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## Enhancement of $\psi(2S)$ in p-Pb collision at LHC as an indication of QGP formation

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Asymmetric p+A collisions serve as a baseline for the understanding of the nucleus-nucleus collisions. Traditionally, they have been employed to observe the differences between the elementary and heavy-ion collision experiments. The heavy flavor production in p+A collision is well explained by cold nuclear matter effects in earlier experiments such as SPS and RHIC. The recent observation of heavy quarkonium production in p+Pb collision at CERN LHC indicates the possible existence of Quark-Gluon Plasma (QGP) in such small system. In this work, we performed pNRQCD calculation to calculate  $\psi(2S)$  enhancement and also incorporated other hot nuclear matter effects to explain the yields of different charmonium states in p+Pb collisions at LHC energy,  $\sqrt{s_{NN}} = 5.02 \text{ TeV}$ . We proposed here that the relative enhancement of  $\psi(2S)$  vis a vis  $J/\psi$ , especially at high transverse momentum ( $p_T$ ), is a possible clean probe for indicating QGP formation in such a small systems at LHC energies. The  $\psi(2S)$  suppression effects observed at ALICE, is also qualitatively explained in the present work.

### Content type

Theory

### Collaboration

N/A

### Centralised submission by Collaboration

Presenter name already specified

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