J/Psi Measurement in Dimuon channel for pp@13TeV

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Out Line

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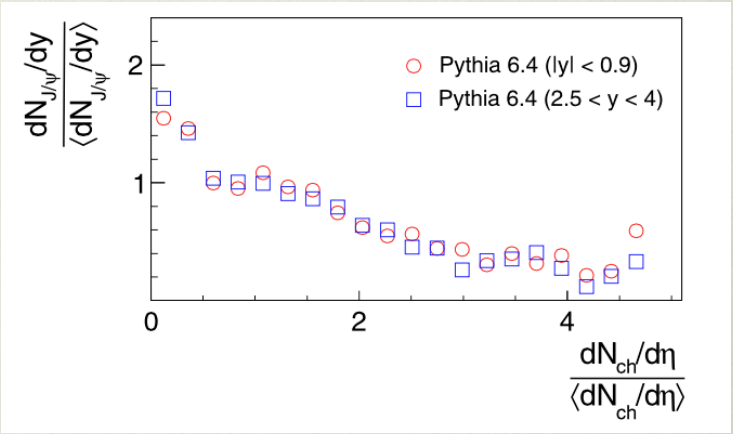
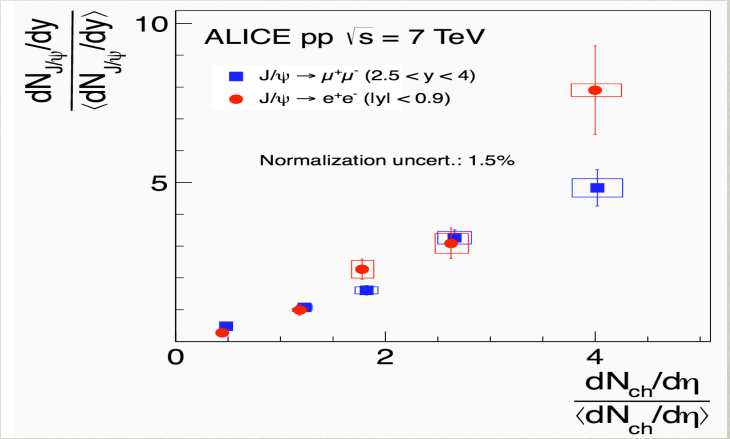
Introduction and motivation

- The understanding of quarkonium production in hadronic collision stays very interesting as always.

❖ ***Results of J/ψ relative yield v/s*** $dN_{ch}/d\eta$ ***in pp@7 TeV.***

- The 1st figure shown is the relation between the multiplicity distributions generated for minimum bias events and events containing J/ψ from hard scatterings.
- A decrease of the J/ψ multiplicity w.r.t event multiplicity is observed.
- On the other hand experiment observe (2nd fig.) the increase of J/ψ production with event multiplicity.
- It can not be understood by a simple 2 --> 2 hard partonic scattering scenario (PYTHIA).
- This might be due to Multi Parton Interaction(MPI).





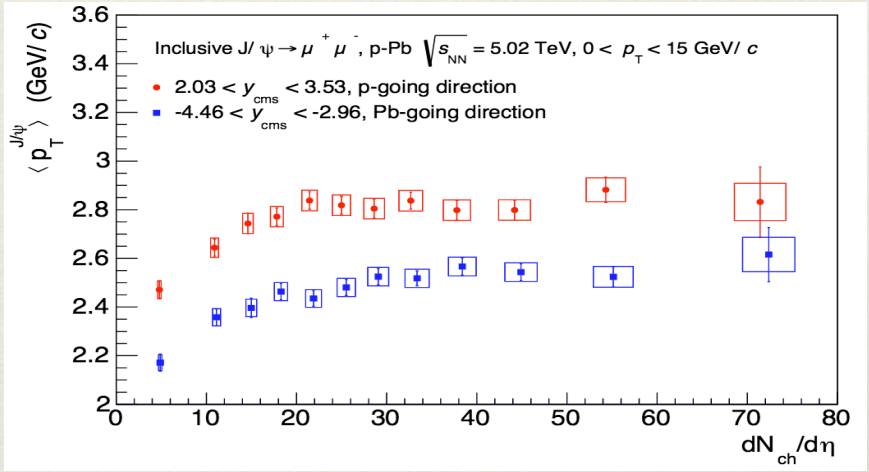
(Physics Letters B 712 (2012) 165–175)

