

Abstract

This work is devoted to the development of quantum theory of coupled five-frequency parametric processes in active aperiodic nonlinear photonic crystals, which consist of a process of frequency down-conversion and two up-conversion processes. Method of describing the processes based on the Heisenberg-Langevin equations is used. Steady state process of self-conversion is considered and the threshold of laser and parametric generation are determined. The behavior of fluctuations of the quadrature components close to stationary solutions is analyzed. The spectral density of fluctuations of the quadrature components at frequencies both below and above the frequency of the laser, as well as their mutual spectral density is considered. The analysis in terms of the formation of EPR pairs (correlation of the Einstein-Podolsky-Rosen) between the Fourier components at different carrier frequencies is performed.