Prompt J/psi R_pA and post Quark Matter analyses

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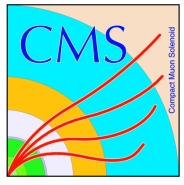
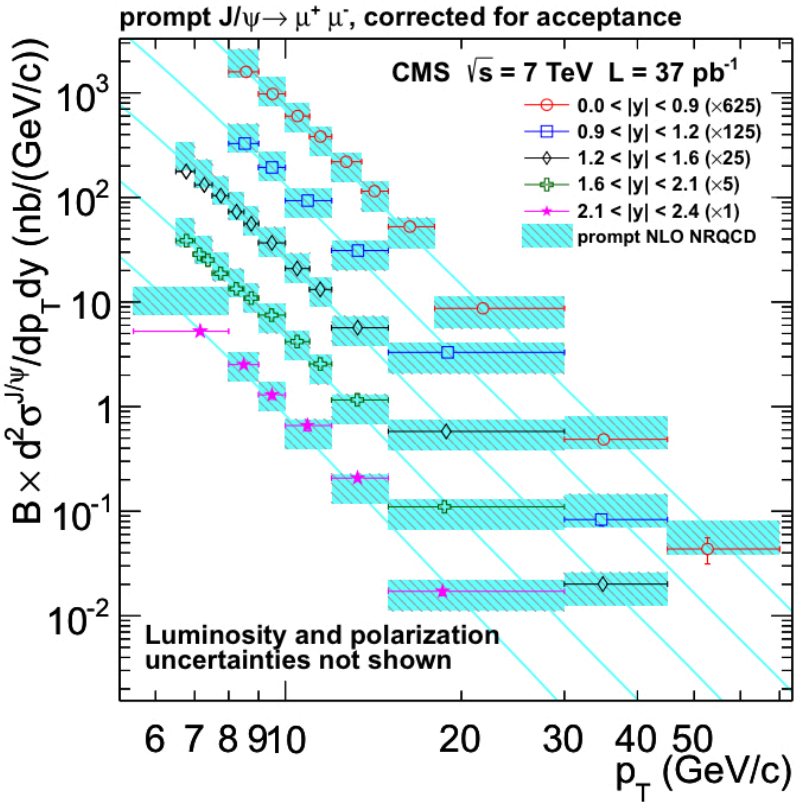
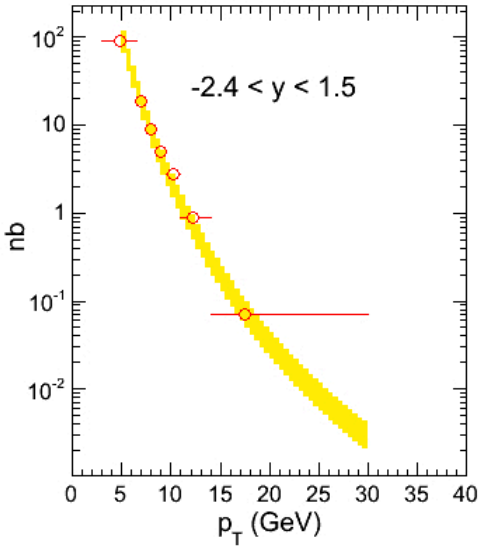


