Abstracts

Application of a new MPIE formulation to the analysis of a dielectric resonator embedded in a multilayered medium coupled to a microstrip circuit

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A new mixed-potential integral-equation (MPIE) formulation is developed for the analysis of electromagnetic problems due to conducting or dielectric objects of arbitrary shape embedded in a planarly stratified medium. In the new MPIE formulation, the dyadic kernel of the vector potential is kept in the simple form originally developed by Sommerfeld. The scalar potential, which is related to the vector potential via the Lorenz gauge, is then represented by a double dot product of a dyadic kernel with a dyadic charge density. An extra line integral term, which is well behaved and nonsingular, will appear when the object penetrates an interface. The numerical implementation of the double dot product is found to be trivial if one takes advantage of the well-established basis functions in which the unknown current density is expressed. The new MPIE formulation is employed in conjunction with the triangular patch model to treat the problem of a dielectric resonator (DR) excited by microstrip circuit. A matched-load simulation procedure has been used to extract the network S-parameters of a DR microstrip circuit. The diameters of the Q circles have been measured to determine the coupling coefficients and the Q factors of the DR excited by a microstrip circuit. The validity of the new MPIE formulation and the numerical procedure have been verified by comparing the obtained S-parameters, with available measurement data.

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