



中国科学技术大学

University of Science and Technology of China

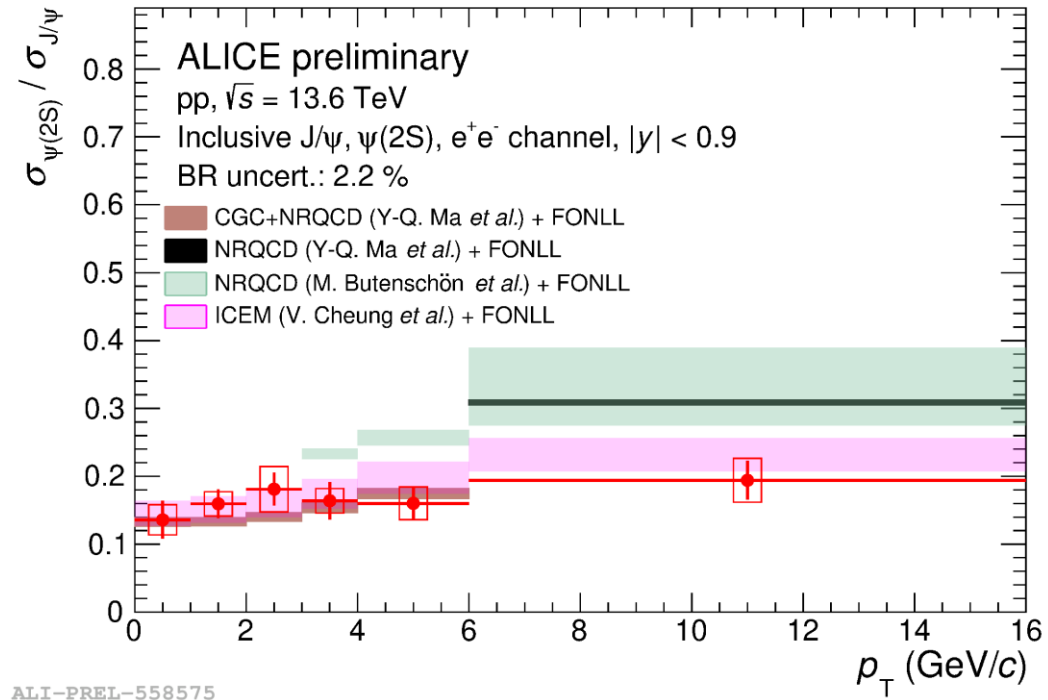
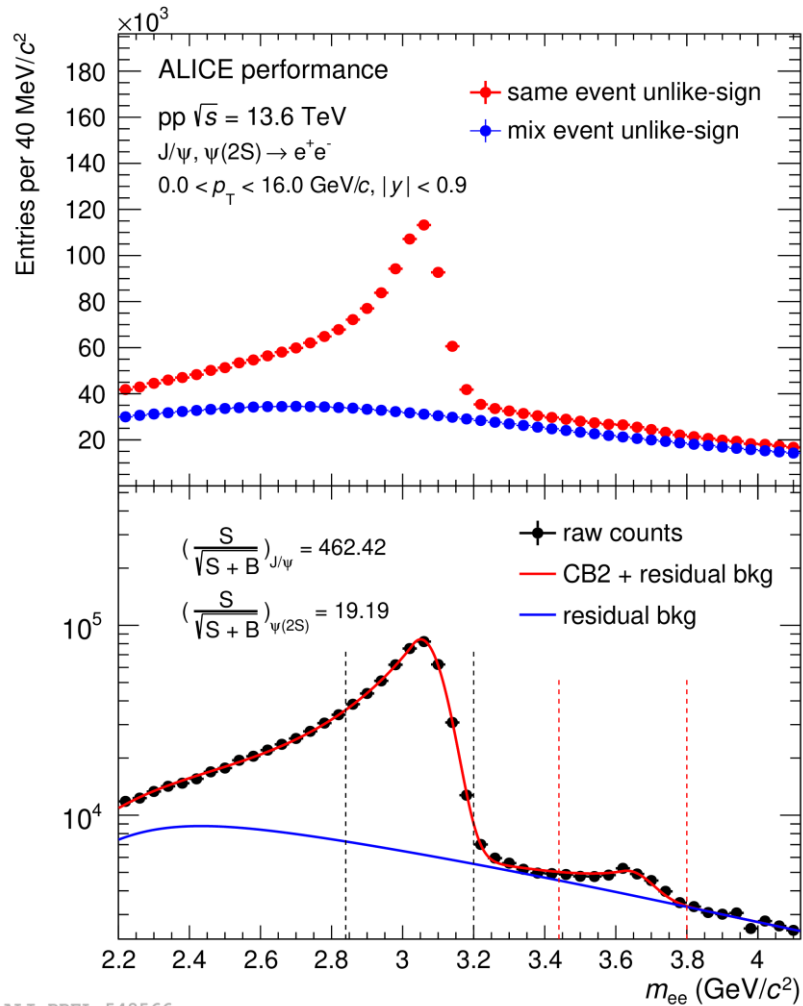
Update on the measurement of $\psi(2S)$ -to- $J\psi$ ratio at midrapidity in Run 3

Yuan Zhang

$J\psi$ 2ee PAG meeting

2024/11/11

Preliminary results



Previous preliminary results measured using LHC22 pass4 data.
 Analysis note:

https://alice-notes.web.cern.ch/system/files/notes/analysis/1476/2023-09-13-Jpsi_2s_ratio_analysis_notes_v3.pdf

Datasets

- ❑ LHC22 pass7 skimmed

LHC22m, LHC22o, LHC22p, LHC22r, LHC22t

- ❑ LHC23 pass4 skimmed

LHC23f, LHC23g, LHC23h, LHC23j, LHC23k, LHC23l, LHC23m, LHC23n, LHC23o, LHC23q, LHC23r, LHC23s, LHC23t, LHC23u, LHC23v, LHC23w, LHC23y, LHC23z, LHC23za, LHC23zb, LHC23zc, LHC23zd, LHC23ze, LHC23zf, LHC23zg, LHC23zh, LHC23zi, LHC23zj, LHC23zk, LHC23zm, LHC23zn, LHC23zq, LHC23zr, LHC23zs, LHC23zt

- ❑ LHC24 pass1 skimmed

LHC24af, LHC24ag, LHC24aj

Analysis cuts

□ Triggers:

- ✓ fDiElectron

□ Event selection:

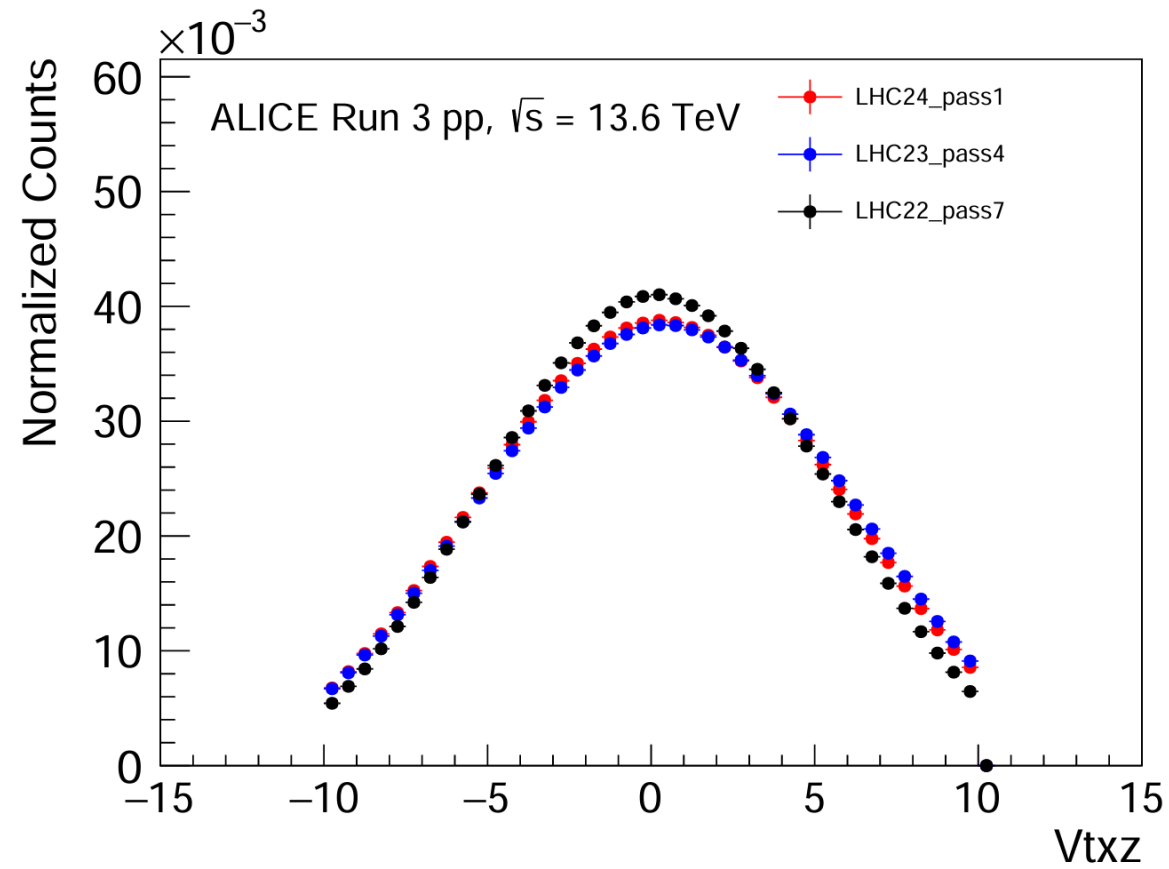
- ✓ $|VtxZ| < 10$ cm
- ✓ lsel8
- ✓ NoTFBorder

□ Track cuts:

- ✓ $pT > 1$ GeV/c
- ✓ $|\eta| < 0.9$
- ✓ ITSncls > 2
- ✓ ITSibany
- ✓ ITSchi2 < 5
- ✓ TPCncls > 90
- ✓ TPCchi2 < 4
- ✓ $|DCAxy| < 1$ cm
- ✓ $|DCAz| < 1$ cm

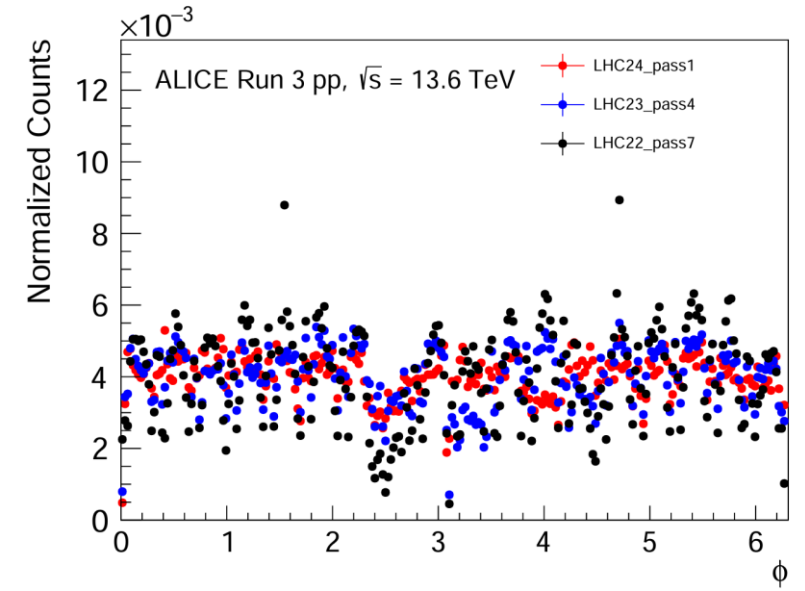
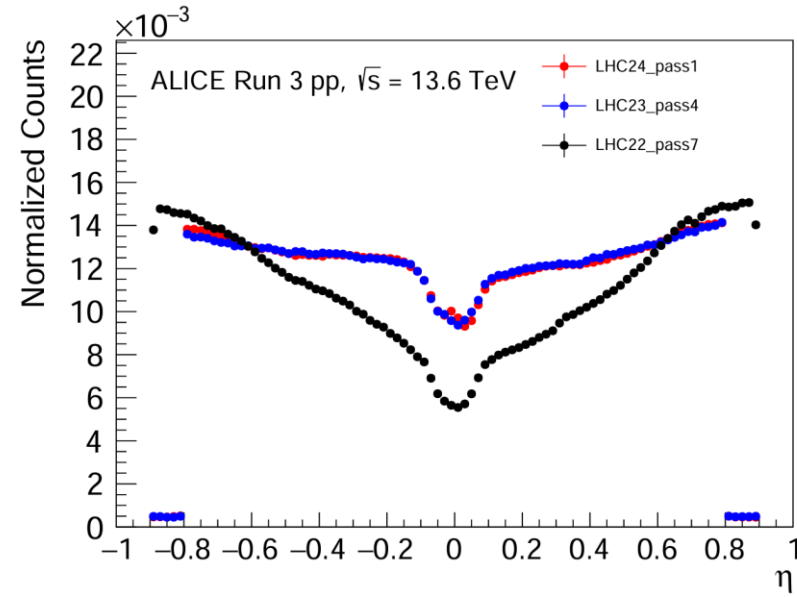
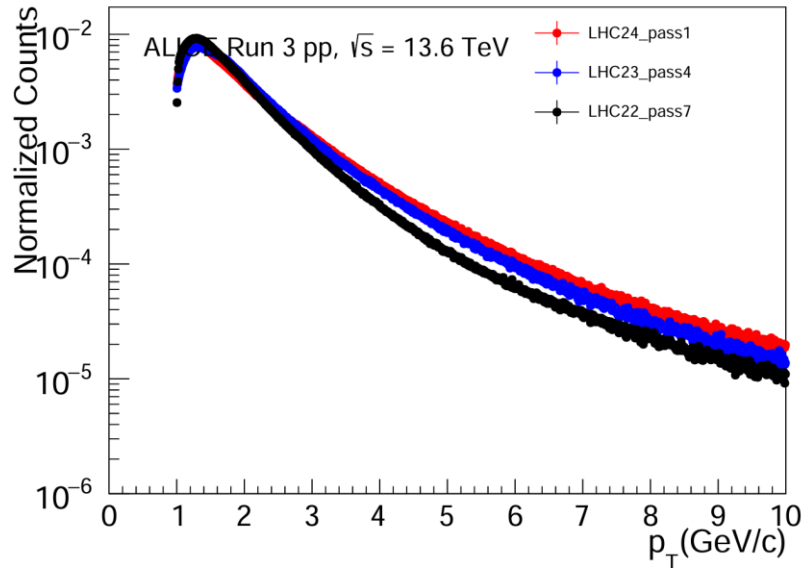
- ✓ $-2 < TPCnSigmaE < 3$
- ✓ TPCnSigmaPi > 3
- ✓ TPCnSigmaPr > 3

