

ELECTROMAGNETIC SCATTERING FROM A BURIED CYLINDER IN LAYERED MEDIA WITH ROUGH INTERFACES

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An exact solution to scattering from a cylinder buried arbitrarily in layered media with rough interfaces based on extended boundary condition method (EBCM) and scattering matrix technique is developed. The reflection and transmission matrices of a rough interface as well as an isolated single cylinder are constructed using EBCM and recursive T-matrix algorithm, respectively. The cylinder/rough surface interactions are taken into account by applying the generalized scattering matrix technique. The scattering matrix technique is used to cascade reflection and transmission matrices from individual systems (i.e., rough surfaces or cylinders) in order to obtain the scattering pattern from the overall system where a cylinder is embedded in layered rough surfaces. Bistatic scattering coefficients are then obtained by incoherently averaging the power computed from the resulting Floquet modes of the overall system. In numerical simulations, the bistatic scattering coefficients are first validated by comparing the simulation results with the existing solutions which are the limiting cases including scattering from two-rough-interface rough surfaces without any buried object and from a buried cylinder beneath a single rough surface. The simulated results are in good agreement with those of limiting cases. Subsequently, the numerical simulations of scattering from a buried cylinder in layered rough surfaces are performed to investigate the relative importance and sensitivity of various physical parameters of layered rough surfaces to incoherent scattering coefficients. The emphasis is placed on how layered rough surfaces affect the overall scattering pattern of a buried cylinder. Results show layered rough interfaces can significantly alter the scattering behaviors of a buried cylinder.

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