

Imaging position and momentum entanglement of bi-photon states of high Schmidt number through a scattering medium

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Among all the experiments dealing with quantum correlation properties of electromagnetic fields emitted by Spontaneous Parametric Down Conversion (SPDC), some studies address the propagation of entangled bi-photon states through random medium.

In this conference, I will report photon-counting imaging with Electron Multiplying Charge-Coupled Device (EMCCD) of entangled photon-pairs of high Schmidt number that are transmitted through a thin scattering medium. In these experiments, momentum or position quantum correlations between twin photons are measured respectively between twin far-field or near-field images of the SPDC source that are recorded on two separate EMCCDs. Different configurations are investigated where the thin scattering medium is positioned either in the near-field or in the far-field field of the SPDC source and where spatial quantum correlations are measured respectively in the far-field or in the near-field field of the SPDC source. In both cases, measurements of spatial quantum correlations exhibit speckle patterns that are related to the properties of the scattering medium. Moreover, the comparison of the degrees of correlation (corresponding to the ratio of detection events of photons by pairs) measured with and without the scattering medium, shows that spatial entanglement of the bi-photons states remains after the traversal of the scattering medium.