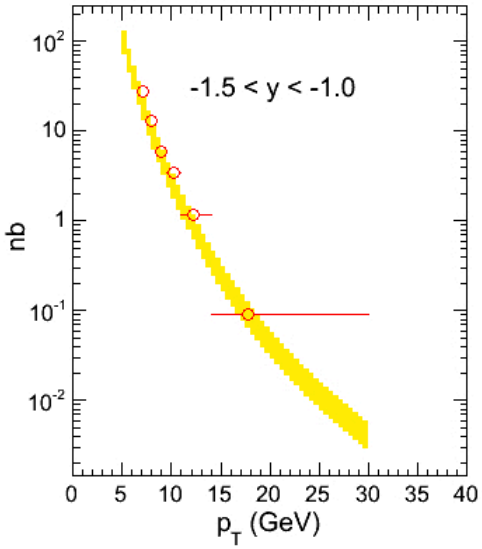
5.02TeV pp reference

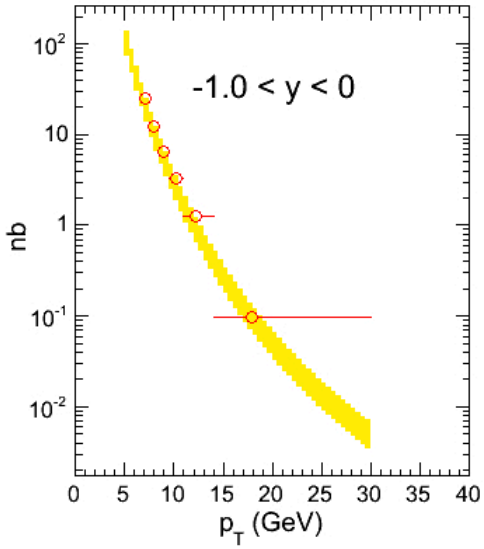
- Contacted nrQCD theorists (Kuang-Ta Chao and Yan-Qing Ma) who provided reference for 7TeV measurement in CMS paper
  - Well agree with data in this energy regime
- Detailed calculators can be found in PhysRevLett. 106.042002 and PhysRevD.84.114001
- Uncertainty is 25–35% but they are strongly correlated, and bin-by-bin uncertainty is less than 3%.
- Uncertainty sources
  - Choice of NRQCD matrix elements
  - Charm quark mass
  - Renormalization/factorization scale
- Another set of calculation using nPDF is on-going

