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Regularization of tunneling rates in quantum chaotic systems

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Prototypical systems of two potential wells separated by a tunneling barrier exhibit the unexpected and counter-intuitive results that regular, non-chaotic systems have tunneling rates that fluctuate with energy dramatically over several orders of magnitude whereas the fully chaotic wells have orders of magnitude smaller fluctuations. All calculations were found from the Schrodinger equation using the Boundary Element Method. A random, plane wave theory explains the magnitude of the average tunneling rates as well as their fluctuations. We show that we can tune the amount of variance in tunneling rates by changing the shape of the quantum wells implying possible device design capabilities for nanodevices that operate in the electron ballistic regime.