According to QCD calculations on the lattice, as well as to several measurements performed at the SPS, RHIC, and LHC facilities, a state of matter composed of strongly-interacting deconfined quarks and gluons (the Quark-Gluon Plasma, QGP) is formed in heavy-ion collisions at ultra-relativistic energies. Produced in hard-scattering processes in the initial stage of the collision, heavy quarks are a powerful tool to probe the partonic interactions ongoing in the medium. The analysis of the pT-differential spectra and of the azimuthal anisotropy of heavy-flavour signals in nucleus-nucleus collisions provides a crucial piece of information to achieve a microscopic picture of the system.

The ALICE experiment at CERN is equipped to measure electrons and muons from charm and beauty hadron decays and to reconstruct D mesons in hadronic decay channels. The results obtained in Pb-Pb collisions at 2.76 and 5.02 TeV will be discussed.

Measurements of open heavy-flavour signals in proton-proton and proton-Pb collisions are required to provide the necessary reference for interpreting the Pb-Pb results and to study initial-state effects. Considerable attention has also recently been given to the dependence of the production yields on the event multiplicity in small systems. These recent open-heavy flavour measurements, performed by ALICE in pp, p-Pb, and Pb-Pb collisions, will also be presented.