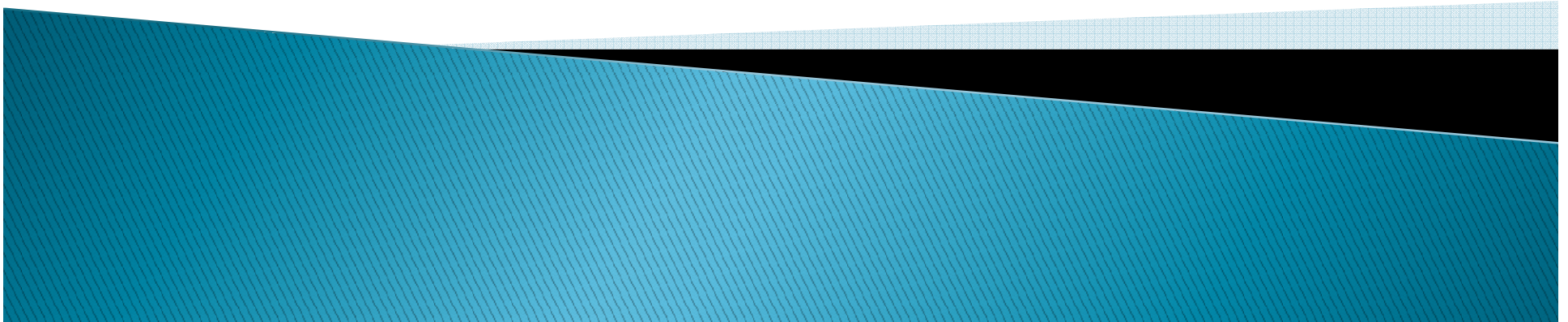
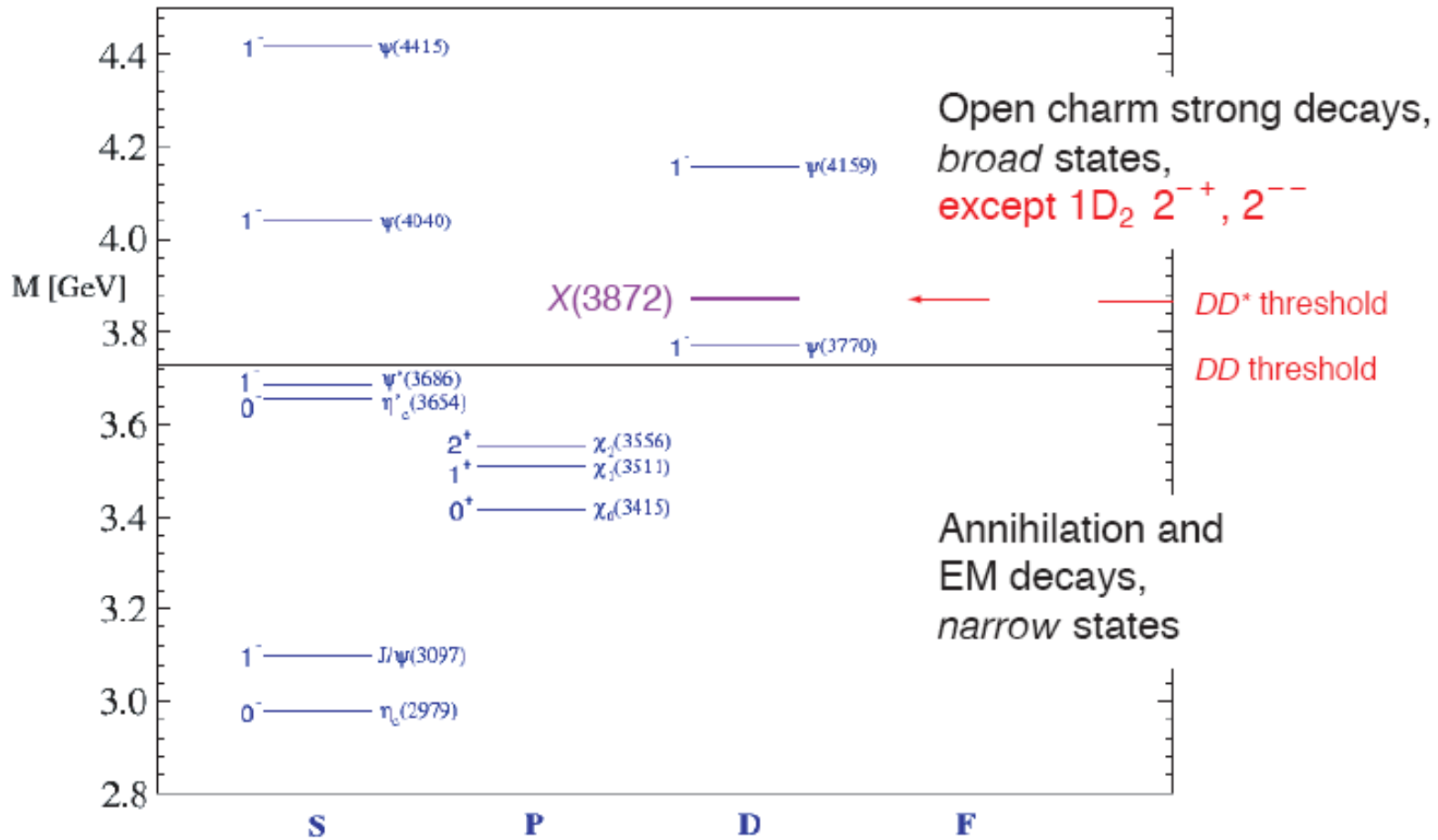


