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Charm production: constraint to transport models and charm diffusion coefficient with ALICE

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In this contribution the nuclear modification factor (R_{AA}) of prompt charm hadrons and heavy-flavour hadrons decaying to leptons measured in Pb-Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV by the ALICE Collaboration are presented. The measurement of heavy-flavour leptons in Xe-Xe collisions is also discussed. Heavy quarks are a very suitable probe to investigate the quark–gluon plasma (QGP) produced in heavy-ion collisions, since they are mainly produced in hard-scattering processes and hence in shorter timescales compared to the QGP. Measurements of charm-hadron production in nucleus–nucleus collisions are therefore useful to study the properties of the in-medium charm-quark energy loss via the comparison with theoretical models. Moreover, the comparison of different colliding systems provide insights in the dependency on the collision geometry.

Models describing the heavy-flavour transport and energy loss in an hydrodynamically expanding QGP require also a precise modelling of the in-medium hadronisation of heavy quarks, which is investigated via the measurement of prompt D_s^+ mesons and Λ_c^+ baryons.

In addition, the measurement of the azimuthal anisotropy of strange and non-strange D mesons is discussed. The second harmonic coefficient provides information about the degree of thermalisation of charm quarks in the medium, while the third one relates to its sensitivity to event-by-event fluctuations in the initial stage of the collision.

A thorough systematic comparison of experimental measurements with phenomenological model calculations will be performed in order to disentangle different model contributions and provide important constraints to the charm-quark diffusion coefficient D_s in the QGP.

In-person participation

Yes

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