Abstracts

Propagation characteristics of finite-width conductor-backed coplanar waveguides with periodic electromagnetic bandgap cells

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Wave propagation along the finite-width conductor-backed coplanar waveguide (FW-CBCPW) with periodically loaded one-dimensional electromagnetic bandgap (EBG) cells proposed earlier by the authors is investigated theoretically and experimentally in this paper. The full-wave simulation in conjunction with Floquet's theorem is employed to find the dispersion diagram for characterizing the guided and leaky waves over a wide frequency range. For examining the guided-wave mode, the equivalent-circuit model is established to obtain the analytical formula of the Bloch impedance. The remarkable slow-wave factor 1.9-2.9 times higher than that of a conventional FW-CBCPW is presented. When operating frequency is sufficiently high, the leaky-wave mode is emitted so that the structure radiates in the backward direction. Good agreement among the results of the full-wave simulation, equivalent-circuit model, published data, and measurement supports the usefulness of the proposed full-wave simulation and also validates the analytical formula. By properly adjusting the circuit configuration, the periodic EBG structure with controllable propagation characteristics, which include the bandgap zone, the slow-wave factor, and the Bloch impedance for the guided wave, as well as the radiation main beam for the leaky wave, may be achieved.

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