

Studying the Quark–Gluon Plasma via charm- and beauty-hadron decays

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In high-energy nucleus–nucleus collisions, heavy-flavour quarks, i. e. charm and beauty, are produced on a very short time scale in initial hard scattering processes and thus they experience the entire evolution of the collision. Therefore, they are valuable probes to study the mechanisms of energy loss and hadronisation in the hot and dense state of matter that is expected to be formed in the collision. In order to investigate these medium effects, proton–proton (pp) and proton–nucleus (p–A) collisions are measured as reference. While the first collision system allows the study of heavy-flavour production when no medium is formed, the latter gives access to cold nuclear matter effects, e. g. parton scattering in the initial state and modifications of the parton densities in the nucleus.

Heavy-flavour production can be measured in several channels with ALICE at the LHC. Special emphasis will be put on recent results from measurements of electrons from heavy-flavour hadron decays in pp, p–Pb and Pb–Pb collisions at mid-rapidity. To study the flavour dependence of the parton energy loss, the contributions of electrons from charm- and beauty-hadron decays are statistically separated using their different track impact parameter distributions and empirical estimations of the background. This approach makes use of the larger decay length ($c\tau \approx 500 \mu\text{m}$) of hadrons with beauty quarks compared with those with charm quarks.