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Bright, Dark N-Soliton Solution of Fokas-Lenells Equation Using Hirota Bilinearization Method

Authors : Sagardeep Talukdar, Riki Dutta, Gautam Kumar Saharia, Sudipta Nandy

Abstract : In non-linear optics, the Fokas-Lenells equation (FLE) is a well-known integrable equation that describes how ultrashort pulses move across the optical fiber. It admits localized wave solutions, just like any other integrable equation. We apply the Hirota bilinearization method to obtain the soliton solution of FLE. The proposed bilinearization makes use of an auxiliary function. We apply the method to FLE with a vanishing boundary condition, that is, to obtain a bright soliton solution. We have obtained bright 1-soliton and 2-soliton solutions and propose a scheme for obtaining an N-soliton solution. We have used an additional parameter that is responsible for the shift in the position of the soliton. Further analysis of the 2-soliton solution is done by asymptotic analysis. In the non-vanishing boundary condition, we obtain the dark 1-soliton solution. We discover that the suggested bilinearization approach, which makes use of the auxiliary function, greatly simplifies the process while still producing the desired outcome. We think that the current analysis will be helpful in understanding how FLE is used in nonlinear optics and other areas of physics.

Keywords : asymptotic analysis, fokas-lenells equation, hirota bilinearization method, soliton
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