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Study of azimuthal correlations between D mesons and charged particles with the ALICE experiment

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The main goal of the ALICE experiment is to investigate the properties of the strongly interacting matter formed in heavy-ion collisions, where a Quark-Gluon Plasma (QGP) is produced. Heavy quarks (charm and beauty) are excellent probes to study this state of matter. Due to their large masses these quarks are produced in hard partonic scattering processes in the initial stages of the collision before the QGP is formed. While traversing the medium they experience the full evolution of the QGP and interact with it.

ALICE measured a significant suppression of D-meson production in a wide momentum range in central Pb-Pb collisions with respect to the expectation based on the cross section measured in pp collisions, scaled by the number of nucleon-nucleon collisions. This effect is interpreted in terms of the energy loss of charm quarks while traversing the medium. Further insight into the mechanisms through which charm quarks lose energy can be obtained by studying the angular correlations between charmed mesons and charged hadrons produced in pp, p-Pb and Pb-Pb collisions. The comparison of the angular correlation distributions can indeed help to spot possible modifications of the charm quark hadronization induced by the presence of the medium. In addition, the analysis of pp and p-Pb data and the comparison with predictions from Monte Carlo simulations, besides constituting a reference for the interpretation of Pb-Pb data, can provide relevant information on charm production and fragmentation processes. Furthermore, the presence of cold nuclear matter effects could affect the charm production and hadronization. This should be reflected by differences between the results obtained in pp and p-Pb collisions, since cold nuclear matter effects are not present in pp collisions.

We will present a study of azimuthal correlations between D^0 , D^+ , and D^{*+} mesons and charged hadrons in pp collisions at $\sqrt{s} = 7$ TeV and p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV. D mesons were reconstructed from their hadronic decays at central rapidity in the transverse momentum range $3 \leq p_T \leq 16$ GeV/c and they were correlated to charged particles reconstructed in the pseudorapidity range $|\eta| < 0.8$. Perspectives for the measurement in Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV after the ALICE upgrade will be presented as well.

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