518. 3Title:Wide-angle and polarization-independent three-dimensional magnetic metamaterials with and without substrates

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Abstract:The sensitivities to incident angles and polarization states influence the usefulness of metamaterials in practical applications. In this paper, a three-dimensional magnetic metamaterial composed of connected symmetric split rings with dielectric substrates is proposed. Both simulation and experimental results show that it exhibits negative magnetic resonances under both normal and parallel incidences of electromagnetic waves. It is also insensitive to the incident angles and polarization states. Then based on this structure, a unit cell without substrates is presented. By alternatively arranging the unit cells in different ways, the combined structure exhibiting negative effective permeability at THz is almost insensitive to incident angles and polarization states. Thus, the proposed structures with and without substrates are the candidates to engineer three-dimensional metamaterials.