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KINKS IN STRIPE FORMING SYSTEMS UNDER TRAVELING WAVE FORCING

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Abstract. We study domain walls in stripe forming systems that are externally forced by a periodic pattern, which is close to spatial resonance of 2:1 (the period of the forcing being half of the internal wavelength) and moving relative to the internal pattern. Two transitions are identified: A transition where the pattern lags behind the forcing as the forcing becomes too fast and a spontaneous symmetry-breaking transition of walls (kinks). The departure from perfect resonance is found to render the kink bifurcation imperfect and causes the walls to drift. We study the velocity of the kinks, which behaves strongly nonlinear close to the transitions. A phase approximation is used to understand the behavior and is found to be valid in a large range of parameters. Results from the phase equation can be generalized to hold for different ratios n:1.

1. Introduction.

Patterns in non-equilibrium systems provide many examples of complex states that can be identified with solutions of model equations. These equations, obtained by perturbative techniques, describe spatiotemporal behavior close to a primary pattern-forming transition of a system. In the last decades their derivation and analysis for systems from hydrodynamics, chemical reactions, biophysics, and other sciences has been greatly advanced [1]. It is now well-understood how the type of instability and the symmetry of the system determine the form of the model equations and the scenarios for spatio-temporal transitions. Additional effects such as external forcing of the system can be incorporated in a controlled way [2, 3]. Recently the analysis of the accordingly modified equations has become important as the number of experiments and applications of forcing and control of non-equilibrium systems is strongly increasing.

Various types of forcing, regular or chaotic, spatial or temporal, have been considered in a number of experimental and theoretical studies [4, 5, 6, 7]. Purely temporal forcing was shown to cause frequency locking and reorganization of the

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