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## Medium effects on $\Upsilon$ yields in p-Pb and Pb-Pb collisions

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The respective contributions of cold-matter and hot-medium effects to the suppression of  $\Upsilon(1S)$  and  $\Upsilon(2S)$  mesons in p-Pb collisions at energies reached at the Large Hadron Collider (LHC) are investigated [1]. Whereas known alterations of the parton density functions in the lead nucleus and coherent parton energy loss [2] account for the leading fraction of the modifications in cold nuclear matter (CNM), the hot-medium (quark-gluon plasma, QGP) effects turn out to be relevant in spite of the small initial spatial extent of the fireball.

We compare our transverse-momentum-, rapidity-, and centrality-dependent theoretical results for the  $\Upsilon(1S)$  suppression in p-Pb collisions at a center-of-mass energy of  $\sqrt{s_{NN}} = 8.16$  TeV with recent LHCb [3] and ALICE [4] data from the Large Hadron Collider (LHC). Both cold-matter and hot-medium effects are needed to account for the data, lending support to a transient QGP formation in small systems. The initial central temperature of the fireball in p-Pb at  $\sqrt{s_{NN}} = 8.16$  TeV is found to be  $T_0 \simeq 460$  MeV.

The results for the asymmetric p-Pb system are compared to the hot-medium effects on  $\Upsilon$ -suppression in symmetric Pb-Pb-collisions at LHC energies, where the spatially extended fireball is mostly responsible for the dissociation of quarkonia, and cold-matter effects are less relevant. Here the hot-medium model [5] yields excellent agreement with CMS data at 2.76 and 5.02 TeV.

[1] V. H. Dinh, J. Hoelck and G. Wolschin, Hot-medium effects on  $\Upsilon$  yields in pPb collisions at  $\sqrt{s_{NN}} = 8.16$  TeV, Phys. Rev. C 100, 024906 (2019).

[2] J. L. Albacete et al., Predictions for cold nuclear matter effects in p+Pb collisions at  $\sqrt{s_{NN}} = 8.16$  TeV, Nucl. Phys. A 972, 18 (2018).

[3] R. Aaij et al., LHCb Collaboration, Study of  $\Upsilon$  production in pPb collisions at  $\sqrt{s_{NN}} = 8.16$  TeV, JHEP 11, 194 (2018).

[4] S. Acharya et al., ALICE Collaboration,  $\Upsilon$  production in p-Pb collisions at  $\sqrt{s_{NN}} = 8.16$  TeV, Phys. Lett. B 806, 135486 (2020).

[5] J. Hoelck, F. Nendzig and G. Wolschin, In-medium  $\Upsilon$  suppression and feed-down in UU and PbPb collisions, Phys. Rev. C 95, 024905 (2017).

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