

378.Accession number:13028577

Title:Full extraction methods to retrieve effective refractive index and parameters of a bianisotropic metamaterial based on material dispersion models

Authors:Feng-Ju Hsieh (1); Wei-Chih Wang (1)

Author affiliation:(1) Dept. of Mech. Eng., Univ. of Washington, Seattle, WA, United States

Source title:Journal of Applied Physics

Abbreviated source title:J. Appl. Phys. (USA)

Volume:112

Issue:6

Publication date:15 Sept. 2012

Pages:064907 (10 pp.)

Language:English

ISSN:0021-8979

CODEN:JAPIAU

Document type:Journal article (JA)

Publisher:American Institute of Physics

Country of publication:USA

Material Identity Number:DK28-2012-028

Abstract:This paper discusses two improved methods in retrieving effective refractive indices, impedances, and material properties, such as permittivity ϵ and permeability μ , of metamaterials. The first method modified from Kong's retrieval method allows effective constitutive parameters over all frequencies including the anti-resonant band, where imaginary parts of ϵ or μ are negative, to be solved. The second method is based on genetic algorithms and optimization of properly defined goal functions to retrieve parameters of the Drude and Lorentz dispersion models. Equations of effective refractive index and impedance at any reference planes are derived. Split ring resonator-rod based metamaterials operating in terahertz frequencies are designed and investigated with proposed methods. Retrieved material properties and parameters are used to regenerate S-parameters and compared with simulation results generated by cst microwave studio software.

Number of references:23

Inspec controlled terms:genetic algorithms - metamaterials - optimisation - permeability - permittivity - refractive index - rods (structures)

Uncontrolled terms:effective refractive index - bianisotropic metamaterial - material dispersion models - full extraction methods - impedances - permittivity - permeability - effective constitutive parameters - genetic algorithms - optimization - Drude dispersion models - Lorentz dispersion models - SRR-rod based metamaterials - CST microwave studio software

Inspec classification codes:A7820D Optical constants and parameters (condensed matter) - A4270 Optical materials - A7720 Dielectric permittivity - B4110 Optical materials - B0260 Optimisation techniques

Treatment:Theoretical or Mathematical (THR)

Discipline:Physics (A); Electrical/Electronic engineering (B)

DOI:10.1063/1.4752753

Database:Inspec

Copyright 2012, The Institution of Engineering and Technology