

# Run 13 BEMC calibration updates -3 Trigger Options

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# Trigger Options for Run 13

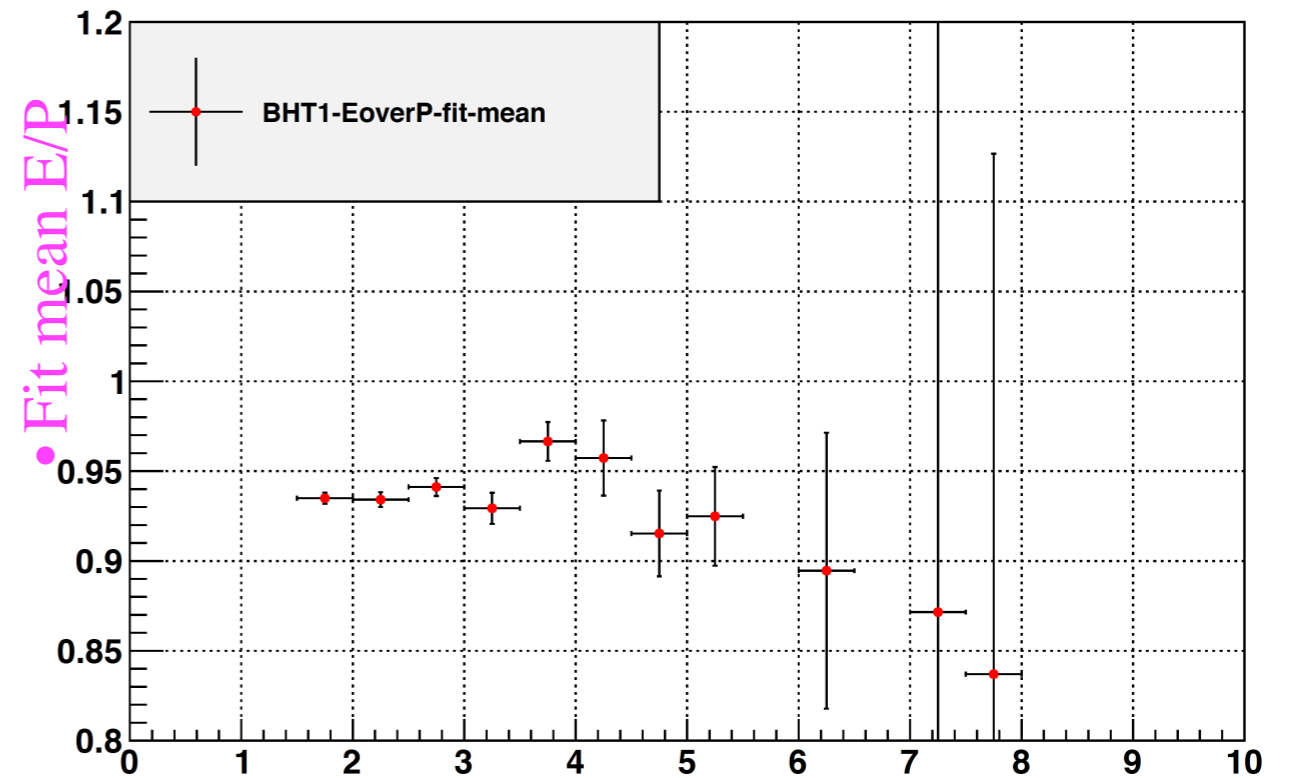
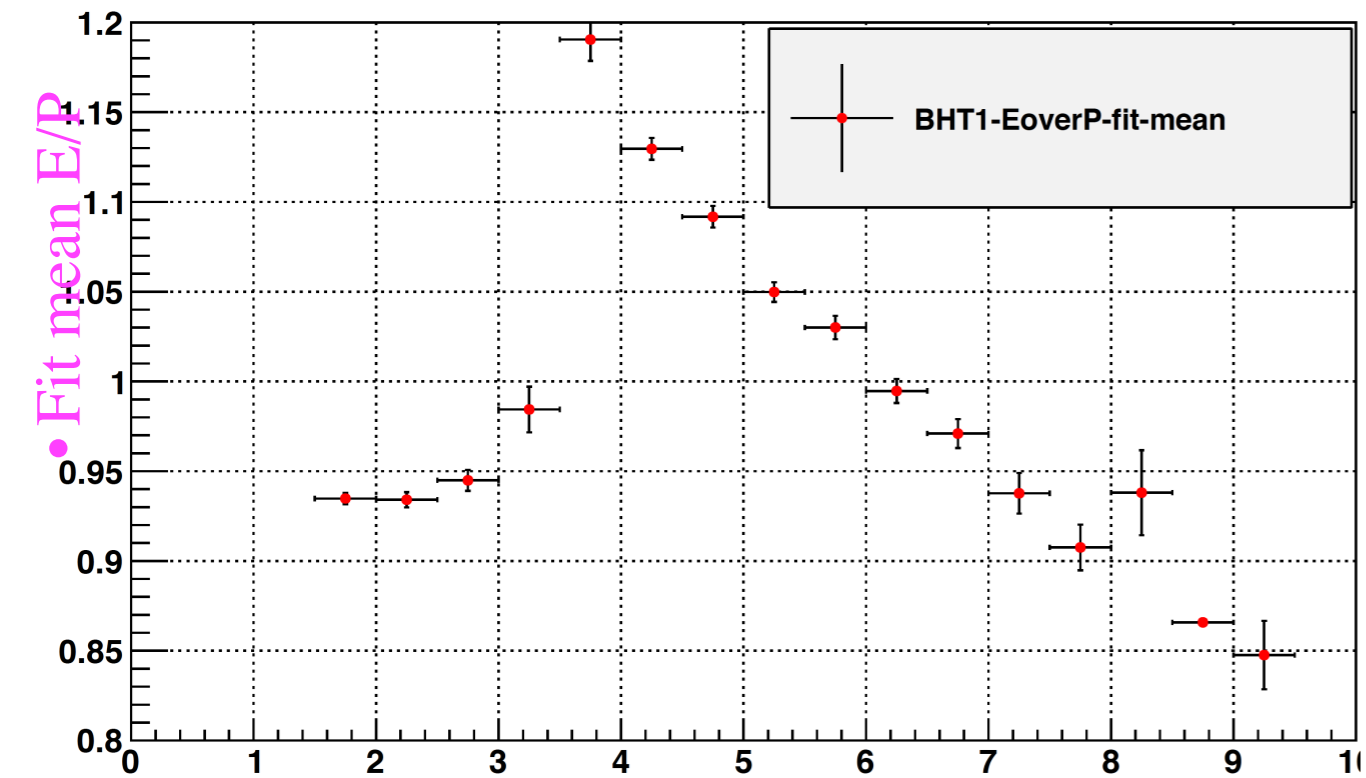
- Trigger options for Electron Analysis should be carefully select to avoid trigger “biases”, “anti biases”
- In Run 13 BHT0, BHT2 have extremely low statistics due to larger pre-scale values hence will not use for the analysis.
- Other Triggers available are “Unbiased”, “BHT3”, JP2 and we should study them for possible biases.

# BHT1 Trigger

•  $if(!triggerFire(BHT0) \&\& triggerFire(BHT1) \&\& !triggerFire(BHT2) \&\& !triggerFire(BHT3) \&\& !triggerFire(JP2))$

• **Trigger Threshold = 4.2**

• **Matched tracks Excluded !!**



• trackP (GeV)

• trackP (GeV)

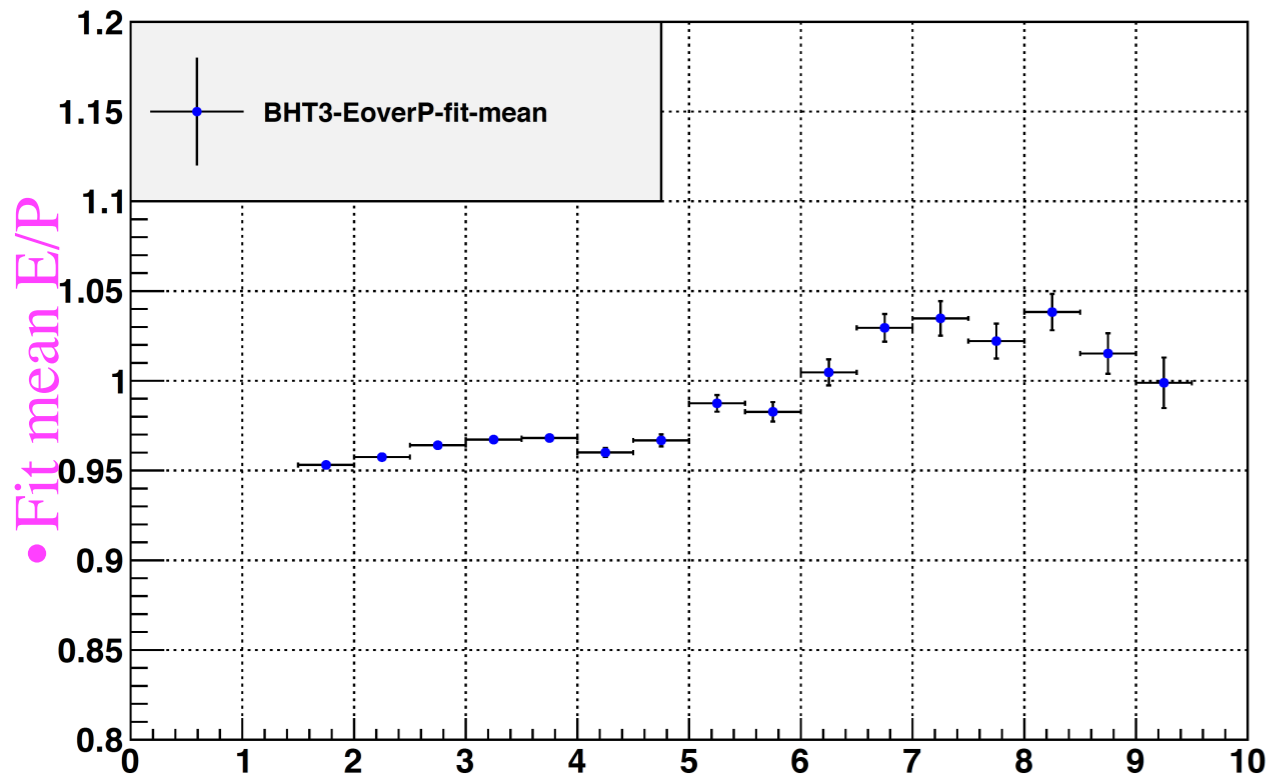
- When Matched tracks are **included** significant momentum dependence of E/P above the threshold value.
- Will not use since lower  $\langle E/P \rangle$  compared to other triggers.

# BHT3 Trigger

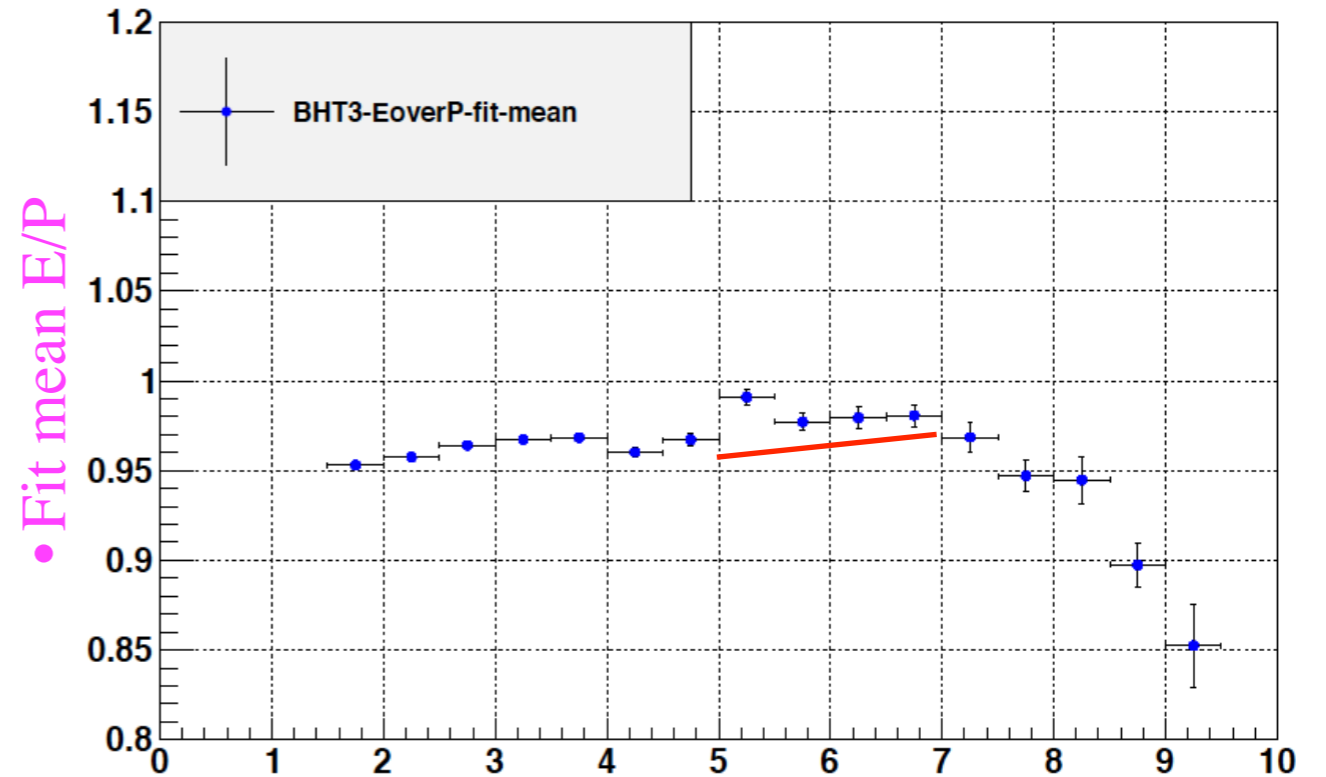
•  $if(!triggerFire(BHT1) \&\& !triggerFire(BHT1) \&\& !triggerFire(BHT2) \&\& triggerFire(BHT3) \&\& !triggerFire(JP2))$

