Abstracts

Terahertz Attenuation and Dispersion Characteristics of Coplanar Transmission Lines

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We present experimental verification of analytic formulas for the dispersion and the attenuation of electrical transient signals propagating on coplanar transmission lines. The verification is done in the frequency domain over a teraherz range, although the experiments are in the time domain. The analytic formulas have been obtained from fits to the full-wave analysis results. We quantitatively verify that the full-wave steady-state solutions can be directly applied to the transient time-domain propagation experiments. We use subpicosecond electrical pulses and an external electro-optic sampling technique to obtain the time-domain propagation data. From the Fourier transforms of the time-domain data we extract both the attenuation and the phase information as a function of frequency. The dispersion and the attenuation characteristics are investigated for both coplanar waveguide and coplanar strip transmission lines. The investigation was also carried out on both semi-insulating semiconductor and dielectric substrate materials and indicates no observable losses caused by the semi-conductor material.

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