Abstracts

Dielectric frequency-selective structures incorporating waveguide gratings

S. Tibuleac, R. Magnusson, T.A. Maldonado, P.P. Young and T.R. Holzheimer. "Dielectric frequency-selective structures incorporating waveguide gratings." 2000 Transactions on Microwave Theory and Techniques 48.4 (Apr. 2000, Part I [T-MTT]): 553-561.

In this paper, a frequency-selective structure based on guided-mode resonance effects in all-dielectric waveguide gratings is demonstrated theoretically and verified experimentally. Reflection (band-stop) filters with high efficiency, extended low-sideband reflection, and symmetric line shapes are designed by embedding gratings in layered antireflection structures. Reflection filter examples employing common dielectric materials illustrate linewidth control by grating modulation. An additional mechanism for linewidth control is demonstrated with phase-shifted gratings. Double-line reflection filters are obtained in structures containing two gratings with different grating periods. High-efficiency transmission (bandpass) filters are demonstrated using multilayer waveguide gratings in a high-reflectance thin-film configuration with a single grating in the center layer bordered by dielectric mirrors composed of high/low quarter-wave layers. Single-layer and multilayer waveguide gratings operating as reflection and transmission filters, respectively, were built and tested in the 4-20-GHz frequency range. The presence of guided-mode resonance notches and peaks is clearly established by the experimental results, and their spectral location and line shape is found to be in excellent agreement with the theoretical predictions.

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