ψ(2S) Measument with CMS 10 TeV Data

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- Purpose: to measure ψ(2S) cross section and pt distribution and decay length using early 10 TeV CMS data.

- Signal includes two part:

  1. Prompt $\psi(2S)$:

     $pp \rightarrow g\psi(2S) \rightarrow \pi^+\pi^- J/\psi \rightarrow \mu^+\mu^-$,

the dataset /Psi2S_1S/Summer08_IDEAL_V9_v2/ GEN-SIM-RECO is produced by CMS group using Pythia and CMSSW_2_1_8, the number of events is 214778, the filter is $|\eta|<2.5$ and $p_t>$ 2.5 GeV for dimuon, the cross section is 4213 pb, hereafter the cross section has taken the fractions and filter efficiency(0.0175) into account.

2. non-Prompt $\psi(2S)$:

$pp \rightarrow b \rightarrow \psi(2S) \rightarrow \pi^+\pi^- J/\psi \hookrightarrow \mu^+\mu^-$,

the dataset /BtoJpsiMuMu/Summer08_IDEAL_V9_v2/GEN-SIM-RECO is produced by CMS group using Pythia and CMSSW_2_1_7, the number of events is 2434076, the filter is $|\eta| < 2.5$ and $p_t > 2.5$ GeV for dimuon, the cross section is 24667.6 pb, which includes the filter efficiency 0.0006444. It should be noted that the dataset also includes $pp \rightarrow b \rightarrow J/\psi$.

- Background includes two part:

  2. Prompt J/ψ :

  $pp \longrightarrow g\, J/\psi \longrightarrow \mu^+\mu^-$,

the dataset is /JPsi/Summer08_IDEAL_V9_v1/ GEN-SIM-RECO produced by CMS group using Pythia and CMSSW_2_1_8, the number of events is 1847135, the filter is $|\eta|<2.5$ and $p_t>2.5$ GeV for dimuon, the cross section is 12720 pb, which includes the filter efficiency (0.0074). It should be emphasized the dataset excludes the undirect production $\psi(2S) \rightarrow J/\psi$.

2. QCD process:

pp→inclusive μX ,

the dataset /InclusivePPmuX/Summer08_IDEAL_V11_redigi_v1/GEN-SIM-RECO is produced by CMS group using Pythia and CMSSW_2_2_1, the number of events is 5309035, the filter is $|\eta|<2.5$ and $p_t>2.5$ GeV for single muon, the cross section is 51.56 MB, which includes the filter efficiency (0.002305).

- event selection

All the processes are normalized to 50/fb.

cut 1: the mass of 2 π < 0.59 ;

cut 2: minimal ΔR ($\pi^{\pm}$, 2μ2π)<0.6, maximal < 1.0, here 2μ2π is ψ(2S) candidate;

