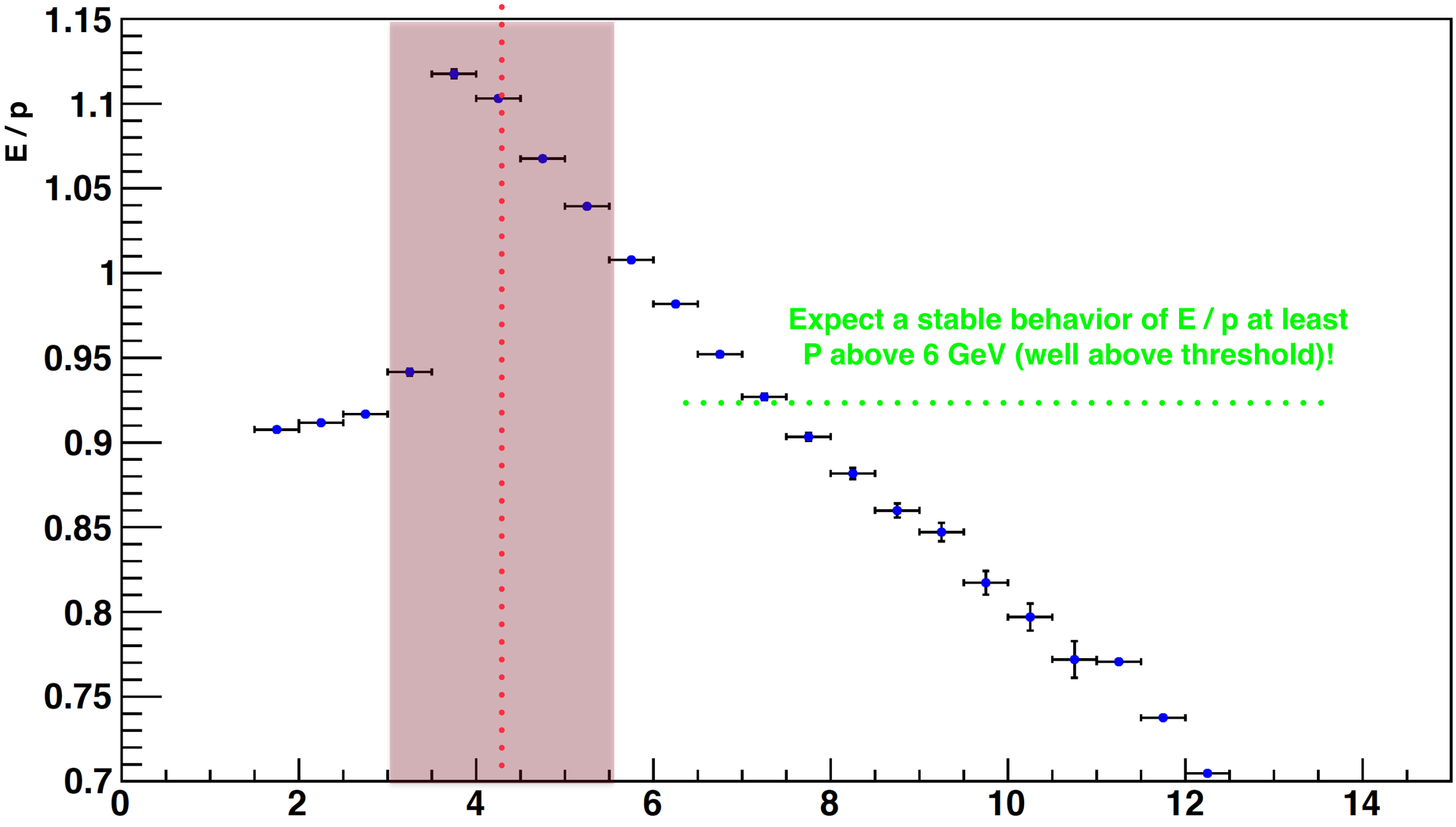
BHT1 Trigger



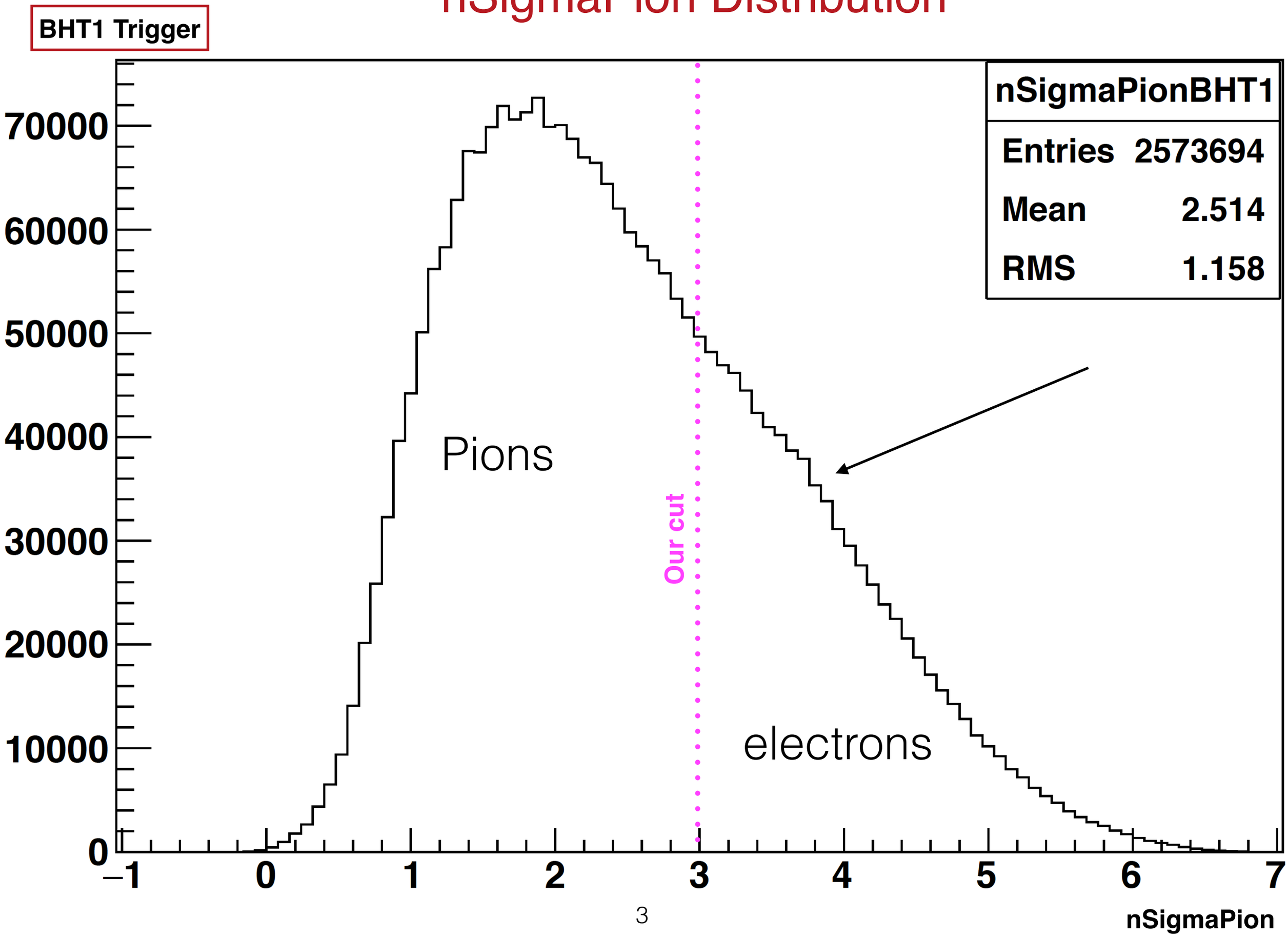
- So the question here is that we should at least see stable behavior for E / p well above the threshold value of BHT1 (4.25 GeV), but we don't see it.

- Well then one possibility is that those tracks (well above threshold , say 6.0 GeV) may be not electron tracks. Perhaps they are pions. Perhaps our pion removal cuts are not tight enough when momentum goes up. [According to dE/dX distribution we know that its hard to separate electrons and pions at high momentum]

- So in order to check this we can look at various distribution before applying PID cuts. [before applying dE/dX cuts its hard to see any electrons, therefore a good start is to check "nSigmaPion" distribution after applying dE/dX cuts.

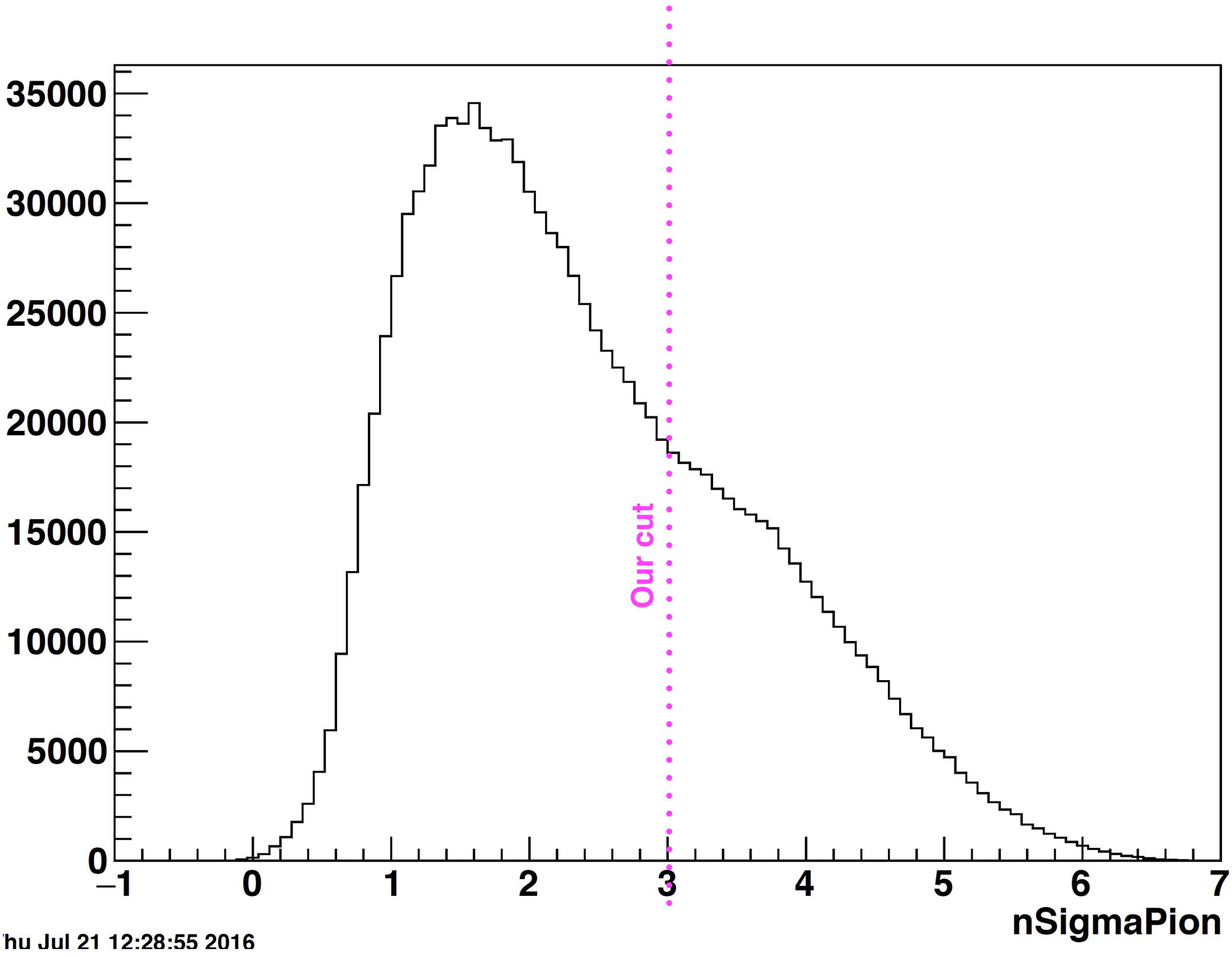
- Next slide shows nSigmaPion distribution of BHT1 trigger

