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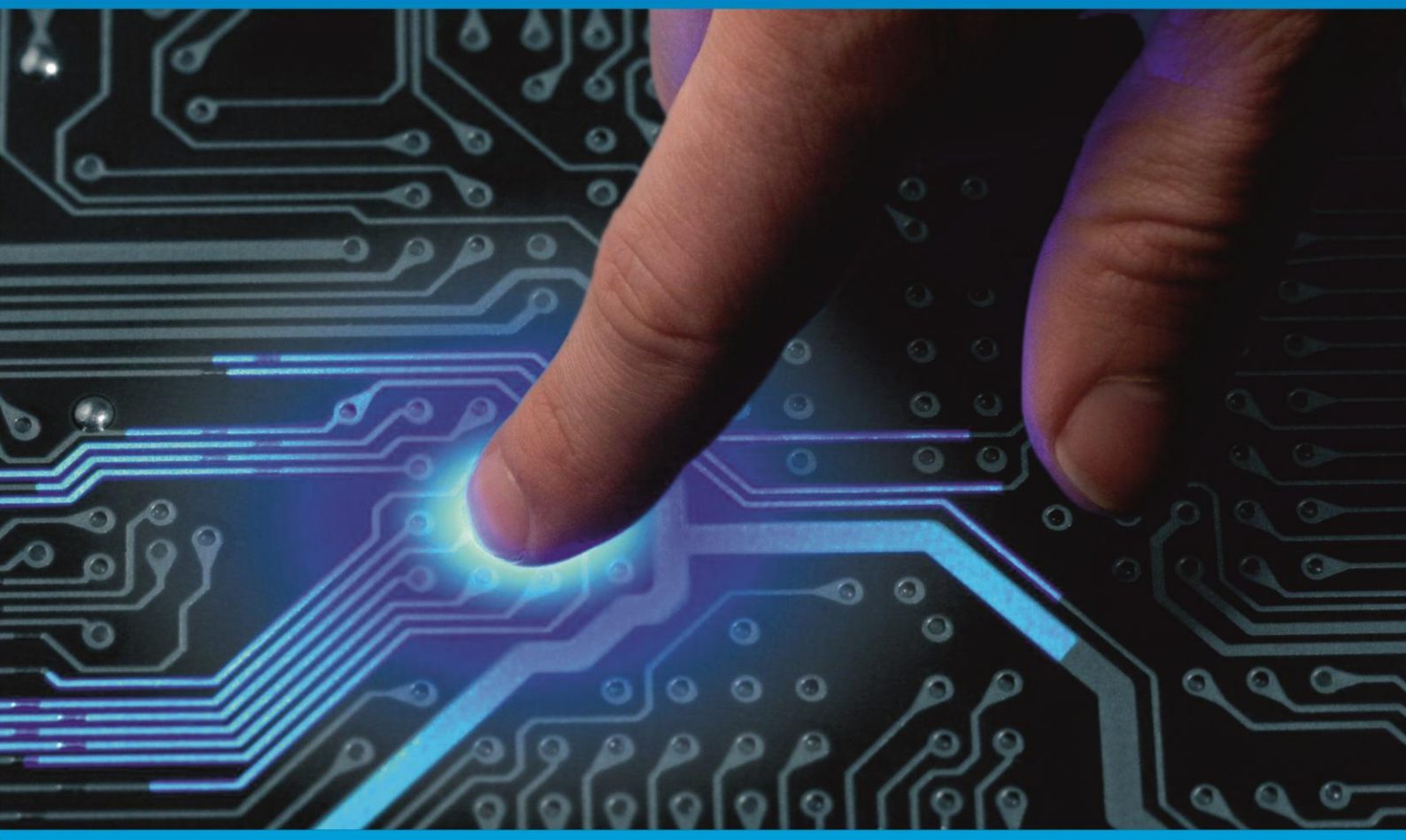

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Survey of Various Protocol for LTE Network Performance and Control under 5G Wireless Communication Applications

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ABSTRACT: Mobile phone became almost essential part of daily life for all generation of people. It functions with the help of transmission of electromagnetic waves from towers to the cell phones in the micro wave frequency region. The energy carried by the waves is not only useful for mobile communication but also produce adverse affects on the users' health as well as to all living beings which are in the radiation area. The paper aims to discuss some of the possible dark side of health concern by the usage of cell phone and radiation from the towers. It also aims to suggest the possible remedies to minimize the health problems.

