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NonMarkovianity of reservoirs with 1/f^a spectra

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We address the use of a quantum probe to assess the non-Markovian features of noisy channels described by the interaction with a random classical field. In particular, we evaluate trace- and quantum capacity-based non-Markovianity measures for two relevant classes of non-Gaussian fields, i.e. random telegraph noise (RTN) and environment exhibiting a colored noise spectra of the the form 1/f^a.
We make a thorough analysis of the trace distance and the quantum capacity as a function of time and show that the behavior of non-Markovianity based on both measures is qualitatively the same.
We found that low frequency environments are usually non-Markovian and that an increasing number of external degrees of freedom destroys non-Markovianity. We also show that, if specific structured environments are engineered and proper channel lengths are selected, it is possible to send information through a quantum channel in a reliable way.