# Non-Prompt J/psi Analysis

# PbPb @ 5.02 TeV

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May 19th, 2020

IFJ - ALICE Meetings

# Timeline of the last 2-weeks:

- **Debugging the** Jpsi2ee **task and** FilterTree **Task**
  - **QA check for Data**
- **Production for filtered trees for ML with proper selection criteria**
- **Pseudo-proper decay length fitting for background description**

# Filtering the dstTrees: Standard Criteria

**Track Cuts**

$1 \leq p_T \leq 30$ GeV/c
$|\eta| \leq 0.9$
$|DCA_{xy}| \leq 1$cm
$|DCA_z| \leq 3$cm
$70 \leq$ TPCnClusters $\leq 160$
Reject Kinks
ITS Refit Requested
TPC Refit Requested
Requested SPD any layer
$0 \leq \chi^2_{TPC} \leq 4$
$0 \leq \chi^2_{ITS} \leq 36$
TPCnClsShared Ratio $\leq 0.3$
$0.8 \leq$TPCCrossedRows/FindableCls $\leq 2$

TPC-PID cuts
$-3.0 < n^{\sigma}_{e} < 3.0$
$n^{\sigma}_{\pi} > 3.2$
$n^{\sigma}_{proton} > 3.5$

**Pair Prefilter Cuts**
Mass $> 50$ MeV/$c^2$

- PID-postcalbration
- Pilup-rejection (out of bunch pile-up)

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Prefilter cuts for rejecting the Gamma-conversions

# Summary of Filtering:

Number of Events

| | LHC18r | LHC18q |
|---|---|---|
| Batch1 | 3002027 | 857906 |
| Batch2 | 3162638 | 2271138 |
| Batch3 | 4004793 | 2648213 |
| Batch4 | 3552716 | 2181603 |
| Batch5 | 3918729 | 3504971 |
| Batch6 | 3476875 | 4060497 |
| Batch7 | 6212700 | 4102549 |
| Batch8 | 2694861 | 6110820 |
| Batch9 | | 6333547 |
| Batch10 | | 2650965 |
| Batch11 | | 748937 |
| Batch12 | | 368654 |
| Total Filtered | **30025339** | **35839800** |
| | | |
| **LHC18 (q+r)** | **65865139** | |

- 0-10 % central collisions Pb-Pb
- Uploaded to cernbox
  `Path:/eos/user/h/hsharma/Jacek_B/FilteredTrees_Round2/LHC18r/Batch1 … so on`

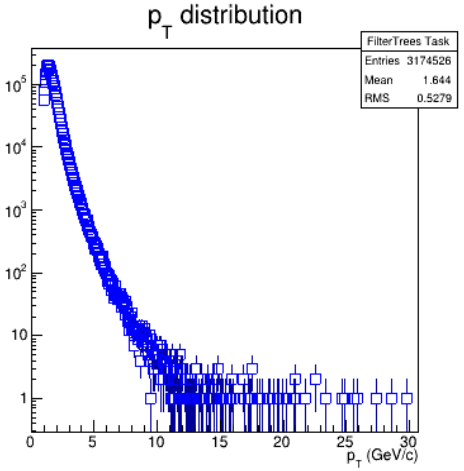
  `some of directories could be empty due to several reasons`
- Avg size/batch : ~ 6-7 GB (Total Batches = 20)
- **Processed statistics**
  - LHC18r : ~ 30M (92 Runs) : Trees = 2134
  - LHC18q : ~ 35M (136 Runs) : Trees = 2441

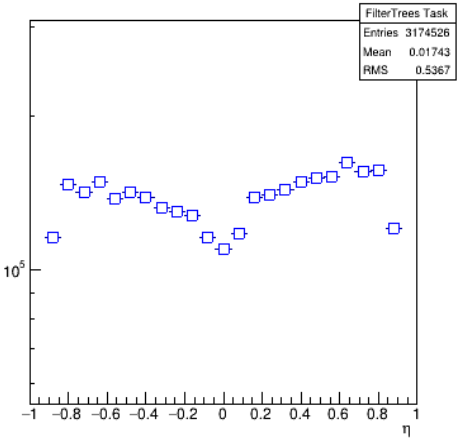
  **=> 228 Runs**
  **=> 4575 Trees**
  **=> 65M Events**

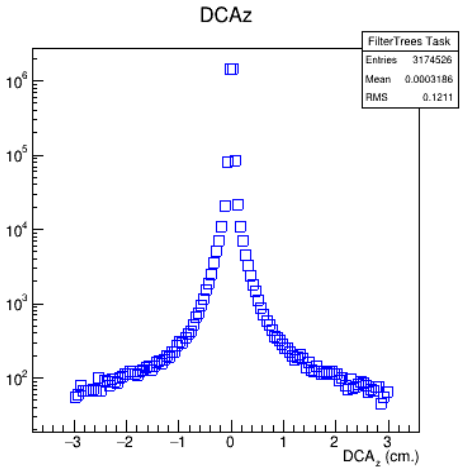
# QA : Filtered Trees

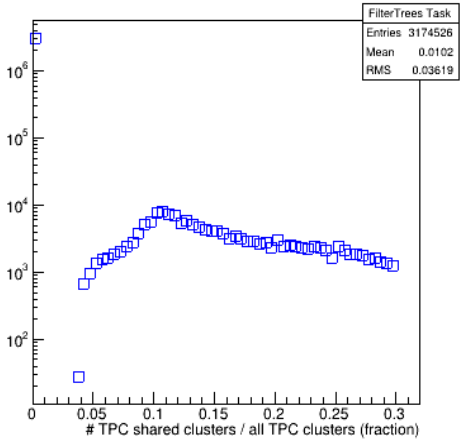
- QA for Small sample (Filtered Trees)

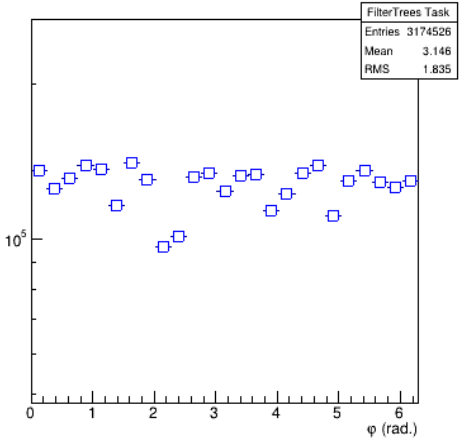
# Tracks QA : With All Cuts – Filtered Tree