❖ *Results of multiplicity v/s J/ψ< p_T >In pPb @ 5.02 TeV*

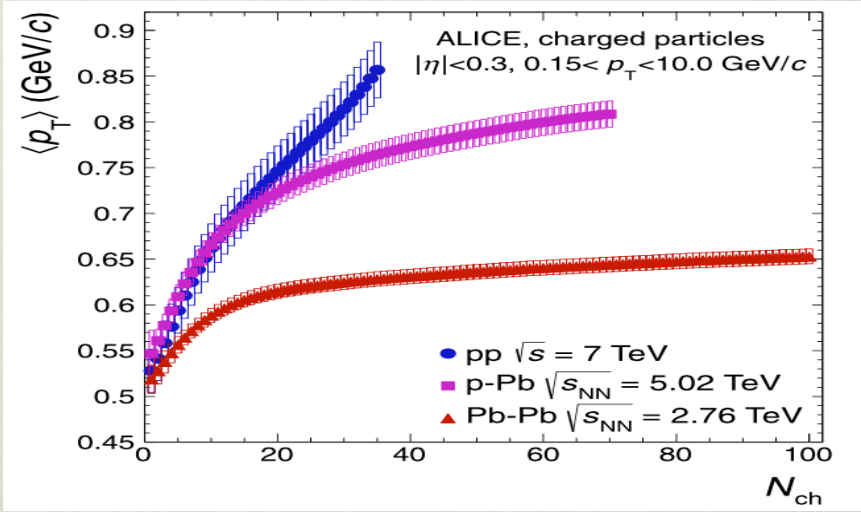
- In Fig.1 multiplicities beyond certain value, the J/ψ $\langle p_T \rangle$ shows a trend towards saturation.

- The observed saturation on the J/ψ $\langle p_T \rangle$ could indicate that the production mechanism does not vary with multiplicity.

- The 2nd figure shows the charged-particle transverse momentum spectrum, $\langle p_T \rangle$, and its correlation with the charged-particle multiplicity *N*ch.



(Analysis note by L. Aphecetche, J. Martin-Blanco*, G. Martinez)



(*Physics Letters B 727 (2013) 371–380)*

- This analysis aims to investigate J/ψ relative yield and mean p_T as a function of the $dN_{ch}/d\eta$ for high multiplicity environment where there is higher probability of hard scattering like pp@13TeV.

J/Psi Characteristics

- The J/ψ is the first excited state (*1S*) of charmonium (i.e *bound state of a charm quark and a charm anti-quark*).

Symbol	Quark content	Rest mass GeV/c^2	Charge	Spin	Parity	Mean Life
J/ψ	$c\bar{c}$	3.0969	0e	1	-ve	7.2×10^{-21} sec

Decay Channel

- In experiment J/ψ decay observed to be through leptonic decays, hadronic decays and radiative decays.
  - ✓ **Leptonic decay**

$$J/\psi -> \gamma^* -> l^+ + l^-$$

  - ✓ **Hadronic decay**

$$J/\psi -> \gamma^* -> Hadrons$$
$$J/\psi -> g + g + g -> Hadrons$$

  - ✓ **Radiative decay**

$$J/\psi -> \gamma + g + g -> \gamma + Hadrons$$

- Hadronic decay modes of J/ψ are strongly suppressed because of the *OZI Rule*. This is why the J/ψ has a significant branching fraction to leptons.

