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Nonlinear interferometer for shaping the spectrum of bright squeezed vacuum

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Bright squeezed vacuum is a macroscopic state of light featuring non-classical properties, from photon-number entanglement and quadrature squeezing to the violation of certain types of Bell's inequalities. By producing this state of light through high-gain parametric down-conversion in two coherently pumped crystals, one obtains a nonlinear interferometer, which offers various interesting possibilities. Among others, this is shaping the bright squeezed vacuum in space/angle and time/frequency, with the ultimate goal being to achieve a single-mode state. Moreover, this single mode can be of any desired shape, both in space and time. In our recent experiments, we have achieved generation of bright squeezed vacuum with a single spatial mode by spatially separating the two crystals forming the nonlinear interferometer. This mode had Gaussian shape but under certain conditions, spatial modes with non-zero optical angular momentum could be also obtained. By completing the nonlinear interferometer with a dispersive medium placed inside it, we achieved the generation of bright squeezed vacuum with only 1.5 frequency modes. The obtained single-mode bright squeezed vacuum can be used for various applications such as conditional preparation of non-Gaussian states, sensitive quantum phase measurements, and enhanced nonlinear optical effects.

Biography

Maria Chekhova has completed her PhD in 1989 from the Lomonosov Moscow State University (Russia) and her habilitation degree from the same University in 2004. She is the Leader of a research group in Max-Planck Institute for the Science of Light in Erlangen, Germany, working in the field of generation and application of non-classical light (single photons, photon pairs, twin beams). She teaches a course of quantum optics at the University Erlangen-Nuremberg and a course on non-classical light at Moscow State University. She has published more than 100 papers in peer-reviewed journals.

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