ALICE

Sphero(i)city technicalities

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Outline

- Efficiency comparison multiplicity bins vs MB case for spherocity/sphericity in three different binnings for the cuts and the percentage selection of the event shape.
- A study of efficiency for Nch & So bins in 3 regions:

  |eta|<0.8, 0<eta<0.8, -0,8<eta<0.
- A study of phi vs pt for Nch & So bins in 3 regions:

  |eta|<0.8, 0<eta<0.8, -0,8<eta<0.
- A study on the dependence of spherocity response with respect a pt max cut.

- 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

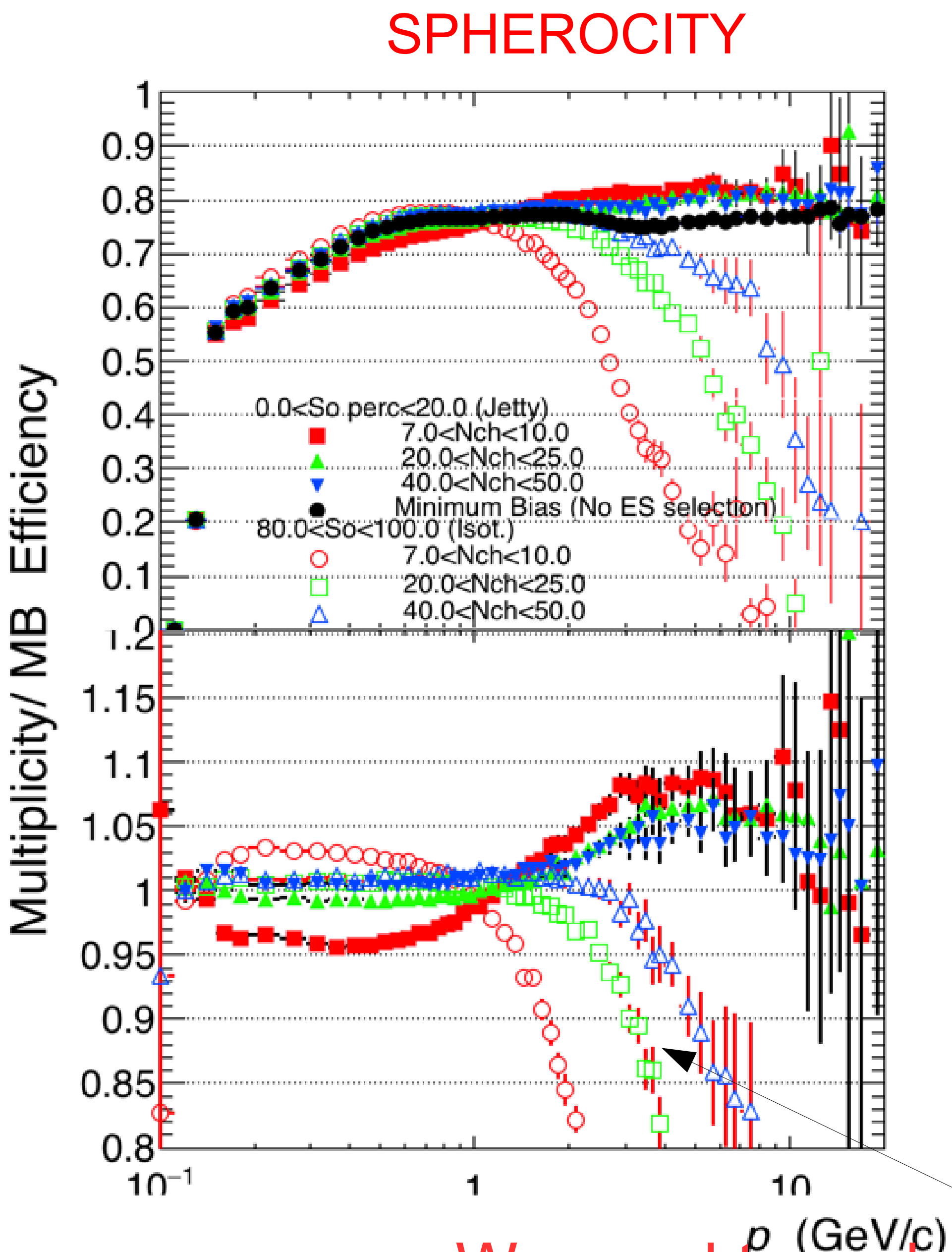
- Sphero(i)city is reconstructed using more than two tracks with transverse momentum greater than 0.15 GeV/c and within $|\eta| < 0.8$. Three sets of cuts were tested:
  - TPC: GetStandardTPCOnlyTrackCuts()+TPCrefit
  - Hybrid: CreateTrackCutsPWGJE(10001008)+CreateTrackCutsPWGJE(10011008)
  - Standard: 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:

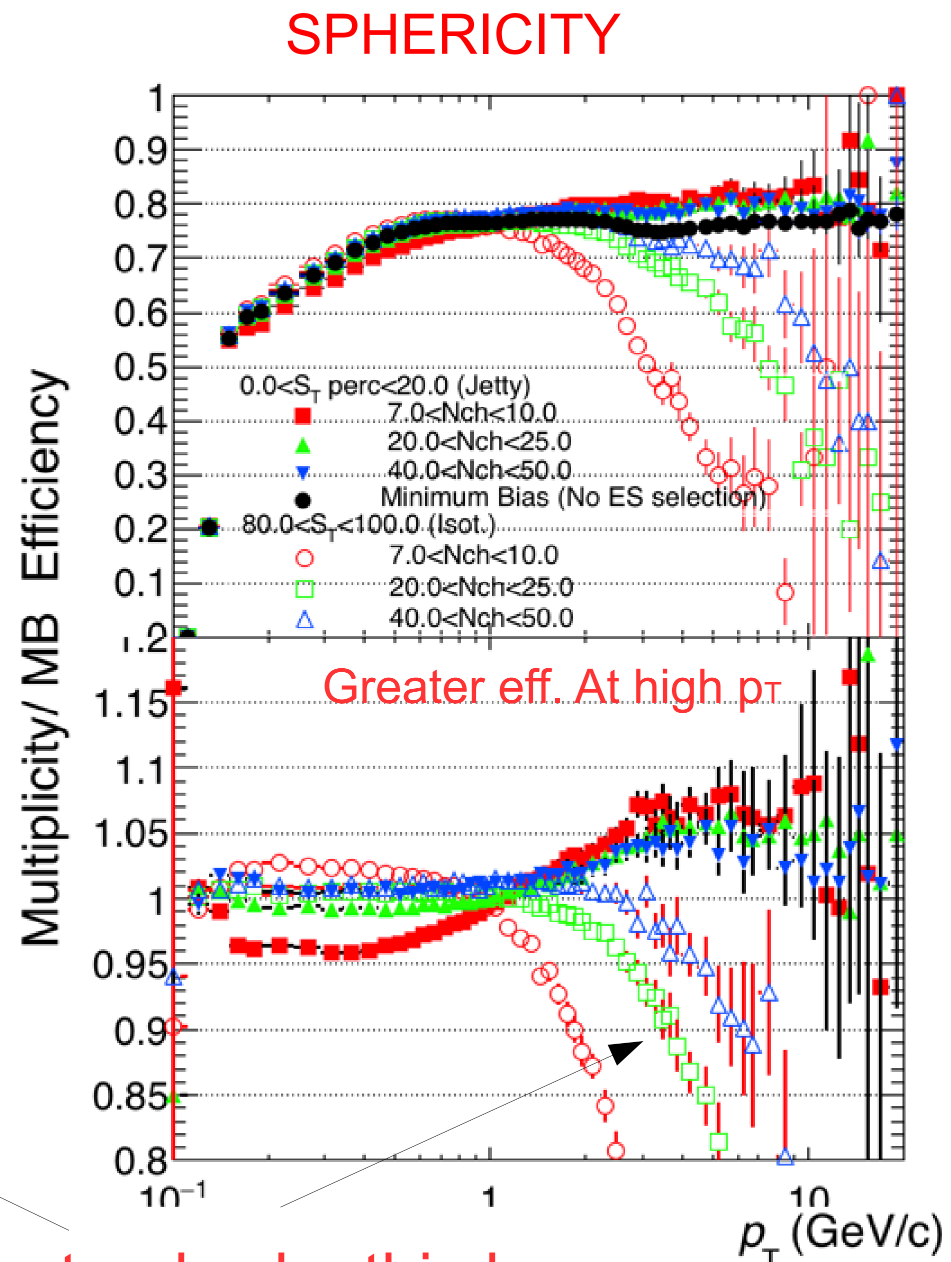
  https://aliceinfo.cern.ch/Notes/node/529
- In this presentation, results for the reference estimator are discussed
  - **GetReferenceMultiplicity(fESD, AliESDtrackCuts::kTrackletsITSTPC, 0.8)**

- 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.

