Abstracts

Extension of Volterra Analysis to Weakly Nonlinear Electromagnetic Field Problems with Application to Whistler Propagation

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In this study, Volterra analysis is extended to weakly nonlinear electromagnetic field problems. Generalized Green's functions and their Fourier transforms are introduced. These are used to express the nth order system response explicitly in terms of the system input, Although the theory is developed in general, homogeneous media are assumed in the examples for simplicity. Application of the Volterra approach is illustrated by investigating whistler-mode propagation in a cold collisionless electron plasma. After defining the nonlinear differential equations for propagation at an angle theta to the uniform magnetic field, exponential probing inputs are used to generate the generalized Green's functions. The second-order responses, which are expressed in terms of the generalized Green's functions, are examined in detail. Computer programs are used to numerically evaluate the second-order response to a sinusoidally varying time function.

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