Preliminary study on $X(3872)$, at CMS

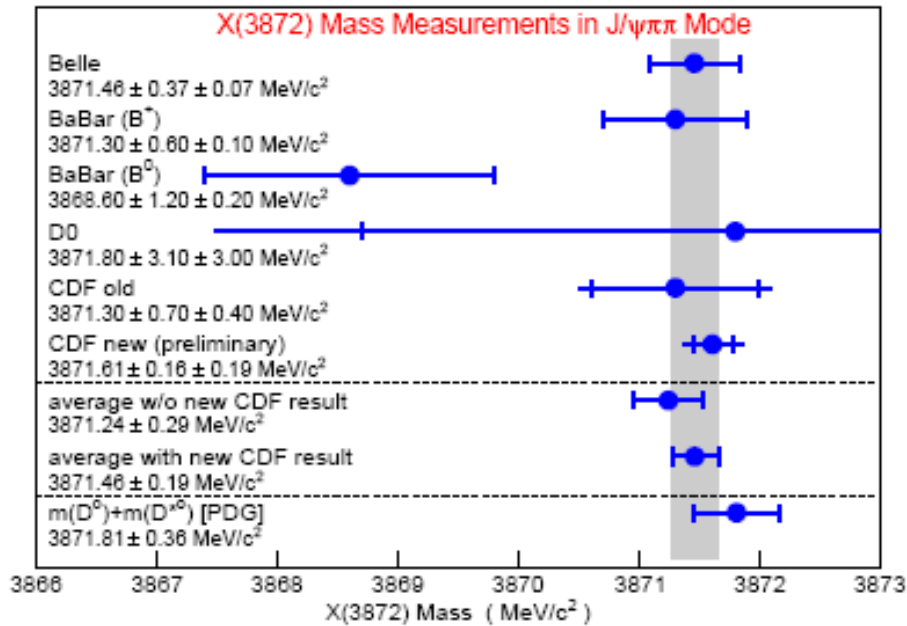
Alberto Vesentini
Università di Pisa & INFN
Pisa, 17 December 2010





- ▶ Charmonium-like decays state doesn't fit to the classical picture of quark model, there are different interpretations

