

HOW TO AVOID MOBILE RADIATION

Harmful effects of mobile phone radiation on the health of human beings and the environment have raised an alarm. It's time that the issue is taken seriously and strict guidelines issued to cellphone manufacturers and network providers

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In India, cellphone use has increased from 50 million in 2005 to approximately 800 million now and the number is increasing. The direct and indirect contribution of cellphones to the growth of the economy is unquestionable, but at what cost? This is a relevant question. The ill effects of radiations from Wi-Fi, laptop, etc are similar but mobile phones need to be looked at urgently because of the increase in their usage. In Europe, their number has increased to more than 100 per cent of the population in most of the countries. In India, the figure will reach this level by 2012.

The radiation will not be from individual radios, televisions or defence transmitters, but practically every individual will act as a source of radio-frequency (RF) radiation. According to scientists researching the harmful effects of mobile radiation, there exists an electromagnetic wave pollution called as 'electro-smog.'

Evidence of EMF's bio-effects

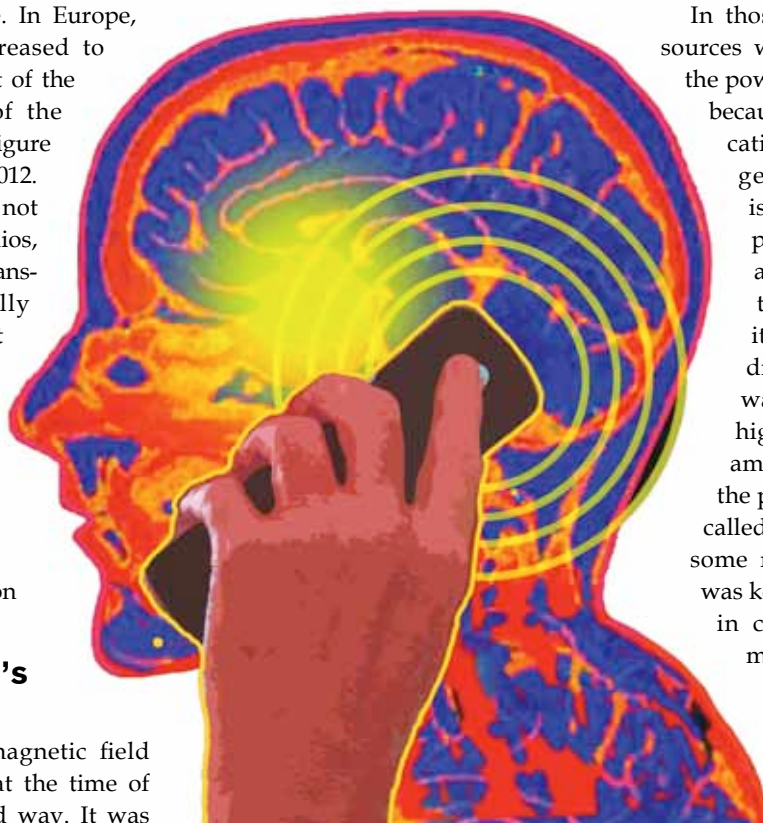
Research on electro-magnetic field (EMF) effects started at the time of world war in a limited way. It was

noticed that birds fell from antenna towers on the warships. The birds not only died but were in a roasted, ready-to-eat condition. This stopped when the radar power was switched off. The effect is similar to present-day microwave oven cooking. Also, birds lost their direction when they approached the antenna and started flying in zig-zag directions. The birds' ability to navigate with the help of the earth's magnetic field (very low level)

and galactic magnetic field (very very low fields) was already known. Based on this, it was identified that powerful electromagnetic effects of antenna-radiated power confused the birds.

Research thus started on the harmful effects of powerful EMF on individuals working on the ship. The focus was on the thermionic effects. It was found that above a certain level of EMF, the cells in the body started splitting. The effects were different for different types of cells.

In those days, EMF-generating sources were less in number and the power emitted was very high because of long-distance applications. Ground-level EMF-generating sources were isolated from the public by putting fences. Professionals working in the field took precautions. Later it was found that the radius maintained to protect was inadequate because of higher incidences of cancer among people living around the periphery of the fence (so-called safe area). According to some reports, this information was kept a secret (only included in classified defence documents). The reason given to people for increasing the radius of the protected area was expansion of the activities in the campus.



