REVERSAL OF NANOMAGNETS ON YTTRIUM IRON GARNET BY PROPAGATING SPIN WAVES

Complete Result

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Micromagnetic simulations showed that ferromagnetic nanoelements controlled the interference of spin waves (magnons) in low-damping yttrium iron garnet (YIG) and gave rise to a neural network enabling neuromorphic computing [1]. Still, magnonics would be even more promising for computation at low-energy consumption if nonvolatile magnetic bits could store directly magnon signals. I will report on our experiments which show that magnons with wavelengths down to 99 nm in YIG induce the reversal of bistable nanomagnets assisted by a small bias field [2]. We combine broadband spin-wave spectroscopy, micro-focus Brillouin light scattering and magnetic force microscopy and study the magnon-induced reversal depending on the YIG thickness, interface properties, nanomagnet shape, the magnon amplitude and their propagation length over 100 μm. The magnon-induced reversal is found to be a robust effect [2] and contributes to the progress of on-chip devices which combine the concept of a neural network with an embedded magnonic memory.
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References:

[1] Papp A., Porod W., Csaba G. (2021). Nat. Commun. 12, 6422.

[2] Baumgaertl K., Grundler D. (2023). Nat. Commun. 14, 1490; Joglekar S. et al. (2023). https://arxiv.org/abs/2312.09177; Mucchietto A. et al. (2023). https://arxiv.org/abs/2312.15107 .