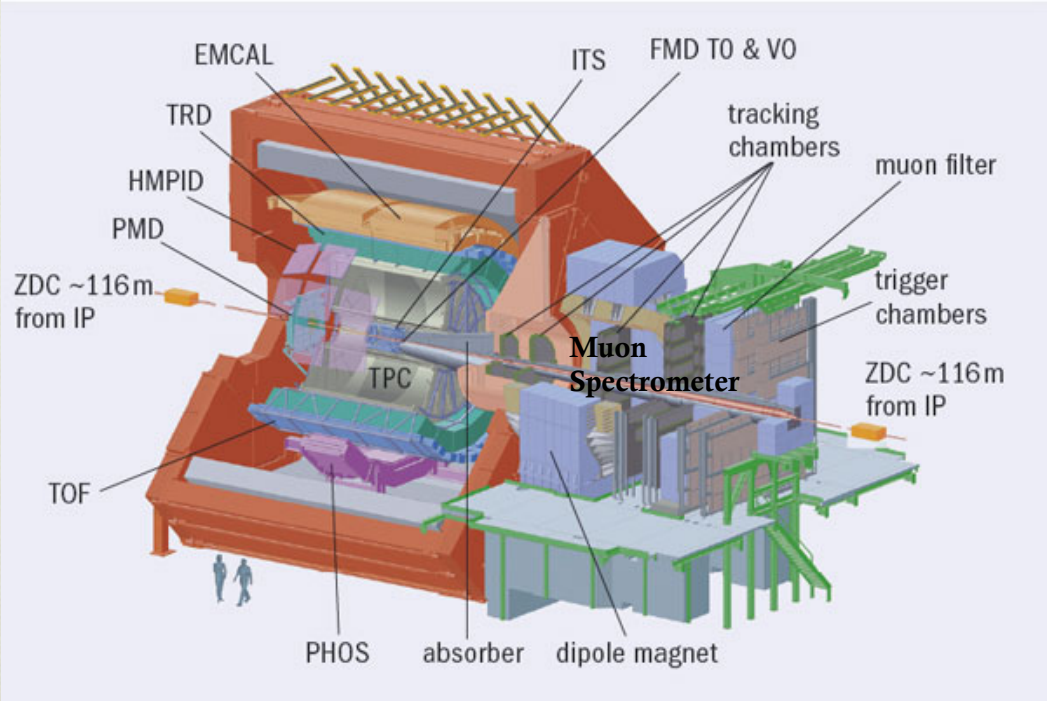
ALICE Muon Spectrometer

- **ALICE** is a dedicated heavy ion detector design for study of system created in heavy ion collisions in a high multiplicity environment.

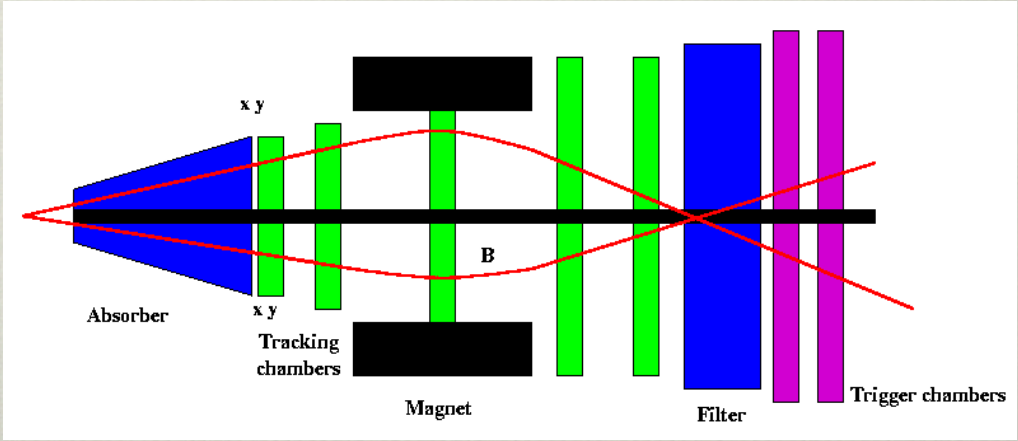
- The sub system ***Muon spectrometer*** is dedicated for the study of quarkonium decaying to $\mu^+ \mu^-$.

- The muon spectrometer is used to study muon produced in $-2.5 < \eta < -4$ ($2^\circ < \theta < 9^\circ$).