Previous mass measure and decay modes

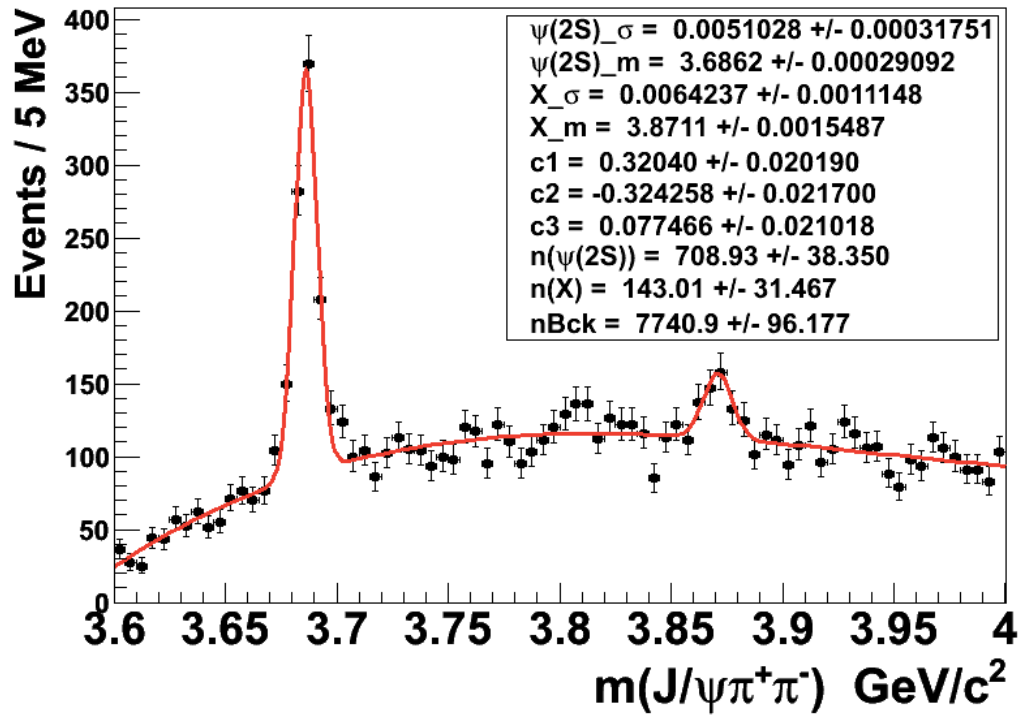


arXiv:1011.0616v1 [hep-ex] 2 Nov 2010

PDG 2010

X(3872) DECAY MODES

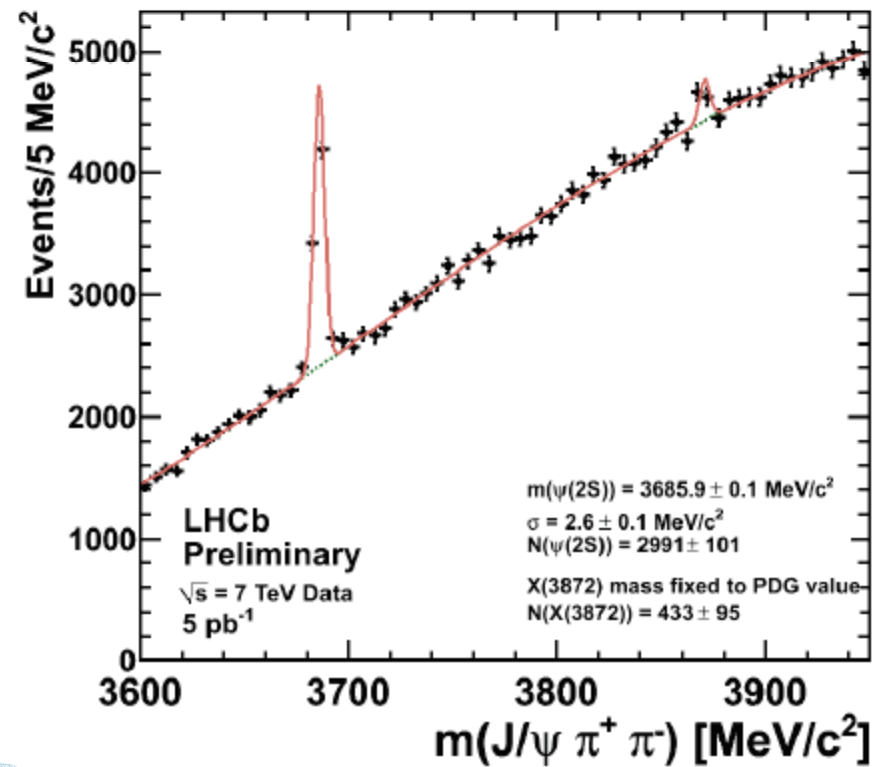
| | Mode | Fraction (Γ_i/Γ) | Confidence level |
|---------------|--------------------------|--------------------------------|------------------|
| Γ_1 | $e^+ e^-$ | $< 8 \times 10^{-5}$ | 90% |
| Γ_2 | $\pi^+ \pi^- J/\psi(1S)$ | $> 2.6 \%$ | 90% |
| Γ_3 | $\rho^0 J/\psi(1S)$ | seen | |
| Γ_4 | $\gamma\gamma$ | | |
| Γ_5 | $D^0 \bar{D}^0$ | not seen | |
| Γ_6 | $D^+ D^-$ | not seen | |
| Γ_7 | $D^0 \bar{D}^0 \pi^0$ | seen | |
| Γ_8 | $\gamma\chi_{c1}$ | | |
| Γ_9 | $\eta J/\psi$ | | |
| Γ_{10} | $\gamma J/\psi$ | | |



CMS

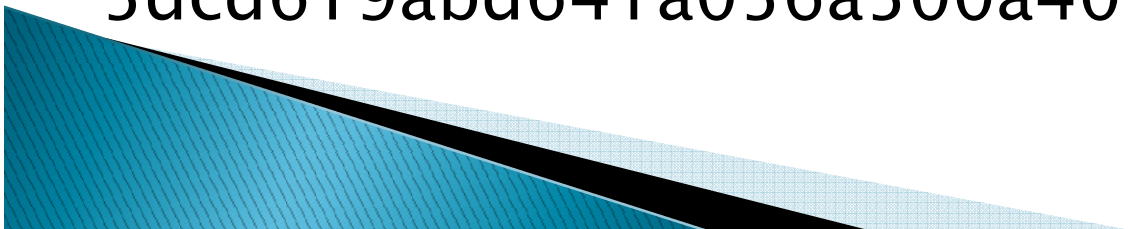
LHCb

Data of today



Dataset used: MC signal

- ▶ /X3872_Singlet3_with_EvtGen_Sept2010/tzie-X3872_Singlet_with_EvtGen_Sept2010_GEN_SIM_REC O-4543e16b326abc355d47ac1d05fa606a/USER
- ▶ /X3872_fromB_Sept2010_GEN_SIM_RAW/tzie-X3872FromB_Sept2010_START38_V10_GEN_SIM_REC O-5dcd619abd641a056a500a40b75c391a/USER
- ▶ /Psi2S__with_EvtGen_Sept2010_GEN_SIM_RAW/tzie-Psi2S_Sept2010_START38_V10_GEN_SIM_RECO-5dcd619abd641a056a500a40b75c391a/USER



PAT tuple and ROOT tuple

- ▶ Make the PAT tuple with the Onia2MuMuPAT
- ▶ Make the ROOT tuple with a modified analyzer: PATAnalyzerNew

DBS discovery :: Adv. search :: Results

Physicist

Found 3 results. Show [all](#)

View results: [grid](#) | [list](#) mode

Sort by DATASET ▾ [desc](#) | [asc](#)

/Psi2S_with_EvtGen_Sept2010_GEN_SIM_RAW/vesentin-X_Psi2S-START38_V12-v1-Onia2MuMu-v6-4fdeab5103bd34f4872f3656e9c78b9b/USER

Created 14 Dec 2010 19:42:45 GMT, contains 290205 events, 15 files, 1 block(s), 3.5GB, located at 1 site ([show](#), [hide](#)), LFNs: [cff](#), [py](#), [plain](#), [jL=N/A](#)
[Release info](#), [Block info](#), [Run info](#), [Conf. files](#), [Parents](#), [Children](#), [Description](#), [PhEDEx](#), [Create ADS](#), [ADS](#), [crab.cfg](#)

/X3872_Singlet3_with_EvtGen_Sept2010/vesentin-Xsinglet_Fall10-START38_V12-v1-Onia2MuMu-v6-4fdeab5103bd34f4872f3656e9c78b9b/USER

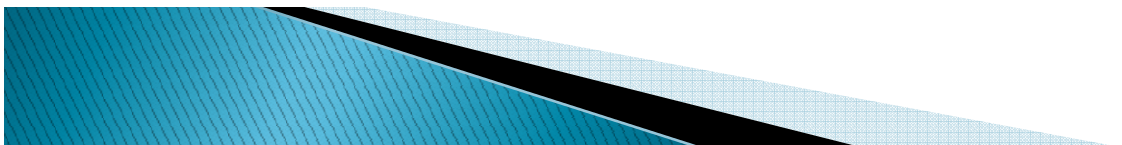
Created 14 Dec 2010 18:36:00 GMT, contains 307529 events, 16 files, 1 block(s), 3.7GB, located at 1 site ([show](#), [hide](#)), LFNs: [cff](#), [py](#), [plain](#), [jL=N/A](#)
[Release info](#), [Block info](#), [Run info](#), [Conf. files](#), [Parents](#), [Children](#), [Description](#), [PhEDEx](#), [Create ADS](#), [ADS](#), [crab.cfg](#)

