Study of the cuts on X(3872), at CMS

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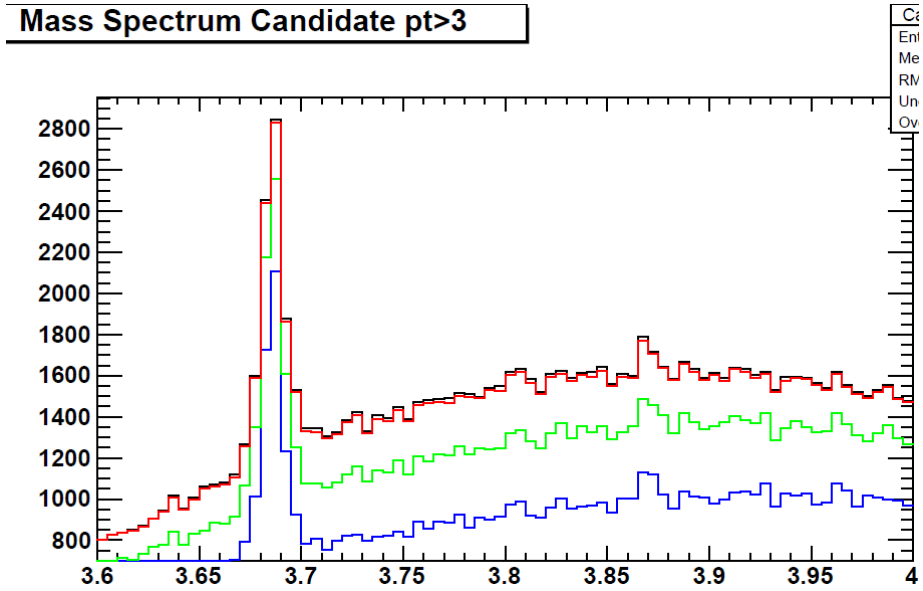
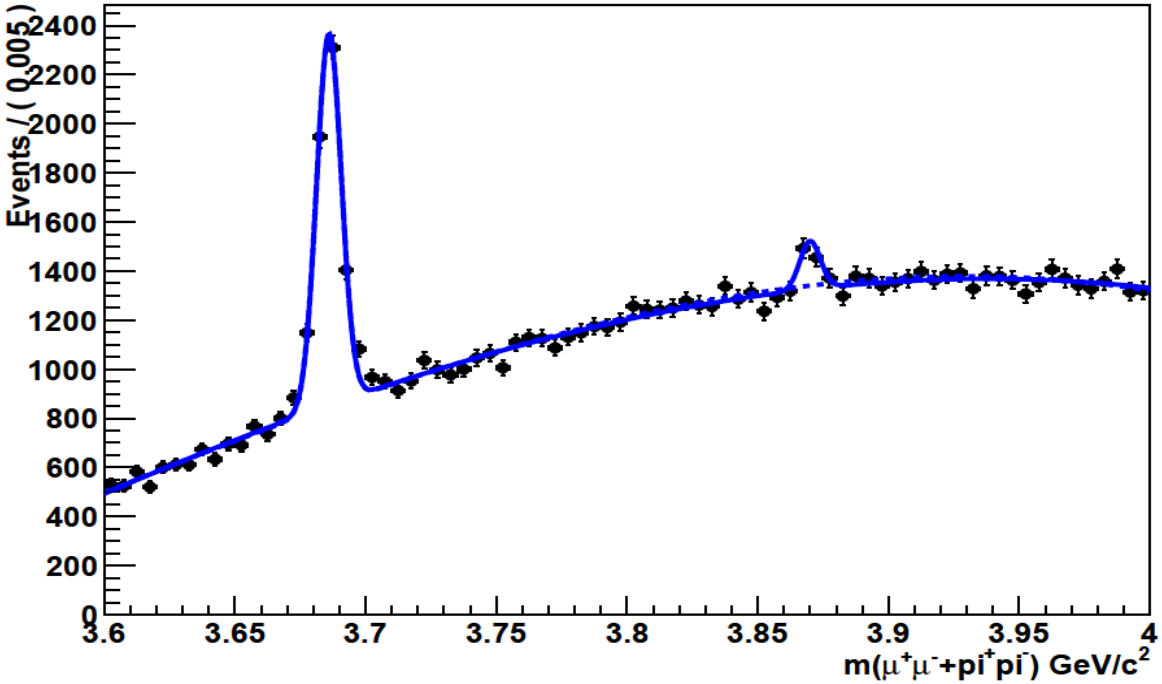
Previuos at QWG...

