# Domain-wall based spin-Hall nano-oscillators

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In the last decade, two revolutionary concepts in nano magnetism emerged from research for advanced information processing and storage technologies. The first suggests the use of magnetic domain walls (DWs) in ferromagnetic nanowires to permanently store information in DW race-track memories[1]. The second proposes a hardware realization of neuromorphic computing[2,3] in nanomagnets using nonlinear magnetic oscillations in the GHz range. Both ideas originate from the transfer of angular momentum from conduction electrons to localized spins in ferromagnets, either to push data encoded in DWs along nanowires or to sustain magnetic oscillations in artificial neurons. Even though both concepts share a common ground, they live on very different time scales which rendered them incompatible so far. Here, we bridge both ideas by demonstrating the excitation of magnetic auto-oscillations inside nano-scale DWs using pure spin currents.

We fabricated a zig-zag structure from a Pt/CoFeB bilayer, and created the domain walls at the kinks. A charge current was applied to the structure, and the magnon intensity at the kink was measured by Brillouin light scattering microscopy. The magnon excitation depending the direction of the charge current was observed in the domain walls. It revealed that the auto-oscillation was driven by pure spin currents from the Pt layer.

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