

ALI YILMAZ

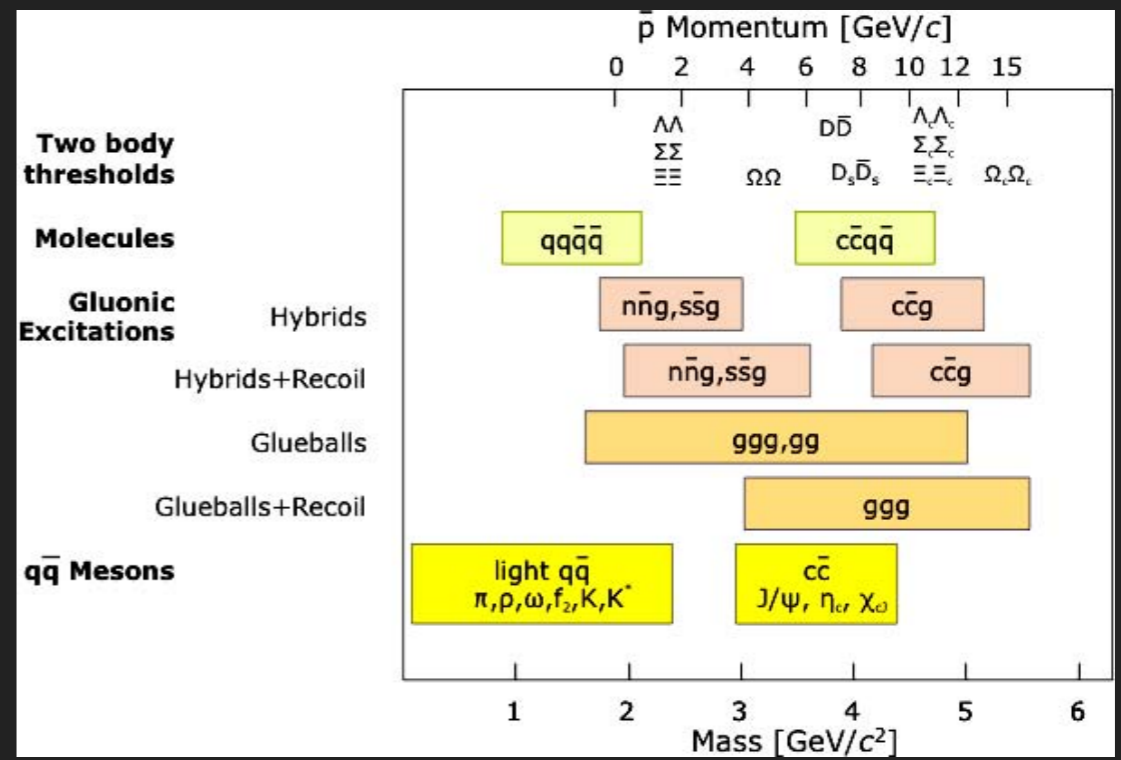
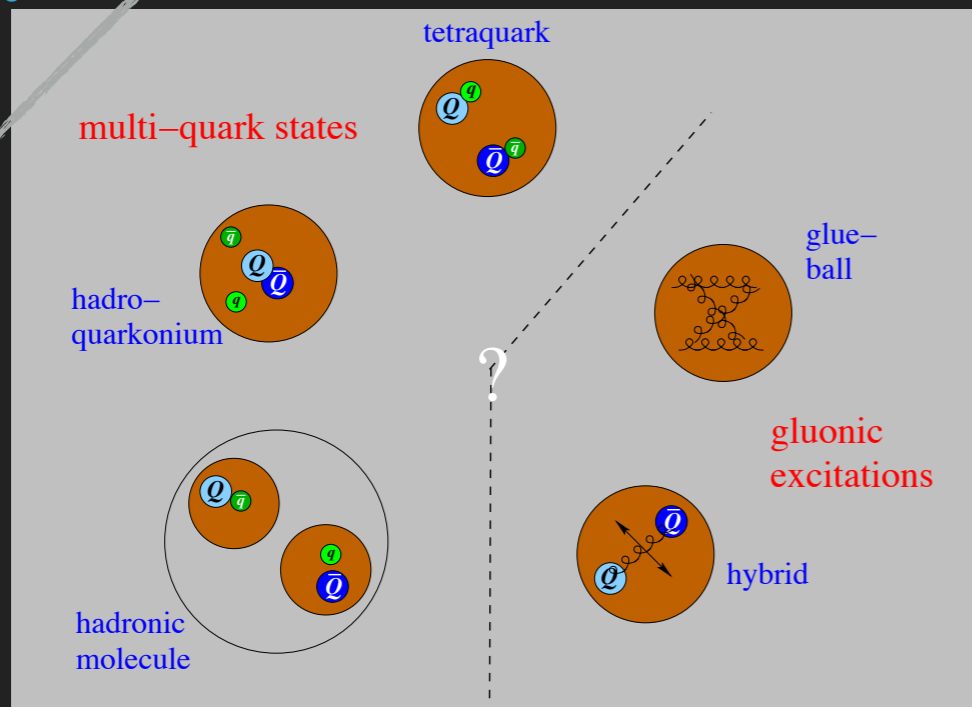
November 14, 2019

