

## **CELL-TOWERS-RESULTS OF MEASUREMENTS AND ESTIMATION OF SAFETY FOR THE PUBLIC**

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In Russia BSs are radiotransmitting radiotechnical objects that radiate electromagnetic power in UHF band (300-3000 MHz).

Besides each BS is supplied with a set of radiotransmitting equipment of radiorelay communication working in SHF band (3-30 GHz) that is responsible for BS integration in the net as a whole.

The radiating power of BS transmitters as a rule does not exceed 5-10 W per channel.

BS antennas are usually set at the height of 15-100 meters from the ground on already existing constructions: public, official, industrial and residential buildings, chimneys of industrial enterprises etc., or on the specially built towers.

BSs are to be set to meet demands of the Sanitary rules and norms:

1. Special Hygienic normatives GN 2.1.8./2.2.4.019-94 "Temporary permissible levels (TPLs) of effects of EMR created by the cellular radiocommunication systems",
2. Sanitary rules and norms MSanPIN 001-96 "Sanitary norms of physical factors' permissible levels in appliances of consumer goods in life conditions",
3. General Sanitary rules and norms SanPiN 2.2.4/2.1.8.055-96. "Radiofrequency electromagnetic radiation (RF EMR) under occupational and living conditions".

The above-mentioned documents set maximum permissible values for population power density  $10 \mu\text{W}/\text{cm}^2$ .

In 1997-1999 the experimental lab of the Center of Electromagnetic Safety (Moscow) carried out measurements of EMF RF intensity in the places of BS allocation in Moscow and suburbs.

The territories close to 86 BSs of NMT-40, AMPS/D-AMPS, GSM-900, DCS (GSM-1800) standards were examined.

The investigation was carried out both on the BSs especially picked out by the operators of cellular radiocommunication nets during the starting and on working BSs in different workload conditions (O. Grigoriev, A. Merkulov et al., 1999).

There were no other evident EMF RF sources.

Specially worked out methods were used for carrying out measurements that were in accordance with the standard project "Measurement and assessment of human exposure to high frequency (9 kHz to 300 GHz) electromagnetic fields" (the project was finished by working group 15 TC 85 IEC).

EMF level instrumental control was carried out in the places of uncontrolled access and possible 24-hour radiation of population – in territories close to BSs inside all the apartments of first line buildings around the BSs and inside the last floor apartments of the buildings where BS radiotransmitting antennas are set.

It is to be noted that very many BSs in Russia are set on the roofs of the residential buildings.

The measurement results are given in Table.

The generalized results of EMF RF intensity measurements in places of BS allocation carried out by the Center of Electromagnetic Safety.

<b>Place for carrying out measurements</b>	<b>Amount of measurements</b>	<b>The fixed power density, <math>\mu\text{W}/\text{cm}^2</math> (<math>p&lt;0.05</math>)</b>	<b>Maximal fixed power density, <math>\mu\text{W}/\text{cm}^2</math></b>
Residential territory (height is 2 meters above the ground level)	258	$0,18 \pm 0,01$	0,38
The last floor of the building where the transmitting BS antennas are set	386	$0,19 \pm 0,01$	0,69
Premises of the first line buildings around the BSs	787	$0,23 \pm 0,02$	0,93

It is showed that the fixed EMF RF levels did not exceed maximum permissible values given in Russian normative documents ( $10 \mu\text{W}/\text{cm}^2$ ).

And in 91% they were below  $0.17 \mu\text{W}/\text{cm}^2$  (the limit of the measurement range of EMR-20 device by “Wandel & Goltermann” that was used).

Measurement were made at the peak of BS workload.

