Predictions for bottomonia suppression in 5.02 TeV Pb-Pb collisions

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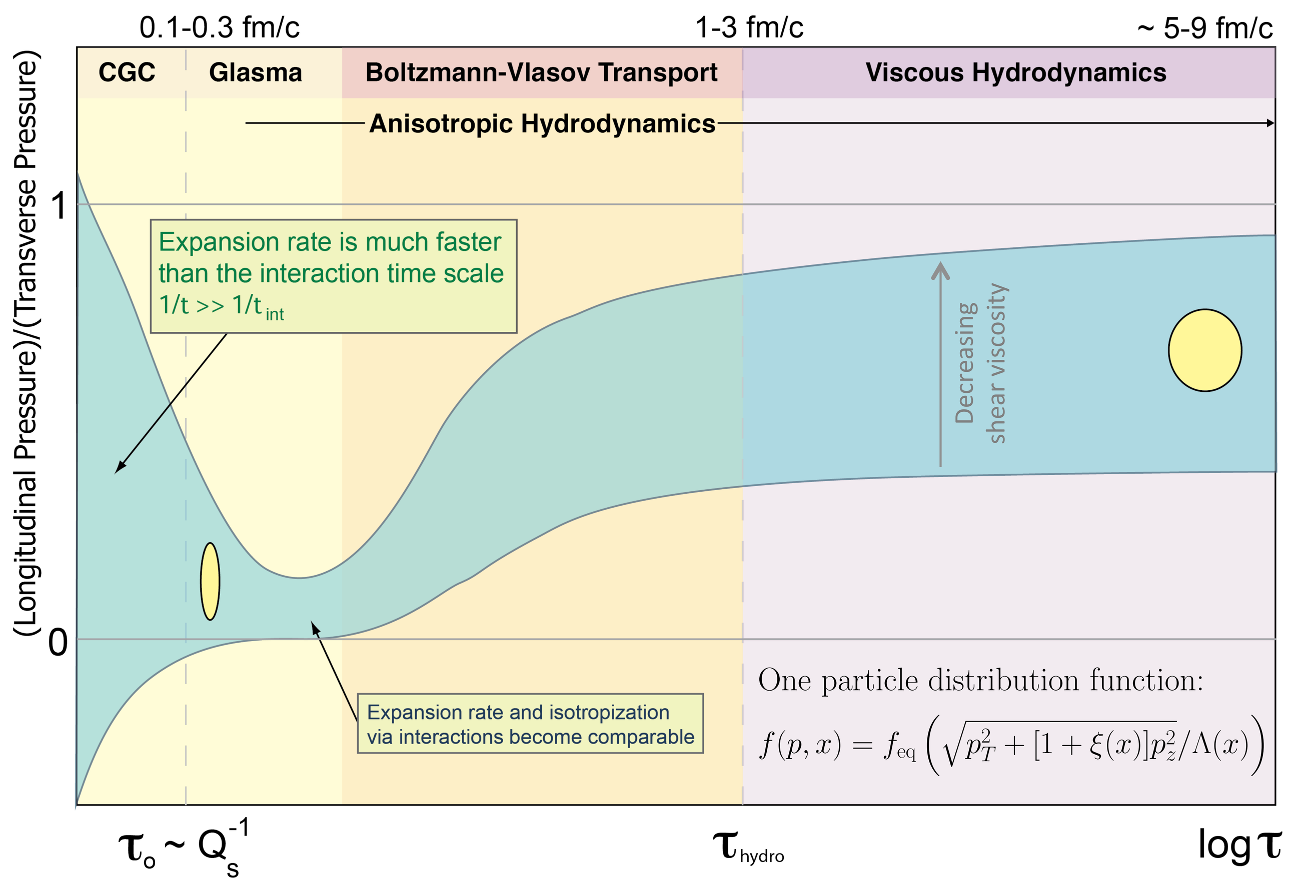
Introduction

We extend our previous work to:

- Anisotropic hydrodynamics background modeling of LHC Run II Pb-Pb collision energies;
- Update the mixing fractions to recent updated values determined via fits to ATLAS, CMS, and LHCb results for Υ and χ_b production in p-p collisions, including the $\chi_b(3P)$ state;
- Correct the probability weight-function used for centrality averaging in order to match the experimental procedure.

We find that, with the improvements listed above, a reasonable quantitative description can be inferred from our model, but there is room for improvement, namely regeneration.

