

Heavy flavour hadronization from small to large collision

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Heavy quarks, namely charm and beauty, are very suitable probes of the colour-deconfined state of the hadronic matter called quark-gluon plasma (QGP) created in heavy-ion collisions. Since they are mainly produced in hard-scattering processes and hence in shorter timescales compared to the lifetime of the QGP, they experience the whole evolution of the system. Measurements of heavy-flavour hadron production in heavy-ion collisions give insight into the mechanisms of heavy-quark interaction with the medium constituents and allow the investigation of the heavy-quark hadronisation processes.

Measurements of the production of heavy-flavour hadrons in proton-proton and protonnucleus collisions provide the baseline for observations of hot-medium effects in heavyion collisions, as well as tests of perturbative QCD calculations. In the last years, they gained additional interest due to the observation of unexpected features typical of the heavy-ion phenomenology. Recent measurements of heavy-flavour baryon production in small systems show a significant deviation from results in $e+e-$ collisions, challenging the assumption of universality of fragmentation functions across colliding systems. These results suggest that the presence of surrounding colour charges may influence the charm quark hadronization. In particular, heavy quarks can hadronize by combining with lighter quarks in the nearby (i.e. recombination), similarly to what expected in the QGP. Other models, explain the enhanced production of baryons in hadronic collisions, introducing additional topologies for the baryon formation from the colour reconnection mechanisms, within the string fragmentation theory. Additional models describe the observations in the context of the statistical hadronization, including augmented set of baryons.

In this contribution, the most recent results on heavy-flavour-hadron production will be presented, focusing on the baryon and meson measurements in the charm and beauty sector, and discussing their modification from $e+e-$ to pp and Pb-Pb, in comparison with different theoretical models.

Primary author: TROGOLO, Stefano (TO)

Presenters: TROGOLO, Stefano; TROGOLO, Stefano (TO)

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