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A theoretical study of spectral properties of generalized chirped Hermite cosh Gaussian pulse beams in oceanic turbulence

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Abstract

Generalized Hermite cosh Gaussian (GHCG) beam has been produced as generalized beams with special profiles. The analytical expression of the intensity spectral of pulsed chirped GHCG beam passing through turbulent oceanic is derived using extended Huygens-Fresnel principle and the Fourier Transform method. The study examines various factors, including ocean turbulence, transverse position, and initial beam parameters, to understand their influence on the spectral intensity of the pulsed chirped GHCG beam by using numerical simulations. Moreover, the effects of both optical parameters and oceanic turbulence parameters on spectral shifts at different observation positions are discussed in detail. The blue shift and red shift of the spectrum on the axis increase with the increase of the transverse distance, which provides valuable insights into the behavior of the pulsed chirped GHCG beam as it propagates through turbulent oceanic environments. These findings offer a comprehensive understanding of the spectral transition of the pulsed chirped GHCG beam in such conditions and hold potential applications in information coding and transmission for marine communication systems.