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Multi-photon interference using laser-written waveguides for BosonSampling and related computations

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Abstract

In recent years, integrated optics has gained a strong foothold in quantum photonics. Interferometrically stable networks exhibiting a high number of connected modes on a compact footprint can be manufactured via a variety of fabrication techniques. Moreover, insertion losses have become so low, that multiple single photons can be scattered through these networks. I present experimental progress on the non-classical interference of multiple, partially indistinguishable photons through arbitrary scattering networks.

I will discuss how the non-classical interference of two photons can be leveraged to reconstruct the unitary matrix, describing these scattering networks, with high precision. Both, perfect non-classical interference and precise knowledge of the unitary transformation of the scattering network are prerequisites for a novel model of quantum computing, called BOSONSAMPLING. I will discuss a proof-of-principle experiment for BOSONSAMPLING, for the case of three photons interfering in a five-moded laser-written integrated network.