

Wave properties of an annular periodic multilayer structure containing the  
single-negative materials

Mei-Soong Chen, Chien-Jang Wu, 楊宗哲

Electrical Engineering

Engineering

yangtj@chu.edu.tw

Abstract

The optical properties of an annular periodic multilayer structure containing two kinds of single-negative materials are theoretically investigated based on the transfer matrix method of the cylindrical waves. At the azimuthal mode number  $m = 1$  and near the magnetic plasma frequency and the electronic plasma frequency for the TE wave and TM wave, respectively, we find that there is an additional high-reflectance band and some reflection dips exist when the plasma frequency is located in the photonic band gap. These two special features arising from the higher order azimuthal mode of the cylindrical waves are not seen in the planar one-dimensional Bragg reflector consisting of the single-negative materials. Such filtering responses provide a feasible way of designing a narrowband resonator without physically introducing any defect layer in the structure.

Keyword : annular periodic multilayer structure, single-negative materials, cylindrical waves, transfer matrix