应用光学 2005 26 (1): 20-24 ISSN: 1002-2082 CN: 61-1171/O4

理论研究

漫射近似在测量生物组织光学性质中的适用范围

李剑平[1], 陈冰泉[2]

1. 山东大学信息科学与工程学院, 济南 250100; 2. 烟台大学光电信息科学技术学院, 山东 烟台 264005

收稿日期 修回日期 网络版发布日期 2007-1-27 接受日期

摘要

漫射近似理论经常被用来作为测量生物组织光学特性参数实验和方法的理论基础,
但是漫射近似理论只是一种对辐射传输理论的近似结果,在一定条件下有其特定的适用范围.
为了确定漫射近似理论在活体非侵入式无损测量要求下的适用范围,本文采用Monte Carlo模拟校验的方法,
对漫射近似理论和Monte Carlo模拟计算的结果进行了比较,
给出了基于单散射反照率a和各向异性因子g的漫射近似理论适用范围数值标准.
这一标准为漫射理论的应用提供了参考依据.

关键词 漫射近似 Monte Carlo模拟 生物组织

分类号 R318.52

Validity of the Diffusion Approximation in Determining the Optical Properties of Biological

LI Jian-ping[1],CHEN Bing-quan[2]

1. College of Information Science and Engineering, Shandong University, Jinan 250100, China; 2. College of Optic-Electro Information Science Technique, Yantai University, Yantai 264005, China

Abstract

Diffusion approximation (DA) theory is often used as basis of the experiments and methods in determining the optical properties of biological tissues. However, DA is only an approximation of the accurate radiative transfer theory and has its validity range under given conditions.In order to assess the validity of the DA under the requirement of in vivo non-invasive measurement, we compared the results from the DA theory with the more accurate results from the Monte Carlo methods.A numerical validity criterion for the DA is established on the basis of the single-scattering albedo a and anisotropy factor g for semi-infinite tissus with index-matched boundaries.

Key words diffusion approximation Monte Carlo simulation biological tissus

DOI:

通讯作者 李剑平