PANDAROOT

INSTALLATION AND $Z_c(3900)^\pm$ TEST

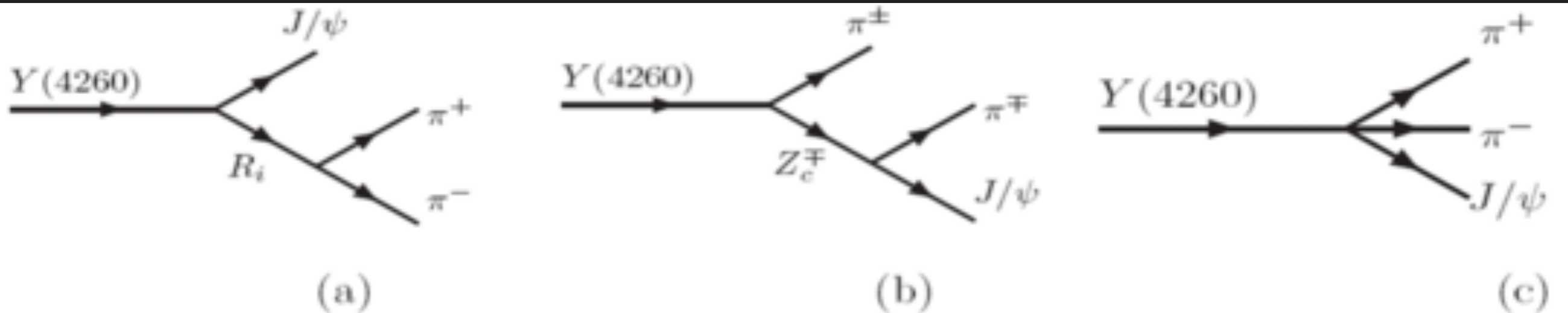
Mass Range of Hadrons That Will Be Accessible at PANDA. The Upper Scale Indicates the Corresponding Antiproton Momenta Required in a Fixed-Target Experiment. The HESR Will Provide 1.5 to 15 GeV/c Antiprotons, Which Will Allow Charmonium Spectroscopy, the Search for Charmed Hybrids and Glueballs, the Production of D Meson Pairs and the Production of Baryon Pairs for Hypernuclear Studies.

most common proposals for the structure of exotic states



INTRODUCTION

DECAY MODES OF $e^+e^- \rightarrow \pi^+\pi^-J/\psi$ @ 525 pb^{-1} , 4.26 GeV



The $Z_c(3900)^-$ was observed in π^-J/ψ invariant mass distribution in the study of $e^+e^- \rightarrow \pi^+\pi^-J/\psi$ at BESIII and Belle experiments.

