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Black Hole Normal Modes and Spectral Form Factor

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We consider a black hole with a stretched horizon as a toy model for a fuzzball microstate. The stretched horizon provides a cut-off, and therefore one can determine the normal (as opposed to quasi-normal) modes of a probe scalar in this geometry. For the BTZ black hole, we compute these as a function of the level n and the angular quantum number J . Though conventional level repulsion is absent in this system, we find that the Spectral Form Factor (SFF) shows clear evidence for a dip-ramp-plateau structure with a linear ramp of slope ~ 1 on a log-log plot, with or without ensemble averaging. We show that this is a robust feature of stretched horizons by repeating our calculations on 2d Rindler $\times S^1$ geometry. We also observe that this is not a generic feature of integrable systems, as illustrated by standard examples like integrable billiards and random 2-site coupled SYK model, among others.

Session

Formal Theory

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