Abstract Submitted
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Theory of Ferromagnetic Transition in One-Dimensional Itinerant Electron Systems[1] KUN YANG, Florida State University — Ferromagnetic transitions in itinerant electron systems are among the very first examples of quantum phase transitions studied theoretically. In the Hertz-Millis approach, one decouples the electron-electron interaction using Hubbard-Strotonovish transformation, integrates out the fermionic degrees of freedom, and arrives at a free energy functional that involves the ferromagnetic order parameter only. It has been pointed out recently that the procedure of integrating out gapless fermions may lead to subtle singularities in the bosonic free energy functional, which may complicate the analysis of the theory or even invalidate this approach. In this work we offer an alternative approach of obtaining a bosonic Ginsburg-Landau-Wilson theory that describes ferromagnetic transition in one-dimension. Our approach is based on Abelian bosonization, which allows for a derivation the effective field theory without integrating out fermions. The resultant theory is shown to have dynamical exponent z=2 at tree level and upper critical dimension 2. Thus one dimension is below the upper critical dimension of the theory, and the critical behavior of the transition is controlled by an interacting fixed point, which we study via epsilon expansion. Comparisons will be made with the Hertz-Millis theory, and possible generalizations to high dimensions will be discussed.

[1]Phys. Rev. Lett. 93, 066401 (2004).

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