

Abstract for GR-TR Conference on Statistical Mechanics and Dynamical Systems

Talk Invited

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An almost exactly solvable charge density wave system

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Charge density wave (CDW) systems refer to elastically-coupled particle systems, in which each particle is subject to a periodic potential with a random phase-offset. When driven by an external driving force F , CDWs exhibit threshold behavior with threshold force F_T , such that for $F < F_T$ all configurations are static (pinned), while for $F > F_T$ the CDW slides.

It has been argued long time ago that the depinning transition of CDWs constitutes a dynamic critical phenomenon [1, 2]. CDWs exhibit glassy dynamics [3] as well as diverging strains [4] and polarizations [5], as the threshold force F_T is approached from below or above.

In this talk we will motivate and present a CDW system that is simple enough to submit to analytical treatment, yet complex enough to capture all the features of criticality near threshold. In particular, we will focus on the subthreshold behavior, describe the characteristics of the CDW configurations as threshold is approached from below and derive analytical expressions for the threshold force as well as the configurations at and near threshold.

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- [1] D. S. Fisher, *Phys. Rev. Lett.* **50**, 1486 (1983); *Phys. Rev. B* **31**, 1396 (1985).
 - [2] Onuttom Narayan and Daniel S. Fisher, *Phys. Rev. Lett.* **68**, 3615 (1992); *Phys. Rev. B* **46**, 11520 (1992).
 - [3] E. Veermans, A. Erzan, R. Heijungs and L. Pietronero, *Physica A* **166**, 447 (1990).
 - [4] S. N. Coppersmith, *Phys. Rev. B* **44** 7799 (1991).
 - [5] A. A. Middleton and D. S. Fisher *Phys. Rev. Lett.* **66**, 92 (1991); *Phys. Rev. B* **47**, 3530 (1993).