• **Trigger Threshold = 7.3**

• **Matched tracks Excluded !!**



• trackP (GeV)

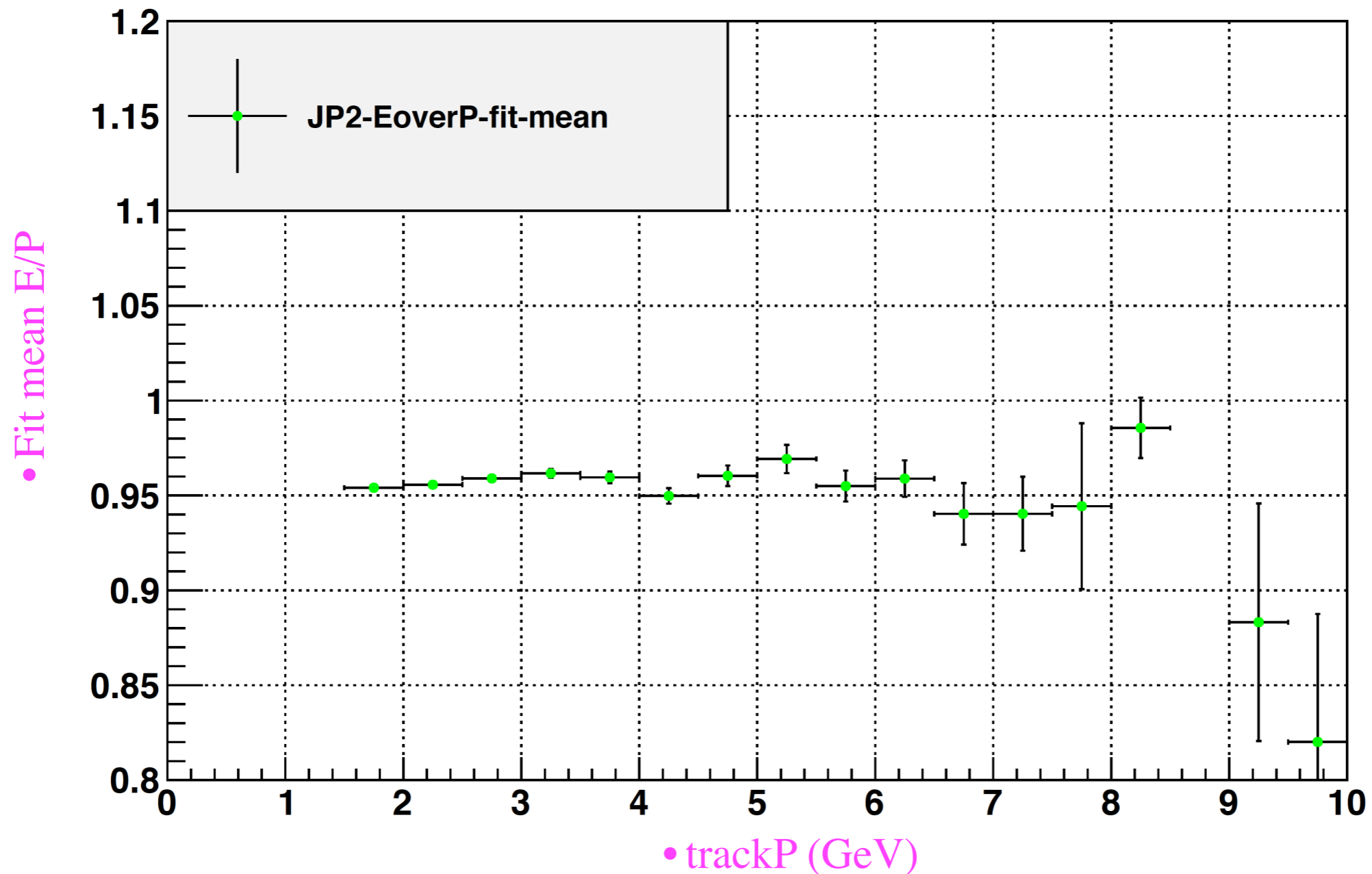


• trackP (GeV)

- Matched tracks are responsible for momentum dependence of E/P around the threshold value
- To remove “antibias” momentum cut can be used ( trackP~5)

# JP2 Trigger

- $if(!triggerFire(BHT1) \ \&\& \ !triggerFire(BHT1) \ \&\& \ !triggerFire(BHT2) \ \&\& \ !triggerFire(BHT3) \ \&\& \ triggerFire(JP2))$



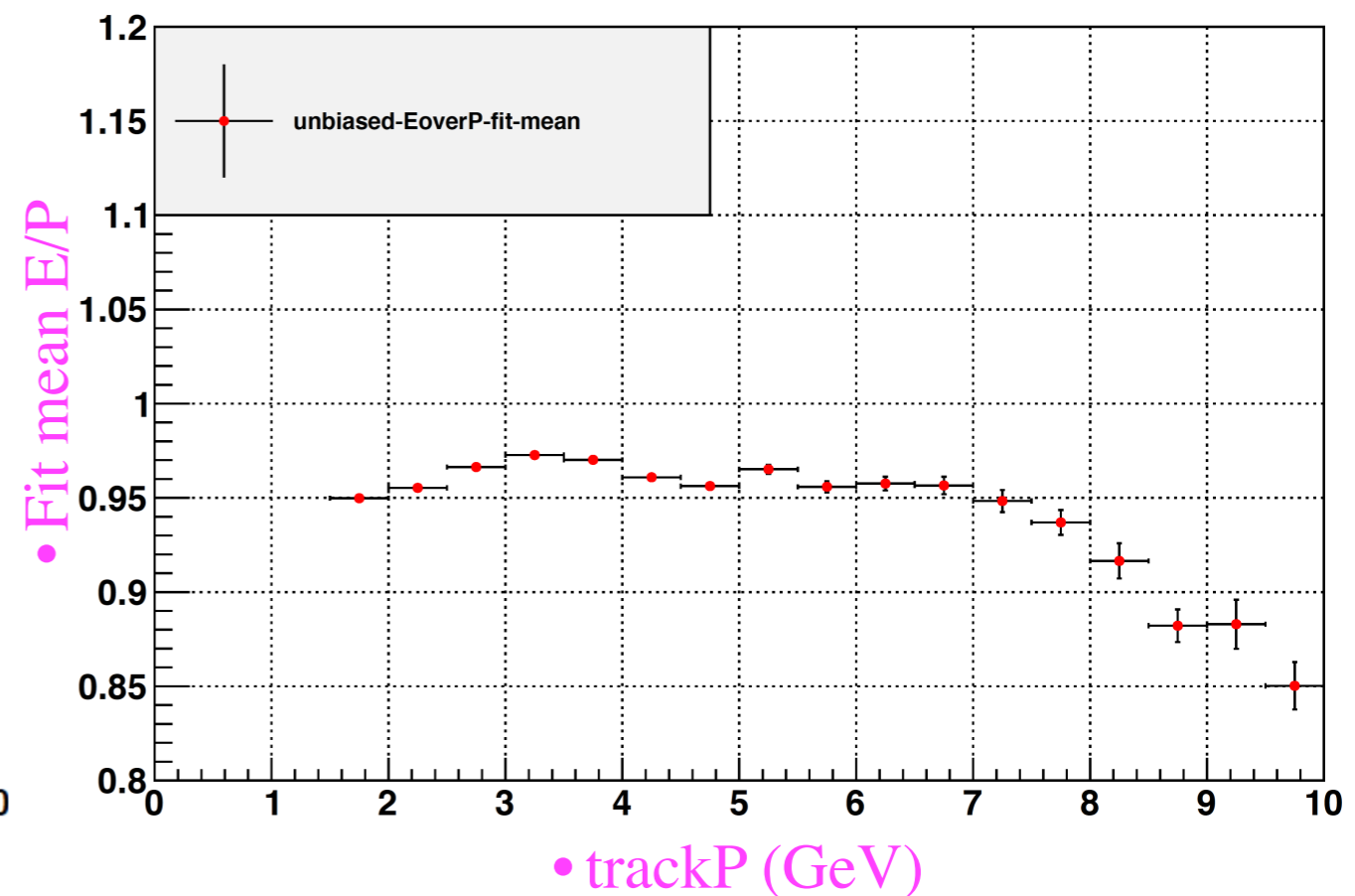
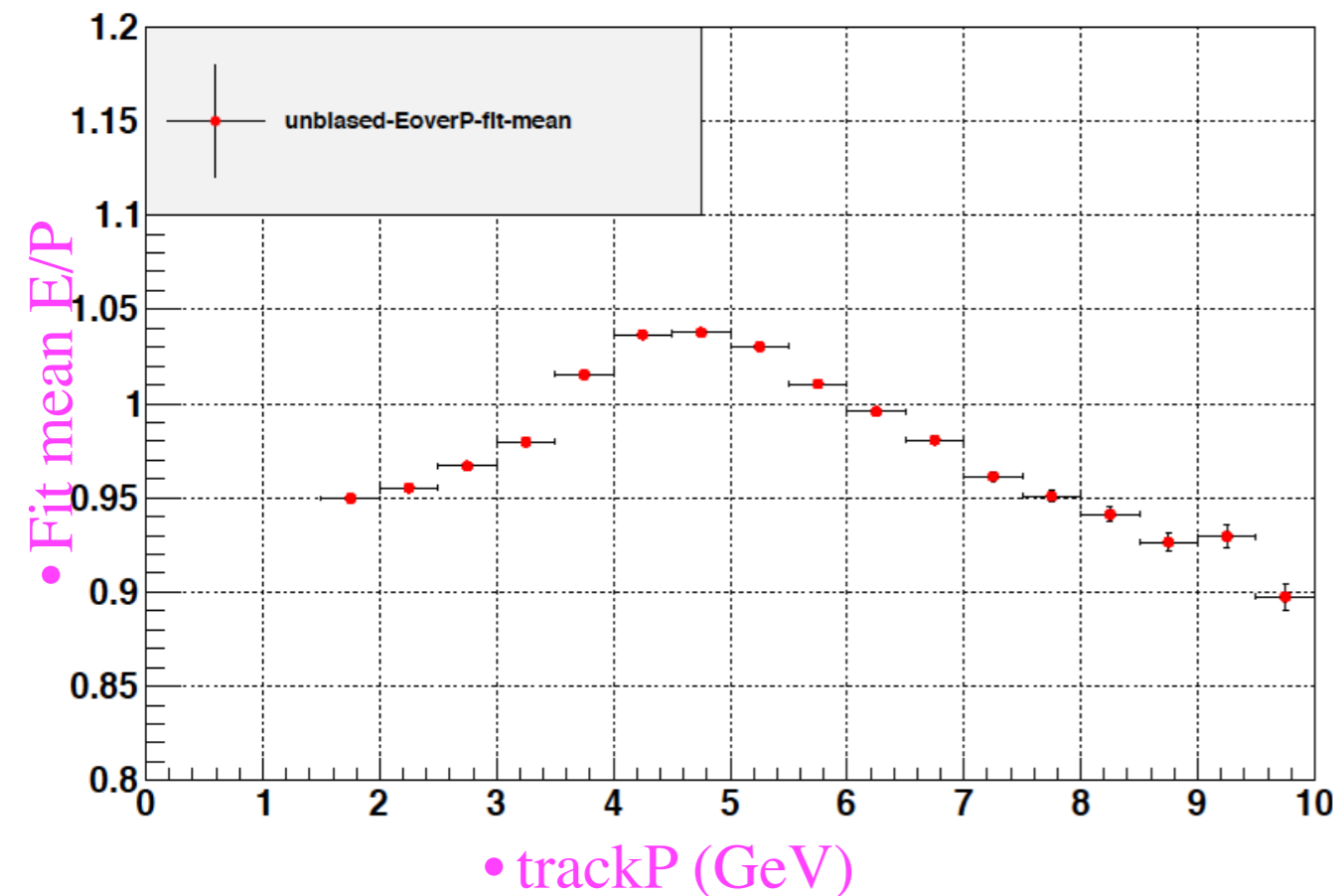
- JP2 trigger does not shows momentum dependance for large P tracks. !!!

