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A multimode framework to describe photon subtraction operation

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Optical non-Gaussian quantum states can be generated in a heralded manner by applying a photon subtraction operation to a Gaussian input state. In our work, we develop a theoretical framework to describe this operation in the case where the input state is spectrally multimode. This framework allows the optimal design of photon subtraction experiments. We give the exact expression of the generated non-Gaussian state in the general case. We apply this framework to the case of Schrodinger kitten state generation using a multimode squeezed vacuum as input state. We show that the quality of the generated state (in terms of fidelity and Wigner function negativity) can be enhanced by adapting the different experimental parameters.

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