Anisotropic QGP



- Finite shear viscosity results in momentum space anisotropies
- Anisotropies, ξ, can be quite large
- Anisotropies present in both weak and strong coupling approaches
- Anisotropies modify the heavy quark potential

Potential Model and R_{AA}

- The heavy quark potential in the QGP has both real and imaginary parts, $V = \Re[V] + i\Im[V]$.

$$\Re[V] = -\frac{a}{r}(1+\mu r)e^{-\mu r} + \frac{2\sigma}{\mu}[1-e^{-\mu r}] - \sigma r e^{-\mu r} - \frac{0.8\sigma}{m_b^2 r}$$

  $a = 0.385$, μ is the anisotropic Debye mass, $\sigma = 0.223$ GeV^2

- Solve Schrödinger equation with complex potential

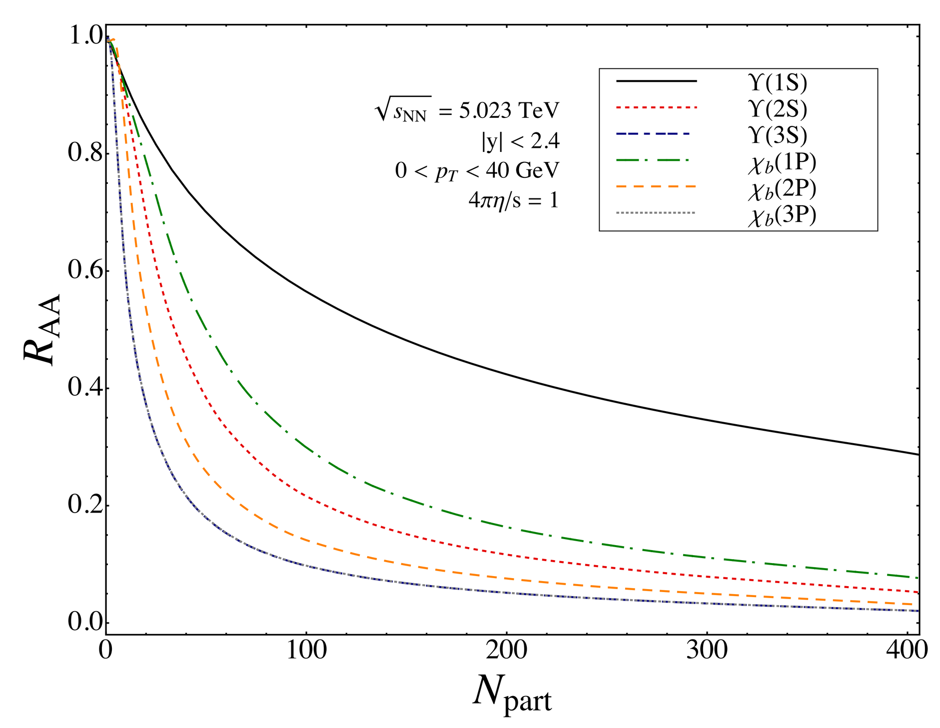
$$\Im[V] = -\alpha_s C_F T\,\{\phi(r/m_D) - \xi[\psi_1(r/m_D,\theta) + \psi_2(r/m_D,\theta)]\}$$

- The imaginary part gives the decay rate.

$$\Gamma(\tau, \mathbf{x}_\perp, \varsigma) = \begin{cases} 2\Im[E_{\rm bind}(\tau,\mathbf{x}_\perp,\varsigma)] & \Re[E_{\rm bind}(\tau,\mathbf{x}_\perp,\varsigma)] > 0 \\ \gamma_{\rm dis} & \Re[E_{\rm bind}(\tau,\mathbf{x}_\perp,\varsigma)] \leq 0. \end{cases}$$

