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Nuclear modification factor and elliptic flow of open heavy flavours in Pb–Pb collisions with ALICE at the LHC

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The LHC heavy-ion physics program aims at investigating the properties of the Quark-Gluon Plasma, QGP, formed in such collisions. Heavy quarks (charm and beauty) are regarded as efficient probes to study and characterize the QGP, as they are created on a very short time scale in initial hard processes and subsequently experience the entire system evolution interacting with the medium constituents.

The measurement of the nuclear modification factor, $R_{\rm AA}$, of heavy-flavour particles gives important information about the colour-charge and parton-mass dependence of energy loss as well as about possible modifications of heavy-quark hadronization in the medium. In addition, the heavy-flavour elliptic flow, v_2, provides insights on the degree of thermalization of heavy quarks in the deconfined medium and carries information on the path-length dependence of parton energy loss, in the low- and high-$p_{\rm T}$ regions respectively.

The heavy-flavour particles are measured in ALICE over a wide rapidity range, via D mesons and heavy-flavour hadron decay electrons at mid-rapidity ($|y| < 0.8$), and heavy-flavour hadron decay muons at forward rapidity ($2.5 < y < 4$).

The latest results on the $p_{\rm T}$-differential $R_{\rm AA}$ and v_2 of D mesons and heavy-flavour hadron decay leptons in Pb–Pb collisions at $\sqrt{s_{\rm NN}} = 5.02$ and 2.76 TeV performed with ALICE will be presented for different centrality classes and compared with theoretical model predictions. The results in different rapidity regions provide further information on the properties of the medium. The leptons at high $p_{\rm T}$ come mainly from beauty-hadron decays, therefore they are sensitive to transport properties of beauty quarks in the medium. Finally, the results obtained with the Event-Shape Engineering (ESE) technique applied to the D-meson v_2 in semi-central Pb–Pb events to investigate the influence of initial geometry fluctuations to heavy-flavour production will be shown.

Experimental Collaboration

ALICE

Primary author: ALICE COLLABORATION

Presenter: ZHANG, Xiaoming (Central China Normal University CCNU (CN))

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