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# *Impact of Mobile Phone/Smartphone: A pilot study on positive and negative effects*

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***Abstract:*** ***The idea of this study is to investigate the impact of Mobile Phone/ Smartphone in the society and also how mobile phone/smartphone is going to transform the culture, social life, technology landscape and other diverse aspects of modern society. The intention of this study is to understand all the positive and negative aspects of mobile phone/Smartphone in the society. The study will primarily focus on impact of mobile phone/Smartphone on business, education, health sectors, human psychology and social life. Finally the authors will summarize the impact of mobile phone/smartphone on individual and by and large the entire society. The study will also focus on how these devices affect the activities of teen agers. The qualitative analysis of the data shows that young people use cellphones for a variety of communication, news and entertainment needs. Additionally they consider cell phones as personal items and use them to store private content, maintain privacy and have private conversations. Smartphones fulfil the demand for immediate access to social worlds. The overall aim of this study is to investigate whether there are associations between psychosocial aspects of mobile phone use and mental health symptoms in a prospective group of young adults.***

***Keywords: smartphone; mobile phone; human psychology; social life; mental health.***

## I. INTRODUCTION

The convergence of communication and computing for mobile consumer devices is on the evolutionary course to bring interoperability and leverage the services and functions from each and every industry. In this process of convergence the Smartphone's are the leading devices taking the front end and playing the role of universal mobile terminal. As a marketing strategy the Smartphone term was introduced in the market, referring a new class of mobile phones that provides integrated services from communication, computing and mobile sectors including voice communication, messaging, personal information management (PIM) applications and wireless communication capability. A smart phone (also known as a cellular phone, cell phone, hand phone, or simply a phone) is a phone that can make and receive telephone calls over a radio link while moving around a wide geographic area. Modern mobile phones also support a wide variety of other services such as text messaging, MMS, email, Internet access, short-range wireless communications (infrared, Bluetooth), business applications, gaming, and photography. A smartphone basically is a mobile phone with an advanced mobile operating system and typically combine the features of a cell phone with those of other popular mobile devices, such as personal digital assistant (PDA), media player and GPS navigation unit. Most smartphones have a touchscreen user interface and can run third-party apps and are camera phones. Smartphones from 2012 onwards also have high-speed mobile broadband 4G LTE internet web browsing, motion sensors, and mobile payment mechanisms.

The Smartphone are equipped with the capabilities to display photos, play games, play videos, navigation, built-in camera, audio playback and recording, send/receive e-mail, built in apps for social web sites and surf the web, wireless Internet and much more. The latest surveys show that the popularity of Smartphone's is increasing in general public with the more paces then it is increasing in Corporations. Smartphones are characterized by several features including the ease of use, speed, Internet

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connection, as well as download capabilities. Smart phones are in the market since 1993 when Apple introduced the smart phone in a mass consumer market. The difference between today's smart phone and early smart phones is that the latter was mostly used by corporate employees and was used as an enterprise device. There are two types of smart phone: phone supporting a touch screen and a keypad phones with an attached screen. The purpose of this research project is to explore the perceptions and impacts of human health regarding uses, abuses, and blurring of boundaries associated with the generation in this Smartphone technology age.

## II. ADVANTAGE OF MOBILE PHONE/SMARTPHONE

**a. Usual advantage**:

Smartphones offer users a level of on-the-go convenience not matched by standard phones, increasing user efficiency. This is important with sales representatives and other executives, as smartphones enable them to check email and browse information while they're on the road or away from a computer. Smartphones are also stylish and portray a sense of professionalism and efficiency, traits that are viewed positively by clients and potential clients.

**b. Over Computer**:

Smartphones are more compact and do not have the capability of providing the amount of power and cooling that more powerful processors require. Prices for a computer (desktop or laptop) can vary widely, depending on its capabilities, storage, and features. Price of Smart phones are less than Computers.

**c. Portability**:

Smartphones, while a bit bigger than a standard cell phone, are still more portable than any computer. They are very lightweight and can fit in a purse or pants pocket with ease.

**d. Over Buisness**:

They are designed for business professional to optimize their work and to get their accomplishments on time. Another key feature in most of the Smartphone devices are that they give you video input and output. So they can view any business presentation and videos in these gadgets.