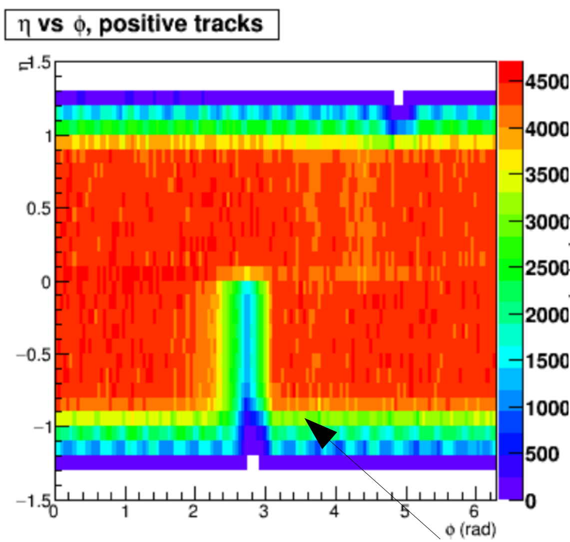


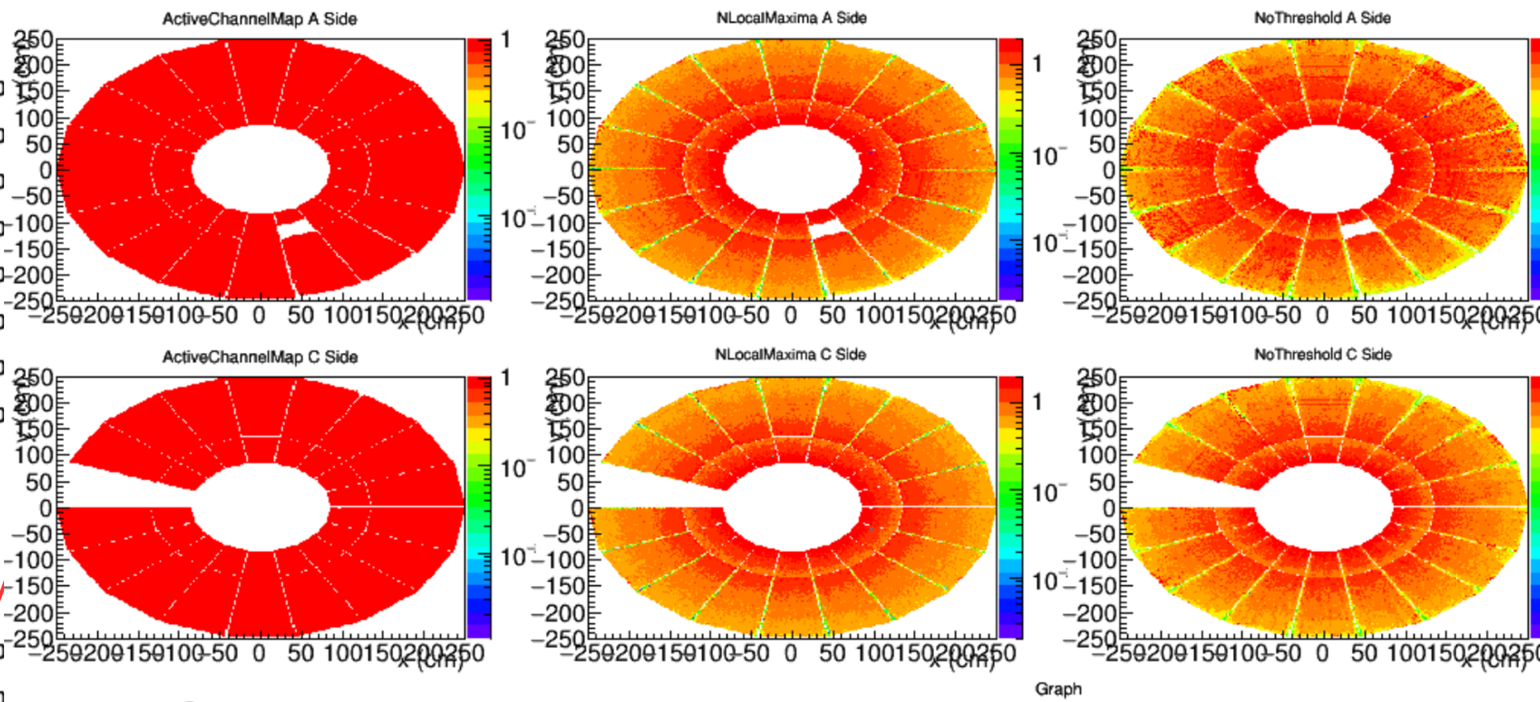


We need to understand why this happen for Isotropic events with low mult

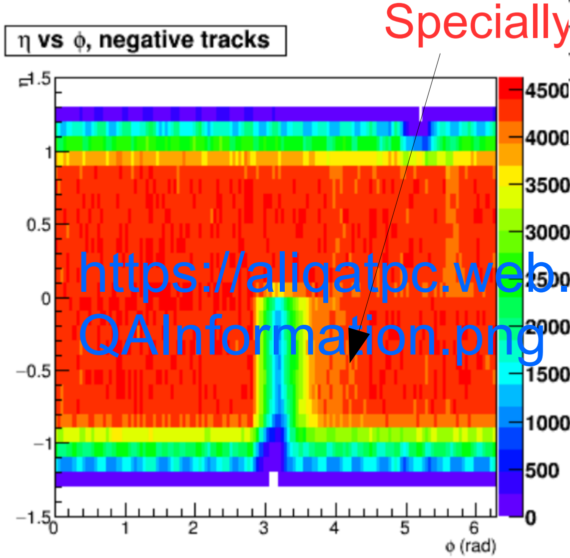
Some issues at the TPC runs (LHC15f) (ex. good run 226452 acc. RCT)

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





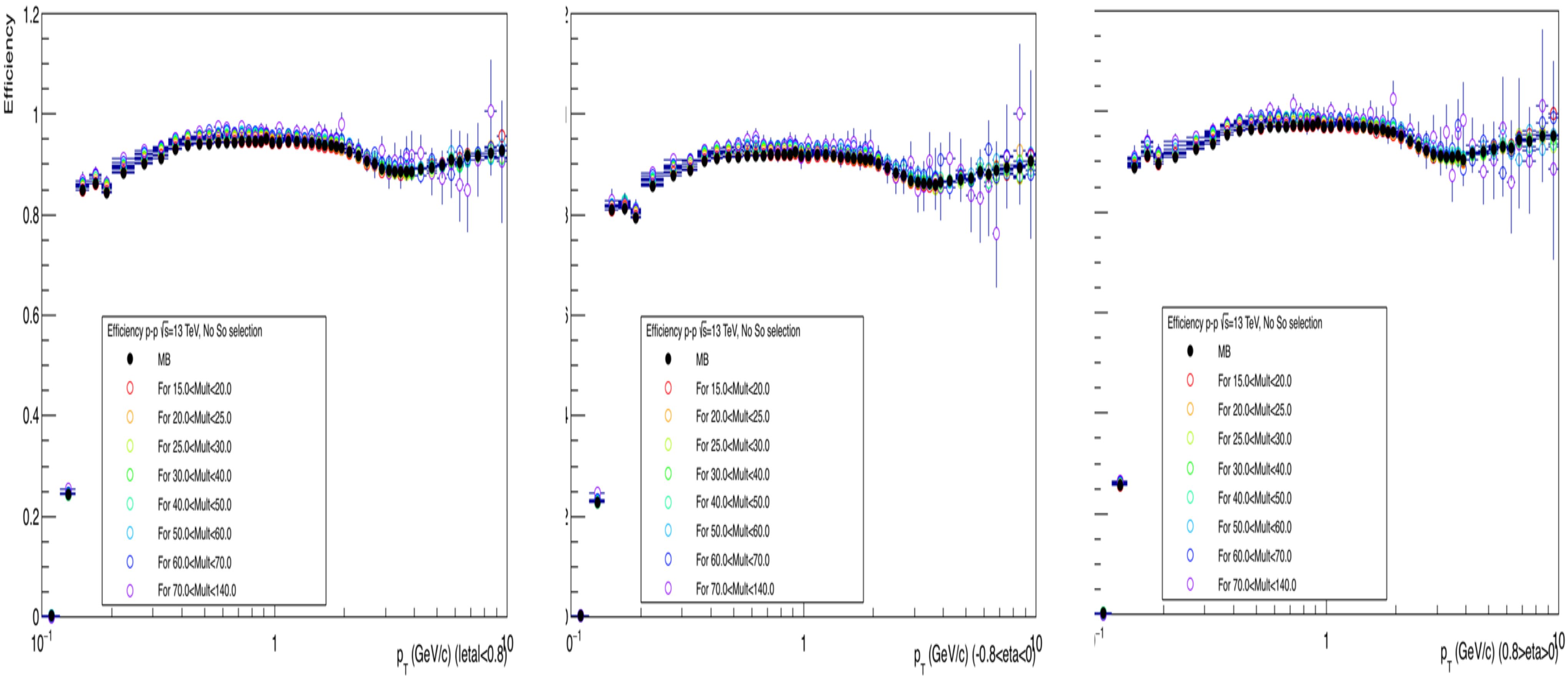
Specially



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

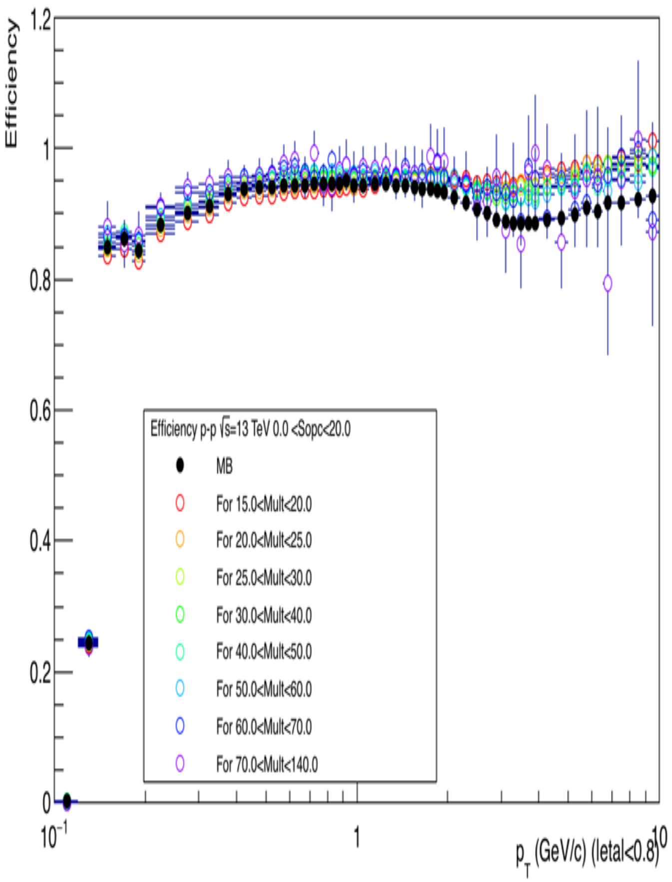
So, we analyze the efficiency for 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.

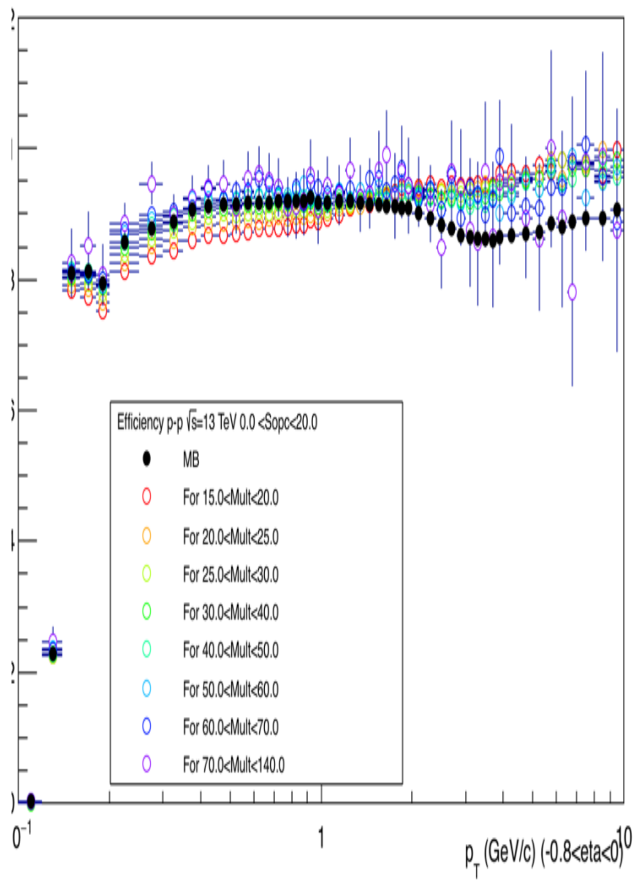
- No So selection

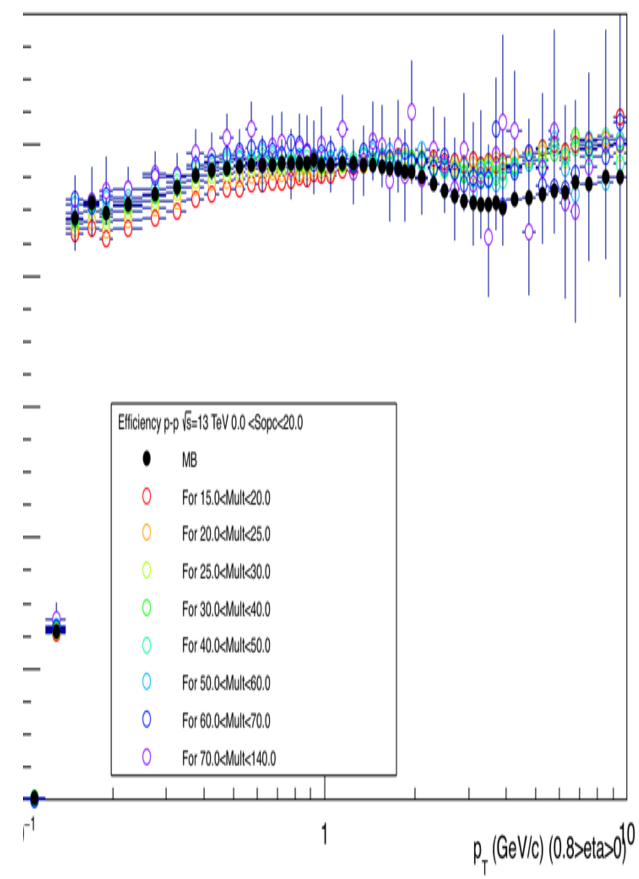


So, we analyze the efficiency for 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.