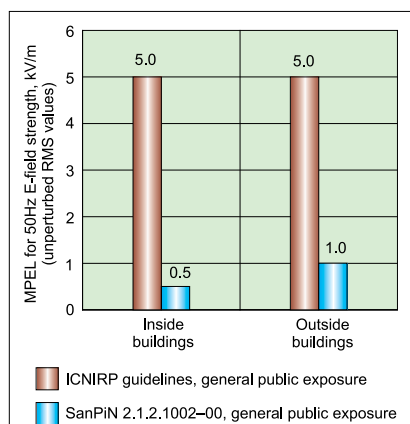


Fig. 1: Comparison of maximum permissible exposure level (MPEL) established for 50Hz power frequency electric fields as the obligatory standard for the general public in Russia versus similar values recommended by ICNIRP

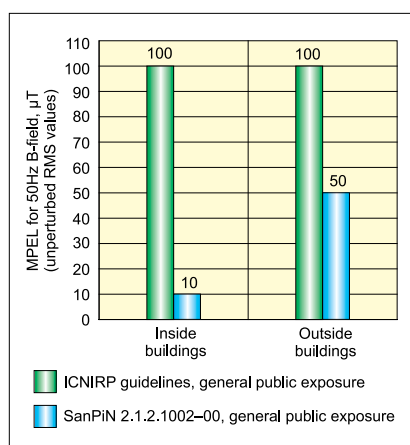


Fig. 2: Comparison of MPEL for 50Hz magnetic field flux density as the obligatory standard for the general public in Russia versus similar values recommended by ICNIRP

Emission standards set by different countries

When RF products came into public use, there was a requirement for fixing emission standards. Thus standards were set by the International Telecom-

Recommendations of India's inter-ministerial committee report

1. Reduce RF emission to one-tenth of current levels in densely populated areas
2. Reduce SAR levels
3. Set up a monitoring network
4. Tropical Indians have low fat content so they are incapable of absorbing more radiation
5. Canada, Australia, New Zealand, Russia, Switzerland, Italy, Poland, China and Belgium have adopted even stricter guidelines
6. Mobile manufacturers should provide booklets carrying warning
7. People with active medical implants should keep cellphones at least 30 cm away from their body

Some facts & figures

1. Power permitted for cellphones is 1000 microwatts/cm²
2. Stellar level is 0.000000000000000000001 microwatt/cm²
3. Cellular power allowed is more than ten million times the levels received from the sun and stars
4. Stars' radiation level is 0.0000000000000000008 microwatts/cm² (10 MHz)
5. Solar radiation is 0.00000000001 microwatt/cm²
6. Cellular satellite received power is 0.0000001 microwatt/cm²
7. Safety standard is 1000 microwatts/cm²

munications Union (ITU) based on the thermionic emission. Safety factor was given to cell-splitting effects. Standard EMF levels were specified. These standards are being followed by the ITU for all types of RF transmissions. Europe has set an International Commission on Non-Ionizing Radiation Protection (ICNIRP) standard of 2 watts per square metre, while the US follows the Federal Communications Commission (FCC) standard of 1.6 watts per square metre. But all European countries do not follow ICNIRP limits. Many countries have set much lower limits. Russia has set a limit hundred times lower than the European limit, based on its research findings.

Electromagnetic waves contain energy. Depending upon the energy level received by the human body, these can be categorised into two types: The high energy levels of electromagnetic fields capable of directly splitting the cells in the human body, and the low energy levels of electromagnetic fields that are incapable of directly splitting the cells in the human body.

The non-thermionic energy of EMF is known to induce changes in the cells, but so far assumed as safe. But of late, particularly after 2000, more cases of

cancer have been reported. Research work was undertaken to find out the causes for the spurt in cancer. The noticeable effect was in patients living near cellular transmission towers. The EMF intensity levels were measured and found to be lower than the ICNIRP standard (being followed in India also). But the difference was that the residents of the area were continuously exposed to EMF twenty-four hours a day. The standard-specified upper limit was a maximum of twenty minutes a day. It meant that continuous exposure at lower levels was the cause for cancer. Earlier studies were field studies and could not establish correlation in case of patients exposed to much lower levels of EMF radiation.