- Full Φ coverage



- The muon spectrometer consists of absorbers, a muon dipole magnet, muon filter (iron wall), trigger system and tracking system.



Data Sample

- The analysis has been done using the LHC15g period from 2015 pp@13 TeV data.
- AOD files are used with the data path *muon_calo_pass1/AliAOD.Muons.root*
- **Run list:- (24 run numbers)**

  231321, 231568, 231323, 231322, 231320, 231319, 231317,231316, 231290, 231291, 239292, 231210, 230985, 230948,230934,230699,230697,230683, 230457,230452,230419,230305,230300,230293

- **Platform used for the Analysis**

```
plugin->SetAPIVersion("V1.1x");
plugin->SetROOTVersion("v5-34-30-1");
plugin->SetAliROOTVersion("v5-06-33");
plugin->SetAliPhysicsVersion("v5-06-33-01");
```

Selection Criteria

Event:

$|Z_{vtx}| < 10.0\ cm$

CMUL7-B-NOPF-MUFAST trigger

Tracks:

$-4.0 < \eta < -2.5$ (on both muons)

$17.6 < R_{abs} < 89.5$ (on both muons) (radial transverse position of muon tracks at the end of the absorber)

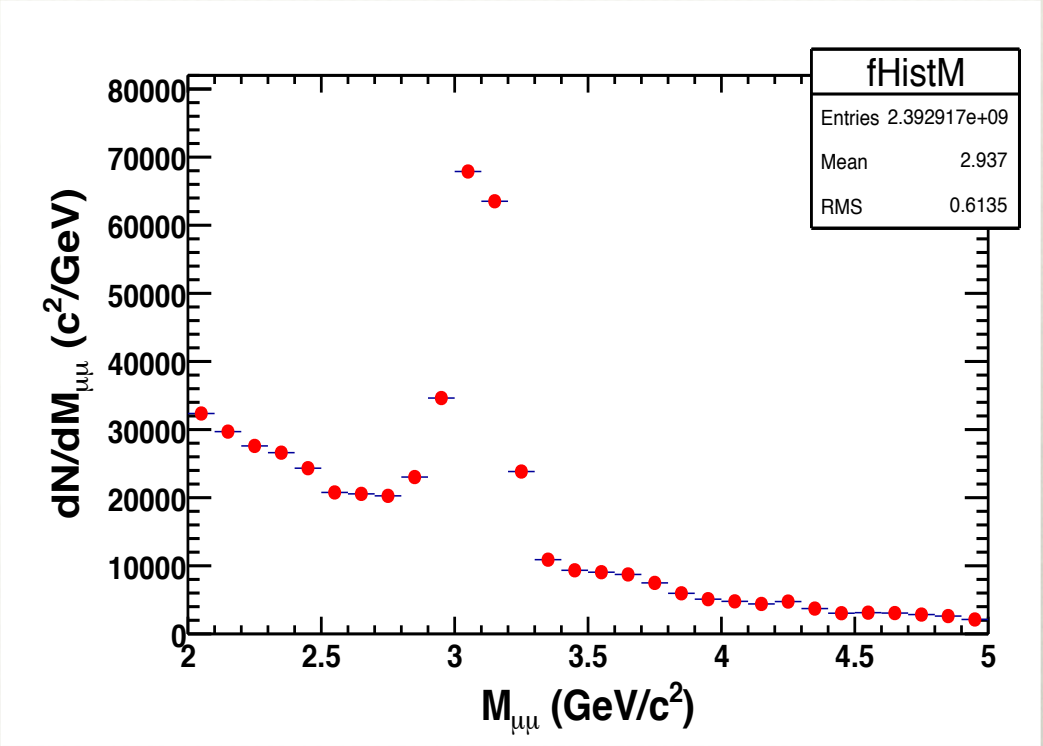
$-4.0 < y < -2.5$ (On dimuon pair)

Both muon matching the low p_T trigger.