# “Unbiased” Trigger

anything other than HT trigger + HT software trigger

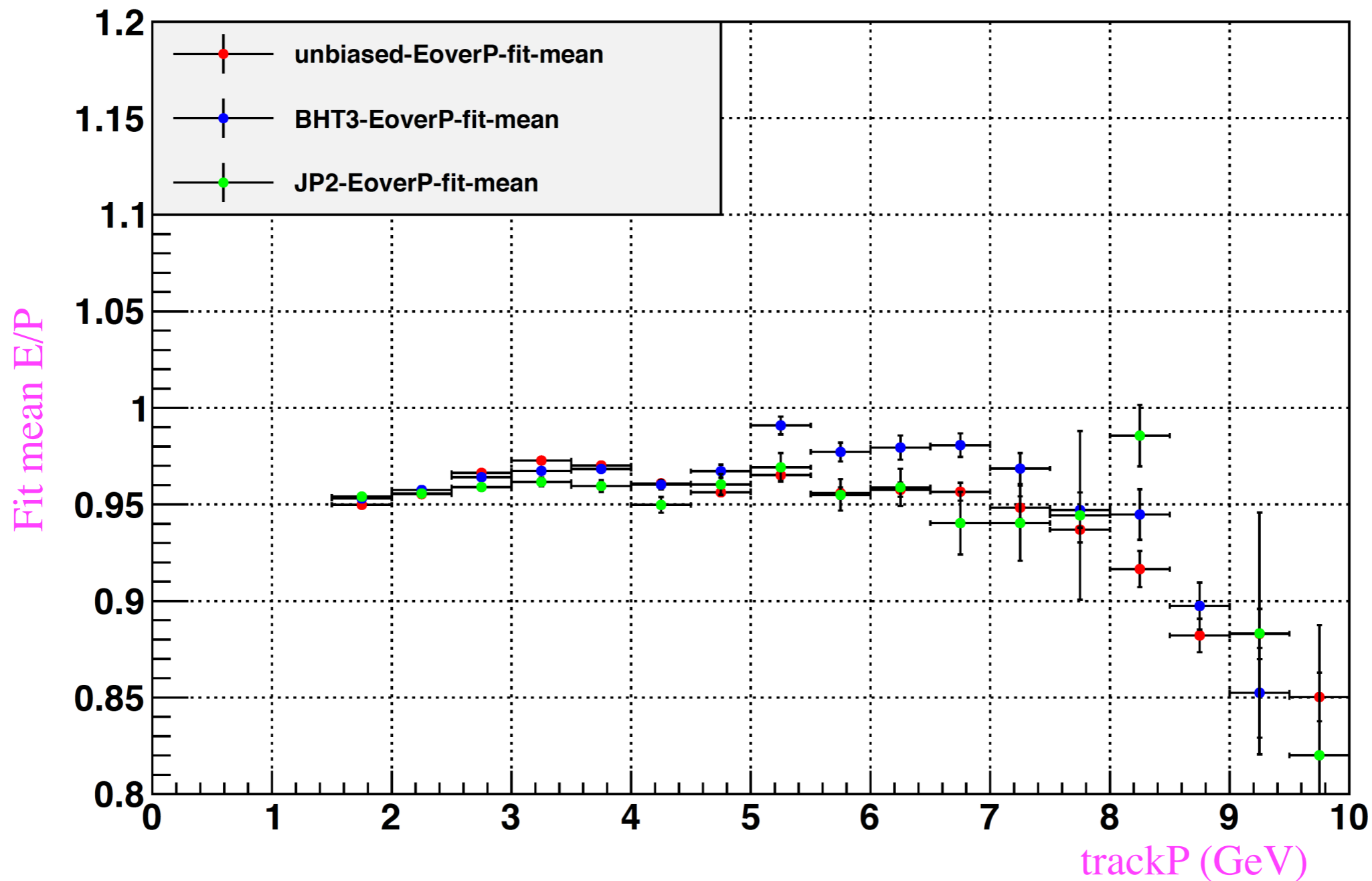
- $(((!mBHT0 \ \&\& \ !mBHT1 \ \&\& \ !mBHT2 \ \&\& \ !mBHT3 \ \&\& \ !mJP2) \ || \ (mBHT0 \ \&\& \ !mBHT0 \rightarrow didFire()) \ || \ (mBHT1 \ \&\& \ !mBHT1 \rightarrow didFire()) \ || \ (mBHT2 \ \&\& \ !mBHT2 \rightarrow didFire()) \ || \ (mBHT3 \ \&\& \ !mBHT3 \rightarrow didFire()) \ || \ (mJP2 \ \&\& \ !mJP2 \rightarrow didFire())) \ || \ (!triggerFire(mBHT0) \ \&\& \ !triggerFire(mBHT1) \ \&\& \ !triggerFire(mBHT2) \ \&\& \ !triggerFire(mBHT3) \ \&\& \ !triggerFire(mJP2)))$

• **Matched tracks Excluded !!**



- Unbiased triggers shows stable  $\langle E/P \rangle$  after removing matched triggered tracks even though unbiased events does not included any hardware triggered events.

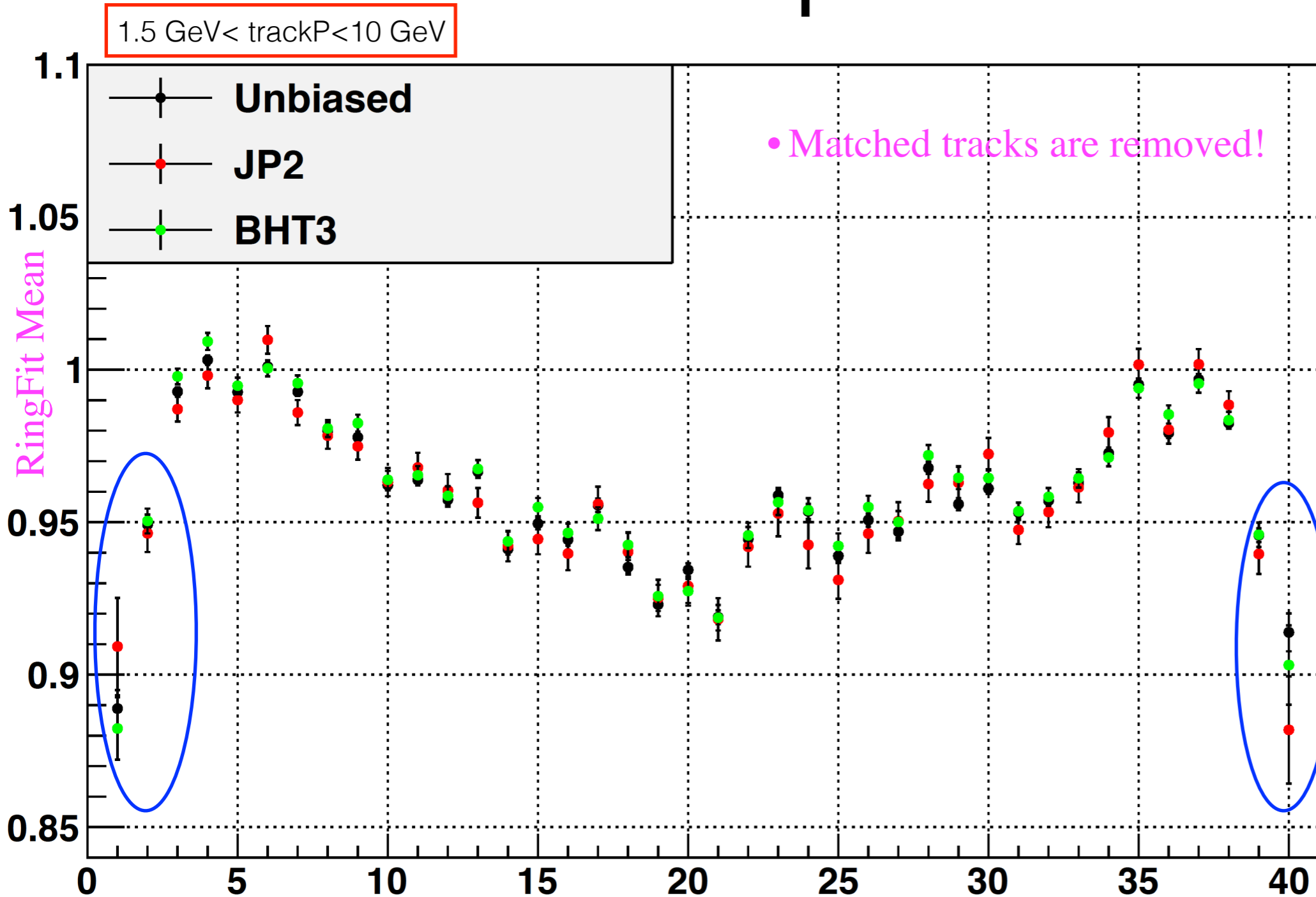
# Unbiased, JP2, BHT3 after Matched Tracks Excluded!



- It is obvious that Tower Matched Tracks should be excluded to avoid trigger biases and to have stable E/P
- We have enough statistics only from Unbiased, JP2, BHT3 triggers

# Eta Dependence

ringIndex	Eta
1	-0.975
2	-0.925
3	-0.875
4	-0.825
5	-0.775
6	-0.725
7	-0.675
8	-0.625
9	-0.575
10	-0.525
11	-0.475
12	-0.425
13	-0.375
14	-0.325
15	-0.275
16	-0.225
17	-0.175
18	-0.125
19	-0.075
20	-0.025
21	0.025
22	0.075
23	0.125
24	0.175
25	0.225
26	0.275
27	0.325
28	0.375
29	0.425
30	0.475
31	0.525
32	0.575
33	0.625
34	0.675
35	0.725
36	0.775
37	0.825
38	0.875
39	0.925
40	0.975

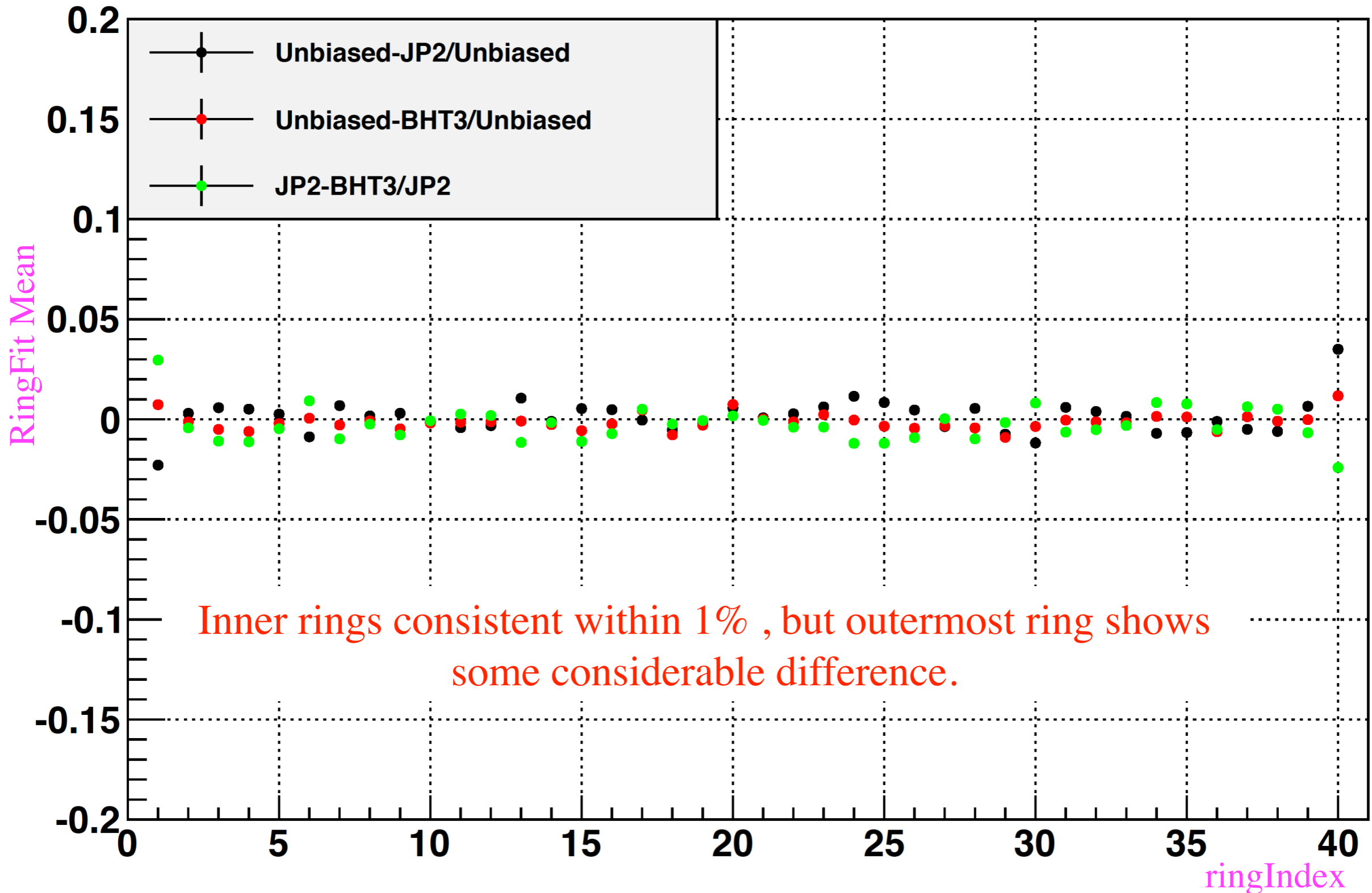


- All 3 triggers shows similar Eta dependance.
- Outermost 2 Eta rings (each side) shows systematically low  $\langle E/P \rangle$ .
- Some cuts shows significant impact in forward eta rings.

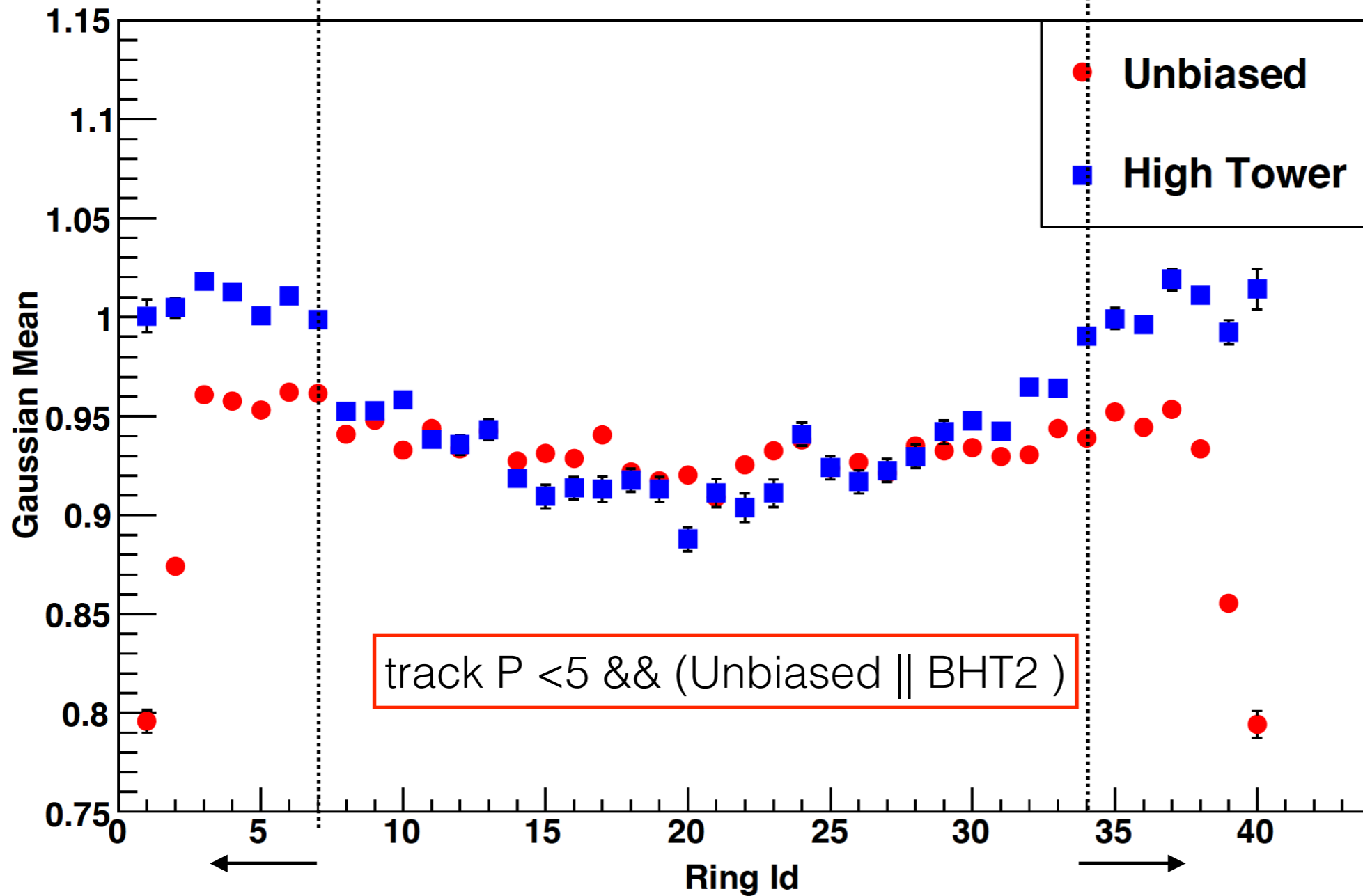
• ringIndex



# Differences



# Eta Dependance : run 12



ringIndex	tower Eta
1	-0.975
2	-0.925
3	-0.875
4	-0.825
5	-0.775
6	-0.725
7	-0.675
8	-0.625
9	-0.575
10	-0.525
11	-0.475
12	-0.425
13	-0.375
14	-0.325
15	-0.275
16	-0.225
17	-0.175
18	-0.125
19	-0.075
20	-0.025
21	0.025
22	0.075
23	0.125
24	0.175
25	0.225
26	0.275
27	0.325
28	0.375
29	0.425
30	0.475
31	0.525
32	0.575
33	0.625
34	0.675
35	0.725
36	0.775
37	0.825
38	0.875
39	0.925
40	0.975

