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Soliton collisions for the Kundu-Eckhaus equation with variable coefficients in an optical fiber

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Abstract

Under invesigation in this paper is a Kundu-Eckhaus equation with variable coefficients, which models the propagation of the ultra-short femtosecond pulses in an optical fiber. Bright one- and two-soliton solutions for this equation are constructed, based on the bilinear forms obtained. Then, by the aid of the solutions, propagation of the one solitons and collisions between the two solitons are illustrated in figures, and with the help of the asymptotic analysis on the two-soliton solutions, the collisions are proved to be elastic. Influences of $r(x)$ and $m(x)$ on the solitons are also be analyzed, where $r(x)$ and $m(x)$ are respectively the group velocity dispersion, nonlinearity parameter: When they are both chosen as the constants, it can be found that the one solitons propagate with unvarying velocities and amplitudes, and shapes of the two solitons are maintained before and after the collisions; $r(x)$ and $m(x)$ are found to affect the velocities and amplitudes of the solitons, respectively.

Keywords: Kundu-Eckhaus equation with variable coecients; Optical fiber; Bright soliton solutions; Soliton collisions

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