Quarkonia results in Run2

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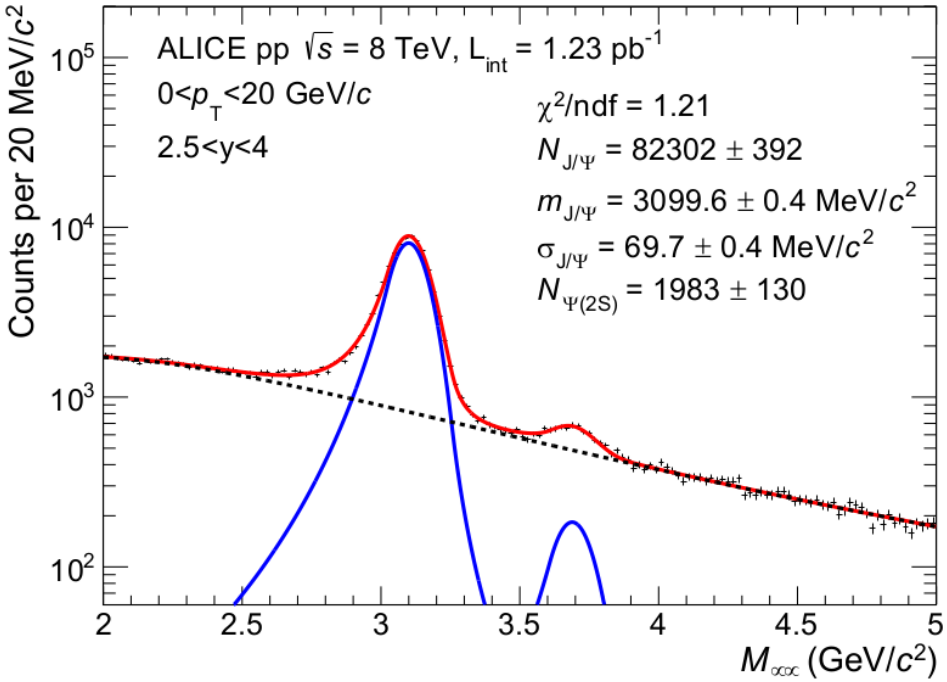
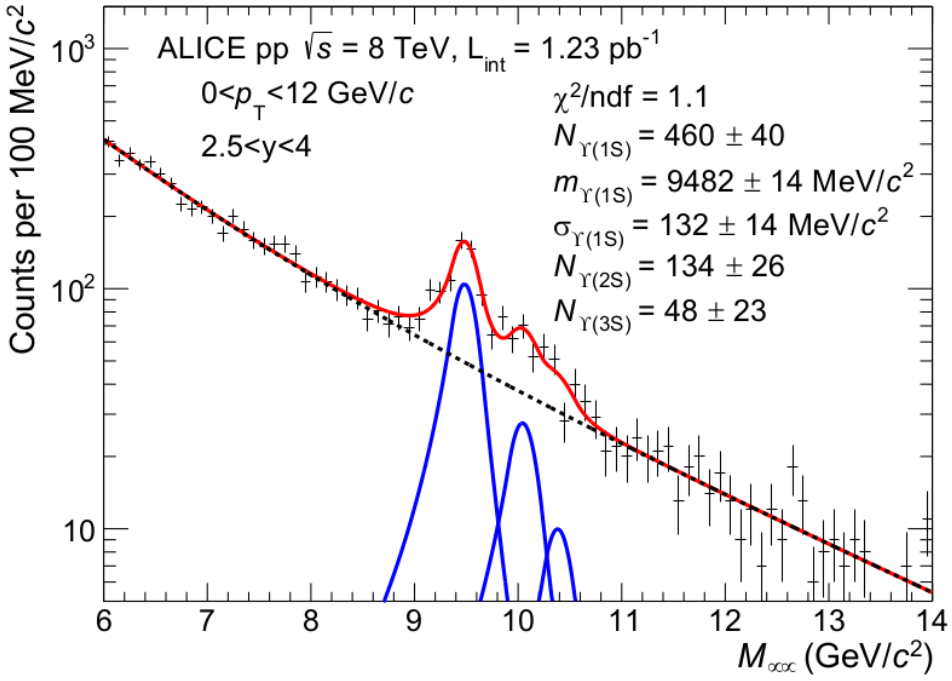
Quarkonia in pp 8 TeV (Run1)

