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Numerical modeling of mutual interaction between multi-color laser beams in plasmas S. AUSTIN YI, SERGUEI KALMYKOV, GENNADY SHVETS, Department of Physics and Institute for Fusion Studies, The University of Texas at Austin — The propagation, electromagnetic cascading, and mutual interaction of weakly-relativistic multi-color laser beams in tenuous plasmas is investigated numerically. We model the laser propagation in the paraxial approximation, taking into account local beam-beam interaction through both the density perturbations due to the plasma wake and the relativistic mass corrections. Long laser beams are assumed, so that the density perturbations are due to the instantaneous plasma response to the periodic ponderomotive force. The resulting set of coupled nonlinear wave equations governs the evolution of the laser cascade envelopes. We solve these equations numerically using several pseudospectral methods. This model is used to investigate the mutual interaction of multi-color laser beams propagating non-collinearly in plasmas. It is demonstrated that laser beams with difference frequency slightly above (below) the plasma frequency mutually repel (attract). We also use this model to investigate the collinear propagation of the electromagnetic cascade, and the enhancement or suppression of relativistic self-focusing. These results are in good agreement with fully relativistic PIC simulations from the code WAKE.

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