VtxZ



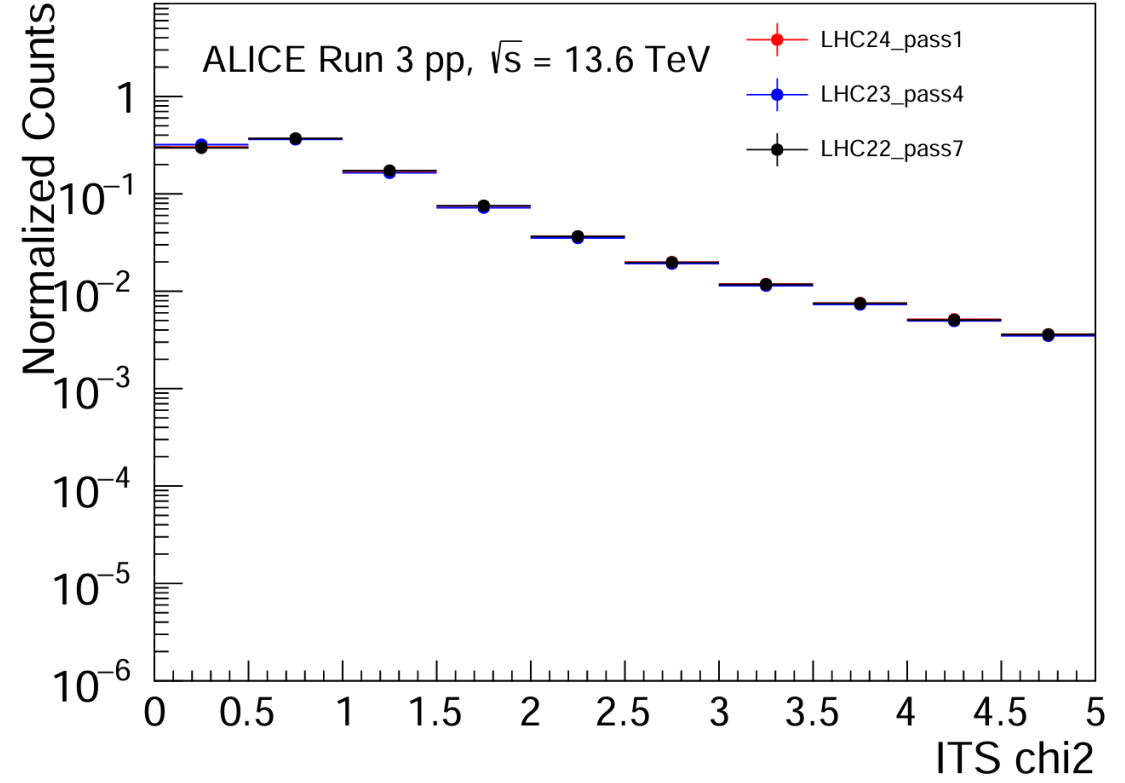
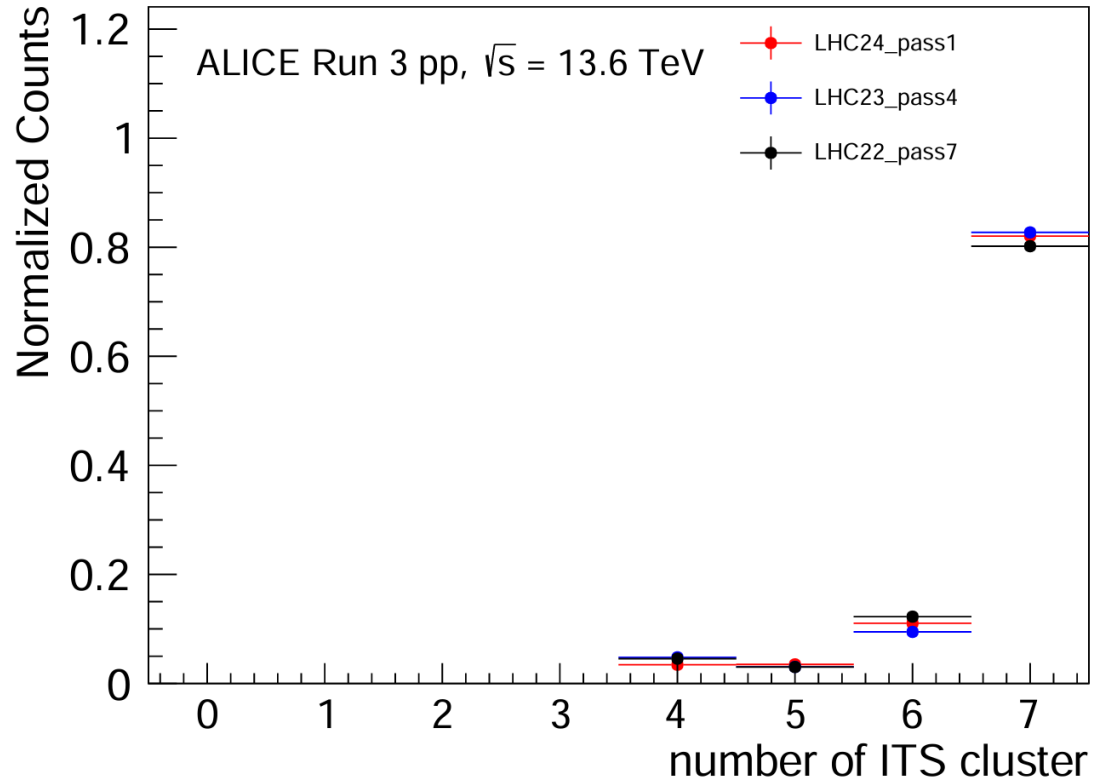
- VtxZ distribution are slightly different for LHC22 pass7

