

Pictorial Analysis of Relationships between Spherical and Plane Waves

by

Masayuki YAMAZAKI

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Abstract

Spherical and plane waves have been described in many textbooks. In this paper, we show by illustrations that a spherical wave can be constructed by the envelopment/superposition of plane waves or inversely that a spherical wave can be decomposed into plane waves each having the same phase at certain point but a distinct propagation direction. A spherical wave is a spherical wave itself. At the same time, a spherical wave is equivalent to the superposition of many plane waves. Based on two interpretations of a spherical wave, we discuss Fraunhofer diffraction and the form of the wavefront of light emitted from an atom.

Keywords: plane wave, spherical wave, Huygens's principle, envelop, principles of superposition, probability

Professor, Department of Applied Science, Course of Optics and Photonics