/X3872_fromB_Sept2010_GEN_SIM_RAW/vesentin-XfromB_Fall10-START38_V12-v1-Onia2MuMu-v6-4fdeab5103bd34f4872f3656e9c78b9b/USER

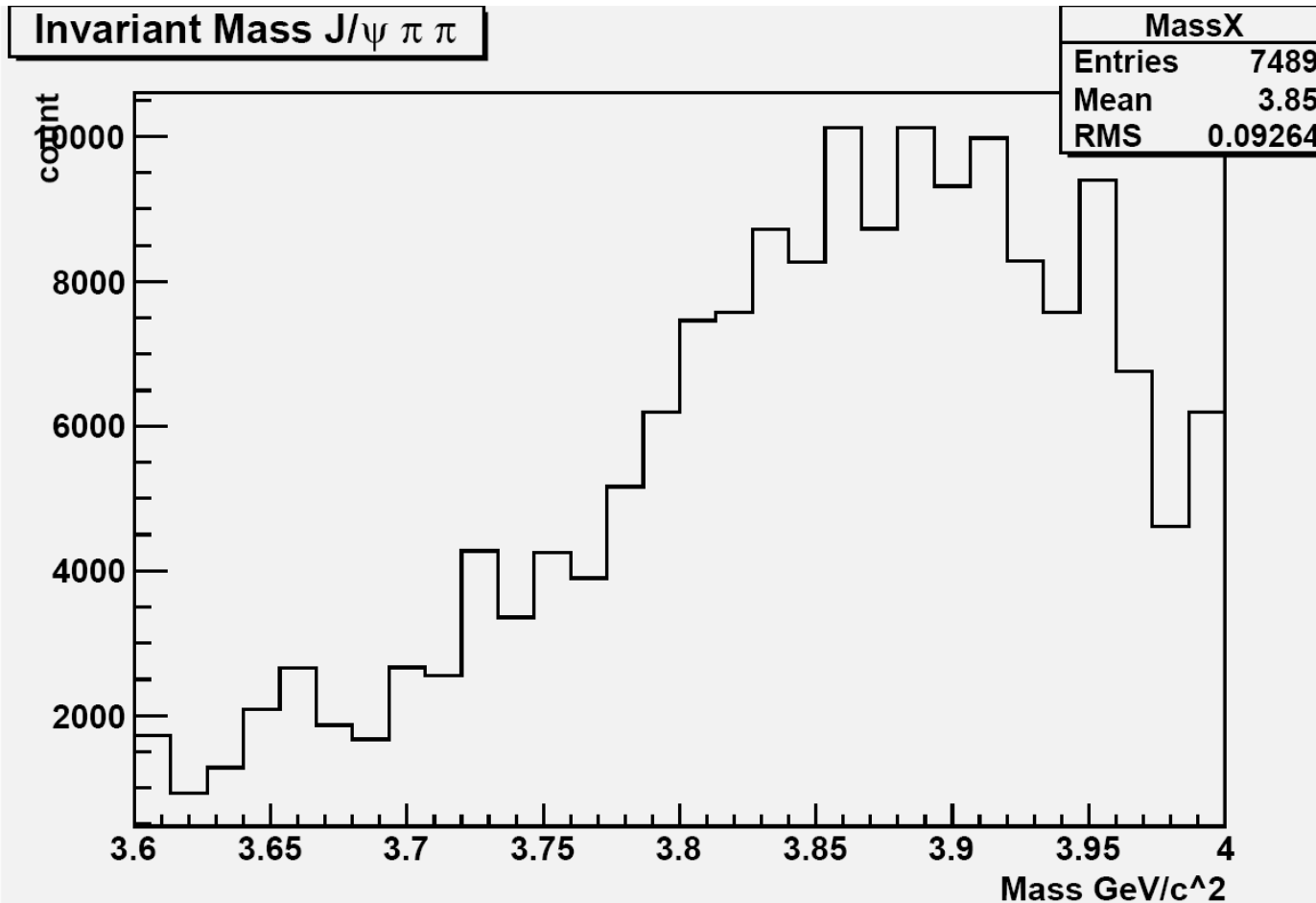
Created 14 Dec 2010 19:40:10 GMT, contains 322384 events, 17 files, 1 block(s), 4.8GB, located at 1 site ([show](#), [hide](#)), LFNs: [cff](#), [py](#), [plain](#), [jL=N/A](#)
[Release info](#), [Block info](#), [Run info](#), [Conf. files](#), [Parents](#), [Children](#), [Description](#), [PhEDEx](#), [Create ADS](#), [ADS](#), [crab.cfg](#)

Number of results per page

Result page: [1](#)

