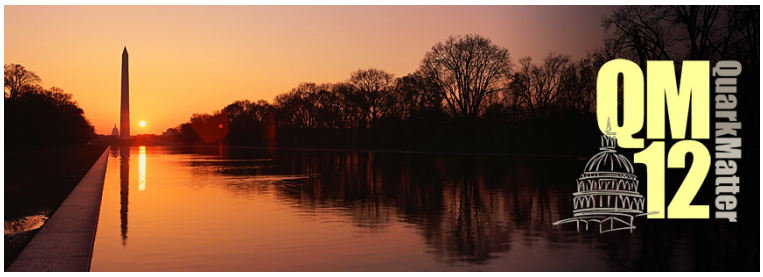

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Upsilon suppression in PbPb collisions at LHC energies

Thursday 16 August 2012 16:00 (2 hours)

We suggest that the combined effect of screening, gluon-induced dissociation, Landau damping, and reduced feed-down explains most of the suppression of Y states that has been observed by CMS [1] in PbPb relative to pp collisions at sqrt(s_NN) = 2.76 TeV at the CERN LHC. The suppression is thus a clear, albeit indirect, indication for the presence of a qgp.

In particular, we calculate the suppression of both the Y(1S) ground state in the quark-gluon plasma in minimum-bias PbPb collisions, and of the Y(2S + 3S) states relative to the ground state. In a major extension of our schematic phenomenological approach presented in [2], we now explicitly consider the time dependence with transverse and longitudinal expansion, and the effect of Landau damping [3] on the widths of the states, in addition to gluodissociation.

The effect of Landau damping of the Y(nS) and Chi_b(nP) states is computed from a complex potential, and is found to be of the same order of magnitude as the gluon-induced dissociation [2] for the 1S state at the temperatures that are relevant at LHC.
The gluodissociation is treated explicitly for all five states considered here (1S, 2S, 3S, 1P and 2P), including the influence of the confining string contribution on the dissociation rates.

As compared to pp collisions at the same energy, the feed-down cascade leading to the Y(1S) ground state is drastically modified due to the substantial suppression of the excited states through screening, damping and gluodissociation. The 1S ground state remains very stable with respect to screening, its suppression is essentially due to damping, gluodissociation and reduced feed-down.

Our results are presented for different Y formation times and qgp lifetimes. For reasonable plasma temperatures at Y formation time, we obtain good agreement with the CMS data for the Y(1S) suppression factor, but less suppression than is needed
for the measured [1] ratio Y(2S + 3S)/ Y(1S) - which requires, however, better statistics.
Should the result persist in the 2011 data, it is likely that additional suppression mechanisms are at work.

References

[1] S. Chatrchyan et al., CMS Collab., Phys. Rev. Lett. 107, 052302 (2011), and contribution to this conference

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