Abstracts

A novel TEM waveguide using uniplanar compact photonic-bandgap (UC-PBG) structure

Fei-Ran Yang, Kuang-Ping Ma, Yongxi Qian and T. Itoh. "A novel TEM waveguide using uniplanar compact photonic-bandgap (UC-PBG) structure." 1999 Transactions on Microwave Theory and Techniques 47.11 (Nov. 1999 [T-MTT] (Mini-Special Issue on Electromagnetic Crystal Structures, Design, Synthesis, and Applications)): 2092-2098.

A novel waveguide using a photonic bandgap (PBG) structure is presented. The PBG structure is a two-dimensional square lattice with each cell consisting of metal pads and four connecting lines, which are etched on a conductor-backed Duroid substrate. This uniplanar compact PBG structure realizes a magnetic surface in the stopband and is used in the waveguide walls to provide magnetic boundary conditions. A relatively uniform field distribution along the cross section has been measured at frequencies from 9.4 to 10.4 GHz. Phase velocities close to the speed of light have also been observed in the stopband, indicating that TEM mode has been established. A recently developed quasi-Yagi antenna has been employed as a broad-band and efficient waveguide transition. Meanwhile, full-wave simulations using the finite-difference time-domain method provide accurate predictions for the characteristics of both the perfect magnetic conductor impedance surface and the waveguide structure. This novel waveguide structure should find a wide range of applications in different areas, including quasi-optical power combining and the electromagnetic compatibility testing.

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