Contribution ID: **195** Type: **Talk**

Coalescence plus fragmentation approach for the hadronization mechanism of heavy hadrons from AA to pp collisions

Wednesday 15 June 2022 09:00 (20 minutes)

One of the present challenge for the theoretical understanding of heavy-quark hadronization is represented by the description of the measurements of heavy baryon production in pp, pA and AA collisions from RHIC to top LHC energies.
The Λ_c/D^0 ratio observed in AA collisions has a value of the order of the unity, and experimental measurements in pp collisions at both $\sqrt{s} = 5.02\,\mathrm{TeV}$ and $\sqrt{s} = 13\,\mathrm{TeV}$ 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.
With a relativistic Boltzmann transport approach we study the propagation of charm quarks in the quark-gluon plasma (QGP), with the non-perturbative interaction between heavy quarks and light quarks described by a quasi-particle approach, then we apply an hadronization mechanism based on the coalescence and fragmentation processes. We present this model 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. where we have found a large Λ_c production resulting in a baryon over meson ratio of order O(1). 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}, we present here new predictions of these productions in different collision system (PbPb, KrKr, ArAr).
We present moreover results obtained for the charmed hadron production in pp collisions at top LHC energies 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; with this approach we also predict 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

Present via

Online

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Session Classification: PA-Heavy-flavor and Quarkonia

Track Classification: Heavy-flavor and Quarkonia