SUMMARY

A cylindrical stripline consists of a circular arc strip placed between two cylindrical ground planes separated by dielectric layers. This thesis presents investigations on characteristics of single and coupled cylindrical striplines.

An inhomogeneous multilayered cylindrical stripline, using TEM mode approximation is analyzed. Laplace equation is solved for potential distribution function in various dielectric regions. The constants appearing in the solutions are evaluated by subjecting the potential distribution function to proper boundary conditions. A special feature of the method followed is that by using a reasonable approximation an expression for the characteristic impedance of a cylindrical stripline with multilayer dielectrics is obtained in a closed form. The case of warped stripline is also studied, considering it as a special case of cylindrical stripline.

A variational technique in spectral domain for finding the characteristic impedances of single and coupled cylindrical striplines is presented. Assuming suitable charge distribution on the strip, variational expressions for the line capacitances of single and coupled cylindrical striplines are derived and hence the characteristic impedances are calculated. The expressions for even and odd mode capacitances and hence the characteristics of a pair of

coupled cylindrical microstrip lines are also presented. Analysis of coupled cylindrical striplines is also carried out using conformal mapping technique and the results obtained by the two methods are compared. Warped coupled strip and microstrip lines are also investigated.

A method of derivation of general expression for coupling which can be applied to coplanar as well as non-coplanar cylindrical striplines of equal and unequal widths arbitrarily located between ground planes filled with multilayered dielectrics is presented. Assuming TEM mode propagation, the coupling coefficient is determined in terms of self and mutual inductances and capacitances. The expressions for electric and magnetic fields are obtained by assuming an appropriate charge distribution over the strips. The general formulation for coupled cylindrical striplines is extended to the case of coupled cylindrical microstrip lines. Extensive numerical data on coupling coefficient between two strips is presented. The effect of warpage on an otherwise planar structure is also studied.

Analysis of inhomogeneous broad side coupled cylindrical striplines is described using variational method in space domain. It is found that unequal phase velocities for even and odd modes can be obtained with these lines thus, making them advantageous for design of cylindrical stripline directional couplers. Numerical data on even and odd mode impedances, effective dielectric constants and mode phase velocity ratios are presented.

Analysis of broad side coupled cylindrical striplines with homogeneous dielectric medium is also carried out using conformal mapping technique and the results obtained by the two methods are compared. The effect of environmental changes on an otherwise planar structure is studied by extending the present analysis to cylindrically warped broad side coupled striplines.

Characteristics of broad side, edge coupled cylindrical striplines are investigated using variational method in space domain. A quasi-static analysis is presented with the assumption of suitable charge distribution on the conducting strips. The data for characteristic impedances and effective dielectric constants are presented for all possible propagating modes. The impedances of broad side, edge coupled striplines which get warped due to environmental changes are extrapolated from the analysis of broad side, edge coupled cylindrical striplines.