APPLICATION OF OPTICAL ANGULAR MOMENTUM AND QUANTUM ENTANGLEMENTS IN BIOMEDICAL TISSUE DIAGNOSTICS

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In turbid tissue-like scattering medium the conventional polarized light, scattered multiple number of times, is depolarized, and the depolarization rate depends strongly on the size and shape of scattering particles, as well as on the number of scattering events. In fact, the structure of light can be more complicated when the polarization of light across the laser beam can be radially or azimuthally polarized and carry orbital angular momentum. When these so-called structured light beams, such as cylindrical vector beam (CVB) and/or Laguerre-Gaussian (LG) beams, propagates through a turbid tissue-like scattering medium, either anisotropic or inhomogeneous, the spin or angular momentum are changed that leads to spin-orbit interaction. The spin-orbit interaction leads to the mutual influence of the polarization and the trajectory of the light propagation. We investigate the applicability of using CVB and LG beams for optical diagnostics of biological tissues. In current presentation propagation of CVB and LG beams in anisotropic turbid tissue-like scattering media is considered in comparison to conventional transfer of Gaussian beams. We demonstrate that by applying CVB and LG beams the sensitivity is increased at least twice in comparison to the conventional tissue polarimetry approach. Both experimental and theoretical results suggest that there is a high potential in application of structured light in tissue diagnosis. Finally, the perspectives of using quantum entanglements for diagnostic purpose are discussing.