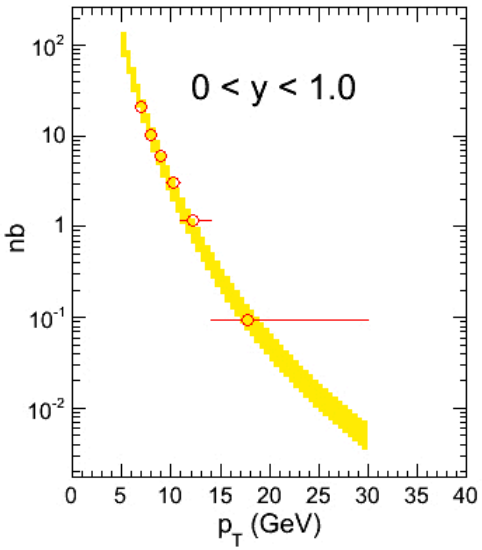


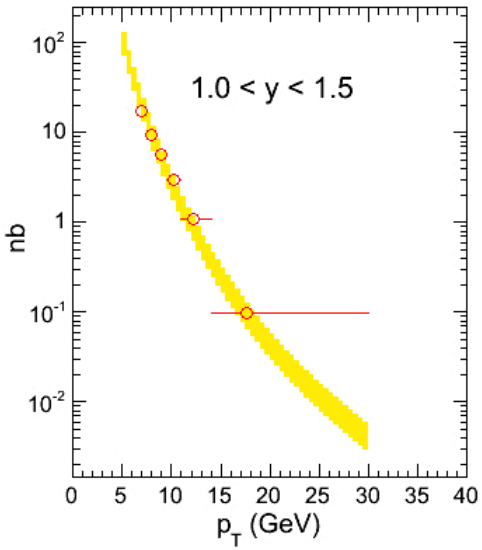
Prompt J/psi cross-section

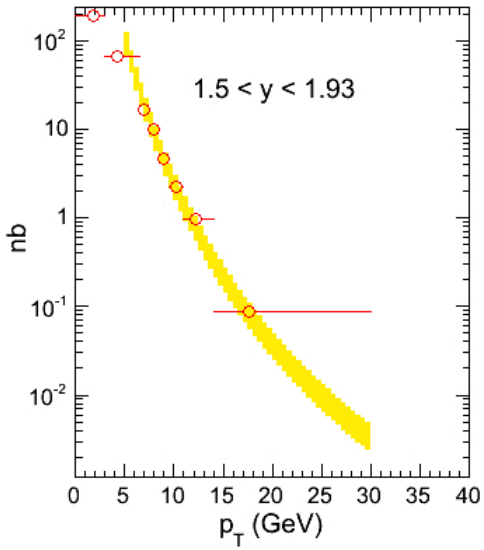




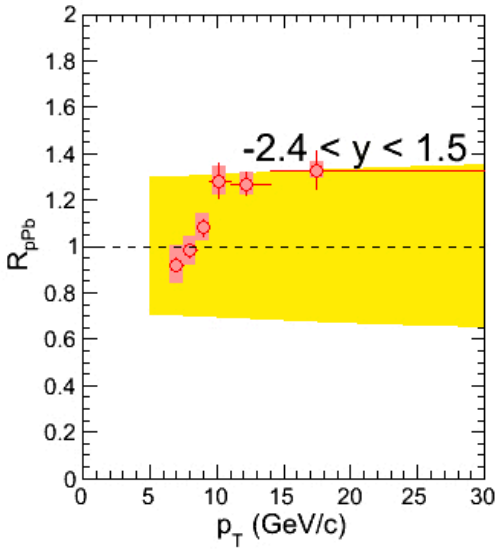


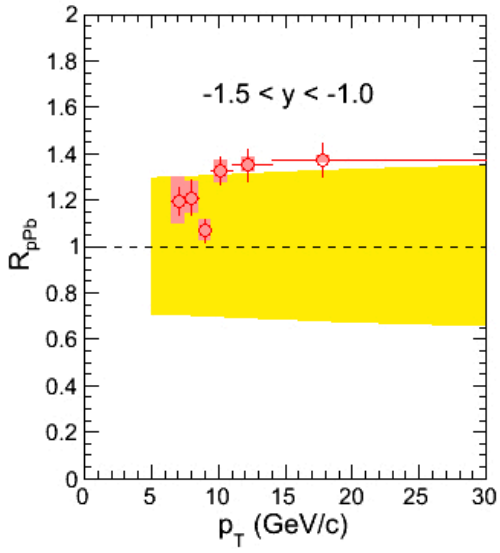


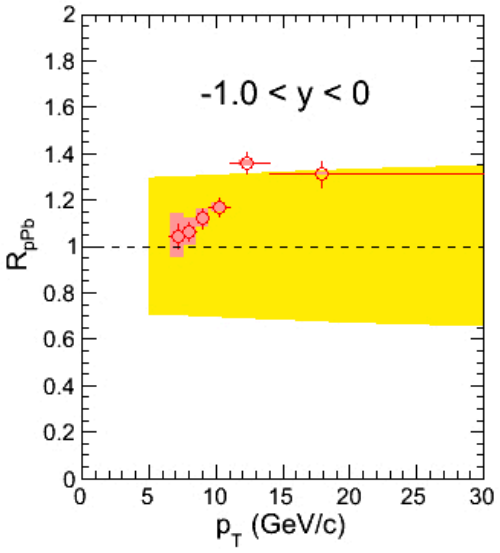


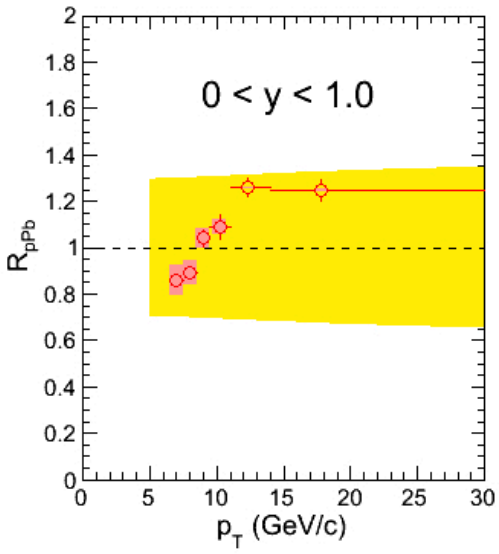


