Quantum Physics

Correlations in photon-numbers and integrated intensities in parametric processes involving three optical fields

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Two strongly-pumped parametric interactions are simultaneously realized in a single nonlinear crystal in order to generate three strongly correlated optical fields. By combining together the outputs of two of the three detectors measuring intensities of the generated fields, we obtain the joint photocount statistics between the single field and the sum of the other two. Moreover, we develop a microscopic quantum theory to determine the joint photon-number distribution and the joint quasi-distributions of integrated intensities and prove nonclassical nature of the three-mode state. Finally, by performing a conditional measurement on the single field, we obtain a state endowed with a sub-Poissonian statistics, as testified by the analysis of the conditional Fano factor. The role of quantum detection efficiencies in this conditional state-preparation method is discussed in detail.

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