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STUDY OF RADIATION AND HEALTH HAZARDS DUE TO MOBILE COMMUNICATION AND CELL TOWERS

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ABSTRACT

In this mutable world it is the race to embrace newer technologies, we often forget or ignore the negative side of it and do not realize its fact until late. The Electronics Technologies have brought a new era to this modern civilization. India's development in the field of science and technology was substantial from British period. Telecommunication has become especially important in recent years because of the enormous growth of information technology and its potential impact on rest of the economy. The popularity of cell phones and wireless communication devices has resulted in a proliferation of cell towers across the city. While all of us have had our share of fun with mobile technology, it is now time to introspect and study the problems due to the Electromagnetic Radiation that one could face because of cell phone towers being installed in residential areas.

I. INTRODUCTION

Often there arises a question in our hibernate mind that, what is the closest to our heart in this world after our fam ily, friends etc without which our life is meaningless and basically hard to lead. If we practically and physically goes in this thought rather analysis then cell phone is the first name which should come in any one's mind. The tiny electronic device undoubtedly revolutionized the modern life style. In India there are approximately 100 corers cell phone subscribers and approximately 6.5 lacks of cell towers[1], mushrooming in India's cities, towns and even deep rural area. The statistic in Fig.-1 indicates the addition of subscriber base till the month of May 2013. Mobile communication technology has immense advantages and has grown rapidly in last decade. Recently there have been appeared debate, many research papers of eminent scientists, professors, technologists, researchers stating that electromagnetic radiation from cell phone and cell towers has associated with great health risks and harmful effects on nature. WHO has classified the mobile phone radiation on the IARC scale into group 2B-possibly carcinogenic. That means that there "could be some risk" of carcinogenicity [5]. At the same side there is a "Wake up call" from leading experts of the world. As examples, M.D, Professor at the Karolinska Institute finds out that electromagnetic radiation is huge compared with what have been there billion of years before and is a matter to serious concern [12]. IIT Professors have presented several papers on this and have been making a serious attempt to prevent it[19]. To this communication is an attempt to make the reader aware of threat to human life and ecosystem, caused by mobile devices and wireless communication and suggest some solutions to the same.

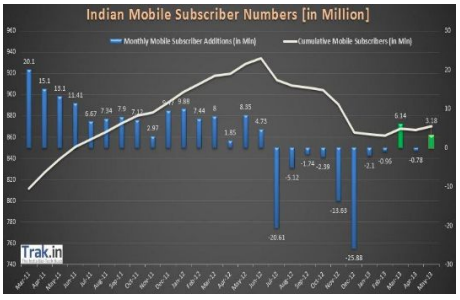


Fig1: Additions of mobile Subcribers

II. RADIATION ABSORPTION

Human heads absorbs a fraction of radio waves emitted my the mobile telephone handsets. The radio waves emitted by a GSM hand set can have a maximum power of 2 watts, and a US analogue phone had a maximum transmit power of 3.6 watts[2]. The rate of absorption of radiation by the human body for cell towers and mobile handsets is measured by the Specific Absorption Rate(SAR) ,and its maximum level for modern handsets have been set by Government Regulating Agencies in many countries In the USA, the Federal Communications Commission (FCC) has set a SAR limit of 1.6 W/Kg, averaged over a volume of 1 gram of tissue, for the head. In Europe, the limit is 2 W/Kg, averaged over a volume of 10 grams of tissue [14]. SAR values are much dependent on the size of the averaging of volume of the particular item. In India, we have adopted radiation norms given by ICNIRP guidelines of 1998 for safe power density of f/200,where f is in MHz. Hence, for GSM900 transmitting band (935-960 MHz), power density is 4.7W/m2 and for GSM1800 transmitting band (1810-1880 MHz), it is 9.2W/m2[5].

Radiation from Mobile Towers:

Cell tower antennas transmits in the radio frequency range of 869 to 890 MHz (CDMA), 935 -960 MHz (GSM900), 1810 -1880 MHz (GSM1800) and 2110- 2170 MHz (3G)[1]. Telecom operators divide a region in large number of cells and thereby each cell is divided into some number of sectors Generally, there are three sectors with equal angular coverage of 120 degrees in the horizontal direction. Here is some information regarding number of towers in Kolkata of some famous telecom operators. Each of them use 3 to 12 carrier frequencies(average around 6) and transmit 20watt of power per carrier[19].

1. Aircel has nearly 2600 towers in Kolkata and uses mostly 10 carriers [2].
2. Idea has approx 3000 towers in Kolkata and uses mostly 8 carries [2].
3. MTS has nearly 920 towers in Kolkata and uses mostly 4 carriers [2].

