
Run-13- trigger Options for Electron E/P calibration.

Devika & Jinlong.

What triggers an event can be fired?

category	Considering only a hardware fired event	Run12-observations	Run13-observations
1	onlyBHT	bias	bias
2	BHT && nonBHT	not bias	bias
3	only nonBHT	not bias	not bias

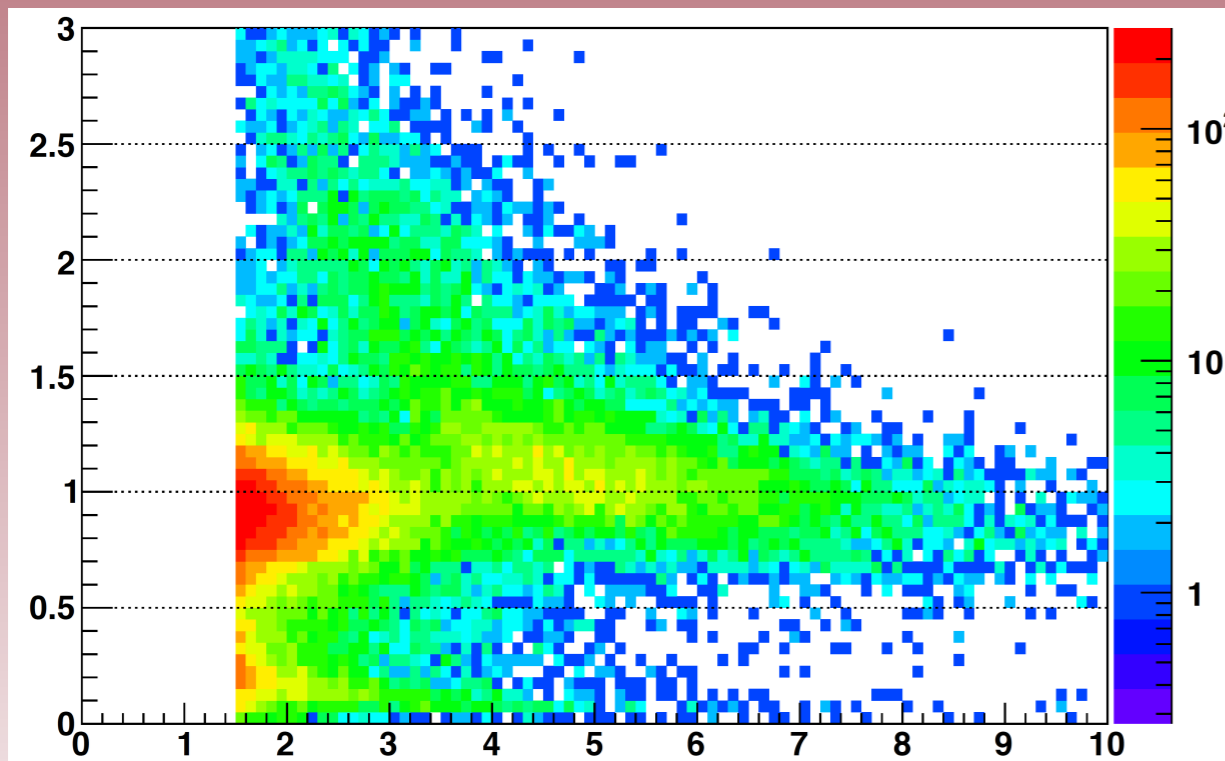
Run 13 calibration trees contain BHT0, BHT1, BHT2, BHT3 and JP2 triggered events. We have checked the 2-D distributions and $\langle E/P \rangle$ as a function of momentum using samples of each trigger individually (only BHT), (only nonBHT) and (only BHT + (BHT && nonBHT)). Various observations starting from next slide.

BHT1 - trigger

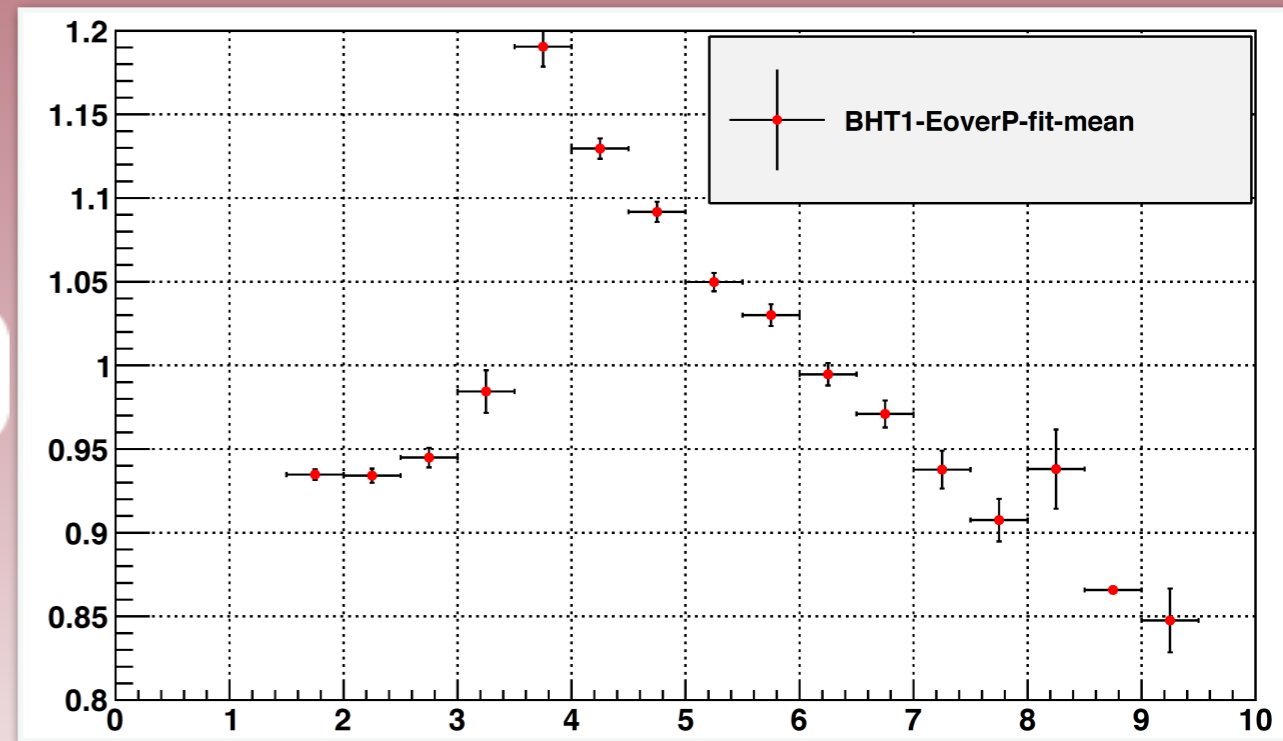
Category 1

$BHT1 \rightarrow hardwareFire() \ \&\& \ !BHTi \ (i=0,2,3) \rightarrow hardwareFire() \ \&\& \ !JP2 \rightarrow hardwareFire()$

\sim only BHT1 hard-ware fired \implies category 1



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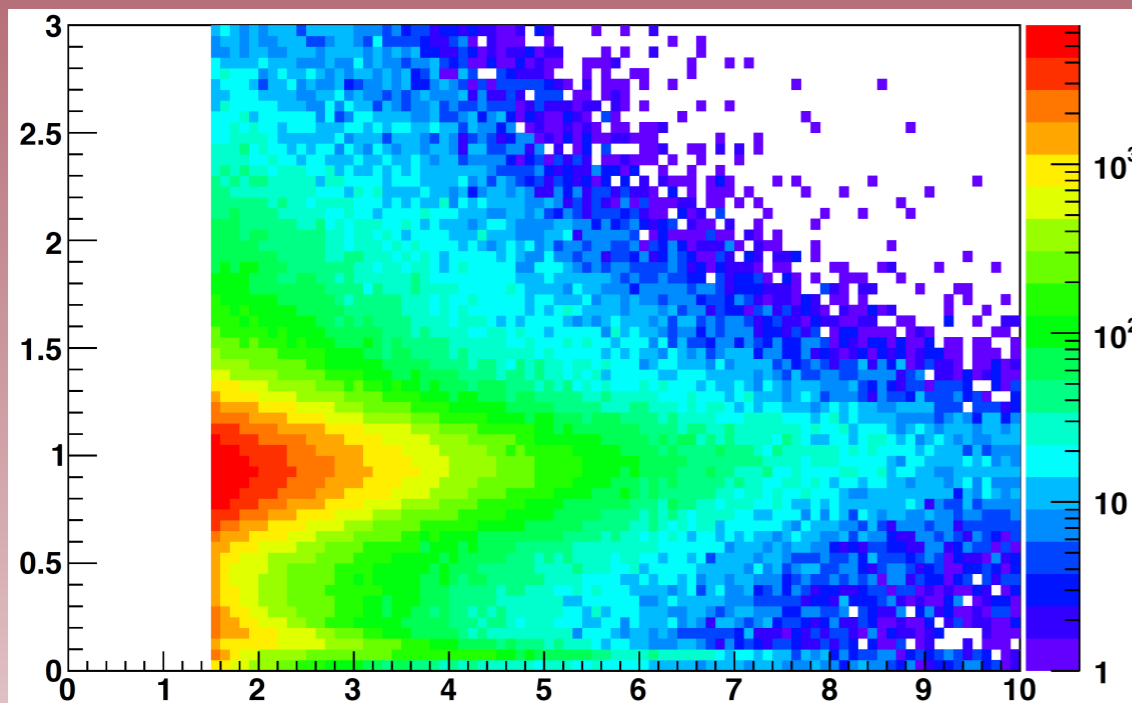
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BHT3 - trigger

