

D-meson production in pp, p-Pb, and Pb-Pb collisions with ALICE at the LHC

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Heavy quarks, i.e. charm and beauty, are considered calibrated probes of the strongly interacting deconfined medium (Quark Gluon Plasma) formed in heavy-ion collisions. Produced in hard scattering processes in the initial stages of the collision, they interact with the medium, lose energy and, depending on the coupling strength to the medium, take part in the collective motion of the QGP matter. ALICE measured the production of D0, D*+, D+ and Ds mesons at central rapidity in pp, p-Pb and Pb-Pb collisions at the LHC. The study of the modification of the transverse-momentum differential yields of charm particles in Pb-Pb collisions with respect to pp collisions, quantified by the nuclear modification factor (RAA), can unravel details of the energy loss mechanism, such as its dependence on the quark mass and on the path length the parton travels through the medium. A similar comparison between pp and p-Pb collision data (RpPb) is fundamental to disentangle effects related to the presence of the hot medium from cold nuclear matter effects, among which nuclear shadowing, suppressing the gluon PDF at low Bjorken-x, is the most important for charm at LHC energies. The degree of thermalization and coupling to the medium is investigated in semi-peripheral Pb-Pb collisions by measuring the elliptic flow coefficient (v_2), which quantifies the angular dependence of the particle production with respect to the reaction plane of the collision and, at high pT, is sensitive to the path-length dependence of the energy loss. The latter dependence can be also addressed by studying the modification to the azimuthal correlation distribution of D mesons and charged hadrons in central Pb-Pb collisions with respect to pp collisions.

Results on the transverse momentum and centrality dependence of the D-meson elliptic flow and RAA will be presented. The comparison with the RAA of non-prompt J/ψ from B decay measured with CMS will be discussed. The preliminary results on D-meson RpPb and the dependence of D-meson yields on rapidity in p-Pb collisions will be shown. As an outlook, the analysis and the preliminary results on the azimuthal correlations between D-mesons and charged hadrons in pp collisions will be described.

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