Spreading and Equidistribution of propagated coherent states on hyperbolic surfaces.

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Abstract

Coherent states are strongly localised wave packets which play an important role in quantum mechanics and many of its applications. One reason why they are so useful is that their time evolution can be described in the semiclassical limit by a single trajectory of the classical Hamiltonian dynamics together with the linearised flow around that trajectory. But if the trajectory is hyperbolic this approximation breaks down at some fraction of the so called Ehrenfest time, due to the spreading of the wave packet induced by the hyperbolic dynamics. In a recent paper with R. Vallejos and F. Toscano we developed an approach which allows to describe what happens to the coherent state at the Ehrenfest time, namely it becomes an isotropic state which is localised on the unstable manifold of the central trajectory. In this talk we apply this approach to the propagation of coherent states on surfaces of constant negative curvature. The classical dynamics is given by the geodesic flow, which is a classical example of a uniformly hyperbolic system, and the construction describing the propagation of coherent states and their transition to isotropic states at the Ehrenfest time can be made very explicit. We furthermore show that mixing of the geodesic flow implies equidistribution of propagated coherent states beyond the Ehrenfest time and up to at least twice the Ehrenfest time.

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