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Title:	Quantum ghost imaging of a transparent polarisation sensitive phase pattern
Authors:	Saxena, Aditya (/jspui/browse?type=author&value=Saxena%2C+Aditya) Kaur, Manpreet (/jspui/browse?type=author&value=Kaur%2C+Manpreet) Devrari, Vipin (/jspui/browse?type=author&value=Devrari%2C+Vipin) Singh, Mandip (/jspui/browse?type=author&value=Singh%2C+Mandip)
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Abstract:	A transparent polarisation sensitive phase pattern exhibits a position and polarisation dependent phase shift of transmitted light and it represents a unitary transformation. A quantum ghost image of this pattern is produced with hyper-entangled photons consisting of Einstein-Podolsky-Rosen (EPR) and polarisation entanglement. In quantum ghost imaging, a single photon interacts with the pattern and is detected by a stationary detector and a non-interacting photon is imaged on a coincidence camera. EPR entanglement manifests spatial correlations between an object plane and a ghost image plane, whereas a polarisation dependent phase shift exhibited by the pattern is detected with polarisation entanglement. In this quantum ghost imaging, the which-position-polarisation information of a photon interacting with the pattern is not present in the experiment. A quantum ghost image is constructed by measuring correlations of the polarisation-momentum of an interacting photon with polarisation-position of a non-interacting photon. The experiment is performed with a coincidence single photon detection camera, where a non-interacting photon travels a long optical path length of 17.83 m from source to camera and a pattern is positioned at an optical distance of 19.16 m from the camera.
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