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A coupled system of ϕ^4 and sine-Gordon fields

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Abstract
Pairing fields can lead to the emergence of new phenomena. In the classical fields and nonlinear systems, a lot of research has been done on the solitary and soliton solutions of these systems. In the literature, usually, we see the coupling of two ϕ^4 systems, or two sine-Gordon systems. The sine-Gordon system has various solutions, all of which are well-behaved, and its soliton solutions are well known. On the other hand, the ϕ^4 system, which is very important in field theory, has solitary solutions, but no soliton solutions. For example, a bound solution cannot be made from a pair of kink and anti-kink; or these two solutions will not survive after collision, and will be destroyed. In this research, we couple a ϕ^4 system to a sine-Gordon system, in order to extend the stability from the sine-Gordon system to the ϕ^4 system. We have shown that , for a coupled ϕ^4 and sine-Gordon system, this expectation is partially fulfilled.

Keywords: coupled fields, soliton, ϕ^4 system, sine-Gordon system

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