LINEAR ANALYSIS OF EXTENDED INTEGRABLE NONLINEAR LADDER NETWORK SYSTEM

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S u m m a r y

The nontrivial integrable extension of a nonlinear ladder electric network system characterized by two coupling parameters is presented. Relying upon the lowest local conservation laws, the concise form of the general semidiscrete integrable system is given, and two versions of its self-consistent reduction in terms of four true field variables are found. The comprehensive analysis of the dispersion equation for low-amplitude excitations of the system is made. The criteria distinguishing the two-branch and four-branch realizations of the dispersion law are formulated. The critical values of adjustable coupling parameter are found, and a collection of qualitatively distinct realizations of the dispersion law is graphically presented. The loop-like structure of the low-amplitude dispersion law of a reduced system emerging within certain windows of the adjustable coupling parameter turns out to reproduce the loop-like structure of the dispersion law typical of beam-plasma oscillations in hydrodynamic plasma. The richness of the low-amplitude spectrum of the proposed ladder network system as a function of the adjustable coupling parameter is expected to stimulate even the more rich dynamical behavior in an essentially nonlinear regime.