- For jetty

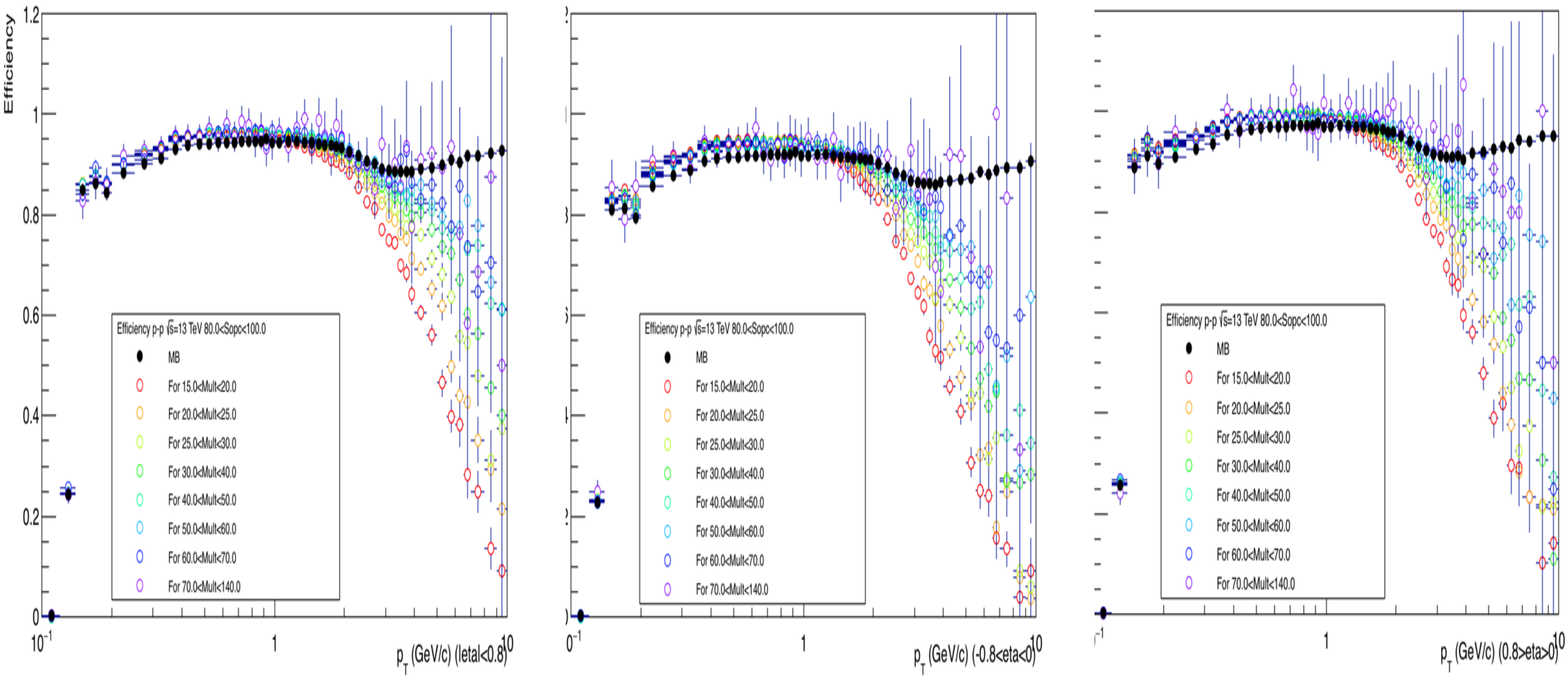




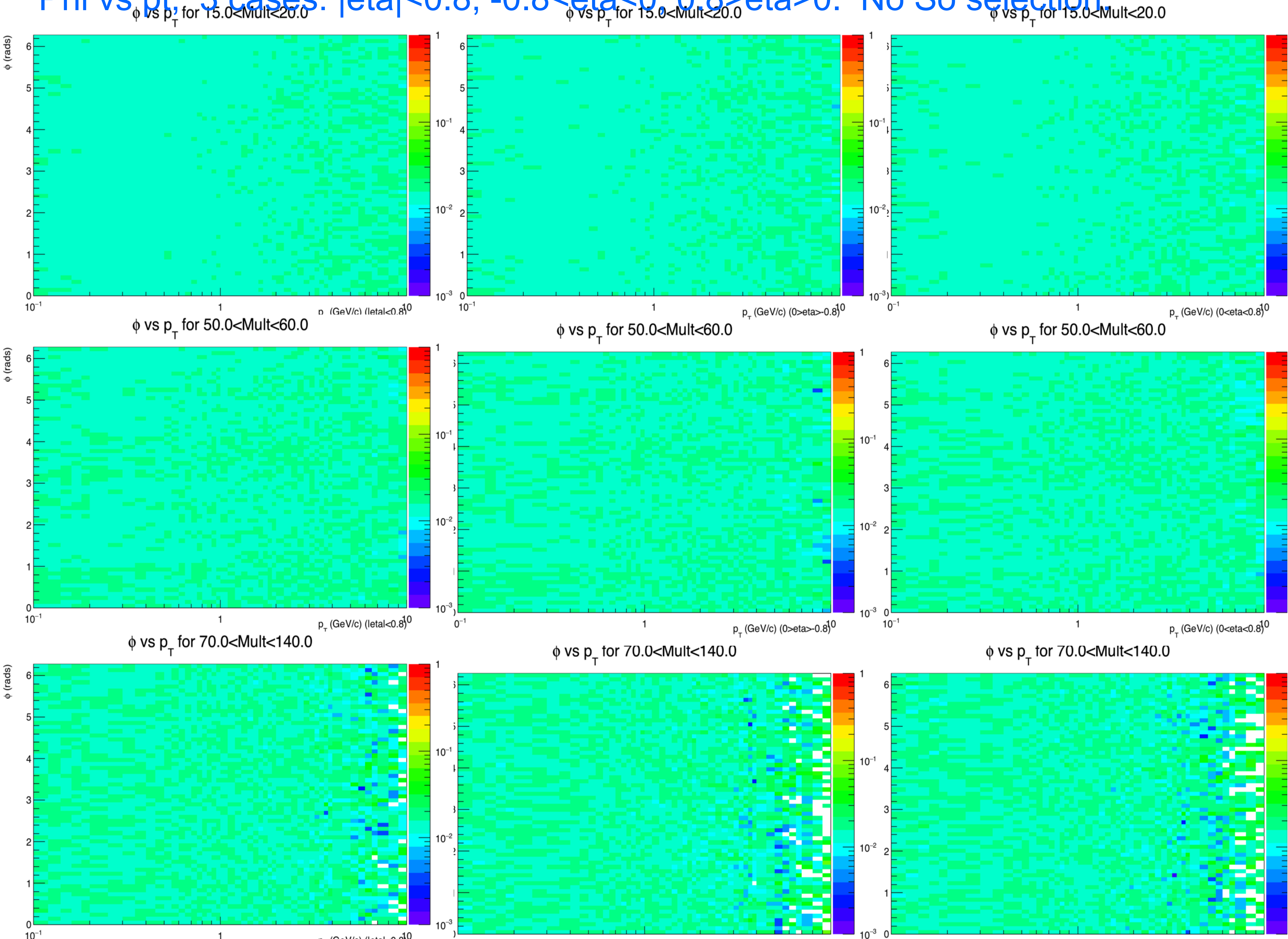


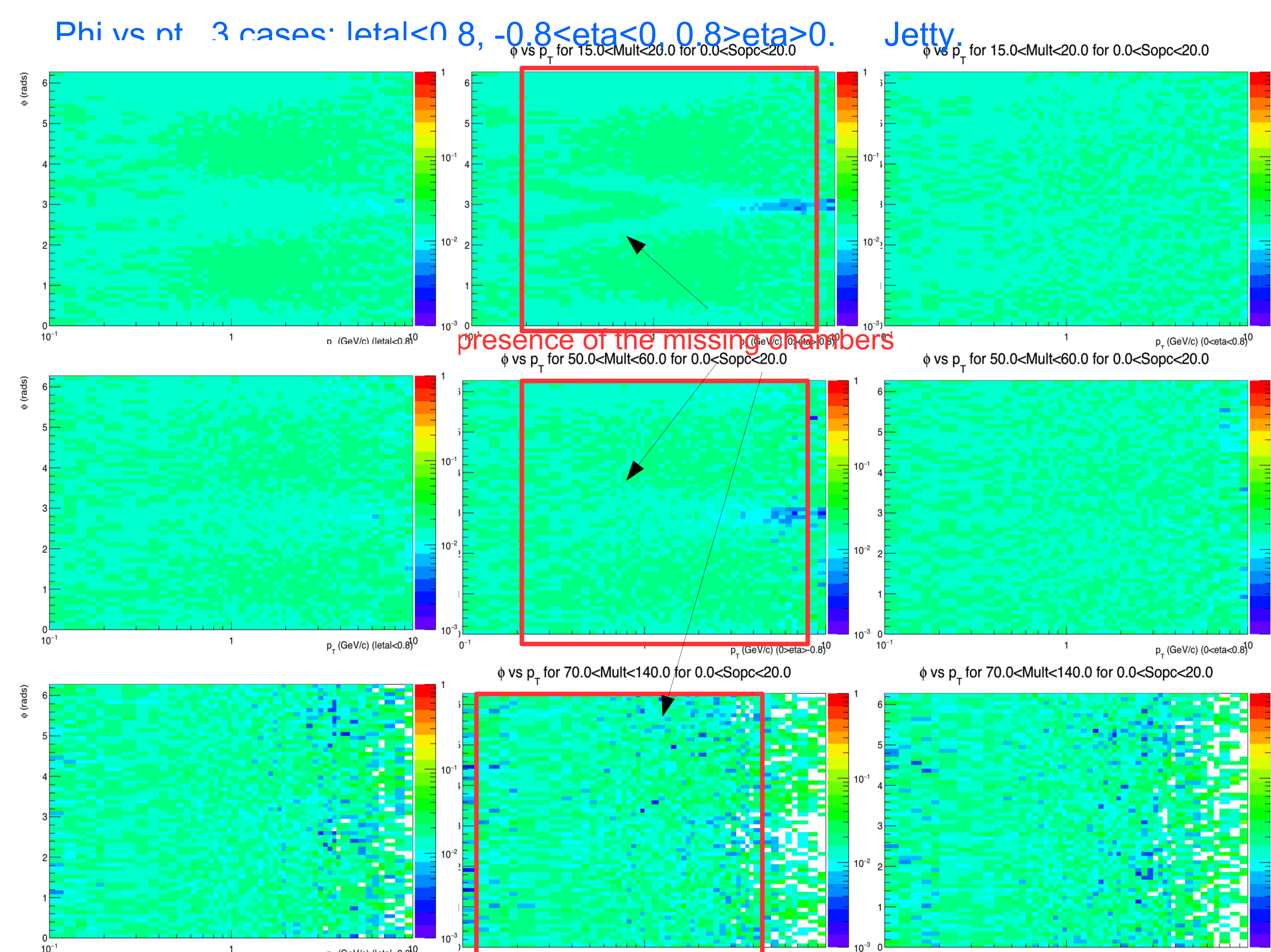
So, we analyze the efficiency for 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.

