

Electromagnetic Radiation Pollution: Sources and Effects

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Short communication

Electromagnetic radiation pollution can be found in both outdoor and indoor environments. Detection and quantification of the electromagnetic radiation using the computer systems by open field testing and microwave anechoic chamber is very common. However, these methods require further testing and experimentation for greater reliability and accuracy in measurement [1]. Some of the notable sources of outdoor electromagnetic pollution are the communication devices and systems, power transmissions, transportation and defense weapons launching. In the communications sector, the establishment of high power electromagnetic wave transmitting base stations and their higher number if installations lead to electromagnetic radiation pollution in the urban areas. The communication infrastructure and the base station antenna are the main sources of electromagnetic radiation. High voltage power transmission equipment also adds to the electromagnetic pollution. Transmitters, if not properly planned and installed can aggravate the radiation [2]. Indoor electromagnetic radiation is also not uncommon. The number of the electromagnetic radiation sources is constantly increasing producing substantial electromagnetic fields. Sources of electrical and magnetic fields of industrial frequency of 50 Hertz or more have significant impact on the electromagnetic pollution of the human environment. The radar, communications, television, and broadcasting equipment, industrial electromagnetic radiation equipment, power systems and household equipment produce waves of electromagnetic radiation [3]. As per the European Commission several sources of nonionizing radiations can be of the following types: radio frequency fields, intermediate frequency fields, extremely low frequency fields, and static fields. There are two types of interferences such as the electromagnetic fields and electromagnetic radiations. High energy microwave radiation falling in the above mentioned frequencies can be potentially carcinogenic and generally result in the thermal effects such as increasing the temperature of the expose organism. Electromagnetic radiation frequencies below 300GHz are generally called as non-ionizing radiations [4].

Electromagnetic radiation has significant interference to the environment. Modern equipment and electrical equipment will perform at reduced efficiency due to electromagnetic radiation. Living organisms also get affected due to electromagnetic radiation. Voltage transformers, power supply wiring, electronic equipment, household appliances, and equipment of information technology produce electromagnetic energy in the normal functioning but may not exceed the frequency range of order of magnitude [5].

Therefore, electromagnetic radiation detection and to take protective measures are very important. Moreover, formulation of policies and laws for regulation of electromagnetic radiation also helps in restricting the radiation effects. Deployment of the electromagnetic radiation control technology plays a significant role in the controlling electromagnetic pollution. The use of the shielding equipment and detection of the levels of electromagnetic radiation can reduce the harmful effects of such radiation on the human body. In medical diagnostics the electromagnetic energy can be controlled within a certain range and operates in defined area. Several technologies need to be developed to reduce the harmful effects of the wireless local area

network on the human body and the environment and the earth biosphere and such technologies need to be developed and optimized. However, there could be some positive usage. The treatment of the human viral disease using the radio-physical technology based on the modeling of the microwave radiation of the Sun for the enzymatic activation and synthesis of molecular entities for the antiviral action are proposed [6].

Negative health effects of electromagnetic radiations

Electromagnetic radiations are omnipresent as a result of the electromagnetic fields generated by the current technologies of the gadgets. These artificial sources of radiations are much more powerful, stronger than the natural radiations. However, there are no definite and conclusive evidence on the harmful radiations produced from the mobile phone, tablets and other portable communication devices. However, such low energy radiation exposure for longer periods of exposure can potentially lead to carcinogenesis. According to the World Health Organization, there is no substantial information on the effect of the low level exposure of electromagnetic fields or extremely low frequency (0-100000 Hz) radiations over long periods of exposure. Several countries have formulated the maximum permissible limits for the electro-magnetic radiation. The American National Standards Institute and Institute of Electrical and Electronic Engineers, World Health Organization and International Commission on non-ionizing radiation protection have proposed formulation of the national standards on the exposure levels and limits. Accordingly for the official exposure limits, the intensity of the incident radiation should not cause heating of tissue above one degree Celsius. However, they do not currently consider long term exposure duration and long term implications that may potentially result in the nervous system pathologies and carcinogenesis such as leukemia [7].

These radiations can be effectively measured in terms of electric, magnetic, electromagnetic frequency intensity or power. The day to day usage devices emit radiation at frequencies of 300 Mega Hertz to 300 Giga Hertz, the upper limit of which can be associated with the microwave radiation. Power transmission lines and electric devices are strong sources of electromagnetic fields and radiation of much lower frequencies but simultaneously of much higher intensities [8].

Epidemiological studies were conducted to assess the effect of the electromagnetic radiation and fields generated by the power lines on the human beings. Most of the studies indicated that there are no negative effects of these fields and the rest of the studies reported negative

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effects to a small extent. An International research program entitled Electromagnetic Fields summarized more than thousand scientific publications and presented with analyzed results. The report mainly is regarding findings associated with low frequency magnetic fields from 50 Hz and 60 Hz and stated that there is no need for restricting the current limits for long term exposure. However, the International Agency for Research on Cancer and World Health Organization have observed that electromagnetic fields of the radio frequencies potentially could increase the risk of developing malignant brain cancer called as *Glioma* and is mainly associated with the use of mobile phone usage.

Several experimental and epidemiological studies have been conducted to analyze the effect of the electromagnetic pollution however, the influence of the electromagnetic pollution on the living organisms remains undefined and there are several gaps in the current knowledge on the influence of the electromagnetic radiation on the experimental investigations on the animal models. The influence of the electromagnetic pollution on the living organisms either positive or negative has not been established so far.

Some reports have suggested that electromagnetic fields affect the pineal glands and the production level of the hormone melatonin and their interactions with the physiological mechanisms that could lead to the sleep disorders, lower mood, reduced concentration, depression and also development of certain types of cancer.

Recently, humans are more exposed to the Wi-Fi range electromagnetic radiation. Some studies were conducted to analyze their effect on the cardiovascular system, nervous system, heart rate variability, psycho-emotional load. The pulse polarized radio frequency electromagnetic radiation is present throughout and the humans are constantly exposed to such radiation. However, the data on their effect is insufficient. The effects of Wi-Fi exposure effects were found to be oxidative stress, damage to the cellular DNA, acceleration of the cell apoptosis, neuropsychiatric effects, reduction of the spermatogenesis, endocrinal effects, and activation of the calcium transportation. In a separate study more than 100 research works on the biological activity

of Wi-Fi range of 2.45 GHz concluded that these could damage the reproductive systems, influence the electroencephalogram, brain functions, influence on the heart, influence on the liver, thyroid gland, gene expression pattern, cellular cycle, cellular membranes, oxidative stress, whereas the potential side effects include memory, attention, behavioral abnormalities as a result of the toxic activities at the cellular level. International collaborative attempts need to formulate effective national and regional regulatory policies for the monitoring, control and regulation of electromagnetic radiations for less environmental effects. The number of microwave towers and the antennas need to be regulated.

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