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NUMERICAL STUDY FOR LRCS OF SPACE TARGETS

Abstract

With the development of space technology, laser scattering characteristics of targets draws attention of more investigators. Driven by the development of laser technique, investigations in laser scattering and radiation characteristics of targets has been put on more importance for its broad application grounds in space defense techniques such as target detecting, target tracking, target identification and target obscuring. Among many conceptions quantitatively describing the target's laser scattering characteristics, Laser Rader Cross-Section(LRCS) is an important index number including the overall contributions from various factors influencing the laser scattering characteristics, such as the laser wavelength, the dielectric property and roughness of the surface material, and the geometrical shape of the structure. Investigators domestic and overseas have made efforts in this area. But most of their works either start from the electromagnetic scattering viewpoint to treat the problem as evaluating the target's radar cross section in light frequency, or start from the radiation viewpoint to treat the whole target surface as a Lambert one. The former method is inadequate in laser scattering analysis, since it insufficiently takes into account the zero limiting case of light wavelength, where the premise of the general electromagnetic scattering theory fails; While the latter method simply treating the target surface as a Lambert one is poor in accuracy too, because the target surface is none the idealized diffuse reflection surface, but an actual one where both mirror reflection and diffuse reflection exist. In the world's current investigations in scattering property of materials, Bidirectional Reflectance Distributional Function(BRDF) has been widely introduced. In this paper, the BRDF is introduced in describing the radiation property of the optically rough surface of a target which is put into investigation in laser scattering. The BRDF model takes a viewpoint superior to the previous methods that it describes precisely the reflectance on the target surface as a distributional function varying with space angle in all directions and has broad application grounds in theoretical modeling and simulation of laser scattering target characteristics.