

Interplay between the nonlinearity and the super-collimation of photonic crystals: New nonlinear optics and novel methods to control light beams

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Near the super-collimation frequency, we theoretically and numerically investigate the beam propagation in the photonic crystal made of the nonlinear material. Between the nonlinearity and the super-collimation, a novel interplay which causes new strong nonlinear effect is found, and a beam-envelope equation with unique form is also obtained. Based on the interplay, the beam-control properties are predicted and observed in the numerical experiments, such as the tunable collimation, the tunable beam-divergence angle, and the collimation self-locking. These properties can be utilized to function as fiber, lens and coupler, or to design new devices in photonic circuits.

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