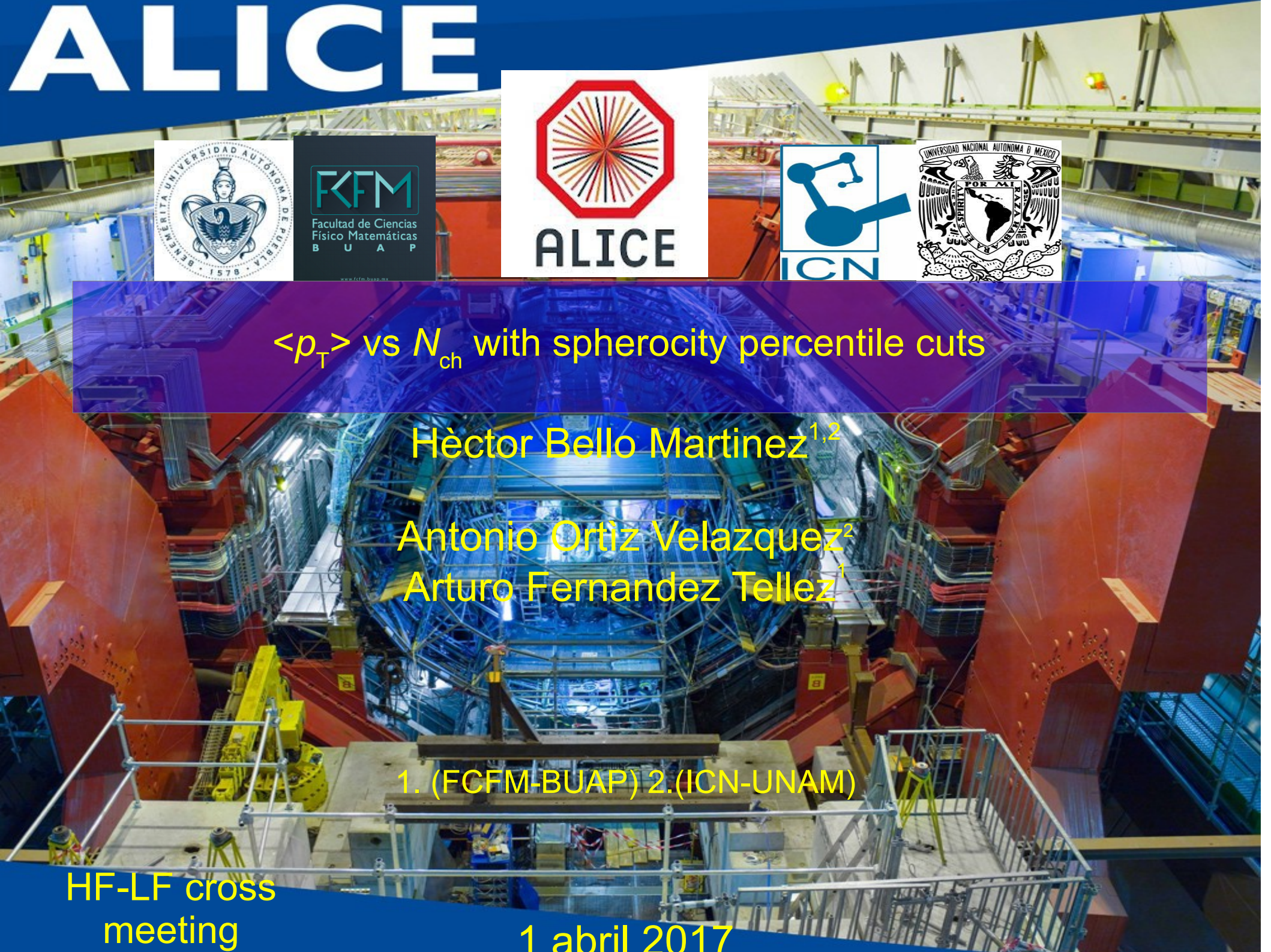


$\langle p_T \rangle$ vs N_{ch} with spherocity percentile cuts

Hèctor Bello Martinez[1,2]

Antonio Ortìz Velazquez[2]

Arturo Fernandez Tellez[1]

1. (FCFM-BUAP) 2.(ICN-UNAM)

HF-LF cross meeting

1 abril 2017

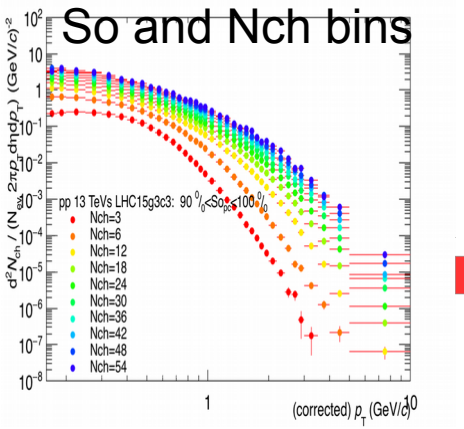
Short summary

Goal: $\langle p_T \rangle$ vs N_{ch} for charge part. in spherocity bins

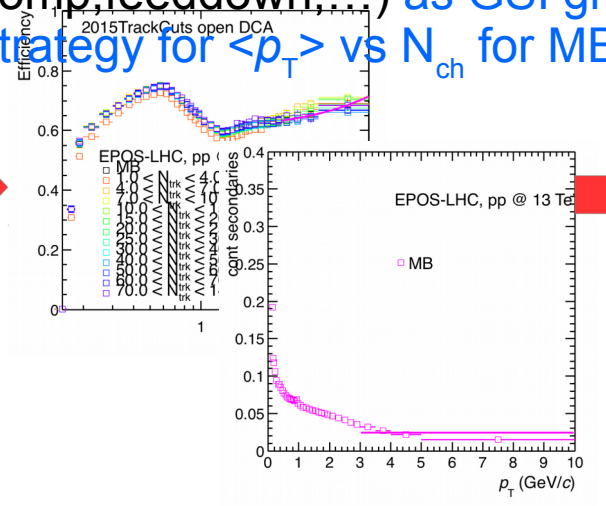
- Strategy for corrections
- Analysis update

Strategy in MC and data

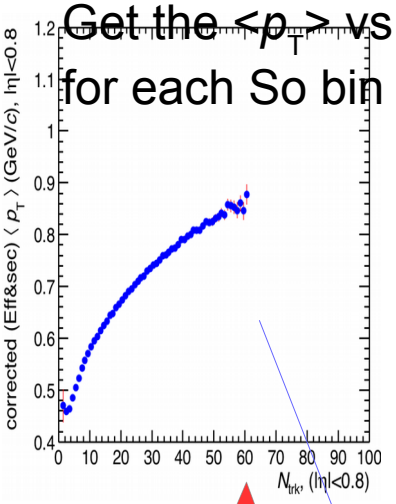
Get the spectra in So and Nch bins



Make corrections to spectra: efficiency, secondaries (particle comp,feeddown,…) as GSI group strategy for $\langle p_T \rangle$ vs N_{ch} for MB

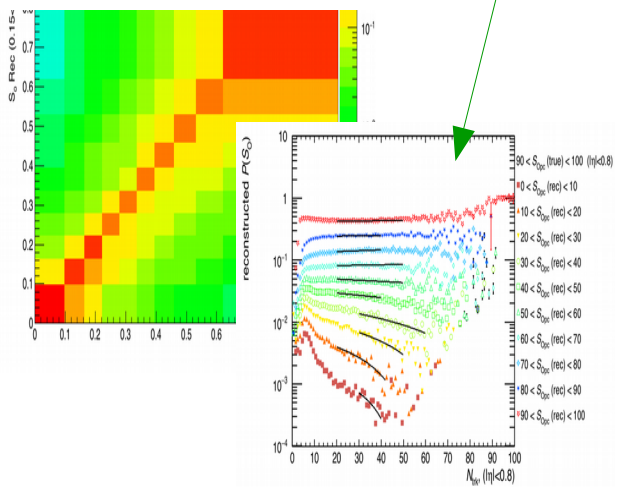


Get the $\langle p_T \rangle$ vs N_{ch} for each So bin



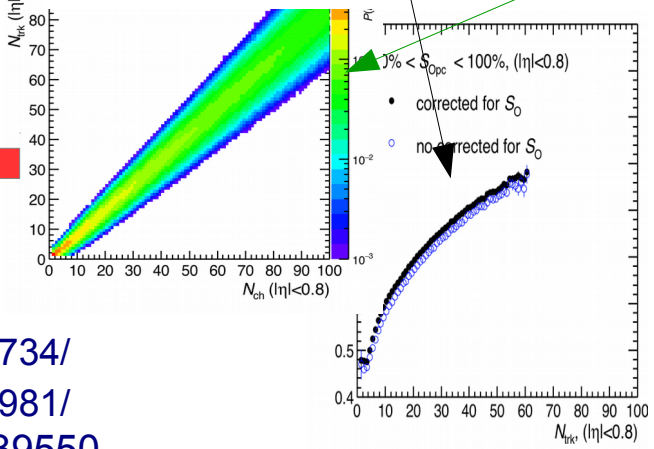
Unfold by Spherocity

$$\langle p_T \rangle (S_O^{corrected_i}) = \sum_{j=1}^{5} \langle p_T \rangle (S_O^{measured_j}) P(S_O^{measured_j})_{at\ S_O^{true_i}}$$

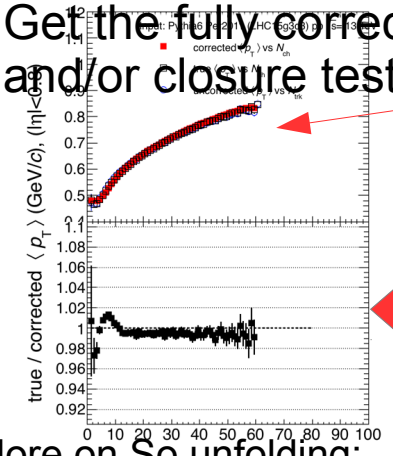


Unfold by Multiplicity

$$\langle p_T \rangle (N_{ch}, S_O^{corrected_i}) = \sum_m \langle p_T \rangle (N_m, S_O^{corrected_i}) \times R(N_t, N_m)$$



