TITLE: Investigation of spin structure and dynamics in magnetically ordered thin films

AUTHOR: Tomáš Janda

ABSTRACT: This thesis is devoted to the development of methods for imaging and ultrafast manipulation of magnetic textures, such as magnetic domains and domain walls (DWs), and to the investigation of the corresponding magnetization dynamics. We focused on techniques that are, besides ferromagnets (FMs), applicable also to antiferromagnets (AFs), in particular, AF thin films. The employed excitation techniques were mostly based on direct or indirect effects of ultrashort laser pulses. We studied the DW motion induced by a transfer of angular momentum from circularly polarized femtosecond laser pulses in a FM GaMnAsP and we found that the observed macroscopic DW displacement is only possible due to its inertia. In a distinct experiment, picosecond current pulses were generated by an absorption of the ultrashort laser pulses in a vertical PIN diode-based photoconductive switch and used to excite a magnetic film deposited directly on top of the diode. For imaging of AF domain patterns, we developed a simple table-top laser-scanning technique, which is based on a magneto-thermoelectric response of the AF textures in the presence of a local laser-induced heating. We first used the method to image the domain structure in a collinear AF CuMnAs utilizing anisotropic magneto-Seebeck effect and we studied the response of the domain pattern to a current pulse excitation. Subsequently, the laser-scanning technique was applied to a non-collinear AF, Mn_3Sn, where the domain structure was visualized via anomalous Nernst effect and the localized laser heating combined with moderate magnetic fields was used also to write magnetic domains.