ANALYSIS OF CYLINDRICAL MICROSTRIP TRANSMISSION LINES
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Single and coupled microstrip lines are the basis of most microwave and millimeter integrated circuits including directional couplers, filters, delay lines, etc. Numerous papers have pursued the analysis, design, and applications of single and coupled planar microstrip lines. However, the analysis and design of microstrip lines conformed on circular or elliptical dielectric (single or multi-layer) substrates have not been explored as extensively. The analysis of these non-planar microstrip transmission lines is of increased importance in applications where the circuit must conform to surfaces on aeroplanes, missiles, and other vehicles. In this paper, single and coupled microstrip lines conformed to a cylindrical boundary along with layers of dielectric substrate and/or superstrate of finite width is considered. A finite width dielectric substrate and/or superstrate provides a very practical design in many microwave and millimeter applications and antenna designs. For the coupled lines, a notch between the conducting transmission lines is also introduced in order to alter the coupling or crosstalk between the lines. This geometrical arrangement provides less coupling between the transmission lines and the surrounding transmission lines or any other microwave devices. The infinite domain surrounding the transmission line is terminated at an artificial circular boundary. At this boundary a second order approximate boundary condition is used to truncate the domain of solution. The finite difference method, with non-uniform mesh, is then used to analyze this transmission line in a region bounded by the artificial boundary and the inner cylindrical grounded core. The potential distribution, self and mutual capacitances, odd and even phase velocities, and line impedance of single and coupled lines are computed to show the effects of the line parameters on its quasi-TEM characteristics.