**Noise and retardation effects in the Landau-Lifshitz-Gilbert equation**

T. Bose and S. Trimper

*Martin-Luther-Univerity Halle, Institute of Physics,*
*Von-Seckendorff-Platz 1, 06120 Halle, Germany,*
*E–mail: thomas.bose@physik.uni-halle.de*

The Landau-Lifshitz-Gilbert equation describing the precession and the damping of collective spin wave excitations is generalized twofold, by the inclusion of retardation effects as well as stochastic magnetic fields. In case of a pure spatial dependent retardation kernel of the width $\xi$ and the strength $\Gamma_0$, the self-organized internal magnetic field is supplemented by a time dependent stochastic force of strength $D$ and a finite correlation time $\tau_c$. The corresponding Fokker-Planck equation enables us to calculate the mean values of the components of the magnetization. Within the spin wave approximation, valid in the long wave-length limit, we find an analytical solution for the dispersion relation and the damping of the spin wave excitation. In particular, we analyze the spin-wave life-time $\tau_L$ and the line width $\Delta B$ according to ferromagnetic resonance (FMR) experiments in dependence on the before introduced quantities. Whereas the life-time decreases with increasing temporal noise strength $D$, retardation strength $\Gamma_0$ as well as correlation time $\tau_c$ it is enhanced for growing width $\xi$ of the spatial kernel. In the same manner we calculate the measurable FMR-line width $\Delta B$ depending on the model parameters, e.g. it offers a strong increase when the correlation time $\tau_c$ ranges in the nanosecond interval.