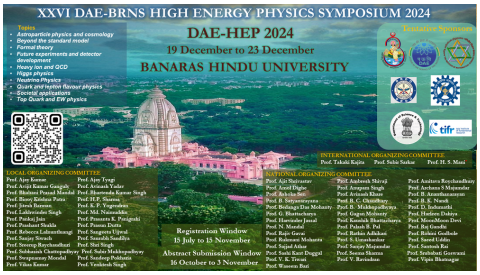

Contribution ID: **17** Type: **Postar**

Chaos, nonconformality and holography

The behavior of a chaotic system and its effect on existing quantum correlation has been holographically studied in the presence of nonconformality. Keeping in mind the gauge/gravity duality framework, the nonconformality in the dual field theory has been introduced by considering a Liouville type dilaton potential for the gravitational theory. The resulting black brane solution is associated with a parameter η which represents the deviation from conformality. The parameters of chaos, namely, the Lyapunov exponent and butterfly velocity are computed by following the well-known shock wave analysis. The obtained results reveal that the presence of nonconformality leads to suppression of the chaotic nature of a system. Further, for a particular value of the nonconformal parameter η, the system achieves Lyapunov stability resulting from the vanishing of both the Lyapunov exponent as well as butterfly velocity. Interestingly, this particular value of η matches with the previously given upper bound of η known as Gubser bound in the literature. The effects of chaos and nonconformality on the existing correlation of a thermofield doublet state have been quantified by holographically computing the thermomutual information in both the presence and absence of the shock wave. Furthermore, the entanglement velocity is also computed, and the effect of nonconformality on it has been observed. Finally, the obtained results for the Lyapunov exponent and the butterfly velocity have also been computed from the pole-skipping analysis. The results from the two approaches agree with each other.

Field of contribution

Theory

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Track Classification: Formal theory