Resonant magneto-acoustic switching for in-plane and out-of-plane anisotropy using Rayleigh waves

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Precessional switching allows sub-nanosecond and deterministic reversal of magnetic data bits: a large angle, highly non-linear, precession of magnetic moments is triggered around a bias field, and stopped at the right moment. Whereas this trigger is usually a pulsed external field, we use the effective rf field generated by inverse magnetostriction by a surface acoustic wave (SAW) on a magnetic layer. Here we show that SAW bursts can irreversibly switch the magnetization in both in-plane and out-of-plane materials: (Ga,Mn)As and (Ga,Mn)(As,P)[1], and that it is directly correlated to their resonant absorption. The influence of the SAW wave-vector and frequency were studied. By exciting a stationary wave with two counter-propagating SAWs, we have moreover imprinted and positioned with sub-micron precision a striped magnetic pattern.

References:

[1] L. Thevenard, I. S. Camara, S. Majrab, M. Bernard, P. Rovillain, A. Lemaître, C. Gourdon, and J.-Y. Duquesne, Phys. Rev. B (2016)