System: Linux Ubuntu 16.04 (gcc-5.4)

FairSoft: jun19p2

FairRoot: v18.2.1

PandaRoot: oct19

WORKING SYSTEM

```
EVTINPUT += "/MACRO/RUN/PSI2S_JPSI2PI_JPSI_MUMU.DEC";
```

```
NOPHOTOS
```

```
DECAY PBARPSYSTEM
```

```
1.0 J/PSI PI+ PI- PHSP;
```

```
ENDDECAY
```

```
DECAY J/PSI
```

```
1.0 MU+ MU- VLL;
```

```
ENDDECAY
```

```
END
```

SUPPRESSES INITIAL AND FINAL STATE RADIATION FOR SIMPLICITY



two intermediate resonances ($\psi(2S)$ and J/ψ),

four final state particles (μ^+ , μ^- , π^+ and π^-)



- ▶ DATA ACCESS
- ▶ PARTICLE IDENTIFICATION
- ▶ COMBINATORICS
- ▶ MC TRUTH MATCH
- ▶ FITTING WITH 4 CONSTRAINT (4C), VERTEX
CONSTRAINT, MASS CONSTRAINT

STRATEGY

`pp_jpsi2pi_jpsi_mumu.dec` - decay file specifying the signal decay channel

FOR EVENT GENERATION

tut_sim.C – Simulation (transport) of the generated events

tut_aod.C – Digitization, reconstruction and pid assignment of simulated data; this is the analysis-objects-data level (AOD).

tut_runall.sh – Shortcut shell script to run the two macros above for sim/digi/reco/pid macros

tut_fastsim.C – Run fast simulation (this skips the Geant based detailed simulation and transport, but only does smearing and acceptance cuts).

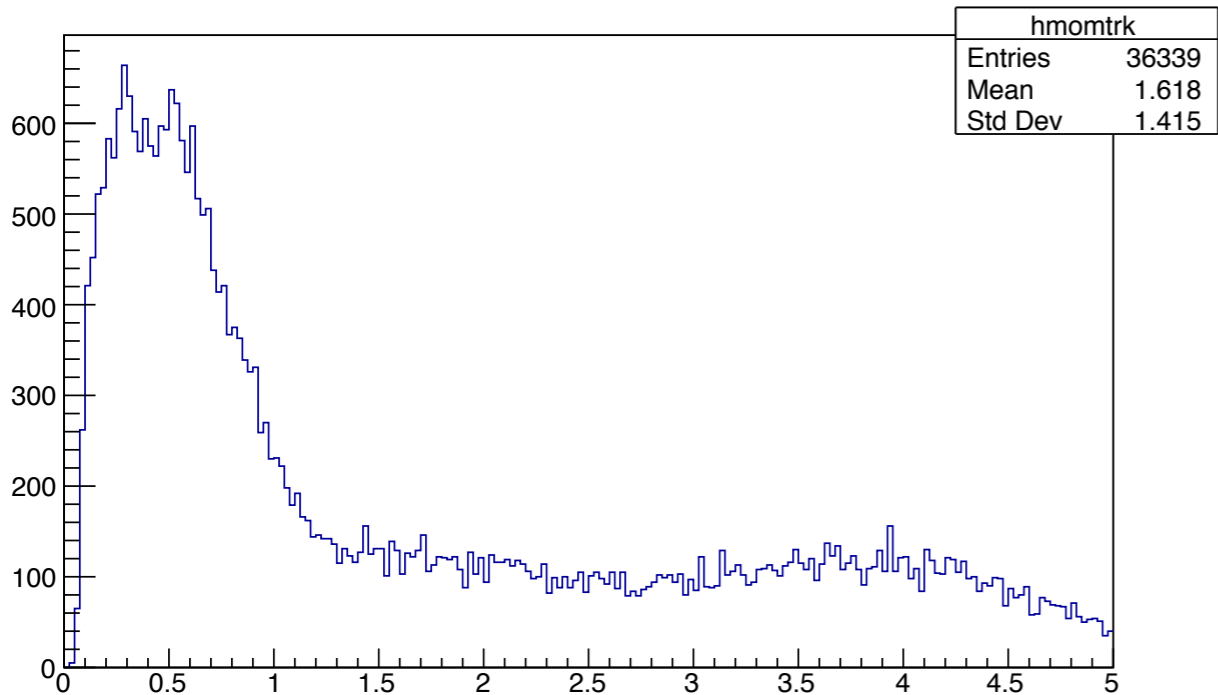
quickfsimana.C – Does fast simulation and analysis in one simple step

