Abstracts

3D Dyadic Green's Function for Radially Inhomogeneous Circular Ferrite Circulator

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Here we develop a three dimensional (3D) dyadic recursive Green's function with elements G sv over ij suitable for determining the electric field components (E/sub z/ E/sub r/ E/sub Phi/) and magnetic field components (H/sub z/ H/sub r/ H/sub Phi/) anywhere within a circular, planar (microstrip or stripline) circulator. All of the components are present, although the E/sub z/, H/sub r/, and H/sub Phi/ components may still be dominant as long as the thickness h of the substrate is small. The recursive nature of G sv over ij is a reflection of the inhomogeneous region being broken up into one inner disk containing a singularity and N annuli, G sv over ij, (r, Phi, z) is found for any arbitrary point (r, Phi, z) within the disk region and within any i th annulus. Specification of G sv over ij, i = E or H, j = H, s = z, v = Phi or z, at the circulator diameter r = R leads to the determination of the circulator s-parameters. The ports have been separated into discretized ports with elements (subports) and continuous ports. It is shown how G zv over ij (r, Phi, z) enables s-parameters to be found for three and six port ferrite circulators. Because of the z-variation present in the finite thickness model, TEM, TM, and TE modal decompositions are not allowed for the 3D analysis, and instead it is found that new coupled governing equations describe the field behavior in the circulator. The theory is readily acceptable to constructing a computer code for numerical evaluation of finite thickness devices. Also, symmetric port disposition and metallic losses are covered.

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