New high-precision measurement of the nuclear modification of prompt and nonprompt charmonia at unprecedently high p_T in PbPb collisions with CMS

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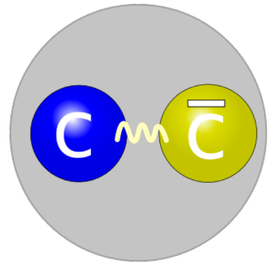
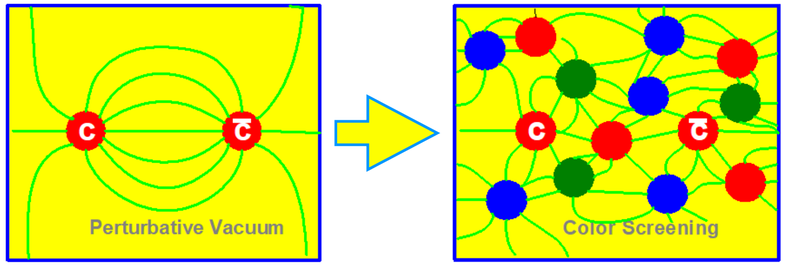
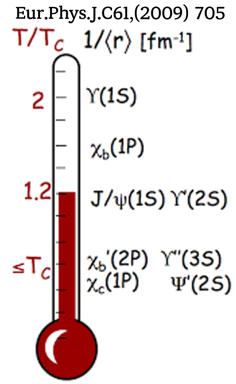
Introduction

- **Quarkonia** : Golden probes in heavy ion collisions
  - Produced via hard scattering : experience whole medium evolution
- **Various in-medium effects inside QGP**
  - Debye screening + Dissociation
  - Recombination
- **The sequential suppression of quarkonium states can result from color screening of the heavy quark potential**
  - Quarkonia can be used as thermometer of the medium

