Suppression and flow of charmonium states in Pb+Pb collisions at 5.02 TeV with the ATLAS

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Strong suppression of charmonia is observed in central Pb+Pb collisions - a well know consequence of a presence of deconfined quark gluon plasma. Significant elliptic flow is seen for all charged particle species as a consequence of initial spacial anisotropy present in the collision. This poster presents the latest results on charmonia suppression and flow based on Eur. Phys. J. C 78 (2018) 762 [1] and Eur. Phys. J. C 78 (2018) [2].

EVENT SELECTION

- 0.42 nb^{-1} and 25 pb^{-1} of Pb+Pb and pp collisions, respectively, at $\sqrt{s_{NN}} = 5.02$ TeV.
- Events triggered by dimuon trigger, each muon with p_T>4 GeV.
- reconstructed muons: p_T>4 GeV, |η|<2.4
- muon pairs: p_T > 9 GeV, |y| < 2; 2.6 < $m_{\mu\mu}$ < 3.5 GeV in [1] and 2.6 < $m_{\mu\mu}$ < 3.5 GeV in [2].

OBSERVABLE QUANTITIES

- Nuclear modification factor:

$$R_{AA} = \frac{N_{AA}}{\langle T_{AA} \rangle \times \sigma_{pp}}$$

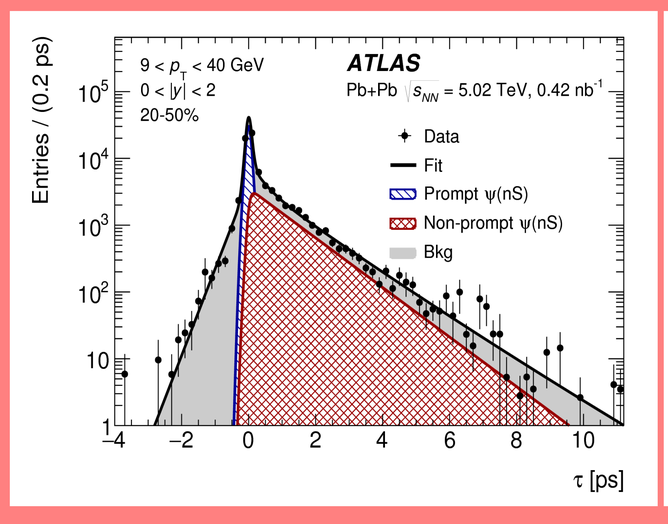
- Angular distribution of particle production can be expanded as:

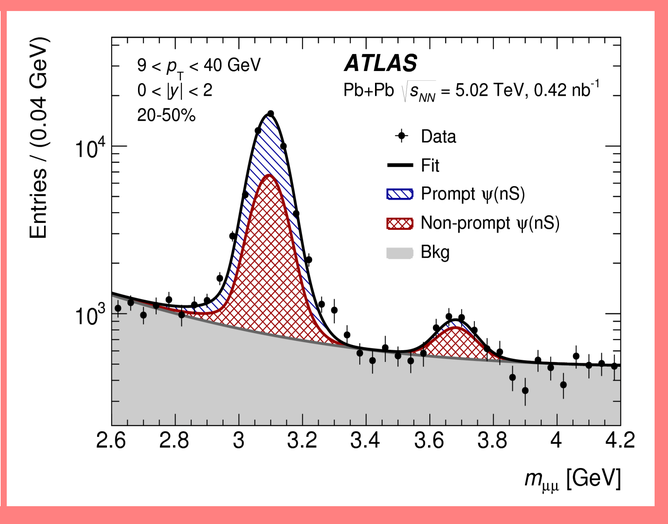
$$\frac{dN}{d\phi} \propto 1 + \sum_{n=1}^{\infty} 2 v_n cos[n(\phi - \Psi_n)]$$

where v2 is the elliptic flow coefficient.

