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Wave diffraction problems on periodical sets of heterogeneities in the stratified media

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Abstract

The universal approach to solving the diffraction problems on the periodical set of heterogeneities in the stratified media is proposed. The infinite periodic grating consisting of thin conducting bands embedded into a dielectric plate is considered as an example. The boundary value problem for the quasi-periodic potential functions is equivalent to the pair summatorial functional equation for the Floquet coefficients. At first, it is advisable to solve the auxiliary diffraction problem for the stratified medium in the case when the heterogeneities are moved off. The heterogeneities generate the field perturbation; it is a solution of a similar pair equation. Secondly, we need to define new unknown variables in such way that the pair equation should have the standard form. To get this result we propose to use the boundary value conditions on the heterogeneities. Then the other conditions on the media interface can be transformed to standard form. The dual equation is equivalent to regular infinite set of linear algebraic equations for the coefficients of decomposition of the electromagnetic field by Floquet harmonics. In the case of elastic waves the wave diffraction problems on the periodical sets of heterogeneities can be reduced to vector dual summatorial functional equations. The electromagnetic wave diffraction problems on the periodical knife grating was investigated by analogous scheme.
