Lecture Notes on Quantum Chaos

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1 Literature

- [1] Martin C. Gutzwiller, *Chaos in Classical and Quantum Mechanics* (Springer, 1990)
  - Classical monography about chaos in physics.
  - Profound physical and mathematical discussion.
  - Sometimes nonstandard notation.
- [2] Fritz Haake, *Quantum Signatures of Chaos* (Springer, 2010)
  - Up-to-date topics, including chaotic dissipative systems and supersymmetric approaches.
- [3] Oriol Bohigas, *Random Matrix Theories and Chaotic Dynamics*, Les Houches LII, ed. M.-J. Gianonni, A. Voros, J. Zinn-Justin, 1989
  - Brief and conscise notes on the basics of quantum chaos.
- [4] Madan L. Mehta, *Random Matrices* (Elsevier 2004).
  - Everything you always wanted to know about random matrices (and quantum chaos is from a big part about random matrices).
  - ... and probably even didn't want to know.
  - If you love formulae, you'll be happy happy reading this book.

2 A way to quantum chaos

2.1 Quantum mechanics is linear

Classical chaos is tightly connected with the nonlinearity of classical equations of motion. Quantum mechanics is linear, quantum evolution unitary$\longrightarrow$no sensitive dependence on "initial conditions".

Reference

[1] Martin C. Gutzwiller, *Chaos in Classical and Quantum Mechanics* (Springer, 1990).

[2] Fritz Haake, *Quantum Signatures of Chaos* (Springer, 2010).

[3] Oriol Bohigas, *Random Matrix Theories and Chaotic Dynamics*, Les Houches LII, ed. M.-J. Gianonni, A. Voros, J. Zinn-Justin, 1989.

[4] Madan L. Mehta, *Random Matrices* (Elsevier 2004).

[5] Linda E. Reichl, *The Transition to Chaos: Conservative Classical Systems and Quantum Manifestations* (Springer, 2004).

[6] Hans-Jürgen Stöckmann, *Quantum Chaos: An Introduction* (Cambridge University Press, 1999).

[7] Alfredo M. Ozorio de Almeida, *Hamiltonian Systems: Chaos and Quantization* (Cambridge University Press, 1988).