J/ψ, $\psi(2S)$

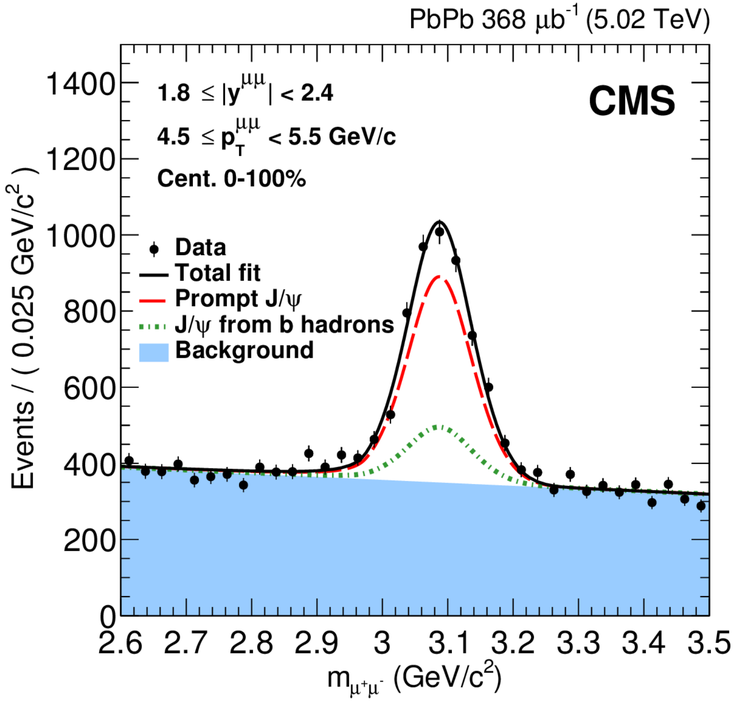


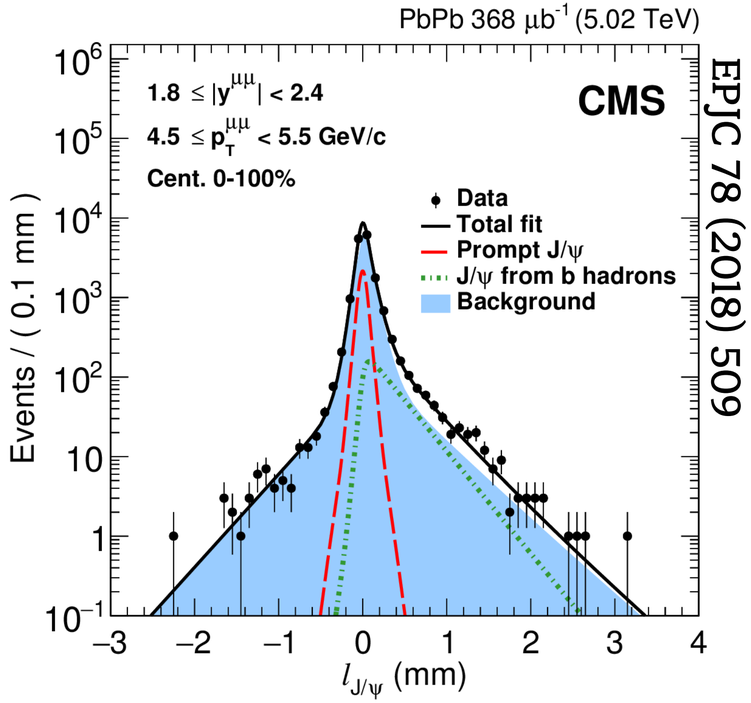




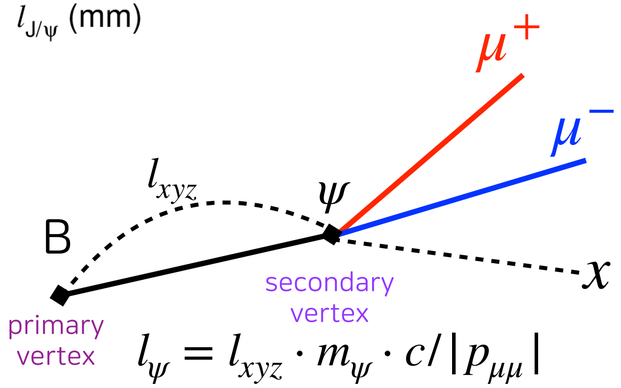
Prompt and b hadron decay Charmonia

J/ψ : 2D fit on mass & decay length

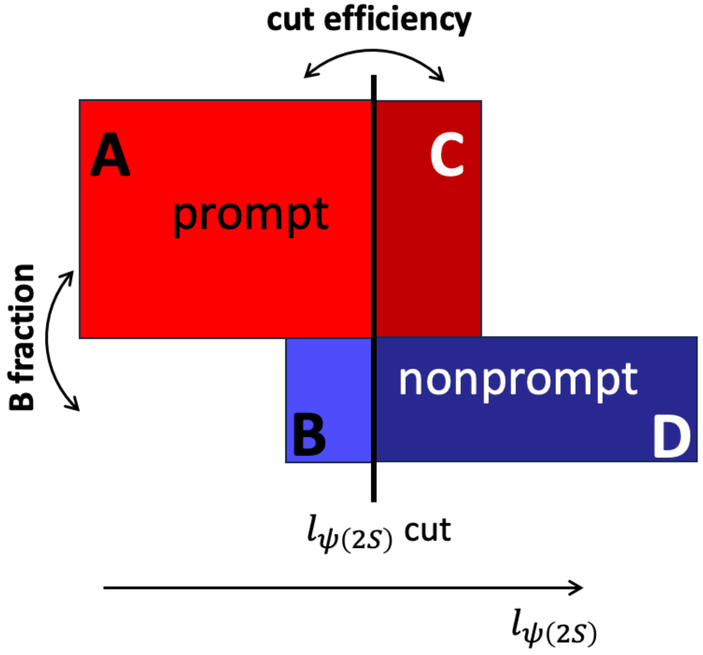