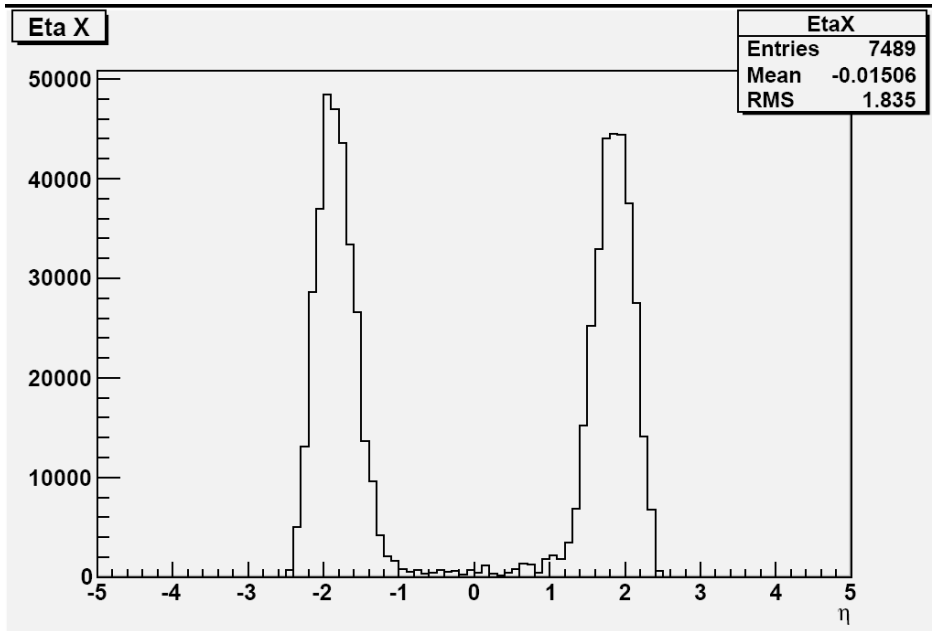


Invariant Mass

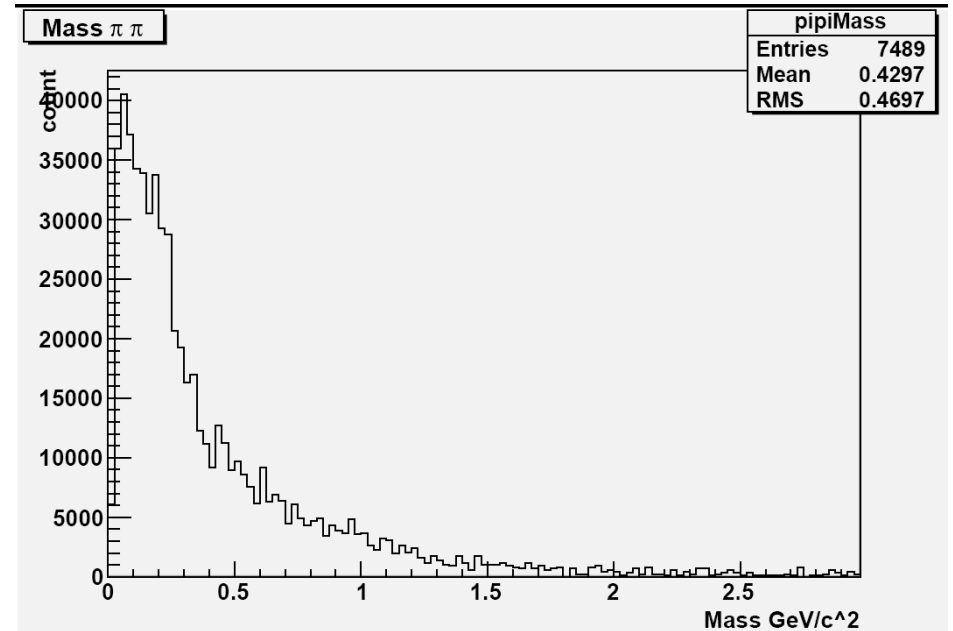


▶ Cuts:

- $P_t \pi$ min: 250 MeV
- $\Delta R_{J/\psi \pi}$ min: 0.4
- $P_t J/\psi$ min: 4 GeV
- $\pi \pi$ with opposite charge



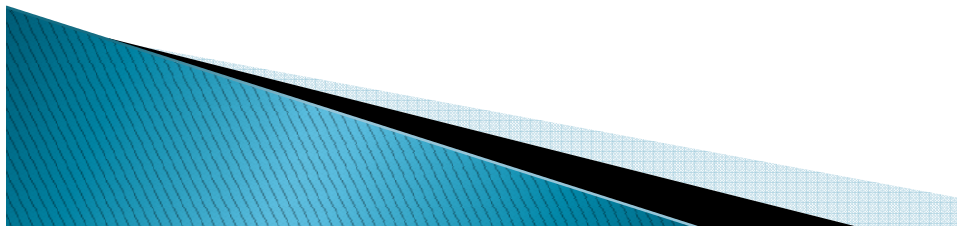
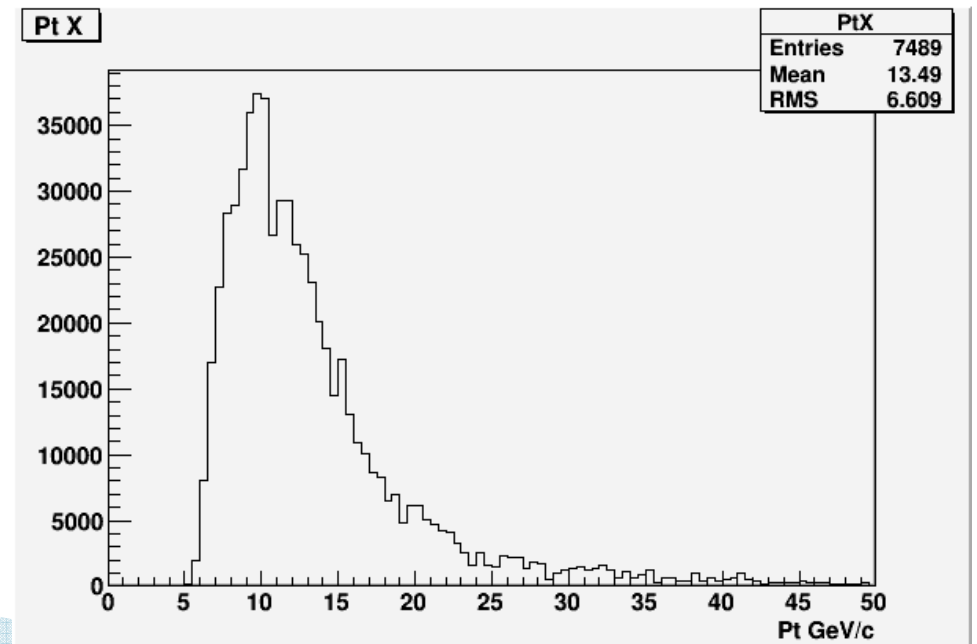
Eta



