Abstract Submitted
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Quantum Potential and Chaos of the Kicked Rotor[1] YINDONG ZHENG, DONALD H. KOBE, University of North Texas — The de Broglie-Bohm approach to quantum mechanics implies trajectories similar to classical trajectories determined by classical forces, except that these quantum trajectories also have an additional quantum force. These quantum trajectories can be used to treat quantum chaos in a manner similar to the treatment of classical chaos. A quantum Lyapunov exponent can be calculated in a manner similar to a classical Lyapunov exponent. The quantum force is the negative gradient of a quantum potential. We show that the quantum potential is a fictitious potential in the sense that it is part of the quantum kinetic energy. Consequently, the quantum force is also a fictitious force. The results of the de Broglie-Bohm approach to quantum chaos agree with standard quantum mechanics only when the quantum potential happens to be zero. We apply the de Broglie-Bohm approach to study the quantum chaos of the kicked rotor. For this bounded system we use the method of Benettin, et al. to calculate both classical and quantum Lyapunov exponents as a function of the control parameter K. In addition to the stability regions in the chaotic sea for even multiples of π associated with accelerator mode islands, we find new stability regions at odd multiples of π associated with oscillating modes. We examine these regions both classically and quantum mechanically.

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