CHARACTERIZATION OF BIPARTITE STATES: FROM THEORY TO EXPERIMENT

S. Olivares

CNISM UdR Milano Università, Dipartimento di Fisica, Università di Milano, I-20133, Italy
email: stefano.olivares@mi.infn.it

Bipartite light beams endowed with nonclassical correlations are crucial resources for quantum technology and represent a building block for the development of an integrated quantum network. Their full characterization has a fundamental interest in its own and represents a tool for the design of protocols of quantum information processing in realistic conditions. Remarkably, entangled states produced by optical parametric oscillator sources are Gaussian states and thus may be fully characterized by the first two statistical moments of the field modes. In turn, the covariance matrix contains the complete information about entanglement of Gaussian states, i.e. about their performances as a resource for quantum technology.

We present the full experimental reconstruction of Gaussian entangled states generated by a type-II optical parametric oscillator below threshold. Our scheme provides the entire covariance matrix using a single homodyne detector and allows for the complete characterization of bipartite Gaussian states, including the evaluation of purity, entanglement, and nonclassical photon correlations, without a priori assumptions on the state under investigation [1,2].
