113

Accession number:20123715436456

Title:Defining material parameters in commercial em solvers for arbitrary metal-based THz structures

Authors:Episkopou, Elpida (1); Papantonis, Stergios (1); Otter, William J. (1); Lucyszyn, Stepan (1)

Author affiliation:(1) Centre for Terahertz Science and Engineering, Imperial College London, Exhibition Road, London SW7 2AZ, United Kingdom

Corresponding author: Episkopou, E.(e.episkopou10@imperial.ac.uk)

Source title: IEEE Transactions on Terahertz Science and Technology

Abbreviated source title: IEEE Trans. Terahertz Sci. Technolog.

Volume:2

Issue:5

Issue date:2012

Publication year:2012

Pages:513-524

Article number:6287043

Language:English

ISSN:2156342X

Document type:Journal article (JA)

Publisher:IEEE Microwave Theory and Techniques Society, 2458 East Kael Circle, Mesa, AZ 85213, United States

Abstract:Frequency-domain solvers are used extensively for modeling arbitrary metal-based terahertz structures. Four well-known commercially available electromagnetic (EM) modeling software packages include HFSS™, CST Microwave Studio®, EMPro, and RSoft. However, there are a number of operational issues that relate to how they can be used to obtain more meaningful and accurate results. Even experienced users of these and similar software packages may not fully appreciate some of the subtle ambiguities in defining boundaries and material parameters for use in THz applications. To this end, a detailed comparative study has been undertaken, in consultation with all four vendors. First, in order to avoid introducing ambiguities, frequency dispersion in materials has to be clearly defined from first principles; in both intrinsic and effective forms. Different frequency dispersion models are then introduced for metal-like materials. To act as benchmark structures, conventional air-filled metal-pipe rectangular waveguides, associated cavity resonators and a spoof surface plasmon waveguide have been simulated, using a raft of different approaches; with a view to illustrating quantifiable weaknesses in commercial software packages for simulating arbitrary metal-based THz structures. This paper highlights intuitive and logical approaches that give incorrect results and, where possible, makes recommendations for the most appropriate solutions that have hitherto not been given in Technical Notes. & copy; 2011-2012 IEEE.

Number of references:42

Main heading: Dispersions

Controlled terms:Cavity resonators - Frequency domain analysis - Metals - Numerical models - Software packages - Waveguides

Uncontrolled terms:Benchmark structure - Commercial software - Comparative studies - CST

microwave studio - Different frequency - Electromagnetic modeling - Frequency dispersion -Frequency domains - Logical approaches - Material parameter - Operational issues - Surface plasmon waveguide - Technical notes - Terahertz

Classification code:531 Metallurgy and Metallography - 714.3 Waveguides - 723.5 Computer Applications - 921 Mathematics - 921.3 Mathematical Transformations - 951 Materials Science DOI:10.1109/TTHZ.2012.2208456

Database:Compendex

Compilation and indexing terms, Copyright 2012 Elsevier Inc.