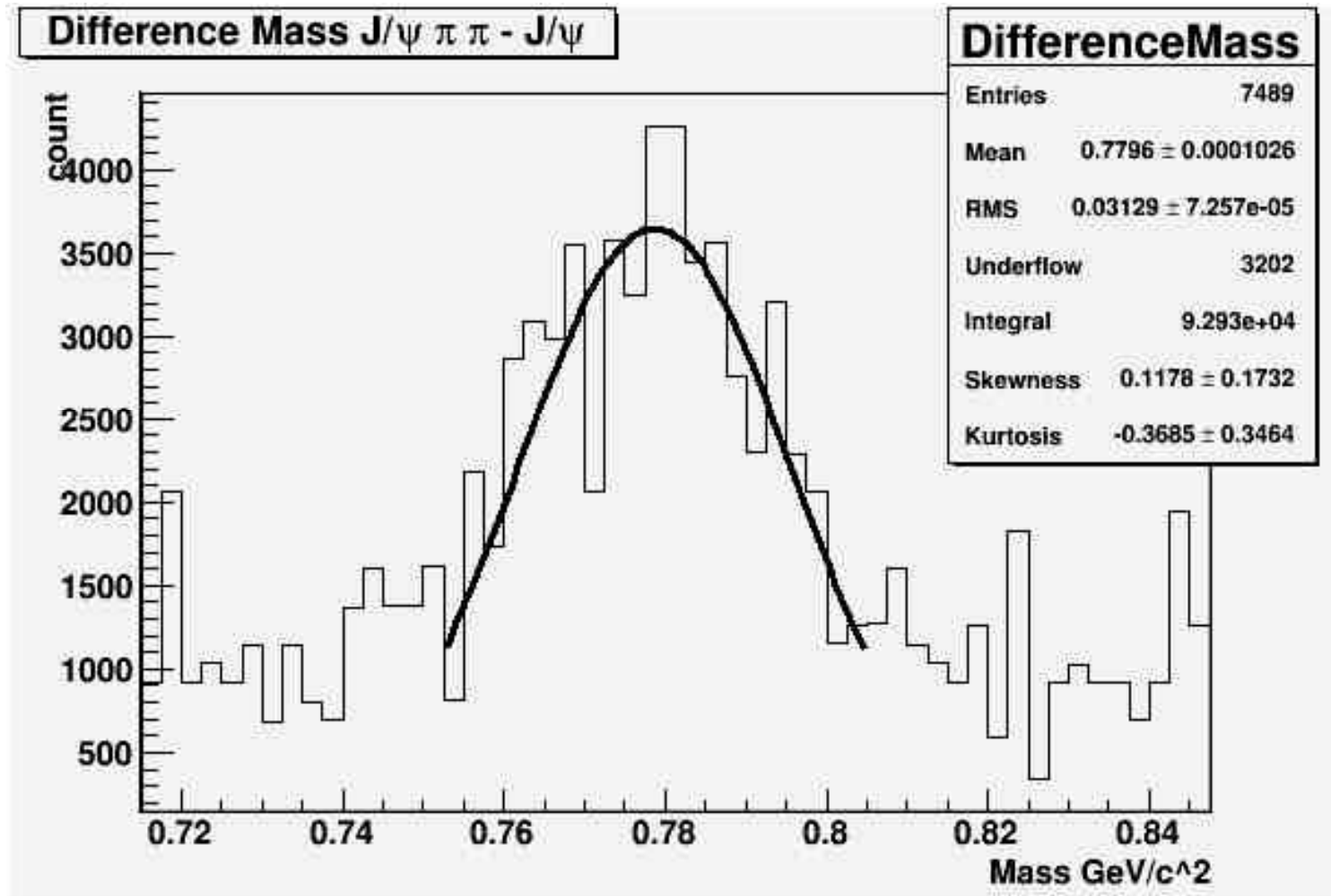
Mass $\pi\pi$

Characteristic
of the X

Pt

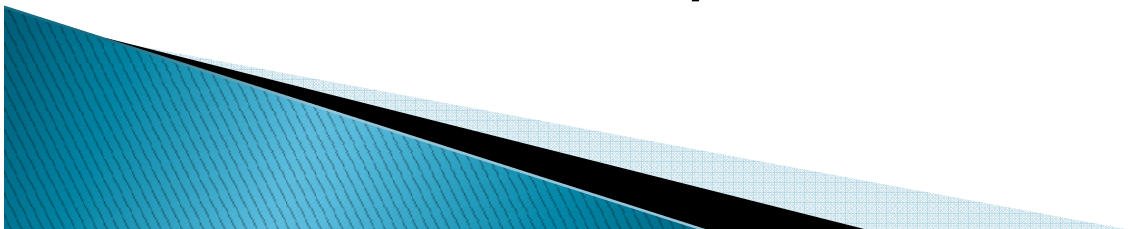


Focus on ω (782)