Get the fully corrected and/or closure test



More on So unfolding:

- https://indico.cern.ch/event/477734/
- https://indico.cern.ch/event/437981/
- https://indico.cern.ch/event/339550
- https://indico.cern.ch/event/325445
- https://indico.cern.ch/event/356335/

Hèctor Bello Martinez

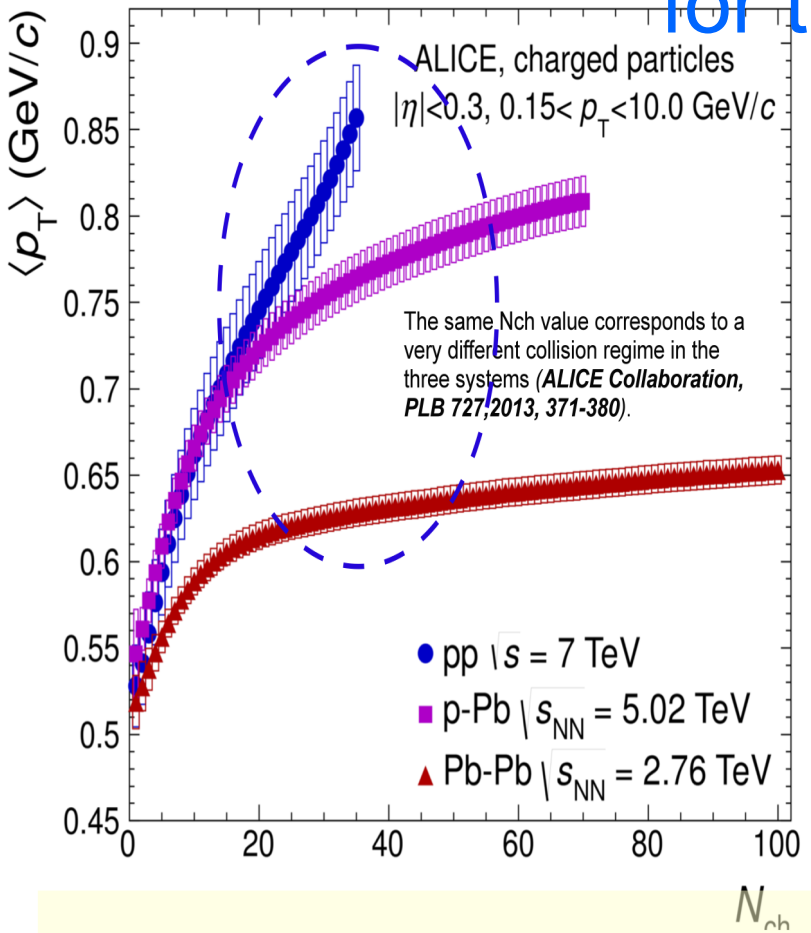
Analysis update

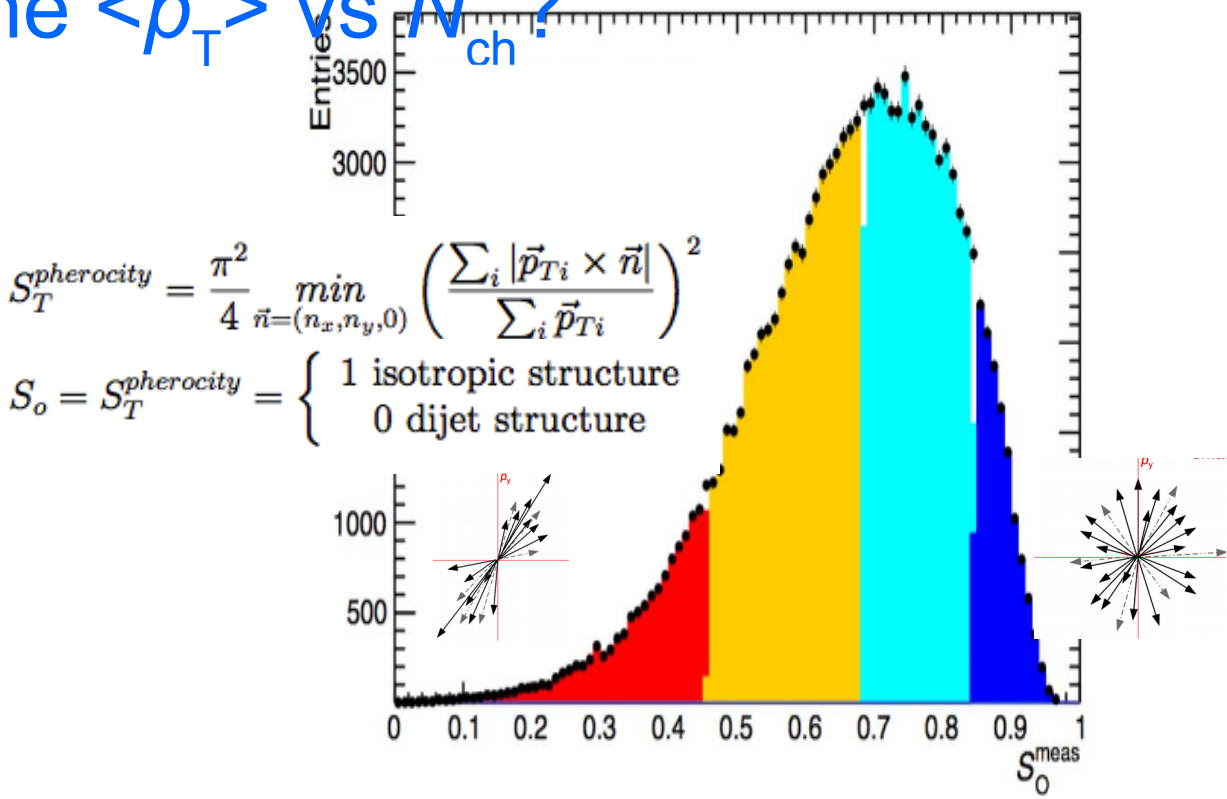
- Why an So analysis in N_{ch}bin=1 and So percentil?
- $\langle p_T \rangle$ in So percentile bins corrected by eff. & sec.

  Pythia Perugia 2011(LHC15g3c3)with EPOS-LHC (LHC16d3)
- Response normalized for So_{med} vs So_{true} for EPOS

  in So bins size = 10% perc and N_{ch} bin size=1.
- Spherocity unfolding procedure and closure test $\langle p_T \rangle$ vs N_{ch} in So percentile bins

- Why a So analysis with N_{ch} bin=1 and So percentil for the $\langle p_T \rangle$ vs N_{ch}?





With a N_{ch} bining of size 1 will allow us to see the first and second rise

A study with So could also help to understand this behaviour

Taking So percentiles as binning give us better statistics for the event shape selection
This are build in percentages of the P(So) distribution

For 13 TeV some results shown don't considere the So percentil binning
https://indico.cern.ch/event/477734/
https://indico.cern.ch/event/437981/

- 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

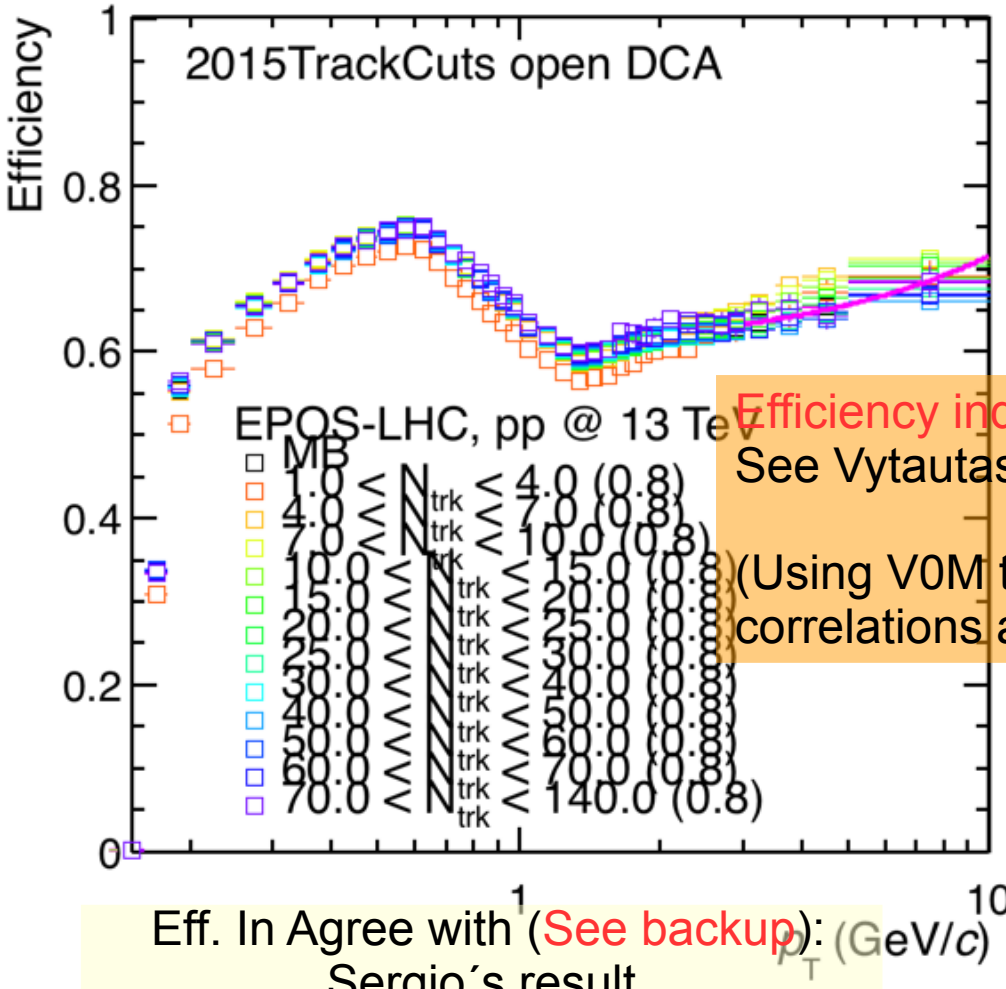
- Sphero(i)city is reconstructed using more than two tracks with transverse momentum greater than 0.15 GeV/c and within $|\eta| < 0.8$. Three sets of cuts were tested:
  - TPC: GetStandardTPCOnlyTrackCuts()+TPCrefit
  - Hybrid: CreateTrackCutsPWGJE(10001008)+CreateTrackCutsPWGJE(10011008)
  - Standard: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

