

A B S T R A C T

The transmission line model for the microstrip patch antenna, reported by Derneryd, has been generalized. The Generalized Transmission Line Model (GTLM) takes care of mutual coupling between the radiating edges, feed reactance and the effect of the substrate parameters on wall admittances and surface wave conductance. Wall admittances and surface wave conductances have been derived for circular and rectangular patches, using the integral transformation technique. GTLM has been applied to the analyses of annular ring, annular sector, circular sector and rectangular microstrip patch antenna. Theoretical results for input impedance and radiation patterns compare very well with the experiment. It has been observed that annular rings with different mean radii can be designed to have the same resonant frequency for the TM_{12} -mode. This behaviour leads to the feasibility of a concentric ring array. A concentric ring array has been designed, fabricated and tested. Good agreement between the theory and the experiment has been found.

The proposed model (GTLM) can be applied to the microstrip patches where the separation of variables is possible for the wave equation when expressed in a coordinate system that matches with the patch geometry. The scope of GTLM to antenna arrays, patches with slots and pins, nonseparable geometries and circularly polarized antennas are discussed.