

# Cell Phone Tower: A Gift or Curse

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**Abstract:** Cell phone towers form an important component of the cell phone network. Cell phones and cell phone towers send signals using radio frequency (RF) energy, or radiation, just like radio, television, pagers and other wireless communication devices. Radio frequency (RF) waves are a subset of electromagnetic waves with a wavelength of 100km to 1mm, which is a frequency of 3 KHz to 300 GHz. A cell phone tower is typically a steel pole or lattice structure that rises hundreds of feet into the air. These towers also called base stations. Cell phone towers pave the way for hazardous effects from RF waves to the human health. In general, all of us must keep in mind that the human body is an electrical system. It will be, and is affected by, outside RF energy fields that can promote unwanted nerve stimulation, cancer, heating effects, and many other unwanted effects. Cell phone tower will be a gift if we are following the safeguard systems, if not it will become a curse to our life.

**Keywords:** Cell phone, Cell phone tower, Cell phone network, Radio Frequency, Hazardous effect

## 1. Introduction

Technology plays a significant role in our daily lives and made our lives very easy for us. Technology, along with its unlimited advantages also has a lot of disadvantages. Cell Phone is one such device that has made our life so easy that we cannot even think of a world without it. Today there are millions of cell phone users in the world and to provide proper service to this growing customer base, companies have set up several towers all over the country. Cell phone towers form an important component of the cell phone network. Cell phones and cell phone towers send signals using radio frequency (RF) energy, or radiation, just like radio, television, pagers and other wireless communication devices. Many people have asked whether the RF energy from cell phones and cell phone towers is safe. But the Electromagnetic radiations emitted from cell phones and cell phone towers causes significant health hazards on human beings and environment.

## 2. Objectives

- To evaluate the growth of Cell phone towers in our country.
- To analyze the operating system of Cell phone tower.
- To highlight the effects of Electromagnetic radiations emitted from cell phones and cell phone towers.

## 3. Review of Literature

**3.1** A joint study conducted in northern Europe had draws the conclusion that "Although our results overall do not indicate an increased risk of glioma in relation to mobile phone use, the possible risk in the most heavily exposed part of the brain with long-term use needs to be explored further before firm conclusions can be drawn."

**3.2** A Swedish scientific team at the Karolinska Institute conducted an epidemiological study (2004) that suggested that regular use of a mobile phone over a decade or more was associated with an increased risk of acoustic neuroma,

a type of benign brain tumor. The increase was not noted in those who had used phones for fewer than 10 years.

**3.3** In 2007, Dr. Lennart Hardell, from Orebro University in Sweden, reviewed published epidemiological papers (2 cohort studies and 16 case-control studies) and found that:

Cell phone users had an increased risk of malignant gliomas. Link between cell phone use and a higher rate of acoustic neuromas. Tumors are more likely to occur on the side of the head that the cell handset is used. One hour of cell phone use per day significantly increases tumor risk after ten years or more.

## 4. Cell Phone Tower

A cell phone tower is typically a steel pole or lattice structure that rises hundreds of feet into the air. These towers, also called base stations, consist of electronic equipment and antennas that receive and transmit radiofrequency (RF) signals.

The elevated structure typically supports antennas, and one or more sets of transmitter/receivers transceivers, digital signal processors, control electronics, a GPS receiver for timing (for CDMA2000/IS-95 or GSM systems), primary and backup electrical power sources, and sheltering.

## 5. The Working of a Cell Phone Tower

Cell phone towers are usually built very tall, nearly 150-270 feet. Their antennas are generally located towards the higher end, so they can adequately cover the range of the entire area. The operating mechanics of a cell phone are quite simple. When a call is made through a cellular phone, a signal is sent out from the cell phone's antenna to the base station antenna. It radios the nearest cell phone tower, which is particular to your service provider or a collaborator of your service provider.

The base station immediately responds to this signal by assigning it an available radio frequency channel. When the base's response is slow or fails, it is caused due to unavailability (congestion) of the radio frequency channels. The transmitting and receiving radio signals transfer the voice information to the base station.