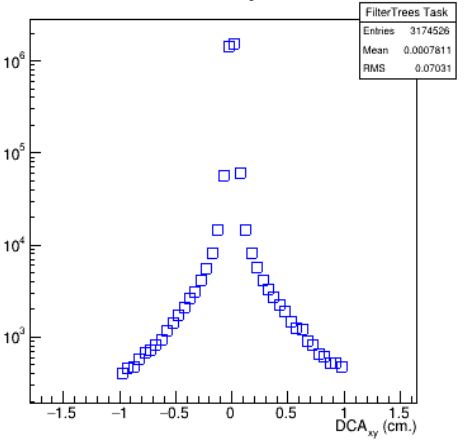


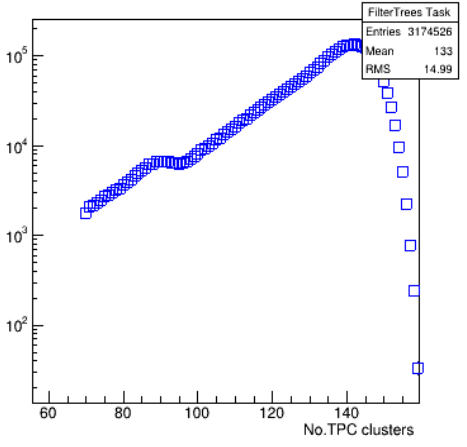



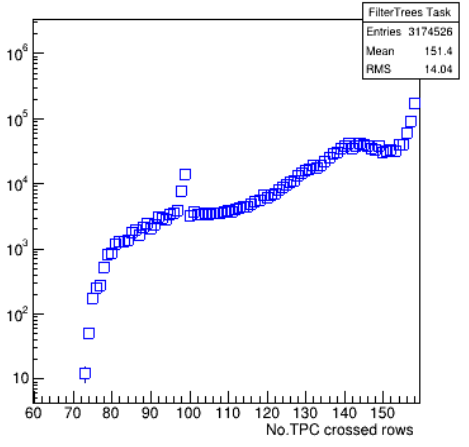



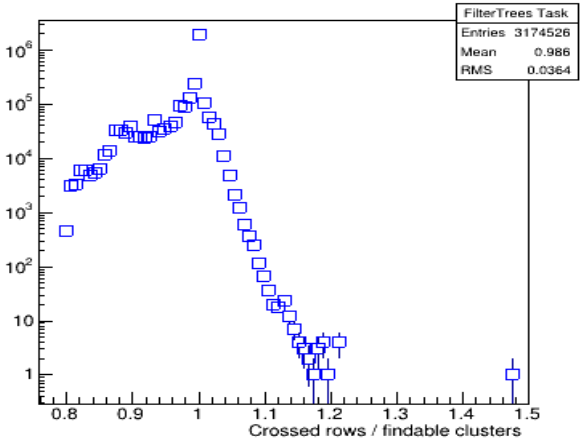



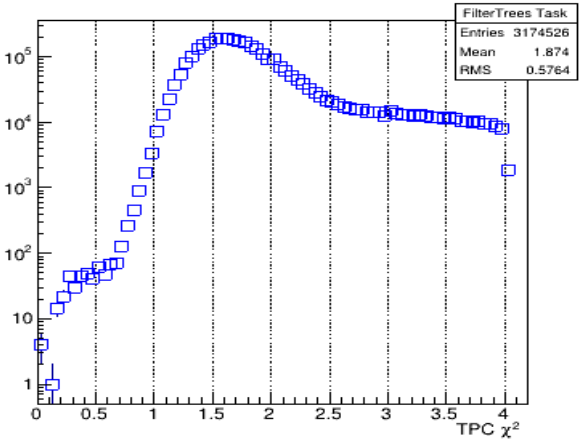



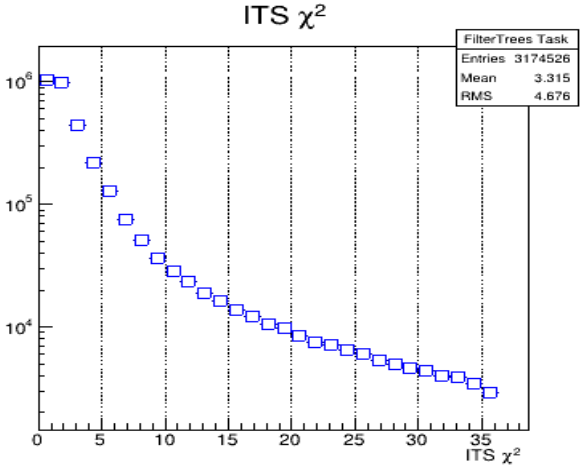



# Tracks QA : With All Cuts – Filtered Tree



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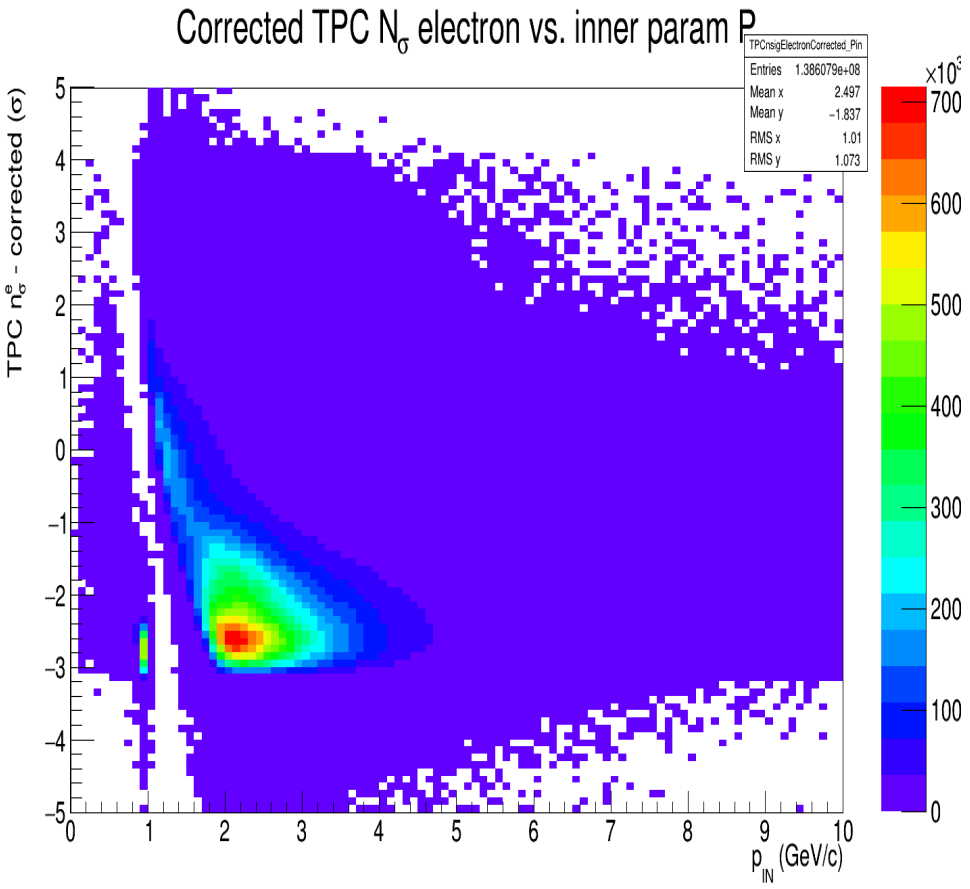
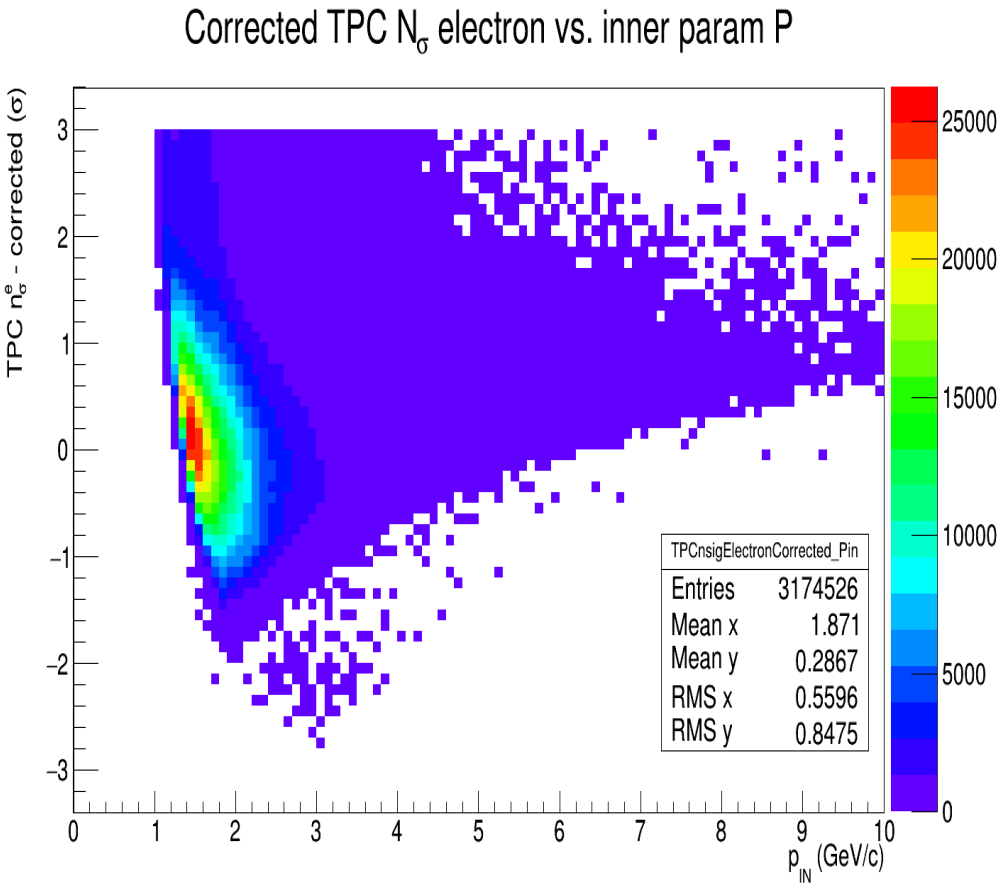