prompt J/ψ, b $\rightarrow$ J/ψ

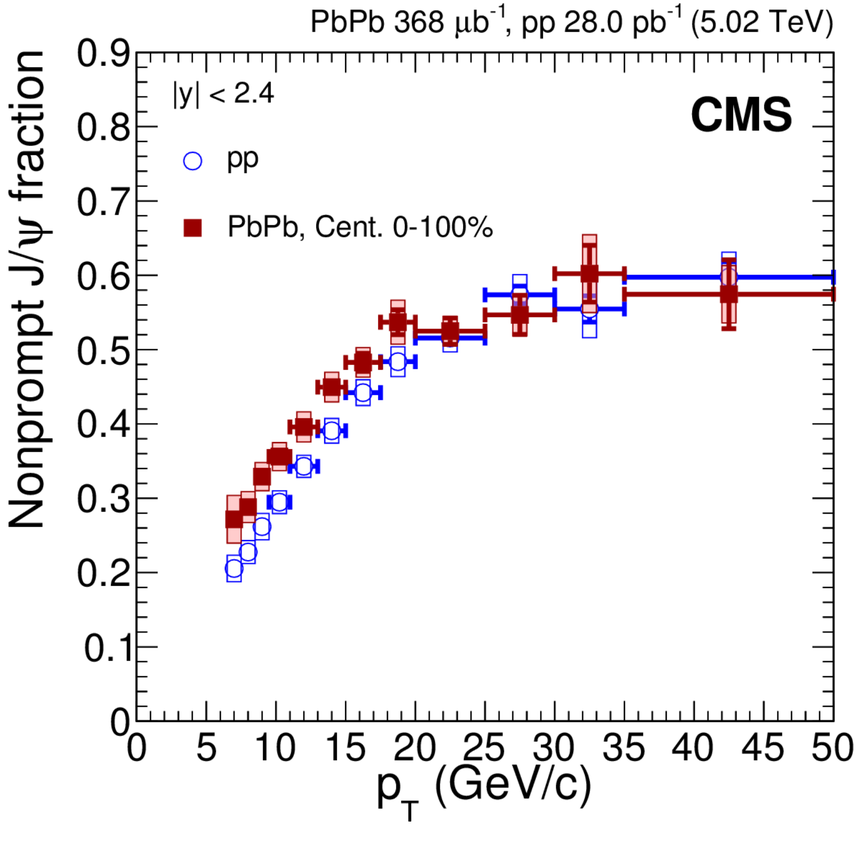


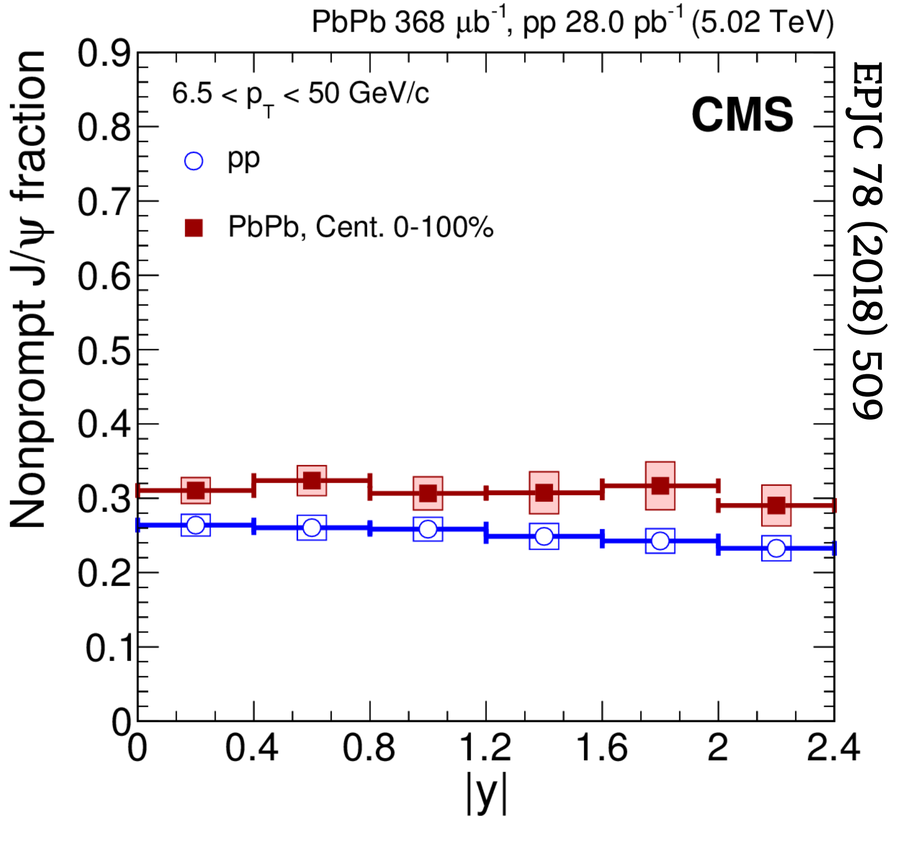
$\psi(2S)$: Cut on decay length



prompt $\psi(2S)$

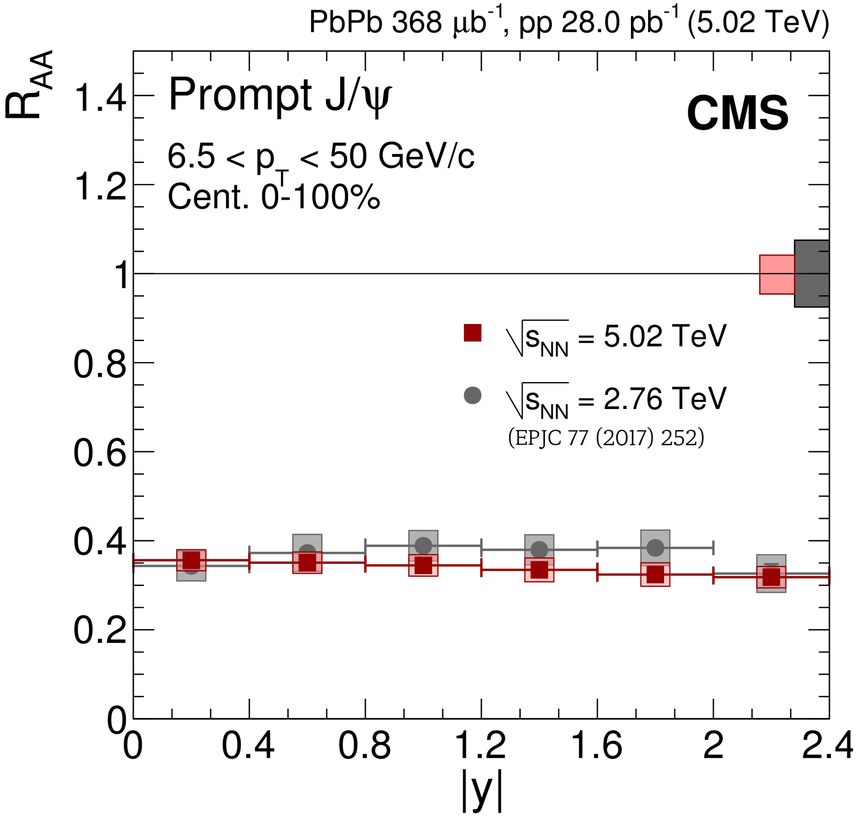
Nonprompt fraction of J/ψ

