вались величины вариаций температуры клеток или клеточных органелл, вызванных воздействием НИЛИ с длиной волны 633 нм и плотностью мощности, наиболее часто используемой в лазерной терапии (1-10 мВт/см^2).

Вариации температуры обнаруживаются по вызываемым ими вариациям показателя преломления объекта. Это приводит к изменениям фазы объектного лазерного пучка, которые регистрируется ESPI-приставкой с точностью до π/100, что, согласно проведенной калибровке, соответствует изменению температуры на ~ 0,01°С. Данный метод является бесконтактным и неразрушающим, он не вносит изменений в жизненный цикл клеток.

Облучаемыми объектами являлись монослойные культуры *Staphylococcus aureus*, *Pseudomonas aeruginosa* и биопленки, выраставшие на стеклянных подложках под слоем воды. Во всех случаях тепловой эффект обнаружен не был - ни интегральный, ни локальный (размер минимальной исследуемой области 0,3 мкм), т. е. величина локального нагрева составляла менее 0,01°С. Этот факт необходимо учитывать при анализе предлагаемых моделей НИЛИ.

В дальнейшем мы планируем проведение аналогичных работ по экспериментальному обнаружению локальных электрических полей, которые могут возникать в биологических объектах под воздействием высокоградиентного НИЛИ.

VIDEO POLARIMETRY OF OBJECTS EMBEDDED IN STRONGLY SCATTERING MEDIA WITH MONTE CARLO TECHNIQUES

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Abstract. Optical techniques are becoming more widespread for the study of strongly scattering media such as biological tissues. This interest is due to the characteristics of non-invasiveness, relatively low cost, and ease of application. However, when optical radiation is used to study multilayer scattering media scattered radiation passes through many random paths, leading to uncertainty and resolution loss in the detected signals.

Objective. Increase reliability of diagnosis by obtaining the dispersion properties of the biological tissue from the spatial distribution of polarized backscattered light.

Materials and methods. Simulations and analysis of samples with known properties were performed. To evaluate the lateral resolution obtained by probing the medium scattering with polarized light, totally absorbing object of small thickness was included in the scattering sample. This object was scanned at different depth, through polarized channels. The extended illumination was simulated using an algorithm based on Monte Carlo techniques and through the variation of the x coordinates of the point of incidence of the different optical radia-

tion simulation. The results were obtained by superimposing different results obtained by scanning the illumination along x fig.1. The simulation of illumination was performed at equidistant intervals along the x direction and for the simulation of detection, photon containers of 1.0 mean free path width were considered. In the simulation, it was used only one layer to avoid the effects of the difference in the properties of the medium. Quantification of the results for different depths was obtained by calculating the optical contrast and the lateral resolution.

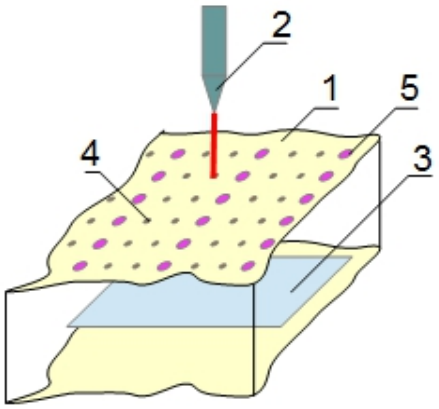

Fig.1: 1 sample, 2 light source, 3 embedded object, 4 scanned points, 5 photon container

Results. As the object was immersed deeper into the scattering medium, the lateral resolution was reduced. For all depths probed, the relative intensity recorded by the co-polarized channel was higher than the intensity recorded by cross-polarized channels. The circular co-polarized channel recorded higher intensity than the linear co-polarized channel. The intensities at large x were the same for all depths.

Discussion. Contrast and the lateral resolution were reduced with increasing depth due to absorption and dispersion of the medium. The values of lateral resolution for linearly polarized illumination showed that the co-polarized channel allows better localization than cross polarized channel. This is apparently due to the light that has preserved its initial polarization state. The polarization maintaining part of the intensity in linear channel slightly increases the sensitivity to the superficial regions. In the other hand, in terms of the levels of contrast, the cross-polar channels give better results than of the co-polar channel. This difference is also due to the polarization maintaining light present in co-polarized channel. This part propagates to superficial regions where the absorbing feature has not been reached. Circular co-polarized channel shows better lateral resolution due to the maintaining circular polarizations, which allows a higher contribution from photons with a better defined path.

Conclusions. An analysis of the backscattered light from biotissues has been performed to retrieve the scattering properties of the tissue. The results might be used for the biotissue condition characterization.