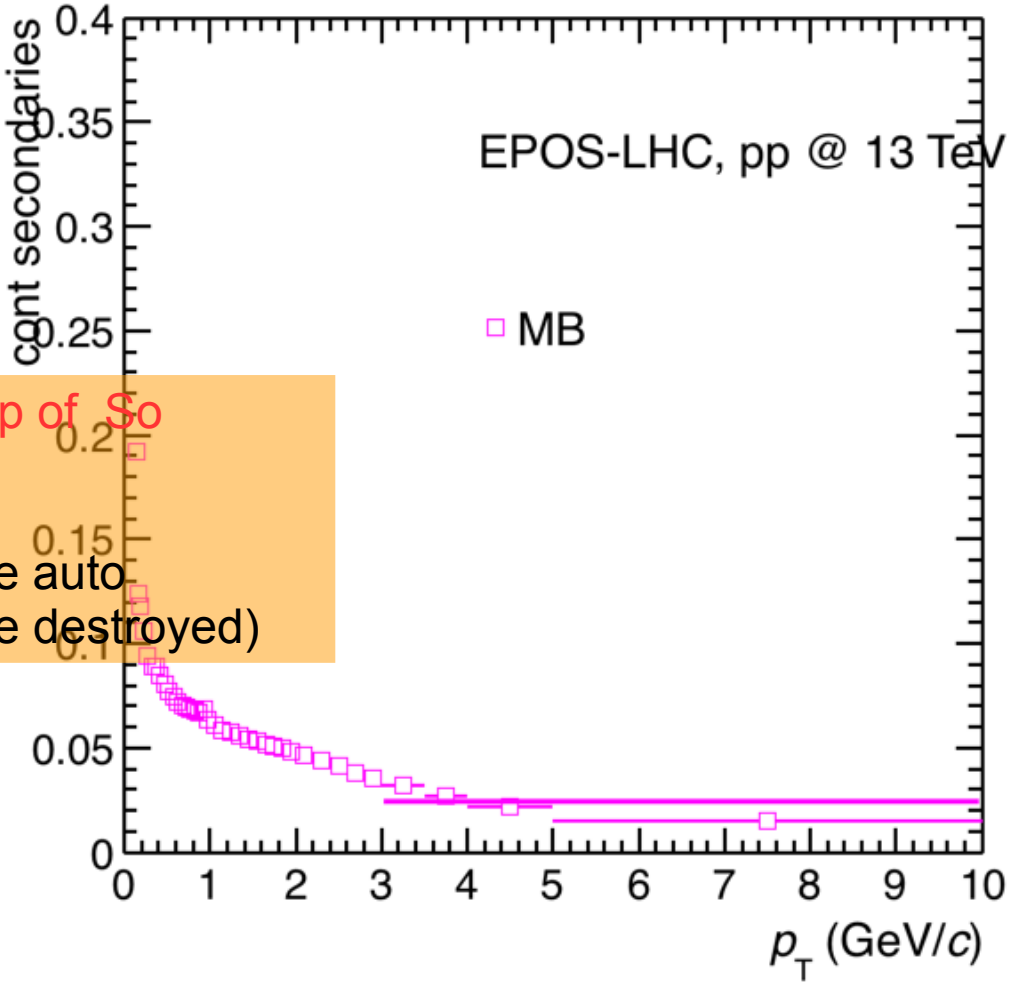
https://twiki.cern.ch/twiki/bin/view/ALICE/PWGPPEvSelRun2pp

• Efficiency & secondaries EPOS-LHC(LHC16d3)



Efficiency indep of S_0
See Vytautas

(Using V0M the auto correlations are destroyed)

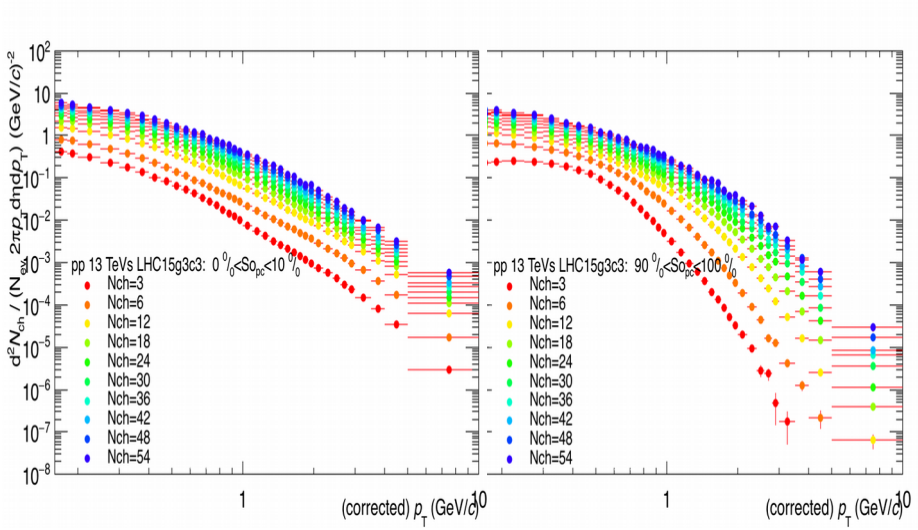


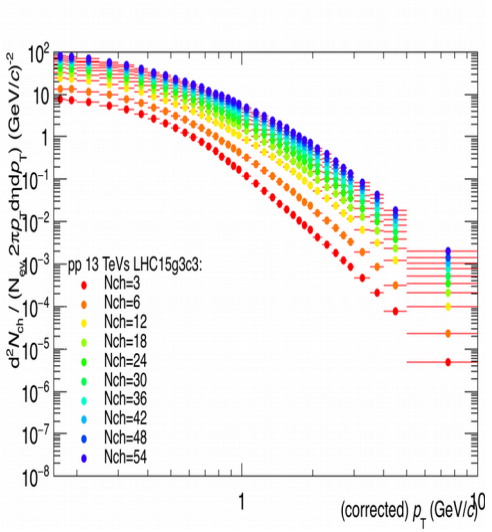
Eff. In Agree with (See backup):
Sergio´s result
LHC15g3a3 (Monash) pp13 |eta|<0.8
Analysis Note:
https://aliceinfo.cern.ch/Notes/node/564
Edgar´s result
LHC15l1b2 (Per11) pp5.02 |eta|<0.8
Analysis Note:
https://aliceinfo.cern.ch/Notes/node/472

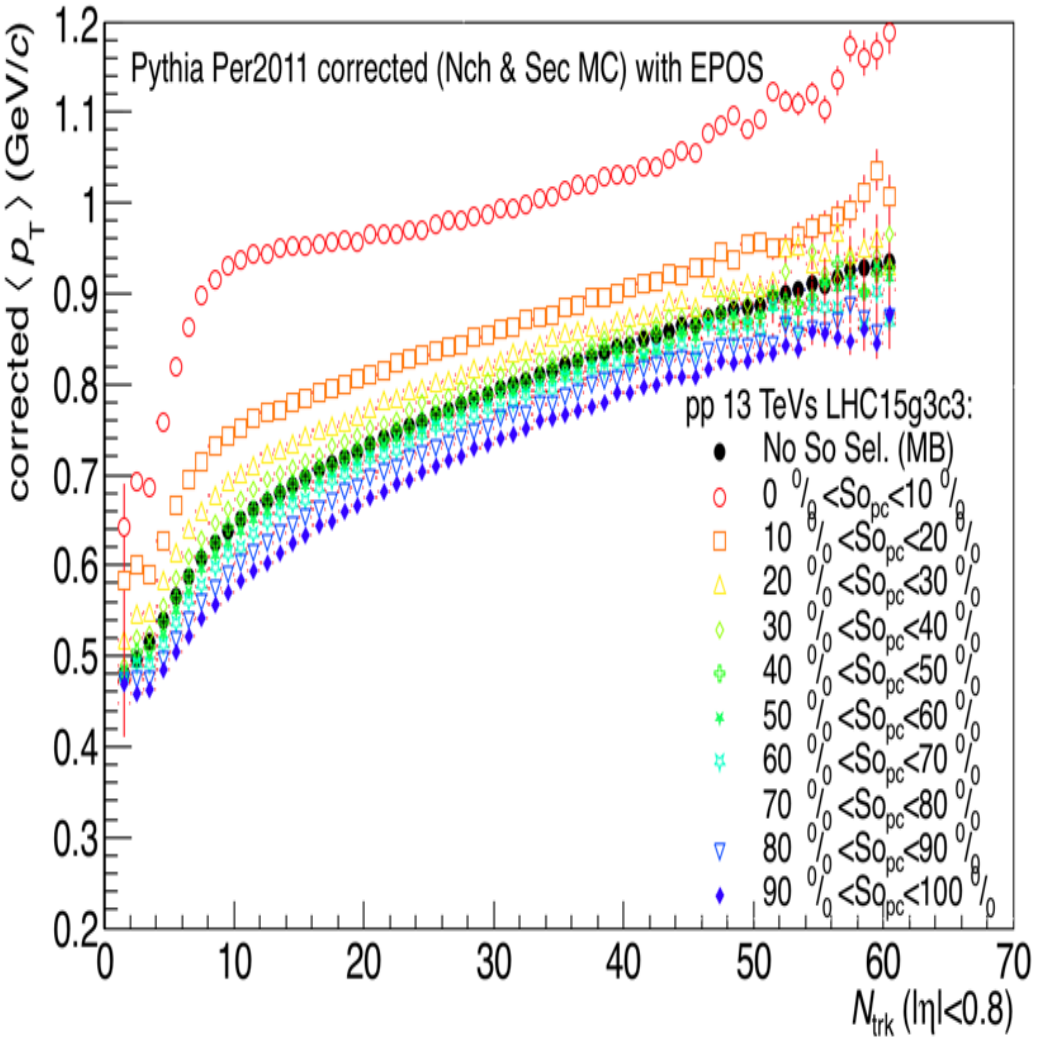
For secondaries we are just testing with MC
For data a more complete analisys must be done (particle composition, feed-down corrections …) like GSI analysis for $\langle p_T \rangle$ MB

$\langle p_T \rangle$ for different So_{pc} bins **corrected by efficiency and secondaries**.