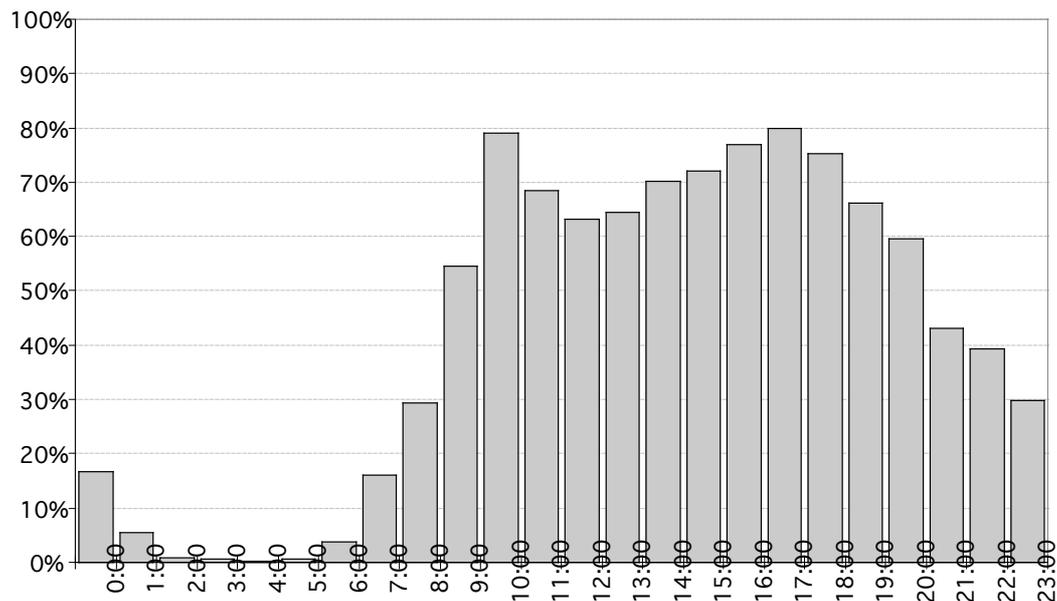


Fig. A typical diagram of BS workload by the hour

Vertical: BS workload, % of maximum possible one  
Horizontal: time

Similar conclusions are made in works of the scientists from the USA, Sweden, Australia, Germany, Hungary and others.

Thus the real levels of exposure from the base stations are lower than the existing standards, but when we're asked whether the precautionary limits for the GSM-signal from base stations should be very strict. I think that we have more arguments for than against it. (=more pros than cons)

I'd like to draw your attention to some discussion positions.

We have some absolutely new situation during the estimation of hazards of EMF B.S. for population.

#### SOME NEW SITUATION DURING THE ESTIMATION OF HAZARDS OF EMF B.S. FOR POPULATION

1. Maximum approximation of EMF to the places of living of every individual.
2. The minimum exceeding of EMF level.
3. Constant electromagnetic radiation of the population including children and growing embryos as well as patients and hypersensitive individuals).
4. Absence of conditions to carry out adequate epidemiology research.
5. Additional "forced" radiation by the potentially hazardous EMF for health in addition to exposure to other factors of environment and on the contrary and possible EMF influence on organism's reactions in exposure to other factors.

As an example:

**The death of sencibilized quinea pigs with anaphylactic shock (A-shock)  
after only WGMF, only EMF or both  
(Yu. Grigoriev, B. Podkovkin)**

	Control	Only WGMF + A-shock	Only EMF + A-shock	WGMF+EMF+ A- shock
Number of sencibilized animals	24	20	20	20
Number of animal death with a-shock	22	19	<u>10</u>	19

EMF (2450 MHz, 1 mW/cm<sup>2</sup>, time of exposure - 30 min, every day, 10 days)

WGMF (reduction in three times, time of exposure - 20 days)

Notice: correspondening correlation were received with investigation of an adrenaline, histamin and serotomin in blood

We have used the model of anaphylactic shock. About 97-100% of guinea pigs always die from anaphylactic shock. More than twenty experiments were carried out. In all cases on control we had 97-100% death of animals. But on preliminary exposure of animals to EMF the character of development of anaphylactic shock changes considerably. We've received a considerable decrease in the death of animals in experiment groups - 50%. Thus there has been a modification of the analyzed bioeffects (anaphylactic shock) under EMF influence.

Some additionally key points:

1. The situation itself spoken above makes us to consider the possibility of non-thermal mechanism of EMF exposure on the organism
2. We have to consider the role of modulation in developing biological effects in the condition of EMF very low level.
3. It's extremely important to get experimental evidence about the presence or absence of cumulative effects, about the presence or absence of "residual" changed background.
4. At the background of constant radiation of EMF B.S. the population can be exposed to other EMF sources but with different frequencies and different modulation. If we admit that EMF can be interference for realisation of live functions of the organism, then it can become a very difficult problem in a certain situation.

