OPTIMAL CONVERGENCE RATE IN THE QUANTUM ZENO EFFECT FOR OPEN QUANTUM SYSTEMS IN INFINITE DIMENSIONS

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In open quantum systems, the quantum Zeno effect consists in frequent applications of a given quantum operation, e.g. a measurement, used to restrict the time evolution (due e.g. to decoherence) to states that are invariant under the quantum operation. In an abstract setting, the Zeno sequence is an alternating concatenation of a contraction operator (quantum operation) and a C_0-contraction semigroup (time evolution) on a Banach space. In this paper, we prove the optimal convergence rate of the Zeno sequence under weak boundedness assumptions, which induce a Zeno dynamics generated by an unbounded generator. For that, we derive a new Chernoff-type $\sqrt{n}$-lemma, which improves the convergence rate for vector-valued function converging linearly to the identity and which we believe to be of independent interest. We achieve the optimal Zeno convergence rate of order $\frac{1}{n}$.