VINCENZO D AMBROSIO 'Rotation-Invariant Single Photon Qubits'

VINCENZO D AMBROSIO
Quantum Optics Group
Dipartimento di Fisic

May 07, 2015

Seminar, May 7, 2015, 12:00. Seminar Room

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Quantum information bits are often encoded in photon polarization since this degree of freedom is easy to manipulate via standard birefringent optical elements. However, in a polarization based quantum communication scenario, users need to have knowledge of their

mutual orientation in order to correctly communicate. Such limitation can be overcome with rotation-invariant single photon states obtained as a proper combination of polarization and orbital angular momentum (OAM) of photons.

By exploiting birefringent plates able to couple together polarization and OAM (q-plates) it is possible to easily generate, manipulate and measure rotation-invariant qubits. These states have been experimentally tested in different scenarios: from a free-space quantum key distribution protocol over 210 meters to a violation of Bell inequality, storage in a quantum memory and resilience to atmospheric turbulences. Finally, by further exploiting the polarization and OAM joint action, it is possible to generate single photon states that allow to increase the sensitivity in polarization based roll angles measurement.

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Hosted by Prof. Romain Quidant