# Sphero(i)city technicalities

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ACO meeting

11 de febrero 2017

# Outline

- The efficciency for the pt spectra calculated inside the cuts on  So true and So reconstructed

  for 10% So perc, Rebinning for high pt

  and considering 0< So <0.3 (no perc)
- Response for Sopc_m vs So_m
- Answere to referee's questions in the text

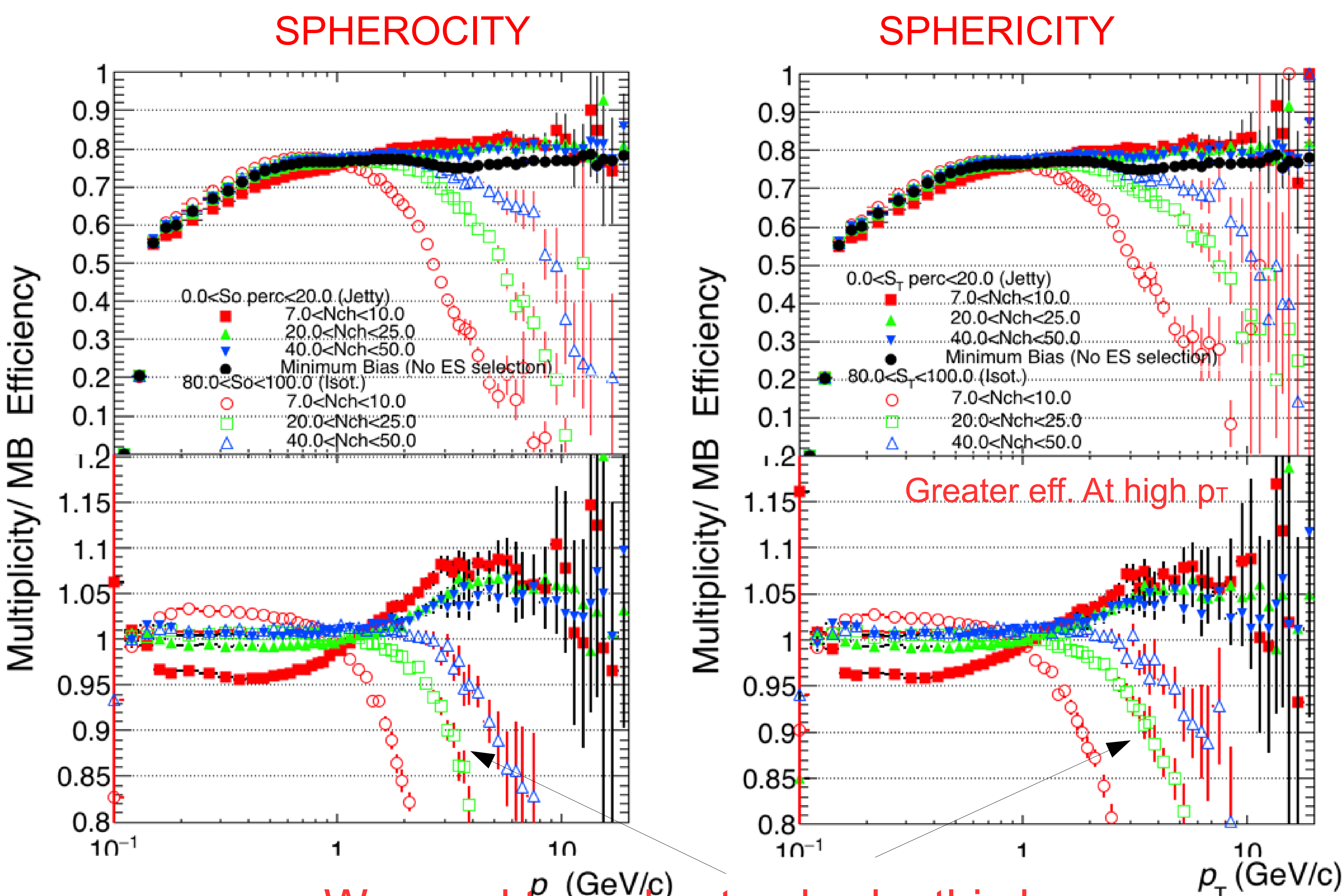
- Software
  - AliRoot: v5-08-13a-1 AliPhysics: vAN−20160716−1 ROOT: v5-34-30-alice5-alice-1
- Datasets
  - Good runs (according with RCT) LHC15f pass2
  - LHC15g3a3 (Pythia 8 - Monash 2013) anchored to LHC15f pass2
- Event selection
  - AliVEvent::kINT7, AnalysisUtils::IsSPDClusterVsTrackletBG(), IsPileupFromSPDInMultBins(), IsIncompleteDAQ()
- Vertex
  - For events with both SPD and Track vertices reconstructed, their separation along the *z*-coordinate was required to be smaller than 5 mm
- Sphero(i)city is reconstructed using more than two tracks with transverse momentum greater than 0.15 GeV/*c* and within $|\eta| < 0.8$. Three sets of cuts were tested:
  - TPC: GetStandardTPCOnlyTrackCuts()+TPCrefit
  - Hybrid: CreateTrackCutsPWGJE(10001008)+CreateTrackCutsPWGJE(10011008)
  - Standard: GetStandardITSTPCTrackCuts2011(kTRUE,1)
- At the end we decided to use the TPC track cuts (global tracks which satisfy GetStandardTPCOnlyTrackCuts()+TPCrefit). More details can be found here:

  https://aliceinfo.cern.ch/Notes/node/529
- In this presentation, results for the reference estimator are discussed
  - **GetReferenceMultiplicity( fESD, AliESDtrackCuts::kTrackletsITSTPC, 0.8 )**

- pp data @ 13 TeV
- Period: LHC15f pass2
- Runs: 225031 225576 225757 226476 225035 225578 225762 226483 225037 225579 225763 226495 225041 225580 225766 226500 225043 225582 225768 225050 225586 226062 225051 225587 226170 225052 225707 226220 225106 225708 226225 225305 225709 226444 225307 225710 226445 225309 225716 226452 225313 225717 226466 225314 225719 226468 225322 225753 226472
- 48 M events were analyzed
- Software: AliRoot::v5-08-13a-1, AliPhysics::vAN-20160716-1
  - According with Evgeny's talk: https://indico.cern.ch/event/489470/, using recent software version: physics selection now implements: new background + pileup cuts
- kINT7 trigger, isIncompleteDAQ
- We use the recommended vertex selection for 13 TeV pp analyses:

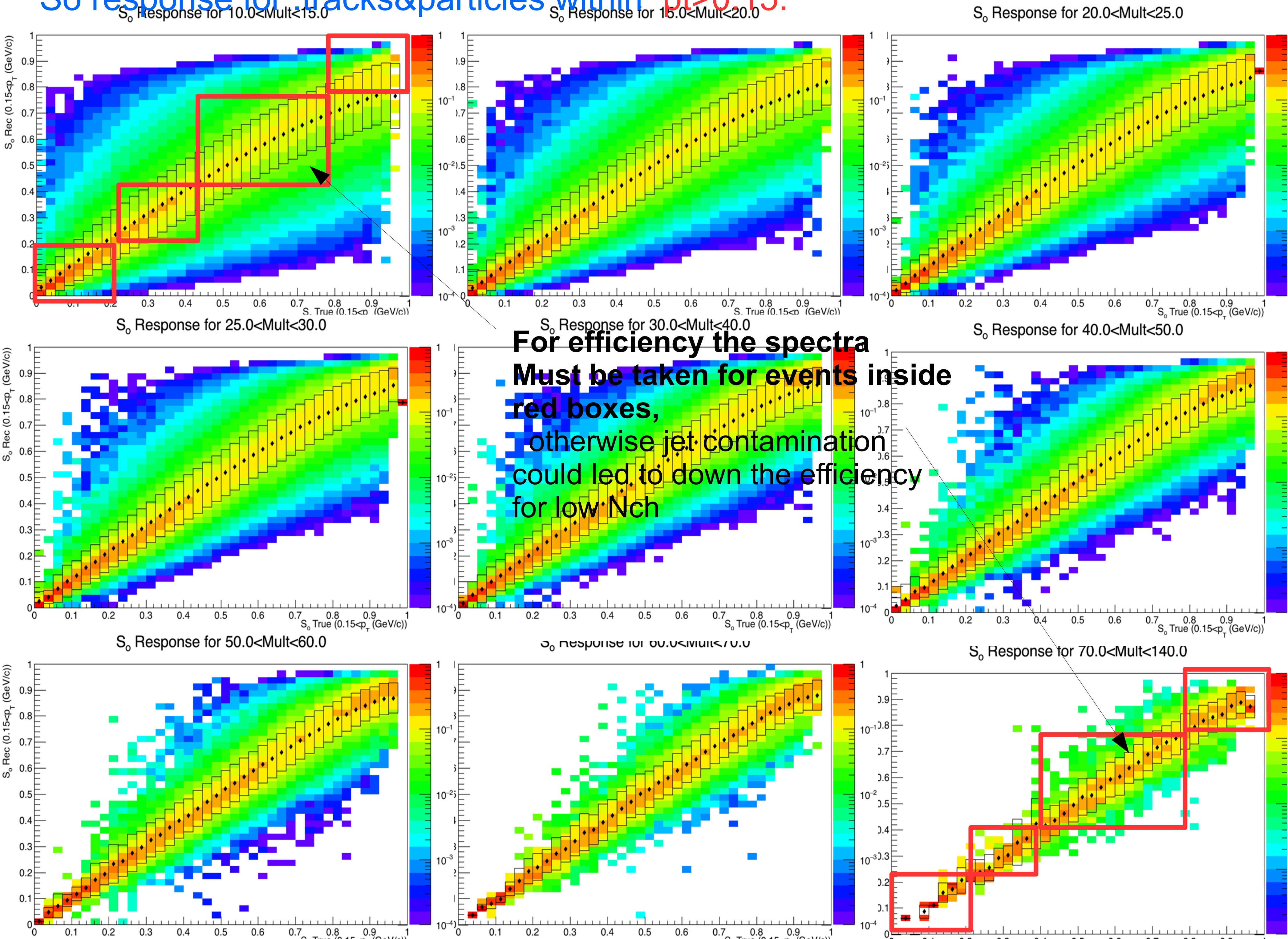
https://twiki.cern.ch/twiki/bin/view/ALICE/PWGPPEvSelRun2pp

Comparison for percentile bins with best statistics.




We need to understand why this happen
for Isotropic events with low mult

So response for  tracks&particles within  pt>0.15.




