Abstracts

Surface-wave elimination in integrated circuit structures with artificial periodic materials

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Surface-wave (or dielectric slab) modes in integrated circuit structures often result in undesired energy losses and cross talk between components. In this paper, we investigate the feasibility of surface-wave elimination in integrated circuit structures by using planar artificial periodic (photonic band-gap) substrates. A full-wave 3-D integral-equation moment-method is employed to find the propagation constants of guided-wave modes on grounded dielectric slabs with planar periodic implants. Rectangular blocks in both a rectangular lattice and a triangular lattice are investigated. It is found that surface-waves forbidden characteristics are mostly determined by the lattice structures and insensitive to the shape and size of the periodic elements. Attempt has been made to obtain the omnidirectional wave band-gap. The limitation on complete surface-wave elimination is discussed. This paper initiates the investigation of a class of novel integrated circuit components which have potential applications in millimeter-waves and optics.

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