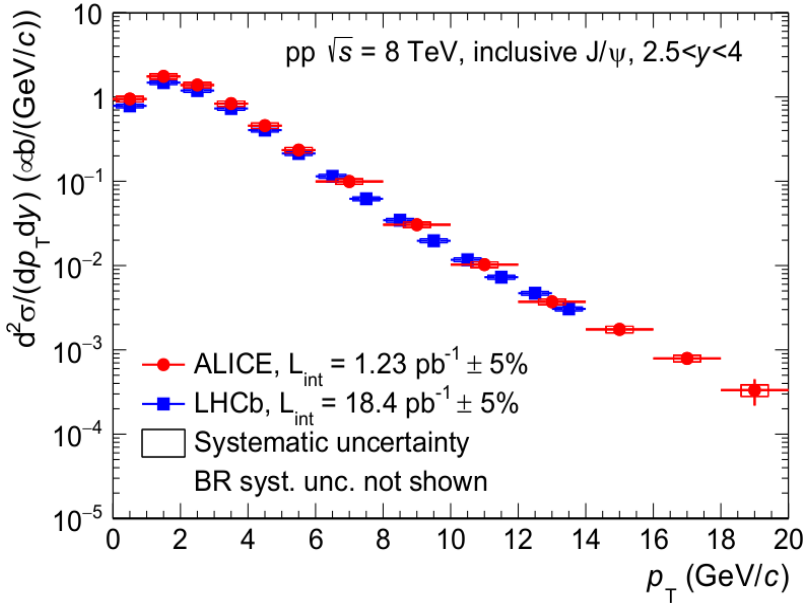
http://arxiv.org/abs/1509.08258

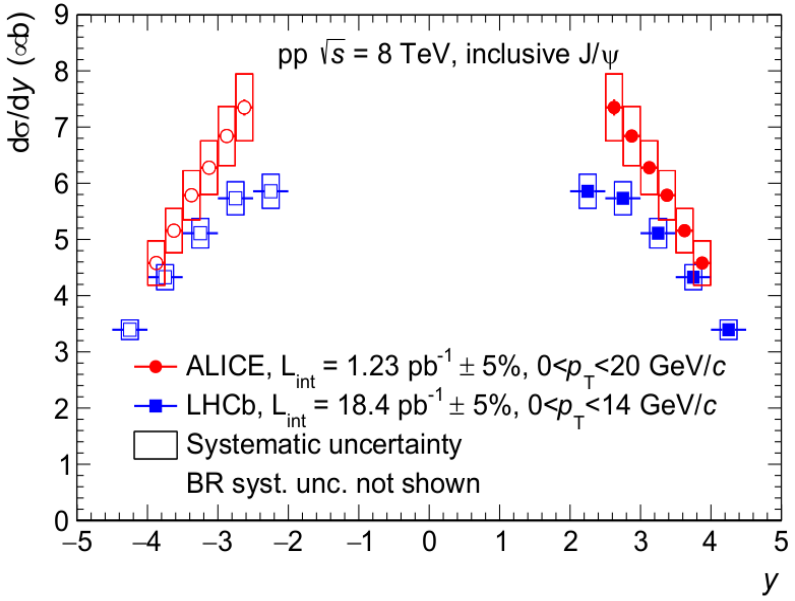


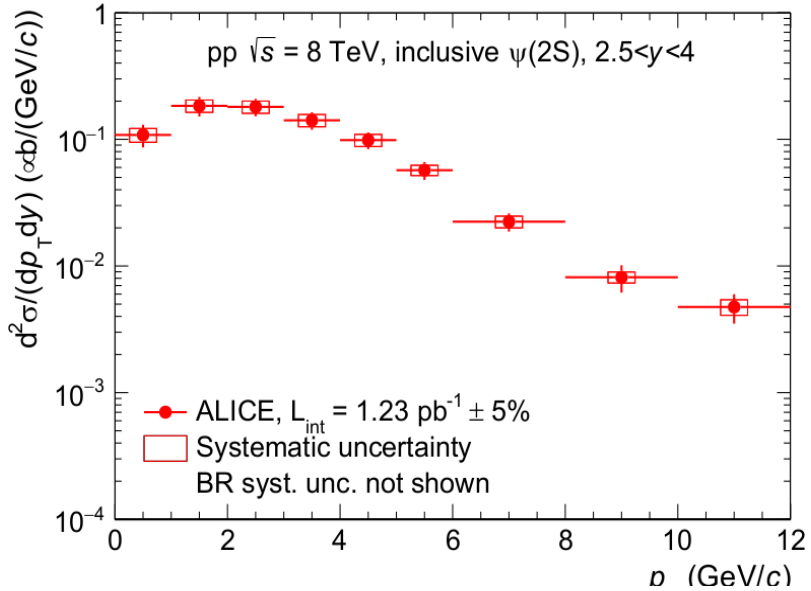


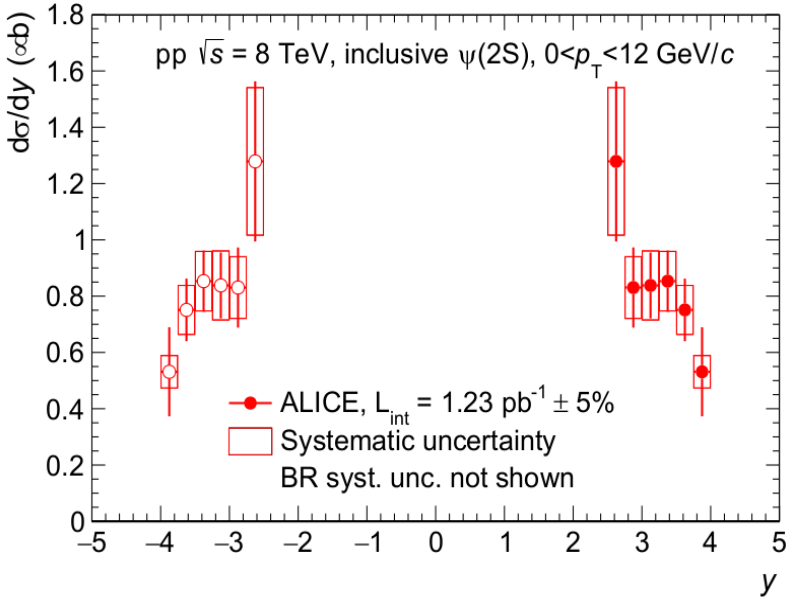
$J/\psi, \psi(2S)$ in pp 8 TeV

1.7 σ max









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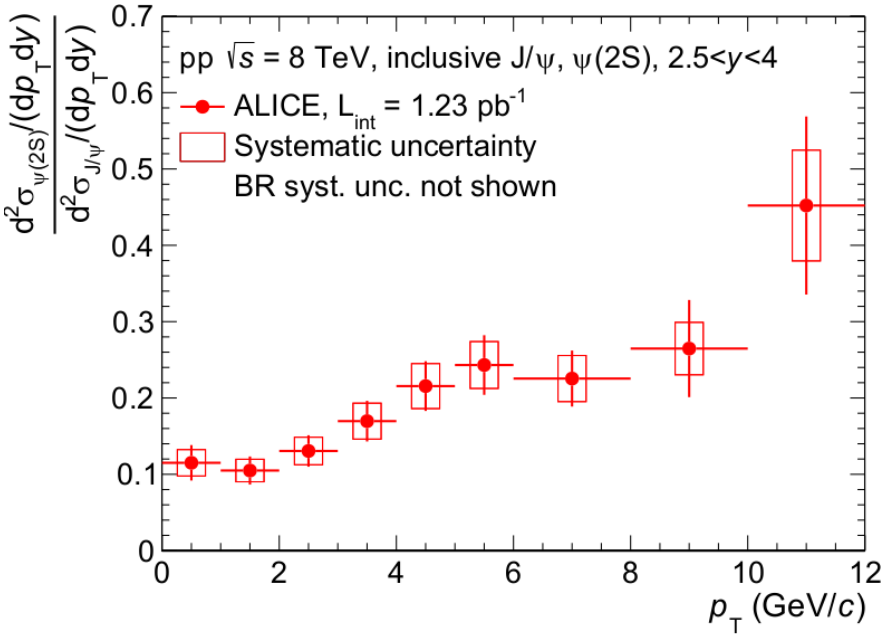
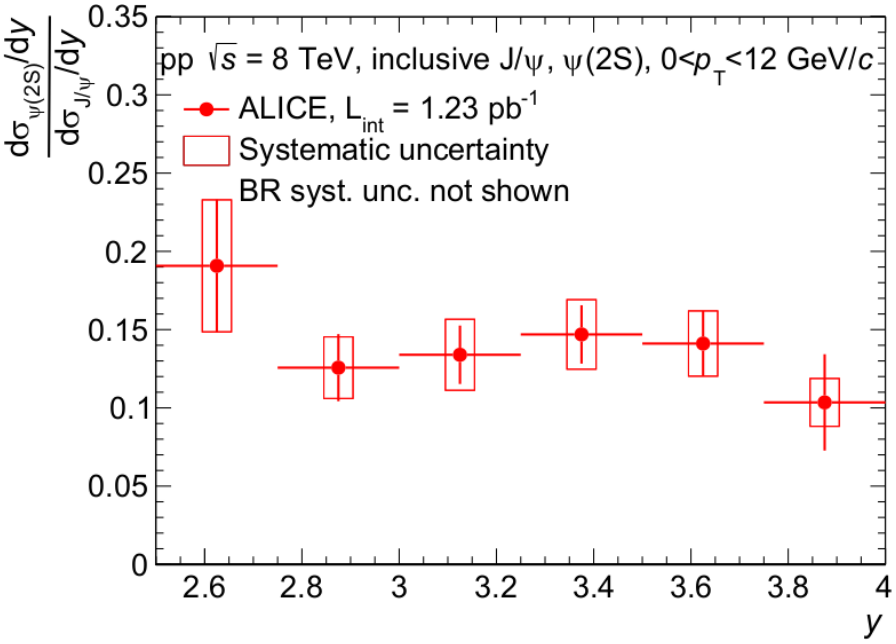
$J/\psi, \psi(2S)$ in pp 8 TeV

