TRR 142
Tailored Nonlinear Photonics

TRR Guest Scientist Lecture / Seminar

Date/Time: 25.10.2016 / 2pm
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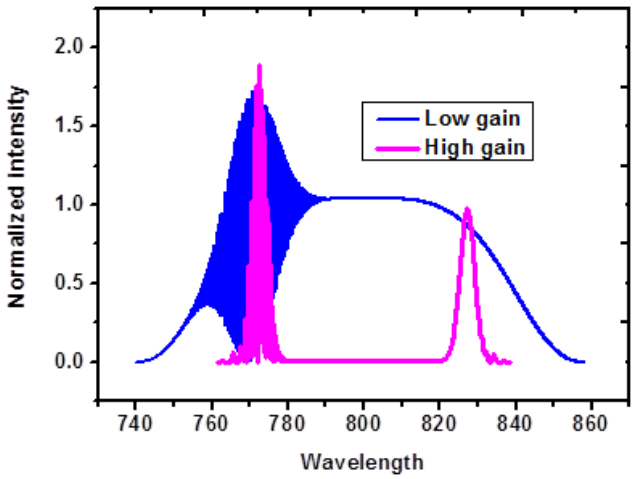
Coherent control of spectral and spatial features of bright squeezed vacuum states of light

Abstract:

In our work we investigate both theoretically and experimentally the spectral and spatial features and correlations in macroscopic (bright) squeezed quantum states of light generated in high-gain parametric down-conversion and referred to as bright squeezed vacuum (BSV). To describe theoretically these states we develop a generalized fully analytical approach, based on the concept of independent collective (Schmidt) modes and valid for the cases of both weak and strong nonlinear interaction. Such possibility is based on the known Schmidt decomposition procedure. In the frame of the Heisenberg representation we obtain the fully analytical solution for the evolution of the photon-creation operators in Schmidt modes and calculate different characteristics measured in experiment. We present the comparison of our theoretical results with the properties of bright squeezed vacuum observed in experiments performed in the Max-Planck Institute (Erlangen) and demonstrate a very good agreement.



In addition we demonstrate the possibility to vary and control the spatial and spectral features of BSV and the number of modes using a nonlinear interferometer based on two nonlinear crystals separated by a certain medium. If a medium with group velocity dispersion is used it is possible “to play” with the spectral properties of the BSV light by changing both the pump power and the time delay between the pump pulse and the nonlinear signal amplified in the second crystal.

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