Abstracts

A Group Theoretic Investigation of the Single-Wire Helix

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This paper discusses the way in which symmetry groups may be utilized in the analysis of periodic microwave structures. The theory of group representations is introduced, and the relationship of these representations to the vector electromagnetic fields which are solutions to the Helmholtz equation (subject to the boundary conditions imposed by the microwave structure) is briefly explained. Also explained is the concept of time reversal. Symmetry analysis involves collecting all of the symmetry operations of a microwave structure into a group, and then finding the irreducible representations of that group. Each solution of the Helmholtz equation must belong to an irreducible representation of the space group, and by examining the irreducible representations it is possible to determine the symmetries and degeneracies of the waves. Symmetry analysis is employed to describe some of the characteristics of the waves of the unsupported wire helix and of the single-wire helix supported symmetrically by three dielectric rods. In particular, the conditions for the occurrence of branch crossings on the k-/spl beta/ diagram are discussed.

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