Marina Giunta slides'

X_{cand} p_t >3
X_{cand} p_t >5
X_{cand} p_t >8
X_{cand} p_t >11



Study on efficiency, acceptance …



c1 = 0.406569 +/- 0.00620918
c2 = -0.137397 +/- 0.00605678
c3 = -0.00983933 +/- 0.00602596
X_mass = 3.87 +/- 0.000899106
X_ σ = 0.00389225 +/- 0.000663821
Ψ'_ mass = 3592.39 +/- 99.7543
Ψ'_ σ = 0.00473338 +/- 0.000150675
Number_ Ψ' = 3592.39 +/- 99.7543
Number_X3872 = 382.518 +/- 75.051
nbkg = 88438.1 +/- 313.375

Run2010A and B

$\sigma_{X(3872)} / \sigma_{\psi(2S)}$ measurement

$$R = \frac{N^{corr}_{X(3872)}}{N^{corr}_{\psi(2S)}} = \frac{\sigma(pp \to X(3872)+anything) \times BR(X(3872) \to J/\psi\pi\pi)}{\sigma(pp \to \psi(2S)+anything) \times BR(\psi(2S) \to J/\psi\pi\pi)}$$

(in the given kinematical range: X_{cand} $p_t > 5$GeV, $|y| < 2.4$)

where: $N_{corr} = N_{meas} * A * \varepsilon$

N_{meas} = from signal yields in the invariant mass distribution

A = acceptance

$\varepsilon = \varepsilon_{\mu\mu} * \varepsilon_{X(or\ \psi')}$

$\varepsilon_{\mu\mu}$ = efficiency to reconstruct and trigger on 2 μ

$\varepsilon_{x(or\ \psi')}$ = efficiency to reconstruct the X(or ψ') given 2 reconstructed and triggered μ (related to different π tracking efficiency)

Ratio of efficiency corrected event yields preliminary result:

$$R = 0.14 \pm 0.027 \text{ (stat)}$$

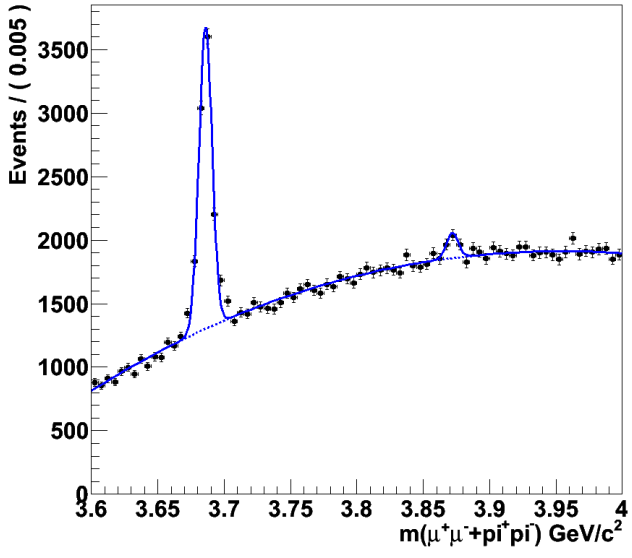
Preparing the slides for DBS for Moriond

