1/f noise in patterned GMR spin valves

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[C22.03] 1/f Noise in patterned GMR spin valves.

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We demonstrate that 1/f noise is a sensitive probe for the micromagnetic aspects of the switching behavior in multilayered systems and spin valves, which show the Giant Magnetoresistance (GMR) effect. We studied patterned Ta/Ni_80Fe_20/Cu/Ni_80Fe_20/FeMn spin valves. Similar studies were performed on single Ni_80Fe_20 films, which show the anisotropic magnetoresistance (AMR) effect. First, we have found that the magnetoresistance effect itself transforms magnetic fluctuations into resistance fluctuations contributing to 1/f noise. This leads to an increased noise output as the sensitivity (\sim dR/dH) of the spin valve is increased. Second, we have found a relation between the 1/f noise amplitude and micromagnetic effects (domain wall nucleation and pinning, ripple, etc.). These potential noise sources can be visualised by means of Kerr and Lorentz microscopy. Third, the role of interfacial scattering, the free and the exchange biased NiFe layer (in a crossed or parallel anisotropy configuration) and an incomplete exchange biasing is discussed. In order to seperate their contributions, we have performed noise experiments for various layer thickne! sses and compositions.

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