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Leptons from heavy flavour decays in pp, p-Pb, and Pb-Pb collisions with ALICE

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At LHC energies heavy-ion collisions produce a high energy density QCD matter. One important probe of this matter are heavy-flavour quarks, as they are primarily produced in the early stage of the collision through initial hard scatterings, thus experiencing the full evolution of the system. In ALICE heavy-flavour production is studied in pp, p-Pb, and Pb-Pb collisions through the measurement of open heavy-flavour hadrons and single leptons from heavy-flavour hadron decays. These final state measurements provide insight into the charm and beauty quark interaction with the hot and dense medium, which can be acquired by measuring correlations of heavy-flavour hadrons (or their decay products) with other particles produced in the collision. For example, properties of the deconfined medium can be studied through the measurement of the elliptic flow (v_2), which represents the second Fourier coefficient of the particle azimuthal distribution relative to the reaction plane. In other words, v_2 is a correlation of the particle of interest in the transverse plane with all other particles produced in the collision. At low transverse momentum v_2 probes the level of thermalization of heavy-flavour quarks, while at high transverse momentum offers information on in-medium, path length dependent, quark energy loss.

Another relevant measurement is the azimuthal correlation of heavy-flavour decay electrons and charged hadrons, which can be utilized to estimate the relative contribution of charm and beauty hadrons to the measured heavy-flavour single electron yield in pp collisions, while also providing a tool to examine the the production and fragmentation of heavy quarks in other systems.

In this contribution we focus on the measurement of leptons from semi-leptonic decays of heavy-flavour hadrons. We present the elliptic flow measurement of heavy-flavour decay electrons and muons as a function of transverse momentum at mid-rapidity and forward rapidity, respectively, for semi-central (20-40%) Pb-Pb collision at $\sqrt{s_{NN}}=2.76$ TeV. In addition, we present the relative contributions from beauty and charm hadron decays to the total heavy-flavour electron yield in pp collisions at mid-rapidity as a function of transverse momentum, along with the resulting correlation functions in p-Pb collisions at $\sqrt{s} = 5.02$ TeV and Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV. Comparison to results obtained at lower collision energy at RHIC and various theoretical models will also be shown.

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