Kinematics comparison



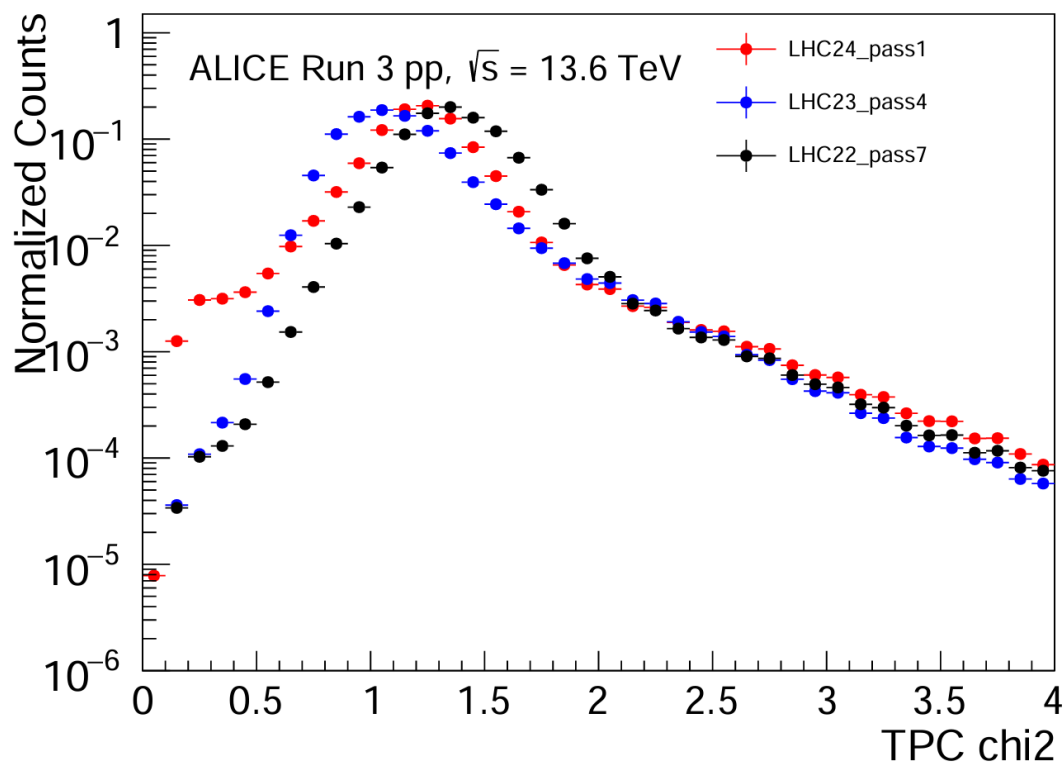
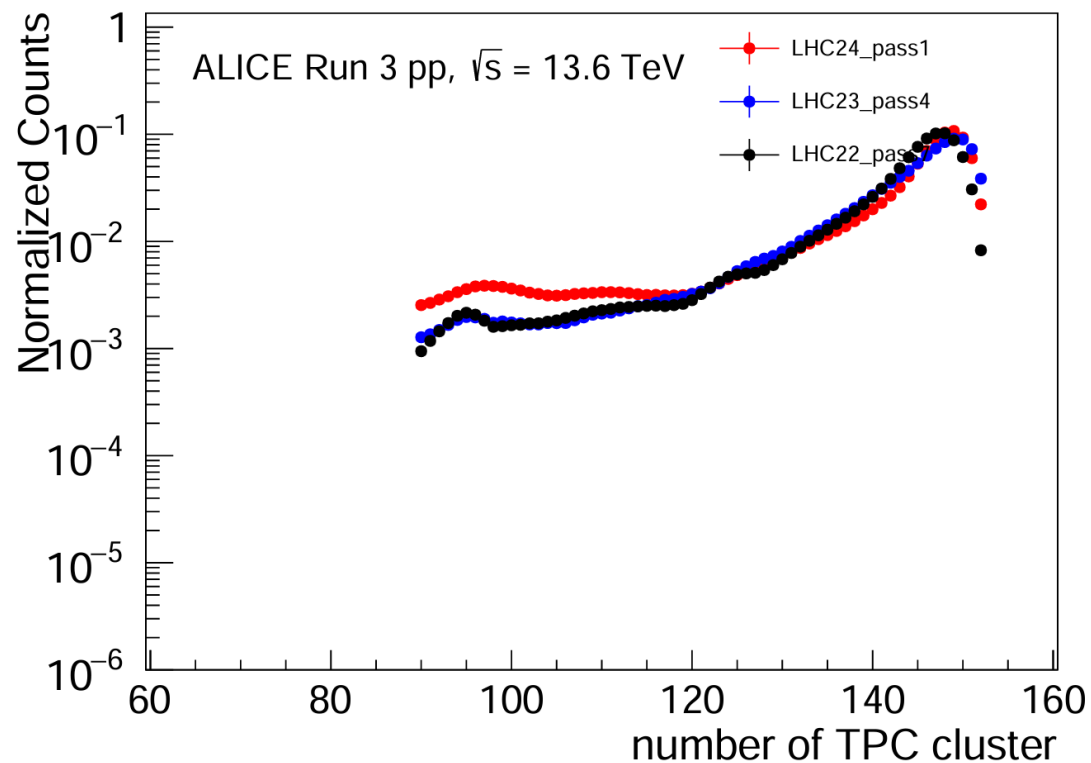
- The p_T and eta distributions are different between the 3 years data.
- Low counts in $0.8 < |\eta| < 0.9$ are caused by track-selection task.

