SPATIAL-FREQUENCY POLARIMETRY IN DIAGNOSTICS OF PATHOLOGILAL CHANGES IN BIOLOGICAL OBJECTS

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The optical model of polycrystalline networks of histological sections of rectum wall is suggested. The results of investigating the interrelation between the values of statistical (statistical moments of the 1st-4th order) parameters are presented. They characterize the coordinate distributions of the fourth parameter of Stokes vector of Fourier transforms of laser images of rectum wall histological sections and oncological changes. The diagnostic criteria of rectum cancer are determined .

Histological sections of rectum wall biopsy with benign (group of samples 1-9) and malignant (group of samples 2-10) were used as objects of investigation.

This research is confined to the analysis of distributions structure of the 4th Stokes vector parameter most vividly characterizing the changes in optical anisotropy of polycrystalline biological networks.

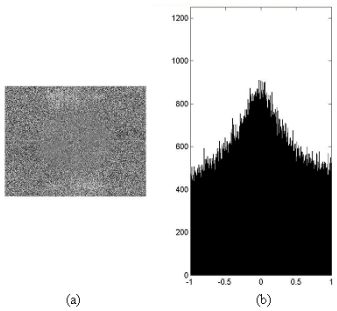

Figure 1. Coordinate structure and histogram of values distribution of the 4th parameter of Stokes vector scattered by histological section of group 1 in Fourier plane

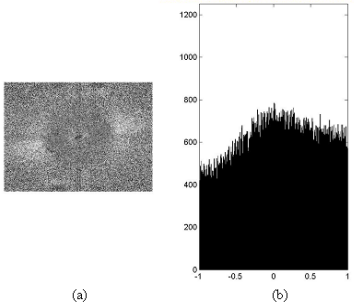

Figure 2. Coordinate structure and histogram of values distribution of the 4th parameter of Stokes vector scattered by histological section of group 2 in Fourier plane

The results of the 1st-4th order moments calculation characterizing the coordinate distributions in Fourier plane of the field of laser radiation transformed by histological sections of rectum wall with benign (group 1) and malignant (group 2) tumors are presented in Table 1.

Table 1. Statistical moments of the 1st-4th orders of Fourier spectrum S_4

Parameters	Benign changes	Malignant changes
R_1	$0{,}28 \pm 0{,}0012$	$0{,}07 \pm 0{,}021$
R_2	$0{,}11 \pm 0{,}008$	$0{,}39 \pm 0{,}014$
R_3	$1{,}14 \pm 0{,}009$	$0{,}59 \pm 0{,}016$
R_4	$2{,}47 \pm 0{,}017$	$0{,}79 \pm 0{,}027$

[1]. Yu.A. Ushenko, Yu.Ya. Tomka and A.V. Dubolazov, Optics and Spectroscopy 110(5), 814-819, 2011.
[2]. *O. Ushenko, Y.Y. Tomka,* O.V. Dubolazov, *V.O. Balanetska, A.V. Karachevtsev, A.-P. Angelsky,* Advances in Electrical and Computer Engineering 11(2), 55-62, 2011.