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Comments on holographic star and the dual QGP

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We study static AdS star in generic dimension. The dependence of the mass limit to the bulk fermion mass is explored. In the bulk conformal limit, the mass limit saturates at a value identical to the mass limit of a radiation star or the AdS space filling with pure radiation. The temperature and entropy of the degenerate AdS star in the bulk conformal limit is zero in contrast to the radiation star. Holographically, the universal mass limit corresponds to the upper limit of the deconfinement temperature in the dual gauge picture. The QGP at this temperature is dual to the large black hole and the heat capacity is positive. When the fermion mass increases, the mass limit falls into the range of the small black holes. We found that even though the small black hole has negative heat capacity, the AdS box allows possibilities that it remains in thermal equilibrium with the radiation as long as the size of the black hole is not smaller than a critical size. Consequently, the dual QGP with negative heat capacity can be produced and remains stable thermodynamically at temperature below a saturation temperature T_2. The QGP with negative heat capacity produced at higher temperature will still condensate completely into a gas of confined hadron.

Primary author: Dr BURIKHAM, Piyabut (Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330 , Thailand)

Co-author: Mr CHULLAPHAN, Tossaporn (Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330 , Thailand)

Presenter: Dr BURIKHAM, Piyabut (Department of Physics, Faculty of Science, Chulalongkorn University, Bangkok 10330 , Thailand)

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