

Diffusion of heavy quarks in the early stages of high energy nuclear collisions

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In the pre-equilibrium stage of relativistic heavy-ion collisions, strong quasi-classical gluon fields emerge. These dense, coherent, colored electric and magnetic fields are known as Glasma. Glasma fields evolve, and the lifetime of these strong fields is of the order of the formation and thermalization time of the QGP, typically a short fraction of fm/c. Heavy quarks (HQs) are good probes to study these early stages of high-energy collisions. We aim to study the diffusion of heavy quarks in the evolving Glasma (EvGlasma). Also, we perform a systematic comparison of the diffusion of HQs in the evolving Glasma fields with that of the Markovian-Brownian motion in a thermalized medium of gluons. We observe the superdiffusion of HQs in the EvGlasma fields as the transverse momentum broadening, σ_p of HQs increases non-linearly during the very early time. We also find that for a smaller value of saturation scale, Q_s , the average transverse momentum broadening is approximately the same for the two cases, but for a larger value of Q_s , Langevin dynamics underestimates the σ_p .

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