Scientists worldwide have carried many experiments. Russia has conducted extensive research in the field. Since the study is expensive and calls for cooperation of doctors, scientists, field study, etc, Europe has signed a contract with Russia to use their expertise.

The theory is that:

1. Continuous exposure to much lower levels of RF radiation leads to serious health hazards
2. Pulsed radiation at the same average power is more harmful than continuous power
3. Women are more susceptible to EMF health hazards
4. Children and younger generation are most susceptible because of early introduction to cellphones and tendency to use these for a much longer duration

FCC regulations

The FCC recommendations closely follow the 1992 recommendations of

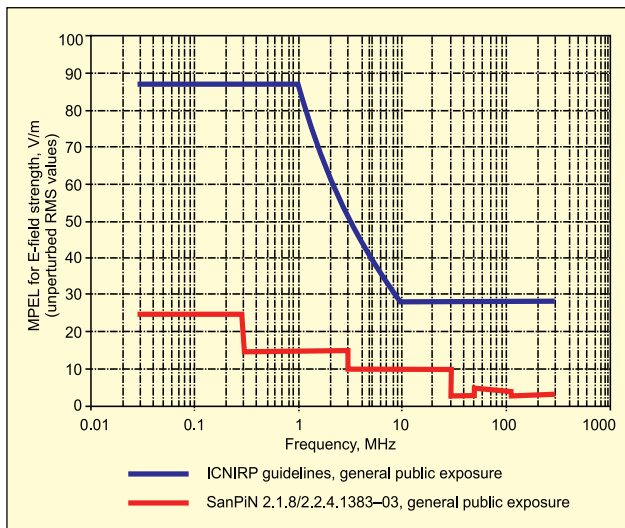


Fig. 3: Comparison of MPEL at 0.03-300MHz frequency range established as the obligatory standard for the general public of Russia versus similar values recommended by ICNIRP

the Institute of Electrical and Electronic Engineers (IEEE). These limit the specific absorption rate (SAR) to 1.6 watts per kilogram for part of the body (head exposure), 0.08 watt per kilogram for the whole body, and 4 watts per kilogram for exposure to hands, wrists, feet and ankles.

The FCC studies are based on the studies conducted on animals in 1970s and 1980s. Based on recommendations of the IEEE, the SAR level of 4 watts per kilogram is adopted for mobile phones. An analysis made by the Environmental Protection Agency (EPA) concluded that biological effects occur at SAR levels of 1 watt per kilogram—one-fourth the SAR level chosen by the FCC. Radio frequency has shown to induce heating of tissues leading to behavioural changes in mice, rats and monkeys, indicating potentially adverse effects in human beings too.

Russian standards compared to ICNIRP

Studies on EMF's health effects were initiated in Russia in 1948. In the following years, comprehensive hygienic, clinical, physiological and experimental studies were carried out. The contemporary Russian electromagnetic safety standards (sanitary and

obligatorily taken into account while assessing the risk of EMF's negative effects on human health to develop Russian standards of electromagnetic safety.

It was also demonstrated that health effects of long-term exposure to EMF over many years may accumulate to cause degeneration of the central nervous system, leukaemia, brain tumours, cardiovascular diseases and hormonal changes later. EMF can be especially dangerous to children, pregnant women, people with central

epidemiological norms and regulations, SanPiN) are developed based upon the analysis of these study results. These studies including chronic (long-term) EMF exposure have given the opportunity to identify the most sensitive systems of the human body—nervous, endocrine, immune, cardiovascular and reproductive systems. These critical system reactions were

nervous, hormonal and cardiovascular system diseases and people with allergies.

The basic requirement for permissible EMF levels established in Russia is the absence of even transient homeostasis disorder (including reproductive function) as well as the tension of protective and adaptive compensatory mechanisms—both at the nearest and late periods of time (which is different from EMF regulation system adopted in Western Europe and the US).

