SYNCHRONIZATION AMONG SPIN-WAVE AMPLITUDES IN CHAOTIC NONLINEAR FERROMAGNETIC RESONANCE

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9.7 cm

A model of chaos in high-power ferromagnetic resonance in coincidence regime, based on three-magnon interactions of the uniform mode with a group of pairs of parametric spin waves, is investigated numerically. The results are interpreted from the point of view of chaotic synchronization theory. If all spin waves are identical, all of them are excited above the first-order Suhl instability threshold and in the chaotic regime their amplitudes show marginal synchronization, i.e. they differ only by a multiplicative factor, constant in time. If spin waves have slightly different instability thresholds, only one or few of them are excited. In the latter case, addition of weak thermal noise changes the results qualitatively. For low rf field amplitude, but above the threshold for chaos, still only few spin-wave pairs are excited above the thremal level. For higher rf field amplitdue all spin waves in the group are excited, and their amplitudes are not synchronized. These results suggest that low correlation dimension of chaotic attractors, observed often in nonlinear ferromagnetic resonance, can be connected with chaotic synchronization among spin-wave amplitudes, in particular just above the threshold for chaos.

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