**For efficiency the spectra Must be taken for events inside red boxes,**

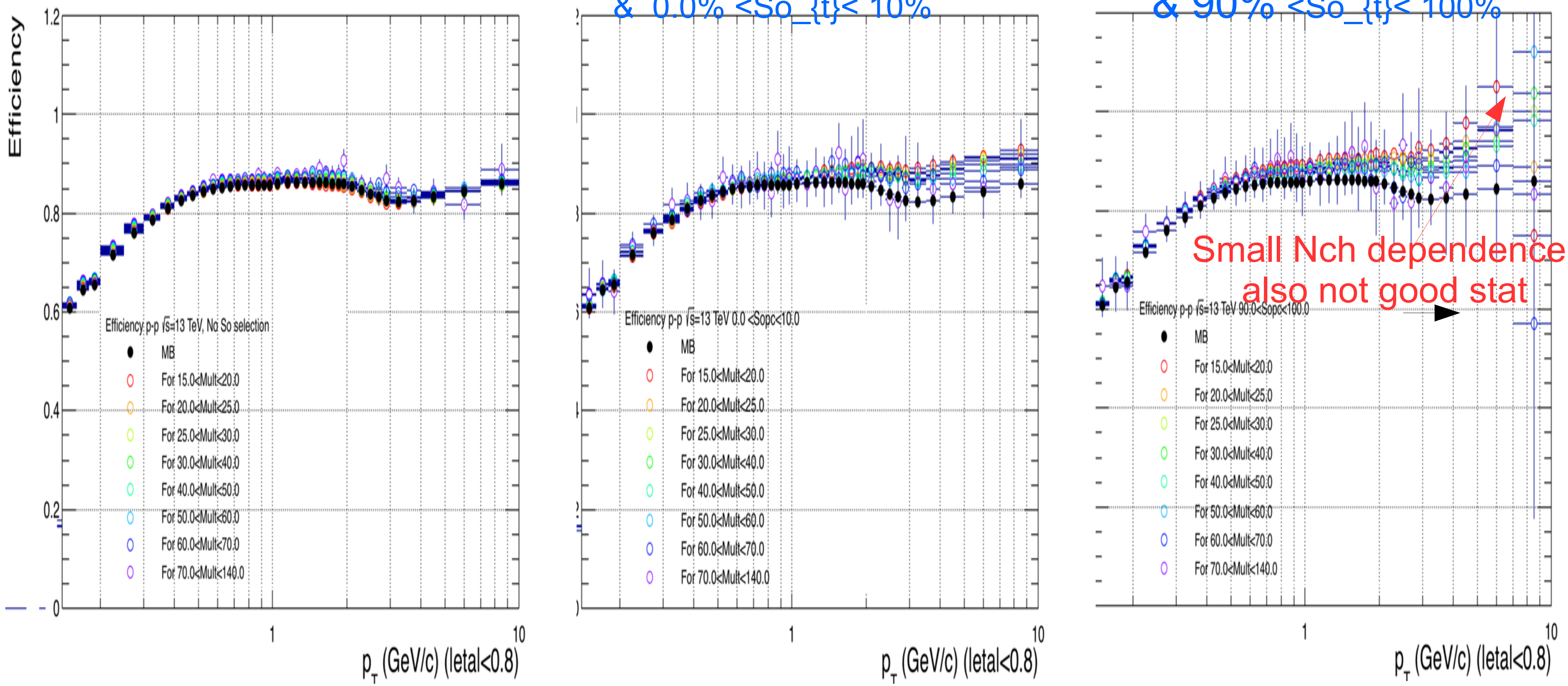
otherwise jet contamination could led to down the efficiency for low Nch

# Efficiency So_{t} not = So_{r} cases: Only primary both in rec and true

MB | Jetty | Isotropic

0.0% <So_{r}< 10% & 0.0% <So_{t}< 10%

90% <So_{r}< 100% & 90% <So_{t}< 100%




Pt Rebinning:

```
const Int_t nPtBins      = 43;
Double_t xBins[nPtBins+1]={0.01,0.1,0.12,0.14,0.16,0.18,0.2,0.2,0.3,0.35,0.4,0.45,0.5,0.55,0.6,0.65,
0.7,0.75,0.8,0.85,0.9,0.95,1,1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,2,2.2,2.4,2.6,2.8,3,3.5,4,5,7,10,20}
```

