Abstracts

A Reciprocity Formulation for the EM Scattering by an Obstacle Within a Large Open Cavity

A formulation based on a generalized reciprocity theorem is developed for analyzing the external high frequency EM scattering by a complex obstacle inside a relatively arbitrary open-ended waveguide cavity when it is illuminated by an external source. This formulation is also extended to include EM fields whose time dependence may be nonperiodic. A significant advantage of this formulation is that it allows one to break up the analysis into two independent parts; one deals with the waveguide cavity shape alone and the other with the obstacle alone. Thus, it is useful for independently estimating the scattering effects due to modifications in the waveguide cavity shape for a given type of large complex obstacle, and due to different types of complex obstacles for a given type of large open waveguide cavity shape, respectively, without requiring one to treat the entire configuration each time one of these is changed. The external scattered field produced by the obstacle (in the presence of the waveguide cavity structure) is given in terms of a generalized reciprocity integral over a surface ST corresponding to the interior waveguide cavity cross-section located conveniently but sufficiently close to the obstacle. Furthermore, the fields coupled into the cavity from the source in the exterior region generally need to propagate only one-way via the open front end (which is directly illuminated) to the interior surface ST in this approach, and not back, in order to find the external field scattered by the obstacle.

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