KEYWORDS: Electromagnetic radiation, radiation hazard, adverse effect, SAR.

I. INTRODUCTION

The increased use of mobile phone by the public is accompanied by a wave of contradictory reports about the possible health effects, which result from exposure to electromagnetic fields (EMF) by the phone's user and neighbors of stations. Given the immense numbers of users of mobile phones, even small adverse effects on health could have major public health implications. Mobile phones also called cellular phones are becoming an integral part of modern telecommunications in the twenty first century. Mobile telephones became available from some telephone companies in the 1940s.

Early devices were bulky and consumed high power and the network supported only a few simultaneous conversations. Engineers from Bell Labs began work on a system to allow mobile users to place and receive telephone calls from automobiles, leading to the inauguration of mobile service on June 17, 1946 in St. Louis, Missouri, USA. The weight of a latest model, presented in 1961, in the then USSR, was only 70 g and it freely took place on a palm. Modern cellular networks allow automatic and pervasive use of mobile phones for voice and data communications. In many countries, over half the population already uses mobile phones and market is still growing rapidly.

Figure 1: diverse uses of electromagnetic radiation

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Cell phone usage includes help people feel safe, financial benefits, manage time efficiently, and keep in touch with friends and family members. Mobile phone enables people to communicate when, where and with whom they wish. People have various feeling and attitudes towards cell phone usage. For many parents, they offer an important means of keeping in touch with their children as they travel to and from school, sporting activities or meeting with friends. Through the global wireless network, participants scattered across a city or the world can easily coordinate activities and upload data to servers that can process it and integrate it with other data, such as GIS map layers and weather reports, that a variety of organizations publish on the web. Mobile phones are not only used for telephoning, but also for sending text messages, transferring data listening to music, playing games and watching videos, thereby exposing different body parts to electromagnetic waves. On the other hand Tele- health technology could encourage better doctor- patient interaction regarding patient symptoms and quality of life monitoring. This may be a better way of communication between doctor and patient for better health condition and curing.

The rapidly evolving mobile phone technology raised public concern about the possibility of associate adverse health effects. The telecom sector is providing millions of jobs in the world but it is also giving cancer and other serious health problem to billions of people besides causing harm to birds, animals, plants etc. to the living world. It is not only fastest growing industry but it is also creating fastest growing health problems.
Many people are increasingly concerned about the possible health effects due to frequent, long term use of cell phone and the radiation. As year after year immense numbers of users of mobile phones, even small adverse effects on health could have major public health implication. Traffic accidents caused by using telephone during driving are another public challenge. Mobile phones are often prohibited in hospitals and on airplanes, as the radiofrequency signals may interfere with certain electro-medical devices and navigation systems. In addition to the context of Nepal, as six voice telecom operators, more than 30 ISPs, more than 320 FM stations, more than 35 Television channels and one AM radio are already in operation, it is already high time to explore the signal level and develop the guidelines to minimize the health hazard from the electromagnetic radiation of wireless communication.

II. BACKGROUND

F. Laassiri et al., [1] The most issues of current cell systems outlining high postponement and bind up identify with their system firmness and consolidated administration and data planes. Nonetheless, the stipulations of 4G cell frameworks square measure low postponement, high turnout, low blockage at the center cell systems, and consistent quality and speedy surrendering in term of nature of administration. To reduce said issues it is will in general propose a 3-Level Software Defined System (SDN) structure joined with a one of a kind OpenFlow (OF) switch, which consolidates a Macroccll/Fcmtocell information Base. The reproductions demonstrate that arranged systems bring fluctuated focal points practically identical to low postponement, high turnout, minimal effort, and consistent quality and snappy giving up to Fourth Era (4G) cell systems and high Thick Systems, that square measure known as DenseNets.

