Abstracts

Analytical solution and frequency extraction of iris problems in waveguide by separation of variables

The field nearby a thin iris discontinuity can be found in an exact manner by solving the wave equation in an appropriate coordinate system. To this end, it is necessary to select a coordinate system that fits the iris boundary. As an example, capacitive and inductive irises in rectangular waveguides have been solved by considering the Helmholtz equation in the elliptic-cylinder coordinate system. The presence of the waveguide environment is then enforced either by using the aperture field solution in a variational expression of the equivalent shunt susceptance or by taking images. The advantage of the new solution is that a single term solution, apart from being very accurate and numerically efficient, also contains the correct frequency dependence; thus providing results over the entire band. Moreover, wide-band equivalent circuits with frequency independent elements of the Foster's canonical form descend directly from the field analysis.

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