**e. Organization of Daily Schedule**:

It gives us the power of communicating everywhere, even if we are away from your office or home. We can personalize our data according to our priorities and preferences. So maintaining our schedule and keeping up to date about the upcoming events and to manage our daily tasks more efficiently.

**f. Mobile payments**:

Smart phones also give you quick access to your banks, it allows you to make immediate payments with just simple clicks, and there are different Apps available for making online payment through your mobile devices.

**g. In Education**:

Access to the internet for research and referencing,access to e-mail,ability to snap a picture of the day's homework assignment scribbled on a whiteboard or take a short video of a key lecture moment etc.

**h. In healthCare**:

Smartphone use by healthcare workers is a growing market. One of the greatest advantages of using medical applications on smartphones is the convenient and quick access to medical references.

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## III. DISADVANTAGE OF MOBILE PHONE/SMARTPHONE

Safety is a legitimate concern of the users of wireless equipment, particularly, in regard to possible hazards caused by electromagnetic (EM) fields. There has been growing concern about the possible adverse health effects resulting from exposure to radiofrequency radiations (RFR), such as those from mobile communication devices. Mobile communication is where signal is transferred via electromagnetic wave through radio frequency and microwave signals. This signal produces electromagnetic radiation in the form of thermal radiation that consists of harmful ionizing radiation and harmless non-ionizing radiation. When using mobile phone, electromagnetic wave is transferred to the body which causes health problems especially at the place near ear skull region where they are known to affect the neurons. The radiations interfere with the electrical impulses that two

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neurons connect each other with. This can lead to deafness and migraines. People using cell phones are prone to high blood pressure and other symptoms such as hot ears, burning skin, headaches and fatigue. There have been various studies into the connection between mobile phones and memory loss. Because of their smaller heads, thinner skulls and higher tissue conductivity, children may absorb more energy from a given phone than adults. International guidelines on exposure levels to microwave frequency limit the power levels of wireless devices and it is uncommon for wireless devices to exceed the guidelines. But these guidelines only take into account thermal effects, as non-thermal effects have not yet been conclusively demonstrated. This paper shows that the non-thermal radiation affects the human brain. Global System for Mobile Communications or GSM is the world's most popular standard for mobile telephone systems. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. GSM networks operate in a number of different carrier frequency ranges. GSM networks operate in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands are used instead Regardless of the frequency selected by an operator; it is divided into timeslots for individual phones to use. This allows eight full-rate or sixteen half-rate speech channels per radio frequency. These eight radio timeslots (or eight burst periods) are grouped into a TDMA frame. Half rate channels use alternate frames in the same timeslot. The transmission power in the handset is limited to a maximum of 2 watts in GSM850/900 and 1 watt in GSM1800/1900. Code division multiple access (CDMA) is a channel access method used by various radio communication technologies. One of the basic concepts in data communication is the idea that it allows several transmitters to send information simultaneously over a single communication channel. This allows several users to share a band of frequencies. This concept is called Multiple Access. CDMA employs spread-spectrum technology and a special coding scheme where each transmitter is assigned a code to allow multiple users to be multiplexed over the same physical channel. The transmission power in the handset is limited to a maximum of 6 to 7 mille Watts. Table 1.1 shows the specifications of GSM and CDMA mobile phone technologies, their power level and mode of transmission.

Table 1.: Specifications of GSM and CDMA.

| MOBILE TECHNOLOGY | POWER LEVEL | MODE OF TRANSMISSION |
|---|---|---|
| GSM | 1-2 watt | Burst |
| CDMA | 6-7 mW | Continuous |