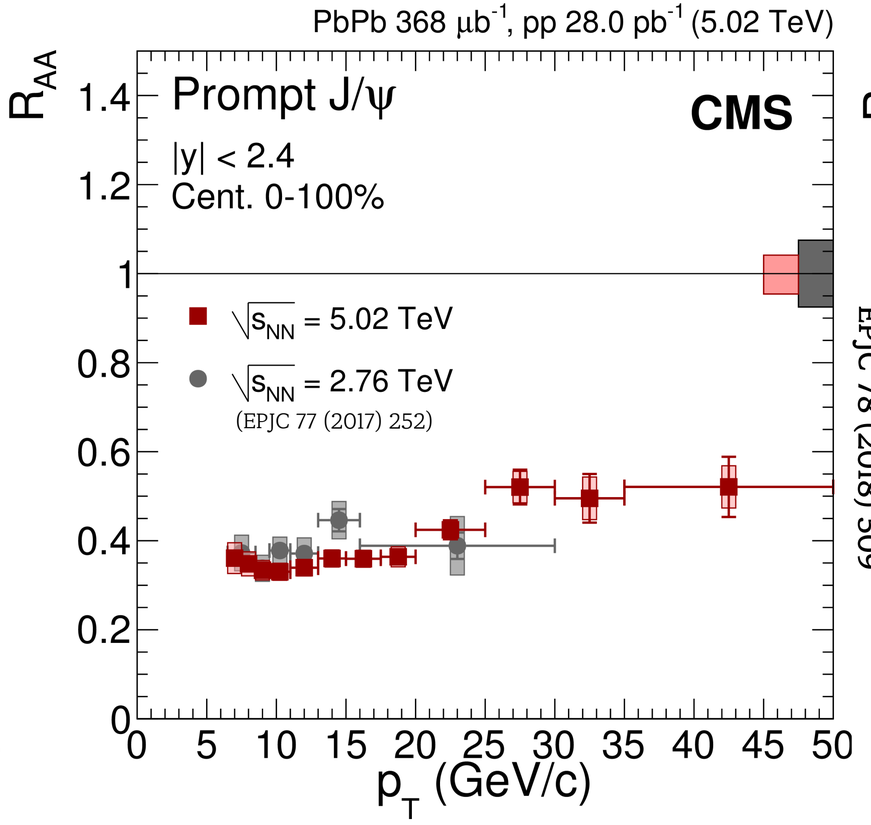


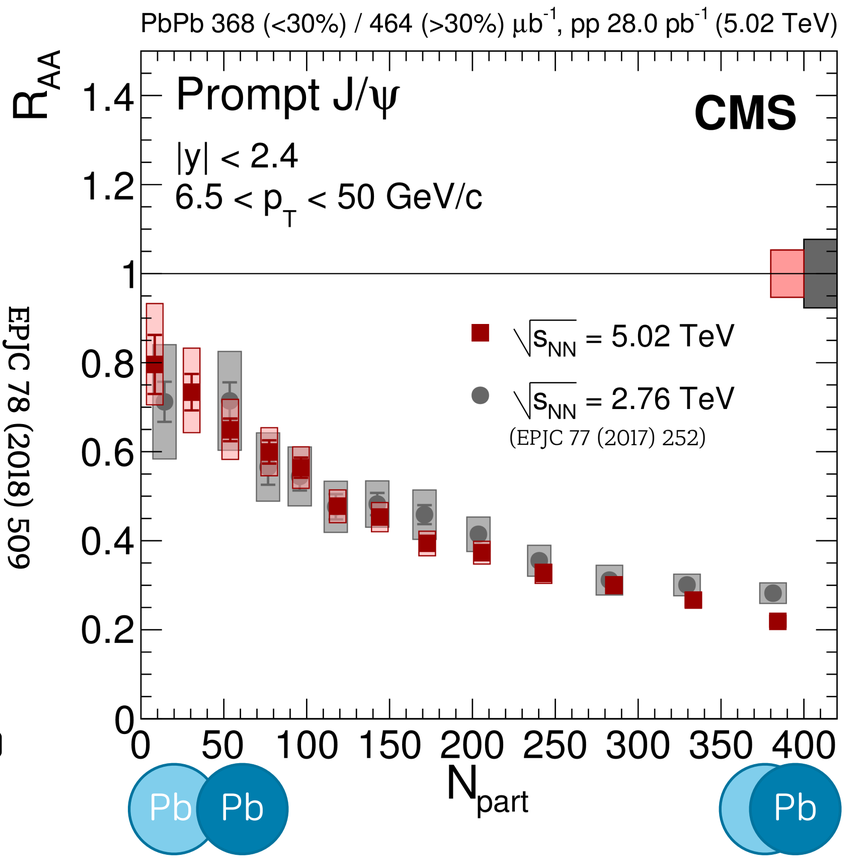


- No significant dependence with rapidity
- Fraction is increasing as increasing p_T from about 20% at low-p_T to 60% at high-p_T
- Nonprompt J/ψ fraction bigger in PbPb than in pp collisions

