Conference 12147

Tissue Optics and Photonics II

5 - 7 April 2022 | Salon 5, Niveau/Level 0

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Session 1: Skin Optics, Microcirculation, and Flowmetry

5 April 2022 • 09:20 - 10:30 CEST | Salon 5, Niveau/Level 0

Session Chairs: **Zeev Zalevsky**, Bar-Ilan Univ. (Israel), **Walter C.P.M. Blondel**, Univ. de Lorraine (France)

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(Invited Paper)

Author(s): Zeev Zalevsky, Bar-Ilan Univ. (Israel)

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How a highly reflective material on the skin surface may affect the light distribution within the skin?

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When light propagates through a turbid medium, such as biological tissue, it is well known that specular reflectance, refraction, scattering, absorption, and diffuse reflectance will be present to generate the final light distribution within the medium. The intrinsic optical properties of the tissue influence the propagation of light, Nevertheless, another aspect to take into account is the light source geometry. With the technological progress in biomedical optics, several lighting devices have emerged for phototherapy and photodiagnosis purposes, each of them built with specific geometry and materials. It is not rare to find devices containing metallic parts that should be placed in contact with the tissue surface. Up to our knowledge, the effect of highly reflective material in contact with biological tissue surface during a phototherapy or photodiagnosis procedure has not been discussed yet. This work aims to use Monte Carlo simulations to evaluate how a highly reflective material on the top surface of the skin may influence light distribution. The MC implementation used is based on the graphics processing unit (GPU) called Monte Carlos eXtreme (MCX) that was developed by Fang. We considered a skin tissue containing six layers: living epidermis, papillary dermis, upper blood net dermis, reticular dermis, deep blood net dermis, and subcutaneous fat. To simulate the reflective material, different optical coefficients were tested to obtain the physical effects of reflection. The results indicate that the reflective material in contact with the skin surface leads to a higher amount of photons propagating into the tissue and this effect is more pronounced at the first skin layer, where the simulations resulted in a higher amount of absorbed photons. This study shows that light dosimetry should consider not only the amount of light that leaves the source but also the amount of light that is effectively coupled to the tissue.

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metrological characterization