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INTERFACE SCATTERING PROBLEMS

We consider two-dimensional transmission problems for the Helmholtz equations in non-locally perturbed half-planes Ω_1 and Ω_2 having a common boundary which is a one-dimensional, infinite, smooth, rough interface line. These type of mathematical problems model time-harmonic electromagnetic and acoustic scattering by a penetrable unbounded obstacle in an inhomogeneous (piecewise homogeneous) medium. In both domains we look for scattered waves corresponding to different wave numbers and satisfying certain transmission conditions on the interface. In addition, the scattered waves satisfy the so-called *upward* and *downward propagating radiation conditions* along with some growth conditions in the x_2 direction, suggested by Chandler-Wilde & Zhang [CWZ1], which generalize both the *Sommerfeld radiation condition* and the *Rayleigh expansion condition* for diffraction gratings.

In this paper we first prove the uniqueness theorem for the interface problem provided that an obstacle Ω_1 represents a lossy medium, which means that the corresponding wave number is complex. Afterwards we apply the potential method to reduce the non-homogeneous interface problem to the corresponding system of integral equations and establish the existence results on the basis of the theory developed in [Ar1] for a class of systems of second kind integral equations on unbounded domains.

References

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