

# SIMULATING MAGNETIC DOMAIN WALL DYNAMICS: FUTURE DEVICES FOR APPLICATIONS

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ABSTRACT. Magnetic materials have been extensively used in applications for recording and sensing devices with outstanding success, influencing our life during the last fifty years. However, the engineering of such devices is now reaching its physical limit and new ways to manipulate matter and store information in it are being investigated. Spintronic, the study and manipulation of the spin of electrons opened a new area of research in condensed matter physics in recent years, leading to a completely new approach to electromagnetism problems and nanotechnology applications. The laws governing the dynamics of these systems at the nanoscale rise from both semiclassical and quantum effects. In my thesis I focus on the study of magnetic domain wall dynamics in different systems and materials, in close contact with experimental groups, performing numerical simulations of such systems, integrating the equations of dynamics that describe them and trying to predict experimental results or help in their interpretation. After a brief introduction to the topic and why it has become of interest, I will try to share my opinion on what is the role of a mathematician in such a field of research and why it fascinates me, showing some of the latest results of my work.

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