# Efficiency So_{t} not = So_{r} cases: Only primary both in rec and true

MB

Jetty

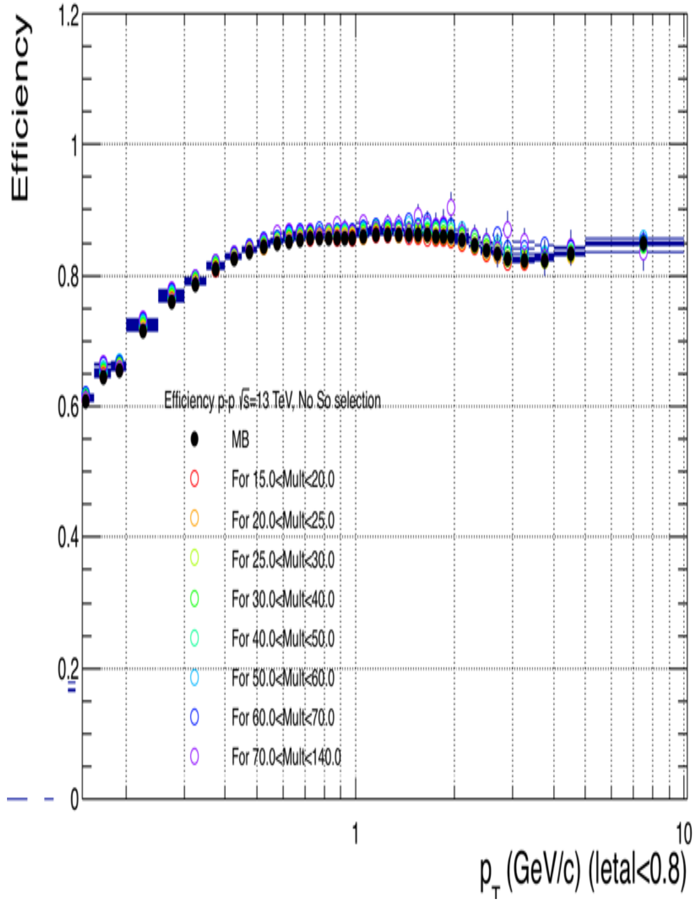
0.0 <So_{r}<0.3

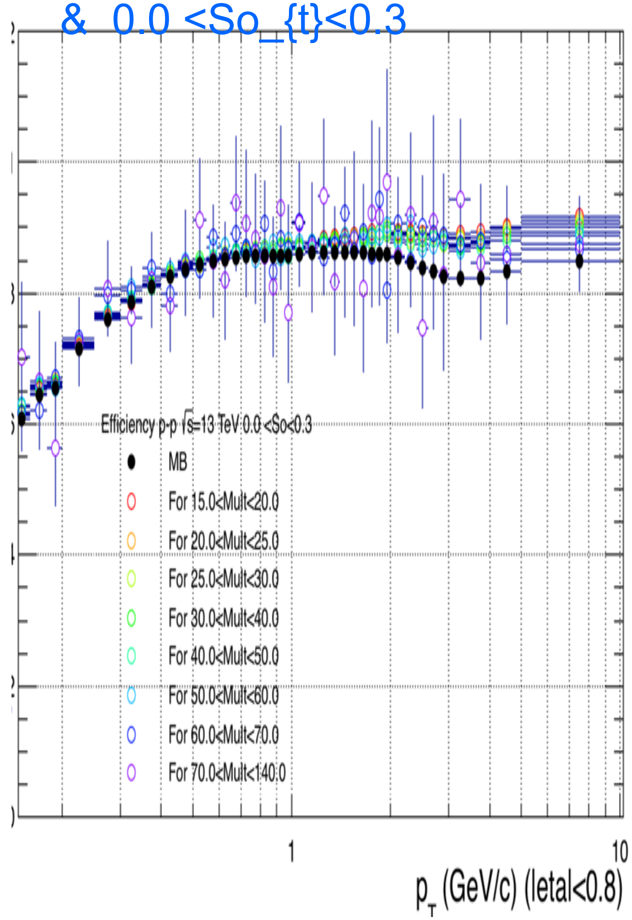
& 0.0 <So_{t}<0.3

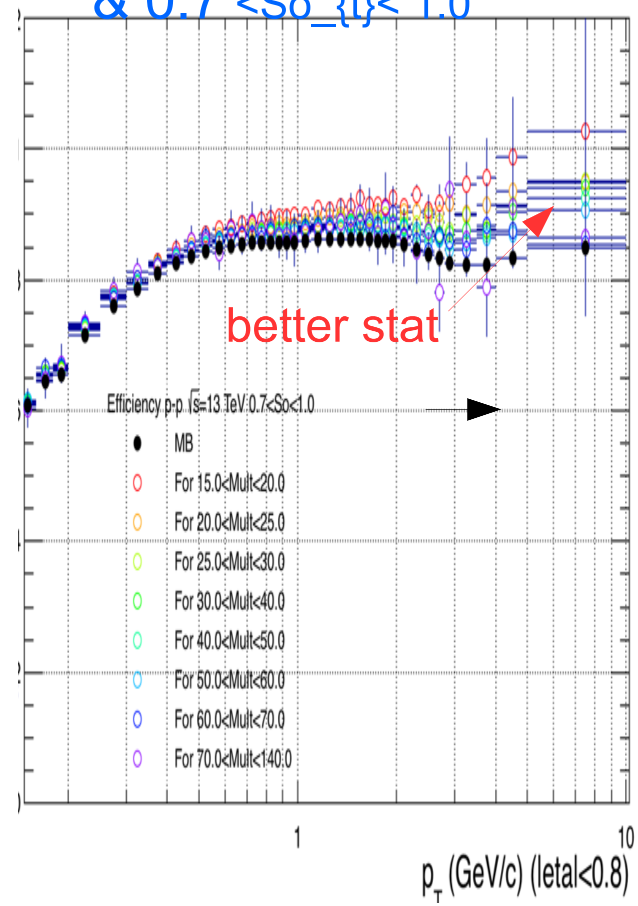
Isotropic

0.7 <So_{r}< 1.0

& 0.7 <So_{t}< 1.0



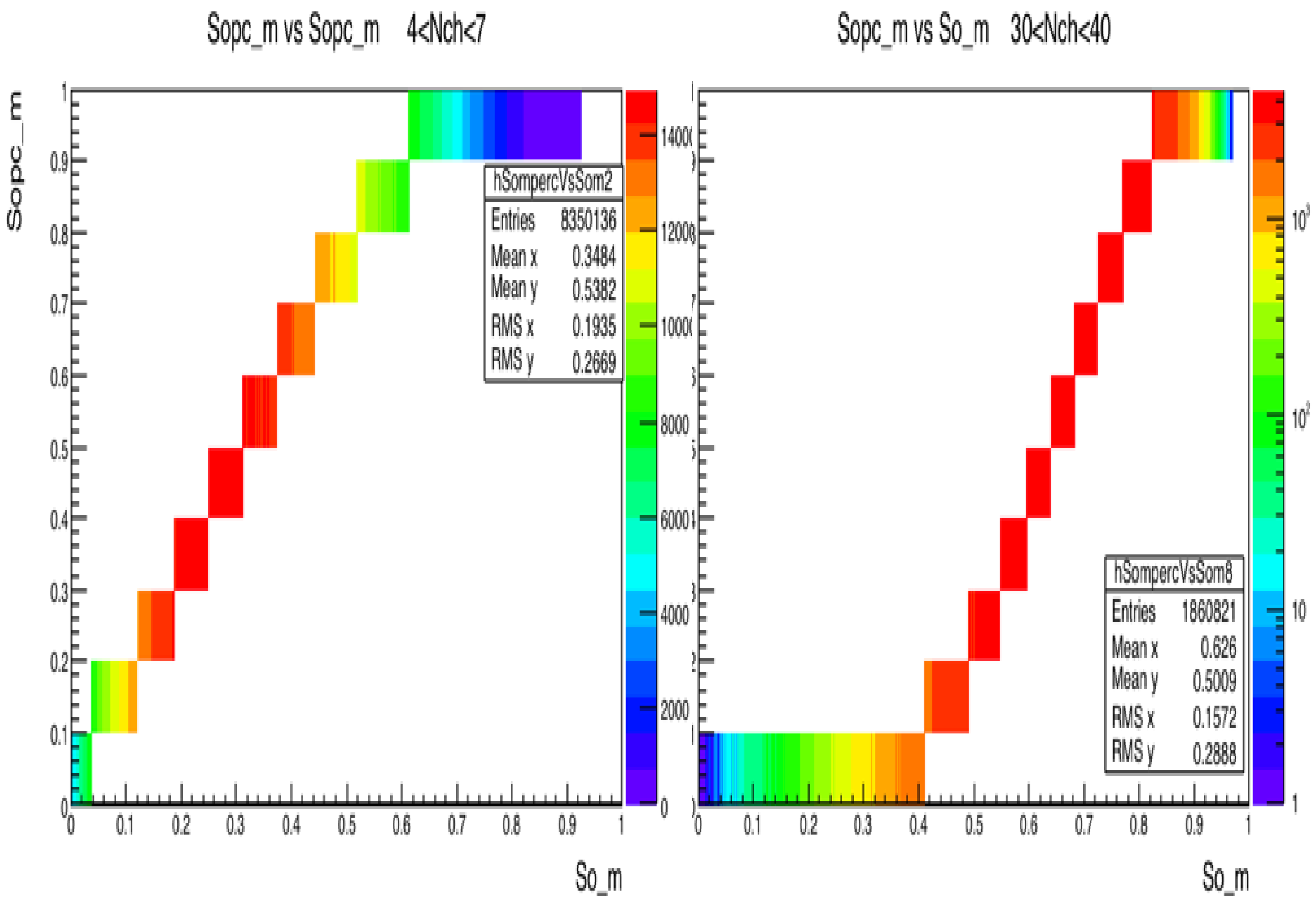




Pt Rebinning:

```
const Int_t nPtBins      = 42;
Double_t xBins[nPtBins+1]={0.01,0.1,0.12,0.14,0.16,0.18,0.2,0.2,0.3,0.35,0.4,0.45,0.5,0.55,0.6,0.65,
0.7,0.75,0.8,0.85,0.9,0.95,1,1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,2,2.2,2.4,2.6,2.8,3,3.5,4,5,10,20}
```

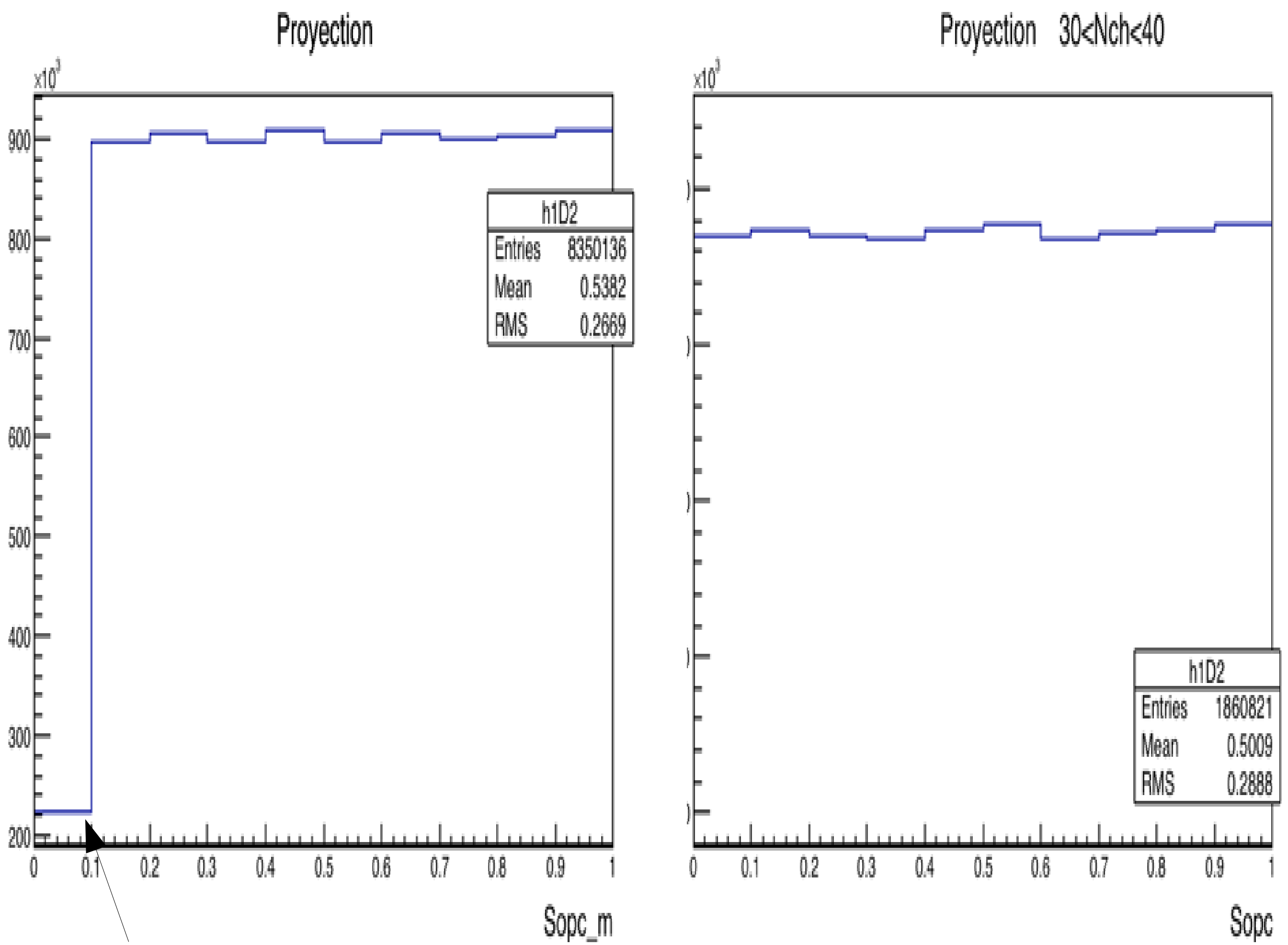
# So response (som vs somperc)

- The idea: to get Soperc response matrix (Sopc_t vs Sopc_m)



# So response (som vs somperc)

- The idea: to get Soperc response matrix (Sopc_t vs Sopc_m)




Something wrong first bin (Under investigation)

Flat is spected if all are 10% pc

# Conclusions

- The effect just reflects that spherocity is quite sensitive to high pT particles.
- The slop down on efficiency increase when calculating the spectra correctly in the So true and So reconstructed cuts

  avoiding the jet contamination.
- To do

  Check the percentile selection
- Get response matrix for unfold So percentile So true

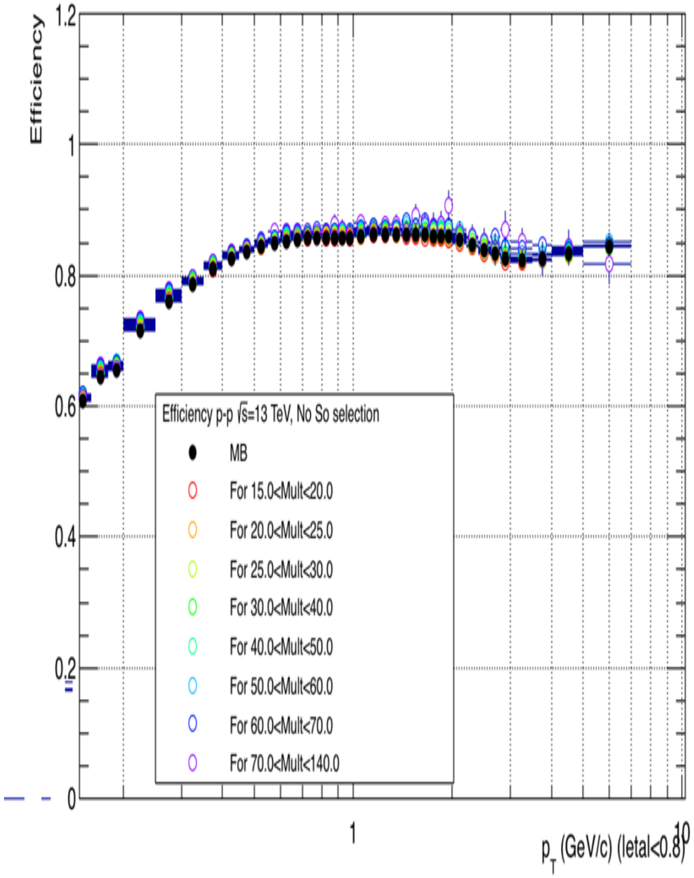
  Unfold by weigths the yield

  Continue with the analisis of <pt> vs Nch for spherocity bins.

