

SPACE DEBRIS SYMPOSIUM (A6)
Modelling and Risk Analysis (2)Author: Mr. Fei Dai
China

MODELING AND MEASUREMENT OF ELECTROMAGNETIC SCATTERING BY SPACE DEBRIS

Abstract

With burgeoning activities of space exploration, space debris is used to be a threat to spacecraft, and its increasing will take over more and more orbits around the earth. Research on electromagnetic (EM) scattering characteristic of space debris is very important to detect and track orbital debris which is helpful to use orbits effectively. For the series of debris is widespread in space. The single debris maybe very small but the whole model of series of debris is very huge. The traditional algorithms to solve the scattering of whole model of series of debris is inefficient. They are limited in computational efficiency. EM scattering analysis, particularly the Radar Cross Section (RCS) evaluations, becomes a tremendous computational task. The present sufficient memory size to store all of the data in the process of computation, What is worse the computational speed is not acceptable. In this paper, we present Adaptively Modified Characteristic Basis Function Method (AMCBFM) for analyzing the EM scattering from electrically large objects. Its advantage is that it can reduce the size of impedance matrix. Compared with Method of Moment (MoM), this method reduces considerably the burden on the CPU time as well as memory requirements. It is based on dividing the object structure into small blocks, and evaluating the characteristic functions that are localized in each of these blocks. The series of debris are partitioned into distinct blocks. The whole matrix of MoM can be reduced. The higher level of Characteristic Basis Functions (CBF) are also computed to respect the mutual coupling effects between various blocks. We also provide a feasible ground simulation test method for EM scattering measurement of space debris. The result of measurement confirmed the accuracy and efficiency of the proposed method in speeding up solving large electrical scale problems. It can be used in EM scattering analysis of large scale model of series of space debris.