Abstracts

Toroidal Resonators and Waveguides of Arbitrary Cross Section

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After introducing a new method to solve Maxwell's equations using a complex electromagnetic field vector F, a rotational coordinate system xi, Theta, psi is introduced. In this coordinate system, the field vector components F/sub xi/, F/sub Theta/ may be expressed by F/sub psi/. This component can be obtained from a two-dimensional Hehlmholtz equation. Specifying xi, Theta by cylindrical coordinates r, z the complex Maxwell equation curl F= gamma F is solved for the axisymmetric case (/spl part///spl part/psi = 0) and for the nonsymmetric case. The differential equations for magnetic field lines are solved and surfaces on which the normal component of B and the tangential components of E vanish are recognized as metallic walls of toroidal resonators of various arbitrary cross sections. In the Appendix the results of the new method are compared with well known results for circular cylindrical waveguides.

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