# Backup

# Efficiency So_{t} not = So_{r} cases: Only primary both in rec and true

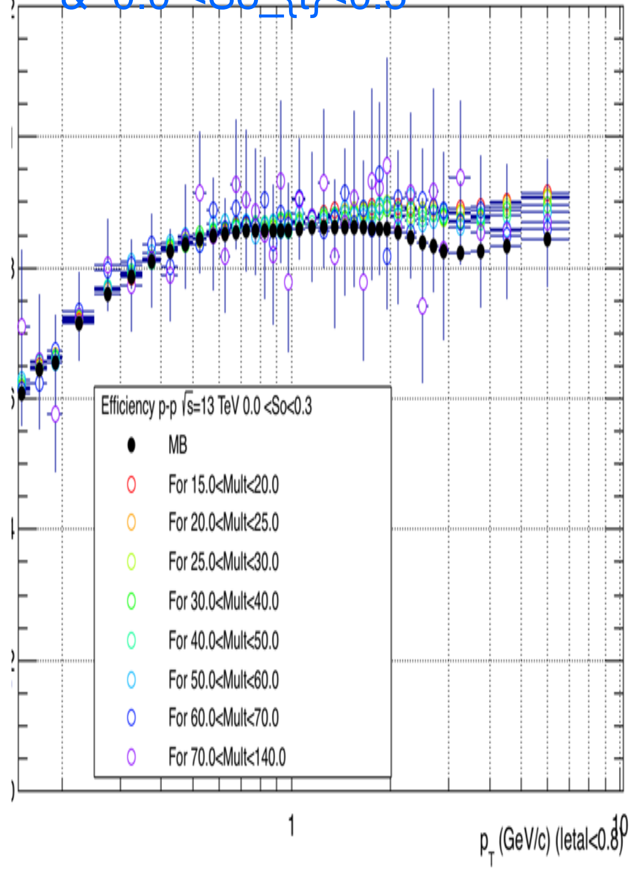
## MB




## Jetty

0.0 <So_{r}<0.3

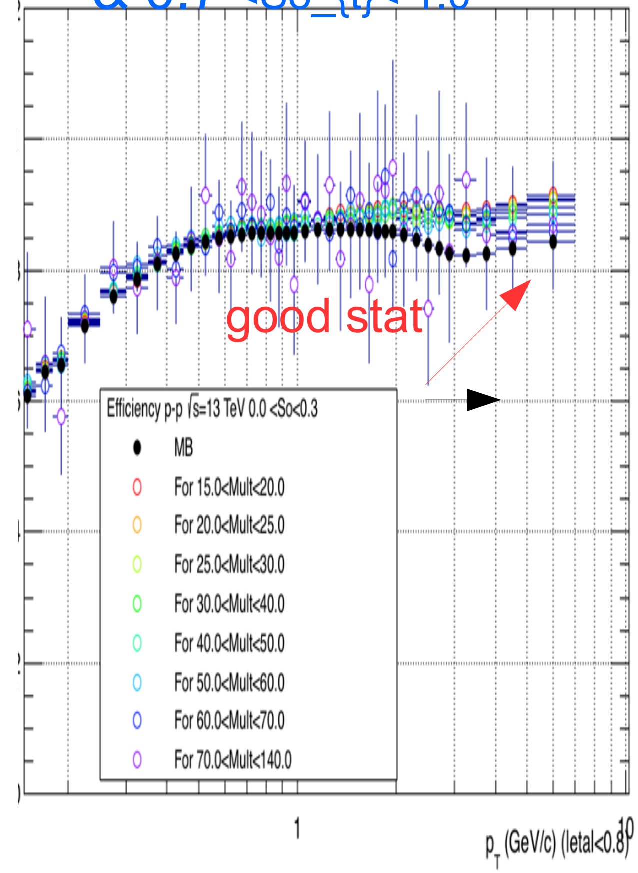
& 0.0 <So_{t}<0.3




## Isotropic

0.7 <So_{r}< 1.0

& 0.7 <So_{t}< 1.0




## Pt Rebinning:

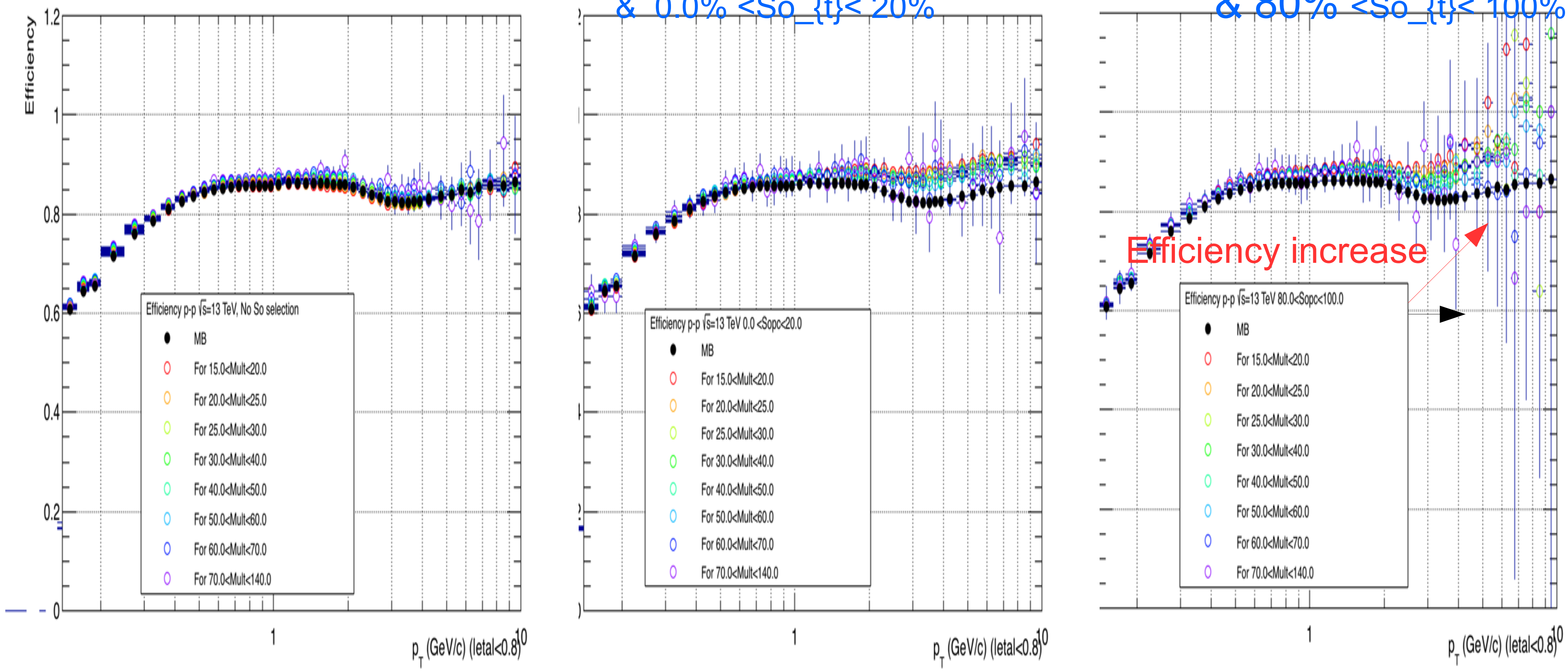
```
const Int_t nPtBins      = 43;
Double_t xBins[nPtBins+1]={0.01,0.1,0.12,0.14,0.16,0.18,0.2,0.2,0.3,0.35,0.4,0.45,0.5,0.55,0.6,0.65,
0.7,0.75,0.8,0.85,0.9,0.95,1,1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8,1.9,2,2.2,2.4,2.6,2.8,3,3.5,4,5,7,10,20}
```

# Efficiency So_{t} not = So_{r} cases: Only primary both in rec and true

MB | Jetty | Isotropic

Jetty: 0.0% <So_{r}< 20% & 0.0% <So_{t}< 20%

Isotropic: 80% <So_{r}< 100% & 80% <So_{t}< 100%

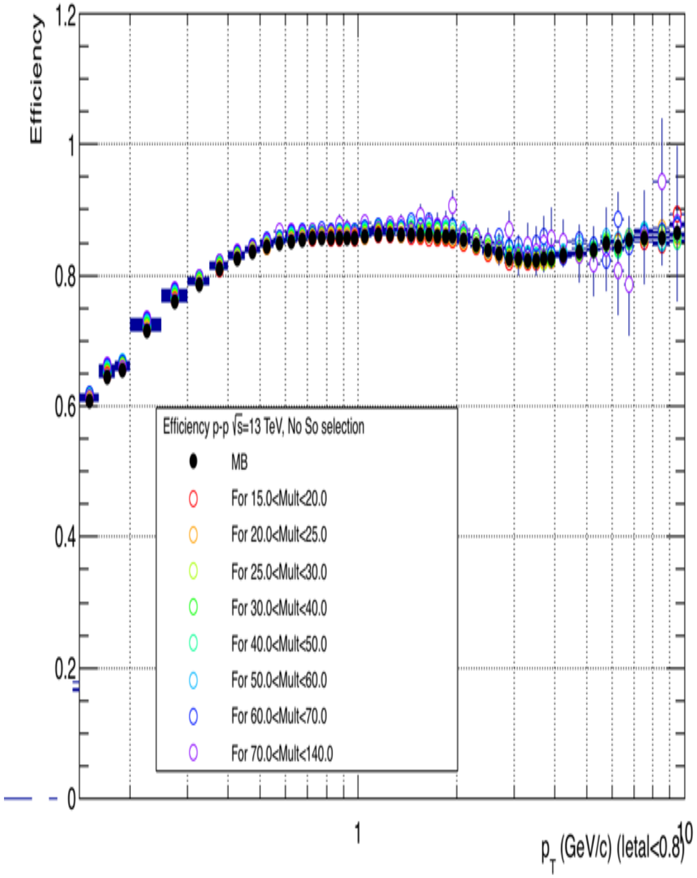


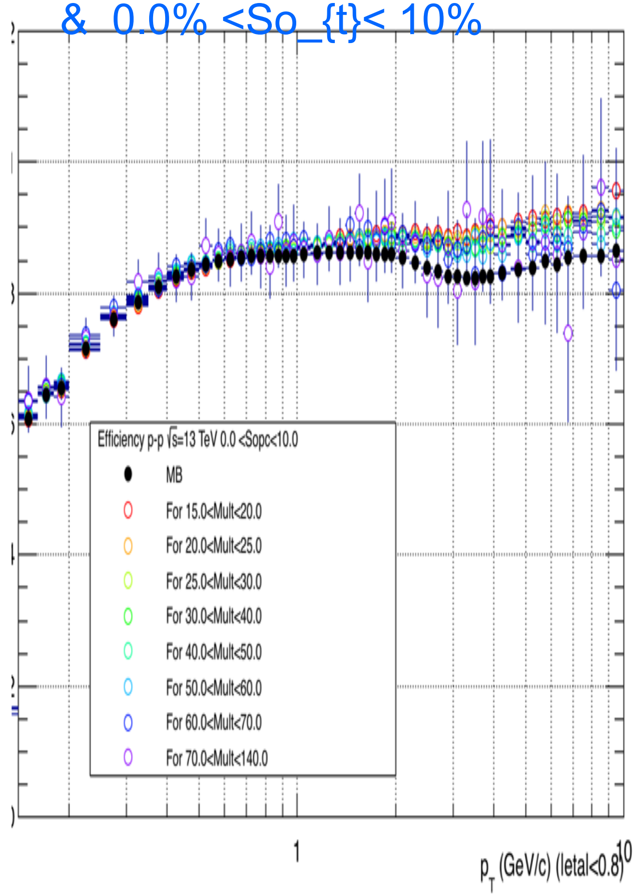
# Efficiency So_{t} not = So_{r} cases: Only primary both in rec and true