**Before cuts**




**After cuts**

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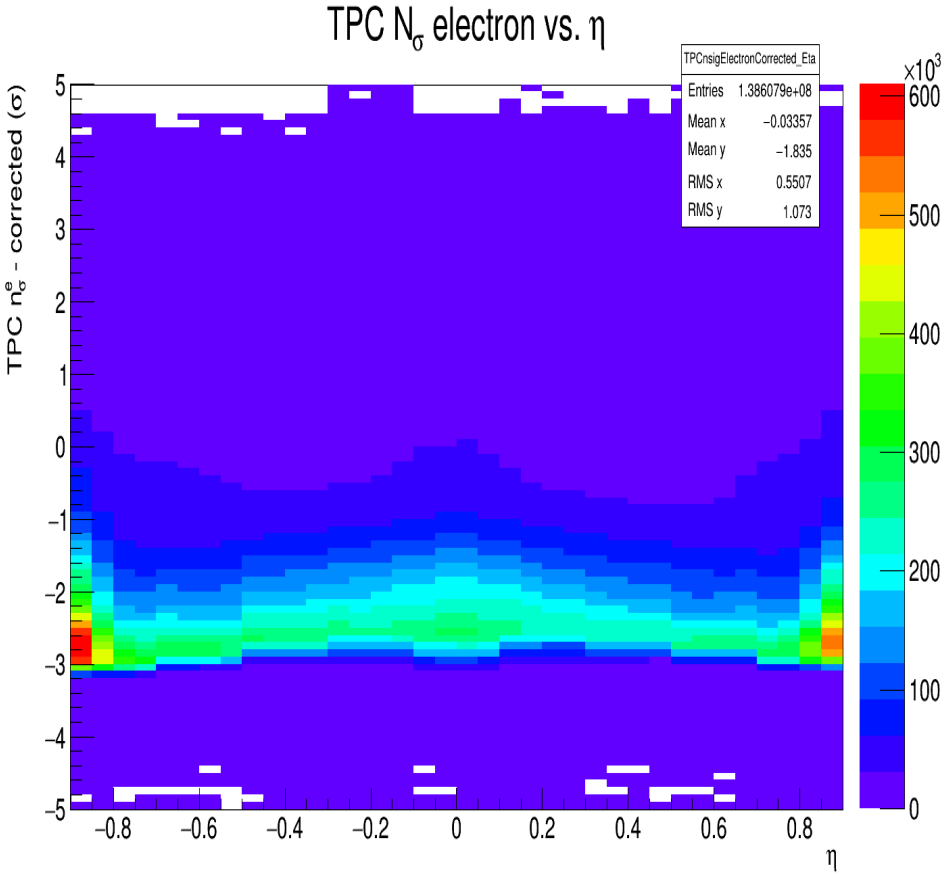
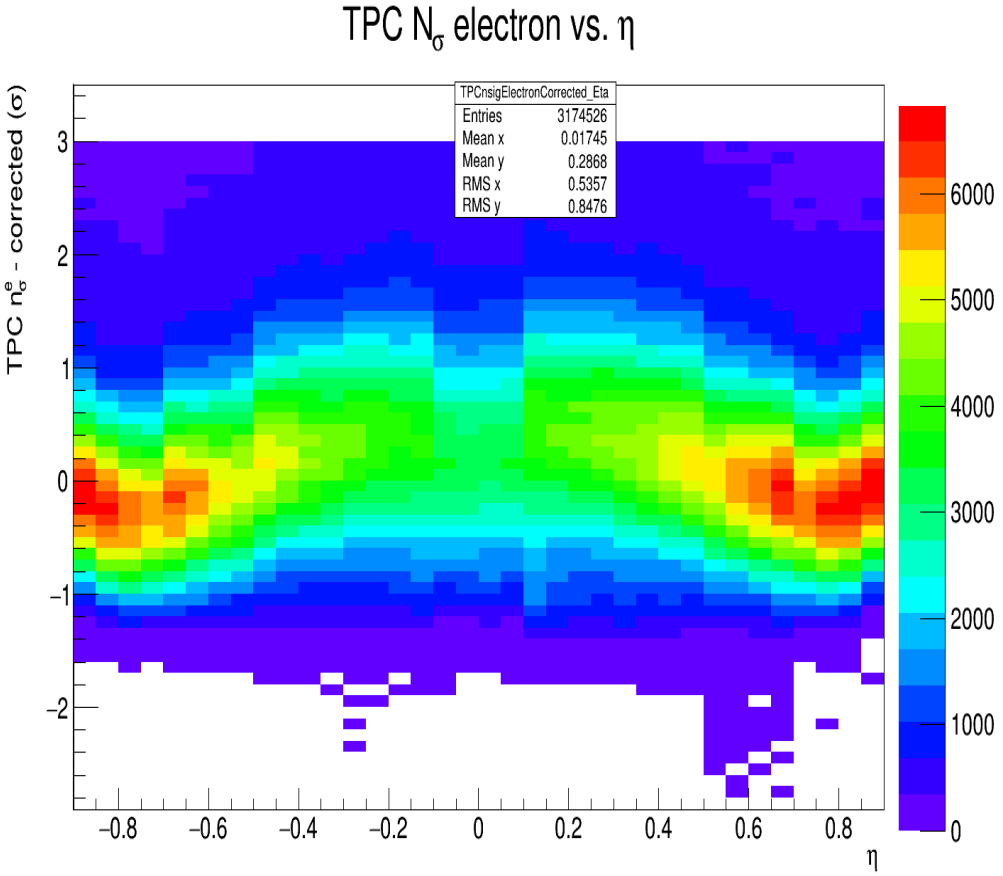



Before cuts



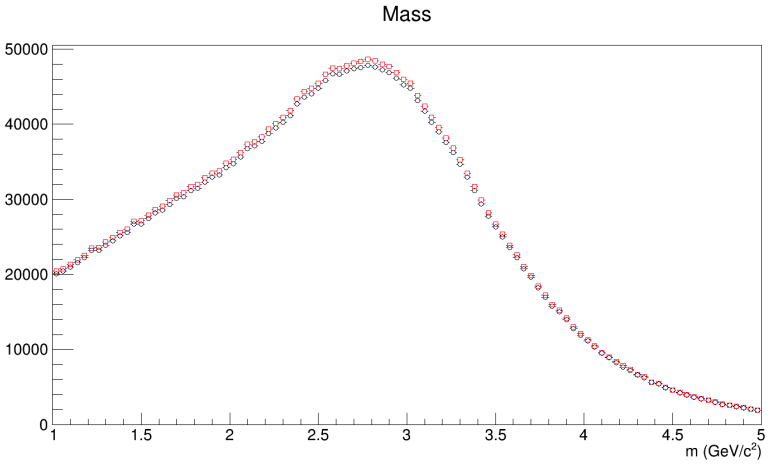

After cuts

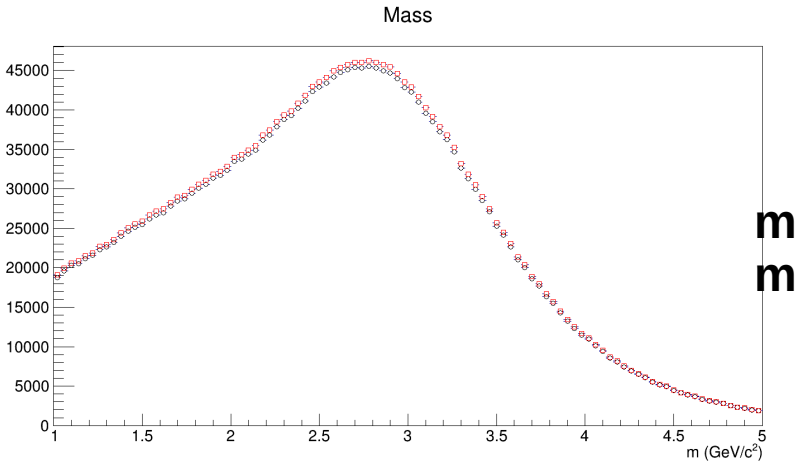
# Jpsi Signal : Comparision with Jpsi2ee task vs Filtered Task

- Data sample ~ 5 batches (50-60 trees)