### 3.1. EFFECTS

Many scientific studies have investigated possible health symptoms of mobile phone radiation. These studies are occasionally reviewed by some scientific committees to assess overall risks. A recent assessment was published in 2007 by the European Commission Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). It concludes that the three lines of evidence, viz. animal, in vitro, and epidemiological studies, indicate that "exposure to RF fields is unlikely to lead to an increase in cancer in humans". With the way technology has grown, especially in the field of genetic engineering, has led scientists to figure out a way to alter how food is made. This raises concerns and lot of questions regarding the methods they are using. From what possible side effects can occur to the risks it poses to everyone and everything. Unfortunately, there has been limited research and testing done. With that in mind there is not enough information available about the hazards of genetically modified foods. But, what we do know is alarming. Most of the debate surrounding GM foods are focus on the following three issues: 1. Human and environmental safety, 2. Labeling , and 3. Consumer choice. In this section of the paper I will be discussing how genetically modified food can be dangerous on the health of humans. First we will start with the definition of Genetically Modified (GM) is "a special set of technologies that alter the genetic makeup of such living organisms as animals, plants, or bacteria. Bacteria is general term, refers to using living organisms or their components, such as enzymes, to make products that include medicines and vaccines, foods and food ingredients, feeds, and fibre. The unique structure of GM food creates risk to humans which can affect them in the following ways: allergic reactions, toxicity, antibiotic resistance, adverse health side effects and death. It is impossible to foresee the damage inflicted by genetic food; it is a matter of wait and sees what consequences occur because of it. During the genetic modification process, proteins from organisms that have never before been

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a part of the human food chain are being used and so, GM food may cause allergic reactions. Allergens could be transferred from foods people are allergic to into foods that they think are safe. For example in 1996, Pioneer Hi-Bred International Inc.

### 3.2. RADIATION ABSORPTION

Part of the radio waves emitted by a mobile telephone handset is absorbed by the human head. The radio waves emitted by a GSM handset can have a peak power of 2 watts, and a US analogue phone had a maximum transmit power of 3.6 watts. Other digital mobile technologies, such as CDMA2000 and D-AMPS, use lower output power, typically below 1 watt. The maximum power output from a mobile phone is regulated by the mobile phone standard and by the regulatory agencies in each country. In most systems the cell phone and the base station check reception quality and signal strength and the power level is increased or decreased.

### 3.3 ELECTROMAGNETIC RADIATION

Electromagnetic radiation is a form of energy exhibiting wave-like behaviour as it travels through space. Electromagnetic radiation has both electric and magnetic field components, which oscillate in phase perpendicular to each other and perpendicular to the direction of energy propagation. Electromagnetic radiation can be classified into ionizing radiation and non-ionizing radiation, based on whether it is capable of ionizing atoms and breaking chemical bonds Non-ionizing radiation is associated with two major potential hazards: electrical and biological. Extremely high power electromagnetic radiation can cause electric currents strong enough to create sparks (electrical arcs) when an induced voltage exceeds the breakdown voltage of the surrounding medium. These sparks can then ignite flammable materials or gases, possibly leading to an explosion. The biological effect of electromagnetic fields is to cause dielectric heating. Complex biological effects of weaker non-thermal electromagnetic fields also exists, including weak Extremely Low Frequency magnetic fields and modulated Radio Frequency and microwave fields. Magnetic fields induce circulating currents within the human body and strength of these magnetic fields depends directly on the intensity of the impinging magnetic field. These currents cause nerves and muscles to stimulate which in turn affects biological processes. The influence of the weak EM radiations on human can be realized as sequence of events which includes exposure to EM radiations which when absorbed modulates the biological field patterns, accumulation of energy and information into the body fluid, change in the functional activities of cell which finally results into some disease. The number of mobile phone users has increased exponentially recently and it has become an important device in human daily life. Estimates suggest there are around 1.6 billion mobile phone users throughout the world and the numbers are increasing and hence the level of background electromagnetic radiation. Figure 1 shows the effect of electromagnetic radiation on human head. Figure 1 shows the level of electrical activities generated in brain. The voltage level ranges from blue to red and represents electrical activities ranging from minimum to maximum. Using Smart phone is not the same as face-to-face. Miscommunication of meaning through text messaging was a common theme in the focus groups. One most important point is, negatively affect grammar skill and reduce face-to-face time with others. A large number of people almost up to 65% are using their smart phones to read news feeds, post, status updates, read & reply to messages and post photos. This shows that now people are leaving PCs and moving towards Smartphone‘s. Psychologists have also been studying the medical phenomena caused by smartphone use. People who incorrectly feel or hear their phone go off are said to have experienced Phantom Cell Phone Vibration Syndrome, and those who are physically affected by the loss of their phone are diagnosed with “nomophobia”—the fear of not having your mobile phone. Although the gadgets are designed to make life easier, and the user, work-smart, experts warn that their insistent rings and bombardment of updates can throw the brain into overdrive, affecting its cells and blunting the mind over time. While earlier we'd easily remember at least 10 important phone numbers , today we can't recall any other than our own. This is because we believe unconsciously everything is saved in our phone. These extra features reduce our mental capacity day by day.

