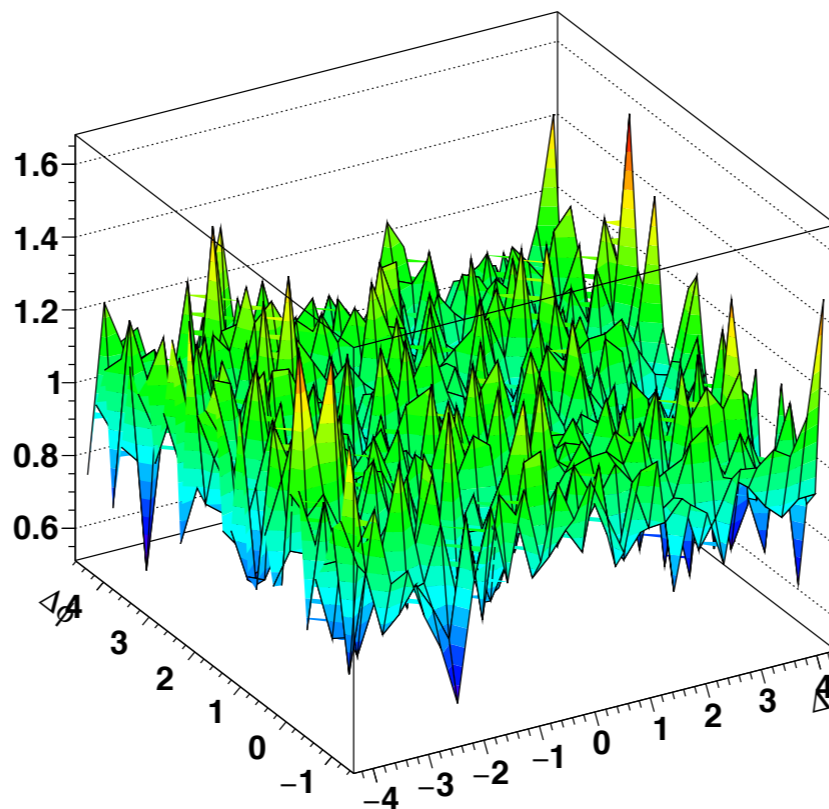
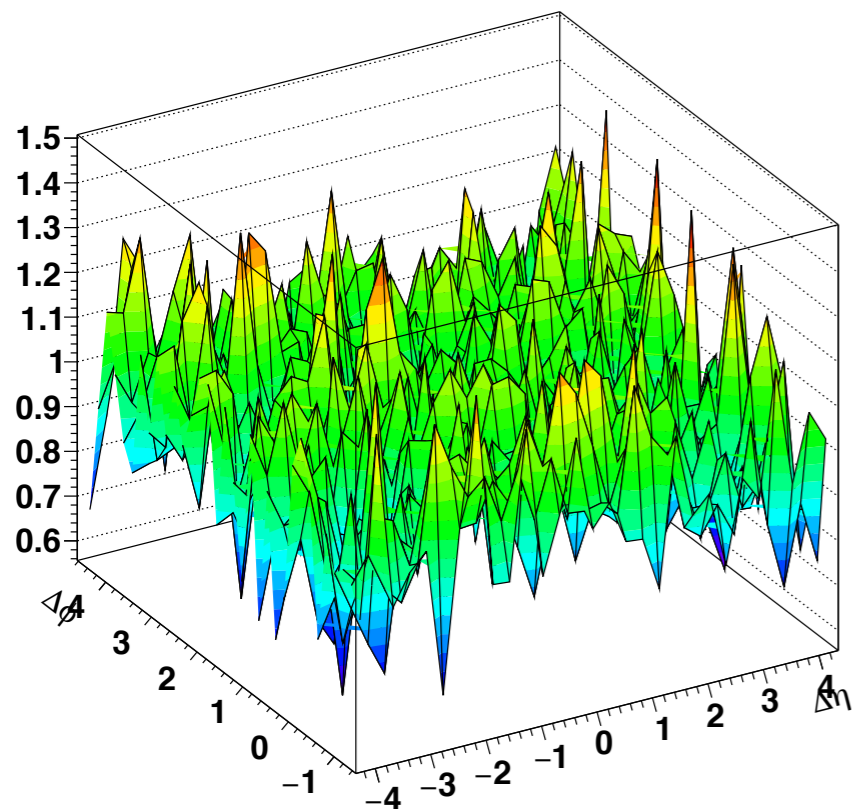
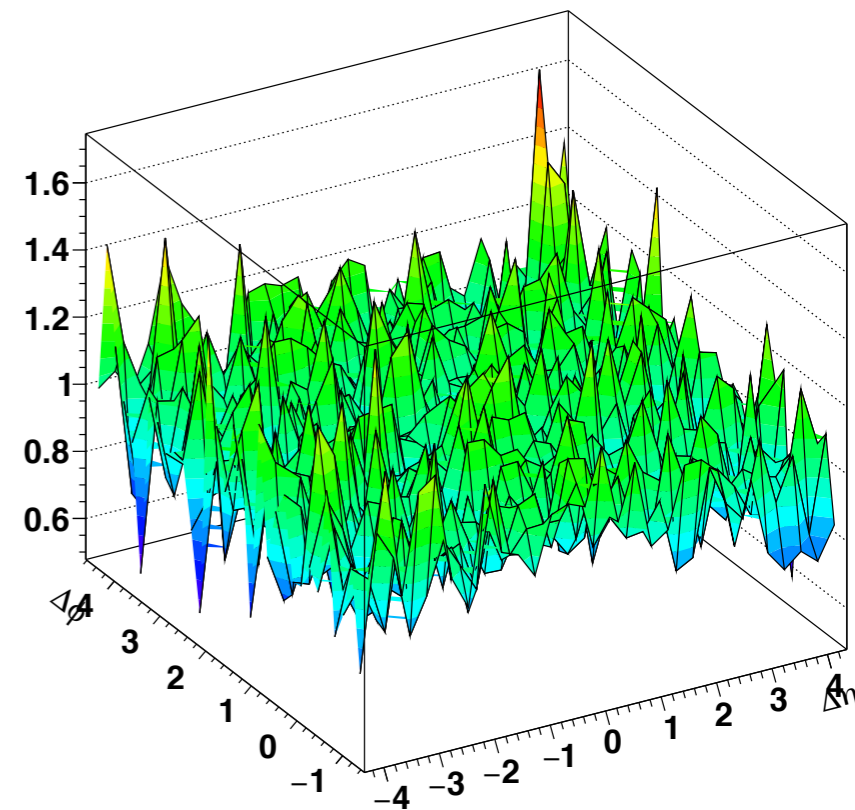
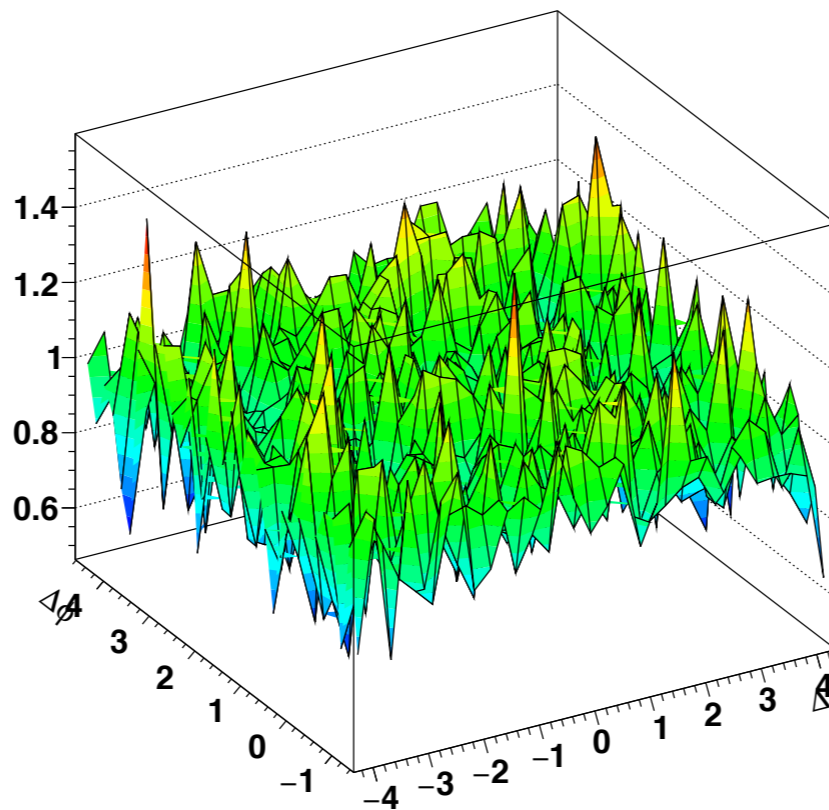
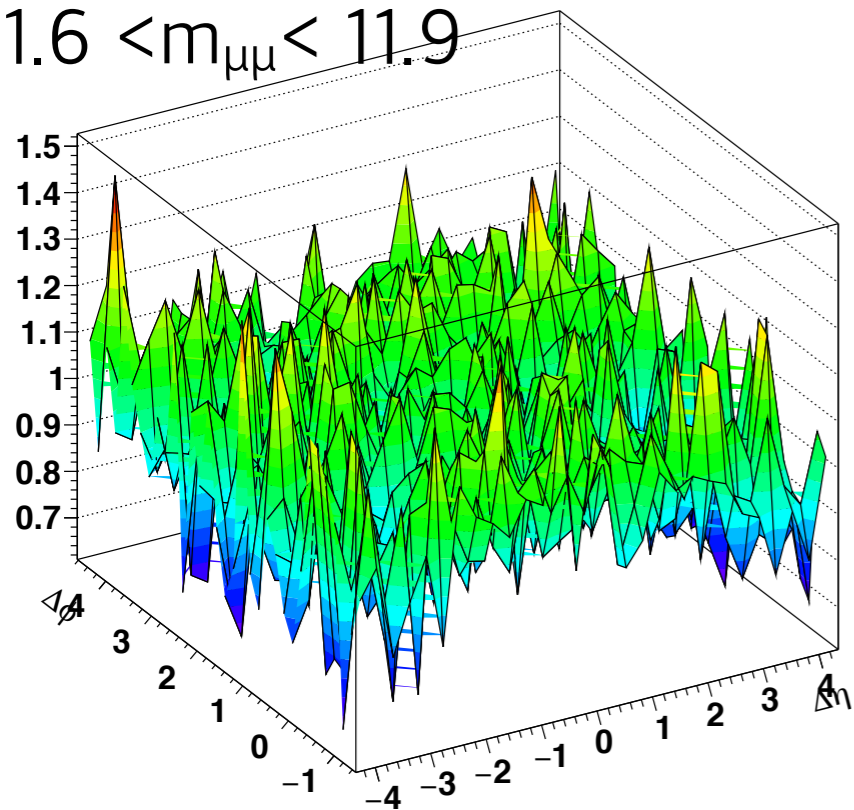


$11.3 < m_{\mu\mu} < 11.6$

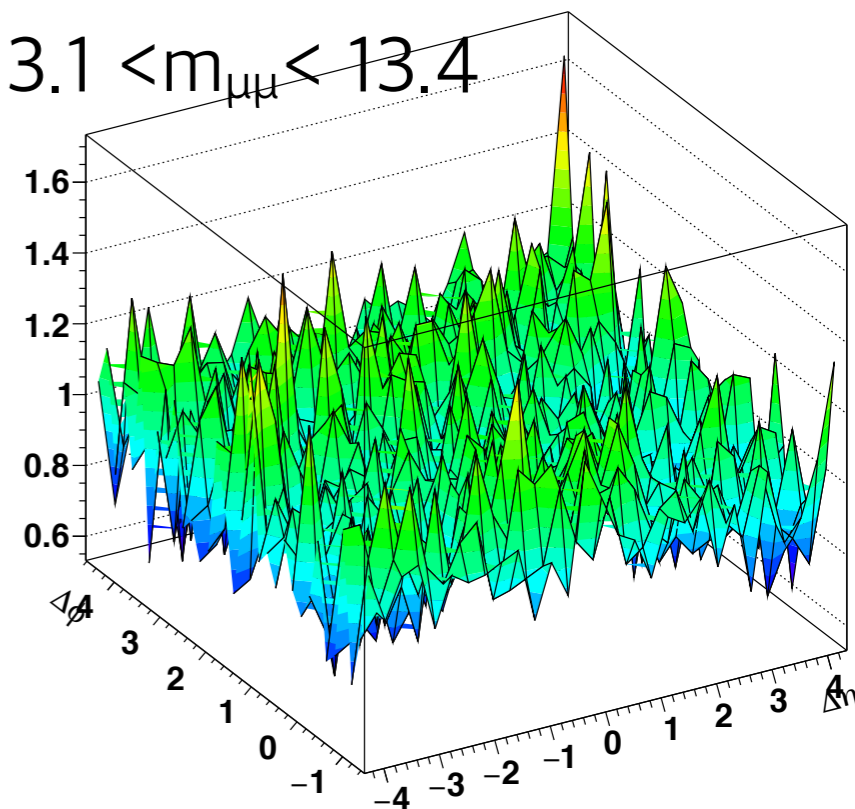


$200 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

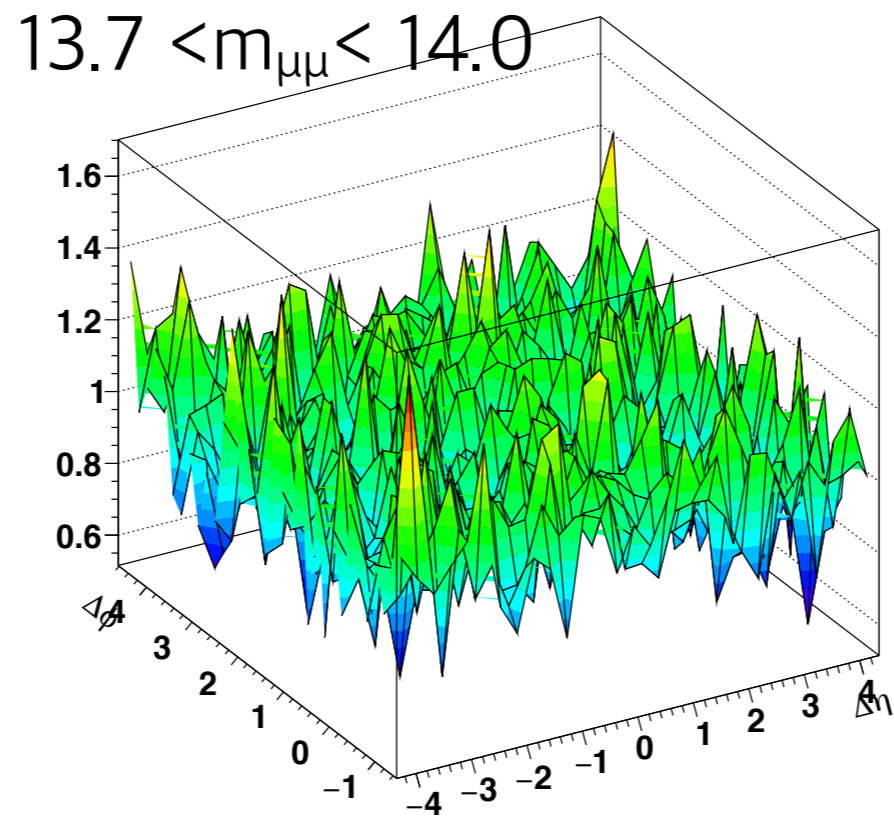
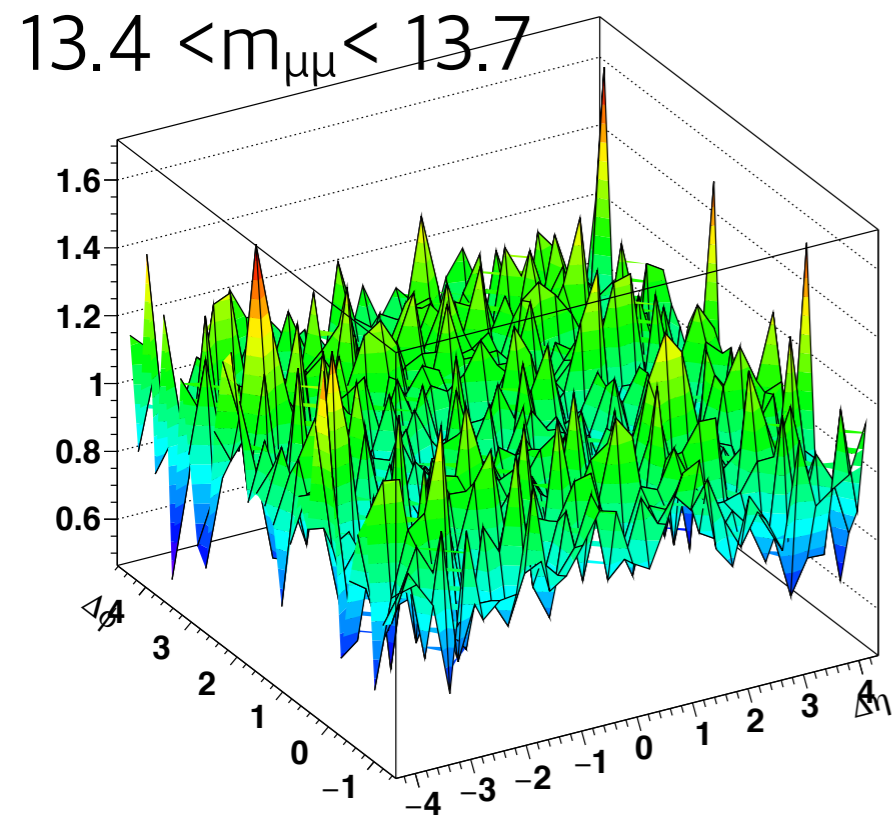
$11.6 < m_{\mu\mu} < 11.9$



$13.1 < m_{\mu\mu} < 13.4$

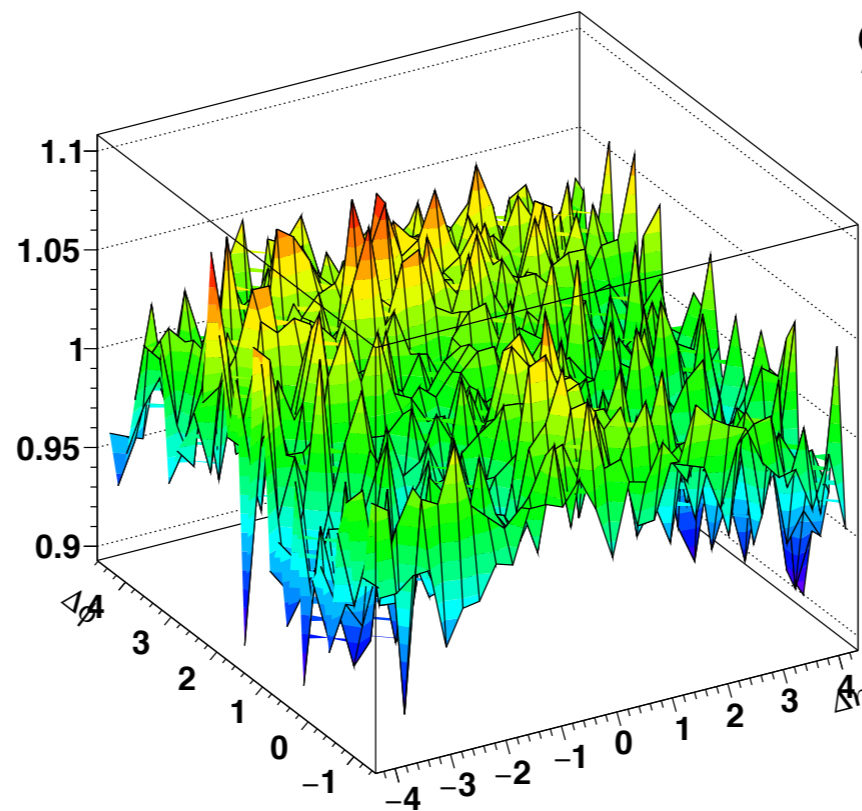
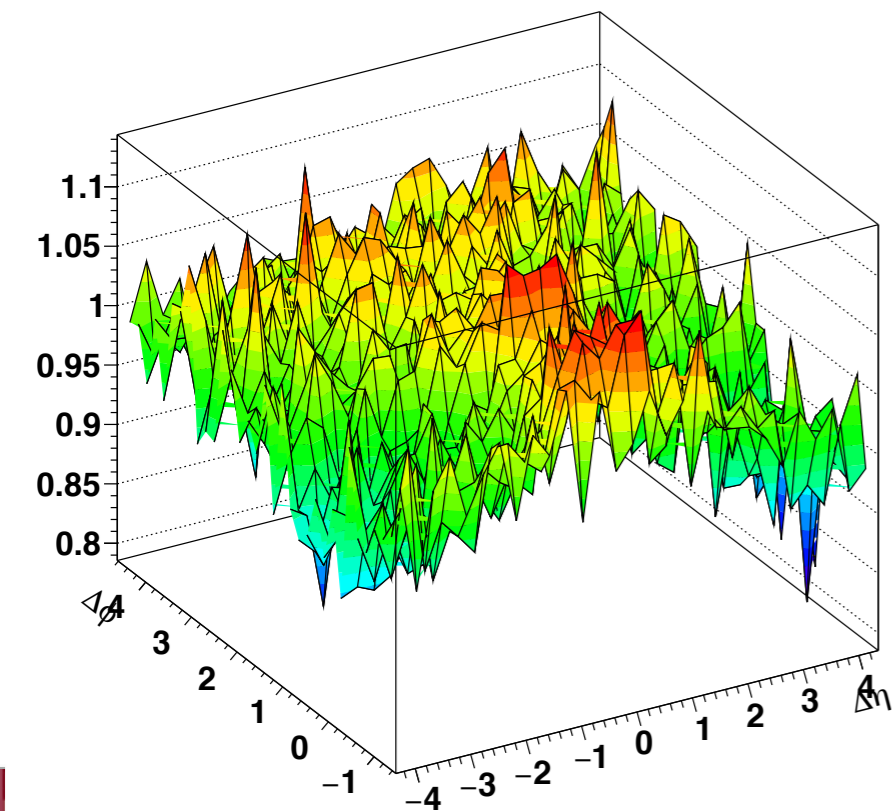
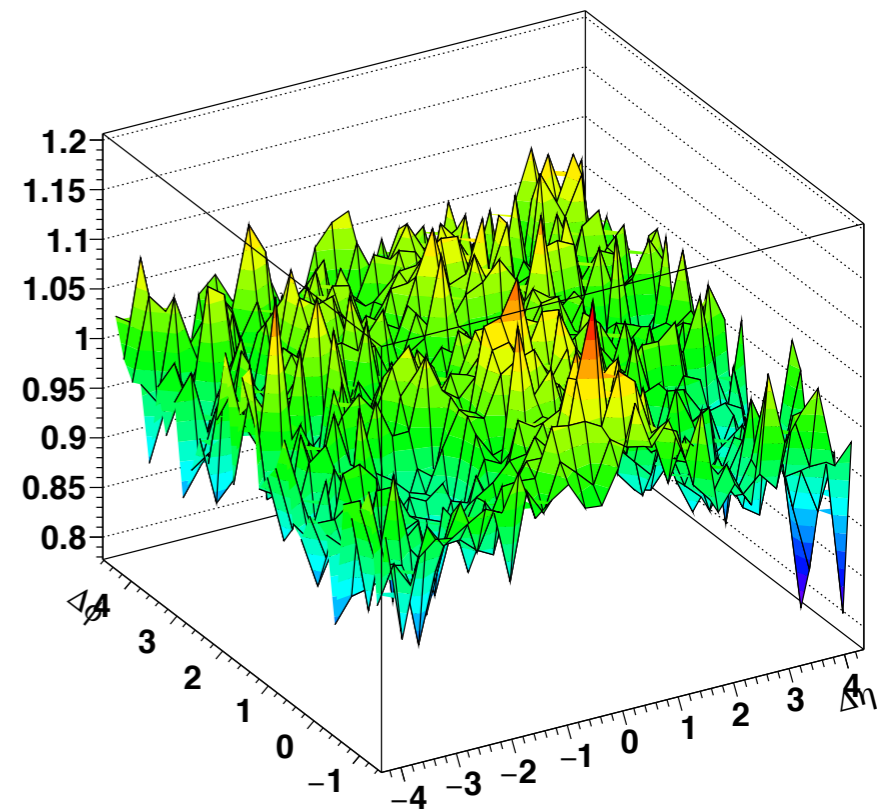
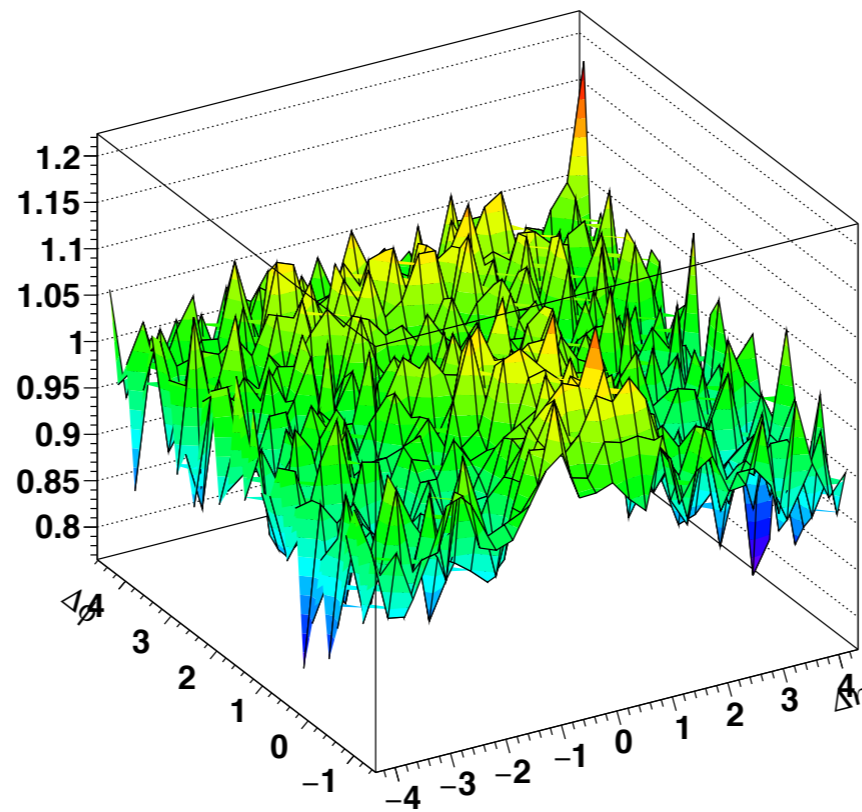
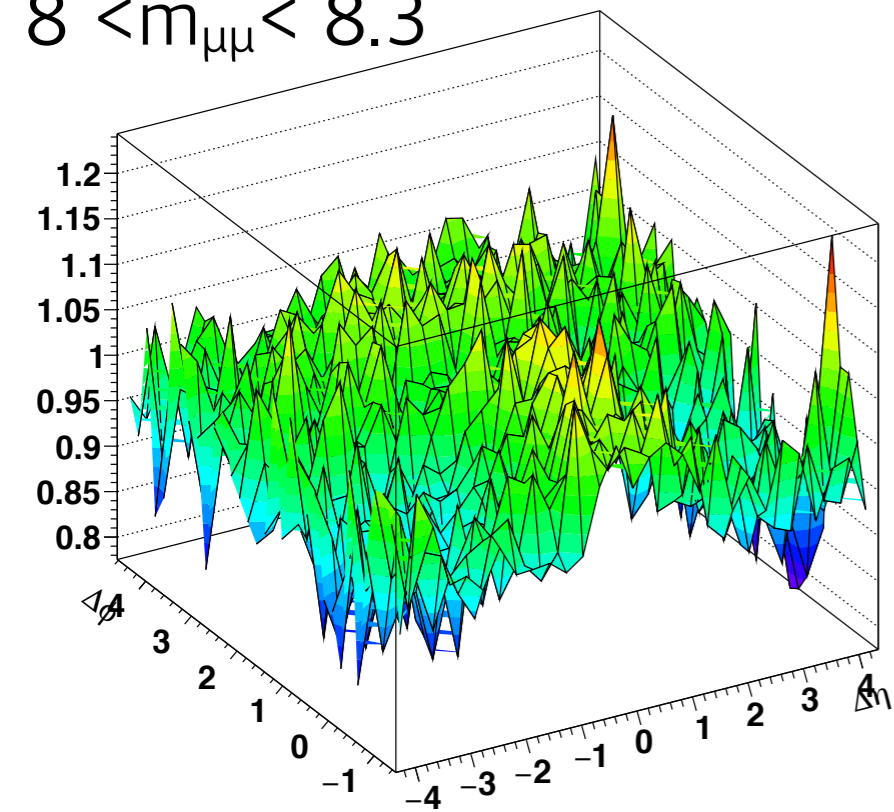


$200 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3(S/B)$

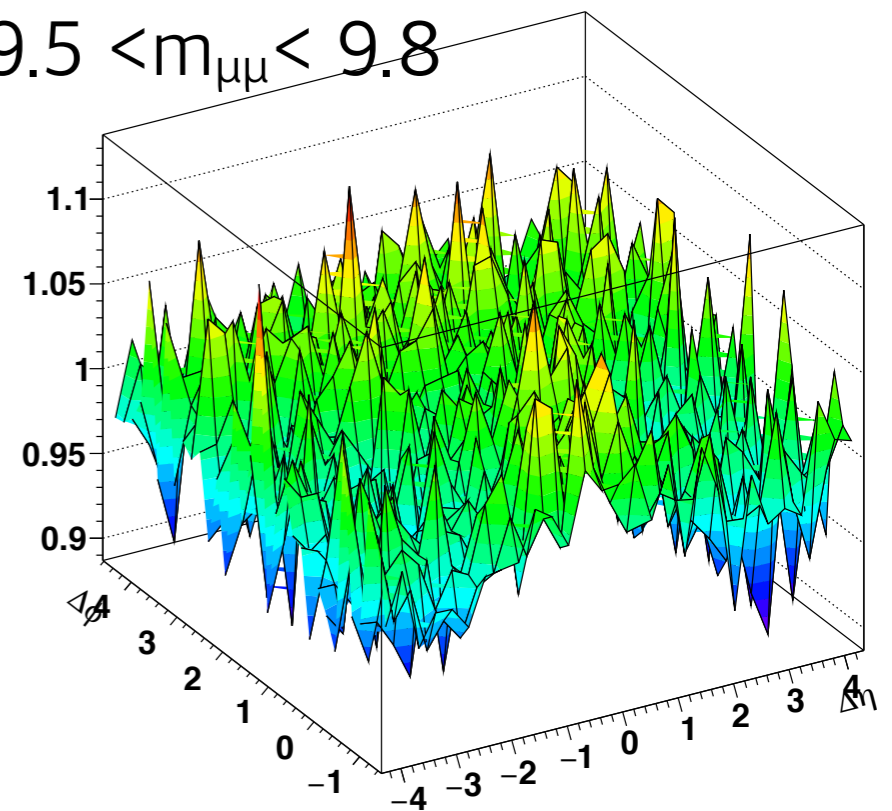


$150 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$8 < m_{\mu\mu} < 8.3$

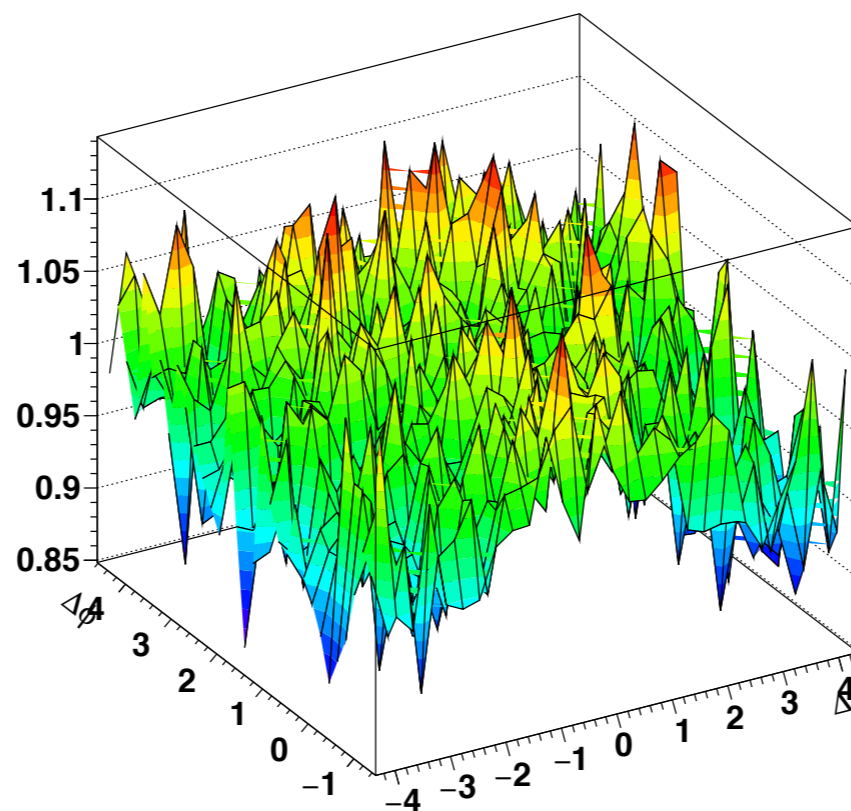
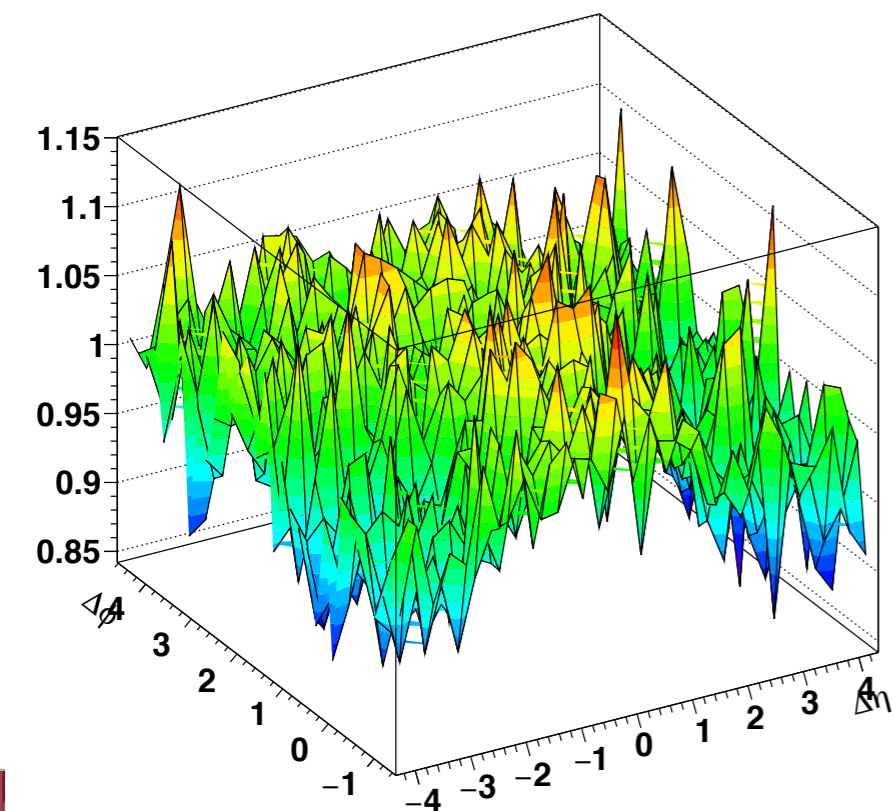
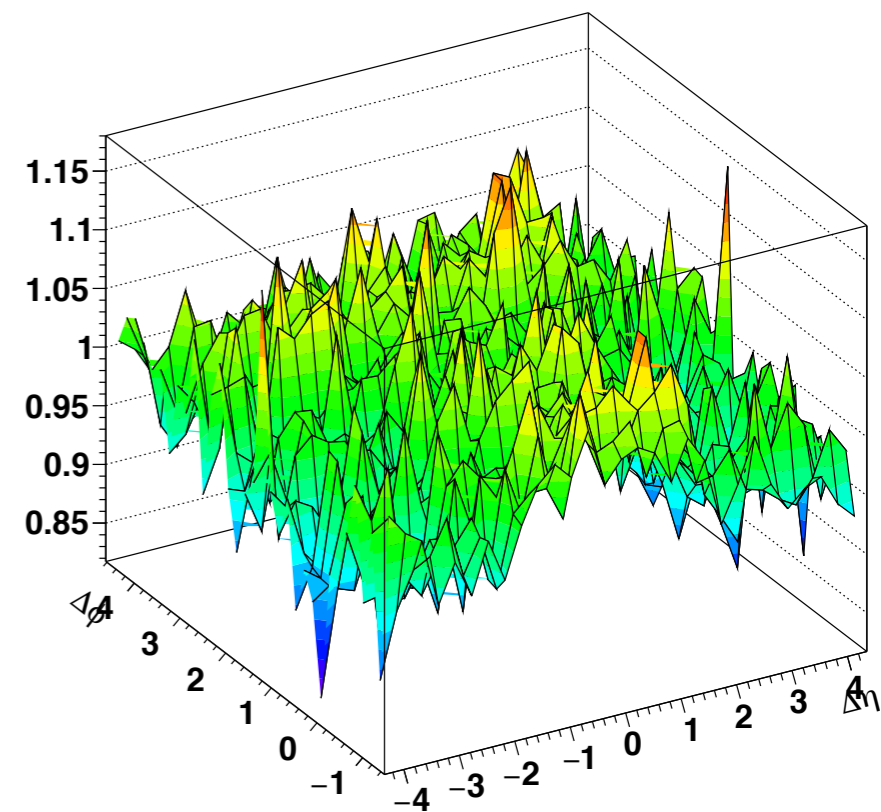
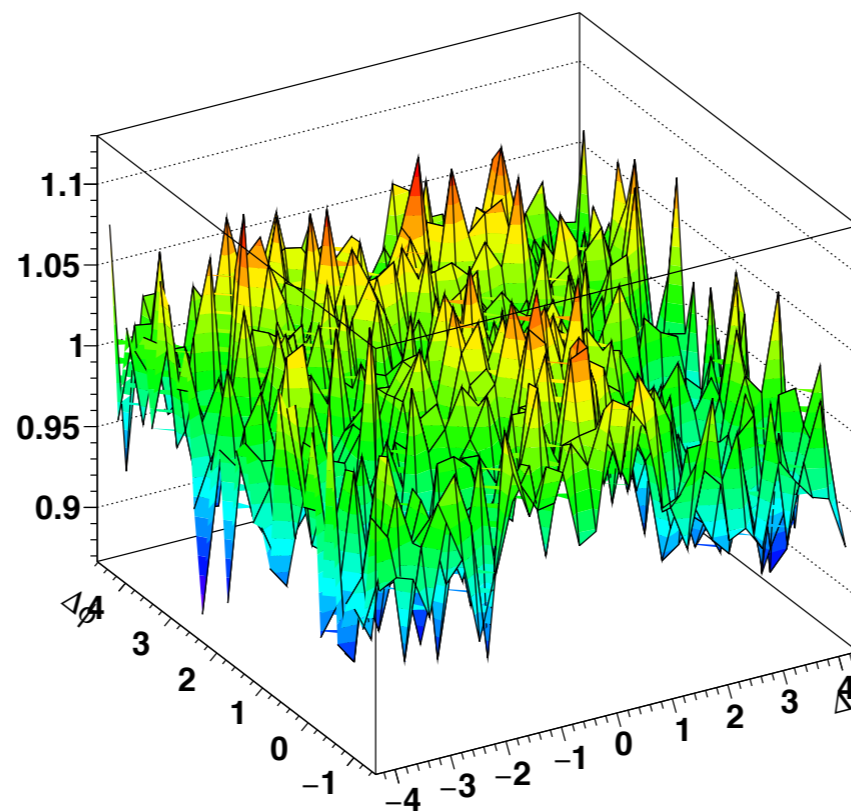
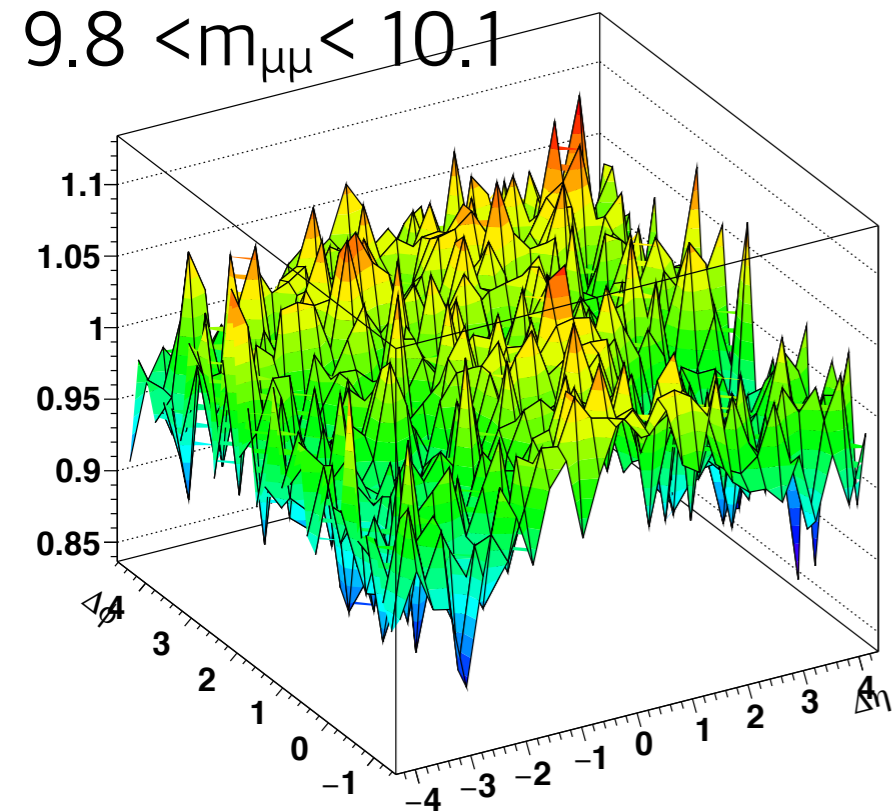


$9.5 < m_{\mu\mu} < 9.8$

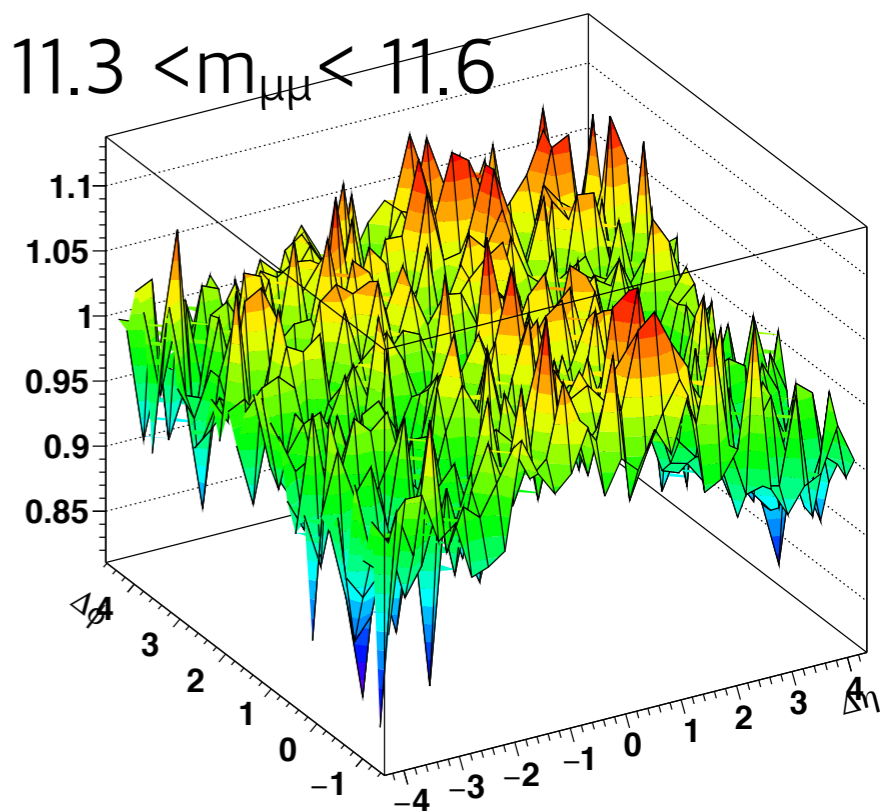


$150 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$9.8 < m_{\mu\mu} < 10.1$

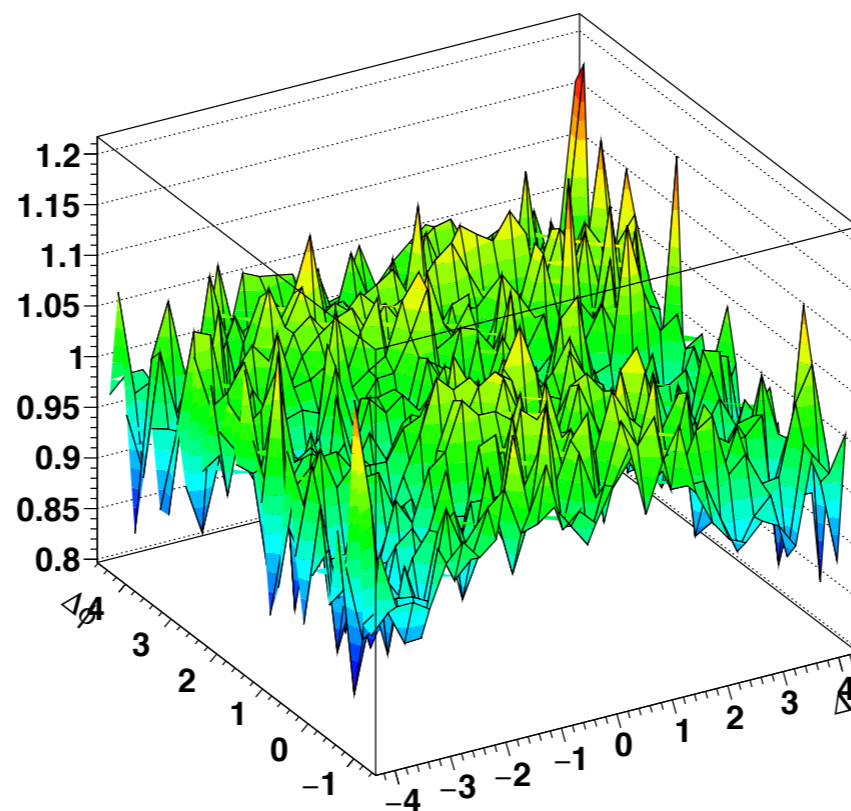
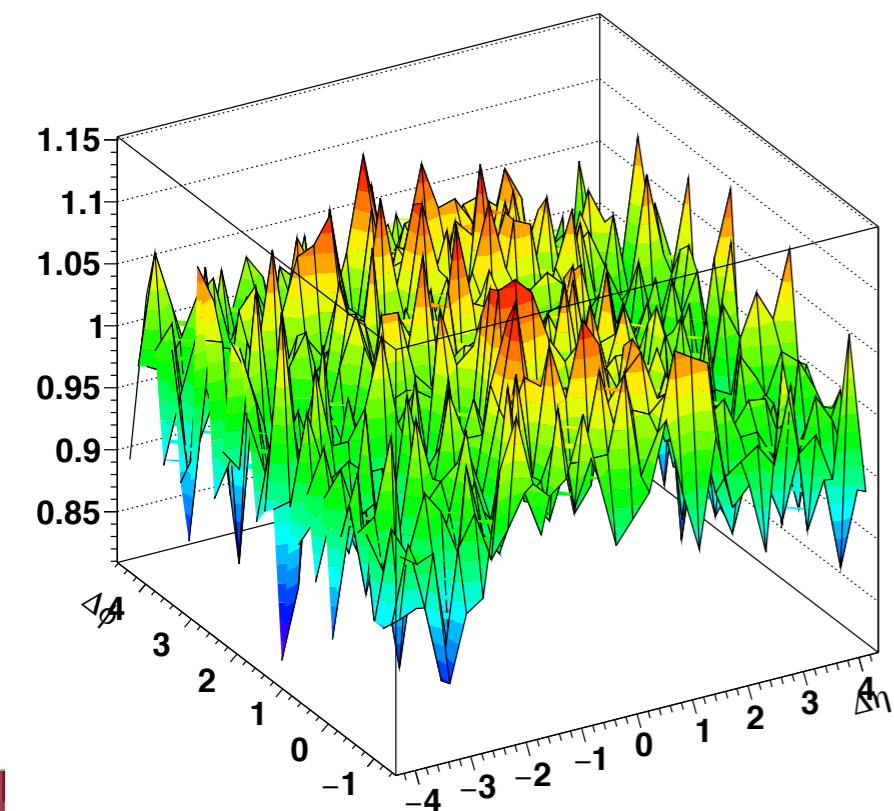
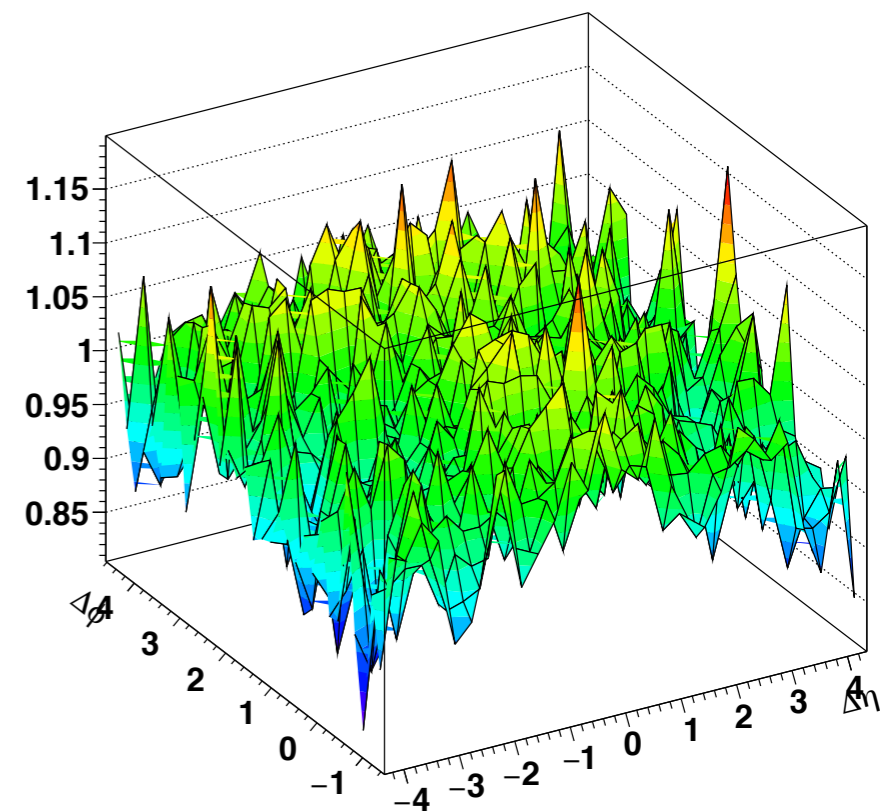
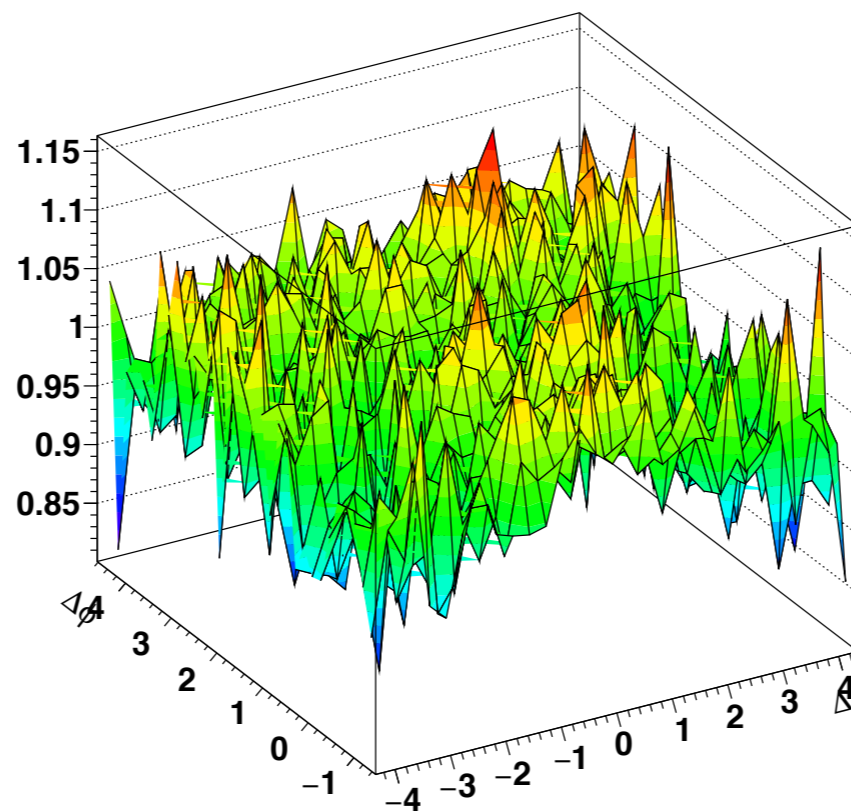
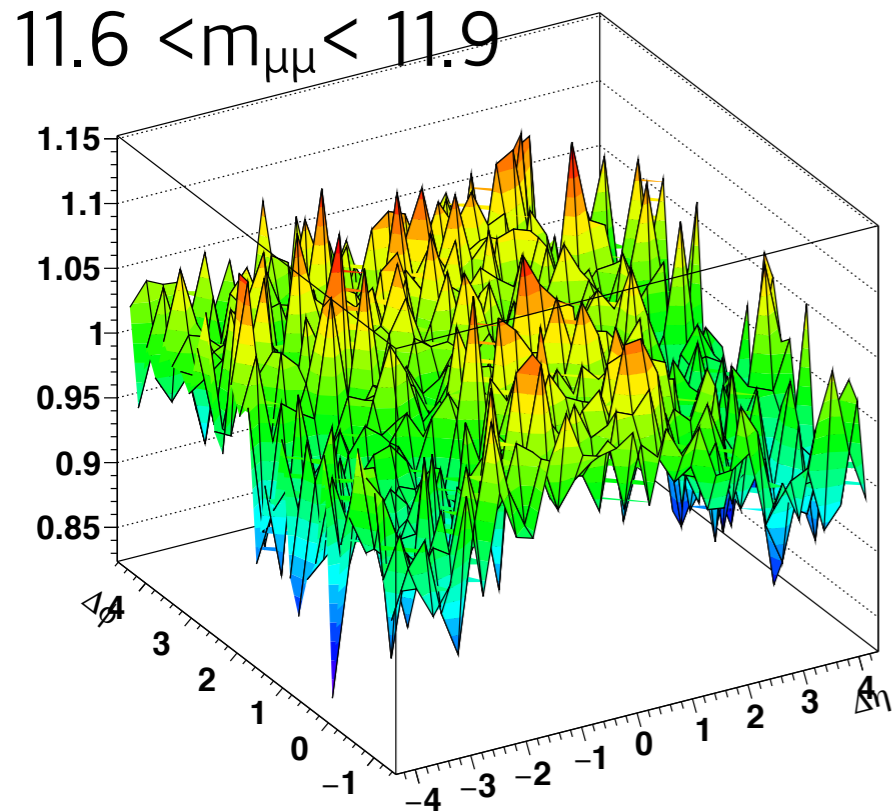