D. T. et al., [2] In this work, present a fast technique for estimating the specific absorption rate (SAR) of multiple-antenna transmitting devices such as mobile phones, which utilize two or more antennas in communication. SAR values for arbitrary relative phase combinations of the antennas at an observation point can be estimated from SAR measurements for several known relative phases at the same observation point. Several numerical and experimental validations on different antenna configurations and operating frequencies have been carried out to verify the proposed estimation method. It has been highlighted that the proposed estimation method is simple yet provides highly accurate estimated SAR values.

B. Thors et al. [3] In this work, maximum specific absorption rate (SAR) estimation formulas for RF main beam exposure from mobile communication base station antennas are proposed. The formulas, given for both whole-body SAR and localized SAR, are heuristic in nature and valid for a class of common base station antennas. The formulas were developed based on a number of physical observations and are supported by results from an extensive literature survey together with supplementary measurements and numerical simulations of typical exposure situations. Using exposure limits, the proposed SAR estimation formulas can be converted to formulas for estimating compliance distance.

D. Al- et al., [4] Since the user is generally in the near field On-body antennas are accepted as more complex to optimise than their free space counterparts. Use of the body as a platform for wearable electronics is a topical subject. Omnidirectional antennas are thought to be useful for antennas in body area networks. However, the desirable properties of omnidirectional radiation patterns close to humans are severely diminished due to the lossy load nature of

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biological matter and high levels of scattering due to shadowing and mismatch. To alleviate these problems two or more antennas can be used on the body. In this paper, two on body antennas are used with three different combination techniques in order to evaluate the diversity performance and then compared with their free space equivalents. Three diversity techniques are used - Selective, Maximal Ratio and Equal Gain. The frequency of operation was 2.4GHz.

M. U. Rehman et al., [5] Electromagnetic waves transmitted by GPS satellite arriving at a GPS mobile terminal antenna undergo reflection, diffraction and scattering from various environmental objects in the vicinity. It results in the formation of a multipath arrival of the wave at the receiving mobile terminal antenna. The traditional approaches to analyse the antenna performance are therefore, not capable to describe the performance of the GPS antenna efficiently in the multipath environment. A new technique to characterise these environmental effects on the GPS antenna was presented and verified. Human body is the integral part of mobile terminal applications and its degrading effects are well established. This paper extends the study to investigate the effects of the presence of the human body in the proximity of the GPS mobile terminal antennas working in the multipath environment.

Y. L. Diao et al., [6] there are many commercial shields for 3G and 4G mobile phones re-emerging onto the market, claiming specific absorption rate (SAR) reduction; however their effectiveness is questionable. In this paper, their SAR and induced electric field (E-field) are measured, and the corresponding induced E-field inside the human body with and without implanted medical devices is analyzed. Results have indicated that the SAR values, either with and without the shields have shown no particular impact and the induced E-field on a human body with and without any implanted pacemaker are similar.

III. MOBILE PHONE GENERATION (G)

The nomenclature of the cellular wireless generations (G) generally refers to a change in the fundamental nature of the service, non-backwards compatible transmission technology and new frequency bands. New generations have appeared about every ten years since the first move from 1981 analog (1G) to digital (2G) transmission in 1992. This was followed in 2001, by 3G multi-media support, and in 2011 by 4G, which refers to all-IP switched networks, mobile ultra-broadband.

First generation refers to the analog phones as they were first introduced for mobile cellular technology. Cell phones began with 1G and signify first generation wireless analog technology. 2G signifies second generation wireless digital technology. The second generation (2G) digital cellular network includes digital phones with added fax, data and messaging services. It is fully digital 2G networks which first commercially began on the Global System for Mobil Communications (GSM). The generation 2.5G wireless technology is as an interim step up from a stepping stone that bridged 2G to 3G wireless technology. Another generation 3G is the third generation of mobile phone with further advanced features, standard and technology. 3G technologies have enabled faster data transmission speeds, greater network capacity and more advanced network services. The generation 3.5 is an interim or evolutionary step to the next generation of cellular technology, not an officially recognized standard. Another generation 4G is the term used to refer to the fourth generation of mobile wireless services, the latest generation in the mobile market. Based on the above observations, a new generation of 5G standards may be introduced approximately in 2020? Since a new mobile generation has appeared approximately every 10th year.