Prompt J/ψ R_{AA}

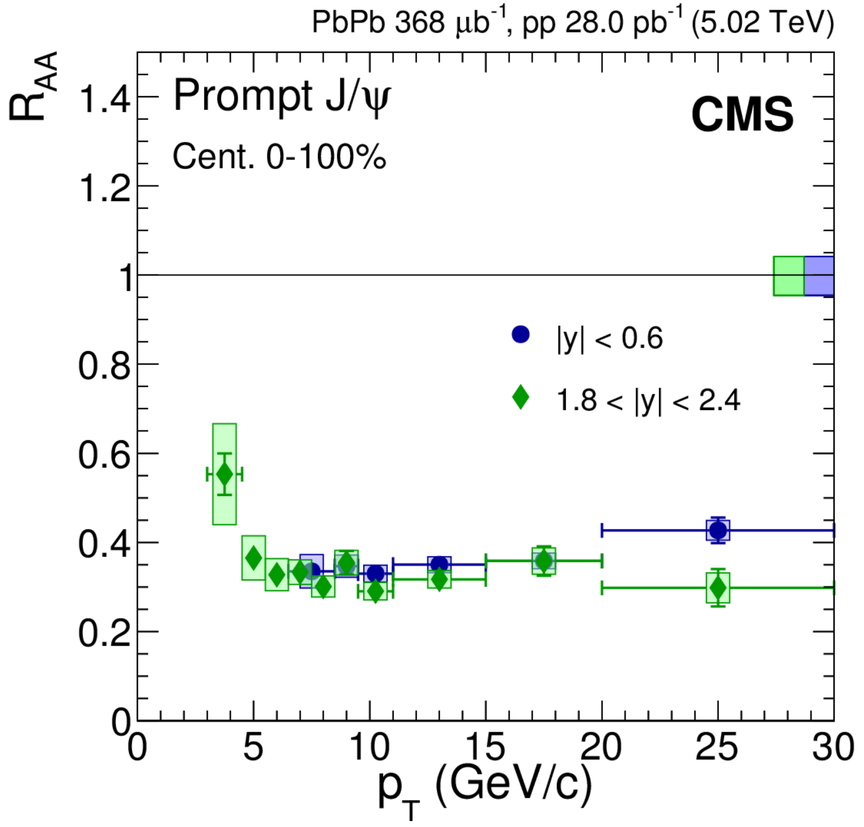


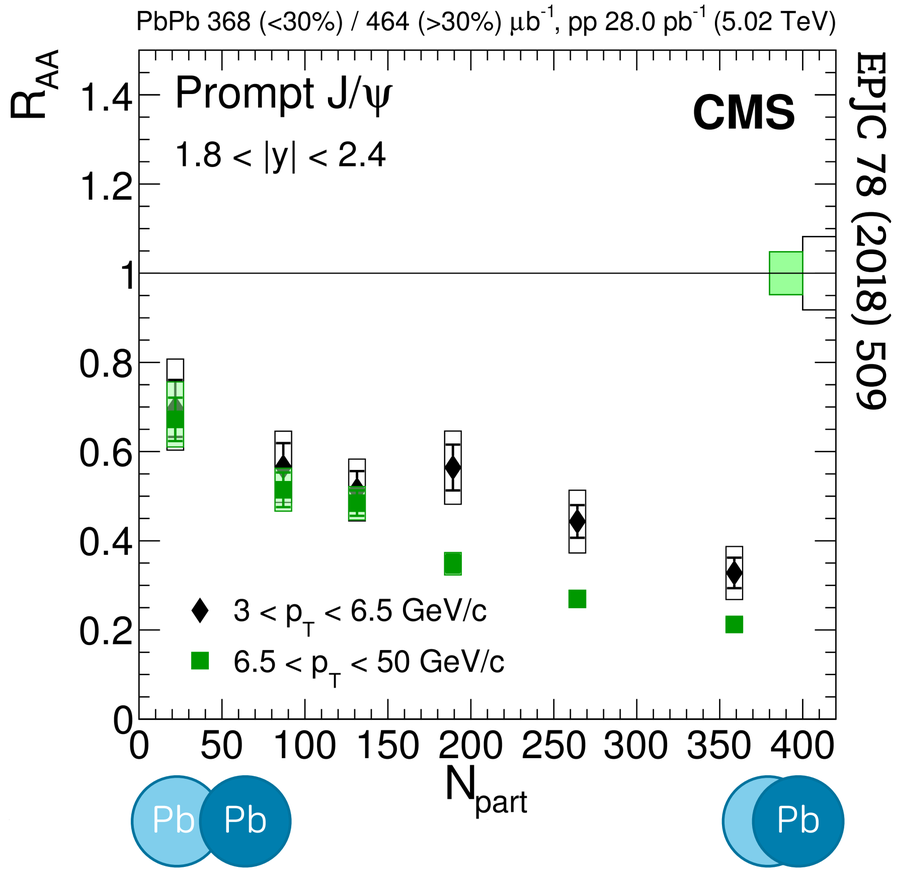




- Good agreement between 5.02 TeV and 2.76 TeV
- No strong dependence on rapidity
- R_{AA} seem to be flat in $5 < p_T < 20$ GeV/c but increasing at higher p_T
- Suppression increases towards central events