nSigmaPion Distribution

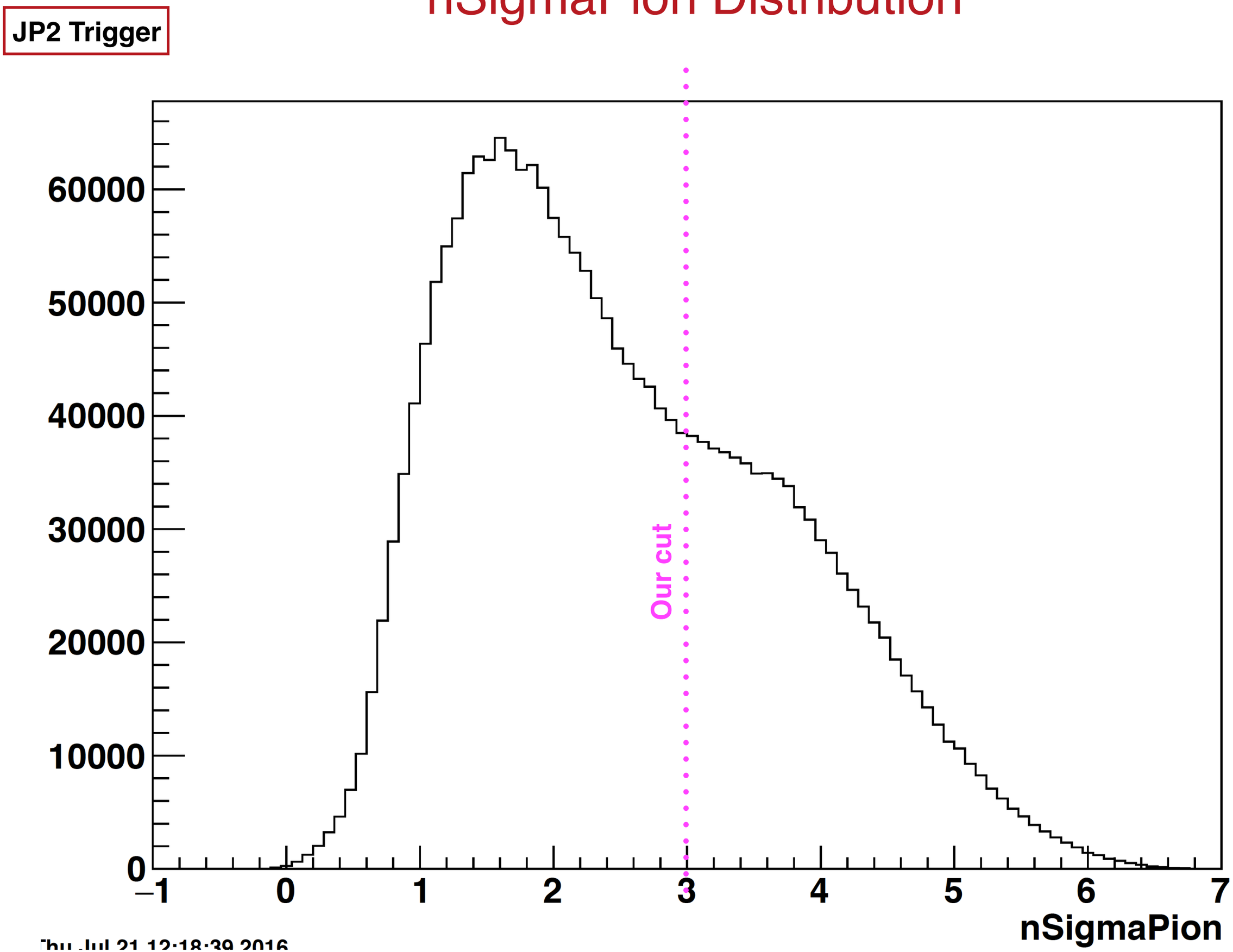


nSigmaPion Distribution

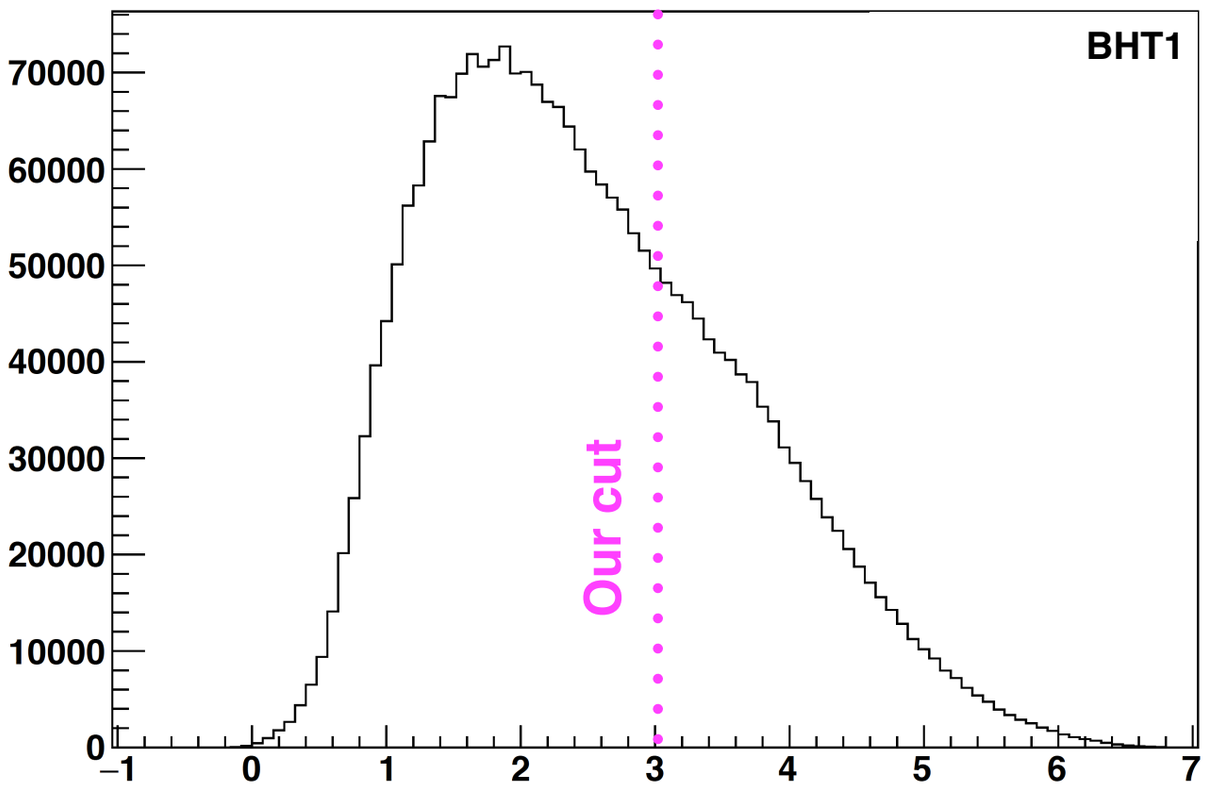
BHT3 Trigger

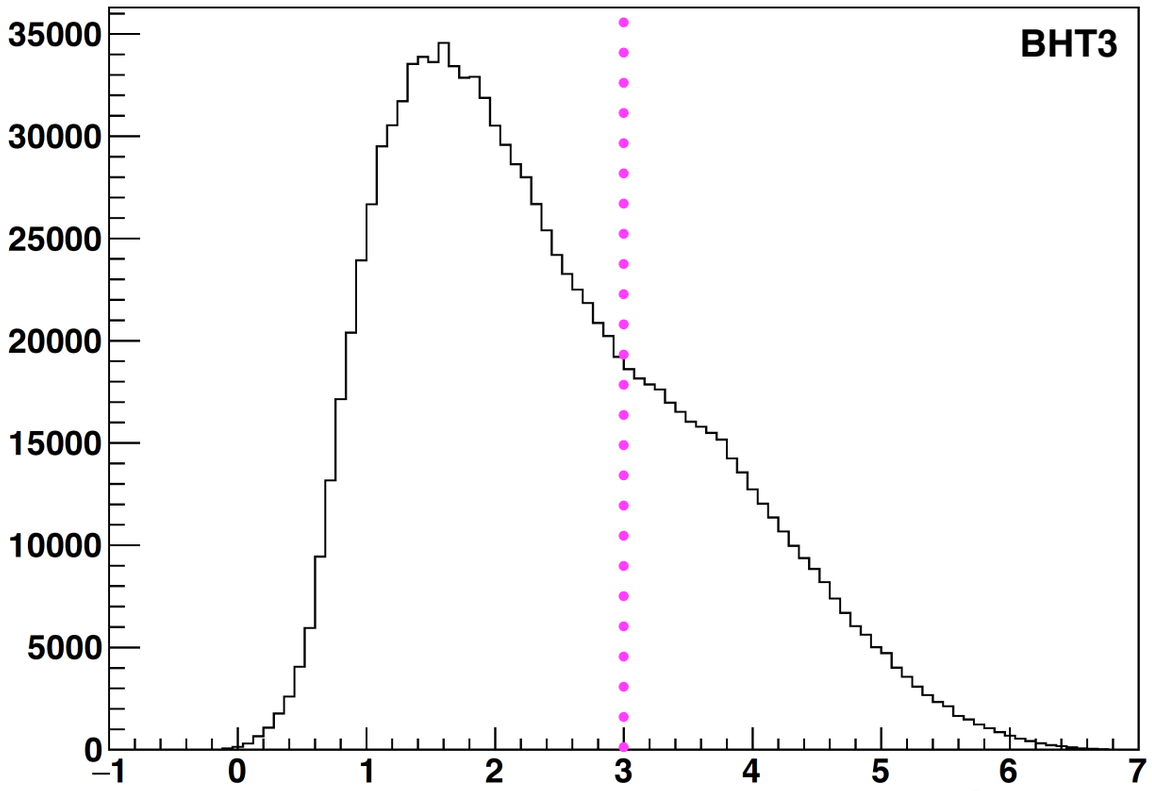


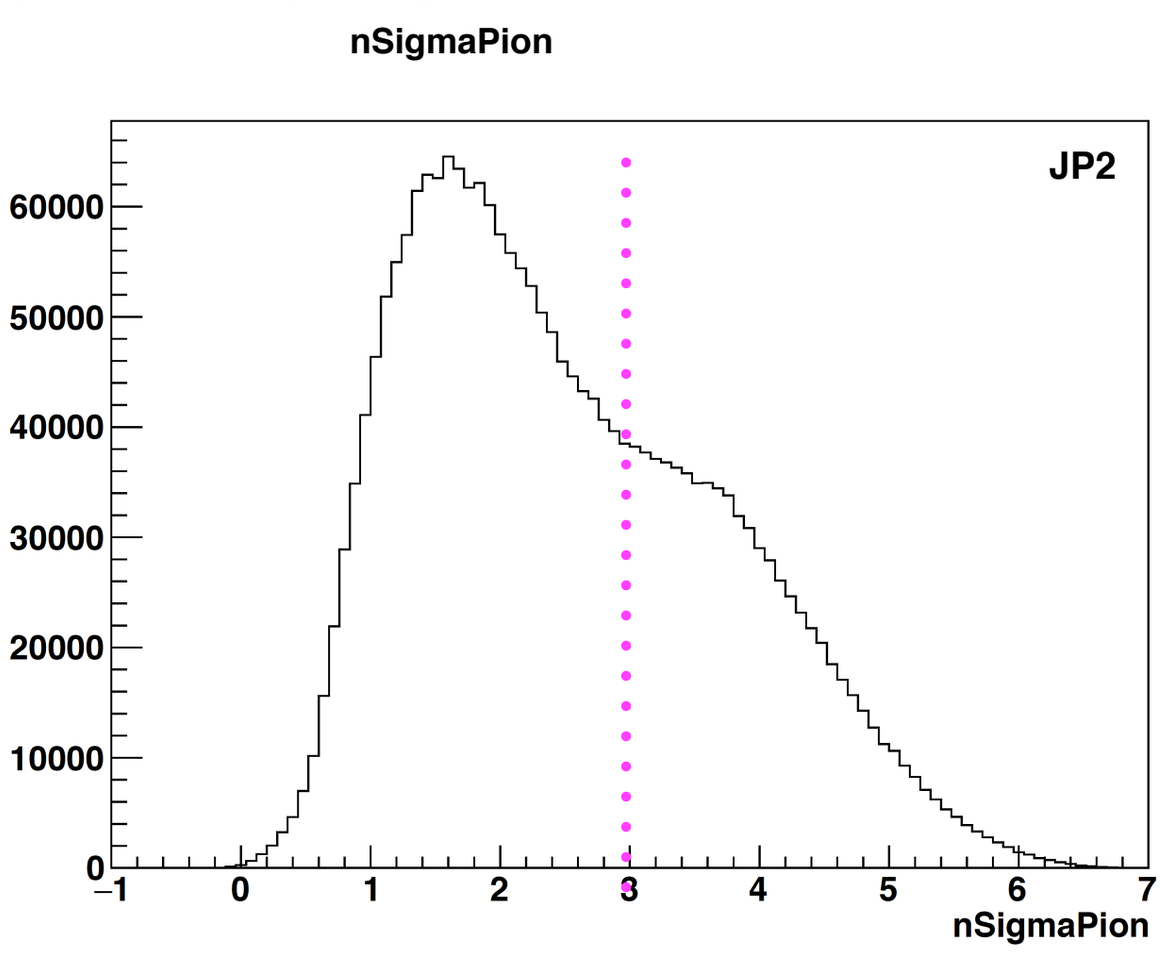
nSigmaPion Distribution



All 3 triggers together







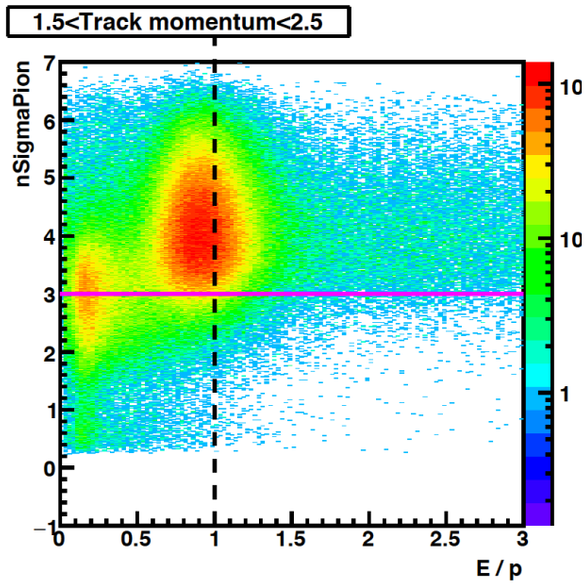
- In above distribution [3-6] I believe for pions we should expect a peak around 0, but since we have already place dE/dX cuts most of the pions are removed. The remaining pions peak around 2.0. The bump you see around 4.0 are electrons. And For JP2 this bump around 4.0 is much clear than HT.

- Also you can see in slide 6, statistics difference in each trigger around 4.0. For BHT3 trigger its 50% less than JP2 and for BHT1 its in the same order with JP2 but the separation of two peaks are very poor.

- To remove pions further, we place a cut at 3.0 of nSigmaPion. So we remove everything below 3.0 of nSigmaPions. You can see already that some pion leaking in to electron is unavoidable with a this kind of linear cut.

- Distribution in slide 8,9,10 are nSigmaPion vs E / P in momentum slices. Its clearly show the impact of the cut. These distributions are before placing nSigmaPion cut.

