Mechanisms related to exchange magnons induced by picosecond acoustic pulses

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The discovery ultrafast demagnetization by femtosecond laser pulses in 1996 [1] open the new and booming field of ultrafast laser manipulation of magnetization [2,3]. This control of magnetization precession is a key for further development in spintronic. Magnetization dynamics induced by a pump laser pulse could be sort in different categories [4]: thermal effects, photomagnetic effects, and optomagnetic. Nevertheless, the magnetic system of ordered substances is coupled with other systems as the elastic system, which can drive the magnetization. In the case of a single ferromagnetic, we can limit our consideration just to two mechanisms: laser-induced heating and phonon-magnon interactions.

This presentation will focus only on phonon-magnon interactions. We consider the generation and propagation of magnons due to the propagation of picosecond acoustic pulses. We will present in detail the mechanism that are at stack and we will describe the spin movement.

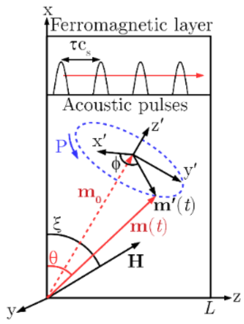

Fig. 1. Scheme of the precession P movement of the magnetization vector **m** around an equilibrium position $\mathbf{m_0}$ induced by the propagation of picosecond acoustic pulses at the sound velocity of c_s.with a delay of τ between them.

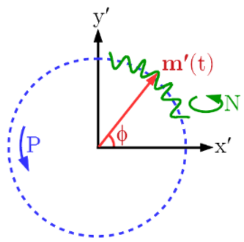

Fig. 2. Scheme of the spin's movement composed by the precession P and the nutation N.

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