Thus maximum permissible levels of EMF established by Russian national standards at the 0Hz-300GHz frequency range are the strictest worldwide and provide the maximum protection to humans under EMF exposure.

How concerned is India

India does not follow many of the guidelines that are followed in the US. For example, in the US there should be no residential building within 50-metre radius of the cellphone tower. But in India, towers are created over lodges and multi-storied buildings. Cellphones might spread health hazards in epidemiological proportions. The types of diseases as per the research are due to the impact on cell growth in the human body and cell differentiation. Immune system, reproductive system and cardiovascular system are the physiological functions affected.

Since communication systems cannot be avoided, power levels should be reduced and guidelines strictly followed. Users should take precautions and manufacturers should be made to follow norms.

The Indian government has started a research programme for analysing the effects of mobile radiations on human health and environment after receiving a report from IIT professor Girishkumar. Its objectives are:

1. To study the standards followed by different agencies on mobile power limits
2. To compare the levels
3. To go through the historical

Power density exposure limits for GSM1800 adopted by various countries

- Australia - 2 W/m²
- Austria, Salzburg City - 0.001 W/m² (precautionary limit)
- Belgium (ex Wallonia) - 1.2 W/m²
- Canada - 3 W/m²
- CSSR, Belgium, Luxembourg - 0.24 W/m²
- India - 9.2 W/m² (as per ICNIRP recommendations)
- Italy, in areas with duration greater than four hours - 0.095 W/m²
- Italy, in sensitive areas - 0.025 W/m²
- New South Wales, Australia - 0.00001 W/m²
- New Zealand - 0.5 W/m²
- Poland, China, Italy and Paris - 0.1 W/m²
- Switzerland - 0.095 W/m²
- USA - 10 W/m² (as per FCC OET-65 Public Exposure Guidelines at 1800 MHz)

Excerpts from Prof. Girishkumar's report submitted to secretary, DoT, on cellphone radiation effects in Dec. 2010

1. Effect of increased dose of radiation on sleep

(i) At 0.1 nW/cm² exposure, sleep disturbance is 25 per cent

(ii) At 1 nW/cm², sleep disturbance is 35 per cent

(iii) At 10 nW/cm², sleep disturbance is 45 per cent

(iv) At 100 nW/cm², sleep disturbance is 55 per cent

It can be seen that with logarithmic increase in dose, sleep disturbance increases linearly.

2. Radiation in Mumbai

A recent study revealed that the electromagnetic radiations emitted from phone towers in Mumbai were way beyond safety levels. According to the study, the real safe limit of radiations for human beings is up to 50 $\mu\text{W}/\text{m}^2$ and the upper limit is 100 $\mu\text{W}/\text{m}^2$. The study revealed that the radiation readings in several residential areas were more than 1000 $\mu\text{W}/\text{m}^2$. Mumbai has witnessed a spurt in the number of phone towers in the recent past exposing people to dangerously high levels of radiations. Being exposed to such radiation leads to problems like loss of appetite, irritation, fatigue, difficulty in concentrating, headaches, problems in vision, infertility and deformity of foetus.

3. Occupational hazard

Studies of people who are exposed to mobile radiations as part of their work have shown elevated levels of health risks in them. Those employed in electrical occupations are 10 to 20 per cent more likely to get brain cancer and show elevations in non-Hodgkin's lymphoma.

4. Auditory perception of microwaves

Ringxiety—the psychological disease of hearing phantom sound and sensation of cellphone ring—has appeared in Japan (also reported in India) among cellphone users.

research papers and conclusions arrived at

4. To look for proven research
5. To study the research carried out in India
6. To identify the power level suited for India, which is a tropical country

7. To give suggestions to the users to avoid problems
8. To give suggestions to the government regarding future actions
9. To give suggestions for immediate implementation
10. To go through case studies in India and abroad

