

Quantum Physics

Quantum Multiplexing with the Orbital Angular Momentum of light

Juan Carlos Garcia-Escartin, Pedro Chamorro-Posada

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The orbital angular momentum, OAM, of photons offers a suitable support to carry the quantum data of multiple users. We present two novel optical setups that send the information of n quantum communication parties through the same free-space optical link. Those qubits can be sent simultaneously and share path, wavelength and polarization without interference, increasing the communication capacity of the system. The first solution, a qubit combiner, merges n channels into the same link, which transmits n independent photons. The second solution, the OAM multiplexer, uses CNOT gates to transfer the information of n optical channels to a single photon. Additional applications of the multiplexer circuits, such as quantum arithmetic, as well as connections to OAM sorting are discussed.

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