

ABSORPTION ENERGY IN ELECTROMAGNETIC HYPERTHERMIA FEATURES

Perov S.

RAMS Institute of Occupational Health, The WHO CC in Occupational Health, Moscow, Russia

One of the most important problems of electromagnetic hyperthermia in oncology is high temperature in exposed tissue control and maintenance. High temperature should be constant in strong limits, because overheat destroys healthy cells and insufficient heating stimulates malignant tumor growth. The leading role in this process is absorption energy maximization. In electromagnetic hyperthermia absorption are used distances or invasive thermometrical methods, but sideways methods don't allow show real absorption maximum.

On the middle of last century J.Pätzold suggested selective absorption conception. This conception was based in selective heating tissue deepened frequency, and it came to pass conception was disallow. It has been proved that absorption maximum is bounded with exposure feature.

We carried out the analyze of "condenser plates – air-gaps - object" system behavior. In these investigations characteristic graphs for three main frequencies which are used in electromagnetic hyperthermia have been obtained. Characteristic graphs show absorption maximum depending on object electrical conduction. All of this characteristic graphs have absorption maximums in the presence of air-gaps. Characteristic graphs without air-gaps have linear dependence.

Our results show that absorption maximums found out J.Pätzold depend on air-gaps condenser plates. At constant frequency analysis characteristic graphs show that air-gaps change gives us a possibility maximal as well as minimal of absorption energy. Electric field frequency change appears equivalent to shift of air-gaps distance between plates and object.

Our results allow to develop real-time system for maximal energy absorption in object. This method allows to evaluate the maximal absorption energy in exposed tissues and determine "maximal absorption - temperature" dependence. The practical application of developed method allows to reduce side-effects for patient.

This method can realize in electromagnetic hyperthermia apparatuses with automatic (overlooker) resonant harmonizing system. Hardware and software method realization may be constructed by addition to any type of 13,56; 27,12 and 40,68 MHz physiotherapy apparatuses. Device design and working regime doesn't vary.