Detection of magnetization fluctuations using the magneto-optical Kerr effect

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Owing to the fluctuation-dissipation theorem, the magnitude of magnetization fluctuations (spin noise) in magnetic materials is connected with the AC magnetic susceptibility [1, 2]. Fluctuation measurements can thus be used to gain insights into the intrinsic properties of magnetic samples in equilibrium, i.e., without external excitation.

We study magnetic fluctuations in Pt/Co/AlOx multilayer thin films with perpendicular magnetic anisotropy. To this end, we exploit the magneto-optical Kerr effect (MOKE) as a direct measure of the magnetization. In particular, we use a Kerr microscope to record spatially-resolved MOKE data. While this in principle enables the investigation of spatial correlation effects between different regions of the sample, the limited digitizing depth and intrinsic noise of the microscope camera hampers meaningful measurements. We thus compare different data taking protocols in terms of their noise performance. Our results show that the microscope camera must be carefully optimized to enable meaningful magnetic noise measurements with this approach.

References:

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