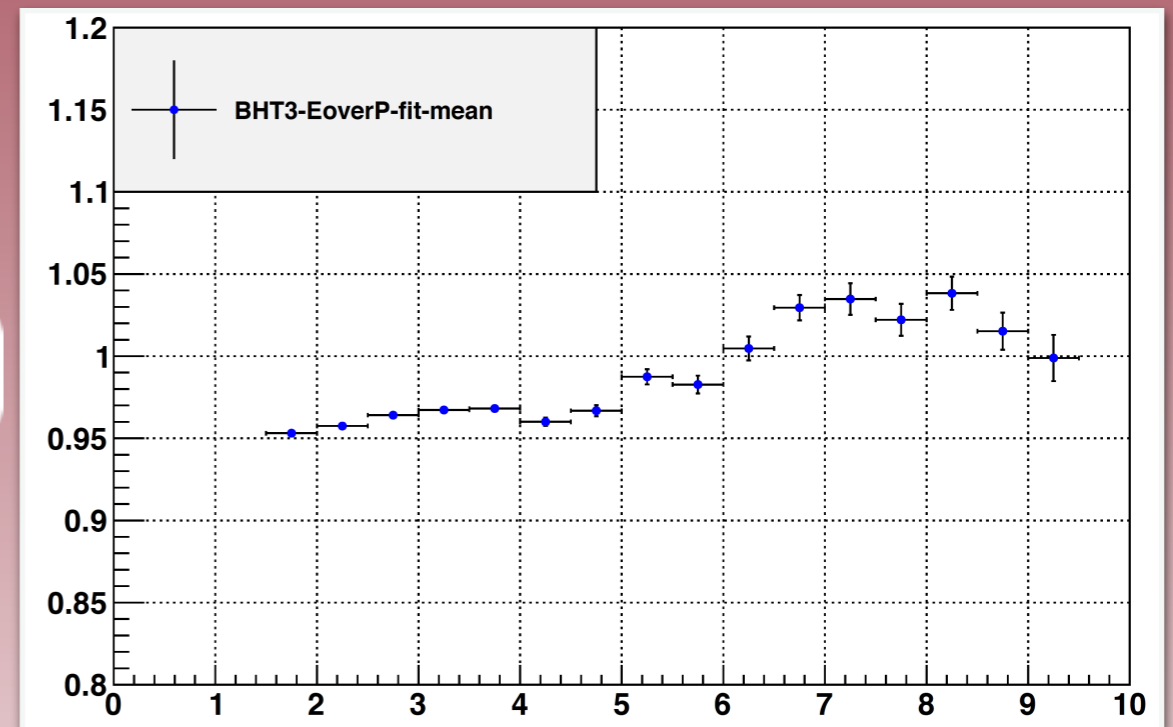
Category 1

$BHT3 \rightarrow hardwareFire() \ \&\& \ !BHTi \ (i=0,1,2) \rightarrow hardwareFire() \ \&\& \ !JP2 \rightarrow hardwareFire()$

~ only BHT3 hard-ware fired — category 1



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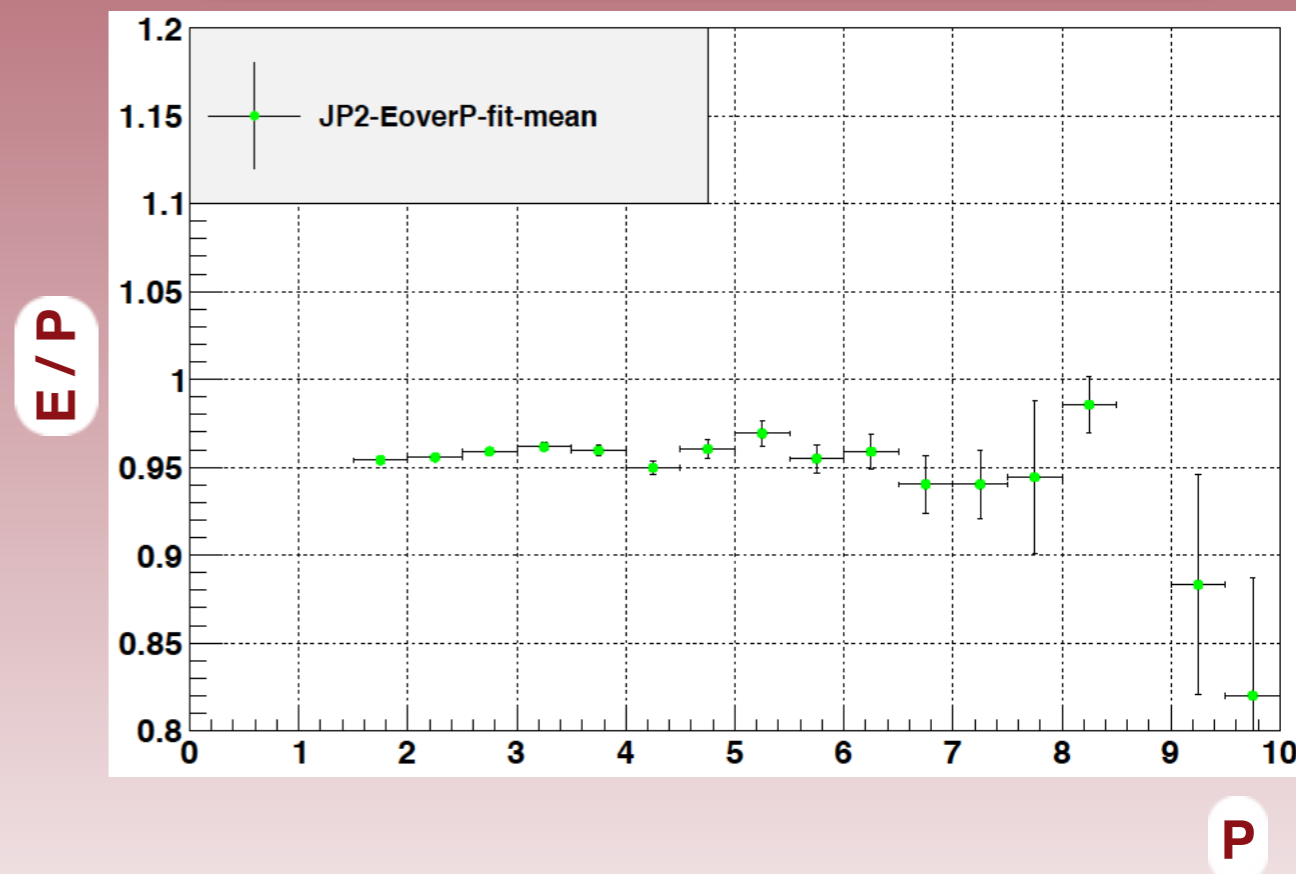
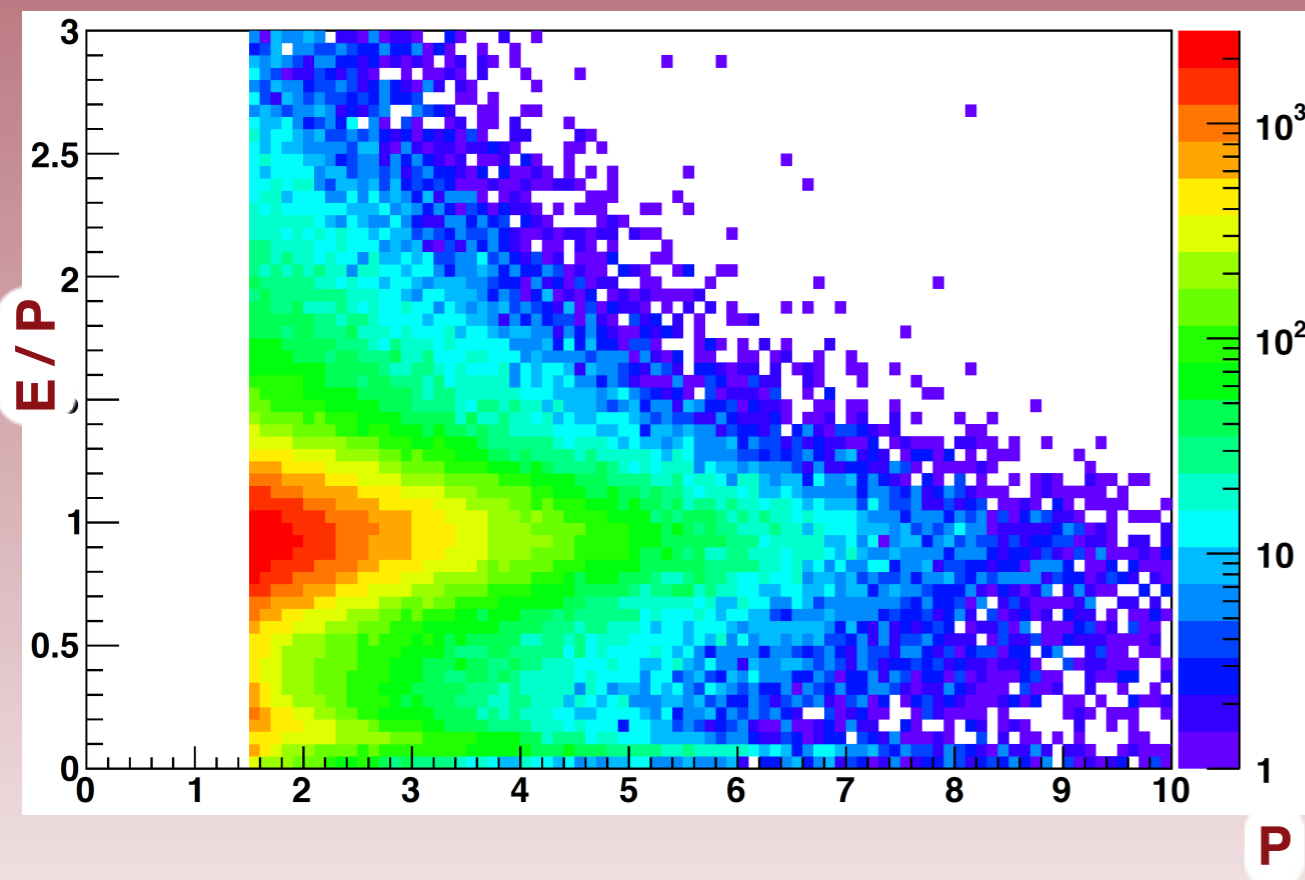
JP2-only

