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Exploring the Effects of Interfacial Dzyaloshinskii-Moriya Interactions on Patterned Nanomagnets[1] CHRISTOPHER ARD, BRAYDEN JOHNSON, KRISTEN BUCHANAN, Department of Physics, Colorado State University — The Dzyaloshinskii-Moriya interactions (DMIs) that lead to the stabilization of skyrmion spin textures also have a strong effect on dynamic excitations in magnetic materials. Recent work has shown that when one includes the DMI energy term, spin waves propagating in opposite directions along an extended thin film will have different frequencies. Here we have explored the effects of the DMIs on spin wave excitations in nanoscale magnetic disks and rings using micromagnetic simulations and we find that the effects are considerable. We chose a magnetic vortex state for this study since the vortex radial modes should be maximally affected by the introduction of DMIs. Simulations were conducted for nano-sized disks with realistic DMI values for ferromagnetic/heavy metal layers. The results show that the mode frequencies are quantized with or without the DMIs as expected for a nanoscale disk, but when we introduce DMIs we find that not only are the mode frequencies shifted, the modes patterns are also affected. The modes now propagate radially inward or outward depending on the vortex chirality. The mode frequencies generally increase with increasing DMIs and increase as a function of 1/radius.

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