Formulating Transmission Probabilities of Arbitrary Potential in a 2-dimensional Quantum Chaotic Systems

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In the following note I have tried to formulate the transmission probability for a 2-dimensional quantum well with finite potential barrier with a chaos inside the system. Analytical formula for transmission probability has been derived by different ways previously; Analytical Transfer Matrix Method is one of them and it has been tested experimentally. Here, I will be discussing the same tunneling with a magnetic field inside the tunnel and that magnetic field creates a chaos inside the well. There is a different scenario when we apply a magnetic field to the tunnel, like the Hamiltonian becomes time dependent. For an arbitrary infinite potential when we will be applying a magnetic field the electron moves to and fro inside the well, and for a finite potential barrier there is a finite probability that the electron pass through the barrier, but as the Hamiltonian becomes time dependent the calculation becomes very rigorous and difficult. Here, we use Random Matrix Theory to resolve the issue, and trying to formulate the transmission probability through an arbitrary but finite potential. In literature we can find Random Matrix Theory has been used to solve problems in Chaotic Quantum Dot problems. I adopt the same approach solving Quantum Tunneling problems for a Chaotic 2-Dimensional well.

PACS numbers: 73.40.Gk, 73.40.Lq, 85.30.De

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