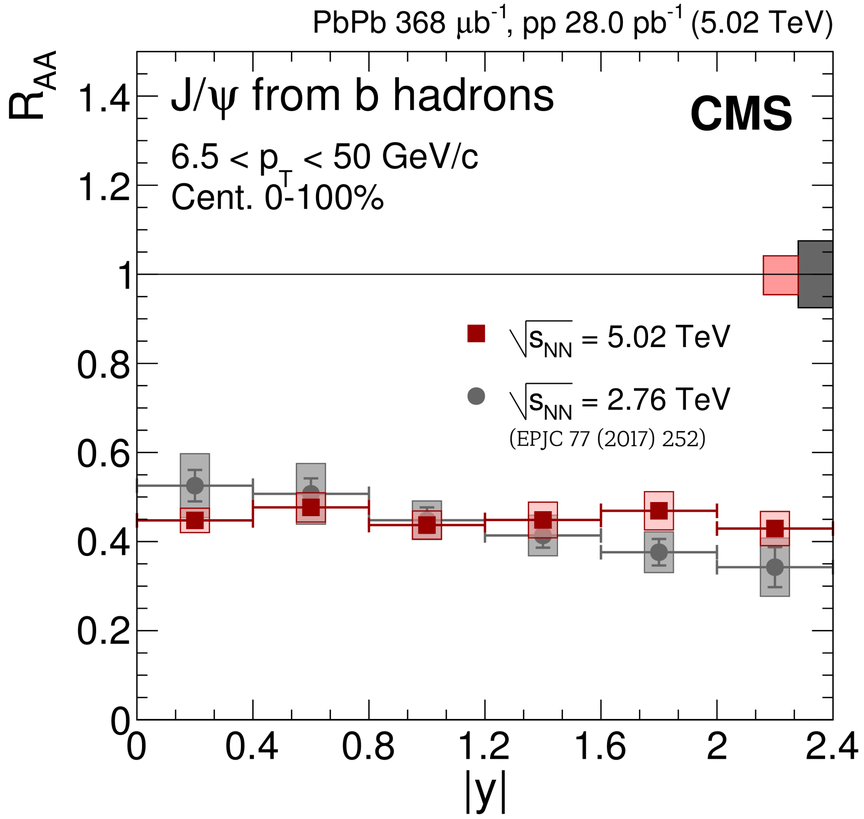
Prompt J/ψ R_{AA} - Low-p_T

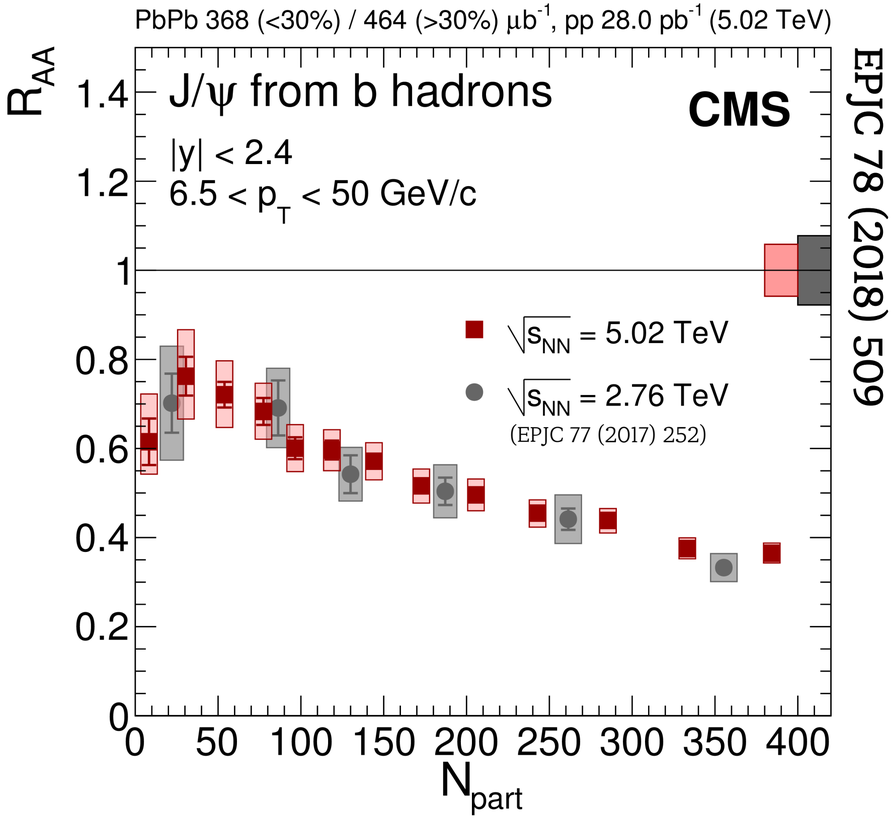




- Similar p_T trend in different rapidities
- Smaller suppression at lowest p_T
- Smaller suppression at lowest p_T for most central events (>30%)