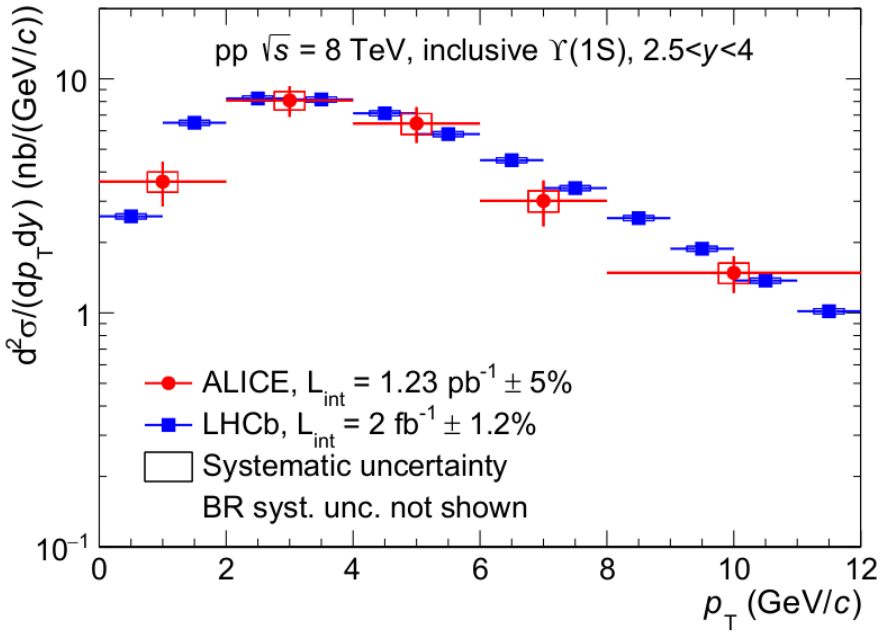


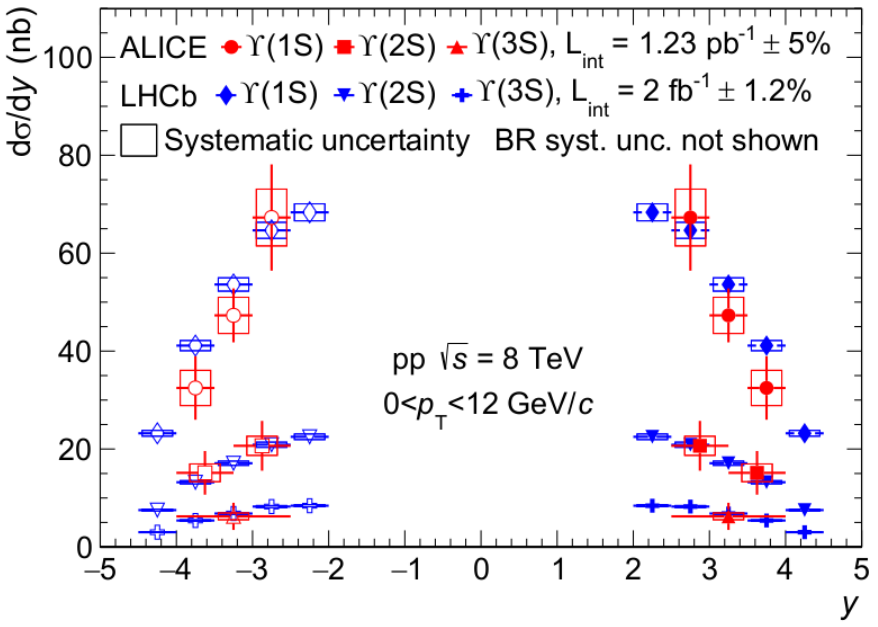


http://arxiv.org/abs/1509.08258

Similar trend to what have been found for 7 TeV results

ϒ in pp 8 TeV





http://arxiv.org/abs/1509.08258

Colliding systems

- pp at $\sqrt{s} = 13$ TeV
- pp at $\sqrt{s} = 5$ TeV
- Pb-Pb at $\sqrt{s_{NN}} = 5$ TeV

J/ψ in pp 13 TeV

- Quite a large data sample, 2.4 pb^{-1} usable in mcp1 out of about 3 pb^{-1}) with quite some caveats

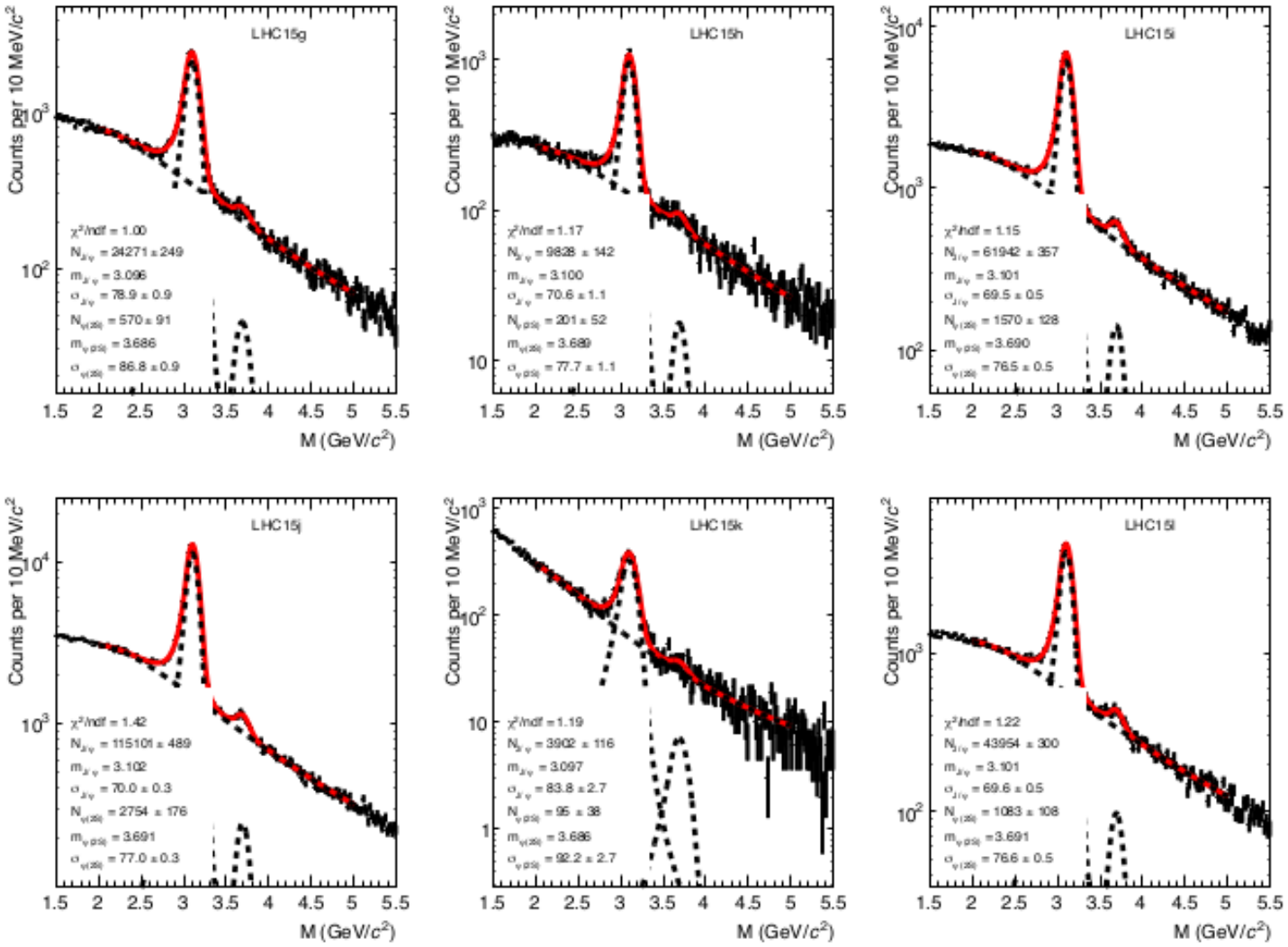
$$\sum_{run_i}^{run_f} N^{L0a}_{CMUL7} \times \frac{N^{L0b}_{C0TVX} \times purity \times pile-up}{N^{L0b}_{CMUL7}} \times 1/\sigma_{T0}$$

Some details on the variables above:

- N^{L0b}_{C0TVX}, N^{L0b}_{CMUL7}: from OCDB
- N^{L0a}_{CMUL7}, from AOD.
- $purity_{C0TVX}$ =1 for the moment (C0VTX purity estimation work in progress.)
- $\sigma_{T0} = 29.09 \pm 0.03\ mb$ from 6 November presentation by Artem (PP run conditions 6-11-2015)

Period	N_{runs}	Luminosity (nb^{-1})
g	25	174.0
h	29	77.8
i	87	569.6
j	83	1127.8
k	5	24.3
l	47	419.7
total	276	2393.3

