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Energy Transition for Depolarized Backscatter from Rough Surfaces

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ABSTRACT

In this paper we study the depolarized backscatter enhancement phenomenon for electromagnetic wave scattering from rough surfaces. Some new experimental data on light scattering from rough metallic surfaces shows a phenomenon of backscattering enhancement existing in the antispecular direction under some conditions, such as the surface parameters, wave polarization and operating frequency. From a roughly random surface the backscattering enhancement is predicted due to the constructive interference of multiple surfaces scattering. The study is based upon the integral equation method modified to be able to predict the phenomenon of multiple scattering and backscattering enhancement. From the study we found the backscattering enhancement takes place on the specialized surface parameters large compared with the incident wavelength. Further we also conclude that the depolarized multiple scattering makes much contribution along the plane of incidence from random rough surfaces, but depolarized single scattering makes little contributions as our expectation. In comparison of model prediction of total multiple scattering strength with measured data along the specular plane, excellent agreement is obtained.

KEYWORDS: Backscatter, energy transition, showing function, backscatter enhancement

I**INTRODUCTION**

Microwave power transmission is the use of microwaves to transmit power through outer space or the atmosphere without the need for wires. It is a sub-type of the more general wireless energy transfer methods. Microwave ovens work by passing non ionizing microwave radiation through the food, water, fat, and other substances at a frequency approximately 2.48 GHz. The microwave in the microwave oven penetrations the depths of electromagnetic waves in matter and also scatters from the rough surfaces of food with complex dielectric relaxation. After the microwave heating the food, the chemical changes of food will change the relative dielectric constant. In this paper we study the scattering direction of microwave in the microwave oven and further the change of scattering direction with different physical parameters.

The experimental study of backscattering enhancement from characterized random surfaces was studied by L. Ailes-Sengers in 1995 [Ailes-Sengers et al., 1995]. The comparisons of Monte Carlo numerical studies and experimental measurement of backscattering enhancement from 2-D perfectly conducting random rough surfaces was made in 1996 [Ocla and Tateiba, 2000; Johnson et al., 1996]. Up to date a theoretical model for studying the relationship among the backscattering enhancement, single scattering and multiple scattering is still lacking, especially for the depolarized backscatter enhancement [Chin-Yuan and Fung, 1997]. Further studying the