Mental process of awareness, perception, reasoning and judgement can only be built if the child experiences something physical, like playing with clay, blocks or a bat and ball. It isn't possible if s/he is staring into a smart phone screen and

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conquering angry birds. Daily use of parent's smart phone make their child's brain undeveloped. The very advantage of smartphones becomes a cause for worry. Smartphones encourage us to carry out multiple tasks at once. It is not physiologically healthy for us because (humans) are not built to do a multitude of tasks at one time. Our phone makes us feel like you have to respond, which then increases our stress and harms your cognitive thinking. It's really keeping us at this distracted level, so everything that we're thinking about tends to be quicker, less synthesised, and that's what's making us dumber. Varied communication features (SMS, video, Whatsapp, BBM, Facebook, Twitter) available on our finger tips, makes us less responsive to the immediate environment. So we are becoming shallow thinkers. Staring at the tiny font in your texts and scrolling through dozens of tweets can lead to eyestrain, blurred vision, dizziness, and dry eyes. And blurred vision plus sore neck muscles can also cause headaches. Now a days people are facing many kinds of disease like "Nomophobia", "Phantom vibrations", "iPosture", "Text neck", "Cell Phone Elbow" etc. due to this excessive use of smart phones. These are the main negative impacts of using smart phone daily.

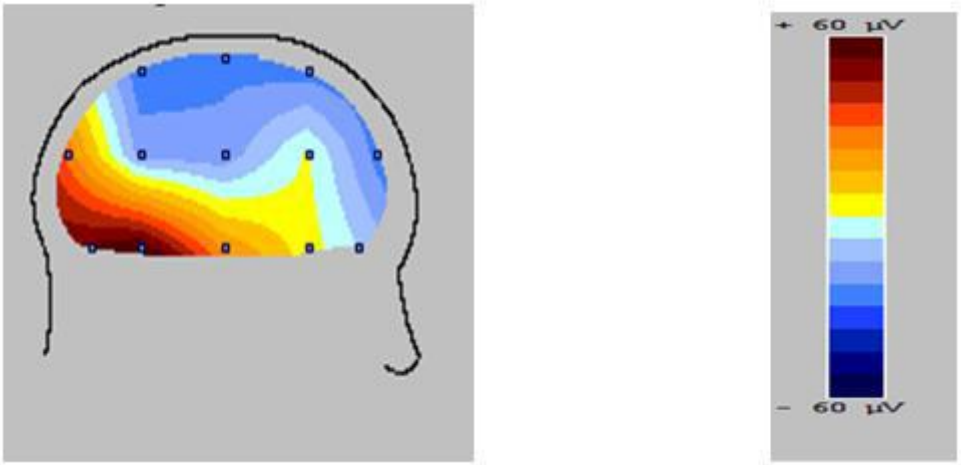


Figure 1: Effect of electromagnetic radiation on human brain

### 3.4. Constraints of Mobile Phone:

Vast technology in communication world has made mobile phone important gadgets for 21st century. Now a day it is very rare to see people not having a mobile phone and it shows mobile phone playing an important role in everyday life. Through mobile phone, communication between people become fast, easier and cheaper especially people in different countries. For business purpose, important event such as meeting and discussion can be held through mobile phone that is much more efficient and cost effective. While in emergency situation, we can easily reach emergency help line or the loved ones through mobile phone. In the past, we need map for travelling but nowadays mobile phone can be use as navigator or to check the weather forecast. Despite all the above, mobile phone still cannot eliminate its disadvantages. Communicate with mobile phone behind steering wheel can cause a serious crime because it's not only dangerous to the driver itself but also people surrounding. In 2009, a report stated that more than 45 countries already banned using mobile phone while driving. Other than that enhanced technology allows the transmission of pictures and videos through mobile phone that is offensive and inappropriate that can create unhealthy atmosphere among youngster. This can lead to immoral ethic and can cause social problem in our society. Mobile phone can also give impact to human health such as cancer, hearing capability, sleeping disorder and blurring vision. Even though all the above matter still not proven scientifically from medical perspective but we cannot ignore the possible consequences. It is crucial that in every aspect mobile phone makes our life easier. However we still cannot ignore the negative impact in our society. Today, mobile phone has become popular with everybody as it is very convenient to use. The advantage of having a mobile phone is you can communicate with your family and your friends no matter where you are. For instance, you can contact your friends easily by calling or sending messages everywhere. It is the main reason why almost all people today choose to own a mobile phone. Students need the phone for safety and security reasons. From the customer's point of view, it is obvious that mobile phones assist you in business a lot, such as, make schedule of working, surf the internet, and keep in touch

