TRR 142
Tailored Nonlinear Photonics

TRR Guest Scientist Lecture / Seminar

Date/Time: 19.06.2017, 15:00 Uhr
Location: Paderborn, P8.4.09

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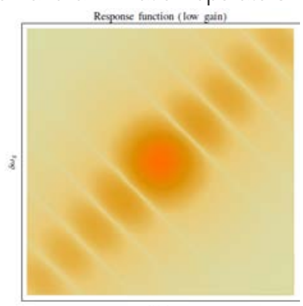
Very nonlinear quantum optics: Generation of bright squeezed light using parametric down-conversion

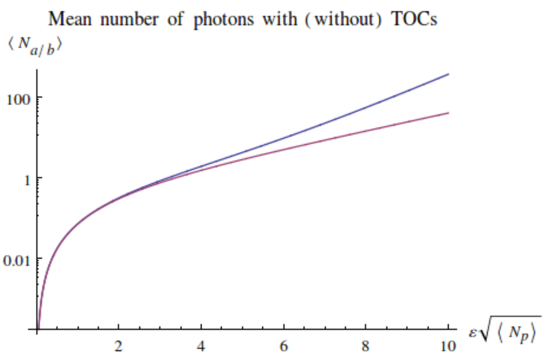
Abstract:

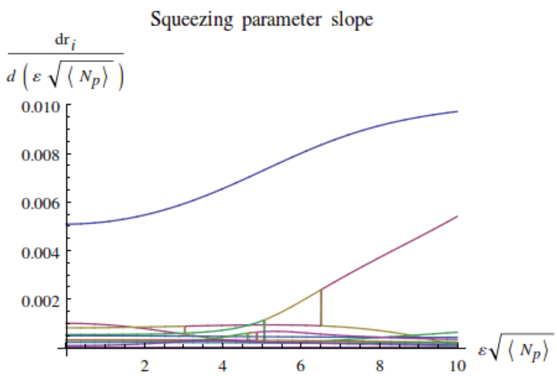
Progress in phase-matching engineering and microfabrication has led to the production of twin beams with unprecedented brightness in a very small set of spatio-temporal modes using a three-wave mixing process know as spontaneous parametric down-conversion (SPDC). The theoretical understanding of this nonlinear interaction is based on solving Maxwell's equations with a second order nonlinearity. In this talk I will present two results related to the theoretical understanding of these processes.

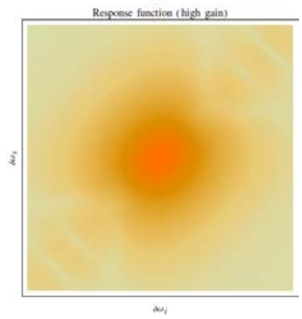
The first one shows that typical approaches to the quantization of light in nonlinear media where the electric field is written as linear combinations of photon (boson) creation and annihilation operators are *wrong* and lead to incorrect expressions for the gain coefficients of nonlinear processes. These wrong expressions are simply a consequence of the fact that an electric field linear in the photon creation and annihilation operators *cannot* satisfy Maxwell's equations in a nonlinear material.

In the second part of the talk I will focus on how the squeezing parameters of the twin beams generated in the high gain regime of SPDC are nonlinear functions of the pump electric field. Different methodologies for studying this problem will be compared and it will be argued that even though the squeezing parameters are nonlinear in the pump electric field the intensity of the signal and idler is still exponential in the same parameter making it hard to observe time-ordering corrections in the scaling of the outgoing signal and idler fields intensities.









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