$11.3 < m_{\mu\mu} < 11.6$

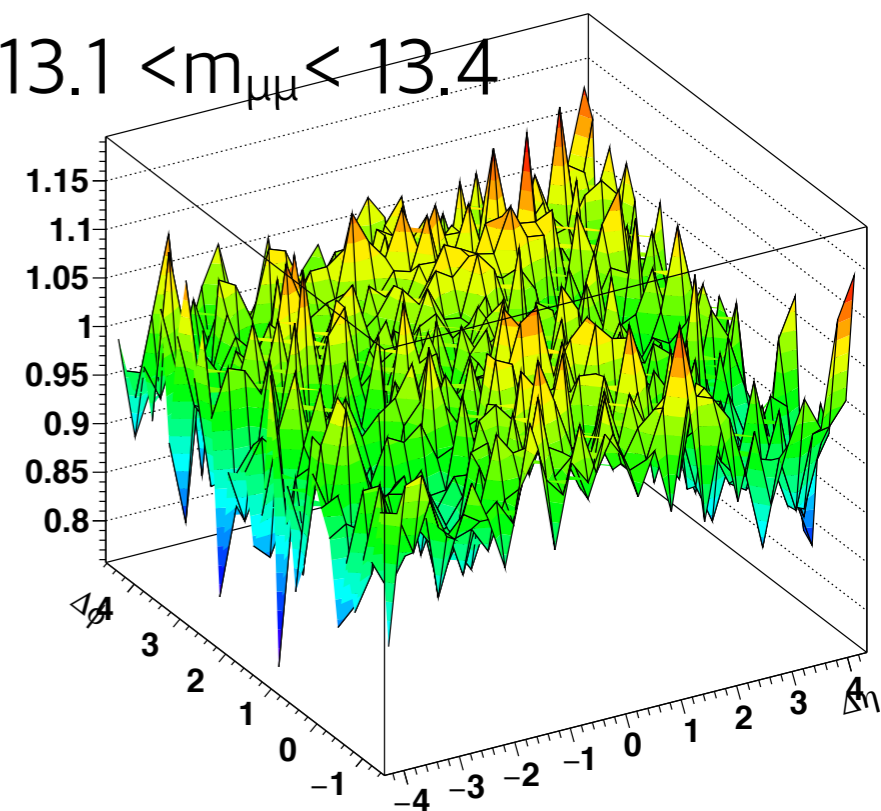


$150 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

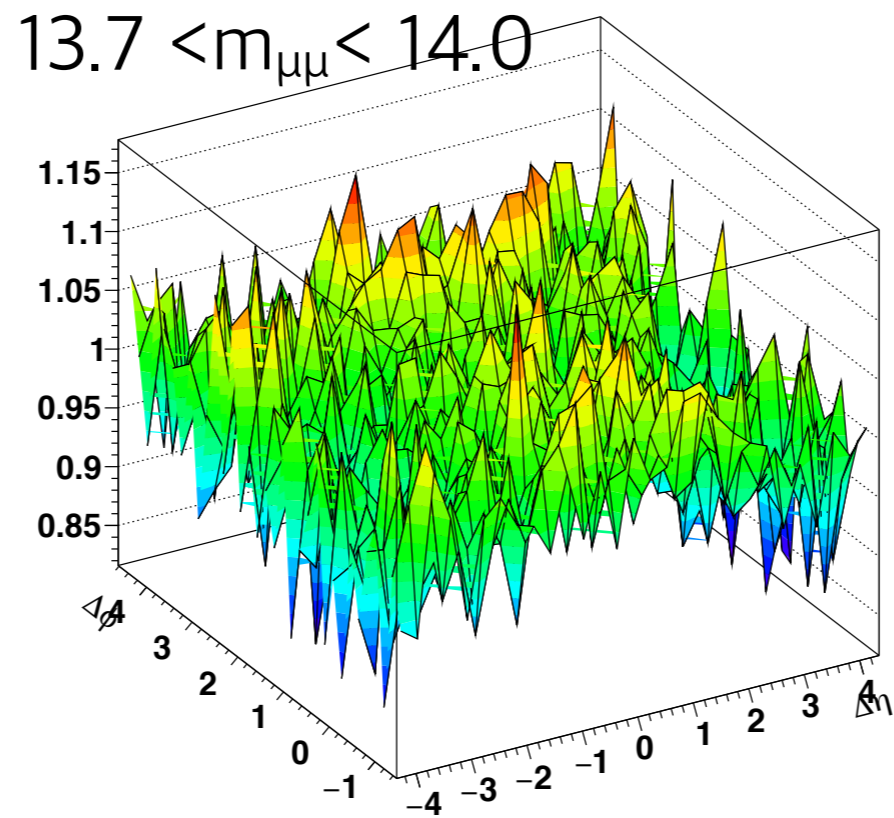
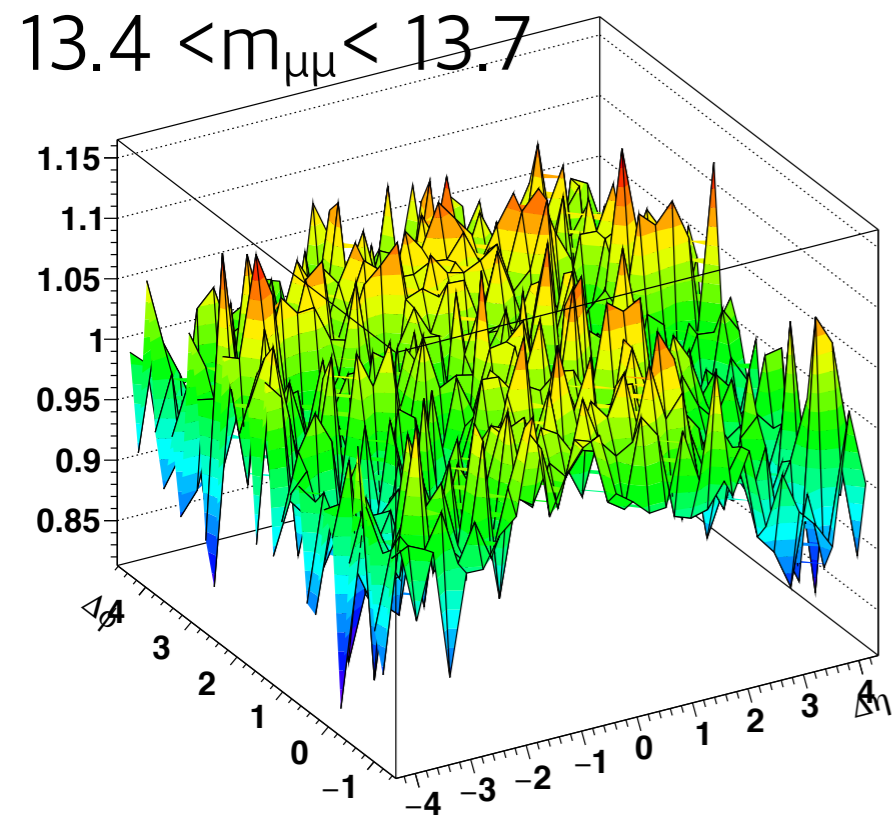
$11.6 < m_{\mu\mu} < 11.9$



$13.1 < m_{\mu\mu} < 13.4$



$150 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100(\text{S/B})$



$$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$9.8 < m_{\mu\mu} < 10.1$$

$$11.3 < m_{\mu\mu} < 11.6$$

$$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$13.4 < m_{\mu\mu} < 13.7$$

$$13.7 < m_{\mu\mu} < 14.0$$

$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100(\text{S/B})$

$8 < m_{\mu\mu} < 8.3$

$9.5 < m_{\mu\mu} < 9.8$

$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100(\text{S/B})$

$9.8 < m_{\mu\mu} < 10.1$

$11.3 < m_{\mu\mu} < 11.6$

$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100(\text{S/B})$

$11.6 < m_{\mu\mu} < 11.9$

$13.1 < m_{\mu\mu} < 13.4$

$100 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100(\text{S/B})$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$9.8 < m_{\mu\mu} < 10.1$$

$$11.3 < m_{\mu\mu} < 11.6$$

$$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$13.4 < m_{\mu\mu} < 13.7$$

$$13.7 < m_{\mu\mu} < 14.0$$

$$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100(\text{S/B})$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100(\text{S/B})$$

$$9.8 < m_{\mu\mu} < 10.1$$

$$11.3 < m_{\mu\mu} < 11.6$$

$$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100(S/B)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100(S/B)$$

$$13.4 < m_{\mu\mu} < 13.7$$

$$13.7 < m_{\mu\mu} < 14.0$$

$$0 < \text{mult.} < 40, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$$0 < \text{mult.} < 40, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$9.8 < m_{\mu\mu} < 10.1$$

$$11.3 < m_{\mu\mu} < 11.6$$

$$0 < \text{mult.} < 40, 1 < p_T^{\text{trk}} < 3(S/B)$$

$$11.6 < m_{\mu\mu} < 11.9$$

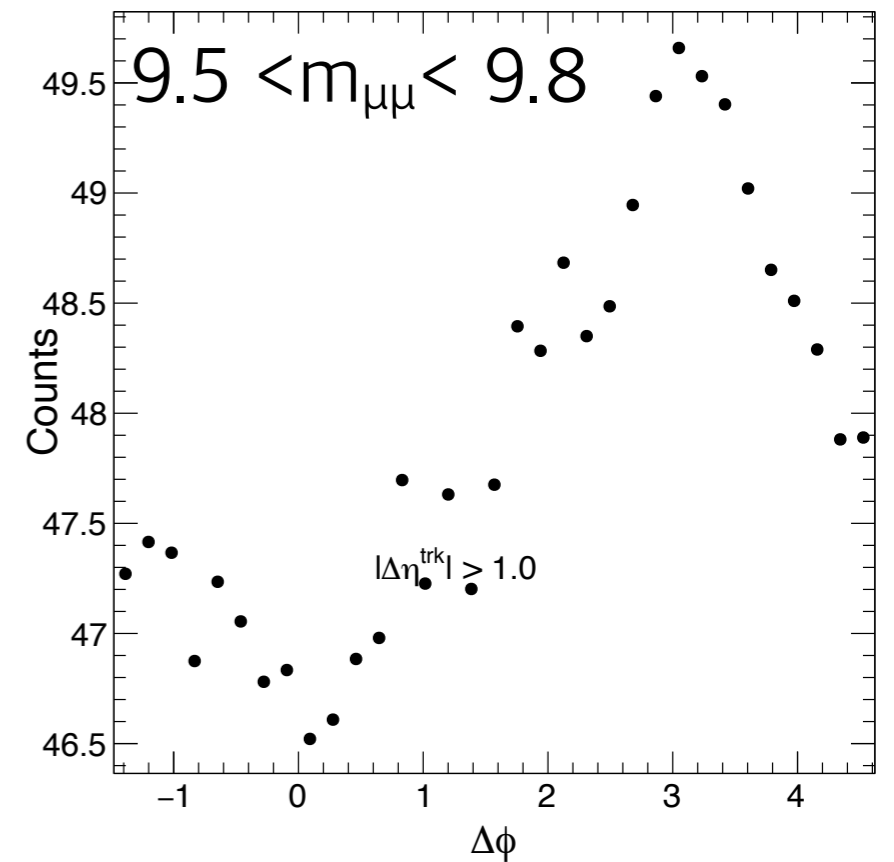
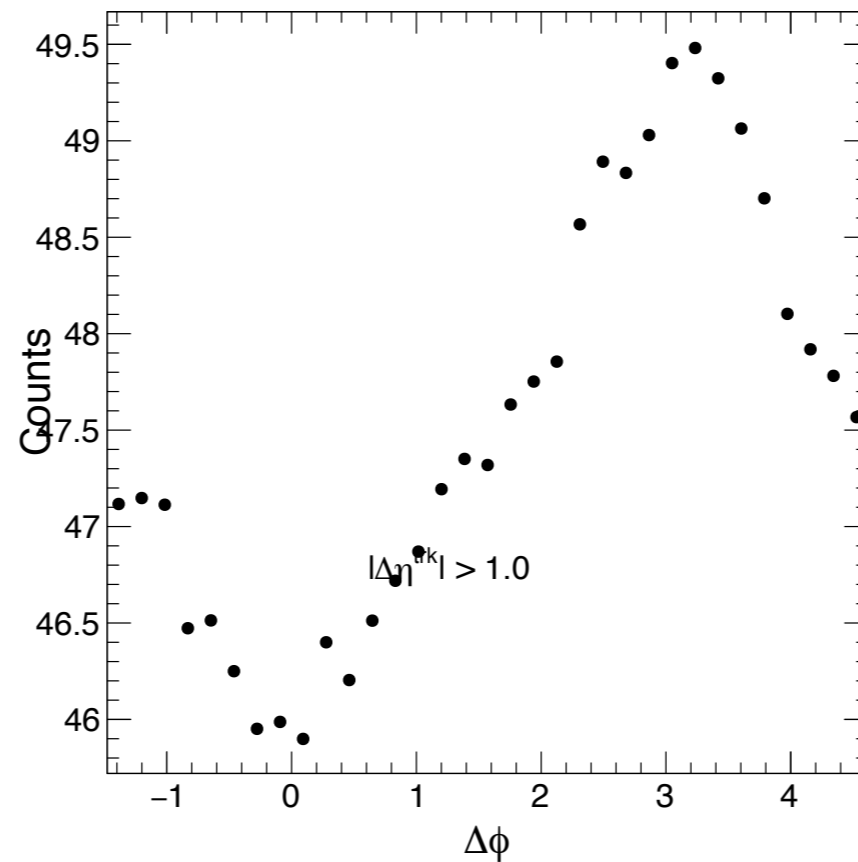
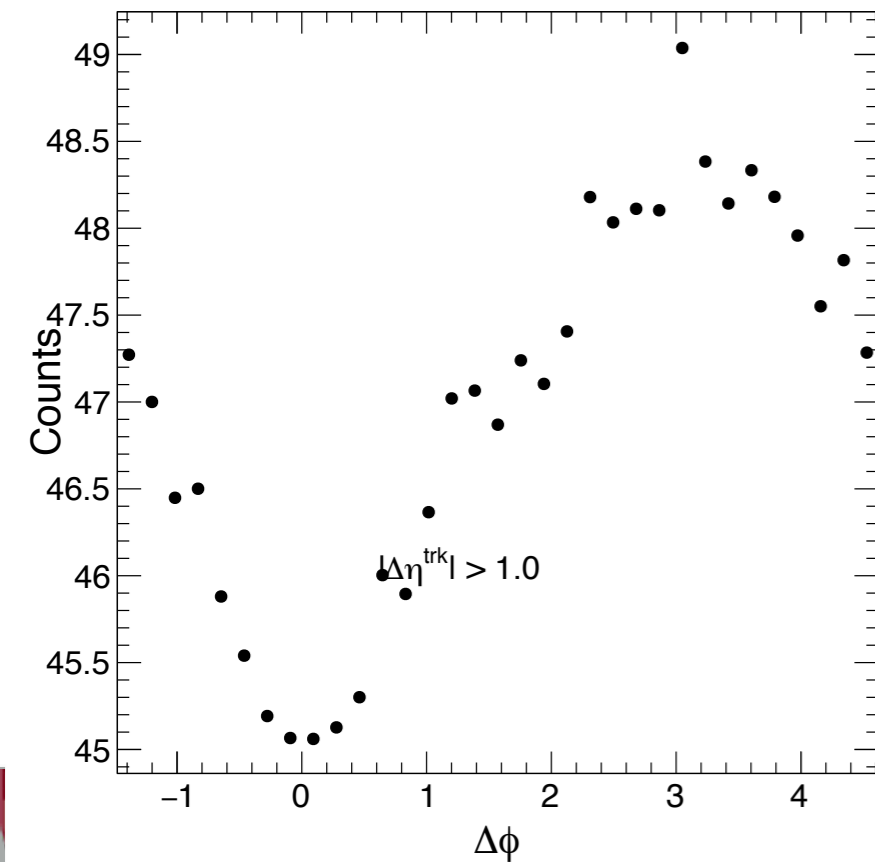
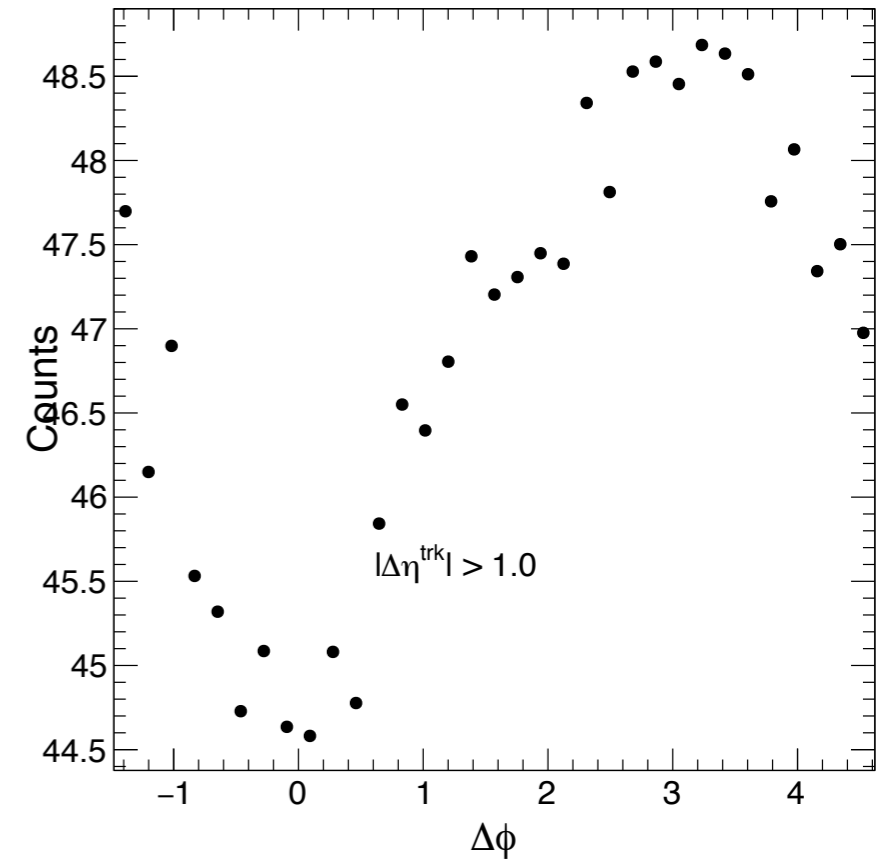
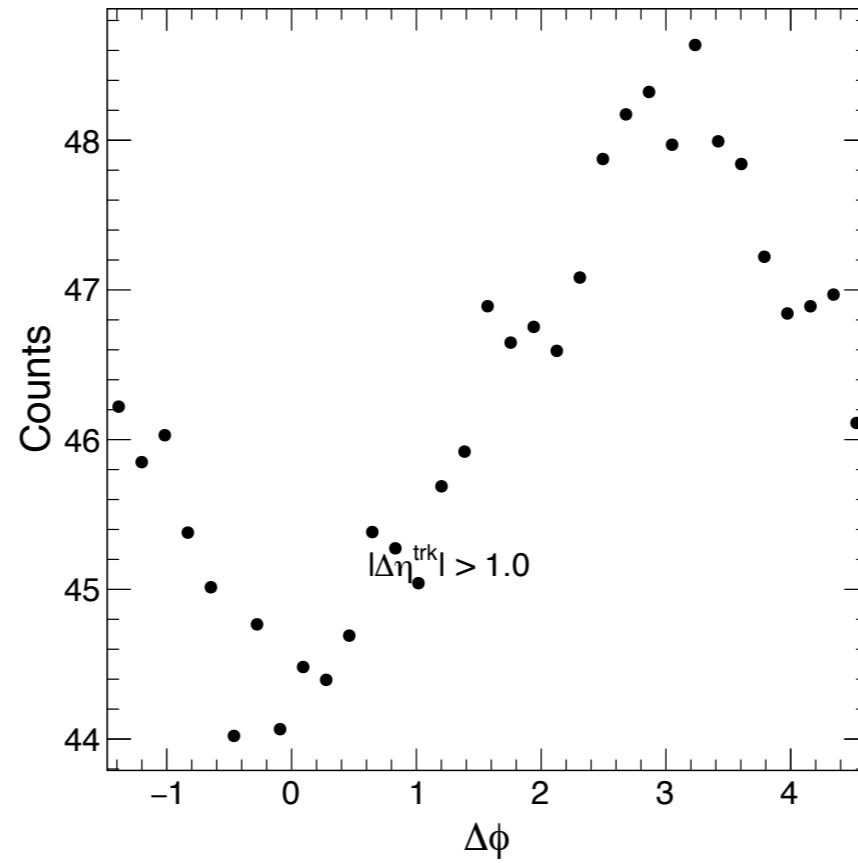
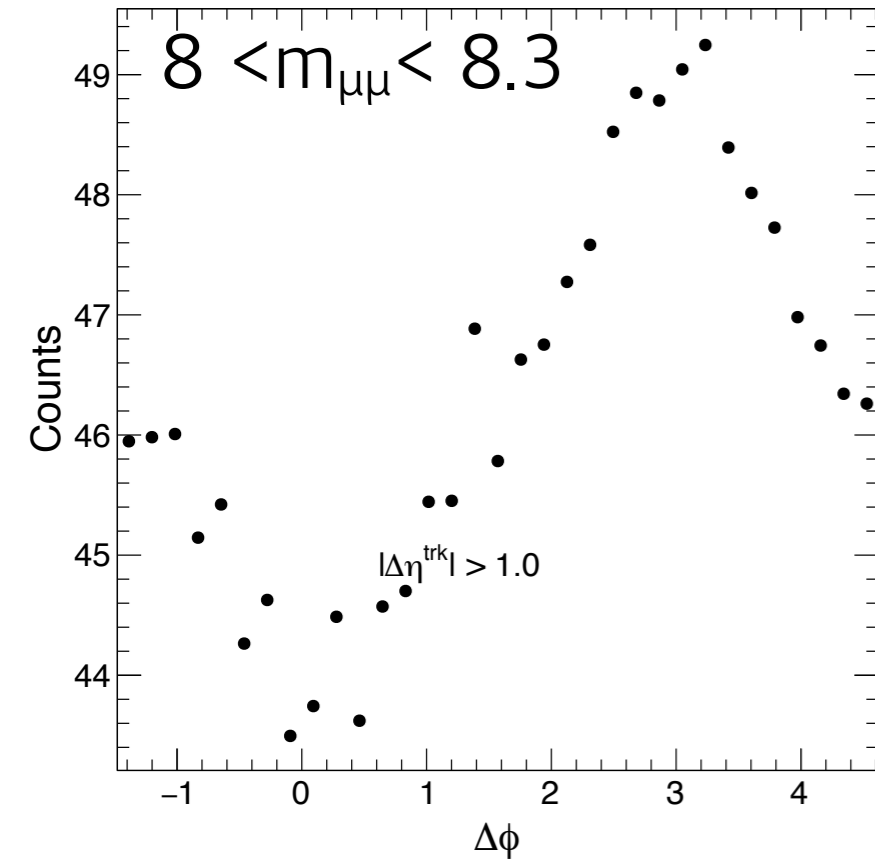
$$13.1 < m_{\mu\mu} < 13.4$$

$$0 < \text{mult.} < 40, 1 < p_T^{\text{trk}} < 3(S/B)$$

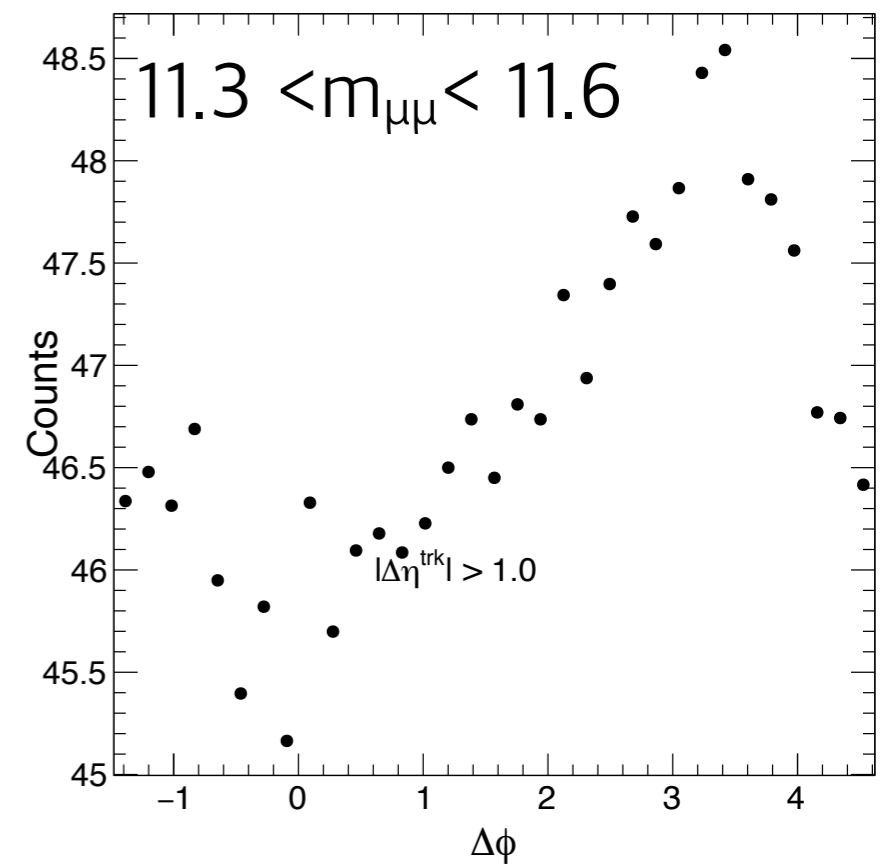
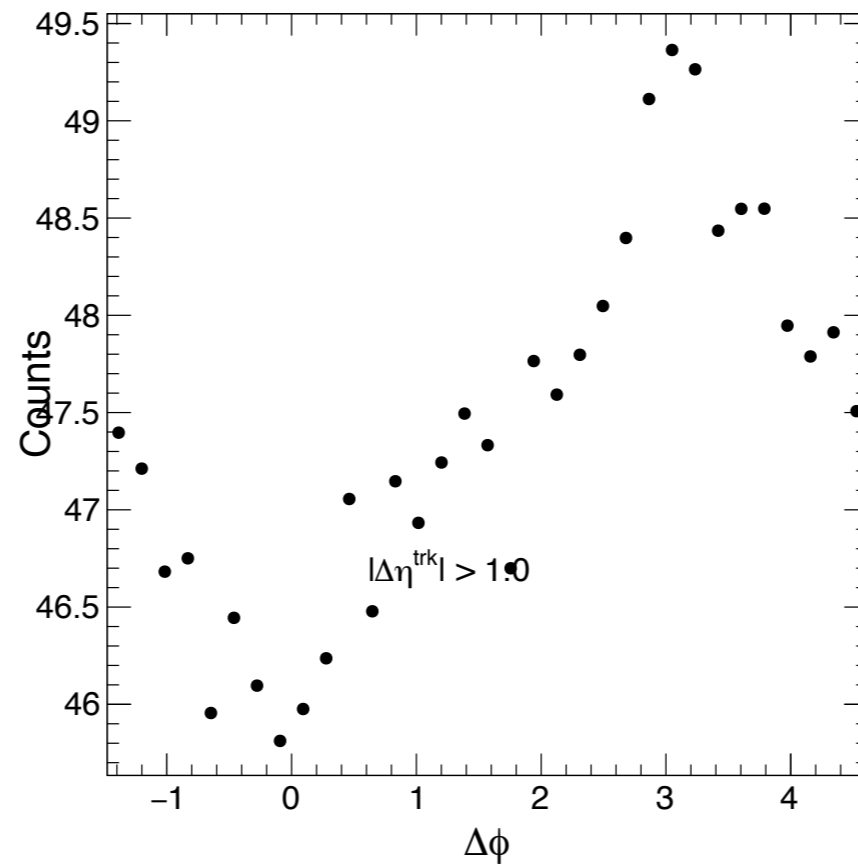
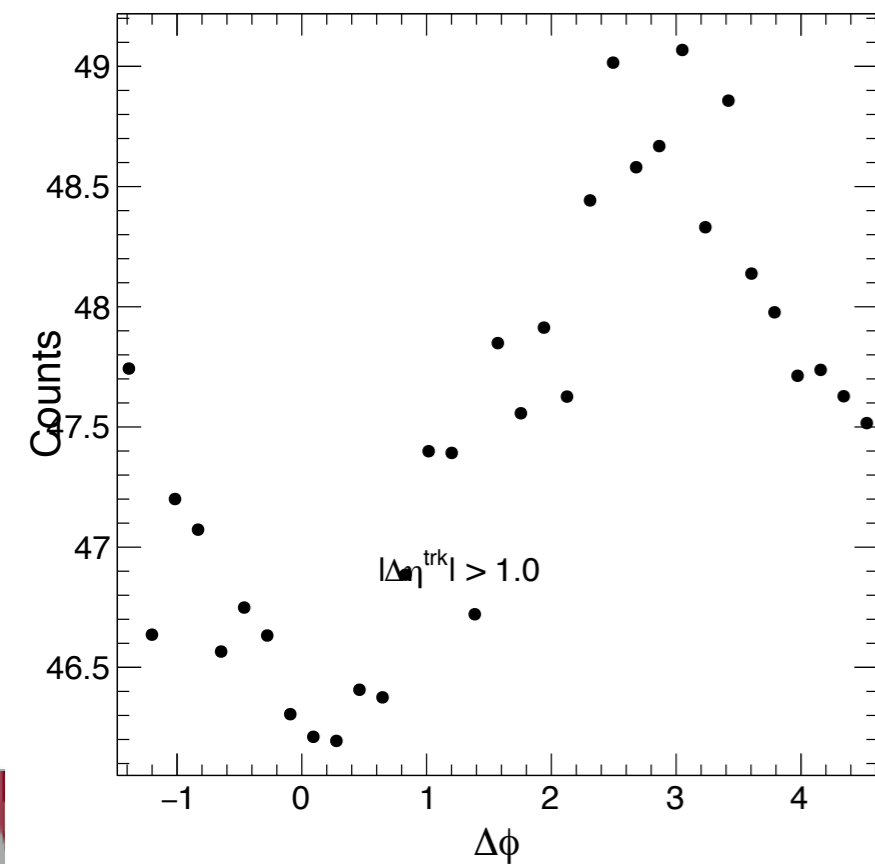
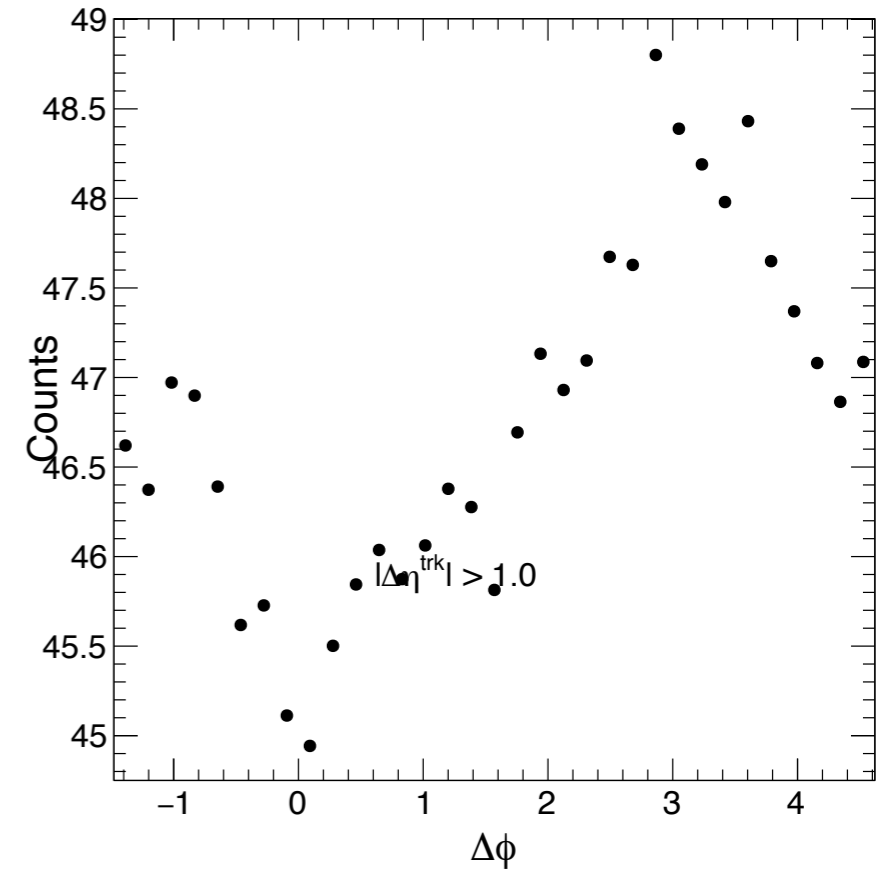
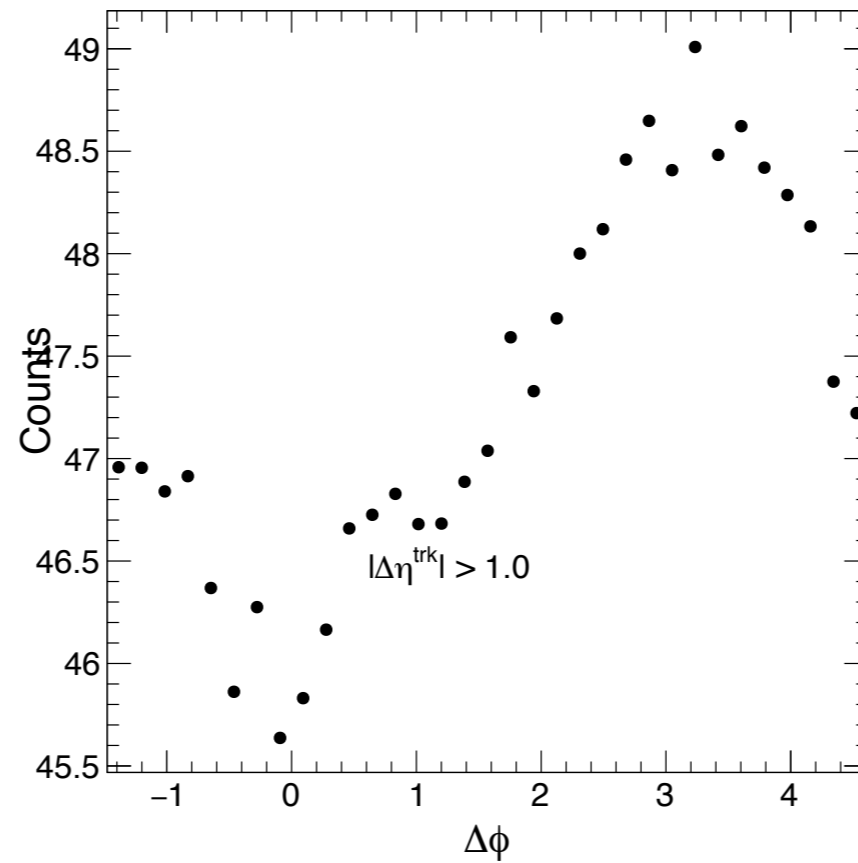
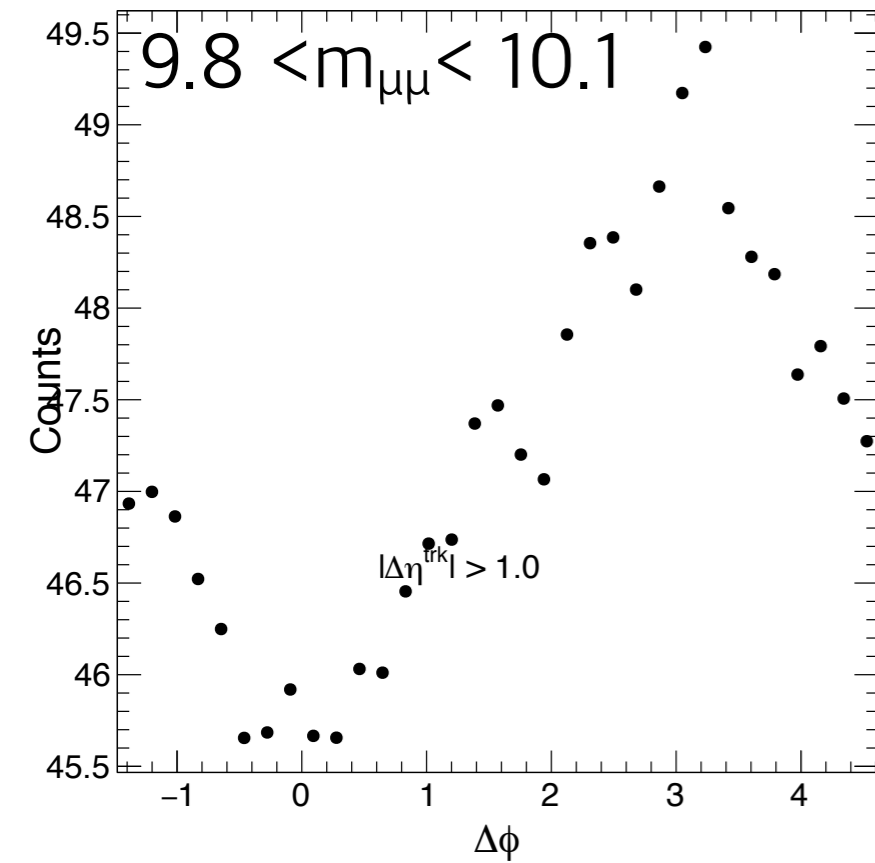
$$13.4 < m_{\mu\mu} < 13.7$$

$$13.7 < m_{\mu\mu} < 14.0$$

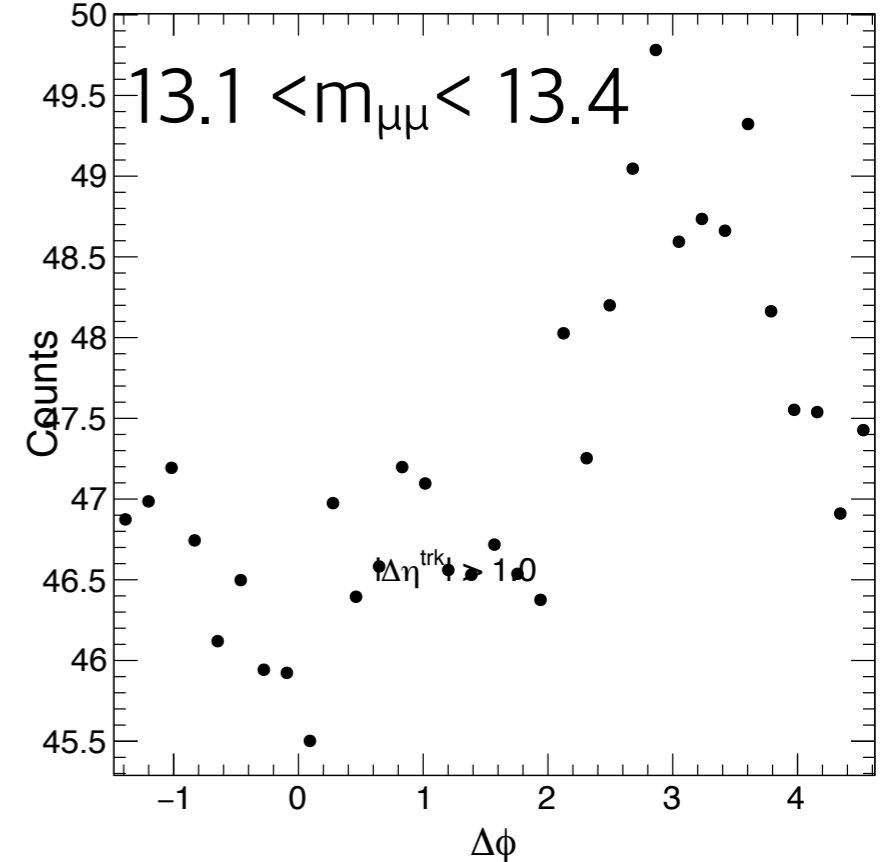
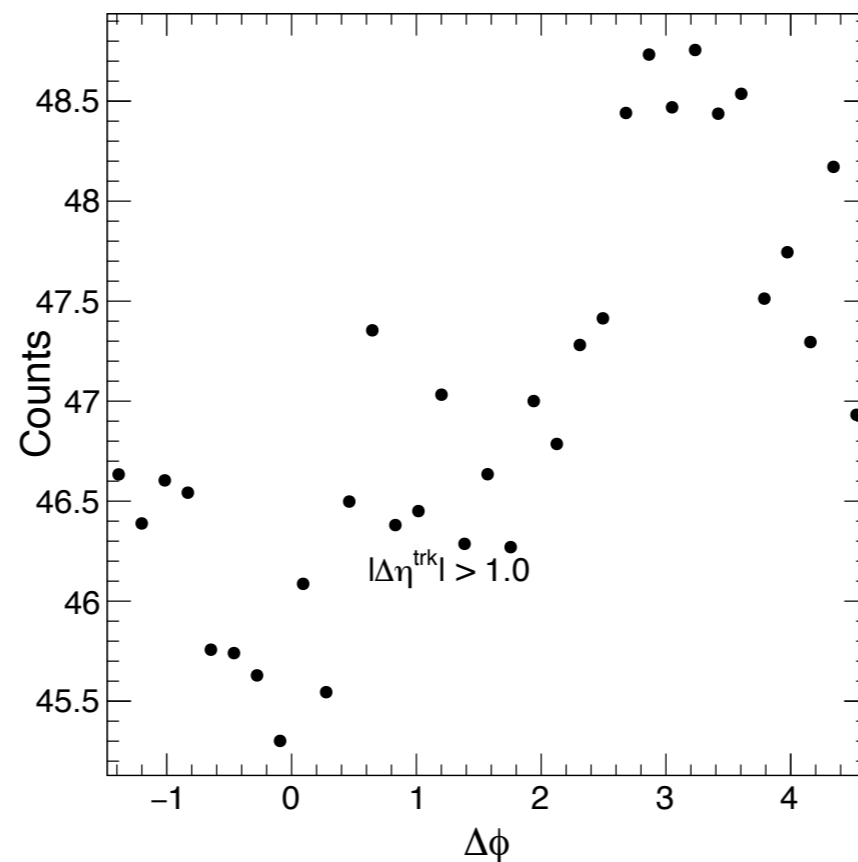
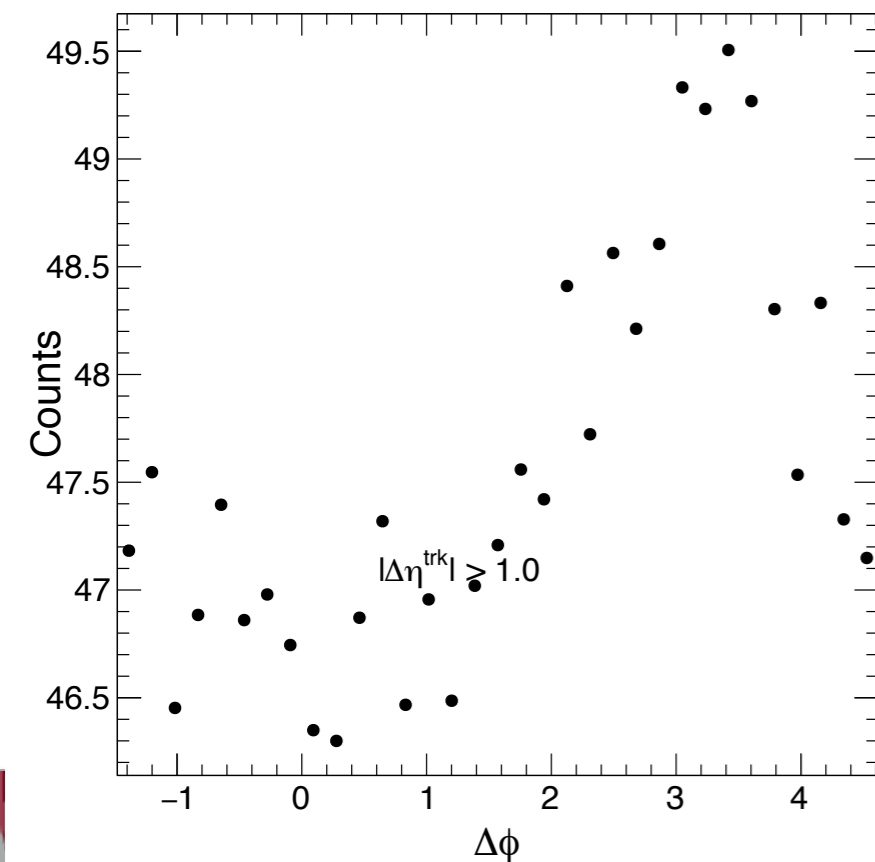
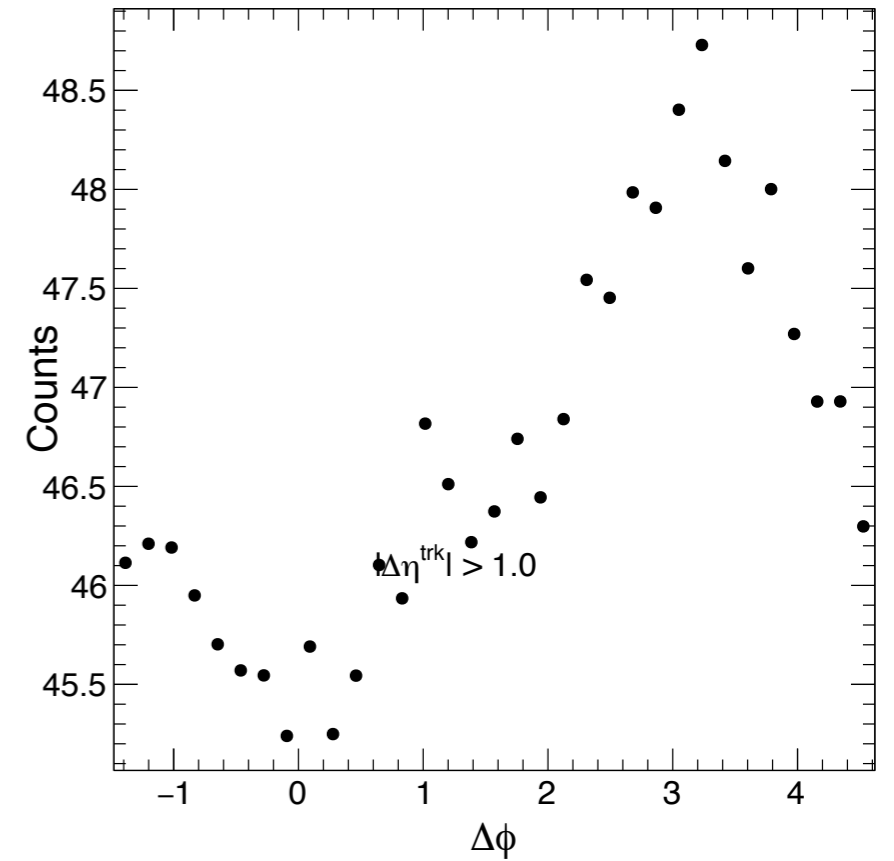
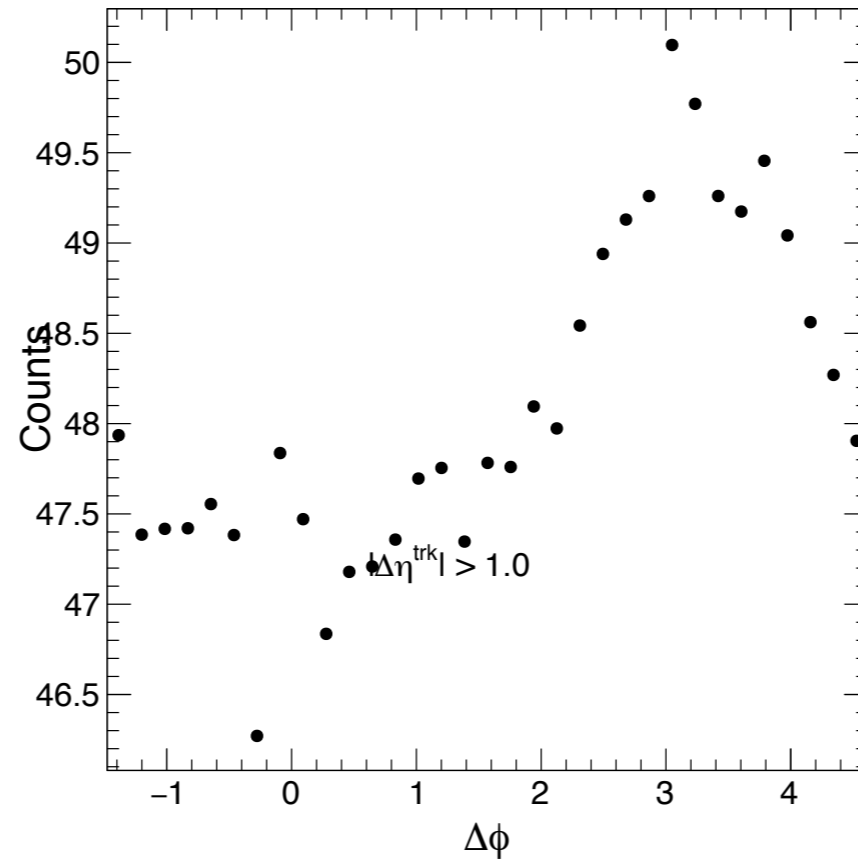
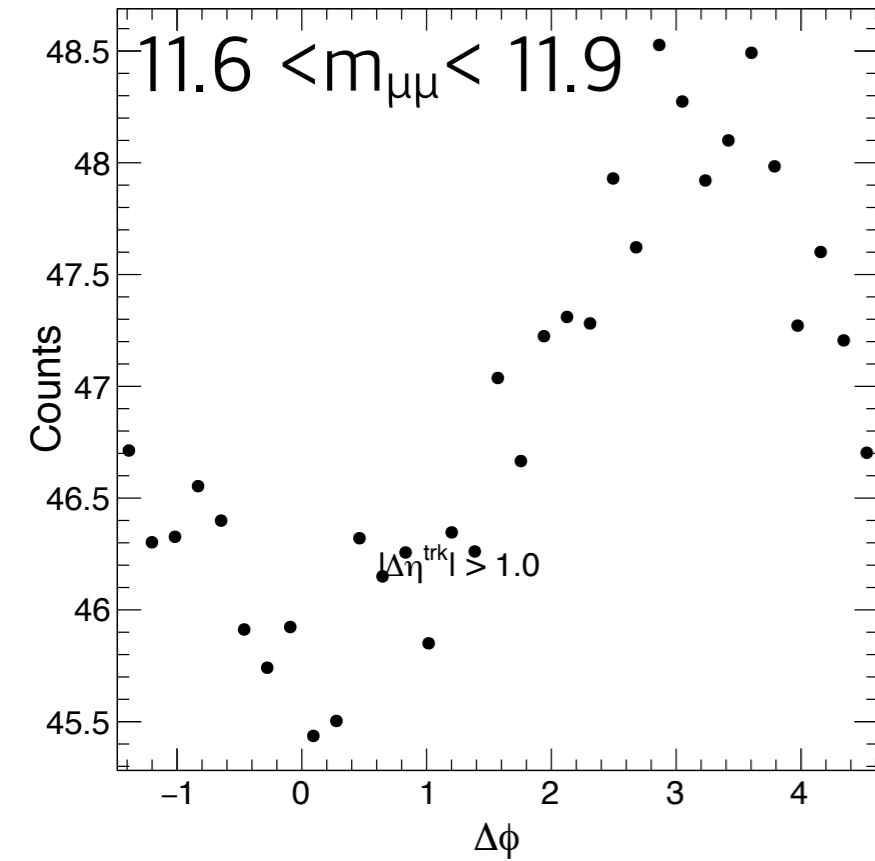
$0 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$



