Strong nonlinearity-induced correlations for counterpropagating photons scattering on a two-level emitter - DTU Orbit (03/01/2019)

Strong nonlinearity-induced correlations for counterpropagating photons scattering on a two-level emitter

We analytically treat the scattering of two counterpropagating photons on a two-level emitter embedded in an optical waveguide. We find that the nonlinearity of the emitter can give rise to significant pulse-dependent directional correlations in the scattered photonic state, which could be quantified via a reduction in coincidence clicks in a Hong–Ou–Mandel measurement setup, analogous to a linear beam splitter. Changes to the spectra and phase of the scattered photons, however, would lead to reduced interference with other photons when implemented in a larger optical circuit. We introduce suitable fidelity measures which account for these changes and find that high values can still be achieved even when accounting for all properties of the scattered photonic state.

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