Pythia Per2011 (LHC15g3c3) as data corrected with EPOS-LHC (LHC16d3)

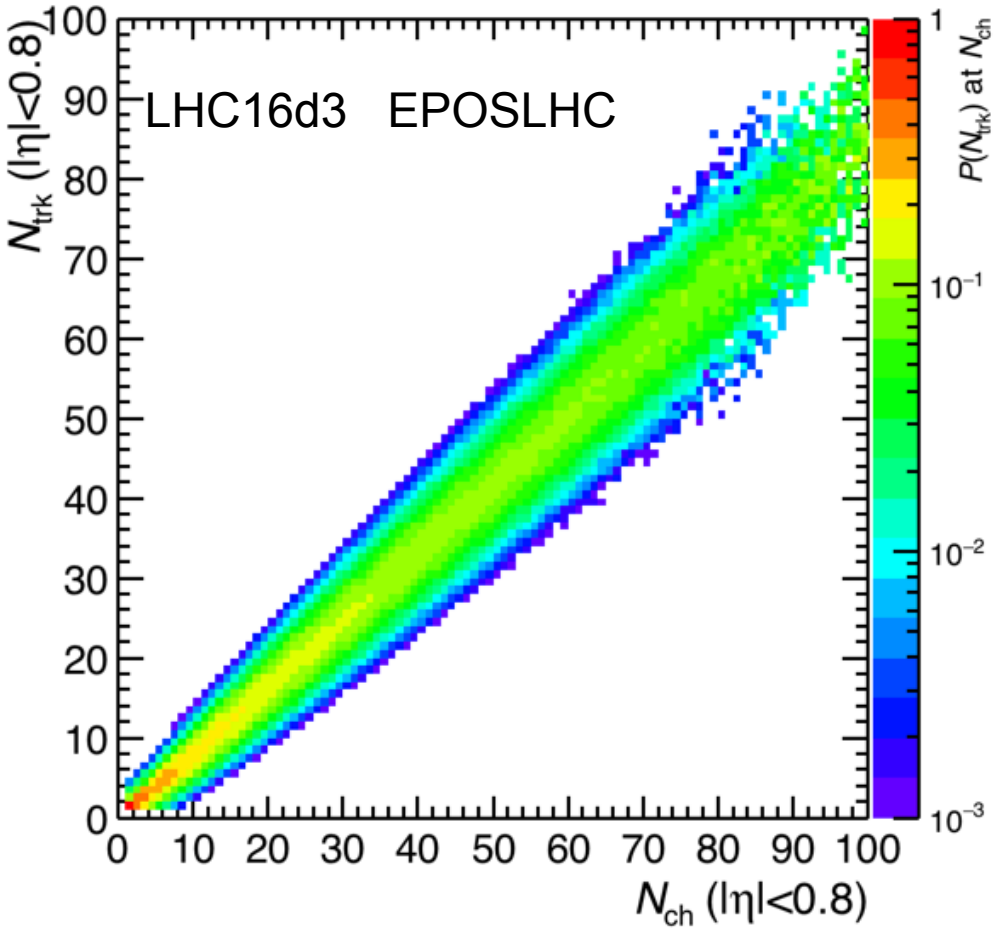




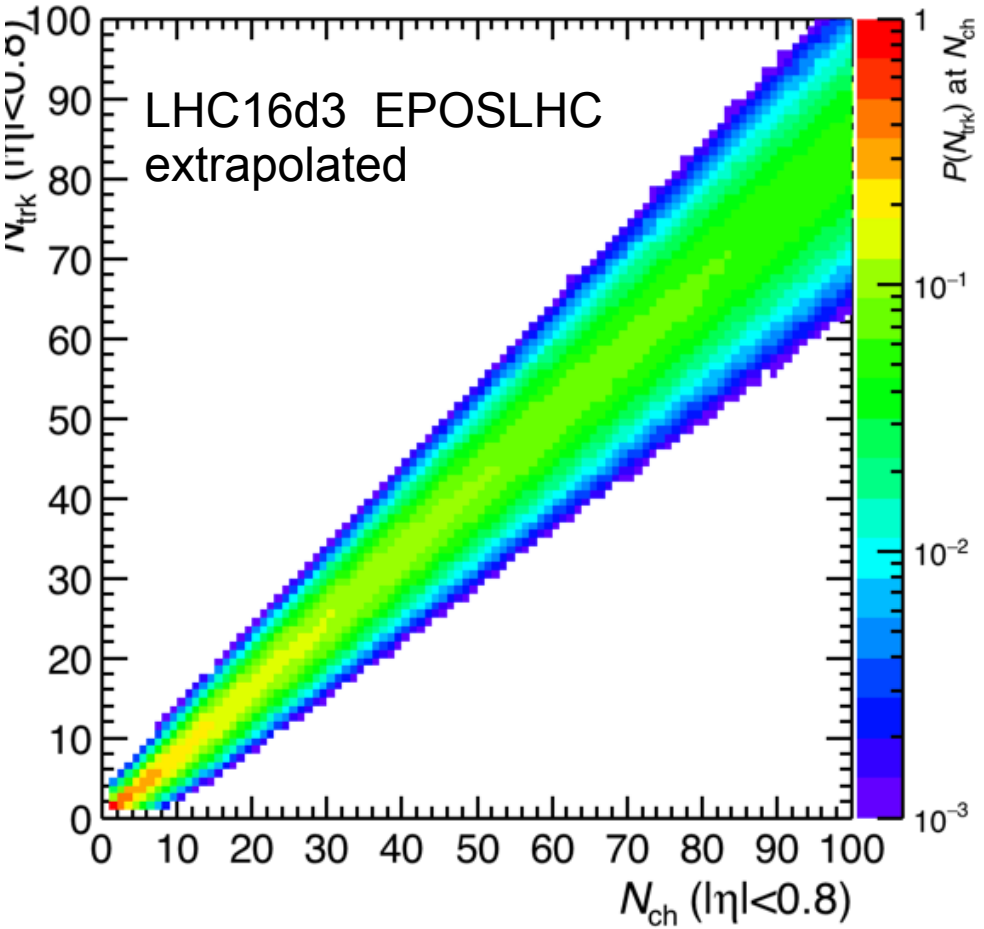


- Nch response matrix to correct by Multiplicity

First



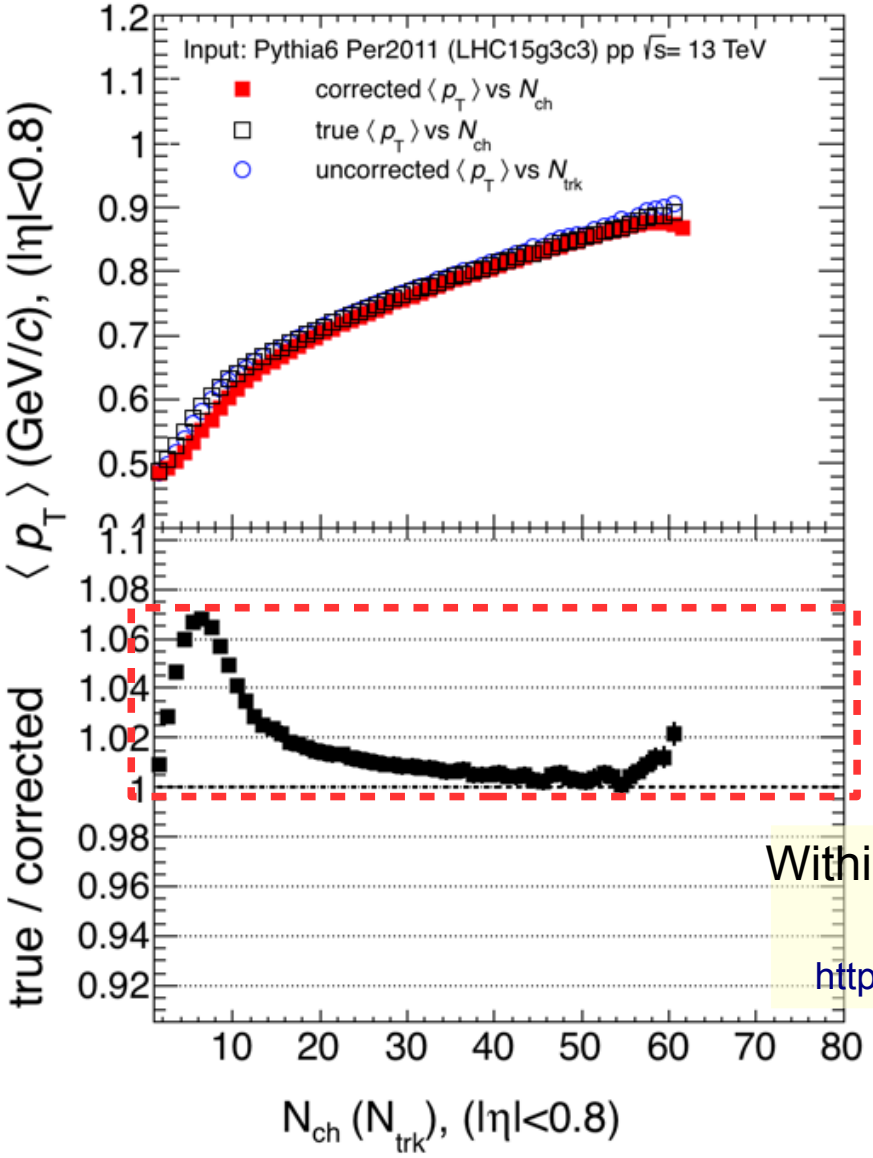
Extrapolated



We will use EPOS-LHC for correction

Inclusive $\langle p_T \rangle$ vs N_{ch} Unfolded (corr. by N_{ch})and closure test.

