

## INFRARED DIAGNOSTICS OF NON-EQUILIBRIUM PROCESSES IN HUMAN TISSUE

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By the law of biogenic energy maximum [1] "each biological system is in the state of "stable non-equilibrium", that is to say of flexible equilibrium with environment". The thermodynamic parameters differences of different parts of the system under investigation are general for non-equilibrium state. Temperature – is one of the parameters for state description of the system macroscopic parts which are at the local thermodynamic equilibrium. Energy which is emitted by biological object under 30 °C is maximal in infrared (IR) spectral band. This fact is used for composition of diagnostics systems which are based on objects IR radiation perception and reconstruction of temperature distribution on their surface. IR thermography is widely used both in biomedical researches and for industrial objects monitoring [2]. Using of IR thermography for medical purposes is based on near-symmetric temperature distribution on human skin. Deviations from symmetric distribution or unnatural hyperthermic areas signal about processes in human organism which are often have disadvantage character. Thermogram – 2-D temperature distribution on human skin – is a result of thermographic experiment.

In this work the examples of IR thermography use for analysis of some physical factors thermal impact on biotissues in therapeutical purposes is presented. The experiments were carried out at the clinic of NASB by computer thermographic system on the basis of IR imaging camera IRSnapShot (USA). On Fig. 1 thermograms of foot before and after VHF (40,68 MHz) irradiation are shown as an example. The temperature of maximum after procedure-heat point is denoted for each shot. VHF stimulates blood circulation including the pathology area. It is mirrored on thermograms as reducing of high temperature area after therapy. Isothermal regime of software allows visualizing the regions of preset temperature. This is good for more clear estimation of pathology localization.

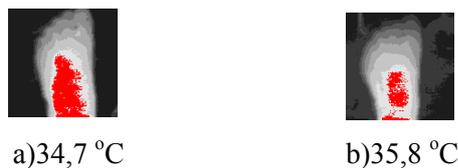


Fig. 1. Thermograms of foot before and after VHF-therapy (a – before, b – after influence)

Qualitative and quantitative estimation of thermograms is a gauge of character and degree of physiothermal procedures thermal effect. Eventually alike investigations allow to infer about therapy effectiveness and to optimize the operation modes.

### References

- [1] Bauer E.S. (2002) Theoretical biology. Rostok, Saint-Petersburg.
- [2] Dragun V.L., Filatov S.A., Holodova E.A., Shutova V.I. (1993) Computational IR thermography: modern state and development perspectives of its application in science and medicine. A.V. Luikov Heat&Mass Transfer Institute of NASB, Minsk.