

Statistical Approach to Quantum Chaotic Ratchets

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The quantum ratchet effect in fully chaotic systems is approached by studying, for the first time, *statistical* properties of the ratchet current over well-defined sets of initial states. Natural initial states in a semiclassical regime are those that are *phase-space uniform* with the *maximal possible* resolution of one Planck cell. General arguments in this regime, for quantum-resonance values of a scaled Planck constant \hbar , predict that the distribution of the current over all such states is a zero-mean Gaussian with variance $\sim D\hbar^2/(2\pi^2)$, where D is the chaotic-diffusion coefficient. This prediction is well supported by extensive numerical evidence. The average strength of the effect, measured by the variance above, is *significantly larger* than that for the usual momentum states and other states. Such strong effects should be experimentally observable.

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