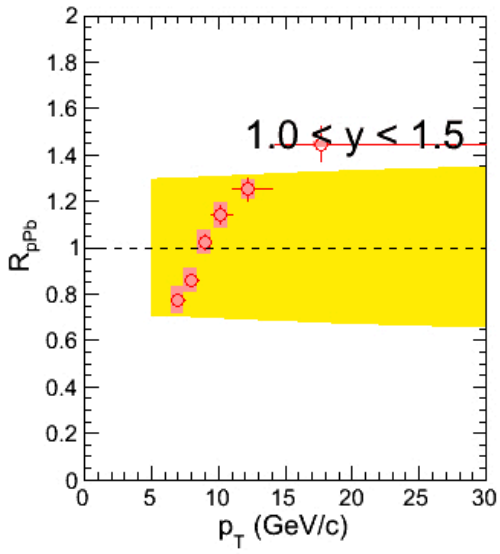
pompt J/psi R_{pA}

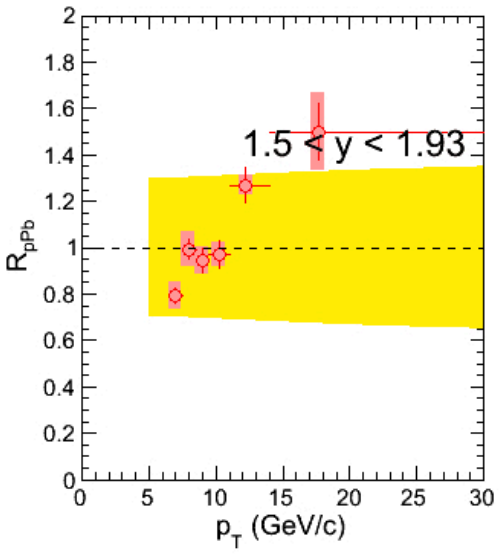




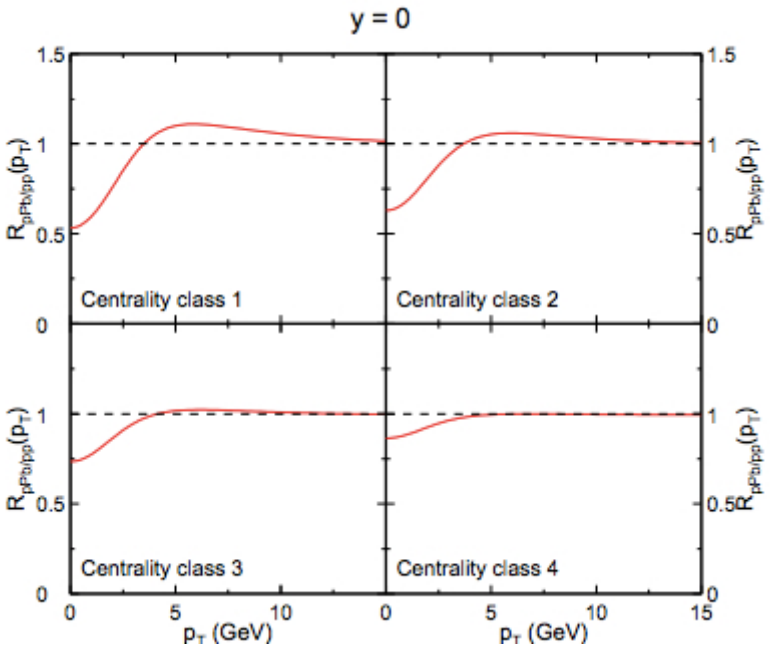


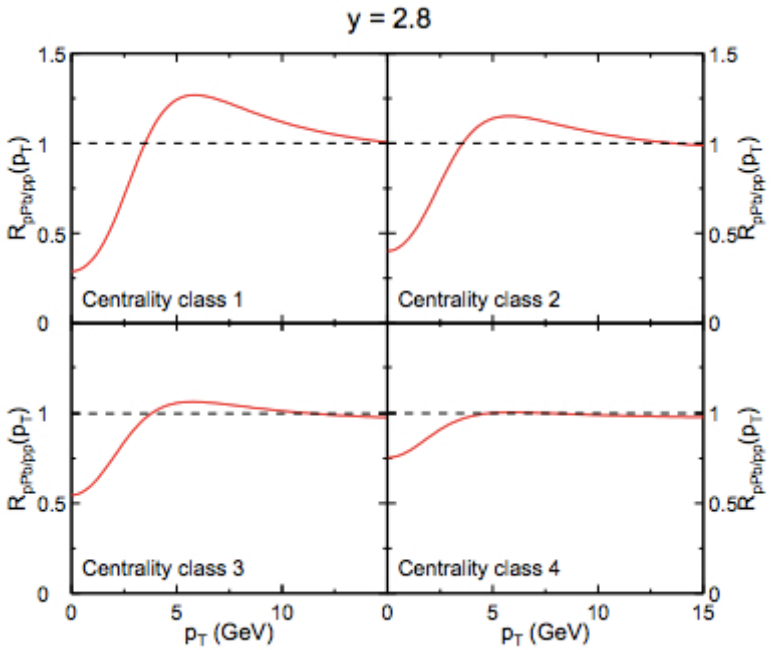






Alreo's prediction





Parametrization from PHENIX result

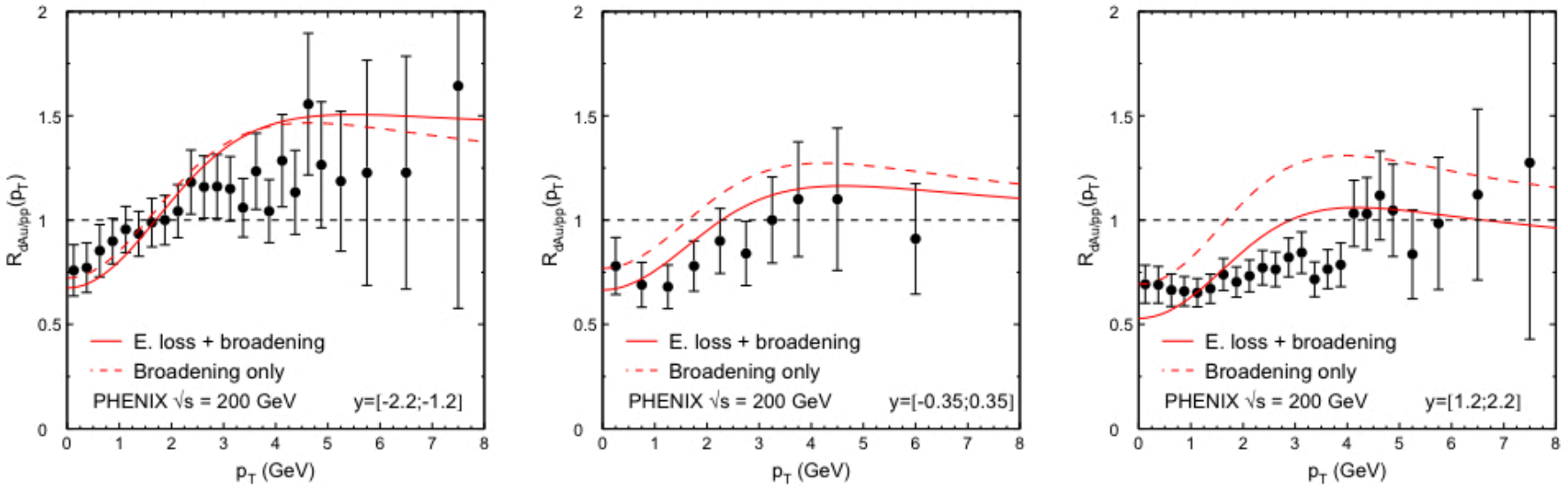


Figure 3. Model predictions for the J/ψ nuclear suppression factor $R_{\rm pA}(p_\perp)$ in minimum bias d–Au collisions at RHIC, at backward (left), central (middle) and forward (right) rapidities (solid curves). The dashed lines indicate the effect of momentum broadening only, $R_{\rm pA}^{\rm broad}(y, p_\perp)$, Eq. (2.14).

