

## Dynamical Decoherence in a Double-slit Scattering Experiment

Zoran Levnajic<sup>1\*</sup>, Tomaž Prosen<sup>2</sup>

<sup>1</sup> Department of Theoretical Physics, Institute "Jožef Stefan"

Jamova 39, 1000 Ljubljana, Slovenia

<sup>2</sup> Department of Physics, University of Ljubljana, Faculty of Mathematics and Physics; Jadranska 10, 1000 Ljubljana, Slovenia

\* Electronic Address: [zoran.levnajic@ijs.si](mailto:zoran.levnajic@ijs.si)

A numerical experiment is performed as follows: a quantum particle is injected in a billiard of a certain shape through a channel opened on one side of it and allowed to leak out the billiard through a pair of small slits opened on the other side of it. The interference patterns produced by the diffusion through the slits are studied in relation to billiard's shape and the input parameters. As billiard's geometry changes from a classically regular (isosceles right triangle) to a classically chaotic (curved right triangle) the interference pattern abruptly changes from showing typical double-slit fringes to the gaussian random wave interference. This shift is interpreted as a decoherence effect produced by the chaotic dephasing of particle's wave function, in analogy with the result observed by Casati and Prosen [1].

---

[1] G. Casati and T. Prosen, *Phys. Rev. A* **72**, 032111 (2005).