Journal of Statistical Physics, Vol. 54, Nos. 5/6, 1989

Propagation and Stability of Kinks in Driven and Damped Nonlinear Klein–Gordon Chains[1]

M. Büttiker[2] and H. Thomas[3]

Received March 30, 1988; revision received July 22, 1988

We consider the propagation of kinks in an elastic chain in a bistable or multistable potential under the action of a driving force [M. Büttiker and H. Thomas, *Phys. Rev. A* **37**:235 (1988)]. Each element of the chain is subject to a damping force proportional to its velocity. We show that both the propagation velocity of the kinks as a function of the driving field, and the kink width as a function of propagation velocity, are determined by characteristic functions which depend only on the form of the potential. These functions can be found by considering a single particle moving in the upside-down potential of the chain. The general properties of these functions are studied and illustrated by several examples. The stability of these driven kinks is discussed. Interestingly, we find in addition to the expected discrete localized eigenmodes a two-dimensional continuum of oscillatory modes with a localized envelope.

KEY WORDS: Kink propagation; kink width; characteristic functions; stability; continuum of modes.

[1] This paper will appear in a forthcoming issue of the *Journal of Statistical Physics.*

[2] IBM Thomas J. Watson Research Center, Yorktown Heights, New York 10598.
[3] Institut für Physik, Universität Basel, 4056 Basel, Switzerland.

0022-4715/89/0300-1427$06.00/0