Topic: effects evaluation

Bioelectrodynamic criterion of the NLW effectiveness estimation and the interaction mechanisms of the multilayer skin tissues with electromagnetic radiation

M.V. Lomonosov Moscow State University

Science Unlimited Inc (Italy)

Korolev A.F., Kozar A.V., Sheveleva E.N., Sysoev N.N., A. Pulino

A lot of papers describing the results of microwave and millimeter wave radiation influence on biological objects were published recently. Experiments performed with the different biological systems show that this influence has resonant character. Quite contrary effects (from therapeutical to aggravating the desease) can be observed during medical experiments carried out in different spectral bands.

The thermal microwave effects are used in the medical applications for the oncological illness treatment, when the given tissue area is heated by microwave up to the temperatures of malign formations destructure. The effect of the non-thermal influence is not so common in medical practice as first one, but nevertheless, it is used now. These applications are based on numerous facts of the biological effect of the exterior signals of, the so called, informational (non-thermal) nature. We cannot point evident specific receptor systems for them.

The biological effects of low intensity millimeter wave radiation are opposed to thermal ones in the context of contemporary view. The criterion of non-thermal influence is that, the elevation of temperatures of the defined object is less than 0.1 K^o. In this case the density of power flow usually does not exceed 10 mWt/cm^2.

The existence of defeated factor while sharply directed electromagnetic irradiation was demonstrated of the different targets during the experiments at US Air Base in New Mexico. The depth of radiation penetration into skin tissue is about 0.4 mm. The results are treated as heating of intracelling liquid that caused the pain sensation [1].

The search of the primordial receptors for such signals is usually done among the membranous systems of biological macromolecular complexes. Such effects arise during the influence of the low intensity electromagnetic fields of various spectral bands: UV, visible light, infrared radiation. These effects are very similar and, as a rule, are of common term “biostimulation” It points that, there must be a common element in the response chains making biological system reaction identical on the heterogeneous signals.

Our approach to this problem identifies the mechanism of the exterior information signal effects with the characteristics of the biological fluids as a structured medium. Modification of the water structure can affect cell processes. The activation mechanism of the low intensity millimeterwave radiation on the biological objects is provided by the interaction of water and aqueous systems in the different stage of binding with the electromagnetic radiation. Assuming water to be the structured medium, we suppose, that low intensity millimeterwave influence modifications of the fluid structure cause changes of macroscopic parameters which can be registered.

Absorption and reflection spectrum are analysed while modelling the millimetre wave interaction with multilayer skin tissues, which considered as the medium with plane-parallel plates, having complex dielectric characteristics. Spectrum are analysed under different skin layers thichness: epidermis, derma, hypodermis. The most critical result of the work demonstrates the formation of the stable interefence picture and gives the opportunity to estimate individual layer contribution to the total interference picture.

Possible mechanisms of non-heating character action are analyzed as well heating influence effects. The experimental results achieved by the methods of the extremely high frequency therapy are also presented (for example people treated for arthritis with voll-method control).

[1]. US Claim Non-Lethal Technology Breakthrough // Jane's Defence Industry. – 2001. – T. 18, №4. – pp. 2,3