Dynamical tunneling in systems with a mixed phase space

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Typical dynamical systems have a mixed phase space, in which regions of chaotic motion coexist with regions of regular motion. While classically they are dynamically separated, quantum mechanically, these regions are connected by the fundamental process of tunneling. In this talk we review how to predict dynamical tunneling rates in systems with a mixed phase space by the fictitious integrable system approach [1,2]. Agreement with numerical data will be presented for kicked systems, two-dimensional billiards [3] and optical microcavities [4]. If prominent nonlinear resonances are present, they can have a strong influence on the behaviour of tunneling rates. We combine the direct regular-to-chaotic tunneling mechanism with the resonance assisted mechanism, which leads to a quantitative description of tunneling rates, even for generic systems such as the standard map [5]. Dynamical tunneling also has an important influence on spectral statistics and explains the power-law behaviour of the level-spacing distribution observed at small spacings [6].

References