JP2 only Trigger option

Category 3

JP2->didFire() && ! BHTi(i=0,1,2,3) -> did Fire()

Mean E/P fit in momentum slices



Events from category 3 only!

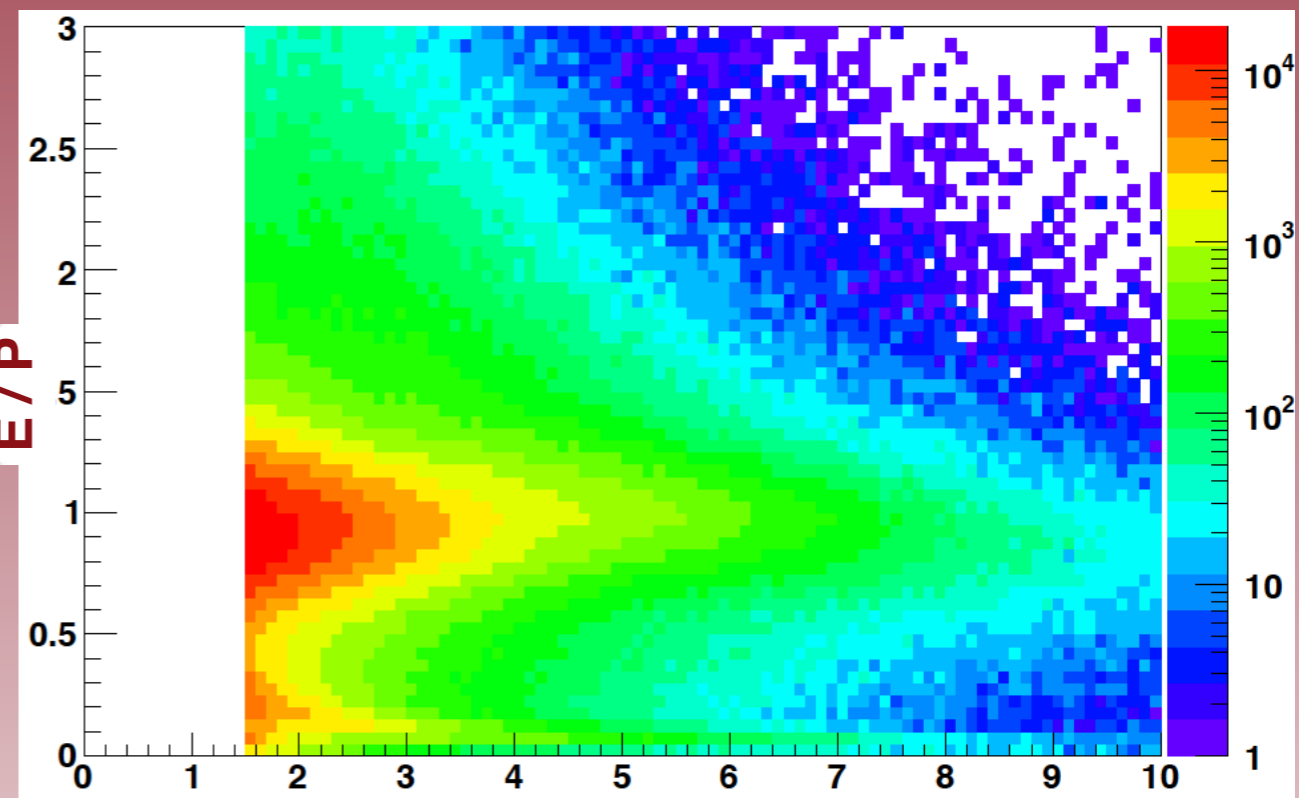
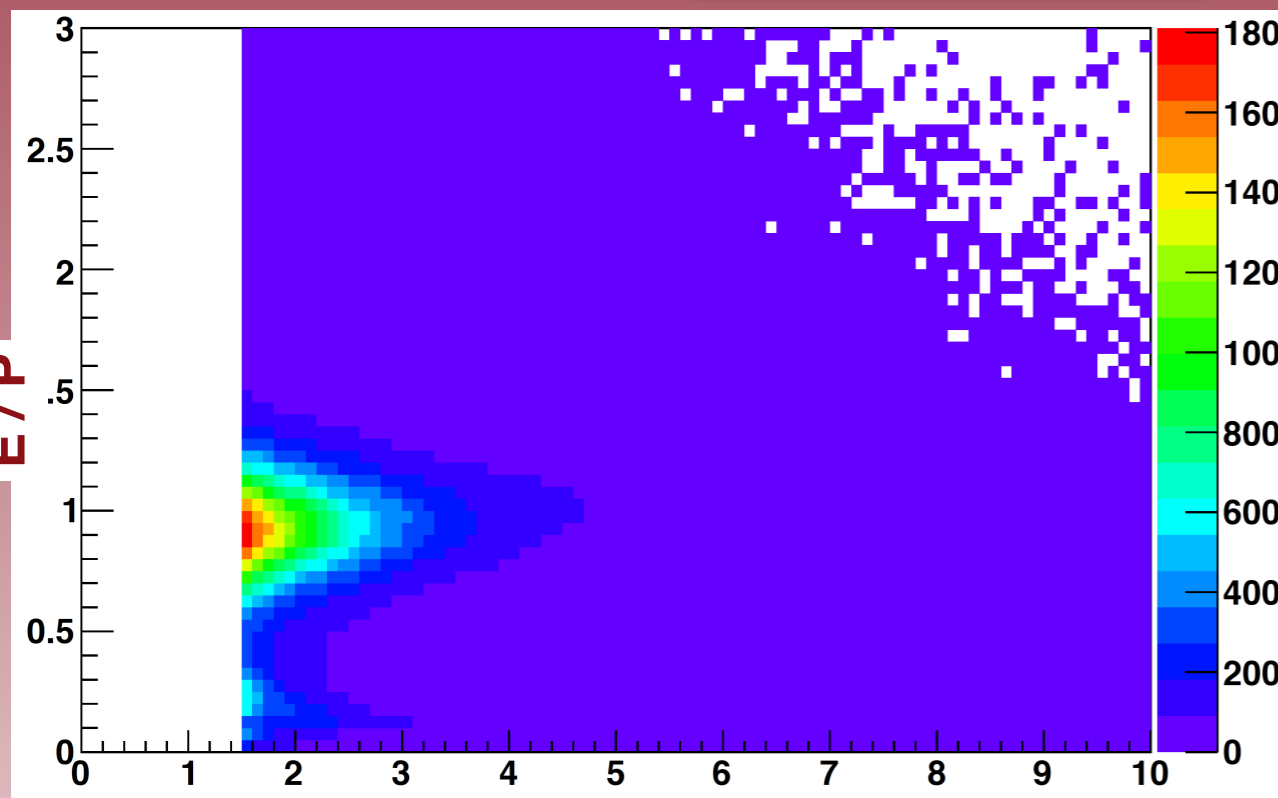
Trigger Option-Renee's suggestion (JP2-trigger)