- For Isotropic



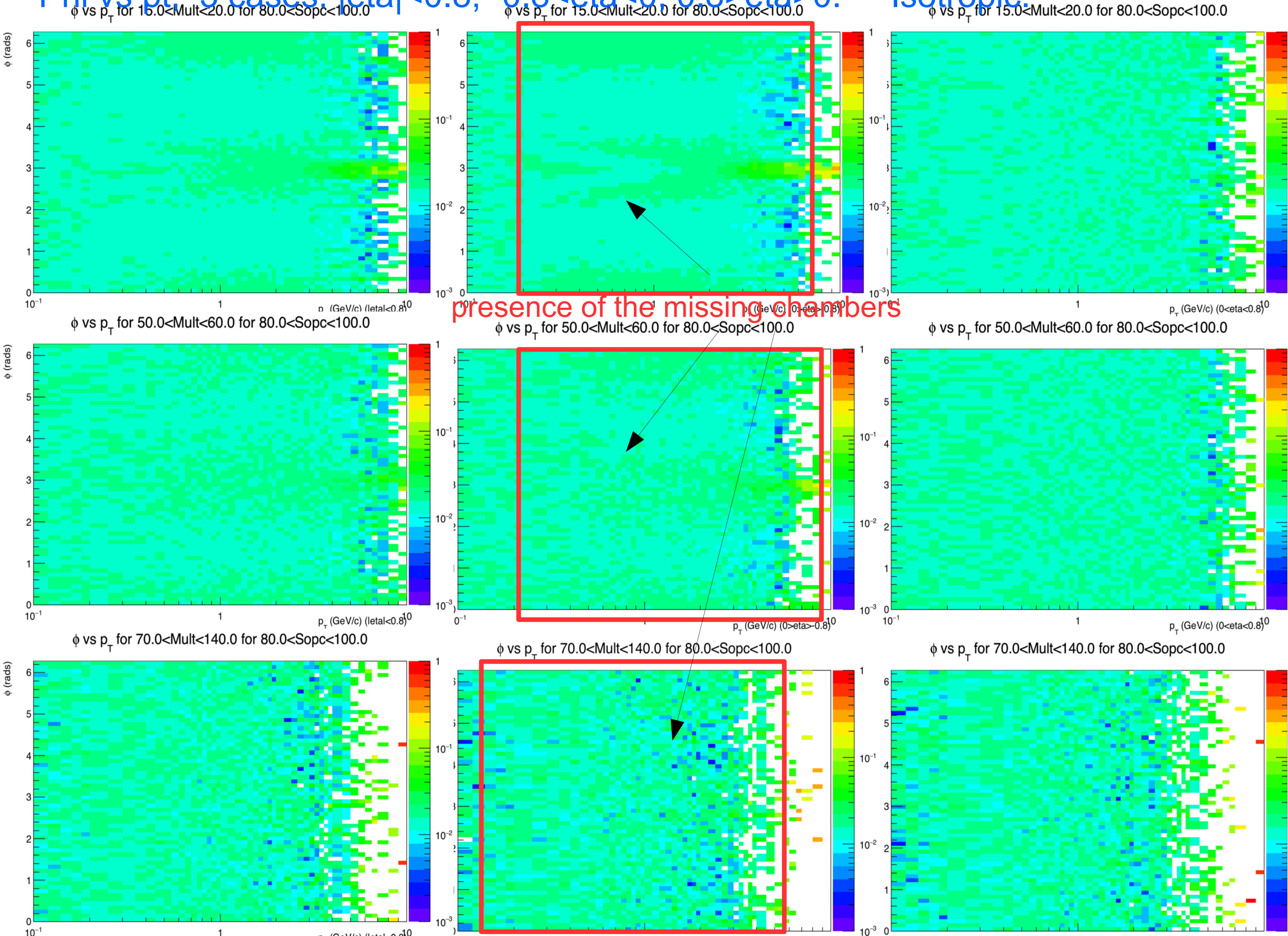
Phi vs pt, 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0. No So selection.



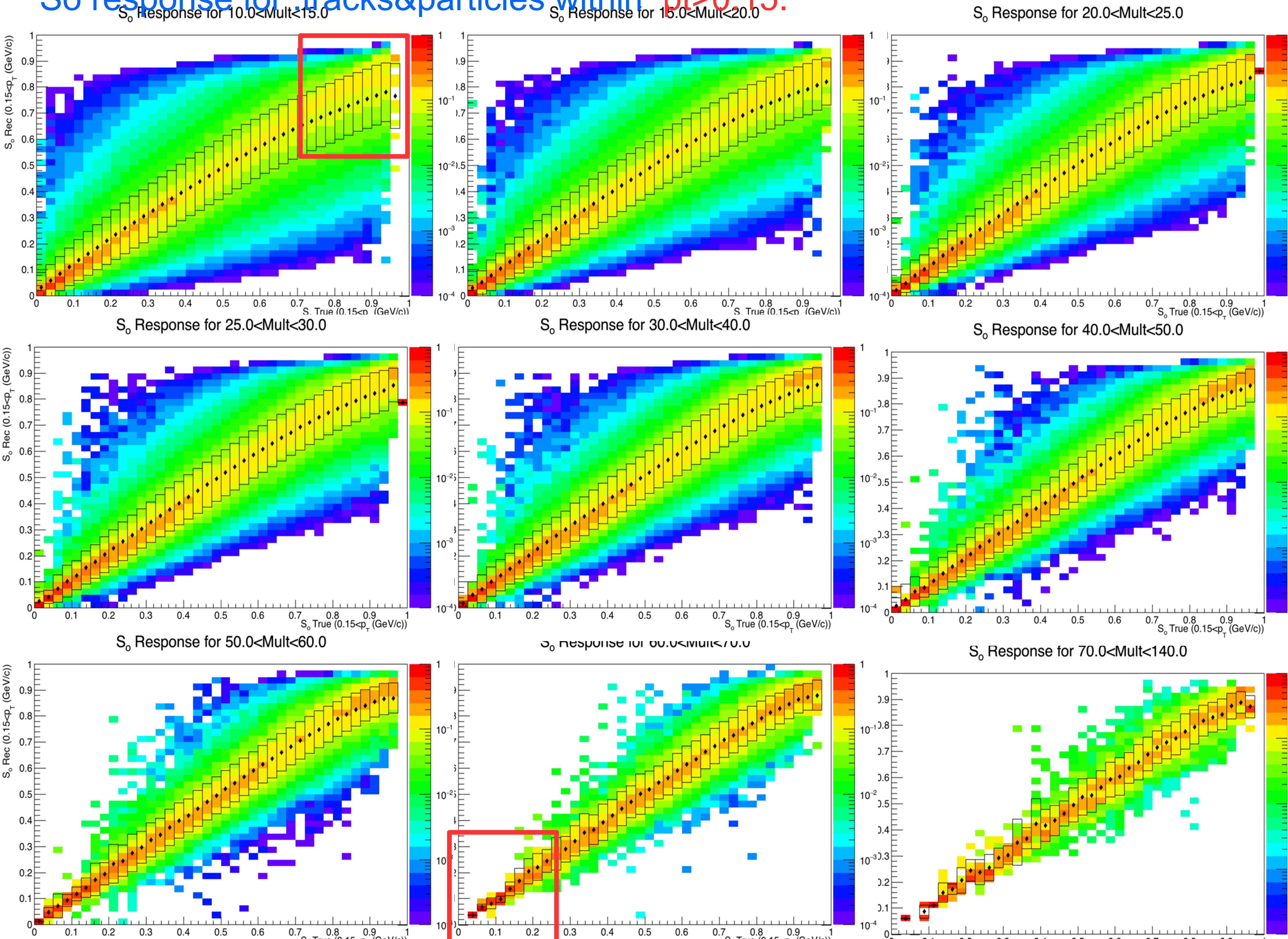


Phi vs pt 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0. Jetty.
ϕ vs p_T for 15.0<Mult<20.0 for 0.0<Sopc<20.0
ϕ vs p_T for 15.0<Mult<20.0 for 0.0<Sopc<20.0
presence of the missing chambers
ϕ vs p_T for 50.0<Mult<60.0 for 0.0<Sopc<20.0
ϕ vs p_T for 50.0<Mult<60.0 for 0.0<Sopc<20.0
ϕ vs p_T for 70.0<Mult<140.0 for 0.0<Sopc<20.0
ϕ vs p_T for 70.0<Mult<140.0 for 0.0<Sopc<20.0
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)

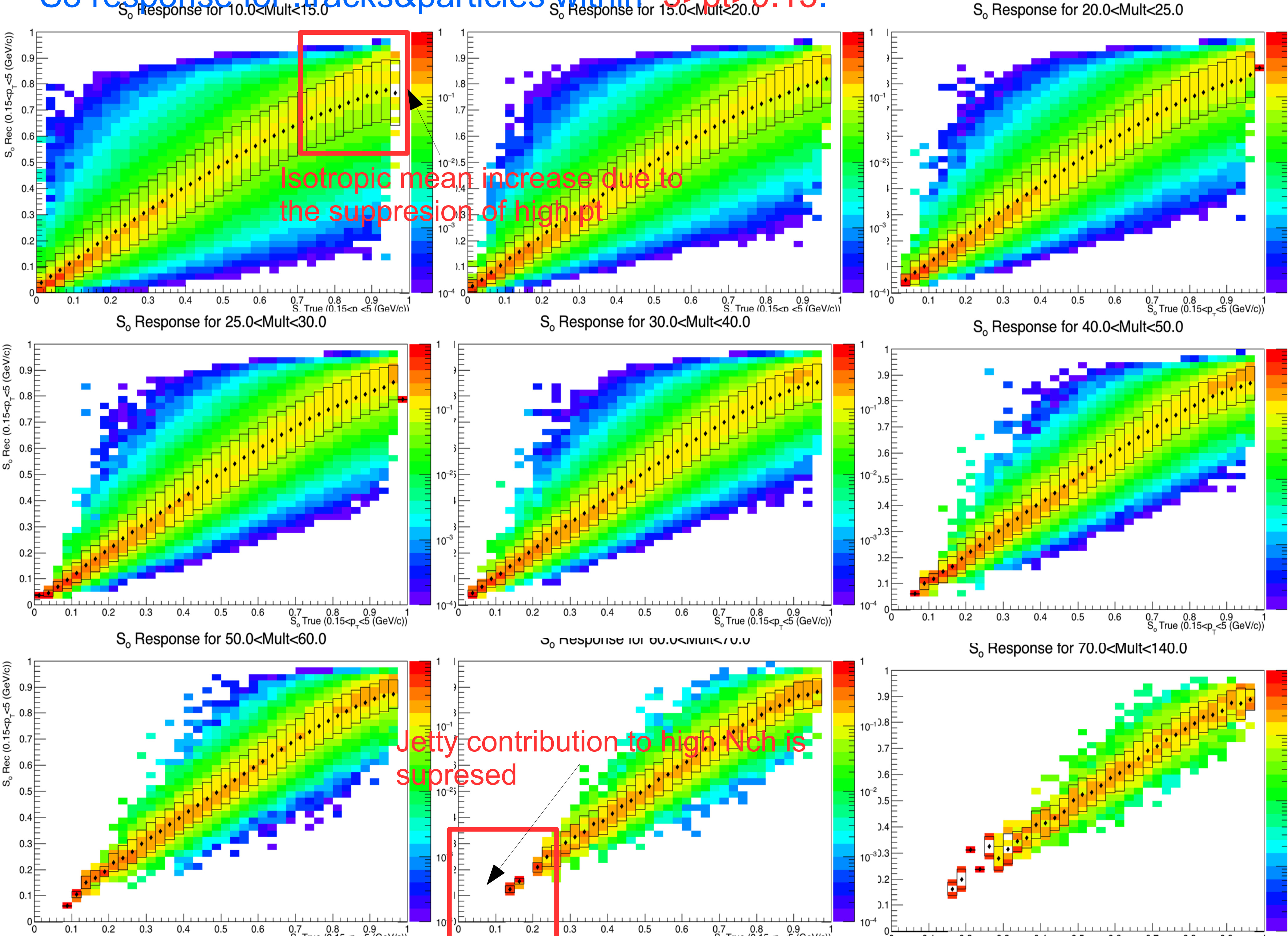
Phi vs pt, 3 cases: |eta|<0.8, -0.8<eta<0, 0.8>eta>0.   Isotropic.