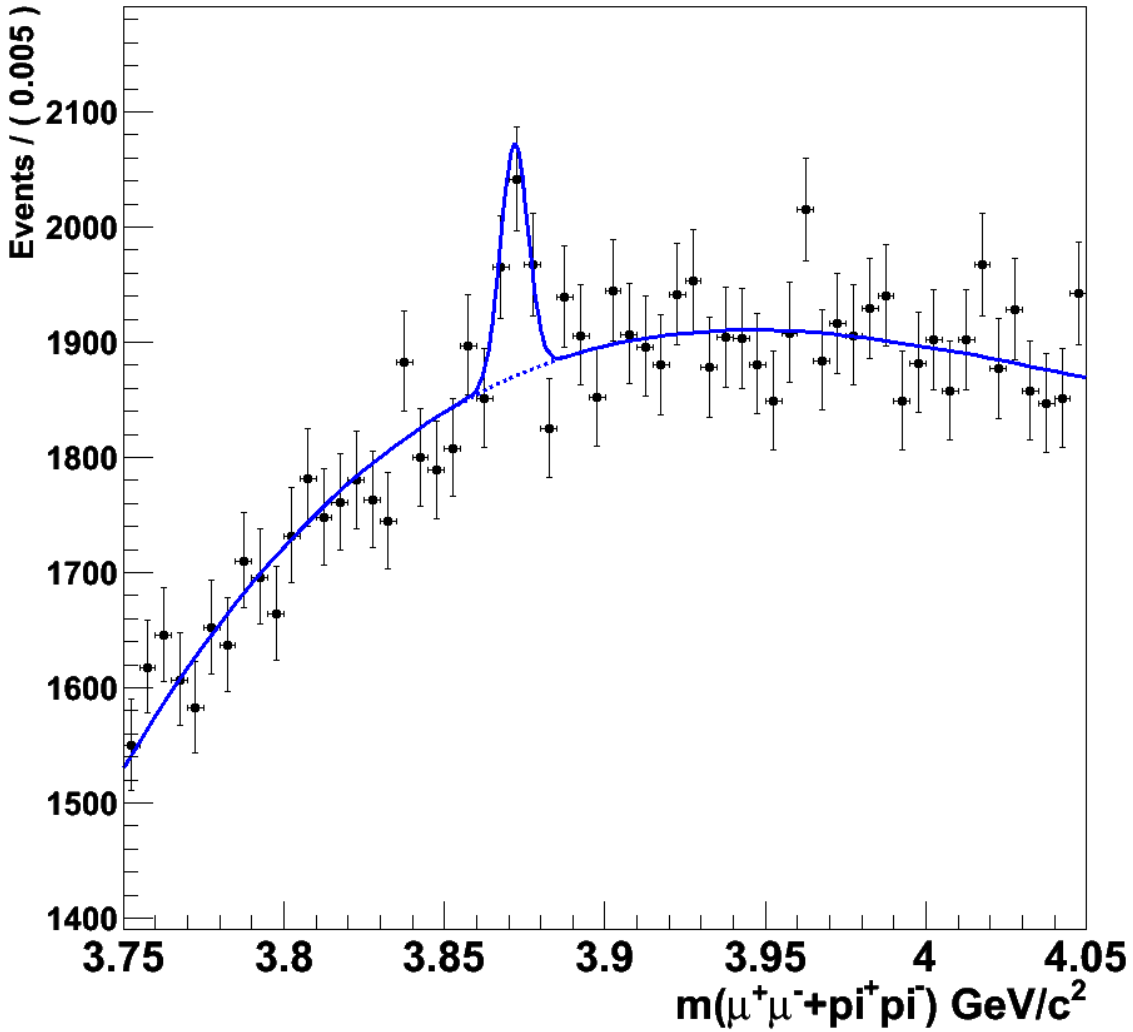
Daniele Fasanella slides'

Fit:
Extended maximum likelihood fit with a single Gaussian plus a Chebychev polynomial, all parameters free to float.

Fit results:
μ_{gauss} = 3.871± 0.001 GeV/c^2
σ_{gauss} = 0.004±0.001 GeV/c^2
N_{signal} = 432 ± 102
N_{BG} = 110295 ±332

$$\sqrt{2\ln(L_{max}/L_0)} = 5.2$$





Dataset used: MC signal

- New version of CMSSW: 3_9_7
- Update the PATAnalyzer