Category 2 + category 3

2-D distribution

JP2->didFire()

JP2 only + (JP2 && BHT)



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Events from both categories 2, 3 present!

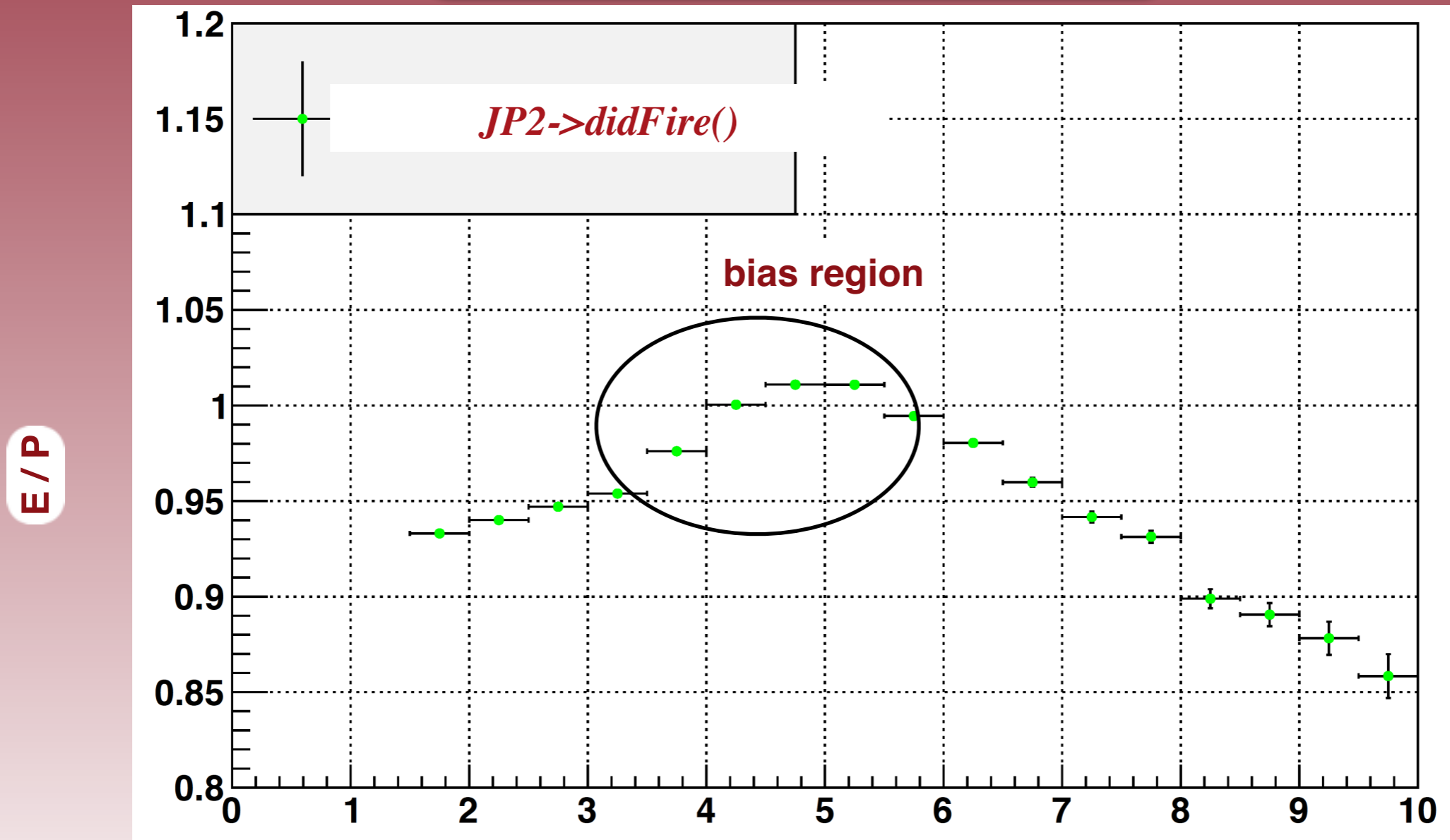
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This option does not seem as an “unbiased” trigger option in run 13. We think it may be caused by large overlap between JP2 triggers and BHT triggers. (~70% with BHT1 and ~66% BHT3)

Trigger Option-Renee's suggestion "Unbiased" (JP2-trigger)

Renee's suggestion- JP2 Trigger option

Mean E/P fit in momentum slices



Events from both categories 2, 3 present!

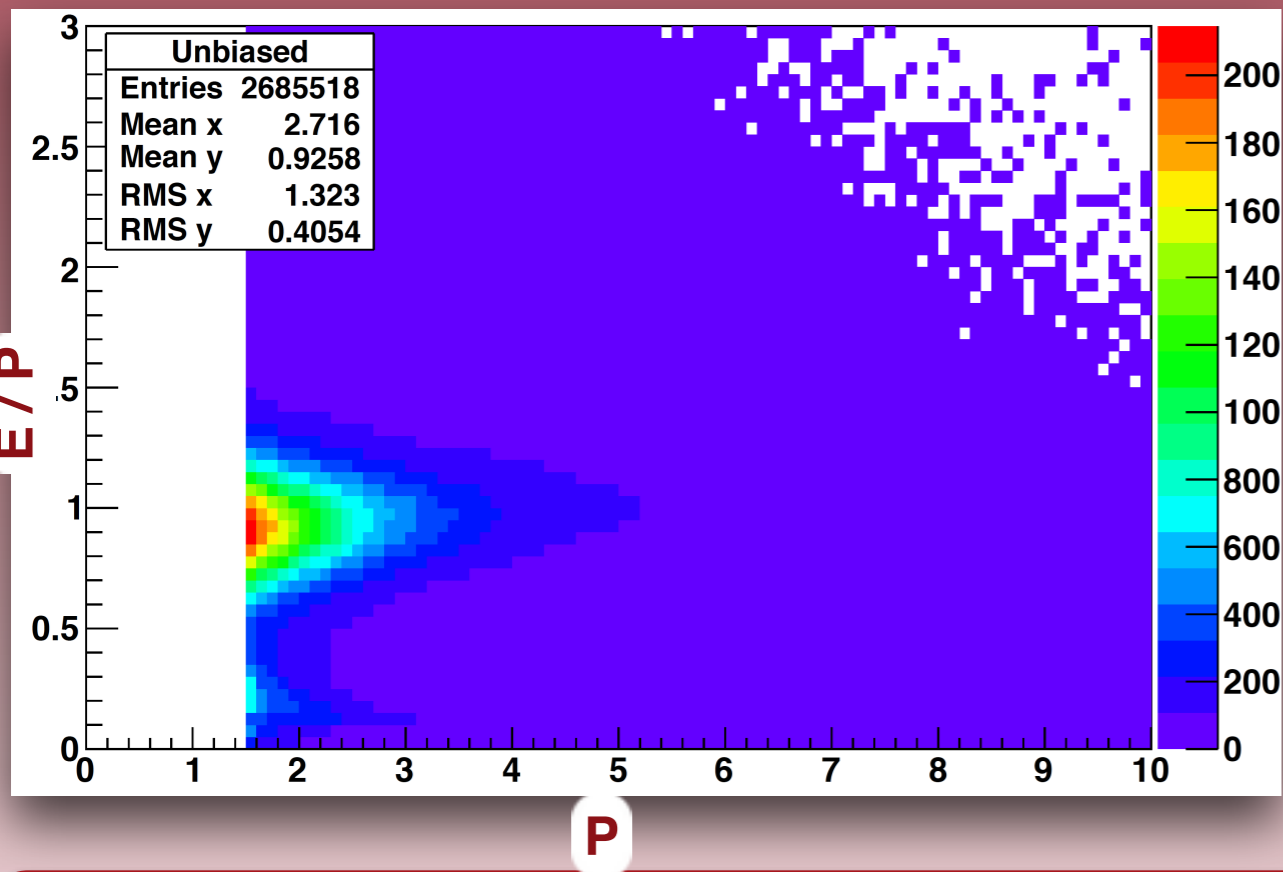
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Trigger Option-run 12 “Unbiased”