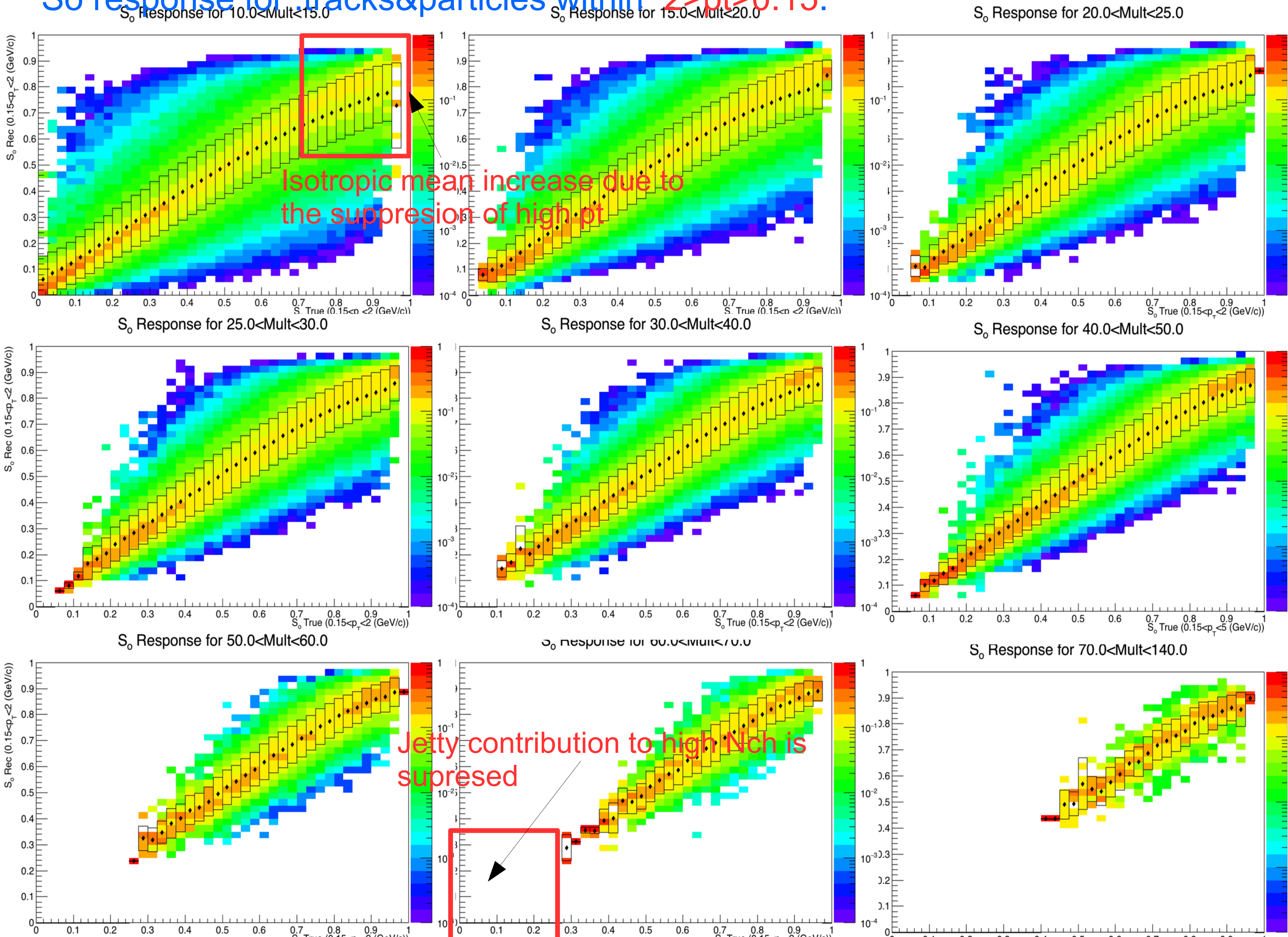
So response for tracks&particles within pt>0.15.



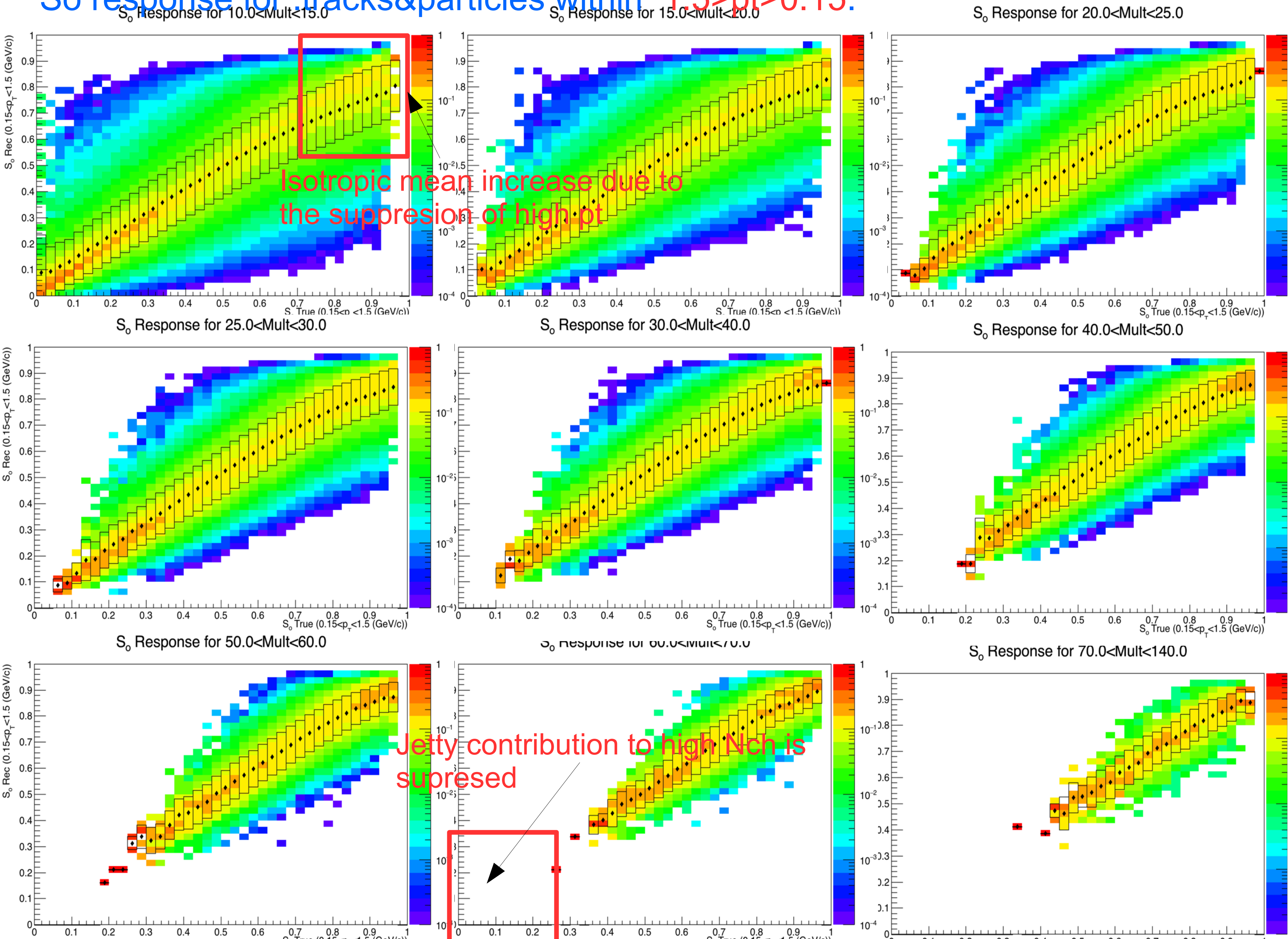
So response for tracks&particles within 5>pt>0.15.



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



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



Conclusions

- Therefore, the spherocity dependence of the efficiency IS NOT related with the missing chambers in the TPC.
- The effect just reflects that spherocity is quite sensitive to high pT particles.
- Phi vs pt behaviour is affected by the missing chambers in the negative region
- To do

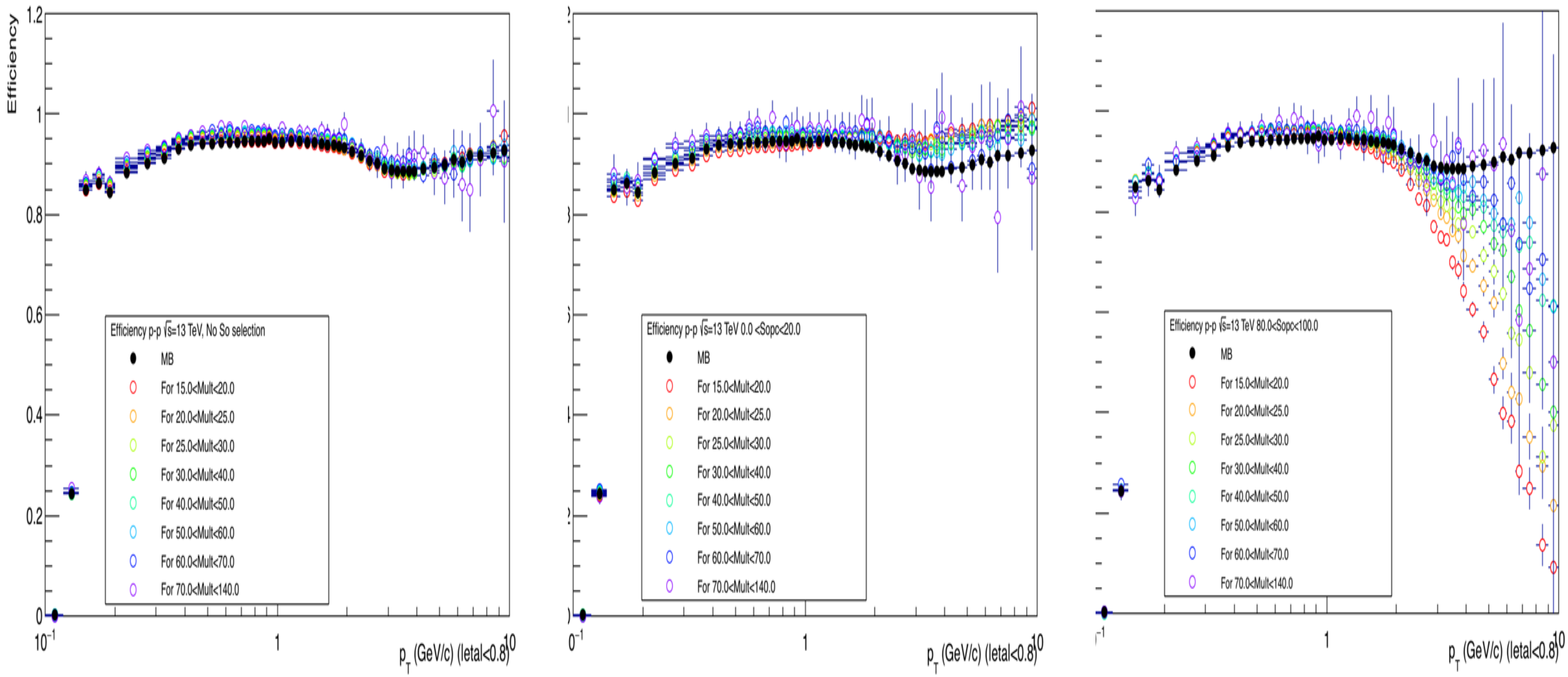
  Get response matrix for:

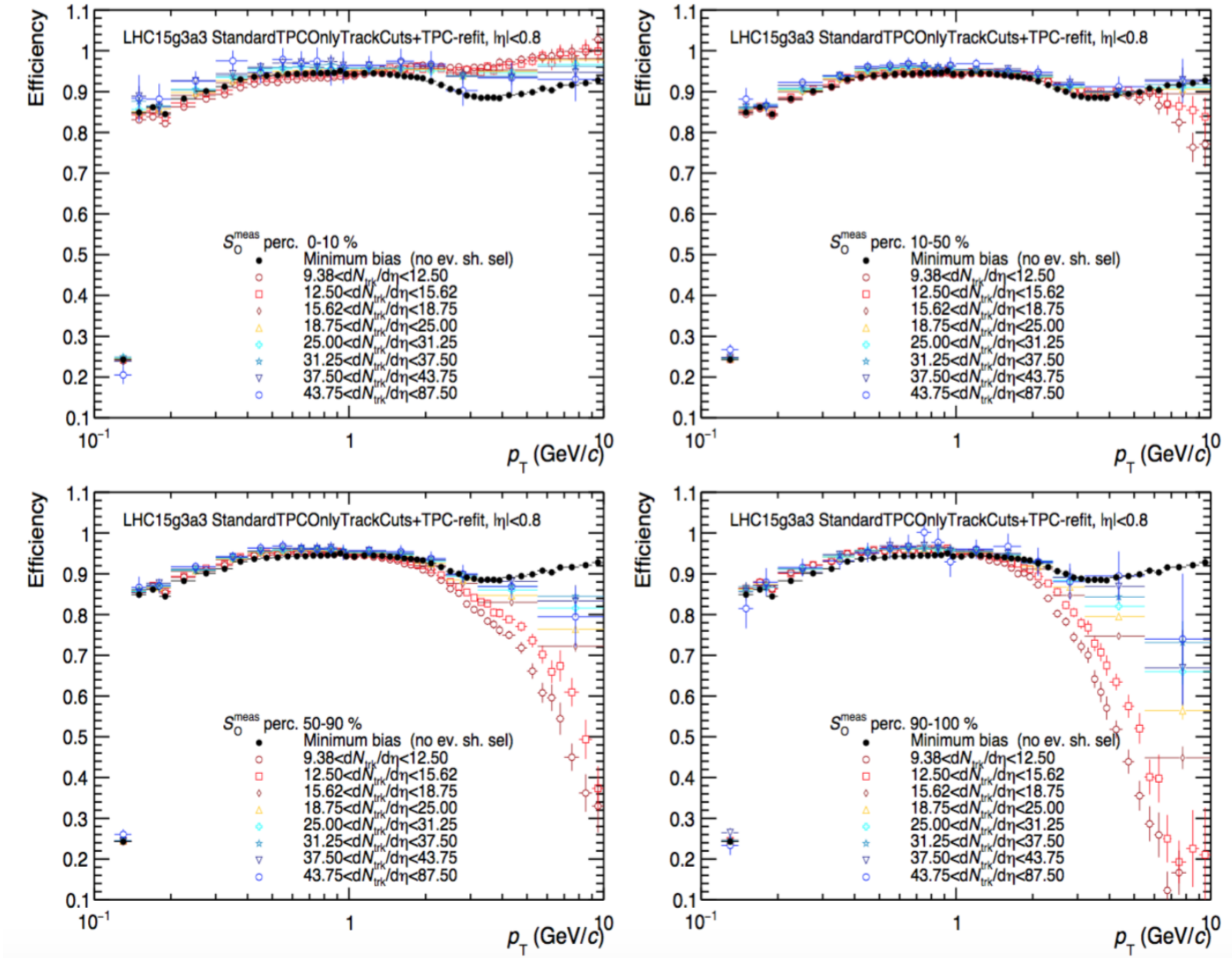
- 1) tracks & particles: 0.15<pT<1.5 GeV/c
- 2) tracks & particles: 0.15<pT<2 GeV/c
- 3) tracks & particles: 0.15<pT<5 GeV/c
- 4) actual case.

Backup

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

- No So selection



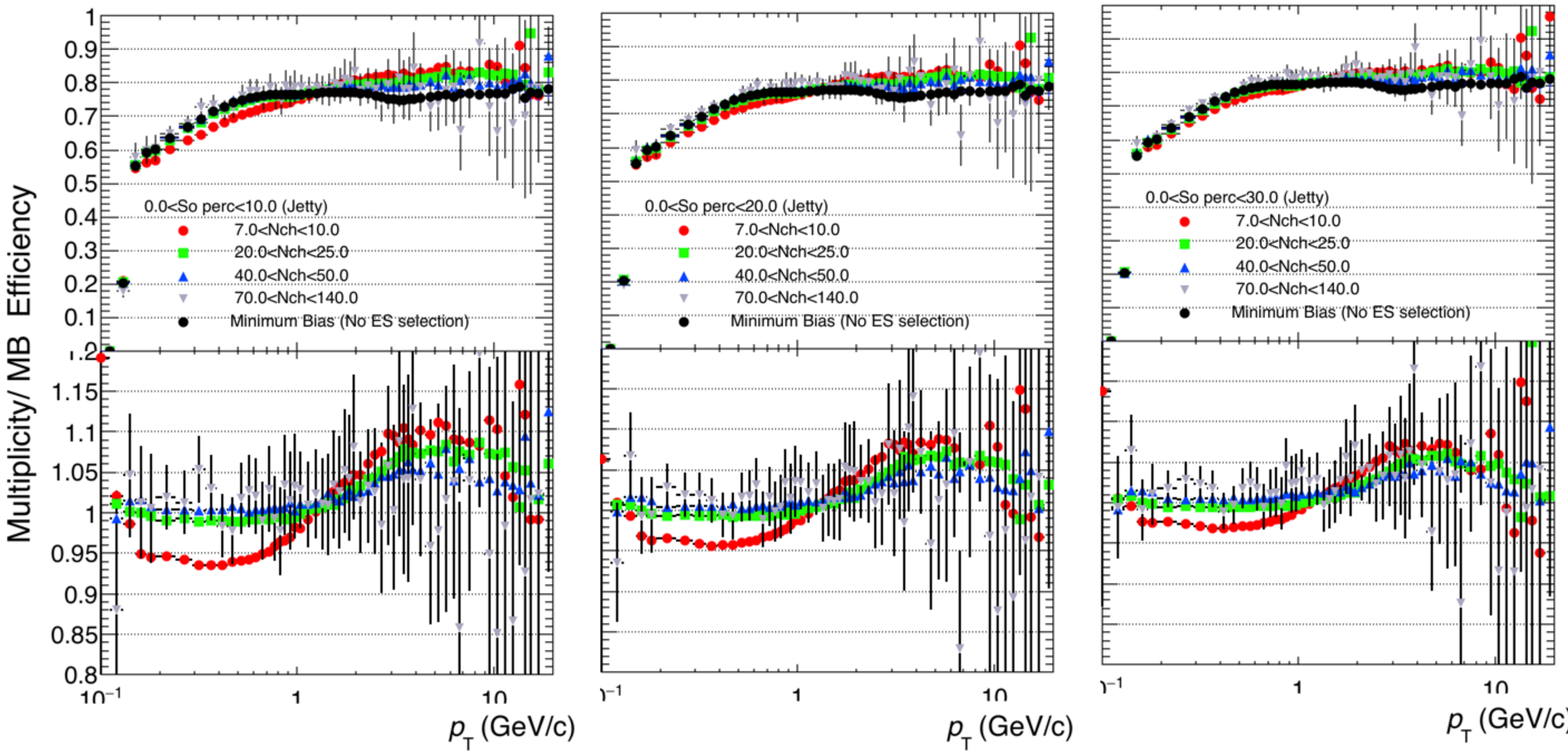


Efficiency
LHC15g3a3 StandardTPCOnlyTrackCuts+TPC-refit, |η|<0.8
S_O^{meas} perc. 0-10 %
S_O^{meas} perc. 10-50 %
S_O^{meas} perc. 50-90 %
S_O^{meas} perc. 90-100 %
Minimum bias (no ev. sh. sel)
9.38<dN_{trk}/dη<12.50
12.50<dN_{trk}/dη<15.62
15.62<dN_{trk}/dη<18.75
18.75<dN_{trk}/dη<25.00
25.00<dN_{trk}/dη<31.25
31.25<dN_{trk}/dη<37.50
37.50<dN_{trk}/dη<43.75
43.75<dN_{trk}/dη<87.50
p_T (GeV/c)

For three different SPHEROCITY percentiles for JETTY events

- BinApc= {0.0,10.0,40.0,90.0,100.0};
- BinBpc= {0.0,20.0,40.0,80.0,100.0};
- BinCpc= {0.0,30.0,40.0,70.0,100.0};