**FOR RUNNING THE SIMULATION,
DIGITIZATION, RECONSTRUCTION, AND PID**

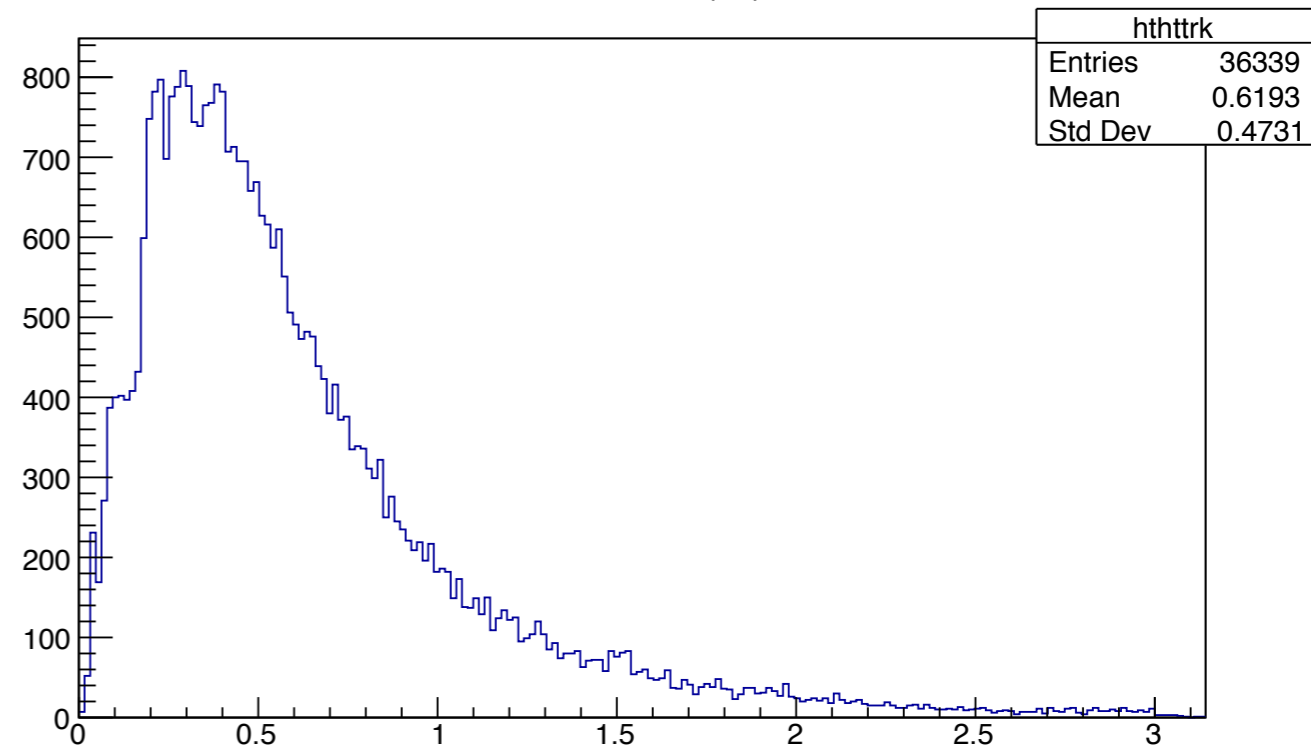
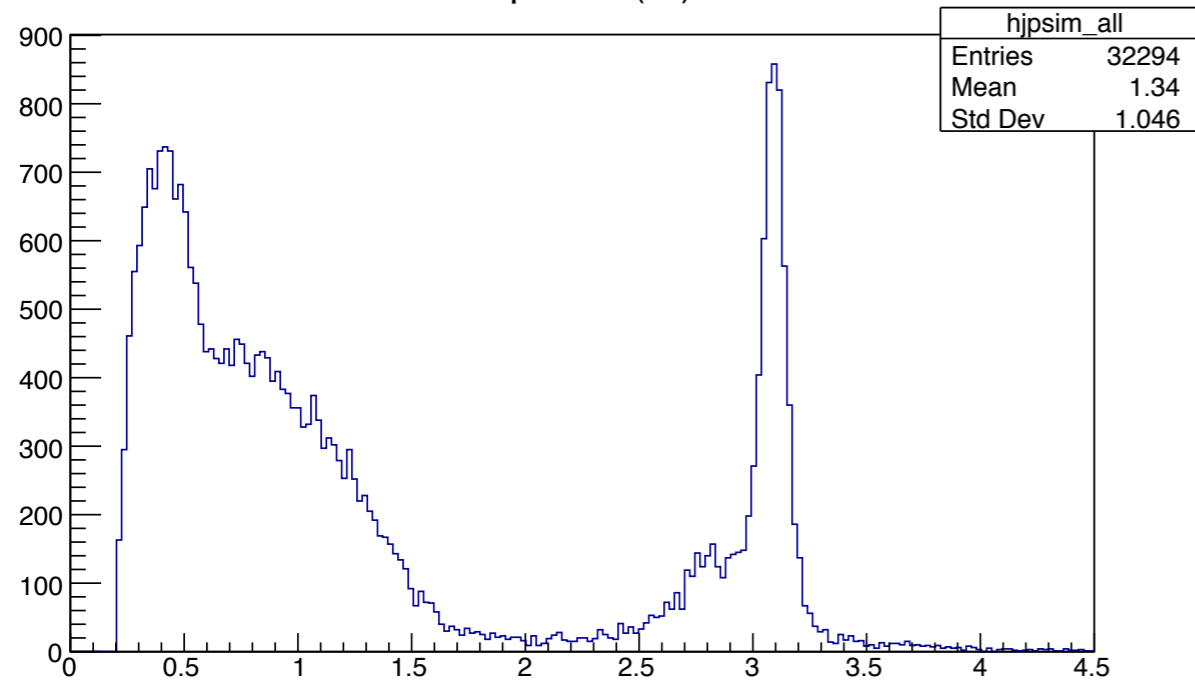
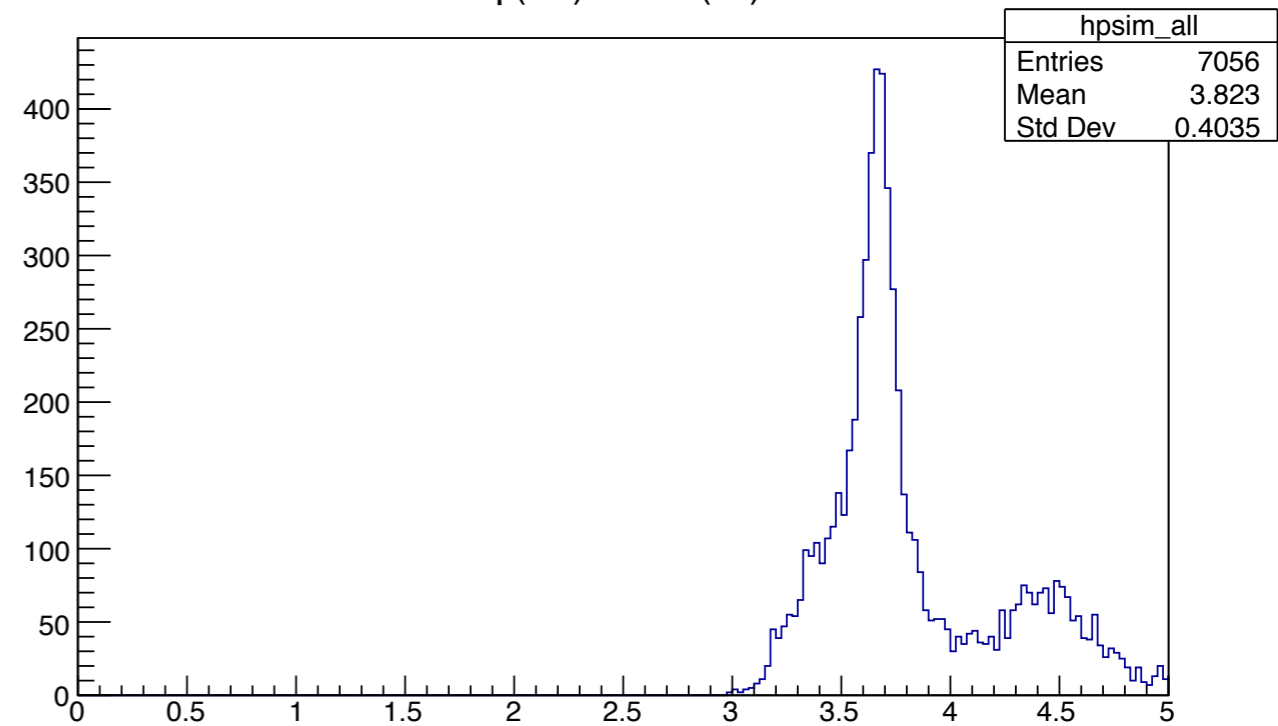
tut_ana_comb.C – Basic combinatorics
tut_ana_pid.C – Particle identification (PID)
tut_ana_mcmatch.C – Monte carlo truth match
tut_ana_mclist.C – Monte carlo truth list access
tut_ana_fit.C – Kinematic/vertex fitting
tut_ana.C – Merges PID, combinatorics, MC truth match and fitting from above
tut_ana_ntp.C – Example for using ntuple for analysis
tut_ana_fast.C – Does the complete analysis on the fast simulation output
quickana.C – Simple one line macro call for a complete ntuple analysis.