BHT1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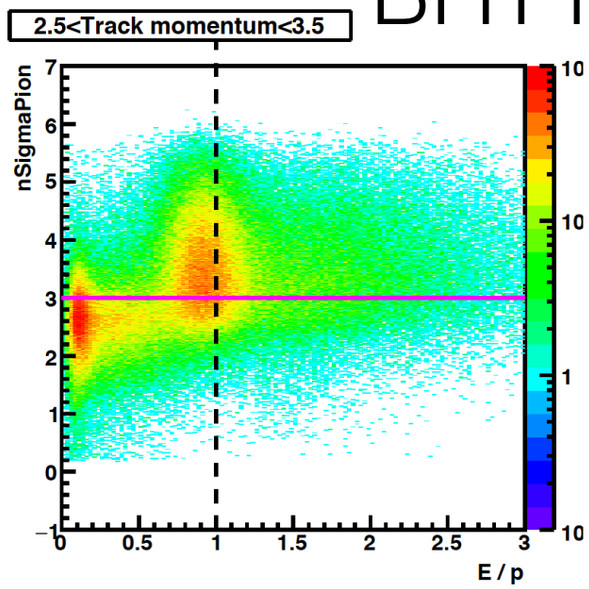
nSigmaPion
E / p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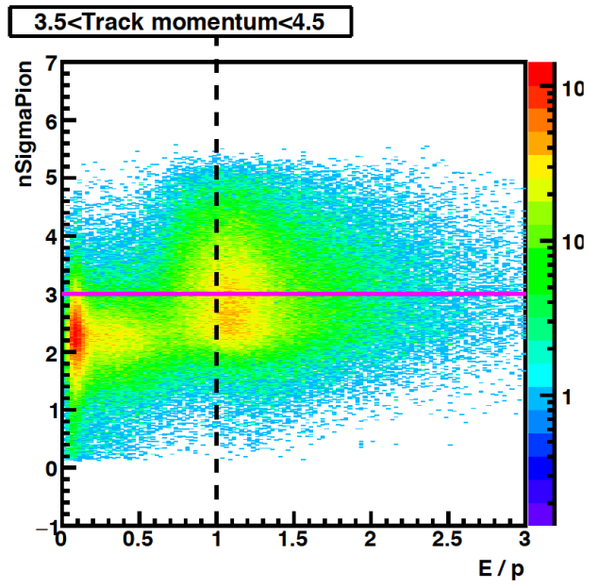
nSigmaPion
E / p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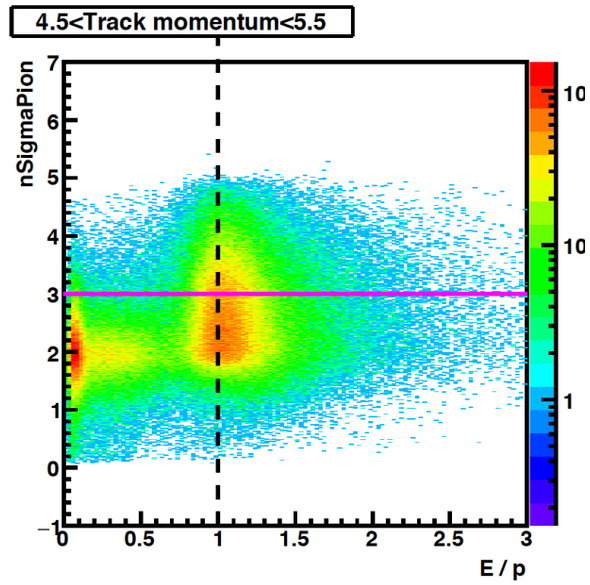
nSigmaPion
E / p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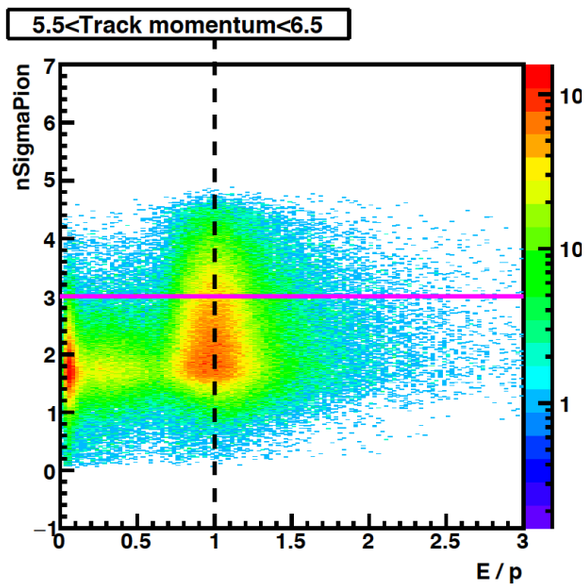
E / p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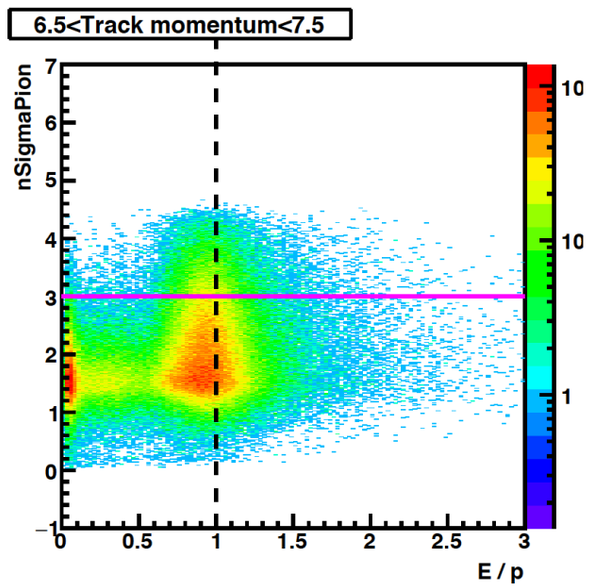
nSigmaPion
E / p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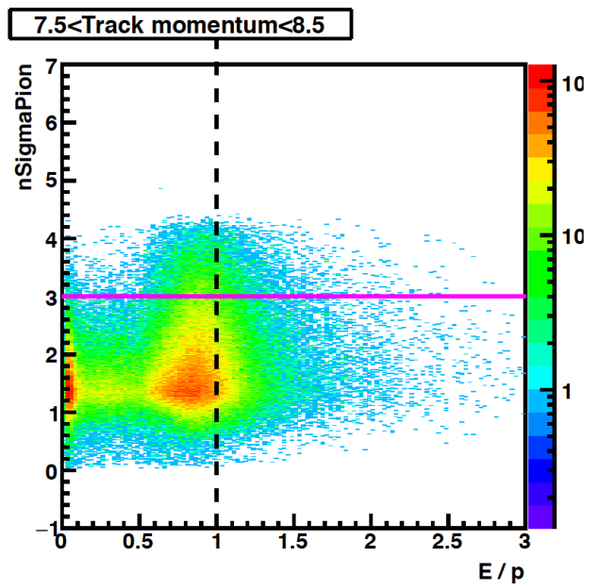
nSigmaPion
E / p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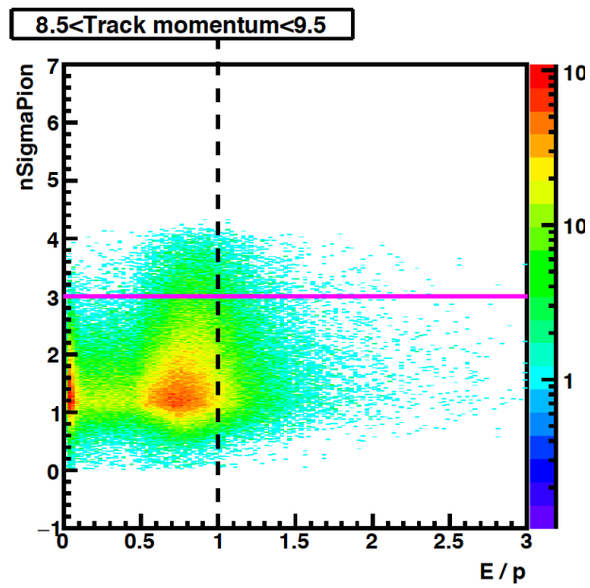
E / p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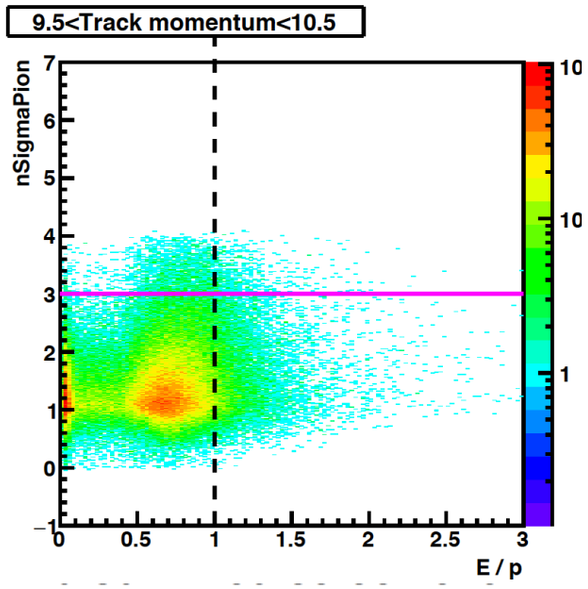
E / p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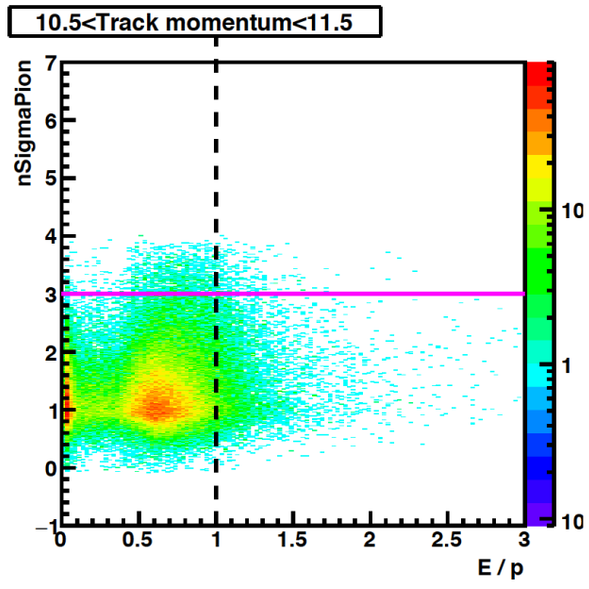
E / p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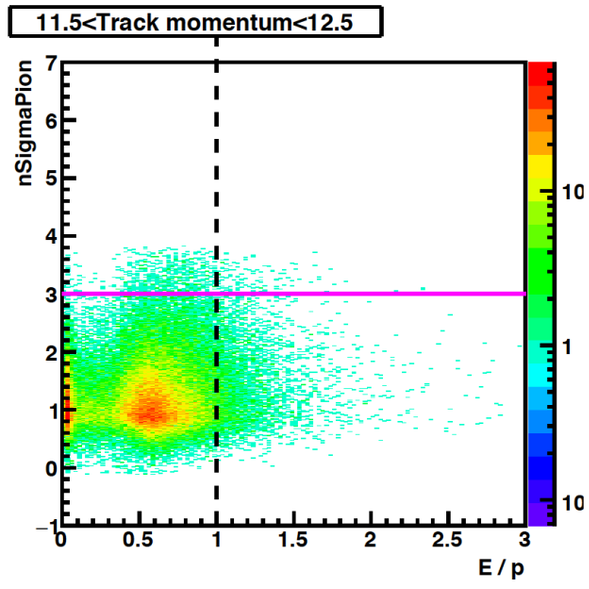
E / p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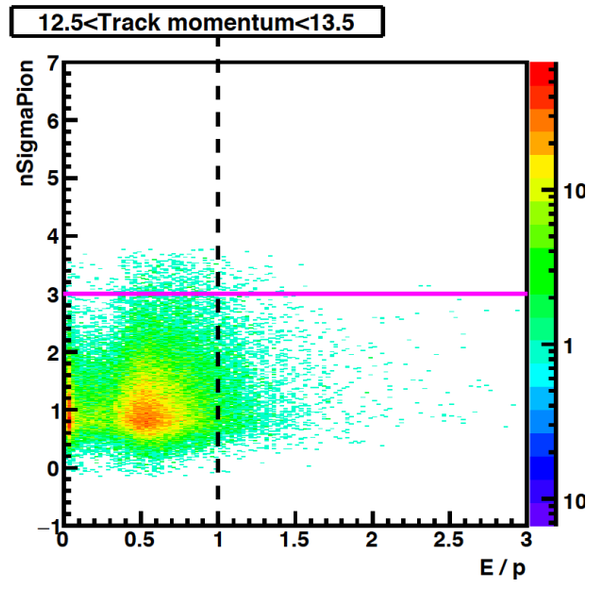
E / p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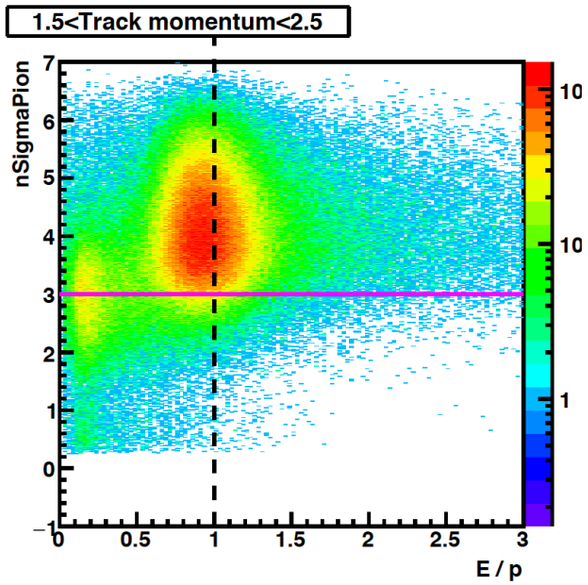
E / p

