



Contribution ID: 219

Type: **Oral Contribution**

ALICE measurement of $\psi(2S)$ production in Pb–Pb

Thursday, 27 October 2022 17:00 (20 minutes)

Charmonia, bound states of charm quark-antiquark pairs, represent an important tool to study creation and evolution of a medium produced in collisions of ultra-relativistic heavy ions, the quark-gluon plasma (QGP). Production of the charm quark-antiquark pair takes place in the early stages of the collision while the subsequent hadronization into a bound state happens on a much larger time scale. In the presence of QGP, the high number of color charges in the deconfined medium screens the pair, leading to suppression of charmonium production. Concurrently, the abundance of charm pairs in the medium created at the LHC allows for a recombination of pairs and thus regeneration of charmonia within the QGP or at the transition between QGP and hadronic phase.

The $\psi(2S)$ meson is an excited charmonium state. Its much smaller production cross section compared to its ground-state counterpart, J/ψ meson, renders measurement of $\psi(2S)$ much more difficult than that of J/ψ . Nevertheless, measurements of different quarkonium states in nuclear collisions are vital to better understand in which way their production is affected by the nuclear medium and to help distinguish between different regeneration scenarios.

This talk reviews recent ALICE results of $\psi(2S)$ production in Pb–Pb collisions at the LHC down to zero transverse momentum and at forward rapidity, most accurate to date.

The results will be discussed in context of other available charmonium data from the LHC and compared with theoretical models.

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Session Classification: P5 Heavy Ion Collisions and QCD Phases

Track Classification: P5 Heavy Ion Collisions and QCD Phases