Radiation pattern of cell antennas:

Radiation pattern refers to the angular dependence of strength of radio waves from transmitting antenna. Sine electromagnetic radiation is dipole Radiation, antennas radiating equally in all directions are very impractical to built. Monopole or dipole antennas are consists of one or two straight metal rods along a common axis. Radiation from different angles interferes in most antennas. This sometime generates zero radiation where the radio waves
from different parts arrive in opposite phase. Therefore the radiation plot of most antennas shows a pattern of maxima or "lobes" at various angles , separated by "nulls" at which the radiation goes zero. In directive antennas there are certain lobes as like "main lobe" ,the lobe of maximum intensity and "slide lobes" representing unwanted radiation in different directions[18]. Fig:2 has shown the standard radiation pattern of antenna.

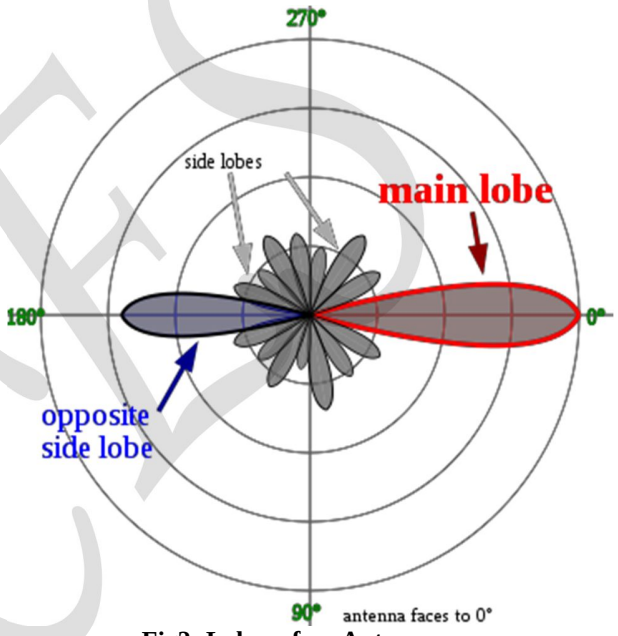


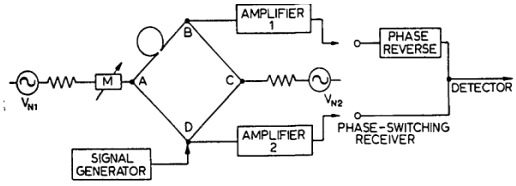
Fig2: Lobes of an Antenna.

Radiation power density from cell tower:

$$\frac{P}{\quad}$$

Power density at some distance R from the transmitting antenna=P .

Comparison of noise powers using a phase-switching receiver:-



III. HEALTH HAZARDS DUE TO ELECTROMAGNETIC RADIATIONS

- The younger the child, the deeper is the penetration of electromagnetic radiation as children's skulls are thinner.
- Children, adolescents and pregnant women can be at ultimate risk in 300mt radius of the towers.
- Radiation from mobile towers possesses grave health risks including memory loss, lack of attention and digestive disturbances.
- The radiation effects to the disappearance of butterflies, bees, insects and sparrows.

According to norms, the radiation level of 600 mW per meter-square (mw/m^2) is considered safe. But Mobile phone towers emit electromagnetic rays above safe unit. They are:

- Thermal effects radiation
- Non thermal effects radiation

Thermal Radiation is most basic form of EM Radiation such as i) Black Body ii) Free -Free iii) Spectral Line. The fundamental effect of electromagnetic radiation is **Dielectric Effect,** so called terminology Thermal effect.[5,6]. It is such like, dielectric material (such as living tissue) is heated by rotations of polar molecules induced by the electromagnetic field. In the case of a human being using a cell phone, most of the heating effect occurs at the surface of the head, causing its temperature to increase by a fraction of a degree**. Dr.Girish Kumar**(Professor of Electrical Engineering Department, IIT, Bombay) who has conducted studies on mobile radiation said, "With 1W power (same output as cell phones) temperatures increase by 1ºC in 500 seconds (9 minutes).4.2KW of microwave power raises temperature of 1 litre by 1 deg centigrade"[3].It effectively leads to drying out of any tissue cells. As human body consists of approximately 70% liquid, when it has been exposed to electromagnetic radiation it absorbs the radiation with a great intensity.[2] It is often that the cell phone towers has been built on the rooftop of residential/commercial buildings. Though the antenna radiates less power vertically down but the distance between the antennas and top floor are usually a few meters, resulting in the radiation level in top two floors remains very high. It can be calculated from the previously mentioned formula that at R=3mt Pd= is equal to 8,840,000 µW/m2 in the main beam[1].