Pythia Per2011 (LHC15g3c3) as data corrected with EPOS-LHC (LHC16d3)



For correction of multiplicity we based on:

$$\langle p_T \rangle(N_{ch}) = \sum_m \langle p_T \rangle(N_m) \times R(N_t, N_m)$$

where, R is the multiplicity response matrix.

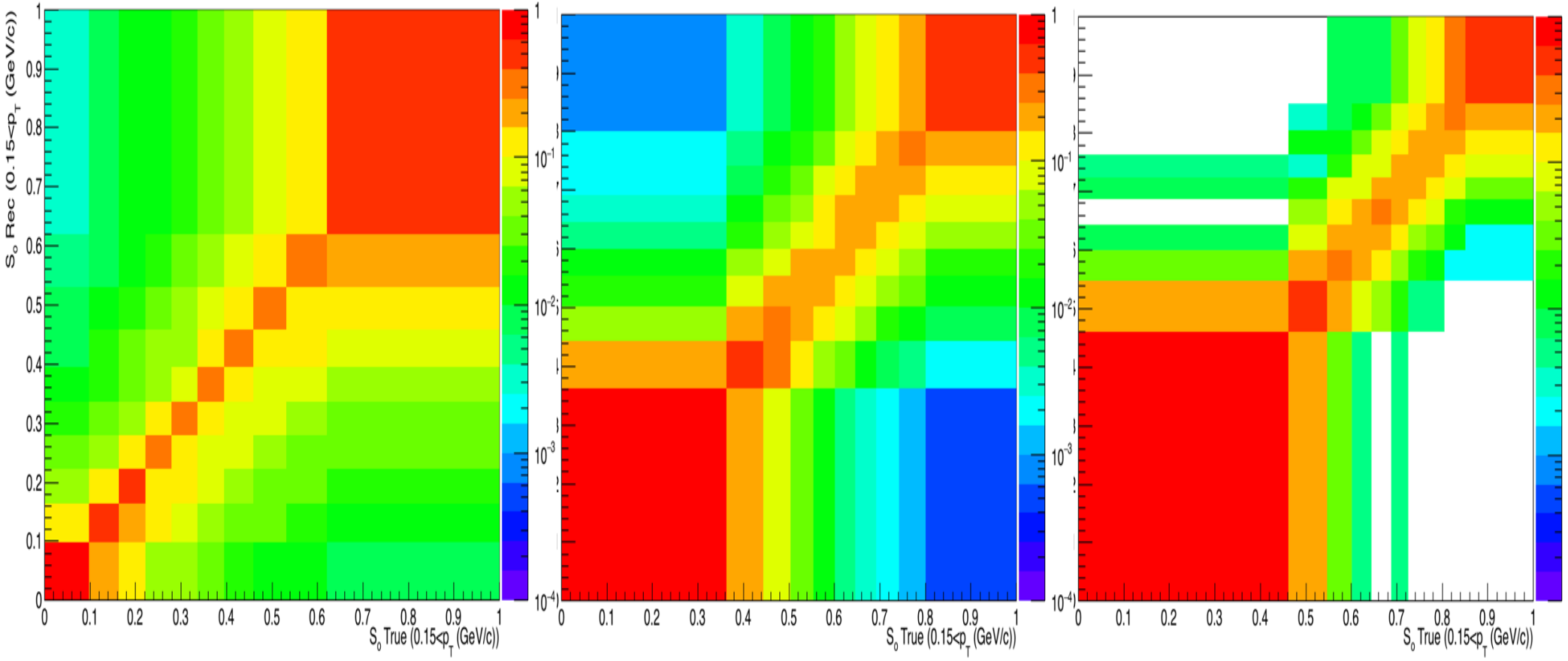
- Correc: Per2011 ESD corr with EPOS-LHC
- True: Per2011 MC
- Unc: Per2011 ESD

Within 7% for low N_{ch} as reported in Analysis Note:
https://aliceinfo.cern.ch/Notes/node/177

Normalized response matrix ($So_{measured}$ vs So_{true} in bins of 10% So percentil)