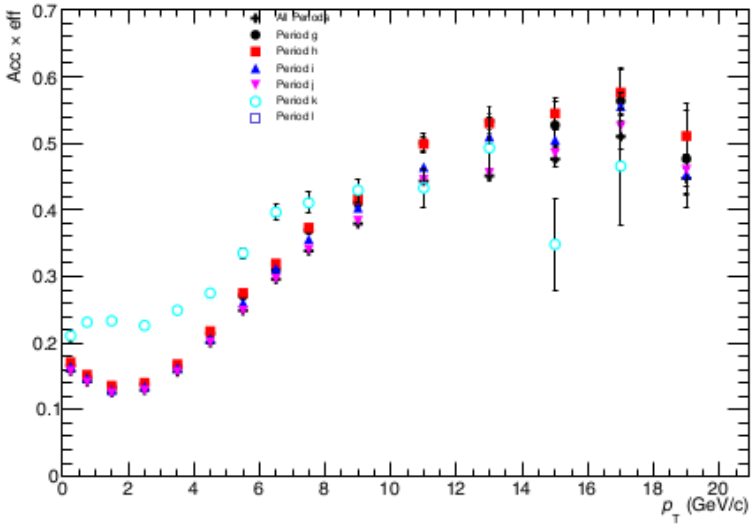
J/ψ in pp 13 TeV

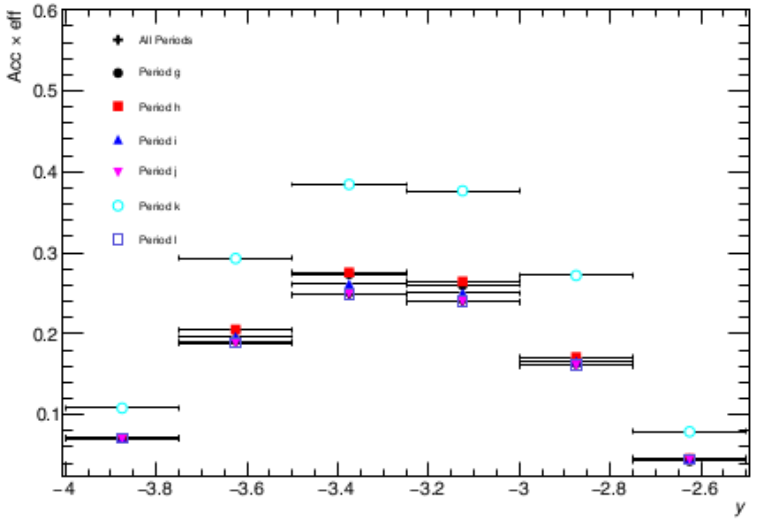


Mass resolution stable at 70 MeV except for LHC15g (high pileup) and LHC15k (Lpt threshold lowered to 0.5 GeV)

J/ψ in pp 13 TeV

- Acceptance x Efficiency





Left: Efficiency in each periods as a function of p_T

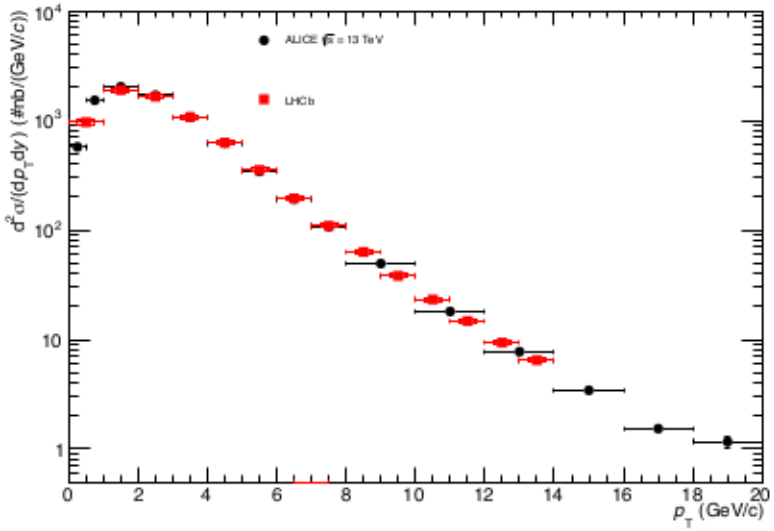
Right: Efficiency as a function of rapidity

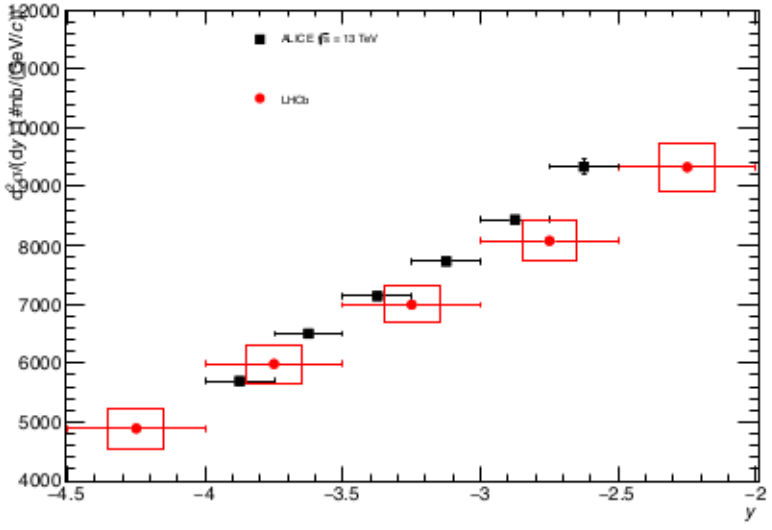
For each period, per-run efficiencies are averaged using the corresponding equivalent number of T0 events.

LHC15k efficiencies are higher at low p_T due to lower p_T threshold.

J/ψ in pp 13 TeV

- Production cross-section
  - Comparison to LHCb (from http://arxiv.org/abs/1509.00771)
    - Correspond to Lint = 3.05 pb^{-1}





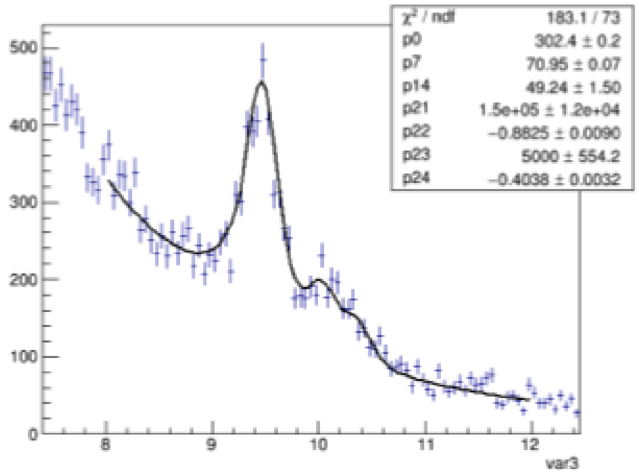
Left: Cross section as a function of p_T. Right: As a function of rapidity

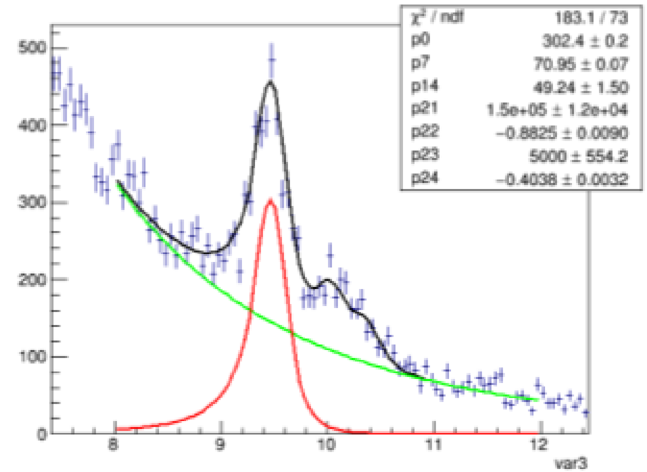
Reasonable agreement is observed (better than at 8 TeV), though we are still slightly above LHCb.

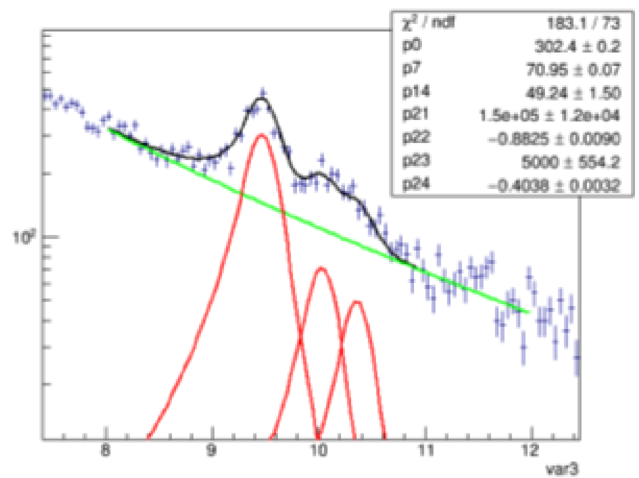
Seem to have different slopes vs y, (was also the case at 8 TeV).

