

N-fold Darboux transformation and soliton solutions for the relativistic Toda lattice equation

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Abstract

In this paper, the relativistic Toda lattice (RTL) equation is investigated via N-fold Darboux transformation (DT) technique. Basing on the Lax pair and gauge transformation, we construct N-fold DT of the RTL equation, and derive two kinds of the N-fold explicit exact solutions from two different seed solutions. Structures of the one-, two-, three- and four-soliton solutions and periodic solutions which have important applications are shown graphically. By studying the elastic interactions among four-soliton solutions, we confirm those solutions' shapes and amplitudes don't change after the interaction, which are the main characteristics of solitons. In particular, we present the relationship between the structures of exact solutions and the parameters with $N=1$. Results in this paper might be helpful for interpreting certain physical phenomena.

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