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Erratic behavior for 1-dimensional random walks in a Liouville quasi-periodic environment.

Summary: We show that one-dimensional random walks in a quasi-periodic environment with Liouville frequency generically have an erratic statistical behavior. In the recurrent case we show that neither quenched nor annealed limit theorems hold and both drift and variance exhibit wild oscillations, being logarithmic at some times and almost linear at other times. In the transient case we show that the annealed Central Limit Theorem fails generically. These results are in stark contrast with the Diophantine case where the Central Limit Theorem with linear drift and variance was established by Sinai.

MSC:
60F15 Strong limit theorems
60K37 Processes in random environments
37A45 Relations of ergodic theory with number theory and harmonic analysis (MSC2010)
37C05 Dynamical systems involving smooth mappings and diffeomorphisms

Keywords:
Liouville phenomena; localization; random walks in random environment; random walks in random potential

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