

1/f noise in patterned GMR spin valves

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Session C22 - Magnetic Heterostructures: GMR in Multilayers.

MIXED session, Monday afternoon, March 18

Room 130, America's Center

[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/Ni₈₀Fe₂₀/Cu/Ni₈₀Fe₂₀/FeMn spin valves. Similar studies were performed on single Ni₈₀Fe₂₀ 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 separate their contributions, we have performed noise experiments for various layer thicknesses and compositions.

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