Noise Measurements on MnSi thin films

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Abstract

Noise measurements are supposed to be a powerful tool to study the dynamical properties of a driven lattice of magnetic skyrmions. In analogy to the properties of driven superconducting vortices, broad-band and narrow band noise is expected to probe the microscopic pinning potential and low-frequency dynamics of the skyrmion lattice. We present first measurements of fluctuation spectroscopy on epitaxial grown MnSi thin film samples, which are expected to show a larger amplitude of fluctuations due to their strongly reduced volume as compared to bulk systems and enhanced absolute resistance values. We observe generic $1/f$-type noise, however with only a weak temperature dependence and no signatures of a magnetic skyrmion phase, which may be explained by electronic inhomogeneities or the absence of a well-defined skyrmionic phase in these samples subject to substrate-induced strain. Upon approaching the helical magnetically ordered phase in zero field, we observe an enhancement of the $1/f$-type fluctuations and two-level switching of a characteristic energy, possibly related to the switching of magnetic grains/clusters.

Index Terms

fluctuation spectroscopy, thin films, skyrmions, $1/f$-noise

REFERENCES