Contribution ID: **96** Type: **Talk**

Generation of entangled photonic states from semiconductor quantum dots

Friday, 10 May 2024 10:00 (30 minutes)

Single-photon sources based on semiconductor quantum dots find several applications in quantum information processing due to their high single-photon indistinguishability, on-demand generation, and low multiphoton emission. In this context, the generation of entangled photons represents a challenging task with a possible solution relying on the interference in probabilistic gates of identical photons emiAed at different pulses from the same source. In this work, we show the results of entangled state generation by using two different approaches. The first is based on a probabilistic gate that generates entangled photon pairs in the polarization and in the orbital angular momentum degree of freedom. We then characterize the entangled two-photon states by developing a complete model considering relevant experimental parameters, such as the second-order correlation function and photons indistinguishability. The second approach investigates the properties of the excitation scheme. The resonant configuration enables the generation of states in superposition in the photon's number basis. We show the results regarding the quality of the generation of such quantum states of light together with possible protocol for teleportation tailored to such a degree of freedom.

Abstract category

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Session Classification: Talks