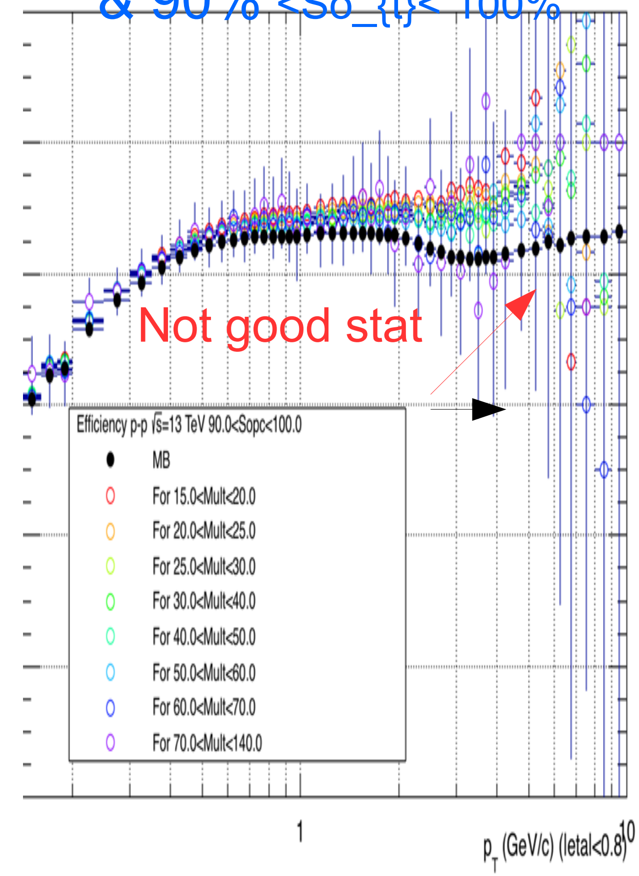
MB | Jetty | Isotropic

Jetty: 0.0% <So_{r}< 10% & 0.0% <So_{t}< 10%

Isotropic: 90% <So_{r}< 100% & 90% <So_{t}< 100%

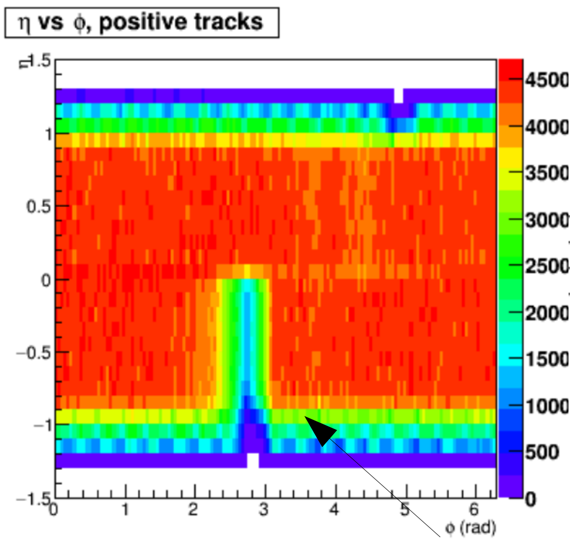


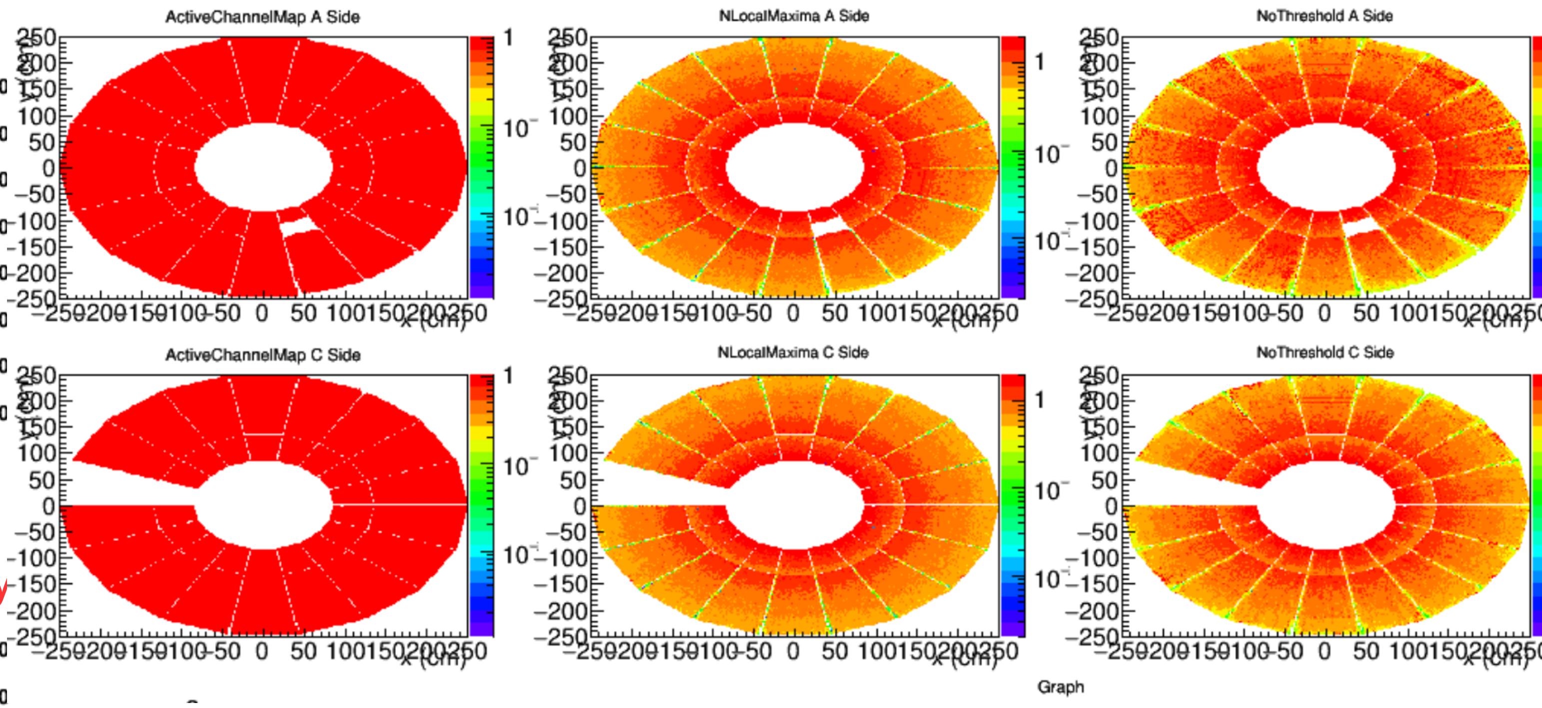



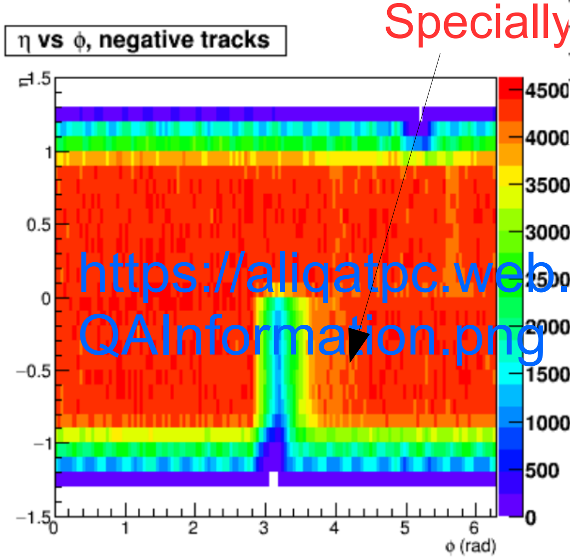
Some issues at the TPC runs (LHC15f) (ex. good run 226452 acc. RCT)

- Some missing chambers as seen in:
- https://aliqatpc.web.cern.ch/aliqatpc/data/2015/LHC15f/pass2/000226452/eta_phi_pt.png




Specially




https://aliqatpc.web.cern.ch/aliqatpc/data/2015/LHC15f/pass2/000226452/rawQAInformation.png

# So Mean values (true vs rec) for Nch and So bins

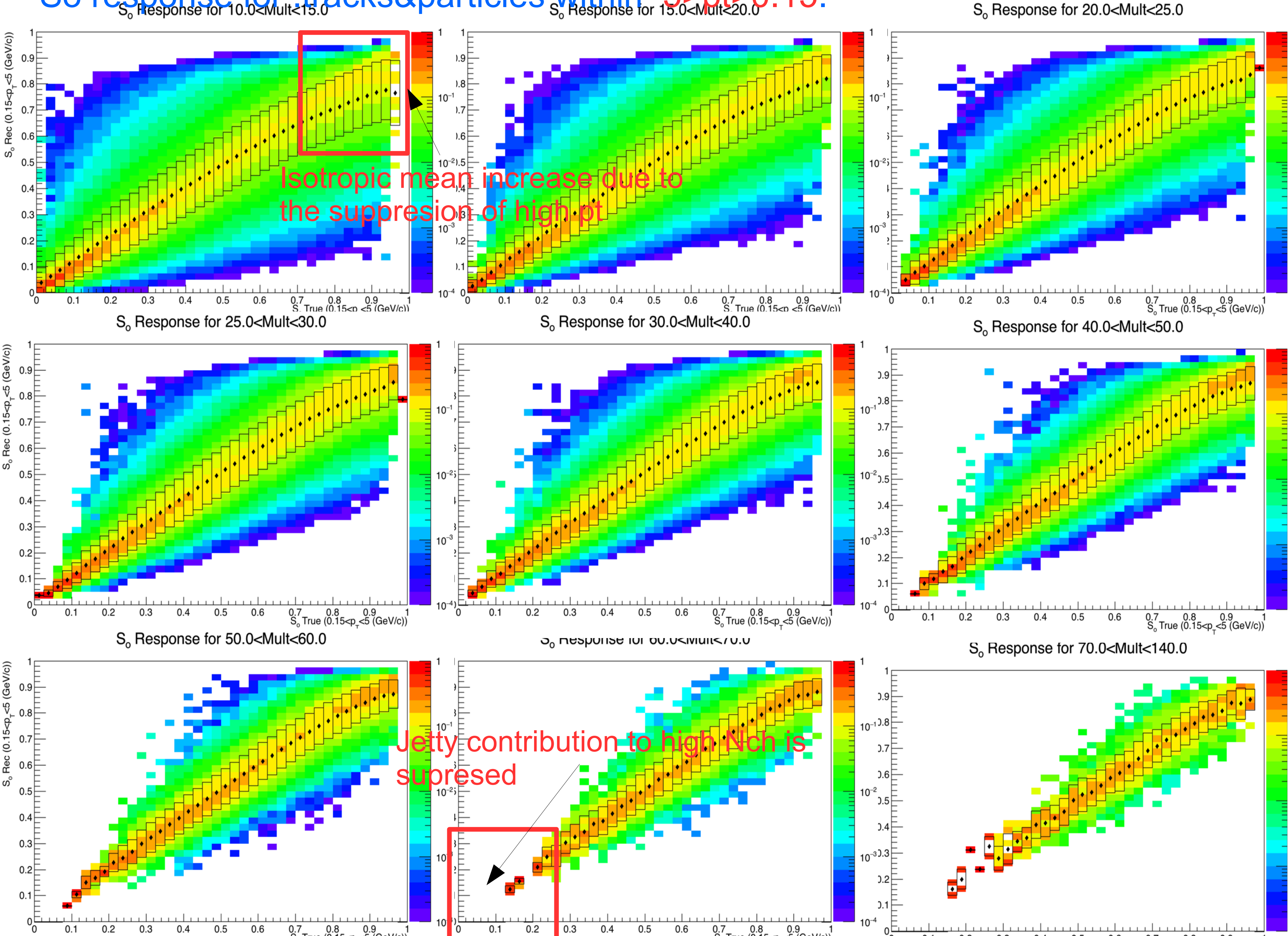
```
1.0<Nch<4.0 ------------
Rango So:   0.0<So<0.2, meanx=0.099343, meany=0.098043
Rango So:   0.2<So<0.4, meanx=0.294874, meany=0.293966
Rango So:   0.4<So<0.8, meanx=0.536426, meany=0.534436
Rango So:   0.8<So<1.0, meanx=0.822036, meany=0.820361
4.0<Nch<7.0 ------------
Rango So:   0.0<So<0.2, meanx=0.113611, meany=0.104945
Rango So:   0.2<So<0.4, meanx=0.301022, meany=0.295661
Rango So:   0.4<So<0.8, meanx=0.563705, meany=0.554647
Rango So:   0.8<So<1.0, meanx=0.828975, meany=0.828118
7.0<Nch<10.0 ------------
Rango So:   0.0<So<0.2, meanx=0.129055, meany=0.118740
Rango So:   0.2<So<0.4, meanx=0.306847, meany=0.297938
Rango So:   0.4<So<0.8, meanx=0.582410, meany=0.570972
Rango So:   0.8<So<1.0, meanx=0.836988, meany=0.835387
10.0<Nch<15.0 ------------
Rango So:   0.0<So<0.2, meanx=0.137637, meany=0.128462
Rango So:   0.2<So<0.4, meanx=0.311544, meany=0.301129
Rango So:   0.4<So<0.8, meanx=0.593551, meany=0.581638
Rango So:   0.8<So<1.0, meanx=0.843667, meany=0.841005
15.0<Nch<20.0 ------------
Rango So:   0.0<So<0.2, meanx=0.143177, meany=0.135041
Rango So:   0.2<So<0.4, meanx=0.316665, meany=0.305695
Rango So:   0.4<So<0.8, meanx=0.602036, meany=0.590691
Rango So:   0.8<So<1.0, meanx=0.848220, meany=0.845504
20.0<Nch<25.0 ------------
Rango So:   0.0<So<0.2, meanx=0.145108, meany=0.137941
Rango So:   0.2<So<0.4, meanx=0.320732, meany=0.309857
Rango So:   0.4<So<0.8, meanx=0.609319, meany=0.598531
Rango So:   0.8<So<1.0, meanx=0.851315, meany=0.848953
25.0<Nch<30.0 ------------
Rango So:   0.0<So<0.2, meanx=0.146112, meany=0.139126
Rango So:   0.2<So<0.4, meanx=0.323986, meany=0.313355
Rango So:   0.4<So<0.8, meanx=0.616137, meany=0.605713
Rango So:   0.8<So<1.0, meanx=0.854111, meany=0.851206
30.0<Nch<40.0 ------------
Rango So:   0.0<So<0.2, meanx=0.146126, meany=0.138989
Rango So:   0.2<So<0.4, meanx=0.326320, meany=0.316202
Rango So:   0.4<So<0.8, meanx=0.624057, meany=0.614128
```

```
40.0<Nch<50.0 ------------
Rango So:   0.0<So<0.2, meanx=0.144138, meany=0.138511
Rango So:   0.2<So<0.4, meanx=0.328128, meany=0.318790
Rango So:   0.4<So<0.8, meanx=0.633102, meany=0.623488
Rango So:   0.8<So<1.0, meanx=0.859600, meany=0.856700
50.0<Nch<60.0 ------------
Rango So:   0.0<So<0.2, meanx=0.140138, meany=0.135462
Rango So:   0.2<So<0.4, meanx=0.327102, meany=0.318141
Rango So:   0.4<So<0.8, meanx=0.639191, meany=0.629897
Rango So:   0.8<So<1.0, meanx=0.862060, meany=0.858481
60.0<Nch<70.0 ------------
Rango So:   0.0<So<0.2, meanx=0.131656, meany=0.126461
Rango So:   0.2<So<0.4, meanx=0.327166, meany=0.319152
Rango So:   0.4<So<0.8, meanx=0.642281, meany=0.633473
Rango So:   0.8<So<1.0, meanx=0.864735, meany=0.860579
70.0<Nch<140.0 ------------
Rango So:   0.0<So<0.2, meanx=0.141810, meany=0.142672
Rango So:   0.2<So<0.4, meanx=0.317270, meany=0.311184
Rango So:   0.4<So<0.8, meanx=0.644305, meany=0.635073
Rango So:   0.8<So<1.0, meanx=0.865221, meany=0.859915
```

