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Cavity QED based open quantum walks

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Open quantum walks (OQWs) have been introduced as a new type of quantum walks that are entirely driven by the dissipative interaction with external environments and are defined in terms of discrete completely positive trace-preserving maps on graphs [1-3]. In this contribution, we discuss a possible experimental scheme for the implementation of OQWs. The scheme is based on a model consisting of a weakly coupled atom-field system in the dispersive regime inside a high-Q resonator ($Q \sim 10^{12}$) [4]. This setup implements an OQW on the line with a two-level atom (driven by a laser) playing the role of the “walker” and the Fock states of the cavity mode as lattice sites of the OQW. The master equation for this system is solved analytically using generating functions for the zero-temperature case and the dynamics of the observables are presented for various parameters.

Keywords: Open quantum walks; quantum optics

References:

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Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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