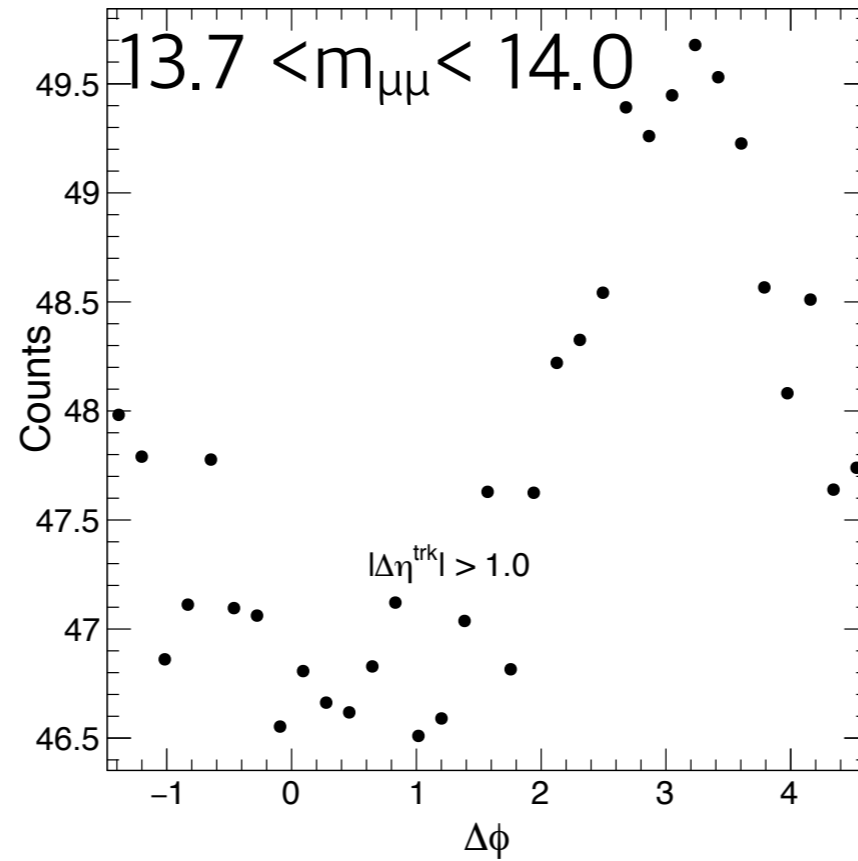
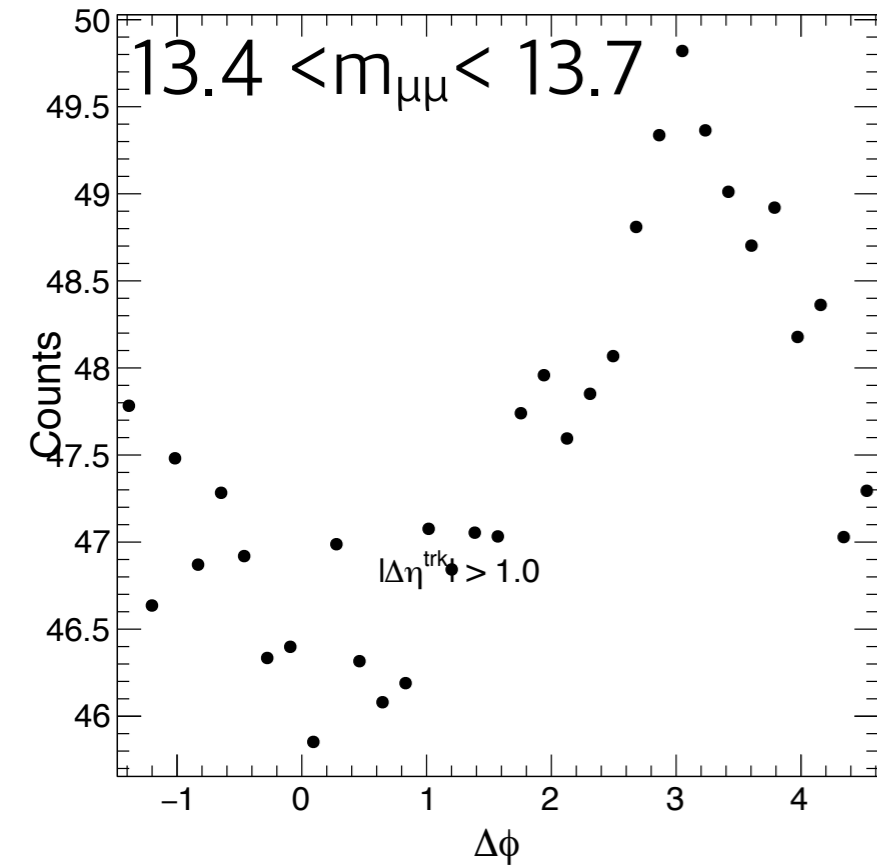
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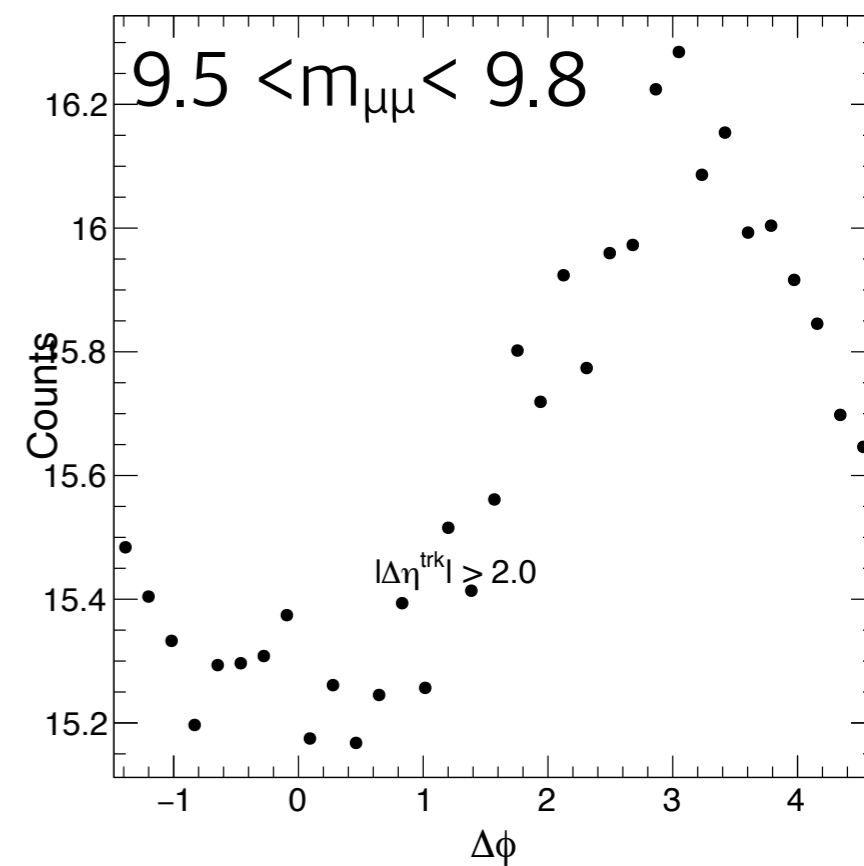
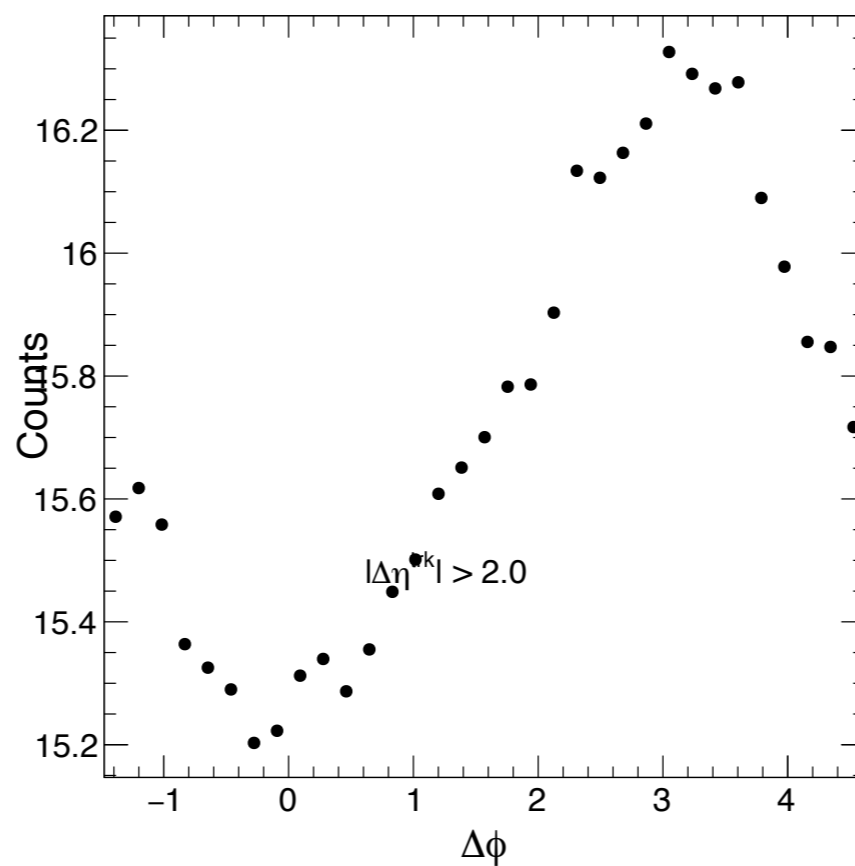
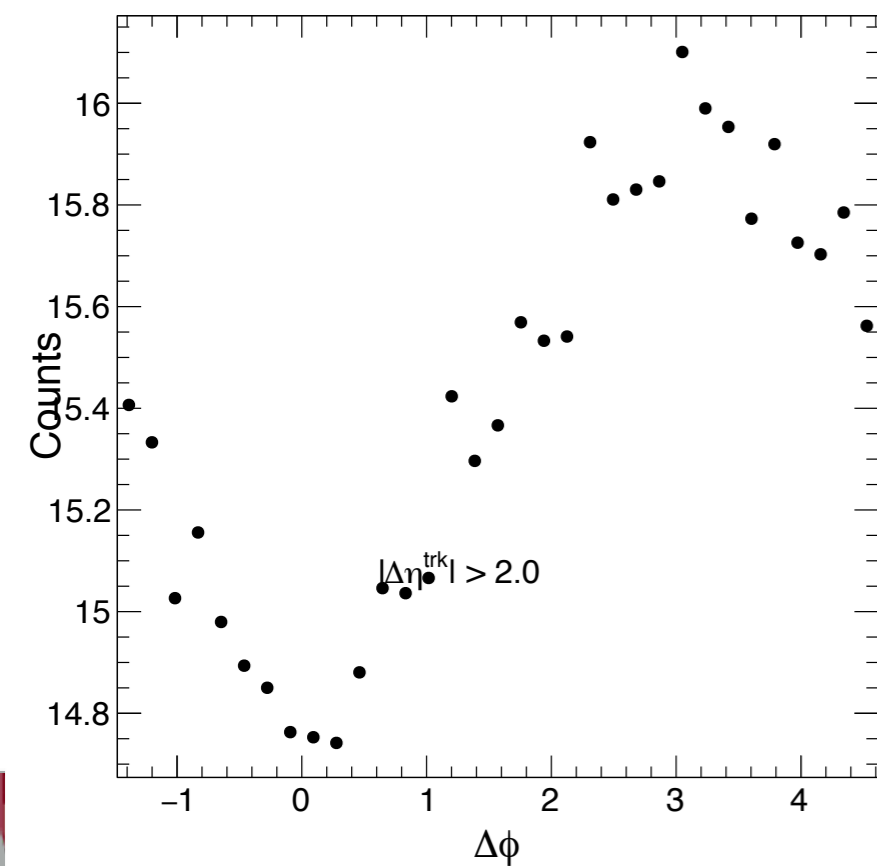
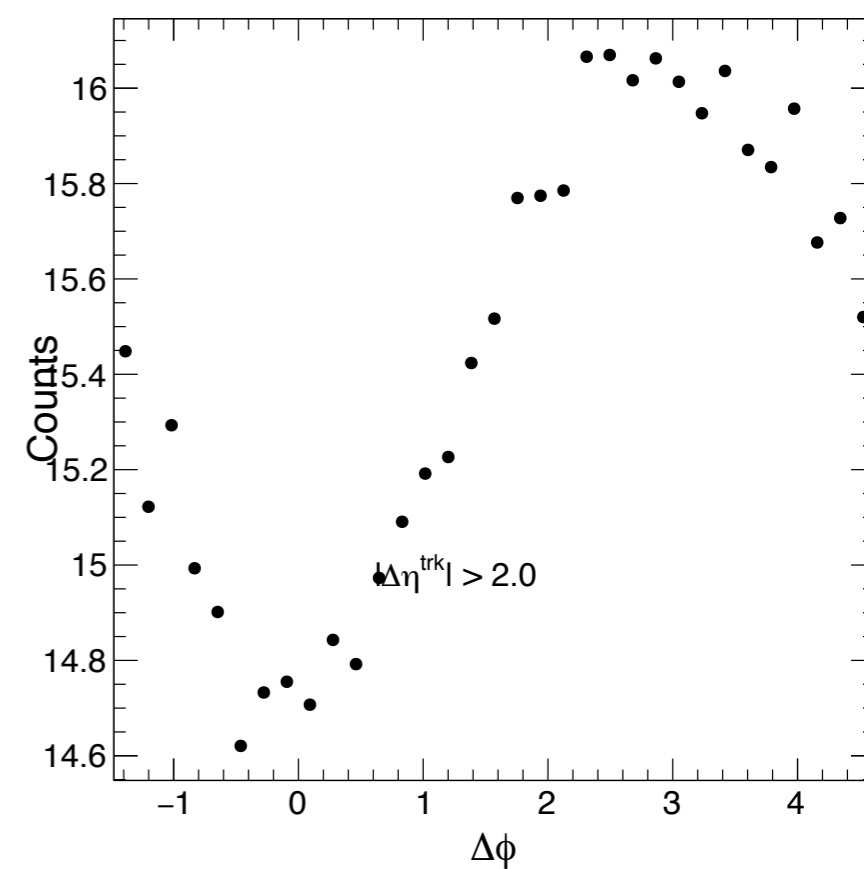
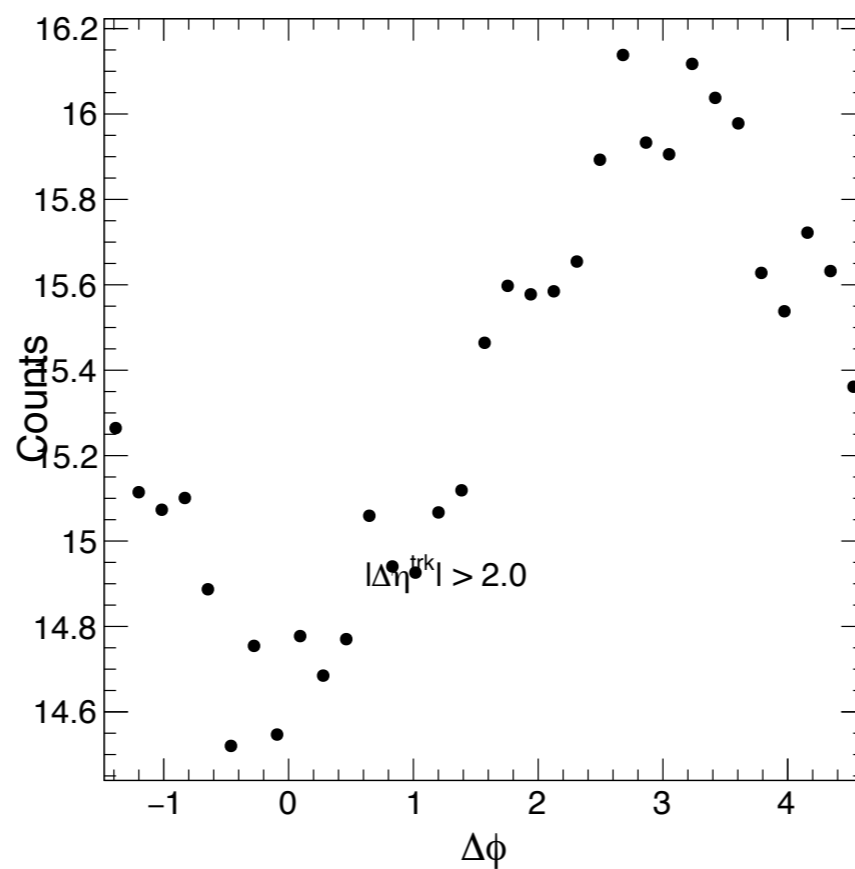
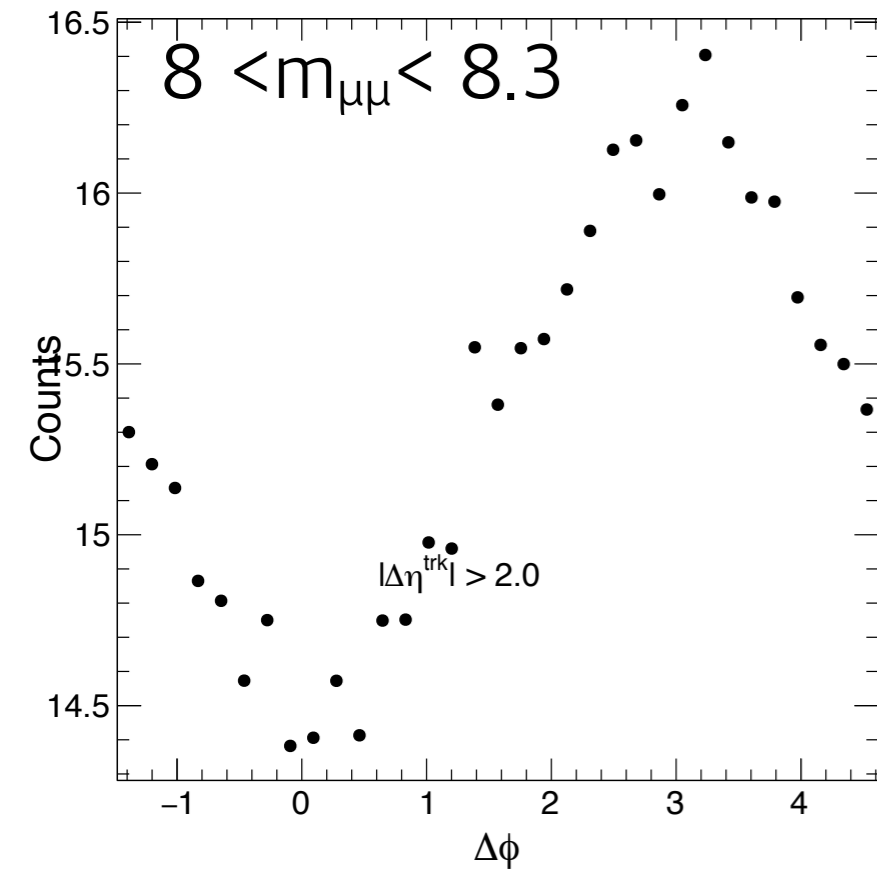
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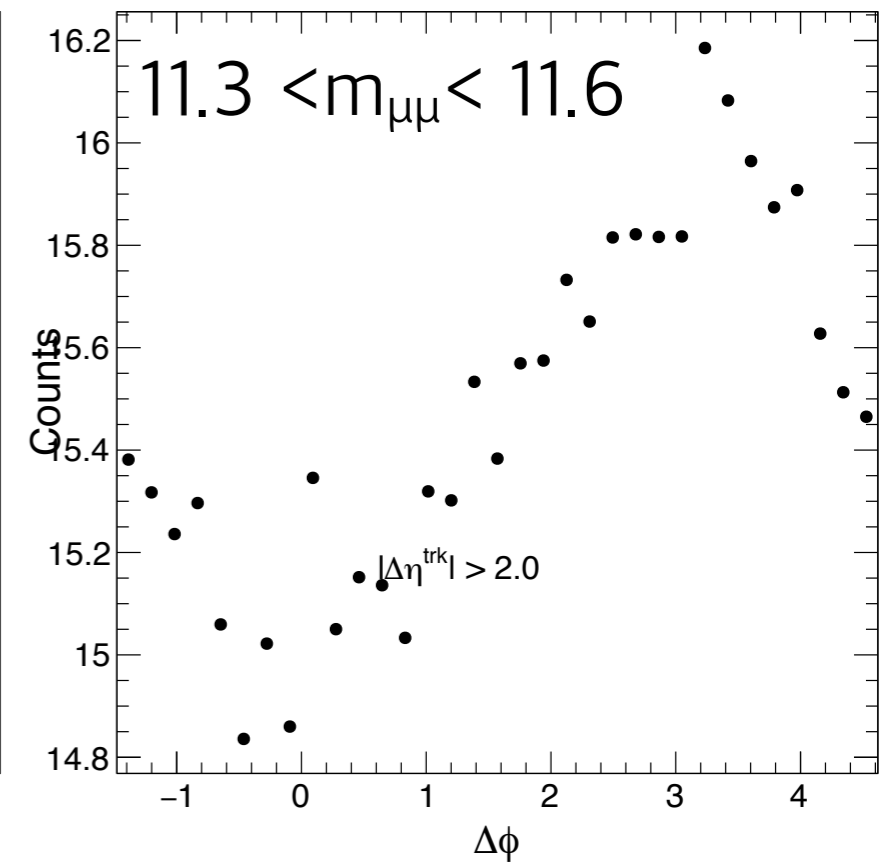
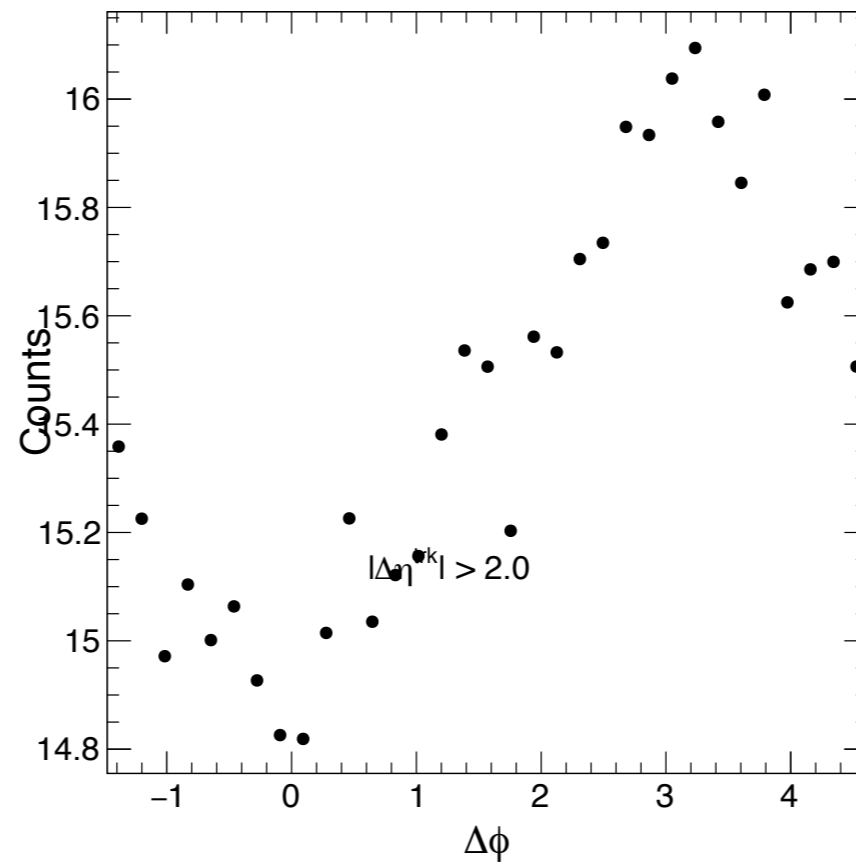
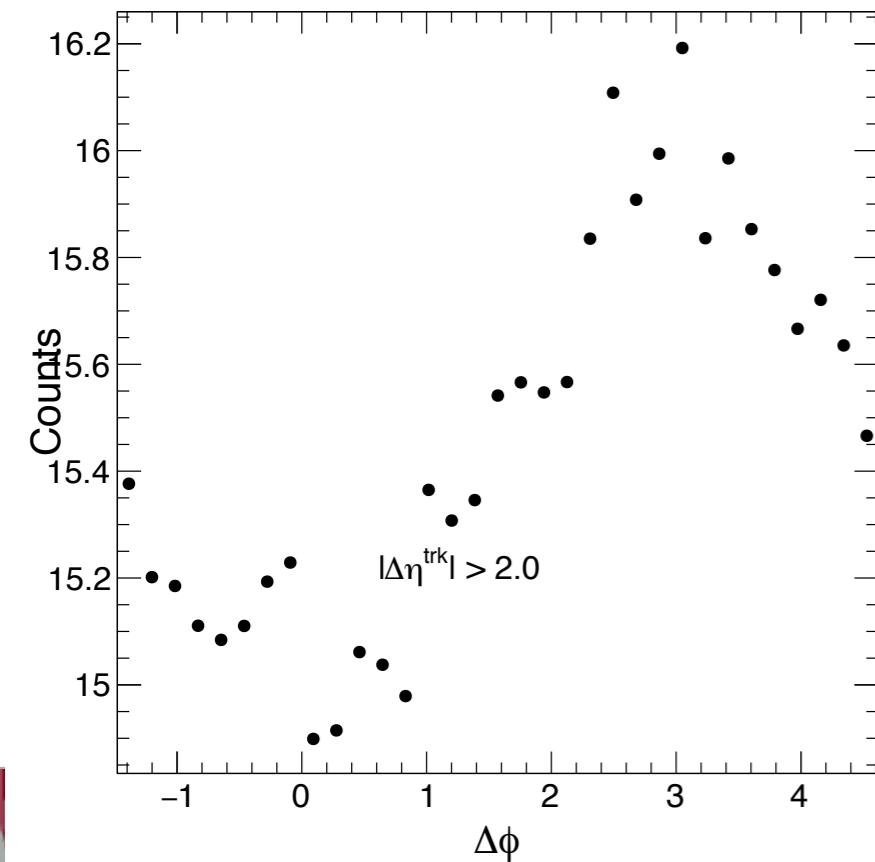
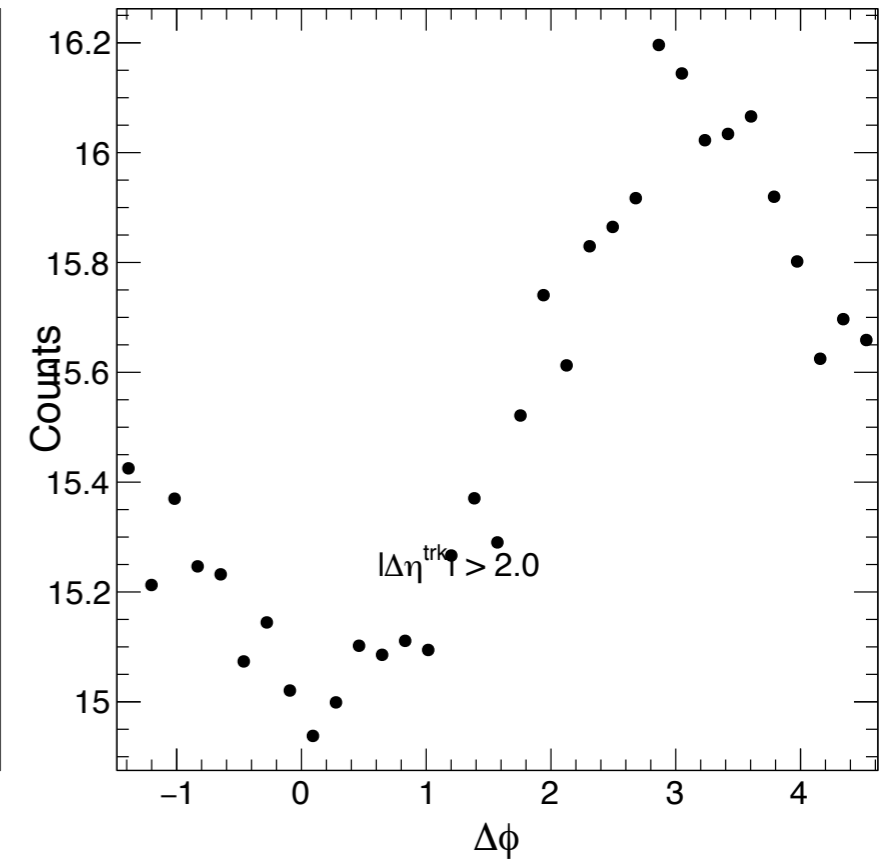
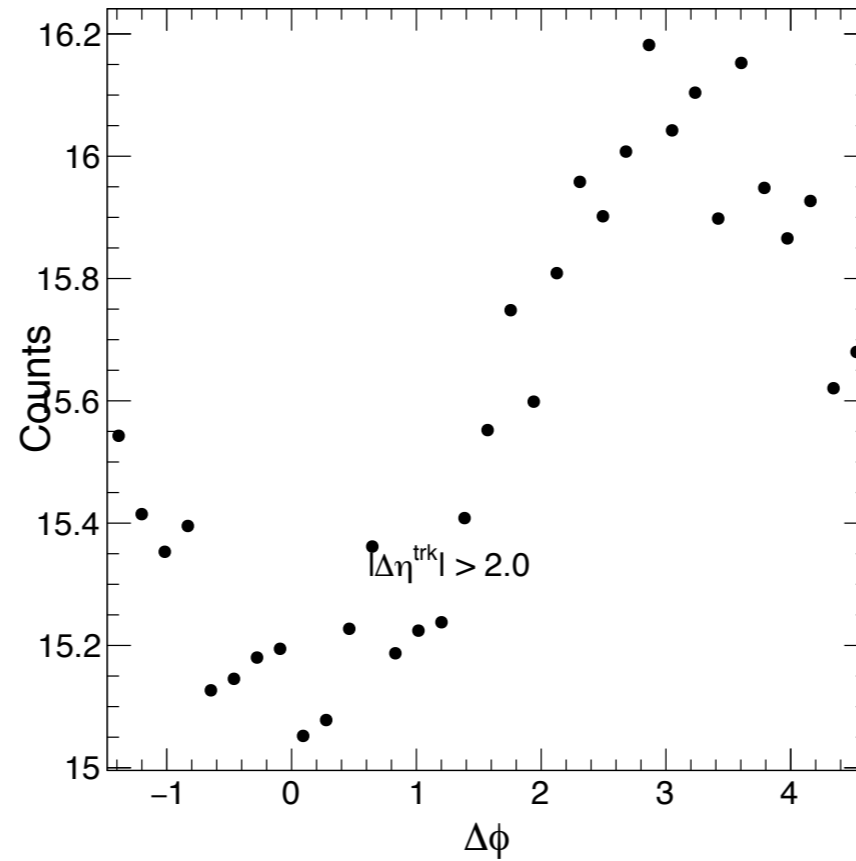
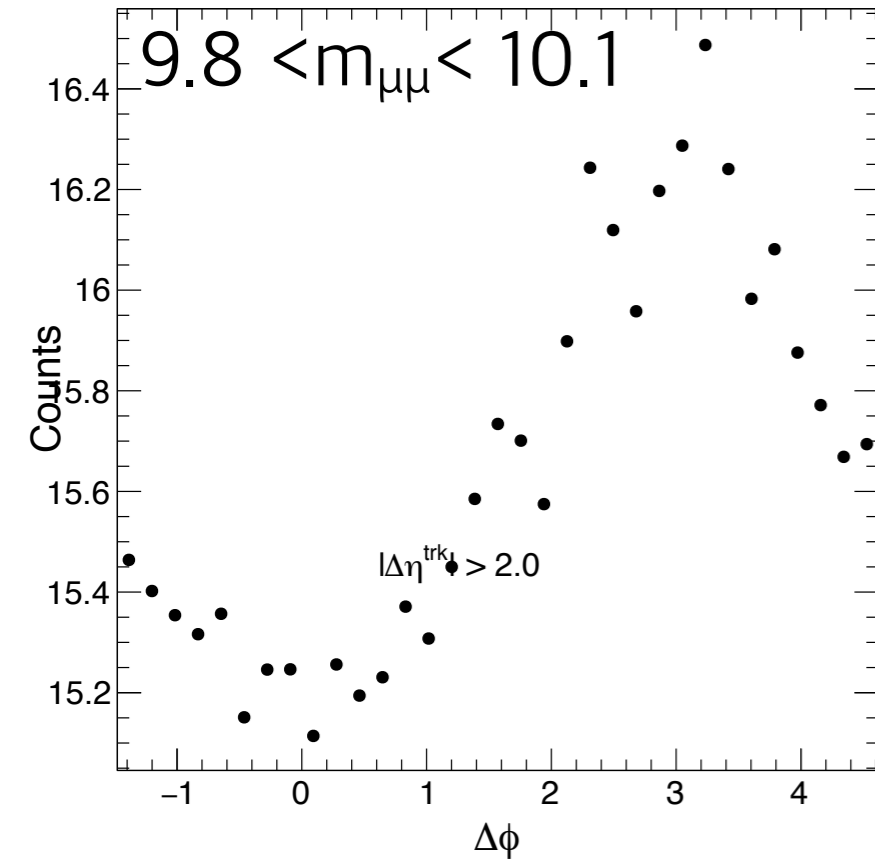
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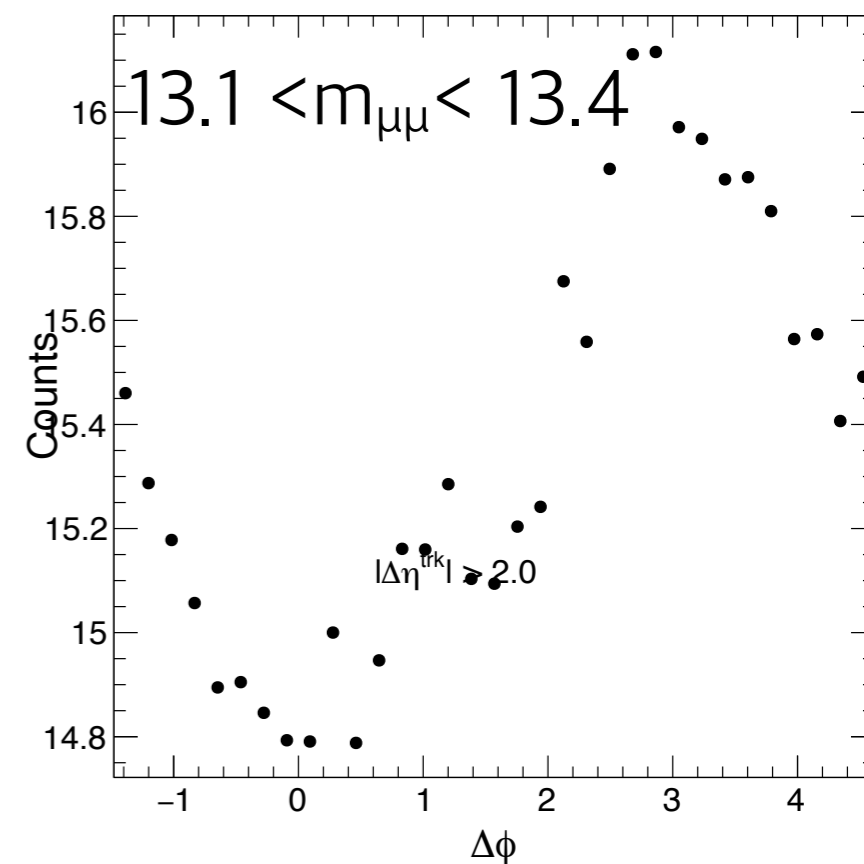
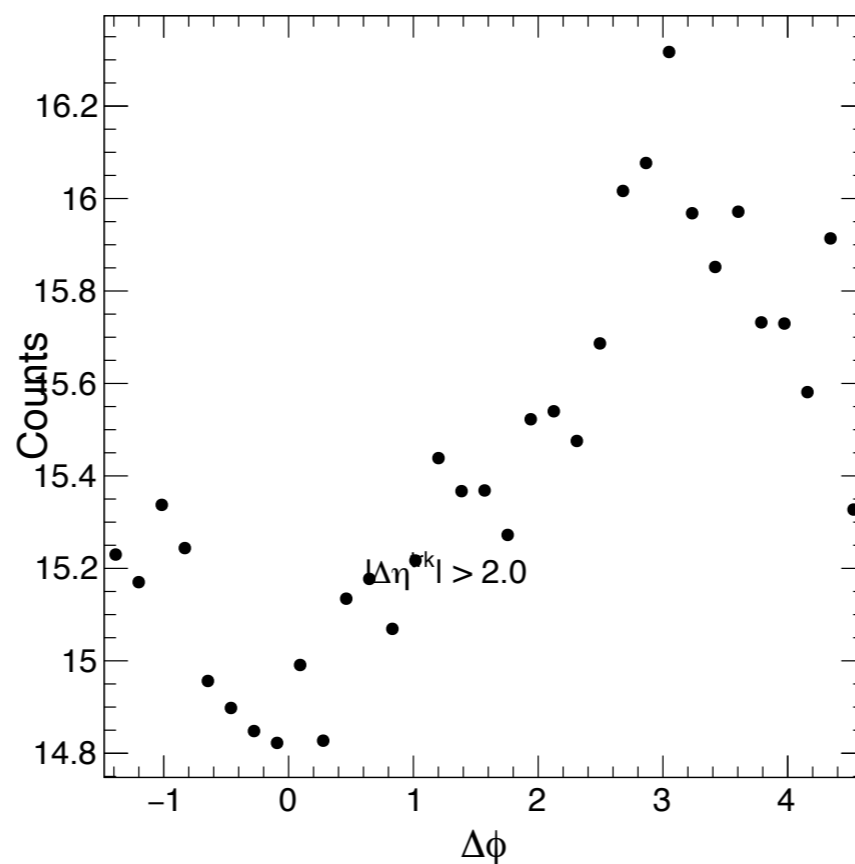
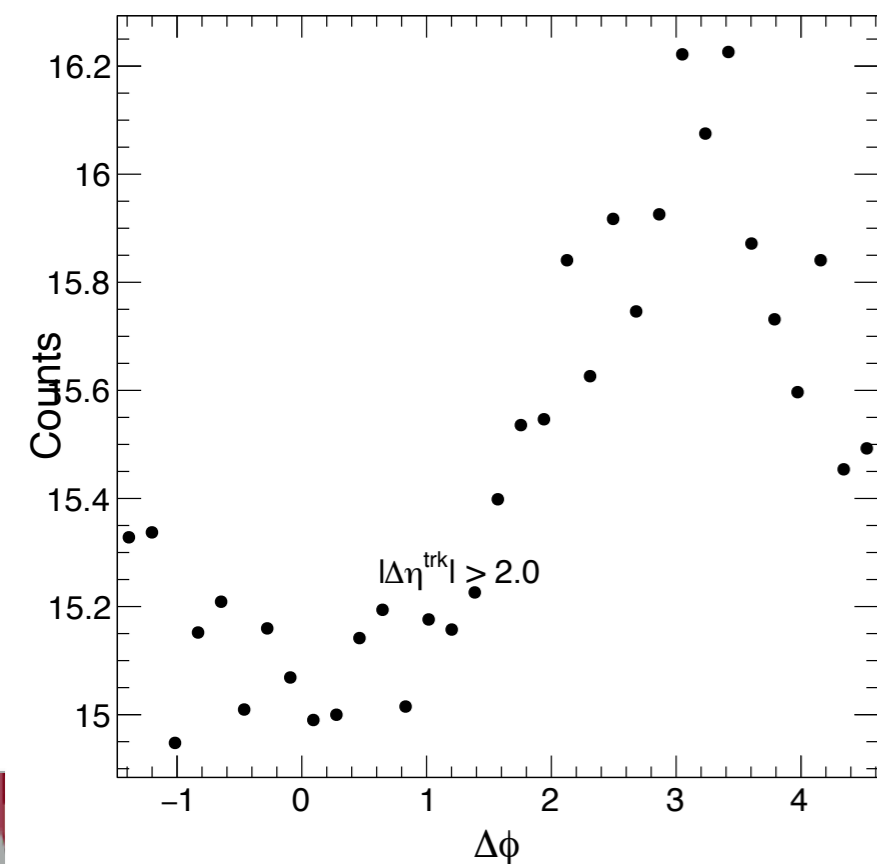
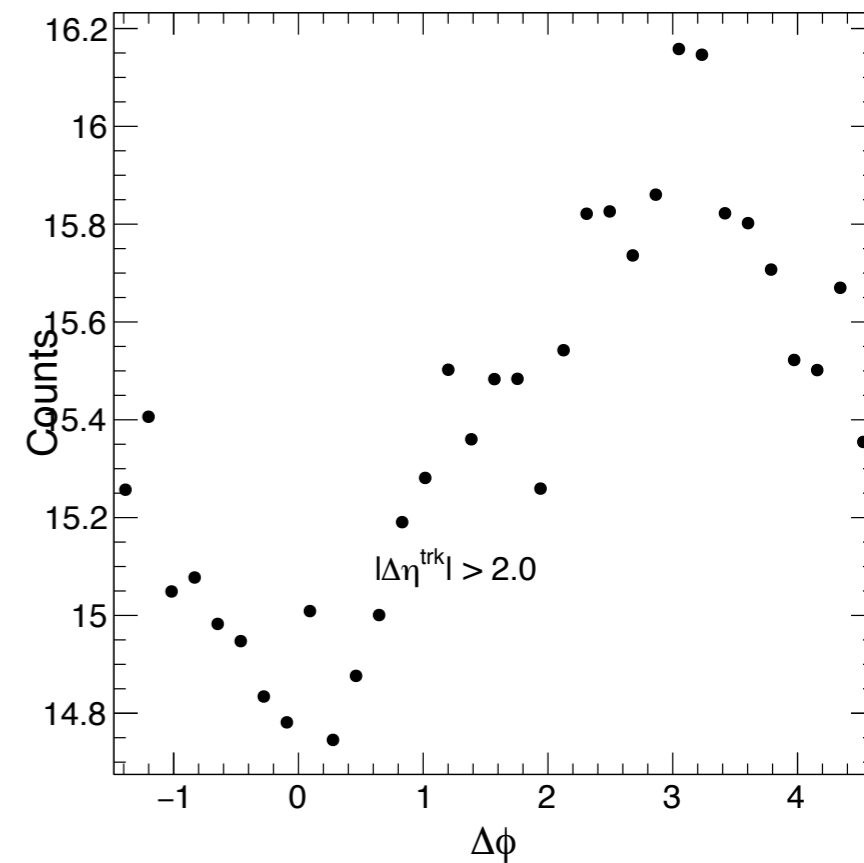
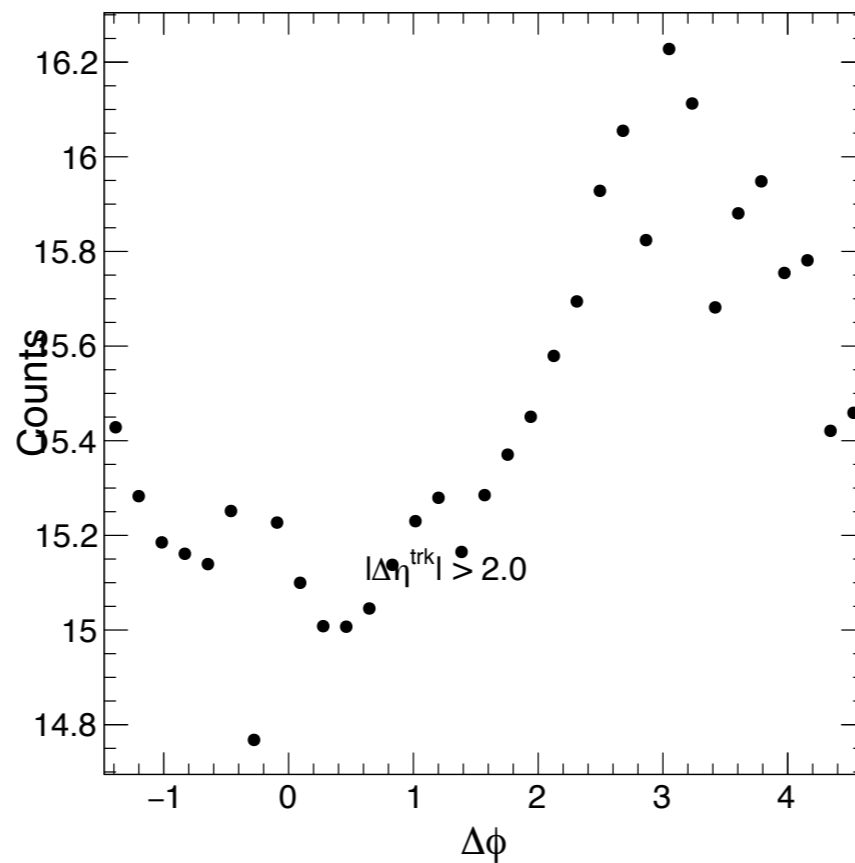
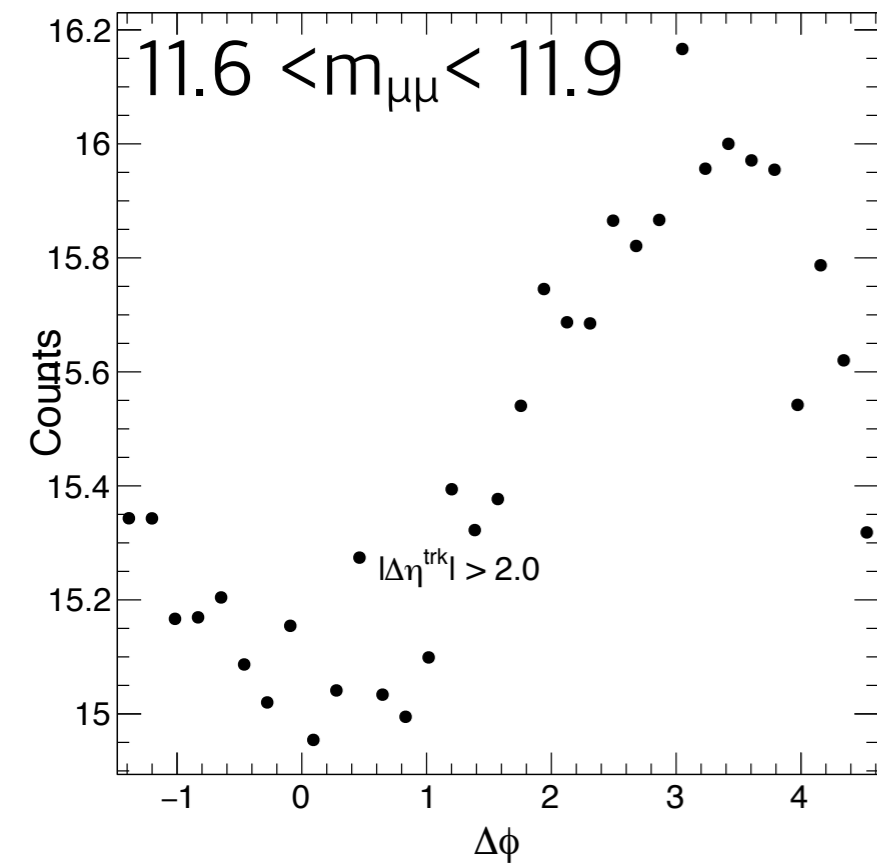
$0 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$



