Abstracts

Efficient optical control of millimeter waves in a slot line on semiconductor plasma substrate

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Efficient control of millimeter-waves in a slot line on an Si and GaAs substrate is discussed both theoretically and experimentally. The spectral-domain method is used to estimate the propagation and the attenuation constants in the slot line with the density of the optically induced plasma as a parameter. Experiments in the millimeter-wave range of 35-50 GHz are carried out using high-resistivity Si and GaAs wafers with the dimension of 15 mm/spl times/30 mm/spl times/600 /spl mu/m. The slot-width could be varied from 0.5 to 2 mm. The attenuation of millimeter waves by over 20 dB can be controlled by optical means using light-emitting diodes with 870 nm wavelength and 68 mW optical power. The experimental results agree considerably well with the theory. The response of millimeter waves with pulsed optical illumination is also examined using a high-power laser diode of 20 W optical power and a pulsewidth less than 100 ns. High-speed response due to optically induced plasma is confirmed for the slot line on GaAs substrate.

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