# Jpsi Signal : Comparision with Jpsi2ee task vs Filtered Task

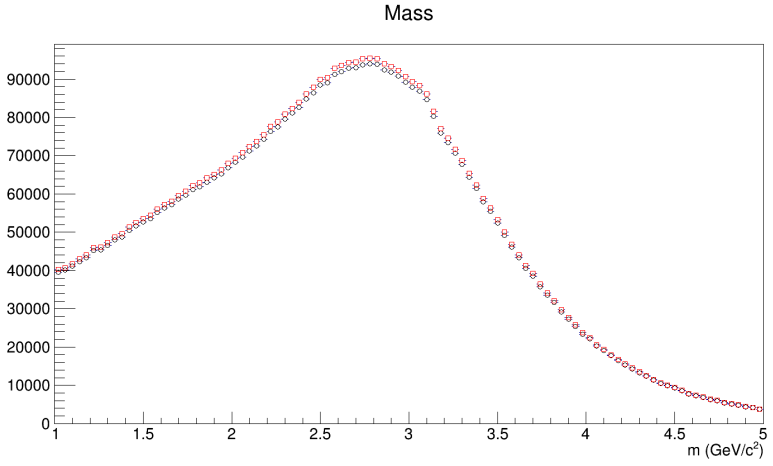
**plus-plus**

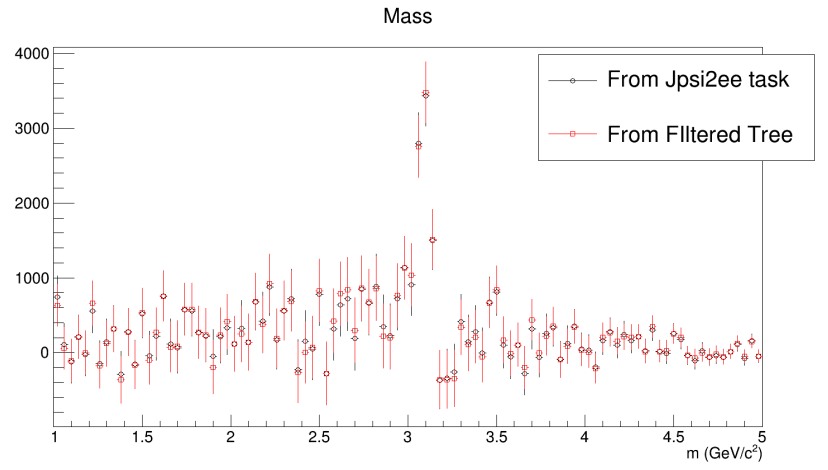



**minus-minus**

**plus-minus**




**-10125**

**10312**

**# of Jpsi**

**Extracted-Signal**

# Conclusions:

- In filtering process, all standard cuts have been applied along with the following procedure
    - Post-calibration
    - Pile-Up rejection (based on the correlation of ITS clusters and TPC clusters )
- The Jpsi counts will not be equal to jpsi2ee task output but it will be far better than previous set of Trees. (More consistent then previous case.)
- Both tasks (Jpsi2ee & filterTrees) produces different outputs, which should be same for same selection criteira.
- Background fitting for Pseudo-proper decay length is yet to be done...

# BackUp

Taken from Ana-note: Elliptic flow of inclusive J/ψ at 5.02TeV – A.Neugu, I. Arsene

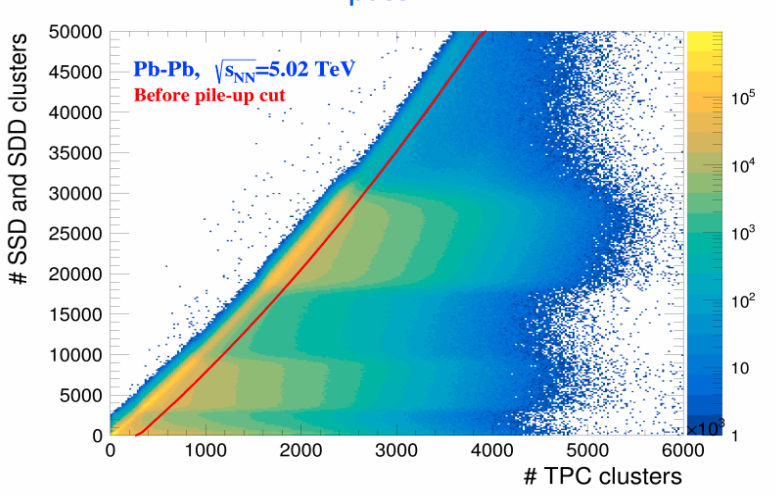
#### 4.4.1 Postcalibration

The TPC electron $n_{\sigma_e}$ is postcalibrated such that the electron band is centered at zero and with a width of 1. The same procedure is also applied for pions and protons. This is achieved using a clean sample of electrons from tagged photons converted in the detector material. The photon conversions are tagged using tracking methods only, such that the TPC pid response is biased as little as possible. Additionally, the electrons from conversions are selected using cuts which would make them as similar as possible to the J/$\psi$ electrons which originate from the main event vertex or from a region very close to it. For the proton and pion maps, clean samples of protons from $\lambda$ decays and pions from $K^0_s$ decays are used. The post-calibration parameters are the mean and width of $n_\sigma$ distribution in the data. To extract the post-calibration parameters the $n_{\sigma_e}$ distributions are fit with a double-gaussian (to account for the pion contamination in the conversion electron sample). In the case of pions and protons, $n_{\sigma_p}$ and $n_{\sigma_\pi}$ are fit with a single gaussian. The TPC electron, pion and proton PID parameters are extracted in 4 dimensions. Figures 7 8 9 10 11 12 13 14 show the dependence of the electron, pion and proton band mean and width as a function of $\eta$, number of SDD and SSD clusters ($N^{ITS}_{cls}$), pileup vertex z position ($vtx_z$) and number of pileup contributors ($N^{pileup}_{track}$) for LHC18r and LHC18q, respectively.
The same procedure was also applied for LHC15o HIR and LHC15o pidfix. The dependence of the electron, pion and proton band mean and width as a function of $\eta$, number of SDD and SSD clusters ($N^{ITS}_{cls}$), pileup vertex z position ($vtx_z$) and number of pileup contributors ($N^{pileup}_{track}$) for LHC15o HIR and LHC15o pidfix is shown in fig. 15 16 17 18 19 20 21 22.

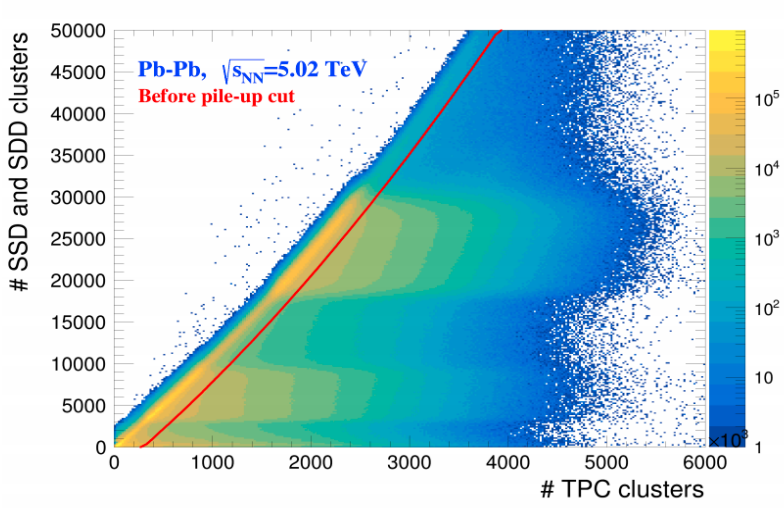
Xiaozhi's slide from QA-meeting (28th Apr 2020)

## Pile-up events rejection

pass1

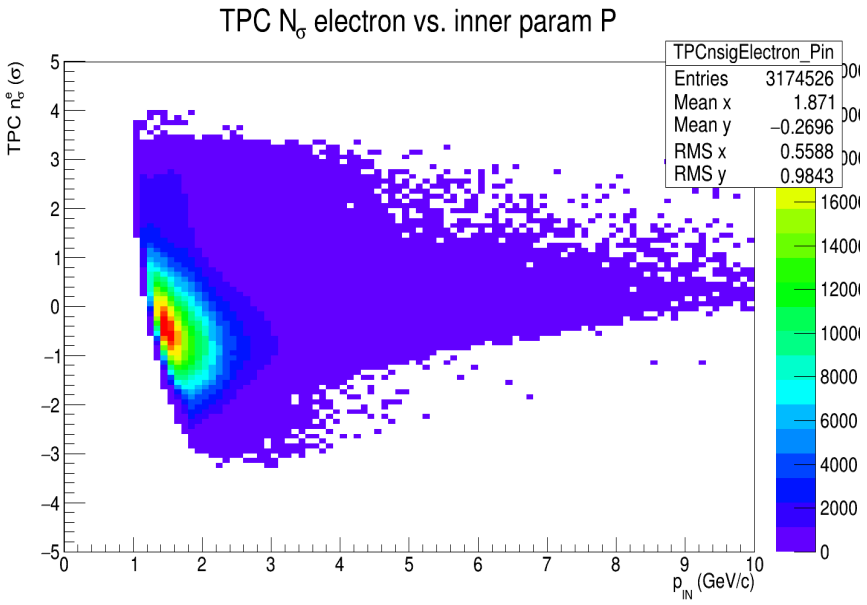



pass3

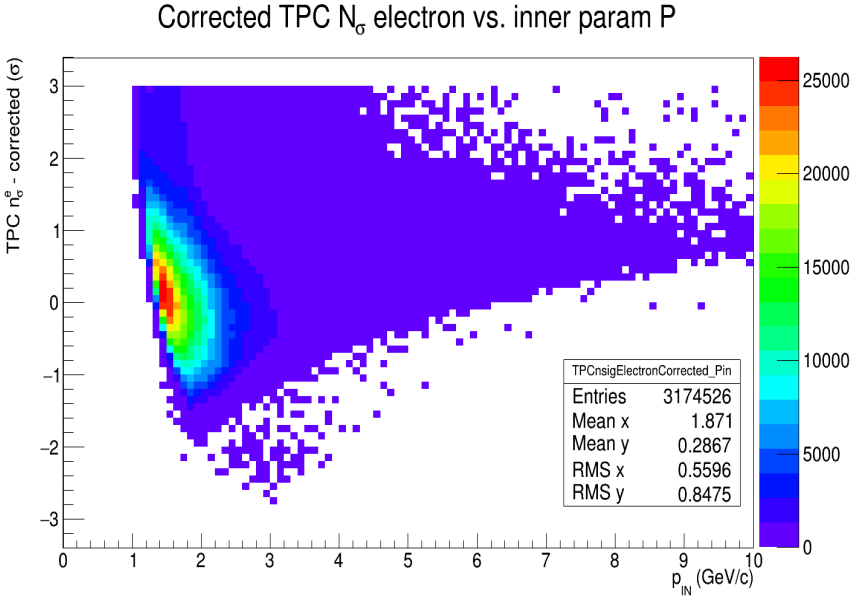



- Using the correlation between the number of SSD+SDD and TPC clusters to tag the pile-up events
- The clusters bring more information for dE/dx compare the number of tracks
- The SSD and SDD have a similar acceptance compared to the VEZRO detector w.r.t to TPC
- Used this approach for the QM preliminary results, the pass1 and pass3 are similar.

