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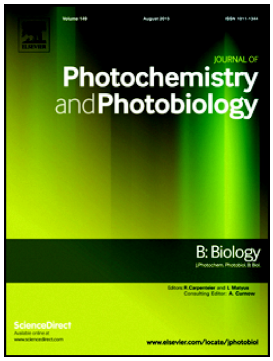

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Coherence and polarization properties of laser propagating through biological tissues

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Abstract

Based on the extended Huygens-Fresnel principle, the analytical expressions of the cross-spectral density matrix elements for random electromagnetic Gaussian Schell-model (GSM) beam propagating in biological tissues are derived, and used to study the changes in spectral degree of coherence μ and spectral degree of polarization P of random electromagnetic GSM beams with the propagation distance z propagating through the different biological tissues. It is shown that the changes closely depend on the species of the biological tissues, beam wave length, the interval between two field points and propagation distance. The spectral degree of coherence μ and the spectral degree of polarization P of the ultraviolet ray (λ=0.325μm) will quickly decrease during the propagation process, which implies that the damage of the ultraviolet ray to biological tissues is strong. The bigger structure constant of the refractive-index C_n^2 corresponds to the smaller change of μ and P. There exists the obvious effect of the interval between two field points on the spectral degree of coherence and the spectral degree of polarization of random electromagnetic GSM beams passing biological tissues. The obtained results can provide the theoretical and experimental basis for the analysis to the coherence and polarization properties of random electromagnetic beams propagating through the complex biological tissues.

Keywords: Spectral degree of coherence; Spectral degree of polarization; Random

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