

Composition Relation between Gap Solitons and Bloch Waves in Nonlinear Periodic Systems

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Abstract: We show with numerical computation and analysis that Bloch waves, at either the center or edge of the Brillouin zone, of a one dimensional nonlinear periodic system can be regarded as infinite chains composed of fundamental gap solitons (FGSs). This composition relation between Bloch waves and FGSs leads us to predict that there are n families of FGSs in the n th band gap of the corresponding linear periodic system, which is confirmed numerically. Based on this composition relation, it becomes clear that all high-order gap soliton, and other stationary solutions of a one-dimensional nonlinear periodic system can be regarded as composed of these FGSs. In other words, FGSs are building blocks for the stationary solutions of one-dimensional nonlinear periodic system.

References:

1. Y. Zhang and B. Wu, Phys. Rev. Lett. 102, 093905 (2009).