JP2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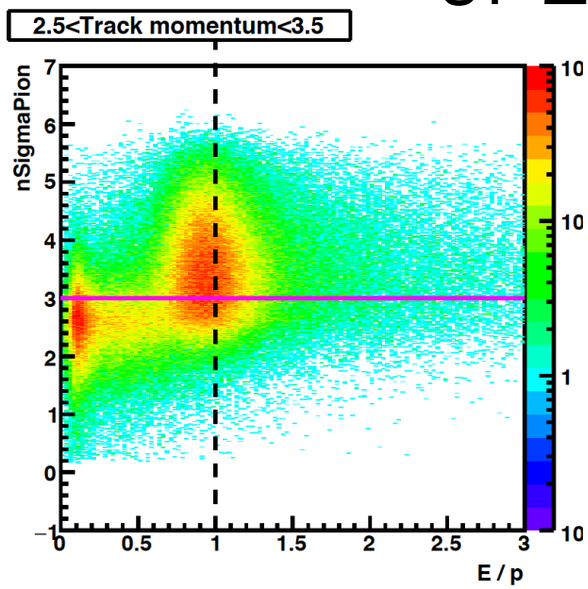
nSigmaPion
E / p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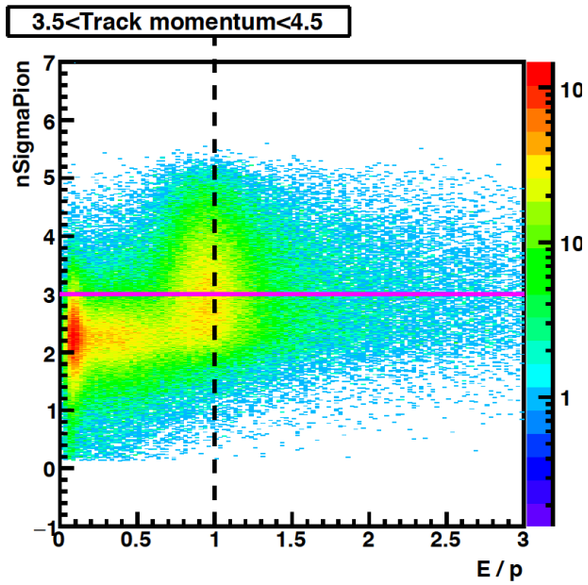
nSigmaPion
E / p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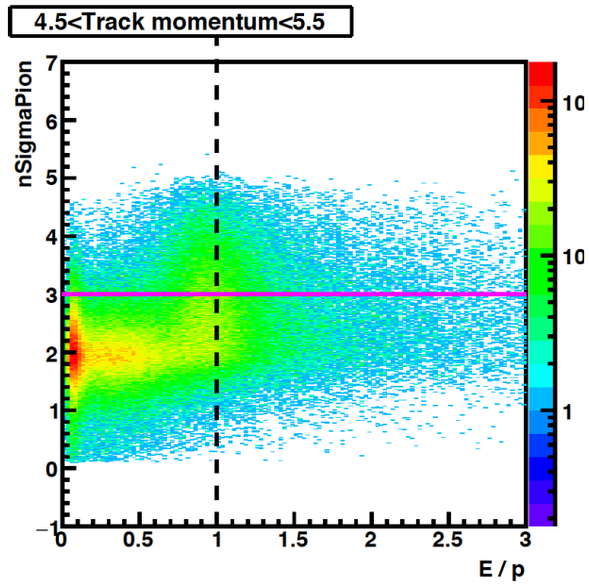
nSigmaPion
E / p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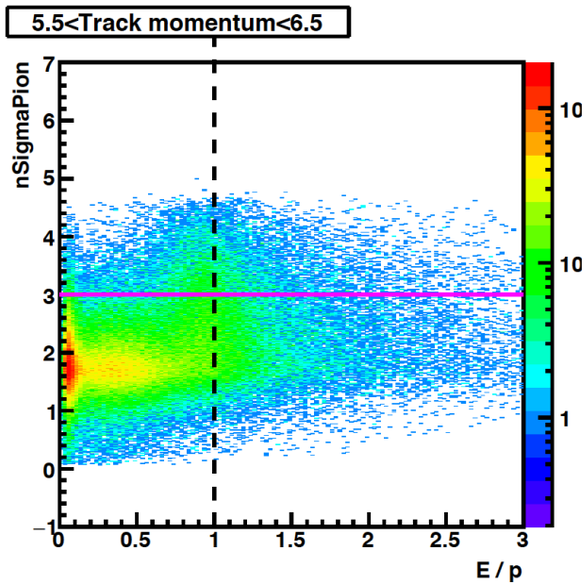
nSigmaPion
E / p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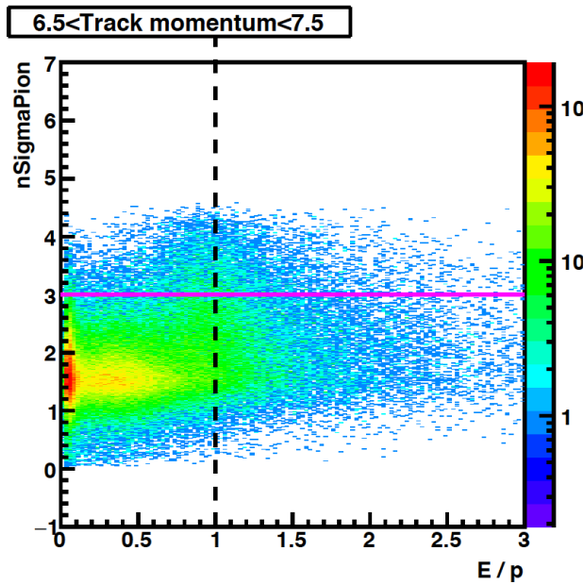
nSigmaPion
E / p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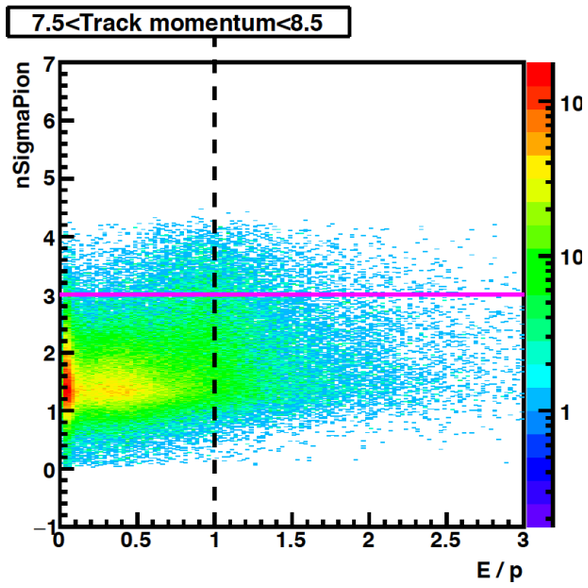
nSigmaPion
E / p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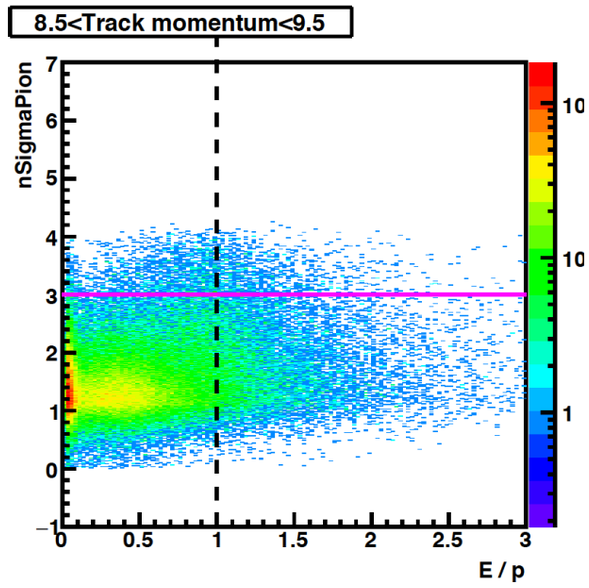
nSigmaPion
E / p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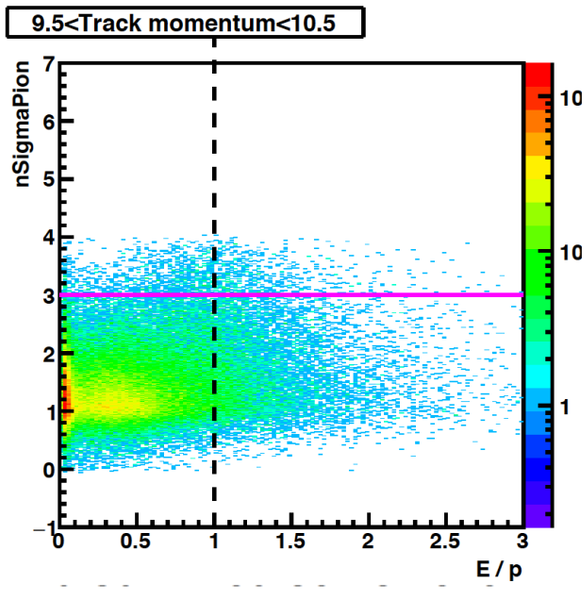
nSigmaPion
E / p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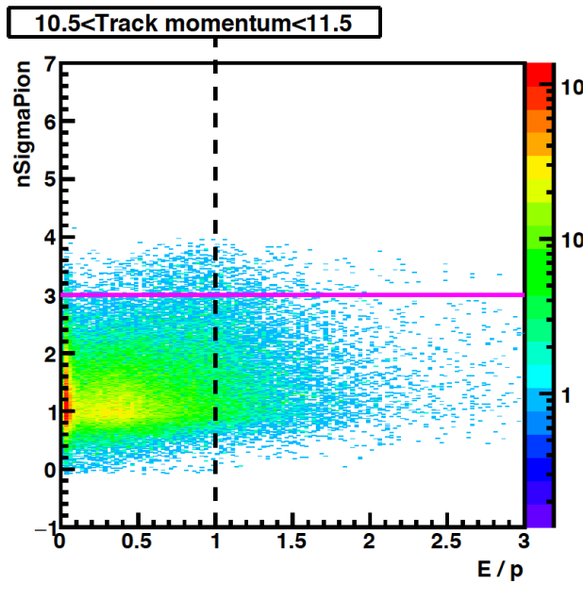
nSigmaPion
E / p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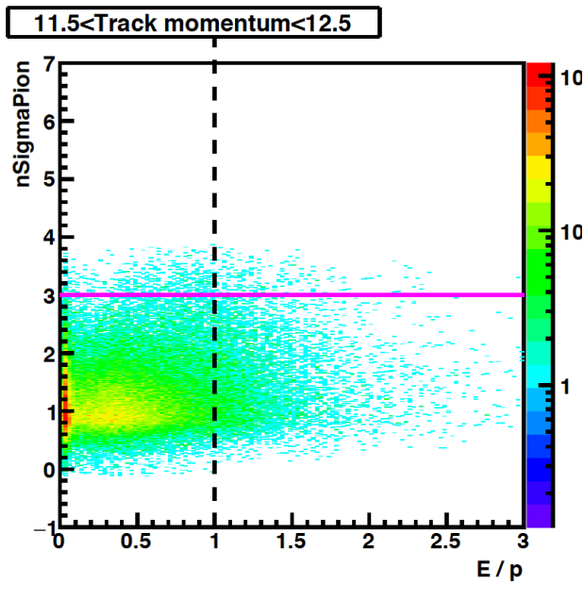
nSigmaPion
E / p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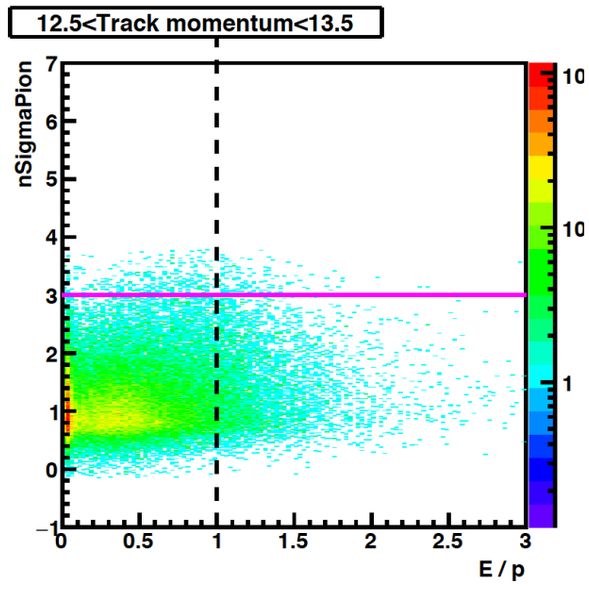
nSigmaPion
E / p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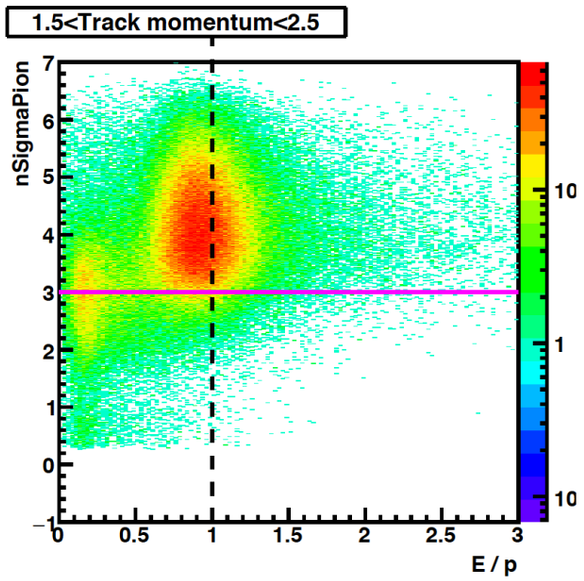
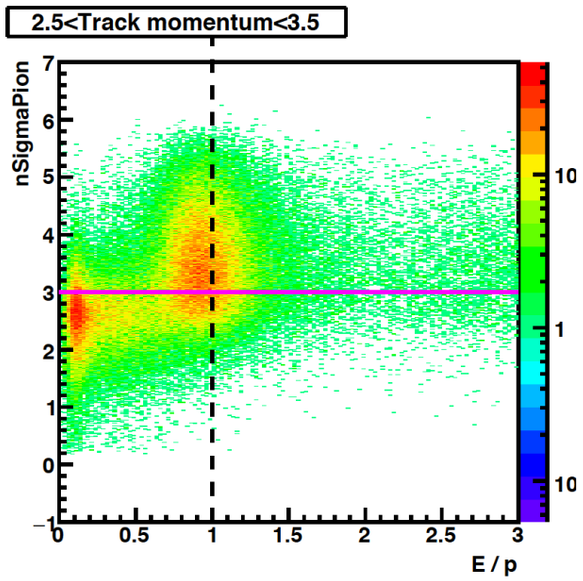
nSigmaPion
E / p