A. MOBILE PHONE FREQUENCY

Mobile phones are low-powered radiofrequency transmitters, operating at frequencies between 450 MHz to 2700 MHz with peak powers in the range of 0.1 to 2 watts. Frequency is the number of cycles per second that energy wave oscillates, also expressed in cycle per second (cps). Cell phone communication is carried by electromagnetic wave, basically microwaves. The cell tower transmits in the frequency range of 869-894 MHz (CDMA), 935-960MHz (GSM 900) and 1805-1880MHz (GSM 1800). The third generation 3G transmits in the frequency range of 2110-2170 MHz. The Wireless Fidelity (Wi-Fi) radiation lies 22.4 -2.5 GHz. For the accessible mobile network majority of towers of the sources are mounted near in the densely populated area

,wireless security (alarm) systems, wireless security video-camera, radio links between buildings for data communication, baby monitors, smart meters and so on. These devices are in frequent touch with the concerning people as well as nearby public. There are other kinds of ionizing radiation such as X-ray or gamma rays, relatively more

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harmful to our body. Unlike ionizing radiation radio frequency fields cannot cause ionization or radioactivity in the body.

B. BASE STATIONS

The mobile phone towers and their transmission power is designed in such a way that it covers a distance of at least few kilometers, implying that a mobile phone at that distance should be able to transmit and receive enough signals for easy communication. The cell phone holders around the tower will receive ten thousand time stronger signal than it is required for mobile communication.

Base stations are low-powered radio antennae that communicate with user handsets. Given the immense number of users of mobile phones, even small adverse effects on health could have major public health implications. Several important considerations must be kept in mind when evaluating possible health effects of radio frequency fields. These are low powered microwave electromagnetic radiation. People living 50 to 300 meter radius is in the high radiation zone. Negative impact is prompt if there is direct facing and at the similar height of the tower, especially to those who live in tall multi-story buildings near the transmitting towers.

At many places, cell phone towers are mounted on the roof top of the residential /commercial buildings. Even though antenna radiates less power vertically down but the distance between the antenna and top floor is usually a few meters, so the radiation level in the top two floors remain very high. However the concrete wall provides some attenuation and hence actual power should be less than theoretically calculated power.

C. SPECIFIC ABSORPTION RATE (SAR)

Different cell phone models emit different amounts of radiations. More the radiation emitted by the cell phone greater will be degree of health hazards. So, one of the ways to reduce radiation exposure is to purchase a cell phone with a lower SAR value. The radiation level differs from mobile phone set model and manufacturing company. It is a number that indicates how much radiation is absorbed by the human body when the handset is being used at maximum power. Its unit is watts/kilogram (W/kg).

IV. NEGATIVE HEALTH CONSEQUENCES OF MOBILE PHONE RADIATION

A. Thermal and non-thermal effects

The known biological effects associated with these fields vary with the radio frequency and intensity of exposure. Intensity varies both with the amount of power emitted by the energy source and the distance of the individual from the source. Different regions of electromagnetic spectrum may affect biological systems to different extent. The effect of radio frequency on living organisms may be didactically divided into thermal effects and non thermal effects. Thermal effects are the best known effects. They result from water molecule polarization as electromagnetic waves course through tissues and produce heat. In the case of a person using a cell phone, most of the heating effect will occur at the surface of the head, causing its temperature to increase by a fraction of a degree. Thus radiation can elevate body temperature similar to microwave oven. With a cell phone in our pocket or by our head, slight temperature increases might disrupt cellular functioning.

B. Effects on fertility:

The electromagnetic radiation (EMR) emitted by cellular phone influences human sperm motility. In addition to these acute adverse effects of EMR on sperm motility, long-term EMR exposure may lead to behavioral or structural changes of the male germ cell. These effects may be observed later in life.