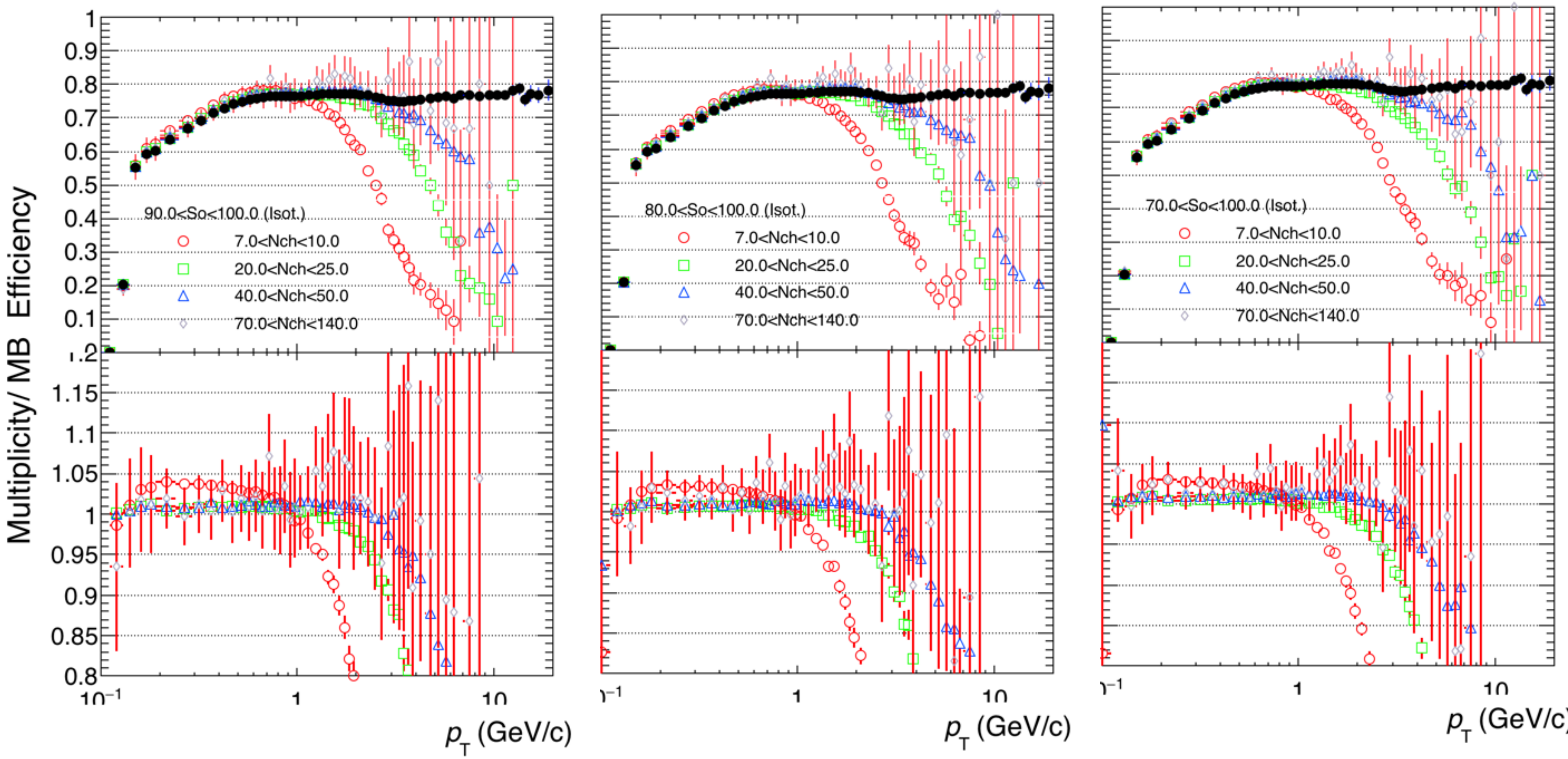
Better statistics for percentiles



For three different SPHEROCITY percentiles for ISOTROPIC events

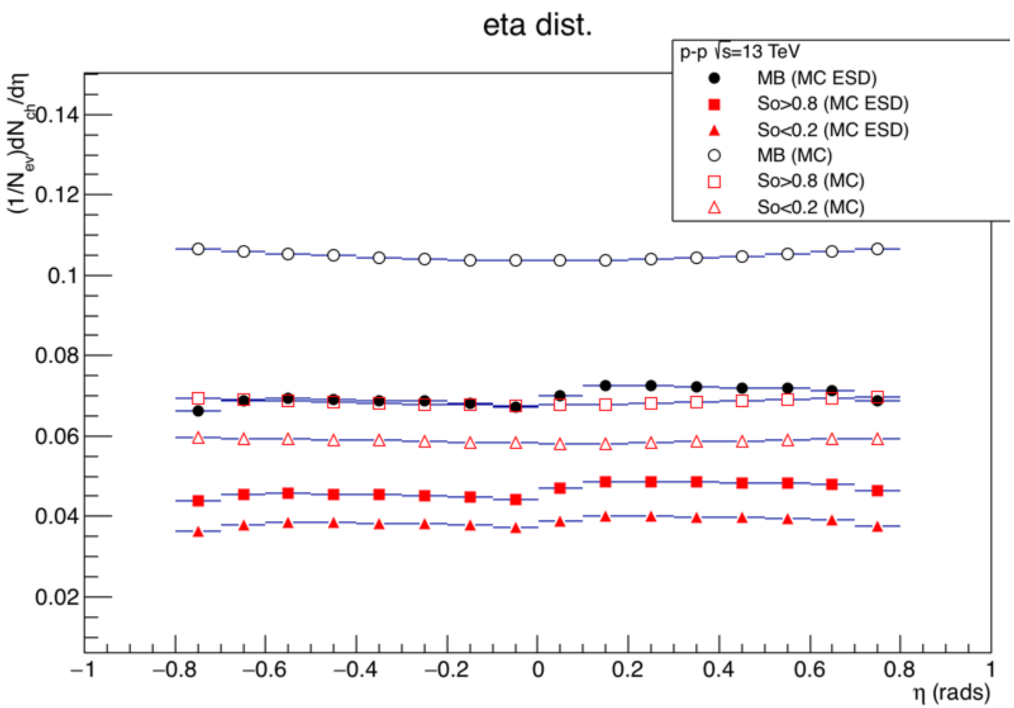
- BinApc= {0.0,10.0,40.0,90.0,100.0};
- BinBpc= {0.0,20.0,40.0,80.0,100.0};
- BinCpc= {0.0,30.0,40.0,70.0,100.0};

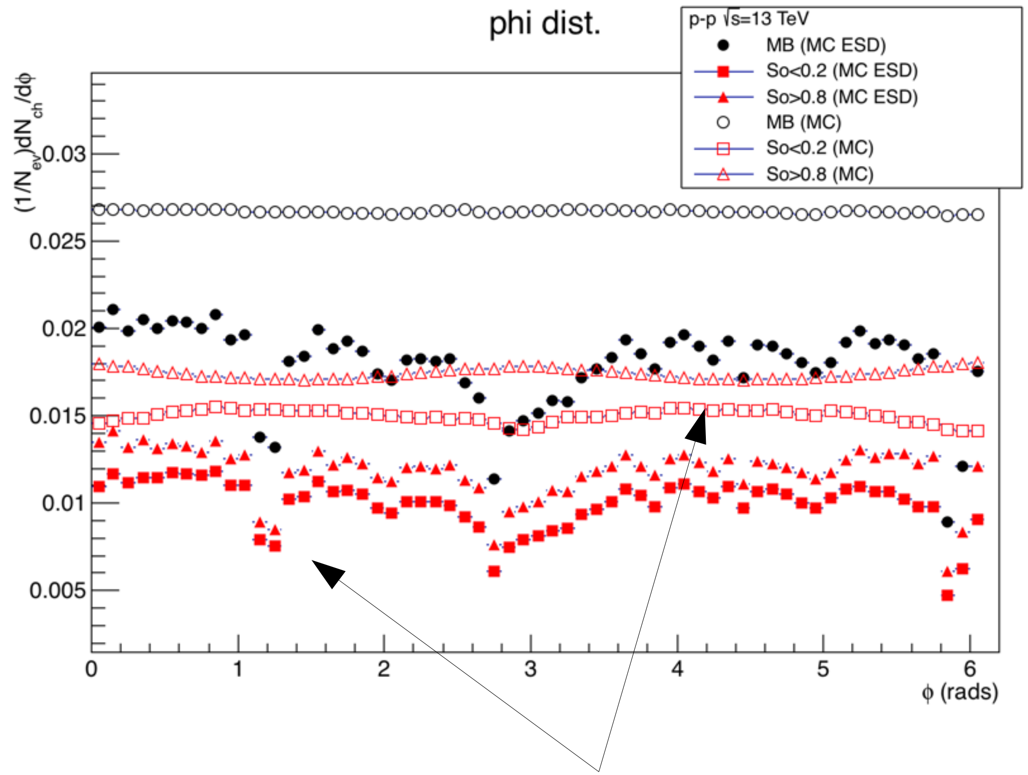
Better statistics for percentiles



To try to understand the behaviour with respect event shape, for fixed holes.

- Eta and phi due the selection on Spherocity

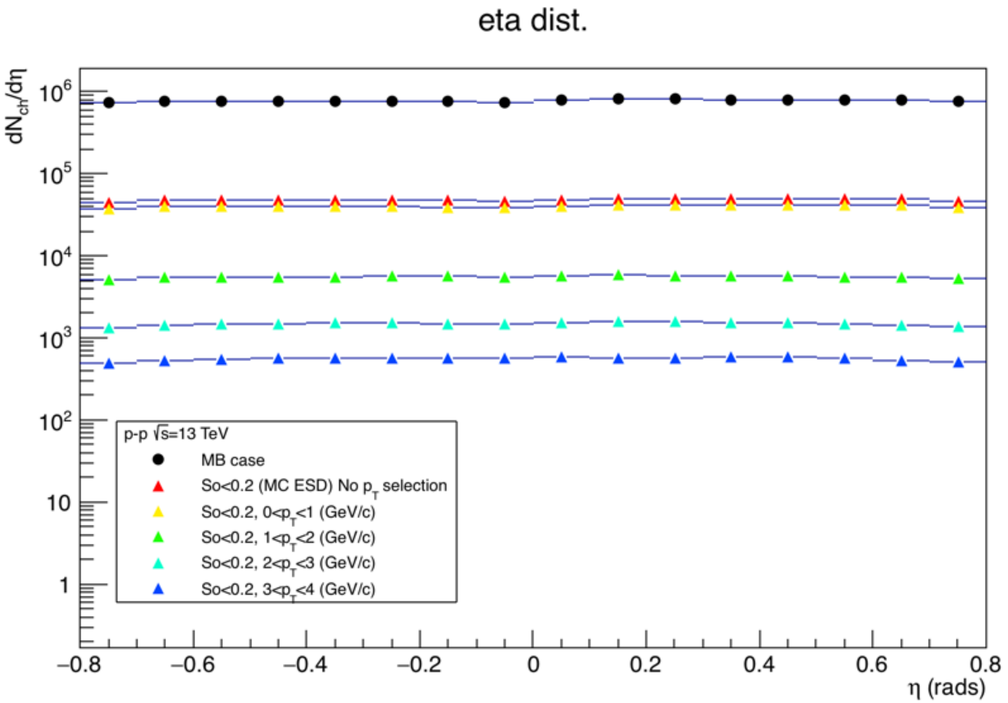


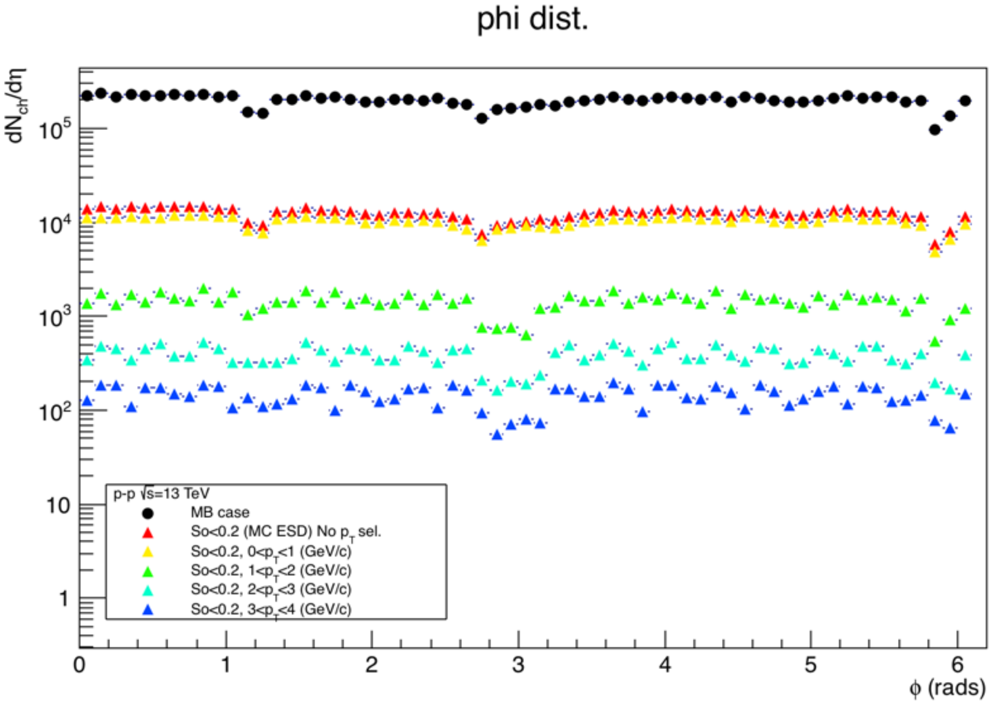


1.- Isotropic events must have Flater phi distributions So holes are more sensible to eff.

To try to understand the behaviour with respect momentum,for fixed holes.

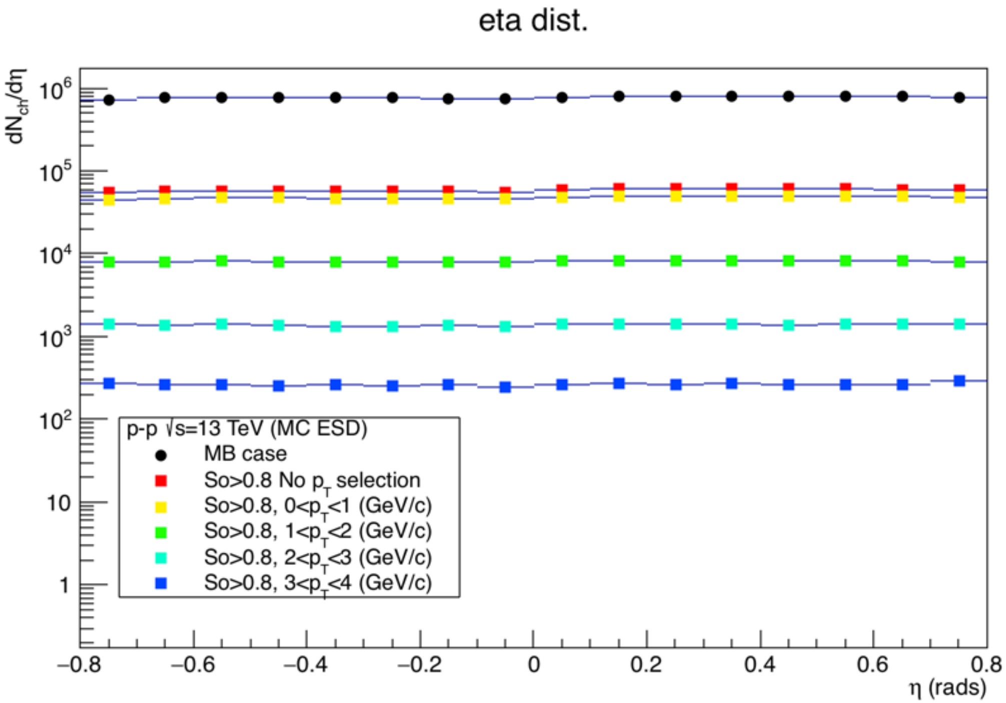
- Eta and phi dependence on the pt selection for dijets

