

Fast vortex core switching at moderate temperatures

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Ferromagnetic vortex core switching is investigated using micromagnetic simulations. For that the OOMMF program is used [1] together with a temperature extension we have developed recently [2,3]. This is a continuum micromagnetic approach where the well-known Landau-Lifshitz-Gilbert equation (valid for zero temperature) is replaced by the recently proposed Landau-Lifshitz-Bloch equation [4]. Thus, temperatures up to the Curie temperature can be modeled.

In our research we simulate switching of a ferromagnetic vortex core in a flat disk (diameter 200 nm, thickness 20 nm) with material parameters that resemble permalloy. Temperatures in the range 400 K to 700 K are considered [3]. Switching itself is caused by a very short applied oscillation magnetic pulse oscillation. Parameters used resemble conditions met in the experiment [5]: oscillation period ca. 140 ps (equal to the peak width) and amplitude 60 mT (in lower temperatures).

References:

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