Υ in pp 13 TeV

- Analysis started
  - Aims to study multiplicity dependence







LHC15i+j, AOD, CMUU7

$X^2/ndf = 2.5$

$N^{\Upsilon 1S}_{3\sigma} = 3330$ i+j=3088

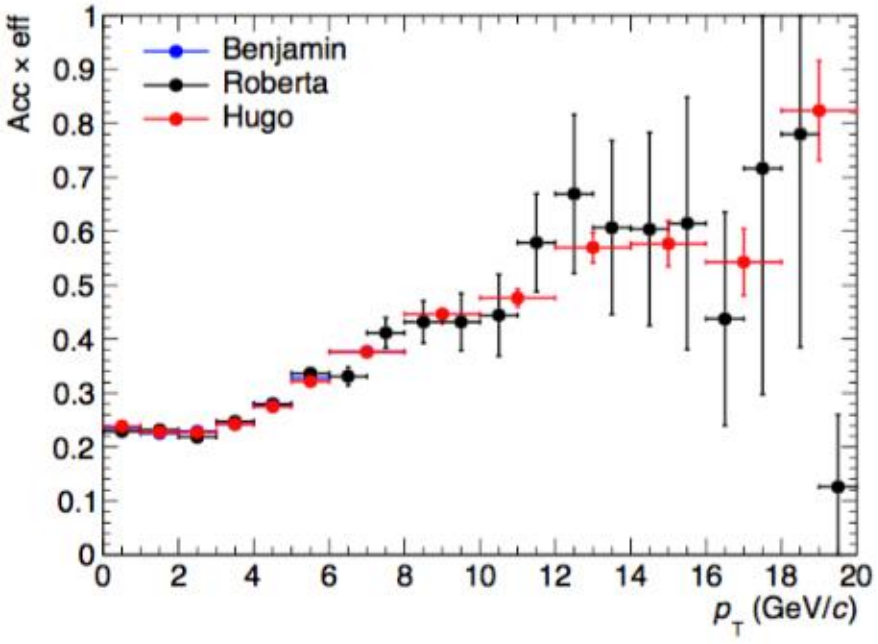
$S/B_{3\sigma} = 0.96$

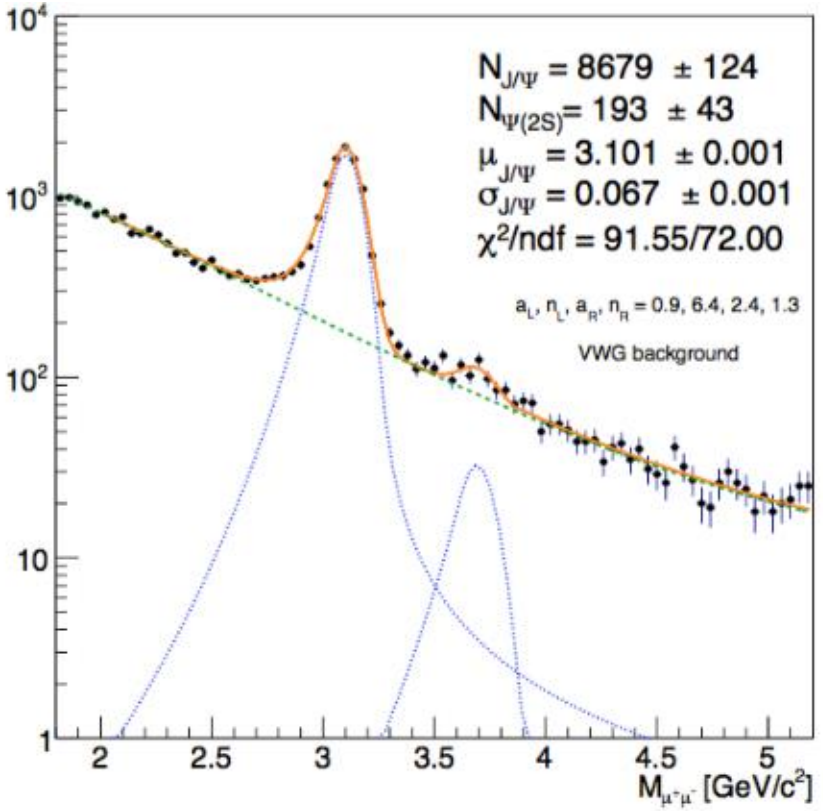
Divide those numbers by two due to faulty file list

Caveats : AOD no physics selection, incomplete events not removed

J/ψ in pp 5 TeV

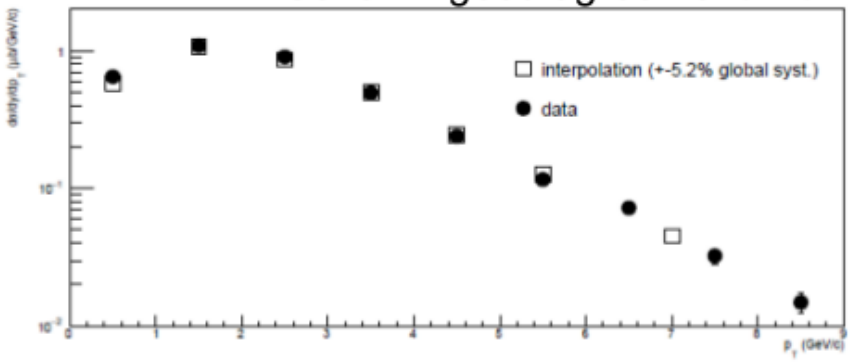
- pp reference data at 5 TeV
  - Signal extraction
    - Fit to CB2 + VWG
    - Two analysis ongoing
    - Enough data to go up to 10 GeV/c

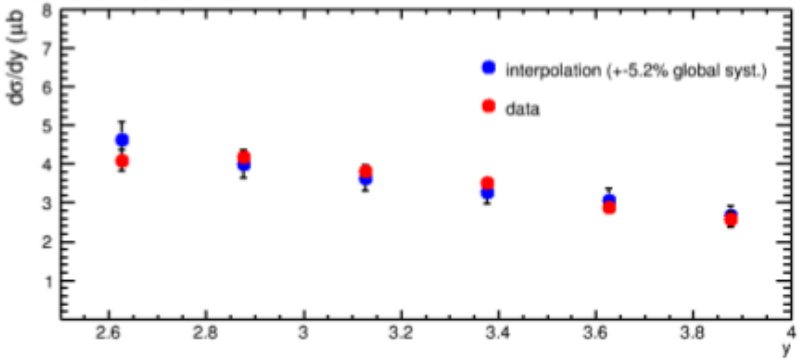


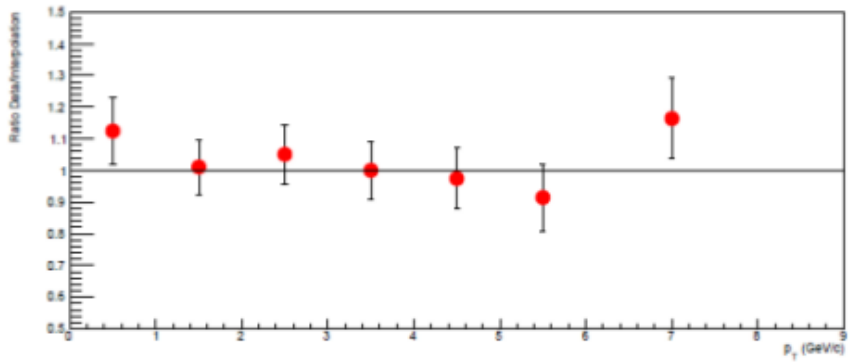


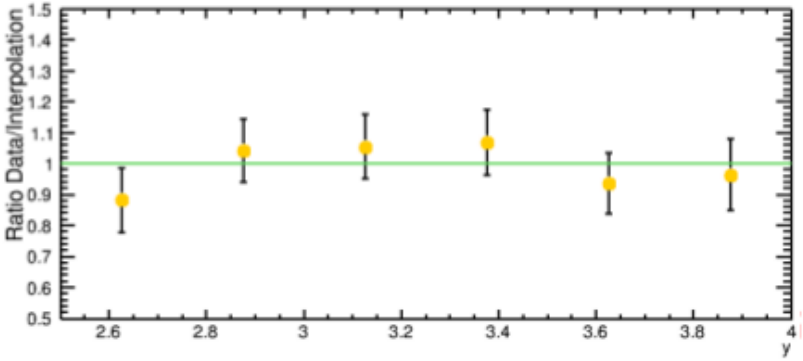
J/ψ in pp 5 TeV

- pp reference data at 5 TeV
  - Results
    - Integrated cross section: 5.46 ± 0.01 μb (syst missing)
    - Interpolated results: 5.28 ± 0.42 μb
    - Differential results
      - So far in good agreement with interpolated results