After which the voice signals are sent to a switching center, which transfers the call to its destination, and completes the communication transmission. Cell phones communicate with nearby cell towers mainly through radiofrequency (RF) waves, a form of energy in the electromagnetic spectrum between FM radio waves and microwaves.

## 6. Radio Frequency (RF) Waves



Radio frequency (RF) waves are a subset of electromagnetic waves with a wavelength of 1mm to 100km, which is a frequency of 3 KHz to 300 GHz, respectively. This range of electromagnetic radiation constitutes the radio spectrum and corresponds to the frequency of alternating current electrical signals used to produce and detect radio waves.

RF can refer to electromagnetic oscillations in either electrical circuits or radiation through air and space. Like other subsets of electromagnetic radiation, RF travels at the speed of light.

## 7. Indian Scenario

The Indian telecommunications industry is the world's fastest growing telecommunications industry. It has the third largest (based on the total number of fixed/mobile subscriber lines) telecom network in the world and the second largest mobile network with 865 million subscribers at the end of 2012. India has more than 4.5 lakhs cell phone towers to meet the increasing communication demand. The cell tower transmits in the frequency range of 869 - 894 MHz (CDMA), 935 - 960 MHz (GSM900) and 1805 - 1880 MHz (GSM1800).

## 8. Positive Aspect in Cell Phone Tower

Cell phone towers may help in predicting floods. "By monitoring the specific and fluctuating atmospheric moisture around cell phone towers, we can cheaply, effectively and reliably provide a more accurate 'critical moisture distribution' level for fine-tuning model predictions of big floods," said Pinhas Alpert, geophysicist, who heads TAU Porter School for Environmental Education in Washington. Cell phone towers emit radio waves that are diminished by moisture in the air, a factor that can be used to improve model warnings on flood levels. Furthermore, TAU researchers measured the rainfall distributions and were able to

accurately estimate the size of impending floods before they struck.

## 8. Dangerous Signal from Cell Phone Towers

Combination of each of the five following factors of RF waves is hazardous to human health:

### 8.1 Frequency:

Certain frequencies are absorbed in the body more than others. For example, the new riot control weapons the Pentagon have operates in the Super-High Frequency (SHF) region. This frequency is about 15 times higher than a conventional microwave oven. Although SHF is not absorbed into the skin, it boils perspiration on the skin causing pain.

### 8.2 Duration:

How long you are exposed to the radiation, or how long the transmitter is "on."

### 8.3 Distance:

How close you are to the antenna. Energy levels decrease with the square of the distance.

### 8.4 Power Level:

What the strength of the signal is. This is measured in microwatts, milli watts and watts. One microwatt is a millionth of a watt; one milli watt is one-thousandth of a watt.

### 8.5 Susceptibility:

Like tobacco smoke, we cannot tell if we will or will not become ill from RF exposure. But RF heating of body tissues and possible DNA alteration (mutation) happens to 100% of the people exposed to RF. The amount of heating is determined by a combination of the four factors above.

## 9. Hazardous Effect from Cell Phone Towers

Nowadays the cell phone towers are having mushroom growth and it is placed near the residential areas. The cell phone towers are also placed in the rooftop of the buildings. This paves the way for hazards effects from RF waves to the human health. The following are effects from cell phone towers:

### 9.1 Risks to Children:

Children are at much higher risk than adults of experiencing health problems related to regular exposure to radio frequency radiation; thinner and smaller skulls translate to greater absorption of radio frequency.

### 9.2 Risks to Pregnant Women:

A pregnant woman and the fetus both are vulnerable because of the fact that these RF Radiations continuously react with the developing embryo, increasing cells,

because of thermal heat also. When the pregnant ladies either use Mobile Phone or when illuminated with RF Radiations, the developing child can become affected, the developmental mall formation may occur.

### 9.3 Risks To Human Brain:

Human Brain is the most vulnerable portion to the NIEMR (RFR). Some of the known effects are Neurological effects, increase in ODC (Ornithine De Carboxylase) activity, effect on enzymes and free radicals decreasing the brain metabolism.