# Summary

- Matched tracks are responsible for momentum dependence of  $E/P$  around the threshold value
- To remove “antibias” momentum cut can be used (  $\text{trackP} \sim 5$  for BHT3)
- JP2 trigger does not show momentum dependence for large  $P$  tracks. !!!
- Unbiased triggers show stable  $\langle E/P \rangle$  after removing matched tracks
- All 3 triggers show similar  $\eta$  dependence.
- Outermost 2  $\eta$  rings (each side) show systematically low  $\langle E/P \rangle$ .

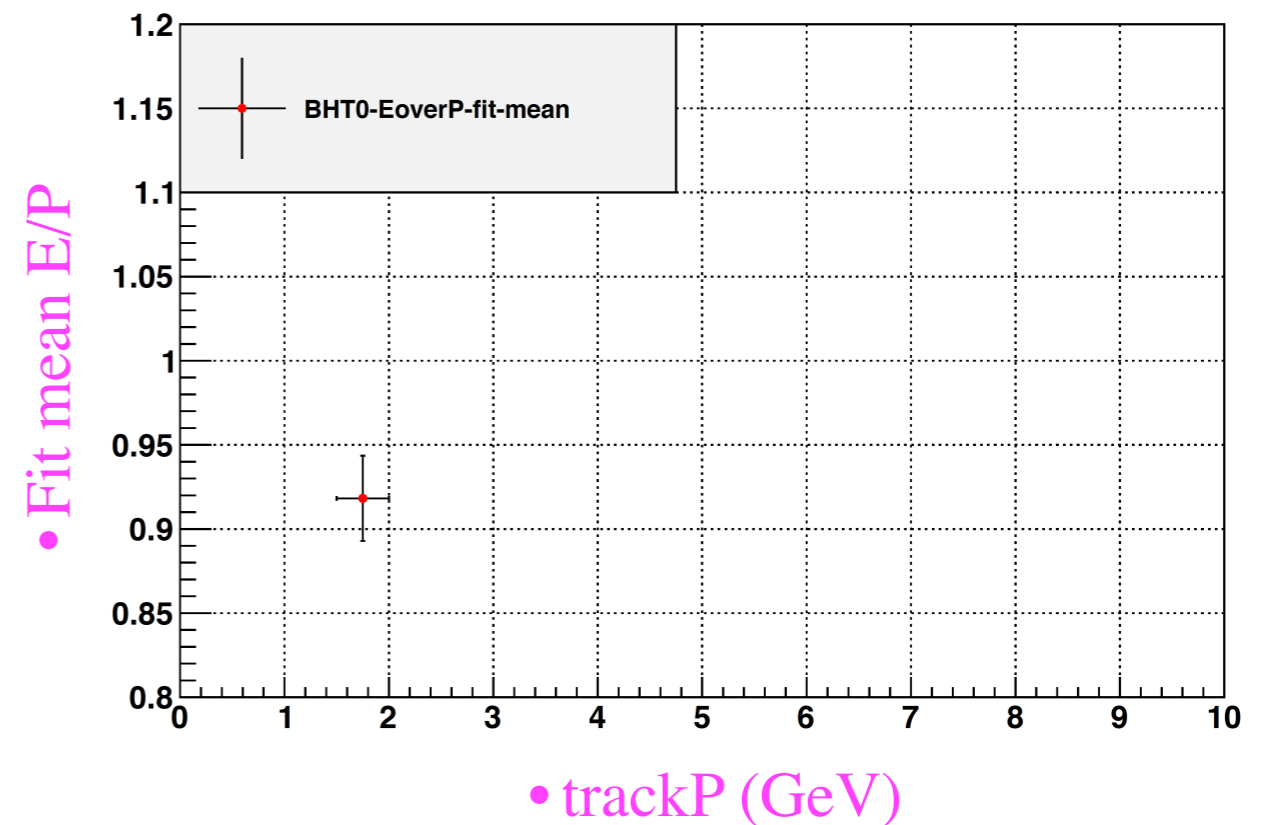
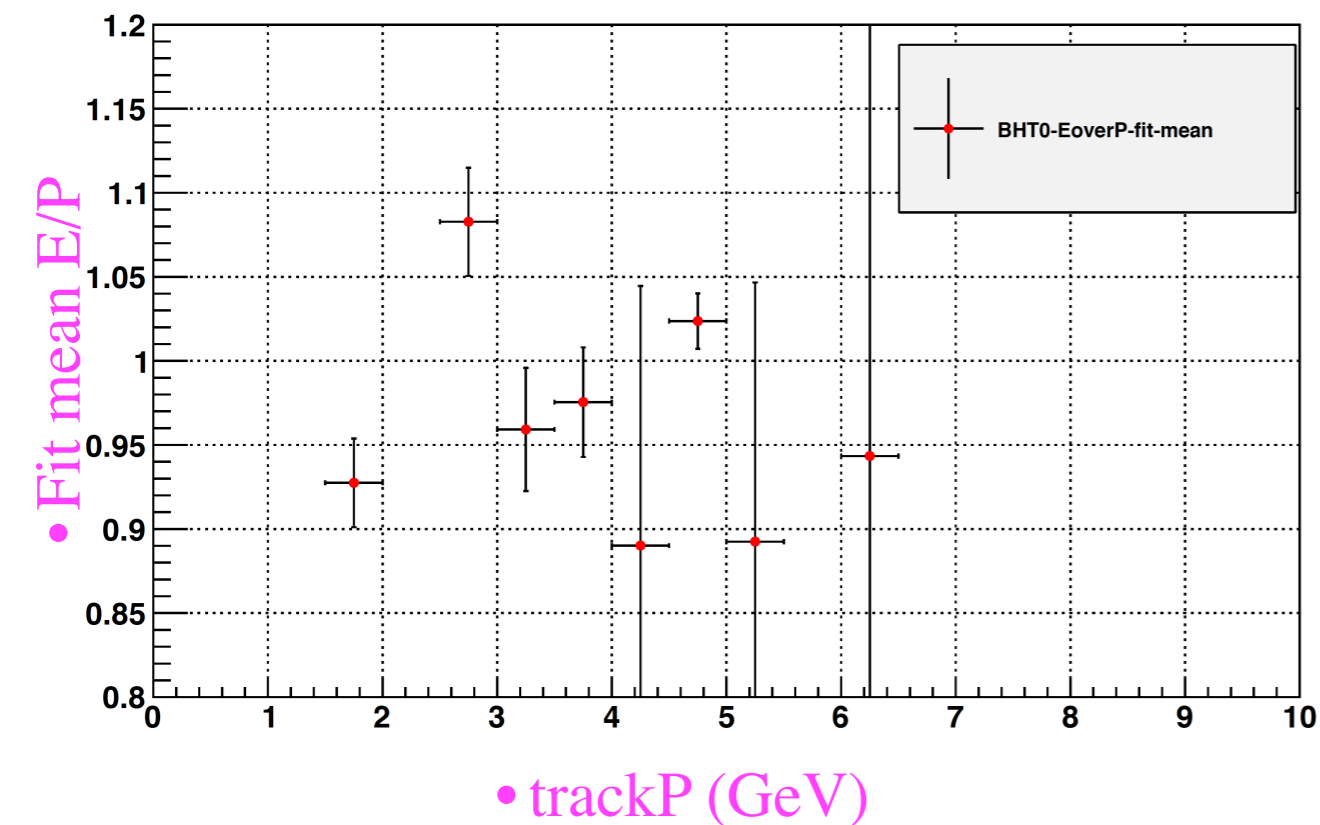
# BackUp

# BHT0 Trigger

•  $if(!triggerFire(BHT0) \&\& !triggerFire(BHT1) \&\& !triggerFire(BHT2) \&\& !triggerFire(BHT3) \&\& !triggerFire(JP2))$

• **Trigger Threshold = 2.6**

• **Matched tracks Excluded !!**



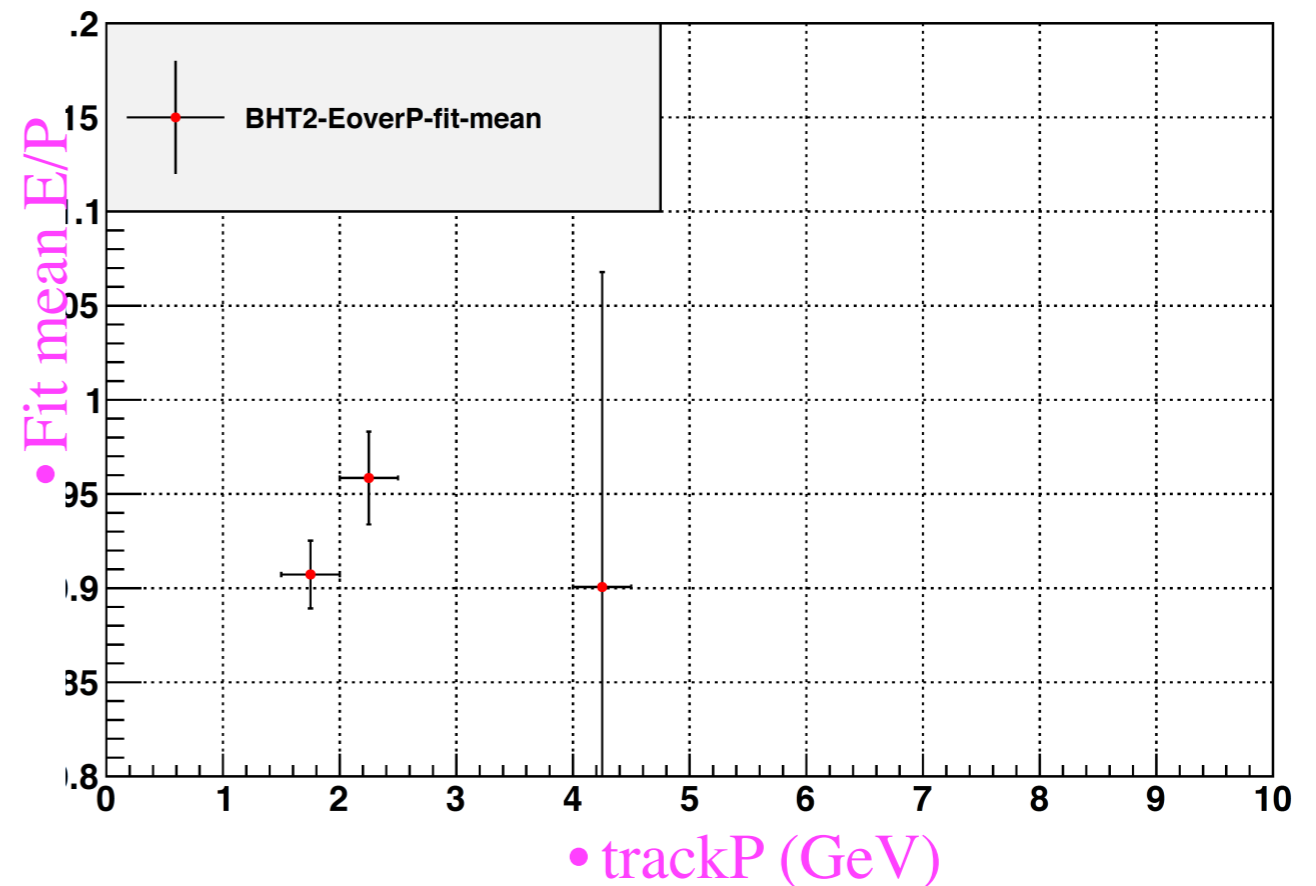
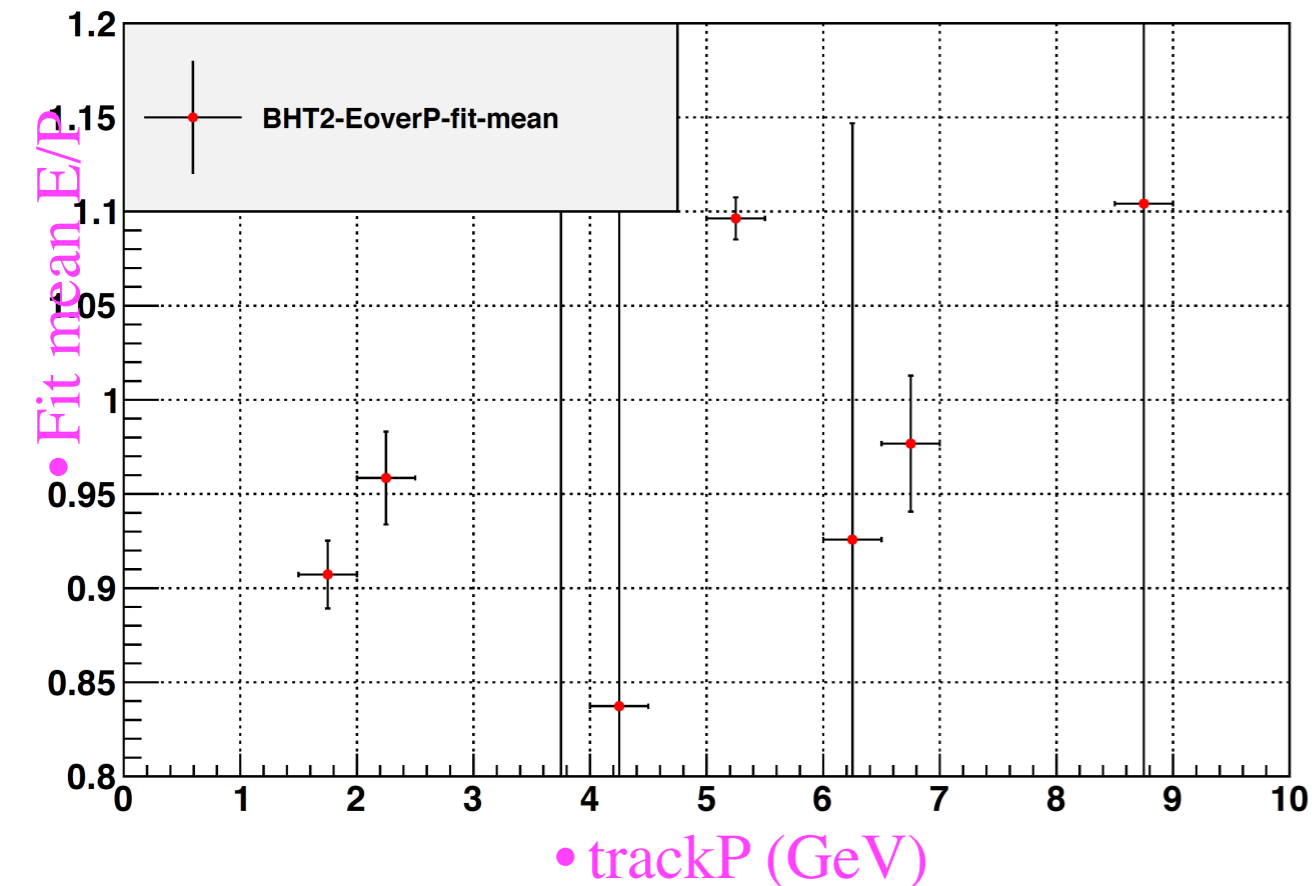
• Low statistics due to larger pre scales => Remove from the analysis