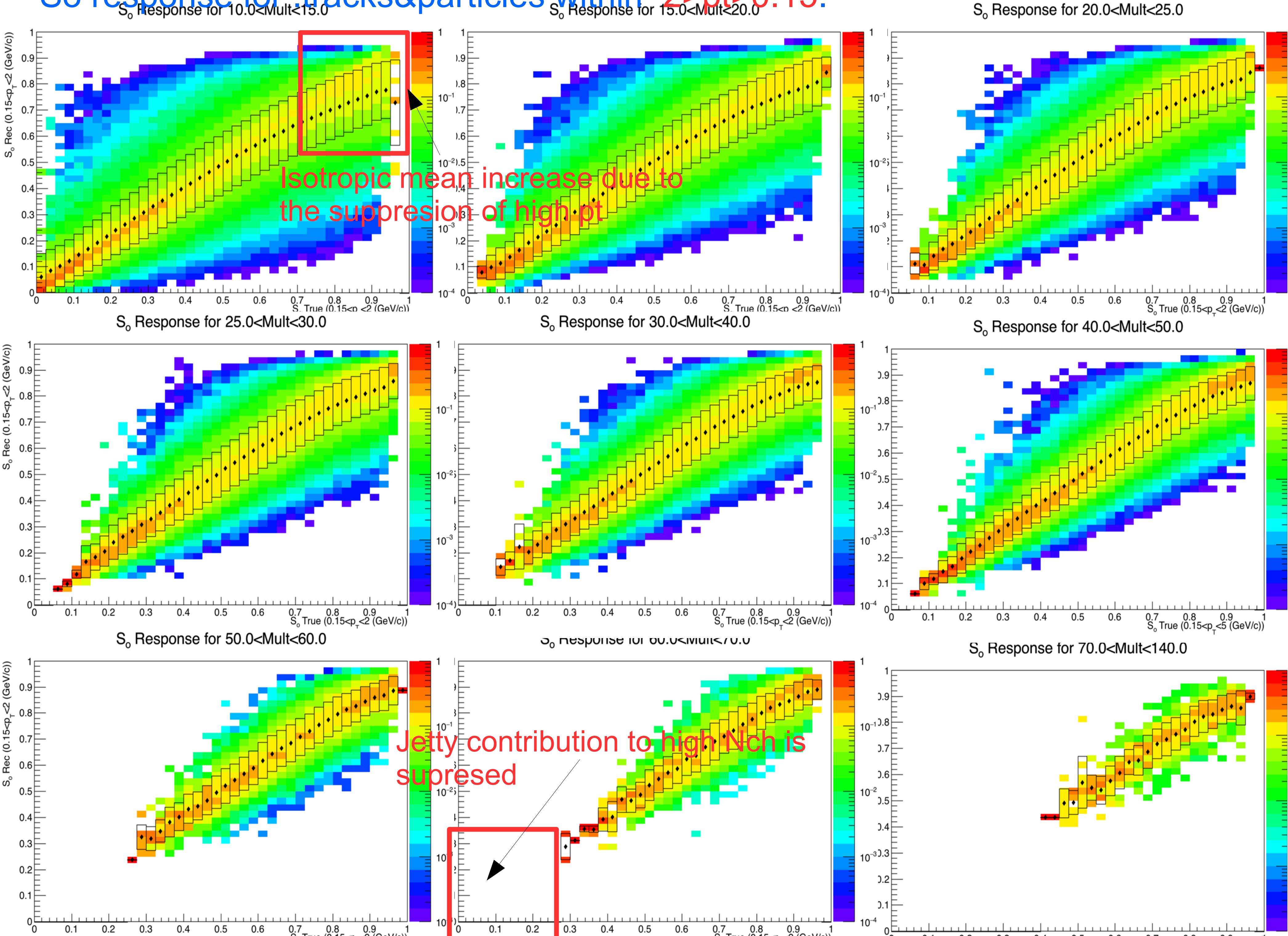
Difference of the order of 0.01, could give contamination of dijets

Recalculation of efficiency with spectra within the respective mean So values is ongoing

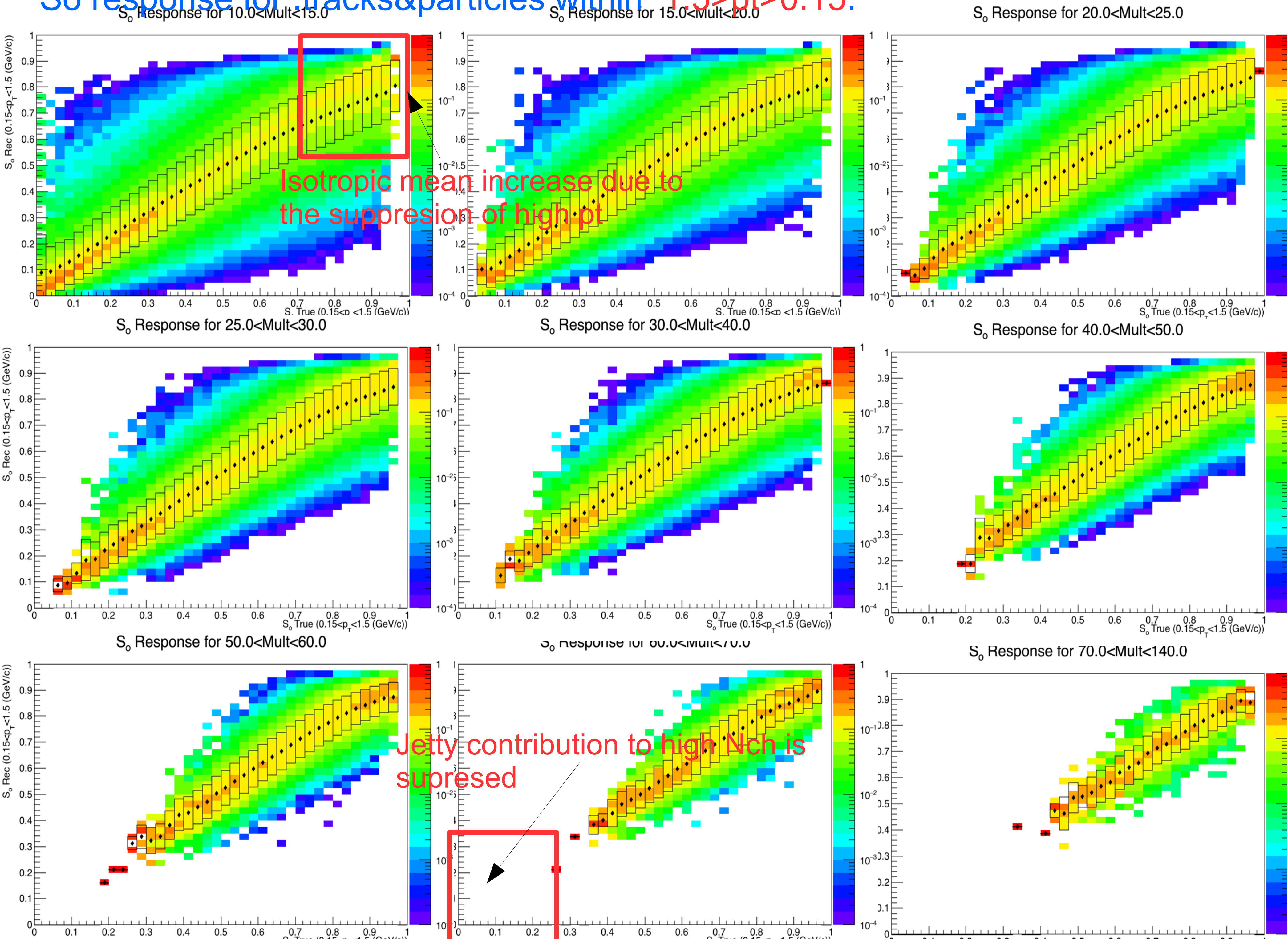
So response for tracks&particles within 5>pt>0.15.



