



## On the critical condition in gravitational shock wave collision and heavy ion collisions

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The paper derived a critical condition for matter equilibration in heavy ion collisions using a holographic approach. A gravitational shock waves with infinite transverse extension is used to model infinite nucleus with an intrinsic saturation scale. We constructed the trapped surface in the collision of two asymmetric shock waves and formulated a critical condition for matter equilibration in collision of nucleus with the same energy but different saturation scale. We expressed the critical energy as a function of two saturation scales and found it is insensitive to the softer saturation scale. To understand the origin of the critical condition, we computed the Next to Leading Order stress tensor in the boundary field theory due to the interaction of the nucleus and found the critical condition corresponds to the breaking down of the perturbative expansion. We indeed expect non-perturbative effects be needed to describe black hole formation.

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