

Calculation and measurement of the diffraction field of a plane electromagnetic wave inside and outside a microsphere

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Abstract:

Based on the Mie theory, the electric-field vector, the vector of intensity, and the Umov-Poynting vector were calculated for the electromagnetic field formed as a result of diffraction of a plane linearly polarized monochromatic wave on a dielectric microsphere with the radius of several wavelengths. Using a microscope and a television camera, light intensity distribution was also measured on different planes near a polystyrene ball with a diameter of 5 microns when a light beam of a helium-neon laser was diffracted on it. The calculated and the experimental diffraction patterns fundamentally comply with each other.

Keywords: electromagnetic wave, microsphere, Mie theory, Umov-Poynting vector, plane linearly polarized monochromatic wave, helium-neon laser

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