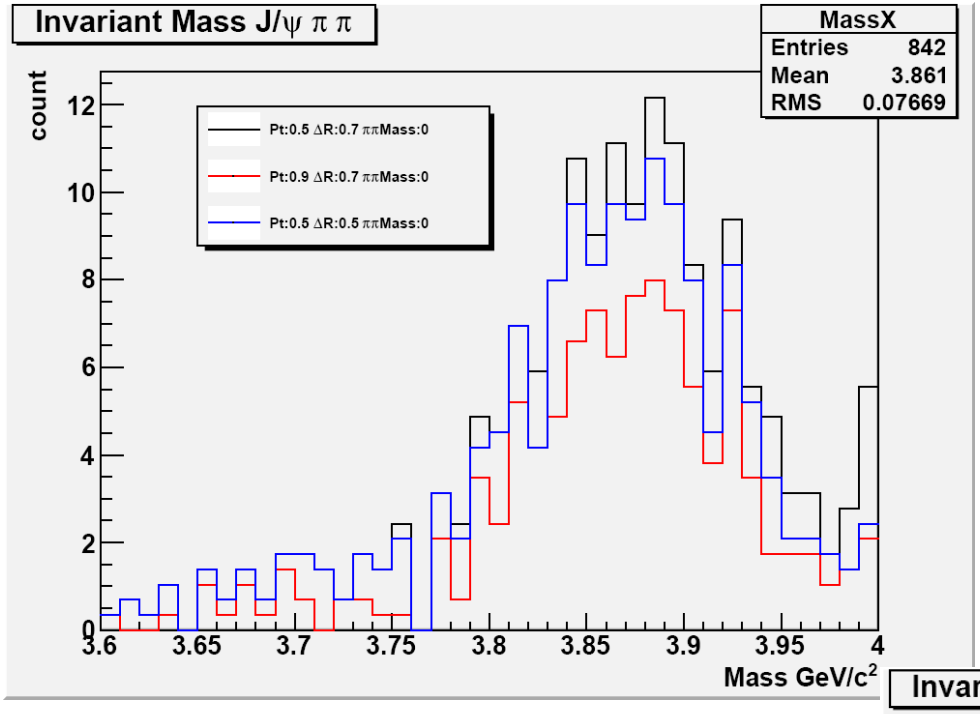
- /X3872_Direct_Feb2011/tzie-X3872_Direct_Feb2011-e30c6095aded777cd6de11b821cf9290/USER
- /X3872_NoRho_Direct_Feb2011/tzie-X3872_NoRho_Direct_Feb2011-5cf9136d06ebe2130852c83adc6fb173/USER
- /X3872_NoRho_FromB_Feb2011/tzie-X3872_NoRho_FromB_Feb2011-a6f3148a409805a69bc38058a9a68e20/USER
- /X3872_WithRho_FromB_Feb2011/tzie-X3872_WithRho_FromB_Feb2011-a6f3148a409805a69bc38058a9a68e20/USER

