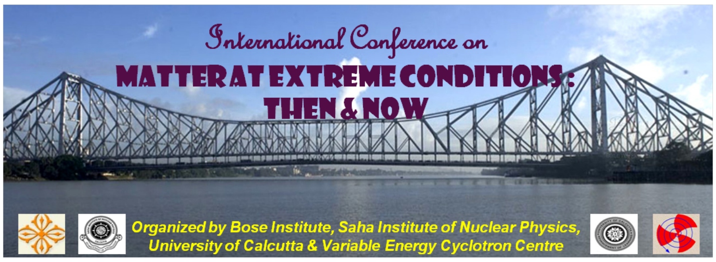

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Dependence of acoustic surface gravity on geometric configuration of matter for axisymmetric background flow in Schwarzschild metric

In black hole evaporation process, the mass of the hole anti-correlates with the Hawking temperature enabling us to infer that the smaller mass holes will have higher surface gravity. For analogue Hawking effects, however, the acoustic surface gravity is determined by the local value of the dynamical velocity of the stationary background fluid flow and the speed of propagation of the characteristic perturbation embedded in the background fluid, as well as their space derivatives evaluated along the direction normal to the acoustic horizon, respectively. The mass of the analogue system - whether classical or quantum - does not directly contribute to extremise the value of the associated acoustic surface gravity. For general relativistic axisymmetric background fluid flow in the Schwarzschild metric, we show that the initial boundary conditions describing such axisymmetrically accreting matter flow influence the maximization scheme of the acoustic surface gravity as well as the corresponding characteristic temperature. Aforementioned background flow onto astrophysical black hole can assume three distinct geometric configurations. Identical set of initial boundary conditions can lead to entirely different phase space behaviour of the stationary flow solutions, as well as the salient features of the associated relativistic acoustic geometry. It is thus important to investigate how the acoustic surface gravity for the aforementioned classical analogue system gets influenced by the geometric configuration of the stationary axisymmetric matter flow described by various astrophysically relevant thermodynamic equations of state. Our work is useful to study the effect of gravity on the non-conventional classical features in Hawking like effect in a dispersive medium as is expected to be observed in the limit of a strong dispersion relation.

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