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Heavy Quarks in Heavy-Ion Collisions

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The heavy charm and bottom quarks and the associated open heavy-flavor mesons (D and B) are a valuable probe for the interactions in the hot and dense medium created in heavy-ion collisions. They are produced in the primordial hard collisions of partons within the nuclei and then traverse the hot and dense partonic (QGP) and hadronic (hadron gas) medium, which shows collective behavior, describable as flow of a nearly ideal fluid. This implies a fast thermalization and a strong coupling of the QGP. Due to their larger mass the heavy quarks are expected to be less equilibrated and thus the p_T spectra (nuclear modification factor R_{AA}) and elliptic flow v_2 of open heavy-flavor mesons and “non-photon electrons” from their semileptonic decay provide important insight about the coupling mechanisms of heavy quarks/open heavy-flavor mesons with the medium. This is investigated with help of Fokker-Planck/Langevin simulations of heavy quarks in a realistic bulk-medium background described with help of the UrQMD-hydro-hybrid model. The comparison of the results concerning R_{AA} and v_2 of D-mesons as well as non-photon electrons with these simulations provide some information about the possible microscopic interaction mechanisms within the hot and dense medium responsible for the strong coupling of the medium and its early thermalization.

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