

Near-Field diffraction of spin waves

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The manipulation of spin-waves in thin ferromagnetic films, which can carry information without moving charges, appears as a potential solution for low-power computing and signal processing [1]. In parallel, the direct interference of short wavelength spin-waves has also proven to be a propitious alternative for high-speed computation functionalities [2]. However, in this context, an analytical understanding of the very mechanisms of spin-waves interference is yet to be formulated. Recently, several independent works demonstrated that the propagation of spin waves in ferromagnetic thin films could be shaped using several concepts borrowed from optics [3-5]. With the aim of engineering spin-wave beams in continuous thin films, we show in this work that the focused nature of spin-wave beam excited from a constricted coplanar wave-guide can be well explained with a Fresnel diffraction model of circular waves [6]. These findings constitute a tool to explore further the potential of interferometric magnonic devices.

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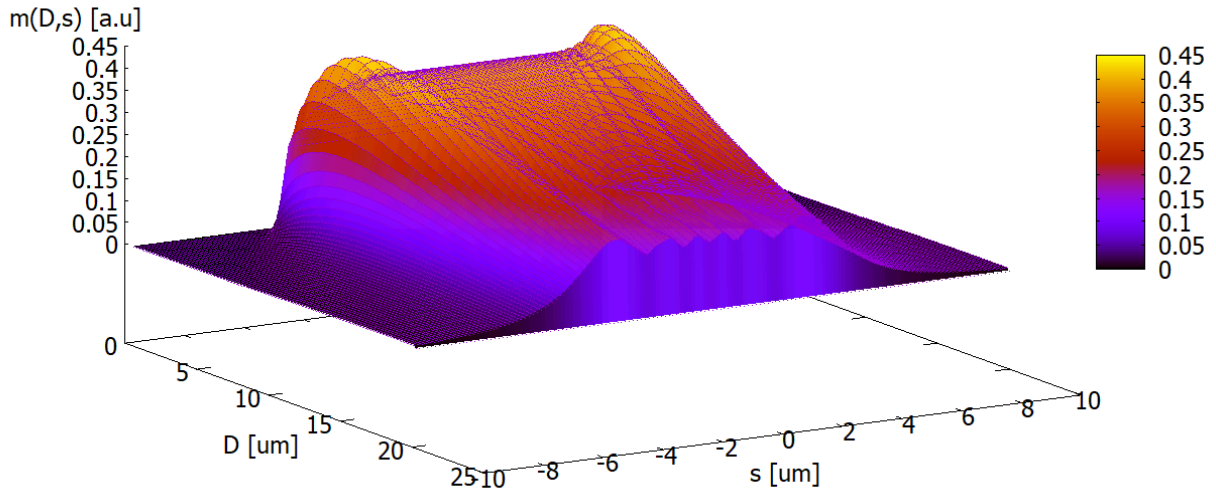


Fig: Fresnel simulation of Magnetostatic Surface Waves in a thin YIG film: $t_{\text{film}}=30\text{nm}$, $\mu_0 M_s=0.2\text{T}$, $\mu_0 H_{\text{eff}}=0.1\text{T}$, $A_{\text{exch}}=1\text{pJ.m}^{-1}$, $f_{\text{res}}=7.35\text{GHz}$.