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Entropy production in the early stage of relativistic heavy-ion collisions from the Glasma

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Entropy production in the early stage of relativistic heavy-ion collisions is studied based on the classical Yang-Mills (CYM) dynamics.
CYM field is regarded as a coherent state, and then the von-Neumann entropy is calculated from the density matrix given by the coherent state assuming that the matrix is diagonal due to decoherence.
We calculate the entropy in the non-expanding plasma from Glasma initial condition, and find that this increases rapidly when longitudinal fluctuations are added in the initial state.
With larger fluctuations, chaotic behavior of the CYM field and hence entropy production emerges in the earlier time, and then earlier thermalization is achieved.
We show that reasonable strengths of the initial fluctuations with respect to the amplitude of the background classical field could account for the early thermalization suggested by the phenomenological analysis based on the hydrodynamics.

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