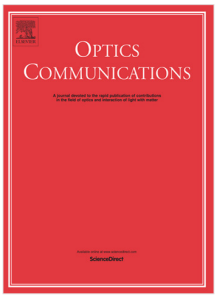
Accepted Manuscript



Depolarizing surface scattering by a birefringent material with rough surface

Jonas Ritter, Ning Ma, Wolfgang Osten, Mitsuo Takeda, Wei Wang

PII: S0030-4018(18)30741-7
DOI: https://doi.org/10.1016/j.optcom.2018.08.048
Reference: OPTICS 23405

To appear in: *Optics Communications*

Received date : 30 July 2018
Accepted date : 17 August 2018

Please cite this article as: J. Ritter, N. Ma, W. Osten, M. Takeda, W. Wang, Depolarizing surface scattering by a birefringent material with rough surface, *Optics Communications* (2018), https://doi.org/10.1016/j.optcom.2018.08.048

Depolarizing surface scattering by a birefringent material with rough surface

Jonas Ritter[a,b], Ning Ma[a], Wolfgang Osten[a], Mitsuo Takeda[c], Wei Wang[a,*]

[a] *Institute of Photonics and Quantum Sciences, School of Engineering and Physical Sciences, Heriot-Watt University, Edinburgh EH14 4AS, UK*
[b] *Institute of Applied Optics, University of Stuttgart, Pfaffenwaldring 9, 70569 Stuttgart, Germany*
[c] *Center for Optical Research and Education (CORE), Utsunomiya University, Yoto 7-1-2, Utsunomiya, Tochigi 321-8585, Japan*

Abstract

The surface polarization scattering is investigated in terms of the coherence matrix for the electric field scattered from a birefringent material with a random interface between its surface and air. The relationship between the statistical properties of the scattered light at the scattering surface and the micro-structure of the anisotropic media has been explored for the first time to understand the underlying mechanism of the surface scattering phenomena for the electric field with random states of polarization.

Keywords: Scattering from surfaces, Coherence in wave optics, Statistics, Polarization in wave optics
PACS: 68.49.-h, 42.25.Kb, 02.50.-r, 42.25.Ja,

As a ubiquitous natural phenomenon, the scattering of electromagnetic waves has been studied extensively and various techniques have been developed during the last decades [1, 2, 3, 4]. As the deflection of a ray from straight path, light scattering is a model of energy re-distribution where light in the form of propagating energy is scattered due to irregularities on a surface. Optical scattering is important for many applications such as detection of surface defects, determination of the contamination of optical systems, medical diagnosis or quality control of food and agricultural product. In

*Corresponding author
Email address: w.wang@hw.ac.uk (Wei Wang)