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Early Time Dynamics in Heavy Ion Collisions from AdS/CFT Correspondence

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We study the matter produced in heavy ion collisions assuming that this matter is strongly interacting and employing AdS/CFT correspondence to investigate its dynamics. At late proper times τ we show that Bjorken hydrodynamics solution, obtained recently by Janik and Peschanski using gauge-gravity duality, can be singled out by simply requiring that the metric tensor is a real and single-valued function of the coordinates everywhere in the bulk, without imposing any constraints on the curvature invariant. At early proper times we use similar strategy to show that the energy density ϵ approaches a constant as $\tau \rightarrow 0$. We therefore demonstrate that the strong coupling dynamics incorporates the isotropization transition in heavy ion collisions. By matching our early-time regime with the late-time one of Janik and Peschanski we estimate the isotropization time at RHIC to be approximately $\tau_{\text{iso}} \approx 0.3\text{-fm}/c$, in good agreement with results of hydrodynamic simulations.

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