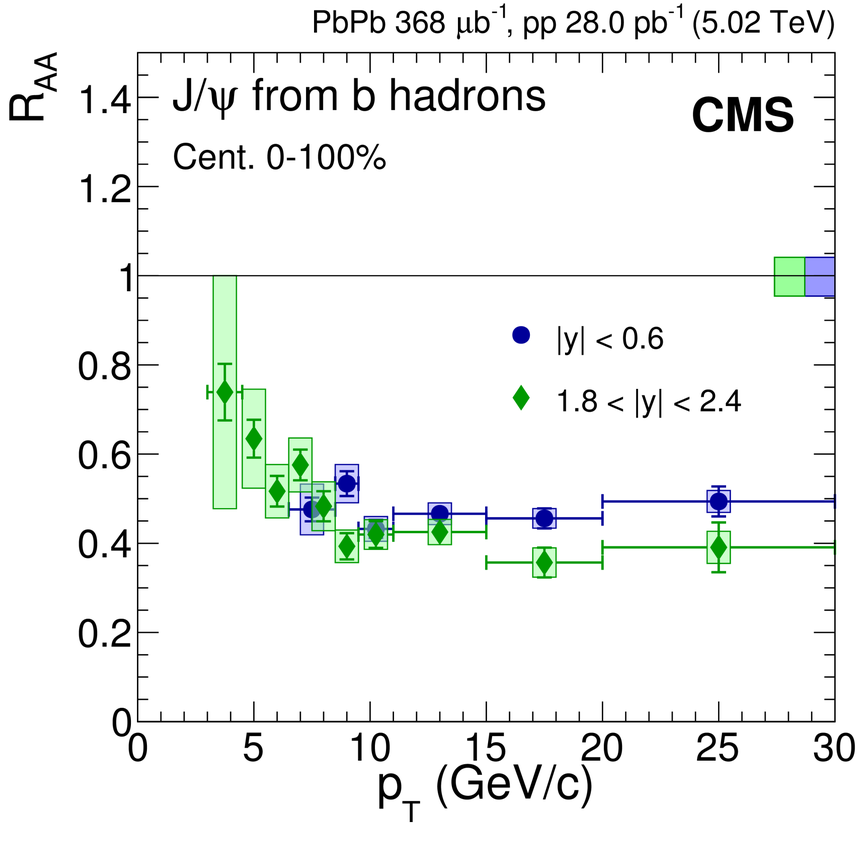
Nonprompt J/ψ R_{AA}

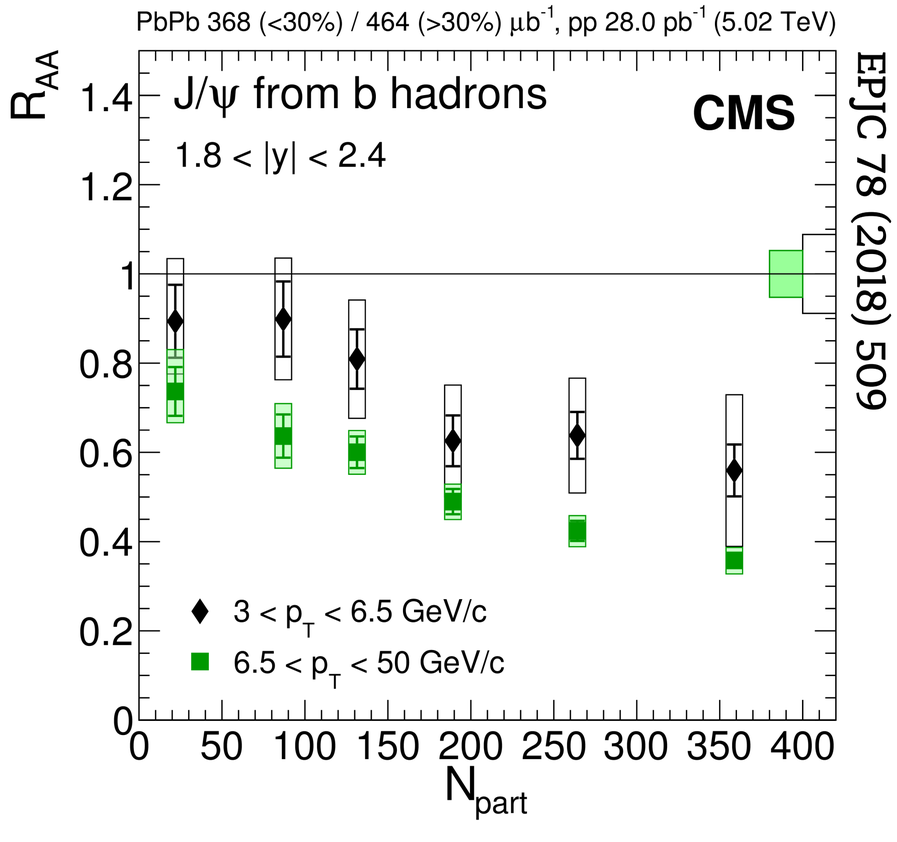




- Good agreement between 5.02 TeV and 2.76 TeV
- No strong dependence on rapidity
- Suppression increases towards central events

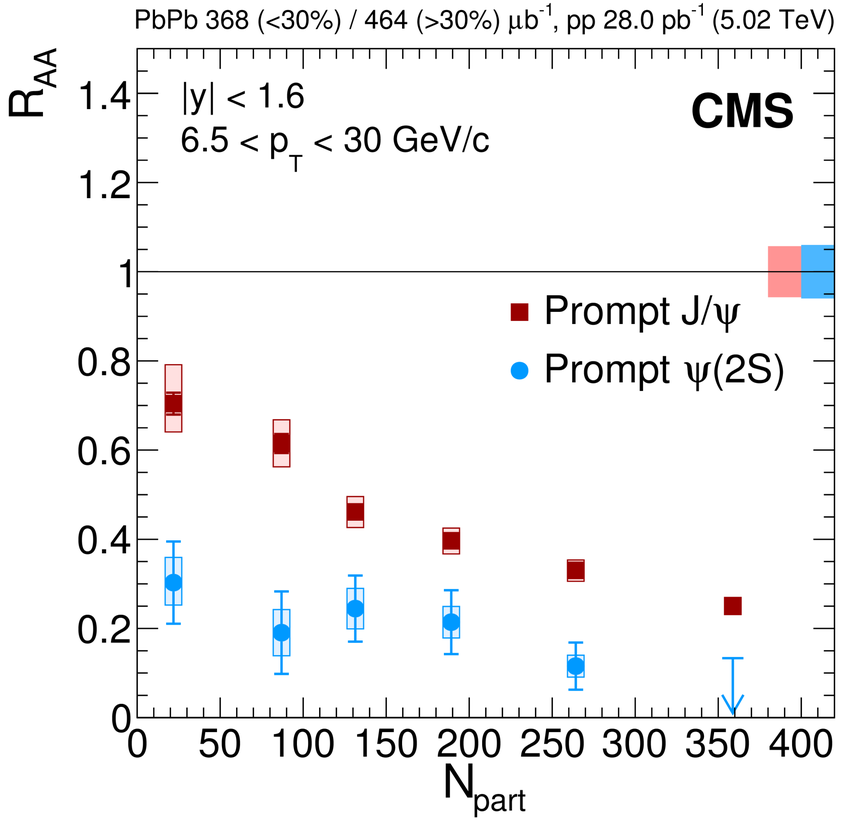
Nonprompt J/ψ R_{AA} - Low-p_T

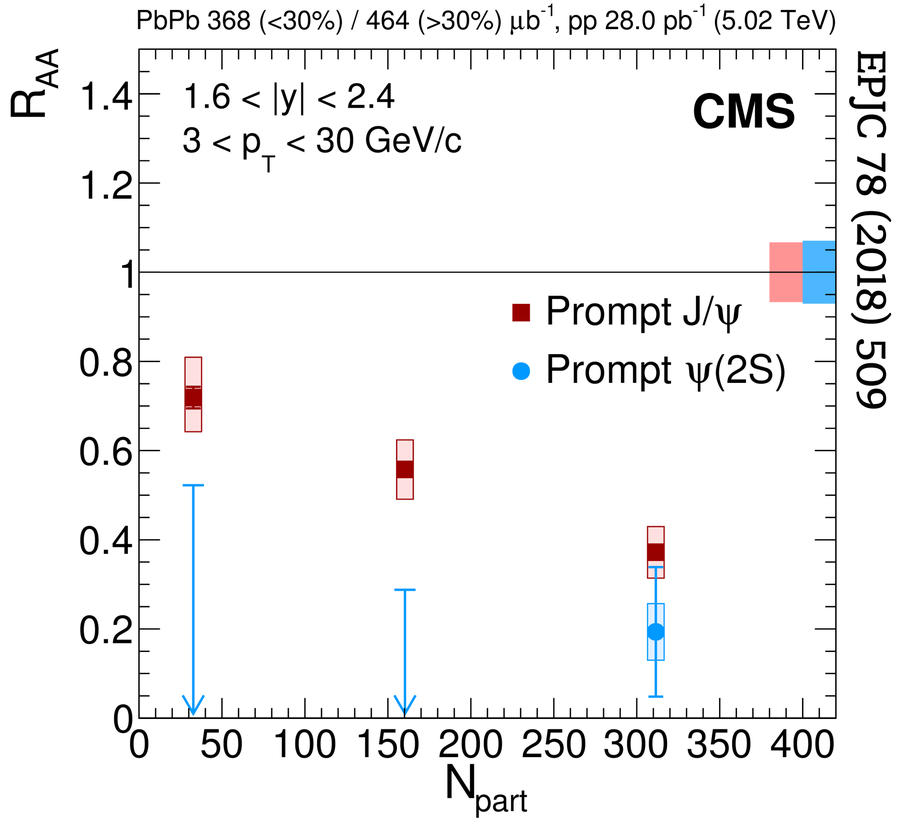




- Similar p_T trend in different rapidities
- Hint of Smaller suppression at low p_T
- Hint of stronger suppression at p_T > 6.5 GeV/c for all centrality