# Effect of PostCalibration

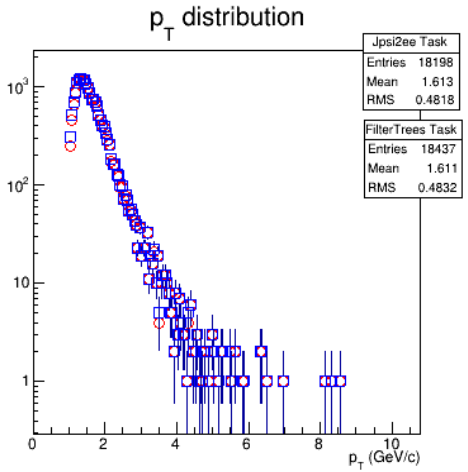


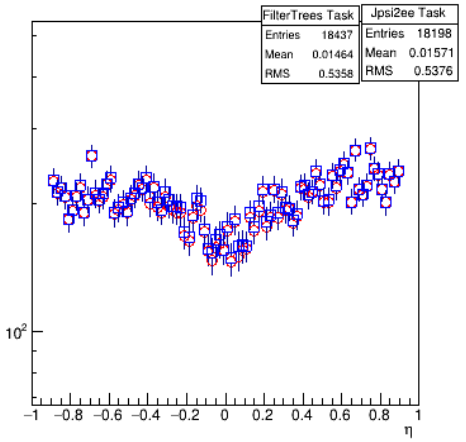

Before PostCal

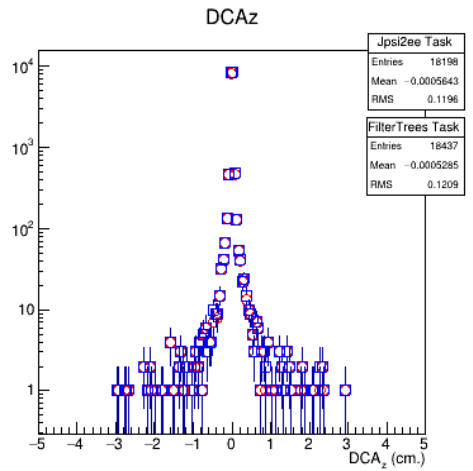


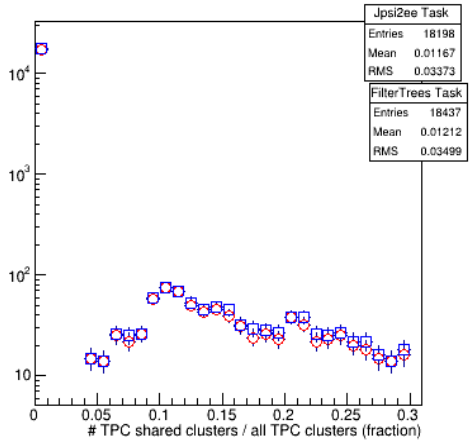

After PostCal

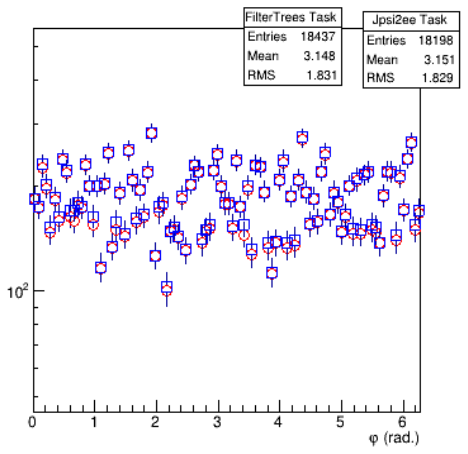
# Tracks QA : With TrackPrefilter Cut

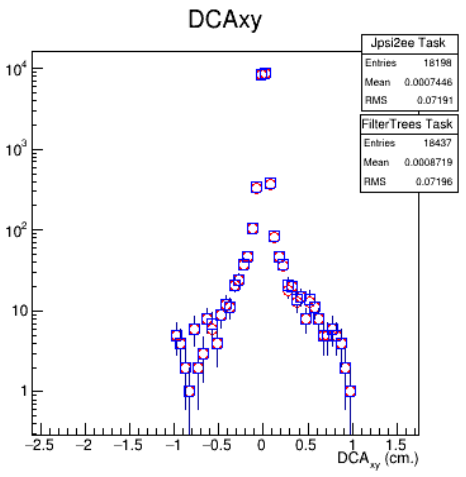


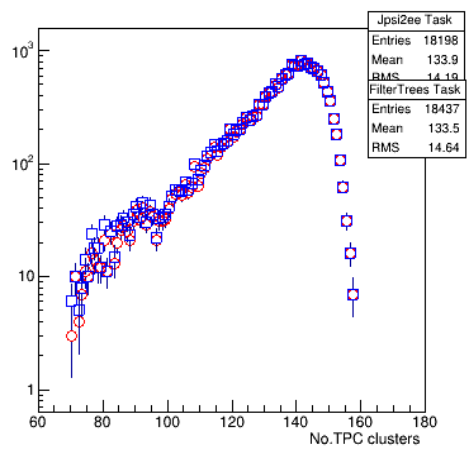



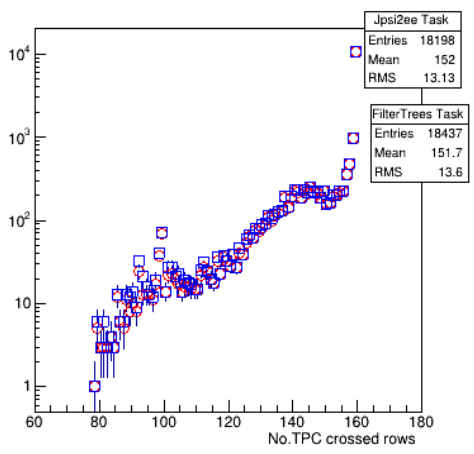



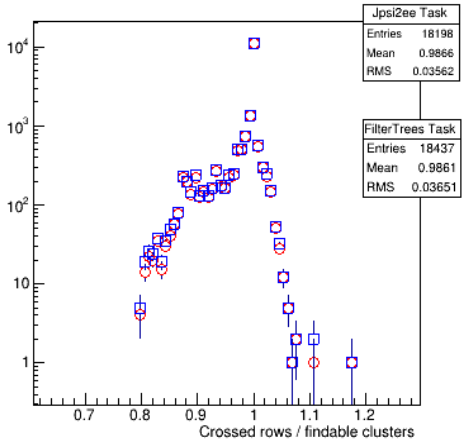



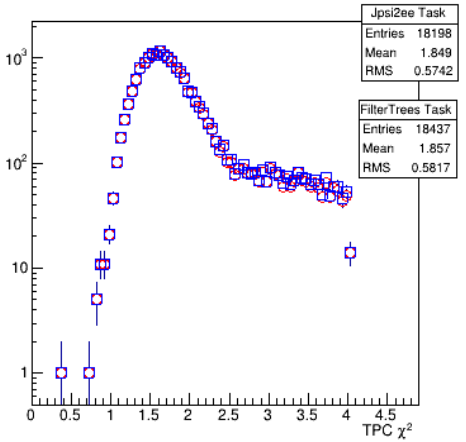



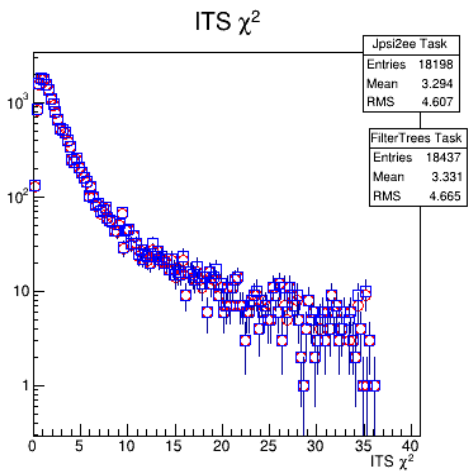




Red : Jpsi2ee & Blue : FilterTrees

# Tracks QA : With TrackPrefilter Cut



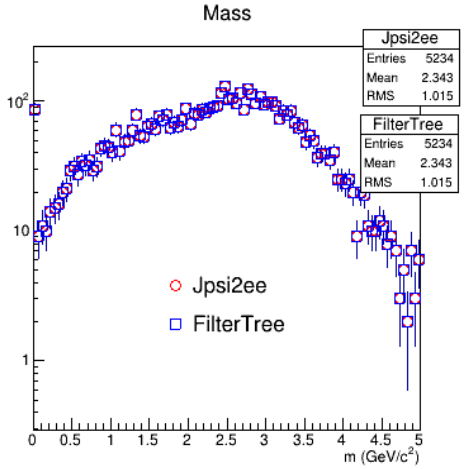



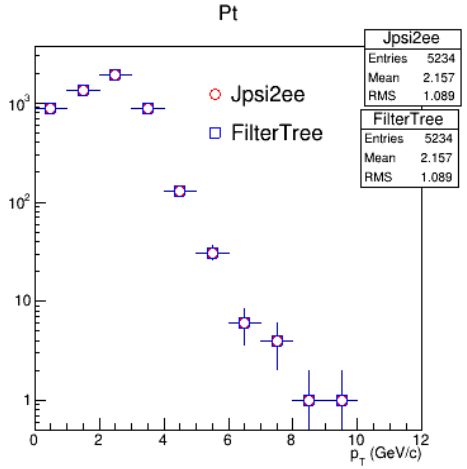



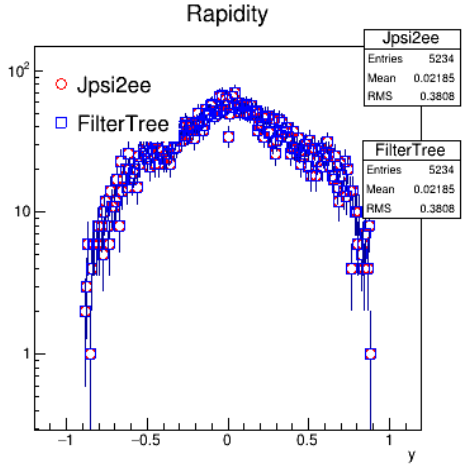

- More Tracks in FilterTrees after all cuts +1.3%
- But No different all Pairs (see next slide)

