Abstracts

3-D FEM/BEM-hybrid approach based on a general formulation of Huygens' principle for planar layered media

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Huygens' principle is used to exclude inhomogeneous regions and ideal conducting regions from planar layered structures. The fields in the inhomogeneous regions are modeled by the finite-element method (FEM) with tetrahedral edge elements in terms of the electric-field strength E/spl I.oarr/. The fields in the layered structure are described by an integral representation of the electric-field strength E/spl I.oarr/ in terms of equivalent electric and magnetic Huygens' surface current densities for the inhomogeneous regions, and in terms of electric Huygens' surface current densities for ideal conducting regions. It is formulated with the help of electromagnetic (EM) potentials resulting in low-order singular integral kernels to facilitate the numerical handling of the integral representation. A general formulation of the integral representation is given for observation points lying in the Huygens' surface. As compared to the homogeneous-space case, additional terms in the integral representation have to be considered if parts of the Huygens' surface lie in an interface of layers with different material properties. An integral equation is formulated and discretized by a Galerkin testing procedure (boundary-element method), together with the finite-element (FE) system resulting in an unequivocal discretized description of the entire field problem. The method is validated with the help of a canonical test problem. Further numerical results are presented for dielectric resonators coupled to microstrip circuits.

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