On The Ultra-Fast Ion Induced Demagnetization in Thin Films

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Abstract. In this paper we discuss ion-induced ultra fast demagnetization and present an approach for experimental investigation of the following magnetization dynamics. The effect, if confirmed, might have applications in spintronics, micro-scale power generation or communication and for basic research in the area of ion track formation as a mean to observe thermodynamics in ion tracks. The proposed approach lies in using magnetic antenna for detection of the field change induced by ion stopping and converting the field change to electrical signal. The approach was confirmed feasible, providing temporal resolution below 100ps in tests with other fast impulse heat source – a femtosecond laser. Presented experimental results and simulations based on ion-induced thermal spike model show a necessity to develop broadband antennas with high sensitivity and micro-scale dimensions together with specialized high frequency amplifier electronics, in order to allow observation of ultra-fast ion-induced demagnetization.