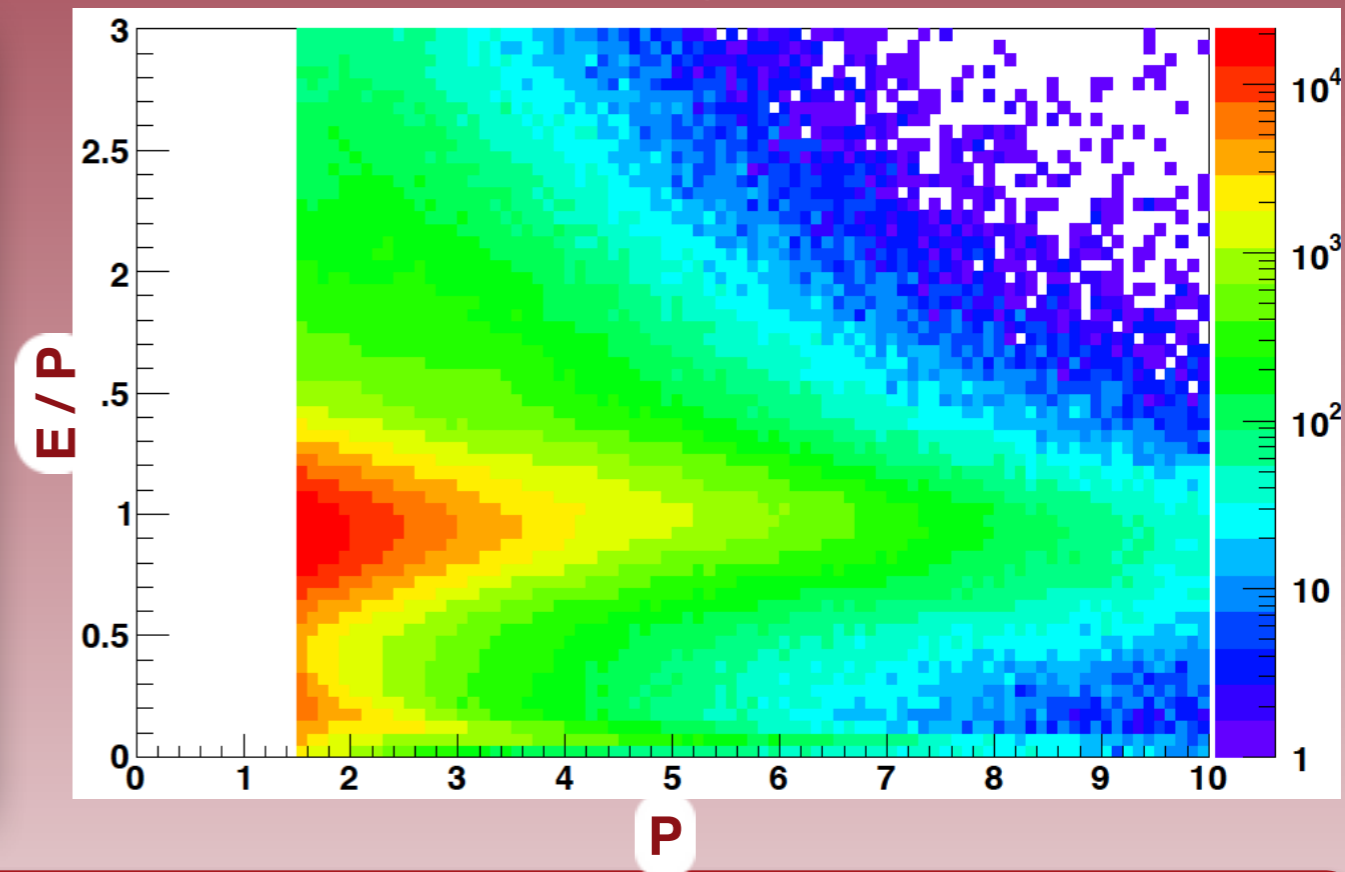
First We used the unbiased trigger option that was used in run 12 200 GeV calibration.

Run12 200 GeV calibration - Unbiased Trigger option

E/P Vs Momentum



Z-axis log-scale



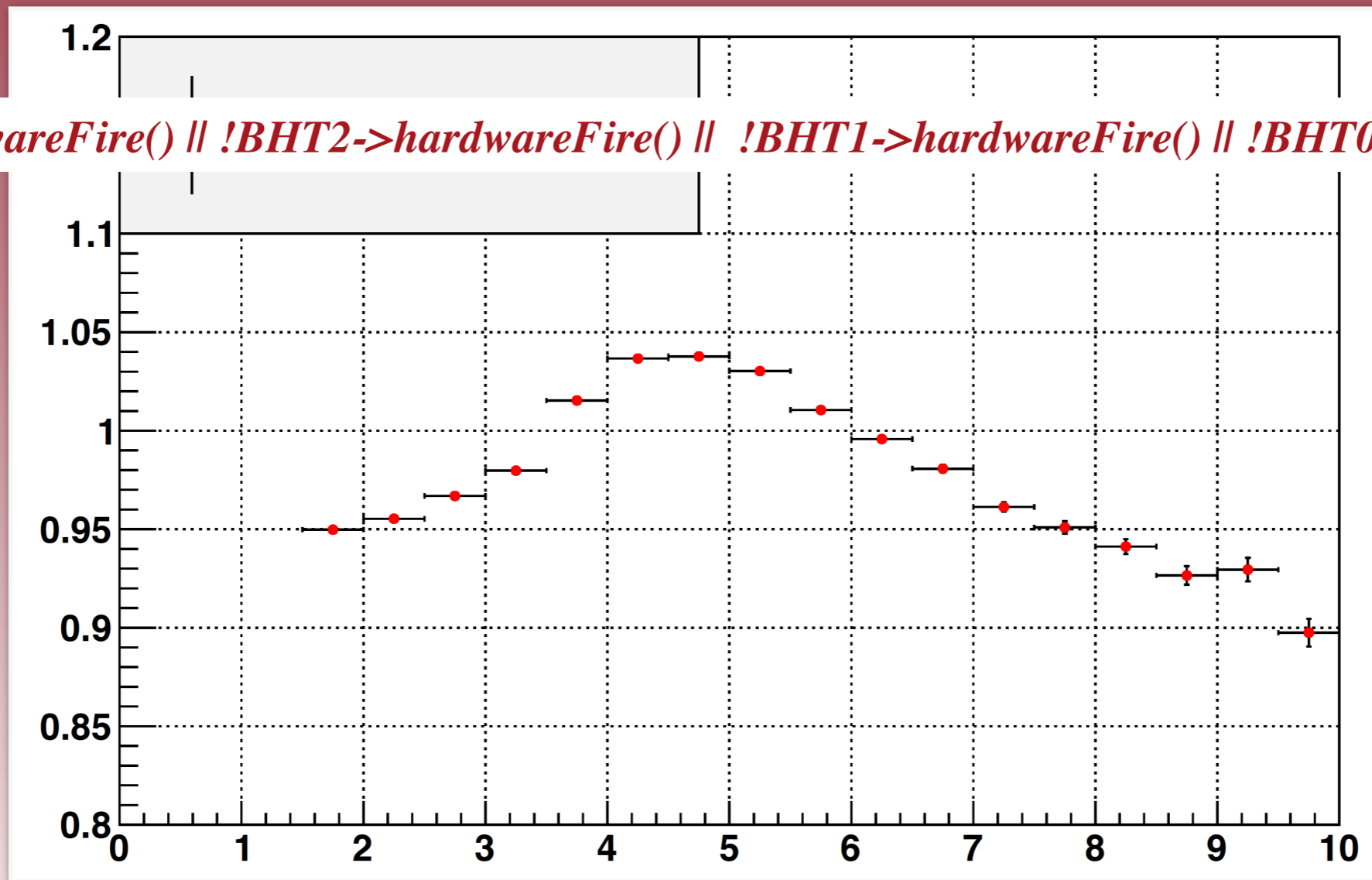
!BHT3->hardwareFire() || !BHT2->hardwareFire() || !BHT1->hardwareFire() || !BHT0->hardwareFire()

