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Numerical study of bouncing-ball mode leakage and migrating scars

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Abstract

Using specialized numerical techniques based on linearizing the Dirichlet-to-Neumann map (scaling method), we can collect large samples of eigenfunction statistics at very high eigenvalue. We present work in progress on two phenomena:

1) Leakage of bouncing-ball modes in the stadium. The existence of a sequence of modes concentrating on the neutrally stable orbit family is believed, but not proven, and would preclude quantum unique ergodicity. We give a conjecture on mode mass lying in a strip neighboring the rectangular region, and find this matches an adiabatic approximation, although mass beyond the strip, and mode shape, does not. We include data on the eigenvalue fluctuations **(joint work with A. Hassell)**.

2) 'Migrating scars': regions of high local density of states (mean eigenfunction intensity in a spectral window) which move as a function of eigenvalue, and are hence averaged away in the physicists' usual model of scarring. We compare data near the self-focal point in the mushroom billiard to a semiclassical approximation.