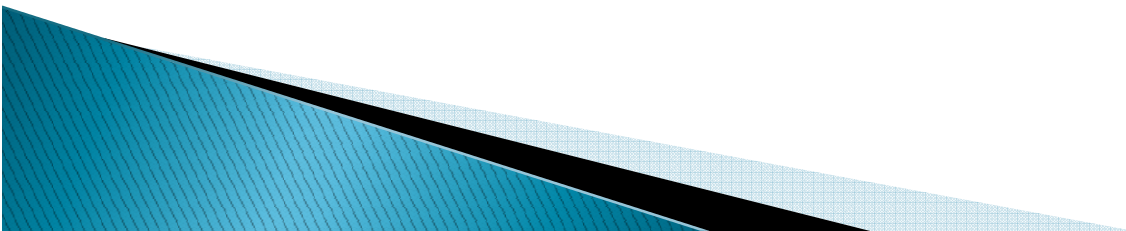


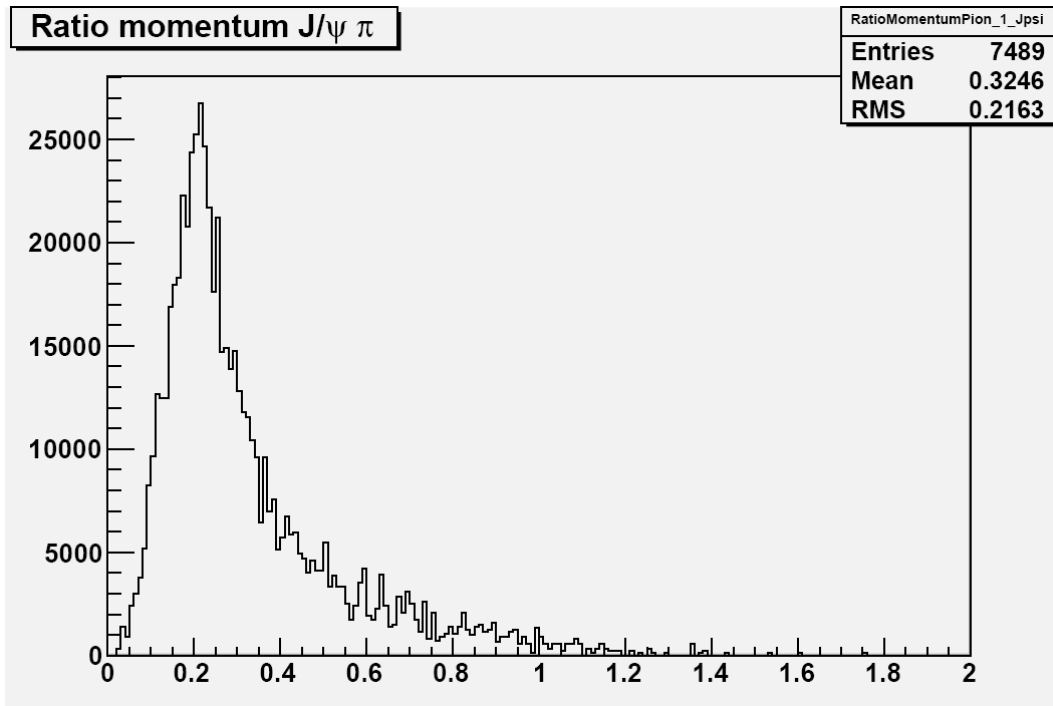
Prospective on future

- ▶ Adding background and study on cuts
- ▶ Working on data, cuts looking/optimization:
 - Difference X from B and from $\chi(\text{chi})$
 - μ of the same sign
 - π of the same sign
 - Minimum number of Pixel/Silicon hits
 - π vertex efficiency
 - Difference between J/ Ψ in the barrel and in the forward
- ▶ Looking to charged state (X^{++} ...) predicted in some theory, used also for background



Back up slides

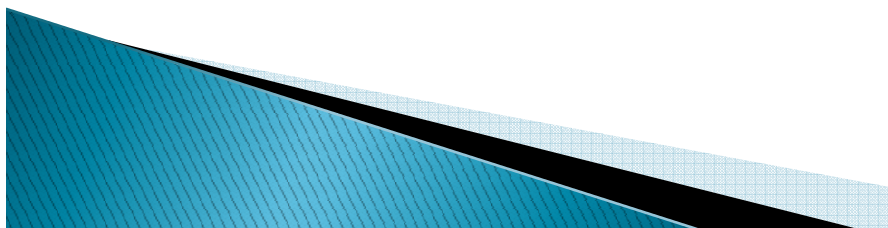
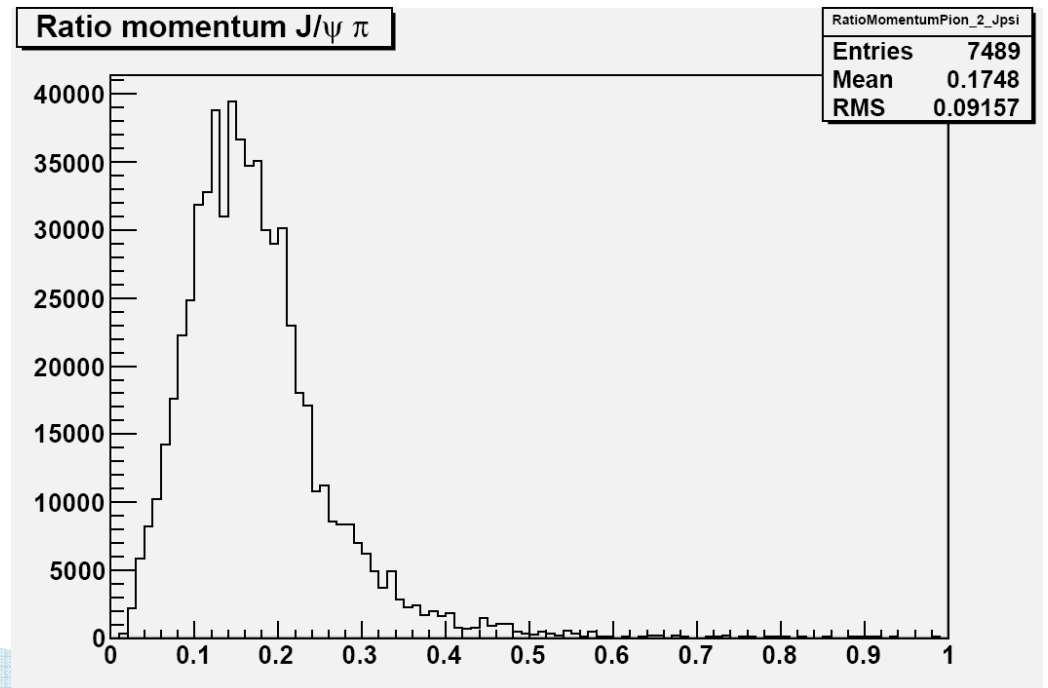