Dataset used: MC background

- Ψ (2S):
  - Prompt:/Psi2S2JPsiPiPi_Prompt/marinag-Psi2S2JPsiPiPi_Prompt-a3715896a069d0a80b1cabba92abdef5/USER
  - From B: /Psi2S_From_B/marinag-Psi2S_From_B-e494ff956b10a5c8748349412daeb757/USER

- Background J/Ψ:
  - /JPsiToMuMu_2MuPEtaFilter_7TeV-pythia6-evtgen/Winter10-E7TeV_ProbDist_2010Data_BX156_START39_V8-v1/GEN-SIM-RECO

Invariant Mass



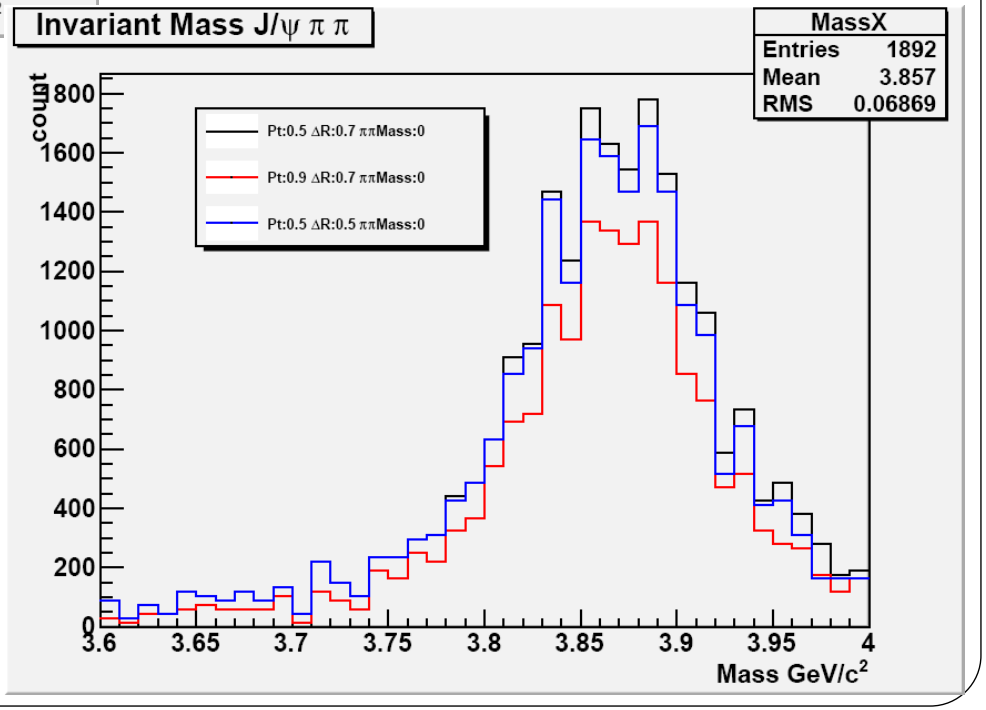
XdirectNoRho

Weight:
σε / #evt

Cuts:

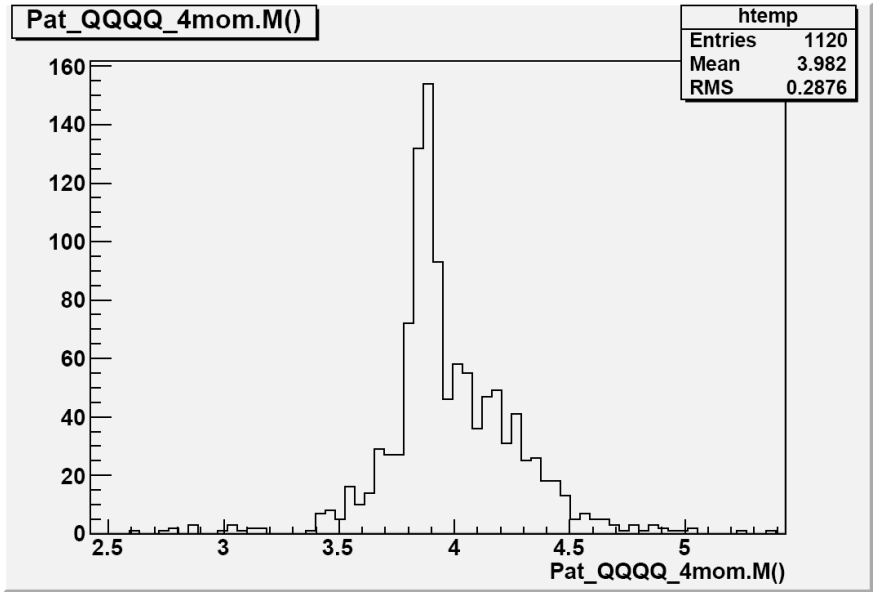
- Vertex Prob (>0.01)
- Pt J/Ψ
- Mass J/Ψ
- J/Ψ TrkTrk = false
- Pt π min
- ΔR(J/Ψ,π)
- Mass ππ (on study)