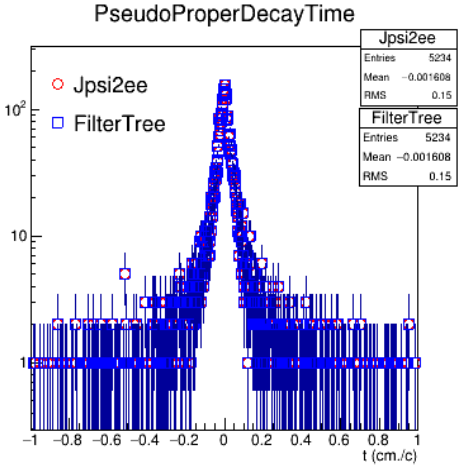
Red : Jpsi2ee & Blue : FilterTrees

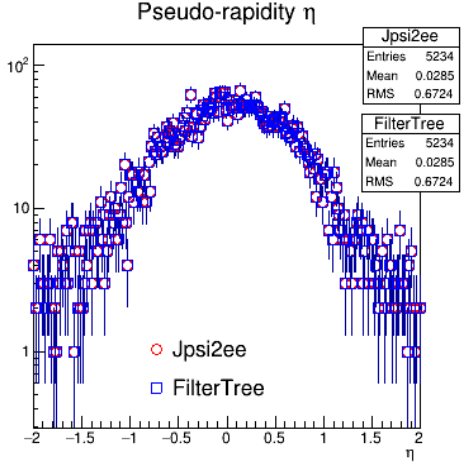
# Pairs QA : With TrackPrefilter Cut

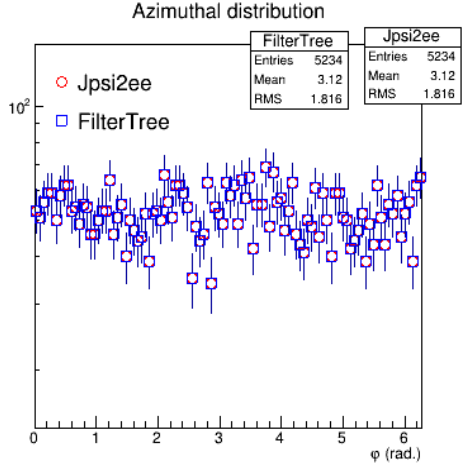


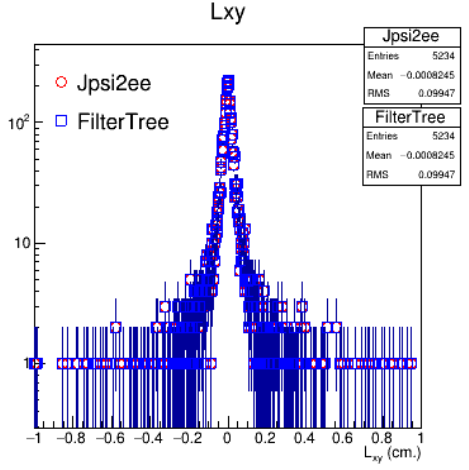



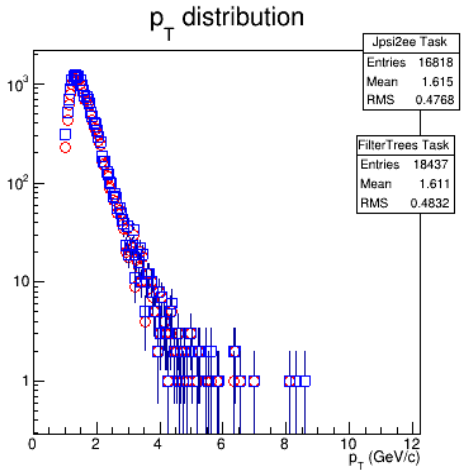



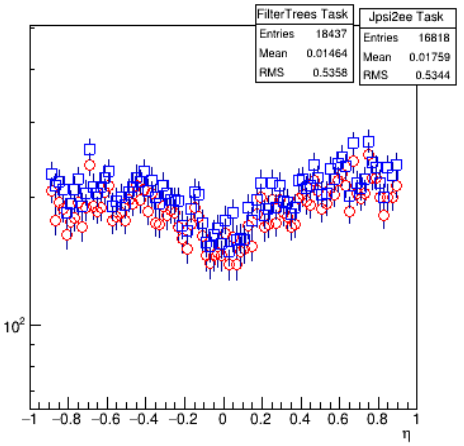



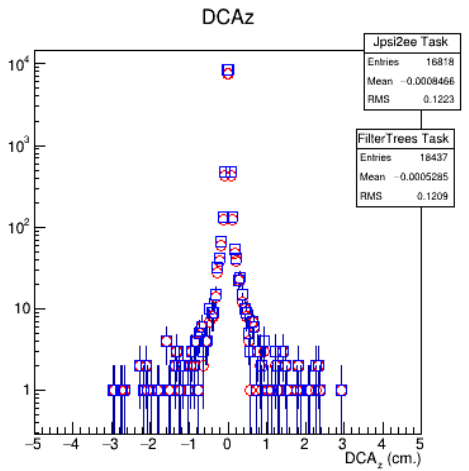



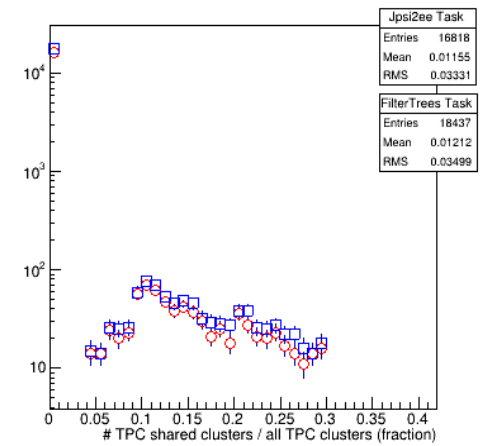



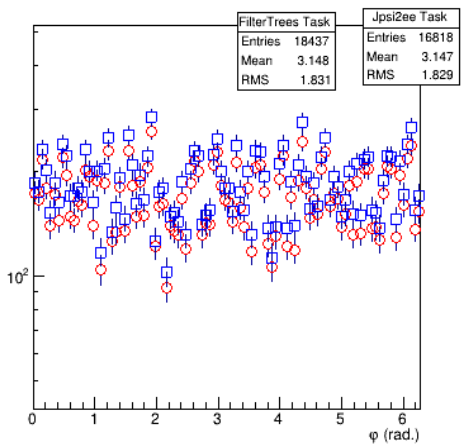
# Tracks QA : With Pair-Prefilter Cut

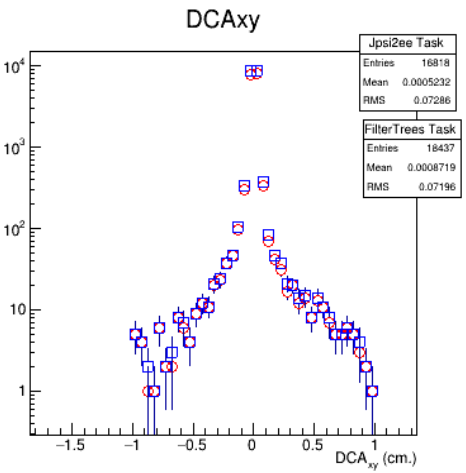


