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Orbital angular momentum correlations with a phase-flipped Gaussian mode pump beam

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Abstract

We report orbital angular momentum (OAM) and angle correlations between signal and idler photons observed when the nonlinear crystal used in spontaneous parametric down-conversion is illuminated by a non-fundamental Gaussian pump beam. We introduce a p-phase step to the transverse profile of the pump, before it impinges on the crystal to create a phase-flipped Gaussian mode, which is a close approximation to an HG10 Hermite–Gaussian-like beam. The correlations in OAM and angular position are then measured holographically using two separate spatial light modulators in the signal and idler arms. We show the transfer of the OAM spectrum of the pump to the down-converted fields, manifested as a redistribution in the OAM correlations consistent with OAM conservation. This corresponds to a modulation of the angular position correlations consistent with the Fourier relationship between the OAM and angle.