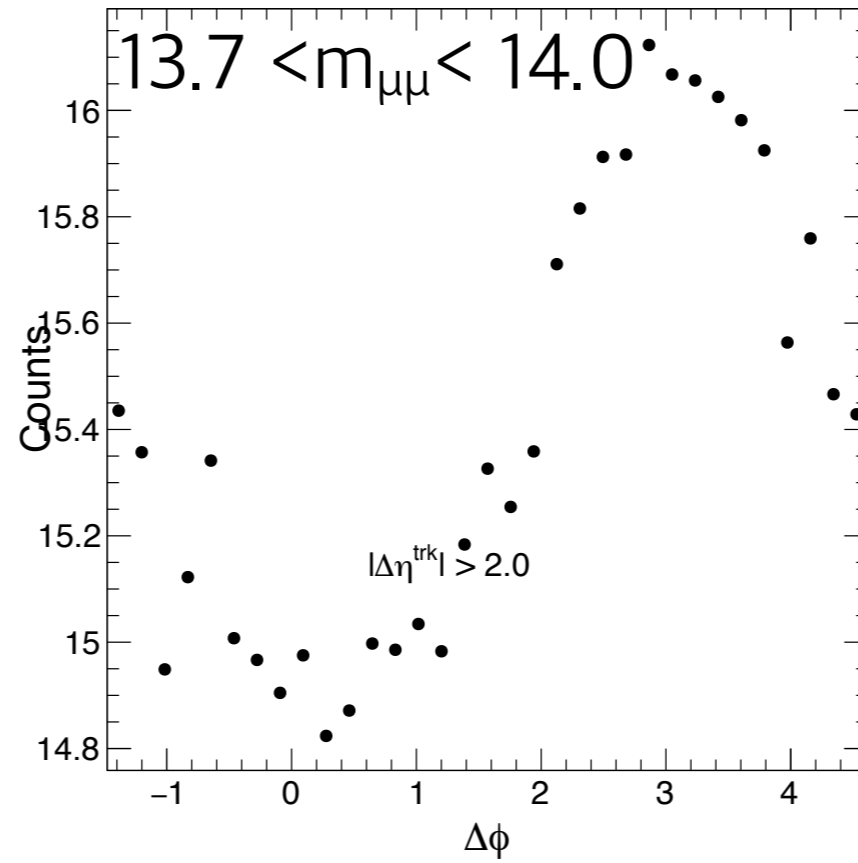
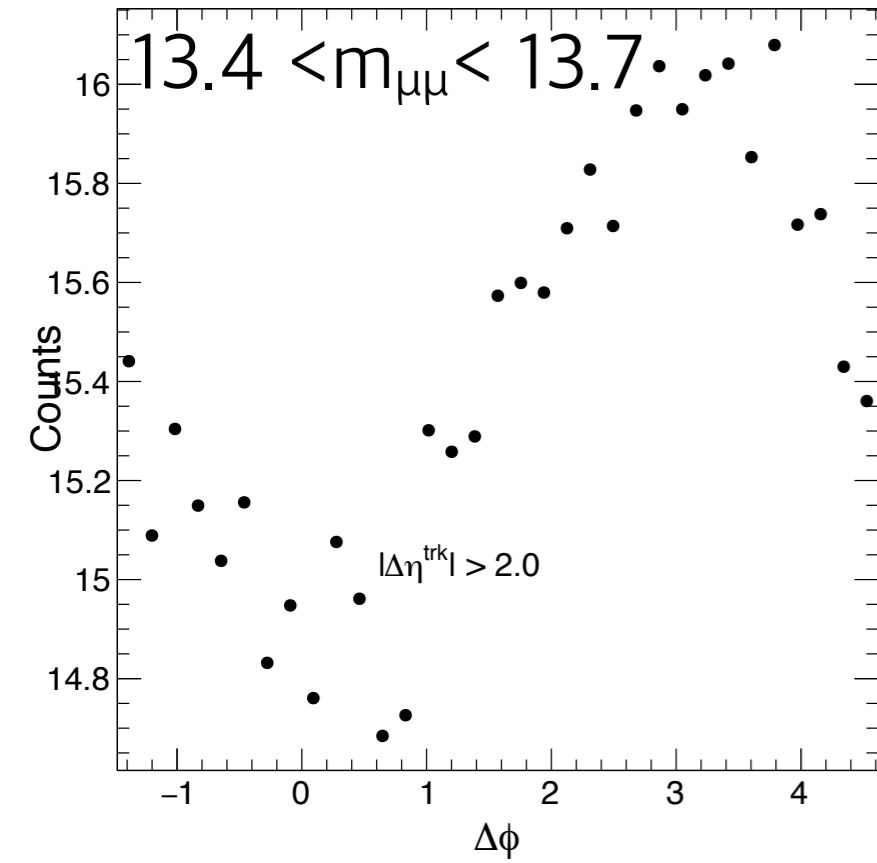
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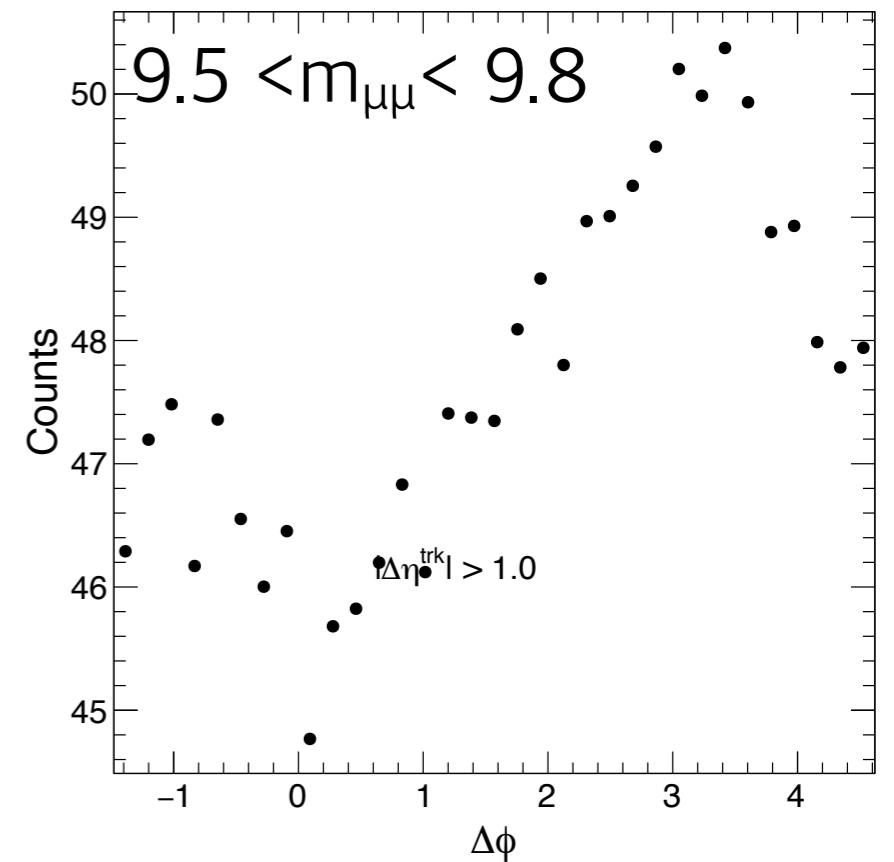
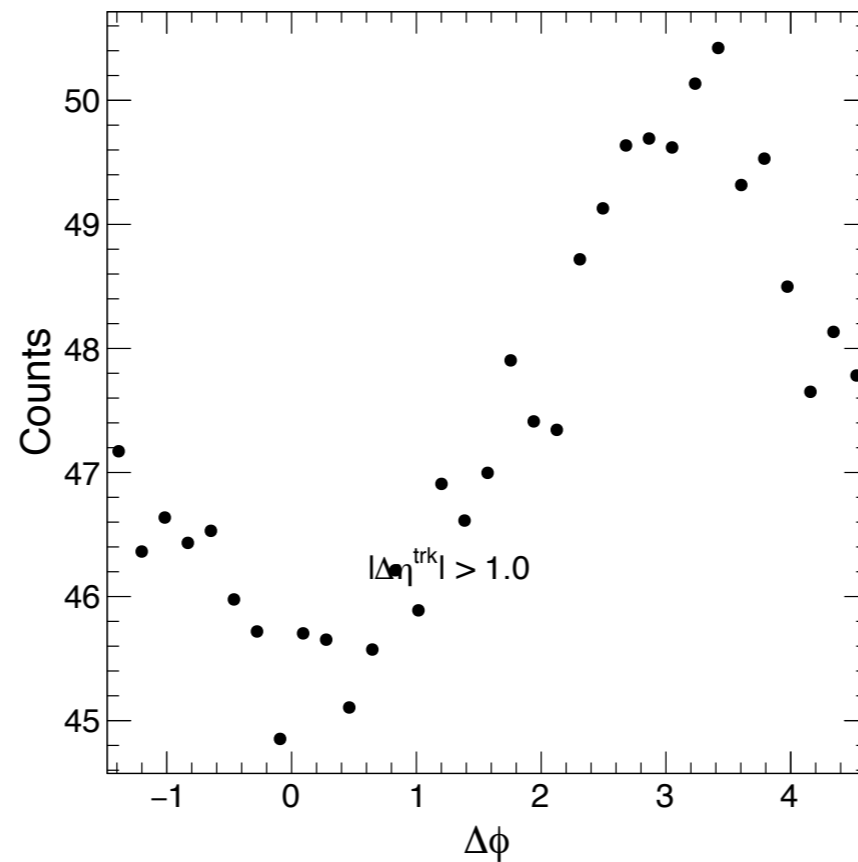
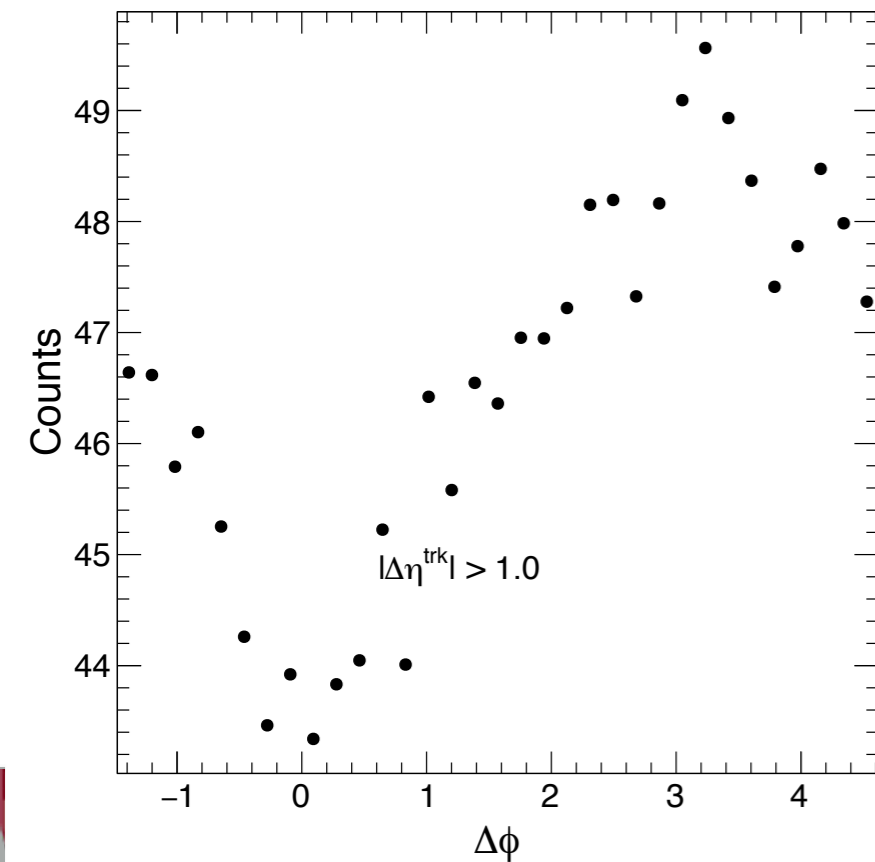
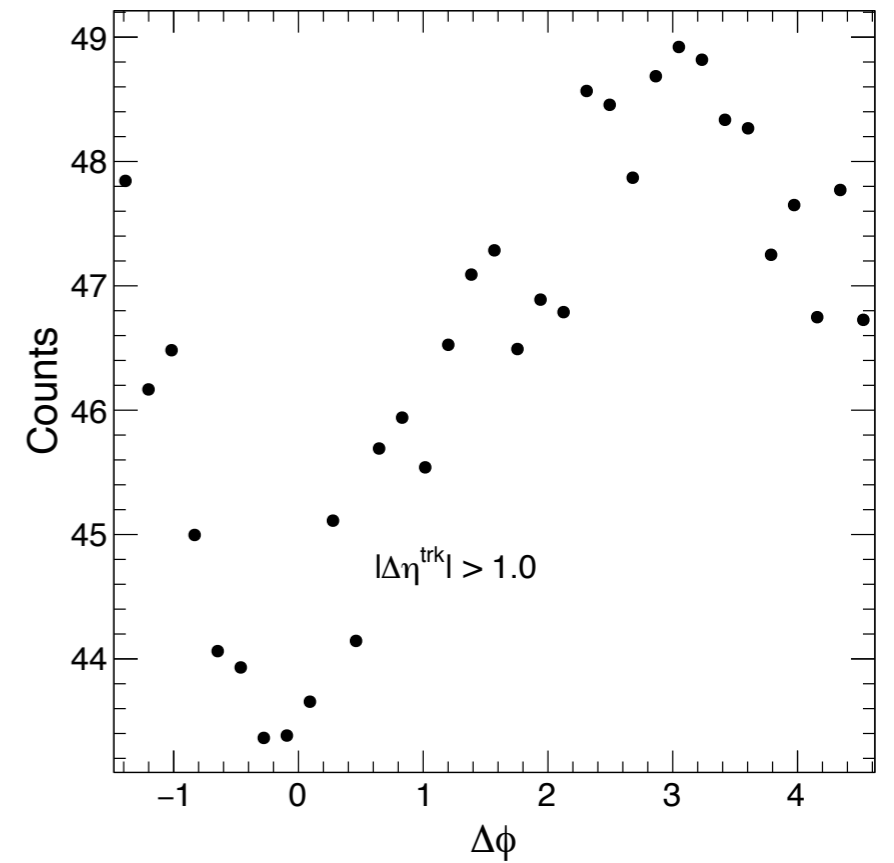
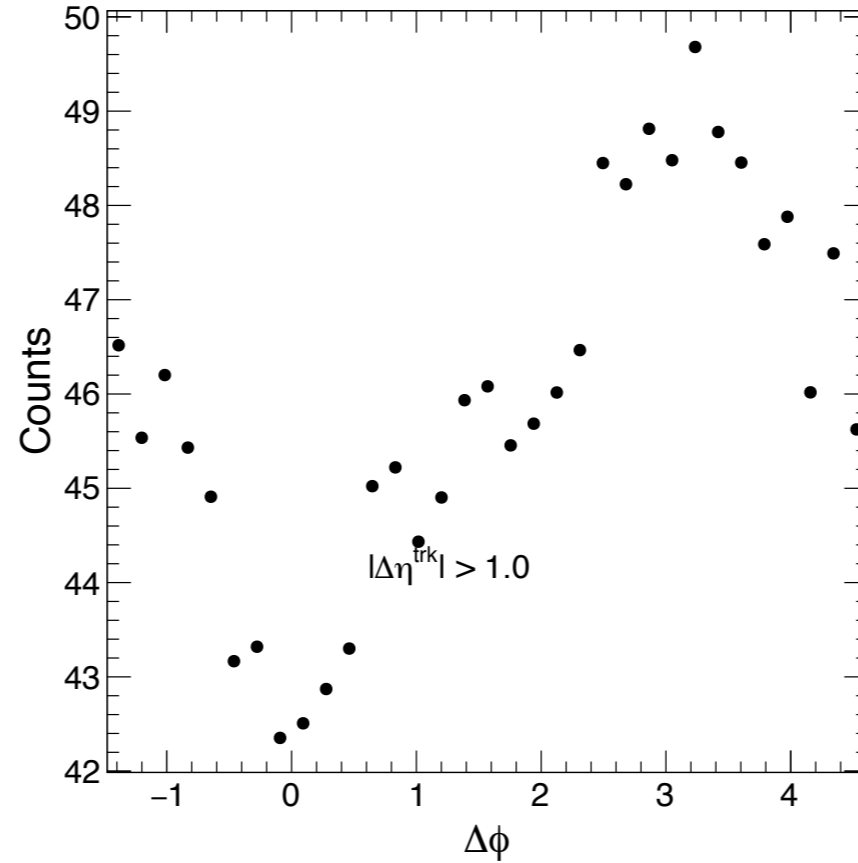
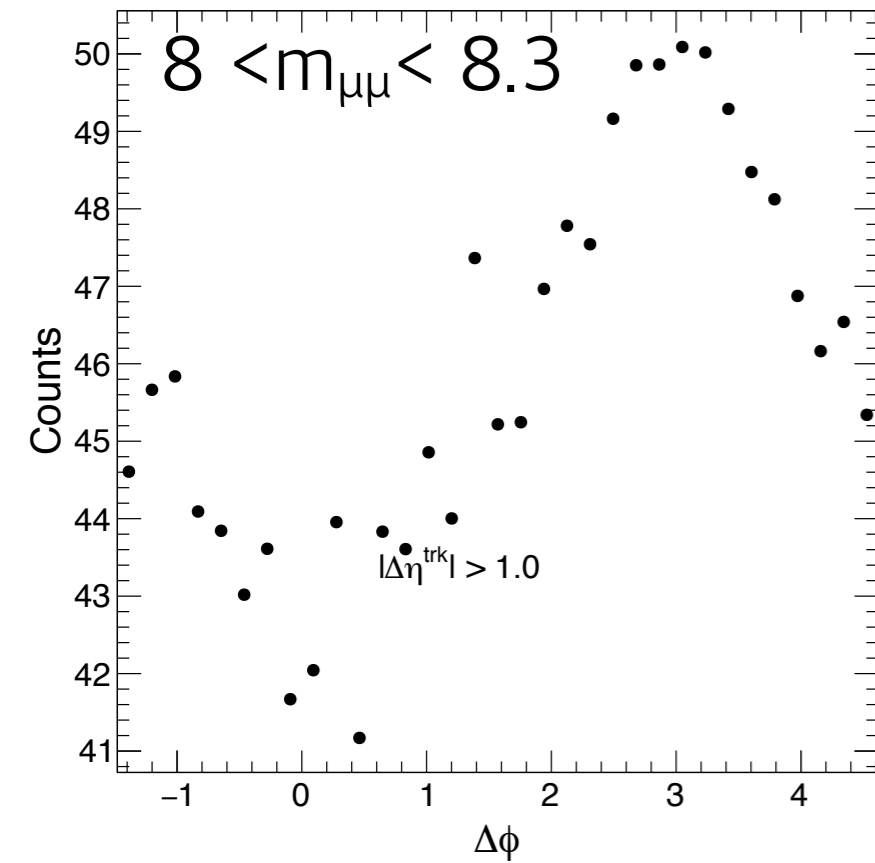
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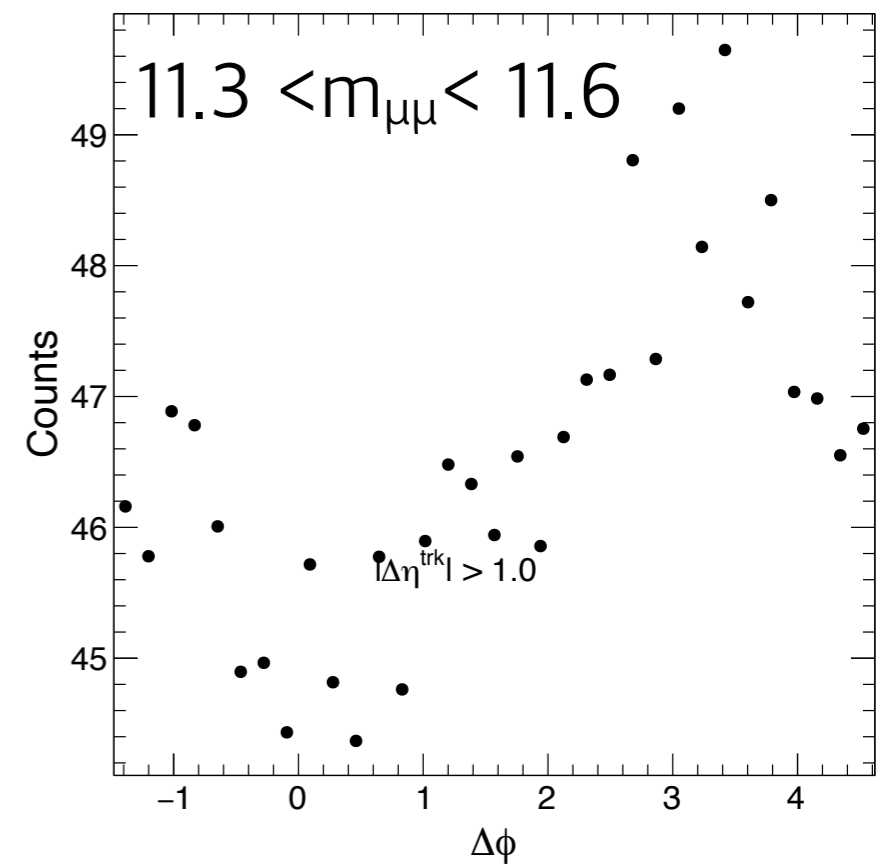
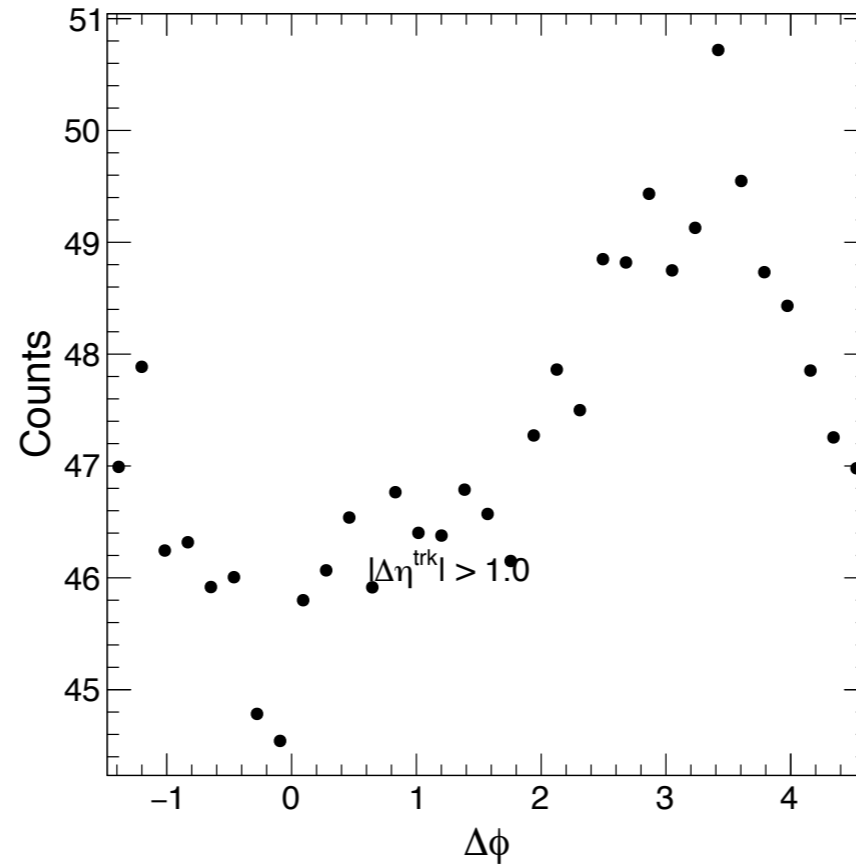
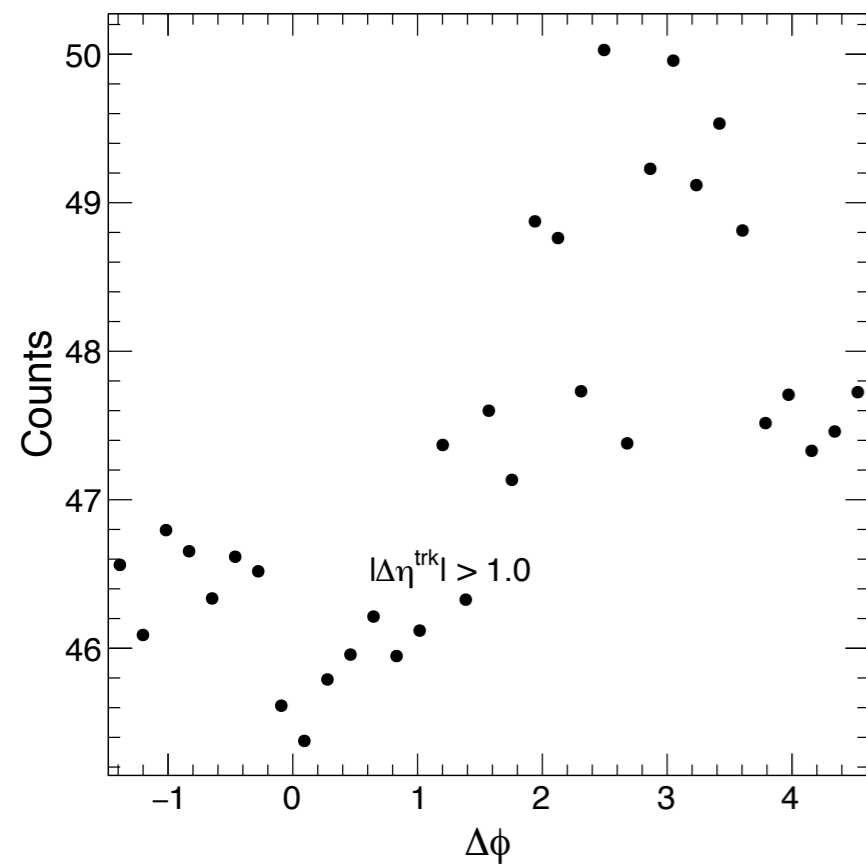
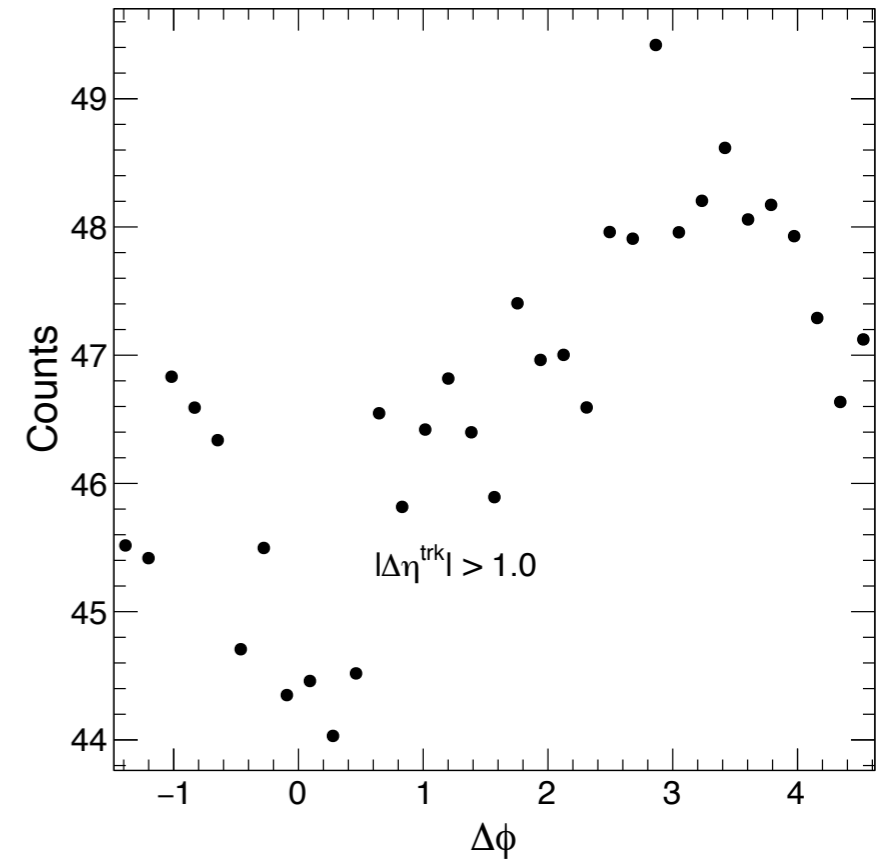
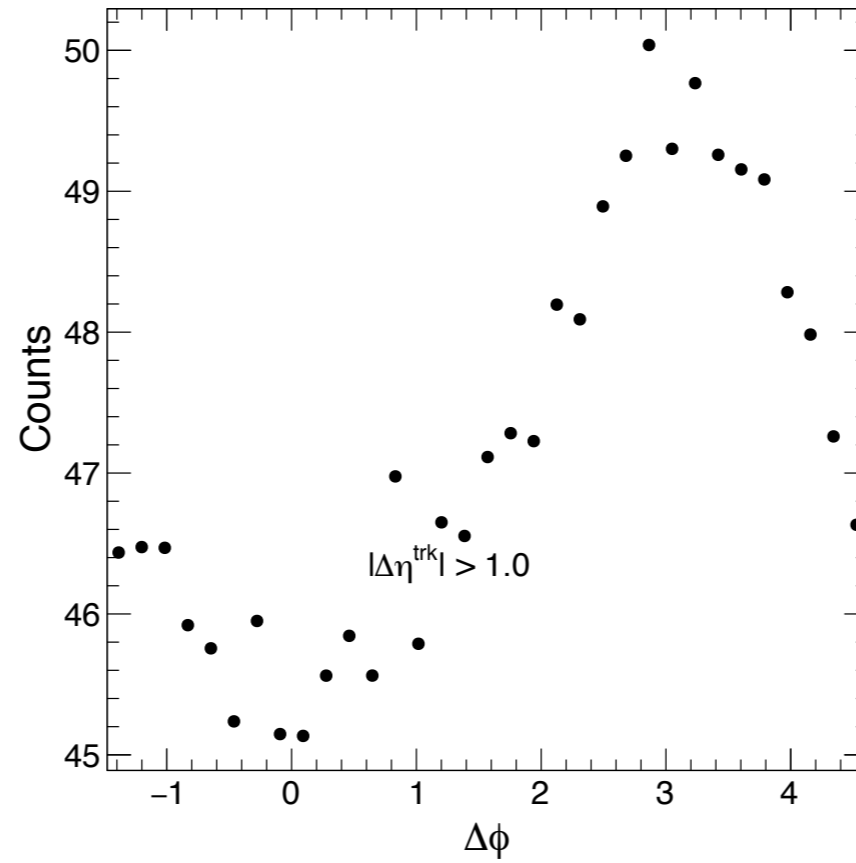
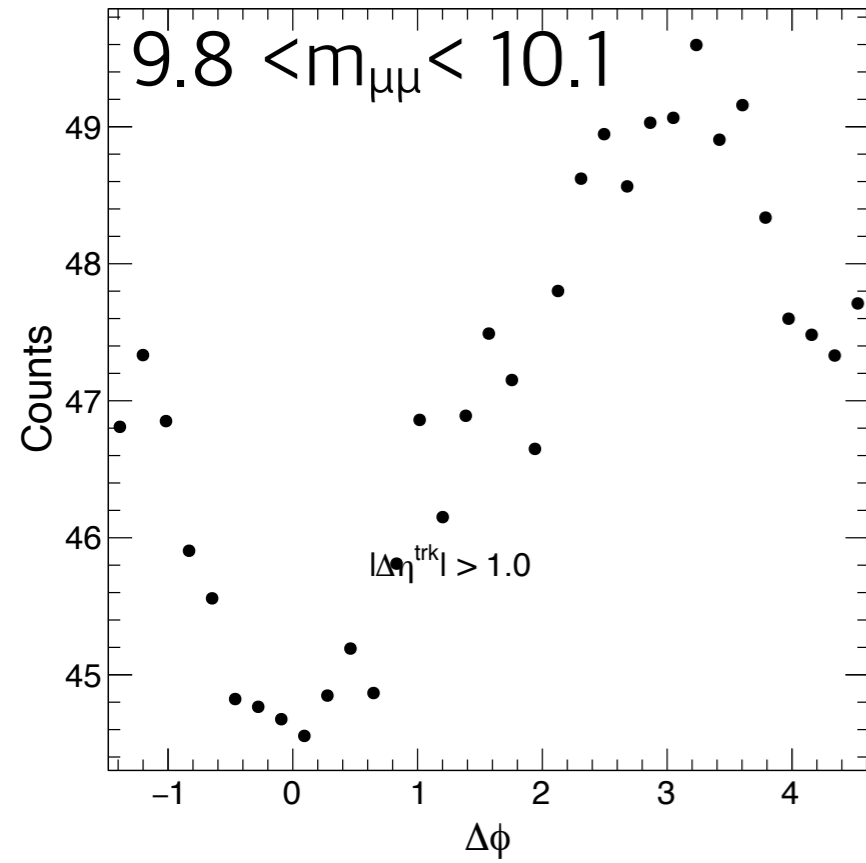
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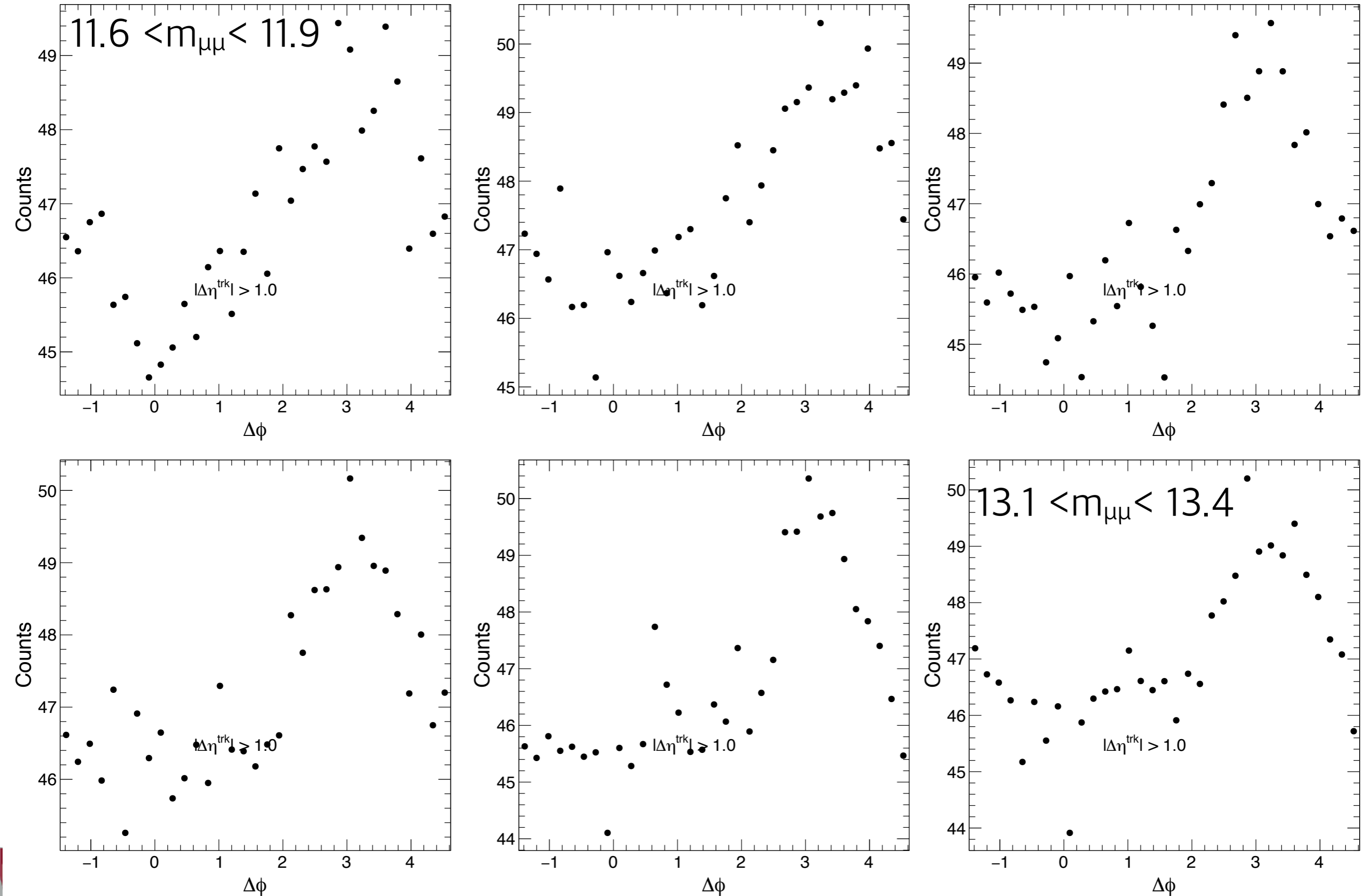
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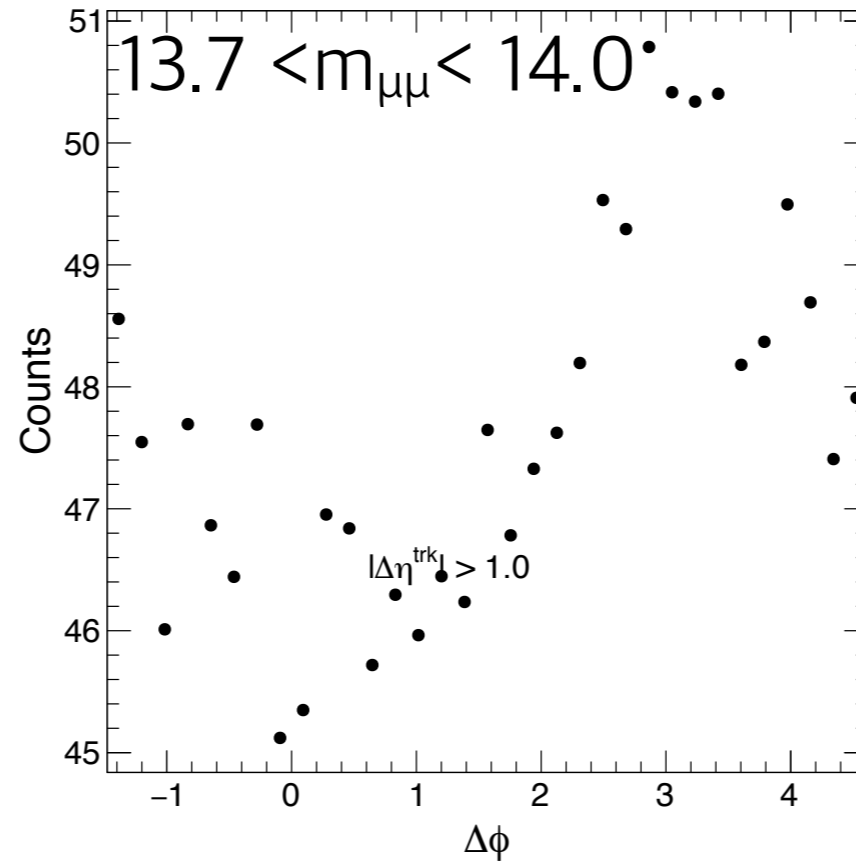
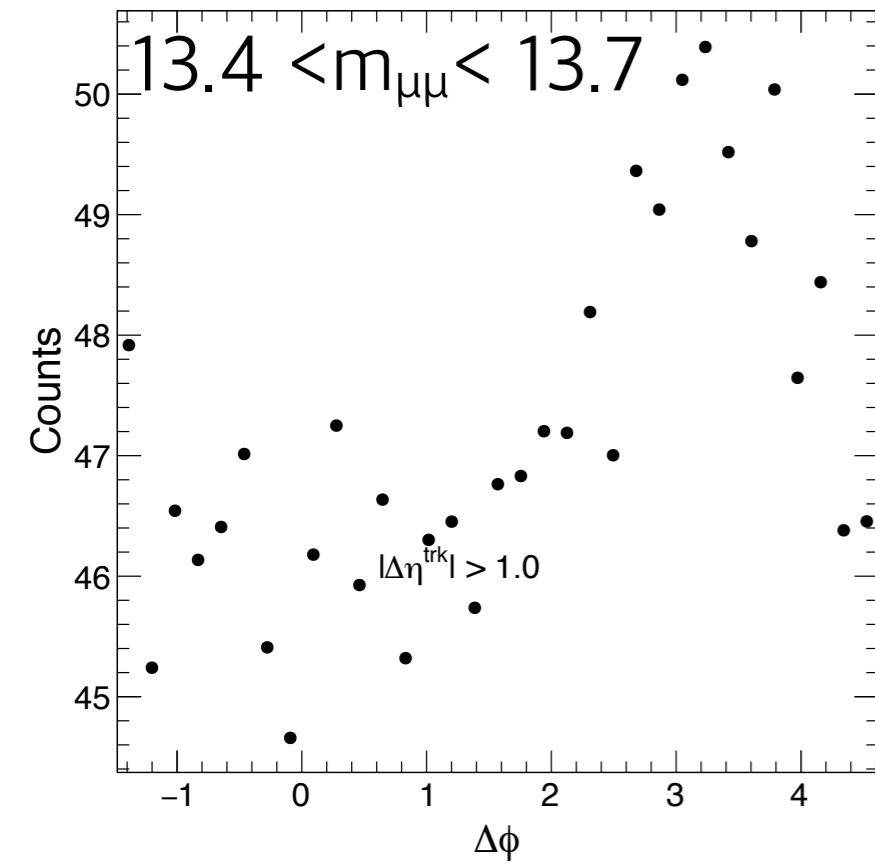
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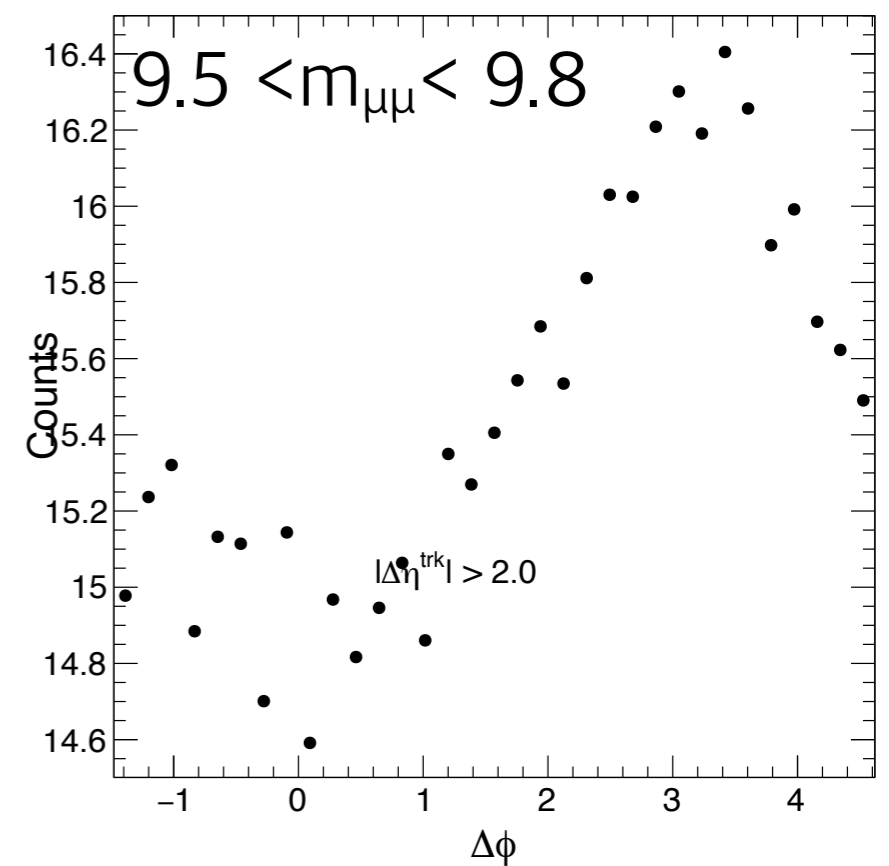
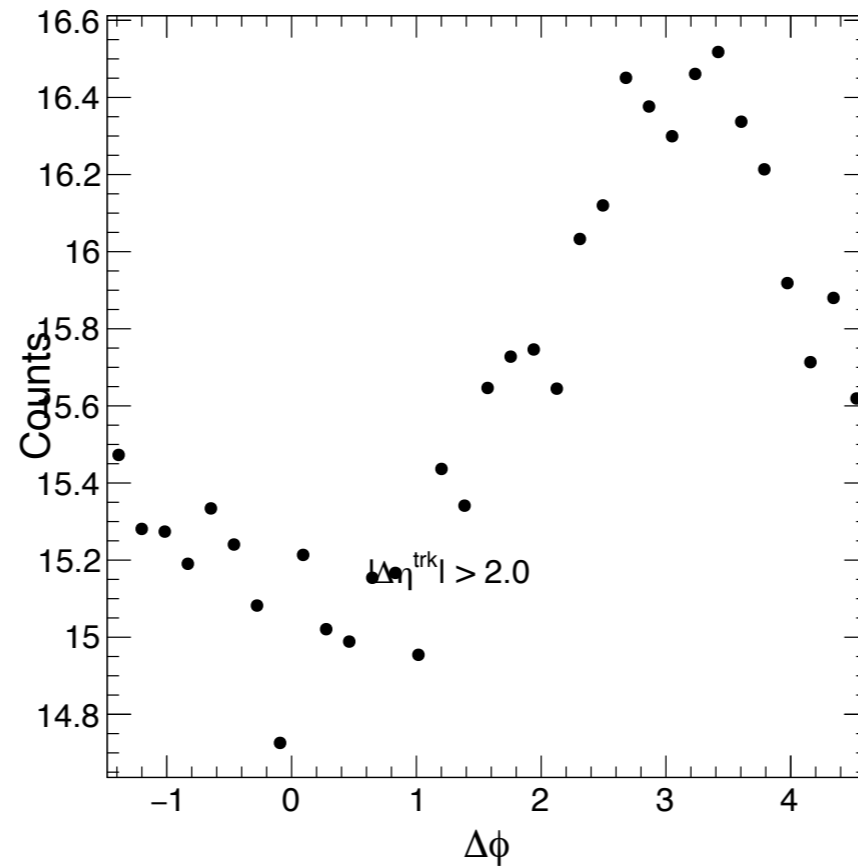
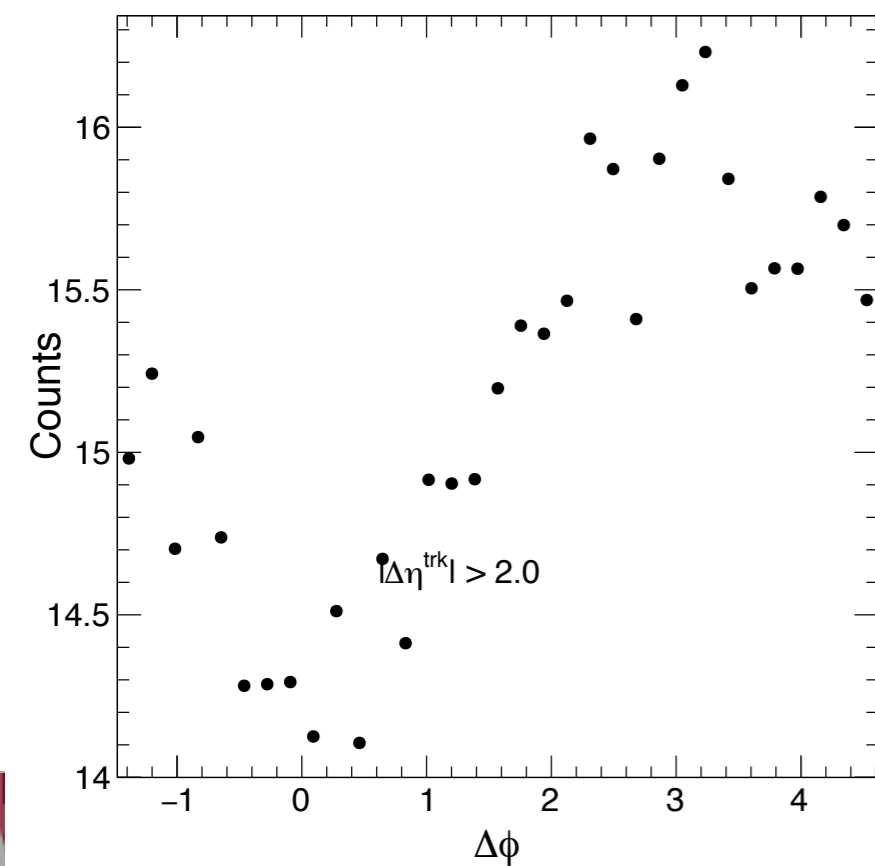
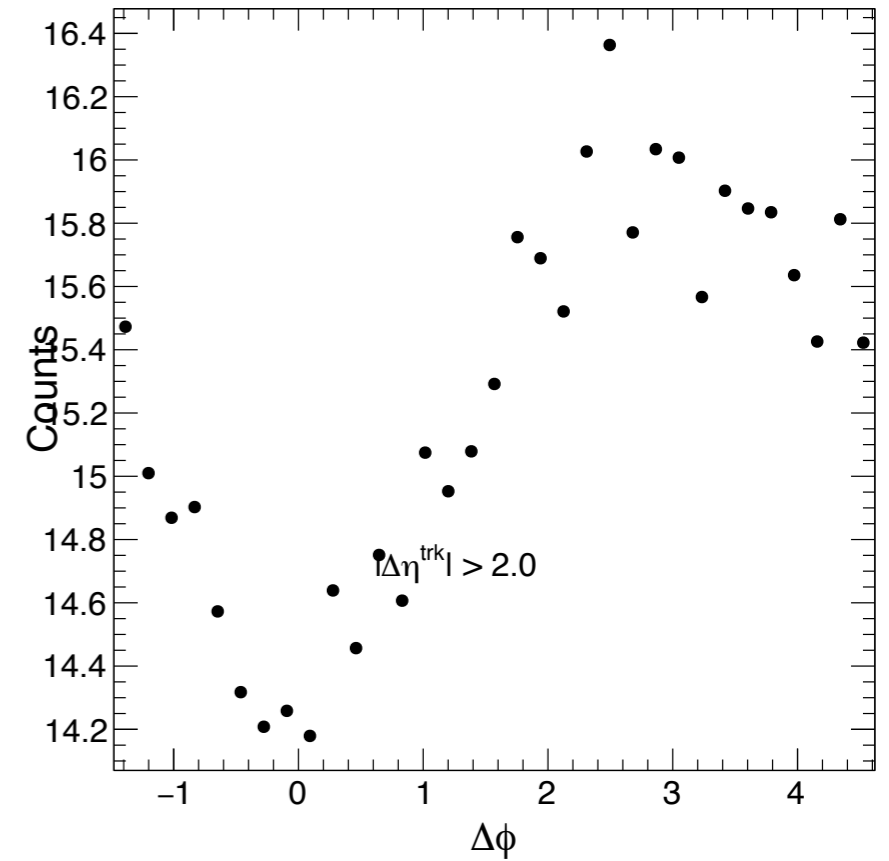
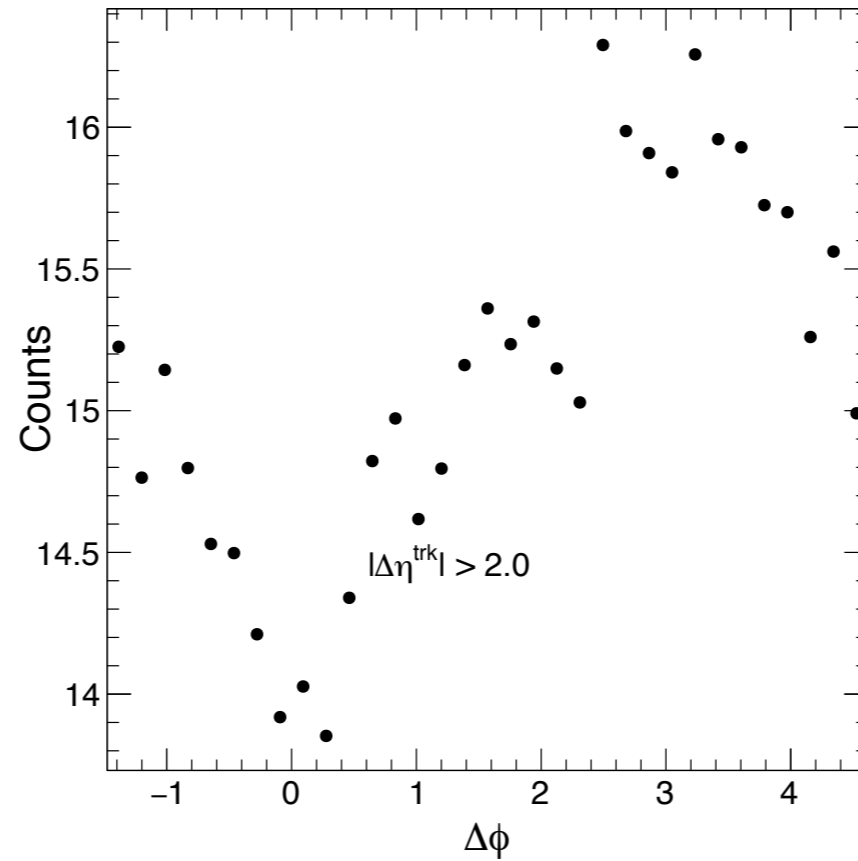
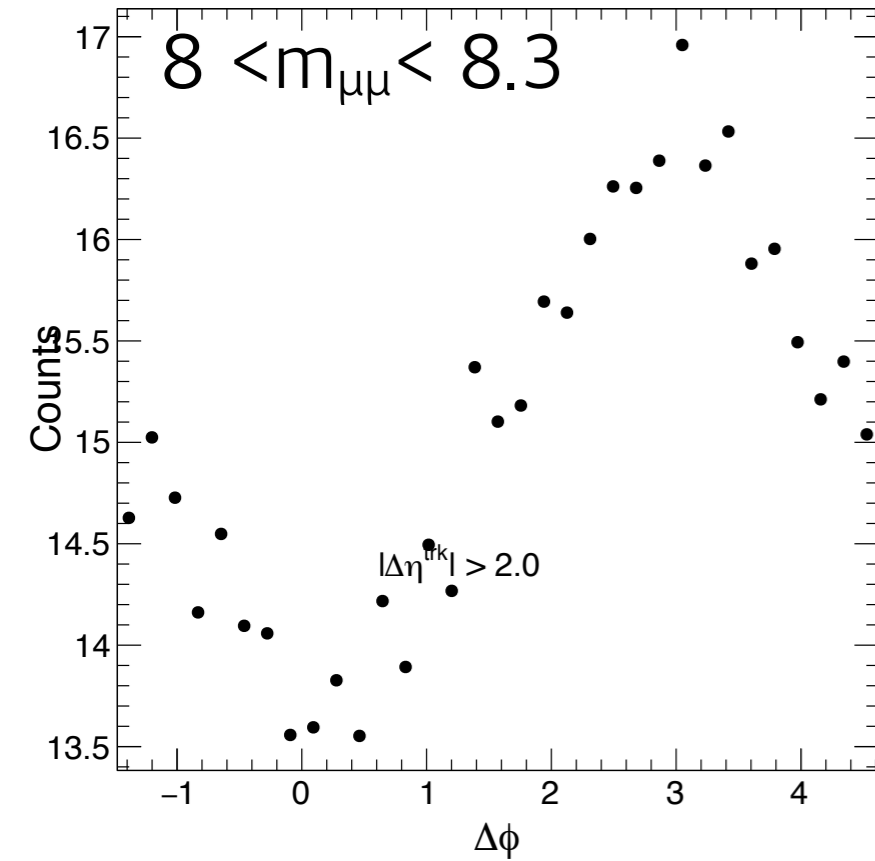
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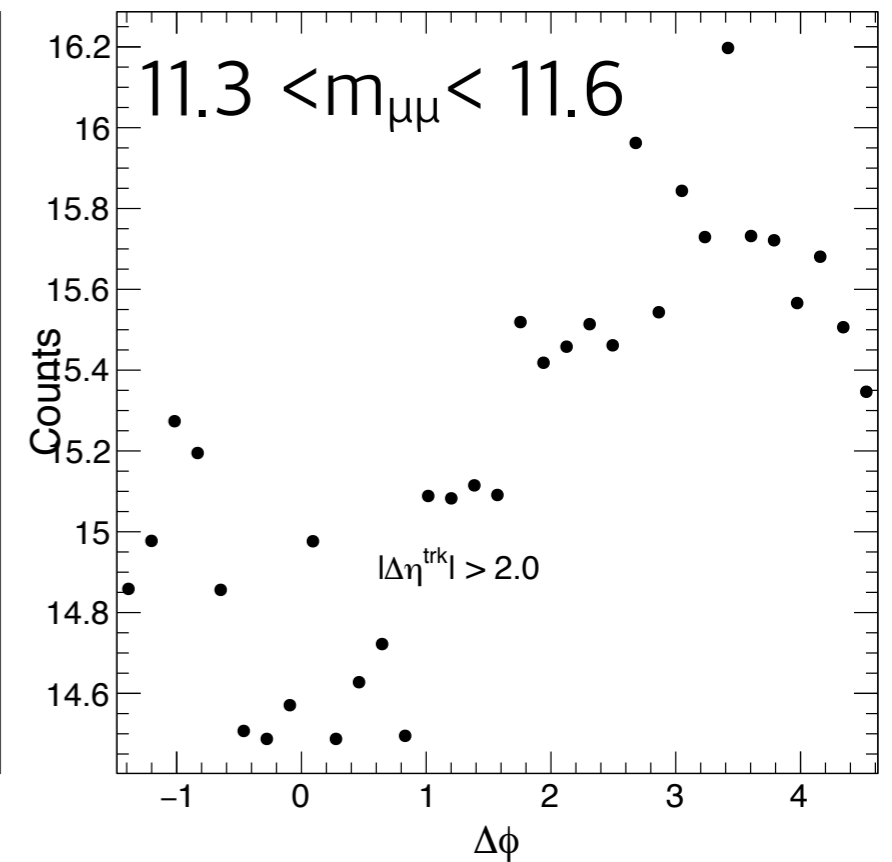
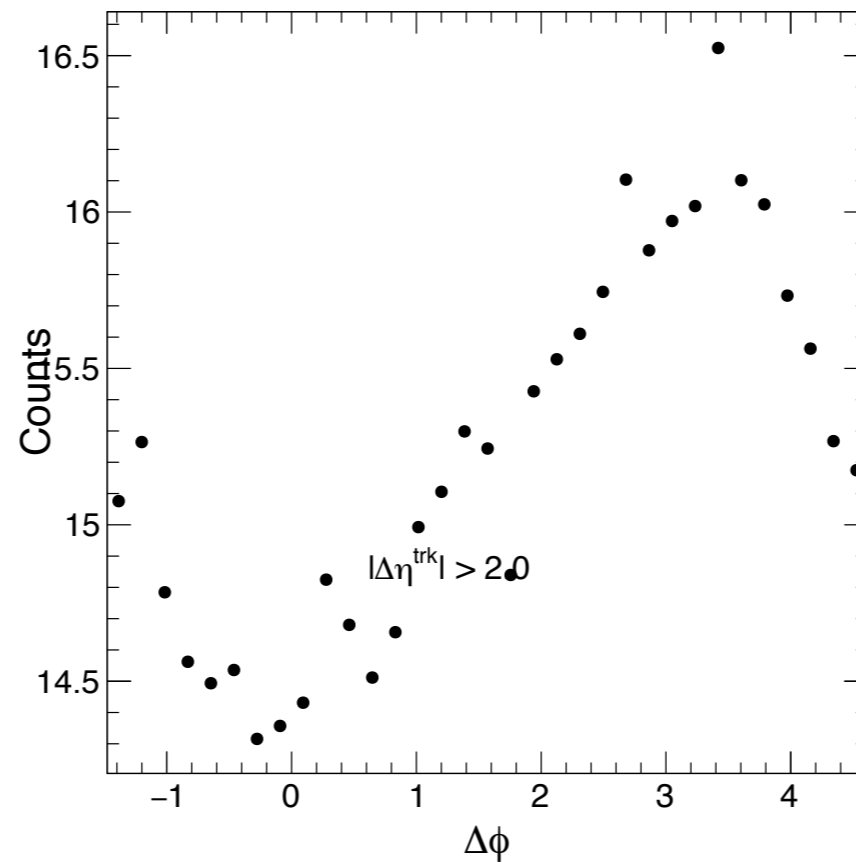
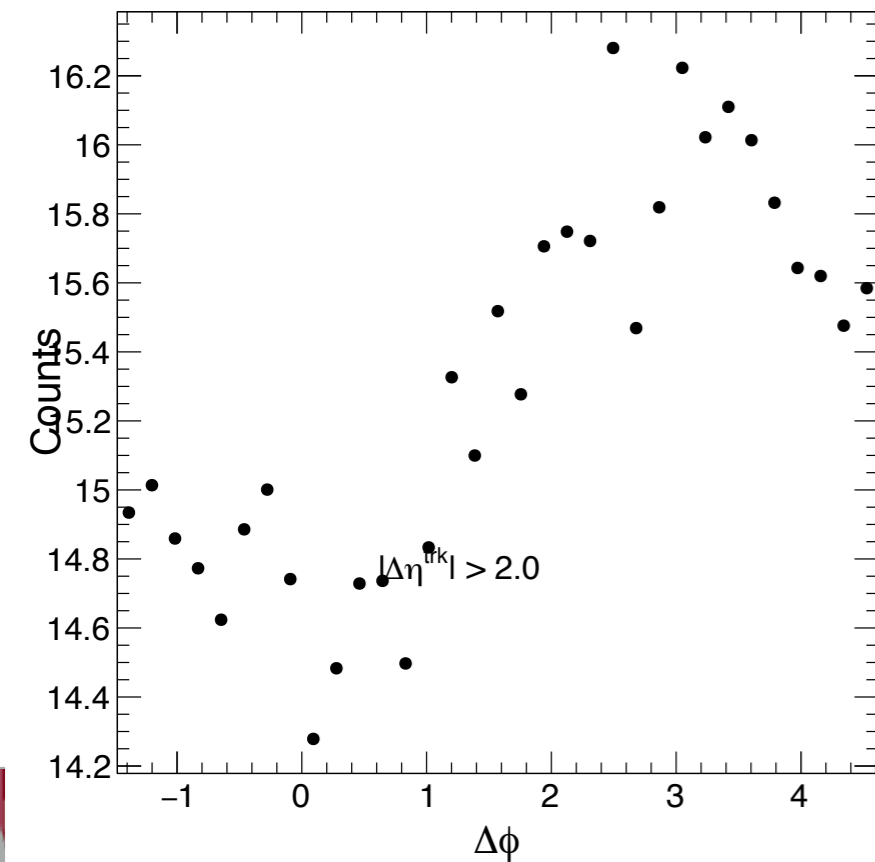
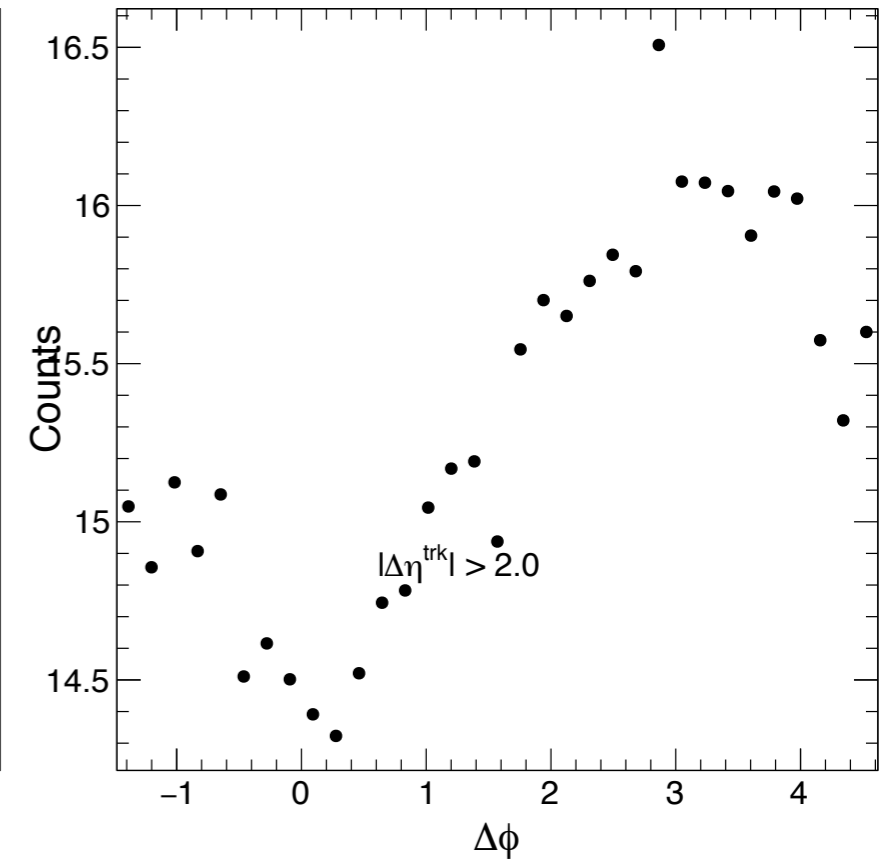
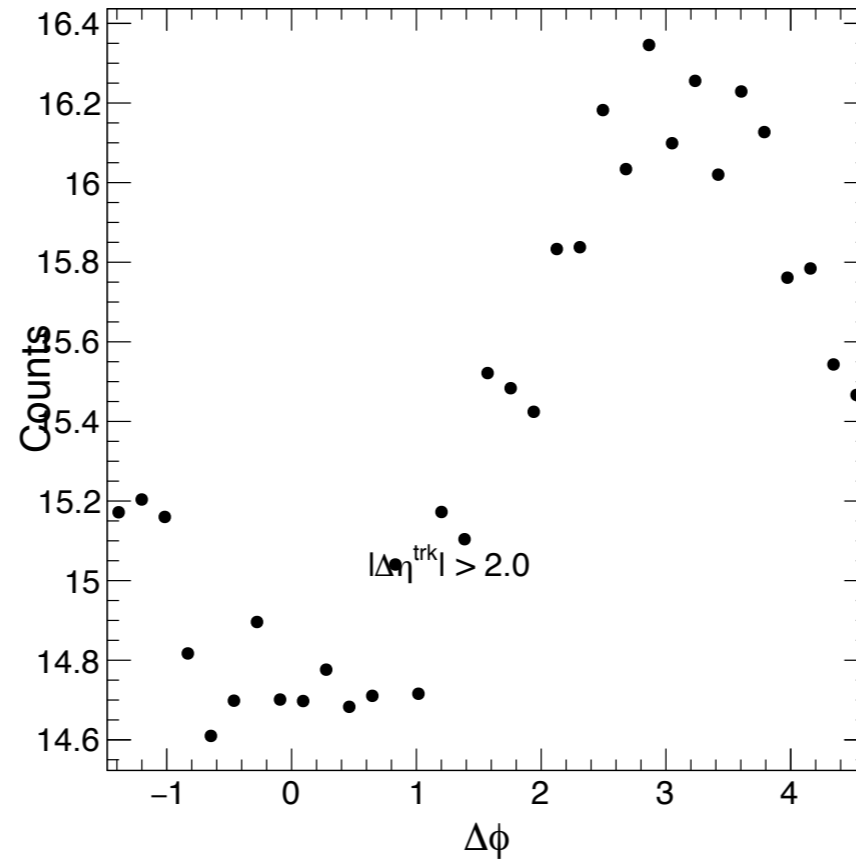
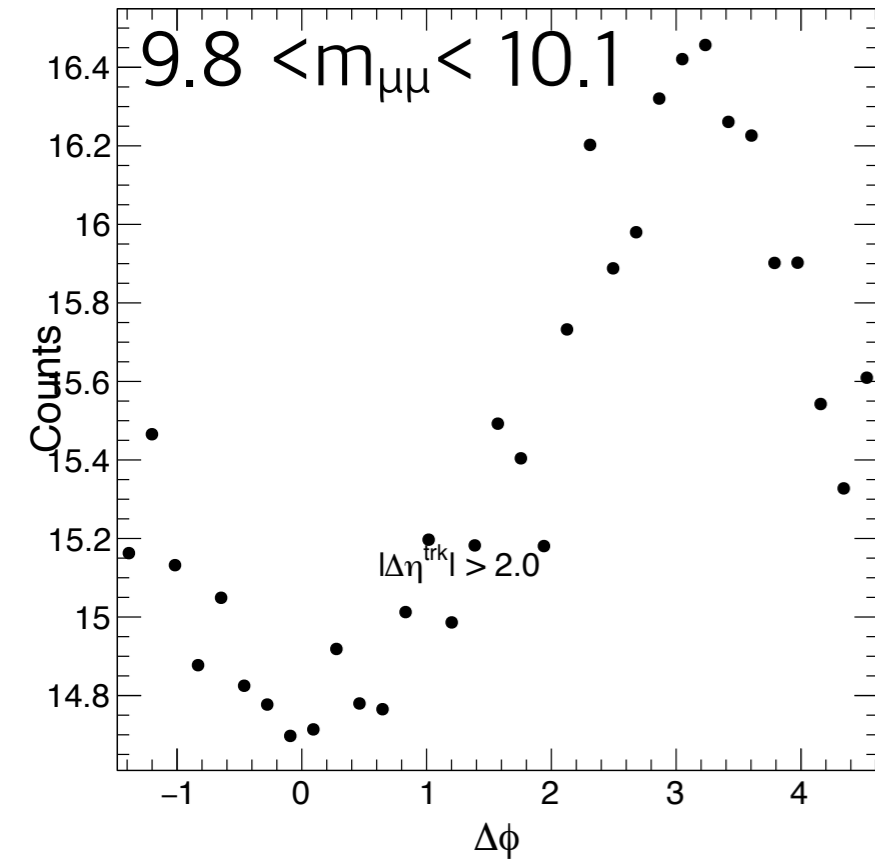
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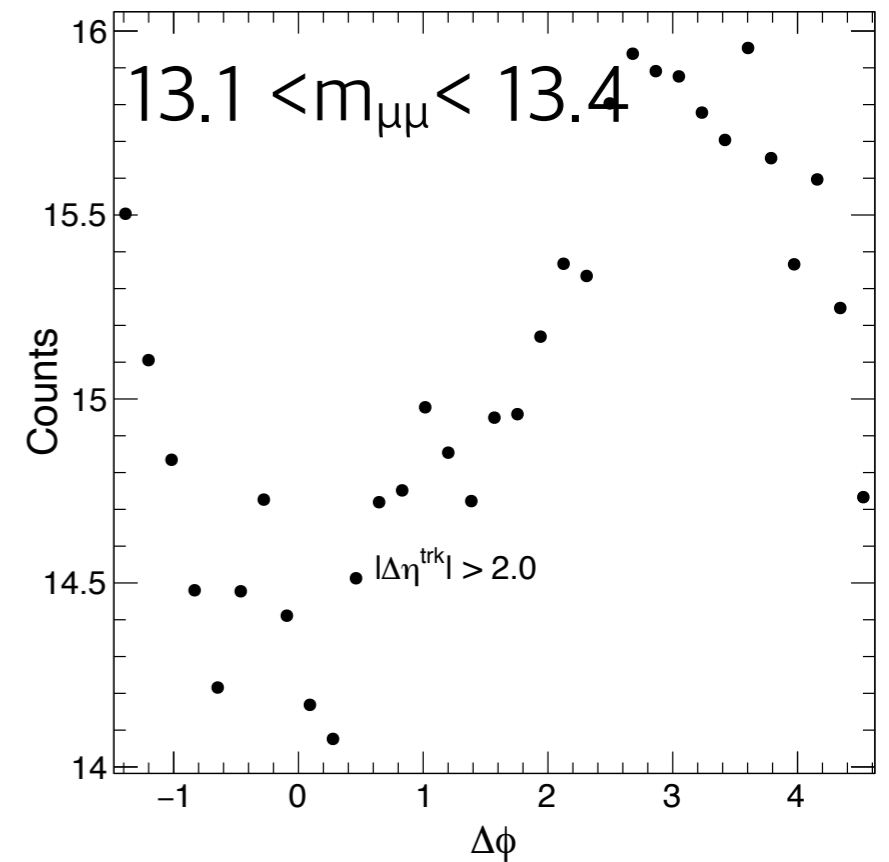
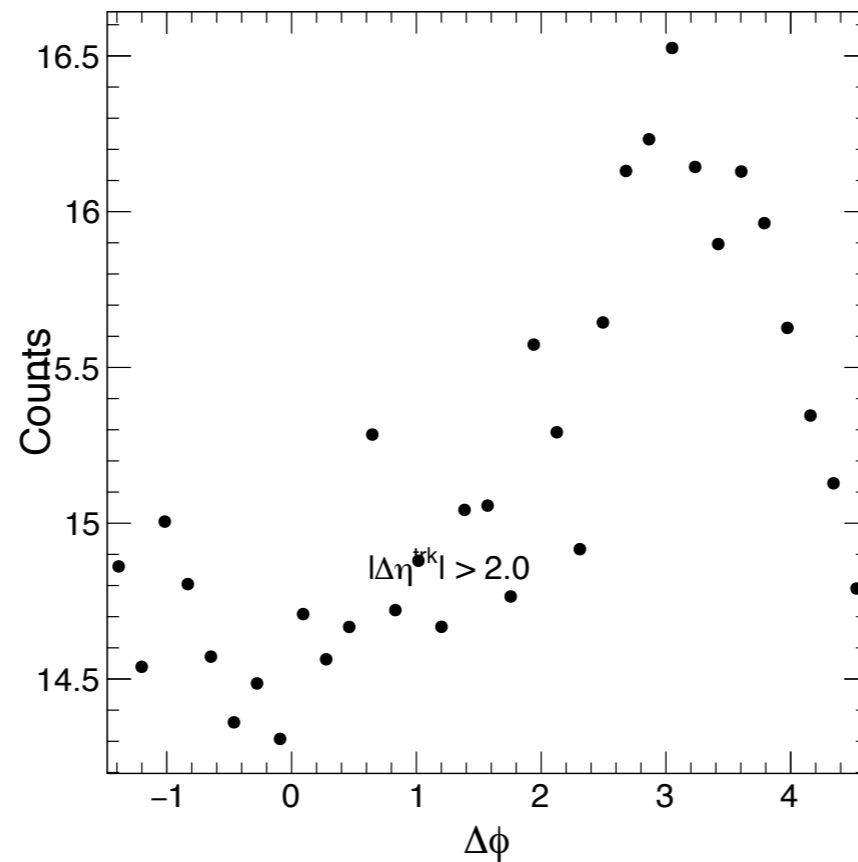
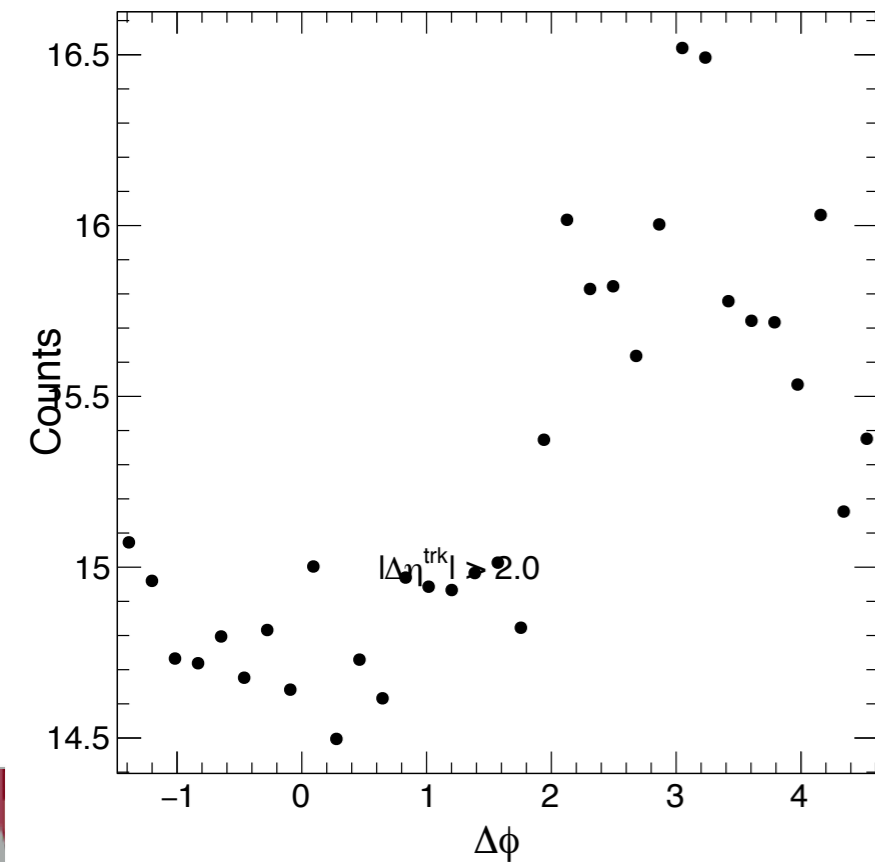
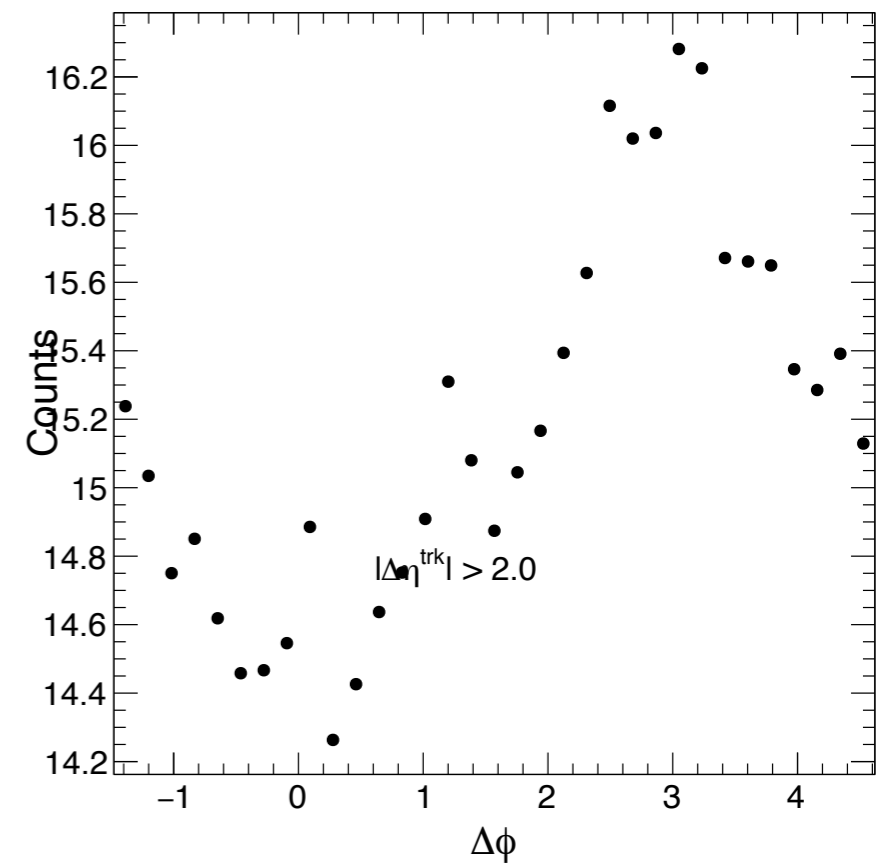
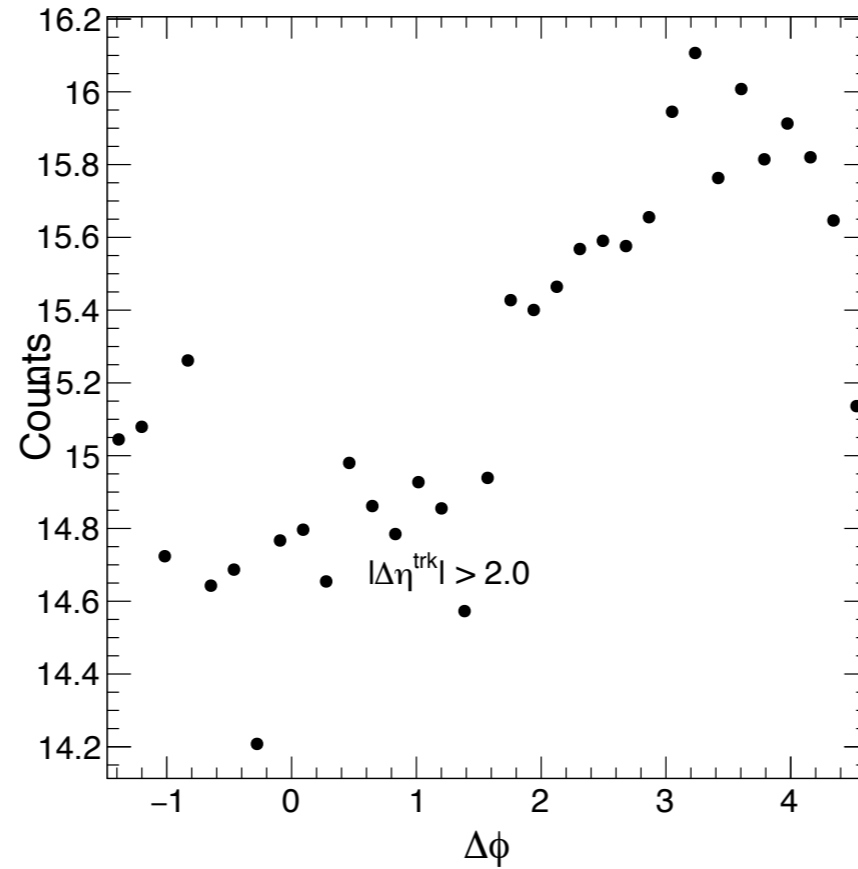
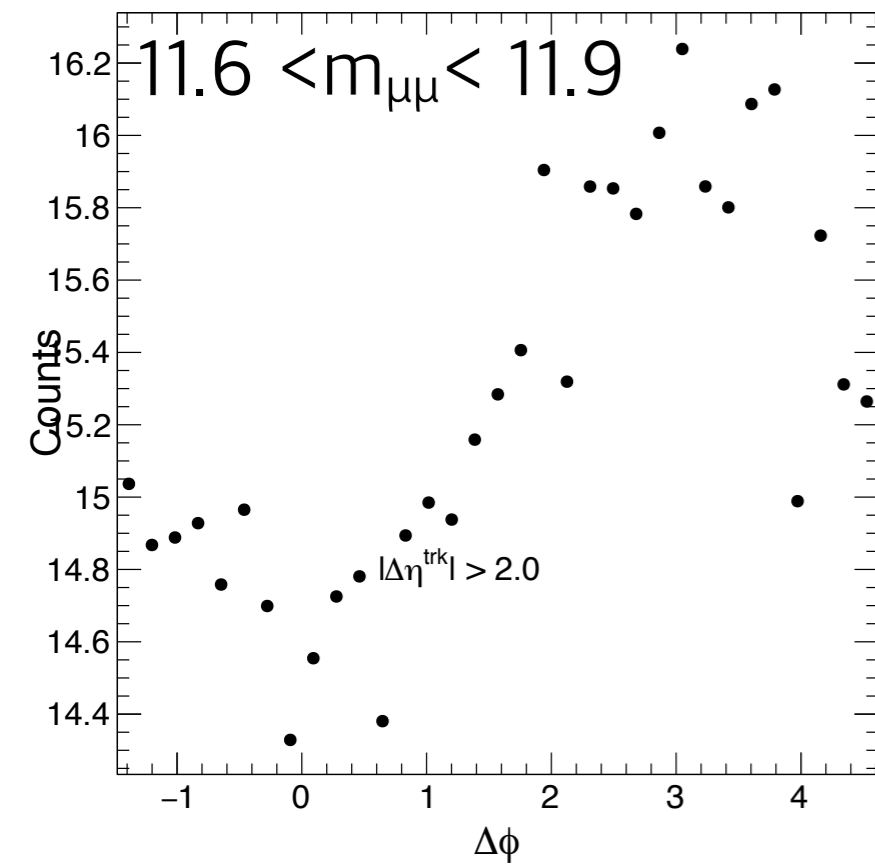
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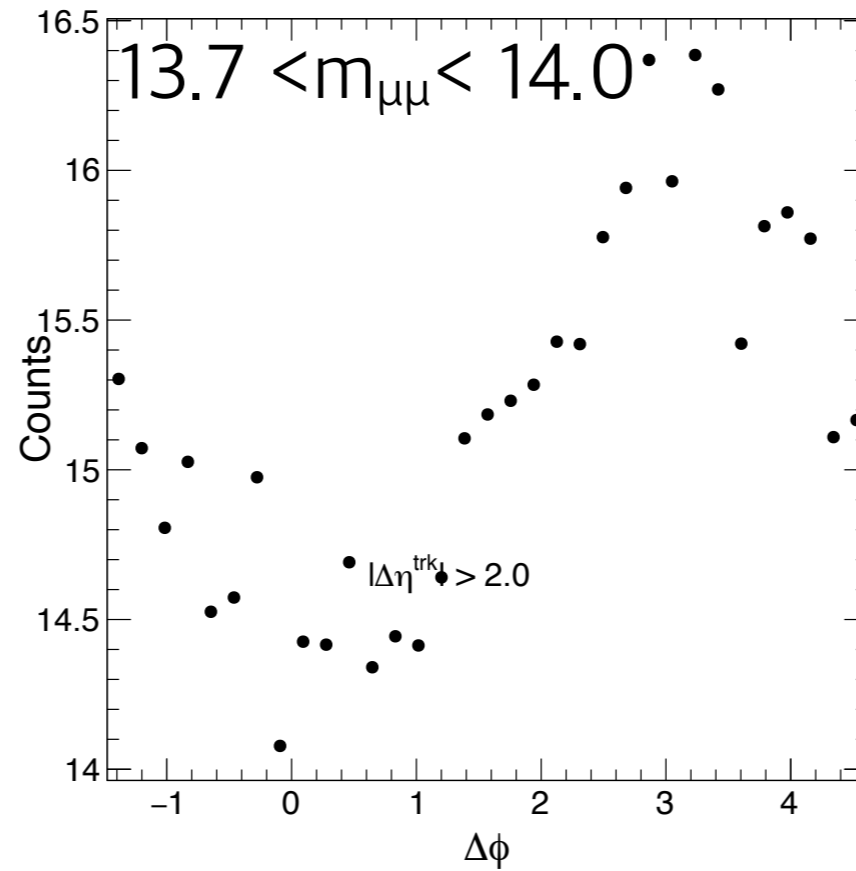
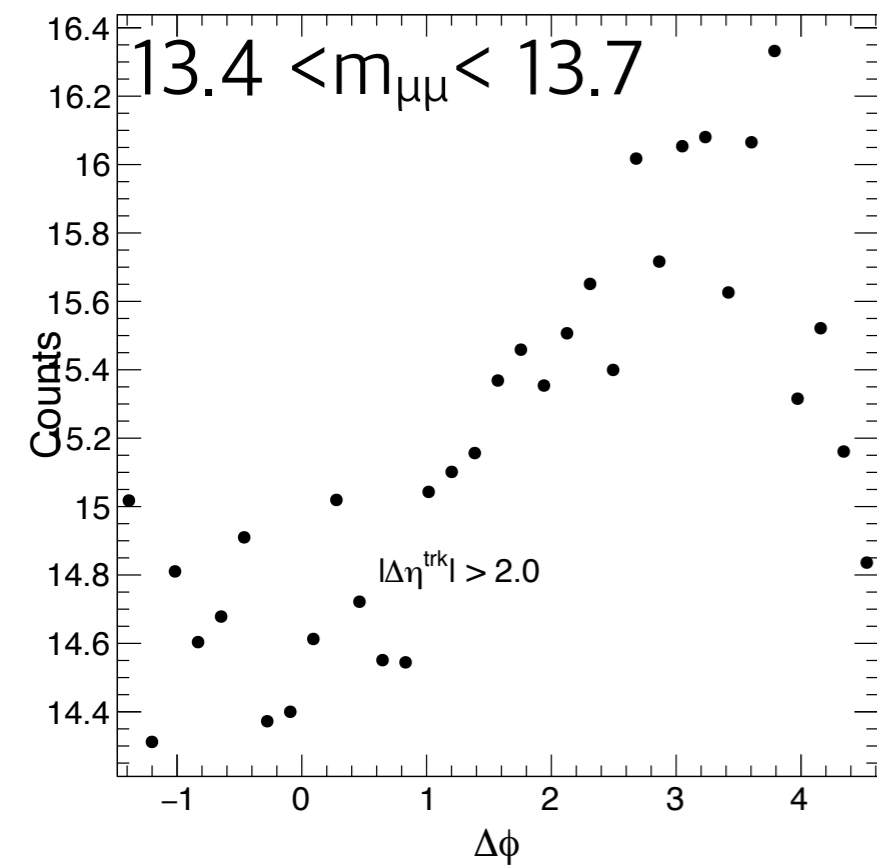
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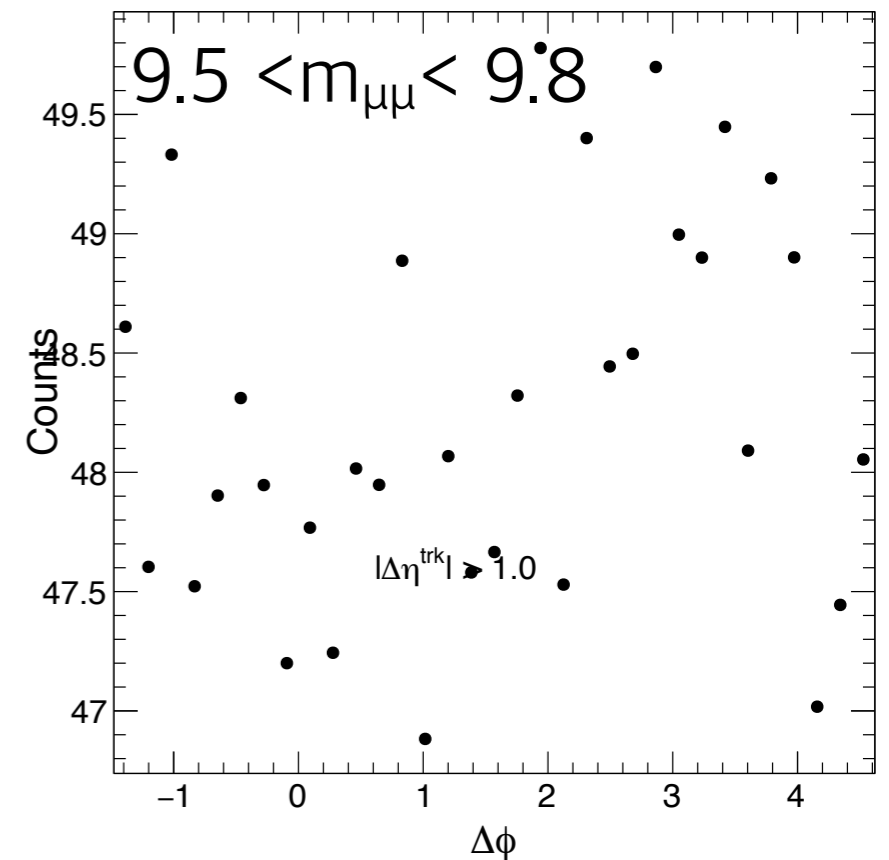
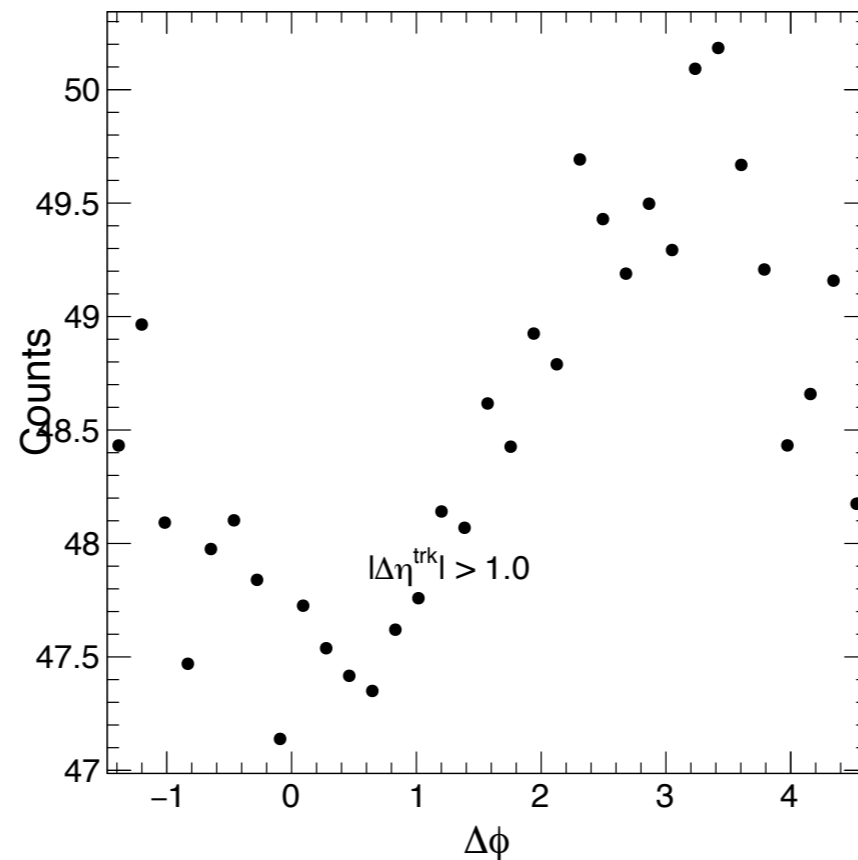
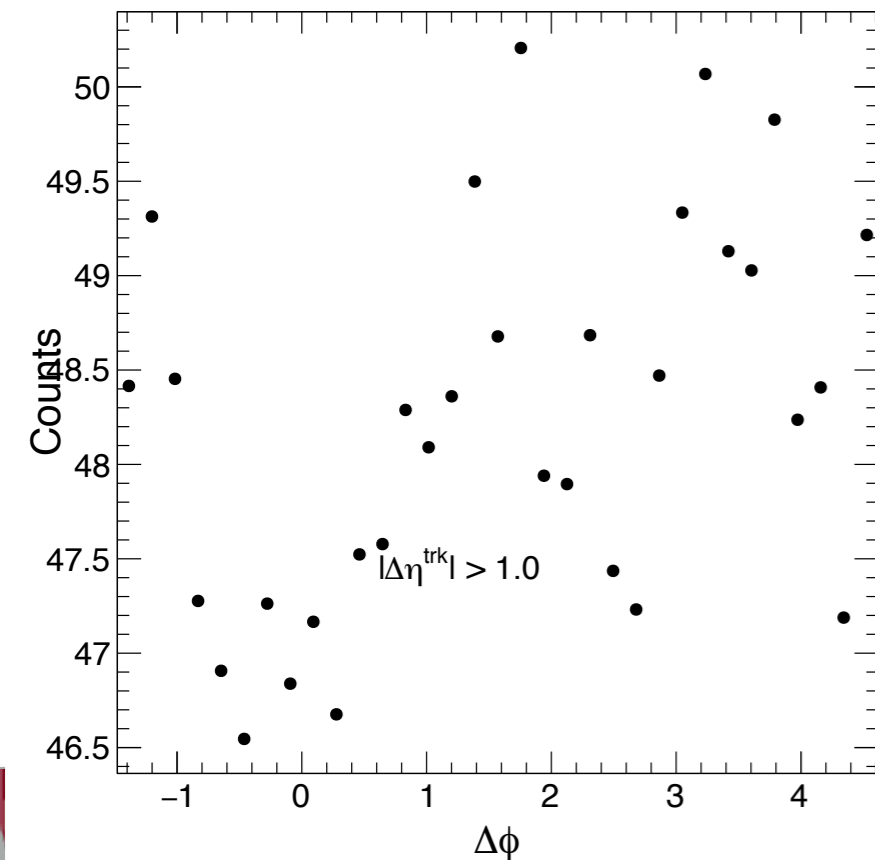