- This was done with EPOS-LHC, to unfold (via So) Pythia Per2011 as data

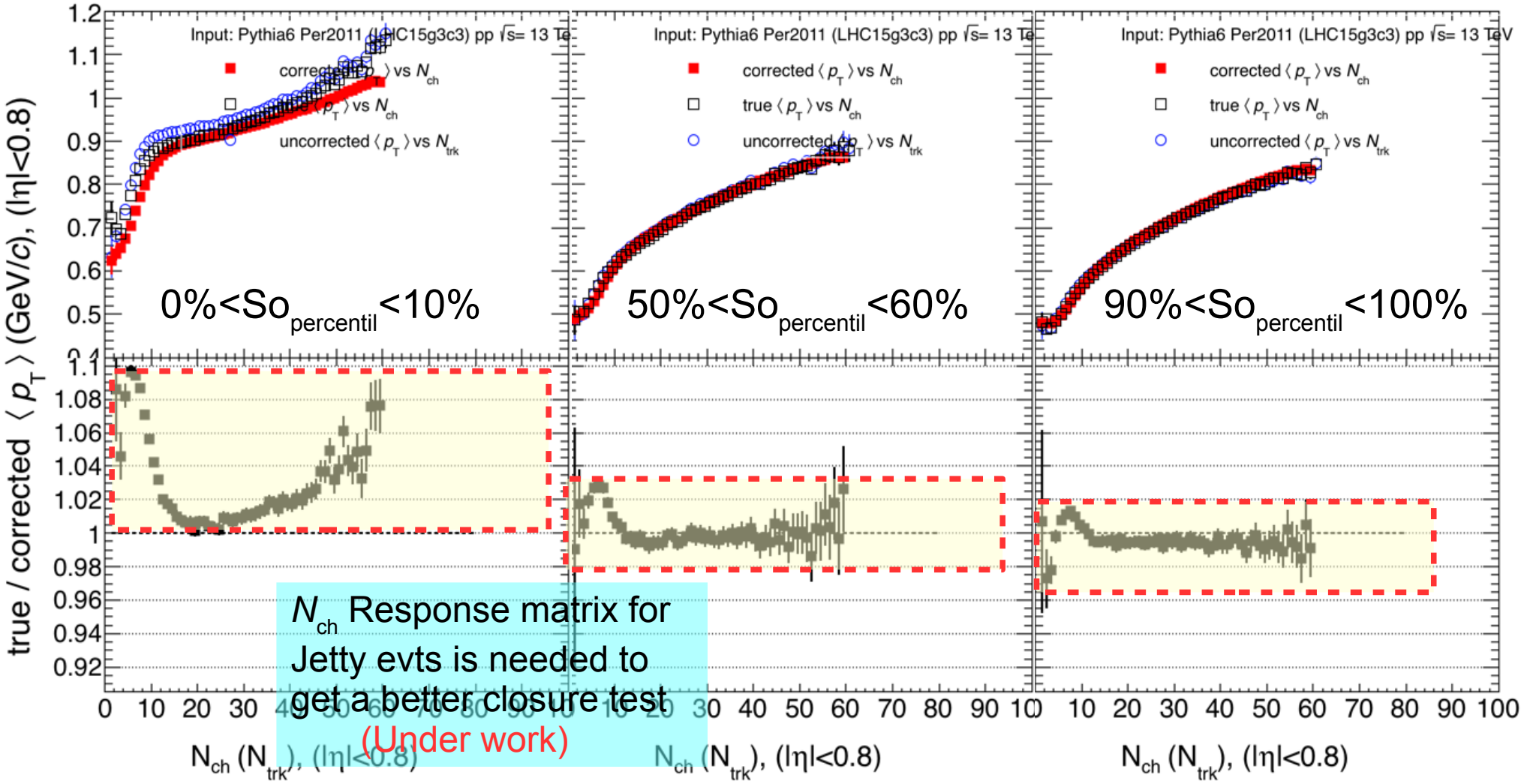
Nch=5 Nch=25 Nch=60



All entries to 10% of Sopc are of the same order

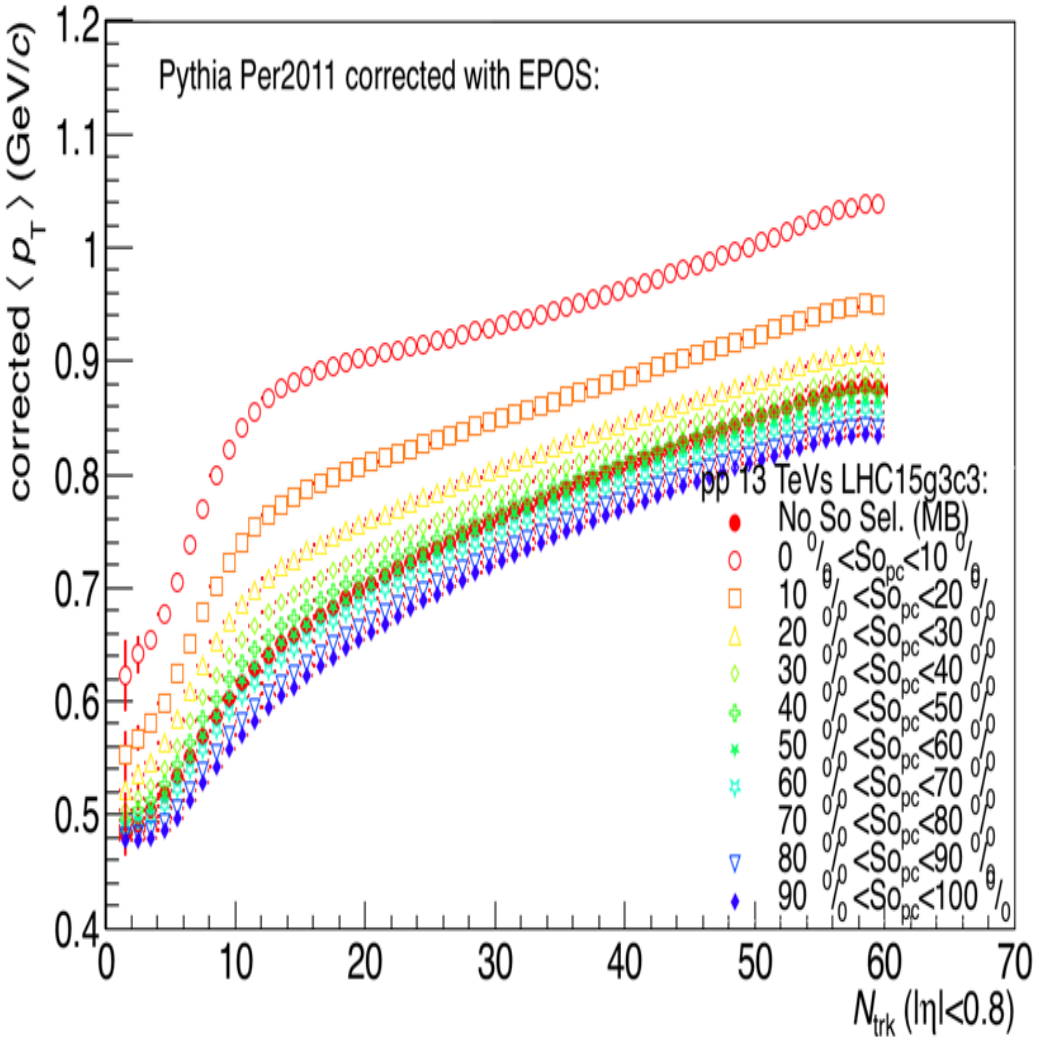
$\langle p_T(So_{corr}, Nch_{corr}) \rangle$ UNFOLDED by N_{ch} Pythia Per2011 used as data Using EPOS-LHC (LHC16d3)

$$\langle p_T \rangle (N_{ch}, S_O^{corrected_i}) = \sum_m \langle p_T \rangle (N_m, S_O^{corrected_i}) \times R(N_t, N_m)$$



$\langle p_T \rangle$ vs N_{ch} in different So_{pc} bins for

Pythia Per2011 (LHC15g3c3) as data fully corrected using EPOS-LHC (LHC16d3)



Conclusions

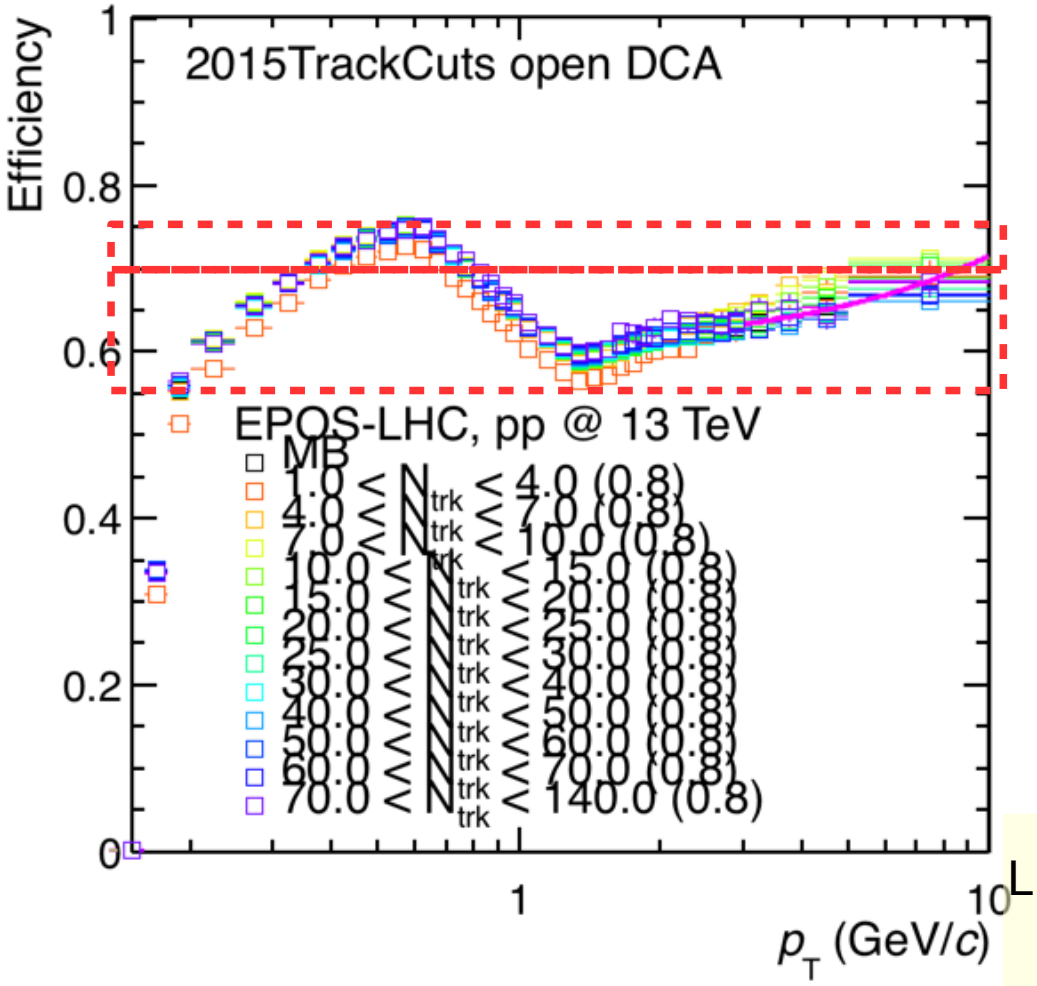
- Spherocity response matrix and proyection for EPOS-LHC in each bin of Nch and in spherocity bins corresponding to the 10% So perc ready for corrections
- Closure test has been made for inclusive charge particles
- Closure test also done for Spherocity intervals

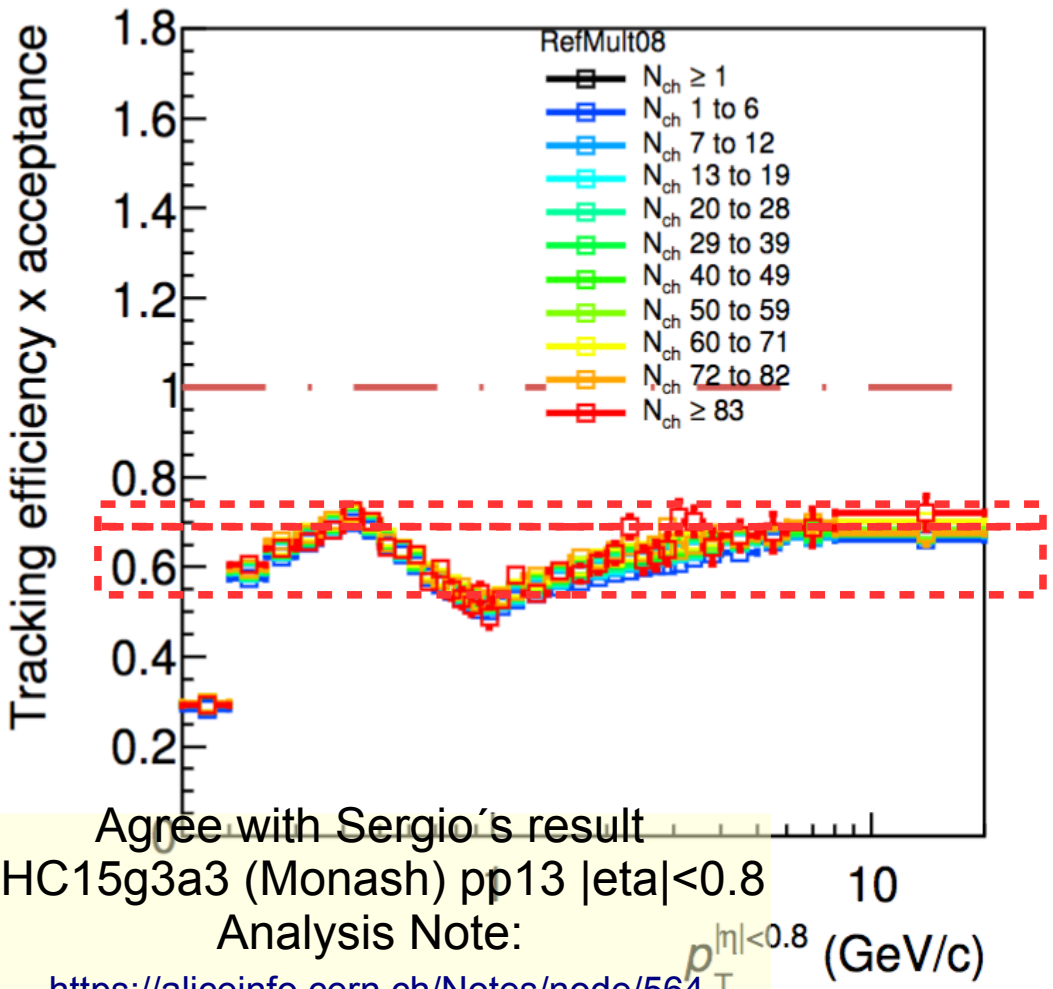
To do

- Do the same with data.