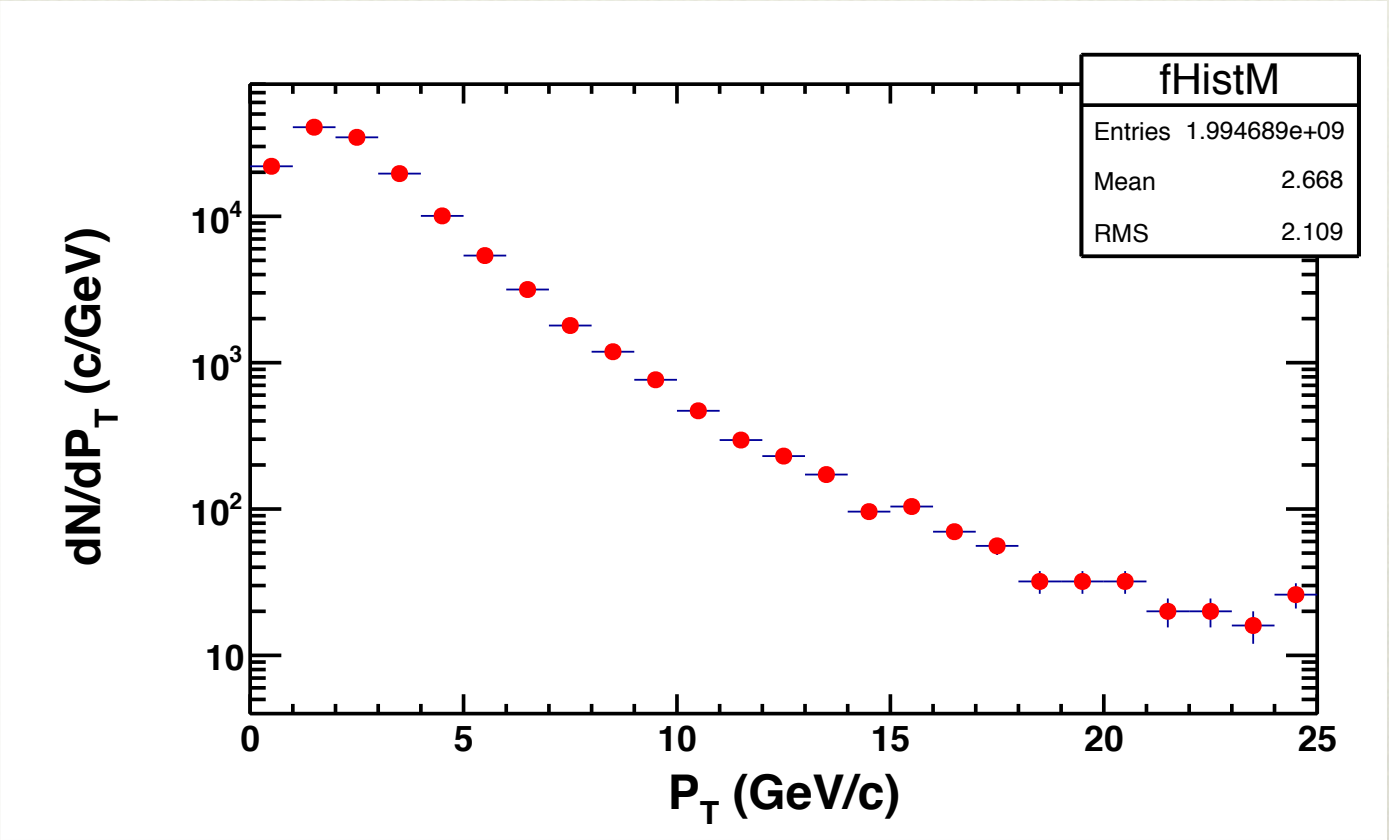
Dimuon Invariant mass reconstruction

To do:

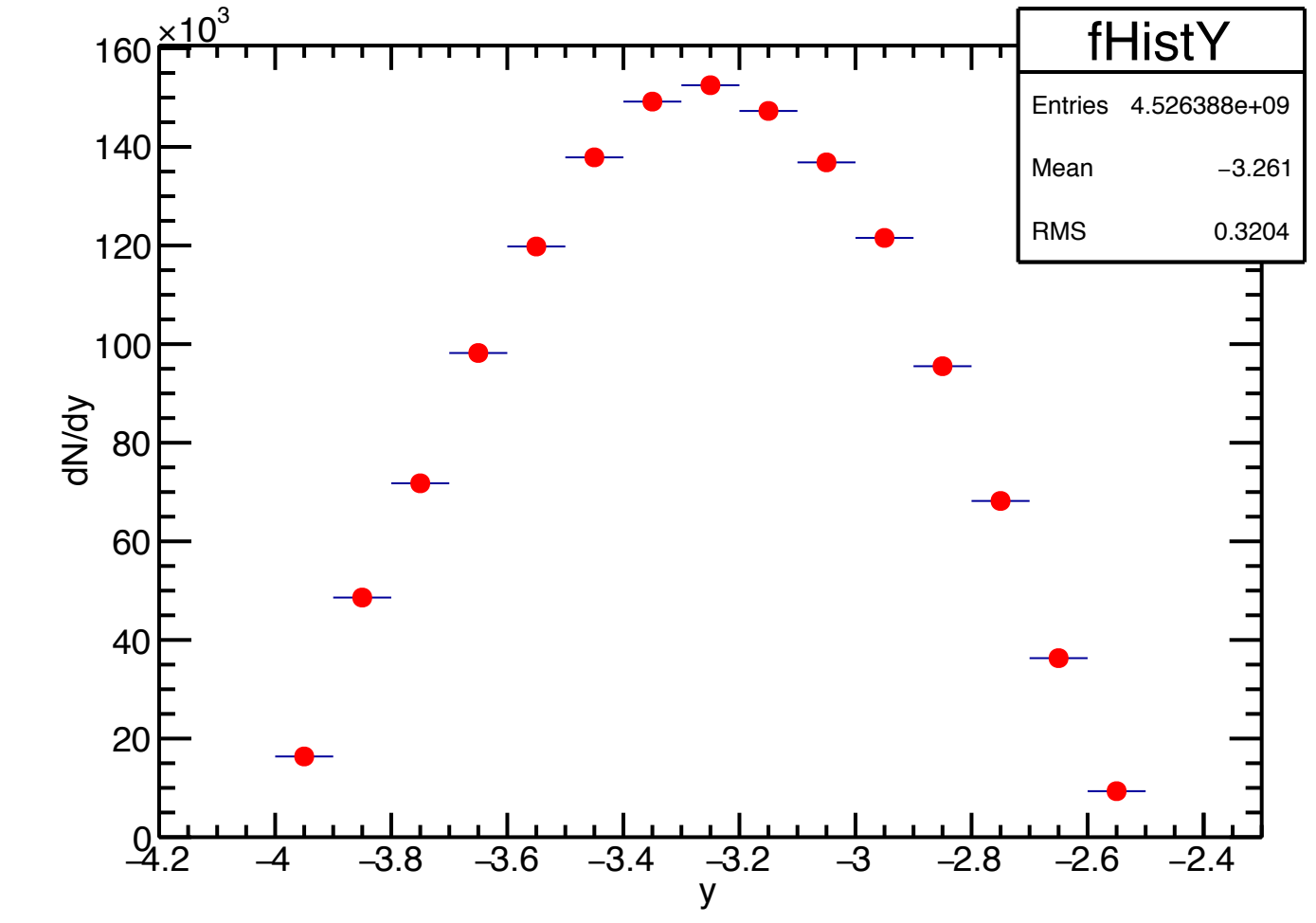
- Extraction of J/ψ signal with removal of background by fitting invariant mass spectrum.



Dimuon Transverse momentum reconstruction



Dimuon rapidity reconstruction



Future Plan

- The fitting of invariant mass spectrum with proper background subtraction to be done to extract the J/Psi signal.
- Q.A analysis will be done to select proper run number.
- Like to do Multiplicity analysis at pp@13TeV.

Thanks

Back up

Fit Function

Gaussian(Signal) +
Exponential(Back ground)