Polarization Characterization of BBO and ppKTP SPDC-based Entanglement Light Sources

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Abstract

This article explores the polarization control and characterization of established experimental generation and characterization of polarization entangled photons using type-II spontaneous parametric down conversion (SPDC) with nonlinear optics[1]. The study investigates the use of different nonlinear optical crystals, such as BBO and ppKTP, to generate polarization-entangled single photon pairs at 810 nm.

The focus of our work is the application of using SPDC photons in quantum networks with the entanglement source as a node optimized based on the mapped network's Fiedler vector, allowing for optimal distribution as quantum networks grow in complexity using continuous variable entanglement light sources based on ppKTP [2].

The Poincaré sphere is used to map the state from the entanglement source (Figure 1), and the Wigner function of the entangled photons is constructed (Figure 2) from standard polarization measures. Quantum state tomography is employed to generate the Wigner function, providing phase-space representations of polarization-entangled states [2].

The experimental results demonstrate the potential of non-linear optical SPDC-sourced polarization states of quantum entanglement distributed as a resource in fibered networks [3].

Figures

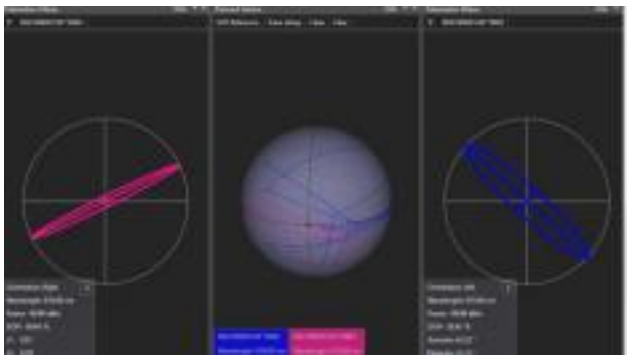

Figure 1: Polarizations of the signal and Idler from an entanglement source mapped to the Poincaré sphere

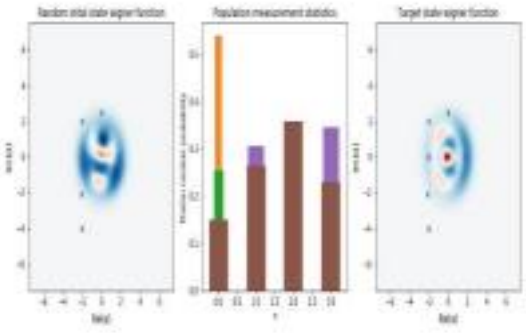

Figure 2: Wigner functions of the entanglement source in the initial basis vs the target Bell-state basis for measurement

References

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[3] . Xavier GB, De Faria GV, Temporão GP, Von der Weid JP. Full polarization control for fiber optical quantum communication systems using polarization encoding. Opt. Express. 2008