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with their companies. Moreover, you can relax with mobile phone's applications, for example, play games, listen to music, or chat with your friends. On the other hand, there are certain disadvantages. Using a lot mobile phone can harm your brain, particularly teenager and children who are under 16yearsold. If you constantly use mobile phones, it might may you feel dizzy, or cause blood-brain barrier, or ears problems. In addition, when you use mobile phones while you are driving, can cause a fatal accident. Moreover, "radiations emitted from the phone are dead harmful for the eardrum", and it has been proved by many scientist. It has irritating effect on other people in restaurants, cinema halls, and buses etc. from users shouting down their phone. Owning a mobile phone in your hand can solve many issues and hold most of information around the world. Mobile phone is a good technology which has added quality to our lives. It's up to us how we can maximize its advantages over disadvantages. Using mobile phones has lots of advantages and disadvantages and most you will be aware of that. Earlier days, when we are out of home or office, we need to search for a public telephone booth to make a phone call, but now, just pick up your mobile phone and dial. I am trying to list the Pros and cons of using a mobile phone in this post. Advantage of using a mobile phone. You are always connected; anybody who knows your mobile number can contact you. If you are travelling out of your territory or to another country, you can use the roaming facility to be connected anywhere and all the time. You can use features like Text messaging to send messages, receive messages, and send greetings, MMS for sending pictures, get information like news, flight timings and many more features. Now most of the mobile phone service providers has GPRS or EDGE or 3G enabled network. You can using internet anytime and anywhere. If you need to check your mail, you can do that when you are travelling or out of your office. You can reply to important messages or emails from your mobile phone itself. Features like Microsoft Exchange and Blackberry are really great. When you receive an email at your server, you get it pushed to your mobile phone. Latest PDA's, or iPhone are not just mobile phones, you even term it as Mobile Office. I get all my mails pushed to my HTC TyTN II. Even if I am travelling, I am always aware of the important messages and I can respond quickly without entering my office. I use remote desktop with my Pocket PC using wi-fi connections, through which I can access all my office desktop computers from anywhere in the World. There is an excellent service called Legmen, which is something I have been using for long time. Other excellent feature of mobile internet is that you can use internet sharing to using internet on your laptop while you are travelling. Just connect your PDA or pocket pc or your mobile phone with GPRS or EDGE or 3G internet.

## IV. Advantage and Disadvantage of Mobile Phone Effect

As time passes by technology are growing faster and move faster. The most important and common part of technology in our life is mobile phone technology. We bring mobile phone with us in everywhere that we go and use it on a daily basis. It is being the part and parcel of our daily life. Mobil phone have been around for quite some time, but as time goes on, mobile phones continuous to gain many features. A mobile phone started out as simple device that had only numbers, and most people used them for emergencies only. Nowadays, cell phones have many features such as phone calls, text messaging, taking pictures accessing the web, using calculator etc as many accessories. People become addicted in cell phone because they are getting many facilities by using it. For example whenever they go outside they can take the phone with them because of its size, networking range, a full charge battery, essay connection etc. There is no doubt about the benefits of mobile phones. Mobile phones have so many advantages but there have some disadvantages too. It has become a vital element for every person but nowadays it has also becoming an addiction to the young generation. If we talking about Bangladesh, nine out of ten young people in the town area, have own a mobile phone. They use it in various purposes. Their attraction of mobile phone is increasing day by day. Medical science says that the radiation of mobile phone is too bad for human health. In 1995 mobile phone has introduced to Bangladeshi people. The first mobile service provider company was City cell. Then Grameenphone, Aktel, Banglalink, Teletalk, and Warid which is being named as Airtel an Indian telecom company who has also started their business in Bangladesh. In the arena of communication mobile has becoming the latest fashion and also the most essential means of communication. These mobile phones let us enjoy all the comforts within a single device.

