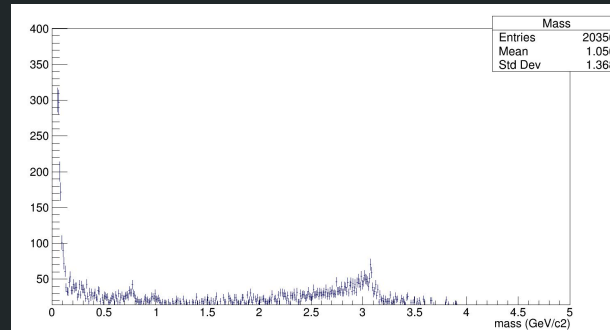


Physics Working Group

Dileptons and Quarkonia

Personal Motivation - X(3872)

1. X(3872) decays to J/ψ (composed by a pair charm/anti-charm)
 - a. X(3872) → J/ψ π⁺π⁻
2. J/ψ decays to a pair e⁺e⁻ or μ⁺μ⁻
3. We can use the framework to correctly reconstruct the J/ψ meson
 - a. Time Projection Chamber
 - i. Particle Identification
 - b. Inner Tracking System
 - i. Tracking
4. The Framework is based on Table Reduction
5. LHC Data → Table Maker + Filter pp → Table Reader → Same Event Pairing



What I Have to Do


Service Work

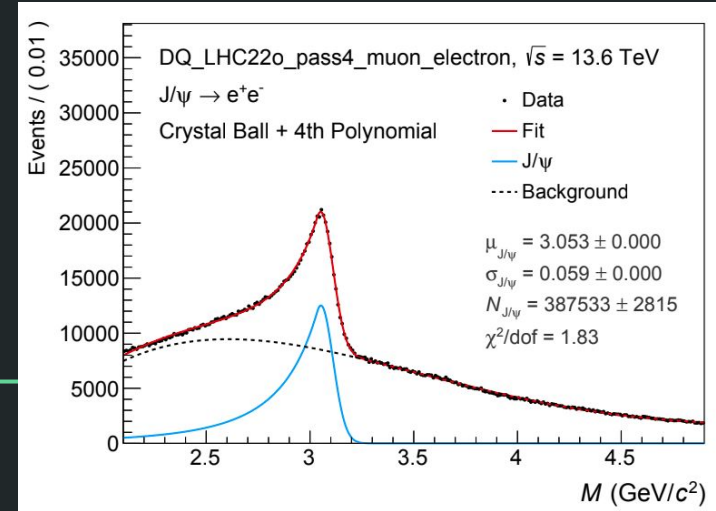
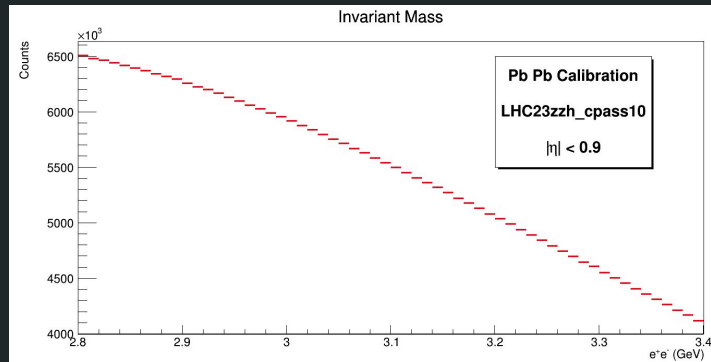
- a. LHC DataSet (PB) \longrightarrow Filter pp \longrightarrow \sim 1 TB \longrightarrow New Cuts (< 1 TB)
- b. Optimize the Cuts and Propose/Use New Variables
- c. Analysis in the e^+e^- channel
- d. Filter pp = Software Trigger
- e. The Reduced Dataset will be available for all the Collaboration
- f. Hyperloop
 - i. Create wagons and trains to run tasks using GRID
 - ii. Graphical Interface