FOR ANALYSIS

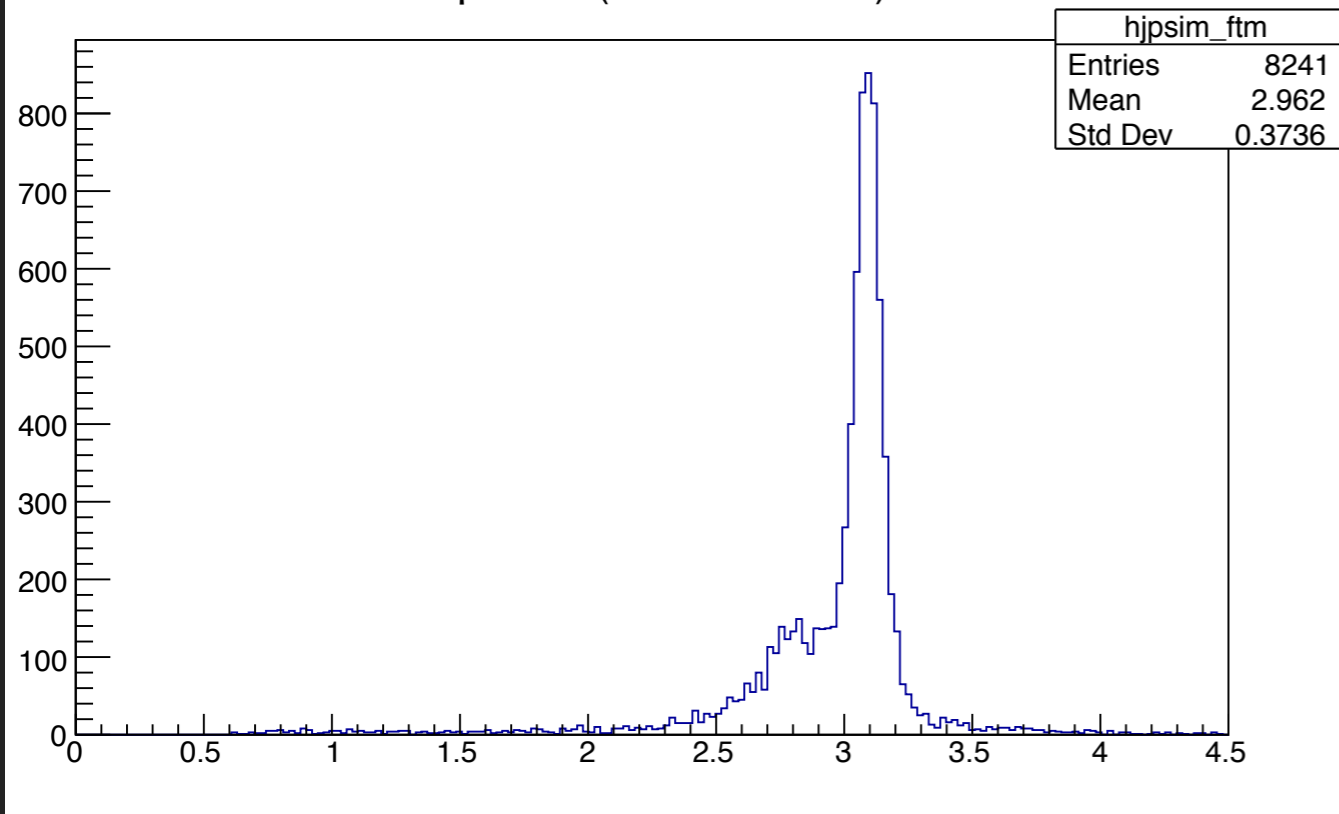
track momentum (all)