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## V. Results and Discussion

The result is shown in Table 2 , Fig-2. It shows that GSM operated phone has highest effect on brain activity as compared to a CDMA operated mobile phone.

Table 2: Average PSD Values of Four Channels (CH1, CH2, CH3, and CH4) Of Montage For Three Conditions Of Recording.

| | CH1 | CHH2 | CH3 | CH4 |
|---|---|---|---|---|
| GSM | 13655 | 13914 | 20291 | 94619 |
| CDMA | 6482 | 3119 | 4361 | 4711 |
| IDLE | 3009 | 626 | 2512 | 3399 |

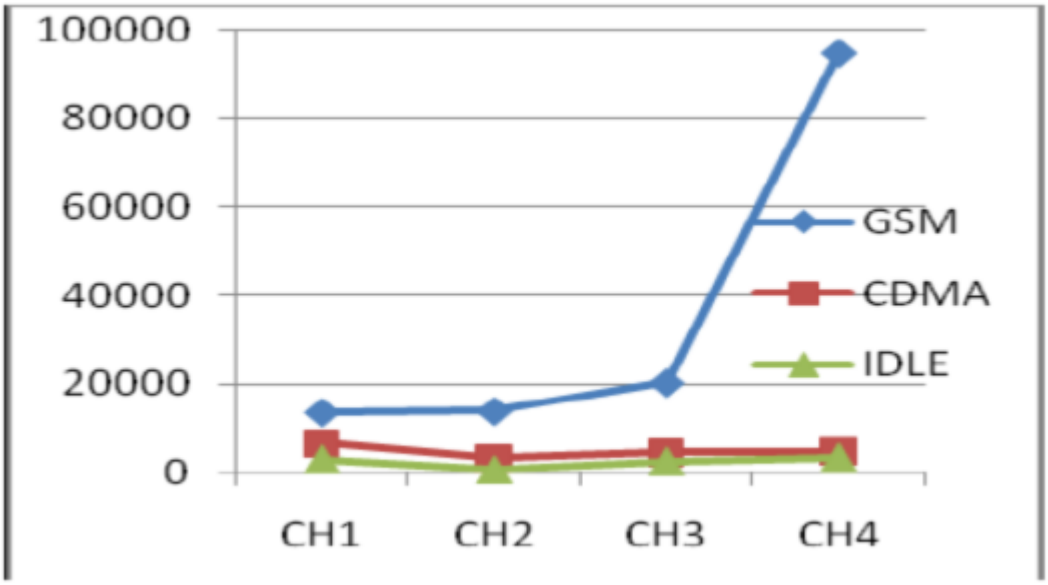


Fig-2 : Plot of Average PSD values of Four Channels of Montage

The result shows powers spectral density values for the three conditions of experiment that includes, idle with no radiation in vicinity, with GSM phone and with a CDMA phone. It can be seen from the table that PSD values with phone serving GSM technology has highest values whereas when no phone is present that is when there is no radiation in the vicinity of the subject, has the least values and values for the phone serving CDMA lies between GSM and Ile condition.

Analyses shows that mobile radiations effect human brain and GSM operated mobile phones has the higher effect on brain activity as compared to CDMA operated mobile phones. Globalization is the new mantra. In this age, it is very difficult not to have technology. But as shown in this study, with every technology invented to facilitate human beings, there come certain hazards. The only way to beat these negative aspects of new technologies is again, a new but better technology. Electromagnetic radiation is everywhere. More and more wireless communication services are expected, so is the artificial electromagnetic radiation. It seems that there is no way to reverse this trend. Scientists and engineers must develop better and safer wireless systems and devices. Smaller cell size, better base station antennas and other more advanced technologies will allow future cell phones to radiate much lower power and make technology a real boon.

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