$p_T > 1 \text{ GeV}/c$
 $-0.9 < \eta < 0.9$
 $0 < \text{TPCchi2} < 4$
SPDany
 $70 < \text{TPCchi2} < 161$
 $-4 < \text{TPCn}\sigma_{\text{Electron}} < 4$
 $\text{TPCn}\sigma_{\text{Proton}} > 2.5$
 $\text{TPCn}\sigma_{\text{Pion}} > 2.5$

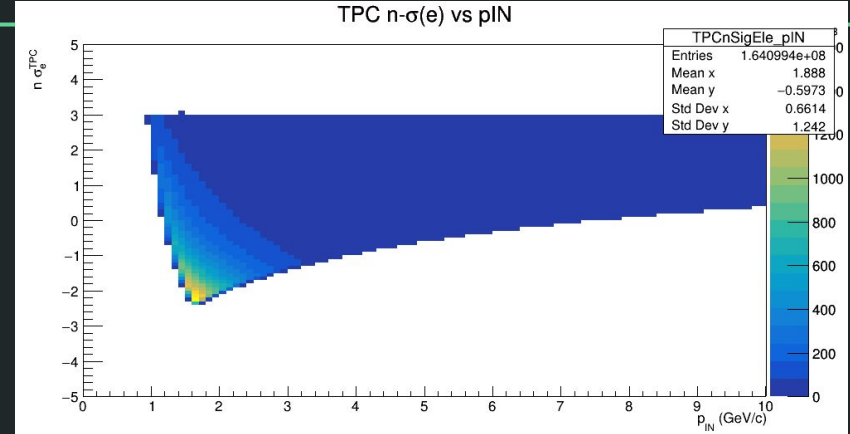
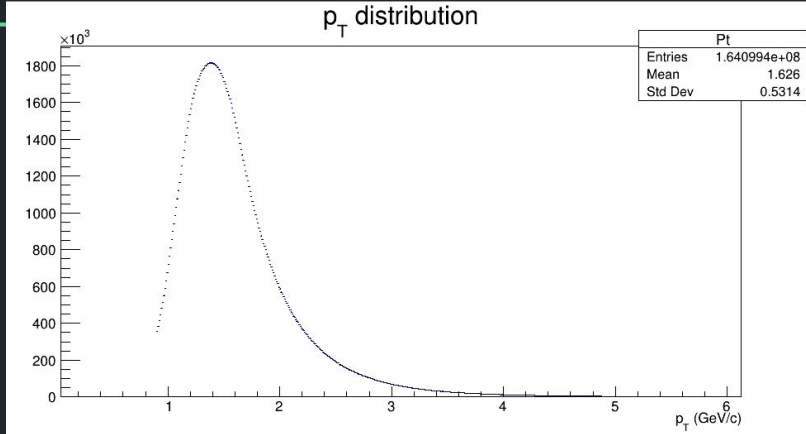
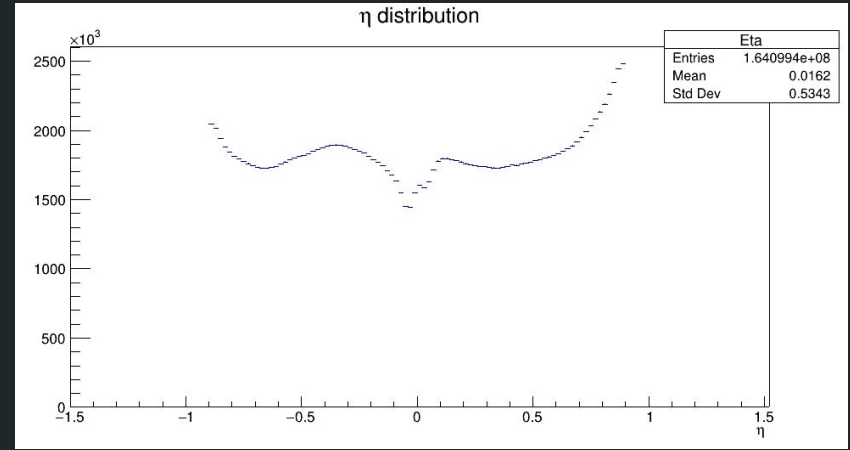
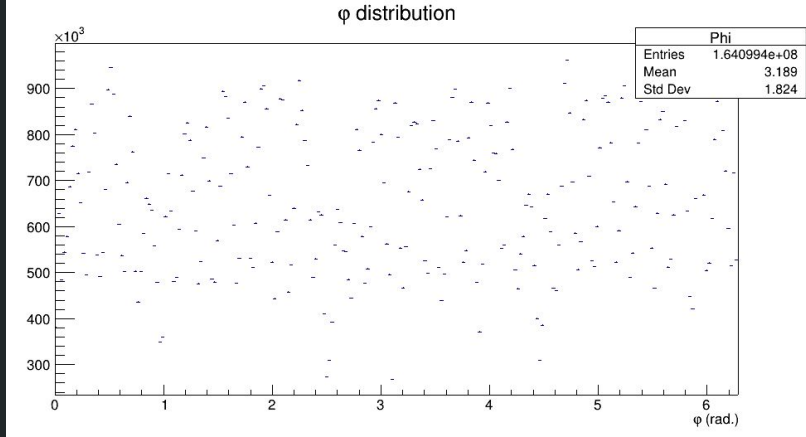
cfgDileptonLowMass	 	2.8
cfgDileptonpTCut	 	0
cfgLeptonCuts	 	jpsiO2MCdebugCuts2
cfgMagField	 	5
cfgMixingDepth	 	5