Ideally this is not exactly “unbiased” because of “||” in between. But the bias effect would be small depending on the % of BHT->hardwareFired, triggers [in run12 its only 2.5%]

Trigger Option-run 12 “Unbiased”

Run12 200 GeV calibration - Unbiased Trigger option

Mean E/P fit in momentum slices



!BHT3->hardwareFire() || !BHT2->hardwareFire() || !BHT1->hardwareFire() || !BHT0->hardwareFire()

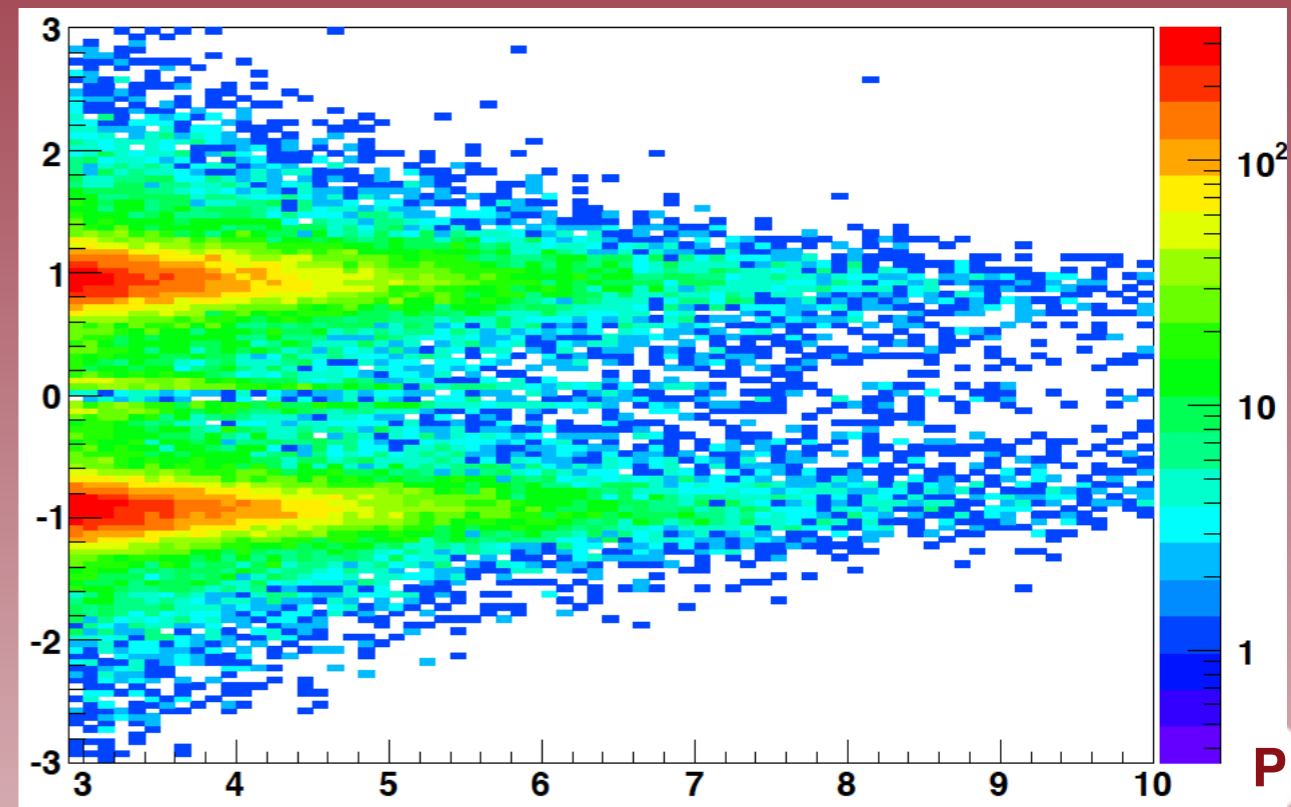
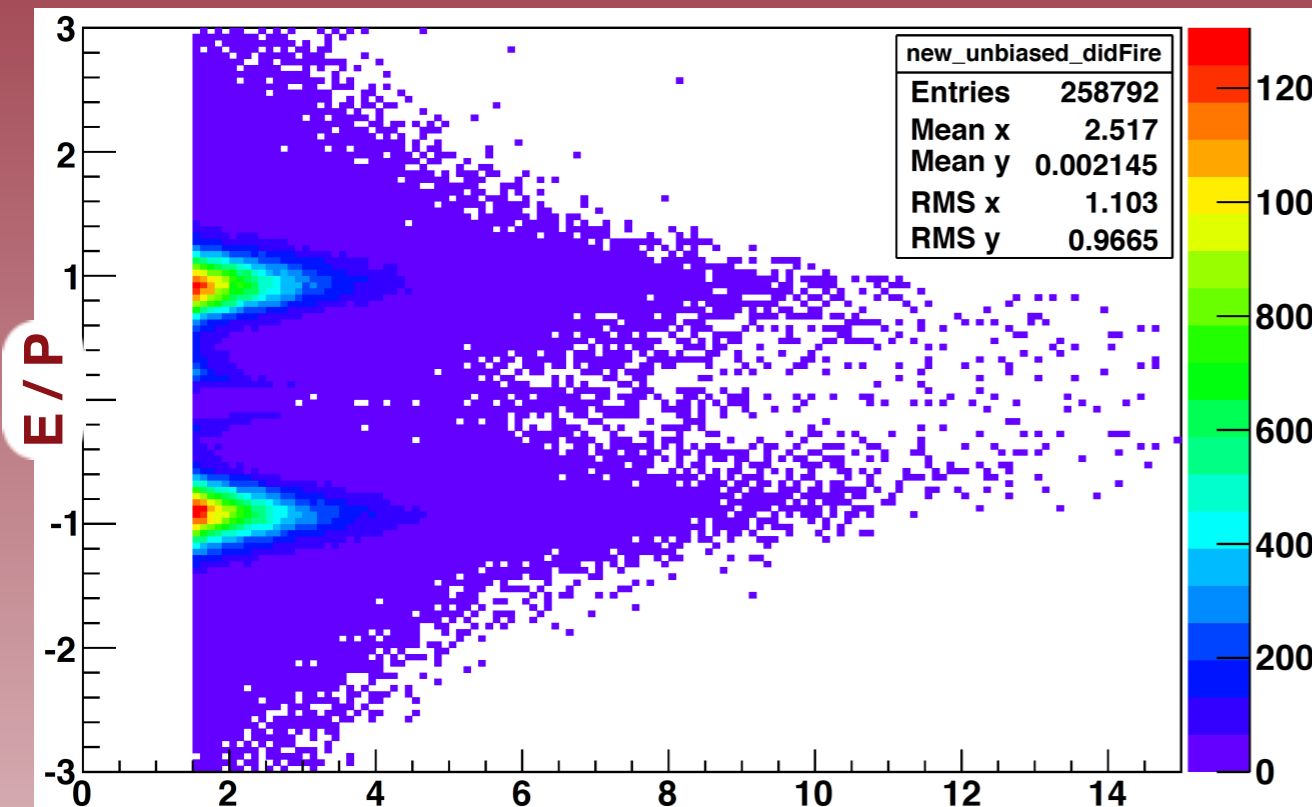
E/P

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Events from all categories 1,2, 3 present [category 1 events are due to || condition] !