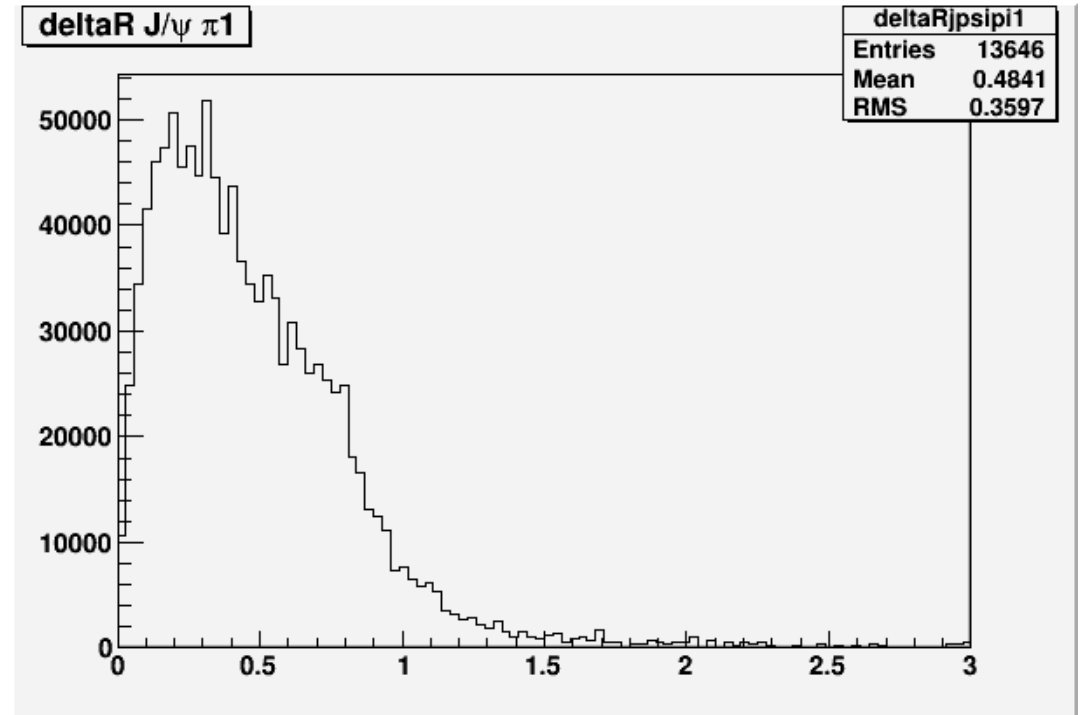
Ratio of
momentum:
 $J/\psi \pi$

π_1

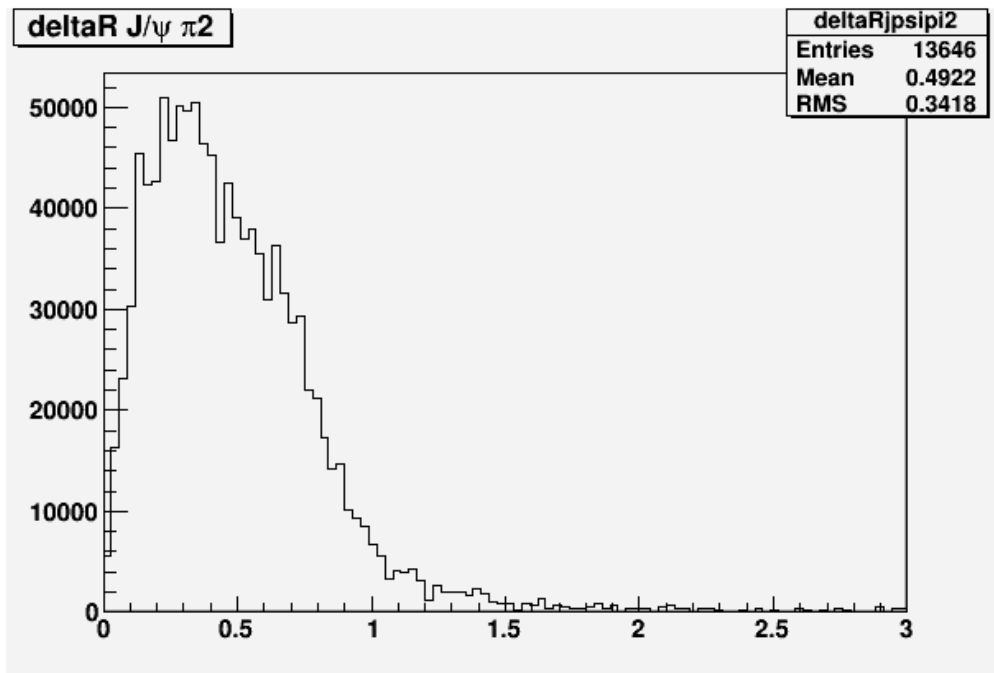
π_2



Delta R J/Ψ π



$$\Delta R(J/\Psi\pi_1)$$



$$\Delta R(J/\Psi\pi_2)$$