REFLECTION AND TRANSMISSION AT CURVILINEAR INTERFACES IN MULTILAYERED MEDIA IN TERMS OF SURFACE INTEGRALS

K. Klem-Musatov, A. Aizenberg, H.B. Helle, J. Pajchel, M. Aizenberg

First we derive a rigorous analytic description of multiple reflection/transmission phenomena of 3-D scalar harmonic wave fields in two inhomogeneous half spaces separated by a smooth curvilinear interface of arbitrary shape. The resulting wave field is expressed in terms of a branching sequence of events connected by recurrence relationships. An individual event is a result of the perturbation of boundary conditions by the previous event of the sequence that, in turn, again perturbs the boundary conditions. Such an event is described by the surface Helmholtz integral of any fundamental solution satisfying conditions at infinity. Functions of the current point of the interface and their normal derivatives (*Cauchy data*) are described by the surface integrals with the fundamental solutions for an absolutely absorbing interface. The Cauchy data of the latter integrals are obtained from the subsequent transformations. The perturbation of the interface and its normal derivatives are mapped into the spatial frequency domain by means of the Fourier transform where they are multiplied by the corresponding reflection/transmission coefficients and then is mapped back to an individual point on the interface by means of the inverse Fourier transform. Parameters of these transformations depend on the point where the result is computed. Therefore the computation at a new point of the interface requires the repetition of these transformations. The derivation of multiple reflection/transmission phenomena in a multilayered inhomogeneous medium with interfaces of arbitrary shape is based on a generalisation of the described technique. The obtained formalism can serve as a basis for the development of the high-frequency asymptotic of the reflection/transmission phenomena. We demonstrate this possibility by numerical examples of the reflection of the spherical wave on the curvilinear interfaces of the simplest forms.

References

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