Exploiting Interaction of spin waves with Domain Walls for magnonic applications

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In magnonics, spin waves serve as low-loss carriers of information, enabling the operation of wave-based devices. Interactions between magnons and domain walls offer great potential for enhancing the capabilities of magnonic and spintronic devices. Using micromagnetic simulations, we study the interaction between domain walls (DWs) and propagating spin waves (SWs) in a magnetic thin nanostrip. We demonstrate that the velocity and direction of DW motion, which can reach 1–100 m/s [1], depend on the frequency and amplitude of SWs, particularly on the DW type. We systematically investigate the correlation between the transmission and reflection of SWs from the DW and the speed and direction of DW propagation in the low-frequency (GHz) range. We also extend our investigation to study the interaction of propagating spin waves with multiple DWs in the nanostrip [2]. Our analysis reveals DW-type-specific behavior, providing insight into magnon-DW interactions and their potential exploitation for energy-efficient, reconfigurable magnonic devices [3], [4].

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