

Time-multiplexed quantum walks

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Photonic quantum systems, which comprise multiple optical modes, have become an established platform for the experimental implementation of quantum walks. However, the implementation of large systems with many modes, this means for many step operations, a high and dynamic control of many different coin operations and variable graph structures typically poses a considerable challenge.

Time-multiplexed quantum walks are a versatile tool for the implementation of a highly flexible simulation platform with dynamic control of the different graph structures and propagation properties. Our time-multiplexing techniques is based on a loop geometry ensures a extremely high homogeneity of the quantum walk system, which results in highly reliable walk statistics. By introducing optical modulators we can control the dynamics of the photonic walks as well as input and output couplings of the states at different stages during the evolution of the walk.

Here we present our recent results on our time-multiplexed quantum walk experiments