Abstracts

A Multipole Analysis of a Dielectric Loaded Coaxial Rectangular Waveguide

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A multipole analysis of a coaxial rectangular wave-guide whose inner conductor is circular is made in order to determine the TE and TM modes of the system. The analysis is based on using multipole (dipole, quadruple, etc.) electric and magnetic current sources to generate field solutions in the waveguide. These solutions are used to match electromagnetic boundary condition in a homogeneous coaxial rectangular waveguide and determine the TE and TM eigenvalues of the waveguide system. The analysis is a generalization of a method first proposed by Mahmoud and Wait to study propagation along thin wires in a coal mine shaft. Eigenvalue results of the multipole method are compared with results of the Generalized Spectral Domain method, and are compared to eigen-value results of a ridged waveguide. Propagation in a coaxial rectangular waveguide is also studied when the coaxial rectangular waveguide is loaded with lossy inhomogeneous dielectric material. A variational formula is used to relate the TEM, TE and TM modes of an empty coaxial rectangular waveguide to the propagation in the loaded inhomogeneous dielectric waveguide. Propagation in a four wire anechoic chamber is given as an example of the application of the theory developed in the paper.

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