Backup

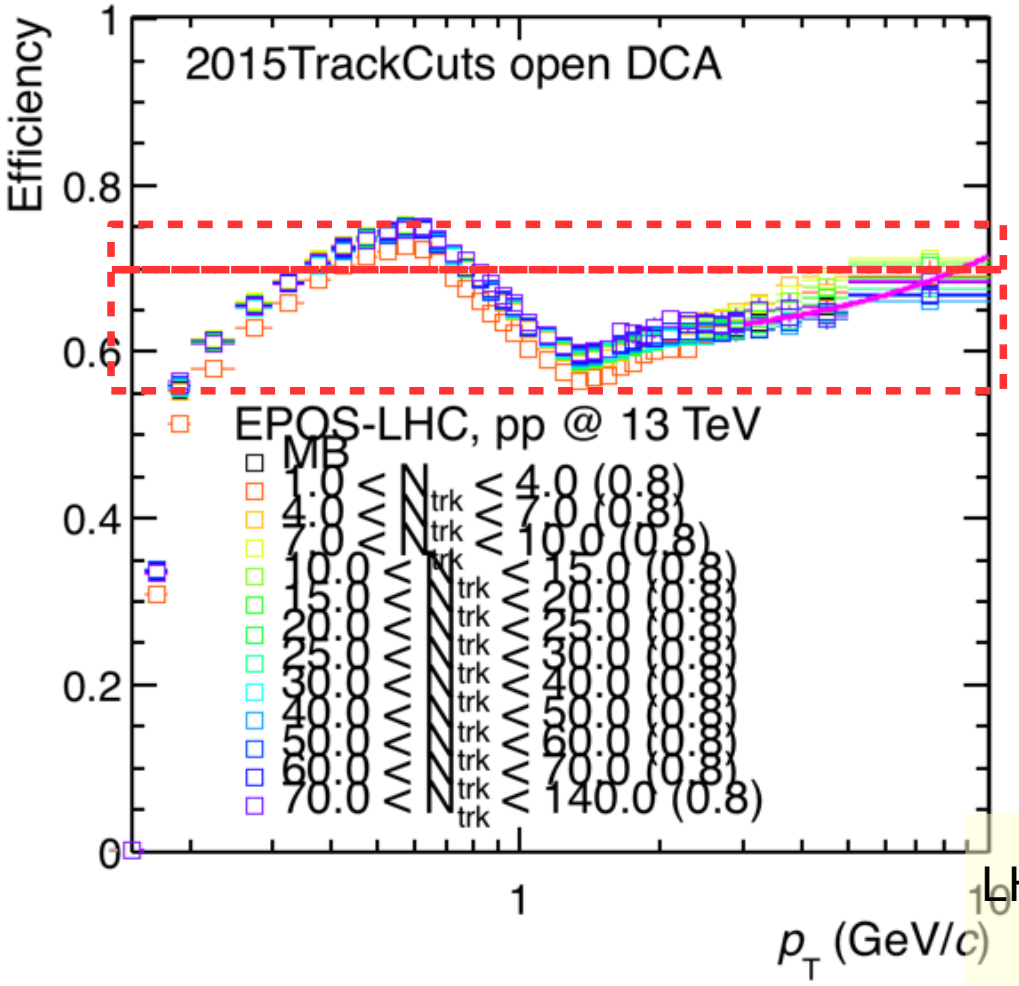
- # Efficiency & secondaries EPOS-LHC(LHC16d3)

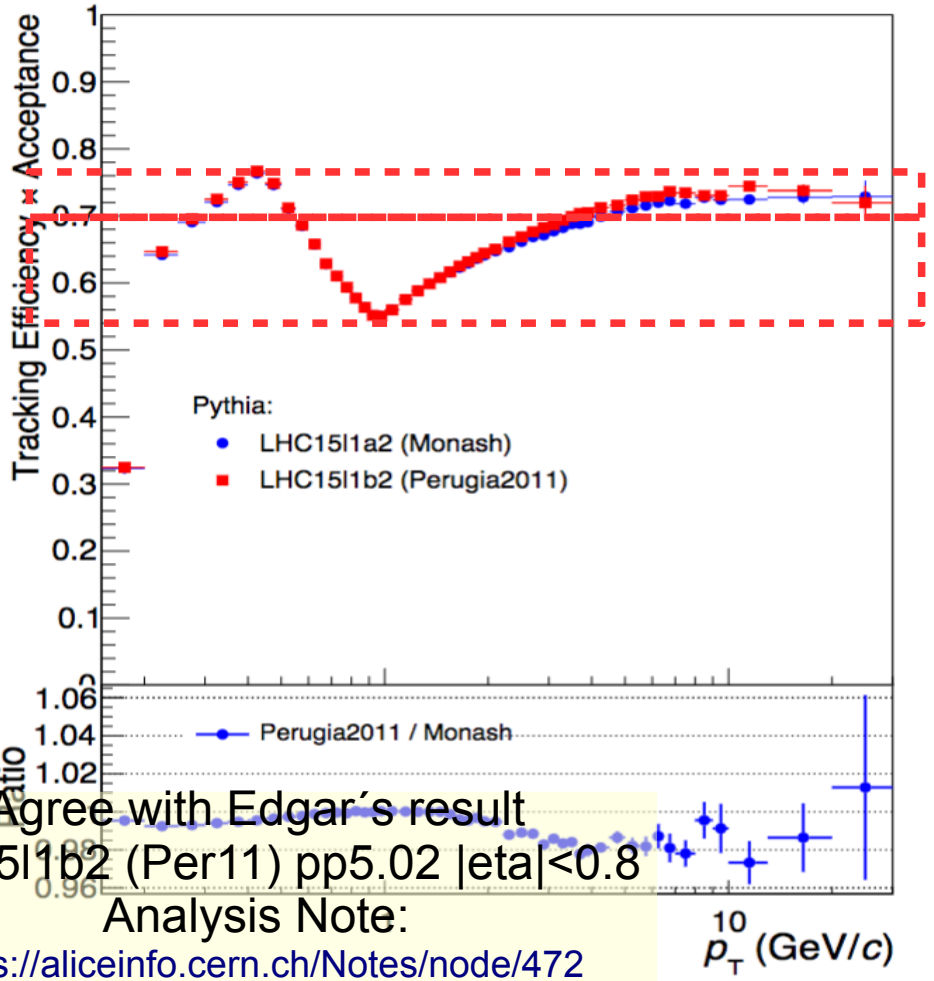




Agree with Sergio´s result
LHC15g3a3 (Monash) pp13 |eta|<0.8
Analysis Note:
https://aliceinfo.cern.ch/Notes/node/564

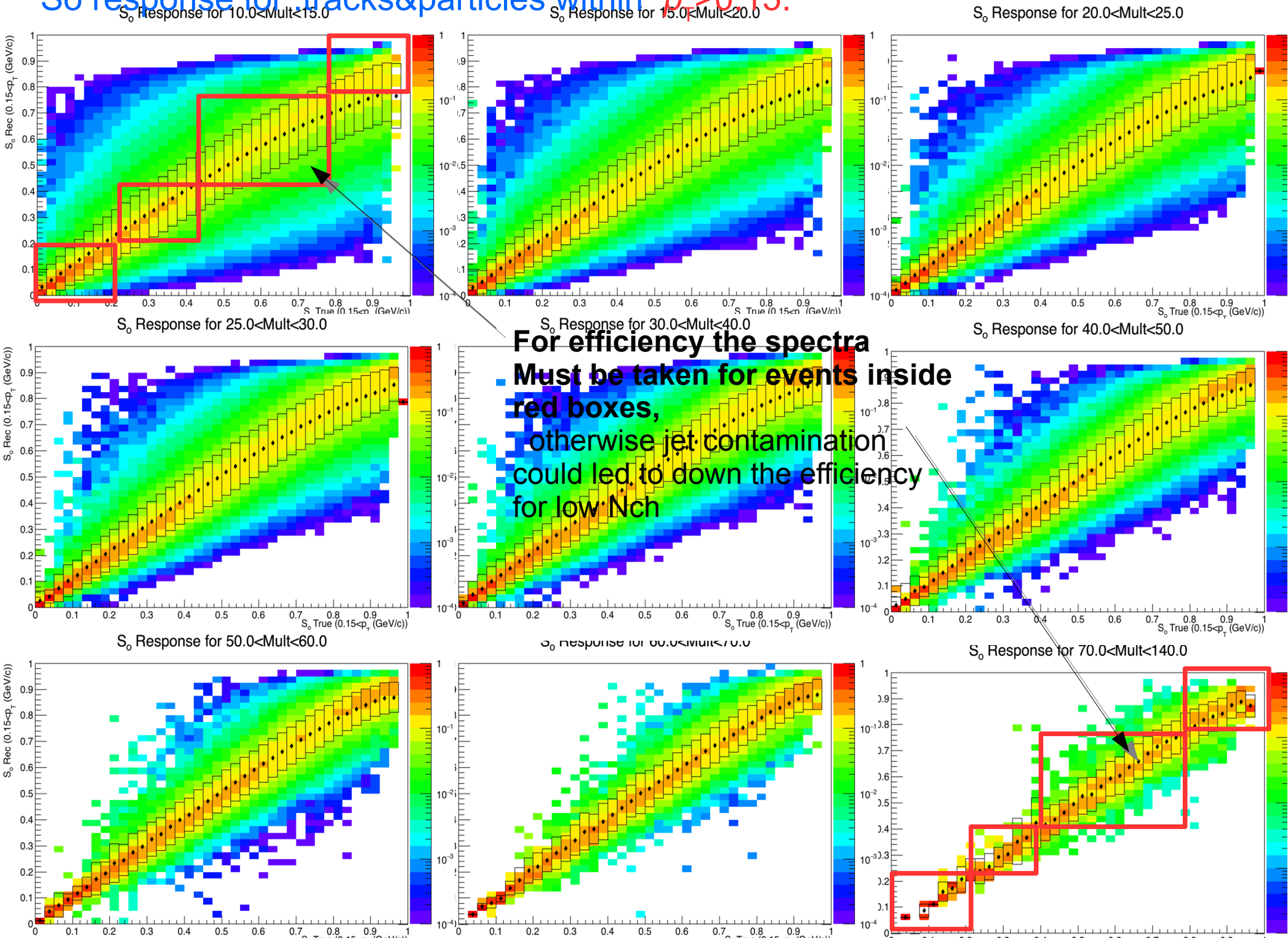
- # Efficiency & secondaries EPOS-LHC(LHC16d3)