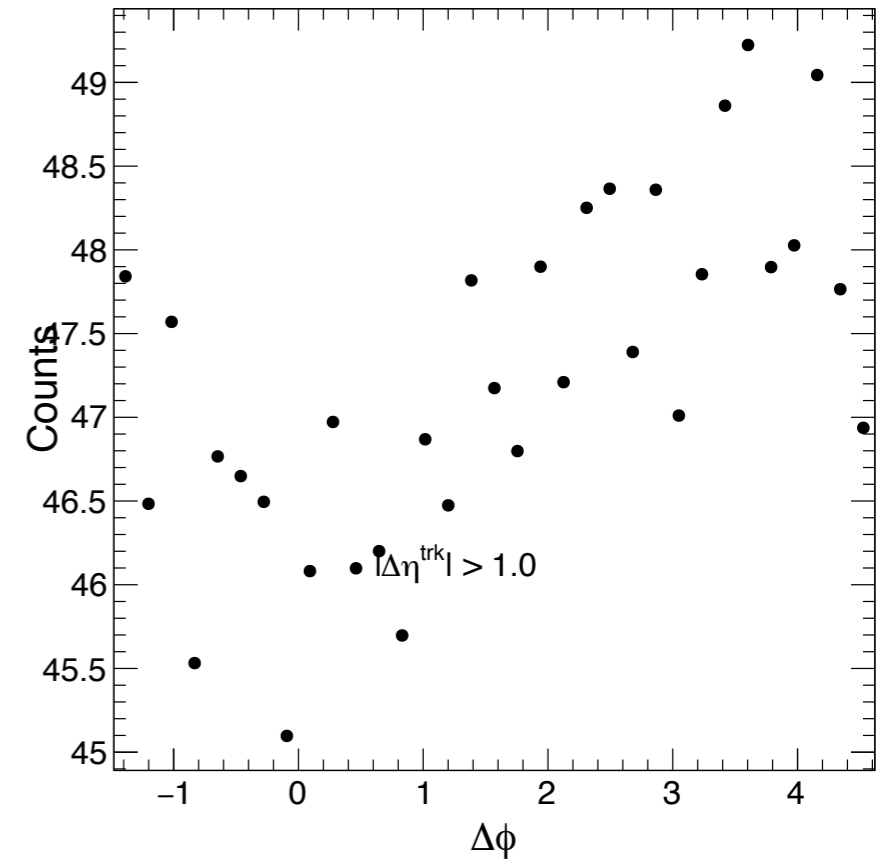
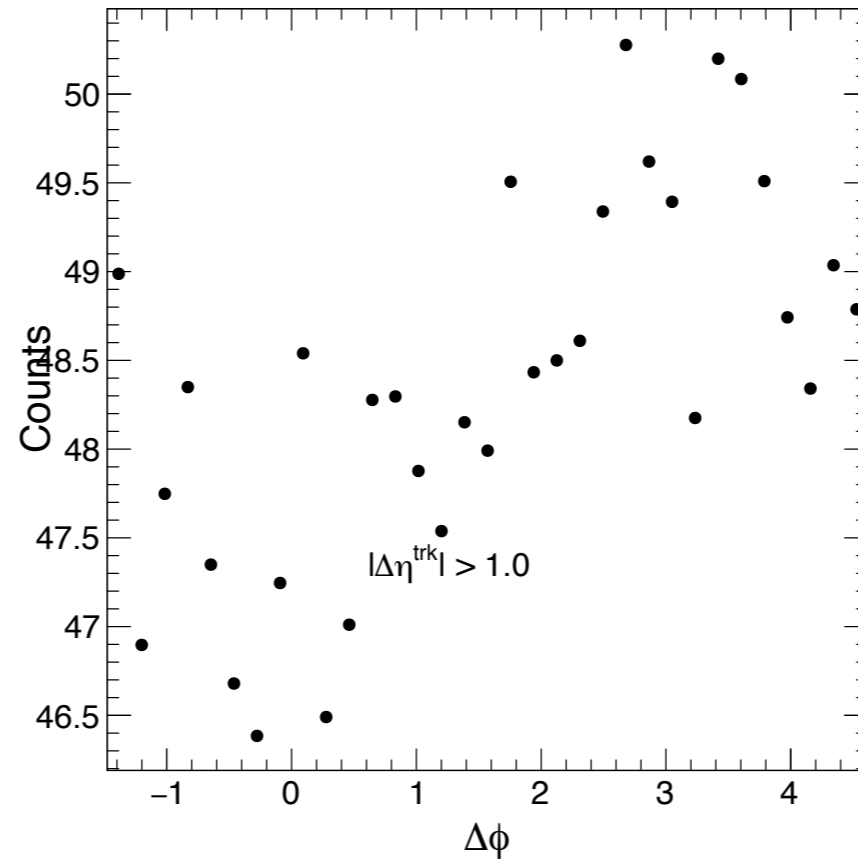
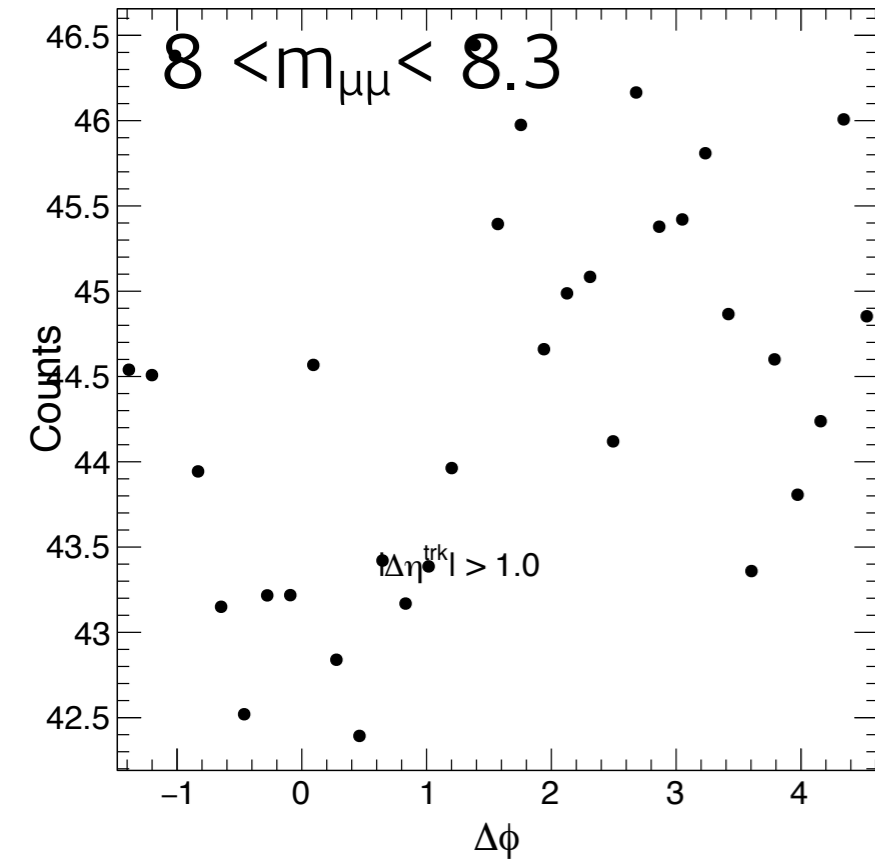
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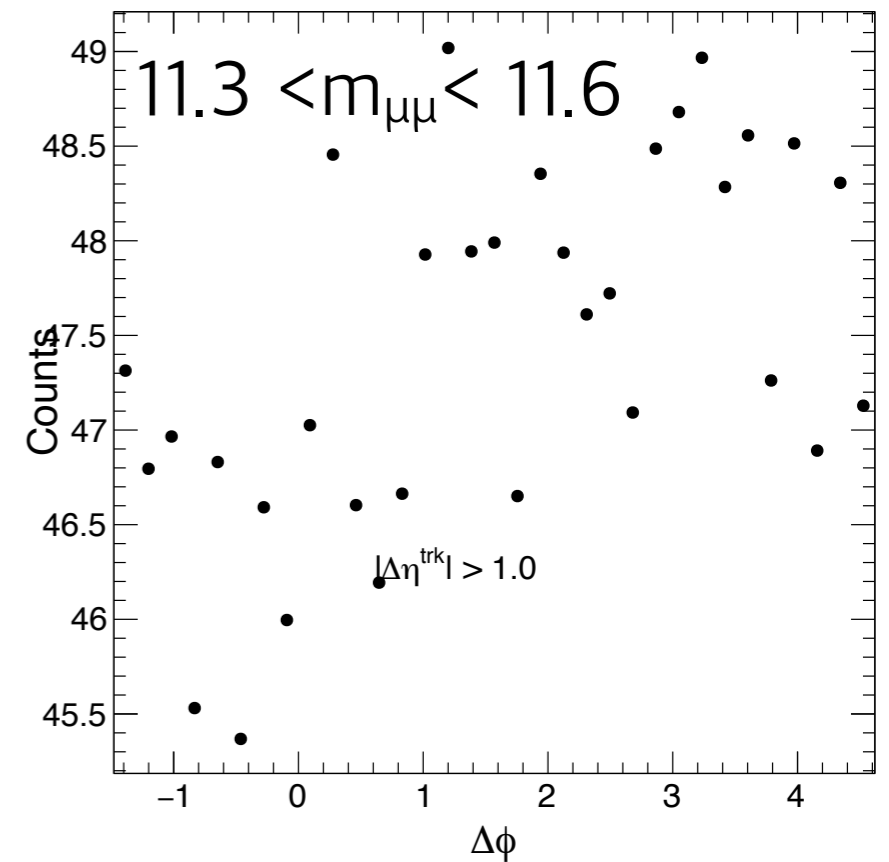
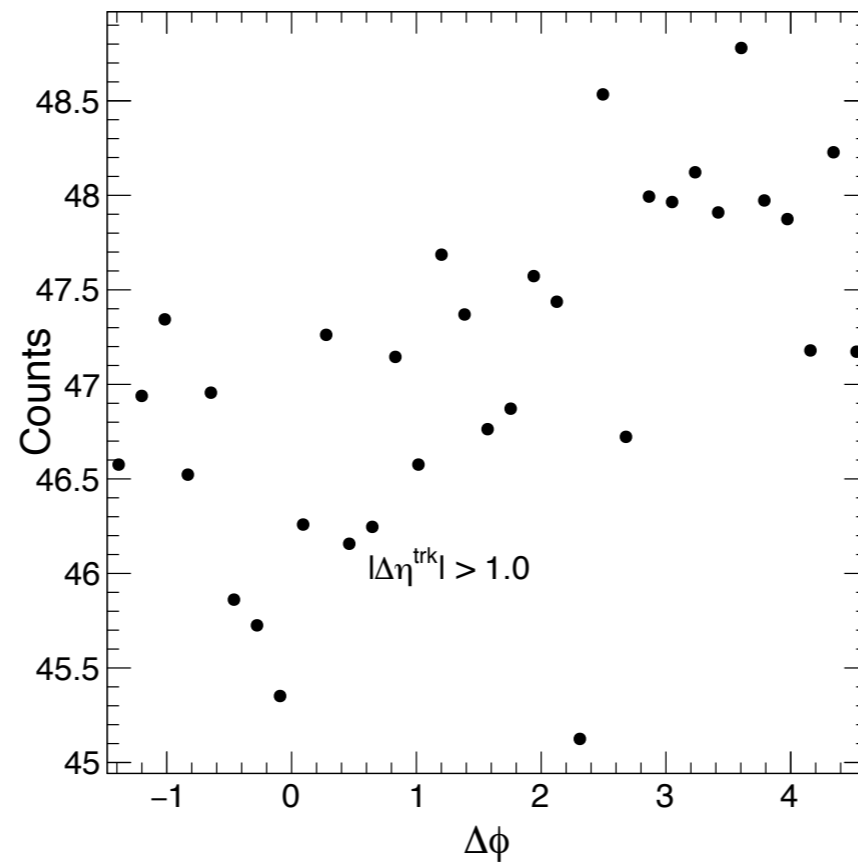
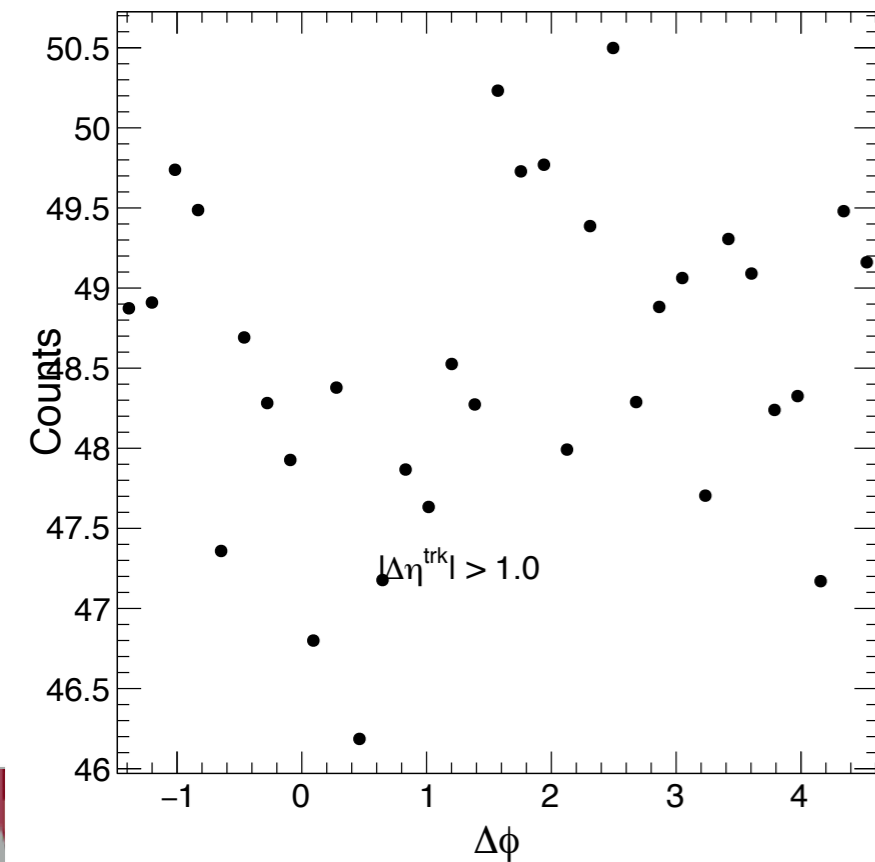
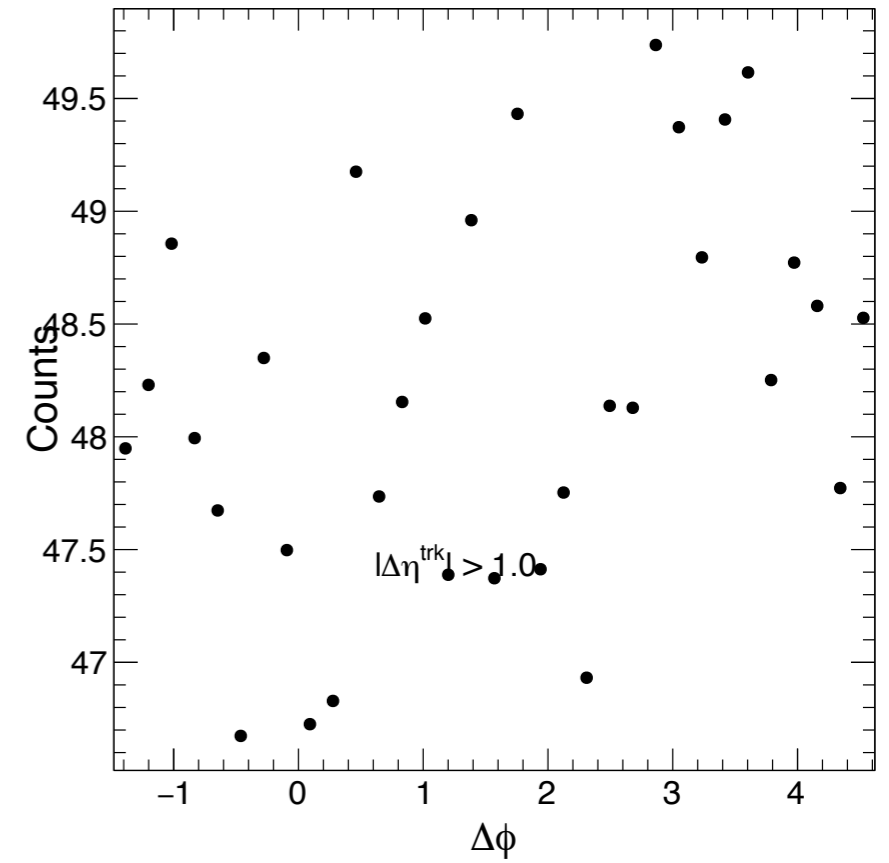
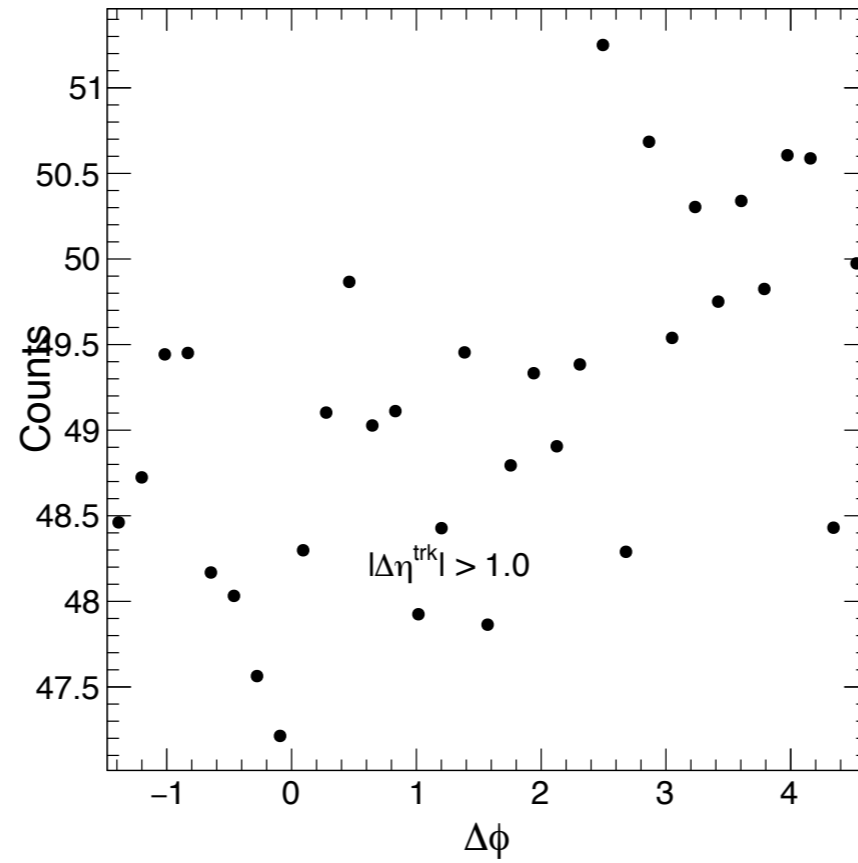
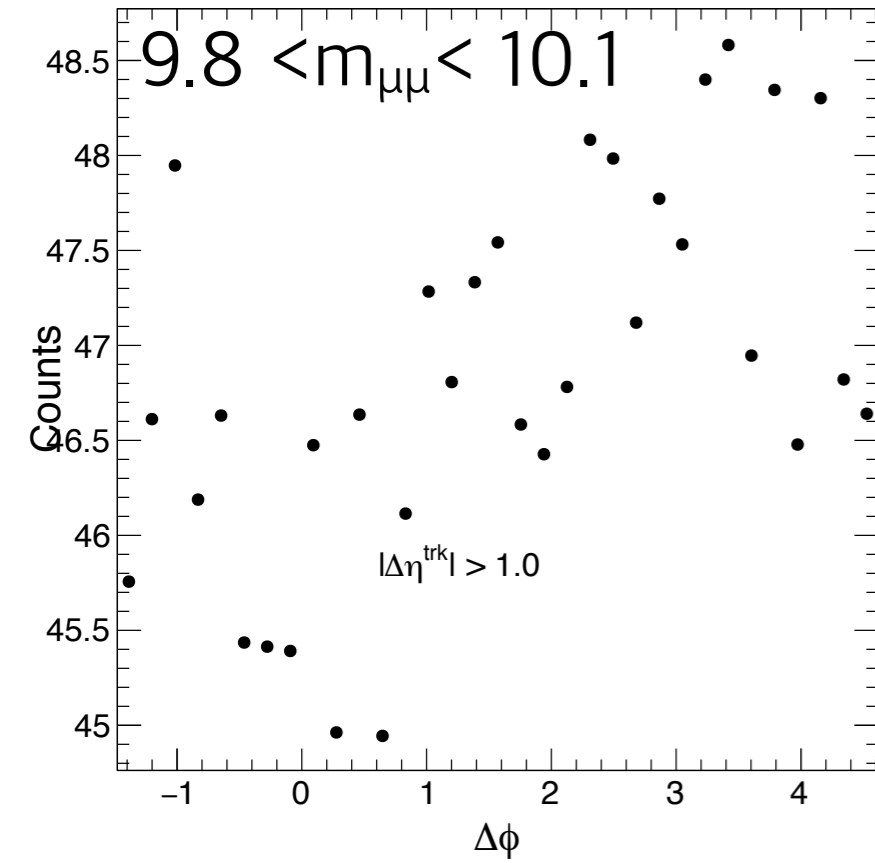
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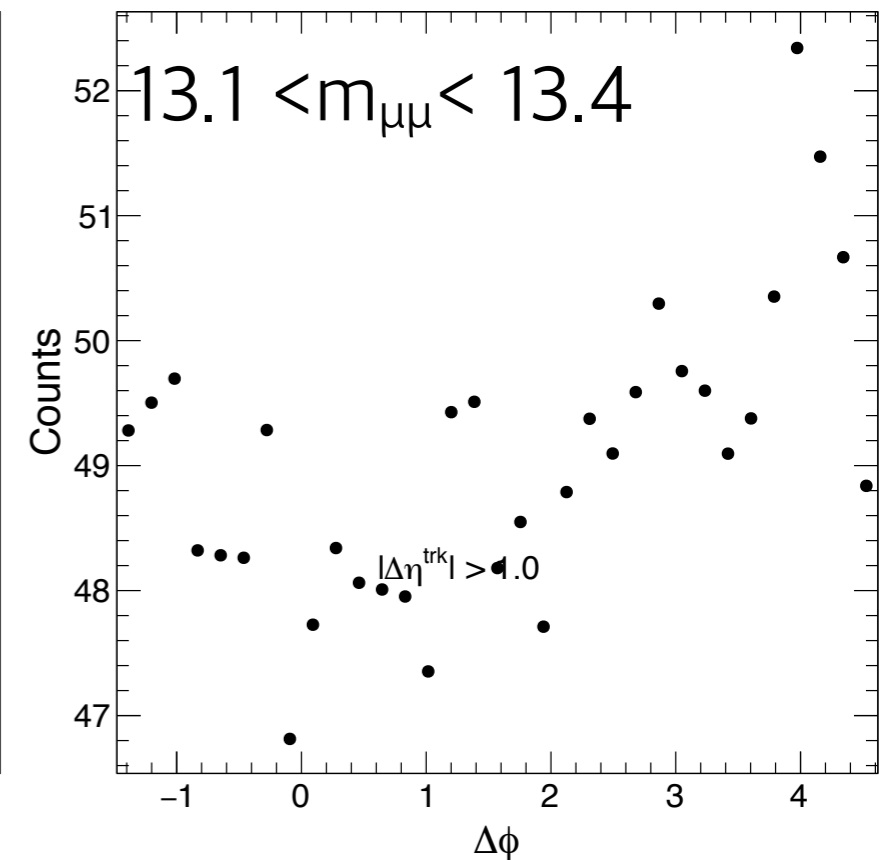
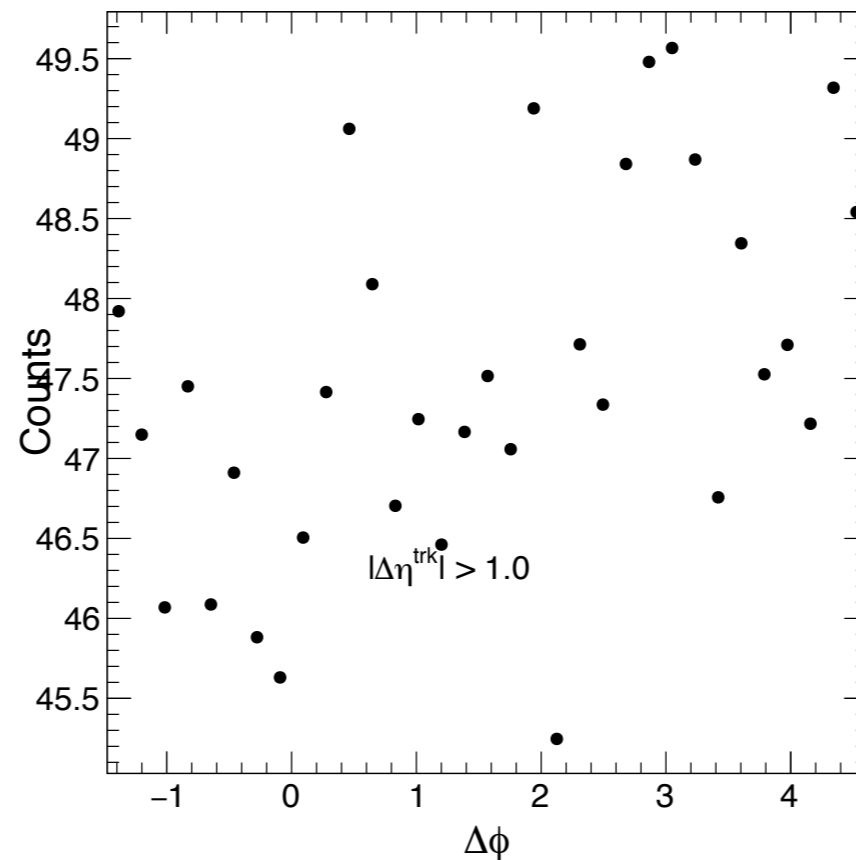
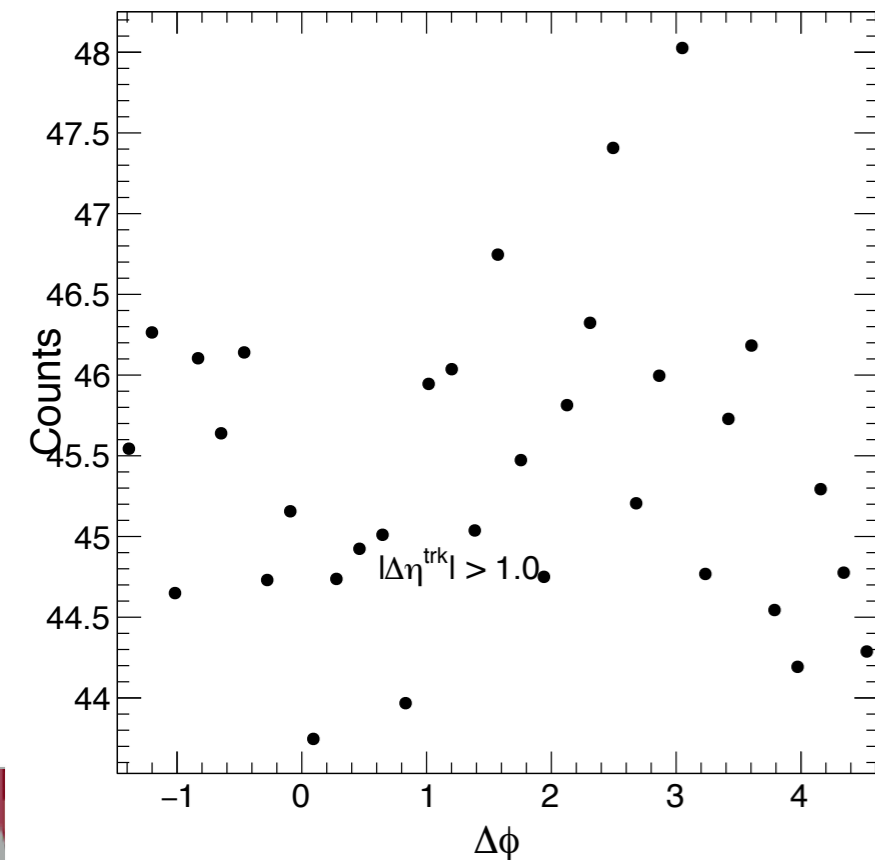
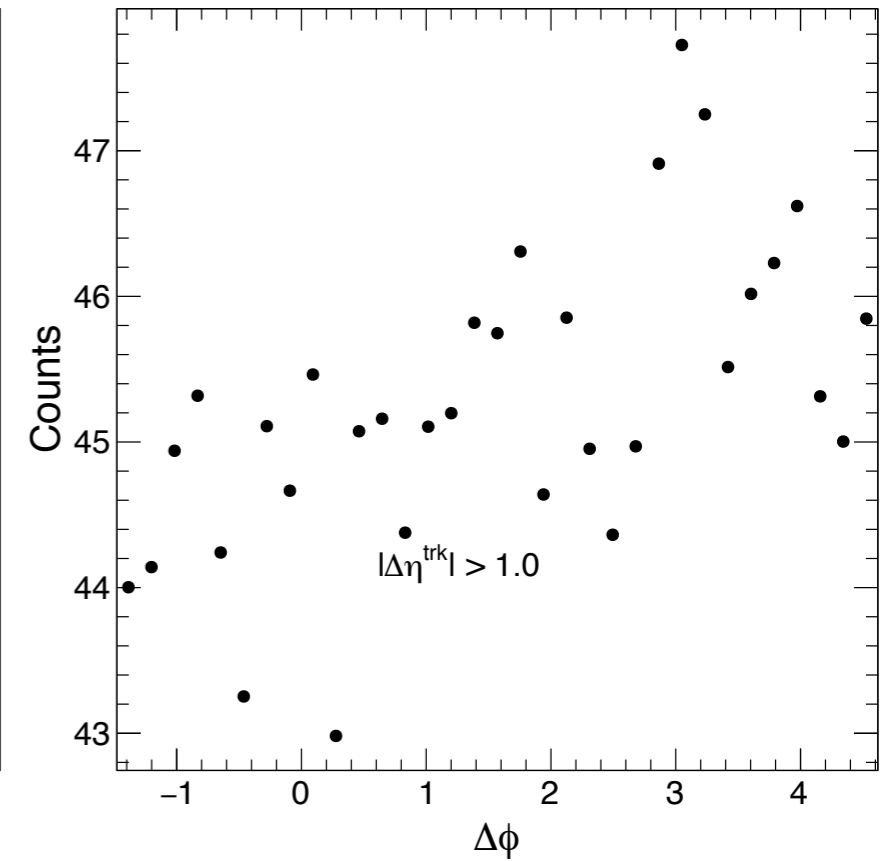
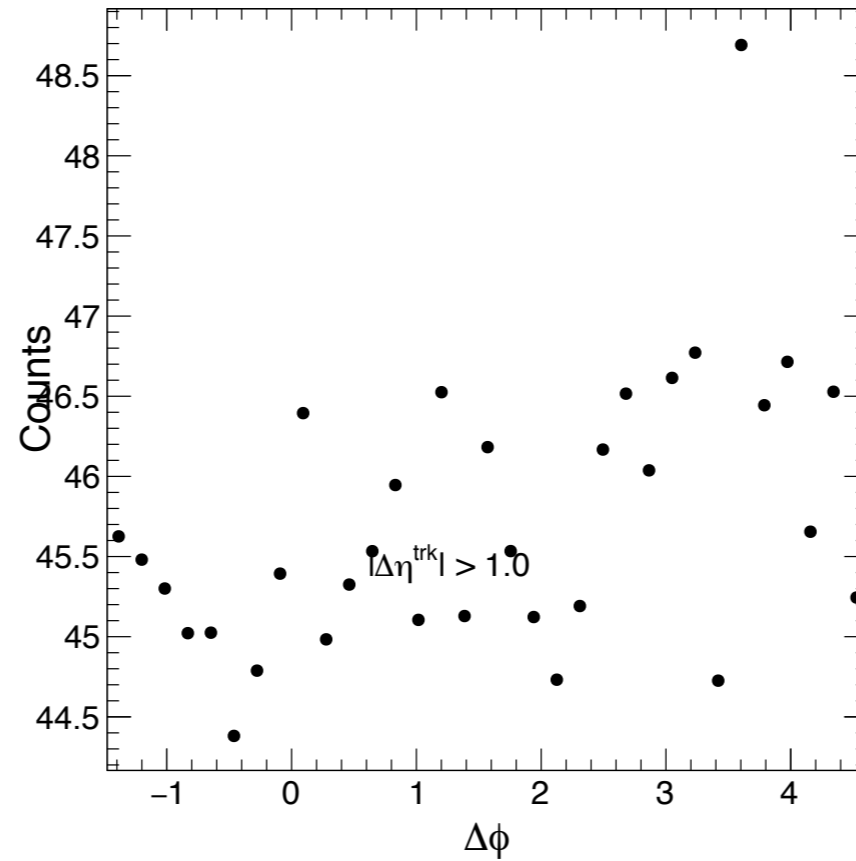
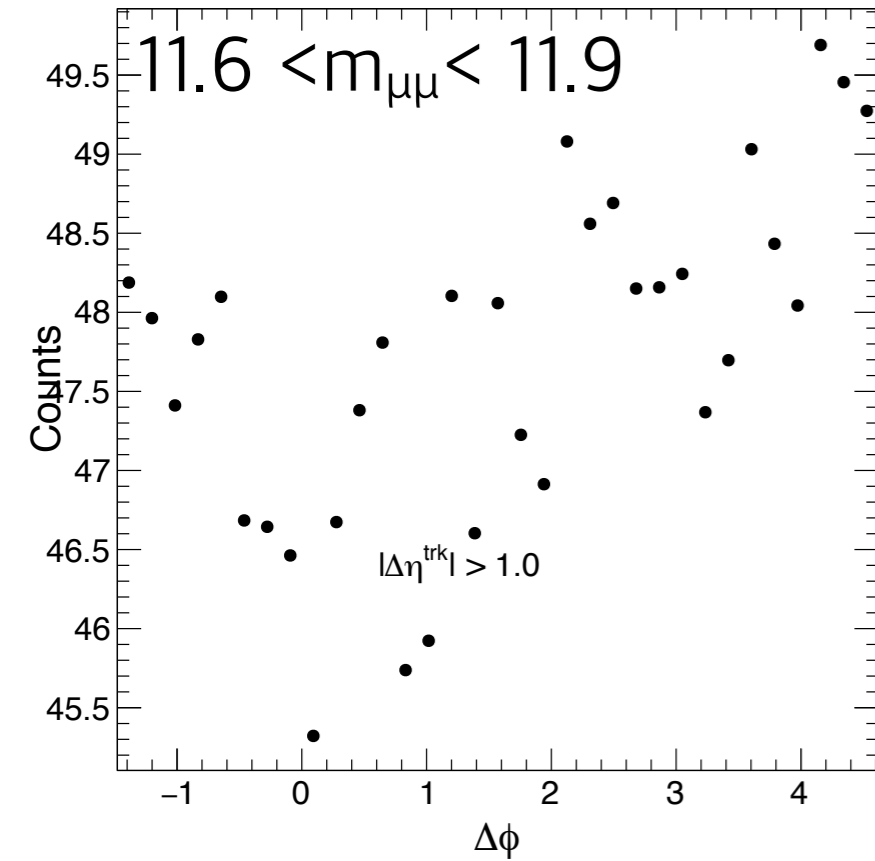
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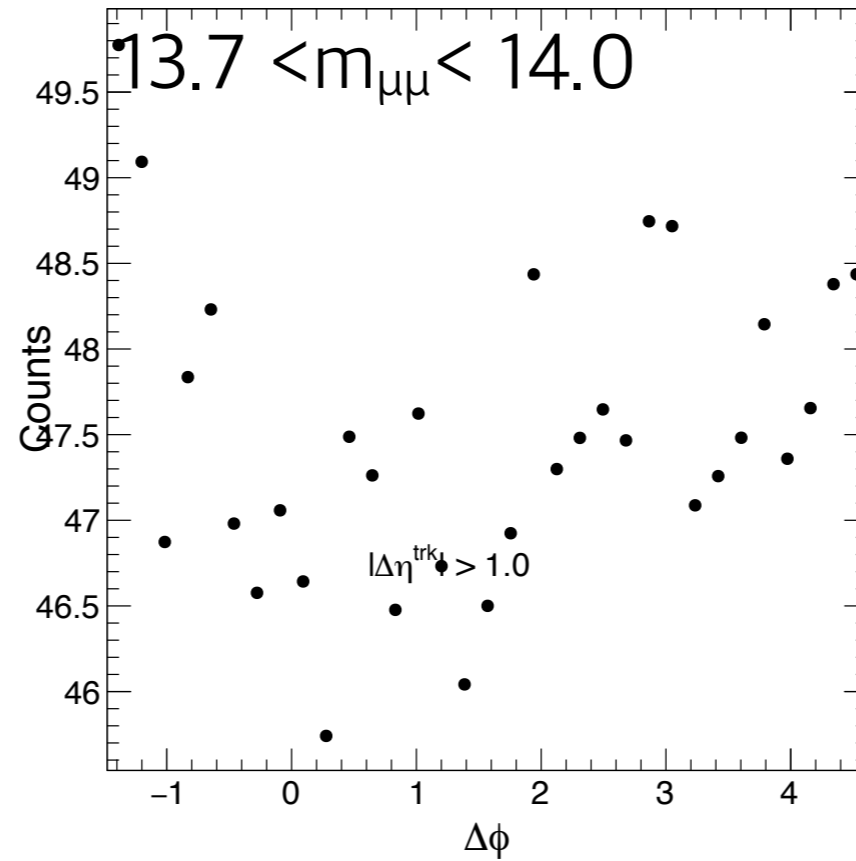
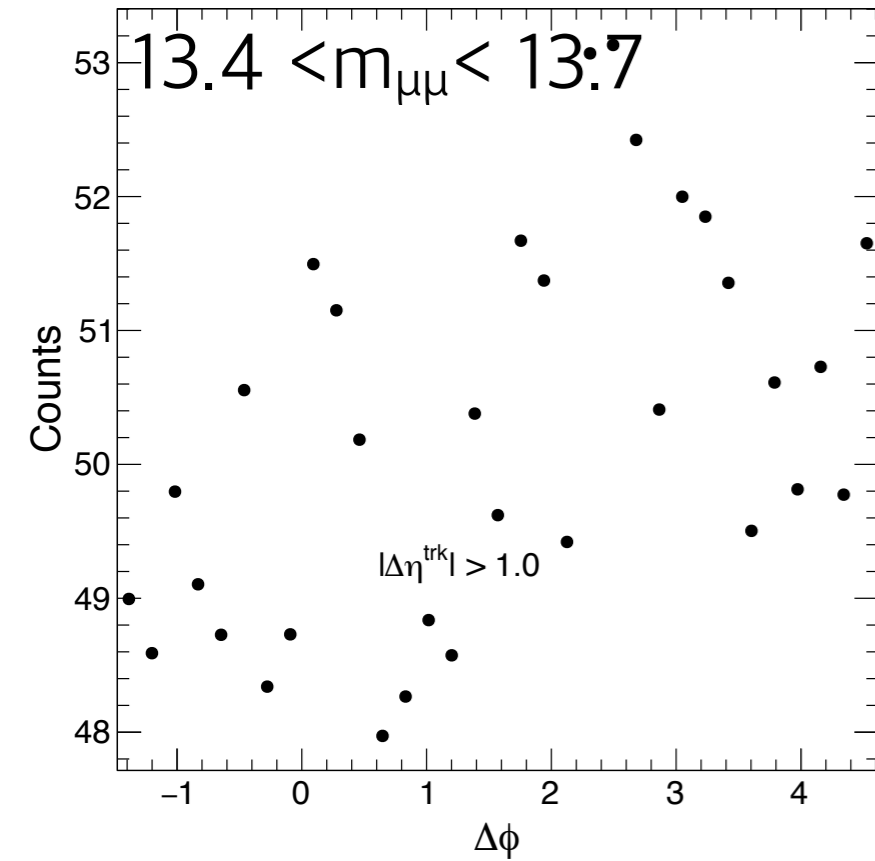
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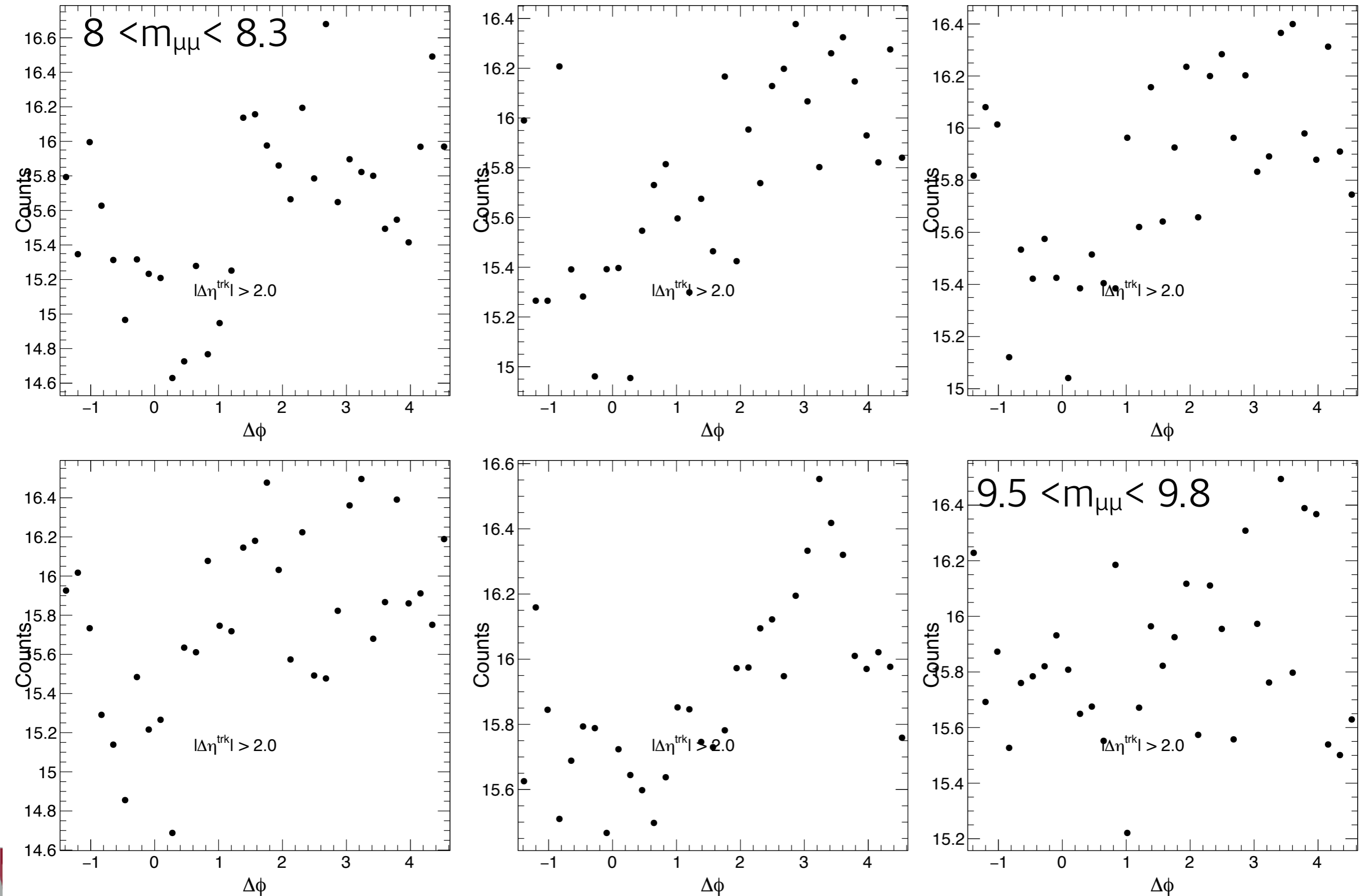
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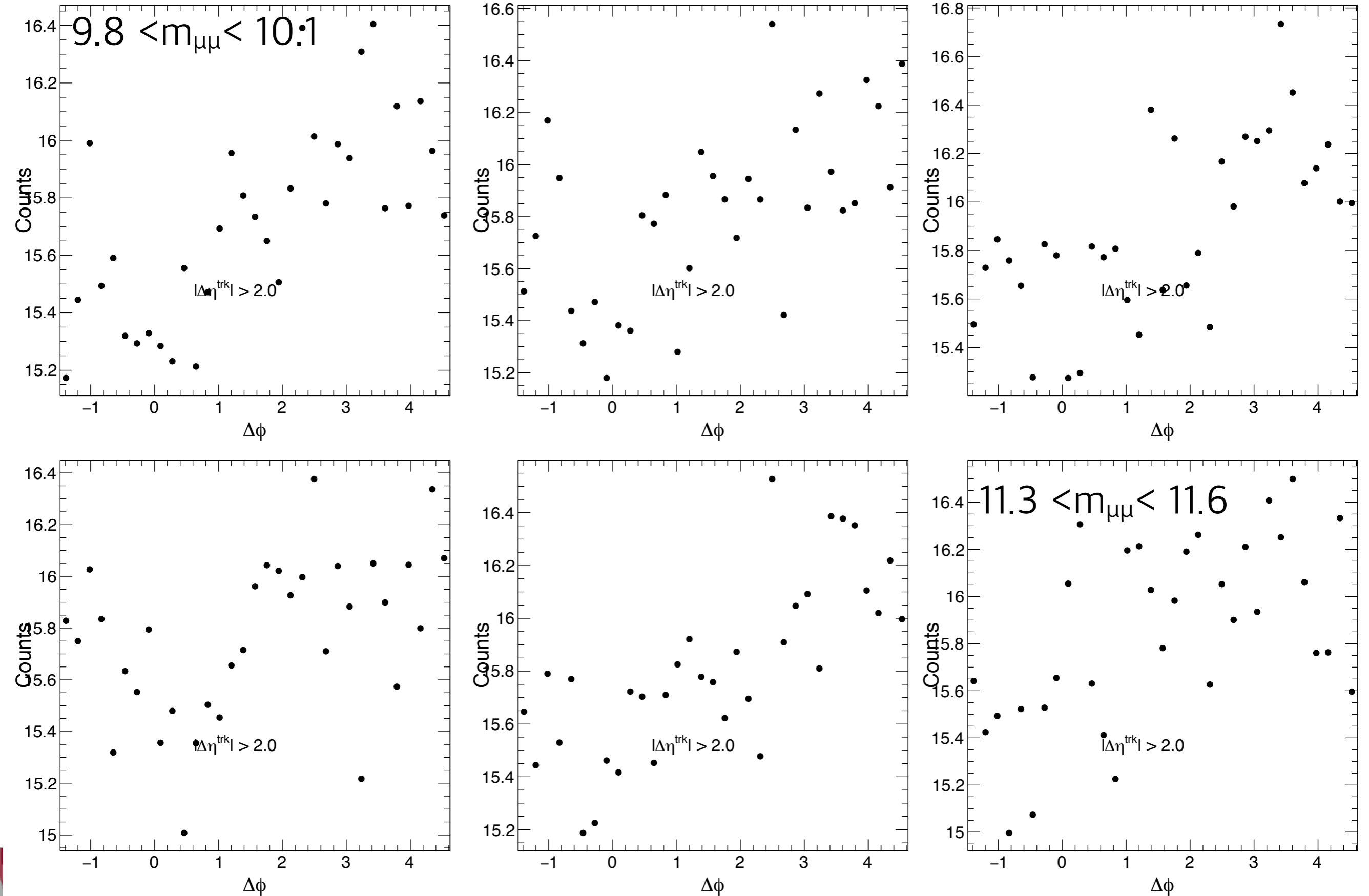
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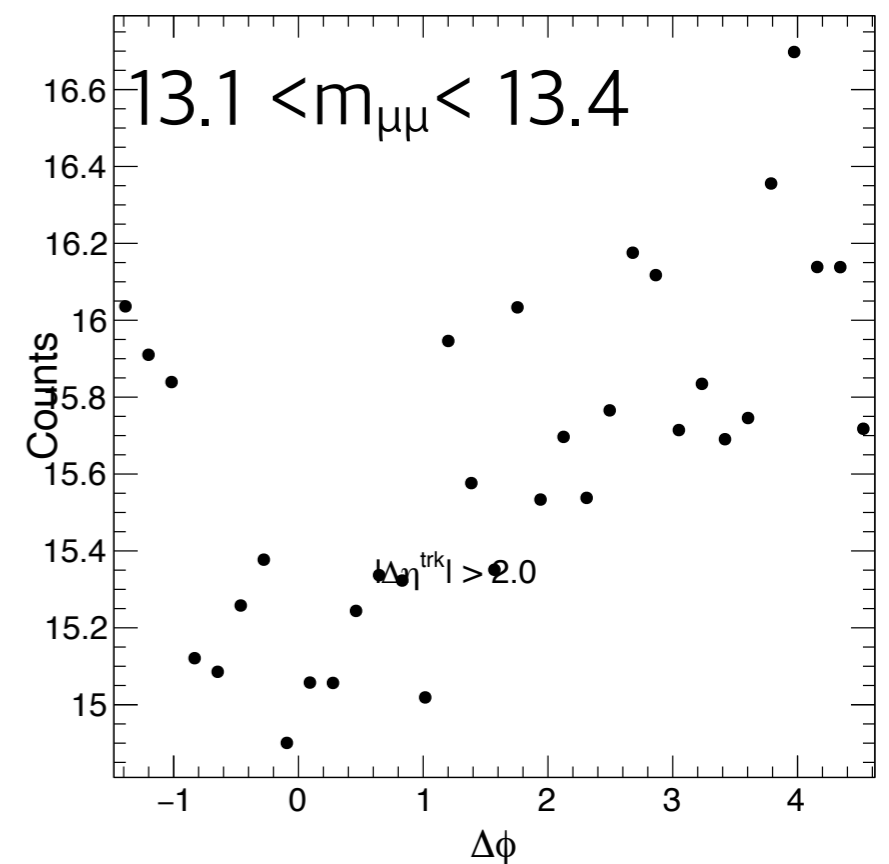
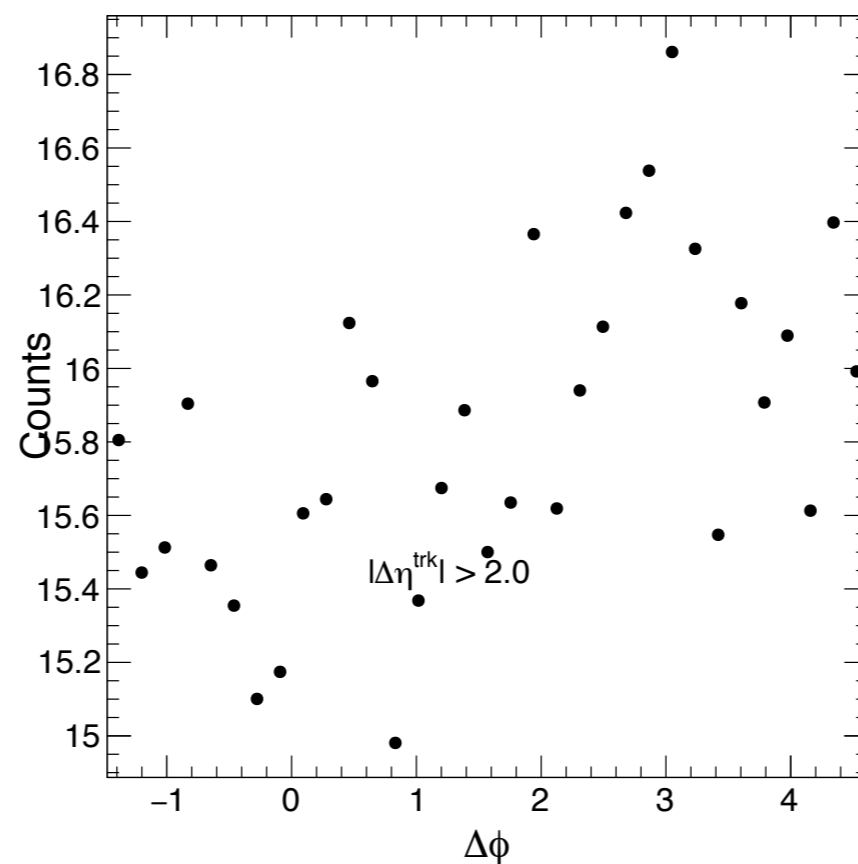
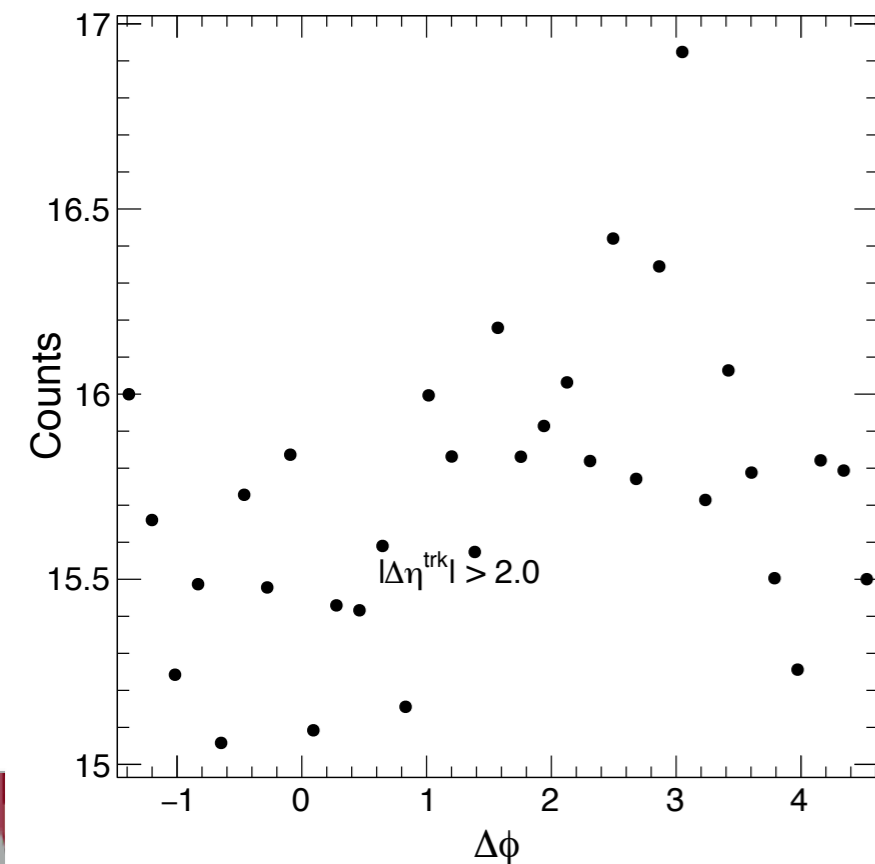
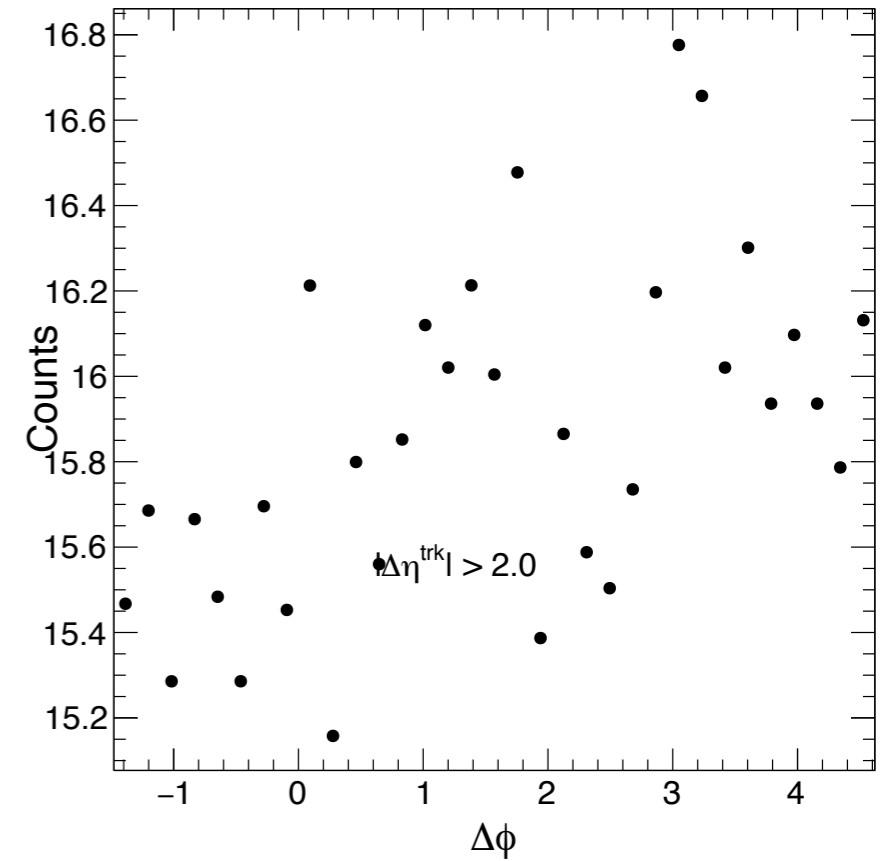
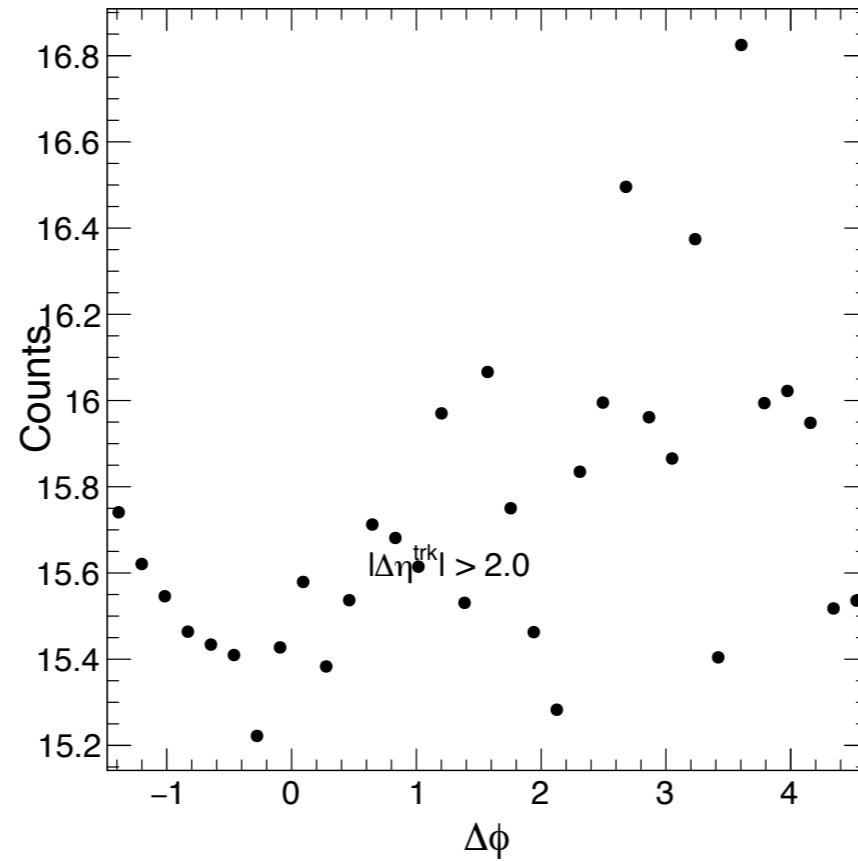
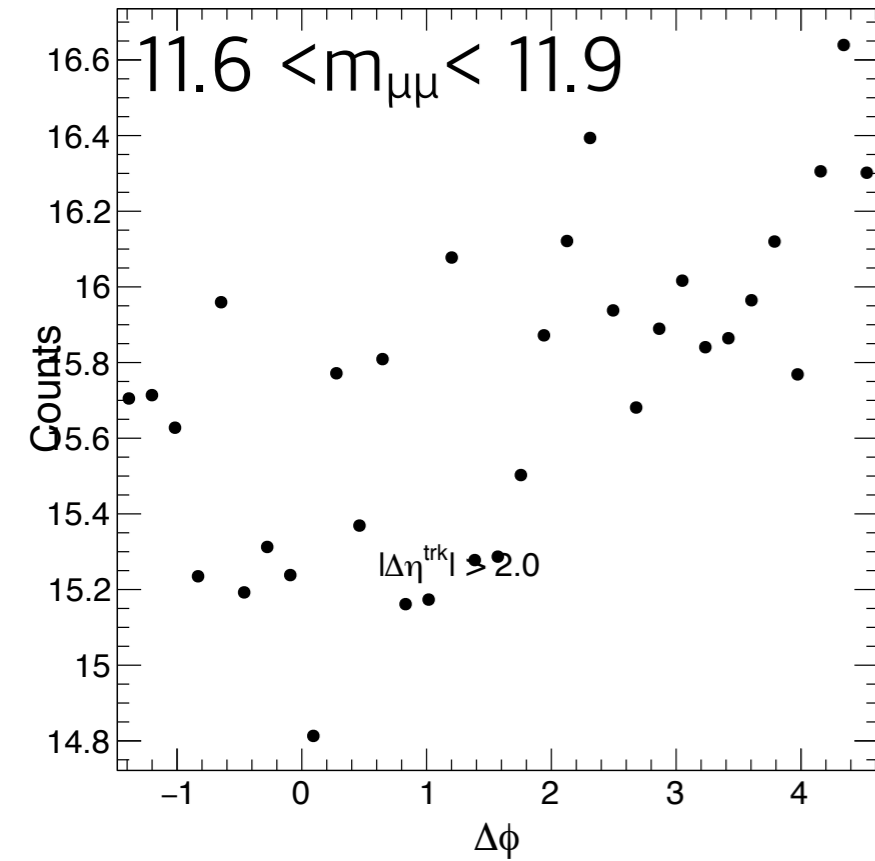
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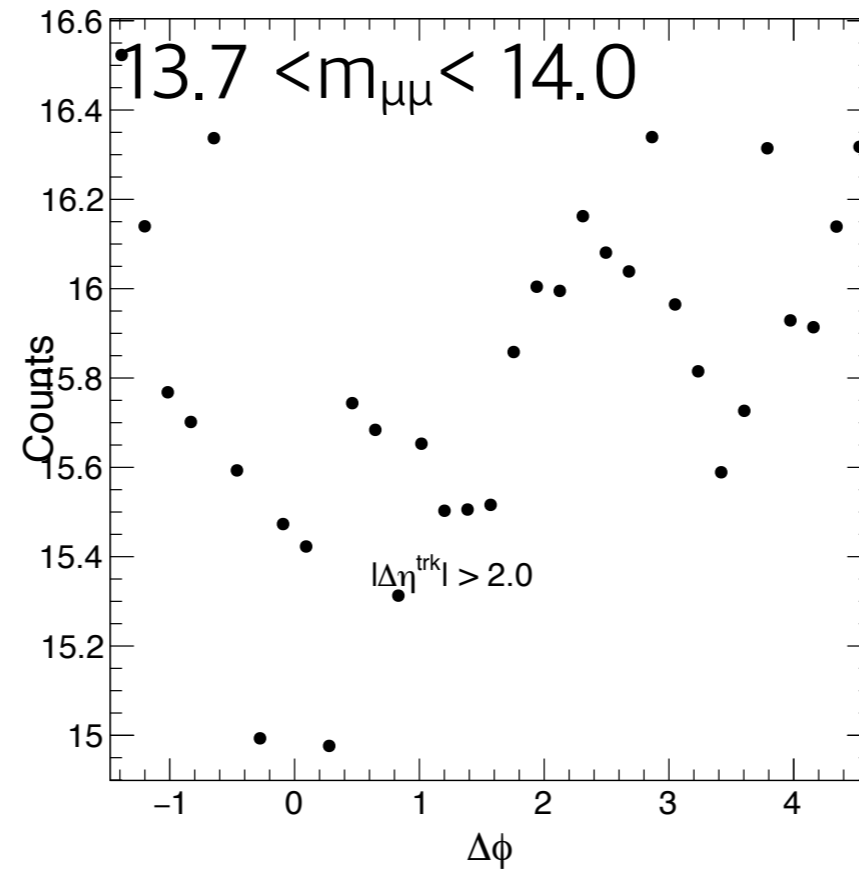
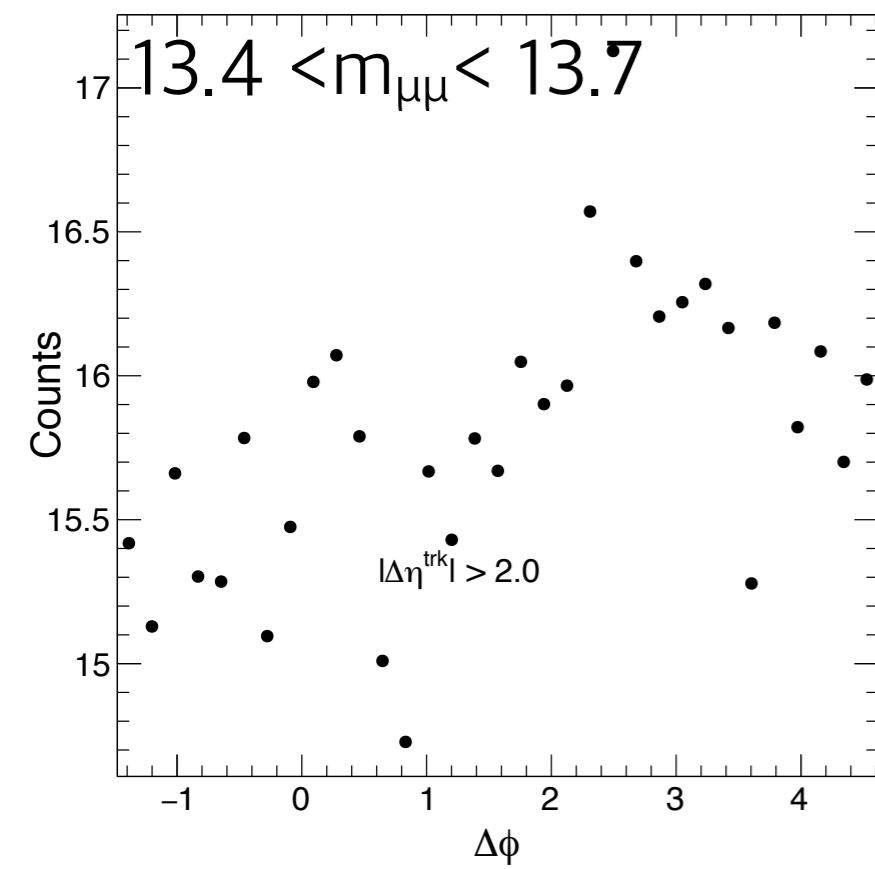
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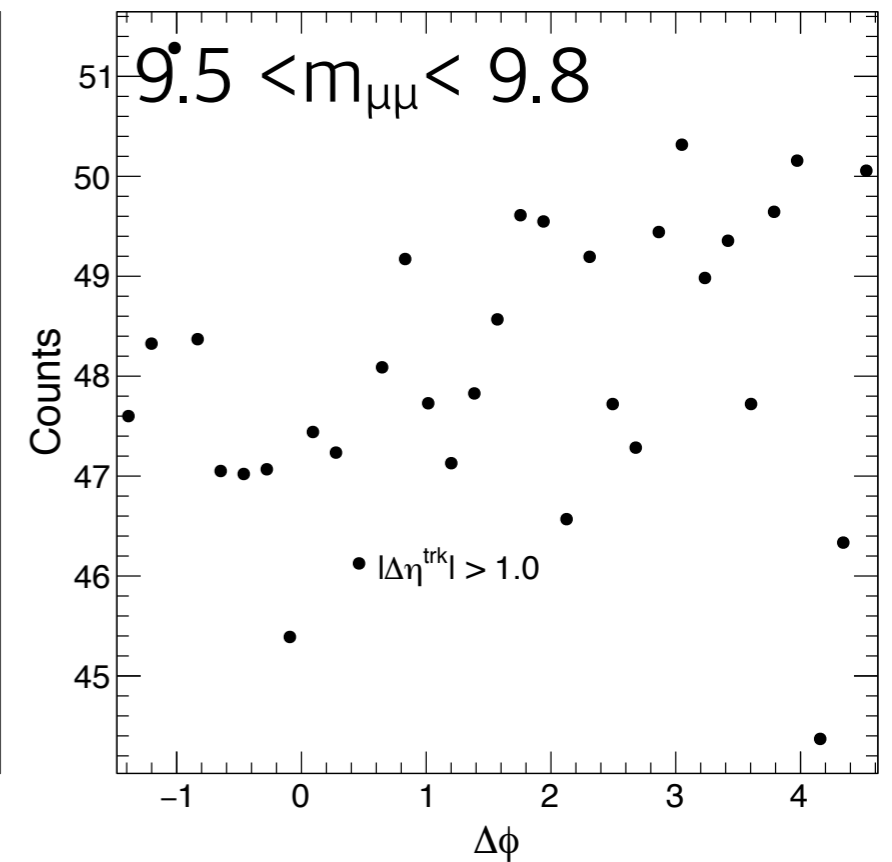
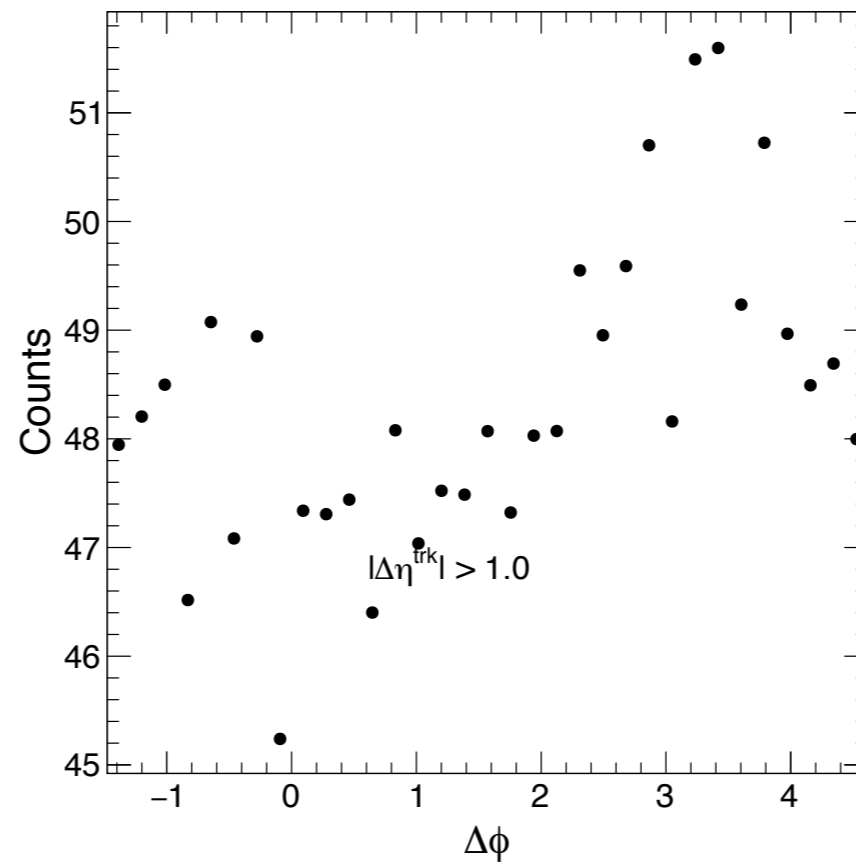
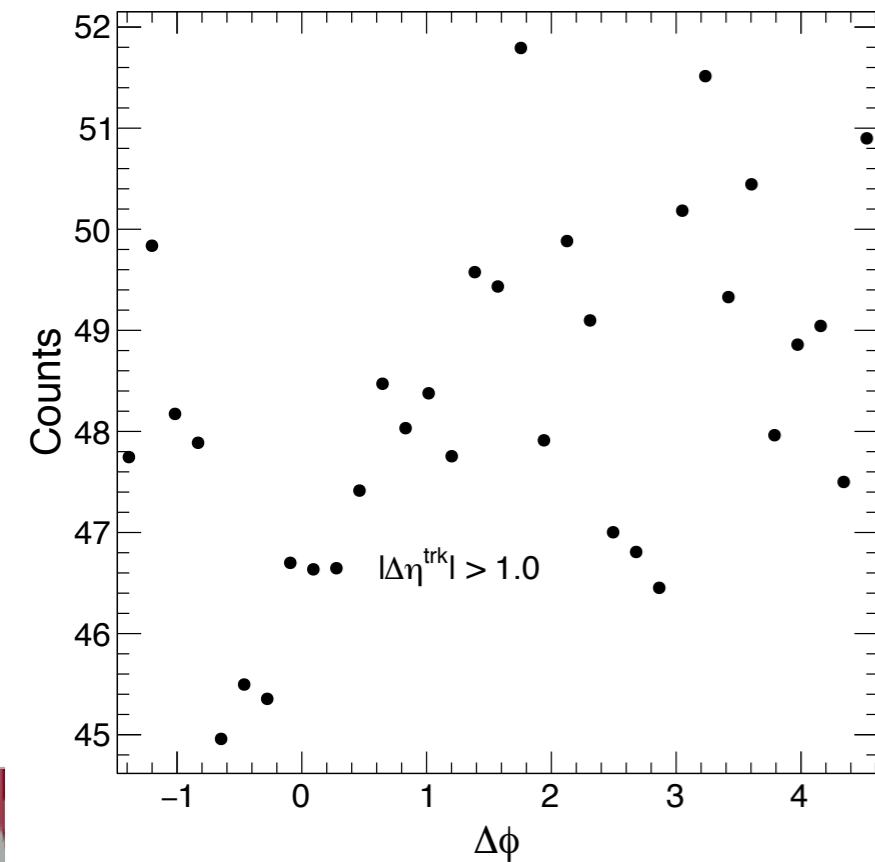
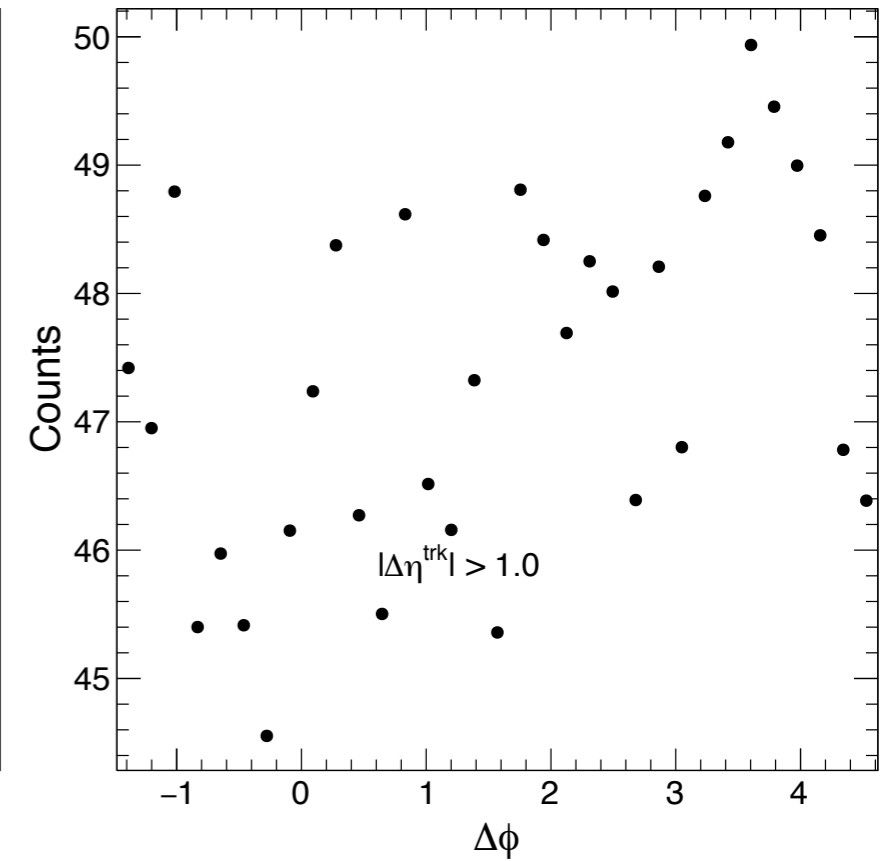
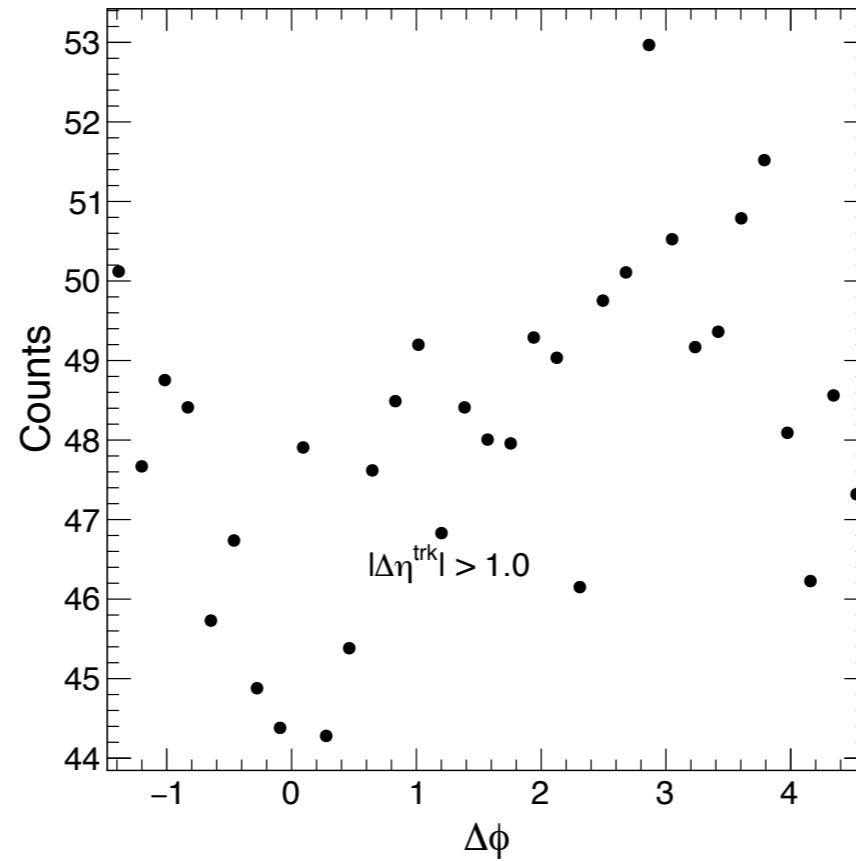
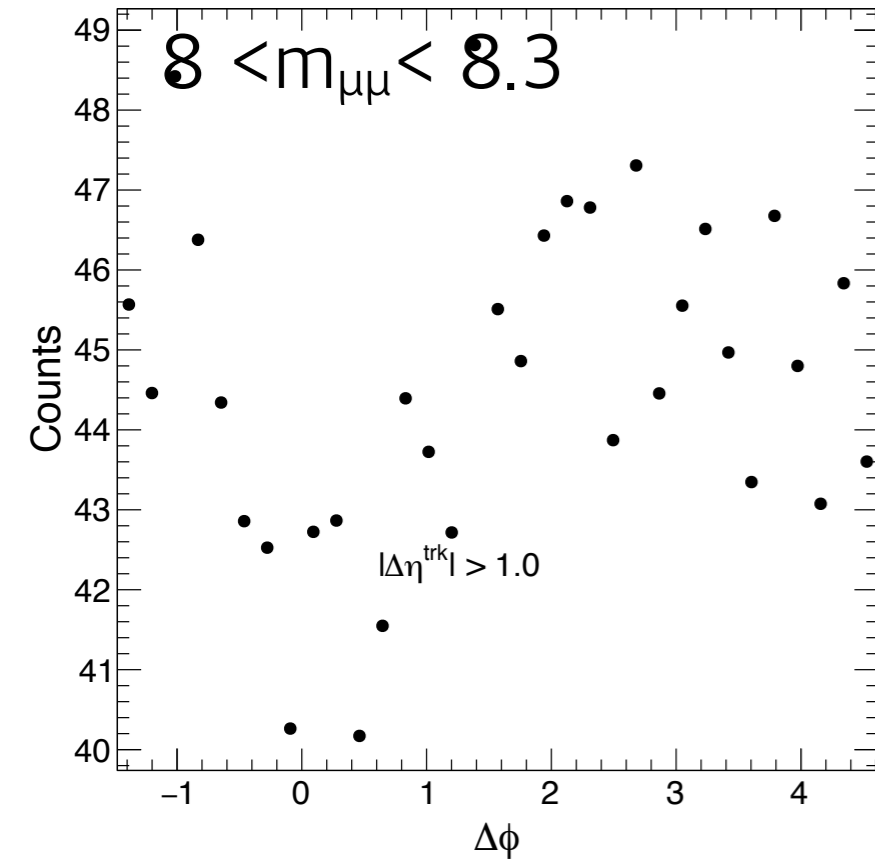
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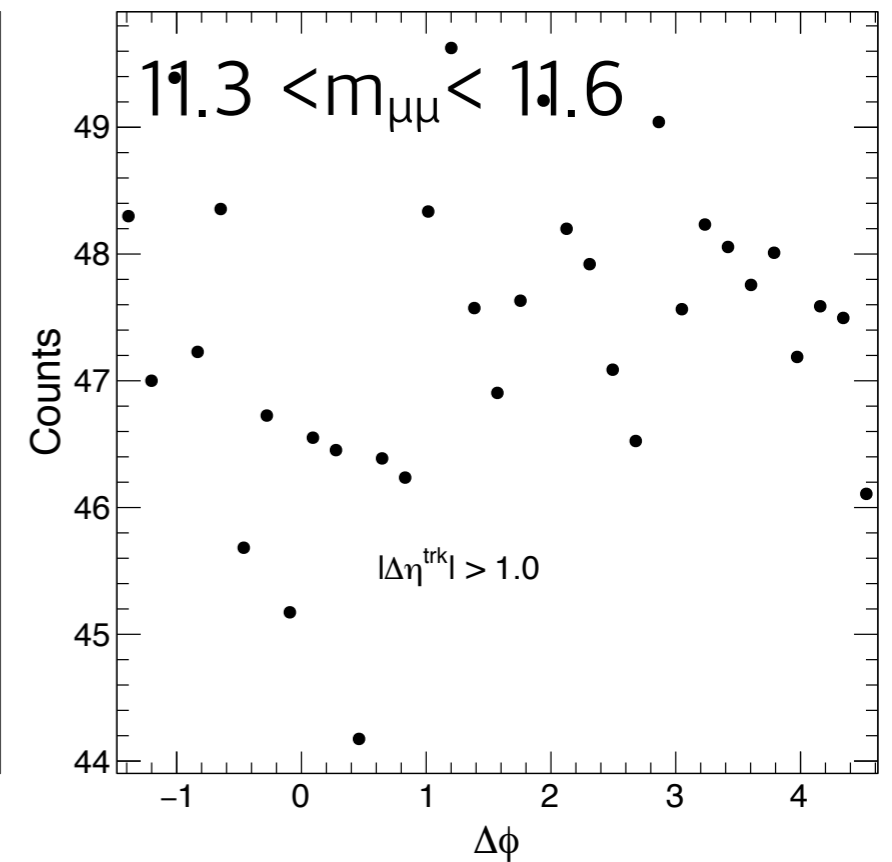
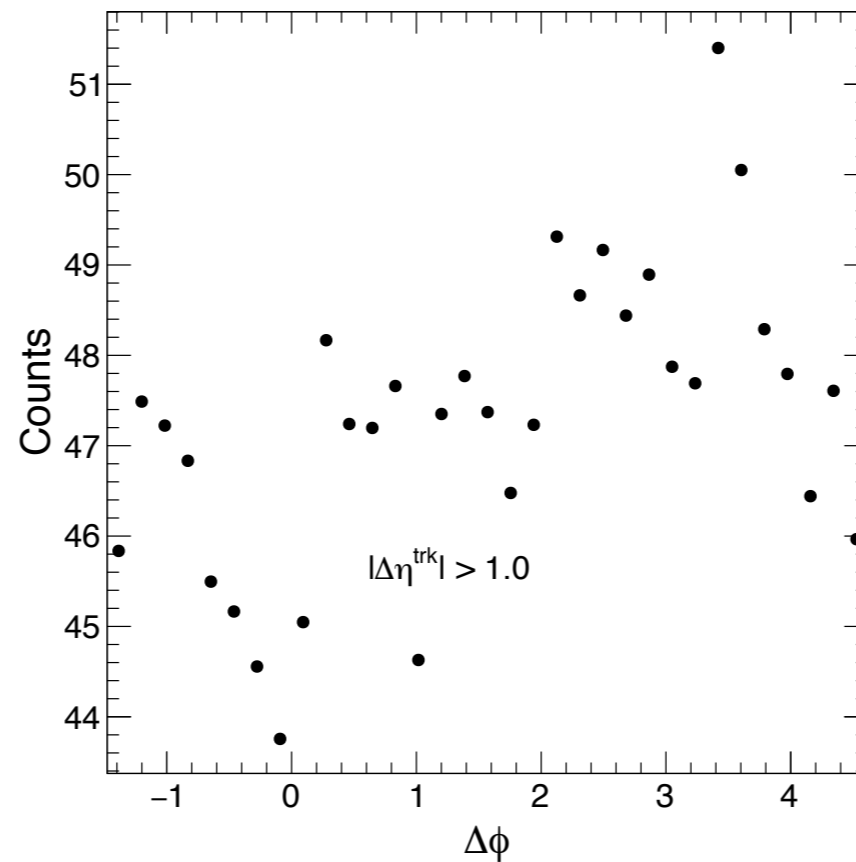
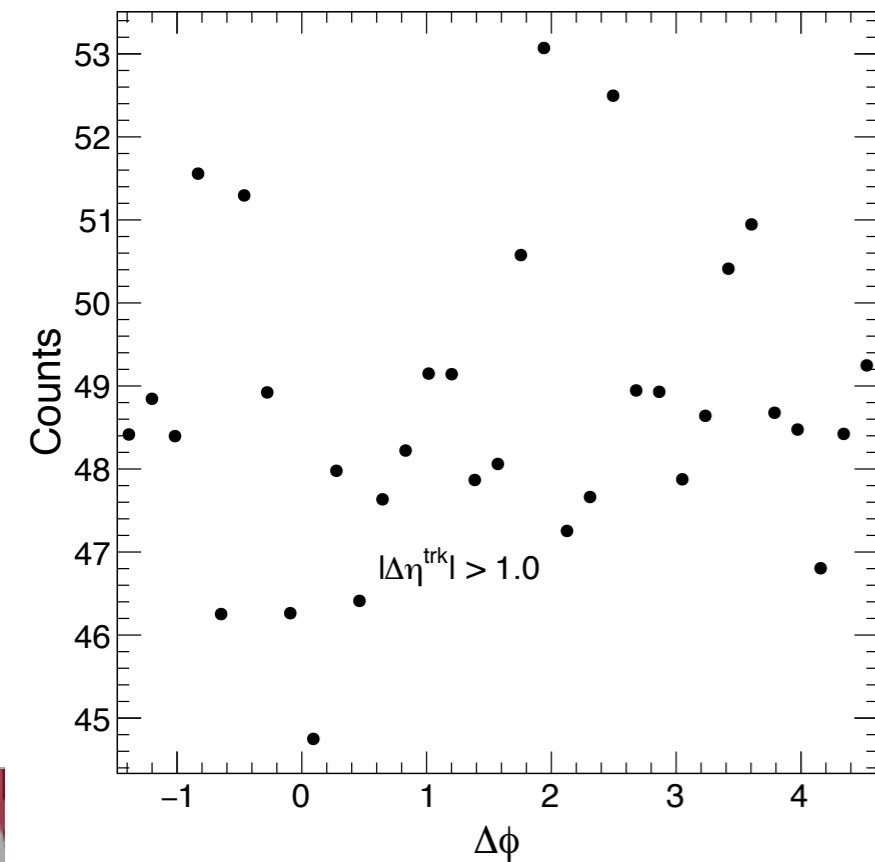
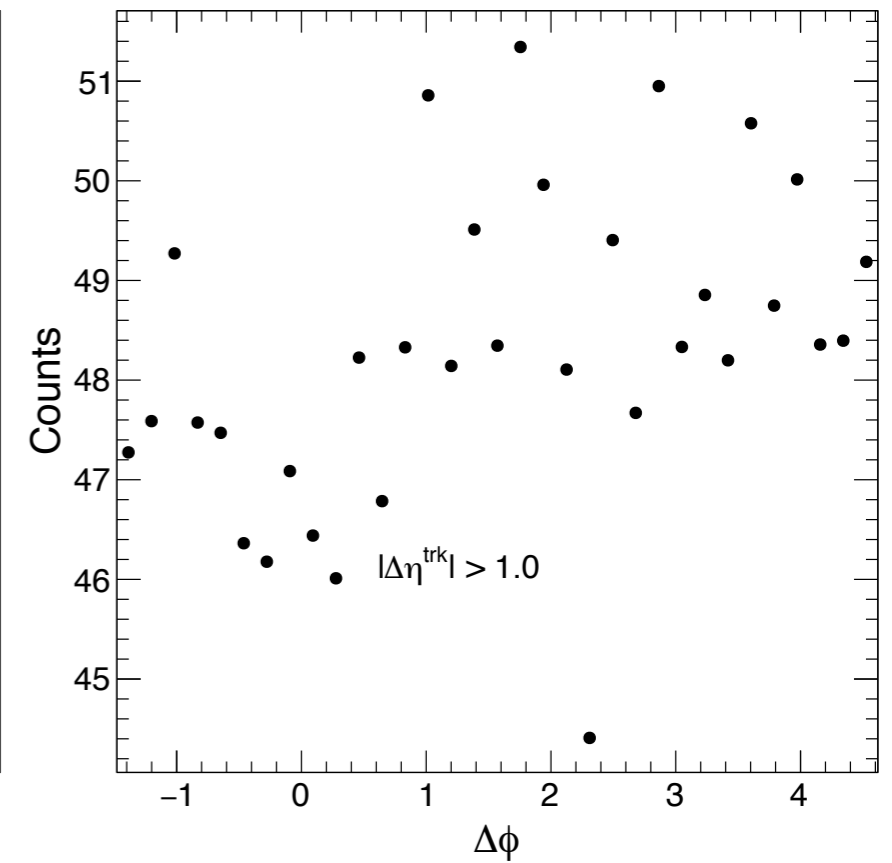
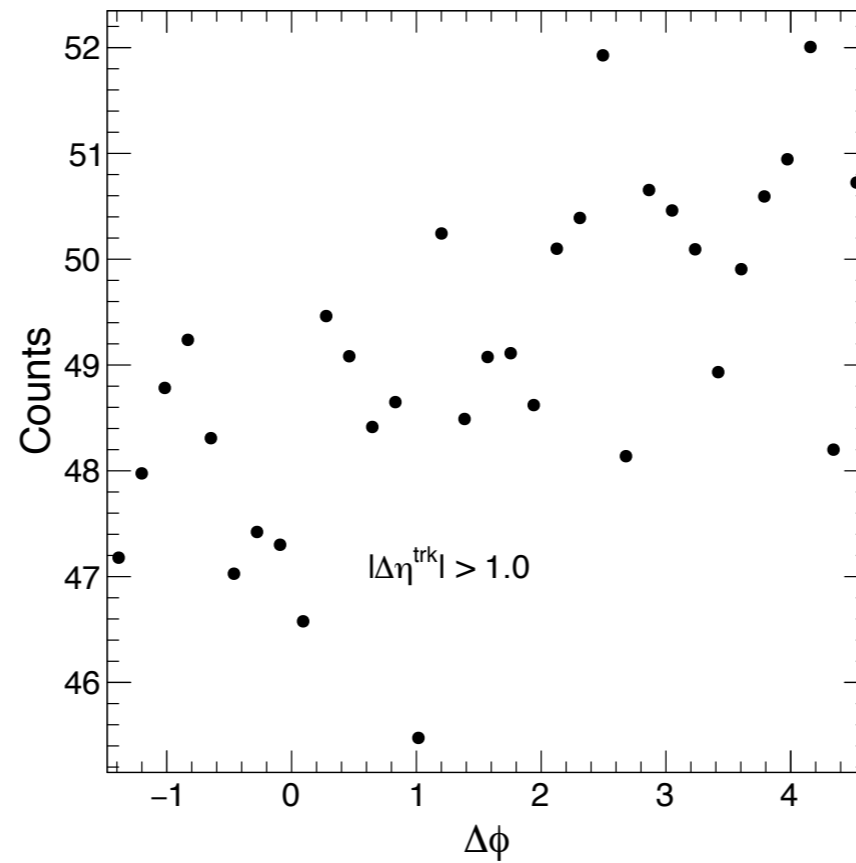
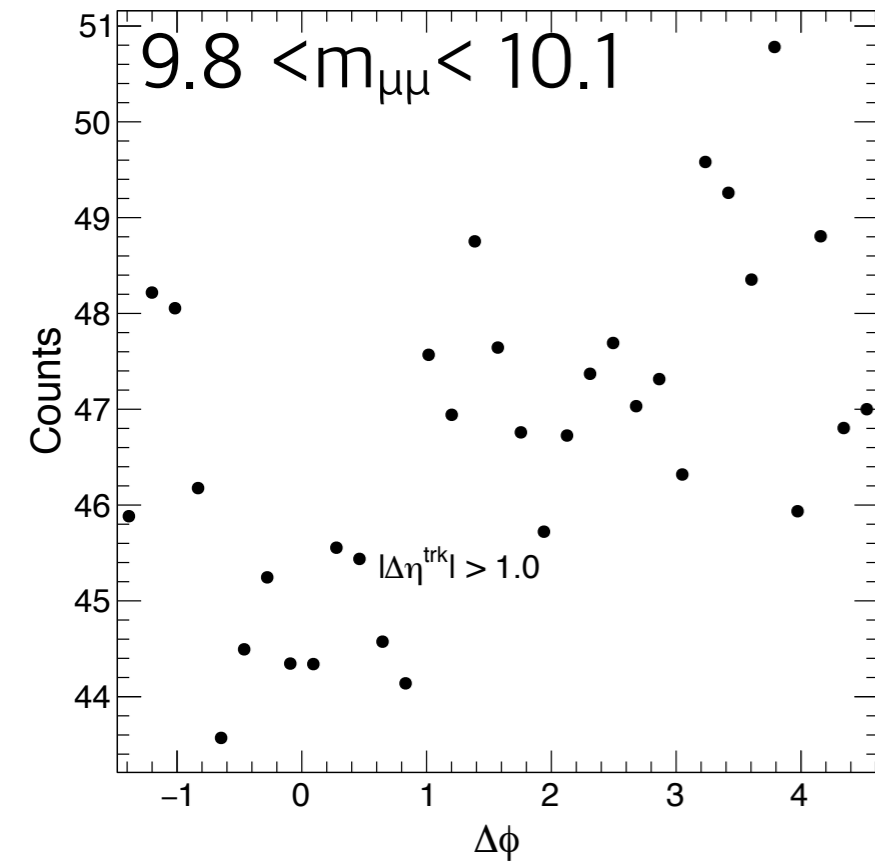
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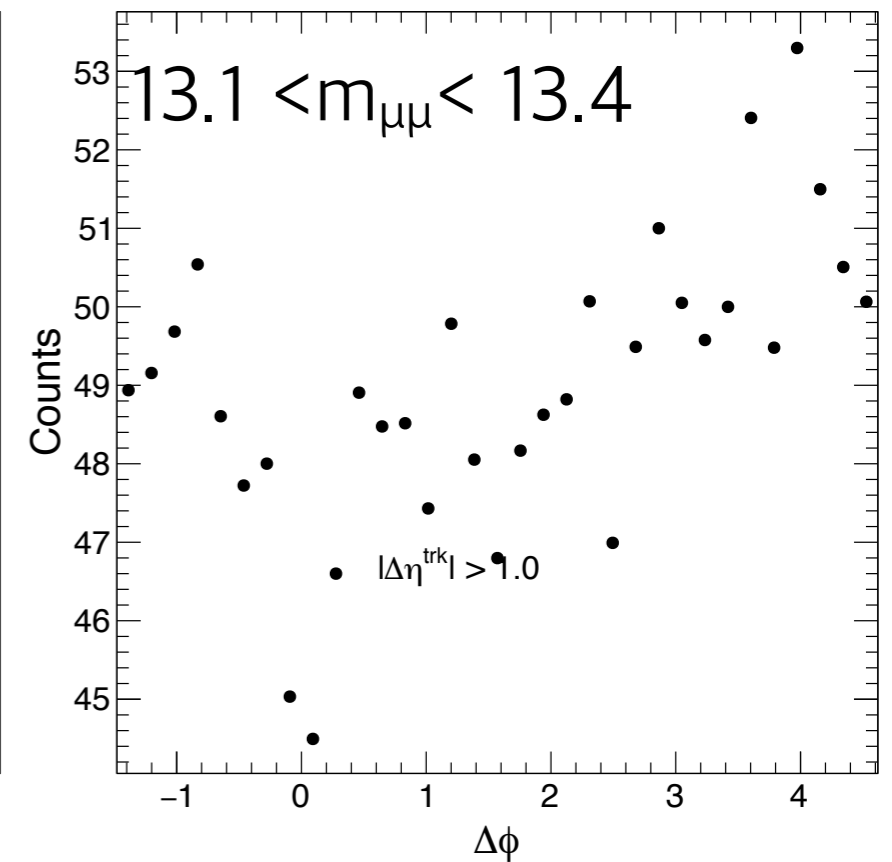
