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Numerical investigation of two-beam coupling in hybrid liquid crystal-photorefractive cells using the finite-difference time-domain method THOMAS E. LANIER, WILLIAM M. DENNIS, Department of Physics and Astronomy, University of Georgia, GARY COOK, DEAN R. EVANS, Air Force Research Laboratory, VICTOR RESHETNYAK, Physics Faculty, National Taras Shevchenko University of Kyiv — Photorefractive two-beam coupling is a nonlinear optical phenomenon that finds application in a range of photonic devices. The spatially modulated refractive index due to the space-charge field that arises from the interference pattern generated by crossed laser beams is responsible for two-beam coupling in photorefractive materials. Penetration of this field into the region surrounding the photorefractive results in the reorientation of liquid crystal molecules, providing a mechanism for enhancement of two-beam coupling. We present a numerical investigation of two-beam coupling in organic-inorganic hybrid cells consisting of a liquid crystal layer sandwiched between two photorefractive windows. Finite-difference time-domain calculations of beam propagation in such hybrid cells are carried out using the electric permittivity tensor field derived from the liquid crystal director spatial profile in steady state.

Thomas E. Lanier
Department of Physics and Astronomy, University of Georgia

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