BHT3


1.5<Track momentum<2.5
nSigmaPion
E / p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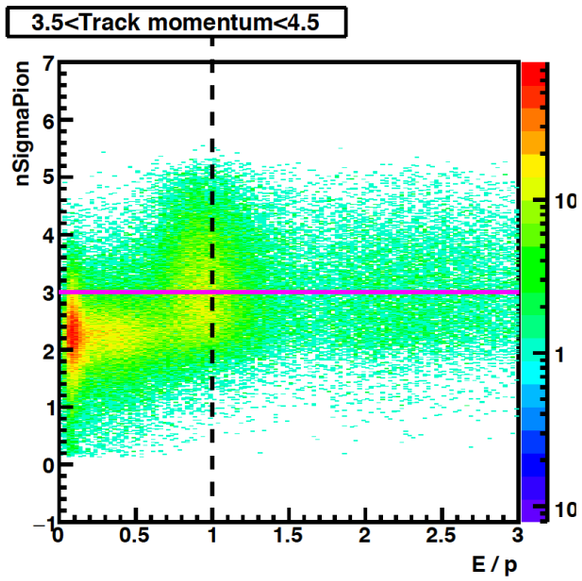
nSigmaPion
E / p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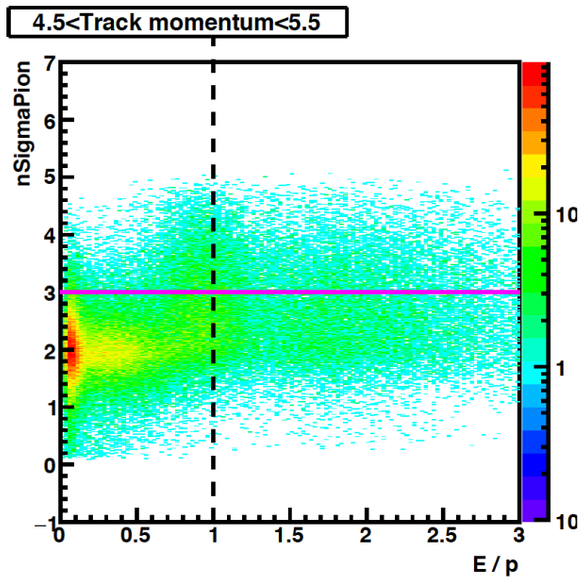
nSigmaPion
E / p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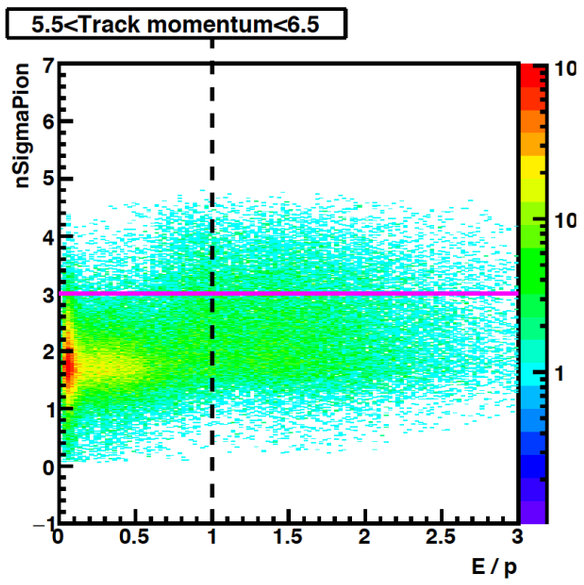
nSigmaPion
E / p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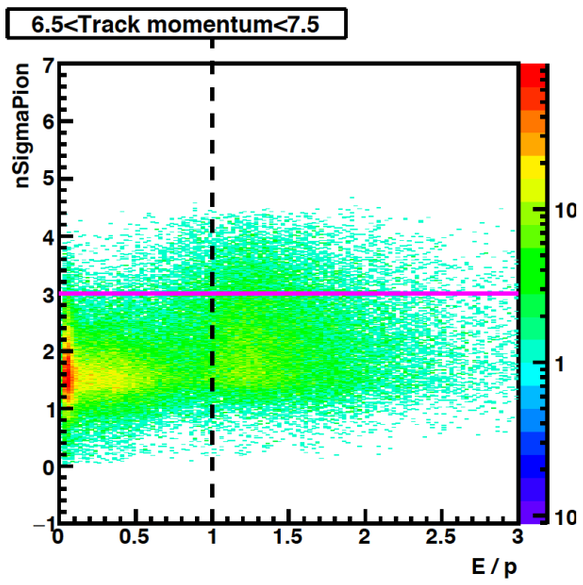
E / p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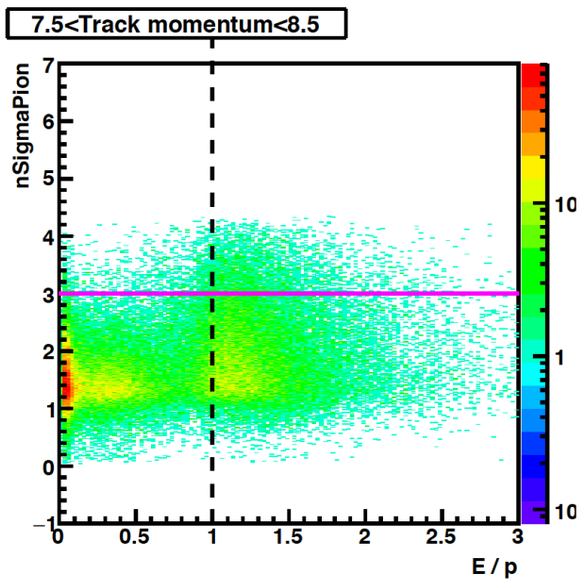
nSigmaPion
E / p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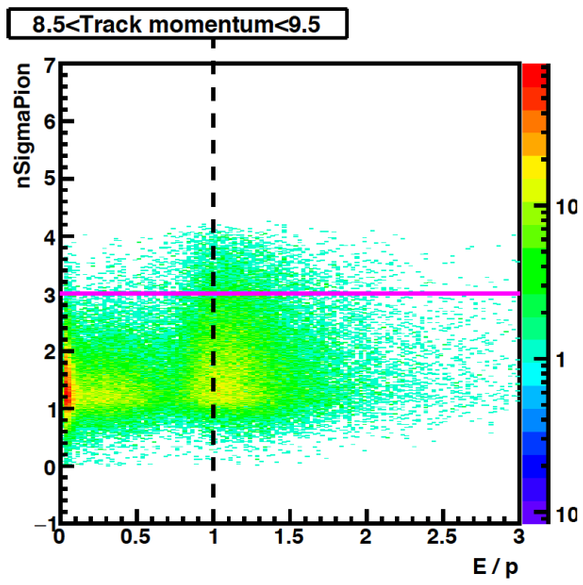
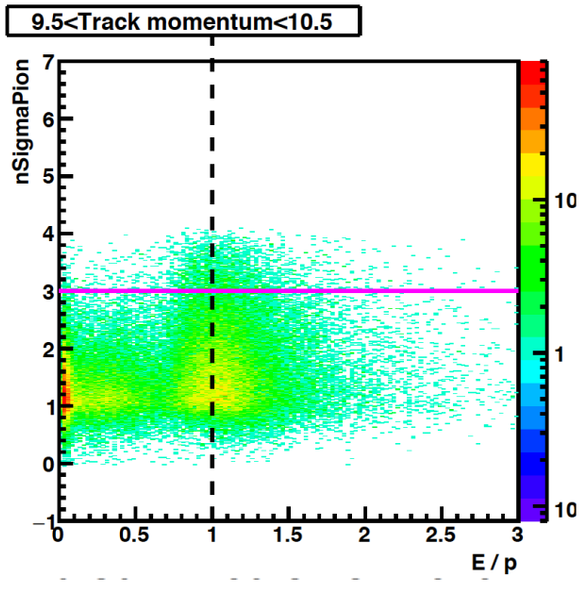
nSigmaPion
E / p


8.5<Track momentum<9.5
nSigmaPion
E / p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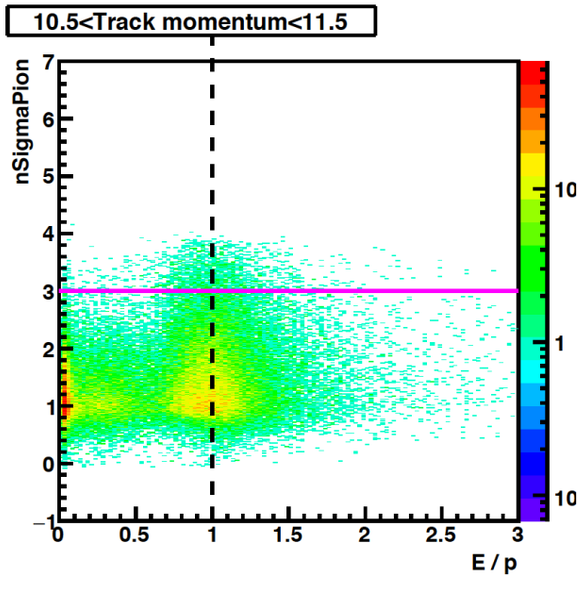
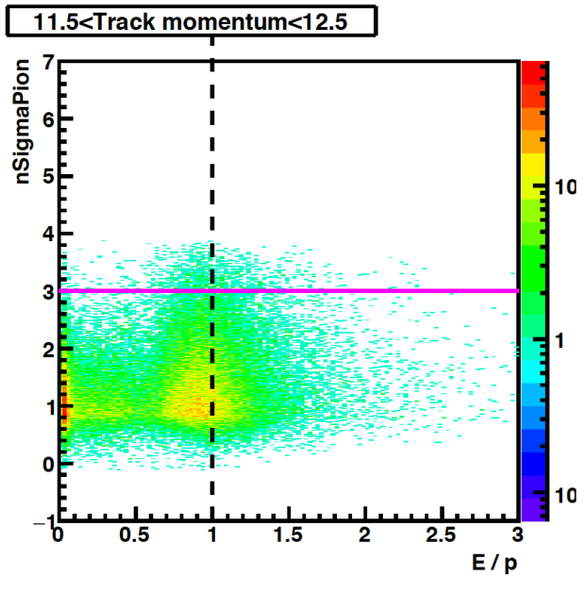
nSigmaPion
E / p


10.5<Track momentum<11.5
nSigmaPion
E / p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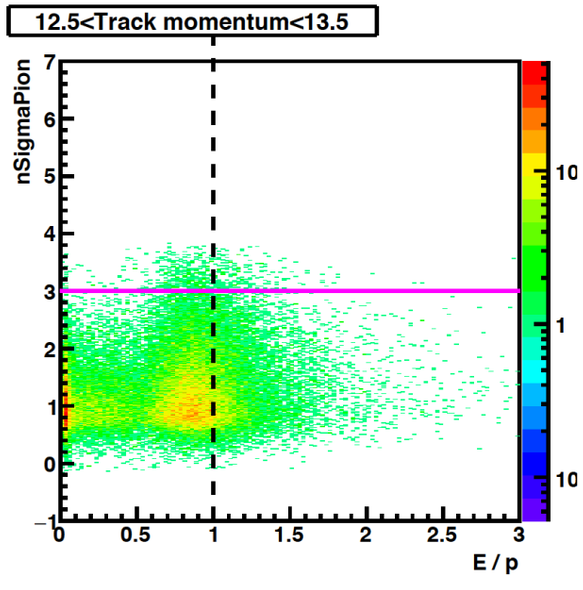
E / p


12.5<Track momentum<13.5
nSigmaPion
E / p

- In slide 8 you can see only in 1st 2 plots you will see good electron candidates. And then until momentum ~ 5.5 GeV you will see entries with larger E / p than 1. So this is around the threshold area for BHT1. And then afterward there is almost no entries above 3 in nSigmaPion. Its clear when you go up in the momentum all the tracks are pions. They are NOT really electrons. This is why E / p drops when momentum goes up.

- Its different in slide 9 where the JP2 distributions are. But to see this clearly lets look at 1-D distributions.

- Slide 12, 13 , 14 has E / p 1-D distributions before and after placing “nSigmaPion” cut. slide 12 - JP2, slide 13 - BHT1, slide 14- BHT3.

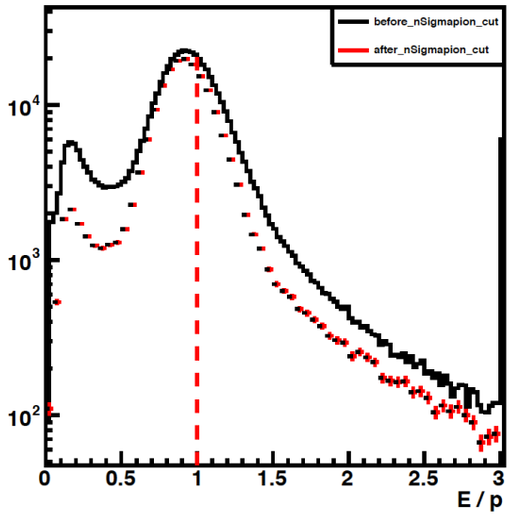
- You can clearly see for JP2 trigger a bump at 1 before and after the cut in in whole momentum range. And clearly a separate bump for Pions.

- But you don’t see that for BHT1 and BHT3. You see that no clear separation of pions and electrons when momentum goes up. In fact if we have to select electrons at high momentum then we would have to tighten the pion cut. Then you will see there is no tracks left. So what we have been selected with 3.0 nSigmaPion cut for HT trigger were all seems pion tracks. And for pions E / p drops when P goes up.