SIGNAL EXTRACTION

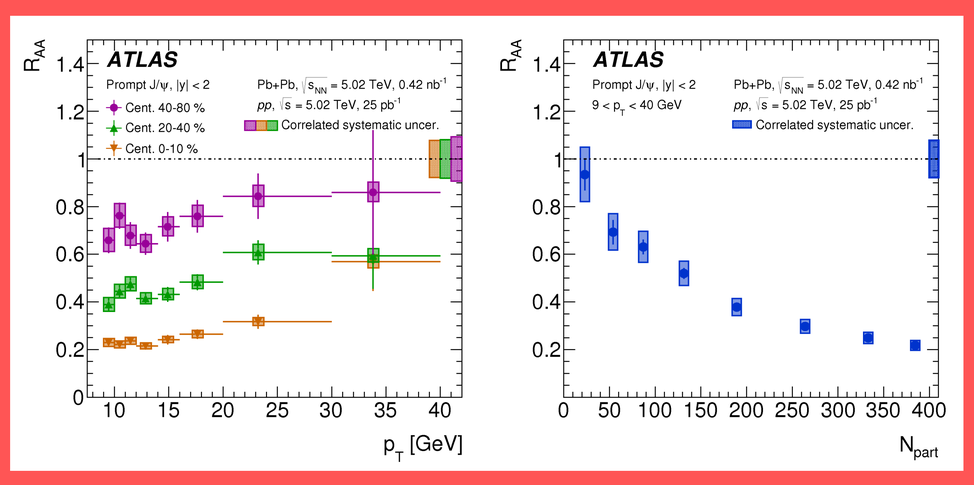
The pseudo-proper decay time, $\tau = L_{XY} \cdot m_{\mu\mu}/p_T$, is used to distinguish between prompt and non-prompt charmonium production. The yields are extracted with a 2D fit to the mμμ and τ distributions corrected for muon trigger and reconstruction efficiencies, and J/ψ and ψ(2S) acceptance.





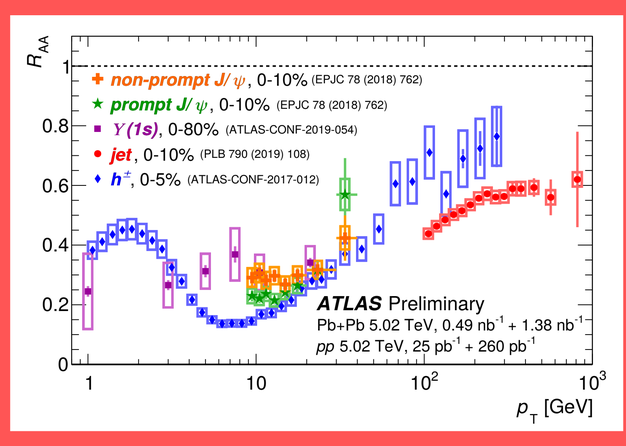
RESULTS

R_{AA} for J/ψ



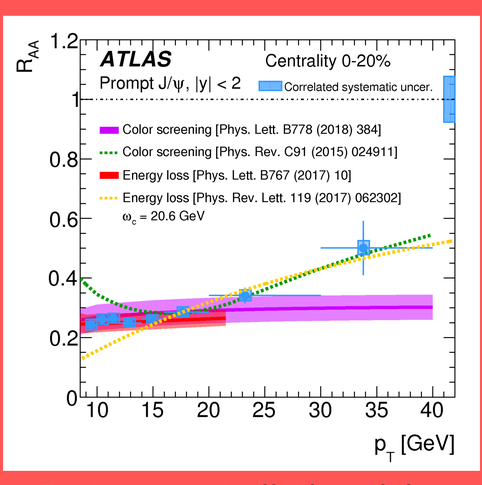
- The prompt J/ψ R_{AA} as a function of p_T shows an increasing trend. Non-prompt J/ψ R_{AA} is consistent with flat behaviour.
- The maximal suppression is observed in the most central collisions.
- R_{AA} flat with rapidity within uncertainties.

