Magnetostatic Wave Coupling in Multilayer Heterostructures

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Ferrimagnetic films such as $Y_3Fe_5O_{12}$, (YIG) are commonly grown using liquid-phase epitaxy (LPE). LPE produces near stoichiometrically identical films, yet magnetically non-identical films on opposite sides of a substrate. The asymmetries in magnetic properties, such as saturation magnetization (M_S) and Gilbert damping (α). YIG is the material with the lowest α, making it ideal for studying magnetostatic wave (MWS) propagation and their coupling. Here, we present a comprehensive study of magnetostatic wave behavior and spin precession dynamics in the bilayer grown YIG/GGG/YIG stack and extend it to more complex multilayer configurations. The effect of the spacer layering thickness, M_S and its effects are studied using micromagnetic simulations in MuMax3 [1], analytical models based on [2] and finite element simulations as well as experimentally measured utilizing VNA-FMR. Specifically, we notice that the spacer layer as well as M_S of the different materials placed in the stack has dramatic effects on which types of MSW are excited.

References:

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