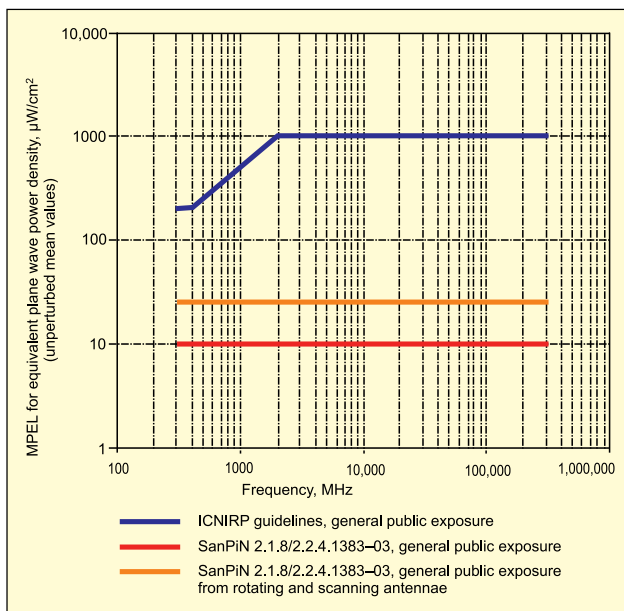


Fig. 4: Comparison of MPEL at 0.03-300GHz power flux density established as the obligatory standard for the general public of Russia versus similar values recommended by ICNIRP

mobile service providers. Whether this level of power reduction is adequate or not is the next question because many countries have already kept power levels much lower than this level in mobile transmitters.

Thus, in the middle of projections of epidemiological proportions of health issues, this topic gains much importance. Even more important is the point that regulations followed in other countries are not followed by mobile service providers in India even to maintain the high-level ITU specifications.

Recommendations to the government

1. Immediately implement the 50-metre safety zone around mobile towers.

2. Separate out different service providers' mobile towers, otherwise, these tend to accumulate more power.

3. Avoid towers near educational institutions.

4. Ensure that SAR rating is provided on the front cover of the cellphone manual with warning.

5. Implement EMF monitoring systems near towers and other locations.

6. Ensure that the ICMR research set-up concentrates on areas where cellphones were introduced first in India and speed up the process.

7. Tie up with countries having rich experience to evaluate the long-term effect of cellphone usage, as in other countries cellphones were introduced much earlier.

8. Ensure that companies supply necessary accessories to mobile users as a preventive action and advertise the harmful effects of cellphones strongly to the public.

Cautions for cellphone users

Mobile companies should accept the fact that radiations cause serious health problems. In the last few years, epidemiology evidence on the mobile phone use and risk of brain and other tumours of the head has

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grown considerably. The studies published till date do not demonstrate a raised risk within approximately ten years of use for any tumour of the brain or head. However, some key problems remain—for example, selective non-response and exposure misclassification.

The available data does not suggest a causal association between the use of mobile phones and fast-growing tumours such as malignant glioma in adults. For slow-growing tumours such as meningioma and acoustic neuroma, as well as for glioma among long-term users, the absence of associations reported thus far is less conclusive because the current observation period is still too short. Currently, the data completely lacks the potential carcinogenic effect of exposures in childhood and adolescence.

Several precautions are suggested for cellphone users:

1. Minimise the time you speak. Preferably use the mobile phone only for a very short duration.
2. Minimise the intensity of the irradiation. Avoid calling when the signal is weak, because then the mobile radiates maximally. Keep your phone as far away from your body as possible. For this purpose:
 - (i) Use safe headsets—the kind with a plastic tube between the earpiece and the phone. Search Google for tube + headset (or airtube) and you will find several alternatives.
 - (ii) Use a loudspeaker phone, as your headset may not always be available. But be careful that your face is as far away from the phone as possible to reduce absorption of radiation by the face.
3. Avoid putting the cellphone in your left pocket, which is closer to heart.
4. Avoid carrying cellphone clipped to your belt, as it has been found to affect fertility.
5. Use a rear shield for the phone to prevent radiation towards your body.
6. Buy cellphones with low SAR rating.
7. Buy cellphones of reputed make so that at least the present-day power levels are ensured.
8. Keep the cellphone away while sleeping.
9. Switch between the left and right side of your head when using the cellphone without headsets.
10. Pregnant women should avoid cellphone usage as it may affect the foetus.
11. More precautions should be taken with children since they are more susceptible to cell damage.
12. Avoid unwanted calls and advertisements through calls.
13. Use your landline, particularly when your work demands a lot of communication. ●

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