- We use (3+1)D anisotropic hydrodynamics for background evolution

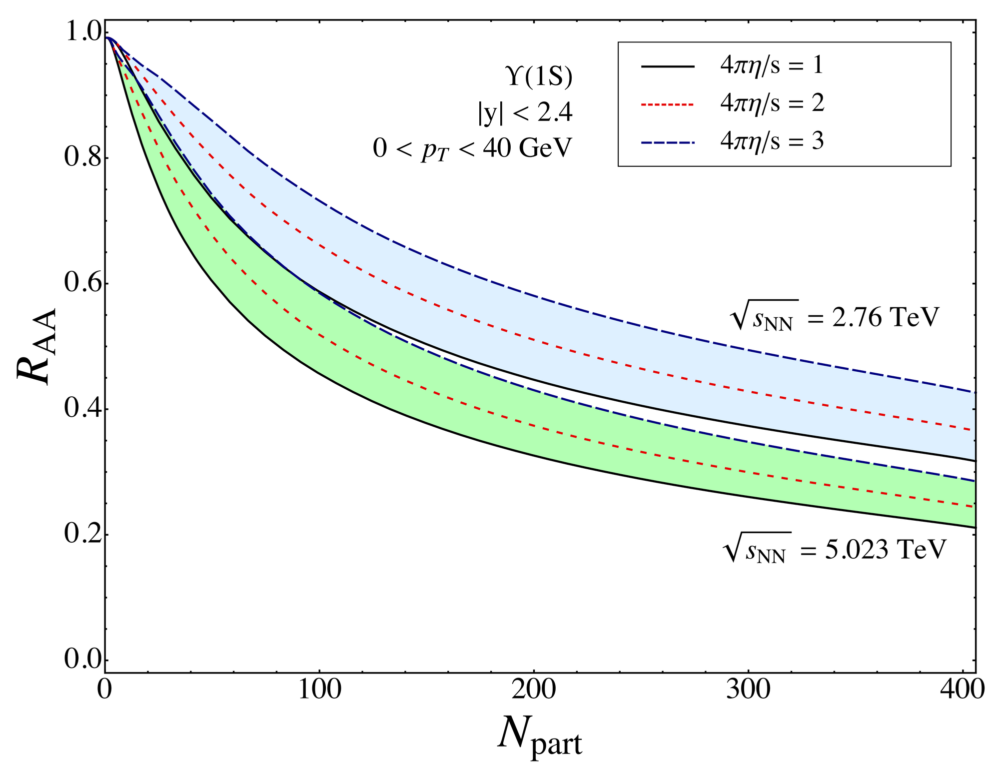
Raw Suppression and Feed Down

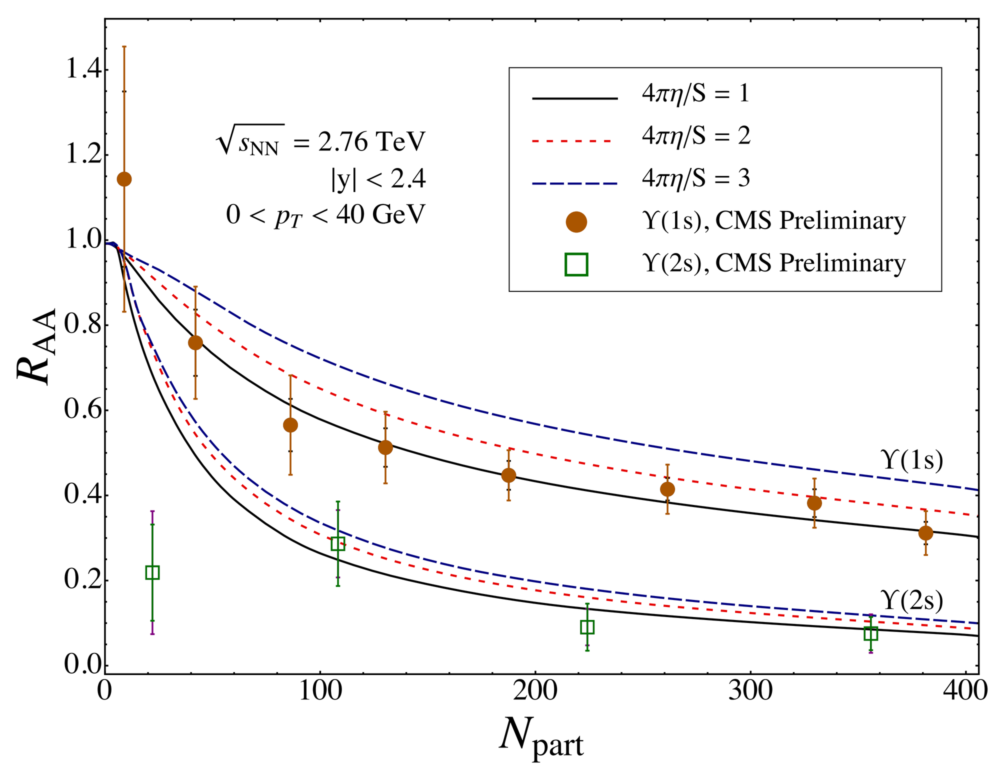


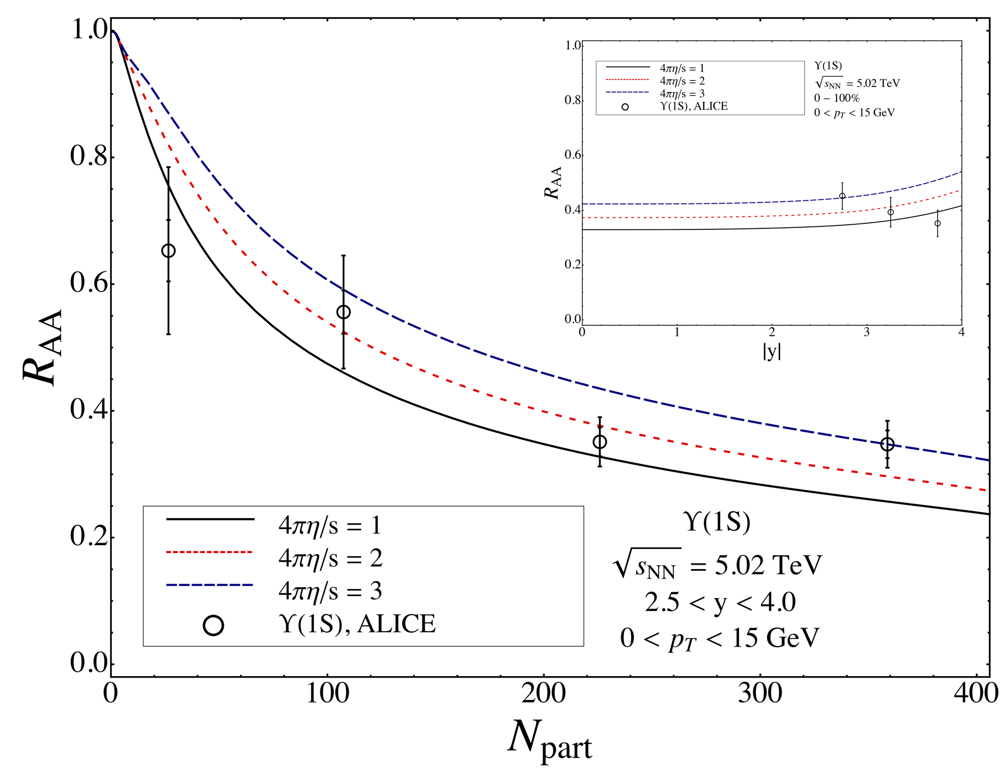
- Sequential suppression, no thresholds, continuous decays

$\Upsilon(1S)$ Production Fractions	
$\Upsilon(1S)$	0.618
$\Upsilon(2S)$	0.105
$\Upsilon(3S)$	0.02
$\chi_b(1P)$	0.207
$\chi_b(2P$	0.05
$\Upsilon(2S)$ Production Fractions	
$\Upsilon(2S)$	0.6
$\Upsilon(3S)$	0.05
