Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
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Pattern evolution and fluctuations in a magnetic model system

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Abstract

Competition between attractive short range and repulsive long range interactions may lead to intricate pattern formation that can be observed in diverse complex systems. In such systems, usually a strong but short range interaction favors a uniform phase, but is in competition with a much weaker long range interaction that favors mixing of phases. As a result the order parameter of the system is modulated on length scales determined by the strength of the competing interactions. Pattern formation is manifested in a large variety of shapes and sizes, the most widely studied being stripe and bubble domain formation.
We are interested in pattern formation and transformation, i.e. non-repetitive phenomena taking place on long time scales between nanoseconds up to several seconds. Not much attention has been paid to these phenomena, one of the reasons being the lack of a non-repetitive magnetic microscopy method with high spatial (< 100 nm) and temporal resolution (< 1 ms).
In this talk I will present data obtained using a fast imaging technique based on the recently developed technique of threshold photoemission magnetic circular dichroism (TP-MCD) in combination with photoemission electron microscopy (PEEM). We achieve large magnetic contrast of several percent in the laboratory using circularly polarized visible light allowing us to image fluctuations and pattern transformation of the domain structure of perpendicularly magnetized Fe/Ni/Cu(001) thin films.

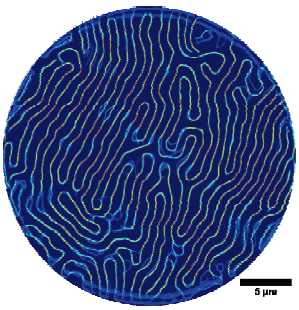

Figure 1: Visualization of domain fluctuations in a perpendicularly magnetized Fe/Ni/Cu(001) thin film obtained by time resolved TP-MCD-PEEM, field of view 28 micrometer, sum of 2738 images, frame rate 24 fps.