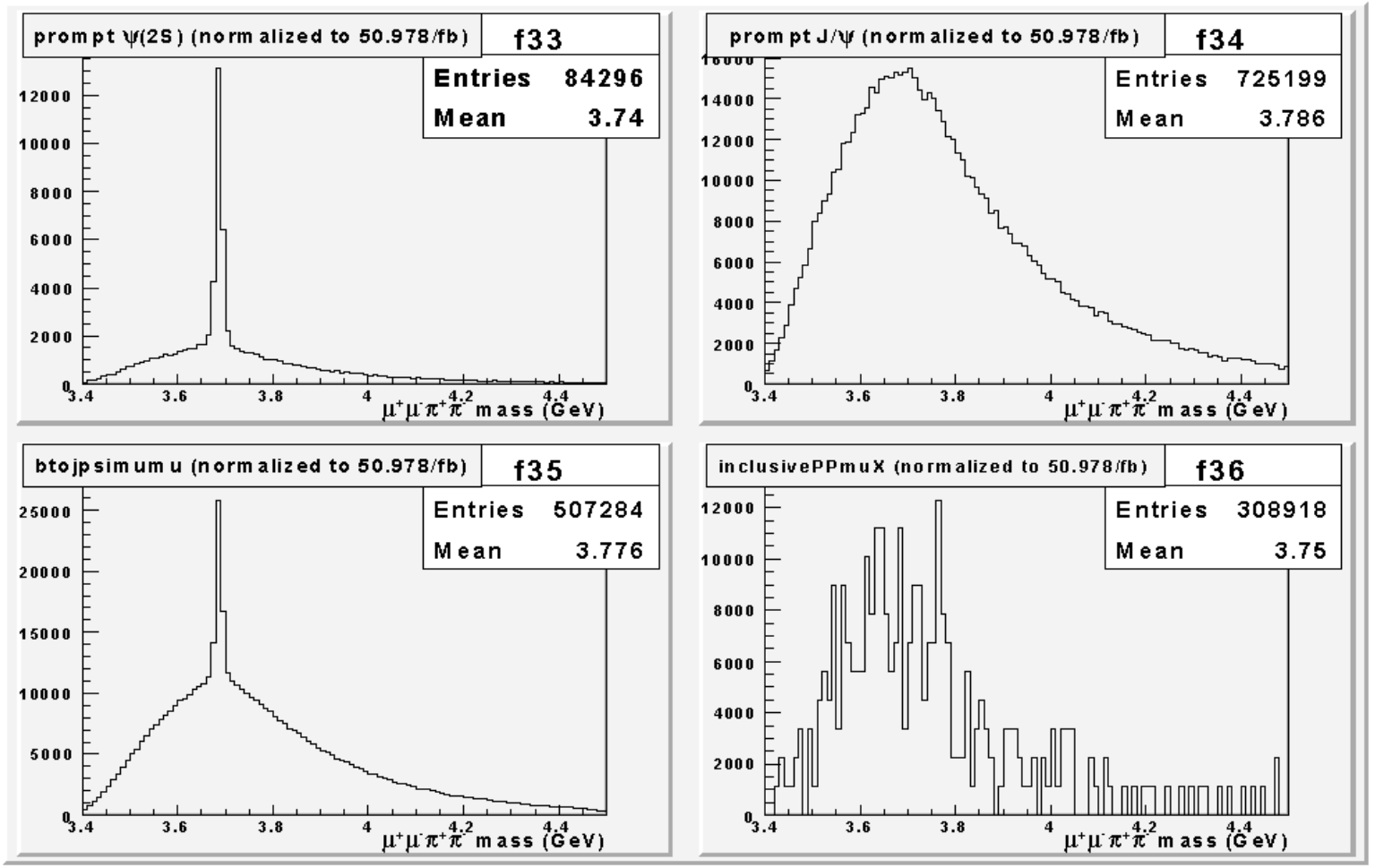
cut 3: ΔR (2μ, 2μ2π)<0.07, here 2μ is J/ψ ;

cut 4: minimal ΔR ($\pi^{\pm}$, 