Arleo's paper

- d

5 Conclusion

Following our earlier work [19], we studied the effects of parton $p_\perp$-broadening and energy loss in cold nuclear matter on the $p_\perp$ dependence of J/ψ and Υ suppression in p–A collisions. We found that the momentum broadening is responsible for the fast variation of J/ψ suppression with $p_\perp$, while medium-induced energy loss essentially affects the magnitude of $R_{\rm pA}$.

Using the transport coefficient $\hat{q}_0 = 0.075$ GeV^2/fm fixed in [19], the model predictions prove in very good agreement with recent PHENIX data [13] in minimum bias and centrality-dependent d–Au collisions at $\sqrt{s} = 200$ GeV. Our results are also successfully compared to earlier results from the E866 collaboration [12]. Finally, predictions for J/ψ and Υ suppression in p–Pb collisions (minimum bias and in four centrality classes) at the LHC ($\sqrt{s} = 5$ TeV) are provided.

The good description, within a consistent framework, of both the rapidity and transverse momentum dependence of $R_{\rm pA}^{\rm J/\psi}$ from fixed-target experiments to RHIC is a hint that parton energy loss induced by momentum broadening might be the dominant effect responsible for J/ψ suppression in p–A collisions.

Non- Prompt J/psi

- Inclusive B cross-section is ready now.
- B->J/psi decay probability function obtained from MC sample.
- Convolution of two items will give us non-prompt J/psi reference

Post QM analyses

- 1. X_c and X_b feasibility study
- 2. Low pT photon/pi0 analysis
  - From 3GeV to ~20GeV or higher
  - Comparison of direct photons and pi0 can extract the energy loss in CNM from nPDF effects
- 3. $\Phi \rightarrow \mu^+\mu^-$ anlaysis
  - Obserable 1. Decay width
  - Observable 2. phi/K ratio in PbPb
- 4. J/ψ - hadron correlation
  - Azimuthal correlation in pp, pPb and PbPb
- 5. Direct photon- hadron correlation
  - This can go in parallel with photon-jet correlation analysis
  - New reconstruction algorithm approved, and re-reco will run soon
- For both 3,4 we will need to investigate track muon reconstruction

X_c and X_b in pp analyses

- Number of reconstructed Chi_c signals with 4.6 fb^{-1} at 7TeV

$p_T(J/\psi)$ [GeV/c]	$N_{\chi_{c1}}$	$N_{\chi_{c2}}$	$N_{\chi_{c2}}/N_{\chi_{c1}}$
7–9	618 ± 31	315 ± 24	0.510 ± 0.049
9–11	1680 ± 49	788 ± 37	0.469 ± 0.027
11–13	1819 ± 51	819 ± 38	0.451 ± 0.025
13–16	1767 ± 51	851 ± 39	0.482 ± 0.027
16–20	1269 ± 43	487 ± 30	0.384 ± 0.028
20–25	642 ± 31	236 ± 22	0.368 ± 0.040

- Total number of Chi_c1 = 7800.
- In our current pPb dataset, total number of Chi_c1 signals are
  7800 * (35pb^{-1} / 4.65fb^{-1}) * 208 = 12 Chi_c1…..
- And 1 Chi_b1 will be reconstructed.

J/psi & hadron correlation study

- J/psi hadron correlation
- D meson : K + pion to hadron correlation
- Z-jet correlation
- phi meson