### 9.4 Risks to Patients Carrying Pace Makers:

The RF Exposure adversely affects implanted Pace Maker and becomes arrhythmical. These radiations may stop Pace Maker from delivering pulses in a regular way or may generate some kind of external controlling pulse putting the patient to death.

### 9.5 Other Health Risk:

- Abnormal cell growth and damage to cellular DNA
- Difficulty sleeping, depression, anxiety, and irritability
- Childhood and adult leukemia
- Eye cancer
- Immune system suppression
- Attention span deficit and memory loss
- Increase cancer risk

### 9.6 Risks to Environment:

- There is a chance of cell phone tower burst.
- Cause damage to the building if the rooftop cell phone towers are not having structural stability.
- At time of earthquake there is a chance of cell phone tower dropping down.
- It also reduces the value of the land property.

## 10. Suggestions

### 10.1 To the Government:

- The Government takes control over what the telecommunications industry have been doing and determinedly insist in the gradual removal of telecommunications towers from hospitals, daycares, institutions where the young, old, and vulnerable may be.
- The Government makes use of the special agencies assigned with authorities concerning these towers and be vigilant in protecting the people of this country who entrust these Government officials to do their job and protect their health and human rights.
- The Government opens the door to support any research towards finding and alternative method of communication.

### 10.2 To the Public:

- Obtain the gauss meter designed for measuring electromagnetic radiation in the cell phone frequency range
- Reduce talk time
- Don't allow children to use cell phones as radiation penetrates their skulls more deeply.
- Place cell phones as far away from your body if using a hands free device
- Wait for the call to connect before placing the phone near your ear
- Avoid using cells in an enclosed space as radiation higher
- Avoid using a cell when signal is weak
- Avoid living near a cell phone tower and 400 meters is a safe distance for most people
- Use a hands-free device, but research is saying that Bluetooth is not necessarily safe. Some Bluetooth intensify radiation into the ear canal.
- Choose a phone with a low SAR (Specific Absorption Rate) but even this does not really keep radiation within safe limits, although it does reduce it.
- Use cell phones with lower Specific Absorption Rate (SAR) values. One can find the SAR value of a phone by simply searching- <Company Name> <Model No.> SAR. The lower the SAR value, the less dangerous it is. Ideally go for a phone which has SAR value – 0.2 – 0.8 W/Kg.

### 10.3 To the Cell Phone Industry:

- Use Radiation Shield - Since antennas are used for transmitting and receiving signals. A "**Radiation Shield**" consisting of multiple orthogonally polarized broadband monopole antennas, has been developed. The antennas are broadband planar circular monopole antennas and are designed to cover the frequency range from 800 to 4000 MHz. The antennas are terminated in matched load to absorb the harmful radiation to produce a safe radiation free environment.
- The multi cell phone companies jointly can set their base stations in a single cell phone tower. This reduces the mushroom growth of cell phone tower.
- The cell phone industries should also display the **SAR- Specific Absorption Rate** in the cell phones. A Cell phone transmits 1 to 2 watts of power. SAR (specific absorption rate) – rate at which radiation is absorbed by human body, measured in units of watts per kg (W/Kg) of tissue. In USA, SAR limit for cell phones is 1.6W/Kg which is actually for 6 minutes. It has a safety margin of 3 to 4, so a person should not use cell phone for more than 18 to 24 minutes per day.

## 10. Conclusion

Although cell phone tower is advantageous in many ways, it has a hazardous effect on the human beings and the environment. In general, all of us must keep in mind that the human body is an electrical system. It will be, and is affected by, outside RF energy fields that can promote

unwanted nerve stimulation, cancer, heating effects, and many other unwanted effects.

Now we understand the seriousness of this issue and take necessary steps to curb the hazards of cell phone towers. The government should create awareness among the public about effects of cell phone tower's and about the usefulness of SAR value in the cell phones. Thus cell phone tower will be a gift if we are following the safeguard systems, if not it will become a curse to our life.

## 11. Future Scope

In future this paper will help the researchers to make a deep analyze and find out the solutions to control the hazardous effect from the Cell phone towers. This paper will also create awareness with the public regarding the cell phone tower hazardous effect.

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