2μ)<0.4, maximal < 1.0;

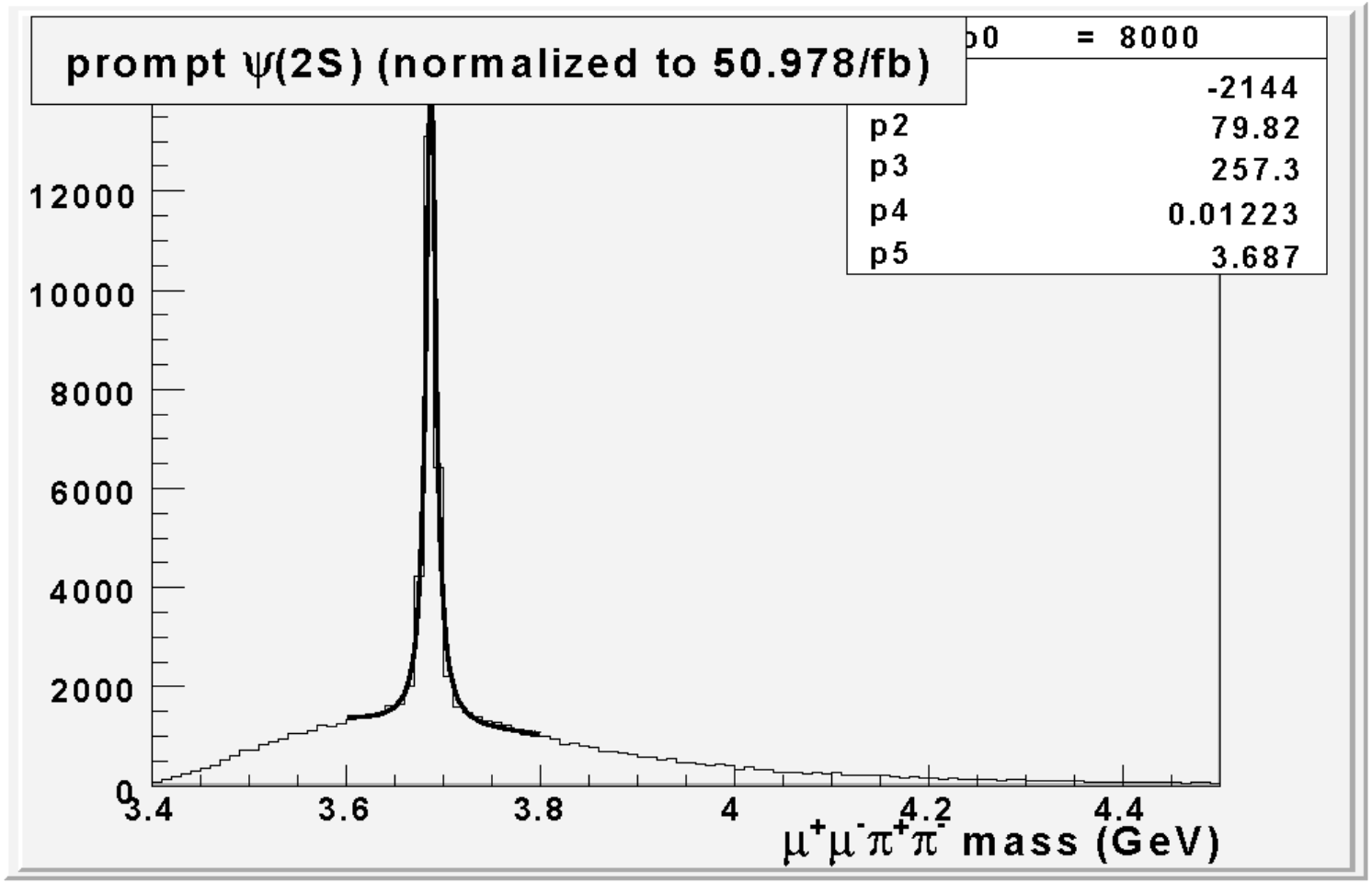
cut 5: ΔR (π^{+}, 2μ)+ ΔR (π^{-}, 2μ)+ ΔR (π^{-}, π^{+}) <2.0;