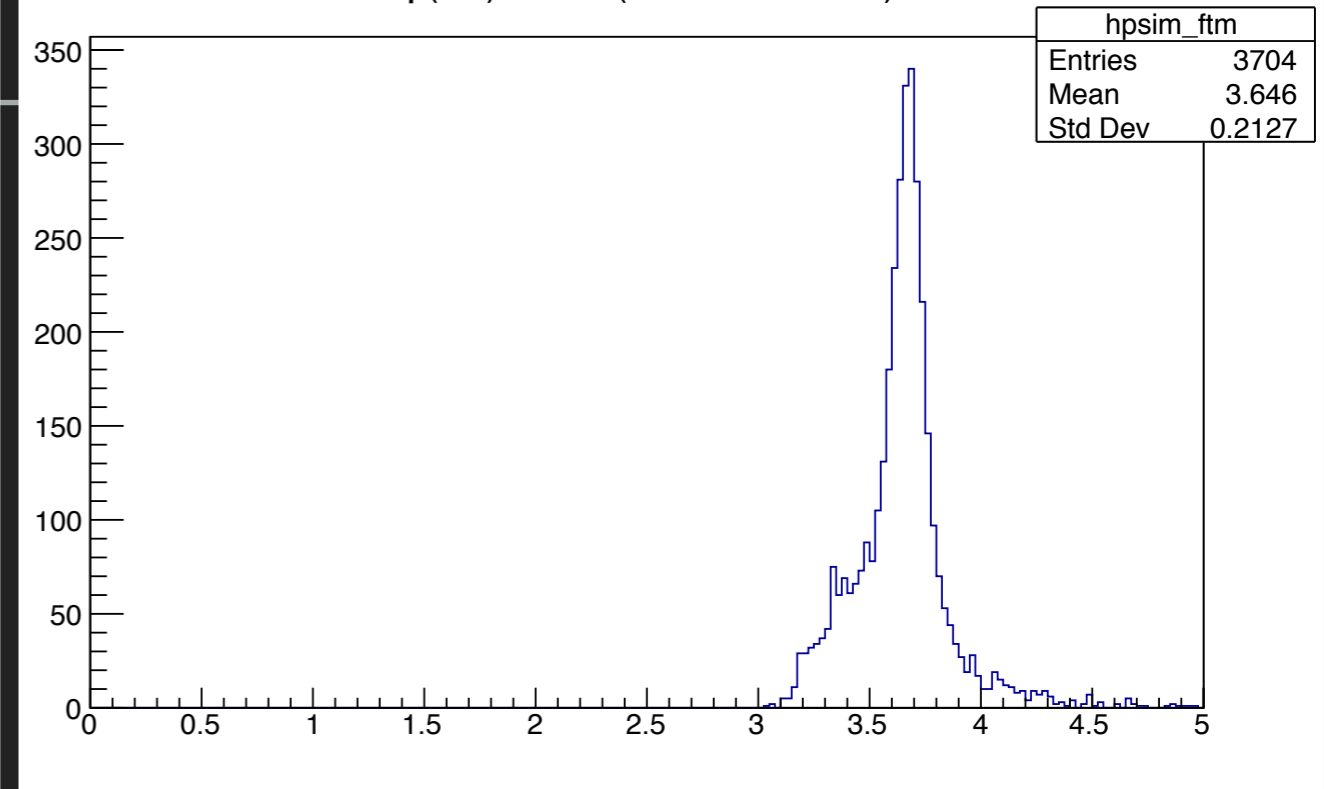
track theta (all)

J/ ψ mass (all) $\psi(2S)$ mass (all)

J/ ψ mass (full truth match)



$\psi(2S)$ mass (full truth match)



(x,y) projection of fitted decay vertex