# So response for tracks&particles within 2>pt>0.15.

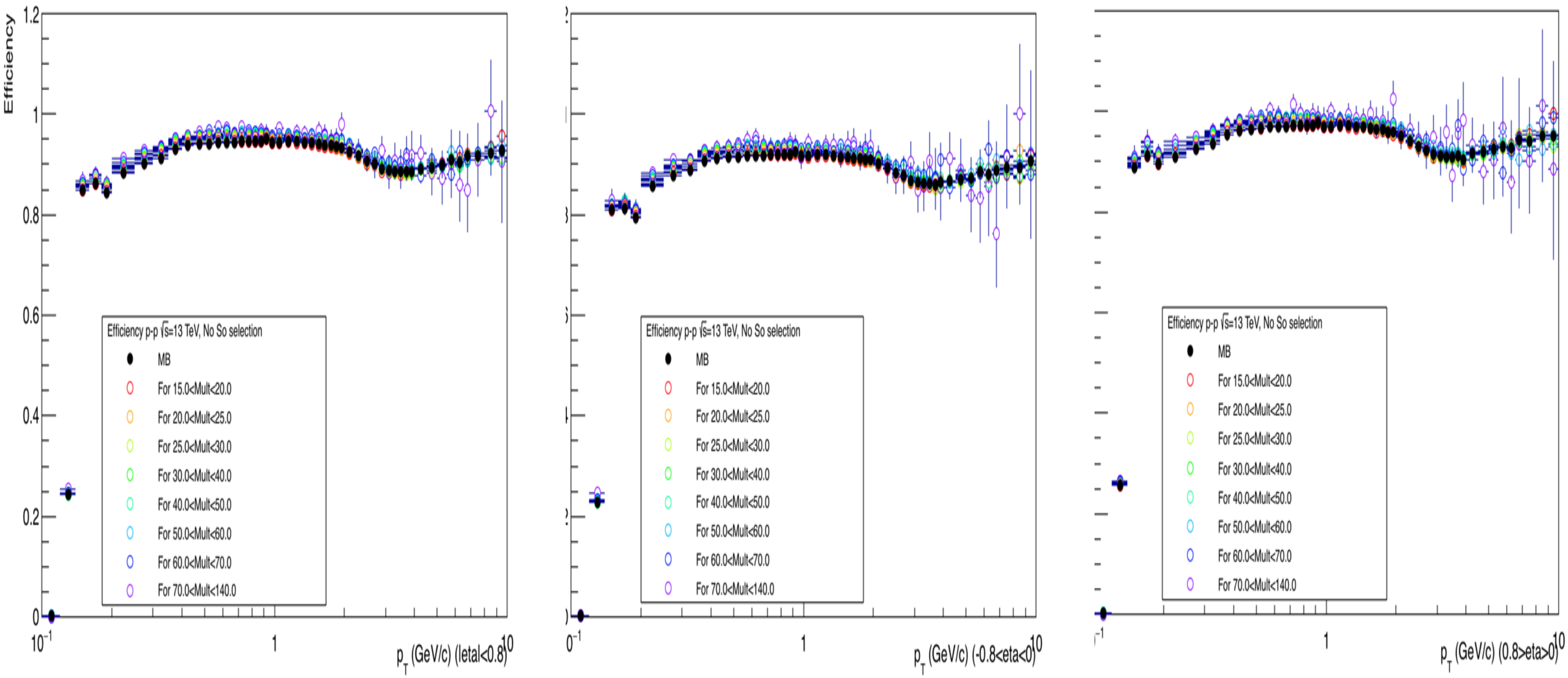


# So response for tracks&particles within 1.5>pt>0.15.



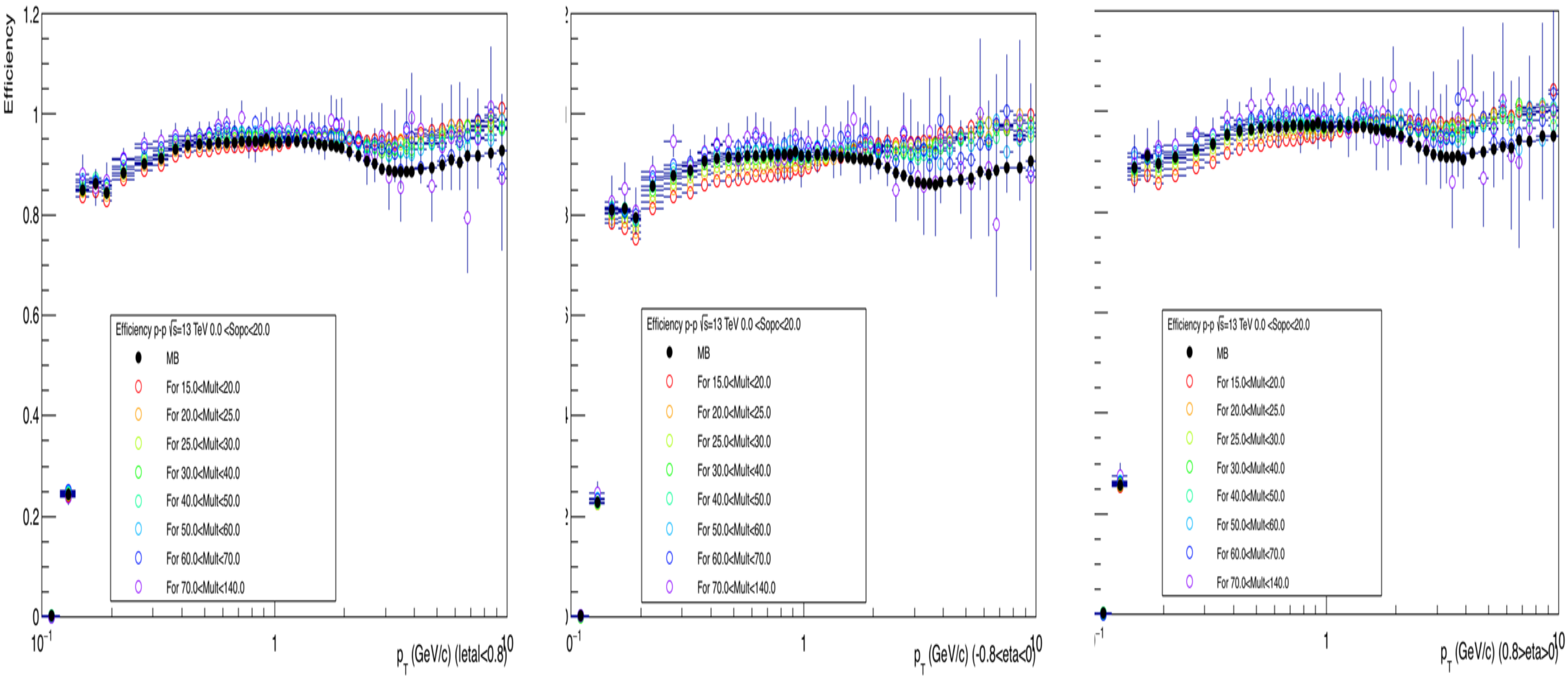
So, we analyze the efficiency for 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.

- No So selection



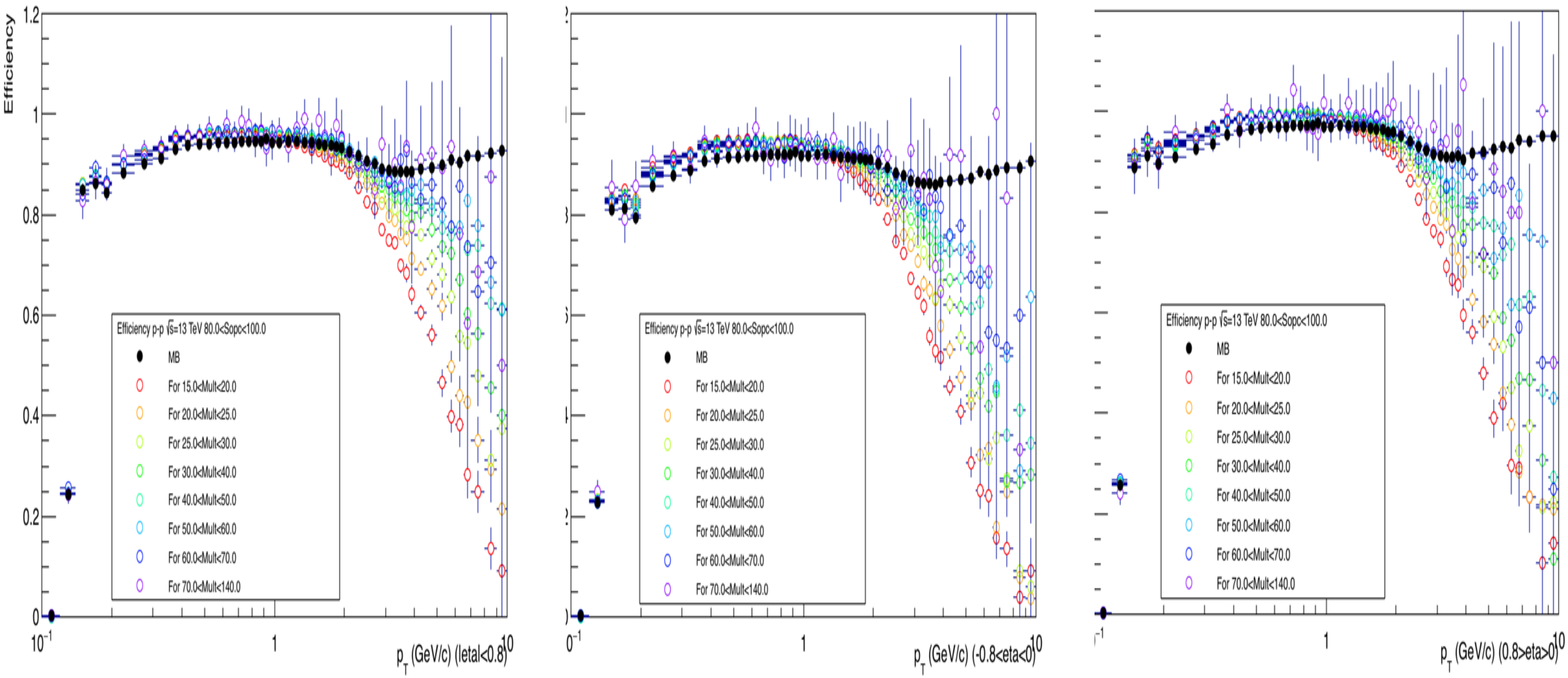
So, we analyze the efficiency for 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.