JP2 Trigger

E /p distributions in momentum slices before and after applying nSigmaPion cut

1.5<Track momentum<2.5



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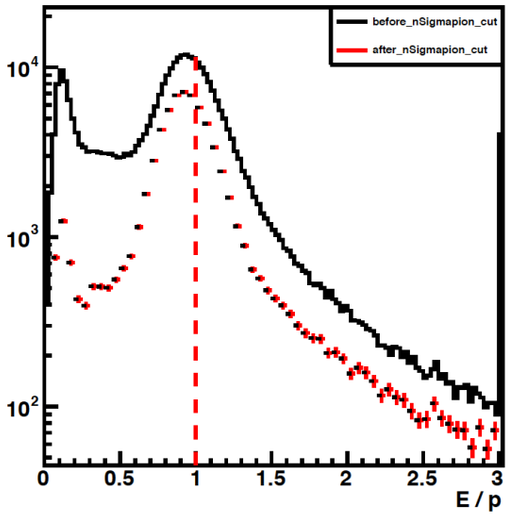
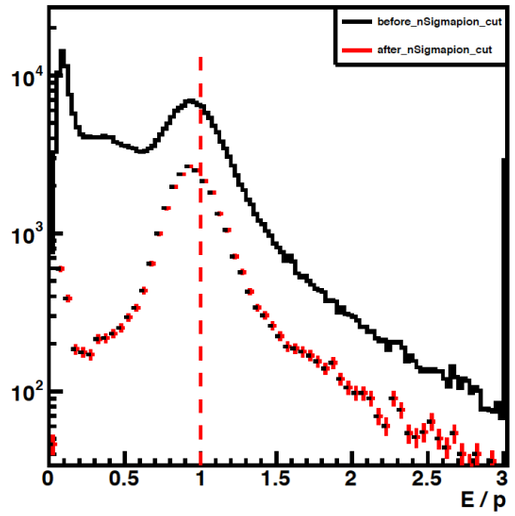
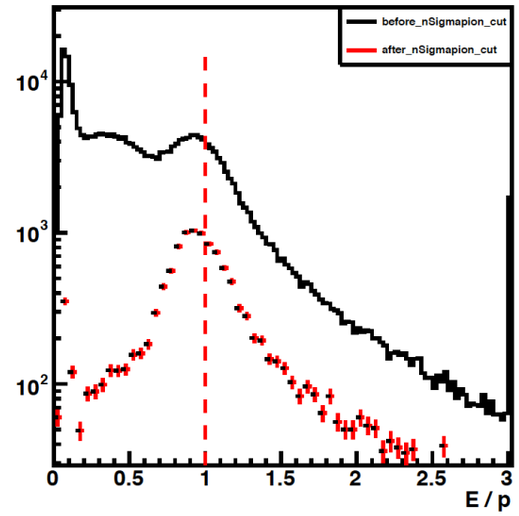