Analysis

1. Proton-Proton at 13.6 TeV
2. Goal  Find J/ψ and $\psi(2S)$ peaks in the invariant mass spectrum
 - a. J/ψ (✓)
 - b. $\psi(2S)$ (X)
3. PbPb at 5.36 TeV per nucleon pair
 - a. J/ψ (X)
 - b. $\psi(2S)$ (X)
 - c. No problem, it's a calibration Run
 - i. Very low statistics
4. Barrel Tracks
 - a. $|\eta| < 0.9$














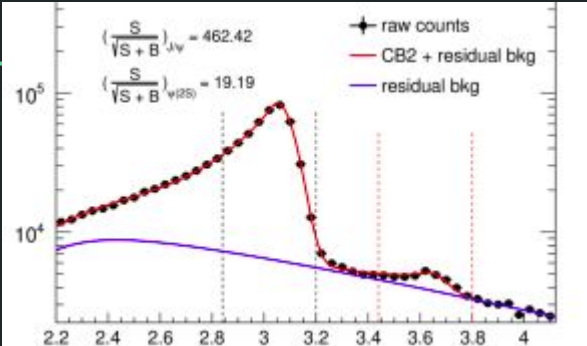
Some QA plots (PbPb)



Dilepton AOD

- 1. Tree with informations related to the tracks and PID
- 2. Strategy
 - a. Define variables
 - b. Train using MC
 - c. Apply to data
- 3. $\psi(2S)$ is difficult to visualize without M.L.

-  O2reducedtrack;1
-  O2revtxcov;1
-  O2rtbarrel;1
-  O2rtbarrelpid
-  O2rtbarrelpid;1
-  O2rtdilepton
-  O2rtdilepton;1
-  O2rtdileptonextra;1
-  O2rtdileptonflow;1
-  O2reducedevent;1
-  O2reextended;1



➔ Yuan Zhang (workshop)

➔ More statistics than me - LHC22 (m, o, r, t)

Plans and Perspectives

1. Analysis Run in the PbPb case
 - a. My task is to calculate the $J/\psi / \psi(2S)$ ratio
 - b. Some QA plots before vacation
2. Use Machine Learn
 - a. Decide which variables will be used in the train phase
 - i. Produce a Dilepton Tree
 - ii. Use TMVA or Python?
 - b. There is no MC production in PbPb until now
 - c. Use MC in pp to train and find the $\psi(2S)$ peak
 - d. Until now, the $\psi(2S)$ significance is small also in pp
3. Decide the variables and cuts for the service work (Cristiane will help me)
4. Use the TPC PID to associate the dilepton with pions
 - a. Reconstruct the $J/\psi \pi^+ \pi^-$
5. Study the ALICE experiment and the Theory of exotics
6. Be more involved in the Working and Analysis groups

THANK YOU