ITS comparison



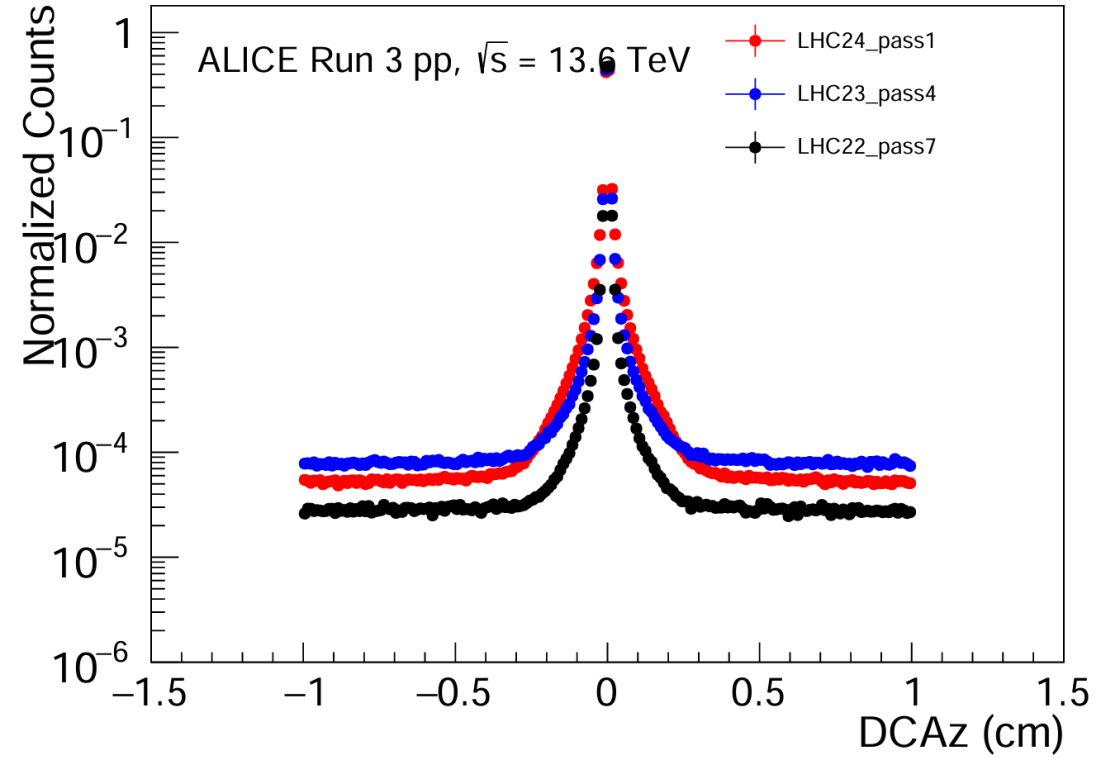
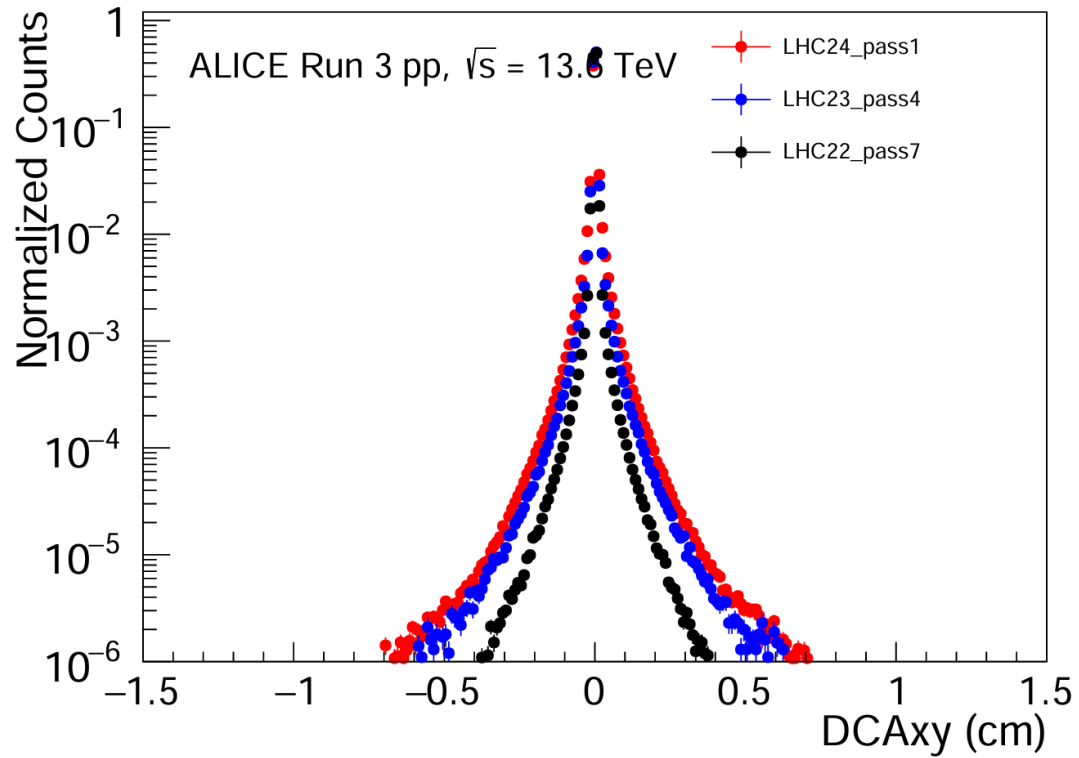
➤ ITS performance are similar between the 3 years data.

TPC comparison



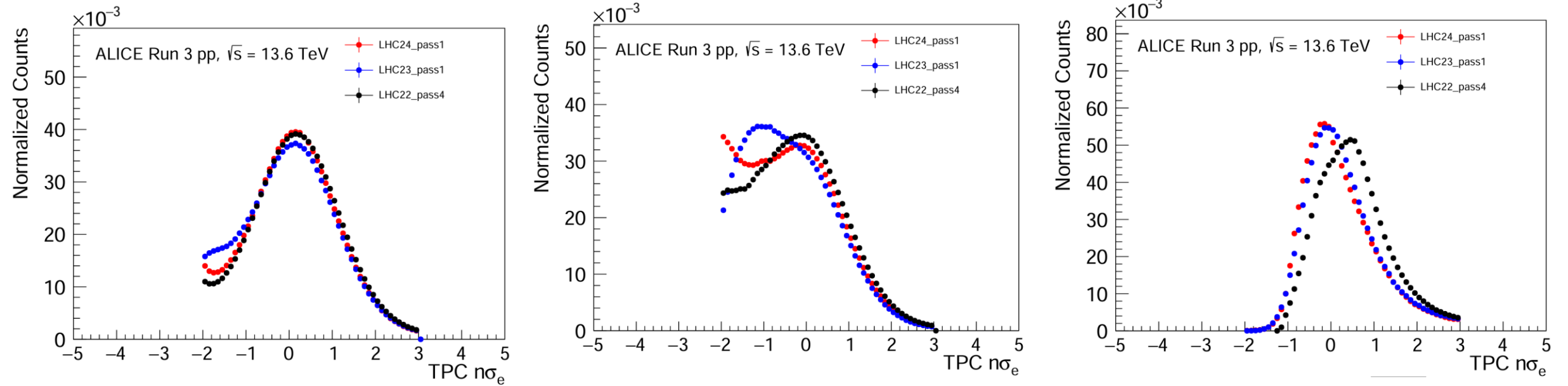
- TPCncls are different for LHC24 pass1.
- TPCchi2 are different for these 3 years data.