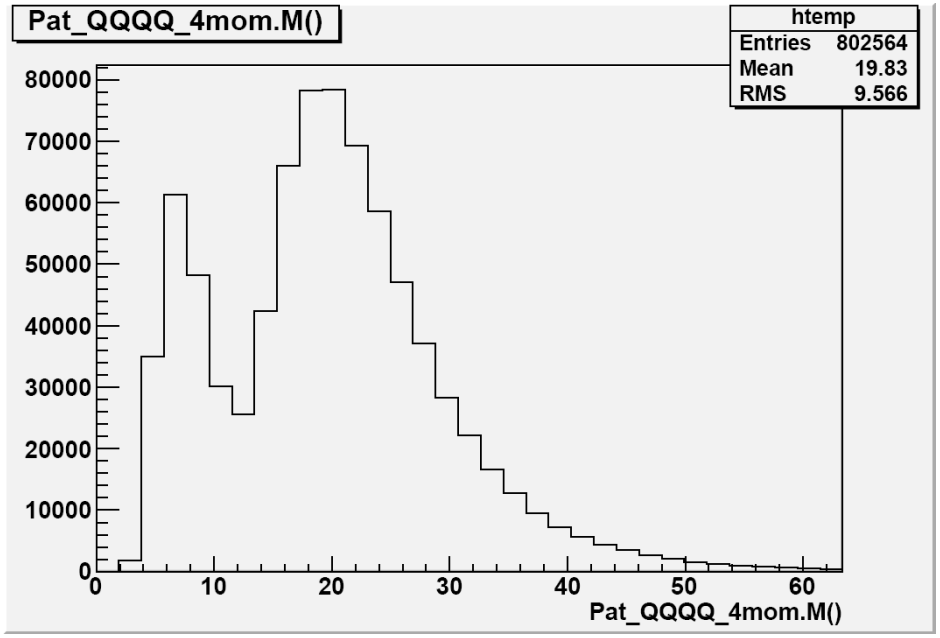
XfromB
WithRho



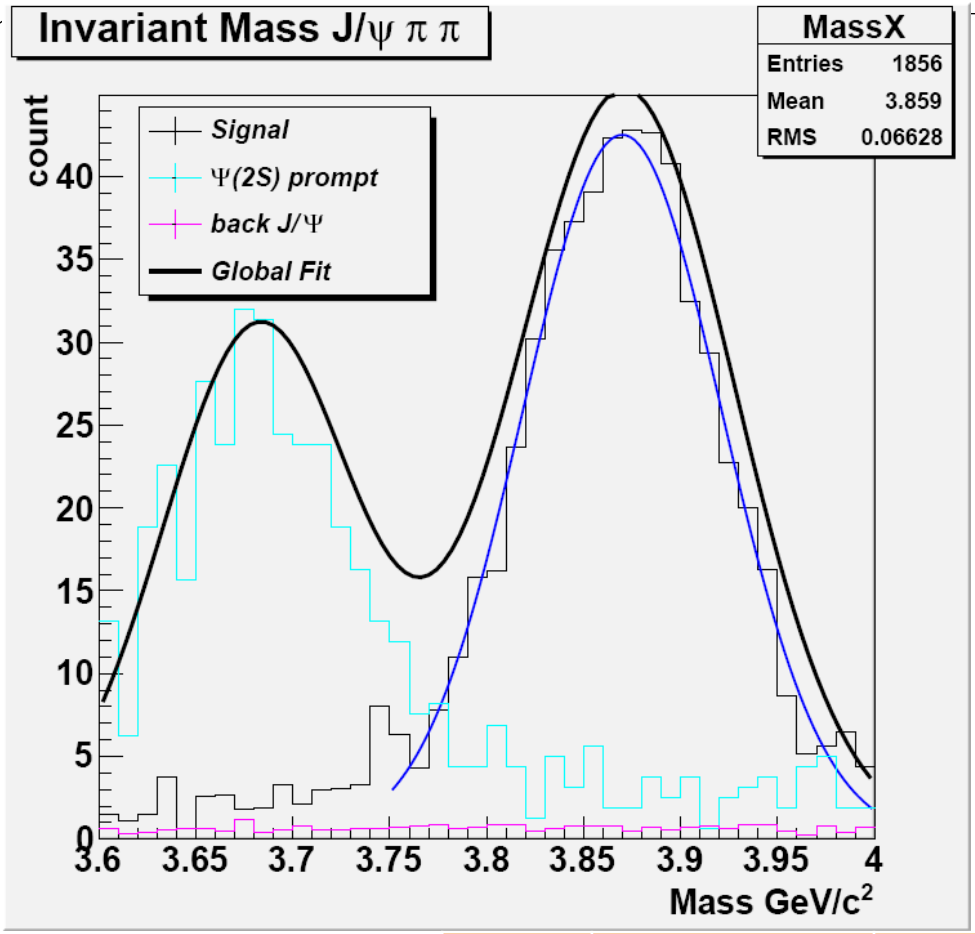
Invariant Mass II

NEW Analyzer
XdirectNoRho





OLD Analyzer
XdirectNoRho



Efficiency

Signal, Back: Integral(μ±σ)

