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Entangled photon pairs from three coupled optomechanical cells
Z.J. DENG, University of Erlangen-Nuremberg, Germany, and National University of Defense Technology, China, S.J.M. HABRAKEN, F. MARQUARDT, University of Erlangen-Nuremberg, Germany — Optomechanics, which couples light to the mechanical motion of an object, is a very important research field. To show features different or superior to the classical counterparts, one major goal in the field of optomechanics is to generate nonclassical states such as squeezed states, entangled states, or states with negative Wigner functions for either or both the optical and mechanical degrees of freedom. In this work, we will discuss on how to generate entangled photon pairs from three coupled optomechanical cells, where each cell consists of a standard optomechanical system and different cells are coupled by photon tunneling. Due to the symmetry of the setup and with the help of mechanical motion, the photons in the driven optical normal mode will be scattered into the other two optical normal modes, where the entangled photon pairs correlated by frequency can be collected. We have investigated the squeezing and entanglement properties of the output light beams, and how these properties would be changed under the influence of the mechanical thermal noise and intrinsic optical losses. Moreover, we find that a suitable choice of parameters can lead to large steady-state entanglement in this proposed setup.

Zhijiao Deng
National University of Defense Technology, China

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