The German biophysicist Roland Glaser, for example has argued that there are several thermo receptor molecules in cells, and that they activate a cascade of second and third messenger systems, gene expression mechanisms and production of heat shock proteins in order to defend the cell against metabolic cell stress caused by heat[2]. The increases in temperature that cause these changes are too small to be detected by studies such as REFLEX, which base their whole argument on the apparent stability of thermal equilibrium in their cell cultures. Non-thermal effects of Radio frequency radiation accumulate over time and shows disasters after several years of exposure. Now a days Alzheimer's disease, motor neuron disease and Parkinson's disease is much common diseases and for a matter of fact, they have a major connection with radio frequency radiation[1,7]. People living near mobile phone base stations are also at risk for developing neuropsychiatric problems as headache, memory loss, nausea, dizziness, tremors, muscle spasms, numbness, tingling, altered reflexes, muscle and joint paint, leg/foot pain, depression, and sleep disturbance.

IV. CASE STUDY

- Professor Lennart Hardell, Sweden has made a large study with 1251 cases of brain tumors compared to controls. The risk increased the more years and the more hours per year the phone had been used. The increased risk was 390% for mobile phones and 190% for cordless phones. The greatest risk was for Astrocytoma, a malignant tumor.[7].
- The scientific journal Reviews on Environmental Health has published a report by ***international scientists calling for greatly reduced exposure limits*** for electromagnetic radiation from power line and telecommunications technologies, including cell phones and wireless technologies.[12].
- Teachers at GM International School, Goregaon, complain there are up to 15 mobile towers on the school premises. The school authorities, though, differ. "We don't have mobile towers on campus, but mobile poles that connect one line with the next," said Gunita Malhotra, a trustee of the school. "The government has tested the radiation emitted by the poles and found it within permissible limits."[3].
- ***Interphone study indicated a significant risk for the worst form of malignant brain tumor (Glioma)***.[12].

Fig5: Cell Towers photos

Why Property owners allow cell phone towers?

Why such deadly Cell Phone Towers would be allowed to install in residential areas? The telecommunication companies or service providers pay rent for installation of towers. Letting building for cell phone towers is **good source of income** for property owners and institutions.**Cell phone companies pay "rent"** for their placement that can range anywhere from Rs 10,000 to 30,000 per month or above Rs 30,000 where competition among service providers is high. Some Cell phone companies set up unauthorized towers which are also called "camouflage towers" which looks like Palm Tree, Water Tank, and Chimney, Street Light etc[14**].**

V. WAY OUT

If some one lives close to mobile tower:

- One can request the operators to reduce the power transmission.
- People can refuse to work or shop in environments that endanger their health. They can demand that wireless devices be removed from their children's schools and If any citizen has apprehensions, he should seek an explanation from the company putting up the tower. If that remedy fails then they have a right to approach the court of law.[11]
- Change the angle of the antenna so that no house falls in the main beam of the antenna[15]

VI. CONCLUSIONS

The intent of this paper was not to oppose against of using cell phones and installing towers, but to argue that pervasive electromagnetic radiation pose an environmental risk that must be addressed. While environmental impacts are typically viewed in terms of minimizing physical material usage and waste, updated and effective technology will play a big role in reducing environmental and health impacts. We each and every one as Communication engineers and researchers, students, responsible citizens have a big role to play. Until unless we raise noise against this, its like we allowing the telecom operators to kill our dear ones, our mother, father, sister, each and everyone. So, There is just one thing to state at the end "**Wake up.**

REFERENCES

1) Neha Kumar and Prof. Girish Kumar, "Biological Effects of Cell tower Radiation on Human Body", ISMOT/09/C/218.
2) http://www.ee.iitb.ac.in/~mwave/Cell-tower-rad-report-WB-Environ-Oct2011.pdf
3) http://nehawilcom.blogspot.in/search?q=Girish+Kumar
4) http://articles.timesofindia.indiatimes.com/2008-05-27/kolkata/27766288_1_cellphone-towers-cell-towers-antennas.
5) http://www.moneylife.in/article/does-mobile-tower-radiation-endanger-your-life/23163.html
6) http://www.downtoearth.org.in/node/1859
7) http://articles.timesofindia.indiatimes.com/keyword/cell-towers
8) http://www.goachamber.org/html/joomdocs/others/GK-Cell_Phone_Radiation-Goa.pdf
9) http://www.psrast.org/mobileng/mobilstarteng.htm
10) http://www.sciencedaily.com/releases/2011/02/110222162308.htm