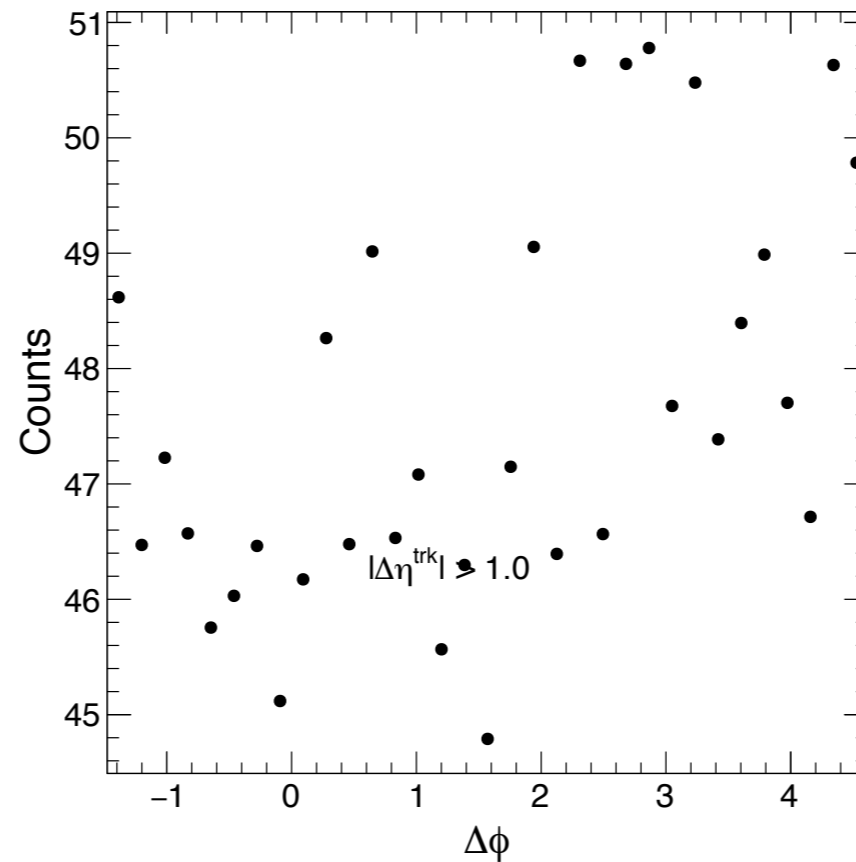
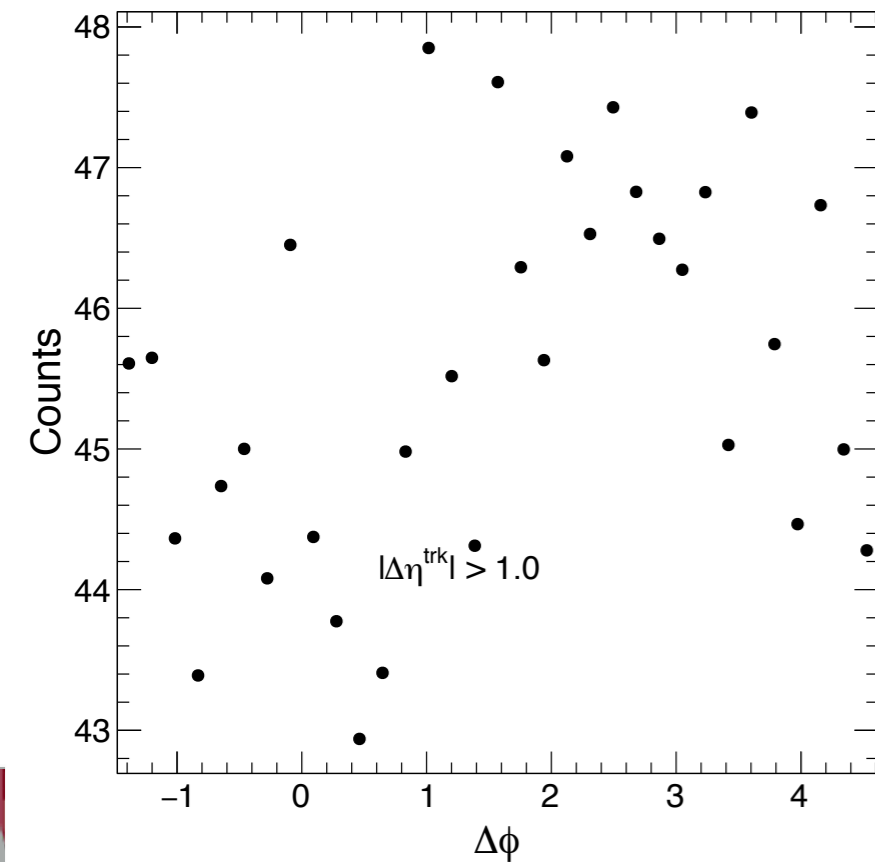
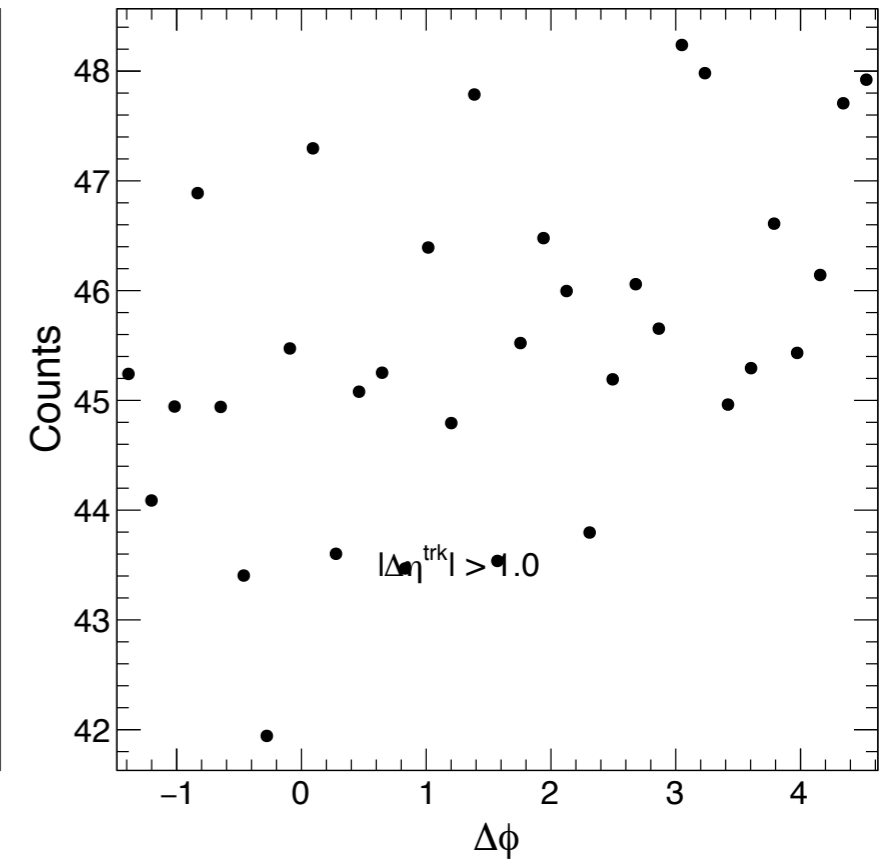
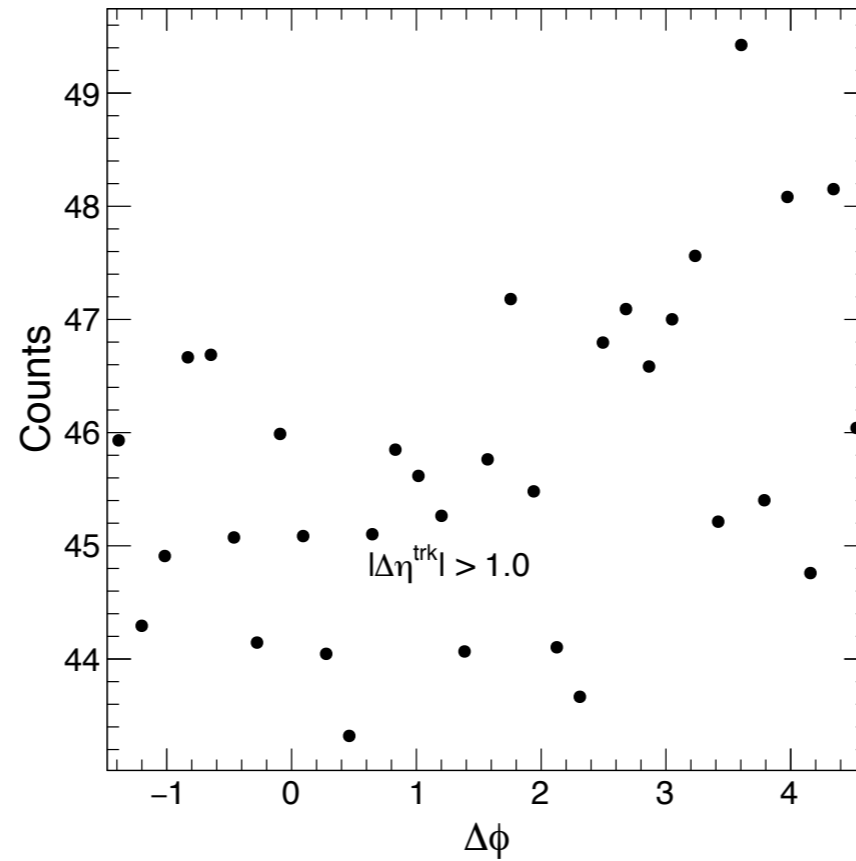
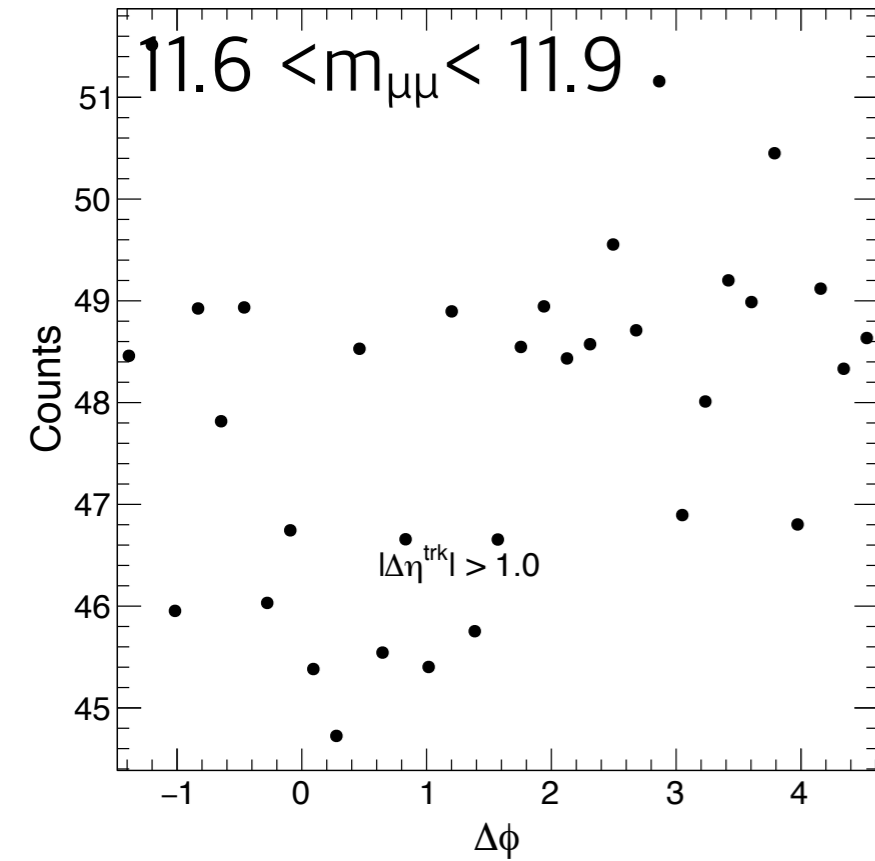
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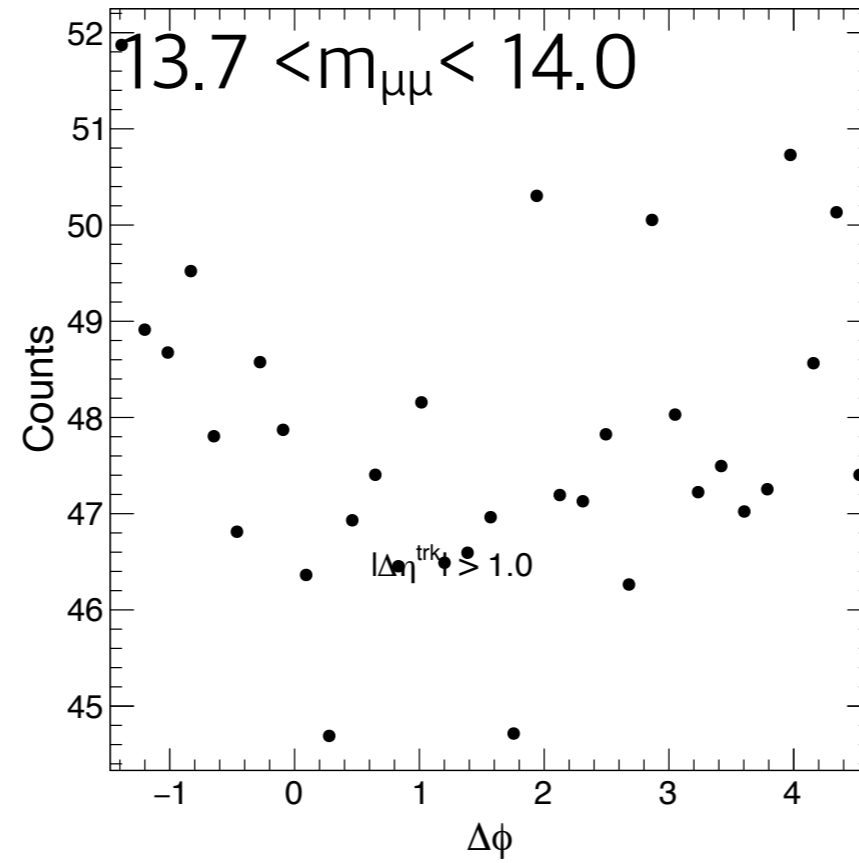
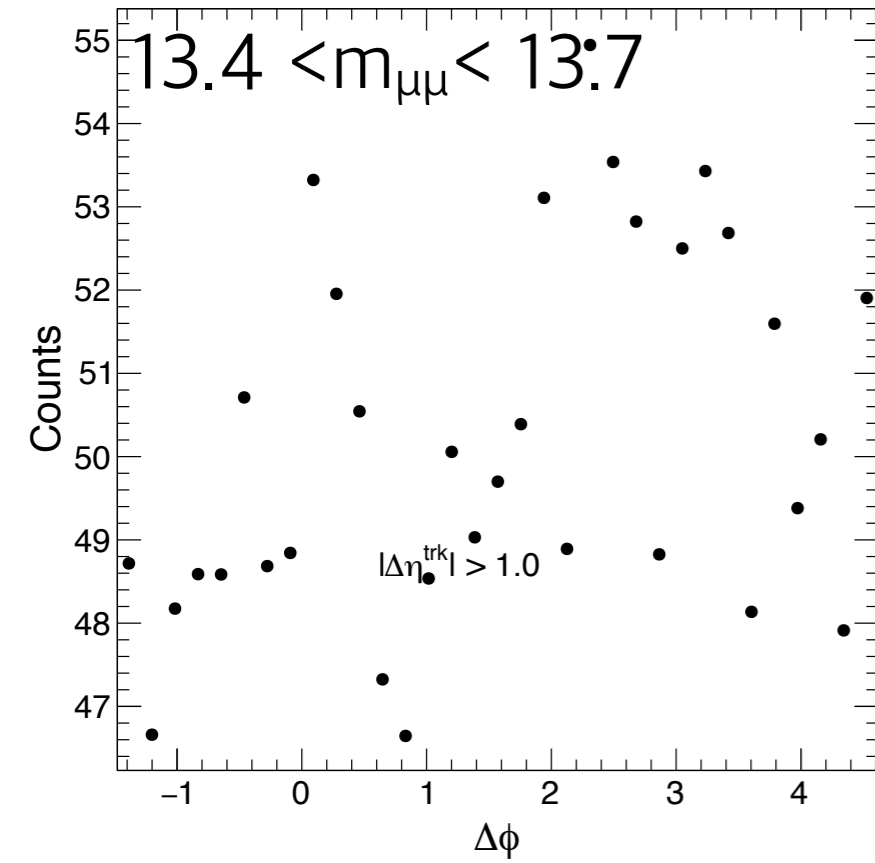
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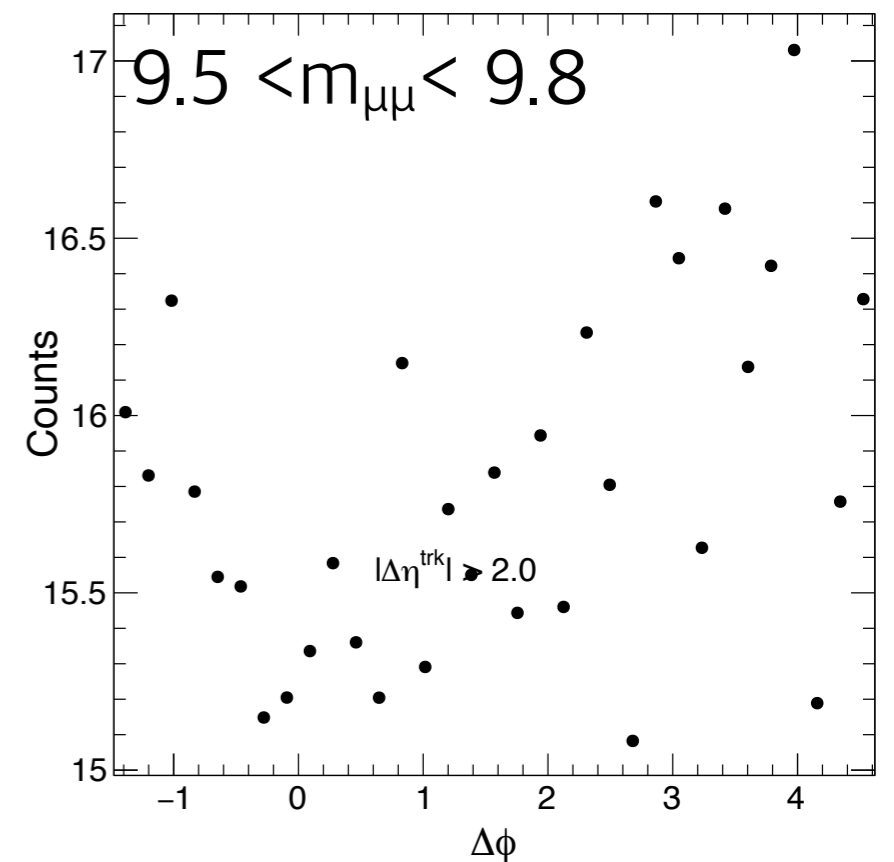
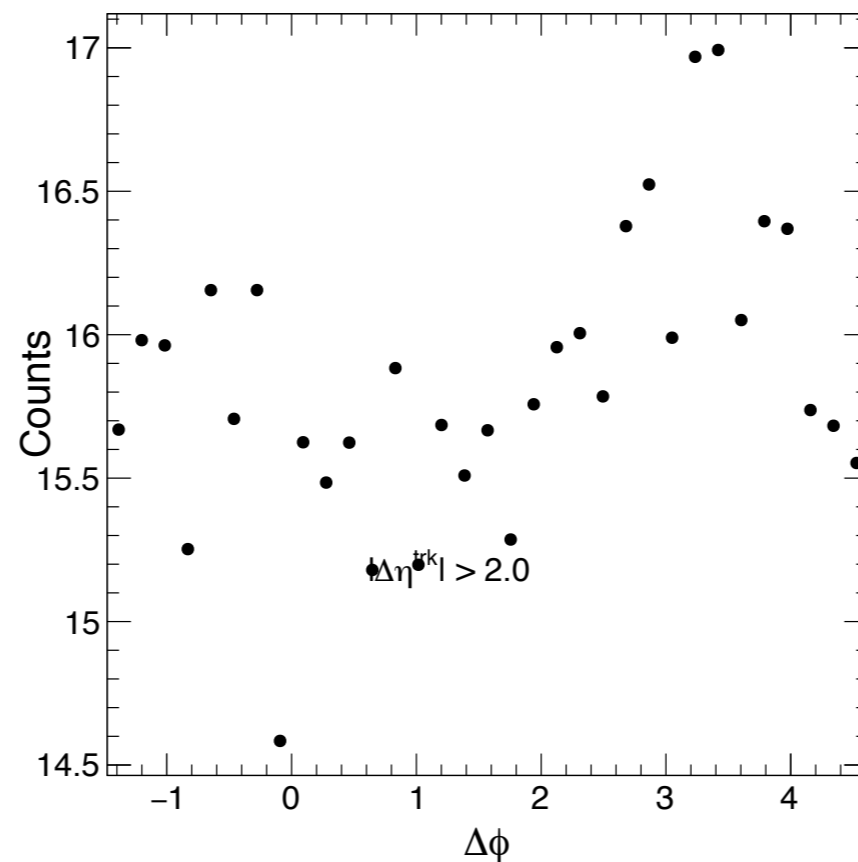
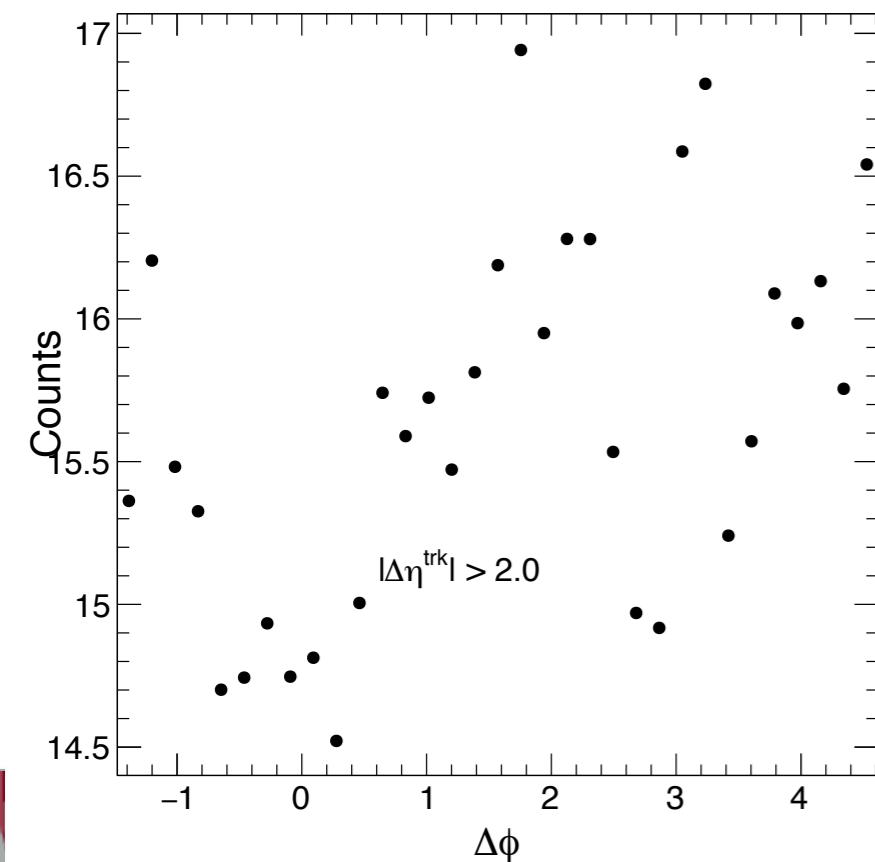
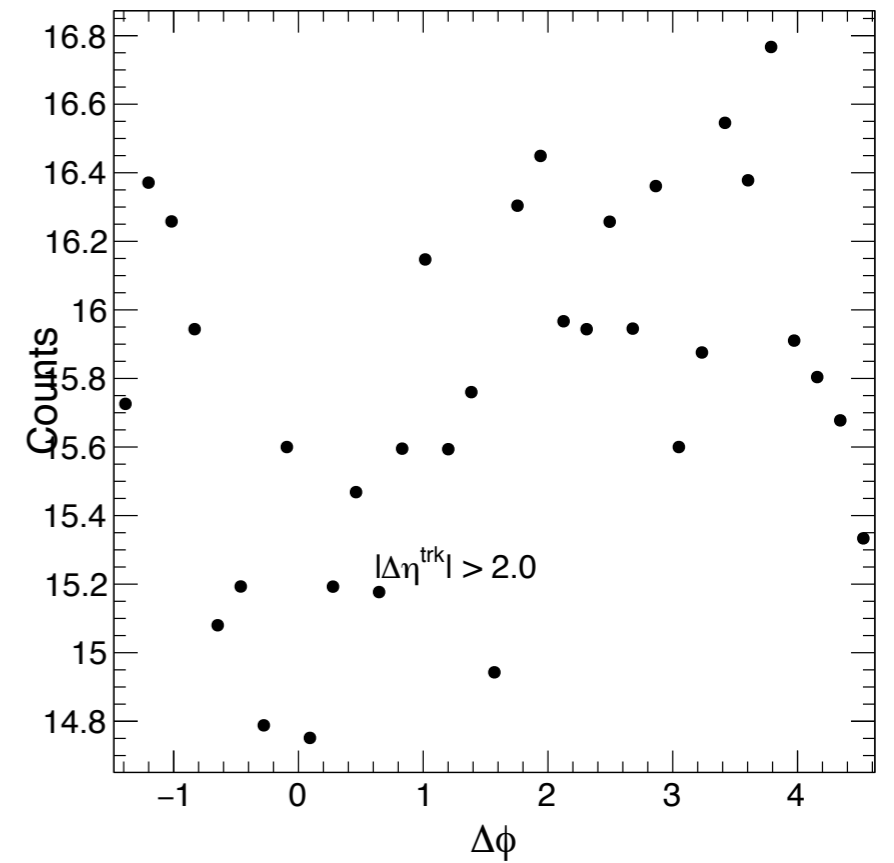
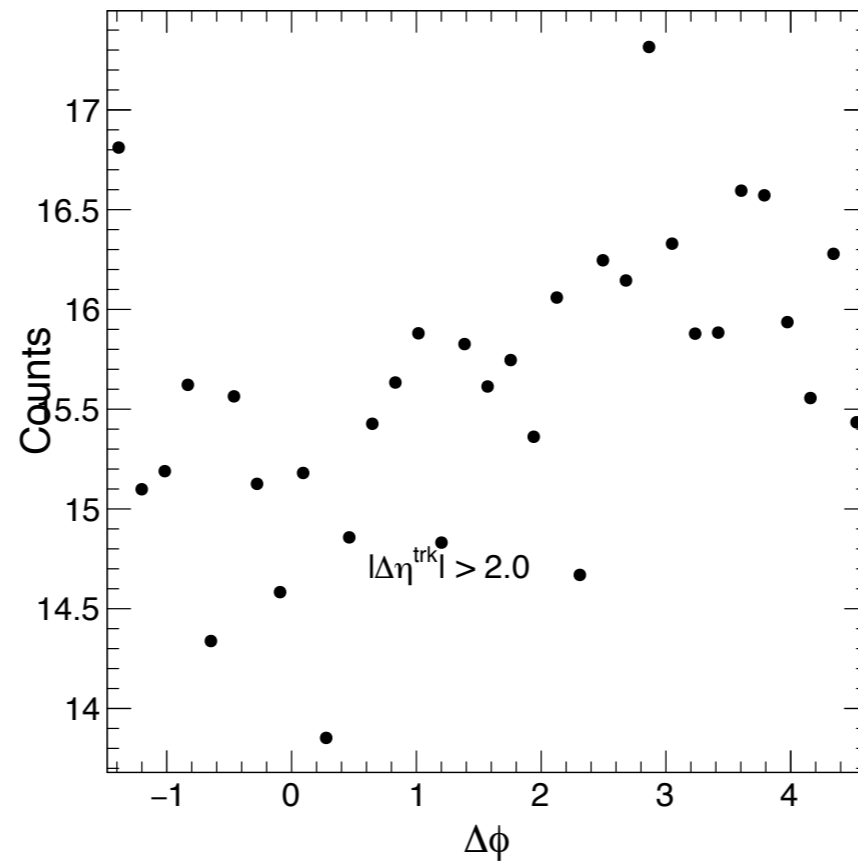
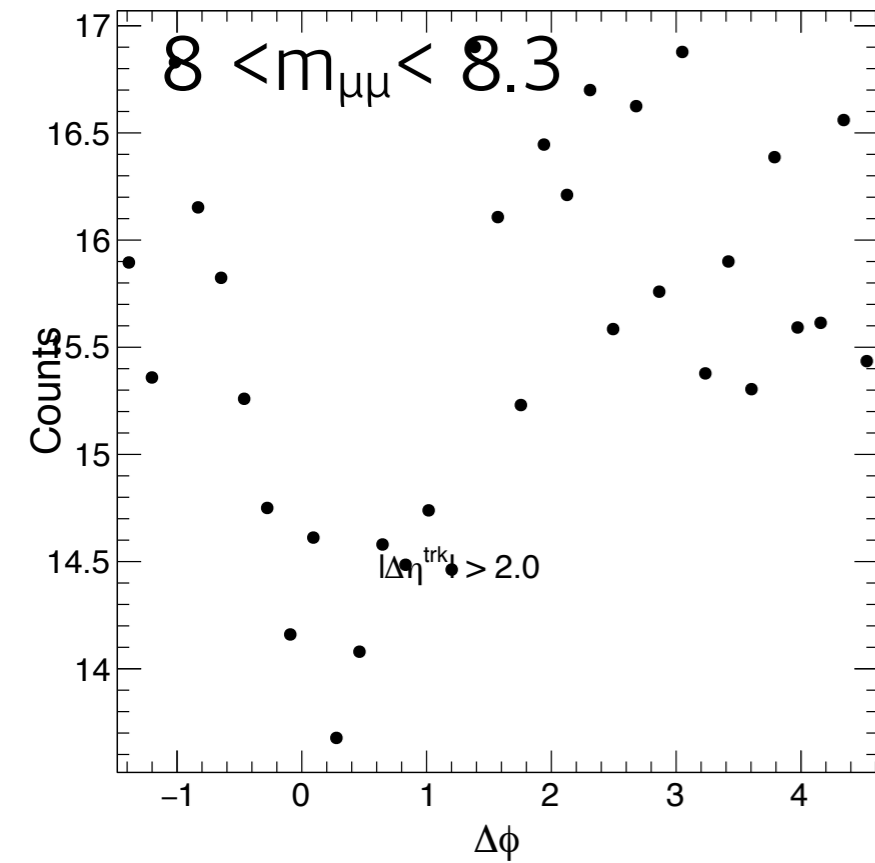
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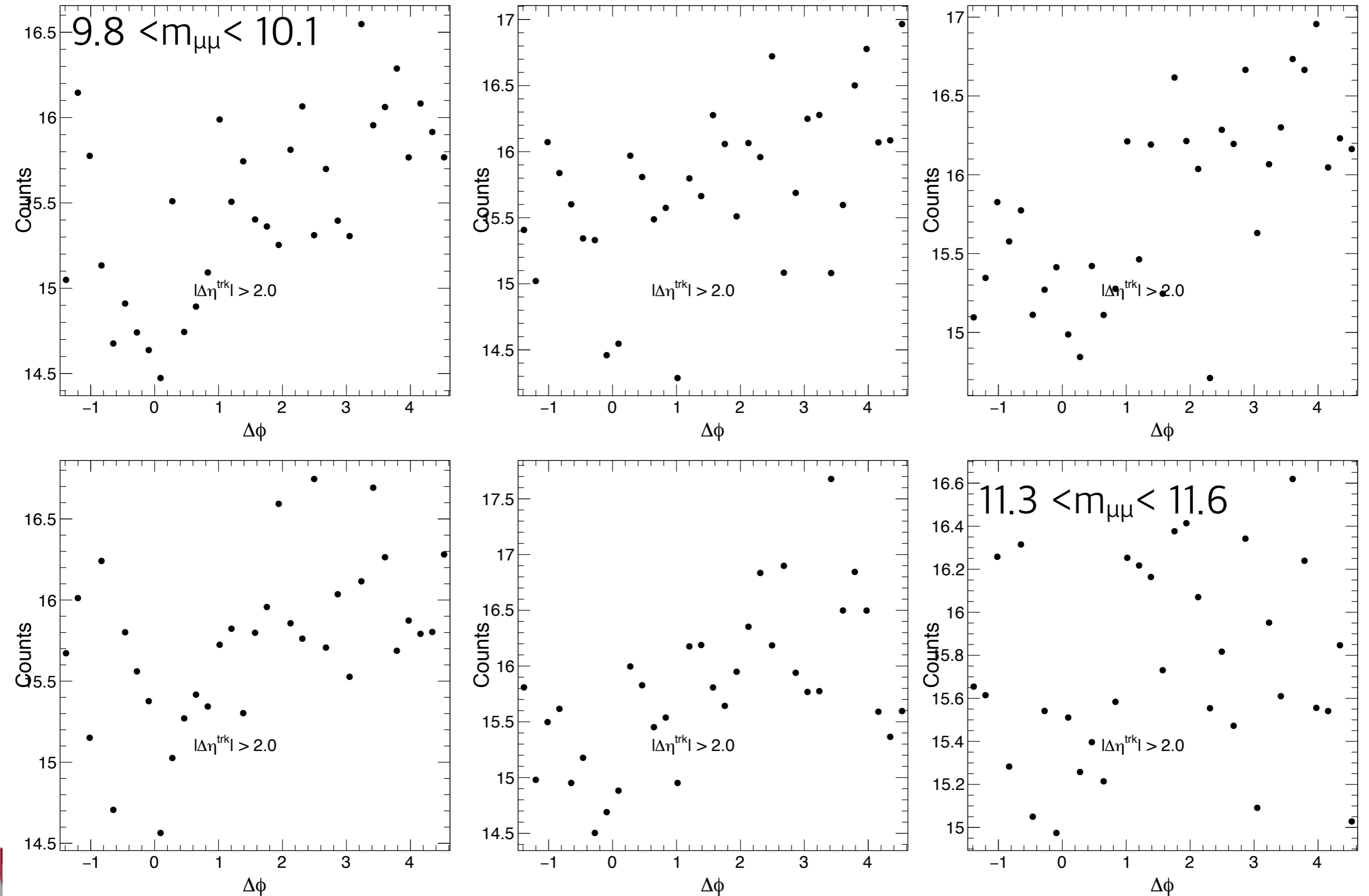
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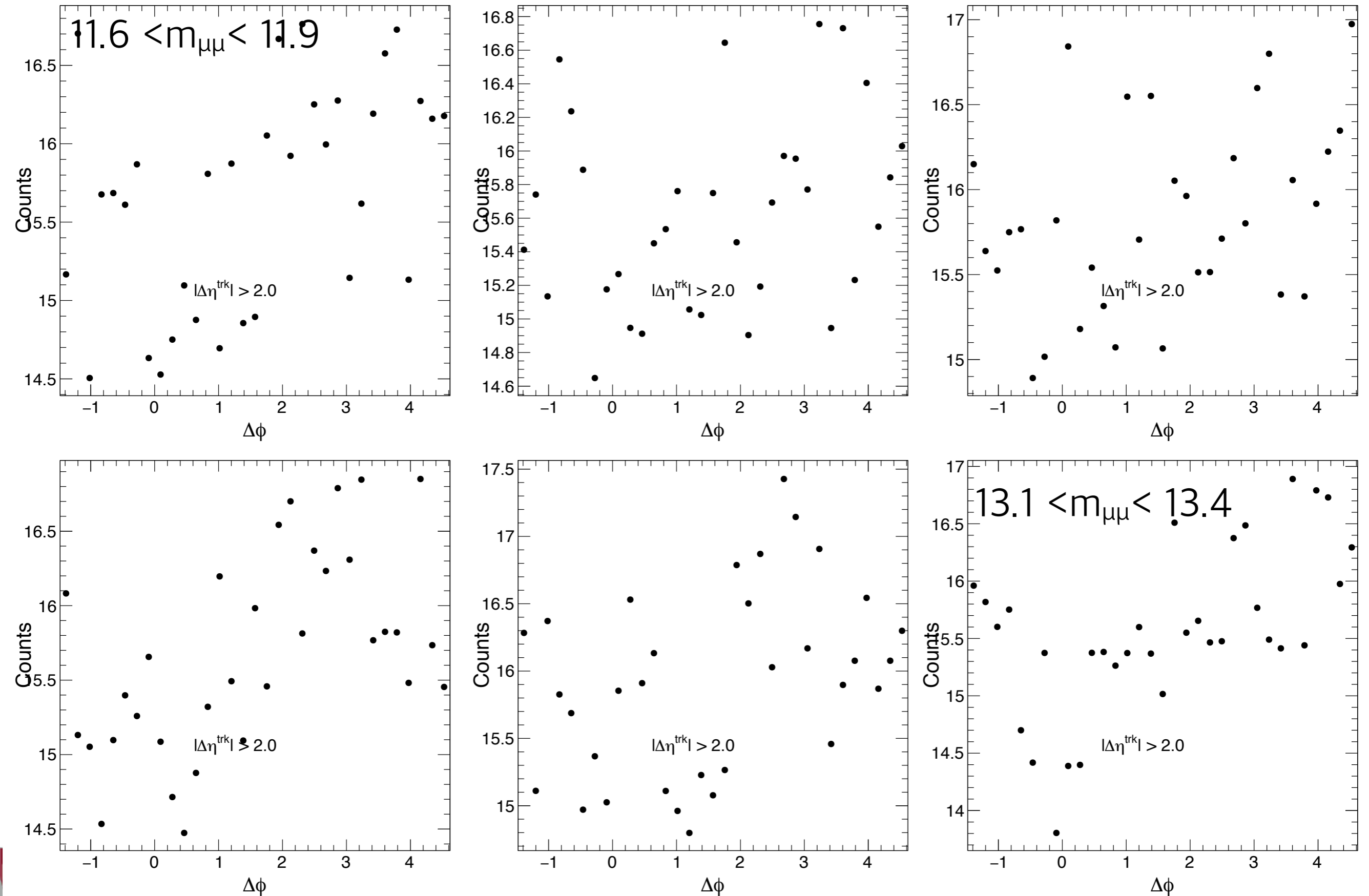
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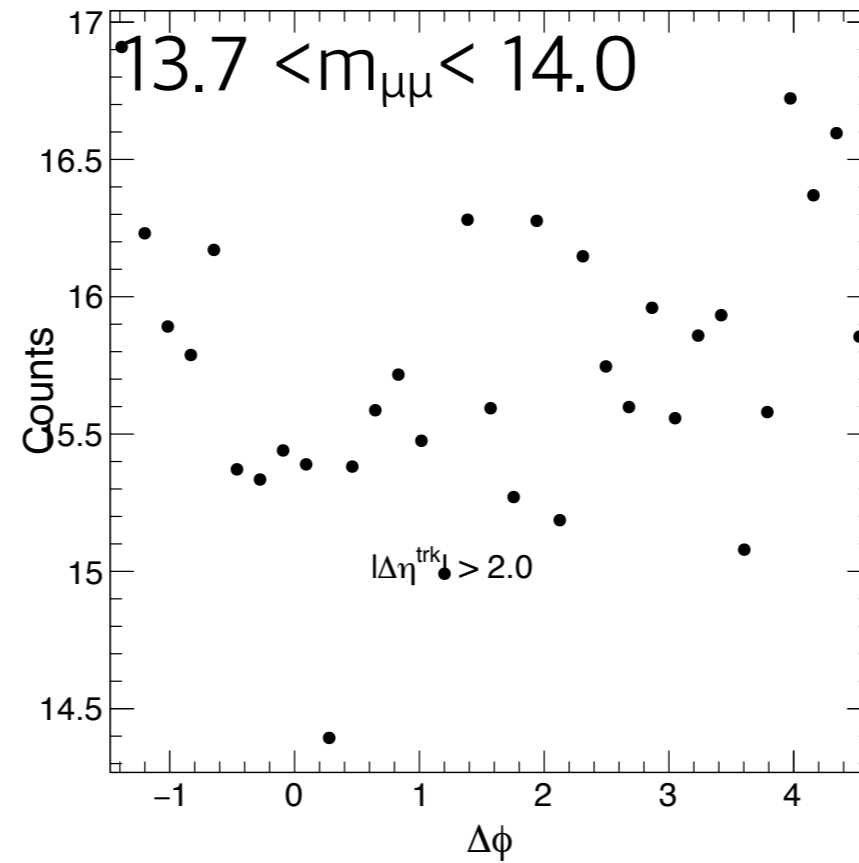
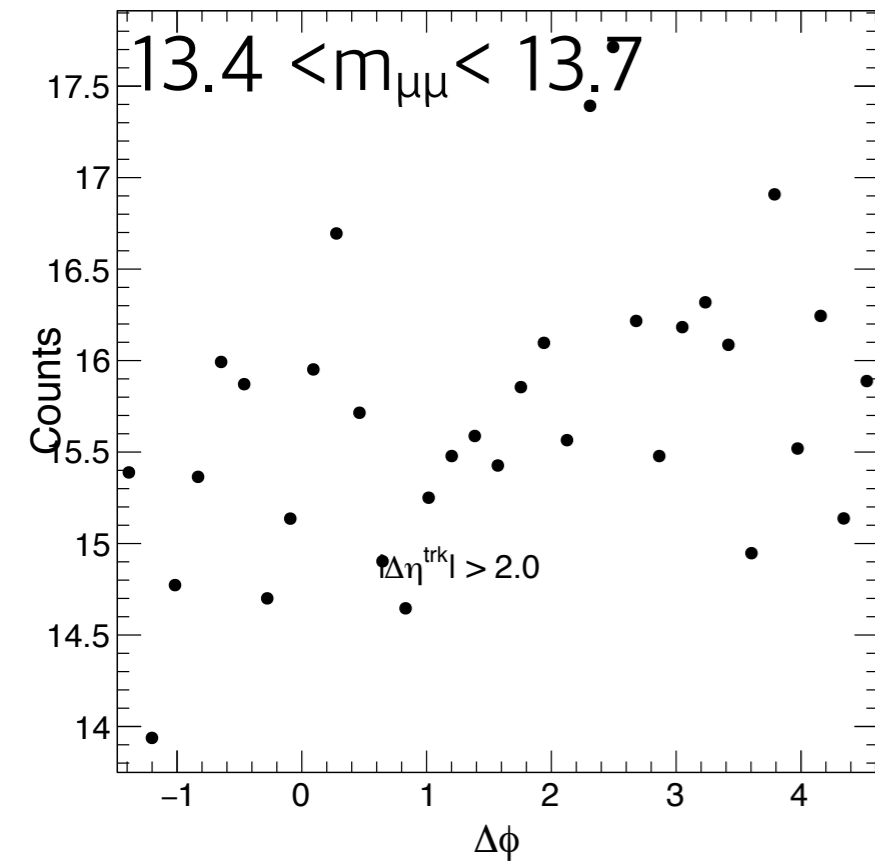
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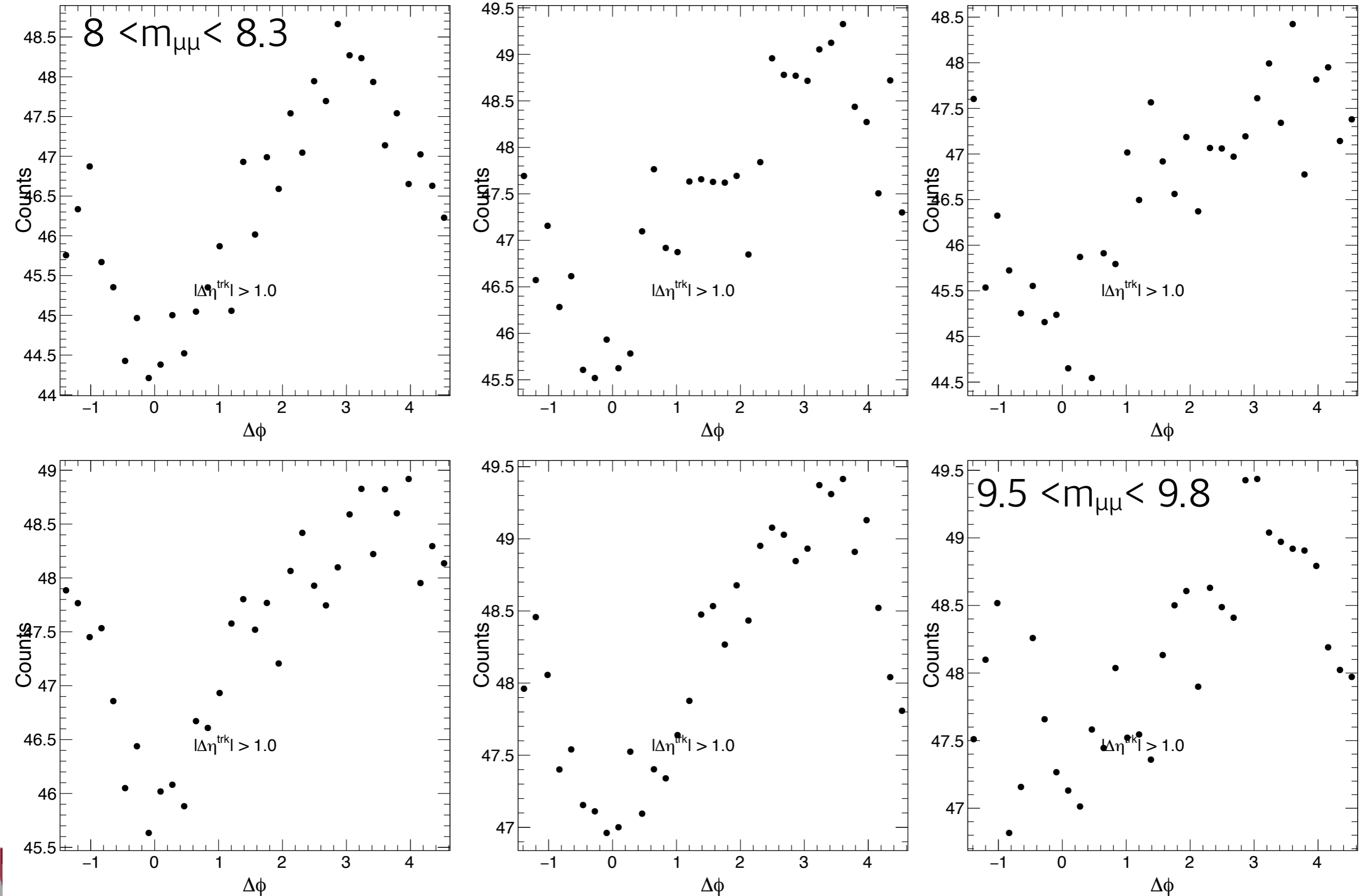
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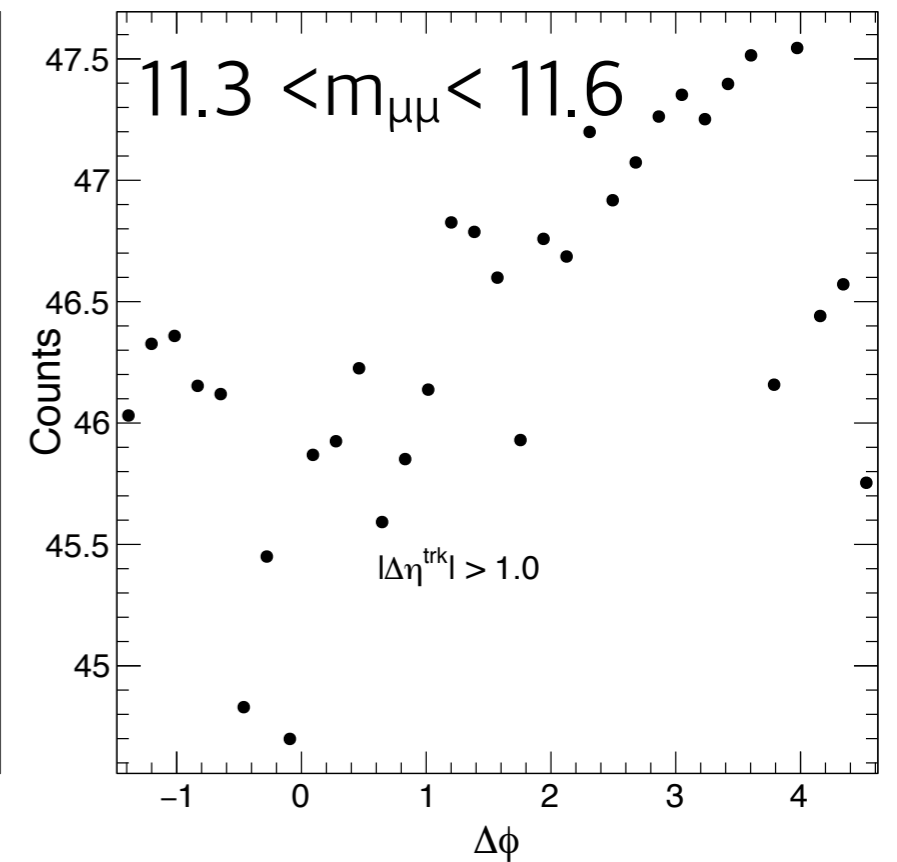
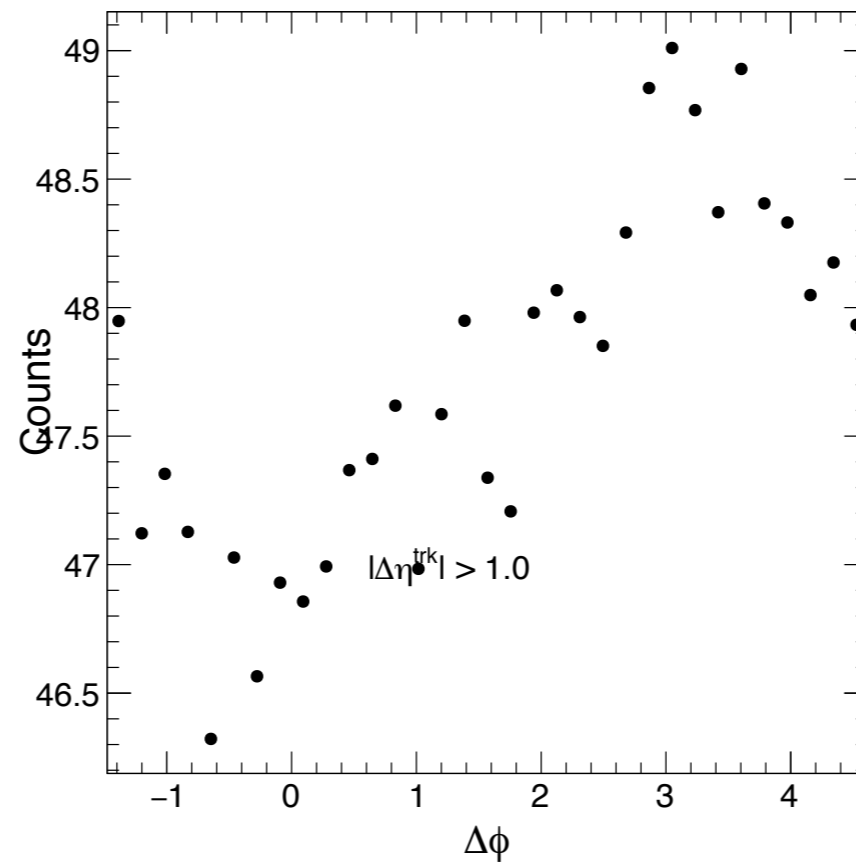
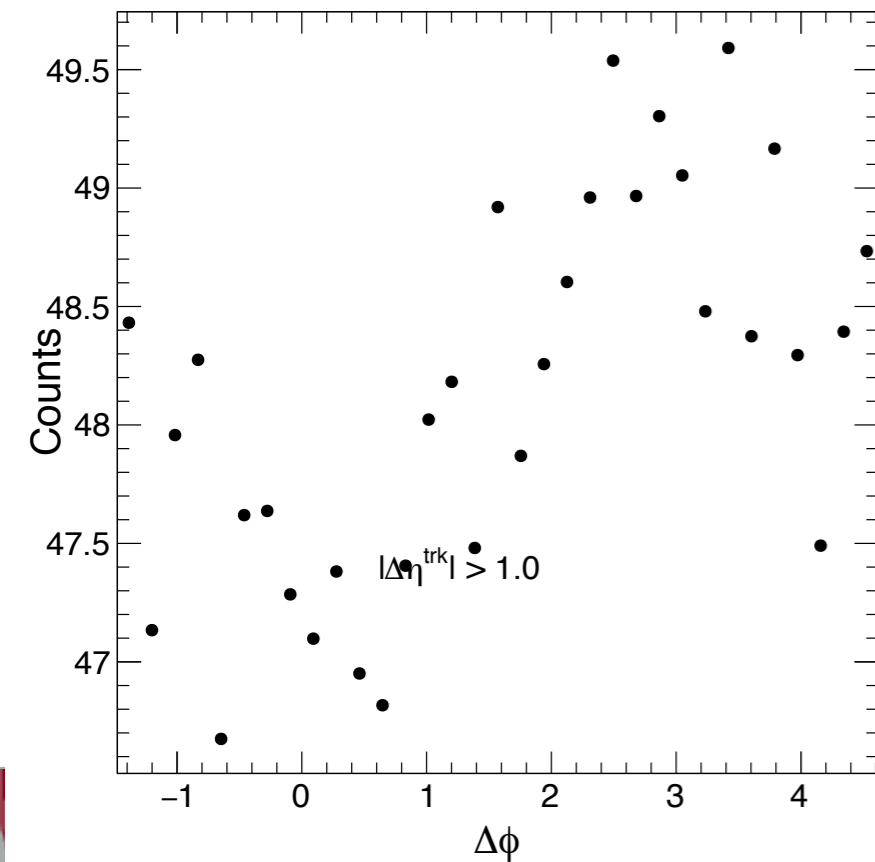
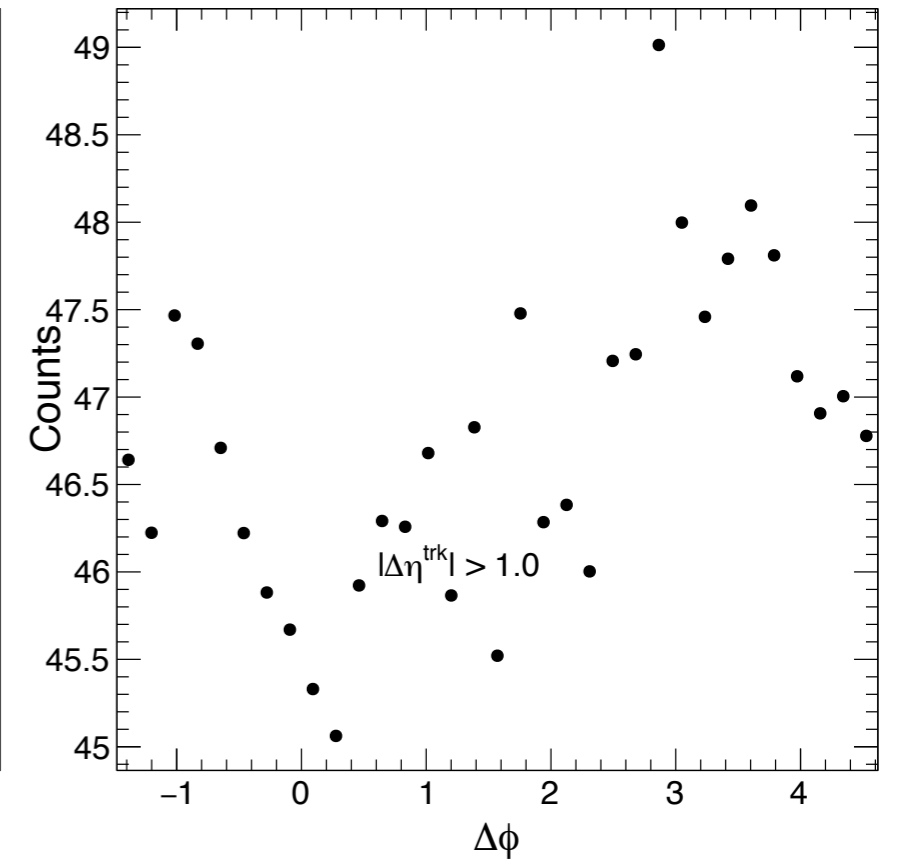
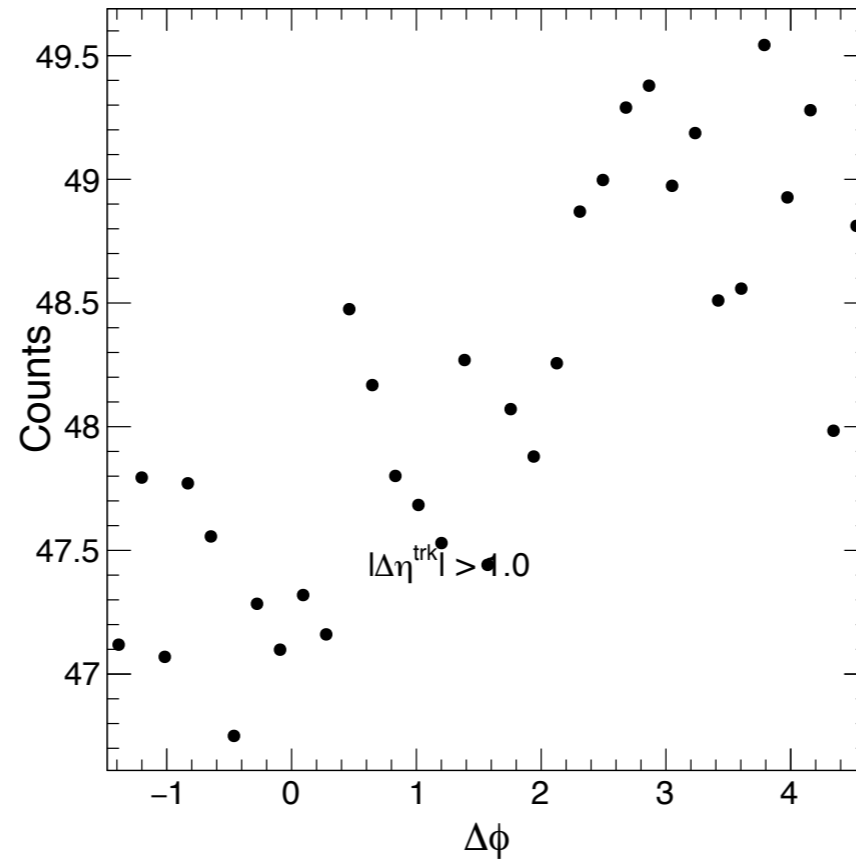
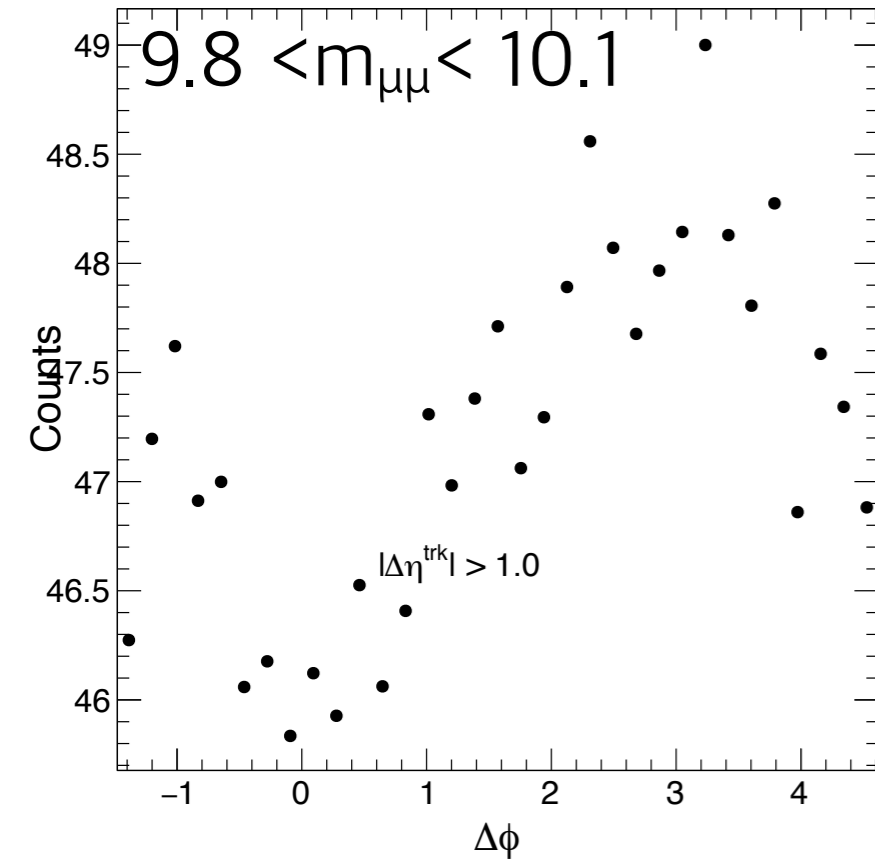
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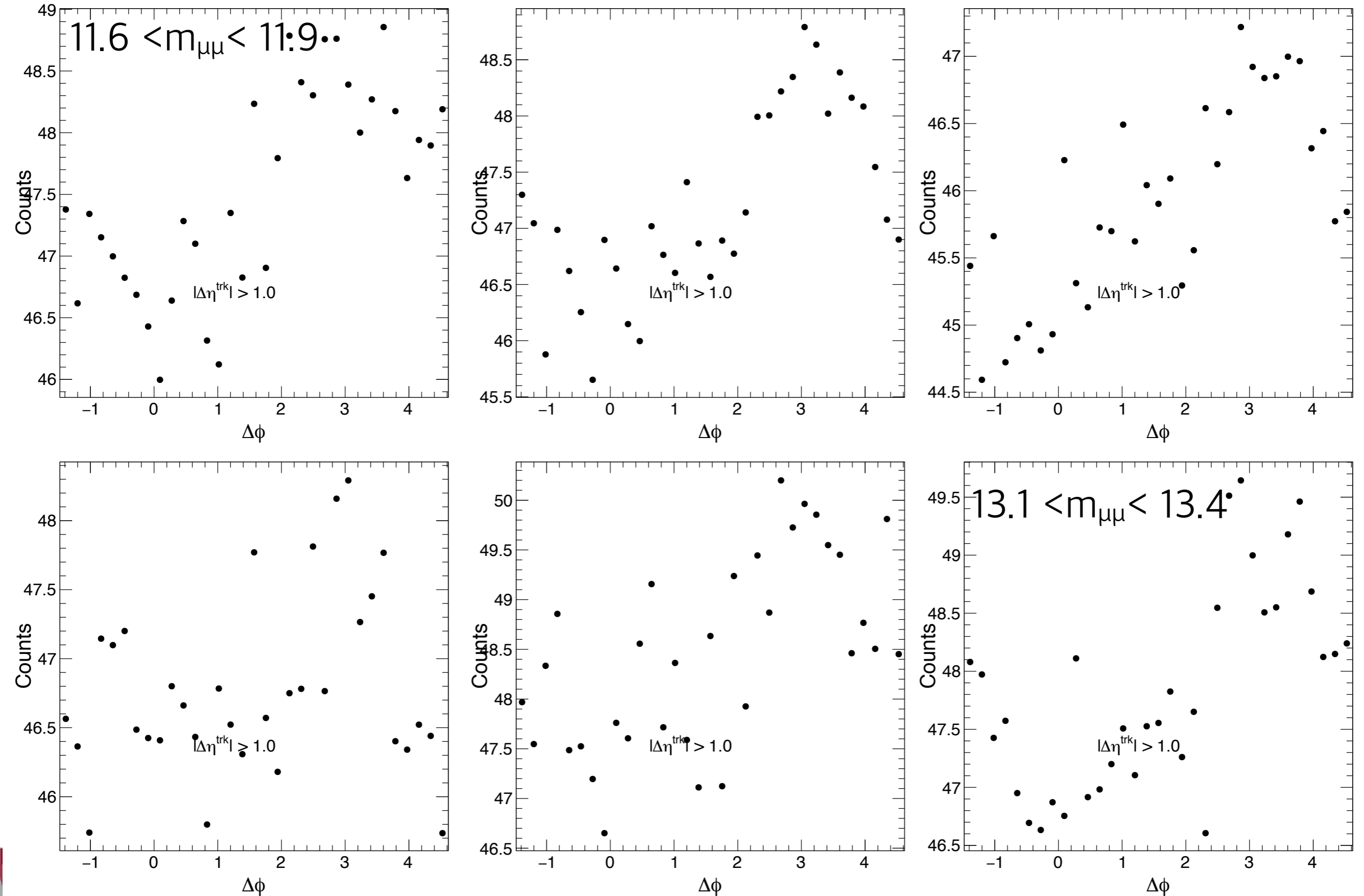
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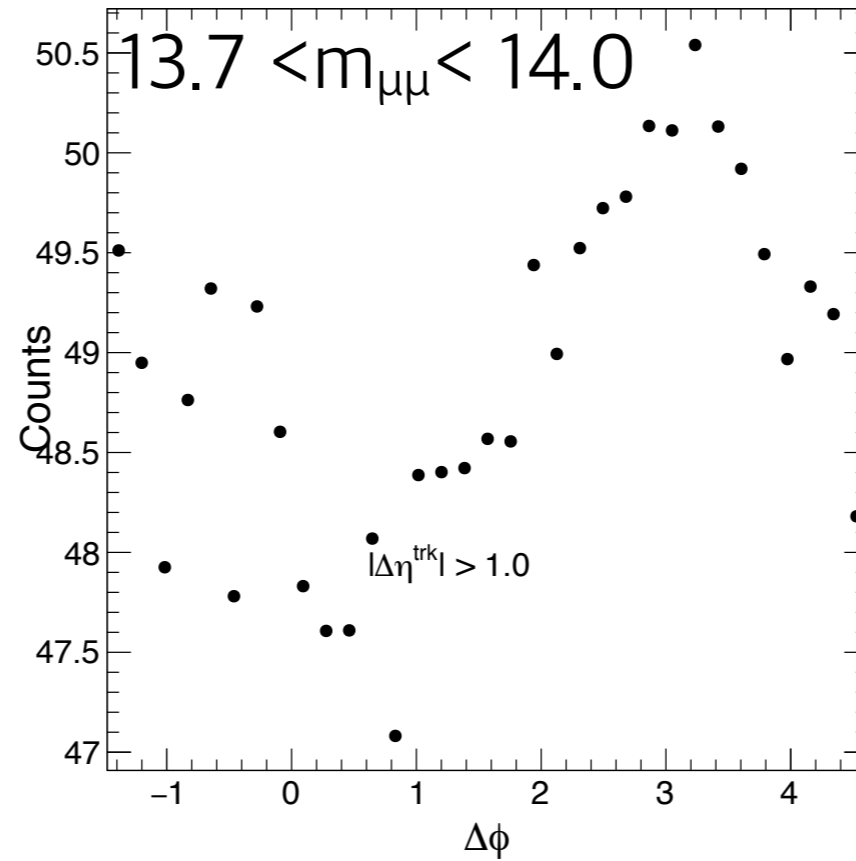
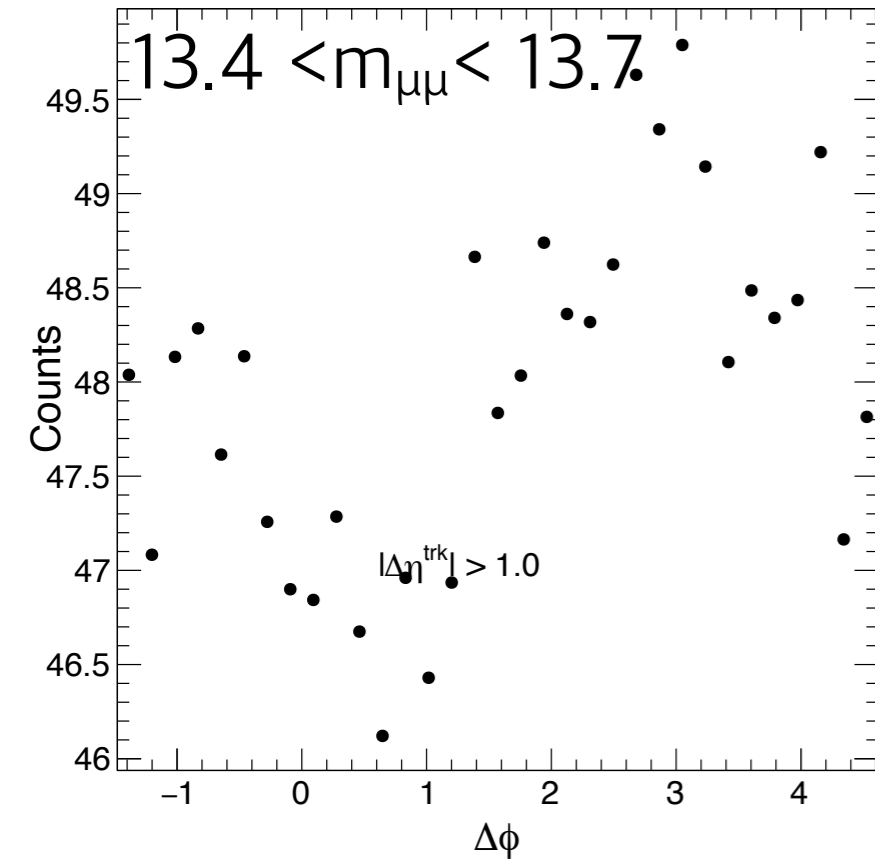
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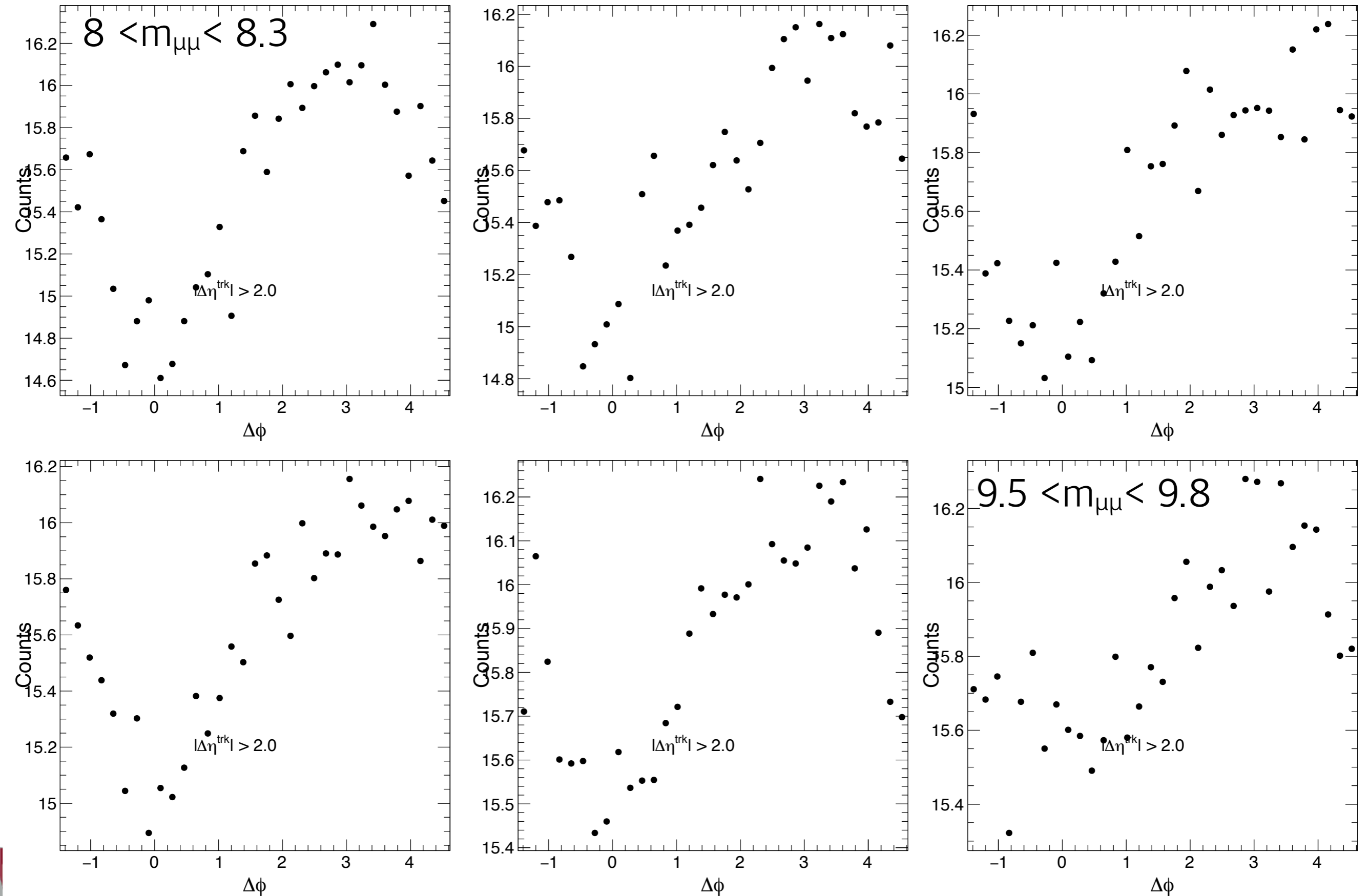
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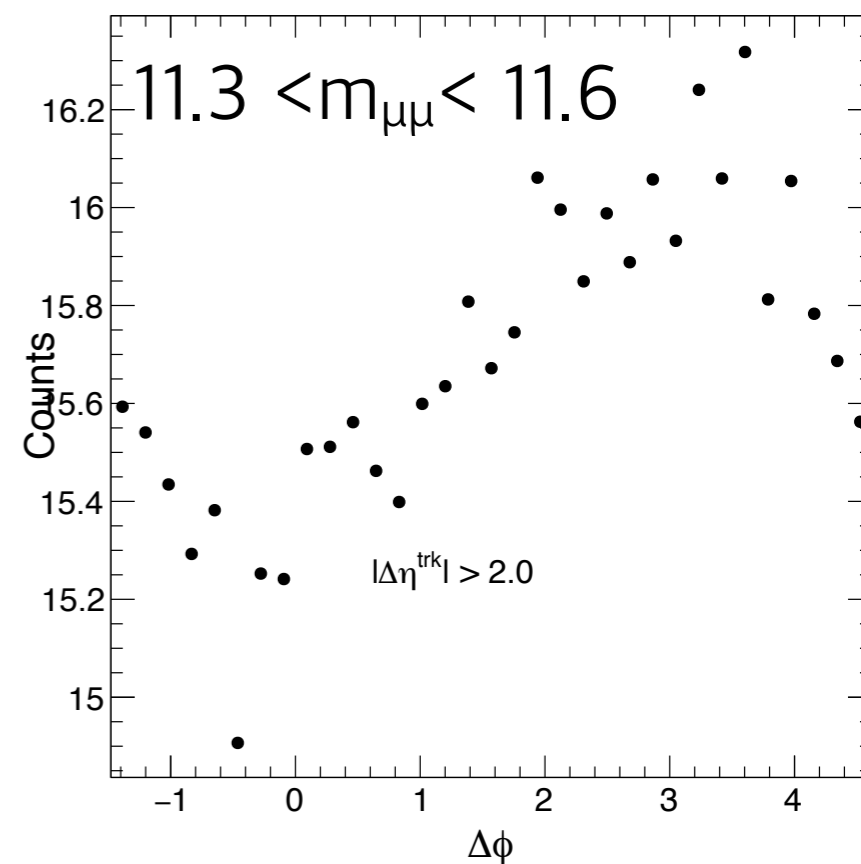
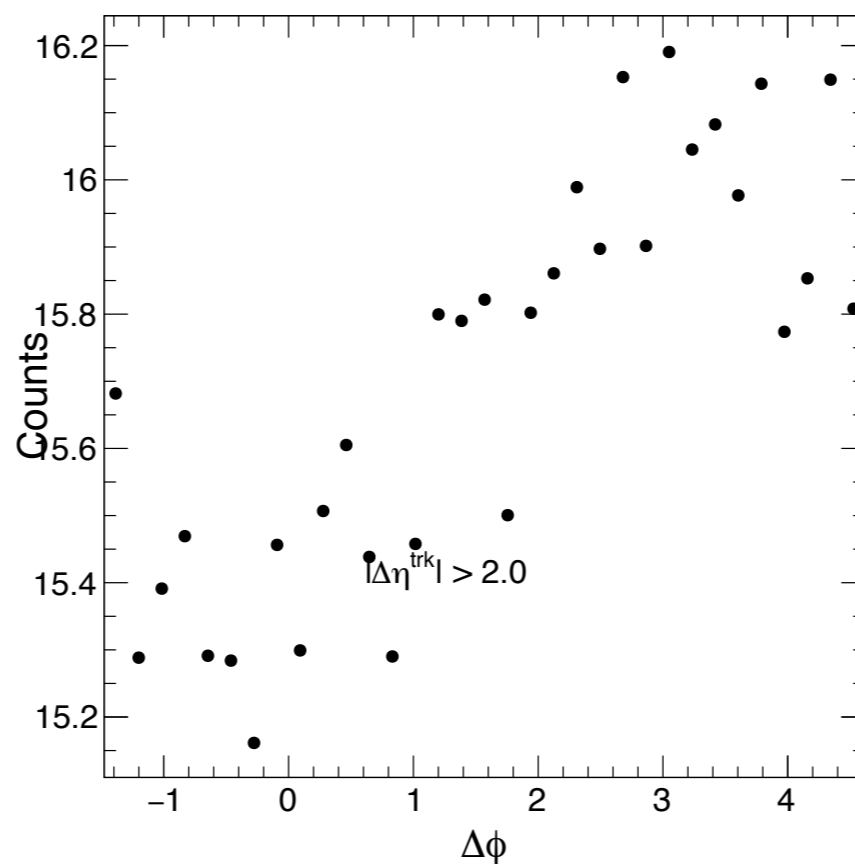
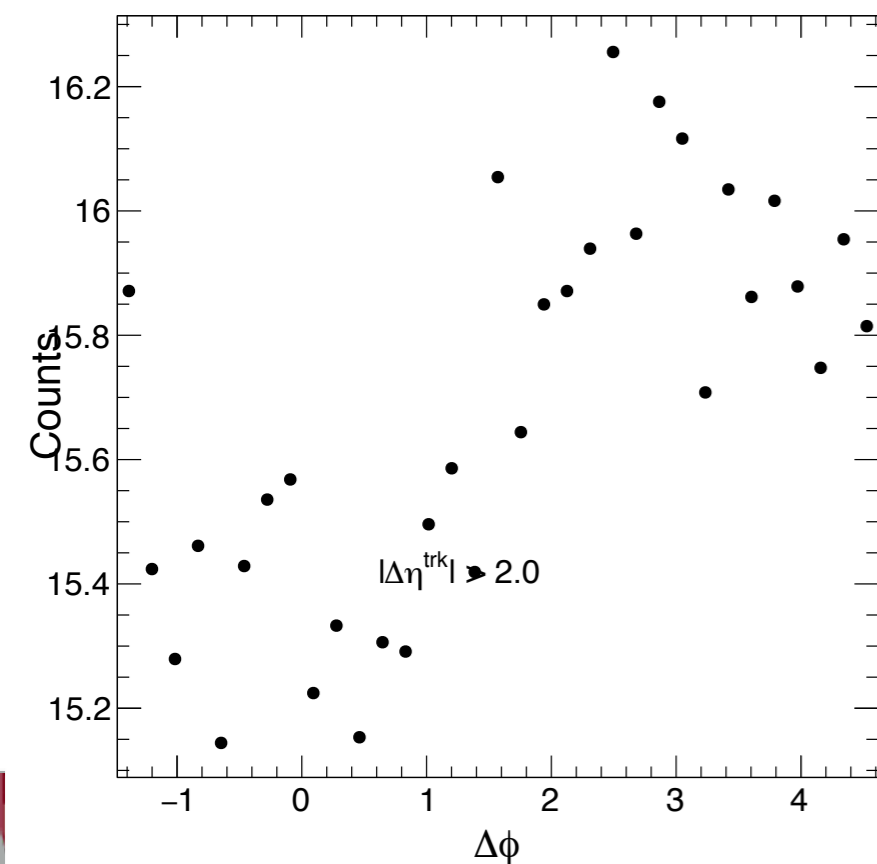
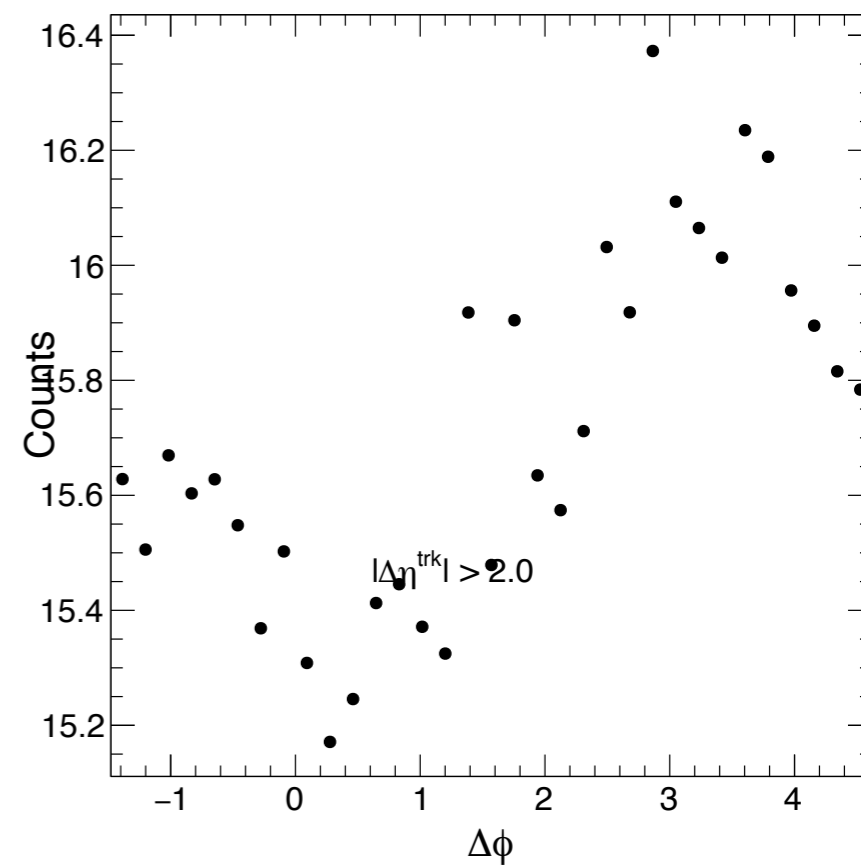
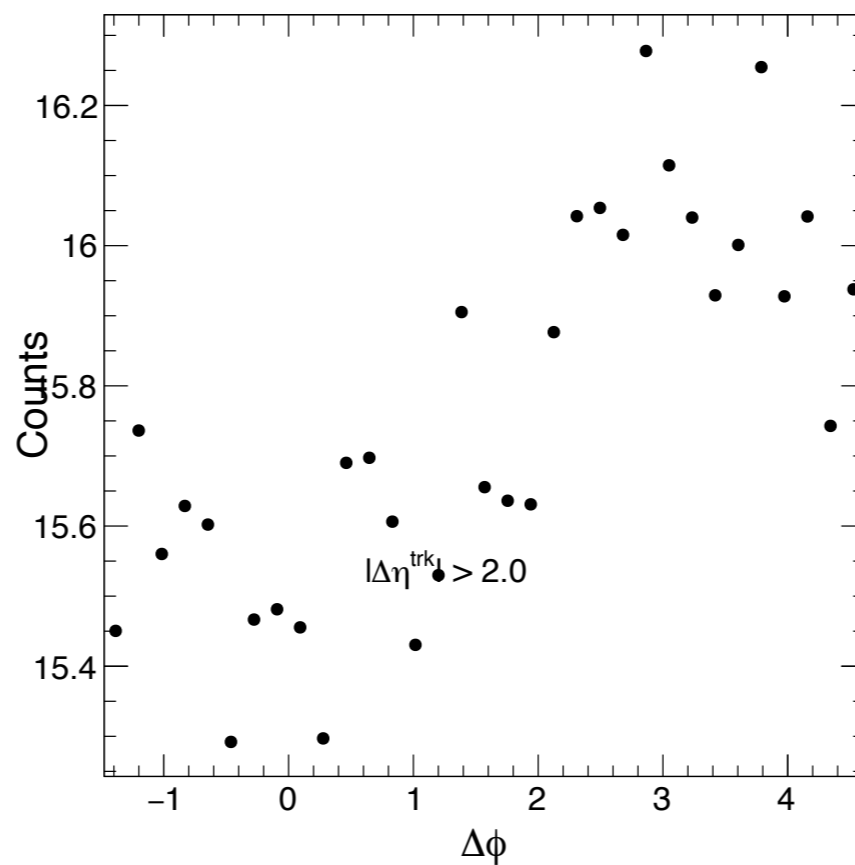
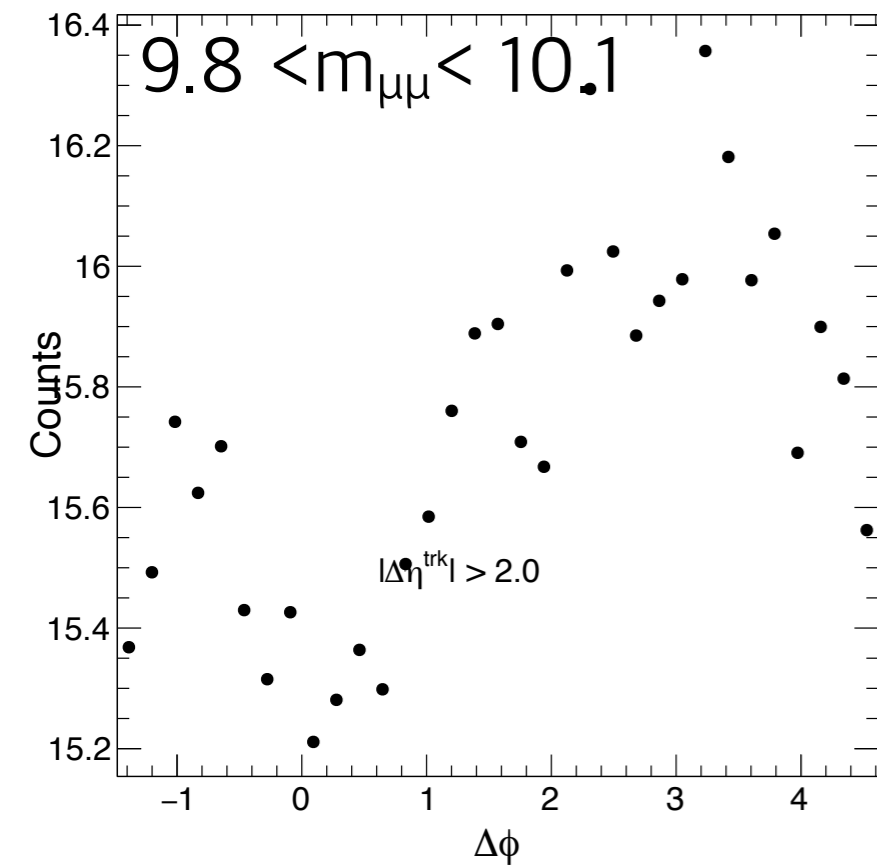
$150 < \text{mult.} < 1500, 0 < p_{\text{T}}^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$



