Imaging of objects buried in a layered medium constitutes an important class of problems in electromagnetic theory. This is due to the fact that the results of such investigations have various applications in practice in the areas such as detection and locations of dielectric mines, non-destructive testing, determination of underground cracks and earthquake zones, detection of underground tunnels and pipelines etc. Although during the last three decades several exact and numerical techniques have been developed, a large number of them are related to the layered backgrounds with planar boundaries. Whereas in most of the real applications the bodies are buried in layered media having rough interfaces and the roughness have a strong effect on the scattering phenomena as well as inversion algorithms. For instance, in the case of bodies buried underground the roughness of the earth surface can potentially modify object scattering returns from those with a flat surface. For that reason the problem has to be considered in its actual conditions. In other words one has to take into consideration the roughness of the interfaces between the layers where the body is located. As far as we know not much work have been done in that direction.

The main objective of this paper is to give a method to solve the inverse scattering problems associated with cylindrical bodies buried in a half-space having a locally rough interface in the case of line source illumination. The measurements of the scattered field are assumed to be performed at the far field region in the half-space not containing the body. For the sake of simplicity we consider surfaces having a one-dimensional profile. The material of the bodies are assumed to be inhomogeneous, i.e: their dielectric permittivities and conductivities are the functions of location. Through the Green’s function of the background medium with rough interface the problem is reduced to the solution of a data and object equations which are solved iteratively by the application contrast source inversion method. The reconstructions are obtained for a number of illuminations. On the other hand the determination of the Green’s function constitutes a separate and difficult problem. Here we give a new and general method which is based on buried object approach (BOA) where the perturbations of the rough surface from the flat one are assumed to be buried objects in a two-part space with planar interface. Modeling the roughness in such a way yields us to formulate the problem as scattering of cylindrical waves from finite number of buried homogeneous cylindrical bodies, which is solved through a method based on MoM. This approach is very effective for surfaces having a localized roughness, arbitrary rms height and slope. The method yields quite accurate results even the reconstructions are obtained with the incomplete data. On the other hand it has been observed that the surface roughness has a strong effect on the reconstructions.