Non-Equilibrium Spin Dynamics in the Subpicosecond Regime

ADNAN REBEI, Seagate Technology — Femto-second laser pulses are becoming an important tool that allows us to explore non-equilibrium spin dynamics at short time (high frequency) scales [1]. It has therefore become apparent [2] that more rigorous treatments are needed to correctly address spin relaxation at these energies. I will show how functional-methods of calculations of correlation energies in electron gas [3] can be successfully adapted to the problem of relaxation in magnetic systems [4]. The study of short time response entails a careful treatment of initial conditions. Our formalism naturally takes care of this and avoids the assumption that the system has been in equilibrium in the infinite past, an assumption common in Boltzmann-type treatments. As an example, we discuss possible non-equilibrium effects due to ultrasonic attenuation on spin relaxation when the magnon sub-system is initially near the Curie point.