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Quarkonia phenomenology with ALICE

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Heavy quarks are efficient probes of different physics aspects related to heavy-ion collisions (HIC), as they experience the full evolution of the system. Quarkonia notably provide a direct probe of the deconfinement of nuclear matter. Recently, the production of J/ψ via (re)generation within the quark-gluon plasma (QGP) or at the phase boundary has been identified as an important ingredient for the interpretation of quarkonium production in Pb–Pb collisions at the LHC. In particular, it is found to be the dominant production mechanism at low p_{T} and in central collisions. Measurements of the quarkonium elliptic flow and polarization bring more insights on the properties of the QGP, while the non-prompt J/ψ, originating from beauty hadron decays, gives access to the interaction of b quarks with the QGP. Quarkonium measurements are also now contributing to the study of the initial state of the collision, via for instance polarization measurements in Pb–Pb as a function of the event plane, to probe the strong magnetic field generated by the fast motion of the charges of the nuclei as well as the large angular momentum of the medium in non-central events. J/ψ measurements in p–Pb recently started to be included in the data pool used for nuclear Parton Distribution Function determination via global fits. Quarkonium studies in pp and p–Pb, besides serving as a reference for HIC, allow for investigating collective effects in small systems and shed light on multiparton interactions through measurements of the multiplicity-dependent production.

In this contribution, the latest ALICE results on quarkonia will be presented and their phenomenological implications will be discussed via comparisons with the latest theoretical developments describing quarkonium production and interaction with the QGP. Even in a high-multiplicity environment, the ALICE detector possesses excellent particle identificationm track and vertex reconstruction capabilities, offering unique opportunities to study the quarkonium production in small and large systems, at both mid- and forward rapidities, and down to zero p_{T}. The measurements, carried out for different collision systems and energies, include the (multiplicity dependent) production and nuclear modification factor of (prompt and non-prompt) J/ψ, ψ(2S) and Υ(nS), as well as the J/ψ v_2 and polarization, with the latter measured also as a function of the event plane. A short overview of the expectations for the LHC Run 3 and 4 will conclude the talk.

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