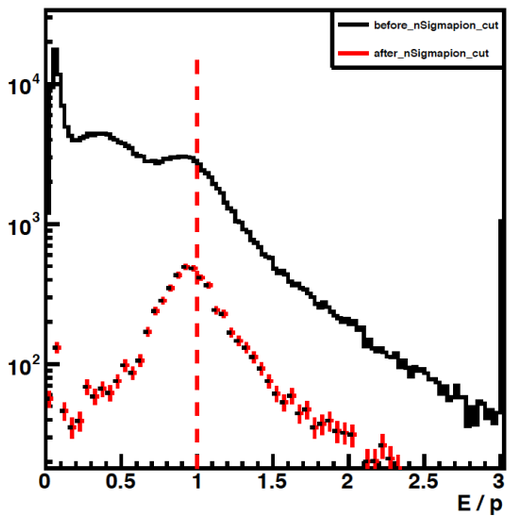
3.5<Track momentum<4.5



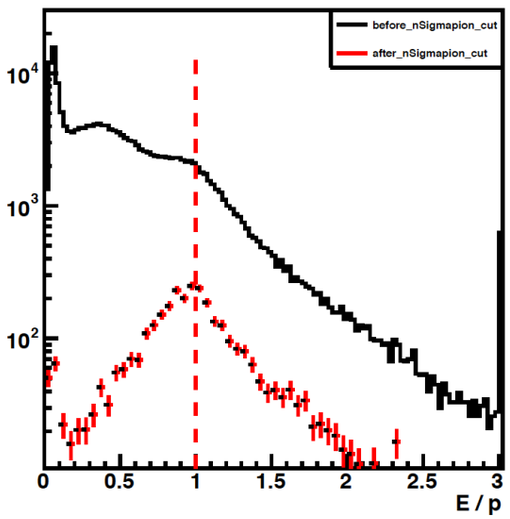
4.5<Track momentum<5.5



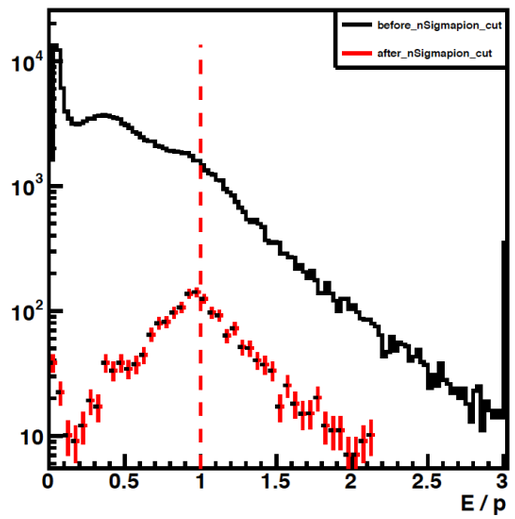
5.5<Track momentum<6.5



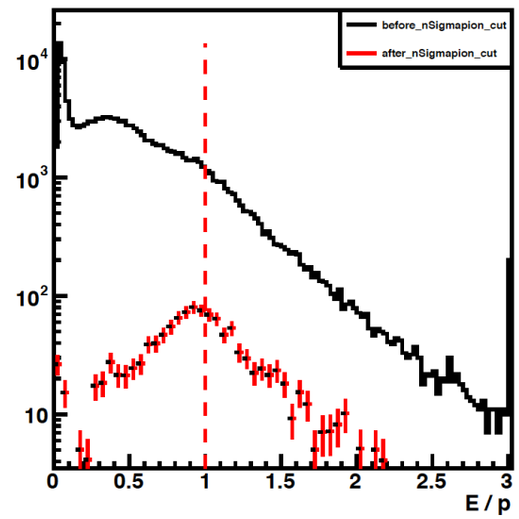
6.5<Track momentum<7.5



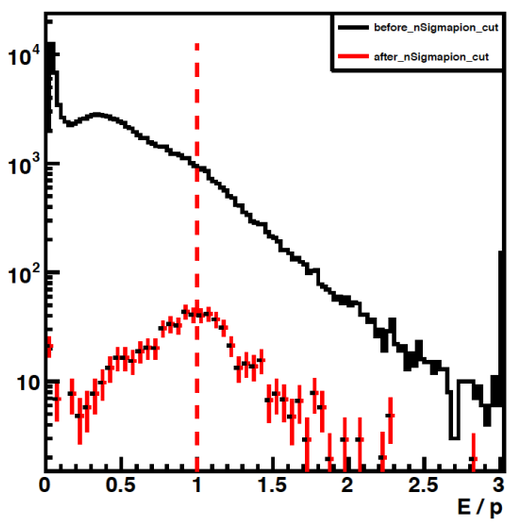
7.5<Track momentum<8.5



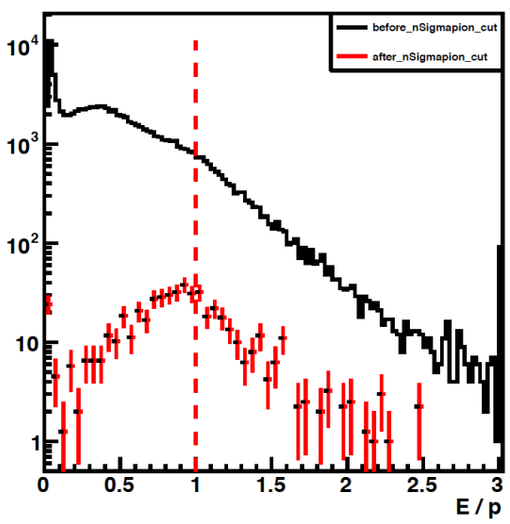
8.5<Track momentum<9.5



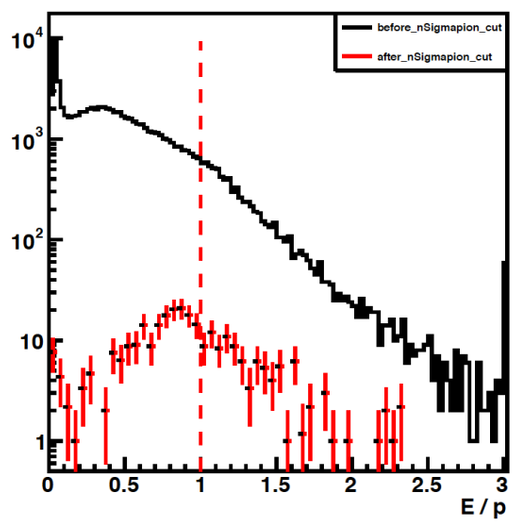
9.5<Track momentum<10.5



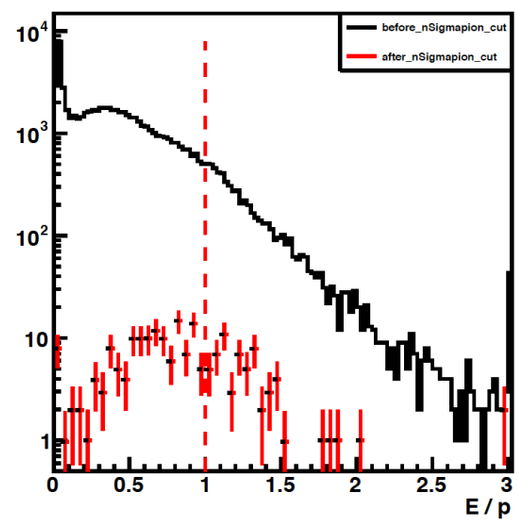
10.5<Track momentum<11.5



11.5<Track momentum<12.5



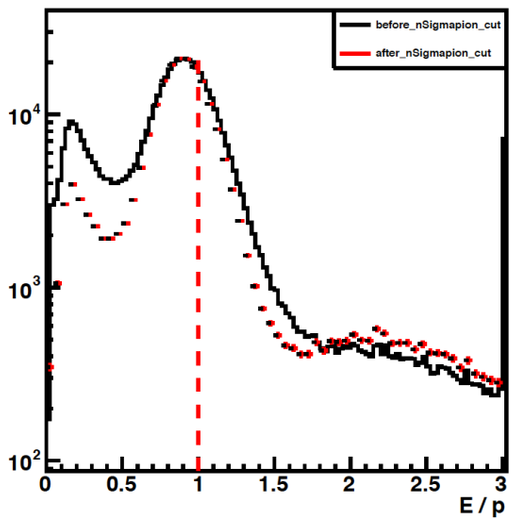
12.5<Track momentum<13.5



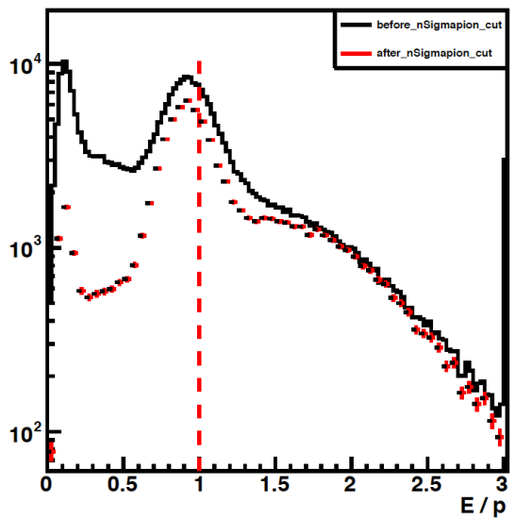
BHT1 Trigger

E /p distributions in momentum slices before and after applying nSigmaPion cut

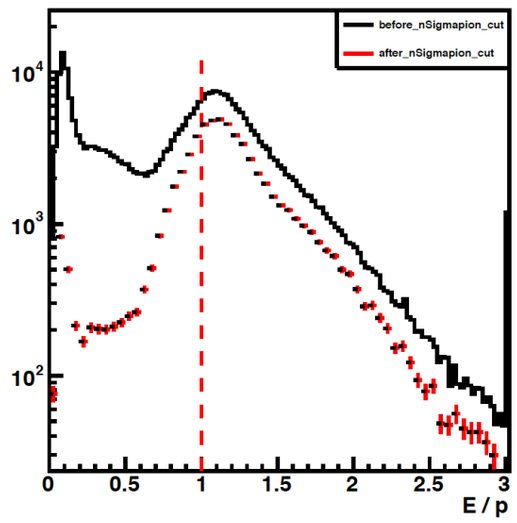
1.5<Track momentum<2.5



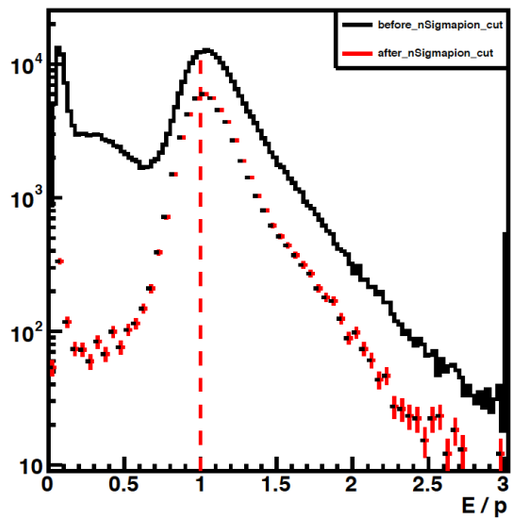
2.5<Track momentum<3.5



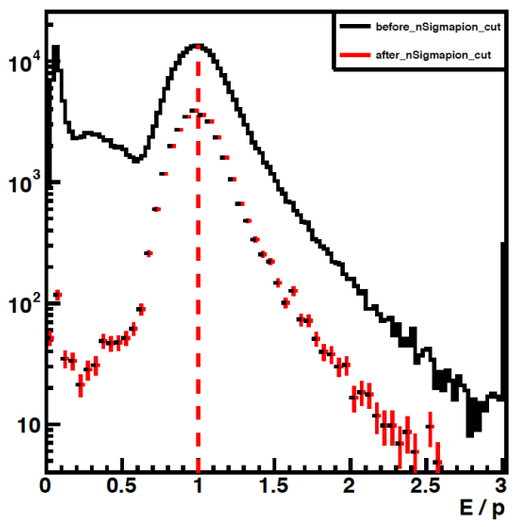
3.5<Track momentum<4.5



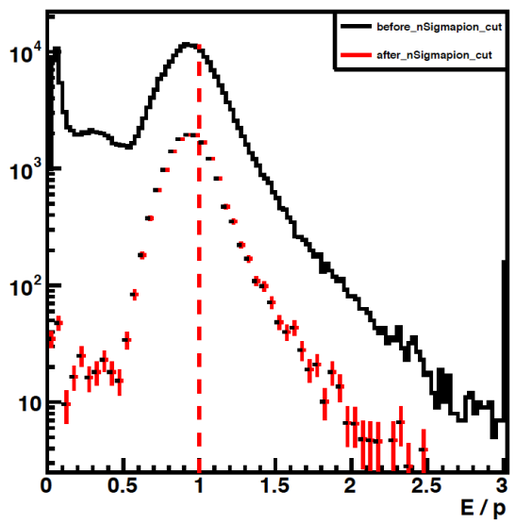
4.5<Track momentum<5.5



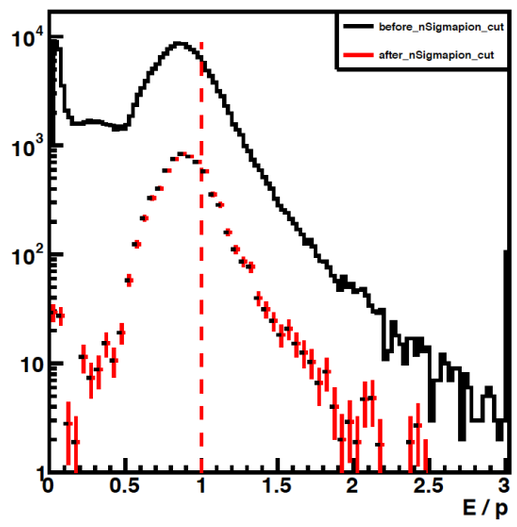
5.5<Track momentum<6.5



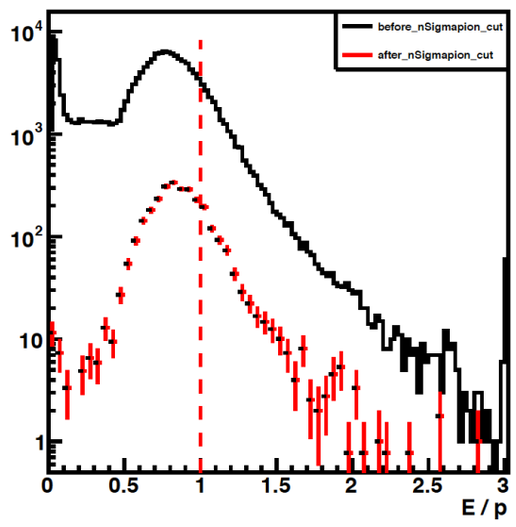
6.5<Track momentum<7.5



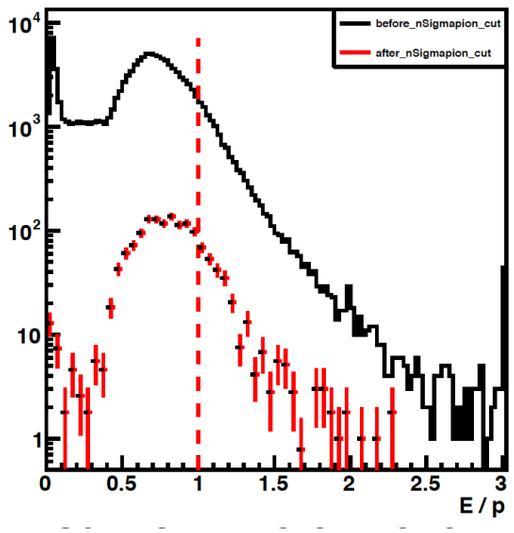
7.5<Track momentum<8.5



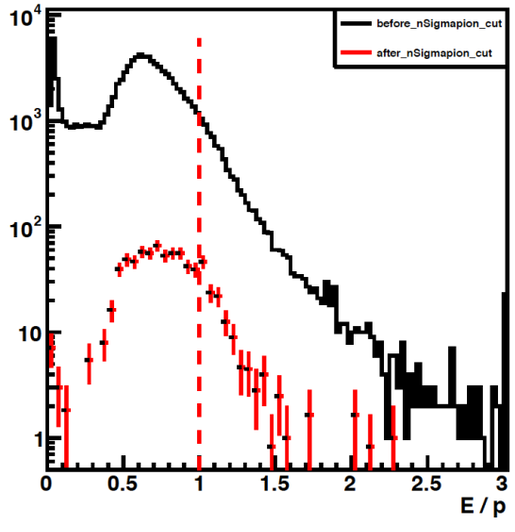
8.5<Track momentum<9.5



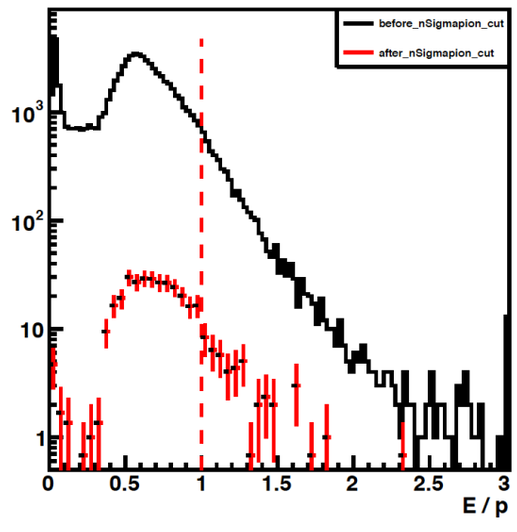
9.5<Track momentum<10.5



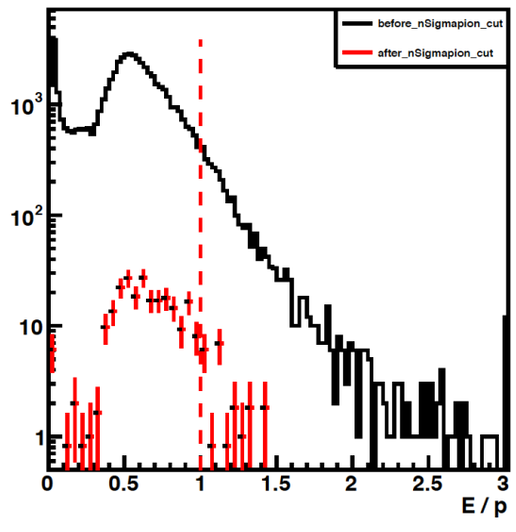
10.5<Track momentum<11.5



11.5<Track momentum<12.5



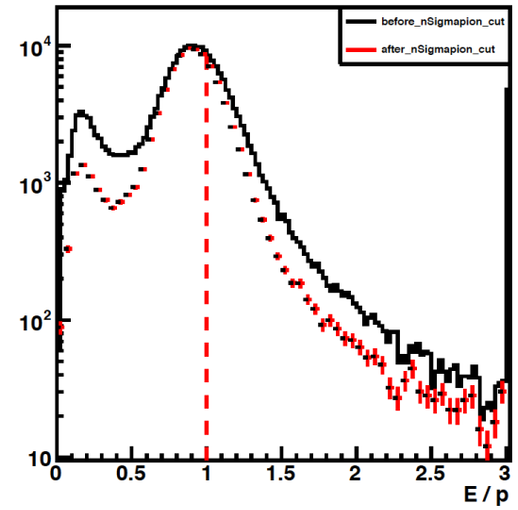
12.5<Track momentum<13.5



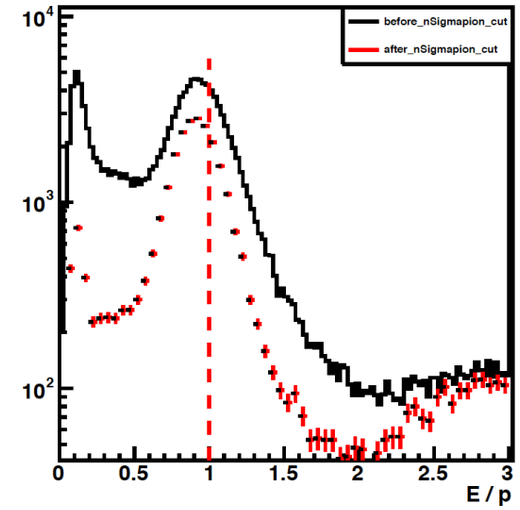
BHT3 Trigger

E /p distributions in momentum slices before and after applying nSigmaPion cut

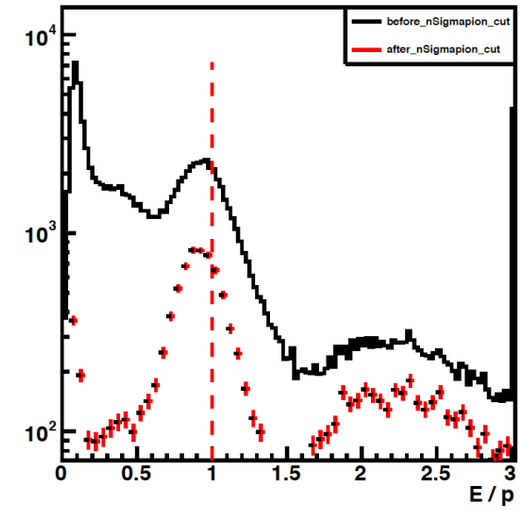
1.5<Track momentum<2.5



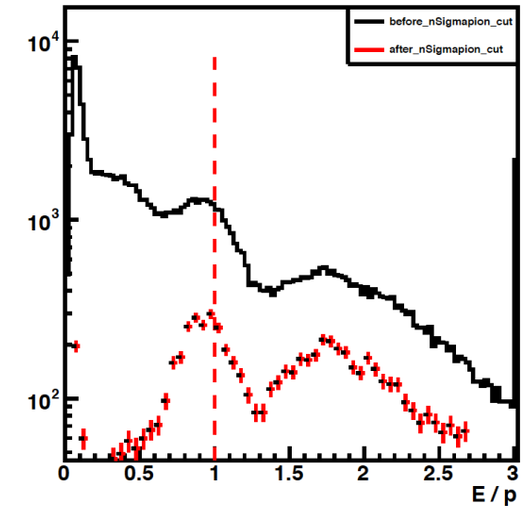
2.5<Track momentum<3.5



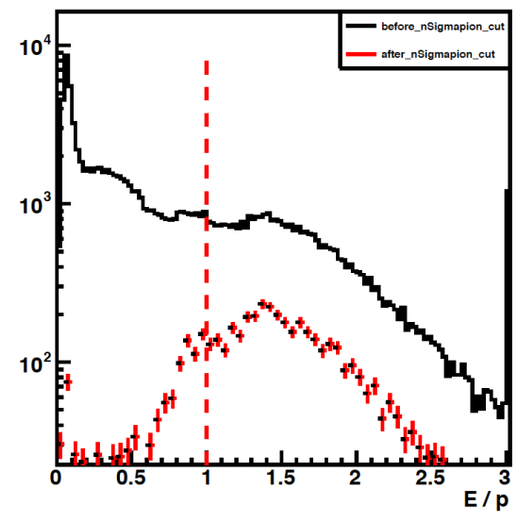
3.5<Track momentum<4.5



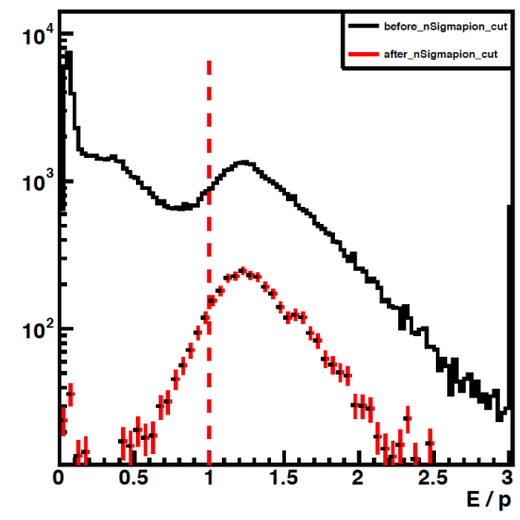
4.5<Track momentum<5.5



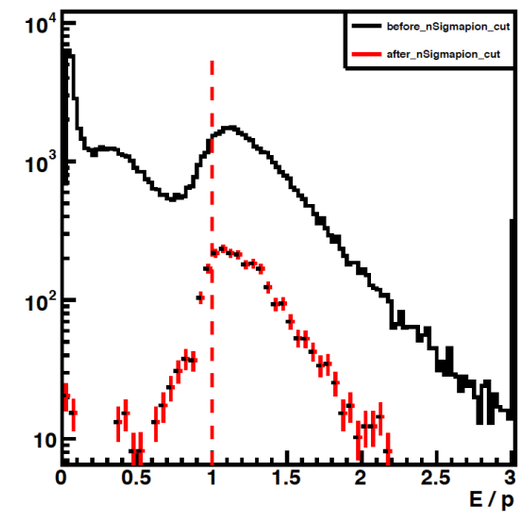
5.5<Track momentum<6.5



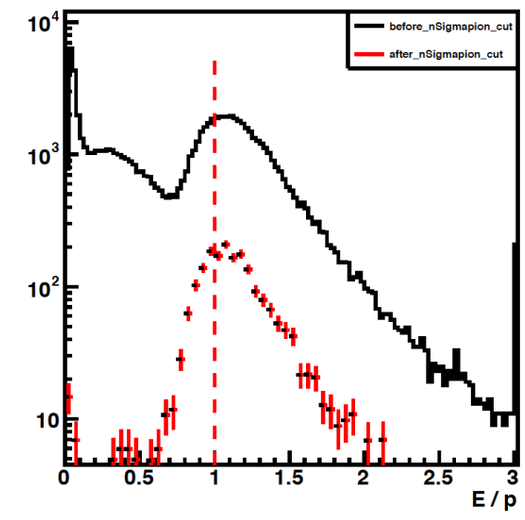
6.5<Track momentum<7.5



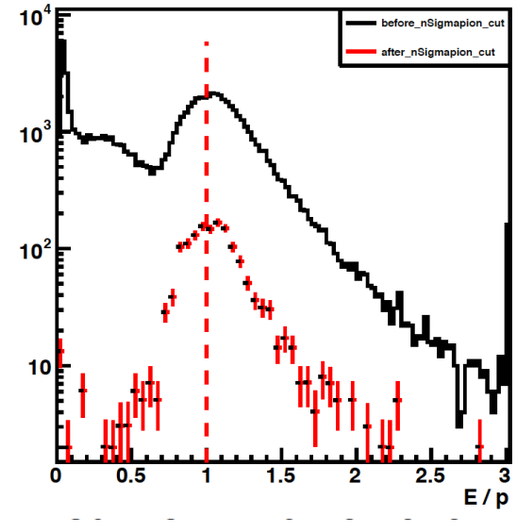
7.5<Track momentum<8.5



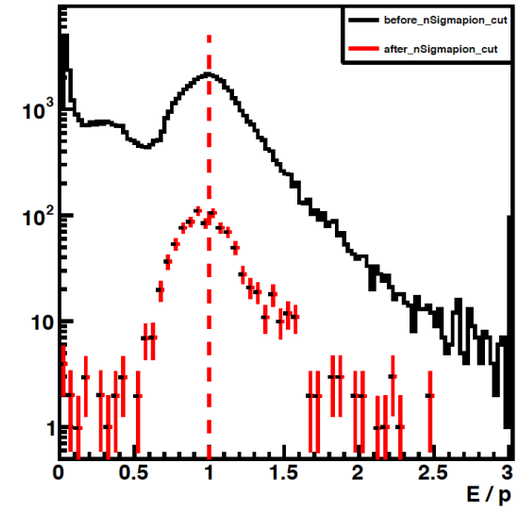