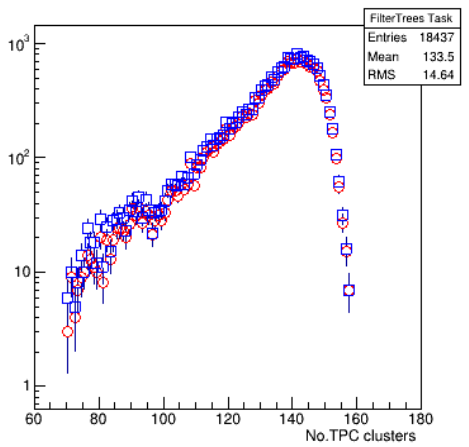



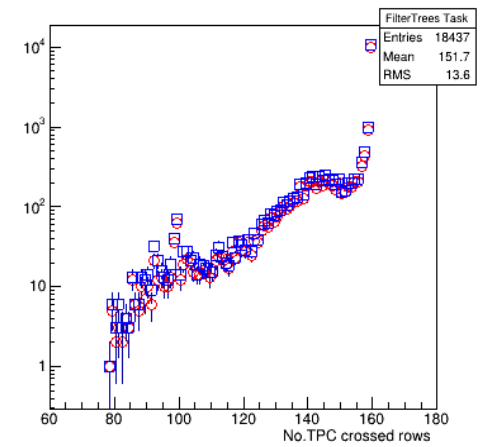



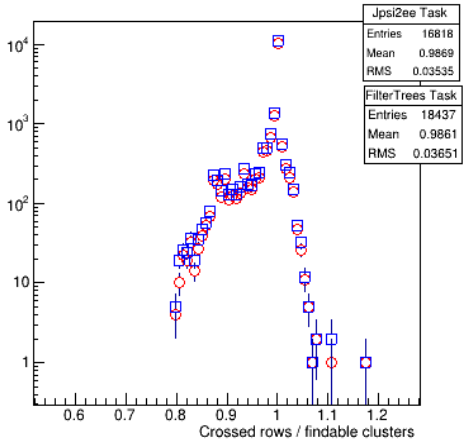



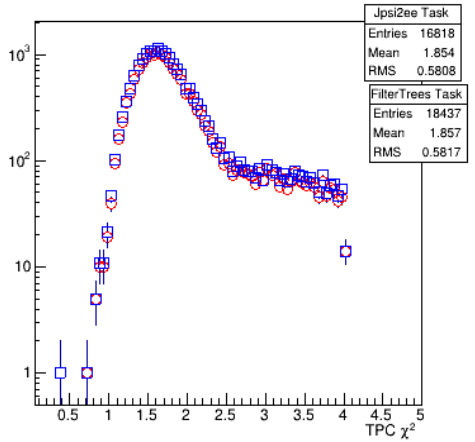



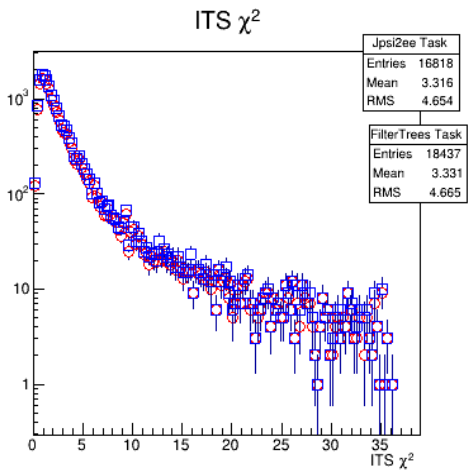




Red : Jpsi2ee & Blue : FilterTrees

# Tracks QA : With Pair-Prefilter Cut



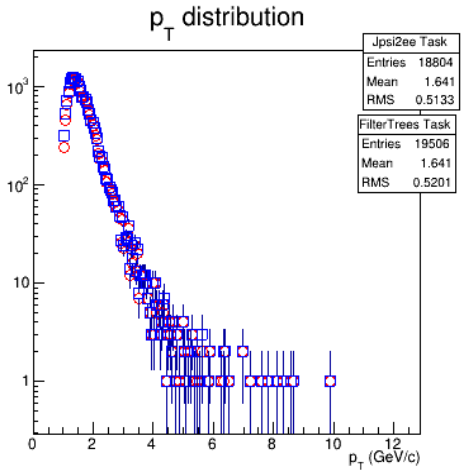



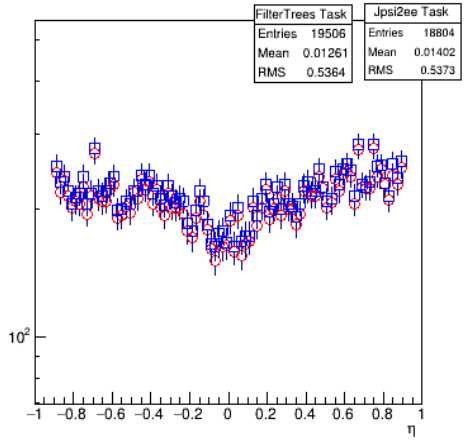



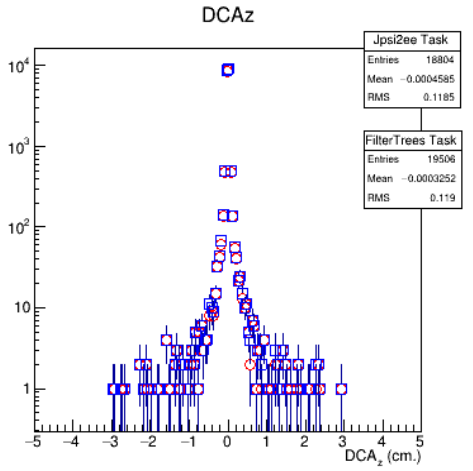

- More Tracks in FilterTrees after all cuts +9.6%
- +10.2% more epem Pairs (see next slide)

