

16 December 2024 Simulation modeling of conversion processes of polarized optical radiation in biological tissue

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Abstract

An improved simulation model of photon propagation in scattering biological tissue has been developed based on the Monte Carlo method, which makes it possible to comprehensively consider all the main optical processes occurring during the propagation of optical radiation through the BT. The model differs from the known ones in that it allows one to consider the polarization state of the incident radiation and the change in its optical characteristics by tracking the electric field in each interaction event. Based on the developed statistical model, simulation modeling of the processes of photon propagation in the skin and its individual layers was carried out, which made it possible to establish the scattering and transmission characteristics for each of the skin layers with model parameters considering the angles of incidence of radiation in the visible and near-IR ranges, and the thickness of the skin layers. The simulation also made it possible to determine the relative intensity of backscattered photons depending on localization.

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