8.5<Track momentum<9.5



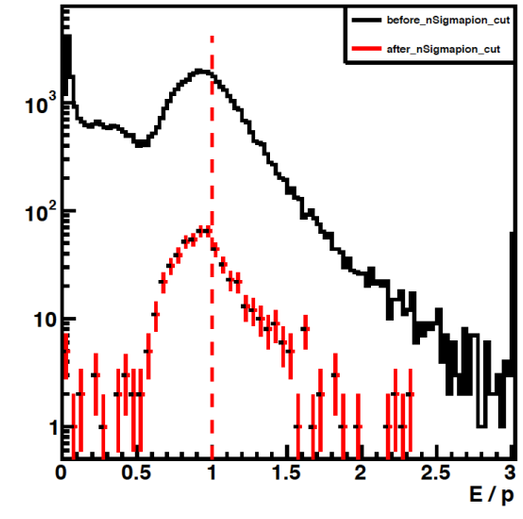
9.5<Track momentum<10.5



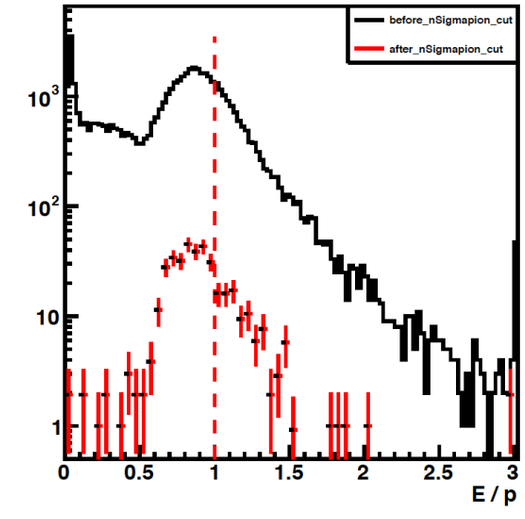
10.5<Track momentum<11.5



11.5<Track momentum<12.5



12.5<Track momentum<13.5



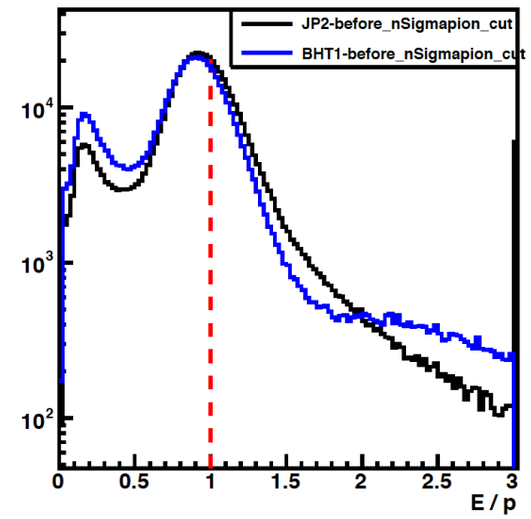
- Next two slides have E / p distributions before applying “nSigmaPion” cut for HT trigger in comparison to JP2. There you will see JP2 has two clear bumps when momentum goes up but for BHT there is only one. And thats not belong to electrons. They are Pions.

- So the conclusion is “When momentum goes up to select electrons we need to tighten our “nSigmaPion” cut. Or find another method to filter electrons from Pions [We have tried to use TOF cuts, but that did not work]. But Even if we were to do so the electrons statistics is extremely limited at high momentum in our sample for HT trigger [This can be clearly see at slide 8] ., And what we have selected as electrons so far at high momentum for HT trigger are not actually electrons. Those are actually pions. Thats why we saw E / p drop for HT trigger when P goes up”

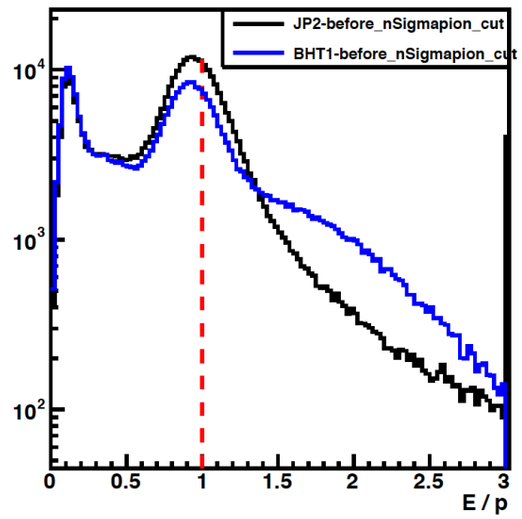
- This does not effect our final gain constants. Because we have only used JP2 trigger and BHT3 < 3 GeV.

BHT1 E /p distributions in momentum slices in comparison to JP2 : before applying nSigmaPion cut

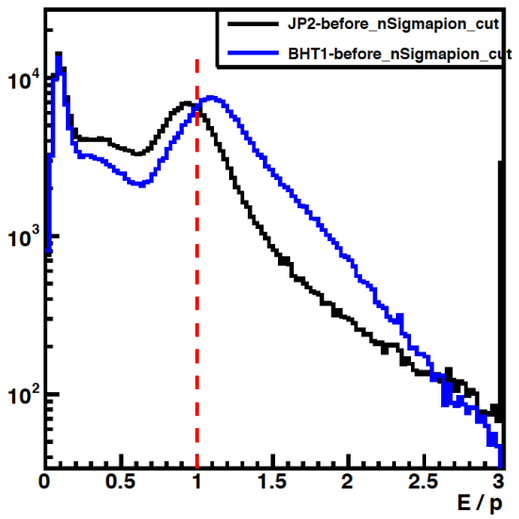
1.5<Track momentum<2.5



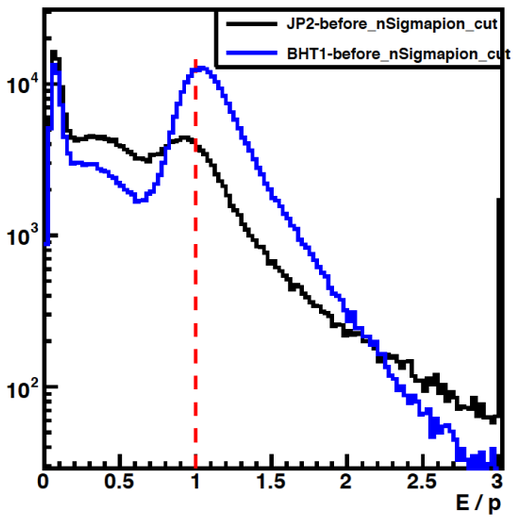
2.5<Track momentum<3.5



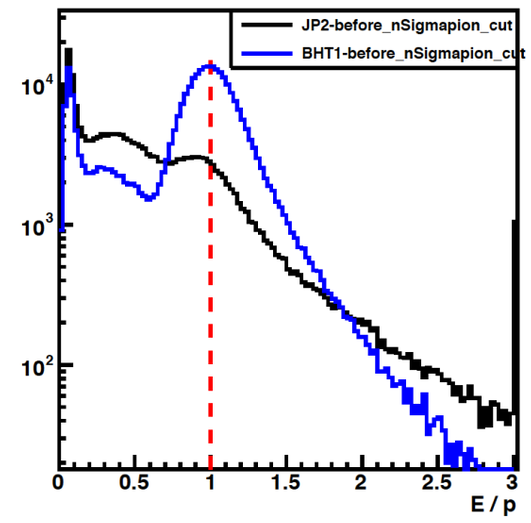
3.5<Track momentum<4.5



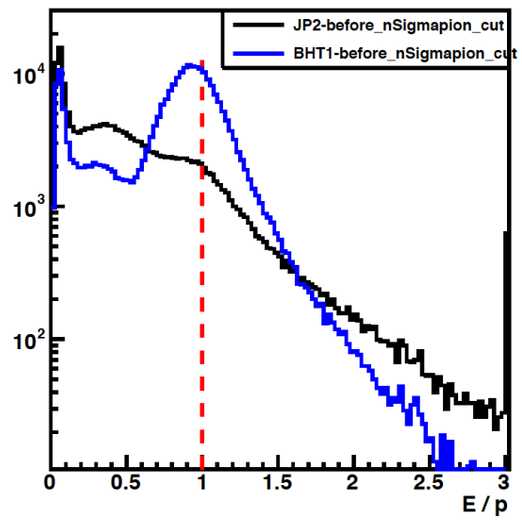
4.5<Track momentum<5.5



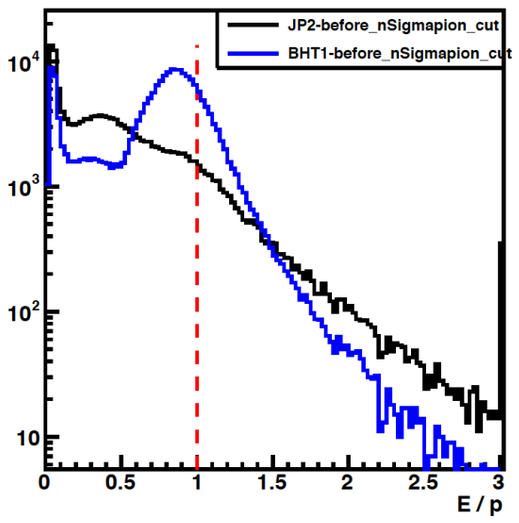
5.5<Track momentum<6.5



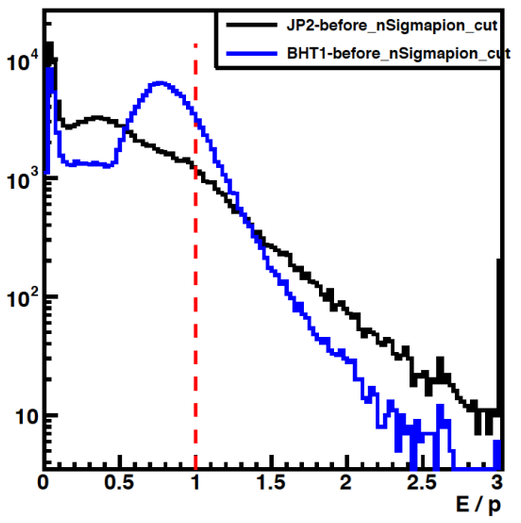
6.5<Track momentum<7.5



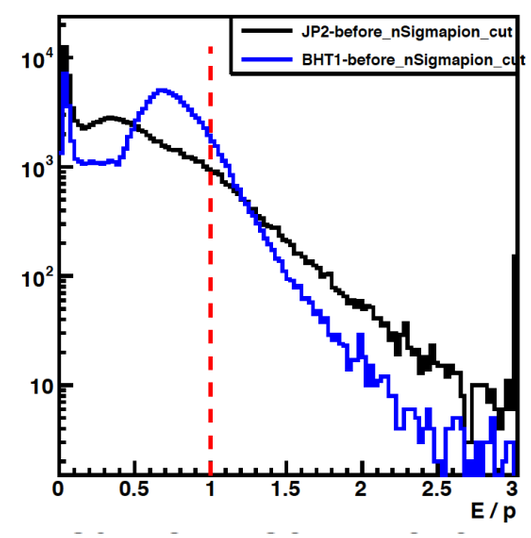
7.5<Track momentum<8.5



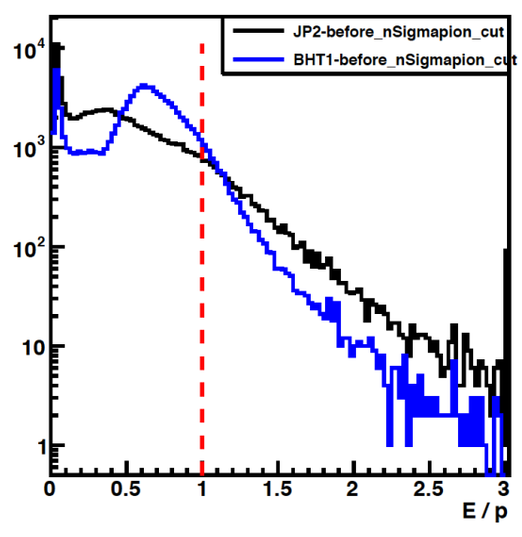
8.5<Track momentum<9.5



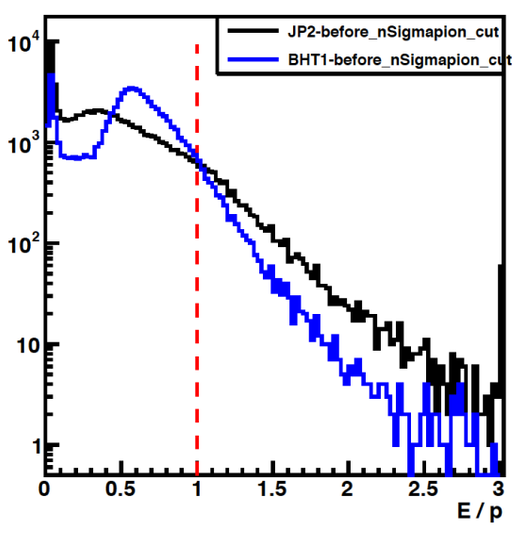
9.5<Track momentum<10.5



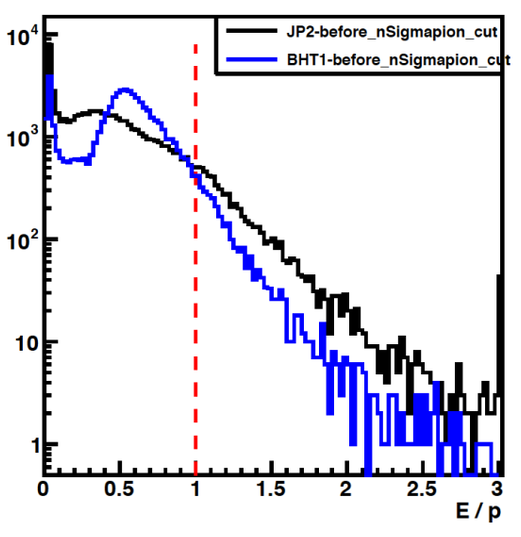
10.5<Track momentum<11.5



11.5<Track momentum<12.5



12.5<Track momentum<13.5



BHT3 E /p distributions in momentum slices in comparison to JP2 : before applying nSigmaPion cut