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Scalable implementation scheme for quantum walks using classical light

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Abstract content
   (Max 300 words)

Quantum walks are the quantum analog of the classical random walks. They have been proved to be universal for quantum computation and quantum algorithms. However, not many scalable experimental realization of quantum walks have been reported so far. Here we present an implementation scheme for quantum walk in the orbital angular momentum space of a laser beam. The scheme makes use of a ring interferometer, containing a quarter-wave plate and a q-plate. This setup enables one to perform an arbitrary number of quantum walk steps by means of amplification. In addition, the classical nature of the implementation scheme makes it possible to observe the quantum walk evolution in real time. We use non-quantum entanglement of the laser beam's polarization with its orbital angular momentum to implement the quantum walk.

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Primary author: Dr GOYAL, Sandeep (UKZN)

Co-authors: Prof. FORBES, Andrew (CSIR); Dr ROUX, F. S. (CSIR); Prof. KONRAD, Thomas (UKZN)

Presenter: Dr GOYAL, Sandeep (UKZN)

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