$\chi_b(2P)$	0.3
$\chi_b(3P)$	0.05

Final Results



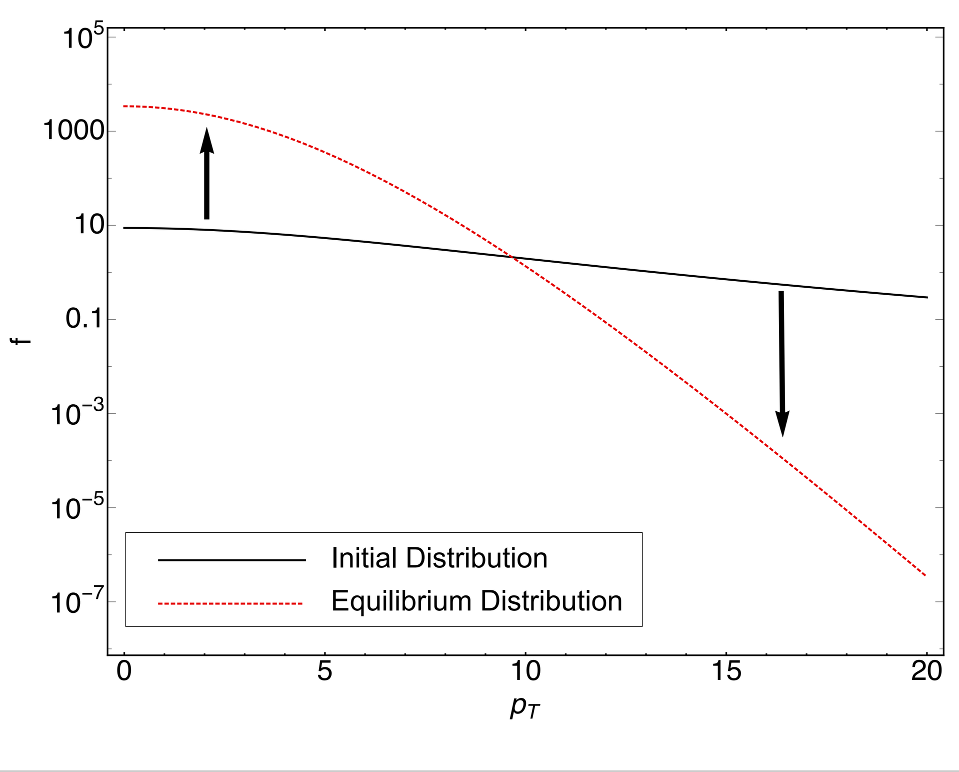




- Qualitative tension with ALICE and CMS data as a function of collision energy
- Model adequately describes 2.76 TeV collisions
- Reasonable description of ALICE experimental data points for $N_{\rm part}$, but tension for rapidity

Future Work

- Regeneration effect coming to the model soon



Acknowledgements/References

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