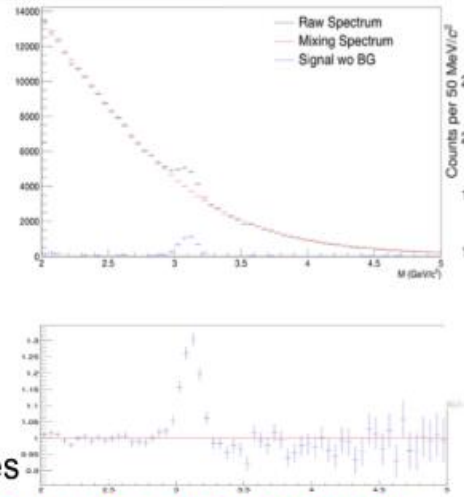


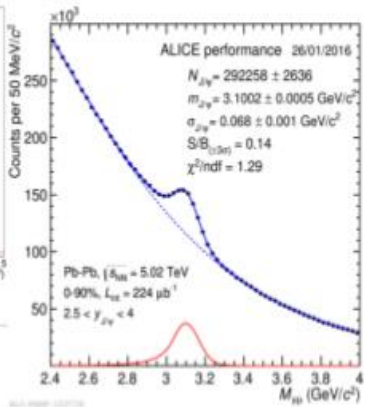


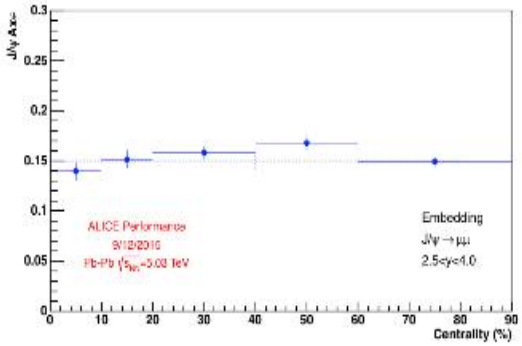


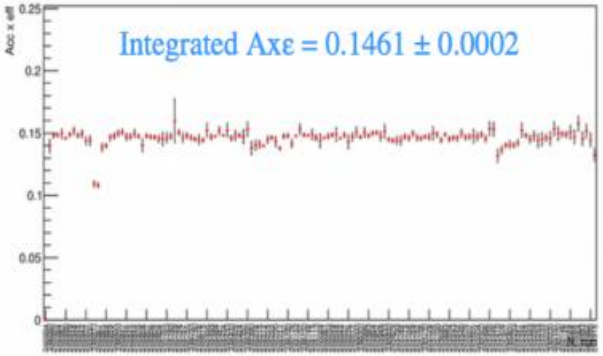
J/ψ in Pb-Pb 5 TeV

- Pb-Pb data at 5 TeV
  - Signal extraction
    - 2+2 independent analysis ongoing
    - Studies versus centrality and p_T
    - No systematic uncertainties yet
    - Final numbers need final MC (tails)
  - Acceptance x Efficiency
    - Pure simulations for systematic studies
    - Final numbers from Embedding of MC J/ψ into real CINT7 events
    - Final input for both (RejectList, Trigger Efficiencies, MisAlignment file, MC shapes … completed)
  - MUON tracking, trigger and matching efficiency systematics
    - Started



