Contribution ID: **74** Type: **Oral**

Quarkonia production in Run 3 using ALICE at the LHC

Friday 5 September 2025 12:10 (20 minutes)

The measurement of quarkonium production is a powerful tool for investigating both perturbative and non-perturbative aspects of quantum chromodynamics (QCD) in proton-proton (pp) collisions, as well as the properties of the quark-gluon plasma (QGP) in heavy-ion collisions. Quarkonia are golden probes of the QGP evolution, with their yields influenced by suppression and (re)generation of initially uncorrelated charm quarks.

In pp collisions, charmonia, such as J/ψ and ψ(2S), are produced through a process that can be factorized into initial hard parton scattering (described by perturbative QCD) and subsequent non-perturbative bound-state formation. Precise measurements of their production cross sections and ratios (e.g., ψ(2S)-to-J/ψ) provide critical tests of theoretical models and serve as benchmarks for studies in nuclear collisions. The newly installed Muon Forward Tracker (MFT) enables the ALICE experiment to separate prompt and non-prompt J/ψ at forward rapidity ($2.5 < y < 4.0$) for the first time, complementing midrapidity ($|y| < 0.9$) capabilities. These measurements serve as essential references for heavy-ion studies while testing expectations of QCD-based models.

From the start of Run 3 at the LHC, ALICE has collected large data samples of \pp and \PbPb collisions at $\sqrt{s} = 13.6$ and $\sqrt{s_{\rm NN}} = 5.36$ TeV, respectively, achieving unprecedented precision in quarkonium studies. This contribution presents preliminary Run 3 results, including measurements of $\psi(2\mathrm{S})$-to-J/ψ ratio in pp and Pb$-$Pb collisions, inclusive J/ψ cross sections in pp collisions, elliptic flow ($v_2^{\mathrm{J}/\psi}$ and $v_2^{\Upsilon(1\mathrm{S})}$), and prompt/non-prompt J/ψ separation at mid and forward rapidities. Additionally, performance studies of the exotic X(3872) state will be discussed. These measurements significantly advance our understanding of heavy-quark production and QGP properties.

Author: Dr THAKUR, Dhananjaya (INFN Sezione di Torino)

Presenter: Dr THAKUR, Dhananjaya (INFN Sezione di Torino)

Session Classification: Plenary Session