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Open Quantum Walks: From Microscopic Derivation to Applications

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A microscopic derivation of an open quantum walk on a simple graph is presented. Open quantum walks [S. Attal, F. Petruccione, C. Sabot, I. Sinayskiy, *Journal of Statistical Physics* 147 (2012) 832] have been shown to be a very useful tool for the formulation of dissipative quantum computing and state preparation [I. Sinayskiy and F. Petruccione, *Quant. Inf. Proc.* 11 (2012) 1301]. Here, a master equation for the reduced dynamics of the open quantum walk is derived for a certain microscopic system-bath model. It is shown, that the resulting master equation has the form of a generalised quantum master equation. Some novel applications of open quantum walks are proposed.