

Dobnikar J.: **Energy level statistics in the transition regime between integrability and chaos for systems with broken antiunitary symmetry**, diploma thesis, University of Ljubljana, Faculty for mathematics and physics, October 1996

We study the transition from integrability to chaos in a billiard system defined by the cubic conformal mapping of the unit disc equipped with the line of magnetic flux perpendicular to the billiard plane at the origin of the coordinate system. Classically the flux line doesn't affect the motion of a charged point particle, while in quantum mechanics it implies the lack of antiunitary symmetry and so the universality class of the spectral fluctuations in the case of classical ergodicity is expected to be GUE rather than GOE. In the classical part we thoroughly study the methods for calculating the volume fraction of the chaotic phase space and show that there are more problems here than expected. While testing the methods we show that the previous results on the quadratic billiard (Prosen, Robnik 1993) are not completely reliable and present our corrected results. Further we also calculate the volume fractions of chaotic regions for different shapes of the cubic billiard. In the quantum part of the work we calculate approximately 5000 good energy levels for each billiard shape and study the level spacing statistics. We compare the cumulative distribution with the Brody model and describe the power-law energy level repulsion. We also study the agreement with the predictions of the Berry-Robnik theory. The agreement is not (yet) seen and we explain why this is so (energies too low).