- For jetty

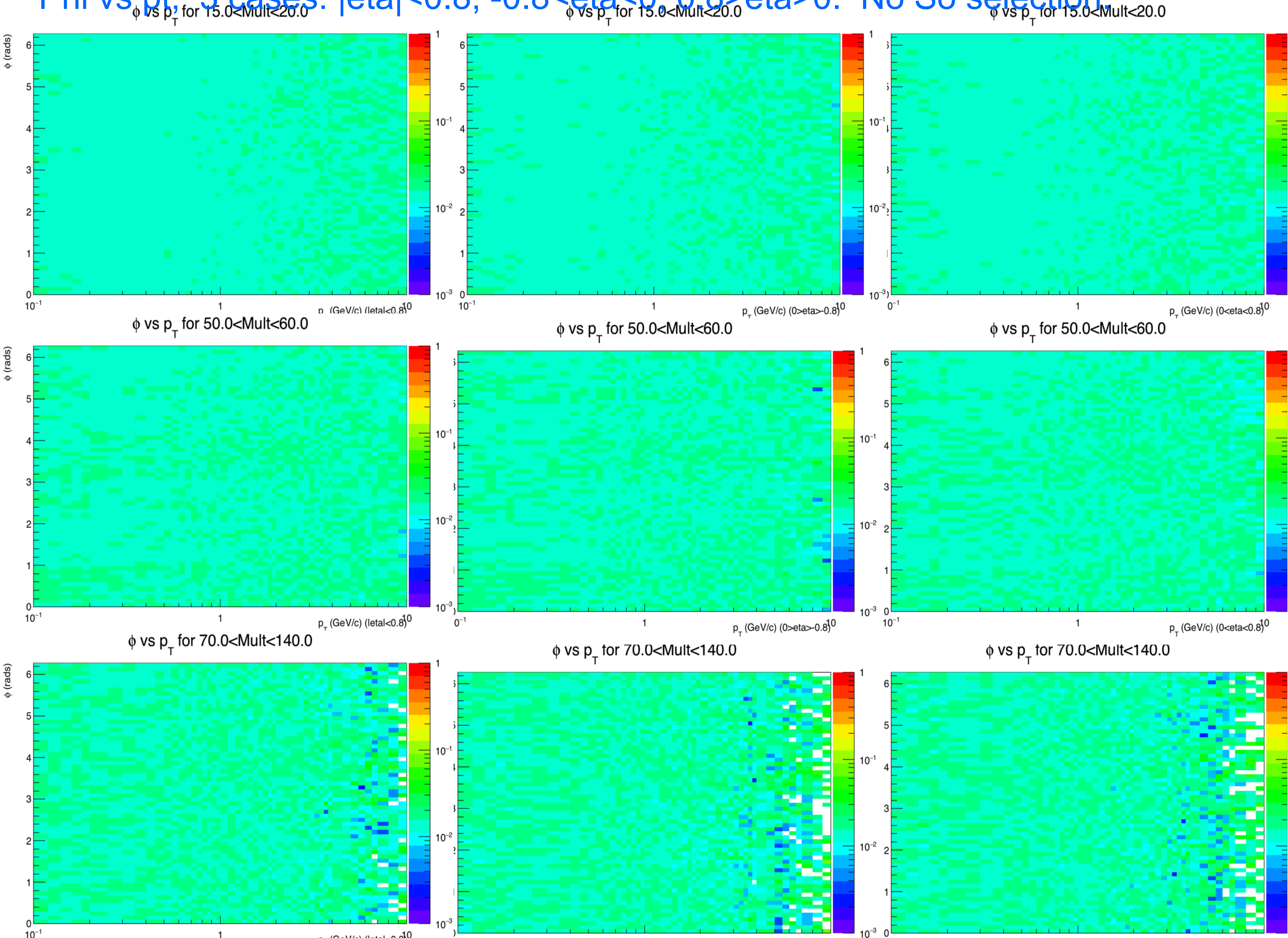


So, we analyze the efficiency for 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.

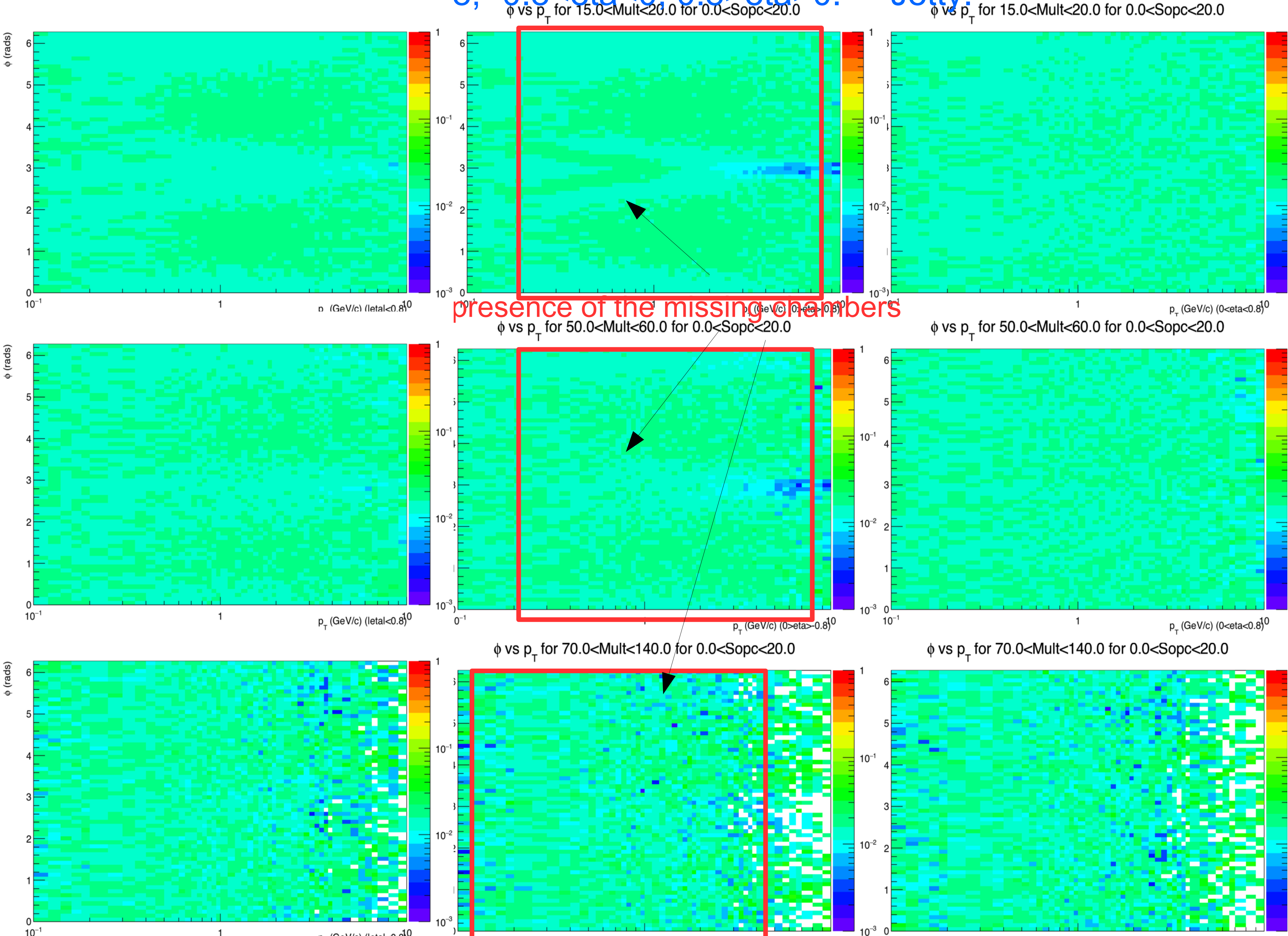
- For Isotropic

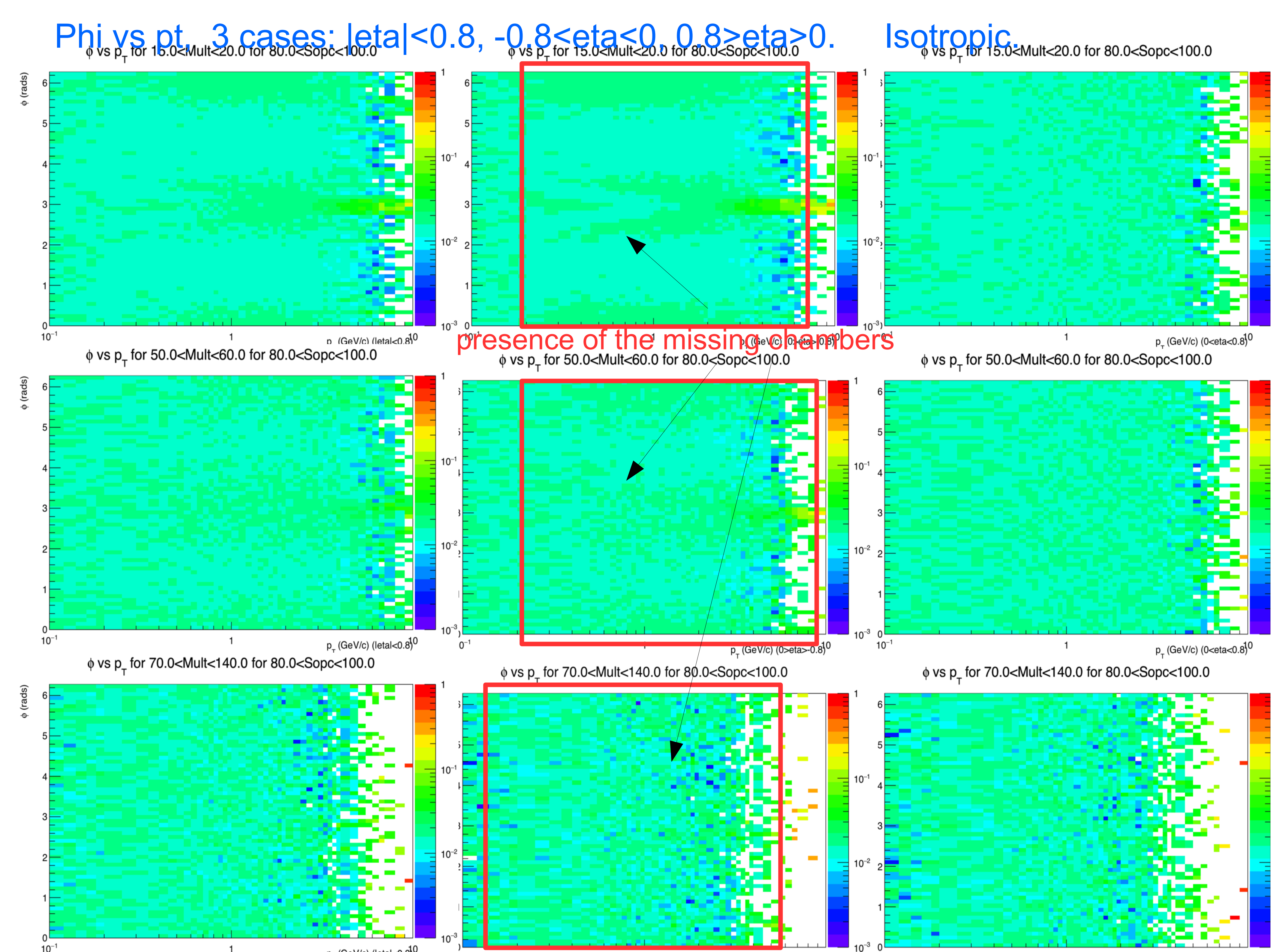


# Phi vs pt,  3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.  No So selection.



# Phi vs pt   3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.    Jetty.





Phi vs pt, 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0. Isotropic.
φ vs p_T for 15.0<Mult<20.0 for 80.0<Sopc<100.0
φ vs p_T for 50.0<Mult<60.0 for 80.0<Sopc<100.0
φ vs p_T for 70.0<Mult<140.0 for 80.0<Sopc<100.0
φ (rads)
p_T (GeV/c) (|eta|<0.8)
p_T (GeV/c) (0>eta>-0.8)
p_T (GeV/c) (0<eta<0.8)
presence of the missing chambers