C. Electromagnetic hypersensitivity

The term electromagnetic hypersensitivity (EHS) if often used to denote a phenomenon where individuals experience adverse health effects while using or being in the vicinity of electric, magnetic, or electromagnetic field sources and devices, and when the individuals themselves attribute their symptoms to these sources and devices. Symptoms experienced vary substantially between different individuals. Some users of mobile handsets have reported feeling

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several unspecific symptoms during and after its use. The effects may be burning and tingling sensations in the skin of the head and extremities, fatigue, sleep disturbances, dizziness, loss of mental attention, reaction times and memory retentiveness, headache, tachycardia and disturbances of the digestive system.

D. Possible hazards on Human beings

From World Health Organization (WHO) report evidence as found of an increase in glioma and acoustic neuroma brain cancer for excessive cell phone users. Exposure to electromagnetic radiations reduces melatonin in animal and humans. Daily cellular phone use of more than 25 minute per day over years may lead to reduced melatonin production. Melatonin is the powerful antioxidant, antidepressant and immune system enhancer that regulates our circadian rhythm. Reduction of melatonin causes, sleep disturbance chronic fatigue, depression, cardiac reproductive and neurological diseases. Some other adverse affects are loss of appetite, damage of DNA, risk of cancer, arthritis, schizophrenia, increased eye stress, renal impairment, Alzheimer's,Parkinson disease and increased risk of childhood leukemia.

The risk is highest on the same side of the head where the mobile set is held. Radiation from the cell phone also dries up the skin, the fluid in the nearest eye and it also penetrates the skull and heats the brain. Consequently it brings sleeping disorder, headache, irritation, loss of memory, lack of concentration and ultimately brain tumor. A research report found a direct association between the duration of cell phone usage among men and a decrease in semen quality, sperm count, mortality, viability and normal morphology. Signal generated by mobile phones causes electromagnetic interference with the device like pace makers, Implantable Cardiovascular Defibrillators(ICDS). So their functions may be improper.

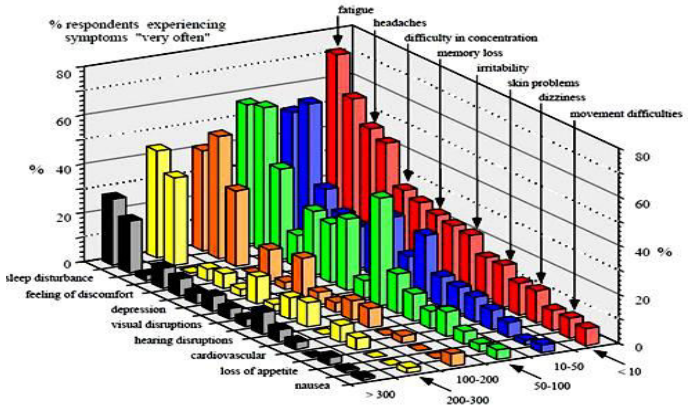

Figure 2: Electromagnetic Hazards According to Sanitini 2002

When we are exposed to solar radiation, heating our body takes place from outside to inside. Heating of skin is more affected than the internal parts of our body. For the compensation of heat, sweating in our body takes place. On the other hand, when our body is exposed to microwave radiation, its heating effect is from inside to outside .It produces internal heating effect earlier. So heat is trapped inside our body. Unnecessary head is trapped in cells which may cause their damage.

V. CONCLUSION

The diverse uses of electromagnetic radiation becoming an inevitable part of human being in the modern technology. We are receiving continuous radiation from cell phone towers, cell phones, wireless phones, computers, laptops, TV towers, FM towers, microwave ovens, etc. Our body is exposed to all these radiations, which are additive in nature. This does not mean that we neither have to stop living near these towers nor stop using cell phones and other accessories. As a common fact, that automobiles create air pollution and we don't stop using them. Instead solutions are to found to minimize the degree of radiation pollution. Likewise, the individual should use cell phone with great conscious of its dark sides. Moreover stricter radiation norms must be enforced by the policy makers.

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