

Time-resolved x-ray imaging with HERALDO

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The magnetisation dynamics of the vortex core and Landau pattern of magnetic thin-film elements has been studied using holography with extended reference autocorrelation by linear differential operator (HERALDO)^{1,2}. Here we present the first time-resolved x-ray measurements using this technique and investigate the structure and dynamics of the domain walls after excitation with nanosecond pulsed magnetic fields³. It is shown that the average magnetisation of the domain walls has a perpendicular component that can change dynamically depending on the parameters of the pulsed excitation. In particular, we demonstrate the formation of bloch-point excitations, which are generated in the domain walls and can propagate inside them during the cyclic motion of the vortex core. Based on numerical simulations we also show that, besides the core, there are four singularities formed at the corners of the pattern. The polarisation of these singularities has a direct relation to the vortex core, and can be switched dynamically by the wave bullets excited with a magnetic pulse of specific parameters. The subsequent dynamics of the Landau pattern is dependent on the particular configuration of the polarisations of the core and the singularities.

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