Trigger Option-run 13 “Unbiased”

Run13 500 GeV calibration - New definition for “Unbiased” Trigger option



!BHT3->hardwareFire() && !BHT2->hardwareFire() && !BHT1->hardwareFire() && !BHT0->hardwareFire()

Events from category 3 only!

PROS

- No trigger biases
- Stable E/P with in the momentum range of interest.

CONS

- No HT trigger
- Low statistics. (can be recover adding more nonHT triggers in to the calibration trees)

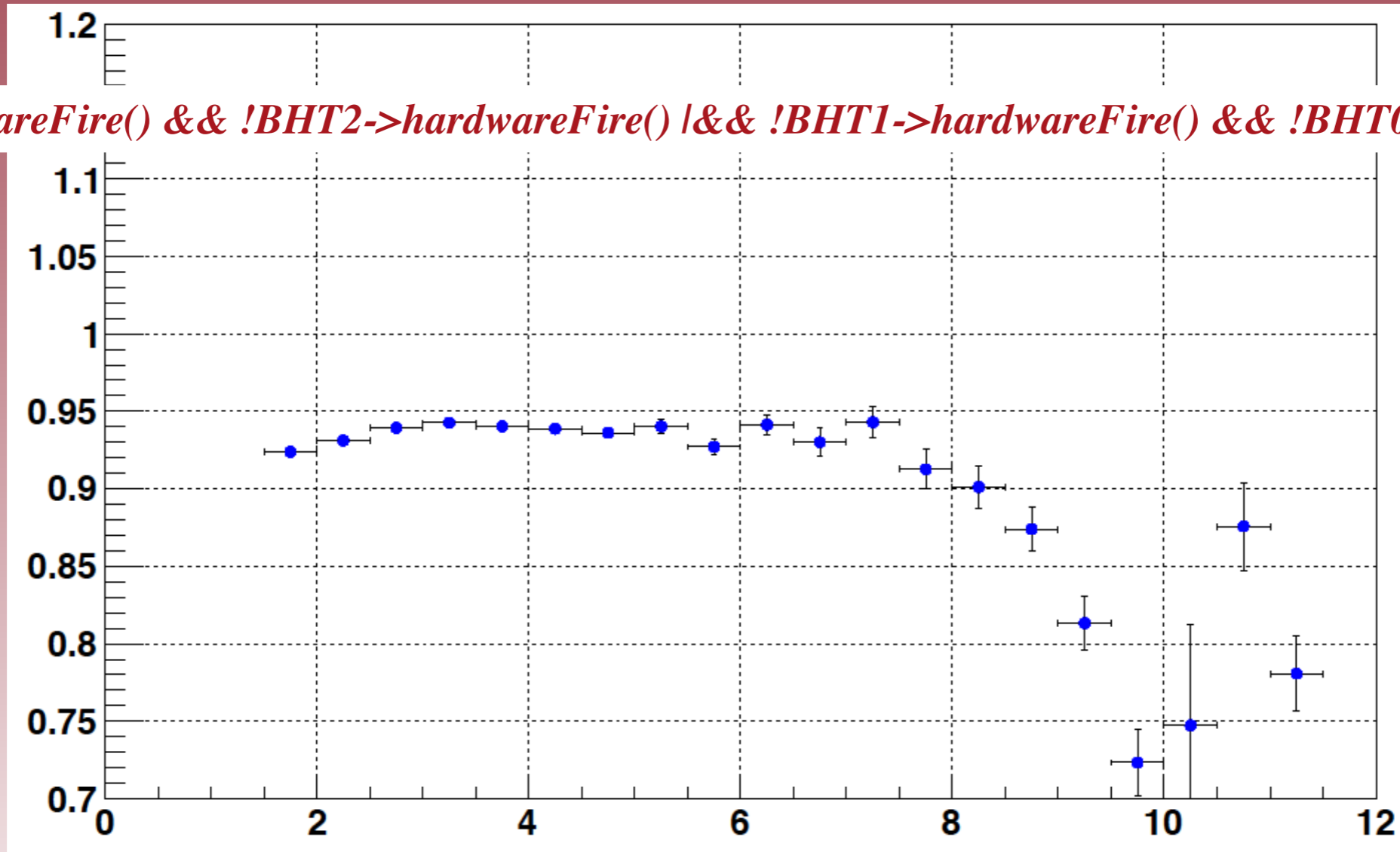
Trigger Option-run 13 “Unbiased”

Run13 500 GeV calibration - New definition for “Unbiased” Trigger option

Mean E/P fit in momentum slices

!BHT3->hardwareFire() && !BHT2->hardwareFire() |&& !BHT1->hardwareFire() && !BHT0->hardwareFire()

E/P

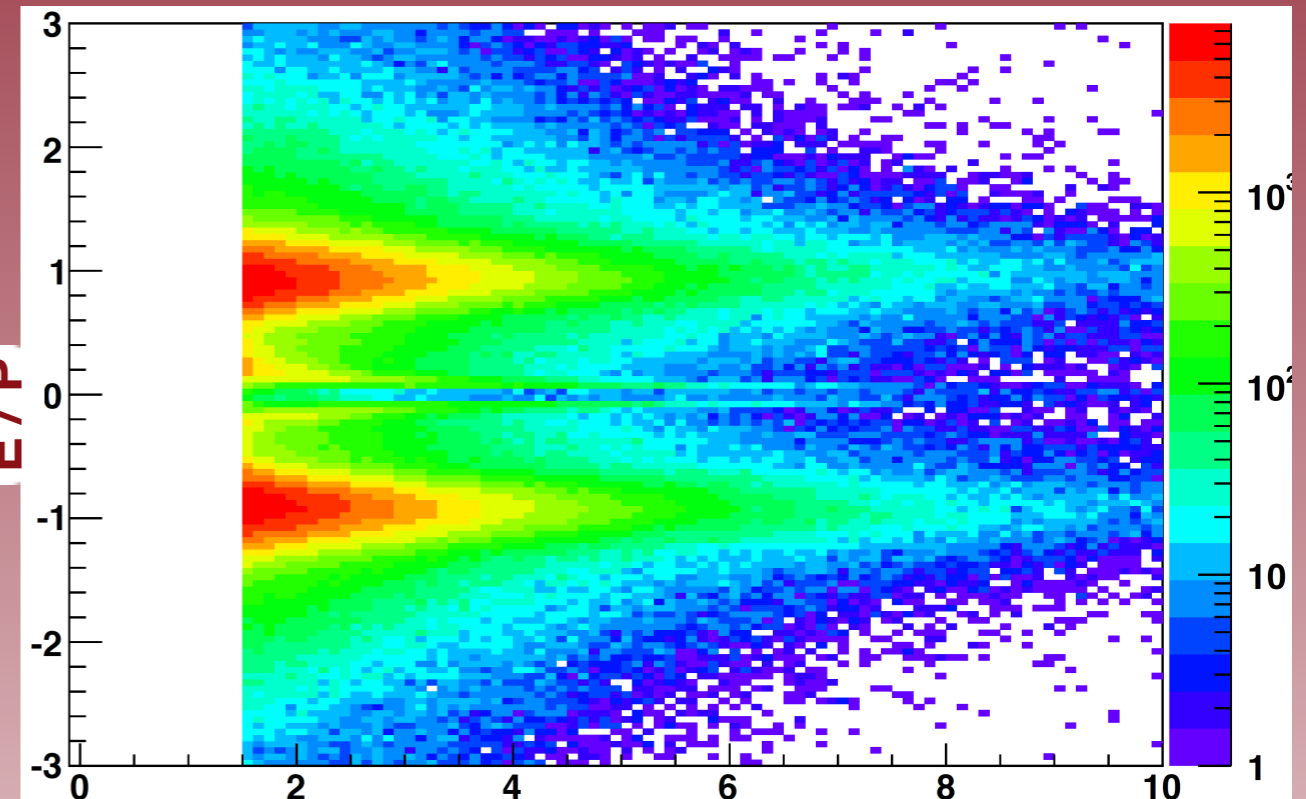
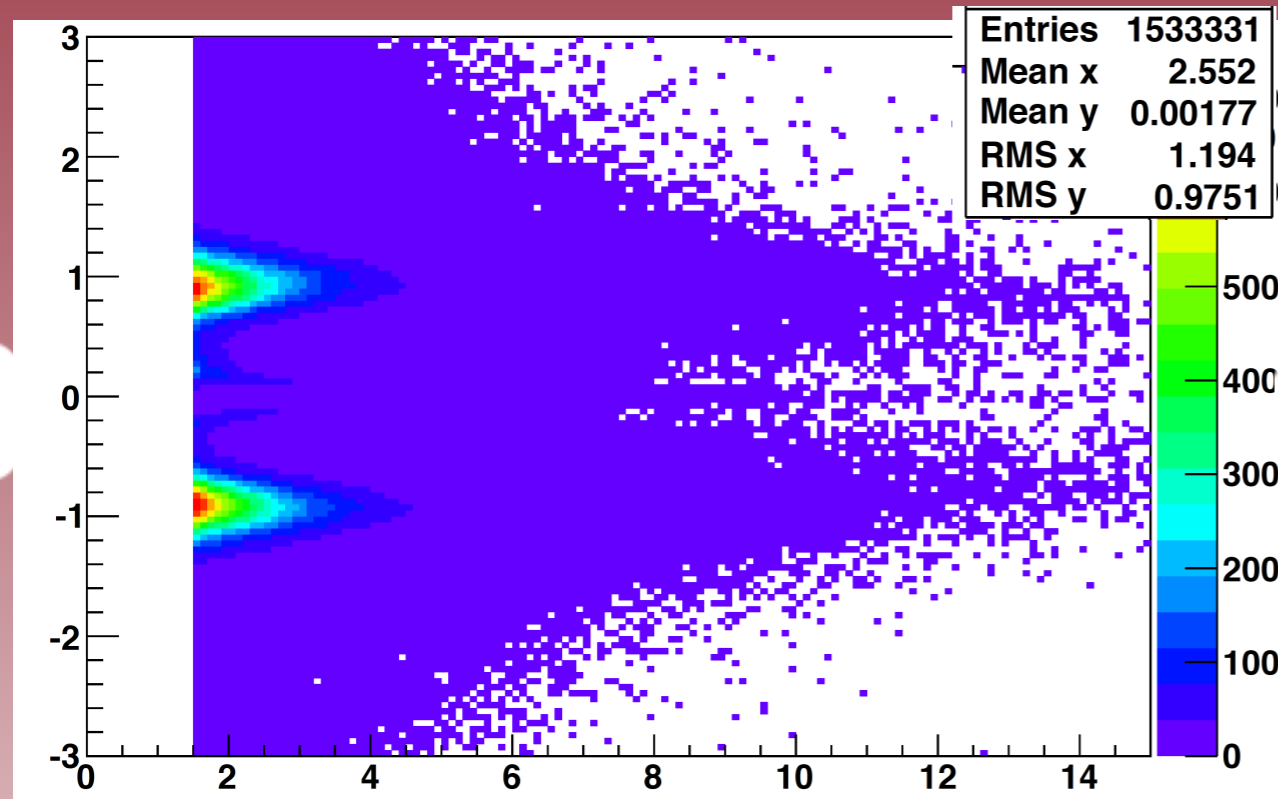


