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Heavy flavour hadron production in a coalescence plus fragmentation approach from AA to pp

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Measurements of heavy baryon production in pp, pA and AA collisions from RHIC to top LHC energies have recently attracted more and more attention, currently representing a challenge for the heavy-quark hadronization theoretical understanding.

The Λ_c/D^0 ratio observed in AA collision at RHIC and LHC energies has a value of the order of the unity. Recent experimental measurements in pp collisions at both $\sqrt{s} = 5.02\,\text{TeV}$ $\sqrt{s} = 13\,\text{TeV}$ have shown ratios for charm baryons Λ_c, Ξ_c^0 and Ω_c^0 respect to D^0 meson larger than that measured and expected in e^+e^-, ep collisions.

We study the hadronization after the propagation of charm quarks in the quark-gluon plasma (QGP). The propagation is described by means of a relativistic Boltzmann transport approach where the non-perturbative interaction between heavy quarks and light quarks is described by means of a quasi-particle approach.

We present a coalescence plus fragmentation model for the hadronization and the results obtained in AA collisions for D^0, D_s, Λ_c spectra and the related baryon to meson ratios at RHIC and LHC.

We found a large Λ_c production resulting in a baryon over meson ratio of order O(1).

We propose the v_2 of charmed baryons as a possible way to have a deeper insight into the hadronization mechanism.

We have furthermore extended this approach to study the production of hadrons containing multiple charm quark, i.e. Ξ_{cc}, Ω_{cc} and Ω_{ccc}, and bottom quarks.

We present, also, results for the charmed hadron production in pp collisions at top LHC energies (5 TeV, 13 TeV) assuming the formation of an hot QCD matter at finite temperature for these systems.

We calculate the heavy baryon/meson ratio and the p_T spectra of charmed hadrons with and without strangeness content: D^0, D_s, Λ_c^+, Σ_c and the recently measured Ξ_c baryon, finding an enhancement in comparison with the ratio observed for e^+e^-, ep collisions; moreover with this approach we predict also a significant production of Ω_c respect to D^0 such that $\Omega_c/D^0 \sim 0.15$.

[1] V. Minissale, S. Plumari and V. Greco, Physics Letters B 821 (2021) 136622.
[2] S. Plumari, V. Minissale, S.K. Das, G. Coci and V. Greco, Eur.Phys.J. C 78 (2018) no.4, 348

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