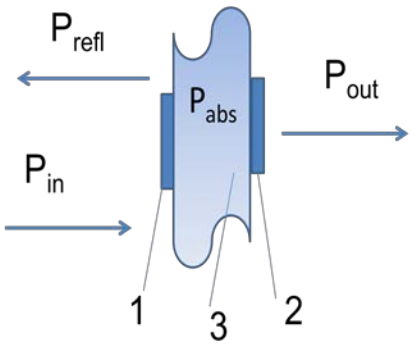
The personal microwave dosimeter.

B. Gurkovskiy [(1)], Vodohlebov[(1)], E.Onishchenko [(2)] A. Simakov* [(1)]
(1) National Research Nuclear University "MEPHI", http://www.mephi.ru
(2) "MEPHI-MICRO" GmbH, 115409, Moscow, Russia.

Modern standards of the microwave security based on complex methods of measurement and calculation of the parameters of electromagnetic field (EMF) and absorbed dose in the living tissues. However, the movement of biological object, the complex structure of living tissues, the temporal and spatial variability EMF create uncertainty of these measurements and evaluations. In addition, current standards do not take into account the effect of weak electromagnetic radiation on physiological parameters and human health, particularly in terms of its professional liability business. Furthermore many research have shown that the weak radiation has an individual and cumulative character. But, today simple technique for the operational control of the personal dose characteristics is absent.

In this report we propose the simple technique and portable device for operational dose control. This technique is illustrated in fig. 1, a. The photo of the experimental device (in the middle) is shown in fig. 1, b.



a) b)

Fig. 1. a) Biodosimetry technique: 1,2 - microwave "hard" sensors, 3 - absorbing material, Pin - incident radiation power, Pout - transmitted power, Pabs - absorbed power; b) photo of experimental device (in the middle).

In this technique the pair of the identical EMF sensors has been separated by a layer of material that simulates the electrical properties of the biological tissues. At the absence of microwave radiation the difference signal between sensors pair equals zero. At the presence of the electromagnetic radiation the detected difference signal corresponds to the absorbed dose of microwave radiation. Therefore the real sensor of the absorbed power characteristics is phantom of tissue, placed between pair of the identical EMF sensors and the measured result doesn't depends on many of technical parameters of "hard" sensors like nonlinearity, response frequency, gain and so on.

The experimental sample of the portable personal dosimeter, controlled by microprocessor type Atmel ATmega328P and has the following characteristics:
1) SAR (Specific absorbed Rate) range: from $1x10^{-8}$ W/kg to 1,5W/kg;
2) SA (Specific Energy Absorption) range: from $1x10^{-8}$ J/kg (Gr) to 10 J/kg (Gr);
3) Power Density Range: from 0,01μW /sm^2 to 15 mW/sm^2 ;
4) Frequency range: from 800 MHz to 3 GHz;
5) Processing Speed - 0,5 mc.