Agree with Edgar´s result
LHC15l1b2 (Per11) pp5.02 |eta|<0.8
Analysis Note:
https://aliceinfo.cern.ch/Notes/node/472

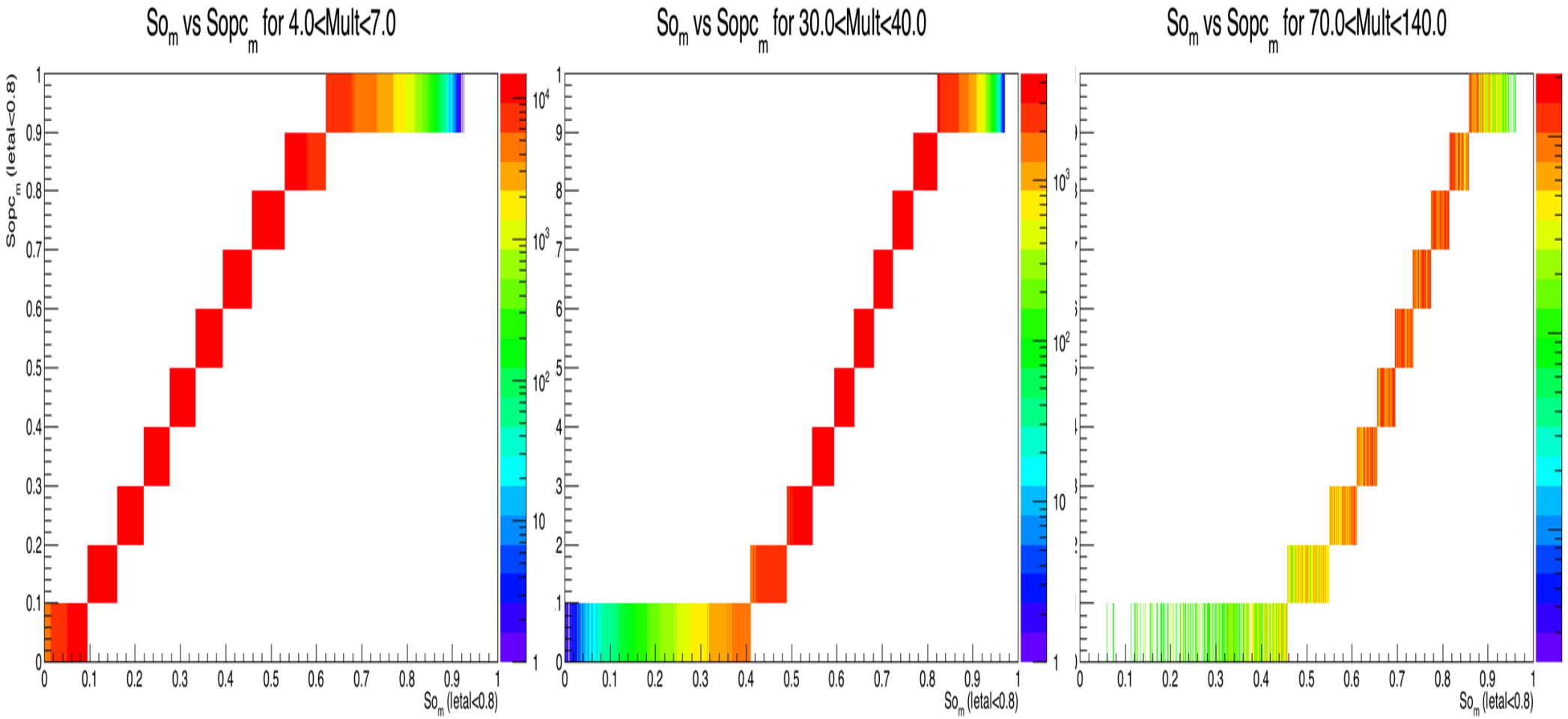
So response for tracks&particles within p_T>0.15.



For efficiency the spectra Must be taken for events inside red boxes,
otherwise jet contamination could led to down the efficiency for low Nch

So response (som vs somperc) To GET the Intervals in data for percentiles

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



So response (som vs somperc)

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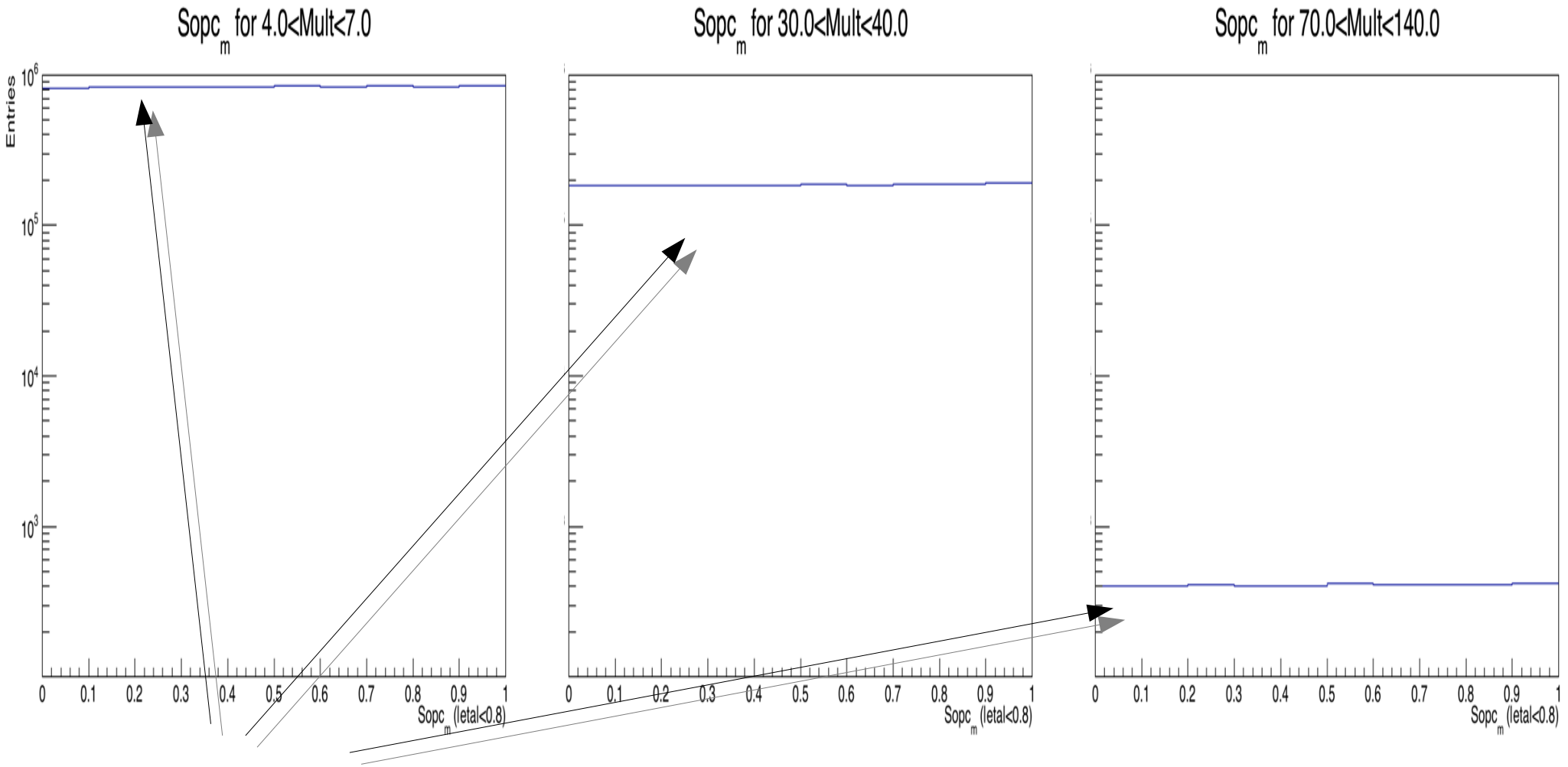

All entries to 10% of Sopc are of the same order

For So UNFOLD Probability of rec So vs Nch_measured for true So percentiles

Using EPOS-LHC $\langle p_T \rangle (S_O^{corrected_i}) = \sum_{j=1}^{5} \langle p_T \rangle (S_O^{measured_j}) P(S_O^{measured_j})_{at\ S_O^{true_i}}$