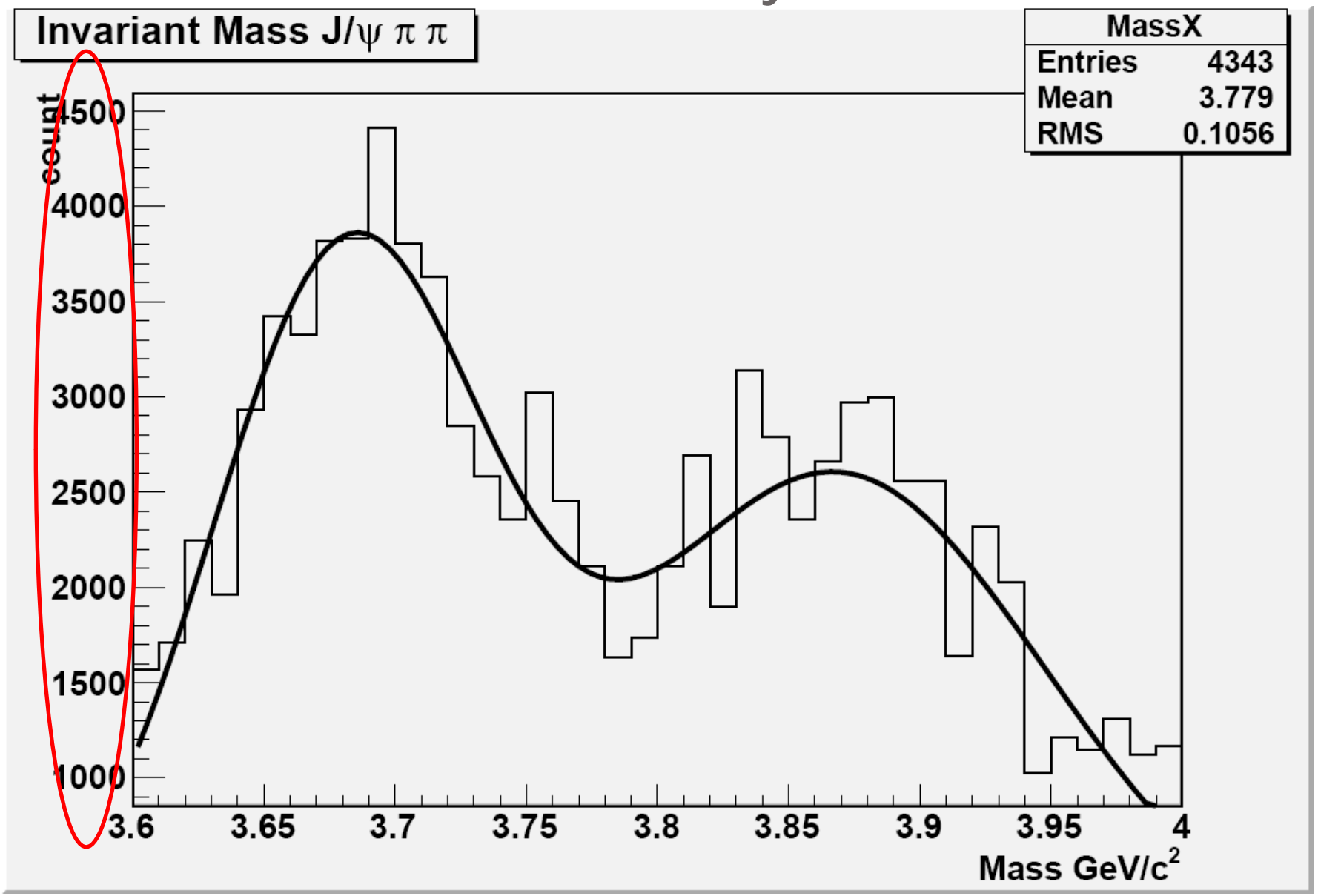
Few π with lowPt

ΔR really small

Pt π	ΔR(J/Ψ,π)	Signal	Back	S/√B	S/B
0	5	467.4	69.01	56.22	6.76
0.4	0.7	441.9	58.6	57.70	7.54
0.5	0.5	419.0	44.6	62.7	9.40
0.7	0.7	433.1	57.5	57.1	7.53
0.9	0.7	293.4	28.46	55.0	10.39

XfromB(With/No)Rho

Efficiency II



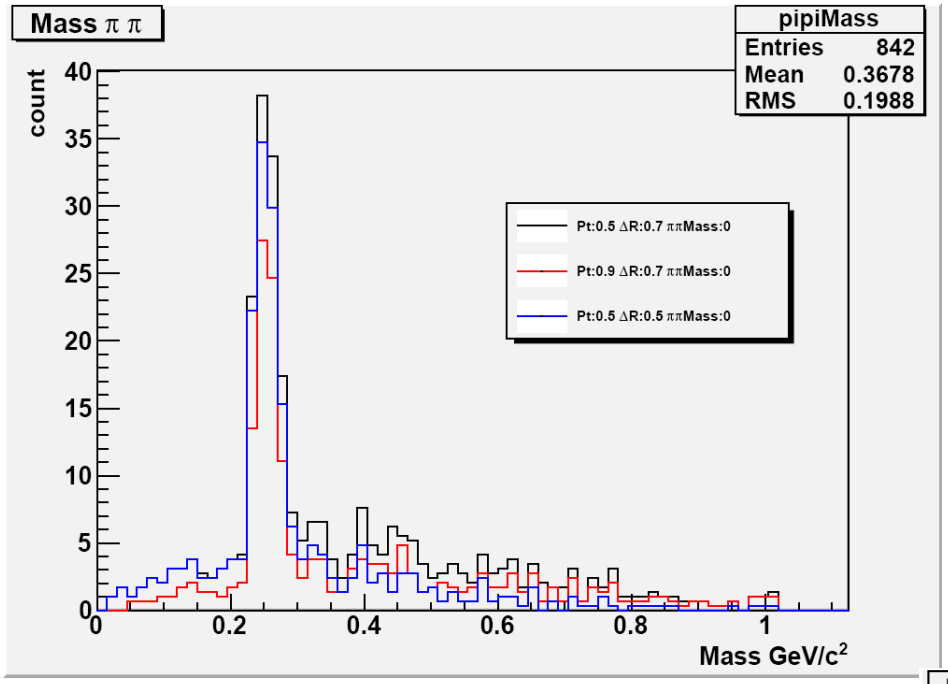
Prospective on future

- Working on data, cuts looking/optimization:
  - Minimum number of Pixel/Silicon hits
- Using the group analyzer (Fasanella et. al.)
- Understand as well as possible the weigths…
- Study other decay, similar to that one:

