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Heavy flavor production and collectivity in high energy proton-proton collisions

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The creation of a quark-gluon plasma (QGP) is expected in ultrarelativistic heavy ion collisions. It came as a surprise that proton-proton collisions at ultrarelativistic energies show as well a “QGP-like” behavior and signs of the creation of a nearly perfect fluid, although the corresponding system size is not more than a few cubic femtometers. Even more surprisingly, also heavy flavor particles seem to be part of the fluid or at least interact with it. Recently, we investigated this “collective behavior” of heavy flavor in a quantitative way-[1], by employing the newly developed EPOS4HQ approach, which has been used to describe both heavy and light flavor hadrons in relativistic heavy ion collisions-[2,3]. In this talk, I will show the detail of the EPOS4HQ framework, which contains gluon splitting, flavor excitation, and flavor creation as elementary processes for the creation of heavy quarks. This allows us to disentangle initial state effects, those being due to interactions between charm quarks and plasma partons, and final state effects. Finally, I will show all observables, which may manifest collectivity, such as particle spectra, elliptic flow, baryon-to-meson ratios, and two-particle correlations, and compare the results with experimental data.

Refs:

[1].arXiv:2310.08684.

[2].arXiv:2401.11275.

[3].arXiv:2401.17096.

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