Transport Mechanisms in Dielectric Optical Microcavities

G. Painchaud-April, J. Poirier, L. J. Dubé

Département de Physique, de Génie Physique et d'Optique
Université Laval, Québec (Québec), Canada G1V 0A6

Optical 2D microcavities have become a source of promising new technologies over the last decades. Applications ranging from high accuracy spectrometry to laser design will benefit from the development of such devices. The versatility of the concept resides in the ray-wave correspondence [1, 2]: the short wavelength limit of the system exhibits properties of well-known billiard systems, which may include Hamiltonian chaos. Therefore, since the wave behaviour of an optical microcavity is influenced by the underlying phase-space structure, a study and characterization of this structure becomes important to predict where the electromagnetic energy will flow out of the cavity. Whereas the correspondence works reasonably well for regular (classically integrable) and completely chaotic systems, partially chaotic systems of mixed phase space show transport properties largely influenced by tunnelling and localization effects with the consequence that the correspondence is all but lost. We will present the results of our investigations, in the ray and wave dynamics, in order to shed some light on the collaborating influence of the different transport mechanisms.

[1] H. G. L. Schwefel et al., Dramatic shape sensitivity of directional emission patterns from similarly deformed cylindrical polymer lasers, J. Opt. Soc. Am. **B21**, 923–934 (2004).
[2] J. Wiersig and M. Hentschel, Combining Directional Light Output and Ultralow Loss in Deformed Microdisks, Phys. Rev. Lett., **100**, 033901 (2008).

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