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Upsilon suppression in the QGP at the LHC

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Heavy quarkonia and in particular, the Upsilon meson as observed by CMS [1] and ALICE [2] have proven to be a very useful tool to investigate the quark-gluon plasma that is likely created in heavy-ion collisions at RHIC and LHC energies.

Here it is suggested that the combined effect of gluon-induced dissociation, collisional damping, screening, and reduced feed-down explains [3,4] most of the suppression of Upsilon states that has been observed in PbPb relative to pp collisions at $\sqrt{s_{NN}} = 2.76$ TeV at the CERN LHC.

The formulation includes hydrodynamic expansion of the medium, the relativistic Doppler effect on the dissociation, and the running of the strong-coupling constant. For the centrality-dependent $Y(1S)$ suppression agreement with the CMS data is found. The momentum dependence of the nuclear modification factor is calculated.

The suppression is a clear, albeit indirect, indication for the presence of a Quark-Gluon Plasma at LHC energies. A prediction for the centrality-dependent $Y(1S)$ suppression at the forthcoming LHC energy of 5.125 TeV is presented. Regarding the suppression of the $Y(2S)$ state, additional mechanisms have to be considered.

[1] S. Chatrchyan et al., CMS Collab., Phys. Rev. Lett. 107, 052302 (2011); 109, 222301 (2012).

[2] B. Abelev et al., ALICE Collab., Phys. Lett. B 738, 361 (2014).

[3] F. Nendzig and G. Wolschin, Phys. Rev. C 87, 024911 (2013); J. Phys. G 41, 095003 (2014).

[4] F. Vaccaro, F. Nendzig, G. Wolschin, Europhys. Lett. 102, 420001 (2013)

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