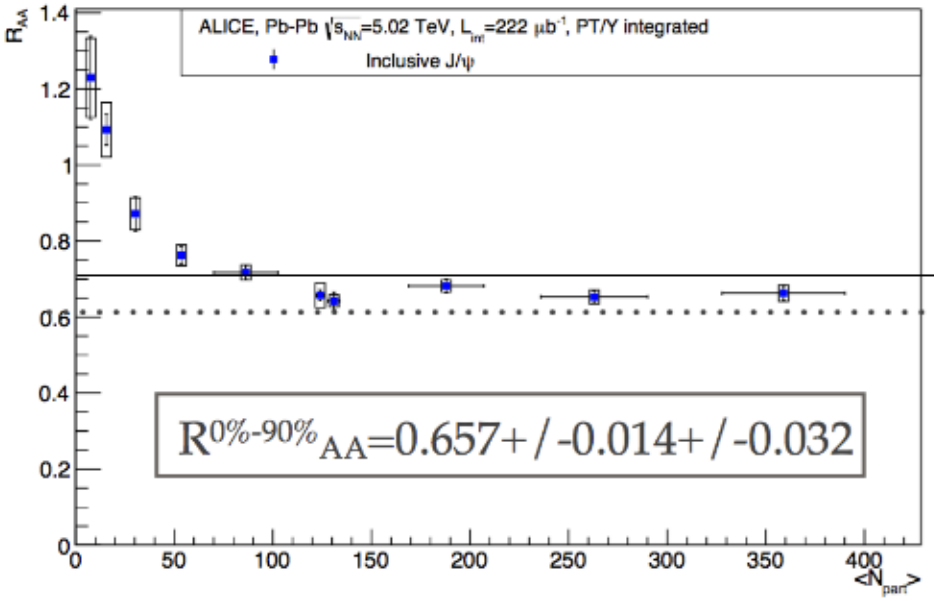


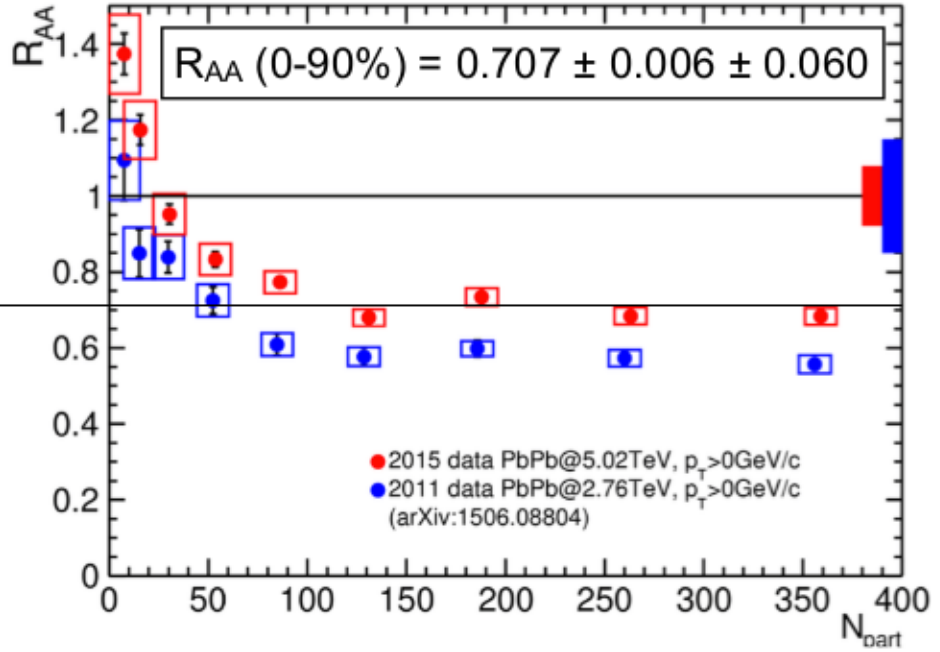




J/ψ in Pb-Pb 5 TeV

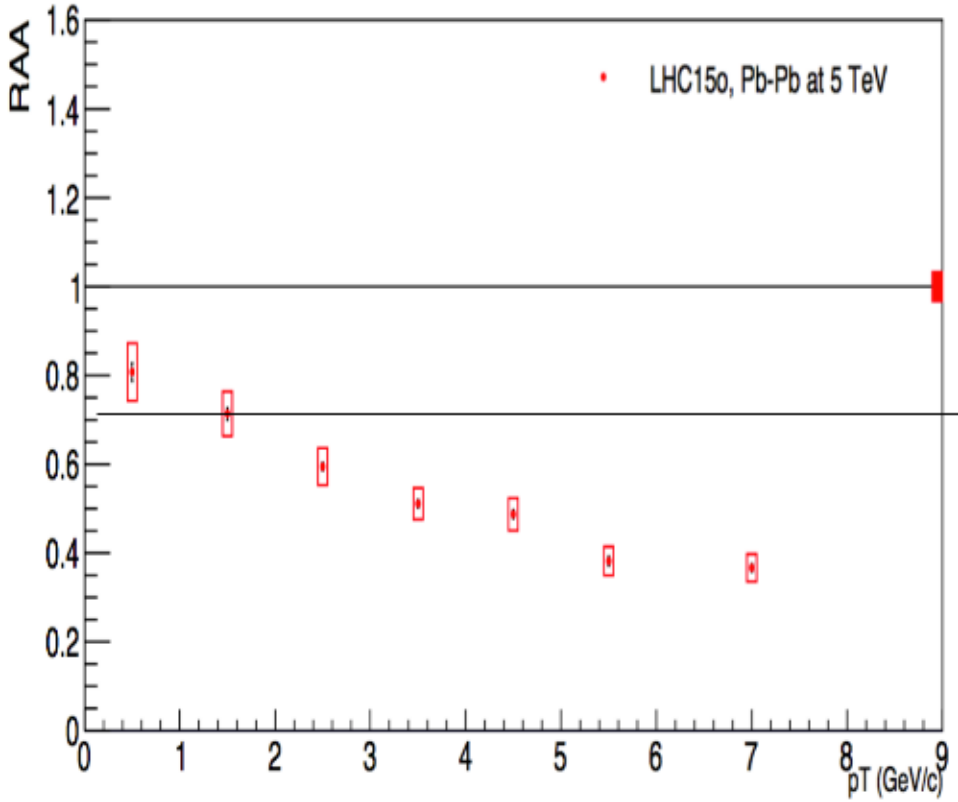
- Pb-Pb data at 5 TeV
  - Results
    - With all caveats mentioned previously and without (most) systematic uncertainties
    - Versus N_{part}
      - Centrality dependence of Acc*Eff from 2011

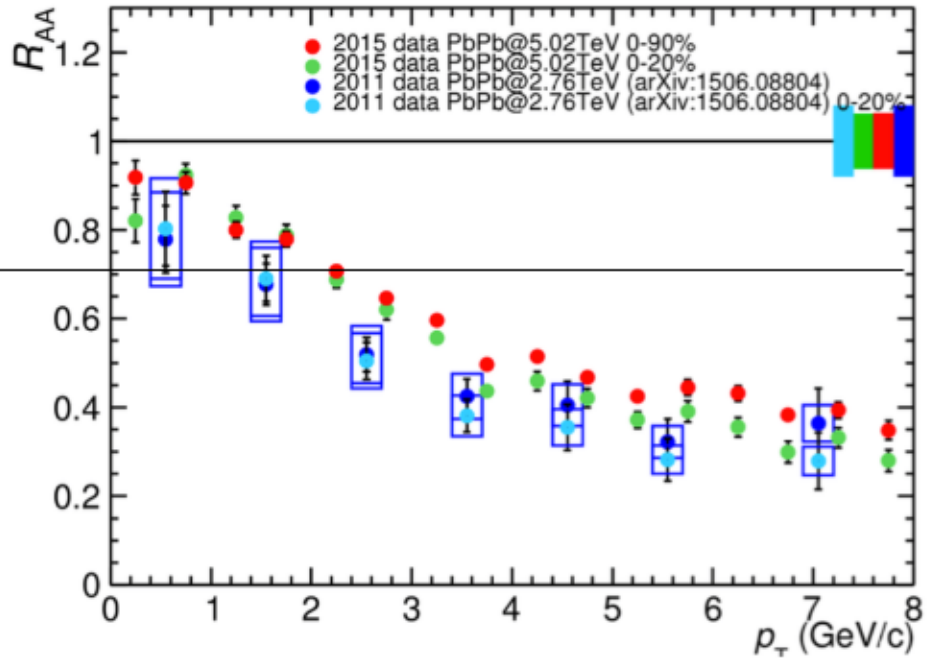




J/ψ in Pb-Pb 5 TeV

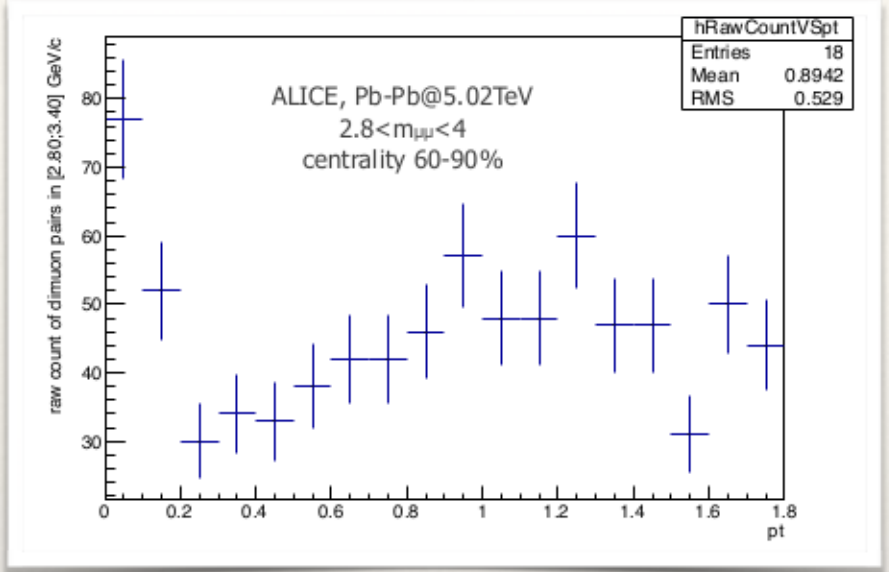
- Pb-Pb data at 5 TeV
  - Results
    - With all caveats mentioned previously and without (most) systematic uncertainties
    - Versus p_T

