# Magnetostatic coupling between a ferromagnetic stripe and a skyrmion inscribed in a nanodot

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One of the main research directions in magnonics focuses on the excitation of short wavelength spin-waves (SWs). Recently, a few approaches have been proposed, but they lack a large efficiency, which further limits the development of magnonic applications.

One promising upcoming solution is to use an inscribed skyrmion in a nanodot as a source of SWs but such a system has a lot of variables, which makes time-resolved analysis complex.

In this study, we narrow the scope and focus on the static system composed of a nanodot with varying magnetic states on top of an in-plane magnetized stripe.

The waveguide is magnetically saturated along its length and is separated from the nanodot by a spacer of 1.5 nm. It is 384 nm wide and 4.5 nm thick, and a few micrometers long with absorbing boundary conditions at its edges to avoid any kind of back-propagating SWs.

We assume the nanodot of circular geometry and nanometer size, as it requires a strong enough interfacial Dzyaloshinskii-Moriya Interaction (DMI) to allow for the formation of a Néel-skyrmion without a new line. For this reason, the nanodot is made of Pt/Co/Ir circular layers.

When relaxing this system, a *spin-dot-shadow* is created in the waveguide, meaning the magnetization below the nanodot deviates from their saturated magnetization along the x axis because of the static dipolar coupling with the skyrmion. In the same way, the waveguide influences the magnetization inside the nanodot and affect the shape of the skyrmion. In our example, the skyrmion's core expends and becomes egg shaped under the influence of the waveguide.

We performed systematical micromagnetic simulations for many values of the DMI as well as shapes of the waveguide as they are the principal factors influencing the resulting magnetization texture in the nanodot and imprinted texture in the waveguide. These studies allow us to compare systems with different skyrmion shapes and to explain the role of different types of mutual magnetostatic interactions between the waveguide and the skyrmion in the nanodot.

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