cut 6: 0.05<ratio of scalar sum of 2π pt to scalar sum of 2μ pt <0.38;

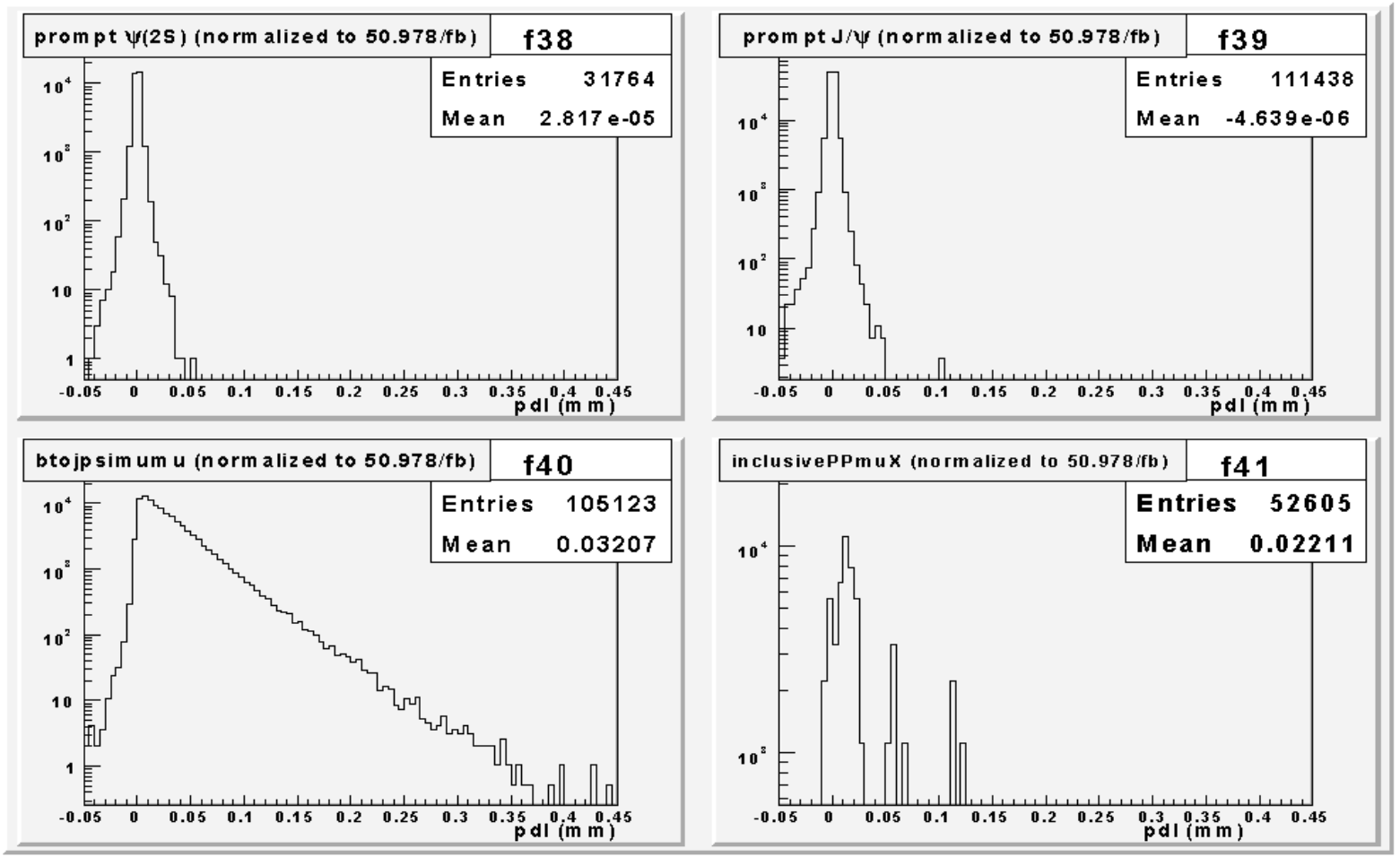
- the mass of ψ(2S) candidate



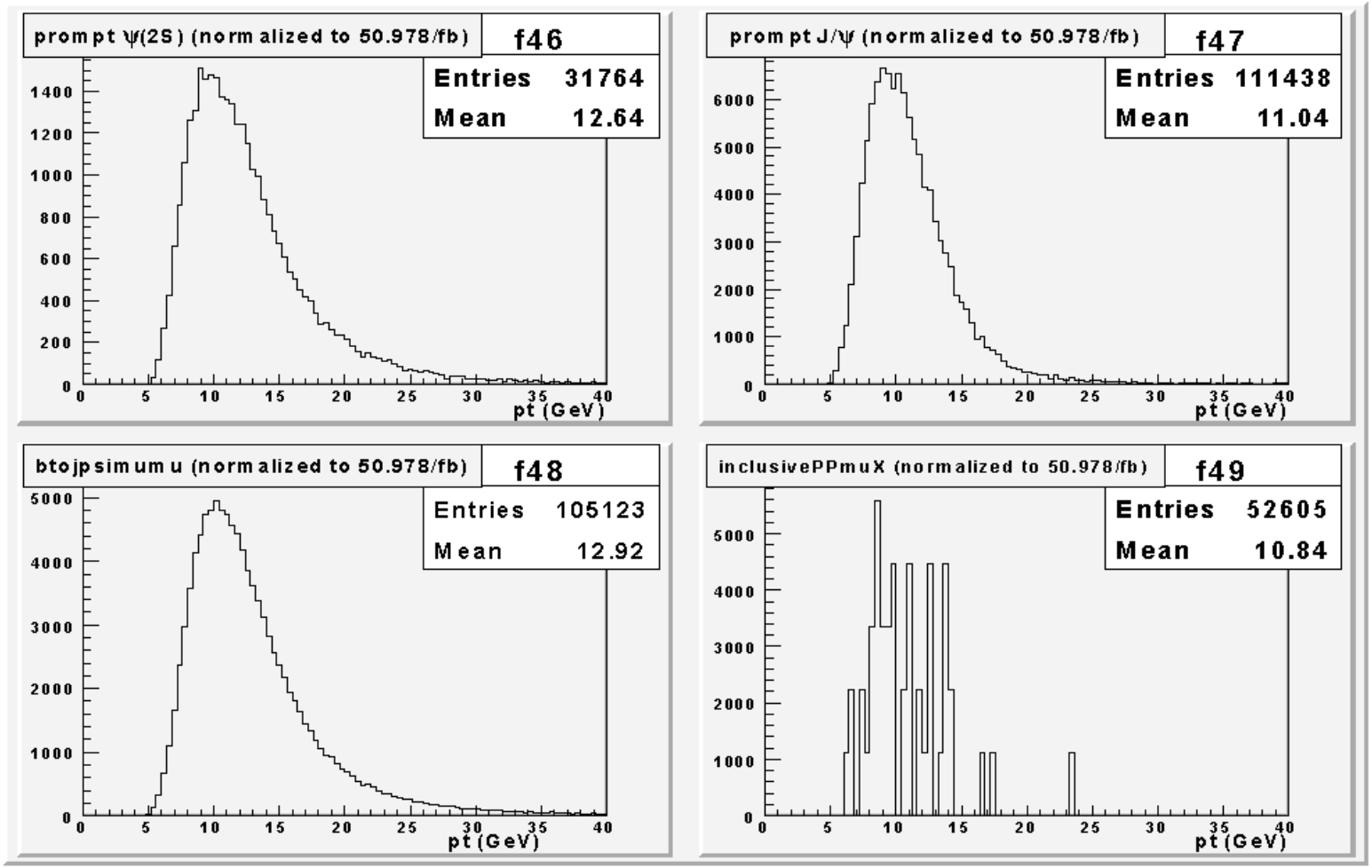
- the mass resolution of ψ(2S) candidate



- the decay length of ψ(2S) candidate



pt of ψ(2S) candidate



- angle of decay length and momentum of ψ(2S) candidate