Optical Quantum Information Encoder: Implications for Quantum Computing Applications

S. Moradi*, C. Brandner, A. Unterhuber, W. Drexler, L. Papp†
1. Department of Medical Physics and Biomedical Engineering, Medical University of Vienna, Währinger Gürtel 18-20, 1090 Wien, Austria

Optical photons, as powerful carriers of quantum information, enable secure long-distance transmission via satellites or fibers [1]. A quantum optical encoder store information as stationary excitations, where the embedded information can be manipulated using just single-qubit and two-qubits gate operations for Quantum Computing applications. In this study, we focus on transferring non-classical optical multi-mode squeezed states, characterized by maximal entanglement, to a network of stationary qubits. Utilizing the Jaynes-Cumming model and separability criteria [2], we calculate the entanglement transfer within qubits initially in ground state exposed to multi-mode squeezed radiation. We also obtain conditions that perform maximum entanglement transfer. Our findings demonstrate the 90% efficiency in entanglement transfer for a three-qubit quantum encoder. Additionally, nearly complete entanglement transfer is achieved through the utilization of quantum state tomography techniques.

References

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*sasan.moradi@meduniwien.ac.at
†laszlo.papp@meduniwien.ac.at