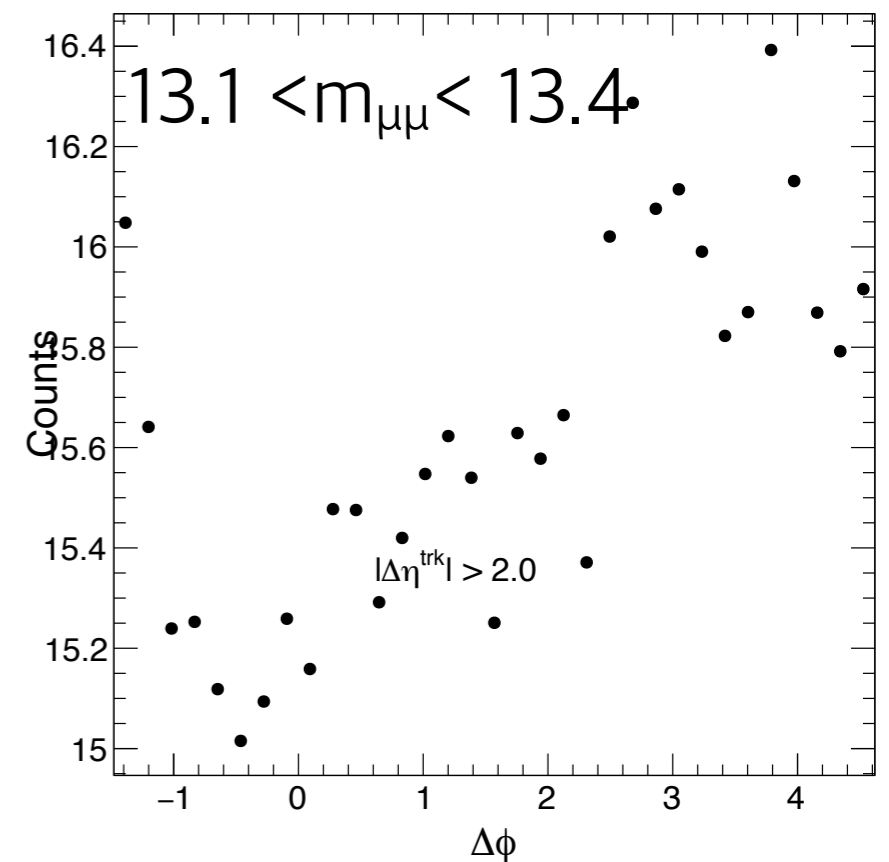
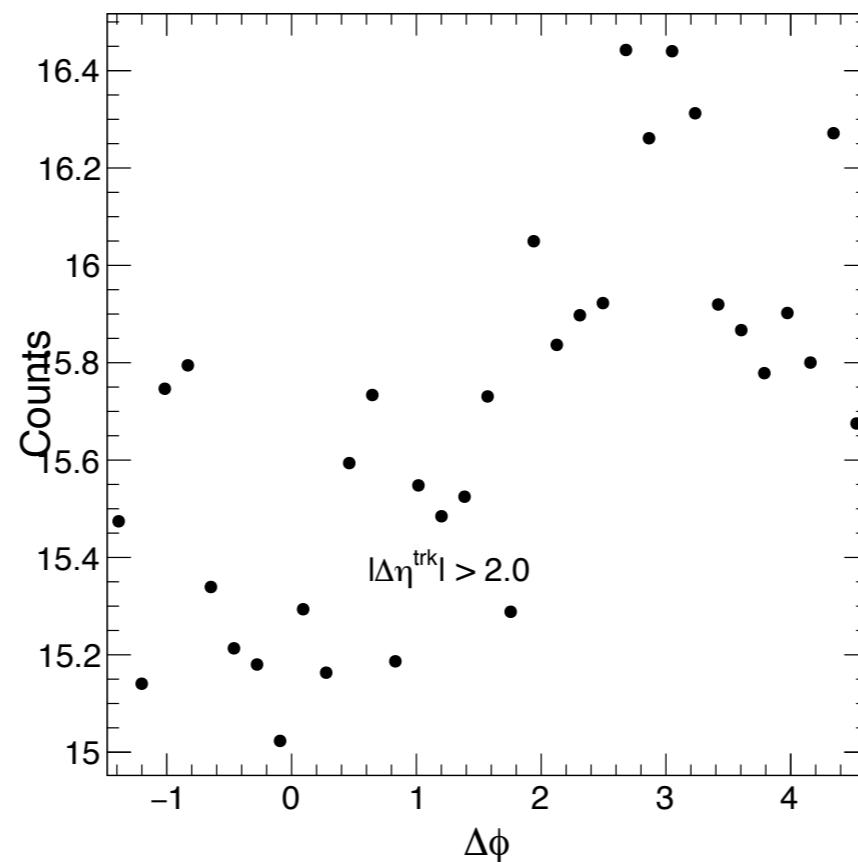
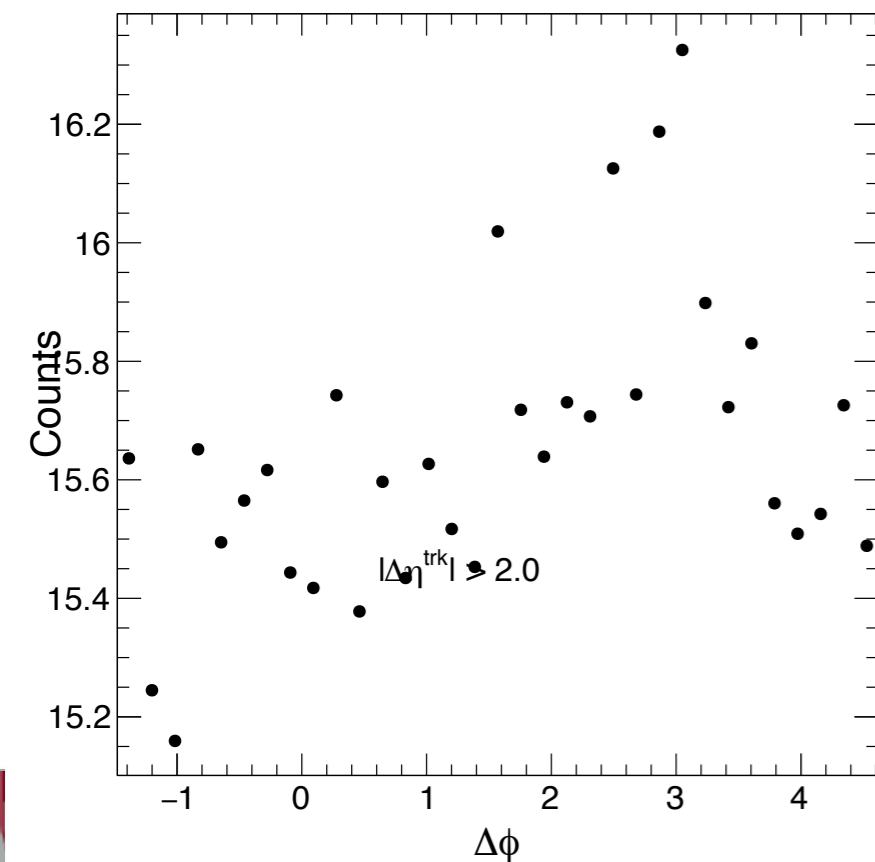
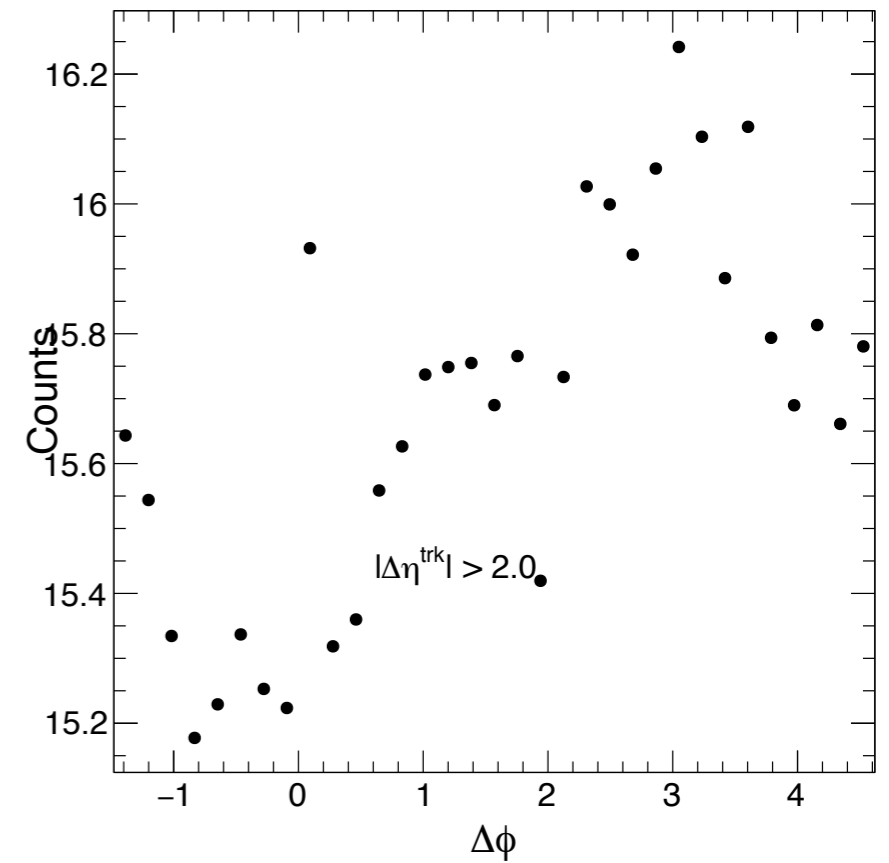
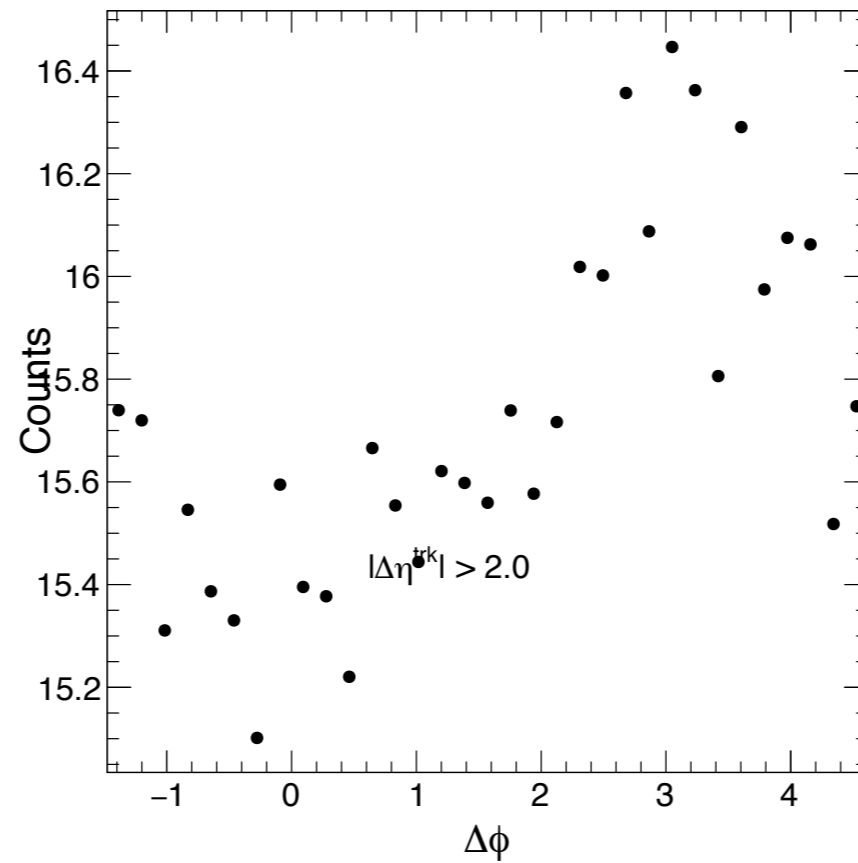
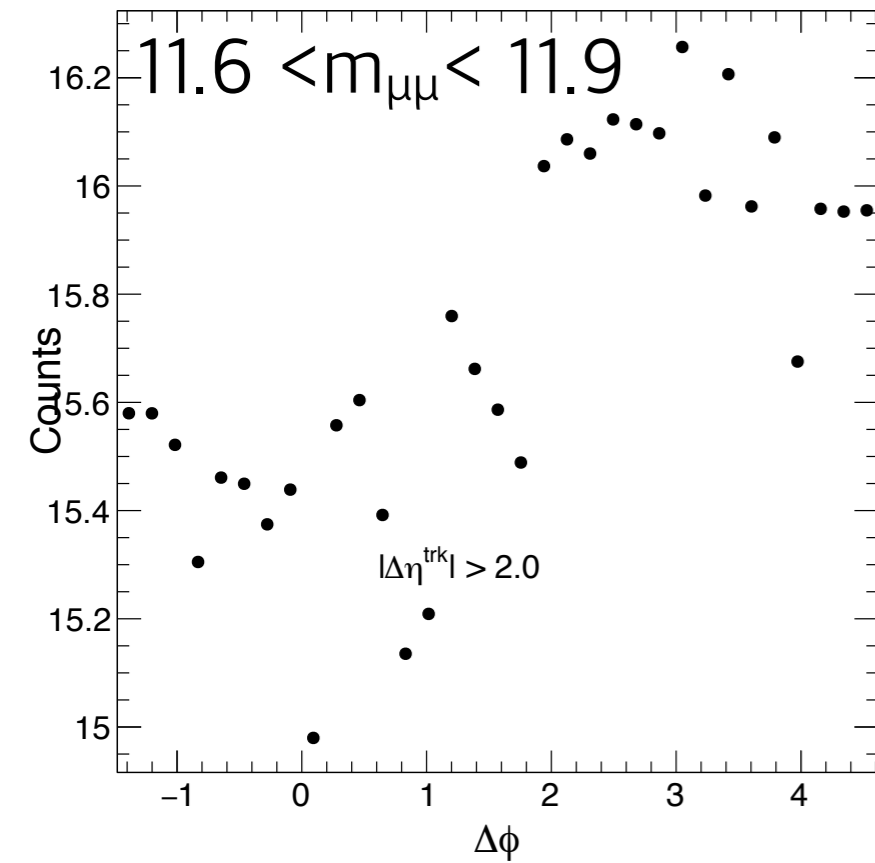
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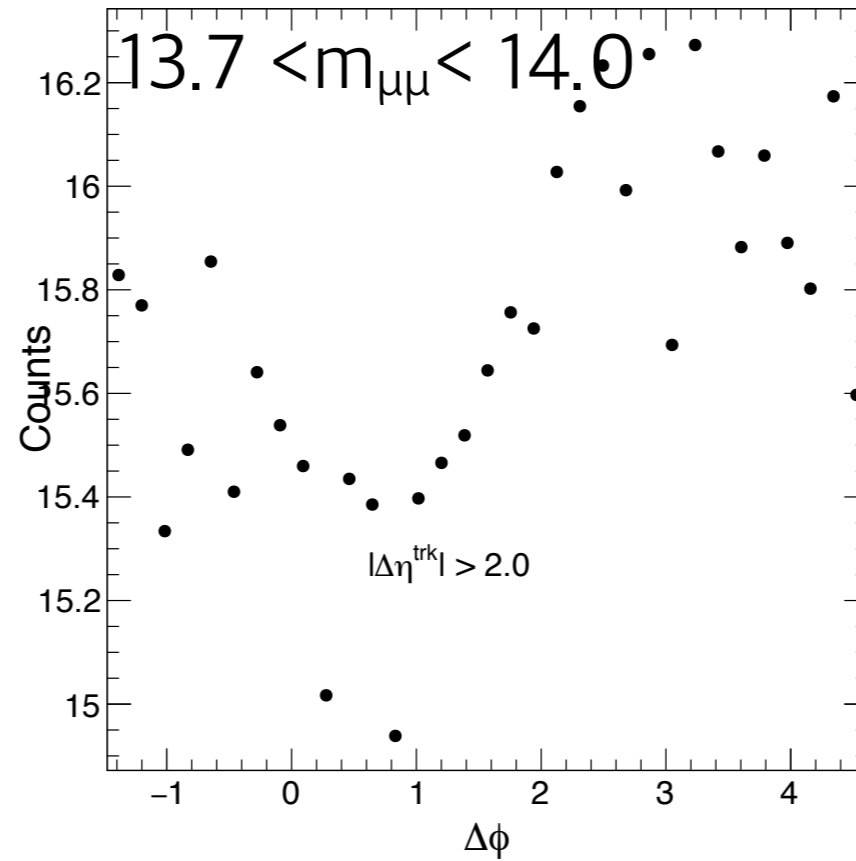
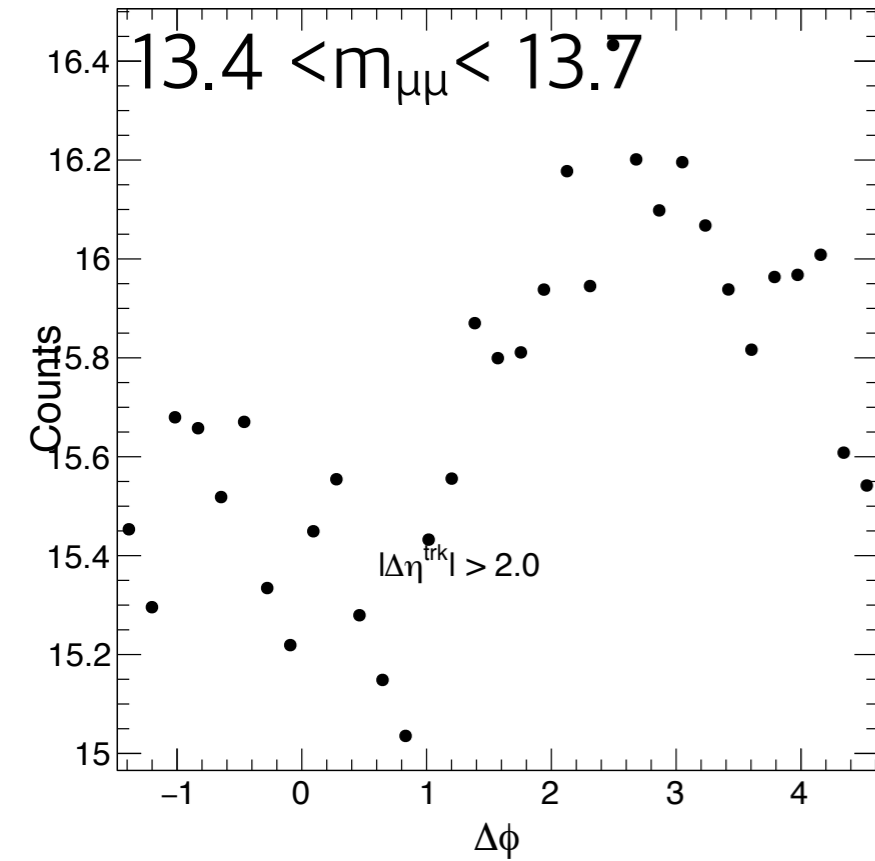
$150 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$



