Abstracts

Analysis of the Effects of a Resistively Coated Upper Dielectric Layer on the Propagation Characteristics of Hybrid Modes in a Waveguide-Shielded Microstrip Using the Method of Lines

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In this paper, propagation characteristics of even-symmetric hybrid modes in a waveguide-shielded microstrip in the presence of a resistively coated dielectric layer affixed to the top cover of the housing is analyzed with the method of lines. The resistive boundary condition is employed to model the resistive film. A shielded microstrip line having a unity strip-width-to-substrate-thickness ratio (i.e., w/h/sub 1/ = 1) placed on top of a 0.635-mm-thick alumina substrate is considered. Based on a 10h/sub 1/ x 7h/sub 1/ reference housing, four different housing arrangements are obtained by varying the structural parameters of the resistively coated dielectric layer. Results obtained indicate that the effects of both the housing walls and the resistively coated upper dielectric layer on the dominant (quasi-TEM) mode are insignificant and may be ignored when frequency is above 15 GHz. For the higher order modes, resistive film appears to be transparent when film resistance is greater than about 1 k Omega, it behaves as a good conductor when film resistance is much smaller than 100 Omega, and in between it results in nonlinear (and even oscillatory) higher order modal behaviors. Apparently, due to the increasing field concentration inside the upper dielectric (as suggested by the increasing epsilon/sub reff/) for a given mode, both the maximum attenuation and the film resistance needed to achieve it increase with frequency and dielectric constant of the upper dielectric layer.

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