# BHT2 Trigger

•  $if(!triggerFire(BHT0) \&\& !triggerFire(BHT1) \&\& triggerFire(BHT2) \&\& !triggerFire(BHT3) \&\& !triggerFire(JP2))$

• **Trigger Threshold = 6.0**

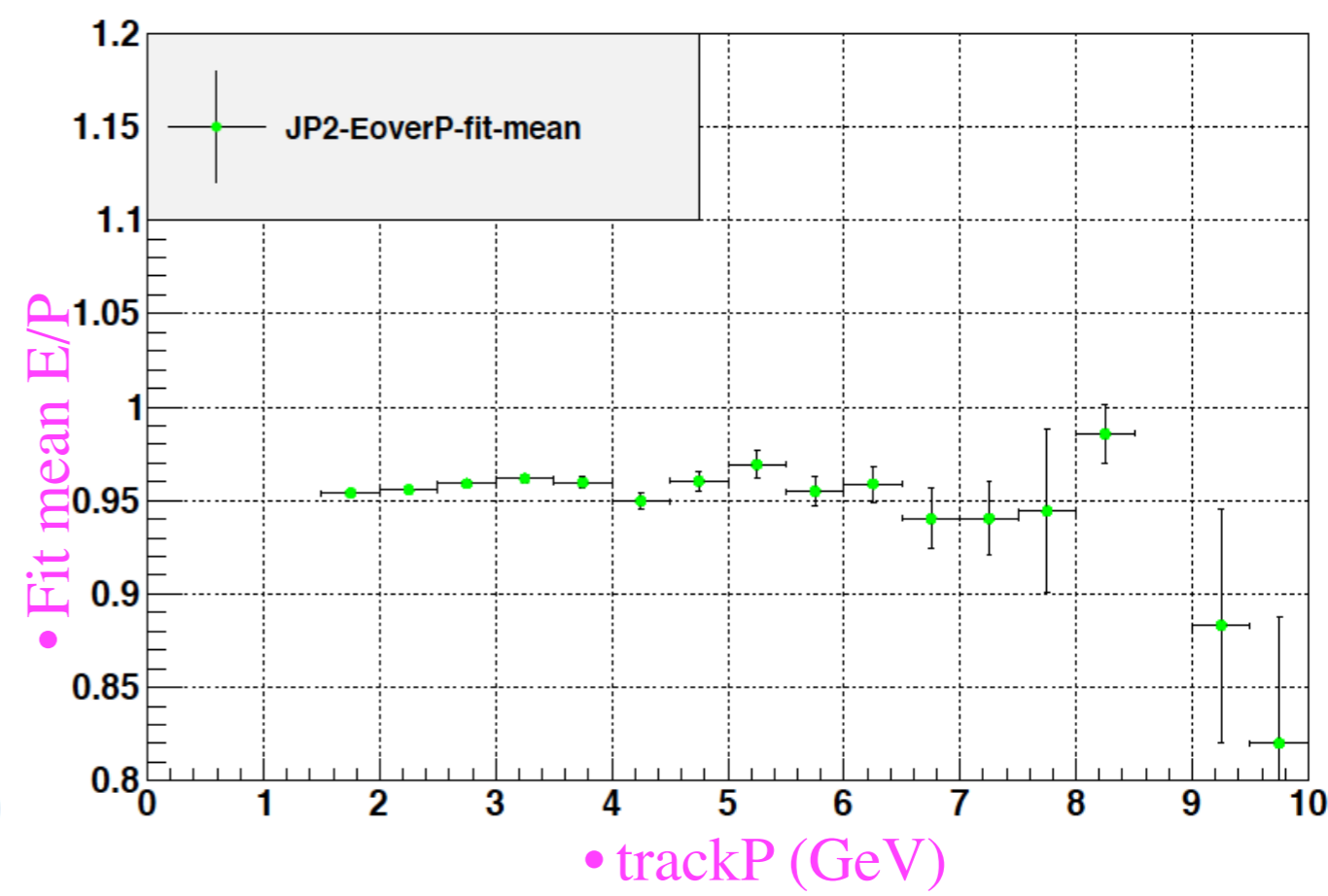
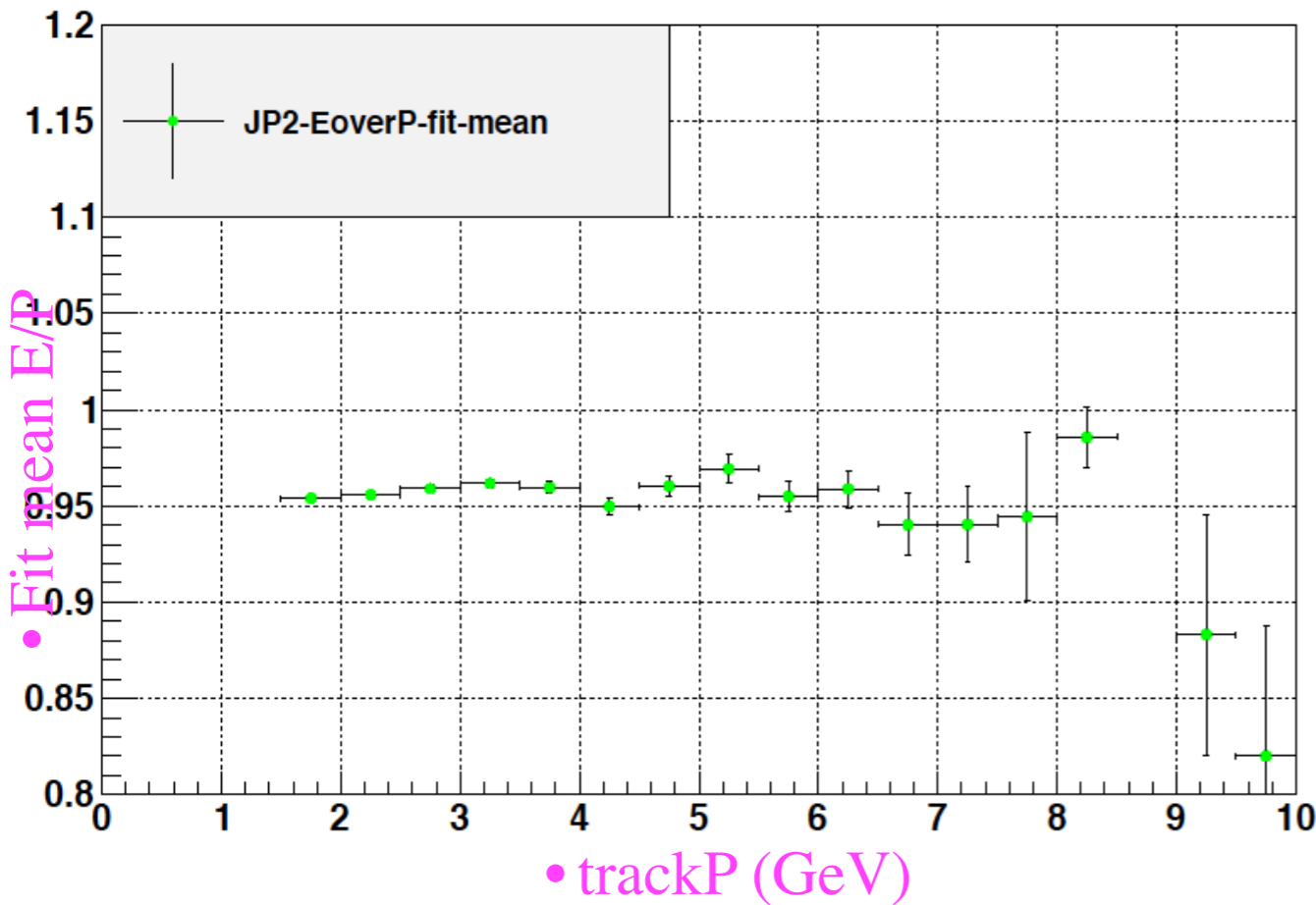
• **Matched tracks Excluded !!**



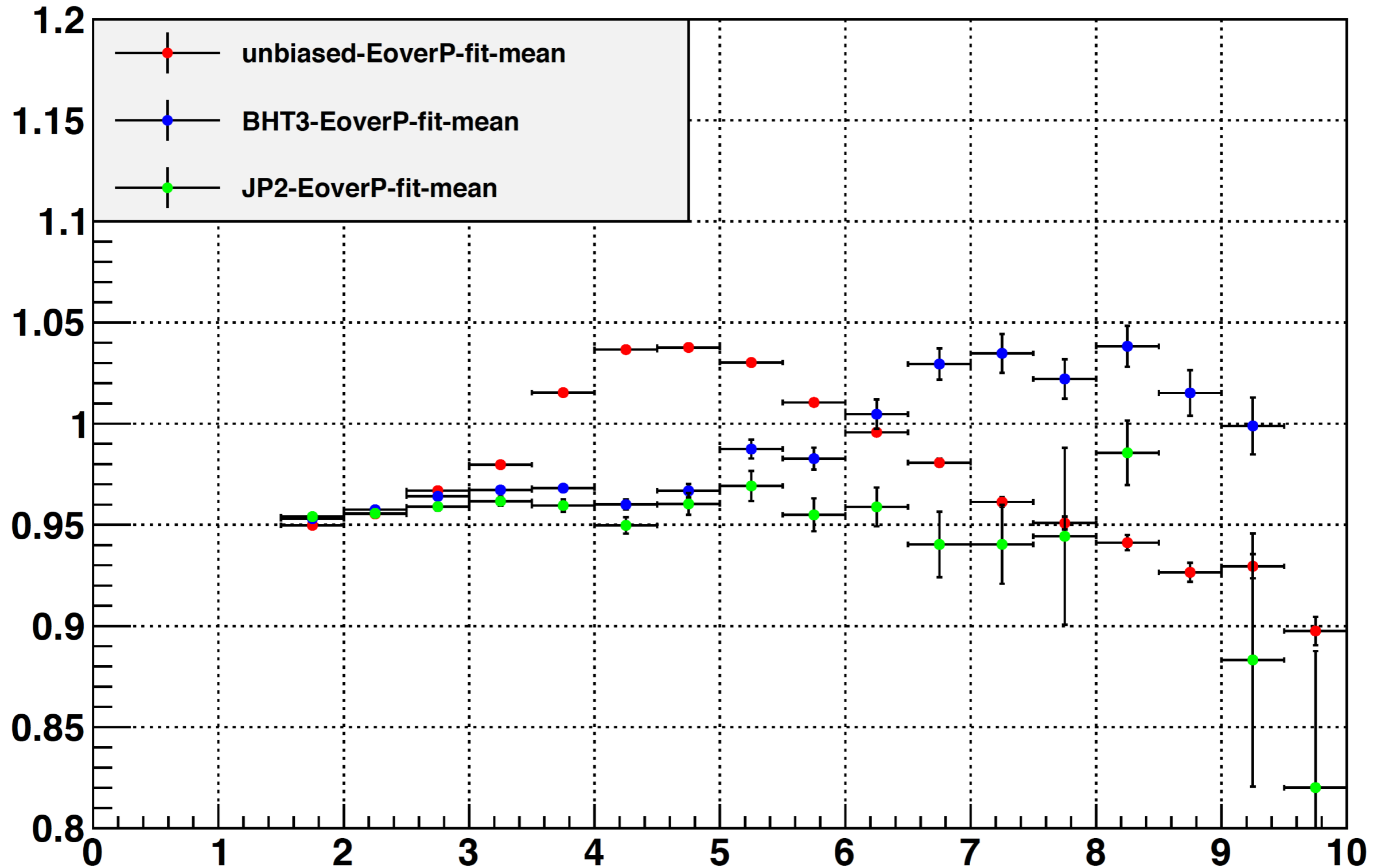
• Low statistics due to larger pre scales => Remove from the analysis

# JP2 Trigger

• Matched tracks Excluded !!



