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Spin current induced nonlinear modes via a nanocontact for thin magnetic films

A fully nonlinear Landau-Lifshitz type model of spin wave excitation in a thin ferromagnetic film is introduced. This zero temperature theory, in the limit of small amplitudes, is approximated with a cubic complex Ginzburg-Landau (CGL) type equation. A steady mode solution of this model and its nonlinear frequency shift are found using perturbation techniques which agree with direct numerical simulations. This model shows that nonlinearity is essential for producing excitation frequencies observed in experiments. In addition, large amplitude magnetic solitons are predicted by the model, which is used to explain recent experimental results.