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Chiral damping in magnetic domain walls dynamics

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Domain wall (DW) motion in materials with structural inversion asymmetry (SIA) and high spin-orbit coupling has attracted much interest in the recent years due to the discovery of unexpected physical mechanisms. Especially, it has been shown that the DW dynamics in such materials can be explained by chiral DWs with (partly or fully) Néel structure, whose stability derives from an interfacial Dzyaloshinskii-Moriya interaction (DMI) [1]. In this work, we show that DMI is not the only effect inducing chiral dynamics and demonstrate the existence of a chiral damping. This result is supported by the study of the asymmetry induced by an in-plane magnetic field on field induced domain wall motion in perpendicularly magnetized asymmetric Pt/Co/Pt trilayers. Using time reversal properties, we show that this asymmetry cannot be attributed to an effective field but originates from a purely dissipative mechanism. The observation of chiral damping, not only enriches the spectrum of physical phenomena engendered by the SIA, but since it can coexist with DMI it is essential for conceiving DW and skyrmion devices. [1] A. Thiaville, et al., EPL 100, 57002 (2012)