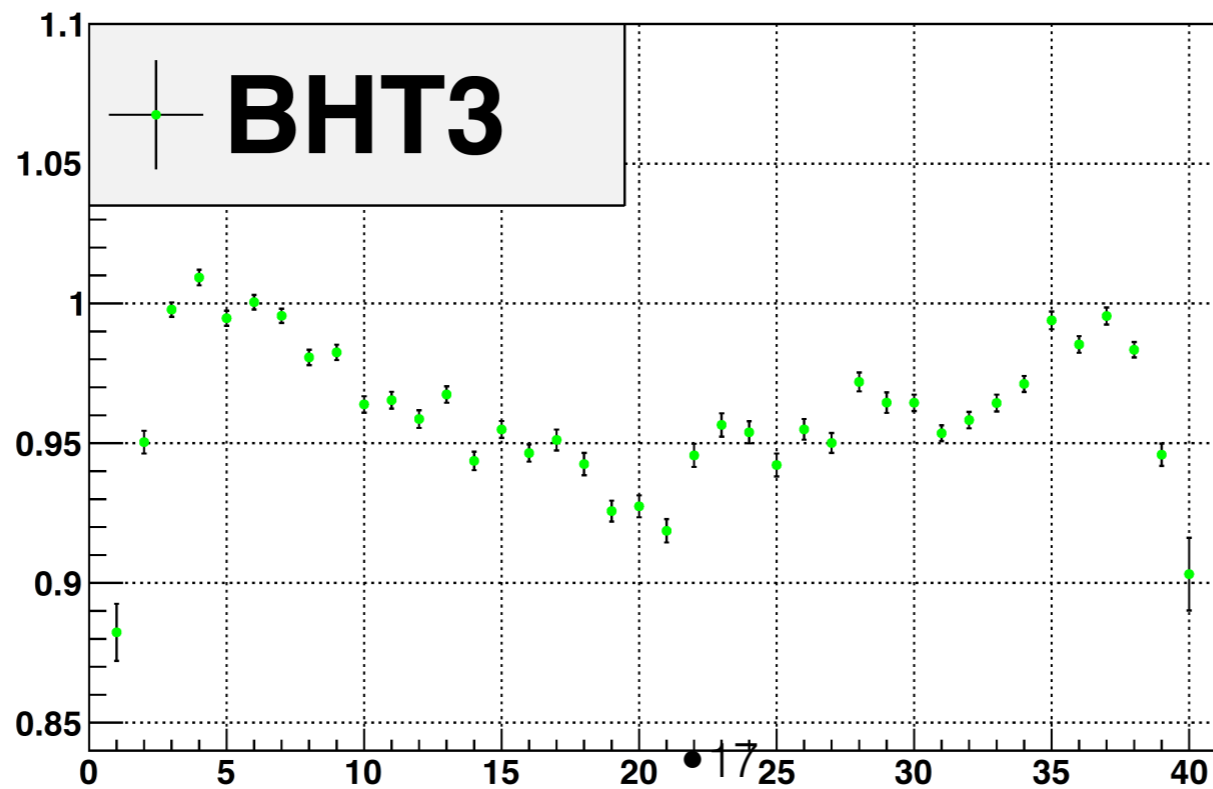
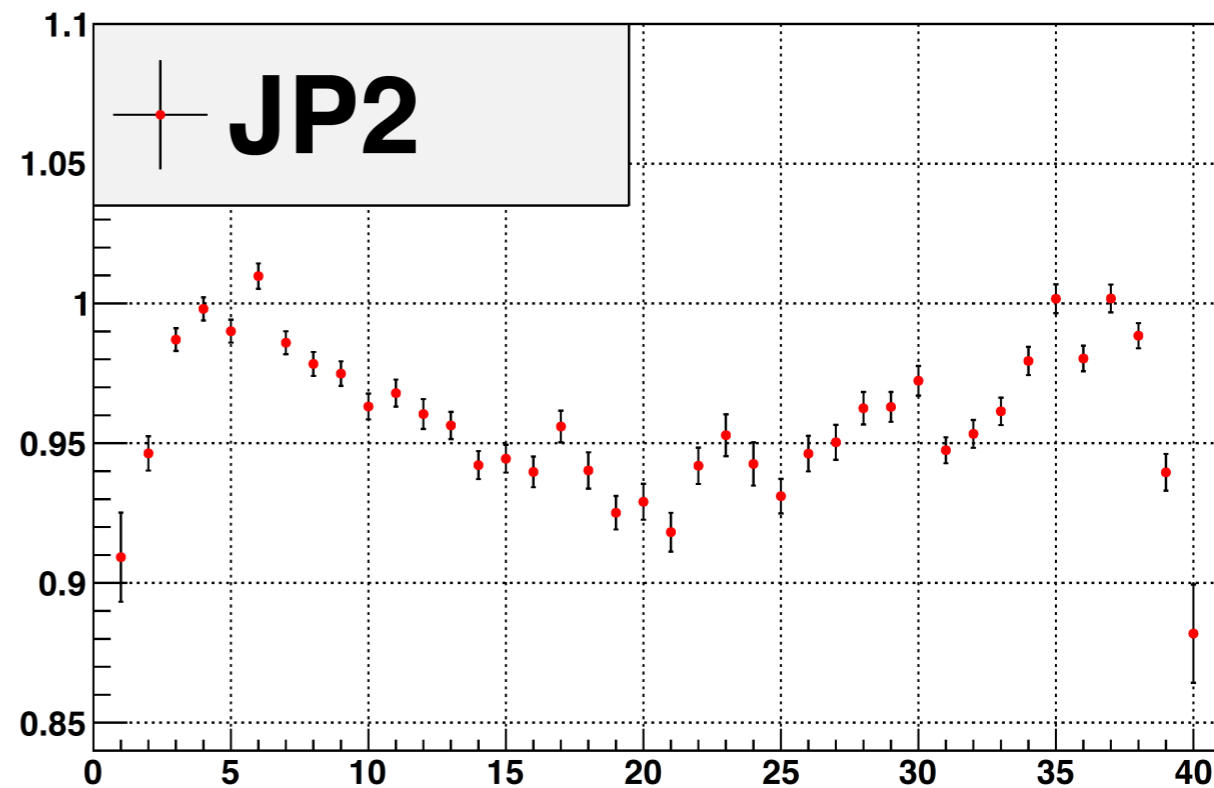
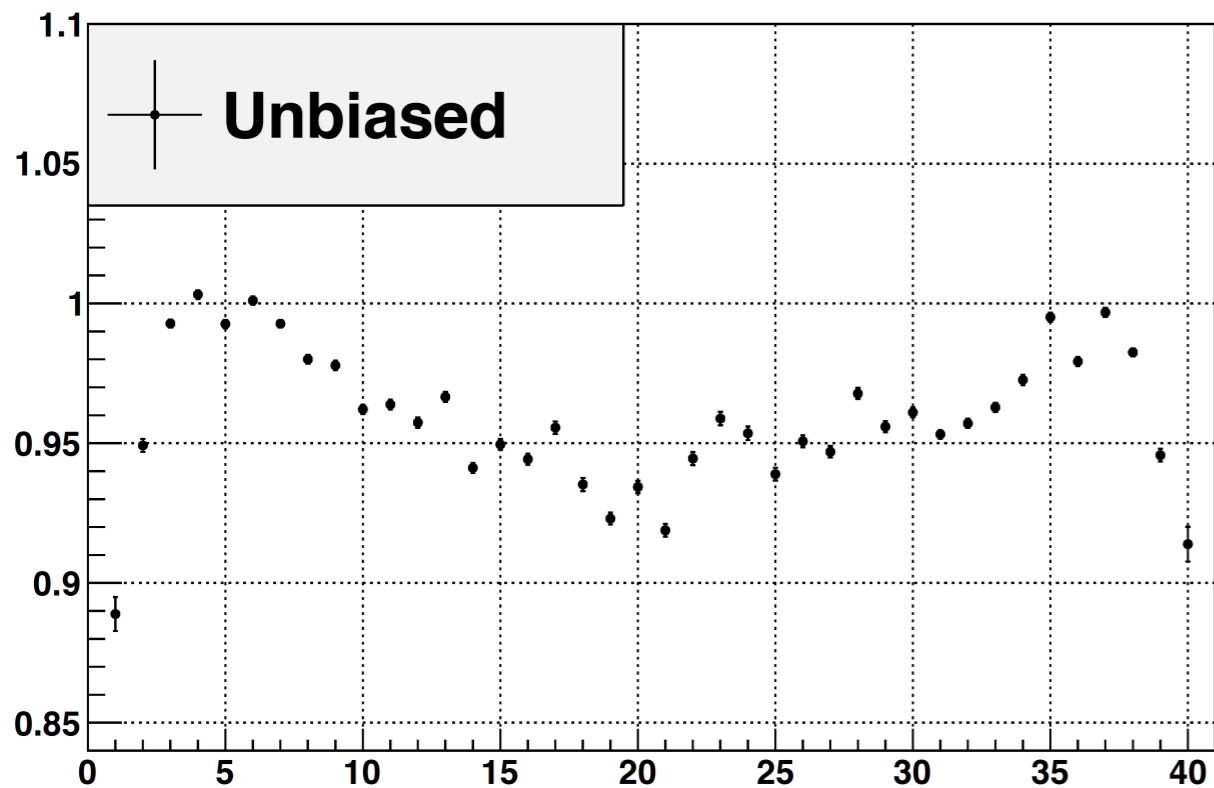
- All Events (Matched+Unmatched Tracks)

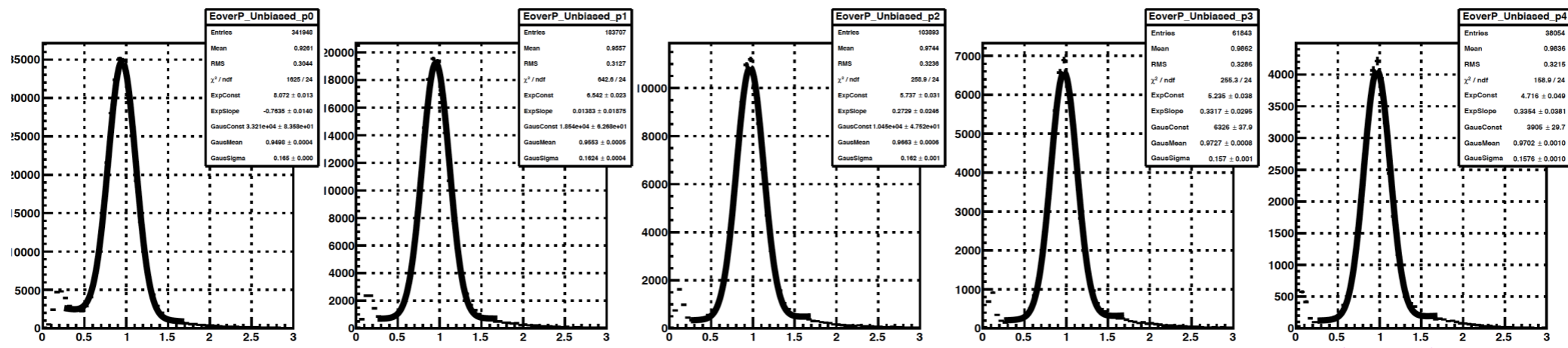






# Eta Dependance





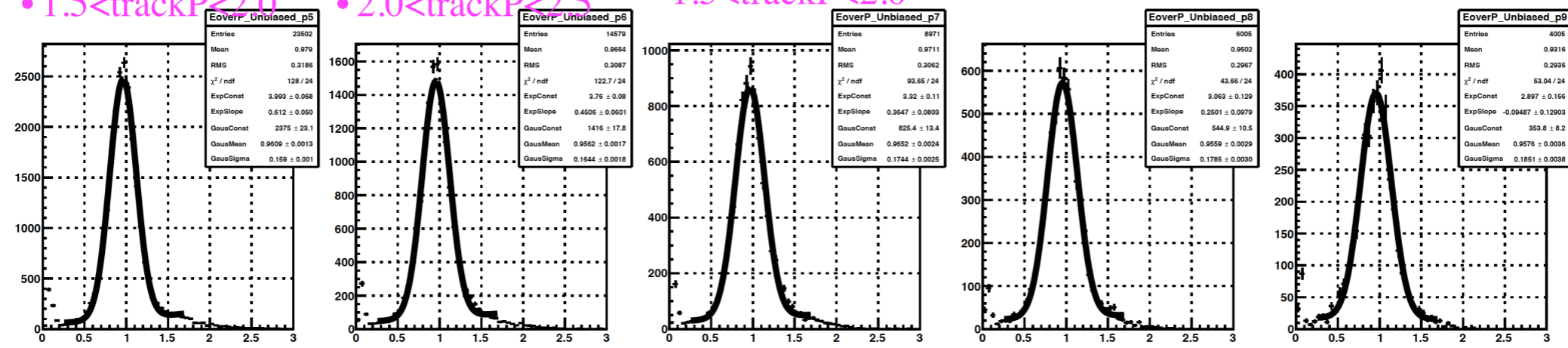
• 1.5 < trackP < 2.0

• 2.0 < trackP < 2.5

• 1.5 < trackP < 2.0

• 1.5 < trackP < 2.0

• 1.5 < trackP < 2.0



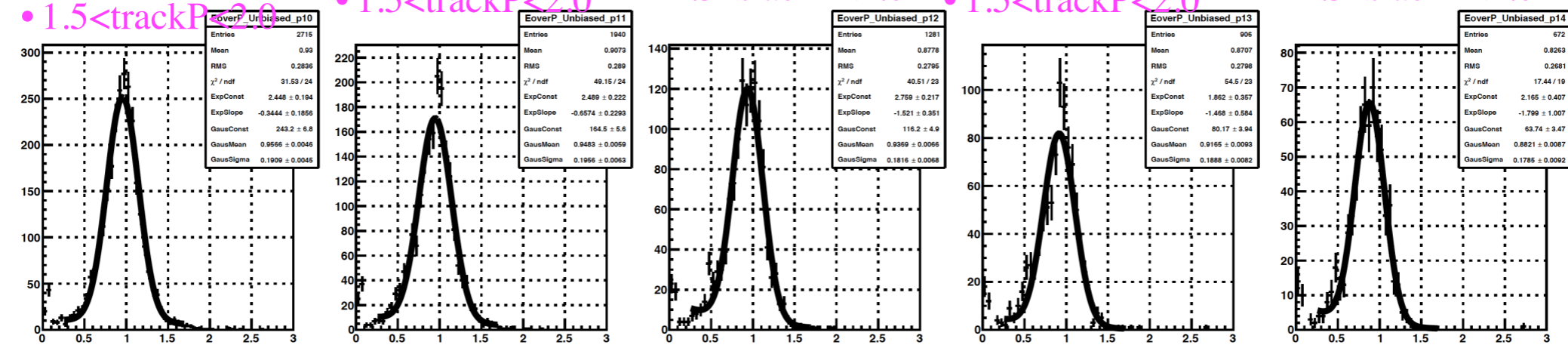
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• 1.5 < trackP < 2.0