$150 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$



$150 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$



$$150 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$$150 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

$$9.8 < m_{\mu\mu} < 10.1$$

$$11.3 < m_{\mu\mu} < 11.6$$

$$150 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$150 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$

$8 < m_{\mu\mu} < 8.3$

$9.5 < m_{\mu\mu} < 9.8$

$$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$$

$$9.8 < m_{\mu\mu} < 10.1$$

$$11.3 < m_{\mu\mu} < 11.6$$

$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$

$11.6 < m_{\mu\mu} < 11.9$

$13.1 < m_{\mu\mu} < 13.4$

$150 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$

$8 < m_{\mu\mu} < 8.3$

$9.5 < m_{\mu\mu} < 9.8$

$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$

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$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$

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$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$

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$13.7 < m_{\mu\mu} < 14.0$

$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$

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$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$

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$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$

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$100 < \text{mult.} < 1500, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$

$9.8 < m_{\mu\mu} < 10.1$

$11.3 < m_{\mu\mu} < 11.6$

$$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$

$8 < m_{\mu\mu} < 8.3$

$9.5 < m_{\mu\mu} < 9.8$

$100 < \text{mult.} < 1500, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$

$9.8 < m_{\mu\mu} < 10.1$

$11.3 < m_{\mu\mu} < 11.6$

$$100 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$100 < \text{mult.} < 1500, 1 < p_{\text{T}}^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 2)$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$$

$$8 < m_{\mu\mu} < 8.3$$

$$9.5 < m_{\mu\mu} < 9.8$$

$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$

$9.8 < m_{\mu\mu} < 10.1$

$11.3 < m_{\mu\mu} < 11.6$

$$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$$

$$11.6 < m_{\mu\mu} < 11.9$$

$$13.1 < m_{\mu\mu} < 13.4$$

$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 1)$

$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$0 < \text{mult.} < 40, 0 < p_T^{\text{trk}} < 100 \text{ d}\phi(|\Delta\eta| > 2)$

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$13.4 < m_{\mu\mu} < 13.7$

$13.7 < m_{\mu\mu} < 14.0$

$$0 < \text{mult.} < 40, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

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$$0 < \text{mult.} < 40, 1 < p_T^{\text{trk}} < 3 \text{ d}\phi(|\Delta\eta| > 1)$$

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