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Time irreversibility of quantum diffusion in complex networks

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We study time-reversal dynamics of quantum diffusion in the Watts-Strogatz small-world networks at the rewiring probability p. We start from the localized wave packet, and integrate the time-dependent Schr\"odinger equation. At time T a perturbation to the wave packet is made and then the system evolves backward in time until $t = 2T$ is reached. We calculate the mean square displacement $\sigma(t;\eta)$ of the wave packet as a function of time t at different perturbation strength η. The time irreversibility is quantitatively measured by $\sigma(2T;\eta) - \sigma(2T;0)$, which reveals that the irreversibility linearly increases with η in the weakly perturbed regime. The results from the WS networks and the regular network are compared.

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