

Riemann-Hilbert approach and N-soliton solutions for a new four-component nonlinear Schrödinger equation

Xin-Mei Zhou¹, Shou-Fu Tian¹, Jin-Jie Yang¹, and Jin-Jin Mao¹

¹China University of Mining and Technology

May 5, 2020

Abstract

A new four-component nonlinear Schrödinger equation is first proposed in this work and studied by Riemann-Hilbert approach. Firstly, we derive a Lax pair associated with a 5×5 matrix spectral problem for the four-component nonlinear Schrödinger equation. Then based on the Lax pair, we analyze the spectral problem and the analytical properties of the Jost functions, from which the Riemann-Hilbert problem of the equation is successfully established. Moreover, we obtain the N -soliton solutions of the equation by solving the Riemann-Hilbert problem without reflection. Finally, we derive two special cases of the solutions to the equation for $N=1$ and $N=2$, and the local structure and dynamic behavior of the one-and two-soliton solutions are analyzed graphically.

Hosted file

FCNLS-MMAS.pdf available at <https://authorea.com/users/302438/articles/432522-riemann-hilbert-approach-and-n-soliton-solutions-for-a-new-four-component-nonlinear-schr%C3%B6dinger-equation>