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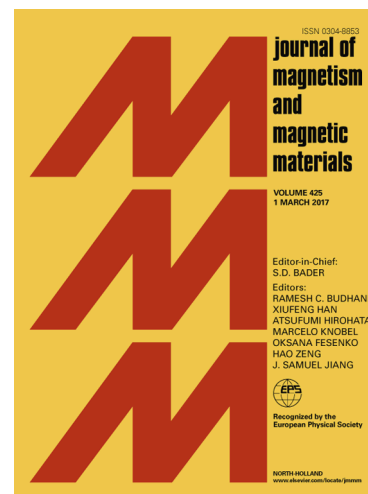
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Effects of disorder on the spin wave spectra of ferromagnetic ultrathin films: a critique of native effective medium approaches

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Abstract

We show that the neglect of vertex corrections in the calculation of the dynamic transverse spin susceptibility for disordered systems can lead to qualitatively incorrect predictions regarding spin wave energies and even the stability of the ferromagnetic ground state. We show numerical evidence indicating that the most critical approximation is the neglect of vertex correction in the RPA equation.

Keywords: disorder, magnetic ultrathin film, RPA, spin, magnetic material, nanostructure, metal system impurity, vertex correction

1. Introduction

Disorder is ubiquitous in real samples, but its effects on dynamical phenomena are notably hard to address theoretically. Effective medium techniques have been employed with some success to investigate equilibrium (ground state) properties, but studies of dynamical properties in disordered systems are rare. In the 1960's and 1970's much attention was devoted to the problem of the exchange stiffness of ferromagnetic alloys, and effective medium theory attained a remarkable success. [1, 2, 3, 4, 5] The exchange stiffness constant is, however, an equilibrium property, and the realm of dynamic properties of non-crystalline

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