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Abstract:For the error of propagation constants with adopting the classical skin-effect model for the conductivity of normal metals in Terahertz frequency, a general and rigorous characteristic equation formulation is proposed for the analysis of hollow metallic waveguide. The characteristic equation for propagation constants is derived in terms of the field components equations and the boundary conditions in the circular waveguide. The propagation constants are obtained with the numerical solutions of the characteristic equation with the classical relaxation-effect model for the conductivity. The proposed method improves the accuracy for the full-wave characterization of waveguide performance, compared with the classical microwave approach that is the variational method with the classical skin-effect model for the conductivity. A comparison with the traditional variational method shows that the relative error of attenuation constant from the proposed method is reduced about 66% at 10 THz., while a comparison with the skin effect model for conductivity shows that the relative error of attenuation constant using characteristic equation method can be reduced by 31% at 6 THz with the classical relaxation model.
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