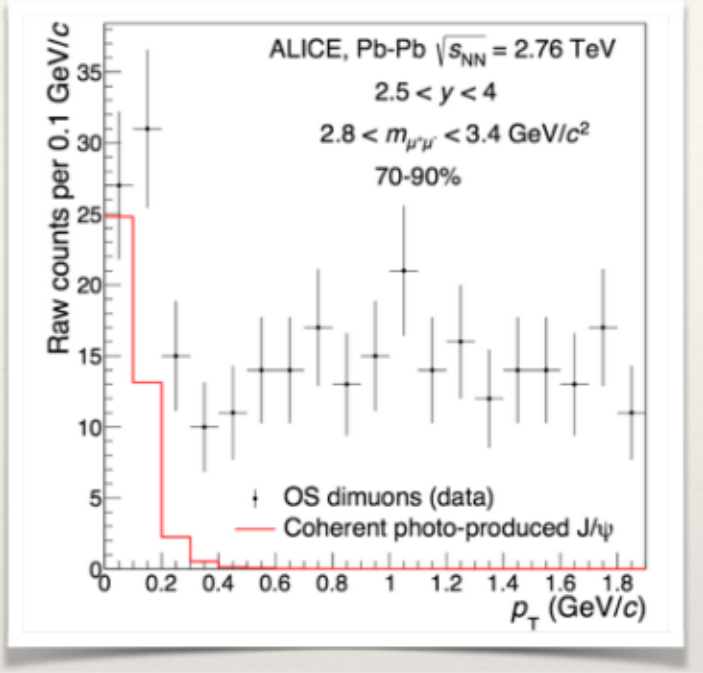




J/ψ in Pb-Pb 5 TeV

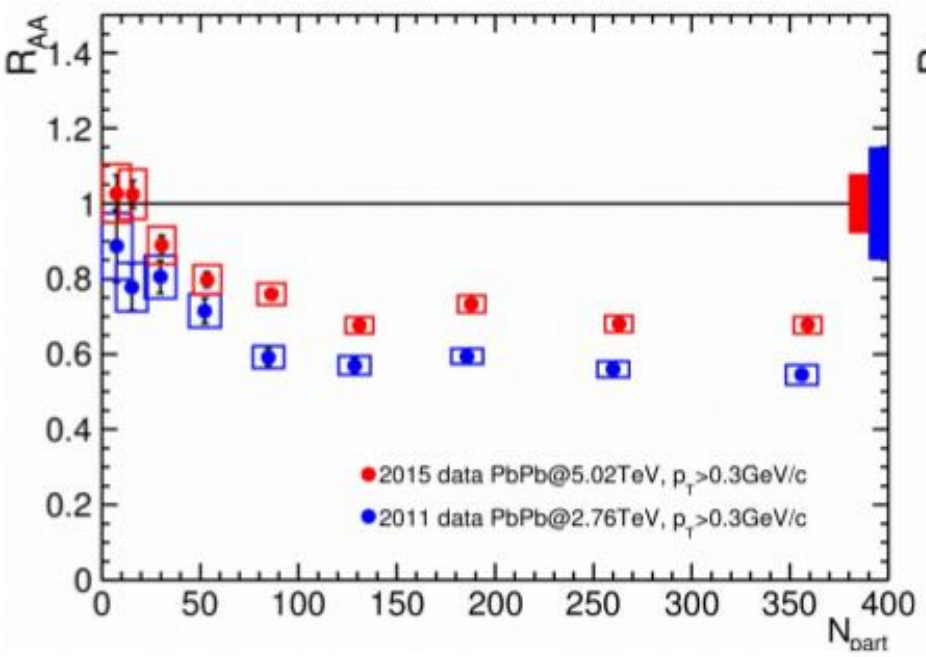
- Pb-Pb data at 5 TeV
  - Very-low-p_T J/ψ excess
    - Seen in peripheral Pb-Pb collisions at 2.76 TeV
      - arXiv:1509.08802
    - Presumably of EM origin
    - Clear signal also in peripheral Pb-Pb collisions at 5.02 TeV

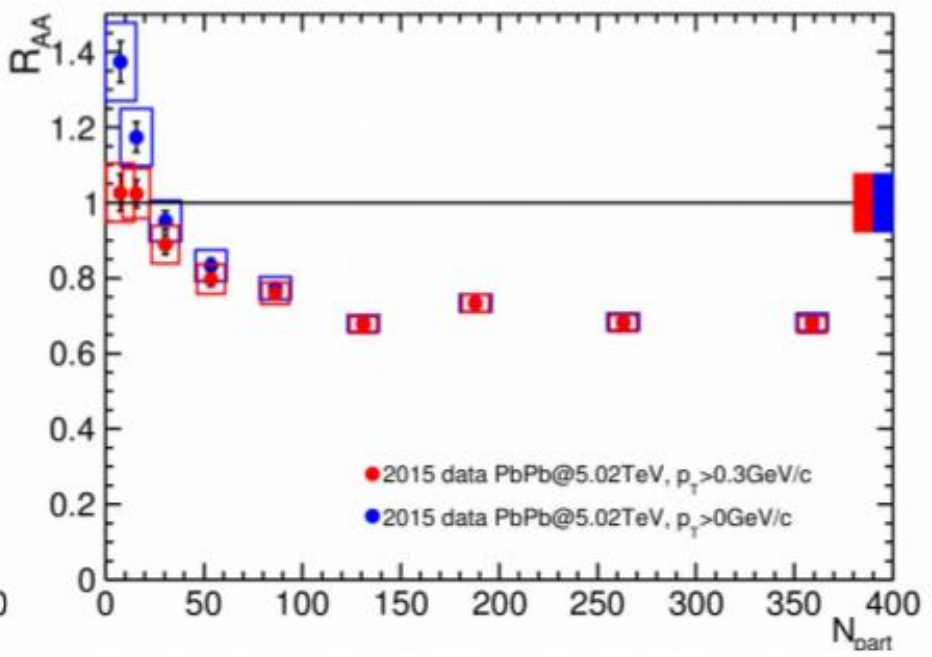




J/ψ in Pb-Pb 5 TeV

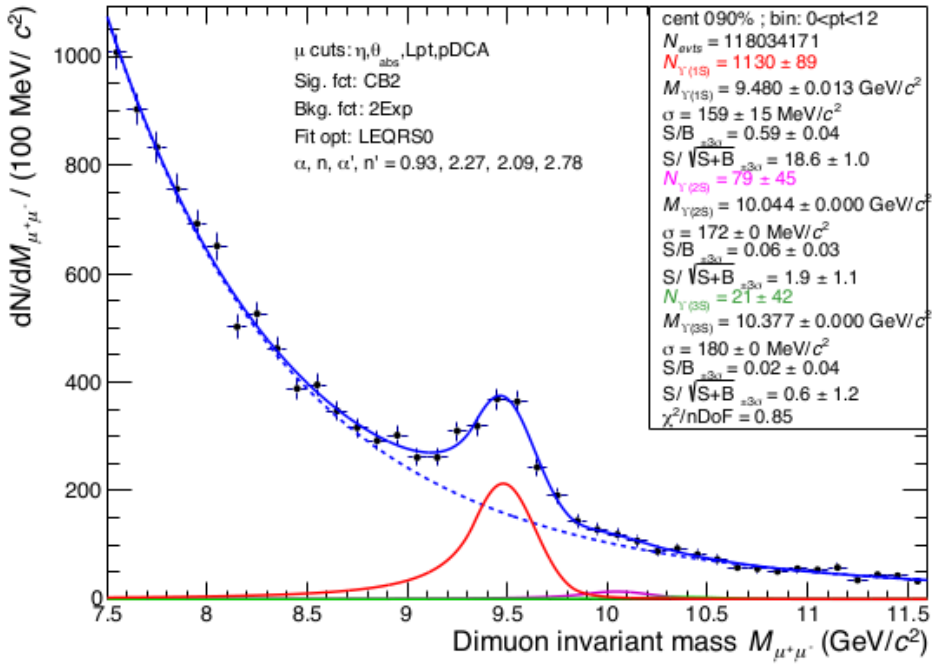
- Pb-Pb data at 5 TeV
  - R_{AA} (p_T > 0.3 GeV)





ϒ in Pb-Pb 5 TeV

- CB2 tails from pure Upsilon simulations



- Width ≈ 160 MeV/c^2
- Marginal Upsilon(2S) signal

Υ in Pb-Pb 5 TeV

- First estimation of integrated R_{AA}
  - $R_{\mathrm{AA}} = \dfrac{N_{\Upsilon(1S)}}{\langle T_{\mathrm{AA}} \rangle \times \sigma_{\mathrm{pp}} \times BR \times AccEff \times N_{\mathrm{MB}}}$
    - $\langle T_{AA} \rangle^{(0\text{-}90\%)}$ = 6.22 mb^{-1} —> From 2015 centrality web page
    - σ_{pp} x BR = 1.14 ± 0.10 nb —> Extrapolation from public note
    - $F_{norm}^{(0\text{-}90\%)}$ = 11.8 —> From Jpsi analysers
    - $N_{MB} = N_{evts}$ x F_{norm}
    - AccEff = 28.28% —> From pure Upsilon simulations
    - AccEff_{corr} = 26.81% —> Centrality effect from embedding of 2011 between most peripheral (80-90%) value and integrated one = 5.2%
  - R_{AA} (0-90%) = 0.43
    - From 2011: R_{AA} (0-90%) = 0.30 ± 0.05 ± 0.04

Thanks

Slide contributors : Muon DQ analysers, summarized by Javier