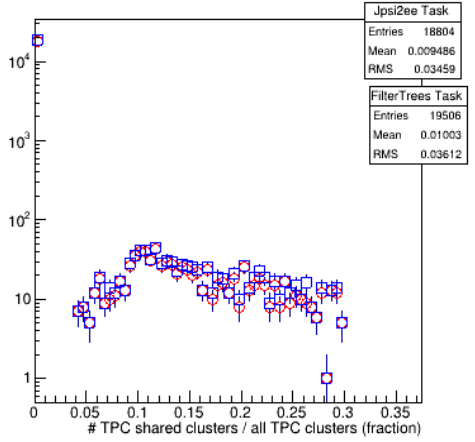
Red : Jpsi2ee & Blue : FilterTrees

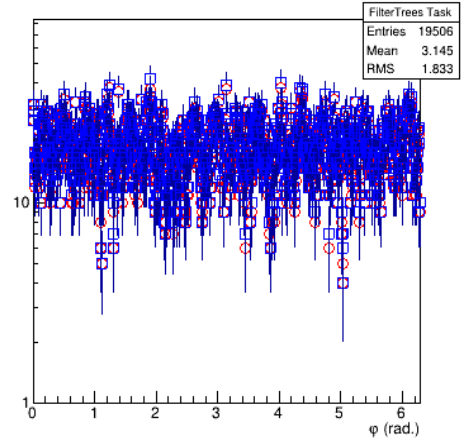
# With All Cuts- Tracks

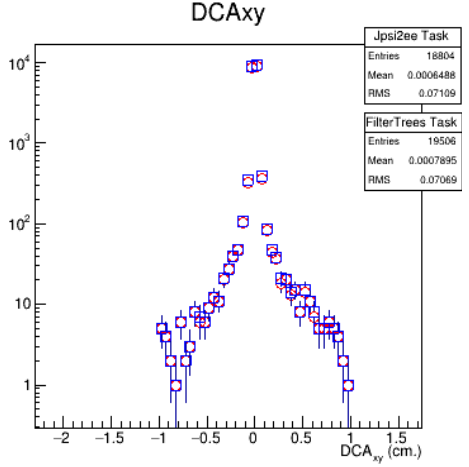


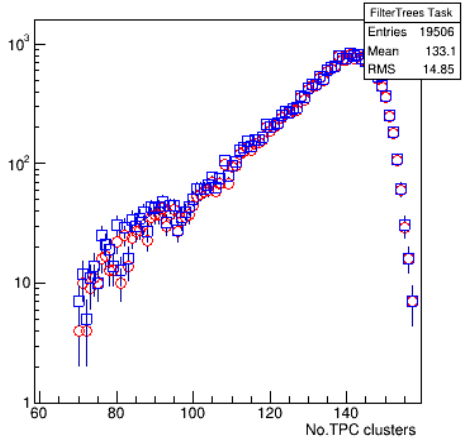



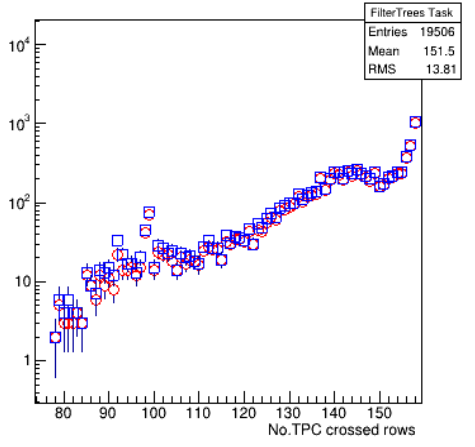



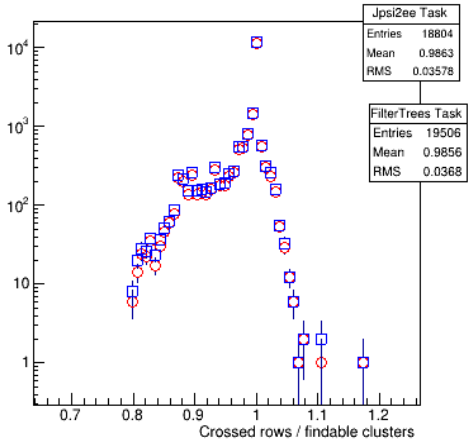



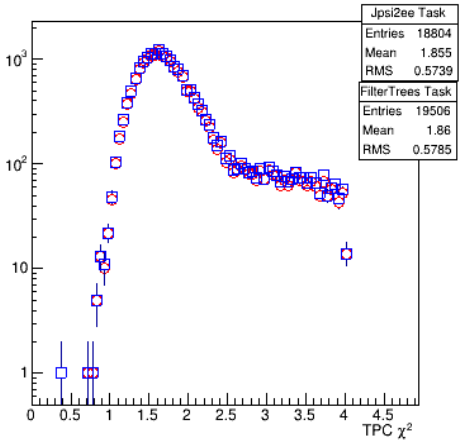



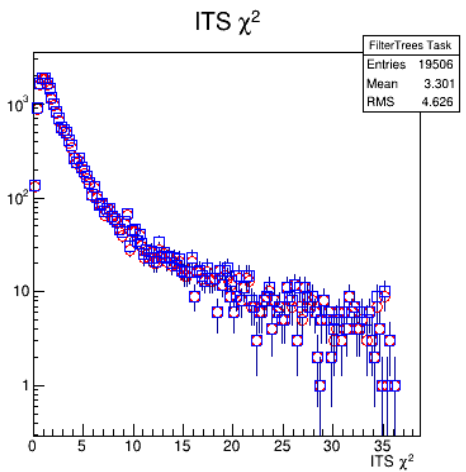



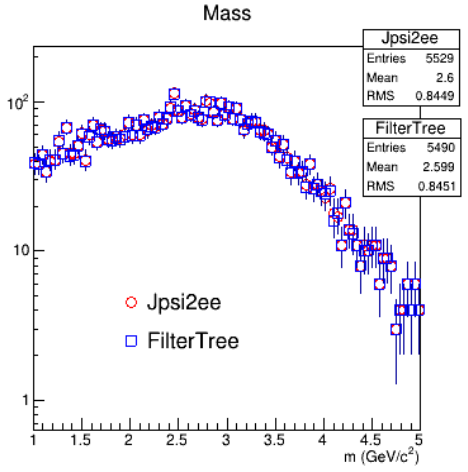
# With All Cuts - Tracks

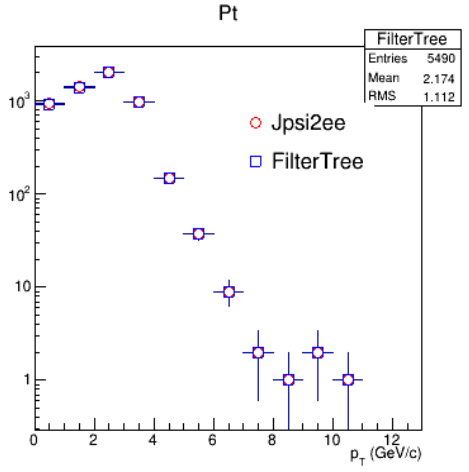


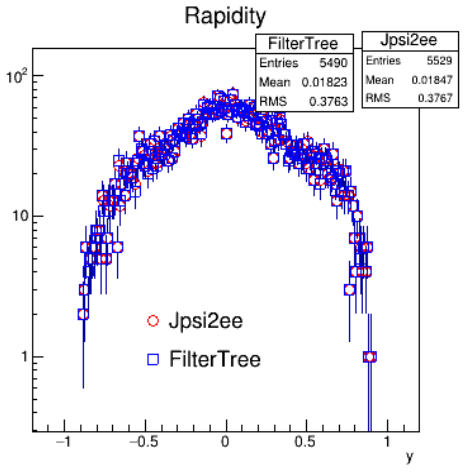



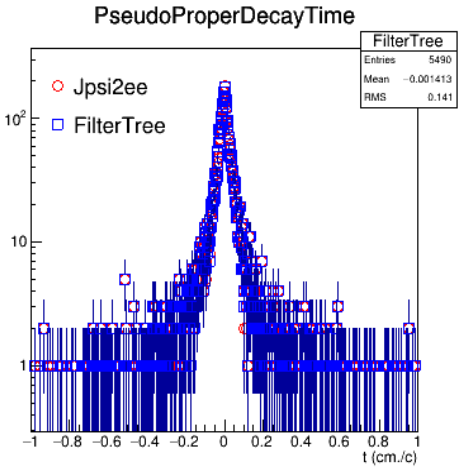



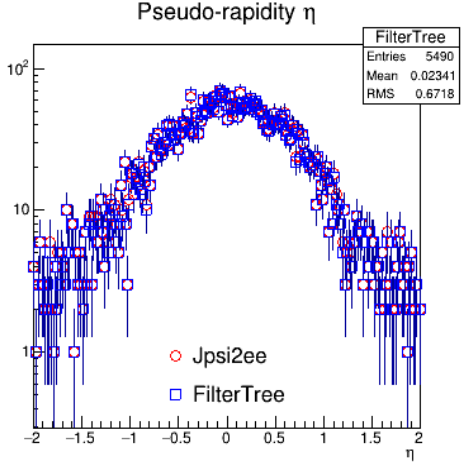
# With All Cuts - Pairs

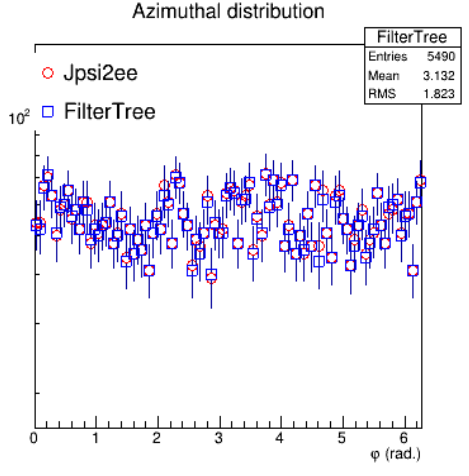


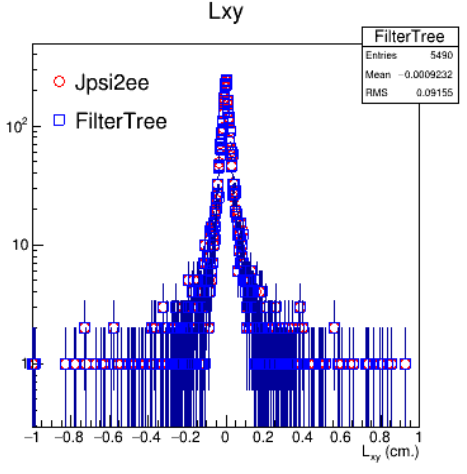



# Jpsi2ee Task on ‘FilteredTree’