

# Active Quantum Particles from Engineered Dissipation

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Active matter describes a broad range of systems of relevance in physics, chemistry and biology. A key feature is their out of equilibrium nature and the fact that activity is due to local injection of energy converted into motion. Systems of many active particles or active field theories display remarkable collective phenomena and phase transitions [1]. An intriguing question is whether active behavior is unique to classical systems or can manifest as well in the quantum world. Different models have been proposed in the literature, including non-unitary quantum walks [2], quantum particles trapped in an active potential [3], driven particles with an internal thermal engine, where spin-orbit coupling provides the mechanism for heat to motion conversion, or even models for quantum flocks [4]. We introduce and characterize three models for an active quantum particle, where activity arises from engineered dissipation i.e. from a suitably coupled environment. These include a lattice model for a particle hopping in a non-reciprocal bath and quantum versions of the celebrated active Brownian motion and active Ornstein-Uhlenbeck process.

## References

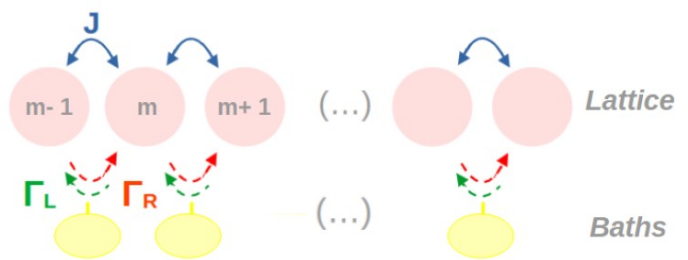
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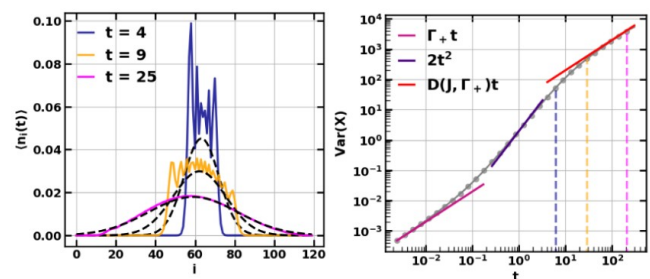
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## Figures



**Figure 1** Description of the model



**Figure 2:** Dynamical behavior