• 1.5 < trackP < 2.0

• 1.5 < trackP < 2.0



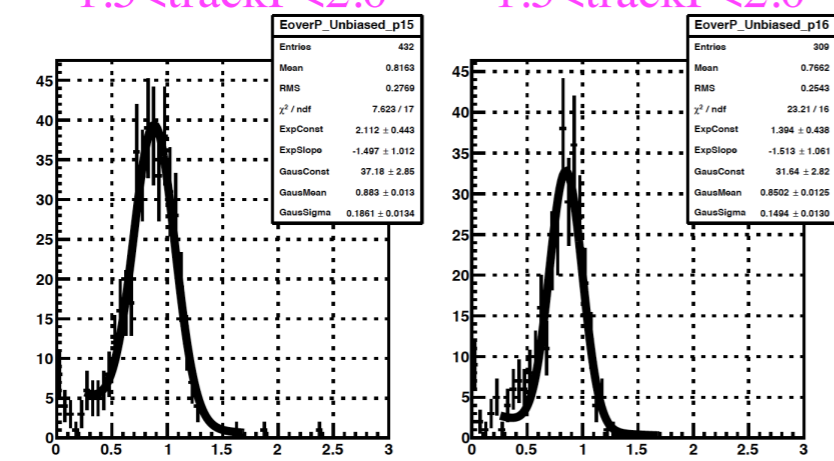
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• 1.5 < trackP < 2.0

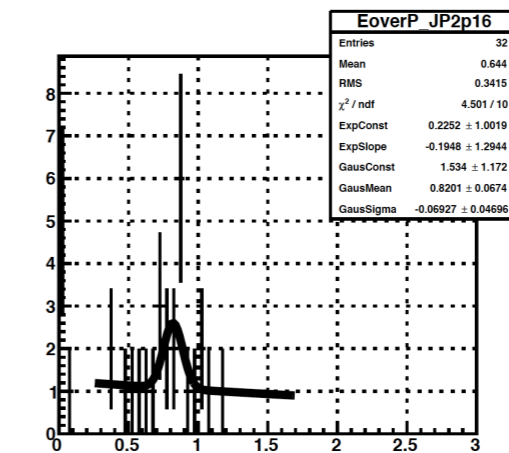
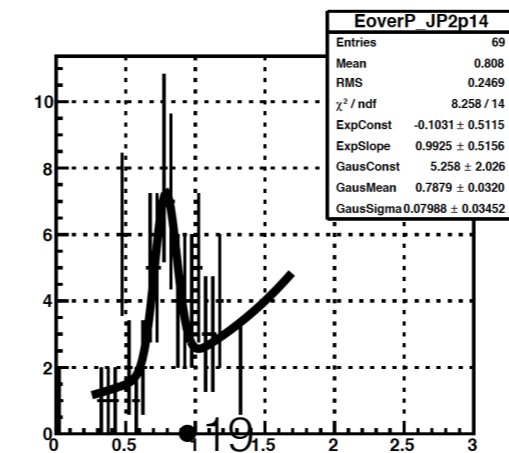
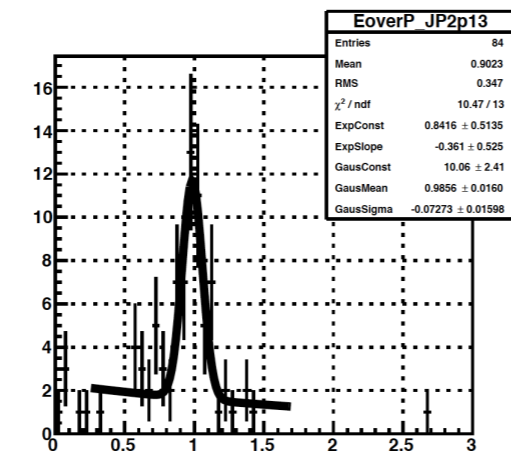
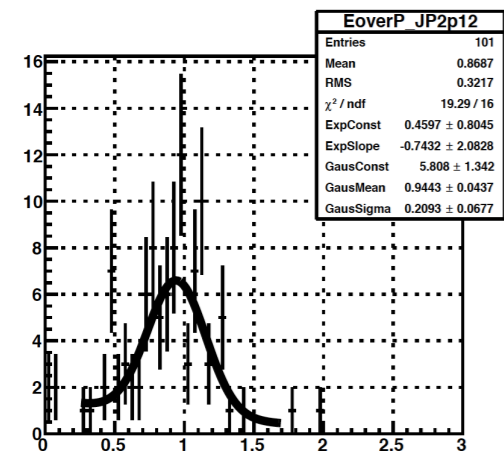
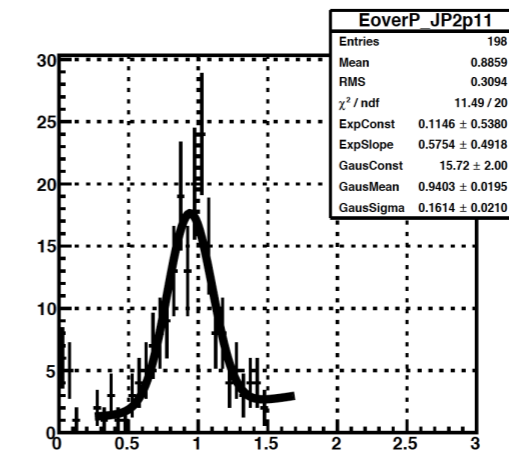
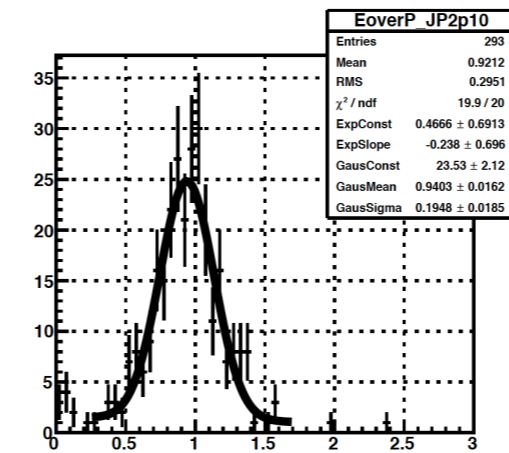
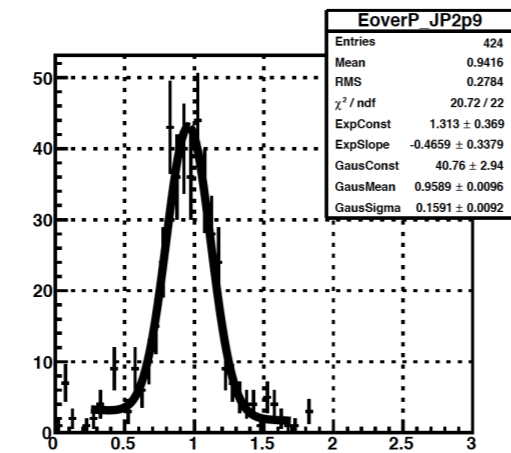
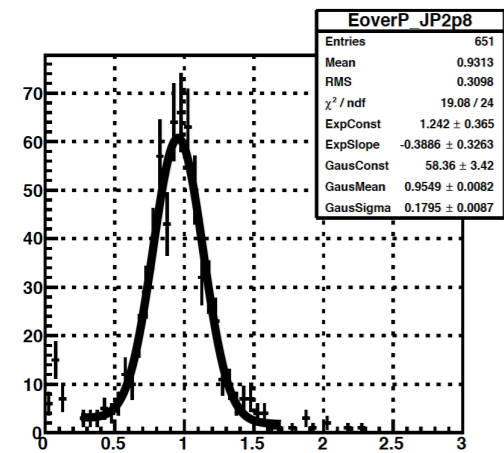
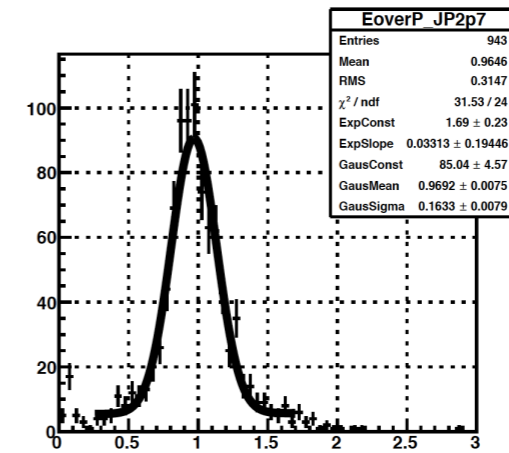
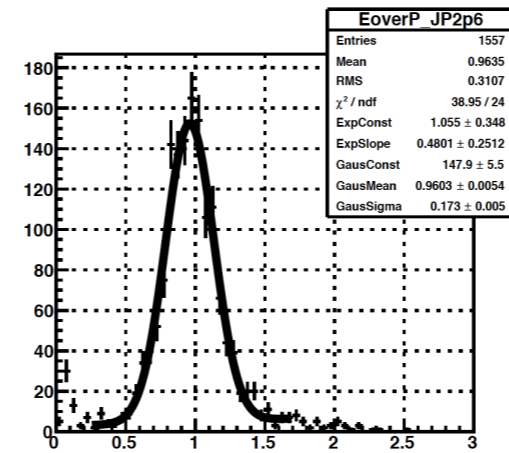
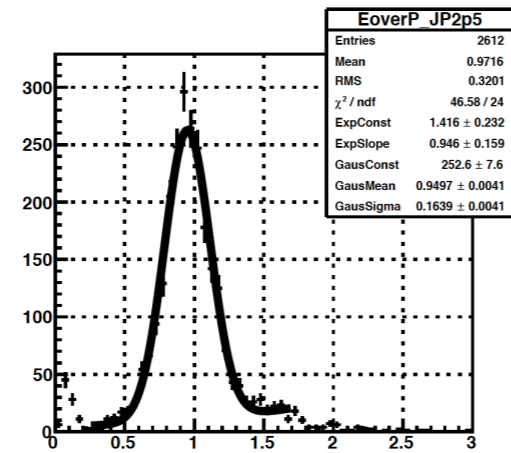
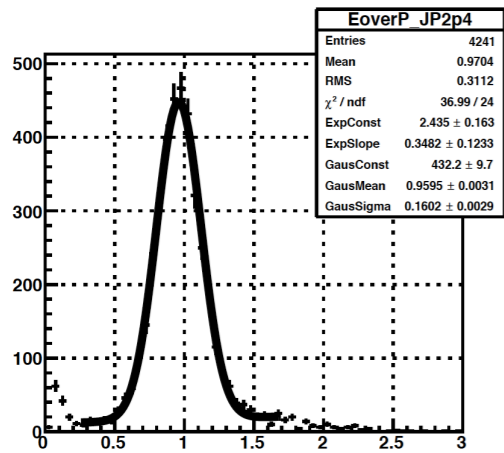
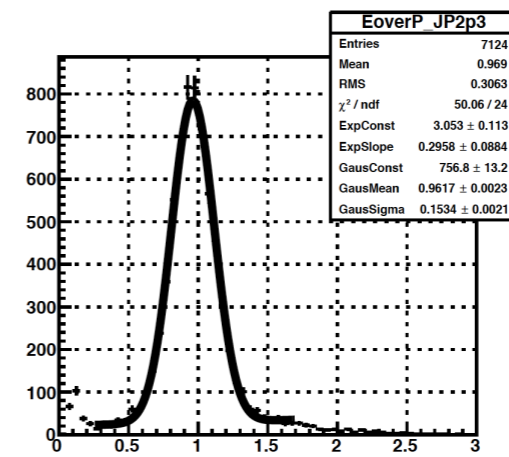
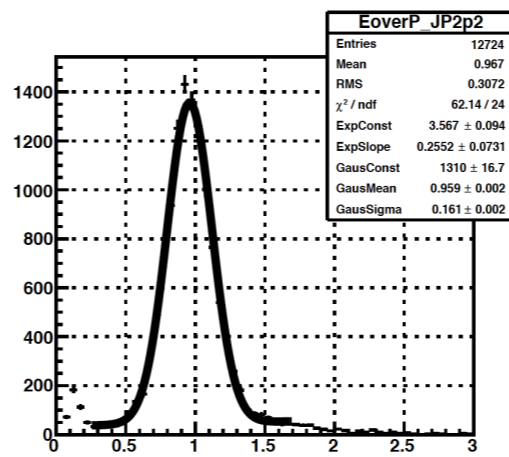
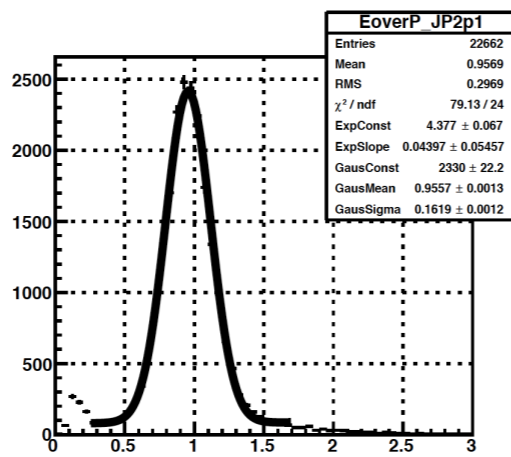
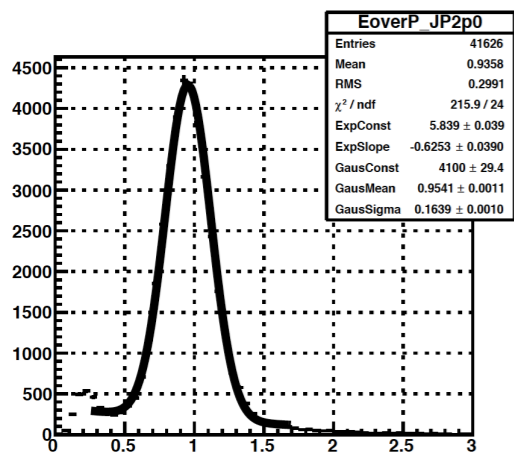
• 1.5 < trackP < 2.0

