Quantum chaos in composite systems

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Unitary evolution operator of a quantum analogue of a classically chaotic system transforms a typical initial state into a delocalized random pure state. Analyzing such a unitary dynamics for a composite, bipartite system and performing partial trace over a selected subsystem one obtains a generic mixed state on the second subsystem. We investigate statistical properties of such generic mixed states and show that for a large dimension of the Hilbert space they become universal due to the effect of concentration of measure. In particular the trace distance between two random mixed states converges to $1/2 + 2/\pi$, which due to the Helstom bound determines their discriminarion in an optimal measurement scheme.

Bibliography

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