The permeability function estimation of thin magnonic crystals slabs

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Materials with a negative refractive index (NRI) can have unusual physical properties and might allow one to construct new devices for superlensing or cloaking in future. In particular, the NRI is observed in artificial materials that possess negative permittivity and permeability simultaneously. Materials with a periodic arrangement of magnetic inclusions (so called magnonic metamaterials) have potential to fulfill this requirement. Since all metals exhibit negative permittivity at frequencies below their plasma frequency, we focus on exploration of negative permeability in the same frequency range. In particular, a strong magnetic resonance in the sub-THz frequency range can lead to the negative permeability. Hence, we investigate one-dimensional stacks of thin patterned metallic magnetic layers separated by dielectric layers. Each magnetic layer (slab) represents one- or two-dimensional binary magnonic crystal. The plane wave method is used to calculate the spin wave spectra and profiles of dynamic magnetization. From this, we are able to extract information about the relative absorption at the resonant frequencies. The method of calculation of relative absorption is elucidated. Furthermore, we calculate the effective magnetic parameters in the long wavelength approximation to derive the effective permeability of one-dimensional stacks of such slabs.
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9.7 cm

13.4 cm

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