• 1.5 < trackP < 2.0

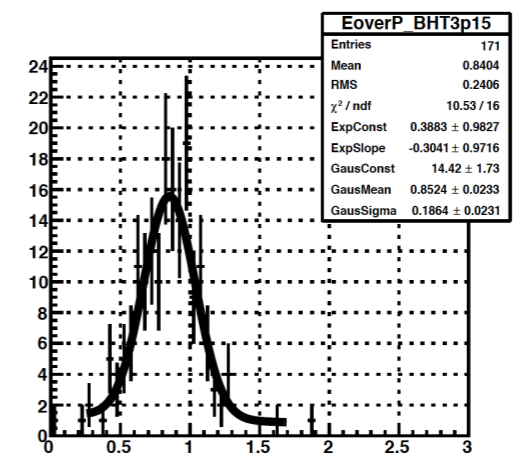
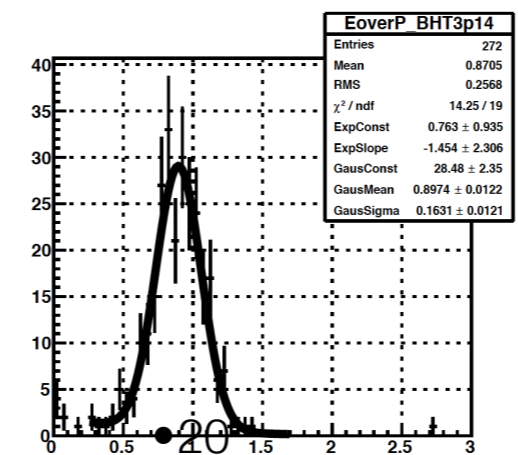
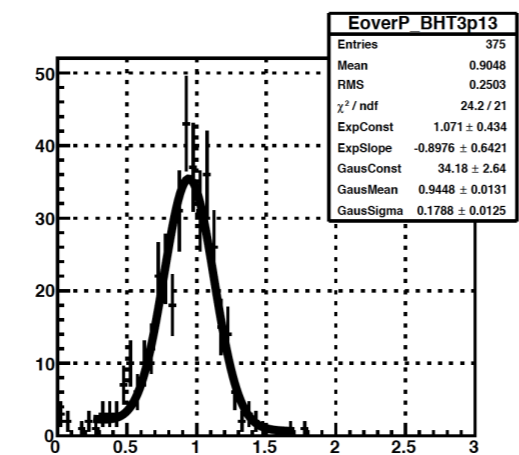
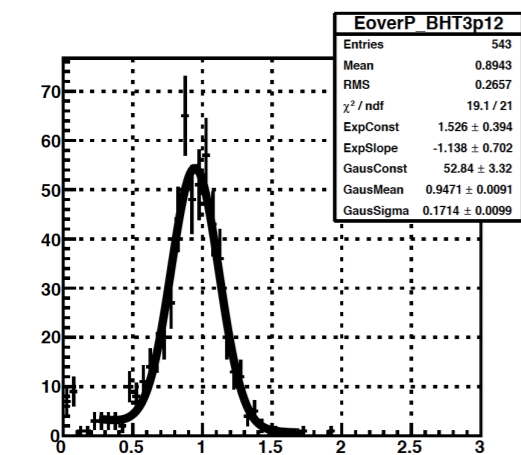
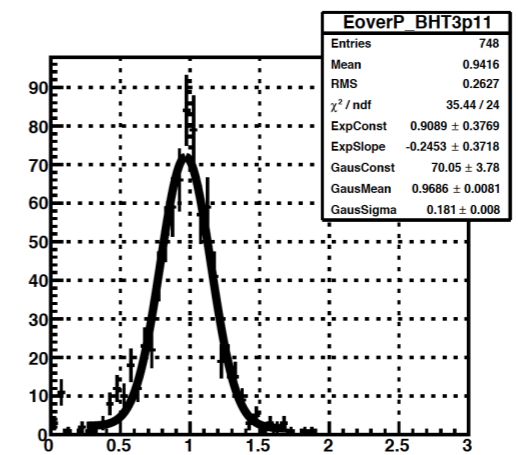
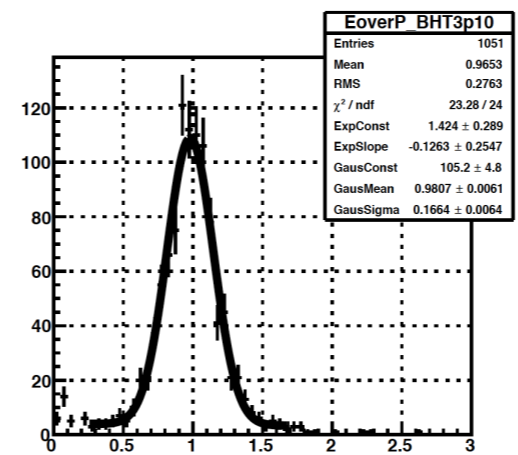
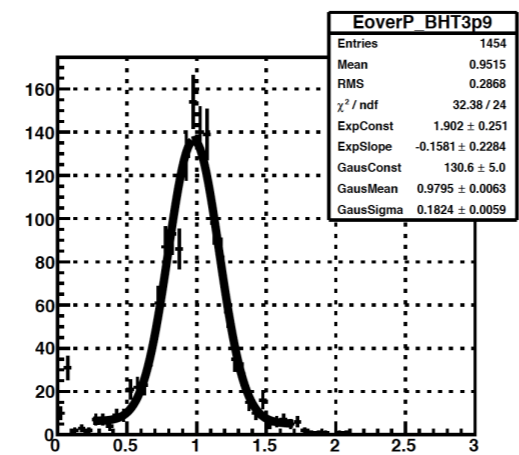
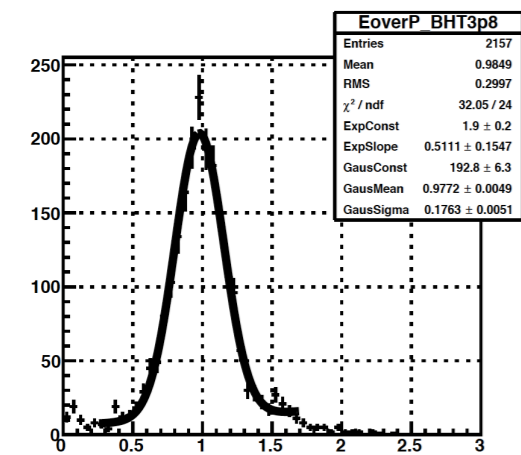
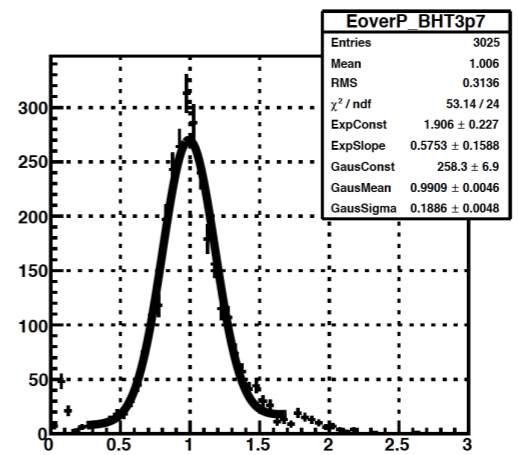
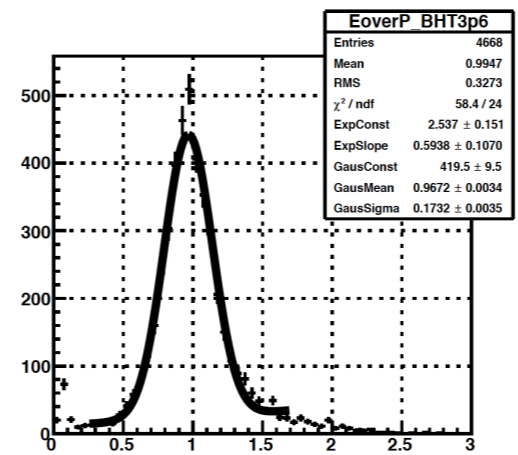
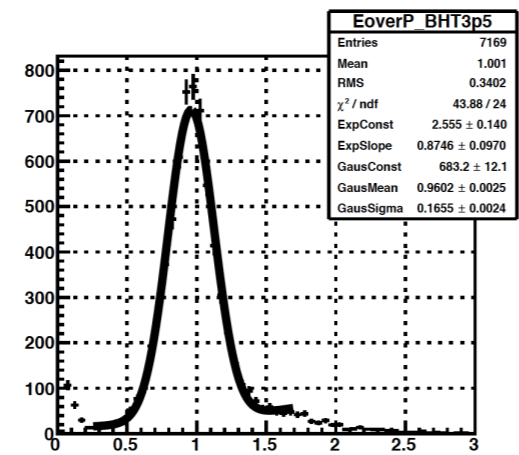
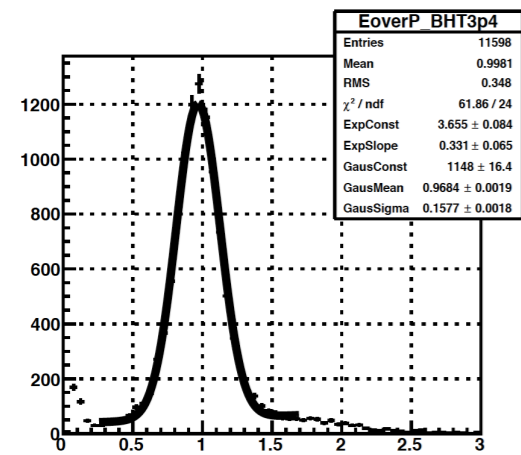
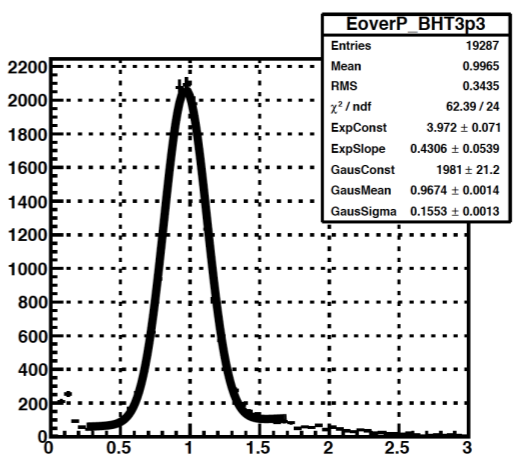
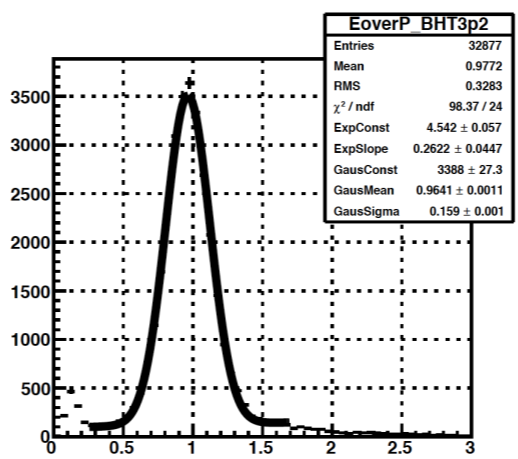
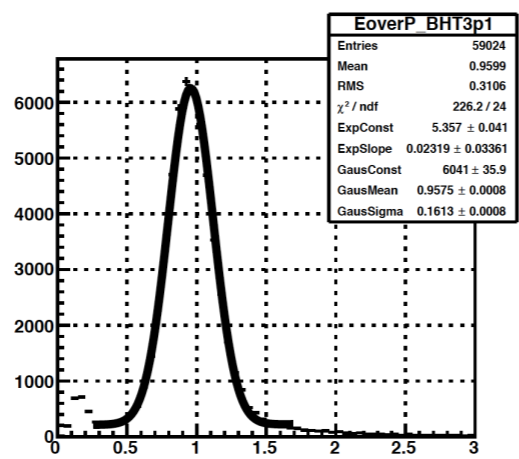
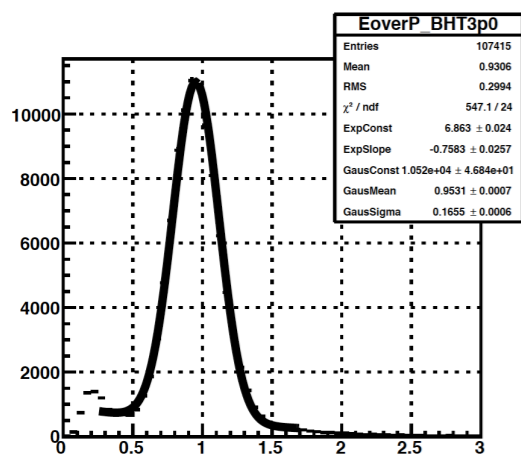
• 1.5 < trackP < 2.0



• Unbiased



• JP2



• BHT3