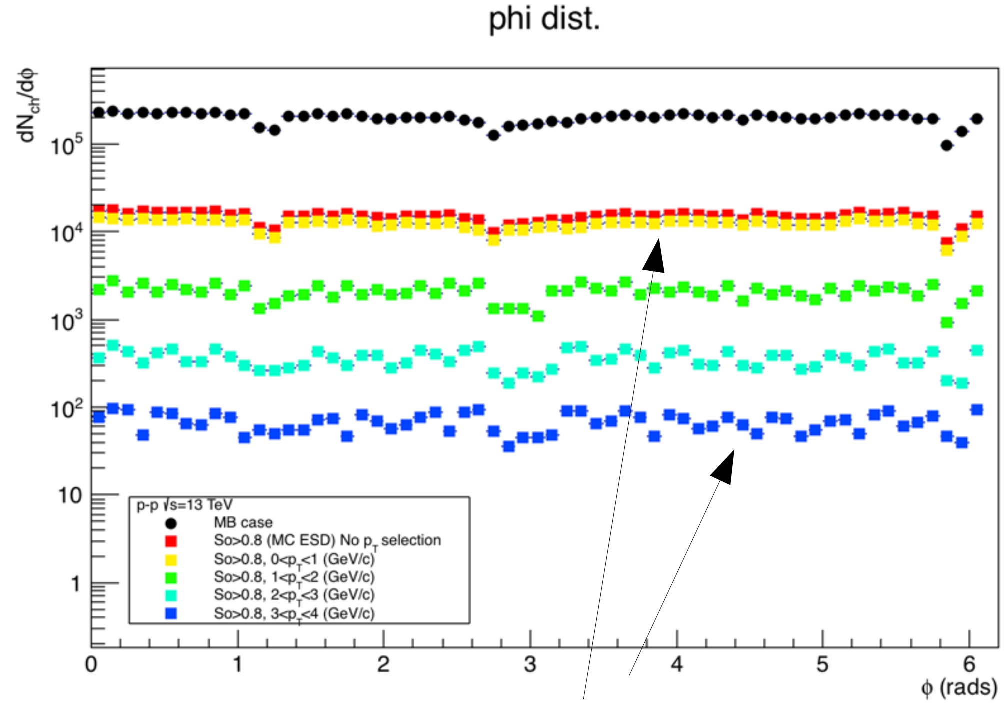




To try to understand the behaviour with respect momentum, for fixed holes.

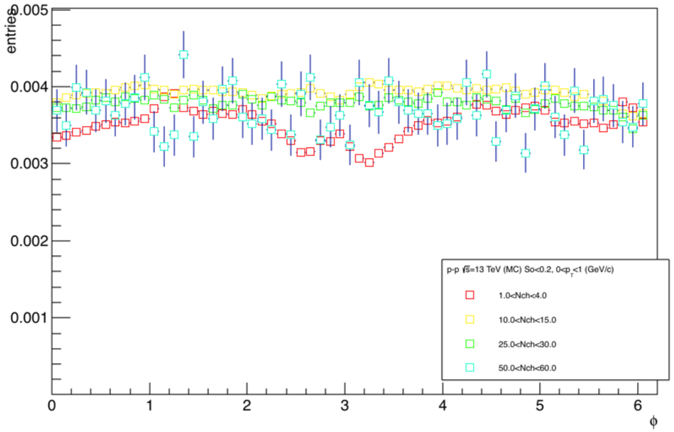
- Eta and phi dependence on the pt selection for isotropic

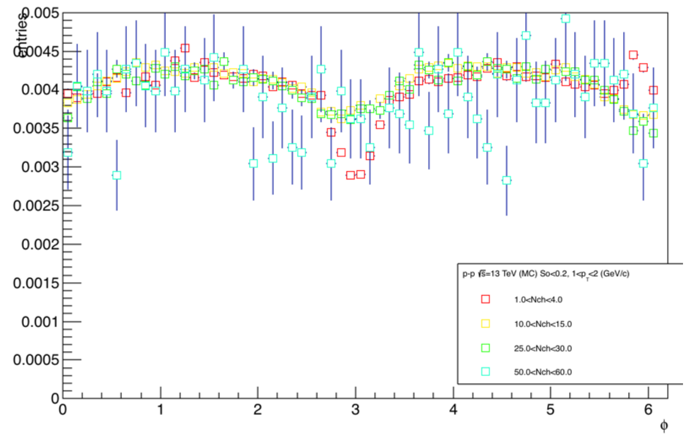


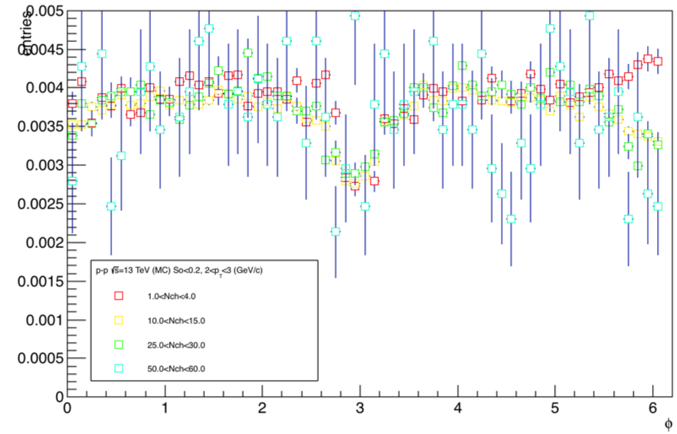


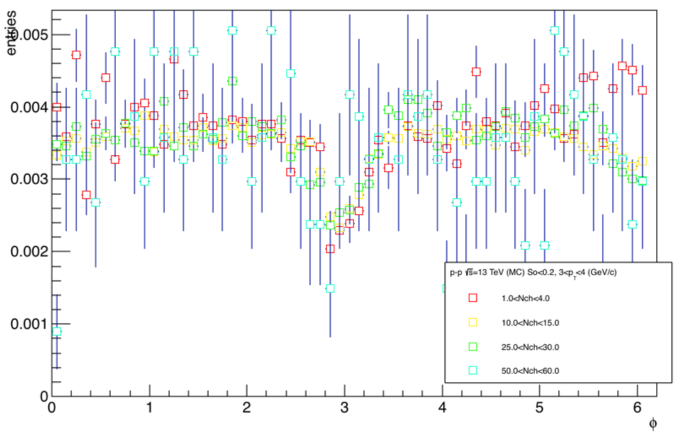
1.-High pT also makes phi distributions sencible to holes. so more sensible to eff.

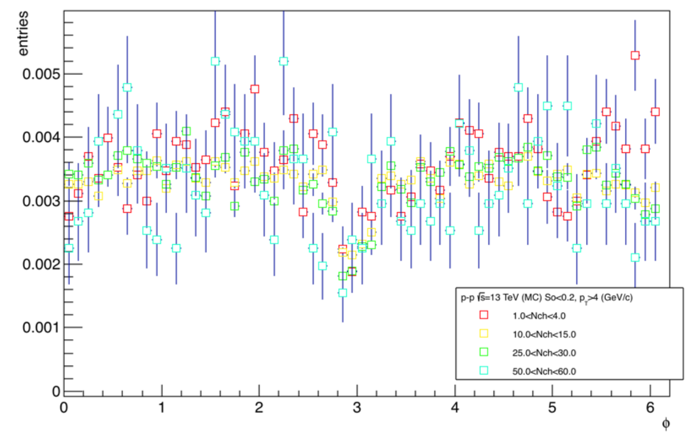
To try to understand the behaviour with respect pT range, and Nch for fixed holes. Phi distributions for dijets





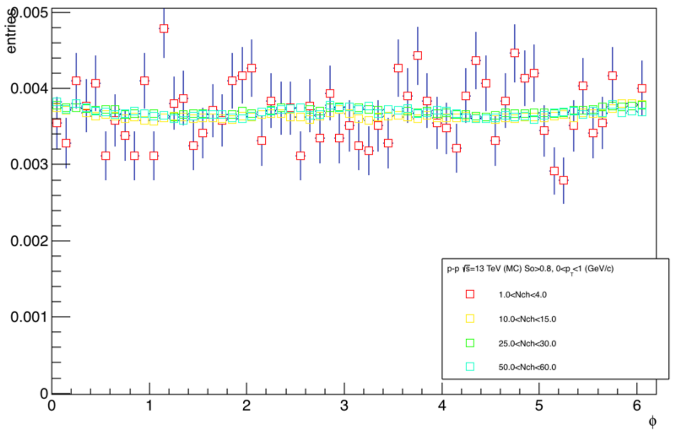


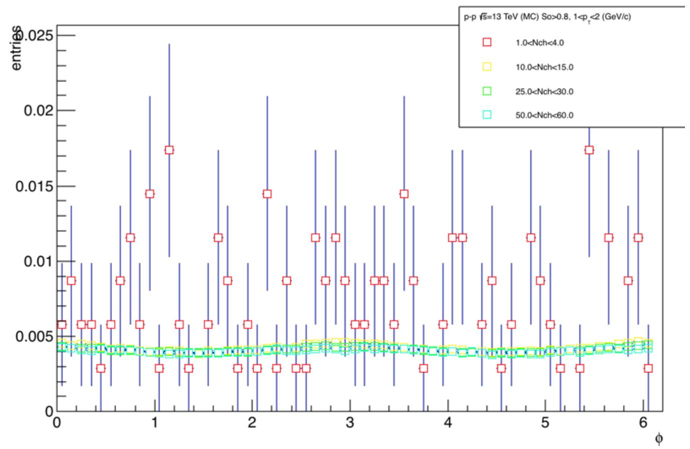


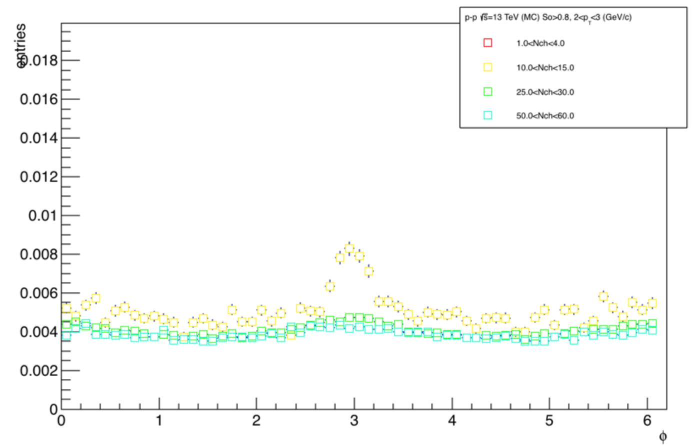


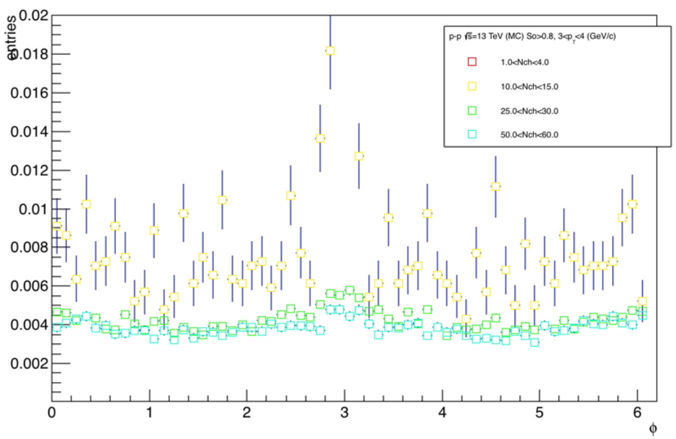
We see that for different samples within diff. p_T ranges, the behaviour of the phi distribution is independent of Nch.

To try to understand the behaviour with respect pT range, and Nch for fixed holes. Phi distributions for isotropic events









We see that for different samples within diff. p$_T$ ranges, is clear the dependence of the multiplicity and also the decreasing of statistics for low Nch when p$_T$ range increase