Abstracts

Reflection and Transmission Operators for Strips or Disks Embedded in Homogeneous and Layered Media

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In this paper, we introduce a new notation to simplify the solution of scattering by strips or disks. We make use of vector Fourier transforms and introduce a double dot product for inner products in an uncountably infinite dimensional linear vector space. We characterize the scattering by a strip or a disk with a reflection operator and a transmission operator that relate the continuum of scattered waves to a continuum of incident waves. After the reflection operator for a single strip or disk is derived, we show how the reflection operator for a strip or disk in the presence of another reflecting medium, e.g., a layered medium, can be derived. The scattering by N strips or disks in a homogeneous medium is also discussed. Next, we derive the reflection operator for an embedded strip or disk in a layered medium. The method can be generalized to N strips or disks embedded in a layered medium and to a slot or an aperture. These operators have applications in a number of scattering, guidance, and resonance problems. In the paper that follows this one, we shall show how such concepts can be used to formulate the guidance and resonance problems involving N strips or disks whose reflection operator is known.

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