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Heavy-flavour correlations in pp, p-Pb and Pb-Pb collisions

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Heavy quarks (charm and beauty) are excellent probes to study the properties of the strongly interacting matter formed in heavy ion collisions, which is expected to be a Quark-Gluon Plasma (QGP). Indeed, due to their large mass, charm and beauty quarks are produced in initial hard scattering processes among partons of the colliding nuclei, before the formation of the QGP, and they traverse the medium and interact with its constituents.

The ALICE Collaboration measured the production of open heavy-flavour hadrons via their hadronic and semi-leptonic decays at mid-rapidity in pp, p-Pb and Pb-Pb collisions at $\sqrt{s_{NN}} = 7, 5.02$ and 2.76 TeV respectively. A strong suppression of the open charm hadron yields at high p_T was observed in Pb-Pb collisions relative to pp interactions: this effect is attributed to a substantial in-medium energy loss of the charm quarks.

Further insight into the effects of the medium on charm and beauty quarks can be obtained by measuring the angular correlations between open heavy-flavour hadrons and charged hadrons.

The comparison of the correlation function in pp and Pb-Pb collisions can provide deeper information on the way heavy quarks lose energy in the QGP and can spot possible modifications to the charm parton shower and hadronisation in the presence of the medium. Furthermore, by studying the correlations of electrons from heavy-flavour decays and the charged hadrons in pp, it is possible to statistically separate the charm and beauty contributions to the yield of heavy-flavour decay electrons, making this analysis an excellent tool to test pQCD calculations.

The observation of double-ridge long range correlations in p-Pb collisions for light-flavour hadrons could originate from a collective behaviour of the system, as well as from gluon saturation in the initial state (color glass condensate). The same effect can be studied for heavier quarks via the correlation between heavy-flavour hadrons (or their decay electrons) and charged particles.

Results from the correlation analyses, performed using the data collected with ALICE in pp collisions at $\sqrt{s} = 7$ TeV, Pb-Pb at $\sqrt{s_{NN}} = 2.76$ TeV, and in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV will be presented in this contribution.

On behalf of collaboration:

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