Frequency-selective control of FMR linewidth in magnetic multilayers

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We report on broadband ferromagnetic resonance (FMR) studies of magnetic multilayer stacks comprised of an exchange-biased synthetic antiferromagnet (SAF) and a metallic free layer, both separated by an MgO barrier. These studies reveal a significant frequency-specific, anisotropic linewidth broadening of the FMR excitation of the NiFe free layer, as shown in Fig.1.

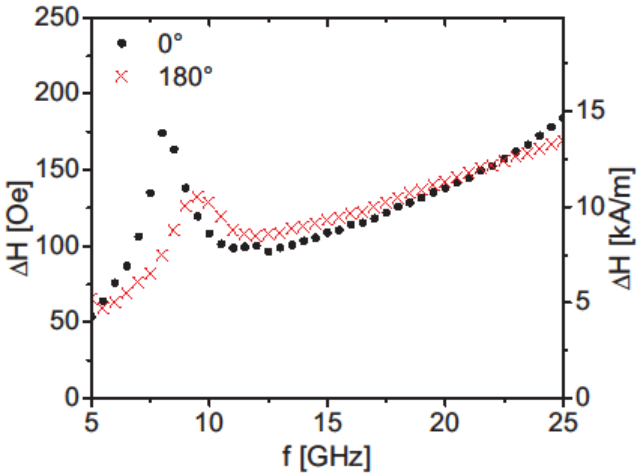

Fig. 1: Free layer FMR linewidth versus excitation frequency for the parallel and anti-parallel orientation of the pinning direction of the SAF with respect to the external magnetic field.

Our investigations show that this linewidth broadening occurs at frequencies where the FMR modes of the free layer and the SAF are degenerate. Its origin is the dynamic dipolar coupling of the FMR modes of both the free layer and the SAF. The anisotropy of this linewidth broadening is caused by the anisotropy of the exchange-bias pinned SAF. We demonstrate that can tailor the relaxation of magnetization dynamics in a free layer in a frequency and angle specific way by modifying various parameters of the magnetic multilayer stack under investigation.