DCA comparison



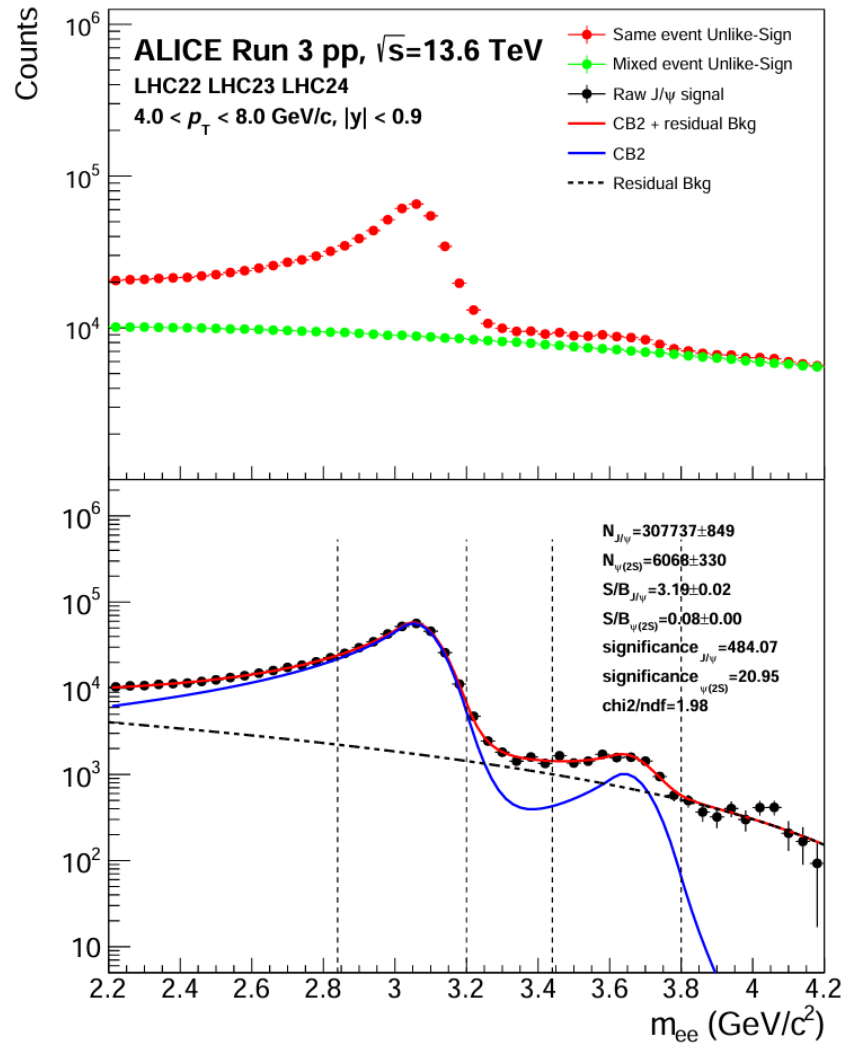
- DCA distributions are different, the width of LHC22 pass7 is smaller.

TPC PID performance



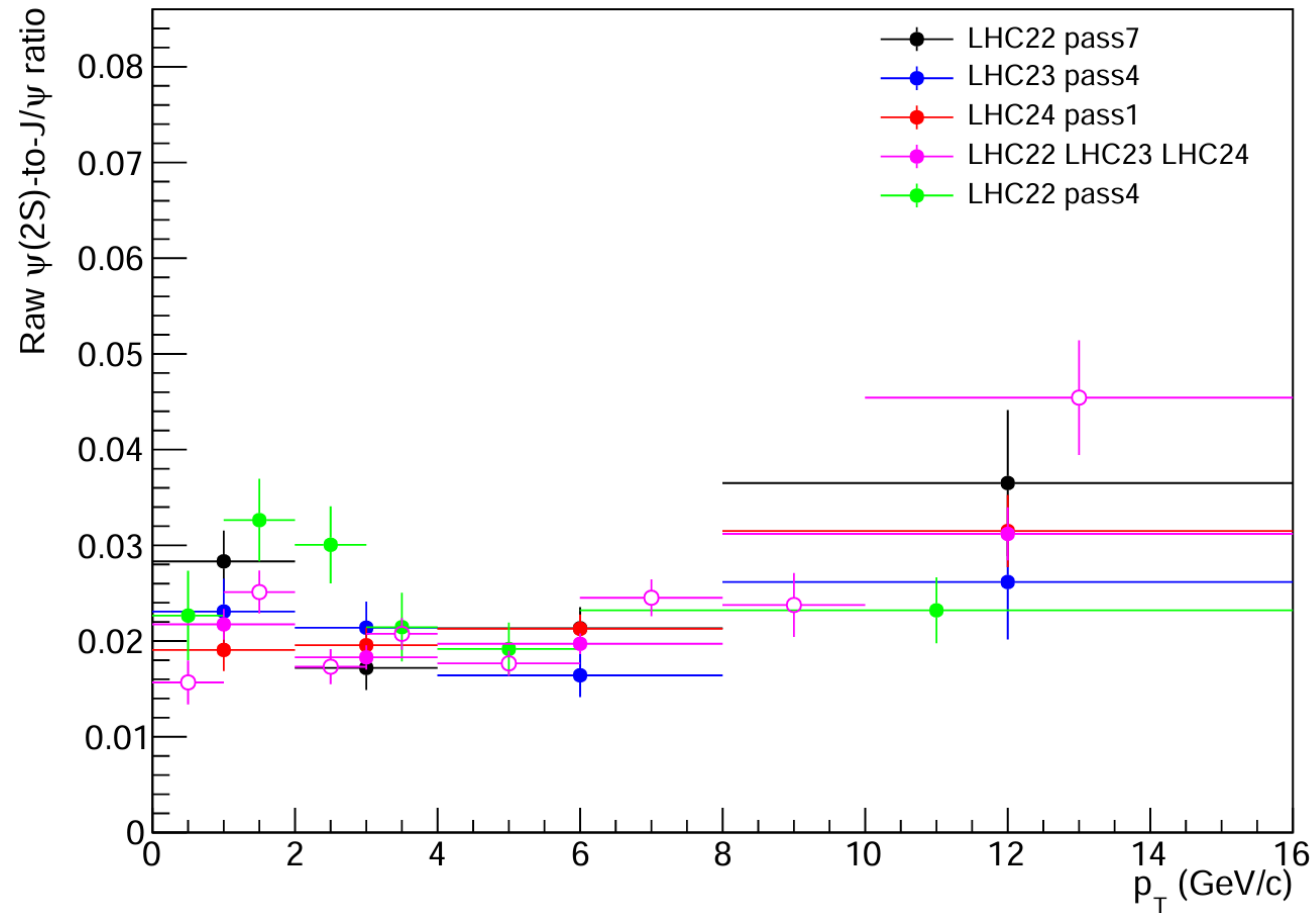
➤ PID performance are different at middle and high p_T .