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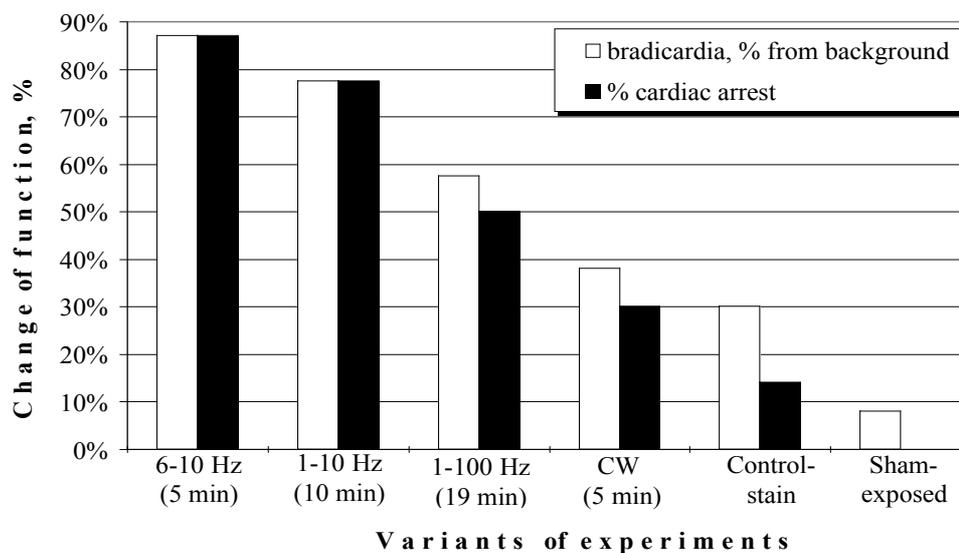
•We have to consider the role of modulation in developing biological effects in the condition of very low level of EMF.

As an example:

We've carried out the following experiments. The experiments were carried out on isolated frog heart (120 frog hearts) during EM-exposure: CW and modulated regime.

In normal conditions the isolated frog heart in Ringer's solution contract for 48 hours without any considerable changes of rhythmus and without cardiac arrest. This situation has been changed sharply as a result of irradiation.

**Change of heart pulsation and cardiac arrest of isolated frog's heart during EM-exposure: CW and modulated regime 1-100 Hz**  
(sweep, meander, radiation 9,3 GHz, 16  $\mu\text{W}/\text{cm}^2$ , 180 frogs)



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There are serious objections against the BSs in many countries. The main reasons for that are that public is afraid of negative EMF influence on health, does not perceive the antennas, lack in information and does not want to take "forced" risks.

At the Second International Conference "Problems of electromagnetic safety of the human being. Fundamental and applied research. Development of EMF standards: philosophy, criteria and harmonization" (September, 1999, Moscow, Russia), scientists from all over the world agreed on the statement given below. This was the conclusion of discussions and information presented at a Round Table on risk assessment to the population from electromagnetic field exposure of base stations used.

Representatives of the World Health Organization, International Committee on Protection from Non-Ionizing Radiation and experts from 13 countries (Bulgaria, Belarus, Germany, Latvia, Poland, Russia, the USA, Yugoslavia, Finland, France, Sweden, Ukraine, Cyprus) took part in the discussions.

The rapid development of cellular communication systems all over the world has caused the appearance of many thousands of mobile telephone base stations. In some cases installation of base station antennas has produced concerns about health and in some cases has resulted in litigation in court. Independent research and measurements on electromagnetic fields in areas close to base stations was discussed, as well as a comparison of the level of exposure of local populations and current exposure limits.

The following conclusions were agreed on the discussion:

- Mobile telephone (cellular communication) base stations are radiofrequency field-transmitting sources with modern requirements for environment and population health protection. Radiofrequency fields are a form of electromagnetic fields (EMF).
- Existing national standards on electromagnetic radiation safety are based on the results of extensive research and consideration of any possible health risks. Of all the national standards, the Russian standards require the lowest levels of exposure to the population from radiofrequency-transmitting installations.
- Direct EMF measurements around mobile telephone base stations have been conducted in many different countries and have produced similar results.
- The observance of existing EMF maximum permissible levels (standards) is obligatory for all base station equipment installations.
- EMF levels in all public areas do not exceed existing maximum permissible levels contained in the Russian national standards. Population safety is well protected by maximum permissible EMF levels.
- However, there is a lack of information provided to the public. This has caused concerns and fears for health and safety. This must be addressed to scientists, government officials and industry representatives.
- Experts responsible for population electromagnetic radiation safety should have full access to all the necessary information. In addition, the public should have full access to clear and accurate information about EMF emitting sources, and all aspects of health and safety against exposure to EMF fields.
- In case of disputes about possible health concerns related to base stations, independent experts in the field of electromagnetic safety should be involved. Their decisions should be based exclusively on the scientific information and existing maximum permissible EMF levels.

The participants of the Round table believe in the necessity of bringing their point of view to the notice of all the interested parties – national authorities, manufacturers and general public.

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