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POS-G58 – Collective dynamics of antiferromagnetic domain walls in an optical cavity

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 Recently, there has been an increasing interest in the study of optical/microwave cavity-confined photon-magnon interaction due to their potential applications in quantum information processing and spintronics [1,2]. In those studies, a number of unique features have been observed at frequencies in the GHz range. On the other hand, less is known about the dynamics of antiferromagnets, which are characterized by frequencies in the THz range [3].

 We report results from an analytical study of the coupling of an antiferromagnetic domain wall to optical photons via the inverse Faraday effect. We consider spin canting and complex spin textures in antiferromagnetic materials that can arise from Dzyaloshinskii-Moriya interactions (DMI) [4]. DMI is not easily measurable and is often inferred from other quantities. In this work, we find that the presence of DMI enables spin interactions with cavity photons in a geometry which otherwise allows no magneto-optical coupling. This result may be used to measure the DMI constant in optomagnonic experiments by measuring the interaction of antiferromagnetic resonances to optical modes in a cavity.

Keywords: optomagnonic, DMI, antiferromagnet, domain wall, spin texture

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