Signal extraction



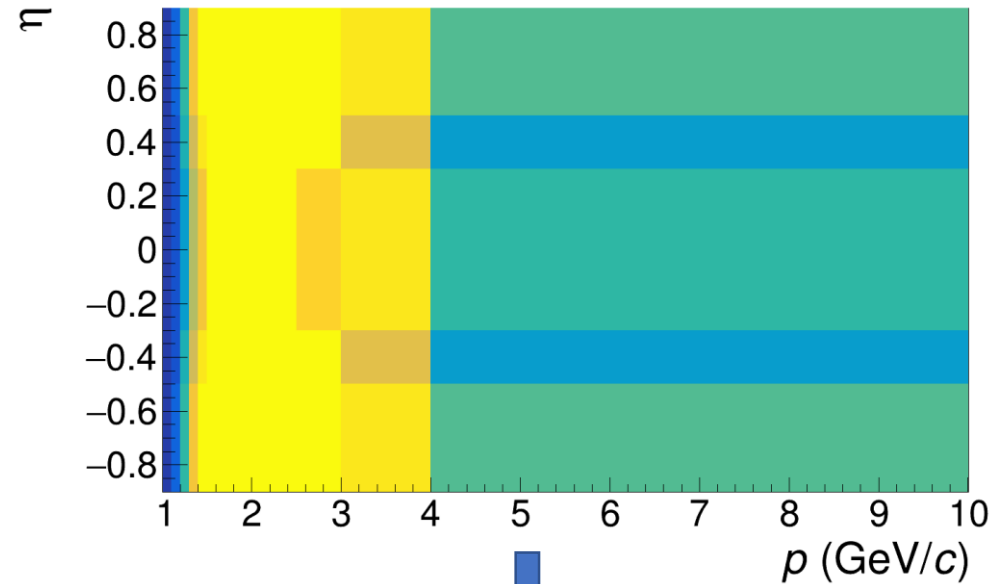
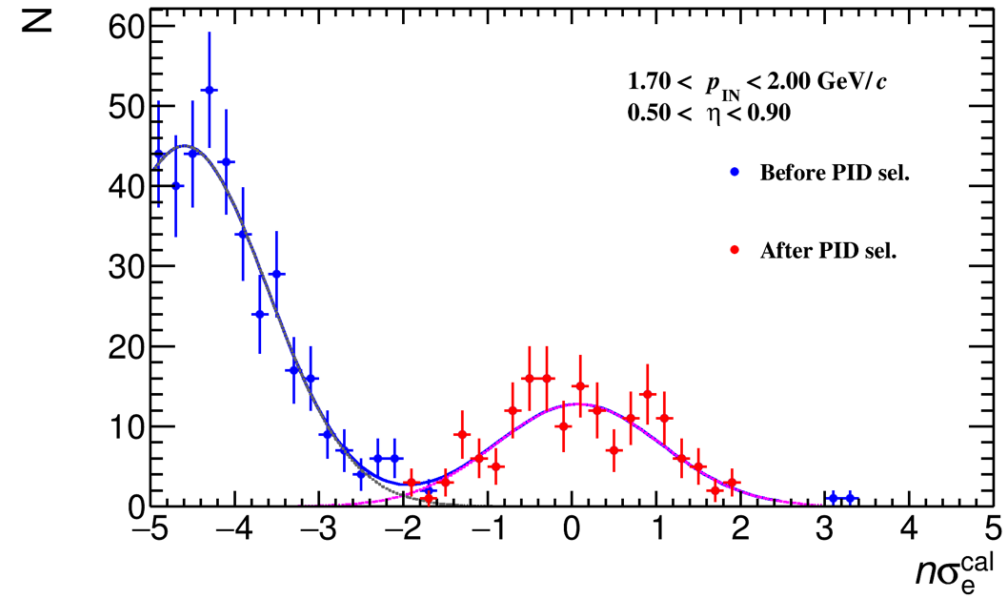
- The signal shape is fitted by **Crystal Ball function**
- The parameters are limited according to the near p_T bins.
- The p_T bins are wide to reduce the systematic uncertainty from fitting.

Raw counts ratio

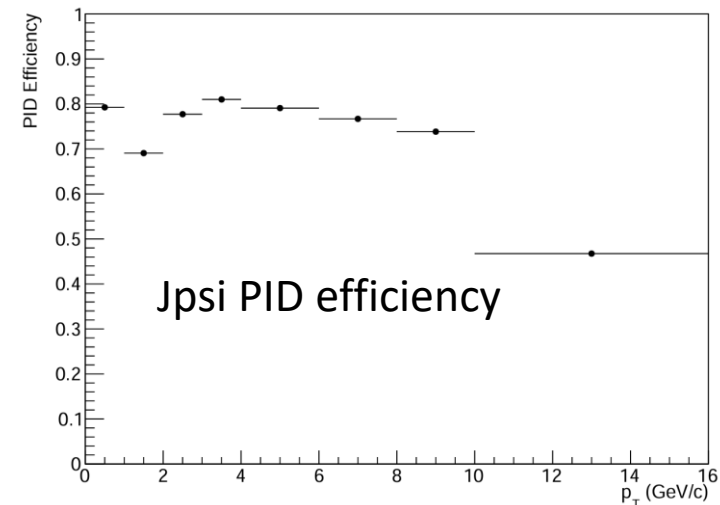


- The raw counts ratio from different year data are consistent with the results obtained from fitting the combined data.
- The p_T bin 6-16 GeV/c can be separated into 3 bins because of the improved statistics.