R_{AA} for different species



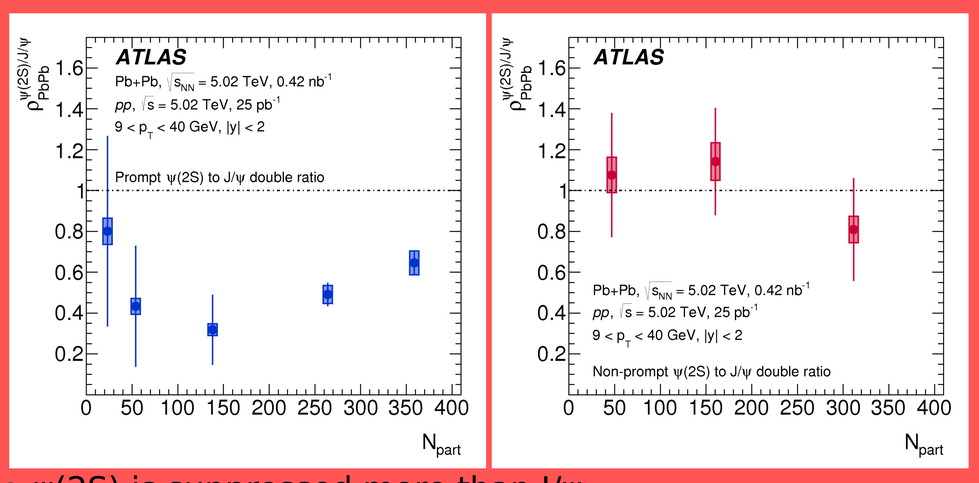
- For p_T > 12 GeV a small increase with p_T is observed which is similar in shape and size to the charged particles.

Theory



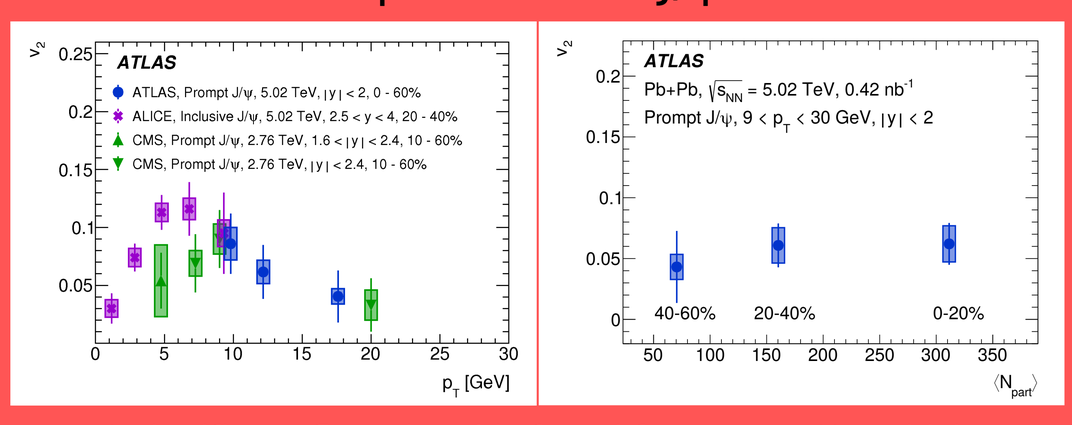
- Data cannot distinguish between color screening and energy loss models.

Psi(2S) to J/ψ yields



- ψ(2S) is suppressed more than J/ψ.
- The non-prompt double ratio is consistent with unity within uncertainties. This supports a possibility, that both particles are created from the b-quark outside the medium.

Eliptic flow of J/ψ



- A significant flow signal is found for prompt J/ψ, which decreases with increasing p_T.
- v_2 flat with centrality and |y| within uncertainties.
- v_2 consistent with results from CMS and ALICE.