

Quantized recurrence time in iterated open quantum dynamics

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We prove that if the superoperator is unital in the relevant Hilbert space (the part of the Hilbert space explored by the system), then the expectation value of the return time is an integer, equal to the dimension of this relevant Hilbert space. Our work connects the previously known quantization of the expected return time for bistochastic Markov chains and for unitary quantum walks, and shows that these are special cases of a more general statement. The expected return time is thus a quantitative measure of the size of the part of the Hilbert space available to the system when the dynamics is started from a certain state.