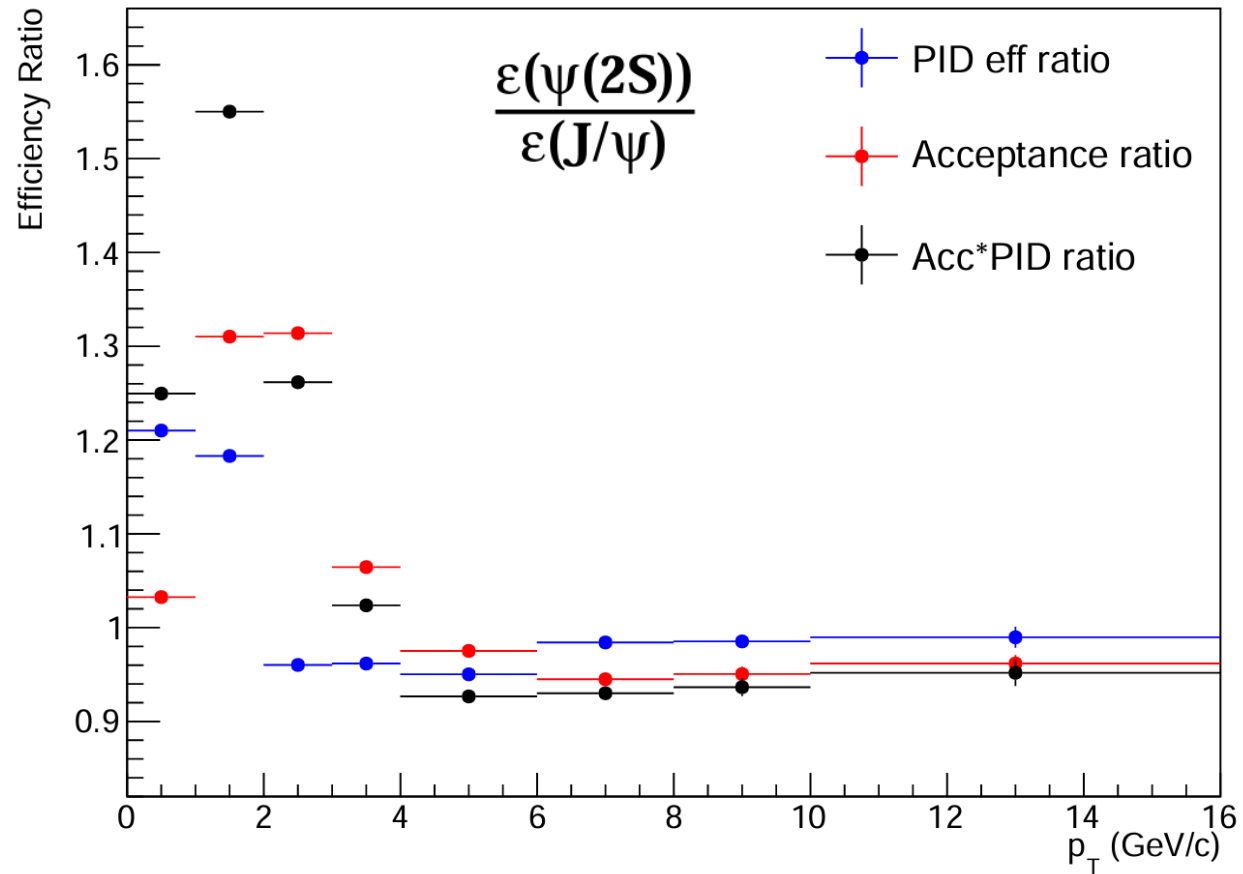
Efficiency calculation



- The PID efficiency is obtained by the data driven method.
 - ✓ Calculate the single track PID efficiency from v_0 electrons.
 - ✓ Run Toy-MC to simulate the Jpsi decay to electrons to propagate the single leg efficiency to pair level.
- The acceptance efficiency can also be calculated by this way.

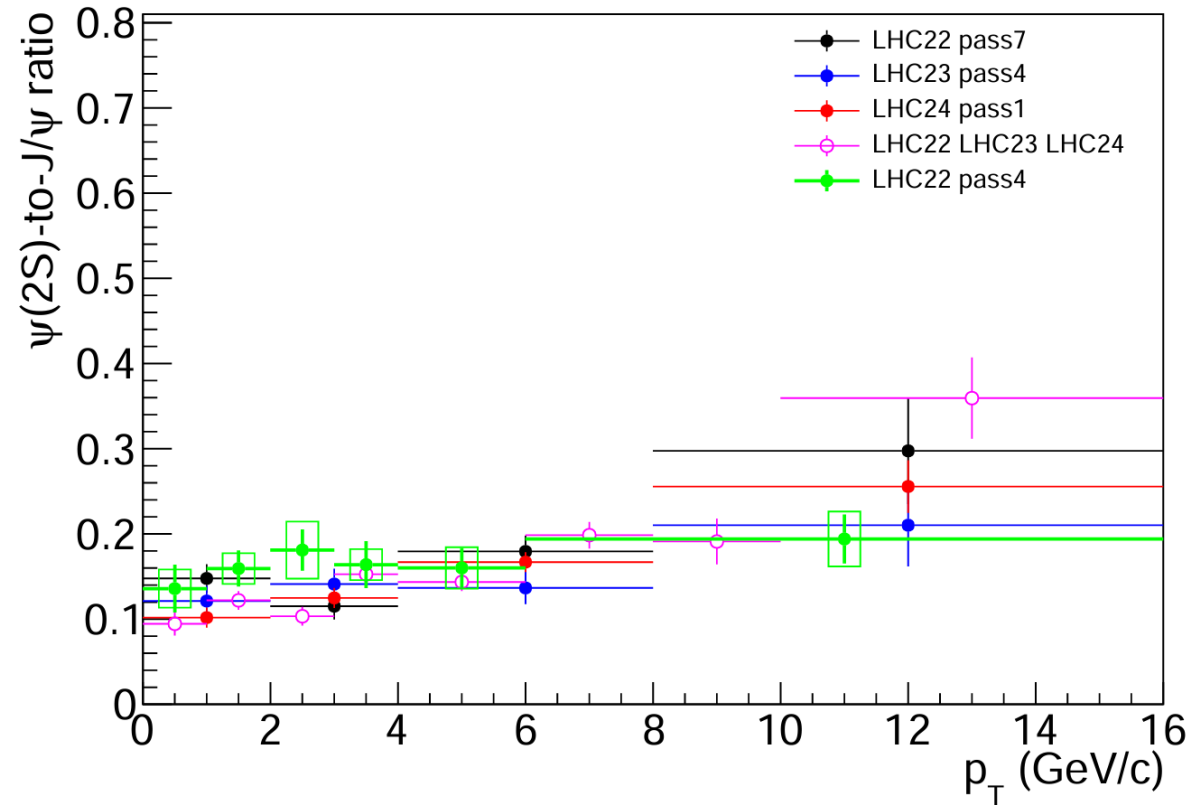


Efficiency ratio



- The efficiency of the 3 years data are **weighted by the number of events** and then combined together.
- The contribution of other efficiency will be cancelled out according to previous study and will be checked later.

Efficiency corrected ratio



- The ratio calculated by different years data and efficiency are consistent with the results obtained from combined data and efficiency.
- The statistic uncertainty is reduced because of the large datasets.

Summary

- The signal extraction are done and efficiency are calculated by the data driven method.
 - ✓ The pT bins are narrowed thanks to the larger datasets.
 - ✓ The results from dataset of different years are consistent with that from the combined datasets.
 - ✓ The statistic uncertainty is reduced.
- Todo:
 - Check other efficiency from MC.
 - Check the influence of association
 - Calculate systematic uncertainty.