Abstracts

Radiation of Millimeter Waves from a Leaky Dielectric Waveguide with a Light-Induced Grating Layer

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A theoretical analysis is presented for the radiation characteristics of millimeter waves in a periodic dielectric waveguide having a light-induced grating layer. The waveguide is assumed to be composed of an insulator (sapphire) slab whose one surface is coated with a high-resistivity semiconductor (silicon) film. A boundary-integral-equation formulation is employed to obtain characteristic solutions of the waveguide. Numerical calculations are made at 94 GHz for both TM and TE polarizations. Estimations of the illumination power required to produce the grating are given. The waveguide presented in this paper, in conjunction with a high-power semiconductor diode laser array as a light source, may be developed to operate as an electronically beam-steerable leaky-wave antenna at millimeter-wave frequencies.

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