  $\Psi \rightarrow J/\Psi\pi\pi$ …

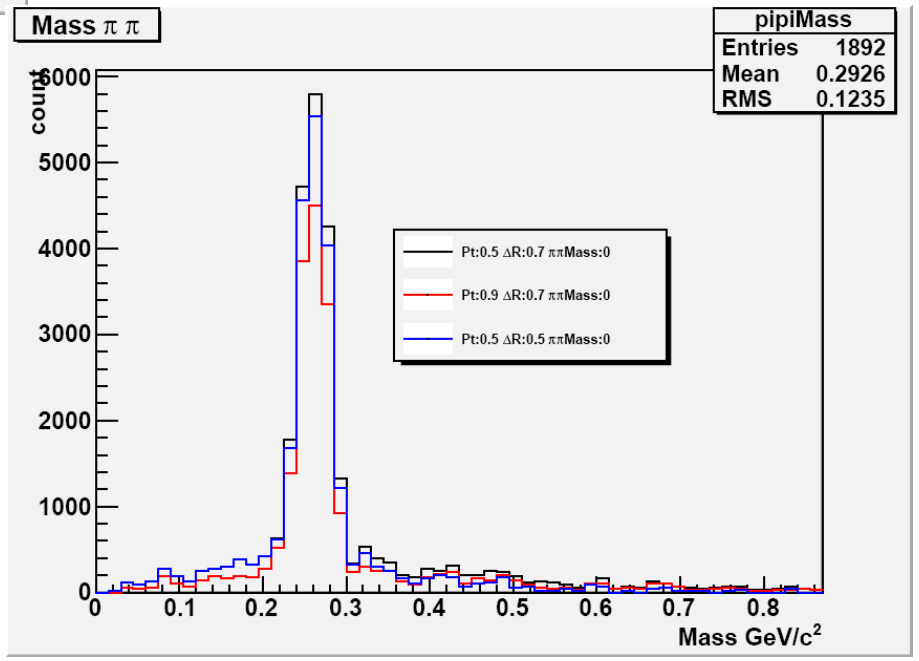
Back up slides

π π mass

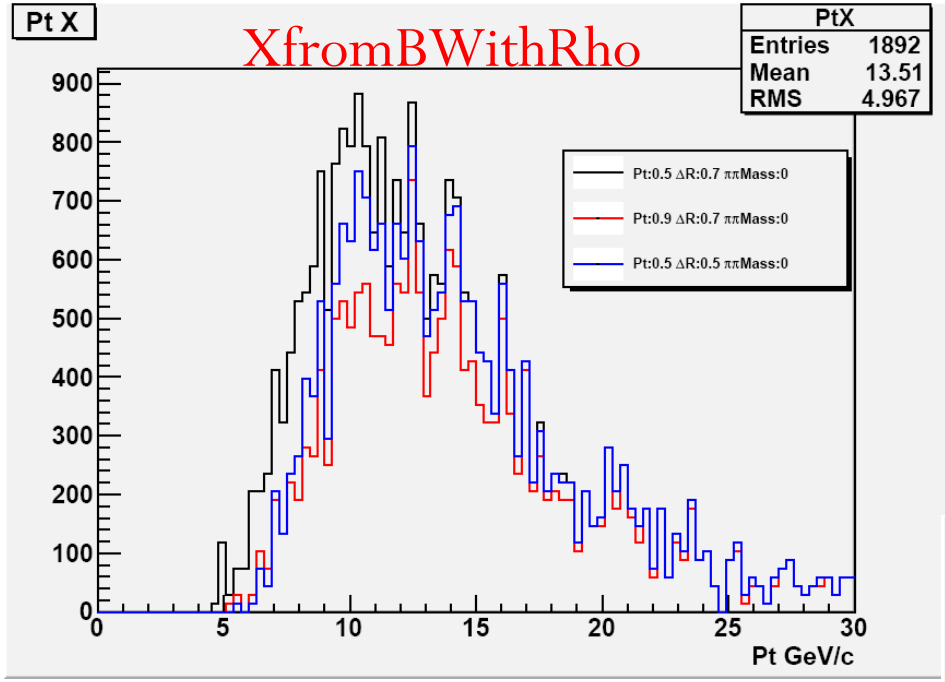


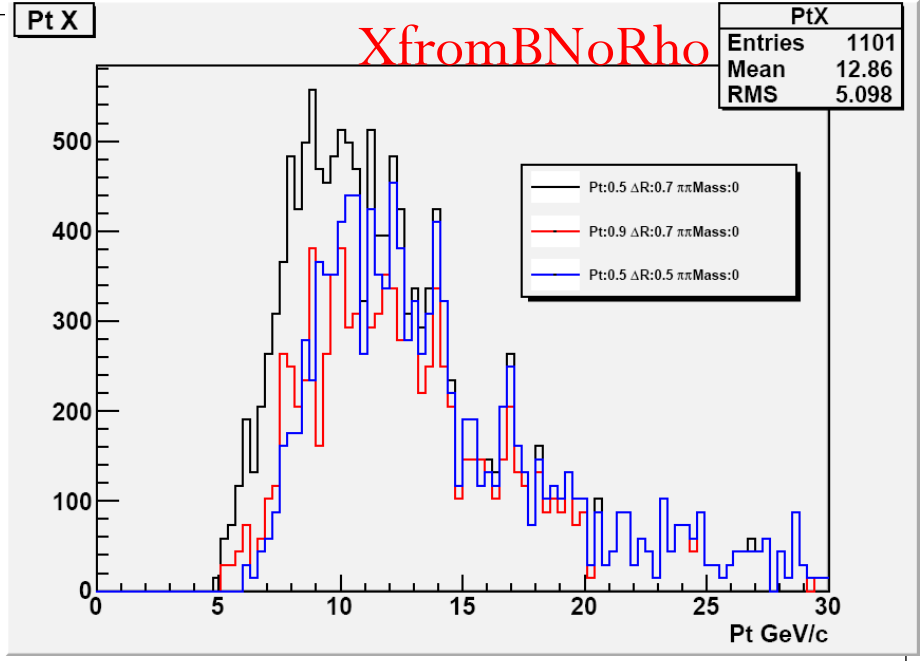
XdirectNoRho

XfromB
WithRho



Pt X





XdirectWithRho