Prompt $\psi(2S)$ R_{AA}





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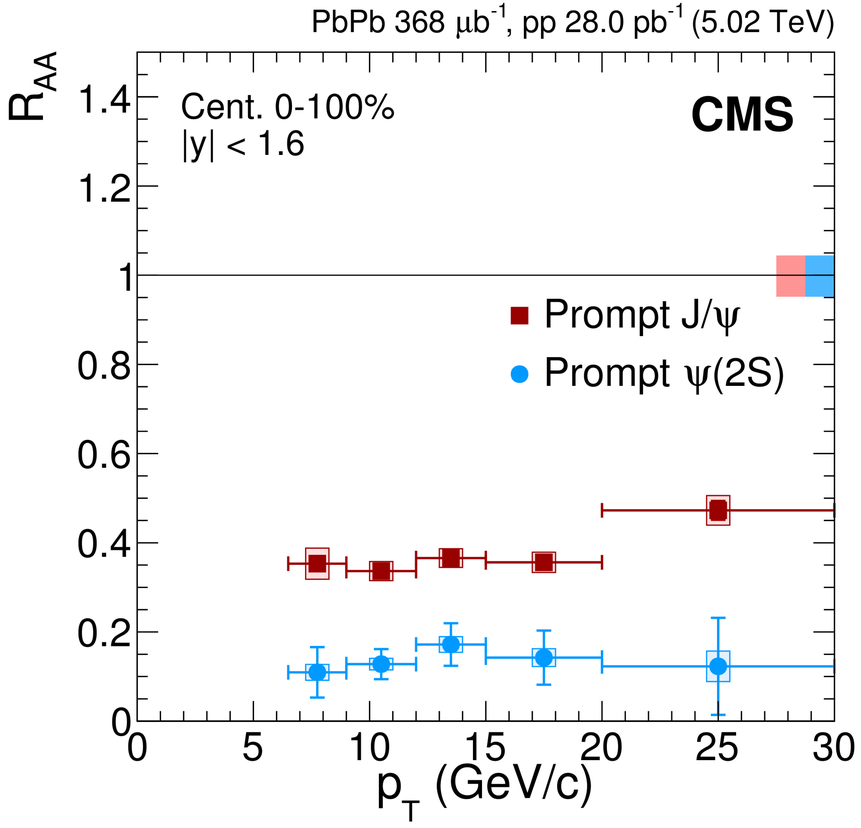
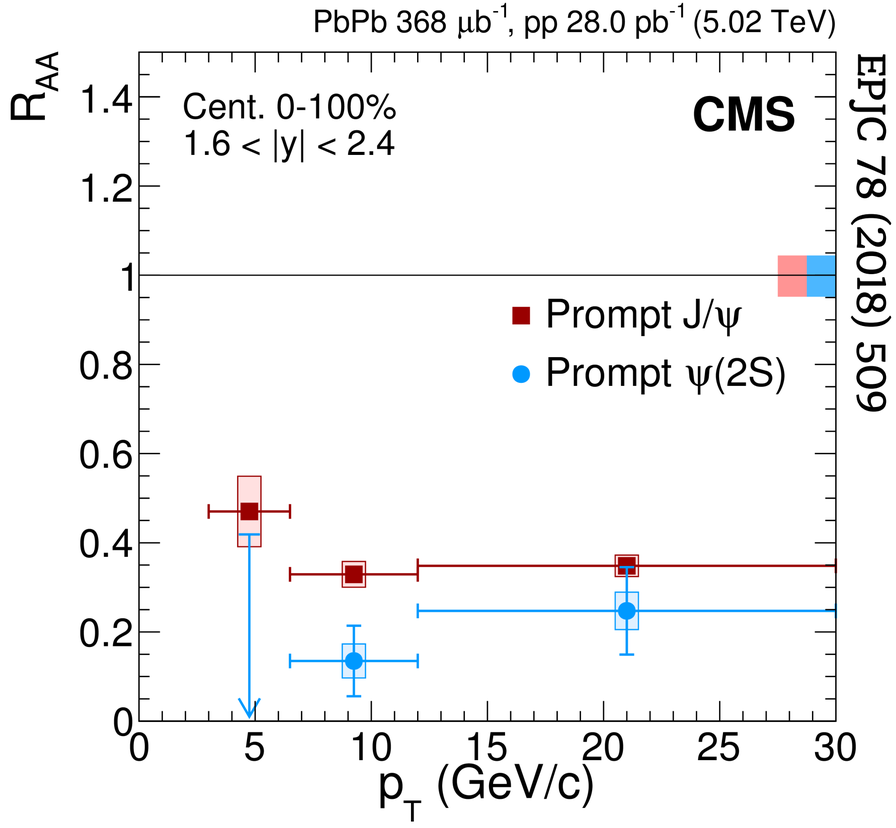
- Increasing R_{AA} of $\psi(2S)$ towards peripheral events
- **Stronger suppression of $\psi(2S)$ than J/ψ in for all centralities**

Prompt $\psi(2S)$ R_{AA}





- No clear dependence on p_T on $\psi(2S)$ suppression
- **Stronger suppression of $\psi(2S)$ than J/ψ in for all p_T**

Summary

- Prompt and nonprompt J/ψ and prompt $\psi(2S)$ modification factor is measured in pp and PbPb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV
- Prompt and nonprompt J/ψ R_{AA} are consistent with previous results at $\sqrt{s_{NN}}$ = 2.76 TeV
- $\psi(2S)$ R_{AA} is more suppressed than the J/ψ for all kinematic regions

Thank you for your attention!