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Events from category 3 only!

Trigger Option-run 13 “Minimum-bias”

Run 13 - “Minimum-bias” Trigger



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!BHT2->hardwareFire() && !BHT1->hardwareFire() && !BHT0->hardwareFire()

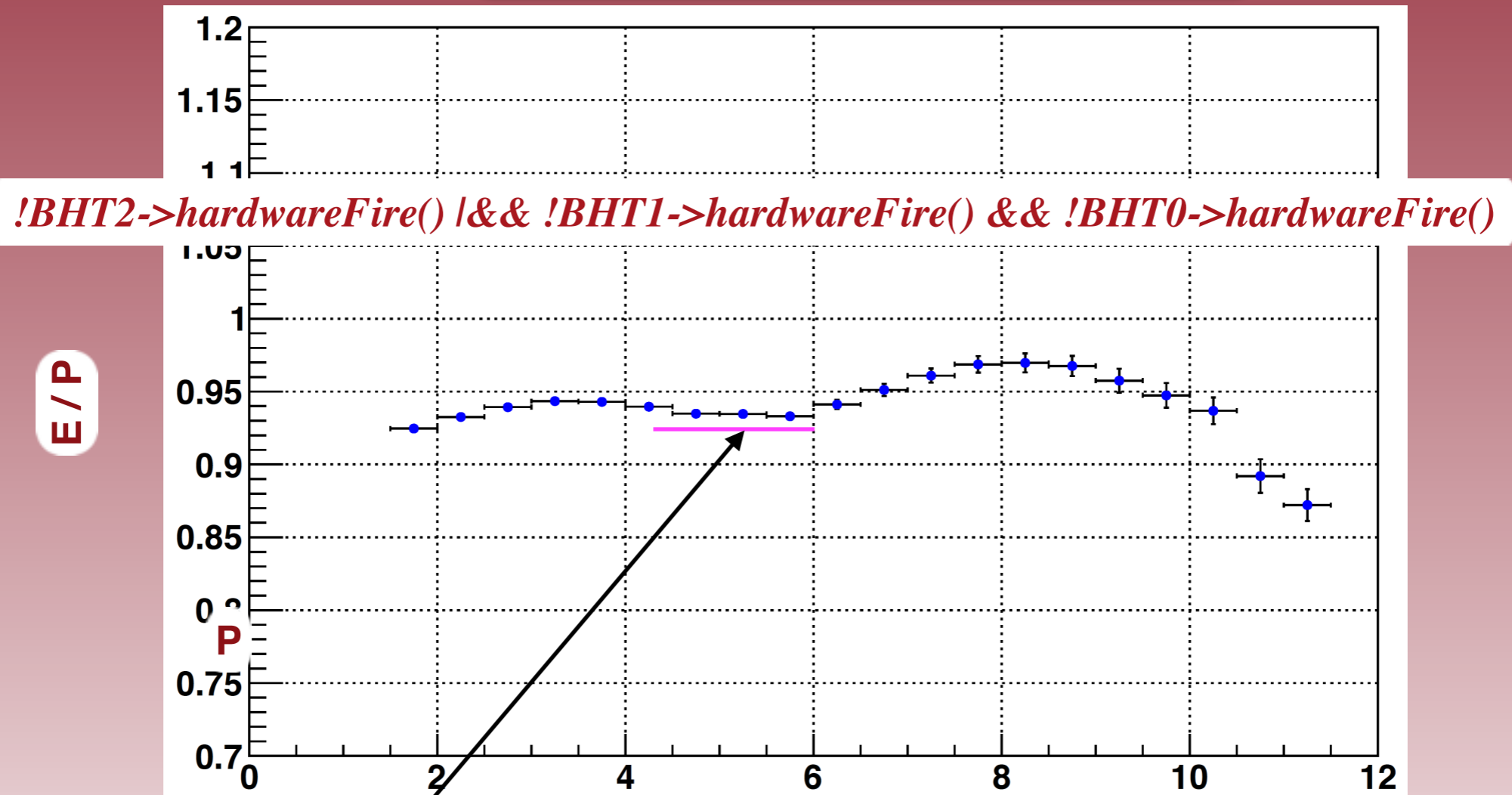
Events from category 3 and some fraction of category 2 (BHT3 && JP2) .

By removing low BHT triggers we can get a “unbiased” sample in the momentum range up to BHT3 trigger threshold. By NOT calling for BHT3->hardwareFire() specifically we can include all JP2 triggered events , not only JP2 overlap with BHT3.

Trigger Option-run 13 “Minimum-bias”

Run13 -“Minimum-bias” Trigger

Mean E/P fit in momentum slices



Events from category 3 and some fraction of category 2 .

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Effect of “anti-bias” from calling off low BHT triggers is ignorable compare to “trigger-bias” effect which get by including low BHT triggers

Table 3 referring to Kevin's document

catogory	Considering only a hard-ware fired event	Run12-observations	Run13-observations
1	onlyBHT	bias	bias
2	BHT && nonBHT	not bias	bias
3	only nonBHT	not bias	not bias

Table 3

catogory		events triggered with	Run 12 (%)	Run 13 (%)
1	HTflag && !nonHTflag	only BHT	2.5	20%
3	!HTflag && !nonHTflag	only nonBHT	88.1	70%
2	HTflag && nonHTflag	BHT && nonBHT	9.4	10%

Summary

- We need final trigger options to proceed.
- We have observations for BHT && nonBHT (only checked using JP2 as non BHT) causes some bias.
- As of now we would like to use so called “minimum-bias” version with a upper momentum cut just below the BHT3 threshold.
- Comments / suggestions/ ?